

Wetland Metaphors

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Grade level: lower elementary and upper elementary/middle school
Duration: one hour gathering objects and a 30-minute class period
Skills: application, visualization, team work, vocabulary, discussion, and communication/presentation
Subjects: science and language arts, fine arts (with additional activity)

Concepts

- Shorebirds are one part of a healthy functioning ecosystem.
- Both shorebirds and humans depend on clean, healthy ecosystems.
- Wetland ecosystems provide extremely important habitats for shorebirds.

Vocabulary

- Metaphors
- Microorganisms
- Decomposition
- Phytoplankton
- Zooplankton
- Algae
- Nutrients
- Runoff

Overview

Students make comparisons between unrelated objects through metaphors to learn the functions of a wetland.

Objectives

After this activity, students will be able to:

- Use metaphors to describe the basic functions of a wetland.
- Describe the value of wetlands.

Materials

- Large, concealing container (pillowcase, bag, or box)
- Sponge
- Small pillow
- Egg beater
- Toy doll's cradle or baby doll
- Sieve or strainer
- Can of soup or whole-grain cereal
- One copy of *Wetlands Metaphors* activity page per student (included here)

Optional

- Pictures illustrating other comparisons (e.g., gardens = food production for animals; airports/landing and takeoff = places for migrating birds)

Introduction

Coastal and freshwater wetlands provide unique habitats for a great diversity of plants and animals. They are nurseries for countless life forms.

Wetlands often act as buffers in times of both flood and drought. Absorbing overflow from flooding, wetlands often swell with *runoff* water and reduce potential flooding downstream. In drier periods, wetlands hold precious moisture after other ponds and lakes have disappeared.

Wetlands have a unique ability to trap silt and other solids, promoting the *decomposition* of many toxic substances, extra *nutrients*, and the neutralization of sewage wastes by *microorganisms* that live there. Yet it must be remembered that as remarkable as they are, the actions and capacities of wetlands have limits. Too much pollution can destroy a wetland.

Many of the functions of wetlands can be explored through *metaphors*. A metaphor is a direct comparison between two things. It gives a vivid image through direct (that is without using the terms "like" or "such as") comparison. "A tree is a home," "books are windows of thought,"

and "she is a tower of strength" are examples of metaphors. In this activity, a variety of objects represent the characteristics of wetlands in order to help students visualize (that is "paint a picture") and remember the valuable functions of wetlands.

For more information about wetlands and shorebird habitat, read *Shorebirds Depend on a Chain of Healthy Habitats* in the *Shorebird Primer*.

Activity Preparation

1. Prepare a *Mystery Metaphor Container* by collecting the metaphor objects listed above and placing them in a concealing box or paper sack.

Procedure

1. Discuss wetland functions and the meaning of *metaphor* with the class. Metaphors offer a dramatic way of drawing a comparison. For example: "Robin is a chip off the old block" or "Wes is a barrel of laughs."
2. Tell students that objects can be used to represent wetland functions.
3. Now bring out the *Mystery Metaphor Container*. Tell the students that everything in the container can be a metaphor that relates to the functions of wetlands.
4. Divide the class into six different groups. Announce that when it is his or her turn, you want a representative of each group to draw an object from the container.
5. Have the designated student reach into the container and withdraw one object.
6. When each group has an object, ask it to describe and demonstrate the relationships between their

Wetland Mystery Metaphors Chart

Object *Metaphorical Wetland Function: Wetlands...*

Sponge	...absorb excess water which helps to prevent flooding; and absorb excess, harmful nutrients from fertilizers and other sources that may cause contamination downstream (related also to filtering--see "Sieve" below).
Pillow or bed	...provide a resting place for migratory birds; and provide a home for resident microorganisms, fish, birds, and wildlife.
Egg beater or whisk	...mix nutrients and oxygen into water.
Cradle or baby doll	...provide shelter and protection (like a nursery) for young fish, insects, mammals, and birds. Have you seen mosquito larvae, dragonfly nymphs, frog eggs, duck nests, or moose calves in wetlands?
Sieve (strainer)	...can strain or filter debris and suspended material such as soil from erosion out of the water..
Can of soup (or whole-grain cereal)	...provide food for many animals in the form of <i>phytoplankton</i> , <i>algae</i> , tiny <i>zooplankton</i> , insects, and fish.
Soap	...clean polluted water that enters. Of course, even wetlands can be overpowered by too much pollution.
Flower	...are beautiful places.
	Add your own objects and ideas.

