

## PROJECT: RIVERS OF CHANGE

**Background.** Rivers often change their form dramatically over time. Erosion and deposition moves sediment. Riparian vegetation grows or is destroyed by floods. Water levels rise and fall. These changes are especially dramatic in flood plain rivers. However, it is hard to perceive these changes over time. This assignment harnesses the power of stored data to examine river dynamics.

### THE ASSIGNMENT:

#### 1. Googling change.

- a. Use GoogleEarth (can download for free) and pick a section of river. Spend some time making sure that this section will have some interesting dynamics.
- b. Zoom in until you are about 150-300 m above the river. Use your judgment to pick a good height.
- c. Click on the clock icon on the GoogleEarth taskbar. This will load older images of the region. If there aren't at least 4 pictures total, find a new site. Use the new action toolbar to look back through time at the stretch of river. If you don't see any changes, find a more dynamic focal reach.
- d. Save the time series of photos through time (click Save image).
- e. Analysis. How has the river changed through time? Has the river changed course? Has vegetation changed? Through time, does the river appear to be at different discharges or have different colored water?

**Hints:** Focus on a floodplain section in a Washington and Oregon river. (BC rivers don't have as good temporal coverage by GoogleEarth and BC is so steep that rivers are often more constrained). You will likely see more interesting dynamics if you choose a river section with islands, braids in the river, or tributary junctions. Some promising rivers include: Skagit, Queets, Hoh, Quinnalt above the lake, some of the rivers that drain Mt. Rainier.

#### 2. River discharge.

- a. Go to USGS website at <http://waterdata.usgs.gov/nwis/rt>
- b. Click on the state to zoom in.
- c. Find appropriate stream gauge. Ideally this comes from a gauging station that is in the same river, but it is ok to use a nearby river if none is available.
- d. Download data for time series of photos. (TA Mike can help with this)
- e. Create graph showing discharge over time. (TA Mike can help with this)
- f. Analysis. What is the flow regime of the river?

**Please turn in the following document on Feb 7, beginning of class:**

Please turn in a single document (word or pdf) that has the following components.

- **Location** (Name of river, latitude, longitude, and elevation).
- **River Change Figures.** These figures will consist of annotated photos from GoogleEarth.
  - Please annotate them to highlight changes. For example, you could draw on the photo to show where the channel used to be or have an arrow to point to notable islands/trees that have changed.
- **River Flow Figure.** A single figure that shows the time series of the discharge of the focal river over the duration of your photos. The flow should be from the study river or a nearby equivalent.
  - Please highlight the dates on this figure that correspond to the dates when the pictures were taken and another other apparently anomalous flow events.
- **Narrative.** Please write a cohesive narrative that describes how the river has changed. This narrative should use proper sentence and paragraph structure and should be approximately 3-4 pages double space pages (not including figures and if you use times new roman 12 point font with regular margins). Please address the following components.
  - River dynamics.—Analyze and discuss how the channel form and structure of the river has changed. What elements of the river have changed and how would this occur? What aspects of the watershed and focus location are linked to the observed changes? How does time of year change what the river look like?
  - Flow regime.—Analyze and discuss the flow regime of this river. How variable is flow? What is the average flow? What time of year are flows highest? What the likely major source of water to this river?
  - Discussion.—Discuss the interaction between watershed, flow, and channel dynamics. How will river dynamics likely change in the face of ongoing climate change? How do your observations match previous scientific literature? How will the observed changes impact aquatic organisms? How have human activities possibly altered river flow and channel dynamics?
  - In this narrative, reference (with properly scientific format) at least 3 scientific papers. How do your observations compare to previous studies? Include a cited references section.
  - Suggestions:
    - Effective narratives will reference specific items in the figures to support statements.
    - Distinguish between observation and interpretation:
      - E.g., Observation: “Between 1998 and 2000, the channel of the river X moved laterally, so that the bulk of the flow appeared to go down the newly formed northern channel (see arrow B in Fig 2).”
      - E.g., Interpretation: “This change in channel may be linked to the high discharge observed in 1999 (see arrow A in Fig. 3).”