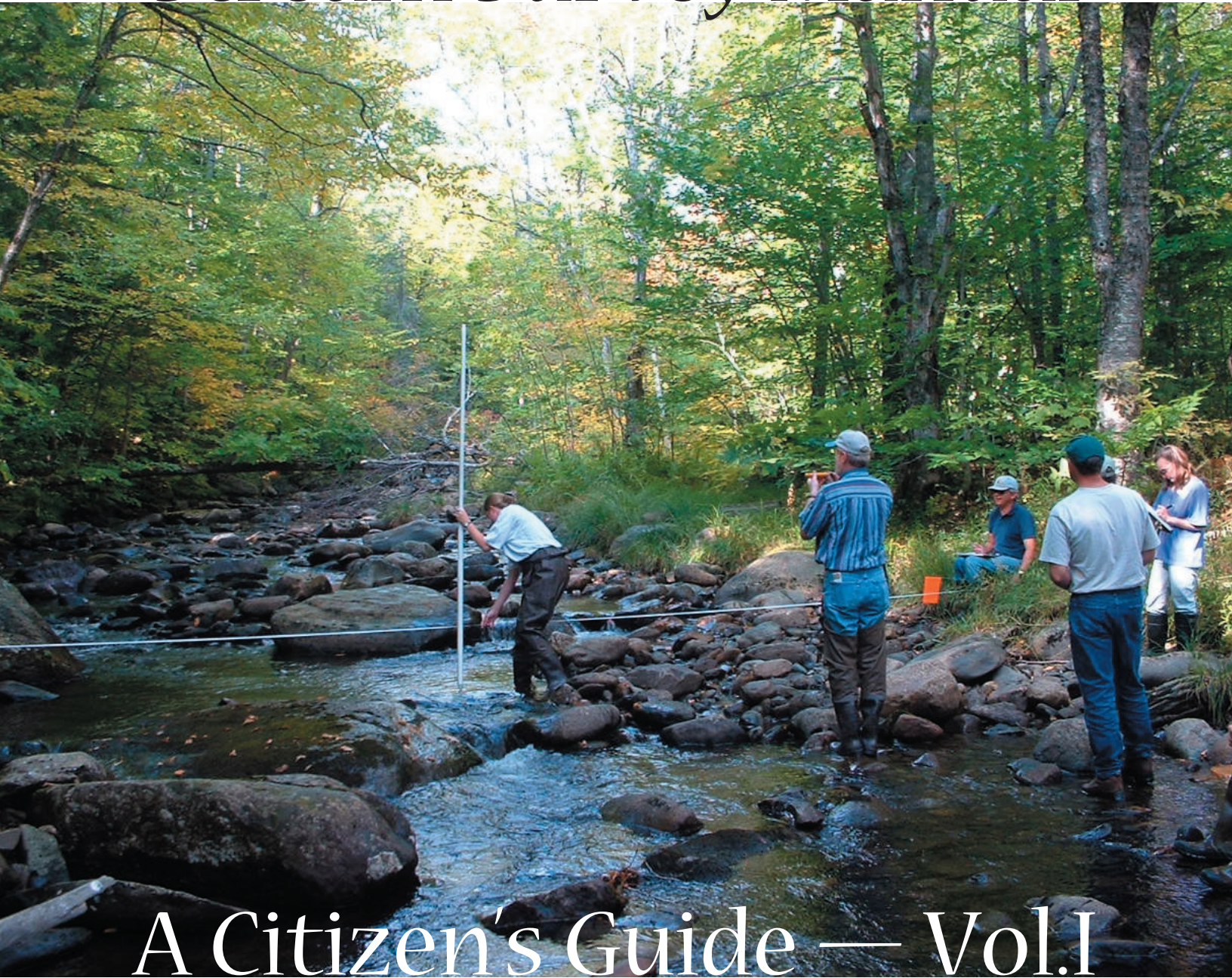# Stream Survey Manual

A Citizen's Guide — Vol. I

A CITIZEN'S GUIDE
to Basic Watershed, Habitat, and Geomorphology Surveys in Stream and River Watersheds — Volume I

prepared by the Maine Stream Team Program of the Maine Department of Environmental Protection

MAINE STREAM TEAM PROGRAM
MSTP

A CITIZEN'S GUIDE
to Basic Watershed, Habitat, and Geomorphology Surveys in Stream and River Watersheds — Volume I

February 2009

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to Basic Watershed, Habitat, and Geomorphology
Surveys in Stream and River Watersheds — Volume I

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PLEASE NOTE: It may be that some links will not connect properly, occurring usually if the URL appears in two lines rather than one. Additionally, certain illustrations may not appear clearly. We welcome your comments (Please mail to: Jeff Varricchione, MDEP, 312 Canco Rd., Portland, ME 04103)

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Unit 1:

Introduction

**Maine is home to
the last remaining
populations
of wild Atlantic
salmon
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and those
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Maine is an
important habitat
for Eastern
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Unit 1: Introduction

There are roughly 45,000 miles of streams and rivers in Maine. These streams and rivers serve as habitats and sources of food for many different types of organisms during part or all of their lives.

Maine is home to the last remaining populations of wild Atlantic salmon in the U.S., and those populations remain at critically low numbers. Maine is an important habitat for Eastern brook trout populations in the U.S.

It is also home to a unique blend of certain aquatic insect, crustacean, mollusk, and plant species; as well as home to many exciting and charismatic reptiles, amphibians, birds, and mammals which rely on streams for sources of water and food.

These stream and river ecosystems also provide much aesthetic beauty; they carry water, nutrients, and food resources to downstream waterbodies such as lakes and the ocean; and they provide important economic benefits (e.g., tourism, fishing, recreation, hydropower, industrial process water, etc.) to Maine and its citizens.

The health of streams, rivers, and the organisms that live in them depends on good water quality and aquatic habitat conditions. Humans, however, can disturb and degrade these conditions through land-use and water-use activities that are not done properly or carefully. Maine is no exception. While it has many beautiful miles of pristine or near-pristine waterways, a significant amount of its stream and river miles has been damaged and impacted.

In order to maintain or improve water quality and habitat conditions, these resources need to be assessed, managed, and protected. Nearby human activities must be done with care and according to the latest standards (sometimes referred to as "best management practices" or BMPs).

Volunteers play an important role in assessment and protection activities because the budgets and staffs of state, federal, academic, private, and nonprofit agencies and organizations can only go so far.

■ **Some examples of volunteer activities include:**
  • forming and operating watershed groups, stream teams, and land trusts;
  • doing streamside tree buffer plantings, trash clean-ups, and stormdrain stenciling projects; and
  • educating the public about ways to reduce its contribution of pollution to Maine's waterways.

■ **Surveys are another great activity in which volunteers can participate.**
  • In general, a survey is an activity which gathers information about a particular topic or place. (For the purposes of this manual, the term "survey" refers to people [volunteers, watershed managers, scientists, etc.] going out and collecting information about a stream [or river], the land around that waterbody, or both.)

- Surveys are an excellent way for volunteers to help gather important information about streams and rivers, their shoreland areas, and the land surrounding them.
- The survey results can be used to educate the participants, their neighbors, and municipal/state officials about the stream and any potential high-value habitats it may have; and/or potential problems that may threaten or exist in their stream watershed.
- Survey information can then be analyzed and used to make better informed management and conservation decisions related to natural resources.

This guide is designed to help volunteer group leaders and, to some extent, the volunteers themselves learn:

- some basic watershed concepts,
- how to organize and carry out basic stream watershed surveys and stream corridor surveys,
- how to use standardized methods so that the information collected in various watersheds and streams around the state can be readily compared. *(Details about these activities are contained in other units later in this guide.)*

For the sake of simplicity in this manual, the term *stream* is used to represent brooks, creeks, and rivers in addition to streams.

Let us begin by summarizing the types of information covered in the remaining units and appendices of this guide:

■ Unit 2: Stream, River, and Watershed Basics — An Overview

This unit explains the very basics about streams and watersheds needed before conducting a survey.

For a more detailed discussion about these topics, the reader is referred to the Maine Stream Team Program guide, *Volume 2: A Citizen's Primer on Stream Ecology, Water Quality, Hydrology, and Fluvial Geomorphology*. To download a copy, visit the Maine Stream Team Program website: http://www.maine.gov/dep/blwq/docstream/team/streamteam.htm.

Alternatively, if an introductory level of information regarding streams is desired, the reader is referred to the brief, but informative, booklet, *STREAMS,* a project of the Gulf of Maine Aquarium (and funded by the MDEP). It is available online at: http://octopus.gma.org/streams/streams.html or in paperback form from the Maine Stream Team Program *(for contact info, visit the website mentioned above)*.

■ Unit 3: Survey Basics — Purpose, Getting Started, and Organization

This unit discusses different types of surveys that can be done by volunteers, including stream watershed surveys and stream corridor surveys (Level 1), and how to determine the best option for your group (in some cases both are recommended). The remainder of this unit provides instructions on certain organizational steps that are common to both stream watershed surveys and stream corridor surveys.

■ Unit 4: Safety and Private Property

This unit discusses two very important considerations related to conducting stream surveys — accessing private property and planning for safety.

■ Unit 5: Stream Corridor Survey (Level 1)

This unit details the steps required for organizing and completing a volunteer survey that examines the status of aquatic and shoreland/riparian habitat, water quality, and geomorphic (channel shape) stability.

■ Unit 6: Stream Watershed Survey
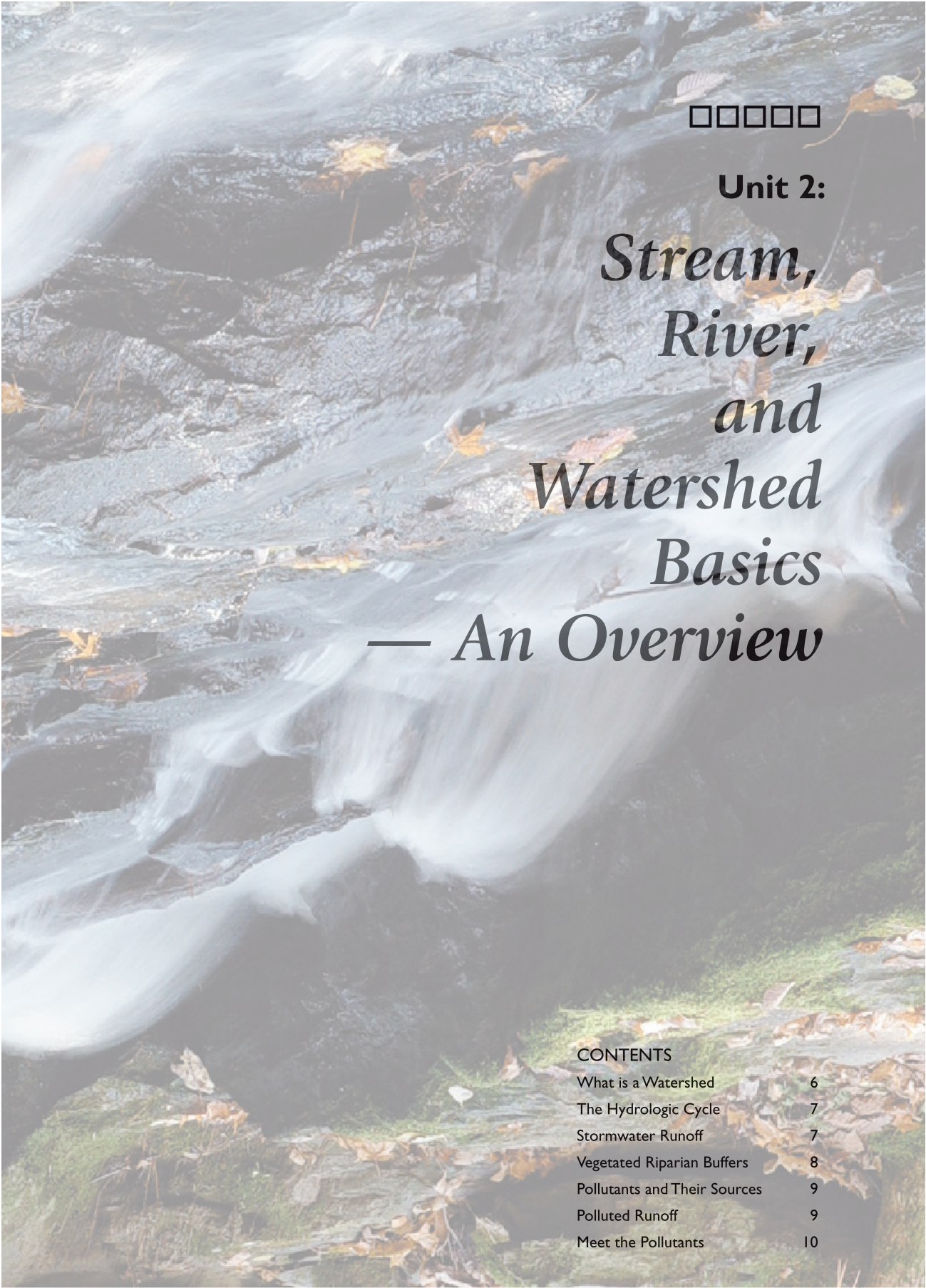
This unit details the steps required for organizing and completing a volunteer survey that examines the lands in the watershed around a stream for potential or existing sources of pollution or stress which could degrade water quality or habitat conditions in that particular stream. (The term *watershed* is described in the beginning of Unit 2.)

■ Unit 7: Take Action

This unit lists suggested steps one can take after gathering and analyzing data collected during stream surveys.

■ Appendices

The appendices in the back of this guide contain important information and data sheets related to various aspects of Units 2 through 7.

Unit 2:

Stream, River, and Watershed Basics — An Overview

CONTENTS

Unit 2:
Stream, River, and Watershed Basics – An Overview

This unit explains the very basics about streams and watersheds needed before conducting a survey. Appendix A contains a glossary that may be helpful too.

The Ups and Downs Along Water's Path…
…all about stormwater runoff and its contents

Stormwater, which consists of rainwater and melted ice and snow, flows over the landscape into streams and rivers, and eventually into lakes, ponds, or the coast. Along the way, it picks up and carries with it contaminants largely produced by humans. Stormwater that carries contaminants is called *polluted runoff*, or **nonpoint source pollution *(NPS)***; that is, not coming from a single point source — such as a discharge pipe at a factory or industrial plant.

Polluted runoff is diffuse, and its sources are diverse and difficult to identify. Yet it's every bit as damaging as point source pollution. Contaminants found in polluted runoff include oil, trash, sediment, metals, toxics, nutrients, and sewage.

To understand how polluted runoff affects stream water quality, it is important to understand the concepts of watershed, the water cycle (hydrologic cycle), stormwater runoff, and vegetated buffers, all of which are described in the remainder of this unit.

■ What Is a Watershed?
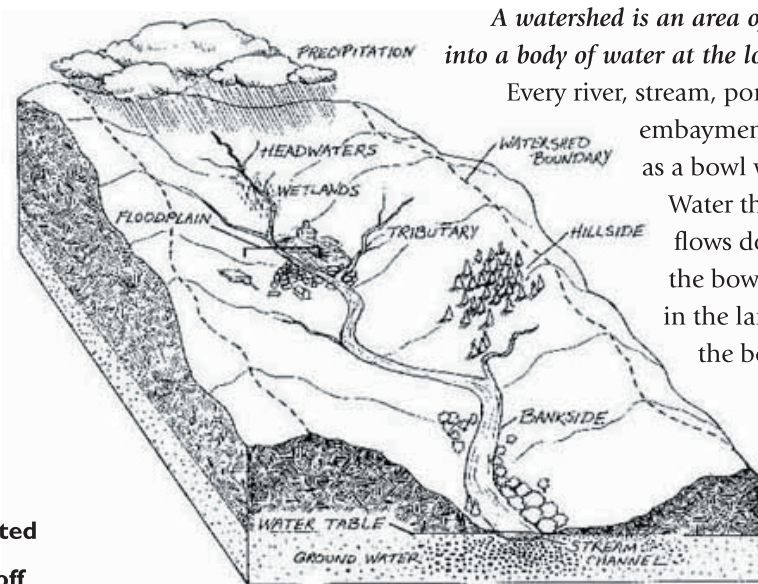
A watershed is an area of land from which water drains downhill into a body of water at the low point in the landscape.

Every river, stream, pond, wetland, lake, estuary, or coastal embayment has a watershed. Imagine a watershed as a bowl with a pool of water at the bottom. Water that falls onto the inside rim of the bowl flows down along the surface to the bottom of the bowl. Much like a bowl's rim, high points in the landscape, such as ridges and hilltops, are the boundaries that separate watersheds.

The shape and size of watersheds are determined by the topography of the land. For example, a coastal watershed may be comprised of several smaller watersheds of tributary streams and rivers.

(Source: USEPA)

Polluted runoff is diffuse, and its sources are diverse and difficult to identify.

For a more detailed discussion about these topics, the reader is referred to the Maine Stream Team Program guide, ***Volume 2: A Citizen's Primer on Stream Ecology, Water Quality, Hydrology, and Fluvial Geomorphology.*** To download a copy, visit the Maine Stream Team Program website : http://www.maine.gov/dep/blwq/docstream/team/streamteam.htm.

Alternatively, if an introductory level of information regarding streams is desired, the reader is referred to the brief, but informative booklet, ***Streams.*** This booklet is a project of the Maine DEP and Gulf of Maine Aquarium, and is available online at: http://octopus.gma.org/streams/streams.html.

■ The Hydrologic Cycle

Water continually cycles from earth to the atmosphere and then back to earth again. Water evaporates from oceans, lakes, rivers, and streams into the atmosphere, where it later precipitates as rain or snow. Rain or melted snow runs off, through watersheds, into surface waters and infiltrates the soil and rock, where it becomes groundwater.

Some water goes directly back into the atmosphere through plants. Groundwater eventually discharges to streams, lakes, wetlands, or oceans.

The sun's heat drives the processes that cycle the water: **evaporation, condensation,** and **precipitation**. Because the amount of water on earth is finite, it is critical to keep it clean as it moves through the hydrologic cycle.
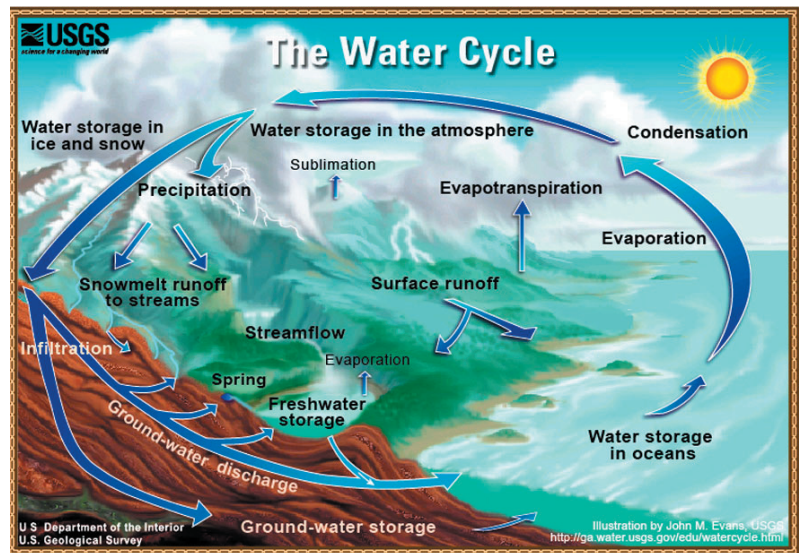
■ Stormwater Runoff

Stormwater runoff is water that runs over ground that is saturated or covered by hardened surfaces. The volume and flow rate of stormwater increases when we change the nature of ground surfaces in the following ways:

- smoothing out irregularities in the landscape by filling and grading;

- increasing the amount of ground covered by hard surfaces — "impervious" areas such as rooftops, parking areas, and roads where water runs off without soaking into the ground;

- reducing the amount of forested area or naturally vegetated areas.

In undeveloped watersheds, forests and other vegetated areas act like a sponge. They soak up stormwater and slowly release it to rivers and streams. Through vegetated buffers, stormwater reaches streams, rivers, and downstream waterbodies more gradually and cleaner.
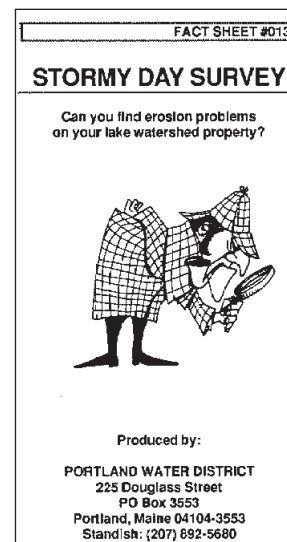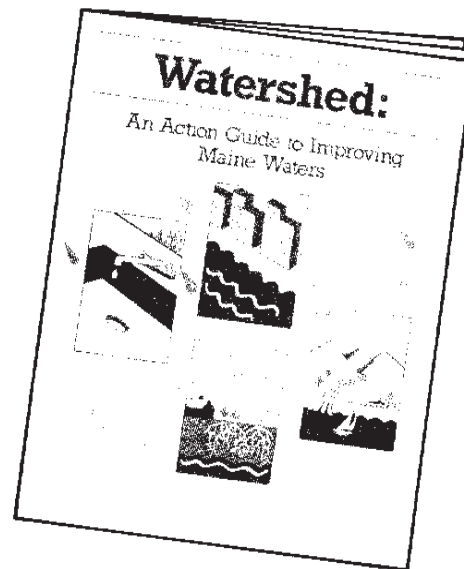
■ Vegetated Riparian Buffers

Riparian zones are areas adjacent streams, rivers, and other waterbodies, and include streambanks and floodplains. They are areas of trees, shrubs, and other vegetation between an upland area, that often is developed, and a water body. Vegetated riparian zones are important components of stream (and other waterbody) ecosystems that are highly valuable towards keeping water clean.

Vegetated riparian "buffers" are tools that watershed managers and landowners manage or restore in landscapes altered by humans, to protect streams and other waterbodies. These buffers can include trees, shrubs, bushes, and ground cover plants.

The irregularities and depressions of the ground in natural buffers retain and treat polluted runoff, because water is allowed to percolate into the ground. Forested areas are most effective in the retention of stormwater because of the duff layer (thick, soft layer) of decomposing pine needles, bark, leaves, and other organic material that has fallen on the ground. The duff layer in forests can be up to several inches thick — an incredible natural sponge! Over time, planted buffers can be as effective as natural ones.

Buffers prevent pollutants from reaching surface waters in several ways: they filter pollutants out of stormwater, they slow the flow rate of stormwater runoff, and they reduce the volume of stormwater runoff. Additionally, vegetated riparian zones (or managed "buffers") along rivers and streams also provide values such as shading, habitat, and food sources for wildlife and aquatic organisms.

WATER BALANCE

Canopy Interception

Evapo-transpiration

Surface Runoff

Interflow   Baseflow

Natural

Transpiration

Surface Runoff

Interflow

Baseflow

Urban/Surburban

STREAMFLOW

Large Storm

Higher and More Rapid Peak Discharge

Small Storm

PRE-DEVELOPMENT
POST-DEVELOPMENT

More Runoff Volume

Larger and Less Rapid Peak

Gradual Recession

Higher Baseflow

STREAM FLOW RATE

TIME

The Pollutants and Their Sources

■ Polluted Runoff and Its Threat to Streams, Rivers, and Receiving Waters

In the past, rivers, streams, and other waterbodies were disposal areas for untreated industrial and manufacturing wastes and raw sewage discharged from point sources. People thought that these waters had a limitless ability to dilute pollutants. However, years of discharging pollutants in some areas of the country led to waters that were toxic to aquatic life and humans.

