




MassDEP

**Massachusetts Department of Environmental Protection
Division of Watershed Management
Watershed Planning Program**

STANDARD OPERATING PROCEDURE

**FISH COLLECTION PROCEDURES FOR THE EVALUATION OF POTENTIAL COLD WATER FISHERIES IN
WADEABLE STREAMS**

CN 533.1
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LIST OF REVISIONS

Revision Date	Revision	Pages #s	CN/ (Old CN if applicable)	Initials
2020	Original		533.0	
March 2025	Amended to allow the habitat survey to be conducted at any time during the same sampling season. Edits throughout	Complete document	533.1	

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1.0 SCOPE AND APPLICATION

This SOP documents the field procedures for the collection, enumeration and taxonomic identification of cold water fishes in streams and rivers by the MassDEP Watershed Planning Program (WPP). The WPP is developing a procedure for designating a fresh water river or stream as Cold Water in the Massachusetts Surface Water Quality Standards (SWQS; 314 CMR 4.00). A DRAFT version of this procedure can be found in Appendix 2. This SOP prescribes the field methods and sampling techniques for conducting fish community assessments to support the Cold Water designation process.

2.0 SUMMARY AND BACKGROUND

Monitoring of the stream fish assemblage to determine Cold Water Fishery status is an integral component of the MassDEP water quality management program, and its importance is reflected in state stream class and use-support designations. For general fish population investigations, WPP uses a standardized method based on the fish protocols in USEPA's *Rapid Bioassessment Protocols For Use In Streams And Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish* (Barbour et al. 1999) to provide comparable data among wadeable sampling sites throughout the state. For the Cold Water Fishery monitoring effort the *Rapid Bioassessment Protocols* are revised (as documented in this SOP) to focus on cold water species.

To maximize the potential of collecting cold water species, the revised Cold Water fish collection procedures prioritize sampling stream habitats with overhanging banks, suitable cover, and potential cold-water seeps or cooler water habitats. Whenever possible, the sample reach should be sampled sufficiently upstream of any bridge or road crossing to minimize the hydrological effect on overall habitat quality. Wadeability and accessibility may ultimately govern the exact placement of the sample reach. A habitat assessment (see Appendix 1) should be performed to document and characterize available habitat specifics within the sample reach either concurrent with the fish survey or concurrent with a macroinvertebrate survey conducted in the same season.

All fish sampling gear types are generally considered selective to some degree; however, electrofishing has proven to be the most comprehensive and effective *single* method for collecting stream fishes. Pulsed DC electrofishing is the method of choice to obtain a representative sample of the fish community at each sampling station. Cold water species considered important for the CWF designation are *Salvelinus fontinalis* (eastern brook trout), and *Cottus cognatus* (slimy sculpin). The accurate identification of each fish collected is essential, and species-level identification is required. Field identifications are acceptable; however, voucher specimens must be retained for laboratory identification if there is any doubt about the correct identity of the specimen. Because the desire to identify reproducing populations of cold water species (as opposed to stocked individuals), the collection of young-of-year (YOY) brook trout and any slimy sculpin is emphasized. Assessments must be conducted between July 1st and September 15th.

Several options exist for electrofisher configuration and field team organization; however, procedures will always involve pulsed DC electrofishing and a minimum 2-person team.

Examples include:

- Backpack electrofisher with on hand-held anode pole and a trailing or floating cathode. The electrofisher unit operator manipulates the anode with one hand and has a second hand free for use of a dip net. The remaining team member(s) also aid in the netting of specimens, and in addition are responsible for specimen transport to buckets or livewells.

- Barge electrofisher with two hand-held anode poles and a trailing/floating cathode. Two team members are each equipped with an anode pole and a dip net. Each is responsible for electrofishing and the netting specimens. A third team member tends cable and assists in netting fish and transporting fish to the livewell. The remaining team member will follow supervising the operation, controlling the flow of electricity via two hand operated switches, and pushing the barge through the sample reach.

3.0 SAFETY CONSIDERATIONS

The safety of all personnel involved is ensured through the adequate education, training, and experience of all members of the fish collection team. At least one biologist with certified experience in electrofishing techniques and fish taxonomy is involved in each sampling event. Staff and assistants are trained in proper field safety techniques consistent with the provisions of WPP's Field Safety Plan and the electrofishing safety precautions and unit operation procedures identified by the electrofishing unit manufacturer. It is recommended that at least two fish collection team members be certified in CPR and that a portable AED be brought on electrofishing surveys. Any lab work with alcohol preservative is consistent with the intent and provisions of WPP's Lab Safety Plan.

4.0 SAMPLE COLLECTION, PRESERVATION AND HANDLING

See Section 8.0.

