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ENVIRONMENTAL MONITORING AND ASSESSMENT PROGRAM-SURFACE WATERS:

WESTERN PILOT STUDY
FIELD OPERATIONS MANUAL FOR
WADEABLE STREAMS

Edited by

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SECTION 3
BASE LOCATION ACTIVITIES

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Field teams conduct a number of activities at a "base" location before and after visiting each stream site. These activities are generally conducted on the same day as the sampling visit. Close attention to these activities is required to ensure that the field teams know where they are going, that access to the stream site is possible and permissible, that all the necessary equipment and supplies are in good order to complete the sampling effort, and that samples are packaged and shipped correctly and promptly.

Modifications to base location procedures described in the previous EMAP-SW field operations manual for wadeable streams (Klemm et al., 1998) are summarized in Table 3-1. Conductivity pens are not used in the Western Pilot Study. Sediment samples for metabolism and sediment toxicity are not being collected for the Western Pilot Study. Performance evaluation procedures for field meters have been modified to reflect new types of instrumentation. Beginning in 2001, field measurements of conductivity and dissolved oxygen are optional, and the frequency of inspection and evaluation of field meters is reduced. In some situations, field teams may have personnel available who are certified to ship preserved biological samples that constitute dangerous goods. Such samples must be transported and presented for shipment in accordance with State, Federal, and international regulations. Because of the large geographic area being sampled for the Western Pilot, it is critical to minimize the potential for transferring exotic or nuisance species of plants and animals or waterborne pathogens such as salmonid Whirling Disease.

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TABLE 3-1. SUMMARY OF CHANGES IN BASE LOCATION ACTIVITIES FOR THE EMAP-SW WESTERN PILOT STUDY

Changes from Klemm et al. (1998):
7. Reference to conductivity pens has been removed
8. Procedures and information related to sediment metabolism and sediment toxicity sampling have been removed
9. Performance evaluation procedures for field instrumentation have been modified or added
10. Added procedures for preparing dangerous goods samples for shipment
11. Cleaning procedures and solutions to prevent interstream transfer of Whirling Disease spores have been included.
Changes from EMAP-Western Pilot Study Year 2000 activities:
1. The frequency of performance evaluation checks for field conductivity and dissolved oxygen meters is reduced from before each stream site to before and after the field season.
2. The use of ice substitute packs whenever possible to ship samples is strongly recommended to avoid problems associated with melted ice during shipment.

Figure 3-1 illustrates operations and activities that are conducted before and after each visit to a stream site. Activities that are conducted after a stream visit include equipment cleanup and maintenance, packing and shipping samples, and communications with project management to report the status of the visit.

3.1 ACTIVITIES BEFORE EACH STREAM VISIT

Before each stream visit, each field team should confirm access to the stream site, develop a sampling itinerary, inspect and repair equipment, check to make sure all supplies required for the visit are available, and prepare sample containers. Procedures to accomplish these activities are described in the following sections.

3.1.1 Confirming Site Access

Field crews should be provided with dossiers containing important locational and access information for each stream they are scheduled to visit. Before visiting a stream, the crew should review the contents of the specific stream dossier. The landowner(s) listed in the dossier should be contacted to confirm permission to sample and identify any revisions to the information contained in the dossier.

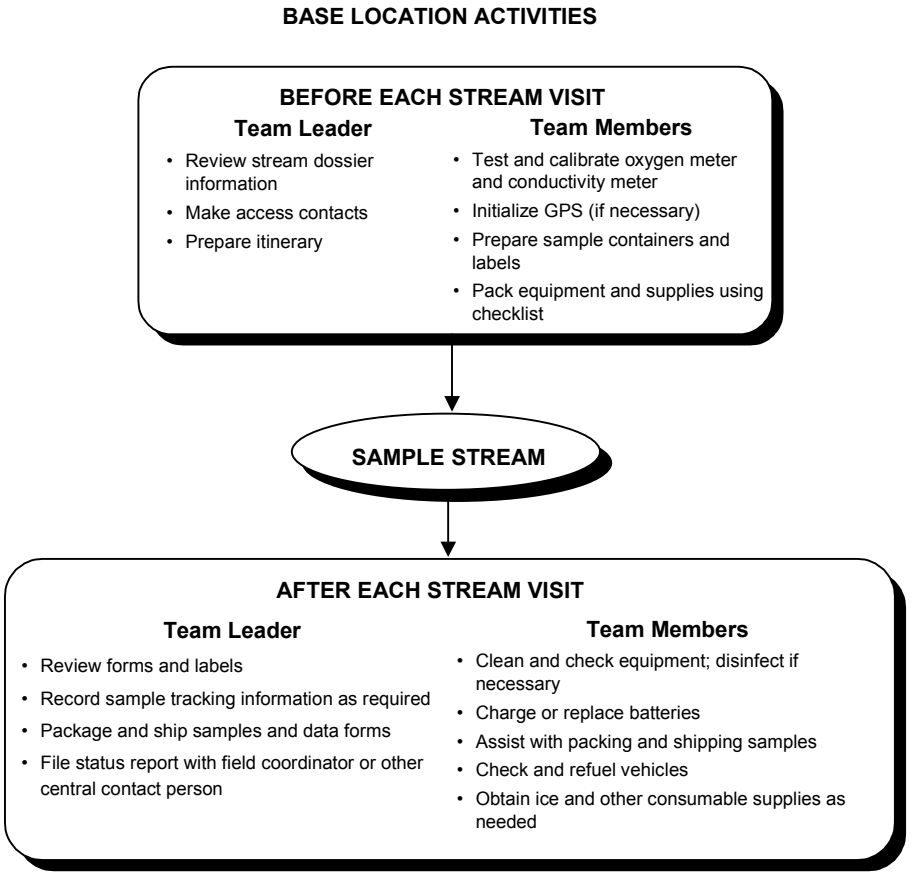

Figure 3-1. Activities conducted at base locations.

