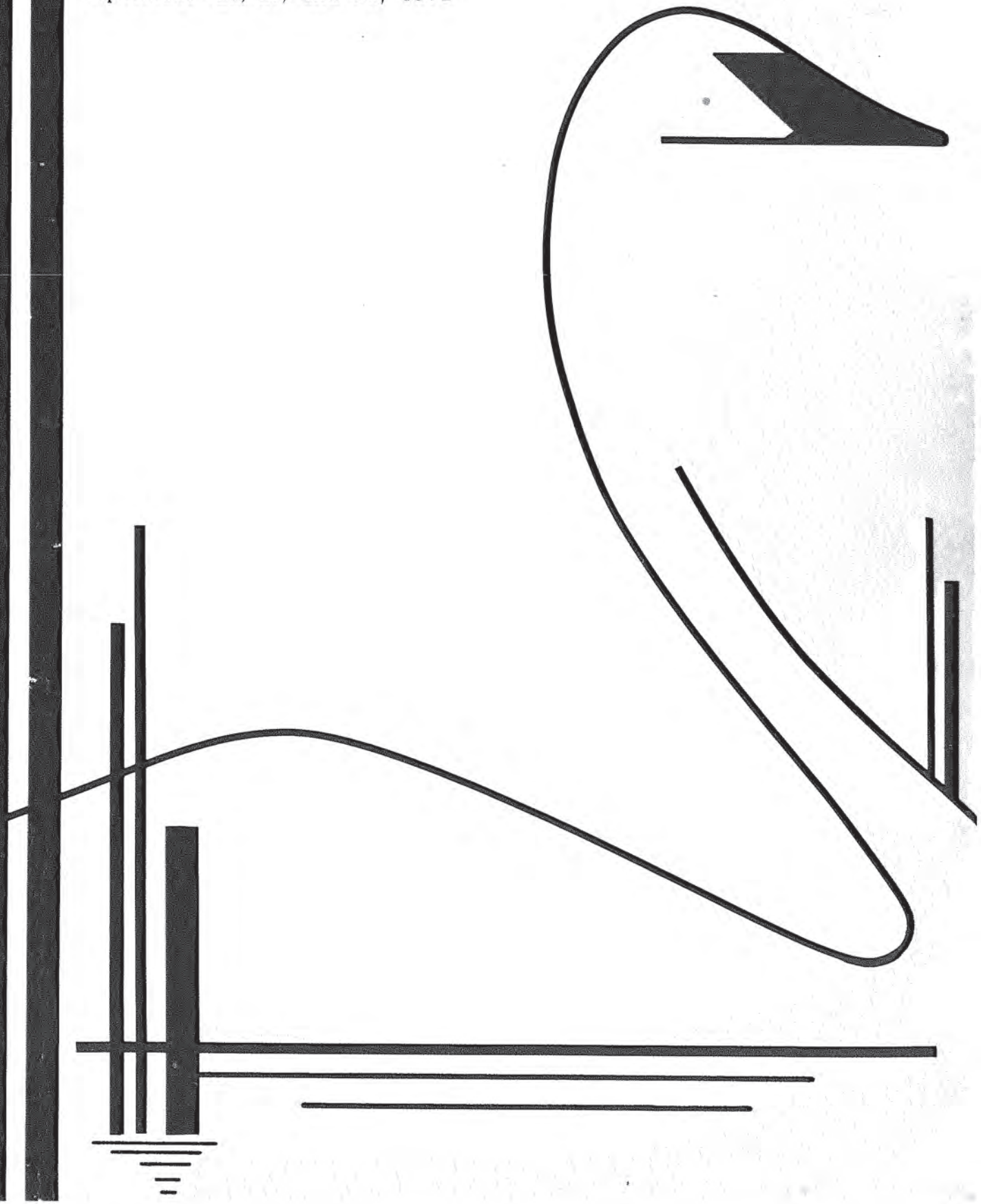
H. Burgess
Izaak Refuge

Proceedings and Papers

Second Trumpeter Swan Society Conference

held in Grande Prairie, Alberta
September 26, 27, and 28, 1972



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Ron Mackay, Conference Chairman, opened the Conference and introduced His Worship, Mayor E. Borstad who welcomed Society members and guests to Grande Prairie - the home of the Trumpeter Swan. The Mayor expressed the interest of Grande Prairie and district residents in the Trumpeter and noted that it had been chosen as the city symbol. He then presented Fred King, Society President, with a Trumpeter Swan miniature as a memento of the occasion.

Mr. King thanked Mr. Borstad on behalf of the Society and expressed his enthusiasm for holding the second conference in Canada, especially at Grande Prairie in the heart of the most important Canadian Trumpeter nesting area. He then outlined the swan introduction program in metropolitan Hennepin County, Minnesota, and compared it with the rural situation in the county of Grande Prairie.

Reports were then presented on the current status of Trumpeter Swans in North America. Summaries of those reports follow with complete reports reproduced in the appendix.

I. Current Status of Trumpeter Swans in North America

1. General

For the benefit of those attending a Society meeting for the first time, Ron Mackay briefly outlined the distribution of our two native North American swans. Whistling Swans breed along the Arctic coast and make a long migration in comparison to the Trumpeter, travelling to Chesapeake Bay on the east coast, the Gulf of Mexico, and California. Trumpeter Swans, on the other hand, breed somewhat farther south and winter as far north as they can find open water and suitable feeding areas. Their breeding range originally extended across the prairie portions of the Canadian provinces and the northern states with the type specimen described by Richardson in 1831 from the west side of Hudson Bay. Because of their accessibility, the Trumpeters were very nearly wiped out by the early trappers and fur traders, with many thousands of skins and quills being marketed in London for swans' down and pens.

Three major wild breeding populations remain today with some 3,000 birds nesting in Alaska and wintering along coastal Alaska and British Columbia, another 500 to 600 birds nesting on the Red Rock Lakes Refuge in Montana and about 100 Trumpeters breeding in the Grande Prairie, Alberta, area. The latter winter with the Red Rock Lakes birds in the vicinity of Red Rock Lakes and the headwaters of the Snake River in Idaho.

2. Grande Prairie

Harold Weaver reported on the Grande Prairie population of Trumpeters. Aerial surveys in the area were started in the mid-1950's and have been carried out annually during the third week of September since that time. The census area is

approximately 50 X 80 miles in size and located to the west-northwest of Grande Prairie. Nesting birds have been recorded on about 45 different lakes over the years. Most of the lakes are smaller than 500 acres and will support only one pair of nesting Trumpeters because of their aggressive territoriality.

The number of Trumpeter Swans counted over the past five years has averaged 96 birds of which there have been 17 pairs, 25 cygnets, and the remainder non-breeders. During those years, the total number of swans has fluctuated from 74 to 114, the number of pairs from 11 to 23, and the number of cygnets from 13 to 36. On September 25, 1972, 104 Trumpeters, made up of 23 pairs, 37 cygnets, and 21 non-breeding birds were counted on 55 lakes surveyed.

The Grande Prairie population has remained fairly constant over the years and appears to be limited by the number of suitable nesting lakes.

Tom Burgess presented data on Trumpeters, collected over the past three years in conjunction with a waterfowl depredation study in the Grande Prairie area. Weekly surveys of 29 wetland areas have shown consistent use of 15 lakes by the swans. Seven of the lakes were occupied by breeding pairs each year. The average dates for the start of egg-laying, incubation, and hatching were May 4, May 15, and June 15, respectively. The mean brood sizes on July 15, 1970, 1971, and 1972, were 3.1, 4.0, and 4.8, respectively, which were reduced to 1.6, 3.5, and 4.2 by September 8 of those years.

Questions concerning mortality factors and the rate of cygnet survival as well as habitat components required by breeding Trumpeters have yet to be answered. The re-introduction of breeding pairs to the Peace River area and other parts of the Province is a worthy objective.

3. Alaska

Ron Mackay expressed Jim King's regrets at not being able to attend and read his report. The last complete census of Alaskan Trumpeters was made in 1968 when 2,848 birds were tallied on the breeding grounds. Young birds made up 38.2% of the population at that time and production in 1969 and 1970 appeared to be about the same as in 1968. Nesting conditions in 1971 and 1972 were not good, however, and the present population is probably little changed from 1968.

A booklet entitled "The Trumpeter Swan in Alaska," authored by H. A. Hansen, R. E. K. Shepherd, J. G. King, and W. A. Troyer, was published as Wildlife Monograph 26 by the Wildlife Society in October 1971.

4. British Columbia

Bill Morris reported that captive Trumpeter Swans have been held at the Reifel Waterfowl Refuge, near Vancouver, Stanley Park in Vancouver, and on a small lake at Cherryville near Vernon. Young have been raised at Stanley Park and Cherryville on several occasions. Reports of wild breeding Trumpeters have been recorded from the northern interior region of the Province and from the

northern part of Vancouver Island but are not yet supported by scientific evidence.

A winter feeding program, started in 1935, at Lonesome Lake some 75 miles southeast of Bella Coola, B.C. resulted in a build-up in swan numbers from 35 to 515 during the winter of 1970-71. Because of the large increase in numbers of swans in limited natural habitat and the need for an ever-increasing artificial feeding program, efforts were made to discourage the swans from wintering at Lonesome Lake during the autumn of 1971. The feeding program which had been started towards the end of November in past years was delayed about a month in an effort to get the birds to move farther south. Several scare techniques, of which colored flares was the most effective, were also used to try and force the birds to move on. The delayed feeding seemed to be the best technique and was credited with reducing the 1971-72 population to a maximum of about 400 birds. The dispersal program will be continued during the autumn of 1972.

A series of colored slides of the Trumpeter Swans at Lonesome Lake and of the Turner family, who care for the birds, was shown.

