

Quagmire

A Simulation Game for
Wetland Decision Making



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126 Portland Street, Dartmouth, Nova Scotia, B2Y 1H8

Phone: 902-420-3474, Fax: 902-424-5334,

Email: cns@clean.ns.ca, URL: www.clean.ns.ca

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Preface

Quagmire: A Simulation Game for Wetland Decision Making is an interactive role-playing game that simulates a reality-based dilemma regarding the development of a saltwater marsh. For teachers outside of Nova Scotia or not in proximity to saltwater marshes additional information concerning freshwater wetlands is integrated into the game. Background information on wetlands may be found in the Background Information and Supplementary Materials section.

Specific information is given about British Columbia, Saskatchewan, Ontario, and Quebec wetlands. For the remaining provinces, a few key wetlands have been listed as possible examples to use as replacements for the Shannon Salt Marsh. See the supplementary background material for more detailed information on these areas, International wetlands, Ramsar Convention, North American Waterfowl Management Plan and climate change.

Controversy is inherent in any issue; local issues can be particularly heated and can deeply divide a community. To be most effective, we must work with each other to share ideas, information and skills. Though problems cannot always be solved, situations may improve with this interaction and the understanding that results.

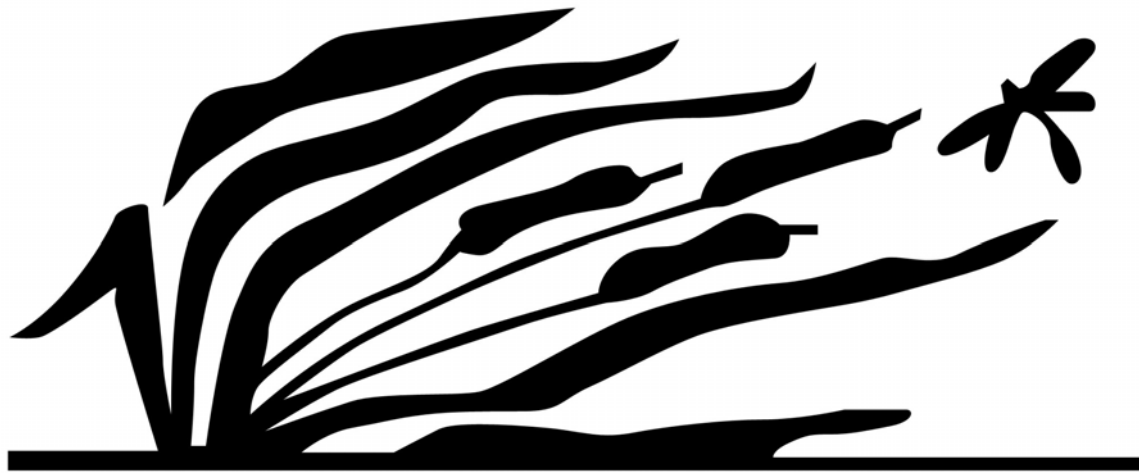
In this instance, a proposal to construct a highway across the Shannon Salt Marsh has caused uproar in Calico County. In *Quagmire* grades 5-8, students are formed into 6 organizations located in Calico County. A teacher or student may take the role of the facilitator who sets the agenda. The students research the impact the proposed highway development will have on their organization, designate a spokesperson and give a presentation to the class. After each organization has presented, the County Councillor distributes more information (letters and faxes) to the organizations to stir up some action. Upon reviewing the new material, each organization must re-examine their stand and debate amongst themselves the fate of the marsh.¹ The students vote individually, choosing the organization they support. They may vote for their organization that they are part of or they may decide to vote for another. The County Councillor/ teacher will tabulate the votes, announce the results and the class will discuss the outcome and reasoning (debriefing session).

In *Quagmire* grades 9-12, students play the roles of councillors, media and various stakeholder organizations as they debate the fate of the marsh in a more structured setting. The fate of the marsh culminates in a final vote at a council meeting.

The section “Where To From Here?” found in the Background Information and Supplementary Materials section, consists of ideas for doing more, designed to further explore the issues of wetlands. Some activities may be undertaken prior to playing *Quagmire*, and all may be done following the game, to further enhance students’ knowledge and understanding of saltwater marshes, and to get involved in local environmental issues.

¹ Please note that for grades 5 to 8, the distribution of these letters and faxes is optional. Teachers may decide to omit this information as a way to further streamline and simplify *Quagmire* for younger grade levels.

Quagmire
Grades 5-8



Quagmire Grades 5-8

Instructions for the Facilitator

Quagmire has been revised to accommodate an easier structure for time constraints and application for grades 5-8.

Playing *Quagmire* consists of students reading background materials, preparing and presenting their stand to the County Councillor as representatives of an organization reacting to the proposed highway development through a wetland area. The students are assigned to one of 6 organizations located in a fictional county. The organizations designate a spokesperson to give a 2 minute presentation to the facilitator. Students will vote individually with the option to either vote for their organization or another, depending on how they feel after the presentations. The facilitator will tabulate the votes and debriefing session and discussion will follow. "Where To From Here?" and complementary activities found in the Background Information and Supplementary Materials section is also provided and may be conducted as time permits.

The facilitator organizes and distributes materials for the rest of the class during preparation for the simulation game as well as ensures that timelines and activities are adhered to during the game. For the younger grades, the teacher may want to explain the role of each organization before assigning students to their groups. The facilitator can also hand out the letters and faxes to the organizations. The facilitator may be the teacher or a student.

Quagmire has been divided into four activities with a suggested 45 minute time length for each activity. Depending on the amount of classroom time available, some of the material may be assigned as homework outside of the classroom. Unless the class has already had wetland education, it is strongly suggested that as many of the activities as possible be conducted in the classroom. Additional classroom time will be required should the students prepare props and visual guides for their presentation to the County Councillor.

Activity Plan

Activity 1: Research, introduction to game, homework

Objectives	<ul style="list-style-type: none">• To introduce the physical, biological and chemical properties of the wetlands.• To provide examples of Maritime or local wetlands.• To provide the context of the game
Procedure	<ul style="list-style-type: none">• The facilitator distributes and reads aloud to the class “Setting the Scene for the Simulation Game”• Read and discuss wetlands.
Materials	<ul style="list-style-type: none">• Background Information about Wetlands,• Wetlands around the Maritimes,• Vocabulary sheet,• Word Search• Shannon Salt Marsh Map• Setting the scene for the Simulation Game

Activity 2: Assigning game roles, research, preparation of presentation

Objectives	<ul style="list-style-type: none">• To assign game roles.• To research roles and develop strategy.• For each group to prepare a two-minute presentation about their organization and create a visual display such as poster, flyers to promote their organizations stand on the proposed development.
Procedure	<ul style="list-style-type: none">• The facilitator assigns players to an organization and distributes information sheets on the roles.• The groups review the information, do further research, read the debating tips sheet and formulate their strategy.• The Facilitator should advise the group that they have to pick a speaker(s) before the end of the class. It might help if the students meet outside of class to further discuss strategy if needed.• Encourage the students to be creative and use whatever means available to them to help get their points across, e.g. props, dramatics, collages, posters, flyers, etc.
Materials	<ul style="list-style-type: none">• Role descriptions for each organization• Map of Shannon Salt Marsh to be put on display• Debating tips

Activity 3: Presentation, group discussions

- Objectives**
- Each of the 6 organizations will present a two minute presentation.
 - The facilitator will hand out letters and faxes (optional)².
 - The press releases, letters and faxes will stir up actions and may influence the decision of each organization.
 - Each organization will discuss the new information, prepare notes and formulate a decision on the fate of the saltwater marsh.
- Materials**
- Letters, faxes and press releases will be handed out (optional activity)
- Procedure**
- The facilitator should time these presentations to ensure they do not run over two minutes.
 - It should be emphasized that during these presentations, members of all groups should be taking notes to help promote their causes.
 - If the letters and faxes are distributed as sources of additional information, each organization will discuss the new information and may as a group collectively decide on the fate of the salt marsh or may form their own opinions based on the new information.
 - At the end of this activity each member of the organization will be prepared to cast their vote on the fate of the saltwater marsh.

Activity 4: Vote and Debriefing

- Objectives**
- Facilitator will hand out ballots and discuss the outcome.
- Materials**
- Flip chart
 - Voting ballots
 - Cardboard box for ballot box
- Procedure**
- Each student will be given a ballot and vote.
 - Ballots will be calculated and result given.
 - Students vote on fate of salt marsh and discuss outcome.
 - Facilitator will ask each organization for Pro's and Con's to the proposed highway, recording reasons on a flipchart.
 - Class will discuss outcome of the vote.

² Please note that for grades 5 to 8, the distribution of these letters and faxes is optional. Teachers may decide to omit this information as a way to further streamline and simplify *Quagmire* for younger grade levels.

Vocabulary List

- Wetlands:** Wetlands are the transition between dry areas and water areas. They can be covered with water for a part of the day or part of the year. There are four major types of wetlands: swamps, marshes, bogs and fens.
- Marsh:** Marshes are the wet areas of wetlands filled with a variety of grasses and rushes. There are two basic types of marshes: freshwater and saltwater
- Bog:** A wetland that has no drainage of water making them very acidic with little oxygen. Very few organisms survive in them. They are composed mostly of sphagnum moss and peat, in which water tolerant shrubs, herbs and trees grow. Bogs are the most common wetland in Nova Scotia.
- Swamp:** A wetland that is periodically or permanently covered with water. Swamps usually are forested with trees and shrubs.
- Fen:** A wetland that is in the transitory stage to becoming a bog. Unlike bogs, fens have a source of water such as a stream, lake or groundwater that feed into them. This water provides more nutrients to the fen and as a result, more plants such as sedges grow.
- Sphagnum moss:** This covers bogs and over years the dead remains of mosses pile up and form deep layers of peat.
- Peat:** The partially decomposed remains of plants such as mosses which have been accumulating since the last glacial period.
- Sedges:** Emergent plants found in shallow water or moist soil around a wetland. They resemble grass but are three sided. They are important plants for nesting and feeding waterfowl and provide valuable cover and food for many species.
- Carbon cycle:** The movement of carbon through the earth's sphere. Wetlands contain a large portion of the earth's carbon pool. Therefore, they can help slow down climate change.
- Ramsar Convention:** Formed in 1971, the Ramsar Convention on Wetlands was the first international treaty about ecosystem conservation to promote the wise use of wetlands.
- Saltwater**

wetlands: These are caused by ocean tides. Some are flooded and dry up twice each day, others are flooded only by particularly high tides that occur at less regular intervals.

Freshwater wetlands: These are usually established in the spring when water levels are highest because of melting snow and flooding. Summer droughts, evaporation and infiltration will gradually cause the areas to dry up, sometimes completely.

Watershed: The land area from which surface runoff drains into a stream, channel, lake, reservoir, or other body of water, also called a drainage basin.

**** Supplementary background material and more detailed information can be found in the Background Information and Supplementary Materials section.***

Word Search-Wetland Wonders

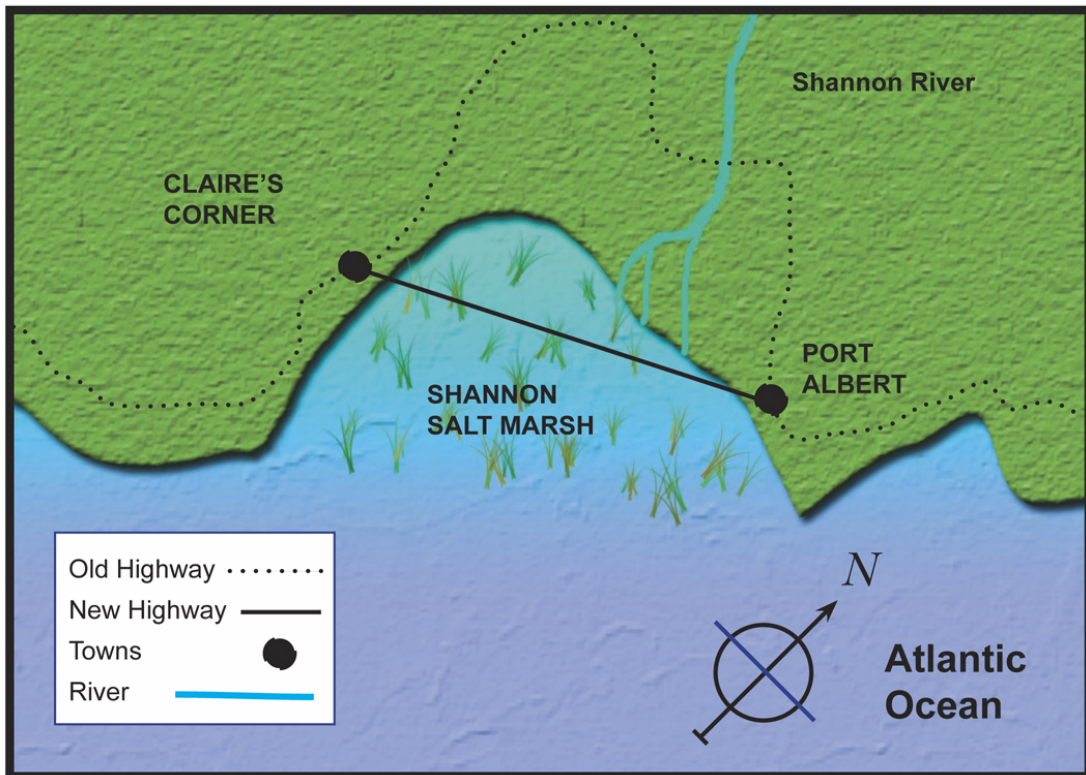
F Z H I Y U M H M S C E X N M
I K O U D A X A X I D Q A F F
L R D O R J N Z T O S E K Z Y
T N A S P G D Y J O W O E L F
R W H M R L H M R Z A M B R V
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N Y J U I S A E A P O S L A U
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R U L R C K T E G D E S E A Y
K N E L A W F T M Y C Y W E I
N I M B K L W X A E P E X P H
T N E M I D E S M C F E N G G

BOG
CARBON
CATTAILS
EROSION
FEN
FILTRATION
HYDROPHYTIC
MANGROVE
MARSH

PEAT
RAMSAR
REEDS
SEDGE
SEDIMENT
SPAGNUM MOSS
SWAMP
WETLAND
ZOOPLANKTON

Map of Calico County

PROPOSED NEW HIGHWAY ROUTE



Setting the Scene for the Simulation Game Grades 5-8

The Shannon Salt Marsh is located on Calico Inlet at the mouth of the Shannon River. It is the last remaining salt marsh of major size in the area (162 hectares).

Presently, Highway 108 arches around the saltwater marsh by heading north from Claire's Corner through a number of small villages and farming communities, and then gradually turns south to the historical town of Port Albert.

The Department of Highways would like to reroute a section of the highway to run directly from Claire's Corner to Port Albert. This would mean cutting across a large part of the Shannon Salt Marsh.

A number of groups are protesting this proposed development. Each of these groups has its own vision of the Shannon Salt Marsh's future. As a result, a storm is brewing in Calico County, and it has nothing to do with the weather! Each group has haphazardly attempted to persuade the County Councillor that its way is best. As a result, the County Councillor has called a meeting to give each group an opportunity to present and defend its position on the Shannon Salt Marsh.

Each organization will research and designate one person as spokesperson to deliver a two minute speech on its stand on the development. After each of the six groups has presented, an optional activity is to give the organizations supplementary materials in the form of letters and faxes to review. This new information may possibly sway their decision on the fate of the marsh. Each organization will discuss the new data with each member of the organizations prepared to vote individually. Organization members may decide to vote in favour of the organization to which they belong, or they may decide to vote in favour of another based on the other presentations, letters, faxes and discussions.

Note to Teachers: Letters and Faxes

Some of the letters and faxes may contain somewhat complex subject matter for younger grade levels such as grades five and six. You may wish to only hand out one fax or letter per group, or simply omit the letters and faxes from Activity Three altogether.

Organizations

- **Calico Clams Inc.** is a family-owned company located in Calico East that harvests and processes clams for sale in Europe and the United States.
- **Farm First (FF)** is an association of landowners who farm dyked marshes. FF deals with concerns and issues affecting farmers and landowners of reclaimed (dyked) marshland.
- **The Department of Highways (DOH)** is the government department responsible for developing transportation systems throughout the province.
- **The Mayflower Naturalist Society (MNS)** is a not-for-profit organization, (one which has a specific goal or objective other than to make money) which encourages the preservation of natural spaces in the province.
- **The Port Albert Downtown Business Association** is composed of town business people. Their goal is to improve local business conditions and promote the services that they offer.
- **The Tourism Association of Calico County (TACC)** is a not-for-profit organization made up of individuals seeking to promote the area's tourism industry.

Calico Clams Inc.

Calico Clams Inc. is a family-owned company that harvests and processes clams for sale in Canada, Europe and the United States.

Their View on the Future of the Shannon Salt Marsh: Calico Clams Inc. would like to have the Shannon Salt Marsh preserved so that the clam beds there now can prosper.

Their Argument: Clams depend on the constant movement of tides to provide fresh oxygen. If the hydrology (water pattern) of the marsh is altered and the clams do not receive a continual source of new oxygen, they will not survive.

