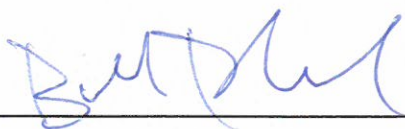


**TITLE:** PROTOCOL FOR COLLECTING ERODING STREAMBANK AND CHANNEL ATTRIBUTES

**DATE OF ISSUE:** December 29, 2014

**AGENCY NAME:** EPA REGION 3, Water Protection Division – Office of Standards, Assessment, and TMDLs

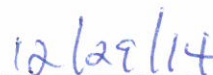
**SIGNATURES:**



Bill Richardson

*Water Protection Division Quality Assurance Coordinator*

*Office of Standards, Assessment and TMDLs*



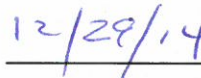
Date



Evelyn MacKnight

*Associate Director*

*Office of Standards, Assessment and TMDLs*



Date

## TABLE OF CONTENTS

1.0	Purpose and Scope .....	3
2.0	Summary of Method .....	3
3.0	Precautions.....	3
4.0	Data Collection .....	3
4.1	Measurement and Observation Data Sheet.....	4
4.1.1	Header Information (Site Identifier).....	4
4.1.2	Weather Condition .....	4
4.2	Photos.....	4
4.2.1	General Dos and Don'ts.....	4
4.2.2	Header Information (Photo Identifier).....	4
4.2.3	Position of Photograph.....	5
4.3	Streambank & Channel Attributes .....	5
4.3.1	Measuring Channel Depth ( <b>Figure 1</b> ) .....	5
4.3.2	Estimating Channel Length.....	5
4.3.3	Predominant Surrounding Land Use Types.....	7
4.3.4	Riparian Vegetation ( <b>Figure 2</b> ) .....	7
4.3.5	Streambank Condition.....	8
4.3.6	Flow Condition .....	9
4.3.7	Site Location/Map (optional) .....	9
4.3.8	Additional Comments.....	9
5.0	Quality Control/Quality Assurance.....	9
6.0	Terms.....	9
7.0	References.....	10
	Appendix 1.....	11
	Appendix 2.....	12

## 1.0 PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) describes the methods for collecting streambank and channel attributes in the field. All personnel who collect streambank and channel data are responsible for adhering to this procedure. The goal and purpose of this SOP is to collect high quality data that can be: 1) Used to validate or adjust regional curve estimates; 2) Used to identify areas for BMP implementation.

## 2.0 SUMMARY OF METHOD

At each site, collect channel depth measurements, photographs, and GPS data. Additionally, complete all field data sheets.

## 3.0 PRECAUTIONS

Waders and specialized wading boots should be utilized when conducting in-stream sampling to remain dry, but also to provide a barrier from potential in-stream contaminants, and natural irritants (i.e., biting insects, poison ivy). It is recommended that a wading belt be used to reduce the chances of water filling waders during a fall (KDOW, 2011).

Investigators should exhibit caution when collecting field data within or around a stream. Some channels have quicksand-like areas, deep holes, sharp rocks, large woody debris, etc., that can cause foot entrapment, injury, or falls. A rod or stick can be used for stabilization and to probe the streambed when conditions are uncertain. Use professional judgment to assess risks involved with working in the stream channel. Wading across a stream can be dangerous depending on flow and substrate conditions. During high flow or runoff events, sampling should be postponed until baseline conditions exist. Do not attempt to wade into a stream deeper than your waders or where fast moving water is evident. If you start to wade across a stream and discover that you are in a dangerous situation, return to the nearest bank and note "too fast/deep to measure" on the data sheet (NMED, 2011).

## 4.0 DATA COLLECTION

This procedure describes the process for collecting *in situ* measurements and observations of streambank and channel attributes. Data should be recorded on printed versions of the Streambank Erosion Data Sheets:

1) *Measurement and Observation* and 2) *Photos*.

Streambank and channel data include documentation of general land uses, riparian vegetation, and observations/measurements of in-stream parameters such as depth and flow. This information will provide insight into streambank erosion issues and conditions that may significantly affect erosional processes.

