

Chapter 2: Exploring Your Watershed

Inventory Available Data and Information

Introduction

- 2.1 Collecting Data and Information
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Active Options

Write It Down

This chapter will help you:

- Gather and organize existing data and information for your watershed

As in every chapter, this one also provides:

- Active Options
- Write It Down

Find related information about this stage of watershed planning in Chapters 5 and 6 of EPA's Handbook

Introduction

Now that you've identified your planning team and its concerns, it's time to gather information about your selected watershed. If your team does not already include a partner with the scientific background to assist in gathering this information, you'll need to find one now.

Your watershed plan should describe the features of your watershed that influence the health of your waterway. Your plan will both rely on and share available scientific information about your waterway's health. It will also identify both gaps in information and ways to fill the knowledge gaps.

There is a wealth of available data that can help you understand your watershed and identify the factors that influence its health. This information will be very useful if you take the time to collect it. In addition, you will want to know what's going on in your watershed so that you don't duplicate existing efforts. This chapter will help you create an inventory of the information you identify and collect.



Each website icon refers to a site on that gateway website. In the electronic version of the document, these icons refer to direct links in a list on the gateway website. This gateway website address is <http://water.ky.gov/watershed/Pages/WatershedPlanningGuidebook.aspx>

Section 2.1 offers guidance for collecting and managing data and information. The rest of Chapter 2 provides sources of data and information for water resources (2.2), natural features (2.3), and human activities affecting water resource quality (2.4), and related demographics and social issues (2.5). As always, the chapter also provides Active Options and Write It Down.

2.1 Collecting Data and Information

You will need many types of information and data about your watershed to better understand the challenges it faces and to prepare a plan that is scientifically defensible. A plan based on objective information will gain broader community support, and will enable you to get the help and resources you need. The more concrete information you have, the more effectively you will be able to present your arguments for watershed protection and cleanup to others.

If you have questions about why any of the information described below is relevant, refer to the Watershed Basics section.

While collecting information about your waterway and watershed is vital to the planning process, it's also one of the most challenging jobs you will have. There will be a wide variety of information and likely gaps in water quality data. Chapter 3 Section 3.1 discusses identifying these gaps and collecting additional data. However, it is also important to remember that your team can move forward even if there are missing data. You may find it necessary to delay data collection, including it as an action item in your implementation plan.

Inventories of data are very important to organizing the information you will gather as you explore how your watershed influences the health of your waterway. Maps are crucial to understanding how land uses and other geographical factors in your watershed influence water quality in your waterway and to effectively present your findings. They are also very helpful in community outreach and education efforts.

When you are collecting information, don't overlook the experience of your team members and other local individuals. Local knowledge is extremely valuable.

2.1.1 Data Inventory

As you assemble the information for describing your watershed, you will want to create a list that contains information about the data, such as its type, source, and timeframe. This will be helpful in many ways, but especially to document information sources. The list can be as simple as a table in a word processing document. For planning efforts with larger scope or diverse information sources, a spreadsheet or database may be preferable (the flexibility of search functions in databases is a factor). The EPA Handbook, Figure 5-5, suggests three ways to inventory data sources using Microsoft Excel, depending on whether the source is a data table, a document, or a **GIS data layer**.

Besides tracking where vital information is located, the inventory will be valuable in identifying gaps in the data that you need to monitor the indicators of your planning team's concerns and goals.

2.1.2 Maps, With and Without GIS

Maps are very useful and condensed ways of displaying and organizing information. In watershed planning, they are indispensable for understanding and analyzing the dynamics of land use and upstream and downstream influences on waterbody health.

Maps Using GIS

Geographic Information Systems (GIS) can bring multiple maps “layers” together and in varying combinations, both for display and for analytical purposes. For example, if you are looking for the potential sources of a nutrient problem, you might highlight sampling sites with high nutrient results and also display residential areas, golf courses, and livestock operations on the same map, to see if there is a spatial connection.

If a partner or team member has the time and interest to acquire and study GIS, the Environmental Systems Research Institute (ESRI) website offers some free software, manuals and training models. ESRI’s conservation program page is . In addition, ESRI has a book called “Getting to know Arc GIS,” which comes with a disc with a one year license for an ArcView program that could be used by a motivated team to learn and use GIS quickly. An introduction to the use of GIS is available on the US Geological Survey (USGS) website .

