7.16

STANDARD OPERATING PROCEDURE FOR THE COLLECTION OF FISH IN WADEABLE RIVERS AND STREAMS

Summary

Fish are an important aquatic community, especially in perennial rivers and streams. Fish are not only highly visible to the public, but are also easily sampled by professional biologists. There are several attributes of fish communities that make them desirable for biological monitoring and assessment programs (Simon 1998). These attributes include: 1) fish populations and individuals generally remain in the same area during summer seasons; 2) fish communities are persistent and recover from natural disturbances rapidly; 3) most fish species have long life spans (3-10+ years) and can reflect both long-term and current water quality; 4) aquatic life uses described in most state's water quality standards are generally characterized in terms of fish; 5) the sampling frequency for trend assessment is less than the sampling frequency for short-lived organisms; and 6) the taxonomy, distribution, life histories, and tolerances to environmental stressors of most North American fishes is well documented.

Fish sampling follows a disciplined collection procedure to get a repeatable, representative, distance-specific, and quantitative estimate of taxa richness and biomass. Fish collection procedures must focus on a multi-habitat approach where all available habitats are sampled in proportion to their availability in the stream sample reach. Each sample reach should contain riffle, run, and pool habitat when available. In order to avoid their hydrological effects on habitat quality, the sample reach should be sufficiently upstream of any bridge or road crossing, whenever possible. In the end, however, wadeability and accessibility may ultimately determine the exact location of the sample reach. Sampling is conducted from mid to late summer to take advantage of stable, low flow conditions. The accurate identification of each fish collected is essential, and species-level identification is required (including hybrids). Field identification of fish is acceptable. However, voucher specimens must be preserved and retained for independent laboratory verification.

Regardless of the sampling method, all fish sampling gear types are considered selective to some degree. Electrofishing however, has proven to be the most comprehensive and effective single method for collecting stream fishes. Pulse DC (direct current) electrofishing is the method of choice to obtain a representative sample of fish at each sampling site.

The following methods have been developed, in part, based on the Rapid Bioassessment Protocols for Use in Streams and Wadable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition (Barbour et al. 1999).

Equipment and Supplies

- North Dakota Game and Fish Department or other appropriate scientific collection permit(s)
- backpack, long-line, or tote barge-mounted electroshocker apparatus
- dip nets
- block nets (i.e., seines)
- polarized sunglasses
- life jacket
- electrician's high voltage rubber gloves
- chest waders
- ear protection (plugs or muffs)
- plastic buckets (20)
- small plastic perforated baskets (20)
- electronic scale
- spring scale
- measuring board
- ruler
- 1 liter and 500 ml jars for voucher/reference specimens
- 10 % buffered formalin (formaldehyde solution)
- fish collection field data sheets
- taxonomic key(s)
- pencils
- digital camera
- maps
- Global Positioning System (GPS)
- first aid kit

Procedures

1. Determine the sampling reach length and mark its upstream and downstream limits. When selecting the sample reach, consideration should be given to the influences of major tributaries and bridge/road crossings. Where feasible, the reach should be located a sufficient distance upstream from these influences so as to decrease their effect on overall habitat quality. The exact location (e.g., latitude and longitude) of the downstream limit of the reach should be determined with a Global Positioning System (GPS) and recorded on the Biological Monitoring Field Collection Data Form (Figure 7.16.1) along with the station ID, water body name, station description, major basin, level IV ecoregion, county, and township/range/section.

   Two methods may be employed to determine the sample reach. The first method is termed the "fixed-distance designation" and is considered the Department's default method for specifying the sampling reach. Using the fixed-distance method a standard 150 meter stream length is sampled. The sample reach should include a mixture of all available stream/river habitats (i.e., riffles, runs, pools, snags, overhanging banks). If all available habitats can not be sampled within the 150 meter designation, the sampling

reach length should be extended either upstream or downstream by increments of 50 meters.

An alternative to the fixed-distance designation is the "proportional-distance designation." With this method, the sample reach is determined by taking the bank full width of the river or stream times a standard number (e.g., 40 times the stream width is used by EPA's Environmental Monitoring and Assessment Program (EMAP) for sampling). The method employed to determine the sample reach should be described in the project specific Quality Assurance Project Plan (QAPP).

2. Complete a habitat assessment of the sample reach. The Department's default habitat assessment methodology is the Rapid Bioassessment Habitat Assessment methodology described by Barbour et al. (1999). When other habitat assessment methods (e.g., EMAP) are used they should be described in the project specific QAPP.

3. Complete the remaining field information on the Biological Monitoring Field Collection Data Form (Figure 7.16.1) by recording information on ambient weather conditions, stream water quality (e.g., temperature, pH, specific conductance, dissolved oxygen), and physical condition (e.g., shoreline condition, bottom substrate, flow, average width and depth), the method of collection, start time, ending time and duration of sampling.