object and wetlands. Encourage the students to build on each other's ideas. You can also assist by strengthening their connections. Refer to the *Wetland Mystery Metaphors Chart* for guidelines. Be sure to allow each group time to discuss its ideas before presenting them to the class.

- Ask students to summarize the way wetlands contribute to a health habitat for wildlife. Ask them if their own attitudes about wetlands are different as a result of doing this activity. If so, how?
- Pass out a copy of the *Wetland Metaphors* activity page (included here) to each student to complete.

This page may be used as an evaluation tool.

Additional Activities

Poetry Writing

Have each student write a poem or essay about wetlands using a metaphor. This lesson is especially appropriate after a field trip.

Transforming a Metaphor into a Picture

Have your students use drawing or painting materials to create an actual image of a metaphor (for example, a tree as a home, a person as a chip off the old block, or a wetland as a sponge).

Shorebird Metaphors

Have students brainstorm other

wetland metaphors that demonstrate the value or function of wetlands specifically for shorebirds. Some other metaphors are: airport; bus transfer ticket for migration; restaurant; "singles" meeting place; even a place or ticket that represents the freedom which shorebirds would lose if they were endangered and confined to zoos.

When Nutrients Are Bad

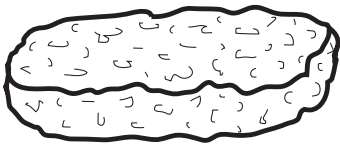
Some minerals that are normally vital to a healthy wetland can sometimes become detrimental. Ask students to research this dilemma. Which nutrients pose a risk when found in excess? Where do these excesses come from? What is the effect when a wetland gets "too much of a good thing"?

Wetland Metaphors

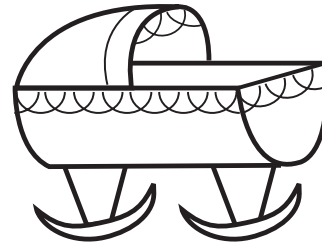
What is a home, a sponge, and a strainer all at the same time?

Metaphors are a way to compare unrelated things, such as "Wes is a barrel of laughs." Below are pictures of items seemingly unrelated to wetlands. Can you figure out how these items compare to a wetland? In other words, think about what each item does. Then compare that item's function to how a wetland might function in that same way. Good luck!

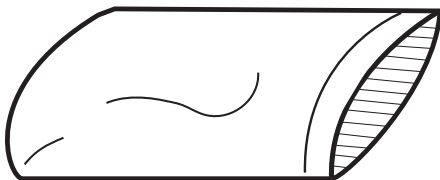
Sponge



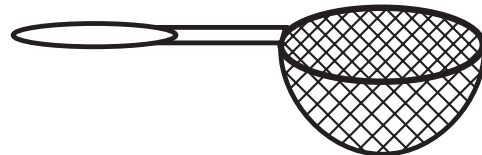
Cradle



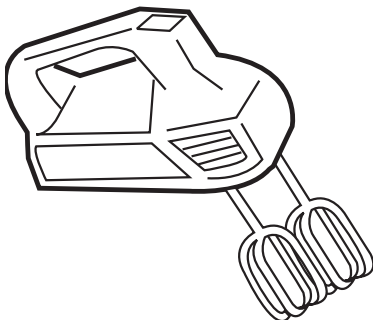
Pillow



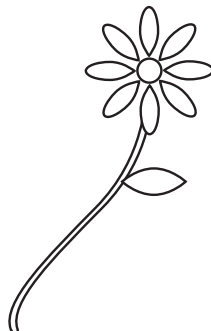
Strainer



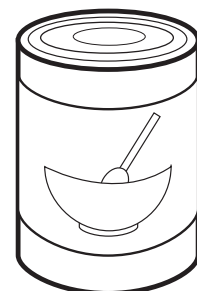
Egg beater



Flower



Can of soup

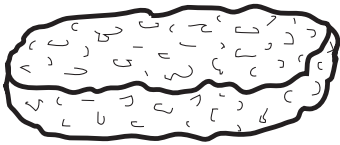


Wetland Metaphors Answer Sheet

What is a home, a sponge, and a strainer all at the same time?

