Module 14 Monitoring Stream Surface Waters

Introduction

This session will be held at a selected stream site with local organizers and sponsors. Participants will participate in a four-hour, hands-on session that focuses on the key concepts presented the previous three days. In diverse groups of three to five individuals you will complete "all" aspects of the *Streamwalk* activity (physical pp. 237-246; the 9 indicators pp. 202-217; and biological pp. 249-256), share your skills, and learn new skills in this monitoring exercise.

Each group will be provided with equipment and testing kits in order to complete their tasks. Please return all this equipment in a clean and orderly condition. Groups are encouraged to do their best work, as if the data collected at this site was going to be used by their community to make water quality decisions. In fact, each group will turn in their completed data sheets to organizers so their data can be compared with future groups. So please write or print very legibly on your data sheets.

In this module participants will: *Review safety considerations for the field component of the short-course, complete a three-part stream walk activity, and turn in their completed field data sheets to organizers for evaluation.*

In-depth Session - Stream Segment

The *Streamwalk* program was originally developed by EPA Region 10 in 1989. In 1991 the Idaho Water Resources Research Institute, at the University of Idaho, implemented the Idaho *Streamwalk* program. Further adaptations of *Streamwalk* were incorporated into the publication *Fishing: A Lifetime Sport* and its companion *Instructor Lesson Plans* available from the Idaho Department of Fish and Game. Components of all three programs have been included in this guide and are utilized in this activity. The guide developers would like to acknowledge these resources.

It is very important that groups complete the monitoring activities in the sequence suggested so that by "discovery learning" they can understand their impacts and opportunities. Therefore, groups need to first do the physical habitat assessment, then do the measurement of 9 surface water quality indicators, and then complete the biological (the "bugs") component of *Streamwalk*.

Streams selected for demonstration monitoring were chosen because of their accessibility and convenience to your training site. Because all streams vary, use caution in directly applying all things you learn at this site to streams in your own area. Circumstances surrounding each stream are unique and should be approached as such.

When you are monitoring take in the entire picture of your site. Some groups so focus on the **doing** part of this activity that the **being** part of the shared learning experience gets lost in the shuffle. When we are relating stream water quality to our environment each monitor will have an individual perspective, collectively the groups perspective will more likely come closer to the actual circumstances that surround the stream being studied.

Groups are encouraged to compare and contrast results between segments. Pondering the similarities and differences up and down stream can help participants become co-facilitators of learning. And remember this can be a lot of fun!

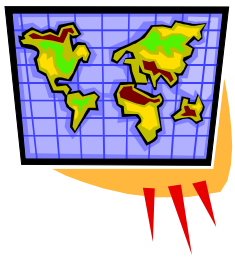
Safety in monitoring and observing local water resources

Before you start your monitoring effort be sure to review the safety and access issues identified in Module 13. Addressing the following key points will insure a safe and effective volunteer monitoring experience:

- Prepare for the elements.
- Protect yourself and your equipment, use safety in sampling and monitoring efforts.
- Read sampling kit instructions and follow safety guidelines.
- Consider the safety of the environment and remember to "Leave no trace!"

Collecting data and evaluating water resource characteristics

It is important that each group of 3-5 participants has photocopies of the Streamwalk Data Sheets (pp. 158-167), pencils, and a clipboard. In addition, each group at minimum should have a measuring tape (100 meters, 50 yards, etc.), yard or meter stick, and a 5-gallon bucket to carry monitoring equipment. See Module 10 (p. 222) for a more complete list of equipment.

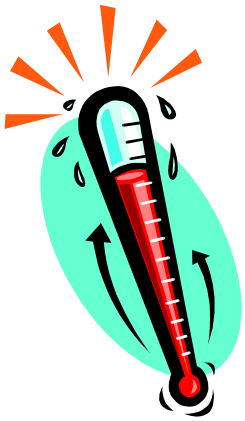


Physical Habitat Assessment Activity

It is helpful, before you start the official monitoring activity, to walk the length of the entire reach that your group is assigned to gain a sense of the entire plant, animal, aquatic, soil, and human community. By using and reviewing the USGS 7.5 minute map for this site, group members can also speculate on the various aspects of water quality. Group members are encouraged to use all their talents and skills in assessing the site. In many cases group members have brought specialized equipment or references for measuring or assessing to use during this activity. For example participants have brought field guides for plants, insects, fish, and geology, minnow traps, flow meters, etc. The best water monitoring data has been gathered by groups with diverse interests, skills, and backgrounds.

