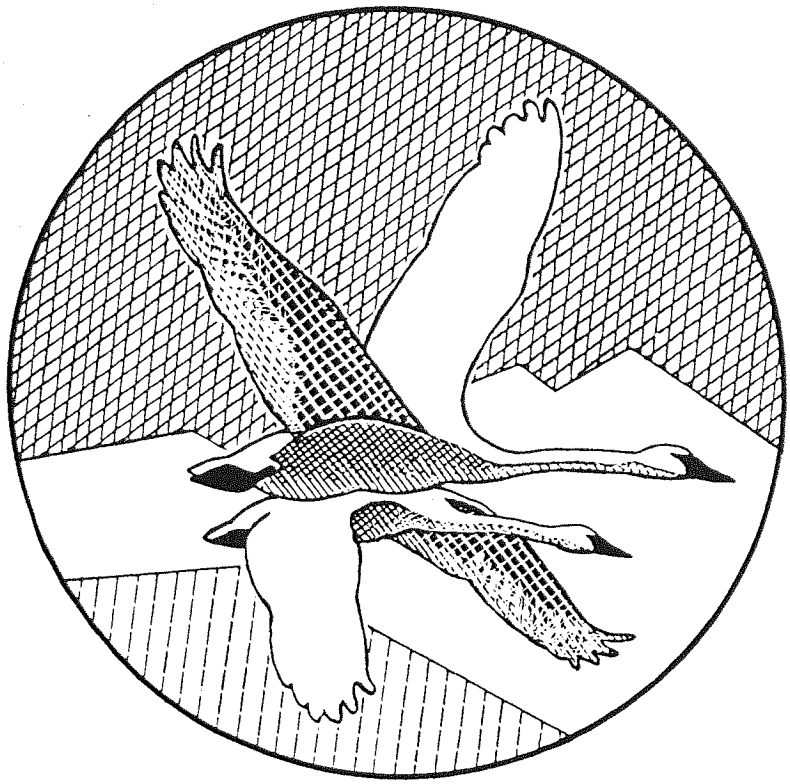
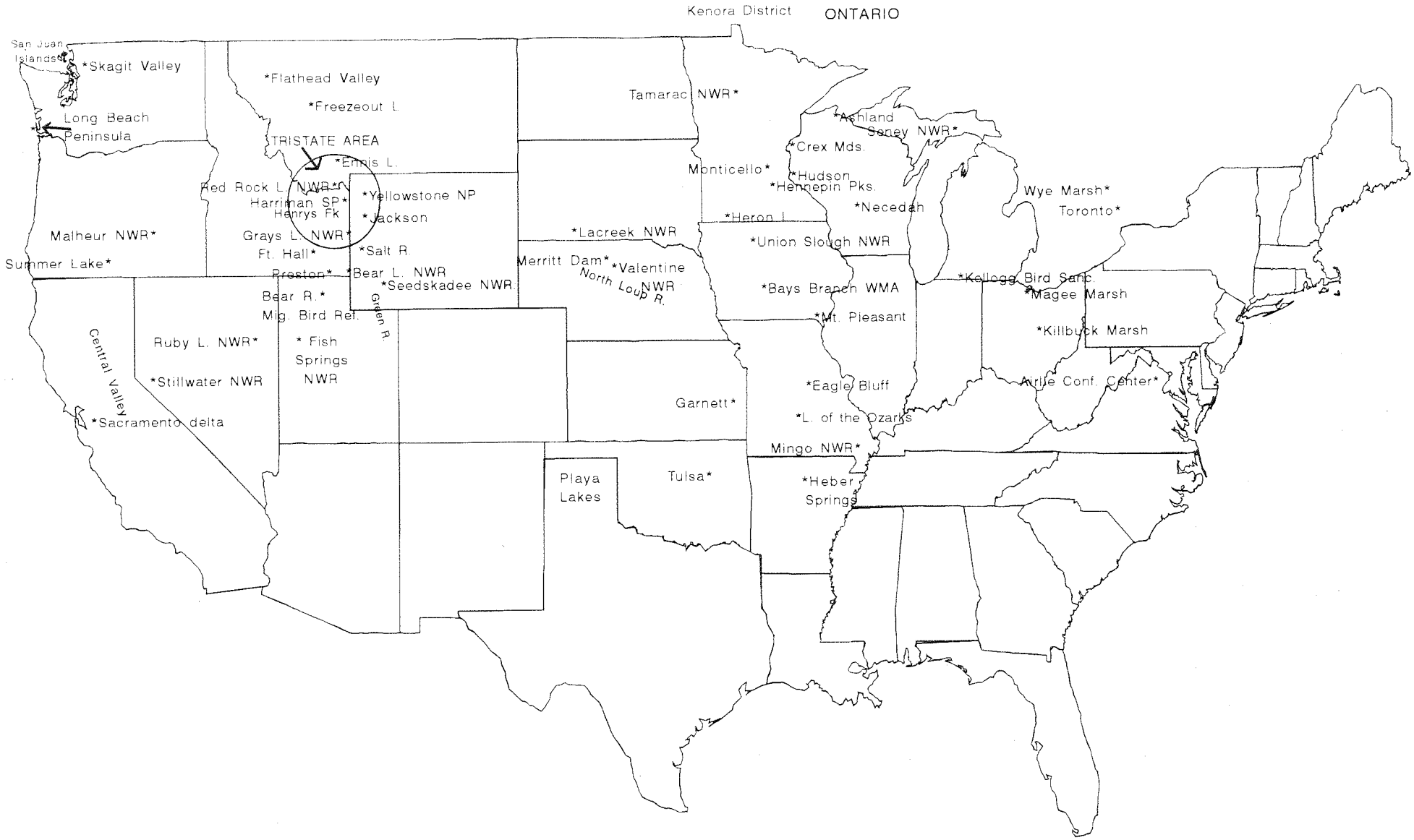
North American Swans



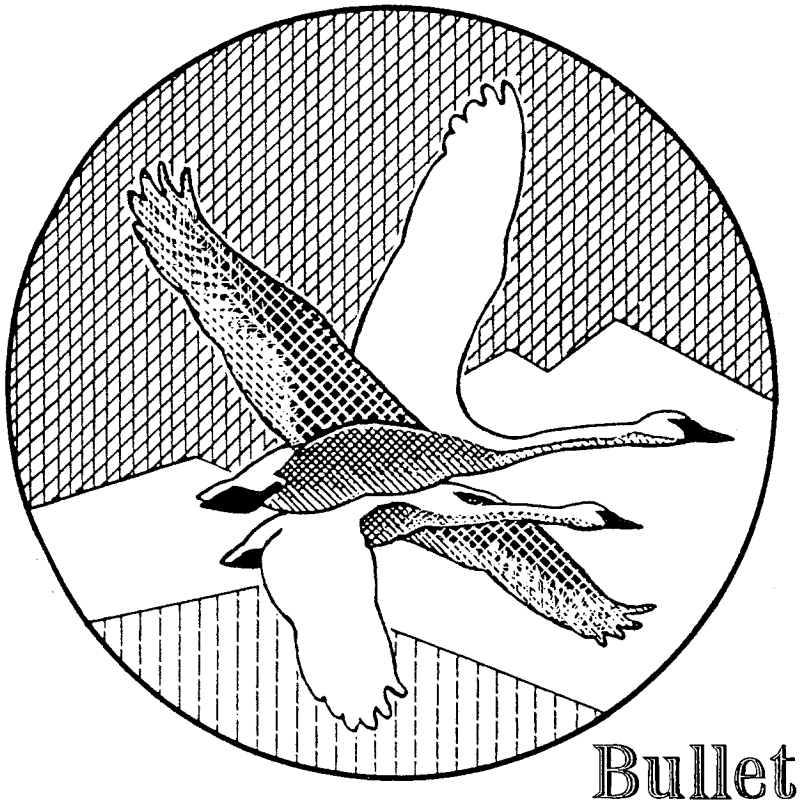
Bulletin of The Trumpeter Swan Society

Volume 31, No. 1 - December 2002



AREAS OF SIGNIFICANCE FOR TRUMPETER SWANS

North American Swans



Bulletin of The Trumpeter Swan Society

Volume 31. No. 1 - December 2002

Editors
Madeleine H. Linck
Harvey K. Nelson

Editors' Note: *North American Swans* replaces *The Trumpeter Swan Society Newsletter*. We will preserve the same system of numbering volumes and issues so that historical information available from the *Newsletters* will not be lost. Our intent is to cover topics in depth, have regional information in each edition and publish reports of research and management that would otherwise be unavailable. We will include articles and research on other species of swans as the information is pertinent to Trumpeter Swans. Publication schedule will be determined by the Editorial Board.

Please feel free to submit reports or articles for publication at any time. Submit articles to: The Trumpeter Swan Society, 3800 County Road 24, Maple Plain, Minnesota 55359. Diskettes can be accepted. Please format in Microsoft Word if possible. Clearly label diskette and send a hard copy as well.

Published by The Trumpeter Swan Society. For more information please contact: The Trumpeter Swan Society, 3800 County Road 24, Maple Plain, MN 55359, (763-476-4663; E-mail: ttss@threeriversparkdistrict.org).

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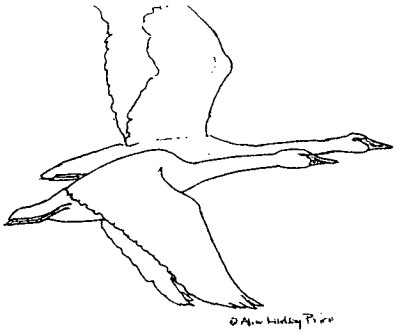

From the President

Harvey K. Nelson

During the past year, The Trumpeter Swan Society (TTSS) Board members have been addressing several new initiatives, three of which are: (1) Improving communications. (2) Launching a strategic planning process. (3) Preparing for the 19th TTSS Conference in February 2003. I want to bring the membership and others interested up to date on the current status of these efforts.

In the December 2001 issue of *North American Swans*, I elaborated on the intent of TTSS to improve and expand our publications and communications. Our goal is to provide timely news regarding management issues and status of Trumpeter Swan populations. Although our publications focus primarily on Trumpeter Swans, we welcome material pertaining to the ecology and management of our native Tundra Swans and introduced Mute Swans. Interactions between these species are increasing, particularly where their ranges overlap. A better understanding of the similarities and differences in their seasonal habitat requirements is needed to help improve future management.

Our newsletter, *Trumpetings,* continues to convey highlights of recent research and management programs, and other timely news items. *Trumpetings* will continue to be published 3-4 times per year. We urge anyone interested to submit pertinent swan news. Longer articles and regional notes are published in *North American Swans,* which is widely distributed to libraries and agencies. It will be published at least once each year, in late fall, and, more frequently, if we have adequate material and staff time allows. We encourage those who seek to publish in *North American Swans* to submit manuscripts by June 1 to allow sufficient time for review and editing. We are in the process of strengthening our editorial board, and welcome assistance from any of our members or other contributors who would be willing to review and edit draft manuscripts, especially in their area of expertise. If we increase the number of issues, we may eventually need a part-time editor. If there are any experienced editors out there who can help, please let us know.

While TTSS conducted a formal organizational study in 1991, we recently embarked on a more comprehensive strategic planning process. The intent is to reexamine the mission statement, organizational goals, objectives and strategies so as to better define priority program needs and resources required to accomplish our mission over the next 10 years. There will be increased emphasis on membership involvement. The effort is being led by Director Mary Maj from Bozeman, Montana. The last issue of *Trumpetings* solicited input from members and other supporters. The Board of Directors will address strategic planning in further detail at the upcoming 19th TTSS Conference. Additional information on progress and scheduling will be circulated after the Conference. This is your opportunity to provide meaningful input into this process that will help guide TTSS for the next decade. We welcome your suggestions. If you can help in any way, please contact Mary Maj through the TTSS office.

The 19th TTSS Conference will be held in Richmond, British Columbia, February 5-8, 2003. Final arrangements are being completed, and an excellent agenda of presentations about current research and management issues is promised. While the conference will highlight Trumpeter Swans in the northwestern United States, Canada and Alaska, there will be presentations on all Trumpeter populations and on other North American swan species. We welcome you to join us. Call 763/476-4663 or e-mail Executive Director Ruth Shea at ruthshea@srv.net for a conference agenda. To learn about TTSS and how to become a member, please see the back page of this issue.

