Making the case for salmon: Characterizing the importance of spawning salmon in local creeks.

This activity consists of several parts – outlined below.

Schedule:

Class/Week 1 – Assign Part 1 reading.
Class/Week 2 – Discuss Part 1 reading, complete Part 2 fieldtrip activity, and assign projects.
Class/Week 3 – Part 2 project presentations, assign Part 3 reading and questions.
Class/Week 4 – Hand-in Part 3 responses.

PART 1: Pre-fieldtrip reading – salmon-derived nutrients in terrestrial ecosystems.
Read Schindler et al. 2003, and be prepared to discuss the biogeochemical concepts covered in the paper.

PART 2: Fieldtrip project - Characterizing the importance of spawning salmon in local creeks.
Fieldtrip activity and project assignment.

ASSIGNMENT PROVIDED BELOW, SUPPORTING PAPERS IN RESOURCE FOLDER

PART 3: Salmon hatchery debate writing assignment (OPTIONAL).
Take-home reading and response.

PART 2: Fieldtrip project - Characterizing the importance of spawning salmon in local creeks.

[INSTRUCTOR NOTES PROVIDED THROUGHOUT]

The situation

Geochemical data collected by the Spring 2010 UPS environmental science class showed that salmon-derived nutrients (specifically nitrogen) were present in the Clark's Creek ecosystem (Figure 1 shows plant nitrogen isotope values). You may need to refer back to Schindler et al (2003) in order to interpret these results. While we are now confident in our ability to detect the presence of salmon-derived nutrients, we don't know how these nutrients *benefit or enhance* the Clarks creek ecosystem.

The City of Puyallup has put out a RFP (request for proposals) to quantify the importance of spawning salmon in Clark's Creek due to a proposed downstream development project. As a part of the flood management plan the developers will put in a narrow culvert (salmon cannot pass). They argue that regional salmon stocks are primarily maintained by WA state and tribal hatcheries in South Puget Sound anyways, and loss of Clarks creek spawning habitat will only affect a relatively small number of fish. The City has put out a call for proposals – they want to understand if/how/why salmon are important in the creek, prior to approving/rejecting the development plan.

[ACTIVITY CAN BE MODIFIED FOR ANY NORTHWEST SALMON CREEK – THE STUDENTS PRIMARILY USE THE FIELDTRIP FOR PROPOSAL 'RECONNOISCANCE', NOT ACTUAL DATA COLLECTION. THE HYPOTHETICAL SITUATION PROVIDED ABOVE (AND ATTACHED MAPS) CAN EASILY BE CHANGED]

Your task

You will quantify the importance of salmon in Clarks Creek; you will propose a plan to research and document the effects of salmon on the creek ecosystem, which you will give to the city in the form of a PowerPoint presentation (max 10 slides). Your proposal will be centered around a very specific research question – for example, you might ask the question; does skunk cabbage flower more with salmon present? Your budget is very tight – the work you propose must be able to be completed in 5 days of fieldwork (by the 2 of you). You will need to outline specifically what fieldwork you will conduct, what data will be collected and analyzed, what stats will be used, and how the data will be reported. Spend your time today at the site doing all of the necessary reconnaissance for this proposal – this means thinking hard about exactly what your plan will be, documenting the sample/measurement locations, mapping the location, etc.

Research areas (choose one variable and component)

Quantifiable variables;	Ecosystem components;
Diversity	Terrestrial understory vegetation
Trophic structure	Terrestrial canopy vegetation
Abundance	Terrestrial food web (vertebrate & invertebrate)
Reproduction	Soil biotic and abiotic variables
Growth	Aquatic primary producers
	Aquatic food web (vertebrate & invertebrate)

Sampling design tips;

- Once you have decided on a research question carefully consider how to collect data that will actually allow you address that question. For example, if you were looking at skunk cabbage reproduction (flowers) you might collect data on number of flowering plants in an area, number of flowers per plant, size of flowers, etc.
- Data should be collected in a meaningful spatial and temporal context; some variables may be influenced by distance from the creek edge, and/or time of day that samples are collected.

- Sample size! Propose a sampling design that maximizes number of samples (including replicates) that can be collected within the short timeframe of project.

Methodology; Utilize the past weeks of experience in this class to decide how/what to measure. Make use of the area we visit today – the upstream dam provides an easy comparison between sites with 'salmon present' and 'no salmon'. You will have access to all of the field and lab equipment in the ENVR105 gear closet for your proposed work.

