Species at Risk in the Classroom

A Guidebook for Educators on the South Coast of British Columbia

Module 2 - Protecting Biodiversity

South Coast Conservation Program

South Coast Conservation Program
Conserving and Restoring at Risk Species and Ecosystems on the BC South Coast
www.sccp.ca

Every effort has been made to ensure content accuracy. Comments or corrections should be directed to the South Coast Conservation Program: info@sccp.ca.

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South Coast Conservation Program

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Image: watercolour painting of Great Blue Heron by Carrielynn Victor

Module 2 Protecting Biodiversity

Introduction to Module 2

The South Coast of British Columbia features many different ecosystems. From the cool, coastal waters of the Pacific Ocean to the snowy peaks of the Cascade Mountains with a wide range of different landscapes in between. The diversity of the South Coast area is able to support a wide variety of plants and animals.

The competition for resources as the human population increases is putting greater pressure on plants and animals in the South Coast area. Many of these plants and animals are now classified as species at risk. It's important to learn how to coexist with nature to protect biodiversity, which provides numerous benefits for all the species who call the South Coast home, including the human population.

This module highlights a few of the unique species that call the South Coast home: Great Blue Heron, Mountain Beaver, Oregon Forest Snail, Pacific Water Shrew, and Phantom Orchid. Not only are these species currently at risk but they reveal the amazing biodiversity of the South Coast. Let's work together to protect them and protect biodiversity for future generations.

Photo: Pamela Zevit

Module 2: Activity Summary

Activity name:	Description of activity:
Activity 1 Biodiversity Hoops	Students learn what biodiversity means and the importance of preserving biodiversity. Students also discuss ways that they can increase biodiversity at home and at school.
Activity 2 Home Sweet Home - Protecting our Waterways	Students learn about the importance of protecting our waterways from pollution and some of the interesting creatures who depend on having a clean source of water to live.
Activity 3 The Great Heron Grab	Students learn information about Great Blue Herons including, habitat preferences, prey items, their place in the food chain, adaptations that make them efficient hunters, and the importance of habitat protection.
Activity 4 Slimy Friends	Students learn about the importance of snails in the ecosystem and why snails should be protected.
Activity 5 Splendid Symbiosis	Students learn about symbiosis and the complex interconnected relationships between organisms.

Activity 1: Biodiversity Hoops

Materials:

- biodiversity word on cardstock split into bio and diversity
- pictures of Great Blue Heron, Pacific Water Shrew, Oregon Forest Snail, Phantom Orchid, Mountain Beaver
- hula hoops (1 per group of 4)
- outdoor area
- pencil, paper

Time required:

45-60 Minutes

Audience:

Grades 4 - 7

The South Coast of British Columbia features many different ecosystems. From the cool, coastal waters of the Pacific Ocean to the snowy peaks of the Cascade Mountains with a wide range of different landscapes in between. The diversity of the South Coast area is able to support a wide variety of plants and animals. Unfortunately, as the human population expands competition for resources heats up and plants and animals often lose out. There are at least 260 species of conservation concern in the South Coast of BC.[1] Among these, 57 species are designated "At Risk" under the *Federal Species at Risk Act* (SARA). The *Committee on the Status and Endangered Wildlife Species in Canada* (COSEWIC) which assesses and designates wildlife species disappearing in the country, estimates that about 70 species would qualify for legal protection and recovery (www.cosewic.gc.ca).

Objectives:

Students will be able to:

- understand what biodiversity is and why it is important;
- identify areas that have more and less biodiversity;

1. In British Columbia the Conservation Data Centre (BC CDC) compiles and maintains a computerized database which provides information on the status, locations and level of protection of all plants, animals and ecosystems at risk in the province. See *BC Species and Ecosystem Explorer* <www.env.gov.bc.ca/atrisk/toolintro.html>. The BC CDC estimates that a total of 285 records of animals and plants (these include subspecies, populations, and non vascular plants) are either Extirpated, Endangered, Threatened or of Special Concern in the South Coast of BC.

- list ways to increase biodiversity around their homes and schoolyards.