In closing, I want to thank the membership and the Board of Directors for the opportunity to serve as President of TTSS for the past 4 years. It has been a challenging and rewarding experience. We have accomplished much together to enhance the welfare of Trumpeter Swans in North America, but there are continuing pressures and much remains to be done. I stand ready to continue to lend my support to help resolve these issues and make future management programs more effective.

Harvey K. Nelson, TTSS President, USFWS Retired
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Bloomington, MN 55437

Selected Papers

Hatchability of eggs from captive Trumpeter Swans

Harry G. Lumsden

Introduction

The Ontario Trumpeter Swan Restoration Program uses captive pairs cared for by cooperating land owners to raise stock for release. Nearly all these breeding pairs originated from aviculturists and were descended from the Greater Yellowstone Population (GYP), also called the Rocky Mountain Population or the Tri-State subpopulation. Hatchability of eggs produced and incubated by these birds was low and there was an unusually high rate of deformity in the hatchlings. Over an 18-year period, the captive breeding pairs incubated 810 of their own eggs and had a hatch rate of only 56%. Hamilton dispelled the possibility that the cause was chemical pollutants or pesticides (Hamilton 1996). She examined 19 dead Trumpeter embryos in their last week of artificial incubation. She found that 14 (74%) showed subcutaneous edema over the head, neck and the foot region distal to the tarsal joint. Twelve (63%) were also found to suffer from curled toes and feet, twisted vertebrae and shortened, wrinkled beaks. Hamilton suggested that improper temperatures in an incubator could cause such deformities. We have, however, found dead hatchlings on the nest with curled toes and feet that had been incubated by wild swans under presumably natural incubation temperatures. The origin of many of our captive breeding stock was the Red Rock Lakes National Wildlife Refuge in Montana. E. Stroops, Refuge Manager, also reported dead cygnets with deformed feet in the nests of wild swans at that refuge (E. Stroops, pers. comm.)

Marsolais and White found that the Ontario captive breeding stock had less genetic variation than the wild Pacific Coast Population (PCP) breeding in Alaska and the Western Canadian Population (WCP) breeding near Grande Prairie in northern Alberta. The Ontario mean Band Sharing Coefficients (BSC) were more similar to the mean BSCs reported for inbred species than for outbred populations (Marsolais and White 1997). They recommended that birds from the PCP or WCP be introduced into the Ontario captive breeding stock to increase genetic variability. We used PCP eggs collected in Alaska because WCP eggs were not available.

Methods and materials

In June 1993, 50 eggs were collected from wild nests on the Minto Flats west of Fairbanks, Alaska (Lumsden 1993). They were artificially incubated. Twenty-eight cygnets were raised in isolation from humans (4 groups of 7) and the remaining 14 were exposed to their keepers (2 groups of 7). The cygnets were used in time budget behaviour studies (Eadie *et al.* 1997). The studies were terminated at 11 weeks of age and all were moved to Metro Toronto Zoo where they were penned as a single flock. Twenty (9 male; 11 female) were pinioned as yearlings and moved to Aurora, Ontario. There they encountered bereaved swans from cooperating landowners and birds bought from aviculturists. The Alaskan swans chose or were chosen as mates by birds originating from GYP, and, in one case, by a bird from the WCP. A stable pair bond was determined when a male and female were usually tallied as nearest neighbors, performed triumph ceremonies together directed at other swans and were seen to copulate.

The bonded pairs were then moved to cooperators for breeding. From 1997-2001, there were two comparison groups: those in which both male and female were from the GYP; and those with one of the pair from the PCP. The Mantel-Haenszel

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test (Snedecore and Cochran 1971) was used for statistical comparisons.

Results

Among the 2-year-olds, there was much promiscuous copulation (Lumsden 1999), but no Alaskan swan formed a stable pair bond with another from Alaska. These birds originated from 16 different nests. It is possible, however, that having been penned as a single flock from 11 weeks of age, they regarded one another as siblings and perhaps not as eligible mates.

Two of the young birds from Alaska nested for the first time at 2 years of age in 1995, three at 3 years, four at 4 years, one at 5 years, one at 6 years and one at 7 years. Not all pairs bred every year. Movement to a new location usually inhibited nesting the following year. Wild pairs flying into their pen killed two captive males in spring. A similar attack on another captive pair, although not fatal, resulted in their failure to breed that year, although they had nested the previous year and subsequently on the same pond. Pinioned captive males are at a severe disadvantage when fighting with a full-winged bird and are probably not capable of maintaining adequate balance.

Table 1 summarizes the productivity data for pairs of GYP origin, compared to pairs with one Alaska partner. The Mantel-Haenszel test (Snedecore and Cochran 1971) was used to compare hatchability between the two groups. There was a significant difference (chi-square=22.8, df=1, $P<0.0001$) in hatchability. However, there was no significant difference between the two groups in the number of cygnets raised to 13 weeks as fledglings (chi-square=1.21,n.s.). The variability in the fledging rate was very much higher than in the hatchability rate.

Between 1997 and 2001, 115 eggs hatched from 25 nestings of pairs that contained a male partner from the PCP. Those with a female PCP partner hatched 107 cygnets in 21 nestings. The difference was not significant (X^2=.0332.n.s.)

Conclusions

Captive Trumpeter Swans originating from the Greater Yellowstone Population possessed less genetic variation than two other discrete wild populations. From 1982 to 1999, the egg hatchability of birds from the Greater Yellowstone Population was low at 56%. Between 1997 and 2001, the hatchability of the same birds was 57%, but, in the same period, the Greater Yellowstone swans paired to a mate from the Pacific Coast Population hatched 74% of their eggs.

While improper incubation temperatures in an incubator may have been partially responsible for the deformities seen by Hamilton, it seems likely that a genetic cause was also involved since similar deformities appeared among embryos incubated under their own parents. The improvement in hatchability of eggs produced by PCP birds paired to GYP mates supports the view that inbreeding was one of the causes of poor hatchability.

Acknowledgments

We are most grateful to Rod King, U.S. Fish and Wildlife Service (USFWS), who flew us to collect eggs in Alaska. Permission was granted by the State of Alaska and the USFWS. I am most grateful to Dr. Beren Robinson, University of Guelph, who carried out the Mantel-Haenszel test on the data. The Ontario Federation of Anglers and Hunters sponsor the restoration program. Scott Paper Ltd. funded the egg collection project and the Amherst Wildlife Foundation supervised subsequent funding.

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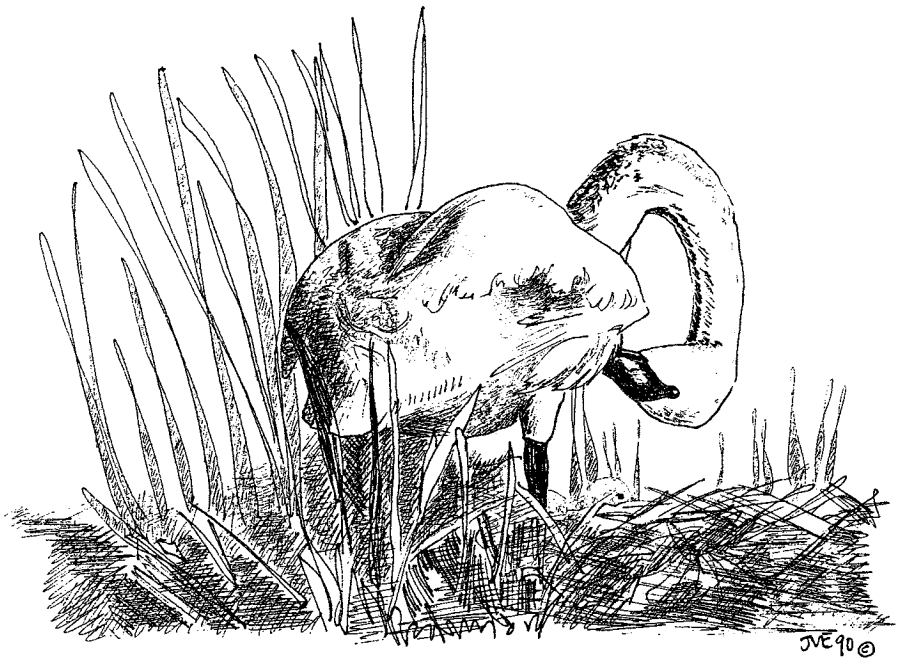
Table 1. Comparison of productivity between two groups of captive breeding Trumpeter Swans.

	Greater Yellowstone Pairs						Pairs with one Alaskan partner					
	Pairs	Eggs	Hatched	% Hatched	Fledged	% Fledged	Pairs	Eggs	Hatched	% Hatched	Fledged	% Fledged
Year												
1997	7	47	29	62	19	66	8	36	27	75	17	63
1998	7	46	27	59	20	74	11	70	54	77	43	80
1999	10	57	37	65	23	62	8	52	40	77	34	85
2000	6	57	41	72	20	49	10	61	43	70	32	74
2001	7	55	15	27	14	93	11	76	55	72	43	78
TOTAL		262	149	57	96	64		295	219	74	169	77



High Plains Trumpeter Swan nesting ecology

Harold H. Burgess

In this paper I discuss Trumpeter Swan (*Cygnus buccinator*) nesting behavior and ecology, which could not be adequately addressed in "History of the High Plains Trumpeter Swan restoration" (Burgess 2001).

Dr. James Cooper described the Hennepin Parks Trumpeter Swan nesting behavior in much better detail than I can from my limited experiences and resources (Cooper 1979). Suffice to say that I have observed at Lacreek National Wildlife Refuge (NWR) in South Dakota, most of the Trumpeter behavior that he describes. It does appear that the Lacreek cobs were more involved in gathering and passing nesting materials to the pens, than the behavior described by Cooper. The difference may have been due to the necessity for swans at Lacreek to gather their own nesting material, unlike at Hennepin Parks, Minnesota, where nesting materials were provided.

Both the pen and the cob were conspicuous during nest-building and egg-laying, both posturing against real and imaginary threats. (This is the best time for aerial nest searches because the swans will vigorously display against low-flying aircraft.) But once incubation started, the pair seemed to melt into the marsh. Nearby Canada Geese did not bother them, but if another swan or an American White Pelican appeared, the cob rose out of the rushes and chased it away.

But let us look at the notes that the Lacreek Refuge managers left behind. Nineteen Trumpeter cygnets were received in late Summer 1960, 17 were received in 1961 and 20 were received in 1962. All had their primary feathers clipped on one wing, so that they could not fly until they grew new primaries.

Thirteen cygnets were allowed to regain flight in 1961. They spent the summer exploring Lacreek Refuge's marshes and the vicinity as far away as 110 miles (177 km). Hughlett reported that six Trumpeters appeared paired, and had established breeding territories on the Refuge (Hughlett 1960-61). In 1963, three pairs defended territories, but only two pairs nested on the Refuge. The other pair vigorously defended its territory, but did not nest (Monnie 1962-65).

The 1961 cygnets regained flight in 1962, and at least one pair of these nested on the Refuge in 1964. The Trumpeters found some acceptable nesting habitat off-refuge. One nest was located near Weta, South Dakota, on a Buffalo Gap National Grasslands impoundment, 45 miles (72 km) to the north, and another nest was found on a 400-acre (156 hectare) Sand Hills lake 15 miles (26 km) southeast of the Refuge

The Weta nest was built on the dam's emergency spillway; the Sand Hills lake nest was probably built on a muskrat house. The Weta nest was washed-out in 1965. The pair then built a nest mostly of willow twigs on a brushy island, and have nested there ever since (Lacreek NWR Reports 1960-98). The 1962 cygnets were reclipped and held an extra year to reduce their wandering off-refuge. Courtship and pairing occurred in mid-winter 1964, but none nested on the Refuge, probably because the best refuge nesting territories were occupied and vigorously defended. Off-refuge wandering was more pronounced than ever.

Monnie was the first to publish about Trumpeters nesting at less than 3 years of age (Monnie 1966). Trumpeters were thought not to nest until they were 4 or 5 years old. He attributed the early nesting to abundant undefended nesting territories.

