STANDARD OPERATING PROCEDURES FOR THE COLLECTION OF FISH COMMUNITY DATA FROM WADEABLE STREAMS FOR AQUATIC LIFE ASSESSMENTS

Bureau of Water Protection and Land Reuse
Planning and Standards Division
79 Elm Street
Hartford, CT 06106

APPROVAL PAGE

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Originator Name: Meghan Ruta
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APPROVALS:

Originator:

Meghan N. Ruta Meghan N. Ruta Date: 2/21/13
Print Name Signature

Program Supervisor/Quality Assurance Control Officer:

Christopher J. Bellucci Christopher J. Bellucci Date: 2/21/13
Print Name Signature

REVISIONS PAGE

Date	Review Number	Summary of Changes	Applicable Section
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1.0 SCOPE AND APPLICATION

1.1 Purpose

The purpose of this Standard Operating Procedure (SOP) is to establish a uniform procedure for the collection of fish community data from wadeable streams and rivers in Connecticut for stream health assessments. Data collected following these procedures can be used to calculate a fish multi-metric index (Kanno et al., 2009) and Biological Condition Gradient (BCG) tier assessment (Stamp and Gerritsen, in preparation) to assist with stream health assessments. Stream health assessments are completed by the Department of Energy and Environmental Protection (DEEP) to evaluate the aquatic life use support designated in wadeable streams use per federal Clean Water Act requirements. This SOP will provide for consistency and efficiency of the sampling effort while maintaining proper safety protocols.

1.2 Applicability

The procedures outlined in this SOP are applicable to all DEEP personnel involved in the planning, coordination, preparation, conducting and/or reporting of fish community data collection from wadeable sections of streams and rivers for the purposes of monitoring and assessing surface water quality.

Generally, sampling locations are expected to be first to fourth order, freshwater stream and river segments. This SOP does not apply to activities conducted on or within non-wadeable stream segments, wetlands, and/or lentic systems.

Activities covered by this SOP include only those fish community data collection activities conducted utilizing backpack electrofishing units. This SOP does not cover fish community data collection activities that require the use of tote barge units or boat mounted electrofishing gear.

2.0 TRAINING REQUIREMENTS & SAFETY CONSIDERATIONS

2.1 Special Training Requirements

Trainings, including safety, sampling, species identification (Appendix A) and data management, are conducted in cooperation with the DEEP Inland Fisheries Division. Trainings are directed by senior biologists responsible for wadeable stream data collection programs. Applicable special training requirements are noted in Table 2.1.

Table 2.1. Special Training Requirements for Personnel Involved in WPLR Fish Community Data Collection

Project Function	*Course or Description*	*Trained by*	*Training Frequency*	*Trainees*	*Certifications/ Records*
Safety	First Aid/CPR	CT Fire Academy	Every 2 years	All Field Staff	DEEP personnel office
Safety	Electrofishing Safety	Fisheries Project Managers	Every Spring	All Field Staff	DEEP Fisheries or WPLR
Safety	Electrofishing Safety (FWS-CSP2202-OLT)	USFWS (Online Course)	Every 5 years	WPLR Crew Leaders	WPLR Records (List of Trained Staff)

Table 2.1. (Continued)

Project Function	*Course or Description*	*Trained by*	*Frequency*	*Trainees*	*Certifications/ Records*
Safety and Data Comparability	Principles of Electrofishing (PowerPoint presentation, videos, field practice session)	WPLR Project Manager	Every Year	All Seasonal Field Staff	WPLR Records (List of Trained Staff)
Species Identification	Species Identification (PowerPoint Presentation, Field Identification Cards)	Fisheries & WPLR Project Managers	Ongoing	All Seasonal Field Staff	WPLR Records (List of Trained Staff)
Data Management	Standard Data Management Policy	WPLR Project Manager	Ongoing	All Seasonal Field Staff	WPLR Records (List of Trained Staff)
Safety	Ice & Cold Water Safety*	WPLR Staff	Every Winter	All Field Staff*	WPLR Records (List of Trained Staff)

**Ice and Cold Water Safety is only required if field staff will be sampling for special projects during cold water periods. Routine annual monitoring occurs during summer months (i.e., June-August) and does not require field staff to be trained in ice and cold water safety.*

2.2 Health & Safety Considerations

The following section outlines health and safety precautions that should be taken in association with performance of fish community data sampling procedures:

a. The SOP is to be read by all participants in the sampling effort prior to the survey.

b. Never electrofish alone. All electrofishing crews must consist of a minimum of three individuals.

c. A briefing is to be held the day of the survey to review safety procedures and potential general and site specific hazards.

d. Make sure that proper personal protection clothing and equipment is worn, including waders and rubber gloves. Waders should have slip resistant soles with lugs. Waders with felt soles are prohibited; such waders increase the risk of spread of aquatic invasive/nuisance species, including *Didymosphenia geminata* (*i.e.,* 'didymo'). Breathable waders should not be worn, as these waders do not provide sufficient protection against electric shock. Rubber gloves should be worn for the person carrying the Smith-Root back pack shocker and are required for all crew members when using a tote-barge unit.

e. All equipment should be inspected for rips, tears or holes, and leak tested prior to each day's use. Any personal protection clothing and equipment failing the leak test should be replaced or repaired before use; report any equipment with damage or that fails the leak test to the project supervisor. If during sampling, gloves or boots begin

leaking, sampling must cease until the equipment is replaced. Report malfunctioning clothing or equipment to the project supervisor.

f. The crew leader is responsible for packing a field bag with: cell phone, first aid kit, back-up A & D batteries, safety vests and blinking yellow vehicle sign. (*Note*: cell phone should be within reach and turned on at all times during the entire duration of the sampling trip.)

g. All field equipment must be in good working condition. Electrofishing equipment maintenance, testing and safety inspection will be completed according to the schedule outlined in Table 5.1 and as advised by the manufacturer (refer to Smith-Root 2012).

h. For the Smith-Root back pack shocker, the battery to the electrofishing unit should connected immediately prior to sampling. Never touch electrodes when the backpack electroshocker is turned on. Electrofish only as far as it is possible to safely wade. Some areas may be unreachable with a backpack Electrofisher.

i. If an individual begins to fall while sampling, he or she will loudly shout the word "Off!" to alert the team member in control of the electrofishing unit to immediately turn the unit (or power source) off. If a fall has taken place and protective gear has become wet inside, the sampling is temporarily suspended and a replacement person or equipment is put in place or sampling is resumed once the equipment has become dry.

j. Take notice of unauthorized people standing on the bank. Electric fields can travel long distances through buried pipes, metal sheet piling, and metal culverts. If members of the public come within approximately 100 feet, cease electrofishing and explain the risks to them being there and ask them to please leave for their own safety. Follow the Electrofishing Safety guidelines outlined by the manufacturer (refer to Smith-Root 2012).

k. No sampling should take place during heavy rain. Sampling should occur when stream flows are stable and approximate median values or below for the period as determined by use of a nearby United State Geologic Survey (USGS) real-time stream flow gage.

2.3 Permits, Notifications and Permissions

The project lead is responsible for obtaining collecting permits prior to the electrofishing field season and for submitting any required post-sampling permit reports at the conclusion of the season. The project lead is also responsible for obtaining any necessary landowner permissions if electrofishing will require the crew to sample on or to cross private property. The field crew leader is responsible for confirming with the project lead that all necessary permits and permissions have been obtained prior to conducting sampling.

The project lead is responsible for providing the State Environmental Conservation Police (EnCon) with the Division's electrofishing schedule (e.g. a list of locations and corresponding survey date) prior to the commencement of the electrofishing season. Whenever possible, the project lead will notify EnCon of modifications to the electrofishing schedule as they arise.

3.0 FIELD TRIP PREPARATION

3.1 Establish Shocking Methodology: Traditional or Shoreline

One of two shocking approaches (i.e. methodologies) will be used to each survey stream reach, either the 'traditional' or the 'shoreline' approach. (Refer to Section 4.9 for detail regarding each approach.)

The approach used is pre-determined based upon the average stream width of the reach to be surveyed (Chart 3.1).

Table 3.1. Shocking Methodology Determination Chart

Average Reach Width (m)	*Method*
<8	Traditional
≥8	Shoreline

When several reaches of varying stream width will be sampled during the same field day, it may be necessary to plan (i.e., select and pack equipment) to allow for utilization of both approaches while out in the field.

3.2 Determine Equipment & Supply Needs

When determining equipment needs, the size of the sampling crew should be considered. Additional equipment may be needed to support additional crew members. The equipment and supplies listed in Table 3.1 are necessary to collect fish community data through the use of electrofishing. A field checklist of the required equipment and supplies is located in Appendix B.

Electrofishing Unit. Pack Smith-Root Model L-24 backpack electrofishing unit, all available charged backpack batteries, yellow anode pole with ring, and cathode 'rat tail.'

Nets. Pack a blue bin with available net heads (4 or more), short net handles (2), long net handles (2), and small aquarium nets (2 or more).

Miscellaneous Equipment. Pack the second blue bin with white buckets (2 or more), an aerator, hip chain measuring device, flagging tape, and fish measuring boards (2).

Voucher Containers. For each site, assemble a sufficient quantity of ethyl alcohol and the following containers unless otherwise specified by the crew leader:

Crayfish specimen containers, individually wrapped (6)

Fish Voucher Preservation Bags

Water Sample Containers. Pack one 1/2 gallon container for water chemistry samples per site. Sample containers are generally sterile and provided by the laboratory.

Coolers. Assemble three large coolers so that none is more than ¾ full of specimen containers and fish voucher specimens at the completion of the sampling run (*i.e.,* leave enough room for ice). Coolers must be clean prior to packing. Pack empty specimen containers and voucher bags in an empty cooler; pack water sample containers in second cooler; fill remaining cooler with bags of ice.

Field Analytical Instruments. Pack calibrated and charged YSI 650 MDS Data Logger and YSI 600 XLM Sonde in travel case with a connecting cable, probe guard, back-up battery pack and maintenance/tool kit. See SOP for proper calibration procedures for YSI data sondes.

Camera. Pack digital camera with extra batteries and two empty discs in travel case.

GPS. If sites to be sampled have not previously been geo-referenced, pack Garmin GPS unit with extra batteries. Check with the Data Management Officer for geo-reference information.

Field Maps and Data Forms. Pack clipboards (2 or more), pencils, permanent markers, site maps, and a sufficient quantity of DEEP Field Data Forms (Appendix C-1).

Personal Protection. Pack one pair of waders and rubber gloves for each field crewmember plus one backup set.

Safety/Backup Bag. Pack field bag with: Cell phone, First Aid kit, back-up set of collection bottles, backup A & D batteries, safety vests and blinking yellow vehicle safety light. (Note: Cell phone should be within reach and turned on at all times during the entire duration of the sampling trip.)

3.3 Equipment Inspection

All equipment should be inspected for condition and the presence of all required parts and accessories prior to sampling (Table 3.1). Any malfunctioning equipment should be reported immediately to project supervisor.

Table 3.1. Field Equipment Inspection Requirements

Equipment	Inspection Frequency	Focus of Inspection	Inspection Instructions
Backpack Electrofishing Units (2)	Pre and post sampling	Wire connections, fuses, output meter, straps	• Examine straps, buckles, cables, connectors • Verify battery cover latches are functional • Verify 2 magnets are inside of battery cover • Ensure quick release system is properly functioning
Backpack Unit Battery (Minimum 2; take as many as available)	Pre sampling	Charge	• Verify load test using Smith-Root battery charger. • Check to ensure no signs of damage or leakage.
Probes: - Anode pole with ring (1) - Cathode 'rat tail (1)	Pre and post sampling	Condition of head, cables, connectors	• Examine connections to ensure free from corrosion; remove scale by using fine grit sandpaper. • Inspect for broken connector pins. • Ensure cable insulation is undamaged.

Table 3.1. (Continued)

Equipment	Inspection Frequency	Focus of Inspection	Inspection Instructions
Nets: - Net heads (5) - Short net handles (2) - Long net handles (2) - Aquarium Nets (2)	Pre sampling	Integrity of mesh and handle	• Examine net heads for holes, rips, tears; mend any found or replace with new mesh. • Examine net head frame for loose wire, loss of protective guard. • Examine net poles for general condition; ensure free of cracks in handles.
YSI Equipment: - YSI 650 MDS Data Logger - YSI 600 XLM Sonde - Travel case - Connecting cable - probe guard - Back-up battery - Maintenance/tool kit	Pre sampling	Battery, cables, general condition	• Verify batteries are fully charged. • Verify cables are present. • Check condition of probes; ensure no tears or bubbling of probe membranes. • Ensure instrument is calibrated.
Digital Camera Setup: - Digital camera - Travel case - Batteries - Empty memory cards (2)	Pre sampling	General condition, battery, memory card	• Verify battery is fully charged. Ensure extra batteries packed. • Verify memory card is present and empty. Ensure extra memory card is packed.
Garmin GPS Device	Pre sampling	General condition, battery	• Verify batteries are fully charged. • Pack extra batteries
Flagging tape	Pre sampling	General condition	• Verify presence of suitable amount
Hip Chain Measuring Device	Pre sampling	Amount of line remaining, working condition	• Verify hip chain is functional and not jammed. • Assess amount of string remaining; replace if needed.
White buckets (2)	Pre sampling	General condition; integrity of handle	• Verify handle is present and in good condition • Check to ensure no holes or cracks in bucket
Blue Bins (2)	Pre sampling	General condition	• Check general condition
Clear Plastic Spare Gear Bin	Pre sampling	General condition	• Check general condition
Fish key(s)	Pre sampling	General condition	• Check general condition; ensure photographs and text are legible
Fish Measuring Boards (2)	Pre sampling	General condition	• Ensure scale is legible

Table 3.1. (Continued)

Equipment	Inspection Frequency	Focus of Inspection	Inspection Instructions
Fish Voucher Preservation Bags	Pre sampling	General condition	• Verify presence of suitable amount • Verify bags are unused and without holes
Crayfish specimen containers, individually wrapped (6)	Pre sampling	General condition; presence of container lids	• Ensure presence of matching lids
Ethyl alcohol	Pre sampling	General condition	• Verify presence of suitable amount
Water Containers, ½ gallon (1 per site to be sampled)	Pre sampling	General condition	• Ensure suitable quantity and presence of matching lids
Large coolers (3)	Pre sampling	General condition	• Ensure lid closes securely • Check for leaks
Pencils, permanent markers	Pre sampling	General condition	• Check general condition
Clipboards (2+)	Pre sampling	General condition	• Check general condition

Upon completion of equipment condition review, place gear in vehicle.

3.4 Sign Out

Record destination, field staff, and cell phone number on calendar in field prep room.

4.0 FIELD METHODS

Fish community sampling occurs during the fish index period June 1 through August 31 of each year.

4.1 Verify Suitable Flow and Weather Conditions

Prior to sampling, the crew leader will verify that weather and flow conditions at the anticipated time of sampling will be suitable. Sampling can occur when flows are stable and are within approximate median values or lower for the period as determined by use of a nearby United State Geologic Survey (USGS) real-time stream flow gage: http://waterdata.usgs.gov/CT/nwis/current?type=flow.