Point source pollution discharges were addressed when the Federal Clean Water Act was passed in the early 1970s. Industrial and municipal wastewater discharges were regulated, pollutant loads were reduced, and municipalities constructed sewage treatment plants with federal funds. State programs, such as the Small Community Grants Program and the Overboard Discharge Program, have funded the removal of untreated discharges and the elimination of overboard discharge pipes (and *combined sewer overflows* [CSOs]). These changes have resulted in great improvements to the quality of Maine's waters.

Today, it is *nonpoint source pollution (NPS)* (also known as *polluted runoff* or *polluted stormwater*) that poses the greatest threat to Maine's waters, particularly as urban and suburban populations increase.

• The driving forces of the hydrologic cycle and the topography of a watershed carry nonpoint source pollution from the land into rivers, streams, wetlands, groundwater, and eventually into receiving waters such as lakes and coastal waters.

• Human activities on land and water generate pollutants such as sediments, nutrients, toxics, and pathogenic organisms (e.g., harmful types of bacteria). Human transformation of natural forest land into impervious surfaces, such as roads, parking lots, and rooftops, can decrease the infiltration of precipitation into the ground and thus increase the speed and volume of runoff and any pollutants it may carry.

• Many Maine towns are experiencing rapid growth. The potential cumulative impacts of many small activities connected with this expansion can degrade water quality. Runoff from a single fertilized lawn seems like a small problem; however, contaminated runoff from many lawns in the watershed, year after year, may have a severe cumulative impact.

These pollutants threaten the health of our environment, our people and our economy. The investment we could make to prevent pollution is minimal compared to the potential costs of losing our water resources. Some of these pollutants can come from natural sources: weathering of soils, wildlife, and decomposing vegetation. **Most polluted runoff is caused by, and can be reduced by, humans.**
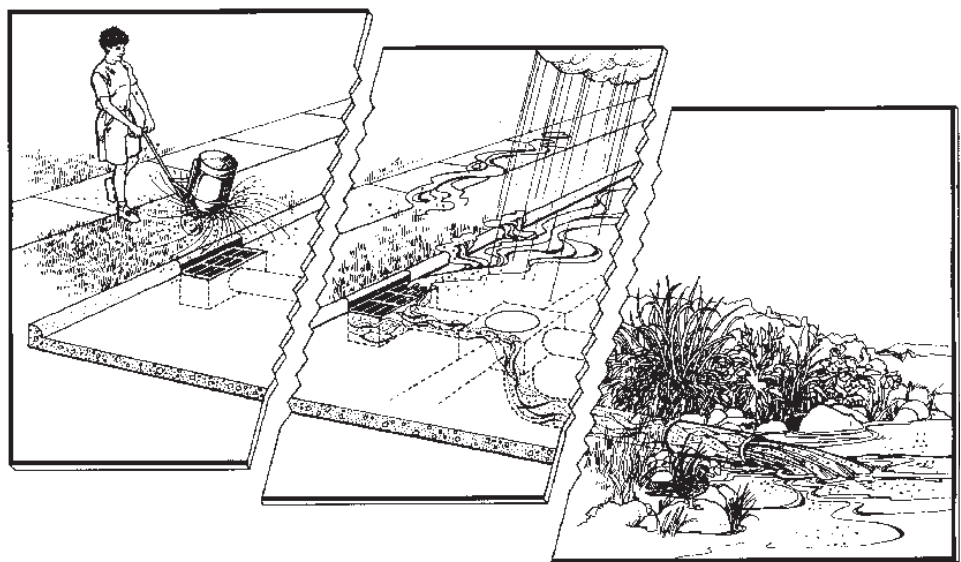
■ Meet the Pollutants:
Sediments, Nutrients, Toxics, Pathogenic Organisms

SEDIMENTS

Sediments (sand, silt, and other soil particles) suspended and transported in streams, rivers, and other waterbodies are harmful in several ways:

- they fill in the spaces between gravel in stream bottoms, eliminating spawning areas of many fish, suffocating any eggs present, and eliminating habitats for fish food such as aquatic insects (e.g., stoneflies, mayflies, etc.) and other invertebrates;

- they reduce visibility, which interferes with fishes' ability to feed;

- they raise water temperature, which reduces the amount of oxygen in the water;

- they clog the feeding apparatus of filter feeders;

- they damage fish and aquatic insect gills;

- they block sunlight, which impairs photosynthesis of aquatic plants;

- they carry **nutrients (e.g., phosphorous) and toxins,** which cling to settled or suspended sediments, resulting in impaired ecosystems, public health risks, and negative consequences for Maine's economy.

Creating larger impervious areas (roads and parking lots) increases the volume and speed of stormwater runoff, which erodes stream banks and deposits sediments downstream where they create large sediment deltas in rivers, lakes, and ponds. Construction projects that leave soil exposed during and after construction are another source of sediment in streams and other waterbodies. Logging or farming too close to water bodies can expose soil, making it vulnerable to erosion.

Wide vegetated riparian buffers (and state-of-the art stormwater treatment systems in urban areas) are encouraged in all these land-use types to help minimize erosion and sedimentation problems.

NUTRIENTS

Major nutrients are carbon, hydrogen, oxygen, sulfur, silica, nitrogen, and phosphorus. To grow and reproduce, plants and animals need a certain portion of each type of nutrient. In most cases, nutrients are a good/required thing to have in streams. Some nutrients can be toxic to organisms. For example, the nitrate (NO_3) form of nitrogen generally helps plants grow; while the ammonia (NH_3) form of nitrogen can be toxic to fish and other organisms in concentrated amounts.

A nutrient that is the least abundant relative to a plant's need for it is called the *limiting nutrient.* Limiting nutrients limit the growth and reproduction of organisms. **Phosphorus is usually the primary limiting nutrient for algae growth in freshwater, such as lakes, rivers, and streams.** (Nitrogen is usually the primary limiting nutrient for growth of algae in marine waters, which can be downstream of coastal streams and rivers. Nitrogen sources are often the same as phosphorus sources.)
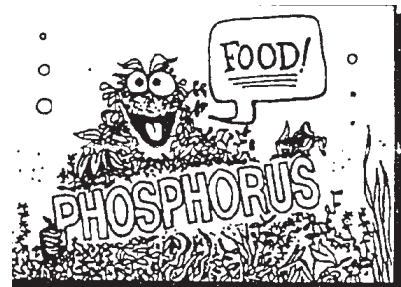
When extra phosphorus enters freshwaters, it may, given the right conditions (e.g., adequate sunlight), promote excess growth of algae and other aquatic plants. Phosphorus enters freshwaters as a result of human activities:

- agricultural sites (e.g., chemical fertilizer, manure, organic matter, soil);
- residential areas (e.g., lawn fertilizer, pet waste, soil);
- urban developments (e.g., runoff from roads, parking lots, automobiles); and
- point source discharges (e.g., treated wastewater and sewage).

Some presence of algae and other aquatic plants in stream ecosystems is a natural condition, especially where sunlight is ample. When excess nutrients are introduced into streams and other waterways, typically from human activities, there can be excessive growth of algae and plants and associated negative impacts. (In heavily shaded headwater streams, sunlight availability is minimal and, therefore, algae and plant growth is also minimal. Still, be careful, the rocks in the stream can be pretty slippery when they're coated with films of tea-colored diatom algae!)

During the daytime when conditions are sunny, algae and plants generate dissolved oxygen via photosynthesis during sunny conditions, which is beneficial to other aquatic organisms. Also during the daytime, algae and other aquatic plants, plus bacteria and animals, use up oxygen for processes such as respiration and decomposition.

At night and before dawn, sunlight is not present and plant photosynthesis is not producing dissolved oxygen. In certain instances, stream reaches having excessive growth of algae and other aquatic plants, large amounts of dead organic material, or large inputs of organic waste such as sewage, can use up significant amounts of oxygen via respiration and decomposition, which occurs 24 hours a day. These night-time lows in dissolved oxygen concentrations can stress sensitive species of fish, macroinvertebrates, and other aquatic organisms.

TOXICS

Toxics are chemicals that can kill or limit the growth or reproduction of aquatic organisms. A harmless substance can become toxic if its chemical form, quantity, or availability is changed. For instance, a trace metal could be a nutritional requirement for an organism in small amounts, yet toxic if consumed in higher concentrations.

Lead, mercury, arsenic, cadmium, silver, nickel, selenium, chromium, zinc, and copper are heavy metals that can be toxic in fresh and marine waters. Metals can be transported into water bodies from vehicle emissions, industrial processes, and improper use or disposal of paints and pesticides. Metals also occur naturally in rocks and minerals and can leach into the environment over time. Soil disturbance can accelerate the release of metals into the aquatic environment.

Many petroleum products are toxic, particularly the polycyclic aromatic hydrocarbons (PAHs) that enter the water through oil spills and the burning of fossil fuels. Polychlorinated biphenyls (PCBs) formerly used in electrical transformers and other products, chlorinated pesticides, and dioxin are other major toxics found in Maine's aquatic environments.

PCBs and many pesticides are now banned because of their toxic properties. Some of these toxins take a long time to degrade, and their persistence in the environment means they will continue to cause problems. Landfills and illegal disposal sites are primary sources of these contaminants.

Heavy metals and organic toxins inhibit the growth, reproduction, and immune systems of aquatic organisms. These contaminants accumulate in sediments and are consumed by bottom-feeding organisms. Fish and crustaceans eat the bottom-feeding organisms (e.g., aquatic insects and mollusks), accumulating the contaminants. Birds, humans, and other organisms then eat the fish and crustaceans and, with them, the accumulated contaminants.

PATHOGENIC ORGANISMS

Pathogenic organisms **are certain bacteria or viruses, that can cause disease.** Pathogens from sewage and animal wastes, are responsible for the closure of swimming areas and shellfish areas downstream of coastal streams that may be contaminated. Some gastro-intestinal illnesses can be contracted by swimming in severely contaminated waters.

Sewage enters streams, rivers, and other waterbodies from malfunctioning septic systems and publicly owned treatment works (POTWs), overboard discharge systems, combined sewer overflows (CSOs), and discharges from boats. Pollution from animal wastes is primarily generated from agricultural activities, such as spreading manure to fertilize fields, but is also generated by pets and wildlife.

Learning More About Various Aspects of Stream Physical, Chemical, and Biological Properties and Processes

There are many topics about streams that we don't get into much detail about in this manual (Volume 1). For more detailed information about topics such as stream organisms, habitats, hydrology, water quality, ecosystem processes, dynamics, geomorphology, etc., we refer you to the Maine Stream Team Program guide *Volume 2: A Citizen's Primer on Stream Ecology, Water Quality, Hydrology, and Fluvial Geomorphology,*

To download a copy, visit the Maine Stream Team Program's website: http://www.maine.gov/dep/blwq/docstream/team/streamteam.htm.

Alternatively, if an introductory level of information regarding streams is desired, the reader is referred to the brief, but informative booklet, *STREAMS,* a project of the Maine DEP and Gulf of Maine Aquarium. It is available online at: http://octopus.gma.org/streams/streams.html or in paperback from the Maine Stream Team Program (http://www.maine.gov/dep/blwq/docstream/team/streamteam.htm).

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Unit 3:

Survey Basics: Purpose, Getting Started, and Organization

CONTENTS

Unit 3:
Survey Basics —
Purpose, Getting Started,
and Organization

A. An Introduction to Different Types of Surveys in Stream Watersheds

Unit 1 described the importance of conducting surveys in order to help gather information to help better manage Maine's roughly 45,000 miles of streams and rivers. The remainder of this guidance manual focuses on types of surveys related to streams and their watersheds, which can be performed by volunteers, requiring only a few hours of basic training by a professional. These surveys identify places on the landscape or stream sections which appear to either be high-value habitats for aquatic organisms, such as coldwater fish, or they identify places where significant pollution or habitat-degradation or water quality problems may exist.

Many of these survey locations are places not yet studied or assessed by state, federal, academic, or nonprofit agencies and organizations. **The benefit of using the methods described in this manual is that a lot of land area around Maine can be surveyed by volunteers after only some basic training.** These volunteer efforts allow agencies, watershed organizations, and other groups to make more efficient use of their staff and resources to gather additional, more detailed data where it is most needed and then manage aquatic organism populations, habitats, and water quality more wisely and effectively.

There are many types of surveys that can be done in streams and their watersheds (e.g., stream corridor surveys [SCS], watershed surveys [WS], etc.) and they will be explained and compared later in this chapter. The choice of which type of survey(s) to do will be based upon: a) the information already existing about the resource and b) the interests, concerns, and goals of those people organizing and participating in the surveys. (The unique, specific planning considerations for the different survey types will be discussed in greater detail in Units 5 and 6, and some appendices of this manual.)

While some quantitative data (measurements) may be collected during these volunteer-oriented surveys, it is generally recognized that a professional or experienced volunteer may need to revisit important locations identified during the surveys in order to collect more intensive, technical information and quantitative measurements.   These types of intensive analyses are beyond the scope of this manual, though references and links to some of those resources and methods are mentioned later in this unit *(section D; Table 3-4)*.

Even though some of the sites identified by volunteers may need to be revisited, a great deal of time will have been saved because the initial surveys first determined whether there were any high priority extraordinary habitats or serious problems warranting follow-up. These surveys identify any specific locations where important situations occur so the follow-up technician does not have to walk the entire length of the stream to find them.

The common, important considerations that apply to these surveys described in this manual include:
- identifying local concerns, issues, and interests;
- gathering and analyzing existing watershed information;
- determining the type of survey to conduct;
- determining project leadership and personnel;
- budgeting for the project and obtaining funding; and
- communicating with the public.

B. Identifying Local Concerns, Issues, and Interests

We've just discussed in general why volunteers might want to do a survey from a statewide and national perspective. **Now, specifically why do you (and your group) want to conduct a stream survey?** Be prepared to answer this question and record your reasons for later use.
- Is there a known specific problem with the stream that will be used as justification for the further scrutiny?
- Is there little or no existing information regarding whether the stream and/or its watershed has pollution or habitat problems or whether it may have potentially high-value coldwater fisheries habitat?
- If there is little or no information, does the watershed community recognize the value and sensitivity of this stream (or the waterbody into which it flows) and want to protect, maintain, or improve that value?
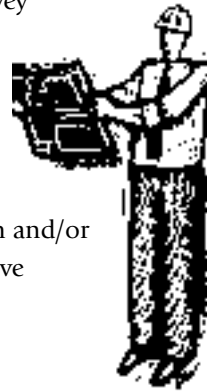
Before enlisting help from the public and agencies or organizations, the project organizers should be able to define the local concerns and basic issues. There are many ways to survey a stream and its watershed, and your objectives will help you to determine which methods to use. This unit provides many sources of helpful information. *(If additional assistance is needed, contact the Maine Department of Environmental Protection [MDEP] or the Maine Stream Team Program. [see Appendix C for contact information])*

C. Gathering and Analyzing Existing Watershed Information

You will need to gather data that already exists about the stream and its watershed from various municipal, state, and federal organizations. This information will be critical to helping you design the project. Categories of existing information and the resources where you can find them are defined below. *(See Appendix C to find contact information for the resource agencies that may have this information.)*

IMPORTANT INFORMATION

■ *Topographic Mapping*

Topography is the relief or surface configuration of a land area. Steeper terrain may send stormwater through a watershed more forcefully, and wider vegetated buffers may be needed to slow the flow and prevent pollutants from reaching surface waters. Steeper watersheds may also have greater soil erosion problems. A topographic map can tell you the overall steepness of your watershed.

Topographic maps are important tools for planning both watershed and stream corridor surveys. You will need a topographic map to determine stream reach endpoints for a **Stream Corridor Survey** (SCS) or to delineate watershed boundaries for a Watershed Survey(WS) *(see* **Watershed Mapping** *below).*

The most common version of maps used is the **"7 1/2 minute topo map,"** which refers to the scale of the map. These maps are available from a variety of sources (*Table 3-1*), including many sporting goods stores, the Maine Geological Survey (http://www.maine.gov/doc/nrimc/mgs/mgs.htm), and online companies. (**Note:** Many of these maps have not been updated since the 1970s. Make sure to check the revision date on the map in order to understand the context.)

A brief discussion on how to read topographic maps is included in Appendix D. Additional information can be found at the U.S. Geological Survey's website on Topographic Map Symbols:

- http://erg.usgs.gov/isb/pubs/booklets/symbols/index.html -or-
- http://erg.usgs.gov/isb/pubs/booklets/symbols/topomapsymbols.pdf

■ *Watershed Mapping*

A watershed map shows the land area included in the watershed. For watershed surveys, it is critical to know the boundaries of the watershed that you will be surveying to identify the major land uses and potential impacts to the stream.

While it is not necessary to have a watershed map to complete a SCS, it may help you to interpret your findings. *(See Appendix D, if a watershed map is not readily available, for instructions on how to delineate a watershed.)*

■ *Water Quality Monitoring Data*

Documented water quality problems will help determine what pollutant source(s) to survey. Gather data about the designated use and the level of impairment of a water body from a variety of sources such as those mentioned in *Table 3-1.*

■ *Pollution Source Data*

Knowing the location of licensed point discharges and documented nonpoint pollution sources is useful in understanding what pollutants are affecting water quality. Documented pollution sources may not need to be surveyed or may only need an update.

Data on point sources, such as licensed discharges, landfills, sludge sites, salt storage, and underground tanks; and nonpoint pollution sources is increasingly becoming available through websites such as those of the MDEP and U.S. Environmental Protection Agency mentioned in *Table 3-1.* Contacting staff at those agencies can lead to information as well.
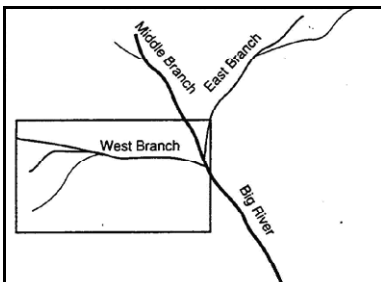
■ *Land Use and Vegetative Cover Mapping*

Locating typical land uses (farms, single-family houses, gravel pits, disturbed land, etc.) and vegetative cover types (hay fields, lawns, pine forests, etc.) will help your group determine where to survey. Land use maps developed for town comprehensive plans, as well as aerial photographs, are often available through local municipal offices or county soil and water conservation districts.

■ *Tax Maps*

When doing survey work on or around private property during a stream corridor or watershed survey, **it is important to first obtain permission to access the land.** Determining property ownership is the first step in developing a mailing list of affected watershed landowners. This can be tricky, especially with seasonal residents because they are not around as often, so it is often necessary to reference municipal tax maps.

Some groups find it helpful to provide copies of relevant tax maps to volunteers surveying a watershed sector or stream reach, including notes on which landowners have requested that their property not be surveyed. Check with your local municipal offices for more information on obtaining tax maps (*Table 3-1).* Tax map information may not be critical at this point, but you probably will want it later on when you are preparing to notify landowners about your survey project.

OPTIONAL INFORMATION

■ *Habitat Mapping*

Knowing the location of critical wildlife habitats and natural areas having threatened or endangered species are is important in targeting areas that are sensitive to pollution. Critical habitat locations and information may be available in fish and wildlife surveys and on maps from the **Maine Department of Inland Fisheries and Wildlife** (MDIFW).   Local town or city conservation commissions may have *Beginning with Habitat* maps which identify some of these local resources — www.beginningwithhabitat.org/the_maps/index.html (*Beginning with Habitat* is a multi-agency effort led by MDIFW.)

■ *Soils Mapping*

The soil types in the watershed affect how easily soil particles are eroded and how easily pollutants are attached to those particles. Soils with a high content of small particles, such as clay, adsorb pollutants more easily than larger soil particles, such as sand.

Soils maps are available through **your county soil and water conservation district,** and through the **USDA Natural Resources Conservation Service.**

■ *Other Information*

Other information that might be useful in planning surveys is listed in *Table 3-1.*
You may also want to contact organizations such as MDEP, MDIFW, the Maine Atlantic Salmon Commission, or any other local natural resource organization to see if any special studies were done on your particular stream.

Table 3-1. Additional sources of survey background information.

Information Type	Suggested Source	Website or Location
Mapping & GIS Basics	• U.S. Geological Survey / Science Education Page	• http://education.usgs.gov/
GIS Maps (Geographic Information System)	• Maine Office of GIS	• http://apollo.ogis.state.me.us/ (see menu buttons for data, maps, aerial photos, etc.)
	• Local natural resource agencies and universities/colleges	• Various locations
Topographic Maps and Aerial Photographs (in either paper & digital form)	• Local natural resource organizations/ agencies and universities/colleges	• Various locations
	• Local sporting good stores	• Various locations
	• Maine Office of GIS	• http://apollo.ogis.state.me.us/ (see menu buttons for data, maps, aerial photos, etc.)
	• Companies found on the Internet	• Type "topographic maps" or "aerial photographs" into an Internet search engine
Municipal Maps (e.g., tax maps, storm drain maps, comprehensive plan maps, etc.)	• Municipal offices	• Various locations
Geology and Groundwater Maps	• Maine Geological Survey	• http://www.maine.gov/doc/nrimc/mgs/mgs.htm
Water Quality Information	• Maine DEP Data Page	• http://www.maine.gov/dep/data.htm/
	• Maine DEP – Biomonitoring Maps & Data	• http://www.maine.gov/dep/blwq/docmonitoring/ biomonitoring/data.htm
	• PEARL (University of Maine)	• http://www.pearl.maine.edu/
	• Maine Watershed Web (Bowdoin College)	• http://learn.bowdoin.edu/apps/hydrology/watersheds/
	• Vital Signs Program (Gulf of Maine Research Institute)	• http://www.gma.org/vital_signs/
	• GLOBE (Global Learning and Observations to Benefit the Environment; geared towards teachers/students)	• http://www.globe.gov/
	• U.S. Environmental Protection Agency –Watershed Programs –STORET / WQX	• http://www.epa.gov/owow/watershed/ • http://www.epa.gov/storet/
	• U.S. Geological Survey (ME office)	• http://me.water.usgs.gov/
	• Local monitoring groups	• if you aren't aware of groups in your area, contact the MSTP Pollution Sources
Pollution Sources	• MDEP Data	• USEPA Watershed Website • http://www.maine.gov/dep/data.htm
	• Other sites	• http://www.epa.gov/owow/watershed/ (e.g., "Surf Your Watershed", etc.

D. Determining the Type of Survey to Conduct

There are a number of techniques and combinations of techniques, with varying values, difficulties, and time commitments, from which people can gather information about streams and their watersheds.

Two types of surveys are of particular note for their importance in assessing overall stream and watershed health at a "volunteer-level" of difficulty and time-intensity, and they are the focus of this manual.

- The first type is a stream-based investigation called the **Level 1 Stream Corridor Survey (SCS).** This technique is comprised of both a stream habitat survey and a rapid geomorphic assessment (RGA).

- The second type is a land-based survey called the **Stream Watershed Survey (WS).** Within this manual we will shorten this name to *Watershed Survey,* recognizing that watershed surveys can also be done in lake, coastal, and wetland watersheds.

Later in section D, we will also describe additional types of surveys that can be done in streams and stream watersheds.

The SCS and the WS are both useful in a variety of types of watersheds, including urban, high or low density residential development, commercial development, agriculture and forested. *(See Table 3-2 for a comparison and summary of the purpose, function, utility, and requirements of these two survey types to help you determine which type of survey is best for your needs.)*

A question to answer is whether to do either a SCS, WS, or both types of surveys. Historically, many groups have opted to do just one type of survey or the other. More recently, a number of groups have decided to do both types of surveys in the same project. The reason for doing just one type of survey for a project is the desire to keep things simpler and more manageable, and to keep costs and requirements of volunteers to a minimum.

