3.1 How to Conduct a Watershed Survey

The Background Investigation

Researching the stream is generally a one-time activity that should yield valuable information about the cultural and natural history of the stream and the uses of the land surrounding it. This information will prove helpful in orienting new volunteers to the purpose of the monitoring program, in building a sense of the importance of the stream and its role in the watershed, and in identifying land use activities in the watershed with a potential to affect the quality of the stream. The program might choose to monitor these areas and activities more intensively in the future.

The background investigation is essentially a "detective investigation" for information on the stream and includes the following steps:

Task 1 **Determine what you want to know about your stream**

Before beginning the background investigation, establish what it is you want to know about the stream you are surveying. Types of information include:

- Location of the stream's headwaters, its length, where it flows, and where it empties
- Name and boundaries of the watershed it occupies, the population in the watershed, and the communities through which it flows
- Roles of various jurisdictions in managing the stream and watershed
- Percentage of watershed land area in each town or jurisdiction
- Land uses in the stream's watershed
- Industries and others that discharge to the stream
- Current uses of the stream (such as fishing, swimming, drinking water supply, irrigation)
- Historical land uses
- History of the stream

Any or all of these types of information should prove valuable to the monitoring program. You might also uncover other important information in the process. At a minimum, the investigation should yield information on the size of the stream, watershed boundaries, and general land use in the area. By establishing categories of information to investigate, program coordinators can assign volunteers to specific activities and end up with a complete picture of the stream that answers many questions of value to the program.

Task 2 **Determine the tools you will need**

Offered below are some of the tools you will need to find answers in your background investigation of the stream.

Stream headwaters, length, tributaries, final stream destination, and watershed boundaries are best determined through maps. Of greatest value are U.S. Geological Survey 7 1/2- minute topographic maps (on a 1:24,000 scale where 1 inch = 2,000 feet). At varying degrees of resolution, they depict landforms, major roads and political boundaries, developments, streams, tributaries, lakes, and other land features. Sporting goods stores and bookstores often carry these maps, especially for recreational areas that are likely to be hiked or camped. The maps can also be ordered through the U.S. Geological Survey (see box–Obtaining USGS Topographic Maps).

Road, state, and county maps might also prove helpful in identifying some of

Obtaining USGS Topographic Maps

The U.S. Geological Survey's Earth Science Information Centers can provide you with a catalog of available USGS topographic maps, a brochure on how to use topographic maps, and general information on ESIC services. Contact the main ESIC office at:

USGS Earth Science Information Center
507 National Center
12201 Sunrise Valley Drive
Reston, VA 22092
1-800-USA-MAPS

You can obtain a free USGS Indexing Catalog to help you identify the map(s) you need by calling 1-800-435-7627. If you know the coordinates of the map you need, you can order it directly from:

USGS
Branch of Information Services
Box 25286
Denver, CO 80225

Place your order in writing and include a check for $4.00 per map plus $3.50 for shipping and handling. The ESIC can also refer you to commercial map distributors that can get you the topographic maps sooner, for a higher fee. USGS topographic maps might also be available from sporting goods stores in your area.

these stream and watershed features. Hydrologic unit maps, also available from the U.S. Geological Survey but at a 1:100,000 scale of resolution (less detail than the 7 1/2-minute maps cited above), might also help you determine hydrologic watershed boundaries. Atlases and other reference materials at libraries can prove helpful in determining facts about population in the watershed.

Land uses in the stream watershed might also be depicted on maps such as those discussed above. You will verify this information in the second half of the watershed survey, when you are actually in the field observing land around the stream. Information from maps is particularly useful in developing a broad statement about general land use in the stream watershed (e.g., land use in the hypothetical Volunteer Creek watershed is 60 percent residential, 20 percent parkland/recreational, and 20 percent light industrial).

