

**Salt Marsh Science and Social Studies**  
**By: Elizabeth Duff**

**Content /Subject Area: Social Studies, (Science and Technology)**

**Unit Theme:** Humans impact ecosystems in both positive and negative ways.

**Focus Concept:** Interactions, Stewardship

**Essential Understandings:** (Learning Standards)

**Strand Two: Geography**

**Learning Standard 9:** The Effects of Geography: Students will learn how physical environments have influenced particular cultures, economies, and political systems, and how geographic factors have affected population distribution, human migration, and other prehistoric and historical developments, such as agriculture, manufacturing, trade and transportation.

Learning Standard	Guiding Questions	Activity
Grades 5-8 Students understand how technology has increased human capacity for modifying the environment and acquiring resources, and analyze the impact of increased technology on the environment.	How have humans impacted this environment? Is the affect positive or negative?	Analyze the impact of a road, culvert, and/or storm drains on a nearby wetland ecosystem. Monitor vegetation, fish, and salinity over time.

**Skills:**

**Science**

Field Science methods  
 Data Collection  
 Data Analysis  
 Web-site design

**Technology**

Data Entry  
 Graphing using Excel  
 Optional: PowerPoint  
 Digital Cameras

Organize data and materials  
 Evaluate and analyze results  
 Map ideas  
 Proofread and edit work  
 Increase vocabulary

**Strand Two: Geography**

**Learning Standard 10:** Human Alteration of Environments. Students will describe the ways in which human activity has changed the world, such as removing natural barriers; transplanting some animal and plant species, and eliminating others; increasing or decreasing natural fertility of land; and the mining of resources. They explain how science, technology, and institutions of many kinds have affected human capacity to alter environments.

Learning Standard	Guiding Questions	Activity
Grades 5-8: Students recognize the intended and unintended consequences of technological advances on the environment.	What was the intended consequence of building a road through the salt marsh? (Or building a tide gate or dam?) What were the unintended consequences?	Assess: Is this road a tidal restriction? How does it impact the environment? Write: What actions do you suggest for improving this environment? Are there any human interests that would conflict with this plan?

**Skills:** Assessing, Writing, Analyzing, Organizing thoughts, and Communicating

**CULMINATING PERFORMANCE TASK(S):** Design and give a presentation to educate people in your community regarding human impact on a local wetland. Inform people on choices they can make to improve impact on the environment. (Could be poster, article for newspaper, web-site, lecture, power-point presentation, slide-show, etc.)

**Strand Four: Civics and Government:**

**Learning Strand 19: Citizenship:** Students will learn the rights and duties of citizens and the principle of equal rights for all; consider the nature of civic virtue in a school, a community, a nation; and identify major obstacles and threats to civil rights.

Learning Standard	Guiding Questions	Enabling Activity
Grades 5-8: Students learn the ways in which individuals participate in the political process and in civic life.	<p>What are ways citizens can help protect wetlands in their community?</p> <p>How are wetlands protected locally?</p>	Learn about the Wetlands Protection Act. Participate in a Mock Conservation Commission Hearing. Roleplay a Conservation commission member, or a local citizen.

**Skills:**

Increase vocabulary, read materials, highlight and take notes, listen, and role-play

**(Optional)**

**Strand 3 Economics**

**Learning Standard 13:** American and Massachusetts Economic History. Students will describe the development of the American economy, including Massachusetts and New England from colonial times to the present.

Learning Standard	Guiding Questions	Activity
Grades 5-8 Describe the stages of economic change in New England from the 1600s to the present.	<p>Why did people settle here? How did people use salt marshes then?</p> <p>How has that changed over time?</p>	Read “ <i>Life and Death of the Salt Marsh</i> ” first 50 pages. Research the history of Essex. Write a report describing changes in uses and attitudes toward wetlands over time.

**Skills:**

Research  
 Create a bibliography  
 Proofread and edit all work

Read a variety of materials  
 Increase vocabulary  
 Highlight and take notes

Write a report

## Enabling Activities

### **Introduction to Wetlands Protection Act:**

Procedure: Introduce the Wetlands Protection Act to Students.

1. What is a wetland?
2. Why do you think people would want to protect wetlands? What is good about them?  
(List on the board.)
3. What laws do you think people would make to protect wetlands?

### **Introduce: Understanding the Massachusetts Wetlands Protection Act**

(Use as the outline for a lecture with students.)

- Describe: Wetlands Protection Act.
- Who enforces it? Conservation Commissions.
- What are Conservation Commissions? (Volunteers who are appointed to enforce the wetlands Protection Act.)
- What are the 8 legal interests? (Compare this list to the one students created while brainstorming.)

