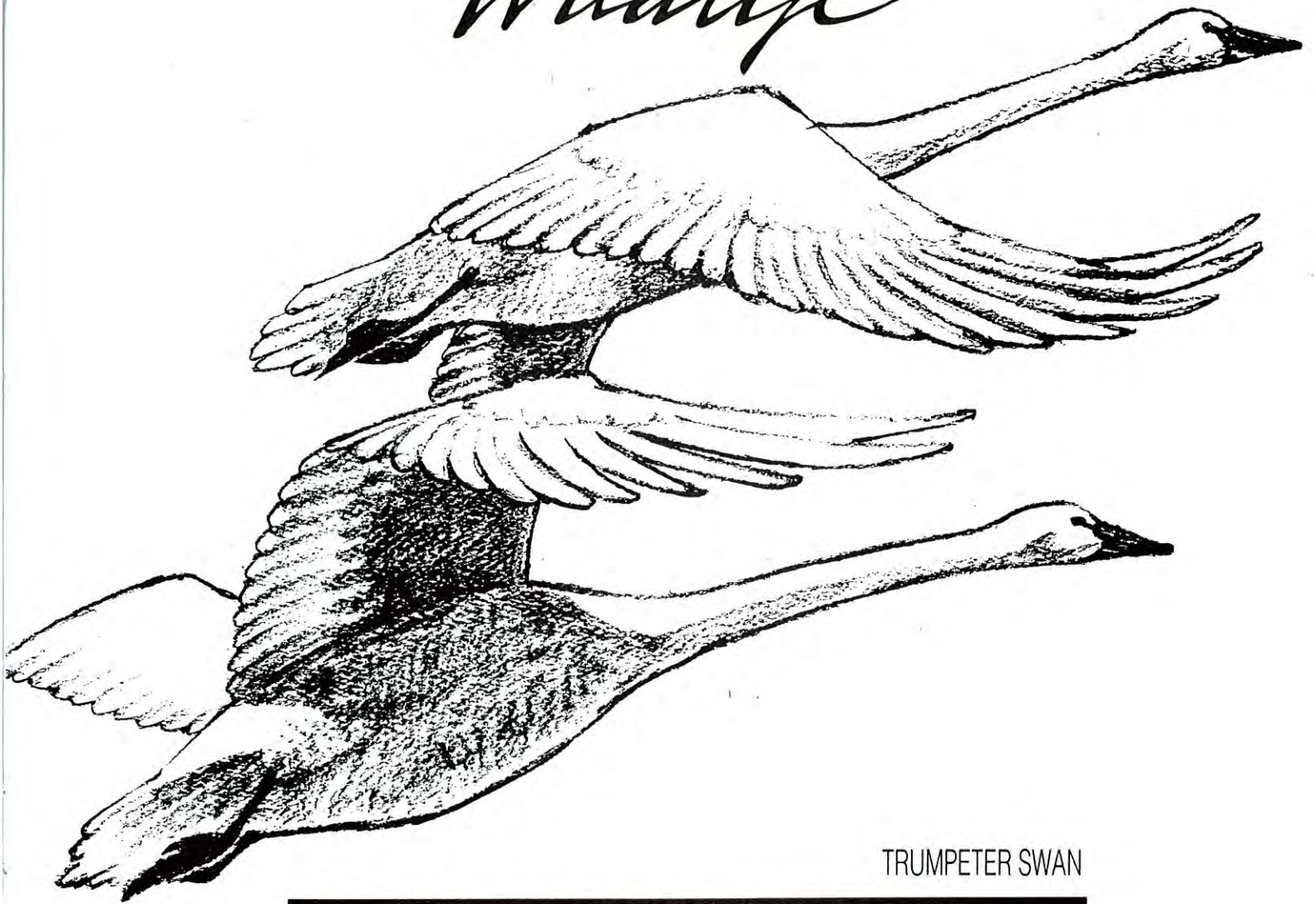


Teacher's Guide

Alberta's
THREATENED
Wildlife



TRUMPETER SWAN

Grades 7 8 9



Canadian Heritage
Parks Canada

Patrimoine canadien
Parcs Canada

Alberta
ENVIRONMENTAL PROTECTION

This educational material is under Crown Copyright and may be freely copied for educational use provided the source is acknowledged.

For more information, contact:

Alberta Environmental Protection
Education Branch
11th Floor, South Petroleum Plaza
9915 - 108 Street N.W.
Edmonton, Alberta, Canada T5K 2G8

Phone: (780) 427-6310

Fax: (780) 422-5136

E-mail: Env.Education@gov.ab.ca

Trumpeter Swan

(*Cygnus buccinator*)

Unit Overview

This unit is one of several developed for grades 7 to 9 to address Alberta's Threatened Wildlife. In the Trumpeter Swan unit, the class of students will be divided into groups of four and delegated the role of wildlife biologists. Each team of wildlife biologists will be presented with a dossier of information on the Trumpeter Swan.

Students will:

- glean specific information from the dossier
- map the range of the Trumpeter (summer and winter)
- make the Trumpeter Swan's Life Calendar of Events which will include drawing swan(s) and writing a summary of the swan's life cycle

The mapping and life calendar activities provide the background information necessary to do the most challenging activity in the unit: to establish a nesting population at Elk Island National Park consisting of ten nesting pairs of Trumpeter Swans. Students will calculate the transplant project's time-line using the limiting factors as a guideline for survival and mortality. This activity is based on an actual transplant program which is considered the only successful Trumpeter Swan transplant in Canada.

The Trumpeter Swan unit closes with suggestions for action. A list of recommended resources to support this unit is supplied.

Objectives

After studying this unit, students will be able to:

- describe the Trumpeter Swan and its habitat
- list the limiting factors affecting the Trumpeter Swan
- list some solutions that will help the Trumpeter Swan

The activities in this unit support Division III curricula in the following grade levels and areas:

Science

Grade 7 Characteristics of Living Things

Life Cycles

Adaptation

Stimulus and Response

Grade 8 Interaction and Environments

Grade 9 Diversity of Living Things

Environmental Quality

Social Studies

Grade 8 Topic A: Geography of Canada and the United States

Activity Name	Time (approx.)	Page
Trumpeter Swan Dossier	1 class period	3
Life Calendar of Events	1 class period	11
Test Your Trumpeter Knowledge Challenge	1/2 class period	15
Glossary Blunderdash	1/2 class period	18
Mapping Madness	1/2 class period	20
Transplant Project	1 class period	30
Displays	1/2 class period	38
What Are You Going to do?	1/2 class period	41
Glossary		42
Recommended Resources to Support this Unit		44

Activity #1:

Trumpeter Swan Dossier

Summary

Each group of four students, delegated the role of wildlife biologists, will be presented with one file folder (dossier) of information. The dossier will contain information sheets describing the Trumpeter Swan's Latin and common name, physical features, characteristics, nesting, diet, habits, migration, life cycle, habitat, and so on.

Materials Required:

- Copy Sheets, Character Dossier pages 5 to 8, Habitat, pages 9 and 10; one set for each group of biologists
- one file folder for each group of biologists

Procedure

1. Divide students into groups of four. Inform them that each of them will be taking on the role of a wildlife biologist. A wildlife biologist specializes in the management of wildlife resources and their natural habitat. In this unit, students will be involved in many of the actual responsibilities of a real wildlife biologist.

Some of the things a wildlife biologist does are:

- studies wildlife in their natural habitat to investigate their interactions with their environment
- designs and implements studies that involve analyzing and monitoring limiting factors
- makes land use management decisions

- reports findings and makes recommendations on management programs and planning for wildlife populations
 - estimates animal populations for management programs (often with aircraft)
 - coordinates preventive programs to control the spread of animal diseases
2. Present each group with its dossier. Explain that a dossier is a collection of information about a person, object or issue; in this case, the Trumpeter Swan. There is some information already in the folder, and more to come. It is important that students work together as a team, each with their own unique point of view and knowledge base. All comments are valid.

Begin distributing the information slowly. Start with pages 5 to 8, Character Dossier, which profiles the life events of the Trumpeter, and Habitat, pages 9 and 10.

3. Have each student in the class summarize the various information items. For example, the first student introduces the Trumpeter, says the Latin name and declares its status. The second student describes the physical features of the trumpeter, the third describes special characteristics and so on until all the information is shared.

Or have each group be responsible for particular segments of the information in the dossier and the group will decide how to present their information. Below are some questions and topics that could be

answered in presentations by individuals or biologist groups:

- What is a Trumpeter Swan? How can it be distinguished from other types of swans? What is the population status?
 - Characterize the reproductive patterns of the Trumpeter Swan. Include mating, nesting and development of young.
 - Describe a strategy for capturing Trumpeter Swans for study purposes. What methods can be used to track Trumpeter Swan movements?
 - Describe the migration behaviour of Trumpeter Swans.
 - What are the feeding habits of Trumpeter Swans?
 - What kind of shelter do Trumpeter Swans require? What are their space requirements?
4. When the students understand the material, move on to documenting some of the information in the next activity, the Trumpeter Swan Life Calendar of Events.

Character Dossier

Name: *Cygnus buccinator*

Alias (or commonly known as):
Trumpeter Swan

COSEWIC* Status: Vulnerable
* see Glossary

Physical Features & Characteristics (Adults)

Color:

- all white feathers, large black bill and feet
- feathers on upper part of neck and head sometimes have reddish or rust coloration, stained by ferrous organic compounds in the marsh or lake bottom where they habitually feed

Special Markings: reddish border on lower mandible (bill)

Voice: resonant, sonorous, loud, low pitched, bugle-like call

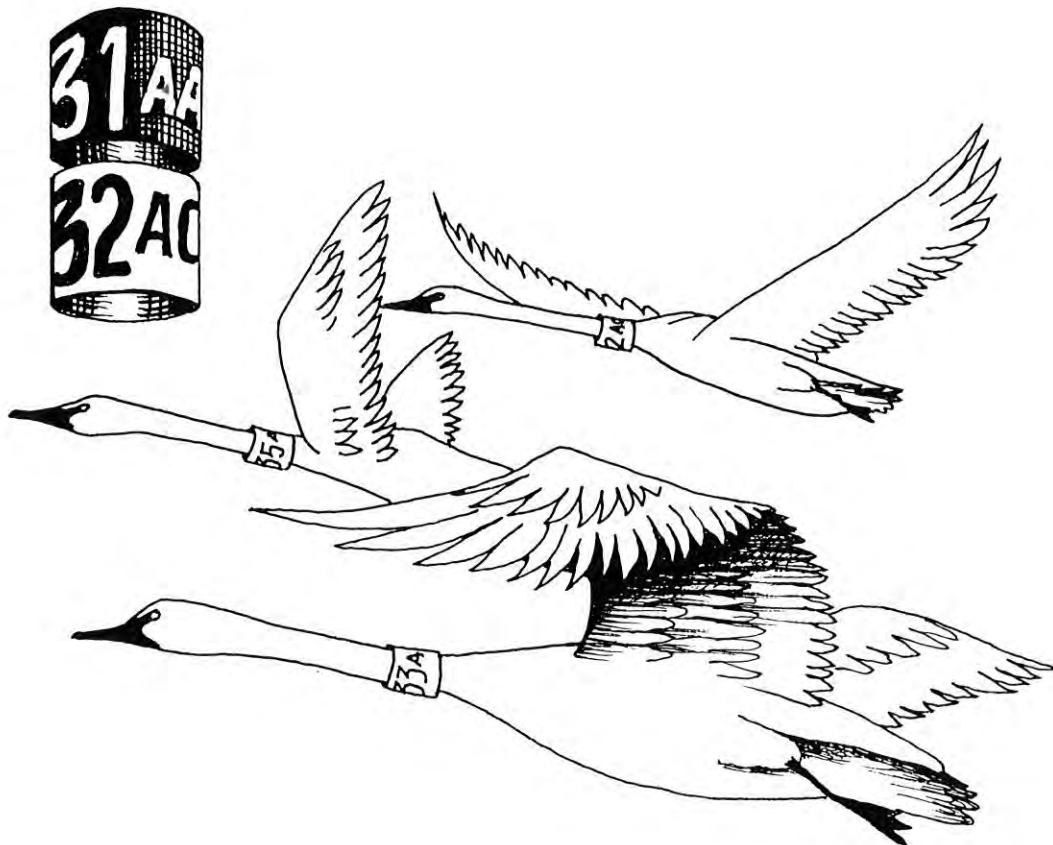
Weight: 9.5 to 13.6 kg (female or pen: 10 kg, male or cob: 12 kg)

Wingspan: 2.1 to 3 metres

Length (height): 152 cm

Reputation:

- largest waterfowl in the world
- traditional in its habits
- loyal to its mate
- territorial when paired
- wilderness species



Special Considerations: People often confuse the Trumpeter with the Mute Swan and Tundra Swan.

Mute Swan

- orange bill and black knob on forehead near the eye
- mostly silent but hisses
- wingspan: 208-239 cm
- weight: 9-11 kg
- length: 145 cm
- introduced from Europe
- found mainly in zoos & avicultural gardens
- found in the wild on the east and west coasts of North America
- are considered pests

Tundra Swan

- yellow marking on bill
- high pitched WHO-WHO
- wingspan: 183-203 cm
- weight: 6-8 kg
- length: 132 cm
- usually nest in the Arctic; common in Alberta during spring and fall migration

Traditions

1. Swan usually mates for life or until a mate is lost (e.g. separated in a storm) or dies.
2. The length and route of migration depends on their traditional over-wintering area. Once a population has been eliminated from an area it is unlikely that other swans would naturally replace them.
3. Pair bonding happens in the second year but Trumpeters will not usually breed until their fourth or fifth year. A mate is chosen in the over-wintering area before spring migration.
4. Trumpeters will return from their spring migration to the area where they took flight (learned to fly.)
5. Adults return to the same lake and attempt to nest every year.
6. Trumpeters are territorial. Paired swans inhabiting the same lake each year will only tolerate other swans if they are not visible from immediate nesting area. Occasionally, Canadian Geese are a threat.

