Module 10 Water Quality Testing Kits

Introduction

What type of tests should I use to best look at the water chemistry or other indicators of quality in a stream, pond, or lake? Where do I obtain water-monitoring equipment and how much does it cost? How do I use the equipment and keep it calibrated? The purpose of this module is to identify the types of equipment recommended for monitoring surface water quality, identify sources of equipment, and discuss how it might be best used in a community.

Water monitoring programs can test for a wide range of water quality indicators. Selection of the equipment to use should be based on a number of factors. These factors include how the collected data will contribute to understanding of water quality and watershed health, the concerns and issues in a particular watershed community, and the ease with which tests can be performed and afforded.

It is important to recognize that data collected using monitoring equipment can suggest that specific water quality issues need to be addressed. When brought to regulatory agencies, municipal water suppliers or the scientific community the result of a monitoring effort can then be further investigated using more sophisticated equipment using agreed upon protocols. In fact, several regulatory agencies in the region will not accept data produced by monitors using test kits.

In this module participants will: *Review recommended components of water monitoring test kits (temperature, dissolved oxygen, pH, BOD, fecal bacteria, phosphates, nitrates, turbidity, and total solids); sources of test kits, and where kits might be found in a local community.*

Recommended water chemistry test kit components

The suggested field equipment package for monitoring water quality should include:

- Kits that test for dissolved oxygen, pH, BOD, fecal bacteria, phosphates, nitrates, turbidity, and total solids;
- Air/water thermometers;
- One 5 gallon bucket/pail; an additional (preferably collapsible) spent chemical container;
- Distilled/clean water; biodegradable soap, eye goggles; latex gloves, blotter towels for spills; garbage sacks; measuring tape(s); paper cups; string or twine; meter/ yard stick (preferably with conversion tables on them); one role of colored flagging tape;
- 2-4 plastic ice trays; 1 plastic sorting tray (app. 2" x 8" x 14"); 2 magnifying sheets or devices; 1 gravy baster; 1 squirt bottle; 2 tweezers; all for counting/collecting insects and examining other collected plant and animal species.
- 2-4 one liter plastic collection containers with lids that can be used to collect samples.
- Instruction guides with selected protocols; reporting and recording forms and tools;
- Kit inventory and replacement instruction sheet;
- Approved first aid kit and eye wash bottle;
- Waterproof container, carry-all w/lid.

The total estimated cost for these field kit components is $175.00. It does not include components for the biological or physical assessment. This suggested list can be pulled together using local and selected resources identified in this module. Selection should be based on the purposes identified for a specific monitoring program.

Once kits are put together it is extremely important that a complete list (inventory) of components be made and an individual assigned to maintain the kit for an agreed upon period of time. The inventory should include the sources and prices of the selected equipment. That individual should be responsible for ordering replacements.

An example inventory (inspection form) is provided in this guide that was developed for the Alaska Cooperative Extension Water Quality Test Kit.

ALASKA COOPERATIVE EXTENSION

WATER QUALITY TEST KIT INSPECTION FORM

Kit #: _____ **Team:** _____ **Date:** _____

Component	✔ In Kit	Condition	Batch/ Lot #	Expire Date	Date Replaced	New Exp Date	Calib Date
Data Sheet Rubber Gloves 2.5 gal. Bucket w/line Distilled Water/Wash Btl Waste Containers (2) 1 ml Pipets (2) Glass Stir Rod Tide Tables MSD Sheets							
Borger Color System Booklet							
Air Thermometer (red) Water Thermometer (grn)							
Secchi Disk & Line 2 Turbidity Columns Standard Turbidity Reagent (60 ml) Turbidity Chart							
5 ml Test Tubes w/Caps (2) Octet pH Comparators (2) pH Indicator Solution							
650 ml Salinity Cylinder Hydrometer in Container Hydrometer Instructions							
Water Sample Btls (3) Manganous Sulfate Solution (30 ml) Alkaline Potassium Iodide Azide (30 ml) Sulfuric Acid (30 ml) Titration Vial w/Cap (20 ml) Titration Plunger w/Extension Tip Sodium Thiosulfate (60 ml) Starch Indicator Soln (30 ml)							
4 in 1 Hanna Meter Hanna Instruction Book							

ALASKA COOPERATIVE EXTENSION

WATER QUALITY TEST KIT INSPECTION FORM

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Kit #: _____ Team: _____ Date: _____

Component	✔ In Kit	Condition	Batch/ Lot #	Expire Date	Date Replaced	New Exp Date	Calib Date
Nitrate Nitrogen Kit 5 ml Test Tubes w/Caps (2) Octa-Viewer and Slide 1 Box Nitrate #1 Tablets 1 Box Nitrate #2 Tablets LaMotte Instructions Safety Card MSD Sheets							
Phosphate Test Kit 10 ml Test Tubes x/Caps (4) Octect Comparator Ampule of Distilled Water Phosphate Acid Reagent (60 ml) Phosphate Reducing Reagent (5 g) 1 ml Pipet 0.1 gram Measuring Spoon LaMotte Instructions Safety Card MSD Sheets							
Coliscan Bacteria Kit Plastic Petri Dishes (3) Coliscan Easygel (3 btls) 1 ml Pipet 10 ml Pipet Coliscan Data Sheet Micrology Laboratories Instruction Sheet							

Selected Commercial Sources of Water Chemistry Test Kits

Field water chemistry testing equipment is sold by several companies and nonprofit organizations. Select testing kits that are simple to understand, convenient, reusable where possible, and that provide accurate results for the parameters you will be testing.