### **Model a Conservation Commission Hearing**

- Assign 1 applicant, 5 Conservation Commission Members
- Have students Act out the hearing.

**Discuss the process:** What legal interests were threatened by the proposal? Why wasn't the first proposal approved?

What was different about the second applicant? (Willing to negotiate.) What restrictions did the Conservation Commission impose to help protect the wetlands?

**Assessment Activity:** Have students create their own proposals for development near a wetland. Assign students roles: Applicants, Conservation Commission, Abutters, etc. Have students design and act out a conservation commission hearing of their own.

### **CULMINATING PERFORMANCE TASK(S)**

Host a Conservation Commission hearing assembly. Invite a conservation commission member from your town to attend and critique your proposals and decisions.

## Conservation Commission Hearing

### Hearing #1

**Applicant:** Hello, my name is \_\_\_\_\_. I own a beautiful lot near the salt marsh in \_\_\_\_\_ (town name). The lot lines of my property extend into the smelly marsh. My plans are to build a swimming pool in a location to provide me with excellent views of the beach and water. The front of the property will be raised with a stone wall in order to prevent storm waves from entering my pool and cement patio facing the ocean. I have waited all my life to own a house and pool on the ocean. My project will be appreciated by everyone going to the beach since I will be replacing the smelly marsh mud and weeds with a nice green grassed lawn. I hope to start construction as soon as possible. Thank you and I await my permit.

**Cons-com member 1:** I am concerned about your encroachment and filing of the salt marsh wetland. Would you consider moving your pool back towards the road on the other side of your house in order to avoid these impacts?

**Applicant:** No! I have my heart really set on locating the pool as close to the water as possible.

**Cons-com member 2:** It appears that the project will disrupt a small high marsh salt pond where local students documented two species of salt marsh fish known as mummichogs and sticklebacks.

**Applicant:** Yes, that is correct, I have seen those fish before myself. But who cares about them, they are far too small for anyone to eat, and besides my project only needs to fill in a total of 500 square feet of the marsh and many acres will remain.

**Cons-com member 3:** \_\_\_\_\_ (Name of applicant), are you aware that over the past 20 years Massachusetts has lost up to 50% of its original salt marshes and that many of the commercially and recreationally important fish and shellfish species depend on this habitat for some point in their lifestyle?

**Applicant:** I did not know that, but I really do not like to eat fish too much anyway.

**Chair of the Con Com (4):** You are obviously not aware of the importance of salt marshes to protecting private property. Salt marshes absorb storm waves and hold sedimentation in place. This keeps your property from eroding away. With sea levels rising, you should be glad to have a salt marsh protecting your land. This is just one more reason not to fill in the marsh.

(Optional): Are there any additional questions from the audience?

**Con Com Member 5:** From my review of the plans and the property, an alternative exists to build the pool at a different location on the property without having to modify the project. However, \_\_\_\_\_ (applicant) does not want to modify the project. I therefore would

like to make a motion to deny the permit application to fill 500 feet of the marsh and construct and maintain 20' x 40' swimming pool.

All in favor, say "aye". "Aye"

**Chair of the Con Com (#4):** Under both state and federal law we cannot independently permit the filling of 450 square feet of salt marsh and we are concerned about this significant impact on fish, birds and impacts to quality swimming at \_\_\_\_\_ beach. Sorry \_\_\_\_\_ (applicant). You will either have to accept our determination or appeal to the state level.

**Applicant:** OK, I guess I now understand that my idea to fill the salt marsh might not have been the best one. I will go back and see if I can redesign it so that it avoids the impacts to the salt marsh.

## Hearing #2

**Chairman (1):** Pursuant to the Wetlands Protection Act and the Essex By-law, the Essex Conservation Commission will now conduct a public hearing on the Notice of Intent of \_\_\_\_\_ (applicant) to construct a single family home within the 100' buffer of a salt marsh on Lot 102-Map 26. The project plans have been available for public review at the town Clerks office during regular business hours. I am \_\_\_\_\_, chairman of the Essex Conservation Commission.

**Applicant:** I am \_\_\_\_\_. This piece of property has been in my family for generations. I grew up near the salt marsh and would love to build a house overlooking it. I would like to build my house 40' away from the marsh and have a nice lawn running down to the marsh.

**Cons-com member 2:** The Conservation Commission has to consider the possible impacts of the project to the marsh from both this project and from cumulative impacts of all the adjacent development.

- Your house would be fairly close to the marsh.
- Runoff from impervious surfaces like the roof and tarred driveway would run right into the marsh.
- Possible failure of your septic system.
- Concern for lawn and household chemicals which might impact the marsh.
- Yard waste and grass clippings lead to the growth of the invasive weed *Phragmites*.

