Classroom Mini Marsh - Kindergarten

Overall Objectives Supported by Mini Marsh:

Science and Technology:

- Demonstrate an awareness of the natural and built environment through hands-on investigations, observations, questions, and representations of their findings;
- Conduct simple investigations through free exploration, focused exploration, and guided activity, using inquiry skills (questioning, planning, predicting, observing and communicating); and
- Demonstrate an understanding of the natural world and the need to care for and respect the environment

Begin by Introducing the Students to Hamilton Harbour and Cootes Paradise Marsh

Topic for discussion: Hamilton Harbour is a large body of freshwater located at the western edge of Lake Ontario (and in downtown Hamilton). Cootes Paradise is a marsh at the west end of the Harbour. It looks very much like a Classroom Mini Marsh only much bigger! Cootes Paradise is the largest remaining marsh in western Lake Ontario and is important for many fish and wildlife. (Recommend showing a map here.)

Hamilton Harbour and Cootes Paradise have historically been degraded by human activities. Today there are many organizations working to clean up the Harbour and the Marsh.

More information:
Hamilton Harbour – hamiltonharbour.ca → Explore the Bay → About the bay
Cootes Paradise – http://www.rbg.ca/wetlandrestoration

The following information can be used as a guide to introduce Classroom Mini Marsh to kindergarten students.

1) **Awareness of the natural environment**

Topics for discussion: Observe and describe the characteristics of the plants in the mini marsh. Represent the mini marsh by drawing or painting pictures of plants, animals and water the students have seen/experienced. Challenge students to find out why snails have shells on their backs. Sort and classify living and non-living things using the mini marsh as an example.

2) **Posing questions**

Topics for discussion: What makes something “living” versus “non-living?” Some plants and snails live in water; based on personal knowledge, what else lives in water? Use the mini marsh kit to explore, e.g. “let’s plant the plants to see if they grow”; discuss the tools you will need. Represent the growth of the plants over time by drawing pictures. Communicate the results of the mini marsh investigation, e.g. “we found out plants grow best in the sun”.

3) **Caring for the environment**

Topics for discussion: Identify differences and similarities between a marsh and a city. What would happen to the plants and animals in the mini marsh if the water dried up? Introduce climate change from the perspective of Mother Earth. Mother Earth has mountains, fields, oceans, rivers and marshes but she also has a problem - she has begun to get a bit of a fever from all the cars, smoke and icky garbage we leave on her. Sometimes her marshes get too warm, rain doesn’t fall from the sky for a long time or too much rain falls hurting the plants and animals. Lots of grownups are helping Mother Earth but she also needs the help from little children to make her feel better. Highlight the importance of working together. Discuss ways the students can care for Mother Earth and the marsh environment, e.g. participate in an environmentally friendly activity, e.g. grow plants in the mini marsh and take them back to the RBG for planting in Cootes Paradise Marsh. Represent the changes in the mini marsh by creating a growth book, include drawings and photographs.

Classroom Mini Marsh - Grade 1

Overall Objectives Supported by Mini Marsh:

Science and Technology: Needs and Characteristics of Living Things

- The role of humans in maintaining a healthy environment;
- Needs and characteristics of plants and animals; and
- Demonstrate an understanding of the basic needs and characteristics of plants and animals

Begin by Introducing the Students to Hamilton Harbour and Cootes Paradise Marsh

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Hamilton Harbour and Cootes Paradise have historically been degraded by human activities. Today there are many organizations working to clean up the Harbour and the Marsh.

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Cootes Paradise – http://www.rbg.ca/wetlandrestoration

The following information can be used as a guide to introduce Classroom Mini Marsh to grade 1 students.

1) **Plants are living things just like you and me**

Topic for discussion: What other livings things do you see when you go outside?

2) **Plants have basic needs like all livings things**

Topics for discussion: Just like people, plants have needs to keep them happy and healthy. Plants need clean water and sunlight to grow. Why do plants need sunlight? Introduce the idea that plants get their needs from the surrounding environment. What is the environment? Do we live in an environment? Measure plant growth from when the marsh is first planted until the end of the program. Compare how plants grow to how children grow. Plants are just like us!

3) Plants help keep other livings things happy and healthy

Topics for discussion: What do you need/use plants for? Other animals also need/use plants for food, shelter, a place to live and to keep out dirt (pollution) and garbage from rivers and ponds.

Food
The stems, roots, leaves and seeds of plants are eaten by lots of different animals. Not all animals behave the same way, e.g. some birds like to eat the leaves and stems, while others only eat the seeds. Big animals, like otter, beaver, turtles and deer will also eat plants. Visual representation of the stem, roots, leaves and seeds would be beneficial.