Directions for completing the physical aspect of the *Streamwalk* are found in Module 11 (pp. 238-246). Addressing the following key points will insure each volunteer of a positive physical habitat monitoring experience:

- Make visual field observations at your reach of the environmental conditions that are noteworthy. Note the evidence of sediment, nutrients, toxic substances, or organic wastes.
- Record the air temperature, time of day, wind speed, and weather conditions.
- Each group needs to collect data at two transects along the reach of the stream they are assigned.
- Stream evaluations need to be made in the stream and along both sides of the entire stream reach each group is assigned. Group members need to determine the entire riparian area for the reach to accomplish this task.
- Data points, photos, and sketches enhance the data collected.



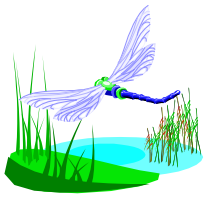
9 Surface Water Indicators (including chemistry) Activity

The next activity should take place at the two transects identified during the physical habitat assessment. Using the provided testing equipment and kits measure for each of the 9 parameters that are surface water quality indicators (temperature, dissolved oxygen [DO], pH, BOD, fecal coliform, phosphates, nitrates, turbidity, and total solids). In addition record the results of other tests that short-course organizers have selected to monitor with your group. For example, alkalinity, copper, lead, sulfur, total dissolved solids (conductivity), hardness, etc.

Consider impacts your collection strategy and testing methods will have on the stream and your data. What should be done first and why?

Directions for completing the surface water indicators (chemistry) of the *Streamwalk* are found in Module 9 (pp. 202-217). Addressing the following key points will insure each volunteer of a positive surface water indicator monitoring experience:

- Try to use as many different types of test kits for each of the parameters you are asked to measure. Which of the four types did you like the best?
- Think about the four key indicators of surface water quality: sediment, nutrients, toxic substances, and organic wastes. How should you sample and what are you measuring?
- Read and follow directions for each test and dispose of waste properly. Record your collected data clearly and legibly on *Streamwalk* data collection sheets.
- Use Appendix C to determine Q values in calculating the Water Quality Index.



Biomonitoring (aquatic macroinvertebrates) Activity

Using the supporting equipment and resources short-course organizers provide, collect biological samples according to the information presented in this guide. Directions for completing the biomonitoring activity of the *Streamwalk* are found in Module 12 (pp. 249-256). Addressing the following key points will insure each volunteer of a positive surface water indicator monitoring experience:

- Bottom dwelling organisms (benthic macroinvertebrates) that can be seen with the naked eye are important parts of stream and river ecosystems and are a measure of water quality. To calculate the water quality, samples need to be collected and compared to a water quality index.
- These organisms are sensitive to physical and chemical changes in their habitat and may live in the water resource studied for a year or more. So if none are found at a specific site the question to consider is what is the reason they are not present? Don't forget that perdition by other organisms, fish, wildlife or even humans can play a role in population numbers.
- Before concluding that a specific site has high or low water quality consider the time of year, seasonal weather patterns, and other natural conditions (fire, drought, flood, etc.) that might affect the organisms in the stream.
- Return all live specimens to the stream you sampled and remember to "leave no trace."
- Use pages 164-166 to determine the Organic Pollution Index, Sediment Pollution Index, and the Clean Water Index in calculating the Stream Condition Index.

Discussion Points

- What is the width of the riparian area of the stream reach that you measured and how did you determine it?
- At which transect did your group begin to measure the 9 surface water quality indicators? How might this impact data collection and why is it important to consider this?
- What type of impact has your group had on the biology of this stream segment or reach? Did you pick up garbage or leave it? Did you return biological samples to the stream? How long will it take the stream to recover from your presence and what implications does that have for other "like" disturbances?
- While you were doing these *Streamwalk* activities what other things did you sense about the stream, yourself, the group dynamics, or the experience?
- What other signs or biological conditions might we measure to determine the quality of the water in a pond, lake, or stream?

Major Points to Remember

- Be safe in your monitoring effort.
- Collect and record data accurately.
- Do the physical habitat assessment first, then do the 9 surface water indicators, and finally complete the streamwalk with the biomonitoring activity.
- Clean up your messes and return all equipment and resources. Remember to "Leave no trace!"

Journal and Evaluation

When you get home pull out your journal and review the notes you took. Think about what you have learned and how you will apply it. On the back of the last page make out a time line or calendar to reach your goals. This will take the issues you have studied to action for yourself, your family, and your community. If you have not already done so, use the journal to complete your post-test and return it to short-course organizers.

Links and References

Gahl, J. and J. Scanlin (1993) Fishing A Lifetime Sport, Idaho Department of Fish and Game, 600 S. Walnut, P.O. Box 25, Boise Idaho 83707.

Gahl, J. and J. Scanlin (1998) Fishing A Lifetime Sport: Instructor Lesson Plans, Idaho Department of Fish and Game, 600 S. Walnut, P.O. Box 25, Boise Idaho 83707.