3.1.2 Daily Sampling Itinerary

Based upon the sampling schedule provided to each team, team leaders are responsible for developing daily itineraries. The team leader reviews each stream dossier to ensure that it contains the appropriate maps, contact information, copies of permission letters, and access instructions. Additional activities include determining the best access routes, calling the landowners or local contacts to confirm permission, confirming lodging plans for the upcoming evening, and coordinating rendezvous locations with individuals who must meet with field teams prior to accessing a site. This information is used to develop an itinerary for the stream. The itinerary should include anticipated departure time, routes of travel, location of any intermediate stops (e.g., to drop off samples, pick up supplies, etc.) and estimated time of arrival at the final destination after completing the stream visit. This information (and any changes that occur due to unforeseen circumstances), should be provided to the field coordinator or other central contact person identified for the specific field study. Failure to adhere to the reported itinerary can result in the initiation of expensive search and rescue procedures and disruption of carefully planned schedules. In addition, each team should carry individual emergency medical and personal information with them, possibly in the form of a "safety log" that remains in the vehicle (see Section 2).

3.1.3 Instrument Inspections and Performance Tests

Each field team is required to test and calibrate some instruments prior to departure for the stream site**.** Field instruments include a global positioning system (GPS) receiver, a current velocity meter, a conductivity meter, and a dissolved oxygen meter. **NOTE: Conductivity and dissolved oxygen are optional measurements beginning in 2001**. Backup instruments should be available if instruments fail the performance tests or calibrations described in the following subsections.

3.1.3.1 Global Positioning System Receiver–

Specific performance checks will vary among different brands of GPS receivers. Follow the instructions in the receiver's operating manual to make sure the unit is functioning properly. Turn on the receiver and check the batteries. Replace batteries immediately if a battery warning is displayed. Make sure extra batteries are stored with the receiver and will be available in the field if necessary. Follow the manufacturer's instructions for initializing the receiver when it becomes necessary (e.g., before first use, after replacing batteries, or if a new positional reference is required).

3.1.3.2 Dissolved Oxygen Meter–

NOTE: Dissolved oxygen is an optional measurement beginning in 2001.

As an initial performance test before use each year, dissolved oxygen (DO) meters should be tested for accuracy against the Winkler titration method, In addition, inspect and test the dissolved oxygen meters periodically during the course of field sampling operations. At a minimum, check the instruments before and after field sampling has been completed. The inspection and testing procedure, based on the use of a Yellow Springs Instruments (YSI) Model 53 oxygen meter, is summarized in Figure 3-2. Some modification to the procedure may be necessary for other models or types of dissolved oxygen meters. The procedure to use for newer models of DO meters (e.g., the YSI Model 85 or 95), is presented in Table 3-2.

Inspect the meter by checking the status of the batteries, and the functioning of the electronics. Confirm the meter is adjusted correctly for measurements in fresh water. Inspect the membrane of the probe. If bubbles are present, if the membrane is discolored, or if the membrane is torn, use a backup probe and/or replace the membrane on the original probe. (NOTE: For older models of meters, new membranes may require conditioning for 24 hours before use).

After inspecting the meter and probe, attempt to calibrate it using the procedure presented in Table 3-2 (for YSI Models 85 or 95), or by following the instructions in the instrument operating manual. Do not record the calibration information obtained during the performance test. The meter is calibrated again at each stream site. If the meter cannot be successfully calibrated, check the temperature probe reading against a thermometer and/or replace the membrane, probe, or meter (if spare units are available). After the test, turn the meter off, and store the probe according to the manufacturer's instructions.

3.1.3.3 Conductivity Meters–

NOTE: Conductivity is an optional measurement beginning in 2001.

Follow the operating manual provided with the meter to check the batteries, the electronics, and to inspect the probe. New probes or probes that have been stored dry may require conditioning before use.