5.0 APPARATUS, EQUIPMENT AND MATERIALS

Equipment

- Backpack electrofishers (battery and gas-powered; e.g. Smith Root Model 12/15, Coffelt Mark 10.BP4, Halltech HT-2000 or equivalent)
- Barge electrofisher (gas powered; e.g. Smith Root Model SR6, SR7 or equivalent)
- Dip nets
- Block nets (i.e., seines)
- Arm-length insulated waterproof gloves
- Chest waders
- Polarized sunglasses
- Livewells (cooler, buckets, cage, or other)
- Jars and/or plastic bags for voucher/reference specimens
- Ethanol or isopropanol (for short and long term storage of voucher specimens)
- Measuring board (500 millimeter minimum, with 1 millimeter increments)
- Fish survey data forms
- Habitat survey data forms and protocols
- Pens
- Pencils

- Waterproof labels
- Clipboard
- First aid kit
- AED (Automated External Defibrillator)
- Hand washing/sanitizing kit or other Covid-related safety gear
- Decontamination spray system (typically NaCl or KCl solution)

6.0 REAGENTS

NA

7.0 CALIBRATION

NA

8.0 PROCEDURE

Procedures

1. Reach selection: A representative 80 to 120-meter stream reach is selected which includes habitats likely to attract and hold cold water species (i.e., riffle, run, overhanging banks, shaded areas, and pool habitats, when available). The sample reach should be located away from the influences of major tributaries and bridge/road crossing (e.g., sufficiently upstream to decrease influences on overall habitat quality) unless those structures might provide temperature refugia for cold water species. A habitat assessment and a physical /chemical characterization of water quality (if conducted) should be performed within the same 80–120 meter sample reach within the same sampling season (either concurrent with the fish survey or with a macroinvertebrate survey).
2. Collection via electrofishing begins at a shallow riffle, or other physical barrier at the downstream limit of the sample reach and terminates at a similar barrier at the upstream end of the reach. In the absence of physical barriers, block nets may be set at the upstream and downstream ends of the reach prior to the initiation of any sampling activities.
3. Fish collection procedures commence at the downstream barrier. A minimum 2-person fisheries crew (for backpack electrofishing) or 4-person fisheries crew (for barge electrofishing), proceeds to electrofish in an upstream direction using side-to-side or bank-to-bank sweeping technique to maximize cold water species habitat coverage. When using the barge electrofisher, two handlers of anode wands work side to side from the middle of the stream to each outer bank and back towards the center of the stream. All wadeable habitats within the reach are sampled via a single pass, which terminates after one of two criteria are met: 1) the team reaches the selected upstream barrier, OR 2) the team successfully collects the target species and sizes specified in the CWF designation procedure (see Appendix 2). The minimum amount of time spent shocking should be 10 minutes if criteria 2 is to be used. At sites where cold water species are not found within the selected reach and the estimated pick-up of observed fish is less than approx. 75%, a second pass is sometimes performed. Cold water species (and a minimum of one of all other species collected) are held in live wells (or buckets) for subsequent identification, enumeration, and measuring (total length).

4. Sampling efficiency is dependent, at least in part, on the field team's ability to see and net the stunned fish. Therefore, each team member should wear polarized sunglasses when doing so increases visibility, and sampling should only be conducted during periods of optimal water clarity and flow.
5. All salmonids, including YOY and slimy sculpin, are collected as well as a representative of each fish species collected. Fish are identified to species (or subspecies). Fish which cannot be positively identified in the field are brought back to the laboratory for identification. At least three individuals (when available) of each questionable type should be retained. Fish which could be state or federally listed as special concern, threatened or endangered are photographed and released unharmed.
6. Fish which are retained as voucher specimens are placed in a plastic bag on ice and may then be placed in HPDE jars which contain ethanol. The fish should be completely immersed in the ice or ethanol solution and the bag or jar should contain a label that includes station number and/or location information, collection date, and collector's name. The label should be filled out in pencil. In the case of the fish placed on ice, long term preservation of voucher samples requires a switch to ethanol. Voucher specimens are stored in a flammables cabinet. When vouchers are no longer needed, they can be offered to museums, universities, other agencies, volunteer or other groups. If they are not wanted, the jars contents are emptied into a 5-gallon bucket in the sink (not to exceed about ½ gallon), the fish removed and disposed as trash, and the bucket filled with tap water until it overflows into the sink. The diluted alcohol in the bucket is then carefully emptied down the drain.
7. Young-of-year fish (with the exception of salmonids) less than twenty millimeters (total length) should not be collected as a representative of a given species unless it is the only fish of that species collected. Specimens being enumerated are examined for external anomalies, (i.e., deformities, eroded fins, lesions, and tumors) and their lengths recorded on field data sheets. For salmonids these are particularly important as some fin deformities are indicative of stocking. All such indications should be noted on the field sheet (i.e., differentiating between natural and stocked individuals).
8. Field notes and a general site diagram are recorded on the "Field Data Sheet: Fish." The stream name, a station identification code (i.e. watershed number and station number separated by a dash or other code), names of field team members ("investigators"), location description (e.g., upstream of a road crossing), river mile, municipality, county and state information should be recorded on this sheet. Also record the date, time of day, shocker start time (in seconds), shocker end time (in seconds), duration of sampling (in seconds), maximum and mean stream widths, and a specific notation that the sampling effort was for CWF designation (check "CWF Only (Partial Pickup)"). Lastly, note any decision on whether salmonids collected appeared to be natural, stocked, or indeterminate.
9. Take notes on representativeness of the data and collection efficiency on the field sheets. Sites where representativeness is considered "low/poor" (i.e., where the species collected do not necessarily match the species known/reasonably expected), data from this site should only be used to confirm species occurrence, not to indicate absence. An example of this would be a trout stream where it was too deep or too wide to be effectively sampled. You may see trout escaping but not collect them. In this case the representativeness might be considered low.
10. Record the weather condition at the time of collection and for the past 24 hours, and measure the air temperature in C°. Note the percent of the reach with instream vegetative cover, circle the dominant group of vegetation (e.g., trees, submerged macrophytes) and record the dominant type