Pairing

- Trumpeters pair for life unless one dies. Unlike other animals, trumpeters are slow-maturing but will pair well before they breed. This factor is critical when considering transplanting swans to increase their population and expand their range.
- After the first year, (one year olds) they may or may not pair.
- Second year, (two year olds) they pair, usually defend a territory, but will probably not breed.
- Third year, (three year olds) they will defend a territory and may or may not breed.
- Fourth to fifth year, (reproductive mature adults) a pair will usually lay (produce a clutch of eggs.) Note: In Alberta, female Trumpeters have been known to breed as early as 18 months.

Nesting

Nest: Made of reeds, rushes, roots, grasses and sedges lined with swan down. Sometimes built on the top of a beaver lodge, muskrat house or a mat of floating plants. They remove vegetation surrounding the nest (so it is surrounded by water) which results in better protection against predators. A pair will return to the same lake in an attempt to nest year after year.

Clutch Size: The mature female swan generally lays between three and nine eggs. In Alberta, the eggs are laid in early May. One egg is laid every other day until the clutch is finished. The average hatching day in Grande Prairie is June 10; in the Yukon it is July 1. Swans are extremely sensitive to disturbance, especially between mid-April and mid-June. If the disturbance is enough, they may not nest, may abandon their existing nest, or will vacate a lake completely. That is the greatest risk for the eggs and the young (also called cygnets).

Incubation: Only the female incubates the eggs. It lasts between 33 and 37 days beginning in early May. The adults moult (to shed feathers and grow new ones) their flight feathers over the summer and are flightless for about one month. The pen (female) loses her primary flight feathers around the time the cygnets hatch and she is flightless during this most critical time. When she regains her flight, the cob (male) becomes flightless. This timing of the moult allows at least one flying parent to be with the family-group during the brood period (the time when the parents look after hatched offspring).

Cygnets Development: Once hatching begins, most cygnets (young) emerge within a 12 to 18 hour period, weighing 300 grams. About 90% hatch successfully; the average clutch size is five. (On average, two or three cygnets from a

clutch survive to migrate in the fall.) The brood stays in the nest for 24 hours until they are able to maintain their own body heat. The cygnets still have the yolk sac internally attached to their stomachs and it can sustain them for a day or two.

The first weeks are crucial. Cold, wet weather may result in high cygnet mortality. At 28 days feathers appear on their shoulders and under their wings. At about nine or ten weeks, they are fully feathered with grey plumage and yellowish legs and feet. The color of their legs can also be olive or gray-black. They start to attempt flight around 100 to 120 days, mid to late September. When they fly, they are called fledglings. Cygnets become yearlings on their hatch date (first birthday - the following year) in June.

Banding and Transplanting

From a management point of view, the best time to capture, examine and band trumpeters is in August when the male adults are moulting and their flight capacity is limited. At this time they are caught, weighed, sexed and measured. Blood samples are taken to help monitor the health of the population. Swans being transplanted are injected with an anti-parasite drug at the time of banding. Processing takes about 15 minutes.

They are also collared and banded. The collar is made of a colored plastic. Three colors are used for Trumpeter Swans:

- yellow means the swan was collared in Alberta,
- red means it was collared in Northwest Territories and
- green means the swan was collared in the United States.

The adults can be fitted with a radio collar for remote monitoring. The leg band is a specially designed, stainless steel, lock-on band. Trumpeter Swans will remove standard

aluminum leg bands.

Once captured, if their feet are bound together, they will not attempt to run or fly. Swans turn docile when restrained and submit with fairly calm resignation to being handled, poked, and probed. Although on the outside they appear calm, inside their heart rate is high and they are definitely stressed.

Trumpeters can retain visual images and recall events well. Anything that has frightened them becomes deeply imprinted. If they are captured once, they are very elusive after release and difficult but not impossible, to recapture.

Migrations

Fall Migration (departure):

The cygnets must develop well enough to migrate south. Trumpeters are consistently the last to leave remaining patches of open water. They leave at freeze-up time, around late October and early November. They fly directly to the traditional wintering area in the Tri-State region. Tri means three. The three states are: Idaho, Montana and Wyoming.

Most of Alberta's swans winter on the Henrys Fork of the Snake River in the area west of Yellowstone Park. The shallow water lakes and streams do not freeze over entirely because they constantly have an influx of warmer water from geothermal springs. Also, the river water is fast-flowing. Currently, about 2500 trumpeters winter in Greater Yellowstone region. That is not a lot of swans, but it is too many swans in one small area.

Trumpeters like secure, protected areas. Three of Alberta's transplanted Trumpeter Swans migrated to new wintering grounds in the Harney Basin marshes in Oregon. They made it back to Elk Island in the spring. It was thought they followed tundra swans which migrate through Oregon on their way to California.

Spring Migration (arrival):

Spring migration usually begins in mid to late April from the Tri-State area. Swans always return from migration to the general area where they took flight (learned to fly.) This is a key behavior and is considered when transplanting cygnets with their family to new areas. They must be moved before they learn to fly, around 100 days old. They learn to fly in the new transplant site and will return there in the spring. Elk Island National Park is Alberta's transplant site. The parents of those transplanted cygnets, even though they accompanied them to the transplant site, will return to where they learned to fly. In Alberta, this usually means the Grande Prairie area, from where cygnets are transplanted.

Reproductively mature adults (four years old) will find a mate in the wintering site. Remember though, they usually pair earlier, when they are yearlings, second, third or fourth year swans. If the two adults are from different brooding and fledgling areas, the female usually (but not always) decides to which area the pair will return for breeding.

Population Status

There are about:

- 7000 swans in Alaska,
- 2200 summering (breeding birds) in Canada, of which
- 500 of them are in Grand Prairie (there were only 100 in 1946)
- about one quarter of Canada's 2200 trumpeters winter on the Snake River (Henrys Fork)
- about 600 swans are residents in the Tri-State region
- 12,000 inhabit the world today

Grande Prairie produces an average of 100 cygnets a year. In 1992 it was a banner year with 200 cygnets. The Trumpeter Swan is native only to North America, but captive Trumpeters are on display in a number of zoos on other continents.

Habitat

All animals on Earth need a place to live. The Trumpeter Swan has special requirements and they are all arranged just the way swans like them in their habitat. Habitat is the life range and includes the following four basic things:

1. Food

Every species of wildlife has unique food requirements which may change from season to season and as they grow older. The cygnets, shortly after hatching, feed on water invertebrates such as water beetles, snails and freshwater fairy shrimp. The parent swans stir up food for their young as they pull up water plants from the bottom and as they pump the water (also referred to as rapid paddling or paddle-stir) with their large webbed feet causing the bottom morsels (insects) to come to the top. The lakes must be shallow enough for the adult swans so they are able to forage for roots, tubers, lower aquatic plants, large insects and snails. They are not picky eaters but they

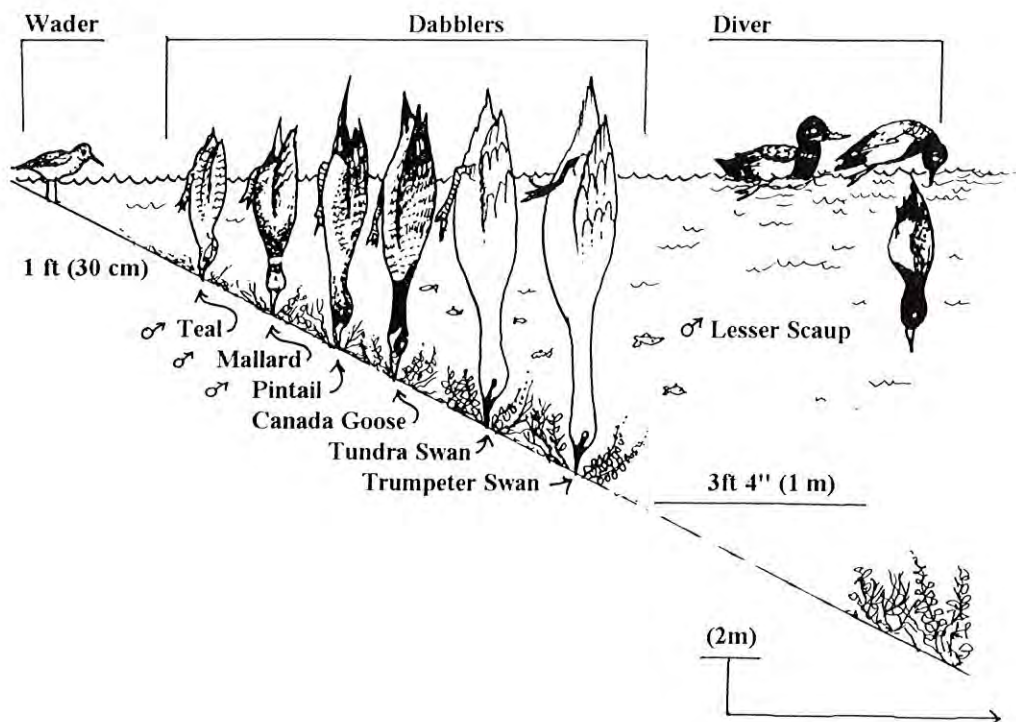
eat a lot. Adults eat up to 9 kg (20 lb) each day, which is as much as a bison eats. If too many swans gather on one wintering area, they can run short of food before the winter is over.

When swans feed on the bottom of the lake it's called dabbling. They turn their head down to put their bottoms into the air. This is called upending or tipping up. Many other birds feed like this too. Some feed on different plants and in different parts of the lake. When swans upend, they feed in deeper water than geese so the limited competition for food allows enough for all.

2. Shelter

Wildlife need shelter or cover to protect themselves from predators and weather and to raise young that will learn to swim and fly. Winter cover is also important. Pairs construct a nesting platform almost always in sedges, cattails or willows. They often use muskrat houses or beaver lodges as a base for their large nest which is about 2 m wide by 2.5 m long. Nesting begins in early May.

They prefer calm, stable water that does not



fluctuate very much. They have a low tolerance for human disturbance. If there is disturbance while nesting, they may abandon the nest. A disturbance could be a hiker passing by, machinery, boats or aircraft. The best lakes have shallow areas in which cygnets may forage, from 0 to 1.2 m deep.

3. *Space:*

Spring, Summer and Fall

Every wildlife species has unique space or territorial needs. During spring, summer and fall the trumpeter swan's nesting territory ranges from 8 to 16 hectares (25 to 40 acres) in size. Wetlands in this size range will normally support one nesting pair. A nesting area can be as small as a 3.6 hectare (8.9 acre) lake (a beaver pond in NWT) or as large as 28 to 60 hectares (69 to 148 acres). Since privacy is a necessity, in the Grande Prairie area usually only one pair will occupy up to a 200 hectare (495 acre) lake. This is a much larger area than swans in other locales. There must be plenty of shallow water filled with marsh plants and water insects to feed a growing swan family.

Winter

The adults and cygnets have a 1280 km (795 miles) migration to the open water of the Tri-State area to the south. The three states in the Tri-State region are Wyoming, Montana, and Idaho. Trumpeters have been clocked flying as fast as 80 kph (50 mph).

4. *Water*

Animals need water all year-round. Trumpeters require open water in which to feed and a long summer season to raise their cygnets. They prefer water about one metre deep but no deeper than 1.2 metres (4 feet) For nesting, they need calm water with little wave action.

They arrive back in Canada as soon as the ice begins to melt (in April) and remain until freeze-up occurs, usually October and November. They stay as late as possible so the cygnets can reach maximum size, strength and flying ability.

ACTIVITY 2:

Life Calendar of Events

Summary

Students will make a 12-month calendar of events about the Trumpeter Swan's life cycle. The finished product should be similar to a regular wall calendar. Students will draw the Trumpeter Swan on the top portion and the 12 months below. The purpose is to help students mentally chart the life cycle of the swan, which will enable them to better comprehend the management and conservation issues.

Each group of four biologists can make its own decision as to when their calendar should start. Following the procedure is a sample of what would be included on a completed calendar, beginning with the month of April, when the swans return on spring migration.

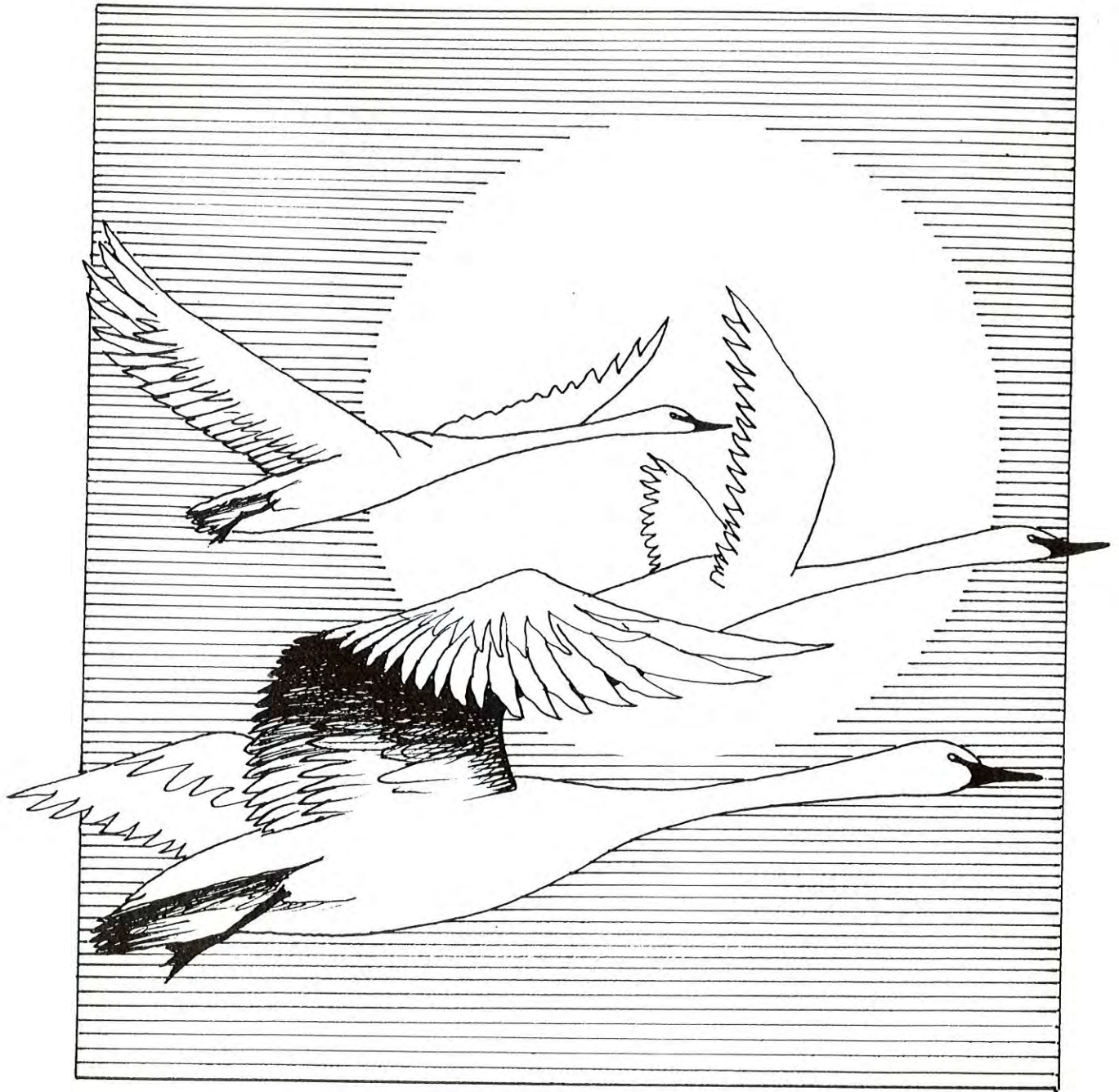
Materials Required:

- copy sheet for Drawing Trumpeter Swan, page 12; one copy per group
- scrap paper for working copies
- drawing materials
- art materials/paper for calendars

Procedure:

1. Have each group glean life cycle events from the Trumpeter Swan Dossier and make a time line using months of the year as heading guides. Their project should resemble the usual wall calendar or have the characteristics of a wall calendar (i.e. chronological events, has a picture, hangs, flips or is on one large sheet).
2. Have each group plan and design their Trumpeter Swan Life Calendar of Events. Use page 12 to copy the Trumpeter Swan for possible artwork. If you have a resource of photographs from old magazines, suggest that students consider them for the calendar picture. Warn your students that they will have to look hard, as there's not much around.
3. Remind them that the calendars will be put on display and their finest work should be represented.