However, comprehensive GIS software is expensive and a challenge to master. If you do not have a partner or team member who can provide experienced GIS support and you are applying for funds, consider including a GIS item in your budget. A 319 budget should always include GIS support.

If your team does have access to GIS expertise, you can secure data for GIS from several sources. Federal sources are listed in Table 5-2 in the EPA Handbook. GIS data for Kentucky are available online through the Kentucky Geography Network . The Kentucky Geography Network (also known as “k-y-geonet”) houses much of the GIS data from agencies in the state. GIS data are also available in other locations, for example from the online “Geospatial Data Library” of the Kentucky Geological Survey.

Chapter 5 of the EPA Handbook provides a detailed guide on digital and GIS sources of the information described in this chapter.

319 Requirements for Maps

Use of GIS is required for 319-funded projects.

319-Funded projects must provide maps showing watershed and sub-watershed boundaries, political boundaries (counties, cities), roads, and hydrology, and others features. The complete list of 319-required maps are listed in the Write It Down section and identified throughout this section. Data for these maps are available through kygeonet . Questions about GIS requirement should be directed to the project’s Nonpoint Source Program Technical Advisor.

Maps Without GIS

If you are not using 319 funds, GIS may not be required. This and other sections of this chapter provide links to many Internet sources of maps and map viewers with watershed-related data.

Regardless of your mapping methods, you will need multiple views because there is too much information to put into one view. Begin with one good map that you can use as your standard, a “base” map that shows your watershed boundary, the waterways, and enough towns and roads to orient the viewer. Once you have this base map, you can make clear overlays, use drawing software, or even ink or colored pencils to add more information to different copies of the base map.

If your team does not have 319 funds, you will still find it helpful to make the maps listed in the Write It Down section. See sections below for sources of the data for these maps.

Internet sources of maps and some data include:

- The Kentucky Watershed Viewer. The viewer has several layers of information that can be displayed and printed .
- EPA’s Enviromapper. This Website provides state-specific information .
- Google Earth offers maps and also aerial photography. The Watershed Academy has a good introduction to using Google Earth in the Wetlands BMP module .
- EPA’s “Surf Your Watershed.” This site provides useful information, but at a scale too large for providing maps for printing .
- USGS’s Hydrology of Kentucky viewer. This viewer is similar to the Kentucky Watershed Viewer, with additional hydrologic information such as stream flow .

2.2 Finding Water Resources Data and Information

It will take some effort and perseverance to find water resources information, but these data are crucial to the efficiency of your planning and the quality of your plan. This section provides a lot of links and contacts, but be creative. Enjoy being a data detective, since you may need to track down bits and pieces. Try the reference departments at colleges, universities, and public libraries. Ask around! Sometimes it only takes an e-mail to discover a world of information.

2.2.1 Watershed Boundary

Begin by defining the boundaries of your watershed, identifying the Hydrologic Unit Code (see Watershed Basics) and the various jurisdictions within your watershed. One way to identify and document your watershed’s boundaries and HUC is by using KDOW’s Kentucky Watershed Viewer . You can also find HUCs at USGS’ website .

The watershed boundary should be shown on your base map and each map your team makes. Sub-watershed boundaries are important, since eventually most of your analysis will be at the sub-watershed level.

GIS coverage of watershed boundaries is in kygeonet . 319-Funded projects must provide a map showing watershed and sub-watershed boundaries.

2.2.2 Hydrology

Information on the hydrology, including the network of streams and lakes, can be found in Kentucky's Watershed Viewer . Hydrology is also available from USGS . The Kentucky Geological Survey has data about wells and springs .

Find real time stream flow data for Kentucky on the USGS's website .

Information about your watershed's rainfall and snowfall can be found at:

- Kentucky Mesonet
- University of Kentucky
- National Weather Service
- The National Oceanic and Atmospheric Administration (NOAA), for a fee
- Kentucky Climate Center at Western Kentucky University

The stream network should be shown on your base map and thus on every map created for your watershed plan.

GIS coverage of hydrology is in kygeonet . 319-Funded projects must provide a map showing streams, lakes, and rivers, and wetlands.

