Lake Notes

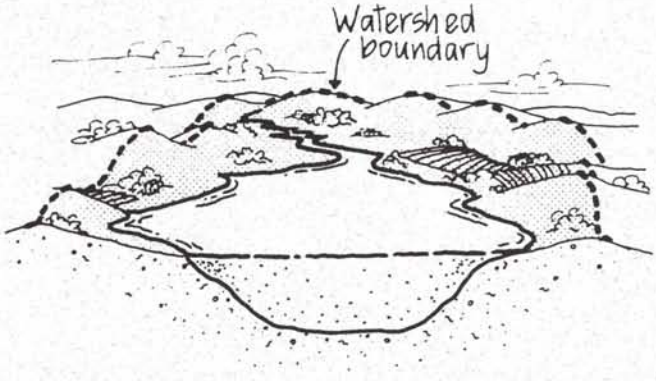
Determining Your Lake's Watershed

Protecting Illinois lakes requires more than shoreside diligence. Even if you don't live on a lakeshore, you may be contributing pollution to lakes—or the streams or groundwater that feed them. In essence, a lake extends beyond its shoreline. It's part of a bigger system—it's part of a *watershed.*

What is a Watershed?

A watershed is the land area that drains into a body of water. A watershed can be as small as a back yard draining into a puddle, or as large as the area that drains into the Great Lakes or the Mississippi River.

The edge or boundary of your lake's watershed is defined by the highest points and ridges of land around the lake. Rain falling or snow melting on the near side, or "inside," of the ridge flows by gravity, over the ground and in streams and groundwater, to your lake. Rainfall or snowmelt on the far side of the ridge flows away from your lake and into a different watershed. Other names you might hear for watershed are drainage basin, drainage area, or catchment.



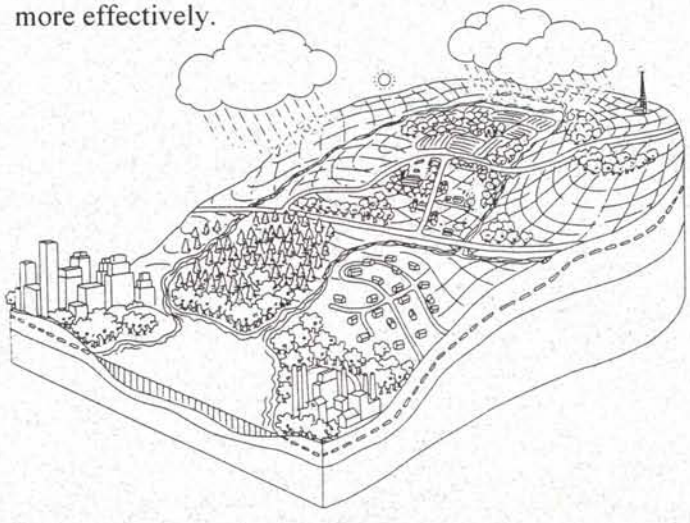
A lake's watershed often includes other waterbodies such as streams, rivers, ponds, and wetlands. Each of these waterbodies also has its own, smaller watershed called a subwatershed or subbasin.

How Do You Fit Into a Watershed?

Wherever you are, you're in a watershed! A particular watershed may contain just one land use or a combination of land uses . . . such as houses, farmland, shops, factories, and forests. Each land use and the activities associated with it can affect the quality of water within that watershed. That's because any substance that can be transported by water can eventually reach a waterbody—no matter how far away.

Just think—anything that you and all the other people do who live, work, and play in the watershed can have an effect on water quality. Common activities such as lawn care, automotive maintenance, construction, farming, and many others can contribute excess soil, nutrients, and pollutants to waterbodies in your watershed—including your lake!

This is why it's important to look beyond the lake and its shoreline and examine the entire watershed when working on lake management issues. Knowing your lake's watershed boundary and the land uses and activities going on within that boundary can help you understand your lake's quality and manage your lake more effectively.



