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QUALITY CONTROL/QUALITY ASSURANCE DOCUMENTATION

Title: Collection of Physical Habitat Data in Wadable Rivers and Streams in ND
Type: Standard Operating Procedure #7.23
Version: 1.0
Date: 09/02/2020
Author: Aaron Larsen

REVISION HISTORY

Revision	Change Description	Date	Authorization

Standard Operating Procedure for the Collection of Physical Habitat Data in Wadeable Rivers and Streams in North Dakota

Summary

Physical habitat measurements are important in understanding the functioning of a stream. Physical habitat measures help put biological and chemical data into a context of the stream's morphology and insight into possible human disturbance. Measurements such as incision height can hint at possible head cutting due to dams or drainage ditching. Canopy cover and overhanging bank width measurements can offer insight to available fish cover. Riparian buffer widths can show how close human land use abuts the stream's edge. The following procedures have been developed primarily from the modification of the protocols found in the EMAP Western Pilot Study: Field Operations Manual for Wadeable Streams (Peck et al. Draft).

Field Sampling Procedures for the Collection of Physical Habitat Measurements

Equipment List

___ Clipboard
___ Physical Habitat Forms
___ Rapid Bioassessment Habitat Visual Assessment Forms
___ Black pens
___ Surveyor rod (metric)
___ 50 m fiberglass measuring tape
___ Orange surveyor flags labeled "A" to "K"
___ Handheld Global Positioning Unit
___ Clinometer
___ Convex Spherical Canopy Densiometer
___ Equipment Vest
___ Waders
___ Personal Floatation Device
___ Wading stick or pole (optional)

Procedures

1. Lay out the sampling reach. Locate the X-site coordinates with a handheld GPS unit if the site is predetermined or determine the coordinates of the center of the reach to be sampled. Take at least 5 channel width measurements considered to be "typical" upstream and downstream of the X-site. The reach length is 40 times the average width (minimum reach length is 150 m and maximum is 500 m). The site may be slid about the X-site to avoid sampling obstacles, but the X-site must still fall within the sample reach. The only time an X-site may be outside the sample reach is when targeted reference and impaired sites are being sampled. These sites may be slid outside the X-site coordinates as long as the reach is still in the target population. Be sure to record the new coordinates at the middle of the reach when sliding reaches outside the X-site.

2. The sample reach is divided into 11 transects each spaced 4 stream widths apart (15 m minimum and 50 m maximum). Starting at farthest downstream transect, transects are labeled from "A" to "K". Orange surveying flags labeled "A" to "K" are used to label each transect when laying out the reach. The X-site, when the site is not adjusted for obstacles, will fall at "F". At each of the 11 transects a series of measurements will occur.

3. Bank measurements are taken at each transect. Bank measurements include wetted width, bar width, bankfull width, bankfull height and incision height. Wetted width is measured across and over mid-channel bars and large rocks. When there are mid-channel bar(s) measure the width(s) and record the total width under bar width. Bankfull is defined as the channel that is filled by moderate-sized flood events that occur every one to two years. Evidence for finding bank full include: obvious slope breaks, transition from stream sediment to vegetation, moss growth on

rocks, drift debris on banks or vegetation and transition zones from flood tolerant vegetation to flood intolerant vegetation. Bankfull height is the height of the determined bankfull from the water's surface. Bankfull width is measured from bankfull boundary on the left bank to the bankfull boundary on the right bank. Incision height is the distance from the water surface to the height of the first floodplain terrace. Bankfull and incision height can be the same, but bankfull is NEVER higher than incision height.

4. Depth, substrate size and embeddedness are evaluated at each transect. This is done at five points located at 0, 25, 50, 75 and 100 percent of the wetted width. These points are recorded as the distances from the left bank. These percentages are called Left, Left center, Center, Right center and Right starting from the left bank wetted edge on the Physical Habitat Field Sheet (Figure1). REMINDER: left bank is on the left hand side when the flow is at your back or facing downstream. Substrate selection is accomplished by placing the measuring rod at each point and determining the substrate directly beneath it. Size classes are listed on the Physical Habitat Field Sheet (Fig.1). For particles larger than sand, estimate the amount of embeddedness by examining the substrate. Look for breaks in the surface staining, markings or algae growth. By definition sand and fines are 100 percent embedded and bedrock and hardpan are 0 percent embedded.

5. Bank morphology measurements are taken at each transect on the right and left banks. These measurements include bank angle, undercut bank width and riparian vegetation width. Bank angle is measured by laying the surveyor's rod or measuring stick down on the bank with one end on the wetted edge. Put the clinometer on the rod and read the angle. Vertical banks will be 90 degrees; gradual banks will be < 90 degrees and undercut banks will > 90 degrees. Undercut banks will be measured by turning the clinometer over (it only reads 0-90 degrees) and reading the angle and subtracting it from 180 degree. Undercut width will also be measured on undercut banks. Undercut width is the distance from the water's edge to the point where a vertical plumb line from the bank's edge would touch the water's surface. Also, submerged undercut banks will be measured by reading the amount of measuring rod hidden when it is thrust under the bank. Riparian vegetation width is measured from the vegetative edge nearest the water until the first visible sign of significant vegetative disturbance. This can be row crops, extensive grazing, mowed pasture, a road, etc. If the distance recorded is greater than the 50 m tape estimate the buffer and mention in comments on the form.

