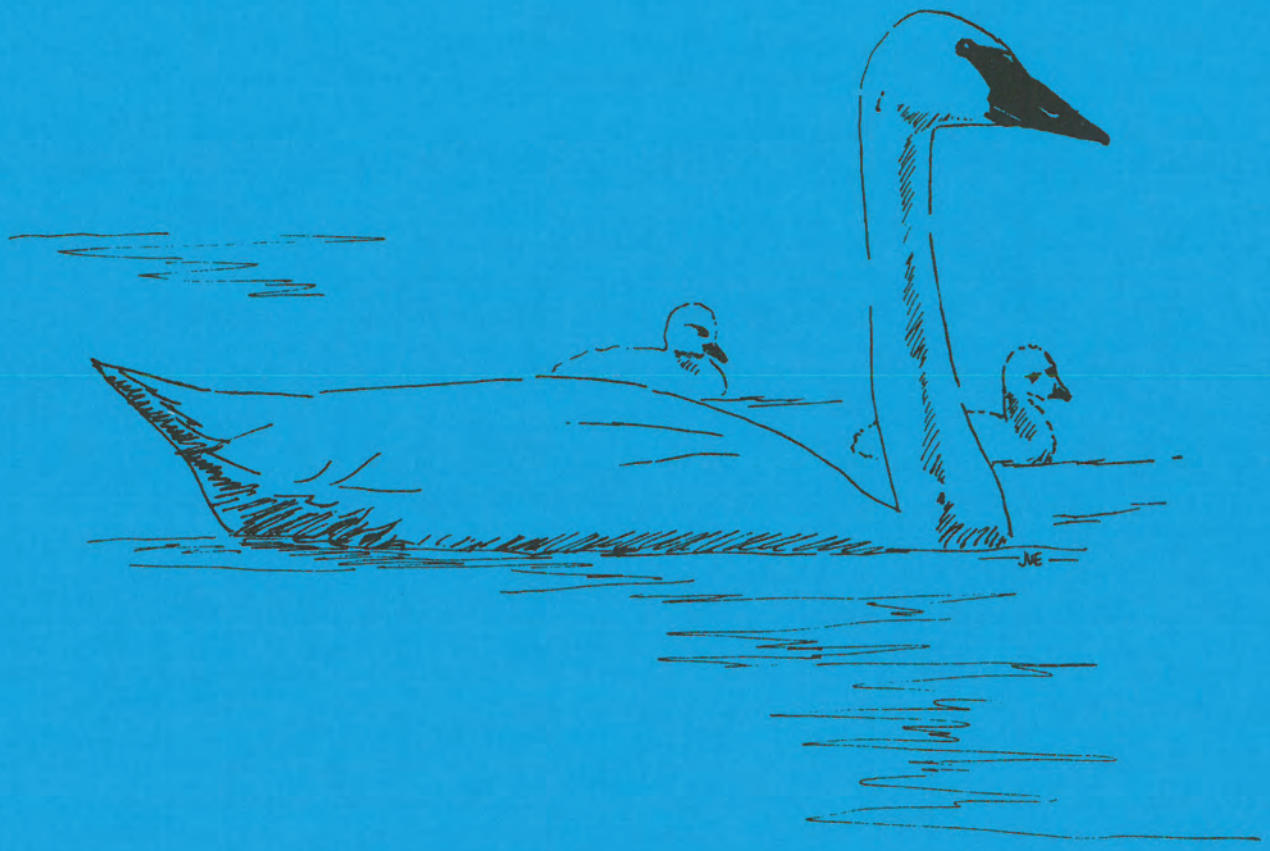
PROCEEDINGS AND PAPERS



THE NINTH TRUMPETER SWAN SOCIETY CONFERENCE

Proceedings and Papers of the Ninth Trumpeter Swan Society Conference

Donna Compton
Editor

Laurence N. Gillette Ruth Shea Gale
Conference Co-chairpersons

5-8 September 1984

West Yellowstone, Montana

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Preface

The Greater Yellowstone Ecosystem -- what a beautiful area in which to hold a Trumpeter Swan conference. West Yellowstone, Montana, was chosen as the conference site because of its central location in relation to Red Rock Lakes National Wildlife Refuge, Harriman State Park, and Yellowstone National Park, all of which provide important Trumpeter Swan summer and winter habitat.

Four objectives were established for the Ninth Trumpeter Swan Society Conference:

1. Increase the awareness of and appreciation for the Rocky Mountain Population of Trumpeter Swans and, in so doing, increase the priority given to Trumpeters by the various governmental agencies responsible for Trumpeter Swan management.

2. Closely examine the status of the Trumpeter Swan at Red Rock Lakes National Wildlife Refuge.

3. Improve the working relationships between The Trumpeter Swan Society and those governmental agencies responsible for swan management.

4. Provide participants an opportunity to examine important Trumpeter Swan habitat on a first-hand basis.

Only time will tell how well we met the first three objectives; however, I am confident that we took some important steps forward. Several key USFWS employees indicated that they learned more about Trumpeter Swans during the 4 days of the Conference than they had during the rest of their careers. It was personally gratifying to see the interest and enthusiasm that existed for the Trumpeter Swan among field personnel. The field trips provided everyone with an understanding of Trumpeter habitat in the Tristate Region that could never be obtained from status reports or monographs and, thus, fulfilled the fourth objective.

We came away from the Conference with an additional set of tasks. The North American Management Plan for Trumpeter Swans needs to be completed. The Red Rock Lakes Committee report needs to be examined to see which recommendations can or should be implemented. Restoration programs, particularly in the Mississippi Flyway, need to be encouraged. A way to provide a dependable supply of eggs or cygnets for restoration efforts and private propagators must be developed. Additional wintering sites for Trumpeters need to be identified. The list could go on and on.

It was a productive and enjoyable meeting. Now, we need to dedicate ourselves once again to (as it says in The Trumpeter Society Society brochure) "helping the magnificent Trumpeter survive and flourish" during the 2 years until our next conference in Grande Prairie, Alberta.

Larry Gillette
Conference Co-chair
Vice President,
The Trumpeter Swan Society
October 1984

Contents

Authors and Conferees

(Addresses have been updated to the best of our knowledge as of 1 August 1986.)

Bob Anderson
127 West Main, Suite A
Bozeman, MT 59715

Steven Ashling
Micrographics
7425 123rd St. W, #206
Apple Valley, MN 55124

Theodore N. Bailey
Kenai National Wildlife Refuge
Box 2139
Soldatna, AK 99669

Joe Ball
Asst. Coop. Res. Unit Leader
107 H.S.
University of Montana
Missoula, MT 59801

Edward E. Bangs
Kenai National Wildlife Refuge
Box 2139
Soldatna, AK 99669

Winston Banko
Research Biologist
National Park Service Associate
630 Shushwap Lane
LaConner, WA 98257

James C. Bartonek
Pacific Flyway Representative
USFWS
Office of Migratory Bird Management
500 NE Multnomah, #1692
Portland, OR 97232

Richard D. Bauer
Migratory Bird Coordinator
USFWS
500 NE Multnomah
Portland, OR 97232

Earl Baysinger
USFWS
Creekside One
2627 Redwing Road
Ft. Collins, CO 80526

Frank C. Bellrose
Illinois Natural History Survey
303 South Broadway
Havana, IL 62644

Lawrence Blus
Wildlife Research Biologist
USFWS
1845 NW Division Place
Corvallis, OR 97350

Karen S. Bollinger
Biological Technician
USFWS
P. O. Box 1287
Juneau, AK 99802

Stephen H. Bouffard
Biologist
Southeast Idaho Refuge Complex
Federal Building, Room 142
250 S. 4th Street
Pocatello, ID 83201

Harold H. Burgess
President, The Trumpeter Swan Society
Box 450
Rio Hondo, TX 78583

Leo Busch
Bureau of Reclamation
1359 Hansen
Burley, ID 83318

Russell S. Canniff
1919-1/2 79th Avenue SE
Everett, WA 98290

Don Childress
Waterfowl Coordinator
Montana Fish, Wildlife & Parks
1420 6th Avenue
Helena, MT 59620

Bruce Conant
Wildlife Biologist/Pilot
USFWS
Box 1287
Juneau, AK 99802

Jim Cooper
Associate Professor
University of Minnesota
Dept. of Fisheries & Wildlife
St. Paul, MN 55108

Ken Czarnowski
Resource Manager
Yellowstone National Park
WY 82190

Alec Dean
5520 Sylvan Lane
Excelsior, MN 55331

Jeff Eaton
Harriman State Park
HC 66, Box 33
Ashton, ID 83420

Judy Voigt Englund
Wildlife Specialist
Hennepin Parks
3800 County Road 24
Maple Plain, MN 55359

Gene Eyraud
Park Manager
Harriman State Park
Box 66
Ashton, ID 83420

Ruth Shea Gale
Wildlife Technician
Idaho Dept. of Fish and Game
Route 8, Box 125
Idaho Falls, ID 83401

Laurence Gillette
Wildlife Manager
Hennepin Parks
3800 County Road 24
Maple Plain, MN 55359

Jack Gulvin
Res. Management Asst.
Yellowstone National Park
WY 82190

Dirk Hagemeyer
2852 Wilderness Lane
Longs Peak Route
Estes Park, CO 80517

Don Hammer Past President,
The Trumpeter Swan Society
Senior Wetlands Ecol. T.V.A.
P. O. Box 65
Norris, TN 37828

Jeff Haskins
Migratory Bird Coord.
USFWS
P. O. Box 1306
Albuquerque, NM 87111

Lori Hawkins
Research Assistant
University of Minnesota
Dept. of Fisheries & Wildlife
St. Paul, MN 55108

John I. Hodges
USFWS
P. O. Box 1287
Juneau, AK 99802

Gordon Holton
Alberta Energy & Nat. Res.
Fish & Wildlife Division
BAG 900-26
Peace River, Alberta T0H 2X0

Art Hughlett
61500 Lobo Road
Montrose, CO 81401

Kenneth Husmann
Photographer
P. O. Box 37
Brookings, SD 57006

Gary Ivey
Biologist
Malheur NWR
P. O. Box 113
Burns, OR 97720

Clay Jobes
Graduate Student
University of Minnesota
Dept. of Fisheries & Wildlife
St. Paul, MN 55108

Martha Jordan
Chair, Washington State Trumpeter
Swan Affairs Committee
11025 - 44th Street SE
Snohomish, WA 98290

John A. Kadlec
Utah State University
1166 Cliffside Drive
Logan, UT 84321

James King
Wildlife Biologist
1700 Branta Road
Juneau, AK 99801

Rod King
Wildlife Biologist/Pilot
USFWS
P. O. Box 74272
Fairbanks, AK 99707

George Knapp
Owner/Propagator
Timberedge Farm, Box 202
Goodfield, IL 61742

Rolf Kraft
Refuge Manager
Lacreek NWR
Star Rt. 3, Box 14
Martin, SD 57551

Bill Kurtenbach
Asst. Refuge Manager
Red Rock Lakes NWR
Monida Star Route, Box 15
Lima, MT 59739

Jerry Light
Forest Wildlife Biologist
Gallatin National Forest
P. O. Box 130
Bozeman, MT 59715

Dave C. Lockman
Migratory Bird Biologist
Wyoming Game & Fish Dept.
Box 96
Smoot, WY 83126

Bill Long
Game Warden
Wyoming Game & Fish Dept.
P. O. Box 179
Elk Mountain, WY 82324

Andrew Lorenger
USFWS
1011 East Tudor Road
Anchorage, AK 99503

Harold G. Lumsden
Ontario Ministry of Nat. Resources
Box 50
Maple, Ontario L0J 1E0

Rees Madsen
Assistant Manager
National Elk Refuge
Jackson, WY 83001

Mary Maj
Wildlife Biologist
USFS
c/o Island Park Ranger Dist.
Island Park, ID 83429

Kevin J. McCormick
Canadian Wildlife Service
Western & Northern Region
Yellowknife, NWT

Terry McEneaney
Biologist
Red Rock Lakes NWR
Monida Star Route, Box 15
Lima, MT 59739

Rick McKelvey
Wildlife Biologist
Canadian Wildlife Service
P. O. Box 340
Delta, British Columbia V4K 3Y3

Justin Naderman
Wildlife Biologist
Idaho Fish and Game
1515 Lincoln Road
Idaho Falls, ID 83401

David Paullin
Wildlife Biologist
Malheur NWR
P. O. Box 245
Princeton, OR 97721

Mary F. Portner
Kenai National Wildlife Refuge
Box 2139
Soldatna, AK 99669

Bert Raynes
Ornithologist
Box LL
Jackson, WY 83001

Barry Reiswig
Refuge Manager
Red Rock Lakes NWR
Monida Star Route, Box 15
Lima, MT 59739

Ronald Robbins
Propagator
Route 1
Hendrick, OK 73549

Len Shandruk
Habitat Biologist
Canadian Wildlife Service
Room 1000, 9942-108th St.
Edmonton, Alberta T5K 2T5

Beth Sheehan
Box 657
Grande Prairie, Alberta T8V 3A8

Bob Shields
Deputy Regional Director
USFWS, Region 6
Denver, CO 80226

Bruce Smith
Biologist
National Elk Refuge
Jackson, WY 83001

John W. Smith
Wildlife Biologist
Missouri Dept. of Conservation
1110 College Avenue
Columbia, MO 65201

Jeff Snyder
1675 Shasta
Idaho Falls, ID 83402

Eugene Stroops
Manager
Medicine Lake NWR
HC 51, Box 2
Medicine Lake, MT 59247

Ralph Town
Regional Supervisor, W.A.
USFWS
Federal Building, Fort Snelling
Twin Cities, MN 55111

R. C. Twist
Manager
Metcalf NWR
Stevensville, MT 59870

Dave Weaver
Director, Department of Natural
Resources & Public Safety
Hennepin Parks
12615 County Road 9
P. O. Box 41320
Plymouth, MN 55441

James Wilson
Ornithologist
Missouri Dept. of Conservation
P. O. Box 180
Jefferson, MO 65102

Bob Wood
Resource Specialist
Grand Teton National Park
Moose, WY 83012

Gail Worden
Wildlife Technician
USFWS
Ashton Road, Highway 20
Ashton, ID 83420

Program

Wednesday, September 5

Reception and registration

Tour West Yellowstone Trumpeter Swan Winter Habitat Management	Tour Leader, Ruth Gale
Welcome - Opening remarks and introductions	Don Hammer
Harriman State Park and Trumpeter Swans	
History of Harriman State Park	Gene Eyraud
Trumpeter Swans at Harriman State Park	Jeff Eaton
Effects of Water Flow Fluctuations, Icing, and Recreationists on the Distribution of Wintering Trumpeter Swans in the Tristate Region	Terry McEneaney
Current and Proposed Management of Harriman State Park	Gene Eyraud

LUNCH - Buffet served at the A-Bar

Water Management of the Henry's Fork	Leo Busch
Ecology of the Henry's Fork - an Overview	Ruth Gale
Targhee National Forest Trumpeter Swans	Mary Maj
Concluding remarks	Ruth Gale
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DINNER

Discussion: Open discussion	Moderator, Larry Gillette

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President's remarks	Don Hammer
Rocky Mountain Population	
Policies of the USFWS Regarding Trumpeter and Tundra Swans	Jim Bartonek
North American Management Plan as It Pertains to the Rocky Mountain Population	Dave Lockman
Management of the Tristate Swan Subpopulation	Bob Shields
Overview of the Distribution and Interrelationships of the Tristate and Interior Canada Subpopulations	Terry McEneaney
Status of the Tristate Subpopulation and the Rocky Mountain Winter Population of Trumpeter Swans	Barry Reiswig

BREAK

Brief Summary of Red Rock Lakes NWR Programs	Terry McEneaney
Yellowstone National Park Policy for Managing Trumpeter Swans	Ken Czarnowski
Population Modeling (Included in North American Management Plan Paper)	Dave Lockman
Draft Proposal: A Long Range Habitat Management Strategy for the Interior Canada Subpopulation of Trumpeter Swans	Rick McKelvey Len Shandruk
Status of Trumpeter Swans in the Northwest Territories	Kevin McCormick
Status Report: A Pilot Project to Transplant Trumpeter Swans into Elk Island National Park, Alberta	Len Shandruk Gordon Holton

LUNCH

Progress Report: Rocky Mountain Trumpeter Swan Population – Wyoming Flock	Dave Lockman Bob Wood Bruce Smith Bert Raynes
Research Efforts and Management in Idaho	Justin Naderman
Trumpeter Swan Expansion in Montana	Don Childress
Status Report of The Lacreek Trumpeter Swan Flock and Management Plan	Rolf Kraft
BREAK	
Other Swans	Moderator, Jim Cooper
USFWS Policy on Tundra Swans and Implementation at the State Level of the Proposed Management Plan (Combined with USFWS Trumpeter Swan Policies Paper)	Jim Bartonek
Western Mute Swan Population Status and Agency Attitudes	Barry Reiswig
Other Swan Research	
Nesting Behavior of Male and Female Tundra Swans	Lori Hawkins
Trumpeter Swan Movements from Tanana Valley, Alaska	Rod King
Trumpeter Swan Surveys and Studies on the Kenai NWR and Kenai Peninsula, Alaska, 1957–1984	Theodore Bailey Edward Bangs Mary Portner
Energetics of Growth of Trumpeter and Mute Swan Cygnets	Clay Jobes
Managing to Have Wild Trumpeter Swans on a Continent Exploding with People	Jim King
Announcements and adjournment	Larry Gillette
Cocktails Banquet	
The Greater Yellowstone Ecosystem	Bob Anderson

Friday, September 7

Tour – Red Rock Lakes National Wildlife Refuge	Tour Leader, Barry Reiswig
LUNCH – Barbeque hosted by John Taft at the Centennial Ranch	
Red Rock Lakes National Wildlife Refuge Trumpeter Swan Committee	
Report of The Trumpeter Swan Society's Red Rock Lakes Committee	Art Hughlett
Group discussion of report	
Open evening to see West Yellowstone	

Saturday, 8 September

Panel Discussion	Moderator, Don Hammer
Discussion: Coordinating Management of the Rocky Mountain Trumpeter Swan Population and the Role of The Trumpeter Swan Society	Panel: Earl Baysinger Dick Bauer Don Childress Rick McKelvey Justin Naderman Barry Reiswig Art Hughlett
BREAK	
Pacific Coast Population	
Alaskan Trumpeter Swan Status Report: 1984	Bruce Conant John Hodges Rod King Andy Loranger

Notes on the Status of Trumpeter Swans in British Columbia and the Yukon Territory and on Grazing Studies at Comox Harbour, British Columbia	Rick McKelvey
A Summary of the Distribution and Status of Trumpeter Swans in Washington State	Martha Jordan
Wintering Trumpeter Swans in the Skagit Valley, Washington: Update 1980-1984	Russell Canniff
Pacific Coast Population: Status of Trumpeter Swan Restoration Flocks, 1983-1984	Stephen Bouffard
Rocky Mountain Population (Tristate Flock): Status of Trumpeter Swans at Camas National Wildlife Refuge 1983-1984	Stephen Bouffard

LUNCH

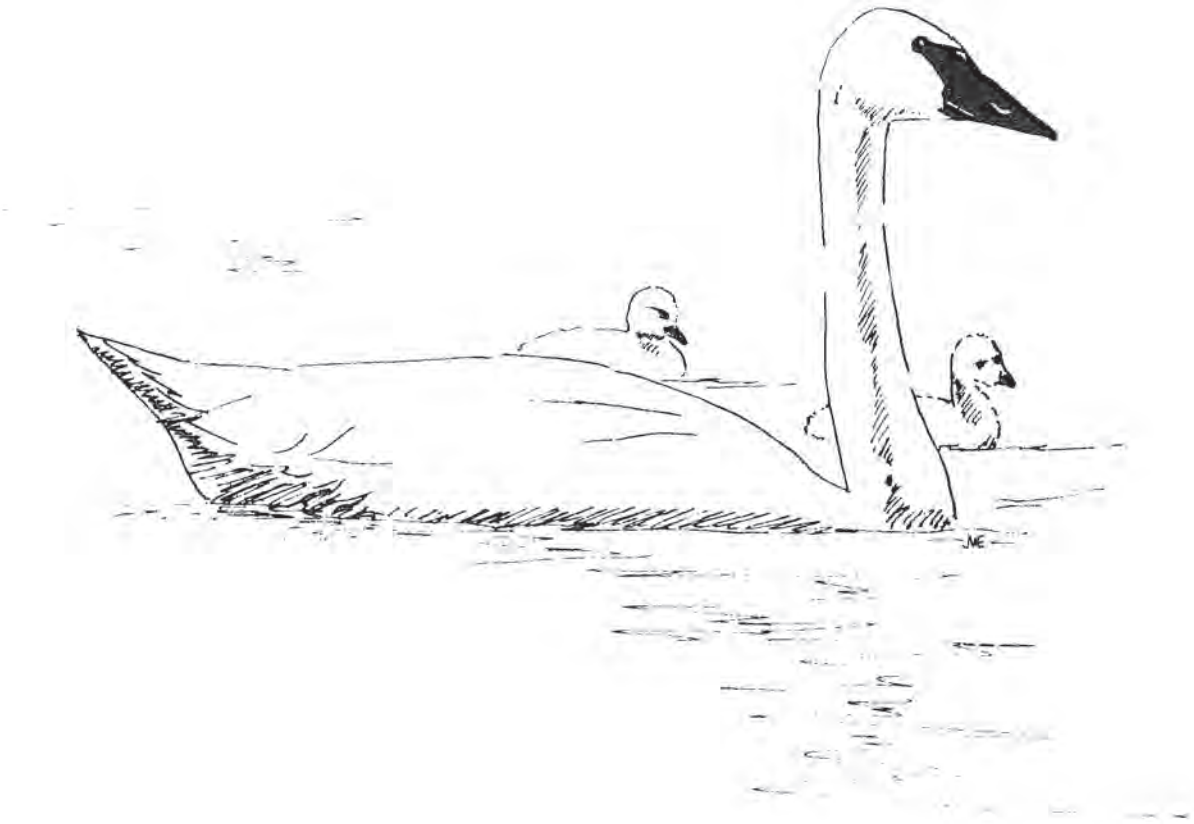
Restoration Programs — Moderator, Dave Weaver

Ontario - The Trumpeter Swan/Mute Swan Experiment	Harry Lumsden
Missouri - Experimental Restoration of Trumpeter Swans to Missouri	Jim Wilson John Smith
Minnesota - Status Report for the Hennepin County Park Reserve District Trumpeter Swan Restoration Project	Larry Gillette
Potential Trumpeter Swan Restoration	Harold Burgess

BREAK

The Trumpeter Swan Society Business Meeting

Concluding Remarks and Adjournment — Don Hammer



Acknowledgments

The Ninth Trumpeter Swan Society Conference was hosted by The Trumpeter Swan Society. The Conference would not have been possible without the many people who contributed by presenting papers or by participating in panel discussions. The U. S. Fish and Wildlife Service, U. S. Forest Service, National Park Service, Canadian Wildlife Service, Idaho Fish and Game Department, Montana Department of Fish, Wildlife and Parks, Wyoming Game and Fish Department, Alberta Fish and Wildlife Division, Missouri Department of Conservation, Idaho State Parks and Recreation, Hennepin County Park Reserve District, Tennessee Valley Authority, University of Minnesota, and University of Montana all supported the Conference by allowing their employees to present papers. The U. S. Fish and Wildlife Service also covered part of the cost of publishing the proceedings.

Co-chairs Larry Gillette and Ruth Gale were responsible for the program content. Ruth arranged for speakers from the Tristate Region, secured accommodations, organized tours, and attended to other details at the local level. The Conference would not have been possible without her assistance.

Gene Eyraud helped with the field trip to Harriman State Park, and Barry Reiswig and the rest of his refuge staff conducted a fine tour of Red Rock Lakes National Wildlife Refuge. The Centennial Ranch provided a beautiful setting for a barbeque lunch. Bob Anderson, of the Greater Yellowstone Coalition, provided an entertaining and informative banquet program on the Greater Yellowstone Ecosystem.

Art Hughlett chaired The Trumpeter Swan Society's Red Rock Lakes Committee which prepared the report on the status of the Trumpeters at the Refuge. Other Committee members included Harold Burgess, Art Hawkins, Frank Bellrose, and John Kadlec.

Special thanks go to Harold Burgess who continually worked behind the scenes to make sure everything went smoothly and who devoted the entire summer of 1984 to the Trumpeter Swan.

Finally, Ann Bassett spent countless hours in the final preparation, organization, and typing of these proceedings.

Larry Gillette, Conference Co-Chair
Vice President, The Trumpeter Swan Society
October 1984

POLICIES OF THE U. S. FISH AND WILDLIFE SERVICE REGARDING TRUMPETER AND TUNDRA SWANS

James C. Bartonek
Pacific Flyway Representative
USFWS
Office of Migratory Bird Management
500 Northeast Multnomah, #1692
Portland, Oregon 97232

I made separate presentations at the 9th Conference of The Trumpeter Swan Society (TTSS) regarding policies of the U. S. Fish and Wildlife Service (USFWS) toward management of Trumpeter Swans and Tundra Swans. However, I have combined the two topics for this written version to avoid redundancy.

TRUMPETER SWANS

At the 5th Conference of TTSS in September 1976, George K. Brakhage, Assistant Chief of the Office of Migratory Bird Management, was similarly asked to speak on the USFWS's policies toward Trumpeter Swans. At that time, when the continental population of Trumpeters was estimated to be a little more than half of that today, the USFWS had only "positions" but no formal policies. Low priority was given to establishing new flocks of Trumpeter Swans through propagation and transplant efforts because: (1) there were no clear benefits to the species, (2) reestablishing flocks would compete with more important programs for an always limited amount of funds and manpower, and (3) there was potential for conflicts with some hunting programs. The desire of both propagators and institutions for having Trumpeters was recognized; and a limited taking of eggs and cygnets from the Tristate Region of Montana, Wyoming, and Idaho for this purpose was allowed.

On 22 June 1978, the USFWS formally established "guidelines" for distributing excess Trumpeter Swans to make them available for sale or exchange among aviculturists and for breeding experiments. This was done in the belief that the population of birds in the Tristate Region, Red Rock Lakes National Wildlife Refuge (RRLNWR) in particular, had saturated its habitat to the point where productivity was depressed. Conditions of those guidelines were that the USFWS retained ownership of all swans, whether taken as cygnets or hatched from eggs of collected clutches. Ownership of any progeny of these birds was to be the same as for other propagated birds, i.e., they could be sold, traded or bartered by the propagator. Up to six permits would be issued each year, with each permittee taking either a clutch of eggs or one male and one female cygnet. Permits would be issued to those who would propagate or display swans but not to those who would develop stock for release. Collections on RRLNWR were to be controlled by the refuge manager. Although not stated because it was presumed to be understood, all other conditions related to collecting and transporting any migratory bird were required of the successful applicants, ie., thay had to obtain the necessary collecting, export, and import permits from the appropriate state wildlife agencies. Issuance of these permits by state agencies implied their concurrence with the collection and disposition of the Trumpeters. Although the prescribed number of eggs or cygnets was not always available, these guidelines were followed through 1982.

Portions of the 1978 guidelines were reinforced by inclusion within the National Waterfowl Management Plan (A National Waterfowl Management Plan for the United States. USFWS, March 1982, p.22) of the following policy:

> "The expansion of Trumpeter Swan distribution will be allowed to occur primarily as a result of normal pioneering. Low priority is assigned to expanding their distribution by artificial means."

An internal review of that policy led to a modification that reflected a willingness to cooperate in certain introductions of Trumpeters that would not likely impact other species or programs. On 21 January 1983, Director Robert A. Jantzen issued the following revised policy:

> "The expansion of Trumpeter Swan distribution will be allowed to occur primarily as a result of normal pioneering. Low priority is given by the Service to expansion by artificial means. However, the Service will consider on a case-by-case basis participation in Flyway Council-endorsed State programs to restore Trumpeter Swans by artificial means. Consideration will be given to the use of Alaskan stocks in the lower 48 states subject to approval by the State of Alaska, but stocks from the Tristate Population centered at Red Rock Lakes NWR will be used first until that population is brought into balance with its habitat."

W. Donald Dexter, Director of Wyoming Game and Fish Department, in a letter (7 April 1983) to Director Jantzen, expressed his agency's concern about that policy. He particularly questioned the continued use of Tristate Trumpeters for purposes outside the area when those birds could likely be better used to achieve those objectives that had been cooperatively developed in a draft management plan for the Rocky Mountain Population. Jantzen, who encourages and supports cooperative management of waterfowl through the flyway planning process, assured Dexter that when the plan was completed the USFWS would review those recommendations regarding removal rates and, if appropriate, revise the policy regarding the use of these swans.

During 1983-1984, the Pacific Flyway Study Committee's Subcommittee revised and consolidated the draft Trumpeter Swan management plans into a single plan. The Subcommittee identified an urgent need to evaluate those guidelines by which Trumpeters were taken from the wild and the purposes for which they were to be used. Through the Study Committee, the Pacific Flyway Council was requested to place a moratorium on use of Pacific Flyway Trumpeter Swans or their eggs until such time that the evaluation could be completed.

Jerry M. Conley, Director of Idaho Department of Fish and Game and Chairman of the Pacific Council, advised Director Jantzen of the Council's action of 24 May 1984, which stated:

1. That there be a moratorium on the removal of Trumpeter Swan eggs (except salvage eggs), cygnets, subadults, and adults from the Tristate Subpopulation of the Rocky Mountain Population for the next 3 years (commencing 15 April 1984, and ending 15 October 1986); and

2. That until the Pacific Coast Population and the Rocky Mountain Population Trumpeter Swan subcommittees have developed guidelines and criteria, in accordance with the March 1984 North American Management Plan for Trumpeter Swans objectives and procedures (i.e., removal rates for restoration efforts), no Trumpeter Swan or Trumpeter Swan eggs be allowed for removal from the Pacific Flyway states, and that flyways wishing to use these eggs or swans, which are of limited supply, develop criteria for prioritizing use of eggs or swans."

(The Subcommittee for the Pacific Coast Population will present their recommendations to the Study Committee in March 1985 for experimental removal of eggs or swans during that year.)

In a reply to Mr. Conley (20 July 1984), the Director concurred with the Council's action, because it was in keeping with the goals and objectives contained in the March 1984 draft of the North American Management Plan for Trumpeter Swans. With this concurrence, the policy of 1983 and the guidelines for removal of Trumpeters from the Tristate Region were nullified.

The Mississippi Flyway Council, at their July 1984 meeting, endorsed the restoration efforts in Minnesota and Ontario and in response to the Pacific Flyway Council's action recommended that any available Trumpeters or their eggs be allocated evenly between the two projects. At this same time, the Atlantic Flyway Council passed a resolution requesting that the Canadian Wildlife Service stop the Trumpeter Swan restoration efforts in Ontario. Two Ontario Trumpeters wintered in the Chesapeake Bay during 1983-1984. The Council perceived that particular restoration effort as being a hindrance to their initiative to hunt Tundra Swans in the Atlantic Flyway.

In a matter related to future policies regarding swans and other waterfowl, the USFWS initiated in 1982, a planning process that resulted in the identification of many fish, wildlife, and plant species that were of high biological, legal, and public interest. Those species meriting special attention at the National level were designated as "National Species of Special Emphasis" (NSSE). Among the more than 50 species, subspecies, and populations of migratory birds being identified, were both Trumpeter and Tundra Swans.

The USFWS is currently developing management plans for these NSSE, and states and Flyway Councils have already been asked to review those drafts pertaining to birds. These range-wide plans embrace the "Regional Resource Plans" that were developed by each of the seven organizational regions. Together, the NSSE and Regional Resource Plans identify the USFWS's goals, objectives, and strategies in the cooperative management of these migratory birds. Both the draft NSSE and Regional Resource Plans on swans use many of the same objectives and strategies that were identified in the draft flyway management plans for Trumpeter Swans and in completed flyway management plans for Tundra Swans. When completed and adopted, these NSSE plans will provide basis for possibly new or revised policies pertaining to swans.

The Pacific Flyway Council on 27 July 1984, endorsed those portions of the National Management Plan for Trumpeter Swans that pertained to the Pacific Coast Population and the Rocky Mountain Population. That portion of the plan pertaining to the Interior Population is incomplete and awaits input from the Central, Mississippi, and Atlantic Flyway Councils. The completed plan will influence future policies of the USFWS, because we have as an objective (National Waterfowl Management Plan, p.22) to: "Achieve goose, brant and swan population objectives identified in species or population management plans established jointly by the Service and the Flyway Councils."

TUNDRA SWANS

There is no USFWS policy pertaining specifically to Tundra Swans. However, there is in the National Waterfowl Management Plan, an array of objectives and policies pertaining to management of waterfowl in general and protection of their habitats. As previously described for Trumpeters, the NSSE and Regional Resource Plans also include Tundra Swans and will ultimately guide our management of that species.

Prior to 1983, Tundra Swans were hunted only in the Pacific Flyway where the average annual harvest during the previous 10 seasons was about 1,300 swans by 3,500 permitted hunters. The winter indices during 1974-1984 were 75,000 and 62,000 Tundra Swans in the Atlantic and Pacific Flyways, respectively, which are well above objective levels. Winter indices indicate long-term increases in both the Eastern and Western Populations of Tundra Swans.

In 1984, six states were authorized the following number of permits for each permittee to take one swan per season:

Utah	3,500	North Dakota	500
Nevada	650	South Dakota	1,000
Montana	1,000	North Carolina	1,000

All but the two Dakotas elected to have hunting seasons on swans.

An Environmental Assessment, "Proposed Hunting Regulations on Eastern Population of Whistling (Tundra) Swans, 1984" (USFWS, Office of Migratory Bird Management, September 1984) describes the status of the Eastern Population and the proposed hunt in North Carolina. The recent status and harvest of the Western Population is summarized in a recent report to the Pacific Flyway Study Committee (Bartonek, et al., July 1984).

OTHER SWANS

The USFWS has as an objective (National Waterfowl Management Plan, p. 21) to develop guidelines for the Federal/state effort to control populations of exotic Mute Swans. Additionally, it is our policy to prohibit the introduction and release of exotic waterfowl, such as Mute Swans, on USFWS lands (p. 22).

Whooper Swans (Cygnus cygnus) are winter residents of extreme western Alaska. While not meriting the distinction of being a NSSE, Whooper Swans are nonetheless an object of the Regional Resource Planning Process and given consideration in management of the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge, where most occur.

# # #

Rocky Mountain Population

NORTH AMERICAN MANAGEMENT PLAN AS IT PERTAINS TO THE ROCKY MOUNTAIN POPULATION

Dave C. Lockman
Migratory Bird Biologist
Wyoming Game and Fish Department (project leader)
Box 96
Smoot, WY 83126

OBJECTIVES:

1. Maintain a winter population of at least 1,060 Trumpeter Swans.
2. Expand the winter and breeding range of swans within and adjacent to the Tristate Region.
3. Achieve and maintain a breeding population of at least 183 active nests.

Montana	Idaho	Wyoming	Canada
43	25	30	85

4. Maintain all current winter habitat in the Tristate Region.

Remember, this is a comprehensive population plan, not a project level plan. This plan's objectives and managment strategies will be reviewed and updated every 5 years.

In July 1984, the Pacific Flyway Council endorsed the Rocky Mountain Population (RMP) and Pacific Coast Population (PCP) Trumpeter Swan Management Plans.

The March 1984 North American Management Plan for Trumpeter Swans draft was updated with minor changes and one major change which was in a continent-wide objective pertaining to winter feeding. The new objective will read:

"Except as determined to be necessary for the maintenance of the RRLNWR and the Lacreek NWR swan flocks, phase-out supplemental feeding programs and the artificial maintenance of ice-free water areas for all U. S. wintering swan flocks by 2000."

And relative to this, the RRLNWR (Red Rock Lakes National Wildlife Refuge) has been asked to add a procedure relating to an evaluation of RRLNWR winter feeding.

MANAGEMENT PROCEDURES

1. Annual Review of Plan.
   a. RMP Subcommittee reviews progress in March and July each year. Subcommittee is comprised of one representative from each state and province, USFWS & CWS.
   b. Chairman of RMP will attend meetings and coordinate with the Pacific Flyway Study Committee (direct link to Flyway Council), the Interior Population (IP) and PCP Subcommittees.
   c. The Trumpeter Swan Society's link to the RMP Subcommittee would best be accomplished through the chairman.
   d. It shall be the responsibility of each Subcommittee member to assure that the objectives and management procedures of this plan are integrated and coordinated with those plans and activities of the various wildlife and land management agencies, interest groups and local planning systems within their purview.

2. Establishment of New Wintering Sites.
   a. Identify potentials.
   b. Wyoming program.

3. Redistribution Programs, Restoration Flocks, and Aviculture.
   a. First priority - RMP range extension.
   b. Guidelines developed by July 1986 to include allowable removal rates, prioritization of use and coordination with other subcommittees on priorities for restoration and avicultural uses.

4. Hunting Restrictions.
   a. Population Subcommittee coordination to resolve population management conflicts between species.

5. Interpretative Program.
   a. Will require a lot of support from The Trumpeter Swan Society.

6. Habitat Identification and Protection.
   a. Swan distribution and range mapping.
   b. Development of geo-based information system.
   c. Water regime data collection.

7. Population Survey.
   a. Winter and autumn survey.
   b. Format and method for annual assessment to measure annual change against objectives developed and evaluated by Subcommittee. (Example--management action taken by Subcommittee relative to removal.)

8. Red Rock Lakes NWR.
   a. Coincidental with refuge management practices and objectives for Trumpeter Swans.

9. Harriman Park and Snake River.
   a. Coincidental with Idaho Fish and Game and State Park coordinated management to safeguard this winter habitat.

10. Human Disturbance Regulation in Yellowstone National Park (YNP) and Grand Teton National Park.
    a. Coordinate management in past recommendations.
    b. Future recommendations.

11. Color-marking.
    a. Subcommittee coordination of protocol.
    b. State reporting systems and follow up.

12. Tristate Disease Investigation.
    a. 1982-1986.

13. Mute Swans.

14. Wyoming.
    a. Coincidental with objectives and strategies for Trumpeter Swans in Wyoming management areas (YNP, Snake R., Green R.).

15. Investigation of Causes of Tristate Decline.
    a. Original intent to assess the situation.
    b. Latest development on how the assessment will be conducted.

16. Wetland Inventory.
    a. Need for!
    b. How?

* * *

MANAGEMENT OF THE TRISTATE SWAN SUBPOPULATION

Bob Shields, Deputy Regional Director
Region 6, USFWS
Denver, CO 80226

Thank you for the opportunity to address the Ninth Trumpeter Swan Society Conference and to discuss, in a general way, the management of the Tristate Swan Subpopulation. Hopefully, this presentation will lead you from the U. S. Fish and Wildlife Service's (USFWS) policy to what is actually being accomplished at the ground level for the swans. Tristate swans are those that both nest and winter in the area where the boundaries of Montana, Wyoming, and Idaho join. This would include such important sanctuaries as the Yellowstone and Grand Teton National Parks and the Red Rock Lakes National Wildlife Refuge which was established in 1935 specifically to protect these swans. During the winter months, Tristate Trumpeters are joined by other Trumpeter Swans migrating from interior Canada. Together, these birds make up the Rocky Mountain Population.

Two draft plans currently exist which specifically address Tristate Trumpeter Swan management. The broader, and more long-range plan is the North American Management Plan for Trumpeter Swans which includes a section on the Rocky Mountain Population. The other plan is USFWS's 5-year National strategic plan for Trumpeter Swans. Both plans are still in the draft stage and could be modified if good biology should dictate. Both have been developed simultaneously and are similar in content where the Tristate Subpopulation is concerned. The Pacific Flyway Subcommittee for Trumpeter Swans prepared

the North American Management Plan for Trumpeter Swans with input from the USFWS, Central Flyway, Canadian Wildlife Service, and several Canadian Provinces; whereas the USFWS National Strategic Plan was prepared by the USFWS input from specific state game agencies, Flyway Council Members, and other interested parties. The principal difference between the two plans as related to the Tristate Subpopulation, is that the National Strategic Plan identifies work to be carried out primarily by the USFWS. The major area of this work falls within the Rocky Mountain Region (Region 6) of the Service. Some related efforts will be accomplished in Idaho, which is within the Pacific Region of the USFWS (Region 1, with Headquarters in Portland). Personnel from both regions have been involved in the development of the National Strategic Plan.

Before I stray from the National Strategic Plan, I should provide some insight on how this plan came about. Some of you have heard of the Service's relatively new emphasis on wildlife species of National interest. There are currently 54 of these species which have been designated National Species of Special Emphasis (NSSE). The Trumpeter Swan has been so labeled. As a result, management of Trumpeter Swan populations is being reviewed and stategies are being developed for managing these birds. This work was first conducted by the USFWS at Regional offices and, then recently, regional strategies were consolidated into a draft National Strategic Plan by the Service's Office of Migratory Bird Management.

The USFWS National Trumpeter Swan Strategic Plan prescribes increased emphasis on the Rocky Mountain Population. In particular, more attention is to be given to the management of USFWS land for wintering Trumpeters until other wintering habitats are utilized by Trumpeters. Also prescribed is the development and implementation of a program to increase cygnet survival. Additionally, in 1984, the USFWS initiated a 3-year moratorium on the removal of eggs, cygnets, or older swans from the Tristate Subpopulation, except for salvage operations. These USFWS strategies for the short-term, along with strategies dealing with population surveys, refuge public-use programs, and public education are in agreement with the long-term program described in the North American Management Plan for Trumpeter Swans.

Both plans call for the review of all new information made available since the publication of Winston Banko's classic The Trumpeter Swan published in 1960. This important review effort is now underway with direction being provided by Dr. Joe Ball at the Cooperative Wildlife Research Unit, University of Montana. Ruth Gale is assisting Dr. Ball in this endeavor. They are now gathering all available information concerning the Rocky Mountain Population with emphasis on the Tristate Subpopulation for publication to occur about 2 years from now. Representatives from Montana, Idaho, and Wyoming and The Trumpeter Swan Society are participating. The USFWS has provided $50,000 to date toward this $58,000 effort. The importance of this 2-year study cannot be overemphasized. As you have probably surmised, some differences exist as to what future management for the Tristate Subpopulation of Trumpeters should be. The results of Dr. Ball's and Ms. Gale's work should provide some excellent insight after which draft plans will be finalized to form documents from which sound management and research projects would ensue. In a separate but related effort, the USFWS has cooperated with a representative of The Trumpeter Swan Society in an exhaustive search of files and records at Red Rock Lakes NWR for biological information related to swans and other waterfowl. The USFWS is pleased to assist the Society in this and similar ventures. No doubt, there are probably changes in the wind that will benefit the Tristate Trumpeters.

Commitments by the Service for research must be based on sound proposals. These submissions would be ranked against other worthwhile migratory bird proposals. The outcome, of course, would depend on the priorities recognized and the availability of funds. As you all know, the necessity to limit Federal spending is a strong reality. Competition for research and other monies is acute. Research proposals on Trumpeter Swans must, of necessity, withstand the test of fire. It appears that the decline of cygnets to the ratio of adults and subadults in the current Tristate Subpopulation along with other considerations will favor more Trumpeter research.

Another consideration that I should mention is the change of leadership in the USFWS involving the Office of Migratory Bird Management. Former chief of the office, Dr. John P. Rogers, is in the process of transferring to our Alaska Region as the Assistant Regional Director for Wildlife Resources. Dr. Rollin D. Sparrowe will be the new Chief. Dr. Sparrowe comes from the Service's Division of Wildlife Research.

As most of you know, the Red Rocks Lakes National Wildlife Refuge and its surrounding environment in the Centennial Valley of southwest Montana is the principal use and breeding area for the non-migratory flock of Tristate birds. The Red Rock Lakes Refuge consists of 40,300 acres of which 32,350 acres were designated by Congress in 1974 as wilderness. Some serious thought did go into this designation as the act permits the use of motorized equipment for winter feeding and other management activities within the wilderness zone. Additionally, latitude is provided to deal with siltation problems in the lakes if sometime in the future, siltation should prove to be detrimental to the waterfowl resource.

I would now like to discuss some specific actions that have recently occurred or are now occurring on or near the Red Rock Lakes Refuge. I have previously mentioned the literature search and compilation being accomplished by Dr. Ball.

The USFWS is also assisting in funding the Wyoming Game and Fish Department in a Trumpeter Swan disease investigation. This ongoing work involves the sampling of blood and tissues of birds from the Refuge to analyze and determine the presence or absence of pathogens associated with cygnet mortalities and suppressed productivity. Concurrently, Larry Blus, a USFWS researcher, has been taking blood samples to test for the presence of heavy metals.

Another project utilizes Refuge staff to provide information on movements and habitat use patterns of Trumpeter Swans within the Centennial Valley. Radio transmitters were placed on swans this summer to track local swan movements and to document seasonal and annual habitat use patterns.

Additionally, Dr. Dave Anderson, Unit Leader, Utah Cooperative Wildlife Research Unit, Logan, Utah, and his student, R. C. Herron, have recently completed an analysis of all of the banding data of swans from the Refuge. Because this species is not hunted, there have been few recoveries. Consequently, the analysis has not resulted in any significant management insights. However, the data suggest that the annual survival rate for adult swans is 80 to 88 percent. Work is being conducted to effect a more adequate banding and resighting program including young birds.

Winston Banko (1960) indicated some lead poisoning problems may exist in the Centennial Valley. A Trumpeter Swan was diagnosed recently as dying from lead ingestion. Some parties feel that swans are picking up lead outside of the Refuge. The Red Rock Lakes Refuge is currently under consideration by USFWS for intensive lead sampling studies to begin this fall. Lastly, Dr. John Moore, University of Montana, is studying the rate of siltation occurring in the Red Rock Lakes.

As you can see, some active and interesting work is taking place in the Centennial Valley. The results of this work and other studies underway, along with the continued professional input from The Trumpeter Swan Society, should do much to enhance the future of the Tristate Trumpeter Swan Subpopulation.

* * *

STATUS OF THE TRISTATE SUBPOPULATION AND THE ROCKY MOUNTAIN WINTER POPULATION OF TRUMPETER SWANS

Barry Reiswig
Refuge Manager
USFWS, Red Rock Lakes NWR
Monida Star Route, Box 15
Lima, MT 59739

The Tristate Region of northeast Wyoming, southeast Idaho, and southwest Montana contains the primary breeding range of the Tristate Subpopulation of Trumpeter Swans as well as the primary winter range for the entire Rocky Mountain Trumpeter Swan Population. Personnel of the Red Rock Lakes National Wildlife Refuge (NWR) conduct annual aerial surveys of the Tristate Subpopulation in September and of the entire Rocky Mountain Population in February. This report highlights the results of the last series of surveys conducted in fall 1983 and winter 1984.

I would like to acknowledge the work of Assistant Manager Terry McEneaney of the Red Rock Lakes NWR and Refuge Manager/pilot Robert Twist of the Lee Metcalf NWR for data collection and compilation during portions of the surveys.

TRISTATE SUBPOPULATION STATUS

Attempts have been made to survey the Tristate Subpopulation in one form or another since the early 1930's. Beginning in the 1950's, aerial surveys were conducted annually by the U. S. Fish and Wildlife Service and others until 1968 when the surveys were conducted once every 3 years. Beginning in 1983, the survey was again upgraded to an annual event. The 1983 survey was flown from 12-15 September. A total of 452 Trumpeter Swans (398 adults, 54 cygnets) were observed in the Tristate Region. This represents a 7 percent decrease from the 1980 survey and a 23 percent decrease from the survey conducted in 1968 (Table 1).

Table 1. Tristate Trumpeter Swan Survey, 1968 - 1983.

Year	Adults	Cygnets	Total
1983	398 (88%)	54 (12%)	452
1980	462 (95%)	23 (05%)	485
1977	403 (82%)	86 (18%)	489
1974	459 (85%)	83 (15%)	542
1971	431 (86%)	68 (14%)	499
1968	431 (74%)	154 (26%)	585

The cygnet count of 54 was considerably higher than the 1980 count of 22 (23 in Table 1), which was the lowest count since 1934, but was still well below the 50-year average of 77 cygnets observed in the Tristate Region (Figure 1).

Of the Tristate total, 260 swans (228 adults, 32 cygnets) were observed in Montana; 98 swans (92 adults, 6 cygnets) were observed in Idaho; and 94 swans (78 adults, 16 cygnets) were observed in Wyoming (Table 2.)

Table 2. Tristate Subpopulation distributed by state, 1983.

Year	Montana	Wyoming	Idaho
1968	365 (62%)	126 (22%)	94 (16%)
1971	346 (69%)	87 (17%)	66 (13%)
1974	404 (75%)	50 (09%)	88 (16%)
1977	331 (68%)	91 (19%)	67 (13%)
1980	322 (66%)	80 (17%)	83 (17%)
1983	260 (58%)	94 (21%)	98 (21%)

Since 1931, Red Rock Lakes NWR has produced slightly more than half (56 percent) of the cygnets observed in the Tristate Region, however, in 1983, only 35 percent (19 cygnets) of the Tristate cygnets were produced on the Refuge.

ROCKY MOUNTAIN WINTER POPULATION STATUS

The 1984 midwinter Trumpeter Swan survey was conducted from 5-9 February. A total of 1460 Trumpeter Swans (1128 adults, 332 cygnets) was observed when survey figures were corrected for the presence of Tundra Swans in the flocks. This represents a record count for the wintering Rocky Mountain Population (Table 3). Ground truthing of many of the primary wintering areas revealed approximately 54 Tundra Swans in the Region.

Table 3. Midwinter Trumpeter Swan Survey, 1975 - 1984.

Year	Adults	Cygnets	Total
1984	1128 (77%)	332 (23%)	1460
1983	1025 (83%)	207 (17%)	1232
1982	952 (78%)	266 (22%)	1218
1981	1000 (80%)	247 (20%)	1247
1980	767 (82%)	172 (18%)	939
1979	743 (86%)	123 (14%)	866
1978	695 (80%)	179 (20%)	874
1977	839 (82%)	178 (18%)	1017
1976	623 (86%)	102 (14%)	725
1975	595 (82%)	128 (18%)	723

Idaho had the largest number of wintering swans with 665 birds (503 adults, 162 cygnets) (Table 4). Of these, Harriman State Park held 213 birds and the Teton Basin held 226 birds. A total of 498 Trumpeter Swans was counted in Montana (389 adults, 109 cygnets). Hebgen Lake and the Red Rock Lakes NWR were the primary wintering areas with 229 and 197 birds, respectively.

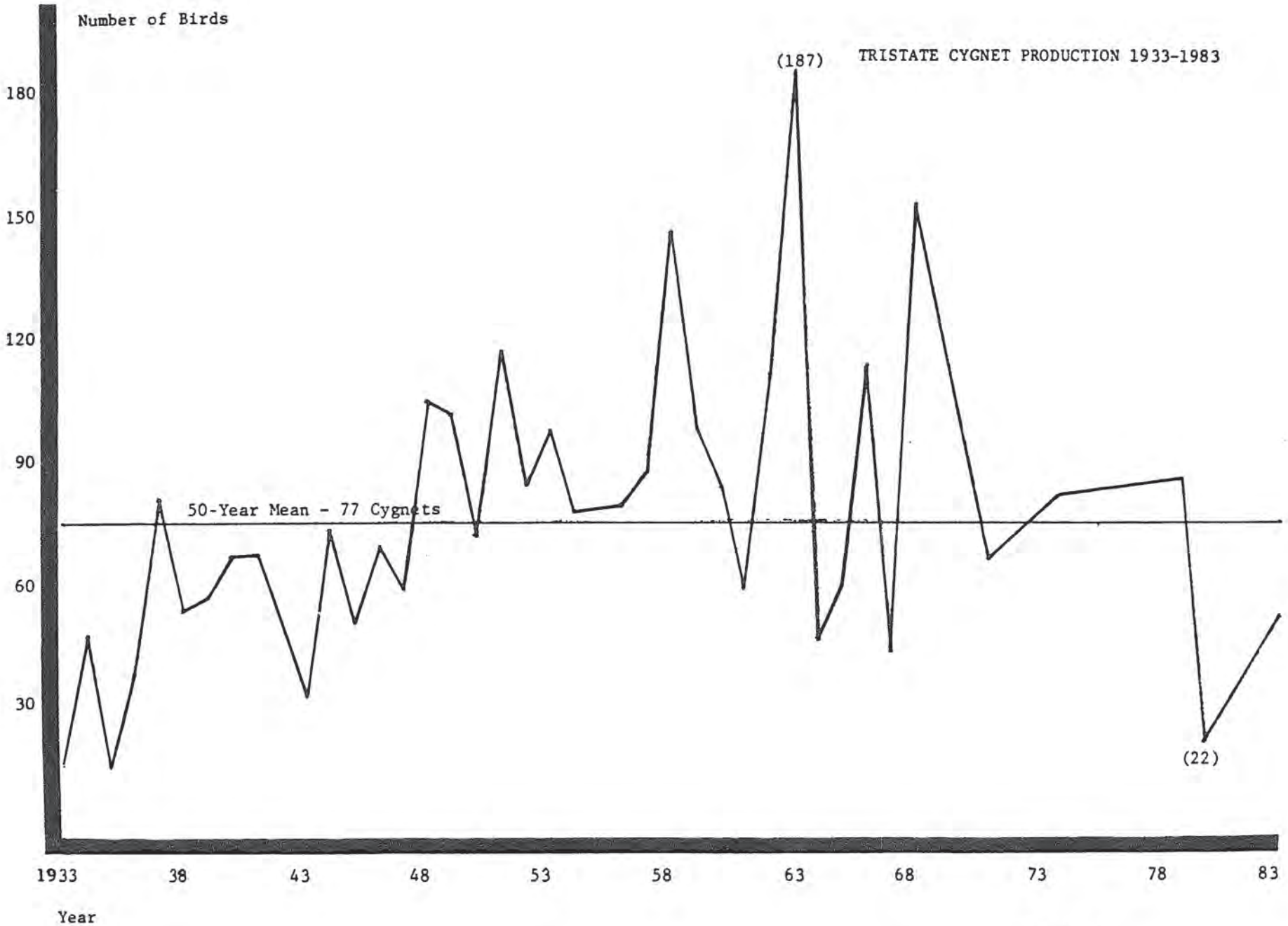

Number of Birds
TRISTATE CYGNET PRODUCTION 1933-1983
(187)
180
150
120
90
60
30
50-Year Mean - 77 Cygnets
(22)
1933
38
43
48
53
58
63
68
73
78
83
Year

Figure 1.

Wyoming held 297 Trumpeter Swans (236 adults, 61 cygnets). Of these, 199 individuals were observed in Yellowstone National Park.

Table 4. Midwinter Trumpeter Swan distribution by state.

Year	Montana	Wyoming	Idaho
1984	498 (34%)	297 (20%)	665 (46%)
1983	422 (34%)	195 (16%)	615 (50%)
1982	480 (39%)	172 (14%)	566 (47%)
1981	388 (31%)	379 (30%)	480 (39%)
1980	454 (48%)	165 (18%)	320 (34%)

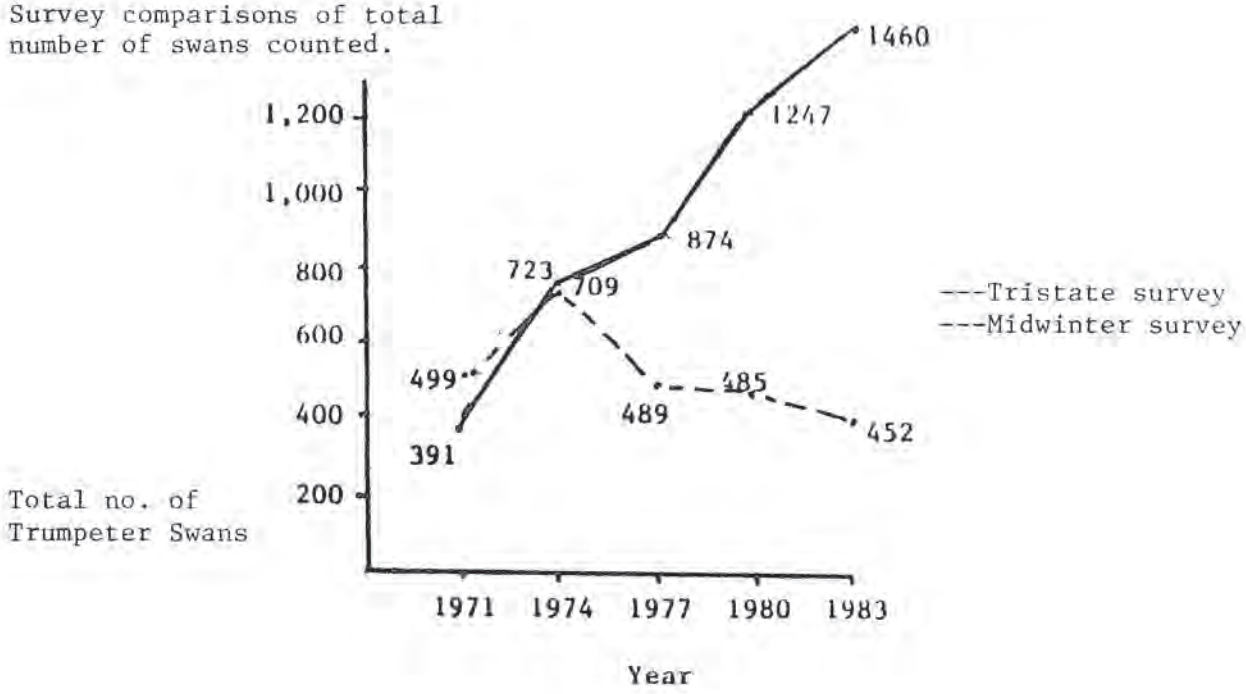
Cygnets comprised 23 percent of the total number of Trumpeter Swans counted on the survey, a record.

DISCUSSION

Based on the results of the Tristate surveys and other population work, there is no question the Tristate Subpopulation is on the decline. Although poor spring weather is a principle factor for poor production in recent years, other as yet undetermined factors appear to be playing a role in the apparent decline.

On the other hand, the Rocky Mountain Winter Population as a whole has never looked better (Figure 2). New population highs are being set with virtually every midwinter survey, despite the declining Tristate Subpopulation.

Figure 2. Survey comparisons of total number of swans counted.