Wetlands

The number and conditions of wetlands in the United States were identified in the National Wetlands Inventory. US Fish and Wildlife has information about the Inventory .

Wetlands can be found using Google Maps. Instructions are available in the Kentucky Watershed Leadership Academy worksheet on wetlands .

Members of your team or other locals may know about specific wetland areas, including some that may have been altered in the past. See also Section 2.4.3 for securing information about permitted activities in wetlands.

GIS coverage of National Wetlands Inventory is available from kygeonet .

2.2.3 Groundwater-Surface Water Interaction

An excellent resource for identifying karst areas in your watershed and securing groundwater data is the online Kentucky Groundwater Data Repository .

Members of your planning team or other locals may know about springs and significant sinkholes in your watershed. There may also be a regional caving society in your area.

GIS coverage of karst is in kygeonet . 319-Funded projects must provide a map showing identified groundwater network features: karst basins, springs, sinkholes dye tracing results.

2.2.4 Flooding

Floodplain map(s) show flood-prone areas in the watershed. Access to these maps will vary depending on whether counties and communities in your watershed have

local floodplain ordinances administered by a local agency. If so, floodplain maps are available from these local authorities, who you will probably want to contact, in any case.

Floodplain maps are available at FEMA Map Service Center .

For the Kentucky Floodplain Management Section and further resources, visit the Kentucky Division of Water website .

KDOW's Floodplain Management Section permits some construction in and filling of floodplains. If you have questions about whether activities have been permitted or about permit specifics, contact the Floodplain Management Section at 502-564-3410 or go online .

Members of your planning team or other locals may know about specific flooding events and locations, and historical changes that appear to have influenced flooding patterns.

GIS coverage of floodplains is in kygeonet . 319-Funded projects must provide a map showing floodplains.

2.2.5 Regulatory Data and Status of Waterways

The key sources of regulatory status of waterways are reports that KDOW submits to Congress every two years, as required by sections 305(b) and 303(d) of the Clean Water Act .

To efficiently use the Report(s) to Congress, you'll need to know a couple of key pieces of information. First, detailed analysis is conducted for each major river basin every five years. This information is included on the website, in the description of each year's report. Second, the format of the report changed in 2006.

As of 2006, the Report to Congress is presented in one, two-volume Integrated Report. Volume I of the Integrated Report [305(b) report] compiles data gathered from assessments conducted during the two years prior to the report's release. It provides assessment status, including impairments.

Volume II of the Integrated Reports to Congress [303(d) report] lists segments of waterways that do not meet the regulatory requirements for their designated uses and for which a **TMDL** (Total Maximum Daily Load Analyses) is required. It provides detailed information on what designated uses are not met, and why.

For each of Kentucky's river basins, maps illustrating waterway health for several of Kentucky's designated uses can be viewed online .

If your watershed was not included in the detailed studies described in the most recent Integrated Report, you will need to refer to two separate documents for the year in which it was studied: the 305(b) and the 303(d) reports.

If your project has GIS capabilities, you can get detailed information from the Integrated Report from kygeonet .

Information about streams that Kentucky has designated as Special Use Waters is available from KDOW .

Reference Reach streams are shown on the Kentucky Watershed Viewer .

When TMDLs are developed for stream segments, extensive watershed data are collected and pollutants loads, flow, and other factors are analyzed. See Watershed Basics and KDOW for introductory information about TMDLs .

- If a TMDL is under development, information will be included in Integrated Report Volume II (see link above).
- Copies of approved TMDLs are no longer part of the Integrated Report, but are available from KDOW. A listing of approved TMDLs is available online . Copies of approved plans can be requested from KDOW's Records Custodian: 502-564-3410 or from KDOW's website .



Make a map showing the regulatory status, including impairment, Special Use and TMDLs. This may require more than one map, depending on how many stream reaches in your watershed have been addressed by designated usage and regulatory status.

GIS coverage of impairment status, designated and special uses are in kygeonet . 319-Funded projects require a map showing regulatory status: impairment status, Special Use waterways, and TMDL status.

