

# Wetland Ecosystems

## SALT MARSHES Interactions & Ecosystems

GRADES 7-9

### Teacher's Guide

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# A Change! Succession of a Salt Marsh

## Curriculum alignment

- Develop a chronological model or geological time scale of major events in Earth's history (209-4, 311-6)
  - Relate various meteorological, geological, chemical, and biological processes to the formation of soils: rain and wind, glaciers and gravity, plants and acidic action (311-3)
  - Identify signs of ecological succession in a local ecosystem: - pioneer species - climax community - primary succession - secondary succession (306-4)
  - Predict what an ecosystem will look like in the future on the basis of the characteristics of the area and the long-term changes (succession) observed in the site (208-5)
- 

## Background Information

Salt marshes are important components of Atlantic Canada's coastal ecosystems, serving as important areas of primary production for coastal food chains and habitats for wildlife such as plants, fish, insects and birds. The loss of coastal wetlands has resulted in declines in populations of all species that are dependent on them. Salt marshes are considered the nurseries of the sea because the young of many marine species depend on them for food and shelter. They help prevent flooding, absorb toxins, act as barriers for high tides, and provide people with beautiful places to appreciate.

### Definition of an Ecological Succession

A process of habitat development that involves changes in wildlife species, structure, and processes over time.

### Ecological Succession of Atlantic Salt Marshes

Some of our Atlantic Coast salt marshes were formed by the glaciers of the last ice age. As the glaciers melted, the water eroded valleys as it flowed toward the rising sea. As sea levels rose, these valleys were swamped and slowly filled with sand and gravel from the streams. Over time, plant seeds and animals of the salt marsh found a fertile place to grow.



Salt marshes can form in shallow inlets where tidal flooding and streams deposit sediments gradually forming the base soil of the marsh. In the zone called low marsh, salt marsh plants grow and help hold the soil in place. The roots and stems slow and trap more sediment. As the plants die and become partially decomposed they form a bed of peat. Peat is formed by the lack of oxygen and saltiness of the soil which prevents complete decay of the plant from occurring. Some areas of peat provide a historical record over 3000-4000 years and are three meters thick. The peat layer can continue to support plant growth.

The salt marsh can be destroyed by the removal of plant root material which causes the tides to erode the soil and displace the sediment elsewhere. Interference with tidal action by dykes and causeways may destroy a salt marsh or cause one to form in another area.

## **Activity**

### **Materials (per pair of students):**

- |   |  |
|---|--|
| <input type="checkbox"/> drawing material   | <input type="checkbox"/> a box (e.g. shoe box or tissue box) or poster board |
| <input type="checkbox"/> construction paper | <input type="checkbox"/> paints or markers                                   |
| <input type="checkbox"/> flour              | <input type="checkbox"/> water   |
| <input type="checkbox"/> food colouring     | <input type="checkbox"/> clay  |
| <input type="checkbox"/> tape               | <input type="checkbox"/> glue  |
| <input type="checkbox"/> scissors           | <input type="checkbox"/> student journal                                     |

### **Procedure**

1. Introduce the topic of salt marshes by asking students the following questions and writing their answers on the board to have a collective image:
  - Have they visited a salt marsh?
  - What were their impressions?
  - What is a salt marsh?
    - A wetland that is located next to an ocean, estuary, or other body of salt water which is covered by species of grass that can survive in salt water and regularly be covered by the tides.
  - Why is a salt marsh important?
    - A salt marsh is an important habitat for many species of birds, fish, and marine animals. These marshes act as buffers against rising seas and can filter some harmful toxins from the water.
  - How does a salt marsh form?
    - The formation of a salt marsh begins with the build up of sediment brought



by the tides. This provides a place for salt tolerant plants to become established which in turn holds more sediment for other plants to grow.

- Are they formed from the land outward or from the sea inward?
    - Salt marshes form from the land outward.
2. Brainstorm with the class to produce a definition of ecological succession and record ideas on the board.

