

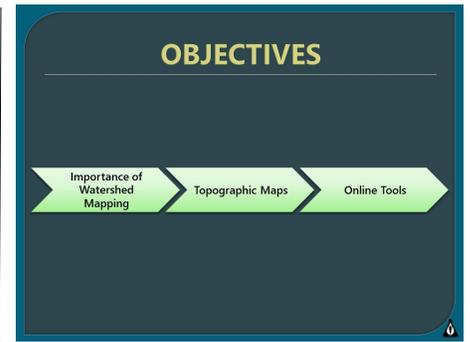
# Chapter 6

## Mapping and Online Tools



The stream site you monitor is just part of a much larger system. When analyzing stream health, it is important to take a holistic view by considering the entire watershed. This chapter will introduce you to:

- The importance of watershed mapping
- How to interpret topographic maps
- Utilizing online tools



### UNDERSTANDING WATERSHEDS

- ⦿ Essential to the interpretation of stream health and water quality
- ⦿ Everything that occurs within a watershed affects water resources
- ⦿ Stream health depends on a healthy watershed

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### HUMAN USES OF LAND AND WATER IMPACT WATER QUALITY

Natural

Natural Environment

Urbanized

Urbanized Environment

drawing courtesy: City of Bellevue Utilities Department

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### THINK ABOUT YOUR WATERSHED MAP

- ⦿ Choose a manageable size
- ⦿ Know your watershed boundaries as defined by topography
- ⦿ Land uses

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## Importance of Watersheds

Knowing the boundaries of the watershed in which your stream site is located allows you to see the big picture when analyzing the health or impairment of a stream. Everything that occurs within a watershed affects the water resources in it. A healthy stream is a good indicator of a healthy watershed.

For example, consider the differences between natural and urbanized environments. Natural environments have a slower rate of overland flow due to plants, trees, and vegetation. This allows for the filtering of water before it enters a stream and a greater recharge of groundwater. Urbanized environments with concrete and other infrastructure has rapid overland flow. This results in higher runoff, no filtering and little or no groundwater recharge.

Mapping the watershed of your stream site has many benefits. It can help identify sources of pollution, aid in locating optimal monitoring sites, provide information to educate your local community leaders, and provide a sense of value. If your site is located in a large watershed, you may want to consider mapping a limited portion of it so it is more manageable. Once mapped, you can identify how the land within its boundaries is used and how this will affect your sampling results.

## Topographic Maps

Because a watershed is defined by the topography of the land, a topographic map will be your best resource in defining the watershed for your stream site. Topographic maps represent a specific area of land or quadrangle; a four-sided region bounded by a particular latitude and longitude. These maps use contour lines to show the shape of the earth's surface. The contour lines make it possible to show the elevation and shape of mountains, hills, and the steepness of slopes. Maps are drawn to a scale that represent distance. This is a ratio comparing a measurement on the map to the distance you would find in real life between two points. Topographical maps will also use symbols to show boundaries, surface features, building, roads, railroads, and communication features. The following symbols are often used on a topographical map:

BOUNDARIES	
National	-----
State or territorial	-----
County or equivalent	-----
Civil township or equivalent	-----
Incorporated city or equivalent	-----
Federally administered park, reservation, or monument (external)	-----
Federally administered park, reservation, or monument (internal)	-----
State forest, park, reservation, or monument and large county park	-----
Forest Service administrative area*	-----
Forest Service ranger district*	-----
National Forest System land status, Forest Service lands*	-----
National Forest System land status, non-Forest Service lands*	-----
Small park (county or city)	-----

CONTOURS	
<i>Topographic</i>	
Index	
Approximate or indefinite	
Intermediate	
Approximate or indefinite	
Supplementary	
Depression	
Cut	
Fill	

RIVERS, LAKES, AND CANALS	
Perennial stream	
Perennial river	
Intermittent stream	
Intermittent river	
Disappearing stream	