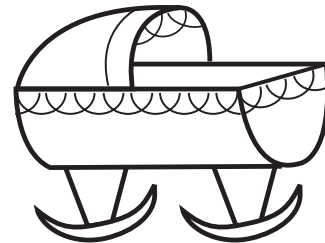
WETLAND

Sponge



help prevent floods,
absorbs water, holds moisture

Cradle



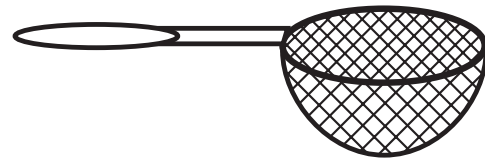
raise young, provide shelter

Pillow



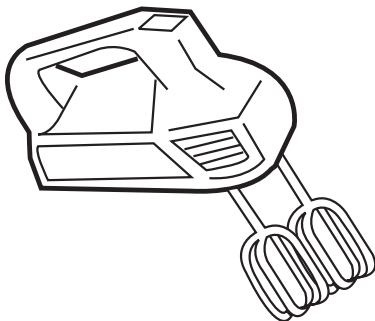
a resting place for migratory birds,
home for resident wildlife

Strainer



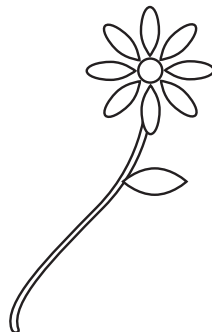
strain out debris and pollution

Egg beater



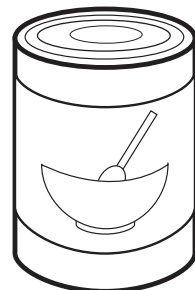
mix and cycle nutrients

Flower



beautiful places

Can of soup



food, nutrients



Where Does a Wetland Begin?
By Elizabeth Duff 1998

Grade Level: K-12

What to expect: We will be exploring a wetland. Expect it to be wet, muddy, windy, and buggy.

Preparation: Wear or bring:

Bring Water proof boots, Water shoes or old sneakers that can get wet.

Wear long pants and shirts out doors to avoid insects.

Bring layers of clothing: For all weather: Short sleeves, long sleeves, windbreaker, rain coat, sweat shirt.

Wear a hat with a brim, to keep out sun, and keep insects away. (Apply repellent to the brim.)

Wear insect repellent. Skin So Soft helps with Green Heads. DEET is made of strong chemicals and works with all insects. Wash your hands so you can touch things without getting chemicals on them. Wear sun screen.

Objectives: Students will learn characteristics and functions of wetlands.
Students will gain an appreciation and respect for wetlands.

Engaging Experience:

Students will decide where a wetland begins and defend their choice using a variety of tools.

Wetland: A place where the soil is very wet and the habitat is part land, part water. Marshes, swamps, bogs and fens are different types of wetlands. Wetlands provide food and shelter to many kinds of animals.

Suggested Materials:

Field Guides:

Plants

Freshwater Wetlands: A Guide to Common Indicator Plants of the Northeast

Dennis W. Magee

Plants in Wetlands

Dr. Charles Redington

A Field Guide to Coastal Wetland Plants of the Northeastern United States

Ralph W. Tiner Jr.