- Clams are part of the mollusk family, which is well known to be highly sensitive to any form of pollution. By building a highway or developing the area surrounding the marsh in any way, the likelihood of pollution is great and chances are extremely high that the clams would suffer.
- The Shannon Marsh is one of the few remaining places where the water is pristine enough for clam beds to prosper. During the past 15 years, clams have become rare due to pollution and are therefore considered a delicacy.
- The clam beds provide a livelihood for the 50 people employed by Calico Clams Inc. If Calico Clams is forced to close down, it would be a blow to the local economy.
- Calico Clams have become famous in restaurants throughout the Western Hemisphere. People from all over Canada and the world travel to Calico County for its clams. The annual Calico Clam Festival is one of the biggest tourist events of the summer and last summer it generated \$3.4 million in spending after expenses.

Farm First (FF)

Farm First (FF) is an association made up of landowners who farm dyked marshes. FF deals with the concerns and issues affecting farmers and landowners of reclaimed (dyked) marshland.

Their View on the Future of the Shannon Salt Marsh: FF would like to dyke the marshes to make them suitable for farming.

Their Argument:

- Farmers all over the province are attempting to grow crops on land that is not nearly as productive as these marshlands would be for farming.
- A new route for the highway, as proposed by Farm First, could actually be used as the dyke for farmland in behind the highway. The modest increase in cost of the highway would be much less than building the highway in its current configuration combined with the cost of building the dyke for the farmland.
- The small increase in traveling time between Port Albert and Claire's Corner would be a small compromise for the increase in farm productivity in the area.
- Farming is an important tradition and should be supported and encouraged.
- Economically, farming the marshland would benefit the area and greatly enhance its reputation as a prime agricultural site.
- Rye is an extremely easy crop to grow on dyked marshland. This was done very successfully in other parts of the province and would be an excellent cash crop with a distillery only 37 kilometres away.
- The marshland is large enough to accommodate mechanical farming, using high tech water control techniques that produce a well-drained soil.
- The modern ditches are shallow enough to manoeuvre farm machinery across, making modern farming of the area quite practicable.
- The Department of Agriculture and Fisheries would provide financial and technical assistance to farmers wishing to dyke and farm the Shannon Salt Marsh.

Department Of Highways (DOH)

Department of Highways (DOH) is the department responsible for developing transportation systems throughout the province.

Their View on the Future of the Shannon Salt Marsh: DOH would like to construct a double-laned highway across part of the Shannon Salt Marsh, from Claire's Corner to Port Albert to replace the current two-lane highway.

Their Argument: Presently, the stretch of Highway 108 from Claire's Corner to Port Albert is extremely dangerous and is notoriously known as "Death's Drive". The traffic on this highway has increased by 30 per cent over the last five years and passing is very dangerous because it is a two-lane highway. This year, there have been five serious accidents caused by impatient drivers trying to pass when they should not have. The road also winds constantly, which makes it even more treacherous.

- A four-lane highway directly through the marsh is the shortest route to Port Albert. Presently, the drive from Claire's Corner to Port Albert is 50 kilometres. A new highway across the marsh would reduce the drive to 35 kilometres.
- The cost of the new highway would be \$10 million but building a new highway on the present route would nearly double the cost of construction. The new highway would be shorter; less roadway means reduced upkeep time and reduced annual operating costs.
- A straight stretch of highway is very safe and would greatly reduce traveling time, and hence pollution from cars.

Mayflower Naturalists Society (MNS)

Mayflower Naturalists Society (MNS) is a not-for-profit organization, which encourages the preservation of natural spaces in the province.

Their View on the Future of the Shannon Salt Marsh: MNS is opposed to any development of the Shannon Salt Marsh.

Their Argument: Wetlands are very fragile ecosystems where everything is interconnected; we should not mess with nature in any way. Canada's wilderness is disappearing at the rate of one acre every 15 seconds; the disappearance of wetlands is linked to many global environmental crises.

- Sixty-five percent of the saltwater marshes in the province have been lost to development already, and the Shannon Salt Marsh is the last surviving marsh of major significance in the area.
- Saltwater marshes are ecologically important for fish communities and greatly influence the resilience and health of many species. Marsh losses over the decades have caused changes in aquatic communities.
- Many organisms living in the salt marshes are close to their physiological limits of tolerance, making them sensitive to any extra stress such as oxygen depletion or pollution. These organisms have adapted to the constantly changing waters, soft sediments and muddy waters of the saltwater marsh and may suffer if these conditions are altered even slightly.
- The Shannon Salt Marsh is important to the people of the area economically. The marshes prevent flood damage on the uplands during rainy periods and retain moisture during drier times.
- People can enjoy the wetlands as a place for walking, reading, photography, or just relaxation and rejuvenation.

PORT ALBERT DOWNTOWN BUSINESS ASSOCIATION

Port Albert Downtown Business Association is made up of town business people. Their goal is to improve local business conditions and promote the services that they offer.

Their View on the future of the Shannon Salt Marsh: The business association would like to see tourism increase.

Their Argument: The new highway would cut driving time between Claire's Corner and Port Albert considerably by reducing the distance from 50 to 35 kilometres.

- There have been five serious accidents on the present route to Port Albert, and people are constantly complaining about the treacherous drive.
- People would have a pleasant view of the water on their drive to Port Albert. The scenery on the present route is far less interesting.
- The proposed highway would make Port Albert more attractive to bus tours.
- The improved driving conditions would allow day trips to Port Albert.
- With more visitors to Port Albert, the economy of the whole area would improve.

Tourism Association of Calico County (TAC)

Tourism Association of Calico County (TAC) is a not-for-profit organization made up of individuals seeking to promote the area's tourism industry.

Their View on the Future of the Shannon Salt Marsh: TACC would like to develop and market the Shannon Salt Marsh for eco-tourism. This plan includes dyking a small area of the marshland to support an historic garden featuring indigenous flowers of the province and building an interpretive centre for the general public.

Their Argument: Eco-tourism, which combines holidays with nature and the environment, is a growing and lucrative trend. The Shannon Salt Marsh is perfect for this. Group and self-directed tours could be organized using boardwalks and information boards. Guides would describe the wetland ecosystem and point out its plant and animal life.

- The mud flats activity could be promoted for mud walking, a popular recreation activity.
- An historic garden and interpretive centre would attract nature lovers and gardeners.
- This project would increase business for local services such as bed and breakfasts, restaurants and gift and card shops.
- Establishing the marshland as a centre for eco-tourism would provide employment in the area for both construction and day-to-day operations.
- The interpretive centre would provide an excellent opportunity to educate people about the importance of wetlands. By managing the wetlands, problems such as littering and damage caused by careless walking could be avoided.

Presentation Tips for the Organizations Grade 5-8

- These tips are recommended for use in activity three.
- The presentation must not exceed two minutes. Please introduce your group and highlight your feelings on the proposed development.
- Give the main points and indicate why the item is important in the first paragraph.
- Write simply and keep concise. Keep paragraphs short.
- You are encouraged to use the map.
- You should display your poster or any visuals during your presentation.

County Councillor Tips for Grade 5-8

- For the younger grades, it is suggested the councillor be a teacher.
- The County Councillor should display a large map or diagram of Calico County showing the location of the proposed highway through Shannon Salt Marsh.
- The groups listed in the order they will speak.
- Please use a clock in order to time each presentation.

Suggested introduction:

"I call this meeting to order. I am pleased to welcome everyone to the Port Albert County debate regarding the fate of the Shannon Salt Marsh.

The organizations presenting today are: _____ (list organizations in the order they will speak).

My name is _____ and as County Councillor, I will be your moderator and timekeeper.

Each group will have 2 minutes in which to deliver their remarks. Following the presentations, if any new data has arisen, it will be distributed amongst the organizations for further review. A ballot will be distributed to each member and the results of the vote will determine the fate of the Shannon Salt Marsh.

Letters and Faxes for Grades 5-8 (Optional Activity)

- These are to be handed out by the County Councillor after the 2 minute presentations.
- These documents are to be shared amongst all groups
- Each group is to review the material and encouraged to take notes.

County Councillor

The way the economy has been going lately we all need to do what we can to increase business in and around the Port Albert area. I will admit it has been tough lately with the most recent economic downturn; we all need to do what we can to increase business in and around the Port Albert area. Being in the business of shipping livestock, the time it takes my animals to get from the farm to the stockyard and from the stockyard to market is of the greatest importance. The longer it takes the more money it costs me and the more time the animals are spent cooped up in the trailers. Having a new highway will allow me to get more product to market, decrease costs and provide jobs for more local truckers.

The whole issue is a no brainer. Highways allow for the transport of goods, which is the lifeblood of the economy of this area. Shipping and exporting goods is so far reaching that there is no business that will not benefit from the new highway. If you manufacture products, you need to get them to your buyers. If you are a retail outlet, you need to receive your goods in a timely manner. Both of these things need highways in order to occur. The decreased time travel that a new highway will create should be incentive enough to make this proposal a reality.

Do not forget that one of your biggest supporters in the last election was the local business community. A strong economy leads to a strong and prosperous community in general. I have heard that the highway may be going through an environmentally sensitive area, which could pose a problem to development. I feel that even if it does, the main thing to consider is the productivity of local business and the increased standard of living.

I am not a mean or heartless man. I believe that the environment is important to all. However, there is nothing more important than the economy. That's what creates jobs and buys food, clothing and shelter. Good intentions don't help you survive.

Yours truly,

Tom Iron

Resident,
Port Albert

Dear County Councillor,

My dad is a farmer here in your riding. When I was born, he told me about how profitable his farm was. As time passed, he said his profits began to shrink because his farm couldn't produce the amount of crops it did in the past. This past summer my Dad was forced to work at the local supermarket as a cleaner because the farm could not pay for our family.

I did some research at the local public library and found out that over time, farming can strip the nutrients from soil. This causes the yield to drop from the land. I also learned that salt marshes have very fertile soil that can be effectively farmed after they've been drained. I also learned a bit about salt marshes and their importance. Things such as water retention, etc. I am requesting from you, on behalf of my father who is too proud to ask, that you set aside some of the marsh for farmland. Maybe you could build the highway through the middle, farm the land side, and keep the water side as marsh.

Thank you for your time,

Lilly Atkinson,
Student.

To: County Councillor

I thought you politicians would learn from your disastrous decision to allow that processing plant to be built and then its polluted effluent closed a few beaches! How can you even consider running a highway through the salt marshes? They are extremely important for the filtration of polluted run-offs coming from inland areas. They prevent harsh toxins like agrochemicals from reaching the intertidal mudflats on which I make my living as a clam farmer. A healthy coastline is needed in order to harvest clams because they're filter feeders -- they ingest food from their surroundings. And high levels of pollution make clams unhealthy and sometimes even poisonous! The highway will disrupt the salt marshes and the filtration services they provide. Even if it goes through part of the marsh the whole ecosystem will be destroyed. There is no partial impact here. If this highway goes through it will directly lessen the amount of money I will make. My family depends on this industry to support us. Have a little common sense! Route it around the marsh or don't build it at all. I travel the existing road on a daily basis and there's no problem with it. It's the crazy drivers who cause the problems not the road! Think hard before you vote. For once listen to those who will be impacted by your decision, not by the companies who line your pockets because of favourable construction contracts.

Ronnie Moody,
Harvester,
Calico Clams

Dear County Councillor,

I am writing to voice my concern for the beautiful salt marshes that are currently threatened by development. How the idea that a highway could even be put through this wondrous natural area is mind boggling. The marsh provides a home for countless species of fish, birds and other wildlife. The habitat these marshes provide to local wildlife is extremely valuable.

In addition, the pristine beauty of the area is very relaxing and provides an area for humans to “get away from it all”. As people, we need unspoiled nature to replenish our souls and keep us in touch with Mother Nature. It inspires, relaxes, focuses and reminds people that we are not the masters of this planet but rather a component to something much larger. These salt marshes have been my sanctuary by providing me with a quiet and peaceful place where I could renew my spirit, focus my energies, and feed my soul. Many other local residents feel the same way about this unique natural area as I do. Please do all you can to halt the proposed project to build a highway through the area. The noise, construction, and the subsequent traffic and pollution would destroy this beautiful area.

Sincerely,

Jude Brandlewood .

Dear Councillor,

I am writing to you to voice my opinion on the new highway that may be built in the near future. As an unemployed truck driver who was responsible for shipping goods locally and all around the country, this new thoroughfare will create more job opportunities for me. The new highway will increase the transportation of goods through the area, and with more shipping comes the need for more drivers.

If increased jobs were not incentive enough, my personal safety is also at stake. Back when I was driving, the poor conditions of the old highway including its narrow width, lack of shoulders and abundance of potholes, made driving on the old road quite treacherous.

How can this be up for a debate? The road won't even be going through valuable farmland. It's being routed through wasted, unproductive land -- a stinky, mosquito-infested swamp! It's crazy that this project could be stopped by a few tree-huggers who think seaweed and mud is more important than local jobs and my kids going to school with a full stomach.

I implore you to listen to those who put you in power. Make decisions for the people. Give us jobs and bring prosperity back to the area.

Yours sincerely,

Tony Firm,
Concerned Citizen

From: Sonya Wells, Executive Director, Canadian Tourism Association
Fax: (902) 555-1367

To: Tourism Association of Calico County

From: (902) 555-3464

Here at the Association, we have been following the debate over the Shannon Salt Marsh very closely and I would like to commend your group's enthusiasm and innovative ideas for the marsh.

However, I have been talking with some wetland specialists, and they feel that it may be more prudent to build the interpretive centre adjacent to the marsh, rather than dyking some of it. Although this would be a nice dyking demonstration, nature lovers may prefer that the marsh be not changed drastically.

I have also been assured by a number of environmental engineers that the interpretive centre could be constructed next to the Shannon Salt Marsh without altering it or the tidal creeks leading into the marsh. The clam industry might also support this plan, because it would have less effect on the clams. Just some food for thought.

Cheers!
Sonya .

From: President, Farm First
Fax: (902) 555-7895
Phone: (902) 555-7896
Fax: (902) 555-4289

I realize that you people have a lot to think about right now, but I just wanted to remind you of a few points that should be emphasized in the debate.

- This is a large area and with modern methods of land farming not as many ditches have to be constructed. The land is therefore adaptable to modern machinery and more economical to farm.
- The ditches often contain small amounts of water, and many types of waterfowl and muskrats still live in them.
- Soil analysis has just been completed on this land and the news is great for us. The land appears to be high in nitrogen and potash. Because it is so fertile, very little compost would have to be used on this area. There is an economic bonus to farming this land.
- The cost of preparing this land is \$500/acre as opposed to \$1000 acre to clear forested land. This cost can be reduced to \$400/acre if the highway is re-routed and doubles as the dyke.
- The Department of Agriculture and Fisheries are accepting applications for financial assistance in reclaiming marshland for agriculture use. The deadline for this funding is at the end of this month.

If there is anything I can do for you give me a call.

Thank you,

Paul Boulanger

President, Farm First

FROM: Marjorie Jessupson, Department of Agriculture and Fisheries
Fax: (902) 555-8886
TO: Calico Clams Inc.
FAX: (902) 555-1352

I thought I should contact you as I know that your group is in the middle of a serious debate about what is to become of the Shannon Salt Marsh.

You should know that the World Environmental Fund has released the latest state of the fisheries report. One of the specific recommendations was the importance of using natural indicators of pollution to monitor ecosystem health. Shellfish, being sensitive to pollution, are an important monitor of health of that region. This is very important considering that the part of the Atlantic Ocean that is being harvested is the home to the right whale, an endangered species. You might want to point this out at your next meeting.

Good luck,

Marjorie Jessupson,
Department of Agriculture and Fisheries

From: Janet P. Millen, Canadian Conservation Council
Fax: (613) 555-6032

To: Mayflower Naturalist Society
Fax: (902) 555-4569

I've been watching the broadcast of the marsh debate and I just wanted to add my two cents to your cause. It might be helpful to let people know that the Shannon Salt Marsh is seriously being considered an internationally valuable wetlands because migratory birds use the marsh as a resting place on their journey from South America to the Arctic. If any major changes are made, even converting Shannon to freshwater marshes, the ecosystem as we know it will be altered unfavourably for these birds.

Developing the area for eco-tourism would also cause problems. Great numbers of people scare off shore birds, particularly the piping plover. If they are forced to move too often they use valuable energy needed for successful migration.

Farming would pose problems because of the run-off of pesticides and fertilizers into the surrounding water. So don't let the farmers get off lightly either. You might stress that altering this marshland could cause a major boycott of Port Albert, which we will help organize! As for the highway construction, make sure you bring up these four questions:

1. How does DOH plan to prevent sediment from building up in the marshes during construction and affecting animal life?
2. What happens to the 50,000 cubic metres of salt marsh that will be excavated to build the highway?
3. Have they considered the environmental costs in the figures for constructing the highway?
4. How about the long-term repercussions on the environment in their area?

Good luck and hang in there!