As time has passed, experience has shown that doing both types of surveys within a given watershed for a particular project may not cost a great deal more than doing a single type of survey, while the amount of information gained increases greatly. *(See Figure 3-1 for a suggested "decision-tree" flow chart for making decisions about which type(s) of survey to do and in which order)*

When a stream watershed survey project adds a SCS component, the information about the types of serious problems the stream may actually be experiencing and where they may be the most serious, is gained. When a SCS project adds a WS, information about the location of nonpoint source pollution problems potentially reaching and impacting the stream is gained.

While a group might be inclined to do just one type of survey for whatever reason, it is worth considering doing both. Also, it is worth considering doing a SCS prior to a WS of a given stream so that the highest priority stream reaches, and the types of problems they are experiencing, can be identified. This information can be used to design the WS more effectively in order to make the best use of volunteer time and effort.

Table 3-2:
Comparison of Stream Corridor Survey (Level 1) and Stream Watershed Survey Techniques

ISSUE	Stream Corridor Survey (SCS)	Stream Watershed Survey (WS)
Where and How Survey Takes Place	• IN-STREAM SURVEY Survey is done by walking along and in the stream, assessing stream channel, bank, and riparian characteristics and conditions.	• LAND-BASED SURVEY Survey is done by walking or driving throughout the watershed looking for nonpoint source pollution sites connected to the stream through a road ditch, intermittent drainage, tributary, or directly connected to the stream being surveyed.
Purpose	• To get to know a local stream or river. •To educate the local community about the condition of a local stream or river and about topics such as stream ecology, nonpoint source pollution, habitats, geomorphology/stability issues, and then promote stewardship. • To determine whether significant pollution, habitat, or geomorphology (assessment of channel dimensions, stability, and possible channelization by humans, etc.) problems exist in the stream reaches being examined. • To determine whether extraordinarily good or sensitive coldwater fishery habitats exist in the stream reaches being examined and where habitat preservation efforts might need to be focused. • This information helps identify where follow-up research, more intensive surveying, or management work should occur at specific locations. When this work is done by volunteers, it saves natural resource agencies, academic institutions, and watershed organizations time and money so that they can devote their time to the highest priority locations and issues.	•To determine where sources of excess sediment, nutrients (e.g., phosphorous, nitrogen), toxins, and other pollutants exist and to prioritize the problems in the order of their severity so that follow-up correction work ("best management practices") can be done in the most ecologically-effective and cost- and time-efficient manner. • Some survey organizers also choose to assess riparian zone conditions (i.e., poor shading or pollutant filtering for the stream) in addition to the issues mentioned above. • To educate the local community about the conditions of the watershed and issues such as water quality, nonpoint source pollution, and other basic stream topics; and then promote stewardship.
Scale of Survey Data	• **REACH:** This survey provides information on the overall condition of a length of stream with a measured start point and end point. The information gathered is more generalized, but may be applied over the entire stream reach. In many cases, groups choose to assess multiple reaches of a stream and its tributaries.	• **SITE:** This survey provides detailed information on many specific sites (each with one unique location point) within a watershed. Little to no information is collected for areas between or around the identified sites, but the site information itself is very specific.

ISSUE	Stream Corridor Survey (SCS) (Level 1)	Stream Watershed Survey (WS)
Table 3-2 *(continued)*: Comparison of Stream Corridor Survey (Level 1) and Stream Watershed Survey Techniques		
What Is Assessed	• Stream channel and bank characteristics and conditions. • Riparian buffer and floodplain conditions (e.g., issues such as poor shading or pollutant filtering for the stream). • Nearby sources of nonpoint sources (NPS) and point sources of pollution. • Land uses close to, and directly affecting, the stream. • Historical effects on the stream from past land uses: forestry, agriculture, dams, channelization. • Visual biological survey. • Simple macroinvertebrate survey (optional). • Stream instability problems (screening-level determination) via the Rapid Geomorphic Assessment (RGA)	• Nonpoint source (NPS) pollution sites including: √Soil erosion and sediment (primarily) √Sources of nutrients, bacteria and/or toxics (e.g. manure piles, stormwater runoff) √Temperature effects or reduced treatment of NPS pollution (e.g. stormwater runoff, riparian degradation) • Problems identified at stream crossings: √Typically the focus is on soil erosion and sources of excessive sedimentation to the stream in the vicinity of stream crossings or culverts Note: More detailed assessments of stream crossings that assess them for fish passage and undersizing (channel constriction) problems, in addition to sedimentation issues, can be done using recently developed survey techniques that are described in Appendix M.
When the Survey Should Be Done	• Any time except winter. If done after leaf-fall, make a note of it on the data sheets because riparian canopy assessments will be misleading. • Avoid high flow periods in the spring and sometimes fall. • Best times are summer and early fall.	• Anytime except winter. • Rainy weather can be beneficial (though by no means necessary) in assessing non-point source pollution issues. • Best times are spring and early fall; the presence of shrub leaves and grasses is much reduced and the landscape and weather usually are more wet (stormy) periods of the year. These are the times when runoff events can be observed and observations about nonpoint sites and other problems can be most easily observed.
Training Required	**INDOOR TRAINING**: • **Short indoor training (1-2 hours)** • For groups, the indoor training usually consists of a slideshow and discussion presented by a DEP or IF&W biologist. **OUTDOOR TRAINING**: • **Short outdoor training (1-2 hours)**. • If enough technical advisors are available, volunteers usually separate into groups led by technical advisors and training consists of actual surveying and data gathering under the supervision of the advisor.	**INDOOR TRAINING**: • **Short indoor training (~2 hours)** •The indoor training usually consists of a slideshow and discussion presented by a DEP or Soil & Water Conservation District staff person or an experienced consultant. **OUTDOOR TRAINING**: • **Outdoor training (1-2 hours)**, typically with a technical advisor present in each group. Additional time may be added if actual data gathering is added to the session.

ISSUE	Stream Corridor Survey (SCS) (Level 1)	Stream Watershed Survey (WS)
Training Required (cont.)	• If not enough technical advisors are available, then outdoor training usually consists of completing and reviewing datasheets as a group at a "practice" reach in order to improve consistency among volunteers. • Occasionally, an individual (usually a person who goes fishing a lot) may meet with MDIFW's Fisheries Research staff for an individual training. • For the Rapid Geomorphic Assessment (RGA) part of the survey technique it is useful to do have a technical advisor (an experienced team leader or member) within each group to help speed the assessment along and provide advice on what issues volunteers may be encountering in the field. • Sometimes groups choose to do actual data gathering immediately after the training.	• Outdoor training usually consists of completing and reviewing datasheets at a "practice" reach in order to improve consistency among volunteers. (This outdoor training may include some actual data gathering.) • Volunteers can then complete the rest of the survey on their own time.
Physical Demands	• Volunteers need to be in very good physical condition to do stream walks. In-stream walking can be treacherous with slippery, uneven surfaces and often involves scaling steep banks.	• Although not necessary, it is helpful for volunteers to be in good physical condition. Most walking will be on even surfaces (roads, etc.); however, there may be climbing down steep embankments.
Effort or Time Needed to Complete Survey	• Typically 1-4 hours per reach • Total time will depend on the number of reaches existing in the stream system of interest. • Reaches vary in length; an average stream reach is 600-1200' long. • For larger streams, you may want to select a subset of particular reaches or sections/tributaries of interest to survey.	• Typically 4-16 hours per sector depending on how densely developed the watershed is and how big the sectors are (see Unit 6 for more details). • Total time will depend on the number of sectors in the watershed. • Whole or significant portion of the watershed should be able to be surveyed.
Appropriate Scale	• Depends on terrain, volunteer commitment, and technical support, etc. • Typically 5-10 stream miles long; usually not more than 10 miles unless many volunteers are involved.	• Depends on volunteer commitment and technical support, etc. • Generally appropriate for watersheds ranging from 1-10 square miles.
FMI	Unit 5 of this manual (related appendices are described in that unit)	Unit 6 of this manual (related appendices are described in that unit)

Thinking Ahead to Stream and Watershed: Best Management Practices and Restoration

The second half of *Figure 3-1* illustrates some management or restoration efforts that can be explored and implemented after doing stream surveys. These kinds of efforts are basically beyond the scope of this manual, though they are discussed briefly in Unit 7. In general, it is wise (and often required) to involve natural resource experts, professional engineers, and/or stream restoration specialists in management and restoration activities. Also, permits from DEP or LURC (Land Use Regulatory Committee) may be necessary.

Figure 3-1

Recommended Decision Tree:
Choosing the Major Survey Type
That Best Fits Your Situation

NOTE: This manual only covers the first page of this diagram. Please refer to Appendix C for a list of important contacts and resources related to the shaded, second page of this diagram. DEP or LURC permits likely are required for any restoration work.

PAGE 1

A group is interested in a stream and/or its watershed.

Little or no information exists about a) potential NPS pollution or habitat problems or watershed or b) potential high-value coldwater fisheries habitat existing in the stream of interest.

The watershed is believed to have numerous substantial sources of NPS pollution that can drain into the stream (e.g., a heavily developed, logged, or farmed stream watershed).

Recommended Path

Stream Corridor Survey (Level 1)
[Unit 5]

- OR -

Alternate Path

Watershed Survey
[Unit 6]

Determine the likely problems in the stream and which stream reaches appear to be the most stressed. Use to decide focus areas for follow-up.

Optional (but Recommended)
Watershed Survey
[Unit 6]

Optional (but Recommended)
Stream Corridor Survey (Level 1)
[Unit 5]

Optional
Complimentary Survey Forms for Both Watershed Surveys & Stream Corridor Surveys

- **Site Form**
  (Detailed form to document individual sites --- required for watershed surveys; optional for stream corridor surveys.)
  [Appendix K]

- **Maine Road-Stream Crossing Survey Form (and associated manual)**
  (This protocol is a multi-agency collaboration developed in 2007 to standardize the assessment of culverts, bridges, etc. across Maine. The focus is on fish passage, but soil erosion and stream geomorphology considerations are also incorporated. This standardization effort is being led by the U. S. Fish & Wildlife Service's Gulf of Maine Coastal Program.)
  [Appendix M]

continued on next page

Figure 3-1 *(continued)*

continued from previous page

NOTE: This manual only covers the first page of this diagram. Please refer to Appendix C for a list of important contacts and resources related to the shaded, second page of this diagram. DEP or LURC permits likely are required for any restoration work.

Study Data and Prioritize Possible Next Steps
- You may select more than one next path.
- Be sure to consult with experienced professionals.

-- IF --
Good Fish Habitat Suspected **OR** Instability / Geomorphology Problems Suspected

-- IF --
NPS Pollution Sources Detected

-- IF --
Toxic Hotspots Common [[urban, dumps, gas stations, golf courses, etc., in watershed]]

-- IF --
Fish Passage Problems **OR** Erosion Problems at Stream Crossings

–ACTION –
Conduct advanced stream surveys (e.g., IF&W's Level 2 or 3) or preserve adjacent lands (e.g., conservation easements).

–ACTION –
Prioritize sites for fixes.

–ACTION –
Conduct Hotspot Inventory

–ACTION –
Conduct Detailed Assessment of Crossings (Appendix M)

Install or implement appropriate Best Management Practices (BMPs) or other conservation efforts.

Table 3-3 describes various types of datasheets related to these types of stream surveys. The *Stream Corridor Survey* (Level 1) and *Site Form datasheets* are the focus of this manual. Additional datasheets may be added to the basic set of SCS or WS datasheets to enhance and increase the types and amount of information obtained.

The *Site Form* is designed primarily to document sites encountered during WS. Some groups, however, may choose to also include the of use of site forms during SCS to gather more site-specific information since SCSs generally notes habitats conditions at the reach scale. This site-specific information can also be integrated into a Watershed Survey project's database.

Table 3-3: Use of various field sheets, according to survey type				
SURVEY TYPE				
Data Sheet Type	Stream Corridor Survey (Level 1)	Stream Watershed Survey	Maine Road-Stream Crossing Survey**	Appendix Containing More Information
Stream Corridor Survey (Level 1) [including RGA]	YES			J
Site Form	Optional	YES		K
Maine Road-Stream Crossing Form**	Optional	Optional	YES**	M
Other Miscellaneous Forms**	Optional	Optional	Optional	(see Table 3-4)

***The Maine Road-Stream Crossing Survey and other miscellaneous surveys are described briefly in Table 3-4 and Appendix M, but actual guidance for conducting these typse of surveys is beyond the scope of this document.*

The methods for doing a Maine Road-Stream Crossing Survey, as created by the U.S. Fish and Wildlife Service and numerous State of Maine (including MDEP and MDIFW), local, and national nonprofit agencies and organizations in 2007 are not contained in this manual. They are not contained here due to the technical training required for personnel (professionals or volunteers) to conduct these types of surveys and then submit data to a statewide database. Still, it is worth mentioning that they exist and that they can be used to gather information on how certain crossings may have a negative impact on aquatic and terrestrial organism passage (e.g., for fish, amphibians), channel habitat/stability conditions, and nonpoint source pollution issues in your stream of interest. In many watersheds, stream crossings may be one of the top sources of some problems. *(See Appendix M for information about how and where folks can get trained for these protocols)*

Other types of stream surveys, including ones with more rigorous methods or which emphasize certain topics more than those covered in SCS or Watershed Surveys, may be desirable to a watershed group. This manual does not detail these other methods. We do, however, provide a list in **Table 3-4** of some other resources that can provide the type of guidance for survey techniques not covered by this manual. Feel free to contact the Maine Stream Team Program or another natural resource program for additional information and suggestions.

Table 3-4:

Examples of alternative stream and watershed survey methods

Some examples of other stream survey and watershed survey methods not covered in this manual. Additionally, many state, federal, tribal, and nonprofit agencies and organizations working in Maine have their own stream survey and assessment protocols.

ORGANIZATION	NAME OF SURVEY TYPE	WEBSITE
Center for Watershed Protection	• Manual 10: Unified Stream Assessment (rapid techniques for locating and evaluating problems and restoration opportunities within urban stream corridors, including surveys of storm water outfalls, riparian buffer conditions, potential channel modification, reach level conditions, etc.) • Manual 11: Unified Subwatershed and Site Reconnaissance (techniques for examining pollution sources and restoration potential within upland areas of urban subwatersheds; techniques include: Neighborhood Source Assessment, Hotspot Site Investigation, Pervious Area Assessment, and the analysis of Streets and Storm Drains) [From Urban Subwatershed Restoration Manual publication series (2005)]	▶ http://www.cwp.org/index.html (click on "Publications)
Multiple Maine Agencies and Organizations	• Maine Road Stream Crossing Surveys	See APPENDIX M
U.S. Environmental Protection Agency (led by U.S. Fish & Wildlife's Gulf of Maine Program)	• "Wadeable Streams Assessment Field Operations Manual" (2004)▶ http://www.epa.gov/owow/monitoring/wsa/materials.html • "Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic, Macroinvertebrates, and Fish" (2nd edition) (1999) ▶ http://www.epa.gov/owow/monitoring/rbp/	
U.S. Forest Service — Stream Systems Technology Center	• "Stream Channel Reference Sites: An Illustrated Guide to Field Technique" (by Cheryl C. Harrelson, C. L. Rawlins, and John P. Potyondy) (1994) ▶ http://www.stream.fs.fed.us/publications/documentsStream.html	
VT Department of Environmental Conservation	• "Vermont Stream Geomorphic Assessment Protocols" ▶ http://www.vtwaterquality.org/rivers/htm/rv_geoassess.htm	

E. Determine Project Leadership and Personnel

Your team should consist of two categories of volunteers: the **steering committee** and the **support volunteers.**

The *STEERING COMMITTEE* is a group of key stakeholders and interested parties responsible for general leadership of the project, and carrying out tasks related to the project.

SUPPORT VOLUNTEERS are people who are interested in helping out on the project in specific (often short-term) ways.

■ DESIGNATE A STEERING COMMITTEE

The steering committee is comprised mostly, or entirely, of volunteers and leads, organizes, and coordinates the project. The responsibilities of steering committee members include designing and organizing the survey project, finding technical help, making decisions, providing leadership, and serving as a point of contact for the public, the media, and public officials.

A suggested steering committee size would be 4 - 8 people, including (if possible) representatives from the municipalities around the watershed, watershed groups, landowners, relevant agencies, land trusts, etc.

The steering committee determines who will play key roles in a project, including:

• *Project Manager:* Responsible for overall coordination of the project, including overseeing the activities of the steering committee.

• *Volunteer Coordinator:* Responsible for coordinating activities of volunteers, including distribution of materials and the collection and preliminary review of data. This individual will communicate directly with the project manager, technical team, and steering committee.

• *Data Coordinator:* Responsible for compiling and storing data, works closely with the technical team on producing reports.

• *Technical Team:* One or more individuals responsible for advising the steering committee on technical issues, training the volunteer surveyors, conducting follow-up work as needed, and assisting with/writing the final report. Some good technical team members could include:

  • Local soil and water conservation district staff
  • State/federal agency staff
  • Private consultants

(NOTE: In some cases, a committee member may need to play more than one role. For small projects, this may be fine. For medium to large projects, it is advised to try and seek another committee member whenever possible.)
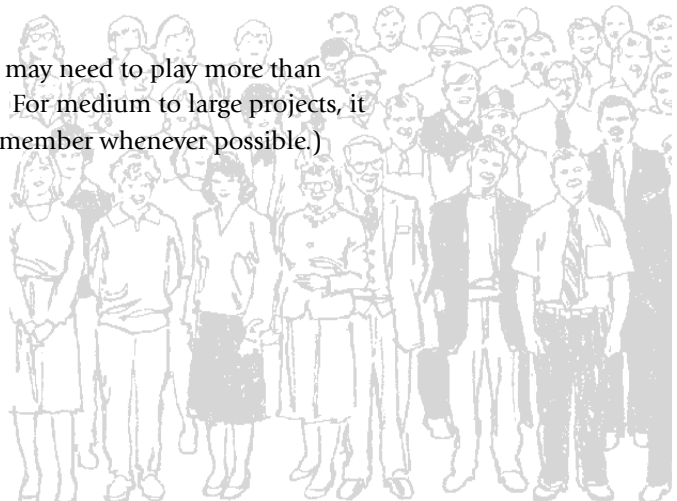
■ RECRUIT SUPPORT VOLUNTEERS

Ask anyone you know, or approach the following organizations to find people interested in getting involved in your project:

- Stream teams
- Water quality monitoring groups
- Land trusts
- Watershed associations/councils
- Fishing community
- Schools
- Conservation Commissions
- Youth Conservation Corps
- Americorps volunteers
- Service organizations (Lions, Kiwanis, Rotary)
- Community volunteers
- Sporting groups
- Boy Scouts and Girl Scouts
- 4-H clubs

[NOTE: When working with students consider only involving teens older than 16 years since they tend to have greater attention spans and patience, and be more responsible. Students ages 12 - 15 may also make good survey participants, but try to make sure ahead of time that they would be interested in the event. Alternatives to involving students in stream surveys are to hold more hands-on, education-oriented events alongside a stream or river. Investigating the macroinvertebrate (aquatic insects, crustaceans, etc.) community or water quality can be very fun and informative, and may hold the students' attention very well.

Contact the Maine stream Team Program (MSTP) or visit its webpage (www.maine.gov/dep/blwq/docstream/team/streamteam.htm) for more ideas. In any situation involving kids 18 or younger, involve as many chaperones as possible — no less than (one) 1 adult per (three) 3 students.]

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The anticipated time commitments and responsibilities for various project participants for both Stream Corridor Surveys (SCS) and Watershed Surveys (WS) are summarized in Table 3-5.

Table 3-5:
Common Responsibilities for Organizers and Particpants of Stream Corridor and Watershed Surveys

This Table presents common responsibilities for organizers and participants of both Stream Corridor Surveys (Level 1) (SCS) and Watershed Surveys (WS). *These recommendations for number of people and hours are estimates and will vary according to the size of the watershed or stream/river of interest. Also, for smaller projects, the project leader/steering committee may opt to take on roles of unfilled positions.

TITLE	# of PEOPLE	TIME COMMITMENT per PERSON (hrs.)	RESPONSIBILITIES
Steering Committee Project Manager	4 - 8	20 - 40 hrs.	• Determine scope of project: survey techniques to use, where to survey, and resources (money, materials, people-hours) necessary to complete the project. • Gather existing data: including topographic, watershed, and tax maps. • Generate the landowner mailing list, as necessary. • Notify landowners about survey and when it will take place. Send a letter to each landowner, including a contact number for those who do not want the stream to be accessed from their property (SCS) or to have their property surveyed (WS). Ensure this information is passed on to volunteers. • Make a list of properties to be excluded from the survey. • Survey preparation (may collaborate with technical team): 　√ WS: divide watershed map into sectors 　√ SCS: Define and number stream reach end-points, and determine logistics of access points, number of groups, etc. 　√ Check conditions: Stream depth / flow and other hazards at representative locations. Address identified safety concerns. • Secure funding as needed. (This may add some additional time not noted in the time column.) • Set a schedule. Arrange training location, date and time. • Provide snacks and beverages. While not necessary, it is often appreciated at the volunteer training. • Participate in the survey alongside volunteers (optional, but recommended). • Develop the format of the final report and distribution plan.
Volunteer Coordinator(s)	1 - 2	8 - 20 hrs.	• Advertise the survey in local papers, cable access channels, posters, etc. • Recruit volunteers to attend training and conduct the survey. • Notify volunteers about training schedule and expectations. • Plan ahead for safety issues. Make sure volunteers know what to expect, and come prepared for expected hazards with first-aid kits, emergency contact numbers, cell phones, appropriate attire, etc. (For more on safety, see Unit 4.) • Coordinate with technical team after the survey if a volunteer needs to be contacted.

Table 3-5 *(continued)*:
Common Responsibilities for Organizers and Particpants of Stream Corridor and Watershed Survey

TITLE	# of PEOPLE	TIME COMMITMENT per PERSON (hrs.)	RESPONSIBILITIES
Data Coordinator	1	15 - 30 hrs.	• Compile survey data, collecting and organizing from the volunteers, and making sure forms are complete. • Photo management: Develop film and label pictures (as needed), or for digital photos, rename and compile pictures. • Data entry: Enter survey data into Excel spreadsheet (as needed). • Submit survey data (watershed survey) to technical team or MDEP's Maine Stream Team Program (if a stream corridor survey). • Coordinate final report and printing.
Survey Volunteers	typically 6 - 20**	6 - 24 hrs.	• Attend full-day training, rain or shine. Bring bag lunch, bug spray, sunscreen, clipboard, pencils and tape measure. • Complete assigned survey (series of reaches for SCS or sector for WS) before the deadline set by the steering committee. • Submit full survey documentation to volunteer data coordinator. (** For reasons of safety and data gathering needs, the minimum recommended number of people for "sector team" or "reach team" is 2. Generally, teams of 3-4 people are preferred. For these reasons, it is highly recommended that the steering committee examine watershed/stream maps and determine where the survey reaches/sectors will exist, so the appropriate number of volunteers and other positions may be recruited. Units 5 and 6 describe these considerations in more detail.)
Technical Team	2 - 6 (1 per reach team or sector team)	8 - 20 hrs.	• Deliver training presentation at classroom portion of training session. • Lead small groups through field portion of training session and, sometimes, through the remainder of the survey efforts. • Conduct follow-up surveys to check volunteer survey data (for WS) • Technical team members are people who have experience conducting surveys (either SCS or WS). Some organizations that may be able to offer such staff include: local county Soil & Water Conservation Districts, community water districts, consultants, watershed organizations, state agencies (e.g., MDEP, MDIFW). • May include steering committee members.