John Ellis and Don Young studied the swans nesting on Lacreek Refuge in 1967. The incubating pen left her nest 150 to 400 yards ahead of the observer. She swam several hundred yards from the nest before flushing. No pairs defended their nest from man. In our experience, the pen regarded the intervening water as a defensive barrier, and she left the nest as soon as we got into the pool.

The nests were built on muskrat houses with bulrush or cattails. The swans gathered all nesting materials within two body lengths of the nest. This left a water moat several feet wide around the nest. The pen built the nest. The cob worked the outer area passing material to the pen. The base of the nest averaged 7.6 feet. The top averaged 6.6 feet, with the nest top 3.65 feet above the water. The depth of the water in the moat averaged 17.4 inches. Four of the five refuge nests hatched between 20 and 27 May 1967. The average clutch size was 6.4 eggs, and ranged from 4 to 9. Sixteen cygnets hatched, but only 13 fledged (Ellis 1966-68).

In 1968, only three pairs nested on the Refuge (perhaps due to the stress of the nest studies). Nest

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construction began between 4 April and 8 May. Hatching was between 20 May and 18 June. Average clutch was seven eggs. Seventeen of 21 eggs hatched. Eleven cygnets fledged on-refuge and at least six fledged off. In 1970, six pairs nested on the Refuge. Ten cygnets fledged on-refuge and at least 10 fledged off-refuge. Thereafter, more cygnets were produced off-refuge than on (Lacreek NWR 1960-98).

Only four Trumpeter pairs nested on the Refuge in 1971. Pool #9 had been drained over the winter, eliminating the muskrat houses. One of the two Pool #9 pairs built a nest from ground up. The other pair did not nest. Eleven cygnets were fledged on-refuge, at least 17 were fledged off-refuge (Hall 1969-71).

The Trumpeters nesting on Sweet Dam near Interior, South Dakota, and at Twin Lakes near Irwin, Nebraska, were unique. The swans nested in fresh water among cattails and bulrushes, but took their day-old cygnets to open alkaline lakes to feed on Fairy Shrimp and other invertebrates for about a month before returning to the fresher waters to gorge on aquatic vegetation.

A pair built two nests on Pool #10 in 1972 and vigorously defended both, but laid no eggs. They acted very much like the pair that defended Pool #6 in 1963. We called them "the spoilers," and thought that they were a pair of cobs (Burgess 1972-77).

A pair of Trumpeter Swans summered on Lee Hamm's White River gravel pond near Interior, Jackson County, South Dakota, during 1969-71, where there were no attractive nesting sites. In 1972, this pair nested on one of the two muskrat houses in the pond. They continued to nest there until 1976, when again there was no muskrat house in the pond.

That should have alerted us to what would happen in other hard clay "Badland" sites. There were six known Trumpeter nest sites in Pennington County, South Dakota, in 1976. The 1991-98 Aerial Production Surveys found no Trumpeters in Pennington County. Droughts in these South Dakota clay lands may have eliminated the muskrats, their houses and swan nest sites. It seems that if the habitat is not suitable for muskrats, it is marginal for Trumpeters.

Extreme droughts and extreme wet seasons are common in South Dakota's clay lands but rare in the Nebraska Sand Hills. The sandhills act as huge sponges to take up the water with little runoff during wet seasons, and usually provide a dependable supply of water for swans during droughts.

There have been many instances of High Plains Trumpeter Swans abandoning their nest sites due to the disturbances of studies, capture, water manipulations, fishing, haying, and fires, yet Trumpeters can acclimate to many disturbances. For an example, Trumpeter Swans nested in a pond adjacent to the Chicago Northwestern Railroad, west of Merriman, Nebraska. This railroad was used to haul low-sulphur coal out of Wyoming. Ten trains of 100 cars each may have passed them daily, yet these swans fledged cygnets for many years.

Acknowledgments

I wish to thank the Lacreek NWR staffs for their notes on nesting Trumpeter Swans for 1960-98. John Ellis' and Donald Young's basic nest data were very useful for this paper. My son, Thomas G. Burgess, Professor of Anthropology, Queens College, New York edited an earlier draft. My daughter, Mary Bote, Database Administrator, Pitney-Bowes, Houston, Texas, edited the final draft. However, I alone take responsible for any error of fact or interpretation that appear.

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Trumpeter Swan myths, movements and migrations of the High Plains Flock

Harold H. Burgess

Introduction

The subjects of "Myths, Movements, and Migrations," "Nesting Behavior and Ecology," and "Vitality and Mortality" could not be addressed adequately in "History of the High Plains Trumpeter Swan Flock Restoration" (Burgess 2001). Myths, movements, and migrations are addressed in this paper.

Myths

Some of the mysteries and myths surrounding the life, movements, and migrations of Trumpeter Swans (*Cygnus buccinator*) have been unraveled in studies of the High Plains Flock. Some observers had thought that Trumpeter Swans were solely wilderness birds. Studies indicate that Trumpeters were wilderness birds because settlement and civilization had isolated them there and had selectively eliminated other swans. Trumpeter Swans reared in more temperate agricultural regions were more productive than Trumpeters reared at Red Rock Lakes National Wildlife Refuge (NWR), Montana.

Others thought that the Trumpeter Swans of the "Yellowstone Thermal Ecosystem" were genetically non-migratory. The Red Rock Lakes Trumpeters were sedentary because their habitat was adequate. They had no reason to leave their thermal-heated waters in winter, and the migratory elements of the flock had been selectively eliminated. Trumpeter Swans transported from Red Rock Lakes to Oregon, Nevada, Manitoba, South Dakota, and Washington were very mobile.

Some managers were adamantly opposed to supplemental feeding of Trumpeter Swans. They believed the myth that once Trumpeters were imprinted on artificial food, they would not leave it. However, the swans prefer natural aquatic vegetation over grain, where it is available. During the winters of the 1960s, 80 percent of the Lacreek NWR Trumpeters used the grain feeder site. But, by 1998, less than 15 percent of the High Plains Flock wintered in that area.

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Young Trumpeters seem to have an instinct for exploring. Hand-reared cygnets often wander far distances south when allowed to fly their first winter without adult guidance. Witness the seven Wisconsin-released cygnets that migrated to Dallas, Texas, in 1989-90. Managers were prone to give up those wanderers as lost, but some of them were reported in Minnesota in 1990.

The mystery of Samuel Hearne's large "barren geese" in the Hudson Bay area in the late 1700's was solved when Dr. Harold Hanson discovered banded yearling giant Canada Geese (*Branta canadensis maxima*) migrating into that undisturbed area to molt. Of course they were barren -- they had not matured (Houston 1987).

Subadult Trumpeters seem to have the same instinct to migrate north into undisturbed marshes to molt. Many young Trumpeters have been given up as dead when they moved north out of their management area, only to reappear later.

Movements

So it was with the Lacreek subadult Trumpeters. They dispersed widely, and always some adults were missing from the previous years, and usually some could not be accounted for during the peak winter count that had been present earlier during the current year. C. A. Hughlett, Lacreek Refuge Manager from the late 1950s until 1962, suspected that some were wintering off-refuge in the early 1960s. It did not occur to him that they might be migrating south.

James Monnie, Refuge Manager in the early 1960's, was concerned that most yearling Trumpeters were wandering off-refuge 110 or more miles away. He reclipped the 1962 cygnets to hold them a second year, but when they were allowed to fly, they all left the Refuge (Monnie 1966). In addition to the three pairs nesting on the Refuge from the 1960 and 1961 cygnets, one pair was nesting 45 miles northwest in Jackson County, South Dakota, and another pair was nesting 15 miles southeast on North Cody Lake, near Cody, Nebraska, in 1964. This was near South Cody Lake, where three Trumpeter cygnets were shot during the November duck hunting season. The swan family may have been pioneering into a new wintering area, because an extended Trumpeter family flock has been reported wintering on South

Cody Lake ever since. Rolf Kraft, the current Refuge Manager at Lacreek, found 16 Trumpeters wintering there on 24 January 24 1988.

Two Trumpeter pairs were observed on Valentine NWR about 61 miles southeast of Lacreek NWR during the summer of 1966. Eleven Trumpeters summered on Valentine Refuge during 1967. A pair was observed there on 17 March 1969. They nested and fledged two cygnets. This family was joined by another adult and two cygnets. They remained there until 18 December.

A Trumpeter pair returned to Valentine Refuge in 1970 to nest and fledged three cygnets. The pen was crippled on Merritt Reservoir during the November waterfowl hunting season. She could not fly and was taken to the Lacreek wintering area. Her family returned to Valentine Refuge and remained until 9 December 1970. On 17 February 1971, two adults and two cygnets appeared on Valentine NWR (Peabody 1973).

A few wintering Trumpeters were regularly reported from the Valentine Refuge/Merritt Reservoir/Snake River Complex. They were seen from public roads and access areas. It did not occur to us that there might be more wintering on nearby inaccessible wetlands until Kraft found 142 birds on Upper Snake River in December 1997, and 168 on 24 January 1999.

The young swans were spreading out from Lacreek seeking undefended nesting territories. South Dakota Conservation Officer Mike Miller reported a pair of Trumpeters on Dogear Lake in Tripp County, 75 miles to the east in 1974; Conservation Officer Jack Kuhl two adults and a cygnet on 4 May 1975, near Hayes in Stanley County, 61 miles north northeast; and Conservation Officer Darrel Tilber a pair of Trumpeters on Carmichael's Impoundment in Ziebach County, 150 miles north. Also, Conservation Officer Larry Stomprud reported Trumpeters had been nesting around Mud Butte in Meade County since 1972.

A peak of only 130 Trumpeters was counted at Lacreek in December 1975, eight less than in 1974, despite expanded brood production. At least 20 percent were thought to winter off-refuge.

Winter vacations were spent searching for potential Trumpeter wintering areas. In Nebraska, from the main highways, only the Calamus River in Loup County and Blue Creek in Garden County appeared to have sufficient open water and aquatic plants for wintering Trumpeters.

Blue Creek was 108 miles south of Lacreek and less exposed to north winds than the Refuge's pools. Here, we had a nearby base of operations, because Crescent Lake NWR, Garden County, Nebraska, was immediately north of Blue Creek. We traded three female cygnets for three males from Hennepin Parks, Minnesota, to get unrelated matches for Lacreek females, and translocated six cygnets to Crescent Lake NWR for release as 2-year olds.

Migration

Meanwhile, Trumpeters were moving into the southern Sand Hills of Nebraska. A pair nested during 1974-75 on Rush Creek Cattle Company lands in Morrill County immediately west of Garden County. Swans began visiting Crescent Lake NWR, and probably Blue Creek, as they moved around in the southern Sand Hills.

The Crescent Lake translocated Trumpeters were eventually killed by coyotes or died from other causes without fledging a known cygnet, but their presence decoyed other Trumpeters to the area. Blue Creek has been a Trumpeter wintering area for about 10 years (Forsberg 1995). Kraft found 42 Trumpeters on Blue Creek on 24 January 1998 and 105 on 14 January 1999.

During the 1978 Missouri goose hunting season, Department of Conservation workers found a Trumpeter pen and two cygnets stashed in a dumpster at Thomas Hill Wildlife Management Area in Macon County. The pen had been banded as a cygnet 4 years earlier at Lacreek NWR. She was apparently leading her family of four cygnets and her mate down the old traditional migration route to the lower Mississippi.

Officials noted this and developed a plan whereby Missouri would translocate adults and cygnets from Lacreek to Mingo NWR in the southeast corner of Missouri with the idea that the cygnets would imprint on the wintering area and the adults would return to their breeding grounds in South Dakota (Burgess *et al.* 1982). The adults remained and nested at Mingo, and the surviving cygnets also stayed. Several modifications of the plan were tried over a 6-year period. Thirty-five Trumpeters were transferred from Lacreek to Missouri during 1982-87. Only two Trumpeters were known to have returned to Lacreek. Seven remained in the Mingo NWR area when the experimental program was shelved in 1988 (Smith 1988).

