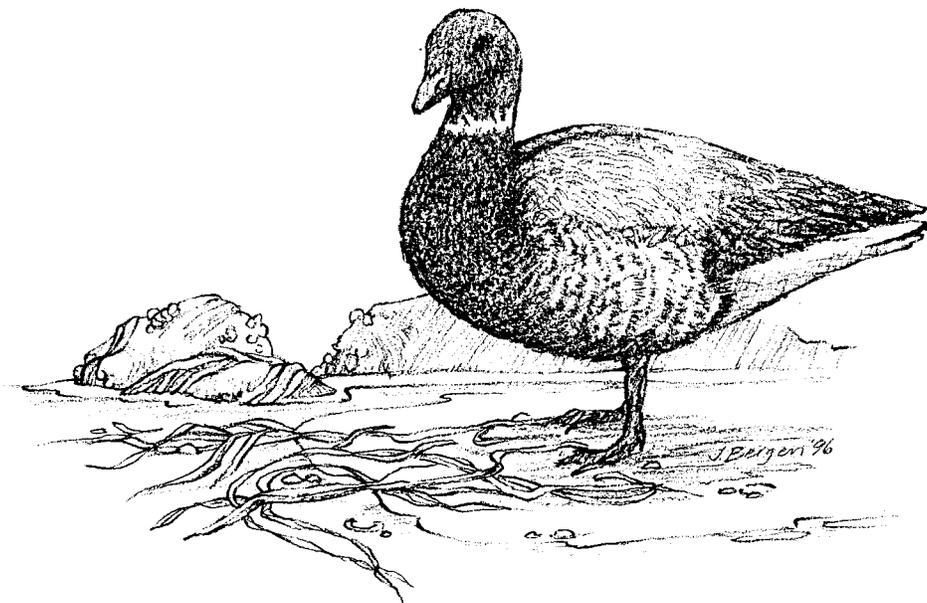


Brant Goose Monitoring Project

A Middle School Curriculum Guide for Teachers



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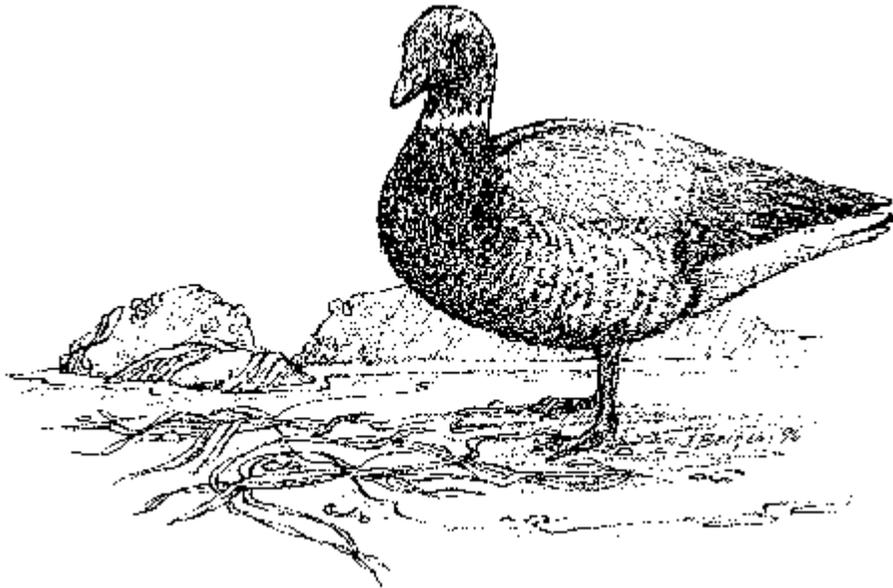
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Chapter 1 - Join the Project!

This chapter provides information on how to begin the project, an overview of what other sites are doing, and the natural history of the brant.



How to Participate

The following outline for how to participate, is a short summary of the project's curriculum. Read on to learn the basics of the project, the natural history of the brant... And then, simply begin with chapter 2. It will lead you through a series of activities to get all new participants started.

1. Take a look at the home page located at <http://www.sd69.bc.ca/~brant> . There you will find a brief introduction, flyway map showing participating sites, information about participants, observation log (tells who saw Brant when and where), artistic exhibits by participants, and the curriculum for implementing the project in your classroom.
2. If you decide you want to become a participant, tell the International Coordinator exactly where your site is by writing to: brantproject@sd69.bc.ca (see chapter 3). We can then add you to the flyway map. Have your students produce information about your site similar to what the other sites have done (see chapter 3) on the homepage and send that to the International Coordinator.
3. If you decide you want to receive correspondence from other participants, ask the International Coordinator to add you to our list serve. Then you will receive entrees to the Observation Log from other sites as they happen. To send a message to everyone, address it to: brantproject@sd69.bc.ca. See the chapter 3 of this curriculum for more specifics on how to communicate with other sites.
4. Begin teaching about Brant geese, their ecology, migration, and their habitat by using the curriculum. Ask a local hunter, wildlife biologist, State regulator (Dept. of Fish and Game?), bird watcher, or other knowledgeable adult to speak to your class. Ask for access to data about Brant.
5. Go out to the bay and observe the geese under the direction of the experts mentioned above and by following the field trip section (chapter 8) of the curriculum. You should try to get students out one or two times each week between the time when your experts tell you the Brant will arrive through when they will depart. Students return to class and produce a synopsis of their findings. Send the report to the list serve address with "Observation Log" in the subject line. It will later be added to the home page.
6. Students can also produce essays, poems, pictures, research reports, and stories about Brant geese. Send these to the International Coordinator to be added to the Exhibits page.

What is the Brant Project?

The Brant Monitoring Project has been developed along the Pacific Coast Flyway for students to participate in an on-going international, cultural, and scientific exchange of information about the Brant Geese. Participants include schools in Alaska, British Columbia, Washington, Oregon, California, and Baja, Mexico. This curriculum offers classes the opportunity to become a part of this exciting, international project. Participation in the Brant Monitoring Project will increase ecological understanding and the willingness to care about the. Students will learn to successfully monitor the presence and behavior of Brant, providing valuable information to resource managers. Students will come away from this project with a global sense of stewardship and individual responsibility to properly manage local ecosystems.

What are Brant?

Brant are small geese that undertake a spectacular migration spanning four countries and two continents. Their life cycle depends on coastal and estuarine waters from the high Arctic tundra of Russia, Alaska, and Canada, to the embayments of Baja California and the mainland Pacific Coast of Mexico. Coastal estuaries of Oregon, Washington, Alaska and British Columbia provide important staging areas for the spring and fall migrations. The energy required for Brant to undertake their migrations makes them particularly vulnerable to disturbances in the habitats upon which they depend, e.g., the eelgrass beds of Izembek Lagoon, Padilla Bay, and San Quintin, nesting habitats in the high Arctic, and staging areas along the California, Oregon, Washington, Alaskan, and Canadian coasts.

The geese converge at the Izembek Lagoon (Alaska) in the fall to commence their fall migration. It is here at this lagoon, the famous staging area for more than 120,000 Brant, where Brant can be found consuming eelgrass in preparation for their migration south. The geese then begin their 3000-mile, non-stop flight (taking between 60 and 90 hours) south to the estuaries and lagoons of the Baja Peninsula, where they forage on more eelgrass to replace the fat reserves expended during their migration. Spring migration commences in February. As the geese migrate northward, the Brant utilize the estuaries in Oregon, Washington, and British Columbia as migratory stopovers to feed on eelgrass, sea lettuce and other marine algae, roe of Pacific herring, crustaceans, and mollusks. By late March and into April, Brant reach Izembek Lagoon, where they may spend from 2 to 4 weeks feeding on eelgrass before going to their nesting areas on the Yukon-Kuskokwim river deltas, and in arctic Alaska, Russia, and Canada.

What pressures are the Brant facing?

Because of the dependence of the population on relatively few key sites, the entire population is vulnerable to pressures at any one location. Pressures on the Brant

population include fox predation on nesting grounds, subsistence hunting and egg gathering, recreational hunting throughout their range, loss of wetlands and food sources due to development, disturbance by aircraft and boat traffic, adverse weather conditions on nesting grounds and potential oil spills. As a result of fly-way wide impacts, the population has varied greatly from approximately 194,000 in 1981 to 130,000 in 1984.

What are the other project sites doing throughout the year?

The Brant Project is one coordinated flyway-wide research project implemented as 'site-separate' but integrated components. The objectives of the project are identical throughout the sites and no site will be able to meet the objectives of the project without relying on information provided by students at the other sites. This interdependency will help ensure quality control among the information gathered by the students with the assistance of project coordinators and wildlife biologists.

Alaska:

The geese depart Alaska for their southward migration near the end of October. Alaska continues to monitor for geese that may overwinter in the area. Alaska is an essential part in transferring information along the flyway throughout the entire year. Alaska is the first to have the care package, and the first to send it south.

Washington and British Columbia:

The geese depart from Alaska for their southward migration near the end of October. Some Brant actually overwinter in these areas, and others use the areas as stopovers and resting areas during their migration north in late winter/early spring.

Oregon:

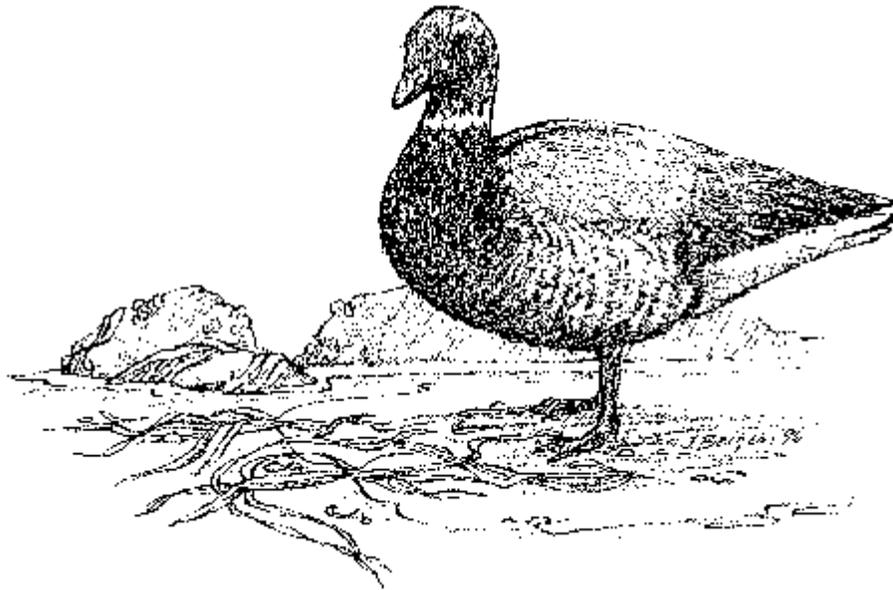
The geese normally arrive in the Coos Bay area in February. There are some overwintering populations known to inhabit areas on the northern coasts of the state.

San Quintin, Mexico:

The geese will be arriving in this area sometime in late October to early November from Alaska.

Chapter 2 - Introductory Activities

This chapter emphasizes the interconnections between cultures, the people, and brant. It will give students an introduction to how people play a role in the life history of brant.



Brant Journal

Objectives: Students will collect information and create personal entries or artwork concerning the brant for their journals.

Methods: Periodically throughout the school year, give students instructions to write or draw in their journals, depending on the activity. Some of the lessons in this curriculum call for specific things to be entered into the students journals. The journal will be particularly useful during the field trips.

Procedure: At some point during this introductory chapter, teachers may want to have students start a journal. This may be a place for students to write down thoughts about an activity, write down observations from field, draw pictures, write a poem, do an assignment, or write down questions or concerns. Throughout the curriculum, at the end of some activities, there will be a section called “Journal Use”. This section will give at least one way that the journals can be used prior to, during or after that particular activity.

A paper notebook with 3-ring paper clips in it, would be ideal for holding the field trip data collecting sheets.

Most importantly, let the students have fun with the journals!!

Brant Video/Slide Show

Objectives:

1. Students will understand what Brant are.
2. Students will learn some of the causes of their decline.
3. Students will be introduced to the migration of Brant.

Method:

Introduce and give an overview of the Brant by watching a video or slide show. Give the students an opportunity to become investigative reporters about the Brant.

Subjects: science, environmental studies

Duration: one class period

Group Size: entire class

Topics: Brant natural history, management of brant, human actions related to brant

Background: Please see the section “What are Brant?” in the first chapter.

Materials:

(check with International Coordinator to see which is available).

- “Brant at Izembek”, a five minute news report video
(contact: brantproject@sd69.bc.ca)

OR

- A slide show made available by the International Coordinator
(contact: brantproject@sd69.bc.ca)

Procedure:

1. Tell the class that they are to carefully watch the 5 minute video or slide show to discover the "News of the Brant".
2. Show the video to the students once. Then, partner up the students explaining to them that they are to answer the questions on the worksheet while watching the video a second, and/or third time.
3. Have students take careful notes on their sheets during these viewings.
4. Lead a discussion on the Brant answering any questions.

Journal Use: Have students write down questions about the video in their journals.

Extension: Create a 3-5 minute video clip sometime during the year, about the significance of the brant in your area for the following year’s classes to use. Make a copy for the Brant Care Package.

Brant Video/Slide Show Questions

1. How many geese converge (group together) at Izembek Lagoon in Alaska?
2. Why do the geese all come here?
3. Where do the geese come from before they get to Izembek?
4. From what different countries are the biologists?
5. What are the biologists doing at Izembek?
6. Why are the population numbers of brant geese declining?
7. Where do the brant geese fly once they leave Izembek?
8. Why do the Brant go to Mexico?
9. How many miles is their flight?
10. How do they know when to migrate?
11. How fast can the brant geese fly?

Brant Care Package

Objectives:

1. Students will begin to understand the international scope of the project by contributing creative items to a “migrating” cultural sharing care package.
2. Students will be introduced to the traveling Brant "care package" as a means of cross cultural communication.