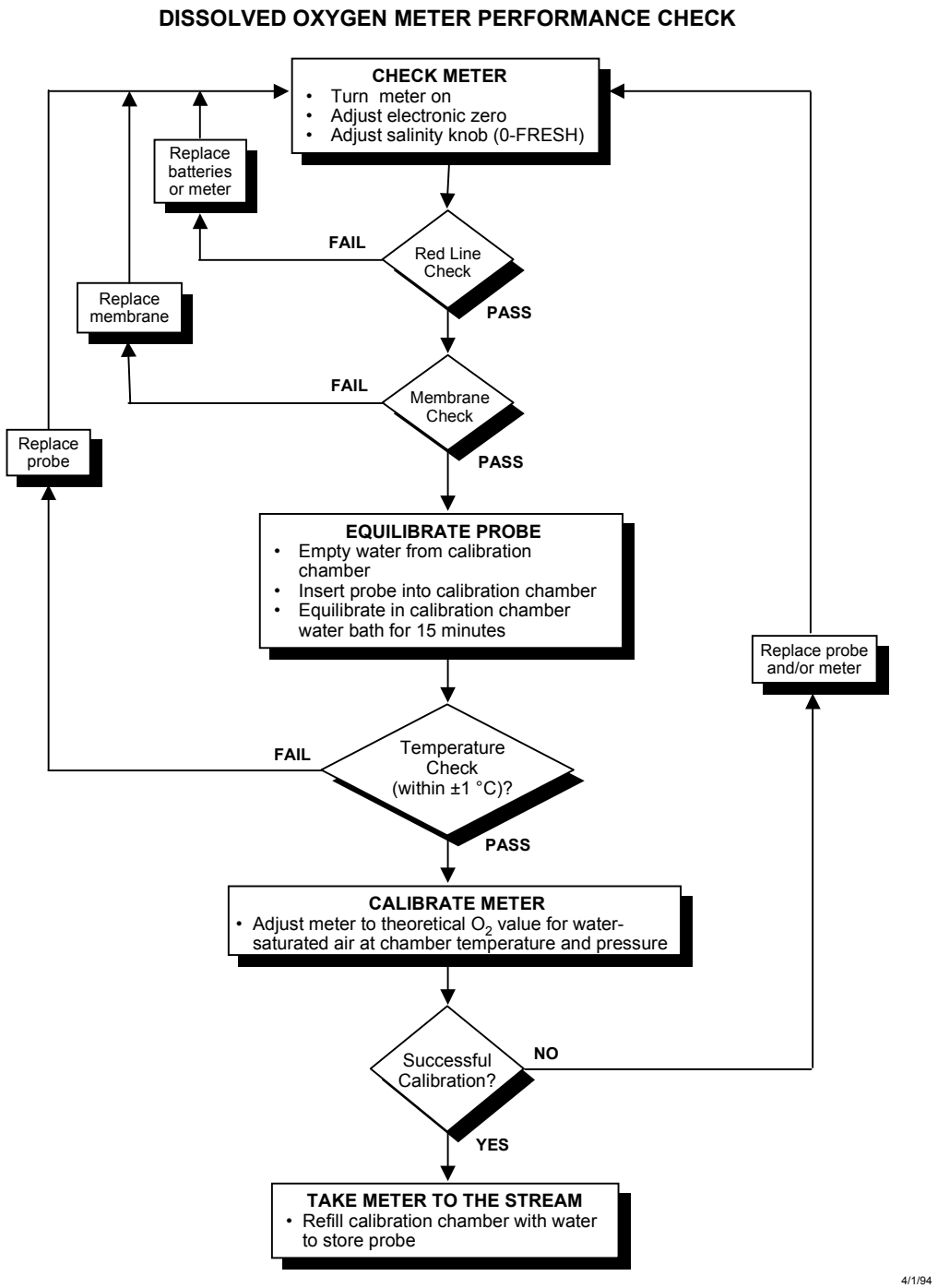

Figure 3-2. Performance test procedure for a dissolved oxygen meter.

TABLE 3-2. CHECKING THE CALIBRATION OF THE DISSOLVED OXYGEN METER[a]

Note: Beginning in 2001, dissolved oxygen is an optional measurement.

1. Periodically, check the temperature probe of the meter against a field thermometer. This can be done in a bucket of water at a base location or at a stream site. The displayed temperature should be within ± 1 EC of the thermometer reading.

2. At each location, obtain the approximate local altitude from a topographic map or other source (e.g., local airport).

3. Inspect the DO probe membrane for wrinkles, cracks, bubbles, etc. Replace the membrane cap assembly if necessary.

4. Check the calibration chamber and fill it with cold tap water to dampen the sponge. Drain the chamber and insert the probe into the chamber.

5. Turn the meter on and make sure the meter passes all the internal electronics checks.

6. Press the MODE key until the dissolved oxygen reading inside the chamber is displayed in mg/L. Allow approximately 15 minutes for the readings to stabilize (i.e., a change of < 0.02 mg/L over a 1-minute period).

7. Press the UP ARROW and DOWN ARROW keys simultaneously to enter calibration mode.

8. Use the UP ARROW or DOWN ARROW key to enter the local altitude [to the nearest 100 feet (e.g., “15" equals 1500 ft)]. After the correct altitude is displayed, press the ENTER button.

9. In the lower part of the display, “CAL” should appear along with the theoretical value based on temperature and altitude.

10. Once the actual value displayed is stable, compare the actual and theoretical values. They should agree ± 0.5 mg/L. If not, check the temperature probe against a thermometer (Step 1), or install a new membrane cap assembly, then repeat the calibration procedure.

[a] For use with YSI Models 85 and 95. Modified from YSI Incorporated. 1986. *Model 85 Handheld Oxygen, Conductivity, Salinity, and Temperature System Operations Manual.* YSI Incorporated, Yellow Springs, OH.

The operation of the conductivity meter is checked periodically at a base location using a standard solution of known conductivity. A quality control check sample (QCCS) is prepared as described in Table 3-3. The QCCS can be prepared as either of two dilutions of the stock standard, depending on the theoretical conductivity desired based on the anticipated range of conductivities in the field. A 1:100 dilution of the stock provides a QCCS with a conductivity of 75.3 µS/cm at 25 °C (Metcalf and Peck, 1993). A 1:200 dilution results in a QCCS with a conductivity of 37.8 µS/cm at 25 °C (Peck and Metcalf, 1991). A fresh lot of the QCCS should be prepared every two weeks from the stock standard solution. For higher conductivity systems, a 0.01 N potassium chloride solution is used as a QCCS (theoretical value = 1,413 µS/cm at 25 °C).

If a YSI Model 85 meter is being used, check the performance of the conductivity pen or conductivity meter by following the procedure presented in Table 3-4. Make sure the correct mode (temperature compensated conductivity) is used for the check. The displayed value of the QCCS should be compared directly to the theoretical value of the QCCS at 25 EC (75.3 µS/cm or 37.8 µS/cm).

If another model of conductivity meter is used, refer to the procedure presented in Table 3-5. If the meter cannot display temperature compensated conductivity, the team should be provided with a table showing theoretical values of the QCCS solution at different temperatures.

3.1.3.4 Current Velocity Meters--

Field teams may be using one of three types of current velocity meters, a photo-optical impeller type meter (e.g., Swoffer Model 2100) a vertical axis meter (e.g., Price type AA), or an electromagnetic type meter (e.g., Marsh McBirney Model 201D). General guidelines regarding performance checks and inspection of current meters are presented in Table 3-6. Consult the operating manual for the specific meter and modify this information as necessary.

3.1.4 Preparation of Equipment and Supplies

To ensure that all activities at a stream can be conducted completely and efficiently, field teams should check all equipment and supplies before traveling to a stream site. In addition, they should prepare sample containers and labels for use to the extent possible.