Tip: Before they have finished the final copy, have each group share their calendar of events with each other. Missing details can be put in and then all the information can be neatly written on the final copy. More information may also be added as you progress through this unit.



Trumpeter's Life Calendar of Events - Answers

April

- Arrive back in Grande Prairie (mid to late April)
- Paired and nesting adults claim territory
- Many of the wetlands are still frozen but thawing out.
- Begin nest building (late April - early May)

May

- lay an average 5 to 7 eggs in early May, one is laid every other day
- Incubate for 33 to 37 days
- all the eggs hatch over a 1 to 1 1/2 day period
- 90% of eggs will hatch

June

- June 15 or later is peak hatching period in Grande Prairie. Average cygnet weight is 210 grams.
- cygnets can survive for the first several days because their bodies still carry some of the yolk
- cygnets feed themselves invertebrates for 2-3 weeks. Later, they feed almost entirely on vegetation.
- first weeks are crucial
- cold weather may result in high cygnet mortality
- females moult (shed the flight feathers on their wings). The moult lasts about 30 days.

July

- mid to late July first feathers appear at approximately 28 days.

August

- male adults moult (females did just after cygnets hatched). One flightless parent remains with the family during the brooding period.

- Around 8 to 10 weeks of age cygnets are fully feathered in brownish-gray (this remains until second year)
- Cygnets weigh, on average, 7 kg.

September

- by mid September the cygnets weigh up to 10 kg
- mid to late September when the cygnets are 100 to 110 days old, the parent swans begin bobbing their heads and trumpeting to start flying. The time a young bird learns to fly is called fledging.
- families go on short exercise flights sometimes leaving the lake where the cygnets were hatched.
- capture and transplant 15 to 20 (2 to 3 families) from Grande Prairie to Elk Island National Park per year, before flight capacity is achieved

October

- Grande Prairie trumpeters leave at freeze-up (late October)
- migrating birds travel mainly at night and during the day they stop to feed and rest.
- fly in a staggered line or abreast but rarely in V formations.
- arrive in the Tri-State area in late October/early November and spend the winter on ponds and fast moving water or rivers fed by hot springs.

November

- families further south than Grande Prairie tend to stay longer giving the cygnets time to strengthen their wings for the long flight, often timed just prior to a major storm
- November 16 depart from Elk Island National Park.
- return to Henrys Fork, Tri-State area.
- fly, feed and rest. Stay as a family.

December

- Feed and rest. The young spend more time feeding than adults while adults protect them from potential dangers.

January

- Feed and rest. Stay as a family.

February

- Feed and rest. Stay as a family.

March

- Fly, feed and rest.
- Family unit usually breaks up just before migration.
- Mate is chosen and the female usually decides where to breed.
- Leave Tri-State wintering in early to mid March and migrate through southwestern Alberta near Cardston and west of Calgary to available open water, March 15 to April 30.
- two out of three cygnets will return

ACTIVITY 3:

Test Your Trumpeter Knowledge Challenge

Summary

Students can work together or alone to test their Trumpeter Swan knowledge and wits on a short 10 question challenge.

Materials Required:

- Copy Sheet for *Test Your Trumpeter Knowledge Challenge*, pages 16 and 17.

Procedure:

1. Make one copy for each student or have them work in pairs or their small groups to try the Challenge.
2. Give students a time limit: 10 minutes.
3. Check answers as a class.

Answers to Test Your Trumpeter Knowledge Challenge

1. b; 2. b; 3. c; 4. b; 5. a; 6. b; 7. c A pen is a female swan (the quiz says pin).; 8. b; 9. a; 10. c.

Note: Space number 3 has two questions associated with it. They are questions 1 and 7. When both are answered correctly, the letter C is placed in space number 3. Students do not write the C in twice; it was designed to be a check on the first question.

Solution: BUCCINARE. This Latin word forms part of the Trumpeter Swan's Latin name, *Cygnus buccinator*.

Test Your Trumpeter Knowledge Challenge

Read the following questions and select the answer you believe to be correct. Then place the letter in the numbered box given in your choice. If you get all the correct answers, the solution spells a word. It's a word you may not be familiar with so be prepared to do a few brain push-ups.

1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---

1. A Triumph Display is . . .

- (a) the behavior of a female swan when the first egg hatches. Letter P in space number 6.
- (b) the behavior of a swan pair after defending their nesting territory. Letter C in space number 3.
- (c) the behavior of the strongest male leading the flock on migration. Letter Y in space number 1.

2. A clutch is . . .

- (a) the nest. Letter G in space number 9.
- (b) the group of eggs in a nest. Letter I in space number 5.
- (c) the grip a female places on a predator. Letter M in space number 3.

3. How do adult swans reach their food?

- (a) They dig with their feet. Letter S in space number 4.
- (b) They dive and push up with feet. Letter L in space number 8.
- (c) They dip their head and neck in the water. Letter B in space number 1.

4. Two differences between a Tundra and a Trumpeter Swan are . . .

- (a) the trumpeter is bigger with yellow on the lower bill. Letter T in space number 1.
- (b) the trumpeter is bigger with red on the lower bill. Letter E in space number 9.
- (c) the tundra is smaller with a yellow bill. Letter O in space number 4.

5. What distinguishes the cygnets and yearling Trumpeters from the adults?

- (a) The cygnets and yearlings have grey plumage with pinkish legs and feet. Letter L in space number 5.
- (b) The cygnets and yearlings have grey plumage with yellowish legs and feet. Letter A in space number 7.
- (c) The cygnets and yearlings have brown plumage with yellowish legs and feet. Letter Y in space number 6.

6. What is the average life span for a Trumpeter swan that lives in the wild?

- (a) Twenty years. Letter W in space number 3.
- (b) Twelve years. Letter U in space number 2.
- (c) Six years. Letter V in space number 8.

7. A pin is . . .

- (a) a female swan. Letter F in space number 7.
- (b) a primary feather. Letter P in space number 1.
- (c) a metal fastener. Letter C in space number 3.

8. Where do Alberta's Trumpeter Swans migrate to in the fall?

- (a) They migrate to the Tri-Mester Area. Letter T in space number 2.
- (b) They migrate to Montana, Idaho, Wyoming. Letter C in space number 4.
- (c) They migrate to Montana, North Dakota, Wyoming. Letter D in space number 5.

9. A fledgling is . . .

- (a) a swan taking its first flight. Letter N in space number 6.
- (b) a swan taking its first swim. Letter A in space number 5.
- (c) a swan taking a mate. Letter O in space number 7.

10. A Trumpeter Swan preens its . . .

- (a) nest. Letter Z in space number 2.
- (b) food. Letter T in space number 9.
- (c) feathers. Letter R in space number 8.

Bonus Clue to Solution: The answer is derived from a Latin word meaning blow the trumpet.

ACTIVITY 4:

Glossary Blunderdash

Summary

Glossary Blunderdash is played much the same as the popular board game called Balderdash which is a hilarious bluffing game. This game is a test of students' vocabulary. In Balderdash, players are not expected to know any of the words. In this version, they probably will know some or many of the terms. The game is an entertaining way to learn new vocabulary and to get the students thinking about the subject matter. Depending on the knowledge level of your students, this game may be the first activity in the unit or played before the Test Your Trumpeter Knowledge Challenge.

Materials Required:

- Glossary (22 definitions), page 42 and 43. (Feel free to add others.)
- scissors
- large brown (already used) envelopes
- scrap paper (all cut the same size, 10 cm square, and the same color)
- pencils
- scoreboard or scoresheet, one per group

Procedure:

1. Explain the rules. Divide the students into small groups of 4 to 6. Six is better.

Object of the Game

Each player in the group, except the one controlling the hand (called the Swan), has two things to do:

1. To invent a phony definition for each word in play that could be mistaken by the other players as the correct definition.

2. To identify and choose the correct definition for each word in play.

The student with the greatest number of points after going through all 22 definitions wins Glossary Blunderdash.

Playing the Game

1. Have each definition cut into strips and placed in a pile or in a large envelope. Do one set for each group.
2. Place a pile of scrap paper in the centre of each group. Each player should have a pencil (with eraser).
3. Choose one person in each group to be the Swan. The Swan starts the game by taking one definition from the envelope. The definition is not shown to anyone until the round is over.
4. The play will always go in a clockwise direction. For example, the Swan in the next round will be the player to the left, and play always starts to the left of the Swan.
5. The Swan reads aloud the word to be defined, spelling it if necessary. All players including the Swan, write the word down on a scrap piece of paper.
6. Each player invents a meaning for this word that s/he thinks will bluff other players and writes it down. (a good preparatory concept would be to discuss how definitions are written and their format)

7. Each player initials the paper when finished and passes it to the Swan.
8. While the other players are creating their definitions, the Swan copies the correct or a corresponding meaning from the piece of paper taken from the envelope onto a scrap piece of paper (like the other players).
9. When all the players' definitions are handed to the Swan, the Swan shuffles them in a random order and reads aloud each definition. Tell the Swan not to read the true meaning in a manner that would reveal it. And players should be told to sit still and not say out-loud "That's mine!" or nudge and wink at each other. It's supposed to be secret, but on the up and up.
10. After everyone has had a good laugh, the Swan reads each definition again.
11. The player to the left of the Swan makes a guess which definition s/he thinks is the correct one. The Swan writes the player's initials on the definition selected. After each player has guessed, the Swan reveals the true meaning. The scores are totaled.
12. The player left of the Swan becomes the new Swan and play continues.

Scoring

1 point is given to each player for the votes (or guesses) his/hers definition receives.

2 points are given to each player who chooses the true meaning

3 points are given to the Swan only if none of the players choose the true meaning.

3 points are awarded to any player who submits a definition which is similar or very close to the correct meaning.

Optional: If the Swan receives a definition from a player which is similar or very close to the correct meaning, the Swan should not read aloud this player's definition. Instead, the Swan should put the definition aside and automatically give the player 3 points. The round is played as usual but the player who wrote the matching definition does not take part in the voting.

If the Swan receives more than one definition closely resembling the correct meaning the round is canceled and the Swan chooses a new word.

ACTIVITY 5 :

Mapping Madness

Summary

In their biologist groups, students will map:

- Alberta's nesting sites for the Trumpeter Swan,
- their spring and fall migration routes and
- their wintering sites.

After mapping, students can check their interpretation against an overhead projection of the actual map with the answers. Students will also label the provinces, Alberta towns and cities, the northwestern States, and the states adjoining the Tri-State area.

Preparation and Procedure

Enclosed is a copy sheet for each map. Answers are provided for the teacher should an overhead transparency be required. Have students work together in their biologist groups to locate the sites and mark them on the map.

There are three maps to label:

1. Alberta, map # 1, page 22
2. Western Canada, map # 2, page 24
3. Tri-State Area, map # 3, page 28

Alberta, Map # 1

Biologists have survey routes which cover much of the known and/or suspected breeding areas of the Trumpeter. Wetlands that have a history of breeding swans and others close to these wetlands are given priority when an aerial survey is done.

In 1990, the following areas were surveyed by biologists from a fixed-wing Cessna 185 aircraft:

1. Cardston/Pincher Creek area

2. Edson/Whitecourt area
3. Grande Prairie area
4. Otter/Russell Lakes area
5. Chinchaga/Whitemud Rivers area
6. Elinor Lake area
7. Elk Island National Park area
8. Fawcett Lake area

The Madness (challenge) for Map #1 is: Using Table 1 - 1990 Trumpeter Swan Survey Results, transfer the information from the table onto map # 1(Alberta). Design and include on the map a legend for the data and a Compass Rose (directional arrows indicating N, S, E, W). Since there will be a lot of information recorded on the map, some suggested alternatives for recording the data are:

- have each group record different information, for example, one group records the pairs with brood at each site on their map, another group records pairs without brood on their map and so on.
- color code or use symbols to represent the data at each site. For example,
 - √ means pairs with brood
 - ≈ means pairs without brood
 - † means total (adults and cygnets), and so on
- have groups identify what they want to show on their maps and record that information

Western Canada, Map # 2

Make an overhead transparency of the copy sheet, page 24, Western Canada, Map #2. Have one student in each biologist group copy the range lines from the overhead transparency.

