

Chapter 7

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Level 1 Volunteer Water Quality Monitoring Training Notebook

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**IF YOU DISCOVER A SERIOUS
WATER POLLUTION PROBLEM
OR A FISH KILL, PLEASE
REPORT IT IMMEDIATELY TO:**

**MISSOURI DEPARTMENT OF
NATURAL RESOURCES (DNR)
EMERGENCY RESPONSE UNIT**

(573) 634-2436

--24 hours a day--

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All other Stream Team Staff may be reached using the
STREAM TEAM 800 NUMBER (Voicemail): (800) 781-1989

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Missouri Department of Conservation
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www.mostreamteam.org
streamteam@mdc.mo.gov or streamteam@dnr.mo.gov



MISSOURI DEPARTMENT OF NATURAL RESOURCES

REGIONAL AND SATELLITE OFFICES

Kansas City Area

- **Kansas City Regional Office**
500 NE Colbern Rd.
Lee's Summit, MO 64086-4710
816-251-0700 FAX: 816-622-7044
- **Truman Lake Satellite Office**
Harry S Truman State Park
28761 State Park Road West
Warsaw, MO 65355
660-438-3039 FAX: 660-438-5271

St. Louis Area

- **St. Louis Regional Office**
7545 S. Lindbergh, Ste 210
St. Louis, MO 63125
314-416-2960 FAX: 314-416-2970
- **Jefferson County Satellite Office**
Eastern District Parks Office
Hwy. 61
Festus, MO 63028
636-931-5200 FAX: 636-931-5204
- **Lincoln County Satellite Office**
Cuivre River State Park
678 State Rt. 147
Troy, MO 63379
636-528-4779 FAX: 636-528-8362

Southeast Area

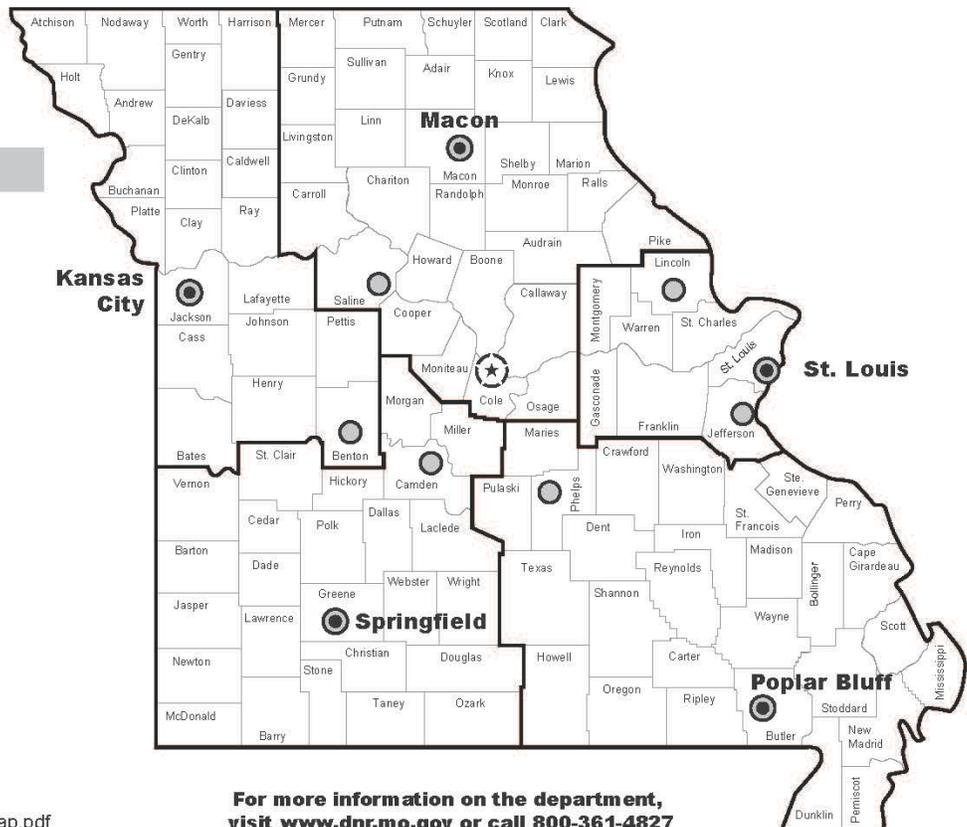
- **Southeast Regional Office**
2155 North Westwood Blvd.
Poplar Bluff, MO 63901
573-840-9750 FAX: 573-840-9754
- **Missouri Geological Survey**
111 Fairgrounds Rd.
Rolla, MO 65401
573-368-3625 FAX: 573-368-3912

Northeast Area

- **Northeast Regional Office**
1709 Prospect Drive
Macon, MO 63552-2602
660-385-8000 FAX: 660-385-8090
- **Arrow Rock Satellite Office**
101 7th St.
Arrow Rock, MO 65320
660-837-3130
- ★ **Department Central Offices**
P.O. Box 176
Jefferson City, MO 65102-0176
573-751-3443
dnr.mo.gov/shared/map-jeffcity.htm

Southwest Area

- **Southwest Regional Office**
2040 W. Woodland
Springfield, MO 65807-5912
417-891-4300 FAX: 417-891-4399
- **Lake of the Ozarks Satellite Office**
5570 Osage Beach Parkway
Osage Beach, MO 65065
Mailing Address: 2040 W. Woodland
Springfield, MO 65807-5912
573-348-2442 FAX: 573-348-2568

