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Tips for Surveying a Lake and Pond Watershed

SAMPLE

The purposes of this survey are to organize residents and officials of communities to work together to solve problems and to protect resources of lakes and ponds. The survey, a cooperative venture, is a primary step in this process. In addition, the success of the survey depends upon volunteers and landowners. Before the survey takes place, all landowners need to be invited to participate in the survey, notified of purposes of the survey, and have an opportunity to give permission for volunteers to walk their property.

This survey form is designed for use with the *Massachusetts Volunteers Guide for Surveying a Lake Watershed and Preparing an Action Plan* (2001). To ensure that the survey is successful, volunteers should be aware of the following safety tips.

Safety and Legalities

- ☐ Always walk with someone.
- ☐ Watch out for irate dogs. Walk cautiously and practice good dog etiquette.
- ☐ Do not drink the water.
- ☐ Lifejackets are required by law for each person in any canoe or boat.
- ☐ From September 15 to May 15 all canoe or kayak occupants must wear a U.S. Coast Guard Approved Personal Flotation Device.
- ☐ Wear long-sleeved shirts and pants to protect against, ticks, mosquitoes, poison ivy, and nettles.
- ☐ Wear insect repellent if necessary.
- ☐ Consider landowner rights. Ask permission to cross private land, posted or not.
- ☐ Do not enter posted areas without permission. Take advantage of public access points.

Environment:

- ☐ Don't walk on unstable banks; your footsteps could speed erosion.
- ☐ Be aware of wildlife and animal homes, for both of your sakes.

NEVER PUT YOURSELF IN DANGER TO GATHER SURVEY INFORMATION.

If at anytime you feel uncomfortable about the bank or waterbody conditions or surroundings, please STOP your survey. You and your safety are much more valuable than any of the objectives of the watershed survey.

Checklist: What to take on your survey

- ___ A buddy
- ___ Data forms and topo map
- ___ Clipboard or other surface for writing
- ___ Two pencils – color is good to mark on maps
- ___ Long-sleeved, snag-free clothing /pants (for bugs and thorns)
- ___ Sunblock
- ___ Sunglasses (polarized to see into the water better)
- ___ Lifejackets & paddles if canoeing
- ___ Camera and film
- ___ Gloves
- ___ Copy of letter sent out to landowners
- ___ Flashlight for checking culverts

Fill out your data sheets, get them to your team leader, and attend action planning meeting, which will be held on: _____

LAKE and POND WATERSHED PRESURVEY FORM

Lake and Watershed Name: _____

Survey Area Number: _____

Surveyors Names: _____

A. Description of the Area from a Topographic Map (*Maps will be available at the training session.*)

1. Do you see developed (*white*) and undeveloped areas (*green*)? What % of each do you see?
 _____ % developed _____ % undeveloped
2. Are the banks of either the tributary or shoreline steep, (*How close together are the contour lines?*)
 indicating a potential for increased runoff or erosion?
 _____ Yes _____ No
3. How many tributaries enter or cross your area?
4. What kinds of development are shown on the map? (*Include major development in the watershed, as well as the shoreline, that could have an impact on the lake.*)

B. General Categories of Land Uses in your Area

_____ % Construction
 _____ % Residential
 _____ % Roads
 _____ % Agricultural land
 _____ % Urban
 _____ % Logging/forestry
 _____ % Other (*please specify, e.g., rural, open, or recreational*) _____

C. If Residential (*Estimate % of area; information will be available at the training.*)

_____ Multifamily _____ year round
 _____ <1/4 acre lots _____ seasonal
 _____ 1/2-1 acre lots
 _____ >1 acre

D. Is the area sewerred? _____ or unsewered _____?

E. Watershed History and Characteristics *What do people know about this area?*

General description:

Historical Information:

LAKE and POND **WATERSHED SURVEY** FORM

Lake and Watershed: _____ Survey Date: _____
 Surveyors Names: _____
 Area Number: _____
 Site Location: Beginning _____ End: _____
 Weather Today: _____ Weather (past 2-5 days) _____
 Landowners Contacted During Survey: ____yes ____no
 Description: Is the lake or pond a... (Please check)
 ____ Naturally occurring lake or pond ____ Lake or pond created by a dam ____ Salt pond

SAMPLE

A. General Categories of land uses on the Problem Site (Identify the land use category on the problem site. May be more than one land use.)

____ % Construction ____ % Agricultural land
 ____ % Residential ____ % Urban
 ____ % Roads ____ % Logging/forestry
 ____ % Other (please specify, e.g., rural, open, or recreational) _____

A.1. Specific Land Use on the Problem Site (Estimate % of site in each use. May be more than one land use.)

____ commercial	____ dirt road	____ protected open space
____ industrial	____ local road	____ undeveloped land
____ junk yard	____ parking lot	____ meadow
____ railroad	____ golf course	____ forest
____ bridge	____ grazing/pasture	____ wetland
____ highway	____ park or beach	____ other (specify) _____

A.2. If Residential (Estimate % of site that is...)

____ Multifamily ____ year round
 ____ <1/4 acre lots ____ seasonal
 ____ 1/2-1 acre lots
 ____ >1 acre (400 x 100 feet)

B. Site characteristics

1. Dominant soil is...

____ rock ____ gravel ____ sand ____ silt ____ clay

2. Slope of site is...

____ flat ____ moderate ____ steep

3. The bank is... (Check a or b, if there is a stream, ditch, shoreline, or steep bank on site.)

a) ____ vegetated with...	b) ____ unstable and...
____ exposed roots	____ undercut
____ shrubs and native grasses (< 20 ft.)	____ eroded
____ trees taller than 20 ft.	

LAKE and POND WATERSHED SURVEY FORM
(Continued, page 2)

C. Site drainage

1. Site runoff is directly to...

☐ lake ☐ stream ☐ ditch ☐ catch basin ☐ vegetated buffer ☐ wetland ☐ other

(describe) _____

2. Site runoff is from...

Construction: ☐ disturbed areas <1 acre) ☐ disturbed areas >1 acre

Residential: ☐ <1 acre ☐ >1 acre **and** ☐ driveways ☐ lawns

Roads: ☐ pavement to catch basin ☐ bridge ☐ shoulders/country drainage

Agricultural: ☐ field ☐ animal grazing area ☐ manure storage area

Urban: ☐ parking lot ☐ vehicle maintenance yard ☐ industrial area ☐ waste storage area

Logging/Forestry: ☐ logging yard ☐ roads/trails ☐ stream crossings ☐ forested areas

D. Land disturbances that affect water quality

1. Do you see evidence of excess nutrients? (Check all that apply)

☐ **Soil erosion:** ☐ silt ☐ sand ☐ soil ☐ stockpiled soil
☐ sedimentation

☐ **Evidence of runoff:** ☐ gullies ☐ rills ☐ channel

☐ **Evidence of nutrients:** ☐ pet waste/manure ☐ fertilizer use ☐ green lawns ☐ other(specify)

2. Do you see any of the following? (Use the same land use categories that were selected for the site.)

Construction: ☐ exposed soil ☐ altered drainage pathways ☐ absence/failure of erosion controls

Residential: ☐ exposed soil ☐ lush lawns ☐ evidence of erosion ☐ pet waste ☐ pipe drains

Roads: ☐ drainage to waterbody ☐ evidence of erosion ☐ sediment in ditches/culverts/drains

☐ sand build up in road

Agricultural: ☐ exposed soil ☐ animals in waterbody ☐ storage areas uncovered

Urban: ☐ drain pipes to waterbody ☐ sediment in ditches/culverts

☐ paved areas near waterbodies ☐ trash/waste storage near waterbodies

Logging/forestry: ☐ exposed soil ☐ poor roads ☐ brush/slash near waterbodies

Other: ☐ (specify)

3. Do you see any of the following? If there are tributaries, catch basins, drain pipes, and/or culverts on the site, explain your observations.

☐ Tributaries bringing in siltation: _____

☐ Condition of the culvert/pipe: _____

☐ Describe what is going into the pipe (Add color and odor): _____

☐ Describe any discharge from the pipe (add color and odor): _____

☐ Try to obtain and attach a map of the drainage system through your site/area.

Lake Watershed Survey Area Summary Sheet 1: Narrative

Area Begins: _____

Area Ends: _____

Date: _____

Surveyors: _____

Today's weather: _____

Weather over past 24-48 hours: _____

SAMPLE

These sheets are designed to (1) give the “big picture” of your area, and (2) describe the problems you have seen that could contribute to impaired water quality in the waterbodies of your watershed. The problems you have seen should be marked on your map (A, B, C, D) and described here. Identify the source of the problem whenever possible. This information provides the basis of the narrative description in your Lake or Pond Watershed Survey Report.

NARRATIVE DESCRIPTION

Sample.

We surveyed the south side of the pond from Oak to John Street. **(A)** There is a small stream, (about 1.5 feet across and 0.5 inches deep) that comes in just east of 3 Oak Street. The stream has a deep tea color but does not smell or have any algae. The bottom of the lake in this area is covered with decaying leaves/muck. This area also has woods coming up to the pond edge- a really well established vegetated buffer and lots of song birds. **(B)** From 3 to 17 Oak Street, people's lawns come up to the edge of the water-no buffer. Some dumping of yard wastes close to the shoreline.

(C) Lots of illegal dumping- at the end of the maintenance access road for Rte. 13 (mostly construction type stuff)! There are 3 large erosion gullies beneath the pipes sticking out of the embankment (from the storm drains on the highway), and there is a large delta of sand forming in the water beneath the embankment. Smells like gasoline and there was a sheen in the water trapped by the tires. This area could be cleaned up and it would make a great boat ramp area. Plant a few trees and it would be a nice place to sit-the view is nice. Can we get permission from Mass Highway to do clean up work near Rte. 13?

(D) There is a thick coating of duckweed along the edge of “Ball Park Cove” and the rest of the cove is thick with milfoil, (a neighbor says it is milfoil-we are not sure). The storm drain across from a new subdivision, (intersection of Oak and John Streets), is clogged with dirt from the construction site.

Describe your area in a paragraph:

Lake Watershed Survey

Area Summary Sheet 2: Priorities for Action

Area begins: _____

Area ends: _____

Look back at your data sheets and include your observations. The information from this sheet will be used to develop the Watershed Survey Report and Action Plan.

PROBLEMS: Problems found in your area, such as pipes or culverts discharging in dry weather, erosion, runoff, trash, dense algae, water quality problems (odor, color, oil, foam, sewage), and degraded wetlands (phragmites, loosestrife) (<i>Describe and give location</i>).	ASSETS: Assets found in your area, such as good habitat, wildlife species, businesses, or landowners using the river (in a friendly way), recreational access (canoe, trails, parks), potential recreational access, and potential park/conservation land (<i>Describe and give location</i>).	PRIORITIES FOR ACTION: List items that you feel would help to address or correct the priority problems in column 1.
1.	1.	1.
2.	2.	2.

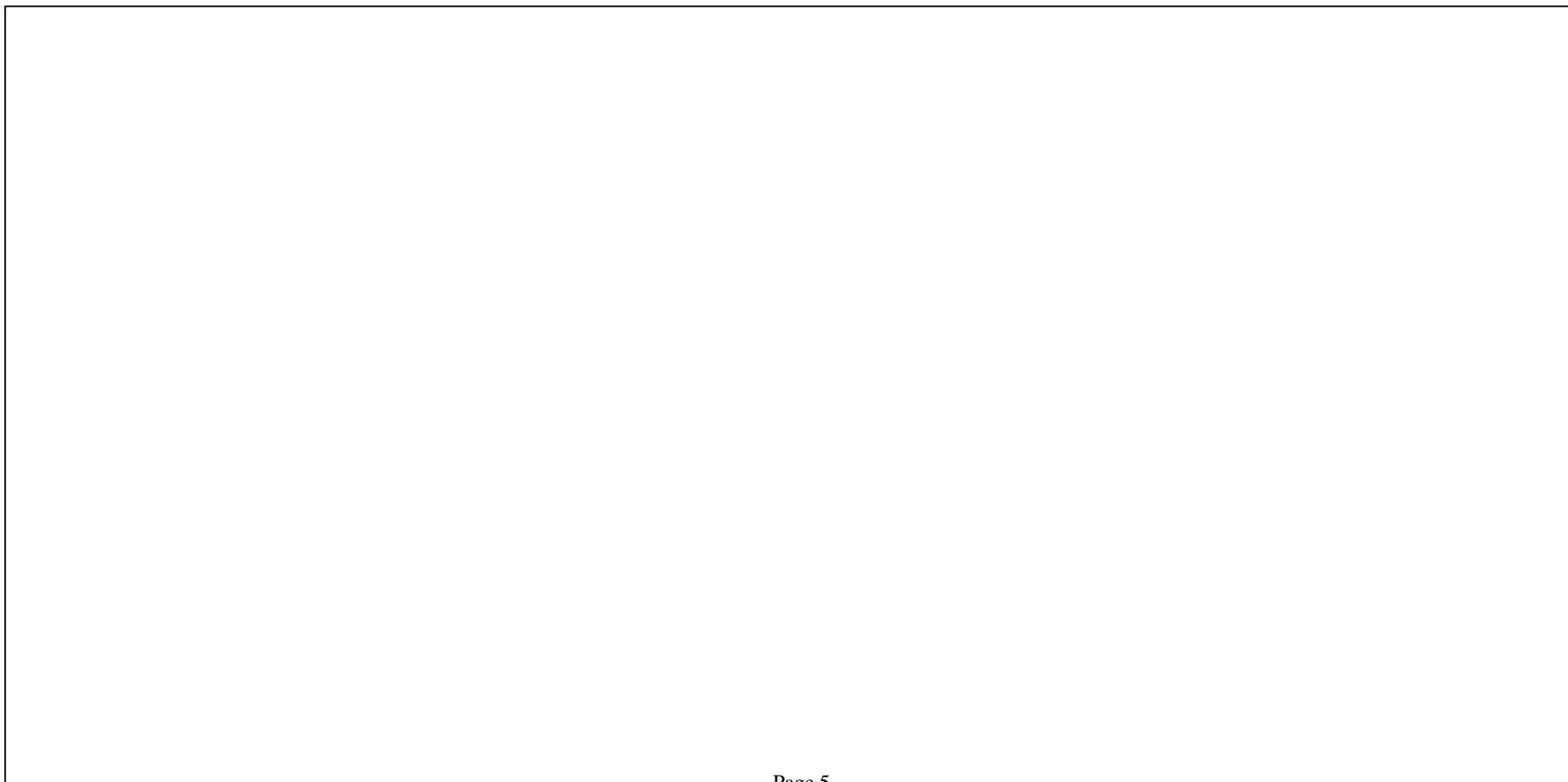
MAPPING PAGE

Survey area:_____ Begin:_____ End:_____

Surveyors:_____

Date:_____ Weather today:_____ Weather past 48 hours:_____

Draw a birds-eye view of your problem site, showing vegetation types and canopy along the streambank or shoreline, land uses, and other features. Include any details such as pipes, drainage ditches, or connections to wetlands or tributaries. Add assets such as habitat, recreation, and open space. If there is enough room write a brief description next to the problems found on site. If you need more room, label the problems A,B, C, on the map and describe these problems on the Narrative Summary Sheet. Be sure to include the following information : (1) where you have taken photos --use arrow showing direction, include photo number, (2) Mark problems, assets, and photo numbers on topographic map of your area. (*See sample on reverse side.*)