The Madness for Map #2 is: In their groups, have biologists (students) label the provinces and states and determine the locations of the

following three ranges:

- summer range,
- winter range and
- current range expansion.

They should be able to easily figure it out from the information included in the Dossier. For example, they have read that Elk Island National Park and Harney Basin are sites for range expansion, and that Grande Prairie is an old established summering site for the trumpeters. The Tri-State region is the wintering range.

Rotate from one group to the next and listen in. Are they referring back to the Dossier for information to help them figure out where the ranges are? When each group has been verified correct by the teacher, have them color code the ranges and put a legend on the map. To refer to the answers, the map with the three ranges is on page 25, entitled, New Homes on the Range.

Tri-State Area, Map # 3

On page 28 is a copy sheet for the Tri-State area which shows the unlabelled wintering range sites. On page 29 is a map that shows the wintering sites labelled, to verify answers.

Try to find some road maps of Idaho/Montana and Colorado/Wyoming in your school library or from the CAA or AAA (if you are a member). If the mapping resources you have access to are limited, make an overhead transparency of the labeled sites, Map #3, page 29, and have one student in each biologist group label a map from the overhead.

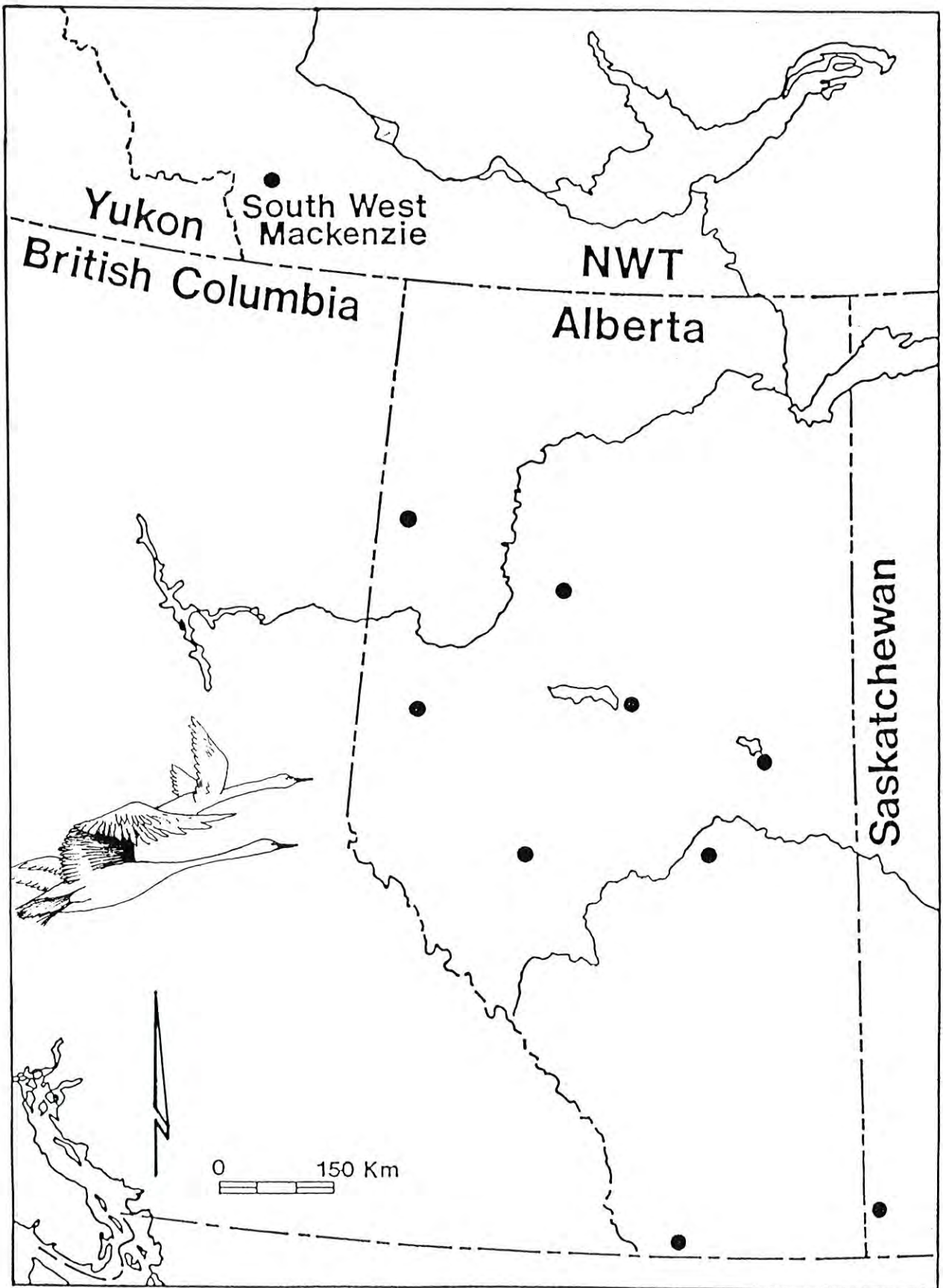
The sites are:

- Lima Reservoir
- Red Rock Lakes Refuge
- Hegben Reservoir
- Henry Lake
- Island Park Reservoir
- Sheridan Reservoir
- Harriman State Park (also called Railroad Ranch)
- Ennis Lake

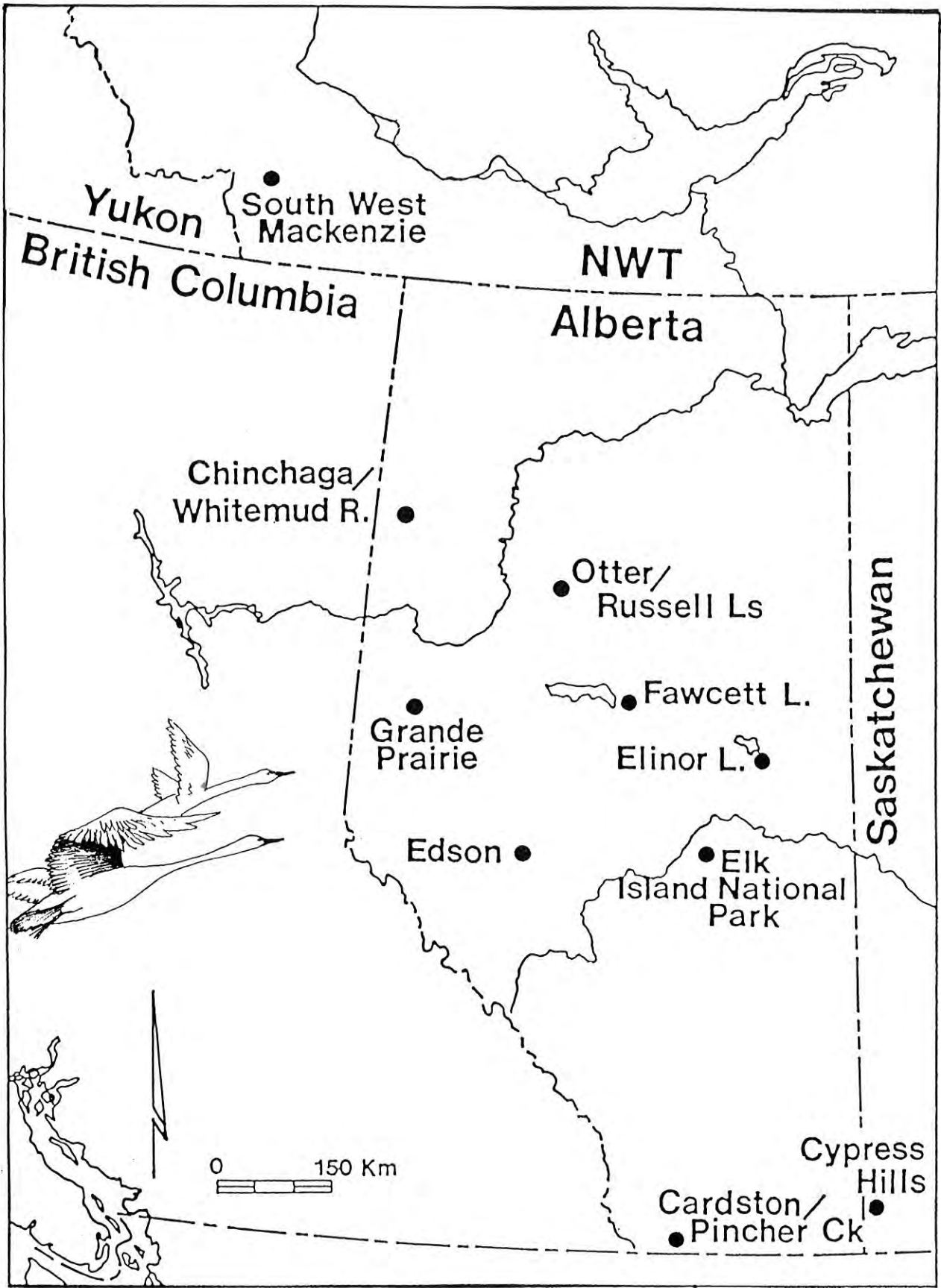
Table 1. 1990 Trumpeter Swan Survey Results

ALBERTA	Pairs with broods	Pairs without broods	Singles with broods	Singles without broods	Flocked adults	Adults subtotal	Total cygnets	TOTAL
1. Cardston/ Pincher Creek	2	3	0	1	0	11	9	20
2. Edson/ Whitecourt	7	0	0	0	0	14	12	26
3. Grande Prairie, Alberta	30	37	0	6	93	233	88	321
4. Otter/ Russell Lakes	1	3	0	2	0	10	3	13
5. Chinchaga/ Whitemud R.	6	8	0	2	3	33	25	58
6. Elinor Lake	1	0	0	0	6	8	6	14
7. Elk Island Park	0	2	1	1	0	6	14	20
8. Fawcett Lake	1	0	0	0	0	2	3	5
TOTAL	48	50	1	11	98	306	160	477

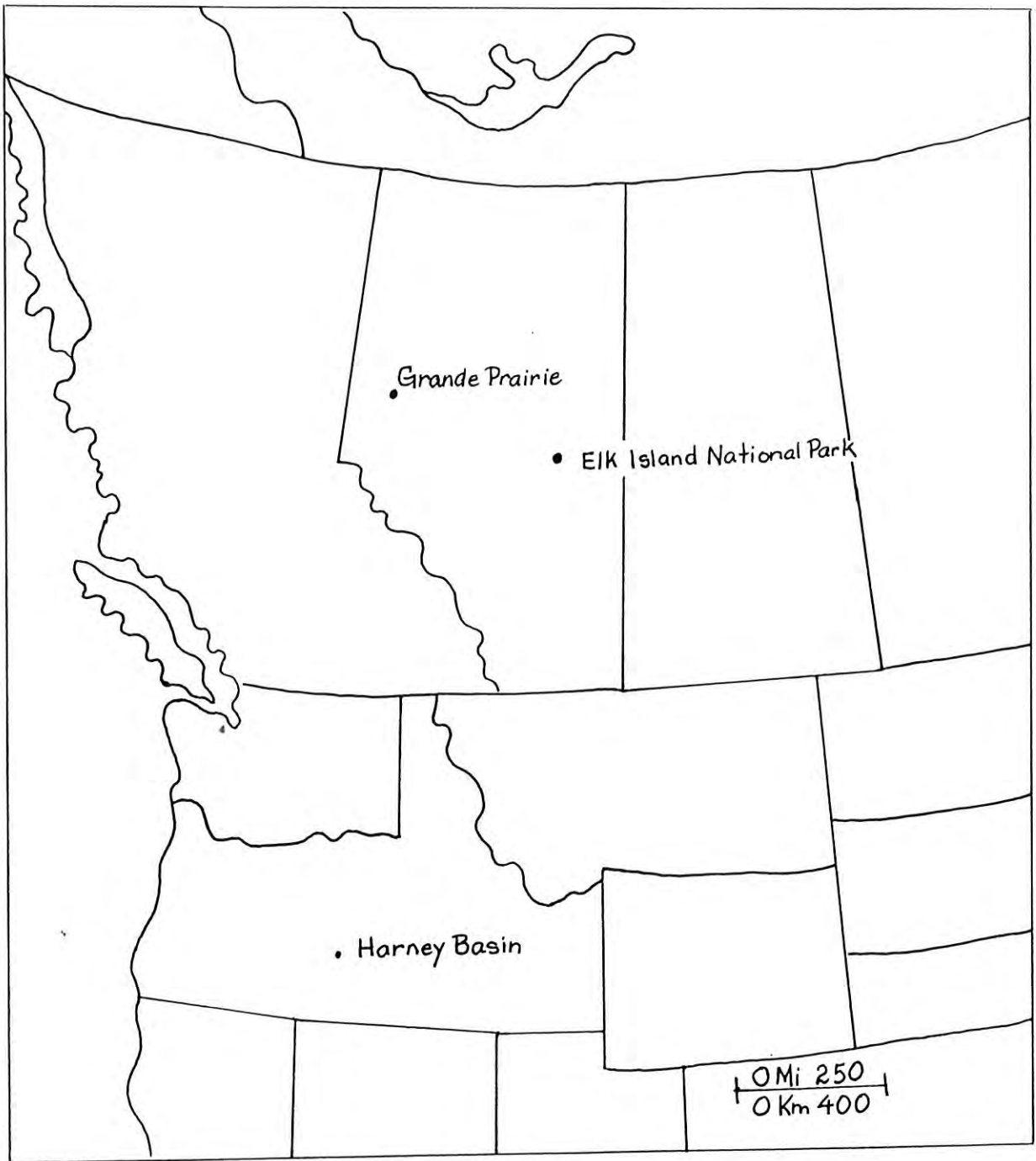
From "A Survey of Trumpeter Swans in Alberta, Saskatchewan and Northwest Territories: 1990. Technical Report Series No. 119 by Leonard J. Shandruk.