**Cons-com member 3:** Mr. \_\_\_\_\_ (applicant), as you know, the job of the Conservation Commission is to ensure that activities avoid or minimize impacts to wetland resource areas. One way that you could help minimize potential impacts to the marsh from your house is to move it further away so that erosion from construction activities is less likely to run into the marsh and freshwater runoff and sediments can be minimized. I see that you would have a large front yard towards the street. Would you be willing to relocate the house closer to the road so that you could have 60' of distance between the house and the marsh?

**Applicant:** I suppose I could.

**Cons-com member 4:** Another way to minimize impacts is to allow a vegetated shrub and tree buffer zone between the edge of your yard and the marsh. This would help take up any freshwater runoff, sediment or pollution from your yard from ending up in the marsh.

**Applicant:** Well I like the plants bayberry and beach plum, a lot. Could I plant that on the edge of my lawn?

**Cons-com member 4:** That would be appropriate buffer vegetation.

**Applicant:** I would be willing to accept the Conservation Commission's recommendations on how I could do this project without impacting the marsh.

**Cons-com member 5:** I would like to add a few specific conditions onto this permit:

- 1) That regular testing and maintenance of the septic system is undertaken.
- 2) That herbicides and pesticides cannot be used on this property.
- 3) Under no circumstances can yard waste and grass clippings be dumped into the back yard near the marsh.

**Cons-com member (2):** I make a motion to accept the permit application and associated conditions.

**Cons-com member (3):** "I second the motion"

**Cons-com Chairman (1)** All in favor, say "aye"

All cons-com members: "Aye"

*(Vote is taken, then Chairman explains to the audience):*

**Chairman:** The Conservation Commission does not set out to stop development, but to make sure that a project does not significantly degrade wetland areas. In the case of the house in the wetland buffer, the opportunity exists for the construction project to impact the wetland. The job of the Conservation Commission is to modify the project in such ways as to minimize the impacts,

- 1) Retain much of the natural buffer.
- 2) Allow only a gravel driveway to allow for rainwater to enter the soil instead of directly running off into the marsh.
- 3) Not allowing for the use of pesticides and herbicides because they can run off and impact the plants and animals in the marsh.
- 4) Prevent grass clippings from being deposited in the marsh.

## UNDERSTANDING THE MASSACHUSETTS WETLANDS PROTECTION ACT\*

### BACKGROUND

Wetlands are valuable natural resources. They serve as important habitats for wildlife, purify drinking water supplies and other waters, serve as important spawning areas, and contain food for fish and other aquatic animals. They are especially important for controlling floods.

Activities that involve filling, excavating, or otherwise altering wetlands can impair their many valuable functions. Because state and federal courts have determined that preservation of wetlands serves the public interest, activities that alter wetlands are regulated by law. In Massachusetts, wetlands are protected by the state's Wetlands Protection Act (administered by local conservation commissions and the Massachusetts Department of Environmental Protection) and the federal Clean Water Act (administered by the U.S. Army Corps of Engineers).

The Rivers Protection Act, passed in 1996, protects riverfront areas in 200 foot zones along rivers. Many cities and towns have adopted local wetland laws that are more restrictive than the State's Wetland Protection Act. Conservation commissions administer local and state laws governing wetlands. They are also responsible for open space planning, and acquisition and maintenance of land set aside for conservation through direct ownership or through conservation restrictions. Conservation Commissions in Massachusetts have 5 or 7 members who are appointed (rarely elected) volunteers. They may have a paid assistant who does not vote at hearings.

### THE MASSACHUSETTS WETLANDS PROTECTION ACT

The Wetlands Protection Act, affects any person proposing to "remove, dredge, fill, or alter any bank, fresh water wetland, coastal wetland, beach, dune, flat, marsh, meadow, or swamp bordering on the ocean or on any **estuary** (a broad mouth of a river into which the tide flows.), creek, river, stream, pond, or lake, or any land under said waters or any land subject to tidal action, coastal storm flowage, or flooding". In order to legally work in any wetland, a person must obtain a permit known as an Order of Conditions from the local conservation commission.

\* This document is based on "Understanding the Massachusetts Wetlands Protection Act" by Massachusetts Audubon and was adapted for educational purposes. For legal definitions, please see the Wetlands Protection Act and regulations.