### TOPOGRAPHIC MAPS

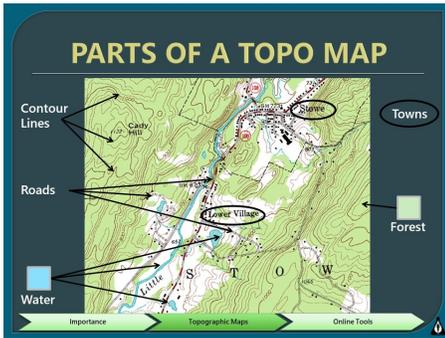
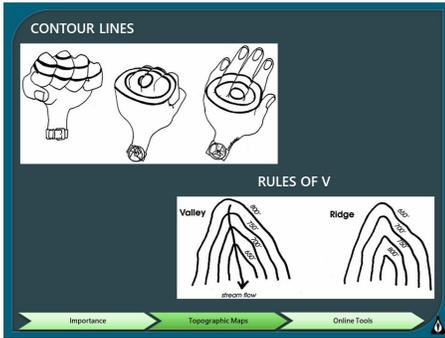
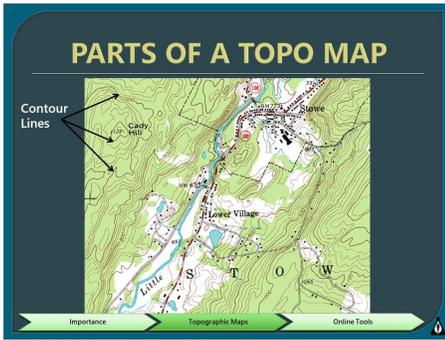
- Four-sided region called a quadrangle
- Illustrate relief
- Scale represents distance
- Symbols show boundaries, surface features, buildings, roads, railroads, and communication features

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### TOPO MAP SYMBOLOGY

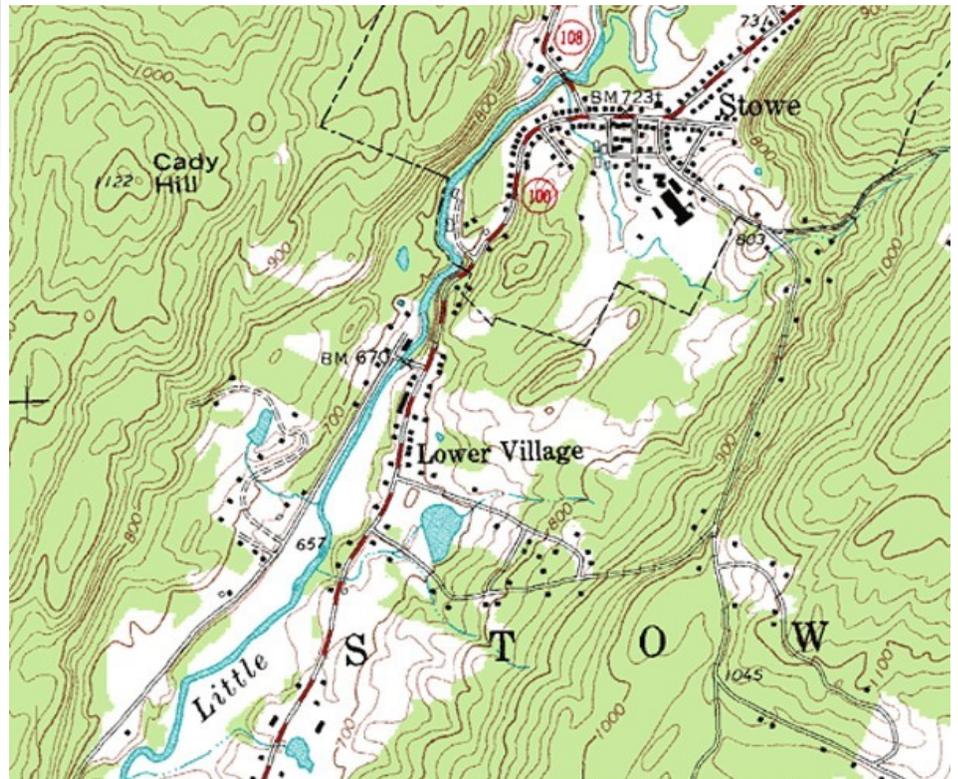
Source: <https://pubs.usgs.gov/gip/topographicMapSymbols/topomapsymbols.pdf>