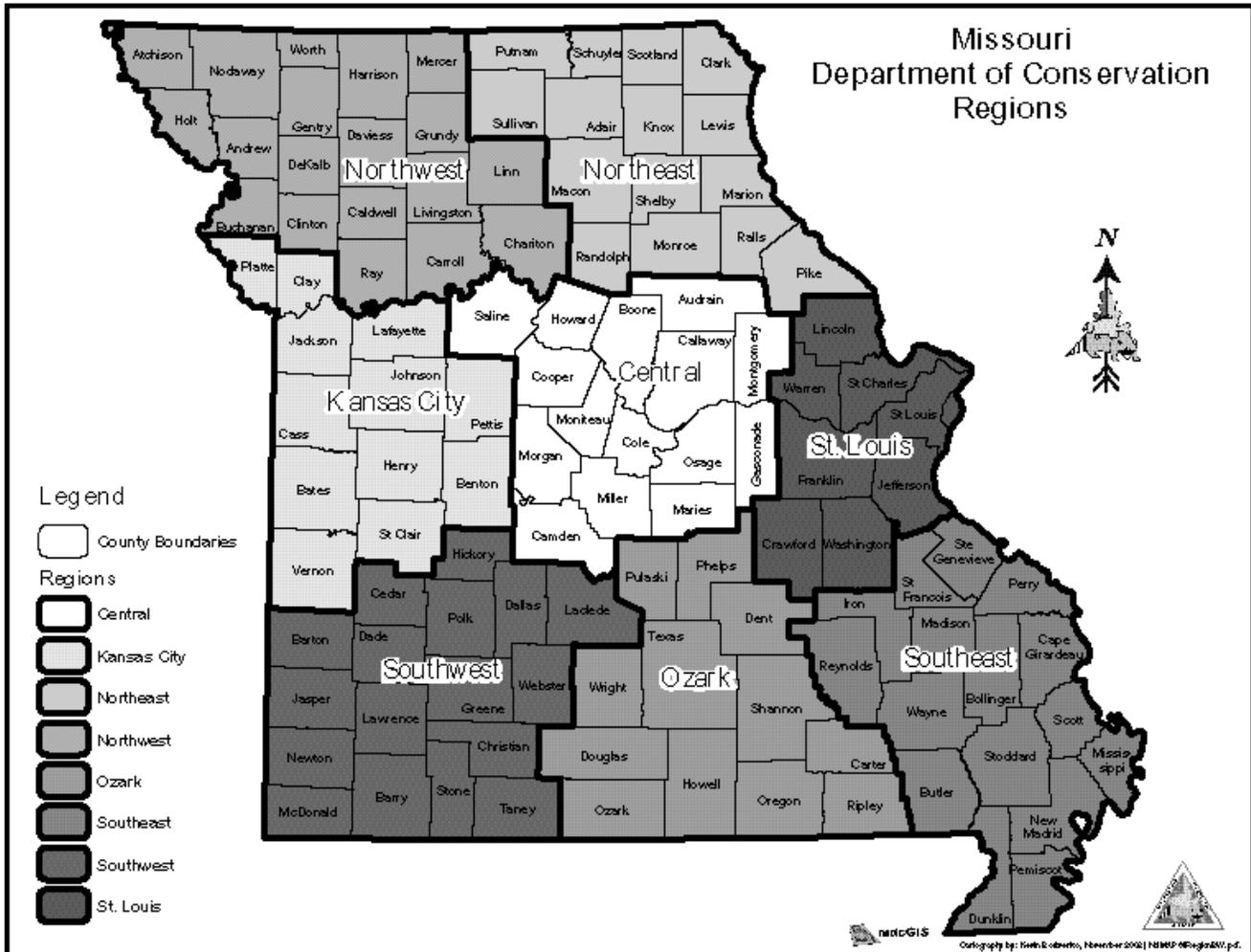


**For more information on the department,
visit www.dnr.mo.gov or call 800-361-4827**



Missouri Department of Conservation

Regional Offices



Northwest Regional Office
 701 James McCarthy Drive
 St. Joseph, MO 64507
 (816) 271-3100
 Fax: (816) 271-3107

Kansas City Regional Office
 12405 SE Ranson Road
 Lee's Summit, MO 64082
 (816) 622-0900
 Fax: (816) 622-0205

Southwest Regional Office
 2630 N. Mayfair
 Springfield, MO 65803
 (417) 895-6880
 Fax: (417) 895-6910

St. Louis Regional Office/August A. Busch Memorial Conservation Area
 2360 Hwy D
 St. Charles, MO 63304
 (636) 441-4554
 Fax: (636) 926-9125

Northeast Regional Office
 3500 S. Baltimore
 Kirksville, MO 63501
 (660) 785-2424
 Fax: (660) 785-2553

Central Regional Office and Conservation Research Center
 3500 E. Gans Rd
 Columbia, MO 65201
 (573) 815-7900
 Fax: (573) 815-7902

Ozark Regional Office
 551 Joe Jones Blvd
 West Plains, MO 65775
 (417) 256-7161
 Fax: (417) 256-0429

Southeast Regional Office
 2302 County Park Drive
 Cape Girardeau, MO 63701
 (573) 290-5730
 Fax: (573) 290-5736

• Dissolved Oxygen Test Kit

- 0.2–4 and 1–20 mg/L O₂
- Mod. OX-2P
- # 1469-00

-
- To ensure accurate results, read carefully before proceeding.

WARNING

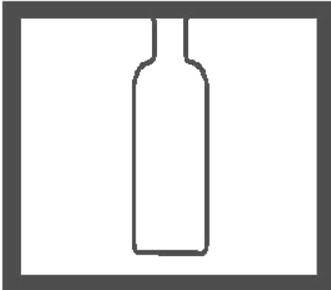
Handling chemical samples, standards, and reagents can be dangerous. Review the Material Safety Data Sheets before handling any chemicals.



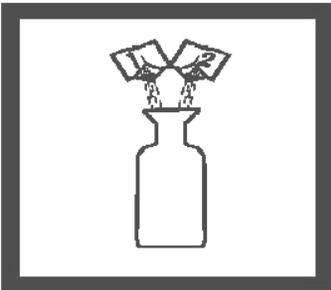
Measuring Hints and General Test Information

- Wash all labware between tests. Contamination may alter test results. Clean with a non-abrasive detergent or a solvent such as isopropyl alcohol. Use a soft cloth for wiping or drying. Do not use paper towels or tissue on plastic tubes as this may scratch them. Rinse with clean water (preferably deionized water).
- When titrating, count each drop of titrant. Hold the dropper vertically. Swirl the mixing bottle after each drop is added.
- Use clippers to open powder pillows.
- Hach strongly recommends that, for optimum test results, reagent accuracy be checked with each new lot of reagents. Use the standard solution included in this kit or listed in the *OPTIONAL REAGENTS AND EQUIPMENT* section. Follow the instructions included with each standard solution.

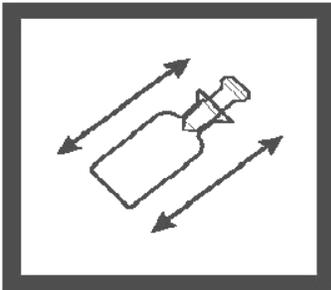
• **High Range Test (1–20 mg/L)**



1. Fill the Dissolved Oxygen bottle (round bottle with glass stopper) with sample water. Avoid turbulence and bubbles in the sample while filling.



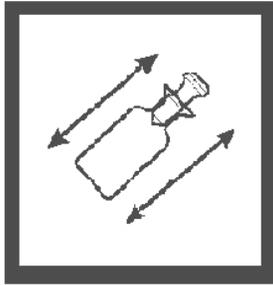
2. Add the contents of one Dissolved Oxygen 1 Reagent Powder Pillow and one Dissolved Oxygen 2 Powder Pillow. Stopper the bottle carefully to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.



3. Shake the bottle vigorously to mix. Flocculant (floc) precipitate will form. Brownish-orange precipitate indicates oxygen is present.



4. Wait for floc to settle below the white line on the Dissolved Oxygen bottle. Floc will not settle if high concentrations of chloride are present. In this case wait 4-5 minutes before proceeding.



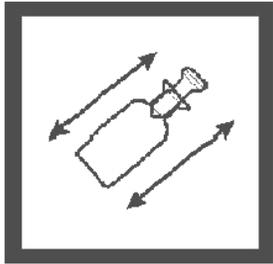
5. Shake the bottle vigorously again.



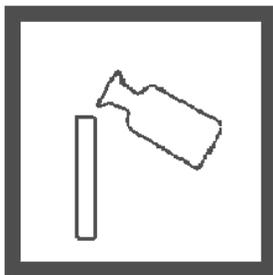
6. Wait for floc to settle halfway. Floc will not settle if high concentrations of chloride are present. In this case, wait 4-5 minutes before proceeding.



7. Remove the stopper and add the contents of one Dissolved Oxygen 3 Reagent Powder Pillow. Stopper the bottle carefully.



8. Shake the bottle vigorously to mix. Floc will dissolve and the sample will turn yellow if oxygen is present.



9. Fill plastic tube (to the top) with prepared sample.

Note: Save the rest of the prepared sample for the Low Range Test, if necessary.



10. Pour the contents of the tube into the square mixing bottle.



11. Add Sodium Thiosulfate Standard Solution one drop at a time to the mixing bottle. Count each drop. Swirl to mix after each drop. Add drops until the sample becomes colorless.