SAMPLE ATTACHMENT

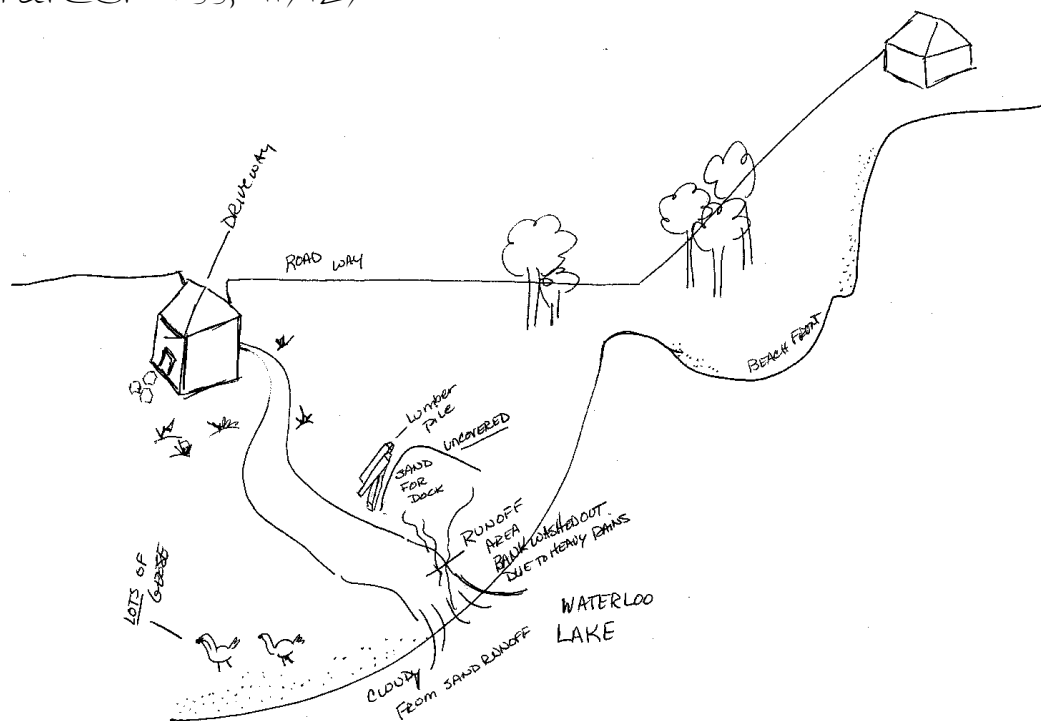


Geese near shoreline, photo #27



Algae growth near shoreline, photo #23

Drawing #1 for Waterloo Lake Survey
Parcel #33, 11/12/00



COMING ATTRACTION!

SAMPLE

Lake Watershed Survey Coming to Your Neighborhood!

Dear Lake Property Owner:

Many Massachusetts lakes have shown evidence of water quality decline in the past few decades. Lake watershed property owners can be affected when lake water quality declines. In addition to undesirable aesthetic changes to lake water, the potential impact to aquatic life, and the negative effects on your use of the lake, property values could be lowered.

As you may know, lakes, streams, and other waterbodies are interconnected within a watershed. A watershed is the area of land which drains to the lake through ditches, wetlands, streams, or rivers. By surveying a lake watershed, it is possible to find the causes and sources of pollution to a lake. Lake watershed surveys, like this one, are being done in watersheds across the state by trained volunteers.

The Waterloo Lake Association is conducting a survey of the Waterloo Lake watershed mainly to locate sources of phosphorus and sediment which may be having a negative effect on lake water quality. Erosion is the focus of this survey because it is a major source of phosphorus — a serious pollutant to lakes. Phosphorus and other pollutants reach our lakes through stormwater runoff and can come from anywhere in the watershed — not just the shoreline. The goals of this survey are to locate pollution sources, make recommendations to reduce or eliminate them, work with landowners to find reasonable solutions, and ultimately to protect the water quality of the lake for future generations. During the course of the survey, volunteers will be requesting access to property within the watershed. These volunteers also may be able to answer your questions about the effects of pollution in your water. There will be ways for you to participate. We need your help in eliminating the causes of the pollutants, and you are invited as a lake watershed property owner, to become part of this effort to restore our lake's well-being. Please call the number below for workshop and training information, if you have questions about the survey, or ideas that may be helpful in conducting the survey.

Contact Person: SCARLETT O'HARA or RHETT BUTLER

Telephone: 508-555-5555

Best time contact person can be reached: MON. - FRI. 7:00-8:30 pm, ANYTIME SATURDAY AND SUNDAY (leave message)

Massachusetts WaterWatch Survey Forms

EXAMPLE**INTENSIVE SURVEY FORM**

Stream name: _____ Segment code: _____
 Segment Start: _____ Surveyor(s) : _____
 Segment End : _____ Date: _____

When filling out this form, record *average* values for the entire survey segment:
 If you observe any high-potential resource areas, pollution sources, or other phenomena, which might bear a closer look, please record them on your map and in the narrative section of the form.

ADJACENT LAND

General land use. What is the nature of the land use within 1/4 mile of either bank?

Use approximate percentages for each use encountered. List each side of stream.

Ranges: 0 - 10%, 10 - 25%, 25 - 50%, 50 - 75%, 75 - 90%, 90 - 100%

Forest (> 20' high)	_____ Left	_____ Right
Shrub (0-20' high)	_____ Left	_____ Right
Pasture _____ Left _____ Right		
Open land (abandoned farm, etc)	_____ Left	_____ Right
Crop (cultivated)	_____ Left	_____ Right
Open perennial (orchards, nursery)	_____ Left	_____ Right
Wetland	_____ Left	_____ Right
Residential :		
R0 - Multi-family	_____ Left	_____ Right
R1 - < 1/4 acre lots	_____ Left	_____ Right
R2 - 1/4 - 1/2 acre	_____ Left	_____ Right
R3 - 1/2 - 1 acre	_____ Left	_____ Right
R4 - Greater than 1 acre	_____ Left	_____ Right
Commercial	_____ Left	_____ Right
Industrial	_____ Left	_____ Right
Transportation (RRoad, airports, etc)	_____ Left	_____ Right
Waste disposal (landfills, sewage lagoons, etc)	_____ Left	_____ Right

Width of riparian zone (Is there a band of trees, shrubs, or grasses covering or extending outward from the streambank itself? If so, indicate the average width of this strip.)

Left Bank: _____ 0 - 5' _____ 5 - 20' _____ 50 - 100' _____ 100'+

Right Bank: _____ 0 - 5' _____ 5 - 20' _____ 50 - 100' _____ 100'+

Streamside vegetation. (What % of segment length is covered by the types indicated?)

Left Bank:
 None or little _____% Grasses _____% Shrubs (< 20') _____% Trees greater than 20' _____%

Right Bank:
 None or little _____% Grasses _____% Shrubs (< 20') _____% Trees greater than 20' _____%

Stream cover. (estimate shading between 10 A.M. and 2 P.M.)

_____ 0 - 25% _____ 25-50% _____ 50- 75% _____ 75-100%

Segment code: _____

EXAMPLE**STREAM BANK AREA****Artificial Bank protection.** (What % of segment length is covered by the types indicated?)

What is the nature of the artificial surface?

Left: ☐ Rip-rap ☐ Concrete/other paved surface ☐ Wood
☐ Junk ☐ Other

Right: ☐ Rip-rap ☐ Concrete/other paved surface ☐ Wood
☐ Junk ☐ Other

Eroded or disturbed banks. (What % of segment length is affected?)

Left bank:

☐ 0 - 10% ☐ 10 - 50% ☐ 50 - 75% ☐ 75-100 %Severity: ☐ Low ☐ Moderate ☐ Severe

Cause: _____

Right Bank:

☐ 0 - 10% ☐ 10 - 50% ☐ 50 - 75% ☐ 75-100 %Severity: ☐ Low ☐ Moderate ☐ Severe

Cause: _____

Any steep banks present in segment?

☐ No ☐ Left bank ☐ Right bank**INSTREAM CONDITIONS****Flow.** ☐ Low ☐ Moderate ☐ High.**Average stream width.** (Over length of segment.) _____ Feet**Water color.**☐ Clear ☐ Green ☐ Tea ☐ Milky ☐ Cloudy ☐ Muddy

If milky, cloudy, or muddy, rate:

☐ Light ☐ Moderate ☐ Severe**Water smell.**☐ None ☐ Sewage ☐ Oil ☐ Chlorine ☐ Rotten eggs**Presence of logs or woody debris in stream.**☐ None ☐ Occasional ☐ Common**Aquatic vegetation.**

- Do rocks on the stream bottom feel slippery or slimy: ☐ Yes ☐ No
- If the following plant types are present, indicate the relative extent within the segment:
H - high M - Moderate L - low

- ☐ Submergent - plants completely underwater
- ☐ Floating - plants w/leaves floating on the surface
- ☐ Emergent - plants w/leaves rising above water surface
- ☐ Mosses - dense, cushion like mats on rocks
- ☐ Algae - green cotton ball or threadlike films, formless if brought out of the water.

Segment code: _____

RIVER RECREATION**EXAMPLE**

1) Accessibility:

By public trail
 by private trail
 nearby road
 nearby parking
 with a canoe
 not accessible

Left Bank

Right bank

Reason: _____

2) Would you come back here to:

swim
 wade
 canoe
 tube/kayak
 picnic
 fish
 camp
 bird watch
 other

list: _____

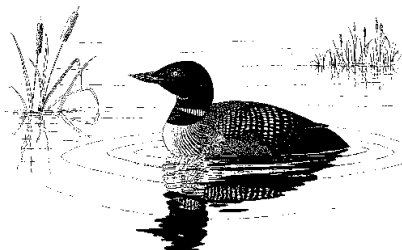
Segment code: _____

Please record here any obvious or potential pollution or problem sources that you find (i.e. pipes (flowing or dry), animal waste entering stream, etc), or any significant resources that you observe (i.e. waterfalls, wildlife, good swimming holes or popular fishing spots, good boating stretches, etc). Describe the occurrence and the location as clearly as you can.

[illegible]

Segment code: _____

The Field Volunteer's Most Frequently Asked Questions



The answers to these frequently asked questions will give volunteers an idea of what to expect.

□ What are the objectives of this work?

The first objective is to locate as many erosion problems in the watershed as possible. A second, but equally important objective, is to help the watershed community understand how land use in the watershed influences lake water quality. Once awareness is raised, people are more likely to change habits that are harmful to the lake.

□ How much time is required?

Volunteers attend three to four hours of classroom training. Times in the field will vary, depending on the size of the assigned area. Expect to spend a minimum of two days over the course of a month on this project.

□ When does the survey take place?

Anytime! For example: If a survey is conducted in the spring, between March and April, these favorable conditions exist:

- The ground is likely to be *saturated* with water due to spring snowmelt. Under these conditions, *runoff* from rainstorms will be at a maximum. Phosphorus and sediment in runoff from spring storms often represent a large percentage of the total annual phosphorus load to a lake.
- Eroded areas will be more visible due to the absence of vegetation.
- Enough time will remain for the follow-up team to complete the project during the summer months.

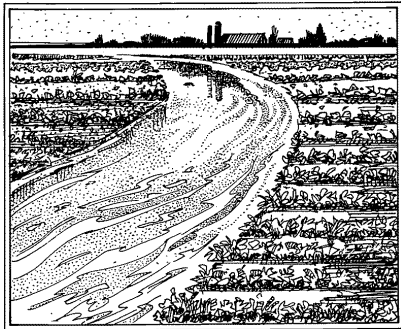
□ Does a volunteer need any special skills to participate?

Volunteers will be trained to recognize erosion problems associated with each land use, for example, residential, roads, and agricultural use. Volunteers will be taught to read a *topographic map* and how to document field findings. Hiking through woods and other types of terrain may be necessary depending on the survey site.

□ What information is covered in the training?

Training topics include:

- Discussion of watersheds and watershed management tools.
- Nonpoint source pollution — with a focus on soil erosion — and its effects on lake water quality.
- Lake ecology.
- The effects of declining water quality on the local economy.
- Reading topographic maps.



□ How to use forms associated with the survey.

- *Site* documentation.
- Typical land use problems (slide show).
- Communicating with landowners.

□ What will volunteers be looking for?

Volunteers will look for erosion problems, both small and large. While a small erosion problem may not seem significant, the accumulation of many small problems throughout the watershed can have a serious impact on a lake. Volunteers will look closely at *stream* crossings, ditches, and other drainage ways for indicators such as cloudy water and sediment deposits (turbidity). Signs of concentrated stormwater runoff heading toward the lake without being absorbed into the ground also will need to be documented.

□ When and where will the volunteer start the survey?

Volunteers may begin surveying their sections of the watershed soon after the training session. Ideally, volunteers should complete their surveys within a week after training.