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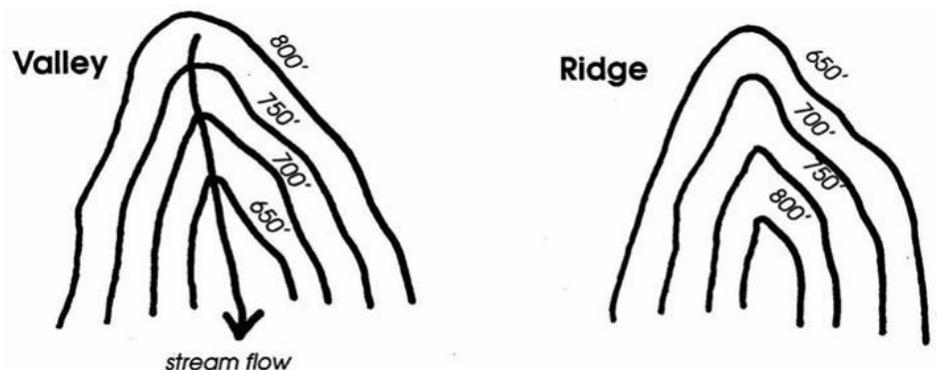


## Parts of Topographic Maps

The most striking feature of a topographic map is the contour lines. These lines show the elevation of the earth's surface. Notice that these lines will never cross on a map. Some contour lines are marked with a specific elevation. You can determine the elevation of the unmarked intermediate contour lines by using the contour interval printed in the margin of a map. When contour lines are close together, it indicates steep terrain. When these lines are drawn further apart, there is a more gentle slope to the terrain.

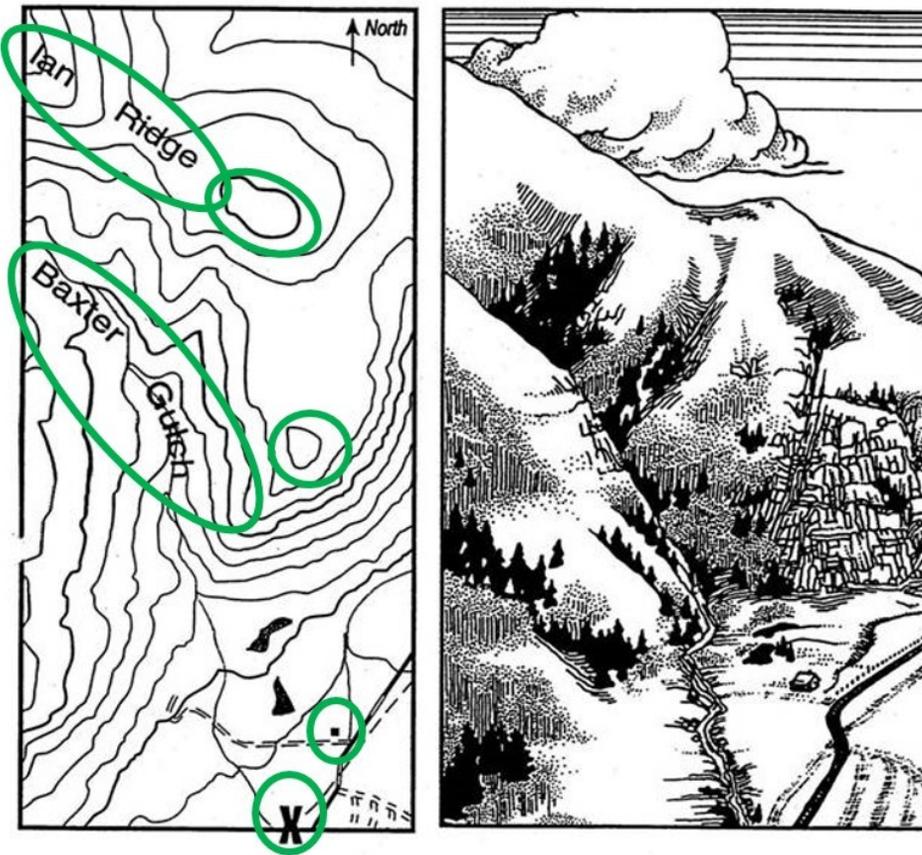
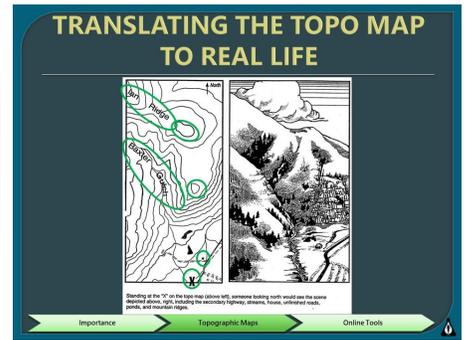


