OKLAHOMA CONSERVATION COMMISSION
WATER QUALITY DIVISION

STANDARD OPERATING PROCEDURE

HABITAT ASSESSMENT

1.0 PROCEDURAL SECTION

1.1 Scope and Application[11,12]

An evaluation of habitat quality is critical to any assessment of ecological integrity. For OCC purposes "habitat assessment" measures the quality of the in stream and riparian zone habitat that influences the structure and function of the lotic aquatic community. Habitat directly influences the biotic community and can be used to discern the source of impairment. The habitat parameters evaluated during this process are related to the overall aquatic life use and are potential sources of limitations to the aquatic biota. Habitat, as structured by in-stream and surrounding topographical features, is a major determinant of the aquatic community potential. Both the quality and quantity of available habitat affect the structure and composition of resident biological communities.

1.2 Summary of Method

The habitat assessment procedure follow a modified version of the EPA Rapid Bioassessment Protocol V (EPA 1999) supplemented by other documents. The habitat assessment was designed to assess the physical habitat available to support the biological community. The assessment is based on particular parameters grouped into three principal categories. The first group represents parameters on the microscale habitat, for example bottom substrate, cover, and flow. The second group of parameters is designed to assess the macroscale habitat such as channel morphology, sediment deposition, and sinuosity. The third grouping evaluates the riparian and bank structure; for example, bank stability, vegetation, and streamside cover. A quantitative value or weight is assigned to each parameter so that biologically significant factors can be emphasized. These weighting values are then adjusted based on the quality of the parameter. Scores are then assigned as an evaluation of in-stream and riparian conditions. Habitat assessments are conducted on a 400 m reach of stream. Measurements/scoring for each parameter are made on 20 m intervals.

1.2.1 Definitions

Left Bank	The bank of the stream that is on the left while facing downstream.

1.3 Health and Safety Warnings

1.4 Cautions

- Record all measurements in meters

1.5 Interference

1.6 Personnel Qualification

Field personal must be trained and evaluated on assessment techniques. Habitat assessment evaluation is subject to approval by the QA Officer and/or the Environmental Monitoring Coordinator. Training will be done through dry run and supervised exercises in the field to familiarize field personnel with procedures and techniques.

1.7 Apparatus & Materials

- field data sheets
- clip board
- wading rod (graduated in 0.1 m units)
- hip chain
- GPS unit

1.8 Instrument/Method Calibration

none

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[11] Text taken directly or in part from "Rapid Bioassessment Protocols for Use in Wadeable Stream and Rivers, 2nd Edition", US EPA 841-B-99-002 July 1999

[12] Text taken directly or in part from Dan Butler, Senior Biologist, Oklahoma Conservation Commission (2000)

1.9 Preparation

- A representative stream reach is selected and measured such that primary physical features are included in the reach (riffles, runs, and pools).
- The reach should be located away from the influences of major tributaries and bridge/road crossings.

1.10 Sample Collection

The stream habitat assessments follows a modified version of the EPA Rapid Bioassessment Protocol V (EPA 1999) supplemented by other documents. The habitat assessment was designed to assess the physical habitat available to support a biological community. The assessment is based on particular parameters as they are observed in the field. A quantitative value or weight is recorded for each parameter at set intervals along the stream segment. The information is weighted and complied to generate an overall score

Interpretation of the assessment parameters in the field can be somewhat subjective; thus it is imperative that the field technician be properly trained in quantitative evaluation. The following paragraphs describe the items of importance, but this information is meaningless without prior instruction.

The **Stream Habitat Assessment Sheet** is divided into 17 general columns some of which are further subdivided. In total, there are 47 cells, for a given distance of stream reach, that require data input. The following paragraphs will explain each grouping and subgrouping as presented on the field data sheet.