Determining Your Lake's Watershed Boundary

Since water naturally flows downhill, watersheds are defined by topography—the land's physical features. To draw a watershed boundary, you essentially connect high points and ridges on a topographic map. While this concept sounds simple, the actual task can be quite challenging for people who are unfamiliar with interpreting topographic maps—especially if the watershed lies in an area of varied and complex terrain, or in extremely flat areas.

Obtaining Maps

First, check to see whether a government agency has already done the work for you—such as your municipality, county planning department, regional planning commission, local soil and water conservation district (SWCD) or Natural Resource Conservation Service (NRCS) office, Illinois EPA (217/782-3362), or Illinois State Water Survey (217/333-9546). They may at least have maps showing the boundaries of major lake or river watersheds that could provide some guidance. For most lake watersheds, however, you'll likely need to draw the boundaries yourself.

To do so, you'll need to obtain one or more U.S. Geological Survey (USGS) topographic maps, called quadrangle or "quad" maps, preferably in a 1:24,000 scale (one inch on the map represents 2,000 feet on the ground). These can be ordered from the Illinois State Geological Survey (ISGS) in Champaign (217/244-2414 or 244-0933; fax: 217/244-0802), as well as from the USGS (1-800-HELP-MAP, or order on-line at http://www.usgs.gov). Each quad map costs $4 plus shipping. ISGS personnel can help you figure out which quad maps to order. You also can search the USGS web site for the names of the quad maps in your area of the state. USGS quad and other topographic maps also can be purchased at some map stores, college bookstores, outdoor recreation stores, and engineering supply houses.

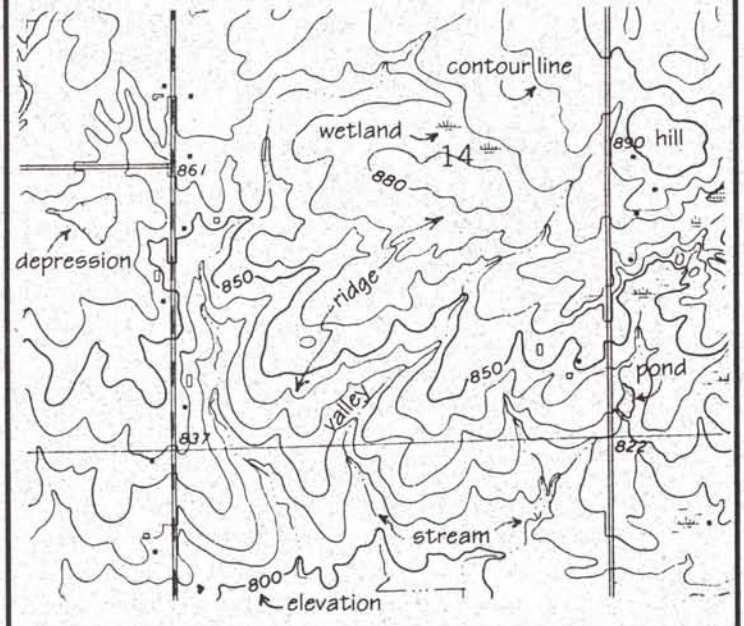
If you live in an urban/suburban area, it's also very important to review a map of the storm sewer system (contact your municipality) and adjust your watershed boundary accordingly. Storm sewers may route stormwater runoff in a different direction (i.e., either toward or away from your lake) than you would otherwise predict by looking at the ground's topography.

If you are not familiar with reading and interpreting a topographic map, see the insert "Reading a USGS Topographic Map" for some pointers.

Reading a USGS Topographic Map

Basic Terms and Conventions

- Contours represent lines of equal elevation. Contour lines never cross each other.
- Colors help to distinguish features: contour lines are brown; water features are blue; cleared areas (fields, developed areas, farmland) are white; woods, scrub, orchards, and vineyards are green; urban areas are pink; roads are red or black; buildings and other cultural features are black; and revisions are purple.
- The elevation, in feet above sea level, is usually indicated on the dark brown (thick) contours, and on certain light brown (thin) contours. Elevations of certain points also are given ("spot" elevations).
- The difference in elevation between two adjacent contours is called the contour interval. It is usually specified in the map legend. On the 1:24,000 scale USGS quads for Illinois, the contour interval is typically 5, 10, or 20 feet.



