Chapter Twenty
Aquatic Habitat Classification Protocol

The principal motivations for collecting information on habitat and vegetative characteristics is to both monitor potential large-scale habitat changes over time and correlate habitat characteristics to faunal presence and absence. One goal of the Iowa statewide monitoring program is to collect data that can be compared to data collected from other places. Data comparisons are most appropriate when the information has been collected in a similar manner. To that end, the following protocol has been designed based upon the USFS Forestry Inventory and Analysis (FIA) protocols, the USFS MSIM protocols, and the Iowa DNR fish habitat protocols.

IOWA AQUATIC HABITAT CLASSIFICATION AND MONITORING

The following are guidelines for those permanent sampling plots which include rivers, streams, creeks, impoundments, backwaters, artificial lakes, natural lakes, and ponds. The program coordinator has the responsibility of ensuring that duplicate efforts are avoided by the respective sampling teams (i.e. that the same information is not being collected by multiple people). However, it is in the interest of the technicians to ensure that other teams associated with that wetland are or are not collecting the same data.

Each wetland for which data is collected with these techniques will be categorized into one of the 8 water habitat types: rivers, streams, creeks, impoundments, backwaters, artificial lakes, natural lakes, and ponds. See Chapter 2 (Plot Design) for definitions of each habitat type.

SURVEY METHODS:

Included in these measurements are data that can be determined from GIS coverages in the lab prior to field work (see Chapter 3, Landscape Characteristics). Measurements include amount of roads and other impacted soils adjacent to the water body, locations of and numbers of water bodies. This information will need to be ground-truthed in the field.

LENTIC (STANDING WATER) SITE MEASUREMENTS:

The area of the habitat will be estimated either from topographic maps and aerial photos (i.e. known values for Saylorville Lake, for example) or by estimating length and width in the field and pacing the circumference of the pond, impoundment, or lake with a GPS unit in hand periodically recording point locations.

The depth of the water is determined either from known data or, if no known data exists, in the field using a meter stick in shallower water, or dropping a depth gauge or sounding line from a boat in deeper water. In some waters, a SONAR depth finder may be necessary to determine the water depth. If the deepest section of the water body is not known, then 5 depths should be taken from around the area thought to be the deepest point.

Plot Establishment

In lakes, impoundments, and ponds, 30 plots should be established extending 3 m from the shoreline into the water. Each plot should be 0.25 m wide (so basically each plot is a 0.75

m^2 rectangle). Plots are spaced equally around the perimeter of the lake, pond, or impoundment. For backwater areas which are not too deep, one transect is established that runs across the longest section of the wetland. Both designs (the plots-from-the-edge and the transect through the backwater) follow those of the USFS MSIM program. Again, this distance needs to be known prior to data collection to allow 30 0.75 m^2 rectangular plots to be spaced evenly. It may be best to decide on exact locations based on GIS coverage and use a surveyor's tape to ensure proper spacing of pre-selected locations in the field.

Substrate Measurements

Within each 0.75 m^2 rectangular plot, record the maximum depth, the depth at the end of the plot furthest from the shore or transect, and the percent of substrate covered by the following 7 categories: bedrock, rubble (contains stones, boulders, and bedrock), cobble-gravel (2-300 mm in size), sand, mud (silt or clay), organic (muck or peat), and vegetation (Cowardin et al. 1979). Percent coverage should add to 100. The substrate measurements will be used as an index for the majority of breeding areas for aquatic species (e.g. emergent vegetation and dragonflies, submergent vegetation and rocks for amphibians, cobble-gravel and certain fish species) along the edge of the wetlands.

