

**State of Wisconsin
Department of Natural Resources**

**Guidelines for Evaluating
Habitat of Wadable Streams**

Revised June 2002



**Bureau of Fisheries Management and Habitat Protection
Monitoring and Data Assessment Section
101 S. Webster St.
Madison, WI 53707**

(Modified from Simonson, et al. 1994.
Guidelines for Evaluating Fish Habitat in Wisconsin Streams
USDA Forest Service General Technical Report NC-164)

GUIDELINES FOR EVALUATING HABITAT OF WADABLE STREAMS

| | |
|---|-----------|
| OBJECTIVES OF BASELINE MONITORING OF WADABLE STREAMS | 3 |
| • General Sampling Procedures | |
| • Data Collection | |
| FIGURE 1: STATION AND TRANSECT DESCRIPTION | 4 |
| STATION SUMMARY DATA SHEET | 5 |
| STATION MAP DATA SHEET | 11 |
| STATION FLOW DATA SHEET | 14 |
| FIGURE 2: CALCULATION OF CELL WIDTH | 16 |
| TRANSECT DATA SHEET | 17 |
| FIGURE 3: BANK EROSION DESCRIPTION | 22 |
| TABLE 1: EQUIPMENT AND SUPPLIERS | 25 |

OBJECTIVES OF BASELINE MONITORING OF WADABLE STREAMS

The overall objective of baseline monitoring of streams is to gather information for science-based assessment and management of stream resources. Habitat, macroinvertebrate, and fish community data collected using standardized field protocols, provides objective physical and biological criteria with which to evaluate the condition of stream resources. Baseline information gathered from “least-impacted” reference streams will provide “reference conditions” i.e. the best attainable conditions for streams of similar type (class), information that can be used to objectively determine whether a stream is meeting its potential. Baseline information will allow resource managers to:

1. Classify streams according to their aquatic life potential, and determine whether streams are meeting their potential.
2. Help determine why some streams are not meeting their use potential.
3. Document the status and trends of the physical and biological integrity of stream resources over time and space.
4. Quantify and rank existing and emerging land and water use factors impacting streams.
5. Direct and evaluate Department land and water resource management activities, based on objective, quantifiable, physical and biological information.

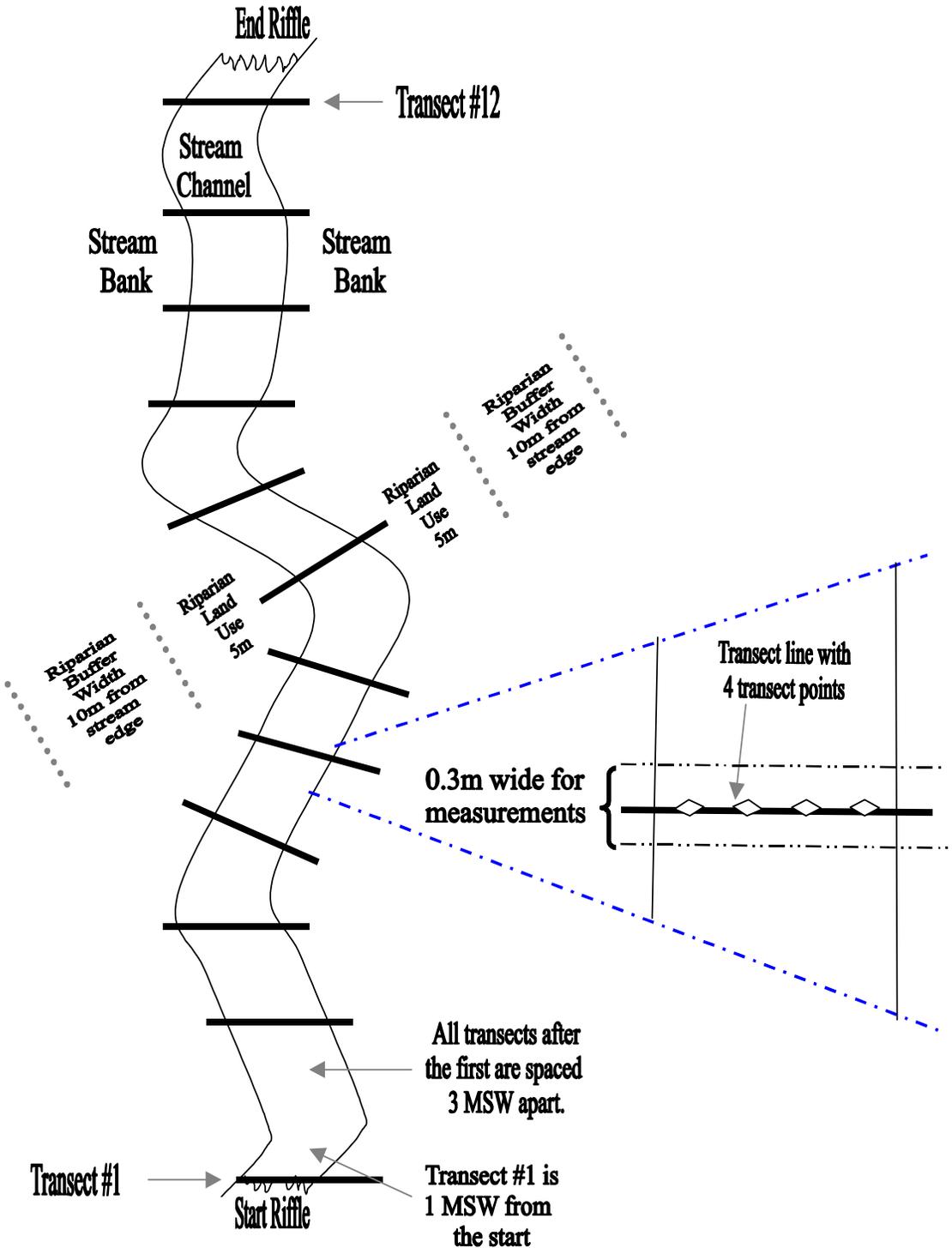
General Sampling Procedures:

Mean stream width (MSW) is an important characteristic of each stream assessment station (reach), and is used to define the length of the station and the spacing of habitat measurements (i.e., distances between transects) for most wadable streams. The MSW is based on the mean of **10** preliminary measurements of stream width from throughout the station (within approximate station boundaries), including all types of macro-habitats. If the stream width does not vary significantly throughout the approximate station length, the 10 width measurements can be taken closer to the start of the station to save time, instead of walking the entire approximate station length. **Station length should be 35 times the MSW for streams between 2.9 m and 23 m MSW.** For streams with a MSW less than 2.9 m, a 100 m long station should be sampled, and streams greater than 23 m MSW an 800 m long station is assessed. If the water level appears to be substantially (> 0.15 m) above normal, sampling should not occur (see **Station Summary** for determination of water levels). Once the MSW for a station has been determined, this value is used for **all** future habitat sampling, including future years when changes in riparian land use or instream habitat improvements may have caused a change in the actual stream width.

If a stream has well-developed pool-riffle structure, then each station should start and end at the downstream end of a riffle (Figure 1), even if this requires that stations be somewhat more or slightly less than 35 times the MSW in length (the distance between the second last and the last transect being greater or less than 3 MSW). Fish community data is collected within the same stream reach in which the habitat is assessed, and beginning and ending the station at the downstream end of riffles helps facilitate fish capture. Ideally, stations should not contain permanent tributaries or hydraulic controls (e.g., dams, old bridge abutments); and the beginning and end of the station should be some distance away from bridges to avoid the influence of stream ponding or scour on the fish and benthic invertebrate community by bridges or old bridge abutments.

