

Chapter 2: Exploring Your Watershed

Inventory Available Data and Information

Introduction

- 2.1 Collecting Data and Information
- 2.2 Finding Water Resources Data and Information
- 2.3 Finding Natural Features Data and Information
- 2.4 Finding Data and Information About Human Influences and Impacts
- 2.5 Finding Data and Information About Demographics and Social Issues
- 2.6 Making Your Own Observations

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.

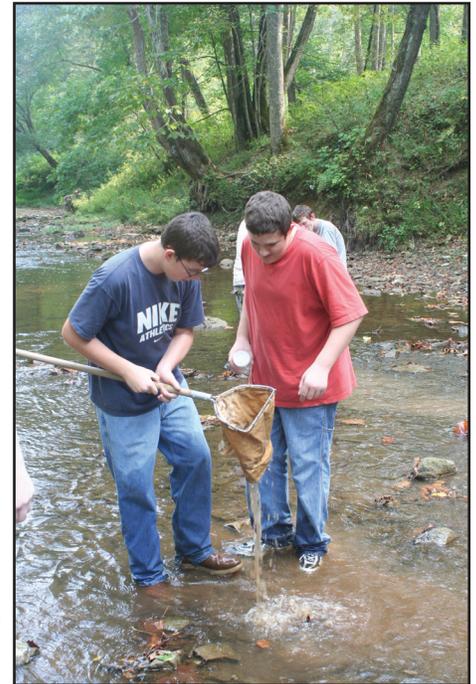
If your project has GIS capabilities, you can get detailed information from the Integrated Report from kygeonet .

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.

2.4.1 Water Use

Water Withdrawals

Some potential water withdrawals include public water suppliers, industries, mines, power plants and agriculture, among others. You can view these water withdrawal locations and specifics regarding their permits on the Kentucky Watershed Viewer . You can obtain additional information about water withdrawal permitting by contacting KDOW's Water Quantity Management Section at 502-564-3410 or at the website .

The water withdrawal program has information on all withdrawals of water greater than 10,000 gallons per day from any surface, spring or groundwater source, with the exception of:

- Water required for domestic purposes
- Agricultural withdrawals, including irrigation
- Steam-powered electrical generating plants regulated by the Kentucky Public Service Commission
- Withdrawals used for injection underground as part of operations for the production of oil and gas

Members of your team or other locals may know more about water withdrawals, particularly agricultural usage, which can be surprisingly voluminous, especially during droughts.

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

Public Water Supply

Source Water Protection and Wellhead Protection Programs, described in 5.1.2, require the delineation of a protection area which is all or part of the watershed or groundwater recharge area for the source and seek to minimize the risks of pollutants entering into those protection areas.

Information about Source Water Protection and public drinking water systems is available through the Kentucky Infrastructure Authority (KIA) Water Resource Information System (WRIS) . To obtain specific information about Source Water Protection in your area you can contact the Water Management Planner for your Area Development District (ADD) . You can also contact KDOW's Water Quantity Management Section .

KDOW administers the Wellhead Protection Program, which is designed to assist communities that rely on groundwater as their drinking water source. To obtain additional information about this program contact KDOW's Water Quantity Management Section .

GIS coverages of water lines and Source Water and Wellhead Protection areas are in kygeonet . 319-Funded projects must provide maps showing public water lines and Source Water and Wellhead Protection Areas.

Do you wonder what some of these programs are and what the terms mean? Go back to Watershed Basics and find out.

Discharges

Municipal, industrial and other wastewater facilities discharges and wastewater networks

Municipal, industrial, and other wastewater facilities directly discharging from a point source (end of pipe) to surface waters are required to obtain a KPDES permit from KDOW. (KPDES stands for Kentucky Pollutant Discharge Elimination System.) The point of discharge is called an outfall. You can locate KPDES permits in your watershed using KDOW's Watershed Viewer . Once you find the basic facility information, you can get more information from EPA's Surf Your Watershed website .

More information about KPDES can be found on the Kentucky Division of Water website .