F. Budget for Project and Secure Funding

The expense of coordinating and administering a project, providing technical oversight, training volunteers, and generating a report can be substantial — depending on the scope of the project and whether or not resource agencies can provide this service.

Consider applying for grant funding at least a year before the survey takes place. An under-funded project creates constraints that may compromise the objectives of the survey. In some instances however, projects such as a small-scale SCS, may have fairly minimal costs and may not need much funding; as long as volunteers and professionals can provide the bulk of their time, labor, and equipment for free or as "in-kind" match or support.*

Funding can be monetary or, "in kind," in the form of materials or labor. Material expenses vary based on scope of the project and the type of survey being conducted, but are minimal when compared to water quality monitoring.

Example expenses could include:

• **Postage:** Letters to be sent to every landowner in the watershed

• **Photocopying:** Landowner letter, training materials, survey datasheets, maps, and printing final report

• **Cameras:** Buy or borrow digital cameras, or disposable cameras. Keep in mind that with disposables you pay for developing film (and perhaps scanning onto a CD)

• **GPS (Global Positioning System) units:** Purchase units, encourage volunteers to bring their own, or borrow from other groups

• **Volunteer expenses**: telephone charges, mileage, etc.

• **Binders for data sheets**: One per team/group or sector

• **Nametags** for volunteers

• **Optional equipment**: SCS: armored thermometers, yard/meter sticks and tapes, macroinvertebrate sampling supplies and identification keys, etc. WS: yard/meter sticks and tapes

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*"In-kind" match/support: any contributions to an agency or organization that have value but are not monetary in nature. In-kind support can include the value of donated products or equipment, volunteer services, donated office space or staff time, and donated professional services, among others.

Try not to rely on only a single source of funding. The more sources you have, the more secure your project will be.

Information concerning possible grants to fund surveys can be obtained from websites such as:

- MDEP's **Bureau of Land and Water Quality** grant page www.maine.gov/dep/blwq/grants.htm

- MDEP's **Maine Stream Team Program** newsletter www.maine.gov/dep/blwq/docstream/team/streamteam.htm

- Local county **soil and water conservation districts** (SWCDs) http://maineswcds.org/

- various resources on the Internet.

■ **Here are connections whereby groups have funded surveys:**

• **319 Nonpoint Source Pollution Grants** (administered by Maine DEP's Division of Watershed Management) — This is the most common source of funding for watershed projects in Maine. A USEPA-based grant originating from Section 319 of the Clean Water Act, it is used to conduct surveys and/or implement "best management practices" (BMPs) for controlling nonpoint pollution sources.

• **Municipal Funding** — If the survey process is planned well in advance, a town may be able to include expenses for the project in its annual budget. A town's conservation commission may help with survey material costs.

• **Local Youth Conservation Corps** — Some watersheds organizations in the state employ small teams of youth through the summer, implementing best management practices (BMPs) throughout the watershed. These groups often participate in watershed and stream corridor surveys — which helps to identify sites for future BMP work.

• **Local Businesses and Corporate Sponsors** — Local sponsors sometimes may contribute money, food, or equipment loans.

• **Organizational Fundraising** — This method has the added value of gaining support and promoting education in the community you serve. Some ideas include: river festivals, fundraising events. association dues, membership drives, product sales, direct mail solicitation.

• **Additional Grant resources** — Search the Internet or read the latest MDEPStream Team Program newsletter at: **www.maine.gov/dep/blwq/docstream/team/streamteam.htm** for ideas.

• **Self-funded** — It is possible to do a low-budget survey for small areas involving just the cost of photocopying, printing of the final report, and mailing expenses. This method involves a higher commitment of volunteer time and makes use of technical assistance from state agencies.

G. Communicate with the Public

■ **Communicating with the public is critical to a successful project.** A stream survey, conducted by community volunteers, is an opportunity to raise public awareness about the link between behavior and water quality, provide education about best practices for landowners, and share the relevance and positive impact of the project.

- **Seek Collaboration and Avoid Misunderstandings**

  Communicating with the public early in the process educates and informs citizens about the project well in advance of the field survey. Misunderstandings about the purpose of a survey can ruin a project before it gets started!

  Early public awareness raises citizens' questions and concerns and affords the steering committee time to address any issues, such as property owners who do not want volunteers to check their land. Community members may also point out problem areas in the watershed/stream before the field surveyors do their work.

  No effort should be spared in communicating with the watershed community throughout the project.

- **Offer Involvement Opportunities**

  A combination of active individual involvement working on the survey, or passive involvement such as reading about the project in a local newspaper, provides people a chance to comment on the project, offer any knowledge they may have that is relevant to the project, and promotes behavior change.

- **Offer Free Education/Technical Assistance**
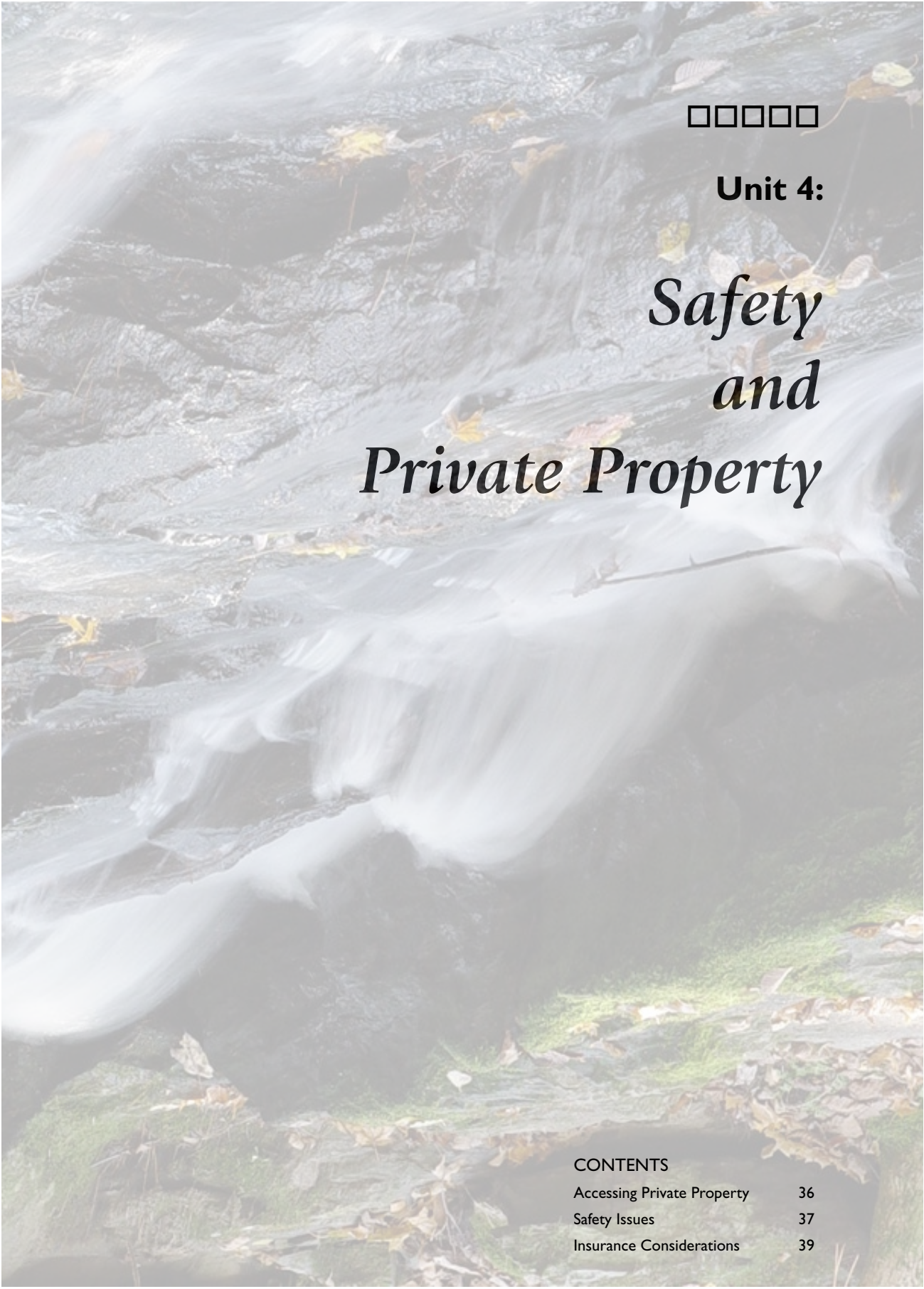
  People are more likely to change their behaviors to minimize their impact on water quality if they are aware of how their actions are linked to water quality. **Communicating with landowners** is one way to inform them that technical assistance is often available to help them address issues such as nonpoint source problems.
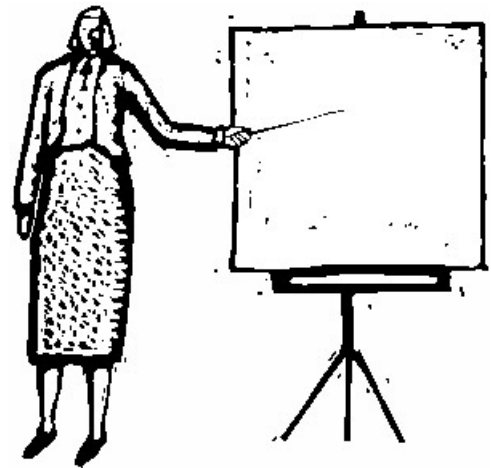
■ Notify the public about the project in as many ways as possible. These are the most common methods:

- **Send Letters to Landowners.** Send notification letters to all landowners in the survey area. The letter gives landowners advance notice about the survey and a name and phone number to call if they have questions. Landowner participation in the survey is optional — landowners might be more inclined to allow surveyors on their properties if they know what to expect. *(See Unit 4 for more information see Unit 4, or find sample notification letters in Appendix E.)*

- **Hold Public Information Meetings.** Hold public information meetings to explain the purpose and procedures of the project. Ideally, several public meetings should be scheduled before, during, and after the project. The meeting(s) should include the following components:
  √ Education on polluted runoff and stream ecology
  √ Information about known problems or sensitive habitats in the watershed/stream
  √ Summary of project goals
  √ Description of survey process
  √ Question and answer session.

- **Work with the Media.** Many people would prefer to learn about the project through the media rather than attending meetings or actively participating. Invite the press to all public meetings and volunteer training sessions. Send press releases to the local newspaper with written progress summaries throughout the life of the project.

- **Alert the Police and/or Town Office in Advance of the Survey.** The police or town office might receive phone calls about suspicious people walking around taking notes the day of your survey. Giving a heads-up to the police can help reduce confusion and suspicion.

Safety and Private Property

CONTENTS

Unit 4: Safety and Private Property

Safety and access to private property are very important issues for the steering committee to deal with before the actual survey takes place. First, we will discuss private property issues, then safety issues, and finally insurance considerations for projects like volunteer Stream Corridor Surveys (SCS), Watershed Surveys (WS), and water quality monitoring.

A. Accessing Private Property

Before accessing or traveling on private property, it is important to have **permission to access the property.** This can be done ahead of time by sending a letter to affected landowners. *(See Appendix E for sample landowner letters.)* A list of landowner addresses can be created at municipal offices. Visit the Assessor's Office to view local tax maps. These maps also delineate cultural features, road names, and natural features.

■ **Here are some things to consider including in your letter:**
- Purpose of the survey
- Educational information needed to convey the purpose of the survey
- Goals of the survey
- How the information will be used
- Invitation to participate in survey
- Date(s) and time(s) of the survey
- Contact information in case the landowner has questions or wishes to deny permission to access property

■ **Here are some additional tips regarding interactions with landowners:**
- Identify landowners who have denied access to their property, and communicate this to the volunteers surveying in those sectors or reaches.
- Do not attempt to access private property without landowner permission; always honor the rights and wishes of property owners. If the property owner does not wish to have his or her property surveyed, you must leave.
- Always honor "No Trespassing" signs.
- Avoid confrontations; they will not help to reach the overall goals of the survey and could potentially jeopardize the project.
- Make sure all volunteers have nametags, ID cards to leave in vehicle windshields, extra copies of landowner letters, etc., as forms of identification for people they meet.
- These same procedures should be followed when surveying commercial properties.
- Some businesses may require you to wear hard hats and steel-toed boots while you are on the premises to comply with safety regulations, or may have other restrictions.

B. Safety Issues

It is crucial for the steering committee and trainers to teach/remind volunteers about taking safety precautions prior to and during their survey. Below are some important tips to consider, share with volunteers, and implement. In planning for a training event, make sure you bring the appropriate safety items. Be sure to let volunteers know ahead of time what they need to bring.

■ **WORK IN TEAMS**
   • Work in teams of two (2) or more for safety and efficiency.

■ **KEEP OTHERS IN THE KNOW**
   • Be sure someone knows where you are.
   • Bring a cell phone.

■ **DRESS FOR THE EVENT / AVOID NATURAL PESTS and IRRITANTS**
   • Dress appropriately for the field. (Long-sleeve shirts and pants are recommended for areas which may require navigating through brushy/shrubby/buggy areas. Bring sunscreen.)
   • Make sure volunteers know how wet they're going to get, and plan accordingly (i.e., knee boots vs. hip boots, spare change of clothing, raincoat, etc.).
   • Be aware that poison ivy, oak, and sumac may be present in the survey areas and try to avoid contact with it.
   • Take precautions to deal with insects and other pests such as ticks (e.g., wear insect repellent, wear long sleeves and pants, tuck pants into socks, check one's body for ticks at the end of the day).
   • Wear hunter's orange clothing (e.g., vests, hats) during hunting season or when working near roads.

■ **WATCH YOUR STEP / BEWARE OF DEEP WATER**
   • Avoid working in stream/river waters that are deep or under high-flow conditions.
   • Walk on the streambanks or (dry) floodplain whenever possible.
   • Use caution walking along shorelines, streambanks, and hillsides that are slippery, rocky/wet/steep.
   • When working around large streams with high velocities, consider wearing a life jacket.
   • Be careful when walking in streams since they often can be deeper than they appear and often have stream bottom materials that are very slippery (due to algae/rocks/bedrock/clay).
   • Try to avoid walking in marshy, mucky soils or sediments — they are tricky to navigate and you may lose your boots or get stuck!
   • Wherever possible, check conditions in advance to give you a better idea of the type of obstacles you will be likely to encounter, and how that may impact time constraints.
   • In any situation, safety is the top priority. Avoid walking any sections that appear too deep or dangerous.

■ **OTHER IMPORTANT CONSIDERATIONS**

- Have volunteers sign a waiver prior to the survey acknowledging that they have been made aware of the risks and that they assume responsibility for their own personal safety while participating in the survey *(see Appendix F for an example)*.

- Have a first-aid kit available in the car.

- Get team leaders and volunteers trained in first aid and CPR whenever possible.

- Avoid dangerous weather conditions such lightning, severe winds, etc., or at least seek appropriate shelter.

- Encourage volunteers to respect the space and/or territory of wildlife and enjoy them from a safe distance.

- Plan ahead for bathroom breaks.

- Always use a map; a compass is handy too.

- Bring water and snacks.

- Wash hands before eating, especially if they have been in the water.

- Heed "beware of dog" and "no trespassing" signs.

■ **HERE ARE SOME HELPFUL SAFETY-RELATED WEBSITES:**

- **Lightning Safety**

  http://www.lightningsafety.noaa.gov/be_prepared.htm

  http://www.lightningsafety.noaa.gov/outdoors.htm

- **Ticks**

  http://www.nlm.nih.gov/medlineplus/tickbites.html

  http://www.mmcri.org/lyme/meticks.html

- **Poison Ivy**

  http://www.nlm.nih.gov/medlineplus/poisonivyoakandsumac.html

  http://www.nps.gov/public_health/inter/info/factsheets/fs_pivy.htm

(NOTE: **When working with students**, consider only involving teens older than 16 years since they tend to have greater attention spans and patience, and be more responsible. Students ages 12 - 15 may also make good survey participants, but try to make sure ahead of time that they would be interested in the event.

Alternatives to involving students in stream surveys are to hold more hands-on, education-oriented events alongside a stream or river. Investigating the macroinvertebrate [aquatic insects, crustaceans, etc.] community or water quality can be very fun and informative, and may hold the students' attention very well. Contact the MSTP or visit its webpage for more ideas. In any situation involving kids 18 or younger, involve as many chaperones as possible — no less than one [1] adult per three [3] students. *[See Appendix F for sample waiver forms you might consider having your volunteers sign])*

C. Insurance considerations

While not mandatory, groups should consider getting insurance coverage for their volunteer event. Some possible types of coverage may include "event insurance," "accident/medical/injury insurance," and "liability insurance." These types of insurance can be obtained through a private insurance company. Alternatively, there are a few insurance programs that are available to volunteers and volunteer groups at reduced costs or for free through various conservation and nonprofit organizations. Contact the Maine Stream Team Program for advice on possible insurance opportunities. Insurance agents are another good source of information.

Since the Maine Stream Team Program is not an expert organization on insurance and liability issues, we refer you to a variety of resources available on the Internet that may answer your questions.

■ **Nonprofit Risk Management Center**

- *Insurance for Volunteer Programs*
  http://nonprofitrisk.org/library/articles/insurance052004.shtml

- *Glossary of Risk Management and Insurance Terms*
  http://nonprofitrisk.org/library/glossary.shtml

- *Myths of Volunteer Risk Management — Part 1*
  http://nonprofitrisk.org/library/articles/volunteer050098.shtml

- *Myths of Volunteer Risk Management — Part 2*
  http://nonprofitrisk.org/library/articles/volunteer09001998.shtml

- *Myths of Volunteer Risk Management — Part 3*
  http://nonprofitrisk.org/library/articles/volunteer010299.shtml

■ **Public Entity Risk Institute**

- *Insuring Volunteers*
  http://www.riskinstitute.org/peri/

- *Myths About Nonprofit Liability and Risk Management*
  http://www.riskinstitute.org/peri/

□□□□□
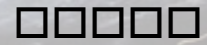
Unit 5:

Stream Corridor Survey (Level 1)

CONTENTS

Unit 5:
Stream Corridor Survey (Level 1)

A. *Introduction to a Stream Corridor Survey*

The Level 1 Stream Corridor Survey (SCS) is a screening-level, in-stream survey technique for wadable streams created by the Maine Department of Environmental Protection (MDEP) in collaboration with the Maine Department of Inland Fisheries and Wildlife (MDIFW).[1] With more than 45,000 miles of streams and rivers existing in Maine, volunteer participation in SCS efforts helps both agencies target resources toward the streams that most need attention.

Although the purpose of individual surveys varies from group to group, SCS projects typically fulfill the following functions:

- Identify streams, reaches, or sites: having high-quality habitat; having moderately- or highly-degraded (impaired) habitat, or significant pollution problems; that are in need of more detailed follow-up survey or assessment work;

- Promote education and stewardship;

- Provide information useful for the management (protection, rehabilitation, conservation, regulation, etc.) of stream water quality, habitats, fisheries, and riparian lands.

SCSs can vary greatly in scope, depending on the topography, access, length of the stream, number of reaches being surveyed, and the number of surveyors. **This manual is geared towards projects that incorporate the use of a group of volunteers as surveyors.**

It is worth noting that an individual, once trained by either MDEP's Maine Stream Team Program (MSTP) or Maine Department of Inland Fisheries & Wildlife (MDIFW)/Fisheries Research Section staff and comfortable with the survey procedure, may complete stream surveys and submit the data to either the MSTP or MDIF&W Fisheries Research Section independent of an organized stream survey event (see Appendix J for more information).

This is often done by people (such as anglers) who frequently spend time on streams and may incorporate the survey into a particular outing. These people, once trained, may choose to bypass the rest of the information in this unit and move right to the abbreviated instructions and datasheets in Appendix J. This unit is helpful as a refresher.

All other folks (including volunteer group efforts) interested in doing these surveys should continue reading this unit, get trained, and then use Appendix J as a portable field manual.

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[1] This technique may have limited use in deeper streams and rivers, since some of the questions (e.g., channel bottom substrate characteristics) will be more difficult to assess and safety concerns might be even greater than normal. Also note that since this is designed to be an in-stream survey, you either need an appropriate water craft or easy access to hike along the banks of the river.

SCSs are **reach-based surveys**, rather than point- or site-based surveys (e.g., watershed survey). A "*reach*" is a relatively homogeneous length of a stream having a repetitious sequence of physical characteristics and habitat types. **This level of information is important screening-level information that identifies a section of a stream that may be experiencing pollution/habitat problems — or may have excellent habitat quality.**

Some groups may also wish to document the location and type of problems or exceptional habitats to a finer precision than at the *reach* level. They wish to do this for a variety of reasons including the fact that they might be also conducting a watershed survey of the area and they would like to include detailed, site-specific information from in-stream or riparian locations into their watershed survey report. In this case, groups can bring along a set of additional datasheets called *Site Forms,* which will be discussed later in this unit.

B. Components of the Stream Corridor Survey

The SCS is a combination of two survey techniques: the **Stream Habitat Survey** and the **Rapid Geomorphic Assessment.** Groups may also complete optional Site Forms during their survey.

■ **STREAM HABITAT SURVEY:** This is an easy-to-use approach for identifying and assessing the elements of a stream's habitat. (It is based on a simple protocol known as *Streamwalk* developed by EPA's Regional Office in Seattle, WA and modified by MDIFW's Fisheries Research Section and MDEP's Maine Stream Team Program.)

The protocol consists primarily of **visual observation** of stream habitat characteristics, basic water quality conditions and potential pollution sources, aquatic life presence, and general physical attributes. A simple **in-stream macro-invertebrate collection** can also be performed, if desired. This approach requires little equipment and only a couple hours of training. It is a useful screening tool for making a preliminary assessment of a stream's overall biological and physical integrity.

A **Stream Habitat Survey is most useful for:**
- Learning about local stream ecosystems and environmental stewardship opportunities;
- Generating general information and data (descriptive and photographic) about a section of stream;
- Identifying high-quality stream habitat and fisheries/wildlife populations for potential preservation or management efforts;
- Identifying severely degraded habitats, nonpoint source pollution (NPS) problems, or water quality issues, all of which can lead to potential restoration planning and actions.

A Rapid Geomorphic

Assessment (RGA):

• screens general

stability and

overall condition of

stream reaches;

• identifys reaches

having significant

sediment sources;

• identifys reaches

receiving unusually large

volumes of stormwater;

• identifys reaches

exhibiting signs of

possible alteration by

human activities;

Target reaches for

further assessment or

restoration planning.

■ **RAPID GEOMORPHIC ASSESSMENT (RGA):** This part of the survey gathers basic, screening-level information about the "fluvial geomorphological" characteristics of the stream reach. **Fluvial geomorphology**, in simple terms, is the **study of the shape and stability of river and stream systems.** It assesses not only the form of these watercourses, but also the associated contributing physical processes related to water and sediment transport through stream systems. Advanced assessment techniques can help determine appropriate restoration techniques to use, if necessary. *(For more resources and information, refer to Volume I, Table 3-4, as well as Volume II's discussion of physical characteristics of streams and rivers.)*

RGA is most useful for:
- Screening the general stability and overall condition of stream reaches;
- Identifying reaches having significant sediment sources (e.g., excessive NPS pollution and runoff, bank erosion, or slumping), which may cause channel instability;
- Identifying reaches receiving unusually large volumes of stormwater from sources (e.g., large amounts of impervious surfaces [parking lots, rooftops, roads, etc.]), which may cause channel instability;
- Identifying reaches exhibiting signs of possibly having been altered by other human activities such as channelization, floodplain alteration, riparian zone degradation, etc.;
- Targeting reaches for further assessment or restoration planning.