Habitat within a station is quantified using the transect method (Figure 1). Sampling of stations proceeds in an upstream direction and a variety of channel, substrate, and bank characteristics are measured or visually estimated along transects. A minimum of 12 transects are sampled within each station to provide an overall assessment of stream habitat. **Parameters unlikely to vary substantially within a station (flow, water chemistry parameters) are measured only once for each station.**

FIGURE 1. Station and Transect description. Station length is 35 x MSW.



Data Collection:

Four data sheets are used in the stream habitat evaluation: **Station Summary**, **Flow Data**, **Map Data**, and **Transect Data**. Clean and completed data sheets are attached. The first three sheets apply to the whole station, and there is typically only one of each of these sheets filled out per station (a second Station Map may be needed for stations with diverse habitat). The Transect Data sheet applies to data collected along transect lines across the stream, and 12 or more sheets are filled out per station. Guidelines for filling out each data sheet are given on the following pages. A list of equipment used for stream habitat evaluations and suppliers is presented in Table 1.

STATION SUMMARY DATA SHEET

This sheet summarizes location, water characteristics, and large-scale channel and basin characteristics for the entire station. Much of the data on this form are derived from U. S. Geological Survey (USGS) maps or from the other data sheets. The parameters on this sheet are as follows:

Location -----

Stream Name The name of the stream as shown on the most recent USGS 7.5' topographic map. USGS maps can be accessed on the WDNR Intranet. The stream name used here should be identical to that used on all other data sheets, and to that used for all other stations on the same stream. Make sure the spelling of the name is accurate and includes all parts of the stream name (e.g., "West Branch", "Middle Fork", "River", "Creek", "Brook", "Run", etc.) to avoid confusion. Other commonly used names for the stream can be written here in parentheses.

Waterbody ID Code A unique seven-digit number identifies each stream (all streams, rivers, and lakes in Wisconsin). All waterbodies have or should have an assigned number. These numbers are available on the WDNR Intranet, under the listing for "SWIS Tabular Database Access System" for the WDNR Register of Waterbodies (ROW).

(http://dnrweb.dnr.state.wi.us:8890/dnr/pk_swis_web_row.row_search)

As with Stream Name, Waterbody ID Code should be the same for all stations on a stream.

Site Mile The reporting of this parameter is optional. The distance along the stream channel from the mouth of the stream to the downstream end of the station. This distance is a useful shorthand for indicating and identifying the location of the station. Site mile should be measured on the most recent USGS 7.5' topographic map to the nearest 0.1 mile using a map measurer (map wheel).

Station No. If a stream has two or more stations, the downstream station is number 1, the next upstream is number 2, and so on. If there is only one station, the number is 1. Always assign a station number.

Date Fill in the date when the habitat data were collected for the station, use the YYYYMMDD format (e.g., 20000607 equals June 7, 2000).

Starting Location A precise narrative description of the point on the stream where the habitat survey began (i.e., the downstream edge of the station). The description should include the exact distance and direction of the start from a "permanent" landmark such as a bridge, building, road marker, rock formation, etc. When referring to roads or bridges include the complete name of the road. **Avoid using landmarks that might be lost in future years** (e.g., don't use tree or fence lines). Make the description as specific and precise as possible so that someone visiting the station for the first time can easily find the starting point.

Township, Range, Section, ¼ - ¼ Section, 1/4 Section Legal description for the Starting Location of the station within the Public Lands System. These can be determined from recent USGS 7.5' topographic maps, a detailed county map, or a county Plat book. On a topographic map, a "land locator" template is useful for determining the ¼ - ¼ and 1/4 Sections, which are indicated by a compass direction (NW, NE, SW, or SE). Note that in Wisconsin, all Townships are "N" (north), but Range can be either "E" or "W" (east or west). Make sure the appropriate letter is included for both Township and Range.

Latitude and Longitude It is important that geographic coordinates of the **start** of the station are recorded, along with the Method Used to determine latitude and longitude (e.g. USGS map, mapping software, global positioning system (GPS) units). The geodetic Datum Used upon which the coordinates of the map or GPS coordinates are based (e.g. North American Datum 1983 (NAD 83)) should also be recorded. Datum for USGS topo maps are shown on the map legend. Latitude and longitude units eventually need to be converted into decimal degrees. This can be done in the office after the field data is collected. To convert a GPS reading from degrees, minutes, seconds into decimal degrees: divide the seconds by 60 and add to the minutes, then divide the minutes by 60 and add to the degrees. To convert degrees, minutes, into decimal degrees: divide minutes by 60 and add to degrees.

7.5' Quad Map Name The name of the USGS 7.5' topographic map on which the station is found.

Basin Name and Watershed Name The name of the DNR Basin and watershed in which the stream is located. These are listed in the Basins and Watersheds of Wisconsin table found on the Wisconsin Department of Natural Resources internet web site at:
<http://www.dnr.state.wi.us/org/gmu/sidebar/watersheds.html>

County The name of the county in which the station is located.

Water Characteristics-----

All water characteristics should be measured in water of moderate current at least 0.15 m above the bottom and 0.15 m below the surface (if possible).

Time The time (in "military" format; i.e., 9:30 AM is 0930 hours and 9:30 PM is 2130 hours) at which measurements of water characteristics are made.

Air Temperature If possible, measure air temperature during the warmest part of the day to estimate maximum values. Take the air temperature in the shade with a **dry** thermometer; evaporation from a wet thermometer will lead to a measured air temperature lower than the true value. Measure to the nearest 1 degree Celsius.

Water Temperature Take the water temperature in mid-channel, during the warmest part of the day to estimate maximum values, if possible. Measure water temperature away from any large objects that project above the surface. Such objects may act to efficiently transmit heat and influence local water temperature. Avoid areas of the stream where subsurface or bank springs may be present. Measure to the nearest 1 degree Celsius.

Conductivity The reporting of this parameter is optional. If reported, measure with a high-quality

electronic meter. Most conductivity meters have built-in automatic temperature compensation to 25 °C (77 °F), but this should be confirmed before using the meter. On some older meters the temperature compensation must be set by hand, and on others, there is no compensation. For the latter meters, conductivity at 25 °C can be calculated using procedures outlined in "Standard Methods for the Analysis of Water and Wastewater", a book available at many WDNR offices. Whatever meter is used, it should be calibrated before every use. Measure conductivity in umhos/cm.

Turbidity The reporting of this parameter is optional. If reported, measure with a high-quality electronic meter, which should be calibrated before every use. Measure and report conductivity in nephelometric turbidity units (NTUs).

Total Dissolved Solids The reporting of this parameter is optional. If reported, measure with a high-quality meter, which should be calibrated routinely. Follow the manufacturer's instructions for use and maintenance (e.g., the membrane and the electrolyte for the probe should be replaced frequently during the field season). Report total dissolved solids in milligrams per liter (parts per million).

Dissolved Oxygen (DO) The reporting of this parameter is optional. If reported, measure with a high-quality meter, which should be air-calibrated before every use. Follow meter manufacturer's instructions for use and maintenance (e.g., the membrane and electrolyte for the probe should be replaced frequently during field season, or immediately if there is an air bubble in the probe electrolyte solution). Report DO in milligrams per liter (parts per million).