Janet

FACSIMILE

From: Tom Forsyth, Deputy Minister, Department of Highways

Fax: (902) 555-7689

To: DOH Special Projects Team

Fax: (902) 555-4913

Please be advised that the okay has been given for the reimbursement program. Therefore, you are now at liberty to offer the Mayflower Naturalist Association financial compensation for any loss of wildlife and plant habitat. Calico Clams will also qualify for financial compensation if the new highway causes problems with the clam beds. The total compensation should not exceed \$75,000.

I don't really feel that any other associations are entitled to compensation, because they are not losing something that they already have. For example, the land is not being farmed or used to any great extent by trappers or hunters.

After some discussion with my colleagues we have decided that for every acre of habitat destroyed, DOH will create an equal area of similar habitat if required.

I feel we have a solid case for building the highway across the Shannon Salt Marsh, so make sure you get your points across to the council.

Best wishes,

Tom Forsyth .

From: Jill Jones, President, Atlantic Chamber of Commerce

Fax: (902) 555-7689

To: Port Albert Downtown Business Association

Fax: (902) 555-2174

Message:

I have been watching the great debate. One thing that you should emphasize in your argument is the possibility of developing a public education program in conjunction with highway safety issue.

With the highway doubled, accidents will decrease. The road is unsafe as it is. You may want to feel out some of the other groups to see if they would be willing to join forces with you. Remember, there is strength in numbers!

Sincerely,

Jill Jones

PLEASE DISTRIBUTE IMMEDIATELY!!!

FROM: Sue Ross, President, Provincial Association of Gardeners
FAX: (902) 555-8647
TO: Tourism Association of Calico County
FAX: (902) 555-5391

Our association had a meeting last night and we discussed your group's proposal to establish an historic garden as part of an overall plan to market the area for eco-tourism. We thought this was a marvellous idea; it has been done quite successfully in other parts of Canada. Realizing that all these projects cost money, our association would be willing to make the historic garden our pet project if your organization agrees.

There are a number of qualified wildlife botanists in our association, and we have always conscientiously avoided disrupting the natural surroundings. For example, we use compost as a fertilizer in as many situations as possible.

I hope you are successful in convincing the council that this is the kind of development we need around here.

Sincerely,

Sue Ross

From: Simon and Wade Environmental Engineers and Consultants

Fax: (902) 555-8921

To: Department of Highways

Fax: (902) 555-6233

Our research results on the proposed Shannon Marsh highway development have been finalized. It appears that construction of the highway across the Shannon Salt Marsh will have minimal effect on the clam beds if a large number of wide culverts are included in the structure of the road. These will ensure that the movement of the water from the ocean up through the marsh and back again is not disrupted. If the water patterns remain the same, the clam beds should still receive the amount of oxygen they need to survive.

If an "enviro-fence" is placed on both sides of the proposed highway when it is being constructed, silt build up will also be reduced. Financially, however, installing a large number of wide culverts will be very costly, adding at least another million dollars to the project cost.

I realize you are in the middle of a meeting regarding the proposed highway, so I will wait to hear from you regarding your thoughts on this topic.

Sincerely,

Linda Matthews,
Senior Consultant.

Ballots for the Vote

Each student will vote for the one organization that they support on a ballot below. The teacher can make photocopies of the below ballot sheets.

Shannon Salt Marsh Development

- Calico Clams Inc**
- Farm First (FF)**
- The Department of Highways (DOH)**
- The Mayflower Naturalist Society (MNS)**
- The Port Albert Downtown Business Association**
- The Tourism Association of Calico County (TACC)**

Shannon Salt Marsh Development

- Calico Clams Inc**
- Farm First (FF)**
- The Department of Highways (DOH)**
- The Mayflower Naturalist Society (MNS)**
- The Port Albert Downtown Business Association**
- The Tourism Association of Calico County (TACC)**

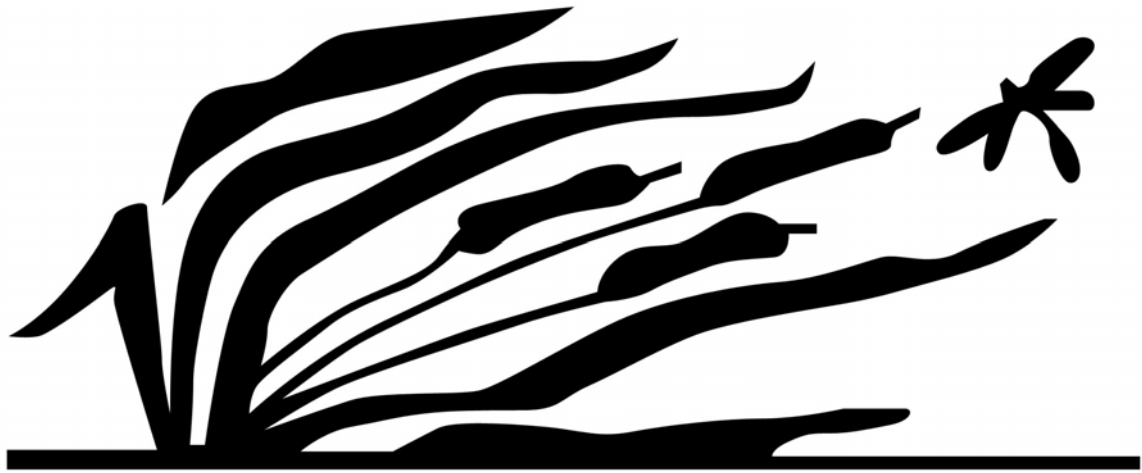
Shannon Salt Marsh Development

- Calico Clams Inc**
- Farm First (FF)**
- The Department of Highways (DOH)**
- The Mayflower Naturalist Society (MNS)**
- The Port Albert Downtown Business Association**
- The Tourism Association of Calico County (TACC)**

Shannon Salt Marsh Development

- Calico Clams Inc**
- Farm First (FF)**
- The Department of Highways (DOH)**
- The Mayflower Naturalist Society (MNS)**
- The Port Albert Downtown Business Association**
- The Tourism Association of Calico County (TACC)**

Quagmire
Grades 9-12



Quagmire Grades 9-12

Instructions for the Facilitator

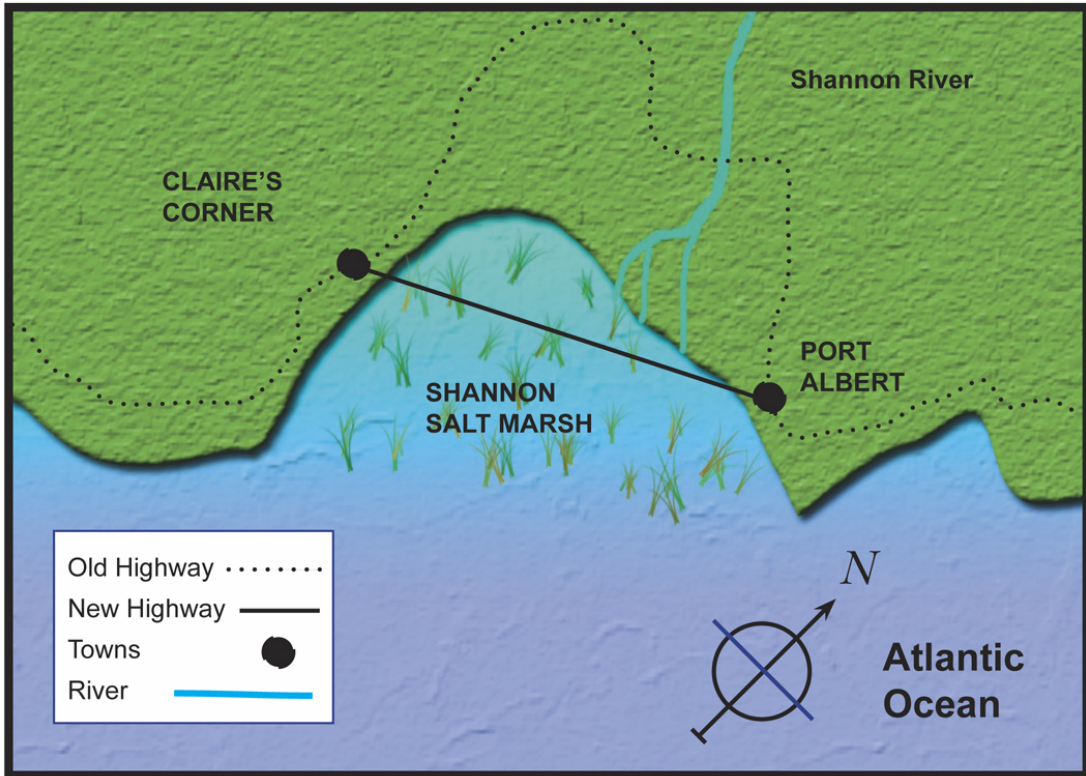
Playing Quagmire consists of reading background materials, preparing and presenting sides of the wetland development debate, cross-examining the other stakeholders, voting, press release preparation and debriefing. “Where To From Here” activities are also provided and may also be conducted, as time permits.

The facilitator organizes and distributes materials for the rest of the class during preparation for the simulation game as well as ensures that timelines and activities are adhered to during the game. The facilitator also strategically hands out the press releases to the councillors and the faxes to the organizations. The facilitator may be the teacher or a student.

The following is an outline of all the activity components involved in playing Quagmire. The game is divided into 4 activities of 45 minutes. Some of the material can be assigned as homework, allowing more time for open discussion.

Map of Calico County

PROPOSED NEW HIGHWAY ROUTE



Activity/Lesson Plans

Activity 1: Estimated time 45 minutes

Objective:

- Introduce Wetlands
- Discuss Maritime Wetlands
- Introduce Game
- Assign game roles

Materials:

- "Background Information about Wetlands"
- Wetland information relevant to your locale see appendices for locations
- "Setting the Scene for the simulation game"
- "Map of Calico County"
- "Game Characters" and "Role Descriptions for Organizations"
- Name tags of the characters may be helpful

Procedure:

- Read as homework and discuss (10 min) "Background Information about Wetlands."
- Facilitator reads aloud "Setting the Scene for the Simulation Game"; and displays map.
- The Facilitator assigns players to the various roles and distributes information on the roles. The numbers of roles can vary depending on class size. It is suggested that there are three students for each of the six organizations, two councillors for each of the five ridings, and three media roles. Name tags would be useful.

Activity 2: Estimated time 45 minutes

Extra class time or group work outside of class may be required for students to prepare

Objective:

- To research roles and develop strategy for the initial meeting and the debate.
- To finalize strategy for the debate once the letters, faxes and press releases have been read.
- To set up the classroom so that the stakeholder groups can introduce themselves to the councillors.

Materials:

- “How to Chair a Meeting”
- “Moderator’s Script”
- “Debating Tips”
- “Media Tips”
- Letters and Faxes
- Press Releases (use of these is optional)

Procedure:

- Prepare for introductory meeting of groups.
- Council members to choose a Chair for the meeting.
- The Chair should study the “How to Chair a Meeting” sheet and the “Moderator’s Script” to prepare for the event.
- Other council members should prepare a creative plan for the room for the meeting, (think of things such as arranging tables and chairs, providing glasses and water, finding table cloths, extra pens, paper, etc.). The Councillors can also aid the Chair in other duties deemed necessary. Council members should also draw a map of Calico County outlining their ridings that can be displayed for the meeting.
- Organizations: Each group reviews the information, does further research, reads the “Debating Tips” and discusses and formulates their strategy.
- The facilitator will announce that there are faxes for groups and letters for the councillors to read over. There is one fax for each group and one letter for each of the councillor’s constituencies. These can be picked up at a desk nominated as the fax machine.
- There are also four press releases (pg.71-72) that the facilitator may chose to distribute to provide the organizations with yet more information to consider when formulating their presentations and debate strategy (use of these press releases is optional).
- Advise groups that they have to pick a representative before the end of class.
- Representatives will have two minutes in Activity Three to introduce their groups to the council and state their case. It might help groups to meet outside of class to further discuss strategy if needed.
- Encourage the students to be creative and use whatever means available to them to help get their points across, e.g., props, dramatics, etc.
- Media: Media should read the sheet titled “Media Tips” to give them ideas for their story. Once this is done, they can begin to formulate questions that they will want to ask the group members and the council. Media will want to ensure that they are fully informed about the situation and the players in order to develop an accurate story.

Activity 3: Estimated time 45 minutes

Objective:

- To set up the classroom so that the stakeholder groups can introduce themselves and give initial two minute introductions to the councillors.
- The media should also be arranging themselves for the initial meeting

Materials:

- "Ranking the Interests" sheets
- "Debating Tips" sheet

Procedure:

- **The chairperson:** Conducts the meeting in which the groups introduce themselves. The chairperson should time these presentations to ensure that they do not run over two minutes. It should be emphasized that during this presentation and throughout the debate, members of all groups should be taking notes to help promote their cases.
- **Council members:** The council chair opens the meeting and distributes "Ranking the Interest" sheets to the council members. Councillors should introduce themselves and then proceed to take notes about the groups' introductions. Each member should rank the options listed for the Shannon Salt Marsh and hand them in to a neutral body (i.e. the chair). Each council member should sign his or her name. These evaluation sheets can then be compared with each council member's final vote at the end of the debate.
- **Organizations:** Representatives from each of the 6 organizations will make their two-minute presentations to the town council.
- **Media:** During the meeting, media should take notes and think about a possible angle for the story and determine whom they might want to interview as soon as this meeting has concluded.
- **The Chair** will adjourn the meeting. The groups will have the remainder of the class time to further discuss their strategy on preparation for the final debate. If they need to research more facts to bolster their case they should be encouraged to get together at other times.

Activity 4: Estimated time 45 minutes

Objective:

- To conduct the debate.
- To conduct cross-examination of the groups.
- To conduct the vote.
- To hold a press conference in which the result of the vote is announced.
- Debriefing session.

** Please note the above activities can be done in two classes.*

Materials:

- Ballot sheet for councillors, cardboard box for the ballot box.
- “Moderator’s script for the Council Debate”.
- “Debating Tips” sheet.

Procedure:

- **Media:** During the first few minutes of the activity, the media will give a summary of the previous days events. They will take the rest of the time to work on their final story.
- **Council members:** The Chair will use the moderator’s script and the debate guide to help guide her/him through the process. Other council members can help the moderator with duties outlined on the moderator’s script such as setting up the class, outlining speaking orders of groups, etc.
- **A two minute cross-examination** per group is allowed in order to ask questions of the other groups. During this part of the debate, the groups can ask for one, five-minute time-out to negotiate or form alliances. They may leave the meeting space for a more private venue.
- **The vote:** Council members retire to a private room to vote individually on the use of the Shannon Salt Marsh. Facilitator will then tally the votes and release the results. Individual councillors may reveal and defend their votes.
- **Press conference:** the result of the vote is announced by the chair.
- During the press conference, reporters from radio, television and the print media can question councillors and the various interest groups about the outcome (5 min).
- **Debriefing:** Following the press conference there should be a class discussion to see how the students felt during the debate. How would they handle the situation if they had to participate in another debate? Why did the councillors vote the way they did? Was it based on fact or on emotion? Did the council members change their opinions during the debate, and if so, how many times?

Setting the Scene for the Simulation Game Grades 9-12

The Shannon Salt Marsh is located on Calico Inlet at the mouth of the Shannon River. It is the last remaining salt marsh of major size in the area (162 hectares).

Presently, Highway 108 arches around the saltwater marsh by heading north from Claire's Corner through a number of small villages and farming communities, and then gradually turning south to the historical town of Port Albert. The Department of Highways would like to reroute a section of the highway to run directly from Claire's Corner to Port Albert. This would mean cutting across a large part of the Shannon Salt Marsh. See map of Calico County. A number of groups are protesting this proposed development. Each of these groups has its own vision of the Shannon Salt Marsh's future (see "Role Descriptions for the Organizations"). As a result, a storm is brewing in Calico County, and it has nothing to do with the weather! Each group has haphazardly attempted to persuade the citizens of the area that its way is best. As a result, council members for the County of Calico have called a meeting to give each group an opportunity to present and defend its position on the Shannon Salt Marsh. Following a debate, the council members will vote on what they feel is the best plan. Newspaper and radio reporters cover the events. A decision must be made and nothing is finalized until the councillors' vote and decide the fate of the saltwater marsh.

Game Characters: Role Descriptions for Councillors, Media, and Organizations

Councillors

At the time of the meeting, all councillors are undecided about what to do about the saltwater marsh. However, they may have some personal ideas or views on the future of the Shannon Salt Marsh, and must keep in mind the people they represent if they want to get re-elected. Councillor names are suggested but students may use their own names if they prefer.

Councillor Murphy/Councillor Anderson

- Represent the riding of Port Albert and therefore a large segment of the business community.

Councillor Jackson/Councillor Boudreau

- Represent the riding of Calico West, which includes a large farming population.

Councillor Stevenson/Councillor Driscoll

- Represent the riding of Calico East, which is made up of a large number of farmers but also includes many Calico Clams employees. It is also the site of Calico Clams Inc.

Councillor States/Councillor Whyman

- Represent the riding of Central Calico, which includes much of the Shannon Marsh. The unemployment rate is very high in this area.