When Tristate Subpopulation estimates are added to estimates of the Interior Canada Subpopulation swans, a shortfall of approximately 600 swans occurs when compared to midwinter survey estimates. The breeding grounds of these birds are presently unknown although areas of the Yukon Territory, British Columbia, and possibly Alaska are likely.

STATUS REPORT: A PILOT PROJECT TO TRANSPLANT TRUMPETER SWANS INTO ELK ISLAND NATIONAL PARK, ALBERTA

Len J. Shandruk
Habitat Biologist
Canadian Wildlife Service
Room 1000, 9942 - 108th Street
Edmonton, Alberta T5K 2T5

Gordon Holton
Alberta Energy & Natural Resources
Alberta Fish and Wildlife Division
BAG 900-26
Peace River, Alberta T0H 2X0

A. BACKGROUND - HISTORICAL PERSPECTIVE

A program to transplant Trumpeter Swans was initiated in Alberta in 1983 under the assumption that the number of swans breeding in the Province is limited by the availability of wintering habitat in the U. S. Tristate Region. This assumption appears reasonable, because Trumpeter Swans for Alberta have been observed wintering only in the Tristate Region and because the large majority of these swans winter on a 14 km portion of the Snake River near Harriman State Park in Idaho.

The successful implementation of the transplant project called for the establishment of a breeding population of Trumpeter Swans in presently unused, suitable habitat in Alberta, but which winter away from the present concentration of swans in the Tristate Region. Use of wintering habitat away from the Tristate Region would reduce overcrowding problems and thereby reduce the vulnerability of those swans to a catastrophic decline.

B. OVERVIEW OF PILOT STUDY

A pilot project was initiated in 1983 to establish a new population of Trumpeter Swans which would migrate to and winter on the Pacific Coast of Canada. The pilot project was considered necessary in order to evaluate transplant techniques to ensure that a full scale transplant program would not proceed until it was clearly demonstrated that new migration, wintering, and breeding traditions could be established.

The site chosen for the pilot project was Elk Island National Park near Edmonton, Alberta. This site was chosen because (1) it is situated within the historic range of Trumpeter Swans, (2) preliminary surveys indicated an abundance of suitable habitat, and (3) public access to the release sites could be controlled, thereby minimizing the disturbance of the swans.

The transplant techniques used for the swans were similar to those used to transplant Canada Geese but modified to accommodate the specific objectives of this project:

1. Three to four adult female Trumpeter Swans were captured at Powell River, British Columbia, and flown to the Brooks Wildlife Centre.
2. Partial clutches of swan eggs totalling 15-20 were removed from active swan nests in the Grande Prairie Region and delivered to the Brooks Centre. The eggs were collected late in the incubation period to ensure that some natural incubation of the eggs had occurred prior to their collection. Eggs which had been added last to the clutch (i.e. those which were least stained) were collected preferentially, because the hatching success of those eggs was lower than earlier-laid eggs. Canoes were used to gain access to the nest sites in both years, but a helicopter also was used in 1984. Swans did not flush from the nest when the helicopter hovered 100-150 m from the nest, but left when an individual disembarked from the hovering craft. Nesting Trumpeter Swans had returned to their nests when checked 2-3 hours later. Although no swans abandoned their nests due to egg gathering activities, in the future egg collection must be conducted more secretively because any activities on swan nesting lakes and their potential disturbance may conflict with public perceptions of restricted land use of those lakes.
3. The eggs were delivered to the Brooks Wildlife Centre and hatched in incubators. After hatching, the cygnets were reared for approximately 3 weeks before being placed with the adult guide bird.
4. Broods of three to six cygnets were placed with each quide bird and held as separate family groups from early July to late August. Separate family groups were used to encourage the formation of a strong family bond similar to that which the swans experience in the wild.
5. Prior to their release, the adult swan and cygnets were banded and collared with radio transmitters to facilitate tracking of the swans.

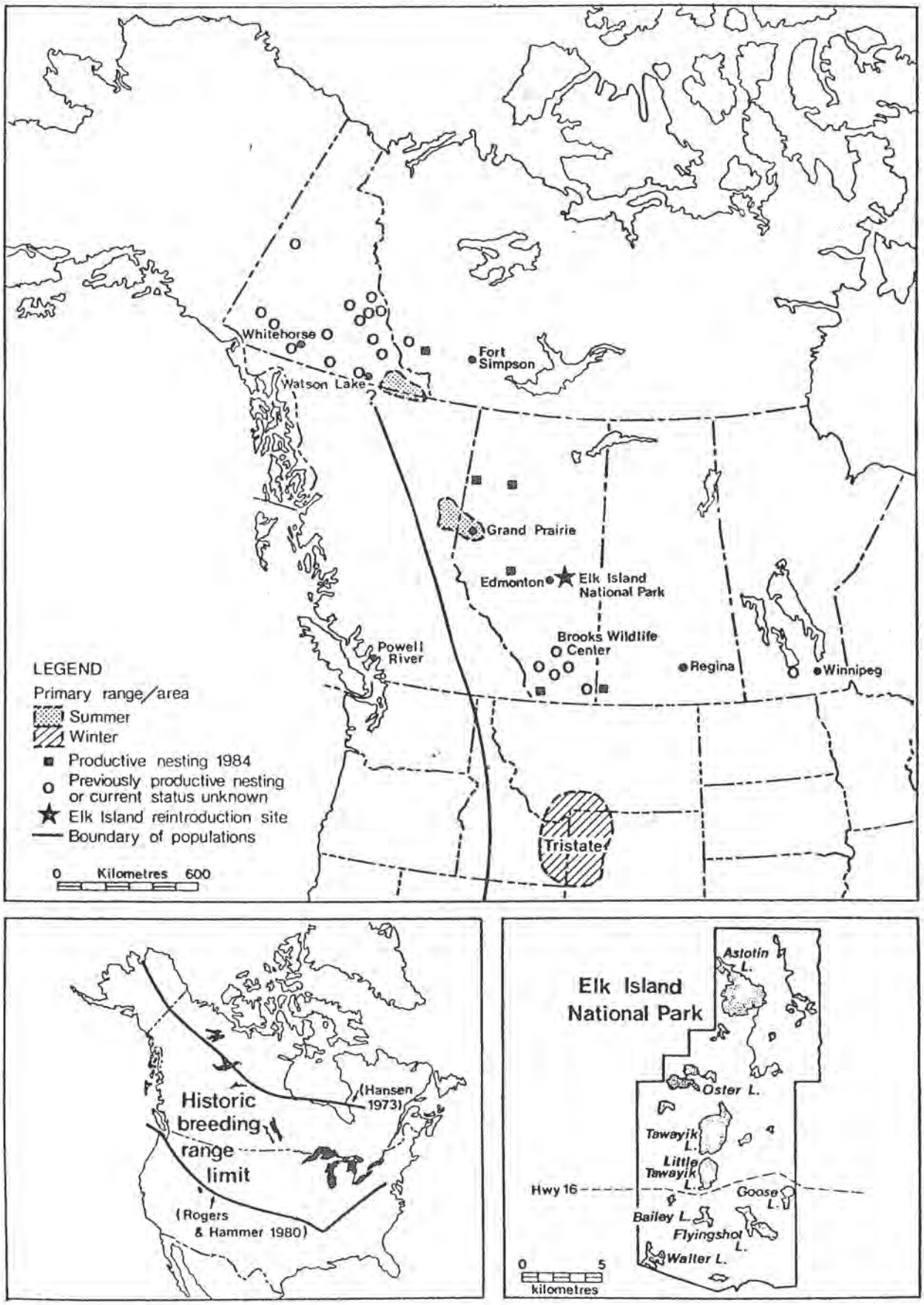


Figure 1. Key Locations: Elk Island National Park Trumpeter Swan Transplant Project.

6. The family groups were released on separate lakes in Elk Island National Park in late August and early September. Initially the guide birds and cygnets were held in pens to ensure a uniform release of each family group, thereby minimizing stress to the swans.
7. After their release, the family groups were monitored on a weekly basis by ground crews and aerial surveys. In 1984, family groups will be monitored on a daily basis during the onset of freeze-up.

C. RESULTS TO DATE

1. Guide birds have been successfully captured at Powell River Municipal Bird Sanctuary in 1983 and 1984 and transported to the Brooks Centre.
2. Seventeen eggs were collected from Trumpeter Swans in the Grande Prairie Region in 1983 and 16 eggs in 1984. These eggs successfully hatched, producing 17 cygnets in 1983 and 11 cygnets in 1984. The theoretical impact of removing these eggs and eggs for other transplant projects accounted for 10-15 percent of the natural production of cygnets from the Grande Prairie Region.
3. In 1983, three artificial family groups totaling three adults and 16 cygnets were radio-collared and released on three lakes in Elk Island National Park. Three family groups totalling three adults and 10 cygnets will again be released this autumn.
4. The 1983 swans adapted well to the lakes in Elk National Island Park, but some problems were experienced with the radio-collars and with predation of the cygnets. Nevertheless, 10 cygnets are known to have fledged from the Park in 1983 and migrated south by mid-November.
5. The last reported sightings of migrating swans occurred in November 1983 in southwestern Alberta. Unfortunately, malfunctioning of the radio transmitters prevented successful tracking of the swans to their wintering area. However, there is considerable evidence that two guide birds wintered on a cooling pond near Wabamun, Alberta, approximately 25 km west of the release site at Elk Island National Park.
6. Surveys of wintering areas near Powell River and in the Tristate Region did not reveal any transplanted swans. However, these surveys were not exhaustive and, therefore, the presence or absence of transplanted swans was not definitively shown.
7. No collared juvenile Trumpeter Swans were observed at Elk Island National Park in the spring of 1984.

D. 1984 INITIATIVES TO OVERCOME 1983 PROBLEMS

1. The radio-collars to be used this year have been redesigned to overcome problems encountered in 1983. First, the whip antenna on the collars has been replaced with a loop antenna which is part of the collar. This should eliminate radio failure due to antenna loss. Second, lithium batteries will be used to power the radio transmitters rather than solar panels used in 1983. This will ensure that the radio transmitters function under all weather conditions. Third, the radio transmitters will be encased in dental acrylic rather than silicone to waterproof the transmitters.
2. More intensive ground monitoring of the swans will take place this year especially during the critical freeze-up period to determine the exact departure time of the swans from Elk Island National Park. In addition, intensive ground and airborne radio tracking of the swans will be undertaken to determine migration routes and wintering areas.
3. Once their wintering grounds are located, the adult guide birds may be recaptured to ensure that they do not adversely influence the migration of the cygnets back to Elk Island National Park.
4. Efforts will be made to track the return migration of the cygnets to their summer habitat.

E. CONCLUSION

The future and long-term health of the Interior Canada Subpopulation of the Rocky Mountain Population of Trumpeter Swans is dependant on the establishment of new wintering areas. Unfortuately, the results of the 1983 transplant program are inconclusive regarding the establishment of a new wintering area. However, this program has successfully collected and incubated eggs and successfully reared cygnets. In 1984, the ability of the transplanted swans to migrate must be fully evaluated to determine if the pilot restoration project is a success.

* * *

DRAFT PROPOSAL:

A LONG RANGE HABITAT MANAGEMENT STRATEGY FOR THE INTERIOR CANADA SUBPOPULATION OF TRUMPETER SWANS

Len J. Shandruk
Habitat Biologist
Canadian Wildlife Service
Room 1000, 9942-108th Street
Edmonton, Alberta T5L 2T5

I. INTRODUCTION

Next to the Whooping Crane (Grus americana), the Trumpeter Swan (Cygnus buccinator) is the rarest migratory bird in the interior of western Canada. Those few Trumpeter Swans which breed in Canada are part of the Rocky Mountain Population and are referred to as the Interior Canada Subpopulation. This western Canadian breeding population numbers about 450 birds. This is approximately one-half of the total Rocky Mountain Population and 4.5 percent of the world population. Increased recreational demands, expansion and intensification of agriculture, resource exploration and development, urban expansion and rural subdivisions have led to increasing levels of disturbance and habitat degradation within this interior breeding range. Without management, these habitat trends will ultimately decimate the population of Trumpeter Swans breeding in Canada, resulting in extirpation.

Trumpeter Swan habitat protection and management is a function of land use control and management. In Canada, these functions fall under the jurisdiction of numerous government and non-government groups and private land owners. The Migratory Bird Convention Act (1916) is the legislative mandate which charges the Federal government with the responsibility for the conservation of the migratory bird resource within Canada. The Canada Wildlife Act (1973) requires that the Federal government undertake cooperative wildlife management habitat programs across Canada. These acts are administered by the Canadian Wildlife Service (CWS) on behalf of Environment Canada. It is, therefore, the responsibility of CWS to coordinate efforts which will conserve and protect the habitat base for Trumpeter Swans nesting in Canada.

The purpose of this strategy is to outline the goals, actions, and agency roles required to ensure the long-range conservation of the Canadian breeding population of Trumpeter Swans and to foster a coordinated international commitment to this important wildlife management concern.

II. BACKGROUND AND HISTORIC PERSPECTIVE

In Canada, the Trumpeter Swan formerly nested from Ontario to British Columbia and north as far as southern Northwest Territories (N.W.T.) and the Yukon (Figure 1). The majority of these birds wintered along the Mississippi River, the Atlantic, Gulf, and Pacific coasts (Rogers and Hammer 1980). During the early 1800's, Trumpeter Swans nesting in Canada were nearly extirpated by a combination of hunting and habitat destruction. An historical summary of conservation efforts in Canada is provided in Table 1.

1.1 Current Status

Today, virtually all of the Trumpeter Swans presently breeding in Canada are part of the Rocky Mountain Population (RMP). The RMP is divided into a non-migratory Tristate Subpopulation and a migratory Interior Canada Subpopulation which also over-winters in the Tristate (Figure 1). Current population estimates are summarized in Table 2. Of the 450-480 birds in the Interior Canada range, 60 percent utilized habitat in the Peace River block of northwestern Alberta and northeastern British Columbia and another 30 percent utilized habitat in the Toobally Lakes region of southeastern Yukon Territory. The majority of birds breeding in Canada utilize habitat in two localized areas and the rest (about 10 percent) are scattered from southern Alberta to southwestern N.W.T. (See Figure 1).

Table 1. Chronology of Canadian conservation efforts.

1900's -	Trumpeter Swan population in North America was believed to be made up of 66-69 birds.
1916 -	Migratory Bird Convention signed by USA and Britain on behalf of Canada.
1918 -	Trumpeter Swans first documented in the Peace River region of Alberta.
1920 -	Canadian government established three Migratory Bird Sanctuaries for Trumpeter Swans in Itatsoo Lake, Vaseaux Lake, and Saskatoon Lake.
1930's -	Winter feeding programs initiated for Trumpeter Swans in British Columbia.
1931 -	Cypress Hills Provincial Park established in Saskatchewan.

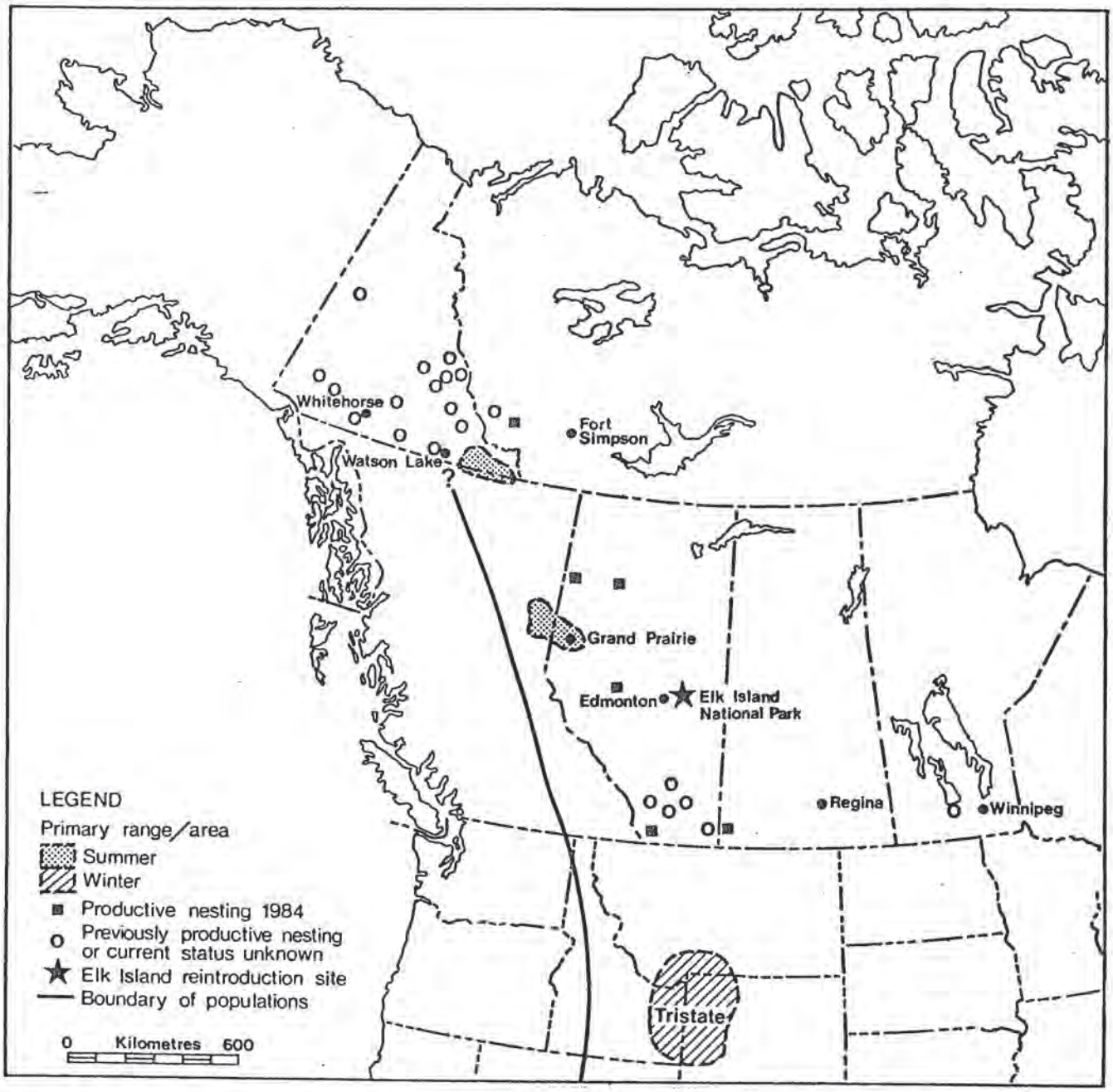


Figure 1. Current distribution of the Interior Canada Subpopulation of Trumpeter Swans.

1946 – Peace River swans first surveyed, 100 swans counted.

1951 – Trumpeter Swans reported to have successfully bred in Cypress Hills of southeastern Alberta.

1952 – Five Trumpeter Swans from Lonesome Lake, British Columbia, were shipped to the Severn Wildfowl Trust in England. Progeny from these birds have provided some breeding stock in captivity worldwide.

1953 – CWS initiated banding and collaring of Trumpeter Swans in the Grande Prairie, Alberta, region.

1956 – Delta Waterfowl Research Station in Manitoba initiated artificial propagation and reintroduction program with birds from Red Rock Lakes National Wildlife Refuge.

1957 – CWS initiated fall Trumpeter Swan surveys in the Peace River District.

1968 – The Trumpeter Swan Society founded.

1970-1972– Alberta Fish and Wildlife Division (AFWD) biologist conducted first detailed reproductive performance studies of Trumpeter Swans in the Peace River area.

1972 – Nahanni National Park established in the Northwest Territories.

1978 – Trumpeter Swans designated as rare in Canada by COSEWIC.

1978 – CWS initiated surveys of southern Yukon to determine status and distribution of Trumpeter Swans.

1978 – Holton initiated M.Sc. thesis research on habitat use by Trumpeter Swans in the Grande Prairie region of Alberta.

1979 – AFWD established a repository of land use information and guidelines to control Crown land use on Trumpeter Swan habitat.

1982 – AFWD prepared a management plan for Trumpeter Swans in Alberta.

1982 – Ontario transplant program initiated.

1982 – Alberta Parks and Recreation Department initiated planning for a Trumpeter Swan interpretation program at Saskatoon Lake.

1983 – North American Management Plan for Trumpeter Swans initiated with contribution from CWS.

1983 – Parks Canada and AFWD initiated pilot project to establish breeding population of Trumpeter Swans at Elk Island National Park.

1983 – CWS developed Proposed Guidelines for Transplanting Trumpeter Swans in Canada.

1984 – CWS initiated development of a habitat strategy for the Interior Canada Subpopulation of Trumpeter Swans.

Table 2. Status of Interior Canada Subpopulation of Trumpeter Swans (adult and subadult) – 1984.

Location	Known population		Source
	Total	Percent	
Alberta: Peace River Area	260 (43 pairs)	59	CWS, AFWD Survey Data
Pioneer flocks (3)	25 (10 pairs)		CWS, AFWD D. Russell, G. Holton
British Columbia	apx. 22+ (10 pairs)	5	CWS estimate
Yukon Territory	apx. 150 (50 pairs)	31	R. McKelvey, et al. 1983
Northwest Territories	18 (7 pairs)	4	K. McCormick p.c.
Saskatchewan	5 (1 pair)	1	D. Nieman p.c.
Total	apx. 480 (128 pairs)		

1.2 Habitat description

The Peace River District is biophysically a northern extension of the aspen parkland surrounded by the boreal mixed-wood forest. Large shallow lakes and marshes occur within both the Peace River parklands and boreal mixed-wood forest. Historically, it is believed that Trumpeter Swans nested on the more productive aspen parkland marshes and lakes within the Peace River District.

Today, however, the Peace River aspen parkland is almost totally in agricultural production. This area has also had an extensive amount of industrial activity associated with the petroleum and forest products industry. Recreational use of lakes in this area has had and will continue to have an impact on Trumpeter Swan habitat use. As a result, Trumpeter Swans now utilize wetland breeding and staging habitats in both the aspen parkland and boreal mixed-wood forests of the Alberta, British Columbia, Peace River District (Figure 1).

Trumpeter Swan breeding and summering habitat in the southern Yukon, southwestern Northwest Territories, and northern British Columbia area is similar to the boreal mixed-wood forests of the Peace River District. The climax vegetation on most areas below the subalpine consists of white and black spruce with a moss or moss-shrub understory. Various fire, slope, and aspect subclimax communities of lodgepole pine, aspen, and larch also occur throughout. Trumpeter Swans in the southern Yukon utilize long deep lakes such as Toobally Lakes for summering and staging. Perched basins associated with moraines, terraces, and beaver impoundments along valley bottom streams provide nesting habitat.

1.3 Habitat Issues

The major problems associated with Trumpeter Swan habitat in Canada can be broadly classified into three areas: habitat degradation, habitat loss, and disturbance. Each is discussed separately below.

1.3.1 Habitat Degradation

This phenomenon is most prevalent in the Peace River parkland and is largely related to intensification of land use. It is a gradual process which results in the inability of wetland habitats to maintain or produce wildlife. More than 50 percent of the swan breeding lakes in the Peace River parkland are at least partially surrounded by private lands which have minimal or no land use restrictions associated with them.

1.3.2 Habitat Loss

The majority of habitat loss is associated with drainage and water manipulation projects to accommodate a desire to increase agricultural production, allow for urban expansion or industrial development. The major problem areas are associated with private lands, although several swan breeding lakes surrounded by Crown lands are subjected to intensive grazing and haying.

1.3.3 Disturbance

The third factor presently affecting Canadian breeding swans is disturbance or related activities. Disturbance can be attributed to agriculture, gas and oil exploration and development, forestry and recreational activities.

In Alberta, a majority of land uses and their subsequent disturbance impact on Crown property are controlled through a land use permitting system. Industrial activities can be controlled to limit their impacts during critical swan breeding periods. However, it is the secondary impact of these developments which improve public access and the resultant increase in recreational activities which are having and will have a profound impact on swan breeding habitat in Canada. A majority of the large shallow marshes within the settled areas of the Peace River parklands provide limited attraction to recreational users except where they are proximal to population centers. It is the deeper, more pristine and remote swan breeding lakes and ponds within the boreal and boreal mixed-wood forest, which are most attractive for recreational boating and fishing. This demand for recreational use of Trumpeter Swan breeding lakes must be managed and controlled if population numbers are to be maintained or expanded in Canada.

III. LONG RANGE GOALS AND OBJECTIVES

The guidelines for a wildlife policy in Canada state the following goals:

(1) to safeguard the ecosystems upon which all life depends;

(2) to preserve the diversity of species, which enables ecosystems to function and which Canadians use and enjoy; and

(3) to ensure that the enjoyment and use of wildlife is sustainable.

An underlying concept of these goals is that the management and protection of habitat is fundamental to the management and protection of wildlife. Environment Canada recognizes that Canadians are developing strong interests in species other than those which are hunted or commercially used, and that policies and laws should be enacted for any wild animal that requires protection.

The long-term goal in managing the Interior nesting Trumpeter Swan Population is:

(1) to conserve and protect adequate habitat to sustain healthy breeding populations of Trumpeter Swans in Canada.

Specific objectives in managing Trumpeter Swan habitat are:

1. By 1988, survey and document all habitat presently utilized and potentially suitable within the Interior Canada range.

2. By 1990, encourage the establishment of a minimum of six new United States or Canadian Interior wintering areas in addition to the Tristate Region, for future implementation by 2000.

3. Ensure maintainence of existing natural breeding and staging habitat in Canada capable of sustaining healthy populations.

4. By 1990, investigate the feasibility of expanding the current breeding range and doubling the population size, provided adequate wintering habitat is available.

5. By 1995, develop and implement a long-term Canadian habitat strategy to ensure that critial breeding, migration, and wintering habitats are protected and preserved for the Interior Canada Subpopulation.

6. Support the establishment of three new breeding populations (at least one in each prairie province) which nest in prairie Canada and over-winter outside the Tristate Region by 1995.

7. Monitor on a continual basis the status of pioneering flocks and determine whether limiting factors are habitat related.

IV. HABITAT MANAGEMENT ACTIVITIES

1.1 Inventory of Habitat

A key component and first step of this strategy is the determination of the location, amount, and quality of swan habitat in Canada. There is a need to define and agree to criteria for breeding, staging, and migration habitats for Trumpeter Swans throughout the range in Canada.

An accurate determination of the total Interior Canada Subpopulation and habitats presently utilized is a necessity. Alberta Fish and Wildlife Division has developed, and with CWS assistance continues to expand, a data base on swan breeding lakes in the Peace River parklands and pioneer flock locations in Alberta. Key components of this data base are: current land use and tenure, land use restrictions, use and productivity of wetlands, nest site location, and potential future land use demands. There is a need for consistent record keeping in a form which is available to all interested parties. Using remote sensing technology and the cooperative efforts of state/provincial agencies, it may be possible to review and upgrade baseline habitat and population data at 5-10 year intervals for the entire range of breeding birds in Canada.

1.2 Winter Habitat

Availability of winter habitat is the primary factor limiting the Interior Canada Subpopulation. Therefore, the development of alternate winter habitat sites is the first priority for swan habitat management. The majority of Trumpeter Swans breeding in Canada winter in the Tristate. The wintering habitat is limiting both the reproductive capabilities of the non-migratory Tristate Subpopulation and the growth of the Interior Subpopulation. The management and preservation of natural wintering habitat in the USA appears to be the most critical factor for the maintenance and/or expansion of the RMP. To this end, there is a need to influence and support efforts to establish new wintering areas in the U. S. In addition, there is a need to fully explore the possibility of establishing new wintering areas in Canada. The Pacific Coast and the Columbia River Basin are candidate areas, especially for transplant flocks. The CWS should assume responsibility for negotiating and advising with the U. S. and Canadian provinces on the establishment of additional wintering areas.

1.3 Habitat Enhancement

Currently, in Canada only minor efforts have been devoted to specifically enhancing or improving habitats for Trumpeter Swans. Some habitat enhancement for Trumpeter Swans has resulted indirectly from efforts by Ducks Unlimited and provincial water management agencies in the stabilization of water levels on swan breeding lakes. Also the creation of nesting islands for ducks and geese has provided secure loafing areas for swans. More effort is required to enhance swan productivity and increase habitat use by providing artificial nesting structures to provide more secure nesting sites for swans. The development and application of natural or artificial visual barriers to reduce the impact of disturbance activities is another technique to be evaluated.

As successful habitat enhancement techniques are developed, private conservation groups and interested individuals should be encouraged to undertake and monitor such activities on an ongoing basis. For example, in Alberta, local fish and game clubs currently apply for wildlife habitat enhancement funds under the Buck For Wildlife Program. A Pincher Creek Club has proposed a project to stabilize water levels in a swan breeding lake in their area.

1.4 Transplants

Establishment of alternate winter and breeding sites by transplanting swans will provide population and habitat stability and will help to buffer the population from major climatic or disease-related impacts. Several Canadian, provincial, and Federal agencies in western Canada are responding to increased public interest in viewing of Trumpeter Swans. Reestablishment of breeding concentrations throughout western Canada is being contemplated.

In addition, it is recognized that new wintering areas are required to provide more security to the current Canadian breeding populations as well as to accommodate any future increases. The Canadian Wildlife Service has proposed guidelines for transplanting Trumpeter Swans in Canada. A key policy statement in these guidelines is that CWS gives high priority to restoration by artifical means. Therefore, CWS should guide, encourage, and support efforts of provincial and Federal wildlife agencies and private groups in the formation and implementation of transplant projects. Ideally, the establishment of at least one breeding transplant flock in Manitoba, Saskatchewan, and Alberta with a wintering tradition in areas other than the Tristate will be promoted. The logistics and biological feasibility of such efforts are currently being investigated by the Elk Island National Park (EINP) transplant pilot project.

1.5 Regulation and Enforcement Needs

There is an immediate need to develop, in cooperation with the provinces and territories, legislation to designate priority swan breeding lakes as critical wildlife areas. This will in turn regulate surface activities such that habitat destruction and human-related disturbance is reduced or eliminated. All public lands within at least 500 m of such lakes should also be included in this designation. To complement this legislation, provincial and territorial wildlife agencies will be encouraged to place special status or designations on Trumpeter Swans under their specific wildlife acts. Regulations should be developed and enacted to prevent the importation, propagation, or release of Mute Swans in western Canada. It would be desirable to declare Mute Swans as problem wildlife and encourage their elimination. Where feasible, existing captive flocks should be eliminated or replaced with Trumpeter Swans.

1.6 Public Information

An information program should be developed in cooperation with provincial and territorial wildlife agencies to inform the general public, private landowners, and government land management agencies of the status and biology of Trumpeter Swans and their habitats in Canada and the U. S. Provincial and Federal parks with resident swans will be encouraged to incorporate messages on swan management in interpretive programs in Alberta, British Columbia, Yukon, and Northwest Territories. Messages should especially be directed toward water-based recreational users of the direct threat posed to nesting swans from certain activities during critical periods. Such messages will have an impact on the thinking of future land managers responsible for Trumpeter Swan breeding areas.

1.7 Habitat Protection Mechanisms and Options

There are numerous legislative mechanisms and techniques for securing wildlife habitat which could be applied in the protection and conservation of Trumpeter Swan habitats in Canada. These range from acquisition of full or partial property rights on private lands to mapping designation of Crown lands which signifies an agency's interest in an area. The CWS has implemented several habitat protection programs such as acquistion and wetland easement programs. Key areas, such as the Toobally Lakes, Yukon area, could be designated as National Wildlife Areas or Migratory Bird Sanctuaries. U.S. sites may be suitable for protection as National Wildlife Refuges. Where direct agency acquisition or administration of lands is impractical, other forms of land use control are available. Easements or restrictive covenants may enable protection of important habitat areas on private lands. Provincial and territorial agencies have many land use designations and restrictive mechanisms which can be applied to Crown lands, such as the critical wildlife area designations made by the Province of Alberta. As part of this strategy, there is a need to develop and use mechanisms for protecting Trumpeter Swan habitat in Canada.

1.8 Interagency Liaison and Agreements

Although the primary legislative responsibility for Trumpeter Swan management in Canada is federal, in practice, management has been and must continue to be a shared responsibility, particularily in areas of intensive habitat protection and management.

This strategy proposes CWS take a leading role in initiating and coordinating long-term multi-agency efforts to protect and manage interior Trumpeter Swan habitats in North America. The many activities included within this broad strategy require the commitment and implementation by numerous governmental and non-governmental agencies (NGO). A key component of this strategy is a CWS initiative to encourage and coordinate government agencies, NGOs, and the private sector in the protection and wise use of Trumpeter Swan habitats. A major thrust of this strategy is the development and implementation of cooperative protection and management agreements throughout various jurisdictions in Canada. Key participants would be provincial and territorial governments, wildlife and Crown land management agencies, Ducks Unlimited, and several non-government conservation groups. Habitat Canada, a new Federally-chartered nonprofit corporation, could provide resources and impetus to facilitate some of the key components, as proposed in this strategy.

A second major thrust of this strategy is a memorandum of understanding outlining long-term objectives for the Rocky Mountain Population, a pledge to cooperate in swan management with the USFWS, and a commitment to the conservation and development of winter habitat areas in the U. S. Efforts to coordinate with U. S. conservation groups and Flyway Committees should be expanded, resulting in a mutually-supported North American Plan for Trumpeter Swans.

1.9 Strategy Implementation

This conceptual strategy is presently a proposal and is summarized in Figure 2. The first step in implementation is to obtain recognition and support of the strategy within CWS and incorporate it within long-term operational plans. At least three CWS regions (Pacific and Yukon, Western and Northern, and National Capital Region) will require input. Once endorsement has been obtained, dialogue can begin with government, private conservation, and land management groups in Canada and the U. S. Undoubtedly, public hearings will have to be held in key areas such as the Peace River District and S. E. Yukon before a clear long-term strategy can be finally charted and implemented. In the short-term, key agencies might be able to agree on and implement certain critical components of the strategy such as the EINP transplant study.

Upon adoption of these concepts as a National priority, a detailed implementation plan can be developed.

LITERATURE CITED

Banko, W. E. 1960. The Trumpeter Swan. N. Am. Fauna No. 63, U. S. Fish and Wildl. Ser., Washington, D.C. 214 pp.

Brechtel, S. H. 1982. A management plan for Trumpeter Swans in Alberta - 1982. Alberta Dept. Energy and Natural Resources, Fish and Wildl. Div., Edmonton. Unpubl. Admin. Rept. 135 p.

Hampton, P. D. 1981. The wintering behavior of the Trumpeter Swan. M.S. thesis, Univ. Montana, Missoula. 185 p.

Hansen, H. A., P. E. K. Shepherd, J. G. King, and W. A. Troyer. 1971. The Trumpeter Swan in Alaska. Wildl. Monogr. 26. 83 p.

Holton, G. R. In prep. Habitat use by Trumpeter Swans in the Grande Prairie Region of Alberta. M.S. thesis, Univ. Calgary, Calgary. 164 p.

Holton, G. R. 1984. Biology of Trumpeter Swans breeding near Grande Prairie, Alberta. In. prep.

King, J. G. and B. Conant. 1981. The 1980 census of Trumpeter Swans on Alaska nesting habitats. Am. Birds 35(5):789-793.

McKelvey, R. W., M. C. Dennington, and D. Mossop. 1983. The status and distribution of Trumpeter Swans (Cygnus buccinator) in the Yukon. Arctic 36(1):76-81.

Nieman, D. J. and R. J. Isbister. 1974. Population status and management of Trumpeters in Saskatchewan. Blue Jay 32(2):97-101.

North American Flyway Councils. 1984. North American Management Plan for Trumpeter Swans. Draft Rept. 61. p.

Rogers, P. M. and D. A. Hammer. (no date). Ancestral breeding and wintering ranges of the Trumpeter Swan (Cygnus buccinator) in eastern United States. Manuscript.

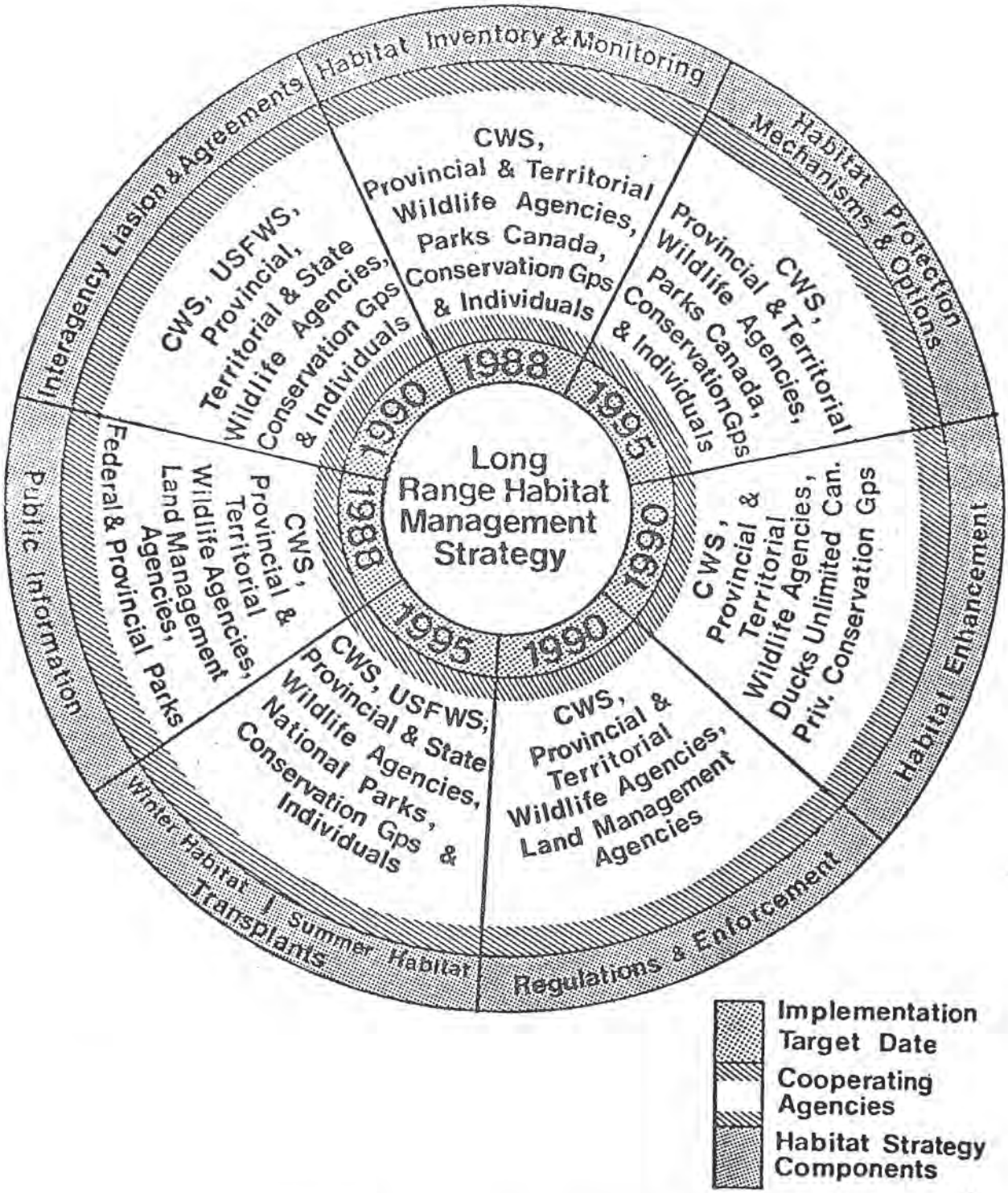


Figure 2. Key components of the Long Range Habitat Strategy for the Interior Canada Subpopulation of Trumpeter Swans.

Shea, R. E. 1979. The ecology of the Trumpeter Swan in Yellowstone Park and vicinity. M.S. thesis, Univ. Montana, Missoula. 132 p.

Turner, B. 1982. The interior Trumpeter Swans of Canada. Canadian Wildlife Service, Edmonton. Unpubl. Rept. 9 p.

Turner, B. and R. McKelvey. 1983. Proposed guidelines for transplanting Trumpeter Swans in Canada. Canadian Wildlife Service. Unpubl. Admin. Rept. 6 p.

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STATUS OF TRUMPETER SWANS IN THE NORTHWEST TERRITORIES

Kevin J. McCormick
Canadian Wildlife Service
Western and Northern Region
Yellowknife, NWT

INTRODUCTION

The Canadian Wildlife Service has recently completed a compilation of key migratory bird terrestrial habitat sites in the Northwest Territories (McCormick et al. 1984). Any site which supports at least 1 percent of a National bird population is considered to be a "key" habitat site. Since some data are incomplete, the sites have been ranked with regard to updating the appropriate population information. The South Nahanni River area was a priority site because: 1) scattered observations (Cairns et al. 1978, Anon. 1980, Anon. 1983) indicate that Trumpeter Swans (Cygnus buccinator) breed and moult in the area, 2) there is considerable suitable habitat in the area, and 3) a survey of swans has never been conducted in the area.

Although the North American Trumpeter Swan population is approximately 10,000 birds (King and Conant 1981), only about 480 individuals occur in Canada (Shandruk in prep.). Accordingly, the Trumpeter Swan is considered a rare breeding bird in Canada (Mackay 1978). The Canadian breeding population consists of approximately 50 pairs in southern Yukon, about 43 pairs in the Peace River area of Alberta and British Columbia, several small pioneer flocks (10 pairs) in other parts of Alberta, 10 pairs in northern British Columbia, and one pair in Saskatchewan. A few birds have also been noted in southwest Northwest Territories.

A survey of Nahanni National Park and the surrounding area was undertaken on 14 and 15 June 1984. The survey was flown in a Bell 206B helicopter at 300 - 600 m and at an approximate speed of 160 kph. Three observers were present, in the rear seats, in addition to the navigator who occupied the left front seat. When necessary, flight altitude was reduced and the waterbody was circled to determine: 1) number of birds present, 2) breeding status of the birds, 3) location of nests, and 4) number of cygnets or eggs present. The helicopter was set down for a closer examination of breeding sites. The results of this survey and information relevant to the region will be reported.

The survey was funded by Parks Canada under the Parks Canada Environmental Conservation Service Memorandum of Understanding (1980).

STUDY AREA

Nahanni National Park is situated in the southwest corner of Northwest Territories, close to the Yukon border (Figure 1). The Park includes the lower reaches of the South Nahanni and Flat Rivers which originate near the Yukon border, at approximately 1070 m elevation. Mountain peaks along these rivers generally range from 1350 to 1850 m elevation although the Ragged Range, to the northwest, rises to over 2750 m.

The mountains of this area are largely composed of sedimentary rocks. The surficial materials were derived locally from the weathering of bedrock and were transported only short distances by glaciers, gravity, or running water. Creeks, prone to flash floods, usually deposit much gravel and rock rubble, whereas well-sorted sand and gravel occurs in the beds of rivers and larger creeks. Generally, fine-grained sand and organic debris is found on the floodplains of the larger rivers, although gravel bars also occur locally. The area has a continental climate with short, warm summers and long, cold winters. The average frost-free period at Tungsten (61° 57' N, 128° 15' W) is only 42 days whereas at Fort Simpson it is 79 days. By comparison, the average frost-free period at Grande Prairie is 116 days (Atms. Env. Serv. 1982). Small watercourses begin to freeze as early as mid-September and ice may form on the larger streams by October.

The vegetation is characterized by boreal and alpine species with the treeline occurring at approximately 1100-1200 m. White spruce (Picea glauca) and balsam poplar (Populus balsamifera) are the dominant species on valley bottoms, especially floodplains. The shrub layer consists of alder (Alnus incana), squashberry (Viburnum edule), and wild rose (Rosa acicularis). Black spruce (P.mariana) becomes more prominent at higher altitudes, growing in association with white spruce, lodgepole pine (Pinus contorta), or jack pine (P. banksiana). This forest grades into open black spruce and reindeer lichen forest before reaching the treeline.

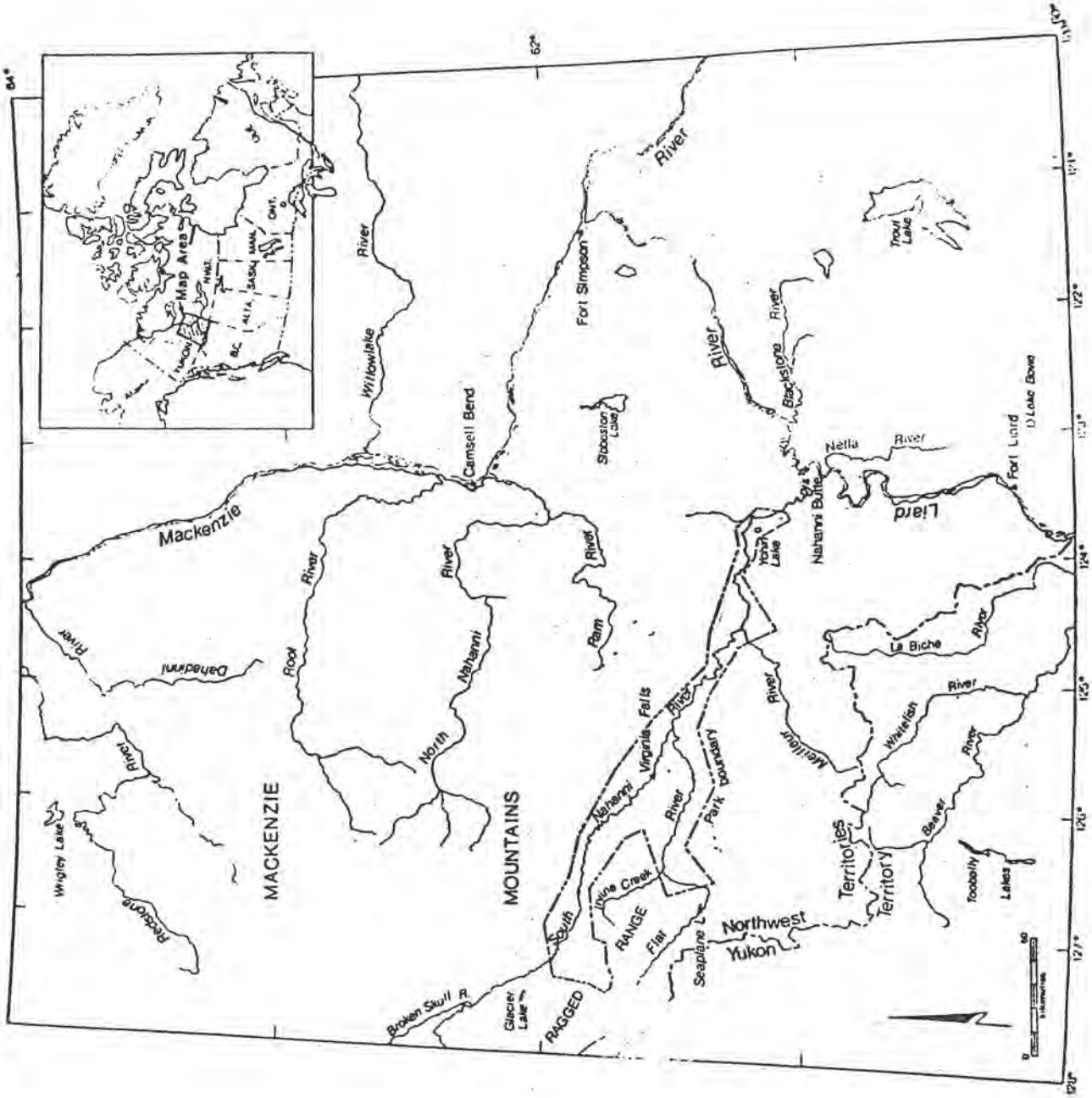

Figure 1. Location of Nahanni National Park.

HISTORICAL INFORMATION

Few observations were recorded in this area before the 1970's when it attracted interest as a potential National park. However, field activities, associated with establishing the Park and developing a nearby mine, have resulted in 44 observations over the last decade (Figure 2). The majority have been noted by Parks Canada personnel who have compiled records since 1977. Breeding has been recorded from 1977 to 1981. With the exception of one brood in the vicinity of Glacier Lake, all breeding has been recorded on Yohin Lake. Although two broods were recorded on this lake in 1979, the late date (16 October) does not preclude the possibility that one or both broods moved there after attaining flight. The lack of brood sightings since 1981 could be the result of limited visitations rather than curtailed breeding activity. Six moulting birds were observed on a small lake (61° 26' N, 123° 34' W) in 1980. Many (50 percent) of the remaining observations involved paired birds.

RESULTS

A total of 18 adult birds (seven pairs and four lone birds) were observed during the survey. These observations are summarized in Figure 3. One pair, on Yohin Lake, was accompanied by five cygnets whereas another pair (at 61° 06' N, 123° 32' W) had a clutch of five eggs. A third pair (at 61° 49' N, 126° 45' W) had a clutch of six eggs. These observations are the first breeding records on these waterbodies although a pair was noted on the latter lake in May 1977. With the exception of a single bird at Seaplane Lake and a pair on Irvine Creek, all individuals were observed along the South Nahanni River. No swans were seen along the Flat River, although the habitat appeared favorable.

Certain habitat features were common to most sites. Differences could be attributed to altitude and related climatic differences (see above). The western sites varied from approximately 600-800 m elevation. Sedge (Carex sp.) was the predominant emergent vegetation although horsetail (Equisetum sp.) was also common. Only two sightings (one included a bird with a broken wing) were recorded on waterbodies which did not contain horsetail. Waterlily (Nuphar variegatum) was the only obvious submergent species.

The eastern sites (Yohin Lake and the nearby waterbody), which occurred at approximately 200 m elevation, supported a more diverse emergent vegetation. Horsetail was bordered by well-developed stands of bog-rush (Juncus sp.) and cattail (Typha latifolia). Extensive sedge meadows occurred beyond this zone. Waterlily was also common.

DISCUSSION

The South Nahanni River area was subject to intensive field study (Scotter et al. 1971; Cairns et al. 1978; A. Wickstrom pers. comm.) during the 1970's. These studies involved numerous flights throughout the Park, yet few birds were observed. Although one bird was observed in 1970, breeding was not recorded until 1977. Since Trumpeter Swans are large conspicuous birds, it is unlikely that they went unnoticed, if present. It appears, therefore, that the swan population has recently expanded in this area and, in view of the number of paired birds, that the number may continue to increase.

The present numbers represent about 2.5 percent of the breeding population and approximately 4 percent of the total Canadian subpopulation. However, on the basis of available information, it appears that there are considerably more birds in the region than previously thought. The theoretical (Hansen et al. 1971) and historical (Clarke 1944) northern limit of the breeding range is approximately 65° N. There is considerable suitable, but scattered, habitat within this range. Futhermore, a number of casual observations and unconfirmed reports suggest a much wider range than is presently known. Birds have been noted on the Netla River (see Figure 1) (B. Kozachenko pers. comm.) and in the Camsell Bend area (K. Davidge pers. comm.). Three sightings were also made in the North Nahanni-Redstone River area during June 1984 (E. Neil pers. comm.).

Further surveys, to confirm these observations and clarify the status of Trumpeter Swans in the Northwest Territories, are planned.

LITERATURE CITED

Anonymous. 1980. Environmental evaluation for Cadillac Explorations Limited, Prairie Creek Project, NWT., Priestman, and Associates Ltd., Victoria. 144 pp and appendicies.

Anonymous. 1983. Nahanni National Park: resource description and evaluation. Unpubl. Rept., Parks Canada, Winnipeg.

Atmospheric Environment Service. 1982. Canadian climate normals, 1951 - 1980. vol 6 - Frost. Downsview, Ontario. 276 pp.

Cairns, A. L., J. D. Henry, and G. W. Scotter. 1978. Vegetation, wildlife, and recreation assessment of the Flat - South Nahanni Rivers confluence area, Nahanni National Park. Unpubl. Rept., Can. Wildli. Serv., Edmonton. 259 pp.

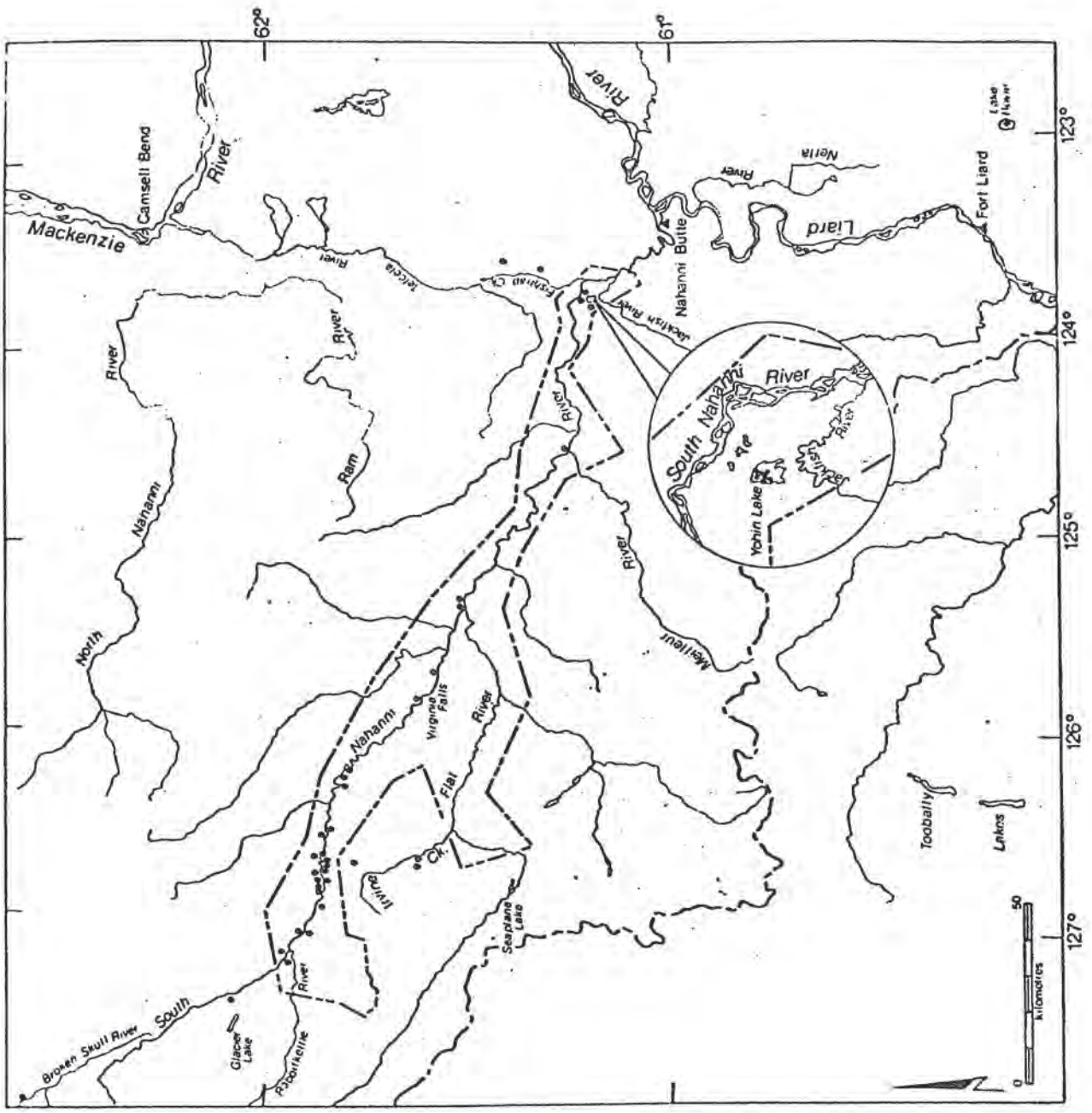

Figure 2. Historical observation of Trumpeter Swans in the South Nahanni River area.

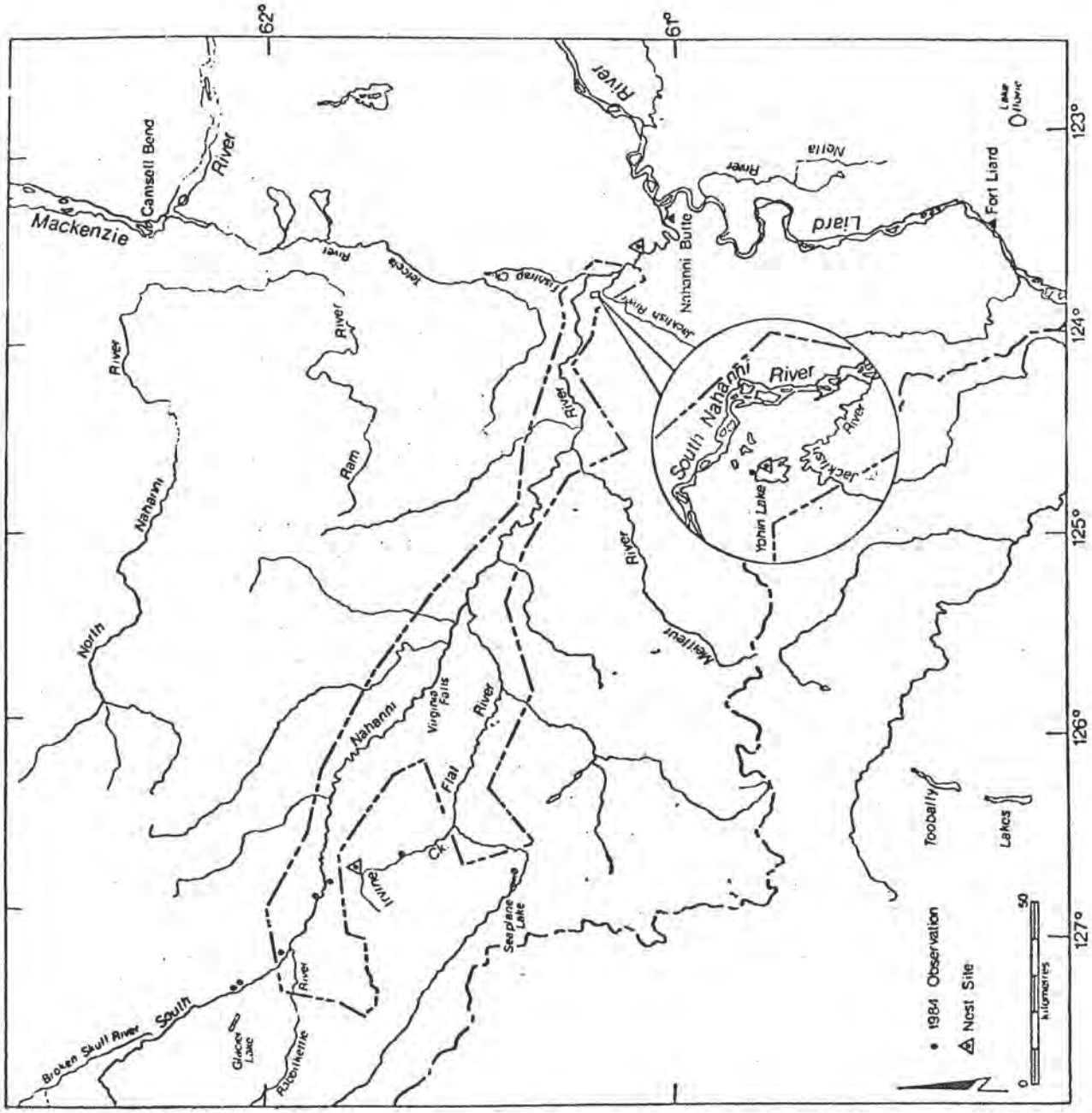

Figure 3. Observation of Trumpeter Swans, June, 1984.