In areas too deep to see the bottom of the plot for the substrate covers, it may be necessary to rely on taking pole-prodding or dredge-samples to determine these values. If the substrate is within reach of a pole yet the water is too murky to see clearly, it may be possible to determine substrate class by using an aluminum pole (often 12 ft in length and 1 3/8 inches in diameter). By using the pole to test the substrate it may be possible to determine what the area is composed of (silt vs. bedrock). Take at least 2 'jabs' within each plot where it is impossible to see the bottom. Larger areas will need more 'jabs' with the pole. However, in some situations it may be impossible to determine substrate type by either sight or pole-prodding. A dredge may be necessary to determine substrate. In deep water, a heavyweight deep water bottom dredge (e.g. 6 x 6 inch samples) may be needed, although a lightweight shallow water bottom dredge may be better for shallower areas.

LOTIC (RUNNING WATER) MEASUREMENTS:

For some areas, i.e. wadeable stream flowing through a site classified as 'savanna', a pre-determined, downstream point of the stream will be considered the starting point and the transect of the stream (which will be monitored for fish in addition to the measures collected under the aquatic habitat protocol) distance monitored will be 30 or 35 times the stream width at that point and moving upstream. This stream-length should not exceed 400 meters, even for larger rivers. In any case, the stream reach should be the same for this protocol as for the fish and mussel protocols to ensure appropriate habitat measures are collected.

Plot Establishment

Along the 30 or 35 times the length of the stream/river/creek being characterized, eleven transects should be established extending across the water, from shore to shore. Each transect should be 0.25 m wide. The spacing between the plots is approximately 3 times the stream width. The first plot should be placed randomly within the first 5 m from the edge of the start of the stream length. Each additional plot-transect should be located at a spacing of 3 times the stream width past the last plot.

Plot Measurements

Within each transect-plot, the following should be recorded:

Channel type: Riffle, run, pool, or glide.

Wetted width: Width of water.

Bankfull width: The area of the channel from one side to the other, including the crest or almost crest area, beyond which the water would flow out onto the floodplain.

Bankfull height: How deep the water would get before flooding, so measure the height of the lower of the 2 banks.

Incised height: The depth of the incision of the channel. The incised height is always greater than or equal to the bankfull height. Incised height is also defined as the distance to the first terrace above the bankfull height. Again, measure the lower of the 2 terraces if they differ across the stream channel.

Stream discharge: The volume of water passing a point during a given time (m^3/sec).

Water temperature

Water pH: The amount of acidity in the water.

Conductivity: The amount of ions (e.g. salts) dissolved in the water.

For this protocol, a run shall be defined as having:

- Moderate gradient with substrate of small gravel and/or cobble;
- above average water velocities;
- average depth;
- low to moderate turbulence;
- channel controlled;
- and generally associated with downstream extent of riffles.

Riffle:

- Relatively high gradient with substrate of large gravel and/or cobble;
- above average water velocities;
- below average depth;
- surface turbulence;
- channel is controlled (i.e. – no backwater influence);
- shallow, turbulent stream segments with higher gradients than pools or glides (Nielson and Johnson 1983)

Glide:

- Relatively low gradient with substrate of small gravel and/or silt/sand;
- below average water velocity;
- below average depth;
- no turbulence;
- variable control of channel;
- generally associated with the tails of pools and the heads of riffles;
- moderately shallow stream channels with laminar flow, lacking pronounced turbulence (Nielson and Johnson 1983)

Pool:

- Relatively low gradient with substrate of fine materials;
- below average water velocity;

- below average turbulence;
- above average depth;
- section controlled;
- often associated with a bounded head crest (upstream break in the slope) and a bounded tail crest (downstream break in the slope – in other words some sort of break in the channel, at least a partial break) (Kerschner et al. 2004);
- deeper habitats with slower current velocities (Nielson and Johnson 1983)

The width (extending perpendicular to the channel) of riparian vegetation is recorded at every plot. Riparian vegetation would include wet meadows or woody vegetation (i.e. willows) on the streambank, hillside, or floodplain. In some areas, it may be possible to do this from GIS or infra-red photos, however this information would still need to be ground-truthed.