TABLE 3-3. STOCK SOLUTIONS, USES, AND INSTRUCTIONS FOR PREPARATION

SOLUTION	USE	PREPARATION
Bleach (10%)	Clean seines, dip nets, kick nets, or other equipment that is immersed in the stream	Dilute 400 mL chlorine bleach solution to 4 L with tap water.
Bleach (90%)	To disinfect gear from spores of whirling disease	Dilute 3.6-L bleach with 400 mL tap water.
"Sparquat"	To disinfect gear from spores of whirling disease	Dissolve 120 mL (2 oz) in 5 gal (19 L) tap water
Conductivity Standard Stock Solution[a]	To prepare conductivity quality control check sample solution	Dissolve 3.4022 g KH_2PO_4 and 3.5490 g Na_2HPO_4 (analytical grade; dried at 120 °C for 3 h and stored desiccated) in 1000.0 g (1.0018 L at 20 °C, 1.0029 L at 25 °C) reagent water.
Quality Control Check Sample	To check operation of conductivity meter	1:100 dilution of standard stock solution with reagent water (theoretical conductivity = 75.3 µS/cm at 25 °C)[a] 1:200 dilution of standard stock solution with reagent water (theoretical conductivity = 37.6 µS/cm at 25 °C)[b]
Formalin, borax buffered[c] (pH 7-8)	Preservative for fish specimens and periphyton samples	Add 400 g borax detergent (e.g., Twenty Mule Team®) to each 20-L container of 100% formalin. Test with pH paper.
Ethanol (95%)	Preservative for benthic macroinvertebrate samples.	None.

[a] Metcalf and Peck (1993)
[b] Peck and Metcalf (1991)
[c] Handle formalin according to 29 CFR 1910.1048.

TABLE 3-4. PERFORMANCE CHECK OF NEWER CONDUCTIVITY METERS[a]

1. If using a combination DO/conductivity meter (e.g., the YSI Model 85), check the conductivity probe after completing the calibration check for the DO probe.

2. Inspect the probe for deposits or fouling.

3. Turn the meter on and make sure all internal electronics checks are completed successfully.
4. Use the MODE key to display “temperature compensated” conductivity (The “EC” symbol on the display will be flashing).

5. Swirl the conductivity probe for 3-5 seconds in a 250-mL bottle containing the daily QCCS solution labeled "RINSE".

6. Transfer the probe from the “RINSE” bottle to a second 250-mL bottle of QCCS labeled “TEST”. Let stabilize for 20 seconds.

7. If the measured value of the QCCS is within ±10% or ±10 µS/cm of the theoretical value (whichever is greater at the theoretical value), rinse the probe in deionized water. Store as described in the operating manual and package the meter for transport to the stream site.
   If the measured value of the QCCS is not within ±10% or ±10 uS/cm of theoretical value, repeat Steps 5 through 7.

8. If the value is still unacceptable, replace the QCCS in both the “rinse” and “test” bottles and repeat the measurement process.
   If the measured value is still not acceptable, clean the conductivity probe as described in the manual, check the batteries, soak in deionized water for 24 hours, and repeat Steps 1 through 7.
   If the measured value is still unacceptable, replace the meter.

[a] For use with YSI Models 85 and 95. Modified from YSI Incorporated. 1986. *Model 85 Handheld Oxygen, Conductivity, Salinity, and Temperature System Operations Manual.* YSI Incorporated, Yellow Springs, OH.

TABLE 3-5. PERFORMANCE CHECK OF OLDER CONDUCTIVITY METERS[a]

1. Check the functioning of the meter according to the manufacturer's operating manual (e.g., zero and "red line" of the meter).

2. Swirl the conductivity probe for 3-5 seconds in a 250-mL bottle containing the daily QCCS solution labeled "RINSE".

3. Transfer the probe from the "RINSE" bottle to a second 250-mL bottle of QCCS labeled "TEST". Let stabilize for 20 seconds.

4. If the measured value of the QCCS is within ±10% or ±10 µS/cm of the theoretical value (whichever is greater at the theoretical value), rinse the probe in deionized water. Store as described in the operating manual and package the meter for transport to the stream site.

   If the measured value of the QCCS is not within ±10% or ±10 uS/cm of theoretical value, repeat Steps 1 through 3.

   If the value is still unacceptable, replace the QCCS in both the "rinse" and "test" bottles and repeat the measurement process.

   If the measured value is still not acceptable, clean the conductivity probe as described in the manual, check the batteries, soak in deionized water for 24 hours, and repeat Steps 1 through 3.

   If the measured value is still unacceptable, replace the meter.

[a] For use with older models of conductivity meters (e.g., YSI Model 33 S-C-T).

TABLE 3-6. GENERAL PERFORMANCE CHECKS FOR CURRENT VELOCITY METERS

Photoelectric Impeller Meters (e.g., Swoffer Model 2100)

- Check that the calibration adjustment cover screws are tightly fitted on the display case.
- Periodically check the condition of the connector fitting between the display unit and the sensor.
- Connect the sensor to the display unit and check the calibration value stored in memory. If this value is less than the correct value for the display unit-sensor rotor combination, replace the batteries.
- Periodically perform a spin test of the rotor assembly, following the instructions in the meter's operating manual. A displayed count value of 300 or greater is indicative of satisfactory performance at low current velocities.
- If a buzzing sound occurs when the rotor assembly is spun by hand, or if the shaft shows visible wear, replace the rotor assembly.
- Periodically examine the thrust-bearing nut on the rotor assembly. If a "cup" begins to form on the bottom surface of the nut, it should be replaced.

Vertical-axis Meters (from Smoot and Novak, 1968)

- Inspect the bucket and wheel hub assembly, yoke, cups, tailpiece, and the pivot point each day before use.
- Inspect the bearings and check the contact chamber for proper adjustment.
- Periodically conduct a spin test of the meter. The minimum spin time is 1.5 minutes, while the recommended time is between 3 and 4 minutes.

Electromagnetic Meters

- Check the meter calibration daily as part of morning routine. Calibration value should be 2.00 $\pm$ 0.05.
- Once per week, check the zero value using a bucket of quiescent water. Place the probe in the bucket and allow to sit for 30 minutes with no disturbance. The velocity value obtained should be 0.0 $\pm$ 0.1. Adjust the meter zero if the value is outside this range.