## Assignment

1. Ask students to look at the salt marsh profile in their student journal in lesson 1
  - Do they think this picture depicts salt marsh succession? Why or why not?
    - The profile does not show the different layers of vegetation and sediment that make up the higher ground of the salt marsh.
  - As students become familiar with salt marsh formation and its ecological succession ask them to describe this process.
2. Assign a plant found in New Brunswick's salt marshes to each student. Each student is to research and become an expert on their plant. Students are to draw a picture of their plant, a description of its' physical characteristics, identify which salt marsh zone it is usually found in, and state one role the plant has in the ecology of the salt marsh. This should be done on one page in order to create a field guide.
3. Working in pairs, students are to make a poster or a model of a salt marsh succession. The projects should have labels indicating the high and low marshes, the types of plants found in each zone, and demonstrate the layers of the salt marsh. The model can be made in one dimension as a poster or a multidimensional model using clay or flour dough layers. The assignment should demonstrate student understanding of the following principles:
  - (a) That salt marshes are comprised of layers
  - (b) Their formation may take thousands of years
  - (c) The difference between the high and low marsh
  - (d) The role of plants in the formation of salt marshes
4. Invite other classes, teachers, and parents to a "salt marsh awareness day" where students showcase their models and posters. (You may want to wait until the class completes Lesson 3 to include the students' food webs).



**Suggested salt marsh plants:**

Arrow-grass (*Triglochin maritima*)  
Bayberry (*Myrica pensylvanica*)  
Beach Pea (*Lathyrus japonicus*)  
Bladder Wrack/Rock Weed (*Fucus vesiculosus*)  
Coralline Algae (*Corallina officinalis*)  
Dulse (*Rhodymenia palmata*, *Ptilota elegans*)  
Dusty Miller (*Artemisia stelleriana*)  
Edible Kelp (*Alaria esculenta*)  
Eelgrass (*Zostera marina*)  
Glasswort (*Salicornia europaea*)  
Graceful Red Weed (*Gracilaria foliifera*)  
Green Thread Algae (*Chaetomorpha melagonium*, *Cladophora sericea*)  
Hollow Green Weed (*Enteromorpha intestinalis*)  
Irish Moss (*Chondrus crispus*)  
Labrador Tea (*Ledum groenlandicum*)  
Orach (*Atriplex* sp.)  
Pitcher Plant (*Sarracenia purpurea*)  
Poison Ivy (*Toxicodendron rydbergii*)  
Round Leaved Sundew (*Drosera rotundifolia*)  
Salt Meadow Grass (*Spartina patens*)  
Salt Water Cord Grass (*Spartina alterniflora*)  
Sea-blite (*Suaeda maritima*)  
Sea-lavender (*Limonium carolinianum*)  
Sea-milkwort (*Glaux maritima*)  
Sea-side Plantain (*Plantago maritima*)  
Sea Lettuce (*Ulva lactuca*)  
Seaside Goldenrod (*Solidago sempervirens*)  
Seaside Sand Spurrey (*Spergularia canadensis*, *Spergularia marina*)  
Sedges (*Carex paleacea* + others)  
Sheep Laurel (*Kalmia angustifolia*)  
Widgeon Grass (*Ruppia maritima*)



# Amazing Salt Marsh Adaptations

## Curriculum Alignment

- Consider observation and ideas from a variety of sources during investigations and before drawing conclusions
  - Identify, delimit, and investigate questions related to a local ecosystem such as “What types of species live in a particular ecosystem?” (208-2)
  - Predict what an ecosystem will look like in the future on the basis of the characteristics of the area and the long-term changes (succession) observed in the site (208-5).
- 

## Background Information

A salt marsh is a place of extremes. Variations in salt, oxygen, and temperature levels; wave and wind action; and scraping of the marsh surface by ice cakes require animals and plants to adapt. Organisms that live in salt marshes have amazing adaptations to cope with these challenges. These adaptations include the ability to excrete excess salt, store water, and unique methods of locomotion and protection.

