

# **Division of Fisheries and Wildlife Stream Survey and Inventory Protocols**

**(Updated May 2014)**

---

## **I. Purpose and Applicability**

The Division of Fisheries and Wildlife (the “Division”) is responsible under M.G.L. c. 131 for the conservation, restoration, protection and management of the inland fish and wildlife resources of the Commonwealth. To that end, the Division conducts biological research to manage and monitor fish, including by surveying streams to determine the nature and scope of fish communities that reside therein. The purpose of these Stream Survey and Inventory Protocols (the “Protocols”) is to summarize the survey methodologies and data collection procedures used by the Division to sample for the presence of or further research on fish communities in wadeable streams and rivers. The objective is to capture a representative cross section of fish species within the stream or river habitat sampled, but such sampling does not represent a census of fish species present in an entire stream.

Among the purposes for which the Division conducts fish community sampling is to determine whether a particular stream or river is a coldwater fish resource (CFR). By way of background, certain species of fish are sensitive to increases in temperature and require coldwater to fulfill one or more of their life stage requirements. Since the 1940’s, the Division has documented the presence of CFRs in the Commonwealth where these fish occur. In the 1990’s, the Division established a list of CFRs to facilitate the tracking and effective monitoring, management and protection of these resources by the Division, other state agencies, and local regulatory authorities, including conservation commissions and planning boards.

The Division is in the process of codifying in regulation at 321 CMR 5.00 its long-standing approach to designating CFRs, which will contain a list of coldwater fish species and define a CFR as a water body containing one or more of such coldwater fish species. The Division will use these Protocols when conducting sampling to determine whether a water body is a CFR. The Division’s promulgation of its CFR regulations is being done in conjunction with major revisions that the Department of Environmental Protection (DEP) is making to its Water Management Act (WMA) regulations at 310 CMR 36.00. Under DEP’s WMA regulations, an applicant proposing a water withdrawal that may affect a CFR designated by the Division pursuant to 321 CMR 5.00 will be required to minimize any impact on the CFR.

Set forth below in Section II of these Protocols are descriptions of typical survey methodologies used by the Division to sample fish communities in wadeable streams and rivers.

## **II. Protocols for Surveying Wadeable Streams and Rivers and for Determining the Inventory of Fish in Waterbodies**

The Division uses a range of equipment to sample for fish communities, depending on the stream or river habitat to be sampled. The type of equipment used is determined by the habitat to be sampled, but includes electrofishing methods (backpack, barge, or boat electrofishing units) as well as the use of gillnets and seines. However, almost all of the Division's fish community sampling in wadeable streams and rivers is conducted using backpack and barge electrofishing methods.

### ***A. Sampling for Fish using Backpack and Barge Electrofishing***

#### Backpack Electrofishing

Backpack shockers, such as a Smith-Root BP-4, are best used in streams that are narrow (i.e., with an average width less than 8 meters) and shallow (i.e., an average depth less than 0.5 meters) streams. In streams that are wider than 8 meters on average but shallow, two or more backpack units can be used to increase efficiency.

The Division typically collects fish samples using this method from June 1 to October 1 in the following manner.

1. Crews of three to five people conduct single pass electrofishing surveys, moving from the downstream end of the sampling reach to the upstream end.
2. The beginning and ending points will be marked on USGS 1:25,000 topographical maps. The sample reach length and average width will be measured with by meter tape.
3. The standard reach length should be at least 100 meters, but optimal reach lengths will be roughly 30 times the stream width, which may include a variety of habitat types (riffle, pool, run, etc.) within the sample reach.
4. All portions of and habitats in the stream will be sampled, including habitat features such as woody debris, submerged aquatic vegetation, undercut banks, and overhanging vegetation.
5. Fish will be sampled by pulsed DC current electrofishing.
6. Backpack sampling will consist of a single upstream pass.
7. The crew member wearing the backpack to electroshock fish will use two ring probes (when average stream width exceeds 3 meters), or a ring probe anode and rattail cathode (when average stream width is less than 3 meters).
8. The rest of the crew members will carry buckets and/or dipnets to collect fish that are influenced by the electric current.

9. Crews will begin at the downstream end of a sampling site and shock to the upstream ending point. Crewmembers will use dipnets to capture fish that roll off the bottom or rise to the surface.
10. All fish will be kept alive in five-gallon buckets.
11. Where appropriate, livecages should be positioned in the water along the sample reach to reduce the potential for significant fish mortality.
12. Crew members will place all fish from the buckets into the live cages as often as is appropriate.

### Barge Electrofishing

For larger streams and rivers, it is more suitable to use an electrofishing barge capable of producing DC pulsed current, such as a Smith-Root, Inc. electrofishing barge with 2.5 GPP generator. The methods for collecting the fish samples are essentially the same for barge electrofishing as for backpack electrofishing, except that the crew will consist of a minimum of three people (one barge operator and two shockers/netters). However, more crew members should be used in wider streams and rivers with the optimum crew consisting of one operator, three members netting fish and manning probes, and three members netting fish only and transferring them to the livewell.

### ***B. Documenting the Fish Sampling***

The Division will identify and measure the first 100 fish of each species it collects. The total length of such fish will be measured from the tip of snout to tip of tail when compressed to the nearest millimeter, except for American eels and sea lampreys which will be measured to the nearest centimeter. If more than 100 fish of one species are captured, they will be tallied and recorded on the *Fish Species and Length Frequency Information* data sheet discussed below, but are not measured to length.