Check the inventory of equipment and supplies prior to departure using the stream-visit checklists presented in Appendix A. Pack meters, probes, and sampling gear in such a way as to minimize physical shock and vibration during transport. If necessary, prepare stock preservative solutions as described in Table 3-3. Follow the regulations of the Occupational Safety and Health Administration (OSHA) for handling and transporting hazardous materials such as formalin and ethanol. Regulations pertaining to formalin are in the Code of Federal Regulations (CFR; specifically 29 CFR 1910.1048). These requirements should be summarized for all hazardous materials being used for the project and provided to field personnel. Transport formalin and ethanol in appropriate containers with absorbent material.

Inspect the vehicles every morning before departure. Refuel vehicles and conduct maintenance activities the night before a sampling trip. Check vehicle lights, turn signals, brake lights, and air pressure in the tires.

Some sample containers can be labeled before departing from the base location. Figure 3-3 illustrates the preprinted labels. A set of three water chemistry sample containers all having the same ID number (one for the 4-L cubitainer and two for the 60-mL syringes) can be pre-labeled with the appropriate information (described in Section 5). After labeling, place the syringes in their plastic container, and place the cubitainer and beakers in a clean self-sealing plastic bag to prevent contamination. Sample containers for biological and sediment samples should **NOT** be pre-labeled before reaching the stream site. Problems in sample tracking can result if jars are labeled and then are not used at a stream.

3.2 ACTIVITIES AFTER EACH STREAM VISIT

Upon reaching a lodging location after sampling a stream, the team reviews all completed data forms and sample labels for accuracy, completeness, and legibility, and makes a final inspection of samples. If information is missing from the forms or labels, the team leader should fill in the missing information as accurately as possible. The team leader initials all data forms after review. The other team member should inspect and clean sampling equipment, check the inventory of supplies, and prepare samples for shipment. Other activities include shipping samples and communicating with the field coordinator or other central contact person.

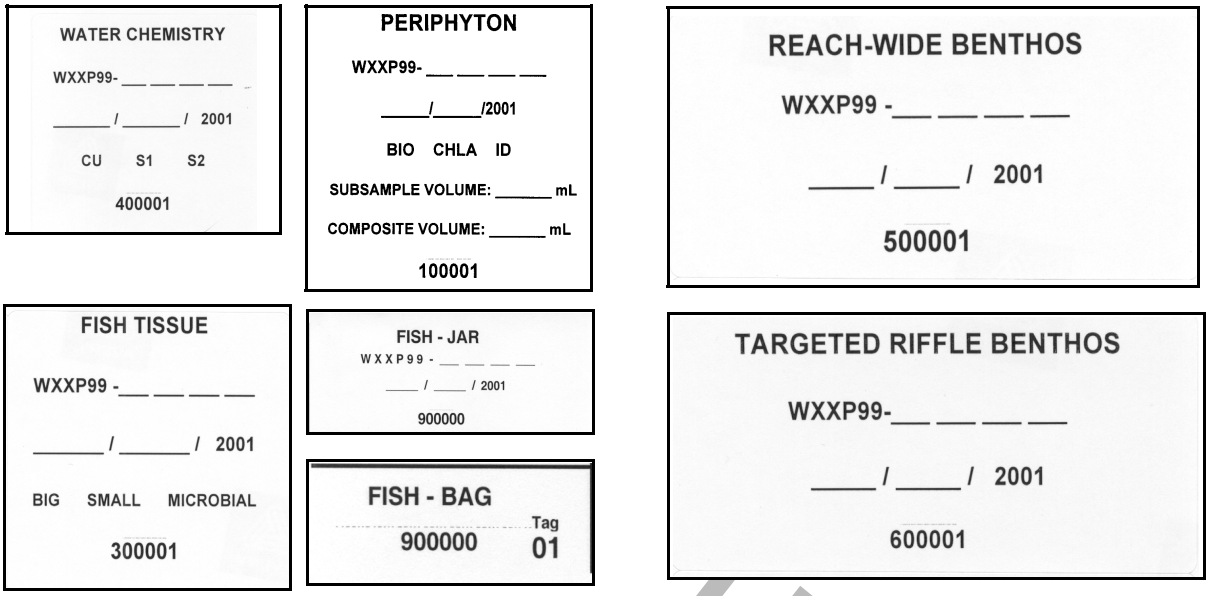

Figure 3-3. Sample container labels.

3.2.1 Equipment Care

Equipment cleaning procedures are given in Table 3-7. Inspect all equipment, including nets, and clean off any plant and animal material. This effort ensures that introductions of nuisance species do not occur between streams, and prevents possible cross-contamination of samples. If nets cannot be cleaned thoroughly using water and detergent, clean and disinfect them with a 10 percent chlorine bleach solution (Table 3-3). Use bleach only as a last resort, as repeated use will destroy the net material. Take care to avoid damage to lawns or other property.

3.2.1.1 Special Precautions Related to Salmonid Whirling Disease–

Salmonid Whirling Disease is caused by a sporozoan parasite (*Myxobolus cerebralis*), and is a serious threat to salmonid populations in several western states. The life cycle of the parasite includes both a "hard spore" and a "fragile spore" stage. The hard spores reside in mud and are very resistant to environmental conditions, remaining dormant for 30 yrs or more. The fragile spores reside in fish and fish parts and the density is very high and concentrated.

TABLE 3-7. EQUIPMENT CARE AFTER EACH STREAM VISIT

1. General cleaning for biological contaminants (e.g., plant and animal material).
   - Prior to departing a stream, drain all water from live wells and buckets used to hold and process fish.
   - Inspect sampling gear and waders, boots, etc. for evidence of plant fragments or animal remains and remove them.
   - At the base location, inspect seines, dip nets, kick nets, waders, and boots with water and dry. If there appears to be the potential for contamination, disinfect gear with a 10 percent bleach solution.