Shelter
Plants hide some animals from predators; introduce the basic concept of a predator, e.g. young fish and insects are food for other animals like birds. They can hide in the plant until they are big and no longer in danger. Use the snail as an example of an animal that uses the plants for protection.

Habitat
Plants make really good homes for animals like fish and insects. Some birds use the stem of plants to build nests (red-winged black bird) and have babies. Muskrats build dens (what is a den?) from plants stems. These dens are really strong and warm during the winter.

Removal of dirt (pollution) and garbage
Some special plants can clean up dirt and garbage that people throw into the water and on the ground. When plants drink the water, they also drink the bad chemicals, removing them from the water. Plants that live in water can make the water cleaner and healthier for us and all the other animals. Use the Mini Marsh as an example; the plants clean the water for the snails and other creatures.

4) Humans need to take care of plants and the environment

Topics for discussion: Plants and their environment are very important and should be treated with care. Introduce climate change from the perspective of Mother Earth. Mother Earth has mountains, fields, oceans, rivers and marshes but she also has a problem - she has begun to get a bit of a fever from all the cars, smoke and icky garbage we leave on her. Sometimes her marshes get too warm, rain doesn't fall from the sky for a long time or too much rain falls hurting the plants and animals. Lots of grownups are helping Mother Earth but she also needs help from little children to make her feel better. Highlight the importance of working together.

Suggest things each student can do to help protect Mother Earth and her plants: grow a Mini Marsh in the classroom to plant in a marsh, make a garden at home, give plants lots of water and sunlight, don't put garbage (pollution) in the water etc.

Classroom Mini Marsh - Grade 2

Overall Objectives Supported by Mini Marsh:

Science and Technology: Growth and Changes in Animals

- Ways in which animals have an impact on society and the environment, and ways in which humans have an impact upon animals and the places where they live;
- Similarities and differences in the characteristics of animals; and
- Understanding that animals grow and change and have distinct characteristics

Air and Water in the Environment

- Assess ways in which the actions of humans have an impact on the quality of air and water, and ways in which the quality of air and water has an impact on living things; and
- Demonstrate an understanding of the ways in which air and water are used by living things to help them meet their basic needs

Begin by Introducing the Students to Hamilton Harbour and Cootes Paradise Marsh

Topic for discussion: Hamilton Harbour is a large body of freshwater located at the western edge of Lake Ontario (and in downtown Hamilton). Cootes Paradise is a marsh at the west end of the Harbour. It looks very much like a Classroom Mini Marsh only much bigger! Cootes Paradise is the largest remaining marsh in western Lake Ontario and is important for many fish and wildlife. (Recommend showing a map here.)

Hamilton Harbour and Cootes Paradise have historically been degraded by human activities. Today there are many organizations working to clean up the Harbour and the Marsh.

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The following information can be used as a guide to introduce Classroom Mini Marsh to grade 2 students.

1) **Animals have distinct characteristics**

Topics for discussion: Examine the physical characteristics on the Mini Marsh snail and compare its distinct characteristics (i.e. shell, tentacles, foot and soft body) to other marsh animals such as a duck, frog, fish, etc. Discuss all the unique characteristics of the different animals and how they help them live in a marsh.

2) **Animals grow and change**

Topics for discussion: Just like people, snails grow over their lifetime. Discuss the life cycle of a snail from egg to adult. Compare and contrast their growth and change to other marsh animals like the frog; some animals when they hatch/or are born, look like small adults (snail) while others (frog) change many times before looking like an adult. Introduce the term "metamorphosis".

3) **Water is a major part of the environment**

Topics for discussion: What is an "environment"? About 71% of the earth is covered by water; show map of earth highlighting the oceans and lakes. Discuss all the places water can be found and its different forms, i.e. oceans, seas, lakes, rivers, ponds, marshes, rain, ice, snow etc. The marsh environment is special because it has water all year long. Plants and animals, like those found in your mini marsh, need constant supply of water to stay healthy.

4) **Living things need water to survive**

Topics for discussion: Everything on earth needs water to survive from tiny bacteria in the Mini Marsh to giant blue whales in the oceans. Without water life would not exist. All living things use water from salty to fresh, hot and cold. The plants in the Mini Marsh need fresh water.

5) **Humans can impact animals and the environment where they live**

Topics for discussion: Personally connect the students to a local creek or marsh near their home or school. How many students have visited a local creek or marsh? Discuss the impact of throwing garbage into the creek or marsh – what happens to the animals and plants? If you haven't already, introduce the term, "pollution". Pollution can come from many places, including the home e.g., when adults dump unused dangerous chemicals down the drain, toilet and tub at home, the toxins sometimes flow into our creeks, rivers, marshes and lakes. Many people also use chemicals to keep lawns green and grow food, but these chemicals can wash away and flow into our water, making the plants and animals sick. Suggest making a class poster depicting types of water pollution (paints, oil, gasoline, plastic bags etc.).