Dissolved Oxygen % Saturation The reporting of this parameter is optional. If reported, measure with a high-quality dissolved oxygen meter, which should be air-calibrated before every use.

pH The reporting of this parameter is optional. If reported, measure with a high-quality meter, which should be calibrated routinely. Follow manufacturer's instructions for use and maintenance (e.g., the membrane and electrolyte for the probe should be replaced frequently during field season). Report pH to 0.1 units.

Flow Taken from the **Flow Data** sheet. Flow data can be calculated in cubic feet or meters per second, but should be reported on the **Station Summary** data sheet in cubic meters per second (CMS). To convert CFS to CMS, multiply the CFS value by 0.0283. To convert CMS to CFS, divide CMS by .0283. There is also a web site that can do many of these conversions for you:
<http://www.sciencemadesimple.net/conversions.html>

Water Level An estimate of the level of the stream at the station. Check the appropriate category, and measure the vertical distance (nearest 0.01 m) if "Above" or "Below" normal. If there are areas of stream bed that are dry but look as if they would normally be underwater, then the water level is "Below"; measure the vertical distance between the current water level and the "Normal" water level. If the stream is flowing over or through areas that have terrestrial vegetation (e.g., grasses, forbs, willows, but not bulrushes and cattails) then the water level is "Above"; measure the vertical depth of water above the normal water line. Otherwise, the water level is "Normal" (at or near baseflow).

Sampling should not occur if the water level appears to be substantially (0.15 m) above normal.
Note: Channel characteristics rather than the amount of precipitation in the recent past should be used to determine water level. Streams with a high proportion of ground water input may retain normal flows well into drought periods. Conversely, such streams may show little response to heavy rains, particularly if the local water table has been greatly lowered by prolonged drought. On the other hand, streams that are runoff dominated may fluctuate greatly in water level in response to short-term wet and dry periods.

Water Clarity Record whether the water is Clear, Turbid from suspended sediment, or Stained due to dissolved organic compounds.

Channel and Basin Characteristics -----

Stream Widths These 10 spaces are provided for the determination of Mean Stream Width. Ten preliminary measurements of stream width (nearest 0.1 m) throughout the approximate station length should be made to determine the MSW. These measurements should be taken at different points to incorporate the variation of pools, riffles, and runs. If it appears that the width of the stream is relatively uniform throughout the approximate station length, all stream width measurements can be taken closer to the start of the station to save time.

Mean Stream Width This space is provided for the average (nearest 1 m) of the above Stream Width measurements. This value is used to determine the length of stream to sample (Station Length) and the distance between transects. The Mean Stream Width value can be rounded up to make easier to determine Station Length and Transect Spacing. For further explanation see page 3, **General Sampling Procedures**.

Transect Spacing Record the distance (nearest 1 m) between transects. For streams between 2.9 m and 23 m wide, start the first transect at **1 times** the Mean Stream Width from the downstream end of the station, and the rest of the transects are spaced **3 times** the Mean Stream Width from each other. If the stream is less than 2.9 m Mean Stream Width, twelve transects are also established, but the first transect is 4m upstream of the start of the downstream end of the station, and each subsequent transect is spaced 8 m apart. On streams greater than 23 m Mean Stream Width, the number of transects is increased to 20; with all transects spaced 40 m apart.

Station Length The length of the station, following the center of the stream channel. Measure, using a tape measure, to the nearest 1 m. For streams less than 2.9 m Mean Stream Width, the Station Length is 100 m. Streams with Mean Stream Width greater than 2.9 m but less than 23 m the Station Length is equal to 35 times the Mean Stream Width. For streams greater than 23 m Mean Stream Width, the Station Length is 800 m.

Channel Condition A qualitative assessment of whether or not the station has been channelized or ditched (straightened and dredged to create a channel with few bends and generally uniform widths and depths). If the station shows no evidence of channelization, check "Natural". If the station appears to have been channelized many years before, but seems to be returning to a more natural morphology (beginnings of stream meanders or pool-riffle formation evident), check "Old Channelization". If the station appears to have been channelized within the last few years, or there is little evidence of meander or pool-riffle formation, check "Recent Channelization". If the station has been channelized, and is a straight, uniform channel kept in place over long distances by concrete stream banks and/or a concrete bed (or is kept in place by other artificial means, such as metal bulkheads or brick retaining walls), check "Concrete Channel".

Percent Channelization An estimate of the proportion of the **assessed stream reach** that is channelized.

Sinuosity The length of the meandering stream channel measured over a 1 km straight line distance within which the stream assessment reach is located. Measure with a map wheel on a USGS 7.5' topographic map. This can be done in the office before or after sampling.

Gradient The overall decrease in elevation (on a per kilometer basis) of the stream over the entire station (= elevation drop / distance). Determine from USGS 7.5' topographic maps, using a map wheel. First, find the downstream and upstream ends of the station on the map. Then find the first contour line that **crosses** the stream upstream of the station and the first contour line that **crosses** the stream downstream of the station. For low gradient streams this may require going to additional maps, covering many miles of stream, and possibly including other streams. With the map wheel, determine the distance along the stream channel between these two contour lines. Then determine the elevation drop between these two lines. To determine elevation drop, count these two contour lines plus each additional contour line that crosses the stream between these two points (sometimes there are no contour lines crossing the stream between these two points). Subtract one of these lines, and multiply the remaining number of contour lines by the difference between two lines. (The difference between two lines is usually either 10 ft or 20 ft. Most topographic maps have 10 ft contours, but some have 20 ft contours; check the legend at the bottom of the map.) For example, if there are 2 contour lines that cross the stream in the station, plus the first line above and below the station, there are 4 lines. The difference in elevation between these = (4 - 1) multiplied by either 10 ft or 20 ft. Divide the elevation drop by the distance measured by the map wheel. This is the gradient for the station. Convert feet/mile to m/km by dividing by 5.3.

Stream Order A qualitative measure of stream size, based on the amount of branching of the watershed upstream from the station, using Strahler's modification of Horton's original system. Generally, the higher the order, the larger the stream. Determine from USGS 7.5' topographic maps; usually requires multiple maps because the entire stream network upstream from the station must be examined. In making determinations, all "blue lines" (streams) on the maps, including intermittent streams, are included. The order system is as follows: All streams (including intermittent streams) from their source downstream to their first tributary are **First** order (stream order is "1" on data sheet). When two first order streams meet, the stream below this confluence is **Second** order (stream order is "2"). When two second order streams meet, the stream below this confluence is **Third** order (stream order is "3"), and so on. When two streams of unequal order meet, the stream order below this confluence is equal to the higher of the two orders. For example, if a first and a third order stream meet, the stream below this confluence is third order. Stream order increases only when two streams of equal order meet. Wadable streams are typically first through fourth order.

Basin Area The reporting of this parameter is optional. The basin area equals the surface area of the entire watershed upstream from the downstream end of the station. Basin area can often be determined from the book "Drainage Area Data for Wisconsin Streams" (U.S. Geological Survey Open-File Report 83-933), which is available at most WDNR offices. This book gives the drainage area in square miles (multiply square miles by 2.590 to get square kilometers for this data sheet) for many locations on many different streams. If the exact location (within 0.25 miles) of the station is not given in the book, but basin areas for locations downstream **and** upstream of the station are given, then the basin area for the station can be determined by linear interpolation (use the Site Mile for the station and stream miles for the downstream and upstream locations with known basin areas to interpolate). If no data from upstream or downstream locations are available, basin area can be determined by using a planimeter, or by digitizing the area within watershed boundary on USGS 7.5' topographic map(s).