□ What's it like in the field?

The best way to investigate the watershed is to walk it. Cars may be used to get around within the watershed. Roads will allow volunteers to access to all types of land uses. Be prepared to access private property. The survey should have been well publicized before volunteers are actually in the field, so watershed residents should be aware of volunteers walking their property. This may include a call to property owners, giving dates of the survey and inviting property owners to join you in the survey. At a minimum, be prepared to talk to watershed residents prior to and during the survey.

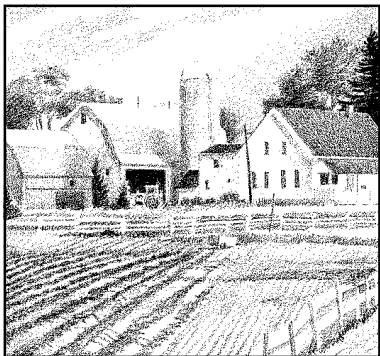
Be prepared to follow signs of erosion along the waterway. For example, if a turbid stream is located, volunteers may need to hike up the stream to find the source. Volunteers will be documenting what they observe along the way. Instructions on recordkeeping can be found in Section 4 of this guide. Survey forms are found in appendix A.

□ What should volunteers bring?

Basic materials are needed and most of the items are found at home, such as bad weather gear and flashlights.

□ What kind of safety issues should be considered?

Volunteers need to take the same common sense safety precautions taken if going on a day hike. For example, take a first-aid kit, a map, and bring water and snacks. A detailed checklist is found in Section 4 of this guide.



□ **Who will be in the field with the volunteer?**

Surveyors need to work in teams of two or more. It's safer than being alone, and volunteers will be able to discuss observations.

□ **Who can volunteers go to with questions?**

There should be a coordinator among the volunteers. This person's responsibilities include acting as a point of contact for surveyors, steering committee members, and technical advisors; providing volunteers with forms and watershed area maps; collecting documentation sheets from volunteers when they have completed the survey; making sure the sheets are properly filled out; and sending the documentation sheets on to the technical advisors.

□ **How many people will be involved?**

The number of volunteers involved depends on the size of the watershed. Other factors include the density of the developed areas and the amount of time the volunteers are willing to spend on the project. The more volunteers there are, the less time each volunteer will need to spend surveying. Typically, eight to twelve volunteers are sufficient.

□ **What do volunteers do first when they get into the field?**

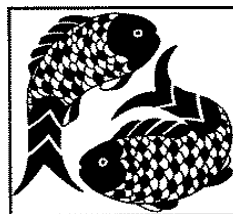
Volunteers should become familiar with their section of the watershed on the topographic map. Locate the roads and the boundaries of the watershed and decide where to begin.

□ **Will volunteers get follow-up information about the survey?**

Yes. A report of survey findings will be prepared by the project's coordinators as soon as the field survey is completed. They'll give the report to field volunteers, town officials, and the press. The initial report will present an overview of the extent of phosphorus and sediment problems in the lake watershed and will summarize the problems by category and priority.

□ **Who will pay to address the problems identified in the survey?**

Funding sources for problems are found in Appendix D.



Finding Your Way: A Guide to Reading Maps



Knowing how to read a United States Geological Survey (USGS) topographic (topo) map is critical to conducting your lake watershed survey in the field. You will be navigating with and marking sites on a topographic map. Once you learn to read a topo map, you'll be able to recognize, by looking at the map's contour lines, steep slopes, valleys, streams, hills, and other topographic features. You will also be able to find your way around various locations.

What is a Topographic Map?

A topographic map tells you where things are and how to get to them. These maps describe the shape of the land. They define and locate natural and manmade features like woodlands, waterways, important buildings, roads, and bridges. They show the distance between any two places, and they also show the direction from one point to another.

Resources

There are many helpful web sites available to obtain topographic maps as well as to find detailed information on how to read maps. Here are some of them:

United States Geological Services: <http://www.usgs.gov>

What is a Topographic Map? <http://mapping.usgs.gov/mac/isbpubs/booklets/symbols/index.html>

Finding Your Way with Map and Compass Fact Sheet. <http://mapping.usgs.gov/mac/isb/pubs/factsheets/fs07999.html>

Working with Maps: How to Read a Topographic Map. <http://www.usgs.gov/education/teacher/what-do-maps-show/WDMSa4.html>

Information Products about Mapping and Related Subjects. <http://www.usgs.gov/mac/isb/pubs/pubslists/index.html>

Understanding Map Scales. <http://mapping.usgs.gov/mac/isb/pubs/factsheets/fs05698.html>

MA. Pond Maps Online. http://www.state.ma.us/dfwele/dfw/dfw_pond.htm

Others

Introduction to Orienteering: The Map. <http://www.williams.edu/biology/orienteering/map.html>

Silva Compasses: Read This or Get Lost. <http://www.silvausa.com/camping/silva/silva.html>

How to Obtain or Purchase Topographic Maps

By Internet

<http://www.topozone.com>

http://www.mapping.usgs.gov/esic/map_dealers/ma./html

<http://umass.edu/tei/esio>










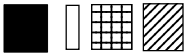



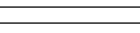
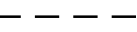




By E-mail

businesspartners@usgs.gov

By Telephone

1-888-MAP-DEAL

Common Map Symbols

Intermittent stream	
Intermittent river	
Disappearing stream	
Perennial stream	
Perennial river	
Perennial lake; Intermittent lake or pond	
Marsh or swamp	
Submerged marsh or swamp	
Submerged wooded marsh or swamp	
Building	
School; church	
Well; windmill	
Primary highway	
Light duty road	
Trail	
Bridge	
Tanks	
Covered reservoir	
Landmark object (featured as labeled)	

Reading Topographic Maps

Map Symbols and Features

Distances and directions take a bit of figuring, but the topography and features of the land are easier to determine.

Interpreting the colored lines, areas, and other symbols is the first step in using topographic maps. Features are shown as points, lines, or areas, depending on their size and extent. For example, individual houses may be shown as small black squares. For larger buildings, the actual shapes are drawn. In densely built-up areas, most individual buildings are omitted and an area tint is shown. On some maps, post offices, churches, city halls, and other landmark buildings are shown within the tinted area.

The first features usually noticed on a topographic map are the area features such as vegetation (green), water (blue), some information added during the map updating (purple), and densely built-up areas (gray or red).

Many features are shown by lines that may be straight, curved, solid, dashed, dotted, or in any combination.

The color of the lines usually indicate similar features or classes of information:

Brown - topographic contours

Blue - lakes, ponds, streams, and irrigation ditches.

Green - vegetation

White - cleared areas such as fields, developed areas, and farmland

Red - land grids and important roads

Black - other roads and trails, railroads, and boundaries.

Purple - updated features using aerial photography, but not field verified.

Gray or Pink - urban areas

Various symbols are used to depict features such as buildings, campgrounds, springs, water tanks, mines, survey control points, and wells. Some of the more common map symbols are shown on this page. More can be found on the USGS web site (see page C-65).

Names of places and features also are shown in a color corresponding to the type of feature. Labels, such as "Substation" or "Golf Course" identify many features.

Ground Configuration Shown by Contour Lines

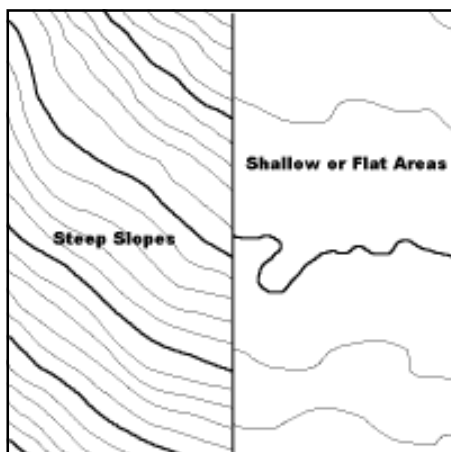


Figure 1: Contour lines that are closely spaced represent steep slopes, and those that are widely spaced, or the absence of contours, represent shallow or flat areas.

Topographic contours are shown as brown lines of different widths. They show the general shape of the terrain. To help the user determine elevations, index contours (usually every fourth or fifth contour) are wider. The narrower intermediate and supplementary contours found between the index contours help to show more details of the land surface shape.

- Contour lines connect points of equal elevation. These lines never cross.
- Elevation is expressed in feet above sea level. It appears on contour lines, and on the summit of hills and mountains, and the surface of many ponds and lakes.
- The elevation difference between adjacent contour lines is called the contour interval. Contour intervals are usually mapped at 10 or 20 feet (which means the change in elevation between contour lines is 10 or 20 feet).
- Lines that connect the tops of hills and ridges form watershed boundaries.
- The top of the maps is always north and the bottom is always south.
- The right side of the map is always east and the left side of the map is always west.

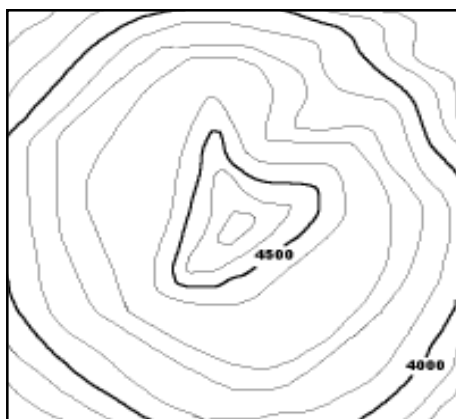


Figure 2: Hills and mountains appear as a series of successively smaller concentric circles. The circles are usually irregularly shaped and the smallest circle at the top represents the highest point of the land.

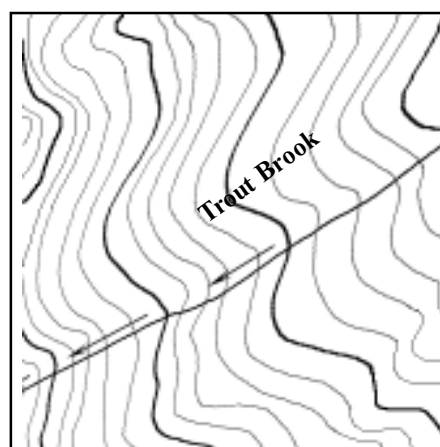


Figure 3: The “V” formed by contour lines that cross a stream always points upstream, or against the flow of the stream.

Ground Configuration Shown by Contour Lines

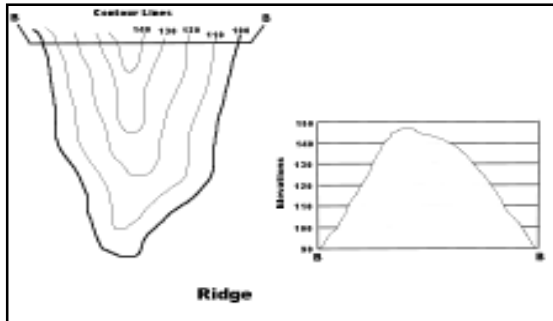


Figure 4b: Contour lines that represent a ridge are also V- or U-shaped, but the point of the “v” indicates the lower elevations.

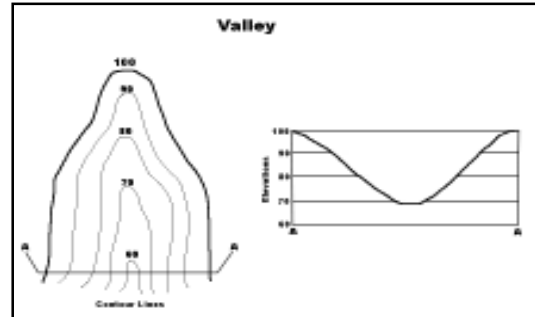


Figure 4a: Contour lines that represent valleys, or depressions in terrain are usually V- or U-shaped, and the point of the “V or U” indicates the higher elevation.

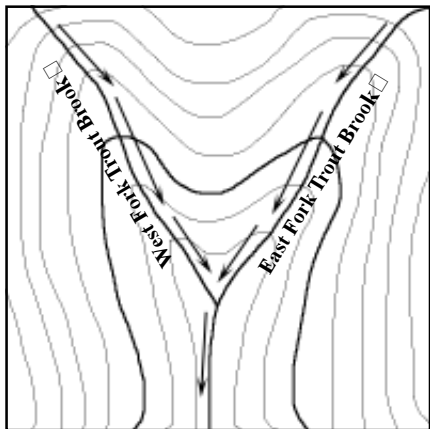
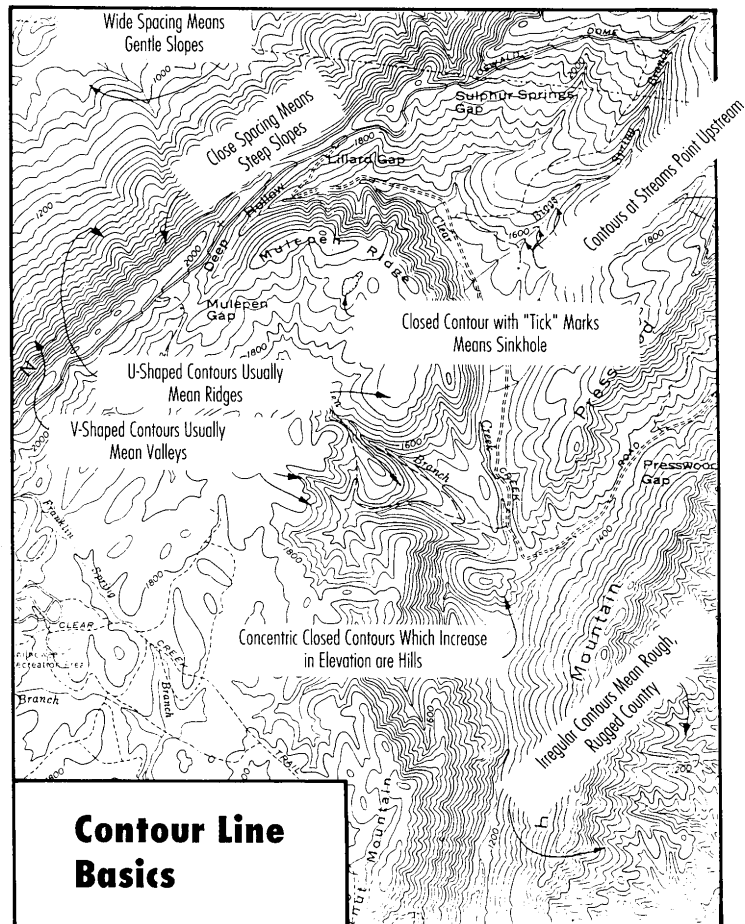


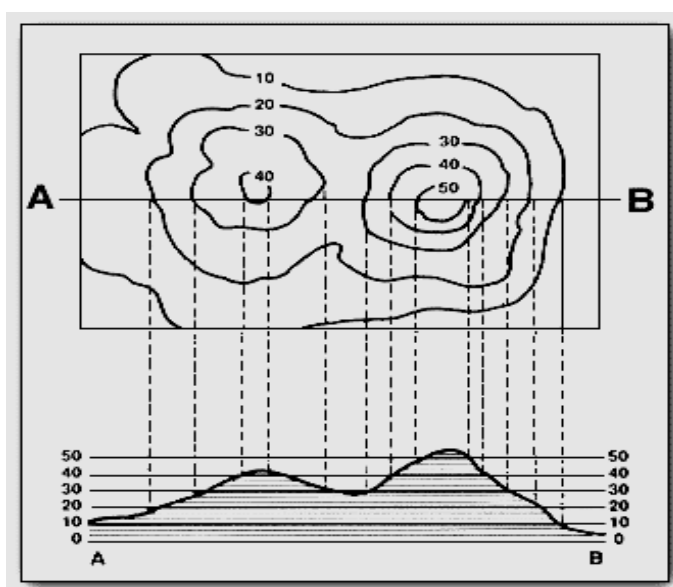
Figure 5: When two streams converge, the “V” formed point where the two streams intersect points downstream.