Councillor Fraser/Councillor MacPhee

- Represent the riding of Calico North, which contains a mix of people, including artists, business people and farmers. The number of councillors may be altered depending on the number of people participating.

Media

Business reporter for The Daily newspaper

You are working as a newspaper reporter for The Daily. You have been assigned to cover this meeting for tomorrow's edition. Your article should include a background of the issue, coverage of the debate and, of course, the outcome of the vote. Remember that another newspaper is jostling for the same story. Try to collect quotes from as many organizations and councillors as possible. How do they feel about the situation? Refer to media tips sheet for suggestions.

News Reporter for The Daily Turn of Events (DTE) newspaper

You are working as a television reporter for DTE. You have been assigned to cover this meeting for tomorrow's edition. Your article should include a background of the issue, coverage of the debate and, of course, the outcome. Remember that another newspaper is jostling for the same story. Try and collect quotes from as many organizations and councillors as possible. How do they feel about the situation? Refer to Media Tip Sheets for suggestions.

Reporter/camera person for Coyote Television (CT)

You are working as a television reporter for CT. You have been assigned to cover this meeting for tomorrow evening's show. Videotape the proceedings, including the press conference. Use your judgment to film what is newsworthy or not. Interview councillors and organizations about their views.

Organizations

- **Calico Clams Inc.** is a family-owned company located in Calico East that harvests and processes clams for sale in Europe and the United States.
- **Farm First (FF)** is an association of landowners who farm dyked marshes. FF deals with concerns and issues affecting farmers and landowners of reclaimed (dyked) marshland.
- **The Department of Highways (DOH)** is the government department responsible for developing transportation systems throughout the province.
- **The Mayflower Naturalist Society (MNS)** is a not-for-profit organization, which encourages the preservation of natural spaces in the province.
- **The Port Albert Downtown Business Association** is composed of town business people. Their goal is to improve local business conditions and promote the services that they offer.
- **The Tourism Association of Calico County (TACC)** is a not-for-profit organization made up of individuals seeking to promote the area's tourism industry.

Calico Clams Inc.

Calico Clams Inc. is a family-owned company that harvests and processes clams for sale in Canada, Europe and the United States.

Their View on the Future of the Shannon Salt Marsh: Calico Clams Inc. would like to have the Shannon Salt Marsh preserved so that the clam beds there now can prosper.

Their Argument: Clams depend on the constant movement of tides to provide fresh oxygen. If the hydrology (water pattern) of the marsh is altered and the clams do not receive a continual source of new oxygen, they will not survive.

- Clams are part of the mollusk family, which is well known to be highly sensitive to any form of pollution. By building a highway or developing the area surrounding the marsh in any way, the likelihood of pollution is great and chances are extremely high that the clams would suffer.
- The Shannon Marsh is one of the few remaining places where the water is pristine enough for clam beds to prosper. During the past 15 years, clams have become rare due to pollution and are therefore considered a delicacy.
- The clam beds provide a livelihood for the 50 people employed by Calico Clams Inc. If Calico Clams is forced to close down, it would be a blow to the local economy.
- Calico Clams have become famous in restaurants throughout the Western Hemisphere. People from all over Canada and the world travel to Calico County for its clams. The annual Calico Clam Festival is one of the biggest tourist events of the summer and last summer it generated \$3.4 million in spending after expenses.

Farm First (FF)

Farm First (FF) is an association made up of landowners who farm dyked marshes. FF deals with the concerns and issues affecting farmers and landowners of reclaimed (dyked) marshland.

Their View on the Future of the Shannon Salt Marsh: FF would like to dyke the marshes to make them suitable for farming.

Their Argument:

- Farmers all over the province are attempting to grow crops on land that is not nearly as productive as these marshlands would be for farming.
- A new route for the highway, as proposed by Farm First, could actually be used as the dyke for farmland in behind the highway. The modest increase in cost of the highway would be much less than building the highway in its current configuration combined with the cost of building the dyke for the farmland.
- The small increase in traveling time between Port Albert and Claire's Corner would be a small compromise for the increase in farm productivity in the area.
- Farming is an important tradition and should be supported and encouraged.
- Economically, farming the marshland would benefit the area and greatly enhance its reputation as a prime agricultural site.
- Rye is an extremely easy crop to grow on dyked marshland. This was done very successfully in other parts of the province and would be an excellent cash crop with a distillery only 37 kilometres away.
- The marshland is large enough to accommodate mechanical farming, using high tech water control techniques that produce a well-drained soil.
- The modern ditches are shallow enough to manoeuvre farm machinery across, making modern farming of the area quite practicable.
- The Department of Agriculture and Fisheries would provide financial and technical assistance to farmers wishing to dyke and farm the Shannon Salt Marsh.

Department Of Highways (DOH)

Department of Highways (DOH) is the department responsible for developing transportation systems throughout the province.

Their View on the Future of the Shannon Salt Marsh: DOH would like to construct a double-laned highway across part of the Shannon Salt Marsh, from Claire's Corner to Port Albert to replace the current two-lane highway.

Their Argument: Presently, the stretch of Highway 108 from Claire's Corner to Port Albert is extremely dangerous and is notoriously known as "Death's Drive". The traffic on this highway has increased by 30 per cent over the last five years and passing is very dangerous because it is a two-lane highway. This year, there have been five serious accidents caused by impatient drivers trying to pass when they should not have. The road also winds constantly, which makes it even more treacherous.

- A four-lane highway directly through the marsh is the shortest route to Port Albert. Presently, the drive from Claire's Corner to Port Albert is 50 kilometres. A new highway across the marsh would reduce the drive to 35 kilometres.
- The cost of the new highway would be \$10 million but building a new highway on the present route would nearly double the cost of construction. The new highway would be shorter; less roadway means reduced upkeep time and reduced annual operating costs.
- A straight stretch of highway is very safe and would greatly reduce traveling time, and hence pollution from cars.

Mayflower Naturalists Society **(MNS)**

Mayflower Naturalists Society (MNS) is a not-for-profit organization, which encourages the preservation of natural spaces in the province.

Their View on the Future of the Shannon Salt Marsh: MNS is opposed to any development of the Shannon Salt Marsh.

Their Argument: Wetlands are very fragile ecosystems where everything is interconnected; we should not mess with nature in any way. Canada's wilderness is disappearing at the rate of one acre every 15 seconds; the disappearance of wetlands is linked to many global environmental crises.

- Sixty-five percent of the saltwater marshes in the province have been lost to development already, and the Shannon Salt Marsh is the last surviving marsh of major significance in the area.
- Saltwater marshes are ecologically important for fish communities and greatly influence the resilience and health of many species. Marsh losses over the decades have caused changes in aquatic communities.
- Many organisms living in the salt marshes are close to their physiological limits of tolerance, making them sensitive to any extra stress such as oxygen depletion or pollution. These organisms have adapted to the constantly changing waters, soft sediments and muddy waters of the saltwater marsh and may suffer if these conditions are altered even slightly.
- The Shannon Salt Marsh is important to the people of the area economically. The marshes prevent flood damage on the uplands during rainy periods and retain moisture during drier times.
- People can enjoy the wetlands as a place for walking, reading, photography, or just relaxation and rejuvenation.

PORT ALBERT DOWNTOWN BUSINESS ASSOCIATION

Port Albert Downtown Business Association is made up of town business people. Their goal is to improve local business conditions and promote the services that they offer. Their View on the future of the Shannon Salt Marsh: The business association would like to see tourism increase.

Their Argument: The new highway would cut driving time between Claire's Corner and Port Albert considerably by reducing the distance from 50 to 35 kilometres.

- There have been five serious accidents on the present route to Port Albert, and people are constantly complaining about the treacherous drive.
- People would have a pleasant view of the water on their drive to Port Albert. The scenery on the present route is far less interesting.
- The proposed highway would make Port Albert more attractive to bus tours.
- The improved driving conditions would allow day trips to Port Albert.
- With more visitors to Port Albert, the economy of the whole area would improve.

Tourism Association of Calico County (TAC)

Tourism Association of Calico County (TAC) is a not-for-profit organization made up of individuals seeking to promote the area's tourism industry.

Their View on the Future of the Shannon Salt Marsh: TACC would like to develop and market the Shannon Salt Marsh for eco-tourism. This plan includes dyking a small area of the marshland to support an historic garden featuring indigenous flowers of the province and building an interpretive centre for the general public.

Their Argument: Eco-tourism, which combines holidays with nature and the environment, is a growing and lucrative trend. The Shannon Salt Marsh is perfect for this. Group and self-directed tours could be organized using boardwalks and information boards. Guides would describe the wetland ecosystem and point out its plant and animal life.

- The mud flats activity could be promoted for mud walking, a popular recreation activity.
- An historic garden and interpretive centre would attract nature lovers and gardeners.
- This project would increase business for local services such as bed and breakfasts, restaurants and gift and card shops.
- Establishing the marshland as a centre for eco-tourism would provide employment in the area for both construction and day-to-day operations.
- The interpretive centre would provide an excellent opportunity to educate people about the importance of wetlands. By managing the wetlands, problems such as littering and damage caused by careless walking could be avoided.

Media Tips

- Give the main points and indicate why the item is important in the first paragraph.
- Write simply and keep the story concise. Keep paragraphs short.
- Answer the following questions when writing your article:
 - Who? - Describe your the players? What are their angles?
 - Why or What? - Summarize the general scenario of what is happening in Port Albert.
 - Where? - Describe the area being considered for development.
 - When? - The time frame that the proposed highway and other proposed developments would go through.
- Try to create an angle for your story.
- Don't forget to prepare a catchy title.
- Try to gather quotes from councillors and groups to add spice and human interest to your stories.
- Review some local and national newspapers to see how reporters cover their stories. Identify styles and formulas that you may want to use. It might be worth a call or visit to your local newspaper or television office for suggestions and tips.

How to Chair the Meeting

The Chair provides instructions for the meeting and debate and keeps things running on time (A chair can be chosen from the councillors).

1. Make an opening statement and outline the purpose of the meeting:

Example: "Good morning/afternoon. Welcome to the public meeting on the fate of the Shannon Salt Marsh. My name is _____ and I will be the chair for this meeting. Our purpose today is to introduce councillors and the various organizations. Councillors can introduce themselves, their name and riding. Then representatives from organizations will each have a maximum of two minutes to introduce themselves and their concerns. I will be watching the clock, so please consider the time. My name again is _____ and starting on my left we will begin with councillor introductions."

2. Ensure the meeting runs on time.

3. Adjourn the meeting and thank everyone for coming.

What makes a good chairperson?

A good chairperson always –

- Keeps order
- Keeps the audience's attention on the speaker
- Speaks loudly and clearly
- Appropriately disciplines people who interrupt
- Keeps a good record of time throughout the debate

A good chairperson never –

- Shouts to keep order
- Uses the gavel before they try to make their presence known verbally
- Treats the gavel as a sledge hammer
- Uses rudeness (i.e. personal insults) to discipline people

Chair's Script for the Council Debate Grade 10-12

Before you begin the debate, the Chair should detail on a flip chart/paper the issue being discussed (Shannon Salt Marsh) and the groups in the order they will speak. The moderator can also be the timekeeper; thus, you will need to make time cards.

You might find the following checklist useful to organize your duties:

Before the debate, ask councillors to assist you to:

- Set up the room.
- Create time cards.
- Write on a blackboard or flip chart the order that will groups will speak.
- Prepare yourself for the debate.

During the debate:

- Use the moderator's script to assist you in chairing the debate
- Call the meeting to order.
- Introduce the councillors, organizations, and yourself.
- Each group will have 3 minutes to deliver remarks.
- Ensure there is a two minute cross-examination period per group.
- Allow the facilitator to distribute the press releases and letters.
- Allow one time out period (5 minutes) if called by groups.

You might have the room arranged in this fashion.



Check to see that all councillors, groups, and media are ready.

Suggested introduction:

"I call this debate to order. I am pleased to welcome everyone to the Port Albert Council debate regarding the fate of the Shannon Salt Marsh.

Seated on the council today are: (introduce the council), the organizations presenting today are: _____ (list organizations).

My name is _____ and I will be your moderator and timekeeper.

This meeting will be on camera; media will be attending (identify media representatives).

Each group will have 3 minutes in which to deliver their remarks. Representatives may sit down when they are finished or the moderator can demand that they relinquish the floor when their time expires. I will also indicate throughout the presentations how much speaking time is left using time cards. After all groups have presented they may cross-examine other organizations. A two-minute cross-examination per group is allowed. .

During the debate, the group can ask for one time-out to negotiate or form alliances. They may leave the meeting space for a more private venue. You can announce new developments that have been brought to your attention by press releases and letters handed to you by the facilitator, which are then passed on to the council members.”

Debating Tips

Good Speakers will always:

- Be knowledgeable about their topic due to their prior research
- Use statistics and facts to support their argument
- Change the tone and volume of their voice whilst speaking
- Change the speed of their speech
- Show enthusiasm and confidence
- Try to answer questions put to them, even if the question is a very tough one.
- Ask somebody to restate their question if it's confusing
- Keep to the point and not wander off the topic
- Consistently display one point of view on the topic, and never contradict themselves
- Speak loudly and clearly

Good speakers will never:

- Mumble their speech
- Wander off the topic
- Contradict themselves
- Take a contradiction of their argument as a personal insult
- Leave the debate in a bad mood should they lose the debate.

Ranking the Interests for Grades 9-12

Councillors are asked to rank the interests according to how important you think each group's cause is (1 = most important). Ranking is to be completed after the initial statement by the groups. These rankings will then be compared to the final results of the vote at the end of the debate. Please do not forget to sign your name!

Calico Clams Inc. _____

Farm First _____

Department of Highways _____

Mayflower Naturalist Society _____

Port Albert Downtown Business Association _____

Tourism Association of Calico County _____

Councillor's Name: _____

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Letters, Faxes, and Press Releases for Grades 9 to 12

Councillors Murphy and Anderson,

The way the economy has been going lately we all need to do what we can to increase business in and around the Port Albert area. I will admit it has been tough lately with the most recent economic downturn; we all need to do what we can to increase business in and around the Port Albert area. Being in the business of shipping livestock, the time it takes my animals to get from the farm to the stockyard and from the stockyard to market is of the greatest importance. The longer it takes, the more money it costs me and the more time the animals are spent cooped up in the trailers. Having a new highway will allow me to get more product to market, decrease costs and provide jobs for more local truckers.

The whole issue is a no brainer. Highways allow for the transport of goods, which is the lifeblood of the economy of this area. Shipping and exporting goods is so far reaching that there is no business that will not benefit from the new highway. If you manufacture products, you need to get them to your buyers. If you are a retail outlet, you need to receive your goods in a timely manner. Both of these things need highways in order to occur. The decreased time travel that a new highway will create should be incentive enough to make this proposal a reality.

Do not forget that one of your biggest supporters in the last election was the local business community. A strong economy leads to a strong and prosperous community in general. I have heard that the highway may be going through an environmentally sensitive area, which could pose a problem to development. I feel that even if it does, the main thing to consider is the productivity of local business and the increased standard of living.

I am not a mean or heartless man. I believe that the environment is important to all. However, there is nothing more important than the economy. That's what creates jobs and buys food, clothing and shelter. Good intentions don't help you survive.

Yours truly,

Tom Iron
President,
Port Albert Chamber of Commerce.

Dear Councillors Jackson and Boudreau of Calico West:

My dad is a farmer here in your riding. When I was born, he told me about how profitable his farm was. As time passed, he said his profits began to shrink because his farm couldn't produce the amount of crops it did in the past. This past summer my Dad was forced to work at the local supermarket as a cleaner because the farm could not pay for our family.

I did some research at the local public library and found out that over time, farming can strip the nutrients from soil. This causes the yield to drop from the land. I also learned that salt marshes have very fertile soil that can be effectively farmed after they've been drained. I also learned a bit about salt marshes and their importance. Things such as water retention, etc. I am requesting from you, on behalf of my father who is too proud to ask, that you set aside some of the marsh for farmland. Maybe you could build the highway through the middle, farm the land side, and keep the water side as marsh.

Thank you for your time,

Lilly Atkinson,
Student .

To Councillors Driscoll & Stevenson,

I thought you politicians would learn from your disastrous decision to allow that processing plant to be built and then its polluted effluent closed a few beaches! How can you even consider running a highway through the salt marshes? They are extremely important for the filtration of polluted run-offs coming from inland areas. They prevent harsh toxins like agrochemicals from reaching the intertidal mudflats on which I make my living as a clam farmer. A healthy coastline is needed in order to harvest clams because they're filter feeders -- they ingest food from their surroundings. And high levels of pollution make clams unhealthy and sometimes even poisonous! The highway will disrupt the salt marshes and the filtration services they provide. Even if it goes through part of the marsh the whole ecosystem will be destroyed. There is no partial impact here. If this highway goes through it will directly lessen the amount of money I will make. My family depends on this industry to support us. Have a little common sense! Route it around the marsh or don't build it at all. I travel the existing road on a daily basis and there's no problem with it. It's the crazy drivers who cause the problems not the road! Think hard before you vote. For once listen to those who will be impacted by your decision, not by the companies who line your pockets because of favourable construction contracts.