National Audubon Society Field Guide To New England

Peter Alden

Wildlife

National Audubon Society Field Guides to:

National Audubon Society

North American Birds

North American Insects & Spiders

Curriculum Resources: Wetlands Kit for K-12 Educators Wetlands Restoration & Banking Program, *WOW The Wonders of Wetlands* Britt E. Slattery and Alan S. Kesselheim

Lessoning Loosestrife by Elizabeth B. Duff 2008

Soils:

Soil Chart from Project Wet.
Soil Probe
Trowels

Fish:

Seine Net
Buckets
Minnow Traps
Hand Nets

Buckets Binoculars
Trays/bins for holding
Jars
Graduated Cylinders

Tools:

Insects:

Bug boxes
Swoop nets
Litter nets
Microscopes Dissecting scopes...

Etc.:

Bug Spray Meter tapes
Chart paper Sun Screen Meter sticks
Markers Food Pencils
Crayons Paper

Introductory Assessment:

Discuss as a whole class:

What is a wetland? What do we know about wetlands? What we think we know? What questions do we have?

Facilitation Guidelines:

Discuss as a class how to treat the wetland with respect while studying it. Do salt marsh etiquette activity.

Optional Activity: Wetland Colors: Focus students attention, and observation skills on the salt marsh through having them do an impressionistic style sketch wetland. Focus on colors of the wetland, rather than drawing every blade of grass.

Investigation:

How can you tell where the wetland begins?

Working in pairs, or small groups, participants observe the differences between a wetland/ not wetland, and mark the edge of the wetland with a flag. Student observe the habitats and record the differences between wetland and upland.

How is the wetland different from what is not a wetland?

Using the tools provided, investigate how the wetland is different from what is not a wetland. Record your observations.

Student Assessment:

Show and tell. Each pair demonstrates an understanding of characteristics of a wetland, by marking the edge of a wetland, and defending it to other participants. Students share their observations of the differences between the wetland marsh and what is not wetland.

Activity Extension:

What additional questions do you have about the wetland?

Make a list in small groups. Which of these questions are investigable?



Refinements/Extensions:

- Science* Investigate Additional Questions:
 - How big is the transition zone?
 - Does the transition zone size change?
 - What conditions favor a large transition zone, or a smaller one?

- Math* Measure the wetland: How deep is the soil?
 - How tall are the plants?
 - Estimate the percent cover of vegetation comparing wetland /not wetland.

- Technology* What tools are important for studying this wetland?

- Social Studies/History* How have humans impacted this wetland?
 - What are the values of this wetland that humans depend on?
 - How has human's use of this wetland changed over time?

- Geography* Map the wetland vegetation, wildlife, signs of human impact.

Assessment of the Activity: Observations throughout the activity.

- Students are actively engaged in the process.
- Students are able to mark a spot on the edge of a wetland, and describe how they made the decision using observations of wetland characteristics.
- Students use materials appropriately, asking questions and getting instructions.
- Materials and the site are treated respectfully. Only minimal impact on the site is evident after the study

Frameworks Connections: Earth and Space #1



Wetland Observations:

Objective: To investigate a wetland to observe one of the important functions of wetlands:
Habitat.

Guiding Question: What species are using our local wetland as habitat?

Observe your wetlands through the seasons to investigate what plants, birds and mammals use your wetland as their home. The following activities encourage your students to observe closely using sight and sound.

Activities:

- 1. Seeing Marsh Plants Through Color** (Any season- great to do a seasonal comparison)
See below for directions.
- 2. Sound Map (Any season- great to do a seasonal comparison) – see below for directions.**
- 3. Sound Map Classroom Follow up and discussion:**
 1. Where did you hear the most sounds?
 2. Did you hear any sounds that surprised you?
 3. Are there more sounds in the wetland or in the upland?
 4. What types of sounds did you hear?
 5. Can you tell if there were more than one kind of bird species in the wetland?
 6. Could you identify any of the birds found in your wetland?

Suggested Follow up: Contact a Mass Audubon Sanctuary near you to learn about bird identification programs/materials they offer. www.massaudubon.org

You can inform students that many birders use their ears for knowing what kinds of birds are present in an ecosystem. You can follow up with bird tapes to learn birds if you have awakened an interest in some of your students.

- 4. Mammal Tracking** (Best to do this in the winter) Go out to observe what animals are using your wetland in the winter. What track patterns do you see? See if you can identify what mammals are using the wetland.
- 5. Follow up discussion:** What species might increase if purple loosestrife is reduced? Are there any rare/endangered species found in your wetland?