Drawings reprinted with permission from Air & Waste Management Association's *Environmental Resource Guide (ERG) — Nonpoint Source Pollution Prevention for Grades 9-12*, copyright, 1993; Air & Waste Management Association, Pittsburgh, PA 15222.

Understanding Contour Lines Activity

Contour lines on a topographic map show the shape and elevation of the land. They are sometimes called level lines because they are at the same level. Here's how contour lines work:



The top of this drawing is a contour map showing the hills that are illustrated at the bottom.

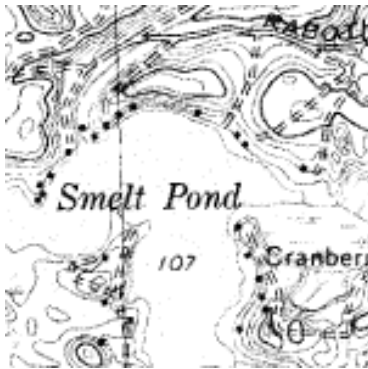
On this map, the vertical distance between each contour line is 10 feet.

- 1) Which is higher, hill A or hill B? _____
- 2) Which is steeper, hill A or hill B? _____
- 3) How many feet of elevation are there between contour lines? _____
- 4) How high is hill A? _____ Hill B? _____
- 5) Are the contour lines closer together on hill A or hill B? _____

Answers:

- 1) Hill B
- 2) Hill B
- 3) 10 feet
- 4) Hill A is 40 feet; Hill B is 50 feet
- 5) Hill B has closer contour lines

Map Scales: The Larger the Number; the Smaller the Scale



Smelt Pond, MA 1:5,000



Smelt Pond, MA 1:10,000



Smelt Pond, MA 1:15,000

To be most useful, a map must show locations and distances accurately on a sheet of paper of convenient size. This means that everything included in the map – ground area, rivers, lakes, roads, distances between features, and so on – must be shown proportionately smaller than they really are. The proportion chosen for a particular map is its scale.

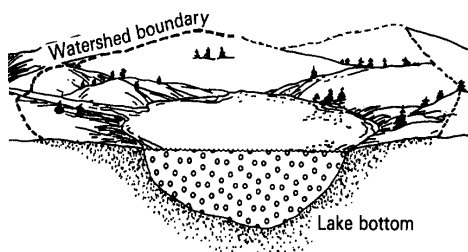
Simply defined, scale is the relationship between distance on the map and distance on the ground. A map scale might be given as a drawing (a graphic scale), but it usually is given as a fraction or a ratio – 1/10,000 or 1:10,000.

These “representative fraction” scales mean that one unit of measurement on the map – 1 inch or 1 centimeter – represents 10,000 of the same units on the ground. If the scale were 1:63,360, for instance, then 1 inch on the map would represent 63,360 inches or 1 mile on the ground (63,360 inches divided by 12 inches equals 5,280 feet or 1 mile). The first number (map distance) is always 1. The second number (ground distance) is different for each scale; **the larger the second number is, the smaller the scale of the map.**

U.S. Geological Survey Scales

The U.S. Geological Survey (USGS) publishes maps at various scales. The scale used for most United States topographic mapping is 1:25,000. USGS maps at this scale cover an area measuring 7.5 minutes of latitude (north to south lines) and 7.5 minutes of longitude (east to west lines) and are commonly called 7.5-minute quadrangle maps. Maps at 1:25,000 scale are fairly large and provide detailed information about features of an area, including the locations of important buildings, footbridges; drawbridges, fence lines, and private roads are also shown at this scale.

Finding the Boundaries of a Watershed



Imagine a watershed as an enormous bowl. As water falls onto the bowl's rim, it either flows down the inside of the bowl or down the outside of the bowl. The rim of the bowl or the watershed boundary is sometimes referred to as the ridge line or watershed divide. This ridgeline separates one watershed from another.

Topographic maps with the scale of 1:25,000 (which means that one inch measured on the map represents 25,000 inches [2000 feet] on the ground) can help you determine a watershed's boundaries.

They also have contour lines that are usually shown in increments of ten or twenty feet. Since each contour is a line of elevation, the water that flows downhill would cross the contour lines perpendicularly.

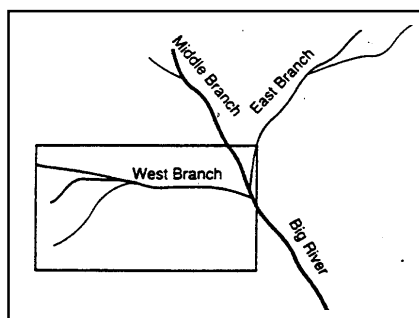
Here's how you would delineate a watershed:

- 1) Use a topographic map(s) to locate the river, lake, stream, wetland, or other waterbodies of interest.
- 2) Trace the watercourse from its source to its mouth, including tributaries. This step determines the general beginning and ending boundaries.
- 3) Examine the contour lines on the topographic map that are near the watercourse. Contour lines connect all points of equal elevation above or below a known reference elevation.

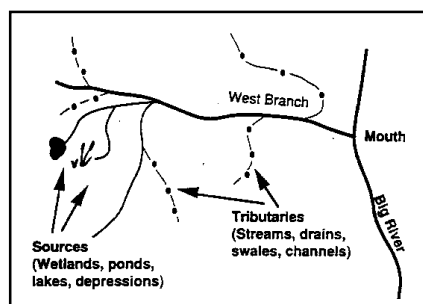
A. The index contour lines (dark brown thick lines) will have an elevation associated with them and are usually mapped at 50 feet intervals. The light brown thin lines, intermediate or supplementary contours, are usually mapped at 10 feet intervals. To determine the final elevation of your location, simply add or subtract the appropriate contour interval for every light brown (thin) line, to the appropriate interval for every dark brown (thick) line.

B. Contour lines spaced far apart indicate that the landscape is more level and gently sloping. Contour lines spaced very close together indicate dramatic changes (rises or fall) in elevation over a short distance.

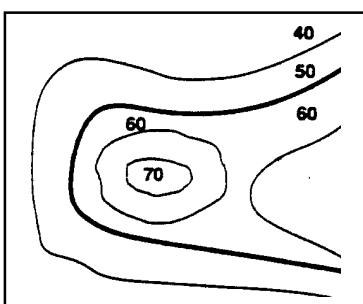
- 4) Check the slope of the landscape by locating two adjacent



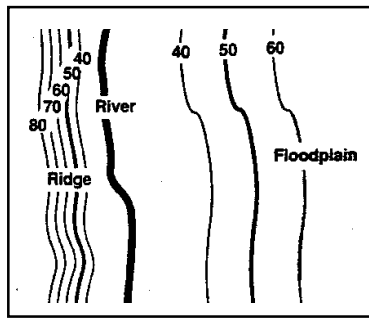
1) Big River Watershed



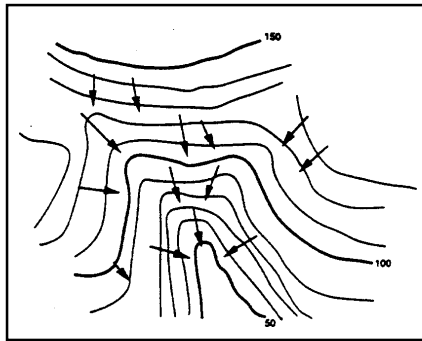
2) West Branch Subwatershed



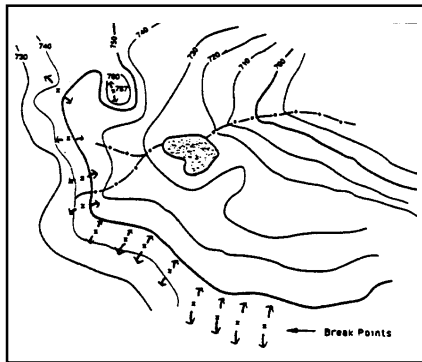
3a) Contour Lines



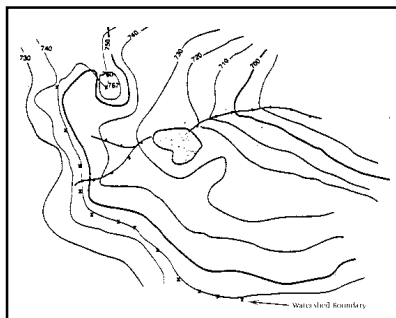
3b) Floodplains and Ridges



5) Direction of Drainage



6) Identify Break Points



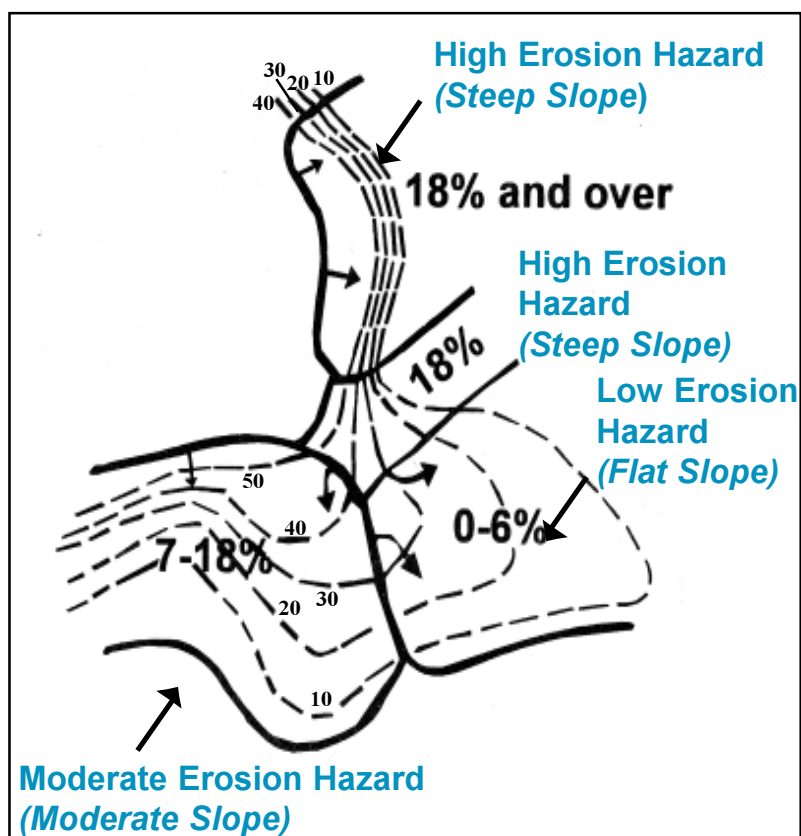
7) Watershed Boundary

contour lines and determine their respective elevation. The slope is calculated as the change in elevation divided by the distance.

- a. A depressed area (valley, ravine, and swale) is represented by a series of contour lines “pointing” towards the highest elevation.
 - b. A higher area (ridge, hill) is represented by a series of contour lines “pointing towards the lower elevation.
- 5) Determine the direction of drainage in the area of the waterbody by drawing arrows perpendicular to a series of contour lines that decrease in elevation. Stormwater runoff seeks the path of least resistance as it travels down slope. The “path” is the shortest distance between contours hence a perpendicular route.
 - 6) Mark the break points surrounding the waterbody. The “break points” are the highest elevation where half of the runoff would drain towards one body of water, and the other half would drain towards another body of water.
 - 7) Connect the break points with a line following the highest elevations in the area. The completed line represents the boundary of the watershed.
 - a. Mark the watershed boundary along break points. For lakes which have an outlet, begin at the outlet and draw the watershed divide lines perpendicular to the contour lines until the watershed line to the outlet meets the larger watershed divide usually located along a ridge line. Repeat for the other side of the outlet.
 - 8) Once you’ve outlined the watershed boundaries on your map, imagine a drop of rain falling on the surface of the map. Imagine the water flowing down the slopes as it crosses contour lines at right angles. Follow its path to the nearest stream that flows to the waterbody you are studying. Imagine this water drop starting at different points on the watershed boundaries to verify that the boundaries are correct.
 - 9) Distribute copies of your watershed map to your group.
 - 10) Your watershed map can be further divided into smaller sections or subwatersheds. The surveyors will be responsible for studying the subwatersheds in the field.
 - 11) Once the watershed and the subwatershed boundaries have been delineated on the map, your team can verify them in the field.