of riparian and aquatic vegetation. Also include observations on condition of the fish and macroinvertebrate communities, and other biota observed.

11. Draw a map of the location on the Field Data Sheet. This map should include in-stream attributes (e.g., riffles, fall, fallen trees, pools, bends) and important structures, plants, and attributes of the bank and near stream areas. Use an arrow to indicate the direction of flow (Q).
12. Note general condition of the habitat and the habitats sampled (e.g., vegetation, proportion of habitat types, depth, width) on the Field Data Sheet. Visual habitat assessment, physical characterization, a general water quality assessment will also be completed (See Habitat Assessment SOPs).

9.0 QUALITY CONTROL

Fish bioassessment data quality and comparability are assured through the utilization of qualified fisheries professionals and consistent methods.

1. Quality control must be a continuous process in fish bioassessment that includes all program aspects, from field collection and preservation to habitat assessment, sample processing, and data recording.
2. Field identification of fish must be conducted by qualified/trained fish taxonomists, familiar with Massachusetts ichthyofauna. Questionable records are prevented by preserving select specimens and those that cannot be readily identified in the field for laboratory verification and/or examination by a second qualified fish taxonomist. Specimens must be properly preserved and labeled (refer to step 6 above). When needed, chain-of-custody forms must be initiated following sample preservation and must include the same information as the sample container labels.
3. All field equipment must be in good operating condition, and a plan of routine inspection, maintenance and/or calibration must be developed to ensure consistency and quality of field data. Field data must be complete and legible and should be entered on standardized field data forms and chains-of custody for all anticipated sampling site, as well as copies of all applicable SOPs.

10.0 INTERFERENCES

NA

11.0 PREVENTIVE MAINTENANCE

11.2 Backpack electrofishing gear

Smith Root Model 20™ batteries should be re-charged immediately after use. The electrode ring and rat tail cathode should be cleaned with steel wool twice per year or as needed to keep them shiny and bright. The gas powered electrofisher should be winterized by adding gas stabilizer to the main and spare fuel tanks each winter. The anode ring and rat tail cathode should be cleaned with steel wool once per year or as needed to keep them shiny and bright. Full maintenance description and use of the electrofishing gear can be found in CN 075.3 SOP for Fish Collection Procedures for Evaluation of Resident Fish Populations.

Halltech HT-2000 batteries should be re-charged immediately after use. The electrode ring and rat tail cathode should be cleaned with steel wool twice per year or as needed to keep them shiny and bright.

The anode ring and rat tail cathode should be cleaned with steel wool once per year or as needed to keep them shiny and bright.

11.3 Barge Electrofisher

The Honda™ generator oil needs to be changed once per year. All items should be checked for tightness (tightened if necessary) prior to each survey. The electrofishing control box should be stored in the fish preparation laboratory or the biological storage shed when not in use. The hull of the electrofishing barge, the cathode plate, and the anode rings should be cleaned with steel wool once per year or as needed.

12.0 CORRECTIVE ACTIONS

Corrective actions to ensure safety and data quality include:

- On-site field direction by the crew leader during the survey. In addition to pre-training, on-the-job direction is practiced as needed to ensure capture efficiency and safe working conditions.
- Review of data package by crew leader following survey. This ensures that all data forms are complete and accurate.

13.0 WASTE AND POLLUTION PREVENTION

Wherever possible, waste is minimized. Voucher collection is only done when needed to fill gaps in the collections. Fish which could be State or Federally-listed as species of special concern, threatened or endangered are photographed and released unharmed.