Our first record of probable Lacreek Trumpeter Swans migrating to Texas was Randolph Mahone's report of "about 32 mature and adolescent Trumpeter Swans in a Jackson County reservoir 1.5 miles west of Francistas, which lies between the east and west branches of the Carankahua Creek during 1976-77. I took photographs of the swans and gave them to U. S. Fish and Wildlife officer Ed Flickinger" (Randolph Mahone pers. comm.). These photos were color slides of 18 adult Trumpeters at baited duck hunting blinds east of Edna shown to me by Flickinger in 1979. Since the larger flock contained about 32

adults and cygnets, the families must have chosen to feed in the marshes, while the unattended adults fed on milo at the blinds.

Apparently, some of those swans persisted in feeding in that reservoir during 1984-85. The eight Trumpeters seen and heard flying over Brenham, Texas, in Washington County on 6 November 1988, may have been en route to their Jackson County wintering area (Burgess and Burgess 1995).

The Lacreek Flock peaked at 263 in 1983. But, that number dwindled to 160 by New Year's Day after a period of very frigid weather. Migration was suspected. Eight adult Trumpeters with five cygnets spent much of the 1983-84 winter on the South Canadian River near Maud, Seminole County, Oklahoma. Six adult Trumpeters with five cygnets were seen near Dumas, Arkansas, on the Arkansas River, 20-30 December 1983. One adult carried an iron-stained yellow collar. It had to be from Lacreek as no other collared Trumpeters were migrating in the Mississippi Flyway at that time (Burgess and Burgess 1995). The unmarked Trumpeter seen near Perry, Oklahoma, on 6 January 1984 can be assumed to be from Lacreek due to the time and place. Trumpeters have migrated periodically to all of these areas since (Burgess and Burgess 1995).

In 1983, we received word from Wyoming's Central Flyway Biologist, Dick Saul, that he had observed 10 swans summering on the Belle Fourche River watershed in the northeast corner of Wyoming in 1981, when a pair was nesting on Arch Creek, a tributary marsh. In 1982, he found a pair nesting on Thunder Basin Grasslands Reservoir #1 on the Little Missouri River. He thought that the 1981 pair had moved to this new site, but probably these were different pairs as there is considerable distance between the sites, placing the pairs in different watersheds. After Rolf Kraft and Wyoming Biologist Bob Lanka collared a family near Colony, Wyoming, in 1984, and the family returned to Lacreek, Kraft coined the term "High Plains Flock" for his Trumpeters. "Lacreek Flock" was no longer descriptive for a flock that nested in three states and wintered in two or more.

Lacreek Refuge's winter population peaked at 237 in 1984. The five adult Trumpeters and a cygnet observed on an impoundment near Magnum, Oklahoma, 8 February – 10 March 1985, can be assumed to be "High Plains Trumpeters" due to time and place.

The Lacreek Refuge winter population peaked with only 187 birds in December 1985 -- a decrease of 50 swans from 1984, when brood numbers were expanding. A migration must have occurred. The Trumpeter identified by Seltman at Cedar Bluff Reservoir, Kansas, 27 November 1985 was clearly from the High Plains Flock due to time and place.

Six pairs nested on Lacreek Refuge and fledged a record 19 cygnets in 1986. The Refuge winter population that year peaked at 229. The four unmarked Trumpeters seen in Morris County, Kansas, on 18 December 1986 and the three Trumpeters seen in Saline County, Kansas, 2 days later were almost certainly from the High Plains Flock since no other free-flying restored Trumpeters in the Central Flyway were unmarked at that time (Burgess and Burgess 1995).

Lacreek Trumpeters peaked at a record 268 in December 1987, with 182 adults and a record 86 cygnets. Lacreek-collar-marked Trumpeter 43RA was observed between Fort Smith and Russelville, Arkansas, from 18 January to 14 March 1988.

In December 1990, the Lacreek Refuge winter population peaked at 225. Trumpeter 43RA, seen near Russelville 2 years prior was sighted at Lacreek. Lacreek-collared Trumpeter 36FA, observed in the Upper Peninsula of Michigan during the summer, wintered on the Mississippi River in Minnesota. A hard freeze with temperatures at -35° F froze all open water at Lacreek in late December. Most swans hunkered down, some dispersed, and 10 died of exposure. An emergency release of water opened some pools.

The two Trumpeters seen 6 miles northwest of Wellston, Oklahoma, 30 December 1990, and the one seen on Lake Eufaula on the same day were likely High Plains Trumpeters escaping the freeze. The two Trumpeters seen 22 January 1991, 5 miles north of Prague, Lincoln County, Oklahoma, were High Plains birds following the North Canadian River. The adult and three cygnets observed in the Cadron Creek Bottoms, Faulkner County, Arkansas, 2-20 January 1991, were probably High Plains Trumpeters. The adult and three cygnets seen in Rush County, Kansas, 25-27 February 1991 can be assumed to be High Plains Trumpeters due to location (Burgess and Burgess 1995).

Canadian collars 30AC and 31AC were observed on two Trumpeters staging at Lacreek in October 1991. The birds had been marked near Greenwater Lake Provincial Park in eastern Saskatchewan on 23 July 1991 (Beaulieu 1999). They had nested on that area for the past 4 years. Lacreek's peak fall number was 160. It was a mild winter with open off-refuge waters where many Trumpeters remained.

The unmarked Trumpeters using Hale's Ranch Lake, south of Maud, Seminole County, Oklahoma, on 30 January 1992, and in February 1993, were most likely High Plains Trumpeters. The pair that wintered on Oak Grove Lake, Chanute County, Kansas, 1992-95, were surely High Plains birds.

The 1992 aerial production survey was flown in mid summer. It accounted for 220 Trumpeters, including 48 nesting pairs, 30 broods with 102

cygnets and 25 non-breeders in five flocks. This was the highest count of cygnets up to that time. Two hundred Trumpeters, including 62 cygnets, peaked at Lacreek in late fall. The 1991, 1992, and 1993 summer surveys were greater than the Refuge winter peaks, and further indicated migrations.

In September 1994, Saskatchewan Regional Biologist Rhys Beaulieu found a pair of Trumpeters at Greenwater Lake Provincial Park as well as 20 adults and 10 cygnets in the Porcupine Hills Provincial Forest to the east. He and his staff marked seven adults from six sites in July 1994 with red collars. All of the red-collared swans staged at Lacreek in October 1994, but many were not seen again until the late winter-early spring migration, indicating movement to the south.

Whether this Trumpeter Swan flock developed from old releases at Delta (Manitoba) Waterfowl Research Station, from pioneering Lacreek Flock swans, or from a mix of these pioneers, the fact is that they are now a part of the High Plains Flock. When Saskatchewan administrators inquired about the situation, they were told the myth that Lacreek NWR was the terminal wintering area for the High Plains Flock, and it was overcrowded. Saskatchewan used that misinformation to de-emphasize Trumpeter Swan management (Beaulieu 1999).

Lacreek Refuge Trumpeters peaked at only 65 in December 1995. Rumors of swans on Upper Snake River in Nebraska prompted Kraft to fly there where he found 142. The winter habitat above Merritt Reservoir and south of the McKelvie National Forest is private ranch land, accessible only by 4-wheel-drive vehicles in summer, and inaccessible by normal travel. It is probable that a number of swans have been wintering there for many years, but only those that approached public roads or accesses were seen.

After receiving a report from Kraft, Nebraska Waterfowl Biologist Joe Gobig responded by sending a report of Nebraska's swan sightings during its 1996 midwinter waterfowl survey as follows: North Platte River 26, Blue Creek 45, Snake River 76, North Loup River 35; total 182 (Joe Gobig, pers. comm.).

Kraft flew a winter survey on 24 January 1998, and found 70 Trumpeters in the Lacreek area in South Dakota. However, he found 258 Trumpeters in Nebraska: 16 on Cody Lake, 130 on Upper Snake Creek, 45 on North Loup River, 28 in the Whitman area, seven on the Platte River, and 32 on Blue Creek.

The 1998 aerial production survey found 299 Trumpeters including 249 in Nebraska, 48 in South Dakota, and two in Wyoming. There were 114 cygnets with 91 in Nebraska and 23 in South Dakota.

On his winter survey of 14 January 1999, Kraft found 455 Trumpeters -- 368 in Nebraska and 87 in South Dakota. In Nebraska, he found 168 birds on Upper Snake River, 72 on North Loup, 105 on Blue Creek, 11 on Keystone, four on Birdwood Creek, and eight in the Whitman area (Kraft 2000).

Conclusions

The myths that Trumpeter Swans were solely wilderness birds, that the Yellowstone thermal ecosystem swans were genetically non-migratory, that Trumpeters supplemented with artificial food would not seek food elsewhere, and that Lacreek NWR was the winter terminus for the High Plains Flock were all unraveled with the restoration of that flock.

It seems obvious that the High Plains Trumpeters have been migrating considerable distances both south and north. They began wintering off-refuge from near the beginning, perhaps in 1964, when they attempted pioneering on Cody Lake. They started migrating farther south about 1976 when they appeared in Texas. The deep freeze of 29-30 December 1983 gave them a big push, and Trumpeters showed up in Oklahoma and Arkansas. It is obvious that the peak numbers at Lacreek did not reflect the total number of Trumpeters in the High Plains Flock.

Perhaps the Lacreek Refuge peaks were 80 percent of the early flocks, but the 1999 peak was less than 15 percent of the High Plains Flock. Trumpeter Swan biologists knew of northward movements and nesting attempts in Ziebach County, 150 miles to the north and over 180 miles northwest of Lacreek into Crook County, Wyoming. But for some reason, the High Plains Trumpeters skipped North Dakota's historic Trumpeter Swan nesting marshes to explore eastern Saskatchewan for nesting sites.

Acknowledgments

I appreciate the efforts of the early Lacreek NWR staffs and cooperators who studied and reported the local movements of Trumpeter Swans. Due to the difficulty in distinguishing and reporting Trumpeter Swans to concerned officials, clues accumulated slowly regarding their migrations. I, therefore, commend Randolph Mahone for his persistence in reporting the 32 Trumpeter Swans that visited his Jackson County, Texas, rice ranch in 1976. It took 25 years, but we finally contacted each other.

Rolf Kraft has managed the High Plains Flock for the past 24 years. I appreciate his many reports, answers to inquiries, and other courtesies given me. Thomas G. Burgess, Queens College, New York City, edited an early draft for grammatical and computer errors. David K. Weaver edited the final draft for style, content, and consistency. I take sole

responsibility for any error of fact or interpretation that appears.

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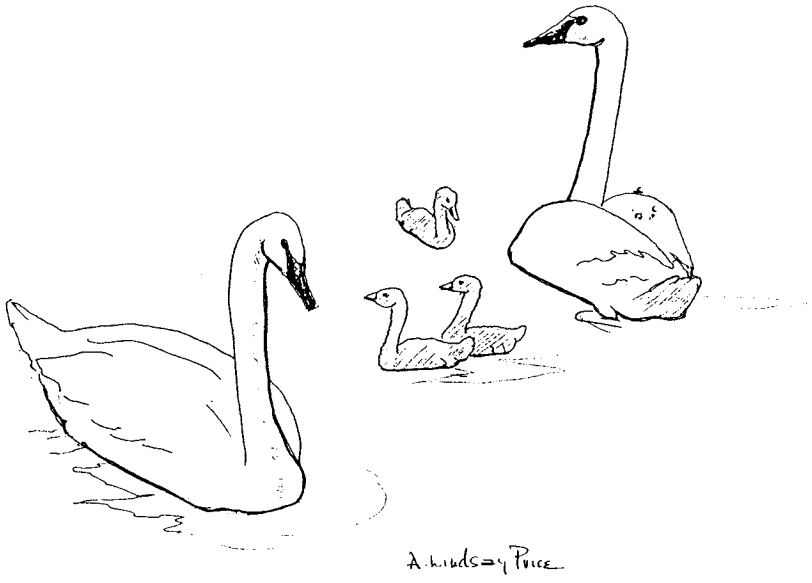

Population Status Reports

2002 Midwinter Trumpeter Swan survey of the Rocky Mountain Population

Dave Olson

Abstract

The 2002 Midwinter Trumpeter Swan survey was conducted 10-15 February. We counted 4,415 Trumpeter Swans (white birds and cygnets), compared to 3,975 swans last year. The number of white birds increased from last year by 19% and the number of cygnets decreased 24% from last year. Of the 4,415 birds, 89% are believed to emigrate from Canada (swans that nest in Canada and winter in the Tristate Region) and 11% are from the U. S. group (swans that nest and winter in the Tristate Region).