Ronnie Moody,
Harvester, Calico Clams

Dear Councillors Fraser and MacPhee

I am writing to voice my concern for the beautiful salt marshes that are currently threatened by development. How the idea that a highway could even be put through this wondrous natural area is mind boggling. The marsh provides a home for countless species of fish, birds and other wildlife. The habitat that these marshes provide to local wildlife is extremely valuable.

In addition, the pristine beauty of the area is very relaxing and provides an area for humans to “get away from it all”. As people, we need unspoiled nature to replenish our souls and keep us in touch with Mother Nature. It inspires, relaxes, focuses and reminds people that we are not the masters of this planet but rather a component to something much larger. These salt marshes have been my sanctuary by providing me with a quiet and peaceful place where I could renew my spirit, focus my energies, and feed my soul.

Many other local residents feel the same way about this unique natural area as I do. Please do all you can to halt the proposed project to build a highway through the area. The noise, construction, and the subsequent traffic and pollution would destroy this beautiful area.

Sincerely,
Jude Brandlewood .

Dear Councillors Wyman and States, Central Calico

I am writing to you to voice my opinion on the new highway that may be built in the near future. As an unemployed truck driver who was responsible for shipping goods locally and all around the country, this new thoroughfare will create more job opportunities for me. The new highway will increase the transportation of goods through the area, and with more shipping comes the need for more drivers.

If increased jobs were not incentive enough, my personal safety is also at stake. Back when I was driving, the poor conditions of the old highway including its narrow width, lack of shoulders and abundance of potholes, made driving on the old road quite treacherous.

How can this be up for a debate? The road won't even be going through valuable farmland. It's being routed through wasted, unproductive land -- a stinky, mosquito-infested swamp! It's crazy that this project could be stopped by a few tree-huggers who think seaweed and mud is more important than local jobs and my kids going to school with a full stomach.

I implore you to listen to those who put you in power. Make decisions for the people. Give us jobs and bring prosperity back to the area.

Yours sincerely,

Tony Firm, Concerned Citizen

From: Sonya Wells, Executive Director, Canadian Tourism Association

Fax: (902) 555-1367

To: Tourism Association of Calico County

From: (902) 555-3464

Here at the Association, we have been following the debate over the Shannon Salt Marsh very closely and I would like to commend your group's enthusiasm and innovative ideas for the marsh.

However, I have been talking with some wetland specialists, and they feel that it may be more prudent to build the interpretive centre adjacent to the marsh, rather than dyking some of it. Although this would be a nice dyking demonstration, nature lovers may prefer that the marsh be not changed drastically.

I have also been assured by a number of environmental engineers that the interpretive centre could be constructed next to the Shannon Salt Marsh without altering it or the tidal creeks leading into the marsh. The clam industry might also support this plan, because it would have less effect on the clams. Just some food for thought.

Cheers!

Sonya .

From: President, Farm First
Fax: (902) 555-7895
Phone: (902) 555-7896
of pages: 2 To: FF Representatives
Fax: (902) 555-4289

I realize that you people have a lot to think about right now, but I just wanted to remind you of a few points that should be emphasized in the debate.

- This is a large area and with modern methods of land farming not as many ditches have to be constructed. The land is therefore adaptable to modern machinery and more economical to farm.
- The ditches often contain small amounts of water, and many types of waterfowl and muskrats still live in them.
- Soil analysis has just been completed on this land and the news is great for us. The land appears to be high in nitrogen and potash. Because it is so fertile, very little compost would have to be used on this area. There is an economic bonus to farming this land.
- The cost of preparing this land is \$500/acre as opposed to \$1000 acre to clear forested land. This cost can be reduced to \$400/acre if the highway is re-routed and doubles as the dyke.
- The Department of Agriculture and Fisheries are accepting applications for financial assistance in reclaiming marshland for agriculture use. The deadline for this funding is at the end of this month.

If there is anything I can do for you give me a call.

Thank you,
Paul Boulanger

President, Farm First

FROM: Marjorie Jessupson, Department of Agriculture and Fisheries
Fax: (902) 555-8886
TO: Calico Clams Inc.
FAX: (902) 555-1352

I thought I should contact you as I know that your group is in the middle of a serious debate about what is to become of the Shannon Salt Marsh. You should know that the World Environmental Fund has released the latest state of the fisheries report. One of the specific recommendations was the importance of using natural indicators of pollution to monitor ecosystem health. Shellfish, being sensitive to pollution, are an important monitor of health of that region. This is very important considering that the part of the Atlantic Ocean that is being harvested is the home to the right whale, an endangered species. You might want to point this out at your next meeting.

Good luck,
Marjorie Jessupson,

Department of Agriculture and Fisheries .

From: Janet P. Millen, Canadian Conservation Council
Fax: (613) 555-6032
To: Mayflower Naturalist Society
Fax: (902) 555-4569

I've been watching the broadcast of the marsh debate and I just wanted to add my two cents to your cause. It might be helpful to let people know that the Shannon Salt Marsh is seriously being considered an internationally valuable wetlands because migratory birds use the marsh as a resting place on their journey from South America to the Arctic. If any major changes are made, even converting Shannon to freshwater marshes, the ecosystem as we know it will be altered unfavourably for these birds.

Developing the area for eco-tourism would also cause problems. Great numbers of people scare off shore birds, particularly the piping plover. If they are forced to move too often they use valuable energy needed for successful migration.

Farming would pose problems because of the run-off of pesticides and fertilizers into the surrounding water. So don't let the farmers get off lightly either. You might stress that altering this marshland could cause a major boycott of Port Albert, which we will help organize! As for the highway construction, make sure you bring up these four questions:

1. How does DOH plan to prevent sediment from building up in the marshes during construction and affecting animal life?
2. What happens to the 50,000 cubic metres of salt marsh that will be excavated to build the highway?
3. Have they considered the environmental costs in the figures for constructing the highway?
4. How about the long-term repercussions on the environment in their area?

Good luck and hang in there!

Janet

FACSIMILE

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From: Tom Forsyth, Deputy Minister, Department of Highways
Fax: (902) 555-7689
To: DOH Special Projects Team
Fax: (902) 555-4913

Please be advised that the okay has been given for the reimbursement program. Therefore, you are now at liberty to offer the Mayflower Naturalist Association financial compensation for any loss of wildlife and plant habitat. Calico Clams will also qualify for financial compensation if the new highway causes problems with the clam beds. The total compensation should not exceed \$75,000.

I don't really feel that any other associations are entitled to compensation, because they are not losing something that they already have. For example, the land is not being farmed or used to any great extent by trappers or hunters.

After some discussion with my colleagues we have decided that for every acre of habitat destroyed, DOH will create an equal area of similar habitat if required. I feel we have a solid case for building the highway across the Shannon Salt Marsh, so make sure you get your points across to the council.
Best wishes,

Tom Forsyth .

From: Jill Jones, President, Atlantic Chamber of Commerce

Fax: (902) 555-7689

To: Port Albert Downtown Business Association

Fax: (902) 555-2174

Message:

I have been watching the great debate. One thing that you should emphasize in your argument is the possibility of developing a public education program in conjunction with highway safety issue.

With the highway doubled, accidents will decrease. The road is unsafe as it is. You may want to feel out some of the other groups to see if they would be willing to join forces with you. Remember, there is strength in numbers!

Sincerely,

Jill Jones

PLEASE DISTRIBUTE IMMEDIATELY!!!

FROM: Sue Ross, President, Provincial Association of Gardeners

FAX: (902) 555-8647

TO: Tourism Association of Calico County

FAX: (902) 555-5391

Our association had a meeting last night and we discussed your group's proposal to establish an historic garden as part of an overall plan to market the area for eco-tourism. We thought this was a marvellous idea; it has been done quite successfully in other parts of Canada. Realizing that all these projects cost money, our association would be willing to make the historic garden our pet project if your organization agrees.

There are a number of qualified wildlife botanists in our association, and we have always conscientiously avoided disrupting the natural surroundings. For example, we use compost as a fertilizer in as many situations as possible.

I hope you are successful in convincing the council that this is the kind of development we need around here.

Sincerely,

Sue Ross

From: Simon and Wade Environmental Engineers and Consultants
Fax: (902) 555-8921
To: Department of Highways
Fax: (902) 555-6233

Our research results on the proposed Shannon Marsh highway development have been finalized. It appears that construction of the highway across the Shannon Salt Marsh will have minimal effect on the clam beds if a large number of wide culverts are included in the structure of the road. These will ensure that the movement of the water from the ocean up through the marsh and back again is not disrupted. If the water patterns remain the same, the clam beds should still receive the amount of oxygen they need to survive.

If an "enviro-fence" is placed on both sides of the proposed highway when it is being constructed, silt build up will also be reduced. Financially, however, installing a large number of wide culverts will be very costly, adding at least another million dollars to the project cost.

I realize you are in the middle of a meeting regarding the proposed highway, so I will wait to hear from you regarding your thoughts on this topic.

Sincerely,

Linda Matthews,

Senior Consultant .

PRESS RELEASES
For Immediate Release

Proposed Highway Gets Thumbs Up From Travel Magazine

(Toronto, Ont.)—After hearing a rumour about a new highway being built across the Shannon Salt Marsh, Travelogue Tours Magazine says that the quaint coastal town of Port Albert is a must for anyone traveling through the province.

“If a new section of highway is built through the marsh, it will be easier and quicker to get there from the major cities, and also provide a spectacular view of the ocean,” says Travelogue editor, Brenda Rubenstein.

Rubenstein says that frequent accidents on the present highway have made her very reluctant in the past to promote Port Albert to visitors to the province. With a new highway, however, Rubenstein predicts that the town will flourish year-round.

CLAM BAKES MAY BE HISTORY

(Port Albert)—After months of research, the Marine Centre of Atlantic Canada has determined that major alterations of the Shannon Salt Marsh, such as building a highway or dyking the area for farming, would endanger the clam beds in the area. “Clams are particularly sensitive to pollution, and the major excavation and construction required in building a highway across the marsh would be life-threatening to the clam beds,” says Mike Talbot, biologist with the centre. Scientists at the centre have not been able to determine exactly what the effects of converting the salt marshes to freshwater marshes would be on the clams. However, research will continue and results are expected by the end of next year.

For More Information Contact:

The Marine Centre of Atlantic Canada at
(902) 555-7421

HUMANS NOT WILDLIFE'S BEST FRIEND

In its recently published report, *The Status of Wildlife Habitat in Canada* concludes that human activity in the province has had a negative impact on wildlife habitat in Canada.

Agriculture has been a major culprit, according to the study. Sixty-five per cent of Maritime wetlands have been dyked for farming. As a result of farming practices, silt has built up in the waters, destroying large areas of fish habitat.

Tourism is also fingered as a serious cause of habitat loss because of the increased accessibility of sand dunes, beaches and wetlands.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) states that, of the 95 species of fish, birds, animals, or plants currently classified as At Risk, 40 to 45 species utilize wetlands as habitat.

For further information, contact Pierre LeCroix at (902) 555-3546.

ENDANGERED PLANT FOUND IN MARSHES

(Port Arthur)—The Willison Botany Association (WBA) announced that the saltmarsh aster, a provincially endangered plant, has been found on the Shannon Salt Marsh.

"We are extremely excited with our new findings," says Kevin Boutlier, president of WBA. "There is only one other place in the province where this plant can be found, although it is fairly common along the New England coast."

Boutlier says that he hopes that plans to change the ecosystem of the marsh will be rejected. "If a highway is constructed through the marsh, or if it is converted to farmland or even a freshwater marsh, there won't be much chance this rare plant will survive," he says.

WBA is encouraging groups to review the Special Places Protection Act for further support to their cause.

Background Information and Supplementary Materials



What in the World is a Wetland?

The term wetland describes a variety of water-land habitats including swamps, marshes, bogs and fens. Wetlands can prevent flooding and erosion, purify water, help reduce greenhouse gases and are host to an amazing range of plant and animal life.

Wetlands play a vital role in nature for the benefit of humankind. Water in wetlands lies near or at the surface for all or part of the year. Water from rain or melting snow is held on the surface of a wetland, where it gradually soaks into the soil until it meets rock or clay and can go no further. This stored water is available for plant growth, maintains water levels in lakes, ponds and streams, and supplies water for wells. If wetlands are filled in or drained, water runs off the land rather than seeping through the soil into the underground reserves. By dredging, draining or filling a wetland, people can completely destroy this habitat for many, or all, of its important residents.

Traditionally, wetlands have been grossly misunderstood. To many people, wetlands are insect-infested swamps that are unsightly, unproductive and should be drained, filled in, dredged for use as parking lots, roadways or even used as dumping grounds for municipal and industrial waste. However, when this happens, the delicate ecology of the area is disturbed.

Some wetlands, such as marshes, have often been compared to tropical rain forests in their ability to produce rich, nutrient-filled organic matter. Like the rain forest, certain wetlands can be some of the most productive and the most threatened ecosystems in the world. Other wetlands, such as bogs, develop a nutrient poor soil.

Wetlands act as a filter for pollutants. The vegetation that grows in a wetland filters out pollutants such as phosphates found in some detergents. Phosphates can increase algal growth, which in turn uses up the oxygen in water, killing living organisms. Wetland vegetation can also absorb other chemicals, which may then be ingested by animals further up the food chain. Certain pollutants, such as oil, are known to cause extensive damage to wetland vegetation and wildlife. Wetlands along shorelines also prevent soil erosion by holding the soil together thus preventing it from washing away.

The Four Major Types of Wetlands

1. Swamps: This is land that is permanently (or periodically) covered with water. A swamp is usually dominated by trees (Red Maple, Larch, Black Ash, Yellow Birch, Gray Birch, Green Ash, and American Elm), woody shrubs (Silky Dogwood, Highbush Blueberry, Willows, and Common Winterberry), and plants such as Duckweed, Cattails, Water Hyacinths, Water Lettuce, and Waterlilies. The soil is made of a mixture of rocks, minerals, and organic materials (dead plants, leaves, etc.), which is full of nutrients. Swamps are often found along streams, lakes and rivers. A mangrove forest is an example of a saltwater tropical swamp found in other parts of the world.ⁱ

2. Marshes: There are two basic types of marshes: the freshwater marsh and the salt-water marsh. Freshwater marshes often form along the shores of rivers, streams, or lakes. Their water can vary from knee-deep to swimming depth or can be completely dried out at the end of summer. You will often find soft-stemmed vegetation such as bulrushes and cattails in freshwater marshes. Marsh soils are mostly mineral based. Marshes also provide essential habitats for

waterfowl across the country. British Columbia's marshes are home to over 28 million birds. Even with water coverage of only a couple of centimetres, many species make their homes there. Water-filled potholes in the Prairie Pothole Region (Saskatchewan and Alberta) have been scooped out by glaciers and fed by rain and snowmelt. These potholes may resemble ponds or marshes depending on their characteristics. They are essential for birds that feed on plants and on tiny protein-rich aquatic animals found in marshy potholes.

Saltwater marshes are found along the seacoast where plants and grasses, such as cord grass, are especially adapted to tolerate saltwater. These tidal marshes are flooded and drained each day as the tide goes in and out. Freshwater marshes can also occur along coastlines where freshwater runoff from the land is greater than the saltwater input from the tides.

Plants in salt marshes must be able to adapt to the constant change in water temperature and saltiness (also known as salinity). Coastal wetlands are important breeding grounds for wildfowl, fish stocks and shellfish. Tidal flooding brings breeding fish, fish eggs, fry and young fish into the saltwater marsh, where materials washed from the uplands provide a rich supply of nutrients. The outgoing tide washes away waste products. A saltwater marsh also provides food and breeding grounds for larger animals such as ducks and muskrats. Humans also benefit from the plants, such as glasswort, an edible plant, and sweetgrass, which are used in Mik'maq ceremonies and art. Saltwater marshes are found all along Canada's coastline.

3. Bog: Bogs are more common in northern climates; they make up a large portion of Canadian wetlands. Evergreen trees and shrubs can be found near a bog. There is no real drainage of water in a bog as there is in a marsh or a swamp. The stagnant water of a bog contains very little oxygen and is often quite acidic. Consequently few organisms can survive there. Plants that can capture insects, such as Bladderwort and Sundew, are frequently found in bogs. The insects provide the plants with much needed nutrients not provided by the soil. Also commonly found in bogs is Cloudberry, Labrador Tea, Bog Laurel, Bog Cranberry, and Pine Trees.ⁱⁱ

Because of the acidic conditions and lack of bacteria, dead plants can lie in a bog for thousands of years without decaying. A bog can thus preserve plants, animals, and even humans for thousands of years.

Bogs are carpeted predominantly with sphagnum mosses. Over the years the dead remains of mosses pile up and form deep layers of peat, which is often used as filler in potting soil because of its ability to bind soil and absorb water. Peat is also used as a heating fuel. There has been controversy over the environmental effects of peat mining, especially in countries such as Ireland where peat is a major energy source.