Mean Distance Between Bends Taken from the DISTANCE SUMMARY of the **Station Map** data sheet.

Mean Distance Between Riffles Taken from the DISTANCE SUMMARY of the **Station Map** data sheet.

Total (Sum) Length of All: Riffles Pools Runs Taken from the DISTANCE SUMMARY of the **Station Map** data sheet.

Mean Length of Individual: Riffles Pools Runs Taken from the DISTANCE SUMMARY off of the **Station Map** data sheet.

Photographic Documentation (optional) -----

An accurate time-series of photographs (digital or 35mm slides) of the station may be important for documenting changes in habitat that occur over the duration of habitat management projects, or changes in stream habitat associated with changes in watershed land use. Photographs should be taken from the same point in the stream each time the station is sampled. The first photograph taken at each station should be on the **Station Summary** data sheet, so that subsequent photographs can later be identified as to location. The frame numbers of photographs taken at set locations in the station should be recorded on the **Station Summary** data sheet. Some convenient locations, such as looking upstream at the station from the downstream end of the station and looking downstream from the upstream end of the station, are listed on the data sheet. Additional locations, looking upstream from the upstream end of the station and looking downstream from the downstream end of the station, are included on the data sheet and can be used to document conditions upstream and downstream from the station. Film should be developed promptly and slides should be immediately labeled with Stream Name, Date, Station Number, location within the station (e.g., looking upstream from the upstream end), and any other pertinent information.

Person(s) Who Collected Habitat Data The **full** names of the person(s) who actually measured or estimated the habitat parameters (water level, substrate coverage, bank vegetation/land use, etc.) during the habitat survey. All field crew members should participate in all aspects of the habitat survey both collecting and recording information.

COMMENTS / NOTES Any and all information that seems to be relevant to the habitat survey but is not recorded anywhere else on the data sheets. This information could include weather conditions (especially regarding the last significant precipitation in the watershed), notes on habitat features that were unusual or difficult to interpret, problems with equipment or measurements, and observations on biotic characteristics of the stream and riparian zone. Note model number and serial number (or some other unique identifier) for each of the meters used to determine WATER CHARACTERISTICS.

STATION MAP DATA SHEET

This data sheet provides a quantitative and visual description of the length and position of the major macro-habitat features of the station (Bends, Pools, Runs, Riffles, Islands, Log jams, Beaver dams). On the MAP DATA sheet (page 3), record the length of the feature and its distance from the downstream edge of the station (measure to the nearest 1 m with a tape measure). Include the downstream and upstream boundaries of the station and the distances to the nearest fixed reference point in the station (e.g., USGS benchmark, bridge, rock formation, etc.). Record all bends and riffles within and immediately upstream and downstream of the station (if within 35 stream widths of the station), and any islands, logjams, or beaver dams within the station. Also include any other specific habitat or environmental problems within or adjacent to the station. The back of the MAP DATA sheet (page 4) is used for an optional hand-drawn map of the station. The hand-drawn map will not be captured in the electronic statewide stream database, and should only be draw if of value to local resource managers. At stations with high macro-habitat heterogeneity, more than one Station Map data sheet may be required. The variables on the data sheet are as follows:

Stream Same as for Stream Name on the **Station Summary** data sheet.

Waterbody ID Code Same as for **Station Summary** data sheet.

Site Mile Same as for **Station Summary** data sheet.

Station No. Same as for **Station Summary** data sheet.

Date Same as for **Station Summary** data sheet.

Distance From Start (column) The distance, following the center of the channel, from the downstream end of the station to the downstream end (or middle, in the case of bends) of each Stream Feature that is encountered (measure to the nearest 1 m with a tape measure). It may be helpful to measure from permanent features downstream of the start of the station as indicated by a minus sign “-“ to the start of the station (start of the station = distance “0”). This helps to identify the start of the station. All Stream Feature measurements are measured from the start of the station, and the last value should equal the Station Length (from the Station Summary data sheet).

Stream Feature (column) Record the stream macro-habitats encountered while moving upstream from the downstream end of the station. Macro-habitats include bends, riffles, runs, pools, islands, dams, and logjams, and are defined as:

Bends: Curves in the channel where the channel changes from its prevailing direction by at least **60 degrees**. Distances should be measured to and from the center of the bend. Bend angles can be measured with a compass by subtracting the headings of the channel upstream and downstream from the bend.

Riffles: Areas of the stream characterized by shallower than average maximum depths and obvious surface turbulence. Water velocity is faster than average. In large streams and rivers, deep, fast riffles are called rapids. During high flows some riffles may become runs.

Runs: Areas of the stream with average maximum depths and little or no surface turbulence. Water velocities may be fast or slow, but the water surface appears generally smooth. Runs with slow velocities are sometimes called glides. During droughts, many shallow runs may become riffles.

Pools: Areas of the stream with deeper than average maximum depths, with no obvious surface turbulence or broken water. Water velocities are always slow. The longitudinal profile of the streambed in a pool is often bowl shaped. "Pocket water" refers to groups of small pools located behind boulders or other obstructions to flow, often in areas of otherwise fast or turbulent flow.

Islands: Areas of land between the stream banks that are surrounded on all sides by a substantial portion of the stream's water. Areas with nearly all of the stream's flow on one side and minimal flow on the other are not considered islands. The number, position, size, and shape of islands may vary with water level. Islands contain soil or numerous rocks; exposed sand or gravel/cobble bars are considered islands, but boulders that project above the water surface are not.

Dams: Intentional structures (constructed by either humans or beavers) that, when in good repair, completely cross the stream channel and block flow. Usually, dams pool water behind them, and there is a sharp drop in water surface elevation at the dam.

Log Jam: A group of three or more large diameter (> 0.20 m) intermingled logs partially or completely submerged in the channel that substantially alter flow and sedimentation patterns. When large and dense, logjams may be similar to dams in their appearance and impact on the stream.

Distance Summary -----

Distance Summary measurements can be obtained from the Distance From Start and Stream Feature columns on the Map data sheet.

Distances Between Bends The distance between the middle of one bend and the middle of the next bend upstream. Measure and record only those bends with a change in direction of at least 60 degrees (can be determined with a compass). Record the distances between bends within and adjacent to the station. The first row is the distance between the first bend within the station and the first bend downstream outside of the station, if there is a bend within a distance of 35 times the mean stream width (MSW) from the downstream end of the station. The second row (1st - 2nd) is the distance between the first and second bends upstream from the start of the station; the third row (2nd - 3rd) is the distance between the second and third bends upstream, and so forth. The last row "- Upstream" is the distance between the most upstream bend within the station and the first upstream bend outside of the station, if there is a bend within a distance of 35 times the MSW from the upstream end of the station. The "sum" and "mean" rows summarize all the distances between bends.

Distances Between Riffles The distance between the upstream end of one riffle and the start of the next upstream riffle. The actual length of each riffle is **not** included in this distance. Fill in each row following the same protocol as for Distances Between Bends.

Length of Individual Riffles, Pools, and Runs-----

Riffles, Pools, and Runs The length of each riffle, pool, and run within the station, starting with the downstream-most one of each type and working upstream to the upstream end of the station. These columns can be filled out using the information in the Stream Feature column.