Background:

To foster the interpersonal connections among students along the flyway, a Brant "care package" will migrate in tandem with the brant, from site to site. This package will be available for students to contribute items, such as poems, art work, video and audio footage, and photographs of their area, their class and the Brant. This can then be mailed along to the other sites to share in the cross cultural experience. The “care package” also contains items useful for the brant monitoring field trips.

Procedure:

If you are a new participant, please send a message to the International Coordinator (brantproject@sd69.bc.ca) to find out with whom to contact about sharing the Care Package when it is in your area. Tell your students about the migrating care package (it will be in your area when the geese are; see schedule following) and the opportunities for them to contribute their art, poetry, audio or video footage, or photographs to the care package for other sites to see what they have done. See chapter 8 for ideas on what students can contribute to the care package. The care package also contains resources for the class to use on the field trip, a banner to hang up in the school announcing the arrival of the brant, a tape recorder to record student poetry, personal interviews about the brant, and sounds of the brant from the field trip. (see the **Brant Care Package Contents Guide following this lesson**). Make sure that is mailed to the next site on the list by the ending date.

Care package Mailing Schedule:

(dates are when each site actually has the care package)

Alaska	Aug. 15 - Oct. 15
Mexico	Nov. 1 - Jan. 5
WA	Jan. 10 - Feb. 5
OR	Feb. 10 - March 5
Canada	March 15 - April 15

Brant Care Package Contents Guide

1. *Tape recorder, batteries, and cassette tapes*: These items can be used in or out of the classroom as a means to record several things: the local sounds of the brant (if they are close enough), interviews by the students about what they are seeing during the field trip (or post field-trip), creative readings or poetry by the students about the brant, or an interesting classroom discussion about brant issues. Make it interesting so that students at other sites will be interested to hear what kids in other states and countries have to say about the brant. You will find that each of the tapes are labeled for each site. If you want to keep a copy of any of your class' dialogue, then please leave the original tape with the care package, and make a dubbed copy at your school for your classroom to keep. Please remember to only use its battery power when out in field. Use the adapter cord when in use in the classroom to conserve the batteries.

2. *Peterson Multimedia Guide to North American Birds*: This useful tool can be used in your classroom to increase students' interest in birdwatching in the field. It offers regional specific information, individual species information, as well as tools to sharpen your birdwatching skills. It is very simple software to install and should take no more than five minutes. Directions are located in the front cover of CD the holder. This CD-ROM for Windows is recommended for: System 486 or higher with 8MB RAM, Windows 3.1 or higher, DOS 3.1 or higher, SVGA display, double-speed CD-ROM drive, MPC-compatible sound card (22khz, 16-bit), 10MB available hard drive space. This multimedia guide can be used while you have the care package at your school and then must be returned to and mailed with the care package on the scheduled date.

3. *Samples of eelgrass and sea lettuce*: These samples are for use for both in class and on the field trip. Refer to the following information so that students can understand more about the plants that the brant eat. These cards can also be taken out on the field trip and to the water's edge (if your site is accessible to the water's edge) and used as identification cards for the marine plant ecologist group. Discuss with them where these plants are found and some of their characteristics:

- Eelgrass (*Zostera marina*) is found up and down the entire flyway in estuaries and open water channels growing in both muddy and sandy substrates of protected areas. Eelgrass has an extensive root and rhizome system which allows it bind to its substrate and provide a protected haven for small animals.

- Sea Lettuce (*Ulva sp.*) is generally found on rocks in the upper intertidal zone, bay and estuaries, or found floating on mud flats. Sea lettuce usually grows as a single, oblong blade in a light to dark green color, and is typically ruffled along the margin. The growth and abundance is determined to some degree by water temperature.

4. *Photographs:* Any of the regular or aerial photographs may be photocopied for your use, but may not be permanently removed from the care package. Please feel free to add any of your class' photos of students, brant, and the habitat in your area. Make sure that you label them with the date and where they were taken. You could even create a small class photo album to add to the care package.

5. *Brant Banners:* These banners were designed to create excitement in the school, in the community, and at the site both for the students and for other members of the community that may just so happen to pass by and see the announcement, "The Brant Are Here"! Hang your large banner somewhere in the school, in a hallway outside your classroom, or out in front of the school. It is waterproof so let it be known! The smaller banner is designed to serve as a marker at your monitoring site to alert passer-bys that something is going on. Plant it in the sand, and let it fly! Just remember to bring it with you when you leave your site.

6. *Additional items:* Be creative with your class. Feel free to add anything that is related to the brant and/or your class: video footage, goose origami art, poems, stories, paintings, paper mache brant eggs and nest, newsletters, news clippings from the newspaper about the brant or anything else!

Regarding shipping, each site covers the cost. Each of the Regional Coordinators will be in charge of coordinating the Package with the schools in their area.

Contacts for the care package:

Izembek National Wildlife Refuge
C/O Sue Schulmeister
P.O. Box 127
Cold Bay, AK 99571-0127
Ph: (907) 532-2445

South Slough NERR
C/O Tom Gaskill
P.O. Box 5417
Charleston, OR 97420
Ph: (541) 888-5558

Pro Esteros
C/O Laura Martinez
4492 Camino de la Plaza, Suite ESE-1162
San Ysidro, CA 92173
Ph. 011 52-617-86050

Padilla Bay NERR
C/O Glen Alexander
1043 Bayview-Edison Rd.
Mt. Vernon, WA 98273
Ph: (360) 428-1558

Brant Map Activity

Objective:

To give students an understanding of when and where the Brant go throughout the year.

Methods:

Students will use a flyway-wide map with movable pieces to put into perspective the migration and behavior of the Brant during the year.

Background:

As Brant migrate each year from Alaska to Mexico, biologists monitor the timing, location, and behavior of the geese. It is up to the students participating in this project to begin to monitor the migration of the Brant in order to gain a better understanding of the needs of the geese. As participants in this project, it will be important to keep track of the location of the brant by using a flyway-wide map and calendar.

Materials - all available to download and print from Brant Homepage (under curriculum) found at:

<http://www.sd69.bc.ca/~brant> :

Brant Flyway Map
Map Key
Brant Map Pieces

Procedure:

- 1.** This activity is a perfect follow-up to the brant video or slideshow. Begin by reminding the students that they are part of an international, monitoring project with participating schools in Alaska, British Columbia, Canada, Washington, Oregon, California, and Baja, Mexico. Explain that the geese migrate from Alaska to Mexico and that students in each of the countries along the flyway, like themselves, will be monitoring the geese. Refer back to the video, and to the idea that the Brant need the assistance of people, such as biologists, and caring students to understand the pressures that the population is facing.
- 2.** In order to track their whereabouts, a map will be used to follow their fall and spring migrations (briefly discuss migration, see chapter 5). Using the provided flyway map (on website), make a copy of it onto an overhead sheet. Project this onto the wall on a large sheet of butcher paper. Have the students take turns tracing the map onto the paper and then coloring it. Use the provided key to paste on to the map. Post your map in the classroom for everyone to see. Make several photocopies of the provided map pieces (the different sizes of brant) which are also on the website. Laminate and cut them in circles. Use these to designate the whereabouts and numbers of Brant at the different sites throughout the year. Participants will be relying on the telecommunications for the

location of the brant (see next activity in this chapter). All project sites will communicate the arrivals and departures of the geese to the other sites so that you and your class can mark that on your map.

3. Go ahead and place your first map pieces on the appropriate location of the map, once you receive word from other sites about how many geese are there. You will need to refer to the list serve in order to find out where the geese are. Alaska will initially notify the other schools as soon as the geese leave Izembek. For example, if students in Mexico observe 15,000 brant in January, students at all other sites will put map pieces on Mexico that total that number (one of the '10,000' brant, and five of the '1000' brant map pieces to equal 15,000).

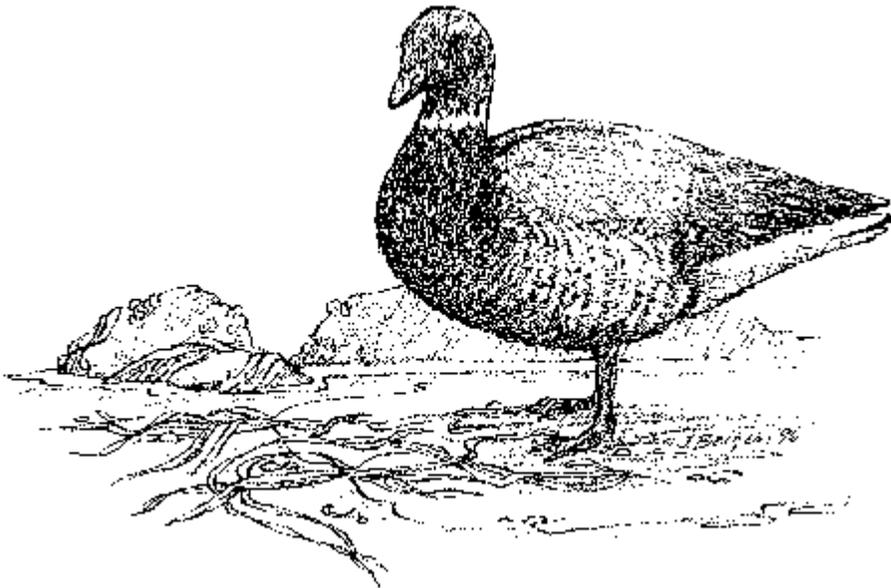
4. As the geese come and go from different areas during the year, be sure to move your map pieces!

Journal Use: A good way to keep record of the different populations, is to enter the numbers each week or each month into the student journals. Total the numbers at the end of each week or month so that these numbers can later be used in an activity to graph population changes over time.

Extension: Obtain GIS maps of your local estuary from state or federal land agencies. Compare and contrast the different layers (forests, development, wetland etc.) what they mean, and how they might affect your local brant populations.

Chapter 3 - Brant on the Web

This chapter is essential for beginning the project, and communicating to other sites about the brant. Here, you will find information about the brant list serve and web page, and how participants can contribute their information to the project.



Telecommunications in the Classroom: A Hello Letter

Objective:

1. Students will write a “hello” letter and send it to the list serve; and will collect the letters from other sites and post them on a brant bulletin board or in a class notebook.

Background:

By becoming a link in the telecommunications process of the Brant Monitoring Project, participants are contributing valuable information to a central database which is accessible by all participants or anyone with access to the Web.

Procedure:

1. Use the chalkboard to brainstorm ideas for a class letter. This should be a “Hello” to all of the participants, who and where you are (your relationship to the estuary, any information students know about brant, local weather, class interests, information about other projects the class has done), and a signal to let them know that you are ready to begin sending information about the Brant sightings, departures, and arrivals.

2. Once your class has drafted a letter, send the message to all of the partners on the list serve: brantproject@sd69.bc.ca

3. As the school year progresses, check your class e-mail regularly for messages from the other sites via your class e-mail. As you receive messages on the whereabouts of the Brant, use the map activity (in chapter 2) to locate where they are. You may also want to print the messages out and keep them in a class notebook. (Students may also choose to have a pen pal throughout the year as well).

4. When the brant come and go from your area, it is up to you and your class to relay those messages right away to the other sites in order for them to keep track of the brant’s whereabouts.

Note: This telecommunications lesson assures you and your class a link in the project. Through field trips and contact with your local “partner wildlife biologist” you will be able to get counts of brant from the field. Your class is responsible for transmitting that information across the internet. Questions like, “where are they?”, “how many are there?”, and “when will they leave?” will be exciting to answer through careful observation, and then to pass that new information along on the internet for answers.

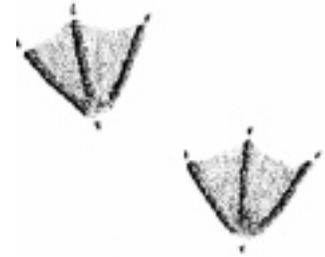
Participant Input: Telecommunications

Objective:

1. Students will learn about the various ways that this project is related to the internet (students will become familiar with the brant list serve and home page and their importance in the brant project).

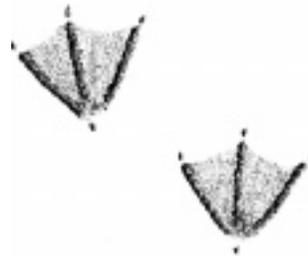
Background:

Students will be able to send notes, letters, data images, and other messages directly from their classroom computer to those of other participants. These communications will include information and observations of participants about brant. For instance, as the Brant begin to leave Izembek Lagoon for their southbound migration, students in Cold Bay will be able to notify classrooms throughout the flyway that the geese are en route. Participants will also be able to share through artwork, poetry, and photos, management issues and local stresses of the brant in their area.



I. Your Class and the Brant Data

While in the field, students collect data about the number of Brant and other birds sighted as well as weather and other environmental conditions (see Chapter 7 for data sheets). This data can then be submitted to a central database, the “observation log”, which is accessible on the World Wide Web to all participants. In addition to these data storage and transmission capabilities, users will be able to access data and produce graphs to assist with analysis. Participants can mail inquiries and observations to: brantproject@sd69.bc.ca



II. Home Page Development

Address: <http://sd69.bc.ca/~brant/>

The brant project homepage serves as the central meeting place for all of those involved in the project, and any newcomers who happen to find our page. The web page is constantly undergoing changes, and we encourage anyone’s input. We are especially looking for new exhibits, poetry, and artwork that can be translated into html language and added to our homepage. Participants can directly send their artistic contributions by contacting the International Coordinator at brantproject@sd69.bc.ca for information on how to send it.