4. Fen: A fen is often the transitory stage into a bog. The main difference between a bog and a fen is that a fen has a second source of water other than precipitation (rain or snow). This second source can be a stream, a lake, or groundwater. This water provides more nutrients to a fen. As a result, more plants, such as sedge (which looks like grass but has a three-sided stem), grasses and willows grow here. Fens are usually found in lime-rich areas near slow-moving rivers and streams. The soil in a fen is generally made up of organic material over lying gravel.

Climate Change and Wetlands

Wetlands are critically important ecosystems, covering about 8-10% of the world's land surface, and contain 10-20% of the global terrestrial carbon. Therefore, they play an important role in the global carbon cycle. When coastal wetlands and peat lands are included, wetlands represent the largest component of the terrestrial biological carbon pool. Therefore, wetlands can help to slow climate change. Climate change is largely due to the release of carbon dioxide into the atmosphere.

Climate change can affect wetlands across Canada through: sea level rise, increased water temperatures, changes in hydrology, and changes in precipitation. Land use change and water consumption patterns will also accentuate climate change impacts on wetlands. Increased use of irrigation could accelerate water loss and lead to higher concentrations of pollutants present in wetlands, such as agricultural chemicals, naturally occurring salts, atmospheric pollutants.³

The Intergovernmental Panel on Climate Change (IPCC) predicts that a warming climate and precipitation changes are problems that North America will be facing in the future.⁴ Wetlands are highly susceptible to even small changes such as temperature increases of 1-3.5% or increased or decreased precipitation. Temperature-sensitive plants and animals will particularly be affected because they have little potential for migration. Even declining water levels of a few centimetres could decrease wetland sizes to the point of changing the type of wetland it is, or possibly drying it out all together.⁵ Furthermore, these changes make room for undesirable species such as Purple Loosestrife and botulism bacterium.⁶ With climate change, land usage will change as well. It is likely that agriculture could move northwards possibly creating conflict between agriculture, forestry and aboriginal interests. In addition, many wetlands will be unable to migrate due to the presence of dikes, levees or other human constructs already in existence.

The increased likelihood of major storms, which result in storm surges (a temporary rising of sea-level) could drastically increase the erosion of saltwater wetlands. Some wetlands could be damaged beyond natural recovery, or disappear altogether.

Though wetlands cover only a small portion of the world's land surface, they are significant carbon stores globally. Conversion and degradation of wetlands releases large quantities of carbon and methane into the atmosphere. Conserving, maintaining, and restoring wetlands can reduce human-induced greenhouse gas emissions.

Wetlands Around the World

The loss of wetland habitat and the realization of their worth became an international issue in the late 1960s and early 1970s. On December 21, 1971, Canadian representatives attended an international conference in Iran to begin protecting and conserving wetlands around the world. Eighteen countries and many international organizations sent representatives to attend this conference, which produced a document called the Ramsar Convention. Under the Convention, countries must designate one or more wetland sites of international importance. By the year 2006, more than 152 parties had signed the convention and 1610 sites were designated, covering an area of approximately 145.2 million hectares.

Canada signed the convention in 1981. By December of 2003, 37 national wetlands had been listed, 8 of which are in Atlantic Canada. The Canadian Wildlife Service carries out the obligations of the convention.

In Nova Scotia, four have been named:

- Malpeque Bay
- Chignecto National Wildlife Area
- Southern Blight-Minas Basin
- Musquodoboit Harbour Outer Estuary

In Newfoundland, one has been named:

- Grand Codroy Estuary

In New Brunswick, three have been named:

- Mary's Point
- Shepody Bay
- Tabusintac Estuary and Lagoon

Twelve wetlands have been named in Central Canada. In Ontario, eight are found:

- Long Point
- St. Clair
- Point Pelee
- Southern James Bay (shared with Nunavut)

Polar Bear Provincial Park
Mer Bleue
Minesing Swamp
Matchedash Bay

In Quebec, four have been named:

Cap Tourmente
Baie de L'Isle-Verte
Lac St. François
Lac St. Pierre

Nine wetlands have been identified in Western Canada. In Manitoba, two have been named:

Delta Marsh
Oak Hammock Marsh

In Saskatchewan, two have been named:

Last Mountain Lake
Quill Lakes

In Alberta, three have been named:

Peace-Athabasca Delta
Hay-Zama Lakes
Beaverhill Lake

In British Columbia, two have been named:

Alaksen
Creston Valley

Seven wetlands were identified in Northern Canada. In the North West Territories, one has been named:

Whooping Crane Summer Range

In Nunavut, five have been named:

Queen Maud Gulf
Rasmussen Lowlands
McConnell River
Dewey Soper
Polar Bear Pass

In the Yukon, one has been named:

Old Crow Flats

North American Waterfowl Management Plan (NAWMP)

The North American Waterfowl Management Plan (NAWMP) is a project designed to bring together community groups, government agencies and organizations to protect and increase the numbers of waterfowl, migratory birds and other wildlife populations through conservation of wetland areas. The governments of Canada and the United States signed the NAWMP in 1986, while Mexico came on board in 1994.

The principles of the NAWMP are:

Wetlands and waterfowl are among the most valuable features of North America's natural heritage.

All uses of waterfowl must be consistent with long-term conservation.

An abundant waterfowl resource depends on protection, restoration and ecologically sound long-term management of habitat. The persistent loss of wetlands and their adjacent zones throughout North America must be halted and reversed.

Protecting waterfowl populations and their habitats in North America will continue to require management that is based on long-term planning, and on close co-operation and co-ordination between Canada, the United States and Mexico.

Long-term measures are needed to achieve population and habitat goals for waterfowl and to preserve and enhance the biodiversity and other ecological functions of wetlands. Joint ventures of private organizations, individuals and government agencies form the basis for carrying out the Plan.

The impact of habitat conservation efforts on North American waterfowl populations will only gradually become apparent and quantifiable, since there is a history of 200 years of habitat destruction to be overcome.

Sport and subsistence hunting are compatible with waterfowl conservation and will continue to be managed in Canada, the United States and Mexico by regulations that reflect waterfowl population needs and the objectives of the Plan.

The NAWMP is divided into the Prairie Joint Habitat Venture (PJHV), the Eastern Joint Habitat and the Pacific Coast Joint Habitat Venture (PCJV). The Atlantic coastal marshes are included in the Eastern Joint Habitat Venture (EJHV) plans.

The focus of the EJHV is to protect and enhance wetlands in eastern Canada that contribute significantly to the waterfowl and other migratory birds of the Atlantic flyway. Over a 15-year (1989-2004) period, the EJHV aims to conserve approximately 1.8 million hectares of wetlands in eastern Canada. Complementary initiatives by federal and provincial agencies and non-government organizations such as Wildlife Habitat Canada and Ducks Unlimited Canada are expected to add significantly to the total wetland area that will benefit from the improved stewardship during that time.

The PJHV aims to sustain bird populations in harmony with human use of the environment. Over the past 10 years, 1.5 million acres of uplands and wetlands have been conserved. But they are still looking forward to more progress. The goal of the PJHV is to achieve conservation of all birds along with prairie habitats to protect the overall health of the prairie ecosystem. Complementary initiatives by federal and provincial agencies and nongovernmental organizations such as Wildlife Habitat Canada and Ducks Unlimited Canada are expected to add significantly to the total wetland area that will benefit from PJHV.

The PCJV aspires to protect seabirds, shorebirds, land birds and sea ducks as well as conserve the wetlands in the region. There is a specific project for each bird type as each inhabits different niches. To date PCJV has secured 13,700 hectares of habitat in southwestern British Columbia for wetland dependent species.⁷ Complementary initiatives by federal and provincial agencies and non-government organizations such as Wildlife Habitat Canada, Ducks Unlimited Canada and the Delta Farm and Wildlife Trust are expected to add significantly to the total wetland area that will benefit from PCJV.⁸

Wetlands are very rich and productive areas that lend themselves to various commercial harvests. Trapping muskrat on the wetland areas has led to a Canadian fur industry. Fisher people harvest fish that were spawned in wetlands. Wild rice is harvested in wetland areas. Peat found in bogs is used for fuel, gardening products and chemical production. Seasonal hay cropping of the wetlands is used for cattle fodder. The recreational value of wetlands includes activities such as bird watching, photography, hunting and fishing.

Wetland Facts

Six percent of the earth's land and freshwater surface are wetlands. Twenty-five percent of the world's wetlands are found in Canada.⁹ Approximately 14%, or 1.27 million hectares, of Canadian land is classified as wetlands. Wetlands in Nova Scotia constitute three percent of all the land area, in New Brunswick eight percent, and in Prince Edward Island one percent.

Agriculture is the major cause of wetland conversion in Canada. It has been estimated that 65 % of Atlantic coastal marshes, 70% of southern Ontario marshes, 71% of Prairie marshes, and 80% of the Fraser River Delta of British Columbia have been converted to farmland. ¹⁰ Close to 45% of the world's wetlands have been lost since the beginning of the 1900's. Canadian wetlands support more than 200 species of birds, including 45 species of waterfowl and 50 species of mammals.

The arctic contains 20% of all Canada's wetlands. Salt marshes constitute 85-90% of the Hudson Bay Lowland. On average, 20% of the land in the Boreal wetland region is covered by wetlands. There are over 100 000 beaver ponds in the Boreal Region, covering 5 to 10% of its total area. Fifteen to twenty-five percent of the Prairie Region is wetland.

Half of the migratory birds in North America pass through the prairies and use its wetlands. Ninety to ninety-five percent of wetlands along the Lakes Erie and Ontario shores have been destroyed to enable urban development and agricultural production.

Common types of wetlands in both parts are floodplain marshes, potholes and shallow basin marshes in valley bottoms. The estuarine wetlands in the Fraser River Delta support the highest densities of overwintering waterfowl, shorebirds, and birds of prey anywhere in Canada.¹¹ The snapping turtle, common to wetlands in Southern Ontario, can live to be 90 years old.¹²

Atlantic Canadian Wetlands

“Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed it’s the only thing that ever has.” Margaret Mead.

Many wetlands in the Maritimes have experienced an invasion by the plant Purple loosestrife. Purple loosestrife is a non-native plant that was unwittingly introduced into North America. It has no natural predators and can invade wetlands. Once established it replaces native vegetation creating a monotype, thereby reducing the diversity within the wetland. Insects control the plant in Europe to the point where it is not a problem. After extensive testing to ensure that these beetles are specific only to loosestrife, they are being released into loosestrife infested areas in the Maritimes. These beetles will control the plant but not eradicate (destroy) it. Many horrible examples exist of introducing non-native species in the past. Usually this involved using non-native species to control a native species. In the case of loosestrife, it is a non-native species to control a non-native species.

Prince Edward Island is an agriculture-dominated province. Consequently, wetlands play a very big role in filtering and purifying water by trapping and breaking down contaminants such as chemicals, organic waste and sediment. Some alarming fish kills have occurred in PEI because of agricultural runoff and chemical spills. Wetlands are a valuable part of the PEI landscape because they provide Islanders with a variety of recreational opportunities such as fishing, hunting and bird watching.

East Baltic Bog, near Souris PEI, is the best remaining example of a domed peat bog on Prince Edward Island. All of the larger sites are already being mined. It’s about 165 hectares and surrounded by a forested buffer zone, or green belt. It’s undisturbed, relatively isolated and home to a number of rare plants such as the Dragon’s Mouth Orchid and Narrow-leaved Sundew. In 1995, it was the proposed site for a peat mining operation. At the time of the peat proposal, the bog was a candidate natural area for PEI, but government granted approval for the project to go ahead anyway. Island Nature Trust (INT), with strong support from the local community, opposed the proposal and lobbied government to reverse the decision. In the end, the proponent withdrew his proposal because the local community did not want him there. Fortunately, this was after the province had purchased the bog from a private landowner, and so pressure was applied by INT and the site was protected under the Natural Areas Protection Act.

Nova Scotia Power does not place transmission lines through wetlands if possible. If there is no alternative, an environmental assessment is conducted to determine if there are any rare plants or animals in the wetlands. When an environmental assessment was carried out on a fen near Leaches Creek in Cape Breton, it was found to contain yellow lady slippers, a provincially rare plant. As a result, tree cutting to make room for transmission lines was done during the winter, when the plants were dormant, causing less of an environmental impact. Low growing shrubs and dead trees were left for wildlife habitat. Transmission poles were placed on both sides of the fen, avoiding the fen itself. When maintenance is done on the transmission lines, an alternative access around the wetland is used, avoiding traffic through the fen. Nova Scotia Power also monitors the growth of plant life in specific areas of the fen.

The Nova Scotia provincial government allowed a private company to mine peat from the MacDonald Bog in Kennetcook. An environmental assessment concluded that there were no rare or endangered plants in this 450- hectare bog (1125 acres) and that the water table would not be significantly affected on a long-term basis. The peat is mined with a large rototiller. Large ditches are dug around the bog to dry it. The peat is then vacuumed, bagged and sold. Mining this bog was expected to create 30 full-time and 15 part-time jobs, as well as additional work for truckers. The prime market for the peat is Japan, where it is used as a soil enhancement.

In Rockingham, a suburb of Halifax, a request was made to develop a wetland for subdivision. The wetland surrounded a lake and was not extremely productive, with no major wildlife inhabiting the area. However, this wetland protects the area from flooding, absorbing water from a connecting stream. The flow of water might increase ten-fold if the entire area were subdivided; the proposed development was refused.

The saltwater marshes of Muggah Creek near Sydney have been used as a dumping ground for effluent from the Sydney Steel Mill. These marshes are now commonly referred to as the Sydney Tar Ponds and are considered the worst hazardous waste site in Atlantic Canada. Toxins are working their way into soils adjacent to the tar ponds. The province, community groups, and non-profit environmental organizations are trying to get together and identify a clean-up strategy after many unsuccessful clean-up attempts, and many, many studies.

A wetland on Drain Lake near Sackville was filled in when a stretch of Highway 101 was twinned. This wetland was highly rated as wildlife habitat, particularly as a nesting area for the Ring Necked Duck. However, increased traffic had made this section of the highway very dangerous. Constructing a barrier in the middle of the double-laned highway would have reduced the infilling, but would have been just as dangerous for drivers as a single-laned highway. Building a bridge or elevating the road meant high costs and difficult maintenance. Therefore, the marsh area was filled in to expand the highway. As compensation for the lost habitat, \$25,000 was given to the Sackville Rivers Association to improve salmon habitat in the river and \$15,000 to the Nova Scotia Department of Natural Resources for wildlife conservation in Halifax County.

The Nova Scotia provincial government constructed a highway across the Chezzetcook Salt Marsh to Porter's Lake (Highway 7). The initial construction proposal was rejected because of its negative impact on the salt marsh. Therefore, the highway was built on the site of an abandoned railroad bed. Because the drainage patterns into the marsh were not changed, the negative impact of the highway on the Chezzetcook Salt Marsh was minimized.

A 1.2-hectare area of salt marsh located in the Shubenacadie River Rolling Hills Natural Landscape was donated by a private landowner to the Nova Scotia Nature Trust for protection. This property is part of a larger 16.2-hectare salt marsh. The property contains no human-made structures and its southern boundary is a steep forested bank. The preservation of this property (and the rest of the saltmarsh) is important because historically, in Nova Scotia, undyked saltmarshes are limited due to intensive dyking for agricultural land. As well, illegal harvesting of peat is becoming a problem in this area. Due to the close proximity of the Shubenacadie River, the marsh receives adequate flooding. The marsh is down slope from a well-used collector highway making it susceptible to run off pollution (road treatments such as salt).

Ten hectares (25 acres) of the Belmont Salt Marsh near Kennetcook Nova Scotia, and 40 hectares (100 acres) of the Victoria Diamond Jubilee Marsh have been dyked for farming purposes. Although it is less expensive to prepare these marshes for farmland (\$500 per acre) than it is to clear forested land (\$1000), these areas are very significant to migrating waterfowl. For example, the Belmont Salt Marsh is very close to the Southern Blight-Minas Basin wetland, which has been recognized as internationally significant for migrating waterfowl. Under the then existing Provincial Environmental Act, an environmental assessment was not required for these areas.

The Tantramar Marsh was originally settled by Acadian farmers in the late 1600's. The area was almost entirely salt marsh in pre-settlement times. The Acadians dyked and drained the salt marsh creating agricultural dykelands, used principally as hayland and pasture. The Acadians fertilized their soils by 'tiding', i.e. periodically allowing the tides to flood the drained marshland, which added 2-3 cm of nutrient-rich sediments to the dykeland soils. In 1755, England conquered the local French Fort Beausejour and the Acadians were expelled from the area. English settlers occupied the vacant Acadian lands and further drained the marshes. Today, over 80% of the original pre-settlement marshes are drained. Land out of agricultural use for over 40 years is now

being restored at the Tantramar Wetlands Centre. Returning it to a wetland will be a huge ecological improvement for the area's wildlife and human communities.