STATION FLOW DATA SHEET

This data sheet is used when calculating instantaneous flow rate, also known as discharge. The data on this sheet are from one stream location within the station that ideally meets the following criteria. The location should be in an area of smoothly flowing water with no obvious turbulence (i.e., a run). The channel should be free of obstructions to the flow of water, and flow should be in a uniform downstream direction (i.e., no eddies). Banks should not be undercut, the bottom should be relatively smooth, and depths should change gradually across the stream.

Discharge is measured using a transect technique, with depths and water velocities measured at set intervals across the width of the stream. Once a suitable location has been chosen, a tape measure is used to determine the actual stream width and to provide a guideline for depth and velocity measurements. Depth and velocity should be measured at a **minimum of 10 points** along the transect, and all measurements must be very precise. Stream discharge is the sum of the products of depth, velocity, and width interval for each measurement point. The parameters on this data sheet are as follows:

Stream Name Same as for Stream Name on the **Station Summary** data sheet.

Waterbody ID Code Same as for **Station Summary** data sheet.

Site Mile Same as for **Station Summary** data sheet.

Station No. Same as for **Station Summary** data sheet.

Date Same as for **Station Summary** data sheet.

Stream Width The actual width (nearest 0.1 m) of the stream (wetted portion of channel) along the transect.

Distance from Left Bank The distance (nearest 0.01 m) along the transect line, perpendicular to the direction of flow, from the left bank (looking upstream) at which depth and velocity measurements are made. In streams narrower than 3 m, measurements should be taken at evenly spaced intervals that are narrow enough to allow for as least **10 separate measurements**. For example, if a stream is 2.1m wide, then depth and velocity measurements should be taken every 0.2 m. In streams greater than 3 m but less than 10 m in width, depth and velocity measurements should be taken **every 0.3 m**. In streams wider than 10 m, depth and velocity measurements should be taken **every 0.5 m**.

Depth The depth (nearest 0.01 m or ft) of the stream at that point. This should be determined with a calibrated wading staff, such as the one used for making velocity measurements.

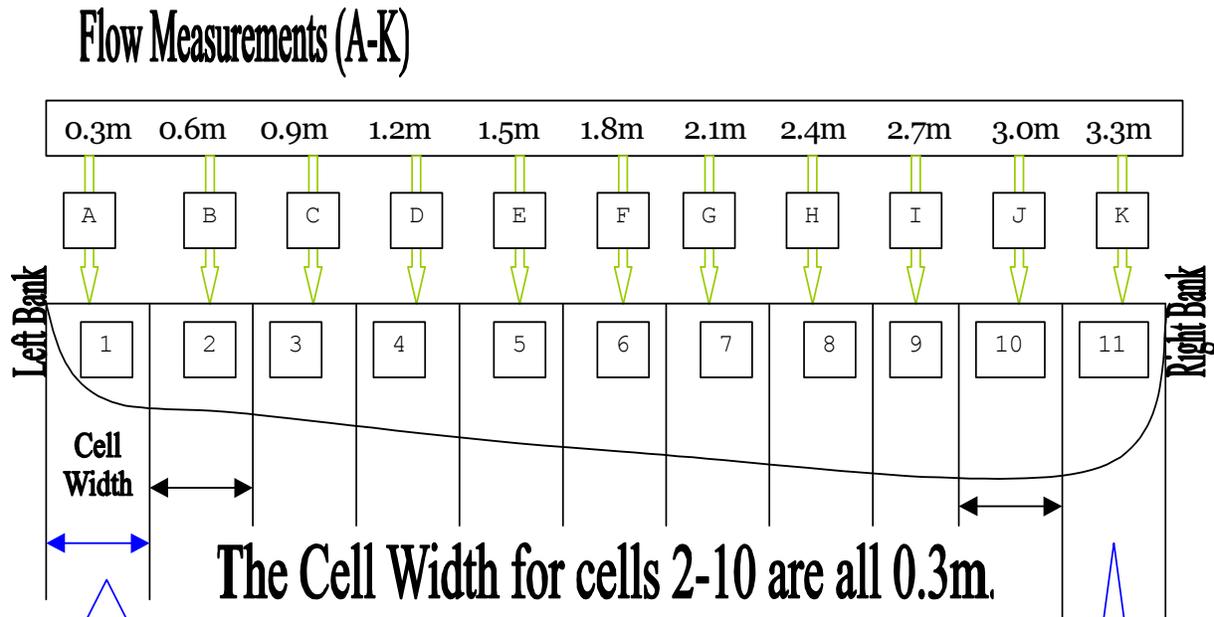
Velocity The velocity (nearest 0.01 m/second or ft/second) of water at that point on the transect. Velocity should be determined with a high quality current (flow) meter, either an electronic or rotating-cup meter, attached to a calibrated, top-setting, wading staff for accurate and precise placement in the water column. In water **shallower than 0.8 m**, a single velocity measurement is made at a depth of **60%** of the distance between the water surface and the bottom of the stream. For example, if the water depth is 0.19 m, then velocity is measured 0.11 m below the water surface. In water **deeper than 0.8 m**, two velocity measurements are made one at **20%** and the other at **80%** of the distance between the

water surface and the bottom of the stream. For example, if the depth is 1.1 m, then velocity measurements are made 0.22 m and 0.9 m below the water surface. The mean of these two measurements is then used in calculations.

Cell Width In most instances, cell width is equal to the interval (nearest 0.01 m) between the points where velocity and depth are measured. For all but the first and last points on the transect, the cell width for a particular point is equal to one half the distance between it and the previous point plus one half the distance between it and the next point. If points are evenly spaced (e.g., every 0.3 m), this is equivalent to the distance between two points (e.g., 0.3 m). For the first and last points, the cell widths are somewhat different. For the first point (nearest the left bank), the cell width is equal to the distance between the left bank and the first point plus one half the distance between the first and second points. Thus, if the first point is 0.3 m from the left bank, then the cell width for this point is 0.45 m. For the last point (furthest from left bank and closest to right bank), the cell width is equal to the distance between the right bank and the last point plus one half the distance between the last and next-to-last point. Thus, if the last point is 3.3 m from the left bank, the stream width is 3.5 m, and the interval between points is 0.3 m, then the cell width for this point is 0.35 m (Figure 2).

Product Depth times velocity times cell width (**make sure units are all in meters**). Values in the Product column are summed to give the discharge for the station in cubic meters per second, but can also be recorded on this sheet in cubic feet per second; however, on the **Station Summary Data** sheet it must be recorded in CMS. See Flow on the **Station Summary Data** sheet (Page 7) for more information about conversion values.

FIGURE 2: Calculation of Cell Width for a 3.5m wide stream.



To calculate the cell width for cell #1, first measure the distance from the left bank to point A. Second add 1/2 the distance from point A to point B. In this case the distance from the left bank is 0.3m plus 0.15m (1/2 distance between A and B). Thus, the cell width is 0.45m.

To calculate the cell width for cell #11 first measure the distance from the right bank to point K. Second add 1/2 the distance from point K to point J. In this case the distance from the right bank is 0.2m plus 0.15m (1/2 distance between K and J). Thus, the cell width is 0.35m.