**The Rule of the V:** When contour lines cross a river or stream, they form a "V" shape that always points upstream. This helps you determine the direction of flow in a stream. The Rule of the V's also applies to ridges. The top of a ridge is shown as an enclosed shape, like an irregular oval. As contour lines extend out from the ridge, they often form rows of parallel "V's" that point downhill towards lower elevations. Other features like forests, water features, town, and roads are depicted on topographic maps.



## Translating Topographic Maps

It is sometimes difficult to translate the contour lines on a two dimensional map to what a specific landscape might look like in three dimensions. The illustration below might help. Imagine you are standing where the X is marked on the topographical map on the left and looking north. The picture on the right demonstrates the landscape you would see.



Standing at the "X" on the topo map (above left), someone looking north would see the scene depicted above, right, including the secondary highway, streams, house, unfinished roads, ponds, and mountain ridges.

**TOPO MAP EXERCISE (PART 1)**

- What is the name of this quadrangle?
- What quadrangle is south of this quad?
- What quadrangle is southwest of this quad?

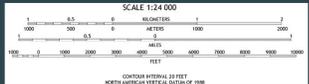
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**TOPO MAP EXERCISE (PART 2)**

- What is the contour interval?
- Find the intersection of HWY 34 and 51. Follow HWY 34 east to the junction of HWY B. What is the elevation of HWY 34 and B?

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**SCALE**



SCALE 1:24,000

CONTOUR INTERVAL: 20 FEET  
NORTH AMERICAN DATUM, EDITION OF 1983

- Ratio representing distance or size
- 7.5-minute quads (most detailed)
  - Covers 7.5 minutes of lat and long
  - Scale is 1:24,000
  - 1 inch = 24,000 inches (2,000 feet)

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**TOPO MAP EXERCISE (PART 3)**

- What is the distance between Shell and Eaker Cemeteries, south of Marble Hill?
- Cedar Branch is a tributary to which stream?
- What direction is Hurricane Creek flowing?

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## Topographic Map Exercise

Using the map and materials provided to you, answer the following questions and complete the activity:

**Part 1:**

1. What is the name of this quadrangle?
2. What quadrangle is south of this quad?
3. What quadrangle is southwest of this quad?

**Part 2:**

1. What is the contour interval?
2. Find the intersection of HWY 34 and 51. Follow HWY 34 east to the junction of HWY B. What is the elevation of HWY 34 and B?