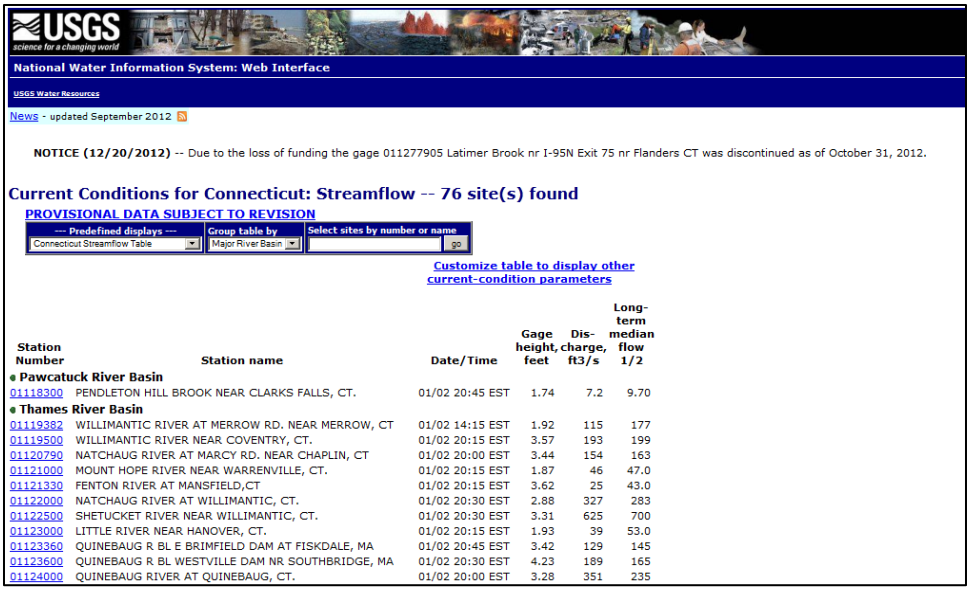

Figure 4.1. USGS website displaying real-time streamflow gage list and gage readings.

Rainfall in Connecticut can be very localized and checking both the USGS and NOAA websites can help target streams that have most suitable stream flows for sampling. Rainfall amounts can be evaluated on the National Weather Service website: http://water.weather.gov/precip/

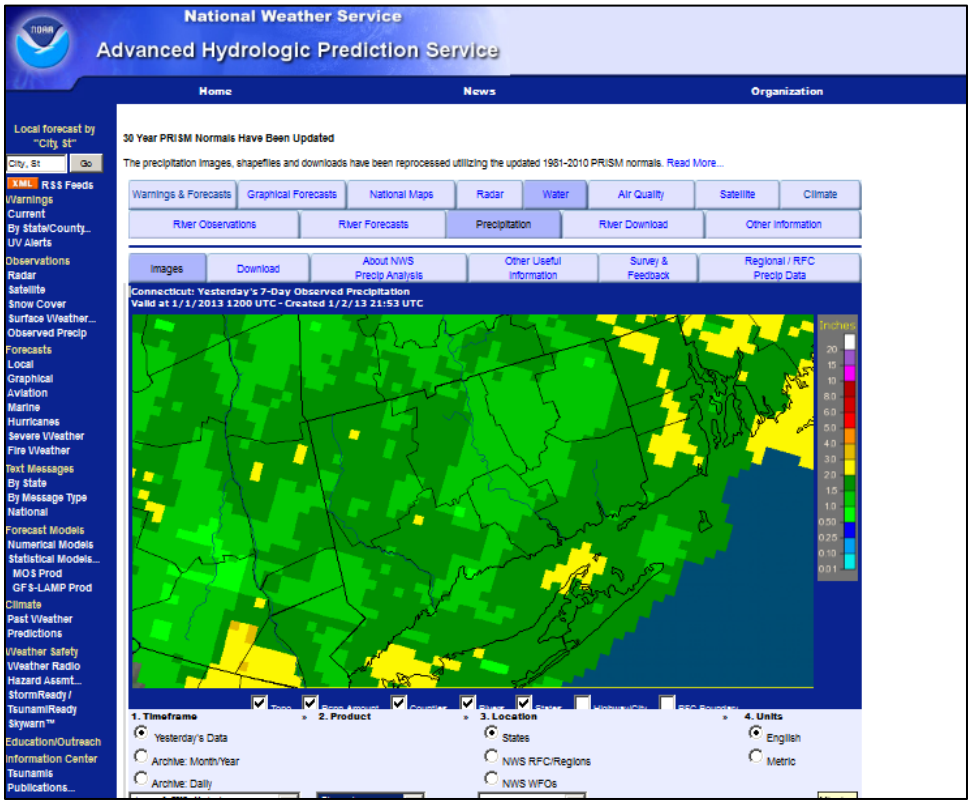

Figure 4.2. NOAA website displaying National Weather Service precipitation information.

4.2 Establish Crew Member Roles

Each crew will consist of a minimum three people; one shocking, one netting, and one containing the captured fish. If additional crew members are available, the remaining crew can assist with netting and transferring the stunned fish to the containment buckets. Larger streams may require additional crew members and equipment (Table 4.1).

Table 4.1. Crew and Equipment Requirements by Sampling Reach Width

Average Reach Width (m)	*Minimum # Crew Members*	*Electrofishing Gear Required*	*Sampling Method*	*Sampling Zone*
<4	3	1 Backpack	Traditional	Full Stream Width
4-8	8	1 Tote Barge*	Traditional	Full Stream Width
	6	2 Backpack	Traditional	Full Stream Width
>8	12+	2 Tote Barges*	Traditional	Full Stream Width
	3+	1 Backpack	Shoreline	5m Shoreline Zone

**This SOP does not apply to sampling efforts requiring the use of tote barges.*

Figure 4.3. A four-person electrofishing crew operating a single backpack shocker using the shoreline method. One individual operates the shocker (center), netters follow to the right and left of the backpack, and a crew member remains in the back with a bucket to contain stunned fish.

Figure 4.4. Crew configuration will vary depending on the number of crew members available and the width and depth of the stream to be sampled. Shown above is a four-person crew with two backpack units and two netters. In this case, one netter also maintains the collection bucket.

Designate a crew leader; the crew leader will be responsible for ordering the Electrofisher to be turned on; any member of the crew can order power turned off.

Determine who will be responsible for data recording, including collecting site location information and site photographs.

4.3 Establish Sample Reach

Determine the mean stream width of the survey area. Record this value on the field datasheet.

Determine the appropriate sample reach length (Table 4.2). The distance necessary to capture the majority of the species present is a function of stream order, geomorphologic characteristics, gradient, and several other physical factors. For small streams, sample reach length is typically 150 meters, however natural or manmade obstructions (*e.g.*, deep pool, dams) may result in a reach length that is less than this distance.

Table 4.2. Target Reach Length Determination

Average Reach Width (m)	*Method*	*Reach Length(m)*
<8	Traditional	100-150*
≥8	Shoreline	150 each bank; 300 total

**Actual reach length will depend on available natural break points/fish barriers.*

Select and mark off the sample reach start and end points with flagging tape. Start and end points for each segment are defined to ensure representation of each habitat type (*i.e.*, riffles, pools, runs) typical for that stream segment. Upper and lower boundaries of the segment are ideally defined by natural impediments to fish travel, such as shallow riffles.

Sample reaches are limited to wadeable sections of streams and rivers. Whenever possible, the reach should be sampled sufficiently upstream of any bridge or road crossing to minimize the hydrological effects on overall habitat quality.

Measure the actual sample reach length by walking the reach with a hip-chain measuring device attached.

4.4 Record GPS Coordinates of the Sampling Reach

Use the Garmin GPS unit to determine the latitude and longitude in decimal degrees at the start of the sampling segment. (Refer to Appendix D-1 for guidance regarding GPS operation.) Record the GPS reading, along with stream name, station ID (from previously prepared survey reach list), date, landmarks, town, and crew member names on the Fish/Crayfish Sampling Field Datasheet (i.e., field datasheet; Appendix C-1).

4.5 Assemble and Distribute Equipment

a. Equip individuals netting fish with a dip net corresponding to the size of fish expected to be caught and the complexity of habitat to be sampled.

b. Equip individuals charged with containing the stunned fish with an appropriately sized dip net and hand-held transfer/capture bucket(s). The water level in the bucket(s) should be at a depth to hold fish in a healthy state.

c. If being utilized, holding bins should be placed in-stream and located in an area of slow current and at a depth to allow the net to hang unencumbered. If using a holding tank in lieu a holding bin, place the tank in a shaded section of the stream to help maintain proper water temperature and with sufficient water to keep it from drifting off.

4.6 Physical and Chemical Field Measurements

Determine how many locations should be used to take measurements at the site, based on stream width and flow (Table 4.3).

Table 4.3. Use of Stream Width to Determine Quantity of YSI Readings

Stream Width (m)	*# YSI Readings*
<5	1
6-10	2
11-20	3
>20	5

At each location, lower the sonde into the stream until probe guard just rests on the bottom; allow probes to equilibrate. When field measures no longer appear to be changing, record the specific conductance and water temperature values on the field datasheet (Appendix C-1) and log the sample in the data logger. Refer to Appendix D-2 for guidance regarding the use of YSI 600XLM Sonde and 650 MDS.

Collect a water quality 'grab sample' in one of the ½ gallon containers. Label the container and place it on ice in one of the coolers; record the sample on the chain of custody form. (Refer to DEEP QAPP for Ambient Physical, Chemical, and Bacterial Monitoring and associated SOPs.)

4.7 Set-Up and Test Electrofishing Unit

a. Make sure the power switch on the electrofishing unit is turned to the OFF position. The unit is off when the red knob on the top is rotated completely counter clockwise. (When the unit is on the LED lamp on the side of the unit will flash.)

b. Ensure a freshly charged battery is securely in place within the backpack unit. If the battery needs to be replaced, after disconnecting electrical connections, release the battery from compartment cover by flipping the handles on the three cam-lock latches out and then turning the latches counter-clockwise. Replace the battery with a freshly charged one, making sure the red and black plastic battery connector is attached to the battery pack connector. Replace the battery compartment cover and re-secure the latches.

c. Attach the anode (pole with aluminum ring) and the cathode (black rat tail) to their respective output connectors on the bottom rear of the instrument case of the backpack unit (Figures 4.5 and 4.6a). (Coffelt backpack units may have a cathode pole rather than the rat tail/pole-ring combination; see Figures 4.3-4.4. The attachment points on these units are located on the top rear of the pack; Figure 4.6b.)

Figure 4.5. A Smith-Root backpack Electrofisher. The black rat tail is visible in the operator's left hand and the anode (pole with ring) in her right hand. Note the red on/off switch located on the anode pole handle. (Note that the switch is in the open/off position and the anode has been removed from the water ensuring there is no chance that a crew member will be shocked. During electrofishing the rat tail is placed behind the operator.)

Figure 4.6a-b. Two backpack electrofishing models- Smith-Root (A) and Coffelt (B). Anode and cathode connections are located on the bottom of Smith-Root models (A, left) and on the top of the Coffelt models (B, right).

d. Have a crew member help place the backpack on the individual who will be electrofishing, and check that all straps, connections, and cables are appropriately attached. Ensure the operator is familiar with the location of the backpack's quick release buckles; ensure the quick release system if functioning properly and the chest strap is released before entering the water.

e. Alert the crew that the pack is about to be turned on.

f. Turn on the power. **Do not press the anode switch**.

g. Check to ensure the tilt switch and immersion sensor are operating correctly (refer to Smith-Root 2012). (This step does not apply to Coffelt electrofishing units.)

h. **Using the backpack controls, select the desired output strength and type.**

Conductive field strength is initially set based on the specific conductance of the waterbody as determined by the YSI prior to the sampling run. In low-conductivity water, high voltage and low amperage are needed to stun fish, while in high-conductivity water, low voltage and high amperage are needed. Water conductivity is the single most important limiting factor in electrofishing effectiveness.

If using the Coffelt Electrofisher:

- Adjust the backpack settings until the output is between 0.3 to 0.6 amps.

If using the Smith-Root Electrofisher:

- When the Smith-Root Electrofisher is turned on it recalls the waveform setting that was in use when it was last turned off. Press the up arrow until the waveform is displayed to view the current settings. To use the current settings begin electrofishing.
- If the current settings are not the desired settings, press the Pulse Type button and use the up/down arrow keys to select **Standard Pulse**. Press Enter.

- Press the Volts key and use the up/down arrow keys to enter the desire voltage; press Enter.

  Table 4.4 offers suggested voltage ranges to use based upon the measured water conductivity:

Table 4.4. Voltage Output Determination Based Upon Measured Conductivity	
Measured Conductivity (umhos/cm)	***Recommended Voltage Setting (Volts)***
<100	900-1100
100-300	700-800
>300	100-400

- Press the Freq key and use the up/down arrow buttons to set the desired frequency. **Set the initial frequency to 30 Hz;** press Enter.

  Frequencies above 30 Hz have been proven to be more effective in collecting fish but appear to cause spinal injuries, particularly in trout and salmon species. Pulse rates below 30 Hz, however, result in low rates of injury, but also are generally ineffective in collecting fish. A frequency within the range of 30-60 Hz is therefore recommended to provide maximum collection effectiveness with a minimum potential for damage to fish. (Moulton II, et al. 2002)

- Press the Duty Cycle button and use the up/down arrow buttons to **set the duty cycle to 12%.** Press Enter.

- Press the Power Limit button and use the up/down arrow buttons to **set the power limit to 400 watts**; press Enter.

- Place the anode ring and cathode cable approximately 12 inches (30 cm) apart in ankle deep water. Press the anode pole switch and listen to the audio alarm. (If the audio alarm does not work, do not use the backpack; return the backpack to the manufacturer for service.) If the alarm is beeping on and off 1 time per second, release the anode pole switch and increase the output voltage 50 volts. Press the anode switch again and listen to the tone. If the tone is beeping on and off two or more times per second, release the anode pole switch and begin electrofishing. If not, repeat this step (increase voltage by 50V increments and listen to tone) until the audio alarm beeps on and off faster than one time per second.

- Test the fish response. Place the cathode rat tail behind the operator and place the anode ring in the water in front of the operator. Press the switch on the anode pole and hold the flapper down until the audio tone stops. If fish response is satisfactory, begin electrofishing.

  A satisfactory response consists of fish beginning to illicit a forced response (twitch) when the anode pole switch is pressed. "Rolling fish over" should be avoided; settings high enough to quickly knock fish out usually result in higher injury rates than are necessary. Ideally, fish will swim into the net while following the anode. Recovery time is zero and the fish is able to swim normally immediately upon being placed in the holding bin. **In general, if it takes more than 5 seconds for a fish to recover it may have been shocked too much.** (If it takes more than 15 seconds it was

definitely shocked too much; reduce the frequency, duty cycle and/or output voltage of the backpack unit.)

- If fish response is not satisfactory, press the Volts button and use the up arrow button to increase the voltage by 50 volt increments; press Enter. Continue to increase voltage until fish exhibit a forced response (twitch) when the anode pole switch is pressed.

  Warning: Never adjust the output when the reed switch on the anode pole is activated.

- If voltage has been increased to the maximum (400V) and fish response remains weak, return the voltage to the original setting and increase the duty cycle by 10% (to 22%); press Enter and try again. If fish still do not exhibit the desired response, increase the voltage by 50V increments. If necessary, continue to increase duty cycle by additional 10% increments (returning voltage to the original setting and increasing to maximum voltage before each subsequent increase in duty cycle). Repeat this step until the fish respond to the electroshock or duty cycle has been set to 50% with voltage set to the maximum allowable output.

