Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**USING GIS AND MODELS AS DECISION MAKING TOOLS**

**A CASE STUDY OF CHOPTANK WATERSHED**

**What is GIS?**

Watch the video to learn about GIS and list three new things you learned about GIS and one question you have about GIS.

*I learned*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*A question I have*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Click the Choptank Watershed: NOAA’s Habitat Focus Area button**

Answer the following questions

* What are some unique characteristic of the Choptank Watershed?
* Why was the Choptank identified as a Habitat Focus Area?

**Scenario**

NOAA has identified the Choptank as a Habitat Focus Area. Assume that you work for NOAA and your goal is to analyze the land use and water quality data for Greensboro, a sub watershed within the Choptank watershed and design an implementation plan to improve the water quality.

Complete the five steps to design and develop your implementation plan.

**Step 1: Graphing Land Use**

Click on the Greensboro 2011 Land Use map.

Click on each land use category in the legend and record the Area (Hectares)

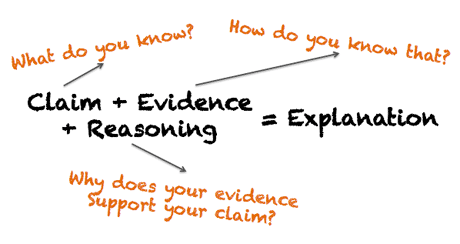
Calculate the percentage of each type of land use

Graph your data (label the X and Y axis)

|  |  |  |
| --- | --- | --- |
| **Land use category** | **Area(Hectares)** | **Percentage** |
| Agriculture |  |  |
| Forest |  |  |
| Extractive |  |  |
| Park |  |  |
| Water |  |  |
| Poultry operations |  |  |
| Road |  |  |
| Developed |  |  |
| Total | ---------- | ---------------  \*Hint: This should add up to 100 |

**Graph Title:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |

[](http://www.edutopia.org/blog/science-inquiry-claim-evidence-reasoning-eric-brunsell)

**Step 2:** **Claim, Evidence and Reasoning (CER)**

**Write a paragraph to answer the following question. Use the CER format to write your answer.**

**Question**

**The Choptank watershed is a unique ecosystem. Is there a relationship between population growth, the land use and water quality? Provide evidence of the types of relationships that exist. How significant are these relationships. Discuss why it is important to setup a Habitat Focus Area. Include vocabulary terms and concepts assigned and/or discussed in class.**

|  |
| --- |
|  |

**Step 3: Ways to improve water quality**

Take the BMP tour, read the descriptions and identify three BMPs that can be implemented in our school’s property to improve water quality. Justify your choice.

|  |  |
| --- | --- |
| **BMP Type** | **Justification** |
|  |  |
|  |  |
|  |  |

**Step 4: Using GIS and Models**

1. Download the Greensboro Watershed BMP Model file.
2. In groups use the Greensboro Watershed BMP Model to identify and calculate the cost and area of different BMPs that can be implemented to reduce nutrient (N and P) loads in Greensboro by 25%. *(Hint: You may have to run the model multiple times)*
3. ***Print your completed model and attach it to your final report***

**Reflection on using models**

|  |
| --- |
| At first I thought \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, but now I know \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Some ideas I have squared away are\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  One thing I have circling around is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  I am amazed/puzzled by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  These results make me think\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

1. Click on the 2009 Greensboro BMP map
2. Using the map as base, identify suitable locations to implement BMPs in Greensboro*.(Hint :Look at the BMP tour for BMP types)*
3. Use the Measure tool to identify the locations and calculate the area in hectares. *(Hint: Use the icons in the tool bar to interact with the map)*
4. For each location identified discuss potential issues in implementing the BMP and propose possible solutions

**Using GIS to make decisions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **BMP Type** | **Location (Lat. Long)** | **Area** (Hectares) | **Potential Issues** | **Possible Solutions** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**Step 5:** **Creating and Communicating**

Compile the data gathered from the previous steps and communicate your implementation plan for the Greensboro watershed by writing a two page report.

Use the following template to write your report.

**REPORT TEMPLATE**

**Abstract:** gives a very brief indication of:

* the aim of the report
* what you did
* what you found
* what you concluded.

**Introduction:** provides the context for the report

* states why the topic is important or useful
* explains any abbreviations or special terms.

**Method:** sets out what you did in sequence

* explains how you did it
* indicates what materials, techniques or equipment you used
* provides sufficient information for the reader to replicate the study.

**Results:** presents what you found

* includes clearly titled tables, figures, model printout

**Discussion**

* explains what the results mean
* indicates whether the results were consistent or inconsistent with your expectations
* explains what possible sources of error there are
* explains what possible problems encountered
* indicates suggestions for future.

**Conclusion**

* briefly restates the main results
* briefly explains the significance of the findings.

**References**

* provides a list of sources of information which you have used, following the referencing conventions

(Adapted from: http://www.monash.edu.au/lls/llonline/writing/science/7.xml)

﻿