## 8 REASONS HUMANS VALUE WETLANDS:

The act identifies eight main reasons humans value wetlands, known as “statutory interests”

- public/private water supply
- groundwater supply
- flood control
- storm damage prevention
- prevention of pollution
- protection of land containing shellfish
- protection of wildlife habitat
- protection of fisheries

The act states that the conservation commission “shall...impose such conditions as will contribute to the protection of the interests” set forth in the act and requires that all work should be done in agreement with the permit conditions.

This means: People who want to do work in or near wetlands must apply to the conservation commission for permission. Conservation commissions decide whether to approve any applications that will affect wetlands, and may set certain conditions that the applicant must follow, in order to protect wetlands, or minimize the impact on wetland functions.

## WHAT AREAS ARE PROTECTED, AND HOW MUCH PROTECTION IS PROVIDED?

The Wetland Protection Act contains specific definitions of the areas it protects and outlines which activities are restricted in those areas.

Different types of wetlands have different degrees of protection under the Act. The greatest protection is provided to wetland areas that border a water body. The water body may be a river or stream, including **intermittent** (stopping and beginning again) ones, or it may be the ocean, a lake, or a pond. Permanent ponds smaller than 10,000 square feet (approximately a quarter acre) and temporary ponds do not meet the legal definition of “pond” in the regulations (the minimal pond area must have been observed or recorded within the last ten years.)

To be protected as a “bordering vegetated wetland,” the area must border a water body, and at least 50 percent of its **vegetation** (plants) must consist of wetland plant species. These plants include those named specifically in the Wetlands Protection Act (e.g. buttonbush, red maple, cattail, highbush blueberry, red maple, etc.) as well as other species generally recognized by wetland professionals as wetland **indicators** (things that are a sign of wetlands.)

Flood areas, determined not by vegetation but by flood elevation, frequency, and **magnitude** (importance or size), may either border a water body or be isolated. To be protected as “bordering land subject to flooding,” an area must border the ocean or other water body and be **inundated** (flooded) by the 100-year flood (the flood that has a 1 percent statistical probability of occurring in a given year.), as determined by the Federal Emergency Management Agency for most



communities or by a registered professional engineer. An area is protected as “isolated land subject to flooding” if it is an isolated depression that contains a quarter acre-foot of water with an average depth of six or more inches at least once a year. (An acre-foot is 43,560 cubic feet, the amount of water that would flood an area of one acre to a depth of one foot.)

Temporary ponds are protected only if they fall within the 100-year floodplain or if they meet the **criteria** (rule or standard for making a judgement) for isolated land subject to flooding. Temporary ponds that meet these criteria can receive additional protection if they are certified by the Massachusetts Division of Fisheries and Wildlife as **vernal pools** (Temporary ponds that fill up with water in the spring as a result of snowmelt, and spring rains. These often dry out during the summer. They are important amphibian habitat) Concerned citizens can help get vernal pools certified by volunteering to gather the necessary information.

## **HOW DOES THE WETLAND PROTECTION ACT AND REGULATIONS PROTECT WETLANDS?**

With some exceptions, work affecting wetlands cannot be permitted if it endangers wetland functions.

Some projects that impact wetland functions can be approved if they fall within categories considered to contribute to the public good, such as coastal navigation, new agriculture; maintenance and improvement of public utilities, roads and bridges, and some kinds of flood control projects. In addition, the conservation commission has the ability to permit wetland filling for a “limited project” such as when a landowner has no alternative access to upland.

## **THE WETLANDS PERMITTING PROCESS**

Any person proposing activities within wetland resource areas or within 100 feet of banks or bordering vegetated wetlands must file with the local conservation commission.

There are two types of filings:

- 1) A Request for a Determination of Applicability (This asks: Do I need a wetland permit? Or are the wetland boundaries correct as I have marked them?)
- 2) Notice of Intent. (I intend to do this work, is it ok with you?)

No work can be done until the conservation commission decides that a wetland permit is not needed, because it will not affect a wetland, or decides that the project may proceed, but the applicant must do the following things. The Order of Conditions states what the applicant must do in order to proceed.

## **THE DETERMINATION OF APPLICABILITY**

The Wetland Protections Act outlines a process that seeks public input. After an applicant files a Request for Determination of Applicability, the conservation commission must hold a public meeting within 21 days. This must be advertised in a local newspaper, at the applicant’s expense, at least 5 days in advance of the meeting. The commission should conduct an on-site inspection

before the public meeting and consider information from a variety of sources including wetland maps, the federal flood insurance study, topography, and observed water levels.

After reviewing information at the public meeting, the conservation commission must issue a Determination of Applicability within 21 days of receiving the request. (Ordinarily it is issued immediately after the public meeting). If a positive determination is issued the applicant must file a Notice of Intent and receive an Order of Conditions before performing work in the wetland. If the conservation commission finds that the proposal does not affect wetlands, the applicant may proceed with the work after a 10 day appeal period has elapsed.