Determining the Slope Condition for the Survey Site

When conducting your lake watershed survey and filling out your survey form, you will need to determine if slope conditions are low, moderate, or high erosion hazards. The graphic below, using contour lines, should give you a better idea of how to determine that. This is a graphic representation of a topographic map. Contour lines spaced close together represent steep slopes. Contour lines spaced far apart represent flat slopes and contour lines in between represents moderate slopes.

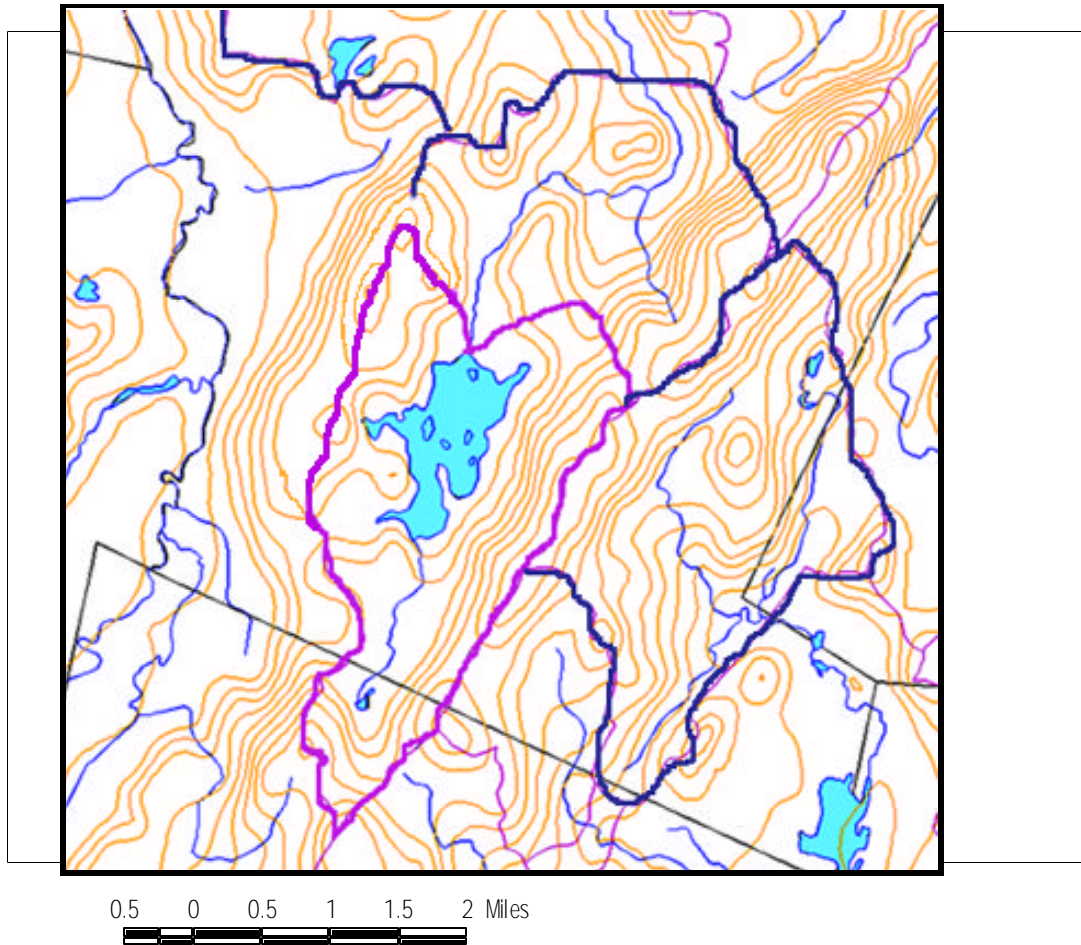







0-6% Slope = Low Erosion Hazard (*contour lines spaced far apart - flat slope*).

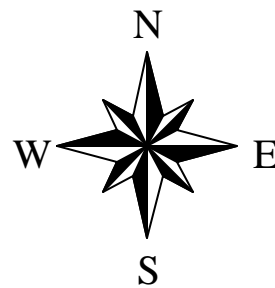
7-18% Slope = Moderate Erosion Hazard (*moderate slope*).

18% and Over = High Erosion Hazard (*contour lines spaced close together - steep slope*).

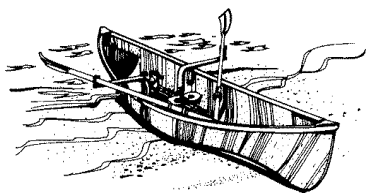
Bare Hill Pond Sub-basin



-  Sub-basins
-  30 Foot Contours
-  Major Basins
-  100k Rivers and Streams
-  100k Lakes and Ponds



Funding Opportunities and Resources



The following funding opportunities and resources are available for lake watershed surveys and implementation of remediation measures. Contact agencies directly for details on grant applications and deadlines. Contact names, addresses, and telephone numbers may change. They are current up to the printing of this document. Check the agency/organization Web sites for the most up to date information.

State and Local Grants

Source: Massachusetts Department of Environmental Management

DEM offers grants for a variety of conservation management projects including those that promote the preservation, protection, and public use of lakes, ponds, and shorelines of waterways. Applicants can include municipalities, non-profit organizations, and planning agencies. For more information, contact the individual grant contacts, or visit DEM's Grants Section Web site at <http://www.state.ma.us/dem/grants.htm>.

Lakes and Ponds Grant Program

Steve Asen (617) 973-8733

Promotes a holistic approach to lake management based on scientific principles and emphasizes the integrated use of watershed management, in-lake management, pollution prevention, and education to provide long-term solutions to lake problems. Priority is given to lake districts, lake associations, and other active citizen groups, as well as to proposals that develop and enhance public access to the waterbody and public uses.

Greenways and Trails Demonstration Grants Program

Jennifer Howard (413) 586-8706 Ext. 18

Greenways are corridors of land and water that protect and link a variety of natural, cultural, and recreational resources. Grant awards of \$1,000-\$5,000 may be given to municipalities, non-profit organizations, and regional planning agencies to support innovative projects which create and/or promote greenways and trail networks in Massachusetts.

MASS ReLeaf Grant Program

Edith Makra (617) 626-1466

Fosters partnerships between business, government, and nonprofit groups to raise money for the planting and care of public trees. The program helps communities purchase trees for energy conservation, screening, community gateway or parking lot enhancement, or to offset urban pollution. The program also engages a network of community leaders, government officials, and corporate partners through educational and promotional events and projects. In addition, the program assures long-term tree survival by



emphasizing proper tree selection, planting, aftercare, and maintenance. Applicants can be municipalities and non-profit organizations that will plant trees on publicly accessible land. The grants require in-kind services such as planting and maintenance of trees. Up to \$5,000 in grant funds are available to each recipient.

National Recreational Trails Act Grant Program

Peter Brandenburg (617) 973-8740

Under the National Recreational Trails Act (NRTA) and the Intermodal Surface Transportation Act (ISTEA) of 1991, fuel tax revenues, generated by off-highway vehicles and backcountry camping, are used to fund trail projects conducted by private organizations, government agencies, and municipalities. Projects can include mitigation of erosion problems of trails that abut waterbodies.

Forest Stewardship Planning and Project Grants for Town Forestlands

Susan Campbell (413) 256-1201

Encourages landowners to practice long-term guardianship through development of management plans for woodlands. The program is designed to improve wildlife habitat and forest aesthetics, to protect soil and water resources, and to increase the potential for high-quality wood products. Grants are awarded to public and private organizations in three categories: landowner outreach projects that deliver a stewardship message, such as tours, workshops, demonstrations, and printed material; preparation of 10-year forest management plans and demonstration areas on town and conservation commission lands; and professional training and technical support to the forestry community for delivery of a stewardship message. Most grants range from \$500 to \$2,500.

Urban Forest Planning and Education Grants

Warren Archey (413) 784-1829 Ext.33 or Edith Makra (617) 626-1466

Assist communities and nonprofit groups in building support for long-term protection and management of community trees and forests. Grants are awarded to tree wardens and nonprofit groups to organize and develop projects with the involvement of local residents and educators. The USDA Forest Service provides the grants, which DEM administers with guidance from the Massachusetts Community Forestry Council. A maximum of \$10,000 is available per project.

Rivers and Harbors Grant Program

Leslie Lewis (781) 740-1600

A statewide program of matching grants from DEM's Office of Waterways to towns and municipalities for design and construction to address problems on coastal and inland waterways, lakes, and great ponds. Projects funded under the program include channel and harbor dredging; pier, wharf, bulkhead, seawall, revetment and jetty repairs; coastal erosion control and beach nourishment; inland flood control; river cleanup and streambank stabilization; and other water-related projects. The grants require a 25% local match for dredging, and 50% for all other types of projects. Because there are practical

limits to funding, projects requiring less than \$300,000 in state funds are preferred. The program also provides matching funds for the local cost share of U.S. Army Corps of Engineers projects within the Commonwealth.

Source: Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement

Riverways Small Grants Program

Patricia Sheppard (617) 626-1541

Promotes greenways along rivers and healthy stream flows by funding projects that restore rivers and their wildlife and fisheries habitats. Grants range from about \$3,000 to \$8,000. For more information, see the Web site at www.state.ma.us/dfvele/river/riv_tac.htm.

Source: Massachusetts Department of Environmental Protection

DEP's grant and loan programs include funds from the U.S. Environmental Protection Agency as authorized by the federal Clean Water Act (sections 604b, 104(b)(3) and 319(h) and from state appropriation (research and demonstration and loan programs for municipalities and homeowners). More detailed information can be found at DEP's Web site: www.state.ma.us/dep/brp/wm/wmpubs.htm or by contacting DEP's Regional Service Centers: Northeast: (978) 661-7677; Southeast: (508) 946-2714; Central: (508) 792-7683; and Western: (413) 755-2124.

Grants:

604b Water Quality Management Planning Grant Program funds projects that combine elements of water supply protection and planning and water quality assessment, particularly addressing nonpoint source issues. Proposals should have a public outreach or technology transfer component. Eligible grant recipients include regional planning agencies, councils of governments, conservation districts, counties, and municipalities. A local match is not required, but is encouraged. Contact Gary Gonyea: (617) 556-1152.

319(h) Nonpoint Source Grant Program funds projects that prevent, control, and abate nonpoint source pollution. Projects must have a 40 % non-federal match of the total project cost, which can be cash or in-kind services performed as part of the approved project activities. Lake protection and restoration projects are eligible for funding if they meet the same criteria for remediating nonpoint source pollution. 319(h) projects typically receive \$20,000 - \$150,000. Lake and pond restoration projects will require additional funding from other sources to implement. Eligible recipients include any interested Massachusetts public or private organization. Contact Beth McCann: (617) 292-5901.



Loan Programs:

Northeast Region: Tom Mahin (978) 661-7660

Southeast Region: Dick Keith (508) 946-2784

Central Region: Paul Andersen (508) 767-2802

Western Region: Dierdre Cabral (413) 755-2148

**Clean Water State Revolving Loan Fund (CWSRF) Program**

The Massachusetts State Revolving Fund for water pollution abatement projects provides low-cost funding to help municipalities comply with federal and state water quality requirements. The CWSRF Program is jointly administered by DEP's Division of Municipal Services and the Massachusetts Water Pollution Abatement Trust. CWSRF loans have the current subsidy level of 50% grant equivalency that approximates a no-interest loan. Loans are available for planning, design, and construction of structural water pollution abatement projects, nonpoint source pollution abatement projects, and stormwater remediation. Non-structural projects, such as planning projects for remediating nonpoint source problems, also are eligible for funding.

Community Septic Management Program

Provides funds to homeowners with failing septic systems to comply with the Title 5 regulations. Communities can obtain loans for septic system planning and improvements.

Massachusetts Drinking Water State Revolving Fund (DWSRF) Program

Provides loans to municipalities for engineering, design, and construction of drinking water projects that protect public health and strengthen compliance with federal and state drinking water regulations. The current subsidy level of 50% equivalency approximates a no-interest loan.

Source: Massachusetts Environmental Trust

The Trust is an environmental philanthropy established by the Massachusetts Legislature in 1988. The Trust funds and coordinates projects that encourage cooperative efforts to raise environmental awareness and support innovative approaches to protect and preserve natural resources, with a special focus on water and related land resources of the Commonwealth. There are a variety of grants available through the Trust with different applicant requirements and funding cycles. For more information, contact the Trust at (617) 727-0249, by e-mail at env.trust@state.ma.us, or see the Web site at <http://www.agmconnect.org/maenvtr1.html>.

Source: Massachusetts Department of Food and Agriculture

The Massachusetts Department of Food and Agriculture's Agricultural Environmental Enhancement Program (AEEP) provides funding to farmers to install a variety of water quality protection practices. Eligible practices include the installation of buffers, animal waste systems, pesticide storage facilities, fencing, culverts, seed and gutters. All farmers who actively farm five acres or more of land which could potentially impact a water resource are eligible. For more information on the program contact the coordinator, Susan Phinney, at (617) 626-1772.