Ducks Unlimited, along with others, has built constructed wetlands designed to treat municipal wastewater. These tertiary, or third stage wetlands, take domestic sewage that has undergone primary and secondary treatment and purifies it through biological processes before it is emptied into receiving waters. One site is River Hebert in Cumberland County, Nova Scotia. In this case, the wetlands are being built on abandoned agricultural dyked land. The wetland at River Hebert was evaluated by the Canadian Wildlife Service for 4 years. Its development included Nova Scotia Department of Natural Resources, Canadian Wildlife Service, Cumberland County, River Hebert-Joggins and Area Development Association, and Canada/Nova Scotia Cooperation Agreement on Sustainable Economic Development Marsh. The wetland not only removes bacteria and excess nutrients such as nitrogen and phosphorous, it also produces over 30 broods of waterfowl each year along with a variety of other species such as swallows. Heavy metal accumulation in the food chain is being monitored. This was the first time this wastewater treatment method had been tested in Atlantic Canada's unique climate and ecosystems.

In 1997, Nature Conservancy Canada (NCC), with the assistance of the New Brunswick Department of Natural Resources, secured an 80-hectare property that was 66 hectares of peat bog and 14 hectares of salt marsh. The property is located near Tabusintac, along the northeastern shore of New Brunswick, just north of where the Miramichi Bay meets the Northumberland Strait. It faces the ocean but is surrounded on three sides by a peat mining operation, which prompted the securement of this important habitat from possible acquisition by the peat company. The property falls within the Tabusintac Lagoon and Estuary, an area designated as a Wetland of International Importance (Ramsar site designation) in 1993.

This property is part of one of the most densely used staging grounds for waterfowl and shorebirds in New Brunswick. The salt marsh is important during migration for such species as Brant, Canada Geese, American Black Ducks, and American Widgeons, Oldsquaws, Green-winged Teal, and Blue-winged Teals. Red-breasted Mergansers, Blue-winged Teal, American Widgeon and American Black Duck also nest on the property. The bog hosts a large number of freshwater ponds that are critical staging areas for Canada Geese during migration.

Central Canada

After the Walkerton tragedy (where water contaminated with cow manure caused the death of 7 people) serious questions were asked about the quality of water treatment in rural areas. Dr. Alan Werker, at the University of Waterloo, is now experimenting with using wetlands as a means of water treatment. He claims that constructed wetlands could reduce the amount of chemicals needed to treat water, as well as reduce the need for burning fossil fuels as these would be powered by the sun. In addition, they are more adaptable to changing circumstances in the environment and, once in operation, require very little maintenance. Also, other than the potential land costs, treatment wetlands are relatively cheap to build. Wetlands could be a viable option for water treatment in the future.¹³

In 2000 DUCKS UNLIMITED Canada (DUC) and the Ontario Ministry of Natural Resources (MNR), in conjunction with The Grand River Conservation Authority (GRCA), launched a programme to restore wetland habitat at the Luther Marsh Wildlife Management Area. Wetlands were lost due to land-drainage in the late 1940s and early 1950s. The effort, known as the Monticello project, enhanced approximately 230 acres (93 ha) of the marsh in the Township of East Luther, by constructing dikes and water-control structures to create two wetland cells.¹⁴

Great Lakes Wetlands Conservation Action Plan (GLWCAP) is a collaboration of government and non-government partners committed to conserving and rehabilitating wetlands in the Great Lakes region. The first plan of action (1994 - 2001) was produced under the umbrella of the 25-year Strategic Plan for Wetlands of the Great Lakes Basin. The long-term goal of the plan is to protect the area and function of 30,000 hectares of existing wetlands in the Great Lakes basin by the year 2020.

In July 1994, the federal and provincial environment ministers signed the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA), a six-year agreement that set specific targets and time frames for restoring, protecting and sustaining the basin's ecosystems. GLWCAP was a key delivery mechanism for COA's goal of rehabilitating and protecting 6,000 hectares of wetland habitat by the year 2001. This target was surpassed, with over 5,000 hectares of wetland receiving protection and more than 12,000 hectares being rehabilitated.¹⁵

Eurasian Watermilfoil is another non-indigenous plant which is slowly choking out wetlands in British Columbia, Ontario and Quebec. It grows so densely that it displaces all other plant species. It can also create public health problems associated with increases in some mosquito populations, such as *Anopheles quadrimaculatus*, which can serve as carriers for malaria and encephalitis.¹⁶ Methods to control the spread of this plant have thus far met with limited success.

Western Canada

The Horseshoe Bay Road Project in Alberta was originally slated to be built on such a path that it would destroy a small natural wetland. However, after environmental assessment experts from the Prairie Farms Rehabilitation Administration (PFRA) reviewed the project they found that a simple design adjustment could save the wetland without adding to the cost of the project. Furthermore they were able to reclaim an existing road and join the small wetland with a larger one further south (the two had been separated by the original road).¹⁷

The Prairie Pothole Region of Canada, stretching across Southern Manitoba, Saskatchewan and Alberta, was shaped by glaciers during the last ice age and left over 10 million depressions, called Potholes. Depending on weather conditions, the Prairie ecozone of this region can contain between 2 and 7 million wetlands. The greatest number of wetlands occurs along the subhumid northern grasslands and adjacent aspen parkland, where 25-50 per cent of the land surface is wetlands.¹⁸

Alberta, Canada's Community Riparian Program (CRP) is offering a province-wide strategy aimed to maintain and protect riparian areas characterized by wetland vegetation and wet soils along streams, rivers, lakes, ponds and springs. The program is being implemented through a collaboration of industry and government partners including Alberta Agriculture, Food & Rural Development, Alberta Environmental Sustainable Agriculture Program, the Alberta Cattle Commission, the Alberta Riparian Habitat Management Program, the Alberta Agriculture and Food Council and Agriculture and Agri-Food Canada's Prairie Farm Rehabilitation Administration.

The CRP projects reflect the goals of the Agricultural Policy Framework agreed to by ministers of agriculture at their annual meeting in Whitehorse, Yukon, in June 2001. The agreement pledges continued efforts to help enhance Canada's agricultural and rural areas' environmental performance and sustainability by adopting and implementing sound environmental practices.¹⁹

Land acquisition programs are underway, such as the Pacific Coast Joint Venture and the Pacific Estuary Conservation Program securing important wetland habitat. For example, the PCJV has secured 13,700 hectares of habitat in southwestern British Columbia for wetland dependent species. And collaborations with farmers such as the Delta Farm and Wildlife Trust show that agriculture and wetlands can work together.²⁰

One extraordinary example of wetland destruction occurred near Chilliwack in the 1920s when all 2,600 hectares of Sumas Lake were drained to create farmland. That alone was a loss of 26 square kilometres of wetland habitat.²¹

International Wetlands

A Water Cat?? - Outside of Canada there are fascinating wetland facts as well. For example in South East Asia, fishing cats contradicts the belief that cats don't like water. They are found in a number of water habitats, including marshy thickets, mangrove swamps, and densely vegetated areas along rivers and streams. Powerful swimmers, they push themselves along with their webbed hind feet. They have been seen wading and swimming in shallow water, hunting for a variety of aquatic prey, including fish, frogs and toads, snails and crustaceans. They will also take small birds and mammals, snakes and domestic stock such as calves and young goats.

Wetland destruction is the primary threat facing this species, as over 50% of Asian wetlands are under threat and disappearing. Fishing cats are considered a food item in some areas of their range, and are also persecuted for taking domestic stock. Skins sometimes turn up in Asian markets, though far less frequently than other cats. They are protected over most of their range, with the exceptions of Bhutan, Malaysia and Vietnam. Although they are considered locally common around wetlands, their wild status overall is poorly known, and they have been placed on Appendix II of CITES.²²

The Mondi Wetlands Project in South Africa is the result of a coalition between South Africa's World Wildlife Fund and Wildlife and Environment Society of South Africa. These groups are aiming to protect wetlands in South Africa, which are a vital source of freshwater. Without these wetlands, South Africa will have exhausted its freshwater resources by 2050, making them incapable of meeting basic human needs. As such it is of paramount importance that the remaining wetlands be preserved and protected, or the population of the country will not survive.²³

Canada has more wetlands than any other country in the world other than Russia.²⁴

Where To From Here?

Did playing Quagmire make you keen on learning more about wetlands and environmental issues in general? Want to do something about it?! There are all kinds of ways to get involved and learn more! Check out the ideas below, and have a brainstorming session with your class to come up with even more ideas. Perhaps you could even link up with another grade level to teach them what you've learned about wetlands and get them involved too!

The following activities are designed to follow-up and expand on the scientific concepts presented by working on various issues concerning wetland habitat, and to give ideas for further involvement with wetland and environmental issues in general.

- The newspaper reporters could submit their reports of the event to the class in the next period. They may be able to present their stories in creative ways. Discuss how people can have different views or interpretations of the same event.
- The learnings of Quagmire could be presented to the entire school, perhaps in the form of a banner or collage outlining the issues and results.
- Email your results and comments/feedback to Clean Nova Scotia at cns@clean.ns.ca, and we'll post them on the website at www.clean.ns.ca – check there to see what other classes have to say as well!
- Volunteer some time (either during class time or encourage personal commitment) at a local environmental organization – or even organize a class or school garbage pick-up or beach sweep.
- Go on a wetland visit, either self-guided, or apply for further funding through Green Street to go on a Ducks Unlimited tour of a local wetland (classes are NOT limited to funding for only one Green Street program in the year!). Check out the program at http://www.greenstreet.ca/home/index_e.asp.
- Download further wetland lesson plans, in French or English, through the Ducks Unlimited website at www.ducks.ca/edu/resource.html
- Discuss relating wetlands to other environmental issues, and suggest adopting environmentally friendly habits at home as lifestyle changes.
- Celebrate your environmental accomplishments and the completion of Quagmire! Hold an Enviro-Day or Earth Parade!
- Conduct one or more of the following supplementary activities (some are best done at a wetland).

The following activities are suggested as effective ways to introduce the concept of wetlands, prior to participating in the simulation exercise, or as follow-up exercises:

- Set a Sediment Trap
- Growing Plankton *
- Recycling In a Wetland *
- Looking at Leeches *
- Perils of Pollution
- Scavenger Hunt *
- Putting It All Together
- Where do you Draw the Line?

*Activity requires items from a marsh, or a class visit to a marsh.

Set a Sediment Trap

Objective: To place a sediment trap in a box to see how wetlands help filter flowing water in streams and rivers.

Background: Have you ever noticed that rivers sometimes look brown after a big storm? Heavy rains wash soil and other materials into the river. This is known as siltation. Too much sediment sometimes clogs the gills of fish. Sediment can contain fertilizers or harmful chemicals that pollute rivers. Wetland plants act as filters, trapping sediment the way a strainer traps spaghetti while allowing water to run down the drain. By trapping and absorbing sediment, wetland plants help reduce pollution problems downstream.

Materials

- Two small boxes the same size (shoe boxes work well)
- Plastic bags
- Garden soil
- A piece of sod
- Scissors
- Drinking straw
- Small spoon or wire whisk
- Some books or blocks of wood
- Two pails
- Two cups
- Measuring cup
- Water
- Tea bag

Procedure

1. Line the inside of each box with plastic bags to make them waterproof.
2. Place 5 cm (2 inches) of garden soil over the bottom of one box. Cover half the soil with a thick piece of sod and pack soil onto the other half until it is level with the base of the grass. The grass represents the wetland plants.
3. Fill the second box with garden soil to the same depth as the soil in the first box.
4. With a scissors point, make a small hole in the end of each box, just above the soil line. In the first box, the hole should be placed at the sod end.
5. Cut a straw in half and poke each half partway into each of the holes so that it pierces the plastic liner in the box. The straw will be the drain spout.
6. Set the two boxes side by side at the edge of a table or counter, with the straw sticking out over the edge. Place a couple of books or pieces of wood under the back end of each box so that both boxes are sloped at the same angle. The slope will make the water move quickly, as it does in a fast river or stream.
7. Place a pail on the floor under each straw to catch the water when it flows out.
8. Put 250 ml (1 cup) of water in each cup. Cut open a tea bag and sprinkle half of the tea into each cup. The tealeaves represent the sediment in the water. Stir up the water so the tealeaves float around.
9. Quickly pour one cup into the soil at the back of each box. Watch what happens to the water as it flows through the box and drains out the other end.
10. Check the water in the pail. Which pail contains the most tealeaves? What else is in the pails?

Growing Plankton

Objective: To catch some plankton, watch it grow and discover why it is an important part of marsh life.

Background :

A marsh contains many types of plants, but some of the most important ones are so small that you need a magnifying glass or microscope to see them. These are the phytoplankton, tiny green plants that float around in water. Phytoplankton, also known as algae, are eaten by zooplankton (tiny floating animals) and insects, which are eaten by large fish. The fish are eaten, in turn, by birds and mammals, including humans.

Materials:

- Large plastic container with lid (a large ice-cream container works well)
- Marsh water
- Large glass jar
- Magnifying glass
- Microscope, glass slide and eye dropper

Procedure :

1. Carefully scoop some clear water out of a marsh with the container. Try not to get any of the bottom muck or large plants. Put on the lid and take the water to the school.
2. Transfer the water to a clean jar with no lid and put the jar in a bright window.
3. After a few days, you will notice the water turning green; it may also be a bit cloudy. The green colour comes from the phytoplankton or algae growing on the water. As the algae multiply, the water will become greener and cloudier.
4. Look at the water with the magnifying glass. Can you see tiny clumps of algae? If you have a microscope, use an eyedropper to place a drop of marsh water on a glass slide. Look through the microscope to see the variety of plankton in the water. In general, the green-coloured organisms are phytoplankton and the fast-moving ones are zooplankton.
5. What happens if you cover the jar with black paper so that no light reaches the water for a few days? What happens to the colour of the water? What happens if you put the jar in the refrigerator? How does the cold affect the growth of the plankton?
6. When you are finished looking at the plankton, return the marsh water to the wetland. .

Recycling In a Wetland

Objective: To discover how hard zooplankton work in a marsh.

Background:

Zooplankton are important recyclers in wetlands, breaking down dead and decaying plants that fall into the water.

Materials:

- Large plastic container with a lid (a large ice cream container works well)
- Marsh water
- Dead leaf from a marsh plant
- Large glass jar
- Pencil
- Thread
- Tape

Procedure:

1. Fill a plastic container with clear water from a marsh. Bring the water home, along with a dead leaf from a marsh plant. Pour the water into the glass jar.
2. Place the jar in a bright window for a day. Lay a pencil across the opening of the jar. Tie one end of a piece of thread to the leaf stem and the other end to the pencil, suspending the leaf in water. The leaf may float at first, but it will eventually sink. Secure the pencil in place with tape.
3. Leave the jar in the sun for a week and watch what happens.

Looking at Leeches

Objective: To examine leeches from a freshwater wetland.

Background :

Here's an animal that can really get attached to you! Leeches are well known for their suckers that grab on to smooth surfaces, such as rocks to anchor themselves. Leeches come in different shapes, colours and sizes, ranging from as small as your fingernail to longer than your arm. You can find leeches in wetlands among the plants in shallow, clean water, especially in spring or summer. Leeches prefer shady spots and often hide under rocks, logs or leaves.

Materials:

- Rubber gloves
- Kitchen strainer
- Three or four leeches
- Tweezers (padded ends)
- Two plastic containers with lids; one should have an air hole (yogurt containers work well)
- Some aquatic plants
- Cotton cloth
- Clean marsh water or non-carbonated bottled spring water (not distilled water)
- Small stones
- Large glass jar (a 4-litre condiment jar works well) or small fish bowl or aquarium
- Elastic band or tape

Procedure:

1. Check for dark-coloured, worm-like leeches swimming in the shady areas of a marsh. Leeches may also be found hiding under small rocks or bits of wood. Gently scoop up a few with the strainer. Transfer the leeches using the tweezers into a plastic container filled with damp water plants.
2. Place a cloth over the container and put the lid with the air hole cut out of it on top. The cloth lets air into the container through the hole but keeps the leeches from escaping.
3. Collect clean marsh water in the second plastic container to use in a jar at home, or use bottled spring water (do not use distilled or carbonated water).
4. At home, place some stones in the bottom of the jar and add a few centimetres (an inch) of marsh water. Leave about 12 cm (5 inches) of air space between the water and the jar lid because some species of leeches like to attach themselves to the sides of the jar above the waterline.
5. Put the water plants in the jar. Then gently add the leeches to the jar with the tweezers. Cover the jar with the cloth and secure it with an elastic band. Leeches are great escape artists, so keep the jar covered.
6. Place the jar out of direct sunlight or direct light from lamps. Leeches prefer the dark and are usually more active at night.
7. When finished looking at the leeches using the information below, carefully return them to the marsh.

What to look for:

Look at the leeches carefully. What other creatures do they remind you of? Leeches belong to the worm family and are close cousins to earthworms. Look for faint lines that show you how the body is divided into sections. A leech's sections can stretch out and tighten up like a Slinky when it moves.

Leeches have tiny coloured dots or patches on their bodies that are very sensitive to movement in the water. These help leeches find food. The dots are hard to see, but you can watch how they work by wiggling a plastic ruler or spatula in the water to see what happens. The leeches will sense the vibrations from the moving object and head for it, hoping to find food. If a leech attaches itself to the side of the jar, take a close look at its sucker-like mouth.

Occasionally a marsh leech may latch on to a person. If this happens, you have a few minutes to get the leech off because it won't start feeding immediately. The best way is to remove it with something stiff, like plastic. As a last resort, sprinkle lime, lemon juice or salt on the leech. This will make the leech drop off immediately but will likely kill it.