## Amazing Plants

Salt marshes are **intertidal** and are flooded by the ocean tides twice a day. This ecosystem is constantly changing and the wildlife that live on the salt marsh must have unique adaptations to cope with many factors. Plants on the low marsh are covered by the tides daily. Plants on the high marsh are flooded periodically by salt water during times of extreme high tides. Therefore, all salt marsh plants must be able to withstand high levels of **salinity**. Plants that are salt tolerant are called **halophytic**; they adapt to the salinity by excreting salt from their leaves and roots, by trapping fresh water in their cells, and having narrow leaves which prevent water loss. They adapt to the lack of oxygen when covered with salt water by storing oxygen in their roots, or by having air passages in the stems that take oxygen to the roots. This is also important as the soils of a salt marsh can be oxygen deprived from being flooded by the sea.

Many salt marsh plants are **perennial** and die in the winter. Their root structure is strong and fibrous which holds them in place during severe storms or allows them to grow again after ice cakes have scraped off the top of the soil.



Salt marsh plants play an important role in preventing erosion and in retaining the particles left by the tides that compose the layers of the salt marsh. Few animals eat the plants on the salt marsh; however, the plants contribute to the ecosystem when they die and become **detritus** which is a food source for many salt marsh inhabitants.

### Amazing Creatures

The varied conditions that apply to salt marsh plants also apply to the animals that spend part or all of their life on the salt marsh.

Some creatures such as mammals, birds, and fish use behavioural adaptations by moving in or out of the water to survive. Marine organisms that have shells use them for protection and close or seal their shells during low tide to conserve moisture and maintain proper levels of salinity. Some salt marsh worms and **amphipods** make burrows or dig under the sand and mud sediment. There are microscopic organisms that move in and out with the tide.

There are many interesting physiological adaptations such as salt glands in birds and shellfish that remove the excess salt. Worms contract their bodies in order to expose less surface area to absorb salt and some can burrow themselves into the sediment to escape danger.

Some salt marsh organisms have unique food-catching **appendages**. Clams have tubes that reach into the surface of the sediment to obtain food and oxygen. They can quickly escape predators by scooting 30 cm under the sediment using their “foot” which is a muscular tongue-shaped organ that can expand and retract.

### Maritime Ringlet Butterfly

The Maritime Ringlet Butterfly is a small orange butterfly that lives only on salt marshes. It is an **endangered** species in New Brunswick and can be found only in a very limited area around the Bay of Chaleur and nowhere else in the world. If that does not make it special, it has a very specific diet being one of the few creatures that gets its food from living salt marsh plants.

The butterflies prefer to eat the nectar of sea-lavender but lay their eggs on the saltwater cord grass. This grass is what the green **larva** (that hatch from the eggs) prefer to eat. The larva spend the winter under the dead plant leaves. The larva have the amazing ability to be submerged under the saltwater and survive.

The Maritime Ringlet Butterfly faces many threats on the Maritime coast. Salt marshes where Maritime Ringlet Butterflies live are mostly privately owned and/or in residential areas. Since the Maritime Ringlet Butterfly is considered a **species at risk**, it is protected from anyone harming it or its habitat under regulation 96-26 of the New Brunswick Species



at Risk Act. Key threats to the Maritime Ringlet Butterfly are habitat loss, habitat fragmentation, pesticide/herbicide run-off, pollutants, and all terrain vehicle use in salt marshes. Conservation groups have joined together to protect the butterfly's important habitat and there is research in progress to introduce the butterfly to other salt marshes that meet the habitat needs of this amazing creature.

## **Activity**

### **Materials (per group of four):**

- One copy of the salt marsh map (Appendix 2A, in Student Journal)
- One threat card (Appendix 2B, in Student Journal)
- Student Journal

### **Procedure**

1. Have students brainstorm about what makes salt marshes different from fresh water marshes.
2. Have students read the Amazing Plants and Amazing Creatures in their journal including the description of the Maritime Ringlet Butterfly.
3. Ask the students "What are some ways wildlife, including the Maritime Ringlet Butterfly, have adapted to living in the salt marsh ecosystem?"
4. (A) Have students work in teams of four to represent a conservation group near a salt marsh that is trying to protect the endangered Maritime Ringlet Butterfly. There is a map in Appendix 2A showing a typical salt marsh and the development in the area. Give a copy of the map to each group. After they have studied their maps, ask what threats they think may pose a problem to their salt marsh and the Maritime Ringlet Butterfly population. They should be aware of roads, the breaking up of continuous habitat known as habitat fragmentation, protective sea barriers, and development from houses or industry.  
  
