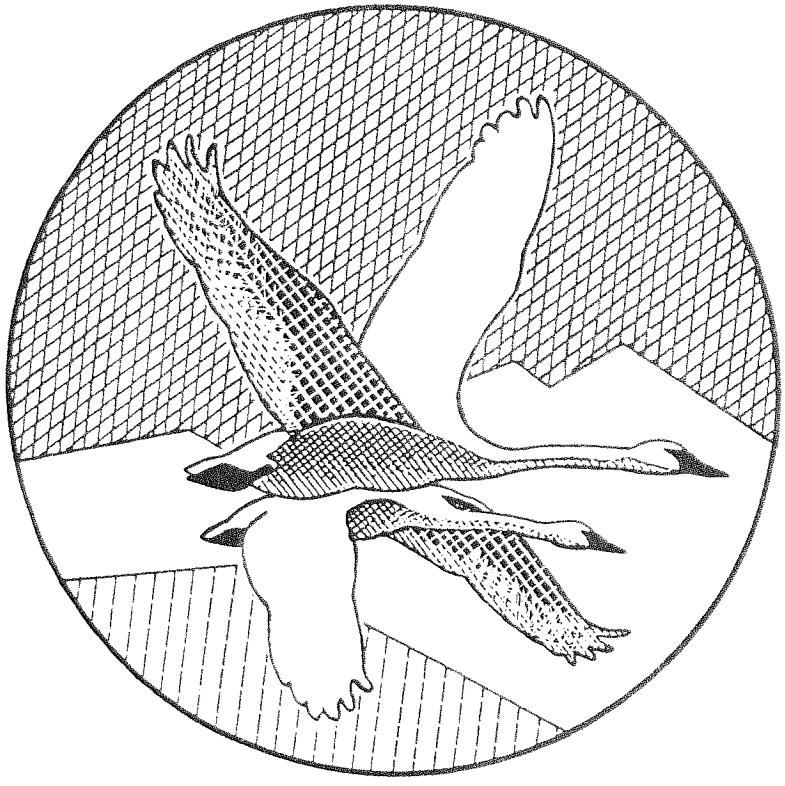
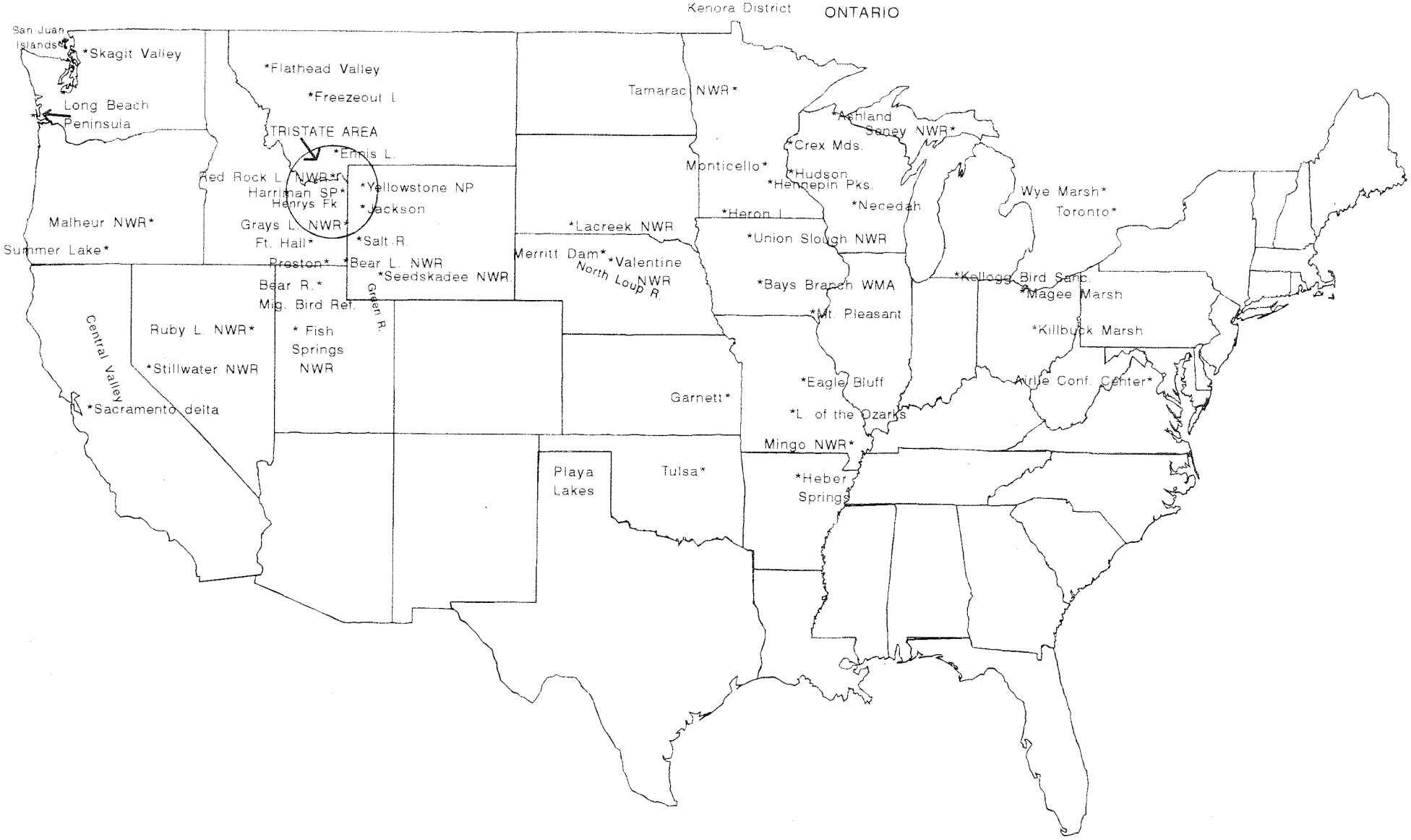
North American Swans



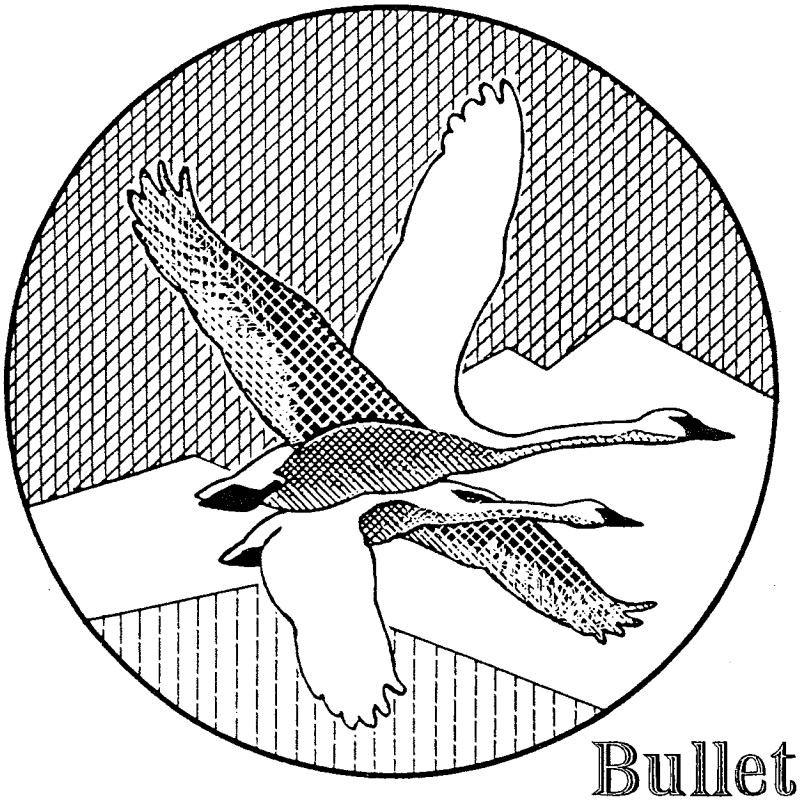
Bulletin of The Trumpeter Swan Society

Volume 30, No. 1 - December 2001



AREAS OF SIGNIFICANCE FOR TRUMPETER SWANS

North American Swans



Bulletin of The Trumpeter Swan Society

Volume 30, No. 1 - December 2001

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@hennepinparks.org).

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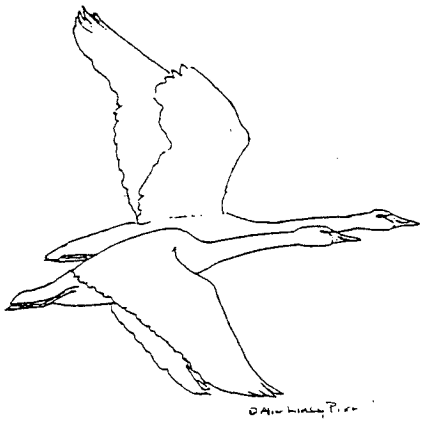


From the President

Harvey K. Nelson

The Trumpeter Swan Society (TTSS) strives to provide timely news regarding the management and status of Trumpeter Swan populations, summaries of significant agency reports that concern Trumpeter Swans, and original papers and notes pertaining to their ecology or management. Although our publications will focus primarily on Trumpeter Swans, we welcome material pertaining to the ecology and management of our native Tundra Swans and introduced Mute Swans. In North America, the futures of these three species are becoming increasingly intertwined, particularly where their ranges overlap. Better understanding of the similarities and differences in their ecology will help improve the management of all.

We plan to use our quarterly newsletter, *Trumpetings,* to convey highlights of recent research and management programs, timely brief regional news items, summaries of TTSS Board meetings, programs, administrative actions, and key meetings and decisions by management agencies. We encourage prompt submission of material to ensure that news is as timely as possible. Materials can be sent either via e-mail or on a diskette. Longer articles and notes will be published in *North American Swans, Bulletin of The Trumpeter Swan Society (North American Swans)* which is widely distributed to libraries and agencies, as well as to our membership. *North American Swans* will continue to be published at least once each year, usually in late fall, and more often if material warrants and staff time allows. The previous issue, Volume 29, Number 1, was a special edition containing the Proceedings and Papers of the Seventeenth Trumpeter Swan Society Conference held in Idaho Falls, Idaho, September 1999.

Those authors who seek to publish in *North American Swans* should submit manuscripts by June 1 to allow sufficient time for review and editing. TTSS will do everything possible to assist authors in the editing process, so that their information can be distributed widely and used where appropriate to improve swan management. We have established an editorial board, but welcome assistance from any of our members who would be willing to assist in the review and editing of submitted articles in their area of expertise.

TTSS continually strives to improve its publications and to provide accurate and useful information to the broadest possible audience, from swan biologists to private citizens who are concerned with the welfare of trumpeters throughout North America. We welcome your suggestions, and urge you to submit material for either *Trumpetings* or *North American Swans*. For more information about our publications and the editorial process, please contact Madeleine Linck, co-editor, at our Maple Plain, Minnesota, office. Please see the back page of this issue to learn more about TTSS and how to join the Society. Thank you on behalf of the majestic Trumpeter Swan.

Harvey K. Nelson, TTSS President, USFWS Retired
10515 Kell Avenue
Bloomington, MN 55437

Reflections

Remembering Ron Mackay

Dave Weaver

You will recall notice of Ron Mackay's passing in the March 2001 issue of *Trumpetings*. We learned of Ron's death from one of his Canadian Wildlife Service colleagues and Society member and Past President, Rick McKelvey. In a review of Ron's career, Rick wrote:

Ron Mackay joined the Canadian Wildlife Service in 1949 in Vancouver, and worked out of our regional office at UBC [University of British Columbia]. Ron had served in the Royal Canadian Navy during the war, and had gone to school at UBC after the war. [He] worked in British Columbia until 1959, when he transferred to Edmonton. While in BC, Ron began work with the Trumpeter Swans in the Grande Prairie area, work . . . he continued after moving to Edmonton. Ron returned to Vancouver in 1975, and retired from the Wildlife Service in 1978. After retirement, [he] continued to work for the conservation of Trumpeter Swans, working at the Delta office as a volunteer, writing up some of his older data, and attending meetings of The Trumpeter Swan Society. Ron passed away 9 July 2000, at the age of 84.

As a new member of The Trumpeter Swan Society, I, Dave Weaver, had the pleasure of first meeting Ron at the Second Trumpeter Swan Society Conference September 1972 in Grande Prairie, Alberta. All this Trumpeter Swan stuff was brand new to me at the time, having recently become the Wildlife Manager at Hennepin Parks in Minnesota where a Trumpeter Swan restoration effort was underway. It was nothing but pure enjoyment for me accompanying Fred King and Ray St. Ores to Grande Prairie, meeting Harold Burgess, and participating in a meeting about trumpeters, learning from experienced swan biologists. Our gracious Conference host was Canadian Wildlife Service biologist Ron Mackay, replete with snow-white hair at the young age of 55. Of all of us there, Ron was undoubtedly the man with the most experience with trumpeters. Needless to say, we all listened when he spoke. After all, The Trumpeter Swan Society was a fledgling organization intent on doing good things for trumpeters. We were in Grande Prairie to learn and share ideas on how to best enhance the conservation and welfare of this magnificent large white bird, and Ron was "the man." It was at this meeting that Ron was elected President of the Society, a position he would hold for 2 years -- 2 formative years. Ron was quiet, soft-spoken, but forceful, aggressive and committed to improving the lot of Trumpeter Swans.

A "partner in crime" with Ron was U. S. Fish and Wildlife Service Refuge Manager and biologist Winston Banko. When asked for his memories of Ron, Win responded:

I was so sorry to hear of Ron Mackay's passing. He was a model real-life, no-nonsense biologist!

Ron and I exchanged correspondence once or twice in the 1950's when I was at Red Rock Lakes and he, I think, pretty much had the run of British Columbia. Since Canada was "off-limits" to federal biologists without special permission, at least in those days, and Ron apparently labored under no such restrictions, I invited him down to examine Red Rock Lakes and marsh in detail and to discuss trumpeter swans at length.

So it was that Ron arrived one summer day. I was in the field near upper Red Rock Lake when he came bumping along the rutted country road with his canoe slung atop his vehicle. He stayed for a couple of days, observing the swans and examining the lake and marsh complex in detail. We talked swans into the night. It was clear that, though he had other responsibilities, trumpeter swans occupied a special place in Ron's heart. In parting, we pledged to work together in the future. Later, we collaborated in the chapter, "Our Native Swans," pp. 155-164 in J. P. Linduska (ed.) Waterfowl Tomorrow, USFWS, USDI, 1964.

Though Ron has disappeared in body, his spirit lives on. I feel certain that *Cygnus buccinator* executed an appropriate formation fly-by that day.

David K. Weaver, TTSS Director
2974 Borge Street, Oakton, VA 22124

Harold H. Burgess, Past President and TTSS member since 1972, offered some thoughts about Ron Mackay:

Past President Ronald Mackay of Maple Ridge, British Columbia, died 9 July 2000, according to a Christmas letter received from his widow, Helene Mackay. Ron and Helene were our perfect guests at Lacreek National Wildlife Refuge during the Third Trumpeter Swan Society Conference at nearby Martin, South Dakota, in September 1973, and have been friendly correspondents ever since.

Older members remember Ron's great Scottish Bag Pipe Show during the Fifth Conference at [John] Turner's Triangle X Guest Ranch in Moose, Wyoming. But, I remember best that Ron was the Canadian Wildlife Service's researcher who banded a family of trumpeters at Lowe Lake, Alberta, that were recovered in the Nebraska Sandhills, where restored Trumpeter Swans are wintering today.

Past President and long-time TTSS member Ray St. Ores, in his inimitable way, typed a letter to Ron on his original vintage Royal typewriter:

Dear Ron,

I know you'll see this!! The magnificent Redwoods live 3 to 4 thousand years, but even they, as you, have settled the debt incurred when germinated, hatched, or born.

Thanks, Ron, for your many contributions to things wild, natural, and free. North America has lost a crown jewel!!

Last night, 2 February 2001, there were 82 trumpeters on the St. Croix River at Hudson, Wisconsin, just five blocks from my home. You were instrumental in them being here for me to enjoy.

You were also instrumental to the successful birth and nurturing of The Trumpeter Swan Society. I will always remember your wise contributions to the agendas and sessions at our meetings in Grande Prairie, Jackson Hole, and Anchorage.

I have great memories of our membership riding horses along the Snake River with the Grand Tetons as a beautiful backdrop. As we neared our picnic area, we heard the unmistakable sound of bagpipes. Arriving at the designated spot, with derriere fatigue, we saw, "Ron, the Kilted Piper!"

Of such things are lasting and fond memories made. Thanks for everything, Ron. Rest well, you've earned it!!!

My best, always.

Ray St. Ores
(an early Top Cob)

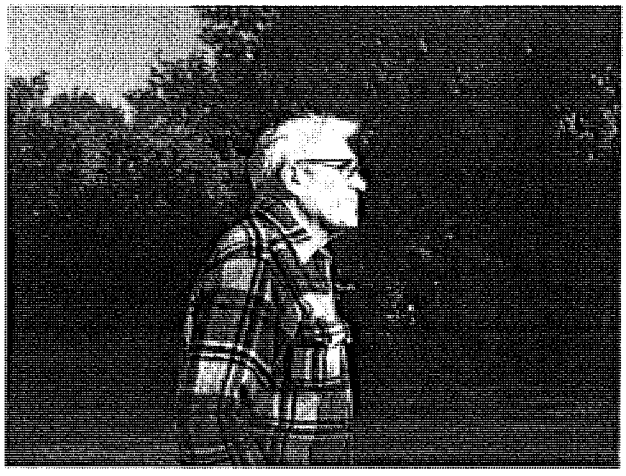
P. S. Save a place for me.

Current TTSS President Harvey K. Nelson added the following thoughts about Ron MacKay:

I would like to add my tribute to Ron MacKay. I had the privilege of working with Ron back in the mid-1960s when he was involved in the annual cooperative waterfowl surveys and breeding ground banding programs conducted by the U. S. Fish and Wildlife Service (USFWS) and the Canadian Wildlife Service (CWS). About that time, we also formed the Program Review Committee between the two agencies to address programs and problems of mutual interest, that subsequently led to the development of the North American Waterfowl Management Plan. Ron played an active role in those meetings as his responsibilities increased with CWS. At the same time, he increased his interest and activities with Trumpeter Swans. I'll always remember Ron as one of the pioneer waterfowl biologists who participated in many of the early cooperative programs between USFWS and CWS. He was a true personal friend and professional colleague, who always had a warm smile and a firm handshake, and was ready for a "party"!

The photograph on page 260 of the book, *Flyways - Pioneering Waterfowl Management in North America,* includes many of the principal waterfowl biologists from USFWS and CWS, who met at the Northern Prairie Wildlife Research Center, Jamestown, North Dakota, in 1967 prior to getting the spring waterfowl survey underway. Ron is near the middle of the second row from the back.

We miss you, Ron, and the swans miss your personal touch.



A single swan can make a difference

Harry G. Lumsden

A female Trumpeter Swan raised by a captive pair held at Wye Marsh, Ontario, has been the ancestor of a long line of offspring. She was hatched in 1990, wing clipped, marked with wing tag Number 100 and released in April 1991. By August 1991, she was flying. With no flying parents to lead her, she started to wander south in December. She was observed at two locations on Lake Simcoe, about 45 km. south of Wye Marsh. On 29 January, she was in the city of Burlington on the shore of Lake Ontario, about 75 km south of her previous sightings on Lake Simcoe, accompanied by two other Wye Marsh swans. They were last seen on Lake Ontario on 27 March, but by 8 April, she had made the 120 km-flight back to Wye Marsh. She stayed in Wye Marsh over the winter of 1992-93 and paired with Number 206. In 1993, their nest was the first in southern Ontario for over 200 years. She laid seven eggs and hatched six cygnets, all of which survived.

Part of Wye Marsh is open to hunting and, in late September, Number 100 was knocked down by an irresponsible hunter. A search by Don Foxall, one of the swan keepers at Wye Marsh, failed to find her body. Next morning, to everyone's surprise, she turned up in the Sanctuary area of Wye Marsh. She swam over a mile to return to her home territory.

By 8 December, she was flying with her family again, turning up at Port McNichol, just east of Wye Marsh. On 12 December, she led her family, including her mate who had not made the flight before, to Bronte Harbour near Burlington on Lake Ontario, not far from where she had wintered in 1991-92. Her span of wandering on the shore of Lake Ontario between December and March was about 22 km. On 30 March, the family had disappeared and was next seen at Wye Marsh on 31 March. On a straight line this would be only a 2.5-hour flight for a swan.

In 1994, Number 100 again nested at Wye Marsh and raised three cygnets. By 21 December, she was with her cygnets on Burlington Bay at the western end of Lake Ontario. She wintered in the same areas as in 1993-94. Her mate, Number 206, was missing and turned up at Bramalea on 18 December. He later wintered alone on Humber Bay on Lake Ontario.

Harry Lumsden, TTSS Director
Ontario Ministry of Natural Resources Retired,
144 Hillview, Aurora, Ontario L4G 2M5

Meanwhile, Number 100 left the Burlington area some time between 11 and 19 February, when she was seen again with her brood at Wye Marsh. By 26 February 1995, she had acquired a new mate, Number 338. They nested and raised a brood of six.

Last seen at Wye Marsh on 20 December, the family was reported at Cranberry Cove Park, northeast of Burlington on Lake Ontario on 22 December. On 25 February 1996, the pair was seen on Lake Ontario, but was at Wye Marsh on the 26th. Number 100 laid eight eggs, but her old mate 206 returned, fought with Number 338 and drove him off. She deserted her nest and spent the summer unpaired on Wye Marsh. Her deserted eggs were placed in an incubator and three hatched.