Federal Grants and Resources

Source: *U.S. Department of Agriculture,
Natural Resources Conservation Services*

Watershed Protection and Flood Prevention Program works through local government sponsors to solve natural resource and related economic problems on a watershed basis. Projects include watershed protection, flood prevention, erosion and sediment control, water supply, water quality, fish and wildlife habitat enhancement, wetlands creation and restoration, and public recreation in watersheds of 250,000 or fewer acres. **Technical and financial assistance** is available for installation of improvement projects to protect, develop, and utilize land and water resources in small watersheds. Applicants can include a local or state agency, county, municipality, soil and water conservation district, flood prevention or flood control district, Indian Tribe or Tribal organization, or non-profit agency with authority to carry out, maintain, and operate watershed improvement works. Funds include cost sharing for 100% of flood prevention costs; and 50% of construction costs related to agricultural water management, recreation, and fish and wildlife. For more information, see the NRCS Web site at <http://www.nhq.nrcs.usda.gov>, or call the appropriate NRCS Field Office:

State Headquarters – (413) 253-4350

Barnstable Field Office (serving the Cape Cod, Dukes, and Nantucket Conservation Districts) – (508) 771-6476

Greenfield Field Office (serving the Franklin Conservation District) – (413) 772-0384 Ext.3

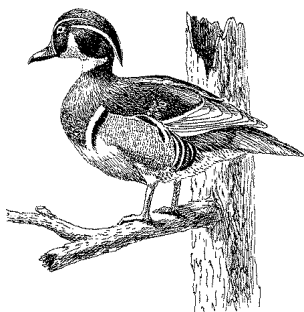
Holden Field Office (serving the Northeastern, Northwestern, and Southern Worcester Conservation Districts) – (508) 829-4477 Ext.3

Northampton Field Office (serving the Hampden and Hampshire Conservation Districts) – (413) 585-1000 Ext.3

Pittsfield Field Office (serving the Berkshire Conservation District) – (413) 443-6867 Ext.3

West Wareham Field Office (serving the Bristol, Norfolk, and Plymouth Conservation Districts) – (508) 295-5151 Ext.2

Westford Field Office (serving the Essex, Middlesex, and Suffolk Conservation Districts) – (978) 692-1904 Ext.3



Environmental Quality Incentives Program (EQIP) is a conservation grants program for farmers whose properties face serious threats to soil, water, and related natural resources. The program provides technical, financial, and educational assistance in designated priority areas such as watersheds, regions, or areas of special environmental sensitivity or having significant soil, water, or related natural resource concerns. These concerns include soil erosion, water quality and quantity, wildlife habitat, wetlands, and forest and grazing lands. The program pays for up to 75% of cost sharing expenses for conservation practices that improve and maintain the health of the natural resources in the area.

Wetlands Reserve Program (WRP) restores and protects wetlands on private property. WRP provides landowners with financial incentives to enhance wetlands in exchange for retiring marginal agricultural land. Landowners may sell a conservation easement or enter into a cost share restoration agreement.

Landowners and NRCS develop a plan for restoration and maintenance of the wetland. Applicant must be a landowner for at least one year and the land must be restorable and suitable for wildlife benefits. NRCS provides from 75 to 100% of the restoration costs depending on the easement and agreement with the landowner.

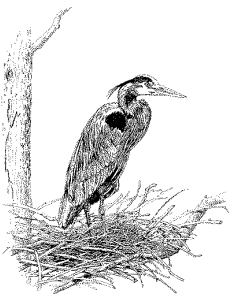
Source: U.S. Department of Interior, U.S. Fish and Wildlife Service

The North American Wetlands and Conservation Act Grant Program promotes long-term conservation of North American wetland ecosystems, the waterfowl and other migratory birds, fish, and wildlife that depend on that habitat. The program supports the acquisition, enhancement, and restoration of wetlands and wetlands-associated habitat. The program also encourages voluntary, public-private partnerships to conserve North American wetland ecosystems by creating an infrastructure and providing a source of funding. Funding is available for any individual or organization with a long-term wetlands conservation project for acquisition, restoration, and/or enhancement with the required 1:1 partnership match. There are two grants available under the Act. The **Standard Grants Program** funds projects that provide long-term conservation of wetlands and associated uplands through habitat protection, restoration, or enhancement. The funding cap is \$1 million per grant. The **Small Grants Program** gives priority to applicants who have never received an Act grant. The funding cap is \$50,000 per grant. For more information, see the U.S. Fish and Wildlife Web site at <http://www.fws.gov>.

Source: U.S. Department of Transportation

Transportation Enhancement Act of the 21st Century funds for water quality projects. The Planning and Conservation League (PCL), Heal the Bay and Rails-to Trails Conservancy developed an EPA sponsored document titled, *“Merging Currents: Transportation and Water Quality, a Guidebook for Funding Opportunities.”* This booklet explains how local agencies can apply for TEA21 (Transportation Enhancement Act of the 21st Century) funds for water quality projects that are impacted by transportation systems. While geared for California applicants, much of the information is applicable nationwide. PCL sells the booklet for \$15. They can be reached at:

PCL Foundation
Publications Office
926 J St. Suite 6112
Sacramento, CA. 95816
(916) 444-8726



Private Trusts and Foundations

Sweet Water Trust is dedicated to the conservation of natural ecosystems and provides grants from its own endowment. It also may allocate grants from other foundation sources. The **Watershed Action Program** provides grants from \$1,000 to \$10,000 to non-profit organizations that support local action-

oriented projects to improve the ecological health and biotic integrity of local watershed ecosystems, particularly shoreline buffer zones and associated uplands where land and water meet. Types of projects eligible for funding include: acquisition of land or easements; assessment, maintenance, or improvement of water quality and quantity essential to aquatic ecosystem functions; and the prevention, removal, or control of exotic invasive species. Projects also may support good local planning; identify, map, and mitigate nonpoint sources of pollution; support conservation policy and advocacy regarding vernal pools, buffer zone areas, instream flow rates, anadromous fish migration, and dam removals; identify and map natural communities, habitat analysis, or ecological restoration. For more information, contact Sigrid Pickering, Watershed Action Program Director, at (617) 492-5998 or by e-mail at watersweet@aol.com.

FishAmerica Foundation provides grants for fishery improvement projects such as habitat improvement, streambank stabilization, aeration systems, silt removal, planting of trees and vegetation, hatchery construction and renovation, stocking and rearing fish, litter cleanups, and prevention and hands-on education. Non-profit organizations can apply with a letter of support from the appropriate state resource agency. For more information see the Foundation Web site at http://www.asafishing.org/outreach/fish_america.htm.



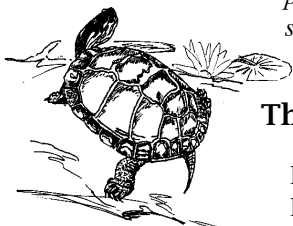
Web Resources

Below are Internet resources and Web sites that deal with non point source pollution, erosion control, watershed management, and related issues.

National Wildlife Federation	www.nwf.org
U.S. Geological Services	www.usgs.gov
U.S. Department of Agriculture	www.usda.gov
Agriculture Research Service	www.ars.usda.gov
Natural Resources Conservation Service	www.nrcs.usda.gov
Forest Service	www.fs.fed.us
U.S. Department of Commerce	
National Oceanic and Atmospheric Administration	www.noaa.gov
U.S. Department of Interior	
Bureau of Land Management	www.blm.gov/education/education.htm
- Environmental Education Programs	
Fish & Wildlife Service	www.fws.gov
U.S. Environmental Protection Agency	www.epa.gov
Envirofacts	www.epa.gov/enviro/index.html
Surf Your Watershed	www.epa.gov/surf or www.epa.gov/nwapsurf
Nonpoint Source Homepage	www.epa.gov/OWOW/NPS
TMDL Homepage	www.epa.gov/OWOW/TMDL
Commonwealth of Massachusetts	www.state.ma.us
Executive Office of Environmental Affairs	www.state.ma.us/enviro
Department of Environmental Protection	www.state.ma.us/dep
Department of Environmental Management	www.state.ma.us/dem
Department of Fisheries, Wildlife and Environmental Law Enforcement	www.state.ma.us/dfwele
Massachusetts Ponds On-line	www.state.ma.us/dfwele/dfw/dfw_pond.htm
Massachusetts Municipal Association	www.mma.org
Lakes and Watershed Related Organizations	
Massachusetts Congress of Lakes and Ponds	www.colap.com
Massachusetts Lake and Pond Association -West	
North American Lake Managers Society	www.nalms.org
Massachusetts Water Watch Partnership	www.umass.edu/tei/mwwp
Massachusetts Water Resources Research Center	www.umass.edu/tei/wrrc
Coop Extension	www.umass.edu/umext
Massachusetts Watershed Coalition	www.ultranet.com/~mwc/index.html
River Network	www.rivernet.org/~rivernet
Merrimack River Watershed Council	www.merrimack.org
Charles River Watershed Association	www.crwa.org
Nashua River Watershed Association	www.ultranet.com/~nrwa
Citizen Monitoring	
Global Rivers Environmental Education Network	www.earthforce.org/green
U.S. EPA Volunteer Monitoring	www.epa.gov/owow/monitoring/volunteer/startmon.html
Other Useful Sites	
Earth Times: environmental news daily	www.earthtimes.org
Environmental Information Resources	www.gwu.edu/~greenu/index2.html
American Society of Civil Engineers, BMP database	www.asce.org/peta/tech/nsbd01.html

Contacts: Agencies & Organizations

A number of agencies and organizations can provide experience, guidance, and direction in your lake survey work. The following are examples of the resources provided by key organizations that are not listed under “Funding” in this appendix section. Individual contact information is current up to the date of document printing



The Executive Office of Environmental Affairs Watershed Teams

Robert O'Connor
Director of Watersheds and Land Policy
 251 Causeway Street, 9th Floor
 Boston, MA 02114
 (617) 626-1170

Karl Honkonen
Watershed Manager
 251 Causeway Street, 9th Floor
 Boston, MA 02114
 (617) 626-1138

Boston Harbor Watershed
EOEA Team Leader: Karl Pastore
 251 Causeway Street, 1st Floor
 Boston, MA 02114
 (617) 626-1165

DEP Team Leaders
 Richard Chretien, NERO
 (978) 661-7606
 Weymouth/Weir
 Sabin Lord, Acting, NERO
 (978) 661-7750 Mystic
 Richard Chretien, NERO
 (978) 661-7606
 Neponset

Blackstone Watershed
EOEA Team Leader: Lynne Welsh
 180 Beaman Street
 West Boylston, MA 01583
 (508) 835-4816 ext. 503

DEP Team Leader
 Robert Kimball, CERO
 (508) 792-7650 x 3722

Buzzards Bay Watershed
EOEA Team Leader: David Janik
 20 Riverside Drive
 Lakeville, MA 02347
 (508) 946-8990

DEP Team Leaders
 Jeffrey Gould, SERO
 (508) 946-2757
 John Viveiros, SERO
 (508) 946-2859

Cape Cod Watershed
EOEA Team Leader: Patti Kellogg
 EOEa, Waquoit Bay National Estuary Reserve
 P.o. Box 3092
 Waquoit, MA 02536
 (508) 457-0648

DEP Team Leaders
 Elizabeth Kouloheras SERO
 (508) 946-2810
 Cynthia Martin, SERO
 (508) 946-2773

Charles River Watershed
EOEA Team Leader: Sarah Cohen
 251 Causeway Street, 9th Floor
 Boston, MA 02114
 (617) 626-1174

DEP Team Leaders
 Rachel Freed NERO
 (978) 661-7783
 Kevin Brander NERO
 (978) 661-7770
 Philip Nadeau CERO
 (508) 792-7650 x 3728
 Tena Davies, SERO
 (508) 946-2804

The Executive Office of Environmental Affairs Watershed Teams



Chicopee

EOEA Team Leader: Paul Lyons
Box 628
Belchertown, MA. 01007
(413) 323-8998

DEP Team Leader

Robert McCollum, WERO
(413) 755-2138
Eugene Brunelle, CERO
(508) 792-7650 x 3710

Connecticut Watershed

EOEA Team Leader: John O'Leary
c/o NRCS
243 King Street, Room 39
Northampton, MA 01060
(413) 587-9329

DEP Team Leader

Robert McCollum, WERO
(413) 755-2138

Deerfield Watershed

EOEA Team Leader: Christine Duerring
55 Federal Street
Hayburn Bldg – Room 290
Greenfield, MA 01301
(413) 773-7899

DEP Team Leader

Lawrence Golonka, WERO
(413) 755-2237

Farmington Watershed

EOEA Team Leader: Michael Parker
Hampton Ponds State Park
1048 North Road
Westfield, MA 01085
(413) 532-4450

DEP Team Leader

Lawrence Golonka, WERO
(413) 755-2237

French Watershed

EOEA Team Leader: John Desmond
627 Main Street
Worcester, MA 01608
(508) 767-2787

DEP Team Leaders: Eugene Brunelle, CERO
(508) 792-7650 x3710
Robert McCollum, WERO
(413) 755-2138

Housatonic and Hudson Watersheds

EOEA Team Leader: Thomas O'Brien
78 Center Street
Federal Building – Room 206
Pittsfield, MA 01201
(413) 447-9771

DEP Team Leader

Mark Schleeweis, WERO
(413) 755-2279

Ipswich Watershed

EOEA Team Leader: Richard Tomczyk
205A Lowell Street
Wilmington, MA 01887
Richard.Tomczyk@state.ma.us
(978) 661-7817

DEP Team Leader: Kellie O'Keefe, NERO
(978) 661-7765

Islands (Martha's Vineyard & Nantucket)

EOEA Team Leader: Patti Kellogg
EOEA, Waquoit Bay National Estuary Reserve
P.o. Box 3092
Waquoit, MA 02536
(508) 457-0648

DEP Team Leader: Tena Davies, SERO,
(508) 946-2804
Richard Wiles, SERO
(508) 946-2767

Merrimack Watershed

EOEA Team Leader: William Dunn
627 Main Street
Worcester, MA 01608
Phone: (508) 767-2799
DEP Team Leaders: Mark Casella, NERO
(978) 661-7771
Philip Nadeau, CERO
(508) 792-7650 x 3728



The Executive Office of Environmental Affairs Watershed Teams

Millers Watershed

EOEA Team Leader: Alice Rojko
627 Main Street
Worcester, MA 01608
(508) 792-7470 x 3855

DEP Team Leaders Robert McCollum,
WERO (413) 755-2138
Eugene Brunelle, CERO
(508) 792-7650 x 3710

Mt. Hope/Narragansett Watershed

EOEA Team Leader: Andrea Langhauser
20 Riverside Drive
Lakeville, MA 02347
(508) 946-2878

DEP Team Leaders Tena Davies,
SERO, (508) 946-2804
Richard Wiles, SERO (508) 946-2767

Nashua Watershed

EOEA Team Leader: Jo Anne Carr
180 Beaman Street
West Boylston, MA 01583
(508) 792-7421 x 501

DEP Team Leader
Robert Kimball, CERO
(508) 792-7650
x 3722

North Coastal Watershed

EOEA Team Leader: Lawrence Gil
205A Lowell Street
Wilmington, MA 01887
(978) 661-7746