NOTE: For all equipment, care must be taken to avoid transporting aquatic vegetation to other locations within waterbodies and to other waterbodies. This is done by thoroughly inspecting and cleaning boats and equipment of all plant fragments both before launching and after take out. This is standard WPP practice.

14.0 REFERENCES

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

Fish Population Data Sheet – MassDEP

Project:	Sample ID Code:	Gear:
Waterbody:	Start Date/Time:	Shock Time (s):
Location:	End Date/Time:	Voltage (v):
Site ID:	Fish ID By:	Frequency (Hz):
Personnel:	Representative?	Efficiency:

[illegible]

Field Sheet Log#: _____ UniqueID: _____
[https://mass.gov-my.sharepoint.com/personal/daniel_davis_mass.gov/Documents/Electrofishing/Field Sheets - Check Lists and Quick Guides/ FishPopulationFieldSheet2024 Proposed.docx](https://mass.gov-my.sharepoint.com/personal/daniel_davis_mass.gov/Documents/Electrofishing/Field%20Sheets%20-%20Check%20Lists%20and%20Quick%20Guides/FishPopulationFieldSheet2024%20Proposed.docx)

[illegible]

Survey Type – Circle one: CWF Only (partial pickup) Fish Population Survey (total pickup) Other:

Field Sheet Log#: _____ UniqueID: _____
[https://mass.gov-my.sharepoint.com/personal/daniel_davis_mass.gov/Documents/Electrofishing/Field Sheets - Check Lists and Quick Guides/ FishPopulationFieldSheet2024Proposed.docx](https://mass.gov-my.sharepoint.com/personal/daniel_davis_mass.gov/Documents/Electrofishing/Field%20Sheets%20-%20Check%20Lists%20and%20Quick%20Guides/FishPopulationFieldSheet2024Proposed.docx)

Fish Population Data Sheet – MassDEP

Field	Notes	Example
Project:	This is the project code assigned at the beginning of the year.	Taunton 2019
Sample ID Code:	Not used currently.	Blank
Waterbody:	The official river name.	Charles River
Location:	Description of access point.	Parking lot off of Jameson Road, Amherst MA
Start Date/Time:	Time that shocking begins. (i.e., not arrival time)	07/12/2020 12:20
End Date/Time:	Time that shocking ends. (i.e., not departure time)	07/12/2020 12:55
Site ID:	Project-specific site id (as opposed to <u>uniqueid</u>)	CR01
Fish ID By:	Last name of fish ID person.	Mitchell
Gear:	Backpack Shocker, Barge Shocker, Shock Boat	Backpack
Shock Time:	The number of seconds of shock time (counter on shock unit or calculated by start/end time)	1285 seconds
Voltage:	The voltage setting for the shock unit (use the voltage used for the majority of the sample)	250V
Frequency:	The frequency of the shock signal used by the unit (typical is 60hz)	60hz
Personnel:	Last name, first initial of each person on crew. Begin with permanent staff.	P Mitchell, D Davis, E Johnson
Representative?	An indication of whether the crew believes the fish population collected is representative of the fish that are within that reach. If answering Yes this means we will use the data for <u>any and all</u> fish pop purposes. If no, then we can only prove that some fish were there and not make statements on the entire population.	Yes
Efficiency:	Efficiency is how well you think you did at picking up the fish you could have collected. This can be Low, Medium, or High. Efficiency is not in and of itself enough to validate/invalidate a sample. That is a function of the representativeness assessment.	Medium
Code:	Letter code for fish species (see official list)	P

*Anomaly: D = Deformities; E= Eroded fins; F= Fungus; L = Lesions; M = Multiple; S = Emaciated; T = Tumors; P = Parasites; Y= Young of year; Z = Other

Field Sheet Log#: _____

UniqueID: _____

[https://mass.gov-my.sharepoint.com/personal/daniel_davis_mass_gov/Documents/Electrofishing/Field Sheets - Check Lists and Quick Guides/_FishPopulationFieldSheet2024 Proposed.docx](https://mass.gov-my.sharepoint.com/personal/daniel_davis_mass_gov/Documents/Electrofishing/Field%20Sheets%20-%20Check%20Lists%20and%20Quick%20Guides/_FishPopulationFieldSheet2024%20Proposed.docx)