(B) Copy the threat card sheet twice from Appendix 2B. Cut them apart and place them in a container. Have each team select a card from the container. See below for list of threat cards and the affect of the threat and possible prevention of human caused threats.



- (C) The students will record the threat their salt marsh may face. Working as a team, students will describe the threat, whether it is natural or human caused, whether it will affect the high or low marsh zones, and how it could otherwise affect the overall salt marsh wildlife. If it is a natural threat they will answer the question “will global warming increase the effect?” If it is a human caused threat they are asked “how the group could prevent or correct the threat?”
- (D) Have students list the effects the threat could have on the Maritime Ringlet butterfly and its life stages.
- (E) Students will suggest actions the conservation group could take to correct or prevent any human caused threats.
5. Each group must report orally to the class, outlining the threat their salt marsh is facing, the harm this threat could cause the butterflies, and what the group has proposed to do to correct or prevent the problem if it was human-induced.

## Threat Cards

### Natural Threats

Natural threats and the effect that could lead to the extinction of the rare Maritime Ringlet Butterfly. *All threats could be increased by global warming.*

**Large ice cakes on the salt marsh:** Scrapes plants off the surface of the salt marsh which could decrease the plants needed by the butterfly.

**Dry summer:** This could cause slow plant growth of the plants needed by the butterfly.

**Sea level rises:** This could cause less marsh area for butterfly and larva feeding; larva could be submerged under saltwater too long to survive.

**Forest fire burns 50% of the salt marsh:** This could decrease salt marsh area for the butterfly.

**Winter time with no snow; the marsh is exposed:** This could cause the hibernating larva to freeze with no insulating snow to protect it.

**Storm surge; erosion of tidal creek bank:** This could cause more sediment to wash over the marsh and change the plant life.

## Human Threats

Human caused threats that may lead to the extinction of this rare butterfly, their effect, and possible actions to prevent or correct the threat:

**Tourism operators want to build a wharf/boat launch:** This could cause the tidal currents to change, alter the sediment build up of the salt marsh, plus increase boat traffic in and around the salt marsh. Research would be needed to design a wharf with the least effect on the salt marsh ecosystem; limit the boat usage of the salt marsh area with signage; and educate people about the Maritime Ringlet Butterfly.

**Cottage sewage drains into the salt marsh:** Pollutants such as nitrogen could cause the plant species to change or cause changes in the butterfly life stages thus decreasing survival rate. Research grants to help people clean up the environment and educate the people about the Maritime Ringlet Butterfly could help alleviate this threat.

**Factory water treatment plant breaks down:** If there are heavy metal pollutants all the creatures and plants of the salt marsh could be destroyed. Conservationists could regularly check the water for pollutants and educate the factory about the Maritime Ringlet Butterfly. If the conservation group is concerned they can contact Environment Canada.

**Oil tanker off coast sinks and leaks oil:** If the oil comes ashore near the salt marsh it could wipe out all the animal and plant life. Volunteer your time to clean it up. Promote safer oil tanker construction.

**Local resident picks sea lavender to sell:** This could cause the butterfly to run out of plant nectar and decrease its population. Educate local people about the butterfly and post signs to inform visitors.

**Residents near the salt marsh spray for mosquitoes:** Spraying insecticides could kill the butterfly, larva, and eggs. Investigate non-chemical methods of decreasing mosquito populations. Educate the people about the Maritime Ringlet Butterfly.

**All terrain vehicles drive through the salt marsh:** The tires from these vehicles break plants and degrade the soil. Also, they could drive over the butterflies, eggs, and/or larva. Post signs along the salt marsh stating “No vehicles allowed”. Educate the people about the Maritime Ringlet Butterfly.

**Guided hikes of the salt marsh offered to tourists:** Increased activity (even walking) could decrease the survival of the butterfly, eggs, and larva by harming the plants or the butterfly life stages. Consider the construction of boardwalks.



