DRAFT

**Sampling & Analysis Plan**

2020 Wadeable Stream Cold Water Fishery Determination

in

Northeastern and Central Massachusetts

CN#: 532.0

June 2020



Massachusetts Department of Environmental Protection

Division of Watershed Management

Watershed Planning Program

8 New Bond Street

Worcester, MA

***NOTE: This draft sampling plan provides detail re: sampling locations, frequencies, analytes, etc. and is intended to augment WPP’s multi-year programmatic QAPP approved by EPA for 2020 through 2024. The contents mirror selected elements of WPP’s programmatic QAPP (i.e.,QA-R5 EPA Guidance). See the QAPP for relevant information not provided in this SAP.***

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#### Project Organization

The Massachusetts Department of Environmental Protection (MassDEP), Division of Watershed Management (DWM), Watershed Planning Program (WPP) gathers background information, formulates sampling plans and carries out monitoring and assessment activities on rivers, lakes and coastal waters pursuant to the requirements of the Clean Water Act (CWA).

Cold water fishery (CWF) monitoring and determination are a component of the Massachusetts’ water monitoring strategy and are used to achieve the objectives of providing the WPP Surface Water Quality Standards (SWQS) staff with assured data to delineate cold water fisheries (CWF) within the Commonwealth and designate them for protection. The SWQS staff has developed 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). This procedure can be found in “Fish Collection Procedures for the Evaluation of Potential Cold Water Fisheries in Wadeable Streams” (CN# 533.0 MassDEP 2020) which also prescribes the field methods and sampling techniques to be used when performing fish community assessments to support the Cold Water designation process. This Sampling and Analysis Plan (SAP) provides details pertaining to CWF resource monitoring planned by the WPP for surface waters in northeastern and central Massachusetts in 2020 and includes both water quality (temperature and dissolved oxygen) and fish population structure and health. Specific descriptions of WPP staff roles and responsibilities for this monitoring project are detailed in Table 1. In addition, the WPP full-time monitoring program staff will be augmented by the hiring of five (5) seasonal employees from June through September to ensure that enough personnel are available to carry out field surveys as planned.

## Table 1. Project Roles and Responsibilities related to monitoring and data use

| **Project Personnel** | **Responsibility** |
| --- | --- |
| Project Coordinators  - Daniel Davis  - James Meek  - Peter Mitchell  - Dahlia Tympanick  - Allyson Yarra | Responsible for site reconnaissance, obtaining landowner access permission, defining monitoring logistics and data generation assigned sites using the procedures contained in WPP SOPs. |
| Fish population survey crews  - Daniel Davis (lead)  - Peter Mitchell (lead)  - WPP staff and seasonal employees | Responsible for conducting fish population sampling using electrofishing techniques contained in WPP SOPs. |
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| Probe deployment survey crews  - Daniel Davis (lead)  - James Meek (lead)  - Peter Mitchell (lead)  - Dahlia Tympanick (lead)  - Allyson Yarra (lead)  - WPP staff and seasonal employees | Responsible for the deployment of probes and data collection at assigned sites using the sample collection techniques and probe use procedures contained in WPP SOPs. |

For each field monitoring survey event, the staff member serving as the survey crew leader (at a minimum) will have met the following qualifications:

• Familiarity with this SAP and all applicable SOPs for that survey

• Completion of a multiprobe sampling/grab sampling/QC training segment

• Prior field experience with survey equipment and with similar monitoring surveys

• Be physically able to access the sites, carry equipment and samples, and perform the sampling.

Survey crew leaders will be accompanied by one additional crew member for each survey. All field survey crew personnel will be trained in standard operating procedures (SOPs). Field training may range from formal WPP training sessions to field instructions provided by a trained and experienced WPP survey crew leader. All WPP training activities will be documented using signature sheets.

#### Project Definition and Background

Cold water fisheries assessment is performed to support both designated use decisions for the SWQS, as well as use attainment status, as described in MassDEP’s Comprehensive Assessment and Listing Methodology (CALM) (MassDEP 2018). The WPP has the capacity to continuously monitor both temperature and dissolved oxygen in waters over extended periods of time. Our understanding of fish population requirements to sustain reproducing populations has also increased. Recent changes to the CALM and the development of protocols for designating a cold water fishery resource (CWF) in the SWQS necessitate that MassDEP revise its CWF assessment methodology. Procedures have been adopted to increase the assurance that CWFs are designated and protected as such in the SWQS and to determine whether they are meeting their Aquatic Life Use goals. Monitoring protocols for the deployment of dissolved oxygen and temperature loggers (DO/T loggers), and the capture of select cold water fish species have been developed and are described in applicable SOPs.

