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 river 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 sampling 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.

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

3.1 Activities before each River Visit

Before each river visit, each field team should confirm access to the sampling 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 will be provided with dossiers containing important location and access information for each river scheduled for sampling. Before visiting a river, the crew should review the contents of the specific site dossier. The landowner(s) listed in the dossier should be contacted to confirm permission to

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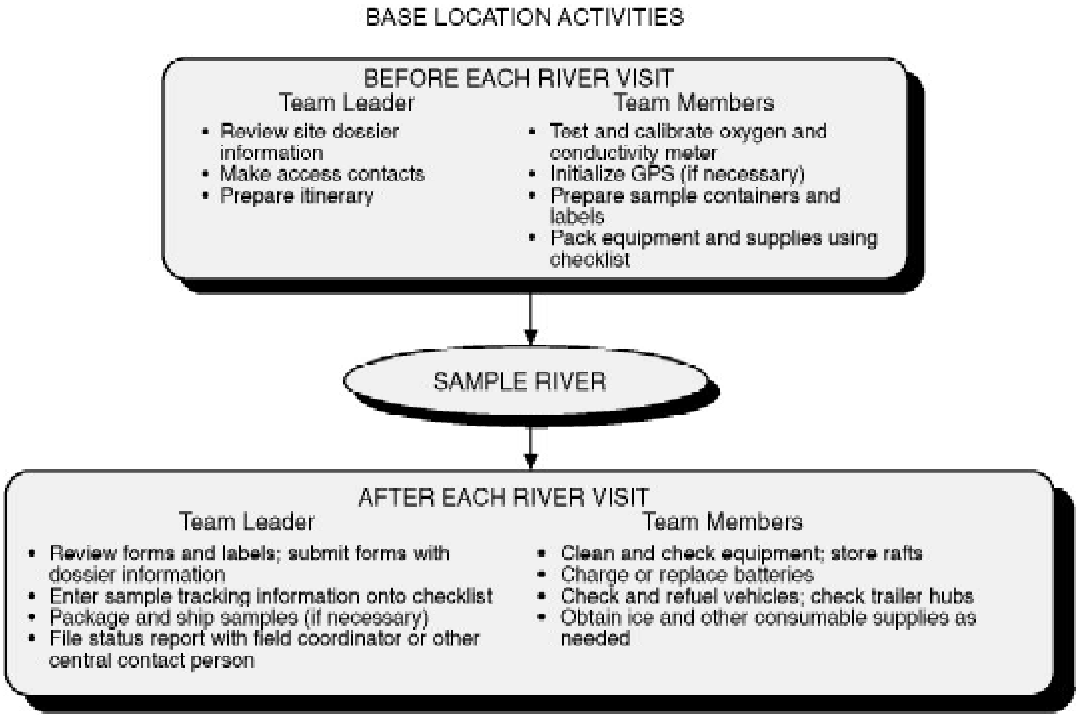

Figure 3-1. Activities conducted at base locations

sample and identify any revisions to the information contained in the dossier. Also, confirm that the proposed launch sites (e.g., public boat launches) are present and operational.

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 river dossier to ensure that it contains the appropriate maps, contact information, copies of permission letters, and access instructions. Additional activities include determining the best boat access locations, 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 river. 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 river 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 instruments prior to departure for the river site. Field instruments requiring testing and/or calibration include a global positioning system (GPS) receiver, a conductivity meter, and a dissolved oxygen meter. 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.

Before the initial use, or, in some cases, if batteries are replaced, the receiver may require inputting the coordinates of a positional reference point that is nearby (e.g., a U.S. Geological Survey benchmark identified on a topographic map). Follow the manufacturer's instructions for initializing the receiver.

3.1.3.2 Dissolved Oxygen Meter

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 at the base location before each river site visit.

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 at the terminal end of the probe. If bubbles are present, if the membrane is discolored, or if the membrane is torn, replace the screw-on membrane cap according to the manufacturer instructions.

After inspecting the meter and probe, attempt to calibrate it, 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 river site, at which time the calibration information is recorded on the field data form. If the meter cannot be successfully calibrated, replace the meter and/or probe. After the test, turn the meter off, and store the probe according to the manufacturer's instructions.

3.1.3.3 Conductivity Meters

Follow the operating manual provided with the instrument 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. The operation of the conductivity meter is checked at the base location using a standard solution of known conductivity. A daily quality control check sample (QCCS) is prepared as described in Table 3-1. The daily QCCS can be prepared as either of two dilutions of the stock standard, depending on the theoretical conductivity desired. A 1:100 dilution of the stock provides a QCCS with a conductivity of 75.3 S/cm at 25°C (Metcalf and Peck, 1993). A 1:200 dilution results in a QCCS with a con-

Table 3-1. Stock Solutions, Uses, and Instructions for Preparation.