Recognizing Features on the Map

- Slopes: Contour lines that are closely spaced represent steep slopes, and those that are widely spaced represent flat areas.
- Valleys and Ridges: Contour lines that represent a valley usually are V-shaped, with the tips of the Vs pointing toward higher elevations. Contour lines that show a ridge are V- or U-shaped, but point toward lower elevations.
- Hills: Hills and mountains appear as a series of successively smaller, irregularly shaped concentric circles. The smallest circle represents the highest elevation.
- Depressions: Low areas or depressions (also called depressional areas) appear as closed contours with "tick marks" pointing inward.
- Water flow: Water flows perpendicularly to contour lines. Streams tend to form in the V-shaped contours on sideslopes, with the Vs pointing in the direction of higher ground (i.e., upstream). When two streams converge, the V formed by the point where the two come together points downstream.

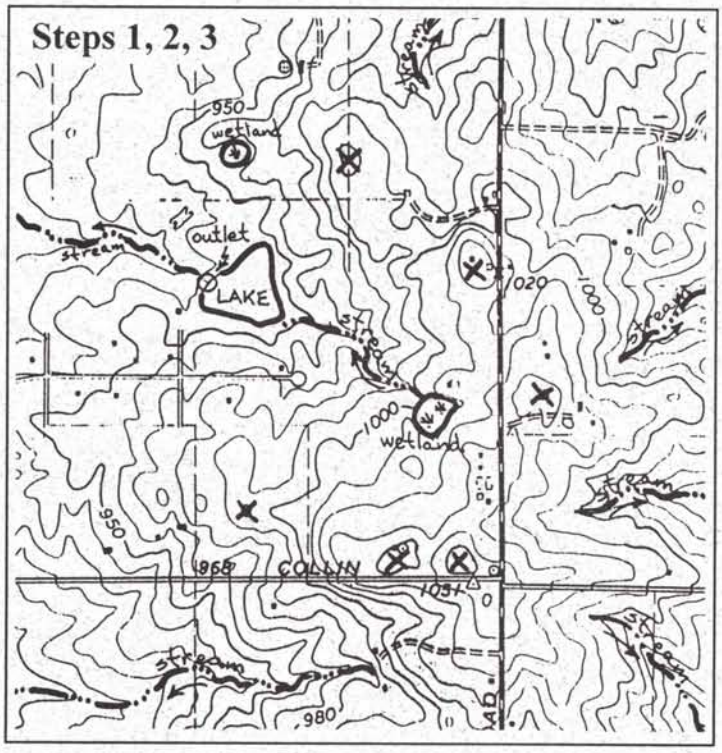
Delineating Watershed Boundaries

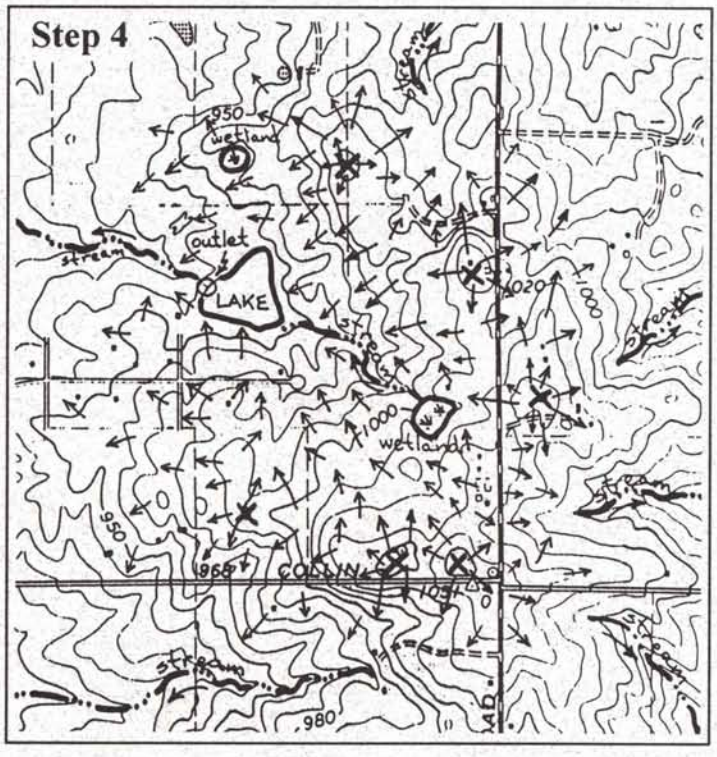
Once you've obtained topographic maps of your area, follow the steps below to draw—or "delineate"—your lake's watershed boundaries. Use a pencil so you can easily erase and revise your work as you go along. The accompanying figures provide an example.