2. Additional precautions to prevent transfer of Whirling Disease spores
   - Consult the site dossier and determine if the stream has been classified as whirling disease positive or negative
   - If the stream is listed as "positive" or no information is available, chemically treat ALL fish and benthos sampling gear and other equipment that has come into contact with water (i.e., waders, boots, etc.) or sediments should be treated by either:
     - A 10-minute soak in a 90% bleach solution, followed by copious rinsing. or
     - A 10-minute soak is Sparquat solution, followed by copious rinsing

3. Clean and dry other equipment prior to storage.

   - Rinse chlorophyll filtration chamber three times with distilled water after each use.
   - Rinse periphyton sampling equipment with tap water at the base location.
   - Rinse coolers with water to clean off any dirt or debris on the outside and inside.
   - Make sure conductivity meter probes are rinsed with deionized water and are stored moist.
   - Rinse all beakers used to collect water chemistry samples three times with deionized water to prevent contamination of the next stream sample. Place the beakers in a 1-gallon self-sealing plastic bag with a cubitainer for use at the next stream.

3. Check fish nets for holes and repair, if possible; otherwise, set damaged gear aside and locate replacements.

4. Inventory equipment and supply needs and relay orders to the Field Coordinator through the Communications Center.

5. Remove DO meters and GPS receivers from carrying cases and set up for pre-visit inspections and performance tests. Examine the DO membrane for cracks, wrinkles, or bubbles; replace if necessary.

6. Recharge all batteries overnight if possible (e.g., electrofishing batteries, 12-V wet cells), computer battery). Replace others (GPS, DO meter, current meter) as necessary.

7. Recheck field forms from the day's sampling activities. Make corrections and completions where possible, and initial each form after review.

8. Replenish fuel in vehicles and/or electrofishing generator (if necessary).

It is extremely important to wash all gear thoroughly with water and remove all mud, debris, etc. to eliminate the possibility of transferring hard spores from one stream to another during the course of a field season. Of higher concern is if infected fish or fish parts (containing fragile spores) are inadvertently transferred from one stream to another and then released or otherwise introduced into a stream.

Field teams should be provided with the latest information (as part of the site dossier) regarding those streams, drainages, etc. that are believed to be infested with Whirling Disease. This information is available for State fishery biologists or pathologists, of from organizations such as the Whirling Disease Foundation (Bozeman, MT). If a team has completed sampling at an infested site and is scheduled to sample a non-infested site next, all gear and sampling equipment must be treated with either a strong bleach solution (90%) or a solution containing “Sparquat” (see Table 3-3), as described in Table 3-7. Pay particular attention to felt soles on wading boots, as the hard spores may embed in this material.

3.2.2 Sample Tracking, Packing, and Shipment

Each field team packs and ships samples from each stream visit as soon as possible after collection, normally the day following a stream visit. Field teams must be provided with specific information for the shipping destinations, contact persons, and the required shipping schedule for each type of sample. Sample tracking information (including sample types, sample ID numbers, and other field-related information that is required by the laboratory to conduct analyses and associate results to a specific sample and stream site) is recorded during the packing process. This information is recorded onto paper forms. The tracking form must be filled out for all samples taken. One form will be filled out on a daily basis and will remain with the site packet. A copy of this form (Figure 3-4) , either xerox or filled in by hand, will be included with unpreserved samples (water chemistry, fish tissue, and periphyton except for ID) shipped to the EPA analytical laboratory facility in Corvallis (Willamette Research Station [WRS]). Another tracking form (Figure 3-5) will include all preserved samples, which will likely be transported to intermediate storage "depots" where they will accumulate prior to shipment to appropriate support laboratories. This form is expected to track samples from multiple sites. The tracking form can be returned to the Information Management staff in Corvallis once it is complete and a copy, either photocopied or filled in by hand, will accompany each shipment of the samples.

FIELD SAMPLE SHIPMENT PACKING/TRACKING FORM

Destination:
Willamette Research Station ☒
1350 Goodnight Ave.
Corvallis, OR 97333
OR: ☐

Date Sent: 07/02/2001
Contact:
Date Received: /__/2001

Airbill Number: 808117727040
IM Contact: MARLYS CAPPAERT (541)754-4467
Lab Contact: KATHY MOTTER (541)754-4877

Site ID	Sample ID	Sample Type	Condition	Comments (List fish tissue species and # small fish here)
WXXP99-9999	100000	CHEM	OK	CU, SI, SZ
WXXP99-9999	300000	FISH	T	20 SMALL FISH - REDSIDE SHINER
WXXP99-9999	300001	FISH	OK	BIG - CUTTHROAT TROUT
WXXP99-9999	300002	FISH	OK	BIG - CUTTHROAT TROUT
WXXP99-9999	300003	FISH	OK	BIG - CUTTHROAT TROAT
WXXP99-9999	300004	FISH	OK	BIG - NORTHERN PIKEMINNOW
WXXP99-9999	300005	FISH	OK	BIG - NORTHERN PIKEMINNOW
WXXP99-9999	300006	FISH	ML	BIG - NORTHERN PIKEMINNOW
WXXP99-9999	300007	FISH	OK	MICROBIAL - MOTTLED SCULPIN
WXXP99-9999	300008	FISH	T	MICROBIAL - MOTTLED SCULPIN
WXXP99-9999	300009	FISH	W	MICROBIAL - CUTTHROAT TROUT
WXXP99-9999	200000	PERI	OK	CHLA, BIO

SAMPLE TYPES	CONDITION CODES
BENT = Benthos	B = Broken Syringe Tip
CHEM = Water Chemistry	C = Cracked Jar
FISH = Fish Tissue	F = Frozen
PERI = Periphyton	L = Leaking
VERT = Fish Museum	ML = Missing Label
	NP = Not Preserved
	OK = Seems Fine
	T = Thawed but Still Cold
	W = Warm

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03/26/2001 2001 Tracking

Figure 3-4. Sample tracking form for unpreserved samples.