12. The total number of drops of titrant used in Step 11 equals the total mg/L Dissolved Oxygen.

$$\text{mg/L Dissolved Oxygen} = \# \text{ of drops}$$

REPLACEMENTS

Description	Unit	Cat. No.
Bottle, BOD, 60-mL w/ 30 mL mark, glass w/ stopper	each.....	1909-02
Bottle, square, glass.....	6/pkg.....	439-06
Clippers for medium powder pillows.....	each.....	968-00
Dissolved Oxygen 1 Reagent Powder Pillows.....	100/pkg.....	981-99
Dissolved Oxygen 2 Reagent Powder Pillows.....	100/pkg.....	982-99
Dissolved Oxygen 3 Reagent Powder Pillows.....	100/pkg.....	987-99
Instruction Card, OX-2P Test Kit.....	each.....	1469-88
Measuring Tube, plastic, 5.83 mL.....	each.....	438-00
Sodium Thiosulfate Standard Solution, stabilized, 0.0109 N	100 mL MDB*.....	24089-32



NITRATE NITROGEN KIT

OCTA-SLIDE 2, 0.25-10.0 ppm

CODE 3110-01

QUANTITY	CONTENTS	CODE
2 x 60 mL	*Mixed Acid Reagent	*V-6278-H
5g	*Nitrate Reducing Reagent	*V-6279-C
1	Dispenser Cap	0692
1	Spoon, 0.1g, plastic	0699
2	Test Tubes, 2.5-10 mL, plastic, w/caps	0106
1	Bottle, Water Sample	0688
1	Nitrate-N Octa-Slide 2 Bar, 0.25-10.0 ppm	3109-01
1	Octa-Slide 2 Viewer	1101

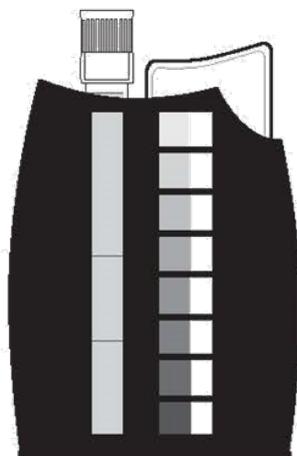
*WARNING: Reagents marked with an * are considered to be potential health hazards. To view or print a Material Safety Data Sheet (MSDS) for these reagents go to www.lamotte.com. To obtain a printed copy, contact LaMotte by e-mail, phone or fax.

To order individual reagents or test kit components, use the specified code number.

NOTES:

- Nitrite interferes at all levels.
- For best results keep all reagents around 23°C.
- Place Dispenser Cap (0692) on *Mixed Acid Reagent (V-6278-H). Save this cap for refill reagents.

USE OF THE OCTA-SLIDE 2 VIEWER



The Octa-Slide 2 Viewer should be held so non-direct light enters through the back of the Viewer. Insert the reacted sample into the top of the Viewer. Slide the Octa-Slide 2 Bar into the Viewer and match the color of the reaction to the color standards.

WARNING! This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision

PROCEDURE

1. Fill sample bottle (0688) with sample water.
2. Fill one test tube (0106) to the 2.5 mL line with water from the sample bottle.
3. Dilute to 5 mL line with *Mixed Acid Reagent (V-6278). Cap and mix. Wait 2 minutes.
4. Use the 0.1g spoon (0699) to add one level measure (avoid any excess) of *Nitrate Reducing Reagent (V-6279). Cap and invert gently 60 times in one minute. Wait 10 minutes.
5. Insert Nitrate-N Octa-Slide 2 Bar (3109-01) into Octa-Slide 2 Viewer (1101).
6. Insert test tube into Nitrate-N Comparator (3109).
7. Match sample color to a color standard. Record as ppm Nitrate as Nitrate Nitrogen ($\text{NO}_3\text{-N}$). To convert to ppm Nitrate (NO_3), multiply by 4.4.

NOTE: Thoroughly clean and rinse test tubes after each use.

LaMOTTE COMPANY

Helping People Solve Analytical Challenges®

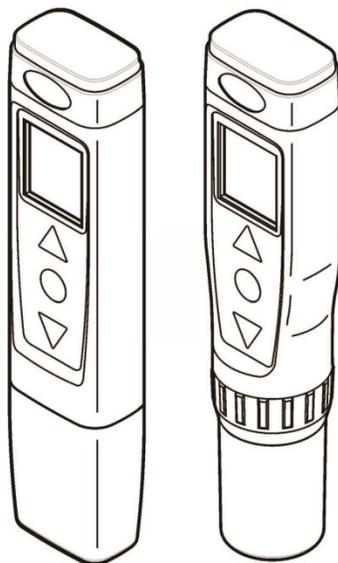
PO Box 329 • Chestertown • Maryland • 21620 • USA
800-344-3100 • 410-778-3100 (Outside U.S.A.) • Fax 410-778-6394
Visit us on the web at www.lamotte.com

63110-01 3/12



Pocket Pro™, Pro™ + pH

Basic User Manual
Manuel d'utilisation de base
Manual básico del usuario
Manual Básico do Usuário
 基本用户手册
 基本取扱説明書
 기본 사용 설명서
 คู่มือผู้ใช้เบื้องต้น



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Pocket Pro, Pro+ pH

Additional information is available on the manufacturer's website.

Warning

⚠ *Explosion hazard. Incorrect battery installation can cause the release of explosive gases. Be sure that the batteries are of the same approved chemical type and are inserted in the correct orientation. Do not mix new and used batteries.*

⚠ *Fire hazard. Battery substitution is not permitted. Use only alkaline batteries.*

Caution

⚠ *Chemical exposure hazard. Refer to the current material safety data sheets (MSDS) for safety protocols.*

Introduction

This pH tester is for use in general water samples.

Keys

	Push to stop changes to the display.
	Push to do a calibration. Push and hold until "SEI" flashes to go to the settings menu. Then, push to scroll through settings.
	To exit, push and hold. Note: Power cannot be set to off while in settings or calibration mode.

2 Calibration

First time use: put the sensor in sample or tap water for several minutes before calibration.

For 1 or 2-point calibration: push and hold after 1 or 2 standards.

3 Measurement

For best results, use the sensor cap.

4 Storage

Refer to the expanded user manual on the manufacturer's website.

Settings

Unit	Temperature unit shown
bUFr	Buffers for pH calibration
AOFF	Automatic off
ACAL	pH calibration reminder
rSEt	Set to the factory settings and default values