Without a brood, she and mate 206 did not migrate to the shore of Lake Ontario in the winter of 1996-97. In the summer of 1997, the pair moved to a strip of marsh on the Wye River where they raised five cygnets. They moved late that winter and were not seen at their usual locations on Lake Ontario until 1 January 1998. They stayed until at least 21 February, but were back at Wye Marsh on 28 February.

In 1998, Female 100 nested again on the Wye River and hatched seven cygnets, but lost three. She wintered with her four cygnets and mate at Wye Marsh, but on 1 March 1999, her mate and one cygnet were killed when they flew into hydro wires. The cygnet contained 71 lead pellets and had 10 ppm lead in its tissues.

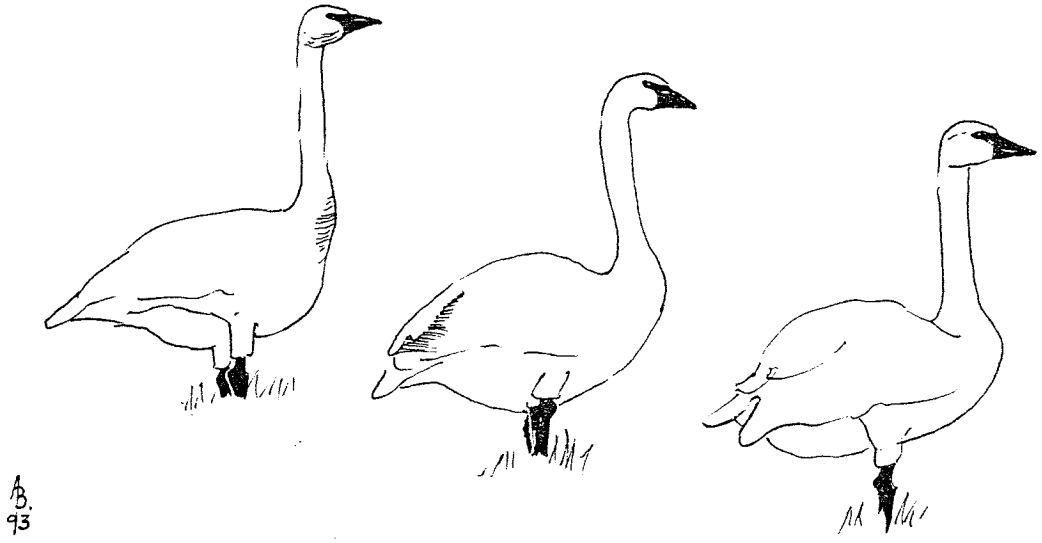
By 19 April 1999, she had formed a new pair bond with Number 366, which was her grandson. They disappeared for the summer and may have nested unsuccessfully at nearby Sucker Creek. In the fall and early winter, they remained at Wye Marsh where they were last seen on 25 January 2000. The next recorded sighting was on 29 January at Bronte Beach on Lake Ontario. They stayed until at least 21 February, but were back at Wye Marsh on 29 February. They were at Sucker Creek in May of 2000, had four cygnets with them in August, but only three in September.

The brood was last seen on 28 November 2000 near Penetanguishene in the Wye Marsh area and then was next recorded at Bronte Beach on 19 December. The swan family was regularly seen throughout January and February until 4 March. On 23 April 2000, the pair was back at Sucker Creek and started to nest. Then, a disgraceful incident occurred. A couple in a fast boat deliberately ran over Number 100, breaking her wing in two places. She was rescued and has been under treatment since.

Female 100's offspring from 1993, 1994, 1995 and two of her cygnets from 2000 were banded and marked with wing tags. Of these marked birds, at least six are known to have nested and their offspring in turn have

bred. Number 100 is known to have produced at least 70 descendants, many of which migrate from the Wye Marsh area to winter on the northwest shore of Lake Ontario. In the winter of 2000-01, about half of the 58 swans that wintered in the Burlington area were from Wye Marsh.

This story has some bearing on the problem of the future of the Greater Yellowstone population of Trumpeter Swans. The accidental kill of trumpeters during a Tundra Swan hunt, although probably very small, may be very important in the ultimate survival of that genetically discrete Trumpeter Swan population. It may not take many pioneers from the Greater Yellowstone breeding population to establish a migratory tradition. This should have the effect of returning birds in better condition and, therefore, more productive to the breeding grounds. Tundra Swan hunting on the Bear River Refuge should be observed carefully to determine the impact on trumpeters. There must be adequate monitoring of the use of new areas by pioneering trumpeters. Indeed, every bird is important at this stage, especially females.



Selected Papers

History of the High Plains Trumpeter Swan Restoration

Harold H. Burgess

Introduction

This is the story of the Lacreek or High Plains Trumpeter Swan (*Cygnus buccinator*) restoration. It tells how concerned men cared for this once "rare and endangered species" for over 40 years to bring them back to a free-flying, self-sufficient flock, and how the magnificent, great white swans responded to man's care. The story is told chronologically. It begins with U. S. Fish and Wildlife Service Biologists Dr. Ray Erickson, Dr. William Green, Harvey Nelson, Robert Ballou, Winston Banko, and Harvey Miller meeting with Refuge Manager C. A. "Art" Hughlett and his assistant Ed Collins at Lacreek National Wildlife Refuge (NWR), South Dakota, on July 25-27, 1960. The purpose of the meeting was to inspect the Refuge as a potential site to translocate Trumpeter Swans from Red Rock Lakes NWR, Montana.

Lacreek - a contraction of Lake Creek - is in southwest South Dakota on the northern edge of the Nebraska Sandhills and its spring-fed streams. Lacreek's spillways are open all winter. In Art's words, "Ed and I pointed out habitat features that would support free-flying Trumpeter Swans over winter. Of course, we wanted the swans on our refuge." Here was an opportunity to establish another flock with supplementary winter feeding, where all of the trumpeter's requirements could be supplied, with no need for the swans to move off the Refuge. A positive decision was made. Hughlett confides that no other agencies nor individuals were involved in the transfer, because they wanted to keep things quiet at first, so that no vandals would kill a rare trophy bird (Hughlett, pers. comm.).

The Refuge staff carefully transported 47 3-month-old cygnets during a 3-year period from Montana to South Dakota and cared for them. It was a struggle for humans to rear those vulnerable fledglings to 2-year-old subadults. Dangers for the cygnets were many. Some died due to transportation stresses. Great Horned Owls took several cygnets from their open pen. The staff covered a corner of the pen and drove the cygnets under cover each night. They also removed 57 Great Horned Owls from the immediate vicinity. It seems that as soon as a territorial pair of owls was removed from this attractive area, another pair moved in. Raccoon, bobcat, and other mammalian predators took other cygnets. Some died due to accidents.

Art released 13 yearlings during the 1961 summer. Six appeared paired, with courtship activities and wandering beginning in March and April 1962. One pair was reported 60 miles away, northeast of Kadoka, Jackson County, South Dakota. Another pair was reported on North Cody Lake, 15 miles southeast. Breeding territories were established in Pools 5, 6, and 7 of Lacreek NWR (Hughlett 1960-61).

Hughlett was promoted to Assistant Refuge Supervisor, transferred to the Minneapolis regional office and was replaced by Refuge Manager James Monnie. By 1 May 1963, two trumpeter pairs were nesting as 2-year-olds on Lacreek NWR. One pair hatched five of eight eggs and fledged one in Pool 7. Another pair hatched four of six eggs and fledged one in Pool 9. The other pair in Pool 6 did not nest, but chased intruders in their territory. The subadults wandered off-refuge, exploring great distances, typical of young Trumpeter Swans.

The cygnets obtained in 1962 were wing-clipped and held on the Refuge for 2 years to reduce their wandering. They did not court until they were 3 years old (probably because the nearby breeding territories were occupied). They took up the wandering habits of their predecessors. Of the 47 cygnets transferred from Red Rock Lakes NWR, only 34 could be released (Monnie 1962-1965).

Monnie (1966) was the first to publish that Trumpeter Swans less than 3-years-old actually nested. He reported courtship and pairing details, and that

Harold H. Burgess, retired USFWS Biologist, 808 S. Kansas Ave., Weslaco, TX 78596

cygnets had been produced off-refuge near Weta in Jackson County and on North Cody Lake in Bennett County. The first goal of the program had been met. A wild flock of Trumpeter Swans had been established.

Three cygnets were shot by a ranch hand on South Cody Lake during Nebraska's 1964 duck hunting season. The poacher was apprehended by Conservation Officer Elvin Zimmerman and prosecuted for killing endangered wildlife. About 10% of the adults were missing in counting the peak wintering flock at Lacreek. It was thought that they were wintering elsewhere.

Monnie's publication (1966) brought the Trumpeter Swan story up to 1965. He transferred to Mark Twain NWR, and was replaced by Refuge Manager John Ellis in 1966. John and Assistant Manager Donald Young carried on with a more detailed study of nesting behavior. They measured nests, flushing distances, and developed tables of nesting success and evaluations of the flock's life histories (Ellis 1971).

Ellis and Young initiated aerial Trumpeter Swan nest surveys on and off-refuge. There were 10 trumpeter nests on the Refuge that fledged 16 cygnets in 1966. They observed a nesting pair at Weta that fledged four cygnets off-refuge. Assistant Manager Jon Malcolm, Valentine NWR, reported a breeding pair on territory in Cherry County, Nebraska, 60 miles east southeast of Lacreek NWR. The winter flock peaked at 43 birds. Some of the 13 missing adults may have wintered on the Valentine NWR/ Snake River/ Merritt Reservoir Complex. A Trumpeter Swan nest was found on Walter Kruse's Sweet Dam, in Pennington County, South Dakota, grasslands in 1967. Trumpeters peaked with 57 at Lacreek NWR that winter. Trumpeters nested on Valentine NWR, and the five missing adults may have remained at the Valentine NWR/ Snake River/ Merritt Reservoir Complex.

Only three pairs nested on the Refuge in 1968, and fledged 11 cygnets. The nesting studies may have been too intrusive, causing some pairs to abandon their nesting sites. Trumpeter Swans nested at Weta for the 5th consecutive year and at Sweet Dam and on Valentine NWR the 2nd year, and fledged at least six cygnets off-refuge. A trumpeter brood was seen off Highway 27 near Gordon, Sheridan County, Nebraska. A peak of 64 Trumpeter Swans were counted on the Refuge. The 11 missing adults probably wintered elsewhere (Ellis 1966-68).

Ellis was promoted and transferred as Regional Refuge Biologist and was replaced by Refuge Manager Victor Hall in 1969. Five trumpeter pairs nested on the Refuge and fledged 10 in 1969. Trumpeters also nested at North Cody Lake, Weta, Sweet Dam, and Valentine NWR and fledged at least 10 off-refuge. A peak of 78 Trumpeter Swans returned to the Refuge. Six adults were missing, perhaps wintering elsewhere.

Victor Hall was a "pure" naturalist. He did not believe in artificial restoration. Since Trumpeter Swans had been removed from the Bureau of Sport Fisheries and Wildlife Red Book of Rare and Endangered Wildlife Species in 1968, they had lost their management priority (Gottschalk 1968).

Vic turned the swan program over to Assistant Manager Conrad Fjetland, after Con arrived in 1970. Six pairs nested on the Refuge, hatched 22 and fledged 10. One nest in Pool 10, seen in aerial survey, was not found in ground search, and was not successful. Off-refuge nests at North Cody Lake, Weta, Sweet Dam, Valentine NWR, and on Adamson Ranch, near Snake River in Cherry County, Nebraska, also fledged at least 10 cygnets.

Several adult Trumpeter Swans were shot by tribe members on Oglala Lake, in the Pine Ridge Indian Reservation. U. S. Game Management Agent Dave Fisher investigated, but found that he had no authority on the Reservation. The Tribal Council administration refused to take action that would prevent a re-occurrence.

The 9,000-acre Sandhills Brown Ranch was added to Lacreek NWR in 1970. Nebraska Conservation Officer Zimmerman retrieved a crippled pen from Merritt Reservoir and brought her to Lacreek. She was from the Valentine nesting pair. Eighty-one trumpeters returned to Lacreek by January 1971, but 11 adults were missing. We do not know how many off-refuge cygnets fledged and did not winter on the Refuge.

Four trumpeter pairs nested on the Refuge in 1971 and fledged 11 young. The 10-year-old pen in Pool 8 died on her nest. Up to this time, all Trumpeter Swan nests in the Refuge had been built on muskrat houses, but Pool 9 had been drained over-winter for renovation, and there were no houses. One of Pool 9's two breeding pairs built their nest in the pool from the ground-up. The other pair did not nest. Nine pairs nested off-refuge and fledged at least 17. A new nest site was found on a muskrat house at Lee Hamm's Cheyenne River pit near Interior, South Dakota.

Fjetland counted 101 trumpeters using the Refuge over winter. Sixty hung around the self-feeder on Pool 5 Levee, below Dam 8 Spillway, and 41 used Cedar Spring Creek on the Brown Ranch Addition. An adult trumpeter collided with a hilltop fence and died. Another adult and five cygnets died of unknown causes (Hall 1969-71).

Five pairs nested on the Refuge in 1972, and fledged eight. Two pairs nested in Pool 6, but only one pair was successful. Two nests were built in Pool 10, but no eggs were laid. Possibly these were by a pair of cobs. The Refuge staff located eight off-refuge nests,

five in the Nebraska Sandhills and three in South Dakota.

Hall transferred to Desota NWR, and I replaced him in August 1972. Fortunately, Fjetland had kept up his trumpeter observations, as I was asked to speak on the status of the Lacreek Flock at the Second Trumpeter Swan Society Conference at Grand Prairie, Alberta, in September. My wife, Ruth, and I joined the Society. We offered to host the Third Trumpeter Swan Conference at Martin, South Dakota, in 1973.

A public relations program for Trumpeter Swans was started with the South Dakota Game and Fish Department, the Badlands National Monument, the Buffalo Gap National Grasslands, the Nebraska Game, Fish and Parks, and private landowners. We initiated an information program among the Nebraska ranchers. Our restoration programs were well known in South Dakota, but Nebraskans did not receive South Dakota news. All were invited to attend The Trumpeter Swan Society Conference at Martin, South Dakota, in September 1973.

Self-addressed, stamped postcards were given to cooperators for reporting swan nesting and other observations. (The cooperator ranks rose to over 100 during Rolf Kraft's tour). Trumpeters peaked at 111 overwintering at Lacreek, but 16 adults were missing. We began hearing about swans wintering at the South Cody Lake outlet and in the Irwin area in Nebraska.

Four pairs nested on the Refuge in 1973. A new trumpeter nest site was found on the Bowman-Heath Marsh in southeast Bennett County. Frank Scharman reported a swan nest on a cattail island in his lake on an inholding of the Buffalo Gap National Grasslands in Pennington County, South Dakota. Mrs. Billie Lefler reported swan nests on Alkali, Twin, and Log Cabin Lakes near Irwin, Cherry County, Nebraska.

Area Biologist William Bair and I drove the Sandhills trails, lake to lake, along the state border from Nebraska Highway 67 in western Cherry County to Highway 27 in eastern Sheridan County to see the swan nest sites. We contacted Ivan Moss, manager of Brush Creek Ranch. While discussing the swans on Hoover and Frye Lakes, he asked, "You know that the swans were nesting on Hoover Lake, when we moved here in 1960?" That was incredible, Trumpeter Swans were thought to have been extirpated from Nebraska. We turned to Mrs. Moss. "Yes," she said, "the swans were nesting on Hoover Lake, when we moved here." Ivan added, "They have nested here ever since." No Lacreek swans had nested before 1963.

We captured, banded, and collared 18 Trumpeter Swans during their 1973 summer molt, to follow individual movement. One of the two families marked on Valentine NWR did not winter at Lacreek NWR. The family nesting on Hoover Lake did stage at Lacreek, but we were not sure whether they were decoyed there, or were from Lacreek stock.

There were speakers from most of the public land agencies in South Dakota and Nebraska at the Third Trumpeter Swan Society Conference at Martin, South Dakota, 18-20 September 1973. Lacreek NWR and the Pierre Area Office hosted the meeting. Fjetland did so well with arrangements and presenting the status of the Lacreek Trumpeter Swan Flock, that he was invited to join the Pierre Area Office. He mentioned that there were about 100 trumpeters in the Lacreek Flock. Nine trumpeters had been killed by gunshot, five had flown into power lines and 20 had died from natural and unknown causes (Fjetland 1973).

Participants had choices of field trips to Trumpeter Swan nesting habitats in the Badlands or the Sandhills. The Conference presented Nebraska Conservation Officer Zimmerman with the Protector's Award and the Buffalo Gap National Grasslands with the Land Steward's Award, for services to Trumpeter Swans.

Trumpeter Swans peaked at 138 in late Fall 1973. We searched hard for Trumpeter Swans in 1974. Nebraska rancher Lester Hawthorn showed me seven trumpeters wintering on Horseshoe Drain and loafing on the Twin Lakes in northwest Cherry County near Hoover Lake. They were in that vicinity at least from 12 February to 19 April. Six trumpeters wintered at South Cody Lake and at least two were on the Snake River on March 16, 1974.

South Dakota Biologist Paul Bultsma reported two adult and four cygnets on an impoundment 7 miles west of Cactus Flats in Pennington County. Conservation Officer Mike Miller reported a pair of swans on Dogear Lake in Tripp County, South Dakota, 75 miles east of the Refuge. We contracted with the Sand Hill Aviation Company to fly the perimeter of the known trumpeter breeding area with a 4-place airplane on June 20. We covered the perimeter in 1 day and saw five trumpeter nesting pairs or broods, but the plane was too big and fast to really search out the marshes for hiding broods.

We were getting great cooperation from South Dakota Conservation Officers Lee Vanderbush, Michael Muck, and Dennis Lengkeek, respectively of Pennington, Haakon-Jackson, and Bennett-Washabaugh Counties. They were reporting trumpeter observations in such detail that we did not really need to check them out. Conservation Officers Zimmerman and Marvin Kampbell of Cherry and Sheridan Counties, and Nebraska Biologist John Sweet gave us similar service in Nebraska, as did Rangers Jim Lees and Greg Schenbeck of Buffalo Gap National Grasslands. I helped Nebraska National Forest Biologist Larry Robinson (1975) write the Nebraska National Forests and Attached Units [National Grasslands] Trumpeter Swan Management Plan.

When we flew the trumpeter nesting area again in a 2-place Piper Cub on July 18-19, 1974, we extended the route, and were able to confirm 13 broods off-refuge. The winter flock peaked on the Refuge at 130. This was eight less than the previous year, even with an increased number of broods.

It was a mild winter and we thought that at least 20% wintered off-refuge. There were four adults and five cygnets using Dick Rose's Trout Ponds, February 14-25, 27 mixed-age trumpeters feeding on Arrowhead (*Sagittaria* sp.) on Carl Jackson's ranch on February 15, and a pair was on Sweet Dam on February 25. In Nebraska, two swans were seen on the Upper Snake River from 4 December to at least 19 January 1975; two on Merritt Reservoir 19 January, and two swans on the Lower Snake River from 29 January to 5 February. After the big blizzard of 18 March 1975, there were from four to 20 swans observed in the Cody Lakes-Nelson Lake area. There was no apparent movement from off-refuge to the Refuge feeders after the blizzard.

Reservation Officer Janis reported that one of six adult Trumpeter Swans was shot by non-Indians on Kyle Lake, Pine Ridge Indian Reservation, on 22 April 1975. Conservation Officer Jack Kuhl reported two adults and one cygnet, 3 miles east and 1 mile north of Hayes, Stanley County, South Dakota, on 4 May 1975. Pairs returned to all of their known nesting sites. Trumpeters peaked at 138 on the Refuge in late Fall 1975. One to 15 swans wintered on South Cody Lake from 21 December 1975 to 16 February 1976.

Conservation Officer Muck reported a trumpeter pair nesting on an old nest, 3 miles east of Ottumwa, South Dakota, in Haakon County on 4 May 1976. Conservation Officer Larry Stomprud reported a nesting pair on the Fauske Impoundment in the Buffalo Gap National Grasslands. Conservation Officer Darrel Tilberg reported a pair on Carmichael Dam, 3-4 miles west of Thunder Butte, Ziebach County, South Dakota, 143 miles north of Lacreek NWR.

Stomprud reported trumpeters seen around Mud Butte in Meade County, 140 miles northwest of Lacreek, since 1972. A pair was nesting on an impoundment 3 miles west and a ½ mile south of Mud Butte on 18 May 1976. They had previously nested on Chris Orwich's dam to the south. Lacreek Biotechnician Al Ridgeway observed two adults and two cygnets there on 19 August 1976, confirming Stomprud's report. There were nesting attempts on 12 known South Dakota off-refuge sites, and 14 attempts in Nebraska. The Refuge peaked with 159 Trumpeter Swans in late fall, 1976. Sixteen swans wintered at South Cody Lake.

Conservation Officer Lengkeek reported new Trumpeter Swan nest sites at Corral and Hidden Ponds in Washabaugh County on 24 June and 1 August 1977. There were six known nest sites in Pennington County. The Refuge peaked with 191 Trumpeter Swans, including 65 cygnets, with six adult and eight cygnet Whistling Swans (*Cygnus columbianus*) on 24 November 1977. The Whistling Swans and 21 trumpeters left before the New Year. Eighteen Trumpeters Swans migrated to South Texas. They fed in a milo-baited duck- hunting club/ rice reservoir and rested on Carancahua Bay, off the Gulf of Mexico. (Burgess and Burgess 1997). These birds had to be from Lacreek NWR as no other restored flocks were migrating in the central United States at that time.