**Farmers use insecticide on fields near the salt marsh:** Spraying insecticides could also kill the butterfly, larva, and eggs. Investigate non-chemical methods of decreasing insect pest populations. Educate the people about the Maritime Ringlet Butterfly.

**Butterfly collectors use nets to collect insects on salt marsh:** The collectors may collect the endangered butterfly. Post signs marking the salt marsh as a habitat where species at risk live and describe the species. Educate people about the Maritime Ringlet butterfly.

**Garbage is dumped up river from the salt marsh:** Pollutants from the garbage could poison the plants and creatures of the salt marsh causing the butterfly population to decrease. Educate the people about the Maritime Ringlet Butterfly. Patrol the river leading into the marsh.

**A resort is built along the edge of the salt marsh:** This development could increase the foot traffic on the salt marsh causing plants, butterflies, eggs, and larva to be trampled. Post signs along the salt marsh. Educate the people by giving a slide presentation.

**Salmon aquaculture farm built near the salt marsh:** This can cause an increase in nitrogen levels and disease that may affect the plants and organisms of the salt marsh. Monitor the salmon farm by taking water samples or by noting changes in the surrounding vegetation. Research how aquaculture has affected other ecosystems.



# The Web of Life and Death

## Curriculum alignment

- Identify, delimit, and investigate questions related to a local ecosystem such as, “What types of species live in a particular ecosystem?” (208-2, 208-3)
  - Identify the roles of producers, consumers, and decomposers in a local ecosystem and describe both their diversity and their interactions (304-2)
  - Classify organisms as producers, consumers, and decomposers (210-1)
  - Apply the concept of a food web as a tool for interpreting the structure and interactions of a natural system (111-6)
  - Describe how matter is recycled in an ecosystem through interactions among plants, animals, fungi, and microorganisms (306-2)
- 

## Background Information

A food web is a complex of interrelated food chains in an ecological community. The difference between a food chain and a food web is that a chain is a single strand of different levels of energy transfers, whereas a food web will show the many strands in a particular ecosystem such as a salt marsh. The different levels of energy transfer are called trophic levels.

## Trophic Levels

1. **Primary producers** are organisms such as plants that make their own food from sunlight and are one of the most important levels of every food chain. These organisms are called **autotrophs** (ex: salt marsh grass).
2. **Primary consumers** are animals that eat primary producers. They are called **Herbivores** (ex: periwinkle).
3. **Secondary consumers** eat primary consumers. These consist of both **carnivores** (ex: whelk) and **omnivores** (ex: hermit crab).
4. **Tertiary consumers** are at the top of the food chain and eat secondary consumers (ex: eagle).



5. **Decomposers** break down the organic matter into another form that can be consumed by organisms directly or give nutrients to the soil for plant growth. (ex: bacteria or fungi).
6. **Detritivores** are organisms that eat detritus formed from dead plants and animals (ex: scud).

## **Activity**

### **Materials**

- |  |   |
|--|---|
| <input type="checkbox"/> Student journal | <input type="checkbox"/> Glue             |
| <input type="checkbox"/> Appendix 3A     | <input type="checkbox"/> Tape             |
| <input type="checkbox"/> Scissors        | <input type="checkbox"/> Legal size paper |
| <input type="checkbox"/> Popsicle sticks | <input type="checkbox"/> A pair of dice   |

### **Procedure**

1. Introduce the topic of simple food chains and ask the students for examples of a food chain occurring in a salt marsh (ex: sun → plant → snail → crab → seagull).
  - Inquire if students believe this is an accurate description of the flow of energy in the wild. Energy flows more in a circular fashion where it is created from the sun, consumed, and the final product is decomposed. You will want to prompt the students to realize that other creatures may eat the plants, the crabs, or the seagulls.
  - Do they think it may be more complicated and if so, in what way?

### **Assignment**

1. Have students read the information in their journals and answer the first four questions in their assignment. Ask students what was the most interesting thing they learned from the reading material.
2. The Web of Life and Death: Who Eats Whom?
  - a) Working in pairs and using Appendix 3A, have students cut out the marsh wildlife with the number and label attached.