The goal of the 2020 CWF monitoring effort is to collect physical water quality (temperature and dissolve oxygen) and cold water fish residence data to assess the CWF applicability of the fluvial assessment units (AUs) represented by the sampling sites. The WPP proposes to gather the following kinds of environmental data and information at each site in fulfillment of this goal:

* Habitat assessment
* Fish community
* Temperature (instantaneous)
* Continuous temperature (one-month duration)
* Dissolved oxygen (instantaneous)
* Continuous dissolved oxygen (one-month duration)
* Selected field observations

#### Project Description

**Overview of CWF Assessment Monitoring in 2020**

##### Water Quality (Physical)

Onset loggers (dissolved oxygen and temperature loggers) will be deployed on a long-term continuous basis (28-days) between July 1 and September 15 at the selected sites. At deployment and prior to retrieval of loggers, QC readings will be taken using a separate meter as specified in WPP’s unattended probe SOPs. After retrieval of deployed multiprobes, post-deployment calibration and QC checks on the data will be performed.

##### Fish Community

Fish community analyses will be conducted once during July 1 and September 15 at all sites. Fish will be collected within the sampled reach using a backpack or tote barge electrofishing device and non-lethal techniques described in WPP standard operating procedures (MassDEP2020). All salmonids and slimy sculpin will be collected, as well as a representative of each other species encountered. Collected fish species of interest (eastern brook trout (*Salvelinus fontinalis*), and slimy sculpin (*Cottus cognatus*) will be measured (total length). The collected fish will then be redistributed throughout the reach. In addition, RBP habitat assessments will be completed at all sites. See SOP CN 533.0 for further details (MassDEP 2020).

#### Sampling Process Design

The 2020 CWF monitoring project is designed to collect physical water quality and fish population data to support the assessment of CWF rivers and streams in northeastern and central Massachusetts. A preliminary list of candidate streams was selected by reviewing MassDEP temperature and dissolved oxygen data, and Massachusetts Division of Fisheries and Wildlife (DFW) fish population records. These records include both DFW and MassDEP fish sample data.

Streams from within the watersheds of interest were then selected. Streams that are already designated as a CWF were removed from further consideration. A review of the remaining streams was conducted in accordance with the procedures described in the “Cold Water Designation Procedure under the Massachusetts Surface Water Quality Standards (314 CMR 4.00) which is presented in Appendix 2 of SOP CN 533.0 (MassDEP 2020). Some DFW samples did comply with the requirements of the designation procedure and those streams were deemed unnecessary for further examination. Samples from the DFW database that did not comply with the designation protocols were chosen as sites for further examination. Sites that were out of compliance with the sampling index period (July 1 – September 15) but would otherwise satisfy CWF designation were included. Sites that had cold water fishes that were either too few in number, or exceeded the specified length (140mm) were also included. Preference was given to streams larger than first-order as a way to ensure that the stream is perennial. A list of the streams to be sampled in 2020 is presented in Table 2.