Instructions for filling out the Stream Habitat Assessment Sheet

SITE INFORMATION:

- SITE NAME: Record the stream named from the USGS 7-1/2' map name. If a county map, soil map, or other map has a different name, the USGS 7-1/2' map takes precedence. If a stream is unnamed on the USGS map, but named on another map, use that name, but write the name of the map in parentheses beside the stream name.
- WBID #: Record the Water Body Identification number.
- SITE DATE: Record the site data in MM/DD/YR format
- START POINT: Provide a GPS lat/long and a brief written description of the starting point (first observation), including obvious features such as bridges.
- SITE TIME: Record the site time in military format. The “site time” is when initial activities began at the site.
- END POINT: Provide a GPS lat/long and a brief written description of the ending point (last observation).
- SINUOSITY: Stream length/valley length. This can be assessed in the field or from aerial photographs. USGS topographic maps should not be used.
- INVESTIGATORS: All people involved with the sampling should be recorded; the “crew leader” (the person responsible for data custody and reporting) should be circled on the form.
- DIRECTION: Record if the assessment was done upstream or downstream from the starting point.

Distance (DIST)

In general, each stream reach is sampled for a distance of 400 m. A stream must be assessed a minimum of 30 times its average width or 400 meters; whichever is greater. Under most circumstances the 400 m reach is divided into twenty-20 m segments. Depending on the QAPP, the measurement interval can be lengthened or shortened.

If measuring **100 or 50 meter segments**, use a rangefinder to select an easily visible landmark such as a large tree or rock 100 meters along the segment. If the stream bends before a full reading can be made, measure the distance to the bend and then measure the remaining distance after going around the bend.

If measuring **10 or 20 meter segments** use a hipchain. Attach the string to a fixed object at the starting point and start measuring the distance while moving along the reach.

Depth

The column "DEPTH" is divided into 3 subcolumns (L1/4, C, R1/4). In general, the depth of water is measured in meters to the nearest 0.1 m. The stream is divided into 3 segments: left ¼, right ¼, and center. The left bank of the stream is on left hand side while looking downstream.

- The left 1/4 (**L1/4**) is the depth of water midway between the center of the stream and the left bank.
- Center (**C**)
- Right 1/4 (**R1/4**) is the depth of water midway between the center of the stream and the right bank.

Width

The column "WIDTH" is divided into 2 subcolumns (WTR and BNK). The width measurement takes into account the width of the wetted surface or water, and the width of the lower bank to the nearest 1 m.

- The width of the water (**WTR**) refers to the water's edge to water's edge, or a perpendicular section across the wetted surface.
- The width of the bank (**BNK**) refers to the lower bank as it extends from the water's edge at summer low flow to the top of the normal high water line. The normal high water line is usually marked by the beginning of well-established perennial vegetation. Below this line will be gravel and bare soil. There may be a sparse covering of annual vegetation below this line. The lower bank width is the distance between the tops of the left and right lower banks.

Substrate

The "SUBSTRATE" column is divided into 8 subcategories (Si&C, SND, GVL, CBL, BLD, BRK, POM, and HPC). The substrate measurement characterizes the physical benthic material. Substrate is evaluated from the water's edge on one side to the water's edge on the other side of the stream at the transect. The substrate is characterized based on component categories: silt and clay, sand, gravel, cobble, boulder, bedrock, particulate organic matter and/or hardpan clay. Record the fraction of each category as a percent of total. The total of all substrate components should add up to 100 percent. The categories include the following:

- **Si&C** Loose silt and clay (not gritty between the fingers)
- **SND** Sand or rock particles smaller than ladybug size (gritty between the fingers); 0.1 to 2mm median diameter.
- **GVL** Gravel rocks ladybug to tennisball size; rocks from 2 mm to 50 mm median diameter.
- **CBL** Cobble rocks tennis ball to basketball size; rocks from 50 mm to 250 mm median diameter.
- **BLD** Boulder rocks basketball to car size; rocks > 250mm median diameter.
- **BRK** Bedrock; rock area greater than a car in size
- **POM** Particulate organic matter; rotten leaves and fragments of stick and logs.
- **HPC** Hardpan clay; firm, consolidated fine substrate.

Habitat Type

The HABITAT TYPE column is subdivided into 4 additional columns (RIF, PL, RUN, or DRY). Check the cell that is most applicable to the habitat type present at the station. If there are two obvious habitat types at the cross section being measured, check both boxes. An example is when a backwater pool is encountered beside a run or riffle.