- If fish still do not respond as desired at 50% duty cycle and maximum voltage, reduce the duty cycle back to 12%, volts to the initial setting, and increase the frequency by 10 Hz (press the Freq button, then the up arrow); press the Enter key and test the fish response.

- If fish still do not respond, repeat the process of increasing the voltage, and then the duty cycle, before increasing the frequency again. Frequency should not be set higher than 60 Hz. In general, lower frequencies are safer for larger fish than higher frequencies.

While sampling, adjustments to field strength are made as needed based on observed sampling efficiency in order to maximize capture.

Note: Use the lowest effective output and keep in mind that larger fish are more sensitive to (2-3 times) lower voltages. Consequently, low voltages and lower frequencies are most effective for sampling larger fish.

4.8 Crew Field Safety Review

Review with crew all alarms, emergency shut-off locations and procedures to turn off electrofishing gear in the event of an emergency. (Refer to 'Safety Features' section in Smith-Root 2012).

Figure 4.7. The large red button located on the top of the backpack unit is the emergency shutdown switch (as well as the main on/off switch). To quickly turn the unit off, push down the red button until it latches. (*Image courtesy Smith-Root 2012*).

Review safety protocols for falling. Field crew members are to yell "Off!" in the event that they fall or observe another crew member falling while the crew is electroshocking. The individual operating the electroshocking is to immediately cease shocking upon hearing "Off!" yelled.

4.9 Fish Sample Collection

Fish community data are collected in wadeable sections of stream. Protocols utilized for survey efforts are a combination of those established by the DEEP Fisheries field monitoring team (Hagstrom et al 1995), EPA RBP methods (Plafkin et al 1989), and DEEP Planning and Standards Division (Beauchene 2010).

Prior to starting the pass, one of the crew members (typically the individual charged with maintaining the collection bucket) attaches a hip chain measuring device to their clothing or the shocking unit. The string is tied off to a point at the start of the survey reach and stopped at the conclusion of shocking. Although the string is biodegradable, when the shocking run is completed, make sure that the crew picks up the string and disposes of it in the trash back in the laboratory.

If applicable, zero the time on the left side of backpack with the magnet.

The crew proceeds to shock the stream reach utilizing the shocking methodology determined during field trip preparation (Section 3.1):

TRADITIONAL SHOCKING METHOD

- Fish sampling commences at the downstream barrier in the reach. The crew proceeds to electrofish in an upstream direction, using a side-to-side or bank-to-bank sweeping technique to maximize coverage area. All wadeable habitats within the reach are sampled via a single pass, which terminates at the upstream barrier.
- All stunned fish regardless of size are netted and placed into a holding container/bucket until the entire reach has been sampled. (American Eel should be kept in a separate holding unit as the mucus that covers their skins can irritate and damage the gills of other fish species.)

SHORELINE METHOD

- Each fish community sample will consist of a paired pass consisting of a single pass along the left bank, followed by a single pass along the right bank of the sample reach.
- The backpacker will proceed in an upstream direction, starting from the downstream most point along the left bank in the survey segment.
- All fish within 5 meters of each stream bank throughout the sample reach are netted and placed into a holding container/bucket until the end of the sampling run (i.e. until both banks are sampled). (American Eel should be kept in a separate holding unit as the mucus that covers their skins can irritate and damage the gills of other fish species.)

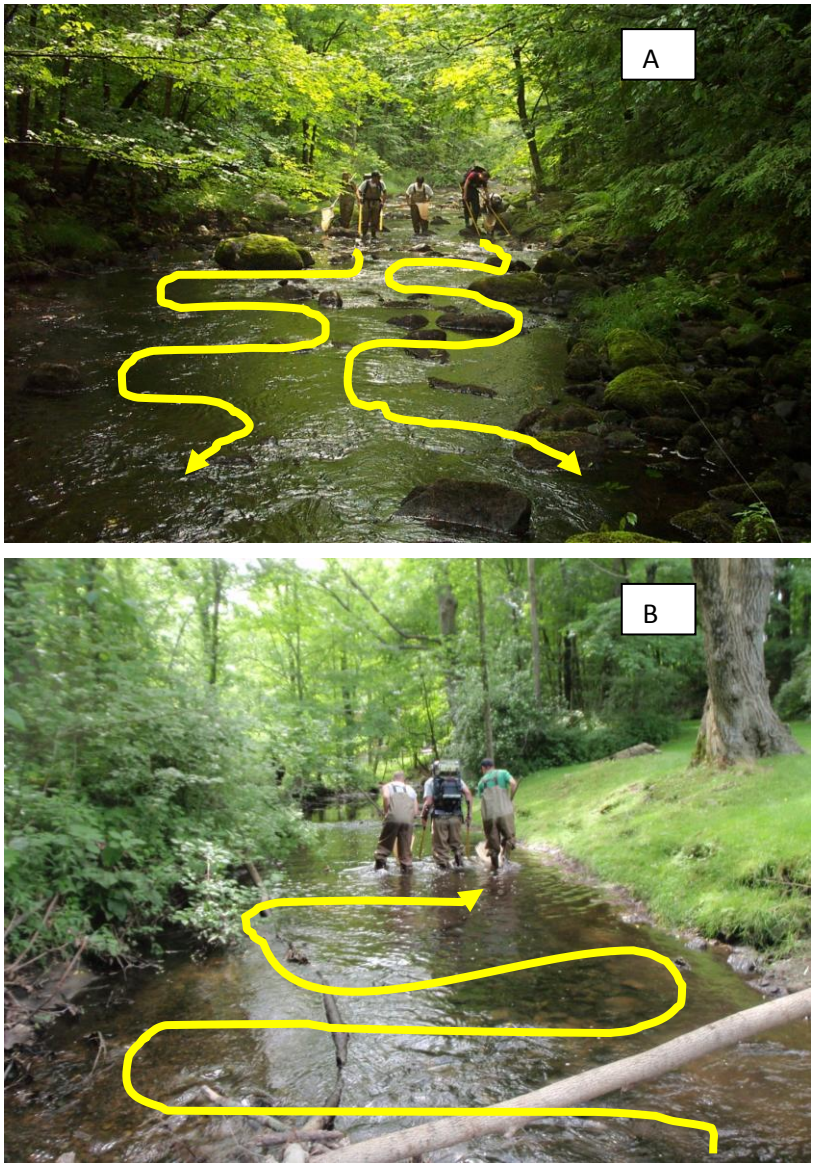

Figure 4.8. When using the Traditional method, the backpacker(s) traverse the stream reach as they move upstream, working back and forth across the stream to cover as much habitat as possible within the reach. The crew in figure A (top) is operating tandem backpacks to cover a wider stream segment. The crew in figure B (bottom) is sampling a narrower reach and requires the use of only a single backpack electrofisher to ensure adequate coverage.

Figure 4.9. When using the 'Shoreline' method, only the first 5m of the stream, from the water's edge are electrofished. Both shorelines in the reach are surveyed; the results are combined to produce one set of data for the reach.

Figure 4.10. A crew uses the shoreline method to sample a large stream. The crew is currently headed upstream (thick yellow dashed line) sweeping the 5m of stream closest to the shore along the right bank (facing downstream). Upon completion the crew will proceed to the opposite side of the stream and sample the 5m of stream closest to the shoreline along the left bank (dashed purple line).

The individual with the holding bucket will monitor the health of the fish and make transfers to holding tanks or fish bins if fish appear stressed or overcrowded. Signs of stress to look for that could indicate low oxygen levels include:

- Hyperactivity in salmonids; other fish may become sluggish
- Very fast movements of gill covers
- Fish come to the surface and appear to gulp air
- Fish start to keel over

Figure 4.11. Fish in the holding buckets are monitored for signs of stress. The fish in the white bucket (top) appear to be in relative good health, while the fish in the blue bin (bottom) are showing signs of stress, including keeling over.

At the completion of the sampling run, energized time, run time, amps, and total shocking distance for the reach is recorded on the field datasheet (Appendix C-1). Also, note the type of electroshocking unit used and the settings. Turn off all electroshocking equipment and disconnect from any power supplies.

4.10 Fish Identification, Measurement and Data Recording

a. At the conclusion of the sampling run, each fish is identified to species and measured to the nearest centimeter total length (TL). Total length is the maximum total length from the anterior-most part of the fish to the tip of the longest caudal fin rays, when the lobes of the caudal fin are compressed dorso-ventrally. Total length is rounded down to the nearest centimeter.

Figure 4.12. A measuring board is used to determine total fish length. Caudal fin lobes are compressed dorso-ventrally before making the measurement.

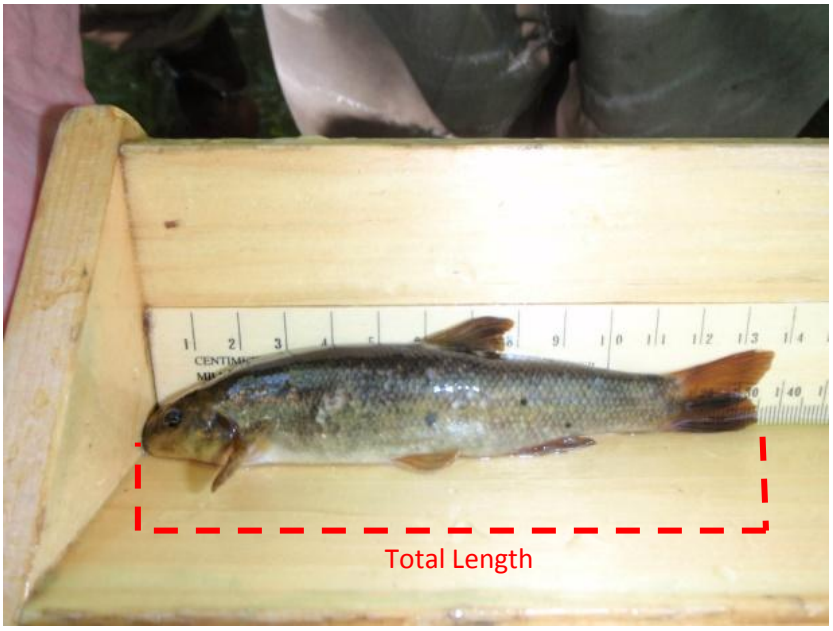

Figure 4.13. A measuring board is used to determine maximum total fish length (from 'nose tip' to 'tail tip'). Shown above is a 13 cm TL long nose dace. Note that the caudal fin lobes are compressed dorso-ventrally.

Field staff identifications are supported using fish identification keys (Appendix A) and are supervised and confirmed by the crew leader prior to recording.

b. Fish species are tallied by centimeter class on the field datasheet (Appendix C-1), using the standard species code list (Appendix E). The data recorder places a single tally mark for each measured species in the appropriate centimeter class on the datasheet. When fish are abundant in the sampled stream reach, the first 100 individuals of each species will be measured to the nearest centimeter class. All

subsequent individuals will be tallied by species, but not measured, to obtain a total count (Hagstrom et al. 1989).

Figure 4.14. Field crew members work together to identify each fish to species and measure total length. One crew member is assigned to record the data (species/total length) on the field datasheet.

The field crew leader reviews each field datasheet immediately following the length frequency measurements. Any errors are reconciled by a single line through the error and initialed by in a sealed plastic bag.

c. Fish specimens not able to be definitively identified to species in the field:

- Cyprinidae less than 3 centimeters long that cannot be identified to the species level are photographed, measured and recorded as an Unknown Minnow/Juvenile Cyprinid (CY), and then released.
- Fish greater than 3 cm long that are not able to be identified in the field are placed in a sealed plastic bag. On each fish voucher bag, write clearly in permanent marker the date, time of sampling, site name, site identification number, type of sample (*e.g.*, unidentifiable fish voucher), and initials of the sampling crew. The bag is then placed on ice in a cooler and brought back to the laboratory for further identification. Record the total number of vouchers collected on the field datasheet.

d. Photograph any unique or unusual fish observed prior to release, including any fish with observed external anomalies (*i.e.*, rare species or fish with deformities, eroded fins, lesions and/or tumors). Release fish as soon as possible after identification and measurement to the stream to avoid fatalities.

Figure 4.15. Example fish 'voucher' photographs. Before being released any fish that are unidentifiable, unusual or unique should be photographed. When possible, the photograph should include the site name, sampling date, location, and either GPS coordinates or the Station ID. (Top photo: yellow perch with black spot disease; bottom photo: redfin pickerel photographed with site and trip information.)

4.11 Crayfish

Crayfish specimen are placed in a crayfish specimen bottle and preserved with isopropyl alcohol. On each bottle, write clearly in permanent marker the date, time of sampling, site name, site identification number, type of sample (*e.g.*, crayfish voucher), and crew member initials. Place all samples on ice in coolers for transport to DEEP field lab. Record the total number of vouchers collected on field datasheet.

4.12 Photographic Documentation

Using the digital camera (using the wide-angle view) take at least one photograph of the upstream portion of the reach, one of the downstream portion of the reach, and one of the

middle of the reach (if not captured by upstream and downstream photos). Photos should include the riparian conditions surrounding the reach.

Photograph any unusual features (i.e. barriers to fish passage) or areas of potential water quality concern; make a corresponding note on the field datasheet.

4.13 Review Datasheets and Labels

Before leaving the field survey site, the crew leader will check the field datasheet and all labels (e.g. sample containers, fish tissue samples, fish vouchers), to ensure all necessary fields have been completed and site location and sampling information (e.g. date, time, etc.) on all datasheets/labels for a given site match. Data sheets should be compiled and given to the crew leader.

4.14 Complete Sampling Conditions Review

Before leaving the site, the crew leader completes the "Sampling Conditions" section on the reverse of the field datasheet, noting flow conditions, netting efficiency, field strength, and channel coverage success.

4.15 Clean and Store Equipment for Transport

At the conclusion of the survey, rinse all equipment used in-stream with stream water. Turn off all electronic devices and store in appropriate storage cases for transport. Remove the battery from the backpack electroshocker and store separately for transport. Field datasheets are stored in a metal storage box/clipboard in the field until return from the sampling trip.

5.0 POST-SAMPLING ACTIVITIES

5.1 Voucher and Sample Storage

Place all fish voucher and crayfish samples in the freezer in the DEEP field lab for storage until they can be further identified by a fisheries expert. Prior to freezing, check to ensure all labels contain the date and location (i.e. site number, waterbody, landmark, town) that the sample was collected on/from. Record sample information in the Fish/Crayfish Sample Laboratory Log notebook (Appendix F). Update sample log entry as each step is completed (*e.g.*, receipt, identification/measurement, validation, entered into database, archive). Consult with fisheries experts as needed to complete identification and validation of each sample.

If water chemistry samples were collected, store or process them according to established agency protocols. (Refer to DEEP QAPP for Ambient Physical, Chemical, and Bacterial Monitoring and associated SOPs.)