■ *(Optional)* **SITE FORMS FOR DETAILED SITE DOCUMENTATION:**
The Site Form *(Appendix K)* is designed to **document specific locations** where either NPS pollution, riparian zone degradation, or exceptional coldwater stream habitat sites may occur. This form is designed so that it can be used as the **primary datasheet** in Watershed Surveys, as well as be a supplemental form in Stream Corridor Surveys.

For WS: these types of surveys *(discussed in Unit 6)* can use these Site Forms both on the watershed landscape and near or in streams. (*NOTE:* WS do not always direct volunteers to walk in or alongside stream reaches, as volunteers do during SCS surveys.)

For SCS: These types of surveys, when using only **SCS datasheets** *(Appendix J)*, assess general conditions at the reach scale, noting problems but not specific locations and problem details. Site Forms are most useful in CS projects for:
- Identifying and recording information about specific locations having NPS pollution or riparian degradation issues or apparently "high-value" habitats within a given stream reach;
- Reducing the number of volunteer hours needed to survey the watershed by making use of SCS volunteers already walking the stream channel;
- Providing data that is comparable to that generated in a watershed survey so that it can be easily used in prioritizing identified sites for restoration projects, etc. (*NOTE:* Restoration projects should not be attempted, especially in stream channels or on their banks, without professional oversight.)

C. Planning a Stream Corridor Survey

The basic steps involved in developing and organizing a survey, including how to determine project leadership and assign responsibilities and how to gather existing data, are described in Unit 3.

The information in this unit is designed to supplement this information with topics specific to SCS planning. These topics include:

- **Scheduling**
- **Securing Funding**
- **Communicating with the public and recruit volunteers**
- **Determining the Study Area and Stream Reach Locations**
- **Gathering Materials (equipment, datasheets, etc.)**
- **Choosing Reaches to Be Surveyed and Assigning Volunteers to Reaches**
- **Training Volunteers**
- **Conducting the Survey**
- **Managing the Data**

The Importance of Steering Committee Meetings

One or two people can usually complete most of the planning tasks listed in section C. Still, it is very important to have at least one or two steering committee meetings in order to keep other committee members in the loop, gather any feedback they may have, iron out any logistical probelms that may arise, etc.

The more that can be accomplished before the actual survey field event, the smoother and more efficient the event will actually be. For example, attempting to prioritize the reaches to be surveyed and trying to assign volunteers and technical leaders to reaches in advance of the survey day, as best as possible, will greatly reduce the amount of organizational time needed before survey teams are sent into the field. Survey training events can be chaotic in the beginning as volunteers arrive, so any effort to be more organized can reduce the amount of time volunteers may waste just standing around waiting for assignments.

■ C1. *SCHEDULING*

The schedule for a SCS is driven by the time of year that you plan to complete the survey. The **best time for conducting these types of surveys is the summer up through the early fall** (before leaf-fall). Keep in mind that aquatic life is most vulnerable to stressful, warm-water temperatures and, thus, we want to know how well the stream is being shaded during the warmest months of the year. Doing surveys before mid-fall (October/November) also helps avoid the spawning season of certain fish and hunting season.

It is also recommended to avoid periods of heavy rains and snowmelt because of the dangerous high flows that commonly are associated with them. If surveys happen to be done before tree and shrub "leaf-out" or after "leaf-fall", make a note of it on the data sheets because the riparian canopy assessments (i.e., shade) will be misleading. It may also be difficult to assess channel bottom characteristics because leaves have accumulated there.

You may need to schedule the survey to **coincide with the needs of your anticipated volunteers.**

The volunteer survey work consists of three parts:
• indoor classroom training,
• outdoor field training, and
• the actual survey.

You may opt to conduct the indoor training (typically about 1.5 - 2.0 hours) prior to the field-work date, depending on the availability of volunteers and time constraints of technical advisors, though most groups do this all on one day.

From start to finish, including designing the survey, recruiting and training volunteers, conducting the survey, submitting the data, and designing a follow-up action plan, a **SCS project's schedule can span at least four to five months,** and often at least a year if the action plan involves writing a final report. *(See Table 3-5 [Unit 3] for estimates of time required to complete SCS projects.* Sample timelines for typical SCSs can be found in **Table 5-2.)**

Table 5-2:
Sample Timelines for Stream Corridor Surveys.

These timelines are not mandatory and are meant to be examples *(for Watershed Survey timelines, see Unit 6)*. Local conditions and logistics will affect timelines. **(Be aware that some grants, such as the Maine DEP "319" grants, may take over a year to submit, be reviewed, possibly awarded, and funded. Plan accordingly. The earlier you can begin the organizing and fund search processes, the greater your chances for a successful and less stressful project.)**

MONTH	TASKS
Example 1	**Stream Corridor Survey (SCS) only**
MARCH–APRIL	• Organize project leadership; assign responsibilities; gather existing data; set timeline; secure funding (see Unit 3).
JUNE	• Send out letter to landowners on stream; do press release and/or volunteer recruitment.
JULY	• Train volunteers and conduct stream corridor survey (SCS); collect datasheets and pictures.
AUGUST	• Compile the SCS data; archive for organizational use; send copies to MSTP or MDIFW.
FALL WINTER	• Write and review report. • Create an action plan for using survey data (may involve presenting data to municipal officials, applying for grants for water quality monitoring or best management practices to reduce pollution or improve riparian buffers, etc.).
Example 2	**Stream Corridor Survey (SCS) plus Watershed Survey (WS)**
MARCH–APRIL (Year 1)	• Organize project leadership; assign responsibilities; gather existing data; set timeline; secure funding (see Unit 3).
JUNE-JULY	• Send out letter to landowners on stream; do press release and/or volunteer recruitment.
AUGUST SEPTEMBER	• Train volunteers and conduct SCS; collect datasheets and pictures.
OCTOBER	• Compile the SCS data; archive for organizational use and send copies to MSTP or MDIFW. • The technical team may need to conduct follow-up visits of specific sites documented with Site Forms in or alongside the stream during the course of the SCS in order to further analyze the situation, rank severity of the problem or extent of highly valuable habitat, and then determine future action.
LATE FALL EARLY SPRING (Year 2)	• Write and review report and create an action plan for using survey data (may involve presenting data to municipal officials, applying for grants for water quality monitoring or best management practices to reduce pollution or improve riparian buffers, etc.). • Use knowledge gained from SCS to help focus and prioritize watershed survey efforts. Use the SCS report to maintain project momentum and generate interest in future survey work.
SPRING	• Conduct a WS (see Unit 6).

■ **C2.** *Secure Funding*

You most likely will have expenses associated with conducting a Stream Corridor Survey, though some small projects can be completed with fairly minimal costs. *(See Unit 3 for more information about funding issues.)*

■ **C3.** *Communicate with the Public and Recruit Volunteers*

Communicating with the public to make them more aware of your project is a very important step in the survey process.

- Communicating through **letters** and **press releases** can be a good way to recruit volunteers.

- You may also consider soliciting **help from other groups** or organizations *(for more information, see Unit 3).*

- You must send out letters to each of the landowners whose land you need to access. *(Instructions and sample letters are included in Unit 4 and Appendix E, respectively.)*

■ **C4.** *Determining the Study Area and Stream Reach Locations*

This is an important part of the planning process and is comprised of **three key steps:**

- Set the appropriate scale for the project

- Divide selected stream sections into survey reaches

- Name the reaches

■ **C4a. Set the Appropriate Scale for the Project**

Ideally, we would like all streams in the State of Maine to have SCSs performed along their entire lengths, including tributaries. Realistically, we all have limited time and resources.

If surveying your entire stream system is unfeasible, develop a plan to prioritize sections of the stream to survey based on the individual goals of your project, available resources, safety constraints, access concerns, and existing information on the stream.

Project leaders or steering committees may select survey locations themselves or in collaboration with local or state water quality or biologist personnel. Other projects allow their volunteers to choose the location(s) based on their personal interests.

Groups choosing to survey the entire stream may do so in one large, concentrated effort, or they may opt to do it in phases over time. If the primary function of your survey is education, you may opt to survey only the few reaches covered in training with the help of your technical advisors.

Once the scale of the survey is determined, and the survey area has been chosen, it should be marked on a copy of the topographic map of the watershed.

> **TIPS** on **how to read topographic maps** can be found at:
> http://erg.usgs.gov/isb/pubs/booklets/symbols/
> and other resources on the Internet.

■ C4b. Divide Selected Stream Sections into Survey Reaches

The SCS involves assessing the overall characteristics of not just a single "point" on a stream, but rather a length of stream called a reach. As mentioned earlier, a stream reach is a relatively homogeneous stretch of a stream having a repetitive sequence of physical characteristics and habitat types. Reaches vary in length, typically between 100 - 1000 yards.

Stream reaches may be delineated in one of two ways: the **recommended method** is to delineate stream reaches in advance of survey, while the **Alternative Method** is to allow volunteers the discretion to identify reach endpoints while they survey.

■ C4b.1. Recommended Method —
Delineating stream reaches in advance of the survey

The topography of the stream channel and banks is a major indicator of how homogeneous a reach is.

- Using a topographic map, you can identify sections of stream that have a certain slope to the stream or its banks/floodplain, or a certain channel shape *(Figure 5-1)*.

- Reaches identified and defined on topographic maps can be copied onto smaller topographic maps (or copies of the map).

- GPS coordinates for the reach endpoints may be provided to the appropriate volunteer groups. Since GPS coordinates can sometimes be erroneous, it usually is worth providing volunteers with a map.

Experience has shown that it is valuable for the project organizer to do a reconnaissance visit to possible access points in advance of the actual survey, whenever possible. This reconnaissance can identify sites the do not allow good access or which may be extraordinarily difficult to walk/survey.

Figure 5-1:

Figure 5-1. An example of reach designations based on changes and differences in topographic features.

TOPO MAP FEATURES:

Stream Gradient

Stream Sinuosity

Width of Stream Valley

Tributaries

Wetlands

Road Crossings
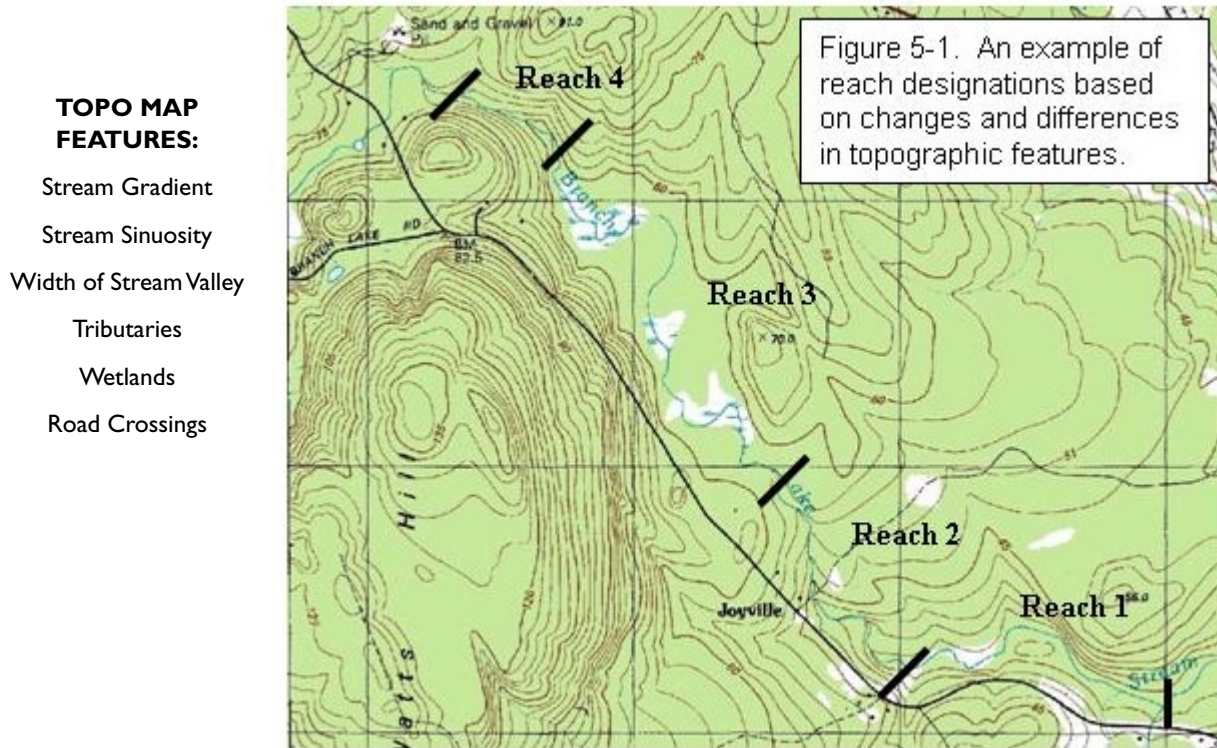
Refer to the the online version of this publication to view the features of *Figure 5-1* more clearly in color. The publication can be found at http://www.maine.gov/dep/blwq/docstream/team/streamteam.htm

The following features, as depicted on your topographic map, will help you to delineate reach endpoints. *(Example reaches used in the text below are shown above in Figure 5-1.)*

- **STREAM GRADIENT:**

Follow the blue line of the stream. It will cross brown elevation contour lines as you follow it downstream or upstream. How closely spaced are the brown elevation lines it crosses?

If the elevation lines are closer together *(see Reaches 2 and 4 in Figure 5-1)*, the stream is relatively steep. There may be more riffles and cascades in steeper sections.

If the elevation lines are further apart *(see Reach 3)*, it is a relatively flat section of stream. There may be more runs or deadwaters in flatter sections of stream.

Generally, noticeable changes in stream slope will designate most reach breaks.

- **STREAM SINUOSITY:**

Sinuosity is the degree to which a section of stream resembles an "S" shape. Is the stream channel meandering (curving) a great deal *(Reach 3)*, or is it more straight *(Reach 4)*? Streams are not naturally perfectly straight, though they might be fairly straight in certain situations (e.g., high mountain streams underlain by bedrock). Historically, some streams in Maine were widened for flood control or log-drive purposes. Is there evidence that the channel may have been straightened on the topographic map? *(Look for this particularly in areas with wide stream valleys, where streams would naturally meander.)* Local residents, officials, or historical records and maps may help provide further evidence about possible stream modifications.

- **WIDTH OF STREAM VALLEY:** Areas on maps where steep elevation contour lines running parallel to the stream are located far away from the line of the stream indicate wide valleys *(Reach 3)* as opposed to areas where these contour lines are located very close to the stream line indicate narrow stream valleys *(Reach 4)*.

- **OTHER FEATURES:** Look for other marked features on the topographic map, such as **tributaries** entering the stream *(see the bottom of Reach 1)*, **wetlands** *(Reach 3)*, or even **land uses** *(transitions from rural to urban)* or **road crossings** to provide additional reach end points. If access on your stream is difficult or limited, you may need to use railroad tracks and road crossings as reach endpoints, particularly where one group surveys reaches upstream of the access point and one group surveys downstream of the access point.

- **MARKING STREAM FEATURES ON THE TOPOGRAPHIC MAP:** Once you have identified **reach breaks** *(endpoints)* based upon major changes in the gradient, sinuosity, valley width, crossings, and other features of the stream, mark them on your topographic map. Check the **length of the reaches** to make sure that they are an appropriate length. If one of your reaches appears to be too long (more than a 1/2 mile), take a closer look at it and see if you can subdivide it by doing a more sensitive analysis of the topographic map.

FIELD WORK MODIFICATIONS:

No matter how thorough a job you do defining reach breaks using topographic maps, volunteers may still need to make minor modifications when they get into the field.

These modifications could include dividing a pre-defined reach into two or more physically- or biologically-distinctive "sub-reaches."

For each sub-reach, a separate datasheet set will need to be completed. Still, defining reach breaks (particularly subtle ones) in the field is sometimes tricky and may require more experience than your average volunteer has.

For this reason, we recommend wherever possible that you carefully identify as many reach breaks in advance of the survey as you can.

■ **C4b. 2.** *ALTERNATIVE METHOD —*

Allow volunteers the discretion to identify reach endpoints while they survey

- **This may be useful for one-day surveys** covering a smaller section of stream, where the **primary purpose of the stream is education,** and where the **technical advisors are available** to advise volunteers on appropriate endpoints in the field.

- **This option may also be useful in larger surveys** where access points are a consideration. You may opt to divide volunteers into groups assigned to survey a certain sections of the stream (predetermined by road crossings, railroad crossings, or other prominent features), with the understanding that the volunteers will divide their section into reaches while in the field, filling out one datasheet for each reach. Having the volunteers bring maps of their assigned sections into the field will aid them in determining reach breaks.

■ **C4c.** *NAME THE STREAM REACHES*

For consistency, we have devised a relatively easy way to name stream reaches which allows you to know where you are on the stream and also to track reach numbers in all photographs taken within that reach. **Figure 5-2** illustrates an example of using this naming system.

The name of any given reach consists of three parts as follows:

• **CAPITAL LETTER:** One capital letter represents the branch of the stream. **Your primary stream of interest is designated 'A'.** All branches off the main stem of the stream and all tributaries feeding into the stream are designated by a different capital letter (e.g., B, C, D, etc.) in alphabetical order *(see Figure 5-2)*. (When selecting a letter, use any letter in the alphabet except 'O' and 'Z' because they also can be easily confused with the numbers '0' and '2'. Flipchart templates can be found in Appendix H.)

• **NUMBER: Each reach within a stream branch receives its own number,** starting with '1' (from the most downstream section of the branch) and increasing upstream from there.

• **LOWER-CASE LETTER** *(optional)***:** If, in the course of the survey, the volunteers determine in the field that the survey reach needs to be broken down into **sub-reaches,** add a lower case letter (starting with 'a' for the most downstream sub-reach) to the end of the reach number. A reach may be divided into up to 11 sub-reaches (from 'a' to 'k') as necessary.

Figure 5-2:
Example of Stream Reach Naming Procedure
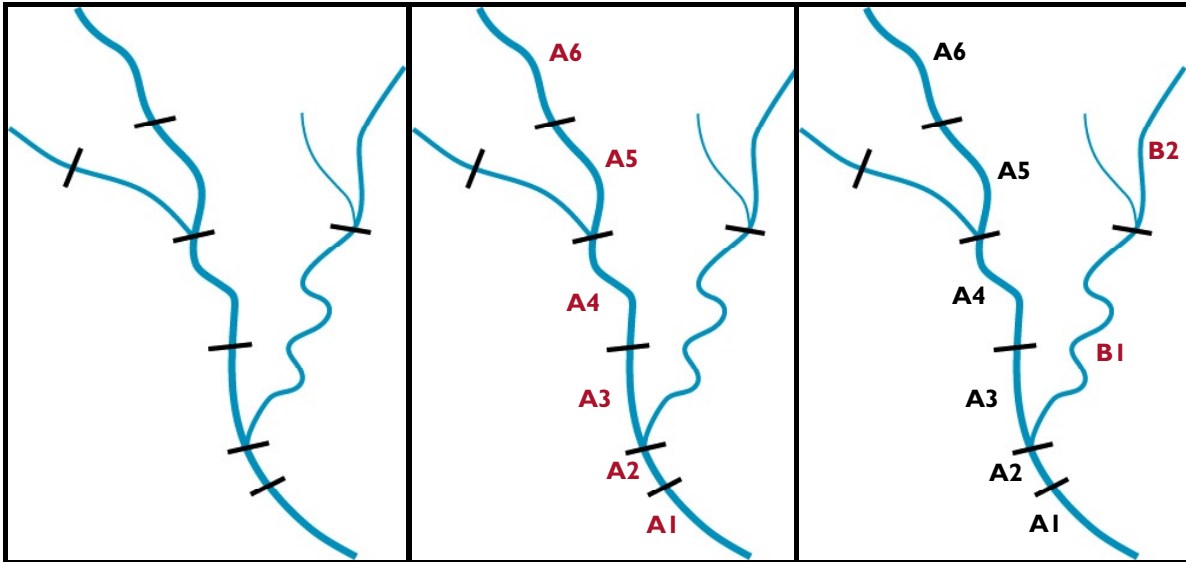
STEP 1: Mark all reach breaks on stream and its tributaries.

STEP 2: Starting with the downstream end of the main stem (labeled 'A'), name reaches 'A1', 'A2', etc., as illustrated above.

STEP 3: Name reaches for the most downstream tributary entering your stream 'B1', 'B2', etc., as illustrated above.
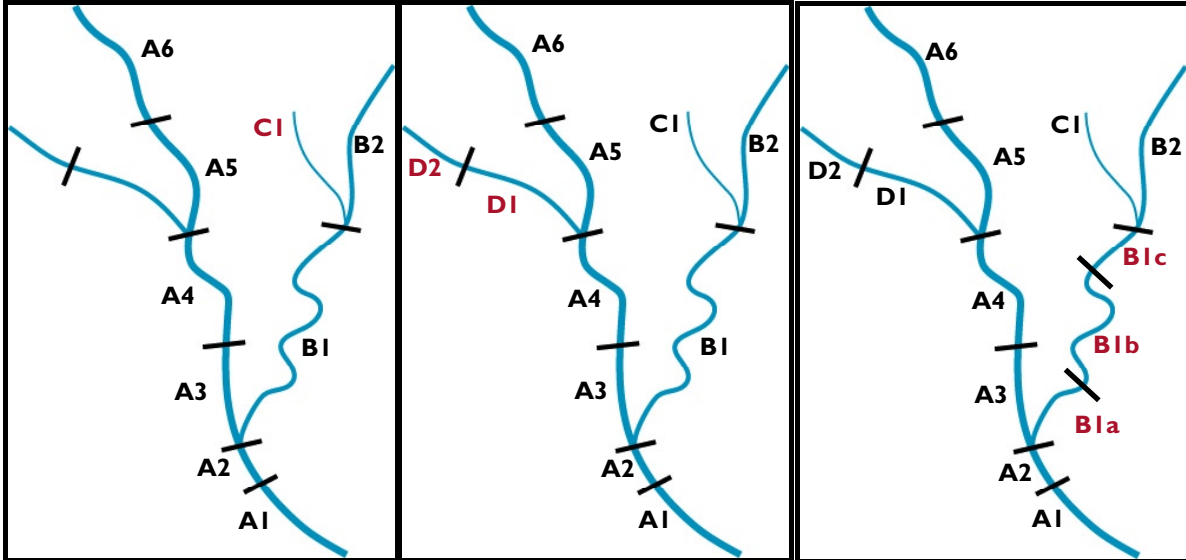
STEP 4: Name reaches for all tributaries entering tributary 'B' from the most downstream tributary ('C', etc.") to the most upstream trib ('D', 'E', etc., if necessary; not shown in this particular example).

STEP 5: Working your way upstream on the main stem, repeat Step 4 on all additional tributaries, being careful to assign each tributary a unique letter of the alphabet (EXCLUDING the letters 'O' and 'Z').

STEP 6: Final reach designations —Volunteers may divide reaches into sub-reaches in the field, keeping the original reach name (e.g. 'B1') as the prefix, and adding 'a', 'b', etc., starting downstream, as shown.

■ C5. *Gathering Materials* (equipment, datasheets, etc.)

Stream habitat surveys can be conducted fairly economically.

C5a. EXPENSES may be limited to:

- Postage for landowner letters, copying of datasheets and reports, and buying disposable cameras/developing film. (Digital cameras, once purchased, provide photos for free.)

- Other materials may often be borrowed from either the volunteers or your technical advisors.

- Better-funded groups may opt to purchase some of the items.

- You may also want to provide some sort of refreshment (water/snacks), particularly for full-day survey events with volunteers. When coffee or lunch is provided, volunteer morale always rises!