Clarke, C. H. D. 1974. Notes on the status and distribution of certain mammals and birds in the MacKenzie River and Western Arctic area in 1942 and 1943. Can. Field-Nat. 58 97-113.

Hansen, H. A., P. E. K. Shepherd, J. G. King, and W. A. Troyer. 1971. The Trumpeter Swan in Alaska. Wildl. Monogr. No. 26. 83 pp.

King, J. G. and B. Conant. 1981. The 1980 census of the Trumpeter Swan on Alaskan nesting habitats. Am. Birds 35:783-789.

McCormick, K. J., M. E. Adams, C. J. Stephenson, and A. S. Goodman. 1984. Key terrestrial habitat sites in the Northwest Territories. Tech. Rept. No. 84-6, Can. Wildl. Ser., Yellowknife. 177 pp.

McKelvey, R. C., M. C. Dennington, and D. Mossop. 1983. The status and distribution of Trumpeter Swans in the Yukon. Arctic 36: 76-81.

Mackay, R. H. 1978. Status report on Trumpeter Swan, Olor buccinator in Canada. Unpubl. Rept., Comm. Status End. Wildl. Can., Ottawa. 38 pp.

Scotter, G. W., N. M. Simmons, H. L. Simmons, and S. C. Zoltai. 1971. Ecology of the South Nahanni and Flat Rivers area. Unpubl. Rept., Can. Wildl. Serv., Edmonton. 186 pp.

Shandruck, L. In prep. A Review of habitat requirements and management for the Canadian breeding population of Trumpeter Swans. Unpubl. Tech. Rept., Can. Wildl. Serv., Edmonton.

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YELLOWSTONE NATIONAL PARK POLICY FOR MANAGING TRUMPETER SWANS

Ken Czarnowski
Resource Manager
Yellowstone National Park
Yellowstone, Wyoming 82190

I have been asked to talk briefly this morning about Yellowstone National Park's (YNP) policy for managing Trumpeter Swans. However, before we talk about management of swans as a species, we need to step back and look at our entire philosophy on natural resource management. How we approach individual species and their place in the ecosystem, how our management goals and objectives differ from those of surrounding Federal agencies, as well as state fish and game departments. As you all know, YNP differs from other Federal and state agencies in that we do not practice multiple use, we are not production oriented in terms of fish and game, and all hunting is prohibited. Yellowstone also has exclusive jurisdiction over all resources within park boundaries.

There was a time however, when the National Park Service practiced species management, and we took this concept directly from our Organic Act which stated: "The Service thus established shall promote and regulate the use of the Federal areas known as National Parks, Monuments, and Reservations...by such means and measures as conform to the fundamental purpose of the said Parks, Monuments, and Reservations, which purpose is to conserve the scenery, and the natural and historic objects, and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." That was in 1916.

As time passed, new areas were added to the park system and a general philosophy for management evolved. Basically, the National Park Service carried out its role quite effectively in preserving the individual objects or species within the Park.

However, we tended to differentiate resources into categories. There were "good" and there were "bad" resources. For example, ungulates were viewed as good and predators were generally thought of as bad. Trees were good and insects and fires were bad. Fish were good and pelicans were bad. Swans, fortunately were thought of as good.

As we approached the 1950's, the concept of ecology came to the foreground. The National Park Service reexamined its ideas of managing objects or species, and began to look at a systems approach. The Service also began to change some of its thinking about natural forces - fires, insects, diseases; and we had to stop making value judgements about what we thought were good or bad or right or wrong components of the ecosystem.

Yellowstone, with its size and surrounding wilderness areas, is being managed under the ecosystem concept. That is, we are attempting to allow the natural processes to function within the Park ecosystem with minimum disturbance by man's activities. At the same time, we want to provide the

highest quality of use and enjoyment for each visitor to the Park and encourage visitors of all ages and interests to make full and appropriate use of the Park. Hence, we are faced with the dichotomy of use - while preserving that same resource.

I have mentioned our natural resources briefly, but we should look at the other side of the coin - the magnitude of the visitation to the Park. Each year, we accommodate nearly 2.4 million visitors, mostly during the months of June through September. A total of nearly 35 million dollars is spent annually in the Park on lodging, gas, souvenirs, and food. Over 7,000 pillows are available in over 2,200 rooms. Seven major developments serve tourist needs including visitor centers, hotels, restaurants, along with supporting facilities such as water and sewage plants, and maintenance yards. In addition, we are faced with a dramatic increase in winter visitation.

Yet, in spite of this, Yellowstone today has one of the greatest displays of wildlife in North America. Herds of bison, elk, deer, and bighorn sheep are common sights. Less visible are grizzly bears, Trumpeter Swans, Peregrine Falcons, and Bald Eagles. Yet all of these species have one thread in common. They are all managed under the "ecosystem concept" or the system of natural regulation. Hence, we must be prepared to accept the fact that numbers of elk and bison may die in the winter and serve as carrion for coyotes, bears, and eagles; that a young Peregrine may be killed by an owl or an eagle, or that a Trumpeter Swan cygnet may fall prey to a coyote.

I have digressed purposely to try to put our swan management program into better focus. Swans are important in Yellowstone, yet they must be allowed to play their natural role in the ecosystem in an extremely harsh environment.

Our objectives for Trumpeter Swans are spelled out in our natural resources management plan which was approved by our Regional Director just last year. This document builds upon our statement for management, our master plan for the Park, and other Park policies to delineate what the Service's position is on approximately 35 specific natural resource issues including wildlife, fish, Trumpeter Swans, bears, geothermal, etc. Recently, using the approved plan as a guide, we have reorganized our resource management division in the Park to better integrate all aspects - bears, fire, forestry, fisheries, ungulates, birds, natural features, under one office.

What then is our approach to managing Trumpeter Swans - one of the rarest of the North American waterfowl? The majority of our monitoring and management activities are based on the research conducted by Ruth Shea Gale during 1976-1980. Although we have had a brief lapse in our monitoring flights, we are continuing with two annual survey flights - the first a 6-hour flight around 25 May, is used to search all historic nest sights and determine the status of breeding activities. Depending on the status of nests and occupancy by birds, recommendations are made to the Chief Ranger as to what protective steps would be appropriate. We generally rely on one or more of the following:

Secrecy - the location or status of nests are not divulged to the public in an attempt to cut down on the possibility of poaching or vandalism;

Closure of backcountry campsites - depending on the location of the nests, we can temporarily close certain backcountry campsites in the vicinity of the nesting swans;

Closure of trails and/or service roads - again, we have the option of temporarily closing access to certain areas depending on the status of nesting birds;

Prohibit boating in areas close to known nesting swans;

Destruction of any Mute Swans found in the Park;

Expand public awareness of the vulnerability of Trumpeter Swans to human disturbance.

In mid-September, another aerial flight is conducted by National Park Service staff in cooperation with U. S. Fish and Wildlife Service staff from Red Rock Lakes National Wildlife Refuge to determine production and to census the population. The results of both aerial flights are made known to the U. S. Fish and Wildlife Service, U. S. Forest Service, and state fish and game agencies, although the exact locations of the nests are not disclosed.

I would like to point out, however, that the protective measures just mentioned are primarily people management. Under our philosophy of natural regulation, the Park Service will resist measures which call for direct intervention by man or involve artificial structures. Thus, suggestions to build artificial islands or other structures will be considered only as a last resort.

To summarize, Yellowstone has long been recognized as a haven for swans, especially as a resting area during their fall migration. The protection given to swans when they enter the Park has been extremely important to birds migrating from Canada. The Park will continue to protect both resident and migratory birds, especially nesting pairs. In addition, we are concerned over the decreasing number of swans found in the Park and the lower number of cygnets produced. We will work with fish and game agencies, the U. S. Fish and Wildlife Service, independent researchers, and The Trumpeter Swan Society to try to find answers to the problems and take whatever corrective steps are necessary and consistent with our management policies.

* * *

PROGRESS REPORT: ROCKY MOUNTAIN TRUMPETER SWAN POPULATION
WYOMING FLOCK, 16 September 1983 through 15 September 1984

Dave C. Lockman, Migratory Bird Biologist
Wyoming Game and Fish Department (project leader)
Box 96
Smoot, WY 83126

Bob Wood, Resource Specialist
Grand Teton National Park
Moose, WY 83012

Bruce Smith, Biologist
USFWS
National Elk Refuge
Jackson, WY 83001

Bert Raynes, Ornithologist
Box LL
Jackson, WY 83001

INTRODUCTION

In this report period, the Rocky Mountain Population Technical Subcommittee obtained a 3-year moratorium on the removal of eggs and swans from the Tristate Subpopulation. The Rocky Mountain Trumpeter Swan Population Management Plan was approved by the Pacific Flyway Council in July 1984. The USFWS and cooperating states funded a publication on the biological status of the Rocky Mountain Population. This publication will be compiled and edited by the Montana Cooperative Wildlife Research Unit. The final chapter on recommendations and management implications will be written by the Subcommittee.

Winter use and production data were summarized for the 1983-1984 period and compared to previous years. Marked and unmarked swan distribution was monitored throughout the year. Distribution data were summarized on the Wyoming Game and Fish Department Wildlife Observation System. In 1984, 10 swans were marked and three banded in the Green River and Snake River drainages.

The data were summarized for the second year of the cooperative swan movements, habitat use, and recruitment study. The following indiviuals are acknowledged for assistance offered in the second year of the project: Mike Scherer, Ernie Cockerell, Walt Feuz, Pete Finch, John Turner, Leonard Serdiuk, Brad Luton, Duke Early, Garvice Roby, Bill Rudd, Sharon Ritter, Rees Madsen, John Wilbrecht, Fred Herbel, Mack Murdock, Tom Mangelson, Joe DeSarro, Gail Worden, Sharon Bartsh, Rod Drewien, Diane Stratton, Seedskadee NWR personnel, and Worland BLM personnel.

RESULTS AND DISCUSSION

Midwinter Survey and Winter Habitat Use

The Red Rock Lakes National Wildlife Refuge personnel flew the annual Tristate midwinter swan survey on 12 February 1984. The results illustrated the continued increase of Trumpeter Swans wintering in the Tristate Region (Table 1). At the time of the survey, 59 Tundra Swans (Whistling Swans) were detected during ground surveys in the Tristate Region. Twelve Tundra Swans were found on the National Elk Refuge (NER), the only Tundra Swans known to have wintered in the Snake River drainage of Wyoming.

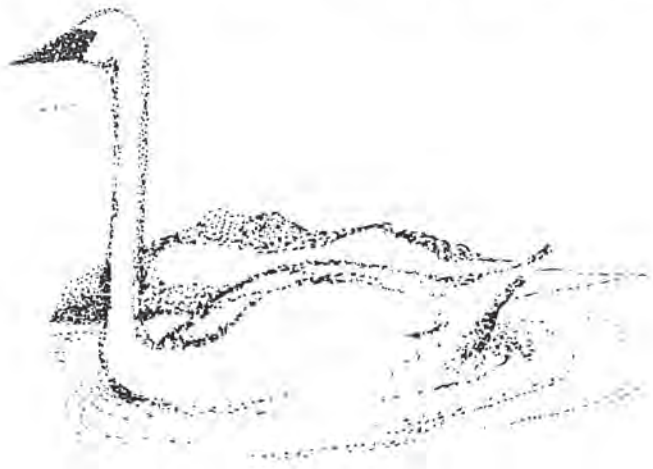


Table 1. Midwinter Trumpeter Swan survey for the Rocky Mountain Population (McEneaney, 1984, USFWS mimeo).

		WYOMING				
Year	Age group	Yellow-stone Park	Jackson Valley, GTNP & Elk Ref.	Wyo. total	Mont. & Idaho total	Overall winter pop.
Mean 1974-78	Total	49	46	95	721	816
Mean 1979-83	Total	139	64	203	898	1101
1983	Adult	88	81	169	856	1025
	Cygnet	14	12	26	181	207
	Total	102	93*	195	1037	1232
1984	Adult	149	87	236	892	1128
	Cygnet	50	11	61	271	332
	Total	199	98**	297	1163	1460

* An additional six Tundra Swans wintered in Wyoming near Jackson.
** An additional 12 Tundra Swans wintered in Wyoming near Jackson.

The Wyoming Game and Fish Department conducted distribution surveys in December, January, and May outside of Yellowstone National Park (YNP). These aerial surveys were also used to locate marked swans. The results of these aerial surveys (Table 2), initiated in July 1982, indicate a slow increase in summering swan numbers and a more marked increase in winter swan numbers in Wyoming. Beginning in the spring of 1984, aerial surveys were expanded to include the southern half of YNP. The differences in swan numbers observed in December, January, and February suggests that some swans (Trumpeters and Tundra Swans) leave the Snake River drainage in December and, to a lesser extent, in January prior to the February survey. We believe this egress consists of migrant Trumpeters (probably of Canadian origin) and possibly lingering Tundra Swans. All locally marked Trumpeters remained within the drainage and were not among those leaving in December.

In future years, aerial and ground distribution surveys, coupled with intensive surveys of marked swans, will help determine late fall and early winter swan movement out of the area. Tundra Swan use of Trumpeter Swan habitat in parts of Wyoming outside the Tristate winter range and the incidence of Trumpeters migrating south with Tundra Swans will be monitored during the 1984 Tundra Swan migration.

Table 2. Numbers of swans observed on aerial surveys in Wyoming outside of Yellowstone National Park.

	Early Dec.		Early Jan.		Early Feb.		Early May**		Early July**		Early Sept.	
Year	ad.	cyg.	ad.	cyg.	ad.	cyg.	ad.	yrlg.	ad.	yrlg.	ad.	cyg.
1982									36	6	42	13
1983	118	22	94	23	81	12	23	8	45	8	49	10
1984			93	20	87	11	34	8	54	6	48	11

* Data in this survey (collected by USFWS) include only Trumpeter Swans. In 1984 six adult and six cygnet Tundra Swans were observed in addition to Trumpeter Swans.
** Includes ground follow-up to confirm yearling status based on plumage and leg color.

A preliminary simulation model of the Rocky Mountain Trumpeter Swan Population was prepared by Lockman in 1984. Simulation runs suggest that a population increase over the past 5 years has resulted in a larger population than observed on the Tristate wintering areas (refer to Appendix I). The 1983

observed winter population size was 1,232, whereas the simulated population size was 1,861. Swan numbers wintering in the Tristate Region have increased markedly since 1980. Simulated winter population size through the period of model simulation (1974 - present) was consistently greater than observed winter population size. Observed winter population size stabilized after a large increase in 1981; however, simulated population size continued to increase. The annual rate of increase became greater as momentum was affected by increasing numbers. The increase has been most affected by the growing numbers and high production from the Interior Canada Subpopulation.

Although not verified to date, we believe more Trumpeters are migrating south with Tundra Swans as Tristate winter habitats have become saturated. Increasing swan numbers in Wyoming suggests saturation of traditional wintering areas in Idaho and Montana and resulting in pioneering.

All but one of 23 marked Trumpeters in the Snake River drainage of Wyoming remained in the drainage throughout the report period. That individual, an 11-year-old male banded at Red Rock Lakes NWR in 1971 and remarked in Wyoming in July 1983 was observed on the South Fork of the Shoshone River (near Cody) in November 1983. This bird was not observed through the winter; however, he was again observed in May 1984 near his banding location. The remainder of the Wyoming-marked swans wintered in the Snake River drainage within a 45-mile radius of Jackson, Wyoming. From marked swan data, we assume that at least 96 percent of the summering swans outside of YNP wintered in the Snake River drainage. Therefore, 57 to 60 of the 98 to 113 Trumpeter Swans wintering in the Jackson area were resident swans in the period of 1 December through 1 March. The non-resident wintering swans were believed to be Canadian swans, primarily, and YNP swans to a lesser degree. An Alberta-marked swan observed on the NER in early November during the Tundra Swan migration in 1983 was not observed the remainder of the winter during thorough air and ground surveys in Wyoming.

Based on winter distribution surveys and relocations of marked individuals, at least 16 areas had one or more specific sites which were occupied by swans from 1 November through 15 March. Prior to 1 November and after 15 March, many additional areas and sites were available and used by swans. All known sites used by marked and unmarked swans were well documented throughout the year. Areas and sites used seasonally by swans in Wyoming outside YNP will be mapped by 20 December 1985.

During the coldest portion of the winter (25 November - 30 January), the most intensively used areas were the NER (30 - 75 swans), South Park spring-fed creeks (15-60 swans), and the Snake River between the Jackson Lake Dam and Moran (10-40 swans). Other areas were generally occupied by less than 20 swans. Winter records were kept on ice conditions relative to daily temperatures and swan density on the most intensively used areas. Distribution shifts occurred in the Snake River area with changing ice conditions. Two to 3 years more data should clarify the relationship between availability of open water and temperature regimes. Four areas received the most swan use in the late fall-early winter and late winter-early spring periods. These were the NER, the northern end of Jackson Lake, Jackson Lake near the dam, and the Snake River Oxbow. The NER received greatest use from about 20 October through 15 November, coincident with the Tundra Swan migration and pre-wintering staging of local and migrant Trumpeter Swans. In this period, daily numbers ranged from 60 to 185 swans on the Refuge. The northern end of Jackson Lake supported 60 to 120 swans from 25 February to 1 April.

Sites used by marked yearlings, non-paired subadults, paired subadults, breeding pairs with broods, and breeding pairs without broods were identified weekly throughout the year. Thirteen marked individuals were relocated at least biweekly and sometimes twice per week throughout the fall, winter, and spring.

Aerial photos were taken of swan wintering areas in the Snake River drainage and are on file with the Wyoming Game and Fish Department. Winter surveys were flown to map open water areas on the Salt River, lower Green River, and Bighorn River drainages. These areas were mapped during early January as part of a project to identify potential swan winter habitat. A ground visit on the upper North Platte River indicated very little open water with submergent vegetation and further investigation will not be pursued. The Bighorn River, near Thermopolis, warrants further evaluation. However, the most promising reach of the Bighorn River between Kirby and Thermopolis was crossed by at least 12 powerlines. The two most promising areas under present evaluation are the Salt River and lower Green River. Others may be evaluated in the future.

Approximately 60 hours of time (activity) budget work were logged on known-age marked swans and unmarked adults and subadults on the NER. These data are not summarized in this report but will be summarized following at least two more winters of data collection. Comparing feeding observations of marked and unmarked swans, collars neither appeared to cause feather stress, resulting from collar movement, nor to hinder feeding activity. Icing was not noticed on collars or necks of collared swans during temperatures of -38°F. or warmer. A collared yearling female collided with a powerline 84 days after being marked. Examination revealed no signs of feather stress or excessive wear caused by the collar. It was noted, however, that at least three individuals (one yearling and two adult breeders) appeared to spend more time preening at the base of the neck than did unmarked individuals. Upon closer examination (within 50 yards and at 45 power), no signs of feather stress were noted, nor was duress or abnormal behavior noted on subsequent observations of these individuals.

PRODUCTION SURVEY AND SPRING-SUMMER-FALL HABITAT USE

There were eight nesting attempts in 1984 outside of YNP, as compared to six in 1983. In 1984, five new nesting pairs were recruited into the flock. As of June 1984, 12 breeding pairs had recently nested in Wyoming outside of YNP. Three pairs occupied territories through the nesting period for at least the second consecutive year and two pairs for the third consecutive year without documented nesting. Two pairs occupied and defended territories for the first year on two previously unoccupied sites. In 1984, four historical nesting pairs did not attempt to nest (Tables 3 and 4).

Figure 1 illustrates the data collected on nesting territories in Wyoming. These data will be collected annually and will be included in the nest register for Wyoming, as developed by the Rocky Mountain Population Subcommittee.

Although spring ice-off dates coincided with those observed in 1983, ambient temperatures in mid-May through mid-June (early through mid-incubation) were extremely cold. The unusually long, cold winter, coupled with cold temperatures and stormy (snow) weather through May, resulted in suppressed clutch sizes, lowered hatchability, late nesting, and lack of nesting in some of the older established breeders. In four clutches of known size, there was an average of 4.75 eggs per clutch in 1983, whereas in 1984, in six clutches of known size, there was an average of 3.83 eggs per clutch. Of 11 cygnets hatched in 1983, 10 fledged. Of 17 or 18 cygnets hatched in 1984, only 11 fledged. Further evidence of the harsh winter and inclement spring's effect on production was the poor hatchability noted in breeding pairs with a previous continuous history of good hatchability and fledged young recruitment (e.g., Pinto Ranch pair). The Enos Lake and Indian Lake pairs' failure to nest in 1984 was attributed to the later-than-usual ice-off (15 to 20 days later than normal at Enos Lake and 10 to 15 days later than normal at Indian Lake). The cause of loss of newly hatched young observed on Widget Lake, Glade Creek, and Wagon Creek was not determined. The lack of physical remains of cygnets and disappearance of entire broods during the first 2 weeks post-hatching on Widget Lake, Glade Creek, and Wagon Creek (all areas in close proximity to tree cover and raptor perching sites) are highly suggestive of avian predation (i.e., Great Horned Owl predation suspected). One first-year nesting female abandoned a clutch of four viable eggs about two-thirds of the way through incubation. The cause of abandonment was believed to be excessive human disturbance in close proximity to the nest site. The time of abandonment coincided with a marked increase in recreation activity by people at a nearby resort (Christian Pond - GTNP).

A pair of swans occupying a territory on Hedrick Pond for the third consecutive year did not attempt to nest in 1984. The pond lacks suitable nesting sites surrounded by water. In the spring before ice-off, an abandoned beaver lodge, providing the only island-type nest site, was modified by removing large logs and sticks and placing sedges and rushes over the top. Within a few days after ice-off (13 May), the pair was observed by a nearby landowner on the lodge arranging materials, perhaps preparing a nest site. On 16 May, a Canada Goose was observed on the beaver hut in incubating posture. The goose was observed on the site on successive visits and was not disturbed by the swan pair. The swans did not attempt to nest.

Another pair, occupying a territory with an apparent lack of any secure, water-surrounded platform, failed to attempt nesting for at least the 4th consecutive year of occupancy on the Elk Ranch Reservoir. A fall and over-winter drawdown and early spring filling of Elk Ranch Reservior resulted in an apparent lack of aquatic vegetation in shallow water portions. The lack of spring feed forced the pair to spend much of their time outside of the territory, feeding miles from the reservoir. The end result of the lack of adequate food and a secure nest site was failure to nest.

Two pairs observed in 1982-1983 in the upper Green River nested for the first time in 1984. One pair produced three cygnets which fledged. The other pair hatched at least two cygnets which dissappeared from unknown causes within 2 weeks after hatching.

A SUMMARY OF HABITAT USE AND BEHAVIOR IN THE PERIOD BETWEEN PRE-NESTING AND LATE MOLTING

Detailed observations of 20 marked swans were recorded in the period between dispersal from winter areas and molting. These 20 represented all of the number of marked swans through the 1984 pre-molt period. Marked birds represented six active breeding pairs, three 2nd-year bonded pairs, one 3rd-year bonded pair, two unpaired subadults, one sibling group (2-year-olds) and one 12-year-old unpaired male (known-age recovery).

Territorial pairs were observed using sites for feeding and loafing within 2 miles of their territory by early March. Slow-moving creeks began thawing in late February and early March. Open water areas with aquatic submergents within close proximity to territories were being used by adult breeders, nonbreeding pairs, and subadult sibling groups (2-year-olds) prior to ice-off of territories and pond/lake areas. Adult pairs with previous history of territorial occupancy moved onto their territories as soon as sufficient open water was available for feeding and security. On most sites, this occurred in the period of 25 April to 15 May. As soon as pairs moved onto territories, their tolerance of close associations with the previous year's offspring and other swans broke down.

Table 3. 1984 Trumpeter Swan Territorial Pair Production Survey, Wyoming.1/

TERRITORY	PAIR OCCUP. TERR. THRU NEST PER. BUT DID NOT NEST	PAIR OCCUP. TERR. OCCAS. BUT DID NOT NEST	APPROX. ICE-OFF DATE	APPROX. HATCH DATE	CLUTCH SIZE	NO. YOUNG HATCH.	NO. YOUNG FLEDGED AS OF 9/1	NOTES
Targhee								
Widget			5/20	7/3	4 or 5	1	0	Obs. 1 yng. 7/5
Indian	X		5/20					& 0 by 7/16
Ernest	X		5/20					
Rock Lake	X		5/20					
Winegar	?		5/20					Uncertain about nesting attempt
Teton								
Christian			5/5	init.5/20	4	Abandoned abt 6/13. Four dead		
Emma Matilda	X					embryo about 23 days old.		
Two Ocean Pond			4/25	6/30	3	1	1	Fate of 2 eggs
Glade Crk-north		X	5/25					unknown.
Glade Crk-south			5/25	7/6	4	3	0	1 inf. egg
Hedrick	X		5/13					
Elk Ranch	X		4/20				Res. empty over winter &	
Private							was filled in April &	
Finch oxbow		X	4/25				early May	
Pinto			5/13		3	0	0	2 early dead embr.
Teton Forest								& 1 inf.egg fem.
Enos	X		6/15-20					begin incub.5/23
Hawk's Rest			5/10-15	6/30	4 or 5	4	3	
Wagon Crk.			5/25-30	7/5-10	4 or 5	1 or 2	0	2 early dead emb,
Roaring Fork			5/10-15	6/30	4	3	3	1 inf. & 1 or 2
Elk Refuge								hatched but not
Pierre's		X	4/20					w/pr. by 7/19
Flat Crk. marsh			4/20	6/28	5	4	4	1 inf. egg

TOTALS: 8 nest attempts, 6 successful nests, 17 or 18 cygnets hatched, 11 cygnets alive as of 9/1/84 (assumed fledged), 5 new nest pairs were recruited in 1984, 4 historical pairs did not attempt to nest; as of 1984 there are 12 breeding pairs that have historically or recently nested in Wyoming outside of YNP.

1/Includes only Wyoming outside of Yellowstone Park.

Table 4. Trumpeter Swan Territorial Site Occupancy and Production Status for Wyoming Outside of Yellowstone National Park, 1981 to 1984.

LAND STATUS	TERRITORY SITE NAME	OCCUPANCY AND PRODUCTION RECORD 1981	1982	1983	1984
Targhee Forest	Widget	N?0	N30	OM	N10
	Indian	N??	N20	OM	OM
	Ernest	OUID	OUID	O	O
	Rock	OUID	OUID	OM	OM
	Winegar	OUID	OUID	OUID	O
Teton Park	Glade-south	OUID	N55	OM	N30
	Glade-north	--	--	OUID	OUID
	Christian	OUID	OUID	OM	N00
	Arizona	--	--	--	OUID
	Emma Matilda	--	OUID	OUID	OUID
	Two Ocean-NE	--	OUID	OM	N11
	Swan	OUID	OUID	OUID	--
	Hedrick	--	O	OM	OM
	Elk Ranch	OM	OM	OM	OM
Private	Pinto	N33	N33	N33	N00
	Finch	--	--	--	O
Teton Forest	Enos	N33	N22	N43	OM
	Hawks Rest	?	OUID	OM	N43
Bridger Forest	Snake	?	?	OUID	--
	Trapper	--	--	--	--
	Wagon Creek	?	?	OM	N?0
	Roaring Fork	?	?	?	N33
Elk Refuge	Main Marsh	N33	N33	N33	N44
	Pierre's Pond	?	O	N11	OM

LEGEND

O - Occupied territory through nest period but did not attempt to nest, loose attachment

OM -Occupied territory through nest period, molted on territory but did not attempt to nest, strong territorial attachment

OUID - Occupied a site, status of pair as bonded unidentified or status of site as a territory unidentified

N - Pair nested, laid eggs but hatched no young

N42 - Pair nested, hatched four young, fledged two young

-- - No record of occupancy

? - Status unknown

Figure 1.

TRUMPETER SWAN NESTING TERRITORY ANNUAL RECORD
STATE OF WYOMING

LAND OWNERSHIP_____ YEAR_____ STATE_____

SITE NAME_____ OBSERVER/S_____

LEGAL DESCRIPTION Sec.____ Tnshp._____ Rng._____ Lat._____ Long._____

NEST SITE DESCRIPTION_____

Ice-On/Ice-Off Dates_____ ELEVATION_____

OCCUPANCY CHRONOLOGY

Date of Arrival on Territory_____

Date of Departure from Territory_____

Comments on Attentiveness, etc. (including behavior characteristics)_____

NESTING AND PRODUCTION CHRONOLOGY

Date of Initiation of Nest Building Activity_____

Comments on Nest Building Activity_____

Date of First Egg Laid_____ Date of Incubation Start_____

Date of Hatch_____ No. Eggs Laid____ No. Eggs Hatch____

Unhatched Egg Status: No. Infertile_____ No. Unknown_____

No. Early Dead Embryos_____ No. Late Dead Embryos_____

Comments: _____

No. Cygnets Fledged_____ Approximate Fledging Date_____

GENERAL COMMENTS (water fluctuation, nest site availability, disturbance level, banding, etc.)_____

Attach Additional Site Data, WOS Records, Maps and Photos

Yearling sibling groups remained together and, although often observed with other non-territorial swans, were rarely observed separated. Non-territorial swans were quite mobile, moving frequently within a relatively well-defined area and rarely violating the space of territorial pairs. The only known permanent egress of swans from this flock (those outside of YNP in Wyoming) occurred in sibling groups prior to the 1st year molt. Based on counts of yearling swans before June and during the 1984 molt, at least one sibling group left the Snake River drainage pre-molt. The same phenomenon probably occurred in 1983 when the yearling siblings from the Elk Refuge left pre-molt and were not relocated the rest of the summer. The amount of egress and ingress in these age classes between and within Tristate and Canadian flock components could only be monitored through banding of cygnets. The data reported here only summarizes a portion of the observations on behavior and habitat use. A detailed analysis of movements, age-class interactions, habitat use, seasonal habitat characteristics, and other data will be prepared in a 1985-1986 project progress report. Appendix II defines the objectives and phases of this Wyoming swan project.

For the 2nd consecutive year, a 12-year-old male remained in the Buffalo Valley area through the summer. This male frequently associated with a yearling sibling group and two sibling 2-year-olds. In May, he was observed with an unmarked subadult on several occasions. However, after mid-June he was by himself or with a sibling group of 2-year-olds.

The first evidence of early pair bonding was witnessed in May and June when two siblings, beginning their third summer (2-year-olds), were observed separated from each other, with unmarked swans. One swan marked in 1983 as a subadult was observed with an unmarked swan from that point on and in 1984 established a territory that had been unoccupied in the previous 3-year period. This new territorial pair was believed to be 3-year-olds. Based on our observations, it appears that sibling groups remain together until the end of their 2nd year or entering their 3rd year. The sibling association is then disrupted by early pair bonding. The pair then begins a search for a vacant, suitable territory as 3-year-olds. If a suitable territory is found, a loose territorial attachment is formed. Presumably, first nesting of a newly-bonded pair could occur anytime after the 1st year of territorial occupancy. Based on current knowledge in Wyoming's Snake River drainage, first nesting is most likely to occur in the 3rd year of territorial occupancy.

The broad dispersion of pre-nesting forage areas and nesting habitat found in western Wyoming contrasts greatly in many respects with the continuous expanse of marsh used by swans in the Centennial Valley. Breeding pairs of swans in the Snake and Green River drainages in most years begin leaving the forage-depleted winter sites by early March, finding widely dispersed feeding areas in close proximity to their nesting territories. The isolated and widely dispersed nature of these territories minimized intraspecific interactions. Given this dispersion, pairs on established territories received little or no visitation from other swans. Those that were accustomed to human disturbance tended to be very sedentary from the time of their arrival in mid-May to their departure in early September. Most nesting and non-nesting pairs molted on their territories.

Subadult or unpaired swans molted on various ponds and lakes throughout the Snake River drainage. Not all marked subadults molted in the same area each of the past two summers. Eight swans (one territorial pair, three yearling siblings, one pair with a loose pair bond, and one 2-year-old male) molted on Elk Ranch Reservoir in 1984. The earliest and latest dates recorded for the flightless period were 4 July and 28 July. Yearling swans retained some gray feathers in the nape region and wing coverts through mid- to late July but by mid-August had no gray feathers remaining. Molting of contour feathers apparently occurred through the summer and into the fall in yearling birds. Feather plucking over the back, neck, and wing covert regions was a daily part of preening activity. It was more exaggerated in yearlings during the post-nuptial molt than in older swans.

It was also noted that females began molting late in incubation or soon after hatching and males were not flightless until females had nearly or completely regained flight. When a clutch failed or young were lost soon after hatching, the male became flightless 10 days to 2 weeks after the female. In non-nesting pairs or sibling groups, molting was nearly simultaneous with females and tended to precede males by a few days.

Table 5 illustrates the chronology of Trumpeter Swan life history on an annual basis between age classes 1 and 7, as observed in the first 2 years of the Wyoming project. Additional study of known-aged individuals will enable the Wyoming project team to determine variations in life stage processes.

FLOCK DYNAMICS - 1982-1984

In July 1984, the flock size was 60 swans. In July 1983, the flock size was 53 swans and in 1982 was 42 swans. These counts only represent yearling and older swans (Table 2). From July 1983 through June 1984, there were 23 marked swans in the flock. The marked birds were two breeding pairs with a long history of nesting experience and territorial occupancy, two breeding pairs with less than 3 years nesting experience, three young bonded pairs that had established territories but had not nested to date, three young pairs believed to be in the early stages of pair bonding that had no known territories, a bachelor male (11 years of age at the time of recapture and marking), two groups of yearling siblings, and one group of three of known parental origin. In this first time period (molt 1983 to pre-winter 1984), there were three mortalities, all of which were yearlings. In the 1984 molt period, an additional 10 swans were marked including an early stage bonded pair, a 1st-year nesting

Table 5. Chronology of Trumpeter Swan Life History as Observed in Wyoming from 1982 to 1984.

PERIOD IN ANNUAL CYCLE	DATES (AVERAGE)	LIFE STAGE PROCESS					
		AGE CLASS 1	AGE CLASS 2	AGE CLASS 3	AGE CLASS 4	AGE CLASS 5	AGE CLASS 6
Nesting (Terr.Defense to Hatching)	May 1 - July 5	Family Assoc.	Sibling Assoc.	Loose sibling attachment, strengthen. pair bond	Loose attachment to territory	Strong, territorial assoc.-potential first nest.attempt	Most probable first succes.nest attempt
*Molting	July 1 - Aug.10		Some sib. groups disperse		Pair firmly bonded		
Fall Dispersal	Aug. 15 - Oct. 1						
Pre-winter Staging	Oct. 1 - Nov. 15		Sibling assoc. first wanes				
Fall Migration	Oct. 25 - Nov. 20						
Early Winter	Nov. 15 - Dec. 15		Early pair bond formation	Pair bond firmed			
Mid-winter	Dec. 15 - Jan. 30						
Late Winter	Feb. 1 - Mar. 1						
Spring Dispersal	Mar. 1 - Apr. 1			Territorial acquisition	Strengthening attachment to territory		
Pre-nesting	Apr. 1 - May 1	Breeding pair on territory					

pair and two sibling groups (yearling to 2-year-old age class) comprised of three members each. Through October 1984 (pre-winter period), all 30 marked swans were accounted for. The status of Wyoming marked swans to date is shown in Table 6. During the next 3 years, all yearlings will be marked and all accessible cygnets will be banded and leg-marked. Worn or broken collars will be replaced as necessary.

To date, four yearling sibling groups have been marked. The sex composition of these groups (four females and seven males) suggests a differential mortality or natality in the sexes through the first age class. This phenomenon might also explain the observed incidence of older bachelor males noted in subadult molting flocks at Red Rock Lakes NWR.

IMPLICATIONS TO MANAGEMENT

Swan data collected since 1984 for Phase 1 has demonstrated the importance of Jackson wintering areas for sustaining the Snake and Green Rivers swan populations. To accomplish the long-range objective of 50 nesting pairs as identified in Appendix II, the following specific information will be needed: 1) number of summering swans required to maintain a Wyoming flock with 50 active-breeding pairs, 2) identification of the winter habitat areas capable of supporting a flock sustaining 50 active-breeding pairs (this will include an assessment of the carrying capacity, potential winter habitat, and existing habitat carrying capacity incorporating a winter migration pattern for the majority of the flock (related to instilling a greater migratory strategy in locally-produced swans, either naturally or man-induced)), and 3) determine the number of presently suitable nesting territories being used, the number of territories presently suitable and not being used, and the number of sites where suitable territories can be created by management.

There is sufficient knowledge available to identify many of the physical and biological attributes of good wintering and nesting habitat. However, local evaluations of existing winter pre-nesting and production habitats provides a basis for evaluation of potential local sites (including identification of limiting factors) and for prescribing methods for improvement or maintenance.

RECOMMENDATIONS

1. Implement protection strategies to minimize human disturbance to swans during the pre-nesting, nesting, and early-brood period on Christian Pond (GTNP).

   Implement protection strategies to minimize human disturbance on Snake River Oxbow (GTNP) and Mosquito Lake (BTNF) to encourage swan territory establishment during the period of 1 May through 30 June.

   Monitor human disturbance levels and implement protection strategies on Hedrick Pond (GTNP) if determined necessary.

2. Develop additional nest sites on Elk Ranch Reservoir.

3. Continue monitoring identified in MANAGEMENT STRATEGY, Phase 1 (Appendix II). Develop seasonal range map for Trumpeter Swans in western Wyoming by December 1985.

4. Initiate MANAGEMENT STRATEGY, Phases 2, 3, and 4 (Appendix II). In 1985, concentrate Phase 2 efforts on the following areas: NER summer and winter habitats, conducted by Bruce Smith (USFWS); South Park winter habitats, conducted by Dave Lockman (WGFD); GTNP nesting and winter habitats, conducted by Bob Wood (GTNP); Buffalo Valley nesting habitats, conducted by Dave Lockman (WGFD); and upper Green River nesting habitat, conducted by Dave Lockman and USFWS. Data to be collected on physical and biological habitat attributes, data collection methods, and format will be finalized by the project team by 1 June 1985 and will include identification of the carrying capacity of wintering areas.

   Phase 3 – a planned experiment will be designed by Dave Lockman, Bert Raynes, and Bob Oakleaf by 15 May 1985. This phase will be initiated in 1985. Rod Drewien will assist in developing experimental procedures.

   Phase 4 - Map historical swan nest sites in Wyoming by December 1985 in conjunction with Phase 1.

5. Complete the potential winter habitat evaluation for the Salt and lower Green River areas. In the assessment, identify the estimated winter carrying capacity for each area.

6. Determine specific sites to be evaluated for potential swan production. In subsequent years, these sites will be evaluated and prescriptions written for improvement and development of each site for swan production.

7. Develop a population model to determine the summer and winter flock size required to sustain 50 active breeding pairs. Update the model as more long-term natality, mortality, survival, and recruitment data are obtained. Utilize existing flock data to predict flock growth rates to 2000.

8. Submit a progress report on the Tristate swan disease project by 1 July 1985.

Table 6. Past and Current Status of Swans Marked in Wyoming - Molt, 1982 through Pre-winter, 1984

SWAN NO.	DATE MARKED, SEX, AGE* AND STATUS AT TIME OF MARKING	TIME PERIODS: 1982 MOLT	1982 PRE-WINTER	1983 WINTER	1983 PRE-NEST	1983 NEST	1983 MOLT	1983 PRE-WINTER	1984 WINTER	1984 PRE-NEST	1984 NEST	1984 MOLT	1984 PRE-WINTER
93MA	7/82,M,8+ Breeding Pair on	→	→	→	→	→	→	→	→	→	→	→	→
94MA	7/82,F,8+ Territory (7+ nest year)												
5	7/83,M,7 Breeding Pair on						→	→	→	→	→	→	→
6	7/83,F,7 Territory (2nd nest year)												
4	7/83,F,8+ Br.Pr.Represent. (8+ nest year)						→	→	→	→	→	→	→
3	7/83,F,6 Br.Pr.Represent. (1st nest year)						→	→	→	→	→	→	→
1	7/83,F,5 Pr.Rep. (no nesting to date)						→	→	→	→	1st nest →	→	→
41	7/83,M,6+ Pair on Territory						→	→	→	→	→	→	→
42	7/83,F,6+ for at least 3rd year (no nest to date)												
45	7/83,M,5 Pair on Territory						→	→	→	→	→	→	→
46	7/83,F,5 for 2nd year (no nest to date)												
47	7/83,M,3 Pair in Early Bonding (suspected to be						→	→	→	→	pr.on terr. →	→	→
48	7/83,F,3 on territory when marked)												
2	7/83,U,3 Pr.Rep. in Early Bonding (not on terr.)						→	→	→	→	pr.on terr. →	→	→
53	7/83,M,3 Pr.Rep. in Early Bonding (not on terr.)						→	→	→	→	pr.on terr. →	→	→
52	7/83,F,3 Susupected Pair in Early Stage						→	→	→	→	pr.suspect on terr. →	→	→
54	7/83,U,3 of Bonding (not on terr.)												
55	7/83,M,11 Single,non-paired,knownaged RRLNWR recapture	→	→	→	→	→	→	→	→	→	→	→	→
43	7/83,F,2 Yrlg. age-class 2, sibling to 44	→	→	→	→	→	→	I (Hit a powerline)					
44	7/83,M,2 Yrlg. age-class 2, sibling to 43	→	→	→	→	→	→	→	→	→	I (Suspect coyote pred.)		
49	7/83,M,2 Yrlg. age-class 2, sibling to 50 & 51	→	→	→	→	→	→	I (Missing, presumed dead-cause unkown)					
50	7/83,M,2 Yrlg. age-class 2, sibling to 49 & 51	→	→	→	→	→	→	→	→	early stages of pr.bonding →	→	→	→
51	7/83,F,2 Yrlg. age-class 2, sibling to 49 & 50	→	→	→	→	→	→	→	→	early stages of pr.bonding →	→	→	→
10	7/84,F,3 Bonded Pair- ?(10 is a leucistic phase)												→
11	7/84,M,3 not on territory or terr.location unknown.												
13	7/84,F,4+ Rep.of a Bonded Pair, not on territory												→
14	7/84,F,6 Rep.of a 1st year nesting pair, on terr.												→
56	7/84,M,2 Yrlg. age-class 2, sibling to 57 & 58												→
57	7/84,F,2 Yrlg. age-class 2, sibling to 56 & 58 (Sibling Group)												→
58	7/84,M,2 Yrlg. age-class 2, sibling to 56 & 57												→
65	7/84,M,2 Yrlg. age-class 2, sibling to 59 & 66												→
66	7/84,M,2 Yrlg. age-class 2, sibling to 65 & 59 (Sibling Group)												→
59	7/84,F,2 Yrlg. age-class 2, sibling to 65 & 66												→

* Ages were estimated for all but yearlings and a known-aged male

APPENDIX I

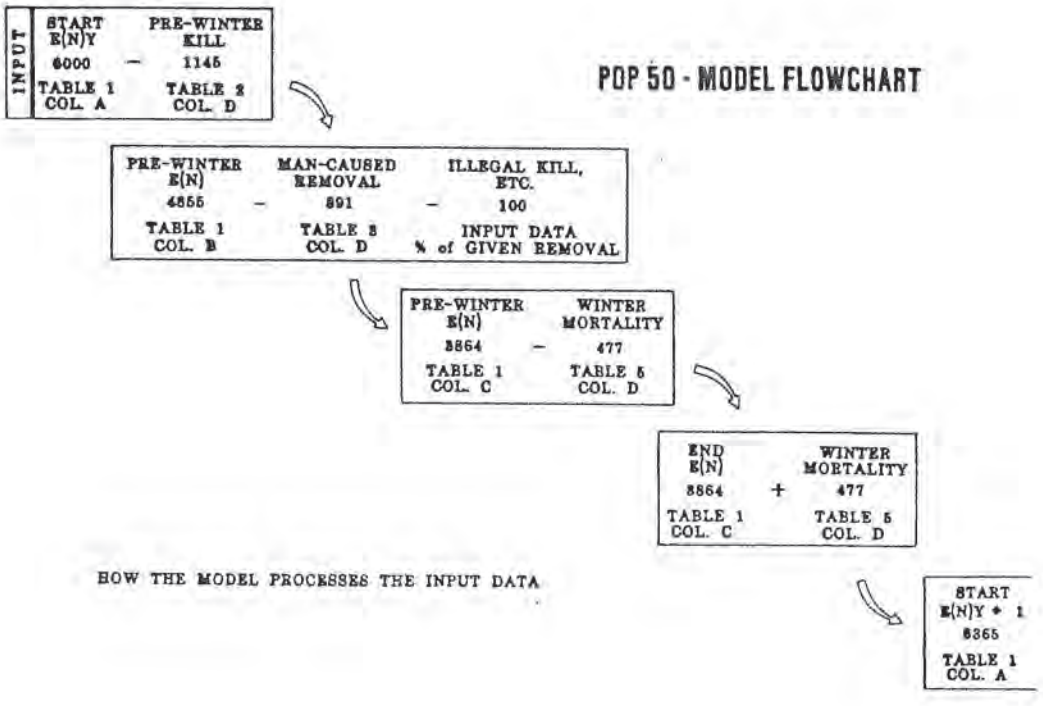
Rocky Mountain Trumpeter Swan Population Simulation Model
A Preliminary Model

PROBLEM: Data sets relating to the Rocky Mountain Population of Trumpeter Swans are currently analyzed as separate entities, all of which independently are difficult to relate to the population and as factors affecting the population.

STRATEGY: Test Pop 50 as a tool for swan population modeling
- Simulate observed cygnet/adult and subadult winter ratios with 95% conf. belts
- Achieve a fit of actual winter count data to simulate pop. size

Modify model input and output files for greater utility in swan modeling

Coordinate this effort with the population subcommittee



CRITERA NEEDED TO MODEL A POPULATION

1. Must define the population - account for 90% of ingress and egress
2. Must have a well-distributed and "statistically" adequate sample of population characteristics
3. Must have at least 5 continuous years' data
4. Major population characteristics data required
   - young/adult ratio at given points in time
   - trend counts of the population
   - man-caused removal rates
   - estimates of production and young survival
   - estimates of annual average age class specific mortality
   - definition of mortality periods in annual cycle
   - estimate of numbers in each sex and age class in the initial year

USES OF POPULATION MODELING TECHNIQUES

1. Testing the definition of a population
2. Testing the "fit" of observed population characteristics with simulated data
3. Highlights data and sample inadequacies
4. Trains users (managers) on the importance of using measurable population parameters to understand population dynamics
5. Good method for monitoring annual and long-term change relative to objectives
6. "Gaming" - testing the effects of various management strategies on population growth
7. Projection of population growth into the future

IN SUMMARY

Converts population characteristics data elements into parameters, useful in evaluating the influence of controlled and uncontrolled factors regulating population dynamics

SWAN PRODUCTION DATA - FOR INTIAL YEAR AT START IN 1974

	WYOMING	YNP	IDAHO*	MONTANA**	GRANDE PRAIRIE	OTHER	TOTAL
NO. NESTING PAIR	6	24	15	42	28		114
NO. CLUTCHES	4	24	12	34	13		87
TOTAL EGGS	20	101	57	160	70		408
AVE. EGGS/CLUTCH	5.00	4.21	4.71	4.71	5.40		4.69
TOT. CYG. HATCHED	16	49	31	89	52		237
AVE. HATCH/CLUTCH	4.00	2.04	2.62	2.62	4.00		2.72
TOT. CYG. FLEDGED	10	12	17	49	49		137
TOT. NO. ADULTS	10	48	30	84	56		228
TOT. NO. SUBAD.	30	4	41	214	43		332

* Data based on summer count (Sept., 1974) for Idaho and all ratios derived from Montana data

** Data from Sept., 1974 count and Paige (1971-73)

- Age at first reproduction in males and females = 5 years (Age Class 6)

- Expected longevity = 15 years for males and females

Therefore, Age Class 1 - cygnets or young of the year

Age Classes 2-5 - subadult, non-breeders

Age Classes 6-15 - adult, breeders

Assume, 50/50 sex ratio in all age classes

Mortality Periods: I May 1 - July 5 (breeding period)

II July 6 - October 20 (molting, fledging, migration)

III October 21 - April 30 (wintering period)

Assume: no differential mortality between the sexes in all age classes

WYOMING GAME AND FISH DEPARTMENT POPULATION SIMULATION MODEL

INPUT PARAMETERS

POPULATION RMP TRUMPETER SWAN INPUT/FILE 1

FIRST DATA 1974 FIRST SIM. 1974 LAST SIM 1987 LAST DATA 1983

	AGE CLASS	INITIAL POPULATION MALES	INITIAL POPULATION FEMALES	PRE. MIGR. MORT. MALES	PRE. MIGR. MORT. FEMALES	WINTER MORT. MALES	WINTER MORT. FEMALES
CYGNET	1	101	101	42.00	42.00	6.00	6.00
SUBAD	2	41	41	0.00	0.00	3.00	3.00
	3	39	39	0.00	0.00	3.00	3.00
	4	37	37	0.00	0.00	3.00	3.00
	5	35	35	0.00	0.00	3.00	3.00
	6	30	30	2.00	2.00	10.00	10.00
	7	26	26	2.00	2.00	10.00	10.00
	8	22	22	2.00	2.00	10.00	10.00
	9	19	19	2.00	2.00	10.00	10.00
	10	13	13	5.00	5.00	20.00	20.00
	11	6	6	10.00	10.00	40.00	40.00
	12	2	2	15.00	15.00	50.00	50.00
	13	0	0	20.00	20.00	50.00	50.00
	14	0	0	22.00	22.00	52.00	52.00
	15	0	0	25.00	25.00	100.00	100.00

SUM 742 DESIRED SUM 925

WYOMING GAME AND FISH DEPARTMENT POPULATION SIMULATION MODEL

INPUT PARAMETERS

POPULATION RMP TRUMPETER SWAN INPUT/FILE 1

YEAR	HARVEST/DES. POP. (9999) SUBAD.	AD. MALE	AD. FEMALE	YOUNG/100 FEM. AGE 6 +	MORTALITY SEVERITY	YEAR
1974	7	1	2	132.0	1.00	1974
1975	7	1	2	161.0	1.00	1975
1976	7	1	2	219.0	1.00	1976
1977	24	1	2	173.0	1.00	1977
1978	41	1	2	212.0	1.00	1978
1979	38	1	2	236.0	1.00	1979
1980	29	1	2	249.0	1.00	1980
1981	9	1	2	178.0	1.00	1981
1982	7	1	2	150.0	1.00	1982
1983	10	1	2	150.0	1.00	1983
1984	10	1	2	150.0	1.00	1984
1985	10	1	2	150.0	1.00	1985
1986	10	1	2	150.0	1.00	1986
1987	10	1	2	150.0	1.00	1987
	ILLEGAL LOSS %			SEX RATIO	SUBADULTS:	
	9.0	9.0	9.0	50.0 : 50.0	AGES 1 TO 1	

WYOMING GAME AND FISH DEPARTMENT POPULATION SIMULATION MODEL

POPULATION BMP TRUMPETER SWAN OUTPUT/FILE 1

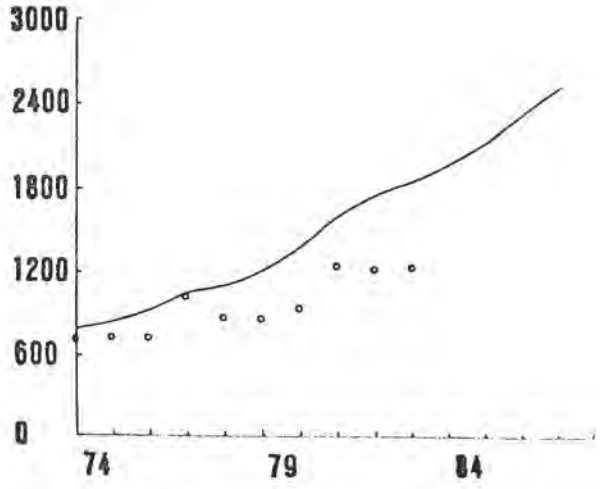
TABLE 1 - POPULATION SIZE

YEAR	START A	PRE WINTER B	POST WINTER C	END D	GROWTH E
1974	925	811	800	744	4.1%
1975	963	860	849	785	11.7%
1976	1076	940	929	855	18.6%
1977	1275	1083	1054	971	3.3%
1978	1318	1155	1107	1022	12.7%
1979	1486	1273	1228	1133	12.2%
1980	1667	1424	1389	1285	14.2%
1981	1904	1623	1610	1494	5.7%
1982	2012	1772	1761	1635	3.9%
1983	2090	1875	1861	1729	7.3%
1984	2242	2001	1986	1843	8.6%
1985	2435	2157	2143	1985	10.5%
1986	2691	2360	2346	2162	8.7%
1987	2926	2567	2553	2353	7.3%

POPULATION BMP TRUMPETER SWAN OUTPUT/FILE 1

TABLE: - POPULATION SIZE

YR	POSTHUNT	OBS
74	800	709
75	849	723
76	929	725
77	1054	1017
78	1107	874
79	1228	866
80	1389	939
81	1610	1247
82	1761	1218
83	1861	1232
84	1987	
85	2143	
86	2346	
87	2553	



WYOMING GAME AND FISH DEPARTMENT POPULATION SIMULATION MODEL

POPULATION RMP TRUMPETER SWAN OUTPUT/FILE 1

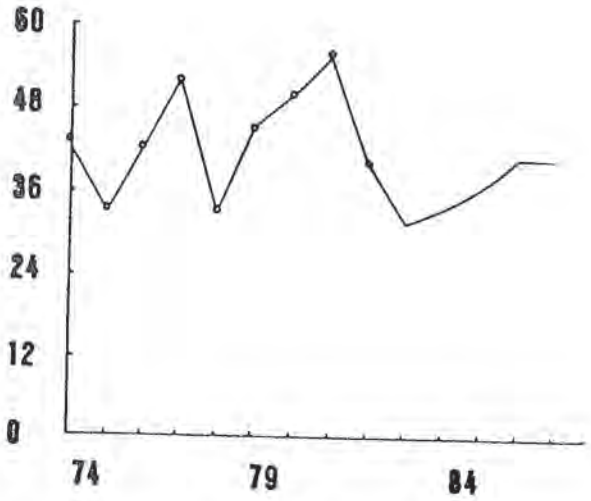
TABLE 6 - PRE AND POST SEASON RATIOS

YEAR	PREWINTER SUBADULTS /100 FEM 2+ A	PREWINTER ADULT MALES /100 FEM 2+ B	MIDWINTER SUBADULTS /100 FEM 2+ C	MIDWINTER ADULT MALES /100 FEM 2+ D	YEAR
1974	44.0	100.0	41.9	100.3	1974
1975	34.8	100.1	32.9	100.4	1975
1976	43.8	100.1	42.1	100.4	1976
1977	58.0	100.0	52.0	100.3	1977
1978	42.1	99.9	32.9	100.2	1978
1979	53.5	100.0	45.5	100.2	1979
1980	55.5	100.0	50.0	100.2	1980
1981	56.8	100.0	55.4	100.2	1981
1982	40.9	100.0	39.9	100.2	1982
1983	32.7	100.0	31.5	100.1	1983
1984	34.9	100.0	33.7	100.1	1984
1985	37.9	100.0	36.8	100.1	1985
1986	42.0	99.9	41.0	100.0	1986
1987	41.7	99.9	40.8	100.0	1987

POPULTION RMP TRUMPETER SWAN OUTPUT/FILE 1

TABLE 6 - PRE AND POST SEASON RATIOS

YR	MIDWINTER SUBADULTS /100 FEM 2+	OBS
74	42	43
75	33	33
76	42	42
77	52	52
78	33	33
79	45	45
80	50	50
81	55	56
82	40	40
83	32	
84	34	
85	37	
86	41	
87	41	



CONCLUSIONS:

- The RMP of Trumpeter Swans is definable and can be modeled using Pop. 50
- The Input and Output File format will require some modification
- To model the population from 1956 to present and into the future will require some modification
- More specific data will require compilation from all population segments to achieve the most reliable results in model refinement
- After refinement of the population model, construct a model of the Tristate Subpopulation to test Subpopulation independence from the Interior Canada Subpopulation

APPENDIX II
State of Wyoming - Wyoming Game and Fish Department
Trumpeter Swan Project
Submitted by Dave C. Lockman
Migratory Bird Biologist

BACKGROUND

Since 1982, monitoring of Trumpeter Swan movements, distribution, habitat use, and flock dynamics have been intensively investigated in western Wyoming outside of Yellowstone National Park. This project will be continued. The results include a wealth of data on habitats and sites used by Trumpeter Swans seasonally and identification of sites used by both the breeding and nonbreeding segments of the flock, as well as their progeny.

Currently, sufficient data exist on seasonal distribution and sites used by known-age swans to launch into another phase required in Wyoming's Trumpeter Swan management program. The long-range objectives and phases (management strategies) required to meet these objectives are as follows for that part of Wyoming outside of Yellowstone National Park:

OBJECTIVE 1. Increase the number of active breeding pairs from the current 1984 level of 12 breeding pairs to a minimum of 50 breeding pairs by the year 2005.

OBJECTIVE 2. Increase the number of suitable nesting and brooding habitats in Wyoming to include historically-used sites within their current breeding range as well as potential habitats outside of their current range.