Introduction

The Midwinter Trumpeter Swan Survey is an annual survey conducted in late January or early February. The survey is a cooperative effort between Red Rock Lakes National Wildlife Refuge, Southeast Idaho Refuge Complex, National Elk Refuge, Harriman State Park, Idaho Department of Fish and Game, Grand Teton National Park, Yellowstone National Park (YNP), Wyoming Game and Fish Department (WYG&F), Malheur National Wildlife Refuge, Summer Lake Wildlife Area, Oregon Department of Fish and Wildlife (ODFW), Ruby Lake National Wildlife Refuge, and Shoshone-Bannock Tribes. The survey is intended to provide a total count of the entire Rocky Mountain Population (RMP) of Trumpeter Swans (*Cygnus buccinator*).

The Rocky Mountain Population is comprised of Trumpeter Swans from the U.S. that nest in Idaho, Wyoming, Montana, Oregon, and Nevada, and those that nest in the Grande Prairie region of Canada. The RMP Trumpeter Swans from Canada share common wintering areas with most of the U.S. birds in the "core" tri-state area within the Greater Yellowstone Ecosystem. The Midwinter Survey is the best way to census and determine the distribution of the entire wintering population. This survey provides the only data where managers can assess annual status of the RMP.

The Pacific Flyway management plan for the RMP of Trumpeter Swans specifies actions to broaden RMP winter distribution. The goal is to restore the Rocky Mountain Trumpeters as a secure and primarily migratory population, sustained by naturally occurring food sources in diverse historical breeding and wintering sites within former range. In response to range expansion efforts, the Fall Survey (U.S. swans) and the Midwinter Survey have been expanded to include Grays Lake NWR area and the Snake River from Idaho Falls to Bruneau Dunes State Park, and the Bear River (Idaho); the Salt River, Wind River, and Green River (Wyoming); Malheur NWR and Summer Lake WA (southeast Oregon), and Ruby Lake NWR (Nevada).

Methods

The objective is to get an accurate assessment of swan abundance during the winter while conducting the survey in as short a time period as possible, to reduce the chance of swans moving and being missed or counted more than once. Data for the survey are collected by aerial observers seated in single-engine, fixed-wing aircraft and by individuals conducting ground surveys.

The majority of the 2002 Midwinter Trumpeter Swan survey was flown during 10-15 February. Swans in Nevada were surveyed by ground on 7 February. Biologists in Oregon surveyed in early February 2002 and used an average count on known wintering areas because of an influx of Tundra Swans precluded accurate estimation of Trumpeter numbers.

General habitat conditions

The winter of 2001/2002 was mild in comparison to previous winters. Temperatures were

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either average or above average for the region. A warm spell in early February started thawing areas earlier than last year. The Montana survey area was 75% ice covered with most of the small lakes north of the Refuge having some open water. The Madison River valley was mostly ice free and all the tributary streams that feed into the Madison River were ice free and contained most of the swans. Hebgen Lake and Quake Lake were mostly frozen and had open water only at the outlet and inlet streams that feed both of these lakes. Swans concentrated in those open areas. Wetlands in Idaho were mostly ice covered with some areas that had open water where swans congregated. YNP experienced a spring thaw followed by cold temperatures.

Results and discussion

We counted 4,415 Trumpeter Swans this winter (Table 1), an increase from 3,975 Trumpeter Swans last year. The total number of white birds observed this year (3,862) increased from last year (3,245) by 19.0%. The total number of cygnets observed this year (553) decreased from last year (730) by 24.2%. We observed a total of 704 swans in Montana, an increase from last year's total of 469. The number of white birds increased by 61%. We observed 104 cygnets in Montana, an 8% increase from last year. Crews counted 2,993 swans in Idaho, essentially the same number observed in 2001. The number of white birds increased from 2,404 to2,636. Abundance of cygnets in Idaho decreased by 35%

Table 1. The total number of RMP Trumpeter Swans counted during the 2002 Midwinter Survey in respective states.

State	Adults	Cygnets	Total
Montana	600	104	704
Idaho	2,636	357	2,993
Wyoming (includes Yellowstone NP)	578	85	663
Tri-State Subtotal	**3,814**	**546**	**4,360**
Nevada	41	2	43
Oregon	7	5	12
Subtotal for other States	**48**	**7**	**55**
RMP (U.S. and Canadian Trumpeter Swans)	**3,862**	**553**	**4,415**

from last year going from a total of 549 to 357 this year. We observed 519 birds this year in Wyoming (not including YNP), a 20% increase. The number of white birds observed this year (447) increased from last year (368) by 21%. Cygnets in Wyoming increased from 2001 by 14%, going from 63 to 72. Biologists in YNP counted 144 birds this year, an increase of 125.00% from last year. The number of white birds observed in YNP increased by 147 from last year, going from 53 to 131. Cygnets increased from last year by 18%.

The number of Canada nesting swans that winter in the area is estimated by subtracting the number of swans in the Midwinter survey from the swans observed in the previous fall survey. This year, we estimated that swans from Canada that wintered in the area to be 3,928 (Table 2 and Figure 6). This suggests that 89% of the swans that wintered in the area are from the Canada nesting birds and the other 11% is comprised of U.S. nesting birds. The data from Table 2 shows a steady increase in the percentage of Canadian birds that winter in the area with a concomitant decrease in the percentage of U.S. birds. But, the absolute number of U. S. birds is stable or slightly increasing recently (1994-2002).

Acknowledgments

All cooperators and contributors deserve a thanks for working around inclement weather and other survey difficulties and for helping to acquire and summarize the data. Pilot Randy Arment and observer D. Olson (FWS) completed the Montana portion of the survey. Pilot G. Lust (Mountain Air Research) and observers C. Mitchell and C. Whitman (FWS) conducted aerial surveys in Idaho. Ground surveys in the vicinity of Harriman State Park, southeast Idaho, and Montana were conducted by C. Whitman. Portions of Wyoming, excluding YNP, were flown by Mountain Air Research of Driggs, Idaho, and observer S. Patla of WYG&F. YNP was surveyed by pilot Roger Stradley and observer T. McEneaney of the National Park Service. J. Mackay (FWS) conducted the ground survey at Ruby Lake NWR, Nevada, and M. St. Louis (ODFW) surveyed

Summer Lake WMA. Funding for this survey was provided by the FWS, Region 6 Migratory Birds and State Programs. D. Olson compiled and completed this report. D. Gomez and J. Dubovsky edited and provided comments for this manuscript. J. Vann and R. Gomez completed production and distribution.

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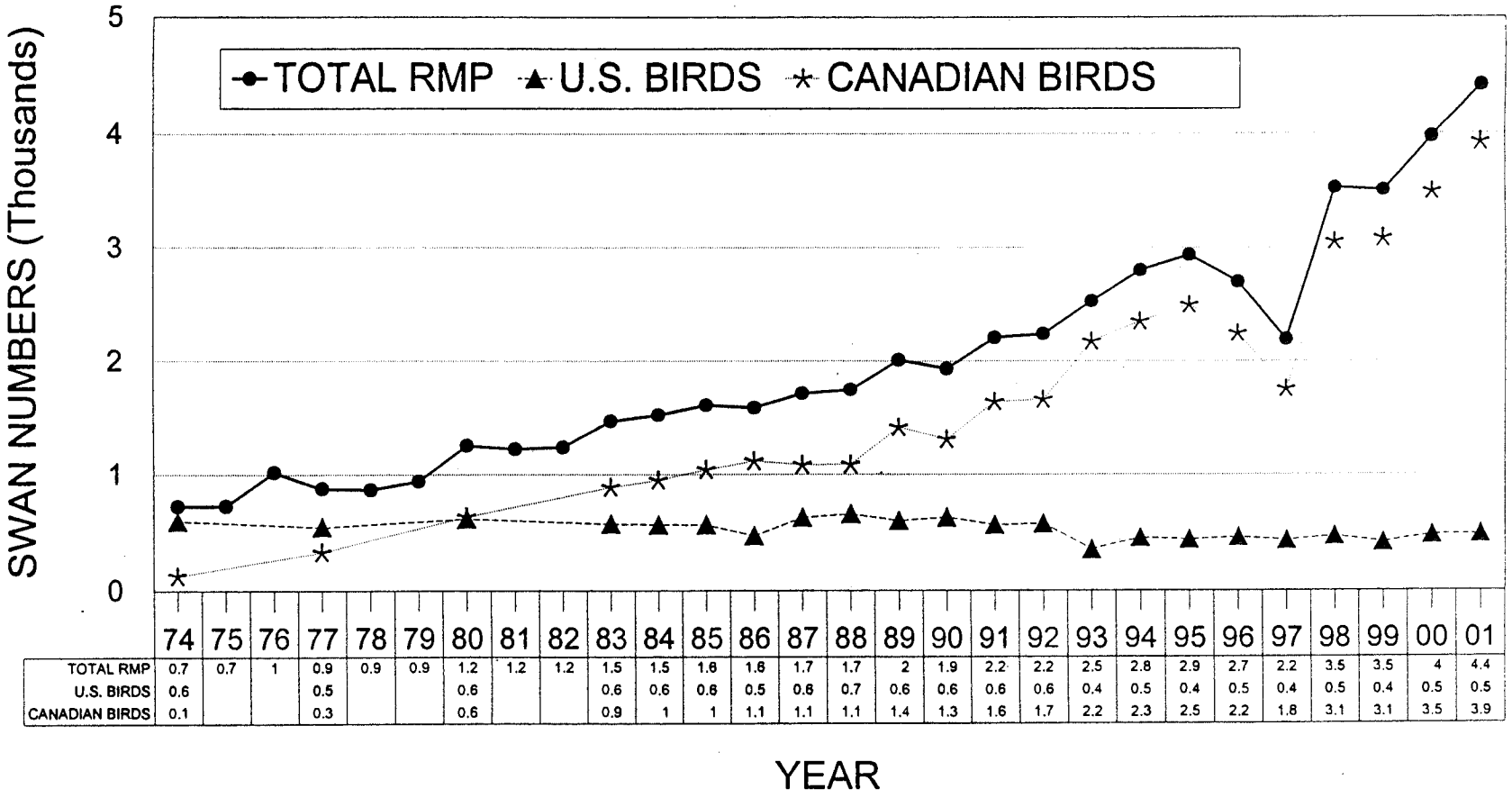
Editors' Note: A copy of the full report is available from Red Rock Lakes NWR. Figure numbers in this paper reflect numbering in the full report.

Table 2. Rocky Mountain Trumpeter Swan Population 1980-2001: U. S. and Canadian Birds and their percent total of the entire Rocky Mountain Trumpeter Swan Population.

Year	Total RMP	U.S. Birds[a]	Percent of Total RMP Population	Canadian Birds	Percent of Total RMP Population
1980	1247	544	43%	703	56%
1983	1460	615	42%	845	58%
1984	1516	571	38%	945	62%
1985	1603	565	35%	1038	65%
1986	1582	563	36%	1019	64%
1987	1710	469	27%	1241	73%
1988	1743	628	36%	1115	64%
1990	2007	598	30%	1409	70%
1991	2203	629	29%	1574	71%
1992	2162	564	26%	1598	74%
1993	2235	575	26%	1660	74%
1994	2526	354	14%	2172	86%
1995	2803	454	16%	2349	84%
1996	2936	438	15%	2498	85%
1997	2699	459	17%	2240	83%
1998	2189	433	20%	1756	80%
1999	3527	469	13%	3058	87%
2000	3505	417	12%	3088	88%
2001	3975	481	12%	3494	88%
2002	4415	487	11%	3928	89%
23 year avg.	2402.15	515.65	25%	1886.5	75%

[a] From Fall Survey (Olson 2001)



	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01
TOTAL RMP	0.7	0.7	1	0.9	0.9	0.9	1.2	1.2	1.2	1.5	1.5	1.6	1.6	1.7	1.7	2	1.9	2.2	2.2	2.5	2.8	2.9	2.7	2.2	3.5	3.5	4	4.4
U.S. BIRDS	0.6			0.5			0.6			0.6	0.6	0.6	0.5	0.6	0.7	0.6	0.6	0.6	0.6	0.4	0.5	0.4	0.5	0.4	0.5	0.4	0.5	0.5
CANADIAN BIRDS	0.1			0.3			0.6			0.9	1	1	1.1	1.1	1.1	1.4	1.3	1.6	1.7	2.2	2.3	2.5	2.2	1.8	3.1	3.1	3.5	3.9

Figure 6. Trends of Rocky Mountain Population of trumpeter swans (white birds, cygnets, and unknown age), U.S. and Canadian birds, 1974-2002. The Canadian swan numbers are derived indirectly by subtracting the U.S. swan numbers (from Fall Survey) from the total midwinter count. (From 2002 Midwinter Survey: Rocky Mountain Population of trumpeter swans, February 2002, Red Rock Lakes National Wildlife Refuge, USFWS).