Solution	Use	Preparation
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 pen or 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	Preservative for benthic macroinvertebrate samples.	None.

* Premade Packets can be Purchased
[a] Metcalf and Peck (1993) Premade Packets can be Purchased
[b] Peck and Metcalf (1991) Premade Packets can be Purchased
[c] Handle formalin according to 29 CFR 1910.1048.

ductivity of 37.8 S/cm at 25°C (Peck and Metcalf, 1991). A fresh lot of the daily QCCS should be prepared every two weeks from the stock standard solution. Check the performance of the conductivity meter by following the procedure presented in Table 3-2.

3.1.4 Preparation of Equipment and Supplies

To ensure that all activities at a river can be conducted completely and efficiently, field teams should check all equipment and supplies before traveling to a river site. In addition, sample containers and labels should be prepared ahead of time to the extent possible.

Check the inventory of equipment and supplies prior to departure using the river-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. Storing sensitive equipment in protective plastic cases (e.g., Pelican® cases) is recommended. Also, many smaller pieces of equipment and other supplies can be packed in labeled coolers or plastic totes. Secure the rafts to the trailer, one on top of the other with tie-down straps and stow the fishing gear in the rafts. Make sure everything stored in the rafts is secure so that nothing can blow away when traveling to and from a sample site.

If necessary, prepare stock preservative solutions as described in Table 3-1. Follow the regulations of the Occupational Safety and Health Administration (OSHA) for handling

Table 3-2. Performance Check of Conductivity Meters.

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 meter's 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 S/cm of the theoretical value, rinse the probe in deionized water. Store as described in the operating manual and package the meter for transport to the river 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.

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 and, if possible, outside the vehicle cab.

Refuel vehicles and conduct maintenance activities the night before each sampling trip, if possible. Inspect the vehicles every morning before departure. Check vehicle lights, turn signals, brake lights, and air pressure in the tires. Also inspect the flatbed trailer used to transport the rafts. Trailer hubs must be greased often, especially if submerged in water when launching the rafts.

3.2 Activities after Each River Visit

Some sample containers can be labeled before departing from the base site. Figure 3-2 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. The microbial bottle (Section 5) can also be pre-labeled as described above and stored with the cubitainer and syringes. Sample containers for biological and sediment samples should NOT be pre-labeled before reaching the river

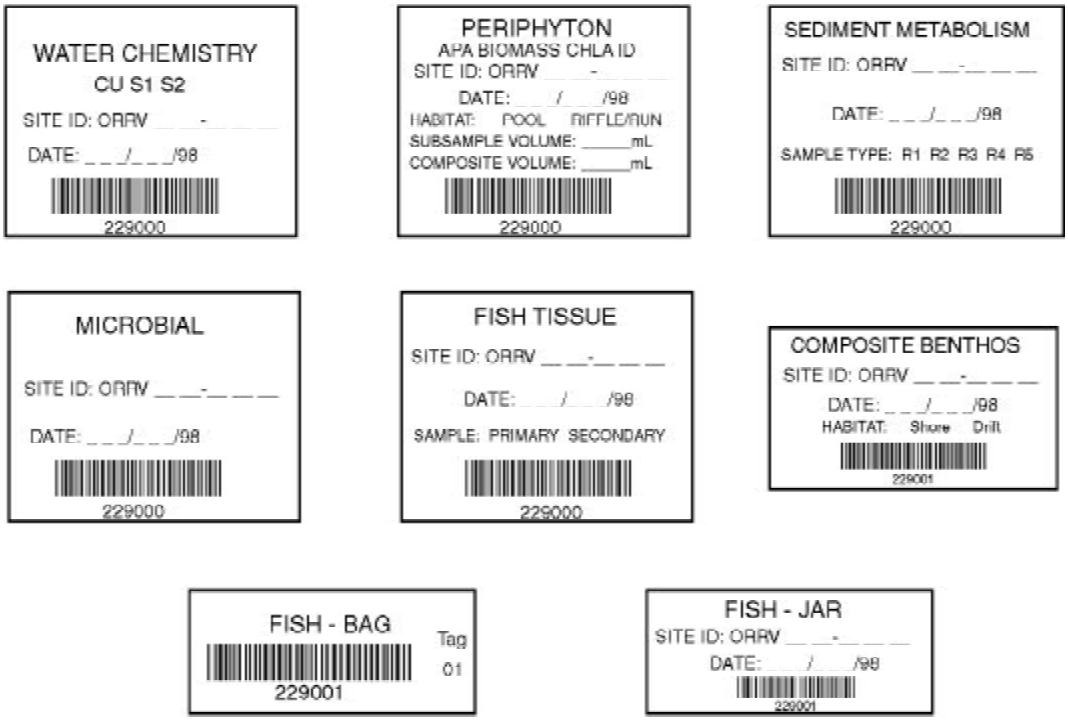

Figure 3-2. Sample container labels

site. Problems in sample tracking can result if jars are labeled and then are not used at a river.