III. Site Descriptions

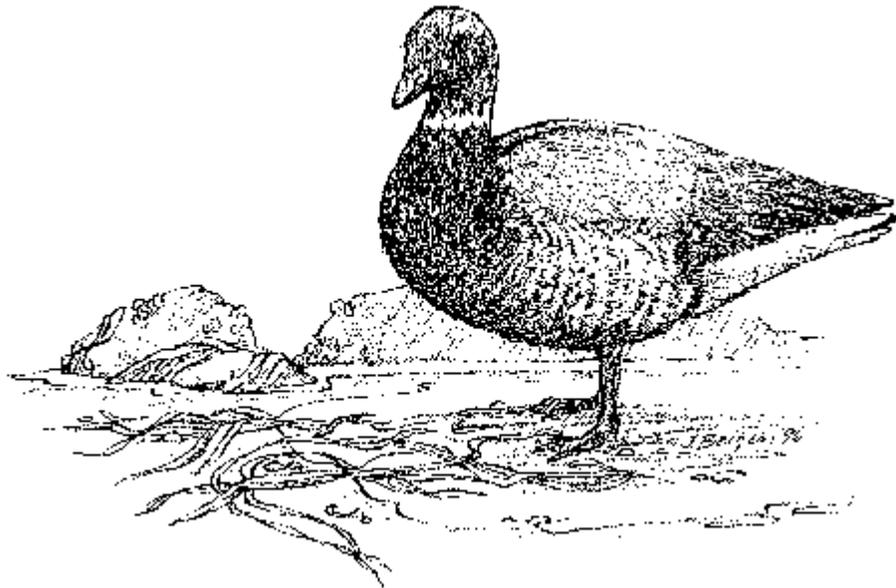
As new participants join the project, we want to hear about that new place and how the brant are related to that area. And, we want to add your new site to the Flyway Map Site Descriptions section of the homepage. If you are a new participant or school, please submit a description of your site (to: brantproject@sd69.bc.ca) containing: latitude/longitude, size of bay, area weather, special features and economic activities in or near the bay where the brant are seen.

Other Computer-Related Activities

As you work through the curriculum, you will find that other activities may have a telecommunications part to it. It may be a wrap-up to an activity or simply the students' reflections of a field trip. Just remember, the web page and list serve are there for the students, participants, wildlife biologists, teachers, and anyone else who may have an interest in the brant. Feel free to contact the list serve at any time to recommend changes, report observations, or start something new for everyone that is involved!

Chapter 4 - Wetland Habitat For Brant

Understanding the kinds of habitat that brant utilize is essential. This chapter will give students the opportunity to research the different places where brant go during their lifetime.



Wetland Metaphors

(designed for younger students)

Objectives:

Students will be able to create metaphors to help them understand the basic conditions and processes in a wetland.

Method:

Students compare familiar objects to wetland functions.

NOTE: a metaphor is a direct comparison between two things. It gives a vivid image through direct comparison. For example, "books are windows of thought" and "she is a tower of strength" are just two examples. In this activity, a variety of objects represent the characteristics of wetlands.

	<u>Object</u>	<u>Metaphoric Wetland Functions</u>
<div style="border: 1px solid black; padding: 5px;"> <p>Subjects: science, language arts</p> <p>Duration: 30 minutes</p> <p>Group size: entire class</p> <p>Setting: classroom</p> <p>Topics: communication, creativity, habitat for wildlife, wetland processes</p> </div>	picture of hotel from a magazine	serves as a stopover on their long trip
	Sponge	absorbs excess water (flooding)
	Pillow	is a resting place for migratory brant
	Egg Beater	mixes ingredients (nutrients and oxygen into fresh and saltwater wetlands)
	Cradle	shelters and protects (like a nursery for young brant)
	Sieve or Strainer	strains debris and suspended material from water
	Can of Soup	provides food

Materials:

- large pillowcase, box, or bag
- sponge
- small pillow
- egg beater
- cradle (or a picture of a house or hotel)
- sieve or strainer
- can of soup

Procedure:

1. Teacher prepares the "Mystery Metaphor Container" (pillowcase, bag, or box) containing the above list of objects.
2. Begin by explaining to the students what a metaphor is. Tell students that objects can be used to represent wetland functions. Metaphors offer a dramatic way of drawing a comparison. A metaphor gives a vivid image through direct comparison. For example: "Frank is a chip off the old block" or "She's a barrel of laughs." Explain that everything in the container can be a metaphor that relates to the functions of wetlands.
3. Have the students divide into as many groups as there are objects in the bag. Announce that when it is their turn, you want a representative from each group to draw an object from the container.
4. Have the designated student reach into the container and withdraw one object. When each group has an object, give them time to describe and demonstrate the relationships between their object and the wetland. Encourage the students to build on each other's ideas and to come up with a group consensus on relationship of the object to a wetland. You can assist by strengthening their connections. Allow each group to share these ideas with the class.
5. Ask the students to summarize the major roles that wetlands perform in contributing to a healthy habitat for wildlife. Ask them if their own attitudes about wetlands are different as a result of doing this activity. If yes, how?

Adapted from: Aquatic Project Wild. Western Regional Environmental Education Council. 1987.

Wetland Reporting

Objectives:

1. Students will determine what type of wetland(s) they have in their area.
2. Students will report on one of the local wetland areas, including reasons why it's a wetland, and its importance to the area.

Background:

What is a Wetland?

There are different definitions of wetlands, as would, say, a biologist. In general, a wetland is an area that has waterlogged soils and is often depending on the perspective of the person using the word. For example, a hydrologist, or one who studies the water cycle, would define a wetland in different terms covered with shallow water at least part of the year. Bog, quagmire, muskeg, tundra, swamp, marsh, estuary... these are just some of the many names for areas that are recognized as wetlands.

Subjects: science, language arts
Duration one class period
Group size: any
Setting: classroom
Topics: habitat for waterfowl and other animals, wildlife ecology, wetland types

What are the Functions of Wetlands?

- 1) Freshwater wetlands often act as **buffers** in times of both flood and drought.
 - Absorbing overflow from flooding, wetlands often swell with runoff water and reduce potential downstream effects of flooding.
 - In drier periods, wetlands hold precious moisture after smaller bodies of water have disappeared.
- 2) Both freshwater and coastal wetlands are **nurseries** for countless life forms. They contain a great diversity of plants and animals and provide habitat for migratory waterfowl.
- 3) Wetlands have the unique ability to trap and **neutralize sewage waste**, allowing silt to settle and promoting the decomposition of many toxic substances. Yet it must be remembered that as remarkable as they are, the actions and capacities of wetlands are still vulnerable to the devastation of human carelessness and pollution.

What Are Some Types of Wetlands?

- 1) **Tundra:** Tundra is the vast, treeless land of northern climates (in the upper regions of Alaska and Canada) where the temperature is very cold in winter and cool in summer. The wind almost always blows. No trees grow on the tundra, and all the plants grow very close to the ground where it is warmer.

Many people think the tundra is flat. Once you've walked on the tundra you know that there are lots of little mounds of grass and sedges. The low spots are wet or even filled

with water, forming little ponds or lakes. The soil is squishy. Even where the ground looks high and dry, it isn't.

Very little rain or snow falls on the tundra each year. It stays wet because of the permanently frozen ground, called permafrost, under the top soil layer. The permafrost does not allow the rain or snow to drain through the frozen soil, and permafrost doesn't thaw, even in summer. Tundra is a type of wetland in Alaska and the upper regions of Canada used by Brant during breeding seasons to nest.

2) **Estuary:** Estuaries occur where salt water from the sea meets and mixes with fresh water from rivers and streams. These waters include bays, sounds, inlets, bayous, and sloughs.

The combination of salt and freshwater produces a unique and fertile environment that supports a diversity of plant and animal life. Estuaries are among the most productive natural places on earth.

More than two-thirds of the fish and shellfish commercially harvested spend part or all of their lives in estuaries. For the Brant, estuaries are important areas for growing plentiful supplies of eelgrass, the brant's main food supply.

Estuaries can be found along the Pacific Coast flyway and are used as stopover areas for the Brant during their spring and fall migration.

3) **Marshes:** Marshes, or bogs, can fill broad, flat areas or be contained in tiny pockets surrounded by higher land. They can share space on the edges of ponds, lakes or rivers. Movement of water through a marsh brings nutrients. When water drains from a marsh, it carries nutrients to the next wetland or to the ocean.

There are two kinds of marshes: inland fresh water marshes and coastal salt water marshes. The inland marshes obtain fresh water directly from rain or snow, or from creeks and streams. Tides bring salt water to the coastal marshes, located in estuaries. Both inland fresh water marshes and coastal salt water marshes have plants which are adapted to the type of water in the marsh. Both inland freshwater marshes and coastal salt water marshes are beneficial to the lifecycles of Brant, providing wintering and feeding grounds in the inlets of the Baja Peninsula, and breeding grounds along freshwater rivers in the northern regions of Alaska and Canada.

Method:

Students determine what type of wetlands are in their area. With this data they put together a news story on a local wetland area.

Materials:

notebooks and pencils
copies of wetland types for each group

Procedure:

1. Break the class into groups of 5 or 6.

2. Write the word wetland on the chalkboard. Have the students, in their groups, brainstorm and write in their notebooks about what comes to mind when they hear the word "wetland". The words can be anything: nouns, feelings, verbs, etc... as long as the group can relate it to wetlands. Take time for students to share some of their more interesting words out loud in class, and then:
 - a. Discuss the proper meaning of wetlands.

 - b. Discuss the three different types of wetlands that the brant utilize (make copies of the sheets for each group). Have students pick 2 animals from each of the 3 types of wetlands and write on the back of the sheets 2 things that each of the animals uses from that particular wetland.

For example: From the Saltmarsh: 1. the great blue heron uses the water and fish as food, and 2. the raccoon uses the grasses for shelter and uses dead or living animals for food.

3. Next, have each group brainstorm about their surrounding community and the types of wetlands they have in their area. They may not know what types they have around them, but allow them to brainstorm places near them (or, have a local fish and game expert come talk to your class about wetlands).

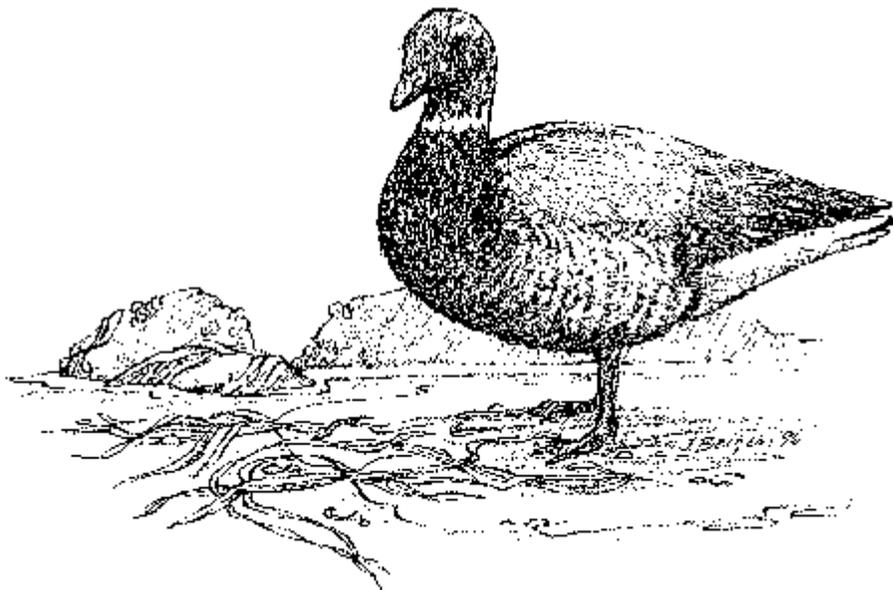
4. Have each group pick a local wetland or an area they believe to be a wetland. They should outline the reasons why that area is a wetland, and think of reasons for its importance, what the use of the wetland is, and what utilizes the wetland.

5. Once students have identified what type(s) of wetlands they have in their area, compile a short class report about their wetland (its importance, uses, and location to their school, and send it to the other project sites on the internet, including anything that students think may be threatening to the long-term viability of their local wetlands.

Extension for Older Students: Teacher collects samples of *Zostera*, *Ulva*, or *Smithora* from estuary. Students view the algae with microscopes in the classroom. Using the class' biology books, students identify components of a cell and look for other organisms that may be living on the algae (are the brant eating the algae, or the organisms that live on the algae for nutritional value?).

Chapter 5 - Brant Ecology

This chapter will help students focus on birds, by specifically studying the adaptations of the brant. The relationship of brant to their ecosystem, and some of the struggles they may face in their lifetime will be explored.



Adaptations

Note: designed for younger students; see older student extension at end of activity

Objectives:

1. Students will be introduced to adaptation as a means of survival for all animals.
2. Students will learn how geese are adapted to survive in their environment.
3. Students will begin to understand why animals have adaptations.

Method:

Students will use pictures to understand the adaptations of wildlife and waterfowl.

Background:

Every organism on earth has, over time, developed certain characteristics to allow it to better survive in a particular environment. These special characteristics, or adaptations, allow species to out-compete other species for survival needs. Birds, and in particular the brant geese, offer us wonderful examples of these special features.

Materials:

- Chalkboard
- About 8 - 10 old nature magazines
- Goose Adaptation Sheets

<p>Subjects: life science</p> <p>Duration: one class period</p> <p>Group size: groups of three</p> <p>Setting: indoors</p> <p>Topics: natural history, adaptations of waterfowl survival needs of wildlife,</p>
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Procedure:

1. Introduce on the chalkboard the word adaptation and its meaning. Below, write the five reasons why animals need adaptations: (1) to get food and water (elephant trunk, bird beak), (2) to reproduce successfully (coloration or display), (3) to protect themselves (claws, camouflage), (4) to maintain their body temperature (warm: fur, cold: scales), and (5) for movement (wings, fins, long legs). Have the students brainstorm examples of each of these as you write them on the board.
2. Divide the students into groups of three. Pass out the nature magazines. Give the students five minutes to find as many different kinds of adaptations of animals as they can. They must be ready to present one of them to the class by using pantomime and to say which of the five reasons their adaptation is most closely related to.
3. Pass out the goose adaptation cards, one to each group of students. Have the students figure out the special adaptation that the goose has from that particular picture. Once again, have the students present that to the class.
4. Discuss the adaptations of the geese specifically:

Bills that are sturdy and serrated for tearing and cutting clumps of grass.