It was a harsh winter and many trumpeters died of stress and lead poisoning. We were feeding whole corn. The trumpeters were picking up spent lead on Cedar Creek. When they ground the corn in their gizzards, they also ground the lead fine enough to absorb it into their blood, paralyzing their digestive system and starving. We changed to feeding wheat and cracked corn. Later, when Cedar Creek was studied, we found one spent lead shot per cubic foot of creek sand (Burgess 1972-77).

A new nest site was reported at Red Rock Impoundment, Washabaugh County in 1978. (This county was incorporated into Jackson County and no longer appears on the map). Badlands National Monument Ranger Bill Lonehill reported two adult and three cygnet trumpeters on Wild Horse Dam in northern Shannon County. Six pairs nested on the Refuge and fledged 14 in 1978. A peak of only 174 was counted in late fall. It is certain that some migration took place because a pen shot at Thomas Hill Reservoir, Macon County, Missouri, on 7 December 1978 had been leg-banded as a cygnet at Lacreek NWR on 24 August 1974. The pen was migrating with her family of a cob and four cygnets. Two cygnets were also shot there and discarded.

I transferred to the Kansas City, Missouri, Area Office in August 1978, but kept my interest in Lacreek trumpeters and The Trumpeter Swan Society. I served on the Swan Committee of the Central Flyway Council and chaired the writing of the Lacreek Trumpeter Plan (Burgess *et al.* 1982). Refuge Manager Rolf Kraft replaced me and has been the Refuge, and Flock Manager since then. He has done a great job, monitoring the flock with his own airplane, and often on his own time.

In 1979, the Lacreek Flock produced 65 cygnets. The Refuge peaked at 184 with considerable off-refuge movement. The Flock produced at least 56 cygnets and peaked at 196 at Lacreek in 1980. Ollie Hanson (pers.comm.), of Seneca, Nebraska, says that 1980-81 was the first winter that trumpeters stayed on the Middle Loup River downstream from his town. The Lacreek Flock peaked at 230 with 58 cygnets in 1981.

In 1982, Lacreek NWR gave the Minnesota Department of Natural Resources eight swan eggs for

the Minnesota restoration program and transferred a pair with three cygnets to Missouri in line with the Lacreek Trumpeter Swan Plan. Trumpeter Swan families would be transferred to Mingo NWR in southeast Missouri to spend the winter and imprint the juveniles to that wintering area before returning to their nesting grounds. A difficulty with the plan was that the swans did not plan it, nor read it. The adults chose to remain and nest in Missouri, and the surviving cygnets remained in the vicinity. The Lacreek Flock peaked at 215, including 48 cygnets in December 1982.

Wyoming Waterfowl Biologist Dick Saul reported 10 Trumpeter Swans had been on the Belle Fourche River Watershed during April 1981. Dick thought that a pair had nested in a large marsh on Arch Creek, 15 miles northeast of Upton, Wyoming, in 1981 and that they had moved northwest to Thunder Basin National Grasslands Reservoir #1 to nest by 3 May 1983.

Kraft surveyed the Sandhills during early summer 1983 to find three families of trumpeters to transfer to Missouri from willing ranchers' lands. He found the right combinations at the ranches of Lester Hawthorn, Ray Weimer, and Alvin Kroger. The adults were captured in July to clip their wings during their annual molt, so that they could be caught again in early September, when the cygnets were ready for transfer.

An aerial survey was flown on 5 September to get a final count on the cygnets so none would be left behind for certain death. The survey found only one adult and one cygnet at Hawthorn's, but the families intact at Weimer's and Kroger's. Upon investigation, they were told by the Hawthorns that they had seen an adult with two cygnets walking 2 miles east of their lake about 2 weeks previous. They searched the area and found the pen grazing with a herd of bulls about 6 miles east of its nesting lake. There were no signs of the cygnets. The pen was run down and captured. The cob and cygnet at the lake were captured and all were held in a safe Refuge holding pen until they could fly.

Kraft's crew captured a pair with three cygnets on Kroger's and another pair with two cygnets on Weimer's for transfer to Missouri. When the crew went in with an airboat, the adults made a distraction run and swim, while the cygnets split for cover. While the crew captured the adults, the cygnets disappeared. Kraft had his crew shut down the airboat, and flew aloft about 1000 feet, dropped his flaps, and throttled his airplane as much as possible to reduce the noise and flew slow circles around the lake until the cygnets reappeared. He than directed the airboat crew to the cygnets by radio.

These families were broken up by predation in Missouri. None stayed at their release site. Due to the high cost of capturing entire families, it was recommended that subadults be used in future Missouri transplants.

In 1983, five trumpeter pairs nested on Lacreek Refuge, hatching four broods, with 17 cygnets, and fledging nine. The refuge flock peaked at 263 with 57 cygnets. But the numbers dwindled to 160 by New Years' after a period of very frigid weather. Aerial searches were made of the vicinity, but only four were found at South Cody Lake. Migration had occurred.

Eight unmarked adult trumpeters and five cygnets were reported on the South Canadian River near Ada, Oklahoma, during the 1983-84 winter. Six adults and five cygnets were seen near Dumas, Arkansas, on the Arkansas River, 20-30 December 1983. One adult was marked with an iron-stained collar. It was from Lacreek as no other collared Trumpeter Swans were migrating in the Mississippi Flyway at that time (Burgess and Burgess 1994). Clues came in slowly, but a massive migration had occurred with little mortality. Most of the known Lacreek Flock nesting sites were filled in 1984.

Five trumpeter pairs nested on the Refuge and fledged seven in 1984. The Lacreek Flock peaked with 237. Six pairs nested on the Refuge and fledged 13 in 1985. The flock peaked with only 187 in late fall. Migration was again suspected.

Six pairs nested on the Refuge and fledged a record 19 in 1986. Lacreek's marshes and swans must have been in excellent condition. The flock peaked at 229. In 1987, the flock peaked at a record 268 with 182 adults and a record 86 cygnets. Six pairs nested on the Refuge in 1988, but only fledged eight. The Pool 2 nest was flooded, and the pair on Pool 8, that usually reared its entire brood, only fledged one out of five. The Lacreek Flock peaked at only 247 in 1988.

Missouri Biologist John Smith reported that the original pair transferred to Mingo NWR had finally fledged a cygnet. This was difficult on a refuge that drains its pools in summer every other year. The cooperative experimental winter reintroduction at Mingo NWR was terminated due to lack of funds and energy. Thirty-five Trumpeter Swans had been transferred from Lacreek NWR to Missouri from 1982 to 1988; and 32 were released. Half of the released birds were known dead, and two others were presumed dead. Seven were known to have left the study area. Two returned to Lacreek. Seven remained on the study area at the end of the experiment (Smith 1988).

Trumpeter 43RA seen at Russelville, Arkansas, in January 1988, was observed back at Lacreek NWR in December 1989. Another Lacreek-collared trumpeter, 36FA, observed during the summer in Michigan's Upper Peninsula was wintering on the Mississippi River in Minnesota. Trumpeters peaked at 231 at Lacreek in the 1988-89 winter.

The 1990 Aerial Production Survey was conducted in northwest Nebraska, western South Dakota, and Crook County, Wyoming, during late summer. A total

of 193 Trumpeter Swans was found including 41 nesting pairs, 22 broods with 68 cygnets and 45 nonbreeders in seven flocks. Postcards reported broods at Dogear Lake in Tripp County, South Dakota, and in Long Lake, Rock County, Nebraska. The Lacreek Flock peaked at 225 including 61 cygnets. A hard freeze with temperatures down to -35° F froze all open water on 29 December 1990, and 10 trumpeters died of exposure. Emergency releases opened some water and provided some relief.

The 1991 Aerial Production Survey of northwest Nebraska, western South Dakota, Crook County, Wyoming, and Carter County, Montana, was flown in late summer. No swans were found in Carter County. A total of 206 trumpeters was observed, including 38 nesting pairs, 24 broods with 89 cygnets, and 26 nonbreeders in four flocks. Reports of broods at Dogear Lake in Tripp County, South Dakota, and at Long Lake in Rock County, Nebraska, were mailed in. Six pairs of trumpeters nested on Lacreek Refuge, hatched 21 and fledged six. The peak number of trumpeters returning to the refuge was only 160 on 4 November. It was a mild winter and there was only marginal ice cover on the surrounding wetlands, where the swans dispersed. Two trumpeters with Canadian collars 30AC and 31AC were observed on Lacreek Refuge on 29-31 October 1991. They had been collared near their nesting site on Greenwater Lake Provincial Park in eastern Saskatchewan on 23 July 1991. They had nested in that area during the past 4 years (Beaulieu 1999). Several swans died from lead poisoning during the winter.

The 1992 Aerial Production Survey covering northwest Nebraska, western South Dakota, and Crook County, Wyoming, was flown August 10-13. A total of 228 Trumpeter Swans was observed, including 48 nesting pairs, 30 broods with 102 cygnets, and 25 nonbreeders in five flocks. Five pairs nested on the Refuge, hatched three broods totaling 11, and fledged five. No swans nested on Pool 7. It was obvious that swan production no longer had top priority on Lacreek NWR, as fishing and trapping occurred around Pool 7 nest site in March and April, prior to summer draw-down and carp control. A vegetation transect line was worked near the nest sites in Pools 6 and 11. A trumpeter family collared near Colony, Wyoming, during the summer was seen at Lacreek on December 7, 1992. Kraft changed the name of the Lacreek Flock to the High Plains Trumpeter Swan Flock, since they were nesting in northwest Nebraska, western South Dakota, and northeast Wyoming, and many wintered south of Lacreek. The High Plains that he wrote about included western Nebraska, eastern Wyoming, and western South Dakota. It is mostly 2,500 feet above sea level and primarily drains into the Missouri River.

A total of 200 trumpeters including 62 cygnets peaked at Lacreek in late 1992. For the first time, the 1991 and 1992 summer production surveys were greater than the following wintering peaks at Lacreek NWR, further indicating fall migration. Seven trumpeters died of lead poisoning. Ten dead trumpeters, or their remains, were found under a power line crossing Lake Creek west of the Refuge. The power company later placed marker balls on the line.

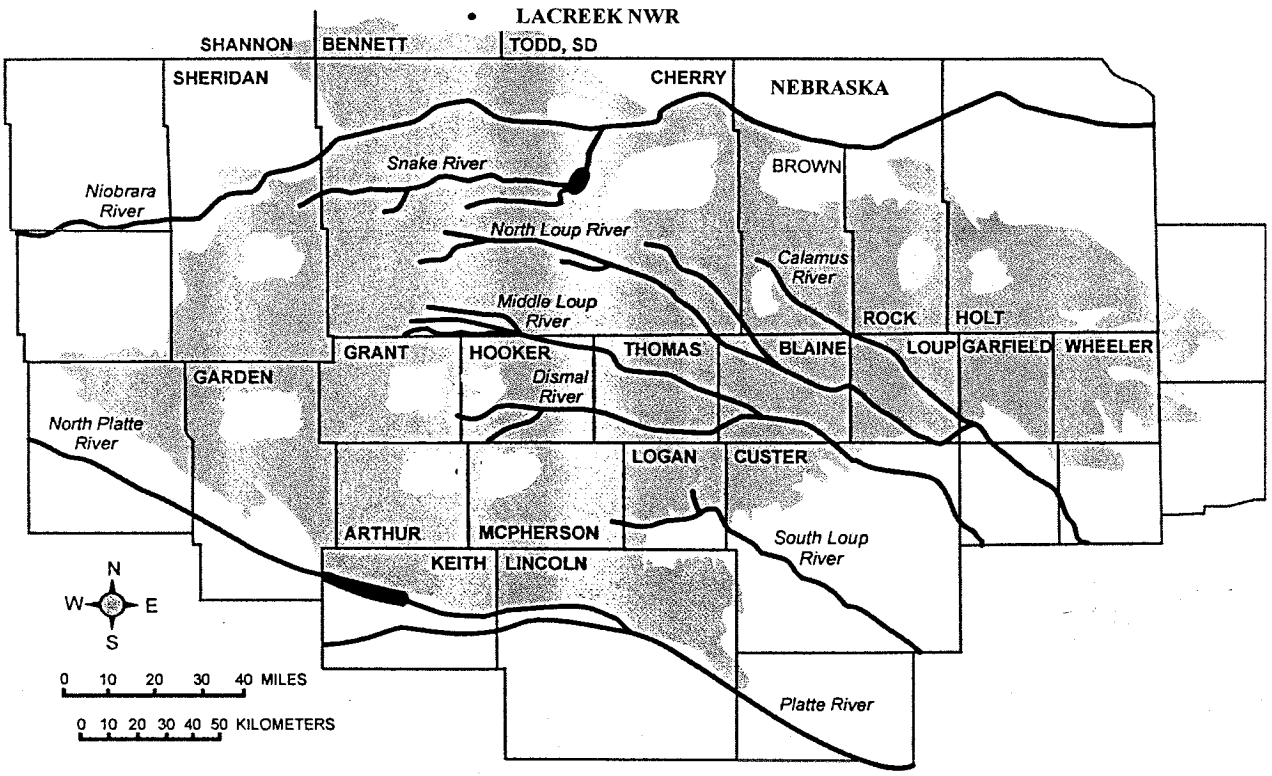
The 1993 Aerial Production Survey of northwest Nebraska, western South Dakota, and Crook County, Wyoming, was flown in late summer. It found 173 trumpeters, including 42 pairs, 21 broods containing 58 cygnets and five nonbreeders in three flocks. Four pairs nested on the Refuge, hatched two broods totaling seven cygnets and fledged four. Nesting was hampered by an on-going water rights dispute, fluctuating water levels for carp control, and research for cattail control. A traditional nest site in Pool 11 was not used because its cattails had been prescribed-burned on 3 May 1993. A total of 164 Trumpeter Swans, including 42 cygnets, wintered at Lacreek NWR.

In 1994, Kraft found 249 trumpeters including 85 cygnets in his production survey. The Refuge 1993-94 winter flock peaked at 205. For the 4th consecutive year the summer count was greater than the following winter count (Kraft 1978-97).

Saskatchewan Regional Biologist Rhys Beaulieu found a pair of trumpeters at Greenwater Lake Provincial Park, and 20 adults and 10 cygnets in the Porcupine Hills Provincial Forest in eastern Saskatchewan. His crew collared seven adults from six nest sites in July 1994. All staged at Lacreek NWR in late October. Some stayed at Lacreek, but others were missing until the late winter migration (Burgess 1997; Beaulieu 1999). The Refuge flock peaked at 249.

Although the 1995 late summer production survey found 214 Trumpeter Swans, the peak number on Lacreek NWR during the 1995-96 winter was only 65. Rumors of swans on Upper Snake River caused Kraft to fly there and find 142 trumpeters. This habitat on private ranchland above the Merritt Reservoir and south of the McKelvie National Forest is quite inaccessible to normal travel, passable only with 4-wheel-drive in summer. It is probable that numerous swans had been wintering there for many years. The few that had been reported were only those that were seen near public roads.

The peak winter counts of these High Plains trumpeters in South Dakota and Nebraska on the Upper Snake River totaled a satisfactory 207. However, Nebraska Waterfowl Biologist Joe Gobig reported that their Midwinter Waterfowl Survey found 76 swans on Snake River, 35 on North Loup, 26 on North Platte River, and 45 on Blue Creek, south of Crescent Lake NWR. They were unable to survey the Middle Loup



Location of Lacreek NWR and key swan survey areas in the Nebraska Sandhills. Map adapted from Figure 1 by J. E. Ducey. From History and status of the Trumpeter Swan in the Nebraska Sand Hills. 1999. North American Swans 28(1):35.

and the Platte River, east of Kearney, due to weather conditions. Their survey indicated that wintering trumpeters were scattered throughout the Sandhills and to the south, and that an accurate winter headcount was impossible.

The 1997 Aerial Production Survey in northwest Nebraska, western South Dakota, and Crook County, Wyoming, was flown in late summer. It found 230 Trumpeter Swans, including 51 nesting pairs, 29 broods with 86 cygnets and 41 nonbreeders in eight flocks, compared to 207 trumpeters, including 52 pairs, 22 broods with 78 cygnets, and 23 nonbreeders in five flocks in 1996.

Kraft flew a winter survey on 24 January 1998. He found 70 trumpeters in the Lacreek area, and 16 on Cody Lake, 32 on Blue Creek, seven on the Platte River, 28 in the Whitman Area, 45 on the North Loup River and 130 on Upper Snake River. This made a total of 70 in South Dakota and 258 in Nebraska (Kraft 1978-98). The 1998 Aerial Production Survey in northwest Nebraska, western South Dakota, and Crook County, Wyoming, was flown on 8 September 1998. It found 298 trumpeters including 249 in Nebraska, 48 in South Dakota, and two in Wyoming. There were 114 cygnets (Kraft 1978-98).

Kraft flew a winter survey on 14 January 1999. He found 87 in the Lacreek area, 168 on Upper Snake River, 105 on Blue Creek, 11 on Keystone, four on Birdwood Creek, eight in the Whitman Area, 72 on North Loup River for a total of 87 in South Dakota and 368 in Nebraska (Kraft 1999). I estimate that 20% of the swans were south or otherwise outside of his survey corridors. Thus, the High Plains Trumpeter Swan winter population was 546, well over the 500 goal with more than 81% south of Lacreek NWR, and its winter feeders.

An Aerial Production Survey of northwest Nebraska, western South Dakota, and Crook County, Wyoming, was flown 31 August – 3 September 1999. It found 311 trumpeters, including 69 nesting pairs, 36 broods with 105 cygnets, and 60 nonbreeders in 12 flocks, but missed the trumpeters in Wyoming.

Trumpeter Swans were declining in western South Dakota's hard clay lands, due to its limited food base, sparse nesting and rearing cover, and its harsh climate. Traditional trumpeter nest sites were flooded out during years of above-normal precipitation, and deserted during dry years. Trumpeter pairs persisted in using those sites, but production was severely reduced.

Trumpeters were steadily increasing in the rich waters of the Nebraska Sandhills where excessive precipitation was absorbed by the sand, which generously provided for the wetlands during dry periods. Charles Pelizza found a much better aquatic food base in the Sandhills than at Lacreek NWR (Pelizza 1999).

Rolf Kraft has successfully managed the High Plains Flock to where it is mostly self-sufficient and winters primarily in the Nebraska Sandhills streams, and south. He still provides some supplementary winter food at Lacreek NWR, because nesting South Dakota trumpeters may need the spring food reserves to nest in the alkali waters of the hard clay lands.

Conclusions

The magnificent Trumpeter Swan was restored in the United States High Plains during 1960-2000. Many conservationists were involved in this effort. The first goal of establishing a wild breeding-flock off Lacreek NWR was reached in 1965.

The Red Rock Lakes genetic strain proved not to be sedentary (as many had claimed), when removed from the "Yellowstone Thermal Ecosystem." Thirty-four subadult trumpeters from Red Rock Lakes NWR were released on Lacreek NWR in southwest South Dakota 1961-64. They and their descendents proved very mobile, moving into Nebraska and eventually migrating as far south as South Texas, and nesting in western South Dakota, western Nebraska, northeastern Wyoming, and eastern Saskatchewan. They were most successful in the Nebraska Sandhills, where they could both nest and winter.

Some adult trumpeters, missing during the early winters at Lacreek NWR, were suspected to be wintering elsewhere, but were routinely written out of the flock as lost. Evidence now indicates that many of those adults with their cygnets wintered south of Lacreek.

The Lacreek Trumpeter Swan Plan, written in 1979, had a management goal of 500 trumpeters with 50% wintering south of Lacreek NWR. This goal was certainly reached in 1998, when Kraft discovered trumpeters wintering on the Snake and Loup Rivers in the Nebraska Sandhills and south. He counted 455 trumpeters. I estimate that at least 20% were farther south or otherwise outside of his aerial survey corridor. More than 81% were south of Lacreek NWR. The management goal of 500 trumpeters may have been first reached in 1987, when 267 swans were counted on the Refuge, assuming 50% were wintering south of Lacreek NWR.

The Lacreek Trumpeter Swan Flock name was changed to "The High Plains Trumpeter Swan Flock" after it was learned that they were nesting in three states and wintering in two or more. The High Plains trumpeters flourished in the rich Nebraska Sandhills, but floundered in the South Dakota hard clay lands. Perhaps they would have done better in the Buffalo Gap National Grasslands, if management would have continued to give them the attention they gave in the 1970s, had followed Robinson's (1975) Trumpeter

Swan plan, and had perhaps supplemented the missing muskrat-house nest sites with some large hay bale sites.

Acknowledgments

I dedicate this paper to the many Nebraskans and South Dakotans, who cooperated in the restoration of the High Plains Trumpeter Swans. Thank you all. The co-operation of Nebraska and South Dakota conservation officers and biologists, sharing information, education, and law enforcement, helped make restoration possible. Ranchers and other landowners provided the habitat, security, and necessary concern.

I wish to thank Art Hughlett and Don Young for their insights about early restoration efforts. Rolf Kraft has kept me informed on later developments and commented on several drafts. Jim Ducey supplied supplementary Nebraska data. Gregory Schenbeck, Wildlife Management Biologist, U.S. Forest Service, discussed the environmental changes that have occurred during the past 23 years on local national forests and grasslands. U.S. Fish and Wildlife Service Biologist Charles Pelizza commented on several recent drafts. My son, Thomas G. Burgess edited the paper for grammatical and computer errors. However, I alone accept the responsibility for any errors that appear in this manuscript.