Information that is useful at this stage of planning includes:

- Location of discharge, both major discharges and discharges of local concern
- Size of treatment facility
- Whether or not the facility is operating at or above treatment capacity, the volume and flow it can effectively handle.
- Whether the owner plans to expand and whether expansion plans have already been developed
- Whether the facility is in compliance with regulatory requirements of the permit

If the situation or data indicate the need for closer analysis, you will need to look for specific monitoring data. You can secure those data directly from the discharger or from KDOW . In addition, the discharger may be able to provide you other monitoring data.

If the discharge is related to pollutants of issue in your plan, it will be necessary to secure these data in order to quantify **pollutant loads**, which are described in Chapter 4.

Maps showing the boundaries of wastewater (sewer) services and some pipe network information are available at Kentucky Infrastructure Authority (KIA) Water Resource Information System (WRIS) . Your local wastewater treatment facility may also be able to provide maps of the networks of pipes carrying wastewater to their treatment facility. Pollutants sometimes emerge from leaky pipes, especially when those pipes are old.

GIS coverage of discharge sites, sewer lines and proposed sewer lines are in kygeonet . 319-Funded projects must provide maps showing permitted discharges and sewer lines.

Stormwater discharges

Although stormwater begins as runoff over surface areas, more than one hundred Kentucky municipalities are regulated by KDOW as permitted, (multiple) point source discharges. Such permits mandate programs to minimize the pollutants in the permitted stormwater system and to encourage citizens to keep pollutants out. Permits also regulate runoff from construction sites greater than one acre and from industrial facilities with outside material storage that might contribute to polluted runoff.

KDOW's website lists communities holding stormwater permits .

To locate stormwater collection systems and outfalls in your watershed, you may need to contact the municipalities and counties in which the systems are located. Some Area Development Districts, who frequently help map these outfalls, may also have this information .

All large Kentucky cities and many small ones have **Municipal Separate Storm Sewer System (MS4)** permits. A listing of Kentucky municipalities covered by MS4 and the administering authorities is provided on the KY Division of Water MS4 website .

GIS coverages of discharge sites and MS4 area boundaries are in kygeonet . In 2010, pipe networks are being added as well. 319-Funded projects' map of discharges, mentioned above, should include stormwater discharge sites.

Combined Sewer Overflows

As a part of inventorying your watershed, your planning team should find out if any of the communities in your watershed are served by **combined sewer systems**. If they are, you'll need to map the location of **combined sewer overflow (CSO)** discharge points. The best sources for this type of information are municipalities, cities and county water departments or public works divisions that manage the systems. Identifying the location of the CSOs on a map will help you to correlate water quality information and accurately determine sources of pollution. Additional information from Kentucky Division of Water is located online .

Sanitary Sewer Overflows

Sanitary sewer overflows (SSOs) are illicit, but they occur if systems become overloaded or are faulty. The best way to locate them is to ask your local wastewater system, team members or other locals.

Unsewered Areas

There are two ways to identify existing areas serviced by onsite systems. One is to contact your local health department's Environmentalist. He or she may also be able to tell you when systems were built and what types of education residents have or have not received about proper maintenance of them.

The second way to identify areas served by onsite systems is to compare areas served by sewer facilities with areas served by public drinking water. The areas receiving water but not sewer are probably populated and using onsite septic systems. You can ask the water and wastewater/sewer facility for service boundaries or go to Kentucky Infrastructure Authority (KIA) Water Resource Information System (WRIS) .

Members of your team or other locals are likely to know whether certain neighborhoods have sewer access or not.

GIS coverages of existing and planned extensions of sewer and water lines are available from kygeonet .

2.4.2 General Land Use

Examination of land use is one of the most important tools for analyzing your watershed and for setting priorities and selecting monitoring sites as your planning proceeds. Remember: what happens on the land impacts water.

Land use is one type of information that is not easy to separate by sub-watershed. However, if you make an effort to do so, it can significantly help when you begin deeper analysis.

There are several ways to examine land use: maps made from GIS data, aerial photography, and making your own observations. In addition, historic and current photos can reveal details.

No matter how much GIS data or aerial photography you have, it is important to ground-truth the information; in other words, to confirm or amend the information by looking around you. See Section 2.6.1, Windshield Surveys.

Figure 2.1 is a GIS-created map of the Hancock Creek Watershed that uses the National Land Cover Dataset to show land uses in the watershed.