OBJECTIVE 3. Increase the number and quality of wintering habitats to include areas within their current winter range and introduce swans into potential habitats outside of their current range.

MANAGEMENT STRATEGIES REQUIRED FOR ACHIEVING OBJECTIVES

Phase 1. Identify seasonal habitats, individual age class movements, degree of subadult pioneering, mortality rates, survival rates, and breeding pair recruitment rates for the swan flock in Wyoming.

Tasks for Accomplishment: Identified in an Inter-agency Cooperative Trumpeter Swan Movement and Recruitment Study (1983 Wyoming Game and Fish Department Migratory Bird Completion Report).

Schedule: Initiated in 1982 and ongoing through 1990.

Phase 2. Characterize the attributes of seasonal habitats used by Trumpeter Swans, particularly winter, pre-nesting, and production habitats.

Tasks for Accomplishment: 1) Qualitatively and quantitatively measure and describe seasonal habitats used by known-age swans according to methods prescribed by the migratory bird biologist for Wyoming, and 2) evaluate relationships between swans and their habitats by collecting production, activity budget, and behavioral data on selected breeding pairs and their seasonal habitats.

Schedule: This phase will be initiated in 1985 and completed by 1988.

Phase 3. Develop methods for relocation of swans into new areas for breeding and wintering, while inducing a stronger migratory and pioneering behavioral strategy.

Tasks for Accomplishment: The methods to be tested and source of swans for this phase will be developed and written by March 1985.

Phase 4. Survey sites on all land jurisdictions with potential as swan habitat in Wyoming and prescribe measures for habitat improvement, development, and protection.

Tasks for Accomplishment: 1) Identify potential swan habitat and 2) prescribe methods for protection and improvement of existing habitat.

Schedule: Initiated in spring 1985 and will be ongoing through 1990 and modified with knowledge obtained from completion of Phases 1 through 3.

Phase 5. This is the final phase and entails the implementation of all four phases to their fullest extent in the accomplishment of objectives.

Tasks for Accomplishment: The Wyoming Game and Fish Department Migratory Bird Biologist will provide direction to land management agencies and cooperating private landowners in this effort. Proposals for funding and cooperative management programs will be the responsibility of the Wyoming Migratory Bird Biologist.

PROJECT REPORTING

Annually, project progress will be summarized in the Wyoming Game and Fish Department Migratory Bird Completion Report for Trumpeter Swans. In 1990, a publication will be prepared on the ecology and management of the Trumpeter Swan in Wyoming by Wyoming Game and Fish and cooperators.

* * *

TRUMPETER SWAN EXPANSION IN MONTANA

Don Childress
Waterfowl Coordinator
Montana Department of Fish, Wildlife and Parks
1420 6th Avenue
Helena, MT 59620

Trumpeter Swan use in Montana outside of the geographic region normally referred to as the Tristate Region or Red Rock Lakes National Wildlife Refuge is not well documented.

The area known as the East Front currently has a small population of nesting Trumpeter Swans. It is approximately 60 miles west of Great Falls, Montana, in the vicinity of Augusta, Montana.

Trumpeter Swan use of the area was first recorded in 1971 by Ron Crete of the U. S. Fish & Wildlife Service. One pair with three or four cygnets was observed in July 1971. Personal communications with Montana Fish, Wildlife and Parks personnel indicate observations of Trumpeters 2 to 3 years previous in the same area.

It was not until 1979 that an effort was made to determine the extent of Trumpeter Swan activity in the Augusta area. A total of seven adults and four cygnets was recorded during the 1 June survey. This survey was never completed because of the loss of both pilot and biologist in a plane crash the next day.

Incidental observations continued through 1983. In 1984, an effort was made to cover a major portion of the East Front to locate swans. Only two nesting pairs were located. An additional pair was observed in the Pine Butte swamp area, however, these birds did not attempt to nest.

Since 1971, a total of seven ponds has had nesting activity by Trumpeter Swans in the Augusta area.

One area has not been surveyed in any detail. The Blackfoot Indian Reservation has several wetland complexes which appear suitable as swan habitat. The Department does not conduct surveys on the Reservation because of jurisdiction. Alberta has recorded two Trumpeter Swan nests just across the border which strengthens the case for the Reservation's potential.

It would be difficult to specifically say we are witnessing an expansion of Trumpeter Swans. No doubt we have a small population outside of the Red Rock Lakes NWR, and they appear to be somewhat stable at their current population level in the Augusta area.

* * *

HARRIMAN STATE PARK: BACKGROUND, MANAGEMENT AND TRUMPETER SWANS

Gene Eyraud
Park Manager
Harriman State Park
HC, Box 33
Ashton, Idaho 83420

I. INTRODUCTION

A. The Idaho Department of Parks and Recreation and Harriman State Park.

1. The Department of Parks and Recreation is a small agency with approximately 50 field personnel manning 22 State parks. Of these, 25 are park professionals with varying backgrounds in parks, wildlife, forestry, range management, and recreation.

2. The Department does not have an official wildlife biologist position on its staff. Each park must individually obtain the voluntary assistance of the Idaho Fish and Game Department, a separate agency responsible for all wildlife in Idaho. The parks also obtain assistance from the U. S. D. A. Forest Service, Bureau of Land Management, U. S. Fish and Wildlife Service, or other agencies which have wildlife expertise.

3. At the time that Harriman became a State park, it was not recognized as an important wintering area for Trumpeter Swans.

   a. Several years before State ownership, the area natural resources were studied. It was determined that development should proceed with caution to prevent negative wildlife impacts.

   b. All of the planning work was conducted during the summer; the importance of the area for wintering Trumpeter Swans was not discovered. After taking ownership in 1977, the full-time staff supervised the construction, developed management plans, and studied the natural resources. It was then that the Department learned of the importance of the Park for wintering Trumpeter Swans.

4. Harriman Park staff has been tracking the Trumpeters since 1977 with the help of the Canadian Wildlife Service, the U. S. Fish and Wildlife Service, and Ruth Shea Gale.

B. Harriman is a State park.

1. The lands included are marked on the attached map.

2. The "gift" to the State of Idaho had several strings attached that directly affect our management of people, the resources, and wildlife. Following are the two conditions that most affect our management:

   a. The Harrimans requested the maintenance of the bird sanctuary they had established in the 1940's or earlier. Consequently, human activities are restricted where necessary to prevent interference with nesting and brood rearing.

   b. The Harrimans established a 16,000-acre area around the Park where no hunting or trapping would be allowed. This area has now been designated Harriman State Wildlife Refuge.

3. The Park's management has been greatly influenced by the refuge concept in the gift conditions and has developed as a wildlife park. The Park has no significant or outstanding features but all in all is a unique State park.

   a. Formerly a working ranch/wealthy owners' retreat.

   b. The natural environment has been created by the climatic conditions.

   c. The use of the resources by modern man was light enough to preclude damage to the natural resources.

   d. All of the above make the wildlife habitat very significant.

4. The historical and physical features of the property required a different approach to the Park's management.

a. People activity had to be restricted and monitored. This is new for a park agency accustomed to encouraging increasing numbers of people to utilize the facilities.

b. Man's past utilization of the resources had to be recognized. It was once a working ranch, now under State ownership. It was to be managed to maintain the working ranch appearance. Grazing and logging were part of the management scheme. Unlike other State parks, this one could not be locked up as a preserve.

c. The significance of the wildlife resource was recognized and management was developed to prevent interference by man and other management activities.

II. PRESENT MANAGEMENT

A. Active people management is the primary business of a park and recreation agency.

1. Travel is restricted. The Park was designed to prevent vehicle travel within the Park. This cuts down on the number of people getting into sensitive areas.

2. Trails or parts of trails are closed during sensitive time periods to keep people away from nesting birds and big game calving.

3. Public education is conducted through interpretive methods such as signs, slide shows, brochures, environmental education programs, and nature walks.

4. People activities are monitored to determine impacts on resources and make necessary adjustments to protect the resources.

B. Range management allows utilization of the resources to maintain the "working ranch" appearance.

1. Aesthetics would be considered one objective including the objective of offsetting the negative impacts of intensive grazing by the Forest Service outside of the Park.

2. Grazing provides a revenue to help support the Parks's operation.

3. Grazing is carefully managed to ensure protection of the Park's other natural resources.

a. Areas are closed to grazing to protect the wet meadow evolution.

b. September and October grazing periods are late enough to prevent conflicts between wildlife and cattle.

C. The forests are managed to prevent forest fires, to ensure public safety from hazards, and for aesthetics.

1. The Park is viewed as a "preserve" where resources cannot be utilized.

2. Primary management has been fire protection and hazard control.

a. Areas where people concentrate are cleared of hazardous trees, dead or green.

b. Dead or fallen trees are cleared along the roads to improve aesthetics.

D. Wildlife is not being actively managed at the present time.

1. Wildlife is left alone and all other programs remain flexible. Adjustments are made when necessary.

2. Active people management continues through controlled access and flexible programming.

a. Summer – Trails are closed that may affect nesting areas and big game calving areas.

b. Winter – Access to all Trumpeter Swan wintering areas is restricted.

3. There is ongoing research to determine problem areas.

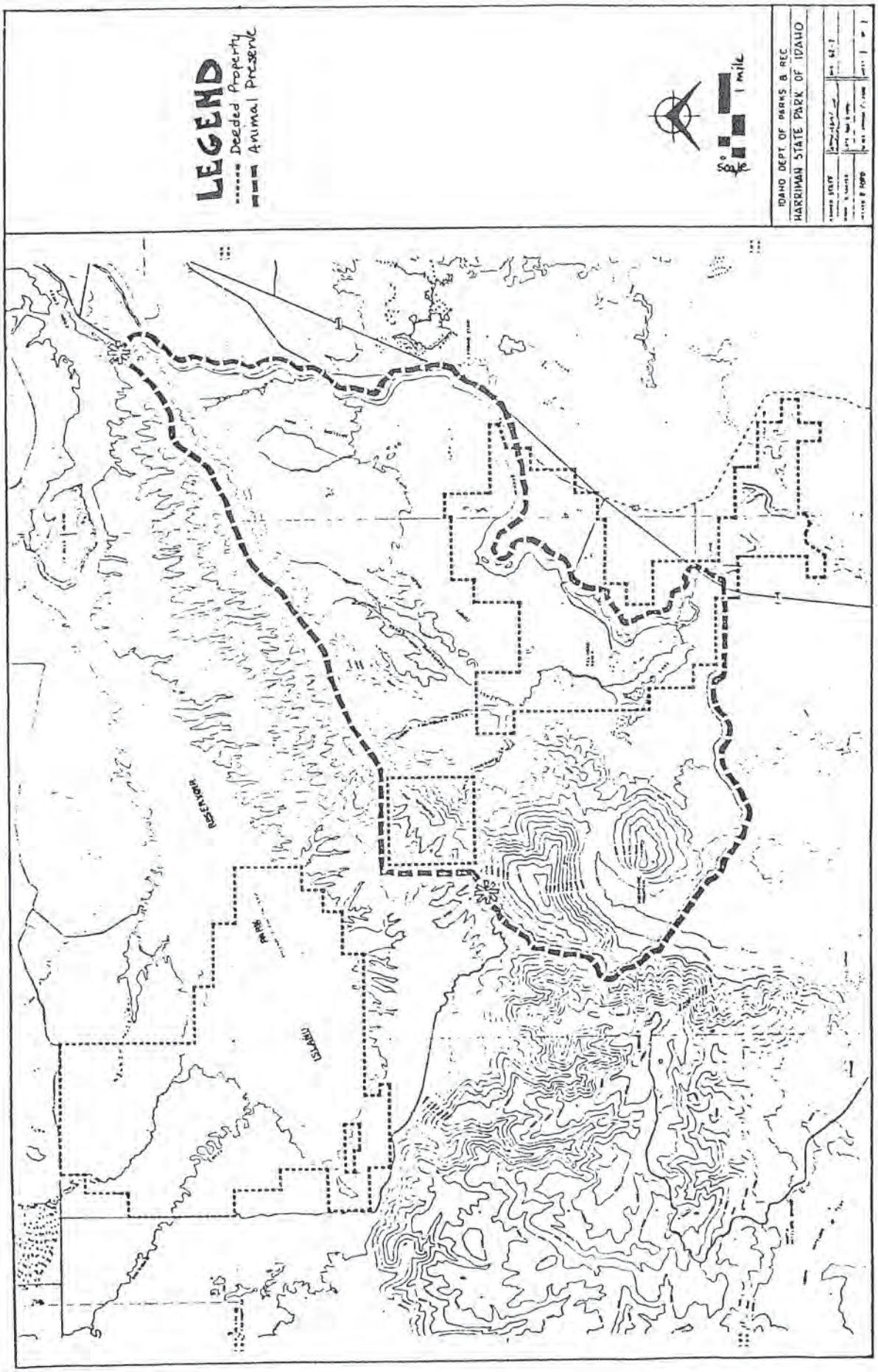
III. FUTURE PARK MANAGEMENT

A. People management must intensify as attendance increases; so will the need for people management programs.

1. Patrolling and monitoring.

2. People contacts and programs.

3. Signing and visitor education.


LEGEND
Deeded Property
Animal Preserve
1 Mile
Scale
IDAHO DEPT. OF PARKS & REC
HARRIMAN STATE PARK OF IDAHO
RESERVOIR
PARK
IDAHO

B. Range and forestry will continue as they are presently operated to improve the aesthetics and the safety to the Park's resources and visitors.

C. Wildlife management will become more active.

1. Develop and improve habitat where possible.

2. Utilize volunteer groups to help with intensive labor projects and research.

3. Work with other organizations and agencies.

4. Increase research.

* * *

TRUMPETER SWANS AT HARRIMAN STATE PARK

Jeff Eaton
Assistant Manager
Harriman State Park
HC 66, Box 33
Ashton, ID 83420

As you read this, keep in mind that Harriman is a State park staffed by recreation professionals. Our State office is also composed of recreation professionals. There is not one wildlife biologist in the entire Idaho Department of Parks and Recreation.

Harriman has a lot of wildlife, and hunting or trapping are not allowed in the Park. But, it is not a wildlife refuge. We are people managers and we provide visitors with something to do when they get here. Watching wildlife, especially waterfowl, is a popular activity. We also provide historical tours, junior range programs, fishing, hiking, horse and wagon rides, picnicking, skiing, educational programs, bicycling, and special ceremonies.

Since Trumpeter Swans are an important resource to the Park, and because people and swans do not mix, the people have to be managed. In order to do that, we need some specific information on the Harriman swans. Thus -- the winter swan survey. There are at least five reasons for the survey: 1) determine the winter distribution of swans in the Park, 2) obtain a feel for the tolerance of people, 3) record weather conditions and determine if they affect distribution, 4) keep human disturbance to a minimum by patrolling the park boundaries, and 5) keep track of swan population numbers, collar numbers, and the percentage of cygnets for swan biologists. The survey is conducted only in the winter. The resident summer population is usually less than 10. No distinction is made between Whistlers (Tundras) and Trumpeters, unless they call. The only Whistlers noted have been in big flocks migrating through the area in the spring and fall.

The survey covers two lakes and 10 miles of river. The river is divided into 17 sections. Each river section and both lakes are counted from 13 observation points about once a week from November through March. One person can do the survey in 4 hours using a combination of transportation methods (ski, automobile, and snowmobile). Spotting scopes have been loaned to us, first by the Canadian Wildlife Service and now by the Idaho Dept. of Fish and Game. Haphazard surveys were conducted during the winter of 1976-1977 due to the inspiration of Al Doberstein. Systematic surveys began 2 years later and have continued ever since.

RESULTS

1. Over the last six winters, swans have congregated on the Henry's Fork of the Snake River in the middle of the Park during the first part of the winter. Then they move up and downstream, but remain within the Park boundaries. Beginning in February, the swans prefer Golden Lake and the River is no longer used.

2. The greatest population ever counted on any survey is listed below for each year. All high counts occurred in January except for 1980-1981, when it occurred in early February.

1978-1979	487 swans
1979-1980	356
1980-1981	316
1981-1982	292
1982-1983	162 (survey did not start until late January)
1983-1984	263

3. Swans on Silver Lake are the most tolerant to humans, while swans on Golden Lake are very spooky.

4. A fair number of collared swans have been seen during the surveys. Collar observations have dropped every year, reflecting the reduction in collaring programs.

5. Portions of the River remain open even when the temperatures drop well below 0 degrees F. The highest counts often occur during a very cold spell.

6. The pasture surrounding the lower 3 miles of river is fenced with barbed wire that is taken down for the winter. Only fence posts remain, and they do not keep skiers and snowmobilers out. Signs at the common access points have reduced the problem of recreationists in swan wintering grounds, but our major advantage is that the area is not very popular with skiers and snowmobilers.

* * *

TARGHEE NATIONAL FOREST TRUMPETER SWANS

Mary Maj
Wildlife Biologist
U. S. Forest Service
c/o Island Park Ranger District
Island Park, ID 83429

A long-time resident of the Targhee National Forest, the Trumpeter Swan can be observed within the Forest boundary during both winter and summer. Habitat used in the winter is found on the river systems within the Island Park District. Habitat used in the summer is comprised of lakes and ponds on the Ashton and, to a lesser extent, on the Island Park District.

The Targhee National Forest has only recently initiated its active involvement in swan habitat management. Two sources of habitat information and management recommendations for resource personnel can be found on the Ashton District. Provided under the Threatened, Endangered and Rare Plant and Animal section of the Forest Plan, recommendations exist for the continual monitoring of use and protection of winter and summer swan habitat. In addition, a more explicit habitat management plan exists for the Ashton Ranger District where, to date, the Targhee's "on the ground" Trumpeter habitat management has occurred primarily.

Following original documentation of Trumpeter Swan nesting on the Targhee in 1932, nesting has occurred almost exclusively on the Ashton District. Since the first summer swan surveys, 44 percent of the lakes on the District have been used by adult Trumpeters. From 1964 to 1984, the occurrence of birds on the Ashton District has averaged 33 adults and seven cygnets. Both these averages are slightly higher than the 50-year averages of 23 adults and six cygnets.

Starting with Shea's work in 1977, yearly, documented, and repeatable summer surveys have been conducted on the Ashton District. Looking at some of the production data for the past 6 years:

Table 1. Trumpeter Swan production data from 1979 to 1984, Ashton District, Idaho.

	Range	6-year average
Number of nesting pairs	5.0- 9.0	6.6
Average clutch size	3.6- 5.0	4.05
Percent hatch	48.0-90.0	75.2
Survival to fledging	3.0-17.0	8.3
% fledged/hatched	17.0-70.0	45
Cygnets fledged per nesting pair	.5- 1.9	1.2

Changes over the years? The numeric fluctuations when examined over a long period of time are relatively small, with a few exceptions. Short-term changes in production appear more drastic. These short-term fluctuations I believe, initially, are dependent upon our late spring conditions and how these conditions influence the availability of nesting habitat.

Looking at data from 1944 to the present, seven out of approximately 50 lakes have produced 35 percent of the cygnets observed on the District. Of those seven productive lakes, five have not been occupied by nesting Trumpeters since at least 1966. In contrast, since 1979, five new nesting territories have been documented. Interestingly, swan nesting appears to be shifting to the northern end of the District, away from the traditionally used southeast corner of the District near Yellowstone National Park. It is this evolution of new use that the Targhee staff hopes to promote through habitat management.

* * *

EFFECTS OF WATER FLOW FLUCTUATIONS, ICING, AND RECREATIONISTS ON THE DISTRIBUTION OF WINTERING TRUMPETER SWANS IN THE TRISTATE REGION

Terry McEneaney
U. S. Fish and Wildlife Service
Red Rock Lakes National Wildlife Refuge
Monida Star Route, Box 15
Lima, Montana 59739

There is very little information about the winter distribution of Trumpeter Swans in the Tristate Region. The reason lies in the difficult access and/or field logistics required to gather this type of data.

Weather is perhaps the greatest single factor influencing the winter distribution of Trumpeter Swans in the Tristate Region of Montana, Idaho, and Wyoming. This area is noted for its long, cold winters, with temperatures reaching as low as -50°F and annual snow accumulation of 100-150 inches. The weather patterns are extremely complex due to the altitude and the geological formations. Within this complex macroclimate there exists numerous microclimates. These microclimates can be either cohesive, forming a continuous weather front, or act independently of each other. Most of the time it is these independent microclimates that typify the weather in the Tristate Region in the winter.

Besides the various microclimates, there appears every year a local phenomenon which is known as the "midwinter thaw." The duration of this thaw varies from 1 day to 2 weeks depending on the winter and the locality. In any given winter, single or multiple thaw periods occur, thus opening up water areas that would not normally be open. For instance, during the winter of 1982-1983, one of the heaviest snow years in 40 years for the Centennial Valley, the weather did not limit the distribution of Trumpeter Swans. Multiple "thaws" occurred all winter long, leaving open water areas available throughout the Valley. Consequently, Trumpeter Swans were distributed over a wide geographical area.

During cold spells, however, the exact opposite occurs. Trumpeter Swans have a very limited distribution due to the small amount of open water available. The Tristate Region is an important wintering area for Trumpeter Swans because of the unique geothermal and hydrological features. This area has a vast array of open water thermal basins, natural springs, ponds, lakes, rivers, and streams which offer ideal wintering habitat for Trumpeter Swans. However, not all open water areas are ideal Trumpeter Swan wintering habitat. Open water areas near geysers, hot springs, and thermal basins are rarely used by Trumpeter Swans. Few macrophytes and invertebrates can survive in this type of environment. Down stream from these thermal basins (i.e., where cooler water mixes with the warm water) Trumpeter Swans are commonly found feeding and resting. Natural springs also offer ideal Trumpeter Swan wintering habitat (e.g. Big Springs, Culver Springs). Ideal river conditions for wintering Trumpeter Swans are those that are shallow, slow moving, and free of ice flows.

Inlets to large lakes also provide excellent Trumpeter Swan winter habitat (e.g. Hebgen Lake inlet, Ennis Lake inlet). Some man-made lakes provide excellent wintering habitat (e.g., Jackson Lake Dam, Island Park Dam, and Palisades Dam).

Water flow fluctuations and icing are somewhat interrelated and have a profound effect on Trumpeter Swan food supplies and Trumpeter Swan distribution. Paul Hampton in his 1981 thesis The Wintering and Nesting Behavior of the Trumpeter Swan found that when the Island Park Dam outflow was lowered to half the existing 1978/1979 water level, this had a profound influence on the number of Trumpeter Swans utilizing the Harriman State Park area. When the water levels were back to normal, the number of Trumpeter Swans utilizing Harriman State Park was also back to normal.

Icing is highly influenced by temperature and water levels. Changing water levels gives ice a greater chance of destroying a river bottom and, consequently, Trumpeter Swan habitat (e.g., Madison River - Hebgen Lake, Madison River - Ennis Lake). Ice is not always bad, in some cases it actually preserves certain swan habitats, by remaining frozen all winter long.

Fluctuation in weather conditions is believed to be responsible for the fluctuations in Trumpeter Swan numbers from week to week, month to month, from area to area. The weather conditions also impact food availability. Swans, like many birds that winter in harsh environments, are opportunists. They take advantage of optimum food supplies. If food was evenly distributed throughout the wintering habitat, then one could expect swans to be more evenly distributed. Sporadic supplies are probably available in different areas at different times as is evidenced by peak population numbers in different areas at different times.

All of the above fluctuating variables influence swan distribution. But there is another variable that does not fluctuate, only increases, and this could have the greatest influence on winter distribution of Trumpeter Swans in the future. This variable is called human disturbance. Trumpeter Swans are much more vulnerable to disturbance in the winter than the summer. Winter recreationists (snowmobilers, skiers, ice fishermen, and mobile homeowners) are utilizing and, in some cases, taking over prime Trumpeter Swan wintering habitat (e.g., Henry's Fork, Jackson Hole, Teton Basin). It is imperative that before we seek out new wintering areas we secure as best as possible, traditional wintering areas for Trumpeter Swans in the Tristate Region.

IN SUMMARY

1. Weather is perhaps the greatest single factor influencing the distribution of Trumpeter Swans in the Tristate Region at the present time.
2. Each area is influenced by its own microclimate.
3. During "thaws," Trumpeter Swans are more widely distributed.
4. During cold periods, Trumpeter Swans are much more concentrated.
5. Water levels and icing are somewhat interrelated and have a profound effect on the distribution of Trumpeter Swans.
6. Swan distribution is also influenced by food availability.
7. Optimum food supplies are sometimes sporadic and may result in swan populations peaking out in different areas at different times.
8. Winter recreationist activity is increasing in the Tristate Region. Valuable Trumpeter Swan wintering areas need to be set aside and managed before it is too late.

* * *

ROCKY MOUNTAIN POPULATION (TRISTATE FLOCK): STATUS OF TRUMPETER SWANS AT CAMAS NATIONAL WILDLIFE REFUGE 1983-1984.

Stephen H. Bouffard
Biologist
Southeast Idaho Refuge Complex
Federal Building, Room 142
250 South 4th Street
Pocatello, Idaho 83201

Trumpeter Swans from the Tristate flock began nesting at Camas National Wildlife Refuge in 1976. Since that time, small numbers have nested there nearly every year.

1983 Highlights

A. Migrants included 20 on 24 March and 36 (including 12 cygnets) on 31 October.

B. Four pairs were present during the nesting season, but no cygnets were produced.

1984 Highlights

A. Six adults were on the Refuge.

B. One pair hatched five cygnets.

* * *

PANEL DISCUSSION: COORDINATING MANAGEMENT OF THE ROCKY MOUNTAIN TRUMPETER SWAN POPULATION AND THE ROLE OF THE TRUMPETER SWAN SOCIETY

Editor's Note: Every organization must occasionally undergo some degree of self-evaluation to determine if its actions are serving to accomplish its objectives. An organization's worth may be viewed differently by the assorted organizations and individuals with which it works.

In an effort to improve the effectiveness of The Trumpeter Swan Society, a panel of biologists who work with Trumpeter Swans was assembled to address one specific question, "What do you feel is the most appropriate role for The Trumpeter Swan Society in the overall management plan for Trumpeter Swans?" It is hoped that the answers they gave can be used to help direct the Society's Board of Directors in the years to come.

Earl B. Baysinger
U. S. Fish and Wildlife Service
Creekside One, 2627 Redwing Road
Ft. Collins, Colorado 80526

Although I don't have a formal presentation, there are a few thoughts and comments I'd like to contribute. My background and perspective are a bit different from those of many of my collegues in the bureaucracy. They include and derive from many years in the Service's International Bird Banding Laboratory working more closely with members of "Academia" and other private individuals and organizations than with governmental organizations or individuals, and a lengthy stint in the Endangered Species Program, followed by an assignment on the International Affairs Staff both of which required close working relations with many non-governmental persons and organizations. There also was a 2-year detail to the Switzerland-based International Union for the Conservation of Nature and Natural Resources, an international Non-Governmental Organization (NGO) comprised largely of other NGOs and a global confederation of cooperating scientists. These assignments have stimulated considerable empathy with persons or groups working outside the "official" governmental agencies to protect or enhance certain values or resources. They also provided an opportunity, as an "insider," to observe where and how some such efforts have succeeded and when and why others have not.

I am of the opinion that NGOs -- such as our Trumpeter Swan Society -- have vital roles to play in the environmental conservation arena and, if they concentrate on those things they do best, can have very significant impacts.

There are some things that NGOs -- with some remarkable exceptions -- do not do very well. These might include actions that require:

- authority. The exercise of authority, by definition, is a function of government. However, many NGOs legitmately use their other considerable talents to influence how governmental agencies exercise authority.

- long-term dedication of monetary resources. Most NGOs are funded by a membership and find it difficult to take on long-term commitments for significant amounts of money. Here again, many have become quite adept at influencing how governmental agencies allocate the monetary resources available to them.

- the dedication of large blocks of time or long-term continuity of personnel. Most NGOs can not afford large, paid staffs, and the bureaucracy needed to support them, and the time one can expect from volunteers - regardless of their dedication - is limited. The efforts of NGOs frequently have persuaded governmental agencies to dedicate personnel to an identified problem area.

What then are some of the areas in which NGOs - like our Society - can be active and effective? From the above, one such area obviously might be assisting or encouraging governmental agencies to use their authorities and resources in such a way that the conservation status of the Trumpeter Swan is enhanced.

My observations over the past two and a half decades have identified several ways in which NGOs consistantly have been remarkably effective in "helping" agencies at various levels of government enhance the effectiveness (or minimize the destructiveness) of their actions. Not all NGOs function equally well in all these areas but all seem to do quite well in some and some do well in all. As with many technocrats, I have a tendency to "lump" concepts into "short-hand" type categories and, true to form, refer to these areas as the "Seven Cs of Enviromental Conservation." Collectively they form a cooperative blend of talent, resources, and movement of information between and among governmental and non-governmental personnel so that the resources of both can be focused effectively

upon the same problem. Persons working within a bureaucracy are subject to a number of constraints that those in the private sector do not suffer and those in the private sector sometimes lack the information or other resources available to the bureaucrat. The consistant action of these "Seven Cs" sometimes dissolves or washes such obstacles away, to the benefit of the resource.

I am frank to admit that I have seen few new or innovative ideas originate and survive the clearing processes that exist within most bureaucracies. This does not mean that persons in those organizations do not have ideas but rather that most agencies are resistant to change and their internal systems, perhaps unintentionally, are such that ideas that would bring about change usually are squelched or drastically modified early in the process. Effective NGOs have no such problem and it is in those organizations that "CONCEPTUALIZATION" and development of new ideas, regardless of their origin, can take place. If this first of the "Seven Cs" is not to become stagnant, there obviously must be effective channels of "COMMUNICATION" through which information can flow between those within the bureaucracies and those in the NGO community. If such channels exist and if the ideas flow freely, then one would expect the third of the "Seven Cs" - "COLLABORATION" - to appear on the horizon. This informal and unofficial "fine tuning" of ideas by knowledgeable persons with different perspectives can very effectively weed out ideas that are "losers," convert some losers into "winners" and increase the payoff of obvious "winners." This "CATALYTIC" role - the fourth of the "Seven Cs" - enables NGOs very effectively to develop and visibly float well-developed, alternative ideas or solutions that those working within a bureaucracy might find very difficult or impossible to surface. The fifth of the "Seven Cs" - "COOPERATION" - really needs no discussion other than to, acknowledge that not very much can happen without it and that with enough of it very little is impossible. Even in instances in which an agency and an NGO might be quite far apart on an issue, individuals within each must be alert to areas of agreement in which they can cooperate and be willing to maintain an environment in which such cooperation can grow.

The two final "Cs" - "CONSTRUCTIVE CRITICISM" - identify the area in which NGOs perhaps can be most effective. Persons working within an NGO usually have much greater latitude and more outlets for the expression of their views or alternative opinions on issues than do those working within a bureaucracy - particularly if such views or opinions do not coincide completely with whatever "official policy" is then in effect within the agency in question. If some of the other "Seven Cs" have been navigated effectively, that is if there has been effective communication, collaboration and cooperation between agency and NGO personnel so that the NGO's constructive criticisms are based upon accurate information and offer workable, more effective alternatives then, through its ability to offer accurate and constructive criticism and workable alternatives, the NGO truly can be a catalyst in bringing about changes to bad policies or practices to the benefit of all concerned.

However, the exercise of constructive criticism must be done effectively and efficiently. The line between constructive and destructive criticism is not clearly defined and the successful critic must watch for it very carefully. Bureaucrats tend to be very conservative, very sensitive to any criticism, very reluctant to acknowledge fault with any decision or action that transpired during their tenure, and therefore very prone to batten down the hatches and become very defensive at the first indication of a ripple on their sea of tranquility. Timing, therefore, is important - it is much more productive to challenge a policy or procedure established by a predecessor than one established by an incumbent unless, of course, the predecessor has been promoted and is now the incumbent's superior! The ability to offer criticism, challenges, or alternatives without being perceived as a threat is a skill to be sought and cherished.

An example of a short cruise on some of these "Seven Cs" took place during the picnic lunch at John Taft's the other day. I don't know how many of you were aware of the little side meeting that took place and during which John was able to demonstrate on the big map in his study, how important the protection of some of the tracts of land now up for sale in this area is to the maintenance of the integrity of the Centennial Valley ecosystem. On Friday, when I return to Denver, we will meet with representatives of The Nature Conservancy and others. I predict we will revise some of our Regional land acquisition priorities to give these important areas in the Valley a higher priority than they now enjoy. This opportunity for effective COMMUNICATIONS already has developed a productive COLLABORATION and the prognosis for COOPERATION is excellent. By thus serving as a CATALYST in developing this CONCEPT, The Trumpeter Swan Society has materially increased the liklihood that their major area of interest -- the continued improvement in the conservation status of the Trumpeter Swan -- will be enhanced. If not, the role of CONSTRUCTIVE CRITIC is still available!

If one looks at the composition of The Trumpeter Swan Society, even that portion of the membership represented in this room today, we can find persons who are experts on the bird itself, those well versed in the management of water or wetland ecosystems, others who have the authority to control significant pieces of Trumpeter Swan habitat, individuals with access to the policy making processes, others with access to the media, and yet others who have a combination of these skills and the time to exercise them. With such a mixture, it would seem that periodically paddling about in the "Seven Cs" might prove most beneficial to the swan and rewarding to those of us concerned about its welfare. This group has an important role to play and one you need not be bashful about. Quite frankly, I'd like to see you get a bit more "pushy." Most folks in positions like mine have been taken on enough cruises through the "Seven Cs" to have developed calluses on most of the vulnerable spots, so we will not be hurt and, in fact, probably will be helped.

I appreciate the opportunity to meet and talk with this group. I've learned a lot, have established some new contacts and renewed some old ones. From my perspective, the meeting already has been highly beneficial. In addition, one seldom gets an opportunity to listen to the likes of Win Banko and Harold Burgess debate at length, as they did yesterday, the relative importance of being able to pass water efficiently!

I will be here through the entire meeting and look forward to opportunities to talk with more of you individually. Thanks for the opportunity.

* * *

Richard Bauer
Migratory Bird Coordinator
U. S. Fish and Wildlife Service
500 Northeast Multnomah
Portland, Oregon 97232

I don't have anything really new to propose or recommend. I think we have a system right now that can work very well in addressing the points that we are discussing this morning. One point is coordination and, more specifically, how we try to operate our Regional Office of the Fish and Wildlife Service in the Pacific Northwest Region as far as coordinating the effort in the migratory bird program. We've divided our program into two sections (a game and a nongame effort), as I think most of the state fish and wildlife agencies have done also.

Most of our coordinated effort with the game program has been through the Flyway Council, Pacific Flyway Technical Section, and the subcommittees of the Flyway Study Committee.

The nongame effort which we really just started in the last few years has been set up a little differently. Again, it is a coordinated effort primarily within the states within our region right now. We haven't reached the point where we are really discussing and coordinating very much with the Canadian Wildlife Service or the provincial departments. Hopefully, that will come. The nongame effort is a very wide spectrum project. Where do you start and where do you stop? To narrow efforts down, we came up with a list of critters. We call it a Sensitive Species List. In our region, which covers the five western states including Idaho, we've identified about 20 species that we are going to put some of our key effort into through the nongame program. Sandhill Cranes and swans are both listed here. However, we took a slightly different approach for both these species, because they were currently being covered by the Pacific Flyway Planning Group. So, even though they are listed as nongame critters, we said that, "Hey, we've already got an organization set up within the Pacific Flyway Council that lets us manage and coordinate the effort on these species." The other nongame species are handled separately. Right now, there is a meeting going on with representatives from our region and state nongame biologists in Reno discussing other birds on the Sensitive Species List. They are not discussing swans and cranes.

It is my recommendation to continue the Flyway Council effort as far as the swans are concerned. We have the councils -- I think that was explained the first day that we met. The next step down from the Council is the Pacific Flyway Study Committee, the technical-type people who make recommendations to the Council. The Study Committee is further divided into subcommittees. Again, the membership within the subcommittees is normally the state representatives and the provincial and Canadian Wildlife Service representatives, as well as the U. S. Fish and Wildlife Service. It's up to those management agencies to take the lead responsibilities for managing migratory birds.

However, the subcommittees have taken it one step further by utilizing the expertise available within groups such as The Trumpeter Swan Society, other special interest groups, and from the universities.

What I am suggesting is that The Trumpeter Swan Society hopefully could be asked to appoint a representative to the Pacific Flyway Council subcommittee for Trumpeter Swans and, more specifically, for the Rocky Mountain Population of Trumpeter Swans. You would not be a voting member and that doesn't really mean a heck of a lot because it's not that structured or formal of an organization. At least The Trumpeter Swan Society could be there, if you are interested, to have input on specific management concerns, whether it's monitoring, strictly management, or research. Most of the time, the subcommittees do try to come up with a priority list of monitoring, management, and research activities. Once the decisions have been made, they can be carried out at the local or field level.

For instance, if one of the recommendations is to put more emphasis into winter population monitoring in the Tristate Region, which would involve Region 1, some of the responsibility would begin with me. Of course, we would try to pass it to the people in the field. That's where it would

end up eventually. All these other steps are guidelines to get things done at the local level. Sometimes it's done at the next level up, but I think that in 90 percent of the cases the action occurs at the field level.

Looking at the whole flyway system, the problems, flyway-wide, are due to limited people power and funds. Some sort of priority system is needed. In summary, I am really suggesting that The Trumpeter Swan Society be asked to appoint a representative to attend subcommittee group meetings.

* * *

Don Childress
Waterfowl Coordinator
Montanta Fish, Wildlife and Parks
1420 6th Avenue
Helena, Montana 59620

If you looked at your program carefully, I am not Dave Lockman, and Dave didn't leave me notes, which is probably fortunate for all of us. I can read his writing, but it gets rather lengthy and, as you noticed in my presentation yesterday, I was rather brief.

We have heard a wide spectrum of ideas about the role of The Trumpeter Swan Society. I think the process exists today that allows the communication, the expertise, to flow freely. It's a matter of making that process work. We have heard the role all the way from international liaison to cooperative critic, communication, the political end, and the technical end. I think those are all valid points. I don't think the Society's role should be any single issue.

I am going to speak a little bit from the lower management program perspective. I have been involved on the Rocky Mountain Population Subcommittee, and I think that the lack of communication is a problem which, in turn, leads to misunderstanding. From the state perspective, I have had an opportunity to work very freely with Red Rock Lakes NWR personnel. We have tried to solve problems on the ground, and I think good communication has been a very important aspect. The presentation that was made yesterday by the Society was excellent. The fact that the Society made recommendations and not demands also puts a different perspective on the way in which they can be viewed and worked. I hope that all of those recommendations were made to the U. S. Fish and Wildlife Service. Those recommendations would also apply to the State of Montana. We do have a role and an obligation to help in the Trumpeter Swan management process.

There is another aspect to consider. The Trumpeter Swan Society has an excellent opportunity to provide input. The facts that we heard yesterday in the report demonstrated that to me very well. I encourage the opportunity to discuss issues, programs, and facts with those people.

Getting back to the critic role, it's very easy for us to sit in the bureaucratic system and make excuses why we haven't done something. If you remember my talk the other day, I said we do not have a Trumpeter Swan program, per se. I think The Trumpeter Swan Society can provide the impetus to change that. The Society can give direction as to the importance that Montana can play in Trumpeter Swan management. I guess I won't ramble on any further, but I think we can start at the base level. The Trumpeter Swan Society can be involved in subcommittee deliberations, provide input, and it can work up from there. The involvement can start out at the bottom, as well as at the top. So, I guess I will leave it at that.

* * *

Rick McKelvey
Wildlife Biologist
Canadian Wildlife Service
P. O. Box 340
Delta, British Columbia V4K 3Y3

How can The Trumpeter Swan Society assist in the coordination and management of the Rocky Mountain Trumpeter Swan Population? At official levels, I think that the coordination of management is appropriately done through Flyway Technical Committees. I see the situation that I am trying to talk about here a little differently from what we have heard this morning. We are now at an international level. It's important that we keep in mind that we have to coordinate at an international level, and we have to keep the official channels open. Trumpeter Swan management may not always be a high priority, either in Canada or in the United States, in the provinces or in the states, but the fact that we have a North American Management Plan for Trumpeter Swans is a good indication that at the official level, we recognize a need for coordinating management.

How can The Trumpeter Swan Society insure that interests are maintained in this Plan? I know at one time The Trumpeter Swan Society had a research committee. That could be expanded to include research and management. Then, at that level, The Trumpeter Swan Society would have an official arm for input to international management, and I think it would be best directed to the Flyway Technical Committees. A lot of what we have accomplished in swan management at the international level has been done at the working level.

The members of the Society, by and large, are technical people. We talk directly to each other, and we don't very often go through the official channels to make national work plans. If we want to insure official recognition of such plans, then we need to twist the arms of the upper level bureaucrats to ensure consideration for swans all the time. I think the route for input from The Trumpeter Swan Society to these types of management options or to insure that these things are recognized by the bureaucrats needs to occur on two levels in Canada. It needs to be done formally by letters and suggestions to bureaucrats in Ottawa in the CWS, and we need to continue the informal input, at the working level, through meetings like this.

I suggest the best way, perhaps, for us to continue to have input to the Ottawa bureaucracy is through some kind of Canadian spokesman. This way, we would avoid the appearance of being by and large an American society. The bulk of the interest in swans is still in the United States. There just aren't enough people in Canada to produce the level of participation we see in the United States. Therefore, if we had a Canadian spokesman speaking for the concerns of The Trumpeter Swan Society, we could insure that the Ottawa bureaucracy was consistantly aware of The Trumpeter Swan Society's concerns. I have no suggestions right now as to who that spokesman might be, but I think, logically, that it should be somebody in Canada with swan expertise who is not employed by the government right now, but we can work on that later. I guess that is about all I have to suggest. Perhaps there will be some discussion later on.

* * *

Justin Naderman
Wildlife Biologist
Idaho Fish and Game
1515 Lincoln Road
Idaho Falls, Idaho 83401

Thank you, Don. My name is not on your program. However, since Idaho is one of the states involved, I was asked to give my views. I don't think that I can add a whole lot to what has already been said today. As I see it, the Rocky Mountain Population Subcommittee through the Study Committee and the Flyway Council is primarily responsible for the coordination of management of the Rocky Mountain Population of Trumpeter Swans. Guidelines for this management along with objectives and goals are outlined in the North American Management Plan for Trumpeter Swans which we all hope will be signed off on in the not-too-distant future.

In addition to that, as far as the role of The Trumpeter Swan Society, I see it as playing a supporting role. When I say supporting, I mean both in the way of knowledge, as well as financial support; support for the research and management efforts of the Subcommittee, the states, and the agencies. I also see that you can play a supporting role in public education and information. Sometimes, it's difficult for state bureaucracies, if you can call them that, or agencies, to deal with certain problems. There are times when our hands are tied. We rely on funds that are appropriated through state legislatures. It is not uncommon to have one of the state legislators walk into our offices and jump up and down because one constituent complained about something that we did or did not do. An agency such as yours is immune to that. You can provide two or three comments, and the legislature relies on votes.

I also see a role that the Society can play in sharing knowledge of swan behavior, physiology, nutrition, and habitat needs. I tend to shy away from the word expert, mainly because I have never been able to describe or define an expert. I will readily admit that probably any one of you has more knowledge of Trumpeter Swans than I do. I have a fair knowledge of general wildlife and habitat management, as well as plant and animal ecology and interrelationships, but when it comes to specific knowledge of Trumpeter Swans, I know that many of you have more knowledge than I have. The state fish and game agencies are primarily responsible for monitoring populations, collecting data necessary to make management decisions, and for the protection of swans within their respective jurisdictions. I don't see this as something that The Trumpeter Swan Society can address directly. You can give your support through the subcommittees or through the states, but you cannot do all of the work. It is up to the states to do the work. Thanks.

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Barry Reiswig, Refuge Manager
Red Rock Lakes National Wildlife Refuge
Monida Star Route, Box 15
Lima, Montana 59739

I'm going to concentrate primarily on the Tristate Region this morning. The Greater Yellowstone Ecosystem is getting more crowded all the time, and the critters and people that live and recreate in this neck of the woods are entering an increasingly competitive situation in certain places for their various activities. I think Trumpeter Swans are now, or will be in the future, facing a squeeze from other pressures if space is not set aside now for their needs and activities. Bob Anderson last night pointed out the number of agencies and governmental entities, as well as private land owners, that live and operate in the Tristate Region. His point was very well taken.

After being here for about a year and a half, I've noticed that many of the local folks, including the land managers, don't really realize how important the Tristate Region is for Trumpeter Swans. I have talked to land managers who were responsible for on-the-ground activities who had no idea that they had Trumpeter Swans using their areas or what types of requirements Trumpeters have. The recommendation I would make to the Society is to become more involved with the various land managers and governmental entities working in the Tristate Region, a more political role, if you will.

Some of that has already been done. Some of your members have taken action. Last winter, Ruth Gale and others made a presentation to the county commissioners during this planning process. It went very well. The commissioners gained a better understanding of what the Trumpeter Swan's needs are along the Teton River in Idaho.

Some of the Society members were instrumental in focusing more attention on the Trumpeter Swan in the U. S. Fish and Wildlife Service. People wrote letters and started talking around to build some interest in the Service. That's been very helpful from the agency's viewpoint.

But, there is still a lot to do. I was just talking to the Forest Service biologist [Jerry Light] out of the Gallatin National Forest. There is increasing recreational use of the upper Hebgen Lake area, which is an area that is extremely important for Trumpeter Swans. It was suggested that the Society's members visit the Regional Director of the Northern Region of the Forest Service and request that the Trumpeter be made a sensitive species. In that way, planning for Trumpeter Swans could be incorporated into the land use plans right down at the district level. Really, that's where the action is. I know that in my work with the Beaverhead National Forest, the same type of action would be very helpful. District personnel there were not aware of the importance of several of their areas to Trumpeter Swans. They were very willing to accommodate the swans' needs and are interested in finding out more. However, I think, particularly in the Forest Service, there are so many conflicting priorities and problems to deal with that if something is not pointed out to them, many times they will not take action on it.

The forest system in the Tristate is going to be extremely important for the future expansion of Trumpeter Swans. Many of the areas the swans hopefully will pioneer out into are on National Forest Service lands. The Beaverhead, Gallatin, Targhee, Bridger, Teton, and the Shoshone National Forests could all play critical roles in the future.

I recommend that the Society form another subcommittee. The goal of this committee would be to meet with a select number of land managers, refuge managers, park superintendents, forest supervisors, regional supervisors, district rangers in the Forest Service, and several of the area managers of the Bureau of Land Management (BLM) in districts where BLM lands are important to Trumpeters. I urge that the Society also begin working with the Idaho State Parks Department. From what I understand, the folks at Harriman State Park find it an uphill battle to maintain the wildlife values they have developed in that park. They need to be supported at the state level, and need to be commended for the work that they and their employees have done.

I am urging a more political role for the Society and also a coordinator role. Society members possess a great deal of knowledge on the needs of Trumpeter Swans in the Tristate Region. Many land managers, once they are aware, will work to better protect the future of Trumpeter Swans in the Tristate.

* * *

Art Hughlett
61500 Lobo Road
Montrose, Colorado 81401

Being last on the panel does have certain advantages. Everything I was going to say has been said before, and now I am just going to go back and reinforce what I like most about those presentations. As a nonbureaucrat, I can do that. As a long-time member of The Trumpeter Swan Society, I can do that. I've looked at the Society over many years now. I think that it really has three important roles. The first is to educate, because there are a lot of people who should know about Trumpeter Swans who don't know that they even exist. I am always amazed when I am so interested in Trumpeter

Swans to find that somebody else is not. And, obviously, there is something wrong with them. But, we need to educate a lot of people, including administrators. We've got one now among us. We've got some others now that are interested in Trumpeter Swans. Galen Buterbaugh, the Regional Director of the U. S. Fish and Wildlife Service, would have been at this meeting except for the fact that his boss, the Director of the Fish and Wildlife Service, called him to a meeting in Juneau of all places, when he could have been here at Red Rock Lakes NWR. He is interested in Trumpeter Swans, probably not as deeply interested as we are, but we need to educate him. There are a lot of administrators who need to be educated.

One group that we have not talked about educating is state and Federal legislators. We have a lot of people in our Congress and in our state legislatures who would do something for Trumpeters Swans if they knew Trumpeter Swans needed help. It is surprising how that big, white bird can draw people's interest. It's a lot better than some little creepy, crawly critter that is on the Endangered Species List. I support protecting those rascals too, but it is a lot easier for me to support a Trumpeter Swan.

I think the same thing is true about our legislators. Some of you have contacts with those people or with their aides and that is where we need to educate them. We need to advise these legislators. That is probably the second role that we have as a Society. We need to advise them of needs. I intend to write to Senator Bill Armstrong from Colorado, if he gets reelected this fall, and tell him what a wonderful state Colorado would be in which to introduce Trumpeter Swans. We already have the Monte Vista and the Alamosa National Wildlife Refuges down in the San Luis Valley, which would probably be nice stop-off places for those critters. It's cold up there at 7,000 feet. It wouldn't be a good spot for them to spend the winter, anymore than this area was. It might be a nice place to have Trumpeter Swans in the State of Colorado for the benefit of the people of Colorado. Legislators like something tangible for the people of the State, because people vote when they get something.

And, the third function of The Trumpeter Swan Society goes right along with the second, and that is to influence -- to educate, to advise, and to influence. We, as single voters, have a lot more power than we've ever dreamed of. If you talk to Congressmen, Senators, or their aides, they will say that a well-written letter by a constituent carries more weight than thousands of names on a petition. We have the ability to influence.

We've got information that nobody else in the world has. This group is now much better informed than they were 3 days ago about Trumpeter Swans and their habitat. Certainly, we ought to be generous enough to pass that along to other people.

Rick mentioned the international activities. We are capable of doing that. We can write to Ottawa; we can write to Alberta; we can write to Saskatchewan; we can write to British Columbia; we can write to Quebec and say, "Hey, why don't you do something about this beautiful, big, white bird?" There isn't a single bureaucrat in this room who has that freedom of action. We influence because we do have that freedom of action.

Now, it takes some doing to get from a prone position to up and walking -- it is a big job. But, we can overcome that inertia. Ruth did it, as you heard when she and others presented information to a group of county commissioners. They listen to people who live in their state. They would probably listen to somebody from the southern part of Idaho, and they would listen to people who are knowledgeable about conditions in their own county. We can influence. Ruth had to educate and advise them a little bit, but, obviously, that group of people influenced those county commissioners. And, this, I think, is a role of The Trumpeter Swan Society. It takes all of us to make The Trumpeter Swan Society a voice that is well known and respected.

We have aviculturalists in our group whom we haven't heard much from at this meeting. These people have expertise that they could share with us, and we need to listen. In order to help educate other people, we have to be willing to listen, to advise. If we're going to influence anyone else, we have to be able to be influenced. Remember, the next time someone asks you to do something for The Trumpeter Swan Society, the answer is, "Yes." It's your opportunity to educate, advise, and influence.

# # #

Pacific Coast Population

AN OVERVIEW OF THE NORTH AMERICAN MANAGEMENT PLAN FOR TRUMPETER SWANS AS IT PERTAINS TO THE PACIFIC COAST POPULATION

R. W. McKelvey
Wildlife Biologist
Canadian Wildlife Service
P. O. Box 340
Delta, British Columbia V4K 3Y3

ABSTRACT

An overview of the North American Management Plan for Trumpeter Swans as it pertains to the Pacific Coast Population is presented. The current status of the Population, the objectives of the Plan, the uses made of swans, management problems facing swan biologists, and proposed management procedures are reviewed for Alaska, Yukon Territory, British Columbia, Washington, and flocks introduced at Turnbull, Malheur, and Ruby Lake National Wildlife Refuges.

INTRODUCTION

Some years ago the need was perceived for management plans for certain species of waterfowl; amongst those was the Trumpeter Swan in the Pacific Flyway. Since the idea originated, the plan has undergone a considerable evolution. What was once a Pacific Flyway Management Plan has now become a North American Management Plan.

To facilitate continental management of the Trumpeter Swan, three subgroups were recognized. These are: Interior Trumpeter Swans - restoration flocks lying east of the Rocky Mountains; Rocky Mountain Population - including the non-migratory Tristate Subpopulation and the migratory Interior Canada Subpopulation; and the Pacific Coast Population - birds breeding in Alaska and wintering on the Pacific Coast of North America. For convenience this Population also includes restoration flocks in Washington and Oregon.

The purpose of this paper is to briefly review the contents of the North American Management Plan for Trumpeter Swans as it pertains to the Pacific Coast Population. The plan reviews the current status of the population, presents objectives, and then discusses uses, management related problems, and proposed management procedures. Management procedures are prescribed for swans on a rangewide basis, and for specific areas within the range. A procedure is set out for annual review of the plan to update status, review progress towards the objectives, and to redefine problems and proposed management procedures.

PLAN SYNOPSIS

Current Status

Summer	Alaska	7,700
	British Columbia	10

The current status of Trumpeter Swans breeding in Alaska is based on estimates derived from surveys in 1980 and 1982 (King & Conant 1981 and 1982). Few swans in the Pacific Coast Population (PCP) breed outside of Alaska. More swans breed in British Columbia than indicated here, but they are part of the Interior Canada Subpopulation.

Winter	Alaska	200
	British Columbia	5,000 - 7,000
	Washington	500
	elsewhere	100+

The bulk of the Pacific Coast Population winters in British Columbia. Recent surveys can account for approximately 5,000 birds, but throughout the range there are still about 2,000 birds unaccounted for. The assumption here is that, given the remote nature of the British Columbia coast and the apparent preference of PCP Trumpeter Swans not to migrate too far south, those birds are probably to be found in British Columbia.

OBJECTIVES

The objectives of the Plan for the Pacific Coast Population are to:

1. maintain the population at or above 8,000 birds;

2. maintain current breeding and wintering distributions and to encourage range expansions as a natural process rather than through transplants; and

3. develop a joint Canada - United States program to maintain habitat.

Since the inception of the Plan, the first objective has already been modified upward once, as the population has expanded.

USES

The known uses people make of Trumpeter Swans are reviewed by province and state. Basically they are confined to viewing, education, and scientific study. As elsewhere in the Trumpeter Swan's range, no hunting of the Pacific Coast Population is permitted.

PROBLEMS

The problems identified by province and state fall into two main categories:

1. loss of or alteration of breeding, migration, and wintering habitat; and

2. the need for more detailed life history information.

MANAGEMENT PROCEDURES

The proposed management procedures to be applied rangewide include the following:

1. an annual review of the Plan;

2. a breeding population survey, on a 5-year cycle, patterned after that of the Alaska survey but also including the Yukon and British Columbia;

3. a wintering population survey, at 5-year intervals;

4. delineation of subpopulations and migration routes;

5. assist, where possible, in developing an interpretive program;

6. promote the use of Pacific Coast Population swans for restoration and aviculture on a priority basis; and

7. continue total hunting restrictions.

Specific management recommendations, that is those applying to specific provinces and states, relate strongly to the first categories of problems: loss of or alteration to habitat. The main points of the specific recommendations are given in the following table.

Table 1. Specific management recommendations by province and state.

Location	Management area of concern
Alaska	Habitat protection
Yukon Territory	Habitat protection Habitat requirements Delineate distribution and migration patterns
British Columbia	Habitat protection Population monitoring
Washington	Habitat protection Population monitoring

The final section of the Plan discusses restoration flocks, presenting current status, uses, problems, and management recommendations in a similar fashion to that done for the main population. Generally, the status of those flocks is very accurately known because of the management effort that has been expended on them. The Plan contents for restoration flocks are summarized in Table 2.

Table 2. A summary of the details pertaining to restoration flocks in the North American Management Plan for Trumpeter Swans.

Flock	Status	Use	Problems	Management guidelines
Turnbull NWR	1	Viewing	Had to be artificially maintained in winter; non-migratory.	Best used for restoration elsewhere.
Malheur NWR	67 over-wintered, 1979-1980	Viewing	Population productive but not expanding.	Use for viewing; reduce predation.
Ruby Lake NWR	40 in 1982	Local interest	Limited disturbance-free nesting areas.	Allow natural expansion, reduce disturbance.

LITERATURE CITED

King, J. G. & B. Conant. 1981. The 1980 census of Trumpeter Swans on Alaska nesting habitats. Am. Birds 35(5):789-793.

_____.1982. Alaska Trumpeter Swan status report 1982. U. S. Fish and Wildlife Service, (Juneau, Alaska). Unpubl. admin. rpt. 15p.

Trumpeter Swan Subcommittees. 1984. North American Management Plan for Trumpeter Swans. U. S. Fish & Wildlife Service, Portland, Oregon. 61p.

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TRUMPETER SWAN SURVEYS AND STUDIES ON THE KENAI NATIONAL WILDLIFE REFUGE AND KENAI PENINSULA, ALASKA, 1957-1984

Theodore N. Bailey, Edward E. Bangs and Mary F. Portner
Kenai NWR
Box 2139
Soldotna, AK

Trumpeter Swans nesting on the 7,972 km^2 Kenai National Wildlife Refuge and Kenai Peninsula have been censused three times annually during the past 28 years (1957-1984) by nesting and early and late brood aerial surveys. The number of annual nesting pairs has averaged 26.7, and early and late broods have averaged 4.03 and 3.45 cygnets/brood, respectively. No significant increase in the Peninsula nesting Trumpeter Swan population has occurred despite a two-fold increase in swan numbers throughout Alaska. Over 20 years of data have been collected and summarized on the use of traditional nesting lakes and nest sites on the Peninsula and related to levels of human use and development.

To better understand the factors influencing Trumpeter Swan population dynamics on the Refuge, 160 swans (31 adults, 128 cygnets, 1 unknown) have been neck-banded since 1966 including 126 since 1977. Resightings of collared swans suggest a coastal migration route with overwintering areas dependent on winter severity in British Columbia and northwestern Washington. Because of poor resighting success and to better monitor the fates of individual broods, 33 Trumpeters have been fitted with radio transmitters to date (1982=5; 1983=15; 1984=13). This includes 13 adults and 20 cygnets from 25 family groups.

Radio tracking has revealed unexpected and extensive movements of family groups on the Refuge prior to migration; periodic separation, mixing and rejoining of individuals within family groups and with other swans; disruption of family groups by man; mortality timing, causes, and rates; and the locations of specific migration stopover points. It has also revealed that brood surveys conducted as late as September failed to detect cygnet mortality prior to migration and that human activity on lakes used by broods has had long-term, significant impacts on swan movements, behavior, and perhaps mortality.