Fish Population Data Sheet – MassDEP

Field	Notes	Example
Common:	Common name of fish (as a check against incorrect code)	Pumpkinseed
Tally:	This is the area for marking fish <u>either in</u> excess of the 25 measured/weighed. This could be counted but not collected, tally marks, or numbers that are added together. It is not a count of any of the 25 measured fish.	12 observed, 8, 9, 12, 44, 16
Grand Total	This is the total of all fish from this column including those in the Tally section AND the measured/weighed column. Since we DO measure/weigh all salmonids even past 25, fish number 26-50 would be in a separate column and totaled separately.	126
Length (mm)	Total length of fish (nose to last part of the tail fully extended). This is different than Fork Length or Standard length [to the caudal peduncle])	
Weight (g)	Weight in grams to the tenths place	1.5
Abnormal	Single letter code indicating any abnormalities. For multiple abnormalities use M. Young of year designation trumps any abnormalities.	P
*Anomaly: D = Deformities; E= Eroded fins; F= Fungus; L = Lesions; M = Multiple; S = Emaciated; T = Tumors; P = Parasites; Y= Young of year; Z = Other		
Sample Notes	This is the place to note anything about the site visit that is noteworthy such as, reach was only 80 meters, backpack broke, water level too high, staff became sick, etc.	Bubba kicked us out of the river for crossing his land. Partial sample only.
Field Sheet Log#	Office assigned field sheet log number.	
<u>UniqueID:</u> Survey Type	Unique ID for the site Allows classification in database to include or exclude for either only CWF designation or population analysis if a full fish pop survey is conducted.	W1212, F1212 Circle CWF or Fish Pop

*Anomaly: D = Deformities; E= Eroded fins; F= Fungus; L = Lesions; M = Multiple; S = Emaciated; T = Tumors; P = Parasites; Y= Young of year; Z = Other

Field Sheet Log#: _____

[https://mass.gov-my.sharepoint.com/personal/daniel_davis_mass_gov/Documents/Electrofishing/Field Sheets - Check Lists and Quick Guides/_FishPopulationFieldSheet2024 Proposed.docx](https://mass.gov-my.sharepoint.com/personal/daniel_davis_mass_gov/Documents/Electrofishing/Field%20Sheets%20-%20Check%20Lists%20and%20Quick%20Guides/_FishPopulationFieldSheet2024%20Proposed.docx)

UniqueID: _____

River Basin _____ Stream Name _____ Saris # _____

Investigator(s) _____ Start Time: _____ End Time: _____

Describe site Location: _____

| RECONNAISSANCE | HABITAT | INVERTEBRATE | FISH | ALGAE | WATER QUALITY | FLOW |

STREAM CHARACTERIZATION• **Subsystem Classification**

- ☐ Tidal
☐ Lower Perennial
☐ Upper Perennial
☐ Intermittent

• **Stream Type**

- ☐ Coldwater
☐ Warmwater

RIPARIAN ZONE INSTREAM FEATURES• **Surrounding Land Use**

- _____ % Forest
 _____ % Field/Pasture
 _____ % Agriculture
 _____ % Residential
 _____ % Commercial
 _____ % Industrial
 _____ % Other

• **Canopy Cover** _____ %• **Local Water Erosion**

- ☐ None
☐ Slight
☐ Moderate
☐ Heavy

• **High Water Mark** _____

- **Dam present** ☐ Yes ☐ No
 • **Channelized** ☐ Yes ☐ No

• **Est. Stream Width** _____ m• **Est. Stream Depth**

- ♦ **Riffle** _____ m
 ♦ **Run** _____ m
 ♦ **Pool** _____ m

• **Velocity**

- _____ m/s @ deployment
 _____ m/s @ recovery

• **Est. Fish Reach Length** _____ m**Local Watershed NPS Pollution**

- ☐ No evidence
☐ some potential sources: _____
☐ Obvious sources: _____

SEDIMENT/SUBSTRATE• **Odors**

- ☐ None/normal
☐ Anaerobic
☐ Chemical
☐ Petroleum
☐ Sewage
☐ Other

• **Deposits**

- ☐ None
☐ Paper fiber
☐ Sand
☐ Sawdust
☐ Sludge
☐ Other

• **Oils**

- ☐ None
☐ Slight
☐ Moderate
☐ Profuse
☐ Relict Shells
☐ Other

• **Are undersides of rocks (not deeply embedded) black?**

- ☐ Yes
☐ No

INORGANIC SUBSTRATE COMPONENTS		% Composition in Sampling:	
Substrate	Size (Minshall 1984)	Area	Reach
Bedrock	> 256 mm (10 in)	_____ %	_____ %
Boulder	64-256 mm (2.5-10 in)	_____ %	_____ %
Cobble	16-64 mm (0.6-2.5 in)	_____ %	_____ %
Pebble	2-16 mm (0.1-0.6 in)	_____ %	_____ %
Gravel	0.06-2 mm (gritty)	_____ %	_____ %
Sand	0.004-0.06 mm	_____ %	_____ %
Silt	< 0.004 mm (slick)	_____ %	_____ %
Clay		_____ %	_____ %

WATER CHARACTER• **Water Odors**

- ☐ Normal/None
☐ Chemical
☐ Fish
☐ Petroleum
☐ Sewage
☐ Other

• **Water Surface Oils**

- ☐ None
☐ Flecks
☐ Globs
☐ Slick/Sheen

• **Water Color**• **Turbidity (if not measured)**

- ☐ Clear
☐ Slight
☐ Moderate
☐ Severe (opaque)