Most sources provide basic and advanced analytical systems and technical support for water quality testing, with solutions for the field. Their products are in use around the world, simplifying analysis with reliable, accurate results. Good portable water testing laboratories and test kits are based on proven protocols and scientific methods, and include: reliable instrumentation, prepared reagents in sealed, single-test packaging, field-oriented labware, easy to follow step-by-step instructions, often with rugged, compartmentalized carrying cases. Test kits and test strips are available for over 120 parameters.

The following companies and organizations carry a number of water quality testing kits. Each has a catalog or web site with more specific information. This list is not exhaustive, and no endorsement is implied for particular companies or products. Due to constant changes in web site URLs, we suggest individuals use a search engine to find other sources of water monitoring kits and equipment.

Acorn Naturalists

17821 East 17th St., #103, PO Box 2423, Tustin, CA 92781-2423 Telephone: 800-422-8886 (US and Canada) or 714-838-4888 (US and all international); Fax: 800-452-2802 (US and Canada) or 714-838-5869; E-mail: EMailAcorn@aol.com Web site: http://www.acornnaturalists.com/index.htm

Ben Meadows Company

P.O. Box 20200, Canton, GA 30114; Telephone: 800-241-6401;
Fax: 800-628-2068; E-mail: mail@benmeadows.com
Web site: http://www.benmeadows.com/

CHEMetrics, Inc.

Route 28, Calverton, VA 20138; Telephone: 800-356-3072 or 540-788-9026; FAX: 1-540-788-4856;
E-mail: orders@chemetrics.com
Web site: http://www.chemetrics.com/

Cole-Parmer Instrument Company

625 East Bunker Court, Vernon Hills, Illinois 60061;
Telephone: 800-323-4340; Fax: 847-247-2929;
E-mail: info@coleparmer.com
Web site: http://www.coleparmer.com/

GREEN (Global Rivers Environmental Education Network)

Earth Force, 1908 Mount Vernon, Second Floor, Alexandria, VA 22301; Telephone: 703-299-9400; Fax: 703-299-9485; Web site: http://www.earthforce.org/green/

HACH Company

P.O. Box 389, Loveland, CO 80539;
Telephone: 800-227-4224; Fax: 970-669-2932;
Web site: http://www.hach.com/

LaMotte Company

P.O. Box 329, 802 Washington Ave., Chestertown , Maryland 21620; Telephone: 800-344-3100 (within the U.S.A.) or 410-778-3100; Fax: 410-778-6394
Web site: http://www.lamotte.com/

Volunteer Monitoring Kit Notes

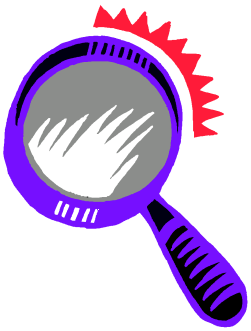
- The Global Rivers Environmental Education Network (GREEN) provides opportunities for young people to understand, improve, and sustain watersheds in their community. GREEN empowers young people to learn more about water quality within their watershed and use their findings to create solutions.

  This award-winning program is aimed at teaching middle and high school-aged youth essential academic skills including critical thinking, teamwork, problem solving, and decision making. GREEN teaches young people how to assess watershed health with the proper tools and then undertake projects to improve environmental quality based on their findings. Water monitoring equipment, resource and action guides, and a network of support are just some of the key elements GREEN provides its participants.

  As part of our network of support, GREEN offers online a Hands-On Center where findings can be entered and monitors can learn more about the background behind chemical water monitoring tests.

- Ben Meadows and the La Motte Company have assembled several kits to be used in cooperation with the GLOBE (Global Learning and Observation to Benefit the Environment) program. These kits contain industry standards for environmental research and are offered at a reduced cost. Components may also be purchased individually. The GLOBE Program is a hands-on environmental science and education program that unites students, educators, and scientists from around the world in studying the global environment. The goals of the GLOBE Program are: to enhance the environmental awareness of individuals worldwide; to increase scientific understanding of the Earth; and to improve student achievement in science and mathematics.

- Hach has toll-free help with product questions, on-site sales and service, and instrument service and reagent reordering programs. Training services are offered by the Hach Technical Training Center in Loveland, Colorado, USA, and locally through many of their distributors. Hach's web based H_2O University is a water quality resource for both students and teachers. It includes information about testing water, factors that affect water quality, important safety information, Teaching Water Science newsletter online, posters, product information, and more.



Where kits might be found in a local community

Water quality monitoring is already happening in your community. Local municipal water districts regularly test for drinking water quality. Solid waste units and sewage treatment plants test treated waters before they are released into other water bodies. Most schools have curriculums that include water quality monitoring components. Tribal, federal, and state agencies also have testing equipment. Soil and water conservation districts, irrigation districts, newly formed watershed councils, private environmental consulting firms, and nonprofit organizations may also have testing equipment. Many have equipment and test kits that sit in storage for parts of the year.