Introduce climate change in relation to a marsh. Scientists have warned that the world's climate has changed a lot and has affected many living and non-living things; many warm places are getting colder and vice versa. In some areas rain doesn't fall for a really long time, in others, too much rain falls at once damaging the environment and the plants and animals. Human activity is the primary cause of the change in climate. Billions of people producing waste, driving cars, planes and building factories has produced a lot greenhouse gases. Describe greenhouse gases. There are a lot of people working to try to fix it and youth need to be a part of it.

6) **Humans need to take care of plants, animals and the environment**

Topics for discussion: Plants and animals and their environment are very important and should be treated with care. Growing marsh plants in a classroom is an excellent way to help the environment stay healthy and strong as the climate changes; lots of plants in a marsh keep the water clean and cool, provide habitat and food for other animals and absorb carbon dioxide (greenhouse gas).

Suggest things each student can do to help protect plants: make a garden at home, give plants lots of water and sunlight, don't dump garbage (pollution) in the water, recycle leftover chemicals at a special recycling centre, only rain should go down the storm drain, etc.

Classroom Mini Marsh - Grade 3

Overall Objectives Supported by Mini Marsh:

Science and Technology: Growth and Changes in plants

- Assess ways in which plants have an impact on society and the environment, and ways in which human activity has an impact on plants and plant habitats;
- Similarities and differences in the characteristics of various plants, and ways in which the characteristics of plants relate to the environment in which they grow; and
- demonstrate an understanding that plants grow and change and have distinct characteristics

Begin by Introducing the Students to Hamilton Harbour and Cootes Paradise Marsh

Topic for discussion: Hamilton Harbour is a large body of freshwater located at the western edge of Lake Ontario (and in downtown Hamilton). Cootes Paradise is a marsh at the west end of the Harbour. It looks very much like a Classroom Mini Marsh only much bigger! Cootes Paradise is the largest remaining marsh in western Lake Ontario and is important for many fish and wildlife. (Recommend showing a map here.)

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Cootes Paradise – http://www.rbg.ca/wetlandrestoration

The following information can be used as a guide to introduce Classroom Mini Marsh to grade 3 students.

1) **Plants keep other living things and the environment healthy**

Topics for discussion: What do you need/use plants for? Other animals also need/use plants for food, shelter, a place to live, and to keep out dirt (pollution) and garbage from rivers and ponds.

Food
The stems, roots, leaves and seeds of plants are eaten by lots of different animals. Not all animals behave the same way, e.g. some birds like to eat the leaves and stems, while others only eat the seeds. Big animals, like otter, beaver, turtles and deer will also eat plants. Visual representation of the stem, roots, leaves and seeds would be beneficial.

Shelter
Plants hide some animals from predators; introduce the basic concept of a predator, e.g. young fish and insects are food for other animals like birds. They can hide in the plant until they are big and no longer in danger. Use the snail as an example of an animal that uses the plants for protection.

Habitat
Plants make really good homes for animals like fish and insects. Some birds use the stem of plants to build nests (red-winged black bird) and have babies. Muskrats build dens (what is a den?) from plants stems. These dens are really strong and warm during the winter.

Removal of dirt (pollution) and garbage
Some special plants can clean up dirt and garbage that people throw into the water and on the ground. When plants drink the water, they also drink the bad chemicals, removing them from the water. Plants that live in water can make the water cleaner and healthier for us and all the other animals. Use the Mini Marsh as an example; the plants clean the water for the snails and other creatures.

2) **Humans can impact plants and their environment**

Topics for discussion: Personally connect the students to a local creek or marsh near their home or school. How many students have visited a local creek or marsh? Discuss the impact of throwing garbage into the creek or marsh – what happens to the plants? If you haven't already, introduce the term, "pollution". You don't have to throw waste directly into the creek or marsh to pollute it, e.g. when adults dump unused dangerous chemicals down the drain, toilet and tub at home, many of the toxins make their way into our creeks, rivers, marshes and lakes. People also use chemicals to keep lawns green and grow food. However, when it rains, excess chemicals wash away into creeks, rivers and then ultimately into our marshes, killing plants that depend on clean water. Suggest making a class poster depicting various types of water pollution (paints, oil, gasoline, plastic bags etc.).