- A riffle (**RIF**) is defined as any sudden downward change in the level of the streambed such that the surface of the water become disrupted by small waves and usually makes a sound.
- A pool (**PL**) has a smooth surface with no or very little current and can be deep or shallow.
- A run (**RU**) has an obvious current, may be deep or shallow and often has a surface that may be slightly broken, but does not make any noise.
- Check dry (**DR**) if the stream has no water in it at the point being measured.

In-Stream Cover % Area

The IN-STREAM COVER % AREA column is divided into 9 subcolumns (UCB, LWD, SWD, RTS, BRL, SAV, EAV, TV, and CB&G). This category attempts to quantify the amount of cover present for fish in the section of stream you walked from the previous station to the present one. For example, if the section was 20 meters long and averaged 6 meters wide, its area would be 120 m^2. A submerged log about 3 m long by 0.5 m wide would offer 1.5 m^2 cover, and you would note that the LWD (large woody debris) category offered 1.5/120 or 1.3 percent cover. Waterwillow, an emergent aquatic macrophyte, might be growing in shallow water along the edge of the stream. If both edges had a zone about 1 meter wide where it grows, there

would be (1 meter) (20 meters) (2 sides)=40m^2 of emergent aquatic vegetation (EAV) in the 120m^2 section of stream and you would check 40/120 or 33 percent in the EAV column. **Note that the totals of the percent cover columns for each row will rarely add up to 100 percent and may often be 0 percent**.

The categories are:

- **UCB** Undercut Banks
- **LWD** Large Woody Debris—woody debris in the water > 10 cm. in diameter.
- **SWD** Small Woody Debris—woody debris in the water <= 10 cm. in diameter.
- **RTS** Roots—these are submerged root wads of trees. If single or occasional roots are encountered, count them in one of the woody debris categories.
- **BRL** Bedrock Ledges—underwater bedrock ledges not forming part of an undercut bank.
- **SAV** Submerged Aquatic Vegetation.
- **EAV** Emergent Aquatic Vegetation.
- **TV** Terrestrial vegetation that is currently underwater. An example would be tree branches or grass leaves that are actually hanging down into the stream.
- **CBG** Cobble, Boulder, and Gravel. This is an estimate of the percent coverage of cobble and boulder in the 20-meter section. It may not be the same number as the percent composition of cobble and boulder in the cross section where you estimated substrate since they represent different areas.

Percent Embeddedness[1] (EMB)

The degree to which boulders, cobble and gravel have been surrounded by fine sediment indicates suitability of the stream substrate as habitat. Embeddedness is evaluated by visual observation of the degree to which larger particles have been surrounded by sediment. This quantifies the amount of silt, clay, and sand that has been deposited in riffles. Percent embeddedness should be recorded only when in a run or riffle. Record the percent embeddedness by looking only at the transect.

If there is no fine material surrounding the cobble and gravel found in the riffles, and there is at least some free space under the rocks, that is 0 percent embedded. If the free space under the rocks is filled but the sides are untouched, count that as 5 percent embedded. As the level of fines rises up the cobble sides, estimate the percentage of the total height of the cobbles that is covered. This is the embeddedness estimate. An obvious "embeddedness line" is often distinctly observed on the side of a rock when it is removed from the water.

Percent Canopy Cover (CAN)

At each measuring station, estimate the percent canopy cover in the previous segment. It can range from 0 to 100 percent, but if any "sky" is observed directly overhead, the estimate should be less than 100 percent.

Point Bar (Pt)

If a recently formed (unstable) point bar is present, that is, it has no or little vegetation, put a check in this box.

Deposition and Scouring (D+S)[1]

These parameters relate to the destruction of in-stream habitat. Characteristics to observe are scoured substrate and degree of siltation in pools and riffles. If there is evidence of scouring (smooth, clean bedrock or hardpan play) or deposition (loose, shifting bottoms of fine sand or silt or filled in pools) in the previous segment surveyed, check this box.