6. Vegetative canopy measures are taken at each transect on the left and right bank wetted edge and in the center of the stream facing toward the left and right bank and upstream. A convex spherical densitometer is taped to limit the grid to 17 intersects. Readings can only be 0-17. The densiometer is held level (using bubble level) at 0.3 m (1 ft) above the water surface positioned so your face is reflected below the apex of the "V". Count the grid intersection if any vegetation (tree, grass, shrub, etc.) covers the intersection.

7. A large woody debris tally is taken throughout the entire reach. This tally only includes woody material at least 10 cm (approx. 4 in.) in diameter and at least 1.5 m (approx. 5 ft) in length. This includes only woody debris within (even partially) or spanning above the active channel (a.k.a. the bankfull width).

8. Complete a visual habitat assessment of the sample reach. The habitat assessment methodology follows the Rapid Bioassessment Habitat Assessment described by Barbour et al. (1999).

9. Complete a site field sheet. This includes field chemistry, photographs and a site drawing. The site drawing should include a map of the reach recording in-stream attributes (riffle, pools, bends, trees, etc.), manmade structures, bank attributes, surrounding land use and vegetation. Be sure to indicate north, the direction of flow and approximate locations of each transect. Photographs should be at minimum one upstream and one downstream picture at the X-site.

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, Macroinvertebrates and Fish, Second Edition. EPA/841/B-99/002. U. S. Environmental Protection Agency, Office of Water, Washington, D. C.

Peck, D. V., J. M. Lazorchak, and D. J. Klemm. Unpublished draft. Environmental Monitoring and Assessment Program-Surface Waters: Western Pilot Study Field Operations Manual for Wadeable Streams. EPA/XXX/X-XX/XXX U. S. Environmental Protection Agency, Washington D. C.

Site ID _____ Date _____ Initials _____

	Left	LCtr	Ctr	RCtr	Right	Left	LCtr	Ctr	RCtr	Right	Left	LCtr	Ctr	RCtr	Right
	Transect A					Transect B					Transect C				
Dist. Left bank m															
Depth cm															
Substrate size															
Embed. 0-100%															
Bank Angle															
Undercut m															
Riparian Veg															
Canopy															
Flag															

	Transect D					Transect E				
Dist. Left bank m										
Depth cm										
Substrate size										
Embed. 0-100%										
Bank Angle										
Undercut m										
Riparian Veg										
Canopy										
Flag										

Woody Debris Tally (4 inX 5 ft)	
Total Count	

CHANNEL CODES	
PP = Plunge Pool	GL = Glide
PT = Pool, Trench	RA = Rapid
PL = Pool, Lateral Scour	RI = Riffle
PB = Pool Backwater	DR = Dry Channel
PD = Pool Impoundment	

	Bank Measurements				
	A	B	C	D	E
Wetted Width m					
Bar Width m					
Bankfull Width m					
Bankfull Height m					
Incised Height m					
Channel Code					

SUBSTRATE SIZE CLASS CODES	
RS = Bedrock (smooth)- (larger than car)	GF = Fine Gravel- (ladybug to marble)
RR = Bedrock (rough) -(larger than car)	SA = Sand- (gritty feel to ladybug size)
RC = Concrete/Asphalt	FN = Silt/Clay/Muck- (not gritty)
XB = Large Boulder- (meter stick to car)	HP = Hardpan- (Firm consolidated fines)
SB = Small Boulder- (basketball to meter stick)	WD = Wood- (any size)
CB = Cobble- (tennis ball to basketball)	OT = Other (explain in comments)
GC = Coarse Gravel- (marble to tennis ball)	

Figure H1. Physical Habitat Field Sheet

	Left	LCtr	Ctr	RCtr	Right	Left	LCtr	Ctr	RCtr	Right	Left	LCtr	Ctr	RCtr	Right
	Transect F					Transect G					Transect H				

Dist. Left bank m															
Depth cm															
Substrate size															
Embed. 0-100%															
Bank Angle															
Undercut m															
Riparian Veg															
Canopy															
Flag															
	Transect I					Transect J					Transect K				
Dist. Left bank m															
Depth cm															
Substrate size															
Embed. 0-100%															
Bank Angle															
Undercut m															
Riparian Veg															
Canopy															
Flag															

	Bank Measurements						Flag	Comments
	F	G	H	I	J	K		
Wetted Width m								
Bar Width m								
Bankfull Width m								
Bankfull Height m								
Incised Height m								
Cannel Code								

Figure H1. Physical Habitat Field Sheet, Continued