Example of human impact: In 1837, the Desjardins Canal was created in Cootes Paradise Marsh, Hamilton, by dredging (removing submergent dirt and vegetation) from the marsh. The creation of the canal allowed large fishing boats to move between Dundas and Lake Ontario, but it destroyed much of the marsh habitat. Link to old photo of Desjardins Canal: http://digital.library.mcgill.ca/osler/fullrecord.php?I=IMG_OSL_CUS_032-038_P

Introduce climate change in relation to a marsh. Scientists have warned that the world's climate has changed a lot and has affected many living and non-living things; many places are dealing with increases or decreases in temperature. In some areas rain doesn't fall for a really long time, in others, too much rain falls at once damaging the environment and the plants and animals. Human activity is the primary cause of the change in climate. Billions of people producing waste, driving cars, planes and building factories has produced a lot greenhouse

gages. Describe greenhouse gases. There are a lot of people working to try to fix it and youth need to be a part of it. Growing marsh plants in a classroom is an excellent way to help the environment stay healthy and strong as the climate changes; lots of plants in a marsh keep the water clean and cool, provide habitat and food for other animals and absorb carbon dioxide (greenhouse gas).

3) Plants can exhibit many different characteristics

Topics for discussion: Compare a desert plant, like a cactus, to a water-loving plant like those found in the Mini Marsh. Do they look different? How do their characteristics relate to their extreme environments? Wetland plants are herbaceous – non-woody. To adapt to their wet environment, they have very long root systems to anchor them to the ground during wave action or water movement. Water lilies are one of the most recognizable aquatic plants. Lily pads do the same work as leaves on land plants, gathering sunlight for the plant to continue photosynthesis and exchanging gases. The flat broad leaf ensures the plant collects as much sunlight as possible. The shape and thickness also helps the lily stay above water even when frogs hop on them. Water lilies and other marsh plants grow very fast because they live in an environment with lots of light, water and nutrients. Suggestion: track the growth of your Mini Marsh over time.

Classroom Mini Marsh - Grade 4

Overall Objectives Supported by Mini Marsh:

Science and Technology: Habitats and Communities

- Analyze the effects of human activities on habitats and communities (positive and negative)

Social Studies: People and Environments, Political and Physical Regions in Canada

- Assess some key ways in which industrial development and the natural environment affect each other in two or more political and/or physical regions of Canada

Begin by Introducing the Students to Hamilton Harbour and Cootes Paradise Marsh

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Hamilton Harbour and Cootes Paradise have historically been degraded by human activities. Today there are many organizations working to clean up the Harbour and the Marsh.

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Cootes Paradise – http://www.rbg.ca/wetlandrestoration

The following information can be used as a guide to introduce Classroom Mini Marsh to grade 4 students.

1) **The impact of human activities on habitats and communities**

Topics for discussion: How many students have visited a local wetland? What are the primary characteristics of a wetland? List the differences between a marsh, swamp and bog. Each of these wetlands is a specialized habitat that supports unique communities of plants and animals. Personally connect the students to a local creek or marsh near their home or school.

Negative effect: Discuss the impact of dumping pollutants into a creek or marsh – what happens to the plants and animals? Pollution can come from many places, including the home e.g., when people dump unused dangerous chemicals down the drain, toilet or tub at home, many of the toxins make their way into our creeks, rivers, marshes and lakes. People also use chemicals to keep lawns green and grow food. However, when it rains, excess chemicals wash into creeks, rivers and then ultimately into our marshes, killing plants and animals that depend

on clean water. Suggest making a class poster depicting types of water pollution (paints, oil, gasoline, plastic bags etc.).

As an extension of pollution, introduce climate change in relation to a marsh. Scientists have warned that the world's climate has changed a lot and has affected many living and non-living things; many places that were warmer are now getting colder and vice versa. In some areas rain doesn't fall for a really long time, in others, too much rain falls at once damaging the environment and the plants and animals. Use the Burlington summer flood 2014 as a local example. Human activity is the primary cause of the change in climate. Billions of people producing waste, driving cars, planes and building factories has produced a lot greenhouse gages. Describe greenhouse gases. There are a lot of people working to try to fix it and youth need to be a part of it.