No more than 2% and no less than two individuals (or one if only a single specimen is collected) of each species captured can be preserved in 10% formalin for confirmation of identification by laboratory analysis. Live fish that are not retained for preservation will be returned to the sample site.

The fish sampling data collected will be recorded on the following Division data sheets.

The *Biological Survey of Waters: Fish Sampling Log* is used to record the sample locations and information on the collection effort. The specific instructions and standards for completing the Fish Sampling Log are contained on page 2 of this data sheet.

The *Fish Species and Length Frequency Information* is used to record the species and lengths of all fish captured. Fish species abbreviations, to be used on the form, appear on page two of this data sheet.

The *Biological Survey of Waters: Fish Sampling Log* and *Fish Species and Length Frequency Information* data sheets are contained in **Attachment A**.

# Biological Survey of Waters: Fish Sampling Log



Date: \_\_\_/\_\_\_/\_\_\_ Waterbody: \_\_\_\_\_ Town: \_\_\_\_\_

Location (road crossing, directions, etc.): \_\_\_\_\_

GPS Coordinates (NAD 83 format in decimal degrees): Lat \_\_\_\_\_ Lon \_\_\_\_\_

Sampling Gear and Effort (circle all methods that apply, circle capitalized words in parenthesis that apply)

Boat Shocking (DAY / NIGHT)- | Seconds \_\_\_\_\_ Amps \_\_\_\_\_ Range Range ( H or L ) % of Range \_\_\_\_\_

Barge Shocking----- | PPS and Mode \_\_\_\_\_ Str. Length (Meters) \_\_\_\_\_ Str. Ave. Width (Meters) \_\_\_\_\_

Backpack | Seconds \_\_\_\_\_ Str. Length \_\_\_\_\_ Str. Ave. Width \_\_\_\_\_ Amps \_\_\_\_\_ Volts \_\_\_\_\_ Freq \_\_\_\_\_ Width \_\_\_\_\_

Seine | Seine Length (in Meters) \_\_\_\_\_ Bag ( Y or N ) Number of Hauls \_\_\_\_\_

Gillnet | ( DAY NIGHT OVERNIGHT ) Ave. Net Length (in Meters) \_\_\_\_\_ # Nets Set \_\_\_\_\_ Ave. Set Time (Hrs.) \_\_\_\_\_

Mesh Description \_\_\_\_\_

Data Collected: (Check appropriate boxes, add water chemistry unless profile data sheets are filled out)

Fish Information: Length-- \_\_\_\_\_ Weight-- \_\_\_\_\_ Scales-- \_\_\_\_\_ Voucher-- \_\_\_\_\_

Fishless Sample  No Sample Conducted

EPA Habitat Assessment Field Data Sheet—

Water Chemistry: Profile (See Attached Form)-- Surface-- Temp \_\_\_\_\_ Cond. \_\_\_\_\_ D.O. \_\_\_\_\_ pH \_\_\_\_\_

Free-Flowing Reach

Crew: \_\_\_\_\_ Comments (Habitat, Sampling Efficiency, Local Conditions, etc.) \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Office Use:**

SARIS/PALIS \_\_\_\_\_

SAMPLE ID \_\_\_\_\_

Date Entered \_\_\_\_\_

Entered By \_\_\_\_\_



## Common Fish Names and Abbreviations

Common Name	Fish Code	Common Name	Fish Code
Alewife	A	Largemouth bass	LMB
American eel	AE	Longnose dace	LND
Atlantic salmon	AS	Longnose sucker	LNS
Bluegill	B	Lake trout	LT
Brown bullhead	BB	Mummichog	M
Blueback herring	BBH	Margined madtom	MM
Black crappie	BC	Northern pike	NP
Bowfin	BF	Ninespine stickleback	NSS
American brook lamprey	BL	Pumpkinseed	P
Bridle shiner	BM	Rock bass	RB
Blacknosed dace	BND	Redbreast sunfish	RBS
Bluntnose minnow	BNM	Redfin pickerel	RP
Banded sunfish	BS	Hybrid Redfin/Chain pickerel	RPXCP
Brown trout	BT	Rainbow smelt	RS
Hybrid Bluegill/Pumpkinseed	BXP	Rainbow trout	RT
Common carp	C	American shad	S
Channel catfish	CC	Striped bass	SB
Creek chubsucker	CCS	Slimy sculpin	SC
Cutlips minnow	CLM	Swamp darter	SD
Central mudminnow	CM	Snakehead	SH
Chain pickerel	CP	Sea lamprey	SL
Creek chub	CRC	Smallmouth bass	SMB
Common shiner	CS	Spottail shiner	SS
Brook trout	EBT	Tesselated darter	TD
Eastern mosquitofish	EM	Tiger muskellunge	TM
Fallfish	F	Tadpole madtom	TMT
Fathead minnow	FM	Three-spined stickleback	TSS
Fourspine stickleback	FSS	Tiger trout	TT
Goldfish	G	Walleye	W
Golden shiner	GS	White catfish	WC
Green sunfish	GSF	White perch	WP
Banded killifish	K	White crappie	WR
Lake chub	LC	White sucker	WS
Landlocked salmon	LLS	Yellow bullhead	YB
		Yellow perch	YP