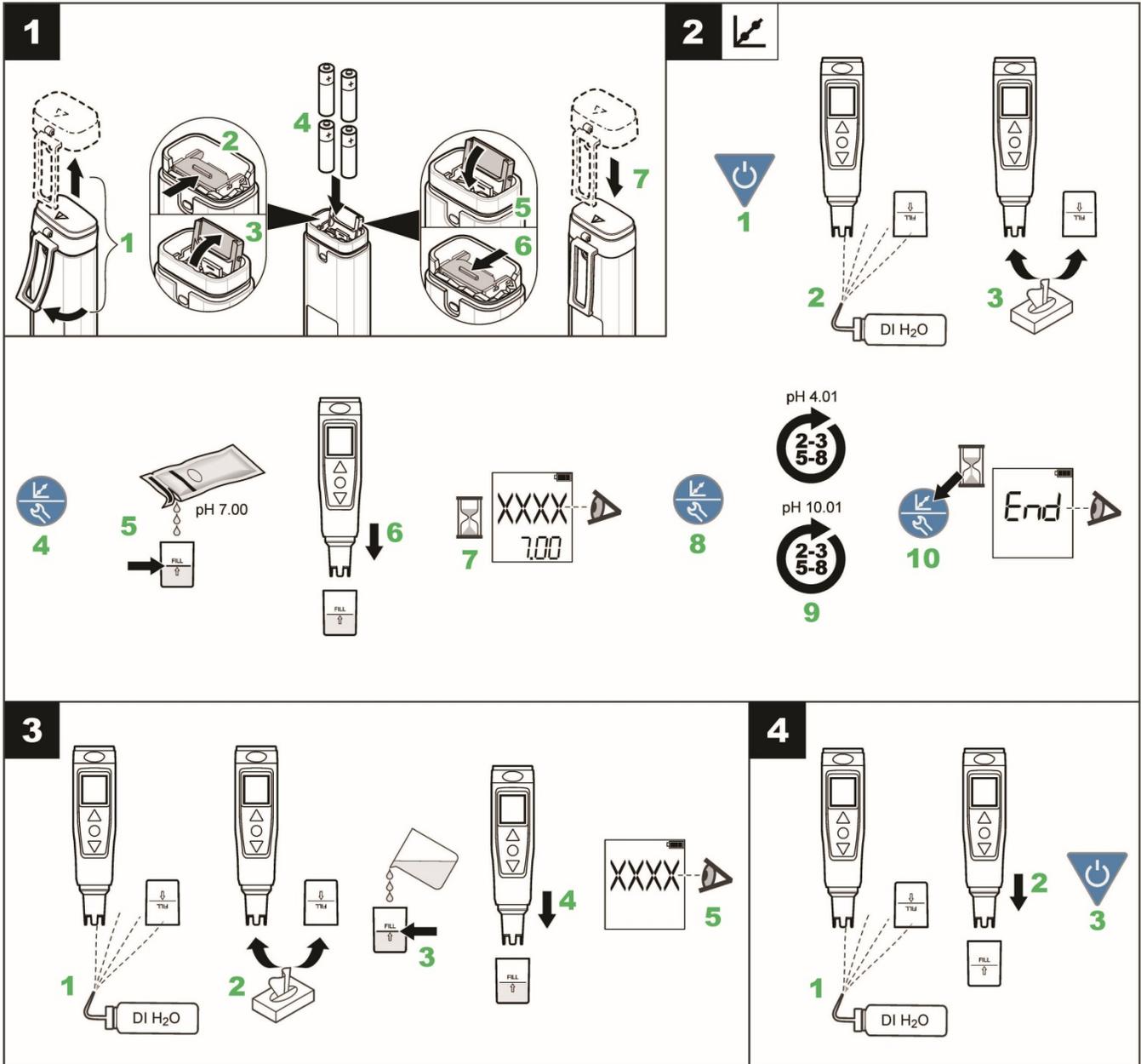
Warranty

6 months for Pocket Pro tester, 1 year for Pocket Pro+ tester body and 6 months for sensor for manufacturing defects only. Damage from use is not covered.



www.hach.com

Hach Pocket Pro pH Instructions Cont.





Pocket Pro™ Cond_{LR}, Cond_{HR}

Basic User Manual

Manuel d'utilisation de base

Manual básico del usuario

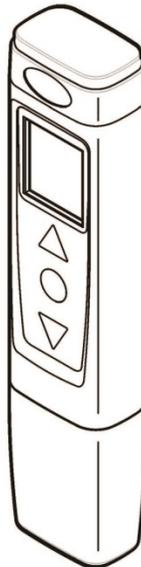
Manual Básico do Usuário

基本用户手册

基本取扱説明書

기본 사용 설명서

คู่มือผู้ใช้เบื้องต้น



www.hach.com

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Printed in China

09/2013, Edition 1

Pocket Pro Cond

Additional information is available on the manufacturer's website.

Warning

⚠ **Explosion hazard.** Incorrect battery installation can cause the release of explosive gases. Be sure that the batteries are of the same approved chemical type and are inserted in the correct orientation. Do not mix new and used batteries.

⚠ **Fire hazard.** Battery substitution is not permitted. Use only alkaline batteries.

Caution

⚠ **Chemical exposure hazard.** Refer to the current material safety data sheets (MSDS) for safety protocols.

Introduction

This conductivity tester is for use in general water samples.

Keys

	Push to stop changes to the display.
	Push to do a calibration. Push and hold until "SEt" flashes to go to the settings menu. Then, push to scroll through settings.
	To exit, push and hold. Note: Power cannot be set to off while in settings or calibration mode.

2 Calibration

For Cond_{LR}: for 2-point calibration, do calibration two times with different standards.

3 Measurement

For best results, use the sensor cap.

Caution

⚠ **Air bubbles under the sensor tip can cause slow stabilization or error in measurement.** Gently shake the tester until bubbles are removed.

4 Storage

Refer to the expanded user manual on the manufacturer's website.

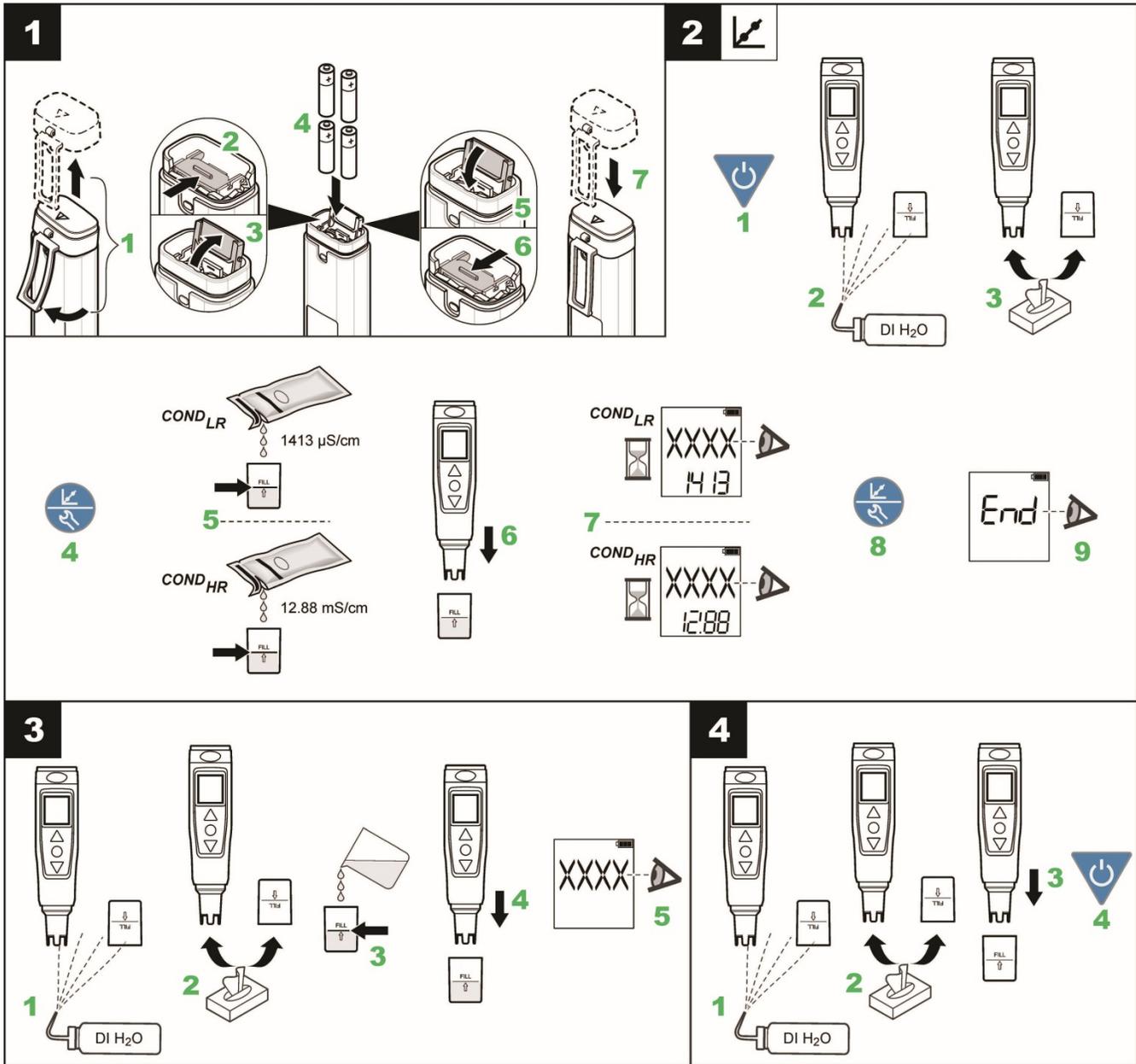
Settings

Unit	Temperature unit shown
trEF	Correction reference temperature
tC	Temperature compensation factor (linear)
AOFF	Automatic off
rSEt	Set to the factory settings and default values

Warranty

1 year for manufacturing defects only.
Damage from use is not covered.