5. Red Rock Lakes National Wildlife Refuge

Roger Page outlined his biological study for predicting the effects of management techniques on nesting habitat of Trumpeter Swans at the Red Rock Lakes Refuge. The study deals with territorial requirements, food availability, food habits of cygnets, population size and changes, hatching rates, and cygnet survival.

The refuge is 39,000 acres in size of which 13,000 acres is suitable breeding habitat. Warm-water springs on the Refuge and in nearby rivers provide wintering habitat.

Wintering Trumpeters numbered only 159 birds at Red Rock Lakes in 1971, the lowest population since 1950. The tri-state area (Montana, Wyoming, and Idaho) winter survey recorded 500 birds, the lowest count since 1957. It has been estimated that if 30 to 40 cygnets reached flight stage each year, the present tri-state population would be maintained.

An inventory of the tri-state area disclosed that Trumpeter Swan habitat is gradually diminishing because of increased fishing and picnicking activity through the building of new roads.

6. Cypress Hills

Dan Nieman reported that Trumpeter Swans were first observed in the Cypress Hills, Saskatchewan, in 1914 with the first verified breeding record in 1953. An intensive ground and aerial survey in 1971 disclosed a total of 16 birds including three pairs with broods. One adult female and her four cygnets were banded in the summer of 1972. The following management plan was proposed in 1971 and initiated in 1972:

a) Complete protection of breeding areas.
b) Annual aerial surveys in May, July and September.
c) Investigation of breeding biology and habitat requirements.
d) Banding and colour-marking.
e) Protection for non-breeders.
f) Public relations and information.

The Cypress Hills Trumpeter Swans, as they do in other areas, require large breeding territories with most lakes supporting only one pair. Habitat in the Cypress Hills region is rather scarce and will probably limit total swan populations to 10 or 12 breeding pairs.

7. Lacreek National Wildlife Refuge

Harold Burgess reviewed the Lacreek program and reported on the present status of Trumpeters there. Sixty-six cygnets were moved from Red Rock Lakes National Wildlife Refuge to Lacreek National Wildlife Refuge near Martin, South Dakota, in the initial transplant program from 1960 to 1962. The first cygnets were produced on the Refuge in 1963 when two young were raised to flight stage. Some breeding occurred off the Refuge for the first time in 1964. At least 56 cygnets were produced off the Refuge between 1965 and 1971. Stock dams and lakes in the sand hills provide the off-refuge nesting habitat and produced 17 cygnets in 1971 as compared to 11 raised on the Refuge.

The total Trumpeter population in the vicinity of Lacreek was 98 birds at mid-September, 1972. There are presently five breeding pairs on the Refuge with habitat for about five more pairs. About 50 lakes and 20 stock dams within 70 miles of the Lacreek Refuge appear to offer suitable habitat for expansion of the flock.

The most important limiting factor to the total population is off-refuge mortality, primarily illegal shooting. To date, production on the Refuge has been high enough to maintain and gradually increase total numbers of birds. Upper limits of the population will eventually be determined by the size of the winter feeding program, presently able to maintain 500 Trumpeters.

Coloured slides of the birds and habitat in the Lacreek region were shown.

8. Hennepin County Park Reserve District

Dave Weaver reported on the Trumpeter Swan program in the Hennepin County Park Reserve District, which consists of 18,000 acres in six reserves in metropolitan Minneapolis-St. Paul, Minnesota.

The re-introduction program was started in 1966 with one pair of Trumpeters from Red Rock Lakes Refuge. Since then 40 more birds from Red Rock Lakes and one pair from Delta, Manitoba, have been acquired for the project. It has been a most frustrating exercise with many birds being lost.

Breeding has occurred with 12 eggs hatching from 1969 through 1971, but all the young died at an early age. Parental inattentiveness appears to account for the losses, but the reasons for that remain unexplained. Five eggs hatched in the spring of 1972 with four cygnets still alive in mid-September. The total population within the Park Reserve District in mid-September, 1972, was 18 birds.

9. Great Bend

Jerry Tillery expressed his regrets for not being able to attend the Grande Prairie meeting but forwarded a report on his Trumpeter Swans at the Brit Spaugh Park and Zoo, Great Bend, Kansas. A copy of that report is included in the appendix.

10. Calgary Zoo

Peter Karsten reported that a male Trumpeter received at the Calgary Zoo in 1962 had mated with a female Whooping Swan in 1966 and produced four "whumpeter" offspring. That association was broken up and the male mated with a female of his own kind in 1968 and raised three cygnets from a clutch of five eggs. The original and a second male have since died but the female appears to be mated with another male received from Delta in 1971 and, hopefully, production can be expected in 1973.

11. Longview

Archie Hogg reported seeing Trumpeters near Stavely in 1958. A pair was seen on a small lake west of Longview, Alberta in 1962 and has returned each year since then. Those birds raised two cygnets to flight stage in 1968 and took three cygnets south with them in 1969. There was only one swan on the lake in 1971, but a pair appeared again in 1972 and raised three cygnets. Unfortunately, Archie has reported since our meeting that the two adult swans were shot on or about October 1, 1972. No trace of the cygnets was found and it is presumed that they were able to migrate south.

12. Nebraska

Bill Mahon reported that seven Trumpeters from Red Rock Lakes Refuge had been released on his ranch near Haigler, Nebraska. There has been no record of nesting to date but three birds remain on the ranch.

Charles Wright expressed concern over the continuing problem of Trumpeters being shot illegally by hunters.

II. Future Transplant Program and Policies for Distribution.

1. Region 3, U.S. Bureau of Sport Fisheries and Wildlife

Harold Burgess reviewed the proposal by the Bureau to establish a captive breeding flock of Trumpeter Swans at the Northern Prairie Wildlife Research Center near Jamestown, North Dakota. The proposal, copy appended, lists five objectives for future Trumpeter swan management and 14 procedures for attaining those objectives.

2. Lacreek

Suitable habitat with spring-fed ponds in the sand hills to the south of Lacreek National Wildlife Refuge lends itself to future expansion of Trumpeter Swan breeding range in that region according to Harold Burgess. Cooperation between the Federal and

Nebraska State government and private landowners will be necessary to achieve success. It may be necessary to provide feeding stations during critical winter periods if the birds do not develop a migratory pattern. There is also a possibility for the expansion of breeding range into Kansas.

3. Canada

Ron Mackay outlined some of the problems facing a Canadian re-stocking program. In view of some reluctance to mix Trumpeters from west of the Continental Divide with those to the east, because of the possibility of there being two distinct subspecies, the number of birds available for transplant on the plains is limited to the progeny of two captive pairs. There are very few natural areas suitable for wintering birds and any successful introduction would require that the birds migrate south for the winter.

There are several Canada Goose transplant programs being carried out on the Canadian prairies now. Federal, provincial, and private landowner agreement will have to be obtained to decide whether Trumpeters or Canada Geese are the most desirable species, as the swans will not tolerate geese on their territories. The provincial Waterfowl Technical Committees are well-suited to drafting plans and arranging transplant programs.

Although the Grande Prairie population of Trumpeters is not very large, it should be possible to take a few eggs on an experimental basis for an artificial propagating program.

4. Distribution Policy

(a) United States

According to word received from Henry Hansen, Bureau of Sport Fisheries and Wildlife, the Bureau removed the restriction of government ownership of Trumpeters in the United States when that species was removed from the endangered species list in December 1968. It is now treated in the same manner as other waterfowl for purposes of acquisition, propagation, and disposal. That is, the birds are owned by individual propagators or zoos and may be traded or sold provided that the necessary permits have been obtained. The Bureau does not normally supply birds to individuals or zoos, not only because of the cost but because an adequate supply is now available from privately-owned flocks in the United States. The Bureau does supply birds from refuge stock for transplant programs, both for its own use and for bona fide programs by public organizations.

(b) Canada

Ron Mackay reported that the Government of Canada has maintained ownership of all captive birds in Canada, has more or less supervised transfers of Trumpeters, and has contributed to the up-keep of some birds in captivity. We have not had enough birds to meet the requests from either public institutions or individuals to the consternation of many of those people.

Some years ago, several Trumpeters were presented to the Queen and have since been very productive at the Severn Wildfowl

Trust. Some of their progeny have been supplied to private propagators in England who are now selling birds to North American buyers. That situation requires some change in Canadian policy and close cooperation with United States officials.

III. Bands and Banding Techniques

Roger Page outlined some of the banding experience at Red Rock Lakes. Aluminum lock-on #9 leg bands have been used over the years, but have been found to wear through and fall off in six or seven years. Stainless steel lock-on bands have been found superior but have to be custom made.

Plastic collars have been abandoned at Red Rock Lakes Refuge because the swans have no difficulty in removing them with their sharp toenails. Food coloring has been used for short-term identification of individual birds, but the dye washes off easily as the birds feed or preen.

Several slides of banding operations and techniques were shown.

Dr. William J.L. Sladen, Johns Hopkins University, has reported on a colour-marking plan for all northern species of swans proposed by the Swan Research Group of the International Waterfowl Research Bureau. They propose a tarsal band and neck collar scheme with colours assigned to all species of swans by area. Individual birds can be identified by numbers on the collars. Thus both Trumpeters and Whistlers marked in Alaska would carry blue markings; the Northwest Territories, red; British Columbia and states west of the Continental Divide, green; interior plains, yellow; and east coast and Gulf of Mexico, black.

As reported by Jim King in his appended progress note on Alaska Trumpeters, 50 birds were marked in Alaska this past season with blue markings. Hopefully, some of those birds will be seen along the British Columbia coast this winter.

IV. Care, Feeding, and Shipment of Captive Birds

Although some airlines have specially designed shipping crates for swans, lay-over problems complicate transfers, and have resulted in the loss of a number of birds. Eugene Stroops, Red Rock Lakes Refuge Manager, stated that recipients of wild Trumpeters from the Refuge must now pick up their birds there and personally supervise their transportation.