[THE DAM AT CLARKS CREEK PROVIDES A VERY CONVENIENT REMOVAL EXPERIMENT. IF YOU ARE WORKING AT A CREEK WITHOUT A DAM; INCORPORATE A HYPOTHETICAL UPSTREAM SALMON IMPEDIMENT INTO YOUR SITE DESCRIPTION OR MAP]

[NB: THE DOWNSTREAM CULVERT (PROPOSED) AND UPSTREAM DAM (EXISTING) ARE TWO DIFFERENT STRUCTURES]

[GEAR THAT STUDENTS HAVE ACCESS TO; MEASURING TAPES, QUADRATS, PLANT/ANIMAL GUIDE BOOKS, SOIL CORERS, MACROINVERTEBRATE SAMPLING EQUIPMENT, BINOCULARS, STOPWATCHES, CALIPERS, LIGHT METERS, ETC]

Resources; The attached map, scholarly papers on importance of salmon in stream ecosystems (posted electronically; Reimchen et al. 2002, Bilby et al. 2003, Helfield and Naiman 2001, Gende et al. 2002), biogeochemical (stable isotope) data collected in Spring 2010, any web-based resources you choose to use (remember to include links).

[INCLUDE A MAP FOR YOUR CREEK, AND STABLE ISOTOPE FIGURE CAN BE RELABELED FOR YOUR CREEK]

Format; Your Powerpoint proposal (10 slides, 5 minutes) to the city needs to be informative and convincing – the layout and content are for you to decide, but suggested material includes;

background (salmon and marine-derived nutrients),
location,
sampling plan,
expected results,
discussion of importance.

This all needs to be conveyed in an aesthetically pleasing presentation –your audience is informed and interested, but not technical. Suggested graphics include;

maps (regional and local),
sampling schematic and photos,
tables of sampling specifics,
results from other similar studies.

[AFTER THE FIELDTRIP I TAKE A FEW MINUTES TO BRAINSTORM ABOUT WHAT MAKES A GOOD PROPOSAL AND PRESENTATION – WE GENERALLY END UP WITH A LIST THAT HIGHLIGHTS CLARITY, AESTHETIC APPEAL, AND NOVEL APPROACH]

[STUDENTS ACT AS THE CITY COUNCIL, AND VOTE ON WHICH PROPOSAL TO FUND. AFTERWARDS WE HAVE A FOLLOW-UP DISCUSSION ABOUT WHAT MAKES A PROPOSAL "FUNDABLE"]

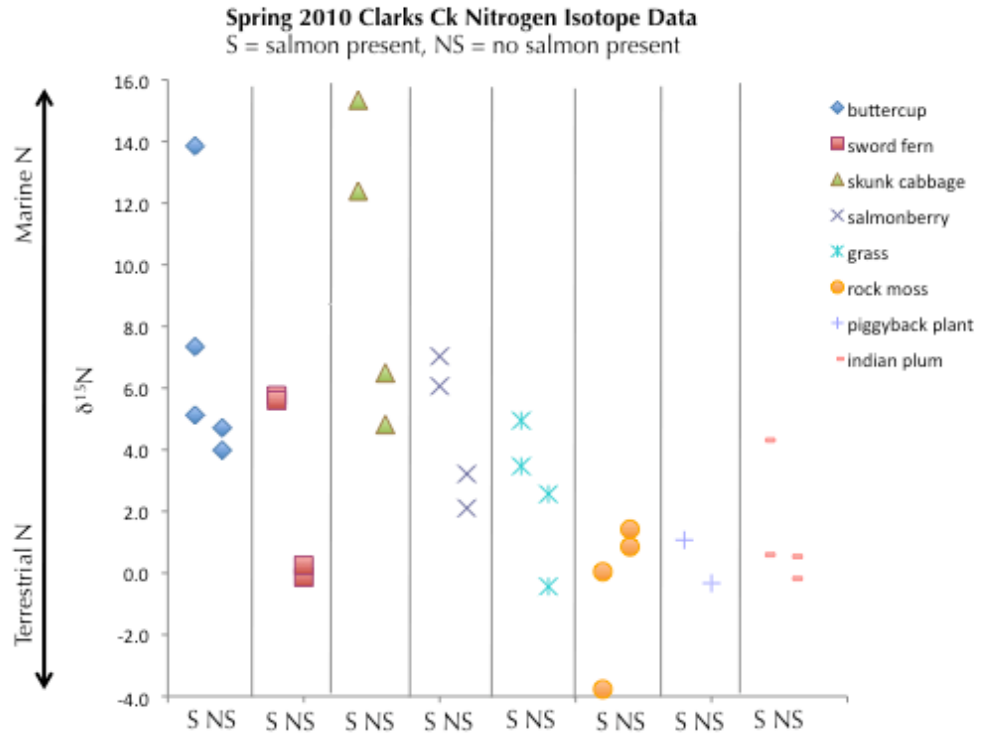

Figure 1. Nitrogen isotope values of common plants from Clarks Ck sites with salmon present (below dam), and no salmon present (above dam).