The results of these surveys and studies are currently being prepared for publication and were the basis for proposing regulations that prohibit aircraft from landing between 1 May and 30 August on lakes traditionally used by Trumpeter Swans on the Refuge. These and other regulations should provide the protection from human disturbance required by Trumpeter Swans nesting on the intensively used Kenai NWR.

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TRUMPETER SWAN MOVEMENTS FROM TANANA VALLEY, ALASKA

Rodney J. King
Wildlife Biologist
U. S. Fish and Wildlife Service
P. O. Box 74272
Fairbanks, AK 99707

Since 1982, 111 Trumpeter Swans (Cygnus buccinator) have been collared in the Tanana Valley. The two major areas of collaring have occurred at Minto Lakes (91 birds) and on and near Tetlin National Wildlife Refuge (20 birds). Of the 111 collars available for observation, there have been 24 collars positively identified (codes read by observer) outside of Alaska. Two birds (one adult female and one cygnet of her brood) have been observed more than once in different geographic locations. In addition to collaring, 18 transmitters (including three satellite transmitters) have been placed on Trumpeter Swans using various techniques (17 near Minto Lakes and one on Tetlin NWR). Nine birds with transmitters have been relocated outside their original breeding/natal area. Three of these birds have been relocated outside of Alaska. Significant progress has been made in identifying migration routes and wintering areas of Tanana Valley Trumpeter Swans. There have also been several voids discovered in the information about portions of the migration routes.

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NOTES ON THE STATUS OF TRUMPETER SWANS IN BRITISH COLUMBIA AND THE YUKON TERRITORY, AND ON GRAZING STUDIES AT COMOX HARBOUR, BRITISH COLUMBIA

R. W. McKelvey
Wildlife Biologist
Canadian Wildlife Service
P. O. Box 340
Delta, British Columbia V4K 3Y3

STATUS OF TRUMPETER SWANS IN BRITISH COLUMBIA AND THE YUKON TERRITORY

Trumpeter Swans breed in and migrate through the Yukon Territory and British Columbia and winter in considerable numbers along the British Columbia coast. The status of swans in the Yukon has been reviewed recently by McKelvey et al. (1983). Based on summer observations of Trumpeter Swans in the Yukon since about 1970, and extensive aerial surveys in 1978, 1979, and 1981, the Yukon population is estimated to number about 50 pairs. At least 32 pairs are found in the southeast corner of the Territory, near Toobally Lakes. Other sightings have come from as far west and north as Dawson City.

Based on sightings of swans collared near Toobally Lakes, the Yukon population appears to winter in the Tristate Region of Idaho, Montana, and Wyoming. Together with other nesting swans in northeastern British Columbia (discussed below), the Yukon population is probably part of the migratory Interior Canadian Subpopulation, (North American Management Plan for Trumpeter Swans, 1984), part of which is centered near Grande Prairie, Alberta.

Nesting of Trumpeter Swans occurs in British Columbia in the Dawson Creek – Fort St. John area near Fort Nelson and at two isolated spots near Terrace and Smithers. The birds in the Dawson Creek – Fort St. John area are part of the Grande Prairie flock, based on sightings of birds from Grande Prairie in that area (McKelvey 1981a). Those from the Fort Nelson area, although well removed from Grande Prairie, are also related to that flock, perhaps through pioneering efforts. Sightings were made in 1980 of swans which had been collared in Grande Prairie (unpublished data). The swans nesting near Terrace and Smithers are doing so within the winter range of the Pacific Coast Population, which breeds mainly in Alaska and winters along the British Columbia coast (McKelvey 1981b). It is not known if these birds migrate or not, but they need not move far to encounter other wintering concentrations.

A large proportion, perhaps 5,000-7,000 birds, of the Alaska breeding population winters in British Columbia, where the preferred habitats are the estuaries of the numerous streams and rivers flowing into the ocean (McKelvey 1979, 1981b), and certain large interior lakes east of the coastal range (McKelvey 1980, 1982).

Until recently, the migration route of Trumpeter Swans between Alaska and British Columbia was presumed to be coastal. However, the results of a small winter banding operation at Powell River, B.C., has shown that at least the spring migration route is an interior one (McKelvey and Burton 1983). Sightings made during that study also emphasize the importance of the large interior lakes which support wintering populations or serve as staging areas on the migration route. The route now is thought to be from the coast to the east flank of the coastal range via the many coastal fjords and drainages, north through the large lakes east of the coastal range and then into the Yukon via the lakes south of Whitehorse, and north to the Fairbanks area or west to the Anchorage area.

GRAZING STUDIES AT COMOX HARBOUR

The wintering population of swans at Comox Harbour, British Columbia, has grown from six in 1965-1966 to over 450 in 1982-1983 (McKelvey 1981b and unpublished data), at a rate much greater than that of the total Pacific Coast Population. What appears to be causing the rapid increase at Comox Harbour is the acquistion of a new diet for Trumpeter Swans, pasture grasses from dairy farms adjacent to the harbour (McKelvey 1981b). With this new diet however, have come problems for swan managers. The dairy farmers on whose fields the swans feed have determined that there are too many swans; overgrazing is resulting in reduced yields the following year.

In 1978-1979, I began a grazing study at the Beaver Meadow Farm, in Comox, to attempt an assessment of the impact of grazing by swans. In subsequent years, I prescribed and evaluated harassment techniques for farmers who wished to reduce the number of swans using their farms. I also initiated a program to provide an alternative source of food on land that normally lay fallow during the winter. In this paper I will describe the major findings of those three undertakings.

FOOD INTAKE

Food intake during the winter of 1978-1979 was assessed using grazing enclosures, clippings, and weekly counts of swans on a field at the Beaver Meadow Farm (McKelvey 1981b). The positions of the enclosures were marked and recorded using standard land survey techniques so that they could be relocated during the following growing season. The types of equipment used to fertilize and harvest at the Beaver Meadow Farm precluded the use of any permanent marker that stood above the ground. Prior to each hay harvest I relocated the study plots and made a clipping to measure the yield in grazed and in ungrazed areas.

The results of the grazing study indicated the swans were consuming about 1.2kg/swan/day dry weight of grass. On a wet weight basis that works out to about 11kg or 25 lbs/swan/day, a rate which is comparable to that reported elsewhere for swans feeding on submerged aquatics. The protein content was very high, approximately 23 percent. Although swans appear to be adapted to a low-protein/high carbohydrate diet in the winter (McKelvey 1981b), the ease with which they can obtain the grass may make the high protein content a reasonable trade-off, or even a bonus.

Clippings made during the following growing season could not detect any significant difference in grazed and ungrazed areas. However, there were problems associated with the clippings and I am not totally convinced that the grazing had no effect. Neither are the farmers, and where they perceive a problem, there is a problem for the manager unless he can prove a benefit to the farmer. Other studies of waterfowl grazing, in similar situations, have detected impacts. Although I continued to attempt grazing studies for the 2 succeeding years the swans would not cooperate. The farmer at Beaver Meadow Farm, E. Smith, became very adept at swan harassment, as described below.

HARASSMENT TECHNIQUES

Three harassment techniques were used. Two involved shot guns firing either cracker shells or live ammunition (both authorized by permit by the Canadian Wildlife Service); the other made use of a border collie dog.

The cracker shells worked well to begin with but soon became ineffective as the swans realized that the noise was no danger. The cracker shells also have a fairly short range and are not recommended for use in anything but a single-shot, no-choke gun. Because of the low muzzle velocity of the charge, the paper wads generally remain in the barrel. If a second cracker shell is fired into the blocked barrel the cracker may explode in the barrel. Live amunition was slightly more effective than cracker shells but only if the swans were close enough to be "dusted" with the shot. After that experience, the appearance of the farmer was enough to make some swans move, but they generally didn't move very far.

The most effective harassment technique made use of the border collie. The dog used was a young dog just being trained. He learned in a matter of days that swans were the object of his work. The dog was able to get all the swans on the farm airborne in a very short time. That turned out to be the key aspect to this technique. If any swans were not forced into the air, they decoyed those

already airborne. It usually took no more than 15 minutes to get all of the swans off the Beaver Meadow Farm. In fact, it was such an effective technique that grazing studies were totally unsuccessful for the 2nd and 3rd years they were attempted at that farm.

ALTERNATE FOODS

Dairy farmers in the Comox area grow silage corn for use during the winter and, after harvesting, the fields lie fallow. These fields could support a grass crop after the corn was harvested that could be used as food by the swans. In 1981, I arranged to seed approximately 40 hectares (100 acres) to fall rye. Fall rye was chosen because of its high tolerance for wetness, which is a common condition at Comox during the winter.

Seeding was accomplished by aerial application into standing corn in late August. A Cessna Agwagon crop spraying aircraft was used, fitted with a dry application hopper. Germination was good in four of the five fields seeded. The fifth field was plowed before an assessment could be made, when the farmer arbitrarily decided the experiment would not work. Three of the remaining four experimental fields supported growth all winter, up to 15 cm. The other field was flooded by heavy fall rains, which washed all of the seedlings out of the ground. That farm had also been the site of heavy swan use in previous years and numerous complaints by the farmer. Very wet conditions on pastures on that farm undoubtedly contributed to reduced yields the following year and may have also been partly responsible for attracting swans to dairy pastures in the first place.

Unfortunately, there was very little use made of the experimental fields by the swans. For some unknown reason, their patterns of field use were very much different from that in previous winters. Entirely new fields were used, and they were used by small flocks of about 50, in contrast to the flocks of at least 350 that had been seen on some farms. Perhaps planting fall rye will be recognized as a useful harassment technique.

LITERATURE CITED

McKelvey, R. W. 1979. Swans wintering on Vancouver Island, 1978-79. Can. Field-Nat. 93:433-436.

_____. 1980. Swans wintering in interior British Columbia, February 1980. Unpubl. Rpt. CWS Delta.

_____. 1981a. The Boudreau Lakes area: observations of habitat and migratory bird use, summer 1981. Unpubl. Rpt., CWS Delta.

_____ 1981b. Some aspects of the winter feeding ecology of Trumpeter Swans at Port Alberni and Comox Harbour, B.C. Unpubl. MS thesis, Simon Fraser Univ. B.C.

_____. 1982. Swans wintering in interior British Columbia, February 1982. Unpubl. Rpt. CWS Delta.

_____, M. C. Dennington, & D. Mossop. 1983. The status of the Trumpeter Swan (Cygnus buccinator) in the Yukon. Arctic 36(1):76-81.

_____ & C. Burton. 1983. A possible migration route for Trumpeter Swans (Cygnus buccinator) in British Columbia. CWS Progress Note #138, CWS Ottawa.

North American Management Plan for Trumpeter Swans. 1984. Prepared by the Trumpeter Swan subcommittees. U. S. Fish & Wildlife Service, Portland, Oregon.

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A SUMMARY OF THE DISTRIBUTION AND STATUS OF TRUMPETER SWANS IN WASHINGTON STATE

Martha Jordan
Chair, Washington State Trumpeter
Swan Affairs Committee
11025 - 44th Street SE
Snohomish, WA 98290

INTRODUCTION

A status report on Trumpeter Swans in the Skagit Valley in northwest Washington was published in 1980 by Russ Canniff and me (Jordan and Canniff 1980). While Caniff continued systematic observations in the Skagit Valley, I expanded my study efforts to include all of Washington with emphasis on that part west of the Cascade Mountain Range.

In 1982, I was appointed chairperson of the Washington State Trumpeter Swan Affairs Committee by The Trumpeter Swan Society. In this position, I started the Trumpeter Swan Project which is an ad hoc project with the objectives of gathering and disseminating information on swans in Washington.

Information is gathered through the cooperation of private individuals and State and Federal resource agencies. A "network" of contacts was established providing data including the location, numbers, and adult/juvenile ratios. This network consists of local residents freely and enthusiastically contributing their time and effort to the Trumpeter Swan Project. Without this assistance, the present level of knowledge on Trumpeter Swans in the Pacific Northwest would not be available.

The Washington Department of Game (WDG) and the U. S. Fish and Wildlife Service (USFWS) have also cooperated with the Trumpeter Swan Project. With their cooperation, aerial and ground surveys and "ground-truthing" of the aerial observations were accomplished, and limited funding for supplies such as maps was received. Also, several representatives of these agencies contributed sightings and habitat descriptions.

The purpose of this paper is to present a summary of Trumpeter Swan use in Washington State. This information includes not only numbers of swans using Washington for wintering but also their current status and problems.

WINTERING AREAS: EASTERN WASHINGTON

During winter months most water bodies and wetlands in eastern Washington are frozen and food resources are unavailable to waterfowl. The only reported winter sightings have been on or near the Turnbull National Wildlife Refuge (NWR) in years when open water has been available. Up to five swans, both Trumpeter and Tundra, have been observed at this location. Thus, this region is generally not used for wintering but is primarily a migratory route for Trumpeters breeding in Canada.

The actual use of eastern Washington habitats by Trumpeters during migration is uncertain because of the lack of reported sightings. This is mostly due to the presence of large numbers of Tundra Swans which are difficult to distinguish from Trumpeters, especially when in flight. It is thought that the Trumpeter fall migration passes through Moses Lake because several sightings have been reported from this area. From Moses Lake, the Trumpeters probably fly south into Oregon.

The spring migration routes lie further east than the fall routes with Trumpeters passing through the Colville and Pend Oreille River valleys in northeastern Washington. A banded Trumpeter originally marked near Powell River, British Columbia, was sighted near Usk on the Pend Oreille River in the spring of 1983.

The only other spring or fall season sightings of Trumpeters in eastern Washington are from the vicinity of Turnbull NWR. These birds are most likely the swans that breed or were reared at this refuge.

WESTERN WASHINGTON

Western Washington as a region is one of the most important wintering areas for the Pacific Coast Trumpeter Swan Population. Wintering habitats used by varying numbers of swans are scattered throughout the region. These habitats can be characterized as two types. The first type is agricultural fields adjacent to or near small lakes. The second type is ponds, lakes, and estuaries generally associated with forested areas. The principal difference between these types occurs in where the swans obtain food. In the first type, feeding is primarily in agricultural fields on grass and waste corn. Where swans are associated mostly with ponds, lakes, and estuaries, their food is emergent vegetation.

The Skagit Valley near Mt. Vernon is the most important wintering area in Washington. It is characterized by agricultural fields adjacent to or near small lakes. An average of 416 Trumpeter Swans have wintered in the Valley with an approximately equal number of Tundra Swans in the last 4 years. Population dynamics and habitat use in the Skagit Valley will be discussed by Mr. Canniff in his paper which follows.

Outside the Skagit Valley, Trumpeter Swans are scattered in many areas as single individuals, family groups, or small flocks. The following are the principal wintering areas:

Lower Nooksack River Valley
San Juan Archipelago
The Olympic Peninsula
  Mukkaw Bay: Waatch River
  Lake Ozette and vicinity
  Lake Quinalt
Willapa Bay and the Long Beach Peninsula

The lower Nooksack River Valley in northern Washington near the Canadian border is similar in available habitats to the Skagit Valley. Approximately 15 to 20 Trumpeters use the extensive agricultural fields along the Nooksack River for feeding.

The San Juan Archipelago which consists of over 50 large and small islands provides wintering habitat in the form of several marshes and small forested lakes on the larger islands. Three Meadows Marsh, a man-made wetland, on San Juan Island supports up to 32 Trumpeters each winter. Other lakes on this island are also used. Individual family groups have been reported from Orcas and Lopez Islands.

The estuaries of the Waatch and Sooes Rivers that enter Mukkaw Bay near Cape Flattery on the Washington outer coast provide winter habitat for about 10 to 30 Trumpeters. These swans feed mostly in the more freshwater portions of these estuarine marshes. Trumpeter Swans have also been reported from Neah Bay, north of Mukkaw, and from several small lakes in the Cape Flattery area.

Lake Ozette and several smaller lakes in the vicinity are used each winter by usually two to 10 Trumpeters. Sometimes as many as 30 have been sighted on Lake Ozette at the north end. This heavily forested wintering area is not well-defined and is relatively large extending from Lake Ozette at the northwest corner to Beaver Lake near Sappho at the northeast corner and south to the Hoh River. The swans that use this area move as family units between Lake Ozette and the numerous small lakes, wetlands, and rivers, including the Hoh and Bogachiel.

Lake Quinalt in the central Olympic Peninsula is used by a group of 15 to 30 Trumpeters. These birds rest and feed at the eastern end of the lake near the mouth of the Quinalt River. Family units probably belonging to this larger group have also been observed in the wetlands associated with the drainages west and south of Lake Quinalt.

Willapa Bay in the southwest corner of Washington has historically been an important wintering area for Trumpeter Swans. The small forested lakes and marshes on the Long Beach Peninsula and in the Lewis Unit of the Willapa NWR provide winter habitat for 30 to 50 Trumpeters.

In addition to these major wintering areas, family groups of Trumpeters have been observed in several other areas in western Washington. For example, Silver Lake east of Castle Rock near Mt. St. Helens supported a group of five Trumpeters for the first time during the 1983-1984 winter season. The extensive marsh areas at the eastern end of the Lake provide secluded feeding habitat for waterfowl. Also, Grays Marsh on Sequim Bay may support 10 to 15 wintering Trumpeter Swans.

Trumpeter Swan pairs or single birds have also been observed at several other locations on the Olympic and Kitsap Peninsulas, such as Lake Aldwell behind the Elwha River dam near Port Angeles, a farm pond between Port Angeles and Sequim, and on Marrowstone Island near Port Townsend.

BREEDING AREAS

Turnbull NWR is currently the only place in Washington where Trumpeter Swans nest. Mr. Jack Hagan, biologist at the Turnbull NWR, described the status and history of Trumpeter Swans on the Refuge (Hagan 1983).

In 1984, one breeding pair, a bachelor male, and a one-year-old female Trumpeter returned to the Refuge. The young female had been hatched there in the 1983 nesting season. This return of a Turnbull cygnet is notable as the first in 5 or 6 years. Upon its return, the breeding pair nested and produced a clutch of seven eggs in the same location as in previous years. Only three of the seven eggs hatched, and of these cygnets one female survived to flight stage. This year, green collars were placed on all Trumpeters at the Refuge.

CURRENT POPULATION STATUS

The total number of Trumpeter Swans that used Washington habitats for wintering in the 1982-1983 season was approximately 650. Through an aerial census and ground surveys in the 1983-1984 season, both supported in part by WDG, 612 Trumpeters were counted. While these surveys were as comprehensive as possible, all possible locations of wintering habitats could not be examined because of time, weather, and funding constraints. Of the total counted population, 424 were observed in the Skagit Valley. The remaining 188 Trumpeters were scattered throughout western Washington as follows:

Nooksack River Valley	40	Trumpeter Swans
San Juan Archipelago	39	
Mukkaw Bay	19	
Lake Quinalt	16	
Willapa Bay	43	
Silver Lake	5	
Other Locations	26	
Total	188	

The ratio between adults and juveniles in the wintering Trumpeter Swan population appears similar throughout western Washington based on data from the last 2 years. In the 1982-1983 winter season, the Skagit Valley group of Trumpeters contained 14 percent juveniles while the populations in southwest Washington and on the Olympic Peninsula had 15 percent. The Skagit populations had 22 percent juveniles in the 1983-1984 winter season, and the other areas listed above together exhibited a 28 percent ratio. These ratios for both seasons are based on population censuses performed in January.

Disease, accidents, lead poisoning, and shootings are major sources of mortality. At this time, data are not available on the extent of deaths from any of these sources. Other investigations have detailed mortalities in the Skagit Valley (Kendall and Driver 1982, WDG 1980-1983). Aspergillosis and lead poisoning from ingesting lead shot and fishing weights were found to be the principal cause of mortalities.

A number of Washington's Trumpeters have been killed each year by uneducated hunters and vandals. For example, documentation exists of at least 15 deaths of Trumpeters in the 1982-1983 hunting season. Three of these occurred on the Willapa NWR. In the past 2 years, vandals shot and killed a breeding female at Turnbull NWR and two swans in the San Juan Archipelago.

CURRENT LEGAL STATUS AND THREATS

The Trumpeter Swan in Washington was classified by WDG in 1983 as "proposed sensitive." This classification indicates that the species is being considered for "State Sensitive" designation. Such a designation would classify the Trumpeter as "Protected Wildlife" meaning that the "species could become threatened if current water, land, and environmental practices continue."

Loss of habitat is the primary threat to wintering Trumpeter Swans in Washington. Wetland drainage, or development adjacent to swan habitat, or both, are the principal causes of this loss. In the Skagit Valley, habitat is being lost to development of single-family housing. The recent effort to develop Skating Lake and the adjacent wetlands on the Long Beach Peninsula for housing and a golf course would have negatively impacted Trumpeters if it had been successful.

Some of the habitat loss has been compensated for by the establishment of Three Meadows Marsh on San Juan Island discussed above. Also, Hines Marsh on the Long Beach Peninsula, which was historically used by Trumpeters before it was illegally drained, is currently being restored through the efforts of concerned citizens and The Trumpeter Swan Society.

The Trumpeter Swan Project will continue its efforts to census wintering Trumpeters in Washington and inventory their habitats. Only through the cooperation of State and Federal agencies and private citizens can this work continue. The information gathered by the Project will be used to further knowledge of the Pacific Coast Trumpeter Swan Population, educate the general public regarding the value of the swan and its wetland habitats, and to help insure continued and increasing numbers of Trumpeter Swans in Washington.

LITERATURE CITED

Hagan, J. 1983. Trumpeter Swan status report for the Turnbull National Wildlife Refuge. U. S. Fish and Wildlife Service, Cheney, Washington.

Jordan, M. and R. Canniff. 1980. Cygnus cygnus buccinator in Skagit Valley, Washington State, U.S.A. Proceedings of the Second International Swan Symposium, Sapporo, Japan, 21-22 February. pp 327-334.

Kendall, R. J. and C. J. Driver. 1982. Lead poisoning in swans in Washington State. J. Wildl. Diseases. 18(3):385-387.

Washington Department of Game. 1980-1983. Unpublished necropsy reports. Olympia.

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WINTERING TRUMPETER SWANS SKAGIT VALLEY, WASHINGTON UPDATE 1980-1984

Russell S. Canniff
1919-1/2 - 79th Avenue SE
Everett, Washington 98201

DESCRIPTION OF THE SKAGIT VALLEY

Located in the northwest corner of the State of Washington, north of Seattle by 60 miles, is the Skagit River Valley. The Skagit River drainage flows from the North Cascade Mountains and is the largest river system north of the Columbia River and south of the Fraser River in Canada. On occasion, most often in December and January, some flooding occurs in the upper Skagit Valley. Trumpeter Swans utilizing the Francis Road area and the Nookachamps Creek basin, which includes the Barney Lake area, would be affected. Winter flooding can result in a fast rise and fall of the river water level, depending on the combined effects of rainfall and temperature fluctuation on snow melt in the mountains. Flooding may continue for a week or more in the Nookachamps basin.

The rather mild winter climate of northwest Washington and the Skagit Valley is a result of the interaction of the warm ocean currents off Washington's coast and the influence of upper atmospheric air currents with the Cascade Mountains. Skagit Valley winter climate consists of daily average temperatures between 35° and 45°F; low ocean cloud cover and light rainfall occur almost every day. Cold periods with temperatures below freezing occur for brief periods, often in the last 2 weeks of December and the first 2 weeks of January. These periods may last from 4 to 6 days. For example, between 17-24 December 1983, there were 5 successive days with daytime temperatures below 20°F, 4 of those 5 days the mercury dropped below 10°F. With changing weather patterns, a return to average winter temperatures occurs quickly. Heavy snow accumulation does not often occur. Snowfall of 4" or more usually dissipates within 36 hours. Small surface water areas may freeze up on occasion.

The Skagit Valley, centered between the town of Sedro Woolley on the east, Fir Island on the west, north of the town of Burlington by 3 miles, and several miles south of the City of Mt. Vernon (Figure 1), is an area of great agricultural diversity. Grown here in abundance are such crops as strawberries, wheat, cauliflower, barley, peas, cabbage seed, carrots, beet seed, potatoes, and grass seed. The industry most closely associated with Trumpeter Swans, the dairy farm with its grasslands and field corn acreage, is also present.

METHODS

For the past 9 years I have worked on Trumpeter Swans within the Pacific Flyway. The birds nest in Alaska and overwinter in northwest Washington. My work has been on population trends, Trumpeter ecology, and physical and behavioral characteristics. Random field observations with binoculars and a spotting scope each year from November through March provides the basis for this paper.

BRIEF HISTORY OF TRUMPETER AND TUNDRA SWANS IN THE SKAGIT VALLEY

Records indicate that Trumpeter Swans began using the Barney Lake area in 1957 when six were noted (Washington Department of Game 1979). Between 1957 and 1972, very little is known. An annual census was initiated in 1972. Since 1974, age classes have been separated. The general trend from 1957 through 1980 has been one of increasing numbers of Trumpeter Swans wintering in the area. In 1974, 35 juveniles and 70 adults were counted; in 1979-1980, 83 juveniles and 273 adults were recorded. From 1978 on, Trumpeter distribution outside of the Barney Lake area was also recorded. Trumpeter Swan peak counts from 1980 to 1984 indicate an apparent leveling off of the population wintering in the Skagit Valley (Table 1). The average number of adults per year for this time period is 324. The average number of juveniles from the 1980-1984 period is 92.

Table 1. Peak number of Trumpeter Swans counted in the Skagit Valley October 1980 - March 1984.

Date Recorded	Adults	Juveniles	Total	% Juvenile	Units	Average # juveniles per family
1/25/81	310	127	437	29%	45	2.8
1/24/82	316	92	408	23%	41	2.2
1/16/83	339	56	395	14%	24	2.3
1/22/84	330	94	424	22%	39	2.4

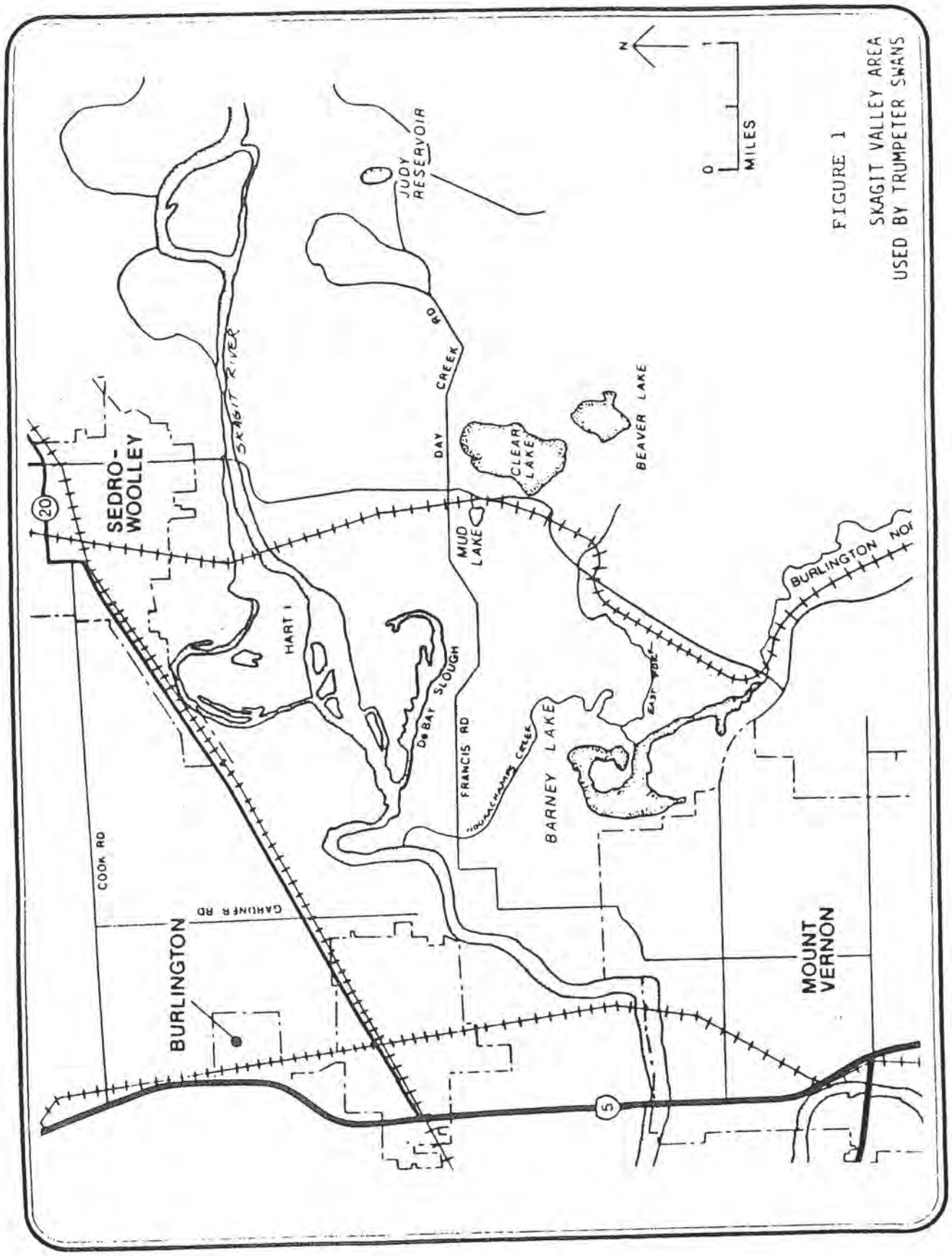

FIGURE 1
SKAGIT VALLEY AREA
USED BY TRUMPETER SWANS

Tundra Swans wintering in the Skagit Valley have apparently existed here since settlement of the Valley (personal communication). Tundra Swans winter primarily on Fir Island, utilizing the tideland marsh of north Skagit Bay and the wheat fields and dairy grasslands in the surrounding area. From October to April, Tundras travel throughout the Skagit Valley, often visiting areas utilized by Trumpeters.

In my observations, Tundra Swan populations have remained fairly stable in the past 4 years. Juvenile counts have averaged 18 percent throughout this period of time. A peak count on 22 January 1984, occurred the same day for both species of swans. Total figures for the Tundra Swan were 314 adults and 138 juveniles, for a total of 452 birds. In 1984, the 30 percent juvenile count is the highest ever recorded for Tundra Swans in the Skagit Valley.

MARKED TRUMPETER AND TUNDRA SWANS AND PLACE OF ORIGIN

In 1972, on the Kenai Peninsula, collar 09VY was placed on a subadult female Trumpeter Swan. From 1972 through 1977, this swan was sighted several times in the Skagit Valley. Since 1977, 09VY (recollared as 00VT in 1979) has been sighted every year, including this winter (1983-1984), in the upper Skagit Valley. She has produced a number of offspring.

Other Kenai Peninsula Trumpeter Swans have also been seen in the Skagit Valley. Between the years 1977-1979, juvenile birds 06VT, 07VT, 08VT, 11VT, 24VT, 25VT, 26VT, 27VT, 86VT, 87VT, and 88VT were observed.

In 1979, the first and only collared Trumpeter Swan (adult 34VT) from the Copper River area of Alaska made its appearance in the Skagit Valley.

The next collared juvenile to make an appearance in the Skagit area was 20UR in the winter of 1980-1981. It, too, had been marked on the Kenai Peninsula.

It was not until the winter of 1983-1984 that a new series of collared Trumpeter Swans appeared in the Skagit Valley. These swans had migrated from the Minto Flats west of Fairbanks. A female (22EA) with a radio transmitter, an unmarked male, and one juvenile (63EA) made their first appearance on 24 December 1983.

My primary interest in Tundra Swans has been to determine ways of differentiating Tundra Swans from Trumpeters using physical and behavioral characteristics.

The first record of collared Tundra Swans in the Skagit Valley was made during the winter of 1983-1984 on a very windy, rainy Thanksgiving Day. Sighted on West Francis Road in corn stubble was the family 9U and 2F with six juveniles (2J, 6F, 8F, 0F, 4F, and 1F). This family had migrated from Izembek National Wildlife Refuge in the Cold Bay area of Alaska.

DESCRIPTION OF SWAN HABITAT AREAS

Barney Lake, located just east of Mt. Vernon, is a lowland marsh area of approximately 150 acres. It is fed by Nookachamps Creek on its meandering trip to the Skagit River. Water levels in this area fluctuate throughout the year. Winter rains and heavy runoff raise the level of Barney Lake, often doubling the water surface area, flooding peripheral pasture. Barney Lake, unflooded, is a natural feeding area. The large majority of biomass in the central portion of the lake is waterpepper (Polygonum hydropiperoides). Dominant lake vegetation in the Lake is listed in Table 2.

Table 2. Barney Lake vegetation.

Scientific name	Common name
Alisma plantago-aquatica	Water plantain
Carex vesicaria	Inflated sedge
Eleocharis palustris	Common spikerush
Eleocharis ovata	Ovoid spikerush
Equisetum fluviatile	Water horsetail rush
Nuphar polysepalum	Spatterdock
Phalaris arundinacea	Reed canary grass
Polygonum hydropiper	Smartweed
Polygonum hydropiperoides	Waterpepper
Sagittaria cuneata	Arrowhead
Scirpus validus	Softstem bulrush
Typha latifolia	Common cattail

Judy Reservoir is located approximately 4 miles northeast of Barney Lake at an elevation of 500 feet. It was built as a municipal water supply and has a surface area of 108 acres surrounded by second-growth conifers. Food resources appear minimal. Use of this area by Trumpeter Swans has diminished drastically since the winter of 1980-1981. The Reservoir was used by swans mainly as a resting area.

DeBay Slough, a curved oxbow channel of the Skagit River, is just north of Barney Lake (approximately 1.5 miles). DeBay is about 1 mile long, lying east to west and bordered on the south by a continuous grove of 50- to 60-foot alders. On the north there is a dairy pasture with thickets of young alder, willow, and blackberry bordering on DeBay. Since the 1980-1981 winter season, Trumpeter use of the Slough has diminished. Prior to 1980, Trumpeter use was similar to that at Barney Lake (natural feeding, resting, roosting) but at a lower density.

Barney Flats, located east of Barney Lake and west of Highway 9, is a basin area utilized for pasture. The area supports one of the largest dairy herds in Washington. In the past 4 years, some field corn has been grown here. This area was still being used in 1984 by Trumpeters but to a lesser extent than in past years.

Clear Lake, located between Barney and Judy Reservoir, covers an area of approximately 220 acres. Clear Lake was once a logging mill pond during the "heyday" of the timber industry. Trumpeters have frequently used the south end of the Lake as a refuge to escape the disturbance or harassment of other areas. It was utilized less frequently in 1984 than in past years.

The Francis Road area is located between Barney Lake and DeBay Slough. Running east to west from Highway 9 toward the Skagit River, this area is about 4 mi^2 of pasture and and field corn. Trumpeter activity was high here because of the remaining corn stubble and the small water-filled depressions created by winter rains.

The Gardner Road area, located northeast of Burlington, is now a major use area for Trumpeter Swans. Bordered on the south by Highway 20, the west by Interstate 5, the north by Cook Road, and the east by Gardner Road, it is an area of approximately 2.5 mi^2. The area is also home to another large dairy herd. Prior to 1980, the area was predominantly in pasture. Within the past 3 years, land use has shifted toward field corn production. In addition, there are numerous small potholes and waterways throughout.

Tundra Swans also utilize the Gardner Road area for feeding and resting purposes. On occasion, their numbers are quite high. Several times in the past 7 years I have noted 100-150 Tundras, along with 200-300 Trumpeters in the same area. Most often the Trumpeters and Tundras are segregated, but some intermingling does occur.

DISTRIBUTION OF TRUMPETER SWANS

As previously indicated, Trumpeter Swans were first observed in the Barney Lake area in 1957. The majority of the Trumpeter Swans wintering in the Skagit Valley utilized this area for all of their needs until the winter of 1980-1981 when peak populations were reached. Since then, Trumpeter Swan use of the Barney Lake area has been declining. The center of Trumpeter activity appears to have moved further north. Gardner Road appears to be the new focal point of wintering activity. Daily movements of the swans are more wide ranging and diverse than they had been. The swans are now ranging throughout the areas outlined in Figure 1.

During the winter of 1980-1981, 61 percent of Trumpeter Swan sightings were in Barney Lake and the surrounding natural areas and 35 percent were in nearby pastures. Pasture land provides primarily orchard grass (Dactylis glomerata) and rye grass (Lolium sp.). In 1981-1982, only 6 percent were in the Barney Lake natural areas and 86 percent in grasslands. At the same time, activity within the corn stubble fields increased from 0 to 7 percent. Activity at Judy Reservoir declined to less than 1 percent and remained constant through 1984. More changes occurred in the winter of 1982-1983. There was a remarkable increase in Trumpeter Swan useage of corn stubble fields (43 percent of the sightings). The Barney Lake area useage decreased even further in 1983-1984 (Table 3).

Table 3. Trumpeter Swan habitat use in the Skagit Valley October 1980 - March 1984.

Year	Pasture rye/orchard grasses		Corn-silage field corn stubble		Natural plants wetlands/Barney DeBay Slough		Judy Reservoir		Total no. of counts	Total no. swans counted
	Total counted	%	Total counted	%	Total counted	%	Total counted	%		
Oct 80 to Mar 81	2194	35	27	less than 1	3821	61	244	4	26	6286
Oct 81 to Mar 82	4219	86	348	7	318	6	46	less than 1	22	4931
Oct 82 to Mar 83	3007	49	2633	43	470	8	44	less than 1	23	6154
Oct 83 to Mar 84	3388	64	1724	32	144	3	44	less than 1	24	5308

POSSIBLE REASONS FOR CHANGES IN WINTERING TRUMPETER SWAN HABITAT UTILIZATION

1. The increasing Trumpeter Swan wintering population may have negatively impacted the Barney Lake area.
2. Increased density of wintering swans may have forced dispersal. The results of the dispersal may have been an increased familiarity with and utilization of other food resources.
3. Exploratory nature of the Trumpeter.
4. Change in feeding habits.
5. Increased human activity in areas frequented by Trumpeter Swans.
6. Decline in natural food productivity in Barney Lake area.
7. Increasing tolerance for some forms of human activity; e.g., dairy farms, traffic.

LITERATURE CITED

Washington Department of Game. 1979. Status report: Trumpeter Swan numbers and losses in Skagit County.

Jordan, M., R. S. Canniff. 1980. Trumpeter Swans of the Skagit Valley, Washington--an overview.

Canniff, R. S. 1984. Report for Washington Department of Game. Trumpeter Swans winter Nov. 1983 - Mar. 1984.

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ALASKA TRUMPETER SWAN STATUS REPORT--1984

Bruce Conant - Wildlife Biologist/Pilot, USFWS, Box 1287, Juneau, AK 99802
John I. Hodges - USFWS, P. O. Box 1287, Juneau, AK 99802
Rodney J. King - Wildlife Biologist/Pilot, USFWS, Box 74272, Fairbanks, AK 99707
Andy Loranger - USFWS, 1011 East Tudor Road, Anchorage, AK 99703

ABSTRACT

Trumpeter Swan population data collected by the U. S. Fish and Wildlife Service (USFWS), U. S. Forest Service (USFS), Bureau of Land Management (BLM), and the U. S. Army on Alaska breeding grounds in 1984 is presented by area and in summary form. Five out of the 10 units were surveyed to varying degrees with comparable coverage on 46 maps (15 percent) and 5730 square miles (19 percent) of Alaskan Trumpeter Swan nesting habitat. Map coverage similar to 1983 found a total of 3243 swans (+17 percent from 1983, +39 percent from average) with 821 or 25 percent (-12 percent from 1983, +20 percent from average) being young of the year. The 250 broods recorded (+1 percent from 1983, +30 percent from average) had an average brood size of 3.3 cygnets (3.3 - 1983, 3.6 - average). Discussion of the results by area and summary tables for the entire State follow. Recommendations are given for continued survey efforts.

INTRODUCTION

Complete censuses of the Alaska Trumpeter Swan breeding population were completed by USFWS in 1968, 1975, and 1980 (Hansen et al. 1971, King 1976, King and Conant 1981). Using a standardized system developed in 1968, the USFWS will continue to census Trumpeter Swans at 5-year intervals, with the next scheduled for August 1985. In the interim, Trumpeters can be monitored by surveying sample areas of the breeding habitat using the same standardized system. With adequate samples, significant population trends and annual production can be detected in the years between the complete counts. We are encouraged that others are collecting swan data with this system. This report summarizes comparable 1984 data from several sources.

ACKNOWLEDGEMENTS

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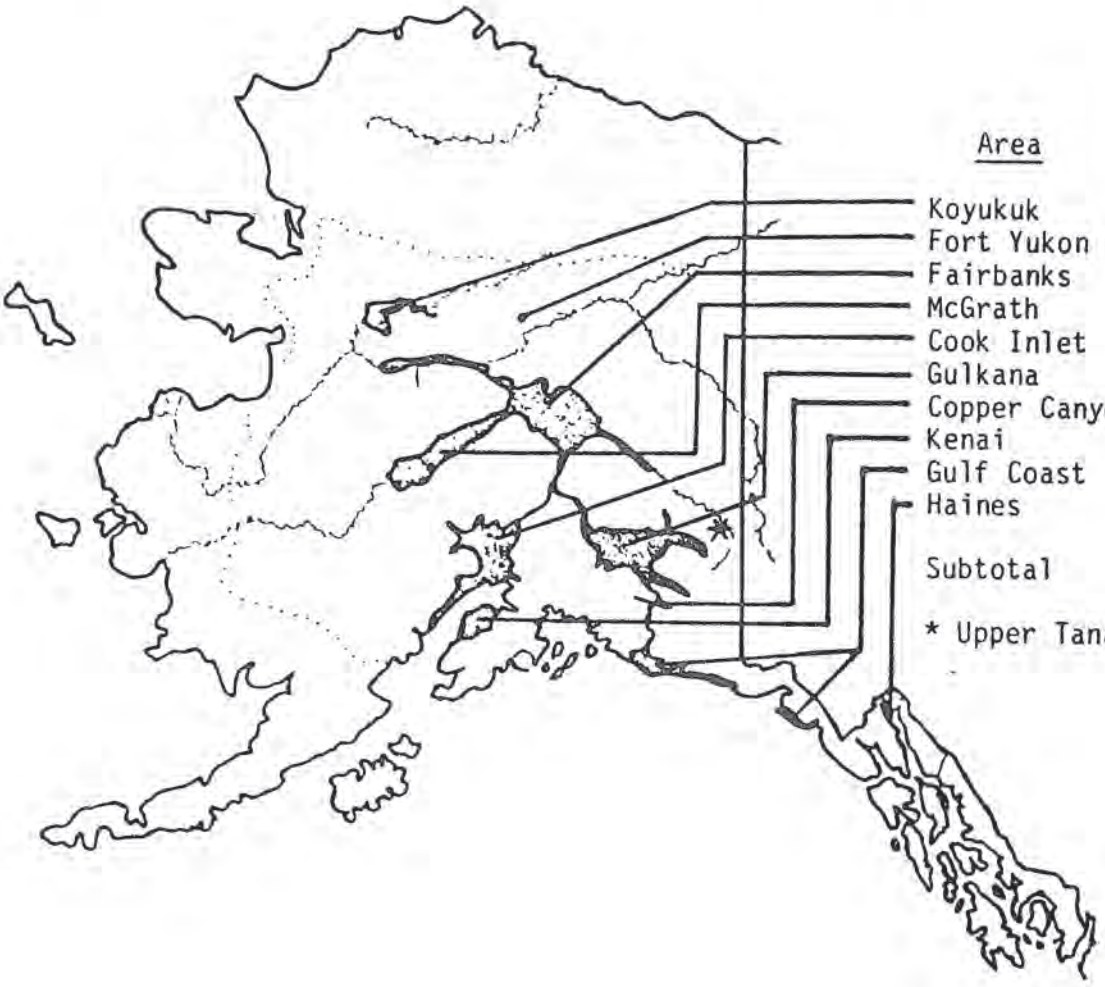
METHODS

The survey system uses small aircraft to put observers over swan habitat where observations are made and recorded in reference to U. S. Geological Survey maps, 1:63,360 (1 inch = 1 mile). The aerial technique is described by King (1973). Generally a system of parallel tracks is flown over all known and suspected swan breeding habitats within each quadrangle map at an altitude of 500-600 feet above ground. When pilot-biologists do the flying, they are responsible for navigation and ensuring that all habitat is adequately surveyed considering factors such as sun glare and observer experience. The right front seat observer is responsible for tracking the flight path on the maps, making swan observations, and recording them by type, number, and precise location. When general pilots or chartered aircraft are used, these duties are all assumed by the observers. Back seat observers, when available, are used to increase the "eye power" from the moving platform. It is essential that observers survey all swan habitat within each map contributed. Incomplete surveys of maps are not comparable in tabular form.

SURVEY AREAS

A total of 46 whole quadrangle maps was surveyed from May to August in 1984 in five of the 10 delineated Trumpeter Swan breeding areas in Alaska (Figure 1). In addition, a partial survey was completed in August in newly pioneered breeding habitat near Tetlin.

Figure 1. Trumpeter Swan breeding areas in Alaska and maps surveyed in 1984.



Results

Survey results are presented by area for 1984 and include previous surveys for those same maps for direct comparison. A brief discussion, together with tables showing swan observations and summary data, is included for each area. Tables summarizing the area data follow the area results with an Alaska-wide discussion.

Haines:

Total Trumpeter habitat:	three maps - 58 square miles
Comparative sample surveyed:	three maps - 58 square miles
Maps surveyed:	Skagway B-2, B-3, C-3

All of the habitat for this relatively small area was surveyed again in 1984. Production increased again this year. This relatively small population continues to expand.

Table 1. Swan observations - for three maps (100 percent of Haines habitat).

Month/Year	Observations	Broods or Nests	Pairs	Flocks	Singles	Paired Birds	Flocked Birds	Adult Swans	Young	Total Swans	Observers/Agency	Aircraft
7/75	1		1			2		2		2	King, Robards USFWS	FWS DHC-2
8/80	4	2	3	1		6	3	9	11	20	King, Conant USFWS	FWS DHC-2T
7/81	5	3[a]	3		2	6		8	12	20	King, Conant USFWS	FWS DHC-2T
7/81	4	3[b]	3	1		6	3	9	13	22	King, Conant USFWS	FWS DHC-2T
7/82	10	2	7		3	14		17	9	26	Conant USFWS	FWS DHC-2T
7/83	7	4	6		1	12		13	11	24	King, Conant USFWS	FWS DHC-2T
8/83	6	5	6			12		12	18	30	Conant, Jacobson USFWS	FWS DHC-2T
8/84	10	5	7	2	1	14	7	22	23	45	Conant, Hodges USFWS	FWS DHC-2T

a. 1 brood with 1 adult present
b. 1 brood with 3 adults present

Table 2. Summary data - for three maps (100 percent of Haines habitat).

Year	Average Brood Size	% Pairs w/Brood or Nest	% Young in Population	Sq. Miles per Pair	Sq. Miles per Brood or Nest	Sq. Miles per Swan
7/75				46		23
8/80	5.5	67	55	15	23	2.3
7/81	4.0	67	60	15	15	2.3
7/81	4.3	67	59	15	15	2.1
7/82	4.5	29	35	8	29	2.2
7/83	2.8	67	46	10	14	2.4
8/83	3.6	83	60	10	12	1.9
8/84	4.6	72	51	8	12	1.3

Gulf Coast:

Total Trumpeter habitat	38 maps - 1942 square miles
Comparative sample surveyed:	11 maps - 690 square miles
Maps surveyed:	Cordova A-1, A-2
	Cordova B-1, B-2, B-3, B-4, B-5
	Cordova C-2, C-3, C-4, C-5

The Copper River Delta experienced an early spring breakup followed by a basically warm summer. The May 1984 survey revealed 143 nests, up 110 percent from 1983 and 43 percent above the 6-year average of 100 active nests. The percent pairs with nests increased dramatically from 1983 and was near average. The highest number of nesting attempts, to date, was recorded this year.

During the August survey, we recorded 61 broods, down 14 percent from 1983 and 11 percent above the 9-year average of 55 broods. These broods contained 228 young, down 12 percent from 1983 and 15 percent above the 9-year average of 199 juvenile swans. Annual production was only slightly above average in spite of the dramatic increase in nesting attempts. Although the number of nests, pairs, and adult swans in this area increased, the number of broods decreased, indicating that most good nesting territories are occupied. Perhaps as more swan habitat develops as a result of the uplift from the 1964 earthquake, more nesting habitat will become available.

Table 3 shows spring swan survey data for 6 years. The May 1978 survey is inflated slightly as a small area outside of the map boundaries was also included. Table 4 gives fall survey swan data for 9 years. The August 1978 and August 1979 surveys are also inflated slightly. Tables 5 and 6 provide spring and fall survey summary data, respectively.

Table 3. Spring swan observations - Chugach National Forest (1978-1984).

Month/Year	Observations	Miles Flown	Broods or Nests	Pairs	Flocks	Singles	Paired Birds	Flocked Birds	Adult Swans	Young Swans	Total Swans	Observers/Agency	Aircraft
5/78	201	967	84[a]	144	35	22	288	371	681	-	681	Bucaria,Watson USFS[1]	Cessna 185
5/80	222	783	94	160	17	45	320	169	534	-	534	Bucaria,Logan USFS[1]	Cessna 185
5/81	244	924	121	175	33	36	350	299	685	-	685	Bucaria USFS[1]	Cessna 185
6/82	248	852	91[b]	179	25	44	358	200	602	-	602	King,Bucaria USFWS/USFS[3]	FWS C-185
6/83	297	-	68[c]	224	26	47	448	144	639	23	662	King,Zimmerman USFWS[2]	FWS C-185
6/84	324	1074	143	251	30	43	502	190	735	-	735	King,Leedy USFWS[2]	FWS C-185
6-Yr. Avg.	256	920	100	189	28	40	378	229	646	-	650		

a 9 nests with single adult
b 13 nests with single adult
c 8 nests with single adult
1 Flown by Kennedy Air Service, Cordova
2 Flown by USFWS. Funding, assistance, logistic support by USFS
3 Flown by USFWS. Assistance, logistic support by USFS

Table 4. Fall swan observations - Chugach National Forest (1968-1984).

Month/Year	Observations	Miles Flown	Broods or Nests	Pairs	Flocks	Singles	Paired Birds	Flocked Birds	Adult Swans	Young Swans	Total Swans	Observers/Agency	Aircraft
8/68	198	851	67[a]	164	10	24	328	181	533	267	800	King,Bartonek USFWS	FWS DHC-2
8/75	195	1125	39	156	15	24	312	142	478	131	609	King,Schoen-felder; USFWS	Cessna 185
8/78	205	1088	35	137	23	45	274	113	432	110	542	Bucaria,Watson USFS[1]	Cessna 185
8/79	184	887	46	133	26	26	266	229	520	163	683	Moitovet USFS[1]	Cessna 185
8/80	262	1961	62	205	24	33	410	187	630	216	846	King,Conant USFWS	FWS DHC-2T
8/81	233	1541	67[b]	186	31	16	372	287	675	263	938	King,Conant USFWS[2]	FWS DHC-2T
8/82	271	1644	51	218	26	27	436	227	690	152	842	King,Conant USFWS[3]	FWS DHC-2T
8/83	314	1948	71[c]	256	26	32	512	219	763	259	1022	Conant,Derksen Baker,Jacobson Covel,Broekema USFWS[3]	FWS DHC-2T
8/84	303	1731	61	224	37	42	448	400	890	228	1118	Conant,Hodges USFWS[3]	FWS DHC-2T
9-Yr. Avg.	241	1420	55	187	24	30	373	221	623	199	822		

a 2 broods with no adults
b 3 broods with single adult
c 1 brood with single adult
1 Flown by Kennedy Air Service, Cordova
2 Flown by USFWS. Funding, assistance, logistic support by USFS
3 Flown by USFWS. Assistance, logistic support by USFS

Table 5. Spring summary data - Chugach National Forest (1978-1984).

Month/ Year	Average Brood Size	% Pairs w/Brood or Nest	% Young in Population	Sq. Miles per Pair	Sq. Miles per Brood or Nest	Sq. Miles per Swan
May 1978	-	52	-	5	8	1.0
May 1980	-	59	-	4	7	1.3
May 1981	-	69	-	4	6	1.0
June 1982	-	43	-	4	8	1.2
June 1983	3.3	30	3	3	10	1.0
June 1984	-	57	-	3	5	.9
6-Yr. Average		52				

Table 6. Fall summary data - Chugach National Forest (1968-1984).

Month/ Year	Average Brood Size	% Pairs w/Brood or Nest	% Young in Population	Sq. Miles per Pair	Sq. Miles per Brood or Nest	Sq. Miles per Swan
Aug 1968	4.0	40	33	4	10	.9
Aug 1975	3.4	25	22	4	18	1.1
Aug 1978	3.1	26	20	5	20	1.3
Aug 1979	3.5	35	24	5	15	1.0
Aug 1980	3.5	30	26	3	11	.8
Aug 1981	3.9	34	28	4	10	.7
Aug 1982	3.0	23	18	3	14	.8
Aug 1983	3.6	28	25	3	10	.7
Aug 1984	3.7	27	20	3	11	.6
9-Yr. Average	3.5	30	24			

Gulkana:

Total Trumpeter habitat: 58 maps - 5097 square miles
Comparative sample surveyed: Two maps - 459 square miles
Maps surveyed: Gulkana C-4, C-5

We, again, appreciate the interest shown by the Bureau of Land Management (BLM) in swan survey work in the Gulkana area. An increase in production was recorded in 1984 as indicated by the number of broods and young produced. Significant increases in adult swans, coupled with good production, gave the highest total swan count on record for these two maps (Tables 7 and 8).

Table 7. Swan observations - for two maps (9 percent of Gulkana habitat).

Month/Year	Observations	Broods or Nests	Pairs	Flocks	Singles	Paired Birds	Flocked Birds	Adult Swans	Young	Total Swans	Observers/Agency	Aircraft
8/68	39	9	33	2	4	66	7	77	35	112	King,Bartonek USFWS	FWS DHC-2
8/75	55	13	42	3	10	84	9	103	40	143	King, Schoenfelder USFWS	Cessna 185
9/80	91	24	79	8	4	158	48	210	86	296	King,Conant USFWS	FWS DHC-2T
8/81[a]	49	13[b]	41	5	3	82	69	154	58	212	Daum,Byrne BLM	Cessna 180
8/82	101	18	77	11	13	154	55	222	57	279	Henderson,Byrne French,Bunch BLM	Cessna 180
7/83	76	23	67	2	7	134	7	148	67	215	Broerman,Kuntz BLM	Cessna 180,185, 206
8/84	152	27	113	10	29	226	62	317	81	398	Conant,Hodges Small USFWS/BLM	FWS DHC-2T

a. Only C-4 surveyed

b. 1 brood with 1 adult present

Table 8. Summary data - for two maps (9 percent of Gulkana habitat).

Month/ Year	Average Brood Size	% Pairs w/Brood or Nest	% Young in Population	Sq. Miles per Pair	Sq. Miles per Brood or Nest	Sq. Miles per Swan
8/68	3.9	27	31	14	51	4.1
8/75	3.1	31	28	11	35	3.2
9/80	3.6	30	29	6	19	1.6
8/81[a]	4.5	32	27	5	16	1.0
8/82	3.2	23	20	6	26	1.6
7/83	2.9	34	31	7	20	2.1
8/84	3.0	24	20	4	17	1.2

a. Only C-4 surveyed

Kenai:

Total Trumpeter habitat: 21 maps - 1560 square miles
Comparative sample surveyed: 13 maps - 1409 square miles
Maps surveyed: Kenai A-3, A-4, B-2, B-3, B-4
Kenai C-1, C-2, C-3, C-4, D-1, D-2, D-3
Tyonek A-1

We appreciate the data supplied again this year by the Kenai National Wildlife Refuge. Good production was recorded for this area this year, and the total number swans is the highest on record (Tables 9 and 10).

Table 9. Swan observations - for 13 maps (90 percent of Kenai habitat).

Month/Year	Observations	Broods or Nests	Pairs	Flocks	Singles	Paired Birds	Flocked Birds	Adult Swans	Young	Total Swans	Observers/Agency	Aircraft
9/68	48	18	38	7	3	76	27	106	53	159	Richey et al. USFWS	Piper Supercub
8/75	48	14	35	9	4	70	29	103	38	141	Richey et al. USFWS	Piper Supercub
8/80	55	18	43	1	11	86	3	100	63	163	King,Conant USFWS	FWS DHC-2T
5/81	35	30	8	1	26	16	4	46	-	46	Berns,Bailey, Portner USFWS	Piper Supercub
7/81	39	24	32	3	4	64	12	80	92	172	Berns,Bailey, Portner USFWS	Piper Supercub
9/81	25	17	21	2	2	42	11	55	60	115	Berns,Bailey, Portner, USFWS	Piper Supercub
6/82		29									Richey,Bangs USFWS	Cessna 206
7/82		16							55		Richey,Bangs, Bailey, USFWS	Piper Supercub
8/82		20							65		Richey,Portner USFWS	Piper Supercub
5&6/83	57	32	48	5	4	96	17	117	-	117	Bailey,Richey USFWS	Cessna 206
9/83	35	19	34	1		68	5	73	70	143	Portner, Richey,Bangs USFWS	Cessna 206
7&8/84	44	28	36	4	4	72	30	106	90	196	Bailey,Bangs Portner, Larned,Richey USFWS	Piper Supercub

Table 10. Summary data - for 13 maps (90 percent of Kenai habitat).

Month/ Year	Average Brood Size	% Pairs w/Brood or Nest	% Young in Population	Sq. Miles per Pair	Sq. Miles per Brood or Nest	Sq. Miles per Swan
9/68	2.9	47	33	37	78	8.9
8/75	2.7	40	27	40	100	10.0
8/80	3.5	42	39	33	78	8.6
5/81	-	?	-	176	47	31.
7/81	3.8	75	53	44	59	8.2
9/81	3.5	81	52	67	83	12.3
6/82						
7/82	3.4					
8/82	3.3					
5&6/83	-	67	-	29	44	12.0
9/83	3.7	56	49	41	74	9.8
8/84	3.2	78	46	39	50	7.2

Fairbanks:

Total Trumpeter habitat: 79 maps - 8113 square miles
Comparative sample surveyed: 17 maps - 3114 square miles
Maps surveyed:
U. S. Army
Fairbanks B-1, B-2, B-3, C-1, C-2, C-3
U. S. Fish and Wildlife Service
Fairbanks B-4, B-6, C-4, C-5, C-6, D-4, D-5, D-6
Livengood A-4, A-5, B-4

We appreciate the data supplied again by the U. S. Army. The same number of broods were recorded as last year, but their average size was smaller. Therefore, annual production was less than in 1983 but was still above average. Total swans continue to increase for this sample (Tables 11 and 12).

