



Data Interpretation Guide

At this point in the Rouge Education Project, you have conducted biological monitoring of benthic macroinvertebrates, chemical monitoring, and a physical assessment. Now it is vitally important to analyze your results. Too often, people jump to drawing conclusions without adequate consideration of the data. A key part of analysis is to examine all of your field research data sets (chemical, benthic, physical) individually and collectively and develop findings statements.

Findings are statements that help you summarize key points observed from your data. You are looking for trends or patterns, or lack thereof. Examples of findings statements after monitoring and inventorying four sites are:

- Bacteria levels exceeded water quality standards for swimming at Site C.
- Nitrate levels increased from Site A downstream to Site C on all days sampled.
- Dissolved oxygen levels were higher upstream than down.
- At all sites, temperature was within acceptable ranges for salmonids in the morning, but in the afternoon increased beyond acceptable ranges at Sites B, C and D.
- Benthic populations indicate poor water quality in the lower reaches.
- The river is lacking in streamside vegetation at all downstream Sites B, C and D.
- Sites B & C have extreme streambank erosion.
- Three gravel excavation sites are located adjacent to the stream between Sites A and D.

Asking questions of your data helps develop findings statements. For example:

- What is the climate of the region where you conducted your water sampling? How does this information factor into what you expect to find?
- If you observed any unusual color or odor changes in the water, how might these results be associated with chemical or biological data you obtained?
- If you found an overabundance of blue-green algal blooms in the body of water, does your chemical data substantiate this physical finding? Describe in a finding statement a congruence or non-congruence.
- Can you find any sources of thermal pollution in the watershed? How can influxes of warm water impact the ecology of a body of water?
- Check out the local geology of the watershed - what types of rocks and minerals do you find? How would this characteristic impact the chemical data you obtained?
- Check out the bank stabilization (vegetation) of the river or lake - do you see high amounts of soil erosion? Is this observation supported by your chemical data and physical assessment?
- What were rainfall and flow like on and before your sampling days? Consider how such factors affect chemical, biological and physical conditions.
- What percentage of stream bank vegetation did you observe? Do your results for temperature and dissolved oxygen levels make sense in light of (no pun intended) your stream bank observations?
- Did you find storm or sewer outlets? Do they directly enter the body of water you are sampling? Where are they relative to your monitoring sites?

- Are there any pulp or paper mills, meat-packing plants, food processing industries, wastewater treatment plants or other industrial sources with direct discharge into your local body of water?
- What sources of runoff can you identify in the watershed? (hint: salt from streets, organic waste, fertilizers)
- When conducting biological sampling, did you find a diverse number of aquatic insect species? How do your benthic findings relate to the dissolved oxygen levels you found?
- How do your data from sites compare over time?
- How do your data from sites compare over distance?
- How do your data from various dates compare?
- Do your results vary upstream versus downstream from a particular pollution point source?

Consider your data in light of national and state water quality standards and designated uses. For example: Do your results exceed standards? Do they do so consistently? By what degree do they exceed? In the body of water designated for full-body contact, are bacteria levels within acceptable limits?

Consider Limitations of Your Data

How consistent were you or your group in collecting samples? (E.g., did you always sample from flowing, versus still, water?) Were you a consistent distance from shore? If different groups collected benthic macroinvertebrates at each site, did each group follow the same procedures collecting and sorting benthic organisms? Did you make sure not to disturb the river bottom too much when sampling? When collecting your water sample, did you test pH, dissolved oxygen and temperature change immediately? If not, how can letting temperature change affect these test results?

How accurately did you use the equipment? E.g., were you careful to add only the minimal number of drops to get a color change on the DO titration? How clean was your bacteria filtration system?

How sensitive is the equipment you used? For example, the GREEN Low Cost Kit detects only the presence or absence of total coliform with a detection limit of 200 colonies/100 ml; it cannot tell you any more about the degree of concentration. If you use a color wheel to determine nitrates, you can detect to .1 mg/L; whereas a spectrophotometer measures to .01 mg/L.

Verify Your Data with Experts

We highly recommend you compare your findings to those of others. Comparing your watershed data to that of existing sources is important in order to: find commonalities and anomalies; ensure consistent findings; and identify any additional water quality concerns.

Questions to consider when comparing your data to that of others include:

- Do your results confirm trends?
- Do they differ, and if so, to what extent?
- Could anomalies be attributable to errors in methods?

Retesting is a sound idea whether or not your confidence in your data is high, in order to confirm your initial results and add to your data set.

There are likely multiple sources of existing water quality data for you to access and review. Below is a list of potential repositories. Not only will you be able to compare and verify your results, but you will also be able to expand your knowledge of watershed conditions based on this additional information. Furthermore, you will build your network of community contacts that can help you in further analyzing your findings statements.

Watershed Organizations: Contact your local watershed organization to determine if they have water quality data and research information about your local watershed. Some organizations may have this information in newsletters or reports, or on websites.

Government: Federal, state, and local governments may have water quality information on your watershed that you could obtain through newsletters, reports, website, or by talking with an employee in the government office. The primary federal agency to check with would be the Environmental Protection Agency. At the state level, contact agencies such as the departments of natural resources, environment or ecology. At the county and city levels, check for departments of public works or environment. Also be sure to call the county Cooperative Extension office.

Internet: Surf Your Watershed <http://www.epa.gov/surf> - (identify your local watershed organization for past water quality data collected and posted for the public)
 EPA Directory of Monitoring Programs <http://yosemite.epa.gov/water/volmon.nsf>
 EPA National Maps, Factsheets and Data <http://www.epa.gov/iwi/national/>
 National Monitoring Data <http://water.nr.state.ky.us/ww/vm.html>
 EPA The Quality of Our Nation's Water 305(b) Report <http://www.epa.gov/305b/>
 USGS Water Information Sources <http://ga.water.usgs.gov/edu/links.html>
 Conservation Technology Information Center Know Your Watershed
<http://www.ctic.purdue.edu/KYW/wspartners/statewscontacts.html>

Don't forget to check your local newspaper for information about water quality concerns within your watershed



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