5.2 Equipment Storage and Maintenance

a. Wipe down and/or clean exterior of sampling equipment and clothing with a scrub brush and hose at the field headquarters prior to storing the gear. To prevent the introduction of nuisance organisms such as *Didymosphenia geminata*, additional disinfection per fisheries protocols are followed for all gear between sample locations (Appendix G).

b. Sand electroshocking probes to remove corrosion. Place all electroshocking unit batteries on the charger and set to be recharged.

c. Detach net heads from net handles and arrange net heads to dry.

d. Hang waders to dry.

e. Empty, clean, and dry all coolers.

f. Replace and recharge GPS unit and digital camera batteries. If needed, replace digital camera memory card with a new/empty card.

g. Store the 600 XLM sonde probes in the calibration cup with 1/8 inch of tap water if the sonde is to be used again within three or four days. For longer-term storage, remove the pH probe and store in 2 molar potassium chloride per Section 2.10.4 of the YSI Incorporated Environmental Monitoring Systems Operations Manual (YSI 2003).

h. If sampling the following day, replace any used sampling bottles/containers. Replace any additional items used up during sampling (e.g. first aid kit materials, hip chain string, etc.)

5.3 Submit Field Datasheets

A photocopy is made of each completed field datasheet at the completion of sample day. All copies are submitted to the WPLR project lead within one day of sampling for review, electronic data entry and archiving.

6.0 DATA MANAGEMENT

All project field data are stored in the DEEP monitoring database. (The database design insures referential integrity between test results and site information.) Following a sample run, YSI field measurements and GPS information area submitted to the Data Management Officer. A project staff person also enters metadata from the trip (date, sites, times of sampling, types of samples, number of containers, field crew members, purpose of trip) into the DEEP monitoring database. Water chemistry data is managed in accordance with the DEEP QAPP for Ambient Physical, Chemical, and Bacterial Monitoring and associated SOPs.

6.1 Establish Trip in Access Database

The Data Management Officer will establish a new trip in the monitoring database, including the trip date, run type (*i.e.*, 'ambient fish community sampling – [year]'), collector names (*i.e.*, field crew members), data collected during the trip, and rationale for the trip.

The Data Management Officer will record streamflow metadata in trip entry form, including the gage used, the flow at the time of sampling, median flow for that date, and the direction of the hydrograph at the time of sampling (e.g. ascending, descending, stable). An image of a hydrograph from the USGS stream flow gage used to note flow conditions at time of sampling will be saved to the trip picture folder within the Stream Monitoring Data folder on the S:\ drive.

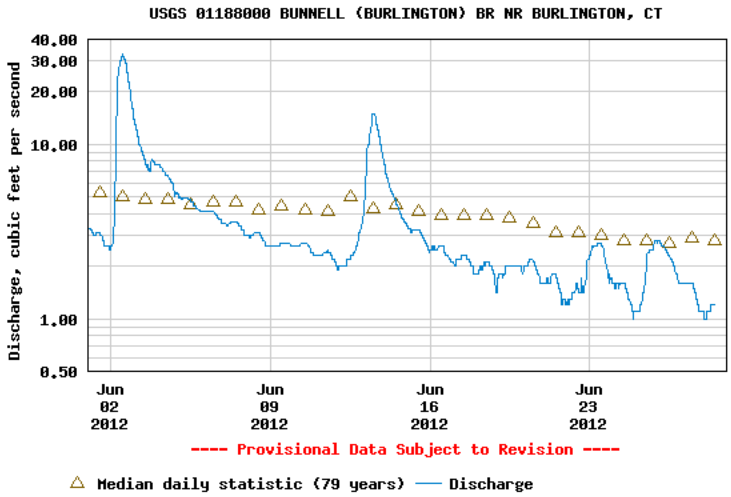

Figure 6.1. An image of the USGS hydrograph used to estimate flow conditions is saved to the trip picture folder. Shown above is a hydrograph of readings from the Bunnell Brook gage in Burlington during June 2012.

The Data Management Officer will generate and file a hard copy of the Trip Metadata Form (Appendix C-2).

6.2 Upload YSI Measurements

Logged field measurements are uploaded into the Access monitoring database from the YSI 650 MDS display/logger using EcoWatch for Windows (YSI 2003; refer to Appendix D-2).

For each set of field measurements, the Trip ID is manually entered. The instream location for each set of measurements is manually entered from the field datasheet (Appendix C-1). Field measurements recorded on the field datasheet are used to verify information uploaded from the YSI 650 MDS display/logger.

All physical and chemical field measures taken with the YSI 600 XLM Sonde and 650 MDS Data Logger are considered definitive.

6.3 Upload GPS Locational Information

Latitude /Longitude in decimal degrees from the Garmin GPS unit are entered into the monitoring database if the station is a new sampling station.

6.4 Process Trip Photographs

Digital photographs are uploaded from the camera disk to the trip folder within the Stream Monitoring Data folder on the S:\ drive following each sampling trip. Each photo is renamed to indicate location and date, such as 'HowellsBrk_5318_DS_06272012' (*i.e.*, "[StreamName]_[StationID]_[PhotoNote]_[mmddyyyy]). At the conclusion of each sampling season, all digital photos collected during the season are copied from the shared computer drive to a CD, which is filed with the Data Management Officer.

6.5 Enter Fish Community Data into Database

Check the Fish/Crayfish Voucher Laboratory Log notebook to ensure that all unidentified fish vouchers for each trip have been identified, measured, and recorded on the field datasheet for the corresponding trip. Final field datasheets will be reviewed and approved by the field crew leader in the field and the project lead upon return. Once approved, data from both will be transferred by the project lead to the monitoring database.

6.6 Archive Forms and Datasheets with Data Management Officer

The trip metadata form, field datasheet and any other forms generated with sampling event are filed with the Data Management Officer as a set (along with the sampling season digital photograph CD).

Any subsequent hardcopy data are filed with the appropriate trip metadata form. All subsequent electronic data are filed by Trip ID and site information in the monitoring database.

7.0 DATA ANALYSIS

Data reduction and summary statistics are performed using MS Access or Excel software applications. Standardization of sampling effort for comparison between streams is achieved by calculating the catch-per-unit-effort (CPUE), which is calculated by dividing the abundance of each species by the shocking time, sampling distance , or sampled area for each stream.

The Access database is queried on an as-needed basis to provide information for specific projects and reports.

8.0 QUALITY ASSURANCE & QUALITY CONTROL

Field staff identifications are supervised and confirmed by crew leader. Unique or unusual specimens, including those fish that cannot be identified to species in the field, are documented with digital photographs. Fish 3 cm or longer that cannot be identified in the field are preserved and brought back to the field laboratory for further identification.

All field datasheets (Appendix C-1) are verified for completeness and accuracy by senior field staff before leaving a sampling site. The data management officer verifies all field datasheets and cross checks field measurements downloaded from the YSI 650 MDS with those recorded on the field datasheet.

Any deficiencies identified during field sampling visits are documented on the field datasheet and forward to the project supervisor. The project supervisor, monitoring staff and the field crew supervisors will discuss and reach consensus regarding any field sampling deviations. Most deviations involve stream flow, habitat, or accessibility issues. Corrective actions are decided and based upon the intended use of the data. If it is determined that conditions will jeopardize the usability of the data, sampling is suspended until the issue can be resolved.

Any real-time changes to this SOP, including sampling effort or location, are to be made only by the project supervisor or the field crew leader. If such changes are necessary they are to be made in such a manner as to not jeopardize the validity and comparability of the fish community data. If a change is made, it is the responsibility of the individual executing the change (e.g. project supervisor or crew leader) to ensure that the change is documented and distributed to project staff and officers for review.

9.0 REFERENCES

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APPENDIX A. Common Fishes & Crayfish Likely to be Found While Electrofishing in Connecticut Wadeable Streams

Common Fishes & Crayfish Likely to be Found While Electrofishing in Connecticut Wadeable Streams

Fish

Snake-like Body

-Eel
-Sea Lamprey

Rounded Body

-Pumpkinseed
-Bluegill
-Redbreast
-Green

Elongated/Streamlined body form

Ventral mouth
- White sucker
- Cutlips minnow
- Longnose Dace

Duck-bill like mouth
- Redfin Pickerel
- Chain Pickerel

Long chin whiskers
- Brown Bullhead
- Yellow Bullhead

Uniformly bright silver body
- Fallfish
- Common Shiner
- Golden shiner

Colored dots on side of body
- Atlantic Salmon
- Brook Trout
- Rainbow Trout
- Brown Trout

Dark stripe on side
- Blacknose Dace
- Creek Chub

Small fish large pectoral fins
- Slimy Sculpin
- Tessellated Darter

Start here with a fish

Elongated/Streamlined body form

Snake-like body

Rounded body form

Red spot on gill

Purplish spot on gill

Has a normal mouth, head, eyes and fins

Elongate spot on gill

Yes=Eel

No=Sea lamprey

Black spot base of dorsal fin

Elongated/Streamlined body form part 1

Ventral mouth

thick round lips
(White Sucker)

lower-lip very small
(Cutlips minnow)

normal looking lips
(longnose dace)

Duck-bill like mouth

Short less than ½ length of the head
(Redfin Pickerel)

Longer than ½ length of the head
(Chain Pickerel)

Long chin whiskers

dark chin whiskers
(Brown bullhead)

light chin whiskers
(Yellow bullhead)

Elongated/Streamlined body form part 2

Colored dots on side of body

Deeply forked tail
(Atlantic Salmon)

Pink tint on side
(Rainbow trout)

Anal fin with white black red
(Brook Trout)

Adipose fin red/orange
(Brown Trout)

Small fish large pectoral fins

Body taller than wide
(tessellated darter)

Body wider than tall
(Slimy sculpin)

Elongated/Streamlined body form part 3:

Uniformly bright silver body

Dark margin on scales mouth in front of head (Fallfish)

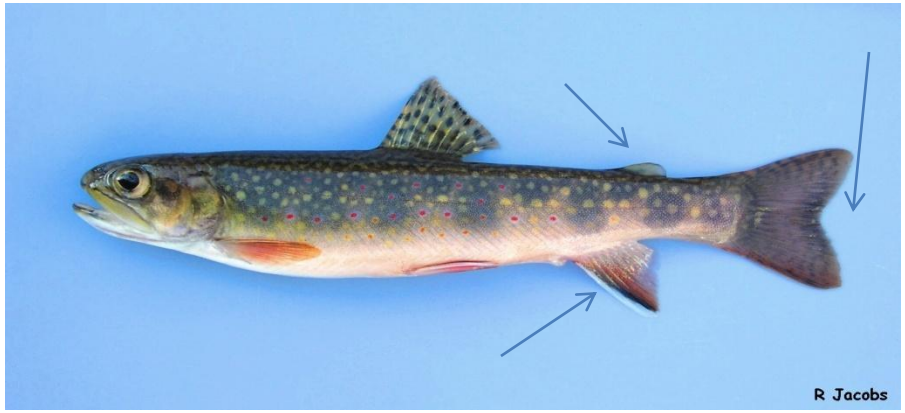
No dark margin on scales
Lateral line does not steeply dip to belly
(Common shiner)

No dark margin on scales
Lateral line does dip to belly
(Golden shiner)

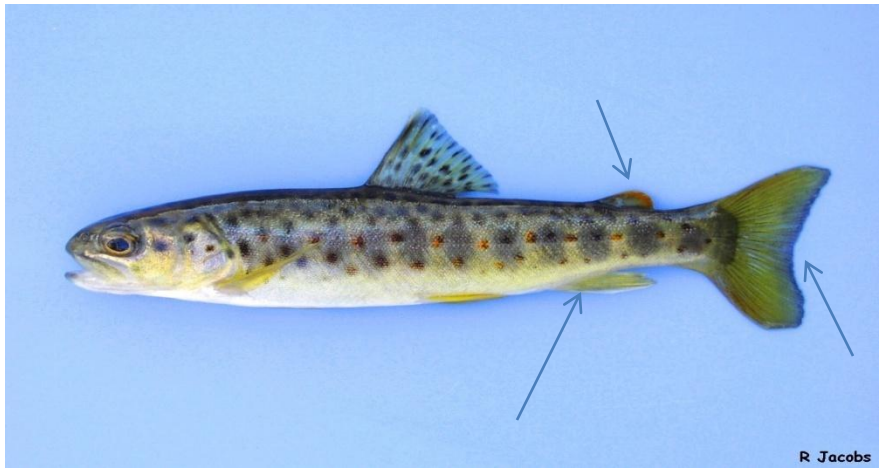
Dark stripe on side

Stripe across nose scales too small to see

No stripe across nose, purplish tint,
Scales are visible

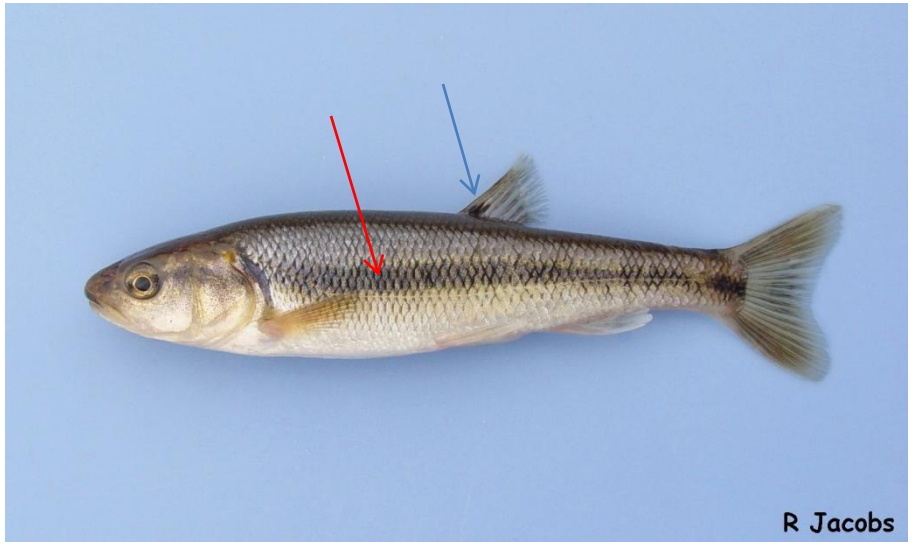


Eastern Brook Trout (WBK or BK):
-very small scales
-Tail is not deeply forked
-large mouth in front of head
-dark green dorsal surface
-white or pink ventral surface
-dark body light colored spots
-pelvic/pectoral fins have white outer edge then black then red



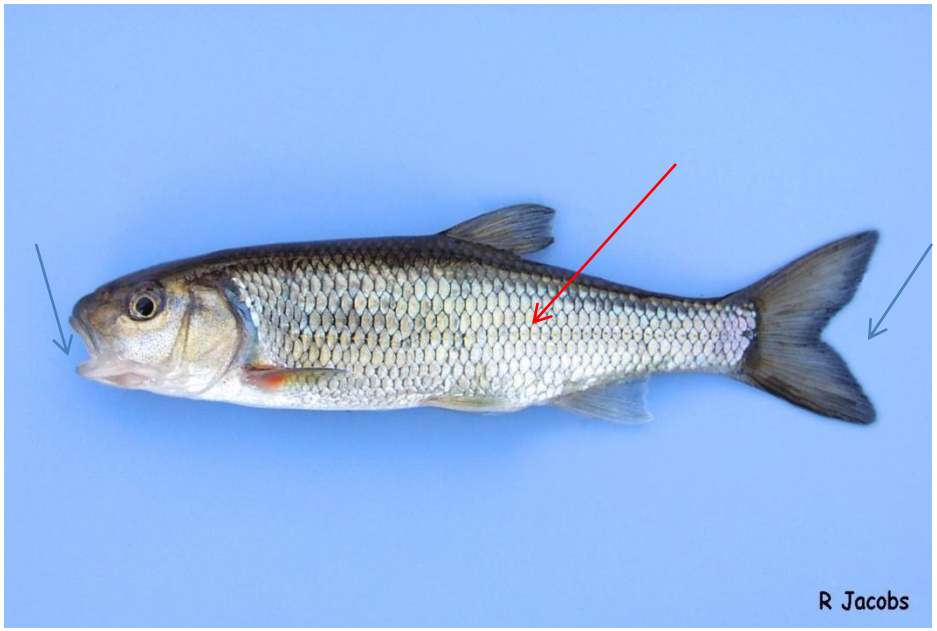
BrownTrout (WBN or BN):
-very small scales
-Tail is not deeply forked
-large mouth in front of head
-light colored body dark colored spots
-fins greenish no red in fins
-red/orange color on adipose fin

