Biomonitoring Surveys: Summary of Data Collection

Study Reach Definition

- 150 meters length
- less than 4% gradient
  (pool-riffle and plane-bed type channels, Montgomery and Buffington 1993)
- first to fourth order streams, mostly between 5000' – 9000' elevation

Physical

At 15 5-point transects, 10 m spacing over reach:

- current velocity
- depth and width
- substrate size class
- discharge
- bank cover, angle and stability
- vegetation cover-shading (4-point densiometer readings)
- vegetation class and ranked density within riparian corridor

and

- cobble embeddedness (n=25)
- sinuosity and slope (gradient) over reach
- riffle and pool lengths
- elevation and GPS UTM coordinates

Chemical / Water Quality

- temperature
- dissolved oxygen
- turbidity
- conductivity
- alkalinity
- pH

Biological

- Algal Periphyton (3 replicates/reach)
  (Chlorophyll a densities, algal taxa in preserved archived samples)
- Organic Matter (3 replicates/reach)
  (>1.0 mm coarse fraction weighed in field, fine fraction 0.25-1.0 mm lab-processed)
- **Benthic Macroinvertebrates** (5 replicates/reach) = **Bioassessment**
  (samples taken as composites across 5 randomly selected riffle habitats)

  Analysis: Relative and absolute abundance of taxa identified to genus or species level (including midges & mites, class level only for oligochaetes and ostracods). Minimum count = 250 (average 400-500). Diagnostic metrics calculated (for multimetric analysis), and community ordination (multivariate analysis) performed to develop quantitative assessments for guiding management (reference biocriteria), defining biocriteria, TMDL listing/delisting, and BMP monitoring.

Monitoring Design Approaches

1. Site-Specific Controls for point-sources
   - up-down or above-below type approach

2. Distance Gradient from source (near-field / far-field)
   - the effect of a point-source or source area is likely to be diluted with distance downstream, and this sampling design allows the affected area to be defined

3. Trend Monitoring relative to a baseline at project or impact sites
   - before-after implementation of BMP project for example (or inside-outside project or impact area)

4. Regional Reference Sites (especially useful for non-point source monitoring)
   - study reaches identified for minimal impact and classified by stream type into comparable groupings (e.g. stream order, gradient, drainage area, elevation)
   - this then represents the best attainable biological condition for the region and forms a basis for rating the water quality status of test streams belonging to the same stream class

Quality Control – Quality Assurance Protocols

- Standard training (Standard Operating Procedures) and cross-checking of field and lab methods by principal investigator(s) and experienced crew leaders (when student participants are involved, they serve only as assistants)
- All samples are archived at SNARL
- Standard data forms are used for recording field and lab observations
- Identifications verified with taxonomic authorities for each group
- Reference collection for each taxon assembled and archived at SNARL
- Database maintained in electronic and hard-copy formats
- Methods are more rigorous than widely-used protocols (finer mesh size for collections and increased replication of samples) but otherwise comparable
- Analytical procedures utilize accepted approaches for alternative procedures (multimetric and multivariate assessments) and are conservative in rating water quality degradation in that they err on the side of making type II statistical errors in evaluations of impact (i.e. not scoring an impact when one actually exists)