<u>Substrate Measurements</u>

From the bank into the water and 0.25 m wide, shoreline substrate is measured by recording the water depth and the percentage of each 0.25 m x 0.25 m covered by the six substrate types as well as emergent and submergent vegetation. The first plot should be placed ½ on shore and 3 additional plots should be placed at equal spacing to cross the channel, but only one of the 4 plots should be on shore.

<u>Water Depths</u>

If it is possible to cross the channel, depth should be measured by taking 10 depth measurements at equal spacing. For rivers, this information may need to be collected with sounding lines or SONAR.

For all pools in the channel reach, maximum depth and surface area are recorded, as well as documentation of the 'cause' of the pool (i.e. channel blocked by tree, rock, or sedimentation).

<u>Woody Debris</u>

Each piece of woody debris in the channel that is at least 3 m in length, or for smaller channels at least 2/3 the width of the channel, and 10 cm in diameter, should have the length and width of the woody debris piece recorded. This may be impractical for larger rivers.

EQUIPMENT LIST:
Appropriate sampling frames made from PVC pipes
Compass
Hip chain or surveyors tape
Meter stick
Notes and maps of GIS coverage
pH & conductivity meter
Standard field kit: Clip board, pencils, ruler, Sharpie marker, hand sanitizer, & data sheets.

STAFF & TRAINING:
Two weeks of training should include 1) field trips to practice skills in the field, and 2) practice surveys with supervisor to ensure proper procedures are followed.

DATA QUALITY & MANAGEMENT:
Technicians need to understand that the importance of following the data collection protocol exactly. Potential sources for error in this protocol include the timing of the surveys, returning to each site for at least 2 visits might reduce the variation associated with timing, if the visits are close in time and under similar weather conditions. Errors associated with the technician (diligence, species ID, etc.) can be mitigated by having different observers do repeat visits.

DATA ANALYSIS:
Aquatic habitat data will primarily be used as covariates to correlate to wildlife species presence or absence.

SAFETY CONSIDERATIONS:
Typical field considerations should be followed. Proper hygiene (i.e. hand washing before meals, checking for ticks & other potential parasites) should be maintained. Technicians should look out for poison ivy and poison oak. Technicians should also take proper precautions around water, i.e. avoiding fast, deep flowing water.

ADDITIONAL METHODS FOR SPECIAL LOCATIONS: None.

ADDITIONAL READING:
Platts, Megehan, and Minshell. 1983. Methods for Evaluating Stream, Riparian, and Biotic Conditions. Gen. Tech. Rep. INT-138.

Simonsen, Lyons, and Kehehl. 1994. Guidelines for Evaluating Fish Habitat in Wisconsin Streams. Gen. Tech. Rep. NC-164.

LITERATURE CITED:
Kerschner, JL, EK Archer, M Coles-Ritchie, ER Cowley, RC Henderson, K Kratz, CM Quimby, DL Turner, LC Ulmer, MR Vinson. 2004. Guide to Effective Monitoring of Aquatic and Riparian Resources. Gen. Tech. Rep. RMRS-GTR-121. Fort Collins, Co. US Dept. og Agriculture, Rocky Mountain Research Station. 57 pp.

Nielsen, LA, and DL Johnson, editors. 1983. Fisheries Techniques. American Fisheries Society. Southern Printing Company, Inc. Blacksburg, VA.

Rosgen, DL. 1994. *A Classification of Natural Rivers*. Catena. 22: 169-199.