### FILING A NOTICE OF INTENT AND OBTAINING AN ORDER OF CONDITIONS

The Notice of Intent should describe the proposed work with enough detail so that the conservation commission and interested citizens can evaluate impacts on the wetlands and conformance with the rules.

**Abutters** (people who live next to the wetland and applicant) must be notified about the proposed project.

At the public hearing, information is obtained from the applicant, and questions are asked about the impacts of the project on wetland resource areas, and their important functions. If the commission determines that the plans, and information presented or both are not enough to allow the evaluation of impacts, it may request further information from the applicant and can continue the hearing until it receives this additional information, provided the applicant agrees to the delay. If the applicant refuses, the conservation commission can deny due to insufficient information.

Interested citizens should attend public hearings and ask questions about the impacts of proposed activities on **statutory interests** (the 8 reasons people value wetlands) and how the developer will **mitigate** (make less severe) the impacts. Note that **ONLY** matters pertaining to wetlands are under the rule of the conservation commission. Planning boards make decisions regarding issues of transportation. The board of health rules on issues of public health concerns such as sewage.

Once the commission has reviewed the available information and closed the public hearing, it has an additional twenty-one days within which to permit or deny the project. The commission's decision is issued in the form of an Order of Conditions, which lists the conditions under which the project may proceed, or permits a project to proceed without modifications. It may deny a project that does not meet the requirements of the wetlands regulations but must explain the reasons for doing so.

## APPEALS

Any abutter or 10 citizens of the community where the site exists may appeal the decision. The appeal is sent to the Department of Environmental Protection (DEP) office, with copies sent to the conservation commission and to the applicant. If no appeals are made within ten days, the Order of Conditions is valid.

## HOW CAN CITIZENS PROTECT WETLANDS LOCALLY

Citizens can be effective in protecting wetlands by becoming familiar with the requirements of Wetlands Regulations, attending public meetings and public hearings, commenting on projects, and working with their local conservation commission to ensure that Orders of Conditions meet the requirements of the regulations.

### Vocabulary Words:

**abutters:** (in this case) people who live next door to the wetland and applicant.

**zoning:** The building restrictions in an area of a city or town.

**bylaw:** Law made by a city or town for the control of its own affairs. 2. A secondary law or rule, not one of the main rules.

**ordinance:** A rule or law, especially one adopted and enforced by a local authority.

**floodplain:** An area of land bordering a river and made of sediment carried by the stream and deposited during floods.

**estuary:** A broad mouth of a river, into which the tide flows.

**intermittent:** stopping and beginning again. (Streams are often intermittent seasonally, running during the spring as snow melts, drying up in the summer.)

**indicators:** Things that show or are a sign of.

**magnitude:** Great importance and effect. Size

**inundated:** Flooded

**criteria:** A rule or standard for making a judgement.

**vernal pools:** Temporary ponds that fill up with water in the spring as a result of snowmelt, and spring rains and then dry up in the summer. They are important amphibian habitat.

**mitigate:** Make less severe

**statutory interests:** public interests protected by a law or “statute”, in the case of wetlands, the 8 reasons people value wetlands.



## FOR FURTHER INFORMATION

Massachusetts Association of Conservation Commission  
10 Juniper Road, Belmont, MA 02178

Massachusetts Department of  
Environmental Protection  
1 Winter Street, Boston, MA 02108

Vernal Pond Certification:  
Massachusetts Natural Heritage Program  
Division of Fisheries and Wildlife 508-792-7270

Certified: A Citizen's Step-by-Step Guide to Protecting Vernal Pools"  
Massachusetts Audubon  
208 South Great Road  
Lincoln, MA 01773  
Send \$9.00 per copy. (Includes postage and handling.)

Massachusetts Audubon is the largest conservation organization in New England, concentrating its efforts on protecting the nature of Massachusetts for people and wildlife. The organization protects over 37,000 acres of conservation land, conducts nature education programs for 200,000 schoolchildren annually, and advocates for sound environmental policies. Across the state, Massachusetts Audubon operates 58 wildlife sanctuaries that are open to the public and serve as the base for its conservation, education, and advocacy efforts. For more information about the organization or to support its important work by becoming a member, call 1-800-AUDUBON or visit Mass Audubon on the internet at [www.massaudubon.org](http://www.massaudubon.org)

For more information about coastal wetlands:  
Visit the Mass Audubon's salt marsh science web site at: [www.massaudubon.org/saltmarsh](http://www.massaudubon.org/saltmarsh) or contact Liz Duff.