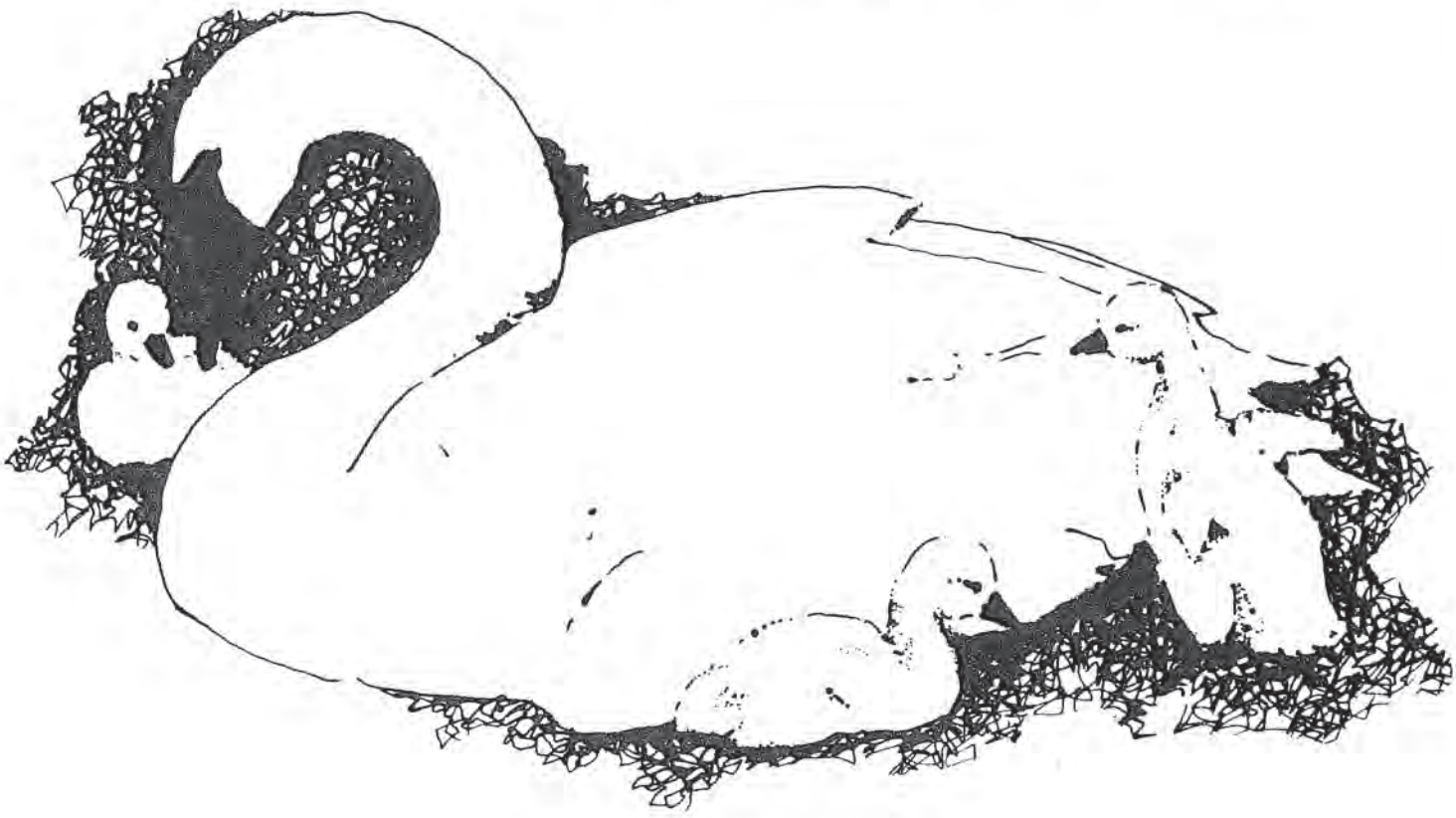


Table 11. Swan observations - for 17 maps (38 percent of Fairbanks habitat).

Month/Year	Observations	Broods or Nests	Pairs	Flocks	Singles	Paired Birds	Flocked Birds	Adult Swans	Young	Total Swans	Observers/Agency	Aircraft
8&9/68	109	33[a]	80	10	19	160	73	252	110	362	Thayer et al.	FWS
											USFWS	DHC-2
8&9/75	199	69	164	22	13	328	94	435	262	697	King,Schoen-	FWS
											felder,USFWS	C-185
9/80	260	124[b]	220	29	11	440	336	787	493	1280	King,King,	FWS
											Conant,Schliebe	DHC-2T
											USFWS	
7&9/81	216	82[c]	169	38	9	338	432	779	315	1094	King,Ambrose,	FWS
											Quinlan	C-185
											USFWS,ADF&G	
											Quirk,Gossweiler	OH-58
											US Army	
7&8/82	380	74[d]	294	33	53	588	159	800	215	1015	King,Bollinger,	FWS
											Ambrose,USFWS	C-185
											Quirk,Bennett,	UH-1
											Clark,US Army	
8/83[e]	372	129	291	34	47	582	222	851	517	1368	King,Bollinger	FWS
											USFWS	C-185
											Kerns,Clark	OH-58
											US Army	
8/84	475	129	361	50	64	722	301	1087	399	1486	King,Bollinger	FWS
											Crosby,King	C-185
											USFWS	OH-58
											Kerns,US Army	

a 3 broods with 1 adult present
b 1 brood with no adults present
c 2 broods with 1 adult present, 1 brood with no adults present
d 1 brood with 1 adult present
e Quadrangle B-6 not surveyed and quadrangle C-3 surveyed by U.S. Army

Table 12. Summary data - for 17 maps (38 percent of Fairbanks habitat).

Month/ Year	Average Brood Size	% Pairs w/Brood or Nest	% Young in Population	Sq. Miles per Pair	Sq. Miles per Brood or Nest	Sq. Miles per Swan
8&9/68	3.3	38	30	39	94	8.6
8&9/75	3.8	42	38	19	45	4.4
9/80	4.0	56	39	14	25	2.4
7&9/81	3.8	47	29	18	38	2.8
7&8/82	2.9	25	21	11	42	3.1
8/83	4.0	44	38	10	23	2.1
8/84	3.1	36	27	9	24	2.1

Upper Tanana:

Total Trumpeter habitat: Unknown
Maps surveyed: 1982--partial survey
1983--partial survey
1984--partial survey

We appreciate the additional swan survey data from the upper Tanana area collected by the Tetlin NWR. The upper Tanana Valley has been surveyed annually for duck breeding pairs since the early fifties. In addition, there have been refuge reconnaissance flights and surveys in connection with the pipeline and other studies. Waterfowl banding crews worked in the area for several years. Swans were occasionally recorded as evident strays, but no swan nesting was ever documented until 1982. As a result of the documentation of Trumpeters in this area, a comprehensive survey of the area will be included in the 1985 Alaska-wide census.

Year	Broods	Cygnets
1982	2	?
1983	6	27
1984	9	34

Alaska Summary:

Table 13 shows that 46 maps (15 percent) and 5730 square miles (19 percent) of Alaskan Trumpeter Swan nesting habitat was surveyed in 1984, not including additional surveys in the upper Tanana area.

Table 14 presents the observations for 7 years for the same swan nesting habitat as surveyed in 1984 and gives a 7-year average. Data is slightly deficient for 1968, 1981, 1982, and 1983 for this sample but comparable. A slight increase in the number of broods (+1 percent from 1983, +30 percent from average) and a decrease in the number of young produced (-12 percent from 1983, +20 percent from average) are shown for 1984.

Table 15 presents the summary data for this sample for the same 7 years. The average brood size and percent young in 1984 decreased from 1983 and is below respective 7-year averages.

Table 13. Alaska Trumpeter Swan survey comparative samples for 1984.

Area	Number of Maps			Sq. Mi. of Habitat			Agency
	Sample	Total	%	Sample	Total	%	
Haines	3	3	100	58	58	100	USFWS
Gulf Coast	11	38	29	690	1942	36	USFWS,USFS
Copper Canyon	0	6	0	0	49	0	
Gulkana	2	58	3	459	5097	9	USFWS,BLM
Kenai	13	21	62	1409	1560	90	USFWS
Cook Inlet	0	52	0	0	5352	0	
Fairbanks	17	79	22	3114	8113	38	USFWS,US Army
McGrath	0	21	0	0	2863	0	
Koyukuk	0	27	0	0	4056	0	
Fort Yukon	0	2	0	0	375	0	
TOTAL	46	307	15	5730	29465	19	

Table 14. Total comparative swan observations - for 46 maps (19 percent of Alaska habitat).

Month/Year	Observations	Broods or Nests	Pairs	Flocks	Singles	Paired Birds	Flocked Birds	Adult Swans	Young	Total Swans	Square Miles
8-9/68[a]	394	127	315	29	50	630	288	968	465	1433	5672
7-9/75	498	135	398	49	51	796	274	1121	471	1592	5718
8-9/80	672	230	550	63	59	1100	577	1736	869	2605	5718
7-9/81[b]	541	189	431	78	32	862	803	1697	741	2438	5463
7-8/82	762	165	596	70	96	1192	441	1729	498	2227	5730
7-9/83[c]	803	247	654	63	86	1308	453	1847	931	2778	5529
7-8/84	984	250	741	103	140	1482	800	2422	821	3243	5730
7-Year Average	665	192	526	65	73	1053	519	1646	685	2331	

a. 43 maps - 18% of habitat (Haines not included)
b. 45 maps - 18% of habitat (Gulkana C-5 not included)
c. 45 maps - 19% of habitat (Fairbanks B-6 not included)

Table 15. Total comparative summary data - for 46 maps (19 percent of Alaska habitat).

Year	Average Brood Size	% Pairs w/Brood or Nest	% Young in Population	Sq. Miles per Pair	Sq. Miles per Brood or Nest	Sq. Miles per Swan
8-9/68[a]	3.7	40	32	18	45	4.0
7-9/75	3.5	34	30	14	42	3.6
8-9/80	3.8	42	33	10	25	2.2
7-9/81[b]	3.9	42	30	13	29	2.2
7-8/82	3.0	28	22	10	35	2.6
7-9/83[c]	3.8	38	34	8	22	2.0
7-8/84	3.3	34	25	8	23	1.8
7-Year Average	3.6	37	29			

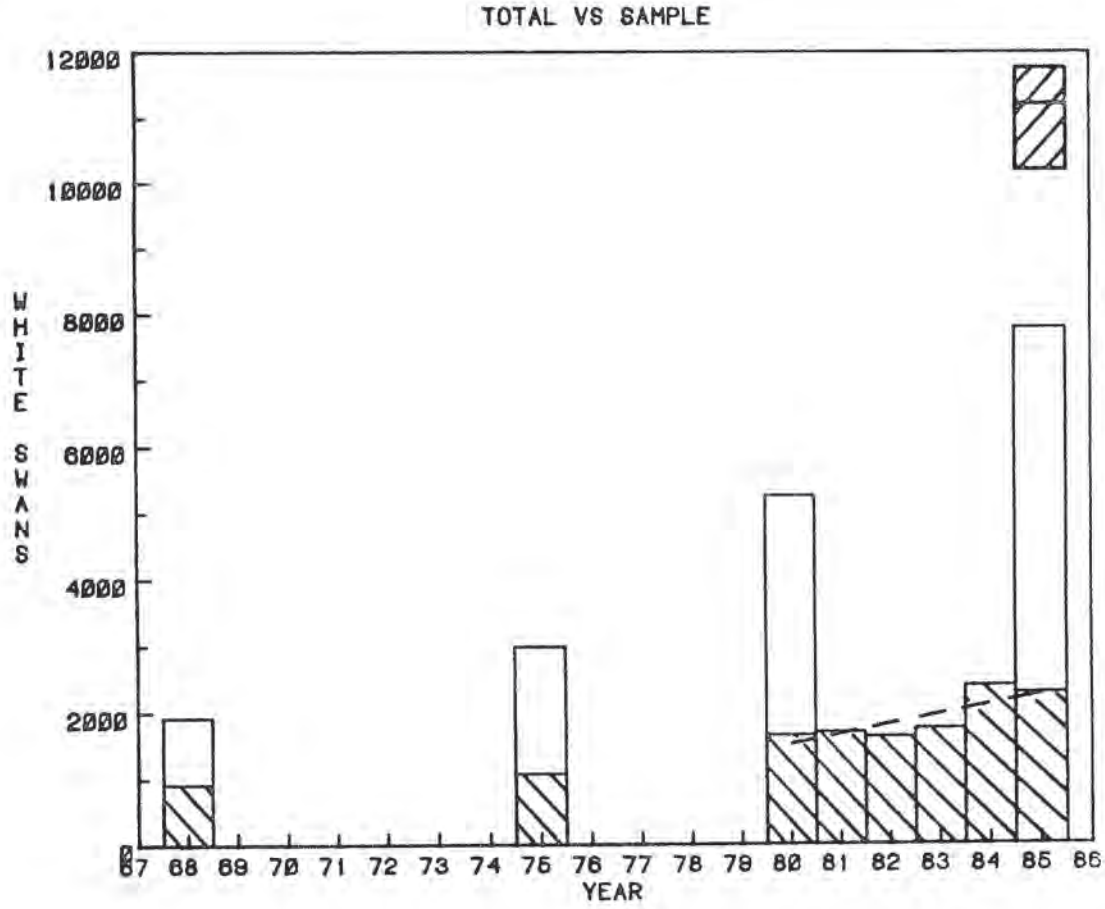
a. 43 maps - 18% of habitat (Haines not included)
b. 45 maps - 18% of habitat (Gulkana C-5 not included)
c. 45 maps - 19% of habitat (Fairbanks B-6 not included)

DISCUSSION

Since the maps surveyed are not a random sample of the Trumpeter nesting habitat, sampling error cannot be determined. Blocks of maps in specific areas were surveyed to fill individual agency management data needs. They show the status of Trumpeters for those specific areas and give us an indication for a broader geographical area. Although the number of broods recorded increased slightly, the total number of young produced decreased from last year, but was above average. Phenology on the Alaska Trumpeter nesting grounds in 1984 ranged from 2 weeks early in the southeastern half to about average in the northwestern half (Conant and Hodges 1984). Most of the decrease in production was found in the Fairbanks sample and was probably a result of the average conditions there. The adult contingent (all but young of the year) continues to increase (+31 percent from 1983, +47 percent from average) for the 46-map sample and is a reflection of good production in recent years.

In 1985, the complete Alaska Trumpeter Swan breeding population census is again scheduled. A prediction of the total population size was made using the "white swans" from the sample surveyed from 1980-1984 (Figure 2). Based on this sample, we expect to record about 8000 adult (white) swans and, depending upon production, somewhere between 10,000 and 12,000 total swans in the traditional Trumpeter nesting habitat.

Figure 2. Relationships of swans counted in sample to total census and a prediction for 1985.



We have a good basic method for measuring Alaskan Trumpeter Swan population dynamics. The computer system for storage and retrieval of data has been developed. We are digitizing all swan data contributed on inch-to-the-mile maps directly into this system. Computer-generated map overlays can be quickly and accurately produced to meet planning and other swan data needs. Data manipulation and analysis will be greatly facilitated with this system.

Beginning in 1986, we plan to alter the interim (between 5-year total counts) sampling procedure. A random stratified sampling scheme will be developed and employed to better monitor total Alaska Trumpeter breeding ground population status. We hope those wishing to continue or to start collecting standardized Trumpeter population data will contribute to the computer-based storage system. A data collecting protocol has been developed and is available upon request.

LITERATURE CITED

Conant, B. and J. I. Hodges. 1984. Alaska - Yukon waterfowl breeding population survey - May 15 to June 12, 1984. U. S. Fish and Wildlife Service Report. 21 pp.

Hansen, H. A., P. E. K. Shepherd, J. G. King, and W. A. Troyer. 1971. The Trumpeter Swan in Alaska. Wildlife Monograph, No. 26. The Wildlife Society, Inc. 83 pp.

King, J. G. 1973. The use of small airplaines to gather swan data in Alaska. Wildfowl 24:15-20.

King, J. G. 1976. Trumpeter Swan survey in Alaska. The 5th Trumpeter Swan Society Conference.

King, J. G. and B. Conant. 1981. The 1980 census of Trumpeter Swans in Alaskan nesting habitats. Am. Birds 35(5):789-793.

* * *

PACIFIC COAST POPULATION: STATUS OF TRUMPETER SWAN RESTORATION FLOCKS, 1983-1984

Stephen H. Bouffard
Southeast Idaho Refuge Complex
Federal Building, Room 142
250 South 4th Street
Pocatello, Idaho 83201

A. Turnbull NWR

This population is barely hanging on. The population declined after the discontinuance of the winter feeding and pond aeration programs in 1976. The Refuge is attempting to band and color mark (green neck and tarsus bands with 2 digits and the suffix PA) all swans. They are also making swan counts every 2 weeks. A report was completed in 1983 entitled A History and Analysis of Trumpeter Swans on Turnbull National Wildlife Refuge.

1983 Highlights

a. One pair and one adult male used the Refuge.

b. A cygnet hatched in 1982 was found dead.

c. The pair nested and laid at least five eggs, four of which did not hatch.

d. Two of the eggs were infertile and two contained well-developed embryos.

e. One cygnet fledged.

1984 Highlights

a. One pair, one adult male, and one subadult were present on the Refuge.

b. The pair nested, laid seven eggs, and hatched three cygnets.

c. Two eggs were infertile and two had well-developed embryos.

d. Three cygnets were still alive as of 2 August 1984.

e. One cygnet alive as of September 1984.

B. Ruby Lake NWR

This flock has remained fairly stable at 30-35 birds, possibly more occur outside of Ruby Valley. The Refuge will begin checking potential nesting areas outside of Ruby Valley in 1985 in accordance with the Trumpeter Swan Management Plan. Limiting factors include disturbance-free nesting areas and suitable wintering areas. At Ruby Lake, four to six pairs nest in the 40 percent of the marsh which is closed to boats (i.e., little disturbance) whereas only two pairs nest in the 60 percent of the marsh which is open to boats. Habitats are similar in both areas. Franklin Lake, a private marsh, has very little disturbance during the nesting season. It normally has four nesting pairs and the majority of the nonbreeding subadults in the population. The only known wintering areas for this flock are the springs and ditches of Ruby Lake NWR that do not freeze.

1983 Highlights

a. High spring water levels at Ruby and Franklin Lakes.

Ruby Lake --

b. Six pairs.

c. Two broods (3,6) hatched; all fledged.

d. One of the adults associated with the brood of three died; the other adult successfully raised the brood alone.

e. Thirty-three Trumpeter Swans seen on Christmas Bird Count.

Franklin Lake --

f. Three or four pairs present.

g. Two cygnets fledged in one brood.

1984 Highlights

a. Record high spring, summer, and fall water levels in Ruby and Franklin Lakes caused nest flooding and delayed nesting.

Ruby Lake --

b. Seven pairs and one adult present.

c. One pair nested, seven eggs.

d. Four cygnets hatched, two still alive on 2 July 1984.

e. Seven male immature Tundra Swans, one male and one female immature Trumpeter Swan, and three unidentified swans were found dead in spring.

f. One Trumpeter female died of lead poisoning caused by eating a lead fishing sinker.

g. Two Tundra Swans died of visceral gout, one Tundra Swan died of trauma, and four from emaciation and subsequent bacterial or parasitic infection.

h. One male Trumpeter died from emaciation.

Franklin Lake --

i. Two pairs and one adult-plumaged bird using the area.

j. At least one pair nested.

k. Two cygnets alive as of 2 July 1984.

C. Malheur NWR

This flock has remained fairly stable at 45-50 birds. Potential breeding habitat on the Refuge remains unoccupied. Low recruitment of fledged cygnets into the population has been recorded, suggesting that winter habitat may be inadequate. Predation on unfledged cygnets may also be a problem. The Refuge is making several swan censuses annually and is continuing a color marking (green neck and tarsus bands with two digits and the suffix AA, collar also has orange spacer with a unique symbol) and radio-tagging study of cygnets to determine movements and survival.

1983 Highlights

a. Forty-three adults (18 pairs) were counted.

b. Seven nests were successful.

c. Twenty-eight cygnets hatched.

d. Seventeen cygnets fledged in six broods.

e. Twelve cygnets in five broods were color-marked.

1984 Highlights

a. Forty-six swans (44 on the Refuge) were counted.

b. Ten of 16 pairs nested.

c. Fourteen cygnets in seven broods hatched; all alive as of 7 August 1984.

d. Two nests were flooded; one nest may have been destroyed by predators.

e. Nine alive in four broods as of September 1984.

# # #

Interior Population

STATUS REPORT OF THE LACREEK TRUMPETER SWAN FLOCK AND MANAGEMENT PLAN

Rolf H. Kraft, Refuge Manager
Lacreek National Wildlife Refuge
Star Rt. 3, Box 14
Martin, South Dakota 57551

ABSTRACT

A total of 263 Trumpeter Swans returned to Lacreek National Wildlife Refuge following the 1983 breeding season including 57 cygnets. This compares to a total of 215 and 230 Trumpeter Swans, including 48 and 58 cygnets, respectively, in 1982 and 1981. It is speculated that the significant increase is due to the severe winter weather of 1983 causing an influx of birds that had been wintering elsewhere. With the continued severe weather, approximately 100 Trumpeters left the Refuge in late December and were not seen again even though many professional and lay persons were alerted. The 1984 aerial survey of the breeding grounds recorded 113 adults, including 46 nesting pairs with a total of 56 cygnets.

The Trumpeter Swan Migration Restoration Program with the Missouri Department of Conservation continued. The solution of complex logistical and public relations problems was required to secure two families of Trumpeters in the Nebraska Sandhills for the transfer. Capturing complete families of Trumpeter Swans is very time consuming because of the birds' natural instincts to protect and hide their young. Special techniques were developed to insure that no cygnets were left behind because abandoned young cannot survive alone.

Special techniques were also required to minimize hypothermia and stress during transportation. Two families of Trumpeter Swans, including three cygnets, were successfully transported to Mingo National Wildlife Refuge near Puxico, Missouri, by the Missouri Department of Conservation. The 1984 transplant was not successful. Due to the difficulties involved in finding and capturing complete families, emphasis will be placed on the use of subadults for future transplants.

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A total of 263 Trumpeter Swans returned to Lacreek National Wildlife Refuge following the 1983 breeding season including 57 cygnets. This compares favorably to a total of 215 and 230 Trumpeter Swans, including 48 and 58 cygnets, respectively, in 1982 and 1981. It is speculated that the significant increase is due to the severe winter weather of late 1983 causing an influx of birds that had been wintering elsewhere. With the continued severe weather, approximately 100 Trumpeters left the Refuge in late December and were not seen again even though many professional and lay persons were alerted. The only exceptions to the disappearance was one report of three swans, that may have been Trumpeters, that were seen near Bassett, Nebraska, flying east in late December, and another report from Maud, Oklahoma, that eight adults and five cygnets were seen on the South Fork of the Canadian River north of Ada, Oklahoma, on 28 December 1983, and remained there until 1 February 1984. The report from Oklahoma seemed to be a valid report. At least the dates match. The sighting was not confirmed by a professional observer, and we cannot be certain that these were Lacreek birds. Another report was received from the Arkansas Game and Fish Department concerning six adults and five cygnets that were reported by a private landowner near Dumas, Arkansas, on 30 December 1983. These were not confirmed as Trumpeters and one bird had a brown collar. We have not been able to identify any bander using brown collars on swans, so this report must also remain unconfirmed.

An aerial Trumpeter Swan survey was flown this summer. This first flight on 17 July covered the Sandhill lakes in eastern Cherry, Brown, Rock, and Holt Counties in Nebraska, and potential swan nesting habitat in southern Todd and southeastern Bennett Counties in South Dakota. No swans were seen in the Nebraska portion of this survey, but a number of broods were seen in South Dakota. The second flight was flown on 18 July covering western Cherry, northern Garden, and eastern Sheridan Counties in Nebraska. As usual, southwestern and northwestern Cherry and northeastern Sheridan Counties produced most of the birds. No swans were seen in Garden County although the Crescent Lake National Wildlife Refuge staff reported seeing a pair on Brewer Lake this spring where a pair had nested last year. No swans were seen in southeastern Sheridan County. The third flight was flown on 31 July covering Bennett, western Mellette, Jackson, and eastern Pennington and Shannon Counties in South Dakota. The Refuge produced four broods, two broods were seen in the rocky butte country of western Mellette and eastern Jackson Counties, and three broods were produced in the Badlands.

Report cards were requested from cooperators for the 1984 breeding season and 28 cards were received. Most reports confirmed broods seen on the survey, but several cards provided data on broods not seen during the aerial survey. We also received information on pairs seen at Mud Butte and Fairpoint in Meade County, South Dakota, and another pair on Ottumwa Lake in Haakon County. No cygnets were observed in these areas in 1984. The aerial and report card survey combined revealed 113 adults including 46 nesting pairs with a total of 56 cygnets.

The techniques for transferring Trumpeter Swans to Missouri, to attempt to restore a natural winter migration, have evolved considerably over the last 2 years as we learn more about the birds. In 1982, we transferred one family of Lacreek NWR Trumpeters to Puxico, Missouri. Only two of those are still alive to date. In 1983, we decided to take additional families from the Sandhill lakes outside of the Refuge to prevent depleting the Refuge nesting flock.

The work began in June with aerial surveys of numerous Sandhill lakes to find at least four families with three or more cygnets on lakes that were accessible to our airboat, and with landowners willing to give up "their" birds. It was not an easy chore. Either the brood was too small, or the lake edges were too densely vegetated or too shallow to get the boat in, or the landowner was reluctant to lose "his" birds. Public relations is an important part of swan management and we did not want to pressure any landowners and risk losing their cooperation. Nebraska Conservation Officer Mick Gray was a real asset in making landowner contacts. He knows everyone in the Sandhills and opened a lot of doors for us.

We finally settled on one pair with three cygnets on South Twin Lake in northwestern Cherry County, and another pair with two cygnets on East Lake in southwestern Bennett County about 25 sand trail miles north of the first family. A backup family was located on Cody Lake in southeastern Bennett County.

The adults were captured in late July during their flightless stage and clipped so that we could recapture them early in September when the the cygnets were old enough to transfer. All went well, except that we could not capture the cob on Cody Lake because he was flying. Although the cobs usually molt in September, for some reason they usually stay with the pens and can be caught in July.

An aerial survey was made again the day before the recapture in early September to get a final count on the cygnets. The count is necessary to insure that all the cygnets are caught, because a cygnet left behind could not survive alone, and to save time, by knowing when all the cygnets have been captured. The precapture aerial survey revealed only one adult and one cygnet on South Twin Lake. The landowner had seen one adult and two cygnets walking east about 2 weeks earlier. We found the pen in a bull pasture 6 miles east of South Twin Lake, but the two cygnets could not be found. An aerial survey of the area confirmed that the two cygnets were probably lost to predators. The pen was reunited with the cob and the remaining cygnet and the family was transferred. We elected not to use the backup family on Cody Lake because the pen was too old. She was wearing a band when we caught her in July, and our records showed that she had been banded in 1973. The family with two cygnets on East Lake was still intact and was captured that afternoon.

Capturing complete families is a very time consuming job because of the swan's defensive instincts. When danger threatens, the adults try to attract attention to themselves to lead the predator away as the cygnets run for cover. The adults are easily captured from an airboat using large dip nets, but one can spend hours searching for cygnets in heavy cover. An airplane is essential to locate cygnets when tall rank cover conditions prevail. The sound of the airboat kept the cygnets in hiding. Therefore, we shut down the boat and took the airplane to about 1,000 feet AGL, dropped the flaps and throttled back to reduce noise, and flew slow, quiet circles around the marsh. After about 15 minutes, one of the cygnets appeared. Once out in open water, the airboat was directed via radio to the swan. The two other cygnets were caught in the same manner. The swans were restrained in wet burlap sacks to keep them as cool as possible for the trip to the Refuge where they were released into a hog-wire holding pen. The Refuge holding pen is located below a large water control structure that provides continuous fresh water, abundant aquatic vegetation for feed, and security against most predators.

John Smith and Jim Wilson of the Missouri Department of Conservation arrived on the 8th of September to prepare the swans for the night airlift to Mingo National Wildlife Refuge near Puxico aboard the Conservation Department's twin engine Cessna 402. The swans were sexed, weighed, and the bills and tarsi were measured to provide a record of vital statistics, and the cygnets were banded and collared. Radio-collars were placed on some of the birds and the clipped remex stubs were pulled to stimulate feather regrowth. The crew encountered considerable difficulty in pulling the feather stubs and silver nitrate sticks were used to stop the bleeding. The legs were taped in a criss-cross pattern to reduce struggling in the nylon mesh transportation bags. The swans were loaded into the aircraft at about 11 p.m. for a scheduled arrival in Missouri to permit their release just before sunrise. The night flight was used to keep the plane dark during the trip to reduce stress.

Both families of Trumpeter Swans were released on the Monopoly Wilderness Area on Mingo National Wildlife Refuge on the morning of 9 September 1983. The Migration Restoration Project suffered a severe setback due to predation. Within 2 days of the release, an adult cob (12FA) was killed by a predator, and during the week of 3 October, two additional adults and one cygnet were killed by predators. An additional cygnet was missing and presumed dead (Table 1).

Table 1. Status of Trumpeter Swans transferred to Missouri in 1983.

Family #	Collar #	Age/sex	Transmitter	Fate
1	10FA	Adult/F	No	
	11FA	Adult/M	Yes	Killed by predator 10/5
	17FA	Cygnet/M	Yes	Killed by predator 11/5
	18FA	Cygnet/M	Yes	Killed by predator 10/5
2	12FA	Adult/M	Yes	Killed by predator 9/11
	13FA	Adult/F	No	Killed by predator 10/5
	16FA	Cygnet/F	No	Missing as of 10/8

On the bright side, the pair of adults from the 1982 transfer are in good health and will hopefully nest in the future.

After the Missouri transplant was completed, we went back to North Cody Lake to recapture the pen we had wing-clipped to pull remex stubs to restore her flight. We pulled the feathers while in the boat right after the capture and noticed that the feather stubs were easily removed with no bleeding or injury, quite contrary to the experience we had had with the transferred birds. Another bird we had clipped on the Refuge was caught about a week later and the remex stubs were easily pulled also immediately after the capture. Perhaps the stress of confinement and handling causes a temporary rigor of the follicle. We will continue to experiment with this, but it appears that pulling remiges immediately upon capture will reduce the stress to the birds.

The logistics of capturing and transporting intact families of Trumpeter Swans is quite complex due to the infrastructure of the family unit. Considerable effort must be made to insure that the families remain intact, and that no cygnets are left behind. In view of the considerable expense in manpower and equipment time, we have recommended the use of nonbreeding subadults for future transplants. The use of subadults will eliminate the need to keep family units together and will eliminate the impact of removing breeding pairs from the source area. The most important factor in using subadults is that these birds learned to fly in this area, increasing the possiblity that they are imprinted to return here to nest.

During the aerial surveys, two groups of subadults were located in the Sandhills for the transplant this year. We had assumed that they would molt in late July and remain flightless for about 3 weeks as the breeding pairs do. We were wrong. Apparently, the subadults molt earlier and remain flightless for only about 2 weeks. The flocks of subadults were first seen on 17 July. Very few molted feathers were seen when the lakes were visited on 23 July, so the capture date was scheduled for 31 July. A precapture aerial survey revealed that the swans had regained flight and had left the molting area. Needless to say, we, and the Missouri people, were very disappointed to learn that the transfer program for this year would have to be cancelled. But all was not lost, what we learned this year should help us to be successful next year.

Another swan transfer was made in 1983 to the W. K. Kellogg Bird Sanctuary of Michigan State University in Augusta, Michigan. R. D. Van Deusen of the Kellogg Sanctuary had requested a leucistic swan, if we could find one, for a genetics study he is conducting. We found two in 1983, and one of the leucistic cygnets was shipped to Michigan in November.

In conclusion, we continue to believe that transplanting Trumpeter Swans to adequate wintering areas remains the only means of restoring a natural migration pattern in this population.

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STATUS REPORT FOR THE HENNEPIN COUNTY PARK RESERVE DISTRICT TRUMPETER SWAN RESTORATION PROJECT

L. N. Gillette
Wildlife Manager
Hennepin Parks
3800 County Road
Maple Plain, Minnesota 55359

Hennepin County, which includes the City of Minneapolis, is located in east central Minnesota. The Hennepin County Park Reserve District operates a series of 1,000- to 5,000-acre park reserves in the western half of the county. The park reserves are operated under what is called the 80/20 concept. Twenty percent of each park reserve may be developed for recreation while 80 percent must be preserved in or restored to its natural state. This concept authorizes the Park District to undertake projects such as the restoration of the Trumpeter Swan. The large population of the metropolitan Hennepin County provides the tax base to pay for the project.

The Park District hopes to eventually restore a flock of 100 free-flying swans with at least 15 nesting pairs to central Minnesota. To accomplish this aim, Trumpeters are raised in captivity for eventual release at 2 to 3 years of age. Voigt Englund (1982) reported on the Park District's progress through 1982. As part of this update, the status of the flock is reviewed since 1980, which was the first year a substantial number of swans was released. Three topics will be discussed:

1. The population changes since then.
2. The fates of released birds.
3. The causes of cygnet mortality.

Table 1 shows the population changes that have occurred since 1980 for the total population and for the free-flying swans. It also shows the number of cygnets fledged each year. On the surface, this looks like a great success story. Numbers have increased dramatically in 4 years. Much of the increase has been due to very high cygnet production during the past 3 years.

Mortality has been high for free-flying birds (Table 2). Only continued influxes of new birds have kept this portion of the total population growing. It is important to note that over 50 percent of the birds released between 1980 and 1983 are now dead or missing. Park District staff feels that the carcasses of most birds killed by hitting power lines are located, since most power lines parallel roads and swans fly primarily in spring and fall when fields are plowed. Losses due to lead poisoning and shooting are more difficult to document and are probably underrepresented.

Undoubtedly, some of the birds that disappeared died from lead poisoning or shooting. The Trumpeters feeding habits make them extremely susceptable to lead poisoning. This is especially true in the spring and fall when they subsist primarily on roots and bulbs of aquatic plants which they dig out of the mud. These food items are fibrous and require considerable grinding in the gizzard.

The Trumpeters' flight patterns make them a very easy target. They normally fly low over marshes and show no fear of people while they are in flight. There is very little chance of anyone accidently shooting a Trumpeter because they thought it was some other species of waterfowl. In most cases, the hunters simply do not care. This was true in the two shootings in Hennepin County which were witnessed by other people. Seven swans were lost as a result. Closing the season on Snow Geese or Canada Geese would not have protected these birds. More public education to increase everyones' understanding and appreciation of Trumpeter Swans is what is needed. If shooting losses can be controlled, the swans may be able to maintain an adequate breeding population despite other mortality factors.

Table 3 lists the causes of cygnet mortality since 1980. One ailment, "New Duck Disease" caused by Pasteurella anatipestifer, accounted for half of the cygnet mortality reported during this period. The origin of the disease is unknown, but older birds appear to be immune. It is interesting that all the birds that died of New Duck Disease were between 65 and 85 days of age while most cygnets that died of other causes were less than 28 days old.

The Park District will continue to propagate and release swans as part of its restoration effort. Two challenges must be met for the program to succeed. First, we need to monitor the movements of the birds to determine where they go, what they do, and what happens to them. Second, the public throughout the Midwest must be educated about the program to provide dispersing or migrating birds the maximum protection possible. The Hennepin County Park Reserve District will not be able to undertake these challenges alone. Cooperation will be needed from the state, Federal, and private sectors to insure success.

Table 1. Trumpeter Swan population 1980 - 1984* Hennepin County Park Reserve District.

Year	80	81	82	83	84
Total population	31	37	55	72	86
Cygnets to flight (but not necessarily released)	9	8	17	27	25
Free-flying swans	8	13	22	21	46

*Numbers for the total population and free-flying swans are for 31 December of each year.

Table 2. Fates of Trumpeter Swans released by the Hennepin County Park Reserve District 1980 - 1983.

No. of swans released	50
No. that died or disappeared	29
No. surviving in 1984	21

Causes of mortality for released Trumpeter Swans

Shot during hunting season	10
Hit power lines	6
Lead poisoning	2
Unknown (1 spring, 1 fall)	2
Disappeared (2 spring, 7 fall)	9
TOTAL	29

Table 3. Causes of death of Trumpeter Swan cygnets hatched between 1980 and 1984*, Hennepin County Park Reserve District.

Cause of death	Number
Confirmed New Duck Disease	6
Suspected New Duck Disease	5
Starvation	1
Aspergillus flavis of cerebellum	1
Head infection	1
Exposure	1
Predation (raccoon)	1
Transedate infection	1
Blindness	1
Unknown	1
Disappeared (unknown)	2

*During this 5-year period, 110 cygnets were hatched and 21 died prior to fledging.

LITERATURE CITED

Voigt Englund, J. 1982. Trumpeter Swans at Hennepin County Park Reserve District. Abstract. Proceedings Eighth Trumpeter Swan Society Conference.

# # #

Restoration Projects

POTENTIAL TRUMPETER SWAN RESTORATION

Harold H. Burgess, Chairman
TTSS Restoration Committee
Box 450
Rio Hondo, Texas 78583

The Trumpeter Swan Society has maintained a Restoration Committee since its organization in 1968. The Committee's purpose has been to find potential Trumpeter Swan restoration areas in Canada and the United States and to support feasible restoration by responsible agencies. We believe that the lack of adequate wintering habitat is the primary limiting factor for Trumpeter Swans. Because our charge is continent-wide, our committee has many representatives. They are west to east: Winston Banko, David Gilmer, Paul Springer, Ruth Gale, Mary Maj, Bruce Turner, C. A. Hughlett, Dave Lockman, Rolf Kraft, David Weaver, John Smith, R. D. Van Deusen and Harry Lumsden. Much of the information in this paper and appendix is theirs. Some new perspectives are included in this update.

The traditional migration routes have been severed by eliminating the migrating segments of the swan population. Some of the historical wintering areas still exist, but the tradition of migration does not. Man eliminated the Trumpeter in the temperate lowlands, isolating them to the less accessible and less productive high mountains and far northlands. This generation of man has an opportunity and responsibility to bring the Trumpeters back.

The Pacific Coast Trumpeter Swan Population, that nests primarily in Alaska, continues to migrate along the Pacific Coast into British Columbia, Washington, and Oregon. Few, however, reach their historical wintering grounds in the Sacramento Valley. Some interior Alaska, Yukon Territory, and British Columbia Trumpeters may, however, use the Rocky Mountain Population migration corridor.

The Interior Canadian Subpopulation remains mobile. Marked Trumpeters seem to be using several different migration corridors: eastern Montana, eastern Wyoming, Colorado, Nebraska, and Missouri in one corridor; Yellowstone National Park and elsewhere in Wyoming in a second corridor; Red Rock Lakes National Wildlife Refuge (RRLNWR) and Ninepipe National Wildlife Refuge and elsewhere in Montana; Teton River, Henry's Fork of the Snake River, Harriman State Park, and elsewhere in Idaho; Bear River National Wildlife Refuge and elsewhere in Utah; and the Columbia River on the Washington-Oregon border.

Some Rocky Mountain Trumpeter Population flocks are mostly sedentary due to available warm springs, year-round open water, supplemental winter feeding, and/or the selective mortality aimed at those Trumpeters that attempt to migrate. Trumpeters transplanted from those "nonmigratory flocks" however, show more mobility in other locations, as indicated by the unaccountable winter disappearances of Trumpeters from the Malheur and Lacreek flocks. The Trumpeters that stage and winter mostly on Lacreek National Wildlife Refuge, South Dakota, have migrated and attempted to winter in Nebraska and Missouri. The Arkansas, Kansas, Oklahoma, and Texas sightings may be Lacreek birds also.

The Trumpeters that winter on RRLNWR are our main concern at this time. This flock was the source of successful restorations in Oregon, Nevada, South Dakota, and Minnesota, and of many breeding Trumpeters in aviaries around the world.

In the late 1950's and 1960's, the United States Fish and Wildlife Service (USFWS) became concerned with the possibility of Trumpeter Swans exceeding the RRLNWR carrying capacity of the area. This was probably the period that breeding Trumpeters reestablished themselves in the Targhee, Beaverhead, and Gallatin National Forests, and in Lewis & Clark County, Montana, and expanded in Yellowstone National Park. Seventy swan nests were found on RRLNWR in 1959, and 60 nests were found there in 1966 and 1968. These were peak nesting years. RRLNWR's highest production year was 1963 when 127 cygnets were fledged by swans and 16 cygnets were reared by man.

Overcrowding was alleviated during the 1950's and 1960's by a number of methods: mortality due to climatic and other natural phenomena; by natural pioneering; by relocating 177 adults, 102 cygnets, and 123 eggs; by removing 125 Trumpeter eggs for incubation/brood studies; and by cutting back supplemental winter feeding at RRLNWR in 1969-1970.

By 1971, the number of Red Rock Lakes' nesting pairs had decreased to 37, fledging only 12 cygnets. Nesting dropped again in 1982 to 24 nests, fledging 10 cygnets. The Pacific Coast Trumpeter Swan Subcommittee, organized to develop management plans for the Rocky Mountain Trumpeter Population, recommended a goal of 40 nesting pairs and/or 50 cygnets fledged annually at RRLNWR.

Meanwhile on 31 January 1983, the USFWS, acting apparently on 1960 data, ordered that the RRLNWR flock be reduced by 150 birds, to carrying capacity. Much of the Restoration Committee's current planning was based on that order with instructions to find the most constructive way to use those "surplus Trumpeters." It is apparent that we must adjust our planning to the real situation at RRLNWR, where there are now no surplus Trumpeters.

There are needs for redistribution of Trumpeters in the Tristate Region. Chairman Dave Lockman and his subcommittee's plan to restore Trumpeters to adequate wintering areas in Wyoming, Idaho, and Montana should have our approval. Nonproductive adults could be captured while completing their summer molt. The primary feathers on one wing could be clipped or pulled and the pair transferred to adequate wintering areas in-state or in adjacent states. If clipped and held temporarily, swan flight can be targeted for later by pulling the clipped remiges when the swans are released. If the primaries are pulled when released, the swans may fly in 60 days.

MIGRATION RESTORATION

There is still a long-range need to reestablish a winter migration corridor from RRLNWR south down the Colorado River to adequate wintering habitat at Topock Marsh in the Havasu NWR in Arizona. Trumpeter decoy families should be maintained at Havasu and at refuges along the Colorado to guide Trumpeters to safe and adequate rest stops while enroute. An alternate program for developing Trumpeter migration from Red Rock Lakes NWR down the Rio Grande to Bosque del Apache NWR in New Mexico should also be considered.

We believe that Quivira NRW in Kansas and Salt Plains and Sequoyah NWR's in Oklahoma could be ideal Trumpeter decoy family sites to attract "Eastern Front" (Montana) and Lacreek Trumpeters to adequate wintering habitat on the stabilized Kerr Navigation Channel and the milfoil-choked waters in Oklahoma. During subnormal frigid weather, Trumpeters could retreat farther south through Tishomingo, Hagerman, Anuhuac - McFaddin, and Brazoria - San Bernard NWR complexes on the Texas Coast.

During the 1977-1979 winters, up to 18 Trumpeter Swans rested on Carancahua Bay in the Gulf of Mexico and fed in a duck hunting club reservoir near Victoria, Texas. We believe that these were Lacreek Trumpeters. Six Lacreek Trumpeters were observed in Missouri in 1978, where two cygnets and a leg-banded female were shot. The pen had been banded as a cygnet at Lacreek in 1974. Other Trumpeters have visited southeast Missouri; two Alberta-marked Trumpeters were observed with two others at the Marais des Cygnes River at the mouth of the Truman Reservoir in western Missouri in April 1983. Eight adult and five cygnet Trumpeters were observed on the South Fork Canadian River, south of Maud, Oklahoma, from 28 December 1983 to 1 February 1984. This was after frigid weather had forced 100 Trumpeters to leave Lacreek NWR. A "brown"-collared swan was also reported in Arkansas by Rolf Kraft in 1984.

In September 1982, Missouri personnel transferred a Lacreek Trumpeter family of two adults and three cygnets to Mingo NWR, Puxico, Missouri. It was an attempt to imprint the young to winter there. In 1983, Missouri personnel transferred two familes of four adults and three cygnets from Lacreek. The cygnets died, but three adults still remain on Mingo NWR. Missouri's plan is being broadened. There will be continued attempts to restore Trumpeters to Missouri.

Hennepin County Park Reserve District (HCPRD) in Minnesota has been involved in an attempt to restore Trumpeter Swans since 1966. Minnesota Department of Natural Resources joined their effort in 1982. In addition to 53 captive Trumpeters, HCPRD maintained 26 free-flying Trumpeters in November 1983. Minnesota has a cooperative agreement with Missouri to develop a winter migration tradition. Marais Temps Clair Wildlife Area near the Missouri/Mississippi River junction, 400 miles down the Mississippi from Hennepin County has been suggested as a good target.

Alberta initiated a plan in 1983 designed to restore additional Trumpeter flocks in Alberta and to guide their migration to the British Columbia coast by using British Columbia Trumpeter foster parents. Three British Columbia pens and 16 Alberta cygnets were released on Elk Island National Park east of Edmonton in August 1983. Three British Columbia pens and 11 Alberta cygnets were released there in 1984.

Discussions centered around using feral European Mute Swans to foster Trumpeter restoration have been carried on for 20 years. Ontario obtained 16 Trumpeter eggs from Alberta in 1982, fledged two Trumpeter cygnets under Mute Swans, and eight cygnets artificially. The Mute-reared Trumpeters wintered together along Lake Ontario and returned to their rearing area. They were supplemented with two hand-reared Trumpeter yearlings. Ontario was able to obtain only six eggs from Alberta in 1983. Two cygnets were fledged by Mute Swans on Cranberry Lake east of Toronto. They subsequently wintered in Maryland. Both birds returned to Ontario in 1984; at least one returned to Cranberry Lake in 1984; the other eventually was recovered dead at Burgessville, Ontario, about 100 miles west of Cranberry Lake.

Aviculturists have long been interested in restoring the Trumpeter Swan. In 1984, Ken Kalenak of Saginaw, Michigan, loaned a Trumpeter pair and two eggs to the Ontario program, and George Knapp of Goodfield, Illionis, loaned 14 eggs for Mute Swan foster-parenting and other behavior studies to The Kellogg Bird Sanctuary near Augusta, Michigan.

There is considerable Trumpeter Swan migration into British Columbia and the Pacific coastal states from Alaska, Yukon Territory, Alberta, Montana, Idaho, and Nevada, as well as some internal movements of Washington and Oregon nesting swans. These swans could be encouraged to rest and winter in more adequate wintering habitat by better protection from disturbances by increasing information, education, and enforcement. Decoy Trumpeter families could guide migrant Trumpeters to safe and adequate resting and wintering sites in western Washington, Oregon, and northern California.

During this study, records of significant Trumpeter Swan observations were recorded and indexed by states, provinces, and territories and are attached as Appendix I. In some cases Tundra Swan records have been included. Habitat suitable for migrating or wintering Tundra (and Mute) Swans is suitable in many cases for Trumpeter Swans. The data on Tundra Swans has been included to highlight areas that Trumpeters might be able to utilize in the future.

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APPENDIX I. Significant Trumpeter Swan Observations

The following alphabetized state and province list is intended as a quick reference to selected Trumpeter Swan observations for planning purposes. All Trumpeter (Cygnus buccinator) and some Tundra (Cygnus columbianus) Swan observations in states such as Colorado and Arizona may be significant for winter migration proposals. All sightings of Trumpeters in states like Alaska and Montana could overwhelm a researcher interested in historical and current distribution. It is suggested that workers in Trumpeter states and provinces maintain a supplement to Appendix I.

ALASKA

See Banko (1960); Hansen et al. (1971); King, J. and Conant (1981) and Conant, R. King, and Bollinger (1983).

1954 Prior To — Trumpeters were identified in Alaska by early naturalists. Monson rediscovered Trumpeters on the Copper River.

1978 October 23 — Blue-collared 09VY swan from Kenai seen with 67 other Trumpeters at Blind Slough (Jeff Hughes, USFS).

November 17 — 75 Trumpeters using Blind Slough, Petersburg, AK.

November 25 — 09VY arrived Mt. Vernon, WA, with mate and 3 cygnets.

1978-1979 — 47 Trumpeters wintered at Blind Slough.

1979 March 24 — "Groups of 5 to 20 Trumpeters moving (northeast) through for past 2 weeks. One group of 17 was seen on open water along Stikine River (British Columbia border). 09VY with mate and 2 cygnets seen today." (Jeff Hughes, USFS, Petersburg, AK)

1980 Summer — King and Conant found Trumpeters as follows:

Alaska Locations	Single adults	Paired birds	Flocked adults	Young in broods	Total
Gulf Coast	52	586	266	351	1255
Copper Canyon	4	70	33	33	140
Gulkana	43	1026	632	660	2361
Kenai	12	90	8	65	175
Cook Inlet	37	608	186	369	1200
Fairbanks	17	752	589	777	2135
McGrath	0	60	22	63	145
Koyukuk	4	124	27	104	259
Ft. Yukon	0	2	0	4	6
Haines	0	6	3	11	20
Total (1980)	169	3324	1766	2437	7696

1982 Summer

Upper Tanana	2	16	8	0	26

Wintering Trumpeter Swan Estimates

Interior Alaska	10	(Isleib 1981)
So. Central Coast (10-yr. average)	150-200	(Isleib 1981)
Southeast Alaska	300-500	(J. King 1982)

1983 August — Sample surveys indicated higher production and larger population in Alaska than in 1980 (Conant 1984).

ALBERTA

See Banko (1960); Mackay (1978); Turner (1984); and Bartonek (1984).

1914 Trumpeter Swans reported in Cypress Hills (Nieman 1972).
1918 Trumpeter Swans reported in Grande Prairie region of Alberta (Mackay 1981).
1944 Soper reported 64 adults and 14 cygnets in Grande Prairie region.
1948 Trumpeter pair, no cygnets, Cypress Hills, SE Alberta.
1949 Trumpeter pair with cygnets, Cypress Hills (Lister in Banko 1960).
1950 Trumpeter pair with cygnets, Cypress Hills (Lister in Banko 1960).
1955-1956 Winters Alberta Trumpeter used Island Park area of Idaho (Mackay in Banko 1960).
1956 Fall 2 adults, 5 immature leg-banded Lowe L., Alberta, shot in Wyoming and Nebraska USA (Banko 1960).

From Table 3 "North American Management Plan for Trumpeter Swans - Grande Prairie Flock"

Year	# Lakes surveyed	Adults & subadults	Cygnets	Totals (Bartonek 1984)
1959	37	87	40	127
1965	42	64	5	69
1970	54	76	24	100
1975	79	84	37	121
1980	120	138	72	210
1983	162	168	81	249

1974 An Alberta leg-banded Trumpeter shot in Utah's Whistling Swan hunt (Mackay 1976).
1975 April An Alberta orange-collared Trumpeter seen on Columbia R., Oregon (Mackay 1976).
1977 January 23 Alberta orange-collared Trumpeters observed on Wyoming's Snake River (Kemper 1977).
1979 February 25 Orange-collared swans seen as follows: 19 adults, 1 cygnet in Idaho; 7 adults, 4 cygnets in Montana; 1 adult, 1 cygnet in Wyoming (Sjostrom 1979).
1980 Winter Orange-collared swan at Denver, CO (R. Ryder).
1983 April 2 orange-collared swans with 2 others on Talley Bend, Truman Reservoir, MO. Others seen on nearby Grand River (Talley fide Sutlich, J. W. Wilson, and J. Smith 1983).
August 3 British Columbia adults, and 16 immature Trumpeters released at Elk Island National Park, Alberta (Bartonek 1984).

ARIZONA

No Trumpeters reported (TTSS focusing on Havasu NWR).

1977 December 3 Christmas Bird Count (CBC). 8 Whistling Swans in Parker-Colorado River Circle (Rosenberg 1978).
1978 December 16 CBC. 3 Whistling Swans in Martinez Lake-Yuma Circle (Irwin 1979).
1940-1984 "Birds of Havasu NWR" lists swans as rare in spring, occasional in fall and winter.

BRITISH COLUMBIA

See Banko (1960); Morris (1969); Halladay (1970).

1830's Summers Adults and cygnets reported in Tobaggan Lake area (Morris 1970).
1936 Summer Flock with cygnets in Vanderhoof area (Morris 1970).
1944 Summer Nest with eggs a few miles southwest of Quesnel (Morris 1970).
1949 Winter App. 1000 Trumpeters in British Columbia (Munroe 1949 in Banko 1960).
1958 Winter Several hundred in interior British Columbia (Mackay 3/19/58).
1968 Summer Pair with 2 cygnets in central British Columbia (Morris 1969).
1968-1969 Winter Morris reported 400 (25% immature) at Lonesome L.; 144 (21% immature) Queen Charlotte Is.; 187 (21% immature) E. Vancouver Is.; 161 (22% immature) W. Vancouver Is.; 86 (27% immature) Mainland Coast and 200 from Prince George to Prince Rupert.

1971-1979	Winter	Davies reported February 1979 in TTSS #18 as follows:

Trumpeter Swans Wintering at Vancouver Island, British Columbia

Vancouver Island	1971	1973	1975	1977	1979
East Coast	336	285	392	520	636
West Coast	622	501	550	405	231
North Coast	104	106	90	87	91
Total	1062	892	1032	1012	958

1975	July	Pair and egg shells in nest near Terrace (Mackay 1976).
1978	August 24	A pair, 3 cygnets, and 7 adults Alsek-Tatshenshini R. (Conant 1979).
	December 17	CBC. 179 Trumpeters Comox Circle (Fitzpatric 1979).
1981	Summer	68 adults and 26 cygnets Tooball L. area (McKelvey in Bartonek 1984).
1982	December 18	CBC. 123 Mutes, 52 Trumpeters, Duncan (Comer 1983).
	19	CBC. 424 Trumpeters Comox Circle (Fitzpatric 1983).
	19	CBC. 58 Trumpeters Campbell River, B.C. (Conway 1983).
	26	CBC. 243 Trumpeters at Nanaimo Circle (VanKerkoerle 1983).
	27	CBC. 83 Trumpeters, 46 Whistling Swans at Larder, B.C.-WA (Grass 1983).
1983	January 2	CBC. 154 Trumpeters at Pitt Meadow B.C. (Robinson 1983).
1982-1983		Seven other CBC Circles reported Trumpeters (1983).
CALIFORNIA		Abundant historical winter records in Sacramento Delta; thought to have nested in northeastern California.
1950's		Family of 3 Trumpeters in Marin Co. Identified by Eugene Krider, USFWS (J. R. LeDonne pers. communication 1983).
1977-1978		Tule L., NWR personnel heard Trumpeter with Whistling Swans several years ago (Shea 1978).
1979-1980		R. Canniff heard Trumpeters wintering with Whistling Swans in California (Canniff pers. communication 1980).
1983	November 24	Steve Summers saw a green-collared adult and 3 Trumpeter cygnets with 11 other swans on lower Klamath Basin NWR. Flew south (Fleischer and Gilmer 1984).
1984	January	Pilot B. Conant saw 20 Trumpeters on Willow Creek, N.E. of Clear Lake NWR, Modoc Co. (Conant 1984).
COLORADO		
1897	November 18	2 Trumpeters shot at Ft. Collins (Burnett 1916).
1977	Fall	Trumpeters reported at Grand Lake (Shea 1978).
	December 23	CBC. 7 Trumpeters and 1 Whistling Swan (calling) in West Cliff Circle (Van Truan 1978).
1978		CBC. 2 swans (Trumpeter or Whistling Swan?) San Luis Valley Circle (McClaughry 1979).
1980	Winter	Orange-collared swan(s) seen at Denver City Lagoon (Dr. Ronald Ryder pers. communication 1981).
1977-1984		Mahon Refuge, Haigler, NE, free-flying Trumpeters used Republic R. watersheds in Yuma Co. (Mahon 1984).
IDAHO		See Banko (1960).
1920		Trumpeters nested on Icehouse Cr. Reservoir, Fremont Co. (Trude 1960).
1923-1924	Summers	Trumpeters nested on Gray's Lake (Fordyce in Banko 1960).
1932		Trumpeter nest on island in Pend Orielle R. near Washington border (James in Banko 1960).
1937	April 17	Condon saw 5 Trumpeters on Marsh Creek, Porteuf R., Bannock Co., 30 miles s. of Pocatello, ID (Banko 1960).
	April 18	Condon saw 2 Trumpeters on Oxbow L., Snake R. near Roberts, ID (Banko 1960).
1943	Fall	A Trumpeter killed on Snake R. near Burley, ID (Slater in Banko 1960).
1951	March 30	5 Trumpeters on Elk Horn Reservoir, Oneida Co., ID (Klepper in Banko 1960).
1952		11 Trumpeters on Spring Cr. Am. Falls Res., Bannock Co., ID (Banko 1960).
1954	Winter	8 to 9 Trumpeters over S. Fork Snake R. s. of Swan Valley, ID, Bonneyville Co. (Winterfield in Banko 1960).

