Cary Institute of Ecosystem Studies — Changing Hudson Project

Name _____ Date _____

Land Use and Water Quality Lab Report

In order to quantify the impact of land use on water quality, you will need to collect a lot of information about your watersheds. Remember, a watershed does not have to be a huge area, and selecting smaller sites will make collection easier. The two sites you select should be different enough to provide comparison, with one site less than 10% impervious surface, and the second site more than 30% impervious. We recommend following the procedures listed in the Hudson Basin River Watch document, which can be found at https://www.dec.ny.gov/chemical/31290.html You can use a watershed that enters either a stream/river or a pond/lake.

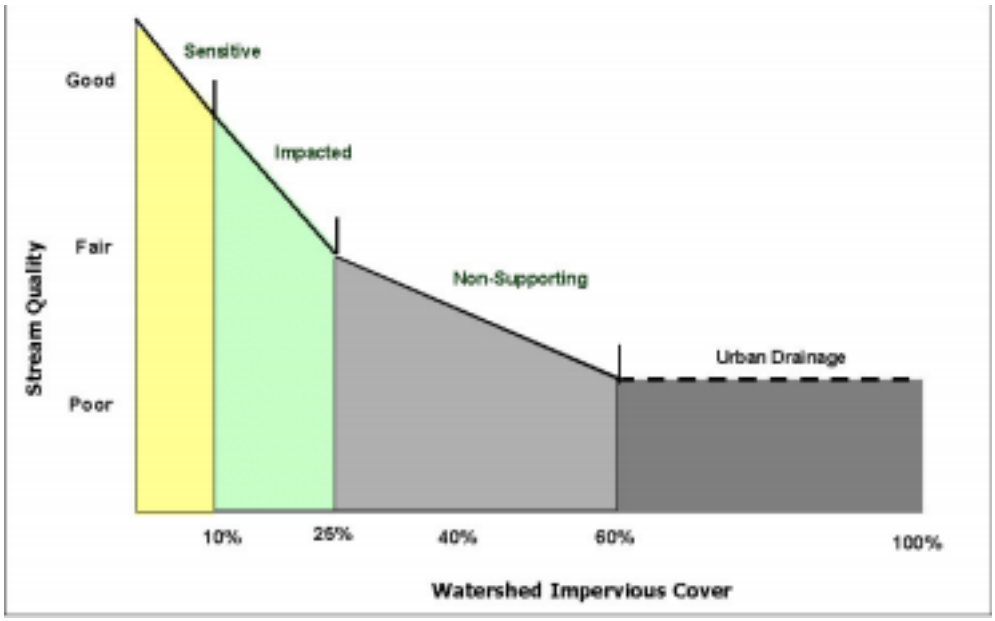
1. Determine how much impervious cover exists in your watershed using aerial photos and/or a walking survey.
2. Create a hypothesis: what do you think you will find? How will your two watersheds differ? Why?
3. All students should do a physical survey of the site, including a site drawing, and record water flow, temperature, odor, habitat features, etc. Use the land use data sheet to write down your findings.
4. Decide which parameters you are going to test: chemical or biological, or a combination of the two.
5. Research the methods needed to complete the appropriate test(s). 6. Collect your data and create a lab report using the following guidelines.

Title: Create a title for your project
Abstract: Summarize your research, what you thought you would find, and your results in a paragraph.
Introduction: Explain the background of your project, and the reasons you decided to conduct your research, and any research that you conducted prior to beginning. Methods: Describe your sampling and analysis methods; how did you collect data, how often did you collect data, what tools did you use, how did you compile your results. Results: Place any graphs or data tables in this section and briefly describe what you found.
Discussion: Synthesize the information you learned and include answers to the questions below.
Conclusion: Briefly conclude your report.

Questions to answer:

1. What were the major changes between the two different ecosystems, according to your data? How do you think land use affects the ecosystems?
2. What other changes took place, based on your classmates' data? Summarize the data for your class and explain the trends in the data. Do these data match your expectations? Why or why not?
3. What parameters are you using to determine the health of your aquatic ecosystem? Based on these parameters, how healthy was your watershed?

4. Look at the diagram below. Do your results support or refute the diagram and the definitions below? Explain why or why not.



Sensitive: Streams have little to no impervious cover. Stable channels, excellent habitat structure, good to excellent water quality, and diverse biotic communities. Little flooding occurs. Some sensitive streams, however, are in rural areas where they may need riparian management in order to recover.

Impacted: Erosion and channel widening are obvious. Stream water quality shifts into fair/good category. Biodiversity declines to fair levels, with most sensitive fish and aquatic insects disappearing.

Non-supporting: No diversity of organisms, with highly unstable stream channel and lots of erosion. High bacteria levels are present, and water recreation is often no longer possible. Water quality is rated fair to poor.

Definitions and diagram from www.stormwatercenter.net

5. Imagine that one of your watersheds is proposed for a development project. The developer wants to create a subdivision along with a shopping area, and will leave 25% of the land undeveloped. Would you consider this type of a change to be a bend or a break for the ecosystem? Explain.

6. Imagine that one of your watersheds includes about 50% lawn, and wants to start using fertilizer on the lawn in order to make it grow greener. What do you think will happen to the water quality in your watershed? Is this a bend or a break in the ecosystem? Explain.

7. Using the following data, answer the questions that follow.

	Suburban	Forested	Agricultural
	(kg N/ha/y)		
Inputs			
Atmosphere	11.2	11.2	11.2
Fertilizer	14.4	0	60
Total	25.6	11.2	71.2
Outputs			
Streamflow	6.5	0.52	16.4
Retention			
Mass	19.1	10.7	54.8
Percent	75	95	77

Data from: Groffman, P., Law, N., Belt, K., Band, L., and G. Fisher. 2004. Nitrogen Fluxes and Retention in Urban Watershed Ecosysetms. *Ecosystems* 7:393-403.

a. Which watershed had the highest amount of nitrogen input? Why? b. Which watershed 'lost' the most nitrogen to the stream? How do you think this would affect water quality in the stream?
c. Which watershed retained the most nitrogen? Why?
d. What does this information tell you about land use and nitrogen? e. How do these data compare with your results? Do these data support your findings?

8. What changes do you recommend for improving the water quality in the watersheds you tested? Recommend at least 2 different ways.