AQUATIC MEASUREMENTS OF LOTIC (running water) HABITAT SAMPLING PLOTS.
DATE:________OBS:_____________LOCATION:__________________PG:___of___

Plot	1	2	3	4	5	6	7	8	9	10	11
Distance	0										
Channel type											
Wetted width											
Bankfull width											
Bankfull height											
Incised height											
Stream discharge											
Water temperature											
Water pH											
Water conductivity											
Riparian veg. width											
0 m from shore 0.25mx0.25m plots											
Depth											
% silt											
%sand											
% gravel											
% cobbles											
% boulders											
% bedrock											
% emergent veg.											
% submergt veg.											
_____ m from shore											
Depth											
% silt											
%sand											
% gravel											
% cobbles											
% boulders											
% bedrock											
% emergent veg.											
% submergt.veg.											
_____ m from shore											
Depth											
% silt											
% sand											
% gravel											
% cobbles											
% boulders											
% bedrock											
% emergent veg.											
% submergt. veg											
_____ m from shore											
Depth											
% silt											
% sand											
% gravel											
% cobbles											
% boulders											
% bedrock											
% emergent veg.											
% submergt veg											

Approximate starting pt (GPS coordinates from GIS): E__________________ N__________________
Actual downstream starting pt (acquired in field): E__________________ N_____________________

Plot	1	2	3	4	5	6	7	8	9	10	11
Water depth											
Location 1											
Location 2											
Location 3											
Location 4											
Location 5											
Location 6											
Location 7											
Location 8											
Location 9											
Location 10											
Spacing between measures:											

Spacing b/t measures – divide wetted width by 10.

Backside of data sheet for:
AQUATIC MEASUREMENTS OF LOTIC HABITAT SAMPLING PLOTS.

Channel type (record for each plot): R=Riffle, P=pool, RU=run, G=glide
Wetted width: Width of water.
Bankfull width: The width of the channel from one side to the other, including the crest or almost crest area, beyond which the water would flow out onto the floodplain.
Bankfull height: How deep the water would get before flooding, so measure the height of the lower of the 2 banks.
Incised height: The depth of the incision of the channel. This is the distance to the first terrace. It will be equal to or greater than the bankfull height.
Stream discharge: The volume of water passing a point during a given time (m^3/sec).
Water temperature
Water pH: The amount of acidity in the water.
Conductivity: The amount of ions (e.g. salts) dissolved in the water.

Riparian vegetation width is the width of the vegetation within the floodplain

At 4 locations into the channel from the shore edge, record the water depth at that point and determine the amount of that part of the plot (0.25*0.25m) in each of the following categories:
Bedrock
Boulders (> 300 mm)
Cobble (75-300 mm in size)
Gravel (2-75 mm)
Sand
Silt (mud or clay, organic muck or peat)
Emergent vegetation
Submergent vegetation
Percent coverage in these 8 boxes should add to 100.

If it is possible to cross the channel, water depth should be measured at 10 equally spaced locations.

AQUATIC MEASUREMENTS OF LOTIC (running water) HABITAT SAMPLING PLOTS.
DATE:_______OBS:____________LOCATION:_________________PG:___of___

POOLS data:

Number	Maximum depth	Surface area	Cause

Number: May be obtained from GIS cover or in the field. Either check with numbered map or mark number and location on map in field for addition to the GIS database.
Cause: Why is the water pooling? Examples include log, rocks, soil, dam.

Additional notes on wildlife encountered today:

Woody debris:

Distance from downstream starting pt.	Small end diameter	Large end diameter	Length	Decay class

AQUATIC MEASUREMENTS OF LENTIC (standing water) HABITAT SAMPLING PLOTS.
DATE:________OBS:_____________LOCATION:__________________PG:___of___
UTM coordinates (GPS acquired in field): E____________________ N_____________________

Plot	Distance	Max. Depth	In edge depth	% silt	% sand	% gravel	% cobble	% boulders	% bedrock	% emerg. Veg.	% submer veg
1	0										
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
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29											
30											

Distance can be filled out in the lab based on GIS coverage and used to find sampling plot.
In edge depth=depth at the edge of the plot furthest into the water from shore.
% classifications: Bedrock
Boulders (> 300 mm)
Cobble (75-300 mm in size)
Gravel (2-75 mm)
Sand
Silt (mud or clay, organic muck or peat)
Emergent vegetation
Submergent vegetation
Percent coverage in these 8 boxes should add to 100