Feathers that trap air to keep heat in.

Oil on the feathers to keep them waterproof.

Flight feathers to give maximum lift for the least amount of weight.

Hollow bones for light weight in flying.

Flying in V's and honking to keep together, but not bumping into each other, even in fog.

Fast growing goslings who grow big enough to fly south in the fall.

Camouflage coloring of young to hide from predators.

Air sacs in their bodies to help them float (they pump air out when they dive).

Webbed feet for swimming (open to push, closed to glide).

Extensions:

- 1.** See "Adaptation Artistry" from Project WILD for ideas on creating a special animal for a specific niche. These may be realistic or imaginary creatures made from paper mache, clay, or just simply a drawing.
- 2.** Have a discussion on human adaptations. How are we adapted to do each of the above five things?
- 3.** For older students, discuss the meaning of adaptation and then hold a class "fish bowl" session. Have a group of 5-6 students come to the front of the room and sit in a circle of chairs. Give them a topic to discuss concerning the survival of different animals in a particular habitat. Let them discuss for 4-5 minutes while taking a few questions from the students "outside of the fishbowl". A new group then comes up and is given a new topic. See if the discussion can lead into talk about survival, conservation, hunting, endangered species by adding in controversial topics. Have the final group discuss the adaptations of the brant.

Much of this activity was adapted from the Teach About Geese curriculum, U.S. Fish and Wildlife Service, Anchorage, Alaska.



Brant Inter-relationships

Objectives:

1. Students will be introduced to the inter-relationships among elements in a Brant food web, including humans.
2. Students will begin to understand the interdependence of humans upon each other to solve the problem of declining Brant populations.

Method:

Students take roles as elements of a Brant ecosystem and state their connection with other elements as they form a 'web of life' with yarn.

Background:

Interdependence describes the way a person, place or thing depends upon (or needs) any other person, place or thing. Producers (plants) make food and oxygen. Other living things depend upon producers for food, either directly or indirectly. This concept is often described as a food chain in which a predator eats prey which eats producers. However, most living things eat a variety of things, not just one thing. For example, a goose diet may include grasses, berries, insects or snails. One animal may eat the same food as another, for instance, both foxes and gulls feed on the eggs of the Brant. Thus, food chains become inter-connected and are more accurately represented as a food web.

Subjects: science, social studies
Duration: one class period
Group size: 6-14; if large class, two groups of 14
Setting: indoors or outdoors if nice weather
Topics: human and wildlife communities, diversity, inter-relationships, interdependence, conservation, food webs, habitat for wildlife

The image of a web of inter-relatedness may also be applied to human interactions. In a school, the principal depends on the teachers to do a good job, the teachers need students to teach, everyone needs the cook for lunch and the janitor to clean up. The groups and individuals responsible for reversing the downward trend of the goose populations on the Pacific flyway are similarly intertwined. Each individual or group is somehow linked and dependent upon one another for a workable solution.

Materials:

Masking Tape, marker, large ball of yarn or string, and the following list:

- Brant
- Canadian Developer
- Sunlight
- Ocean
- Fox
- Gull
- Boater in San Quintin, Mexico

- Eelgrass
- Water
- Hunter in Oregon
- Fish and Wildlife Biologist
- Wetland Community
- Hunter in Alaska

Procedure:

1. Begin with a short discussion on the food web of the Brant (see background): Brant eat eelgrass, fox and gulls eat the eggs and prey on the young Brant, they all live in a of wetland community.
2. You may want to divide your class into two groups, as there are only fourteen items on the list. Give each student a piece of masking tape with one of the words written on it. Have them attach the tape to the front of their shirt and sit in a circle.
3. Hand one student the ball of yarn. The student will hold on to the end of the yarn, then throw the ball of yarn to someone else in the circle that they depend on, are related to, or that depends upon them. The student catching the ball then holds onto the yarn and throws the ball of yarn to someone else that is inter-dependent. Before throwing the ball of yarn, the student should state the relationship. Students may receive the ball of yarn more than once, depending upon the inter-relationships other students see.
4. When everyone is connected by the yarn, ask: What does the yarn look like? (a spider web). If I tug in the yarn, who can feel it? Is anyone not connected to the rest of the group? What does this tell us about geese? (Geese are dependent upon other things to live.) How do humans fit into this web?
5. Make sure that all students have gotten the ball of yarn at least once. Also, be sure that students are seeing as many connections as possible with each thing. (Examples: Water and Hunter - if there was a lack of water in the wetland because of development, then there would be less geese there for the hunter and tighter restrictions on hunting **OR** sunlight and fox - eelgrass depends on sunlight for growth, Brant feed on eelgrass, and fox preys on the eggs of Brant.

Evaluation:

1. Ask students to state at least one interrelationship each food web element has with another element from the list.
2. Ask students to state at least one manner in which each person can work together with another person described on the cards to ensure Brant for the future. Send some of these recommendation to the list serve.

(Adapted from: Teach About Geese, U.S. Fish and Wildlife Service, Anchorage, Alaska.)

Oh, Brant!

Objectives:

1. Students will learn to identify and describe food, water, and cover as three of the essential components of habitat.
2. Students will be able to describe the importance of good habitat for animals.
3. Students will be able to define “limiting factors” and give examples.
4. Students will recognize that some fluctuations in wildlife populations are natural as ecological systems undergo a constant change.
5. Students will demonstrate that humans can affect wildlife population dynamics with management.

Method:

Students become Brant Geese, “components of habitat” and “hunters” in a physically active game.

Subjects: science, mathematics, physical education, social studies
Duration: 45 minutes
Group size: 15 and larger
Setting: indoors or outdoors; large area for running
Topics: population dynamics, wildlife management, predator/prey relationships

Background:

A variety of factors limit the ability of wildlife to successfully reproduce and to maintain their populations over time. Disease, predator/prey relationships, varying impacts of weather conditions from season to season (e.g. early freezing, heavy snows, flooding, drought), accidents, environmental pollution, and habitat destruction and degradation are among these factors.

Limiting factors are a natural part of a healthy ecosystem. When one or more limiting factors gets out of balance, the result could be threatening, endangering, or could eliminate a whole species of animals.

The most fundamental of life’s necessities for any animal are food, water, cover, and space in suitable arrangement.

Without these essential components, animals cannot survive. The major purpose of this activity is for students to understand the importance of good habitat as well as factors that affect wildlife populations in constantly changing ecosystems. Students should be able to apply these principals to the Brant of the Pacific Coast Flyway.

Materials:

Indoor or outdoor area, (large enough for students to run, e.g. playing field or gym), chalkboard, flip chart or dry erase board, writing materials.

Procedure:

1. Begin by telling students that they are about to participate in an activity that emphasizes the most essential things that animals need in order to survive. Review the essential components of habitat with the students: food, water, cover, and space in a

suitable arrangement (have students define boundaries, how far apart lines are etc...). This activity emphasizes three of those habitat components (food, water, and cover) but the students should not forget how important it is for animals to have sufficient space in which to live, and that all the components have to be in a suitable arrangement or the animals will die.

2. Ask your students to count off in four's. Have all the one's go to one area; all two's, three's, and four's go together to another area. Mark two parallel lines on the ground or floor ten to twenty yards apart or closer, if less space is available. Have the one's line up behind one line; the rest of the students line up behind the other line.

3. The one's become "geese". All geese need good habitat in order to survive. Ask the students what the essential components of habitat are again: food, water, cover, and space in a suitable arrangement. For this activity, assume that the geese have enough space in which to live and that emphasizing food, water, and cover are needed in order to survive. When a goose is looking for food, it should clamp its hands over its stomach. When it is looking for water, it puts its hands over its mouth. When it is looking for cover, it holds its hands over its head. A goose can choose to look for any one of its needs during each round or segment of the activity; the goose cannot, however, change what it is looking for (when it sees what is available) during that round. It can change again what it is looking for in the next round, if it survives.

4. The two's, three's, and four's are food, water, and cover components of habitat. Each student gets to choose at the beginning of each round which component he or she will be during that round. The students depict which components they are in the same way the geese show what they are looking for; that is, hands on stomach for food, etc. go over the three hand signs with all the students.

5. The game starts with all players lined up on their respective lines (geese on one side and habitat components on the other side) and with their backs to the students at the other line.

6. The facilitator or teacher begins the first round by asking all the students to make their signs, each goose deciding what it is looking for and each habitat component deciding what it is. Give the students a few moments to get their hands in place - over stomachs, mouths, or over their heads. As you look at the two lines of students, you will normally see a lot of variety, with some students water, some food, some cover. As the game proceeds, sometimes the students confer with each other and all make the same sign. That's okay, although don't encourage it. For example, all the students in habitat might decide to be cover. That could represent a drought year with no available food or water.

7. When you can see that the students are ready, count: "one, two, three." At the count of three each goose and each habitat component turns to face the opposite group, continuing to hold their signs clearly.

8. When the geese see the habitat component they need, they should run (or walk if in a small area) to it. Each goose must hold the sign of what it is looking for until getting to the habitat component person with the same sign. Each goose that reaches its necessary habitat component takes the "food," "water," or "cover" back to the goose side of the line. This represents that the goose successfully reproduced as a result. Any goose that fails to find its food, water or cover dies, and moves to the habitat side to become part of the habitat. That is, in the next round, the goose that died is a habitat component and so is available as food, water or cover to the geese who are still alive. Note: when more than one goose reaches a habitat component, the student who gets there first survives. Habitat components stay in place on their line until a goose needs them. If no goose needs a particular habitat component, the habitat person just stays where it is in the habitat. The habitat person can, however, change which component it is from round to round.

9. You as a facilitator or teacher may keep track of how many geese there are at the beginning of the game, and record the number of geese at the end of each round or ask a student to do this. Continue the game for approximately 15 rounds. Keep the pace brisk, and the students will thoroughly enjoy it.

10. At the end of the 15 rounds, gather the students together to discuss the activity. Encourage them to talk about what they experienced and saw. For example, they witnessed a small gaggle of geese (seven students in a class size of 28) begin by finding more than enough of its habitat needs. The population of geese expanded over two to three rounds of the game, until the habitat was depleted and there was not sufficient food, water, and cover for all the members of the flock. At that point, geese starved or died of thirst or lack of cover, and they returned as part of the habitat. Such things happen in nature also.

11. Using a flip chart pad or an available chalkboard, post the data recorded during the game. The number of geese at the beginning of the game, and at the end of each round represent the number of geese in a series of years. That is, the beginning of the game is year one; each round is an additional year. Geese can be posted by five's for convenience. For example:

The students will see this visual reminder of what they experienced during the game. The goose population fluctuated over a period of years. This is a natural process, as long as the factors which limit the population do not become excessive, to the point where the animals cannot successfully reproduce. The wildlife populations will tend to peak, crash, and rebuild, peak, crash, and rebuild, as long as there is good habitat and sufficient numbers of animals to successfully reproduce.

12. In discussion, ask the students to summarize some of the things they have learned from this activity. What do animals need to survive? What are some of the "limiting factors" that affect their survival? Are wildlife populations static, or do they tend to fluctuate, as part of an overall "balance of nature?" Is nature

ever really in "balance," or are ecological systems involved in a process of constant change?

13. Now, start the activity again. This time, give half of the habitat people 'hunter' cards to put in their pockets. These people still make their sign as a part of the habitat. This time, when a goose tags them, they show their 'hunter' card. This means the goose was shot by a hunter and dies. The goose becomes part of the habitat. Collect the hunting cards to hand out the next round. Keep giving hunter cards to half of the habitat people until there are no geese left.

14. This time do the activity using cards to represent other limiting factors, for example: predator, weather, pollution, or development.

15. Talk about what it would mean if there were no geese left. Can we get more geese once the last one is gone? Sometimes, if a population of animals has been depleted in one area, animals from another area can be reintroduced into the depleted area. For instance, hunting areas near villages in Alaskan Deltas are easily accessible. Those areas were hunted first, and tend to be the areas that have no geese nesting in them now. But, it is a fact that hunting has always been a part of the lives of many people's heritage, and that must be respected. So, the U.S. Fish and Wildlife Service may try to increase the numbers of geese in the depleted areas by reintroducing young geese. When the geese learn to fly, they 'imprint' or 'remember' that area and will return to nest there the following fall. For this plan to work, the cooperation of villagers by not hunting the geese until their populations are well established is important. This is also why wild birds are sometimes kept in captivity. Then, if the natural populations are low, the captive birds can be reintroduced into an area to give populations a chance to build up again. Of course, if there are no geese left at all, they cannot be reintroduced.

-Ask the students to try to choose how many hunters they think they can have to keep the goose population healthy. Start the game with one goose then see what is necessary to keep at least two geese in the population. Talk about how people can control the numbers of geese they shoot when populations are low, then increase the numbers when the population is large enough to withstand more hunting.

-Is it worth not hunting geese for a few years so that there will still be geese to hunt later?

-What will happen to the geese if we keep hunting them this year and next year? (You will need the Goose Population Chart, showing the declining geese, to figure out these questions.)

-If the goose population kept declining at the same rate, what year would they become extinct?

-How old will you be in that year?

-Do you think that you would like to have geese in your area when you reach that age?

-What can you do to make sure there are still geese here?