Negative effect: In 1837, the Desjardins Canal was created in Cootes Paradise Marsh, Hamilton, by dredging (removing submergent dirt and vegetation) from the marsh. The creation of the canal allowed large fishing boats to move between Dundas and Lake Ontario, but it destroyed much of the marsh habitat. By the mid-20th century after years of dredging, pollution and other negative human activities, Cootes Paradise lost approximately 85% of its plant cover. Mammals like beaver, fox, muskrat, and coyotes began to disappear. Birds, fish, reptiles and amphibians no longer had a source of food and shelter for resting and raising their young. Link to old photo of Desjardins Canal: http://digital.library.mcgill.ca/osler/fullrecord.php?I=IMG_OSL_CUS_032-038_P

Positive effect: Each year, local community groups (BARC) and organizations like the Royal Botanical Gardens (RBG) plant thousands of marsh plants back into Cootes Paradise in an effort to create new habitat for plants and animals. Growing marsh plants in a classroom is an excellent way to help the environment stay healthy and strong as the climate changes; lots of plants in a marsh keep the water clean and cool, provide habitat and food for other animals and absorb carbon dioxide (greenhouse gas). Contact the RBG to plan a school trip to plant your kit in Cootes Paradise at the end of the year!

Positive effect: In 1993 the RBG built the Fishway – a two-way fish barrier that prevents invasive species like carp from entering Cootes Paradise. Carp are bottom-feeders like your pet goldfish at home. As they feed along the bottom, they uproot plants and cloud the water. The cloudy water prevents sunlight from reaching plants under the water. It is estimated there 70,000 carp in Cootes prior to the Fishway, now there are less than 1000. Show a graph that represents large fish intercepted at the Fishway since 1996: http://www.rbg.ca/fishway.

2) Relationship between industrial development and the environment

Topics for discussion: Industrial development in Hamilton and Burlington shaped the Harbour landscape and its resources. Hamilton evolved as a major port city because of its access to freshwater and the Great Lakes. Look into the history of the Harbour beginning with the early

development of its fishing industry. Students may want to research the environmental and geographical factors that supported this industry. What other resources were/are plentiful in the Harbour? Visit HamiltonHarbour.ca → Explore the Bay → Harbour Explorer and discover Hamilton's industrial history.

In equal measure, the Harbour's industry has affected and shaped the natural environment. Visit HamiltonHarbour.ca → RAP → What is the Rap → What Needs to be Done, to learn about the negative affects our actions have had on the environment, with particular emphasis on the loss of fish and wildlife populations and their habitat.

Classroom Mini Marsh - Grade 6

Overall Objectives Supported by Mini Marsh:

Science and Technology: Biodiversity

- Assess human impacts on biodiversity, and identify ways of preserving biodiversity;
- Identify distinguishing characteristics of different plants and animals; and
- Demonstrate an understanding of biodiversity, its contributions to the stability of natural systems, and its benefits to humans

Social Studies: People and Environments, Canada's Interactions with the Global Community

- Investigate some global issues of political, social, economic, and/or environmental importance, their impact on the global community, and responses to the issues

Begin by Introducing the Students to Hamilton Harbour and Cootes Paradise Marsh

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Hamilton Harbour and Cootes Paradise have historically been degraded by human activities. Today there are many organizations working to clean up the Harbour and the Marsh. Cleanup of Hamilton Harbour (including Cootes Paradise) is governed by the Hamilton Harbour Remedial Action Plan. Project Paradise is a project to clean up Cootes Paradise (led by the Royal Botanical Gardens) and is the largest of its kind in North America.

More information:
Hamilton Harbour – hamiltonharbour.ca → Explore the Bay → About the bay
Cootes Paradise – http://www.rbg.ca/wetlandrestoration

The following information can be used as a guide to introduce Classroom Mini Marsh to grade 6 students.

1) **Global issue of concern: water quality**

Topics for discussion: Use Hamilton Harbour and Cootes Paradise Marsh as a case study to discuss water quality. Visit HamiltonHarbour.ca → Explore the Bay → About the Bay, to learn about the Harbour's physical features and history. Discuss how poor water quality has/continues to have an effect on the city's economy, recreational and environmental health, e.g. the Harbour once supported a booming fishing industry until industrial and urban pollution

contaminated the water mid-century. Excess amounts of nutrients (phosphorus and nitrogen) continue to pollute the Harbour affecting its water quality. Visit HamiltonHarbour.ca → Resources → BARC Toward Safe Harbours Reports, to view the 2014 report on sediment and phosphorus pollution. Page 12-13 graphically depicts changes in phosphorus levels in the Harbour since the 1970's.

Marsh vegetation, like those found in the Mini Marsh, play an important role in maintaining local water quality. Wetlands preserve water quality by removing nitrogen, phosphorus and pesticides from agricultural runoff. By participating in the program, your class is helping to improve the water quality of a very important freshwater system.