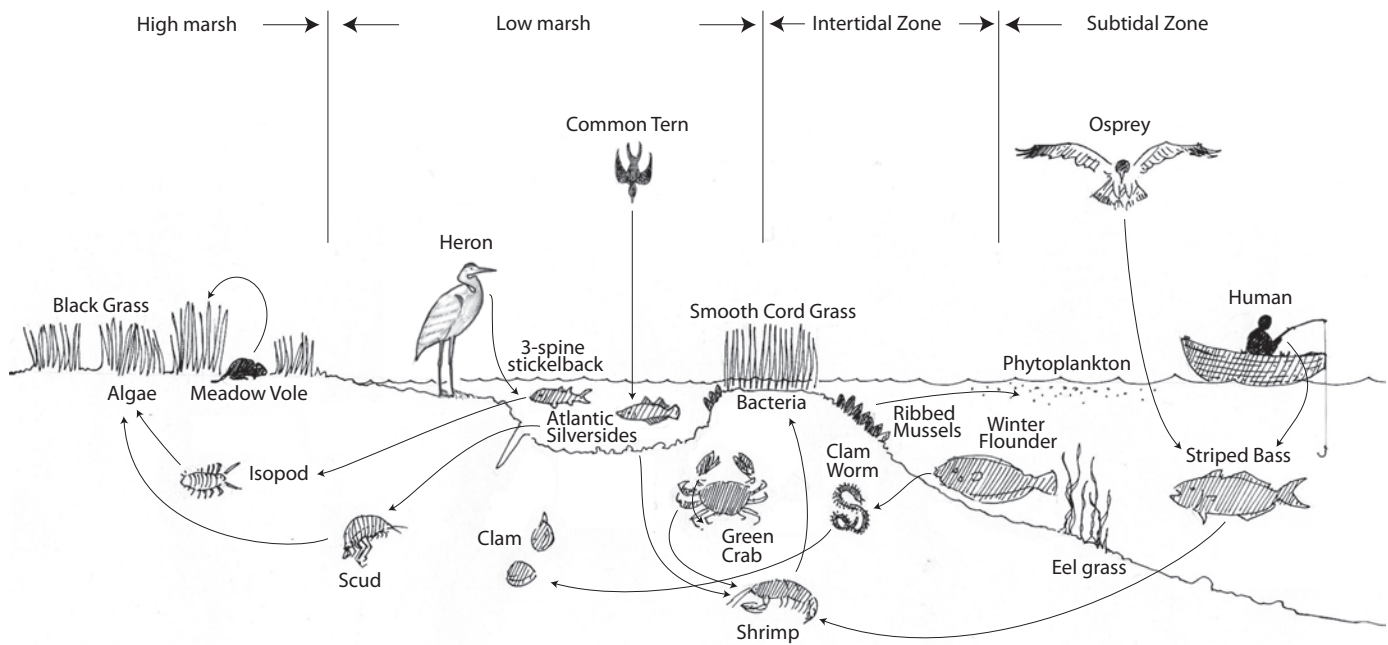
- b) Using their journal for clues, have students create a food chain with four or five links.
- c) Connect the links on their desks with Popsicle sticks (do not glue or tape them in place).
- d) Connect the remaining marsh wildlife to the food chain using more Popsicle sticks until all twelve marsh wildlife figures are connected to another figure and form a food web.
- e) Once students have made a food web have them share their food webs with the class.
- f) Have each pair work on a food web using all twelve salt marsh figures.
- g) When all class members have designed a food web, tell them you will roll the pair of dice and whatever number comes up is a species that will have a problem in the salt marsh. This should demonstrate how the removal of one species affects a salt marsh food web or an entire ecosystem.
- h) Ask for ideas on what may have caused this species to disappear. (Ex: are storm surges, pollution, construction, sea level rise, and over harvesting of shell fish).
- i) Have the students try to recreate their food web without the species that was rolled by the dice.
- j) Ask students what was affected when that species was removed.
- k) Repeat this procedure.
- l) Once students have grasped the food web concept have them finalize a food web by taping or gluing all twelve species on a piece of paper drawing lines or gluing Popsicle sticks to show the connections, making arrows to show energy flow.
- m) Display the food webs during your Salt Marsh Awareness Day.