Percent Bank Vegetative Cover (BV)

Record an estimate of the percent of total area on both banks that is protected from erosion by well-established, perennial vegetation. Soil does not have to be covered as long as it is stable.

Dominant Vegetation (DV)

Place an S (shrub), T (tree), or G (grasses and forbs) in the box indicating which type of vegetation is most dominant on the banks in terms of percent of ground protected. For our purposes, shrubs are any woody plant whose trunk and branches are <= 10 cm in diameter. If the vegetation is mixed but each of the three groups contribute at least 20% of the total put an M in the box.

Percent Eroded Banks

The "% ERODED BK" column is divided into 2 subcolumns (LEFT and RIGHT). Record the average % of streambank that is actively eroding for both the left bank and the right bank of the stream segment. Measure from the edge of the lower bank to the edge of the upper bank. The upper bank is usually the edge of the flood plain. The left bank is refers to the left side of the bank while looking in a downstream direction.

Average Height of the Eroding Banks

The "HT ERODED BK" column is divided into 2 subcolumns (LEFT and RIGHT). Record the average height of the eroding banks on either side of the stream segment. Measure from the edge of the lower bank to the edge of the upper bank.

Average Slope

The "^{o} SLOPE BANK" column is divided into 2 subcolumns (LEFT and RIGHT). Record the average slope of the bank in degrees. That is, a vertical bank would be 90° while all other estimates would be less than 90°. Measurements are taken from the edge of the lower bank to the edge of the upper bank.

Riparian Zone Width

The "RIP WIDTH" column is divided into 2 subcolumns (LEFT and RIGHT). Record the average width of the riparian vegetation for each side of the stream. The riparian zone, for OCC purposes, extends from the top of the upper bank outwards from the stream. The riparian zone ends where the unmanaged (i.e. not plowed or mowed) portion of land ends. In other words, the riparian zone stops where pasture or crop management begins.

Riparian vegetation is typically bottomland hardwood forest when in a natural state, but mixtures of trees and herbaceous plants are frequently encountered. These will vary from a fairly dense forest with sparse grasses to land that is mostly pasture with a few scattered trees. For consistency, forest and pasture have been defined below:

Pasture:	If woody shrub and sapling growth can be controlled using a 6' brushhog and a medium size tractor in between the larger trees, the land will be labeled pasture and may or may not be included in the riparian zone.
Forest:	If the large trees are so dense that a tractor and mower of this size cannot be used for brush control, the land should be labeled as forest and included in the riparian zone.

Riparian Condition

The "RIP CONDITION" column is divided into 2 subcolumns (LEFT and RIGHT). Natural riparian vegetation is typically bottomland hardwood forest, but when disturbances have been or are present there will be varying amounts of herbaceous plants and bare soil also. For this column the decision must be made as to whether the majority of the land in the riparian zone, on either side of the stream, is pasture (grassland) or forest. Refer to the definitions presented in the Riparian Width section.

In addition to the habitat type, there is a determination of how much soil is exposed. In grassy areas, this is a straightforward determination and is done by estimating the average % of bare soil observed within the 20-meter riparian zone in question. Forest, while not expected to have grasses & forbs covering the ground, is expected to have a layer of spongy duff composed of organic matter in various states of decay covering the soil. This layer is usually covered by an accumulation of recently fallen leaves or annual herbaceous vegetation that have not started to decay. The top layer of leaves and/or vegetation will have to be moved out of the way to determine if the duff layer is present. Soil not covered by duff should be counted as bare. Estimate the % bare soil exposed in forest while walking the area in question.

The riparian zone on both sides of the stream should be placed in <u>one</u> of the following categories.