Alberta Map #1

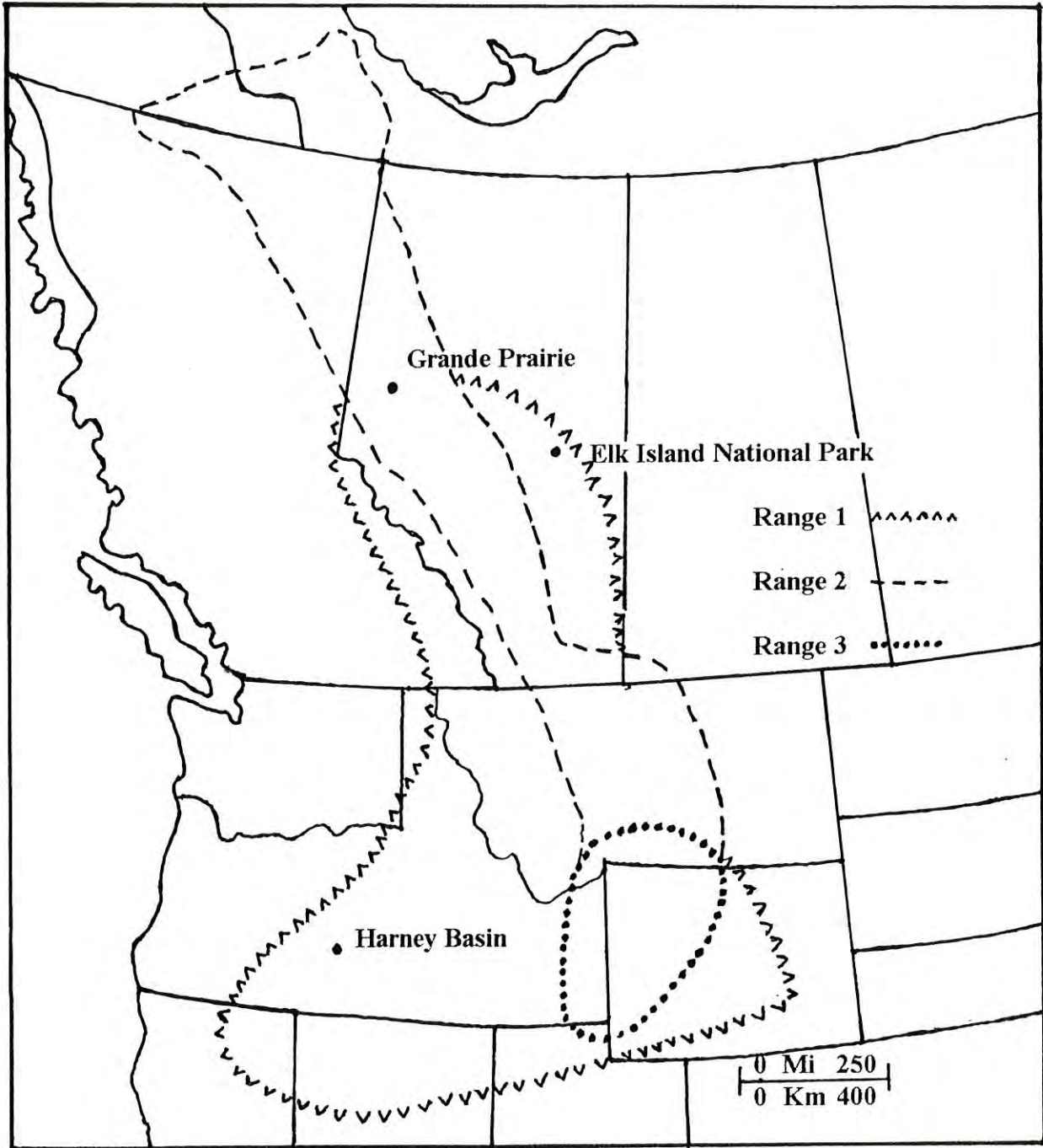


Alberta Map #1 Answers

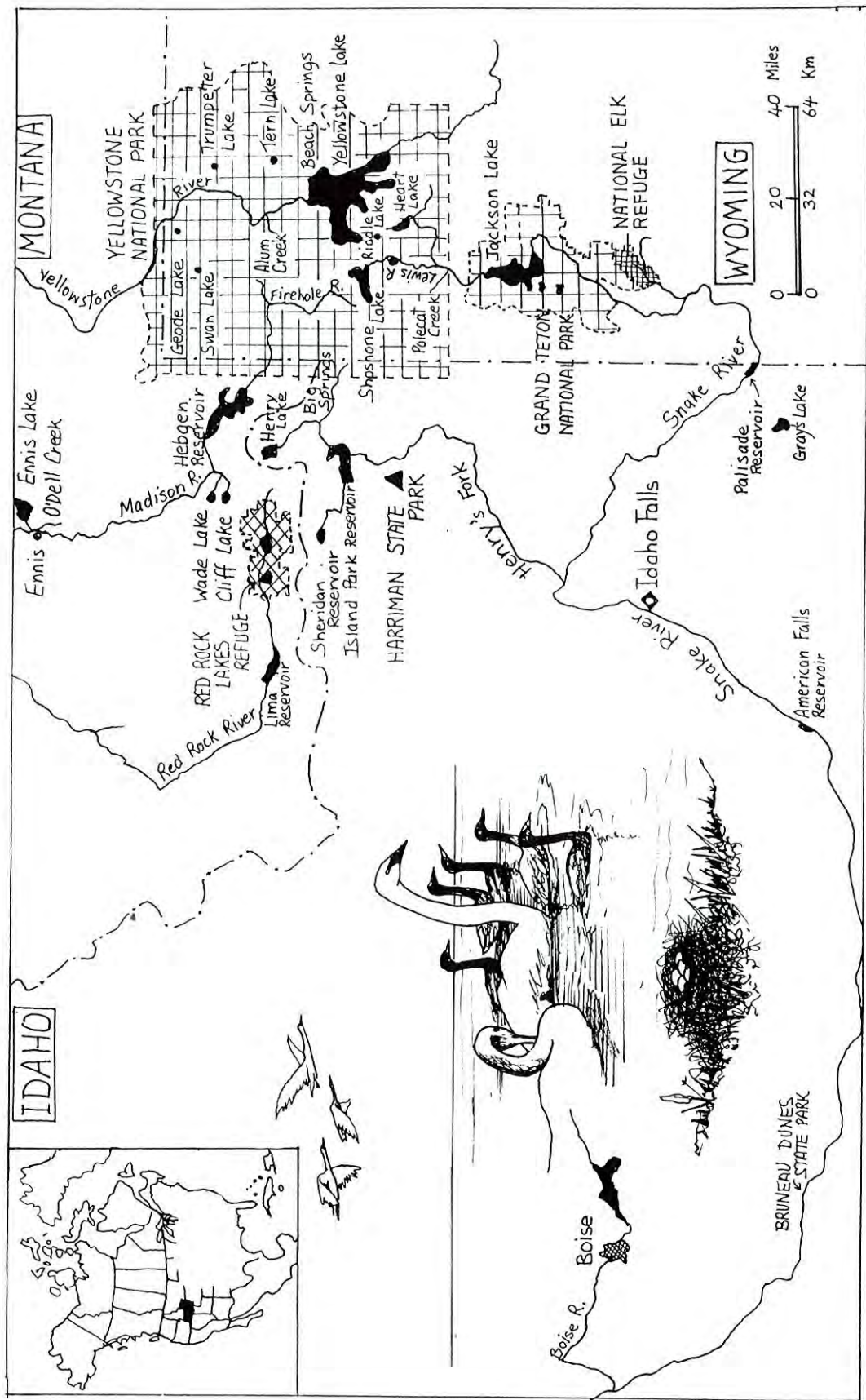


Map #2 Western Canada and United States

New Homes on the Range



Western Canada and United States Answers

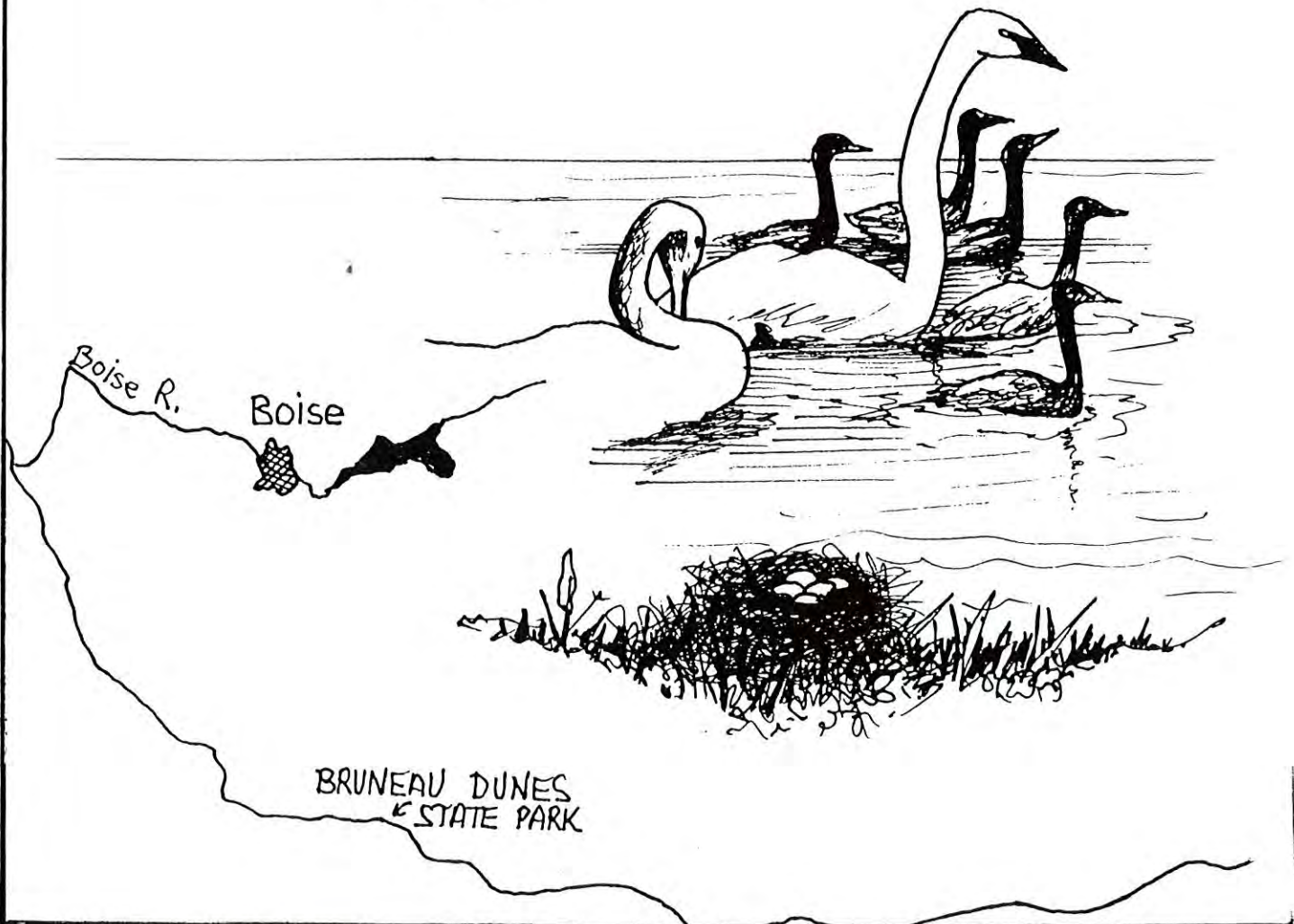


The two maps on the following pages can be pieced together to form one map like the one above. Note that one right hand piece is blank (for students to fill in) and the other is complete.

IDAHO



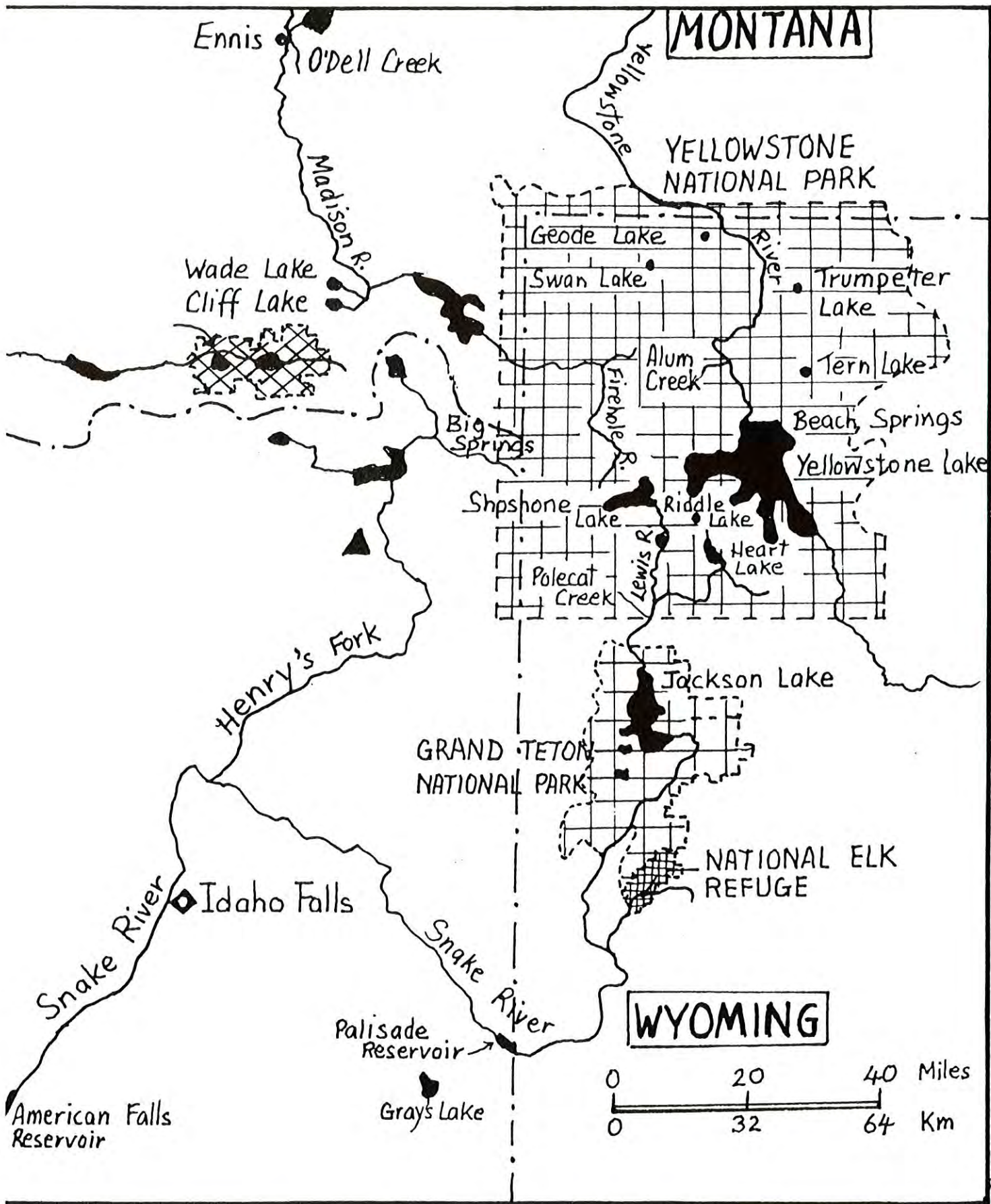
Red Rock R.