4. Begin sampling via long line electrofishing with a minimum of a three (3) person fisheries crew; one person to handle the wand, one person to pull the line and to carry buckets full of stream water to hold the stunned fish; and one person to attend the generator. The third person attending the generator should maintain visual contact with the electrofishing crew at all times and should be prepared to turn off the generator should there be an accident. The safety of all personnel and the quality of the data is assured through the adequate education, training, and experience of all members of the electrofishing team. At least one biologist with training and experience in electrofishing techniques and fish taxonomy **must** be involved in each sampling event. It is also required that at least 2 members of the fish collection team be certified in CPR (cardiopulmonary resuscitation) and have basic first aid training.

   Sampling begins at the bottom or furthest downstream end of the reach. Sampling is performed by shocking along both shorelines in streams 5 meters wide and wider, or following a serpentine pattern along both shores for streams less than 5 meters wide. All habitat and stream types are sampled thoroughly in an attempt to capture all fish encountered. Fish collected are held in buckets for later identification and enumeration.

   Note: When natural barriers to fish migration (e.g., riffle areas) are lacking in the sample reach, it is recommended that a blocking net be placed on either end of the reach to prevent fish from escaping.

5. Adult and juvenile specimens from each site are counted and identified to species utilizing taxonomic keys relative to the region. Smaller and more difficult to identify taxa can be preserved for later identification in the laboratory. Young of year fish less

than 25 mm in length are not included in the analysis. As fish are sorted, record the number of individuals of each species collected, the composite weight of each species, and the minimum and maximum length of each species on the Fish Collection Field Form (Figure 7.16.2). All fish should be examined for the presence of gross external anomalies (e.g., deteriorated or eroded fins, lesions, or tumors) and their number recorded for each species. The presence of hybrid species encountered in the field should also be recorded, and when possible the potential parental combinations recorded.

6. A voucher sample with representation of each species sampled is jarred, preserved with 10% buffered formalin, and labeled for permanent record. A label, containing the site identification, river/stream name, site description, date of collection, and sampler(s), should be placed on the outside of the jar as well as inside the jar.

7. After data collection all fish not retained in the voucher sample are released back into the waters from which they came.

   Note: If any species of special concern (e.g., threatened or endangered) are encountered they should be noted and released *immediately* on site.

8. After the final site clean-up and prior to leaving, take a minimum of one upstream and one downstream photograph from the mid-point of the sample reach.

9. Quality and quantity assurance is verified by revisiting a minimum of 3 sites each sampling year. The re-sampling will identify the range of variance associated with the method of sampling and analysis employed. For future reference and verification a voucher collection of all species collected at each site will be preserved and archived by the NDDH.

References

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

Simon, T.P. 1998. Introduction: Biological Integrity and Use of Ecological Health Concepts for Application to Water Resource Characterization, in T.P. Simon Ed. *Assessing the Sustainability and Biological Integrity of Water Resources Using Fish Communities*. CRC Press, Boca Raton, FL. 3-17.

North Dakota Department of Health
Division of Water Quality
Biological Monitoring Field Collection Data Form

Station ID: _____ Field Number: _____
Waterbody Name: _____
Station Description: _____
Latitude: _____ Longitude: _____
County: _____ Township: _____ Range: _____ Section: _____
River Basin: _____ Ecoregion: _____
Weather (air temp, wind, etc.): _____ Flow (cfs): _____
Water Temp: _____ pH: _____ Specific Cond.: _____ Dissolved Oxygen: _____
Reach Length (m): _____ Average Reach Width (m): _____ Average Reach Depth (m): _____
Stream Habitat Type (%): Riffle: ____ Pool: ____ Snag: ____ Aquatic Vegetation: ____ Undercut Bank: ____
Overhanging Vegetation: ____ Other: _____
Bottom SubstrateType(%): Boulder: ____ Cobble: ____ Gravel: ____ Sand: ____ Silt: ____ Clay: ____
Collection Method: _____Time Start: _____ Time Stop:_____ Total Time:_____
Habitat Assesment: Yes or No Macroinvertebrate Sample: Yes or No Water Chemistry: Yes or No
Sampler(s): _____
Comments: _____
_____

North Dakota Department of Health
Division of Water Quality
Fish Collection Field Form

Station ID: _____ Field Number: _____
Waterbody Name: _____
Station Description: _____
Latitude: _____ Longitude: _____
County: _____ Township: _____ Range: _____ Section: _____
River Basin: _____ Ecoregion: _____
Sampler(s): _____
Comments: _____

Species	Number of individuals	Length Range (mm)		Bulk Weight (g)	No. Anomalies	Voucher	
		Minimum	Maximum			Y	N

Figure 7.16.2 Fish Collection Field Form.