Suggested Follow up: Contact a Mass Audubon Sanctuary near you to learn about mammal tracking programs they offer. www.massaudubon.org

Materials:

Paper, colored pencils or crayons, clipboards,

Mammal Tracking Field Guides



Seeing Marsh Plants Through Color

By Kristen Whiting Grant

Summary: Observe a local wetland in different seasons. Notice color changes. Observe the wetland is composed of different kinds of plants by recognizing the distinct colors of these plants.

Length of time: 30 minutes or so.

Objectives: Through this activity, participants will

- Become familiar with landscape painting by focusing their attention on the colors in the wetland.
- Recognize and discuss the plants of the wetland by focusing their attention on the colors of the wetland.
- Translate their observations of marsh colors into an understanding of the different wetland species by walking into/near the wetland and noting their different characteristics.

Skills: Observation, communication, documentation/visual expression; exploration; analysis; characterization.

Motivator: Looking out at the wetland, does anybody see a beautiful deep orange-brown color? (Note: colors may vary according to season.)

Materials:

Visuals of Monet's landscapes

Clipboards

Colored pencils or crayons, and trays or bags to hold them

Drawing paper

Guidelines:

Class works together to share observations

Each participant creates his/her own landscape drawing of the wetland.

Fall (or Spring) Observations:

- Find a spot in the upland where you can look out for a good view of the wetland. Ask participants to take a seat. After the motivator ask participants to point out a color in the marsh and describe what it is. (Ex. Orange-brown at the base of those grasses in the middle of the marsh.)
- Explain to the participants that making observations is what a painter does before s/he creates a landscape painting. Show reproductions of landscapes by Claude Monet, pointing out subtle shades of color found in his works. Having developed this skill for observing subtle differences in color, tell the participants that they are ready to become landscape artists themselves. Remind participants not to try to draw every blade of grass, but to look for large areas of color and try to capture those colors on paper.
- Pass out clipboards with paper to each participant, and pencils, or crayons. Let participants know they will have 10-15 minutes to draw. You will let them know when time is up. As they work, ask questions: "Why are we seeing all those colors? What creates all these different colors in the wetland? These could range from theories such as light and shadow, old grass and new grass, to different plant species.
- Have students share their drawing with a partner. Invite students to share with the group something they observed while doing the sketch.
- Tell students to go exploring the wetland to find out what those colors come from. (But do not pick!)



Name _____ Date _____

Wetland Colors

Observe the wetland in front of you with an artistic eye. Using colored pencils or crayons, draw the natural features of the area, capturing the different shades of color of the wetland. Add as much detail as possible: focusing on the different colors, rather than on every blade of grass. (Suggested time: 10-15 minutes).




Sound Map (c) 1989 by Joseph Cornell

Detailed instructions are found on <http://www.sharingnature.com/Focus.html>

From *Sharing Nature with Children II*, formerly *Sharing the Joy of Nature*,

Put an x in the center of this paper. That represents your location.

Listen for 10 minutes to the sounds around you. Create a symbol to represent each sound. For example you might draw  To represent thunder and lightning. Draw the symbol on the map in the place you heard it (in front of you, to the side, etc) .



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 The Massachusetts Audubon Society 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 judgment) 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 DO THE WETLANDS 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: 1. 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 judgment.

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.



Name _____ Date _____

Read “UNDERSTANDING THE WETLANDS PROTECTION ACT” and answer the following questions:

- 1) What group administers the Wetland Protection Act, and other local and state laws governing wetlands?
- 2) If you want to legally do any work in a wetland, what must a person obtain from the local conservation commission?
- 3) What are 8 main reasons why humans value wetlands?

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____
- 7 _____
- 8 _____

- 4) If someone applies to the conservation commission to do work in a wetland, what may the conservation commission do in order to protect or minimize the impact on wetland functions?

- 5) Sometimes it is hard to know where a wetland begins and ends. What are examples of plants that only grow in wetlands, and therefore are wetland indicators?

- 6) Work affecting wetlands cannot be permitted if it endangers wetland functions.