FIELD SAMPLE SHIPMENT PACKING/TRACKING FORM

Destination:
Willamette Research Station ☐
1350 Goodnight Ave.
Corvallis, OR 97333

OR: ☒
POISON DEPOT
123 HAZMAT RD.
ANYTOWN, XX

Date Sent: 07/12/2001
Contact: H. OLDEMFORME
Date Received: 07/12/2001

Airbill Number: HAND DELIVERED
IM Contact: MARLYS CAPPAERT (541)754-4467
Lab Contact: KATHY MOTTER (541)754-4877

Site ID	Sample ID	Sample Type	Condition	Comments (List fish tissue species and # small fish here)
WXXP99-9999	500000	BENT	NP	RW
WXXP99-9999	500001	BENT	OK	2 jars, TR
WXXP99-9999	200000	PERI	OK	ID
WXYP99-9999	259000	VERT	OK	

SAMPLE TYPES			CONDITION CODES		
BENT	=	Benthos	B	=	Broken Syringe Tip
CHEM	=	Water Chemistry	C	=	Cracked Jar
FISH	=	Fish Tissue	F	=	Frozen
PERI	=	Periphyton	L	=	Leaking
VERT	=	Fish Museum	ML	=	Missing Label
			NP	=	Not Preserved
			OK	=	Seems Fine
			T	=	Thawed but Still Cold
			W	=	Warm

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Figure 3-5. Sample tracking form for preserved samples.

General guidelines for packing and shipping the various types of samples described in this manual are presented in Table 3-8. Use ice substitute packs whenever possible to avoid leakage due to melting ice. When shipping samples using ice, use fresh ice. Use block ice when available; it should be sealed in a large plastic bags. If block ice is not available, contain the ice in several self-sealing plastic bags. Label each bag of ice as "ICE" with an indelible marker to prevent any leakage of meltwater from being misidentified by couriers as a possible hazardous material spill. If ice substitute packs are used, place each pack into a self-sealing plastic bag before use.

Water chemistry samples must be shipped as soon as possible after collection in order to meet holding time requirements for some laboratory analyses (especially nutrients). To ship water chemistry samples, place a large (30-gallon) plastic bag in an insulated shipping container (e.g., a plastic or metal cooler). The sample labels on the cubitainer and syringes should be completely covered with clear tape to prevent damage from water or condensation during shipment. Place the syringes into a separate plastic container for shipment. Place the cubitainer and syringe container into a second large plastic bag and close. Place the bag containing the samples inside the plastic bag lining the shipping container. Place bags of ice around the bag of samples, but inside the plastic bag lining the shipping container.

Then close the outer plastic bag. Seal the cooler with clear tape. Place the required sample tracking forms in the shipping container and close it. Seal the container with shipping tape and affix any required shipping-related labels to the outside of the container. Attach an adhesive plastic sleeve to the lid of the container and insert any required shipping forms.

Samples requiring freezing (Table 3-8) may be stored in the field in a portable freezer or on dry ice for a short period (e.g., one week). If only ice (or ice substitute packs) is available for field storage, ship the samples to the laboratory as soon as possible after collection, using fresh ice (or ice substitute packs) to keep them as cold as possible. When using ice, double bag the ice and tape the last bag shut to prevent contamination of samples by melting ice. If ice substitute packs are used, place each pack into a self-sealing plastic bag. If possible, place samples into a sealed plastic container to protect them from meltwater. Dry ice may also be used for shipping. Note that dry ice is considered a hazardous material, and requires special shipping containers, shipping labels, and shipping forms for ground or air transport. If dry ice is used, the requirements and directions for packing and shipping samples should be provided to each field team.

TABLE 3-8. GENERAL GUIDELINES FOR PACKING AND SHIPPING UNPRESERVED SAMPLES

Sample Type (container)	Guidelines
Samples requiring refrigeration (4 °C)	
Water Chemistry (4-L cubitainer and 60-mL syringes)	Ship on day of collection or within 24 hr by overnight courier. Use fresh ice in labeled plastic bags for shipping. Line each shipping container with a large plastic bag. Place syringes in a plastic container. Place syringe container and cubitainer inside of a second plastic bag. Cover labels completely with clear tape. The cubitainer and syringes should have same sample ID number assigned. Confirm the sample ID assigned on the labels matches the ID number recorded on the field collection form and the sample tracking form.
Samples requiring freezing (-20 °C) within 24 hours of collection	
Periphyton chlorophyll (filter in aluminum foil)	If samples cannot be kept frozen in the field, ship on day of collection or within 24 h by overnight courier. Cover the label completely with clear tape. Protect samples from meltwater if ice is used by double bagging ice and placing samples in a plastic container. Confirm the sample ID assigned on the label matches the ID number recorded on the field collection form (or other sample tracking report). If dry ice is used to transport or ship samples, special shipping containers, outside labeling, and shipping forms may be required.
Periphyton biomass (filter in a numbered container)	
Periphyton activity (50-mL centrifuge tube)	
Fish Tissue (aluminum foil; two 30-gal plastic bags)	If samples cannot be kept frozen in the field, ship on day of collection or within 24 h by overnight courier. Cover labels completely with clear tape. Label on each bag should have identical Sample ID number assigned. Confirm the sample ID assigned on the label matches the ID number recorded on the field collection form (or other sample tracking report). Protect samples from meltwater if ice is used by double bagging ice. Special shipping containers, outside labeling, and shipping forms may be required for shipments containing dry ice.

Each team leader should contact the field coordinator or other central contact person after each stream visit to provide a brief update of each sampling visit, and to request replenishment of supplies if necessary. For each shipment, provide the stream identification number, date sampled, date that samples are being shipped, and the airbill number from the courier's shipping form. If the shipment date is on a Friday, call the contact person or leave a message that a Saturday delivery is coming. Teams should inventory their supplies after each stream visit and submit requests for replenishment well in advance of exhausting on-hand stocks.

