Watershed GIS Activity – Neuse Watershed

Student Sheet – Attachment 1

The U.S. Fish and Wildlife Service's mission is to preserve and protect our nation's threatened and endangered wildlife, including fish. Biologists in North Carolina are working to restore a specific fish known as the American Shad. American shad, a member of the herring family, is an anadromous species, meaning they live in the ocean but return to the rivers of North Carolina in the spring to spawn, or reproduce.

American shad populations can be increased by opening up miles of North Carolina's rivers for shad to spawn in by removing dams or putting fish passageways that allow the fish to bypass dams. These two actions can increase the numbers of miles American shad are capable of traveling upstream to spawn, which will ultimately increase their population.

Today you will participate in an activity that features a management tool U.S. Fish and Wildlife biologists use to help restore anadromous fish populations to their historical populations. This management tool is known as Geographic Information Systems, or GIS. GIS is a computer mapmaking system that stores measurements of data in various layers and can combine data layers into one concise map. The combination of data layers of information reveals relationships, patterns, and trends within our river systems in North Carolina.

Using GIS generated maps; you will learn about blockages, or dams, along our rivers impeding anadromous fish, like American shad, from moving up rivers and tributaries. You will become a fisheries biologist for a day and use real GIS data found on watershed maps to decide which dams should be removed to allow shad to migrate further upstream and back to their traditional spawning grounds.

Directions:

A. Read the attached "American Shad" profile and "Profile of a Biologist" and then answer the following questions:

1. According to the "American Shad" profile, what were the three reasons that American shad numbers declined in North Carolina?

a) _____

b) _____

c) _____

2. What is the primary goal of federal and state fisheries biologists, such as Mike Wicker, for shad restoration in North Carolina? _____

_____

3. What are two ways listed in the articles to get fish by dams so they can spawn upriver?

a) _____

b) _____

4. What is the main type of river data used by fisheries biologists to help determine the most important dam to work on? _____

5. Why is this type of river data important to consider when trying to restore American shad?

_____

_____

B. Divide up into groups. Each group will receive a series of maps and a piece of string for measuring. Use the GIS maps to answer the following questions with your group.

1. Review Map 1. This GIS map of North Carolina has two river watersheds highlighted: the Neuse and the Roanoke/Chowan.

2. Review Map 2. This map contains the GIS data layer that has tributaries of your river. These tributaries contain dams that block shad migration further upstream into the tributary. Map 2 is divided up into five smaller watershed maps. These maps are labeled Map 3a, 3b, 3c, 3d, 3e. Your group will get a set of these three maps to work on.

3. Map 3 (a, b, c, d, e) shows a creek or river and the dams located along the waterway. Your group will need to determine the mean annual flow rate of the runoff of water by the lowest dam in each of the study watersheds.

Calculate the total mean annual runoff rate for each watershed. The mean rate of runoff of water from the land surface is measured in cubic feet per second (CFS). Use the following mathematical formula: runoff rate per square mile (CFS) x area in square miles = mean annual runoff rate of rainfall (for divided watersheds, calculate each section and then add them together). Record the numbers for each part of your watershed here:

Lake Raleigh Dam _____

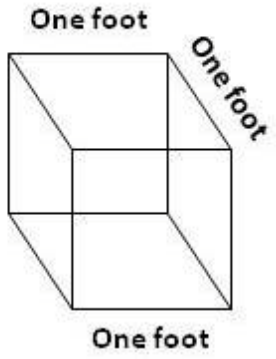
Lassiter Mill Dam _____

Atkinson Mill Dam _____

Wiggins Mill Pond Dam _____

Milburnie Dam _____

Hint: Mean rate of runoff of water from land is measured in Cubic Feet per Second (CFS). For example: 100 CFS runoff rate of water by a dam is like 100 students carrying a cubic box of water by a dam every second (see diagram below).



4. **Calculate the number of river miles** you will open to American shad in each of the study Neuse watersheds if you provide fish passage on each of the dams.

Use the piece of string provided to estimate the mileage of the river by laying the string along the path of your tributary. Use the key at the bottom of your 3 a, b, c, d, e maps to estimate your mileage. Record your river mileage for the area opened up above each dam:

Lake Raleigh Dam _____

Lassiter Mill Dam _____

Atkinson Mill Dam _____

Wiggons Mill Pond Dam _____

Milburnie Dam _____

5. Analyze the findings

a. As a class, discuss which dam has the highest total runoff rate.
_____

b. Which dam, if removed, would open up the most amount of mileage for migrating American Shad?
_____

c. Which two dams should be removed ***or*** have fish passage placed on them to restore American shad populations in your basin?_____

Why?_____

_____

_____

d. How many total river miles would be opened should these those two dams get fish passage in them?
_____

Extension Activity:

1. Go to the website: http://waterwatch.usgs.gov/. A map of the United States will appear with all of the river gauges in the U.S. that monitor river data. Click on your state. You will be able to bring the cursor to each gauge and access the river conditions including flow in real time. Compare these current river flow rates to the flow rates you calculated. Why are your numbers higher or lower now?

_____

_____

_____

2. Research Milburnie Dam (or another dam of your choosing).

    a. Why was the dam constructed? _____

    _____

    _____

    b. What purpose(s) does it presently serve? _____

    _____

    _____

c. Given the information that you have learned, would you determine that it is a good idea to remove this dam and why? _____

_____

_____

d. If you choose to not remove the dam, what other options could you think of that would help the American shad. _____

_____

_____