C5b. TYPES of MATERIALS

You and/or your technical advisors will need to organize the following materials prior to training and encourage volunteers to bring what items they can. The amount of materials depends on the number of volunteers (and groups), you anticipate being part of the project . You may ask volunteers and technical advisors to bring some of these items; others you may have to obtain yourselves.

❏ **SAFETY EQUIPMENT:**

- First-aid kits

- Cell phones

- Field gear (water, sunscreen, insect repellent, long sleeve shirts/pants [optional, but recommended]; volunteers are encouraged to pack a spare set of clothes in the unlikely event they fall in the water)

- Hand-cleaning wipes

- Blaze orange clothing (**We recommend NOT conducting surveys during hunting season; however, if you must, blaze orange is an absolute necessity.)** Blaze orange clothing is a worthwhile precaution in high traffic areas. Make sure it is reflective clothing if working close to dawn or dusk.

❏ **PAPERWORK:**

(All SCS paperwork listed here, except topographic maps, is included and/or referenced in Appendix J.)

- **Topographic map:** Copies of U.S. Geological Survey (USGS) 7 1/2 minute topo maps, or other maps such as GIS maps, of the stream area with pre-assigned reaches or segments marked on them. These can be supplemented or substituted by regular street maps or an atlas/gazetteer if needed, though they tend to show features at a larger, less-detailed scale. Some websites offer the ability to print portions of topo maps; *(contact the MSTP for more details)*.

- **SCS Field Datasheets:** Include several extra sets in case volunteers want to have their own copy, or need to divide a reach into multiple sub-reaches *(Appendix J)*. (*NOTE:* The datasheet sets are available in two GPS-type formats: UTM Zone 19 and Latitude/Longitude. The UTM system is preferred because that is what most Maine state agencies use [including MDEP and MDIFW], however Lat/Long is still an option.)
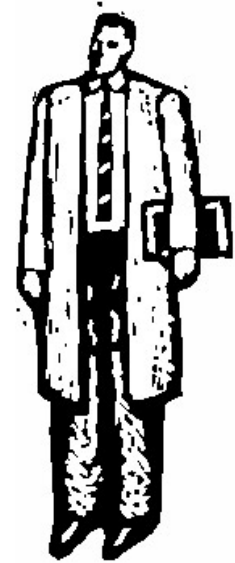
- **SCS Instructions:** This reference document contains detailed information about each of the questions on the SCS datasheet *(Appendix J)*.

- **RGA Picture Key:** This 15-page reference guide with color pictures is an invaluable tool that helps translate complex Rapid Geomorphic Assessment jargon into useable information *(Appendix J)*.

- **Site Form Datasheets:** Any survey organization that will be identifying NPS pollution sites as part of a larger subsequent watershed survey, or who simply want to document very specific locations along the survey reach, will need to provide volunteers groups with a set of site survey datasheets *(Appendix K)*.

- **Landowner letter:** A copy of the letter sent to landowners prior to the survey may be useful (optional) *(Appendix E)*. A list of landowners requesting volunteers to stay off their property can help volunteers avoid confrontation.

- **Clipboards:** Clipboards with covers are preferred to help keep papers dry; 1-3 per group, depending on the division of group responsibilities.

- **Pencils** or other **writing implements**

- **GPS unit and adequate batteries:** A GPS unit is recommended, but not mandatory. If you don't have this equipment, try to at least submit a copy of a map indicating where you surveyed, along with a detailed description.

- **Camera:** Digital cameras (and batteries) are preferred. If not using digital cameras, include adequate film as needed. It is recommended when having film developed to request a CD copy of the prints.

- **Photograph ID "Flip Charts":** Useful for helping identify where each photo was taken (Appendix H).

- **Tape measure,** string, or twine (at least 25 yards) for taking stream width measurements (optional).

- **Yard/Meter stick** for taking stream depth measurements.

- **Thermometer for measuring water temperature** (optional, but recommended): A number of companies on the Internet sell inexpensive armored thermometers that are best suited for this purpose. Aquarium stores may have some too. Contact the MSTP if you need additional information.

- **Stopwatch** or watch with a second hand for estimating flow rate (optional).

- **Macroinvertebrate collection supplies** (optional): small bucket, shallow white pan/white plastic plate/bottom of a white plastic jug, tweezers/soft brush, ice cube trays for sorting, magnifying glass, and macroinvertebrate identification keys. For more rigorous macroinvertebrate surveys, a net (with handle) with fine mesh netting (500 µm mesh) is recommended. [To locate macroinvertebrate identification keys and field guides, search the Internet (including online distributors), check with organizations such as the Izaak Walton League of America, River Network, Adopt-A-Stream Foundation, etc., or contact the MDEP Maine Stream Team Program.]

(See Unit 3 for information on possible sources of funding and resources to help obtain materials for a SCS survey.)

■ C6. Choosing Reaches to Be Surveyed/Assigning Volunteers to Reaches

(This section continues the discussion about volunteer recruitment, choosing the reaches to be surveyed, and the assigning of volunteers to reaches.)

■ C6a. Determine how many volunteers you need

The number of volunteers you will need for a survey depends on two things: the number of volunteers per "group" (a subset of your total number of volunteers) and the number of reaches your project hopes to survey. It is important to try to plan for these numbers in advance of the event as much as possible. Still, it is important to keep in mind that you must flexible on the day of the event in case the actual number of volunteers, who show up to participate, is less than what you had expected. *Flexibility* is a critical trait an organizer must have for these types of projects.

■ C6b. Number of volunteers per group

The recommended number of people per group is two - four (2-4), including one experienced technical leader, if possible. An ideal number of people per group is usually three (3), given the types of tasks associated with conducting a survey. This number helps ensure there are enough people to complete the various tasks within a reasonable amount of time, while avoiding having extra people becoming bored.

■ C6c. What kind of volunteers are needed?

Because of the risks inherent in working in, and close to, streams, make sure your volunteers are in excellent health and physically able to participate in the survey. Also, take volunteer age into account. Teens may perform the survey with adult supervision, but these surveys are not recommended for preteens or younger unless many adult supervisors are involved. Whenever working with kids, carefully scout out and select safe (i.e., not steep, slippery, deep-water, etc.) survey locations. *(See Unit 4 for more information.)*

■ C6d. Where do you find volunteers?

See Unit 3 for ideas.

■ C6e. What do you tell volunteers?

This is an in-stream technique. It is your responsibility as the volunteer recruiter to make sure the volunteers understand what the survey entails, and to prepare them for the conditions they are likely to encounter.

GENERAL LOGISTICS AND SAFETY ISSUES:

• **Location and time**

• **Water depth** (estimated): What kind of footwear do they need?

• **Degree of difficulty:** Some stream reaches are more physically challenging than others. Will they be expected to hike through the forest, shrubby riparian lands, marshy wetlands, or on very steep or uneven terrain?

• **Special safety considerations:** Be sure to scout these out well in advance of the survey, and make volunteers aware of potential hazards (weather, wildlife, etc.). Always make sure to state how slippery stream channels and banks can be. *(See Unit 4 for more information.)*

• **Contingencies:** Provide your phone number in case a volunteer must cancel, or to find out plans in the case of foul weather.

• **What to bring:** See checklist in section C-5.

■ **C6f: Divide up the survey tasks/roles and assign them to volunteers**

The division of tasks and roles among various members of each reach-surveying team will ultimately depend upon the number of volunteers who show up to the survey event and the resulting size of these teams (groups). **Table 5-3** presents an example of how survey responsibilities might be divided within an example team made up of three (3) volunteers. Keep in mind that this is an example; it may need to be modified according to team size and individual interests.

Table 5-3:

Division of tasks and roles among survey team of 3 members — an example

The decision of whether or not tasks are required depends on: (1) the goals of the survey (e.g., did the project leaders choose to include the use of Site Forms to add that data to a related watershed survey?) and (2) the availability of certain equipment (e.g., GPS unit).

SURVEY TASKS	VOLUNTEER MEMBER ROLES			
	Required	Volunteer 1	Volunteer 2	Volunteer 3
Make observations of stream channel, bank, riparian zone, geomorphology, nearby land uses, pollution (if any), organisms, etc.	YES	X	X	X
Fill out datasheets:				
Stream corridor habitat/ pollution conditions	YES	X		
Sketch of reach	YES	X		
Rapid geomorphic assessment (RGA)	YES	X		
Individual Site Forms	Optional		X	
Take photographs	YES		X	
Make measurements of stream depths and widths (widths may be estimated)	YES			X
Manage the Photograph flip chart (Appendix O)	Recommended			X
Collect GPS coordinates	Recommended			X
Make measurements or complete inventories of: temperature, water velocity of stream, quick macroinvertebrate inventory	Optional			X

■ C6g: Choose the reaches to be surveyed and then assign volunteers

Once you have determined reach breaks and named all the reaches of interest, an important step is to estimate how many volunteers and group leaders (technical staff) will be available to actually conduct the survey. **The recommended method is to first estimate the number of volunteers, based upon responses from your conversations and correspondences with people, and use the estimate for preliminary planning of the survey**. On the day of the event, count the number of volunteers and technical staff present. This number will determine the actual number of reaches you and your volunteers are reasonably able to survey.

■ There are a number of considerations to take into account when estimating the number of reaches to be surveyed during a project.

Indicate on a "master" copy of the project map which groups will cover which sections. Keeping in mind the considerations and constraints, divide the survey reaches into sets for each group (e.g., Group #2 will survey reaches B1, B2, and B3). You may not be able to survey all the reaches you had hoped to, so make sure to prioritize reaches you are most interested in surveying before the actual survey day.

- **REACH LENGTH:** Most of the time spent surveying a reach is spent walking the length of it, observing conditions as you go along. Longer reaches, obviously, take more time to survey. A "ballpark" estimate for the amount of time to walk and survey a 1/2 mile reach, including the completion of datasheets, is about two hours. Circumstances that can add time to this estimate include trekking through the stream and along its banks (versus hiking along cleared paths); numerous meander bends (as opposed to walking a roughly straight line); occasional deep water; and sometimes-dense riparian zone shrubs. Also, when volunteers assess their first-ever reach using these techniques, it generally takes longer. Overall, the speed of these assessments increases as one gains more experience.

- **ACCESS:** Are there easy access points to get into and out of the stream? Where access points are plentiful, volunteers can leave a second car near the end of their section. This allows them to walk their section of the stream once rather than twice. This can significantly reduce the amount of time needed to survey.

    On the flip side, when access is limited to a single point, volunteers will have to trek the length of the stream twice (once to get in and once to get out), reducing the amount of stream they are able to cover in a day. Similarly, if there are no good access points, and volunteers must hike a significant distance before reaching the stream, survey time may be severely limited.

- **STREAM CONDITIONS:** How difficult is it to walk the stream channel? Deep or flat sections, particularly wetland sections, can be difficult or impossible to walk through. Try to avoid walking in marshy, mucky soils or sediments - they are tricky to navigate and you may lose your boots or get stuck! Steep sections or sections with uneven or slippery streambeds or streambanks can make for treacherous walking. Groups should be advised to take their time navigating through these sections. Wherever possible, check conditions in advance to give you a better idea of the type of obstacles you will be likely to encounter, and how that may impact time constraints. In any situation, safety is the top priority. Avoid walking any sections that appear too deep or dangerous.

- **VOLUNTEER EXPERIENCE LEVEL AND PHYSICAL REQUIREMENTS:** With the exception of the cover sheet, the photograph log, and the site sketch, the SCS datasheet is filled out once volunteers have finished walking the length of the reach. For volunteers experienced with the datasheets, it may take only 10 minutes (per reach) to fill out the entire set of datasheets. Newer volunteers who are unfamiliar with the terminology will need to rely more heavily on supplemental materials (RGA picture key, datasheet instructions, etc.), and could take 20 - 30 minutes to fill out the datasheet their first time. Also, volunteers who are not adequately prepared for the work, or who are not strong or healthy enough to complete the work, can seriously impact the efficiency of the survey process. Make sure volunteers know in advance what they can expect, for safety purposes first and foremost, but also to make best use of group surveying time.

- **TRAINING SCHEDULE:** If you are hoping to do all of your training (indoor and out) and surveying on a single day, keep in mind that you are seldom able to begin surveying before 11:00 AM unless the volunteers are fairly experienced.

- **HOW MUCH TIME DO THE VOLUNTEERS WANT TO CONTRIBUTE TO THE SURVEY:** It is suggested that volunteers be contacted in advance to determine how much time they are willing to put into the survey efforts.

- **EXPECT THE UNEXPECTED:** Even the best-planned surveys usually do not cover as much ground as hoped. There are many problems or situations that can be encountered in the field, which can reduce the number of reaches that can be surveyed.

■ C7. Training Volunteers

Most of the training details are arranged by your technical team advisors. Below is some basic information that should help you to know how the classroom and field training works.

■ CLASSROOM TRAINING

RESPONSIBILITIES:
- **Trainers:** Classroom training should be conducted by a member of the technical team with extensive experience with both streams and the SCS protocol (usually someone from MDEP or MDIFW). The trainers usually provide their own computer laptops and projectors.

- **Setup People for Training:**
  Training organizers should consider the following when setting up a training room:
  √ projector screen or blank wall
  √ accessible outlets
  √ extension cords
  √ chairs
  √ tables
  √ restroom location
  √ refreshments

TOPICS:
  The training includes background information on watersheds, stream ecology, nonpoint source pollution, fluvial geomorphology, and an overview of how the survey is conducted. Don't forget safety topics!

DURATION:
  Classroom training typically is about 2 hours, including a 15 minute break

TIMING OF TRAINING:
  Some groups request to have classroom training on a day different from the "field day" to allow for more time in the field.

■ FIELD TRAINING

Ideally, each volunteer field group has one member of the technical team (selected by the steering committee) to lead the group through the field portion of training. (Names of qualified individuals can be obtained from the MDEP Maine Stream Team Program or the Fisheries Research Section of the MDIFW.)
There are two primary methods of conducting field training:

OPTION A
- The training is essentially done while the assigned technical leader points out features along the course of the reach and then assists the group with filling out data sheets. Once the volunteers are comfortable with the survey process, they may proceed with the survey without direct supervision, though the technical leader typically stays with the group that day.

- **DURATION:** The duration of this type of field training is essentially less than about 15 - 20 minutes of orientation (quickly reviewing the datasheets). The rest of the time is actually spent walking, making observations, and recording actual (not practice) data.

OPTION B

- Field training can also be conducted as a larger group, with one (or a small group) of technical leaders walking the large group through the steps of the field survey process. This is useful where technical support is limited, for smaller groups of volunteers, for groups that conduct training on a separate day from the survey, or for when the primary purpose of the survey is to educate many people about the stream all at once. Special care will need to be taken to ensure that each volunteer is comfortable with the process and each of the questions on the datasheet.

- Conducting a practice survey of a reach (including the filling out of data sheets and answering any questions) prior to an actual survey is strongly recommended. This assists volunteers to be aware of the stream corridor features to which they are supposed to be paying attention, as they walk along their reach.

- **DURATION:** Field training is about 1 - 1.5 hours.

■ C8. Conducting the Survey

- Once volunteers are trained and comfortable with the process, they may conduct the SCS without supervision from the technical team. Experience has shown that volunteers typically are willing to commit to a one-day training and survey effort. Sometimes volunteers are willing to complete surveys on additional reaches after the initial training/survey has taken place.

- If volunteers stumble across a question with something they see on the survey or with one of the questions on the datasheet, they are encouraged to make a note of it (including location info), take a picture (if applicable), and follow up with either the volunteer coordinator or the technical team at the end of the survey.

- **Remember to make sure volunteers are aware of safety issues, respect the wishes of landowners, and have fun.** Don't forget to arrange a way to collect all completed datasheets, cameras, and any other borrowed materials.

(*NOTE:* **One critical concept to remind volunteers of is to walk the entire length of the reach before filling out survey datasheets for that reach.** Habitat/geomorphology and pollution conditions may change substantially over the course of walking a reach! Also, stream conditions immediately upstream or downstream (typically 50 -100 ft) of stream crossings/culverts can be very different than remaining portions of reaches.

Care should be used when filling out datasheets to keep this situation in mind and recognize that conditions around culverts and bridges may not be representative of the entire reach of interest. Additional data sheets [e.g., the Site Forms in *Appendix K*] or methods and datasheets [e.g., the Maine Road Stream Crossing Survey technique outlined, but not detailed, in *Appendix M*] may be useful for highlighting the unique condition in and around these features, which often have significant impacts on streams.)

■ C9. Managing the Data

The volunteer group's (assigned) data manager is responsible for compiling the data at the end of the survey. A list of general data manager responsibilities is provided below.

• Make sure that at least one datasheet set is submitted for each reach and quickly checked for obvious errors.

• If groups have submitted multiple datasheets completed by different volunteers for a single reach (as frequently occurs in the field portion of the training), the data manager should use his/her discretion to compile the responses for that reach onto a single completed datasheet. The data manager may need to contact the volunteer(s) as soon as possible to clarify their responses.

• If a single reach was broken into more than one reach in the field by volunteers, then it may be necessary to amend the name of the reach so that this alteration is reflected in the name (e.g. Reach A3 becomes Reach A3a and Reach A3b, each having its own set of datasheets).

• The data manager should collect all the digital photo files or photographs and label them with a sensible name (ideally including a code that identifies date and location). If possible, use a computer photograph program to modify the photograph file size to 1 MB of memory or less (300 KB is recommended).

• Finally, the data manager is encouraged to complete the SCS "Photolog Summary" file — a Microsoft Excel template available from the Maine Stream Team Program (MDEP). This file catalogs all pictures taken during the survey. The file records each photograph's name (or number), reach name, GPS location, and description of what is seen in the photograph. (This step reduces any confusion the MSTP may encounter when reviewing and archiving the data.)   Be sure to include file extensions such as "jpg," "tif," or "bmp" in the name if you are providing electronic pictures. By providing this information, your survey pictures will be able to be efficiently uploaded into the survey database, which in turn will aid future users in data interpretation.

• When all of this is done, the data manager should submit the following information to the MSTP (preferred) or MDIFW's Fisheries Research Section *(see Appendix C for contact information):*
√ Hardcopies of the final datasheets: One completed datasheet set per reach. (Make sure the copies are readable or send the originals.)
√ Survey photographs: in electronic (preferred) or hard-copy format.
√ Electronic copy of SCS Photolog Summary: One Microsoft Excel file per project, filled in with information on all survey photographs you are submitting.

(*NOTE:* For surveys that have included use of the Site Form datasheets, the data manager will also be responsible for managing this set of information and files separately from the SCS-related survey data and photos. (Use file-naming-codes that distinguish these files and sheets from the SCS files and sheets.) The management of that data is up to the discretion of the data and project managers, but in general it is recommended to use your project's predetermined watershed survey data management techniques to catalog this data *(if applicable)*. Contact the MSTP if more advice is needed.)

D. Reports

Analyses and reports on SCSs are produced by the Maine Stream Team Program as time permits. Projects that are given priority for report writing by the Maine Stream Team Program are based upon such conditions as: Maine Stream Team Program staff were involved in the project (including field work), multiple reaches were surveyed for the project, or the stream is on MDEP's list of impaired waterbodies.

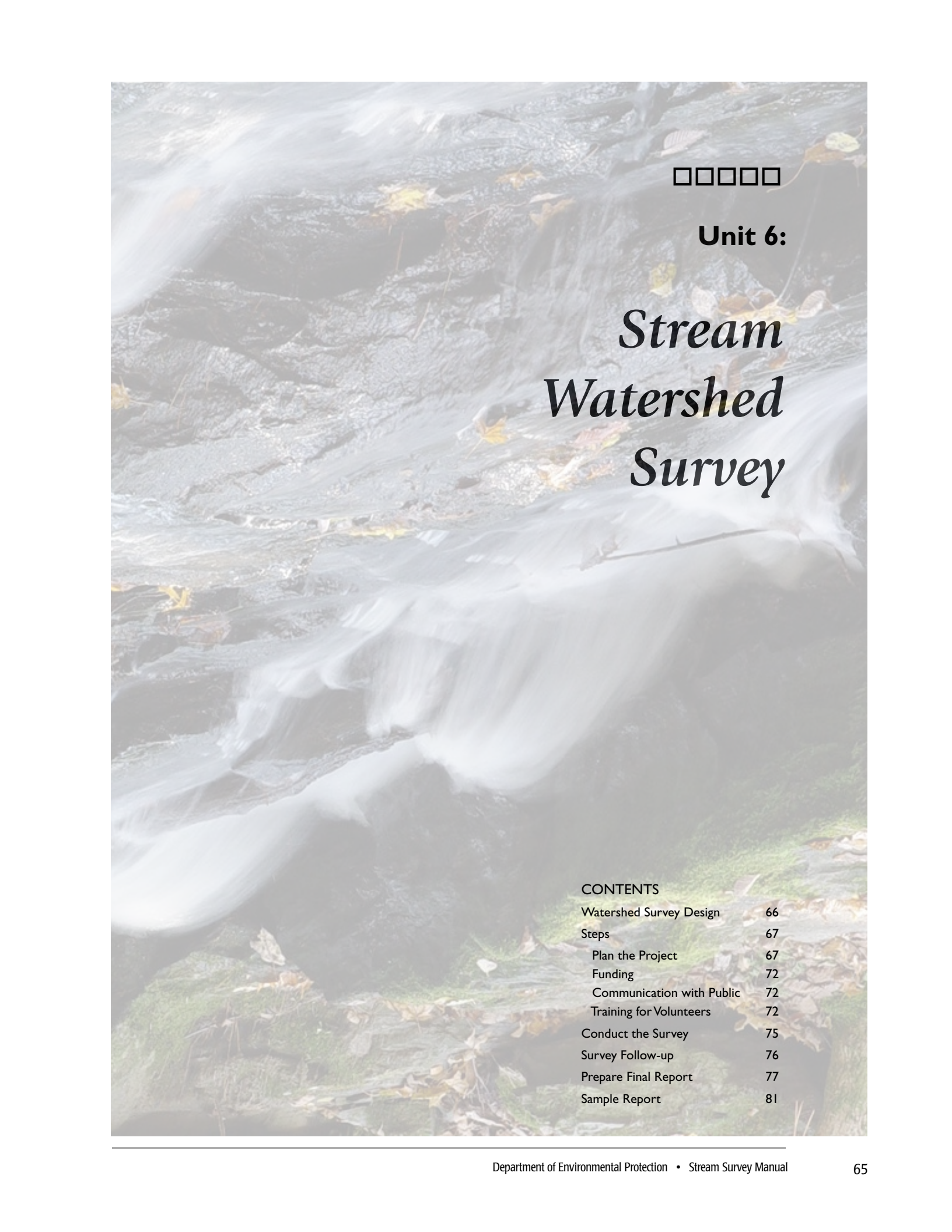Regardless of whether reports are written, all data that is submitted to the Maine Stream Team Program is entered into its statewide database.

Volunteer groups are also free to write their own reports.

E. Next Steps

After you have completed the SCS and its report (if applicable), refer to Unit 7 for suggestions on how to take action.

□□□□□

Unit 6:

Stream Watershed Survey

CONTENTS

Unit 6:
Stream Watershed Survey

A. Introduction

A Stream Watershed Survey focuses on finding, describing, and prioritizing specific sites throughout a watershed where nonpoint source pollution (NPS) is potentially impacting a stream. Some surveys also include an assessment of riparian buffer conditions as time permits. These assessments determine how much shading they provide, whether they are wide enough to filter pollutants, and whether they have a good mix of trees and shrubs versus being mostly lawn.

These surveys provide essential information for planning and implementing future projects aimed at installing best management practices (BMPs) to address NPS pollution (an NPS Watershed Project) or riparian buffer problems.