1968	June 2-November 2	2 adults, 1 yearling Trumpeter spent 462 swan days on Grays Lake NWR (Deutscher letter 1/9/84).
1969	April 6-19	5 Trumpeters on Grays Lake (Grays Lake NR 1969).
1969	April 20-August 30	Trumpeter pair on Grays L. & vicinity (Grays Lake NR 1969).
1970-1971	Summers	2 adults, 2 immatures on Grays L. (Grays L. NR 1970 & 1971).
1972	Spring	2 adults, 2 yearlings early (Grays L. NR 1972).
1972	Summer	Pair nested, produced cygnets (Grays L. NR 1972).
1973		An occasional Trumpeter visited Bear L. NR (Grays L. NR 1973-1974).
1973	Summer	1 adult, 3 cygnets (Rod Drewien to Maj 1983).
1974-1975		A few Trumpeters migrate thru Grays L. spring and fall. An adult molted on the Refuge (NRs 7/1/73-7/30/75).
1976		Trumpeters migrate thru Grays L. spring and fall. A pair used Grays L. April 23-June 4, 1976 (NR CY 1976).
1977 & 1980	Spring & Fall	Trumpeter migration. An adult Trumpeter Swan molted on Grays L. NR (NR CYs 1977-1980).
1977	Summer	4 adults, 2 cygnets on Camas NWR (TTSS #16 1977).
1979-1980		6 adult Trumpeters nesting at Camas (Maj 1984).
		Pair at Market L. (E. of Camas NWR) 1 cygnet in 1980 (Maj 1984).
1980	Prior to	Pair swans nested on "No Name Pond" along Lochsa Highway near Montana border (L. Odenburg to Maj 1983).
	Summer	5 adults, 2 cygnets Henry L., ID (Maj 1984).
	August	73 adults and 10 cygnets in ID Survey (TTSS #21 1981).
1981	Summer	5 adults on Camas NWR (Maj 1984).
		2 adults, 4 cygnets on Henry L. (Maj 1984).
1981-1982	Summers	2 adults at Market L. (Maj 1984).
1982	Prior to	Pair produced 4 cygnets on Macherett Pond (Maj 1983).
1982	February	Survey results: 429 adults, 137 cygnets in Idaho (TTSS 11(2) 1982).
	Summer	2 adults, 3 cygnets on Camas NWR (Maj 1984).
1979-1982		Pair nested, produced no cygnets on Rickey Pond, Camas NWR (Maj 1983).
1983	February	Survey results: 493 adults, 122 cygnets in Idaho (Bartonek 1983).
	March 8	Migration--17 Trumpeters on Hauser L., ID-WA border (Maj 1983).
	Summer	Trumpeters in Targhee N.F. at: Mesa Marsh, Swan L., Eccles, Bear L. Thompson Hole, Long Meadows, Indian L., Ernest L., Chain L., Upper Goose, Twin L., Lower Goose, Pineview Hatchery Butte and Lily Pond (7 cygnets from 10 eggs hatched) (Worden & Maj 1983).
ILLINOIS		Abundant "New France" (pre-English) Trumpeter data.
1978	December 16	CBC. 5 Mute Swans in Fermi Lab - Batavia Circle (Mooring 1979).
	16	CBC. 2 Whistling Swans in Collinsville Circle (Wrischnik 1979).
	28	CBC. 12 Whistling Swans in Horseshoe L. Circle (Kleen 1979).
1981	October 12	12 Trumpeter cygnets with Mute foster parent put on Fermi Lab Prairie cooling pond(s) (Crawford 1982 and Hendee 1982).
1982		2 free-flying Trumpeters (from Brookfield Zoo?) at Batavia and Kankakee R. (Hendee 1982).
KANSAS		Potential migration area for Interior Canada, Lacreek, and Mahon Refuge Trumpeters.
1971	Winter	5 Trumpeters wintering on Republic River in Cheyenne Co., KS, were shot (Mahon 1972).
1977-1984		Should have been plenty of observations of Mahon Refuge's free-flying Trumpeters in Cheyenne Co. (Harold Burgess).
1984		TTSS & Kansas Fish and Game Commission studying Marais des Cygnes W.M.A. as potential restoration site (Burgess 1984).
MANITOBA		
1955		3 adults, 3 cygnets transferred from Red Rock Lakes, MT, to Delta Waterfowl Research Station, Delta, Man., to supplement small group of Canadian Trumpeters already there (Banko 1960).
1972	April 5	6 Trumpeter Swans released with primaries pulled on L. Manitoba marsh.
	November 19	5 cygnets departed Delta with giant Canada Geese.
1972		3 Trumpeter Swan cygnets allowed free flight at Delta--migrated (Batt 1976).
1973		4 Trumpeter Swans returned and summered on L. Manitoba.
	November 6	4 cygnets departed Delta with giant Canada Geese.
1974	April	Sighting of 3 Trumpeter Swans confirmed on L. Manitoba (Batt 1976).
1982	August	"Swans nesting on Swan L." (B. Hart to R. D. Van Deusen).

MEXICO		Early exploitation of Mexico may have significantly reduced Trumpeters before English-speaking people arrived.
1909	January	An old record of Trumpeters at Matamoros (Peterson and Chalif 1973).
1975	Winter	2 Trumpeters brought in by hunters (Pihl to Ward 1976).
1979	Winter	2 swans defended site against survey plane at Santiago Lake, Durango. Observed by Eugene Knoder & Harvey Miller (Miller 1981).
1981	Winter	2 swans at Tintero Lake and 3 at Bastillos L. n.w. and w. of Chihuahua City, Chihuahua (Voelzer 1981). Earlier surveys picked up swans in that area (Matlock 1984).
MICHIGAN		Numerous "New France" pre-English records. See Lumsden (1982).
1701	July	"There are such large numbers of swans that the rushes among which they are massed might be taken for (white) lillies" (M. de Lamothe de Cadillac, 1701).
1860		2 Trumpeters shot on Lake St. Clair (Barrows 1912).
1875	November 20	1 specimen taken on L. St. Clair by Collins (Barrows 1912).
1878-1884		2 specimens from L. St. Clair (Barrows 1912).
1884		A specimen shot on L. St. Clair (Barrows 1912).
1912		Trumpeters occasionally seen in spring and fall on St. Mary's River near Sault Ste. Marie (Mj. Bois to Barrows 1912).
1978-1979	Winter	5 swans larger, warier, and louder than Mutes observed and reported on Upper Indian River (Kalenak to Burgess 1981).
1978	December 16	CBC. 40 Whistling Swans (indicates suitable migration or winter Trumpeter habitat) in Anchor Bay Circle (American Birds 1979). (Many other similar Michigan entries in American Birds.)
1983		Swan bones were recovered from prehistoric Indian sites at the junction of the Saginaw and Titabawassee Rivers in Saginaw Co. and at Moccassin Township, Berrien Co. (Cleland 1983).
1983-1984		Ongoing leucistic Trumpeter studies and Mute/Trumpeter fostering studies at Kellogg Bird Sanctuary and Pitchfork Valley Farms, Hickory Corners, Michigan.
1984		The Trumpeter Swan Society and Michigan Wildlife and Nongame Divisions are focusing on Swan Creek Wildlife Management Area, Allegan, MI, for Mute/Trumpeter fostering studies. Michigan gave 54 Mute Swan eggs to University of Minnesota for surrogate Trumpeter research.
MINNESOTA		
1937	August 31	2 Trumpeters on small marsh all summer in Beltrami Co. (Banko 1960).
1966		2 Trumpeters air-expressed from Red Rock Lakes NWR (RRLNWR) to Hennepin County Park Reserve District (HCPRD) (F. King 1969).
1967	September 10	10 adults, 10 cygnets trucked from RRLNWR to HCPRD (F. King 1969).
1968	Fall	10 cygnets trucked from RRLNWR to HCPRD (Hunt & F. King 1969).
1969	January	16 adult-plumaged and 29 cygnet Trumpeter Swans at HCPRD.
	July	HCPRD 1st Trumpeter cygnets hatched in Minn. in 80 years (Weaver 1972).
1970	Winter	5 free-fliers remain at HCPRD. Adult male reported as far away as Rochester, MN.
1970-1971	Winter	15 adults including 12 free-fliers at Carver Park Reserve. 2 prs. on Sunny Lake produced 2 cygnets (Weaver 1972). 1 pr. on Hayden Lake Elm Cr. Park Reserve (30 miles NNW) (Weaver 1972).
1974	Fall	HCPRD produced 4 Trumpeter cygnets to flight.
1976	October 24	2 adults and 1 cygnet over L. Traverse, SD, border (Leach 1976). (Probably not HCPRD Trumpeters - H. Burgess.)
1979	July 5	Pair free-flying Trumpeters hatched 4 cygnets on N. Twin L. Crow-Hassan Park Reserve, Hennepin Co. First nesting of free-flier.
1980	October	9 Trumpeters shot near Crow-Hassan Park Reserve (Gillette 1983).
1982	June	Free-flying Trumpeters nested in Baker and Lake Rebecca Park Reserves. Trumpeters reported in Hennepin, Anoka, Sherburne, Wright, and Carver Counties as result of release (Gillette 1983).
1982	Fall	5 MN DNR cygnets added to HCPRD flock.
1982-1983	Winter	Leucistic male cygnet transferred to Kellogg Bird Sanctuary, Michigan (Van Deusen 1983).
1983	April 10	Pair of collared Trumpeters at Crow-Hassan Park Reserve. This pair was observed south of Grantsburg, WI, on 3/13/83 (Gillette 1983).
1983		6 pairs of HCPRD Trumpeters nested, hatched 31; reared 27 to flight. MN DNR reared 7 from 12 eggs collected at Red Rock Lakes NWR and added 6 cygnets to HCPRD Flock (Gillette 1983).

MISSOURI		Missouri has early history of nesting and migrating Trumpeters.
1972-1973	Winter	Cygnet reported at Mingo NWR (Weaver 3rd TTSS Conf.).
1978	December 6	Trumpeters at Thomas Hill Reservoir. 3 shot (1 banded at Lacreek NWR, SD, in 1974) (Burgess 1979).
1981	Winter	3 Trumpeters with 3 Whistlers at Mingo NWR, Puxico, Stoddard Co. (Bell letter 1982).
1982	September	2 adult, 3 cygnet Trumpeters transferred from Lacreek NWR to Mingo NWR (Wilson, 8th TTSS Conf.).
1983	April	2 orange-collared, Alberta Trumpeter swans with 2 others in Talley Bend, Truman Reservoir, St. Clair Co. Other swans seen in Henry and Cass Counties (R. Talley fide Sutlick 1983).
1983	August	2 adults remain at Mingo NWR from 1982 transplant.
	September	4 adults, 3 cygnets transferred from Lacreek area to Monopoly Lake Wilderness Area, Mingo NWR (J. Smith memo 1983).
1984	January	Adult pair from 1982 release alive and well at Mingo NWR (Larry Gale, Report to Special Agent, Denver 1/17/84).
	March 16	1982 released pair at Crowley's Ridge W.A. in Stoddard Co. Remaining 1983-released adult female was on 15-acre pond near Poplar Bluff, Butler Co. (Vance 1984).
	May 3	3 adult Trumpeters on Mingo NWR (J. Smith telecon).
MONTANA		See Table 2 etc. in Banko (1960).
1842	April 15	Trumpeters nested near Flathead L. (Pierre J. DeSmet in Thwait 1906).
1871		Trumpeters nested on Thompson R. (western MT) (E. S. Cameron).
1881		Trumpeters nested on Clearwater, Missoula Co.; Lake Rogers, Flathead Co.; Swan L., Lake Co.; and Flathead L., western Montana (E. S. Cameron in Coale 1915).
1883-1888		Trumpeters nested in Centennial Valley, Beaverhead Co. (Ed Forbes in Bent 1925).
1889		Trumpeters nested on headwaters of South Fork Flathead River (E. S. Cameron in Bent 1925).
1896	June 10	Trumpeters nested on Swan L., Beaverhead Co. (Brower 1897).
1903		Trumpeters nested on Highland L., Fergus Co. (Silloway to Saunders 1921).
1910		Trumpeters nested on Red Rock Lakes, Beaverhead Co. (C. French USFWS files).
1917		Trumpeters nested on Big L., Stillwater Co. (Saunders 1921).
1920		Trumpeters nested on Big L., Yellowstone Co. (USFWS files).
1922		Trumpeters nested on Red Rock Lakes (Sperry USFWS files).
1950	October 10	Trumpeter found dead at Freeze-out L., Fairfield, Teton Co. (Roahen in Banko 1960).
1953	October 31	30 Trumpeters flew over Missoula (Hand in Banko 1960).
1955	Spring	Pair of swans attempted to nest on Mystic L. "on the Rosebud" (Hansen-Lentfer in Banko 1960).
1948-1958		See Banko (1960) for nesting and wintering numbers.
1977	December 27	CBC. 36 Mute Swans in Park Co. Circle (Clark 1978).
	31	CBC. 22 Trumpeters in Ennis Circle (Skarr 1978).
1979	February 25	5 adults, 4 cygnets; orange-collared Alberta Trumpeters at Red Rock Lakes NWR (Sjostrom 1979).
	June 1	Pair and 4 cygnets on pond east of Haystack Butte; a group of 3 adults on Smith Creek Rd. pond; one adult on Cobb's Reservoir and one adult on nest on pond north of Cobb's Reservoir -- all near the Sun River Game Range, Teton Co. (Lorange - Nyberg 1981).
1980		Trumpeter nested at Albino L., Park Co. (Maj 1983).
		"Occasionally a few migrating Trumpeters will pass through the Freeze-out L. area, 4 in 1980 sounded like Trumpeters" (Nyberg letter 1981).
	June 9	Pair on pond north of Haystack Butte produced 2 cygnets (McCarthy - Nyberg 1981).
	August	Survey: 315 adults, 6 cygnets (TTSS #21 2/81).
	Fall	Trumpeters on pond on Kelly Rd. near Columbia Heights (Terry Stidham, Glacier Bible Camp, Hungry Horse, MT).
1979-1981		Trumpeter collared at Smith R., Yukon, seen at Ninepipe in 1979 and at Red Rock Lakes NWR in 1981 (McEneaney & Sjostrom 1983).
1980-1981	Winter	Yukon-collared pen and cygnet at Moiese and Red Rock Lakes NWR; cygnet returned to Montana winter 1981-1982 (Bechtel 1982).
1981	Spring	Pair Trumpeters on Cobb Res., Teton Co. (McCarthy 1981).
1982	Prior to	Trumpeter production noted at Aldridge L., Park Co.; Trumpeters were seen spring and fall at Wade L. and Twin Bridge, Madison Co.; Wisall L., North Park Co., and nearby stock ponds. Up to 200 Trumpeters summered at Lima Reservoir, Beaverhead Co. (Maj 1983).
1965-1982	Springs	About 15 Trumpeters used Teton Co. eastern front (D. Witt to Burgess 1983).

1982	February 3-May	Winter Survey: 363 adults, 59 cygnets (Bartonek 1983).
1983	Spring	Trumpeters heard and seen around Glacier Bible Camp, Hungry Horse, MT (Stidham 1983).
	Spring-Summer	RRLNWR had 37 pairs; 29 pairs nested; 34% of nests flooded; 47 cygnets sighted and 19 fledged.
	September	Survey: 228 adults, 32 cygnets (Bartonek 1984).
NEBRASKA		See Banko (1960).
1929	November 11	5 Trumpeters in Holt Co. (Swenk 1945).
1956	Fall	2 adult, 3 cygnet Trumpeter Swans (all banded at Lowe L., Alberta); one shot at Schoolhouse L; another at Shaup L., Cherry Co. on 10/27; one shot on Loup River, 12 miles west of Fullerton, Nance Co. on 11/2; one crippled adult captured near Fullerton on 10/30 and another cripple captured near Shelton, Buffalo Co., on 11/2. The cripples were donated to Children's Zoo, Lincoln, NE, for breeding stock.
1960-1976	Summers	Trumpeters nested on Hoover L., Sheridan Co. (Moss 1976).
1961-1963		Trumpeters nested on Hoover and vicinity lakes, Sheridan Co. (Moss 1976).
1964		Pair of Trumpeters nested on Cody L., Cherry Co., NE (Lacreek NWR 1964).
1966	Summer	Trumpeter pair used Lake 21, Valentine NWR (Ellis 1969).
1969	June 19	2 adults, 2 cygnets observed on Lake 21 (Winship & Vaughn 1969).
1970-1983	Summers	Pair nested on Lake 21, Valentine NWR (Lacreek NWR 1970-1983).
1972		Nebraska Dept. placed 7 Trumpeters on Mahon Refuge, Haigler, NE (Mahon 1977).
1974	November 16	3 adult Trumpeters on Whitney L., Dawes Co. (Rosche 1978).
	Fall	6 cygnets obtained by Crescent L. NWR (Burgess 1976 and 1977).
1975	Spring	7 free-flying Trumpeters on Gimlet L., Crescent L. NWR (Perry 1976).
1976	March 27	4 adults on University L., South Sioux Co. (Rosche 1978).
	Spring	2 adult pairs released at Gimlet L., Crescent L. NWR. Dominant pair (cob wt. 38#) attempted nesting; killed by coyotes.
	Summer	2 pairs nested on Valentine NWR. Both families collared. One family wintered at Lacreek; the others disappeared.
	November 11	1 adult, 2 cygnets on Whitney L., Dawes Co. (Rosche 1978).
1977		Trumpeters at Mahon Refuge began annual production of free-flying cygnets (Mahon 1977).
	April 4	2 adult Trumpeters at Walgren L., Sheridan Co. (Rosche 1978).
1979		Remaining Crescent L. NWR Trumpeter returned to Gimlet L., Garden Co.
1980		The Trumpeter obtained mate. Nested flooded at Gimlet L. (Sowards 1980).
1981	April	"Flock of 13 Trumpeters visited Mahon Refuge 2 days" (Mahon letter 1983).
1983		"Have raised 2 to 7 free-flying cygnets past seven (7) years" (Mahon letter 1983).
NEVADA		
1952	December 2	Groves reported Trumpeter Swan east of Carson City (Banko 1960).
1947-1949		A total of 22 RRLNWR cygnets transferred to Ruby Lake NWR (Bartonek 1983).
1953		Pair of Trumpeters nested, reared a cygnet at Franklin Lake.
1954-1958		Total of 49 cygnets, 6 breeding adults, and 19 subadults transferred from Red Rock Lakes NWR to Ruby Lake NWR (Bartonek 1983).
1967		Trumpeter reported near Reno (R. Shea 1978).
1975	January	28 adults and 2 cygnets at Ruby Lake NWR (cygnets from St. Mary's River 85 miles north).
1978	December 16	CBC. 35 Trumpeters, 4 Whistling Swans in Ruby Lake Circle (Bouffard 1979).
1979	Summer	7 prs. on Ruby Lake hatched 11, reared only 2; 4 prs. nested off Refuge (Franklin L., etc.), reared 11 (Bouffard 1980).
1981	Fall	Ruby L. flock hatched 19, reared only 5 due to drought and motorboat disturbances (Bouffard 1981).
1983	January 27	Ruby Valley flock consisted of 43 adults and 2 cygnets (TTSS 1/83).
	Winter	"Possibly Trumpeters have found wintering sites in isolated springs and other waters" (S. H. Bouffard in Bartonek 1983).
1984		TTSS looking at Pahranagal NWR marshes as migration decoy site, nominated by Robert Yoder (Hughlett 1984).
NEW MEXICO		
1931	November	Adult Trumpeter collected near Las Cruces (American Birds 5/77).
1975	Winter	Zahm photographed cygnet at Bosque del Apache NWR.

1977	February 23	Adult Trumpeter shot in Bear Canyon Res. east of Silver City (Zimmerman 1977).
1975-1983		At least 9 swans visited Las Vegas NWR (Berlinger 1984).
1982	December	Zahm photographed another Trumpeter cygnet at Bosque del Apache NWR.
NORTH DAKOTA		
1928	February 25	Trumpeter pair with 125 Whistling Swans at Slade L. (Cassel in Banko 1960).
1930	October 2	Trumpeters flew over Lake Isabel s. of Slade L. (Reid in Banko 1960).
1967	November 4	Heard Trumpeters with Whistling Swan flock on Alkaline L. app. 10 mi. west of Streeter, Kidder Co. (Cowardin and Bartonek 1968).
1972-1983		Lacreek flock wandered into North Dakota (Burgess 1983).
1983	May 12	Bair recorded 3 swans on private marsh s. of Streeter, Kidder Co. (Bair 1983).
	September 4	Simpson reported 5 swans with White Pelicans on WPA 12 mi. w. of Ellendale, Dickens Co. (Simpson 1983).
NORTHWEST TERRITORIES		See "Historical Distribution of the Trumpeter Swan in Central Canada" (Halladay 1970).
1977	July 5	2 adults and 5 cygnets on Liard R. system, s. side of Nahanni Natl. Park, n. of 60th Parallel on the Yukon T. border (Kemper 1977).
1982	March 31	Alberta Plan reports about 10 Trumpeters in NWT (McKelvey 1982 & Bartonek 1984).
OHIO		Trumpeter bones found near Toledo, Chillicothe, and along Ohio R. Probably exploited and extirpated by pioneers (Rogers & Hammer 1979).
1980	Summer	A Trumpeter inadvertently released at Crane Cr. WA (Bednarik 1981).
OKLAHOMA		No Trumpeters reported by Banko (1960) or Sutton (1974). TTSS looking at Salt Plains and Sequoyah NWRs as potential migration decoy and/or wintering sites for Lacreek and eastern front Trumpeters.
1979	Spring	3 swans at jct. of Canadian-Arkansas Rivers (Wiseman).
1979-1980		At least 10 swans visited Tishomingo NWR (Jemeson 1984).
1973-1981		At least 16 swans visited vicinity of Sequoyah NWR (Heflebower 1984).
1984	January 2	One swan each at Sooner and Hulah L. (Lem Due 1984).
	January 6-February 2	8 adult, 2 cygnet Whistling Swans No. Fork, Red R. (Robbins 1984).
1983-1984	December 28-February 1	8 adult, 5 immature Trumpeters on South Fork of Canadian R. identified by Donnie Ledbetter, Rt. 1, Box 111, Maud, OK 74854.
ONTARIO		See "The Trumpeter Swan in Eastern Canada," Lumsden, H. G., 1982 OMNR WI. Res #82-11, for details of separate historical northern and southern populations. The presence of wintering Mute and Whistling Swans are indicators of Trumpeter winter habitat.
1973	December 26	CBC. 11 Mute Swans in Pickering Twp. Circle (L. Ontario shore) (Speirs 1974).
1978	December 16	CBC. 2 Mute and 319 Whistling Swans in Long Pt. Circle (St. Clair L.) (Jobes 1979).
1982-1983		Alberta air-shipped 16 Trumpeter Swan eggs to Toronto; shipment delayed enroute - air cells dislocated; incubator at Kortright saved 10; 2 "Trumps" reared by Mute pen at Ontario Place, Toronto; wintered near Pickering; returned to Ontario Place in spring; supplemented with 2 captive-reared yearlings from Kortright Park. 1 Mute-reared Trumpeter attempted to summer on Cranberry L. (Lumsden 1983).
1983	June	Received and incubated 6 Alberta eggs. Placed 3 "Trumps" each under 2 pairs of nesting Mutes on Cranberry L. in company with 2 other families of Mutes under intensive time-budget study (Lumsden 1983).
1984		2 Mute-reared Trumpeters wintered in Maryland in 1983; departed Maryland April 5; 1 sighted on Cranberry L., April 25 (pers. commun. Lumsden 1984). (Lumsden raised $2000 for helicopter time - expected to get 10 Trumpeter eggs from Alberta in 1984.)
OREGON		Numerous historical records of Trumpeters in Oregon, including records of 1877 and 1921 in Harney Basin (Cornely, et al. 1981).
1929	September 7	A Trumpeter Swan observed at Davis L. (Gabrielson 1940).
1939-1961		25 adults, 102 cygnets transferred from RRLNWR to Malheur NWR (Stroops 1981 in Brechtel 1982).
1958		First Trumpeter nesting at Malheur NWR (Cornely et al 1981).

1976	April	An Alberta orange-collared Trumpeter on Columbia R. (Mackay 1976).
1977	December 20	CBC. A Trumpeter and 131 Whistling (?) Swans in Corvallis Circle (Ramsey 1978).
	December 16	CBC. 4 Trumpeters in Wallowa Co. Circle (Conley 1978).
1978		6 nests; only 7 Trumpeters wintering at Malheur NWR (winter migration?) (Stroops 1981 in Brechtel 1982).
	December 16	CBC. Bend Circle swans: 2 Mutes, 1 Whistling (?) (Baker 1979).
	16	CBC. 26 Trumpeters at Malheur NWR (Thompson 1979).
	20	CBC. 16 Trumpeters in Sod House Circle, Malheur NWR (Thompson 1979).
	24	CBC. 1400 Whistling (?) /Trumpeter Swans at Sauvie Island (Gilligan 1979).
1979	December	3 Trumpeters on Netart Bay, Tillamook (Mensik and Henry 1980).
1980-1981	Winter	6 Trumpeters on Lower Columbia R. (Cady 1981 in Bartonek 1983).
1980	Winter	3 marked Turnbull Trumpeters of same family observed on Crooked River near Prineville, Oregon (Bartonek 1983).
		Leg-banded Malheur young recovered from Malheur R. near Ontario, OR (Bartonek 1983).
1981-1982	Winter	CBC. 4 Trumpeters on Lower Columbia R. (Cady et al. 1981 in Bartonek 1983).
		Est. 10 Trumpeters on n.w. Oregon coast (B. Sharp in Bartonek 1983).
1982	December 18	CBC. 3 Trumpeters in Tillamook Bay Circle (Thompson 1983).
		CBC. 52 Trumpeters Malheur NWR Circle (Thompson 1983).
	20	CBC. 3 Trumpeters Sod House Circle (Thompson 1983).
1983	January 27	Malheur NWR: 45 adults and 7 cygnets (D. Weaver 1983).
	Summer	Malheur NWR: 43 adults Trumpeters; 36 paired; 1 group of 3; 10 pair nested; 7 nests successful; hatched 28 & fledged 17 cygnets (70% nests, 61% cygnets were successful.) (Ivey 1983).
	November 24	Steve Summers saw 1 green-collared adult; 3 immature with flock of 15 on Klamath Basin NWR near California border (Fleischer 1983).
SASKATCHEWAN		No Trumpeter Swans reported by Banko (1960) in Saskatchewan.
1914		Trumpeter Swans first reported in Sask., Cypress Hills (Nieman 1972).
1948-1950	Summers	Trumpeters reported in Alberta, Cypress Hills (Banko 1960).
1953		First Trumpeter Swan nest reported in Saskatchewan portion of Cypress Hills (Brechtel 1983).
1971	Summer	3 prs. nesting and 1 adult and 9 cygnets in Cypress Hills (Nieman 1972).
1976	Summer	6 adults and 4 cygnets, Cypress Hills (Nieman 1976).
1978	Summer	2 prs. nesting and 3 cygnets in Cypress Hills (Nieman 1979).
1971-1980		Cygnets fledged annually but Cypress Hills flock has not increased due to migration mortality (Brechtel 1983).
SOUTH DAKOTA		Except for transplants, no South Dakota Trumpeters in Banko (1960).
1804	October 6	"saw, 'Gees, Swan, Brant and Ducks on the (Missouri River) sand bars today'" (M. Lewis 1804).
1800-1900		"The Trumpeter Swan undoubtedly nested in South Dakota during the last century." Over and Thoms (1946) state that it nested in the eighties (Harris 1978).
1960-1962	Summers	57 cygnets transferred from Red Rock Lakes NWR to Lacreek NWR (Hughlett Lacreek NR 1960-1962).
1963		17 Trumpeters released on Lacreek NWR at 3 and 2 years of age.
1964		First cygnet produced on Lacreek NWR.
1976	October 24	First Lacreek Trumpeters nested off Refuge.
		Leach and Wilson heard and saw 2 adults and 1 cygnet over Lake Traverse, Robert Co. (Leach 1976).
1978		Trumpeters common summer residents in Bennett, Shannon, Jackson, Pennington, Meade, Washabaugh, Melette, Todd, and Tripp Counties in South Dakota; winter at Lacreek NWR (Harris 1978).
1981	August	Survey: 104 adults; 54 cygnets (15 broods) in Lacreek Flock area (Kraft 1982).
1982-1983		Trumpeters were nesting and using most of western South Dakota and Nebraska Counties extending to Colorado and into Wyoming and North Dakota (Saul 1982, Bair 1983, Simpson 1983, & Burgess 1983).
1983	January 27	167 adults and 48 cygnets wintering at Lacreek (Kraft 1983A).
	December 7	263 Trumpeters staged at Lacreek NWR (Kraft 1983B).
	December 23	Temperature at -42°F.; windchill -100°F. 100 Trumpeters at Lacreek disappeared (Kraft 1983B).
TEXAS		Early Spanish and other explorers decimated swans. Trumpeters were probably once more numerous than Whistling Swans along the Gulf Coast, on beaver dams on the Rio Grande and other rivers, and on freshwater inland lakes.

1900	Prior to	Locally fairly common in eastern two-thirds of Texas.
1927	February 15	Last record: Trumpeter shot on High Island, Galveston Co. (Oberholser 1974).
1946	November 21	Swans at Eagle Mountains Fish Hatchery, Tarrant Co. (Pulich).
1951	December	12 swans at Black Gap WMA, Brewster Co., shot by local rancher (W. L. Thompson).
1954-1956		Swans on Mercedes Reservoir (Kiel 1984).
1966	December 1-30	1 adult, 3 cygnet swans "without yellow lores" in Norton Tank (stockdam), Black Gap WMA, Brewster Co. (Brownlee 1976).
1974		Kincaid in Birdlife of Texas, (Oberholser 1974): Trumpeters, TX: winter (extirpated), also erroneously writes, "closest wild Trumpeters in Wyo." (actually closest nesting wild Trumpeters were in Nebraska in 1974).
1960-1976	Winters	Swans on stockdam one-half mile S. of Cayo Del Oso Creek, Lorales Div., King Ranch, Nueces Co.; also swans seen on Laguna Largo in spring (Layman and Matlock 1984).
1977-1979		Up to 18 Trumpeter Swans wintered on Carancahua Bay, Gulf Coast, and fed on an Edna rice reservoir - duck hunting club near Victoria, TX (documented by photographs and Ed Flickinger 1979).
1980	December	5 swans in Chambers Co. (Stutzenberg 1981).
1959-1984	Winters	At least 8 swans visited Hagerman NWR, Grayson Co. (Hagerman NRs 1959-1984).
1984	January	1 swan in northeast Texas (Johnson 1984).

UTAH

1965	December 27	Trumpeters wintered on east side Great Salt Lake (3-5 mi. s. of Bear River NWR; 2-3 mi. w. of Willard Reservoir, Box Elder Co.) (Bartonek, 1966; Bartonek 1983).
1973	December 17	CBC. 8000 Whistling Swans (no Trumpeters?) Bear R. NWR (Beall 1974).
1974		An Alberta leg-banded Trumpeter shot in Utah during Whistling Swan hunting season (Mackay 1976).
1977-1978	Winter	1 adult, 5 cygnets at Fish Springs NWR (Shea 1978).
1977	December 17	CBC. 5572 Whistling Swans (no Trumpeters?), Bear R. NWR (Krey 1978).
	December 18	CBC. 316 Whistling Swans (no Trumpeters?), Salt L. City Circle (Dunkle 1978).
1978	December 21	CBC. 162 Whistling Swans (no Trumpeters?), Bear R. NWR Circle (Varney 1978).
1981	December 27	CBC. 4 Trumpeter Swans, Fish Springs NWR Circle (Forrest 1982).
1982	December 21	CBC. 10,415 Whistling Swans (no Trumpeters?), Bear R. NWR Circle (Watters 1983).

WASHINGTON

1912		Trumpeter specimen taken at Moses L. (Jewett 1953).
1913		Trumpeter skin from Bellingham Bay, Whatcom Co. (Jewett 1953).
1924	Fall	18 Trumpeters crossed border from B. C. (Brooks in Banko 1960).
1939	April 17	20-25 Trumpeters at Othello (Palmer 1960).
1947	Spring/Fall	Small numbers Trumpeters winter S. of border (Munro 1947).
1962-1966		36 cygnets transferred from RRLNWR to Turnbull NWR (Bartonek 1983).
1967		Pinioned Trumpeters first nested at Turnbull NWR (Bartonek 1983).
1969		Free-flying Trumpeters first nested at Turnbull NWR (Bartonek 1983).
1970		Turnbull Flock of Trumpeters produced 8 nests (Bartonek 1983).
1975		Turnbull Flock of Trumpeters fledged 14 cygnets (Bartonek 1983).
1973	December 16	CBC. A Trumpeter in flight and heard swan sp. (?), Grays Harbor (Hunn 1974).
	December 23	CBC. 3 Trumpeters (by call, habitat), 68 Whistling Swans in Leadbetter Pt. Circle (Van Wormer 1974).
	December 29	CBC. 28 Whistling Swans, 2 swans sp. (?) (no Trumpeters?) Bellingham Circle (Wahl 1974).
1975	April	Alberta-collared Trumpeter sighted on Columbia R. (Mackay 1976).
1975-1976	Winter	5 Trumpeters on San Juan I. pond; another family on Orcas I. (Blau 1978).
1976	Fall	Turnbull Flock peaked at 47 Trumpeters (Bartonek 1983).
1977	Spring	Only 18 Trumpeters returned to Turnbull after forced migration (Bartonek 1983).

December 17 CBC. 13 Trumpeters & 1 swan sp. (?) in Leadbetter Pt. Circle (Burr 1978).

Trumpeters (Jeffrey 1978)

Date	Adults	Cygnets	Location
11/15/77	29	11	Judy Reservoir
11/28/77	32	6	Cook Road
11/28/77	9	3	Barney Lake
11/28/77	6	6	Nookachamps
11/29/77	111	35	Nookachamps
12/05/77	32	20	Nookachamps
12/07/77	142	70	Nookachamps
12/19/77	129	43	Judy Reservoir
1/04/78	118	28	Barney Lake
1/04/78	30	9	Judy Reservoir
1/09/78	102	25	Judy Reservoir
1/10/78	150	38	Barney Lake
1/26/78	168	16	Nookachamps
1/27/78	74	35	Nookachamps
1/27/78	137	28	Barney Lake
2/03/78	19	10	Nookachamps

1978	January	Count: Skagit Co.: 83; Pacific Co.: 57 Trumpeters.
1976-1978		Mortality due to: shooting, aspergillosis, & lead poisoning.
1978	December 31	CBC. 45 Whistling Swans, 1 Trumpeter Swan in Bellingham Circle (Wahl 1979).
1979	December 30	CBC. 6 Trumpeters in Bellingham Circle (Wahl 1980).
1980	December 28	CBC. 10 Trumpeters (100 Whistling) Bellingham Circle (Wahl 1981).
1981	January 4	CBC. 4 Trumpeters in Padilla Circle (Bruyn 1981).
	December 27	CBC. 11 Trumpeters; 125 Whistling Swans; 100 swans sp. (?) in Bellingham Circle (Wahl 1982).
1980-1981	Winter	436 Trumpeters in Skagit Valley (Jordan in Bartonek 1983).
1981	Fall	2 nesting pairs fledged 4 Trumpeter cygnets at Turnbull NWR (Rees 1982).
1981-1982	Winter	405 Trumpeters in Skagit Valley (Jordan in Bartonek 1983).
1982-1983	Winter	395 Trumpeters in Skagit Valley, 348 Trumpeters elsewhere in WA, 100-150 Trumpeters estimated not counted in Washington (Jordan in Bartonek 1983).
1982	December 18	CBC. 22 Trumpeters San Juan I. Archipelago (Wright 1983).
		CBC. 2 Trumpeters, 61 Whistling Swans, Padilla Bay (Bruyn 1983).
	December 19	CBC. 12 Trumpeters, 48 Whistling Swans, Everett Cir. (Van Niel 1983).
	December 20	CBC. 6 Trumpeters in Sequim-Dungenes (Smith 1983).
1983	January 2	CBC. 6 Trumpeters, 116 Whistling Swans, 53 swan sp. (?), Bellingham Circle (Wahl 1983).
	January 27	3 adults, no cygnets at Turnbull NWR (Weaver 1983).
	Summer	Only 1 adult Trumpeter remaining at Turnbull NWR (Bartonek 1983).

WYOMING

1926		A Trumpeter pair at Bridger; another pair at Yellowstone L. (V. Vailey 1930 in Banko 1960).
1929	Prior to	Unsuccessful nests at Trumpeter L., Lamar Valley (Banko 1960).
1931-1957		See Fall, Yellowstone Pk. Census Table 7, p. 146 in Banko (1960).
1953	September	A pair and 5 cygnets on small lake near Pathfinder Migratory Bird Refuge, central Wyoming (George Wrakestraw in Banko 1960).
1956	October 27	2 cygnets found shot near Cody, banded at Lowe L., Alberta (Mackay 1957 and Banko 1960).
1977	January	Kemper observed 23 Alberta-collared swans on Wyoming's Snake River (Kemper 1977).
1979	December 15	CBC. Seedskadee NWR Circle-2 Trumpeter Swans (June 1981).
1980	September 2-5	74 adults and 6 cygnets in Wyoming (McEneaney in Bartonek 1983).
	December 20	CBC. 27 Trumpeter Swans, Jackson Hole Circle (Raynes 1981).
1981	Spring	10 Trumpeters on Fourche R. 30 mi. n. of Sundance (Saul 1981).
	Summer	Pair of swans on Arch Cr. Dam. 15 mi. n.e. of Upton (Saul 1981).
1982	February 3-5	Survey: 952 adults and 266 cygnets in Wyoming (Bartonek 1983).
	May 3	Pair of swans at Basin Reservoir #1 (e.n.e. of Oshonto) (Saul 1982).
	Spring	Yearling cygnet sighted on Tongue R. marsh near Sheridan (Maj 1983).
1976-1983		Trumpeters wintered on Salt R. near Afton and on Big Creek near Cokeville (Lockman 1983).
1982	December 18	CBC. 54 Trumpeters, 15 Whistling Swans, Jackson Hole Circle (Raynes 1983).

1983	Prior to	Trumpeters wintered on Madison and Yellowstone R.; in protected Yellowstone Lake bays; on Snake R. from Grand Teton Natl. Park to Jackson and National Elk Refuge (Maj 1983).
1983	Prior to	Trumpeter attempted to nest at Hawks Rest, Ennos Hole, Arizona, Christian, and Half Moon Lakes; nesting at Half Moon Lake is intermittent due to flooding (Maj 1983).
1983	February 3-5	Survey: 169 adults and 26 cygnets in Wyoming (McEneaney 1983).

YUKON TERRITORY

1975	April	120 Trumpeter Swans migrating over Alaska Highway (Mackay 1976).
1977	July 5	A pair and 5 cygnets collared on Yohin L. on border of Northwest Territories s. of Nahanni National Park (Kemper 1978).
1980-1981	Winter	Yukon-collared adult female and cygnet seen at Moiese, Montana, and at Red Rock Lakes NWR. The adult female was seen in the Yukon in 1981 and the collared cygnet returned to Montana in 1981-1982 winter (Brechtel 1982).
1978-1981		5 single adults, 42 paired, 25 flocked, and 6 cygnets in Yukon Territory, other than Toobally Lakes (Bartonek 1983).
1981	Summer	Approximately 100 Trumpeters in Yukon Territory (McKelvey in Bartonek 1983).

LITERATURE CITED

Note: Many of the citations within the appendix did not have adequate information to be included in this list. Personal communications have been described as such in the text where that information was available. Where there was no information, the reference may or may not be to a personal communication. The author comments that the personal communications are, in many cases, conjecture. They have been cross-checked as far as possible and are presented here to give as complete a report as possible.

Baker, 1979. Christmas Bird Count (CBC). American Birds (7/79).
Blau, 1978. The Sixth Trumpeter Swan Conference Proceedings. Anchorage, AK, Sept. 7-11, 1978.
Banko, W. 1960. The Trumpeter Swan. N. Am. Fauna No. 63, U. S. Fish & Wildlife Service, Washington, DC 214 pp.
Bartonek, J. 1966. Condor 68(5):521.
Batt, 1976. TTSS #9 (1/76).
Beall, 1974. CBC. Am. Birds (4/74).
Bent, A. C. 1925. Life Histories of No. Am. Birds - Wild Fowl. Dover.
Bouffard, S. 1979. CBC. Am. Birds (7/79).
_____, 1980. TTSS #20 (8/80).
_____, 1981. TTSS #23 (2/81).
Bruyn, 1981. CBC Am. Birds (7/81).
_____, 1983. CBC. Am. Birds (7/83).
Burgess, H. 1976. TTSS #10 (7/76).
_____, 1977. TTSS #12 (3/77).
_____, 1979. Bluebird.
Burr, 1978. CBC. Am. Birds (7/78).
Clark, 1978. CBC. Am. Birds (7/78).
Comer, 1983. CBC. Am. Birds (7/83).
Conley, 1978. CBC. Am. Birds (7/78).
Conant, B., 1979. TTSS #18 (8/79).
Conway 1983. CBC. Am. Birds (7/83).
Cowardin and J. Bartonek, 1968. The Prairie Naturalist, TTSS #11 (12/76).
Crawford, 1982. TTSS Vol. 11 #1 (2/82).
Davies, 1979. TTSS #18 (2/79).
Dunkle, 1978. CBC. Am. Birds (7/78).
Fitzpatric, 1979. CBC. Am. Birds (7/79).
Forrest, 1982. CBC. Am. Birds (7/82).
Gillette, L. N., 1983. TTSS, Vol. 12 #2 (Summer 1983).
Gilligan, 1979. CBC. Am. Birds (7/79).
Grass, 1983. CBC. Am. Birds (7/83).
Halladay, 1970. TTSS #4 (10/70).
Harris, 1978. The Birds of South Dakota, SDOU.
Hunn, 1974. Am. Birds (4/74).
Irwin, 1979. CBC. Am. Birds (7/79).
Ivey, G., 1983. TTSS, Vol. 12 #13 (Autumn 1983).
Jeffrey, 1978. The Sixth TTSS Conf. Proceedings. Anchorage, AK Sept. 7-11, 1978.
June 1981. CBC. Am. Birds (7/81).
Kemper, 1977. TTSS #13 (8/77).
_____, 1978. TTSS #15 (2/78).
King, F., 1969. TTSS #1 (1/69).
Kleen, 1979. CBC. Am. Birds (7/79).
Krey, 1978. CBC. Am. Birds (7/78).

Kraft, 1982. TTSS, Vol. 11 #1 (2/82).
_____, 1983A. TTSS, Vol. 11 #4 (1/83).
_____, 1983B. TTSS, Vol. 12 #3 (Autumn 1983).
Leach, J. 1976. TTSS #11 (12/76).
Lewis, M. The History of the Lewis & Clark Expedition, Vol. 1. Dover pg. 155.
Lumsden, H. G., 1982. The Trumpeter Swan in Eastern Canada Ontario Ministry of Nat. Res. WI Res. #82-11.
Mackay, 1976. TTSS #9 (1/76).
Mahon, W., 1977. TTSS #13 (8/77).
McClaughry, 1979. CBC. Am. Birds (7/79).
Mooring, 1979. CBC. Am. Birds (7/79).
Morris, 1969. TTSS #2 (7/69).
_____, 1970. TTSS #3 (7/70).
Nieman, 1972. 2nd TTSS Conference.
_____, 1976. TTSS #11 (12/76).
Oberholser, 1974. Birdlife of Texas.
Peterson and Chalif, 1973. Field Guide to Mexican Birds.
Ramsey, 1978. CBC. Am. Birds (7/78).
Raynes, 1981. CBC. Am. Birds (7/81).
_____, 1983. CBC. Am. Birds (7/83).
Rees, 1982. TTSS, Vol. 11 #1 (2/82).
Robinson, 1983. CBC. Am. Birds (7/83).
Rosenberg, 1978. CBC. Am. Birds (7/78).
Shea, R., 1978. TTSS #6 (7/78).
_____, 1978. The Sixth TTSS Conference Proceedings, Anchorage, AK Sept. 7-11, 1978.
Skarr, 1978. CBC. Am. Birds (7/78).
Sjostrom, 1979. TTSS #18 (8/79).
Smith, 1983. CBC. Am. Birds (7-8/83).
Speirs, 1974. Am. Birds (4/74).
Thompson, 1979. CBC. Am. Birds (7/79).
_____, 1983. CBC. Am. Birds (7-8/83).
VanKerkoerle, 1983. CBC. Am. Birds (7/83).
VanNiel, 1983. CBC. Am. Birds (7-8/83).
VanTruan, 1978. CBC. Am. Birds (7/78).
Van Wormer, 1974. Am. Birds (4/74).
Varney, 1978. CBC. Am. Birds (7/78).
Wahl, 1974. Am. Birds (4/74).
_____, 1979. CBC. Am. Birds (1979).
_____, 1980. CBC. Am. Birds (7/80).
_____, 1981. CBC. Am. Birds (7/81).
_____, 1982, CBC. Am. Birds (7/82).
_____, 1983, CBC. Am. Birds (7/83).
Ward, P., 1976. TTSS #9 (1/76).
Warden, G. and M. Maj, 1983. TTSS, Vol. 12 #3 (Autumn 1983).
Watters, 1983. CBC. Am. Birds (7-8/83).
Weaver, D. K., 1972. 2nd TTSS Conference Proceedings.
_____, 1973. 3rd TTSS Conference Proceedings.
_____, 1983. TTSS, Vol. 11 #4 (1/83).
Wilson. 8th TTSS Conference Proceedings.
Wright, 1983. CBC. Am. Birds (7-8/83).
Wrischnik, 1979. CBC. Am. Birds (7/79).

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GUIDELINES FOR TRUMPETER SWAN RESTORATION IN CANADA

Rick McKelvey
Wildlife Biologist
Canadian Wildlife Service
P. O. Box 340
Delta, British Columbia V4K 3Y3

1. Trumpeter Swan restoration projects require specific authorization of the Canadian Wildlife Service Release Permit. The Avicultural Permit and other permits issued under the Migratory Bird Convention Act and Regulations do not grant authority to transplant migratory birds.

2. No Trumpeter Swan restoration project shall be undertaken without consultation with the wildlife agency of the province in which the restoration project is to take place.

3. Restoration projects which could result in the movement of Trumpeter Swans across the Canada-U. S. border will not be undertaken without consultation with Flyway Technical Committees and the U. S. Fish and Wildlife Service (USFWS).

4. All Trumpeter Swans held in captivity may be used as source stock for restoration subject to approval by the Canadian Wildlife Service (CWS).

5. Capture and removal of adult, subadult, and young swans from the Grande Prairie flock or from the Yukon flock will not be authorized.

6. A maximum of 10 adults, subadults, or young per year will be authorized for capture from the Pacific Coast Population, with no more than five being taken from any one location.

7. A maximum of 25 eggs per year will be authorized for removal from the Grande Prairie flock. No eggs shall be removed from the northern British Columbia/Yukon flock.

8. Egg collection will be permitted only on those lakes which have been specifically identified by CWS.

9. Complete clutches shall not be taken and removals must adhere to the following schedule: two eggs from a clutch of four or five; three eggs from a clutch of six, seven, or eight.

10. Capture and collection permits shall be issued on a priority basis as follows:

    a). Government-sponsored restoration project on Crown land.

    b). Government-sponsored restoration project on private land.

    c). Privately-sponsored restoration project on Crown land.

    d). Privately-sponsored restoration project on private land.

    e). Aviculturist for private propagation and trade.

11. Use of wild birds rehabilitated from disease or injury for restoration will not be discouraged.

12. Eggs of captive Trumpeter Swans will be considered favorably as a source for restoration stock.

* * *

EXPERIMENTAL RESTORATION OF TRUMPETER SWANS TO MISSOURI

John W. Smith, Wildlife Biologist
Missouri Department of Conservation
1110 College Avenue
Columbia, Missouri 65201

Jim D. Wilson, Ornithologist
Missouri Dept. of Conservation
P. O. Box 180
Jefferson, Missouri 56102

INTRODUCTION

Earlier, Rolf Kraft presented an overview of the Lacreek National Wildlife Refuge (NWR) program, including information about the cooperative program between the U. S. Fish and Wildlife Service and the Missouri Department of Conservation. Rolf thoroughly described the mechanics of the transfer effort from the Lacreek perspective. Our purpose this afternoon is to provide you with an overview of the Missouri Trumpeter Swan restoration program, our study objectives and strategies, and a status report on our restoration efforts to date.

As most of you already know, during the course of this project we have experienced a substantial amount of mortality due to predation on the study area. Nevertheless, we remain enthusiastic about our participation in this program and its potential for a significant long-term contribution to the well-being of the species.

HISTORICAL PERSPECTIVE

Hundreds of Trumpeter Swans historically migrated through Missouri (McKinley 1962), and the species is believed to have nested in the State (Widmann 1907; Bent 1925). Trumpeter Swans gradually receded before the advance of civilization and agriculture, and no free-flying Trumpeters had been documented in Missouri since 1907 until 7 December 1978, when three were killed from a family of six at Thomas Hill Reservoir in north central Missouri. The adult female from that family had been banded as a local cygnet on Lacreek NWR in 1974. The occurrence of these birds in Missouri indicated a potential for establishing a migration between Lacreek and Missouri. Trumpeter Swans were later reported wintering at Mingo NWR (1981-1982), although the origin of those birds is unknown.

EXPERIMENTAL RESTORATION PROGRAM

Trumpeter Swan reintroductions have been conducted in numerous areas for the purpose of extending the breeding range (Banko 1960), but this and an Alberta program represent the first attempts to extend the wintering range of the species. The reestablishment of a migratory tradition in Trumpeter populations that are presently sedentary, particularly to predetermined wintering areas, is perhaps the most difficult task to accomplish if the restoration of Trumpeter Swan to the historic wintering range is to be achieved. Obviously, much remains to be learned about migratory behavior in Trumpeter Swans.

Reintroduction programs assume, if not outwardly, then by implication, that animal access to unoccupied habitat is limited. For Trumpeter Swans in Missouri, the few sightings of wintering birds since 1978 suggest that Trumpeters do occasionally reach extralimital areas, but these migrations have not resulted in the reestablishment of wintering populations. It is hoped that migratory behavior can be rekindled or learned and exploited through reintroduction programs.

The objectives of the Missouri experimental Trumpeter Swan restoration program, and the strategies for their accomplishment, are as follows (Smith and Wilson 1983):

Objective 1: Determine the efficacy of Trumpeter Swan reintroductions as a technique for reestablishing migratory behavior and effecting recolonization of historical wintering range.

Strategies: A. Transfer and release one or more family groups and/or a number of subadults/nonbreeders per year for at least 3 years.

1. Maintain family unit integrity.
2. Remove clipped remiges of adults.
3. Attach radio transmitter units to selected individuals.

B. Program evaluation.

1. Degree of migratory behavior exhibited by reintroduced Trumpeter Swans.
2. Extent of establishment as winter residents in Missouri.
3. Impact of Missouri's program on the general well-being of the species.

Objective 2: Document movements and habitat use of Trumpeter Swans released in Missouri.

Strategies: A. Monitor post-release movements, dispersal, and habitat use within the release area.

1. Visual observation.
2. Analysis of telemetry data.

B. Monitor movements to and from release areas through systematic observations, telemetry, and by encouraging reports of banded or collared birds.

Objective 3: Determine the food habits of Trumpeter Swans released in Missouri.

Strategies:
A. Direct observation of feeding swans.
B. Collection of time budget data.
C. Collection and identification of apparent food materials from areas in which swans are observed feeding.
D. Microscopic analysis of droppings.

Objective 4: Promote Trumpeter Swan well-being in Missouri.

Strategies:
A. Protect and elicit reports of migrating or wintering Trumpeter Swans through public relations and information programs.
B. Determine causes of mortality.
C. Establish management priorities.

SWAN SOURCE

Program emphasis has been placed on acquiring Trumpeter Swans from the Lacreek NWR in support of the Management Plan for Lacreek Trumpeter Swans (USFWS 1982). Objective C of the Lacreek Plan provides for at least 300 Trumpeter Swans that migrate and winter south of Lacreek NWR. It is hoped that part of this objective can be met by encouraging birds from the Lacreek flock to winter in Missouri.

STUDY AREA

The area chosen as the release site for the experimental restoration program was the Mingo NWR in southeast Missouri. Encompassing an area of approximately 21,600 acres, Mingo NWR offers an abundant natural winter food supply and remains ice-free through most of the winter.

RESULTS AND DISCUSSION

Twelve birds comprising three family groups have been transferred and released to date (Table 1). Analysis of movement and telemetry data is not yet complete, and no attempt will be made to present that data here. However, some comments regarding post-release habitat use and survival are appropriate. In each of the 2 years that transfers have been accomplished, the family groups made extensive use of drainage ditch habitat within the Mingo NWR wetland complex. These tree-lined ditches contain an abundant supply of Spirodela oligorhiza and other duckweeds (Lemna spp.), which were utilized as a food source by cygnets and adults. Heavy use of duckweed may be explained in part by its extremely high protein content. Van Dyke and Sutton (1977) found duckweed in Louisiana to contain approximately 35 percent crude protein on a dry matter basis. So, it would seem that the birds know what they are doing. The food habits investigation continues.

The family of five swans released in September 1982 remained together until late December, at which time the family group split up and the cygnets dispersed. Two cygnets from this family were killed by predators (one in early December 1982 and the other in August 1983), and the third cygnet left the study area and disappeared in early January 1983, its fate unknown. Two additional family groups (seven birds) were released in September 1983. Five of those birds (three adults/two cygnets) have been killed by predators, while the third cygnet is missing and presumed dead. The primary predator suspected in these losses is the raccoon, although a Great Horned Owl and a bobcat were suspected in two cases. The surviving adult female from the 1983 release and the adult pair from the 1982 release are doing well at Mingo NWR. These birds have not migrated, and the pair has not attempted to nest.

Table 1. Summary of Trumpeter Swan Releases, Missouri restoration program.

	Family groups	No. adults	No. cygnets	Total
1982	1	2	3	5
1983	2	4	3	7
Total		6	6	12

CONCLUSION

Experimental reintroduction of the Trumpeter Swan offers an opportunity to evaluate the potential for reestablishing winter populations within the Mississippi Flyway through translocation of Trumpeters from northern breeding areas to potential wintering areas within the historical winter range of the species. The advantages of such an assessment prior to an extensive restoration effort are apparent in terms of determining approaches needed, total effectiveness, costs, and the ultimate success to be expected. While some losses were anticipated prior to undertaking the experimental reintroduction, the loss to predation of so many birds from our relatively small number of transplanted individuals is indeed unfortunate. However, we remain committed to the premise that the potential for reestablishing migratory behavior and effecting recolonization of historical wintering range through Trumpeter Swan reintroductions deserves careful evaluation. Although logistical problems prevented the scheduled transfer and release of a group of subadults in 1984, we hope that the program can resume in 1985 with a larger number of birds.

ACKNOWLEDGEMENTS

We are extremely grateful to Rolf Kraft and the staff of Lacreek NWR for their continued cooperation and demonstrated interest in this experimental program. We recognize the magnitude of the logistical considerations involved and appreciate the enthusiasm with which they have addressed numerous difficult tasks. We would also like to thank Gerald Clawson and the staff of Mingo NWR, whose support and commitment during all phases of this program has made the task immeasurably easier. This program is financed in part with Federal Aid in Wildlife Restoration Act Funds under Missouri's Pittman-Robertson Project (W-13-R).

LITERATURE CITED

Banko, W. E. 1960. The Trumpeter Swan, its history, habits, and population in the United States. USFWS, N. Am. Fauna No. 63. 214pp.

Bent, A. C. 1925. Life histories of North American wild fowl. Part 2. New York, Dover Publications, 314pp.

McKinley, D. 1962. The Trumpeter Swan in Missouri. The Bluebird 29:2-7.

Smith, J. W. and J. D. Wilson. 1983. Management-research recovery plan for the Trumpeter Swan in Missouri. Phase I: Experimental Restoration Program. Missouri Dept. of Conservation, Columbia. 9pp.

U. S. Fish and Wildlife Service. 1982. Management plan for Lacreek Trumpeter Swans. UFSWS, Lacreek NWR, South Dakota.

Van Dyke, J. M. and D. L. Sutton. 1977. Digestion of duckweed (Lemna sp.) by the grass carp (Ctenopharyngodon idella). J. Fish Bio. 11:273-278.

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Other Swans, Swan Research, and Swan Thoughts

WESTERN MUTE SWAN POPULATION STATUS AND AGENCY ATTITUDES

Barry Reiswig, Refuge Manager
Red Rock Lakes NWR
Monida Star Rt., Box 15
Lima, Montana 59739

So far as is known, Mute Swans were introduced into the Tristate Region in 1964 when a pair was purchased by a landowner living in the Paradise Valley south of Livingston, Montana. Nearly all of the Mute Swans flying free in the Tristate Region today originated from this site, although several other pairs of Mute Swans have been introduced into the Region by other individuals.

Generally, pairs are brought into the Region as "pets." In nearly all cases, to date, the young are allowed to fly free, and in some cases the adults as well are allowed to fly free. These circumstances are causing the greatest concern among wildlife professionals today.

There is the potential that offspring from these private flocks of Mute Swans may become established in the Tristate Region and will compete for living and breeding space with the struggling Tristate Trumpeter Swan flock.

CURRENT STATUS ON A STATE-BY-STATE BASIS

Montana

Since 1964, Mute Swans have been sighted in such diverse locations as Belgrade, Three Forks, Canyon Ferry Reservoir near Helena, Ennis Lake in the Madison Valley, and at the Red Rock Lakes National Wildlife Refuge in the Centennial Valley. Statewide, the current population is estimated to be 40-50 birds, primarily centered in the Paradise Valley south of Livingston. This estimate does not include birds held in captivity by aviculturists.

Idaho

One pair is known to exist in the St. Anthony area.

Wyoming

None.

Utah

A pair is observed occasionally on Bear Lake in northern Utah.

LEGAL STATUS

After checking with the Division of Law Enforcement, U. S. Fish and Wildlife Service (USFWS) and the law enforcement chiefs of Montana, Wyoming, and Idaho, it appears that the legal status of the Mute Swan on both the Federal and state level is somewhat unclear. This is apparently because there has been very little research done, to date, on Mute Swans.

Based on available information, it appears the Mute Swan is not listed under the terms of the Migratory Bird Treaty Act. However, recent treaty amendments with Japan and the Soviet Union include language which may give the USFWS some authority to regulate the species.

The Mute Swan is considered a non-protected species in Wyoming at the present time. In Idaho, Mute Swans receive no legal protection if they originate from a non-wild source such as a flock of breeding birds owned by an individual. The Mute Swan is apparently protected in Montana. However, Montana does exercise control over the release of Mute Swans to the wild under their game farm regulations.

The current Mute Swan situation may have some positive spin-off value to Trumpeters. Ontario is currently placing Trumpeter Swan eggs in Mute Swan nests in that province as a method of establishing Trumpeter Swans. If that effort is successful, it would serve as a model for similar work in the Tristate Region.