He then showed the movie "Time and the Trumpeter Swan," which was filmed at Red Rock Lakes depicting the various management techniques and studies that have brought the Trumpeter back from near extinction in the United States in the early 1930's.

V. Recommendations approved by delegates

1. His Worship, Mayor E. Borstad was made the first honorary member of the Trumpeter Swan Society.

2. In view of reservations expressed regarding the mixing of Trumpeters from west of the Continental Divide with those to the east, it was recommended that a serological study be carried out before any transplant program using birds from both

populations is initiated. Roger Page offered to carry out preliminary investigations to determine the feasibility of such a study.

3. The Bureau of Sport Fisheries and Wildlife proposed Trumpeter Swan study at Jamestown received approval from the group with the recommendation that the Bureau be requested to revise their plan to include consideration of the Trumpeter Swan in Canada and possible cooperation with Canadian authorities.

4. Because of the need for common policies in the control and distribution of Trumpeter Swans in the United States and Canada, it was unanimously approved that the President of the Society appoint a committee with American and Canadian representation to:
   (a) Formulate a common distribution policy for presentation to and discussion with both Federal wildlife agencies.
   (b) Determine the numbers and location of Trumpeter Swans that are available for restocking and other distribution.
   (c) Evaluate and set priorities on all applications for birds for captive flocks.
   (d) Coordinate the transfer of birds for restocking programs when necessary.

VI. Field Trip and Social Activities, September 27

In spite of inclement weather (nearly a foot of snow on Saskatoon Mountain) several of the Trumpeter Swan nesting lakes were visited by chartered bus. The first stop was on Richmond Hill just west of Grande Prairie where it was possible to get a panoramic view of Bear, Hermit, and Hughes Lakes. Two cygnets without parents were observed at close range on Wembley Slough on the outskirts of the village of Wembley. A drive up Saskatoon Mountain, which usually provides a spectacular view of the surrounding countryside, was most disappointing as visibility was limited by a light snowfall and low clouds.

The trip was made a little more pleasant at Saskatoon Island Provincial Park where the local staff had built a roaring fire and supplied coffee to go with our frozen sandwiches. The return trip was made via Bear and Ferguson Lakes, traditional swan lakes, and the site of a lure crop program operated by the Alberta Fish and Wildlife Division to ameliorate waterfowl depredation on grain crops. Tom Burgess outlined the problem and explained the program initiated to solve it.

The Canadian Wildlife Service sponsored a social hour Wednesday evening prior to an Alberta beef steak dinner through the courtesy of the Alberta Fish and Wildlife Division. Following a short address by His Worship, Mayor Borstad, Fred King made him the first honorary member of the Trumpeter Swan Society. Chairman Mackay expressed thanks on behalf of the Society for the excellent banquet to the Provincial Government through Tom Burgess.

VII. Business Meeting

President King expressed some disappointment that our Society was not invited to participate in the meeting of the Swan Research Group of the International Waterfowl Research Bureau in England last December and hoped that we would have representation at future meetings.

He then presented a report by the Treasurer:

Receipts		
Dues since 1968	$340.00	
Profit 1969 meeting	2.50	
Interest	15.87	
	$358.37	
Expenses		
Stationery, Stamps		
Printing newsletter	$324.66	
Balance on hand	$ 33.71	

Mr. King explained that the Society did not have annual dues but operated on the understanding that a call for dues would go out whenever our coffers needed replenishing. That time has now arrived and a motion that a call for dues of $5 be made by our Secretary-Treasurer was approved.

He then commended the Chairman on the organization and smooth operation of our second conference and presented the nominations for the new executive of the Society.

For President	-	Mr. R.H. Mackay
For Vice-President	-	Dr. H.A. Hochbaum
For Secretary-Treasurer	-	Dr. David K. Weaver
For Executive Directors	-	Mr. Peter Ward, Mr. Ray St. Ores and Mr. Fred King

The slate of officers was elected by acclamation and the meeting turned over to President-Elect Mackay who thanked the members for the privilege of serving the Society. He then called for discussion on the date and location of the next meeting. It was agreed that the business pending and past accomplishments warranted another meeting next year and it was decided to accept Harold Burgess' offer to hold the next meeting at Martin, South Dakota, near the Lacreek National Wildlife Refuge, during the third week of September 1973.

Mr. Mackay then presented a report on the financial status of the Conference:

Receipts		
19 Registrants at $5.00		$95.00
Expenses		
Hospitality room	$28.10	
Coffee breaks	36.90	
Sandwiches for field trip	30.00	
	$95.00	$95.00
Balance		ø

He then thanked all the delegates for their attendance and participation in the discussions. He also expressed the gratitude of the delegates to Beth Sheehan and Rosemarie Corry for their most hospitable efforts throughout the Conference. The meeting adjourned at 3.30 p.m.

Trumpeter Swan population near Grande Prairie, from Canadian Wildlife Service aerial surveys, 1957 - 1972.

	Average 1957 - 66	1967	1968	1969	1970	1971	1972
No. lakes surveyed	37	42	47	43	56	56	55
No. non-breeders	42	5	52	47	48	35	21
No. of pairs	15	23	11 *	13	14	22 *	23
No. of cygnets	27	23	31	13	24	36	37
Total no. swans	99	74	104	86	100	114	104

* Only one adult of unknown sex observed with brood.

Submitted by
H.R. Weaver
Canadian Wildlife Service
Edmonton, Alberta
September, 1972

"Investigations Into The Breeding Ecology of The Grande Prairie Trumpeter Swan Population"

or

"Grande Prairie Trumpeters - Once Over Lightly"

INTRODUCTION

- study, a fortunate by-product of the Crop Depredation Control aerial censusing 1970-1971-1972.
- with aerial census data available, it seemed logical to exert added effort to obtain a recent picture of the spring and early summer breeding situation.

ACKNOWLEDGEMENTS

- Daryl Cole for most of aerial census.
- Jim Rosin for this year's field observations.

STUDY AREA

- about 25 townships within a 30 mile arc east, north and west of the city (i.e. C.D.C. area).
- Trumpeters are present on lakes to the west as far as the B.C. border.

METHODS

- spring and early breeding status was determined by weekly checks May 1st to July 10th of all lakes, using a canoe for visiting nests.
- breeding chronology was determined by back-dating using criteria from the literature.
- aerial censusing was conducted weekly from July 15 to October 31, using a Cessna 172.
- 28 wetlands were counted.
- 100 feet, 70 - 80 m.p.h.

RESULTS A. Breeding Status - ground observation

- in study area there were 29 wetland areas of varying size: 12 square miles - 10 - 20 acres; varying cover: secluded to open.
- 15 wetlands consistently had swans.
- seven had breeding pairs as evidenced by broods
  N.B. Unsuccessful nesters, if present, would have been recorded as non-breeders.
- only one brood was missed on the ground and found by aerial census.
- regular checks on six breeding pairs suggest the following:
  - pairs present in late April.
  - mean date first egg laid - May 4 (Apr. 28 - May 19).
  - average clutch size - 5.8 (4-7).
  - mean date incubation started - May 15 (May 6 - 28).
  - mean hatching date June 15 (June 6 - June 28).
  - average brood size 5.0 (3 - 7).
  - percent hatching 81% (N=35 eggs, 30 cygnets).

B. Aerial Census - extent and consistency of error?

- July 15 - September 8 (after which presumed Trumpeters from west (?) and Whistling Swans compound things).
- of 28 wetlands utilized - 3 years observation.

Breeding (1 or more)		"Loafing" (1 or more)			
Hermit	- 3	Bear	- 3	Small Buffalo	- 3
Buffalo	- 3	Sexsmith	- 2	Flyingshot	- 3
Clairmont	- 2	Gummer	- 2	Dimsdale	- 3
Chrystal	- 2	Kleskun	- 1	Saskatoon	- 3
Wood	- 2	Chrystal	- 1	Lowe	- 3
Hughes	- 2	Correction Line	- 1	Anderson	- 3
Little	- 2	Hughes	- 1	La Glace	- 3
Intermittent	- 2	Little	- 1	Wolfe	- 3
Correction Line	- 1	Mulligan	- 1	Jones	- 3
	9		18		

- "loafing" wetlands might have had unsuccessful nests, or early cygnet mortality.
- of the 18 "loafing" or non-breeding areas,
  - 4 did produce broods in one or two years.
  - 5 are too small, too large or have fluctuating water.
  - 9 appear to offer potential for breeding and these were "loafing" areas all 3 years.
- 9 "potential" wetlands vary from
  - large - small
  - brushland edge - open edge with agriculture
- 3 year populations

	1970	1971	1972	
Adults	33	25	19	Down 40%
Breeders	12 (35%)	14 (56%)	12 (60%)	Same
Non-breeders	21	11	7	Down 65%

N.B. Total population down by 40%
Breeding population - same
Non-breeding population down by 65%

N.B. Inclusion of west area might pick up some of the "wandering" non-breeders

- 3 - year brood data

	1970	1971	1972	Total
Broods	6	7	6	19
$\bar{X}$ (July 15)	3.1	4.0	4.8	4.0
$\bar{X}$ (Sept. 8)	1.6	3.5	4.1	3.1
Survival (July 15 - Sept.8)	50%	88%	85%	77%

- 1970 smallest broods, worst survival
- 1972 largest broods, good survival

DISCUSSION and/or QUESTIONS

1. Cygnet survival fluctuates: why? can we influence it?
2. Are there lakes where nesting fails? By what cause? Can we change this?
3. Given "good" lakes, but no nesting:
   Can we introduce swan around G.P.?
   around Peace country?
   around Alberta?