2) **Plants can exhibit many different characteristics**

Topics for discussion: Compare a desert plant, like a cactus, to a water-loving plant like those found in the Mini Marsh. Do they look different? How do their characteristics relate to their extreme environments? Wetland plants are herbaceous – non-woody. To adapt to their wet environment, they have very long root systems to anchor them to the ground during wave action or water movement. Water lilies are one of the most recognizable aquatic plants. Lily pads do the same work as leaves on land plants, gathering sunlight for the plant to engage in photosynthesis and exchange gases. The flat broad leaf ensures the plant maximizes surface area exposed to the sun to collect as much sunlight as possible. The leaf shape and thickness also help the lily stay above water even when frogs hop on them! Water lilies and other marsh plants grow very fast because they live in an environment with lots of light, water and nutrients. Suggestion: Measure and graph the growth of your Mini Marsh over time.

3) **Biodiversity in Hamilton Harbour**

Topics for discussion: Cootes Paradise is the largest wetland on the western-end of Lake Ontario and supports a very biodiverse community of plants and animals. The marsh supports many other ecosystems in southern Ontario and the United States (identify Hamilton Harbour and Cootes Paradise on a binational map). It is a migration stopover and breeding ground for many birds (eg ring-billed gulls, cormorants, black-crowned night herons, mallard ducks and Caspian terns) and an aquatic nursery for fish; considered a fish "hot spot" with over 60 species. Cootes Paradise supports the highest number of plant species anywhere in Canada with over 750. Discuss the interconnectedness of all the species and the importance of a robust community to the stability of an ecosystem.

Plants, like those found in the mini marsh, are crucial to the health and function of the marsh: they filter pollution and contaminated sediment, provide shelter, breeding habitat, food and regulate the temperature of the water. A biologically diverse plant community not only provides benefits to wildlife but also humans. Ask the students how they benefit from a biodiverse system such as Cootes Paradise.

4) The Human Impact

Topics for discussion: Once again, use Hamilton Harbour and Cootes Paradise to assess human impacts on biodiversity.

Negative impact: Pollution can come from many sources, including a home e.g. when people dump unused dangerous chemicals down the drain, toilet or tub at home, many of the toxins make their way into the marsh through the sewer system. However, it's nearby agricultural fields loaded with fertilizers and pesticides that account for the majority of contaminated sediment entering the marsh; during large rainstorms, sediment washes into creek and river systems which flow directly into the Harbour and marsh. These chemicals and nutrients can be toxic to wildlife, dangerously reducing the population of many species. Suggest making a class poster depicting types of water pollution (fertilizers, paints, oil, gasoline, plastic bags etc.) that can have a negative effect on the marsh.

As an extension of pollution, introduce climate change in relation to a marsh. Scientists have warned that the world's climate has changed a lot and has affected many living and non-living things; many places that were warmer are now getting colder and vice versa. In some areas rain doesn't fall for a really long time, in others, too much rain falls at once damaging the environment and the plants and animals. Use the Burlington summer flood 2014 as a local example. Human activity is the primary cause of the change in climate. Billions of people producing waste, driving cars, planes and building factories has produced a lot greenhouse gages. Describe greenhouse gases and provide examples. There are a lot of people working to try to fix it and youth need to be a part of it.

Negative impact: In 1837, the Desjardins Canal was created in Cootes Paradise by dredging (removing submergent dirt and vegetation) from the marsh. The creation of the canal allowed large fishing boats to move between Dundas and Lake Ontario, but it destroyed much of the marsh habitat. By the mid-20th century after years of dredging, pollution and other negative human activities, Cootes Paradise lost most of its plant cover, approximately 85%. Mammals like beaver, fox, muskrat, and coyotes began to disappear. Birds, fish, reptiles and amphibians no longer had a source of food and shelter for resting and raising their young. Link to old photo of Desjardins Canal: http://digital.library.mcgill.ca/osler/fullrecord.php?I=IMG_OSL_CUS_032-038_P

Example of preservation: Each year, local community groups (BARC) and organizations like the Royal Botanical Gardens (RBG), plant thousands of marsh plants back into Cootes Paradise in an effort to create new habitat for plants and animals. Growing marsh plants in a classroom is an excellent way to help the environment stay healthy and strong as the climate changes; lots of plants in a marsh keep the water clean and cool, provide habitat and food for other animals and absorb carbon dioxide (greenhouse gas). Contact the RBG to plan a school trip to plant your kit in Cootes Paradise at the end of the year!

Example of preservation: In 1993 the RBG built the Fishway – a two-way fish barrier that prevents invasive species like carp from entering Cootes Paradise. Carp are bottom-feeders like your pet goldfish at home and as is the case with most invasive species, they are very effective at reducing biodiversity. As they feed along the bottom, they uproot plants and cloud the water. The cloudy water prevents sunlight from reaching plants under the water. It is estimated there 70,000 carp in Cootes prior to the Fishway, now there are less than 1000. This graph represents large fish intercepted at the Fishway since 1996: http://www.rbg.ca/fishway.