Upon reaching lodging facilities or the base site after sampling a river, 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 must initial all data forms after review. If the team returns to the base site the day of sampling, the samples are not shipped. Under these circumstances, all sample information such as barcodes and sample condition is recorded by the team on a central log-in sheet. The team then stores all samples in their proper locations (e.g., freezer, refrigerator, chemical cabinet). The other team members should inspect and clean sampling equipment, store rafts (if at the base site), check the inventory of supplies, and prepare samples for shipment. If not already completed, the sediment metabolism samples should be processed. Other activities that must be conducted include shipping samples and communicating with the field coordinator or other central contact person.

3.2.1 Equipment Care

Equipment cleaning procedures are given in Table 3-3. Inspect all equipment, including nets, and clean off any plant or 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,

Table 3-3. Equipment Care after Each River Visit.

1. Clean for biological contaminants (e.g., plant and animal material).
   - Prior to departing each river, drain all water from the live well and buckets used to hold and process fish.
   - Inspect sampling gear for evidence of plant fragments and remove any fragments observed.
   - At the stream or base site, dry out dip nets, and kick nets, and inspect and remove any remnant vegetation or animal life. If the weather is rainy and gear cannot be dried out, then use a different (backup) set of gear, if available. If an additional set of gear is not available, disinfect gear with 10% bleach solution.
   - Clean the rafts by rinsing dirt and debris from the outside and the floors.
2. 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 site.
   - 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 river sample. Place the beakers in a 1-gallon self-sealing plastic bag with a cubitainer for use at the next river.
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.
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. Replace batteries as necessary (GPS, DO meter).
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, electrofishing generator, and spare gas container.

clean and disinfect them with a 10% chlorine bleach solution. 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.

3.2.2 Sample Tracking, Packing, and Shipment

Each field team must pack and ship samples from each sampling visit as soon as possible after collection, normally the day following the visit. Field teams will be provided with specific information for shipping destinations, contact persons, and the required shipping schedule for each type of sample. If the team returns to the base site the same day samples are collected, and the base site is the location of all sample analyses, samples are not required to be shipped.

Sample tracking information (including sample types, sample ID numbers, sample condition, number of samples, and other field-related information that is required by the laboratory to conduct analyses and associate results to a specific sample and river site) is recorded during the packing process. The field form used to record this information and accompany the sample shipment to the laboratory is illustrated in Figure 3-3. Procedures for conducting sample tracking activities should be provided to each field team by the information management staff. The sample

FIELD SAMPLE SHIPMENT TRACKING FORM

LAB NAME	CHEM ONE	AIRBILL NUMBER	1234567890
LAB CONTACT	J. DOE	IM CONTACT	S. DOE
DATE SENT	8-5-98	DATE RECEIVED	8-6-98
TEAM ID	(1) 2 3 4 5 6		
SITE ID	ORRV 98-999	VISIT	0 (1) 2 3

SAMPLE ID (BARCODE)	SAMPLE TYPE	CONDITION	COMMENTS
243223	FISH	T	PRIMARY SAMPLE (1 BAG)
243224	FISH	T	SECONDARY SAMPLE (1 BAG)
243663-667	SMET	OK	5 TUBES
243012	CHEM	OK	2 SYRINGES, 1 CUBITAINER
243113	MICR	OK	1 SAMPLE
243612	BENT	OK	DRIFT SAMPLE (1 JAR)
243611	BENT	OK	SHORE SAMPLE (1 JAR)
244013	PERI	OK	2 FILTERS, 2 TUBES
243360	VERT	OK	3 JARS

SAMPLE TYPES

BENT	=	Benthos
CHEM	=	Water Chemistry
FISH	=	Fish Tissue
MICR	=	Microbial
PERI	=	Periphyton
SMET	=	Sediment Metabolism
VERT	=	Fish Museum

CONDITION CODES

B	=	Broken Syringe Tip
C	=	Cracked Jar
F	=	Frozen
L	=	Leaking
ML	=	Missing Label
NP	=	Not Preserved
OK	=	Seems Fine
T	=	Thawed but Still Cold
W	=	Warm

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FIELD SAMPLE SHIPMENTTRACKING FORM - STREAM/RIVERS - 1

Figure 3-3. Tracking form to accompany shipped samples

tracking system should identify the final destinations for each sample, and provide an informal "chain-of custody" to prevent the loss of samples and associated information.