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Eastern Population Tundra Swans: population status, survival, and movements

Khristi Wilkins, Richard Malecki, Sue Sheaffer, and Dennis Luszcz

Introduction

Tundra Swans (*Cygnus columbianus*) are divided for management purposes into an Eastern Population (EP), which winters within the Atlantic Flyway and a Western Population (WP), which winters in the Pacific Flyway. EP Tundra Swans number about 102,800 (1997-2000 average midwinter estimate), with a winter range that extends from southern Pennsylvania to North Carolina. Midwinter estimates for WP Tundra Swans are similar (93,300; 1997-2000 average).

Recreational hunting of EP Tundra Swans resumed in 1984 following a closure of more than 60 years. Present guidelines for the harvest of swans are formalized in the "Management Plan and Hunt Plan for the Eastern Population of Tundra Swans" (revised July 1998). This plan provides for a permit system that allows up to a 10% rate of harvest. Based on harvest estimates and midwinter survey estimates, issuance of about 9,000 permits results in a current estimated harvest rate on eastern Tundra Swans of just below 5 percent (J. Serie, pers. comm.). North Carolina is the primary harvest area for EP swans with about 50 percent of the total permits. Montana, North Dakota, and South Dakota account for another 40% of the permits. Virginia, with 600 permits, is the only other state in the Atlantic Flyway that presently hunts swans. Roughly 4,000 Tundra Swans are thought to be harvested annually, and about 75% of these are taken in the eastern states.

Several issues impact management of Tundra Swans. Tundra Swans are a long-lived species with annual recruitment that is less than that of most other species of waterfowl. The total population (≅100,000 EP swans) is also smaller than that of most other hunted waterfowl. The limitations of the data currently available for managing EP Tundra Swans demand that our management strategies remain conservative. Knowledge is limiting primarily in precise, sex-specific annual survival rates, migrational and winter movements, and EP and WP population fidelity. We hope to address at least the first two of these information needs with this project.

Efforts are currently underway to determine average annual survival rates of EP Tundra Swans through post-season leg banding. This technique requires marking of a rather large annual sample (>2,000 swans) and operations have been hampered by a short banding period, mild winters, and increased wariness in some swan flocks. Techniques requiring a smaller sample size, commensurate with our ability to capture swans, will have a greater certainty of success.

Movements of EP Tundra Swans are poorly understood. These include movements between breeding and wintering areas, migration stopover locations, and movements within the Atlantic Flyway during the winter period. No information is available on possible subpopulations or flock affiliations, nor is there information on interchange between various winter aggregations. Radio tracking projects in Ontario (Scott Petrie, pers. comm.) and Minnesota (Eric Thorson, pers. comm.) have gathered some information about the timing of migration flights and the relative importance of various migration stopover locations. This project would continue that work on a larger scale, as well as provide more information about winter movements. Identification of key migration habitats is necessary to protect these areas from detrimental land use changes, which is particularly important for a bird that spends about 50% of the year in these transition areas (Scott Petrie, pers. comm.). Information about the timing of migration is of interest to managers and hunters. Understanding the timing of migration movements has applications as well, namely in the prevention of swan-aircraft interactions, because fall migrations of Tundra Swans are often initiated in response to weather fronts and can involve movement of large numbers of swans over a short period of time.

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Objectives

Objectives for this study include the following:

1) To determine the breeding range and migration stopover locations of EP Tundra Swans, as well as patterns of movement between these areas;

2) To determine fidelity and possible sub-population affiliations of Tundra Swans to Atlantic Flyway wintering locations within years and between subsequent years;

3) To increase precision of survival rate estimates for EP swans;

4) To determine extent and nature of winter movements of Tundra Swans in relation to habitat use and human disturbance.

Methods

In Year One, swans will be marked with three types of collars: standard collars (gray collars with unique black lettered codes), conventional radio transmitters mounted on white collars (battery life approximately 18 months, range 2-5 miles), and satellite transmitters mounted on white collars (battery life approximately 24 months). Adult females will receive radio or satellite transmitters; all other age and sex groups will receive standard collars. All birds will also be marked with a standard USFWS aluminum leg band.

Marking of birds with standard collars and radio transmitters will begin after arrival of swans (Mid-November - Mid-December). Marking of swans with satellite transmitters will take place after the hunting season is over (after January 31). In Year One, we plan to put out 500 standard collars, 140 radio collars, and 19 satellite collars. These collars are distributed among the states based on swan population density, availability of trapping locations and personnel, and availability of funding within states to purchase satellite collars.

As a side project, not funded through this study, one inch of a secondary feather will be collected from all adult female birds. These samples will be sent to Keith Hobson of the Canadian Wildlife Service (CWS) for stable isotope analysis. Stable isotope analysis can be used to determine locations of breeding grounds.

Observations of neck banded birds and monitoring of conventional transmitters will be done at approximate 2-week intervals throughout the wintering period, until spring migration. Whenever possible, aerial telemetry flights will be taken to locate lost radio transmitters. Collar observation data will be collected by project personnel and cooperating state and USFWS refuge biologists. All collar sightings will be forwarded to the Bird Banding Lab (BBL), and all sighting information collected by non-project observers will be obtained annually from the BBL. Satellite telemetry data will be obtained directly from ARGOS. This data will be downloaded quarterly, screened for reliable fixes, and plotted on maps.

Cooperating state and USFWS refuge biologists will be solicited to collect collar and telemetry data on swans during spring and fall migration. Radio receivers will be sent to those biologists agreeing to search for radio collars. USFWS pilot biologists surveying swan breeding areas in the spring will conduct radio telemetry whenever possible.

In Year Two, these procedures will be repeated, modified as appropriate based on data from Year One and available funding. Radio and satellite collars from Winter 2000-01 should still be active, so swans can be tracked as they complete the fall migration of October-December 2001.

Summary of banding effort, November 2000-March 2001

In the winter of 1999-2000, a total of >700 birds were marked with standard collars in North Carolina and Pennsylvania. In the winter of 2000-01, a total of >700 birds were marked with the three types of collars in the four states. Collars were apportioned between states based on a compromise between bird distribution and funding. The number of birds marked in each state was roughly in proportion to the size of the swan population in that state. Within each state, placement of collars was based on a compromise between the spatial distribution of birds and access to capture sites. Again, the number of birds marked in each location was roughly in proportion to the distribution of the swan population in that state. The satellite collars were all put on adult females, radio collars were put on almost all adult females, and standard collars were put on all other birds (adult and immature males, immature females).

Birds were marked on state and private lands as well as at four participating refuges: Alligator River NWR, Mattamuskeet NWR, and Pocosin Lakes NWR, all in North Carolina; and Eastern Neck NWR in Maryland. All birds were marked with leg bands as well as collars, as were several hundred birds that only were marked with leg bands. A summary of marked birds is in Table 1. The satellite transmitters should transmit a signal for at least 1.5 years, and the VHF radio transmitters should work for about 2 years. This will enable us to track the birds throughout the winter, as they migrate to the breeding grounds in the spring, throughout the summer, and as they migrate back to the wintering grounds next fall and winter.

Table 1. Summary of number of EP Tundra Swans marked with collars November 1999 - March 2001.

	November 1999-March 2000			November 2000-March 2001			
State of marking	Satellite Collars	Radio Collars	Standard Collars	Satellite Collars	Radio Collars	Standard[1] Collars	Total
Maryland	0	0	0	2	20	55	77
North Carolina	0	0	676	10	80	517	1,283
Pennsylvania	0	0	61	5	20	32	118
Virginia	0	0	0	2	20	[2]	22
Total	0	0	737	19	140	604	1,500

[1]Preliminary
[2]Unavailable at this time

Satellite data

Status of radios: One satellite collar in North Carolina appeared to have quit working almost immediately. Two other birds either died or dropped their collars. One collar has been in eastern Wisconsin since mid-May 2001. The other has been at Long Point, Ontario, since mid-April. Thus, there are 16 active satellite collars remaining.

Movements: The birds first started leaving the wintering grounds during the week of 15 March. By 6 April, they had all moved to Ontario, Wisconsin, and eastern Michigan, where they rested for 1-2 weeks. By mid-April, they then moved to western Minnesota, and the eastern Dakotas, where they again rested for 1-2 weeks. The first satellite collared bird entered Canada on 4 May. The first satellite collared bird reached Alaska by 17 May. By mid-June, the birds appeared to have settled down in their breeding locations. The satellite marked birds were well-distributed across the Arctic.

Satellite locations are updated weekly at the project website, located at http://www.dnr.cornell.edu/research/tundraswan/tswan.html. The Pennsylvania Game Commission has developed a more extensive website, located at http://sites.state.pa.us/PA_Exec/PGC/swan/index.htm.

Radio and standard collar data

Winter: Swan habitat was surveyed every 2 weeks in North Carolina and Pennsylvania. Almost all marked birds were seen again on the wintering grounds. Most birds were seen repeatedly throughout the winter. Survey coverage in Maryland and Virginia was more sporadic, due to lack of personnel.

Spring-summer: Radio receivers were sent to cooperating biologists in Manitoba, Ontario, and Wisconsin for tracking during spring migration, and several hundred radio signals and collar sightings were reported (most near Long Point, Ontario, where observation was most intense). Several state, federal, and provincial biologists, as well as private citizens, looked for swan collars spring 2001. A summary of volunteer sightings is given in Table 2.

We are also collaborating with a graduate student from the University of Northern British Columbia who is working on the Mackenzie Delta Tundra Swan Project. She is including collar observations (radio and standard) in her fieldwork in Tundra Swan breeding grounds. A summary of all organizations that have volunteered to collect observation data is included at the end of this paper.

Other issues

Biologists in North Carolina and Pennsylvania collected feather samples from 159 adult females during the winter of 2000-01. As noted under Methods, the feathers will be shipped to Keith Hobson of CWS for stable isotope analysis. At this time, neither this project nor CWS have funds to analyze the feathers, so analysis will be performed only if additional funding is found. If funding for further analysis is found, we will also attempt to coordinate feather collection from WP harvested birds, and from EP and WP birds harvested on their breeding grounds.

Plans for Winter 2001-02

We plan to put out similar numbers of VHF radio and satellite radio collars in the winter of 2001-02. Collar distribution will be similar to previous year. It has not been decided whether or not we will put out more standard collars. Plans for putting out VHF radios may alter, however, because the frequency range of our VHF radios (150-152 MHz is within the frequency range of Alaska Department of Fish and Game VHF radios. If this overlap becomes too problematic, we will stop putting out VHF radios.

Table 2. Total sightings of collared Tundra Swans by volunteers from March-June 2001.[1]

State/Province	Radio Collars	Standard Collars
Manitoba	3	1
Michigan	0	5
Minnesota	0	7
Ontario	74	171
Wisconsin	0	12
Total	77	196

[1] All sightings, including repeated sightings of one collar.

Cooperators:

Delta Waterfowl Foundation
Division of Migratory Bird Management, USFWS
Maryland Forest, Wildlife, and Heritage Commission
North Carolina Wildlife Resources Commission
Pennsylvania Game Commission
USFWS Region 3, Minneapolis, MN
USFWS Region 4, Atlanta, GA
USFWS Region 5, Hadley, MA
USFWS Region 6, Denver, CO
USFWS Region 7, Anchorage, AK
USGS/BRD
Virginia Department of Game and Inland Fisheries

Groups assisting in observation of Tundra Swans:

ABR Environmental Research Services, AK
Agassiz NWR, MN
Alligator River NWR, NC
Back Bay NWR, VA
Blackwater NWR, VA
Bowdoin NWR, MT
Canadian Wildlife Service
Currituck NWR, NC
Devils Lake NWR, ND
Ducks Unlimited, ND
Eastern Neck NWR, MD
Hennepin Parks, MN
Iowa Department of Natural Resources
Lake St. Clair NWR, ON
Long Point Waterfowl & Wetlands Research Center, ON
Mattamuskeet NWR, NC
Medicine Lake NWR, MT
Minnesota Department of Natural Resources
Ontario Ministry of Natural Resources
Pocosin Lakes NWR, NC
Shiawassee NWR, MI
South Carolina DNR
University of Northern British Columbia
Waterfowl Branch, USFWS Region 7
Wildlife Population Surveys Section, Div. of Migratory Bird Management, USFWS
Wisconsin Department of Natural Resources

A survey of Trumpeter Swans in the Kenora District of Ontario

Harry G. Lumsden

Introduction

In 1989, Dave Schneider recorded the first recent appearance of Trumpeter Swans breeding in the Kenora District in western Ontario. Since then, Trumpeter Swans have been regular breeders in increasing numbers. In 1995, an aerial search recorded a brood of five cygnets and an additional pair for a total of nine swans (Anderson *et al.* 1996). A single bird tagged by the Minnesota Department of Natural Resources (DNR) was found nesting on Split Lake. It was located wintering on the Otter Tail River (Otter Tail County) in Minnesota suggesting the origin of the Kenora swan population. Steve Kittelson, Minnesota DNR, counted over 300 swans in Winter 2000-01 in this area and was unable to account for about 100 birds on nesting grounds in Minnesota. In Year 2000, two broods and an apparently failed nest were recorded in the Kenora District. These observations and an increasing number of reports of trumpeters in the Kenora District suggested that an extensive aerial survey should be carried out to document their distribution and abundance.

Methods

An aerial survey of part of the Kenora District (Figure 1) was carried out on July 2-3, 2001, in a DeHaviland Beaver at 300m and 190km/hour. Lines were orientated north south and were spaced 8 km apart. Previous surveys suggested that we could see swans at a distance of about 1 km. We therefore expected to cover a systematic sample of about 25% of the area flying a total of 1,870 km. of transect. Circling to look at and photograph swans at about 100m, turning at the end of each line and leaving or returning to base at Kenora added many more kilometers. A study area of close to 15,000 square km was sampled, including a brief detour to check Separation Lake where swans had been recently reported.

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Results

There were no observations of swans on the western half of the study area (49° 48' -50° 43', 94° 15' - 95° 09') despite lakes with good habitat. On the eastern half, a single and two groups of two swans were seen on the survey lines. Circling to confirm a report revealed another two birds. No broods were seen. The swans seen were located in or near where the earlier reports and records had been made. Two outlying observations extended the core area to the southeast and southwest. The swans are distributed in an area roughly 40 x 50 km (50° 12' - 50° 30', 93° - 42' - 94° - 15'). They occupy small lakes with shallow areas supporting submergent vegetation and shallow winding creek mouths with abundant emergents. The presence of Pelicans (*Pelecanus erythrorhynchos*) kept the observers alert. A total of 48 Pelicans was seen within the study area.

If five Trumpeter Swans were seen on 25% of the area searched, we can estimate that there were at least 20 swans present. The swans are probably all concentrated in the core area surrounding Oak, Maynard, Ball, and Lennan Lakes. The forest cover surrounding the wetlands of the core area is composed of a dense mature deciduous/conifer mixed woods with Trembling Aspen (*Populus tremuloides*) dominant. There are many recently harvested areas and on the shallower soils stands of Jackpine (*Pinus banksiana*) dominate with Black Spruce (*Picea mariana*) and White Spruce (*Picea glauca*) (Anderson *et al.* 1996).

There is a complication associated with an estimate of this kind. Shandruk and McCormick (1989) tested the relative effectiveness of a Cessna 185 and a Bell 206B helicopter for surveying Trumpeter Swans in the southwestern Northwest Territories. They saw 70% more adults and 44% more cygnets from the helicopter than from the fixed-wing aircraft. There is a strong likelihood that in Kenora we failed to see some of the trumpeters on the flight lines. We have no helicopter data to provide a correction factor. If we actually saw only half the swans that were on the flight lines, there could have been as many as 40 birds in the core area. In conclusion, it seems likely that there were between 20 and 40 Trumpeter Swans in the Kenora District in 2001.

Acknowledgments

We are grateful to Will Hilts who piloted the aircraft, Fred Zroback who acted as an observer and to the Ministry of Natural Resources, Kenora District, which partly funded the flight and provided accommodation for Steve Kittelson and Harry Lumsden. The Minnesota Department of Natural Resources paid a share of the costs of the flight and Steve Kittelson acted as an observer. The Amherst Wildlife Foundation provided funds for the flight and for a portion of the travel costs.

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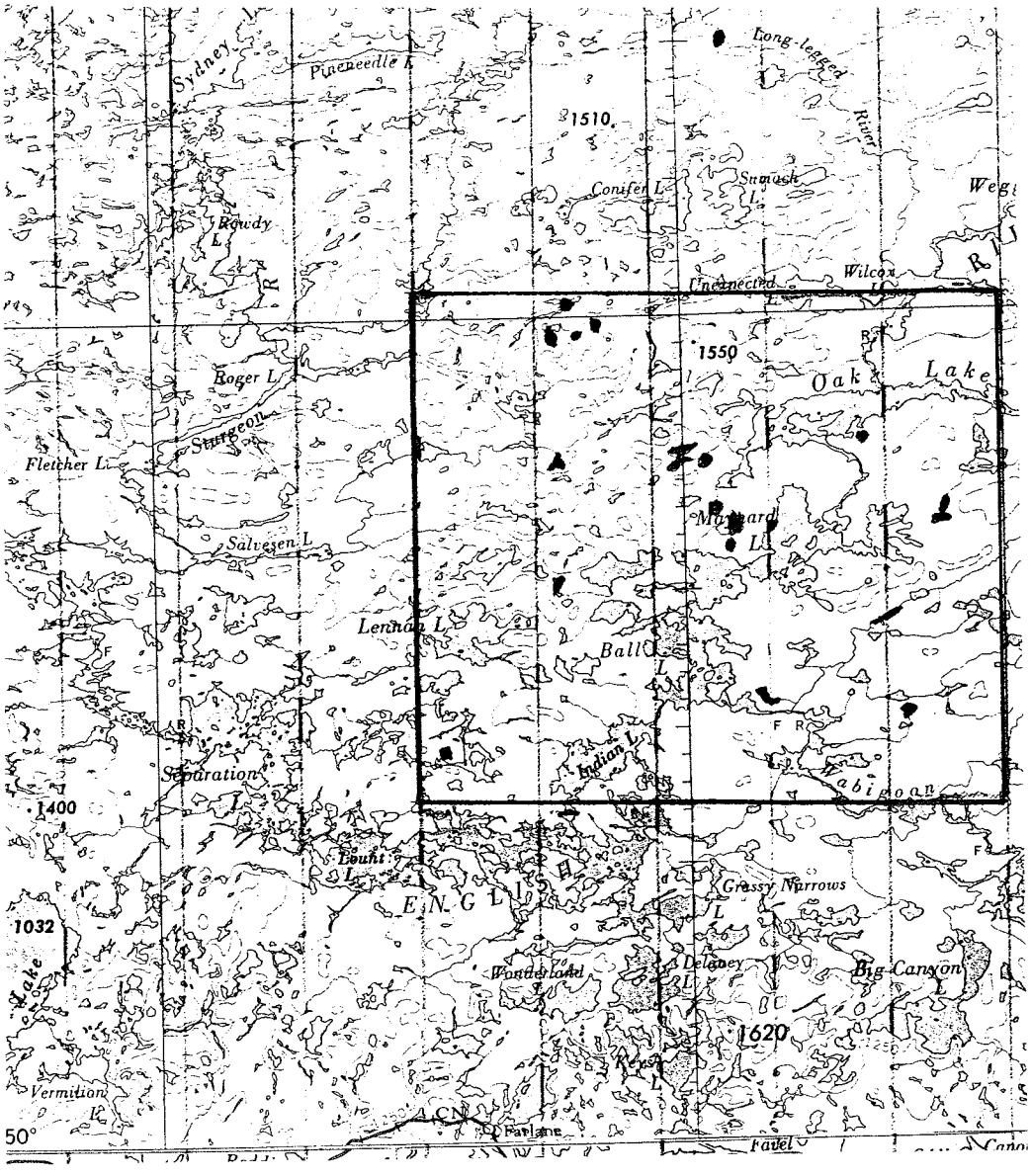
Photo of survey area by S. Kittelson.



Kenora District study area showing flight lines and concentration area of swans. Lakes marked in black are where nests or broods have been observed.

North Dakota Trumpeter Swan observations

Harold H. Burgess

Introduction

Since 1984, we have recorded significant observations of Trumpeter Swans (*Cygnus buccinator*) chronologically by states and provinces as we became aware of them. We hope that these lists might help researchers, writers, planners, biologists, and managers refer, restore, and manage their Trumpeter Swans. Our rediscovery of Robert Stewart's (1975) Breeding Birds of North Dakota has made it possible to publish a detailed list for that state, and the recent initiation of Tundra Swan *(Cygnus columbianus)* hunting seasons in North Dakota has made this information important.

Chronology

1800 September 5: Fur trader Alexander Henry reported that two small lakes along the Red River south of the Pembina River were covered with swans and other waterfowl (Steward 1975:64).

September 9: From his camp on Park River, Henry saw a flock of swans rise in alarm from the nearby Red River, indicating Indians in the vicinity (Coues 1897). These swans were local Trumpeters Swans as it was too early for migrant swans (Burgess and Bote 1999).

October 11: Henry killed "a fat swan" while walking from Park River to Pembina River (Coues 1897). Here Henry has described the swan in the manner of earlier Hudson's Bay Company men, beginning with James Isham's account of Trumpeter Swans as "bigger and fatter" than the lesser species (in Rich and Johnson 1949:127; see Burgess and Bote 1999:25).

October 16: Henry killed another "fat swan" near Pembina River (Coues 1897).

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1801 March 11: Henry saw a swan at his Park River camp.
March 16: Henry saw six swans near the same camp (Coues 1897). These were trumpeters as the time of year is too early for Tundra Swans, which normally arrive at this latitude in April (Bent 1925:293).