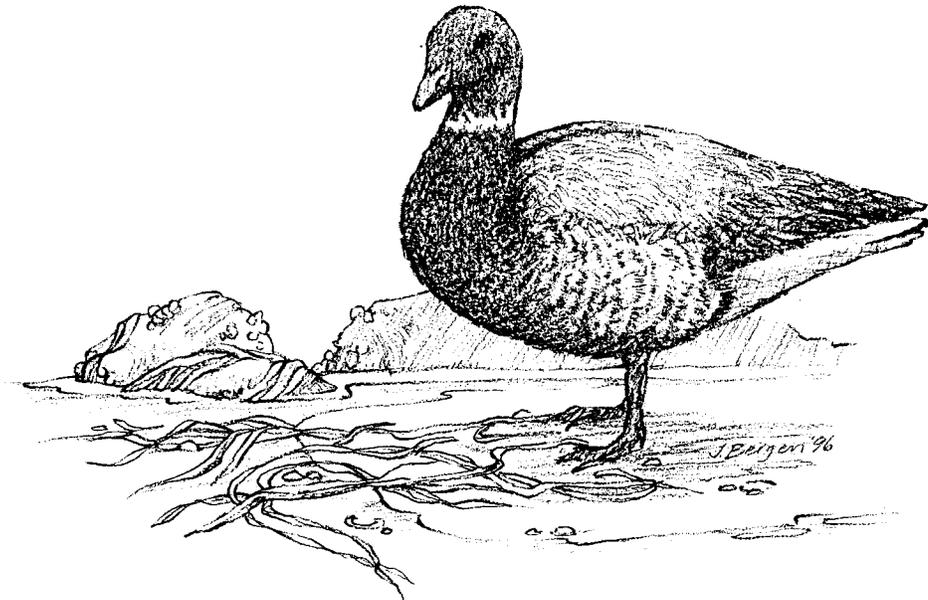
Evaluation:

- 1.** Name three essential components of habitat. (food, water, cover)
- 2.** Define “limiting factors, “ and give three examples. (factors that limit the ability of wildlife to successfully reproduce and to maintain their populations over time)

Adapted from: Project WILD, Western Regional Environmental Education Council, and from the “Teach About Geese” curriculum, U.S. Fish and Wildlife Service, Anchorage, AK.

Chapter 6 -Brant Migration

In this unit, students will learn some of the challenges that the Brant face during their migration. A mapping exercise will introduce students to the idea of 'bird banding' and the use of band reports.



Migration Headache

Objectives:

1. Students will learn that Brant are dependent upon their environment for survival.
2. Students will be able to list limiting factors affecting migratory Brant populations, predict the effects of such limiting factors, describe the effects of habitat loss and degradation on Brant populations, and make inferences about the importance of suitable habitat for migrating Brant.

Subjects: science, mathematics, physical education, social studies
Duration: 45 minutes
Group size: 20 and larger
Setting: indoors or outdoors; large area for running
Topics: flyways, migration, wintering habitat, nesting

Method:

Students role-play migrating Brant traveling between nesting areas and wintering grounds. The Brant are subject to hazards at either end of the migration path as well as along the way.

Background:

What is migration?

Migration is the seasonal or periodic movement of birds or other animals from one area to another. Migration has long been considered a mystery. How do animals (birds, mammals, fish, etc.) know when to leave? How do they know where to go? How do they navigate the long trip without a compass? Scientists have proposed that they use the stars, the sun, and even the earth's magnetic field to guide their journey. No one

knows for sure how it works.

What is a flyway?

A flyway is like a bird superhighway. There are four such "superhighways" in North America that run north and south. The Pacific North American Flyway is the name of the flyway used by the Brant. It starts in Baja California and the west coast of mainland Mexico. The flyway then continues up the west coast of California, Oregon, Washington, Canada and finishes in Alaska.

How do birds prepare for migration?

In preparation for a long migratory flight many birds have to build up extensive energy reserves. For the Brant, this means feeding heavily on eelgrass and sea lettuce. Such reserves (fat supplies) are required to help the Brant make it all the way to their nesting or wintering grounds.

What are nesting and wintering grounds?

A nesting ground is that area used by birds to mate, build a nest, lay eggs, and raise their young. The Brant's nesting grounds are in Alaska, northwestern Canada and northeastern Russia.

Wintering grounds are areas where birds spend the winter. Many migratory birds fly south in search of their wintering grounds. Here they find warmer temperatures and an increased abundance of food. The Brant fly south from their northern nesting grounds in the arctic to reach their wintering grounds. Most will head straight to Mexico, although some stop along the western coast of North America. Some have even been known to go to Japan!

Why are wetlands important during migration?

Migratory Brant require the presence of wetlands in their breeding habitat and on their wintering grounds. Since these two regions are thousands of miles apart, the Brant also need wetlands to provide them with food and rest, especially during their northward migration.

Why do birds migrate?

It is thought that seasonal changes in weather, which affect the availability of food and water, is the main reason for which migration occurs.

What are the hazards encountered during migration?

Some people question why birds migrate when so many obstacles are encountered along the way. Such obstacles include bad weather (storms can blow them off course), hunting pressures, destruction of habitat (wetlands) along the flyway, predation, pollution, pesticides, etc.

Materials:

- Large playing field or gymnasium
- Paper plates (two for every three students)★
- Two signs to designate "Wintering Habitat" and "Nesting Habitat."

Procedure:

1. Select an area about 70 feet in length. Place the paper plates in two locations on the playing field as shown below:

There should be one plate for each three students at each end of the field. Place the sign which designates "Wintering Habitat" at one end and "Nesting Habitat" at the other end.



★The paper plates could be drawn on by students to represent wintering and nesting habitats.

2. Explain to the students that they are Brant and will migrate between these two areas at your signal. Tell them that each paper plate represents a "wetland," suitable habitat for only three Brant (students). At the end of each migration the students will have to have one foot on a paper plate in order to be allowed to continue. If they cannot get their foot on a plate then they weren't able to get suitable habitat. They "die" and have to move, at least temporarily, to the sidelines and watch.

3. Explain to the students that many factors limit the survival of populations of migrating Brant. Some involve changes in the wintering and nesting habitats. There will be times of abundant food, water, shelter, and space suitably arranged to meet the habitat requirements of the Brant. There will be other times when the habitat is stressed, with many factors limiting the potential for survival. Sometimes the area of available habitat is reduced.

4. Begin the activity with all the students at the wintering habitat. On the first try, all the birds will successfully migrate to the nesting habitat. Explain that there has been no loss in available nesting habitat. Thus, a successful nesting season is at hand.

5. Before the students migrate toward the wintering habitat, pick up one of the plates from the wintering region. Explain that a large wetland area has been drained and used for agricultural purposes. Repeat the instruction to migrate and send the birds to the wintering habitat. Have the three students that will be displaced stand on the sideline. Tell the students that these three have died as a result of loss of habitat. Remind any "dead birds" that they will have a chance to get back into the activity. They can come back as surviving hatchlings when favorable conditions prevail and there is habitat available in the nesting ground.

6. Before the next migration to the nesting region, pick up four plates in the nesting habitat. This represents a catastrophic loss. Tell the students that this is the result of a period of unusually heavy rain during nesting which flooded many of the nests. Instruct the students to migrate. This results in a large number of students waiting on the sidelines to reenter the nesting habitat. Before many cycles are repeated, provide them with an opportunity for reentry. Each time, give the students examples of changes in habitat conditions that could have taken place making it possible for them to survive. Two students can be made permanent monitors to place the paper plates down or pick them up as you instruct them.

7. Repeat the process for eight or ten migration cycles to illustrate changes in habitat conditions with resulting effects on the Brant. Give examples of factors that might influence the Brant's survival.

Factors Reducing Survival:

- wetland drainage
- drought
- pollution and contamination of water (e.g., oil or chemical spill)

- urban expansion
- conversion of wetlands to farm land
- conversion of natural waterways to canals
- illegal hunting
- lead shot in food supply
- disease

Factors Favoring Survival:

- preservation of wetlands
- high rainfall
- restoration of habitat
- dynamic balance with predators
- human action aimed at protecting and restoring wetlands, including education
- regulation of hunting

NOTE: Some limiting factors are a natural and dynamic part of any environment. This is true of factors favoring survival as well. Be sure to create one or more "disaster" years to illustrate catastrophic loss of large areas of available habitat. Remember that, overall, the availability of suitable habitats for Brant are diminishing. The activity should end with fewer areas of available habitat than can accommodate all the birds. There is general agreement that the greatest long-term threats to the survival of Brant populations are the loss and degradation of habitat.

8. Hold a class discussion. The following questions are included to get you going.

Migration Headache Discussion:

- 1.** Identify the possible causes of the Brant's population decline from year to year.
 - what are the major factors contributing to habitat loss and degradation?
 - what are the effects of these factors?
 - list and discuss human-caused vs. environmental factors.
 - distinguish between catastrophic effects and gradual changes.
 - highlight those factors which the students identify as posing the most significant long-term threat to Brant survival.
- 2.** Discuss what kinds of things can and should be done to protect and restore habitats for migrating bird populations. What are the potential trade-offs? What kinds of wetland conservation program do your area/estuary have?

Telecommunications: Write a paragraph or two discussing the above issues in your area and send it to the listserve.

Journal Use: Write about some of the above issues in your journal

Adapted from: Aquatic Project WILD. Western Regional Environmental Education Council. 1987.

Migratory Mapping

Objectives:

1. Students will be able to map the migration route of the Brant on both the Pacific and the Atlantic flyways based on band and leg band recovery reports.
2. Students will be able to define the terms "wintering grounds" and "breeding grounds", and list two uses of band reports.

Subjects: science, social studies
Duration: one class period
Group Size: groups of 3 or 4
Setting: inside
Topics: migration, geography, bird banding,

Students analyze information from band and leg band recovery reports. With this data they chart both the Pacific and Atlantic flyways used by the Brant.

What is the Pacific Flyway?

Flyways are generalized migration pathways. There are four of these flyways in North America which run north to south. The Pacific Flyway, used by the Brant, is the westernmost flyway. From bird band returns biologists have discovered that during spring migration birds make more stopovers as they follow improving weather northward. In fall the birds

wait and move south all at once to good weather.

Why Band Brant?

Banding of Brant is done to provide information regarding their migratory routes. Through recovery of bird bands, data on direction and duration of migration is obtained. Sightings of live tagged birds and retrieval of dead bird tags provide additional information about birds' use of migration areas and provides indications of survival rates and life spans.

Who Uses the Information?

The U.S. Fish and Wildlife Service Bird Banding Laboratory in Maryland maintains a record of all bird bands in the United States. All researchers must obtain permits from the Bird Banding Laboratory in order to embark on a bird marking project. Marked birds must have, at a minimum, a silver colored U.S. Fish and Wildlife band with an 8 or 9 digit number. This number and all information about the bird- such as sex, age, weight, condition, date, and place of banding- are on file at the Bird Banding Laboratory.

Why Use Colored Tags?

Quite often researchers will also tag another part of a bird. This extra tag is usually colored and has a combination of letters and numbers that identify that bird in the biologists' study. Some of the colored tags have larger, more distinct codes that may be read from a distance. If a biologist wants a goose to be distinct, he or she may add a colored collar with a code such as "8Y3" in large print. Colors are assigned to specific breeding areas

What Should You Do if You Find a Banded Bird?

If you find a banded bird and can read any or all of the numbers on the bands or the leg band collar, you should contact the U.S. Fish and Wildlife Service and they will forward the information to the Bird Banding Laboratory. The laboratory staff will look up the numbers and contact the biologists who conducted the study. The biologists will then use the information that you gave them about the circumstances in which you saw the bird in their studies. The laboratory will also let you know when and where the bird was banded.

How do Brant Migrate?

Brant migrate in strings, v's, and often in less organized flocks. They can, with a good tailwind, reach speeds up to 65 mph. Their migration on the Pacific Flyway follows the movements of the seasons. In general, the Brant's migration is as follows:

Location	Arrival/Departure	Reason
Mexico	Oct-Nov/Mar-Apr	wintering grounds
California	Mar-Apr/Apr-May	staging grounds ¹
Oregon	"	"
Washington	"	"
B.C.	"	"
Alaska	Apr-May/Aug-Sept ²	nesting grounds
N. Canada	Apr-May/Aug-Sept	"
Russia	Apr-May/Aug-Sept	"
Izembek, AK	Aug-Sept/Oct-Nov	feeding grounds
Izembek, AK	spring/fall	staging/wintering areas

Materials:

- Brant reports and maps of North America (masters provided)
- The large classroom map of North America or overhead projection of blank map of North America.
- Push pins
- String or thread

Procedure:

1. There are 10 Brant reports included with this activity. The reports are simplified versions of actual data that have been turned into the U.S. Fish and Wildlife Service. There are two ways to do this activity:

¹Staging grounds are areas where Brant stop to rest and feed.

²Almost the entire population of Pacific Brant congregate in Izembek Lagoon to feed on the rich supplies of eelgrass before heading south.

a. **Younger students:** While students follow along on their own maps, plot the band reports on a large map at the front of the classroom. See the following procedures for more detailed instructions.

b. **Older students:** Have the students break into groups of three or four and plot the Brants' use of the Pacific and Atlantic flyways. Make as many copies of each set of band reports as you'll need for the groups.

NOTE: If possible, have a U.S. Fish and Wildlife Service employee bring in samples of actual bird bands and/or mounted birds with bands to discuss banding in greater detail. Have the speaker tell students why banding is done, and what they should do if they see a band on a bird (either alive or dead).

2. Introduce students to the idea of flyways.

3. Hand out copies of the North American maps to each student. Each map should have all of the states, Mexico, Siberia and Canada.

4. Tell students that they are wildlife biologists compiling Brant recovery data. The reports include color tarsus band numbers and leg band observations that people have given to wildlife biologists so that they can track where the Brant have been. Each report gives the following information:

- A band number (explain that actual band numbers would be longer).
- Where the Brant band and/or leg band was found or seen.
- Where the Brant was banded. Occasionally someone will report seeing a band or leg band more than once.

5. It is the students' job to mark these data points on the map as follows:

- Have one of the students from each group read one of the band reports. The other students should locate where the Brant was found on the map.
- Once located, the students should circle the area on their maps and fill in the band number.
- They should then find the area where the Brant was banded and mark that area with the same band number.
- Have students draw a straight line between the two points on their maps.

6. If time remains, have each group use the string and push pin method for the large classroom map, to designate the Brant banding reports found.

