

Defining the Patuxent River Watershed

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Introduction

The Environmental Science Lab is a non-majors science course that is populated by students for a variety of reasons. They might take this course because they are looking for a lab credit that is “easy,” it avoids dissection, they are genuinely interested, they heard that we go on great field trips, etc. When this course was originally developed, it was a series of outdoor field exercises on campus and field trips to various facilities providing important environmental services. As Howard Community College’s student population increased we lost our on-campus field sites and were forced to move off campus for many exercises. It was evident from student evaluations they saw no connection or theme in the series of exercises they were performing.

I decided to use a cohesive theme, the Patuxent River watershed, to help students see a connection in what they were learning within the semester’s work and with human impact on their environment in general and their lives in particular. Each week there is a different field experience and topic to explore. All the field work and trips occur in the Patuxent River watershed with one exception. Besides the lab work itself, each exercise has a list of objectives, an introduction with general information about the concept they are exploring and discussion questions which tie their procedures and collected data to that week’s topic and to the Patuxent River theme.

This first lab exercise sets the theme for the rest of the semester. The lab is designed to be engaging, using a place students know to introduce them to a concept, and then letting them take the concept and apply it to the watershed I want them to discover. We define the concept of watershed and let them discover that our campus has two watersheds. We use the satellite imagery to let them see that the campus is part of the greater Patuxent River and Chesapeake Bay watersheds. This can work for any campus and in any watershed, though there is a lot of information available on line about the Chesapeake Bay and its watersheds (www.chesapeakebay.net). As an instructor, you might find some other physical features in your area serve as better focal points.

Student Outline

Objectives:

1. To understand the concept of a watershed.
2. To use maps and satellite imagery to define the Patuxent River watershed.
3. To relate personal activities, such as home, school, work, recreation, shopping, etc., to the Patuxent River watershed.
4. To understand that our activities in the Patuxent River watershed also affect the Chesapeake Bay.
5. To get to know your classmates through cooperating in this exercise.

Materials:

Per Group:

Maps	Colored pencils
Satellite images*	Rulers

Our satellite images were produced by the Howard County, MD, GIS Service, free for educational institutions within the county. See <http://www.howardcountymd.gov/maps>

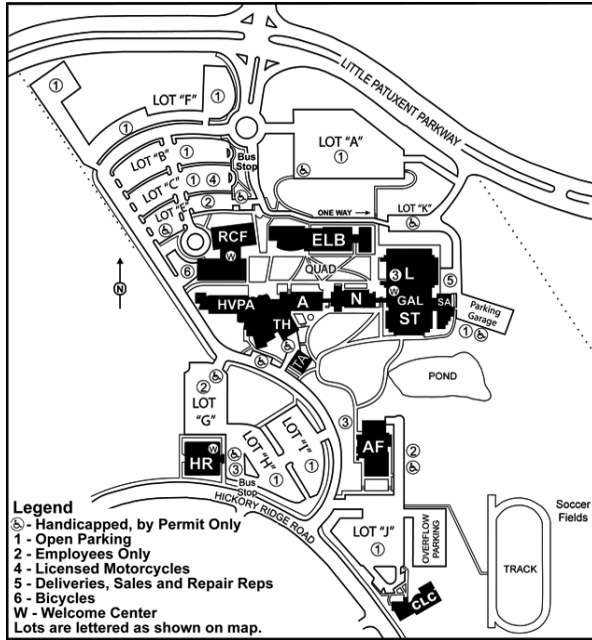
Procedure:

This lab is a series of exercises and discussion questions interspersed in the lab text. Students complete the exercises with the people sitting at their lab bench, thereby spending time getting to know them as they work through the exercises. The instructions are imbedded in the text of the lab and the answers student most provide are indicated by an *. They follow the instructions as they are encountered; spaces are provided in the lab text for this. We stop for class discussions as we work the questions. This work is graded.

Introduction:

One thing we all have in common – we all live in a watershed. If you are living on an off-shore oil rig or an ocean liner, you may be an exception to this rule, but it's a safe bet that all your normal daily activities take place in at least one watershed.

What is a watershed? It is all the land drained by a body of water. So, what does that mean? One concept that helps you understand is that of a “map.” What is a map? Let's figure that out together.



