

Mapping A Watershed History

VIRGINIA SOL

- *Science* 4.8
- *Social studies* VS.1
- *Language arts* 4.1, 4.6, 4.7, 5.6, 5.7, 5.8
- *Technology* C/T5.3

OBJECTIVES

- Use topographic maps and/or aerial photographs to define a local watershed area
- Discuss relationships between physical features of a watershed and locations of human activities
- Compare current and historical aerial photographs of the watershed area
- Research information about the watershed area at different times
- Think of questions about the watershed area
- Interview local community members about past water use
- Make proposals for future land development to protect water quality
- Create a presentation display of water uses in the local community

MATERIALS

- Laminated topographic maps of the local watershed area
- Markers for writing on the laminated maps
- Current and historical aerial photographs of the local area

TIME NEEDED

Two or three class periods will be needed. Time is also needed if students carry out interviewing of community members.

What are the relationships between people and the watershed today and in the past?

This lesson is written for fourth grade students to learn about the geography and history of their local watershed area (Social Studies SOL VS.1).

The lesson also supports Science SOL 4.8, dealing with watershed and water resources.

Students will first look at topographic maps and/or aerial photographs of their local area. Using these maps and photographs, the students will identify different landforms and water features in their local area and define the boundaries of a local watershed area.

Students can look at how locations of human activity are related to physical features of the watershed area. If old and new aerial photographs are available, the students can look for changes that have occurred. This leads students to carrying out research for information about their watershed area at different times in the past. The students can also generate questions they are interested in about their watershed area.



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Students can collect oral histories by interviewing residents who have lived in the community for a long time, asking about past water uses. Students can use collected information to make suggestions for future land development in their area that will protect water quality. Finally, students should make a presentation display of the different water uses they have discovered in their community.

A watershed is a geographic area in which water, sediments, and dissolved materials drain into a common body of water. The watershed of any large river, lake, or estuary can be divided into numerous smaller local watersheds, down to the individual watersheds of the smallest creeks. Choosing the appropriate watershed area for students to study is an important decision to be made by the teacher. The watershed area that is chosen should be a relatively small local area that includes a local water study site. It may be practical to focus more on the area of a watershed immediately bordering the water site and give less attention to areas of the watershed that are at a greater distance. You can identify a watershed containing your local area through the Virginia Department of Conservation and Recreation web site (<http://www.dcr.state.va.us/sw/wsheds.htm>). The U.S. Environmental Protection Agency web site also has a feature for identifying a local watershed from a zip code (<http://cfpub.epa.gov/surf/locate/index.cfm>).

Since water flows downhill, watersheds are defined by topography. As topographic maps show elevation with contour lines, students can use the contour lines on a topographic map to determine the direction of water flow. Students can define the boundaries of a local watershed area by marking the high points and ridges surrounding the water site on the topographic map.

Students can use both topographic maps and aerial photographs to relate different physical features of the area to locations of human activities. In this way they can try to identify possible sources of water pollution. If current and historical aerial photographs of the local watershed area are available, students can look for differences between photographs taken at different times. They should be able to identify changes in land use that have taken place within their local area and discuss how these changes might have affected water quality. Comparing current and historical aerial photographs can provide different kinds of information relevant to water quality. Specific sources of water contamination such as old dump sites or aboveground storage tanks may be hidden by vegetation now but visible in older photographs. Where land use has changed from predominantly agricultural or forests to mainly residential and commercial, there will be more hard, impervious surfaces such as highways, driveways, parking lots, and roofs. This leads to increased runoff following storms, decreased percolation to groundwater, and greater fluctuations in

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streamflow with peaks after storms and lower flows between storms. There will also be increased runoff of road salt, oil, litter, and other contaminants.

Topographic maps and aerial photographs can be ordered from the United States Geological Survey (USGS) through their web site (<http://edc.usgs.gov>). The appropriate maps can be identified on the web site through the site Online Map Lists and ordered for \$4–7 each (estimated cost). Aerial photographs from the USGS National Aerial Photography Program (NAPP) can be easily located at the USGS web site using the site PhotoFinder feature.

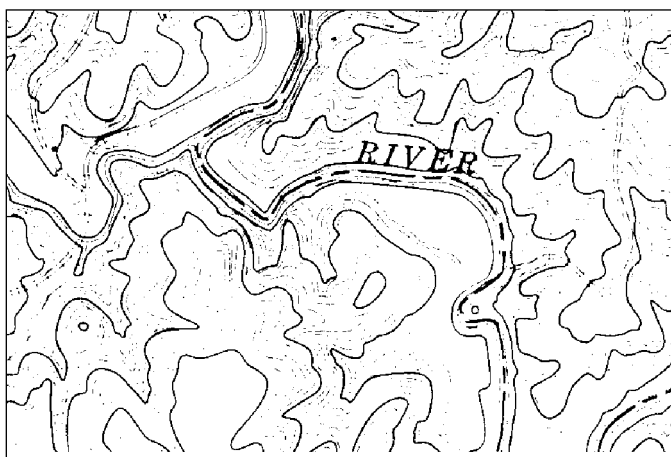
Photographs are available taken in 1989, 1994, and 2000 and can be ordered for \$10 if black and white or \$16 if colored (estimated costs). Students can also look at topographic maps and aerial photographs on the Internet free of charge. This can be done through the USGS site <http://mapping.usgs.gov>. This site has links to several sources for viewing maps and photographs. Terraserver is one site where both maps and photographs can be viewed (<http://terraserver.homeadvisor.msn.com>). Maps and photos can be laminated so they can be used for several years. When students write on the maps, be sure they use markers or grease pencils that can be erased. A sheet of clear plexiglas can also be put over the maps before the students mark the maps.