## Table 2: DRAFT 2020 CWF determination monitoring sites

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **SARIS** | **Group** | **Name** | **Watershed** | **Latitude** | **Longitude** |
| 5131025 | 1 | Abbott Run | Blackstone | 41.94479 | -71.37164 |
| 5131400 | 8 | Fox Brook | Blackstone | 42.02820 | -71.54040 |
| 5131475 | 8 | Round Top Brook | Blackstone | 42.00792 | -71.70506 |
| 5131700 | 8 | Emerson Brook | Blackstone | 42.04626 | -71.63013 |
| 5131900 | 8 | Rock Meadow Brook | Blackstone | 42.09246 | -71.59144 |
| 5131950 | 8 | Miscoe Brook (1) | Blackstone | 42.12288 | -71.59914 |
| 5132025 | 8 | Miscoe Brook (2) | Blackstone | 42.22538 | -71.65267 |
| 5132150 | 8 | Cook Allen Brook | Blackstone | 42.11486 | -71.70458 |
| 5132175 | 8 | Steamburg Brook | Blackstone | 42.10853 | -71.69456 |
| 5132240 | 8 | UNT to Wellman Brook | Blackstone | 42.07256 | -71.70276 |
| 5132450 | 5 | Axtell Brook | Blackstone | 42.22356 | -71.68764 |
| 5132550 | 5 | Coal Mine Brook | Blackstone | 42.29070 | -71.76730 |
| 5132575 | 5 | Poor Farm Brook | Blackstone | 42.30650 | -71.76600 |
| 5132600 | 5 | Sewall Brook | Blackstone | 42.32472 | -71.74141 |
| 5133050 | 5 | Tatnuck Brook | Blackstone | 42.26072 | -71.84794 |
| 5133100 | 5 | Silver Spring Brook | Blackstone | 42.30550 | -71.87770 |
| 7341600 | 1 | Mill Brook | Boston Harbor | 42.18920 | -71.24016 |
| 7341250 | 1 | Purgatory Brook | Boston Harbor | 42.20928 | -71.18480 |
| 7240225 | 1 | Dix Brook | Charles | 42.06030 | -71.42140 |
| 7239550 | 1 | Noanet Brook | Charles | 42.25252 | -71.26265 |
| 7239300 | 1 | Seaverns Brook | Charles | 42.34154 | -71.26663 |
| 7239250 | 1 | Cherry Brook | Charles | 42.38896 | -71.29708 |
| 3625075 | 2 | Fuller Brook | Chicopee | 42.16320 | -72.53470 |
| 3625130 | 2 | UNT to Higher Brook | Chicopee | 42.18858 | -72.45233 |
| 3625350 | 2 | Broad Brook (2) | Chicopee | 42.21049 | -72.40260 |
| 3625675 | 2 | Blodgett Mill Brook | Chicopee | 42.17390 | -72.25330 |
| 3625775 | 2 | O'Neil Brook | Chicopee | 42.22285 | -72.22523 |
| 3626000 | 3 | Meadow Brook | Chicopee | 42.28937 | -72.12806 |
| 3626025 | 3 | Sucker Brook (2) | Chicopee | 42.29793 | -72.11710 |
| 3626035 | 3 | UNT to Sucker Brook | Chicopee | 42.31486 | -72.09624 |
| 3626275 | 5 | Sevenmile River | Chicopee | 42.26514 | -72.00530 |
| 3626300 | 2 | Cranberry River | Chicopee | 42.21653 | -72.00015 |
| 3626325 | 5 | Turkey Hill Brook | Chicopee | 42.27080 | -71.98280 |
| 3626400 | 3 | Fivemile River | Chicopee | 42.33886 | -72.03408 |
| 3626475 | 3 | Maynard Brook | Chicopee | 42.33175 | -72.05032 |
| 3626553 | 2 | Murdock Brook | Chicopee | 42.21659 | -72.37554 |
| 3626600 | 9 | Chaffee Brook | Chicopee | 42.33666 | -72.36874 |
| 3626785 | 9 | UNT to Quabbin (Dickey Brook) | Chicopee | 42.44412 | -72.37156 |
| 3626925 | 9 | Prescott Brook | Chicopee | 42.36452 | -72.32489 |
| 3627025 | 9 | Giles Brook | Chicopee | 42.50354 | -72.31803 |
| 3627075 | 9 | Manning Brook | Chicopee | 42.51855 | -72.31728 |
| 3627200 | 4 | East Branch Swift River | Chicopee | 42.43775 | -72.20826 |
| 3627245 | 4 | UNT to East Branch Swift River (McManus Brook) | Chicopee | 42.45200 | -72.16650 |
| 3627550 | 3 | Muddy Brook | Chicopee | 42.35630 | -72.23090 |
| 3627675 | 3 | Danforth Brook (2) | Chicopee | 42.31551 | -72.20667 |
| 3627700 | 3 | Fish Brook | Chicopee | 42.31604 | -72.18082 |
| 3627725 | 4 | Moose Brook | Chicopee | 42.41375 | -72.14289 |
| 3627825 | 4 | Pratt Brook | Chicopee | 42.37749 | -72.10762 |
| 3627850 | 4 | Burrow Brook | Chicopee | 42.37476 | -72.08738 |
| 3628150 | 4 | Natty Pond Brook | Chicopee | 42.45145 | -72.02946 |
| 3628250 | 4 | East Branch Ware River | Chicopee | 42.41615 | -72.00791 |
| 3628365 | 4 | UNT to East Branch Ware River | Chicopee | 42.44674 | -71.93977 |
| 8247877 | 7 | Unnamed Tributary | Concord | 42.37600 | -71.47660 |
| 8247875 | 7 | Run Brook | Concord | 42.38603 | -71.43967 |
| 8247675 | 7 | Dugan Brook | Concord | 42.44790 | -71.37850 |
| 8247325 | 7 | Hog Brook | Concord | 42.39321 | -71.58177 |
| 3522300 | 9 | Wickett Brook | Millers | 42.55699 | -72.42509 |
| 3523010 | 6 | Shingle Swamp Brook | Millers | 42.55640 | -72.30080 |
| 3523325 | 6 | Lawrence Brook | Millers | 42.68350 | -72.17190 |
| 3523550 | 6 | Rich Brook | Millers | 42.62957 | -72.16371 |
| 3523575 | 6 | Thousand Acre Brook | Millers | 42.60698 | -72.16342 |
| 3523600 | 6 | Beaver Brook (2) | Millers | 42.61270 | -72.12970 |
| 3523700 | 6 | Chickering Brook | Millers | 42.55493 | -72.12750 |
| 3523925 | 6 | Bailey Brook | Millers | 42.58925 | -72.03684 |
| 8145500 | 5 | Asnebumskit Brook | Nashua | 42.35240 | -71.89120 |
| 8144875 | 7 | Pearl Hill Brook | Nashua | 42.58519 | -71.77108 |
| 8144849 | 6 | Baker Brook | Nashua | 42.56351 | -71.76140 |
| 8144525 | 7 | Catacoonamug Brook | Nashua | 42.56710 | -71.69660 |
| 8349150 | 7 | Content Brook | Shawsheen | 42.57870 | -71.21088 |