### EQUIPMENT AND TOOLS

- field notebook or data sheets
- clipboard
- pencils/pens
- tape measure
- stadia rod or height stick
- digital camera
- Global Positioning System (GPS) unit

#### 4.1 MEASUREMENT AND OBSERVATION DATA SHEET

Before assessing streambank and channel attributes, complete the following information on the *Streambank Erosion Data Sheet – Measurement and Observation (Appendix 1)*:

##### 4.1.1 Header Information (Site Identifier)

The header provides information to identify the site where the survey was conducted such as: stream/watershed name; GPS waypoint ID (latitude/longitude), date of survey, and the investigators responsible for the quality and integrity of the data.

- GPS waypoint ID: establish a waypoint using the GPS device (e.g. Indian001). The waypoint with store the latitude/longitude of the site.

##### 4.1.2 Weather Condition

Note the present weather condition on the day of the survey and those immediately preceding the day of the survey (previous 24hrs). This information is important to interpret the effects of storm events on the sampling effort. Select either precipitation or no precipitation on the data sheet.

#### 4.2 PHOTOS

A photograph is helpful in identifying the site location and documenting streambank and channel conditions. Take photographs of eroding streambanks and potential causes of erosion.

##### 4.2.1 General Dos and Don'ts

- Do not zoom
- To ensure proper lighting, do not take photos looking into the sun, take photos with the sun at your back. Also, try to minimize the photographs where part of the frame is in the shadows and part in the sun.
- Do have an object or person in the photo for scale

After taking the photo, complete the following information on the *Streambank Erosion Data Sheet - Photos (Appendix 2)*:

##### 4.2.2 Header Information (Photo Identifier)

The header provides information to link the photo (i.e. photo ID) with the site location (i.e. GPS waypoint ID).

- Photo ID: record the number in the display screen on the back of the camera after you take a photo

- GPS waypoint ID: use the same GPS waypoint ID from the *Measurement and Observation* data sheet.

#### 4.2.3 Position of Photograph

It is important to note whether the photo was taken facing upstream or downstream. Additionally, if the photo is of a streambank, the investigator should note which bank was photographed. The bank is located on either river left or on river right. When facing downstream, the left bank is located on river left. When facing downstream, the right bank is located on river right.

### 4.3 STREAMBANK & CHANNEL ATTRIBUTES

Measurements and observations should be located at a site representative of the eroding streambanks in the area. In order to find the most suitable location, try to avoid:

- Islands and Bars
- Sites downstream of confining features (e.g. bridges, culverts, log jams, beaver dams, etc.)
- Uneven water surface

The following attributes should be collected at each site:

Channel depth	Channel length	Land use types
Riparian vegetation	Streambank condition	Flow condition

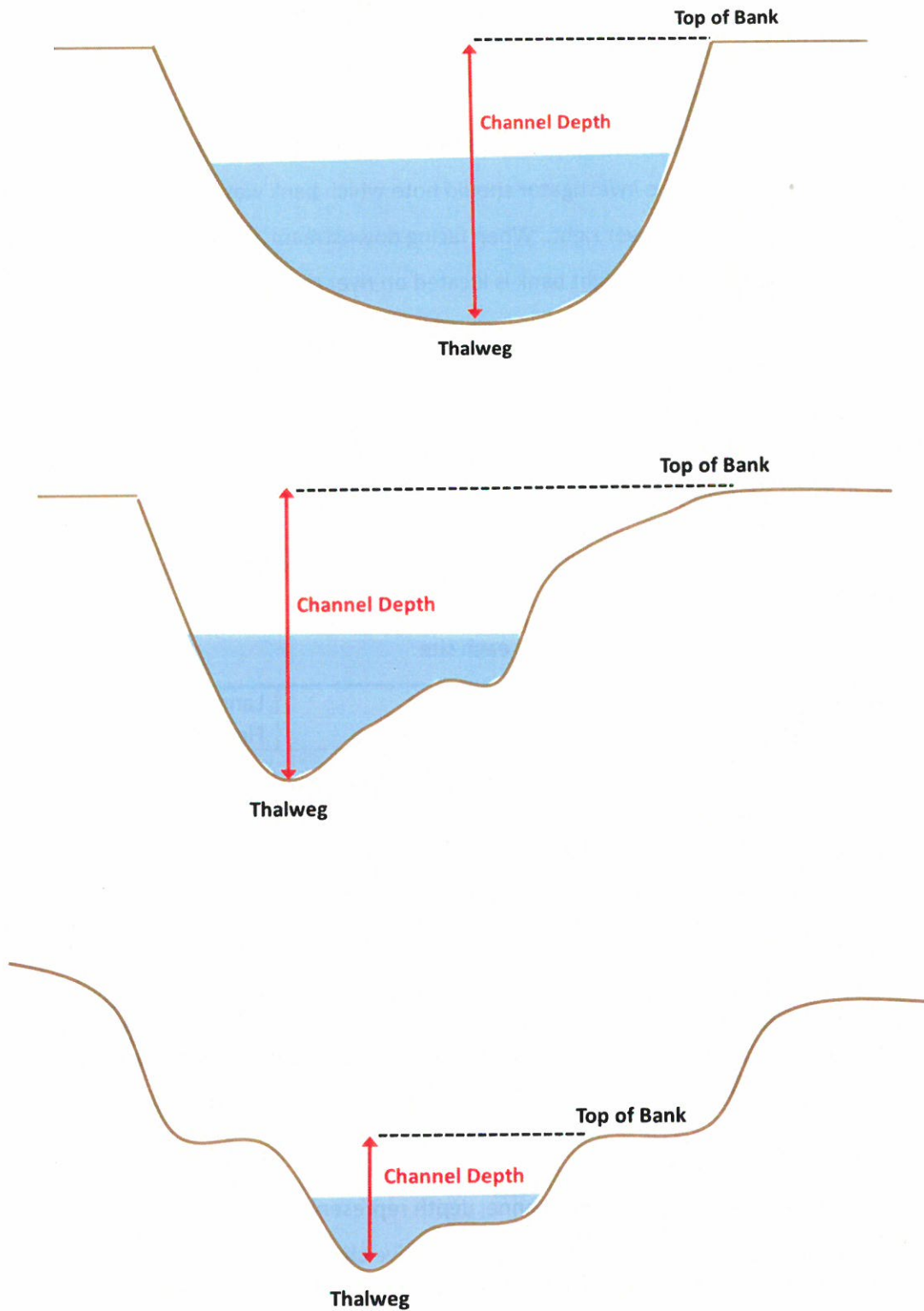
#### 4.3.1 Measuring Channel Depth (**Figure 1**)

