

Name: \_\_\_\_\_ Class Pd: \_\_\_\_\_ Date: \_\_\_\_\_

## Stream Chemistry Across the Fall Zone

Investigating the impacts of human activities on the Critical Zone across different sites.

---

### Part 1 - Brain Warm-up

Study the satellite images of the four sites. What do you notice about the sites? What do you wonder? Record your thoughts in the table below.

I notice...	I wonder...
<i>What information do these images provide?</i>	<i>What questions do you have about these images, or the information provided in these images?</i>

In the spaces provided below, record (#1) **one question** you have about the relationship between urbanization/development and water quality, and (#2) **one question** you have about urbanization/development and its impacts on critical zone processes.

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_



## Part 2 - Digging into the Data

Let's start digging into some real data! We will be using CODAP for this investigation. Once you're set in CODAP, follow the instructions below:

1. Assign one of the tasks to each member of your group. Write that group member's initials next to their assigned task in the table below:

### Preparing Data Investigation in CODAP:

1. Import the provided dataset into CODAP.
2. Create a graph with "Date" on the x-axis.
3. Filter the data by site  
(HINT: drag the "Field Site" attribute to the middle of the graph)

Initials	Task	Task Description
	1	Compare the concentrations of alkalinity between sites. Are levels higher in certain sites than in others? What other trends/patterns do you notice?
	2	Compare concentrations of nitrates and other nitrogen-containing compounds between sites. Are levels higher in certain sites than in others? What other trends/patterns do you notice?
	3	Investigate seasonal trends of carbon (DOC or TOC): <ul style="list-style-type: none"> <li>• Does the carbon data show higher or lower levels during certain months? <ul style="list-style-type: none"> <li>◦ Do all of the sites show these same seasonal trends?</li> </ul> </li> <li>• Compare the trends in carbon <u>between</u> the four sites (DR, PP, NWB, POBR) - are there any significant trends that are present between these sites?</li> <li>• Compare the trends in carbon between subwatershed <u>within</u> a site (e.g. examine DR4, DR5, and DRKR) - are there any significant trends that are present between these subwatershed sites?</li> <li>• What other trends/patterns do you notice?</li> </ul>
	4	Investigate seasonal trends of chloride: <ul style="list-style-type: none"> <li>• Does the chloride data show higher or lower levels during certain months? <ul style="list-style-type: none"> <li>◦ Do all of the sites show the same seasonal trends?</li> </ul> </li> <li>• Compare the trends in chloride <u>between</u> the four sites (DR, PP, NWB, POBR) - are there any significant trends that are present between these sites?</li> <li>• Compare the trends in chloride between subwatershed <u>within</u> a site (e.g. examine DR4, DR5, and DRKR) - are there any significant trends that are present between these subwatershed sites?</li> <li>• What other trends/patterns do you notice?</li> </ul>

### Parameter (Attribute) Cheat Sheet

<b>TN</b> = Total Nitrogen	<b>IC</b> = ion chromatography (a technique used to measure ions in water)	<b>Alkalinity</b> measures resistance to pH change (buffer capacity)
<b>TDN</b> = Total Dissolved Nitrogen	<b>DOC</b> = Dissolved Organic Carbon	<b>TOC</b> = Total Organic Carbon
<ul style="list-style-type: none"> <li>• All other abbreviations (e.g. Cl, NO<sub>2</sub>, etc.) represent chemical formulae of common ions.</li> <li>• Reminder: CODAP refers to parameters/variables as "attributes"</li> </ul>		

2. Record your data dig findings for your task in the table provided in the Data Dig Handout.
3. Once everyone in your group has finished their analysis, take turns sharing your findings. You will record your partners' findings in the appropriate box of the Data Dig Handout.
4. Based on the data that you have been analyzing, discuss the following with your team (record your team's responses in the "Summarizing Findings" box of the Data Dig Handout):
  - a. What differences did you observe between urban and reference sites for the parameters you investigated? Present specific data to support your claims.
  - b. Predict which urban processes might influence the trends/patterns you observed, and how.
  - c. Predict how the critical zone might be impacted by the different parameters you investigated in this activity (e.g. how might high or low alkalinity impact the critical zone differently?).



### Part 3 - Understanding the Parameters

Your group will be assigned one parameter to be investigated, using the questions provided in the table below as a guide. Follow the instructions below:

1. Record your assigned parameter in the table below.
2. Assign one of the questions to each member of your group (including yourself!). Write that group member's initials next to their assigned question in the table below.

Initials	Our parameter is: _____
	What is the <b>significance</b> of the parameter (e.g. what is it in the context of water/stream health and chemistry - what does it tell us about)?
	What influences the <b>concentration</b> of this parameter in a stream (e.g. what are sources and sinks—natural or man-made—of this parameter)?
	How does this parameter influence the <b>health or quality of a stream</b> ?
	Does/could this parameter have an impact on <b>critical zone functions or processes</b> ? Explain how it does, or why it doesn't.

3. Record your research notes for your question in the table provided in the Parameter Research Organizer. Record your source(s) below. You need to reference at least one source, but can use more if you would like.
  - a. Source #1: \_\_\_\_\_
  - b. Source #2 (optional): \_\_\_\_\_
  - c. Source #3 (optional): \_\_\_\_\_
4. Once everyone in your group has finished researching their questions, take turns sharing your information. You will record your partners' findings in the appropriate lines of the Parameter Research Organizer.

Now that you and your partners are “experts” with respect to your assigned parameter, you will create a presentation (Google Slides, poster, whiteboard, etc.) that effectively communicates what you have learned to the rest of your class. When your group is not actively presenting, you will be listening to the presentations from groups presenting the other parameters, and recording notes in the appropriate boxes of the Parameter Research Organizer. **Be sure to ask clarification questions if you need them, because what you learn now will be important for the next activity!**



### Part 4 - Digging Deeper

It's time to apply what you have learned over the course of the last few activities to start analyzing the trends and patterns you identified in Part 2 - Digging into the Data. To help you with this task, you will be given additional data that will help you think about what we see in the data. The table provided at the top of the Digging Deeper Handout provides a brief description of each of the new data resources. Once you have familiarized yourself with this information, you will be ready to begin responding to the prompts in the Digging Deeper Handout. An important practice that all scientists practice is recording new questions that come up while you're trying to answer the original question - so make sure you use the Question Collector provided!