**Species:**

- |                        |                     |
|------------------------|---------------------|
| 1. Cord grass          | 7. Bacteria         |
| 2. Mummichog           | 8. Great Blue Heron |
| 3. Scud                | 9. Raccoon          |
| 4. Mosquito larva      | 10. Mud Dog Whelk   |
| 5. White-tailed Deer   | 11. Fungi           |
| 6. Semipalmated Plover | 12. Black Duck      |

**Food Web Example**



# “You Have the Power”

## The Protection of a Salt Marsh

### Curriculum alignment

- Be sensitive and responsible in maintaining a balance between the needs of humans and a sustainable environment (432)
  - Project, beyond the personal, consequence of proposed actions (433)
  - Identify questions to investigate arising from practical problems and issues (208-2)
  - Define and delimit questions and problems to facilitate investigation (208-3)
  - State a prediction and a hypothesis based on background information or an observed pattern of events (208-5)
- 

### Background Information

#### Empowering Students with Knowledge

This lesson plan empowers the students to learn about a salt marsh from several sources. They will assess the health of a salt marsh and make a plan of action to protect the salt marsh.

### Activity # 1

#### Materials

- Student Journal
- Internet access
- Appendix 4A, in Student Journal

#### Procedure

1. (A) Students will select one salt marsh near their community and investigate the condition of the salt marsh. Use the map in Appendix 4A which identifies salt marshes along



the New Brunswick coasts. Use a New Brunswick atlas to find the names of the community near the salt marsh closest to your school. Here are web sites for New Brunswick maps:

[http://www.snb.ca/gdam-igec/e/2900e\\_1.asp](http://www.snb.ca/gdam-igec/e/2900e_1.asp)

<http://www.new-brunswick.net/new-brunswick/maps/nb/nbmap.html>

2. (A) Each student will investigate the salt marsh on the internet to see if they can find clues to understand if there are possible threats (man made and/or natural) to the salt marsh.  
  
(B) Students will list all possible threats found and state how Federal and Provincial Laws could protect their salt marsh.
3. (A) Working in pairs, students will conduct an interview of a stakeholder near the salt marsh either by phone, email, or mail. For example: farmers, residents, fishermen, business people, youth, and conservationists. If the salt marsh is located far away from the school, the teacher may initiate contact with a school that is close to the salt marsh in order to establish a list of people to contact.  
  
(B) Students will have one week to identify who they will interview. The teacher will then make a list of the people the students have selected to interview to insure more than one side of the story is heard. As a class, compile a list of questions about the salt marsh or use the survey form provided that can be emailed, mailed, or used in a phone interview.  
  
(C) Research the human activities that occur in and around the salt marsh, including the watercourses that drain into the salt marsh.  
  
(D) Students determine if any local industries depend on the health of the salt marsh.  
  
(E) Check out the sample survey at the end of the lesson. Does the class want to add or delete some of the questions?
4. Each pair of students may submit their survey.

5. Compile a list of answers for the questions asked in the survey. Discuss this information with the class.
  - a) What industries are there?
  - b) What structures?
  - c) How is the salt marsh used?
  - d) What wildlife is present at the salt marsh?
  - e) Ask students to discern how each person's occupation may affect their outlook.
  - f) Ask students if their evaluation of a salt marsh survey makes them think their salt marsh needs protection, restoration, or both?
  - g) Are local people willing to help with the protection of the salt marsh?
6. Tell students that by learning about this salt marsh they have empowered themselves with knowledge. The next step is to gather more knowledge and take action on what they deem necessary to protect this marsh.