Procedure:

1. Show students pictures of Great Blue Heron, Pacific Water Shrew, Oregon Forest Snail, Phantom Orchid, and Mountain Beaver. Ask, "what do all of these species have in common?" Give students a hint by showing them the word biodiversity. Tell students that these five species represent a fraction of the hundreds of species of plants and animals that call the South Coast home.
2. Define biodiveristy by breaking the word down: bio = life, diversity = variety. Ask "why is biodiversity important?" *(Possible answers:* moderates our climate, filters water and air, conserves soil and nutrients, controls pests, makes the environment more beautiful).
3. Take students to an outdoor area. Put students in groups of 4 and tell them that they are going to have a competition to see which group can find the most diversity in an area. Give each group a hula hoop. Tell groups that they are allowed to place their hula hoop anywhere in the outdoor area then they must record how many different types of plants and animals are in this area. Give the groups a 10 minute time limit.
4. Have each group present the results of the Biodiversity Hoops competition. Compare and contrast the areas that had the most and least amount of biodiversity.
5. Discuss ways that students could increase biodiversity at home and in the school yard. Some ideas include: plant a variety of native plants, add habitat for animals by putting up nesting boxes for birds and bats and mason bee houses, put up bird feeders and bird baths, and don't use pesticides or herbicides.

Activity 1: Biodiversity Hoops

Assessment:

Assess students oral responses during discussion and group work.

Extensions:

- Give students a picture of a backyard or schoolyard that has only grass and tell students that they must increase the biodiversity.
- Make a venn diagram and have students meet with another group to compare the biodiversity in their areas. What conclusions can they draw? (*Answer:* the areas with more different types of plants also support more animal species).

Activity adapted from: *"Biodiversity Hula Hoops," Botanic Gardens Conservation International*

Module 2: Activity 1 (Species cards)

Species Cards:
Great Blue Heron - Pacific Water Shrew
Oregon Forest Snail - Phantom Orchid
Mountain Beaver

Photos By:
Isabelle Houde, Denis Knopp, Ryan Durand, Dane Blakely, and Dale Steele

Pacific Water Shrew

Great Blue Heron

Phantom Orchid

Oregon Forest Snail

Mountain Beaver

Activity 2: Home Sweet Home - Protecting our Waterways

Many unique creatures live in and around the various waterways on the South Coast. While we often think of salmon when we think of streams or frogs when we think of wetlands, two interesting small mammals need healthy permanent water bodies nearby for food and shelter. These are the Pacific Water Shrew (*Sorex bendirii*) and the Mountain Beaver (*Aplonditia rufa olympica*). The Mountain Beaver has had its scientific name changed and is now lumped with the other subspecies due to DNA work last year. The Pacific Water Shrew is only found in the Pacific North West of the North American continent. It is at it's Northern range here in BC and is found nowhere else in Canada. It is listed as endangered by COSEWIC[2]. The Mountain Beaver is actually the most primitive rodent still alive today and is not related to the much more familiar and larger American Beaver. It is listed as a species of Special Concern by COSEWIC. The main threats to these two unique species are habitat loss and damage due to development and pollution. Domestic pets including free range dogs and cats are also a cause of mortality for these species.

Materials:

- Home Sweet Home: A story about Boomer the Mountain Beaver
- white paper
- pencil crayons or markers

Time required:

45 Minutes

Audience:

Grades K-7

Objectives:

Students will be able to:

- understand why protecting waterways is important;
- learn about the hazards of pets in streams;
- identify ways to prevent pollution from entering waterways.

2. The Committee on the Status and Endangered Wildlife Species in Canada (COSEWIC) For more information: www.cosewic.gc.ca.

Procedure:

1. Read *Home Sweet Home*: A Story about Boomer the Mountain Beaver. Discuss why it was so important for Boomer to return to his home. (*Answer:* his home had everything he needed to live - protection from predators like cats and dogs and coyotes, an underground burrow, lots of food, easy access to clean water).
2. Brainstorm the hazards to local waterways (pollution from storm drains, litter, industrial waste, pets waste). Brainstorm ways to prevent pollution from entering the waterways (reuse, reduce, recycle, don't put chemicals down stormdrains.
3. Tell students that they have to help save animals like Boomer, the Mountain Beaver, and Beny the Pacific Water Shrew. Their job is to come up with conservation posters to educate other people about the importance of protecting local waterways and the species who depend on them.
4. Ask students to draw a picture of Boomer in his burrow or Benny the Pacific Water Shrew in the stream. Discuss what should be included in the picture. (*Answer:* underground home, insects for food, a water source, lots of large

Pacific Water Shrew. Photo: Denis Knopp

Moutiain Beaver. Photo: Dale Steele

logs on the ground for cover). In their drawings they should include a slogan such as “Don’t pollute! Help protect Boomer and his Friends” or “Keep your dogs on a leash and your cat indoors! Help protect Boomer and his friends”.