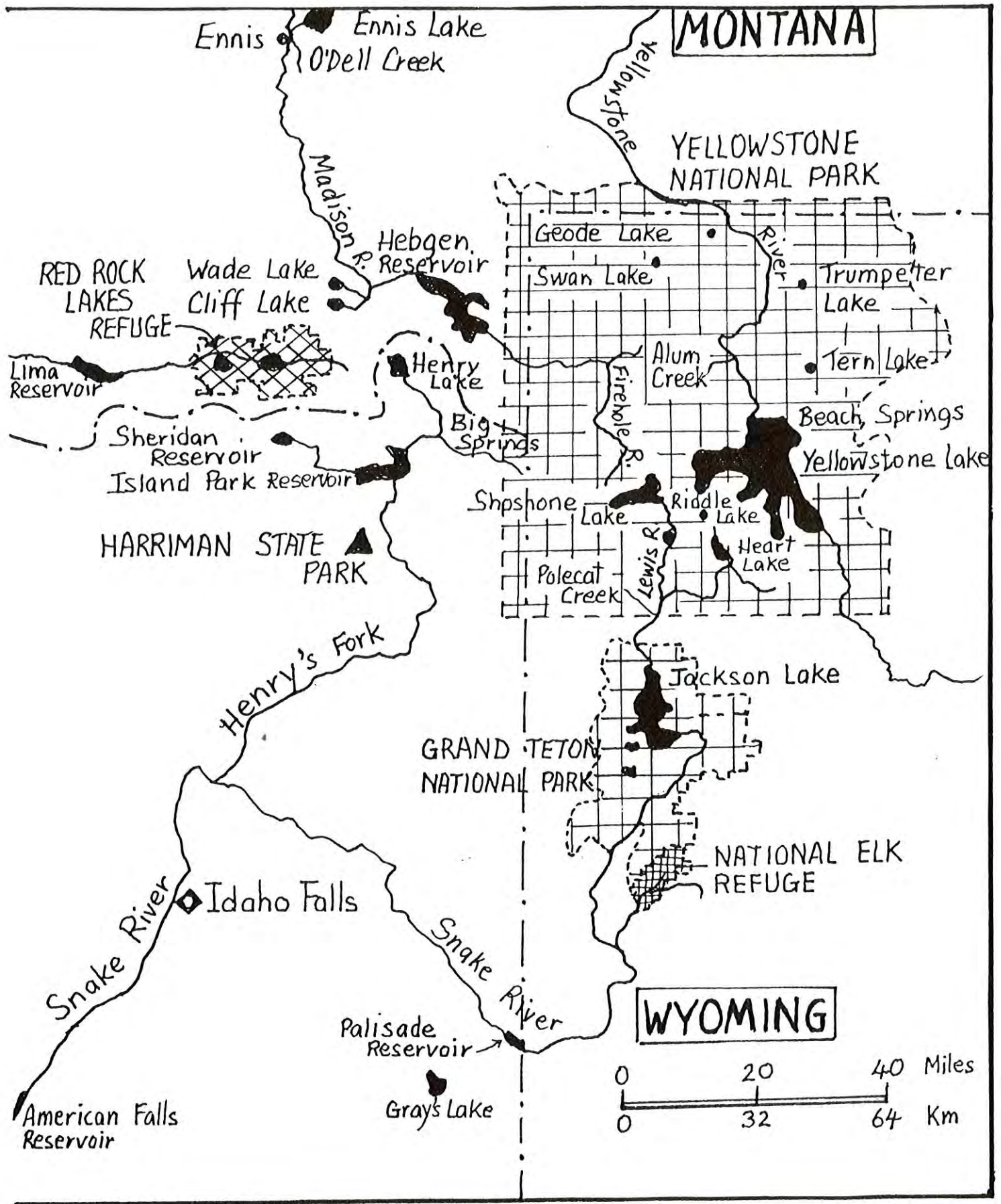
Boise R.

Boise

BRUNEAU DUNES
STATE PARK



Map #3 Tri-State Area, Wintering Range



Map #3 Tri-State Area, Wintering Range Answers

ACTIVITY 6:

Transplant Project

Summary

Students will develop a plan for transplanting swans from the Grande Prairie area to Elk Island National Park. Elk Island is the actual site of the Trumpeter Swan transplant program in Alberta.

Each group of biologists will calculate how long it will take to establish a nesting population of trumpeters in the Elk Island National Park area. Ten breeding pairs make up a nesting population.

Students will be presented with a sheet listing all the limiting factors that affect the trumpeter, entitled, *Limiting Factors*, pages 34 and 35. Students (biologists) in each group will work together using the chart, entitled, *Calculation Chart*, on pages 36 and 37 to statistically calculate the generations of swan, the mortality rate and reproduction while considering the limiting factors.

Answers are on page 38.

Materials Required:

- Copy Sheet, Transplant Program, 1 per student or every 2
- Copy sheet, *Limiting Factors*, 1 per group
- Copy Sheet, *Calculation Chart*, 1 per student
- Map of Alberta, make a transparency
- overhead projector
- calculators, pencils, erasers
- scrap paper

Procedure:

1. Prepare student biologists with the following:
 - refine their understanding of Limiting Factors
 - review the life cycle of the Trumpeter Swan
 - read out loud to the class or copy for their Dossiers, the short articles entitled:
 - *Elk Island National Park: Site of First Breeding Trumpeters Since the 1800s*, page 32
 - *Transplanting - The Real Story*, page 32
 - how to calculate percentages
2. Students have to understand mortality. The definition for mortality rate is death rate; usually expressed in deaths per hundred or percentage. If the mortality rate is 66%, then 66 birds out of 100 die.

Write the two problems (below) on the board.

3. Make a transparency of the Alberta map, page 23, to show the biologists where Elk Island National Park is located (approximately 45 km east of Edmonton on Highway 16).

Problem 1

"Every year two families of Trumpeter Swans totalling of four adults and 15 cygnets are transplanted from Grande Prairie to Elk Island National Park. Cygnets experience approximately 66% mortality their first year of life. The first year includes both fall and spring migrations. After the first year, adults have a 10% mortality rate every year of life for the rest of their life. How many swans will be returning to Elk Island National Park after the fifth transplant?"

Ask students: "What are the limiting factors that contribute to mortality? Why does mortality differ so greatly between cygnets and adults? Do mortality rates vary in the real world?" (Yes, the above rates are only used to demonstrate how numbers affect the swans.)

Problem 2

"How many years until Elk Island National Park will have a nesting population of Trumpeter Swans consisting of 10 breeding pairs?"

Note: The mortality rates used in the Calculation Chart are given only as an example. Mortality rates will vary year to year depending on the limiting factors in play. The mortality rate for the cygnets first year is 66%, although the rate ranges from 50 to 80%. The mortality rate for each year of life after the first year for the rest of their life is 10%, but that also ranges from 10 to 15%.

Have students round off the calculations to the nearest decimal point. Although one will not have 3.6 swans, these fractions become significant over time.

Students will notice that the population begins to accelerate when the transplanted cygnets become mature enough to reproduce (at four years of age) and their cygnets (when four years old) begin to reproduce.

Students begin to pair the swans when they are mature enough to reproduce.

Note: Brother and sister swans do not pair, so you have to wait until the next transplanted cygnets become mature and then begin to pair them (when the first transplant generation is five years old and the second transplant generation is four years old).

Answers: Refer to the Calculation Chart filled in by hand, page 38.

4. Have students, in their groups, compile a written report. This report will act as a back-up for any future transplant programs as well as document the progress of this transplant program. (statistics, record-keeping and documentation are an important part of biologists' work) Write a sentence of two on each generation of transplanted swans. Refer them to the Limiting Factors for some of the causes of their mortality. Each year could present its own set of environmental challenges to the swans and students (biologists) can make educated guesses as to what they are and put them in the report.
5. Presentation time. Each group will present their report to the other groups of wildlife biologists and discuss the various limiting factors, problems and unforeseen factors that had to be dealt with on an annual basis.

Computer Alternative to Calculation Chart

Those students who are fortunate to have access to IBM compatible computers, are double lucky because there is a software program available to make all those calculations easier. It's entitled Leslie Matrix.

The Leslie Matrix can be used with spreadsheet programs Quattro Pro, Lotus 1-2-3 and Excel (or XL.) Students are able to input various data such as: age of swans, different survival rates, the reproductive rate and the computer will compute the number of births and the population each consecutive year. It's the real thing! Biologists use this program to predict population trends up to 20 years. If you are interested in obtaining a copy on disc, see Recommended Resources to Support this Unit section for information.

There are two files on the disc:

1. ASWAN LES L. WKS (for Quattro Pro and Lotus 1-2-3.)
2. SWAN LES L. XLS (for Excel)

ARTICLE 1:

Elk Island National Park: Site of First Breeding Trumpeters since the 1800s

The Trumpeter Swan population was reduced due to loss of habitat and over-harvesting in the early part of this century. Today there are less than 2,000 swans east of the Rocky Mountains. COSEWIC, the Committee on the Status of Endangered Wildlife in Canada has listed the Trumpeter as Vulnerable. In 1983 a re-introduction program was initiated at Elk Island because of available and suitable habitat and protection by National Parks legislation.

The largest breeding swan population in Canada breeds in the Grande Prairie area and migrates for winter to the Tri-State area (Montana, Wyoming and Idaho). If a catastrophe on the summer or winter grounds were to happen, most of the population of Alberta's Trumpeter Swans could be wiped out. A transplant program was designed to restore the Trumpeter back to a portion of its historical breeding range and to diversify migration and wintering traditions.

Since 1987, ten families have been relocated from Grande Prairie to Elk Island. So far, two cygnets have returned in 1988 and 1989. Their return was the first successful transplant. In 1990 one of the males had paired with a female from an unknown origin and became the first breeding Trumpeters in the Elk Island area since the 1800s. In 1993 almost a dozen swan summered in the Park. It is anticipated that 24 Elk Island trumpeters will migrate in fall 1993.

Elk Island National Park 1994 Update:

Seven yearlings (transplanted cygnets) returned to the Park but then went somewhere else outside the Park. Eight others returned (four pairs) to the Park. None are nesting.

ARTICLE 2

Transplanting - The Real Story

The transplant program in Alberta was developed by Len Shandruk, a wildlife biologist with Canadian Wildlife Service, Environment Canada. The transplant theory rests on the traditional nature of the birds. Swans return from spring migration to the place they took flight or learned to fly. If you transplant the cygnets (with adults to maintain the family unit) before they learn to fly, then they should return to the relocation site. In Alberta, swan families are transplanted from Grande Prairie to Elk Island National Park.

A family unit is captured when one of the adult swans is still in moult. The prop wash (downward pressure from the helicopter propeller) makes it hard for the birds to escape. In daring aerial captures, each swan is scooped up in a long-handled salmon net; further processing takes place back on land. There they are collared, banded and put into holding cages (large travelling cages for dogs) in a horse trailer for the seven-hour drive to Elk Island. They are closely monitored after release at a predetermined site in the Park. They are checked to see if the family is feeding and staying together.

ARTICLE 3

Future Challenges for the Trumpeter

The wintering habitat is a *weak link* that limits expansion of the Rocky Mountain population. New wintering grounds have to be found and secured. Then the swans have to be forced to try these new areas. Swans are reluctant and unwilling pioneers to new areas. Efforts are being made to reduce their dependence on winter habitats in the Harriman State Park, Henrys Fork of the Snake River, and Red Rock Lakes National Wildlife Refuge. Hazing is one method; it involves people on skis, snow machines or in

helicopters putting the swans to flight thereby forcing them to seek other open water in the region. Some swans are captured and transferred to other lakes. The swans have to learn to migrate further southward, out of the Tri-State area.

In the 200 years that brought a dramatic decline in Trumpeter numbers, knowledge about their former migratory patterns was lost. In other words, the Swan's memory or knowledge of where to migrate was lost (erased). The flyway traditions were gone. The only traditions that remained were those that brought surviving swans to Grande Prairie and Yellowstone. Even as the numbers increase, they keep going back to the Tri-State ecosystem because they know no other wetland. Now the winter grounds cannot sustain the growing population.

The challenge is to expand their knowledge of other wetlands within their traditional range by increasing their breeding (through transplants) and wintering sites (by hazing.)

Transplant Program

Purpose of Wildlife Biologist Groups:

To increase the range of the Trumpeter Swan by extending their breeding range. This will primarily be accomplished by transplanting families from a traditional breeding ground, Grande Prairie, to a new locality in Elk Island National park.

Prime Goal:

To preserve the existing habitat necessary to hold the substantial population gains made in recent years. In addition to the important requirement of transplanting to favorable and secured habitat, sufficiently protected wintering waters must also be provided.

Factors to Consider

1. Spring Migration

Swans always return from migration to where they learned to fly. This is a key behavior and is considered when transplanting cygnets with family to new areas. They must be moved before they learn to fly, just before 100 days old. They are captured, relocated and learn to fly at the new transplant site. If the cygnets survive the migrations and the winter, they will return to the transplant site in the spring. The parents of those transplanted cygnets, even though they accompanied them to the transplant site and taught them to fly, will return to where they learned to fly, which is the Grande Prairie area.

2. Pairing

Trumpeters pair for life unless one dies. Unlike other animals, trumpeters are slow-maturing and will pair well before they reproduce. This factor is critical when considering transplanting swans to increase their population and range.