* * *

THE TRUMPETER SWAN/MUTE SWAN EXPERIMENT: ONTARIO

H. G. Lumsden
Wildlife Research Section
Ontario Ministry of Natural Resources
Box 50
Maple, Ontario L0J 1E0

1984 PROGRESS REPORT

Ten Trumpeter eggs were picked up by helicopter from isolated nests at Grande Prairie, Alberta, between 31 May and 1 June 1984 by Len Shandruk (Canadian Wildlife Service). The eggs were shipped to Kortright Park, Guleph, Ontario, where they were placed in a hatcher.

Ontario Mute Swan breeding cycles were synchronized with those of the Grande Prairie Trumpeters by removing first clutches and making the birds lay again. In 1983, incubation was at the 23rd- and 25th-day mark when the eggs were placed under the foster parents. In 1984, the Mute Swans began laying their first clutches on 11 April, 11 days later than in the early spring of 1983, and second clutches were correspondingly later. When given Alberta Trumpeter eggs in 1984, the Mute foster parents had been incubating their second clutches for 9 to 13 days. This shorter period did not seem to affect the foster parent behaviour and all accepted the cygnets and cared for them normally.

In 1983, bonds between Trumpeter cygnets and their Mute Swan foster parents were loose. We thought this was probably because the eggs were not placed in the Mute Swan nests until after clicking or calling had started. They, therefore, had not benefited from the full period of pre-hatch conditioning under their foster parents which may be necessary for tight bonding.

In 1984, however, all the Alberta eggs except one were transferred from the incubator to Mute Swan nests before clicking began, and we observed much stronger family bonds. Of the 10 eggs received, two did not hatch. When opened, it was evident that the embryo had been incubated for about 13 days when collected. Five eggs hatched on 9-10 June and three hatched on 14 June.

Ontario has fostered Trumpeter cygnets using five pairs of Mute Swans. The males of four of these pairs pecked at the cygnets after they left the nest. In two cases, the aggression was not extreme; it waned, and the males accepted the cygnets. In a third case, however, the male was caught in 1982 and sent to the Metro Toronto Zoo. In the last case, the male's attacks were serious, and, without intervention, would probably have killed the cygnets. As it was, the young were only loosely bonded to the pen. This may have contributed to their vulnerability to attacks by the male.

On 21 June 1984, two Trumpeter eggs were placed with a Mute Swan pair consisting of a Polish male and a Royal female. The female had been incubating for about 17 days when given the Trumpeter eggs in 1984. The eggs hatched on 22 June, and the cygnets left the nest about midday on 23 June. These cygnets appeared to be poorly bonded to their foster mother, probably because they had been exposed to less than 24 hours of conditioning to her prior to hatching.

On 2 successive days, the Trumpeter cygnets were attacked by their foster Mute father which seized, shook, and dropped them. Each finally followed other pairs of Mutes with Trumpeter cygnets and were last seen 2 and 3 days after hatch, respectively. Attacks by male and even female Mute Swans on their own white (Polish colour phase) cygnets have been reported in the literature by five authors. This pair had hatched eight of their own cygnets in 1983, two of which were of the white (Polish) colour phase. Four of these cygnets, including the two white ones, disappeared sometime within 24 hours of leaving the nest. We do not know the cause. The pair was successful in raising two cygnets in this brood. Trumpeter cygnets are pale grey dorsally fading to white on the belly. (The pure white (leucistic) colour phase is rare.) Their colour is closer to that of the white phase (Polish) Mute cygnet than they are to the brown-grey (Royal) colour phase.

Norman experimented with white and brown model swans and found that territorial adults directed more threats and attacks toward white than brown models (Norman 1977). It may be possible to overcome this fostering problem of attacks on Trumpeter cygnets by dying the cygnets after they hatch and before they leave the nest.

The productivity of Cranberry Marsh, where these swans were raised, was much lower in 1984 than 1983. Only about half the number of duck broods were seen. There were no nesting Black Terns, whereas in 1983, 15 pairs nested. No Pied-billed Grebes nested in 1984. Pondweed flowers were conspicuous in 1983, but there was little or no blossom on the beds in 1984. Consequently, the pattern of swan foraging changed in 1984. Instead of feeding largely on pondweeds, as in 1983, they moved in close to shore and fed more on duckweed, filamentous algae, and arrowhead.

It is possible that this change in feeding location within the Marsh may have resulted in the loss of cygnets to turtles. Turtles do not lie among the pondweeds in the open part of the Marsh, but remain near the shore among the logs and alders, close to the floating mats of vegetation.

In summary, cygnet losses in 1984 were much higher than in 1983. Of the eight which hatched:

1 was squashed by the Mute female on the nest on day 1,
1 was found dead in the water beside the nest on day 1,
2 disappeared on day 18; they seemed to have been healthy and may have been taken by turtles,
2 were killed by turtles, one on day 5, and one on day 16, and
2 were alive and thriving on day 65 and day 69.

SURVIVAL OF 1982 AND 1983 TRUMPETERS

Two Trumpeter cygnets were raised by Ontario Mutes in 1982. They survived their first winter in good condition. The female was at Cranberry Marsh in May and was last seen on 19 June 1983 on Lake Ontario, adjacent to Cranberry Marsh. If still alive, we do not know where she spent the winter of 1983-1984. The male spent the winter of 1984 on the Toronto waterfront in the company of another released Trumpeter and two Tundra Swans. He was last seen in late March 1984 near the Humber Bay on the Toronto waterfront.

The two cygnets raised at Cranberry Marsh in 1983 were not seen in Ontario after 28 August. They migrated to Maryland, on the east side of Chesapeake Bay, arriving about mid-December. They visited John Harrington's property daily and eventually left on 5 April 1984. On 7 April, two swans arrived at Frenchman's Bay near Cranberry Marsh. As they planed in to land, one started to trumpet. However, since the patagial tags were not seen, we cannot be sure that they were the pair from Cranberry Marsh and Chesapeake Bay. On 30 April, the female flew into Cranberry Marsh. She was seen several times in the vicinity and, on 29 May, was retrapped at Whitby Harbour and fitted with larger patagial tags. She was last seen on 13 June 1984, east of Cranberry Marsh at Darlington Provincial Park.

The male subsequently appeared in late April on a farm at Burgessville, Ontario, about 170km west-southwest of Cranberry Marsh. It arrived with another swan of the same size. After a time, it went lame and died on 24 May. The second swan, which may have been the 1982 male which wintered on the Humber Bay, flew away on 22 May.

ACKNOWLEDGEMENTS

The Ontario Ministry of Natural Resources would like to thank Len Shandruk who collected and shipped the Trumpeter Swan eggs. We would also like to thank the World Wildlife Fund and an anonymous donor who generously paid for helicopter time to make this possible. Rick Ortlieb (Kortright Waterfowl Park) incubated the eggs upon arrival. David McLachlin, Regina Rieckenberg, and Maryann Houston spent long hours in the field, both day and night, working on the swan program. Above all, we thank Ken Kalenak for his gift of two Trumpeter Swan eggs.

LITERATURE CITED

Norman, Douglas O. 1977. A role for plumage color in Mute Swan (Cygnus olor) parent-offspring interactions. Behaviour 62(3-4):314-321.

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NESTING BEHAVIOR OF MALE AND FEMALE TUNDRA SWANS

Lori L. Hawkins
Department of Fisheries & Wildlife
University of Minnesota
St. Paul, Minnesota 55108

ABSTRACT

The nature and adaptive value of male and female participation during nesting among Tundra Swans (Cygnus columbianus) was studied by observing and photographing six wild pairs and one captive pair. Mean female incubation constancies were 60.4, 62.0, 74.7, 79.1, and 79.2 percent in the wild and 83.0 percent in captivity. Wild males consistently sat on the clutch during female absences and combined constancy for all wild pairs averaged 98.5 percent. The captive male sat on the clutch erratically and averaged only 2.5 percent each day. Consequently, incubation and hatching required only about 32 days in the wild but 38 days in captivity. During the captive female's recesses, a heat-sensitive dummy egg set in the clutch cooled an average of 2.5 times less for periods of equal length when the

male sat than if he did not. Foraging dominated recesses of a wild female and her daily foraging time rose as incubation progressed. Although male Tundra Swans are incapable of true incubation, their nest attendance: 1) retards egg cooling during female absences, 2) reduces nesting stress on females by allowing them to spend significant time feeding during incubation, and, 3) ensures almost continuous predator protection for the clutch.

* * *

ENERGETICS OF GROWTH OF TRUMPETER SWAN AND MUTE SWAN CYGNETS

Clayton R. Jobes
Department of Fisheries and Wildlife
University of Minnesota
St. Paul, Minnesota 55108

ABSTRACT

Typical growth model data consists of weight at time 't,' food consumed at time 't,' or serial carcass analysis. A three-dimensional model consisting of the ordered triplet (t,F,W), where t=age, F=food consumed at time 't,' and W=weight at time 't,' is presented for Trumpeter Swan and Mute Swan cygnets. Since the model describes how an individual gains weight as it feeds over time, the model allows for predictions of weight gain on different feeding regimes. Specifically, it predicts threshold energy intake to support growth at a given age and weight. Results from the model will be used in a larger time-energy budget for growing cygnets. Field work in 1985 will include determining metabolisable energy (ME) of natural foods and food intake rates by age of bird, size of food item, and type of food.

* * *

MANAGING TO HAVE WILD TRUMPETER SWANS ON A CONTINENT EXPLODING WITH PEOPLE

James G. King
Wildlife Biologist
1700 Branta Road
Juneau, Alaska 99801

The Trumpeter Swan (Cygnus buccinator), largest flying creature in the world and one of our most lordly and graceful forms of wildlife, continues to fight for a place to live on a continent dominated by man. Outnumbered 25,000-to-1 by the people of North America, it remains one of our rarest bird species inspite of 50 years of conservation effort. People continue to increase at an alarming rate and a continental population of a billion in the next 100 hundred years is not impossible. That is not a prediction, but it is a possibility we must consider. If we cannot make a place for the largest and showiest of our birds ,can we succeed with any waterfowl that are in difficulty? If we settle for a remnant population of Trumpeters confined to marginal habitat, could that set a pattern or precedent for future conservationists dealing with ever more difficult problems? The Government target of holding Trumpeter populations at their current level seems far too conservative. It is time now to reexamine our goals and our conservation methods to see if in fact there is a chance that we can help the Trumpeter recover its former abundance and survive in wild, free-flying families and flocks.

CURRENT STATUS

Trumpeter Swans were once distributed across the Continent from the Atlantic to the Pacific. They were well known to early explorers. Trumpeters have no fear of other creatures when airborne and tend to fly over and scrutinize all forms of disturbance on the ground, including armed men. The trappers of the north and homesteaders of the plains, living as they did off the resources of the land, exterminated the Trumpeters from the rich heartland of the United States and Canada. By 1933, only 66 Trumpeters could be located in the U. S., a nonmigratory population in high mountain valleys, near Yellowstone National Park, isolated from the rich marshes of the Great Plains and Canadian prairies which once was their optimum habitat. Another remnant was known to occur in Alberta, Canada. Though we now find records of Trumpeters in Alaska from that time, they were unknown to conservationists of the 30's. Fear for the extinction of the Trumpeter led to a substantial conservation effort based on law enforcement, public education, and land acquisition (Banko 1960).

The Trumpeter is no longer considered in danger of extinction. A 1983 winter survey in the Rockies tallied 1232 birds. That includes the locally nesting swans as well as the wintering population from Alberta's Peace River (McEneaney 1983). Several introduced nesting flocks at refuges and reserves may aggregate another 500 swans. An exhaustive 1980 census of the Alaska nesting grounds disclosed 7696 Trumpeters, up considerably from earlier counts (King and Conant 1981).

There is some cause for cheer, but it is worth scrutinizing where we really are with Trumpeter Swan restoration after 50 years of conservation efforts. The current number of Trumpeters (about 10,000) may not exceed 5 percent of the prehistoric population. The wild population is still largely confined to the fringes of their former range and, except for under 500 restocked birds, are excluded from the the great American "breadbasket" of the Midwest and western plains, which may have been their optimum habitat. There has been some success in increasing the number of swans in the high Rockies, but that population does not migrate and appears to be limited by winter range. Efforts to disperse these swans to more optimum winter habitat have been unsuccessful. There seems to be some sort of biological block that prevents swans from exploring for wintering places.

Some 80 percent of the current population nests in Alaska and winters in fresh water near or along the Pacific Coast from Cook Inlet to the Columbia River, mostly in British Columbia. The Alaska birds have been increasing quickly in recent years because of protection from hunters and perhaps as a result of moderating climatic conditions, allowing them to nest at higher elevations and latitudes than was possible a few decades ago.

Much of the Alaska nesting habitat is in productive lowlands that are attracting increasing numbers of airborne recreationists, would-be farmers, oil prospectors, miners, wood cutters, and settlers. Swans have already been crowded out of some larger lakes near Anchorage that were productive in the past (Timm and Wojeck 1978). Problems are also developing on wintering grounds such as recent agricultural conflicts in British Columbia and suburban conflicts in Washington State. It is not guaranteed that the Alaska Trumpeters can continue to thrive in the face of burgeoning human activity. The settling of Alaska may be as unsettling to swans as was the settling of the plains.

While Trumpeters continue to have difficulty expanding back into their former range, Mute Swans (Cygnus olor) from Eurasian stock are gaining a foothold in several places. Is the Mute destined to usurp the place of the Trumpeter over much of our country?

It is clear that we do not now have control of the Trumpeter Swan situation to the extent that we can "manage" increases and decreases at will. Can we really find any joy in the fact that after 50 years of intensive conservation efforts Trumpeters are still confined to less than 10 percent of their pre-settlement range and are still the rarest of the world's swans? It is time to review all the possibilities for the future and perhaps chart a new course.

TRUMPETER SWAN LIFE CYCLE

There are a lot of things we do not know about swan behavior but, it is clear that they have a very strong social tradition within which they must live and which cannot be violated by our attempts at management. The general parameters of their life cycle are similar for all northern swans. The larger forms, Trumpeters and Mutes, do seem less inclined to long, direct migrations perhaps because it takes longer for their young to develop full flight strength in the fall.

Adult swan pairs return in the spring to a nesting territory from which all other swans are excluded. The territory usually comprises an entire lake, but rarely two or more pairs occupy a very large water body. Though not an Arctic species, they do use far north and high altitude sites where the nesting and rearing season may be restricted by late thaw and early freeze up. Nest building often begins with the first thawing weather, before there is any substantial open water. This suggests that they return to a site that was evaluated and claimed in a previous year. The family remains a very tight unit and usually, but not always, stays on the nesting lake until the young fly. Once the young are fledged, the family is apt to join a bachelor flock at a nearby premigration feeding area, or if it is nearby, the wintering site. Young swans normally accompany their parents to a traditional winter home. Once settled for the winter, swans do not normally move even in the face of overcrowding or deteriorating conditions which may cause starvation. Probably by the time a winter emergency becomes evident, swans no longer have the fat resources to try a migration. Young swans follow their parents back to the nesting region, but are then excluded from the parental nesting territory. In their first spring, they are forced to search for a summer resort of their own. They probably decoy to the nearest bachelor flock where they find a number of youngsters as well as adult birds that are not nesting for whatever reason. In subsequent years, they pair as adolescents and leave the flock on a major exploration for a future nesting territory. The search may take more than one year. Eventually an unoccupied, acceptable nesting place is found and defended against other swans until fall. Proprietary rights acquired this way seem to sustain through the winter. In the next season, the pair can go directly to their territory and nest without conflict.

POSSIBLE CONSERVATION STRATEGIES

Here are a number of strategies that have been used, are being considered, or should be considered by those with an interest in the success of Trumpeters.

1. Do nothing. This is the course that resulted in the near extermination of Trumpeters in the past. No action now could result in Mute Swans filling the largely vacant Trumpeter niche.

2. Provide protection from hunting. We do this fairly well now and will probably continue to do so. There will eventually be debate on whether to allow some hunting of the expanding population.

3. Provide protection from disturbance. We have provided some protection on existing parks and refuges, through acquisition of refuges (Red Rock Lakes National Wildlife Refuge), and through public education. Many more opportunities exist.

4. Educate the public. A public appeal was a major factor in protection of the swans that winter in the Rocky Mountains near Yellowstone and Red Rock Lakes National Wildlife Refuge. An important aid to any education program would be viewing points or observatories properly screened so that school classes or noisy groups could approach feeding flocks without impacting the birds. The British do a much better job of this sort of thing than do the Americans.

5. Establish new breeding populations. The problem with establishing new breeding populations in high quality northern nesting habitat is that it has not been possible to get these birds to search out a suitable winter resort. Success of the expanding Rocky Mountain Population and new Midwest populations has depended on winter feeding and sometimes provisions to keep water open throughout the winter.

6. Winter feeding. Winter feeding has been done in British Columbia, Montana, the Dakotas, and perhaps elsewhere to help wild and transplanted birds through the northern winter. These areas are remote places far from human population centers. Wildlife managers are in general agreement that efforts should be made to get birds to migrate to where they can survive on natural food. Feeding is causing birds to overwinter in some extremely cold places from which they would normally benefit by leaving in winter. Feeding tends to concentrate birds, possibly increasing their vulnerability to disease, predation, and accidents. Feeding is expensive. On the other hand, feeding programs in Japan and England seem to have benefited wintering Whooper (Cygnus cygnus) and Bewick Swans (Cygnus bewickii) which are wintering near cities. Masses of feeding swans are sometimes lured near heated observatories where flood lights allow night viewing, a grand and exciting show. Feeding programs in America near large urban centers might have positive effects for conservation. Who fought for protection of killer whales (Grampus sp.) before they began to perform for the general public in commercial parks?

7. Establish new wintering areas. This has not really been tried although there has been some interest expressed. It may offer the best and most natural way to extend the range of the Trumpeter. Though swans are reluctant to search for new winter quarters, perhaps no such stigma is attached to the search for nesting sites. Several strategies might be tried for establishing wintering flocks: a) Juveniles could be taken just prior to fledging and established at a good wintering site where some protection could be provided. The presence of older pinioned swans would make the youngsters more comfortable and probably more successful. These birds should pair and search for nesting sites eventually but continue to home to the wintering site where they had learned to fly. b) Subadult birds taken from bachelor flocks during the flightless period in July and released a long distance away at a place suitable for a wintering area might establish there. And, c) swans do not migrate in winter probably because they lack the necessary fat reserve. Whole families gathered up in midwinter at a place like Red Rock Lakes NWR could be moved to a suitable site farther south and be expected to stay there until spring. These older birds would then have the option of leading their young on an exhaustive search for the old nesting sites, remaining for one or more seasons at the new wintering site or pioneering new nesting sites. Establishment of wintering flocks, especially along north-south river corridors such as the Mississippi could result in renewed migratory traditions.

8. Develop new refuges and better habitats. There may be an opportunity to develop artificial ponds with or without suitable nesting islands and upland plantings on the Great Plains. Swans readily take to field feeding on grasses or grains, although since their exclusion from the American "breadbasket," they have had little opportunity for grazing. Grassland refuges could benefit swans and possibly lure them away from private grasslands where they are unwelcome, as in British Columbia.

9. Captive flocks and propagation programs. Trumpeters nest and rear their young readily in captivity. There are possibilities for producing stock for reintroduction into the wild and at the same time developing high visibility flocks for public education and enjoyment. Perhaps captive-reared Trumpeters would be large and aggressive enough to displace the semi-domestic, foreign Mute Swans in the places where they are becoming established in the wild.

If additional restocking is to occur, there is a question of where to obtain eggs or young. A study by Vyse and Barrett (1978) to determine if there were separate Pacific and Eastern subspecies was inconclusive. If they are the same, there should be no problem in moving healthy Alaskan stock to the Midwest. It now appears that the nesting ranges of the two natural populations are merging in the Yukon and that there may already, or soon will be natural exchange which should end the concern about mixing stock. If substantial numbers of birds are taken from Alaskan nesting territories, it should be done in a scientifically planned way so that the effect on nesting territories can be documented.

DECIDING HOW MANY TRUMPETERS ARE "ENOUGH"

Public interest in Trumpeters is mounting both in the United States and Canada. There seem to be lots of opportunities to produce more Trumpeters which then leads to the question, "How many do we want?" There are those who feel that as long as we succeed in keeping them off the Endangered Species List all is well and no more expense for Trumpeters is warranted. We are about there now. On the other end of the spectrum are those who think we should restore them to every part of their former range with populations of several hundred thousand birds that can withstand some annual hunting. There is a very strong argument for making Trumpeters a more visible part of our avifauna so that more people can see and enjoy the product of the public conservation effort. There is a need for more spectacular winter concentrations such as at Barney Lake near Seattle.

GOALS AND OBJECTIVES

The Reagan Administration, through the U. S. Fish and Wildlife Service, is developing a management plan for Trumpeter Swans. Noble as this effort is, the Government seems to have the very conservative goal of holding Trumpeter numbers about where they are now. Though wildlife managers talk of quotas and goals, they still have not demonstrated that they have any substantial control over how wild swan populations increase or decline. A much larger population might be easier to manage. Here are suggested goals and objectives that would seem to offer optimum safety for Trumpeters and benefits for man.

GOAL:

The major goal is restoration of Trumpeter Swans in viable numbers throughout their former range, for maximum benefits to man and for their own intrinsic value.

OBJECTIVES:
Rangewide

A. To manage Trumpeter Swans so that the species never again becomes either threatened or endangered.

B. To encourage the restoration of representative wild, nesting, or wintering Trumpeter flocks near population centers throughout their historic range for the benefit of a maximum number of people.

C. To establish wintering Trumpeters in areas where Mute Swans now occupy traditional Trumpeter habitat.

D. To encourage the use of natural food sources by the swans and to discourage their dependence on artificial feeding in remote northern wintering areas.

E. To develop interpretive and educational materials to help people better understand the values of having swans as part of our native fauna and the needs of the swans.

F. To develop interpretive, educational, and observatory facilities at refuges and parks where swans can be seen under semi-natural conditions.

G. To do a status report on Trumpeter Swans for each state and province to include: 1) an historical review of museum and literature records, 2) an inventory of possible wintering habitat, 3) an inventory of possible nesting habitat, and, 4) a review of the potential for restoration. This report would be the basis for local management plans and restoration projects.

H. To establish a Trumpeter Swan research laboratory with field stations as appropriate.

I. To use proper scientific design and proper scientific reporting for any manipulation or transplanting of Trumpeters. Existing populations from which swans are removed should be as carefully monitored as the transplant. Scientific reporting of unsuccessful projects should not be neglected.

J. To establish an international scientific review committee to evaluate every project dealing with Trumpeter population manipulations.

PACIFIC COAST POPULATION (PCP)

K. To encourage the Population to reach a minimum of 50,000 birds and not allow it to decline below that figure.

L. To complete and implement the management plan for Alaska that will ensure that Trumpeters remain a viable part of the wildlife of each major valley where they now nest, no matter how high the human population goes.

M. To continue to census the Alaska summer population at least once every 5 years and keep computerized records on all nesting territories.

N. To review the potential for additional areas in the northwest, near human centers, that could be acquired and/or developed for wintering swans.

ROCKY MOUNTAIN POPULATION (RMP)

O. To develop and maintain RMP of at least 10,000 birds.

P. To maintain the Tristate nesting subpopulation at or above the 1983 level (1000 + or -).

Q. To develop new wintering areas in the southern Rockies and encourage migration to them from the Tristate Region so that the number wintering in northern areas declines and the need for artificial feeding is eliminated.

R. To encourage southern wintering birds to pioneer new nesting areas in the Rocky Mountain valleys.

S. To develop new wintering traditions for the Peace River subpopulation in either the southern Rockies or the Pacific Coast.

INTERIOR POPULATION (IP)

T. To reach and maintain a population of at least 100,000 wild Trumpeters east of the Rockies.

U. To develop a number of southern wintering Trumpeter flocks with young birds that are not imprinted to another wintering site, and let them search out nesting places on their own.

V. To establish and maintain additional high visibility flocks near the big cities.

ATLANTIC COAST POPULATION (ACP)

W. Why not?

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The Trumpeter issue is perhaps a moral issue as much as anything. Is man really civilized or is he just another animal destined to use up everything he values and then expire himself? Medical doctors protect human life for its inherent value and do not establish population limits. Conservationists, fallible as we are, should not be presumptuous enough to establish an arbitrary limit on Trumpeter numbers. Better we should make what effort we can to help the swans return to their natural population level. The opportunities are there. If we dedicate ourselves to the tasks, we can again have abundant wild Trumpeters.

LITERATURE CITED

Banko, W. E. 1960. The Trumpeter Swan. N. Am. Fauna #63. USFWS, Wash. D. C. 214 pp.

King J. G. and B. Conant. 1981. The 1980 census of Trumpeter Swans on Alaskan nesting habitats. Am. Birds 35(5):789-793.

McEneaney, T. 1983. 1983 Midwinter Trumpeter Swan Survey. USFWS Red Rock Lakes NWR, Lima, Mont. 6pp.

Timm, D. and L. Wojeck. 1978. Trumpeter Swans. Fish Tails and Game Trails. Alaska Dept. Fish & Game. Juneau, AK. Nov. 4-6.

Vyse, E. and V. Barrett. 1981. Genetic comparison of Cygnus c. buccinator populations. Proc. 2nd. Int. Swan Symp., Int. Waterfowl Res. Bur., Slimbridge, England. pp. 350-356.

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The Trumpeter Swan Society's Red Rock Lakes Committee Report and Resolution

DECLINING PRODUCTIVITY OF TRUMPETER SWANS AT
RED ROCK LAKES NATIONAL WILDLIFE REFUGE, LIMA, MONTANA

Presented by the Red Rock Lakes Committee
of The Trumpeter Swan Society
Charles A. Hughlett, Chairman
Frank C. Bellrose
Harold H. Burgess
Arthur S. Hawkins
John A. Kadlec

INTRODUCTION

Persons who have worked with Trumpeter Swans in the vicinity of the Red Rock Lakes National Wildlife Refuge (RRLNWR) often use terminology to describe the various flocks that is confusing to outsiders. We will define the flocks as follows:

1. The Centennial Valley flock consists of swans that nest or summer on the Red Rock Lakes Refuge or on private or public lands in the Valley. Subadults and unsuccessful breeders usually move about 15 miles west to the Lima Reservoir to molt. Successful breeding pairs usually molt on the Refuge. The Centennial flock usually numbers between 325-350 birds but dropped to 250 in 1983.

   It is suspected that the successful pairs, with their progeny, make up the majority of the birds that winter on Red Rock Lakes Refuge. It is also believed that many of the subadults move south during the winter to the Henry's Fork of the Snake River.

2. The Tristate summer subpopulation of swans consists of the swans which summer in the Centennial Valley plus those that nest or summer in nearby Yellowstone and Grand Teton National Parks, the National Elk Refuge, the Targhee National Forest, or any other areas where the Montana, Wyoming, and Idaho boundaries join.

3. The United States swans are joined in the winter by birds from the Interior Canada Subpopulation. The total is known as the Rocky Mountain Population. Most birds winter along the Henry's Fork of the Snake River in Idaho; at Red Rock Lakes Refuge; in Yellowstone NP; or on the Snake River nearby. This winter population has exceeded 1,200 birds since 1981. In the most recent survey, in 1984, 1,460 Trumpeters were counted, including 332 cygnets or 23 percent of the total. Obviously, most of the cygnets were raised outside of the Tristate Area.

Trumpeter Swans of the Tristate Subpopulation are long-lived birds which have demonstrated remarkable hardiness under some of the most severe wintering conditions faced by any waterfowl population on the North American continent. From the brink of extinction in the 1930's, this rugged group of birds increased several fold as a result of a program combining protection and management. Successful transplants were made from this population to other areas, thereby assuring perpetuation of the population in case of a local catastrophe.

In compliance with laws of nature, this population increased rapidly until carrying capacity was apparently reached by the late 1950's, when it leveled off. This was anticipated. What was not anticipated was the recent decline that has taken place in the Tristate population, particularly in the Centennial Valley and at Yellowstone Park where the major part of the population nests.

Records show that during the past five nesting seasons (1980-1984), the Trumpeter Swan flock of the Centennial Valley has declined to the lowest point in the past 25 years, down nearly 20 percent since 1979. Although the 1984 surveys have not been completed, preliminary information indicates the third consecutive low production year at RRLNWR, the principal production area of the Centennial Valley. Total cygnets fledged on the Refuge during the past 5-year period will be fewer than 100.

The Tristate Subpopulation cannot be sustained unless the rate of reproduction is increased substantially.

Part of the recent low rate of success is explainable. In 1983, as many as a third of the nests were lost through flooding. Also, 12 eggs were taken from ongoing nests to meet the requirements of approved Trumpeter cygnet studies in Minnesota.

In 1984, high water again was a problem, and cold rains and a July hail storm destroyed some broods. Traditionally, late seasons mean poor nesting success and the past 5 years had its share of late springs. However, these obvious conditions fail to explain why nests that were free from flooding and hatched, failed to yield cygnets to flight stage.

Concurrent with the population decline in the summer Tristate Subpopulation has been an increase in the Rocky Mountain wintering population. An influx of Trumpeters from Canada apparently accounts for this increase which has added competition to an already precarious winter range. The Interior Canada Subpopulation is increasing at the same time that the Tristate Subpopulation is decreasing. At present, there is no clear cut evidence that there are too many swans to obtain an adequate maintenance diet from the present winter range, but the danger exists that some catastrophe on the limited wintering area could pose a serious threat to the entire Rocky Mountain Population.

The recent RRLNWR flock decline, coupled with low cygnet survival and an implied threat to the wintering area, has aroused the concern of the U. S. Fish and Wildlife Service, several state wildlife agencies, and groups such as The Trumpeter Swan Society. As a result, directors of this Society asked five of its members to serve as a study committee. Your committee has reviewed available literature on the subject, met as a group in Havana, Illinois, last spring to plan strategy, and spent a week late in August at RRLNWR and vicinity. One member spent nearly 2 months screening information in the Refuge files. This is our report.

We wish to thank the Conservation Endowment Fund, especially John Taft and David Hartwell, for providing food and lodging for Committee members at their Centennial Ranch adjacent to Red Rock Lakes Refuge.

Through a special appeal to members, The Trumpeter Swan Society provided funds for travel and for incidentals. We are especially grateful for the support and assistance of Refuge Manager Barry Reiswig and his staff. Without their aid, this report would have been impossible. The Regional Office of the U. S. Fish and Wildlife Service in Denver offered its complete cooperation. Numerous authors of publications on Trumpeter Swans and their habitat gave freely of their expertise. We appreciate all the help we have received.

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The problems of determining why the swan population at Red Rock Lakes Refuge and adjacent areas is declining is amazingly complex. We must admit at once that we have found no clear cut reason or reasons for the decline. We have addressed the following areas of concern: 1) water levels; 2) natural food resources; 3) supplemental winter feeding; 4) lead poisoning; 5) capturing, marking, and weighing; 6) removal of eggs, cygnets, and adults; 7) waterfowl other than Trumpeter Swans; 8) survival and recruitment; and 9) fact-finding and research, plus a discussion section. Each area of concern will be discussed in the order listed.

1. Water Levels

There are three major natural lakes on Red Rock Lakes National Wildlife Refuge: Swan Lake and Upper and Lower Red Rock Lakes. All were impacted to a certain extent by a wooden dam constructed across Red Rock River below the Lower Lake. This structure flooded low areas along the stream which are collectively known as the River Marshes.

A new concrete water control with a fixed crest, plus a short emergency spillway, was constructed in 1957 just above the old wooden dam. The crest of the water control was set at 6607.0 feet above sea level. This is the same elevation as the crest of the old wooden dam. The new emergency spillway crest is set at 6608.5 feet above sea level. The new structure has much less capacity to pass water than the old inefficient wooden dam had, hence the backed-up water flooded low areas in the River Marshes and created much new waterfowl habitat. Deeper water levels, especially in the Lower Lake, temporarily inhibited the growth of aquatic vegetation in the deeper parts of the lake.

Perhaps as a response to the changed water levels, Trumpeter Swans produced 133 cygnets in 1963 - an all time high. But, higher water levels were also causing problems. At least one swan nest was flooded out in 1965. It was also noted that submerged plants grew better and set seed better when drought periodically lowered high water in the Red Rock Lakes.

Several small impoundments of value to Trumpeter Swans have been created or extended since the Refuge was established. Most notable of these are Culver, MacDonald, Widgeon, Pintail, and Shambow Ponds. Culver and MacDonald Ponds are fed by springs warm enough to keep portions of the water ice-free even during the most severe winters. These ponds are unaffected by the water control described above.

The continuously stable high water levels in the major lakes imposed by the fixed-crest spillway are suspected of reducing the growth of desirable swan food plants in the deeper areas. The inability to quickly pass high spring and summer runoffs also has flooded out an unacceptable number of swan nests.

Experience at many other national wildlife refuges shows that stable high water over long periods of time usually results in greatly lowered production of food and cover plants needed by waterfowl. Periodically lowering the water level for a growing season or longer, followed by reflooding at a lower level, appears to stimulate a remarkable growth of desirable food and cover.

Water control structures are needed here that will permit drawdowns of up to complete drainage of the River Marshes and the Lower Lake. The structures should have the capacity to quickly pass flood waters and should permit flushing out of excessive silt. These facilities, combined with flexible water management that takes advantage of opportunities offered by drought, should improve habitat for all waterfowl on the Refuge.

The U. S. Fish and Wildlife Service has filed for water rights for the Refuge that are adequate to supply all the needs of wildlife that can be foreseen. The State of Montana has started the long process of adjudicating the various claims for water. All concerned are hopeful that this process will recognize the water rights claimed and used by Red Rock Lakes Refuge over the past four decades.

2. Natural Food Resources

Questions of carrying capacity and reproductive performance of Trumpeter Swans at RRLNWR frequently involved concern about the adequacy of the quantity and quality of the natural food resources. Conditions for both wintering and breeding birds are suspected as potential causes of poor condition of adult swans and poor growth and survival of cygnets.

Unfortunately, food requirements and preference data are scarce for Trumpeter Swans. Paullin (1973) reviewed the scanty data and concluded that the birds were highly opportunistic in their choice of plant foods, but that waterweed (Elodea canadensis), muskgrass (Chara vulgaris), and the tubers of duck potato (Sagittaria cuneata) and sago pondweed (Potamogeton pectinatus) were especially important at RRLNWR. There does not appear to be any information about the potential importance of invertebrates as a food resource for swans, although it is clear that a high level of protein nutrition is necessary for both egg production and cygnet growth, as in other birds. Quantities of food required are not well known, but a study by Refuge personnel (1971) suggested that adult swans consume about 20 pounds per day, wet weight, of submerged vegetation. Energy requirements are probably similar to that of other birds. Hampton (1981) estimated energy demands for birds wintering on Henry's Fork to be about 900 Kcal/bird/day.

The submerged plant food resources on RRLNWR have been monitored carefully since 1966. Data collection has followed an appropriate standardized scheme of biennial surveys. As a result, there is good background information on changes in abundance of the major plant species over 18 years. Turnover of Refuge personnel undoubtedly introduced some biases, as has variation in the dates of the survey. Nevertheless, the data set is probably better than would be found at most other refuges.

The results of the vegetation surveys indicate that there have been major changes in both abundance and species composition of the submersed vegetation. Abundance of all plants combined expressed in average weight per unit area, has frequently fluctuated by a factor of 2 or 3, but even the low averages were about equal to standing crops of similar plants in other areas. In general, then, submersed plant abundance, as measured by the Refuge surveys, must be considered very good.

Many shifts in relative abundance of species have occurred over the years. Common plants include waterweed, muskgrass, white-stemmed pondweed (P. praelongus), Richardson's pondweed (P. richardsonii), flat-stemmed pondweed (P. zosteriformis), water milfoil (Myriophyllum spicatum), and coontail (Ceratophyllum demersum). Submersed plants such as these seem to fluctuate widely in abundance for no obvious reason - such has certainly been the case at RRLNWR. In the late 1960's and early 1970's, there was much concern about a decrease in waterweed, a favored swan food. It has recently shown substantial increases in some areas. Other species have also gone up and down, but there is little reason to suspect these are long-term trends, with two exceptions: sago pondweed has generally decreased and muskgrass has increased, often dramatically.

Although the changes in the abundances of the various submersed plant species is of considerable interest to marsh managers, the significance to the swans is debatable. Back-of-the-envelope calculations suggest that 3 to 6 acres of average density submersed vegetation can supply the needs of a pair and cygnets for an entire breeding season with sufficient "seed stock" to replace the stand the following year. Territory sizes are much larger than this, suggesting that current levels of submersed plant production are more than adequate unless there are seasonal (spring) shortages or qualitative deficiences.

We know that nutrition of females is particularly critical during the pre-laying and laying periods. Various species of waterfowl have different strategies for meeting the increased need, especially for protein, during that time. Some store reserves while on the wintering grounds, some increase their intake during spring migration, and some wait until arriving on the breeding grounds to increase the intake of high quality foods. At present, the data are inadequate to determine either the strategy or the source of the increased protein for wild swans.

Another critical period is that of cygnet growth. Young of many species feed on high protein foods, especially invertebrates, during this time. Page (1976) observed cygnets feeding on floating dead insects, but, in general, there is little information on cygnet diets. Although casual observations by our committee, admittedly long after the period of peak need, suggested abundant invertebrates, there are no data on this important resource.

3. Supplemental Winter Feeding

Supplemental feeding of barley and/or wheat to Trumpeters was initiated on spring-fed ponds of RRLNWR during the winter of 1935-1936. Hand-feeding was considered necessary when ice covered all the natural food except that found in the pools below the springs. The concentrated birds soon depleted the vegetation in the spring holes that remained ice-free in temperatures far below zero.

As the number of swans increased, the handouts kept pace until as much as 1,600 bushels of grain were fed during the winter period. The amount of feed dispersed varied considerably from year to year depending on the starting date, severity of the weather, number of birds present (including ducks), and other considerations.

During the winter of 1969-1970, supplemental feeding was delayed for the first time until 16 March in hopes that the hungry birds would leave the Refuge for the food-rich stretches along the Henry's Fork of the Snake River only 20 airline miles away in Idaho. About 140 swans, including 20 cygnets, refused to leave. Since this number corresponded closely to the number of breeding adults and young censused in the Centennial Valley the previous fall, the manager of RRLNWR concluded that it was the resident breeding population and their offspring that refused to leave, whereas the nonbreeders and subadults spent much of their time elsewhere. He attributed the 17 known deaths and the suspected high level of emaciation among the remaining birds on the Refuge to the lack of a supplemental feeding program. He resumed feeding after 16 March and recommended that the experiment not be repeated. He found that most ducks left the area when grain was denied them and recommended delaying feeding until the natural feed in the spring ponds was nearly gone, possibly, in a mild winter, as late as January.

Recent recommendations call for holding off as long as possible, then feeding twice a week, only enough so that a small amount of grain is left on the feeding site before the grain is replenished. A major change in the feeding program has been making "Turkey Finisher," recommended by Ralston-Purina, available to the swans. This is presented with wheat to the swans in dry-land hoppers. Potential benefits to the birds of providing this balanced diet are obvious. Getting the swans to accept the dry feed readily remains an unsolved problem.

Wildlife managers generally agree that hand-feeding programs are undesirable and that the species being managed should be encouraged to move to a wintering area where supplemental feeding is unnecessary. But, in the case of some populations of swans, different rules may apply. Swans of the Tristate Subpopulation have lived a non-migratory existence for as long as records have been kept. They may still possess the ability to migrate, but they have lost their traditional direction to adequate wintering areas. There is no reason for them to search for a new area when all their living requirements are met within their existing range.

Managers are well aware that although the winter range of this subpopulation may be adequate at present, it is marginal at best and highly vulnerable to some major catastrophe. They would like to move at least some of the birds. Until the where and hows are answered -- where the birds would be better off and how to move them without subjecting them to unacceptable hazards -- this committee recommends continuing the winter feeding program at RRLNWR much as in the past, but starting only after natural feed becomes scarce or unavailable. Enough grain should be fed so that the supply does not become exhausted. Turkey finisher pellets with wheat in dry-land hoppers should be provided on a free-choice basis. We further suggest that to encourage the use of the pellets, that cracked corn be added to the diet. Corn is considered a highly palatable "hot" food supplying carbohydrates, vitamin E, and warmth to wintering waterfowl. It should be cracked rather than whole to reduce the danger of lead poisoning. We suggest also that bales of green, leafy (3rd cutting) alfalfa be supplied at the water's edge to see if the birds will use them. Grit, perhaps pea gravel and/or oyster shell, should be provided also.

Studies, to date, indicate that the open waters of the Henry's Fork, Teton, Snake, and Madison Rivers provide abundant sources of food for the present swan populations. However, the number of birds using these limited stretches of suitable river habitat has been increasing due to the addition of swans from Canada. It is uncertain, too, that existing high quality feeding areas along the rivers will remain that way indefinitely. Therefore, they should be inspected regularly to determine any change that may threaten the birds.

Meanwhile, a search for wintering habitat more hospitable to the birds, yet within reasonable moving distance, should continue in anticipation of the development of acceptable methods for moving Trumpeters.

4. Lead Poisoning

Waterfowl and other wildlife have been hunted with lead shot on Red Rock Lakes and vicinity since the late 1800's. Fishermen have also used and lost lead sinkers on ponds used by Trumpeter Swans. Most of the lead has apparently sunk into the silt below the reach of most waterfowl. Trumpeter Swans, however, have long necks and, in our opinion, actively seek grit the size of lead shot to aid digestion. Lead sinkers are causing lead poisoning problems for Mute Swans in Europe, so we should expect similar problems with lead sinkers in Trumpeter Swan range.

E. R. Kalmbach, USFWS Denver Research Laboratory, diagnosed lead poisoning of three dead Trumpeters picked up on their winter feeding pond at RRLNWR by A. V. Hull during March - April 1937. Mr. Hull found 19 lead pellets in the gizzard of the fourth swan and made a similar diagnosis.

Few winter-killed swans from RRLNWR were submitted for autopsy from 1956 to 1984. Terry McEneaney, Assistant Refuge Manager, found an emaciated dead swan in Lower Red Rock Lake with 32 wafer-shaped lead pellets in its gizzard during the spring of 1983. One of three suspected lead-poisoned Trumpeters sent to the National Wildlife Health Laboratory in 1984 was diagnosed as killed by lead poisoning.

Duck hunting clubs were popular in the early 1900's at RRLNWR and were not eliminated until the early 1970's. Since the 1970's, duck hunting has been restricted to the Lower Red Rock Lake and River Marsh. In 1983, about 150 hunters using lead shot bagged 600 ducks in 550 hunting hours from 7,000 acres of the Refuge. On 4 July 1984, Trumpeter Swan Society President, Donald A. Hammer, wrote Montana Department of Fish, Wildlife and Parks Director, James W. Flynn, noting the Society's concern that Montana hunters were still shooting lead on the Nation's primary Trumpeter Swan refuge and urged him to ban lead shot on RRLNWR. That is not likely to happen in the current State and Federal political climates with little data and little public knowledge available to defend the request for banning lead shot on RRLNWR.

Waterfowlers and ammunition manufacturers have known for more than half a century that spent lead shot poisons waterfowl and other animals. Massive waterfowl die-offs attributable to lead poisoning have been reported since the 1930's. Nontoxic shot, comparable to lead in potential for bagging birds, has been available to manufacturers and hunters for over 10 years. Reluctance to change any aspect of traditional waterfowling has prevented a changeover from lead. There is no ballistical reason to continue hunting with lead shot. There is certainly no logical reason to allow lead shot to be used on the premier Trumpeter Swan refuge.

5. Capturing, Marking, and Weighing

A theory commonly expressed about the production failures in the RRLNWR Trumpeter flock is that the pairs enter the nesting season in poor breeding condition due to unfavorable wintering conditions (severe weather, inadequate diet). This, according to theory, results (in extreme cases) in failure to nest or in inferior eggs, weak cygnets, and low survival rates. This theory appears weakened by the relatively high rate of nesting success of the Trumpeters that nest in Canada's Grande Prairie Region. Many Tristate and Interior Canada Trumpeters spend the winter in the same area so it would appear that both subpopulations are subjected to the same debilitating factors. However, there is a ready answer to this objection. The Tristate birds continue to reside in a hostile environment during the pre-nesting period whereas the Grande Prairie birds move slowly toward their nesting grounds feeding along the way in food-rich areas and completely recover from their winter malnutrition before they start nesting.

This theory may be true -- in fact, appears to have logic on its side, but remains unproven. A comparison with nest success at Lacreek NWR (Martin, South Dakota), where Trumpeters from RRLNWR have been successfully transplanted, shows a larger clutch size and higher egg fertility among the Lacreek birds. Cygnet survival at RRLNWR is definitely lower than at Lacreek, again suggesting some weakness in the Red Rock Lakes birds during most recent years but not in many earlier years.

It seems to us that a better understanding of the physical condition of pre-nesting swans will require capturing, color-marking, placing radios on an adequate sample of the Tristate Subpopulation, and using weights of the birds handled as one index of condition. Weights taken early in the wintering period and shortly before nesting begins would be needed for such a comparison. It also would be necessary to compare the weights of birds from this subpopulation with those of birds from areas where good production rates are being achieved.

Color-marked or radioed birds also are needed to detect movements by the different population segments during the wintering period. It is important to know whether the birds refusing to leave RRLNWR are the Centennial Valley breeders and their offspring, as has been suspected, or simply a mixture of breeders and nonbreeders. To what extent is there an exchange of birds between Red Rock Lakes and other wintering areas? Only marked birds will provide such answers.

If it was known that the birds wintering at Red Rock Lakes and/or Henry's Fork were entering the nesting season in a rundown condition, which results in poor production, perhaps corrective measures might be applied. These might include supplying nutritious foods at Red Rock Lakes, and elsewhere, to build up the birds before they nest. It also strengthens the argument for moving the birds to better wintering areas.

6. Removal of Eggs, Cygnets, and Adults

We have studied Manager Reiswig's rationale for banning Trumpeter Swan cygnet and egg loans at this time. We agree that the breeding flock has dwindled far below the goal of 40 nesting pairs. Production is well below the 50 fledglings needed annually to build a viable flock. We agree that no birds or eggs should be removed until those goals are obtained.

When the population recovers, we believe that Trumpeter eggs can again be loaned for restoration and research programs, but RRLNWR should select and collect the eggs. Advanced-embryo eggs should not be guaranteed.

7. Waterfowl Other Than Swans

Red Rock Lakes National Wildlife Refuge is internationally known for its part in saving the Rocky Mountain Trumpeter Swan Population and its part in restoring nesting Trumpeters to Wyoming, Oregon, Nevada, Washington, South Dakota, Nebraska, and Minnesota. But, Red Rock Lakes NWR has never been considered a great waterfowl refuge. Unnoticed has been the Refuge's nearly threefold increase in duck production from 3,450 a year in the 1954-1963 period to 8,900 ducklings a year in the 1974-1983 period. More surprising has been the increase in diving ducks from 726 in 1954 to 4,386 in 1983, with an astounding 15,745 estimated from the 1974 survey! The 1984 duck brood counts have not been transcribed from the recorders, but this summer's production appeared great with many Redhead broods appearing after the last count.

Canada Goose and Trumpeter Swan production have not followed the same upward trend as the ducks on the Refuge. Canadas had their best year in the 1960's, with 144 goslings produced in 1966 compared to 31 goslings in 1983.

Waterfowl use data were not available for the past 10 years, but earlier data indicated a great increase in duck use from 7.5 million duck-use-days in 1957 to 10.6 million duck-use-days in 1959, after the "Lower Dam" was built and the adjacent marshes and grasslands were flooded. Duck production then decreased for several years indicating that considerable duck nesting cover was flooded. The recent surge in duck production is attributed to more nesting cover. Grazing has been reduced more than 50 percent. Pastures are rotated so each is grazed only one summer in three, leaving excellent cover.

8. Survival and Recruitment

Anderson and Herron (1984) have analyzed all data from bandings of swans other than cygnets. Because the data are sparse, they used several approaches to estimating survival, resulting in estimates ranging from 80 to 88 percent average annual survival for birds banded at ages of 1 year or older. Because swans have a long subadult period of up to 5 years, the average survival obtained by Anderson and Herron also averages breeding, nonbreeding, and subadult classes. They recognized several potential biases in the data and analysis, all of which would tend to reduce the survival estimates. Thus, it may be reasonable to assume that adult swan survival is 85 to 90 percent and perhaps even higher. Other species of large birds with long subadult periods, for which better data are available, usually have adult survival rates over 90 percent.

Page (1976) examined the population dynamics of RRLNWR swans using estimates of survival that now look slightly low. He assumed that subadult survivorship was somewhat lower than an estimate of the adult rate of 85 percent. If there were 50 nests with an average clutch of 4.7 eggs (approximately the RRLNWR average), an average of about 50 cygnets per year would be required to maintain a stable population. Currently, there are fewer than 50 nests, perhaps around 40 pairs, in the Centennial Valley. It appears that to maintain the current population, average annual production should be about 40 fledged cygnets. In fact, from 1980 through 1984, average annual production has averaged less than 20 cygnets fledged per year. Clearly, current cygnet production is not nearly enough to maintain the population in the Centennial Valley. In contrast, the Interior Canada Subpopulation is producing more than enough cygnets as inferred from very high cygnet:adults/subadults ratios in the wintering population. Transplanted birds at Lacreek NWR also have a much higher rate of cygnet production.

The question then becomes why is the RRLNWR cygnet production so low (Yellowstone National Park also seems to be in this category)? Egg fertility rates are somewhat lower than at Lacreek, but hatching success is roughly comparable in the data available. The problem seems to revolve around cygnet survival. RRLNWR cygnet survival has been highly variable, apparently because of weather. Years with frequent cold, rainy days have poor cygnet survival. Page found in the mid-70's that only about 17 percent of the cygnets survived. Survival in recent years is consistently poorer than prior to 15 years ago. This had led to speculation about the possible causes, including disease, genetic, and nutritional problems.

Due to the abnormal losses of 1- to 5-week-old cygnets, extensive studies of cygnet mortality were carried out by Drs. Wayne T. Jensen and Malcolm McDonald of the Bear River Research Station. Dick Sjostrom, Biological Technician, summarized those studies in 1978. Greatest cygnet mortality occurred during the peak hatch period and within 4 weeks of hatching. Predation was minimal. Mortality varied between 18 and 90 percent. Necropsies revealed tremendous loads of trematodes, cestodes, nematodes, and Acanthocephala. In one case, a 9-week-old cygnet contained over 4,000 parasitical worms in its gastro-intestinal tract, mostly trematodes. The Acanthocephala (thorny-headed worms) were abundant in the cygnets. Amphipods, the thorny-headed worm's host, are also abundant in RRLNWR marshes. Up to 40 percent of two species of amphipods collected in 1964 contained larval forms of Acanthocephala. Nasal leeches suffocated a number of cygnets.

Nutrition has been the most commonly suggested cause for poor cygnet survival. This includes poor female nutrition resulting in poor egg quality and, hence, impaired cygnet growth, as well as poor cygnet nutrition. However, the data we have examined do not suggest a plant food shortage. Unfortunately, the data are incomplete both with respect to season and possible impact of invertebrate food or other qualitative aspects. Thus, we are not sure whether nutrition is or is not at the source of the problem.

9. Fact-finding and Research

The Trumpeter Swan Society should carefully consider and analyze the available accumulation of data, the current concentration of activities, and the resulting stress on Trumpeter Swans before recommending further studies. Some of the activities that we are recommending can be integrated into the current program, others should be planned for future years to supplement or to replace completed studies:

A. Use aerial photography to pinpoint nest sites and aid in determining criteria for successful nests.

B. Use aerial photography for accurate censusing of wintering populations of Trumpeter Swans.

C. Trap, band, mark, and weigh wintering swans to determine condition and any weight loss during the winter.

D. Examine apparent occupation of territories in the fall -- requires pre-marking of occupants.

E. Ask why nesting territories are concentrated on the north side of the Refuge? What is the percentage of successful nests? Is there any difference in north side vs. south side nest success?

F. Continue to examine blood samples for parasites, disease, and heavy metals, especially lead.

G. Determine incidence of lead poisoning in Trumpeter Swans, partly through blood samples.

H. Determine the cause(s) of high mortality in cygnets.

I. Determine relations of climate and weather to reproductive success; e.g., annual frost-free and threshold days, temperatures, precipitation (Jan-June and July), ice-out and freeze-up dates.

J. Consider maintaining the fenced Shambow Pond for controlled research purposes.

DISCUSSION

An examination of available reports, discussions with individuals who have conducted studies on swans, and our on-location observations lead us to the following conclusions:

1. The adult and subadult population of Trumpeter Swans of the summer Tristate Subpopulation is at its lowest level of the past two decades.

2. Replacement through cygnet production has not matched mortality in recent years; hence, the population will continue to decrease until this trend is reversed.

3. There is no shortage of suitable territorial sites or lack of vegetation suitable for swan food at these sites, at least in summer when the vegetation surveys are made.

4. On RRLNWR, there are more than 40 mapped territories which have a recent history of use by nesting swans and, to our eyes at least, still meet territorial requirements. However, during the past 5 years, most of the nests of these territories have failed to produce cygnets.

5. Many nesting failures are easily explained during years of high water when nests built on muskrat houses are lost due to flooding. Renesting is inconsequential in this high country where growing seasons are short; hence, flooding may wipe out most of the annual production.

6. Cygnets are vulnerable to cold summer rains. Such rains catching a large part of the hatch at an early stage of development can result in a near wipe-out of annual production.

7. Early dry springs, free of flooding and cold rains shortly after the hatch have, in the past, resulted in high levels of annual production.

8. We are uncertain, without a more careful review of the weather data, whether the consistently low production of the past 5 years can be explained entirely by weather phenomena or whether more subtle factors are involved.

9. The theory that poor production is the result of breeders entering the nesting season in poor physical condition remains untested. However, lack of sufficient evidence should not influence attempts to improve the nutrition of Tristate swans through supplemental feeding where necessary and where practical. RRLNWR provides an opportunity to add a balanced supplement to the diet of the wintering population, presumably of the Centennial Valley flock. We recommend that this be tried to determine whether improved nesting success follows.

10. A continuing program of floating active nests on platforms and placing floating platforms piled with nesting material in known territories in hopes of getting the birds to use them will help reduce losses due to flooding. This program should be expanded, if possible.

11. Predation on swans or cygnets at RRLNWR appears unimportant and needs no special consideration.

12. The goal should be to at least double the number of fledged young produced at RRLNWR as compared to the period 1980-1984. At present, an average of fewer than 10 percent of the fall population of the Centennial Valley has been fledged cygnets. It will take at least 20 percent if the population is to maintain itself.
13. Until this 20 percent-plus level is achieved, we recommend that no adult swans, cygnets, or eggs be removed from RRLNWR.

14. Little is known at present concerning the role of large invertebrates in the diets of adults and cygnets. Consider initiation of such studies under contract with universities.

15. Whether the birds are suffering malnutrition before entering the nesting season, or there are disease problems, will remain mysteries until an adequate sample is trapped, weighed, and marked. Likewise, movements of unmarked populations will remain uncertain. However, Trumpeter Swans are almost paranoid about disturbances. So, no banding programs are recommended except on molting areas or possibly on certain wintering areas until population levels of the Tristate group improves. Even then, no banding or marking is recommended unless backed by adequate funding and follow-up plans, and funding sufficient to accomplish the objectives.

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THE TRUMPETER SWAN SOCIETY
RED ROCK LAKES RESOLUTION

WHEREAS the Red Rock Lakes National Wildlife Refuge Trumpeter Swan population represents the historical core for Trumpeter Swan populations of the lower 48 states and population increases from management and protection represent an outstanding success for management agencies; and

WHEREAS the Red Rock Lakes National Wildlife Refuge population has declined in recent years and its productivity during the last 5 years has been less than adequate to maintain a stable population; and

WHEREAS The Trumpeter Swan Society has established a study committee to review the Red Rock Lakes population and report to the Society at its Ninth Conference in West Yellowstone, Montana;

NOW, THEREFORE, BE IT RESOLVED that The Trumpeter Swan Society requests that the Fish and Wildlife Service expeditiously implement the following Committee recommendations:

1. Provide the latitude for the Refuge Manager to pass flood waters and manipulate water levels by, if necessary, modifying or replacing the existing fixed crest water control structure and spillway to permit water level management;

2. Continue the Rocky Mountain Population Subcommittee recommended moratorium on removal of Trumpeter Swan eggs (except salvaged eggs), cygnets, subadults, and adults from the Tristate Subpopulation of the Rocky Mountain Population until 15 October 1986 (commenced 15 April 1984);

3. Continue current aquatic vegetation surveys to provide long-term food availability information and initiate a less extensive survey in late June or early July to determine availability of food to cygnets;

4. Continue to investigate all factors causing mortality in cygnets at Red Rock Lakes National Wildlife Refuge;

5. Investigate the importance of invertebrates in the diet of adult Trumpeter Swans in early spring and of invertebrates and aquatic plants in the diet of cygnets in early summer;

6. Continue the supplemental winter feeding program at Red Rock Lakes National Wildlife Refuge until it is determined that excessive Trumpeter Swan mortality and poor productivity will not result from a cessation of the feeding program; enrich the grain with a high protein addition such as the turkey finisher fed in dry-land hoppers;

7. Monitor areas contributing to siltation of Red Rock Lakes National Wildlife Refuge to identify methods for reducing silt inflow;

8. In cooperation with the wildlife agencies of Montana, Idaho, and Wyoming, and with the appropriate flyway councils, require the use of nontoxic shot for waterfowl hunting in all areas used by Trumpeter Swans during the 1985-1986 hunting season and thereafter;

9. Expand the use of aerial photography to describe Trumpeter Swan territories and successful nest sites and to increase the accuracy of waterfowl censuses;

10. Explore techniques to monitor movements and concentration of Trumpeter Swans in the Tristate Region that will not require capture and physical handling of individual swans;

11. Continue to identify specific nests prone to flooding and relocate these nests to floating platforms, minimizing disturbance to nesting pairs; and

12. Recognize through funding and staffing levels that Red Rock Lakes National Wildlife Refuge produces significant numbers of other waterfowl species and other wildlife, as well as representing the premier Trumpeter Swan area, and provide additional financial and staff support to evaluate and implement these recommendations.

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