*** 1. Campus Map.** With the people sitting at your bench, draw a map of the HCC campus in the space below – from memory. Don’t look at the HCC web site or in your course catalog, student handbook or any HCC publication. Answer the following questions.

* What features did you include? Why?

(The campus map from the school’s website is included to the left; students do not have this and are asked not to consult it)

So, then, a map is a way to organize information you find useful in a spatial framework.

* Now I want you to take your map and add features I think are important. Where is the ground highest? Where is it lowest? How can you tell? Add them in different colored pencils.

I am hoping that you drew the two low points on campus as the pond and the man made “wetland” between parking lot A and the English and Languages Building (ELB). Make sure your campus map includes the pond and wetland. If you didn’t already put them in, add them now. Knowing where the ground is high and where water collects is useful in defining a watershed.

Do you see the connection between points on campus that are lower in elevation and the presence of bodies of water? Water runs downhill from those points that are higher in elevation drain to the pond and wetland.

Look at your campus map and see that you have drawn two watersheds, two areas of land that drain to two bodies of water.

2. Patuxent Watershed.

The pond drains to a stream feeding the Little Patuxent River; we are in the Patuxent River watershed. Now let us look at the greater watershed that we are in, the Patuxent River Watershed. Use the satellite image to mentally trace the watershed from its source to the Chesapeake Bay on the image provided.

a. Once you have found the three sources of the Patuxent River (the Little Patuxent, the Middle Patuxent and the Patuxent Rivers), look more closely at the features on satellite image. Can you

determine within which general political division (county, city, township, etc.) the river’s sources are found? One way you can figure this out might be by looking for major roads and seeing if you can recognize a pattern with which you might already be familiar. You can use the road map to help.

- b. Pick out the places on the image
- where you go to school
 - where you live
 - where the public buildings you might carry out business (the county government complex, for example)
 - where you work
 - where you shop
 - where you recreate

(<http://www.co.ho.md.us/gis/MiscellaneousWatersheds.htm> This is different from the satellite images we use. Ours are specially drawn for us.)

* c. The activities you picked out in (b.) impact the watershed. How? List **ALL** these activities! (Don’t just think about driving, eating, walking. Think about the trash, waste water, etc., that you generate!) Answer below:

* d. River water quality is very dependent on how land in the watershed is used. With the people in your group, think about how each of the following affects the water quality of the Patuxent River. Be sure to give an example of where you think this might be occurring. (Don’t worry about how much you know or don’t know right now; this is an exercise to get you thinking.)

Land Use (approximate location in the county)	Example of Where It Occurs	How Land Use Affects Water Quality
Agriculture	(Example: The western part of the county.)	(Example: Can cause erosion. Can add to the nutrient load of the river. Can add pesticide and herbicide pollution. Riparian buffers can lessen the impact of each of these.
Forested		
Recreation		

Residential – High Density		
Residential – Low Density		

Table 1 has a list of land uses for the Patuxent River, broken down by category, and the whole Chesapeake Bay watershed. It is interesting that the Patuxent River has a lot of undeveloped land in its watershed. It is disturbing that most of the developed land is closest to the headwaters of the river in Howard, Ann Arundel and Prince Georges Counties. Note the land uses on the satellite images.

Table 1. Comparisons of population, land area and land use and of the Patuxent River tributaries, the entire river and the Chesapeake Bay.