- after the first year (yearlings), adults may or may not pair
- second year (two year-olds), they pair and usually defend a territory, but will probably not reproduce
- third year (three year-olds), they will defend a territory and may not reproduce
- fourth or fifth year (adults), a pair will usually reproduce

3. Mortality

There is a high mortality rate during their first year and migration which ranges from 50 to 80%. Only one out of every three cygnets will survive through their first year to reach adult age. And the mortality rate for each year after their first year, for the rest of their lives, is 10 to 15%.

TASK

Your job is to establish a successful nesting population (10 nesting pairs) of Trumpeter Swans at Elk Island Park. Calculate how long that will take.

Compile a written report. This report will act as a back-up for any future transplant programs as well as document the progress of this transplant program. Write a sentence or two on each generation of transplanted swans. What were the causes of their mortality?

Present your report to the other groups of biologists and discuss the various limiting factors and problems that had to be dealt with on an annual basis, and any unlucky situations.

Limiting Factors

Size of Wintering Area - The Rocky Mountain population of trumpeters is vulnerable to high winter mortality because its winter range has diminished. Over 90% of the population congregates in the Tri-State area (west of Greater Yellowstone). Mortality from a disease outbreak or a severe winter could affect all the breeding flocks of western Canada as well as the local swans that live in the Tri-State area all year.

Food Shortages - In February 1989, 100 swans died in the wintering area due to a freeze up of feeding sites in the Tri-State area. Vegetation at some wintering sites is no longer adequate to sustain growing flocks throughout the winter. The carrying capacity of the winter habitat has declined due to over-use by feeding swans. Artificial feeding programs have been terminated.

Starvation accounts for many deaths. They die when they remain on their feeding ground too long and become so weak they are unable to struggle free from the frozen water.

Natural Predators - Coyotes, mink, eagles, great horned owls, raccoons, ravens, otters, gulls. Cygnets are subject to most hazards such as predation, being trampled by clumsy parents, becoming entangled in plants, becoming immobilized by mud sticking to their feet, drowning when they venture to feed on their own for the first time, or suffocation when leeches enter their air passages through nostrils.

Accidents:

1. Illegal shooting - Shot for trophy or vandalism.
2. Mistaken Identity - Trumpeters look like the Tundra Swan. From a distance they are mistaken for Snow Geese. It is legal to shoot Tundras in most parts of Montana. **Freeze Out Lake, Montana, has a legal open season to shoot Trumpeter Swans.** Illegal shootings occur chiefly during the open waterfowl season in Idaho on the Snake River and its tributaries and in Montana and Wyoming. The U.S. government began imposing stiffer fines on those who accidentally shoot Trumpeters. **It is illegal to shoot Trumpeters anywhere in Canada.**
3. Lead Poisoning - Swans are dabblers and feed of the bottom of shallow lakes. Lead poisoning is caused by the ingestion of lead shot in areas that have been heavily shot over by hunters.
4. Collisions with power transmission lines, overhead wires and fences on takeoffs and landings are threats.
5. Drowning can occur while feeding (dabbling) due to their head and neck getting caught in fences that cross waterways.

Habitat Loss - due to continued expansion of human populations and their activities. This has resulted in more swans being pushed into smaller, unsecured habitat, and habitat that is

less than ideal. Trumpeters prefer secluded and secure areas.

The issue of habitat loss is particularly critical around existing summering and wintering areas because these are the sites they now depend on. A system of protected areas throughout their traditional range will have to be maintained to ensure their long-term survival and expansion.

Human Disturbances - Human intrusion is the greatest cause of egg failure and the Trumpeters are particularly sensitive mid April to mid June. In heavily farmed areas like Grande Prairie, farmers sometimes cultivate too close to wetland habitats. Farming activity during breeding season disrupts breeding behavior. Constant noise from hikers, low flying aircraft, vehicle travel or nearby oil and gas exploration or construction can also disturb swans.

Genetic Deformities - Cygnets are occasionally hatched with deformed feet. They are not able to walk or swim and eventually die.

Weather - Unseasonable cold weather affects hatching success and cygnet survival. If there were a late hatching, there may be some loss due to ice forming earlier than usual.

The formation of ice over normally open wintering water areas will prevent adult swans from feeding in their traditional locations. If the ice remains for a prolonged time, starvation may result because the adults are reluctant to move out of the region to areas where food might be available. Artificial feeding is considered during these situations.

The icing of swans' plumage during severe winter weather has also been reported as a cause of death. The overall health of a swan is definitely related to the water-shedding capacity of a swan's plumage. Low food supplies play a determining role in these cases.

Parasites*

- flukes enter their bowels
- tapeworm (the worst for swans)
- feather lice in plumage
- leeches, a nuisance to adults but sometimes lethal to cygnets
- botulism from dabbling in mud full of poisonous bacteria (salmonella) causing food poisoning.

Disease

- fowl cholera
- avian tuberculosis

Calculation Charts - Trumpeter Swan Transplant Program

Step #1

Complete Chart #1 to familiarize yourself with calculations.

Question: 1. Circle the year in which the transplanted swans are able to nest (breed).

Chart #1: Becoming Familiar with Transplant Calculations

Transplant Year (Autumn)	Number of Transplanted Cygnets	Number surviving first year (66% mortality rate). Multiply number transplanted by 33% (.33); round to nearest tenth for # surviving. 1988 is 1st year for 1st transplant	Number of Swans Surviving Each Year											
			Factor in 10 % mortality rate. Multiply number of swans in one year by 90% (.90) to get the number of swans that survive to the next year.											
			1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1987														

Step #2

Complete Chart #2. Transfer figures from Chart #1 to get you started.

Questions: 1. How many swans will be returning after the fifth transplant, and what year will that be?
 2. How many years does it take to establish a nesting population of 10 breeding pairs of Trumpeter Swans in the area of Elk Island National Park?

Chart #2: Transplants and Surviving Swans

Transplant Year (Autumn)	Number of Transplanted Cygnets	Number of Swans Surviving Each Year												
		Factor in 66 % mortality rate for first year, and 10% mortality rate for each successive year.												
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1987														
1988														
1989														
1990														
1991			4											
1992														
1993														
1994														
1995														
1996														
1997														
1998														
1999														

Tips and Bits of Information

Round off all calculations to the nearest tenth.
 e.g. 4.01 to 4.0 4.15 to 4.2
 3.609 to 3.6 2.98 to 3.0

.....
 • Transplants occur in the **fall**. When asked to calculate
 • *after* a transplant, use figures from the **spring**, which
 • would be the following year.

One never finds 3.6 swans, but the calculation works out in the end; statistically, "0.6" swans is significant.

.....
 • The transplant program really begins to accelerate
 • after transplanted cygnets become nesting adults.

Step #3

Complete Chart #3. Although the chart begins in 1989, you will need to determine (from Chart #2) the year cygnets are born to transplanted swans. When calculating the number of pair, if your answer involves a fraction, such as 2.7 pair, round it down to 2 nesting pair, because .7 is not a full nesting pair (column 2, Number of Nesting Pair). Continue rounding to tenths for *survival rates* though.

- Questions:**
1. What is the first year that these cygnets, born to transplanted swans, are able to mate and nest (breed)?
 2. How many pair are there in that year (from question #1)?
 3. How many breeding pairs of swans would be in the area of Elk Island National Park in the year 2000? You will need to calculate the number of transplanted cygnets (chart #2) and cygnets born to transplanted cygnets (chart #3).
 4. Based on the answer you calculated for question #3 (above), how many cygnets would be born in the year 2000?

Chart #3: Factoring in Number of Cygnets born to Transplanted Swans

Year	Number of Nesting Pair	Number of resulting cygnets (hatched)	Number of Cygnets Born to Transplanted Swans Surviving Each Year Factor in 66 % mortality rate for first year, and 10% mortality rate for each successive year.											
			1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	
1989														
1990														
1991														
1992														
1993														
1994														
1995														
1996														
1997														
1998														
1999														

More Tips and Bits of Information

Remember: Look at transplant chart #2 to determine what year the "now adults" can nest. They will be nesting and reproducing in the same year they are able to. Start calculations from the spring population; not the fall.

Percentages used in mortality rates (66% first year; 10% each year thereafter) are averages. In "real-life", these rates may change from year to year.

Remember, adult swans nest when they are 4 years old.

Pitfalls of this model:

- a freak storm could set back the transplant program by one year.
- number of swans returning may be lower than expected, depending upon the limiting factors affecting the swans.

- Some assumptions:**
- all five eggs successfully hatch and the cygnets are healthy
 - there are an equal number of cobs and pens

Answers to Calculation Charts - Trumpeter Swan Transplant Program

Step #1, Chart #1

Answer: 1. Transplanted swans are of age to nest in 1991 - but won't until 1992, because brothers and sisters do not mate.

Step #2, Chart #2

Answers: 1. The fifth transplant will occur in 1991; so in 1992, 20.6 swans will be returning.

Read 1992 down: $3.3 + 3.7 + 4.1 + 4.5 + 5$

2. It will take 11 years to establish 10 breeding (nesting) pairs. It will take from 1987 to 1998.

Chart #2: Transplants and Surviving Swans $3.3 + 3.7 = 7.0 \div 2 = 3.5$
3 pair can nest.

Transplant Year (Autumn)	Number of Transplanted Cygnets	Number of Swans Surviving Each Year												
		Factor in 66 % mortality rate for first year, and 10% mortality rate for each successive year.												
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1987	15	5	4.5	4.1	3.7	3.3	3.0	2.7	2.4	2.2	2.0	1.8	1.6	1.4
1988	15	X	5	4.5	4.1	3.7	3.3	3.0	2.7	2.4	2.2	2.0	1.8	1.6
1989	15	X	X	5	4.5	4.1	3.7	3.3	3.0	2.7	2.4	2.2	2.0	1.8
1990	15	X	X	X	5	4.5	4.1	3.7	3.3	3.0	2.7	2.4	2.2	2.0
1991	15	X	X	X	X	5	4.5	4.1	3.7	3.3	3.0	2.7	2.4	2.2
1992	15	X	X	X	X	X	5	4.5	4.1	3.7	3.3	3.0	2.7	2.4
1993	15	X	X	X	X	X	X	5	4.5	4.1	3.7	3.3	3.0	2.7
1994	15	X	X	X	X	X	X	X	5	4.5	4.1	3.7	3.3	3.0
1995	15	X	X	X	X	X	X	X	X	5	4.5	4.1	3.7	3.3
1996	15	X	X	X	X	X	X	X	X	X	5	4.5	4.1	3.7
1997	15	X	X	X	X	X	X	X	X	X	X	5	4.5	4.1
1998	15	X	X	X	X	X	X	X	X	X	X	X	5	4.5
1999	15	X	X	X	X	X	X	X	X	X	X	X	X	5

10 breeding pair

24.1

Step #3, Chart #3

Answers: 1. The first year in which cygnets of transplanted swans are able to nest with others cygnets of transplants is 1997.

2. In 1997, $3.3 + 6.1 = 9.4$ 9.4 divided by 2 = 4.7 Therefore, there are 4 pair in 1997. (.7 of a swan can't mate)

3. 24.1 (chart #2) + 30.1 (chart #3) = 54.2 54.2 divided by 2 = 27.1 There would be 27 breeding pair in yr. 2000.

4. In the year 2000, according to calculations and statistics, 27 pair, hatching 5 cygnets each, would yield 135 cygnets. ($27 \times 5 = 135$).

Chart #3: Factoring in Number of Cygnets born to Transplanted Swans

Year	Number of Nesting Pair	Number of resulting cygnets (hatched)	Number of Cygnets Born to Transplanted Swans Surviving Each Year							
			66 % mortality rate first year, and 10% mortality rate each successive year.							
			1993	1994	1995	1996	1997	1998	1999	2000
1992	3	15	5.0	4.5	4.1	3.7	3.3	3.0	2.7	2.4
1993	5	25	X	8.3	7.5	6.8	6.1	5.5	5.0	4.5
1994	6	30	X	X	9.1	8.9	8.0	7.2	6.5	5.9
1995	7	35	X	X	X	11.6	10.4	9.4	8.5	7.7
1996	8	40	X	X	X	X	13.2	11.9	10.7	9.6
1997	9	45	X	X	X	X	X	14.9	13.4	12.1
1998	10	50	X	X	X	X	X	X	16.5	14.9

30.1

not old enough to breed

ACTIVITY 7:

Displays

Summary

Each group will make a display from the above activities and find a place to post it so others may learn. They may decide to use the calendar of life events, migration and range map, pictures, mobiles with paper swans, to convey the messages. Potential display sites could be the school hall or library, classroom, local mall or restaurants, community hall or presentations at local Scout or Guiding troops.

Materials Required:

- copy Sheet for Trumpeter Swan Mobile
- completed Swan Life Calendars
- Character Dossier
- labelled maps
- limiting factors, pages 34 and 35
- transplant program - written reports
- any pictures to enhance the display

Procedure

1. Have each group of biologists determine where they would like to post their Trumpeter Swan display. Have groups obtain permission early in this unit. For example, a library window display box may already be planned by the library months in advance and a courtesy to the staff, it would be nice to ask permission for the space as early as possible.

Note: Consider posting the displays during a special week such as .Wildlife Week held in April or Environment Week held near first week in June.

2. Go through the 5 Ws. . . Who, What, Where, When, and Why.

Who?	To the general public.
What?	A display about the Trumpeter Swan.
What?	A series of graphics, short texts, drawings and a mobile.
Where?	In an approved space where the greatest impact will be.
When?	Anytime during the year, consider Wildlife or Environment Week.
Why?	To educate the public about one of Alberta's natural resources. The Trumpeter Swan needs some publicity and public support to save their habitat. If we don't tell others, who will? We can't keep the Trumpeter Swan all to ourselves.

Don't forget to answer "How," too. "How can the average person living in your community help the Trumpeter Swans?"