1A	STABLE FOREST	<1% bare soil exposed
1B	MODERATELY USED FOREST	1-10% of surface is bare soil
1C	HEAVILY USED FOREST	>10% of surface is bare soil
2A	GOOD CONDITION GRASSLAND	<1% bare soil exposed
2B	FAIR CONDITION GRASSLAND	1-5% bare soil exposed
2C	POOR CONDITION GRASSLAND	>5 <20% bare soil exposed
2D	BAD CONDITION GRASSLAND	>20% bare soil exposed
W	WETLAND	at least 5 meters of riparian area depth appear to be wetland based on the presence of standing water or saturated soil after at least a week of dry conditions, or dominance by sedges, rushes, button bush or willow

Cattle

The CATTLE column is divided into 4 subcolumns (%TRAM, #CP, TRAIL, & CLASS TRAILS). This category attempts to identify the impact cattle are having on the habitat:

- **%TRAM:** Percent of land trampled. This is an estimate of land where livestock trampling is evident within one meter either way of the transect. In other words, you are looking at a 2-meter wide strip that runs from the top of the right upper bank across the stream to the top of the left upper bank.
- **#CP:** This is the number of cow pies in a 2 meters wide transect.
- **TRAIL:** This is the number of livestock trails on both banks that reach the stream over the entire 20 meter segment. A single trail that crosses the stream and goes up the other side counts as two trails.
- **CLASS TRAILS:** Each cowtrail should be placed in one of the following classes and the class of each trail recorded in this column. There should be as many numbers listed as there were cow trails identified. Separate each number by a comma.

  1. < 0.75 m wide
  2. ≥0.75 < 1.5 m wide
  3. ≥ 1.5 < 2.5 m wide
  4. ≥ 2.5 m

Comments

If a road is contributing excess sediment to the stream, or a pipe is discharging to the stream or there is a dump present or any other thing which you deem to be significant is present, record it in the comment block at the end of the page.

1.11 Sample Handling & Preservation

Not applicable

1.12 Sample Preparation and Analysis

Not applicable

1.13 Troubleshooting

Consult the Environmental Monitoring Coordinator

1.14 Data Acquisition, Calculation & Data Reduction

Not applicable

1.15 Computer Hardware & Software

Not applicable

1.16 Data Management & Records Management

1.16.1 Field Notation

All measurements and observations made at each site should be recorded on the **Stream Habitat Assessment Sheet** (see **SOP Appendix: Data Sheets**). A **Site Collection Sheet** (see **SOP Appendix: Data Sheets**) should also be filled out; include all physical and chemical information if required by the QAPP or instructed by the Monitoring Coordinator. In addition, flow measurement should be recorded on the **Flow Meter Data Sheet** or **Timed Flow Data Sheet** (see **SOP Appendix: Data Sheets**) if applicable; see the Flow Measurement SOP. Data should be recorded following procedures outlined in the **Procedure for Completing Field Data Sheets SOP**.

1.16.2 Chain of Custody Procedure

Not applicable.

2.0 QA/QC SECTION

2.1 Training

Training of field personnel will be done through dry run exercises in the laboratory and field to familiarize them with instrument operation, use, calibration and maintenance. All samplers should read Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers, 2nd Edition (EPA, 1999) prior to performing a habitat assessment. All operators are required to become familiar with the SOP documents. Prior to solo assessment, field personnel must be evaluated in a field setting for proper use of equipment and sample collection protocol. Annual field audits and training exercises are performed on sample collectors following procedures outlined in the Quality Management Plan.

2.2 Maintenance

Equipment should be kept in working order

2.3 QC Procedures

If required by the QAPP, replicate samples will be collected.

3.0 REFERENCES

EPA, (1999) Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers, 2nd Edition, EPA 841-B-99-002, Office of Water, Washington, D.C.

Butler, D., (1999) Personal Communication, Senor Biologist, Oklahoma Conservation Commission, Oklahoma City, OK.

Nielsen, L.A. and D.L. Johnson, (1983) Fisheries Techniques, American Fisheries Society.

4.0 APPENDIX A

STANDARD OPERATING PROCEDURE
Field Summary

Apparatus and Materials
- field data sheets
- clip board
- wading rod (graduated in 0.1 m units)
- hip chain
- GPS unit

Preparation
- A representative stream reach is selected and measured such that primary physical features are included in the reach (riffles, runs, and pools).
- The reach should be located away from the influences of major tributaries and bridge/road crossings.