1) Locate and highlight your lake and circle the lake's outlet.

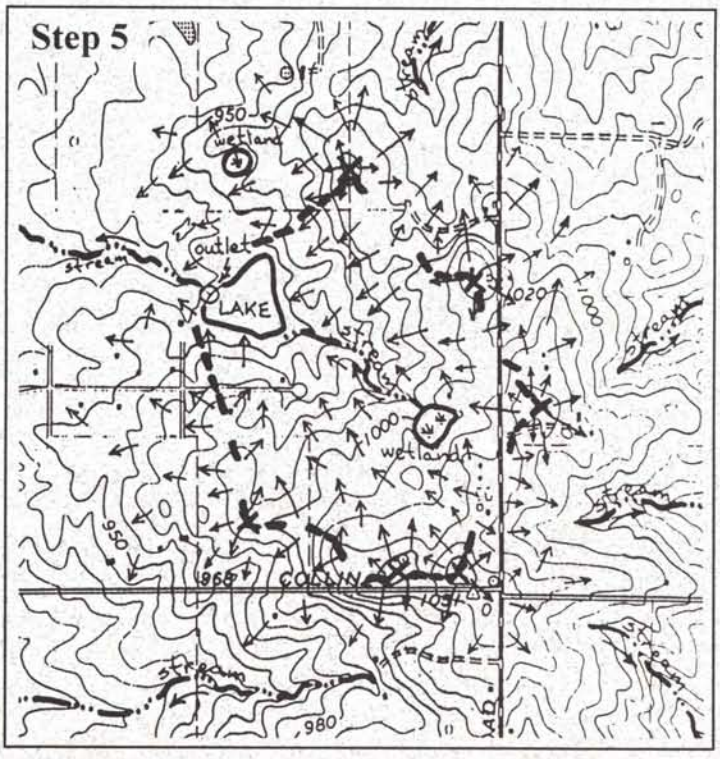
2) Locate and highlight all water features (streams, wetlands, ponds, other lakes and reservoirs) in the vicinity of your lake. Work outward from your lake, starting with streams and wetlands "tributary" (connected) to your lake, then highlighting other water features that don't appear directly connected. Use arrows to mark the direction of stream and wetland flow. To determine if a stream is flowing toward or away from another waterbody, compare the elevation of land features around the stream to that of the other waterbody. With these water features identified, this forms a general picture of where to look for the watershed boundaries.

3) Examine the contour lines surrounding the lake and the tributary waters and mark each high point (hills, ridges) with a small "x."





4) Determine the direction of drainage from the high points and ridges by drawing arrows perpendicular to a series of contour lines that decrease in elevation. Water running off the land seeks the shortest distance between two contour lines and thus follows a route perpendicular to those lines.



5) Mark the break point on each contour line with a dash. Each break point marks the spot where the runoff on one side of the break point would drain toward the lake, and the runoff on the other side of the break point would drain away from the lake.

6) Connect the high points and break points with a solid line following the highest elevations in the area. Remember that the watershed boundary line will always be perpendicular to each contour line it crosses. This completed line represents the boundary of the watershed.