| Table 3. Project Schedule for 2020 targeted assessment monitoring | | | |
| --- | --- | --- | --- |
| **Activity** | **Approx. Date of Initiation** | **Approx. Date of Completion** | **Deliverable** |
| Coordination, staff meetings, reconnaissance, river/stream sampling plan development, site selection, etc. | Jan 2020 | Apr 2020 | Draft sampling plan; meeting notes, etc. |
| Draft sampling plan review and approval | Mar 2020 | Apr 2020 | Internal WPP concurrence on sampling plan |
| 2020-2024 WPP monitoring QAPP | Mar 2020 | May 2020 | 2020-24 WPP Monitoring QAPP |
| Probe deploy/retrieval | Jul 2020 | Sep 2020 | Continuous DO/temperature data |
| CWF Fish sampling surveys | Jul 2020 | Sep 2020 | Field data |
| Data QA/QC review and validation | Jan 2021 | Jun 2021 | 2020 Data Validation Report |
| Data review, analysis and preliminary reporting | Jun 2021 | Mar 2022 | Final data analysis |

#### Non-Direct Measurements

Table 4 presents a brief list of relevant external data sources that may be used in coordinating monitoring efforts or the interpretation of monitoring data. For example, stage data from the USGS could be used to determine if water levels are appropriate for certain types of sampling or rain data from NCEI could be used to determine if a sampling event occurred during wet or dry weather.

## Table 4. External data sources used for the 2020 targeted assessment monitoring

|  |  |
| --- | --- |
| **Organization** | **Data** |
| United States Geological Survey (USGS)  <https://www.usgs.gov/centers/new-england-water/> | Continuously stream stage and discharge measurements at gage stations within the project extent. |
| National Centers for Environmental Information (NCEI)  <https://www.ncdc.noaa.gov/> | Daily precipitation and temperature data weather stations within the project extent. |
| The Weather Underground  <http://www.wunderground.com/> | Daily precipitation and temperature data weather stations within the southwestern basin group. |

#### Literature Cited

MassDEP. 2020. SOP: Fish Collection Procedures for the Evaluation of Potential Cold Water Fisheries in Wadeable Streams CN 533.0. Massachusetts Department of Environmental Protection, Watershed Planning Program, Worcester, MA.

MassDEP. 2018. Massachusetts Consolidated Assessment and Listing Methodology (CALM) Guidance Manual for the 2018 Reporting Cycle. [Online]

<https://www.mass.gov/doc/2018-consolidated-assessment-and-listing-methodology-guidance/download>

MassDEP. 2018. Massachusetts Surface Water Quality Standards. [Online]

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MassGIS. 2019. MA DFW Coldwater Fisheries Resources (1:25, 000). [Online] <https://docs.digital.mass.gov/dataset/massgis-data-ma-dfw-coldwater-fisheries-resources-125-000>