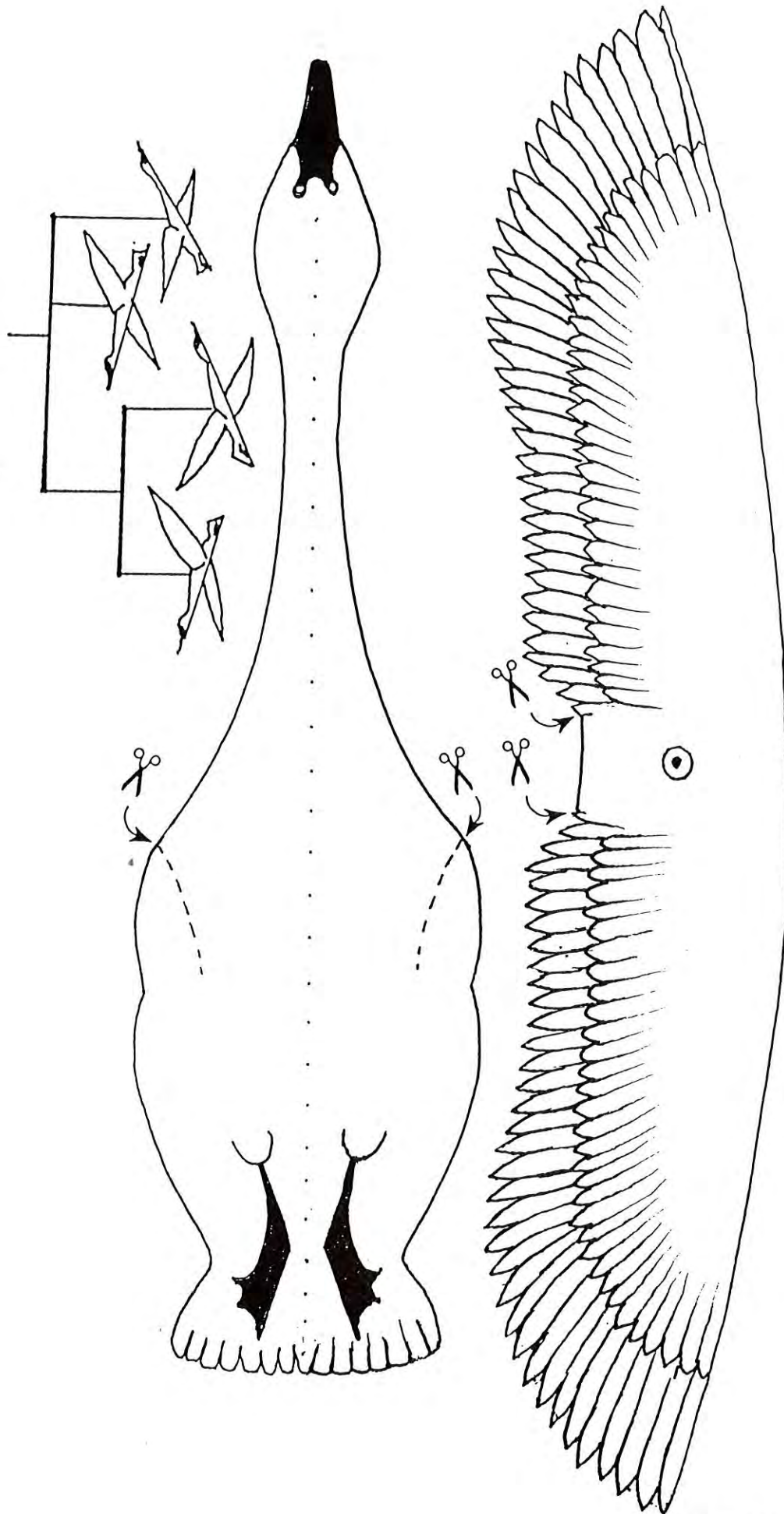
Trumpeter Swan Mobile

Materials Required:

- thin white cardboard or paper
- scissors
- pencil
- needle and thread (any color)
- coat hangers, one to two per mobile
- wire cutters
- glue, tape

Procedure:

1. Have groups plan the swan mobile on paper first. Calculate how many swans are required and the length of wire. How many are needed on one side to balance the other?
2. Trace the patterns on to the cardboard and cut out. Make as many as required.
3. Fold the swan body lengthwise along the dotted line. Fold the wings along the dotted line too.
4. Cut the other two sets of dotted lines which will be the slots for the wings.
5. Fold the body. Fit the slots on the wings into the body slots.
6. With needle and thread, pass through the hole in the centre of the wings. Tie a knot and glue or tape to wings. Cut thread the desired length. Glue the wings in place if desired.
7. Cut the coat hanger into lengths needed. Straighten if necessary and tie the swans to the wire. Tie the wires to each other.
8. Hold the main thread and adjust the swans and wire until the whole mobile balances. Glue the threads in place (unless you want to figure out the balance points again and again!) Display the mobile with the rest of your Trumpeter Swan materials.



ACTIVITY 8:

What Are You Going to Do?

This activity provides a wrap-up for the Trumpeter Swan unit with a list of ideas and suggestions for students to help threatened species. These suggestions will stimulate some thought and encourage students to further develop a sense of personal responsibility and to recognize the necessity to take personal action.

1. Support local efforts to restore the Trumpeter Swan. Raise money and donate funds to the Trumpeter Swan Transplant program at Elk Island National Park.
Trumpeter Swan Conservation Project
c/o Friends of Elk Island Society
Site 4, R. R. #1
Fort Saskatchewan, Alberta
T8N 2N7
2. Educate others. Blow your horn! Tell family, friends, relatives, politicians what you know about the Trumpeter Swan. What can they do to help the Swan?
 - Be respectful of the habitat when outdoors.
 - Go green to lessen impacts on the environment.
 - Clean green! Reduce your use of commercial cleaning products that end up down the drain and into water systems.
 - Learn more. Go outdoors, visit parks and participate in programs about wildlife. Then you'll know what you can do for the Trumpeter.
3. The Trumpeter Swan Society is an international (Canada and United States) nonprofit organization established in 1968 to help protect and restore the Trumpeter to

as much of its original range as possible.

Contact:

The Trumpeter Swan Society
3800 Country Road 24
Maple Plain, Minnesota
United States 55359
Tel: 612-476-4663
Calgary, Alberta
T2P 1H5
Tel: 294-7064
Fax: 265-8263

4. There are several organizations in Alberta and Canada dedicated to conserving habitat and helping wildlife. Encourage students to research several organizations to learn about what they do. Compare notes to see what organization you wish to support or work with.

Two reference books that may be useful are listed below.

The Alberta Environmental Directory, 7th Edition - 1995, ISBN 0-921719-11-6.

Available from:
The Pembina Institute
Box 7558
Drayton Valley, AB T7A 1S7
Tel: 542-6272
Fax: 542-6464

The Canadian Environmental Directory, 94/95 - 4th Edition

Available from:
Canadian Almanac and Publishing
Company Ltd.
225-55 St. Clair Avenue West
Toronto, ON M5W 2J8
Tel: (416) 972-6645

Glossary

Breeding - All behaviors associated with reproducing cygnets (courting, copulation, laying, incubation, brooding, fledging).

Brood - hatched offspring cared for by the parents

Carrying Capacity - a term used to describe a balance expressed by the number of animals that can live in a certain amount of habitat. For example, the carrying capacity of winter habitat may be defined (limited) by the amount of food in the winter habitat area. The habitat has the *capacity* to support only so many swans.

Clutch - the number of eggs laid per laying

Cob - a male swan

COSEWIC - Committee on the Status of Endangered Wildlife in Canada. This committee is responsible for producing the official Canadian List of Species at Risk. COSEWIC reviews scientific status reports about species suspected of being in danger and assigns it in one of five categories: vulnerable, threatened, endangered, extirpated, and extinct.

Cygnets - a swan less than one year old

Fledging - taking the first flight

Habitat - the combination of food, shelter, space and water that is necessary to meet the needs of a particular animal.

Lay - produce a clutch of eggs

Legend - an explanatory title accompanying a map, chart or illustration.

Limiting Factor - a feature in the environment that limits the size of a particular population

Migration - to move to a different area at different times of the year, either to breed or to spend the winter

Mortality Rate - the death rate

Moult - to shed feathers and grow new ones

Pen - a female swan

Staging - a term used to describe the gathering of some bird species before migration or dispersal. Ducks, swans and geese will collect and come together before migration and after migration too before they break up and disperse. A stop-over during migration could also be considered as staging.

Survival Rate - the number that continue to live

Tri-State - the area where most of Alberta's Trumpeter Swans migrate to in the fall. They over winter in an area called the Tri-State region. Tri means three. The three states are: Idaho, Montana and Wyoming.

Triumph Display - the behavior of a swan pair after defending their territory

Transplant - an animal moved to a new area

Vulnerable - a species at risk because of low or declining numbers

Waterfowl - water birds

Recommended Resources to Support this Unit

Audio Visual

Field Identification of Trumpeter, Tundra and Mute Swans. Martha Jordan. Colored slides with manual audio tape, 1993. 35 minutes. \$75. plus \$5. Shipping, U. S. dollars.

A slide carousel containing 45 slides designed to improve field identification of three swan species. An audio cassette is included. Teachers manually advance slides at the sound of a tone. An eight-page hard copy of the narration is also provided. Students and teachers who live in areas near swans would benefit the most.

Available for purchase from:
Martha Jordan
14112 - 1st Avenue West
Everett, Washington
U. S. A. 98208
Tel: 206-787-0258

Reluctant Pioneers. Slide to videotape. VHS 15 min. Produced by Canadian Parks Service, Elk Island National Park. 1990. Copyright free to teachers; copies may be made from a borrowed master tape.

A short slide show converted to video about the Trumpeter Swans in Elk Island National Park. It briefly describes the Swan's life cycle, the transplant program at the Park and the Swan's reluctance to go to new areas. Teachers have permission to make their own copy from the master tape borrowed. Copies are available from the Education Branch in Edmonton as well as the Regional Offices of Alberta Environmental Protection. Call the Education Branch if you need help locating an office near you.

Available to borrow from:
Alberta Environmental Protection
Education
11th Floor, South Petroleum Plaza
9915 - 108 Street
Edmonton, Alberta
T5K 2G8

Toll-free, dial 310-0000, ask for:
Tel: 427-6310
Fax: 422-5136

Trumpeter Blues: A Swan Story Video. VHS. 24 minutes. Landis and Trailwood Films Production. 1986. \$24.95 + \$3.00 Postage & Handling U.S. funds.

This award winning film (now on video) documents the life cycle of the Trumpeter Swan in the region around Yellowstone National Park. It discusses the historical aspects of the species, including the near-extinction in the lower forty-eight states. It depicts the reintroduction of the swan into its former habitat. Suitable for all ages, the video contains dramatic sequences such as:

- coyote predation on a swan
- defense of nesting territory from intruding swan
- young cygnets attempting to fly
- other animals that share swan habitat

Available for purchase from:
Trailwood Films
P. O. Box 1421
Huron, South Dakota
United States 57350
Tel: (605) 353-1153

Available to borrow from:
Alberta Environmental Protection
Education
11th Floor, South Petroleum Plaza
9915 - 108 Street
Edmonton, Alberta
T5K 2G8

Toll-free, dial 310-0000, ask for:
Tel: 427-6310
Fax: 422-5136

Brochures

Alberta's Threatened Wildlife: Trumpeter Swan. Brochure. Alberta Environmental Protection. Feb. 1992. Free.

This double-sided, three paged pamphlet is full of current information about the Trumpeter Swan. It covers the Trumpeter's:

- Status
- Description
- Habits
- Reproduction
- Food
- Limiting Factors
- Management and Outlook

It is one of a series of information brochures about Alberta's threatened wildlife and how they are being managed.

Swans, Cranes & Geese of Alberta. Fold out Poster. Alberta Environmental Protection. Free.

A double-sided fold out of Alberta's swans, cranes and geese and their life zones. Contains a color drawing and short biography on the following birds: Whooping Crane, Sandhill Crane, Trumpeter Swan, Whistling Swan, White-Fronted Goose, Canada Goose, Snow Goose, Ross' Goose, Blue Goose and Black Brant. There are also maps of Alberta showing each of the birds' nesting grounds.

Both are available from:

Alberta Environmental Protection - Information Centre
Main Floor, Bramalea Building
9920 - 108 Street
Edmonton, Alberta
T5K 2M4

Toll-free, dial 310-0000, ask for:

Tel: 944-0313

Fax: 427-4407

Also available from local Alberta Environmental Protection Regional Offices and Fish and Wildlife.

Trumpeter Swan. Brochure. Canadian Wildlife Service, Environment Canada. 1992. Free.

This large (21 X 24 cm) four-page folder is one from the Hinterland Who's Who series. It covers the following topics: distribution, description, related species, food and feeding, life history, limits to population growth, management, and a short reading list is included. This and other folders may be obtained free (up to a certain amount) from the Canadian Wildlife Service. Suitable for both students and adults interested in wildlife. For more information about this and other publications, write to:

Publications
Canadian Wildlife Service
Environment Canada
Ottawa, Ontario
K1A 0H3
Tel: (819) 997-1095
Fax: (819) 953-6283

Books

Ko-hoh: The Call of the Trumpeter Swan. Jay Featherly. Carolrhoda Books, Inc. Minneapolis. 1986. 48 pages. ISBN 0-87614-288-9. Juvenile Literature.

This book explains the life cycle of the world's largest swan, including information about nest-building, mating, raising young, feeding and other behaviors. Lots of color photographs.

The Trumpeter Swan: A White Perfection. Skylar Hansen. Northland Press, Flagstaff, Arizona. First printing 1984. 75 pages. ISBN 0-87358-357-4 softcover, 0-87358-358-2 hardcover.

A book full of many beautiful photographs and comprehensive text about the Trumpeter Swan's life cycle in the Red Rock Lakes National Wildlife Refuge (Tri-State area).

Computer Software

Leslie Matrix. Public Domain. 3 - 1/2" disc. Free.

The Leslie Matrix is a spreadsheet program which students can use to determine population trends by inputting data, for example, number of adults, various mortality rates, number of transplants (cygnets) per year. It's the actual program biologists use to predict populations. The Leslie Matrix is IBM compatible with the following spreadsheet programs: Quattro Pro, Lotus 1-2-3 and Excel.

Reduce by reusing. Send in your own disc to be copied.

Alberta Environmental Protection

Education

11th Floor, South Petroleum Plaza

9915 - 108 Street

Edmonton, Alberta

T5K 2G8

Toll-free, dial 310-0000, ask for:

Tel: 427-6310

Fax: 422-5136