RECOMMENDATIONS/CONSIDERATIONS FOR FUTURE ACTION:

1. Aerial census May 15, June 15 to find any nests missed by ground counts.
2. Expansion of study westward to include larger numbers.
3. Intensive breeding study as necessary.
4. Investigate Transplant Opportunities.

Submitted by:
T.E. Burgess
Regional Wildlife Biologist
Red Deer, Alberta
September, 1972

Alaska Trumpeter Swans

A Progress Report for The Second Trumpeter Swan Society Conference

Since 1968, when 2,848 Trumpeter Swans were counted on the Alaskan breeding grounds, there has been no complete census. In the fall of 1968, young of the year comprised 32.8% of the population. It was my impression that production in 1969 and 1970 may have been as good and we began to wonder about the possibility of a Trumpeter population explosion. In 1971 and again in 1972, we had extremely late spring breakup and swan production dropped way down particularly along the Gulf coast where the population is most dense. It now appears likely that Trumpeters in the north must make the most of good years because they may not replace normal mortality in poor years.

In spite of the two poor seasons, we are finding a few swans in spots not occupied in 1968 and a few areas not searched then. We may have some increase in total numbers. We hope to do another complete count in 1973 and should be able to determine the population trend for the past five years at that time.

In 1971, we finally published a complete report on Alaska Trumpeter Swan studies: The Trumpeter Swan in Alaska by H. A. Hansen, P.E.K. Shepherd, J. G. King, and W. A. Troyer; Wildlife Monograph No. 26.

As a result of the Monograph, we are getting more requests from propagators to export live birds from Alaska. In most cases permits have been denied because we are not yet sure that all Trumpeters are of the same race. If there are two races it would be a shame to mix them in an effort to re-establish Trumpeters in their unoccupied former range. Indications that there may be two races come from the larger egg sizes and somewhat different nesting and migration habits of the Alaskan birds. Is there a possibility that some Trumpeters survived the last ice age in the unglaciated "refugia" of the Yukon Valley and that this population is still pioneering south toward a southern population that is still pioneering north? Of course some natural mixing could have already taken place. At any rate until some taxonomist resolves this question it seems prudent not to flood the Mid-west with Alaskan stock. It might be well for the Trumpeter Swan Society to take some position on this matter.

Last year in a letter from J. B. Fitzgerald, Director, Game Branch of the Government of the Yukon Territory, I was advised of the possibility of some Trumpeters nesting in the southern part of the Yukon. A pair with one cygnet was reported from Rose Lake, lat. 60°20'N, long. 135°50'W and three adults with three cygnets on Toobally Lakes, lat. 60°10'N, long. 126°20'W. In Alaska, the population is continuous from the Gulf coast through several mountain passes to intermountain basins. It certainly seems reasonable that the same situation could occur across the boundary into southern Yukon Territory and northern British Columbia. This possibility needs further exploration. Our experience in Alaska shows that several hundred swans can sometimes be found in remote areas where casual reports indicate only a few pairs.

I hope that Professor W. J. L. Sladen has provided you with a report on his world-wide swan marking scheme. In case not, here is a brief summary.

For the past three or four years Dr. Sladen and his cooperators have been marking Whistling Swans with four-inch plastic neck collars. These collars have a vertical number that can easily be read with a telescope in the field. The color of the collar tells where it was applied. Black is used on the Atlantic and Gulf states except Texas, yellow is used in the Midwest and Prairie states and Provinces, green for the Rocky Mountain area through British Columbia, red in the Yukon and Northwest Territories and blue in Alaska. The re-sightings of these birds so far indicate no interference with breeding or increase of mortality due to the collars. Extremely valuable data is accumulating on migration and family relationships. This year it was decided to try some collars on Alaskan Trumpeters. In cooperation with Bob Richey of the Kenai National Moose Range, 21 Trumpeters were collared there. With the help of Julius Reynolds of the Alaska Department of Fish and Game, 29 more were marked near the Copper River on the Gulf Coast for a total of 50 Trumpeters. The color scheme is the same for all species, thus the Alaskan Trumpeters are wearing blue and cannot be distinguished by color from several hundred marked Whistlers. Trumpeters can be distinguished from Whistlers by the number. Whistlers have one letter followed by three numbers and the Trumpeters have two numbers followed by two letters. All swan watchers should be advised to keep their telescopes handy and search for collars. For those of you that fly, if you look sharp you can see colors from the air although numbers of course can only be read from the ground. We are hoping for a flood of reports from British Columbia as well as points farther south. Neck collar sightings of either Trumpeters or Whistlers should be reported to:

Dr. W. J. L. Sladen
Johns Hopkins University
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Last year, I acquired a few young Trumpeters and Whistlers. We watched their growth rate and plumage development through the winter, hoping to find something diagnostic that would help us identify species of juveniles through their first year. The answer seems to be that although there are individual differences in the rate that the grey juvenile plumage disappears, there is no clear-cut difference between the two species. I am getting a fairly good set of comparative weight data.

That just about summarizes the Trumpeter situation in Alaska. Our swan population seems to be in good shape with no foreseeable threats to the habitat. We continue to keep track of them especially on the Kenai where annual surveys are made but have no intensive program at the moment. We are excited about the possibilities from the neck collar scheme.

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September, 1972

Red Rock Lakes National Wildlife Refuge, Trumpeter Swan Study

The study was made possible by a grant from the Bureau of Sport Fisheries and Wildlife Wilderness Survey. Its main purpose is to be able to predict the effects of manipulative management, or the lack of it. This information will hopefully aid in deciding whether or not the lakes and marsh on the Refuge should be proposed for a wilderness area.

This study was initiated with the following objectives:

(1) to determine the territorial requirements for breeding pairs of swans;
(2) to determine food habits of cygnets;
(3) to study the seasonal distribution and numbers of aquatic invertebrates in connection with these food habits;
(4) to examine the population and production trends of swans on the Refuge;
(5) to compare the Red Rock Lakes population with the total Trumpeter Swan population as indicated in the Annual Swan Census;
(6) to compare hatching and survival rates from active nests by territory and area of the Refuge; and
(7) to prepare a life table model of the Red Rock Lakes population in which various parameters, such as hatching rates, age at first reproduction, reproductive longevity, etc., could be analyzed severally and individually for their effect on the net reproductive rate.

These objectives, when completed, should give insight into:

(1) what physical factors are required for a breeding territory;
(2) what makes one territory more successful than others;
(3) how population trends affect production; and
(4) what factors affect the net reproductive rate, and to what extent.

Armed with positive information in these areas, the effects of physical manipulation of the habitat can be predicted with a fair probability of being correct.

I would like to state again that the following results are from a partially completed study and that trends and conclusions I have drawn might well be changed by the time I am done.

Located in the Centennial Valley of Beaverhead County, Montana, Red Rock Lakes National Wildlife Refuge lies at the foot of the Continental Divide, 6,700 feet above sea level. Of its 39,000 acres, 13,000 acres of shallow lakes and marsh are excellent breeding habitat for the Trumpeter Swan. Two warm springs which flow into Culver and McDonald Ponds remain open even in extended temperatures below -30°F and allow the birds to remain on the Refuge the entire year.

Swan Lake (400 acres), Upper (2880 acres) and Lower (1540 acres) Red Rock Lakes, and the River Marsh (8000 acres) comprise the greatest part of the habitat used by nesting swans.

During the spring and summers of the last two years, three general activities were pursued: ground and aerial observations, and work conducted in the nesting areas with the airboat.

Ground observations were made from various points to map territories and general usage patterns of swans. Territories were mapped before and after the hatch to determine any change. The best observations were made from a ledge located south of the campground on Upper Lake and from a ridge just east of Little Sheep Mountain. Both points are approximately 1400 feet above the level of the lakes, and give an excellent view.

Aerial observations were made possible through the cooperation of the Bureau of Sport Fisheries and Wildlife and the Refuge personnel. These flights proved highly valuable in making pair counts, nest locations, cygnet counts, and for following general nesting activity through the spring and summer.

Large amounts of data were collected through the use of the airboat. It was used to capture and band swans, gather nest site data, and collect invertebrate samples.

Nests were visited just prior to, and shortly after the hatch. During the first visit, nests were examined for physical features and clutch size. The second visit determined the number of eggs hatched and the reasons for those unhatched.

Since such a great deal of time was spent in observation and the lakes and marsh are entirely visible from the vantage points, all nests were considered to have been found.

All the territories I have observed have centered around a muskrat house which was used as the nest site. This year showed an increase of five, to 42 the number of nesting territories on the Refuge. A breakdown shows that 34 pairs returned this year that were in the same area last year. This was one of the short term benefits of our banding, and without exception , birds returned to the same territory. Three pairs from last year did not nest again, and there were three new pairs nesting this year. The increase of five nests was from five pairs nesting this year that had just claimed territories last year.

I have been using the term territory referring to the area claimed by a nesting pair and used in everyday activity. More accurately this should be called the home range since in some cases I observed birds defending greater areas than are used in everyday activity. These territorial defenses are so uncommon that the actual area defended could not be measured accurately. The territories ranged from 5 to 104 acres with an average of 32.

About the first of July, pairs that had not hatched or had lost their broods, abandoned their territories. I assumed that these birds joined the flock of moulting birds on Upper Lake.

Many pairs with broods showed a breakdown of the pre-hatch territory by enlarging or changing their areas of usage. Most of these pairs with broods were hard to observe since they hid their cygnets in emergent vegetation most of the time. The broods that were the easiest to observe were those on Upper and Swan lakes.

In most cases, the post-hatching territories were larger than pre-hatching territories. This is possibly due to the fact that the pair

is not tied to or obligated to defend the nest site. Territory delineation is less obvious than before the hatch since unsuccessful pairs have moved away and those pairs remaining are less aggressive. Other than a loss of aggressiveness, and that the territories are less well defined, there seems to be no general rule of post-hatching territorial behavior.