1805 March 24: At Lewis and Clark's Ft. Mandan winter camp, William Clark wrote, "Saw Swans and Wild Gees flying N.E. this evening" (in DeVoto 1953:90). Although the expedition shot swans on the Missouri River, Meriwether Lewis did not see nor describe the lesser Tundra Swan until they approached the Columbia River Narrows (Burroughs 1961:199; see Burgess 1980).

1823 Summer: William Keating recorded that at the Lake Traverse fur post (20 miles south of North Dakota) two packs of 60 swan skins were worth 120 Spanish dollars (Banko 1960:13).

1833 June 15: Maximilian, Prince of Wied, recorded the sighting of swans on the Missouri River near "Bald Eagle Head" downstream from Apple Creek (Stewart 1975:64).

1843 John J. Audubon recorded Trumpeter Swans during his Missouri River journey (M. Audubon 1897; Stewart 1975:64):
June 5: "We saw two swans alighting on the prairie at a considerable distance" near the mouth of the Cannonball River (M. Audubon 1897).
June 8: "We saw two Swans on a bar" of the Missouri River between Ft. Clark and the mouth of the Little Missouri River (ibid.:10,18-19).
June 9: After passing the Little Missouri River for six hours upstream, a hill was climbed, from which a large lake could be seen where a large number of swans reportedly bred (ibid.:20-21).
August 9: At Ft. Union, where Audubon collected before returning down river, he

wrote, "We have nine Indians, all Assiniboins, among whom five are chiefs. These nine Indians fed for three days on the flesh of only a single Swan" ibid.:101,123,140).
August 17: A day's travel downstream from Fort Union, Audubon saw 22 swans (ibid.:154).
August 26: "Many Swans" were seen near the mouth of the Heart River (ibid.:9,157).
August 31: "Saw large flocks of Ducks, Geese and Swans" a few hours above the mouth of the Cannonball River (ibid.:159).

I follow Stewart (1975) in assuming that all North Dakota summering swans were Trumpeter Swans.

Mid 1800s: According to Russel Reid, Superintendent of the Historical Society of North Dakota, a newspaper account noted breeding trumpeters at Island Lake, Barnes Co. (Banko 1960:24, 37; see also Steward 1975:74).

1873 Late September/early October: Elliot Coues occasionally heard Trumpeter Swans on the North Dakota-Manitoba boundary and "saw a small lot" at Ft. Stevenson on the Missouri (Coues 1878:545,648; see also Thompson 1891:487). These were probably local Trumpeter Swans on training and feeding flights as it was too early in the autumn for migrant swans.

1884-85 Wells W. Cooke reports breeding swans along Red River (Stewart 1975:64).

1895 Alfred Eastgate reports breeding swans at Rock Lake in Towner County. (ibid.).

1898 Herbert K. Job reports "a few swans . . . in the Devil's Lake area during breeding season" (ibid.).

1928 April 25: Lee Pettibone observes two Trumpeter Swans among "125 whistling swans" on Slade Lake in Kidder County, near Dawson (Banko 1960:37).

1967 November 4: Trumpeter Swans heard among flock of what were then known as Whistling Swans on Alkali Lake, Kidder County. (Cowardin and Bartonek 1968:15).

1978 Summer: Two trumpeters at Bowman Dam, Bowman Co. (Dr. Paul Springer 1979: pers. comm.)

1983 May 12: Three trumpeters on Alkali Lake, Kidder County (William Bair 1984: pers. comm.).

September 4: Five Trumpeter Swans near Ellendale, Dickey County (South Dakota Waterfowl Biologist Gay Simpson 1984: pers. comm.).

1987 May 3: Trumpeter Swan reported at Steel, Kidder County.

May 31: Trumpeter reported near Lake Isabel, Kidder County. (Berkey 1987).

1989 Summer: A trumpeter photographed at Grand Forks by Lambeth, a Trumpeter Swan observed in Burleigh Co. by Randy Hill, and five trumpeters seen on Chain of Lakes, Lake Alice NWR in Ramsey County (Berkey 1989).

1989 October 14. Trumpeter in Benson County observed by Ron Martin and Gordon Berkey (Martin 2000, pers. comm).

1991 September 23: A Trumpeter Swan at Minot Lagoon observed by Gordon Berkey (1992).

1992 October 27: A Trumpeter Swan at Cottonwood Lake, La Moure County was heard repeatedly by Gary Krapu (Berkey 1993:110).

1993 April 17: A trumpeter in Bowman County observed by Mayme Johnson (Martin 2000, pers. comm.).

1995 July 30: A Trumpeter Swan observed at West Fargo Lagoon by Gary Nielson and Bob O' Connor. (Berkey 1995:943).

1997 October 16: Trumpeter Swan observed at J. C. Salyer National Wildlife Refuge by Gordon Berkey (Martin 2000, pers. comm).

1998 May 31: Trumpeter at West Fargo observed by Rich Kostecke (Martin 2000, pers. comm.)

Summer: A Trumpeter Swan observed by David Lambeth at Grand Forks Lagoon. Its collar code indicated it had hatched in Iowa in 1996 (Martin 1998:470).

October 6-7: Trumpeter Swan on J. Clark Salyer NWR observed by Gordon Berkey (Martin 1999).
October 7: Trumpeter at the Grand Forks Lagoons observed by Eve Freeberg (Martin 2000, pers. comm.).

November 11: David Griffith reported five Trumpeter Swans at Hettinger, Adams County (Martin 1999). These were in addition to the domestic Mute Swans on Mirror Lake (Martin 2000, pers. comm.).

2000 March 22: Four trumpeters observed in Cass County by Carol Spurbeck and Connie Norheim (Martin 2000, pers. comm).

Discussion

It is obvious from the above observations that Trumpeter Swans were once common residents of the Red River watershed. The Red River also transported the swan skins from its upper reaches to be sold to the American Fur Company post at Lake Traverse, about 20 miles south of North Dakota. Trumpeters were also numerous along the Missouri River in western North Dakota, where Audubon counted 22 swans between the Yellowstone and the Little Missouri Rivers on 17 August 1843. From 26-31 August 1843, he reported many swans near the mouths of the Heart and Cannonball Rivers.

Trumpeters may have been common throughout North Dakota before 1850, but, to my knowledge, their occurrence had only been described near those two rivers. The Trumpeter Swans that appeared in North Dakota between 1850 and 1970 were likely from remnant populations in North Dakota or Canada. Trumpeters observed in North Dakota after 1970 probably pioneered from the restored High Plains or Lake States Flocks.

In my opinion, the North Dakota state-wide Tundra Swan hunting season is, in fact, an "any swan hunt," because it is no longer monitored for illegal taking of Trumpeter Swans. Also, with the recent opening of southwest North Dakota to swan hunting, no provisions are made to allow summering North Dakota trumpeters, nor migrant Canadian trumpeters, to escape the early swan hunting. This hunt functions to prevent the natural restoration of trumpeters in one of their historically more productive areas, and reduces Trumpeter Swan restoration potentials in Iowa, Minnesota, Manitoba, eastern Saskatchewan, and South Dakota.

Acknowledgments

I wish to acknowledge my family's assistance in recording significant sightings of Trumpeter Swans continent-wide. I thank Forrest B. Lee of Jamestown, North Dakota, for his help in finding reference material. Forrest read an early draft and urged me to complete it. Michael Johnson, Bismarck, North Dakota, commented on a later draft and provided information on North Dakota's Tundra Swan hunts. Comments of Harvey K. Nelson caused me to re-write the paragraph on swan hunting, giving credit for earlier monitoring and protecting swans in southwest North Dakota. Ron Martin, Editor, Northern Great Plains Region, *North American Birds*, commented on a later draft and added six observations. My son, Anthropology Professor Thomas Burgess, Queens College, New York City, edited the manuscript. Data interpretation, errors, and omissions are my responsibility.

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Population Status Reports

2000 Survey of Trumpeter Swans in Alberta, Saskatchewan, Manitoba, and the Northwest Territories

Michael Norton and Gerard Beyersbergen

[***Editors' Note:*** *Reprinted with permission from Canadian Wildlife Service, Environmental Conservation Branch, Prairie and Northern Region, Environment Canada. For the full report, please contact the authors.]*

Introduction

This report summarizes results of a survey of Trumpeter Swans (*Cygnus buccinator*) that was conducted in August and September 2000. Surveys were conducted across the known and suspected wild range of this species in Alberta, Saskatchewan, Manitoba, and the southwest Mackenzie District, Northwest Territories (NWT), Canada. These surveys comprised a portion of a continent-wide survey of Trumpeter Swans conducted this year. Similar surveys have been conducted in this region in 1985, 1990, and 1995. Results of the survey will be used to update population estimates for Trumpeter Swans in Canadian jurisdictions and continent-wide, to update land-use referral maps, and for other management purposes.

Trumpeter Swans which breed in Alberta and the NWT are part of the Rocky Mountain Population and primarily winter in the Tristate area of Montana, Idaho, and Wyoming. Eastern Saskatchewan birds are considered part of the Interior Population, and winter in the area of Lacreek National Wildlife Refuge (NWR) in South Dakota.

This report summarizes the results of the 2000 census, but does not present a detailed analytic comparison to previous surveys. Numbers of adult swans and cygnets are summarized and discussed by survey sub-region, and some general comparisons to the 1995 continental survey results are presented.

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Methods

Most surveys were conducted by intensive searching from aircraft. Elk Island National Park (NP) survey results are from regular ground checks during the breeding season. All portions of the survey are assumed to be total counts of birds, and numbers are thus reported with no statistical error.

Surveys were focussed on established breeding areas of Trumpeter Swans. All waterbodies known to have been occupied by swans in previous years were searched, as well as other potentially suitable waterbodies in the immediate area. Most surveys were conducted from fixed-wing aircraft with an observer on either side of the plane; two regions utilized a helicopter (Porcupine Forest, Saskatchewan, and High Level, Alberta). A precise total number of birds was tallied by adult/subadult plus young-of-year age categories.

Intensive searches were conducted in a few regions not previously surveyed, but which were now known or suspected to be occupied by Trumpeter Swans. The Pasquia Hills in east-central Saskatchewan, the Porcupine Hills straddling the Saskatchewan - Manitoba border, and areas around The Pas, Lake Manitoba, and Shoal Lakes, Manitoba, all contain potentially suitable trumpeter breeding habitat and unconfirmed reports of swans had been received in those areas. In Alberta, the Utikuma Lake - Peerless Lake - Sawn Lake area had not been previously surveyed, but confirmed sightings of Trumpeter Swans had been made there this spring.

Locations of Trumpeter Swans were recorded with GPS units, marked on 1:250000 topographic maps or a combination of both. Locations were compared to previously documented sites and this year's numbers were added to existing site histories. Many new locations were also added.

Surveys were all conducted between 8 August and 18 September 2000. Survey dates and effort are summarized in Table 1. Personnel from the three

provincial government wildlife agencies, the Canadian Wildlife Service, and Parks Canada conducted all surveys.

Results

A total of 1,338 Trumpeter Swans was counted in Alberta, Saskatchewan, and the NWT: 904 adults or subadults and 434 cygnets (Figure 1, Table 2). No swans were found in Manitoba. Total population for each jurisdiction as of early October 2000 is estimated as follows: Alberta 995, Northwest Territories 294, and Saskatchewan 49. Demographic summaries are given in Table 2, and the distribution of adult swans in pairs, flocks or as singles is given in Table 3. The number of birds observed in each jurisdiction was higher than in any previous year, although some smaller sub-regions did not show this increase (Table 4). As is also noted for some sub-regions below, survey coverage and effort varied between years and has not been consistently reported for all areas in the past. Thus, comparisons of this years numbers with previous survey results are not always possible.

Grande Prairie

Good numbers of both adults and young were found this year, with a record high total of 608 birds (Table 2). Survey coverage was largely the same as in previous surveys, with a few additional waterbodies in the foothills near the British Columbia border being added (no birds found). Notably, a large number of birds was observed north of Sturgeon Lake on new waterbodies. Numbers of birds and lakes occupied appeared to be down in the Saddle Hills. Environmental conditions may have affected hatch or brood survival, resulting in early abandonment of nesting lakes in the Saddle Hills and swans concentrating on Bear Lake where 101 birds were observed. Numbers of broods and cygnets were up significantly throughout the area from previous continental censuses in 1995 and 1990. Because of relatively standardized survey area and similar effort in all years, population size can be compared reliably between 1990, 1995, and 2000. The total population has increased from 314 (1990) to 533 (1995) to 608 (2000), a 93.6% increase in just 10 years (Table 4).

Peace River - High Level - High Prairie

Scheduled surveys over a very large area of northwestern Alberta accounted for 207 swans with incidental sightings of 17 birds for a total of 224 swans (Table 2). Surveys covered locations of all historic records of swans, except two outlying lakes (Moose Lake and a lake in the Caribou Mountains), and much ground in between. Numbers were generally comparable to those found in 1995, although they may have been a little lower in the Chinchaga area. When 1995 and 2000 surveys were corrected for differences in geographic coverage, the number of birds counted in 2000 was higher by 6.5% (212 vs. 199, Table 4).

During the scheduled survey of the Bistcho Lake area, seven adults and five cygnets were found. In early October, in an area not surveyed previously, a pilot reported more swans near Spawn Lake, north of Bistcho Lake on the Alberta - NWT border: three adult pairs with broods of 3, 2, and, 1 respectively.

New survey coverage for this year was the region north of Utikuma Lake, west of Peerless Lake, and south of Sawn Lake. A surprising 72 swans were found in the area, at 15 locations, including 35 cygnets. At 48.6%, this area had the highest proportion of young of all areas surveyed. Most of the birds were clustered around the Whitefish fire tower roughly 30 km north of Utikuma Lake. It is unknown how long swans had been occupying this portion of Alberta.

Edson - Whitecourt

Only a relatively small number of birds (27) was found on these surveys (Table 2). Particularly noticeable was the very low production, with only a single brood of two cygnets seen. It is difficult to compare this with previous years' surveys as the coverage this year was much more extensive. However, with more than 4 times the survey effort in 2000 than 1995, almost the same number of birds was reported both years (28 in 1995, 32 in 2000). Production of young was clearly low in 2000 with only three cygnets reported, compared to 10 in 1995 when survey effort was low. Two additional localities in the Drayton Valley area were added to results of the formal survey. Incidental reports were received of a pair of adults at a site east of Drayton Valley and a pair with one cygnet near Cynthia.

Lac La Biche

The survey area around Lac La Biche was expanded this year, and covered lakes around St. Paul, Athabasca, Lac La Biche, and north to Fort McMurray. Nine swans were seen at five locations, but no young were observed (Table 2). Pairs were present at Elinor Lake and at Portage Lake as in the past, but two singles and a group of three were also seen, all in the vicinity of Lac La Biche. (A group of three birds was seen on both days of the 2-day survey. It is thought that these were the same birds, but it is possible that the total number for the survey could have been 12 instead of nine). The two single birds were both wearing green collars, likely placed on the birds in the Greater Yellowstone area of Montana, Wyoming, and Idaho during a winter translocation program. No birds have yet been confirmed to have dispersed to the Lac La Biche area from Elk Island NP.

Elk Island National Park

A total of 13 swans was counted in Elk Island NP (Table 2). Eight adult swans (four pairs) were resident in the Park during Summer 2000. Two pairs successfully raised broods of two and three cygnets. This marks the 3rd consecutive year of successful breeding in the Park.

Southwestern Alberta

A total of 35 swans, including three broods, was recorded in the Pincher Creek - Waterton Lakes National Park area (Table 2). This is 66.7% higher than the 21 birds recorded in 1995, but survey effort was doubled in the current survey (geographic coverage was similar). The 2000 survey also found an additional adult pair just south of the Alberta - Montana border. An isolated, nonbreeding pair spent the summer at Frank Lake, east of High River. This is the first time swans have been observed at this location.

Southwest Mackenzie District, NWT

A total of 294 birds was found in the southwestern NWT (Table 2), including 32 broods (90 cygnets). After correcting for differences in survey coverage, substantially more birds were found in 2000 (257) than in 1995 (179), an increase of 43.5%. Numbers of both adults and cygnets were higher in 2000; adults and young were well distributed over the survey area. The upper reaches of the South Nahanni River, surveyed by Parks Canada staff in 1995, was not covered this year due to poor weather conditions.

Saskatchewan

The Porcupine Forest area southwest of Hudson Bay and the Porcupine Hills of Saskatchewan had 49 birds, including 17 young (Table 2). The survey also found birds on Kelsey Lake and Birchbark Lake, two new waterbodies to the northeast of the Porcupine Forest search area. Not counting these birds, the number of adults was the same as in 1995 (21), but with better production this year: four broods totaling 17 young this year compared to a single brood of five in 1995. Abundant suitable habitat still remains unoccupied.

The Pasquia Hills were also searched exhaustively by aircraft, but no birds were found. Although some suitable habitat is found in this area, overall, it appeared to be of lower potential for swan use than the Porcupine Forest and Hills.

Manitoba

Despite intensive searching in several areas, no birds were found in Manitoba, although a bird was seen in the Porcupine Hills of Saskatchewan within roughly 2 km of the Manitoba border. Upland forests were heavily logged in Manitoba, but were relatively untouched in Saskatchewan. Reports of birds near The Pas had been received, but a flight to the northeast of the town found no birds. Other unconfirmed reports of possible Trumpeter Swans had been received from the Riding Mountain National Park and the Lake Manitoba - Shoal Lakes area, but a survey flight found no swans.

Discussion

It is clear that Trumpeter Swans are doing well in the region. In most areas the number of adult and subadult swans was higher than in previous years, with good production of young; reported total numbers included 27% - 47% cygnets. The Edson - Whitecourt area of Alberta was the notable exception with no increase in the number of adult birds, and very low production (9% cygnets). Many of the areas covered on the survey recorded swans on new waterbodies where surveys had previously been conducted, as well as in areas not previously surveyed. Incidental reports, particularly from unsurveyed portions of northwestern Alberta, provide some indication that trumpeters may be continuing to expand their Canadian range.

Eastern Saskatchewan swans winter in Lacreek NWR area in South Dakota along with U. S. local breeding swans. The total winter count in 1998-99 minus the U. S. resident swans accounts for a larger number of birds than have been observed in Saskatchewan. This suggests there are a number of trumpeters unaccounted for during the breeding season that could be found on future surveys, probably in Saskatchewan and Manitoba.

With expansion of swans into new areas, it is critical to track survey area and effort to allow fair comparisons between survey years. Comparison of results of the 1995 and 2000 census could only be made with some certainty for the Grande Prairie flock. Swans appear to have expanded their range in Alberta rapidly in the Peace River - High Level area, but the area covered by surveys has also increased over the same time interval making it difficult to draw any rigorous conclusions. Effort and coverage have been documented for all areas for the 2000 census so that fair comparisons can hopefully be made following future censuses. It is strongly recommended that a standardized reporting of survey coverage and effort be continued in the future.

Table 1. Survey dates, methods, and effort of late summer 2000 Trumpeter Swan surveys in Alberta, Saskatchewan, Manitoba, and the Northwest Territories.

Jurisdiction	Subregion	Survey area	Dates	Survey Method	Effort (hours)
Alberta	Grande Prairie - Valleyview	Entire	6-7 Sept.	Fixed wing	9.25
	Peace River - High Level	1. Chalmers L. - "Haig" L. - Notikewin P.P.	24 Aug.	Fixed wing	16.5
		2. Gerry L. - Notikewin tower	7 Sept.	Fixed wing	
		3. Trading Post L. - Osland L.	11 Sept.	Fixed wing	
		4. Frank L. - Jackpine L.	13-14 Sept.	Fixed wing	▼
		5. Hay-Zama L. - Bistcho L.	29 Aug.	Helicopter	3.5
	Utikuma - Peerless	Entire	29-30 Aug.	Fixed wing	13.4
	Edson - Whitecourt	1. Whitecourt	5 Sept.	Fixed wing	6.3
		2. Edson	6 Sept.	Fixed wing	6.0
	Elk Island	Entire	31 Aug.	Weekly ground checks	--
	Lac La Biche	Lac La Biche - Primrose L. - St. Paul - Smoky L. - Athabasca	7-8 Aug.	Fixed wing	12.0
	SW Alberta	Waterton - Pincher Creek	10 Aug.	Helicopter	4.5
NWT	Fort Liard - Nahanni - Tetcela	1. Camsell Bend - North Nahanni R.	21 Aug.	Fixed wing	19.8
		2. South Nahanni R. - Tetcela R. - Liard R.	22 Aug.	Fixed wing	▼
		3. Root R. - Fishtrap Ck. - Beaver Water Ck.	24 Aug.	Fixed wing	
Saskatchewan	Hudson Bay	1. Porcupine Hills (SK portion) - Pasquia Hills	28-29 Aug.	Fixed wing	7.5
		2. Porcupine Forest	18 Sept.	Helicopter	5.8
	Cypress Hills	Cypress Hills	24 July	Helicopter	1.0
Manitoba	Porcupine Hills	Manitoba portion	28 Aug.	Fixed wing	1.0
	The Pas		29 Aug.	Fixed wing	1.0
	Lake Manitoba - Shoal Lakes	Entire	8 Aug.	Fixed wing	2.75
Total			8 August - 18 September		109.3

Table 2. Demographics of Trumpeter Swan populations in Alberta, Saskatchewan, and the Northwest Territories in late summer 2000. Figures given include results of formal surveys plus incidental reports.