The Trumpeter Swan restoration program in Ontario 2001

Harry G. Lumsden

Introduction

Restoration of Trumpeter Swans to Ontario started 20 years ago, but did not make significant progress until 1990 when Scott Paper Ltd., through the advocacy of Donald Pettit, began to fund the program. With this funding, the program was able to acquire enough captive breeding pairs to produce and release at least 30 2-year-old swans per year. Scott Paper also funded genetic research and a study of the causes of low hatchability.

Analysis of survival data indicates that we do not yet have a self-sustaining wild population. To achieve this goal, we must continue to release captive bred swans, and do all we can to protect the wild birds. It appears that the progeny of released Trumpeter Swans are more productive than their captive parents. We can expect that, with time, the production of wild Trumpeter Swans will increase. To measure productivity and survival we must make banding and marking with wing tags a priority.

Production of captive breeding pairs

Since 1997, the program has concentrated on producing cygnets from natural incubation and raising under their own captive parents. Increasing egg production by double clutching and using incubators did not pay off.

2001 was had the most successful year since the program began. There were 25 breeding pairs held by program cooperators. Twenty of these pairs laid 130 eggs. The average clutch size was 6.5 eggs, a little above the 5-year average of 6.3. From these eggs, 79 cygnets (61%) hatched, slightly lower than the 5-year average of 65%. However, survival to 1 September of these cygnets was the best yet at 64 (81%). The 5-year average was 74%. Thus, we have 64 cygnets alive as of 1 September. Most have been moved to the Fair Lake pens owned by the Grand River Conservation Authority. The birds will be released at 2 years of age.

Despite the cool spring, we had the earliest nesting since the program began with one pair laying their first egg on 14 April. Most pairs do not begin laying until after 20 April or early May. The increasing wild population of Trumpeter Swans has caused problems at Wye Marsh and the Mac Johnston Wildlife Management Area where neighboring wild pairs interfered with the captive nesting pairs. All our captive breeders are pinioned and, thus, flightless. This puts them at a severe disadvantage in a fight with a wild flying male. The sad result of this was that the captive Wye Marsh and Mac Johnston males were cornered in fences and killed. Unfortunately nothing practical can be done about this beyond removing fences. We have lost only one other captive breeder up to 1 September 2001. This bird died from kidney disease.

Without the help of cooperators who care for the breeding pairs, the program would be impossible. We thank Peter Calverley, Gordon Cook, Gerald Donnelly, Al Dunford. Stefan Foerster, Gil Henderson, Karin Johnston, Scott Milne, Tony Kostrich, Ross Tucker, Terry LeBlanc, Mrs. T. McColl, Mary Jane and Irving Langill, Pat Semach, Barbara and Joe Shaw, Norma Soul, Colin Springette, Robert Bell, Rob Boyle and George Vanner. We welcome three new cooperators to the program: Marjory Linton, Jan Stewart and David Graham. We thank Barbara and Joe Shaw who are leaving the program to move to British Columbia. Their contribution to the program over the years has been significant.

Through a generous grant from the Garfield Weston Foundation, we have been able to roof and put new siding on the pens at Fair Lake. Andrew Scott, James Rupnow, Fiona Morrison, Lindsay Gerrard, Amanda Jordan, Kim Wienk, Marc Casas, Rob Elderhorst and Jason Walker from the Wrigley Corners Outdoor Education Centre gave invaluable help, as did Michael White.

Production of wild Trumpeter Swans in southern Ontario

A large number of wild Trumpeter Swans took up territories in 2001. Some did not build nests, but remained on the same wetland all summer. Twenty nine are known to have laid eggs. Eighteen pairs hatched cygnets, but only 13 pairs succeeded in raising them. The total number of wild cygnets alive on 1 September was 50. The average brood size was 3.8, which is well above the long-term average

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(1993-2000) of 3.0 for wild nesting Trumpeters in Ontario. Figure 1 gives the approximate locations of the known nests. Not on the map are broods on Big Rideau Lake, Burwash, and a nest at Callander Bay on Lake Nippissing. Two additional pairs with cygnets turned up in fall 2001. We do not know where they nested and expect this will be an increasingly common occurrence in years to come. Many people do not know about the restoration program and the importance of reporting the presence of Trumpeter Swans on isolated wetlands.

Survival and losses of wild Trumpeter Swans

In 2000-01, the loss of wild Trumpeter Swans was low at 39 (13%). Only six dead swans were retrieved. Two swans were shot by irresponsible hunters. One swan was seriously injured when it was deliberately run over by a boat, but it is recovering in captivity. Thirty two swans disappeared. We have always had difficulty with swans losing their wing tags. Some of these birds we must place in the category of disappeared and count as dead. However, we know that four of these swans are still alive this year because their leg band numbers were read. Some swans emigrate outside that part of southern Ontario in which we operate. The individuals may turn up 1 or 2 years later. They further cause an underestimation of the population. We utilized a new type of tag this year that is made by injecting the plastic into a mold. It is not cut out of an extruded sheet that needs a cemented attachment. We thank Dan Ralph of the Hennepin County Technical College, Minnesota, who made the new tags for us. We hope these tags will last longer and be easier to read.

We had an estimate of 303 Trumpeter Swans in southern Ontario in 2000. From these, we must subtract 39 as dead or missing. Our annual target for release is 30 swans. During the year we released 34 mostly 2-year-old birds. To these must be added 50 cygnets raised by the wild pairs. Thus, the total for 1 September is 348 free-flying swans.

Trumpeter Swans in eastern Ontario

One pair of Trumpeter Swans is known to have nested successfully on Big Rideau Lake. They raised four cygnets. Of the swans released on the Mac Johnston Wildlife Management Area at Brockville, nine are alive and reports have suggested they are moving in the surrounding area. There are at least three unmarked Trumpeters in the Big Rideau and Beverly Lakes area. The total of swans in eastern Ontario was at least 19 on 1 September 2001.

Trumpeter Swans in the Kenora District of Ontario

Since their discovery in the English River drainage of Kenora in 1989, the Trumpeter Swans have increased in numbers, but have not expanded far beyond their core area. A flight in 1995 had identified some excellent habitat for Trumpeter Swans close to the Manitoba border. A July 2001 aerial survey was flown with the purpose of obtaining a 25% sample of 15,000[2] km of possible swan range north of Kenora. For results of this survey, please see *North American Swans* (30)1.

Acknowledgments

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We thank Angela Coxon of Wye Marsh and Ron Bauman and family of Fair Lake for care of the Trumpeters at their facilities. David Tomlinson, Pat Sumach and Bill Carrick caught swans for banding and helped in many ways. Dick Rogers of Arbrux Ltd. serviced our ice-aways. Bev and Ray Kingdon and friends fed the wintering swans at Burlington and, with Barbara Harker and many naturalists, recorded tag numbers. Wayne O'Shea kindly flew aerial surveys over the Wye Marsh area to find swan nests and broods. The Amhurst Wildlife Foundation accepted donations and Mrs. Wagner kept accounts. The Ministry of Natural Resources in the Aurora, Kenora, North Bay, and Midhurst Districts greatly assisted the program.

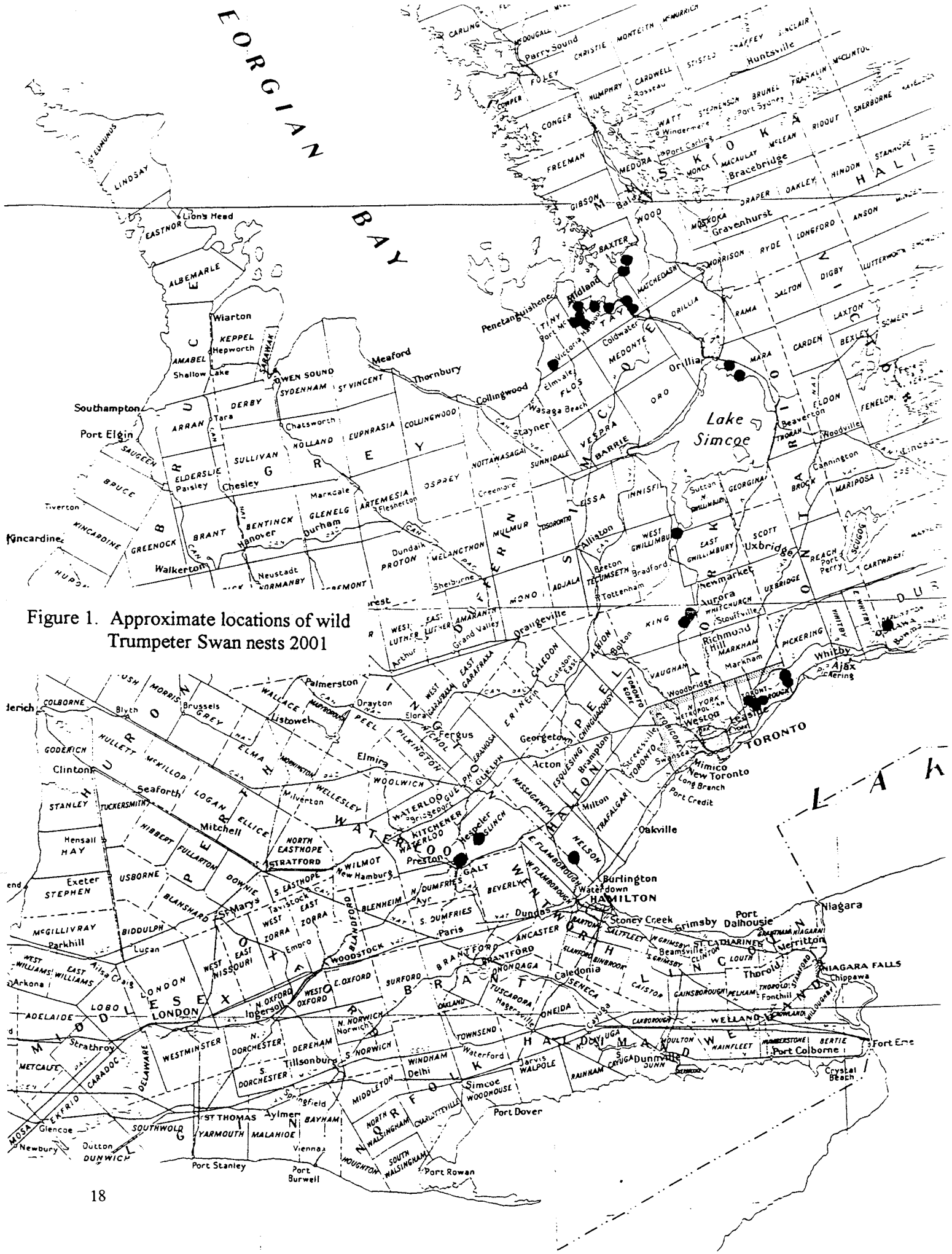

Figure 1. Approximate locations of wild Trumpeter Swan nests 2001

Trumpeter Swan surveys on the Chugach National Forest 2001 – an update

Deborah J. Groves, Bruce Conant, Ed Mallek, and Daniel Logan

Introduction

Trumpeter Swan aerial surveys were conducted on the Copper River Delta and surrounding areas of the Chugach National Forest in south central Alaska. The surveys were accomplished through cooperation between the U. S. Fish and Wildlife Service and the U. S. Forest Service.

Results

Population trend

In May 2001, 566 white swans (adults and subadults) were counted, down 18% from spring 2000 and 7% below the 23-year average. The decrease occurred solely in the number of flocked birds, while single and paired birds increased slightly.