TRANSECT DATA SHEET

This data sheet is used for recording information on the physical characteristics of stream and riparian habitat along a minimum of 12 transects within the station. One data sheet is filled out for each transect. On streams between 2.9 m and 23 m MSW, the first transect is located a distance of one MSW upstream from the downstream end of the station. Subsequent transects are spaced three MSWs apart. **If possible the start (first transect on the downstream end) of the station and the end of the station (last transect) should end on a riffle or in a shallow run even if this increases the distance between the last and second to last transect.** For streams less than 2.9 MSW the station length is 100 m, the first transect is located 4 m upstream from the start of the station, and subsequent transects are spaced 8 meters apart. On streams greater than 23 m MSW the station length is 800 m, the number of transects is increased to 20, and all transects are spaced 40 m apart. For baseline monitoring, the fish community is assessed within the habitat station; starting and ending the station in a shallow run or riffle will help insure that all fish can be captured within the station since blocknets are not used. Each transect consists of several measurements or visual estimates made within 0.3 x 0.3 m quadrat centered around each of the **4** equally-spaced **transect points**, along the **transect line** that is perpendicular to the flow of water (Figure 1). The number of transects, and hence the number of **Transect Data Sheets**, depends on the length of the station, but is always **a minimum of 12**.

Stream Name Same as for Stream Name on the **Station Summary** data sheet.

Waterbody ID Code Same as for **Station Summary** data sheet.

Site Mile Same as for **Station Summary** data sheet.

Station No. Same as for **Station Summary** data sheet.

Date Same as for **Station Summary** data sheet.

Transect No. The transect at the downstream end of the station is number 1, the next one upstream is 2, the next one upstream from that is 3, and so on. Thus, each transect data sheet for a station should have a different Transect number.

Distance from Start The distance, following the stream channel, from the downstream end of the station ("Start") to the current transect. This should be measured to the nearest 1 m with a tape measure. If all transects are positioned three MSWs apart, and Transect No. 1 is located 1 MSW from the downstream end of the station, then Distance from Start should equal [(Transect No. - 1) x (3 x MSW)] + MSW.

Stream Width Stream width measurements are taken with a tape measure to the nearest 0.1 m, along the transect line. Stream width is the actual wetted width of the channel along the transect. Islands, isolated pools, backwaters not in contact with the stream at the transect, and wetlands or swamps along the stream are not included in the measurement.

Habitat Type Check the habitat type that exists at the transect line. Check only the predominant type, even if more than one type is present. See the definitions for riffle, pool, and run in the station **Map Data** sheet (pages 10-12).

Bankfull Depth The reporting of this parameter is optional. Bankfull is the volume of water that fills

the stream channel to the top of its banks but does not overflow onto the flood plain, and on average occurs every 1.5 years. The tops of point bars or central bars within the active stream channel, the height above the stream that exposed plant roots below an intact layer of soil are visible, and the base of mature alder (*Alnus* spp.), are good indicators of stream water elevation at bankfull. One stream bank is usually lower than the other, and the **lowest stream bank** is the one that should be used to determine bankfull depth. Bankfull depth is measured to the nearest .01 m from the stream bottom at the deepest point (thalweg) in the stream. If there is no obvious stream bank, or the stream edges are marsh-like with emergent vegetation, it may not be possible to measure bankfull depth. In these situations, draw a line through the bankfull depth space on the data sheet.

Bankfull Width The reporting of this parameter is optional. Bankfull width is the maximum width the stream could reach before overflowing the bank. Measure to the nearest .01 m.

Channel Position Measurements-----

Several characteristics, including Depth, Embeddedness, Substrate, Algae Abundance, Macrophyte Abundance, and Canopy/Shading are each measured at four evenly spaced positions along the transect line. To determine these four positions divide the Current Stream Width along the transect line into fifths (5 equal segments). Starting from the left bank (facing upstream), measurements are made at each of the four boundaries between segments; i.e., at 1/5 the distance between the left and right banks, at 2/5 the distance, 3/5 the distance, and 4/5 the distance. Each measurement is entered in the appropriate column on the form. For example, if the stream is 2.7 m wide, each segment is 0.54 m, and depth measurements are taken along the transect at 0.54, 1.08, 1.62, and 2.16 m from the left bank. An additional Water Depth measurement is made at the deepest point (the thalweg) along the transect line, if the deepest point is not located at one of the four evenly spaced points. In the event that the deepest point occurs at one of the transect point, record the depth measurement in the Channel Position (Fifths of Current Stream Width) column **and** Deepest Point column.

Water Depth The depth of the stream at each transect point. This should be measured to the nearest 0.01 m with a meter stick or calibrated wading staff, such as the one used for making velocity measurements. Make sure the measuring device (meter stick or wading staff) is not sticking into the sediment, so that only the actual water depth is measured. In water depths greater than one meter, use another measuring device or stack one meter stick on top of the other to get the actual water depth. **If the water is too deep to wade, then estimate Water Depth.** If a boulder is directly on the transect point, measure the depth next to the boulder.

Depth of Fines & Water The total depth of the water **plus** the depth of sand, silt, or other fine sediments (< 2 mm in diameter) that overlay or comprise the streambed. Measure to the nearest 0.01 m by pushing a meter stick down into the sediment. **Do not push the meterstick down into hard clay or gravel – only measure the amount of fine sediment lying on top of the bottom substrates (ie. fine sediment may be lying on top of a layer of clay or gravel. If there is a lot of resistance when pushing the meterstick into the sediment, you are probably measuring the clay or gravel in addition to the fine sediment lying on top.)** If the bottom substrate is gravel and there is not a layer of fine sediment covering it (feel the stream bottom with your hand to determine if there is any fine sediment over the gravel), do not measure the depth of the gravel. The combined measurement of Depth of Fines & Water is later converted to depth of fines by subtracting the Water Depth (measured above).

Embeddedness of Coarse Gravel and Rubble/Cobble Embeddedness is the degree to which coarse **gravel and rubble/cobble (rocks 16 - 260 mm in diameter)** are surrounded by or covered with sand, silt, and other fine substrates < 2 mm in diameter. Visually estimate (to the nearest 10%) the average

amount of embeddedness within a 0.3 m x 0.3 m quadrat on the stream bottom centered on the transect point. As a guide for estimation, if embeddedness is 100%, then rocks are completely buried by fine sediments. If embeddedness is 75%, then rocks are completely surrounded and half-covered by fine sediment. If embeddedness is 50%, then rocks are surrounded by sediment but their top surfaces are clean. If embeddedness is 25%, then rocks are half surrounded by fine sediment and their top surfaces are clean. If embeddedness is 0%, then there is essentially no fine sediment surrounding or covering rocks. Do not confuse attached algae on rocks with fine sediment. Embeddedness values are for all areas of the quadrat with coarse gravel or rubble/cobble substrates; if these two substrate types are absent then put a dash on the data sheet; embeddedness cannot be estimated. In some instances (e.g. turbid or deep water) it may be difficult to see or feel the streambed, in this case one should use their feet and feel the substrate to estimate Embeddedness.