The nearest-neighbor analysis gives insight into the dispersion of the swans on the Refuge. Taking into consideration the size of the area, the observed nearest-neighbor distances are compared to those expected from the same number of animals placed at random. In aggregated populations, the observed mean distance will be less than in a randomly placed population and the nearest-neighbor index will be less than one. Populations with uniform distributions will have the index greater than unity, ranging to a maximum of 2.15.

Before nearest-neighbor analysis could be made, the areas of usage by nesting swans had to be determined. I used the average radius of territories in 1971 as the average radius around all nest sites recorded since 1954. A composite map showed three major nesting areas clearly: Northern Lower Lake, the River Marsh, and Swan Lake, plus many smaller nesting areas.

The three major nesting areas have held 66-82 per cent of the nests since 1959, when records of the River Marsh were initiated. During this time, population fluctuations in the three areas are shown roughly to be in synchrony, when Lower and Swan Lakes are combined and compared to the River Marsh.

The comparison of both the percentage of the population and the nearest-neighbor analysis figures gives a seemingly high degree of inverse correlation when the River Marsh data are compared to the composite data of Swan and Lower Lakes.

It is also seen that for all years except 1960-61, when the percentage of the population in the River Marsh declined, the per cent in the two lakes increased, and vice versa. A possible explanation is that since the three areas hold such a high percentage of the total population, they could act as a compliment to each other. Another could be that the population is actually choosing between the two areas.

A more unique type of relationship is seen among nearest-neighbor figures. Since 1959, with three exceptions, the dispersion trends in Lower and Swan Lakes have been the same. When the two lakes became more regular, the Marsh became less regular, and vice versa. In the three years that the dispersion trends in the two lakes diverged, the River Marsh has maintained an almost equal dispersion to the previous year. As yet, I have not figured this out.

The number of nests, the percentage of the population, and the nearest-neighbor analysis figures do not always correspond. It would seem that as the population increased in an homogeneous area with a finite number of territories, the nearest-neighbor figures would become more regular in the primary habitat with animals being forced out into the secondary habit. This has not been true in all cases and could be due to a change in the habitat conditions or 'rat house locations.

Shoreline development seems to be a morphological feature related to the size and number of territories in a given area. Hansen, Shepherd, King, and Troyer suggested in their monograph that shoreline development is

the ratio of the length of shoreline to the length of the circumference of a circle of the same area as the lake. The index is based on a perfect value of 1 for a round lake. Shoreline development on the Refuge ranges from a low 1.6 for Upper Lake to an extremely high 34.5 for the River Marsh. Lower Lake has an index of 6.7 and Swan Lake 9.1. The River Marsh, Swan Lake, and Lower Lake had average nesting territory areas of 23, 30, and 47 acres, respectively, correlating with the shoreline development figures. Territories located on open shorelines throughout the Refuge had a much larger average area (45 acres) than those located on secluded areas or private ponds (17 acres).

While the mean nearest-neighbor figures are almost equal for Swan Lake, the River Marsh, and Lower Lake (1.41, 1.41, and 1.44, respectively), the areas with less shoreline development have a higher range of fluctuation. Those areas with a higher shoreline development have also shown a higher rate of nests per unit area.

So far, I have not found any features of territories that might make the pair nesting there more successful than another pair. One pair's repeated success or failure seems to be related to the age of the bird or individual conscientiousness in incubating and caring for young.

The past two winters have differed remarkably in length and amount of precipitation. The winter of 1970-71 was nearly normal with enough snow and ice to keep the roads closed until mid-April. Hatching was first seen on June 20, which is about average. Last winter started with a large amount of snow, but little fell after December and the road opened early in March. Nesting was proportionately early with the first nest hatching on June 5, the earliest known hatching date for the Refuge.

This early mild weather might also explain the increases in clutch size and production seen over last year.

In 1971, 35 of 37 nests were visited. They contained 152 eggs, (an average of 4.3) in clutches ranging from 2 to 6.

This summer clutches ranged from 3 to 7 and 178 eggs were counted in 33 nests, an average of 5.4. Average clutch sizes this large have not been seen at Red Rock Lakes in 20 years, and there were just three years in the late 40's and early 50's that the average clutch size exceeded this number. Banko reported in 1960 that the average clutch size was 5.1 out of 74 nests. Since his book was published, 292 nests have been examined with an average of 4.5 eggs per clutch. Whether the clutch sizes have actually diminished or this difference is due to a small yearly sample of nests before 1955, is unknown.

I classified nests as successful if one or more eggs hatched. In 1971, 26 of 34 nests hatched and 21 of 33 hatched in 1972, 76 and 64 per cent success, respectively. Abandonment is the overt reason most nests don't hatch with a few nests containing infertile eggs or weak embryos. The reasons for abandonment are unknown since disturbance with the airboat was kept at a minimum and other outside disturbance is unusual. Several of these failures are from new nests possibly by young, inexperienced birds.

Eggs from unhatched nests are presently being tested for DDT content.

Both years, early summer storms corresponded with the death of many cygnets. In 1971, only 13 of 78 cygnets remained at summer's end, a loss

of 83 per cent. This year 20 cygnets of 83 remained, a 76 per cent loss. Originally I thought that this high cygnet mortality might correspond to the availability of an adequate food source in combination with the cold weather. Previous reports showed that cygnets use a majority of animal matter for the first few weeks, gradually changing to plants. I had planned to study the population of the main aquatic invertebrates found on the Refuge to obtain an idea of when each species was most prevalent. I also obtained permission to collect six cygnets at various intervals to determine which foods were being used. Collection of cygnets was found to be unnecessary when several broods were observed feeding right next to the air boat. After the boat had scared the parents away and the engine had been turned off, the large floating object seemed to attract the cygnets, and they would paddle around the boat and feed for as long a period as we wished to observe them. Even calls from their parents did not coax them away.

The first observation was made of a brood of six, one- to three-day-old cygnets. Food taken consisted of all types of matter floating on the surface which included bits of vegetation, seeds, and many dead flying insects of different species. Dark colors attracted more attention than light, and the cygnets would peck at any dark spot like small leeches on themselves and each other and dark spots on the side of the boat. One fairy shrimp was eaten when it swam to the surface and stopped in front of a cygnet, although these young cygnets made no attempt to take invertebrates or any other food under water.

When five two-week-old cygnets were observed, their necks had already started to elongate and their attention was divided between taking floating material which was both plant and animal, and taking small bits of vegetation from underwater.

From these observations and the amount of food that was available, I concluded that cygnet mortality related to food must be minimal. It is possible, though, that cygnet mortality as well as the drop in nesting pairs seen in the last few years might be affected by another factor, namely the winter feeding program.

Several years ago, an attempt was made to force the birds to other wintering areas by withholding winter feed. The birds would not move and more than several starved to death before feeding started after it was apparent that the attempt to move the birds had failed. Since then, feeding has been once a week instead of the previous twice a week.

When I have discussed this fact with others, all agree that the birds might be going into the breeding season in poor condition, manifesting in a wide range of effects ranging from weak embryos and infertile eggs to no nesting attempt at all.

This coming winter, feeding will be done twice a week, with enough grain being given to assure all the food the birds want between feedings. It will be interesting to see any changes in next summer's nesting.

Other future work includes the preparation of a life table and demographic model of the population from all Trumpeter banding data recently received from Patuxent.

The 159 swans counted on Red Rock Lakes Refuge during the 1971 Tri-State Swan Survey was the lowest number counted since 1950 when there were 146. The entire survey last year counted fewer swans than any year since 1957.

Does this indicate that the population is growing smaller? I think this could be a strong possibility concluded from brief visits that I took to the surrounding tri-state area. Major nesting areas visited were Yellowstone and Teton National Parks, Targhee National Forest, Elk Refuge, and Railroad Ranch. In all cases, except the private Railroad Ranch, many nesting areas were near major disturbances, even at lakes like Riddle in Yellowstone, several miles off the road. What seems to have happened was that old pairs grew accustomed to the gradual buildup of disturbance, but when they left, no others would take their place and nest even though swans were seen in some of these areas. Even now, the Railroad Ranch habitat is in jeopardy of being lost, since the ranch will become a state park at the time of Roy Harriman's death.

So, it seems that the tri-state population is still gradually losing nesting acres.

But this does not mean that the tri-state population is in immediate danger. Taking into consideration the long life of the birds, a recruitment of 30 to 40 young per year is probably ample to maintain a stable population. Knowing the limited habitat and a few basic life history factors, questions of future management become apparent, and these are questions I ask myself quite often. Will manipulative management benefit the present flock by seeking to increase it? I rather doubt it, considering the limited and shrinking habitat. On the other hand, do we want to completely remove the tool of management from capable and knowledgeable people by placing the Refuge in wilderness area?

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September 1972

Cypress Hills, Saskatchewan Trumpeter Swans

A very small part of the continental population of wild Trumpeter Swans breeds in the Cypress Hills region of southwestern Saskatchewan. This local isolated breeding population is thought to be the only one in the Province.

Trumpeter Swans were first observed in Saskatchewan in 1914, but were not reported as breeders until 1953 when one pair with a brood was located in the Cypress Hills. The breeding population apparently fluctuated from one to two breeding pairs with broods, and one or two non-breeding adults until 1971 when the first extensive ground and aerial surveys were carried out by the Canadian Wildlife Service.

In 1971, we located three breeding pairs, one adult non-breeder, two broods of two cygnets each and one of five cygnets for a total of 16 Trumpeter Swans. Investigations into this population were intensified in 1972. An aerial survey in late May revealed three breeding pairs with nests. Subsequent ground investigations revealed two clutches of six and one of seven. Of the 19 eggs, 10 cygnets survived to the flight stage. Two eggs were addled.