Classroom Mini Marsh - Grade 7

Overall Objectives Supported by Mini Marsh:

Science and Technology: Interactions in the Environment

- Assess the impacts of human activities and technologies on the environment, and evaluate ways of controlling these impacts;
- Investigate interactions within the environment, and identify factors that affect the balance between different components of an ecosystem; and
- Demonstrate an understanding of interactions between and among biotic and abiotic elements in the environment

Begin by Introducing the Students to Hamilton Harbour and Cootes Paradise Marsh

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More information:
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Cootes Paradise – http://www.rbg.ca/wetlandrestoration

The following information can be used as a guide to introduce Classroom Mini Marsh to grade 7 students.

1) **Biotic and Abiotic**

Topics for discussion: What is the difference between abiotic and biotic? List the different components of the Mini Marsh as biotic or abiotic e.g. biotic = snail, plants, fungus, bacteria, algae etc.; abiotic = rocks, minerals, sand, soil and water.

2) **Investigating Interactions**

Topics for discussion: Investigate biotic and abiotic interactions in a marsh environment, with a focus on aquatic plants. Create a multimedia poster depicting the web of interactions.

Discuss how aquatic plants interact with abiotic components in the mini marsh. How do the plants interact with soil and water?

Other interactions include:

Food
The stems, roots, leaves and seeds of plants are eaten by many different animals. Not all animals behave the same way, e.g. some birds like to eat the leaves and stems, while others only eat the seeds; each species is adapted to feed on various parts of the plant. By providing a source of food for animals, the plant ensures its seeds are dispersed. Visual representation of the stem, roots, leaves and seeds would be beneficial.

Shelter
Plants provide shelter from predators; discuss prey-predator relationship, e.g. young fish and insects are prey for larger animals. Use the snail as an example of an animal that uses aquatic plants for protection.

Habitat
Plants provide the raw materials for dens and nests. Some birds use plant stems to build nests (red-winged and yellow-headed black bird and marsh wren). Muskrats use plant rhizomes for food and the foliage to build their houses, while amphibians lay their eggs in the water and amongst vegetation.

Pollution removal
Aquatic plants help maintain and improve the water quality of streams, rivers and lakes. Positioned between uplands and water sources, they intercept polluted runoff from the watershed before it reaches the open water. The runoff may contain nutrients (nitrogen and phosphorus), sediment, metals and pathogens. To learn more about the Hamilton Harbour watershed visit: HamiltonHarbour.ca →Explore the Bay → About the Bay.

3) The Human Impact

Topics for discussion: Study Hamilton Harbour and Cootes Paradise to assess human impacts on the environment.

Negative impact: Pollution can come from many sources, including a home e.g., when people dump unused dangerous chemicals down the drain, toilet or tub at home, many of the toxins make their way into the marsh through the sewer system. However, it's nearby agricultural fields loaded with fertilizers and pesticides that account for the majority of contaminated sediment entering the marsh; during large rainstorms, sediment washes into creek and river

systems which flow directly into the Harbour and marsh. These chemicals and nutrients can be toxic to wildlife, dangerously reducing the population of many species. Suggest making a class poster depicting types of water pollution (fertilizers, paints, oil, gasoline, plastic bags etc.).

As an extension of pollution, introduce climate change in relation to a marsh. Scientists have warned that the world's climate has changed a lot and has affected many living and non-living things; many places that were warmer are now getting colder and colder areas are now getting much colder or warmer. In some areas rain doesn't fall for a really long time, in others, too much rain falls at once damaging the environment and the plants and animals. Use the Burlington summer flood 2014 as a local example. Did any students experience the flood or know someone who did? Human activity is the primary cause of the change in climate. Billions of people producing toxic waste, driving cars, planes and rapidly industrializing nations have produced a lot greenhouse gages. Describe greenhouse gases and provide examples. There are a lot of people working to try to mitigate and adapt to the effects of climate change, and youth need to be a part of that process.