Atlantic Salmon fry/smolt (SA):
-very small scales
-Tail is deeply forked
-large mouth in front of head
-very large pointed pectoral fins
-light to creamy ventral surface
-dark body light colored spots
-no red on adipose fin or pelvic/pectroal fins

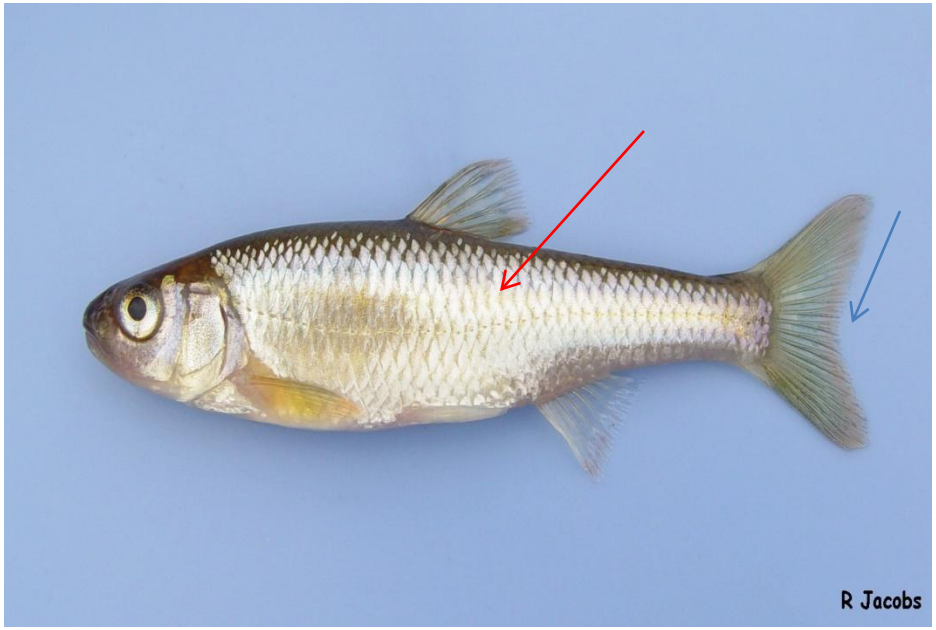


Creek Chub Minnow (CR):
-medium size scales
-purplish hue on dorsal surface
-Tail is rounded
-mouth is in front of head
-lower lip is normal
-spot at base of dorsal fin
-sometime a stripe on side

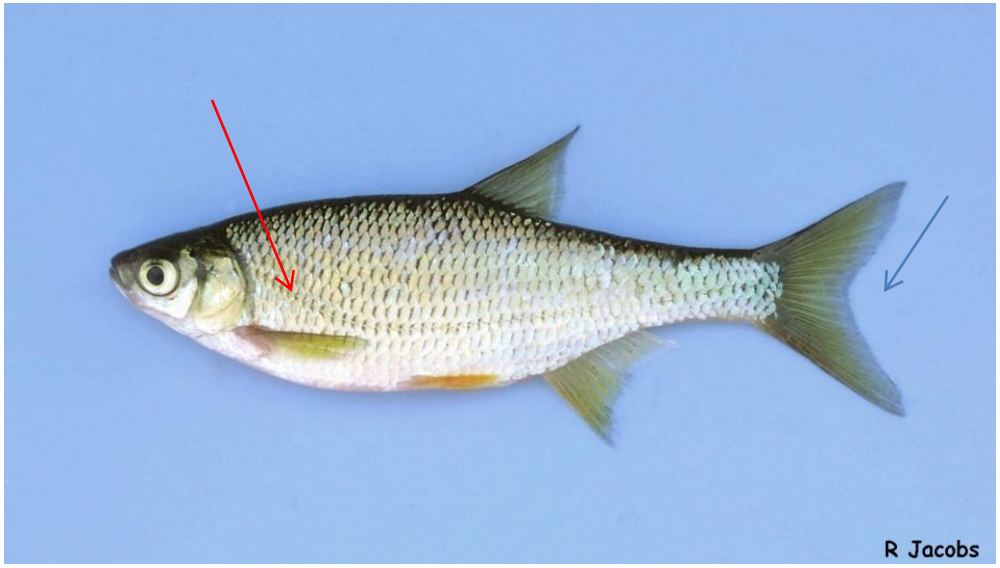
Blacknose dace minnow (BL):
-very small scales
-very dark stripe
-dorsal surface is tan
-ventral surface is creamy
-mouth in front of head
-stripe across nose from eye
To eye.



Fallfish (FF):
-silver minnow
-large scales with black margin
-large mouth
-forked tail
-scales do not fall off easily

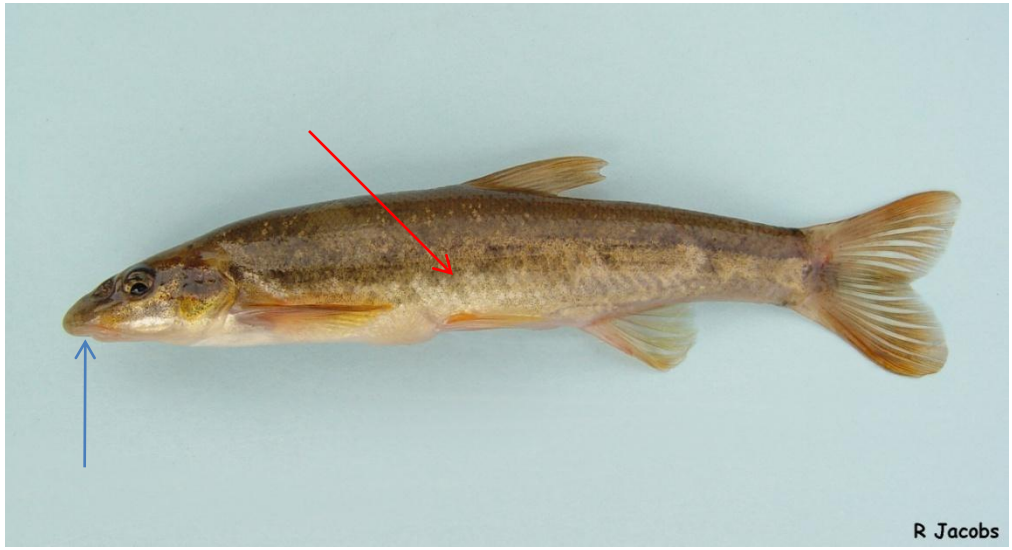


Common Shiner (CS):
-silver minnow
-large scales No black margin
-Tail is not forked
-scales do fall off easily
-males can be brightly colored purple
And red, with nose tuburcles



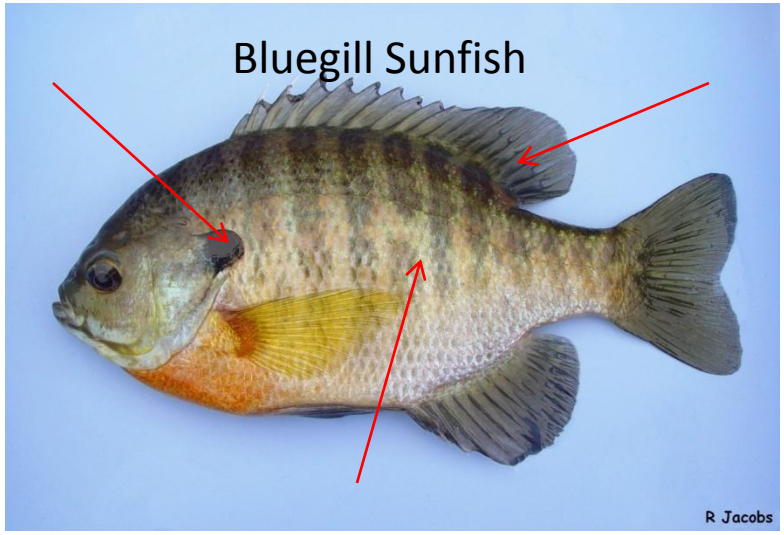
Golden Shiner (GS):
-silver/yellowish minnow
-large scales slight black margin
-Tail is forked
-scales fall off easily
-Lateral line takes a very deep
Bend towards belly.

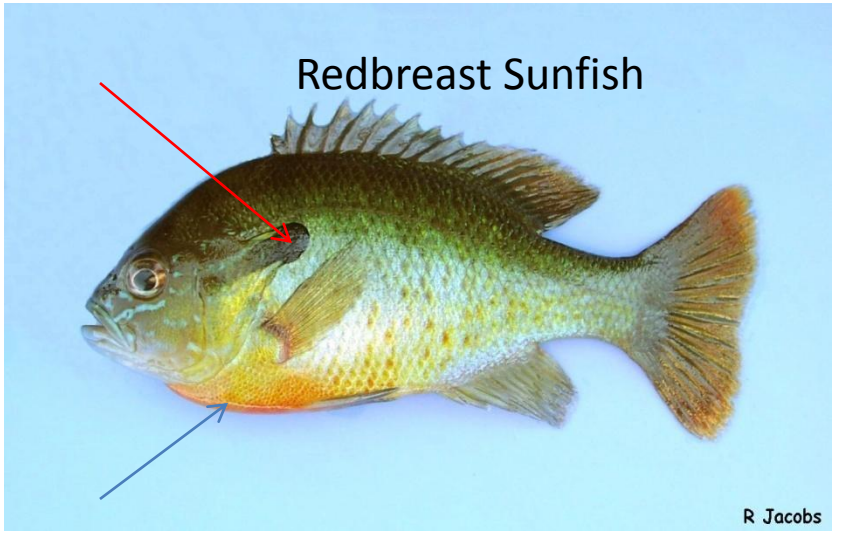
Cutlips Minnow (CM):
-medium size scales
-slight purplish hue sometimes
-Tail is rounded
-mouth is under head
-lower lip is greatly reduced

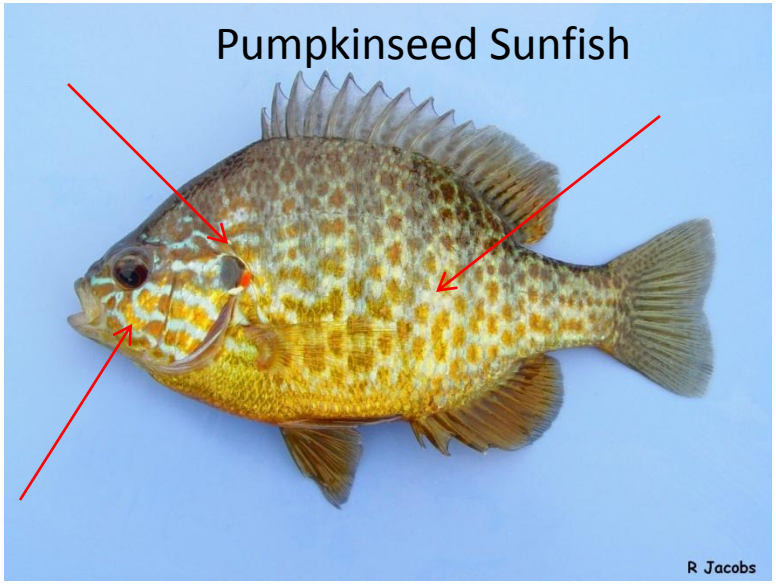


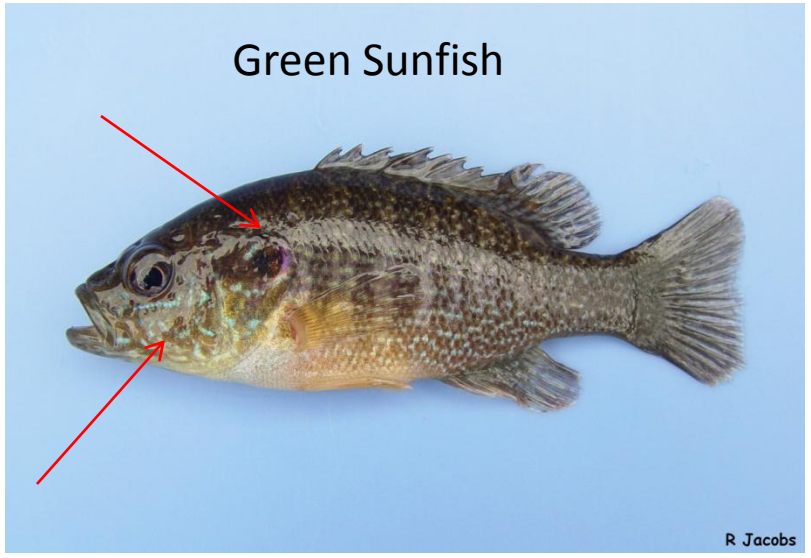
Longnose dace minnow (LD):
-very small scales
-usually no stripe
-dorsal surface is dark brown
-ventral surface is creamy
-mouth under head
-no stripe across nose from eye
To eye
-very streamlined, shark-like

White Sucker (WS):
-large scales
-usually no stripe
-uniformly colored sometimes brownish
-mouth under the head
-large lips
-can be quite large


Bluegill Sunfish
R Jacobs


Redbreast Sunfish
R Jacobs


Pumpkinseed Sunfish
R Jacobs

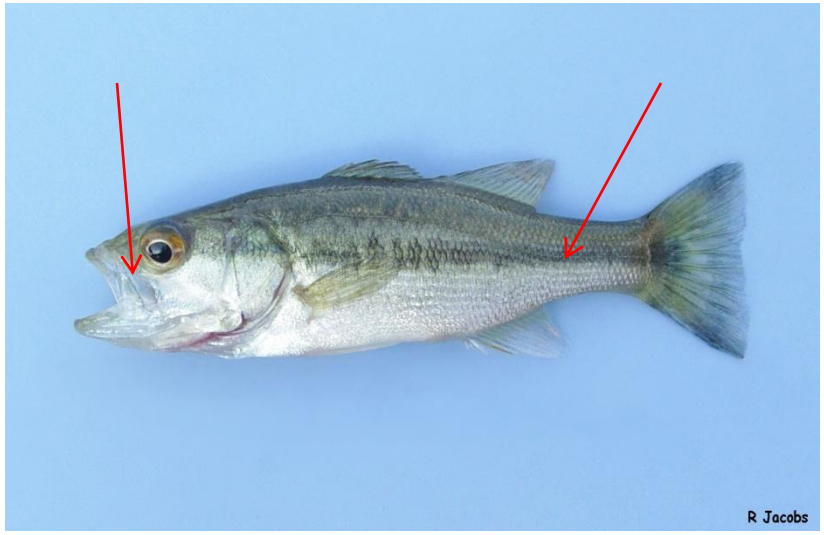

Green Sunfish
R Jacobs

Bluegill Sunfish (BG):
-large scales
-sharp spines in dorsal fin
-Vertical stripes (tiger)
-no color to spot on gill cover
-has a dark spot at base of dorsal fin
-round body shape

