

2011 KHSA Klamath River Periphyton Pilot Study Plan February 3, 2011

PURPOSE

The benthic community is often an important element of aquatic system condition, supporting a diverse flora and fauna that plays a role in the physical, chemical, and biological response in riverine systems (Naimen et al, 2009). An important element of the benthic community is the periphyton community. Although periphyton data in the Klamath River has been collected in the basin for several years, the record is spatially and temporally incomplete.

Benthic periphyton sampling is being proposed to a) form an initial baseline sampling program to define current conditions, and b) identify the appropriate systematic approach for characterizing the periphytic algal community in the Klamath River. Proposed sites extend from Keno Dam to Turwar Gage, a single site is proposed above Iron Gate Dam (the site below Keno Dam). The proposed sampling would employ KHSA Interim Measure #15 funding in 2011. The Yurok and Karuk Tribes will coordinate with Watercourse Engineering Inc. to adopt consistent sampling methodology to efficiently collect periphyton samples based on selected river reach location.

PROJECT HYPOTHESES

Several hypotheses have been identified as part of this pilot study (largely based on sampling completed by JC Headwaters, North Coast Regional Water Quality Control Board, Watercourse, and the Yurok Tribe).

- Periphyton species composition (spp. ID and enumeration) and algal biomass changes through time at individual sites during the principal growing season (June to October) in response to physical, chemical, and biological conditions.
- Species composition (spp. ID and enumeration) and algal biomass (periphyton chlorophyll-a) vary at different river locations during the principal growing season.
- Nutrient stoichiometry (N, P, and C) in periphyton mirror ambient water nutrient concentrations.
- Percentage of N, P, C present in periphyton samples reflect riverine water quality conditions (test to be carried out in August).
- Single composite samples collected at discrete sites are representative of local reach scale conditions (to be tested with multiple transects)

STUDY DESIGN AND HYPOTHESES

The purpose of this sampling study is to compare periphyton species and algal biomass spatial and temporal trends in the Klamath River from June to October (first of month) utilizing a standard sampling method. Each sampling entity will be responsible for collecting samples consistent with the final sampling protocol (to be developed) and proper sample handling to submit samples to the laboratory for analysis. The same laboratory will be selected to process the species identification and enumeration samples (Aquatic Analysts Inc.) and the periphyton chlorophyll-a and stoichiometry samples (Aquatic Research Inc.).

Nine sites (see Table 1) have been identified for sampling periphyton in 2011. These sites may slightly change in location depending on how difficult it may be to safely and adequately collect cobbles for periphyton samples.

Table 1. Sampling sites for Klamath River Pilot Periphyton Study 2011

1. Below Keno Dam RM 233
2. Below Iron Gate Dam RM 189
3. above Shasta R (at I-5) RM 179.3
4. above Scott River RM 143.5
5. Seiad Valley (Sluice Box river access) RM 130
6. above Clear Creek RM 98.5
7. Green Riffle river access (ab salmon) RM 72
8. Weitchpec (above Trinity) RM 43.5
9. Turwar RM 6

Species identification, enumeration and periphyton chlorophyll a. samples will be collected at each site. During the month of August additional sampling will to address two special elements of the pilot study:

- 1) To further explore periphyton variation at specific locations, multiple transects will be sampled near left bank, mid-stream, and near right bank. Sample crews will perform three transects at three sites (near sites 3. ab Shasta R at I-5, 6. ab Clear Creek, and 9. Turwar) to further characterize the variability at a site and determine the appropriateness of single composite samples. Three transects will be established at each location, and a total of 9 samples at each site.
- 2) During the sample event in August an additional periphyton sample will be collected at each sampling site to be analyzed for nutrient composition (stoichiometry), namely nitrogen, phosphorus and carbon. These data will be interpreted in coordination with the KHSA baseline water quality monitoring date that will occur during the same study period throughout the same river reaches.

SAMPLING METHOD

As part of this study, the project team will develop a sampling protocol based on other periphyton sampling programs and specific conditions within the Klamath River. A draft sampling protocol is included herein as an example (see Appendix), and will be modified based on field experience and study objectives.

DATA SUMMARY AND REPORTING

Each sampling entity will generate agreed upon metrics to summarize sampling results and compile in a single report. Report will include all laboratory data; summary of sampling program, and “lessons learned;” outcome of pilot study special elements completed in August (multiple transects and stoichiometry); and a proposed sampling methodology.