## Salt Marsh Evaluation Survey (sample interview)

Name of community: \_\_\_\_\_

1. What is your occupation? \_\_\_\_\_  
\_\_\_\_\_

2. Do you work or do recreational activities on or near the salt marsh? \_\_\_\_\_  
\_\_\_\_\_

If so, what activities do you perform on or near the salt marsh? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. What wildlife have you seen on the salt marsh? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Are there or have there ever been any wharves or similar structures on or near the salt marsh? \_\_\_\_\_ How many? \_\_\_\_\_

Where are they located? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. Are there dykelands on or near the salt marsh? \_\_\_\_\_

Are the dykelands used for agriculture? \_\_\_\_\_

In what way?     Animal grazing     Crops

Are there any aboiteaux? \_\_\_\_\_



6. Is there a highway or railway near the salt marsh? \_\_\_\_\_

Do you know if there are culverts for tidal flow? \_\_\_\_\_

How many? \_\_\_\_\_

7. Is there any industry close to the salt marsh or up river from it? \_\_\_\_\_

What is the industry? \_\_\_\_\_

8. Do you think your salt marsh is protected from harmful human activities? \_\_\_\_\_

If yes, how? \_\_\_\_\_

\_\_\_\_\_

If no, what suggestions do you have? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

9. Over the years have you seen changes in the salt marsh? (Examples: water level, different plants, different wildlife, or human activities.) \_\_\_\_\_

What kind of changes? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

10. Would you be willing to help protect your salt marsh? \_\_\_\_\_

How? Please check all that apply.

- Write a letter to a politician
- Volunteer time
- Learn more about salt marshes
- Join a salt marsh citizen's group

THANK YOU FOR YOUR TIME



## **Activity # 2**

### **Description**

Empower the students to initiate a plan for their salt marsh. Brainstorm with the class what actions they would need to take to involve the government, commercial interests, conservation groups, and the social community in the project to protect the salt marsh.

1. By completing Activity #1 they have started to gather information to get a community profile of their salt marsh. The surveys will help initiate community awareness.
2. Gather information from the government about your salt marsh. Areas of government that may be of help include the Department of Natural Resources, Department of Fisheries and Oceans, Department of Agriculture, Canadian Wildlife Service, and Department of the Environment. Explain to these departments that you wish to promote awareness of your salt marsh. Ask them for ideas. Ask about available grants.
3. Gather information from community groups such as the New Brunswick Nature Trust

Website: [http://conservationcouncil.ca/marine/marine\\_tides.html](http://conservationcouncil.ca/marine/marine_tides.html).

*Explain to these groups that you wish to promote awareness of your salt marsh. Ask them for ideas. Ask about available grants.*

4. Educate the stakeholders of the community about the importance of the salt marsh through a presentation or a salt marsh clean up day.

## **Activity**

1. Divide the class into these four sections: (1) government, (2) commercial, (3) conservation, and (4) social. Assign each student one area to research and contact. The class must compile questions that they should ask their assigned contact.

### **Government Section:**

Federal or Provincial Department of Natural Resources, Department of Fisheries and Oceans, Department of Agriculture, Department of the Environment, the Department of Transportation (if there is culvert or other barrier preventing or restricting the flow of the tide), the Canadian Wildlife Service, and municipal government.

### **Commercial Section:**

Fishers, farmers, tourism interests, and other industries.

### **Conservation Section:**

Ducks Unlimited Canada, New Brunswick Nature Trust, Petitcodiac Riverkeepers, Conservation Council of New Brunswick, Canadian Wildlife Federation, Sierra Club of Canada, Nature Canada, and Fundy Baykeeper.

### **Social Section:**

Elders, youth, schools, New Brunswick universities (research of salt marshes), community organizations (4-H, scouts and guides, heritage societies).

Give each student a week to compile information from their assigned contact and come up with an action that will help to protect their salt marsh. After one week give students an hour to meet in their four sections (1) government, (2) commercial, (3) conservation, and (4) social to allow each section to share their knowledge and develop an outline of a plan of action for the protection of the salt marsh.

One student from each section gives an oral report on the actions their group recommends.

The outlines are passed in to the teacher who decides which parts of the plans are feasible for the class to implement. The class takes ACTION because they have the power of knowledge!

## **Enrichment Activity**

Ask a guest speaker to come to the school to talk about how they were empowered to change the way land was used (examples are people from New Brunswick Nature Trust, or Department of Natural Resources). Ask why a change was necessary? What actions did they take? Who (people or organizations) assisted them? What challenges did they face and conquer? Were any compromises made?