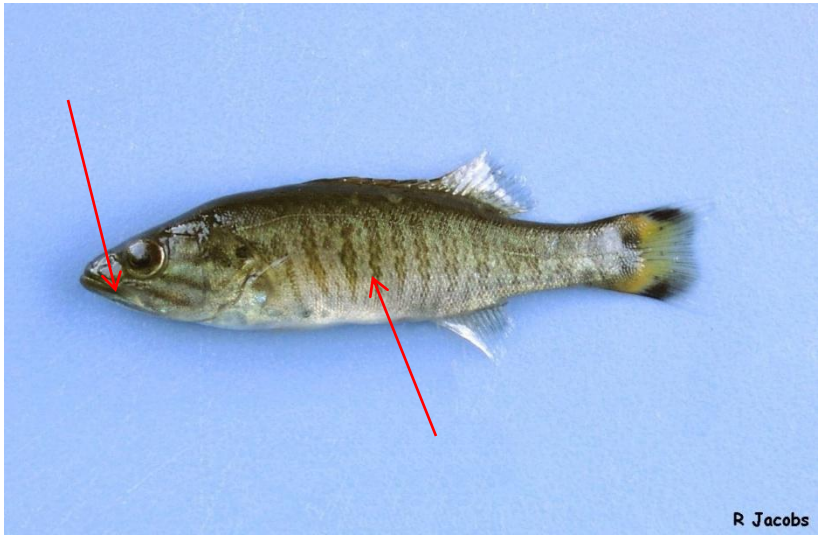
Redbreast Sunfish (RS):
-large scales
-sharp spines in dorsal fin
-Vertical stripes (tiger) less obvious
-usually more uniform green color
-dark orange to reddish chest and belly
-No red spot on gill cover
-no dark spot at base of dorsal fin
-Turquoise lines on face
-Long black earlobe on gill cover

Pumpkinseed Sunfish (PS):
-large scales
-sharp spines in dorsal fin
-Vertical stripes (tiger) less obvious
-Speckled appearance
-Red spot on gill cover
-no dark spot at base of dorsal fin
-Turquoise lines on face
-round body shape

Green Sunfish (GR):
-large scales
-sharp spines in dorsal fin
-Vertical stripes (tiger) sometimes
-Purple to lavender spot on gill cover
-no dark spot at base of dorsal fin
-Turquoise lines on face
-more streamlined than round body shape



Largemouth Bass (LM):
-large scales
-usually horizontal stripe
-dorsal surface is dark green
-ventral surface is creamy
-mouth in front of the head
-Jaw extends past the centerline
Of the eye



Smallmouth Bass (SM):
-large scales
-usually vertical stripes (tiger)
-dorsal surface is dark green
-ventral surface is creamy
-mouth in front of the head
-Jaw does not extend past the
Centerline of the eye

Tessellated Darter

R Jacobs

Slimy Sculpin

R Jacobs

Tessellated Darter

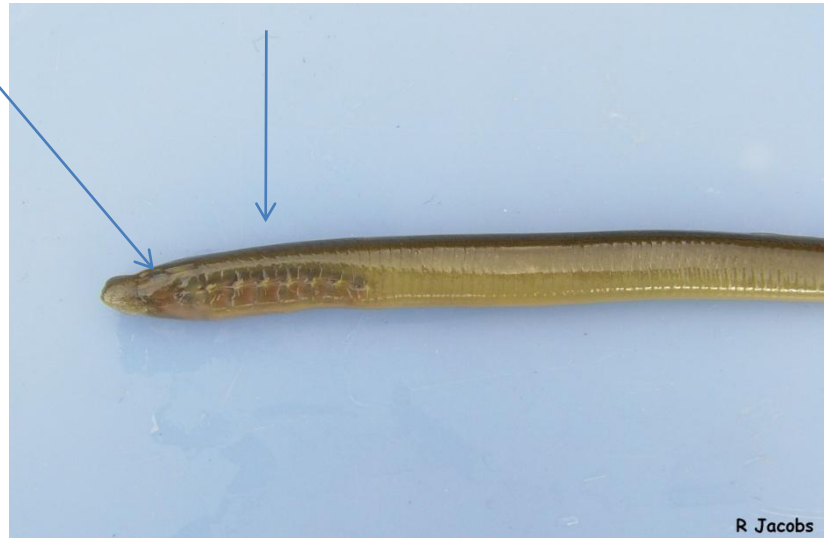
R Jacobs

Slimy Sculpin

R Jacobs

Tessellated Darter (TD):
-small fish
-small scales
-”w” pattern on side
-eyes on top of the head
-large pectoral fins
-from front view much taller than wide
-small head compared to body
-small mouth

Slimy Sculpin (SC):
-small fish
-small scales
-”w” pattern on side
-eyes on top of the head
-large pectoral fins
-from front view much wider than tall
-very large head compared to body
-huge mouth



Sea Lamprey (SL):
-no scales
-no eyes
-no fins
-gill slits along side of head
-snake like
-U-shaped mouth

American Eel (AE):
-no scales
-eyes
-has fins
-snake like
-regular mouth in front of head

Brown Bullhead (BB):
-no scales
-sharp spines in dorsal and pectoral fins
-Chin whiskers are dark colored
-underside usually creamy white

Yellow Bullhead (YB):
-no scales
-sharp spines in dorsal and pectoral fins
-Chin whiskers are light colored
-underside may be yellowish white

Redfin Pickerel (RP):
-small scales
-red/orange pelvic and pectoral fins
-large duck-bill like mouth
-mouth is less than ½ the total length of the head
-Not larger than about 20 cm

Chain Pickerel (CP):
-small scales
-large duck-bill like mouth
-mouth is more than ½ the total length of the head
-can be larger than 20 cm

Crayfish

Rostrum forms a J shape and spines present

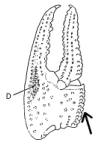
NO

YES

Gonopods not pipe wrench like

Pipe-Wrench like Gonopods

1 ROW OF TUBERCLES =
C. BARTONII (native- rare) no depression on large claw, lower part of pipe longer than top part.



YES

Long slender curved claws
Males with 4 boinker hooks

NO

2 ROWS OF TUBERCLES =
C. ROBUSTUS (Introduced) deep depression on large claw, pipe wrench equal in length

AREOLA OPEN =
P. ACUTUS (Introduced)
Pleopod 4 points not hatchet like.
Brown mottled in color. Claws narrow not spiked on inside margin

CLAWS TIPS ARE ORANGE WITH BLACK BAND

YES

NO

AEROLA CLOSED =
P. CLARKI (No records yet)
Pleopod had broad flat process (hatchet like) Red color. Claws wider, spiked on inside margins

SPINY CHEEKS

YES

NO

Prominent white bumps on claws, boinkers scissor like, blue claws, pairs of black spots on tail

O. VIRILIS

O. LIMOSUS
(Native- common)

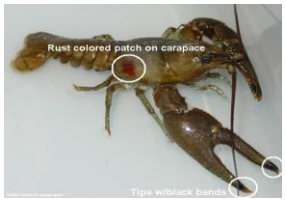
RUSTY PATCH NEAR TAIL ABOVE LEGS

YES

NO

NO

O. RUSTICUS
(Introduced-common in Hous)



O. NEGLECTUS
(Introduced- rare)
HEAVY BLACK BANDING

PICKLE AND BRING BACK, COULD BE SOMETHING NEW AND EXCITING!!!!

WATCH LIST:

-BARTONII
-CLARKII
-IMMUNIS
-PROPINQUUS
-NEGLECTUS
-OBSCURUS

Cambarus robustus: (CR)


Cambarus bartonii
R Jacobs

Orconectes limosus

Orconectes rusticus

Orconectes virilis

Procambarus acutus

APPENDIX B. Sampling Equipment Field Checklist

Electrofishing Equipment Checklist

ELECTROFISHING UNITS

☐	2	Backpack Electrofishing Units
☐	6	Batteries for Electrofishing Units (*Load Test before packing)
☐	3	Anode pole with ring
☐	2	Rat tail' cable cathode

BASKET BACKPACK with:

☐	2	Hip chain measuring devices w/ string
☐	4+	Rubber electrofishing glove pairs (black, forearm length)
☐	1	YSI (*check battery charge)
☐	1	Digital camera in case with memory card and extra battery (*check battery charges)
☐	1	GPS unit (*check battery charge)
☐	1	Metal field clipboard w/ datasheets and sharp pencils
☐	1	Field thermometer (Store in metal clipboard)
☐	2	wooden clipboards
☐	1	measuring tape, 30m+
☐	3	Fish ID card rings

PLASTIC SPARE EQUIPMENT BIN with:

☐	2	Rolls hip chain string (extra)
☐	1	Flagging tape roll
☐	1+	bug spray bottle
☐	1+	sunscreen bottle
☐	6+	Plastic storage bags (for fish preservation)
☐	6+	Manila labels
☐	6+	Plastic containers w/ lids (for fish preservation)
☐	3+	Sharpie markers
☐	3+	Extra pencils
☐	4+	Extra datasheets
☐	1	Bottle of isopropyl alcohol
☐	1	Wrench

GRAY STORAGE BIN with:

☐	2+	Construction buckets w/ hose-covered handles
☐	2	Small fish measuring boards
☐	2	Long fish measuring boards
☐	2	Aquarium nets
☐	4	Large net heads
☐	2	Small net heads
☐	4	Short net handles
☐	2	Long net handles

H20 CHEMISTRY SUPPLIES:

☐	9	1/2 gallon plastic water chemistry containers (in milk crate)
☐	1	Milli-Q chemistry, 1/2 gallon (*First sample day of the week only; label and place in cooler on ice)
☐	1	Large cooler w/ ice bags
☐	1	Small cooler w/ ice bags & water bottles (*esp during HOT weather)

MISCELLANEOUS:

☐	1 ea	waders
☐	1-2	Car GPS units
☐	1	First aid kit
☐	1	Road Atlas

Last revised 10/02/2014

APPENDIX C-1. DEEP Fish/Crayfish Sampling Field Data Form

Stream Name:_____ **AWQ ID#:**_____ **Date:**_____ **Crew:**_____

Landmark:_____ Mean Width (m):_____ Shock Dist. (m):_____

Y Lat:_____ X Long:_____ Gear: _____ Settings:_____

Town: Energized Time: Run Time: AMPS:

Species abbreviations with size range (SR1, SR2 or SR3) and stocked= (ST) and wild= (W) qualifier

BL=blacknose dace, LD=longnose dace, WS=wht sucker, CS=common shiner, GS=golden shiner, CR=creek chub, FF=fallfish, TD=tess. darter, BN=brown trt, BK=brook trt, SA=salmon, AE=eel, SM=sm mth bass, LM=lg mth bass, RB=rock bass, RS=red brst sun, BG=bluegill, PS=pumkinseed, GR=green sun, RP=redfin pickerel, CP=chain pickerel, BB=brown bull, YB=yellow bull, SC=sculpin, YP=perch, CY=unknown minnow

CM R1	CM R2	CM R3																		R1
1	30	59																		1
2	31	60																		2
3	32	61																		3
4	33	62																		4
5	34	63																		5
6	35	64																		6
7	36	65																		7
8	37	66																		8
9	38	67																		9
10	39	68																		10
11	40	69																		11
12	41	70																		12
13	42	71																		13
14	43	72																		14
15	44	73																		15
16	45	74																		16
17	46	75																		17
18	47	76																		18
19	48	77																		19
20	49	78																		20
21	50	79																		21
22	51	80																		22
23	52	81																		23
24	53	82																		24
25	54	83																		25
26	55	84																		26
27	56	85																		27
28	57	86																		28
29	58	87																		29

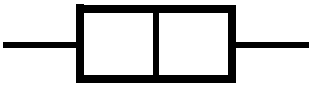
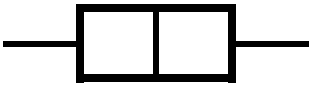
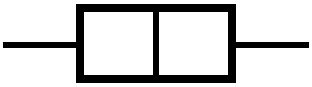
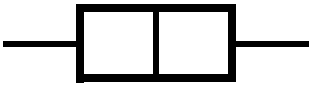
AWQ ID#:	Stream Name:	Date:	Page 2 of _____

SITE INFO STICKER HERE	Immediate US Surrounding Landuse/Instream Habitat Comments:

YSI FIELD DATA

Reading	At HOBO?	Time	Temp C	pH	DO (mg/L)	DO %	Sp Cond (ms/cm)	TDS (g/L)

SAMPLING CONDITIONS Very Low Average Very High

Flow Conditions		Notes:
Netting Efficiency		Notes:
Field Strength		Notes:
Channel Coverage		Notes:

VOUCHER INFORMATION

FISH Voucher(s):	MUSSEL Voucher(s):	CRAYFISH Voucher(s):
Quantity: _____ Comments:	Quantity: _____ Comments:	Quantity: _____ Comments:

CRAYFISH DATA

Species name	Quantity	Sex	Male Form*	Soft	ID Confid.		Photos	Notes
		M F	1 2	Y N	? +			
		M F	1 2	Y N	? +			
		M F	1 2	Y N	? +			
		M F	1 2	Y N	? +			

**Form 1 males are the sexually mature version. The pleopods are thin and flexible.*
Form 2 males are the immature version. The pleopods are thicker, ridgid and bone-like.

Additional Comments:

APPENDIX C-2. DEEP Trip Metadata Form

ENTER INFORMATION FOR SAMPLING TRIP **AUTO TRIP ID**

TRIP DATE RUN NAME chain of custody Collector 1: entered by:
Collector 2:
Collector 3:

Monitoring Projects Supported by this Event:

Benthic
Quarterly phys/chem
Probablilistic Monitoring
Sediment
Tissue
Toxicity
Microscopic
Fish Community
Other

Check Rationale for Trip

Routine
Intensive Survey
Request
Special Project

Comments about trip:

Sites Subform

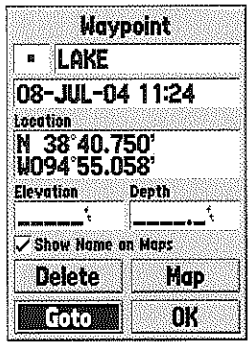
Sample	Trip ID	Station	Collection Time	DEP site number	Number of containers	Comments

APPENDIX D-1. Garmin GPSMAP 76 Quick Reference Guide

Finding a Destination (Waypoint)

You can search for a destination using the Navigation Menu. A destination can be any map item such as a Waypoint, City, or Point of Interest (restaurant, museum, etc.) available from the map database. Without downloaded detailed map data from Garmin MapSource®, only waypoints, cities, interstate exits, and tide stations points can be used as destinations.

1. Press the **NAV** key to display the Navigation Menu.
2. Use the **ROCKER** key to select **Go To Point** and press **ENTER**. Highlight **Waypoints** and then press **ENTER.** By default, a list of waypoints nearest to your current location is displayed. Press the **MENU** key to view additional options.
3. Use the **ROCKER** key to scroll through the list until the desired waypoint is highlighted. Press **ENTER** to display the information page for that waypoint.
4. Use the **ROCKER** key to select the **Goto** button at the bottom of the page. Then press **ENTER** to begin navigation to the waypoint.