Students can produce oral histories of their watershed area by interviewing older community members about past water use. An oral

history is a history “based on storytelling and listening” (Kathryn Walbert, Duke University and Southern Oral History Program at the University of North Carolina, www.sohp.org. See Resources at the end of this lesson for more web sites with information on oral history.) If a student’s family has lived in the area a long time, the student can gather information about the past from parents, grandparents, or even great-grandparents. A teacher can also invite older community members into the classroom to speak to the class and to answer their questions.

LESSON INTRODUCTION

Show students a slide show of photographs of their local watershed area. Emphasize physical landform and water features in the area as well as locations of human activities and possible sources of pollution. Ask students what kind of information about a watershed they think can be obtained from maps and aerial photographs.



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Describe for students some symbols and colors used on topographic maps. Show students different examples of buildings, roads, and streams on a map. Help students to interpret the information provided by contour lines on a topographic map. Interpreting contour lines is important in order to obtain watershed information from the map. The contour lines connect different points of equal elevation above sea level. When contour lines on a topographic map are close together this indicates a steep slope.

Contour lines representing a valley or depression usually form a V-shape on a map with the tip of the V pointing uphill to higher elevation. Contour lines representing a ridge are usually shaped like a more rounded V with the V this time pointing downhill to lower elevation. Streams are at right angles to contour lines. When contour lines cross streams they always form a V that points upstream.

ACTIVITY PROCEDURES

Identifying a local watershed area...

Provide each group of students with a topographic map and an aerial photograph of the local area. Help students get oriented to what is shown in the map and photograph and how to correlate the two. Ask students questions about what is represented on the maps and photographs. Ask the students to try to identify features they know such as their school, houses, parks, creeks, or landfills.

Each group of students should draw on their topographic map the boundaries of their local watershed area. To begin, the students should locate the furthest downstream point of a creek or stream. Working backwards from that point, students should next use the contour lines on the map to mark high points and ridges surrounding the water site. Ask the students which way water would flow from different points, and have the students draw arrows to show drainage patterns. Finally, the students should define the watershed area by marking lines along the hilltops and ridges surrounding the water site.

Making inferences about the watershed area...

Ask each group of students to look at both their map and aerial photograph to identify important locations of human activity. Then have the students mark these locations on their map. Have each group discuss relationships between physical features of the watershed and the locations of human activities. Ask the groups of students to use their map and photograph to identify possible sources of water pollution in the watershed area. Lead a discussion of different student answers.

If both current and historical aerial photographs are available, ask the groups of students to compare the current and historical aerial photographs of the watershed area. Ask them what changes have taken place in the watershed and what effects they think these changes have had on water quality in

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the watershed. Lead a discussion of different student answers. Students might carry out further research into the history of their watershed area. You could help students carry out some simple research by providing leads to newspaper articles and books. You may also be able to suggest Internet web sites with local information. As students research the history of the watershed area, they can generate a list of questions they are interested in finding out more about.

Creating an oral history for the watershed area...

Students can produce simple oral histories of their watershed area by interviewing older community members about past water use. If a student's family has lived in the area a long time, the student can interview parents, grandparents, or even great-grandparents. A teacher can also invite older community members into the classroom to speak to the class and to answer their questions. If speakers are invited to class, different students could interview them afterwards in turn. Carrying out interviews teaches students many useful skills. In order to carry out a good interview, a student must use good listening skills. The student will learn skills important for carrying out conversations. This supports English SOL 4.1. You may choose for students to carry out their interviews in pairs or teams. This will make the interviewing easier, and the students working together can learn from each other.

Go over a simple interview process with students before they do their interviews. Teach students to carry out interviews by asking a question, listening carefully to the answer, writing down major points of the answer, then asking another question. Students can use the interview guide provided at the end of this lesson, Interviewing Community Members About the Watershed Area. As part of their interview, ask students to record two interesting quotes from the interviewee that relate to the watershed.

When the interviews have been completed, have the students discuss their findings, first in small groups and then as a class. Ask the students in their small groups to select a few key points or quotes from their interviews to share with the whole class. The students can try to create a timeline of major events that have taken place in the history of the watershed area. Each group of students can write a summary of what they identify as key points in the history of the watershed area.

Making proposals for future land development to protect water quality...