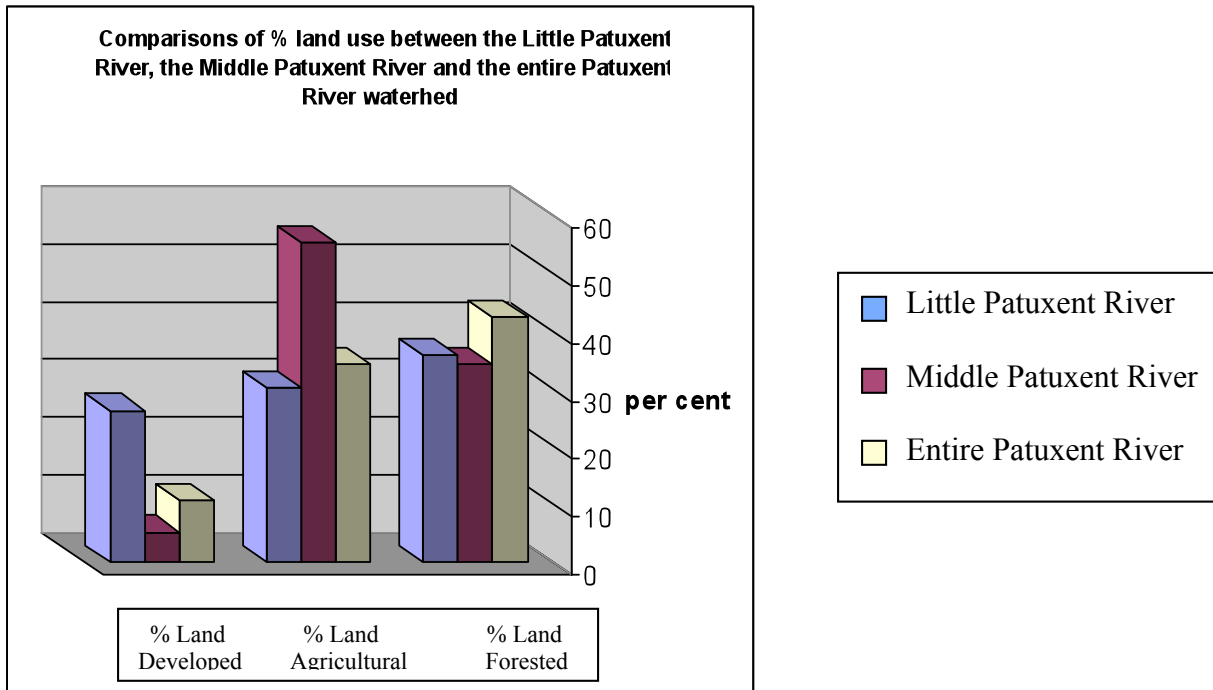
	Little Patuxent River Watershed (includes Columbia)	Middle Patuxent River Watershed	Entire Patuxent River Watershed	Entire Chesapeake Bay Watershed
Population (2000)	181,887	36,560	590,769	15,594,241
Land Area (square miles)	103	58	957	66,388
Developed	27 (26.2%)	3 (5.2%)	102 (10.7%)	2,409 (3.6%)
Agriculture	31 (30.1%)	32 (55.2%)	328 (34.3%)	18,895 (28.5%)
Forested	37 (35.9%)	22 (37.9%)	405 (42.3%)	39,901 (60.1%)

Open Water	1 (1.0%)	0	61 (6.4%)	2,863 (4.3%)
Wetland	6 (5.8%)	1 (1.7%)	52 (5.4%)	1,707 (2.6%)
Barren	2 (1.9%)	0	9 (0.94%)	599 (0.90%)

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e. Using Table 1.



Our Patuxent River is a bit unusual because a lot of the development associated with Columbia and the rest of Howard County that grew up around it is located in the headwaters of the river. The Little Patuxent River starts in a golf course, immediately crosses a major highway (U.S. 40), runs through a large development, past the Columbia Mall and into the Middle Patuxent River. The Middle Patuxent River originates in farmland and moves into the Columbia region, where it is protected as low impact parkland by the Howard County Department of Recreation and Parks. The

Patuxent River is protected through much of its journey as a source of drinking water for Washington, D.C. By the time it reaches I-95, it is joined by the Middle Patuxent and continues through the Washington suburbs. Once past Washington, the last two-thirds of its 110 mile length is through rural lands, much of which is protected. This is a point that I try to impress on students, whose activities take place mostly in the upper third of the watershed.

* Since you have thought about how your activities affect the Patuxent River Watershed, take a look at Table 1 and the graph in the figure above.

1. What % of the entire Patuxent River population resides in the Little Patuxent watershed? (You need to calculate this.)

2. What % of the Little Patuxent watershed is developed? How does this compare to that of the Middle Patuxent River and the entire Patuxent River?

3. Do you think there is some correlation between the % of developed land in the Little Patuxent River watershed, the % of population in the watershed, and the health of the river? Explain.

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