- a. What kinds of projects may be approved because they contribute to the public good?

- b. Under what circumstances may a landowner be granted permission to do wetland filling?



- 1) If work in a wetland is being proposed, _____ must be notified. These are people who live in the neighborhood, and may have a concern about the proposed work. They may ask questions, and communicate concerns.

- 2) Think about a wetland near you. What wetland functions do you think it supports? Put a star next to the functions in question 3 that you think the wetland near you supports.

- 3) Invasive species may be a threat to wetland functions. Which of the functions in question 3 may be harmed when one plant species takes over a wetland, blocking out all other plants? Explain your answer.



Name _____ Date _____

Read “UNDERSTANDING THE WETLANDS PROTECTION ACT” and answer the following questions:

1. What group administers the Wetland Protection Act, and other local and state laws governing wetlands?

Conservation Commission

2. If you want to legally do any work in a wetland, what must a person obtain from the local conservation commission? A permit (called an Order of Conditions)

3. What are 8 main reasons why humans value wetlands?

- | | |
|-----------------------------------------|--------------------------------------------------|
| 1 <u>private/public water supply</u> | 2 <u>groundwater supply</u> |
| 3 <u>flood control</u> | 4 <u>storm damage protection</u> |
| 5 <u>prevention of pollution</u> | 6 <u>protection of land containing shellfish</u> |
| 7 <u>protection of wildlife habitat</u> | 8 <u>protection of fisheries</u> |

4. If someone applies to the conservation commission to do work in a wetland, what may the conservation commission do in order to protect or minimize the impact on wetland functions?

The conservation commission decides whether to approve applications (and may deny them) and may set certain conditions that the applicant must follow.

5. Sometimes it is hard to know where a wetland begins and ends. What are examples of plants that only grow in wetlands, and therefore are wetland indicators? buttonbush, red maple, cattail, high bush blueberry, red maple

6. Work affecting wetlands cannot be permitted if it endangers wetland functions.
a. What kinds of projects may be approved because they contribute to the public good?

Coastal navigation, new agriculture, maintenance and improvement of public utilities, roads and bridges, some kinds of flood control

- b. Under what circumstances may a landowner be granted permission to do wetland filling?

In limited projects such as when a landowner has no alternative access to upland.

1. If work in a wetland is being proposed, abutters must be notified. These are people who live in the neighborhood, and may have a concern about the proposed work. They may ask questions, and communicate concerns.



8. Think about a wetland near you. What wetland functions do you think it supports? Put a star next to the functions in question 3 that you think the wetland near you supports.

9. Invasive species may be a threat to wetland functions. Which of the functions in question 3 may be most harmed when one plant species takes over a wetland, blocking out all other plants? Explain your answer: Invasives may pose a threat to protection of wetland habitat. An invasive plant may outgrow other plants that provide food and shelter to animals.



Common Conservation Commission Questions about Purple Loosestrife Biocontrol

1. What are the biocontrol organisms?
2. Where are the biocontrol organisms normally found?
3. Do the biocontrol organisms attack other plants or animals?
4. Where do the biocontrol organisms go in winter?
5. How do most conservation commissions handle the review of these projects?
6. How are the beetles obtained and released?
7. Do the biocontrol organisms attack humans?
8. Will the biocontrol eliminate purple loosestrife?
9. How long does it take for the biocontrol to work?
10. Do the beetles disperse away from the release location?



Common Conservation Commission Questions about Purple Loosestrife Biocontrol

Answers by Lou Wagner

Mass Audubon Regional Scientist

1. What are the biocontrol organisms?

The most commonly used biocontrol organisms for purple loosestrife biocontrol are beetles of the family Galerucella. These are small beetles that live on and eat purple loosestrife leaves and stems in Europe where purple loosestrife is native. They are natural predators on purple loosestrife that help to control the growth and spread of purple loosestrife in its native range. A primary reason that purple loosestrife has become a problem in North America is the lack of predators such as Galerucella that control purple loosestrife in its native range.