As a closing activity, you can ask students to make proposals for future developments in the watershed area that protect water quality. Ask students to predict how the physical features of the watershed area might influence future human activities in the area. Ask students to try and relate the information they have learned about past changes in the area to likely effects of different future developments.

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Creating a presentation display of water uses in the local community...

Students should summarize and communicate the work they have done by making a presentation display. Each group can write a summary of what they have learned, and then the groups can work together to develop posters for a class display. The class display should include a large-size map of the watershed area, with artwork of watershed features that can be attached to the map. Depending on the time spent by the class on this project, it might be appropriate to share the display either with the school or with a wider community audience, perhaps by setting up the display in a local library.

QUESTIONS

- What were some of the landform and water features that you located on your map?
- How are locations of human activity related to the physical features of the watershed?
- How do the watershed area boundaries that you marked on your map compare with the boundaries identified by other groups?
- Why is it useful to know the boundaries of our local watershed area?
- What changes do you predict would be seen in future aerial photographs of the watershed area?
- What are some key points in the history of our watershed area?

- What are some future developments we can recommend that will protect the quality of the water in our area?

ASSESSMENTS

- Have students locate several natural landform and water features on the topographic map and on the aerial photograph.
- Have students locate several man-made features on the topographic map and aerial photograph.
- Have students write about how human activities can change the nature of a watershed and patterns of water flow in the area.
- Have students write about how waterways can become polluted.
- Have students produce an overall description of their local watershed area.
- Have groups of students write summaries of key points in the history of the watershed area.
- Have students write summaries describing what they have learned about their watershed area, changes that have taken place in the past, and their recommendations for future developments to protect the quality of water in the area.

EXTENSIONS

- Take students on a field trip in the watershed area. Students could directly observe

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different landform and water features in the local watershed area. They could also look for manmade features and evidence of human activities, and discuss their impacts on the watershed.

- Ask students to define the larger watersheds that their local watershed area is part of.

RESOURCES

For the teacher...

- Information on watersheds across Virginia is available from the Virginia Department of Conservation and Recreation (www.dcr.state.va.us) and the Virginia Department of Environmental Quality (www.deq.state.va.us).
- Information on watersheds is also available from the U.S. Environmental Protection Agency. <http://www.epa.gov/wateratlas>
- An online source of information about Geography of Virginia, which includes historical information, is available, provided by George Mason University. Information is grouped into three categories, The Natural Setting, The Places of Virginia, and The People and Development of Virginia. www.viriniaplaces.org
- Information on helping students develop oral histories is available at the following web sites.
 - Association of Oral History Educators. www.geocities.com/aohelanman
 - Bland County Oral History Stories by Rocky Gap High School, Bland County, Virginia. www.bland.k12.va.us/bland/rocky/gap.html
 - Oral History Association at Dickinson College. www.dickinson.edu/organizations/oha
 - Southern Oral History Program, University of North Carolina - Chapel Hill. www.sohp.org
 - Utah State University Oral History Program. www.usu.edu/oralhist/edu.html
- A Change in Perspective: Using Aerial Photos to Study Watersheds. Krasny, M. (1999). *The Volunteer Monitor*, 11(2), 11–12.
- A Pond Investigation. Koschmann, M., & Shepardson, D. (2002). *Science & Children*, 39(8), 20–24.
- Aerial Photographs – A Useful Monitoring Tool. Trautmann, N. M., & Barnaba, E. M. (1994). *The Volunteer Monitor*, 6(2), 17–18.
- Coastal Concerns – Reporting the News. *Waterways: Links to the Sea*.
- Color Me a Watershed. *Project WET*.
- Delineating a Watershed. Baughman, A., Leyden, K., & Trautmann, N. (1994). *The Volunteer Monitor*, 6(2), 3–4.
- Living Research: Aquatic Heroes and Heroines. *Aquatic Project Wild*.
- National Mapping Information. USGS. <http://mapping.usgs.gov>

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- Terraserver. *<http://terraserver.homeadvisor.msn.com>*
- United States Geological Survey.
<http://edc/usgs.gov>
- Watered Down History. *Aquatic Project Wild.*
- Wish Book. *Project WET.*

STUDENT HANDOUT

*Interviewing Community Members About the
Watershed Area*

Interviewing Community Members About the Watershed Area

First introduce yourself, and explain the purpose of the project. We are trying to learn about the history of our watershed area, and find out about past activities involving the water and the surrounding area.

Ask some of the following questions, listen carefully to the answers, and then write down major points from the answers.

How long have you lived in this area?

What childhood memories do you have relating to the water in our area?

Have any of your jobs ever depended on our local water resources? Please tell me about it?

Can you tell any stories of using local water resources for pleasure or recreation?

Do you know of any old customs or traditions that involved the water?

Can you tell any stories of memorable characters in our community relating to the water?

What changes have you seen in the area relating to the water or the area surrounding the water?

Do you know of any pollution affecting the water in our area, either now or in the past?

What changes would you like to see in the future that relate to our water?

Write down two interesting quotes from your interview, which illustrate the history of the area and activities relating to the water of the area.

NOTES