DEP Team Leader
David Ferris, NERO
(978) 661-7740

Parker Watershed

EOEA Team Leader: Richard Tomczyk
205A Lowell Street
Wilmington, MA 01887
(978) 661-7817

DEP Team Leader Kellie O'Keefe,
NERO (978) 661-7765

Quinnebaug Watershed

EOEA Team Leader: John Desmond
627 Main Street
Worcester, MA 01608
(508) 767-2787

DEP Team Leaders
Robert McCollum, WERO
(413) 755-2138
Eugene Brunelle, CERO
(508) 792-7650 x 3710

South Coastal Watersheds

EOEA Team Leader: George Zoto
20 Riverside Drive
Lakeville, MA 02347
(508) 946-2739

DEP Team Leader Lawrence Dayian,
SERO (508) 946-2769

Shawsheen Watershed

EOEA Team Leader: William Dunn
627 Main Street
Worcester, MA 01608
(508) 767-2799

DEP Team Leader Rosalia Wollenhaupt,
NERO (978) 661-7816

SuAsCo Watershed

EOEA Team Leader: Michael Fleming
Box 155
Clinton, MA 01510
(978) 368-0216

DEP Team Leaders Frederik Schuele,
NERO (978) 661-7789
Heidi Davis, NERO (978) 661-7781
Philip Nadeau, CERO
(508) 792-7650 x 3728

Taunton Watershed

EOEA Team Leader: Patrick Rogers
20 Riverside Drive
Lakeville, MA 02347
(508) 946-2836

The Executive Office of Environmental Affairs Watershed Teams

DEP Team Leaders John Hamm,
SERO (508) 946-2737
Leslie O'Shea,
SERO (508) 946-2837

Ten Mile Watershed

EOEA Team Leader: Andrea
Langhauser
20 Riverside Drive
Lakeville, MA 02347
(508) 946-2878

DEP Team Leaders Tena Davies,
SERO, (508) 946-2804
Richard Wiles,
SERO (508) 946-2767

Westfield Watershed

EOEA Team Leader: Michael Parker
Hampton Ponds State Park
1048 North Road
Westfield, MA 01085
(413) 532-4450

DEP Team Leader

Lawrence Golonka,
WERO (413) 755-2237

State Agencies

Massachusetts Department of Environmental Protection Bureau of Resource Protection

Dennis Dunn
Watershed Planning Program
DEP Central Regional Office
627 Main Street
Worcester, MA. 01608
(508) 767-2874

Regional Non-Point Source Coordinators:

Northeast Region: Rosalia Barber
(978) 661-7816
Southeast: Jeffrey Brownell
(508) 946-2702
Central: Brian Duval
(508) 849-4027
Western Region: Tracey Miller
(413) 755-2162



Massachusetts Department of Environmental Management

Lakes and Pond Program Coordinator
251 Causeway Street
Boston, MA 02114
Tel: (617) 626-1395
Web site: www.state.ma.us/dem/programs/lakepond/lakepond.htm

Massachusetts Division of Fisheries, Wildlife and Environmental Law Enforcement

Riverways Program
175 Portland Street
Boston, MA 02114
(617) 727-0594 x106
Web site: www.state.ma.us/dfwele/

County Conservation Districts

Cape Cod

PO Box 296
West Barnstable, MA 02668
(508) 771-8757

Dukes

Box 1010
Edgartown, MA 02539
(508) 627-6165

Nantucket

PO Box 1146, Candlehouse Lane
Nantucket, MA 02554
(508) 825-9797

Franklin

243 King St., Room 39
Northampton, MA 01060-2329
(413) 585-1000 ext. 5

Worcester

Medical Arts Center Building
Room 100, 52 Boyden Rd.
Holden, MA 01520-2587
(508) 829-0168 x5

Hampden and Hampshire

243 King St., Room 39
Northampton, MA 01060-2329
(413) 585-1000 ext. 5

Berkshire

78 Center Street (Arterial)
Pittsfield, MA 01201-6117
(413) 443-1776

Bristol

PO Box 475, 84 Center Street
Dighton, MA 02715
(508) 669-6558

Norfolk

460 Main St.
Walpole, MA 02081
(508) 668-0995

Plymouth

Essex Conservation District
562 Maple St.
Hathorne, MA 01937
(978) 774-5578

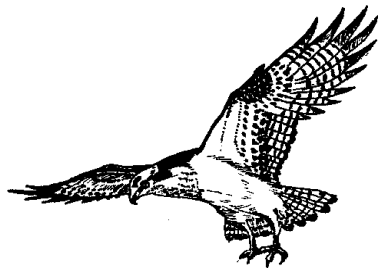
Middlesex

319 Littleton Road, Suite 205
Westford, MA 01886-4104
(978) 692-9395

Suffolk

PO Box 248
Boston, MA 02121-0248
(617) 265-6647





Regional Planning Agencies

Barnstable County Health and Environment Department

Barnstable (508) 362-2511

Berkshire County Regional Planning Commission

Pittsfield (413) 442-1621

Cape Cod Commission

Barnstable (508) 362-3828

Central Massachusetts Regional Planning Commission

Worcester (508) 756-7717

Franklin Regional Council of Governments Planning Commission

Greenfield (413) 774-1196

Martha's Vineyard Commission

Oak Bluffs (508) 693-3453

Merrimack Valley Planning Commission

Haverhill (978) 374-0519

Metropolitan Area Planning Commission

Boston (617) 451-2770

Montachusett Regional Planning Commission

Fitchburg (978) 345-7376

Nantucket Planning and Economic Development Commission

Nantucket (508) 228-7237

Northern Middlesex Council of Governments

Lowell (978) 454-8021

Old Colony Planning Council

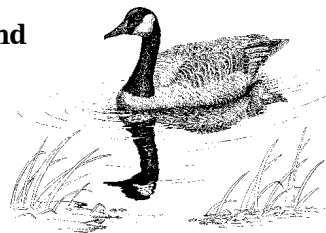
Brockton (508) 583-1833

Pioneer Valley Planning Commission

West Springfield (413) 781-6045

Southeastern Regional Planning and Economic Development District

Taunton (508) 824-1367



Other Contacts



The University of Massachusetts Cooperative Extension

212 Stockbridge Hall
University of Massachusetts
Amherst, MA 01003-0099
413-545-4800

The Massachusetts Water Watch Partnership

Blaisdell House
University of Massachusetts
Box 30820
Amherst, MA 01003-0820
413-545-5531 or 545-5532
Web site: www.umass.edu/tei/mwwp/
E-mail: mwwp@tei.umass.edu

The Massachusetts Water Resources Research Center

Blaisdell House
University of Massachusetts
Amherst, MA 01003-0820
413-545-5531 or 545-5532
Web site: www.umass.edu/tei/mrrc/
E-mail: godfrey@tei.umass.edu

The North American Lake Management Society (NALMS)

P.O. Box 5443
Madison, WI 53705-5443
608-233-2836
Web site: www.nalms.org
E-mail: nalms@nalms.org

Massachusetts Watershed Coalition

12 Pleasant Avenue
P.O. Box 577
Leominster, MA. 01453
978-534-0379
Fax: 978-534-1329
Web site: www.ultranet.com/~mwc/index.html

Massachusetts Congress of Lakes and Ponds (COLAP)

135 Washington Street
Holliston, MA. 01746
1800-845-2769
Fax: 508-429-5085
Web site: www.colap.com
e-mail: hildrethcr@aol.com

Massachusetts Lakes and Pond Association-West

e-mail: LAPAWEST@aol.com

Sources of Hydrologic Information

U.S. National Weather Service

Tel: (617) 561-5754

Web site: www.nws.noaa.gov/index.htm

U.S. Army Corps of Engineers

New England Division

696 Virginia Road

Concord, MA 01742-2751

Tel: (978) 318-8338

Web site: www.wes.army.mil/el/aqua

U.S. Geological Survey Water Resources Division

10 Bearfoot Road

Northborough, MA 01532 Tel: (508) 490-5000

Web site: ma.water.usgs



Massachusetts Publications

The Department of Environmental Protection

To obtain these publications contact a DEP Regional Service Center:

Northeast: (978) 661-7677, Southeast: (508) 946-2714,

Central: (5098) 792-7683, Western: (413) 755-2124

Some publications can also be found in the DEP Web site at:

<http://www.state.ma.us/dep>

Brochures:

- ▣ Lawns and Landscapes in Your Watershed
- ▣ TMDLs: Another Step to Cleaner Waters
- ▣ Don't Trash the Grass

Manuals and Guides:

Volume I: Stormwater Policy Handbook

This handbook provides information on the consistent implementation of the Stormwater Management Policy and performance standards. March 1997

Volume II: Stormwater Technical Handbook

Contains technical information on site planning and stormwater management techniques. March 1997

Nonpoint Source Management Manual: A Guidance Document for

Municipal Officials. May 1994 An extensive resource manual covering the causes and possible solutions for nonpoint source problems to Massachusetts waters. Currently out of print and being revised.

Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas: A Guide for Planners, Designers, and Municipal Officials. March 1997. A complement to DEP's Nonpoint Source Manual which covers an environmental planning and best management practice principals and methods. This document was produced in conjunction with other state and federal agencies and is currently out of print but will be accessible on the DEP's Web site by 2001.

Eutrophication and Aquatic Plant Management in Massachusetts.

This generic environmental impact report being produced in conjunction with the Department of Environmental Management's Division of Water Resources is intended to (1) provide technical guidance on lake management to lake and pond managers, conservation commissions, and citizens; and (2) help local and state officials make informed and consistent decisions about the use of lake management techniques by providing a sound scientific understanding of the potential benefits and drawbacks of each. This guide will be available in early 2001.

Newsletter

"**Waterline**" is a quarterly newsletter published by DEP's Bureau of Resource Protection. It includes news and information on drinking water, wastewater, wetlands, waterways, and watersheds.

Also available on DEP's web site :

Publications of the Division of Watershed Management, 1963 - 1999

This report contains an index by watershed of 612 technical reports and 63 technical memorandums published by DEP's Division of Watershed Management during the years 1963 to 1999.

1999 Grant and Loan Programs - Opportunities for Watershed Planning and Implementation

The DEP grant and loan programs consist of federal funds from EPA as authorized by the Clean Water Act (sections 604B, 104(b)(3) and 319). Other programs are derived through state appropriation. These include the state bond fund for research and demonstration and state loan programs for municipalities (state revolving loan fund (SRF)) and homeowners (community septic management program). Each of these programs provide an opportunity for watershed initiative planning and/or implementation. Please note the eligibility criteria, time frame for application and Department contacts for further information.

From the Department of Fisheries, Wildlife and Environmental Law Enforcement, Riverways Program

To obtain call (617) 727-1614 x360

Fact sheet # 8: Functions of Riparian Areas for Pollution Prevention. 1992

Brochures

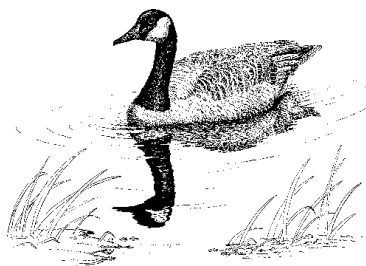
- ▣ The Riverways Programs...Building Partnerships for Protection
- ▣ Adopt-A-Stream Program
- ▣ Massachusetts Rivers are Coming Back...But They Need Your Help! 10 Ways to Protect Your Favorite River, Brook or Stream.
- ▣ Citizen Participation in the NPDES Process--How to Protect Your River or Stream.
- ▣ Clean Rivers Begin at Home: A Guide to Understanding Nonpoint Pollution.
- ▣ Shoreline Surveys: Action Tool



Newsletter

Published 3 times a year, the Riverways Newsletter gives information about the Riverways and Adopt-A-Stream Programs as they are implemented across the state. It also reports on related activities of community and volunteer citizen groups and other state agencies around the state in protecting watershed resources, rivers and streams.

Guides



Adopt-A-Stream Workbook: How to Protect Your River, Stream or Brook. Step-by-step guidelines for community groups to use in protecting local resources.

Adopt-A-Stream Shoreline Survey: A Stream Team Monitoring Project. Includes setting goals, recruiting volunteers, creating maps, conducting training sessions, gathering and presenting data, evaluating findings, and taking action. (57 pages)

Adopt-A-Stream Educational Packet. A collection of Riverways materials on river resources protection best suited to school and youth groups and lists of related resources.

Guidelines for Gathering and Mapping Ownership and Other Data for River Corridor Lands [excerpt from the forthcoming Riverways' Guide to River Corridor Mapping and Land Protection]. Provides watershed associations with step-by-step suggestions for making a base map showing parcel demarcations within the river corridor. Includes information on land protection and forming a local land trust.

Maps

Massachusetts River Basins: a 2'x3' map depicting the state's 28 major watersheds and the rivers, streams and other major water bodies located within them.

Massachusetts Coastal Zone: a 2'x2' map depicting the coastal watersheds and rivers that flow into the Massachusetts Bays.

Videos

Watershed Protection, Clean Water, and Nonpoint Source Pollution Prevention videos are available for short term loan.

From the Department of Environmental Management, Office of Water Resources, Lakes and Pond Program Coordinator: To obtain call: (617) 626-1395

The Lake Book: Actions You Can Take to Protect Your Lake. Developed in conjunction with the Massachusetts Congress of Lakes and Ponds as a resource to lakefront property owners to encourage stewardship of their lake.

From the Department of Food and Agriculture, Pesticide Bureau
To obtain call: (617) 727-3020

A Homeowner's Guide to Environmentally Sound Lawncare: Maintaining a Healthy Lawn the IPM Way. 1997

The SuAsCo Watershed Project

Volunteer efforts go a long way in achieving success, shown by the involvement of volunteers in the SuAsCo watershed. The SuAsCo watershed refers to the drainage area of the Sudbury, Assabet, and Concord Rivers.

The Assabet, Sudbury, and Concord Rivers suffer from excessive algae and aquatic plant growth, low dissolved oxygen, and offensive odors caused by excess nutrients, such as phosphorus, which enter the rivers and tributaries from wastewater treatment plants and nonpoint sources (NPS). Population growth and housing development contributed to the declining water quality by increasing runoff from construction sites and taxed sewer systems. The communities located in the SuAsCo watershed realized that the integrity of the rivers was becoming compromised by the tremendous amount of pollutants finding their way to the water. Recreational activities were becoming jeopardized as plant growth and odors became more prevalent from excessive nutrient pollution. Volunteer associations were organized as a grass roots effort to address the problems that were being created by the accelerated growth of the area. These groups acquired state and federal funding to provide technical aid in the identification of problems found throughout the watershed.