Table 2. Schedule of Events for Klamath River Pilot Periphyton Study 2011.

Task	Timeline
1. Planning	April
2. Sampling	June-October
3. Reporting	December-January

References

Naiman, R.J., H. Decamps, M.E. McClain. 2005. *Riparia: Ecology, Conservation, and Management of Streamside Communities*. Elsevier Academic Press. Boston. 430 pp.

Appendix: Draft Sampling Method

A sampling plan has been developed and refined based on USGS methods for collecting periphyton samples (<http://water.usgs.gov/nawqa/protocols/OFR-93-409/alg1.html>). These methods consist of:

- a) a fixed area sample (a 1x3" microscope) slide area of substrate is to be sampled
- b) Two samples per location are collected for (a) chl a (b) species identification and enumeration - In August a third sample will be collected at each site for nutrient composition.
- c) To identify sites that had consistent characteristics we used the following criteria
 - a. Depth: 1 to 2 feet (used current meter staff)
 - b. Velocity: 1 to 2 feet per second (current meter)
 - c. Exposure: clear sky (i.e., no serious topographic shading, no riparian shading)
- d) Thus the sites are not "random" – instead the community that was probably most prevalent in the river (i.e., not the very-near shore assemblage, not the deep water assemblage) was selected

At each sampling location, a representative area is identified that has the above depth and velocity characteristics and five cobbles are selected that could readily be sampled. Care is taken to avoid collecting rocks in extremes of algal cover and physical site conditions. At each sampling location, five rocks (five rocks are sampled for the chl.a sample and five rocks are sampled for the speciation and enumeration sample, in August, five rocks for N, P and C concentration analysis) are placed in a plastic tub below the water surface to reduce loss of periphyton. The rocks are transported in the tub to a convenient sample-processing area.

Record the stream velocity, water depth, distance from the shore and the stream width for the location in which rocks will be removed for sampling on the datasheet. Also, record any general observations that may be useful such as weather conditions and/or any drastic change in stream flow that could influence the periphyton community (i.e, recent rain event that caused increase in flow or scheduled flow releases or reductions).

Rocks are sampled by selecting five rocks that were large enough to place a one-inch by three-inch (1x3) microscope slide, firmly hold microscope slide to rock (pinning down the algae), then with a brush clean off that face of the rock. This allows you to wash away all the excess material around the microscope slide, then brush your 1x3 sample into a small plastic tray or directly into the sample jar other tools that are available at the hardware store to aid in the brushing process includes: toothbrushes, scrapers, razor blades and spatulas. Then carefully pour the contents of the tray into the sample bottle. Using distilled water is recommended to help wash all of the trays contents into the sample jar. **POUR DI WATER INTO THE CHL. A PERIPHYTON SAMPLE JAR ONLY.**

Place the chl.a sample jar on ice immediately. The algae speciation and enumeration sample jar does not need to be stored on ice before it is delivered to the lab. The periphyton speciation and enumeration sample jar has Lugol's solution that preserves the sample for the cell ID and counts by the lab. The chl.a sample must be mailed overnight in a sealed cooler packed with wet or dry

ice so the lab can perform the analysis within the 48 hour hold time. Normally, both sample jars are mailed off to the lab so they receive both samples in a timely manner.

Percent cover is measured by using a grid made out of a mesh that is approximately 1.5 square feet that is laid on the river bed to determine approximate percentage of cover. This grid data is recorded on a separate datasheet. The information that is collected here helps measure the percent of the gravel covered by periphyton and can help characterize how dense the algae is from month to month. Place the mesh on the stream bed in an area adjacent to the area where the sampler removed the rocks that were scraped. Effort is made to select an area that has not been disturbed by the sampling crew but still meets the same depths and velocities of location where the rocks were collected for scraping. Place your feet on the edges of the grid so that it does not float away in the river current. With the view finder visually inspect the amount of periphyton or macrophyte in each quadrant and record the amount that is covering the stream substrate and record this information on the datasheet. The datasheet contains room for two locations to place the mesh grid to record percent cover. If the sampling location has a homogenous benthic periphyton distribution then only one location is necessary. If the benthic algae community is distributed in a more patchy heterogenous nature record percent covers in two locations to reflect the representative nature of the sampling site.

Record water quality parameters onto the datasheet with a freshly calibrated multi-parameter water quality probe and record the type of sample collected, date and time and any other pertinent observations that may be useful when reporting this data.