The breeding areas utilized by the Trumpeter Swans in the Cypress Hills include two lakes and one beaver pond, one water body per breeding pair. These areas are typically large and isolated with extensive stands of emergent aquatic vegetation. Breeding habitat and nest construction are similar to that of other wild breeding populations of Trumpeters.

A plan for the management of this population was initiated in six stages in 1972 and will be continued in successive years. The first stage involves providing complete protection for these birds on their breeding grounds. Special posters warning against the killing or molesting of Trumpeter Swans were posted on the peripheries of all known breeding areas. These signs will be maintained and, if the population expands, additional posters will be erected as new breeding territories become known.

The second stage involves annual breeding pair, brood, and fall population aerial surveys in May, July, and September, respectively. These surveys will provide an accurate estimate of population size, breeding success, and the location of breeding territories.

The third stage involves investigations into the breeding biology of the swans and an evaluation of their habitat. Data collected from this flock could vary significantly from that of other breeding populations and possibly reveal the habitat requirements of these birds and the factors limiting the breeding population size.

The fourth stage involves banding and color marking to provide information on mortality and to determine the migration patterns and wintering grounds of this population, so far undetermined. Banding was attempted this year on an experimental basis. One adult female and four cygnets were ringed. Coloured neck and leg bands will be placed on as many birds as possible next year.

The fifth stage involves the protection of the non-breeding Trumpeter Swans present in the Cypress Hills every year. These birds have

historically remained a considerable distance from the breeding areas and are possibly cygnets originally reared in the Cypress Hills. These birds could be important to the existence of the Cypress Hills flock as they may represent replacement birds for the limited breeding areas when resident pairs fail to return in the spring. Water areas supporting these birds will be posted to ensure their protection. An attempt will be made to band these swans during the flightless period of their moult.

A public relations program completes our proposed management scheme. Landowners in the Cypress Hills area play an active role in protecting those swans which nest on their land. The local ranchers, Cypress Hills park officials, and local detachments of the Royal Canadian Mounted Police are kept well informed of all our management efforts.

The size of the Cypress Hills population of Trumpeter Swans has not increased greatly in recent years. The reasons are not clear, but further growth of the population may be restricted by a shortage of the proper habitat and high cygnet mortality.

The Cypress Hills Trumpeter Swans require, as they do in other areas, large breeding territories with a maximum of one pair on each lake. While other suitable breeding areas may exist in the park, they are not enough to provide nesting habitat for many more swans, probably no more than 10 or 12 breeding pairs.

Further research and management is needed if the breeding population of wild Trumpeter Swans in Saskatchewan is to be preserved. The loss of even one nesting territory or breeding pair will seriously jeopardize the survival of this small group. An evaluation of the breeding biology and habitat requirements and determination of the migration routes and wintering grounds of this flock could help preserve this remnant of a rare waterfowl species in Saskatchewan.

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THE STATUS OF THE LACREEK TRUMPETER SWANS

As reported by Monnie in the October 1966 issue of the Journal of Wildlife Management and by Ellis and Monnie at the First Trumpeter Swan Conference at McGregor, Minnesota, in 1969, Trumpeter Swans were transplanted from Red Rock Lakes National Wildlife Refuge in Montana to Lacreek National Wildlife Refuge in South Dakota. Beginning in 1960 and continuing thru 1961 and 62, a total of 56 cygnets were successfully transferred to Lacreek. Successful reproduction first occurred in 1963 with the production of two cygnets to flight.

This paper describes the Lacreek flock's expansion from 1965 through 1972.

Expansion of the Flock 1965 - 1972

In 1965, 37 Trumpeter Swans wintered at Lacreek including 11 cygnets produced in 1964. Wintering populations decreased to 32 in 1966 but have increased every year since, peaking at 101 Trumpeters early in the winter of 1972. The average increase was 16.4% for this period. Survival and mortality factors which will determine the flock's growth are discussed under Reproductive Seasons, Fall and Winter.

Reproductive Seasons, Spring - Summer

By 1965, Trumpeter Swans had four nests on the Refuge; the number has varied annually between three and six nests since.

In the past eight years, 38 nests were built on the Refuge and 243 swan eggs were laid; 60 per cent of these hatched. Of the resulting 145 cygnets, 93 have survived to flight.

Swans began seeking off-refuge nesting areas as early as 1964 and this segment of the population continues to spread. From 1965 through 1971, 56 off-refuge cygnets were produced to flight. In 1971, off-refuge production exceeded Refuge production for the first time when 17 cygnets returned to Lacreek in eight different broods.

Aerial surveys this year found 20 cygnets in eight off-refuge nest locations with the probability that more broods will appear when the birds return to the Refuge to winter.

Trumpeter Swans find off-refuge nesting habitat in large stockdams to the north and in natural sandhill lakes to the south. Aerial surveys in 1972 located three nests on stockdams and five in sandhill lakes. These nests were 45 miles to the north, 80 miles to the southeast, and 40 miles southwest of the Refuge.

The typical Trumpeter nest is located on a muskrat house in a bulrush - cattail marsh, but the swan will accept other sites.

One pair reared young successfully for several years on a stockpond island. This nest site was inspected in 1971 and was located in a willow - aspen thicket. The nest was constructed of twigs, decayed leaves, and grasses.

In 1971, a pair adapted to a habitat change on one of the Refuge pools by completely building its own nest. The pool had been drawn down the previous winter, so neither muskrats nor houses were present. The swans built their own platform of bulrush, cattail, and phragmites in two feet of water.

Since Trumpeters require large territories during their nesting season, they are generally limited to one nest to a pool or to any other body

of water. This territory appears to shrink, however, as incubation progresses. Sometimes a later, second nesting pair that has been unable to find suitable nesting habitat elsewhere may move in and share a large pool. There have been two such cases at Lacreek, but neither of the later nests were successful in rearing cygnets to flight stage.

Large territories also appear to play an important role in the welfare of the non-breeding segment of the swan population. Apparently there are only two undisturbed pools on Lacreek National Wildlife Refuge large enough to support a breeding pair and a flock of non-breeding Trumpeter Swans. If neither is available, as was the case in 1970 when both pools were drawn down, the non-breeding flock is forced to seek summer molting habitat elsewhere. Only one non-breeding swan remained at Lacreek in 1970, compared to 11 in 1969 and 15 in 1972.

Summer mortality increases when non-breeding swans are forced to seek habitat off the Refuge. It is essential then that Lacreek Refuge provide summer habitat for both breeding and non-breeding swans.

Fall

Illegal shooting is the primary mortality factor for Trumpeter Swans in the fall. There have been four confirmed cases of Trumpeter Swans being shot in Nebraska. Two incidents of Trumpeter Swan shooting were also confirmed on the Pine Ridge Indian Reservations in South Dakota. Many other shooting cases have probably gone undetected.

Although Trumpeters are vulnerable to shooting at any time, they are most vulnerable during the fall hunting season when hunters are afield and swan families are wandering from lake to lake on their return to their former wintering quarters or are seeking new wintering areas.

Accidents are also important in fall mortality as well as during other times of the year. Trumpeters normally fly low, barely skimming hills and often collide with utility lines and other obstacles, even barbed wire fences. Several swans have been found that have met such fates.

Past mortality of adult Trumpeters off the Refuge has countered off-refuge production. During 1965-71, 261 emigrations were made from the Refuge and only 258 return trips occurred in spite of 56 cygnets being produced off-refuge. Thus, the annual growth of the Lacreek Flock has so far been carried on by on-refuge production.

Winter

Wintering mortality at Lacreek has been one or two swans a year. An exception occurred in the severe winter of 1970-71 when six swans, including five cygnets, died. Their symptoms were similar: weak, unable to fly, then death. Postmortem examinations by Dr. Gary Pearson of Northern Prairie Wildlife Research Center found enteritis lesions (symptoms that were common to waterfowl mortality at the Center and thought associated with winter stress). Since similar die-off's have not been noted before or after, we can hope that it was a one-time affair.

Current Status of the Population

There were 101 Trumpeter Swans, including 28 cygnets, on Lacreek Refuge at the beginning of 1972. Two swans died during the winter and an unconfirmed report of a dead swan off of the Refuge was received during the spring.

Since the swans are unmarked it is impossible to determine the exact number of breeding-age Trumpeters in the Lacreek population. However, by subtracting from the 1972 spring population the number of cygnets known to

have survived their first winters for the years 1969, 1970, 1971, and 1972, a minimum of 40 (or 20 pairs) of Trumpeter Swans are in their fourth year or more. Since only 13 nests were found, there is a strong possibility that additional broods will return this fall from unknown nesting sites.

Future Growth of The Lacreek Population

Several factors will determine the growth of the Lacreek swan population and its ultimate size. Off-refuge mortality is the gravest limiting factor. Unless this is reduced, and the off-refuge nesting begins to make a real contribution, the growth will be limited to the Refuge's production.

We estimate that there are over 50 sandhill lakes and 20 stockdams suitable for swan nesting within an 80-mile radius. If the swans choose to travel farther, potential nesting sites increase.

The number of nesting sites on Lacreek Refuge will continue to be limited by the Trumpeter Swan's territorial requirement. If staggered nesting on some of the larger pools becomes more common and successful, we estimate that nesting pairs may increase to a maximum of 10.

The potential for wintering swans at Lacreek Refuge may be limited by the extent and quality of the supplementary feeding program. Lacreek has sufficient open water during the winter to accommodate 500 swans if optimum habitat and food can be made available. We believe, however, that 200 wintering swans would be a better goal.