When a leech bites, you usually don't feel it because its saliva contains an anaesthetic that numbs your skin. The saliva also contains chemicals that keep your blood from clotting, so you may bleed a bit for about 20 minutes after the leech is gone. When a leech is full, it drops off by itself. Although leech bites are unpleasant, they are not dangerous.

Perils of Pollution

Objective: To find out how pollution affects wildlife.

Background:

Many wetlands are polluted with oil or detergents from factories and houses. Some wildlife can leave; however, crustaceans, some fish, and aquatic plants cannot and may die because of the pollution. Even larger animals will suffer if there is no similar habitat nearby or if their food source dies.

Materials

- Clear glass bowl
- Water
- Cooking oil
- Spoon
- Powered laundry detergent

Procedure:

Part One:

1. Fill the bowl halfway with water. Add two spoonfuls of cooking oil, which represents oil pollution in a wetland.
2. Stir the oil and water mixture and let sit for one minute. What is happening to the oil in the water?

The oil should form a separate layer on top of the water. This is because oil is lighter than water and floats. In a wetland, a layer of oil acts like a barrier between the water's surface and the air above. Insects, such as mosquito larvae and other tiny animals, that get their oxygen at the surface, cannot break through the oil barrier so they suffocate. Animals eating water plants covered in oil can become very sick.

Crude oil, which sometimes is spilled from ships at sea, is thicker and blacker than the cooking oil used in this experiment. It's also much heavier than the natural oils found on animals' fur and feathers. Birds like Terns and Belted Kingfishers, which dive from the air into the water to catch fish, can become covered with the sticky, heavy oil and then are unable to fly. Animals can be poisoned as they try to clean themselves by licking their fur.

Part Two:

1. Sprinkle a spoonful of detergent into the bowl. The oil now represents the natural oils on a duck's feathers or on an aquatic mammal's fur, such as an otter's. The detergent represents detergent pollution in a wetland. Stir the mixture gently, but not enough to create bubbles. Let the mixture sit for one minute. What happens to the oil? Where is the detergent?

When the detergent is added to the oil, the oil should break into tiny droplets surrounded by detergent particles. Some of the oil may even sink to the bottom. The detergent connects the oil and water, mixing them together so that they no longer form separate layers. A duck's feathers have a natural coating of oil on them that makes the feathers waterproof and keeps the duck warm and dry while it swims. When water is polluted with detergent, the oil coating breaks into droplets and water can reach the duck's feathers. If the feathers are soaked, the bird becomes cold and very wet. Wet feathers also make the bird much heavier—it can sink and drown. Aquatic mammals can also lose their natural waterproofing in this manner. .

Scavenger Hunt

Objective: To investigate the saltwater marsh habitat.

Procedure:

1. Visit a saltwater marsh in your local watershed.
2. Obtain permission from private landowners or public managers to visit the area. Before taking participants on the field trip, talk about the importance of these fragile ecosystems and the need to treat natural habitats with care.
3. Once at the marsh, divide the class into small groups. Give each group the following list for the scavenger hunt. Have a volunteer check items off on the list as they are found: Ask each group to find:
 - a crab shell that has been shed;
 - a blade of cord grass;
 - something they have never seen before;
 - three pieces of trash;
 - a snail shell;
 - a filter feeder (mussels, clams etc.);
 - evidence of birds;
 - the edge of the marsh (the highest point that saltwater reaches);
 - something that reminds the students of themselves.
4. If possible, bring along a metal minnow trap (available at fishing stores), tackle (fishing gear) and a plastic bucket. Leave the trap in a pool with rope attached to the bucket; later, empty the contents into the bucket for observation. Let participants view the mummichugs (small fish commonly found in the marsh). You may also capture sticklebacks (another small fish) and eels in this manner. Return the fish to the pool after students have seen them. Be sure that all other "finds" from the scavenger hunt are left in the marsh, except the pieces of trash! .

Putting It All Together

Objective:

To identify and research issues related to wetlands or wildlife on their own school grounds or in their community.

Background:

Each of us can make constructive contributions to improving the environment in which we live. Sometimes our actions can improve the environment for people, for wildlife, and sometimes both. We can often effectively improve a situation by working in cooperation with others. Wetlands issues generally arise in communities in response to proposed developments or land use plans.

Procedure:

1. Participants can think of some way to improve local areas as homes for wildlife. They might generate a list of activities having a negative impact on wildlife on their school grounds or in their community. This list might include the hazards that litter poses for some kinds of wildlife; pesticides which not only kill the "pest" but perhaps affect other plants and animals; and removal of vegetation that helps produce oxygen and serves as food or habitat for wildlife.
2. Ask the participants to select an issue. If they have difficulty reaching a consensus, participants may vote on choices. They could also make speeches in support of the issue they wish to tackle.
3. Once participants have selected the issue, have them work in small groups to brainstorm possible solutions and ways to implement the project. Each group could come up with a plan, including a written description and sketches illustrating how to accomplish the project step by step.
4. Ask the groups to present their plans to the rest of the participants. Each group may ask questions of the others. Once all the plans have been presented, ask the students to select the plan that seems most a) constructive, b) realistic, c) helpful to wildlife, d) likely to make a lasting contribution.
5. Ask students to select one or more alternative plans, in case their first choice is not acceptable to the school or the community.
6. Once a plan has been selected, ask the students to select a delegation to present their proposal to the school principal or the appropriate authority. A practice session before students or interested parents might be helpful.
7. After making their presentation, they should report back to the rest of the class. If their plan is accepted, they should obtain permission from other appropriate authorities. Students can then proceed with their project. It is wise to divide the project into manageable stages so that the students feel like they accomplished something if the final goal is not achieved. If a proposed project is not completed, have the students analyze and discuss why, what they have learned and what they would do differently next time.
8. Once the project is completed, students should analyze their results. Did things work out the way the students wanted them to? Were there any surprises? Were there any unforeseen problems? How might they have been more effective?

Possible Community Projects:

- Monitor the Spring Peepers in your area. (Contact The Nova Scotia Museum of Natural history for information on the Frog Watch Program.)
- Initiate a water quality testing program for a stream or wetland near your school. (Obtain a copy of the publication Adopt-A-Stream from the Nova Scotia Department of Natural Resources).
- Initiate a waste reduction program in your school. (Contact Clean Nova Scotia for guidance.)
- Develop an anti-litter campaign or clean-up day for local streams or wetlands. (Contact Clean Nova Scotia for details on The Great Nova Scotia Pick Me Up).
- Develop a wildlife calendar for a local wetland, interviewing people in the community, or make observations to find out when the different species of migratory birds return and leave, when they nest, when the water freezes over, etc.
- Produce a classroom newspaper with articles about wetland habitats and wildlife.
- Participate in the Piping Plover Guardian Program. (Contact the Nova Scotia Bird Society for details). Research water in your community. Where does it come from? Where does it go? How is it used? Are things added to the water or to sewage before discharging it back into water?
- Develop an information program for the community about your wetland and any problems facing it: leaflets, posters, video tapes, newspaper articles, displays at local events.

Where Do You Draw the Line?

Objective:

To form decisions about issues and explain the reasons behind their choices. This activity should encourage participants to obtain information before forming opinions. Facilitators should stress that there are no right or wrong answers to these questions. There are various types of knowledge such as traditional, emotional and experiential, as well as scientific that could be considered when making a decision.

Materials:

- Masking tape
- “Strongly Agree” opinion card
- “Strongly Disagree” opinion card

Procedure:

Place a long masking tape line on the floor (approximately 4 metres/15 feet long). Put one card at each end of the tape line. Read the first issue card. Students are to place themselves along the masking tape line according to their personal opinions. If they strongly agree with the statement, they stand closest to the “Strongly Agree” card; if they strongly disagree, they stand at the opposite end. Students who have no opinion, or are somewhere in between a strong feeling and a neutral one, can place themselves accordingly along the line. After students place themselves along the line, they should explain the reasons behind their position. Encourage discussion among students. Remember: there are no “right” or “wrong” answers in this game. Participant could move on the line if they are enlightened by others comments.

Issue Statement:

Environmental assessments should not be required for privately owned wetlands in Nova Scotia. Presently in Nova Scotia, environmental assessments are not required for wetlands less than two hectares. If activity occurs on wetland areas less than two hectares, landowners must submit a plan to the Department of Environment for approval. This is not a public hearing, like an environmental assessment. (Contact the Department of Environment to obtain a copy of new Environment Act completed in 1995 which amalgamated 16 previous acts and the Wetland directive.)

Possible points to be discussed:

1. Wetland regulations halt economic development and community growth.
2. Wetland protection leads to a lack of affordable housing.
3. Local wetland regulations may be too costly for local government to administer—regulations may be unreasonable, excessive, and administered with lengthy delays and multiple hearings.
4. Wetland regulations contribute to the development of more liveable communities by providing public benefits such as critical fish and wildlife habitat, recreation facilities and valuable natural space in residential areas.
5. Residential lots bordering on protected wetlands are often more desirable and expensive than other properties. Developers who realize this and integrate wetland protection into their developments have the opportunity to increase their profits.
6. The cost of dredging and filling would be avoided by directing development out of wetlands.

Issue Statement: Wetlands should be classified to help assign value to them. (In many countries, including Canada, a Wetlands Classification System is used to help assign value to the wetlands.)

Possible points to be discussed:

1. How do you decide what is valuable?
2. Are marshes more important than a cedar swamp?

3. Wetlands serve multiple functions, e.g., control flooding, plant habitat, wildlife habitat. Which are most important?

Issue Statement:

The “No Net Loss” policy is an effective way of conserving wetlands. The Federal Policy on Wetlands Conservation (1991) states that on federal lands, developers must replace any wildlife habitat destroyed through development so that “no net loss” of wetland function occurs.

Possible points to be discussed:

1. Many wetlands are very difficult to replicate. Peat lands, for example, have developed through complex processes over thousands of years.
2. If it is assumed that replacement wetlands will be constructed, it may be easier to obtain permission to destroy existing ones.
3. If developers are made to replace any wetland they destroy, they may be hesitant to develop on wetlands in the first place.

Contacts

More information on wetlands is available by contacting the following organizations:

Canadian Wildlife Federation

350 Michael Cowpland Drive
Kanata, ON K2M 2W1
(800) 563-WILD
<http://www.cwf-fcf.org/>

Canadian Wildlife Service

Atlantic Region
PO Box 6227, 17 Waterfowl Lane
Sackville, NB E4L 1G6
(506) 364-5044
<http://www.ns.ec.gc.ca/wildlife>

Ducks Unlimited

Nova Scotia Office
P.O. Box 430, Unit 64, Hwy. 6
Amherst, NS B4H 3Z5
(902) 667-8726
<http://www.ducks.ca/home.html>

Nature Conservancy of Canada

Atlantic Region
924 Prospect Street, Suite 2
Fredericton, NB E3B 2T9
(506) 450-6010
<http://www.natureconservancy.ca/>

North American Waterfowl Management Program

Eastern Habitat Joint Venture
Sainte-Foy, QC
(418) 648-7225
<http://www.qc.ec.gc.ca/faune/sauvagine/html/ehjv.html>

Nova Scotia Department of Agriculture and Fisheries

P.O. Box 2223
Halifax, NS B3J 3C4
(902) 424-4560
<http://www.gov.ns.ca/nsaf/home.htm>

Nova Scotia Department of the Environment and Labour

5151 Terminal Road, PO Box 697
Halifax, NS B3J 2T8
(902) 424-4125
<http://www.gov.ns.ca/enla>

Nova Scotia Department of Natural Resources

P.O. Box 698
Halifax, NS B3J 2T9
(902)424-5935

<http://www.gov.ns.ca/natr>

The Ramsar Convention Bureau

Rue Mauverney 28

CH-1196 Gland

Switzerland

<http://www.ramsar.org/>

Wildlife Habitat Canada

7 Hinton Avenue North, Suite 200

Ottawa, ON K1Y 4P1

(613) 722-2090

<http://www.whc.org/>

World Wildlife Fund

245 Eglinton Ave. East, Suite 410

Toronto, ON M4P 3J1

(800) 26-PANDA

<http://www.wwfcanada.org/>

Bibliography

- Boyd, H., D.1. Gillespie, and P. Logan (1991) *Wetlands for the World: Canada's Ramsar Sites*. Ottawa, ON: Canadian Wildlife Service.
- Breen, Bill (1993, December). *To Build A Bog*. *Garbage Magazine*, pp. 33-39.
- Canadian Wildlife Service (1989). *Wetlands* (Cat. No. CW69-4/75E). Ottawa, ON: Environment Canada.
- Environment Canada (1986). *Wetlands in Canada: A Valuable Resource* (Cat. No. En 73-6/86-4E) Ottawa, ON.
- Hickman, Pamela (1993). *Wetlands*. Toronto, ON: Kids Can Press.
- Mitchell, John G (1992, October). *Our Disappearing Wetlands*. *National Geographic*, pp. 3-45.
- National Wetlands Working Group (1988). *Wetlands of Canada. Ecological Land Classification Series, No. 24 Sustainable*
- Development Branch, Environment Canada, Ottawa, ON and Polyscience Publications Inc., Montreal, PQ 452 pp.
- North American Wetlands Conservation Council. (1 993) *A Coming of Age: Policy for Wetland Conservation in Canada* (Cat. No. CW69/93- I E). Ottawa, ON: North American Wetlands Conservation Council.
- Simmons, M. D. Davis, L. Griffiths and A. Muecke (1984). *Habitats*. In *Natural History of Nova Scotia*, pp. 305-408. Nova Scotia
- Department of Education and Department of Lands and Forests, Halifax.
- The Common Heritage Programme (1991). *The World's Wetlands*, Ottawa, ON.
- The Federation of Ontario Naturalists (1985). *Why Wetlands - Education Kit*. Ontario.

Endnotes

1. "Marsh and Swamp" 19 November 2004
<<http://chesterfield.k12.va.us/~jdudley/habitats/marshsw/mrsw.html>> and
Department of Environmental Protection. "Deciduous or Evergreen Forested Swamps." 19
November 2004
<<http://www.state.me.us/dep/blwq/wetlands/forested.htm>>
2. Camosun Bog. "Plants." 19 November 2004
<http://www.naturalhistory.bc.ca/CamosunBog/about_plants.htm>
3. Gov't Canada. http://www.ec.gc.ca/water/en/nature/wetlan/e_clim.htm
4. Kusler, Jon.
<http://www.usgcrp.gov/usgcrp/Library/nationalassessment/newsletter/1999.06/wet.html>
5. Kusler, Jon.
6. Gov't Canada. http://www.ec.gc.ca/water/en/nature/wetlan/e_clim.htm
7. Wetlands in BC http://www.wcel.org/wcelpub/1996/11580/11580_inbc.html
8. Canadian Habitat Matters <http://www.nawmp.ca/pdf/NAWMP1.pdf>
9. The Atlas of Canada. Wetlands and Forests
<<http://atlas.gc.ca/site/english/maps/environment/forest/forestcanada/wetlandsforests/1>>
10. The Atlas of Canada Wetlands
<http://atlas.gc.ca/site/english/learningresources/theme_modules/wetlands/index.html#top>
11. The Atlas of Canada Wetlands
<<http://atlas.gc.ca/site/english/maps/freshwater/distribution/wetlands/1>>
12. Wetlands It's a Fact <http://www.on.ec.gc.ca/community/classroom/millennium/m5-facts-e.html>
13. University of Waterloo "Wetland Water Treatment....Can it Save Us?"
<http://imprint.uwaterloo.ca/issues/051801/3Science/science01.shtml>
14. Bashista, Tim. "Luther Marsh Improvements [Monticello Project]." Ontario Out of Doors.
Toronto 32.6 (2000): 10.
15. Environment Canada "Great Lakes Wetlands Conservation Action Plan"
<http://www.on.ec.gc.ca/wildlife/wetlands/glwcap-e.cfm>
16. Environment Canada "Eurasian Watermilfoil" http://www.cws-scf.ec.gc.ca/publications/inv/p1_e.cfm
17. Federal Environmental Assessment Making a Difference "Horseshoe Bay Road Project"
http://www.ceaa-acee.gc.ca/017/0003/fea09_e.htm
18. IISD Wetlands and Climate Change. "Science" http://www.iisd.org/wetlands/sci_abstract1.htm
19. Anonymous. "Alberta Projects Focus on Riparian Conservation." Resource. St. Joseph 9.1
(2002): 18.
20. *ibid.*
21. Wetlands in BC http://www.wcel.org/wcelpub/1996/11580/11580_inbc.html
22. "Fishing Cat" International Society for Endangered
Cats<<http://www.wildcatconservation.org/cats/factsheets/asia/fishing/index.shtml>> . 69
Quagmire: A simulation game for wetland decision making

23. The Mondi Wetlands Project. Wetlands are Crucial to South Africa's Survival
<<http://www.wetland.org.za/crucial.htm>>

24. "Wetland Research at UW" University of Waterloo (1997)
<http://www.newsrelease.uwaterloo.ca/archive/news.php?id=908>