Jurisdiction	Subregion	Total Swans	Total Adults	Total Cygnets	% Cygnets	Number of Broods	Brood Size	
							Mean	S.E.
Alberta	Grande Prairie - Valleyview	608	404	204	33.6	60	3.40	0.22
	Peace River - High Level	224	154	70	31.2	24	2.92	0.33
	Utikuma - Peerless	72	37	35	48.6	7	4.50	0.67
	Edson - Whitecourt	32	29	3	9.4	2	1.50	0.5
	Elk Island	13	8	5	38.5	2	2.50	0.50
	Lac La Biche	9	9	0	0	0	0.0	
	SW Alberta	37	27	10	27.0	3	3.33	1.20
NWT	Fort Liard - Nahanni - Tetcela	294	204	90	30.6	32	2.81	0.25
Saskatchewan	Hudson Bay	49	32	17	34.7	4	4.25	0.63
Total	Prairie & Northern Region	1338	904	434	32.4	134	3.28	0.14

Table 3. Number of adult and subadult trumpeters in Alberta, Saskatchewan, and the Northwest Territories that were singles, paired, or in flocks in later summer 2000. Figures include results of formal surveys plus incidental reports.

Jurisdiction	Subregion	Singles		Paired		Flocked		Total
		No.	%	No.	%	No.	%	
Alberta	Grande Prairie - Valleyview	14	3.5	222	54.9	168	41.6	404
	Peace River - High Level	9	5.8	132	85.7	13	8.5	154
	Utikuma - Peerless	2	5.4	22	59.5	13	35.1	37
	Edson - Whitecourt	3	10.3	22	75.9	4	13.8	29
	Elk Island	0	0	8	100	0	0	8
	Lac La Biche	2	22.2	4	44.5	3	33.3	9
	SW Alberta	2	7.4	14	51.9	11	40.7	27
NWT	Fort Liard - Nahanni - Tetcela	15	7.3	156	76.5	33	16.2	204
Saskatchewan	Hudson Bay	3	9.4	20	62.5	9	28.1	32
Total	Prairie & Northern Region	50	5.5	600	66.4	254	28.1	904

Table 4. Comparison of late summer 1995 and 2000 Trumpeter Swan survey results for Alberta, Saskatchewan, and the Northwest Territories.

Jurisdiction	Subregion	Year	No. Locations	No. Adults	No. Broods	No. Cygnets (mean)	Total Swans
Alberta	Grande Prairie - Valleyview	1990	67	220	29	94	314
		1995	99	392	41	141 (3.43)	533
		2000	134	404	60	204 (3.40)	608
	Peace River - High Level[1]	1995	66	132	25	67 (2.68)	199
		2000	68	148	21	64 (3.05)	212
	Elk Island	1995	4	11	0	0	11
		2000	4	8	2	5 (2.5)	13
	Southern Alberta[1]	1995	6	21	0	0	21
		2000	10	27	4	10 (3.33)	37
NWT	Fort Liard - Nahanni - Tetcela	1995	52	132	15	47 (3.1)	179
		2000	81	180	28	77 (2.75)	257
Saskatchewan	Hudson Bay	1995	12[2]	22	1	5 (5.0)	27
		2000	10	21	4	17 (4.25)	38

[1] Although survey area was similar in 1995 and 2000, survey effort was higher in 2000 for these regions.
[2] Includes a single bird in the Cypress Hills in 1995; no swans were present in the Cypress Hills in 2000.

Note: Results from 1990 are included for Grande Prairie where surveys have been most standardized. The survey areas covered each year were standardized as much as possible (i.e. only areas visited both years are included), and, therefore, total numbers reported here may differ from those in tables 2 and 3. This table is for cross-year comparisons only. Only regions with roughly similar survey effort in both years are included.

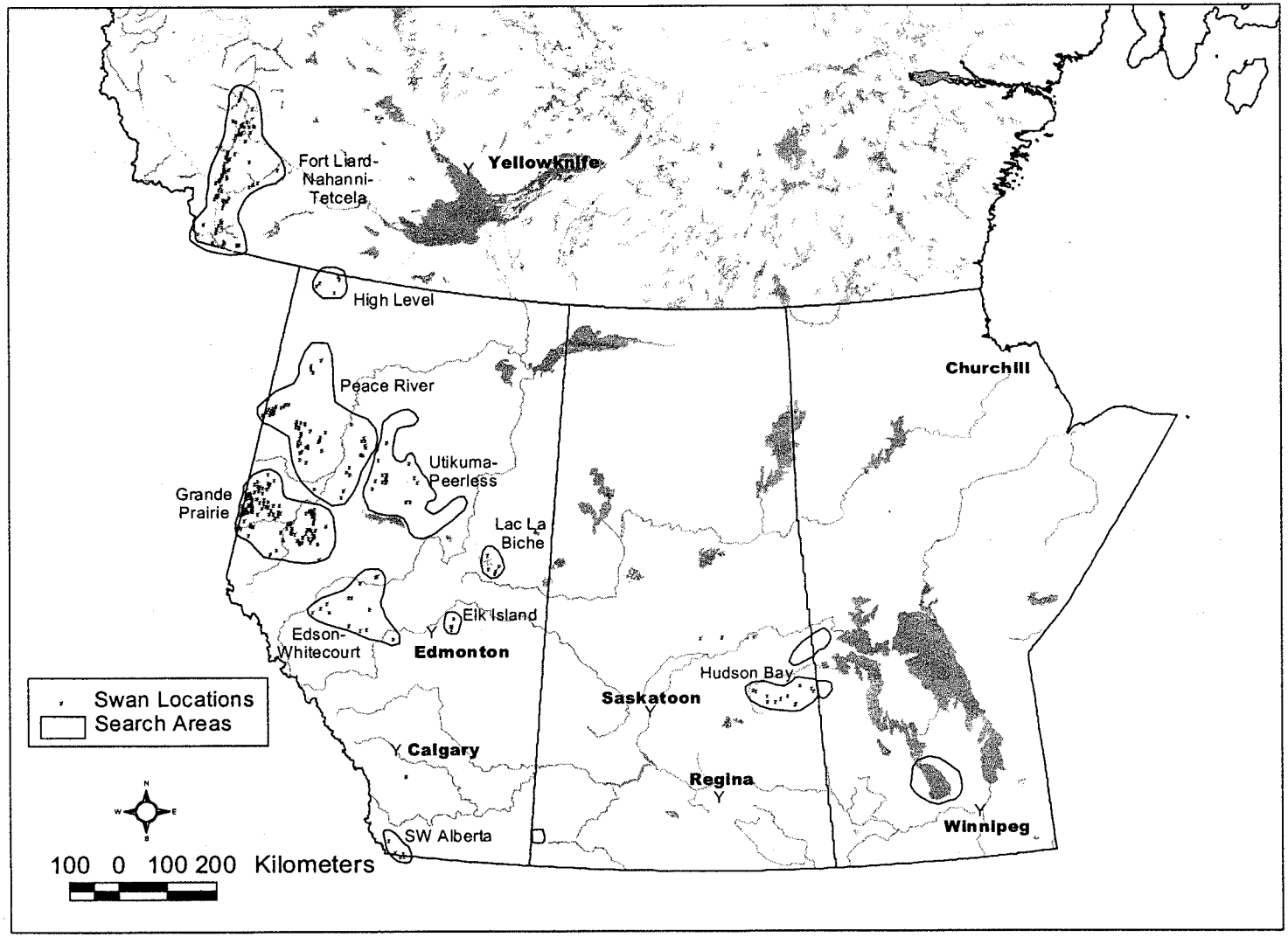

Figure 1: Locations of Trumpeter Swan observations, Prairie and Northern Region, during August and September 2000. Approximate boundaries of intensive search areas are shown. Flock names shown correspond to those used in the text.

Status report of the High Plains Trumpeter Swan Flock for 2000

Rolf H. Kraft

Population report

A total of 227 Trumpeter Swans, including 42 cygnets, was observed during the, midwinter aerial survey conducted 5 January 2001. This compares to 374 trumpeters, including 80 cygnets in 1999, and 455 trumpeters, including 101 cygnets in 1998 (Table 1). The survey has been changed to include the new wintering areas discovered in Nebraska in 1996. Data prior to 1996 includes only those birds returning to the Lacreek National Wildlife Refuge (NWR) area in South Dakota. The new winter aerial survey includes Bennett County, South Dakota, and Cherry, Sheridan, Garden, Keith, Lincoln, McPherson, Arthur, Grant, and Hooker Counties in Nebraska.

A total of 319 Trumpeter Swans was observed during the late summer aerial production survey in 2000, including 56 nesting pairs, 28 broods with 86 cygnets, and 118 nonbreeders in 18 flocks (Table 2). The production of 105 cygnets in 1999 is an all time high, but cygnet production declined 22% to 86 in 2000 even though the total summer population continued to increase. The disparity is explained by the 97% increase in nonbreeding birds in 2000 over 1999. There has been a steady increase in non-breeding swans since 1996 when the number of nonbreeders declined from 61 in 1995 to 23 1996, and then increased to 118 by 2000 (Table 3). Although production has declined for 2000, the increase in nonbreeders resulted in an overall population increase for the High Plains Flock.

A few Trumpeter Swans began to show up at Lacreek NWR in October with over 150 arriving in early November when severe cold weather froze most wetlands. An aerial survey of the Refuge on 9 December 2000 revealed 104 adults and 26 cygnets. The swans fed on available aquatic plants in open areas for about a month, but began to move off the Refuge in mid-December. The unusually cold weather remained until January 2001 and the local population declined to about 75 birds. Most of the High Plains trumpeters wintered in Nebraska on the Snake River and North Loup River drainages in Cherry County, on Blue Creek in Garden County, along the North Platte River below the Lake McConaughy Dam, and up Birdwood Creek in Lincoln and McPherson Counties.

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Production report

The 2000 aerial production survey was conducted 20 August through 8 September 2000. The survey included Bennett, Shannon, Pennington, Meade, Butte, Perkins, Ziebach, Haakon, Jackson, Mellette, and Todd Counties in South Dakota; Cherry, Sheridan, Garden, Grant, McPherson, Arthur, and Hooker Counties in Nebraska; and Crook County in Wyoming. No swans were observed in Shannon, Pennington, Perkins, or Haakon counties in South Dakota, or in Hooker County, Nebraska, or Crook County, Wyoming, this year. A total of 319 Trumpeter Swans was observed, including 56 nesting pairs, 28 broods with 86 cygnets, and 118 nonbreeders in 18 flocks, compared to 311 trumpeters, including 69 nesting pairs, 36 broods with 105 cygnets, and 60 nonbreeders in 12 flocks in 1999. The 2000 production of 86 cygnets is down from the all-time high of 105 in 1999. The previous all-time high for production occurred in 1992 with 102. Summer production in the Sandhills is on a steady increase (Table 2).

Swan nesting associated with the Colony, Wyoming, site is apparently in peril. A single with a brood of four was observed in 1997 and a pair without a brood was seen in 1998. No swans were observed in 1999, but we did observe a pair there in 2000. Trumpeter production in northwestern South Dakota remains steady while pairs in the South Dakota Badlands have declined as the older pairs die out. Trumpeter nesting and production has increased in the Nebraska Sandhills since 1997. Cygnet production in Nebraska increased from 60 in 1997 to 66 in 2000, while total adults, including young nonbreeders, increased from 100 in 1997 to 200 by 2000.

Refuge production

Refuge swan production has steadily declined. The pair on Pool 7 hatched three cygnets in 1998, but only brought one to flight. The cob died in the fall of 1998, but the pen (52FA, banded 18 July 1991) had a new mate (S28, banded 22 July 1999) for the 1999 breeding season. They defended a territory on Pool 7

again, but no young were hatched. The same pair nested on Pool 7 again in 2000. The pen laid a clutch of nine eggs, but only two hatched and both cygnets died during their first month (Table 4). The development of the wintering site in Nebraska has shifted production to the Sandhills.

Migration attempts

The High Plains Trumpeter Swans apparently began wintering in the Nebraska Sandhills in the early 1990's when winter declines were noticed on Lacreek NWR. The winter migration to the Snake River and Blue Creek in the Sandhills was confirmed in 1996. Aerial surveys of the Nebraska wintering area were expanded to include the North Platte River, Birdwood Creek, the Whitman, Nebraska, area, and the North and Middle Loup River drainages. The wintering population continued to increase, peaking out at 455 trumpeters in January 1999, and then began to decline to 374 in January 2000, and to 227 by January 2001 (Tables 5 & 6). The January 2000 decline was attributed to mild winter weather that left many Sandhills wetlands with open water. It was believed that the decline in the survey was due to the swans being scattered in the myriad of open water wetlands that were too numerous to include in the survey. However, a major decline to the 227 swans was observed during the 5 January 2001 aerial survey, when all Sandhills wetlands, except those with running water, were frozen, leaving little doubt that additional migration beyond the currently observed area is occurring. The aerial winter waterfowl survey conducted by the Nebraska Game Commission, also on January 5, 2001, revealed 15 Trumpeter Swans on the North Loup River just beyond the perimeter of the Lacreek survey area (Nick Lyman, pers. comm.), but no others. With no losses indicated by the increasing summer breeding population, additional winter migration to other areas is certain. A recent report of a fall sighting of Trumpeter Swans on the South Platte River in Colorado near Julesburg (Jack McGrath, pers. comm.) may indicate movement in that direction.

Trumpeter Swan A03, banded by Rhys Beaulieu (Saskatchewan Environment and Resource Management) and Gerry Beyersbergen (Canadian Wildlife Service) in 1994 near Greenwater Lake Provincial Park, Saskatchewan, was observed on Lacreek NWR on 5 December 2000.

Banding and marking

Summer banding and marking continues in late June - early July when the subadults are flightless. The Refuge staff banded 26 trumpeters in July 2000. The banding crew, consisting of Refuge Biologist Kim Bousquet, Biological Technicians Mike Artman, and Joe Nichols, and graduate student Laura McHale captured and banded four swans on Fairhead Lake and 12 swans on Home Valley Lake, both in Cherry County, Nebraska, on 18 July 2000. On 21 July 2000, they banded five swans on Clubhouse Lake, and another five on South Twin Lake, both in Cherry County, Nebraska. The birds were banded S30-34, R19, and R22-41. No birds were injured. Blood samples were taken to be analyzed for the presence of lead and genetic testing.

This was the first year that collars were not used. The current collars have a tendency to ice up during severe winter weather and can lead to unnecessary mortality. Trumpeter Swans were found with iced collars in December 1998 (Pelizza 1999). All of these swans were captured, de-iced, and released. The collar ice removed averaged 4.4 pounds per bird and the birds could barely keep their heads off the ground. The Refuge did not have an icing collar problem until we began to use a thicker, more rigid collar. Despite the tendency for the lighter collars to break off more easily, we need to go back to the lighter collars unless a heavy flexible collar material can be found.

Conclusion

The High Plains Flock of Trumpeter Swans is becoming self-sufficient by the use of natural wintering areas. Although there has been a recent decline from the all-time high of 455 swans in winter 1998, it appears certain that the midwinter decline may be the result of expansion of the winter migration outside of the current survey area. The steady growth of the summer breeding population demonstrates that the population is, indeed, increasing, giving no reason to believe that the winter decline is the result of mortality. The population goal of 500 Trumpeter Swans in the High Plains Flock set by the North America Waterfowl Management Plan in 1984 may soon be realized.

Literature cited

Pelizza, Charles A. 1999. Trumpeter Swan collar icing documented at Lacreek National Wildlife Refuge. North American Swans 28(1):24.

Table 1. Peak population and production data for High Plains Trumpeter Swans based on the January 2001 winter aerial surveys in South Dakota and Nebraska.*

Year	Adults	Cygnets	Total
2000**#	185	42	227
1999*@	294	80	374
1998**	354	101	455
1997**	239	89	328
1996***	163	44	207
1995	118	34	152
1994	144	61	205
1993	122	42	164
1992	138	62	200
1991	105	45	150
1990	164	61	225

* This table reflects the wintering population on Lacreek NWR through 1996. An off-refuge wintering population in Nebraska was discovered in 1996.

** Includes new wintering areas found in the Nebraska Sandhills from the Snake River in Cherry County south to the North Platte River in Nebraska.

*** Includes 58 adults and 7 cygnets observed on Lacreek NWR and 105 adults and 37 cygnets found on the Snake River in Cherry County, Nebraska.

*@ Mild winter conditions resulted in open water on many wetlands. It is assumed that some small flocks were missed in the survey.

Table 2. Breeding performance of South Dakota, Nebraska, and northeastern Wyoming Trumpeter Swans.

Year (summer)	#Adults	#Pairs	#Broods	#Cygnets	Total
2000*	235	56	28	86	319
1999*	206	69	36	105	311
1998	184	62	35	91	298
1997	171	51	29	86	230
1996	129	52	22	78	207
1995	168	48	17	46	214
1994	164	54	32	85	249
1993	115	42	21	58	173
1992	126	48	30	102	228
1991	117	44	24	89	206
1990	127	41	22	68	195

Note: No swan observations in northeast Wyoming.

Table 3. Changes in nonbreeding Trumpeter Swan numbers in the High Plains Flock.

Year	# Flocks	# Nonbreeding Trumpeter Swans
2000	18	118
1999	12	60
1998	9	48
1997	8	41
1996	5	23
1995	9	61
1994	8	47
1993	7	26
1992	5	25
1991	8	45
1990	10	46

Table 4. Production data for Trumpeter Swans on Lacreek NWR.

Year	Nesting Pairs	Broods	Hatched	Fledged
2000	1	0	0	0
1999	2	0	0	0
1998	2	1	3	1
1997	1	0	0	0
1996	2	2	2	1
1995	4	3	14	2
1994	3	3	13	2
1993	4	2	7	4
1992	5	3	11	5
1991	6	6	21	6
1990	5	4	18	8

Table 5. Winter peak population for the High Plains Trumpeter Swan Flock in South Dakota and Nebraska for 1999. Aerial survey carried out 21 January 2000.

Location	Cygnets	Adults	Total
Pool 7*	15	86	101
Pool 8*	5	21	26
Johnson**	0	0	0
Micheel**	0	0	0
Todd GMA**	0	0	0
Lacreek Area Total	20	107	127
Snake River	35	115	150
Blue Creek**	0	0	0
Keystone**	0	0	0
Birdwood Creek	3	5	8
Whitman	4	38	42
North Loup River	18	29	47
Sandhills Area Total	60	187	247
Grand Total	80	294	374

* On Lacreek NWR

** Open water as a result of the mild winter has allowed the swans to winter in non-traditional areas that were not surveyed.

Table 6. Winter peak population for the High Plains Trumpeter Swan Flock in South Dakota and Nebraska for 2000. Based on 5 January 2001 aerial survey.

Location	Cygnets	Adults	Total
Pool 7*	0	1	1
Pool 8*	12	47	59
Johnson	2	1	3
Micheel	0	2	2
Todd GMA	2	5	7
Lacreek Area Total	16	56	72
Snake River	23	64	87
Blue Creek	2	8	10
Oshkosh, NE	0	3	3
Keystone	0	9	9
Birdwood Creek	0	18	18
Whitman	0	0	0
North Loup River	1	27	28
Sandhills Area Total	26	129	155
Grand Total	42	185	227

* On Lacreek NWR

2001 Midwinter survey: Rocky Mountain Population of Trumpeter Swans

Dave Olson

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 (RRLNWR), Southeast Idaho Refuge Complex (SEIRC), National Elk Refuge, Harriman State Park (HSP), Idaho Department of Fish and Game, Grand Teton National Park, Yellowstone National Park (YNP), Wyoming Game and Fish Department, Malheur National Wildlife Refuge (NWR), Summer Lake Wildlife Management Area (WMA), Oregon Department of Fish and Wildlife, Ruby Lake NWR, and Shoshone-Bannock Tribes.

The survey is intended to provide a total count of the entire Rocky Mountain Population (RMP) of Trumpeter Swans. The RMP is comprised of two distinct subpopulations: the U.S. flocks, which nest in the northern Rocky Mountains, and Canadian flocks. The Canadian flocks summer in Canada and share common wintering areas with the U.S. flocks in the "core" Tristate area within the Greater Yellowstone Ecosystem. The Midwinter Survey is the best way to census and determine the distribution of the entire wintering population. It provides essential data for waterfowl managers in three provinces of Canada and five U.S. states, as well as numerous other parties.

Observers were contacted to determine the weather conditions and anything of note during their observations. This year there were many areas in the Tristate area that were frozen. The Ennis Lake area in Montana was frozen and the majority of the birds occurred along the smaller tributaries of the Madison River flowing into Ennis Lake. Survey areas in YNP were mostly frozen.

The Southeast Idaho Refuge Complex (SEIRC) again hired technicians to conduct frequent ground surveys to look for trumpeters and to conduct hazing operations. These technicians were based at HSP in Island Park, Idaho. Hazing is intended to minimize the congregation of trumpeters in the limited winter habitats of the Upper Henry's Fork areas and to encourage them to continue moving south.

A hazing effort was performed from mid-November to late December 2000. Six hazing efforts were made at HSP. Hazing this year differed from efforts made in previous years. Swans were hazed 2 consecutive days each week at Harriman on Tuesdays and Wednesdays as compared to only 1 day a week in previous years. Hazing occurred on 15-16, 20-21 and 28-29 November 2000; 5-6, 12-13, and 19-20 December 2000. HSP was surveyed the day before and after hazing as weather allowed. The number of swans overwintering at HSP peaked on 13 November at 1,196 birds (969 adults and 227 cygnets). Hazing occurred on 15-16 November 2000 resulting in a 50% reduction in swan numbers, but within 4 days, most of the swans had returned to HSP. By the 3rd week of January 2001, swan numbers increased to 758 total birds (590 adults and 168 cygnets). The technicians also logged 371 sightings of 91 individual collars on Trumpeter Swans, recorded grazing pressure on aquatic vegetation, and recorded 10 swan mortalities to April 2001. More detailed information is available from the SEIRC.