Aerial imagery offers a bird's eye view of the watershed, giving life to features identified from research described above, and shows additional land features, such as vegetative cover along riparian corridors and presence of natural areas. An aerial image may serve as background to a land use map, or be used separately – in which case it is best to put identifying features on the photograph, such as those on your base map. An aerial image marked with natural areas, nature preserves, scenic rivers, historical or archaeological sites and/or other assets can increase community appreciation of the watershed. The Kentucky Watershed Viewer provides land cover and aerial photography (in the "base imagery" file), but only when zoomed into a small area . Guidance for using Google Earth aerial imagery is available from the Kentucky Watershed Leadership Academy .

Some cities and regions in Kentucky have land use databases. You can learn about these from local planning or economic development officials or from your local Area Development District (ADD) . Your partners and local university and college researchers can alert you to mapped sources for land use data.

Land ownership may be a significant factor in your planning if an agency, organization or individual manages a considerable amount of land in your watershed. This might include the US Forest Service, the US Army Corps of Engineers, a Kentucky State Park, a prison, or others. If so, they could be important partners in your planning effort. Some of this information will be in the Watershed Viewer . Some Property Valuation information is readily available:

- A directory of Property Valuation Administrators (PVAs) is available from the Kentucky Department of Revenue .
- The Kentucky PVA Association has other related Internet links .