2.2.6 Other Water Data

Existing water monitoring data for your watershed may be limited or extensive; it may have been collected over a long period of time, or for a brief period; it may have been gathered on some characteristics, but not others. Some are contained in datasets available on the Internet; others are on scientists' computers, in state records, or in volunteer monitoring newsletters. It's your challenge to find it! Don't forget the reference section of your local library, college or university.

Biological Data

University biology programs are good sources for data about biological communities in streams. Environmental consulting firms may also have biological data they have gathered doing work on other projects. There may be proprietary issues about some of those data, but it's worth asking. In Kentucky, all agencies and universities use "biological indices" that are approved by KDOW.

Procedure manuals for Kentucky biological indices and other surface water assessment methods are posted on the KDOW website .

Other Water Quality Monitoring Data

Other sources of monitoring data include:

- Many sanitary sewer authorities, especially larger ones, collect water quality data. See more in the Discharges section, below.
- University or college biology programs often collect water quality data.
- Watershed Watch in Kentucky is a nongovernmental, citizen monitoring program in each of Kentucky's basins. Watershed Watch volunteers have monitored over 1000 stream sites in Kentucky. Not all these data have been collected with an approved quality assurance project plan (QAPP), but data without a QAPP can provide key insights worth verification with additional monitoring .
- Kentucky Water Watch, sponsored by KDOW also has a network of citizen monitors who upload their stream information to a database .
- The US Forest Service sometimes collects biological data within its property limits .
- Kentucky Department of Fish and Wildlife sometimes collects biological data within Wildlife Management Areas .
- The USGS collects water data .
- The US Army Corps of Engineers collects water data related to reservoirs under its jurisdiction. (Louisville District 502-315-6318; Huntington District 866-502-2570; Nashville District 615-736-7161)
- Discharge monitoring reports (see section 2.4.1)

Make a map showing the locations of monitoring sites for which stream data are available.

2.2.7 Geomorphologic Data

Stream geomorphology is introduced in the Erosion section of the Watershed Basics section. It is an emerging science, so not many assessments have been conducted. However, there is a chance that geomorphic and sediment assessments are available for some part of your watershed. These data are important for a number of reasons, including identification of sediment sources, assessing stream stability, and predicting the physical response of the stream channel to future activities.

Local universities may have conducted or may be conducting assessments in your watershed. The Stream Institute at the University of Louisville conducts geomorphic assessments in the Commonwealth .

Where geomorphological assessments have not been done, you may find related data that will provide clues. For example, USGS streamflow data, as well suspended sediment data, are useful for flood frequency analysis, identifying historic major flood events and looking at duration of baseflow (or absence during the summer) .

The Natural Resources Conservation Service (NRCS, US Department of Agriculture) soil surveys have some very helpful details on soil erosion, landform shape, slope stability etc .

You may be able to locate historic aerial photographs or topographic maps, which you can compare to existing aerial photographs and maps to determine if the streams in your watershed have been modified. Historic photos and maps can also provide evidence of channel straightening, old mill dams, historic channel condition, whether sinkholes or old farm ponds have disappeared or appeared, etc.

Sources of historic aerial photography, maps, and photos include:

- Kentucky Transportation Cabinet Division of Highway Design Phototechnic lab
- Kentucky Office of Geographic Information Systems
- USDA Farm Services Agency County Offices: USDA Service Centers in each county in KY
- Kentucky Geological Survey
- The Kentucky Historical Society
- Universities. The University of Louisville has some of their archives historic photos online
- Local libraries may also have useful historical photographs
- Group members or other locals

KDOW uses the EPA's Rapid Bioassessment Protocol (RBP) has detail on physical habitat that, rather than focusing on the total score, could be used to compare geomorphological characteristics between sites. If this habitat assessment has been performed in your watershed, you can use the information from the parameter numbers below. The RBP score sheet is provided in Appendix E. However, it is important to understand that these data are subjective. Results are most useful when comparing observations of one person at different sites.