Watershed Survey Design Objective:

■ **A Watershed Survey (WS) is designed to produce:**

- A **Survey Report** listing and describing NPS pollution source sites in the watershed, along with relative importance (problem severity) ratings and preliminary recommendations (suggested fixes) for each site.

- An **increase in citizen awareness and action** to adopt best management practices (BMPs) at these sites in the watershed. Watershed surveys often prompt landowners to take action to reduce sources of polluted runoff contaminants such as eroded soil, excess fertilizer or pesticides, pet waste, petroleum spills, various toxins, etc., or improve or protect their riparian buffers. Survey results can be used to help attract local support for developing and conducting a NPS Watershed or Buffer Project.

■ **ACTIVITIES:**

WSs usually rely on trained volunteers from the community to identify the sources of NPS pollution. Following up on volunteer efforts, professionals evaluate the sites identified by the volunteers, prioritize them, and recommend general solutions. Other watershed survey tasks often include: forming the steering committee, publicizing the survey, training the volunteers, preparing the survey report, and informing the public through outreach efforts about the findings and recommendations of the survey.

B. Steps

The basic steps involved in developing and organizing a survey, including how to determine project leadership, assign responsibilities, and gather existing data are described in Unit 3. The information in this unit is designed to supplement this information with topics specific to Stream Watershed Survey (WS) planning.

These topics include:
- **Plan the project (scheduling, dividing watershed into sectors, etc.)**
- **Secure funding**
- **Recruit volunteers and communicate plans with the public**
- **Hold a training session for the volunteers**
- **Conduct the survey**
- **Arrange follow-up field work**
- **Prepare and distribute survey reports**

■ B1. PLAN THE PROJECT
(scheduling, dividing watershed into sectors, etc.)

B1a: SCHEDULING:

It's important to establish a time frame for each phase of the watershed survey. This ensures that surveyors are in the field during the best time of the year for seeing runoff-related NPS problems, and it provides volunteers with a deadline for returning field forms. Volunteer help is the backbone of the project, and their interest and enthusiasm is critical to the project's success. Volunteer interest is more easily sustained by giving volunteers clearly defined goals to accomplish within a reasonable time frame.

The best time to conduct the survey is in spring, soon after the snow has melted and the ground is exposed (usually mid-April through mid-May). At this time, runoff and erosion problems are usually most evident. Spring surveys are most effective because:

- The ground will probably be saturated with water from snowmelt. Under these conditions runoff from rainstorms is at a maximum and problems are more visible.
- Eroded areas are more visible due to the absence of ground cover vegetation.
- Maintenance on town and private roads has not taken place, and problems are more obvious than they would be after roads have been regraded and culverts reset.
- Eroded sediment in runoff flows is usually at its highest concentration and most visible because the freeze-thaw cycles and high levels of runoff weaken unstable soils.
- Enough time remains to complete the project during the summer months if needed.

If a spring survey is not possible, the next best time is fall. Conditions, however, may not be as favorable, and safety issues are greater because of fall's hunting season. (It is recommended to avoid hunting season, whenever possible, or at least to have volunteers wearing blaze orange clothing.) Summer surveys can be conducted if volunteers are not available in the spring or fall, although problems will be much less visible compared to spring or fall conditions.

The amount of time to complete the field survey component of a watershed area (per team) is typically 1/2 to 2 days, though it may take more. Variables affecting length of time include: size of the watershed, complexity of pollution problems, and number of volunteers. The amount of time needed for gathering data on the watershed, doing follow-up, and preparing a report is variable.

From start to finish (including designing the survey, public meetings, training volunteers, conducting the survey, follow-up, and reporting), a watershed survey project generally will take at least six months, and often closer to a year. For a timeline of a typical watershed survey held in the late spring, see **Table 6-2** below.

For help developing a timeline for your project, see Worksheet 6-1.

Table 6-2:
Sample watershed survey timeline

MONTH	TASKS
YEAR 1	
FEBRUARY-MARCH	• Seek funding opportunities (see Unit 3 — F)
YEAR 2	
MARCH–APRIL	• Form steering committee, appoint a technical team to oversee survey, gather existing data, and design project
APRIL	• Hold public information meeting, send out letter to landowners in watershed, press release, and/or volunteer recruitment
MAY	• Train volunteers and conduct survey
JUNE	• Wrap-up volunteer field work
JULY – SEPTEMBER	• Follow-up work by technical team
WINTER–SPRING	• Prepare and distribute report; meet with town officials and community members to develop action plan
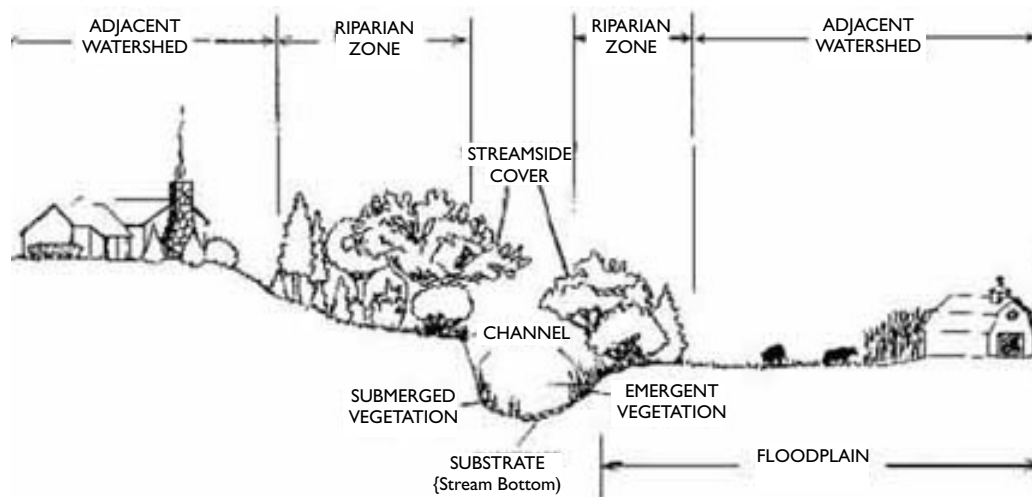
(Source: USEPA)

Worksheet 6-1:

SETTING A SCHEDULE

DATE	EVENT
	☐ Gather information about the watershed. ☐ Investigate funding opportunities. ☐ Design project and project schedule, including volunteer training date and location. ☐ Meet with watershed stakeholders (e.g.: local residents, municipal officials, neighborhood businesses, local conservation organizations [e.g., watershed councils, stream teams, land trusts, fishing groups] county soil and water conservation district (SWCD) and DEP staff) to identify preliminary interests and concerns, discuss feasibility, and seek funding. ☐ Form steering committee. ☐ Secure funding.
	☐ Recruit volunteers. ☐ Run article/notice in local newspapers. ☐ Hold public information meetings. ☐ Get permission from landowners whose property you will need to access. ☐ Advise local law enforcement about the survey ☐ Conduct training sessions for volunteers.
	☐ Begin the survey.
	☐ Volunteers complete and return survey forms to the volunteer coordinator. ☐ Volunteer coordinator checks with each team to be sure work has been completed
	☐ Technical staff conduct follow-up field work. ☐ Technical advisors review volunteer data and report findings to steering committee.
	☐ Prepare preliminary summary of findings and share with volunteers. ☐ Address any critical problems with the steering committee and consider contacting landowners. ☐ Hold public meetings to present findings. ☐ Prepare final report. ☐ Begin efforts to seek funding to address problems and develop watershed protection strategies.

B1b. DIVIDING THE WATERSHED INTO SECTORS:

Another important aspect of planning, which may impact the schedule you create, is the watershed itself.

- If you haven't already, create a map of the watershed (see Appendix D for watershed delineation instructions).
- Divide the watershed into clearly defined sectors, each small enough so that a few volunteers can cover it in approximately a day or less.
- Take population density and development intensity into consideration. (Higher population densities and/or development intensity will likely result in a greater number of NPS sites.)
- Establish sector boundaries along features that are easy to locate, like roads and streams.

As an example, the following watershed map has been divided into a few sectors with easily recognized boundaries. Your technical team may assist with this process.
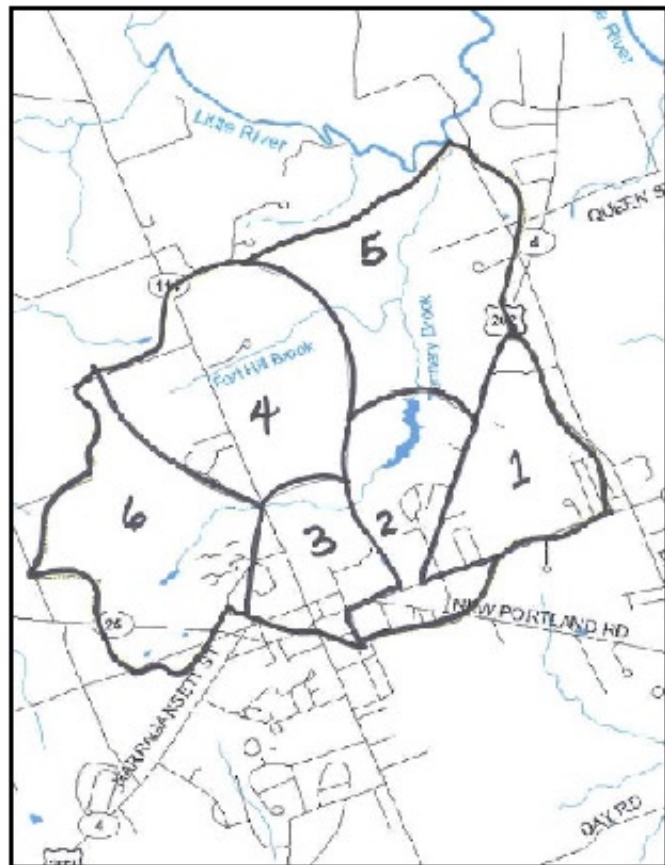
The number and size of sectors in your watershed will impact:

- number of volunteers you need to recruit (2 to 3 volunteers per sector).
- time commitment per volunteer for the survey.
- number of technical advisors needed to help on the training day.

Table 6-3 provides some example watershed sector data and volunteer commitment required.

Table 6-3:
Examples of volunteer time commitments in different watershed types

**When communicating the expected commitment to the volunteers, it is safer to call it 15 hours, including training. Also, factor in more time if your watershed is known to have many severe sites.

Watershed Type	# Residences in watershed	Size watershed (square miles)	# Sectors	# Volunteers	Average time per volunteer (hours)
Urban	~ 250	1	4-5	15	8**
Rural	~ 250	5	5	20	6 - 10**

B1c. Conduct Preliminary "Windshield Survey" Reconnaissance of the Watershed *(Optional)***:**

Project organizers are encouraged to conduct a rapid, preliminary survey by driving various parts of the watershed — in order to get a sense of what types of pollutant or riparian buffer issues team leaders and volunteers may encounter during the actual volunteer survey. Watershed areas which may require more time and attention can be identified during this process. Also, additional types of pollutants and/or other issues can be identified and added to the datasheets, if necessary.

■ B2. Secure Funding

See Unit 3 for more information about funding issues.

■ B3. Communicate with the public and recruit volunteers

Communicating with the public is a most important step in the survey process. Communicating through letters, press releases, or websites can be good ways to educate citizens about watershed issues. This also may result in recruiting additional volunteers. Alternatively, you may solicit help from other groups or organizations. *(See Unit 3, for more information.)*

At the very minimum, you must send out letters to each of the landowners whose land you need to access. Instructions and sample letters are included in Unit 4 and Appendix E, respectively.

■ B4. Hold training sessions for the volunteers

• What volunteers should bring to the training

Make volunteers aware of safety items to bring (e.g., water, snacks), appropriate field clothing, and gear considerations described in Unit 4. Also, if you don't have enough cameras and GPS units to loan to each survey team, check with volunteers to see if they can provide their own.

• Who should do the training

Training should be provided by technically-qualified individuals (i.e., technical team members) who have been selected by the steering committee. Names of qualified individuals can be obtained from the Watershed Management Division of the MDEP or your county soil and water conservation district.

• How the training is structured

Training is generally broken into two sessions. The first is an indoor session providing volunteers with background information on stream and watershed ecology and an overview of how the survey is conducted. The volunteers then break into their small groups (or pairs) by sector, and a member of the technical team typically accompanies each small group into the field to conduct the second session of training. Once the volunteers are comfortable identifying and documenting sites, they will be allowed to continue the survey without direct technical supervision.

• Fundamentals volunteers should learn

Volunteers should understand there are three fundamental questions that need to be answered in reporting each problem:

Where is the problem?

What is the problem?

How might this problem be fixed (as best as the volunteer can determine)?

Documentation that doesn't at least answer these three questions can slow the process and add considerable expense to the project. Ideally, problems should be reported with the greatest detail possible.

Volunteers should also understand the definition of a *site* in your survey.

Typically, a site is a **single land use** such as a town road, private road, driveway, house lot, streambank, logging area, farm field, industrial facility, etc. that can be marked on a map or with a GPS unit. Many groups choose to allow surveyors to write-up more than one problem (e.g., eroded soil, poor buffer quality, pile of lawn clippings near stream) per land use on a single Site Form *(Appendix K)*. Note: it can be helpful to go over an example of a completed Site Form and a photo illustrating the example problem site during training.

■ **The following topics may be included in volunteer training:**
- What a watershed is and how it works.
- Tools for watershed management.
- How stormwater runoff, nonpoint source pollution (e.g., eroded soil, excess fertilizers and pesticides, leaking petroleum), and degraded riparian buffers affect stream water quality.
- Stream ecology and how changes to the stream's ecology reduce recreational enjoyment.
- How changes in water quality affect the local economy.
- The importance of — and methods for — keeping accurate and detailed documentation.
- Examples of typical erosion and other pollution problems (photos and slides as well as visits to actual sites).
- How to fill out a WS datasheet *(Site Form: Appendix K)*.
- How to approach, and discuss the survey with, landowners.
- How to use GPS units, and the importance of recording every digit without rounding off *(see Appendix G)*.
- Survey-specific details: survey deadline, how and where to hand over their completed survey materials.
- Next steps: how the survey data will be used.

■ **Establish teams of at least two for each sector**
Volunteers should work in teams of two for several reasons:
- Safety
- To share ideas about site evaluations
- To help each other consistently and accurately fill out datasheets
- To make the survey more fun (plus volunteers tend to motivate each other).

■ **Distribute materials volunteers will need to complete the survey**

Make sure each survey team has each of the following:

- Binder (or clipboard) to protect field sheets, etc.
- Pencils (pen ink runs when wet)
- Tape measure for measuring area of sites
- Camera (digital, if available or disposable)
- Watershed map (with sectors marked)
- Tax maps for each sector
- Handheld GPS units
- WS datasheets *(Site Forms: Appendix K)*
- Name tags or volunteer identification badges to wear and to place in car windshield
- Flip chart with numbers for site identification in photographs *(See Appendix H for instructions on how to easily make one.)*
- Extra landowner letters to hand out as needed
- Blaze orange safety clothing (e.g., vests, hats) for groups working on roads or during hunting season

■ **Conduct field training**

It's important that volunteers be taken into the field during training to see and learn about typical sources of sediment, phosphorus, and other pollutants.

If you have enough technical support available, divide the large group into smaller sector groups and send each small group into the field with a technical support person. These small groups may then start the survey, with the technical support person providing direction on identifying and reporting sites. Once the volunteers are comfortable with the survey process, they may proceed with the survey without direct supervision. Note that if you choose this option, the survey starts before training officially ends. *(See section B5 below.)*

Those groups lacking adequate technical support could do a large group field training. Special care will need to be taken to ensure that each volunteer has the opportunity to practice identifying a site, filling out the survey form, and receiving feedback. You may wish to scout out examples of erosion or other nonpoint pollution source (NPS) problems as well as examples of good conservation practices (BMPs) in advance of the training. A good resource in identifying appropriate sites for training could be your county soil and water conservation district office.

In either case, the field training is designed to give the trainees practice. In addition to seeing typical NPS problems, the survey teams should participate in a problem-solving exercise. Ask the volunteers to locate as many sites as possible within a specific area and to make recommendations to eliminate or minimize the problems from those sites. This exercise points out weak areas in the training process and allows volunteers to share ideas on mitigation measures.

■ B5. Conduct the survey

Some basic tips to keep in mind while conducting the survey:

■ Stay on Schedule

The survey should be conducted within the time frame set by the steering committee and technical advisors. Make sure the volunteers are aware of the survey deadlines. The public will be expecting volunteers to be surveying the watershed within the period of time discussed in newspaper articles and landowner letters. Staying within the designated time frame also allows time during the follow-up process for technical advisors to contact volunteers with questions concerning their findings.

■ Provide additional support for volunteers in the field

The volunteers may need technical support beyond what they receive in initial training sessions. If trainers and volunteers feel additional help is needed, consider meeting with volunteers again during the survey. This allows volunteers to check back with advisors during the day with questions, and it allows advisors to review survey forms to insure that information is being properly documented. This can save a lot of time for the technical team after volunteers have finished and are less available.

■ Interacting with landowners

Volunteers should be prepared to talk with watershed landowners. Their presence in the community will generate interest. People may approach them, questioning what they're doing, and the project leader may need to follow through on a problem they've identified by going onto private property. Volunteers should be encouraged to be proactive, checking to see if landowners are home and informing them about the survey and its goals.

The following is a list of things to help prepare volunteers. Everything on the list should be covered in training.

❏ Be sure volunteers take along a handout provided by the steering committee to give to landowners. The handout will explain the work you're doing *(see Appendix E for examples)*.

❏ Be clear about the purpose of the survey:
   √ You're trying to identify problems that may be impacting the stream; specifically, you're determining the pathways in which storm water carries eroded soil and other pollutants to streams and, in some surveys, also noting where riparian buffers are in poor condition.
   √ You're developing solutions to the identified problems and creating an action plan detailing these solutions.
   √ You're raising public awareness about the effects of polluted runoff on the stream and building support in the community for local watershed management.
   √ You're not using the information for enforcement purposes. (This is usually the case, except in extreme situations.)

❏ Be prepared to discuss polluted runoff with landowners *(refer to Unit 2 for basic information on streams and watersheds)*.

❏ Review how you might respond to difficult people.

❏ Always respect the property owner's wishes, regardless of the situation! Remember — enforcement is not the object of the survey. If you suspect a serious problem exists on a non-accessible site, note it on the survey form and a technical advisor can visit the site later if the landowner is agreeable. If in doubt about what to do, get a second opinion from another field volunteer.

Finally, and importantly, be sure to arrange a way to collect all equipment and forms once the survey is completed. A lot of groups arrange a collection spot at the town office.

■ B6. Arrange a survey follow-up by technical advisors

■ Give preliminary data to technical team for review

Immediately after the survey is finished, all data should be reviewed first by the volunteer coordinator (if there is one), and then by the technical advisor(s) to be sure each team has properly completed the survey forms and that all survey sectors have been completely covered.

If information is missing or incomplete, the volunteer coordinator should contact the volunteers immediately — this is essential — to ask them to provide the missing information or return to the field to get it. Volunteers may be reluctant to return to the field several weeks after the information has been collected. Contacting the volunteers shortly after they have completed their work can save the time and expense of having technical advisors spend hours in the field attempting to locate problems of undetermined location and nature.

■ Send the technical team into the field for follow-up site visits

A technical team advisor should do follow up in areas that were visited after the original training day (i.e., sites identified by volunteers without a technical advisor present). The purpose of this step is to check the accuracy of documented sites and to look for additional undocumented sites. This process may take several weeks, depending on the number of problems identified and the time availability of the technical team.

The technical advisor should expect to spend approximately the same amount of time (or possibly more) following up on each sector as the volunteers spent surveying that sector. If volunteers did a fairly thorough and accurate job, the follow-up by the technical person will take less time.

■ B7. Prepare and distribute final report

■ PRELIMINARY REPORT

Work with the technical team to prepare a preliminary report. Creating a preliminary report helps you to maintain momentum on a project, keeping it in the public eye. The preliminary report does not have to be lengthy (about two pages). Design it to give a brief overview of the extent of soil erosion, other NPS pollution, (and in some cases) riparian buffer problems in the stream watershed. Include information about the number of problems and where they were found.

Use the report to:

• Publicize the extent of nonpoint source problems in the watershed. This information should be made available to the towns in the watershed as soon as it is available. If a town official (planning board member, selectman, or town manager) is not on the steering committee, one should be contacted. The press may also be interested in preliminary findings. Remember to keep communication open during the entire process to maintain good public relations with the watershed community.

• Tally the number of sites identified and categorize them by land use (see Table 6-4). Keep track of the most frequent problems found for each major land use. You may even want to highlight some particularly significant problems.

• Serve as the basis for a final report.

• Inform the SWCD and the DEP about problems in the watershed that appear to be critical.

• Let volunteers know their data are being used, which will help keep them motivated and interested.

Table 6-4:
Simple Land Use

Land Use	Number of Sites
Town Roads	26
Private Roads	21
State Road	2
Driveways	18
Residential	18
Shoreline	12
Construction	5
Commercial	3
Gravel Pits	3
Logging	1

■ FINAL REPORT

The final report is more comprehensive than the preliminary report and should serve to organize, analyze, and communicate the results. Either a technical advisor or the steering committee can prepare the report. Ask members of the steering committee, technical team, and volunteer surveyors to review the report and provide feedback so that the report will be more thorough and balanced.

The final report may be used and referenced for many years in the future. If the stream should experience a change in water quality, the report may be valuable for providing a historical perspective on the types of problems that have existed in the watershed. The documentation of watershed protection efforts by the community may also help to get funding for mitigating future problems.

A Watershed Survey report should include the following information:
- Watershed overview
- Survey description
- Survey results
- Site list
- Data analysis
- General recommendations for fixing each type of site

❑ Watershed overview

Prepare a report-sized (8 1/2″ x 11″) watershed map and a general description of the watershed summarizing the background information you gathered before doing the survey.

❑ Survey description

Describe the purpose of the survey and the method of performing the survey.

❑ Survey results

Include a description of the overall level of development in the watershed relative to the number, type, and severity of problems found in the survey. Also include a general discussion of the kinds of problems typically found for each type of land use (agriculture, logging, industrial, residential, etc.).

If certain types of problems are recurrent throughout the watershed, recommendations could be made for developing local ordinance standards to prevent similar problems from occurring in the future. For example, if the road ditches in residential subdivisions are consistently found to be unstable and eroding into streams, a standard could be added to the local subdivision ordinance. Such a standard might require developers to stabilize ditches with vegetation or stone and to direct runoff from ditches to well-vegetated wooded areas, so that phosphorus and sediment would be filtered out.

Survey information can help to identify areas of the watershed where existing land uses have resulted in significant NPS problems due to poor soils, steep slopes, or other natural limiting factors to development. This information may also highlight the need for comprehensive stream water quality protection and serve as a basis for recommending that a town adopt a phosphorus control policy, or measures that control an assortment of stormwater/NPS pollution-related problems, which can be used when reviewing new land use applications.

❏ Site list

Prepare a spreadsheet of the sites with potential pollution problems. For each site, be sure to include the following:

- Site number*
- Tax map and lot*
- Location*
- Land use
- Type of problem/description
- Area affected
- Recommendations for fixing each site
- Impact (low/medium/high)
- Cost (low/medium/high)
- Technical level to install (low/medium/high)

(This information is usually not listed in the report version, which is made available to the public, for privacy reasons.)