Percent of the Stream Bottom Covered-----

A description of the materials that make up the streambed, within the area that is covered by water. With your hand feel the substrate composition and visually estimate the percent composition of the stream bottom within a **0.3 m x 0.3 m quadrat** centered on the transect line. If turbid or deep water make it difficult to see the stream bottom, use your feet to feel the substrate and estimate substrate composition. **The sum of the values for all substrate categories must equal 100%**. Estimate each category to the nearest 5%; if a category listed on the sheet is not present in the quadrat, enter a zero for that category. If a bottom type that is not listed on the sheet is present, identify the category and record the percentage next to "Other". When the surface of the bottom is a mixture of substrate types (e.g., a sand-fine gravel mixture), or a mosaic of types (e.g., a patch of pure sand in one area and a patch of pure fine gravel in an adjacent area), make an estimate of the percent substrate composition of the surface of the stream bed. The substrate categories are as follows:

- Bedrock:** Solid, uniform rock bottom.
- Boulder:** Rocks with a maximum length of 261 mm - 4.1 m.
- Rubble/
Cobble:** Rocks with a maximum length of 65 mm - 260 mm.
- Gravel:** Rocks with a maximum length of 2 mm - 64 mm.
- Sand:** Inorganic material smaller than fine gravel but coarser than silt. The material found on a beach. Maximum length of 0.062 mm - 1.9 mm.
- Silt:** Fine inorganic material, typically dark brown in color. Feels greasy and muddy in hands. Loose; does not retain shape when compacted into a ball. Will not support a person's weight when it makes up the stream bottom. Maximum diameter of 0.004 - 0.061 mm.
- Clay:** Very fine inorganic material; individual particles barely or not visible to the naked eye. Either dark brown or gray in color. Feels gummy and sticky in hands; slippery when underfoot. Retains shape when compacted, and partially or completely supports a person's weight when it makes up the stream bottom. Maximum diameter of 0.00024 - 0.0005 mm.
- Detritus:** Partially decayed organic matter such as leaves, sticks, dead macrophytes, etc. When very fine, may appear similar to silt.

ALGAE (%) A visual estimate (**nearest 10%**) of attached and filamentous algae within each quadrat. Filamentous Algae is algae attached to the bottom or banks that forms long filaments, and Attached Algae is algae attached to the bottom or banks that forms a mat or crust, but does not form long filaments.

MACROPHYTES (%) A visual estimate (**nearest 10%**) of submergent and emergent plants within each quadrat. Submergent and emergent macrophytes are defined Cover for Fish, below.

CANOPY / SHADING (%) The degree to which canopy vegetation intercepts sunlight to the stream channel. Estimate to the **nearest 10%** at each channel transect position using a concave Forest Densimeter (if available). The densimeter should be held at elbow height and read facing upstream. If a Densimeter is not available, circle shading on the data sheet and make a visual estimate of the percent shading over the entire stream-reach surface within the 35 MSW station.

Cover for Fish Measure the length (m) of cover for fish along a 0.3 m band centered along the transect line. Fish Cover is defined as any objects, channel features, or bank features that provide complete shelter from the current, or provide visual isolation for a fish that is at least 0.20 m in total length. **Water must be at least 0.20 m deep for cover to exist.** Measure (to the nearest 0.01 m) the length of each cover type along (parallel to) the transect line within the 0.3 m wide band centered on the transect. If the cover for fish (e.g., a submerged log crosses the transect line at an angle, only the length of the cover that crosses the transect is measured and recorded. If a cover type is absent, enter a zero on the datasheet. Cover types present but not listed on the sheet should be specified and recorded in the column listed "Other". Habitat improvement devices that provide cover are listed under "Other". The actual lengths (m) of each cover type along the transect line are later used to determine the percentage (length of cover divided by stream width at the transect, times 100) of the transect with cover.

- | | |
|--------------------------------|--|
| Undercut Banks: | Banks that overhang the water by at least 0.20 m at a point where the water is at least 0.20 m deep. To be considered cover for adult gamefish, the bottom of the undercut bank must be no more than 0.10 m above the water surface. |
| Overhanging Vegetation: | Thick vegetation overhanging the water that meets the same criteria for cover as Undercut Banks. |
| Woody Debris: | Large pieces or aggregations of smaller pieces of wood (e.g., logs, large tree branches, root tangles) located in or in contact with water at least 0.20 m deep. |
| Other Debris: | Pieces of human-made debris found in or in contact with water at least 0.20 m deep, that provide shelter or visual isolation for fish. Examples include old tires, abandoned farm implements, and discarded home appliances. |
| Boulders: | Rocks at least the size of small boulders (> 0.26 m ; see Stream Bottom Types) that are located in or in contact with water at least 0.20 m deep. Large pieces of concrete and other artificial rocky aggregates also belong in this category. |

Submerged Macrophytes: Vascular plants that normally have all or nearly all of their biomass below the surface of the water. Examples include Potamogeton, Vallisneria, Elodea, Ceratophyllum, and Myriophyllum. To count as cover, submerged macrophytes must be rooted in water at least **0.20 m** deep and must be dense enough to provide shelter or visual isolation for fish.

Emergent Macrophytes: Vascular plants that normally have a significant portion of their biomass above the surface of the water. Examples include bulrushes, sedges, cattails, and water lilies. To count as cover, emergent macrophytes must be rooted in water at least **0.20 m** deep and must be dense enough to provide shelter or visual isolation for fish.

Bank Erosion The degree to which each stream bank is susceptible to loss of material when inundated by water (either from precipitation or from stream flow during floods) or subject to heavy winds. More simply, the amount of the bank that is exposed soil. For the right and left bank along the transect-line, measure the length (nearest 0.01 m) of contiguous bare soil within 1 m of the stream edge (Figure 3). The stream edge is the edge of the wetted stream channel under “normal” flow conditions. If the flow is above or below normal, estimate where the wetted stream channel edge would be under normal flow conditions. Record the length of bare soil for each bank separately. **Patchy clumps of vegetation or other bank features (e.g., exposed rock) must be > 0.5 m long or they are counted in the measurement of bare soil.** If the length of bare soil is > 1 m from the stream, record > 1; if there is no contiguous bare soil, record 0. Also, visually estimate the Percent, to the nearest 10%, of the surface area (essentially the length) of each bank that is bare soil. The percent bare soil estimate requires that the crest of the bank is visually determined, and then the area of bare soil in a line from the stream edge to the crest of the bank is visually estimated. If the bank crest is not easily discernible, estimate the bank erosion within **5 m** of the stream edge. It may help to measure the length of the entire Bank (from stream edge to the crest of the bank), if easily discernible, and then divide into the length of bare soil to obtain the percent bank erosion.

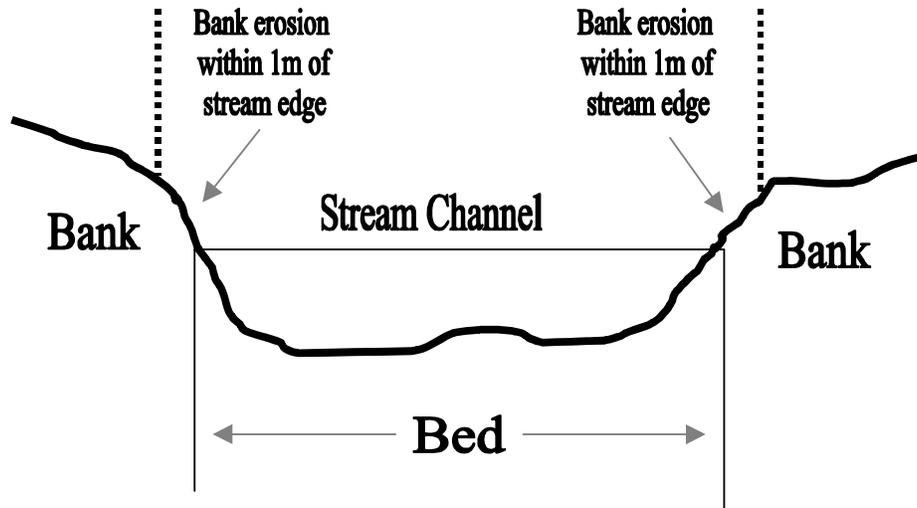


FIGURE 3. Bank Erosion description.