Marl or travertine? ☐ present

ORGANIC SUBSTRATE COMPONENTS		
Substrate	Characteristic	% Comp. in sample reach
Detritus	Sticks, wood, coarse plant material (CPOM)	_____ %
Muck-Mud	Black, very fine organics (FPOM)	_____ %

HabSamp ID#:

BenSamp ID#(s):

Date _____

Station _____

River Basin _____ Stream Name _____ Saris # _____

Investigator(s) _____ Start Time: _____ End Time: _____

Describe site Location: _____

• Weather Conditions: ♦ Now <input type="checkbox"/> Rain/sleet/snow <input type="checkbox"/> cloud cover _____ % ♦ Antecedent Period Ppt. Amount (data from http://www.erh.noaa.gov/box/dailystns.shtml) 24 h— 7 d—	How were samples collected? <input type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat
--	---

■ Riparian vegetation (18 m buffer)

Record dominant species present and % area covered

_____ % trees

_____ % shrubs & vines

_____ % herbaceous

■ Aquatic vegetation (coverage within reach: _____ %)

Record dominant spp. and % composition (should = 100%)

_____ % rooted emergent

_____ % rooted submergent

_____ % rooted floating

_____ % free floating

_____ % mosses

■ Algae (coverage within reach: _____ %)**■ Number of algae samples taken:** _____

Forms	Color			Substrate				Microhabitat		
	Green	Brown	Other	Rock	Wood	Plant	Other	Pool	Riffle	Other
<input type="checkbox"/> filamentous	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		%	%	
<input type="checkbox"/> flock	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		%	%	
<input type="checkbox"/> thin film	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		%	%	
<input type="checkbox"/> other	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		%	%	

	Riffles	Snags	Stream Banks	Submerged Macrophytes	Other
■ Number of jabs/kicks in ea. habitat type:					
■ habitat types by % of sample reach	%	%	%	%	%

■ Site sketch

Date _____

Station _____

Investigator(s): _____

River Basin: _____

Stream Name: _____

Saris#: _____

Describe site location: _____

Scoring for wadable riffle/run dominated streams (moderate to high gradient) with velocities approx. 30 cm/s or greater.

Habitat parameter	Category																				
	Optimal					Suboptimal					Marginal					Poor					
1. Instream cover (fish)	A mix of submerged logs, undercut banks, rubble, or other stable habitat in > 50% of the sample area.					30-50% of area with a mix of stable habitat; adequate habitat for maintenance of populations.					10-30% of area with a mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					< 10% of area with a mix of stable habitat; lack of habitat is obvious; substrate unstable of lacking.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2. Epifaunal Substrate (in sampled area only)	Well-developed riffle and run; riffle is as wide as stream and length extends two times the width of stream; abundance of cobble (Boulders prevalent in headwater streams).					Riffle is as wide as stream but length is < 2X width; abundance of cobble; boulders and gravel common.					Run area may be lacking; riffle not as wide as stream and its length < 2X the stream width; gravel or bedrock prevalent; some cobble present.					Riffles or runs virtually nonexistent; bedrock prevalent; cobble lacking.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
3. Embeddedness (riffles/runs)	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.					Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.					Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.					Gravel, cobble, and boulder particles are > 75% surrounded by fine sediment.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization or dredging may be present but not recent (> 20 y).					New embankments present on both banks; and 40-80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
5. Sediment Deposition	Little or no enlargement of islands or point bars and < 5% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand, or fine sediment; 5-30% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand, or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition in pools prevalent.					Heavy deposits of fine material, increased bar development; > 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Date _____

Station _____

Habitat parameter	Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Velocity-Depth Combinations 1. slow deep 2. fast deep 3. slow shallow 4. fast shallow	All 4 velocity/depth patterns present. Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream < 7:1 (generally 5-7); variety of habitat is key. In streams where riffles are continuous, location of boulders or other large, natural obstructions is important.					Only 3 of 4 velocity/depth patterns present. Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Only 2 velocity/depth patterns present; usually lacking deep areas. Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Dominated by one velocity/depth pattern. Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of > 25.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Channel Flow Status	Water reaches the base of both banks, and minimal amount of channel substrate is exposed.					Water fills > 75% of the available channel; or < 25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed..					Very little water in channel and mostly present as standing pools.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Vegetative Protection (score each bank) <i>Note: Determine left or right side by facing downstream</i>	More than 90% of the streambank surfaces covered by naturally occurring vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by naturally occurring vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation I very high; vegetation has been removed to 5 cm or less in average stubble height.					
SCORE	Left bank					8					5					2					
SCORE	Right bank					8					5					2					
9. Bank Stability (score each bank)	Banks stable; evidence of erosion of bank failure absent or minimal; little potential for future problems. < 5% of bank affected.					Moderately stable; infrequent. Small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
SCORE	Left bank					8					5					2					
SCORE	Right bank					8					5					2					
10. Riparian Vegetative Zone Width (score each side)	Width of riparian zone >18 m; human activities (e.g., parking lots, roadbeds, clear-cuts, lawns, crops, etc.) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 m; human activities have impacted zone a great deal.					Width of riparian zone < 6 m; little or no riparian vegetation due to human activities.					
SCORE	Left zone					8					5					2					
SCORE	Right zone					8					5					2					