Other sources of information include:

- Land use plans from local planning offices, which include information not only for current land uses but for potential uses for which the area is zoned
- Conservation district offices or offices of the agricultural extension service or Natural Resources Conservation Service (Formerly the Soil Conservation Service, these offices might be able to provide information on agricultural land in rural areas)
- Local offices of the U.S. Geological Survey, which might provide a variety of publications, special studies, maps, and photos on land uses and landforms in the area
- Aerial photographs, which might provide current and historical views of land uses

Industries and others that discharge to the stream might be identified at the state, city, or county environmental protection or water quality office. (The name of the agency will vary by locality.) At these offices, you may ask to see records of industries with permits to discharge treated effluent to streams. These records are maintained through the National Pollutant Discharge Elimination System (NPDES). All industrial and municipal dischargers are required to have permits that specify where, when, and what they are allowed to discharge to waters of the United States.

Especially in older metropolitan areas, combined sewers are also potential discharges. Combined sewers are pipes in which sanitary sewer waste overflow and storm water are combined in times of heavy rain. These combined sewers are designed to discharge directly into harbors and rivers during storms when the volume of flow in the sewers exceeds the capacity of the sewer system. The discharge might include raw sanitary sewage waste. Combined

sewers do not flow in dry weather. Maps of sewer systems can be obtained from your local water utility.

The state or local environmental agency should also be able to provide location information on other potential pollution sources such as landfills, wastewater treatment plants, and stormwater detention ponds.

Current uses of the stream are established in state water quality standards, which specify what the uses of all state waters should be. These uses can include, for example, cold water fisheries, primary contact recreation (swimming) and irrigation. The state also establishes criteria or limits on pollutants in the waters necessary to maintain sufficient water quality to support those uses, as well as a narrative statement that prohibits degradation of waters below their designated uses.

Section 305(b) of the Clean Water Act requires states to report to the U.S. Environmental Protection Agency on the designated uses of their waters, the extent of the impairment of those uses, and the causes and sources of impairment. This information is kept on file at the state water quality agency. While state reports cannot specify water uses and degree of impairment in all individual streams in the state, they are a good starting point. Write to the state water quality agency for its biennial water quality (section 305(b)) assessment.

You might also be able to obtain a copy of your state's water quality standards or establish contact with a water quality specialist who can give you information on standards for your stream. Again, information on actual water uses will be verified and detailed once you walk the stream during the visual assessment portion of your watershed survey.

Historical land uses and the history of the stream might take some legwork to uncover. Local historical societies, libraries, and newspaper archives are good places to start. Look for historical photos of the area and stories about fishing contests, fish kills, spills, floods, and other major events affecting the stream and its watershed. County or town planning offices might be able to provide information on when residential developments were built and when streams were channelized or diverted. State and local transportation agencies might have records on when highways and bridges were built. State environmental regulatory agencies have records of past or current applications to modify stream hydrology through dredging, channelization, and stream bank stabilization.

Long-time residents are another invaluable source of information on the history of your stream. People who fished or swam in your stream in their youth might have witnessed how the stream has changed. They might remember industries or land use activities of the past—such as

Getting to Know the Boundaries of Your Watershed

Once you've obtained topographic maps of your area, follow these steps to draw your watershed boundaries:

1. Locate and mark the downstream outlet of the watershed. For rivers and streams, this is the farthest downstream point in which you are interested.
2. Locate all water features such as streams, wetlands, lakes, and reservoirs that eventually flow to the outlet. Start with major tributaries, then include smaller creeks and drainage channels. To determine whether a stream is flowing to or from a lake or river, compare the elevation of land features to that of the waterbody.
3. Use arrows to mark the direction of stream or wetland flow.
4. Find and mark the high points (hills, ridges, saddles) on the map. Then connect these points, following ridges and crossing slopes at right angles to contour lines. This line forms the watershed boundary.