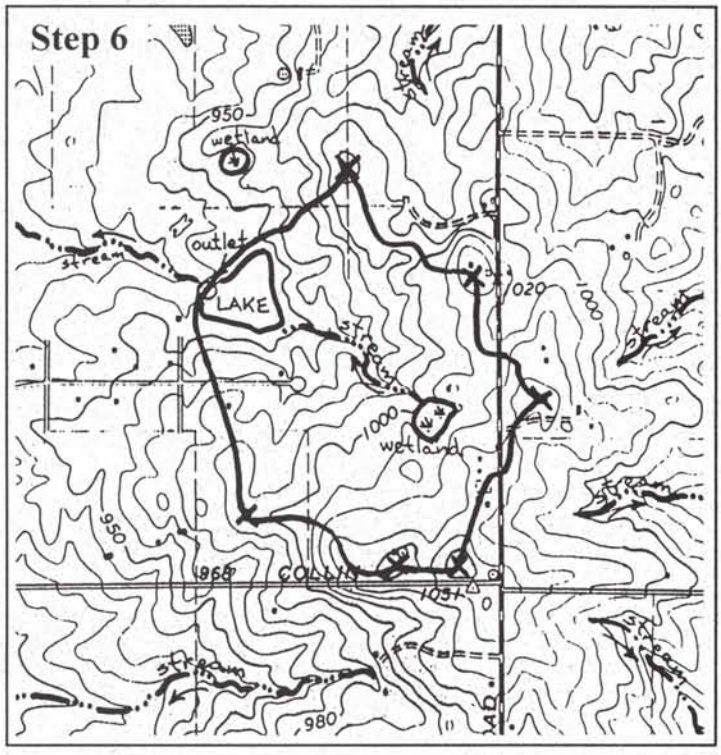
If desired, subwatersheds can be delineated by locating internal drainage divides that are bounded by ridges within the primary watershed boundary.

Some of the steps outlined above for delineating a watershed are easier said than done. For the inexperienced, expert guidance is strongly recommended. Your local SWCD or NRCS office is a source of ready help. Field checking the boundaries also is a good idea. Going out into the field allows you to identify human alterations, such as road ditches, storm sewers, and culverts, that could change the direction of water flow and thus change the watershed boundaries. Finally, bear in mind that delineating a watershed is an inexact science. Any two people, even if both are experts, will come up with slightly different boundaries.

(Note: These same steps also are used for delineating a stream or river watershed, with the outlet being the furthest downstream point you're interested in.)

Measuring Watershed Area

Now that you know your lake's watershed boundary, you can measure the watershed's area. Two methods are by using a dot grid or a small device called a planimeter. Again, your local SWCD or NRCS office can provide assistance.



Next Steps

Once you have delineated your lake's watershed, you have taken a key step toward managing and protecting your lake more effectively. This watershed boundary forms the framework within which important follow-up steps take place: identifying and mapping land uses. Knowing the locations of the different land uses can help 1) focus watershed monitoring and management activities on areas that may be contributing pollutants to the lake, and 2) identify areas that may benefit from protection—and in turn benefit your lake!

Lake Notes . . is a series of publications produced by the Illinois Environmental Protection Agency about issues confronting Illinois' lake resources. The objective of these publications is to provide lake and watershed residents with a greater understanding of environmental cause-and-effect relationships, and actions we all can take to protect our lakes.

This *Lake Notes* publication was prepared by Holly Hudson of the Northeastern Illinois Planning Commission, Chicago, Illinois. Thanks are extended to Tom Price and Jason Novota of the Commission and Illinois EPA Headquarters staff for their review and comments.

Watershed illustrations on first page by Linda Wallis and from the Northeast Regional Agricultural Engineering Service, respectively. Topographic map figures excerpted from U.S. Geological Survey quadrangle sheets.

For more information about other publications in this series and to request copies, please contact: Illinois Environmental Protection Agency, DWPC-Lake and Watershed Unit, P.O. Box 19276, Springfield, Illinois, 62794-9276; 217/782-3362.