Hach Pocket Pro Conductivity Instructions Cont.



Water Quality Monitoring Procedures

What	When	Where
Watershed mapping	Once every 2-5 years	Whole watershed
Biological monitoring	Minimum 2x/year (Max. 4x/year)	Monitoring site
Visual survey of site	Minimum 2x/year	Monitoring site
Chemical monitoring	Minimum 4x/year	Monitoring site
Flow measurement	Each time you monitor	Monitoring site

1. Obtain maps of your stream's watershed. Ideally, make a **watershed map** once every 5 years. If your watershed is being developed or is rapidly changing, then do this more frequently. Determine land use and locate point and nonpoint sources of pollution. You do not submit your watershed maps to the Program, but if you see a change in the watershed that you feel has affected your sampling results, be sure to make a note of that on all your data sheets.
2. Conduct **biological monitoring** two to four times per year (not more than four because you can negatively affect the site). One monitoring trip should be in later winter/early spring and the other in late summer/early autumn. Collect three net sets at each site and report the results for each set. Each net set should be collected from a different part of the riffle, or a different type of habitat such as a leaf pack, root wad, root mats or old woody debris. Be sure to sample the same habitats each time you sample that site and make a note on your data sheet (e.g., two riffle sets and one root mat). Use the *Macroinvertebrate Data Sheet* for this activity.
3. Conduct a **visual survey** of your stream at each of your sampling sites twice per year, once with foliage present and once with foliage absent. Use the *Visual Survey Data Sheet* for this activity.
4. Conduct **chemical monitoring** at each site four times per year (ideally once per season) and more often as needed. Chemical parameters to be tested include air and water temperature, dissolved oxygen, pH, conductivity and nitrate. Use the *Water Chemistry Data Sheet* for reporting the activity.
5. Measure **stream discharge** every time you conduct chemical or biological monitoring and report on the *Stream Discharge Data Sheet*. Do not attempt to measure discharge if you cannot safely wade across the stream, e.g. a large river like the Missouri River or a small stream during high flow. If flow is too low or too high to measure, indicate that on the data sheet.
6. **Maintain a file with copies of all of your field notes and data sheets.** Submit your data to the program **after** you have made copies for your own files.

Send Data to:

Attn: Volunteer Water Quality Coordinator
 Missouri Department of Natural Resources
 Water Protection Program/WQMA Section
 P.O. Box 176
 Jefferson City, MO 65102-0176

7. If you discover a serious water pollution problem or a fish kill, please report it **immediately** to:

Missouri Department of Natural Resources (DNR) – Jefferson City
 Emergency Response Unit, available 24 hours a day
 (573) 634-2436

Care of Standard Solutions

- Cap all solutions tightly. Evaporation can change the value of the standards and affect all subsequent readings. Do not re-use calibration solutions.
- To prevent contamination, meters should be rinsed with tap or deionized water before calibration procedures. Excess water from the rinsing process can also contaminate a solution by diluting it. Gently pat the bottom of the meter dry before inserting it in the standards.
- Do not store calibration solutions or any chemicals where they may be exposed to extreme heat or cold, such as a car or garage. Extreme temperatures can denature or compromise chemicals. It is best to store them in a temperature-controlled, dry environment.

Disposal of Standard Solutions & Chemical Reagents

Safety Data Sheets can be found on the Stream Team Website: www.moststreamteam.org/datasheets.asp

- All reagents should be placed in a container and disposed of after the monitoring event. Do not dispose of reagents by dumping them in the stream. *Most*, but not all, liquid standards and reagents can be safely disposed of by pouring them down a sink drain while flushing with ample cold water.
- The test waste resulting from your DO test may, also, be poured down the drain. **However, the nitrate reducing reagent in the nitrate kit contains cadmium.** This element is present in very small quantities, but it is a heavy metal and is listed as hazardous material. It is recommended that the solution resulting from the nitrate tests be kept separate from other VWQM waste for disposal in an appropriate facility. **Pour the nitrate waste in a cubitainer supplied by the Program or in a heavy plastic container, such as a well-rinsed bleach or antifreeze container. Do NOT put it in a milk jug or soda/water bottle, or leave out to evaporate.** Label the container as "Stream Team Nitrate Waste." If you do not, the lab at DNR's Environmental Services Program (where waste returned to the VWQM Program is sent for processing) must treat the waste as if it contains a variety of chemicals, which is both time-consuming and expensive.
- *Please DO NOT put any waste materials in your waste container other than those generated from chemical tests performed by volunteer monitors.* Adding other unrelated wastes (e.g., petroleum products) can be dangerous and will increase the time and handling costs for staff at DNR's lab in order to properly dispose of the waste.
- For those volunteers living in an area with household hazardous waste pick-ups, you may use that program for reagent disposal. Many schools and colleges have systems set up for the disposal of chemicals.
- Please return expired nitrate reducing reagent and nitrate waste to the VWQM Program:
 - A. Drop off nitrate waste at any Introductory, Level 1, or Level 2 workshop.
 - B. Nitrate waste may be turned in to Department of Natural Resources or Missouri Department of Conservation regional offices. *BE SURE to indicate to those at the front desk that you are with the Stream Team Program.* Again, be sure to label any waste reagents as directed above. You may also return VWQM equipment you no longer use at the regional offices.
 - C. You may also request a pre-paid shipping label to return your nitrate waste or unused VWQM equipment. To request a shipping label, contact Stream Team staff at Streamteam@mdc.mo.gov or at 1-800-781-1989.