Sample Collection
All measurements and observations made at each site should be recorded on the **Stream Habitat Assessment Sheet** (see **SOP Appendix: Data Sheets**). A **Site Collection Sheet** (see **SOP Appendix: Data Sheets**) should also be filled out; include all physical and chemical information if required by the QAPP or instructed by the Monitoring Coordinator. In addition, flow measurement should be recorded on the **Flow Meter Data Sheet** (see **SOP Appendix: Data Sheets**) if applicable.

Instructions for filling out the **Stream Habitat Assessment Sheet**:

SITE INFORMATION:

- SITE NAME: Record the stream name from the USGS 7-1/2' map name. If a county map, soil map, or other map has a different name, the USGS 7-1/2' map takes precedence. If a stream is unnamed on the USGS map, but named on another map, use that name, but write the name of the map in parentheses beside the stream name.
- WBID #: Record the Water Body Identification number.
- SITE DATE: Record the site date in MM/DD/YR format
- START POINT: Provide a GPS lat/long and a brief written description of the starting point (first observation).
- SITE TIME: Record the start time in military format. The "site time" is when initial activities began at the site..
- END POINT: Provide a GPS lat/long and a brief written description of the ending point (last observation).
- SINUOSITY: Stream length/valley length. This can be assessed in the field or from aerial photographs. USGS topographic maps should not be used.
- INVESTIGATORS: All people involved with the sampling should be recorded; the "crew leader" (the person responsible for data custody and reporting) should be circled on the form.
- DIRECTION: Record if the assessment was done upstream or downstream from the starting point.

Distance (DIST)
In general, each stream reach is sampled for a distance of 400 m. A stream must be assessed a minimum of 30 times its average width or 400 meters; whichever is greater. Under most circumstances the 400 m reach is divided into twenty-20 m segments. Depending on the QAPP, the measurement interval can be lengthened or shortened.

If measuring **100 or 50 meter segments**, use a rangefinder to select an easily visible landmark such as a large tree or rock 100 meters along the segment. If the stream bends before a full reading can be made, measure the distance to the bend and then measure the remaining distance after going around the bend.

If measuring **10 or 20 meter segments** use a hipchain. Attach the string to a fixed object at the starting point and start measuring the distance while moving along the reach.

Depth

In general, the depth of water is measured in meters to the nearest 0.1 m. The stream is divided into 3 segments: left ¼, right ¼, and center. The left bank of the stream is on left hand side while looking downstream.

- The left 1/4 (**L1/4**) is the depth of water midway between the center of the stream and the left bank.
- Center (**C**)
- Right 1/4 (**R1/4**) is the depth of water midway between the center of the stream and the right bank.

Width

The width measurement takes into account the width of the wetted surface or water, and the width of the lower bank to the nearest 1 m.

- The width of the water (**WTR**) refers to the water's edge to water's edge, or a perpendicular section across the wetted surface.
- The width of the bank (**BNK**) refers to the lower bank as it extends from the water's edge at summer low flow to the top of the normal high water line. The normal high water line is usually marked by the beginning of well-established perennial vegetation. Below this line will be gravel and bare soil. There may be a sparse covering of annual vegetation below this line. The lower bank width is the distance between the tops of the left and right lower banks.

Substrate

The substrate measurement characterizes the physical benthic material. Substrate is evaluated from the water's edge on one side to the water's edge on the other side of the stream. Record the fraction of each category as a percent of total. The total of all substrate components should add up to 100 percent. The categories include the following:

- **Si&C** Loose silt and clay.
- **SND** Sand or rock particles; 0.1 to 2mm.
- **GVL** Gravel; rocks from 2 mm to 50 mm.
- **CBL** Cobble; rocks from 50 mm to 250 mm.
- **BLD** Boulder; rocks > 250mm.
- **BRK** Bedrock
- **POM** Particulate organic matter--rotten leaves and fragments of stick and logs.
- **HPC** Hardpan clay

Habitat Type

Check the cell that is most applicable to the habitat type present at the station. If there are two obvious habitat types at the cross section being measured, check both boxes. An example is when a backwater pool is encountered beside a run or riffle.