2. Where are the biocontrol organisms normally found?

Galerucella beetles are native to parts of Europe and Asia, the same areas where purple loosestrife is native.

3. Do the biocontrol organisms attack other plants or animals?

The potential for Galerucella beetles to attack plant species native to North America was extensively researched prior to approval for use as a biocontrol agent in the U.S.. Initial research and releases of Galerucella in the U.S. (since the 1990s) have indicated there are no significant negative effects on native species. Galerucella beetles have been known to feed on a few native species, such as Decodon verticillatus (water-willow), a close native relative of purple loosestrife, but they prefer purple loosestrife. Galerucella beetles have not been found to reproduce successfully except on purple loosestrife, because young larvae must feed on purple loosestrife.

4. Where do the biocontrol organisms go in winter?

Galerucella beetle adults spend the winter in the wetland soil and emerge again in spring (usually mid to late May).



5. How do most conservation commissions handle the review of these projects?

The state of Massachusetts does not have a specific procedure for reviewing projects of this type. Project proponents should contact the conservation commission of the town in which they wish to release beetles to control purple loosestrife to determine what information the commission would like to have about their project. Most conservation commissions request an initial project proposal be presented to them and that they be annually updated regarding the project. Others have requested that project proponents file a Request for Determination of Applicability (RDA) rather than the more detailed and expensive Notice of Intent (NOI) procedure. Since the release of the beetles is intended to enhance wetland values, conservation commissions generally approve and support Galerucella beetle biocontrol releases.

6. How are the beetles obtained and released?

The importation of these beetles into Massachusetts is regulated by the U. S. Department of Agriculture and a permit is required to import the beetles. In Massachusetts, the state Wetlands Restoration Program has a permit to import the beetles, and biocontrol projects initiated in coordination with the state program can import beetles under their license. The beetles may be purchased from a rearing lab and released directly into the wild. Alternatively, small numbers of beetles may be purchased from a lab or collected from a population already established in the wild and then raised in a controlled environment until a sufficient number are produced for release. The beetles are shipped overnight from a rearing lab in New Jersey and are then released into the wetlands the next morning. Five thousand beetles, a typical minimum release number, fit into a two gallon container. To release the beetles, you simply take the container into a dense stand of purple loosestrife and open the lid. The beetles then disperse into the purple loosestrife on their own. Release of the beetles is typically done in June or early July.

7. Do the biocontrol organisms attack humans?

The Galerucella beetles are entirely herbivorous and are seldom found far from purple loosestrife. They have never been reported to harm or pose a nuisance to humans. The beetles have been raised in a controlled environment to ensure they do not harbor or spread any parasites or diseases.

8. Will the biocontrol eliminate purple loosestrife?

Galerucella beetles are a natural predator on purple loosestrife and depend on purple loosestrife to complete their life cycle. Biocontrol with Galerucella beetles will not eradicate purple loosestrife. If successful, a biocontrol release will suppress purple loosestrife and allow native plants to grow in areas that were formerly dominated by purple loosestrife. However, enough purple loosestrife should survive to support the beetle population. A successful beetle release will result in a significant decline in purple loosestrife, but loosestrife will persist in low numbers along with a small population of beetles.



9. How long does it take for the biocontrol to work?

Three years of releases are typically recommended to establish a self-sustaining biocontrol beetle population large enough to significantly reduce the presence of purple loosestrife. Monitoring beetle success and purple loosestrife response to the beetles is an important component of project implementation. You can adapt your treatment plan (for example release more or fewer beetles in consecutive years) in an attempt to meet your purple loosestrife control goals. The Massachusetts Wetlands Restoration Program provides a monitoring protocol that can be used to track the success of beetle releases over time.

10. Do the beetles disperse away from the release location?

When beetles reduce the amount of purple loosestrife at a site to the point there is not enough purple loosestrife to sustain the beetle population, they will likely move to another purple loosestrife infestation. In fact, beetles have been known to disperse from the original point of release and become established in purple loosestrife infestations up to ten miles from the release location. The Wetlands Restoration Program is trying to track beetle migration by inventorying beetle populations and beetle damage to purple loosestrife that are not associated with release locations.