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Submitted by:
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Table 1. Trumpeter Swan on-refuge nesting data, 1963-72, Lacreek National Wildlife Refuge

Year	No. of nests	Number of eggs					Hatched		Survival to flight	
		Laid	Destroyed	Sterile	Addled	Dead Embryo	No.	%	No.	%
1963	2	14	0	4	0	1	9	64.2	2	22.2
1964	3	19	?[a]	?	?	3	12	63.1	10	83.3
1965	4	25	5	3	0	2	15	60.0	14	93.3
1966	6	35	?	10	?	2	20	57.1	16	80.0
1967	5	32	6	9	0	1	16	50.0	13	81.2
1968	3	21	0	3	0	1	17	80.9	11	64.7
1969	5	34	0	10	1	2	21	61.8	10	47.6
1970	6[b]	33	0	1	6	4	22	66.7	10	45.5
1971	4	28	0	1	10[c]	3	14	50.0	11	78.6
1972	5	35	0	4	4	7	20	57.1	?	?
Totals	43	276	11	45	21	26	166		97	

a Data incomplete.

b One nest in Pool 10 could not be located on the ground, but was unsuccessful; all egg data is based on the five located nests.

c The adult female of the Pool 8 pair died. All seven eggs were spoiled and are listed here.

Table 2. Growth of the Lacreek NWR Trumpeter Swan flock

Year	Wintered on Lacreek	Nests On	Nests Off	Production to flight On	Production to flight Off
1965	37	4	2	9	0
~~1966~~	32	6	1	15	4
1967	43	5	2	13	6
1968	57	3	3	11	10
1969	64	5	3	10	9
1970	76	6	4	10	10
1971	81	5	8	11	17
1972	101	5	~~8+~~	8	22 ~~20+~~*

* As of June 26

Table 3. Off Refuge population dynamics

Year	Emigrating from Refuge in spring	Off-Refuge production	Immigrating to Refuge in fall	adults lost
1965	22	0	9	13
1966	16	4	13	7
1967	27	6	25	8
1968	39	10	36	13
1969	43	9	47	5
1970	59	10	57	12
1971	55	17	71	1
Total	261	56	258	59

THE TRUMPETER SWAN IN MINNESOTA

History

The Hennepin County Park Reserve District, through the initiative of Fred E. King, began its efforts to re-establish the Trumpeter Swan (Olor buccinator) as a breeding species in Minnesota in 1966. In that year, the District received one pair of adult swans from Red Rock Lakes National Wildlife Refuge in Montana.

Since then, Red Rock Lakes has furnished the Hennepin County Park Reserve District with an additional 40 Trumpeters. In 1967, there was a shipment of 20 birds, including 10 cygnets. In 1968, 10 more cygnets were received, and in 1970, an additional 10 cygnets were transferred to the Park Reserve District. A pair of yearling swans was received from the Delta Waterfowl Research Station in June 1971 in an effort to introduce new blood into the flock.

The District's endeavors to bring back the Trumpeter Swan to the Minneapolis area and Minnesota have been frustrating at best. To date, five birds have been shot by hunters and vandals, nine have succumbed to disease, four have died from injuries, one was stolen, one swan flew off, and seven are unaccounted for, although a pair has been sighted several times this summer in an area to the west of Carver. The other five birds have left the Sunny Lake Refuge in the spring. Two pair of swans did return to Sunny last fall to overwinter.

Also on the negative side of the ledger, six swans have been transferred out of the Park Reserve District. A pair of Trumpeters was given to the Sherburne National Wildlife Refuge just north of Hennepin County in July of 1968. In February of 1969, single birds were sent to Forest Park in St. Louis and to Mesker Park in Evansville, Indiana. In exchange for the Delta birds, a pair of Red Rock yearlings was given to Belford Waterfowl Research in 1971.

The Trumpeters in Carver Park Reserve's Sunny Lake Refuge were left unclipped for the first time in the summer of 1970. Since that time, there has been some movement in and out of the refuge. One pair of swans was shot during the 1970 hunting season just a few miles west of Carver Park Reserve. A farmer's dog found the birds stuffed into a culvert. Last fall, a hunter shot an adult pair of Trumpeters on opening weekend 50 miles to the west-northwest of Carver Park Reserve. The man turned himself in and claimed that he had mistaken the swans for Snow Geese. On Saturday afternoon of 1 July this year, a vandal shot and killed the female Trumpeter of our original pair with a .22 caliber weapon just 150 yards from the Carver Nature Center.

Production

The first Trumpeter Swan nesting in Minnesota since the 1880's occurred in the Carver Park Reserve in 1969. One egg was hatched, but the cygnet disappeared three weeks thereafter. There was an unsuccessful nesting attempt in 1970 by a pair of free-flyers outside of the Carver Park

Reserve. The same year, a clutch of five eggs was hatched in the Sunny Lake Refuge in Carver. Three cygnets disappeared; one died from an undetermined cause; and the fifth cygnet fledged only to succumb to aspergillosis later that fall.

In June of 1971, two clutches of three eggs each hatched in the Sunny Lake Refuge. The first three cygnets did not survive past five days. Two of these disappeared and one was found dead at the nest. An autopsy attributed death to starvation. In the second hatch of three, one cygnet disappeared at five weeks of age and two survived to flight stage, both of which are still with the Sunny Lake flock.

In June of this year, a brood of one cygnet disappeared at four to five days of age. On 10 June, a brood of five cygnets was first seen in the south end of the Sunny Lake Refuge. Two weeks later, one cygnet was missing, but the remaining four have survived, and were 15 weeks old on 22 September.

A pair of swans originating from Carver Park Reserve attempted to nest in Hayden Lake in 1971. Hayden Lake is located in the Park Reserve District's Elm Creek Park Reserve 30 miles to the north-northeast of Carver. The start of a nest was found, but for some reason, perhaps human disturbance, the Trumpeters abandoned the area. The pair of adult swans shot by a hunter last fall, flew from Carver the previous spring and is assumed to have been out in search of a nesting site. If there was a nesting attempt, it was presumably unsuccessful.

Earlier this summer, a farmer reported that he was confronted by a pair of swans on Patterson Lake, about 10 miles west of Carver Park Reserve. These birds were no doubt Trumpeters and were defending a nesting territory. However, having received reports of more recent sightings in the same area of what must be these birds, there was no evidence of young.

Presently, there are 18 Trumpeter Swans within the Hennepin County Park Reserve District. In Sunny Lake Refuge there are six adults, two yearlings, and four cygnets. In each of three other Park Reserves there is a pair of Trumpeters now in their third year.

Reproductive success

From my relatively brief association with Trumpeter Swans and from reading the literature, it is quite apparent that breeding adults require a large nesting territory. When breeding birds are translocated to an atypical situation, such as our Park Reserve refuges, the nesting pairs are every bit as territorial, but the relatively small number of nesting sites available necessitates a decrease in what would normally be a larger territory. As a result there is defense not only against other members of the same species, but also against closely related species, such as the Canada Goose.

Behavior of Note

Also related to territory size, and thereby to reproductive success, is a swan pair's breeding and parental experience. What I am saying is not based upon quantitative data, but merely upon some observations made of parental behavior of a given pair of swans over the past two breeding seasons.

A mated pair of Trumpeter Swans will tend to return to a given nesting territory year after year (Roger Page, pers. comm.). I am assuming that the same pair of swans has been nesting in the south end of Sunny Lake Refuge for the past four breeding seasons. Table 1 illustrates this pair's past endeavors. Their 1971 hatch is the one which did not last past five days of age; two cygnets disappeared and the one was found dead near the nest. The University of Minnesota Veterinary Diagnostic Laboratory determined, as mentioned previously, that the cygnet died of starvation. Internally, the alimentary canal was empty and the liver was fatty. The fact that this bird starved to death indicates that the parents perhaps were inattentive, possibly due to lack of experience.

TABLE 1. South-end pairs' production record in Sunny Lake Refuge, Carver Park Reserve

Year	Eggs hatched	Young fledged	Young survived
1969	1	0	0
1970	5	1[a]	0
1971	3	0	0
1972	5	4	4[b]

[a]Died of aspergillosis, 12-70.

[b]Thru 9-22-72.

My observations of parental behavior this year indicated great attentiveness of the adult swans toward their five, and finally four, cygnets. The parents were successful in defending a territory against both swans and geese that encompassed the entire south half of Sunny Lake, or approximately 20 to 30 acres. The adults were seen to actively stir the bottom with their feet through a peddling motion followed by an extension of their heads under water and a tugging motion as if pulling or digging something on the lake bottom. This is a means of bringing vegetable foods to the water's surface for the young swans to feed (pers. comm. between F. E. King and P. Ward; Banko and Mackay, 1964:156). In an alarm situation, the adults would lead the cygnets back into the cattails, out of sight.

When the cygnets were about $6\frac{1}{2}$ weeks old, one of the adults, presumably the male, left the family group, but as far as could be determined remained within the Refuge. Three weeks later, the two adults were seen together again with the cygnets. When the one adult was noted to be gone, I put a canoe into the lake in search of it, dead or alive. Through a count of the known number of swans in Sunny Lake, I found that the missing parent was still alive and in the Refuge. During the search,

I spooked the four cygnets, then seven weeks old, and one attending adult, presumably the female, out of their territory and into the north half of the lake. While moving from the south to the north end, the pen made no movement toward me in defense of her young and did not remain with the cygnets, but rather swam to the north at a rate that opened a gap of 75 to 100 yards between her and the young.

Soon after the cygnets departed their territory, they were attacked by a lone adult Trumpeter in the northwest portion of the refuge. The attacking swan flew at the cygnets one by one and when it was nearly on top of a cygnet, the cygnet would dive. From where I was in the southeast corner, it did not appear that there was any physical contact made. There was no attempt on the part of the parent to defend its young from the attacking adult. Fortunately, the next morning found one adult and four cygnets back in the south end of the refuge.

A similar abandonment of the young by its parents (a different pair) was noted in 1971 when Dr. W. J. Breckenridge attempted to film the family from a rowboat.