In August, 870 white swans were counted, up 15% from August 2000 and 33% above the 26-year average (Figure 2). The number of single and paired birds was similar to last year (-1%) and was 22% above the average. The number of flocked birds increased 60% from 2000 and was 54% above the average.

Productivity

The May and August surveys recorded 90 nests (actually 84 nests and six broods) and 93 broods, respectively, resulting in a calculated nest success of 1.03. This figure is obviously erroneous, and true nest success is unknown. Regardless of the actual proportion of nests that successfully hatched young, the number of successful nests was 86% above the average and was the highest ever recorded. The average brood size of 3.8 was also large (26-year average = 3.3), resulting in excellent production. A total of 352 cygnets was counted during the August survey, 90% above the 26-year average and 32% above the previous high of 267 recorded in 1968. The number of young per occupied nest, a productivity statistic based on the number of known territorial pairs (as evidenced by the presence of a nest or brood), was 3.9 (23-year average = 1.7). However, this figure, like nest success, is erroneously high. The proportion of young in the early fall population was 0.29, 32% higher than 2000 and 32% above the 26-year average.

Discussion

The breeding phenology of Trumpeter Swans on the survey area was apparently at least somewhat early in 2001, as indicated by the presence of six broods during the spring survey. The spring survey was flown a few days later than normal (average median survey date is 25 May), but, nevertheless broods have only been recorded during the spring survey two times previously. If additional recently hatched broods were present, their small body size would have made their detection difficult. This might explain, in part, why fewer nests/broods were recorded in spring than during the August survey.

Conclusions

Conditions were favorable for Trumpeter Swans nesting on the Copper River Delta and Controller Bay drainages in 2001. The large number of breeding pairs that successfully hatched young, as well as above average egg/cygnet survival, resulted in the highest number of young ever recorded in the survey area. Overall, Trumpeter Swans experienced excellent production in 2001.

Recommendations

We now have 49 comparable Trumpeter Swan surveys (23 spring and 26 fall) on the Copper River Delta, one of the most complete records for a swan population in Alaska. We recommend continuing a cooperative program of two surveys per year. Information acquired from both the early and late phases of the breeding season has greatly enhanced our ability to understand the factors influencing the population's reproductive success. Long term, standardized data sets such as these are an invaluable tool for evaluating population dynamics and properly managing Trumpeter Swan breeding populations.

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Editors' Note: See *North American Swans* Volumes 27 and 28 for details on survey area, methods, bias, previous results, and discussion with supporting figures and tables. The information here updates these reports. Figure numbers in this paper reflect numbering in the full report.

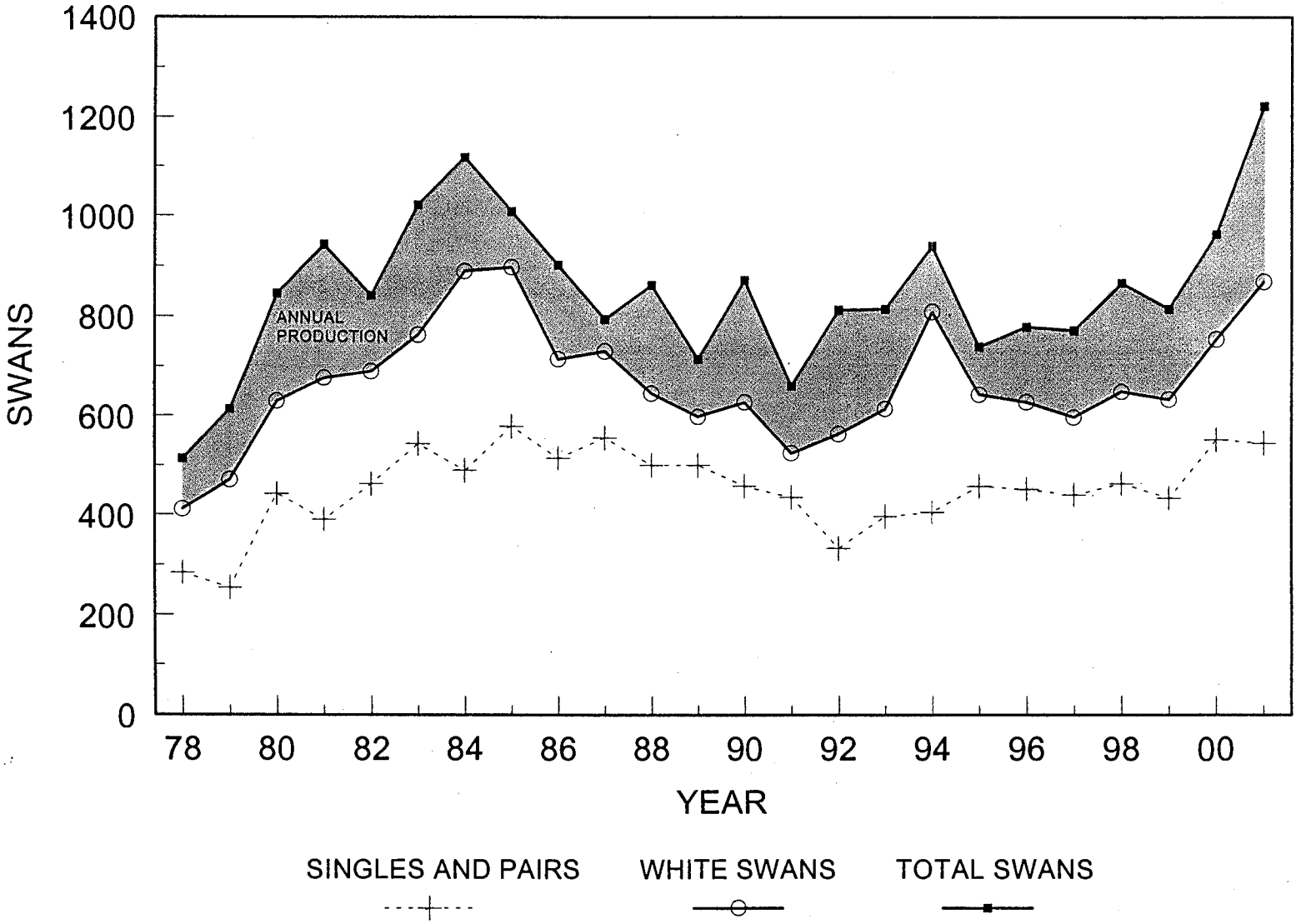

Figure 2. Population trend of trumpeter swans on the Copper River Delta survey area from fall surveys, 1978-2001.

Trumpeter Swan abstracts from the 4th International Swan Symposium and 18th Trumpeter Swan Society Conference, 2001

Editors' Note: The following 14 abstracts are from Trumpeter Swan papers presented at the combined 4th International Swan Symposium and 18th Trumpeter Swan Society Conference, 13-18 February 2001. The papers are published in E. C. Rees, S. L. Earnst and J. Coulson, (Eds) 2002. Waterbirds 25, Special Publication 1.

Activity budgets of nesting Trumpeter Swans in Interior Alaska

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Abstract

Activity budgets of wild Trumpeter Swans (*Cygnus buccinator*) nesting in Interior Alaska were recorded in 1982 and 1983. Analysis of these time budgets were used to quantify and compare the behavior of females, males and broods during incubation, hatching and brood-rearing. Male behavior changed little during the breeding season; however, they fed less and were alert more during hatching than during either incubation or brood-rearing. Females interrupted incubation sessions only to feed and occasionally to assist males in chasing intruding swans. Females initiated recesses during incubation usually when males were near the nest. Males attended nests during their mates' absence, but were never observed to sit on the eggs. During brood-rearing, behavior of females and males was similar, but cygnets spent more time feeding and resting, and less time preening and being alert, than did parents. Activity budgets are compared to those from other studies of wild Trumpeter Swans and Tundra Swans (*Cygnus columbianus columbianus*) in Alaska.

Census of Trumpeter Swans on Alaskan nesting habitats, 1968-2000

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Abstract

In Alaska, hundreds of hours were flown by many survey crews during late summer in 7 years to conduct a census of all occupied Trumpeter Swan (*Cygnus buccinator*) habitat (range 46,729 km^2 in 1968 to 123,857 km^2 in 2000). The total number of adult Trumpeter Swans increased from 1,924 to 13,934 between 1968 and 2000, a 624% increase. Population trends varied among eleven distinct geographical areas. Swan numbers increased in both high quality core habitat as well as in peripheral habitat added during the survey period. Although the Trumpeter Swan population summering in Alaska continues to grow, a comprehensive Alaska Trumpeter Swan Management Plan is needed to ensure that swans remain well distributed and a complete census every 5 years is recommended at least until the Alaska summering population stabilizes.

Laying and incubation behavior of captive Trumpeter Swans

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Abstract

Trumpeter Swans (*Cygnus buccinator)* do not develop a brood patch as do most other species of waterfowl. Observations of three pairs of captive breeding Trumpeter Swans, which were uncharacteristically non-aggressive, showed that they incubated with their feet on top of the eggs. In addition, two instances of egg-laying were witnessed at close range and are described here. First view of the egg in the cloaca to final emergence took just over 2 minutes. Trumpeter Swans lay very small eggs in proportion to their body size, and their large feet can theoretically cover 5.7 eggs. It is suggested

that Trumpeter Swans are able to regulate blood flow to their feet and provide effective circulation.

Survival and reproductive success of Trumpeter Swans after treatment for lead poisoning

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Abstract

During the peak of the Trumpeter Swan (*Cygnus buccinator*) restoration programs in Minnesota and Wisconsin, in 1988-1990, many swans developed lead poisoning. Drought conditions allowed the birds access to spent lead shot in lakes and refuges. At least 94 swans developed lead poisoning, 63 were treated, of which 29 were successfully treated and released. The birds that were successfully treated were normal on physical examination, had blood lead levels in the normal range and no longer had radiographic evidence of lead shot in their gastrointestinal tract. In all, 23% of free-flying birds were successfully treated for lead poisoning compared to 67% of captive (previously pinioned or wing-clipped) birds. Six of 29 swans successfully treated for lead poisoning were confirmed to reproduce 2 to 10.5 years after treatment. Males and females were equally likely to reproduce after treatment for lead poisoning. Only one of 20 cygnets successfully treated was confirmed to reproduce compared to five of nine birds treated as subadult/adults (1-2 years or $\geq$ 2 years of age).

Use of winter translocations to expand distribution of Trumpeter Swans in the Western United States

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Abstract

During 1990-1996, Trumpeter Swans (*Cygnus buccinator*) were translocated from high-risk wintering sites in the Greater Yellowstone Region of wintering areas in Idaho, Wyoming, Oregon, and Utah in an attempt to broaden winter distribution and reduce the vulnerability of the Western Canada and Greater Yellowstone breeding populations, which winter primarily in Greater Yellowstone. Survival and movements of 1,127 neck-banded swans translocated in 1990-1995 were monitored to determine their use of new wintering areas in years after translocation. Survival estimates were hindered by uneven resighting effort and lack of data on neck-band loss, however, at least 683 swans, including 71% of adults and 50% of cygnets, survived at least one year after translocation. Of these 683 swans, 62% subsequently wintered away from the monitored Greater Yellowstone winter habitats. By 1997, persistent use by >50 wintering swans existed at only two of eight release sites. We conclude that Trumpeter Swans would establish greater use of new wintering sites if winter translocations, primarily of juveniles, were made to sites (1) that have adequate ice-free food and low human disturbance, (2) that are situated directly south of currently occupied winter habitat, and (3) at which obvious mortality factors, such as shooting and power lines, are minimized.

Baseline hematology and clinical chemistry results from captive-raised Trumpeter Swans

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Abstract

Results from hematology and clinical chemistry tests are presented for healthy captive-raised Trumpeter Swans (*Cygnus buccinator*) to help establish baseline data. Blood samples were obtained from 14 cygnets between the ages of 3-4 and 7-8 months that were the subjects of a study to teach migration routes to swans. Males and females differed significantly in asparatate aminotransferase, alanine aminotransferase and total protein. Age categories differed significantly in hematocrit, white blood cell counts, alkaline phosphatase, aspartate aminotransferase, glucose, cholesterol and uric acid. There were no significant differences among age

categories in values of alanine aminotransferase, calcium, triglycerides and total protein.