- A riffle (**RIF**) is defined as any sudden downward change in the level of the streambed such that the surface of the water become disrupted by small waves and usually makes a sound.
- A pool (**PL**) has a smooth surface with no or very little current and can be deep or shallow.
- A run (**RU**) has an obvious current, may be deep or shallow and often has a surface that may be slightly broken, but does not make any noise.
- Check dry (**DR**) if the stream has no water in it at the point being measured. .

In-Stream Cover % Area

This category attempts to quantify the amount of cover present for fish in the section of stream you walked from the previous station to the present one. For example, if the section was 20 meters long and averaged 6 meters wide, its area would be 120 m^2. A submerged log about 3 m long by 0.5 m wide would offer 1.5 m^2 cover, and you would note that the LWD (large woody debris) category offered 1.5/120 or 1.3 percent cover. Waterwillow, an emergent aquatic macrophyte, might be growing in shallow water along the edge of the stream. If both edges had a zone about 1 meter wide where it grows, there would be (1 meter) (20 meters) (2 sides)=40m^2 of emergent aquatic vegetation (EAV) in the 120m^2 section of stream and you would check 40/120 or 33 percent in the EAV column. **Note that the totals of the percent cover columns for each row will rarely add up to 100 percent and may often be 0 percent**.

The categories are:

- **UCB** Undercut Banks
- **LWD** Large Woody Debris—woody debris in the water > 10 cm. in diameter.
- **SWD** Small Woody Debris—woody debris in the water <= 10 cm. in diameter.
- **RTS** Roots—these are submerged root wads of trees. If single or occasional roots are encountered, count them in one of the woody debris categories.
- **BRL** Bedrock Ledges—underwater bedrock ledges not forming part of an undercut bank.
- **SAV** Submerged Aquatic Vegetation.
- **EAV** Emergent Aquatic Vegetation.
- **TV** Terrestrial vegetation that is currently underwater. An example would be tree branches or grass leaves that are actually hanging down into the stream.
- **CBG** Cobble, Boulder, and Gravel. This is an estimate of the percent coverage of cobble and boulder in the 20-meter section. It may not be the same number as the percent composition of cobble and boulder in the cross section where you estimated substrate since they represent different areas.

Percent Embeddedness (EMB)

Embeddedness is evaluated by visual observation of the degree to which larger particles have been surrounded by sediment.

If there is no fine material surrounding the cobble and gravel found in the riffles, and there is at least some free space under the rocks, that is 0 percent embedded. If the free space under the rocks is filled but the sides are untouched, count that as 5 percent embedded. As the level of fines rises up the cobble sides, estimate the percentage of the total height of the cobbles that is covered. This is the embeddedness estimate. An obvious "embeddedness line" is often distinctly observed on the side of a rock when it is removed from the water.

Percent Canopy Cover (CAN)

At each measuring station, estimate the percent canopy cover in the previous segment. It can range from 0 to 100 percent, but if any "sky" is observed directly overhead, the estimate should be less than 100 percent.

Point Bar (Pt)

If a recently formed point bar is present, that is, it has no or little vegetation, put a check in this box.

Deposition and Scouring (D+S)

Characteristics to observe are scoured substrate and degree of siltation in pools and riffles. If there is evidence of scouring (smooth, clean bedrock or hardpan play) or deposition (loose, shifting bottoms of fine sand or silt or filled in pools) in the previous segment surveyed, check this box.

Percent Bank Vegetative Cover (BV)

Record an estimate of the total area on both banks that is protected from erosion by well-established, <u>perennial</u> vegetation. Soil does not have to be covered as long as it is stable.

Dominant Vegetation (DV)

Place an S (shrub), T (tree), or G (grasses and forbs) in the box indicating which type of vegetation is most dominant <u>on the banks</u> in terms of percent of ground protected. For our purposes, shrubs are any woody plant whose trunk and branches are <= 10 cm in diameter. If the vegetation is mixed but each of the three groups contribute at least 20% of the total put an M in the box.

Percent Eroded Banks (% ERODED BK)

Record the average % of streambank that is actively eroding for both the left bank and the right bank of the stream segment. Measure from the edge of the lower bank to the edge of the upper bank. The upper bank is usually the edge of the flood plain. The left bank is refers to the left side of the bank while looking in a downstream direction.