MIGRATION MAPPING DISCUSSION QUESTIONS:

- 1.** Where are Brant normally banded and when? (Brant are usually banded in their nesting areas while they're molting and can be easily captured)
- 2.** How many different ways are reports of banded birds obtained? (e.g., shot by hunters, seeing marked birds, finding dead birds, etc.)
- 3.** Discuss what people can learn from band returns and information about Brant migration. (Returns tell us where important feeding and resting areas are so that they can be protected, where and how many birds are taken by hunters so that the harvest can be regulated to maintain healthy populations, how much energy birds need, how long birds live, etc.)

Adapted from: Issue Pac. "Hunting and Wildlife Management." U.S. Fish and Wildlife Service.

Pacific Brant Reports*

1. A banded bird was found dead on the shore of Puget Sound in western Washington state on April 29, 1984.

FILE DATA: Banded July 11, 1963 near Hooper Bay on the west coast of Alaska when it was one year old.

2. A previously banded bird was caught and released by a U.S. Fish and Wildlife employee on July 20, 1978 near Cold Bay, Alaska.

FILE DATA: Bird was banded in northern California on April 12, 1976.

3, 4, and 5. Whale-watchers in Baja California (Mexico) saw a flock of Brant in Scammon's Lagoon in west central Baja on January 15, 1990. Three birds had yellow leg bands.

FILE DATA: Biologists put yellow leg bands on 300 Brant near Hooper Bay on the west coast of Alaska in July, 1989.

6. A hunter shot a banded Brant on February 10, 1958 in Northern California.

FILE DATA: On March 17, 1953, this goose was banded in California.

7. A single band was found by a bird watcher on February 6, 1980 off the southern coast of California.

FILE DATA: This particular goose was banded on May 18, 1966 near where the band was actually found.

8. While hunting at Cold Bay on the Alaska Peninsula, a hunter from Anchorage shot a Brant with a blue leg band on October 20, 1990.

FILE DATA: Blue bands were put on 50 Brant on Banks Island (northwest of the mainland in the Northwest Territories) on July 20, 1989.

9. A British Columbia hunter shot a banded Brant near the border between Washington and Canada at Boundary Bay on March 2, 1988.

FILE DATA: Banded July 13, 1963 near Hooper Bay on the west coast of Alaska.

10. While boating off the coast Ensenada, Baja, Mexico, a local family identified the leg band of a Brant on January 21, 1990.

FILE DATA: On July 20, 1978, Brant geese were banded in Alaska.

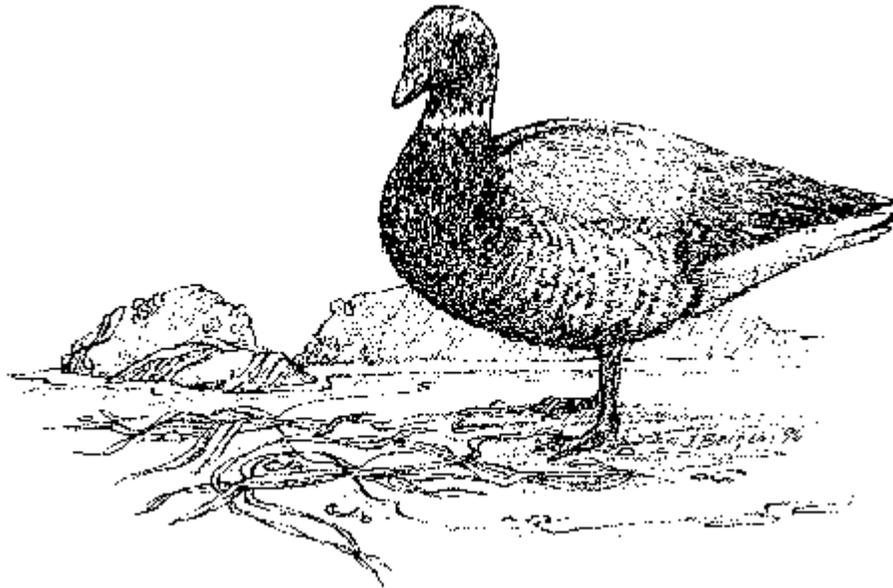
11. A bird watcher in Coos Bay, Oregon sighted the following: a group of 223 Brant, 2 of which had bands that could be read. This occurred on February 23, 1998.

FILE DATA: One was banded on July 1989 near Hooper Bay in Western Alaska. The other was captured and banded near Teshekpuk Lake in northern Alaska in July 1991. He was also seen wintering in Mexico in 1992 and 1993.

*These reports were obtained with the help of Bird Banding Laboratory in Maryland.

Chapter 7 - “Mock” Bird Watching

This activity encourages proper etiquette for handling binoculars and spotting scopes, and correct viewing habits before heading out into the field for Brant-watching.



Equipment Usage and Mock Birding Activity

Objectives:

1. Students will identify methods used by biologists to observe waterfowl populations
2. Students will learn how to identify and observe birds before going into the field.
3. Students will learn the proper use of binoculars and spotting scopes

Subjects: science, physics
Duration: entire class period
Group Size: whole class, and then into small groups
Setting: indoors and /or outdoors
Topics: optics, observation, bird watching, data collecting

Method:

Students will learn to identify birds by doing a “mock birding” activity at school before heading out to the field.

Background:

Birdwatching is an activity as old as humanity and for good reason! The migrations and habits of avian fauna (bird-like animals) tell us a great deal about the changing of conditions in the environment and the availability of essentials such as food and water. Of course, birds are also a beautiful and diverse group of animals which are often easier to view than many other kinds of creatures.

While the “rare bird” may be an exciting discovery, watching the behavior of the most common birds can be fascinating and informative. After all, birds common to one region may be considered rare in another.

Careful observational skills are necessary to be accurate when trying to identify a bird. The way the bird flies or acts may be as important as noticing the color of the feathers. The size and shape of the birds’ body, wings, head, feet, and beak are very important. The sounds you hear the bird make and the location in which you see it are also important. A Brant would not be found perched in the top of a Douglas Fir tree and we would not expect to see a Great Blue Heron swimming over an eelgrass bed either. The habitat in which a bird is found and the time of year can give you important clues when trying to solve the mystery of the unidentified flying creature.

In this activity, we will learn how to use a field guide, identify some common types of birds which may be seen during Brant migrations. The goal is to get the students familiar with the techniques and skills which are used to identify, count and differentiate between different species of birds, in preparation for the field experience. By taking part in a mock birding exercise designed to improve observation skills, students will be prepared to differentiate and make careful observations of Brant in the field.

Materials:

- The 9 observation sheets, laminated.
- At least 6 pair of Binoculars 7x35*, or better (ask students to bring own if possible)
- 1-6 spotting scope(s), 22x or better. Zoom capabilities, preferably a 15x - 45x zoom lens for one of the scopes would be useful.
- Enough copies of the mock birding question sheets for every 2-3 students.
- pens or pencils
- Field Guides (enough for 1/3 of class to have one, if possible)

* The 7 refers to the multiple by which the image is magnified and the 35 refers to the diameter, in millimeters, of the largest lens.

Procedure:

- 1.** This activity will have 2 or 3 stations. Try to have 3 adults for this activity if you incorporate the field guide part into it. This activity works well in a large empty classroom, a gymnasium, or, if weather permitting (including no wind) it can be done outside where there is a fence to attach the pictures. Set up three stations: Binocular use, spotting scope use, and field guide use (each having an adult leader). Divide in half and hang the pictures on walls or fences, among the binocular and spotting scope groups (hang them using the given distances). The third station will have no pictures, but some bird field guides.
- 2.** Introduce to the students that this is a “mock birding” activity that will prepare them for the field observation of the Brant geese. Before beginning in the stations, demonstrate how to properly use the spotting scopes and binoculars. Be very specific in how you want the students to carry, set-up, take down, clean and focus the equipment. Later, you may want to have the students demonstrate one by one each of these tasks. This is important, as you want students to learn how to be responsible for the equipment on the actual field-trip.
- 3.** Divide the class into 3 groups: Binocular use, spotting scope use, and field guide use.
- 4.** Explain that they will be going around to each station and answering the questions on the worksheet about what they are seeing. Give them about 20 minutes per station, or enough time for each student to look through the equipment, focus on the picture, and answer the questions. The adult at the field guide station can explain how the birds in the guides are grouped by certain characteristics (swimmers, waders, raptors, songbirds, etc.). Name birds for them to find, giving clues etc...if time permits, go outside and actually find a bird to I.D. A whistle used to signal rotations usually works well.

As the students attempt to see the real Brant in this exercise, remind them to heed these important tips (**read aloud to class**):

- Observe carefully! Many a casual bird watcher has made a mistake in identification of birds and lost credibility amongst fellow birdwatchers for crying "Bald Eagle" too often.
- Look for key features first (length and shape of bill, head, neck, body; color of wings, body, neck; behavior in flight, feeding, at rest, around other birds; distinctive markings (what stands out above all else when you see the bird?))
- Check and check again until you are absolutely certain. Remember to look at more than one of the birds in view. Birds molt their feathers and may appear in many different patterns and colors, yet they are still the same species.

5. The following is the list of images to use for the activity (these images are available to download and print out from the Brant project web page):

A. "Brant Geese begin their lives in nests on the tundra of northern North America and Asia."

(Reproducible image of triangle and sentence; place 75 ft. from observer)

B. What color is the belly, band around neck, and head of the Brant?

(Image of 3 Brant wading in the water; place 75 ft. from observer)

C. How many different kinds/species of birds can you count?

(Reproducible image of silhouettes of Brant, Canada Goose, American Widgeon, Western Gull, Northern Pintail, Common Loon, Surf Scoter; place 75ft. from observer)

D. Which bird has the longest neck?

(Reproducible image of Spectacled Eider, Emperor Goose, Brant and Pacific White-fronted Goose; place 75 feet from observer)

E. Name three differences between the bird on the left and the bird on the right.

(Reproducible image of Emperor Goose and Brant)

F. Which Brant has a leg band and what color is the leg band?

(Reproducible image of Brant Geese; place 75 ft. from observer.)

answer: goose on far left has white band)

G. How many birds can you count in the photo? How many are Brant?

(Reproducible image of six Brant and two Western Gulls)

H. How many Brant in flight can you count?

(Reproducible image of 5 Brant placed 75 ft. from the observer)

I. How many Brant are there total in the photo? (Reproducible image of approximately 60 Brant dabbling in the water.)

Student Worksheet for the Mock Birding Activity

A. Write down the sentence that is inside of the triangle:

B. What color is the belly on the Brant? _____ The band around their neck? _____
The head of the Brant? _____

C. How many different kinds of bird species can you count? _____ Try to identify these birds using your field guide. Write them down:

D. Which bird has the longest neck? circle 1 2 3 4
Try to identify these birds using your field guide. Write them down: _____

E. Name three differences between the two birds: _____

F. Which Brant has the leg band? _____
What color is the leg band? _____

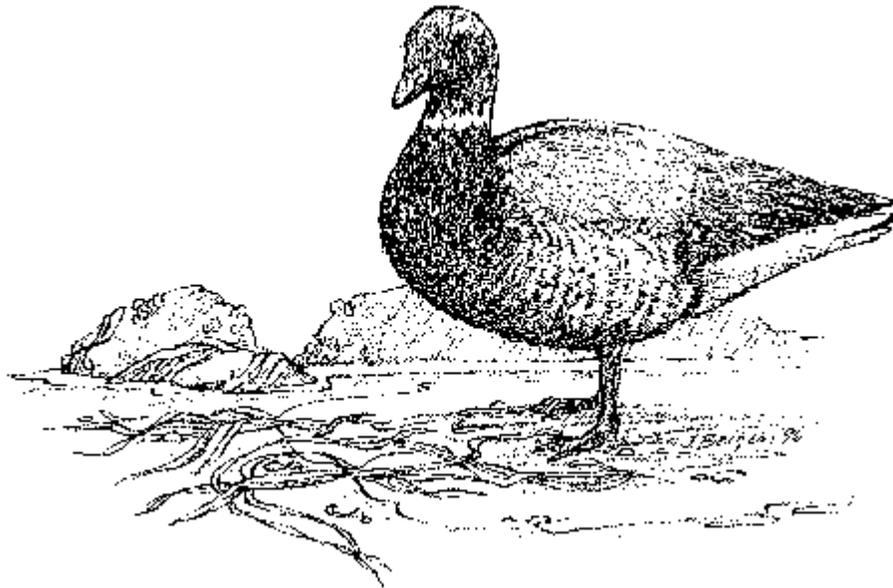
G. How many Brant do you see? _____
What other kinds of birds do you see in the picture? _____
How many? _____

H. How many Brant do you see in flight? _____

I. How many Brant are there total in the photograph? (approximately)

Chapter 8 - Brant Monitoring in the Field

This chapter gives different options for viewing the Brant in the field, data sheets, and some creative alternative to the typical field trip.



Field Trip Guide for Teachers

Background:

Once your class has had an introduction to the Brant project (the introductory activities in Chapter 2) you can begin to monitor for the geese in your local estuary. These field trips are designed to give students an experience that will not only allow them to observe and collect data about the Brant, but also to study the surrounding area and habitat of the Brant.

Objectives:

1. Students will have an opportunity to observe the Brant, their behavior, and the surrounding area that may affect the Brant.
2. Students will observe and count the population of Brant using sampling techniques.
3. Students will map significant areas of their estuary.
4. Students will observe other plants and animals that share the Brant habitat, and be able to note any pressures that they are facing.

Method:

Through the use of data collection sheets, the students will be able to gather information about the Brant such as number of flocks, bands sited, age of birds, etc. As an optional activity in addition to the normal data collection, students will have a different “focus activity” to do on three different visits to the observation sites to gather additional information. The students are given a “job”. The following is a brief description of the three different activities:

1-the Behavioral Ecologists: Students will make careful observations about the area surrounding the Brant and the relationships of that environment to the Brant.

2-the Geographic Interpretation Specialists: In this activity, students will create a map with representations of objects and landforms that are in the vicinity of the Brant.