- Before purchasing water quality monitoring kits or equipment check to find out if they are available locally for free or to rent. Offer to replace supplies that you use and/or give back volunteer time in other monitoring efforts if businesses, agencies, schools, or organizations will let you use their equipment. This can save volunteer monitoring groups time and money. Also local experts can provide insight on proper equipment use, resources, and ideas to help with a monitoring effort.

- Examples of programs or projects that have water monitoring equipment include:

  Project WET (http://www.montana.edu/wwwwet/);
  Adopt-A-Watershed (http://www.adopt-a-watershed.org/);
  The **Blue Thumb Project** (http://www.awwa.org/bluethumb/bt97.htm);
  Kids in the Creek Stream Study (http://www.bpa.gov/corporate/kr/ed/kidsinthecreek/materials.htm)

  The Master Watershed Steward Program;
  Water Watch (http://www.waterwatch.org/);
  Beach Watchers or **Groundwater Guardians** (http://www.groundwaterfoundation.org/Guardian/overview.htm).

- Washington State University has the Howard Hughes Equipment Loan Program and the University of Idaho has science equipment to loan through the GLOBE program.

The **WSU Howard Hughes Equipment Loan Program's** office hours are from 8:00 a.m. to 12 noon, Monday through Friday. You may also contact Dr. John Paznokas, Director of the WSU Howard Hughes Program at 509-335-6822; Fax: 509-335-3184; or e-mail: paznokas@wsu.edu. Dr. Paznokas is Associate Professor Microbiology, Director SLIC/SMEEC; Equipment Loan Program, College of Sciences at Washington State University, Pullman, WA 99164-4236.
Web site: http://www.sci.wsu.edu/bio/equiploa.html

The WSU Equipment Loan Program has a significant inventory of equipment commonly used for basic and enhanced experimentation in the high school biology laboratory, available throughout the year on a first come, first serve basis. For more specific information please call Marge Druffel in the Equipment Loan Program Office at 509-335-8528 or you may e-mail her at marged@wsu.edu.

The GLOBE Program is coordinated by Dr. Michael Odell and Mr. Tim Ewers at the University of Idaho. Dr. Odell, along with Dr. Teresa Kennedy, is Associate Professor for Elementary/Secondary Science Education at the University of Idaho. He can be reached at Room 410, College of Education Building, University of Idaho 83844-3082, Phone: 208-885-6786; E-mail: mirodell@uidaho.edu.

Local schools and community groups can join the GLOBE Program by contacting the Idaho GLOBE Franchise at 208-885-7536. The GLOBE hydrology investigation resource is excellent and provides a great resource for community monitoring groups and teachers.
Web site: http://www.globe.gov/sda-bin/wt/ghp/tg+L(en)+UP(hydrology/Contents

Discussion Points

- Where might you find state, tribal, or federal water quality standards to measure and why is this important to know when selecting water-monitoring equipment?
- Why might it be more important to use basic water quality monitoring equipment rather than more advanced equipment in a volunteer monitoring program?
- Who in your community could help with equipment calibration and/or maintenance of equipment to assure accuracy in sampling.
- Why is storage of water chemistry test kits important and what measures need to be taken after each use?
- Who is responsible for replacing supplies for each kit and why is this important?

Major Points to Remember

- Match your water chemistry testing equipment with the purpose of your monitoring program.
- The suggested field equipment package for monitoring water quality should include: kits that test for dissolved oxygen, pH, BOD, fecal bacteria, phosphates, nitrates, turbidity and total solids; air/water thermometers; safety equipment, instruction guides with selected protocols; reporting and recording forms and tools; package inventory and replacement instruction sheet; approved first aid kit; and waterproof container, carry-all w/lid.
- Field water testing equipment is sold by several companies. Select testing kits that are simple to understand, convenient, reusable where possible, and provide accurate results for the parameters you will be testing.
- Several organizations, institutions, or agencies may already have water quality monitoring equipment in your community. Before purchasing a new set check to find out if it is available for check out and offer to replace supplies that you use.

Journal and Evaluation

Ask each participant to list in their journal the 10 most important items to include in a field water chemistry-monitoring package. For each item listed have them speculate if they could obtain it in their county today and where it might be located.

Short-course Presenters

Two activities support this module, the first is to have participants use different types of equipment to measure pH and the second is to display the contents of a typical water monitoring test kit.

Activity one: To support this discussion on measuring indicators of water quality, have participants use a variety of methods to measure the same parameter (e.g., pH) and debate the merits of each type. Use test strips, an electronic meter, a Hach kit (colorimetric), and LaMotte kit (titrimetric) on participant collected water samples and record and compare the data. This can be used later in the water chemistry discussion. This is an extension of the demonstration presented in Module 9.

Activity two: The second activity is to display as many different types of equipment as available for the other 8 parameters and the contents of one of the test kits participants will be using in the field portion of the program. Be sure and emphasize the safety equipment available and how to return the equipment in proper condition.