Earth Systems Science

# Florida River Project

The Florida River is a source of water for the city of Durango and for agriculture south and east of town. It is affected by both natural processes (typical river processes, plus the local geology and weather) and by human activities (irrigation, natural gas drilling, and simply building new houses in the watershed). Since the fall of 2007, FLC geology students have been studying the water flow in the Florida River. Your part of this project will come in groups of assignments: an individual project leading to a final paper (based on analysis of data collected by government agencies and by past FLC classes), and group project involving data collection (including presenting and discussing the data that your group adds to the class data set).

Individual project:

In your individual project, you will use data that has already been collected to propose and answer a scientific question. The goals of this project are:

* To make an argument supported by quantitative evidence.
* To communicate a scientific argument using appropriate formats (graphs, tables, and words).

You will develop the skills necessary to complete this project through a series of graphing exercises, and demonstrate the skills in a final paper that follows the format of professional scientific papers. Graphing Exercise #1 (due 2/3), Graphing Exercise #2 (due 2/17), Question (due 3/10), and the Final Paper (due 4/25) are components of the individual project.

Group project:

Each lab group will be responsible for collecting data at one or two of the nine sites that we are monitoring. The labs will be divided into groups responsible for four different types of data: discharge, sediment load, one set of water chemistry data (pH, total dissolved solids, alkalinity, nitrate, nitrite, and phosphate) and a second set of water chemistry data (dissolved Na, Ca, K, and Mg). Your group will be responsible for comparing your data with that collected by other members of your class, with that collected at different sites by other classes, and with that collected at your site in previous years.

The Background (due 2/24), Data Collection (3/31), and Presentation of Preliminary Results in Lab (4/14) are components of the group project.

**Project Schedule (dates are for Mon. lab; Tues. lab will turn in assignments on Tuesdays)**

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| Handout 1/27; Due 2/3 | Graphing exercise #1 (seasonal variations in discharge) |
| Handout 2/10; Due 2/17 | Graphing exercise #2 (comparison of previous data using Excel) |
| 2/10/14 | Choose data group |
| Due 2/24 | Background |
| Due 3/10 | Question |
| 3/31/14 | Data collection during lab |
| 4/14/14 | Presentation of preliminary results (in lab) |
| 4/25/14 (Friday) | Paper on project due |

**Instructions for Project Components**

**Individual project**

**1.** ***Graphing exercise #1 (due 2/3).*** Graph the data (by hand) and answer the questions on the handout (available on Canvas and as paper handouts on 1/27)

**2.** ***Graphing exercise #2 (due 2/17).*** The full handout is available on Canvas, and will be available on paper on 2/10. You will complete this assignment in steps:

1. Graph your assigned data using Excel, and bring your graph to lab on Monday, February 17.
* You will graph one of two sets of data, depending on the first letter of your last name.
* You may use Excel on a campus lab computer, or on your own computer. However, you must use Excel to graph the data; part of the purpose of this assignment is to gain experience use software to make graphs, so you will be comfortable making graphs for your own project.
* Follow the instructions on the handout.
1. During lab, share your graphs with someone who made the other set of graphs. Discuss the graphs with them, and use both of your sets of graphs to answer the questions on the handout. Turn in the questions during lab.\

**3*. Question (due 3/10)***

Look at the data that you graphed in Graphing Exercise #2 (or the more complete data available on Canvas), and propose a question that you could answer with that data or with data combined with what you collect this year. Write approximately one page describing your question, and explaining what kinds of information you would need to be able to answer it.

There will be opportunities to discuss your question (including brainstorming data sources and ways to graph the data) with your instructor from March 11 to March 21.

*Resources:*

* **Colorado Division of Water Resources:** http://www.dwr.state.co.us/Surfacewater/default.aspx
* **National Weather Service precipitation archives**: http://water.weather.gov/precip/
* **Snotel Colorado:** http://www.wcc.nrcs.usda.gov/snotel/Colorado/colorado.html

**4.** ***Final Florida Project Paper (due 4/25)***

Your final paper should address the question that you proposed (and modified in discussions with your professor). It should use data (either collected by past classes or retrieved from reliable sources) to investigate a question. Use the typical scientific paper format (Introduction, Methods, Data, Discussion, Conclusions). Include graphs and tables to present your data, and discuss the graphs and tables as part of the evidence to support your argument.

The length of the paper should be as long as it needs to be to explain the question and to analyze and discuss the data. Three pages of text (in addition to the graphs and tables) are reasonable.

More details about the expectations of the paper can be found in the paper handout (on Canvas and handed out in class).

**Individual project (data collection)**

**1. *Background (due 2/24)***

Before you collect data, you should know what it is you are collecting, and why we care about it. In a typical scientific paper, this information is contained in the background section. A draft of the background section of your Florida River paper is due February (Monday lab) or 25 (Tuesday lab).

Your background section should be approximately one page long, and should include discussion of the following issues:

* Which data group are you in? (Possibilities are discharge, sediment, water chemistry 1, or water chemistry 2.) Answer the other questions for your data group ONLY.
* Explain the kind of data you will be collecting:
	+ Discharge group: explain what discharge is.
	+ Sediment group: explain turbidity.
	+ Water chemistry 1: explain pH, total dissolved solids (TDS), alkalinity, nitrate, nitrite, and phosphate.
	+ Water chemistry 2: explain dissolved Na, Ca, K, and Mg.
* In what units is your kind(s) of data measured?
* What controls whether they are high or low in a stream? What range of values are reasonable for your measurements?
* What values would be high? What values would be low?
* What do you expect for the area we are observing – high, low?
* How does the season (fall versus winter) affect your expectations? What kinds of conditions would change the values that you expect?
* Do they cause any problems or provide any benefits (to human health, to plants and animals, to the economy)?

Your background should be written in sentences and paragraphs, not as questions and answers. You will be graded on writing as well as on content.

**2. *Data collection (3/31)***

Done in lab – meet for lab with clothes for going into field, notebook for collecting data. Your instructor will provide equipment, sample bottles, etc. Details about sample collection are found on the handout for Lab 11.

**3. *Presentation of preliminary results (due 4/14 in lab)***

With your data group, prepare a Power Point presentation that explains your data to the rest of the class and compares it to similar data collected at different dates and at different sites along the river. The entire class will discuss how each type of data relates to the others.

The presentations should include, at a minimum:

* An introduction that explains the data that your group collected. What is it, why do we care about it, and how did you collect it?
* A presentation of your results. What did you find out?
* A comparison of your results with the same type of data collected at different sites along the river. You should make appropriate graphs in Excel and explain them.
* A comparison of your results with the same type of data collected in previous months. Again, make graphs in Excel and explain them.
* A discussion of what you think it means. Were all the analyses the same? If not, what do you think caused the differences? How did your results compare with your predictions?