General guidelines for packing and shipping the various types of samples described in this manual are presented in Table 3-4. Use fresh ice when shipping samples requiring 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 possible, place samples into a sealed plastic container to protect them from meltwater.

Water chemistry and microbial samples must be shipped as soon as possible after collection in order to meet holding time requirements for some laboratory analyses. To ship water chemistry and microbial samples, place a large (30-gallon) plastic bag in an insulated shipping container (e.g., a plastic cooler). The sample labels on the cubitainer, syringes, and glass microbial bottle(s) should be completely covered with clear tape to prevent damage from water or condensation during shipment. Place the syringes and microbial bottle(s) into a separate plastic container for shipment. Place the cubitainer and plastic 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 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 shipped without designating them as a hazardous material. Specific directions for packing, labeling, transporting, and shipping samples containing formalin or ethanol will be provided to each field team.

Each team leader must contact the field coordinator or other central contact person after each river visit to notify that the team is safely off the river, provide a brief update of each sampling visit, and request replenishment of supplies, if necessary. The team leader must also provide, for each shipment, the river 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 river visit and submit requests for replenishment well in advance of exhausting on-hand stocks.

3.3 Equipment and Supplies

A checklist of equipment and supplies required to conduct the activities described in Section 3 is presented in Figure 3-4. This checklist is similar to the checklist in Appen-

Table 3-4. General Guidelines for Packing and Shipping 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 (or other sample tracking report).
Microbial (200 mL glass bottle)	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 microbial bottles in a plastic container (with syringes). Place container inside of a second plastic bag (as above). Cover labels completely with clear tape. Confirm the sample ID assigned on the labels matches the ID number recorded on the field collection form (or other sample tracking report).
	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. (Portable Freezers Periphyton biomass (filter are available that can be run off a in aluminum foil cigarette lighter while in the field and electrical outlets in Motels).
Periphyton activity (50-mL centrifuge tube)	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.
Sediment metabolism (50-mL centrifuge tubes)	Confirm the sample ID assigned on the label matches the ID number recorded on the field collection form (or other sample tracking report).
	Samples requiring freezing (-20°C) within 24 hours of collection
Fish Tissue (aluminum foil;	If samples cannot be kept frozen in the field, ship on day of collection or within two 30-gal plastic bags) 24 h by overnight courier. (Portable Freezers are available that can be run off a cigarette lighter while in the field and electrical outlets in Motels).

(continued)

Table 3-4. Continued.

Sample Type (container)	Preservative	Guidelines
		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.
	Samples requiring preservation in formalin	
Periphyton ID (50-mL centrifuge tube)	10% buffered formalin	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.
Fish Specimens (1-L , 2-L, and/or 4-L jars)	10% buffered formalin	Confirm the sample ID assigned on the label matches the ID number recorded on the field collection form (or other sample tracking report). Special shipping containers, outside labeling, and shipping forms may be required for shipments containing formalin.
	Samples requiring preservation in ethanol	
Benthic Macroinvertebrates (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 (or other sample tracking report). Special shipping containers, outside labeling, and shipping forms may be required for shipments containing ethanol.

Base Location Activities		
Qty.	Item	
Before Departure for River		
1	Dossier of access information for scheduled river 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" Assorted extra batteries for dissolved and conductivity meters	
1 set	Completed water chemistry sample labels (3 labels with same barcode)	
1	Completed microbial sample label	
1 set	Water chemistry sample containers (one 4-L Cubitainer and two 60-mL syringes with a plastic storage container	
1	Microbial sample container (200 mL specially prepared square glass bottle)	
1 box	Clear tape strips to cover completed sample labels	
1	Checklist of all equipment and supplies required for a river visit	
Packing and Shipping Samples		
	Ice	
1 box	1-gal heavy-duty sealable plastic bags	
1-box	30-gal plastic garbage bags	
2	Insulated shipping containers (plastic coolers) for frozen samples	
2	Containers suitable to transport and/or ship samples preserved in formalin and ethanol	
	Shipping airbills and adhesive plastic sleeves	

Figure 3-4. Equipment and supply checklist for base location activities

dix A, which is used at the base location to ensure that all of the required equipment is brought to the river. Use this checklist to ensure that equipment and supplies are organized and available at the river site in order to conduct the activities efficiently.

3.4 Literature Cited

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