Riparian Land Use The amount of various land uses on both banks. In baseline habitat evaluations "banks" are defined as the land from the edge of the stream at normal water level to a point **5 m inland**, following the contours of the land (Table 2). This definition avoids confusion in identifying the actual banks. There are two major types of land uses within the riparian zone. **Disturbed Land Uses** are unnatural, human-related uses, while **Undisturbed Land Uses** are characterized by relatively unaltered natural vegetation and soils. Visually estimate each category listed below to the nearest 10% for both banks combined. **The sum of estimates must equal 100 %**. The land use must be > 1 m wide (along the transect- line) to count. If a category listed on the sheet is not present along the transect, enter a zero for that category. If a category that is not listed on the sheet is present, specify the identity of that category and list the percentage next to "Other". The listed categories are as follows:

Disturbed Land Uses

- Cropland:** Land that is plowed and planted with crops on a yearly basis or is regularly mowed for hay.
- Pasture:** Land that is regularly grazed by livestock.
- Barnyard:** Land that is used to confine and feed high densities of livestock. Also known as feedlots, this land often contains little vegetation and large volumes of manure and mud. Usually associated with farmsteads.
- Developed:** (Commercial/Residential/Urban): Includes lands that have been modified for human use. Buildings used for commerce or industry, plus residential buildings. Includes all roads (paved and unimproved), railroads, paths > 2 m wide, parking lots, and yards, etc. Also, parks, playgrounds, golf courses, ball fields, and associated roads, parking lots, etc.

Undisturbed Land Uses

- Meadow:** Land dominated by grasses and forbs with few woody plants, which is not subject to regular mowing or grazing by livestock.
- Shrub:** Land dominated by small (< 3 m high) woody plants, such as alders, honeysuckle. or juvenile box elders and willows.
- Woodland:** Land dominated by trees (either coniferous or deciduous), most of which are taller than 3 m.
- Wetland:** Low-lying land that is covered with standing water for much of the year.

Exposed Rock: Land covered by exposed bedrock outcrops, boulders, riprap, gabions, or other natural materials along the banks.

Slumping or "cut" banks with little vegetation and exposed soil eroding into the stream are not considered a separate category but are included with the land use found at the top of the bank. For example, an eroding, bare bank in an otherwise wooded area would be included as **Woodland** land use, while a severely eroding bank in a pasture would be included as **Pasture** land use. If a cut bank with a narrow band (1 m wide) of undisturbed land use (e.g., **Meadow**) at the top of the bank is followed by a disturbed land use (e.g., **Pasture**), the cut bank is included as **Meadow**.

Riparian Buffer Width Measure the width of contiguous Undisturbed Land Uses (above) from the stream's edge out **10 m** along the transect-line, following the contours of the land, for both banks (Table 2). If no undisturbed land uses are directly adjacent to the stream, then the riparian buffer width is 0 m; if undisturbed land uses are present from the stream edge to a point > 10 m, then the riparian buffer width is recorded as > 10 m. Riparian buffer widths 10 m from the stream should be measured to the nearest 1 m.

Table 1: Gear used to sample stream habitat, and the postal and email addresses, and telephone numbers of the suppliers are listed at the end of the table.

| Item | Supplier |
|---|--|
| <u>Measuring Tapes</u> Used for measuring short distances | |
| Keson - Model OTR - 10m – 165m | Forestry Suppliers, Inc. Stock #39972, 165 ft., 50 meters |
| <u>Flagging Tape</u> Used for marking habitat stations and fish sampling areas | |
| Biodegradable (lasts for one year) or Vinyl (for a more permanent mark) | Forestry Suppliers, Inc. |
| <u>Map Gear</u> Used for determining gradient, sinuosity, and legal description of areas sampled | |
| Land Locating Map Template - 40 Acre | Forestry Suppliers, Inc. Stock #45660 - Type A |
| Map Mesurer - PECO Swivel Handle #45240 Digital Map Mesurer #45251 | Forestry Suppliers, Inc. |
| <u>Clipboard</u> Used for recording and storing data in the field | |
| Cruiser Mate Sheet Holder | Forestry Suppliers, Inc. Stock #53282 |
| <u>Meter Sticks</u> Used for measuring depths and other short (< 1 m) distances | |
| Maple - Meter stick - with metal ends | Fischer Scientific* Stock # S32052 |
| <u>Paper</u> | |
| "Rite in the Rain" Water-proof paper 208511 Bulk Cut Sheets (500) \$27.25 8511 Copier Sheets (200) \$21.25 | J. L. Darling Corp. 8 1/2" X 11" - White |
| <u>Camera</u> Digital, or conventional film, used for documentation photographs of habitat before and after improvement. | |
| Film - Color Slide (Ektachrome - ASA 100, 200 or Kodachrome ASA 64) | |
| <u>Forest Densiometer</u> Used to estimate overstory canopy density; more objective and precise than visual estimation of stream shading. | |
| Spherical Crown Densiometer (Concave) | Forestry Suppliers, Inc. Stock # 43888 |

Table 1: (continued).

| Item | Supplier |
|---|--|
| <u>Topographic Maps</u> Used for locating sampling sites and determination of station characteristics such as gradient, sinuosity, etc. | |
| 7.5' or 15' Topographic Maps | WI Geological & Natural History Survey |
| Aerial Photographs | County Land Conservation Department WDNR Bureau of Forestry |
| <u>County Plat Books</u> Used to identify landowners when seeking permission to access streams | |
| | Most county extension offices |
| | Milwaukee Map Service, Inc. |
| | Rockford Map Publishers, Inc. |
| Addresses ----- | |
| Forestry Suppliers Inc. 205 West Rankin St. P.O.B. 8397 Jackson, MS 39204 1 - 800 / 647 - 5368 http://www.forestry-suppliers.com | J. L. Darling Corp. 2212 Port of Tacoma Rd. Tacoma, WA 98421 206 / 383 - 1714 http://www.riteintherain.com |
| Milwaukee Map Services Inc. 959 Mayfair Rd. Milwaukee, WI 53226 414 / 774 - 1300 1 - 800 / 525-3822 http://www.mapservice.com | Rockford Map Publishers P.O.B. 6126 Rockford, IL 61125 1 - 800 / 447 - 2222 http://www.rockfordmap.com |
| Ben Meadows Co. P.O.B. 80549, Atlanta, GA 30366 1 - 800 / 241 - 6401 (order) http://www.benmeadows.com | Fischer Scientific* 4500 Turnberry Dr. Hanover Park, IL 60103 1 - 800 / 766 - 7000 (order) 630 / 259 - 1200 http://www.fischersci.com |
| Wisconsin Geological and Natural History Survey 3817 Mineral Point Rd. Madison, WI 53705 608 / 262 - 1705 http://www.uwex.edu/wgnhs/intro.htm | VWR Scientific Products Chicago Regional Distribution Center 800 East Fabyan Parkway Batavia, IL 60510 1 - 800 / 932 - 5000 (order) 630 / 879 - 0600 http://www.vwr.com |

*The State of Wisconsin has a contract with Fischer Scientific and other vendors for substantial discounts on equipment and supplies purchases. To receive these discounts Regional WDNR staff should set-up an account with Fischer or other vendors by contacting their Regional purchasing agent. Along with a discount on equipment and supplies, there are no shipping charges on regular or hazardous materials.