Hunt, M., Mayio, A., Brossman, M., and A. Markowitz (1996) The Volunteer Monitor's Guide to Quality Assurance Project Plans, U.S. Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds 4503F, EPA 841-B-96-003, September 1996.

Mitchell, M. and W. Stapp (2000) Field Manual for Water Quality Monitoring: An Environmental Education Program for Schools, 12th Edition, Kendall/Hunt Publishing Co. Debuque, Iowa.

Rabe, F. and J. White (1992) Idaho Streamwalk: A program for people interested in learning more about their streams and rivers, Idaho Water Resources Research Institute, University of Idaho, Moscow, ID.

Water Quality Monitoring: Technical Guide Book (1999) The Oregon Plan for Salmon and Watersheds, Version 2.0, Oregon Department of Environmental Quality, Salem, OR.

Short-course Presenters

The field day is an exciting and fun learning opportunity. Short-course developers found it helpful to check out the site before the start of the short-course. Collecting water samples on-site ahead of time, noting vegetation types, and understanding present use (livestock, recreation, water-shed protection, etc.) also helped in facilitating the actual field day. The teaching site should have easy access for the type of learners in your group, preferably a rest area nearby, and have all safety issues identified and hazards noted or flagged.

On the field day, organizers should arrive at least an hour before participants. Pre-marking or flagging the reaches (50 or 100 meters; 50 yards, etc.) that groups will study saves time. Organizers should also have equipment ready to go for the number of task groups that will be monitoring the stream. We found providing 5-gallon buckets helpful for organizing the materials and resources for each group and can be used for each segment of the *Streamwalk*.

Since individuals will arrive early to late, we found it helpful to assign them to task groups as they showed up at the site. Task groups of 3-5 worked best. Assigning facilitators to each group allows organizers to float between groups to ask critical thinking and problem solving questions. It also allows for monitoring of safety issues that might emerge. This may require organizers to give 2-4 safety and orientation to equipment overviews to each group, but in the end does not frustrate the early arrivers who want to get going.

Facilitators can be recruited from local conservation, irrigation, or park districts. We found the state Departments of Environmental Quality in Washington and Oregon more than willing to help in this role. Often they would help in co-teaching the short-course and then showed up on Saturday to help with the field experience. In Idaho the state Parks Department and the Coeur d'Alene Tribe responded similarly.

It is vital that each learning group have a facilitator to help the participants have a good learning experience. It is their job to ask questions…not necessarily to answer them related to the stream site and conditions. Example questions might include

- So what is happening here?
- So how wide is the riparian area?
- What would be a good protocol to assess this stream?
- What would be the best way to measure depth using the equipment we have?
- Why do we have to do two transects and choose them randomly?
- The cliff is too steep. Can't we just go down and measure where it is easy to get in?

The short-course uses the discovery education approach and facilitators will defeat the joys of the learning opportunity by just "telling" the answer. The point is to explain to each of the participants what a protocol is and not which specific protocol to use. We found over six different protocols for the same activity during the pilot with each of the advocates (federal, state, or local) insistent that theirs was the best! Short-course participants just need to gain an awareness that there are protocols. The facilitator's role is to coax, challenge, and encourage discovery learning among task group members. Also to challenge each participant to use critical thinking, their gifts, and talents to address the issues raised. Sometimes this requires organizers and facilitators to request task groups to go back and check if they have missed the obvious on a particular reach. For example:

> At *a Yakima, Washington stream site all the reaches had a park on the east side of the stream and a housing development on the west side. There were three bridges across the stream that enabled the task groups to look at both sides. Unfortunately one group only focused on the east side of the stream and had defined a rather short riparian area. On the west side there was a road that ended in a cul-de-sac with three dry wells. These dry wells had been linked by pipe and were drained into a ditch that went directly into the stream that we were studying. Participants had missed this. When they were sent back across the bridge to the west side to "look again" by organizers they discovered a number of other concerns and totally redefined their riparian area.*

By giving each task group materials to do only the physical habitat assessment it requires the group to come back for the next set of equipment. In many cases the work will be incomplete and this process allows the organizers to check for understanding. Mini-debriefs should be held between each of the three parts of the streamwalk activity.

The physical habitat assessment takes about two hours with the debrief, the measurement of the 9 indicators at the two transects about 1 hour, and the bio-monitoring about an hour. In the pilot the *Streamwalk* was conducted in the morning from 8:30-12:30 and then a debrief and Part 5 was presented over lunch in the form of a roundtable discussion with the entire group. In the afternoon either Module 15 or 16 should be presented depending upon the needs identified by the short-course organizers.