The town tax map and lot numbers are a useful way to identify the sites in the report. Provide precise information about the location of sites, but do not make specific reference to the names of the landowners, particularly if the report will be made available to the public. This will help prevent the perception that the survey's purpose is for enforcement, which could alienate landowners.

Site data should be stored in both paper and computer files. Storing data in a spreadsheet program or database is useful because it consolidates the data, makes it easier to manipulate the data for analysis and reporting, and allows you to share your information more easily. There are a number of computer software programs for storing data, and these days most up-to-date programs are easily compatible with other spreadsheet/database programs.

Create and include a map overlaying the site locations on the watershed. If GPS units were used to document site locations, the points can easily be imported into GIS software to create a map. A good backup step to collecting GPS data using handheld equipment is to record the geographic coordinates on the (paper) site datasheets, in case the electronic data is lost or misplaced. Ask a member of your technical team for assistance as needed.

Naturally occurring foam in a stream. Visit http://www.umaine.edu/waterresearch/fieldguide/ for more information.
(photo: Helen McAlpin)

❏ **Data analysis**

Analyzing survey data defines and prioritizes the problems in the watershed. It is often tempting to draw conclusions and develop solutions before or during the survey. Your group may find, however, that analysis of the data when the survey is finished reveals different causes of pollution than were expected.

Work with members of your technical team to sort the problem sites listed in the spreadsheet according to priority, based upon factors such as impact, cost, and technical level to install. (Some additional follow-up visits may be necessary.) These factors need to take into account characteristics such as:

- Size of the area affected by the problem
- Slope of the land where the problem occurs
- Type of landcover (e.g., asphalt, lawn, bare soil, or forest)
- Distance between the problem site and a ditch or the stream itself
- Natural treatment capacity by a buffer
  Some pollutants carried by runoff may be naturally filtered or treated through a vegetative area (buffer) if the runoff travels through a field or woodland and it flows as a thin, uniform sheet of water and not traveling as channelized (stream-like), concentrated flow.

This ranking information will come in handy later when the data are used to prioritize where best management practices (BMPs) should be put into place.

One common way to analyze and summarize the data is to do separate sections on the most common land uses with their associated problems. Include the average cost and impact of issues within the land use, pictures of typical problems, and a pie chart or figure demonstrating the relationship between the total number of sites identified and the number of sites identified within that land use. (See *Figure 6-1 for an example of watershed survey data analysis and summary.)*

❏ **General recommendations for fixing each type of problem site**

❏ **Distributing the final survey report**

For the benefit of the project, distribute the final report as soon as possible to:
- Ensure open communication about the project.
- Demonstrate that the team completed the survey.
- Maintain project momentum.
- Allow volunteers to know their data is being used.

Consider sending the final report to the following organizations:
- Town offices relevant to the project.
- Maine Department of Environmental Protection (MDEP).
- Maine Department of Marine Resources.
- University of Maine Cooperative Extension.
- Appropriate county soil and water conservation district.
- Local land trusts and other conservation organizations
- Local libraries.
- Local newspapers and television stations.

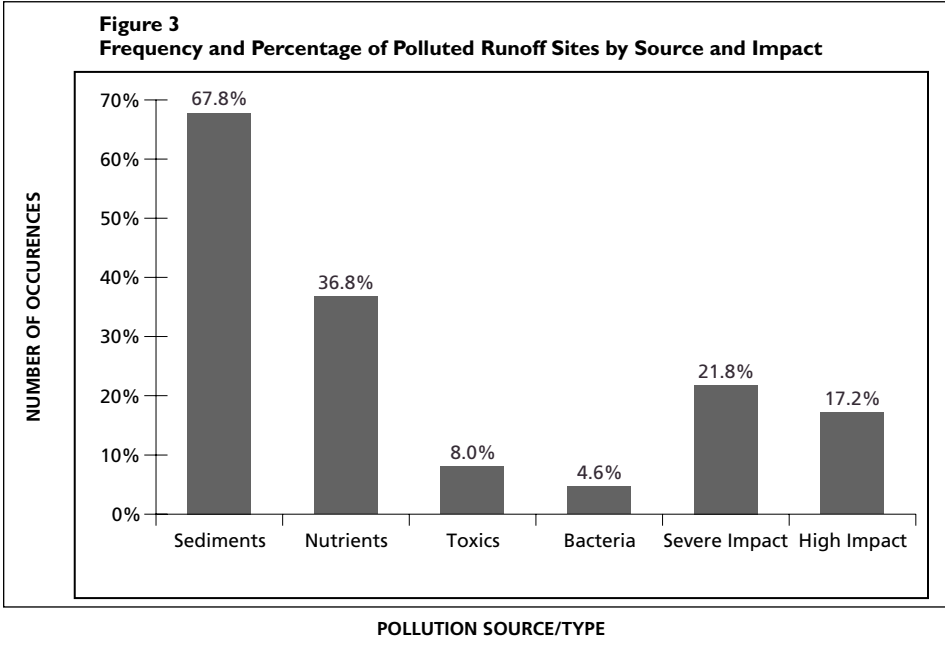**Figure 6-1: Sample page from a watershed report.**

Taken from *Trout Brook Watershed Survey (Cape Elizabeth and South Portland, Maine): Final Project Report;* 2006; South Portland Land Trust (SPLT) and MDEP. (*NOTE:* The appendices referred to below are in the original document and not this current DEP stream survey guidance manual.)

WATERSHED SURVEY SUMMARY

The SPLT determined that it would implement this Trout Brook watershed survey through the auspices of a Steering Committee, whose diverse members are listed in the Acknowledgements section. The committee met several times in late 2002 and early 2003. It divided the watershed into 6 sections, devised a Survey Field Sheet and Site Sketch Sheet for use in the survey, and arranged for the field surveys, which took place on April 26 and May 6, 2003.

In addition, it devised a form specifically for habitat analysis and arranged for a habitat walk, which took place on June 28, 2003. It sent a letter on April 1, 2003, to all 151 landowners whose properties abut Trout Brook and its tributaries, explaining the survey and giving contact information.

Eighteen volunteers conducted the field surveys on April 26 and May 6. They split into 6 teams, one for each section of the watershed, and then went out and viewed their sections. They looked for sources of pollution and filled out the Survey Field Sheet and Sketch Sheet for each pollution source identified. The field surveys identified a total of 86 sources/types of pollution. **Figure 3** and **Table 1** depict a summary of these findings.

Figure 3
Frequency and Percentage of Polluted Runoff Sites by Source and Impact

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The Field Survey Summary Table *(Table 1)* is derived from the Trout Brook Watershed Survey spreadsheet found in that report as Appendix 5. The spreadsheet gives greater detail and the location of each pollution source. Appendix 1 contains maps detailing each specific pollutant site.

**Table 1:**
Breakdown of Pollution Sites by Type and Impact

SECTOR	Total # pollution sites	# toxic pollution sites	# nutrient pollution sites	# sediment pollution sites	# bacteria pollution sites	# severe problems	# high impact on brook
1	14			14	1	6	4
2	23	3	10	12	2	6	5
3	2	2					
3A	6	1		6		6	6
4	3		1	2			
5	26	1	16	15	1	1	
6	12		5	10			
TOTALS	86	7	32	59	4	19	15

Some sites are sources for multiple types of pollution.

## Land Use Breakdown and Common Pollution Sources

A total of six land use types were associated with the identified pollution sites. The highest numbers of problems were linked to residential areas, followed by dump sites, recreational areas, town roads, construction sites, and trails *(Figure 4)*.

Figure 4

Residential (32%)
Town Roads (13%)
Construction (9%)
Dump Sites (23%)
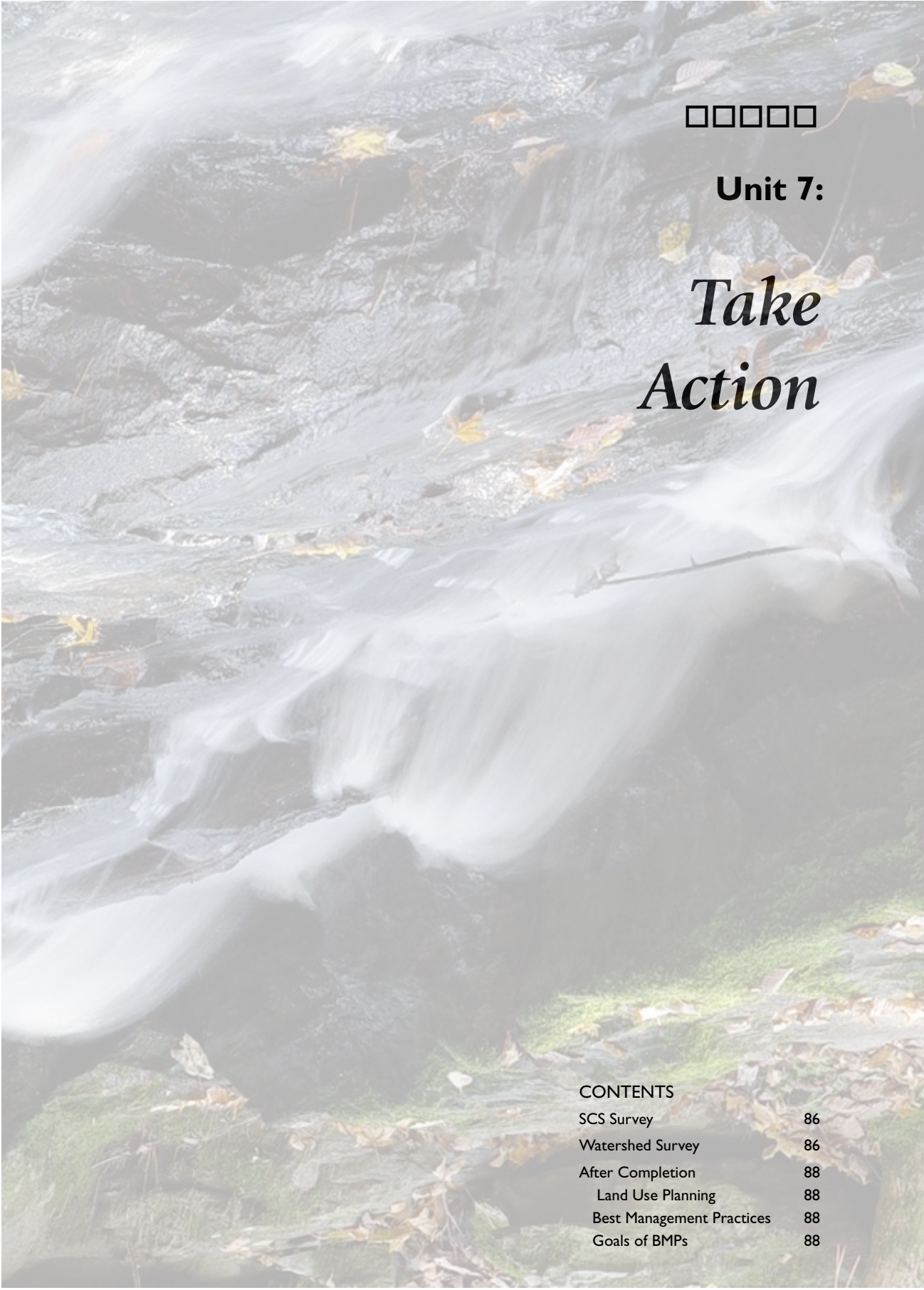Recreation (16%)
Trails (7%)
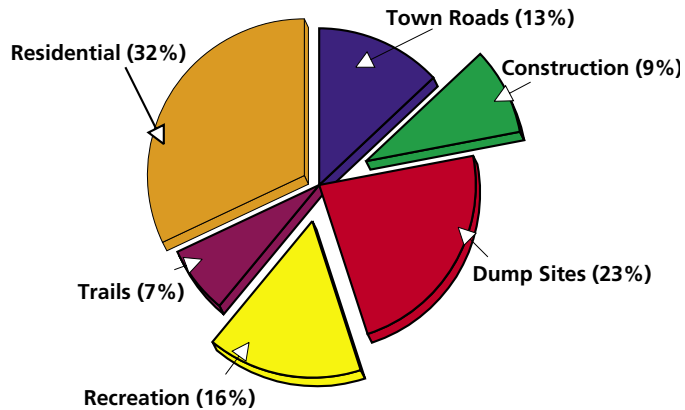
C. Next Steps

After you have completed the watershed survey and its report, refer to Unit 7 for suggestions on how to take action.
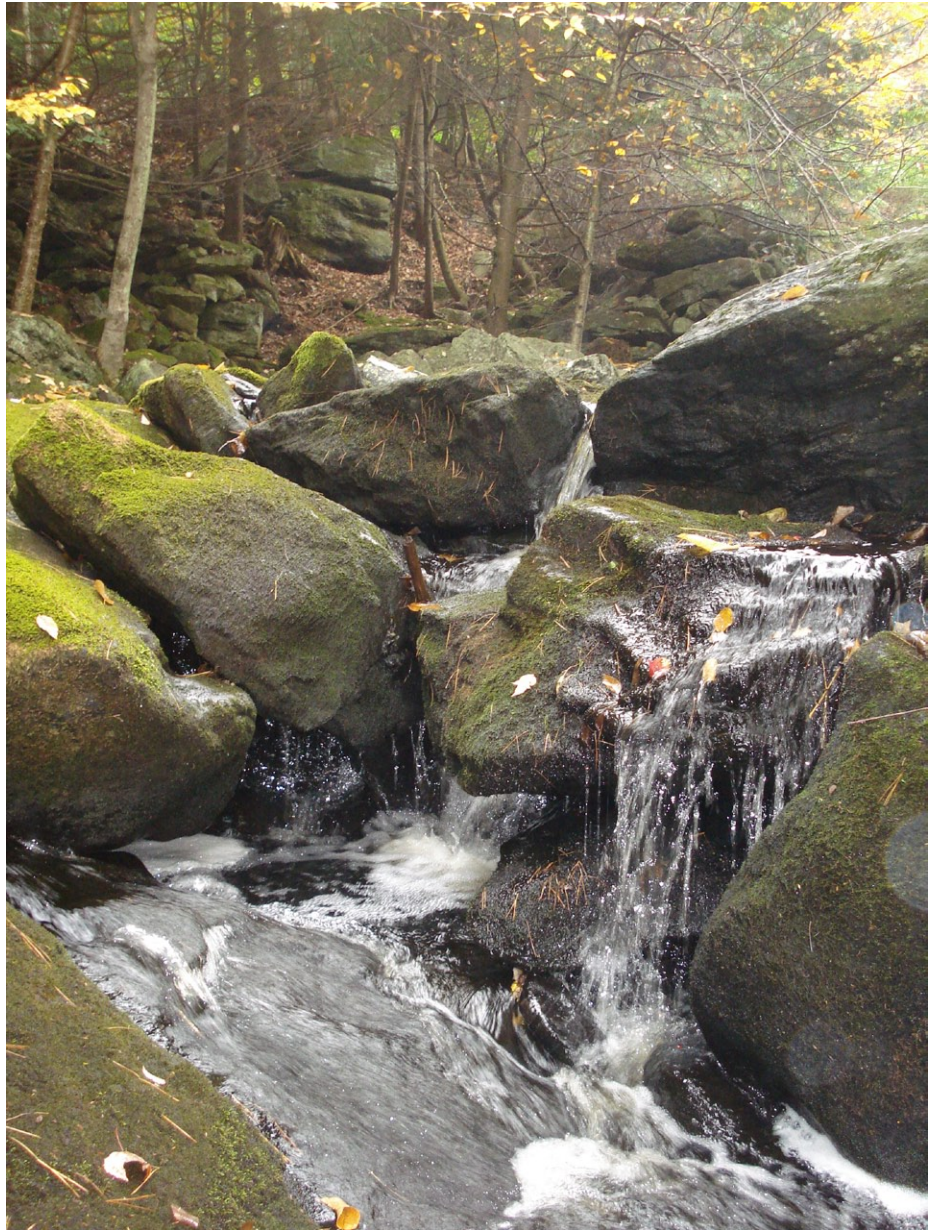
Courtesy: Casco Bay Estuary Partnership

□□□□□

Unit 7:

Take Action

CONTENTS

Unit 7:
Take Action

Having finished the Stream Corridor Survey (SCS) or Stream Watershed Survey (WS), your team will have already worked significantly toward protecting the stream and will have produced a strong tool toward continuing efforts.

■ If you conducted an SCS (Level 1):

• The State of Maine uses your survey data for habitat and pollution screening purposes, but your data can be put to use in other ways as well. The SCS is a great step to take before embarking on a water quality monitoring or land preservation program. It provides a better idea of which regions of the stream are in trouble, which in turn can help you to target likely monitoring sites. It also provides an idea of where excellent habitats may be present, and where preservation or rehabilitation efforts ought to be focused.

• The SCS is also a good way to get a general idea of the kinds of problems the watershed may be experiencing, such as soil erosion (and sedimentation) and other NPS pollution, urbanization, and riparian vegetation degradation. This can help you (when coupled with a stream WS) to prioritize the problems in the watershed having the greatest impact on the stream.

• As the buffers along your stream are examined, you may become aware that development is encroaching on the delicate riparian zone. You may wish, with the help of your technical advisors, to create a survey report, or other presentation, to share with your town council, conservation commission, or local land trust. You may be able to encourage your town to develop stream-friendly zoning in order to protect local streams and rivers beyond minimum protections that exist through local and state regulations such as Shoreland Zoning.

■ If you conducted a WS:

• The survey should have been designed primarily to identify and assess sources of nonpoint source (NPS) pollutants, inform the watershed community about the effects of NPS pollution on stream water quality, and recommend proce-dures to correct NPS problems. By advancing public awareness about the effects of NPS pollution and relying on voluntary action for mitigation, the survey can be an extremely valuable component of local water quality protection. Watershed survey information is generally needed in order to submit a competitive application for 319* grants aimed at watershed protection and restoration work. *(319 grants are USEPA/DEP nonpoint source pollution funds.)

SURVEY REINFORCEMENT MEASURES:

The following is a list of measures that can be incorporated into the Watershed or Stream Corridor Survey process to help reinforce the basic premises of the project. These actions can be taken before, during, or after the survey.

- **Town-owned properties can set a good example for sound land use**. Areas of public access, such as boat launches and town beaches, should be stable, and measures should be taken to limit and control stormwater runoff. Towns should be encouraged to develop an annual work plan to address areas of chronic erosion within the stream watershed.

- **Ask watershed towns to attach a list of BMPs for erosion and sediment control** (with emphasis on water quality protective measures) **to building permits.** When construction is proposed in a stream watershed, information about the stream and the special measures that should be taken during construction could also be attached (see Appendix B for resources). A form could be included that would require a signature from the contractor indicating that the attached information had been read and that appropriate measures were taken to protect stream water quality.

- **Encourage town code enforcement officers and road crew members to attend workshops on the basics of erosion and sediment control for water quality protection.** The DEP, SWCDs, USDA Natural Resources Conservation Service, and Maine Department of Transportation periodically offer training seminars on this subject.

- **Sponsor local watershed association or Conservation Commission workshops** that cover the basics of erosion and sediment control and NPS runoff control. These workshops should be open to anyone interested in protecting water quality.

- **Set a good example.** Use shoreline lots, with good erosion control and vegetated buffers, as demonstration sites for educational tours of the watershed. Town or camp roads could be upgraded and maintained for both demonstration and training purposes.

- **Distribute educational materials** that can be dispersed throughout the watershed by watershed associations or other interested groups. *(See Appendix B for more details.)*

- **Encourage volunteers** from the survey project (who have now become local experts on erosion control and stream protection) **to be involved in the town comprehensive planning** process or the conservation commission.

- **Encourage watershed towns to develop standards for erosion and sediment control.** This information can be added to existing ordinances (Land Use and Subdivision), or it can be used as a free-standing ordinance.

- If appropriate, **send a letter to landowners with survey results** for their property, identifying problem sites and suggestions and resources for fixing the problems. (If possible, you may want to offer technical assistance for fixing problems.) Be diplomatic. This is not intended to be an enforcement action, but rather an educational tool.

Things to Consider after Completing either a Stream Corridor Survey or Stream Watershed Survey

■ COMPREHENSIVE LAND USE PLANNING

Education and awareness of the need to address NPS issues are vital precursors to the development of effective water quality protection guidelines and ordinances. Sponsors of the survey should get involved in the town planning and implementation process using the results of the survey to justify a review of educational measures and land use standards in the watershed. Comprehensive plans should acknowledge that surveys and/or other watershed protection efforts have been done or exist in particular watersheds, if applicable.

■ BMPS: BEST MANAGEMENT PRACTICES (conservation practices to protect water quality)

It is generally beyond the scope of most survey projects to attempt to fix all of the problems identified in the survey. However, if funding and other resources are available, keep the ball rolling while there is momentum! *(See Unit 3 for a discussion on funding fixes.)*

Many measures have been developed to reduce or mitigate the harm caused by NPS pollution. These BMPs range from simple preventive practices that any property owner can undertake, to highly engineered systems designed to remove specific pollutants from stormwater runoff. Mitigation is less costly when it's incorporated into long-range land use planning. Adding BMPs after a problem exists may be difficult, or even impossible, due to site limitations. But just as every NPS problem site in a watershed contributes to the cumulative damage to stream water quality, even a limited amount of mitigation can lead to improvements in water quality.

This section provides general information about how BMPs address different types of NPS problems. *(See Appendix B for a listing of publications offering more specific information on the design of BMPs.)*

■ BROAD GOALS OF BMPs

BMPs are **specific conservation practices** designed to mitigate the effects of nonpoint source pollution from development and other activities. There are hundreds of specific measures that can be used to achieve this goal. Many BMPs are simple to use and very inexpensive. Other BMPs in stream rehabilitation projects are more complex and require involvement of professional engineers and stream restoration specialists. Also, permits from DEP or LURC may be necessary.

Education and awareness of the need to address NPS issues are vital precursors to the development of effective water quality protection guidelines and ordinances.

Most of the BMPs that have been designed to protect streams and other surface waters from phosphorus, sediment, and other NPS pollutants in stormwater runoff from developed or disturbed areas share these common broad goals:

• **Reducing the risk of soil erosion by stabilizing exposed soils.** Soil erosion is a major source of nutrients (e.g., phosphorus) and sediment to streams (and lakes). Many erosion problems can be eliminated easily by seeding and mulching exposed areas. Some problems have complex causes and may require evaluation by professionals. By reducing the number of erosion problems in a stream watershed, nutrient and sediment loading to the stream, and downstream waters such as a lake, can be reduced significantly.

• **Minimizing vegetation loss, or replacing vegetation that has already been removed.** As the natural forest cover is removed, stormwater runoff increases. In addition, the natural sediment and NPS pollutant filtering (buffering) capability of the vegetation is lost. By minimizing vegetation loss, erosion problems are also minimized. Generally, trees, shrubs, and ground cover vegetation are preferable to lawns. Replacement vegetation should mimic natural forest conditions in the area, if possible.

• **Reducing stormwater runoff volumes and velocities by minimizing the amount of impervious area.** Road and driveway lengths should be minimized, where possible. Parking lots and building areas should also be minimized. Less impervious area means less erosive runoff traveling through the watershed.

• **Diverting runoff from developed or disturbed areas to vegetated buffers or areas where runoff can filter into the ground.** This reduces the amount of phosphorus, sediment, and other NPS pollutants in stormwater runoff. Runoff from buildings, parking lots, driveways, roads, construction areas, farmlands, and logging areas should not discharge directly into streams without first receiving some level of treatment to reduce pollutants. Natural woodland buffers are very effective at reducing most pollutants from stormwater runoff. Grassed areas, while less effective than woodland areas, can provide some treatment.

(There are a number of great publications on simple best management practices which landowners can implement themselves. See Appendix B for more publications on simple BMPs.)