3-the Marine Plant Ecologists: In this activity, students will conduct a basic survey of the major plant life in the area near the Brant, including their favored foods: eelgrass and sea lettuce.

Procedures (Before you go)

1. Make sure that you have extra copies of the field sheets for your students to use on the field trip. Have students bring the journals on the field trips; they are good place for students to keep field notes and data sheets, and to make reflections.
2. Contact a local resource person in your area. Check with your State Fish and Game, or Federal Fish and Wildlife agency for a wildlife biologist that is knowledgeable of the area and of the Brant. Check early enough to give them time to schedule in your class field trip.

3. Review the activities provided for your class for the field trip. Also in class, give students the opportunity to learn to read a tide table. Have them help decide when the best times to go in the field would be.
4. Let the class know where they are going and the behavior that is expected of them (see field trip etiquette). Discuss safety with the students. See “Field Trip Safety” section.
5. Give the students a list of what they need to bring along, including proper dress for the location and conditions. Remember that you will be near the water's edge...dress with appropriate foot wear!
6. Ensure that students can properly use equipment prior to the field trip and have all completed the “Can You See the Real Brant” activity. Encourage students to bring their own binoculars and bird field guides from home.
7. Clipboards are handy for students to hold field sheets. Mount a pencil to each board. Enclose the entire clipboard in a large ziplock bag to protect from rain
8. Be sure to bring along some empty plastic shopping bags (the kind with handles) for a beach clean-up of the area.
9. Make sure you bring the sample plant pressings of the eelgrass and sea lettuce from the Brant Care Package for the plant group leader to use for that station.

Procedure At Site:

1. Depending on the length of time that you stay and observe the brant, take in to consideration that the optional “focus activities” should be given at least 10 minutes to complete.
2. Try to make the data gathering procedure as accurate as possible. A wildlife biologist will be helpful in determining counting procedures.
3. A strong closing is just as important as the activities themselves. Have students write some reflections while still in the field, or have them finish the sentence "the most interesting thing I learned about the Brant was or they could share something specific that they found interesting.
4. A must before you and your class leave: A Beach or Wetland Clean-Up. Have students participate in cleaning up any litter and encourage them to leave the area cleaner than they found it when you arrived. This might be a good activity to do in their groups as well.

5. Upon your return, the data that the class collected, can be compiled into a short half page observations report (this could be assigned to a different group of students each week). Also, any other student reflections that the class feels is important, should be sent to the listserv: brantproject@sd69.bc.ca.

6. A final report at the end of the season (or once all of the “focus activities” have been completed) can be done (see Follow-Up Activities, chapter 9, lesson 1).

Some helpful hints for the teacher:

- Remember to always be versatile. Recognize the magic of the moment. Use unexpected experiences to illustrate ecological concepts, or just enjoy it.
- Enthusiasm is the main attention-getter. Whatever is being done, do it with gusto! If you are not getting excited about it, will your students? Get down on your hands and knees to look at plants and tiny creatures. Point silently at a feature to which you want to draw attention. Enthusiasm is a greater catalyst than knowing all the names. Create an appealing atmosphere.
- Make sure the activity does the teaching and not you. Model good conservation and environmental behaviors.

Field Trip Etiquette:

It is important to not only have an enjoyable time on your field trip and learn about the Brant, but to also promote conservation. By first telling your students these basic conservation rules, and then as a teacher being the model, you will be contributing to the protection and wise use of our precious and limited natural resources. Explain to your students that you are entering fragile wildlife habitat, and that to misuse or be a careless visitor, is to destroy the homes of valuable plants and animals. Here is a list of some things you and your class can do to have a more stimulating and low-impact experience on your field trip:

- Step softly and quietly while observing animals.
- Replace rocks and logs after looking underneath (to keep roofs on animals' homes).
- Handle all animals gently.
- Fill in holes after looking at worms or clams (to prevent suffocation of the animals next door).
- Do not take live animals away from their homes.
- Do not litter.
- Pick up any litter that you find.
- Minimize trampling of plants. If trails are designated, stay on them as much as possible.

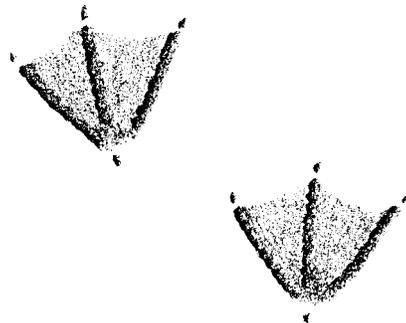
- Stay quiet. Yelling, shouting, and "roughhousing" will scare the geese away, and may cause some to abandon the area, and even avoid the area in the future.

Field Trip Safety:

- Have a partner.
- Dress warmly and keep dry.
- Know the dangers of, and treatment for, hypothermia. Take extra clothes, rubber boots and rain gear (plastic bags will do in a pinch).
- Step carefully around the water in the area. Because the ground may be mushy, you could get stuck.
- Observe animals from a safe distance. If an animal shows signs of being crowded or disturbed, sit quietly or move away.
- Do not taste any wild plants. Some plants are poisonous and some people are allergic to plants that are normally harmless.
- Carry a first aid care package.
- Be aware of special allergies or medical problems.
- Always know what students you have in your group. Carry a list of students and take frequent head counts. To prevent stragglers and explorers from getting lost, assign a leader and follow-up person when traveling from one point to another.

Equipment Checklist

- Spotting Scopes
- Binoculars
- Field Guides
- Clip Boards
- Pencils
- Large Ziplock Bags for Clipboards
- Data Sheets (extras)
- First Aid Kit
- Garbage Bags



Much of this field-trip chapter was adapted from *Shorebirds of the Pacific Flyway*, U.S. Fish and Wildlife Service, Alaska Maritime National Wildlife Refuge, Homer, Alaska.

Data Sheet Explanations

Point” would be the Site and “Izembek Lagoon, Cold Bay, Alaska” would be Site/Location: Where exactly did you see the banded Brant? Example: "Grant the Location at the top of the page.

Date: The date of your field trip.

Time: The time you started observing the Brant.

Observer: Name of person who read the band.

Band: The combination of letters and numbers. Remember read the band from **bottom to top**. Also - **Don't guess!** If you can't quite make out the letter or number, put a "_" in the place of the questionable character. Most tarsus bands contain a 3 character code repeated 3 times around the band. Restricted character set:
A,E,G,H,K,L,N,R,S,T,V,Y,Z & ALL NUMBERS.

Color: What color is the band:

Yellow with black letters
White with blue letters
Aqua with black letters
Blue with white letters
Red with white letters
Green with white letters
Orange with black letters

Age: Is it a juvenile (Juv) or an adult (Ad)? Check with your local biologist to find out how to tell the difference.

Comments:

Was the banded bird standing next to another color-banded bird of the same color?
Was the bird feeding or resting when you read the band? Anything of interest can be added to this column.

Data Sheet Explanations:

Location: In what geographic area was the count made? Example: “Izembek Lagoon, Cold Bay, Alaska”

Site: Did you count all the birds at that location or just the birds in “Applegate Cove”. Draw a map of the area where the counts were made, showing boundaries.

Date: The date of your field trip.

Time: The time you started observing the Brant.

Tidal height: Height of the tide: Low, Medium or High.

Tidal flow: Flow of the tide: Slack, Ebb, Flood

Brant present: Fill out a sheet even if Brant are not present.

Flock number: Number each flock counted.

Number of Brant: Estimate the number of birds present in each flock.

Juvenile/Adult: Number of juveniles to the number of adults in the flock. For example, 15/25 or 15 juveniles and 25 adults were seen in the flock. Try to age >30% of the flock.

Behavioral Ecologist
Focus Activity

You will be investigating how animals interact with their living and non-living environments or how they behave under certain conditions. Specifically, you are interested in what the Brant are interacting with and how they act because of those certain conditions. It is very important that you learn as much as you can about the behavior of the Brant so that you have information that can support the Brant population in this area if ever there were ever any threats to its population.

1. What kinds of sounds do hear in this area? Where are the sounds coming from? How do think they affect the Brant?_____

2. Look around you....List 20 things that you see all around. Now, choose 5 of them and describe how they might affect the brant.

3. What types of human activity (buildings, boats, roads, trails, bridges, etc.) do you see around you? Do these things help or hurt the survival of birds, such as the Brant?_____

4. Find a piece of litter...take it to the litter bag. How might this piece of litter affect the animals and the plants in the area? Why do people litter?

5. Find a piece of living material. How is this connected or related to a Brant?

6. Find a piece of non-living material. How is this connected or related to a Brant?_____

7. If you were a Brant, where would you go to escape from a predator?

Why?_____

8. Explain how you might behave if a fox or a threatening person approached you and your nest. _____

9. If you were a Brant, where would you go to find food? Why?

10. Do you see any boats, people fishing, or other human activity?

Describe: _____

11. If you were a young Brant just after leaving the nest, would you feel safe on your own, or would you feel threatened by the local disturbances around you?

12. Take turns watching the Brant with binoculars. Record your observations. Be specific about what you are seeing. Describe their behavior and what might be causing that certain behavior. _____

13. Make note of any air, water or noise pollution. _____

14. How do the actions and behavior of the Brant relate to their surroundings, the disturbances, and your class being there?

15. In what direction are the Brant moving, if they even are? If moving, why do you think they are?

Mapping Specialist

Focus Activity

Your Job: You are a one of a kind specialist in your field. You have training in mapping very remote areas, following certain species of animals, and mapping their location. You have recently joined a team of biologists to determine the whereabouts of the Brant during its migration up and down the Pacific Coast Flyway. It is up to you to investigate the area, learn what is there, why the Brant Geese are there, and to map this information. This information may be compiled into a report for a management team for use in decision making on the future uses of this estuary or bay.

1. Use the back of your paper to draw your map. Decide what kind of map key you are going to use, what types of symbols will represent water, land, eelgrass, human development etc...
2. Where does the water in this wetland or estuary come from? (called an outlet)
3. Mark that on your map. Where does the water go to? (called an inlet) Mark that on your map.
4. Find and name the different bodies of water around you and the Brant.
5. What types of landscape features and objects can you identify (hills, forests, rivers, sand spits, beaches). Put them on the map.
6. Are the Brant in the water? On the sand? Locate where they are on the map.
7. Most importantly, we want to know how close the Brant are to human disturbance. Map any type of human built structures or things (buildings, parking lots, parks, roads, airports, boats, docks and anything else).
8. Compare where you are to an aerial map (if you have one). Can you find where you are?

Marine Plant/Algae Ecologist: Eelgrass and Sea Lettuce

Focus Activity

Your Job: You are a biologist that works with marine plants. You have heard about the Brant Project through some of your other biologist friends and have decided to contribute some of your findings to their work. The Brant get most of their food from two marine plants: eelgrass, and sea lettuce. You are interested in learning more about these particular plants and their relationship to the Brant geese. You are going to sample the area at which you are near today for evidence of these two plants

1. Begin your survey by describing the general plant coverage around the Brant:

2. Go over to the water's edge. What do you see? Is there evidence of plants living in the water? Describe what you see:

3. Are these plants affected by the tide?_____ How so?

How might the tide affect the Brant?

4. How are these plants adapted to live in the very high tides? Very low tides?

5. What might live on these plants?_____

6. Notice the landscape around you.....notice all of the plants in the vicinity. How might the Brant use these plants?

7. How many different types of plants and algae are found in the sand?

8. How many different types of plants and algae are attached to rocks? _____

9. What do these plants and algae need to survive? _____

10. Using the samples of eelgrass, find an area where it lives. Describe the color, texture, size, number of blades and its general location.

11. Using the samples of sea lettuce, find an area where it lives. Describe the color, texture, size, number of blades and its general location.

12. Eelgrass is classified as a plant and sea lettuce is classified as an algae. Describe the physical differences between the two.

13. What gives plants their green color? _____

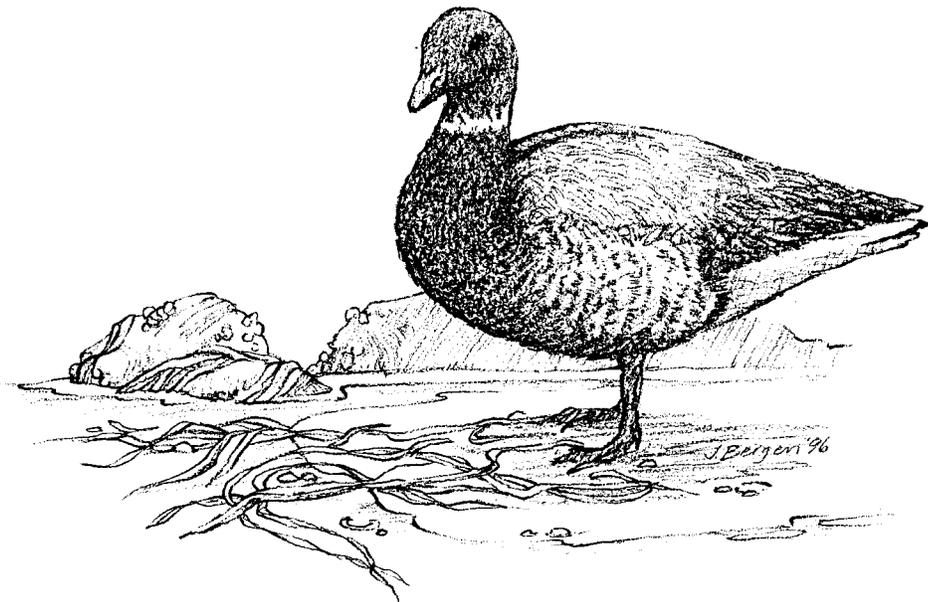
Smear some on your paper next to this question.

14. How would the plant life in this area change if a resort hotel were built here? or if there were an oil spill? or if there were dredging in the estuary? _____

15. Because Brant primarily eat sea lettuce and eelgrass, how might the above actions affect the Brant? _____

Chapter 9 - Follow-Up Activities

Through creative and thought-provoking activities, students will have an opportunity to take what they have learned about Brant and apply that to classroom and community projects.