Sampling Procedures

1. *Do not collect chemical or invertebrate samples from disturbed areas.* Do not collect chemical samples downstream from someone kicking up the sediment to monitor for invertebrates. Likewise, do not collect invertebrates from a riffle that others have just used to wade across the stream.
2. *Collect macroinvertebrate net sets by progressing in an upstream direction from one net set to the next.* Sample areas with different current velocities, substrate types or varying amounts of aquatic plants or woody debris. This helps ensure that several different types of microhabitats are assessed. Collect each net set from an undisturbed portion of the riffle.
3. *Always use clean sample containers and equipment.* Containers and equipment can be washed using non-phosphate soap and rinsing with tap water or deionized water (can be purchased from most grocery stores). Allow to air dry or dry with paper towels. Follow this procedure after each monitoring event.
4. *Rinse sample containers three times with sample water to be tested.* This ensures an unaltered sample by rinsing out any residues that may be present from a previous sampling event.
5. *Face upstream (into the stream flow) when collecting samples for chemical testing.* This prevents substances stirred up by your activities in the stream from altering the sample. The goal is to measure the impacts of land uses throughout the watershed, not the impact caused by the sampler wading into the stream.
6. *Collect samples upstream from bridge structures when possible.* Bridges can have a variety of impacts on a stream, such as trash from passing vehicles. Also, petroleum or metal compounds from cars, or salt put on roads in the winter, can wash off bridges and affect monitoring results. Collecting samples upstream of the bridge gives more accurate data regarding watershed impacts as opposed to bridge-related impacts.
7. *Collect samples in the same manner and in the same place each time you monitor.* One of the uses of the data is to evaluate trends over time. This requires data that can be compared from one sampling event to another. For instance, volunteers frequently ask if dissolved oxygen samples should be collected above or below a riffle, as this could impact the amount of oxygen present. The more critical factor is to collect the samples in the same place each sampling event and document the site information to ensure consistency.
8. *Collect water samples just below the surface of the water.* Surface samples may not always be most representative of what is present in the water column. This is, however, the easiest way to collect a sample and helps ensure uniform sampling methods throughout the program. When comparing data from several volunteers within one watershed, uniform methods are essential if the comparisons are to be meaningful.
9. *When sampling at point source discharges, samples should be collected at least 100 yards to ¼ mile downstream of the facilities outfall.* Discharge permits contain allowances for mixing zones below discharge pipes. This is an area where some parameters may exceed the permit limits due to the fact that they have not yet been evenly diluted by the stream flow. For your safety and to obtain accurate information, samples should be collected below the mixing zone.
10. *Follow all sampling procedures recommended by the manufacturer of the sampling equipment.*

**Volunteer Water Quality Monitoring
FIELD CHECKLIST**

- _____ *Volunteer Water Quality Monitoring* training notebook (Intro, Level 1, etc.)
- _____ Appropriate footwear (boots, waders, athletic shoes)

Biological Monitoring

- _____ *Macroinvertebrate Data Sheet*
- _____ Kick net (500-micron mesh)
- _____ Forceps
- _____ Hand lens or magnifying glass
- _____ Identification resources (Blue Bug Card, Key to River Life)
- _____ *Paper/pen/pencil
- _____ *Clipboard or other writing surface
- _____ *White ice cube trays and/or large white tray
- _____ *Squirt bottle(s) Sample vials and *70% ethyl alcohol for sample preservation (optional)

Visual Survey and Chemical Monitoring

- _____ *Visual Survey Data Sheet*
- _____ *Water Chemistry Data Sheet*
- _____ Thermometer
- _____ Nitrate test kit
- _____ Dissolved oxygen test kit
- _____ Conductivity meter (calibrated within 12 hours of field use)
- _____ pH meter (calibrated within 12 hours of field use)
- _____ Turbidity Tube
- _____ Other test kits (such as ammonia or phosphate, if available)
- _____ Vinyl or disposable gloves
- _____ Eye protection
- _____ Cubitainer for waste
- _____ *Spare batteries for meters
- _____ *Stop watch or timer
- _____ *Litter bag
- _____ *Topographic map and/or county highway map of area to be monitored
- _____ *Clipboard or other writing surface
- _____ *Paper/pen/pencil

Flow Measurements

- _____ *Stream Discharge Data Sheet*
- _____ Float ball (wiffle golf ball)
- _____ 100-foot long Measuring tape (marked in tenths of a foot)
- _____ *Depth measurement rod (dowel rod marked in tenths of a foot)
- _____ *Clipboard or other writing surface
- _____ *Paper/pen/pencil
- _____ *Metal pins or sticks
- _____ *Stopwatch or timer

*Not provided by the program. Volunteer provides.

Weather/Rainfall Information

When we ask for rainfall data on Volunteer Water Quality Monitoring data sheets, we want the rainfall in that area the 7 days preceding your sampling event. There are various ways to obtain this information:

Possible sources on Internet:

waterdata.usgs.gov/mo/nwis/current/?type=precip&group_key=county_cd

www.intellicast.com

www.weather.com

www.wunderground.com

www.noaa.gov

www.kait8.coAoril.m

www.kfvs12.com

NOTE: For some weather sites you may have to provide the zip code of the town closest to your sampling site. If possible, use the zip code of a town in the same watershed as the stream you are sampling!

If you know the town's name, you can get the zip code from: www.usps.gov

Other possible sources:

Local airports

Television or radio stations

Local newspapers

Local college or university

Use a rain gauge

EQUIPMENT SOURCES

Missouri Volunteer Water Quality Monitoring Program

June 2017

NOTE: Items marked with an asterisk () on the next 2 pages indicate the basic equipment provided to all volunteers who have completed both the Introduction and Level 1 VWQM workshops. Prices cannot be kept current.*

Companies

LaMotte Company	Aquatic Research Instruments	Capitol Scientific, Inc.	Agathos Laboratories	Lawrence Enterprises, Inc.	Ben Meadows
802 Washington Ave	620 Wellington Place	2500 Rutland Drive	900 Lafayette St. Suite 201	PO Box 344	401 S. Wright Road
Chesterfield, MD 21620	Hope, ID 83836	Austin, TX 78758	Santa Clara, CA 95050	Seal Harbor, ME 04675	Janesville, WI 56546
1-800-344-3100	1-800-320-9482	1-800-580-1167	1-888-699-0445	207-276-5746	1-800-241-6401
Fax: 410-778-6394	Fax: 208- 264-5263	Fax: 512-836-1338	Fax: 408-246-5227	Fax: 207- 276-4058	Fax: 800-628-2068
www.lamotte.com	www.aquaticresearch.com	www.capitolscientific.com	www.agathoslabs.com	www.watermonitoringequip.com	www.benmeadows.com

Chemical Analysis

Item	Company	Catalog No.	Description	Price
*Dissolved Oxygen	Hach Company	1469-00	Test Kit, OX-2P Dissolved Oxygen	\$95.17
*Conductivity	Hach Company	95314-00	Pocket Pro Conductivity Tester	\$80.87
*pH	Hach Company	95310-00	Pocket Pro pH Tester	\$83.06
*Thermometer	Hach Company	26763-00	Pocket Celsius Thermometer (-5° to 45°C)	\$35.43
*Nitrate	LaMotte Company	3110-01	Nitrate Kit, NCR	\$87.89
Ammonia	Hach Company	58700-40	Pocket Colorimeter Ammonia II	\$534.43
Phosphorus	Hach Company	58700-06	Pocket Colorimeter Phosphate II	\$515.85
Hardness	Hach Company	1454-01	Test Kit 5-EP Hardness	\$35.83
Alkalinity	Hach Company	24443-01	Test Kit AL-AP Alkalinity	\$54.72

Replacement Reagents

Item	Company	Catalog No.	Description	Price
Dissolved Oxygen	Hach Company	981-99	DO 1 Reagent Powder Pillows pk/100	\$22.39
	Hach Company	982-99	DO 2 Reagent Powder Pillows pk/100	\$22.39
	Hach Company	987-99	DO 3 Reagent Powder Pillows pk/100	\$22.39
	Hach Company	24089-32	Sodium Thiosulfate STD 0.0109N	\$18.69
Conductivity Standard pH	Hach Company	LZW9710.99	Sodium Chloride 1413 μ s/cm, 250 mL	\$23.81
	Hach Company	22835-49	Yellow pH 7.0 Buffer Solution, 500 mL	\$14.83
	Hach Company	22836-49	Blue pH 10.0 Buffer Solution, 500 mL	\$14.83
Nitrate	LaMotte Company	V-6278-H	Mixed Acid Reagent, 60 mL	\$12.71
	LaMotte Company	V-6279-C	Nitrate Reducing Reagent, 5g	\$12.03

Additional Equipment and Resources Used by the Volunteer Water Quality Monitoring Program

Item	Company	Price
* Turbidity/Transparency Tube – NTU – 60 cm length	Lawrence Enterprises, Inc.	\$39.95
Tape Measure (100 ft, FEET & 10ths, not inches)	Ben Meadows (Cat. #122386)	\$18.30
* Kick Net (without poles; 1 square meter; 500-micron mesh; hemmed sides to accept 1 1/8"-diameter poles; reinforced bottom seam)	LaMotte Company (Cat. #123660 Ben Meadows)	\$66.15
	OR Aquatic Research Instruments (500-micron mesh, flat)	\$65.00
Long-Handled Nets (EPA Standard "D" Net; 500-micron mesh)	Aquatic Research Instrument	\$129.00
Scintillation Vial Support Racks (24 place, 30 mm)	Capitol Scientific, Inc. (Cat. #S7300)	\$58.43/ea; \$146.08/case of 4

The white pans used for sorting invertebrates can be purchased from photographic equipment suppliers. Ask for "development pans."