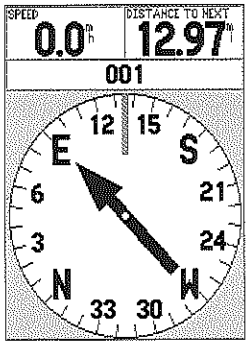


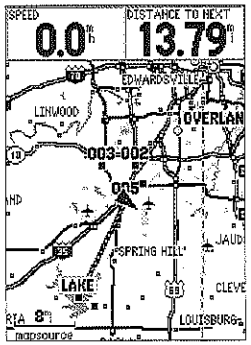
Navigating to a Waypoint

When using a "Go To" to navigate, you follow a course line on the Map page to the waypoint. If you stray off course, use the pointer to redirect you toward your destination.

1. Press the **PAGE** key repeatedly until the Pointer page is displayed. This page contains a Pointer and a Compass Ring.

   The Pointer indicates the direction to go and the Compass Ring rotates to indicate North orientation when you begin to move. Digital data fields at the top of the page display selectable navigation information such as speed, distance to go, and elapsed time.



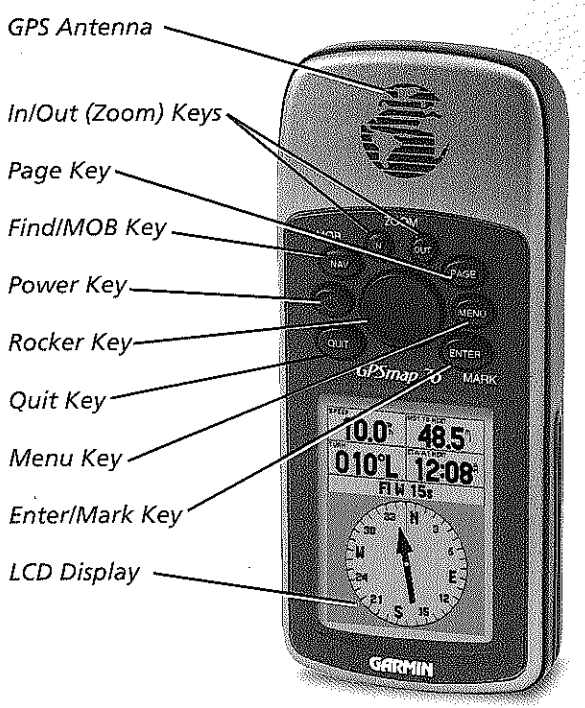


2. Press the **QUIT** key to access the Map page and observe your progress toward the waypoint. A line displays the course on the map.
3. To stop navigation, press the **NAV** key while the Pointer or Map page is displayed, then select **Stop Navigation**, and press **ENTER**.

GARMIN

GPSMAP® 76

chartplotting receiver
quick reference guide



Unit Operation—Key Function

POWER Key - Press and hold to turn unit On/Off. Press and release to adjust backlighting.

IN/OUT Zoom Keys - From the Map Page, press to zoom in or out. From any other page, press to scroll up or down a list.

NAV/MOB Key - Press and release at any time to view the Navigation Menu. Press and hold for MOB feature.

QUIT Key - Press and release to cancel data entry or exit a page.

PAGE Key - Press to cycle through the main pages or exit a menu.

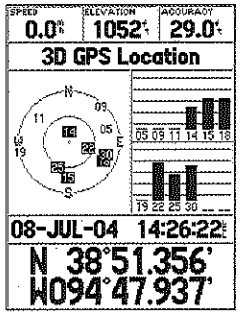
MENU Key - Press and release to view options for a page. Press twice to open the Main Menu.

ENTER/MARK Key - Press and release to enter highlighted options, data, or confirm on-screen messages. Press and hold at any time to mark your current location as a waypoint.

ROCKER Key - Move Up/Down or Right/Left to navigate through lists, highlight fields, on-screen buttons, icons, enter data, or move the map panning arrow.

Start-Up and Satellite Acquisition

Find a location where you have a clear view of the sky. If you're starting up for the first time or you have moved over 600 miles since last using the GPSMAP 76, it must determine its location by searching for satellites that are in position over your current location. Press the **MENU** key and use the **Location** option from the Satellite Page Options Menu to mark your approximate location on the Map page.



1. Turn On the GPSMAP 76 by pressing and releasing the **POWER** key. A Welcome page briefly appears before showing the Satellite page.
2. Observe the Satellite Page and the GPS status messages as they appear at the top of the page.
   - "Acquiring Satellites" message appears as the GPSMAP 76 begins to search for satellites.
   - "3D GPS Location" displays when four or more satellites are fixed.

If the GPSMAP 76 continues to display the "Acquiring Satellites" message or "Lost Satellite Signal" message appears, move away from overhead obstacles.

Using the Map Page

The Map Page displays a detailed map of the area around your current location. You can view your progress when moving or navigating to a chosen destination. The **In** and **Out** keys allow you to change the map range, while user-defined data fields provide navigation information.

1. Press **PAGE** to cycle the Main pages until the Map page is displayed.
2. Press **MENU** to view options for the Map page.
3. Begin to move about and observe the Position Arrow on the map. Use the **ROCKER** key to move the Panning Arrow to highlight a map item or view more map area.

Marking Your Location as a Waypoint

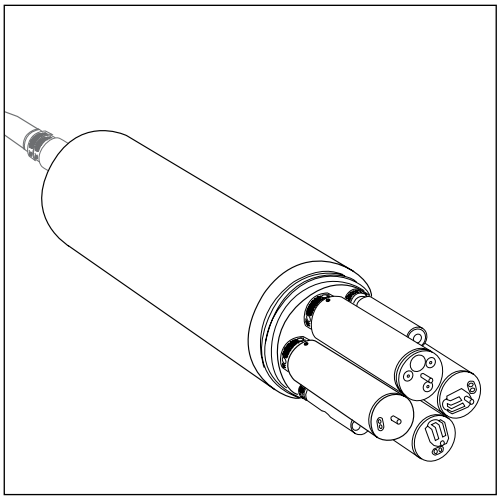
A waypoint is a geographic location that you specify. It can be your current location, a point on the Map Page or any item from the Find Feature database. Waypoints are saved to the Find Menu.

1. Press and hold **ENTER/MARK** to display the Mark Waypoint page.
2. Highlight the **NAME** field and press **ENTER**. Use the **ROCKER** key to change the Waypoint name.
3. Use the **ROCKER** key to select **OK** and press **ENTER** to save the waypoint to the Waypoints List.

Part Number: 190-00230-01 Rev. B Printed in Taiwan

APPENDIX D-2. YSI 6-Series Sonde Quick Start Guide

6-Series Sonde Quick Start Guide



This document will assist an experienced user with the steps required to make your YSI 6-Series product operational.

For full instructions, please refer to the 6-Series User Manual.

Unpacking and Inspection

Inspect the outside of the shipping container(s) for damage. If you see any damage, contact your shipping carrier immediately.

Remove the equipment from the shipping box. Some parts are loose in the box, so check the packing material carefully. Check off all items on the packing list and inspect them for damage.

Items Needed

- Sonde
- Probes
- Calibration cup
- Probe guard
- Batteries (if sonde has battery compartment)
- DI water
- Flathead screwdriver
- Calibration standards
- Communication or field cable

If using 6562 DO probe:

- 6570 maintenance kit
- 5775 membrane kit
- Razor blade

Preparing Sonde for Use

To prepare the sonde for operation, you will need to:

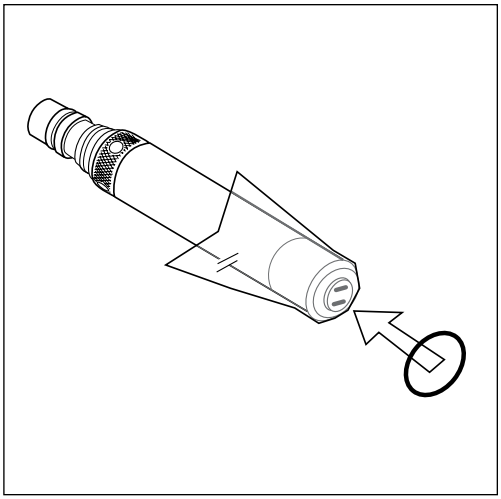
- Install a new membrane on the YSI 6562 DO Probe, if you are using this item.

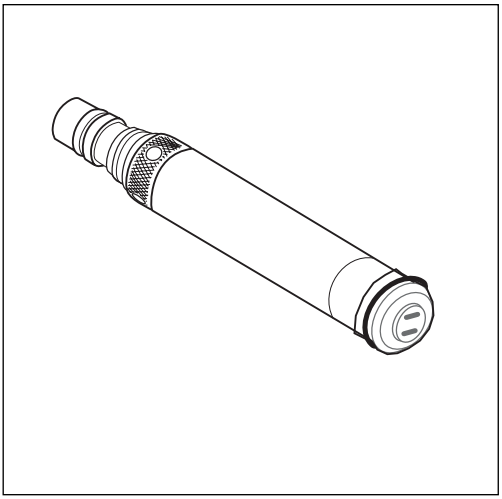
- Install probes (sensors) into the connectors on the sonde bulkhead.

- Provide power for the sonde through batteries or line power.

- Connect a field cable or PC communication cable.

⚠ It is important to calibrate all sensors prior to using the sonde for field measurements. Refer to Section 2.6.2 of the 6-Series User Manual.





Installing Membrane on 6562 DO Probe

(Skip to next section if you are not using this probe)

The 6562 Rapid Pulse™ Dissolved Oxygen probe is shipped with a protective dry membrane on the sensor tip. Remove the O-ring and membrane. Handle the probe with care. It is important not to scratch or contaminate the sensor tip.

⚠ The DO sensor on the 600R/QS cannot be removed.

Open the 6562 DO Probe Kit and follow these steps:

1. Prepare the electrolyte solution as specified on the bottle.

2. Put/keep the protective cap on the connector end of the probe to protect it from contamination.

3. Hold the probe in a vertical position and apply a few drops of KCl solution to tip. The fluid should completely fill the small moat around the electrodes—and create a large meniscus on the probe face. Be sure no air bubbles are stuck to the face of the sensor. If necessary, shake off electrolyte and start over.

4. Secure a membrane between your left thumb and the probe body. Touch membrane only at the ends.

5. With the thumb and forefinger of your right hand, grasp the free end of the membrane and gently stretch it up, over, and down the other side of the sensor. The membrane should be stretched below the ridge where the O-ring seats so a good seal is achieved.

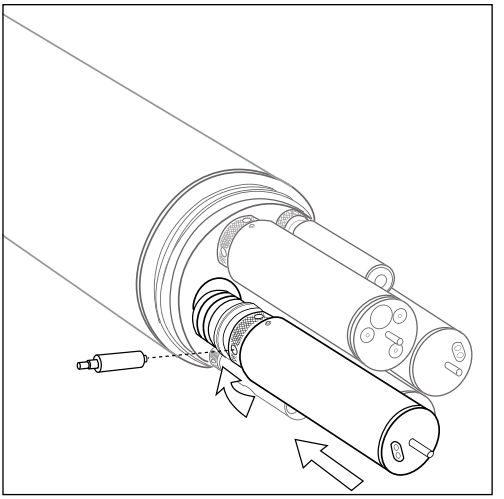
6. Secure the end of the membrane under the forefinger of your left hand.

7. Roll the O-ring over the end of the probe, being careful not to touch the membrane surface with your fingers.

8. If bubbles or wrinkles are present, remove the membrane and repeat steps 3-7.

9. Trim excess membrane with a razor blade. Rinse off any excess KCl solution, but be careful not to get any water in the connector.

Refer to Section 2.3 of the 6-Series User Manual for complete instructions and photos.



⚠ *When installing probes, be careful not to cross-thread the probe nuts. If you meet resistance while finger-tightening, STOP, back out, and begin again.*

Installing Probes

⚠ Before installing any probe into the sonde bulkhead, be sure that the probe port is free of moisture. Use a Kimwipe™ or lint-free cloth to dry.

1. Remove the calibration cup from your sonde, if necessary.

2. Using the long end of the probe installation tool supplied in the 6570 Maintenance Kit, remove the port plug from the port.

3. Some probes can only be installed into specific ports. Refer to Section 2.3 of the 6-Series User Manual for port designations.

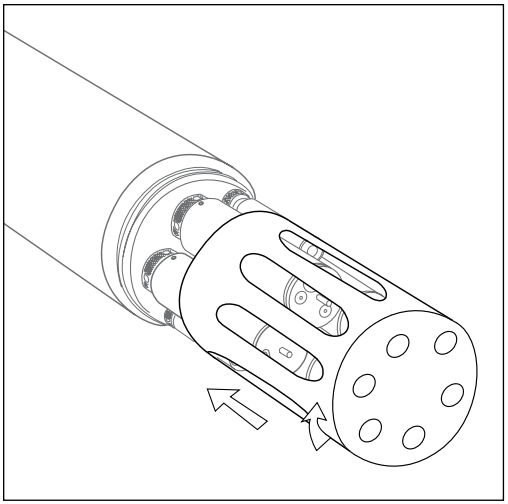
4. Apply a thin coat of lubricant (Krytox™) to the O-rings on the connector side of the probe.

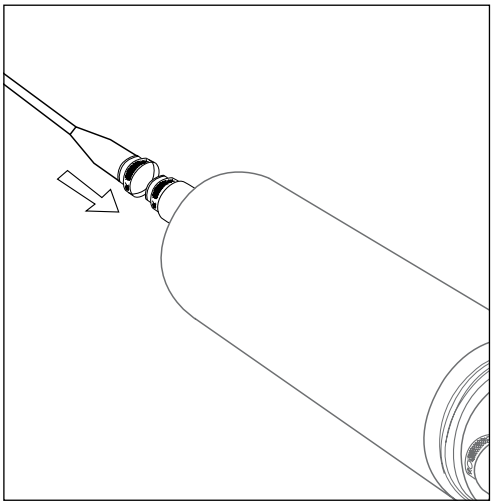
⚠ Make sure there are NO contaminants between the O-ring and the probe. Contaminants will cause leaks when the sonde is deployed.

5. Optical probes (6025 chlorophyll, 6130 Rhodamine, 6131 phycocyanin blue-green algae, 6132 phycoerythrin blue-green algae, 6136 turbidity, and 6150 ROX DO): Insert the probe in the appropriate optical port, seating the pins of the two connectors. Hand-tighten the probe nut to the bulkhead. Finish tightening the probe using the short end of the installation tool. Do not over-tighten.

6. 6562 Rapid Pulse DO, 6560 conductivity/temperature, 6561/6579 pH, or 6565/6569 pH/ORP probes: Insert the probe into the appropriate port, seating the pins of the two connectors. Push the probe inward so that it seats into the port. Screw down the probe nut by hand until it is finger tight. Use the long end of the installation tool to tighten the probe a quarter turn or until snug. Do not over-tighten.

7. Ammonium, nitrate, and chloride ISE probes do not have slip nuts and should be installed without tools. Seat the probe body directly on the sonde bulkhead. Use your fingers to tighten.





Installing Probe Guard

The probe guard protects probes during deployment and some calibration procedures.

Once the probes are installed, screw on the guard by aligning it with the threads on the bulkhead and turn the guard clockwise until secure. Be careful not to bump the 6562 probe membrane when installing the probe guard.

Installing Calibration Cup

Installing the calibration cup is performed in the same manner as installing the probe guard. The calibration/storage cup is used for calibration procedures as well as sonde storage when not in use.