Assessment:

Examine students’ pictures to see that they have all the necessary components for a healthy home for Boomer and Benny and effective messaging about water conservation and responsible pet ownership.

Extensions:

Contact your local conservation group like “Streamkeepers” or City Hall to find out about a storm drain marking kit to paint storm drains in your area. What is your local municipality doing to protect local streams and wetlands and especially endangered species.

Images: watercolour painting of Mountain Beaver by Carrielynn Victor

Activity 3: The Great Heron Grab (Great Blue Heron)

Great Blue Herons are a fairly common sight in the South Coast. Herons tend to nest in large colonies called heronries, that can have as many as 350 nests. Herons prefer to nest within 10 km of their foraging habitat. Nesting sites are generally in large stands of trees, which are away from loud noises, bright light, and human disturbance. Herons like to nest in the treetops and build their nests anywhere from 4 to 70 m above the ground on large carefully constructed platforms made of sticks. The breeding success of herons has been shown to be negatively affected when humans move in too close to their nesting trees. Other threats to herons include habitat loss, logging, and draining and infilling of wetlands and field habitat. Herons are a beautiful symbol of life on the South Coast and we need to work together to protect them!

Materials:
- picture of a Great Blue Heron
- pool noodles
- large area
- bean bags

Time required:
45 Minutes

Audience:
Grades K- 7

Objectives:
Students will be able to:
- understand why wetland areas and farmland need to be protected;
- describe a simple food chain;
- examine predator/prey relationships;
- learn about animal adaptations.

Procedure:
1. Show students a picture of a Great Blue Heron (GBH). Ask them what do the features of a heron (long, skinny legs and neck, dagger-like beak, etc.) tell us about what they hunt or where? Ask where do students think that GBH's spend most of their time? (*Answer:* close to a food source).
2. Brainstorm what types of food herons eat and where they would find this food. (*Answer:* mostly fish, shellfish, frogs, voles, rats) (*Answer:* River and lake

edges, farmlands, wetland habitats). Tell students that as with many other species at risk one of the biggest threats to GBH's is loss of habitat as wetlands and farmer's fields are filled in to make more houses or buildings.

3. Tell students that GBH's have a special way of getting their food. They learn how to be very patient which makes them very efficient predators. They stand very still and then use their beaks to strike very fast at their prey either by spiking the prey with their bill or by snapping it up and swallowing it.
4. Take students to a large area and tell them that they are now going to learn how to be patient hunters like herons. They are going to enter a food chain! Choose a small number of students to be herons to start, position these students around the outside edges of the playing area. Tell students that this is a pond or wetland.
5. Give the herons pool noodles to use as their beaks and tell them that they must stand very still and can only move their "bills" to snap or spear (poke) their prey. If pool noodles are not available students can use their arms to act as a bill. Tell the rest of the students that they are the heron's prey. Ask for examples of prey items.
6. Distribute food for the prey (bean bags) around the playing area, making sure to put lots around where the herons are, ask students what they think fish eat (plants, small insects), tell them that the plants are the start of the food chain The prey must pick up as many food items as possible without getting "caught" by a heron. If a prey is caught by a heron they must wait at the edge of the pond until the signal is given to stop the game
7. Replace bean bags and play game again, giving students the opportunity to change roles. Play until everyone has had a chance to be both heron and prey.

Assessment:

- After the activity ask students to review threats to GBH, how have GBH adapted to catch their prey, what do GBH like to eat, what are the habitats in which GBH can be found.
- Assess oral responses during discussion time.

Extensions:

- Make a food web drawing using the following: Great Blue Herons, fish, insects, plants, sun.
- Older students can make more complex food webs including scientific terms such as, primary producer, primary consumer, secondary consumer, decomposer.

Types of organisms Great Blue Heron eats: Voles, fish, frogs, and shellfish.