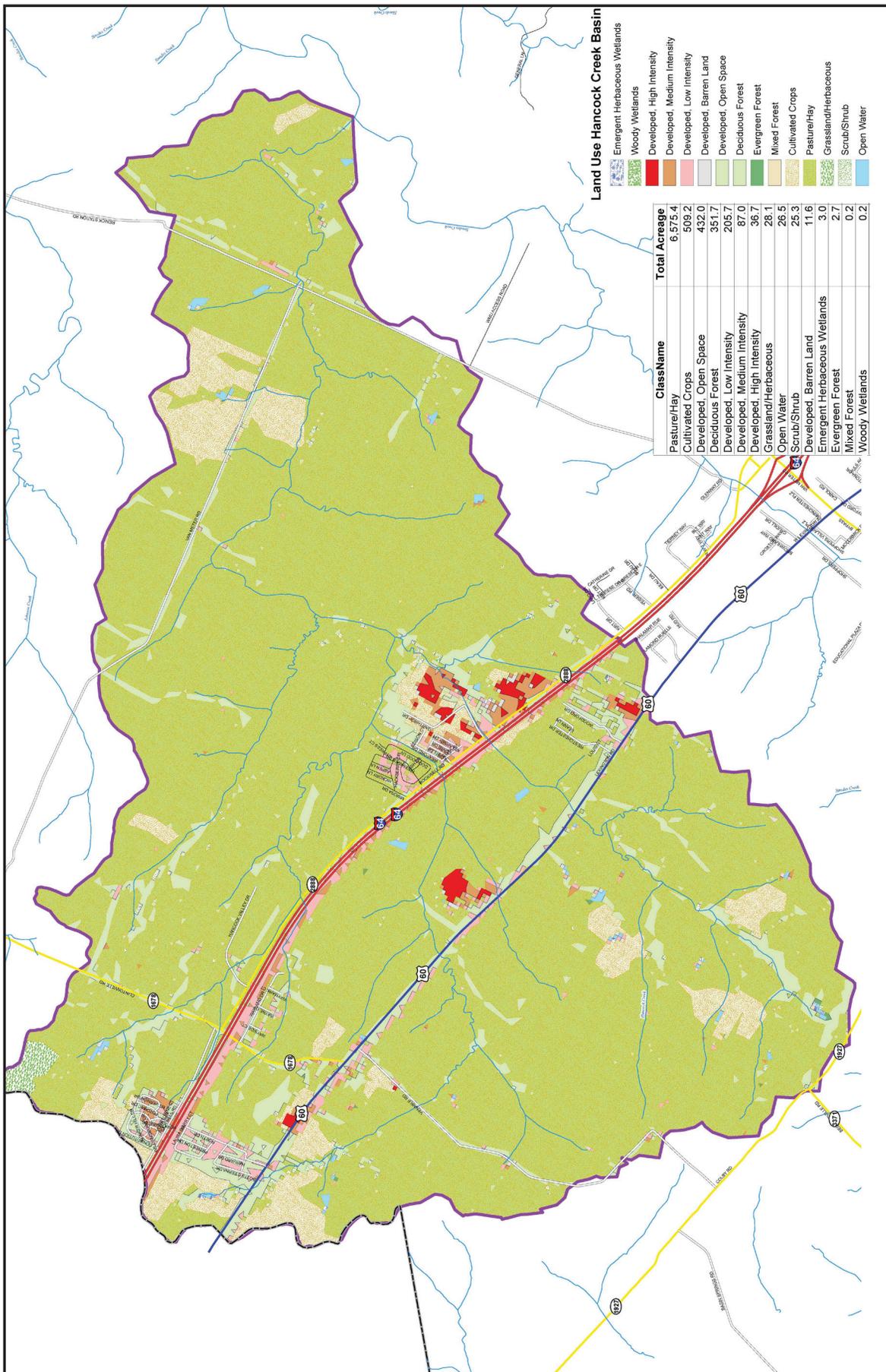


Figure 2.1 - Land Use in Hancock Creek Watershed

Historic photos, maps, and aerial views can provide information about changes in land use. Section 2.2.7 has ideas for finding these items. Members of your team or other locals may know of concerns related to land use. They may also know about historical land uses in your watershed that are not shown on current data. The latter is perhaps most relevant with respect to waste disposal areas.

GIS coverages of land use (National Land Cover Dataset) and aerial photography are in kygeonet . 319-Funded projects must provide a map showing land use.

Impervious Surfaces

Since impervious surface has been shown to effect stream degradation, it is important to determine the amount of imperviousness throughout your watershed. See Watershed Basics for more information.

Land use information can be used to predict the percentage of impervious cover. A study by the USDA in 1975 indicated that a one acre residential development may only be twenty percent impervious cover, whereas an industrial or commercial development of the same size may be up to seventy percent impervious cover.

2002 Kentucky GIS land use data identifies impervious surfaces and kygeonet also has an impervious surface coverage . 319-Funded projects must provide a map showing impervious surfaces.

2.4.3 Other Water Disturbances

Instream Construction or Disturbance (Hydromodification)

Examples of instream construction or disturbance include moving stream channels, filling in the floodplain, dams, and dredging. See also section 2.2.7, Geomorphologic Data, for sources of information.

Most projects that take place in waterbodies or wetlands, or dump or place dredged or fill material in waterbodies or wetlands, require a **404 permit** from the US Army Corps of Engineers. The Louisville District, which covers most of Kentucky, lists recently issued permits at , but if you want information on previous projects in this district, you may need to visit or telephone their office at 502-315-6686 or 502-315-6733. There may be a fee, although you can request a waiver. Louisville District permits are available by county and show only information about the permittee; they do not give the location of the activities.

Parts of southern and eastern Kentucky are covered by other Corps Districts. The Huntington District lists issued permits at . The Nashville District can be reached at 615-369-7500.

Projects that result in significant physical disturbances to wetlands or streams require **Water Quality Certification** (401 WQC) from the Kentucky Division of Water. Impacts in streams or lakes designated as Special Use Waters require an individual WQC. You can find more information regarding this program on the Kentucky Division of Water website . To determine whether a specific site required and obtained 401

Certification, contact KDOW's Water Quality Certification Section at 502-564-3410 or visit their website [www.kdow.com](#).

In the end, often the best sources of information about hydromodifications are aerial photographs, maps, and members of your team or other locals. Small, low-head dams and historical stream channeling will not be identified by databases or permit programs. In almost all of Kentucky, a straight stream is one that has been altered, so look suspiciously at any straight stretch of stream. Ask locals about low-head dams, small stream obstructions built for various purposes.

GIS coverage of dams is available from [kygeonet.com](#).



Low-head dam on South Elkhorn Creek

2.4.4 Land Disturbances That Can Impact Waterways

Mining and Quarries

Mining operations require KPDES permits when water will be used to wash coal, the operation will pump water from underground seams, or for any discharge of water from the mining site. If mining is active in your watershed, mining operators will be vital stakeholders for your planning team, and the Kentucky Department for Natural Resources will be important partners.

For information on surface mining locations visit the Kentucky Department for Natural Resources website [www.kdnr.com](#).