One of the two abandoned cygnets in its efforts to rejoin its parents, strayed from its northern territory and was attacked by the south-end pair of adults, which had failed in raising their three cygnets. This cygnet, five weeks old at the time, dove several times and swam underwater for distances of 20 and 30 yards. It finally made it back to its parents.

To what can this apparent parental inattentiveness be attributed? It would seem that Trumpeter parents would defend their young, whether it be against a fox, another swan, or a human. Perhaps it can be related to the atypical situation that Sunny Lake Refuge offers these birds; i.e., relatively crowded breeding conditions. However, one would think that this would make the birds more defensive of their young and territory.

To what may the male Trumpeter's temporary desertion of his family be attributed? According to Banko and Mackay (1964:160), the Trumpeter pen goes into her postnuptial molt about the time her eggs hatch. When she fully regains her flight feathers about a month or so later, the cob goes into his molt. Possibly, the male sought seclusion during the initial weeks of his flightlessness, which would account for his absence from the family group.

Just after the cygnets' 13th week, Fred King observed the parents in company with three of the four cygnets. They were followed by the fourth cygnet and a third adult. This was an indication that territorial boundaries were not as stringent as earlier in the brooding period.

It became evident this past spring that the three pair of young swans now in their third year would have to be isolated from the Canada Geese in each of their respective refuge pens during the breeding season. Each pair went through the motions of partially constructing nests and of courtship displays. In the process, the swans disrupted several goose nests and in general made nesting for the geese difficult.

Park Reserve District Management

The next two or three years will tell whether or not the efforts of the Park Reserve District to re-establish Trumpeter Swans in the Hennepin County area of Minnesota will succeed. There are several areas of suitable habitat within the District boundaries, and innumerable areas outside of our ownership. There are two lake-marsh areas which would be enhanced

considerably for swan use with the elimination of carp now present in great numbers.

Although habitat improvement is being accomplished, it will not mean a thing if we are not able to effectively publicize our endeavors and educate the people. The loss of an adult pair of swans in each of the past two hunting seasons is difficult to absorb. Then, when a vandal comes along and maliciously shoots a Trumpeter within the confines of a Reserve, your hands go up in despair.

To date, I think that the Hennepin County Park Reserve District's management of Trumpeter Swans has been more than adequate. Young birds have been held within the refuges until they have gained maturity and then allowed to fly free in hopes that they would nest outside the refuges. There have been, to our knowledge, no successful nestings on the outside. However, there is a possibility that some swans have made it.

At this point, certainly the Hennepin County project has shown that it is possible to raise and release Trumpeter Swans and that we have accomplished the potential of supplying some free-flyers to the flyway. The prevention of accidental and deliberate killing of Trumpeters in the Twin Cities area may well prove to be the most difficult part of the project.

LITERATURE CITED

Banko, W. E., and R. H. Mackay. 1964. Our native swans, p. 155-164. In J. P. Linduska (ed.), Waterfowl tomorrow. U.S. Dept. of the Interior.

Submitted by:
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September 1972

TRUMPETER SWAN PROGRESS REPORT, SEPTEMBER 22, 1972
BRIT SPAUGH PARK & ZOO
Great Bend, Kansas

JERRY R. TILLERY, Director

No. eggs laid	No. eggs hatched	Date hatched	* Mortality	Placement Number	Placement Location
6	6	June 28, 1965	1	0/1 1/0 1/0 1/0 1/0	Seattle, Washington Topeka, Kansas Denver, Colorado Victoria, Texas San Antonia, Texas
10	8	May 23, 1966	3	0/1 1/1 0/1 1/0	Topeka, Kansas Buffalo, New York San Antonia, Texas Milwaukee, Wisconsin
10	9	May 24, 1967	2	2/2 1/1 1/0	Canadian Wildlife Service Wyoming Fish & Game Great Bend stock
7	6	May 21, 1968	2	1/1 1/1	Sonoma, California Garden City, Kansas
8	8	June 8, 1969	1	2/1 1/1 1/0 1/0	Adel, Iowa Oyster Bay, New York Marston Mills, Massachusetts Garden City, Kansas
11	9	June 2, 1970	7	0/2	Plymouth, Massachusetts
7	6	June 7, 1971	4	0/2	Viva Animals, Waco, Texas
7	5	June 11, 1972	3		DoAll Co. Thunderbird Recreation Area Des Plains, Illinois
TOTAL 66	57		20	37	

* (Injured and killed, died, or killed by predators)

HISTORY AND SUCCESS OF TRUMPETER SWAN REINTRODUCTION ON THE MALHEUR NATIONAL WILDLIFE REFUGE, OREGON

Prior to 1939, the only reported record of Trumpeter Swans in southeastern Oregon was by Captain Charles Bendire (1877), who collected a single specimen at Malheur Lake, March 24, 1877. Trumpeter Swans were reintroduced to southeastern Oregon on the Malheur National Wildlife Refuge in 1939. Various attempts to establish a breeding flock were unsuccessful until 1958, when two cygnets were raised to flight stage. With the exception of 1959, at least one cygnet has been raised annually, with a peak of 22 raised in 1971. Total production since 1958 through 1971 is 122 cygnets. However, no more than 45 adults and sub-adults can be accounted for at the beginning of each breeding season. Although natural and accidental mortality accounts for a portion of this population disparity, they do not equal the annual increment. It is suggested that Trumpeters raised at Malheur may be contributing to a presently unknown population. However, this hypothesis has yet to be proven.

Eldon L. McLaury
Malheur National Wildlife Refuge

A summary of the Bureau of Sport Fisheries and Wildlife Research Division proposed Trumpeter Swan study plan for discussion at the Second Trumpeter Swan Conference, Grande Prairie, Alberta. September 26-28, 1972.

Name of Project: Development of methods of selecting, breeding, and rearing wild waterfowl.

Project Number: N. A. 431

Name of Work Unit: Development and evaluation of techniques for breeding, rearing, re-established, and maintenance of local breeding populations of Trumpeter Swan.

Work Unit # NA-431.7

Justification: The Trumpeter Swan has demonstrated a good potential for development of local breeding populations. In order to provide swans for release, research is needed on improved methods of breeding and rearing.

Objectives:

1. Obtain understanding of wildness and domestication in Trumpeter Swans regarding both generic and environmental influence and develop means of maintaining basic wildness in artificially reared swans.
2. Develop production methods to guide governmental agencies, aviculturists, and others in rearing Trumpeter Swans for release in the wild.
3. Develop and test methods of establishing Trumpeter Swan populations on selected areas while simplifying maintenance and reducing costs.
4. Develop technique for inducing safe Trumpeter Swan migrations to secure wintering situations.
5. Provide assistance for review, evaluation, and coordination of Bureau research and management of Trumpeter Swans in the north central states.

Procedures:

1. Review literature and acquire captive stock of Trumpeter Swans.
2. Measure reproductive characteristics of Trumpeter Swans:
   a. Egg production for individual swans.
   b. Egg data, i.e. sample, length, width, and weights.
   c. Length of incubation.
   d. Hatching and production records for artificial and natural incubation.
   e. Growth and development of cygnets.
3. Investigate rearing technique to develop better method for release of swans.
4. Keep accurate records on the Northern Prairie Trumpeter Swan flock characteristics, including pedigree.
5. Propose Red Rock Lakes NWR furnish 40 Trumpeter Swan eggs each of three years.

First year Forty eggs will be incubated at Northern Prairie Wildlife Research Center and young used to build a captive breeding stock.

Second year Twenty eggs will be used as previous. Twenty eggs will be substituted and hatched under giant Canada Geese at Slade NWR in an experimental (migration) release.

Third year Forty eggs from Red Rock Lakes will be used in the egg substitution release at Slade NWR.

6. N.P.W.R.C. Trumpeter Swans will all be transferred to Sand Lake NWR during FY 1978 and used to produce hand-reared swans for release at Agassiz and Seney NWR.
7. Approximately 25 cygnets will be released at Agassiz NWR in 1978, 1979, and 1980.
8. A release of three-year Trumpeters will be made at Seney NWR in 1980 (summer?).
9. All released swans will be banded (with lock-on bands) and some may be marked to determine migration and wintering patterns.
10. The southern wintering quarters of the migrants will be identified as soon as possible through reports of color-marked and banded Trumpeter Swans.
11. The number of released geese (swan or foster parents?) returning to the areas of liberation will be determined. Their ecology, behavior, and subsequent breeding success will be carefully observed.
12. An intensive public relations program to gain understanding, cooperation, and support should be accomplished before the release program.
13. Objective and procedures will be reviewed with the respective State Conservation Departments. Their approval and cooperation will be obtained before releases are made.

Location: N.P.W.R.C., Jamestown, North Dakota; Sandlake NWR, Columbia, South Dakota; Slade NWR, Dawson, North Dakota; Agassiz NWR, Middle River, Minnesota; Seney NWR, Germfask, Michigan; and Red Rock Lakes NWR, Monida, Montana.

Work Schedules: FY 1973-85

Date of Reappraisal and Completion: Study will be reappraised annually and terminated in Fy 1985.

Reporting Schedule: Annual progress reports March 1. A completion report will be prepared when the study is completed. Findings warranting, will be published.

Work Assigned to: Principal Investigation, Forrest B. Lee and Arnold D. Kruse; assistant(s), Wildlife Aids (and refuge managers).

Cooperators:

N. P. W. R. C.

Division of Refuges:

Sand Lake NWR

Agassiz NWR

Seney NWR

Slade NWR

Red Rock Lakes NWR

Costs:	1	2	3	4	5	6	7
Grand Total:	$7,550;	10,600;	10,800;	10,850;	10,900;	15,100;	13,900

Summarized by:
Harold H. Burgess
November 9,1972

Registration Trumpeter Swan Society Conference

Grande Prairie, Alberta

Sept. 26-28, 1972

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