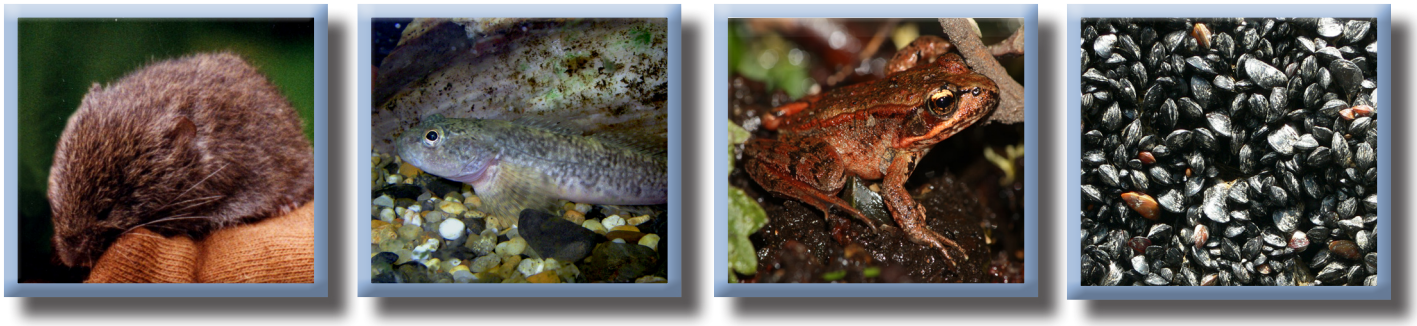

Photo: Meadow Vole and mussels - Isabelle Houde, Pygmy Sculpin - Sylvia Letay, Red-legged Frog - Walter Siegmund-wiki.


Photos: Isabelle Houde

Activity 4: Slimy Friends (Oregon Forestsnail)

Snails are amazing examples of big things in small packages. They are from the phylum Mollusca, class Gastropoda, which includes snails and slugs both on land and in the water. There are many thousands of species of snails and slugs worldwide. British Columbia is home to 94 species of terrestrial (land) snails and slugs. Oregon Forestsnails are the second largest land snails found in BC. They are currently listed as endangered in Canada by COSEWIC. Snails are slow movers so they have a very hard time escaping from threats such as urbanization, agriculture, logging, and pesticide use. This makes them vulnerable to extinction (gone for good) and extirpation (disappearing locally).

Materials:

- picture of an Oregon Forestsnail
- strawberry or other large plastic fruit container (ask students to bring their own)
- wood chips
- fresh plant terial (ferns or other leafy greens)
- jar lid
- beer (optional)
- small plastic plant pots

Time required:

45 Minutes

Audience:

Grades K- 7

Objectives:

Students will be able to:

- understand why poisoning snails can be harmful to the environment;
- identify the components of a snail habitat;
- recognize the need to protect snail habitat, including forests.

Procedure:

1. Play: Snail True or False. Teacher asks students questions and students vote thumbs up for true and thumbs down for false.
    a. The largest native land snail in BC is the Pacific Sideband. Its shell has 6 to 7 spirals, about 2 more than the Oregon Forestsnail. (*True*: Oregon Forestsnails are the second largest land snail in BC and are 3.5 cm long).

b. Snails can eat a hamburger and french fries in 1 hour. (*False:* most land snails are herbivores but some snails like the Lancetooth are carnivorous hunters and prey on Sidebands and Forestsnails. Neither type is likely to eat a hamburger and french fries).
c. Snails teeth are located on their tongue. (*True:* it is a toothed fleshy ribbon called a radula).
d. When threatened by a predator, snails can spray a smelly gas at their attackers. (*False:* some Cone Snails, a type of sea snail, can kill a human with their venom but most land snails are harmless).
e. Snail slime is used in some beauty products. (*True:* in some cultures, people pay a lot of money to have snails put on their faces).
f. In ancient times, the shells of sea snails were used as currency (money). (*True:* the shell most widely used world wide as currency was the shell of Cypraeamoneta or cowry which is still a popular ornament today).
g. Land snails do not breathe using a lung. (*False:* land snails are members of the Pulmonate family, which means having a simple lung, and do breathe using a lung).


Oregon Forestsnail. Photo: Pamela Zevit


Oregon Forestsnail. Photo: Ryan Durand

h. The main difference between a snail and a slug is that a slug has no shell. (*True*).