At RRLNWR, the historical swan grain-feeding areas, Culver and Macdonald Ponds, are now used as roosting sites through the winter. Weekly winter ground surveys are conducted from early December until late April. This winter, the number of swans using the ponds increased from last year. This year, about 51 trumpeters used the ponds. Last year, four to six trumpeters used MacDonald Pond and about 35 trumpeters used Culver Pond during the winter. However, counts were not conducted as frequently last year. Swans will use other waters on the Refuge as they open. Shambow Pond, a small spring-fed five-acre pond near the Upper Red Rock Lake, is typically used as a roosting and feeding site as it opens early in spring before other Refuge waters are ice free. As other streams and lakes begin to open, the swans disperse.

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Methods

The objective is to conduct 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 Midwinter Survey are collected by fixed-wing aircraft (Cessna Turbo 210 or Husky) and ground surveys. Flying altitude varies according to terrain and surface winds, but generally averages 30-60 m AGL, at 135-155 kph. A pilot-observer and one to two other observers count and classify swans as adults (white birds) or cygnets (gray birds). Ground surveys are used to verify species composition of swan flocks (tundra and trumpeters are hard to differentiate from the air) and provide data from isolated pockets of swans that are not covered by aerial surveys.

The traditional Tristate portion of the 2001 Midwinter Survey was flown over a 3-day period except for Yellowstone (NP) which was flown 7 days later, due to inclement weather. Montana was flown on 7 February 2001; Idaho and Wyoming 8 and 9 February 2001; Yellowstone NP 14 February 2001. Outside of the Tristate, a ground survey was conducted at Ruby Lake NWR on 7 February 2001. Summer Lake WMA in Oregon was unable to fly the traditional areas and instead used a ground count that should be considered a minimum count for south-central Oregon.

Results and discussion

The 2001 Midwinter Survey censused 3,975 swans, which included 3,245 adults and 730 cygnets (Table 1). The total number of swans increased from last year as well as the total number of adults. When

Table 1. The total Number of RMP Trumpeter Swans counted during the 2001 Midwinter Survey in respective states.

State	Adults	Cygnets	Total
Montana	373	96	469
Idaho	2404	549	2953
Wyoming (includes Yellowstone NP)	421	74	495
Tristate Subtotal	***3,198***	***719***	***3,917***
Utah	N/A	N/A	N/A
Colorado	N/A	N/A	N/A
Nevada	31	4	35
Oregon	16	7	23
Washington	N/A	N/A	N/A
California	N/A	N/A	N/A
Subtotal for other States	47	11	58
RMP (U.S. and Canadian)	**3,245**	**730**	**3,975**

Table 2. RMP 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	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%

we look at the total numbers of swans from the fall survey, we see an increase in the total number of swans and number of adults for both the U.S. birds as well as the Canadian birds (Figure 6) comprising the RMP. The U.S. birds increased in total numbers from last year and is running a stable trend line since 1993 within the RMP. This is consistent with the results of the most recent survey of Trumpeter Swans in North America (Caithamer 2001). The increase in the total number of swans for the RMP of trumpeters appears to be composed mainly of Canadian birds.

At present breeding pair numbers, summer breeding habitat is not believed to be a limiting factor. The lack of growth in the swan population might be a result of pre-breeding condition prior to nest initiation. Swans probably derive a significant part of their nutrient requirements for reproduction from wintering grounds and/or spring staging areas (Batt *et. al.* 1992).

Winter may continue to be a limiting factor. This year, temperatures have been colder and the majority of the water courses over the survey area were frozen. The combination of the colder temperatures with the drought conditions from the past summer may result in more frozen habitat that could lead to a greater percentage of birds wintering further south. This may explain more birds being in Idaho this year than in previous years.

The swan survey data by state for adults, cygnets, and total swans, shows that the total number of birds observed in Idaho has increased. The total swan numbers observed for the State of Montana has decreased from last year while the swan numbers observed for Wyoming has increased from last year. Since 1997, there appears to be an inverse relationship in total swan numbers observed between the states of Montana and Wyoming. One year the swan numbers for Montana increase while those in Wyoming decrease followed by the exact opposite the next year. This may be as a result of an interchange of swans between Montana and Wyoming.

The cygnet data from the winter swan survey indicates a similar trend at least for the Idaho data. The total number of cygnets for Idaho has been increasing since 1998. This increase though, is offset by the decrease in the number of cygnets for both Montana and Wyoming. This offset has lead to a decrease in the total number of cygnets observed during the winter swan survey since 1999.

Survey results indicate that the Canadian swans of the RMP continue to increase and the U.S. birds remain below the long-term trend, but have been relatively stable over the past 7 years. Recently, the Tristate area has had very mild winters which should lead to better over winter survivability for the U. S. birds, however, this will not be known until subsequent fall surveys are conducted. The warmer weather may also result in early nest initiation, and potentially higher cygnet survival, if we experience extended summer weather. However, if less than adequate runoff results from light snow pack, fewer wetland acres may be maintained throughout the critical brood rearing period. This may lead to fewer isolated, productive wetlands than in previous years resulting in poor cygnet survival.

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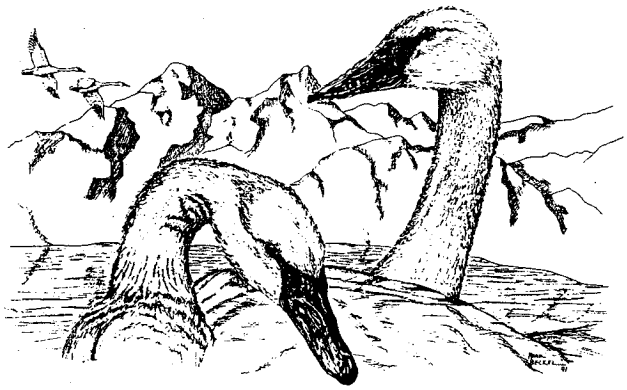
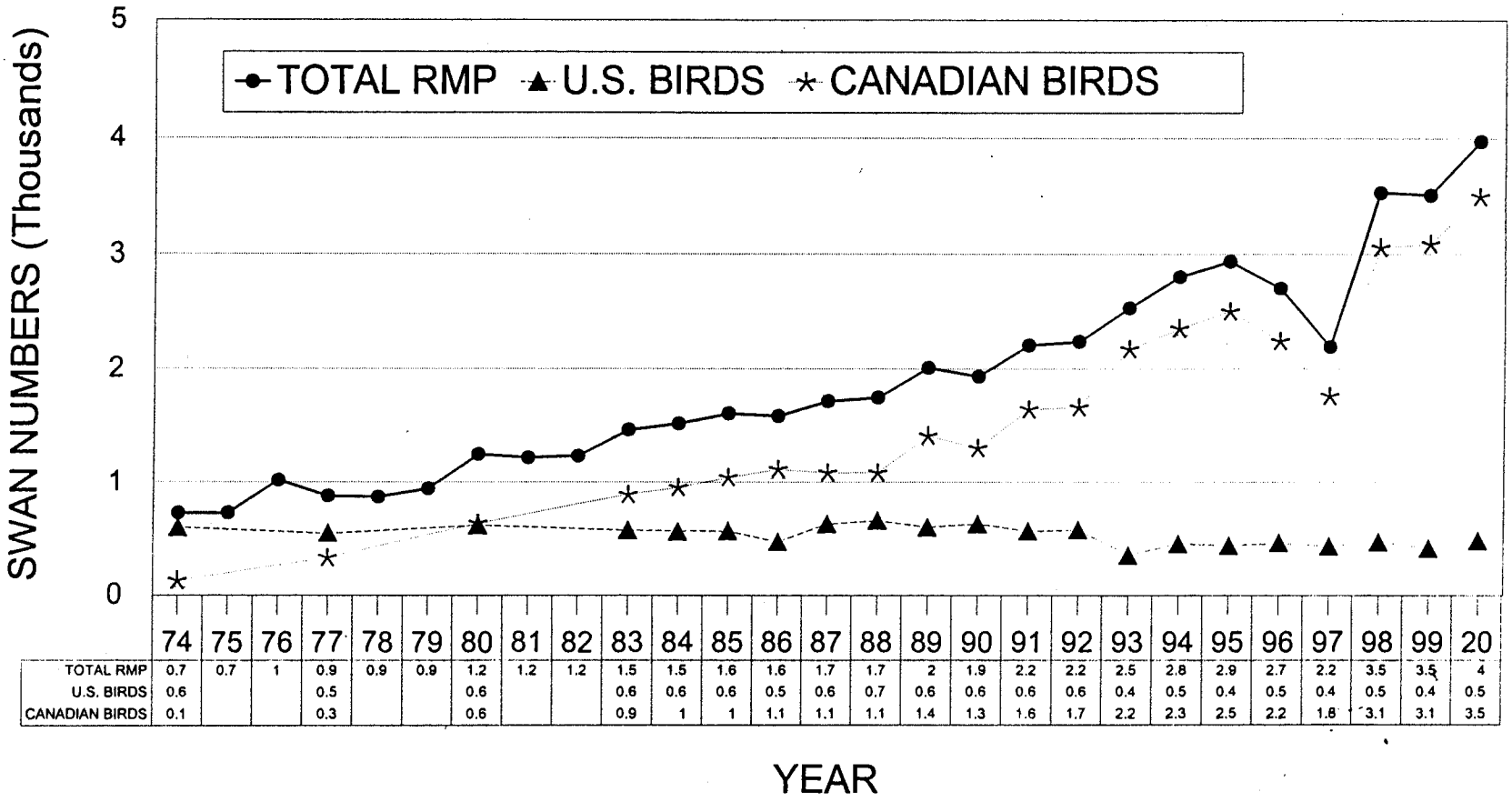
Editors' Note: A copy of the full report is available from Red Rock Lakes NWR. Figure numbers in this paper reflect numbering in the full report.





	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	20
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
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
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

Figure 6. Trends of Rocky Mountain Population of trumpeter swans (white birds, cygnets, and unknown age), U.S. and Canadian birds, 1974-2001. The Canadian swan numbers are derived indirectly by subtracting the U.S. swan numbers (from Fall Survey) from the total midwinter count. (From 2001 Midwinter Survey: Rocky Mountain Population of trumpeter swans, February 2001, Red Rock Lakes National Wildlife Refuge, USFWS).

2000 Midwinter survey: Rocky Mountain Population of Trumpeter Swans

Thomas M. Reed and Daniel Gomez

Introduction

Due to weather and visibility, the aerial portion of the 2000 survey could not be initiated until 16 February. Montana was flown on 16 February; southeast Idaho on 17 and 18 February; Yellowstone on 18 February; and Wyoming on 3 March 2000. Weather caused a 2-week delay in flying the Wyoming portion of the flight. While some movement of trumpeters into and out of Wyoming may have occurred in this 2-week period, we assume that the movement was minimal. Any movement was more likely out of Wyoming than into Wyoming, therefore, it is not likely that trumpeters in Wyoming were double-counted birds from Idaho or Yellowstone National Park. Fewer swans were counted in Wyoming than in 1999, therefore, it appears from the survey results that fewer birds were in Wyoming at the time of the count than 2 weeks earlier when Idaho, Montana, and Yellowstone were surveyed.

Observers indicated that there was more open water this year. Steve Bouffard, Southeast Idaho Refuge Complex (SEIRC), indicated that a few new areas were surveyed this year, such as Immigrant Slough and Dry Bed, both in the Roberts-Mennan area of Idaho. Steve also indicated that many of the survey sites in Idaho were consolidated under the Lower Henry's Fork subheading. This enlarged subheading now includes reservoirs and water bodies off the Snake River yet in the same general geographical area. In previous reports, these sites were reported in the separate subheadings: (1) Henry's Fork Area (Snake River) and (2) Lower Henry's Fork Area. Other survey sites along the Snake River were consolidated into fewer subheadings that corresponded to the sites' locations and some new site names were added to the Fort Hall Bottoms subheading.

The Pacific Flyway Management Plan for the Rocky Mountain Population (RMP) of Trumpeter Swans directs aggressive actions to broaden RMP distribution. The goal of RMP management 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.

Recent efforts to restore trumpeters to historical range resulted in the translocation of 1,477 swans from the RMP in the Tristate area of southeast Idaho, southwestern Montana and northwestern Wyoming to sites in Oregon, southern Idaho, Utah, and southwestern Wyoming. Tristate swans have been relocated during both summer and winter range expansion programs and Canadian swans during the winter program. In response to these efforts, the Fall and Midwinter Surveys have been expanded to include Gray's Lake National Wildlife Refuge (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 Wildlife Management Area (southeast Oregon), and Ruby Lake NWR (Nevada).

In the early 1990s, winter feeding at Red Rock Lakes NWR (RRLNWR) was attracting increasing numbers of swans into inadequate winter habitat, subjecting the RMP to increased disease risk and reducing the effectiveness of winter range expansion efforts. Beginning in the winter of 1992/93, actions were taken to end the winter feeding program, disperse swans to natural winter habitat, and begin restructuring the Centennial Valley flock so that summer residents migrate out of the valley to suitable wintering sites.

Additionally, some limited mixing of RMP and Pacific Coast Population (PCP) Trumpeter Swans may be occurring as well. In the winter of 1997/98, a trumpeter banded with collar 75T at Tetlin NWR in Alaska was observed in the Teton Basin of southeast Idaho. Marked RMP trumpeters have also been observed in the Skagit Valley of Washington State (S. Bouffard, pers. comm.). The extent to which RMP and PCP trumpeters may mix in the Yukon Territory of Canada is largely unknown.

SEIRC hired technicians to conduct frequent ground surveys to look for trumpeters and to conduct hazing operations. These technicians were based at Harriman State Park (HSP) in Island Park, Idaho. The number of trumpeters overwintering at HSP peaked at 774 (568 adults and 206 cygnets) during January 2000. Prior to that peak, swans at the Park were hazed on six separate occasions: 12 and 19 November, and 3, 10, 17

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and 22 December 1999. Swans, ducks, and geese were surveyed before and after four of the hazing events to determine the effectiveness of the effort.

During the first two hazing events in November, an unseasonably warm period with much open water, the action achieved a 50% reduction in the number of swans present at HSP with little effect on ducks and geese using the same area. With the Henry's Fork River running at 700 CFS, swan use was restricted to the Big Bend and Thurman Creek reaches of the river and to Silver Lake until it froze on 2 December. This was similar to the 1997/98 season when the river was running at 700CFS. This pattern of use changed when Hebgen and Ennis Lakes froze around 9 December 1999, at which time a large influx of swans moved into the Last Chance and East Harriman reaches of the river (C. Whitman, pers. comm.).

The observers also logged 451 sightings of 117 individual collars on trumpeters, found various levels of waterfowl grazing pressure on aquatic plants, and recorded five trumpeter deaths, possibly from predation by coyotes.

At RRLNWR, the historical swan feeding areas, Culver and Macdonald Ponds, are used as roosting sites through the winter. A few swans remain on the ponds and are believed to fly to nearby areas such as Ennis Lake in the Madison Valley or the Henry's Fork in Idaho to feed along with migrant Canadian trumpeters. The ponds used to hold about 200 trumpeters, but now roost about 16 - 35 on average. This winter, we counted an average of four to six trumpeters on MacDonald and approximately 35 trumpeters on Culver Pond through most of the winter. In early March, these numbers increased to a total of about 130 trumpeters on both ponds. Also in March, two-six trumpeters started using Shambow Pond, a small spring-fed five-acre pond near the Upper Red Rock Lake, and on 15 March, 24 trumpeters and one tundra were observed on Red Rock River, just downstream of the structure on Lower Red Rock Lake.

Swans will use other waters on the Refuge as they open with temperature fluctuations. Shambow Pond is typically used as a roosting and feeding site as it opens early in spring. During this early spring period, up to 90 trumpeters can be seen feeding on submerged aquatic plants. As other streams and lakes begin to open, the swans disperse, with several initially moving to the Lower Lake Dam outlet.

Results and discussion

The 2000 Midwinter Survey censused 3,524 swans, which included 2,763 adults and 761 cygnets (Table 1). In 1999, 3,527 swans were observed during the Midwinter Survey, composed of 2,745 adults and 782 cygnets (Gomez 1999b). The results did not reveal much change in the numbers or composition of flocks wintering in the Tristate area. We were concerned with the 2-week delay period in which Wyoming was surveyed. Wyoming did experience a significant reduction in swans observed in 2000 as compared to 1999 (372 total, including 294 adults and 78 cygnets as compared to 728 total in 1999, which included 609 adults and 119 cygnets). In examining the data, however, it appears that Wyoming experienced an unusually high count during the 1999 Midwinter Survey.

When we compare the growth of the Canadian Flock with the lack of growth in the U. S. Flock, we are concerned with the continued reduction in the size and proportion of the U. S. Flocks with the RMP. Eight years have passed since winter feeding was eliminated. It is a matter of perspective as to whether the lack of growth in the U. S. Flock is a decline, a slow recovery, or a stabilization at lower levels. Summer breeding habitat is not believed to be a limiting factor. When the Tristate and breeding populations were higher, the Centennial Valley had ample suitable vacant breeding habitat (Gale *et. al.* 1987). The number of trumpeters in the Valley is down to about 100 today.

Winter continues to be the probable limiting factor. Recently, winters have been more moderate and more water courses remain open and unfrozen. Given this, we could anticipate increased survival. The open water contributes to some birds using non-traditional sites outside of the survey areas. For example, J. Mackay (Ruby Lake NWR) observed 15 - 20 swans, presumed to be trumpeters, on the Duck Valley Indian Reservation in northern Nevada. However, the Midwinter and Fall surveys count the large majority of trumpeters and are representative of actual trends in RMP. Therefore, we do not attribute lower numbers to birds missed during the survey except where noted, such as in Wyoming this year.

In Wyoming, one of two or more scenarios may have occurred. The first would occur if birds did not move into Wyoming due to the open water to the north in the HSP area. Or, because of the delay of 2 weeks between counts, it is possible that swans began to move out of Wyoming by the time Wyoming was surveyed. The lower numbers in Wyoming may reflect this movement of birds. If this is the case, then Wyoming may have wintered more birds than what was counted. Future surveys may show an increasing trend.

Although not included in previous reports, J. McGrath reports that trumpeters have appeared in Colorado for several years. Since 1991, he and other observers have recorded 41 sightings of one to nine trumpeters at various locations, including one at Lake Henry (28 February 1993), nine at Boulder Reservoir (11 December 1995) and six at Chatfield Reservoir (12 November 1997). These are a few examples of some locations. More recently, McGrath found two cygnets

at Viele Lake (16 February 1999) and three adults at Pueblo Reservoir (5 January 1999). He recorded nine separate sightings of adults and cygnets in 1999. None of these birds have had collars, so their origin is unknown (J. Cornely, pers. comm.). For now, we will not include these numbers in the Survey since it is not known if they are part of the RMP or Midwestern migrants. We will continue to examine these sightings and attempt to determine the origin of these swans.

The cygnet to adult ratio of the U. S. Flock remains within historical ranges, about 20% cygnets to adults. However, while ratios remain consistent, there are fewer adults in the U. S. Flocks now. While cygnet fledging in the U. S. Flock is representative of historical trends, the higher production, or "peaks" in cygnet numbers occasionally experienced is dampened by the lower numbers of breeding adults, or recruitment of subadults into the breeding segment. Therefore, there are fewer cygnets to counter the losses in some years. The overall effect is that the U. S. Flocks will be vulnerable to severe winters.

We conclude that productivity in trumpeters has always fluctuated. Following the end of artificial feeding, the U. S. Flock will probably continue to experience lower productivity than the Canadian Flock. The lower productivity may be partly due to a lack of migration into more temperate areas with better aquatic foods.

There are a number of other factors that may be contributing to this lack of growth or decline. These include: less nest initiation, lower cygnet survival and recruitment, elimination of artificial feeding, and insufficient wintering areas outside of the Tristate area. Despite the continued stagnant growth to downward trend of the U. S. Flocks, the total RMP maintained approximately the same numbers as last year and the RMP continues to be comprised largely of Canadian birds. The swan survey data, by state, and total, are provided at the end of the full report.

To conclude, in 1992, the Service proposed to "...terminate artificial feeding of trumpeter swans at Red Rock Lakes National Wildlife Refuge and restructure the Centennial Valley flock so that summer residents migrate out of the valley to suitable wintering sites." (USFWS 1992). The potential for an increasing or recovering flock after the end of winter feeding formed the basis for the 1992 Environmental Assessment, which ended the winter feeding program. The success of that action depended on the restructuring of the U. S. Flocks to a migratory flock which would winter in more suitable habitats with less severe winters outside of the Tristate area.

Eight years after the end of artificial feeding and in spite of intensive relocation of trumpeters from 1990-95, few Trumpeter Swans have established migration to new habitats (Trost *et. al.* 1999). Survey results indicate that the RMP's Canadian Trumpeter Swan flock continues to increase and the U. S. Flock is stable, static, or decreasing, depending upon a person's perspective. Either way, since 1995, the adult and subadult segment of the U. S. Flock has not increased, when productivity has been average and when winter mortality should have been less than in more severe winters (Gomez 1999).

The Tristate area experienced below normal snowpack and temperatures this winter. This relatively mild winter may favor good over-winter survival and, possibly, increased subadult breeding pair formation. The warmer weather may also result in early nest initiation, and potentially higher cygnet survival if we experience extended summer weather. However, with the lower runoff expected this spring, there will be fewer wetland acres throughout the critical brood rearing period. This may dampen the potential benefits of a mild winter, spring, and longer summer.