Negative impact: In 1837, the Desjardins Canal was created in Cootes Paradise by dredging (removing submergent dirt and vegetation) from the marsh. The creation of the canal allowed large fishing boats to move between Dundas and Lake Ontario, but it destroyed much of the marsh habitat. By the mid-20th century after years of dredging, pollution and other negative human activities, Cootes Paradise lost most of its plant cover, ~85%. Mammals like beaver, fox, muskrat, and coyotes began to disappear. Birds, fish, reptiles and amphibians no longer had a source of food and shelter for resting and raising their young. Link to old photo of Desjardins Canal: http://digital.library.mcgill.ca/osler/fullrecord.php?I=IMG_OSL_CUS_032-038_P

Controlling impacts: Each year, local community groups (BARC) and organizations like the Royal Botanical Gardens (RBG), plant thousands of marsh plants back into Cootes Paradise in an effort to create new habitat for plants and animals. Growing marsh plants in a classroom is an excellent way to help the environment stay healthy and strong as the climate changes; lots of plants in a marsh keep the water clean and cool, provide habitat and food for other animals and absorb carbon dioxide (greenhouse gas). Contact the RBG to plan a school trip to plant your kit in Cootes Paradise at the end of the year!

Controlling impacts: In 1993 the RBG built the Fishway – a two-way fish barrier that prevents invasive species like carp from entering Cootes Paradise. Carp are bottom-feeders like your pet goldfish at home and as is the case with most invasive species, they are very effective at reducing biodiversity. As they feed along the bottom, they uproot plants and cloud the water. The cloudy water prevents sunlight from reaching plants under the water. It is estimated there 70,000 carp in Cootes prior to the Fishway, now there are less than 1000. This graph represents large fish intercepted at the Fishway since 1996: http://www.rbg.ca/fishway.

Classroom Mini Marsh - Grade 8

Overall Objectives Supported by Mini Marsh:

Science and Technology: Water systems

- Investigate factors that affect local water quality; and
- Demonstrate an understanding of the characteristics of the earth's water systems and the influence of water systems on a specific region

Begin by Introducing the Students to Hamilton Harbour and Cootes Paradise Marsh

Topic for discussion: Hamilton Harbour is a large body of freshwater located at the western edge of Lake Ontario (and in downtown Hamilton). Cootes Paradise is a marsh at the west end of the Harbour. It looks very much like a Classroom Mini Marsh only much bigger! Cootes Paradise is the largest remaining marsh in western Lake Ontario and is important for many fish and wildlife. (Recommend showing a map here.)

Hamilton Harbour and Cootes Paradise have historically been degraded by human activities. Today there are many organizations working to clean up the Harbour and the Marsh. Cleanup of Hamilton Harbour (including Cootes Paradise) is governed by the Hamilton Harbour Remedial Action Plan. Project Paradise is a project to clean up Cootes Paradise (led by the Royal Botanical Gardens) and is the largest of its kind in North America.

More information:
Hamilton Harbour – hamiltonharbour.ca → Explore the Bay → About the bay
Cootes Paradise – http://www.rbg.ca/wetlandrestoration

The following information can be used as a guide to introduce Classroom Mini Marsh to grade 8 students.

1) **Characteristics of the Hamilton Harbour watershed**

Topics for discussion: Over 700,000 people live in the Hamilton Harbour watershed (see HamiltonHarbour.ca → Explore the Bay → About the Bay, to learn more about the dynamics of the watershed), and every person, farm and factory in that watershed contributes to the water quality of the Harbour. Locate the school or student homes on a Hamilton Harbour watershed map. Do they live near a creek or river that flows into Cootes Paradise Marsh and/or the Harbour?

2) **Factors affecting water quality**

Topics for discussion: Visit HamiltonHarbour.ca → Explore the Bay → Current and Emerging Challenges, to learn how the city of Hamilton processes wastewater and projects designed to mitigate water pollution. Cootes Paradise Marsh often suffers from sewage spilling into its waters from a nearby sewer overflow tank and polluted sediment washing in from agricultural fields and urban landscapes – how might this affect water quality in the marsh? What are some measures of water quality?

As an extension of wastewater management, introduce climate change in relation to a marsh. Scientists have warned that the world's climate is rapidly changing affecting every continent on the globe; many places that were warmer are now getting colder and colder areas are now getting much colder or warmer. In some areas rain doesn't fall for a really long time, in others, too much rain falls at once damaging the environment and the plants and animals. Use the Burlington summer flood 2014 as a local example. Did any students experience the flood or know someone who did? The massive amount of rain that fell during that event backed up sewer systems forcing untreated overflow into creeks. Those polluted creeks then emptied out into the Harbour and Cootes Paradise. These massive rain events will only increase as climate change progresses, therefore, it is urgent that we work to mitigate and adapt to the effects of climate change and youth need to be a part of that process. Growing marsh plants in a classroom is an excellent way to help our local environments stay healthy and strong as the climate changes; marsh plants keep the water clean and regulate the temperature, provide habitat and food for other animals and absorb carbon dioxide (greenhouse gas). Contact the RBG to plan a school trip to plant your kit in Cootes Paradise at the end of the year!