Aquatic Entomology. The Fishermen's and Ecologist's Illustrated Guide to Insects and Their Relatives. 1998. W. Patrick McCafferty. Jones and Bartlett Publishers, 40 Tall Pine Drive, Sudbury, MA 01776. Tel: 1-800-832-0034. \$250.95 List Price. \$170.79 from Barnes and Noble.

The Streamkeeper's Field Guide. 1999. Murdoch, T. and Martha Cheo with Kate O'Laughlin. The Adopt-A-Stream Foundation, 600 128th St. SE, Everett, WA 98208. Tel: (425) 316-8592. Email: aasf@streamkeeper.org; Website: www.streamkeeper.org; \$29.95

“Watershed View” Chapter Information

The agencies listed below can provide you with:

Maps & Map Information

Topographic and other Maps

United States Geological Survey
Missouri Water Science Center
Independence Road, MS-100
Rolla, MO 65401
(573) 308-3500
Denver Customer Service (303) 202-4700
(\$8.00 + \$5.00 S&H out of Denver)
www.usgs.gov/

State and County Road Maps

Missouri Atlas Gazatteer
DeLorme
P.O. Box 298
Yarmouth, Maine 04096
(207) 846-7000
Check local library, books stores, or internet book sellers.
If road names/numbers are wrong on the map, let us know.

Missouri Department of Transportation
General Services Division/Mapping & Graphics Section
P.O. Box 270
Jefferson City, MO 65102-0270
(573) 751-2825
Printable County maps:
www.modot.mo.gov/newsandinfo/CountyMaps

Online Maps and Map Info

www.mostreamteam.org/mapwelcome.asp www.communitycommons.org/groups/agsite/
www.digital-topo-maps.com
www.mapsport.com.au
www.nrcs.usda.gov
www.esri.com

www.terraserver.com/
www.dnr.mo.gov/env/wpp/wpp-map-gallery
store.usgs.gov

Land use maps and aerial photos

U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS) office in each county

Land Ownership

Contact your city or county assessor’s office to discover who owns land within your watershed. If your watershed contains publicly owned lands, like National Forests or state or local parks, you can contact the following agencies for more information.

Public Lands

Missouri Department of Conservation
Contact the Regional Office
(See map on page 5 of this Appendix)
www.mdc.mo.gov

U.S. Forest Service
(USFS – Mark Twain National Forest)
401 Fairgrounds Road
Rolla, MO 65401
(573) 364-4621
www.fs.fed.us/

Missouri Department of Natural Resources
Division of State Parks
P.O. Box 176
Jefferson City, MO 65102-0176
(573) 751-2479
1-800-334-6946
www.mostateparks.com/

Contact your local parks department for information about city and county parks.

Physical and Biological Information

Physical and biological information can include data about climate, soils, geology and any fish or wildlife that occurs in your watershed.

National

**United States Geological Survey
Missouri Water Science Center**
1400 Independence Road, MS-100
Rolla, MO 65401-2602
(573) 308-3664
mo.water.usgs.gov/
www.usgs.gov/

The United States Geological Survey measures flow and tests water quality at nearly 100 locations in Missouri. They also collect water-use data throughout the state and have all types of mapping information. For Real-Time Water Data, Stage & Streamflow Data go to:
water.usgs.gov/waterwatch/

**Natural Resources Conservation Service of the U.S.
Department of Agriculture**
State Conservationist
601 Business Loop 70 West
Parkade Center, Suite 250
Columbia, MO 65203
(573) 876-0900

Missouri website:
www.mo.nrcs.usda.gov/contact/
National website:
www.nrcs.usda.gov/

The NRCS supplies soil maps and aerial photograph maps of your watershed. They can also provide information on geology, land use and other topics of interest.

Weather Information

For local weather information, including daily rainfall:

www.noaa.gov
www.weather.com
www.weatherunderground.com
www.kait8.com
www.kfvs12.com
waterdata.usgs.gov/nwis
intellicast.com

NOTE: For some weather sites you will need the zip code of the town closest to your sampling site. If you know the town name, get zip code from www.usps.gov.

State

Missouri Department of Conservation
2901 West Truman Blvd.
P.O. Box 180
Jefferson City, MO 65102-0180
(573) 751-4115
mdc.mo.gov/

Missouri Department of Natural Resources
Lewis and Clark Bldg.
1101 Riverside Drive
P.O. Box 176
Jefferson City, MO 65102-0176
1-800-361-4827
www.dnr.mo.gov/

Local

- Electric utility companies, especially those that provide hydroelectric power, often have information on fish and wildlife populations.
 - Sewage treatment plant operators typically monitor water quality downstream of their discharges.
 - City or county public works departments can provide information about water quality, domestic water use, storm drains and sewage treatment systems.
-

Political, Regulatory and Other Information

Government agencies can tell you which laws, policies and regulations are working to protect watersheds and their inhabitants

National

U.S. Environmental Protection Agency Office of Wetlands, Oceans and Watersheds

1200 Pennsylvania Ave., NW (4501T)
Washington, DC 20460
(202) 566-1300

www.epa.gov/OWOW

The EPA Office of Wetlands, Oceans and Watersheds (OWOW) provides a wealth of information on watershed partnerships, water quality monitoring and the watershed approach to resource management.

U.S. Environmental Protection Agency, Region 7

901 N. 5th Street
Kansas City, KS 66101
(913) 551-7003 or 1-800-223-0425

www.epa.gov/region7/

The Water Quality Protection Division of the EPA issues National Pollutant Discharge Elimination System (NPDES) permits, and the Water Enforcement Branch ensures that all discharges are in compliance with NPDES permits. To learn more about federal NPDES permits in general, call the EPA Region 7 office. To learn about these permits in Missouri (where they are called “State Operating Permits”) contact the Department of Natural Resources’ Water Protection and Soil Conservation Division (address on next page) or the DNR Regional Office for your area (see map on Page 4 of this Appendix). Knowing the location of State Operating Permit sites within your watershed will help you better assess water quality and potential point source pollution.

U.S. Environmental Protection Agency

Surf Your Watershed Site and other watershed-related sites

cfpub.epa.gov/surf/locate/index.cfm and water.epa.gov/resource_performance/planning/ provides information on NPDES discharge permits nationwide.

For information on environmental justice, see the EPA website,

www.epa.gov/environmentaljustice/

Know Your Watershed

Conservation Technology Information Center (CTIC)

1220 Potter Drive, Suite 170
West Lafayette, IN 47906
(765) 494-9555; FAX: (765) 494-5969

Email: ctic@ctic.purdue.edu

www.ctic.purdue.edu

CTIC publishes several brochures and videos about building watershed partnerships and understanding watersheds. They also have a website with links to the National Watershed Network and the National Watershed Library.