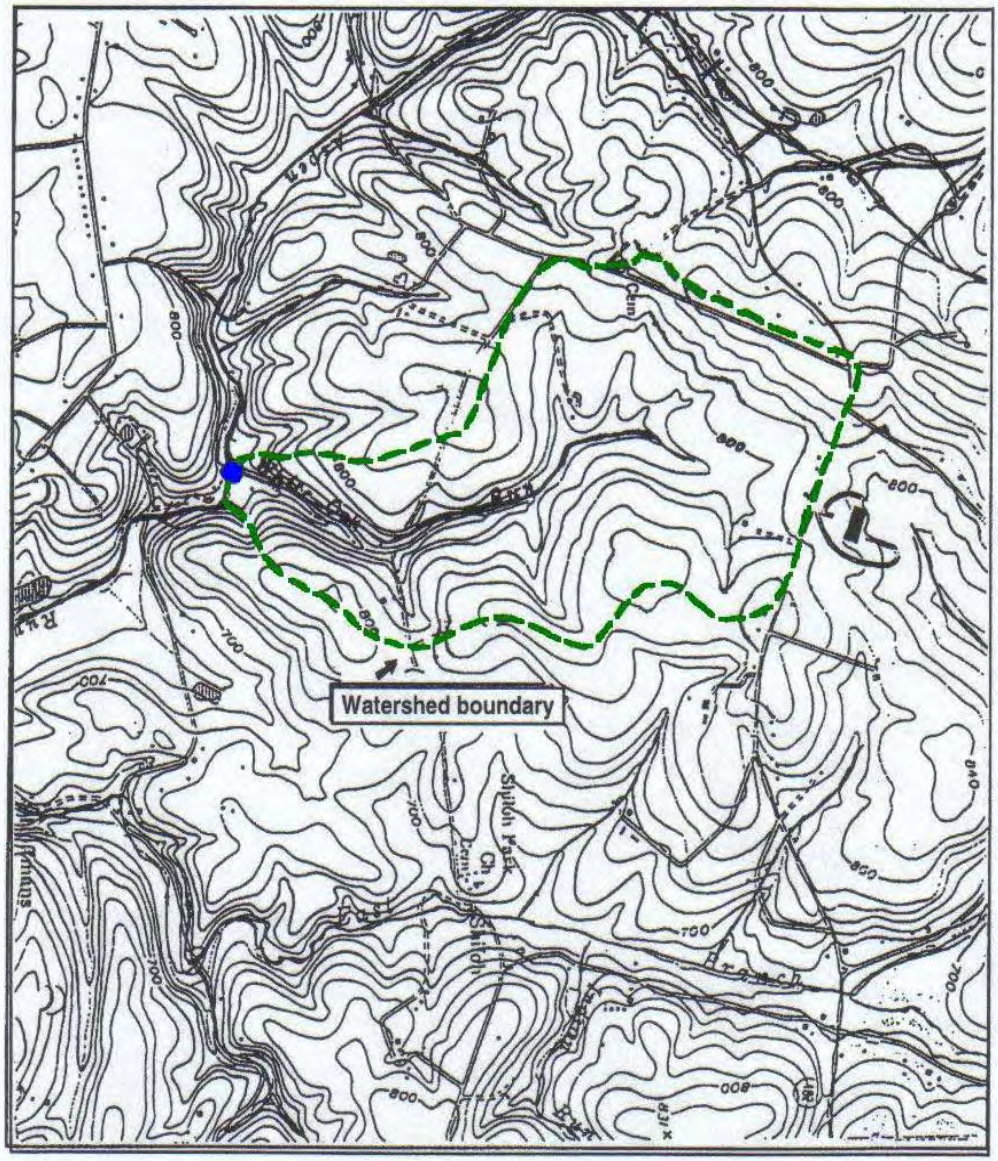
If you don't need to know exact watershed boundaries, simply look at the pattern of streamflow and draw lines dividing different stream systems. This will give you an idea of the shape of your watershed and those that border it. Also, once you've identified watershed boundaries, water features, and flow direction, you might want to transfer this information to a road map for easier use.

From: Eleanor Ely, Delineating a Watershed, *The Volunteer Monitor* 6(2), Fall 1994.

Figure 3.1

A topographic map with a delineated watershed.

Volunteers should learn to read a topo map to learn about the natural and cultural features of their study stream's watershed



mines or farms—that could have affected the stream. They might have tales to tell about fish they once caught or floods that led to channelization and dams. Assembling such oral histories is a particularly good activity for school-age volunteers.

Task 3 **Conduct the background investigation**

It is best to conduct your background investigation of the stream in the early stages of the volunteer program and use the information it uncovers to help design the program's monitoring plan, future activities, and projects.

The investigation might emphasize those aspects which are most important to the volunteers or the watershed, or it might include all the resources and tools listed above. In any case, rely on the interests of the volunteers in designing and conducting the background investigation, and divide duties among different volunteers.