2. Show students a picture of an Oregon Forestsnail. Ask students what type of habitat this snail might like? (*Answer:* they like forests with Bigleaf Maple, Western Redcedar, and Stinging Nettle and Swordfern (their favourite foods!). Stinging Nettle is high in calcium and helps snails build their shells).
3. Tell students that Oregon Forestsnails are currently endangered in BC. Ask students what they think are the greatest risks to snails? (*Answer:* housing developments, agriculture, logging, pesticide use). Ask students why they think snails may disappear in certain areas? (*Answer:* snails cannot fly or run away so they can't relocate easily once their habitat has been destroyed).
4. Tell students that most gardeners really dislike snails and slugs and even try to poison them. Ask students why gardeners dislike snails? (*Answer:* snails and slugs are excellent herbivores and can eat their way through 40 % of their body weight in one day, they especially like young seedlings and plants like lettuce). Gardeners frequently use pesticides and traps that kill snails. Ask what could be the problem with using pesticides? (*Answer:* pesticides could hurt other animals and could also go into the water supply and local fish habitats).
5. Show students how to make a snail habitat using a plastic fruit container, bark, twigs, stones, some fresh leafy greens, a disposable plastic cup, water and a tray to place the habitat on. A small plastic plant pot can also be added. See instructions with photos (http://blog.elysianstudiosart.com/2011/06/artful-life-creating-snail-habitat.html). Discuss with students what they think each item in the snail habitat is for and then let them make their own. Make sure the snail habitat is kept out of the sun.
6. Students can place their snail hotels outside, away from the garden. Ask students if the snail could live in this habitat forever? (*Answer:* no, there are

many things that the forest provides that we can't create with the snail hotel so students need to relocate the snails even farther from the garden after they enter the habitats. Oregon Forest Snails are strongly associated with stinging nettle so they should be placed back into those patches). Children should do this with an adult as stinging nettle deserves its name!

Assessment:

- Assess the snail friendly habitats and ask students about what each part of the habitat is for.
- Assess responses during discussion time.

Extensions:

- Make a pamphlet for gardeners that talks about all the great features of snails and slugs and lists some snail-friendly ways to live with them in your garden.
- Students can distribute their pamphlets to their favourite gardener or ask a garden center if they can leave some pamphlets there for any interested gardeners. Provide a focus on our local native, endangered snails to raise awarness.

Image: watercolour painting of Oregon Forestsnail by Carrielynn Victor

Activity 5: Symbiosis Shuffle (phantom orchid)

Materials:

- picture of phantom orchid
- picture of big leaf maple
- picture of fungi
- pictures of examples of symbiosis, such as anemone and clownfish
- large indoor or outdoor area
- 3 colours of pinnies

Time required:

45 Minutes

Audience:

Grades K- 7

Phantom or "snow" orchids, as they are sometimes called, are a unique member of the family Orchidaceae, and the only member of their genus Cephalanthera that occurs naturally outside of Europe and Asia. They take their name from their beautiful white stems and flowers, produced because this species lacks the green chlorophyll found in most plants. Without chlorophyll, phantom orchids are unable to photosynthesize so they need to get creative to make their food. They form a distinctive, complex symbiosis relationship with fungi and trees (usually a hardwood like Bigleaf Maple), in order to obtain nutrients. Symbiosis relationships can be of various types including mutualism, commensalism, and parasitism (Martin and Schwab, 2013). Phantom Orchids use fungal intermediaries to withdraw nutrients from other plants. They are considered to be epiparasitic (WA Native Orchid Society). To make these flowers even more mysterious, most of their plant structure is underground and they often remain dormant for long periods of time (up to 17 years) making their distribution and occurrence hard to predict.

Species that rely on relationships with other species are often at greater risk because they rely on the health of many components of their ecosystem. Phantom Orchids are listed as endangered by COSEWIC, meaning we are at risk of loosing them here in BC.