⚠ It is important to calibrate all sensors prior to using the sonde for field measurements. Refer to Section 2.6.2 of the 6-Series User Manual.

Power

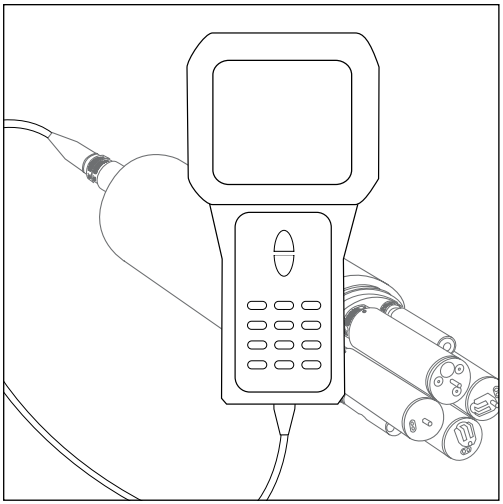
• External power is required for the YSI 600R, 600QS, 600XL, 600XL V2, 6820 V2, and non-battery versions of 600OMS V2 and 600LS sondes.

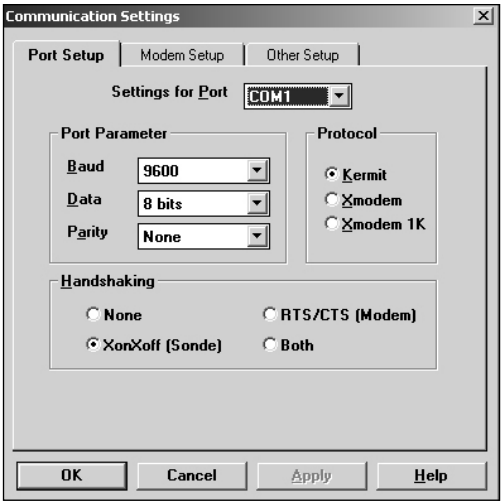
• Internal batteries power the YSI 6920 V2, 6920DW, 6600 V2, 6600EDS V2, 600XLM, 600XLM V2, 600DW, and battery versions of 600OMS V2 and 600LS sondes. These can also run on external power.

• If you have a YSI 650 MDS display or other datalogger, attaching your sonde to it will power the sonde when "power sonde" is enabled.

• For lab calibration, a YSI 6067 or 6095 calibration cable and YSI 6038 (110 VAC) or 6037 (220 VAC) power supply is required for sondes without internal batteries. (6095 cable must be used with a field cable.)

• Connect the 6038 or 6037 power supply to the 6067 or 6095 cable. After attaching the four-pin connector from the power supply to the pigtail, plug the power supply into the appropriate AC outlet.





• When using the sonde's internal batteries, install batteries prior to test and calibration.

• When using the 650 as the interface for sondes with internal power, disable the "sonde power" feature. Conversely, when using the 650 for sondes without batteries, enable the "sonde power" feature.

• Expected power supply outputs are:
6VDC = 4AA
12VDC = 8AA
12VDC = 8C
If you see significantly differing values from these outputs, the batteries may not have a full charge or may be installed incorrectly. (You can find outputs in "Status" in the sonde menu; see next page.)

Refer to Section 2.2 of the 6-Series User Manual for complete details.

Communication

Communication to the sonde is started with EcoWatch® for Windows®, the 650 display/logger, or any terminal emulator.

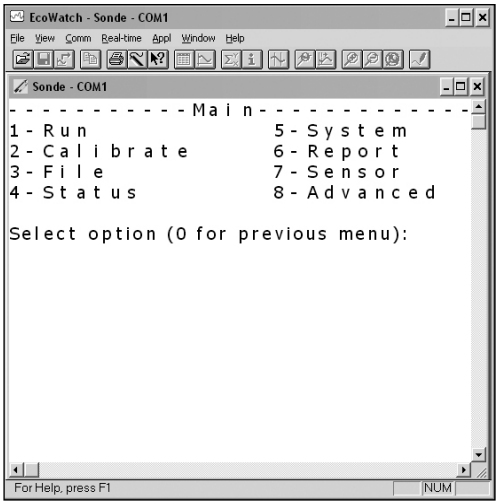
1. Place the EcoWatch compact disk in your computer's CD drive. An Installshield Wizard will automatically start on most computers. Follow the prompts to complete the installation.

 2. Select the EcoWatch icon on your desktop or from the Windows Program Menu and open the application.

 3. Select the sonde icon in the toolbar, and then select the proper Comm port to which your sonde is connected. Refer to the diagram above for Communication Settings. Click "OK" to open a terminal window.

4. The terminal window is white. Type "Menu" after the # sign, press Enter, and the sonde Main menu will be displayed.

5. This software is menu-driven. Select functions by typing their corresponding numbers. You do not need to press Enter after choosing a selection. Type the 0 or Esc key to return to the previous menu.



6. After establishing connection with EcoWatch, you can configure sonde settings including date/time, sensors, logging, setup, and access stored files.

Refer to Section 4 of the 6-Series User Manual or the Help section of the software.

Menu

Run = set up sonde for discrete or unattended logging applications

Calibrate = access sensors for calibration

File = view logged files including the calibration record (.glp file)

Status = access firmware version, date and time, battery voltage and estimated life, amount of free memory, and logging status

System = access sonde communication settings and instrument identification

Report = choose parameters to log and units of measurement

Sensor = enable sensors and assign probes to ports

Advanced = view calibration constants, choose Auto Sleep configuration, adjust TDS constant and other sonde settings. Refer to Sections 2.5 and 2.9.8 of the 6-Series User Manual before making any changes to the settings in the Advanced Menu.

Technical Support

YSI Technical Support is available Monday through Friday 8 AM to 5 P.M. Eastern Time.

Tel: 800-897-4151 option 1
or +1 937-767-7241 option 1

E-mail: environmental@ysi.com

Web: www.ysi.com

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APPENDIX E. Species Code List

Fish Species Code List

Code	***Common Name***	***Scientific Name***
AE	American Eel	*Anguilla rostrata*
AL	Alewife	*Alosa pseudoharengus*
AS	American Shad	*Alosa sapidissima*
BB	Brown Bullhead	*Ameiurus nebulosus*
BC	Black Crappie	*Pomoxis nigromaculatus*
BD	Bridled Shiner	*Notropis bifrenatus*
BG	Bluegill	*Lepomis macrochirus*
BK	Brook Trout, Stocked	*Salvelinus fontinalis*
WBK	Brook Trout, Wild	*Salvelinus fontinalis*
BL	Blacknose Dace	*Rhinichthys atratulus*
BM	Bluntnose Minnow	*Pimephales notatus*
BN	Brown Trout, Stocked	*Salmo trutta*
WBN	Brown Trout, Wild	*Salmo trutta*
BO	Brook Stickleback	*Culaea inconstans*
BS	Banded Sunfish	*Enneacanthus obesus*
BU	Black Bullhead	*Ameiurus melas*
BW	Bowfin	*Amia calva*
CA	Common Carp	*Cyprinus carpio*
CC	Channel Catfish	*Ictalurus punctatus*
CE	Unknow Sunfish	*Juvenile Centrarchid*
CH	Creek Chubsucker	*Erimyzon oblongus*
CM	Cutlips Minnow	*Exoglossum maxillingua*
CP	Chain Pickerel	*Esox niger*
CR	Creek Chub	*Semotilus atromaculatus*
CS	Common Shiner	*Luxilus cornutus*
CY	Unknown Minnow	*Juvenile Cyprinid*
FF	Fallfish	*Semotilus corporalis*
FM	Fathead Minnow	*Pimephales promelas*
FS	Fourspine Stickleback	*Apeltes quadracus*
GC	Grass Carp	*Ctenopharyngodon idella*
GF	Goldfish	*Carasius auratus*
GR	Green Sunfish	*Lepomis cyanellus*
GS	Golden Shiner	*Notemigonus crysoleucas*
HY	Hybrid Sunfish	*Hybrid Sunfish*
LA	Brook Lamprey	*Lampetra appendix*
LD	Longnose Dace	*Rhinichthys cataractae*
LL	Burbot	*Lota lota*
LM	Largemouth Bass	*Micropterus salmoides*
LN	Longnose sucker	*Catostomus catostomus*
MM	Central Mudminnow	*Umbra limi*
NP	Northern Pike	*Esox lucius*

NS	Ninespine Stickleback	*Pungitius pungitius*
PS	Pumpkinseed	*Lepomis gibbosus*
RB	Rock Bass	*Ambloplites rupestris*
RP	Grass Pickerel/Redfin Pickerel	*Esox americanus*
RS	Redbreast Sunfish	*Lepomis auritus*
RW	Rainbow Trout	*Oncorhynchus mykiss*
SA	Atlantic Salmon	*Salmo salar*
SB	Striped Bass	*Morone saxatilis*
SC	Slimy Sculpin	*Cottus cognatus*
SD	Swamp Darter	*Etheostoma fusiforme*
SL	Sea Lamprey	*Petromyzon marinus*
SM	Smallmouth Bass	*Micropterus dolomieu*
SS	Spottail Shiner	*Notropis hudsonius*
TD	Tessellated darter	*Etheostoma olmstedi*
TT	Tiger Trout	*S.fontinalis x S. trutta*
WA	Walleye	*Stizostedion vitreum*
WC	White Catfish	*Ameiurus catus*
WP	White Perch	*Morone americanus*
WS	White Sucker	*Catostomus commersoni*
YB	Yellow Bullhead	*Ameiurus natalis*
YP	Yellow Perch	*Perca flavescens*
ZZZ	NO FISH CAUGHT	*Sans poisson*

APPENDIX F. Fish/Crayfish Voucher Laboratory Log

CTDEEP MONITORING & ASSESSMENT PROGRAM - FISH/CRAYFISH SAMPLE LABORATORY LOG

Date Received by Lab	Entered By	Trip Date	Station ID	Stream Name and Location	Type (Fish/ Crayfish)	Sample #	Date & Initial Completion:			Species ID	Total Length (cm)
							Identification	Verification	Database Entry		

APPENDIX G. DEEP Inland Fisheries Division Equipment "Didymo (Didymosphenia geminata)" Spread Prevention Guide

How can you prevent the spread of didymo?

Humans are the primary vector responsible for the recent spread of didymo.

Anglers, kayakers and canoeists, boaters and jet skiers can all unknowingly spread didymo. Pets are also capable of spreading didymo.

The microscopic cells can cling to fishing gear, waders (felt soles can be especially problematic), boots and boats, and remain viable for months under even slightly moist conditions.

To prevent the spread of didymo to additional waters, DEP asks that anglers, especially those who also fish the Farmington River or streams outside Connecticut, and other users practice **CHECK, CLEAN, DRY** procedures.

CHECK: Before leaving the water, remove all obvious clumps of algae and plant material from fishing gear, waders, clothing & footwear, canoes & kayaks and anything else that has been in the water. Leave them at the site. If you find any later, clean your gear and dispose of all material in the trash.

CLEAN: Soak/spray & scrub boats and all other "hard" items for at least one minute in either very hot (140°F) water, a 2% bleach solution, or a 5% dishwashing detergent solution. Absorbent materials such as clothes and felt soles on waders should be soaked for at least 40 minutes in very hot water (140°F), or 30 minutes in hot water (115°F) with 5% dishwashing detergent. **FREEZING THOROUGHLY WILL ALSO KILL DIDYMO.**

DRY: Drying will also kill didymo, but items must remain completely dry (inside and out) for at least 48 hours.

Thank you for your cooperation!

Additional Guidelines

- When outdoors use only small quanties of cleaning agents such as bleach, dishwashing detergent, and other chemical compounds. Always avoid using cleaning agents streamside or in areas where they can drain into surface waters.
- When possible clean all gear, boots, boats and clothing at home.
- If entering multiple streams in one day, please enter waters known to contain didymo (i.e. Farmington River) last.

Don't forget to properly wash and dry your pets after they leave waters known to contain didymo!

(Munson, Bernese Mountain Dog, swimming in the West Branch Farmington River)

Individuals wishing to report possible sightings of didymo and other aquatic nuisance species can contact:

Department of Environmental Protection
Inland Fisheries Division
79 Elm Street
Hartford, CT 06106-5127

860-424-3474
dep.inland.fisheries@ct.gov

For more information on didymo:

- CT DEP website: (*www.ct.gov/dep*)
- CT Angler's Guide: (*www.ct.gov/dep/lib/dep/fishing/anglers_guide/anguide.pdf*)
- Biosecurity New Zealand website: (*www.biosecurity.govt.nz/didymo*).

Didymo

(*Didymosphenia geminata*)

(a.k.a. "Rock Snot")

Learn what you can do to help prevent the spread of this invasive alga!

State of Connecticut
Department of Environmental Protection
Bureau of Natural Resources
Inland Fisheries Division
www.ct.gov/dep

Created April 11, 2011

What is didymo?

Didymo is an invasive freshwater alga that is most frequently found in cold, relatively shallow streams and rivers having a rocky bottom, characteristics that are also typical of good trout habitat.

During blooms, didymo can form thick mats of material that feel like wet wool and are typically gray, white and/or brown, but never green in color.

These mats form on the bottoms of rivers and streams. If dense mats of didymo develop, they can reduce the recreational and aesthetic value of the affected river.

Since didymo also prefers areas open to sunlight, it is not anticipated that this species will become problematic in smaller headwater streams as long as they have well shaded and naturally forested riparian areas.

Didymo does not present a hazard to human health or to pets.

Where is didymo?

The presence of didymo was first confirmed in the northeastern United States in 2007.

It has since spread to suitable waters in a number of northeastern states (New Hampshire, Vermont, New York, Pennsylvania, Maryland, West Virginia and Virginia).

Didymo has recently been discovered (March 2011) in portions of the West Branch Farmington River in northwest Connecticut.

Signs will be posted in areas where didymo has been found.

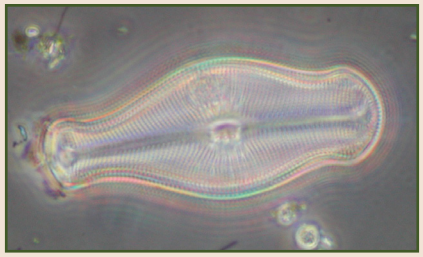

Image of the single cell diatom *Didymosphenia geminata* under microscope magnification.

How to tell if you may be seeing Didymo

	YES	NO
Location	mostly clear flowing water with rocky bottom, may be attached to plants	deep silty areas with no rocks or plants, highly colored waters.
Color	tan, light brown or whitish	green or dark brown/black clear or transparent
Texture	clumps or ropy strands, rough cottony feel, fibrous	thin layers, slippery or gelatinous
Appearance	no leaves or roots (BUT may attach to leaves or stems). Sometimes mistaken for fiberglass, toilet paper or tissue.	has leaves or roots looks like an aquatic plant

If your sample matches three of the “yes” descriptions above and was found in another river or stream we’d like to know!

Please send a dime-sized sample in a small container or in a sealable plastic bag to:

Department of Environmental Protection
Bureau of Natural Resources
Inland Fisheries Division
79 Elm Street
Hartford, CT 06106-5127

Be sure to include your name, address and phone number or e-mail address so that we may contact you.

Also, please provide a detailed description of where you found your sample: name of the river or stream, the town, and precise location (such as GPS coordinates, nearest road, a clearly marked map, or a street adress).