TOTAL SCORE _____

Comments:

Date _____

Station _____

Low

Massachusetts DEP/DWM Habitat Assessment Field Scoring Sheet (page 1 of 2) Revision Date: October 2003

Investigator(s): _____ River Basin: _____

Stream Name: _____ Saris#: _____

Describe site location: _____

Scoring for streams of low to moderate gradient, with velocities usually < 30 cm/s (except from storm events) and predominantly fine sediments.

Predominantly fine sediments.

Habitat Parameter	Category																				
	Optimal					Suboptimal					Marginal					Poor					
1. Bottom Substrate/Available Cover (fish and macroinvertebrates)	Greater than 50% mix of snags, submerged logs, undercut banks, rubble or other stable habitat and at a stage to allow full colonization potential (i.e., logs/snags that are not new-fall and not transient)					30-50% of area with a mix of stable habitat; adequate habitat for maintenance of populations; well-suited for full colonization; <i>(presence of new-fall, not yet prepared for colonization may rate at high end of scale).</i>					10-30% of area with a mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					< 10% of area with a mix of stable habitat; lack of habitat is obvious; substrate unstable or lacking.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow, or pools absent.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization or dredging may be present but not recent (> 20 y).					New embankments present on both banks; channelization may be extensive, with > 80% of stream reach channelized and disrupted.					Extensive channelization; banks shored with gabion or cement; heavily urbanized areas; instream habitat greatly altered or removed entirely.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
5. Sediment Deposition	Less than 20% of bottom affected; minor accumulation fine and coarse material at snags and submerged vegetation; little or no enlargement of islands or point bars.					20-50% affected; moderate accumulation; substantial sediment movement only during major storm event; some new increase in far formation.					50-80% affected; major deposition; pools shallow, heavily silted; embankments may be present on both banks; frequent and substantial sediment movement during storm events.					Channelized; mud, silt, and/or sand in braided or non braided channels; pools almost absent due to deposition.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Date: _____

Station: _____

Massachusetts DEP/DWM Habitat Assessment Field Scoring Sheet (page 2 of 2) Revision Date: October 2003

Habitat Parameter	Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Sinuosity	The bends in the stream increase the stream length 3-4 X longer than if in a straight line. <i>(Note—channel braiding is considered normal in coastal plains and other low-lying areas. This character is not easily rated in these areas.)</i>					The bends in the stream increase the stream length 2-3 X longer than if in a straight line.					The bends in the stream increase the stream length no more than 2 X "straight-line length."					Channel straight; waterway has been channelized for a long distance.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Channel Flow Status	Water reaches the base of both banks, and minimal amount of channel substrate is exposed.					Water fills > 75% of the available channel; or < 25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Vegetative Protection (score each bank) <i>Note: Determine left or right side by facing downstream</i>	More than 90% of the streambank surfaces covered by naturally occurring vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by naturally occurring vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 cm or less in average stubble height.					
SCORE	Left bank					8					5					2					
SCORE	Right bank					8					5					2					
9. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
SCORE	Left bank					8					5					2					
SCORE	Right bank					8					5					2					
10. Riparian Vegetative Zone Width (score each side)	Width of riparian zone >18 m; human activities (e.g., parking lots, roadbeds, clear-cuts, lawns, crops, etc.) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 m; human activities have impacted zone a great deal.					Width of riparian zone < 6 m; little or no riparian vegetation due to human activities.					
SCORE	Left zone					8					5					2					
SCORE	Right zone					8					5					2					

TOTAL
SCORE _____

Comments: _____

Date _____

Station _____

APPENDIX 2: DRAFT COLD WATER DESIGNATION PROCEDURE

**COLD WATER DESIGNATION PROCEDURE UNDER
THE MASSACHUSETTS SURFACE WATER QUALITY STANDARDS (314 CMR 4.00)**

May 20, 2020

The following procedures are necessary to designate a fresh water river or stream as Cold Water in the Massachusetts Surface Water Quality Standards (SWQS; 314 CMR 4.00). The procedures were developed by the Massachusetts Department of Environmental Protection's (MassDEP) Watershed Planning Program (WPP).