Objectives:

Students will be able to:

- define symbiosis;
- learn about Phantom Orchids and what make them unique;
- recognize the need to protect mature forests.
-

Procedure:

1. Tell students that they will be learning about symbiosis. Ask students what they think symbiosis means? (*Answer:* symbiosis is an interaction between organisms where at least one organism benefits). Ask if anyone can think of any examples of symbiosis in nature? (*Example:* someone might say the clown fish and the sea anemone from "Finding Nemo", the Clownfish uses sea anemone for shelter from predators and the Sea Anemone provides food for Clownfish and benefits from having algae removed by the Clownfish).
2. Show students a picture of a Phantom Orchid, Bigleaf Maple, and a fungus. Tell students that this is an example of symbiosis that we have in the South Coast. Phantom Orchids rely on the fungus that grows near mature trees such as Bigleaf Maples. Tell students that Phantom Orchids are currently endangered

Phantom Orchid. Photo: Kym Welstead

Phantom Orchid. Photo: D. Blakely Springmeyer

in this area and brainstorm reasons why (deforestation from urbanization).

3. Go to a large indoor or outdoor area and play the Symbiosis Shuffle:
   a. Tell students that the object of the game is to grow as many Phantom Orchids as possible, but the only way to grow a Phantom Orchid is to have all the partners of the symbiotic relationship together.
   b. Choose 2 students to be the "destroyers" then divide the rest of the students into 3 groups. The green group are the big leaf maples, the yellow group are the Phantom Orchids, and the blue group are the fungi.
   c. Tell the green group to go stand somewhere in the play area, they are trees so they can't move.
   d. Tell the yellow and blue groups that they are to spread out in the play area. When the teacher gives the signal they must form a group of 1 yellow, 2 blues, and 1 green. Anyone who is not with their symbiotic partners can be tagged by the "destroyers". If they get tagged they must sit down. Play again alternating positions so that students get to try different roles. Add more destroyers to make it harder for groups to form.

Assessment:

Discuss how game is different then real life (fungi and orchids can't run around in real life). Review what was needed for a Phantom Orchid to grow and some real life examples of the destroyer (things that would stop the orchid from growing).

Extensions:

Students can research forms of relationships between organisms including symbiosis, mutualism, parasitism, and commensalism.

Appendices

Appendix

1 Curriculum Connections

The following is a list of some of the BC Prescribed Learning Outcomes that are met by the activities in this guidebook. It is expected that students will:

Grade K.

- Use the five senses to make observations [Processes and Skills of Science.
- Describe features of local plants and animals [Life Science: Characteristics of Living Things].
- Compare common animals [Life Science: Characteristics of Living Things].

Grade 1.

- Classify objects, events, and organisms [Processes and Skills of Science.
- Describe the basic needs of local plants and animals [Life Science: Needs of Living Things].
- Describe how the basic needs of plants and animals are met in their environment [Life Science: Needs of Living Things].

Grade 2.

- Classify familiar animals according to similarities and differences in appearance, behaviour, and life cycles [Life Science: Animal Growth and Change].
- Describe ways in which animals are important to other living things and the environment [Life Science: Animal Growth and Changes].
- Explain why air, water, and soil are important for living things [Earth and Space Science: Air, Water, and Soil].

Grade 3:

- Classify familiar animals according to their similarities and differences in appearance, behaviour and life cycles [Life Science: Animal Growth and Changes].
- Explain why air, water, and soil are important for living things [Earth and Space Science: Air, Water, and Soil].

Grade 4:

- Ask questions that foster investigations and explorations relevant to the content [Processes and Skills of Science].
- Compare the structures and behaviours of local animals and plants in different habitats and communities [Life Science: Habitats and Communities].
- Determine how personal choices and actions have environmental consequences [Life Science: Habitats and Communities].

Grade 5:

- Describe potential environmental impacts of using BC's living and non-living resources [Earth and Space Science: Renewable and Non-renewable Resources].

Grade 6 and 7:

- Analyse how different organisms adapt to their environments [Life Science: Diversity of Life].

Appendix

2 References

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Checkout the species profiles on the SCCP's website at www.sccp.ca

http://www.sccp.ca/species-habitat/**phantom-orchid**

http://www.sccp.ca/species-habitat/**oregon-forestsnail**

http://www.sccp.ca/species-habitat/**great-blue-heron-fannini-spp**

http://www.sccp.ca/species-habitat/**pacific-water-shrew**

http://swww.sccp.ca/species-habitat/**mountain-beaver**

Image: watercolour painting of Phantom Orchid by Carrielynn Victor