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Editors' note: This report is included for purposes of continuity. Please refer to the 2001 Midwinter Survey (preceding article) for details of survey area and methods. A copy of the full report is available from Red Rocks NWR, Monida Star Rt., Box 15, Lima, MT 59739.

Table 1. The total number of RMP Trumpeter Swans counted during the 2000 Midwinter Survey in respective states.

State	Adult/subadults	Cygnets	Total
Montana	519	155	674
Idaho	1,881	513	2,394
Wyoming	294	78	372
Tristate subtotal	***2,694***	***746***	***3,440***
Utah			
Colorado			
Nevada	54	9	63
Oregon	15	6	21
Washington			
California			
Subtotal for other states	***69***	***15***	***84***
RMP (U. S. and Canadian Flocks)	**2,763**	**761**	**3,524**

Table 2. Rocky Mountain Trumpeter Swan Population 1974-2000: U.S. and Canadian Flocks.

Year	Total RMP	U. S. Flocks
1974	723	599
1977	874	596
1980	1247	544
1983	1460	615
1984	1516	571
1985	1603	565
1986	1582	563
1987	1710	469
1988	1743	628
1990	2007	598
1991	2203	629
1992	2162	564
1993	2235	575
1994	2526	354
1995	2803	454
1996	2936	438
1997	2699	459
1998	2189	433
1999	3527	469
2000	3524	417

2000 Fall Trumpeter Swan survey of the U. S. subpopulation of the Rocky Mountain Population

Thomas M. Reed

Introduction

The Fall Trumpeter Swan Survey is an annual aerial survey conducted in September. The survey is a cooperative effort between Red Rock Lakes National Wildlife Refuge (RRLNWR), Southeast Idaho Refuge Complex (SEIC), National Elk Refuge, Harriman State Park (HSP), Idaho Department of Fish and Game, Grand Teton National Park, Yellowstone National Park (YNP), Wyoming Game and Fish Department, Ruby Lake National Wildlife Refuge (NWR), Malheur National NWR, Oregon Department of Fish and Wildlife's Summer Lake Wildlife Management Area (WMA), the Shoshone-Bannock Tribes, and other parties. The Fall Survey is intended to provide as accurate of a count as possible of the core U.S. subpopulation of the Rocky Mountain Population (RMP) of Trumpeter Swans. It is a direct count, in that only birds observed are recorded.

Over the course of the fall surveys, there has been various terminology used to describe the group of swans that are surveyed. Prior to 1992, "tri-state subpopulation" was used. Then, when flocks were established outside of the Tristate area, the term "Tristate" did not capture the entire survey area and the term "U.S. Flocks" of the RMP, was used (Niethammer and Gomez 1992). Upon managerial recommendation, and because of confusion with the status of the swans as a result of using the term "flocks", this report will refer to the surveyed swans as the U.S. subpopulation for now, pending further discussion. We apologize for any confusion that this may present to readers of this report.

We typically do not use correction factors for birds not observed. However, this year, upon request, six adults and 10 cygnets were added to the Idaho survey based on the ground observations of Ruth Shea. Ruth is confident that these birds were not included in the aerial survey.

The trends are depicted in figures included in the full survey report. The RMP is comprised of two distinct subpopulations: the U.S. subpopulation, formerly known as the Tristate subpopulation and the U.S. flocks, and the Canadian subpopulation. The U.S. subpopulation spends the summer and nests in the northern Rocky Mountains. The Canadian subpopulation summers and nests in Canada and shares common wintering areas with the U.S. subpopulation in the "core" Tristate area within the Greater Yellowstone Ecosystem. The Fall Survey (Figure 2) is the best method to census and determine the distribution of the U.S. subpopulation and the number of cygnets near fledgling stage. It provides essential data for waterfowl managers in three provinces of Canada and six U.S. states.

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Methods

Data for the survey are collected by single-engine, fixed-wing aircraft and ground surveys. Flying altitude varies according to terrain and surface winds, but generally averages 30-60 m AGL, at 135-155kph. We conducted the 2000 Fall Survey 13 - 24 September. Ideally, the survey would be conducted within a few days to 1 week, however, inclement weather prohibited flights for several days once the survey was initiated. In addition, in years past, one pilot, Bob Twist (Western Montana Aviation), flew most of the survey. This year, due to new policies in YNP requiring slower aircraft, and other logistical factors, multiple pilots and aircraft were used. This increased the scheduling time and span of the survey. YNP was flown on 13 September, southwest Montana on 20 September, southeastern Idaho on 15 and 20 September, and northwestern Wyoming on 24 September. Ruby Lake NWR, Nevada, was flown on 15 September and Summer Lake WMA, including the Sprague and Williamson Rivers, was flown on 21 September. Ground surveys were conducted at Malheur NWR, Oregon, on 18 September.

Results and discussion

The 2000 Fall survey found 481 Trumpeter Swans, a 15 % increase from last year's 417 trumpeters and the highest number of swans since the termination of winter feeding (Table 1). This is an encouraging turn-

Table 1. Yearly trends in the U.S. Subpopulation of the Rocky Mountain Trumpeter Swan Population (1990 - 2000).

Year (September)	White Birds	Cygnets	Total Swans
1990	432 (75%)	147 (25%)	579
1991	463 (81%)	108 (19%)	570
1992	473 (83%)	97 (17%)	570
1993	303 (86%)	51 (14%)	354
1994	302 (67%)	152 (33%)	454
1995	372 (85%)	66 (15%)	438
1996	381 (83%)	78 (17%)	459
1997	360 (83%)	73 (17%)	433
1998	364 (78%)	105 (22%)	469
1999	347 (83%)	70 (17%)	417
2000	**372 (77%)**	**109 (23%)**	**481**

Table 2. State by state summary for Fall 2000 survey.

State	White Birds	Cygnets	Total
Montana	127	24	151
Idaho	102	40	142
Wyoming	95	38	133
Nevada	26	2	28
Oregon	22	5	27
RMP, U.S. Subpopulation	**372**	**109**	**481**

around from last year's low (which was the lowest since 1993) and promising that swan numbers have at least tenuously stabilized or are on a slight increase post removal of artificial winter feed. The increase in swan numbers is very likely directly related to mild winter and spring weather conditions in the Tristate area. At the Lakeview, Montana, weather station, January, February, March, and April 2000 monthly average temperatures were 4 to 7 degrees higher than the 52-year average. Monthly precipitation during June, July, and August 2000, was approximately half of the 52-year monthly average (Western Regional Climate Center, Reno, NV). In addition, very few cold hailstorms occurred in the Tristate area this spring, which typically reduces cygnet survival.

In analyzing the 2000 Survey, one must look at the population trend from the cessation of feeding at RRLNWR, during the winter of 1992-93. It appears that the population has tenuously stabilized after this significant change in management. It would be encouraging to see this year's upward trend continue, yet the data from the past 8 years suggests that it will probably alternate relatively high numbers with somewhat lower numbers. Although we are encouraged by the Fall Survey numbers, it should be noted that a severe winter has not occurred in the Tristate area since 1992-1993, and the risk of losing substantial numbers of swans during a severe winter is very real, as adequate winter habitat is still limiting.

The perceived stability may be deceiving, as it does not reflect the loss of new individuals which could have been added to the subpopulation. Using the end of winter feeding as a starting point, the surveys indicate that, in the 8 years since 1993, 704 cygnets have fledged. However, the number of white birds shows an overall increase of only 69 birds. Without knowing the adult annual survival rate and the rate of fledgling survival to adulthood, it is difficult to determine how many birds should have been added to the population during this time. However, the Tristate surveys that are conducted in the spring have not shown a marked increase of birds returning after winter. Given the well-documented social and family structure of Trumpeter Swans, it is very unlikely that Tristate birds are migrating to Canada. The combination of these factors suggests that many of the cygnets counted in September are not surviving to breeding age and that significant winter mortality is likely occurring. It is interesting to note that T. McEneaney (YNP) reports that many cygnets surveyed as fledged this September have already been lost. We are optimistic that management efforts will investigate winter mortality factors and focus on establishing adequate winter habitat.

White birds and cygnet numbers were up in Montana and Wyoming. Cygnet numbers were up in Idaho. As mentioned above, an additional six adult and 10 cygnets were added to Idaho's numbers post survey. This significantly affected the percentage of cygnets produced in Idaho. As mentioned in last year report, the trend in Montana's white bird numbers is encouraging, however the trend in cygnet survival to fledging remains poor. This appears to be a chronic issue of management concern.

The 109 fledged cygnets that were surveyed this fall is up from the 70 cygnets fledged in 1999, a 56 % increase. A mild and early spring led to a greater number of nest attempts (up 6% from 1999), a greater number of successful nests (up 11%), and a greater number of cygnets hatched (up 25%). It is encouraging to see the production up overall in the Tristate area, as would be expected with a mild spring. Wyoming experienced a 220% increase, from 12 birds to 38, while Idaho experienced a 74% increase in cygnets fledged, from 23 birds to 40, and Montana, a 14% increase in fledged cygnets, from 21 to 24 (Gomez 1999). According to Susan Patla, Wyoming Game and Fish Department, the large increase in Wyoming's fledged swans was associated with a very mild spring and subadult pairs finally attempting to nest after years of not doing so. Susan stated that historic territories that had not been occupied in years were occupied this year, including four sites on the National Elk Refuge and one site at Pinto Pond.

Both Oregon and Nevada showed marked declines in cygnet production, experiencing a decrease of 44% and 88%, respectively. It appears that the Oregon population may be on a steady downward trend that may be difficult to reverse.

Unfortunately, despite over-all good production, some areas are still experiencing poor fledging rates. On Swan Lake, RRLNWR, although four nesting pairs were active, only one cygnet fledged. This is similar to 1999 production at Swan Lake in which five active nests fledged only one cygnet. There is the possibility that some of these fledglings are being counted on adjacent areas of the refuge, yet not to a large extent.

Conclusion

This year, the Fall Survey accounted for the highest number of swans in the U.S. Subpopulation of the RMP of Trumpeter Swans since the cessation of winter feeding. Over the past 8 years, since winter feeding was terminated, the U.S. Subpopulation of the RMP has fluctuated, but at lower numbers than when winter feed was provided (354 - 481 compared to 469 - 658). It would be desirable to realize a steady increase in swan numbers to at least the numbers that existed during winter feeding through managing a steadily increasing

migratory population of the Tristate subpopulation. With continued efforts focused on providing suitable winter habitat and protection from human disturbances along migration routes, we are optimistic that the upward trend will continue. Although the survey numbers for this year are very encouraging, trend data since the cessation of winter feeding suggest that an uninterrupted continued steady growth in the U.S. flocks is highly unlikely.

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Editors' note: A copy of the full survey report is available from Red Rock Lakes NWR, Monida Star Rt., Box 15, Lima, MT 59739.

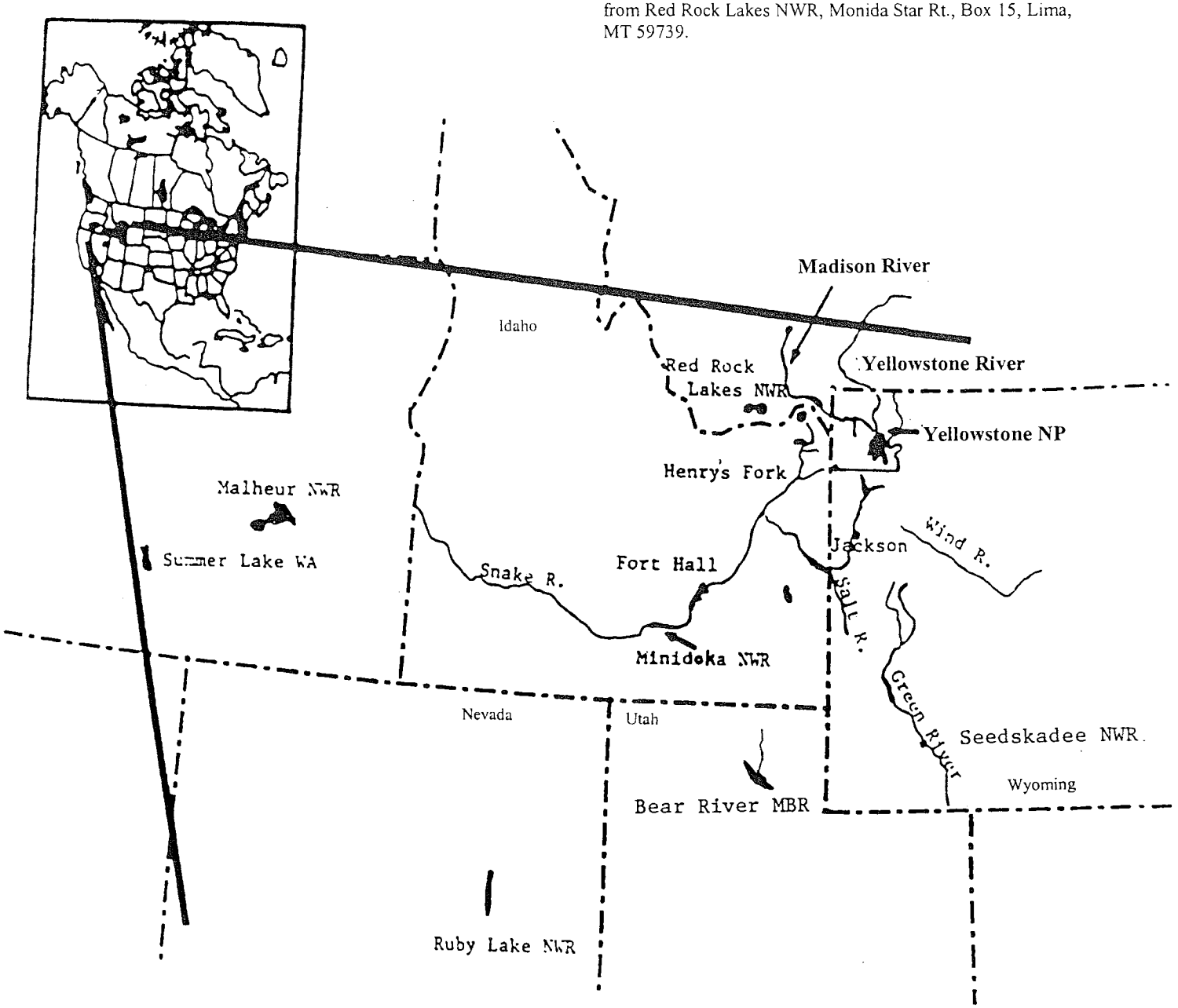

Figure 2. Fall and Midwinter Trumpeter Swan survey area.

Trumpeter Swan surveys on the Chugach National Forest 2000 – an update

Deborah J. Groves, Bruce Conant, John Sarvis, and Daniel Logan

Abstract

Trumpeter Swan (*Cygnus buccinator*) aerial surveys were conducted during May and August 2000 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 (USFWS) and the U.S. Forest Service (USFS). In May, 691 white (adult and subadult) swans and 115 nests were counted. In August, 755 white swans and 66 broods were counted. Production was slightly above average. Nest success was 0.57, average brood size was 3.2, and young made up 22% of the early fall population. The fall white swan population was up 22% from 1999 and was 17% above the 25-year average. There are now 47 comparable swan surveys in 25 different years for this area. A continued standardized Trumpeter Swan survey program is recommended.

Introduction

The Copper River Delta and surrounding coastal wetlands in the Chugach National Forest support a large and dense nesting and summering population of Trumpeter Swans. Aerial surveys were conducted in this area as part of the USFWS statewide trumpeter censuses in 1968, 1975, 1980, 1985, 1990, 1995, and 2000 (Hansen *et al.* 1971, King 1976, King and Conant 1981, Conant *et. al.* 1985, Conant *et al.* 1991, Conant *et al.* 1996, Conant *et al.* 2001). The USFS initiated aerial surveys in 1978, and annual swan surveys have been jointly accomplished under a formal agreement between the USFWS and USFS since 1981.

Results

Population Trend

In May 2000, 691 white swans (adults and subadults) were counted, up 47% from Spring 1999 and 13% above the 22-year average (Table 1). The number of single and paired birds in spring increased 12% from last year and was 1% below the average. The number of flocked birds increased 223% from 1999 and was 52% above the average (Table 1).

In August 2000, 755 white swans were counted, up 19% from August 1999 and 17% above the 25-year average (Table 2). The number of single and paired birds increased 27% from last year and was 25% above the average (Table 2). The number of flocked birds increased 2% from 1999 and was 2% below the average (Table 2).

Productivity

The proportion of pairs with nests in early June was 0.52, down 4% from 1999 and 4% below the 22-year average. One hundred fifteen nests observed in June produced 66 broods still present in August, resulting in a nest success of 0.57. Nest success increased 10% from 1999 and was 19% above the average. A total of 209 cygnets was counted during the August survey, 17% above the 25-year average (Table 2). 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), was 1.8 (22-year average = 1.6), and average brood size was 3.2 (25-year average = 3.3). The proportion of young in the early fall population was 0.22, equal both to 1999 and to the 25-year average (Table 2).

Discussion

The nesting effort by Trumpeter Swans on the survey area, as measured by the number of nests and the proportion of pairs nesting, was average in 2000. However, those nesting experienced above-average reproductive success, reflected by above-average nest success and number of cygnets produced. Overall, Trumpeter Swans experienced slightly above-average production on the Copper River Delta and Controller Bay drainages in 2000.

Bias

Possible sources of bias in these data come from using different pilots and observers with variable levels of experience and training, using more than one type of aircraft, and surveying in variable weather conditions. However, by using a standardized system, comparable

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sets of data were collected as evidenced by comparable recorded flight paths and mileage flown.

Recommendations

We now have 47 comparable Trumpeter Swan surveys (22 spring and 25 fall) on the Copper River Delta, one of the most complete records for any 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* Vol. 27, No. 1 (December 1998) and Vol 28, No.1 (December 1999) for details on survey area, methods, previous results and discussion with supporting figures and tables. The information presented here updates these reports. For a copy of the complete report, please contact D. Groves.

Table 1. Spring survey swan observations - Chugach National Forest (1978-2000).

Date	Miles Flown	Observations	White Swans				Cygnets	Total Swans
			Paired	Single	Flocked	Subtotal		
5/1978	967	192	278	20	362	660	--	660
5/1980	783	222	320	45	169	534	--	534
5/1981	924	244	350	37	235	622	--	622
6/1982	852	247	356	44	200	600	--	600
6/1983	--	297	448	47	144	639	23	662
6/1984	1074	324	502	43	190	735	--	735
6/1985	986	309	452	50	235	737	--	737
5/1986	935	304	508	35	123	666	--	666
5/1987	--	291	462	39	101	602	--	602
5/1988	--	263	418	42	116	576	5	581
5/1989	--	241	400	28	174	602	--	602
5/1990	989	226	374	25	121	520	--	520
5/1991	966	250	394	34	152	580	--	580
5/1992	905	249	412	25	195	632	--	632
5/1993	985	248	394	25	159	578	--	578
5/1994	912	278	436	31	204	671	--	671
5/1995	921	246	402	24	157	583	--	583
5/1996	915	267	442	27	125	594	--	594
5/1997	934	246	406	27	84	517	--	517
5/1998	997	285	462	40	110	612	--	612
6/1999	1298	229	358	33	79	470	--	470
5/2000	880	256	408	28	255	691	--	691
22 Yr. Avg.	957[a]	260	408	34	168	610	--	611

a Eighteen year average.

Table 2. Fall survey swan observations - Chugach National Forest (1968-2000).

Date	Miles Flown	Observations	White Swans				Cygnets	Young in Pop.(%)	Total Swans
			Paired	Single	Flocked	Subtotal			
8/1968	851	199	326	24	181	531	267	33	798
8/1975	1125	196	312	24	142	478	131	22	609
8/1978	1088	186	248	36	127	411	103	20	514
8/1979	887	160	234	20	217	471	143	23	614
8/1980	1961	262	410	33	187	630	216	26	846
8/1981	1541	234	374	16	287	677	266	28	943
8/1982	1644	271	436	27	227	690	152	18	842
8/1983	1948	314	512	32	219	763	259	25	1022
8/1984	1731	303	448	42	400	890	228	20	1118
8/1985	1952	348	534	45	319	898	111	11	1009
8/1986	1611	298	490	25	200	715	188	22	903
8/1987	1648	318	510	46	175	731	64	8	795
8/1988	1600	281	472	29	145	646	217	25	863
8/1989	1578	278	460	41	98	599	117	16	716
8/1990	1710	267	424	35	169	628	245	28	873
8/1991	1247	253	400	36	90	526	136	21	662
8/1992	1025	197	314	19	231	564	250	31	814
8/1993	1158	237	368	29	218	615	201	25	816
8/1994	1486	260	382	24	404	810	131	14	941
8/1995	1659	280	408	51	185	644	97	13	741
8/1996	1231	259	430	23	176	629	151	19	780
8/1997	1533	259	416	25	157	598	175	23	773
8/1998	1403	273	428	37	185	650	217	25	867
8/1999	1306	258	408	27	199	634	182	22	816
8/2000	1469	325	512	41	202	755	209	22	964
25 Yr. Avg.	1456	261	410	31	206	647	178	22	826

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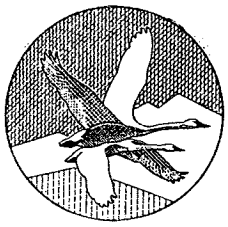
THE TRUMPETER SWAN SOCIETY

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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