Average Height of the Eroding Banks (HT ERODED)

Record the average height of the eroding banks on either side of the stream segment. Measure from the edge of the lower bank to the edge of the upper bank.

Average Slope (SLOPE BANK)

Record the average slope of the bank in degrees. That is, a vertical bank would be 90° while all other estimates would be less than 90°. Measurements are taken from the edge of the lower bank to the edge of the upper bank.

Riparian Zone Width (RIP WIDTH)

Record the average width of the riparian vegetation for each side of the stream. The riparian zone, for OCC purposes, extends from the top of the upper bank outwards from the stream. The riparian zone ends where the unmanaged (i.e. not plowed or mowed) portion of land ends. In other words, the riparian zone stops where pasture or crop management begins.

Mixtures of trees and herbaceous plants are frequently encountered. These will vary from a fairly dense forest with sparse grasses to land that is mostly pasture with a few scattered trees. For consistency, forest and pasture have been defined below:

Pasture:	If woody shrub and sapling growth can be controlled using a 6' brushhog and a medium size tractor in between the larger trees, the land will be labeled pasture and may or may not be included in the riparian zone.
Forest:	If the large trees are so dense that a tractor and mower of this size cannot be used for brush control, the land should be labeled as forest and included in the riparian zone.

Riparian Condition (RIP CONDITION)

For this column the decision must be made as to whether the majority of the land in the riparian zone, on either side of the stream, is pasture (grassland) or forest. Refer to the definitions presented in the Riparian Width section.

In addition to the habitat type, there is a determination of how much soil is exposed. In grassy areas, this is a straightforward determination and is done by estimating the average % of bare soil observed within the 20-meter riparian zone in question. Forest, while not expected to have grasses & forbs covering the ground, is expected to have a layer of spongy duff composed of organic matter in various states of decay covering the soil. This layer is usually covered by an accumulation of recently fallen leaves or annual herbaceous vegetation that have not started to decay. The top layer of leaves and/or vegetation will have to be moved out of the way to determine if the duff layer is present. Soil not covered by duff should be counted as bare. Estimate the % bare soil exposed in forest while walking the area in question.

The riparian zone on both sides of the stream should be placed in <u>one</u> of the following categories.

1A	STABLE FOREST	<1% bare soil exposed
1B	MODERATELY USED FOREST	1-10% of surface is bare soil
1C	HEAVILY USED FOREST	>10% of surface is bare soil
2A	GOOD CONDITION GRASSLAND	<1% bare soil exposed
2B	FAIR CONDITION GRASSLAND	1-5% bare soil exposed
2C	POOR CONDITION GRASSLAND	>5 <20% bare soil exposed
2D	BAD CONDITION GRASSLAND	>20% bare soil exposed
W	WETLAND	at least 5 meters of riparian area depth appear to be wetland based on the presence of standing water or saturated soil after at least a week of dry conditions, or dominance by sedges, rushes, button bush or willow

Cattle

This category attempts to identify the impact cattle are having on the habitat.

- **%TRAM:** Percent of land trampled. This is an estimate of land where livestock trampling is evident within one meter either way of the transect. In other words, you are looking at a 2-meter wide strip that runs from the top of the right upper bank across the stream to the top of the left upper bank.
- **#CP:** This is the number of cow pies in a 2 meters wide transect.
- **TRAIL:** This is the number of livestock trails on both banks that reach the stream over the entire 20 meter segment. A single trail that crosses the stream and goes up the other side counts as two trails.
- **CLASS TRAILS:** Each cowtrail should be placed in one of the following classes and the class of each trail recorded in this column. There should be as many numbers listed as there were cow trails identified. Separate each number by a comma.

1. < 0.75 m wide
2. ≥0.75 < 1.5 m wide
3. ≥ 1.5 < 2.5 m wide
4. ≥ 2.5 m

Comments

If a road is contributing excess sediment to the stream, or a pipe is discharging to the stream or there is a dump present or any other thing which you deem to be significant is present, record it in the comment block at the end of the page.