Members of your planning team or other locals may know about mining sites, including old sites and sites that have been restored as required by permitting.

Quarries are permitted through the Noncoal Review Branch in the Kentucky Division of Mine Reclamation and Enforcement. Call 502-564-2340 to find out if there is a quarry in your watershed. More information about noncoal permits is available at their website [www.kdow.com](#).

2.4.5 Hazardous Materials

Information about sites that store or contain hazardous materials and/or waste is available through a number of programs administered by the Kentucky Division of Waste Management: CERCLA (Superfund), RCRA (Resource Conservation and Recovery Act), Brownfields, Underground Storage Tanks, and landfills. Contact the Division of Waste Management and ask for the program of concern: 502-564-6716.

2.5 Finding Data and Information About Demographics and Social Issues

To provide comprehensive context to your analysis and planning for implementation, consider examining trends on the following issues:

- Population (age, size of family, composition, etc)
- Average household income
- Education levels
- Housing (ownership, rental, vacancy rates, etc.)
- Property tax values
- Unemployment rate
- Farming trends (part-time/full time, owner operated/rental, etc.)
- Limited resource landowners
- Major employers, location of facilities
- Regional economic trends

County and zip code level data are available through the US Census Bureau. Local officials and universities maintain census data to a finer grain. A major source of detailed census data available online for Kentucky is the Kentucky State Data Center at the University of Louisville .

Local libraries and historical associations may also help with information about demographics and social issues. Members of your planning team or other locals may have information about social issues.

Census data are available from kygeonet .

2.6 Making Your Own Observations

Besides doing all the detective work described above, it is extremely important for your planning team to get out into the real world and look around and to use your collective knowledge, memory – and brains.

For example, land use data are only collected every few years at best, and changes on the landscape occur continually. Checking land uses throughout the watershed is generally called a Windshield Survey. In addition, data collection isn't always detailed, comprehensive or accurate. Data collected through statewide programs or from satellite data are not going to yield the same results as walking or canoeing along or in a stream provides.

Don't forget to take safety precautions.

2.6.1 Visual Surveys

Conduct a visual or "windshield" survey of your watershed using your watershed map and a car or a couple of bicycles. It is preferable to work in pairs, so you can see more and take detailed notes -- and also for safety, because streams have lots of slippery spots, steep slopes, etc.

It's helpful to use a form to stimulate and organize your observations. It's a good idea to do visual surveys twice, once during the growing season and once when leaves are gone and crops have been harvested. Look for changes in land use and

land use practices, including construction sites, agricultural operations, etc. Look for erosion, impervious surfaces, and information related to any of the topics listed in this chapter. Be respectful of private property, of course.

EPA's guidebook has guidance for making these observations . Forms specific to Kentucky's rural areas are available through Kentucky Waterways Alliance's website .

2.6.2 Stream Surveys

Walking segments of your stream can be very revealing, and fun, too. Always go in pairs or as a group, to make observations less subjective and for safety reasons. Respect private property. The streams in Kentucky belong to the Commonwealth of Kentucky, and if you are on a boat, you are not trespassing. However, not all landowners know that fact; plus stream banks are not public property. The Natural Resources and Conservation Service has instructions and forms for conducting a stream assessment .

The Center for Watershed Protection (cwp.org) has a comprehensive, Unified Stream Assessment manual available for a fee .



Active Options

- Acquaint your team with how information can be organized onto maps using a map-drawing exercise: From Kentucky's Watershed Viewer or another GIS mapping tool, print a map showing only the waterway and the watershed's boundary. Make enough copies for every member of the team. Distribute the copies with markers or crayons, and ask each member to mark things that are personally significant, such as cities, roads, parks, farmlands, and forests, on the map. Ask them to put a big star where they live or work. Then ask members of the team to take turns presenting their maps to the rest of the team. Discuss how individuals view the watershed's characteristics differently.
- When making contacts with other information sources, consider asking if they want to partner with the team. When they provide information but don't get involved, be sure to keep them informed of your team's progress.
- You might invite special speakers to your planning team meetings to present aspects of watershed description:

How Much To Share?

The detail provided for each of the topics in this section depends on the subject and the scope of your plan as well as your findings.