U.S. Fish and Wildlife Service

101 Park DeVille Drive, Suite A
Columbia, MO 65203-0007
(573) 234-2132; FAX: (573) 234-2181

Region 3 Web page: www.fws.gov/midwest/ -- Click on the State of Missouri on the map to get Missouri information.

Have authority over federally “listed” species (e.g., endangered); manage federal refuges (e.g., Squaw Creek) and fish hatcheries (e.g., Neosho); and more.

Political, Regulatory and Other Information

(continued)

State

Missouri Department of Natural Resources

P.O. Box 176

Jefferson City, MO 65102-0176

(573) 751-3443 or toll-free 1-800-361-4827

Website: www.dnr.mo.gov

Regulatory agency in Missouri with authority over water, air, solid waste, environmental hazardous waste, and mining. DNR also has responsibility for parks, energy, and geology & land survey.

Water Protection Program

(573) 751-1300

Website: www.dnr.mo.gov/env/wpp/index.html

Division of State Parks

1-800-334-6946

Email: moparks@dnr.mo.gov

Website: www.mostateparks.com/

Missouri Department of Conservation

2901 West Truman Blvd.

P.O. Box 180

Jefferson City, MO 65102-0180

(573) 751-4115 (if you know the person's extension number, use 573-522-4115 and the 4-digit extension)

Website: mdc.mo.gov/

Agency mandated to protect and manage the fish, forest and wildlife resources of the state.

Conservation Federation of Missouri (the MO Chapter of the National Wildlife Federation)

728 West Main

Jefferson City, Missouri 65101

(573) 634-2322 or toll-free 1-800-575-2322; FAX: 573-634-8205

Email: confedmo@socket.net

Website: www.confedmo.org

Missouri Watershed Information Network (MoWIN)

205 Agricultural Engineering Building

Columbia, MO 65211-5200

(573) 882-0085 or toll-free (in Missouri only) 1-877- H2O-SHED (426-7433); FAX: (573) 884-5650

Email: mowin@missouri.edu

Website: www.mowin.org/

Political, Regulatory and Other Information

(continued)

Local

County Soil and Water Conservation Districts (SWCDs) can provide information on local efforts to reduce both soil erosion and agriculture-related water pollution. The Soil and Water Conservation Program within DNR can provide contact information on local SWCDs.

Call (573) 751-4932, or click on the individual county in the map available at:

www.swcd.mo.gov/

City and county planning/zoning departments will provide information on zoning ordinances. They can tell you which areas within your watershed are zoned for commercial, industrial or residential development.

Local environmental and civic organizations may already be working in your area to protect aquatic habitats. They can assist you in forming watershed partnerships.

MISSOURI
VOLUNTEER WATER QUALITY MONITORING PROGRAM

SUMMARY OF PARTICIPANT EXPECTATIONS

- 1) Monitors will make safety a first priority when engaging in data collection activities.
- 2) Volunteers will enter private property only with the landowner's permission.
- 3) Participants will submit monitoring data and *Missouri STREAM TEAM Activity Reports* in a timely fashion. If a monitor chooses not to submit data, they will at least submit *Activity Reports* to indicate they are using the information and equipment to benefit the resource.
- 4) If a monitor chooses to no longer participate in the program, they will return all equipment and supplies to the Program so they may be put to use by another volunteer.
- 5) Participants will foster cooperative partnerships within watersheds to resolve resource issues not carelessly place blame or "point fingers" at others. The Program's goal is to create *alliances* in local communities, *not* adversarial relationships.
- 6) Participants will try to see all points of view on water resource issues and recognize that waters in Missouri serve many purposes, some of which may appear to conflict.
- 7) Volunteers will continue to educate themselves about water resources and share the knowledge they gain with others.
- 8) Monitors will gather information as accurately as possible, whether they are collecting water quality data or researching a water issue.
- 9) Participants will examine their own behavior and minimize negative impacts on water resources.
- 10) All program participants will continue to enjoy and appreciate the extraordinary water resources of the State of Missouri!

**Level 1 VWQM
TRAINING RECORD FORM**
Please PRINT legibly

Location of Training: _____ Date: _____

Instructors' Names: _____

Mr. Mrs. Ms. Name (First, MI, Last): _____

Mailing Address: _____

City, State, Zip: _____

County of mailing address above: _____

Home/Cell Phone: (_____) _____ - _____ Work Phone: (_____) _____ - _____

Email: _____

Shipping Address if different from above: (Business/School Name): _____

Address, State, Zip: _____

If you are in an EXISTING Stream Team, list Team Number and/or Name: _____

If you will be a NEW Stream Team, please list other people who will be members of your Team.

This is especially important if some of them are also attending this workshop.

NOTE that it's okay to add or subtract members at any time.

Names:

Addresses:

_____	_____
_____	_____
_____	_____

Are you leading this Team as a teacher? Yes No If yes, name of school: _____

Are you leading this Team as a youth leader? Yes No If yes, name of group: _____

If you are NOT already a Stream Team and **do not wish** to be a Stream Team, check this box:

By leaving this box **unchecked**, you will automatically become a Stream Team, be assigned a Stream Team Number, and **receive a membership ID Card** in the mail.

Stream you are interested in adopting/monitoring (if chosen): _____

Location(s) to be monitored (if chosen): _____

County of stream/location (if listed above): _____

If you listed a stream above, would you like a list of other Volunteer Water Quality Monitors in your watershed? Yes No

LETTER OF AGREEMENT

Please **print** legibly

The individual named below has been trained at the Level 1 level and may request equipment to conduct chemical monitoring after submitting a visual survey. In exchange for equipment and training, the named person agrees to:

1. Become familiar with the monitoring equipment and learn the sampling techniques.
2. Share information received during training with other members of their Stream Team or group who did not attend the workshop. (Note, in order for Team members to submit data under their name, they must have attended the appropriate VWQM workshop.)
3. Survey on a periodic basis the reach and/or watershed of the adopted stream and identify land use, riparian corridor conditions, and point sources and nonpoint sources of pollution.
4. Conduct visual stream survey and biological monitoring twice per year (early spring and early fall), and chemical and physical monitoring on a quarterly basis, weather permitting.
5. Submit data to the MO Dept. of Natural Resources, Water Protection Program, WQMA Section, P.O. Box 176, Jefferson City, MO 65102-0176.
- 6. Return the equipment to the Volunteer Water Quality Monitoring Program if the individual, Stream Team, or group stops monitoring or participating in the program.**

In consideration of the foregoing, I do hereby agree to the stipulations placed forth in this document. I will fulfill this agreement to the best of my ability and if I am no longer able to meet the requirements placed upon me herein, I will send notification and return all equipment to the Volunteer Water Quality Monitoring Program.

Name (please print): _____

Signature: _____

Date: _____

If a volunteer is under 18 years of age, a parent or adult sponsor must sign this agreement.

EVALUATION FORM

Volunteer Water Quality Monitoring Workshop

Name of course: VWQM Level 1

Workshop Location: _____ Date: _____

Instructors' Names: _____

1. Was the workshop beneficial? Yes No

If not, please explain. _____

2. Did we answer all of your questions concerning water quality monitoring? Yes No

If not, which topics needed more explanation? _____

3. Was the information easily understood? Yes No Somewhat

4. Was the amount of material: Too much Just right Too little

5. What additional information would you like to see included in the future? _____

6. What are your goals as a water quality monitor? _____

7. What are your expectations of the use of your data? Did these expectations change today?

8. General comments: _____