Cold Waters are designated in Tables 1 through 27 of the SWQS. Cold Water Fishery dissolved oxygen (DO) and temperature criteria apply to these waters. Cold Water Fisheries are defined in the SWQS as those in which the mean of the maximum daily temperature over a seven day period generally does not exceed 68°F (20°C) and, when other ecological factors are favorable (such as habitat), are capable of supporting a year-round population of cold water stenothermal aquatic life such as trout (Salmonidae). In order to designate a Cold Water, data must show that the waterbody (or waterbody segment) meets this definition.

In 2006, WPP and Massachusetts Department of Fish and Game (DFG) staff developed an informal agreement regarding data needed to meet the definition of a Cold Water Fishery in the SWQS. If the data show that the definition is met, the waterbody can be designated as Cold Water in the respective SWQS table. The informal 2006 agreement for Cold Water designation is presented below, followed by a discussion of the issues that brought WPP to develop a new approach. The new designation procedure at the end of this document replaces the informal 2006 agreement.

2006 Agreement:

Per the 2006 agreement, a stream had to meet the following conditions to be designated as Cold Water in the SWQS:

1. Fish community samples with cold water species representing > 50% of individuals;
2. At least one temperature data point < 20°C;
3. Both fish and temperature samples collected between July 1 and August 31 (inclusive);
4. If the cold water fish are all trout, there must be evidence that they are not all stocked (usually this means multiple age classes); and
5. Evidence of other cold water species (e.g., slimy sculpin), regardless of trout being stocked or unstocked.

WPP has found that the above conditions in many instances are not an accurate determination of a Cold Water Fishery. For example, a stream may support a reproducing population of cold water fish species, but the presence of a more abundant common species (e.g., black-nosed dace) could minimize the relative proportion of the cold water species (i.e., the 50% threshold would not be met).

New Cold Water Designation Procedure:

To be eligible as a proposed designated Cold Water stream or river, fish population or surface water quality data collected must meet the following conditions in either Scenario #1 or Scenario #2. Scenario #1 of the new procedure outlined below posits that if a reproducing population of cold water fish species is present during the peak of the summer, then the habitat is presumed to meet the SWQS Cold Water Fishery definition. Scenario #2 presumes that even if fish are not

present, the habitat is capable of supporting a year-round population of cold water aquatic life if specific measurement endpoints for both temperature and DO are met. All data must have been collected after November 28, 1975 for consideration in Cold Water designation.

Scenario #1: Evidence of cold water fish presence

1. Waters that contain the following cold water species in the specified numbers and size ranges during a single sampling event (defined as sampling that occurred over a single day) are eligible:
 - a. two or more individual *S. fontinalis* (eastern brook trout or EBT) ≤ 140 mm (~5.5") in length. A minimum of two larger individual EBT may also qualify if stocking records indicate that the fish were not stocked or did not likely come from a stocked waterbody; or
 - b. two or more individual *Cottus cognatus* (slimy sculpin or SC) of any size; or
 - c. one individual EBT measuring ≤ 140 mm in length and one individual SC of any size.¹
2. AND, fish sampling was conducted between July 1st and September 15th.

Scenario #2: Lack of fish population sampling or documented cold water fish presence

1. Waters where either no fish sampling has been conducted or sampling data document that no cold water fish are present are eligible for Cold Water designation if:
 - a. temperature measurements meet the SWQS criterion ($\leq 20^{\circ}\text{C}$ based on the mean of daily maximum measurements over a 7-day period) and an additional acute threshold where the maximum 24-hour average $\leq 23.5^{\circ}\text{C}^2$; and
 - b. DO measurements meet the following cold water thresholds where the 7-day mean minimum (mean of each day's minimum) ≥ 6.0 mg/L and the 1-day minimum ≥ 5 mg/L³.
2. AND, temperature and DO measurements within the same segment are collected between July 1st and September 15th. Temperature and DO sampling within a segment are encouraged to be concurrent and continuous; however, data that are not concurrent or continuous may be used.

Determination of the Cold Water Segment Length:

If morphological, geological (such as substrate type), or gradient characteristics indicate that the Cold Water segment should start and end at certain points, the segment boundaries should be noted on a map or indicated using GPS coordinates. Sampling locations necessary to determine the extent of the potential Cold Water segment should be displayed in a sampling plan. In accordance with the data, delineation of a Cold Water segment may be a subset of an SWQS segment or extend across multiple SWQS segments.

¹ See MassDEP's 2018 Consolidated Assessment and Listing Methodology (CALM), Figure 5, Tier 1 cold water fish species.

² See MassDEP's 2018 CALM, Figure 5, designated Cold Water and Tier 1 acute temperature thresholds.

³ See MassDEP's 2018 CALM, Table 2, Cold Water dissolved oxygen thresholds.

Cold Water Designation Procedure Under the Massachusetts Surface Water Quality Standards (314 CMR 4.00)