If you can, integrate information your team discovered through visual or stream surveys into the related sections.

If you were unable to find information or the category is not relevant to your plan, it is still worthwhile to explain, because otherwise people may wonder why you did not consider that particular factor in your analysis.

If you cannot connect information with a specific location, try to connect it with a sub-watershed, or note where the practice or condition is applicable to a part or to the entire watershed.

Identify sources of information whenever possible.

- Soils and topography: A staff member from the Conservation District
- Land use and cover: A staff member from the county Planning Commission or Area Development District
- Impairment and Protection: A staff member from the Division of Water
- Water Quality Data: A stream scientist from your state university's streams program
- Consider using modules from the Commonwealth Water Education Project, which was created to educate citizens and students about nonpoint source pollution .
- Members of your group can do visual assessments of key segments of your waterway using one of the formal survey instruments in Section 6.5.1 of the EPA Handbook. When they're complete, ask the members to share their results (and pictures!) with your group.
- Plan some optional outings, ideally at locations where partners or stakeholders can be hosts. Sites might include:
 - Stream restorations
 - Innovative stormwater management practices
 - A Watershed Watch monitoring site
- Take photos! Develop a brief slide show about what you've learned that can be used for a creek-side news event or short presentations to other local groups. However, avoid the temptation to draw premature conclusions; remember, you have lots of analysis to do first.



Write It Down

First, revisit and update the information in the first section of your plan. You are likely to have new partners and stakeholders to list as a result of your research process. Also, your team will have learned information that may refine the preliminary concerns.

Chapter 2: The *[insert the name of your watershed]* Watershed Introduction

Describe your watershed in one or two paragraphs, relating:

- The name of the waterway of concern
- The larger waterway to which it is tributary
- Its location within Kentucky (counties and communities)
- Its area in square miles

Add a paragraph or two to introduce the information you found about water resources, natural features and human influences. This is the part of the plan where you begin to tell the story of your watershed, to integrate existing information.

Water Resources

- Describe and provide map(s) of the water resources in your watershed.
- Watershed Boundary
- Hydrology
- Groundwater-Surface Water Interaction
- Flooding
- Regulatory Status of Waterways
- Water Chemistry and Biology
- Geomorphology

Natural Features

Describe and provide maps of the natural features of your watershed.

- Geology and Topography
- Soils
- Ecoregion

Riparian/Streamside Vegetation

Describe and provide maps of any riparian information you found.

Rare and Exotic/Invasive Plants and Animals

Describe and provide any information about rare and exotic/invasive plants and animals you identified in your watershed.

Human Influences and Impacts

Describe and provide maps about human activities in your watershed. As much as possible, connect these activities to specific locations or sub-watersheds. Be accurate and respectful.

- Water Use
- Land Use
- Other Water Disturbances
- Land Disturbances
- Hazardous Materials

Demographics and Social Issues

Provide any relevant information about demographics or social issues. If feasible, identify differences within sub-watersheds.

Team Observations

Describe any visual or stream survey activity of the team, partners, or volunteers. Include any observations that have not been integrated into other sections of this chapter.

Interim Conclusions

Consider including a short section that summarizes the information that appears to be most relevant.

The following information must be included in map form for all 319-funded projects:

- Watershed and sub-watershed boundaries
- Political boundaries (counties, cities)
- Roads
- Hydrology: streams, lakes, rivers
- Groundwater network: karst basins, springs, sinkholes, dye tracing results
- Floodplains
- Regulatory status: impairment, Special Use, TMDLs
- Geology
- Topography
- Soils
- Water withdrawals
- Water lines
- Source Water Protection Areas
- Wellhead Protection areas
- Permitted discharges
- Sewer lines
- Land Use
- Impervious Surfaces

Other Records

Record your team's impressions of watershed issues before, during, and after collecting information. What implications does the team see? These impressions will be helpful as you continue your discoveries. Hopefully, you will either prove the impressions are right or wrong.

Although your plan will summarize much of your research findings, be sure to keep records of your research activities:

- Who you contacted and their contact information, whether or not the contact yielded data. Keeping this information electronically will make it easier to share and update.
- Data inventories
- Calculations
- Dead-end research efforts
- Surveys, if any were conducted, with details about how they were conducted.