Isozyme analysis reveals genetic differences between three Trumpeter Swan populations

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Abstract

Reintroduction efforts have established small, scattered flocks of Trumpeter Swans (*Cygnus buccinator*) in the Midwestern United States. Management of these flocks as distinct population units is debated among wildlife managers. The purpose of this study was to quantify genetic differences among three recognized populations of Trumpeter Swans. Blood and tissue samples were collected during 1999 and 2000 and analyzed using horizontal starch-gel electrophoresis. Trumpeter Swans from the High Plains Flock and the Greater Yellowstone Population, from which the High Plains Flock was derived, were genetically indistinguishable. However, both flocks differed from the Pacific Coast Population in allele frequencies at the adenosine deaminase (ADA) locus. Founder effects may have influenced both the High Plains Flock and the Greater Yellowstone Population. Results also suggest unidirectional gene flow from the Pacific Coast Population into the other populations. The High Plains Flock may be a suitable source of individuals to increase the size of the Greater Yellowstone Population while maintaining similar allele frequencies. Additional higher resolution genetic surveys are warranted.

Restoration of Trumpeter Swans in North America: a century of progress and challenges

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Abstract

By the beginning of the 20th Century, North America's once widespread and abundant populations of Trumpeter Swans (*Cygnus buccinator*) had been devastated by overharvest and were nearing extinction. By the close of the century, due to growth of remnant populations and restoration efforts, over 23,000 Trumpeter Swans existed in the wild. Large portions of vacant historic breeding habitat in Canada and the United States remain suitable for future reoccupation, however, traditional migration patterns to southerly wintering areas have been disrupted, winter habitat has been reduced in quantity and quality, and some populations that depend upon marginal winter habitat are vulnerable to high winter mortality. To maintain current populations and allow for growth, we recommend protecting and improving current winter habitat, creating new wintering sites, and developing methods to establish use of these areas. Particular emphasis should be placed on using the National Wildlife Refuge System to provide secure focus areas for expansion of migration and winter distribution and exploring ways to create additional wintering habitat in partnership with agricultural interests.

Development of an expert system for assessing Trumpeter Swan breeding habitat in the Northern Rocky Mountains

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Abstract

A decision support system for the management of the Rocky Mountain Population of Trumpeter Swans (*Cygnus buccinator*) is being developed. As part of this, three expert systems are also in development: one for assessing the quality of Trumpeter Swan breeding habitat; one for making water level recommendations in montane, palustrine wetlands; and one for assessing the contribution a particular site can make towards meeting objectives from a flyway perspective. The focus of this paper is the development of the breeding habitat expert system, which currently consists of 157 rules. Our purpose is to provide decision support for issues that appear to be beyond the capability of single persons

to conceptualize and solve. We propose that by involving multiple experts in the development and use of the system, management will be significantly improved. The knowledge base for the expert system has been developed using standard knowledge engineering techniques with a small team of ecological experts. Knowledge was then coded using production rules organized in decision trees using a commercial expert system development shell. The final system has been deployed on the world wide web.

Bayesian time series analysis of segments of the Rocky Mountain Trumpeter Swan Population

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Abstract

A Bayesian time series analysis technique, the dynamic linear model, was used to analyze counts of Trumpeter Swans *(Cygnus buccinator)* summering in Idaho, Montana, and Wyoming from 1931 to 2000. For the Yellowstone National Park segment of white birds (sub-adults and adults combined) the estimated probability of a positive growth rate is 0.01. The estimated probability of achieving the Subcommittee on Rocky Mountain Trumpeter Swans 2002 population goal of 40 white birds for the Yellowstone segment is less than 0.01. Outside of Yellowstone National Park, Wyoming white birds are estimated to have a 0.79 probability of a positive growth rate with a 0.05 probability of achieving the 2002 objective of 120 white birds. In the Centennial Valley in southwest Montana, results indicate a probability of 0.87 that the white bird population is growing at a positive rate with considerable uncertainty. The estimated probability of achieving the 2002 Centennial Valley objective of 160 white birds is 0.14 but under an alternative model falls to 0.04. The estimated probability that the Targhee National Forest segment of white birds has a positive growth rate is 0.03. In Idaho outside of the Targhee National Forest, white birds are estimated to have a 0.97 probability of a positive growth rate with a 0.18 probability of attaining the 2002 goal of 150 white birds.

Vocal characteristics of Trumpeter and Tundra Swans and their hybrid offspring

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Abstract

Trumpeter Swans (*Cygnus buccinator*) and Tundra Swans (*C. columbianus columbianus*) in captivity produce hybrid offspring that are visually similar to their parent species. In this study, call note vocalizations of Trumpeter Swans, Tundra Swans, and their hybrid offspring were analyzed for differences in call duration and initial low frequency. Sixty-five locator vocalizations were digitally recorded from four Trumpeter Swans, four Tundra Swans, and seven known Trumpeter-x-Tundra Swan hybrids. Call duration did not differ significantly among swan types ($\bar{x}$ = 200.5 mS ± 53.3 [SD], N = 65). However, the initial frequency of the locator call was significantly lower in the Trumpeter Swan ($\bar{x}$ = 303 Hz ± 73[SD]) than in the Tundra Swan ($\bar{x}$ = 479 Hz ± 89[SD]). Initial low frequency of hybrid swan locator calls was intermediate ($\bar{x}$ = 398 Hz ± 58[SD]) and did not differ significantly from either parent species. This suggests that the duration of the locator call does not vary among these swan species or their hybrids. However, the initial low frequency of the locator call differs in the two species and their hybrids demonstrate intermediate values.

Teaching migration routes to Canada Geese and Trumpeter Swans using ultralight aircraft, 1990 - 2001

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Abstract

This paper summarizes 11 years (1990 - 2001) of experiments to teach Canada Geese (*Branta canadensis*) and Trumpeter Swans (*Cygnus buccinator*) pre-selected migration routes using

ultralight aircraft. When Canada Geese were trained to follow an ultralight aircraft for southward autumn migrations of 680 or 1,320 km, 81% (83/103) returned on their own in the next spring to near their place of training. In contrast, none returned of 21 similarly raised geese that were transported south in a closed truck over a route of 680 km. Trumpeter Swans have proven more difficult to train. However, in two experiments in which Trumpeter Swans followed an ultralight for the entire pre-selected route, one of three and two of four returned close to their training area. A stage-by-stage method, in which swans were transported in trucks between stops, flown in the vicinity and penned with a view of the night sky, has shown some promise. So far an established migration route (north and south twice) has been confirmed in only two geese.

Trumpeter Swan numbers and distribution in Western Canada, 1970 – 2000

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Abstract

During the period 1970-2000, substantial efforts were made to document the distribution and number of Trumpeter Swans (*Cygnus buccinator*) in western Canada. Breeding surveys have expanded from covering less than 20,000 km^2 in the Grande Prairie region of Alberta to cover 780,000 km^2, perhaps one-third of northwestern Canada. Aerial surveys involving total or partial counts have been used in most areas. Since 1995, sample-based surveys have been used in Yukon Territory and extreme northern British Columbia. Between 1970 and 2000, breeding surveys have documented a dramatic increase in both breeding distribution and numbers in western Canada (100 to more than 3,700). Winter surveys in British Columbia have corroborated an increase in numbers on the southern coast (from 1,000 to at least 7,100) and in the southern interior (from 0 to 504), and also documented changes in the wintering distribution. Most, if not all, of the increase in wintering numbers on the southern coast has been in agricultural areas on Vancouver Island and in the delta and lower valley of the Fraser River.

Overview of the Trumpeter Swan Reintroduction Program in Ontario 1982-2000

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Abstract

Restoration of Trumpeter Swans (*Cygnus buccinator*) to their former range in Ontario has involved many techniques, some more successful than others. Rearing methods included cross-fostering on wild Mute Swans (*Cygnus olor*), artificial incubation, and incubation and rearing by their own Trumpeter Swan parents. Egg hatchability was low ($\bar{x}$ = 45%) for eggs laid by captive pairs and was suspected to be due to inbreeding. Few toxic contaminants were found in unhatched eggs, but 15-17% of unhatched eggs that had been artificially incubated were infertile. Eggs cross-fostered under wild Mute Swans had lower hatchability than those incubated by Trumpeter Swans, and cygnets raised by Mute Swans survived less well to fledging. Time budgets revealed that rearing methods significantly influenced behavior but differences disappeared by 26 weeks of age. However, wild-hatched swans, when adults, bred somewhat but not significantly more frequently than those hatched by their own, captive parents. Translocating adult wild-caught Trumpeter Swans did not prove to be an effective reintroduction technique; none of the six translocated adults were resighted after the first year. Annual survival rate of wild-hatched males and females > 2 years old was 0.831; survival rates did not differ between captive and wild-hatched swans in any age or sex category. The most common cause of death was lead poisoning. Released Trumpeter Swans bred for the first time at 2 to 8 years of age. Four adults were taught to follow an ultralight aircraft to a predetermined wintering site. They returned on their own in the spring but did not migrate back to the wintering site during the next autumn.

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Guide to abbreviations used in the above index
Date given in parenthesis refers to publication date.

9th Proc. (1986): Proceedings and Papers of the Ninth Trumpeter Swan Society Conference, 5-8 September 1984, West Yellowstone, Montana.

10th Proc. (1988): Proceedings and Papers of the Tenth Trumpeter Swan Society Conference, 3-6 September 1986, Grande Prairie, Alberta.

11th Proc. (1990): Proceedings and Papers of the Eleventh Trumpeter Swan Society Conference, 3-6 February 1988, Everett, Washington.

12th Proc. (1991): Proceedings and Papers of the Twelfth Trumpeter Swan Society Conference, 6-9 September 1989, Minneapolis, Minnesota.

13th Proc. (1992): Proceedings and Papers of the Thirteenth Trumpeter Swan Society Conference, 13-16 February 1991, Salt lake City, Utah.

14th Proc. (1994): Proceedings and Papers of the Fourteenth Trumpeter Swan Society Conference, 3-6 February 1993, Courtenay, British Columbia.

15th Proc. (1996): Proceedings and Papers of the Fifteenth Trumpeter Swan Society Conference, 1-4 February 1995, Mount Vernon, Washington.

16th Proc. (1999): Proceedings and Papers of the Fifteenth Trumpeter Swan Society Conference, 3-6 February 1997, St. Louis, Missouri.

17th Proceedings (2000) = Proceedings and Papers of the Seventeenth Trumpeter Swan Society Conference, 15-18 September 1999, Idaho Falls, Idaho.

Editors' Note: For an earlier compilation of literature on the Trumpeter Swan, the reader is referred to A Trumpeter Swan Bibliography edited by James A. Cooper and David K. Weaver. 1986. Copies of this publication may be purchased from the TTSS office in Maple Plain, Minnesota.

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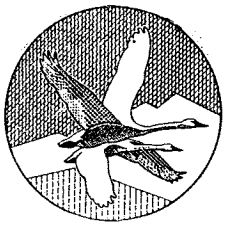
THE TRUMPETER SWAN SOCIETY

The Trumpeter Swan Society (TTSS) is a private, non-profit organization dedicated to assuring the vitality and welfare of wild Trumpeter Swan populations, and to restoring the species to as much of its former range as possible.

Since its founding in 1968, TTSS has provided the vision, knowledge and advocacy to move restoration efforts forward and improve management of Trumpeter Swans across North America. Our 480 members in the U. S. and Canada include interested private citizens and waterfowl propagators, plus most of the professional waterfowl biologists and managers who have guided Trumpeter restoration and management in recent decades. Most of our accomplishments result from the work of our members and Board of Directors in their professional roles and through their countless hours of volunteer effort.

The Society is run by a President, Vice President, Board of Directors and a part time Executive Director and Administrative Assistant. The Society headquarters is located at Hennepin Parks, Maple Plain, Minnesota. We publish *Trumpetings* four times per year and *North American Swans*, schedule determined by the Editorial Board. We are a nonprofit, tax exempt corporation under Section 501(c)(3) of the Internal Revenue Code. Contributions are tax deductible. The TTSS Web Page is located at www.taiga.net/swans/index.html.



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