3.2.2.1 Packing, Transport and Shipment of Preserved Samples–

Samples that are preserved in buffered formalin (periphyton ID samples and fish voucher specimens) or ethanol (benthic macroinvertebrate samples) should be transported in appropriate containers and surrounded with some type of acceptable absorbent material (e.g., vermiculite). The total volume of formalin in the periphyton ID samples (2 mL per 50-mL centrifuge tube) may be small enough that they may be transported or shipped without designating them as a hazardous material. Guidelines for packing, labeling, transporting, and shipping samples containing formalin or ethanol are presented in Table 3-8, and it may be necessary to provide additional guidance to each field team. Alternatively, these samples may be transported to a central repository for later shipment.

Table 3-9 presents additional guidelines for dealing with preserved samples. In order for field personnel to ship dangerous goods from field locations, they must be trained by a person who has been certified to prepare dangerous goods for shipment. Most of this training deals with packaging, forms and labels that must be used. Dangerous goods shipments must always be presented to the shipper directly as either a pick-up by a driver or a drop-off at a shipping facility.

3.3 EQUIPMENT AND SUPPLIES

A checklist of equipment and supplies required to conduct the activities described in Section 3 is presented in Figure 3-6. This checklist is similar to the checklist in Appendix A, which is used at the base location to ensure that all of the required equipment is brought to the stream. Use this checklist to ensure that equipment and supplies are organized and available at the stream site in order to conduct the activities efficiently.

TABLE 3-9. GENERAL GUIDELINES FOR PACKING AND SHIPPING PRESERVED SAMPLES

Sample Type (container)	Preservative	Guidelines
Samples requiring preservation in formalin		
Periphyton ID (50-mL centrifuge tube)	10% buffered formalin (2 mL per 50-mL sample)	Labels or tags placed inside of the jar must be of water-resistant paper or 100% rag content paper. The label on outside of the container should be completely covered with clear tape. Confirm the sample ID assigned on the label matches the ID number recorded on the field collection form and sample tracking form.
Fish Specimens (1-L and/or 4-L jars)	10 % buffered formalin	
	Packaging and Shipping Guidance	
Inside packaging		
Outside packaging		
Absorbent material		
Labeling		
Shipping forms		
Samples requiring preservation in ethanol		
Benthic Macro-invertebrates (500-mL or 1-L jars)	70 % ethanol	Confirm the sample ID assigned on the label matches the ID number recorded on the field collection form and sample tracking from.
Packaging and shipping guidance		
Inside packaging	HDPE bottles with leakproof screw-top cap (must meet UN specification IP2). Apply a strip of plastic tape around the cap to seal each bottle securely. Place bottles in upright position in outer package and surround with sufficient absorbent material to prevent tipping.	
Outside packaging	Screw-top plastic pail (5-gal size) with ratcheted lid is recommended. Must meet UN specification 1H2. Each pail can hold no more than 5.0 L total liquid (= 8 500-mL bottles or 5 1-L bottles).	
Absorbent material	Sufficient volume of absorbent material (vermiculite or equivalent) to absorb contents of all inner packaging.	
Labeling	Outside package marked with UN ID no. and name (“1170-Ethanol”), “Flammable Liquid” label, and package orientation label	
Shipping Forms		

BASE LOCATION ACTIVITIES

QTY.	ITEM	
Before Departure for Stream		
1	Dossier of access information for scheduled stream site	
1	Sampling itinerary form or notebook	
1	Safety log and/or personal safety information for each team member	
1	GPS receiver with extra batteries	
1	Dissolved oxygen/temperature meter with probe	
1	Conductivity meter with probe	
1	500-mL plastic bottle containing deionized water	
2	500-mL plastic bottles containing conductivity QCCS, labeled “Rinse” and “Test”	
1	Current velocity meter with probe and wading rod	
	Assorted extra batteries for dissolved, conductivity, and current velocity meters	
1 set	Completed water chemistry sample labels (3 labels with same barcode)	
1 set	Water chemistry sample containers (one 4-L Cubitainer and two 60-mL syringes with a plastic storage container	
1 box	Clear tape strips to cover completed sample labels	
1	Checklist of all equipment and supplies required for a stream visit	
Packing and Shipping Samples		
	Ice (also dry ice if it is used to ship frozen samples)	
1 box	1-gal heavy-duty sealable plastic bags	
1-box	30-gal plastic garbage bags	
2	Insulated shipping containers for frozen samples (special containers may be needed if dry ice is used)	
2	Containers, absorbent material, labels, and shipping forms required to transport and/or ship samples preserved in formalin and ethanol	
2-4	Sample tracking forms (can xerox completed originals or complete two sets of forms per shipment)	
	Shipping airbills and adhesive plastic sleeves	

Figure 3-6. Equipment and supply checklist for base location activities.

3.4 LITERATURE CITED

Klemm, D.J., B.H. Hill, F.H. McCormick, and M.K. McDowell. 1998. Base location activities. pp. 27-44 **IN**: J.M. Lazorchak, D.J. Klemm, and D.V. Peck (Eds.). *Environmental Monitoring and Assessment Program-Surface Waters: Field Operations and Methods for Measuring the Ecological Condition of Wadeable Streams*. EPA/620/R-94/004F. U.S. Environmental Protection Agency, Washington, D.C.

Metcalf, R. C., and D. V. Peck. 1993. A dilute standard for pH, conductivity, and acid neutralizing capacity measurement. *Journal of Freshwater Ecology* 8:67-72.

Peck, D. V., and R. C. Metcalf. 1991. Dilute, neutral pH standard of known conductivity and acid neutralizing capacity. *Analyst* 116:221-231.

Smoot, G. F., and C. E. Novak. 1968. Calibration and Maintenance of Vertical-axis Type Current Meters. Book 8, Chapter B2 **IN:** *Techniques of Water-Resources Investigations of the United States Geological Survey.* U.S. Government Printing Office, Washington, D.C.

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