Report Writing: Back In The Classroom

Subjects: Science, language arts
Duration: at least one class period
Group Size: entire class, small groups, or individuals
Setting: at home and at school
Topics: researching special topics, writing, local Brant status and natural history

Objectives:

Students will be able to research and report on their findings of the Brant in their local area and share the information on the Brant homepage.

Method: Students compile group field data into a class report that can be communicated to the other project sites over the internet.

Background:

Students should now have a good understanding of what problems the Brant in their area are facing. The field trip has provided them with first hand experience allowing them to actually see where the Brant are, and some of the challenges that they are facing.

Procedure:

1. Using the “focus activity” sheets from the field trip, divide students into 3 teams, 1 team for each of the activities: marine plant/algae ecologists, geographic interpretation specialists, and the behavioral ecologists.
2. Once these groups have been established, pass out their already-filled in sheets (unless they are in their journal) and explain to them that they need to compile a short outline on the status of their group’s particular topic. Let them discuss and combine things that they feel are the most important aspects of their topic. Have the students form sentences from the sheets; example: Take the question, “How might the tide affect the Brant?”, and turn it into, “The tide in our area affects the Brant by exposing more of their food source during a low tide.”
3. Have students include reasons why they think things are the way they are in their area..... over hunting, disturbance in eelgrass beds, human impact, other reasons, and include that in their segment of the report. Finally, as a specialist in that particular field, let them make some “scientific recommendations” about their particular topic in relation to protecting the brant populations.

Telecommunications: This information can then be transmitted on the internet to the other sites and onto the homepage.

Graphing Brant Data

Objectives:

1. Students will learn how to graphically depict the data that was collected during the season from the different sites.

Method:

With a computer graphing program such as 'Excel', or, by hand, students will produce color graphs to show the fluctuations in brant populations over time.

Procedure:

1. Put students into groups of 2 or 3.
2. Make 1 copy of the data tables from the web site's observation log for each group (this year's and last year's – depending on the types of graphs you want).
3. Assign each group a different site to compare. Examples:

Group 1: compares monthly populations of Coos Bay with that of Padilla Bay

Group 2: compares '96 – '97 with '97 – '98 Mexico populations

4. Let the students group the data by months, year, place
Example: Group 1 will add all of the Brant seen in January in Coos Bay from the handout, (and will get totals for each month). The same will be done for Padilla Bay.
5. Next, let students draw conclusions from this: which area saw the greatest number of Brant in February, etc.
6. If computers are available with a graphing program, let students, one group at a time, work with an adult that is familiar with the program, to properly enter the data in the columns similar to this:

	Coos Bay	Padilla Bay
November	38	0
December	0	554
January	156	1876
February	891	3304
March	400	2500

The computer program will then let you choose how you want to graph it.

7. If a computer with graphing capability is not available, give students graph paper and have them draw very simple bar charts to depict the information. Let each group explain to the class what their chart represents.

Telecommunications: Attach the graph (as a separate file) to an e-mail message and send it to the listserv for everyone to see!

A Day (or week or year) In My Life As A Brant:

Objectives:

1. Students will experience a creative way to express what they have learned about the Brant.
2. Students will recognize the life processes of the Brant as well as some of the problems affecting them during their migration and stopovers.

Method:

Students will imagine themselves as a Brant and use creative writing to express these ideas on paper to share with others.

Subjects: Science, language arts
Duration: one class period
Group size: entire class
Setting: classroom
Topics: migratory waterfowl, habitat, migration, pressure on Brant geese

Procedure:

1. Have students imagine themselves Brant, and then write a story telling where they have traveled, what they have eaten, the dangers they have encountered, and their perceptions of the world as seen when in flight.
2. The story should be based on factual information. Students can use information provided from this curriculum, from local wildlife biologists, and from resources at local libraries.
3. Encourage students to use information gathered during the field trip. Ask students to write from the perspective of the Brant included using senses as part of the experience, so they write about the temperature, sights, smells, sounds, feeling of flight, textures of habitat (i.e. eelgrass, water) and light levels that they would experience if they were a Brant.

Telecommunications: Send some student stories to the list serve for the web page.

Journal: This would be an excellent activity for the student journals.

Extension: This activity could also be done as a hands-on art project. Instead of writing about what the world seems like to a Brant, have them draw or paint an interpretation of these ideas. Encourage the students to accurately portray the habitat the bird might pass over but use their imagination so that their picture conveys the length of the journey, the altitude the bird flies at, and the feel of the air.

Adapted from: "Alaskan Wildlife Week," published by Alaska Department of Fish and Game. 1983, 1984.

Brant Poetry

Subjects: science, language arts
Duration: one class period
Group Size: entire class
Setting: indoors or outdoors on a nice day
Topics: poetry, creative writing, Brant natural history

Objectives:

1. Students will be able to apply recently learned scientific knowledge in a creative way.

Procedure: “A poem is a word picture.” Discuss this concept with students. Then ask them to write a poem about Brant, feeding, migrating, or about its habitat. Students can write poems year-round in their journals. Or, you may want to put the poems written by the students in a display, compile them into a class book, or ask your local newspaper to publish the best ones in a future edition. You could also send the favorites to the listserve.

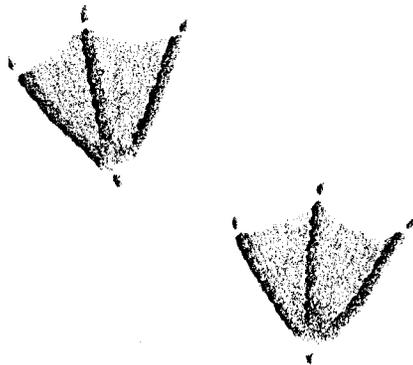
Haiku (pronounced Hi-koo): This is an unrhymed Japanese verse consisting of 3 lines containing 5, 7, and 5 syllables, respectively:

Pacific Brant
What a spectacular flight
Migrating over seas

Cinquain (pronounced sin-kwane):

A five line poem. The first line consists of 1 word, the second 2 words, and so on until the 5th line which contains 5 words:

Geese
Brant
Creatures that migrate
From north to south
From cold seas to warm



Limerick:

This is a light, humorous poem consisting of 5 lines of verse. Lines 1, 2, and 5 consist of roughly 3 metrical feet, while lines 3 and 4 contain 2 metrical feet. (A metrical foot consists of 2 short, not accented syllables followed by 1 long, accented, syllable.) Lines 1, 2, and 5 rhyme with each other, and lines 3 and 4 rhyme together.

There once was a Brant,
which everyone thought, on the loose,
He flew north to south,
without ever a doubt,
That he definitely was not a moose!

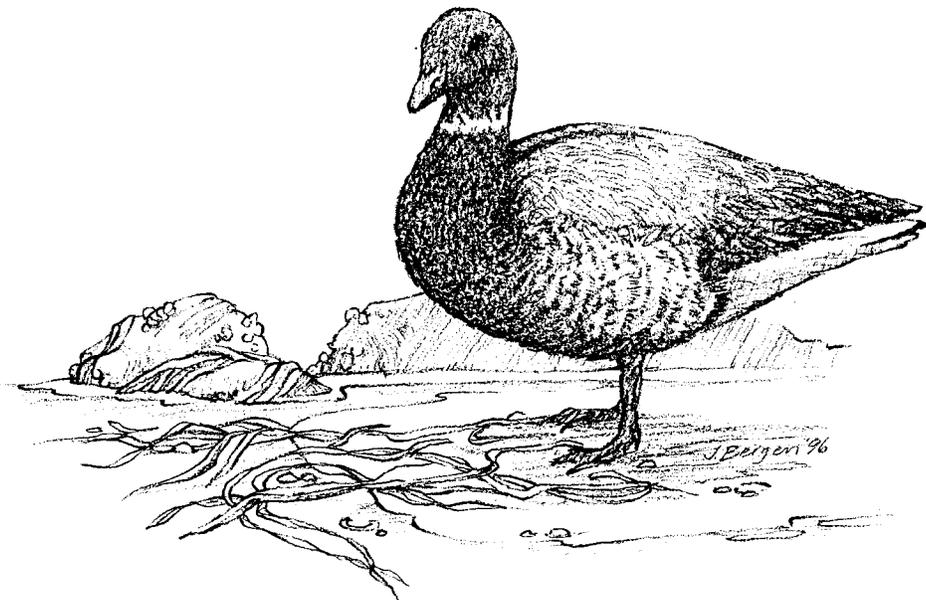
Adapted from: Shorebirds of the Pacific Flyway. U.S.F.W.S., Homer, Alaska.

Other Follow-up Activity Ideas:

- Give your students the opportunity to feel creative about the things they have been learning about the Brant: paper mache Brant nests and eggs for the care package, Brant puzzles from photographs, or other artwork.
- Put on a play or a skit about the issues concerning the population of Pacific Brant.
- Let students create a Brant Display somewhere on your school grounds or at the local town information center to alert tourists of the challenges facing the Brant. They can include on it pictures they have drawn, or photographs, poetry, pieces of eelgrass, or even do a mural depicting what the Brant sees from above.
- Have the students write letters to local, state, or federal agencies and land managers (planning and zoning commissions) to receive information about laws governing local Brant habitat.
- Using the information from the report writing activity, find out what students can do locally. Conduct interviews with locals that rely on the Brant habitat: hunters, fisherpeople, hotel owners along the water. Have students do an actual survey on the level of community interest about the Brant. Send some of this information along with letters that they have written to the agencies listed above.
- Don't forget to write letters of appreciation to everyone that was involved in your project: parents, wildlife biologists, bus drivers.

Appendices

- Adapted Curricula
- Common Curriculum Goals
- Alphabetical Listing of Activities
- Activities by Subject



Adapted Curricula

Teach About Geese:

U.S. Fish and Wildlife Service
Office of Public Use and Information
Environmental Education
1011 Tudor Road
Anchorage, Alaska 99503

Project WILD and Aquatic Project Wild

Western Regional Environmental Education Council
P.O. Box 18960
Boulder, CO 80308-8060

Alaska Wetlands, and Wildlife

Alaska Department of Fish and Game
Division of Wildlife Conservation
P.O. Box 3-2000
Juneau, Alaska 99802-2000

Issue Pac

“Hunting and Wildlife Management”
U. S. Fish and Wildlife Service

Shorebirds of the Pacific Flyway

U.S. Fish and Wildlife Service
Alaska Maritime National Wildlife Refuge
Homer, AK

Estuary Study Program

South Slough NERR
P.O. Box 5417
Charleston, OR 97420

Common Curriculum Goals for the Brant Project:

Taken from the Oregon Department of Education's Content and Performance Standards from the science section, August, 1996.

The following is a list of several of the benchmark goals outlined by the State of Oregon's Department of Education and are from sections in "Life Science", "Science and Technology", and "Science in Personal and Social Perspectives". These items are applicable to this curriculum and represent only some of the goals contained in the complete "Common Curriculum Goals" document for the State of Oregon.

Grades 4 and 5:

- a-**Describe how adaptations help an organism survive in its environment.
- b-**Describe characteristics of specific habitats and the organisms that live there.
- c-**Identify the factors that influence or change the balance of populations in their environment.
- d-**Describe a variety of approaches scientists employ in investigations, observations and methodology.
- e-**Understand the relationship that exists between science and technology.
- f-**Apply the processes of technological design to solve new problems and meet new needs.
- g-**Summarize the characteristics and interaction of populations, resources and environments.
- h-**Describe the role of science and technology in local, national and global issues.
- i-**Describe how the daily choices of individuals, taken together, affect global resource cycles, ecosystems and natural resource supplies.
- j-**Relate how scientists participate in public affairs both as specialists and public citizens.
- k-**Ask questions and make predictions that are based on observations and can be explored through simple investigations.
- l-**Analyze, interpret and summarize data from investigations.
- m-**Report results through speaking, writing, graphs and charts.

Grades 6 through 8:

A- Apply knowledge of specific cycles in the environment and within organisms.

B- Apply knowledge of the effects of environmental changes on populations.

C- Describe ways scientists differ in the phenomena they study and how they go about their investigations.

D- Understand the relationship that exists between science and technology.

E- Summarize the characteristics and interactions of populations, resources and environments.

F- Describe the role of science and technology in local, national and global issues.

G- Describe how the daily choices of individuals, taken together, affect global resource cycles, ecosystems and natural resource supplies.

H- Relate how scientists participate in public affairs both as specialists and public citizens.

Alphabetical Listing of Activities

(Next to the name of each of the activities are the letters that correspond to the Oregon Common Curriculum Goals on the previous pages)

Adaptations (a)
A Day In My Life As A Brant (m)
Brant Poetry (m)
Brant Interrelationships (g, i, A, E, G)
Brant Video (h, i, j, F, G)
Map and Care Package
Migration Headache (c, B)
Migratory Mapping (d)
Mock Birding and Equipment Usage (d, e)
Oh, Brant! (c, B)
Other Ideas (m, H)
Report Writing (l, m, E, G, H)
Student Focus Activity Sheets (field trip) (j, k, l, C, H)
Teacher's Field Trip Guide
Telecommunications in the Classroom (e, f, D)
Wetland Metaphors (b)
Wetland Reporting (b)

Activities By Subject

Science:

The Brant Video
Wetland Metaphors
Wetland Reporting
Adaptations
Brant Interrelationships
Oh, Brant!
Migration Headache
Migratory Mapping
Mock Birding and Equipment Usage
Field Trip
Report Writing

Language Arts:

Telecommunications in the Classroom
Wetland Metaphors
Wetland Reporting
Report Writing
A Day In My Life As A Brant
Brant Poetry
Brant Journal

Computer Science:

Telecommunications in the Classroom

Mathematics:

Oh, Brant!
Migration Headache

Social Studies:

Brant Interrelationships
Oh, Brant!
Migration Headache
Migratory Mapping

Physical Education:

Oh, Brant!
Migration Headache

Physics:

Mock Birding and Equipment Usage