**Part 3:**

1. What is the distance between Shell and Eaker Cemeteries, south of Marble Hill?
2. Cedar Branch is a tributary to which stream?
3. What direction is Hurricane Creek flowing?

## Topographic Map Exercise

### Part 4:

Write a site description for the site marked with an X near Marble Hill.

### Part 5:

Delineate the watershed for the given monitoring point.

1. Find the asterisk on the east central portion of the map on Drunken Creek to identify the most downstream point of the watershed to map. This is the monitoring point.
2. Trace the stream and tributaries in blue upstream from the monitoring.
3. Mark ridge tops with an X.
4. Connect the Xs following the contour lines.

**TOPO MAP EXERCISE (PART 4)**

Write a site description for the site marked with an X near Marble Hill

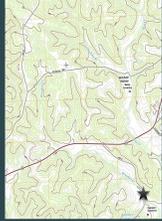


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**TOPO MAP EXERCISE (PART 5)**

Find the asterisk on the east central portion of the map on Drunken Creek

Outline the watershed upstream of that point



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## Watershed Mapping Tools

Tools to help delineate watersheds are constantly being updated and improved online. A couple resources that monitors may find helpful are:

- Model My Watershed  
[modelmywatershed.org/](http://modelmywatershed.org/)
- EPA WATERS GeoViewer  
[epa.gov/waterdata/waters-geoviewer](http://epa.gov/waterdata/waters-geoviewer)

**STREAM TEAM WEBSITE**  
MOSTREAMTEAM.ORG

- Water Quality Resources
- Order Equipment
- Activity Report
- Online Data Submission
- Stream Team Calendar
- Interactive Map



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## Online Tools

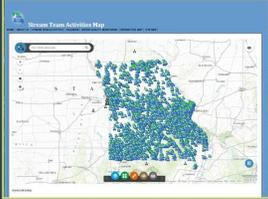
There are many resources and tools online to aid you in your monitoring efforts:

**Stream Team Website**  
[mostreamteam.org](http://mostreamteam.org)

The Missouri Stream Team website has many resources available for you. Under the **Forms** tab, you can submit activity reports, request equipment, and add new members to your Stream Team. The **Water Quality** tab has many of the documents and resources you have covered in this workshop, helpful tips for monitoring, and information on future workshops. The **Calendar** keeps you informed of the many events taking place around the state. You can even post your own events to this calendar.

**STREAM TEAM INTERACTIVE MAP**  
MOSTREAMTEAM.ORG/INTERACTIVE-MAP.HTML

- Stream Team adopted sites
- VWQM sites
- VWQM data



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**Stream Team Interactive Map**  
[mostreamteam.org/interactive-map.html](http://mostreamteam.org/interactive-map.html)

This map can be used to find Stream Team adopted sites and corresponding VWQM data. If you use this map to find a site, note that not all locations are currently adopted or monitored. If you see a VWQM icon at the site you want to monitor, contact Stream Team staff to see if it is currently being monitored.

**USGS WATER DATA**  
WATERDATA.USGS.GOV/MO/NWIS/RT

- Instantaneous Data:
  - Stream Discharge
  - Precipitation Values
  - Gage Height Values



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**United States Geological Survey Water Data**  
[waterdata.usgs.gov/mo/nwis/rt](http://waterdata.usgs.gov/mo/nwis/rt)

This site offers water data online, including stream discharge and precipitation. This is an excellent tool to evaluate general stream conditions before you monitor your site. For instance, you may want to know if recent flood waters have receded or if stream discharge has increased with a recent snow melt. **Remember, you may only use USGS stream discharge data if the USGS gage station is within one-half mile of your monitoring site and there are no inputs or outputs between the gaging station and your monitoring site.**

**USGS WATER DATA**

**Reminder!**  
You may only use USGS discharge data to report on your VWQM Discharge Data Sheet if:

- The USGS gaging station is within one-half mile of your VWQM monitoring sites
- There are no inputs or outputs between the gaging station and your monitoring site

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