As a result of the volunteer data collected in the watershed associations, the Massachusetts Department of Environmental Protection (DEP) and U.S. Environmental Protection Agency (EPA) categorized the Assabet River as “impaired,” which means stricter pollution controls are needed to ensure a healthy river. In 1998, DEP began assessing the amount of pollutants the Assabet River could receive and still meet state water quality standards. This process known as a total daily maximum load allocation, or TMDL, would provide the knowledge and understanding to make many important decisions necessary to restore and protect the SuAsCo watershed community.

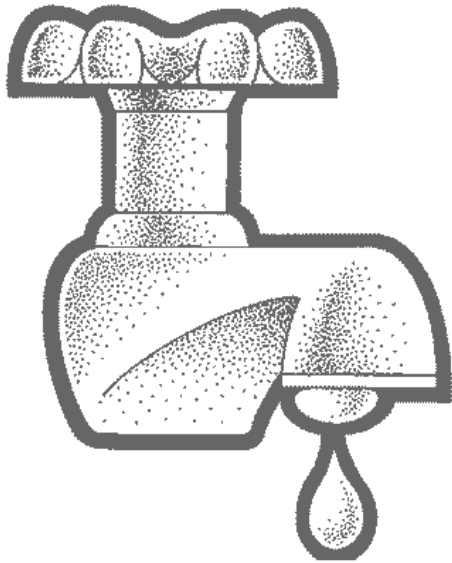
The information gathered from the volunteer associations also lead to community-run workshops to educate the public about the hazards and implications of phosphorus, to provide information about phosphorus reduction

technologies, and involve communities that are affected by the phosphorus problem. These workshops were sponsored by the Middlesex Conservation District, the Organization for the Assabet River, the SuAsCo Basin Team, and the SuAsCo Community Council, and funded by the Massachusetts Executive Office of Environmental Affairs.

Such community involvement with state and federal agencies will make the realization of a healthier watershed a reality and provide an example for other communities facing a similar situation.



Protecting Your Drinking Water



There are 176 lakes in Massachusetts that are active drinking water sources. Each public water system is responsible for conducting regular inspections of the reservoir and its watershed and for enforcing the protection requirements of the Massachusetts Drinking Water Regulations, 310 CMR 22.00.

The regulations prohibit swimming and other human or animal contact with the water and restrict land uses that may cause contamination of drinking water reservoirs. Other recreational activities on the reservoir and on system-owned watershed lands are left up to the discretion of the local Board of Water Commissioners. The Commissioners consider both the availability of staff and other local resources to adequately monitor recreational activities and the vulnerability of the drinking water source when making their decisions.

DEP encourages the multi-barrier approach to drinking water protection. This includes source protection, water quality sampling, and treatment. DEP helps suppliers, local officials, and watershed groups in their efforts to protect drinking water sources. This assistance includes conducting sanitary surveys, providing guidance manuals and public education materials, technical workshops, and on-site technical assistance.

The Drinking Water Program's (DWP) "Developing a Local Surface Water Supply Protection Plan" offers a step-by-step guide for water suppliers to write a plan that identifies local drinking water protection concerns and specific actions to address them. DWP's Source Water Protection Grant Program provides funds to public water systems, local officials, regional planning agencies, and watershed groups to plan and implement local protection measures.

As part of the requirements of the federal Safe Drinking Water Act, DWP is conducting the Source Water Assessment Program to identify and map potential contaminant sources at the 3000+ drinking water sources in Massachusetts. After meeting with suppliers and local officials to discuss findings, DEP will issue a final report for each system that will include recommendations for improving local protection.

Reports will also be made available to the public. DEP encourages individuals and local groups to assist and support water suppliers in implementing protection measures. Volunteers will find a wide range of opportunities available, from conducting stream surveys to assisting with the development of a local protection plan.

More information about drinking water protection can be obtained by visiting DEP's web site at www.state.ma.us/dep or by calling the Drinking Water Program at 617-292-5727.

Glossary



Algae: Small simple plants without roots, that grow in the water. Blue-green algae are typically found in waters with high concentrations of phosphorus.

Algal Bloom: A growth of algae resulting from excessive nutrient (phosphorus) levels or other physical and chemical conditions that enable algae to reproduce rapidly. The overgrowth of algae can form scums and mats, and reduce the amount of oxygen in water when they decay.

Best Management Practices: (BMPs) Conservation practices to reduce nonpoint source impacts from construction, agriculture, timber harvesting, marinas, and stormwater. Information describing these techniques has been developed by Massachusetts (see appendices E and G).

Biological Contaminant: (pathogen) An agent such as a virus, bacterium, or fungus that can cause disease in humans.

Buffer: (vegetated buffer) Areas of vegetation, left undisturbed or planted between a developed area and a waterbody. Buffer vegetation should include trees, shrubs, bushes, and ground cover plants.

Channel: A pathway to carry runoff, such as a ditch between two banks or the bed where a natural stream of water runs.

Channelized Flow: Flow that is concentrated in a channel, rather than spreading thinly and evenly over the land surface.

Coldwater Fishery: Fishery habitat that supports trout and salmon.

Comprehensive Lake Management Plan: A plan to protect lake water quality by including educational and regulatory measures to minimize phosphorus and other pollutant inputs from new development in the lake watershed as well as existing development.

Contour: An imaginary line on the surface of the earth, or a line drawn on a map, connecting points of the same elevation.

Culvert: A conduit through which surface water can flow under or across roads and driveways. Culverts are usually a pipe and can be made of metal, wood, plastic, or concrete.

Cultural Eutrophication: The accelerated aging process of lakes by human activities that overload waterbodies with nutrients and sediments.

Cumulative Impact: The combined environmental impacts that accrue over time and space from a series of similar or related individual actions, contaminants, or projects. Although each action may seem to have a negligible impact, the combined effect can be severe.

Database: A collection of data (such as water quality monitoring data, soils data, and land use data.) that has been arranged for ease and speed of retrieval, usually by computer.

Demonstration Project: A project or a place that is used to demonstrate how to implement best management practices to reduce or eliminate polluted runoff.

Ditch Turnout: A best management practice used to direct runoff in a ditch into a vegetated buffer. This shortens the distance that runoff travels in a ditch, thus reducing volume and speed of the water traveling in the ditch and preventing ditch erosion. A turnout prevents runoff in a ditch from reaching a stream or other water body by directing water into a vegetated buffer.



Diversion: A best management practice used to intercept and direct surface runoff. Diversions are usually channels or depressions with a supporting ridge on the lower side, constructed across or at the bottom of a slope.

Duff Layer: A layer of needles, leaves, and decaying organic matter on the forest floor.

Ecosystem: The interacting system of living organisms with one another and their physical environment.

Erosion: Wearing away of rock or soil by the gradual detachment of soil or rock fragments by water, wind, ice, and other mechanical and chemical forces. Human activities can greatly speed this detachment.

Erosion Controls: Physical measures installed prior to and through the duration of filling or grading activities in order to prevent soil erosion. A silt fence is an example of an erosion control; it is a physical barrier installed along the perimeter of a earthmoving activity. Water can pass through the fence but soil cannot. Hay mulch is another example; when spread over bare soil it prevents rainwater from eroding the soil.

Flushing Rate: The time it takes for the entire volume of the lake's water to be exchanged, usually expressed in years. Lake biologists calculate the flushing rate by dividing the annual water outflow from the lake by the lake volume. This information is useful to determine the lake's sensitivity to inputs of phosphorus and pollutants.

Food Chain: A representation of the succession of organisms in a community through which energy is transferred. Each type of organism is a "link" in the chain, which feeds on and obtains energy from the one preceding it and in turn is eaten by and provides energy for the one following it.

Habitat: A place used by plants and animals to live, feed, find shelter, and reproduce.

Impervious Surface: A hard surface area that either prevents or retards the entry of water into the soil as under natural conditions prior to development and/or a hard surface area that causes water to run off the surface in greater quantities and at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, rooftops, walkways, patios, driveways parking lots, storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam, or other surfaces.

Intermittent Stream: A stream that flows during part of the year.

Lake Ecology: The study of living things in and around a lake and their relationships to each other and their environment.

Metabolism: The chemical and physical processes of an organism in order that maintain life.

Mitigation: Corrective action to eliminate nonpoint pollution sources from a watershed, or to reduce their impacts on a water body.

Monitoring: (water quality monitoring) Assessing the condition of a waterbody over time by collecting physical, chemical, or biological information.

Mulch: A layer of hay or other material covering the land surface that holds soil in place so that it does not erode. It aids in the establishment of vegetation by holding the soil in place, conserving moisture, and minimizing temperature fluctuations.

Nonpoint Source: An indirect discharge, not from a pipe or other specific source, usually as a result of stormwater runoff.

Nutrients: Any substance required by plants and animals for normal growth and maintenance. Enriched nutrient loads from land runoff, septic systems, and atmospheric deposition can result in excessive growth of algae and lead to degradation of water quality. Phosphorus is generally the nutrient of concern in lakes.

Phosphorus: An element found throughout the environment; it is a nutrient essential to all living organisms. Phosphorus binds to soil particles, is found in fertilizers, sewerage, and motor oil, and is found in high concentrations in stormwater runoff. The amount of phosphorus present in a lake determines the lake's production of algae. A very small change in phosphorus levels can dramatically increase algae growth.

Phosphorus Control Method: A methodology that sets forth criteria to minimize phosphorus entering a lake from new development in a lake watershed. The method is used by towns to review new development plans, and by developers as they plan new development.

Phosphorus Load: The amount of phosphorus entering a lake in a given time period.

Point Source: Any confined and discrete conveyance (usually a pipe) from which pollutants are or may be discharged into a watershed.

Polluted Runoff: Runoff that has picked up contaminants or nutrients from the landscape (or air), as it flows over the surface of the land to a waterbody.

Project Manager: The person that leads and manages the watershed survey project.

Rills: Small gullies or channels that can be seen on the surface of bare soil as a result of soil particles being washed away through erosion.

Runoff: Precipitation or snowmelt that runs off the land and into waterbodies. It can carry pollutants from the air and land into a water body (polluted runoff).

Saturated: Soaked with moisture and unable to hold or contain more. A saturated soil has all of the spaces between the individual soil particles filled with water.

Scouring: As it pertains to this manual, the removal of soil particles by stormwater runoff from streambanks, channels such as ditches, or other areas.

Sector: (Survey area) A geographic portion of the watershed assigned to a survey team.

Sediment: Mineral and organic soil material that is transported in suspension by wind or flowing water, from its origin in another location.

Sediment Loading: The amount of sediment entering a lake.

Silt Fence: A physical barrier used to control the erosion of soil. It is made of a plastic fabric that allows water to pass through and not soil.

Site: The location or place of something. As it pertains to watershed surveys, the place that is generating polluted runoff.

Stakeholder: Anyone who lives in the watershed or represents major land uses or interests in the watershed.

Stormwater Runoff: Runoff caused by rain or snow storms.

Stream: (River, stream, or brook) A channel between defined banks including the floodway and associated flood plain wetlands where the channel is created by the action of the surface water and characterized by the lack of upland vegetation or presence of aquatic vegetation and by the presence of a bed devoid of top soil containing waterborne deposits on exposed soil, parent material or bedrock.



Surface Water: Water that has a surface exposed to the atmosphere.

Swale: A natural depression or a constructed wide shallow ditch that runoff flows through.

Technical Team: In a watershed project, the individuals responsible for providing training, technical advice, and review and analysis of data gathered by the steering committee and volunteers.

TMDL: A total maximum daily load (TMDL) is the greatest amount of a pollutant that a waterbody can accept and still meet water quality standards for protecting public health and maintaining the designated beneficial uses of those waters for drinking, swimming, recreation, and fishing.

Topographic Map: A map that represents the shape of the land surface with contour lines and the location of physical features such as waterbodies, streams, woods, buildings, and roads. Contour lines can be used to measure the height of mountains or the steepness of slopes. The US Geological Survey has produced topographic maps of all of the land in the United States.

Topography: The physical features of a region such as the relief of the landscape and positions of waterbodies.

Toxic: Poisonous, carcinogenic, or otherwise directly harmful to humans and other living creatures.

Tributaries: Streams or rivers that flow to a larger body of water.

Turbid: A term used to describe water that is clouded by soil or organic particles.

Vegetated Buffer: Areas of vegetation, left undisturbed or planted between a developed area and a waterbody that are used to capture pollutants from surface water and groundwater. Buffer vegetation can include trees, shrubs, bushes, and ground cover plants.

Velocity: The speed of an object or substance.

Volunteer Coordinator: In a watershed project, the person that serves as a point of contact for volunteers, coordinates the volunteer activities, and collects data gathered by volunteers. The volunteer coordinator serves on the steering committee.

Waterbar: A diversion ditch and/or hump installed across a trail or road to divert runoff from the surface before the flow gains enough volume and velocity.

Water Body: Watercourse or lake, pond, river, stream, or ocean.

Water Quality: Pertaining to the presence and amount of pollutants in water.

Watershed: The geographic region within which water drains into a particular river, stream, or body of water. A watershed includes hills, lowlands, and the body of water into which the land drains. Watershed boundaries are defined by the ridges of land separating watersheds. All land is located in a watershed.

Watershed Management: The long term management of the watershed through phases of assessment, planning, and implementation and evaluation. Throughout these phases, education plays a major role in reaching set goals.

Wetlands: Low lying areas inundated or saturated by water at a frequency and duration sufficient to support wetland vegetation. Some of their valuable functions to include holding runoff, and removing pollutants through a series of chemical, physical, and biological mechanisms.



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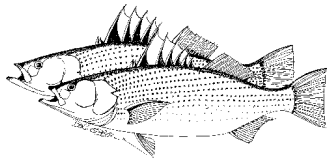
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