Data from RBP that are relevant to geomorphologic analyses include the following:

Habitat parameter number	Parameter (Low Gradient)	Parameter (High Gradient)
2	Pool Substrate	Embeddedness
3	Pool Variability	Velocity/Depth Regime
4	Sediment Deposition	Sediment Deposition
6	Channel Alteration	Channel Alteration
7	Channel Sinuosity	Frequency of Riffles
8	Bank Stability	Bank Stability

Kentucky Department of Fish and Wildlife Resources (KDFWR) Stream and Wetland Restoration Program is running a program to conserve and restore streams and wetlands. They may be conducting a restoration in your watershed. If so, they would have geomorphologic information - in addition to being potential partners, etc .

Members of your group or other locals may have observed stream channel and sediment changes in your watershed. While this is subjective information, it's worth collecting. Don't underestimate local knowledge!

Additional geomorphic assessment resources can be found in Chapter 5, Section 5.8.3 of the EPA Handbook.

2.3 Finding Natural Features Data and Information

An inventory of the natural features in your watershed will help you to identify sensitive areas. It will also help you to determine the causes, sources, and impacts of pollutants.

2.3.1 Geology and Topography

Topographical maps are widely available. They can be downloaded online (with digital imagery) from the Microsoft Research Maps (MSR Maps) . They are also available through USGS .

The Kentucky Geological Survey has a list of agencies and well-informed people to contact on their website .

See related information about soils in Section 2.3.2.

GIS coverages of geology and topography are in kygeonet . 319-Funded projects must provide a map showing geology.

Do you wonder why some of this information is relevant? Go back to Watershed Basics and find out.

2.3.2 Soils

The Natural Resources Conservation Service (NRCS) has a wealth of expertise and data. To find your local NRCS office, visit their website . Local staff should be invited to be partners in your planning team. They can provide information on soil surveys, highly erodible lands, hydric soils (indicative of wetlands), and prime farmland. Find your soils and other information at the "Web Soil Survey" site .

GIS coverage of soils is in kygeonet . 319-Funded projects must provide a general soils map.

2.3.3 Ecoregions

Ecoregion information is available from the US EPA .

2.3.4 Riparian/Streamside Vegetation

Riparian vegetation is the plant life that grows adjacent to flowing water. It serves many functions: filtering and absorbing sediments and nutrients, providing shade to maintain cooler water temperatures, and regulating the exchange of nutrients and woody residue between land and water. These functions are best performed when the riparian vegetation is native. See the Watershed Basics section for more information.

The level of vegetative cover in the riparian area can be explored using aerial photography. Sources of photos, both historic and current, are listed in Section 2.2.7, Geomorphologic Data. Use current photography or GIS to identify areas with and without vegetative cover. Be sure to use photos that were taken during the growing

season! Members of your team or other locals may have information about riparian areas with which they are familiar, both for protection and restoration purposes.

KDOW may also know of restoration projects in your watershed, past and present. Members of your team or other locals may also know about past or current vegetative restoration projects.

You can visually “surf” your watershed and look at riparian areas using a web-based three dimensional mapping program, which requires downloading a program and broadband access, using either of the following:

- Google maps
- Microsoft Virtual Earth

Unique natural areas that may need protection can be identified by consulting with:

- Kentucky State Nature Preserves Commission
- Kentucky Department of Fish and Wildlife

GIS coverage of current aerial photography is available on kygeonet.

2.3.5 Rare and Exotic/Invasive Plants and Animals

Plants and animals are also referred to as flora and fauna. Information about rare flora and fauna that need protection and are known to live in the area defined by your watershed can be found at the Kentucky State Nature Preserves website.

If your watershed includes special areas managed by federal or state agencies, contact them for information.

- US Forest Service (USFS) Daniel Boone Forest District
- USFS Land Between the Lakes Recreational Area
- Kentucky Department for Fish & Wildlife Management and Hunting Areas
- Kentucky State Nature Preserves and State Natural Areas (lists and maps)

Exotic invasive species of plants and animals can wreak havoc with ecological balance, creating trouble for rare and common species alike, and also degrade waterways and interfere with water uses. The sources of rare species information above also provide information about exotic invasive species. More information is available from:

- University of Kentucky Invasives Species Working Group
- Kentucky Exotic Pest Plant Council

2.4 Finding Data and Information About Human Influences and Impacts

There are a variety of human activities that influence water quality. You’ll need to inventory these to identify human needs and potential impacts as well as to explore sources and causes of pollutants.

Appendix E shows potential sources for common pollutants.