1. Identify the top of the streambank
2. Identify the thalweg (i.e. location of maximum stream depth)
3. Using a stadia rod, place the “zero” end of the rod at the channel bottom in the center of the thalweg
4. Extend the survey rod until the top of bank has been reached. Channel depth is measured as the vertical distance from the top of the streambank to the channel bottom at maximum depth.
5. Measurements are recorded to the nearest 0.1m. Several quick measurements should be taken to get a representative average channel depth of the site.

#### 4.3.2 Estimating Channel Length

Used to estimate the length of stream the channel depth represents

1. Identify the longitudinal extent of the representative channel depth
2. Pace off or measure the distance along the thalweg, start at the upstream endpoint and stop at the downstream endpoint
3. Record the channel length estimate



**Figure 1.** Examples of Channel Depth – a) parabolic channel b) channel with distinctive floodplain c) channel with terraced floodplains

### 4.3.3 Predominant Surrounding Land Use Types

Document the prevalent land-use type adjacent to the stream channel. Land use maps should be consulted to accurately document this information. Types include: agriculture, residential, wooded, open, and mixed. More than one land use can be selected (e.g. river left is agriculture and river right is wooded). Use the following descriptions to select the appropriate land use(s):

- Ag – agricultural lands with minimal riparian buffers
- Mix – highly impervious areas (industrial land use, parking lots, STPs, etc.)
- Open – open space such as parks and golf courses
- Residential – individual houses and housing developments, large open lawns; minimal riparian buffer width
- Wooded – prominent riparian buffers with minimal human impact (no development, lots of vegetative/woody cover)
- Wooded/Ag – agricultural land use with prominent buffers between agricultural fields and stream channel; one side of the stream may be dominated by agricultural lands while the other side of the stream is wooded
- Wooded/Residential – residential land use with prominent buffers between houses and stream channel

### 4.3.4 Riparian Vegetation (Figure 2)

Vegetation within the riparian zone is documented based on the following index:

- Optimal – Riparian zone consists of several sizes of trees, shrubs, and grasses with a good streambank buffer width (>5m).
- Sub-Optimal - Surrounding area consists of several sizes of trees, shrubs, and grasses with a marginal streambank buffer width (1 – 5m).
- Marginal - Surrounding area consists of either trees OR shrubs; streambank buffer ranges from good (>5m) to marginal (1 – 5m).
- Poor - Surrounding area consists of short grasses and/or bare soil; no streambank buffer.

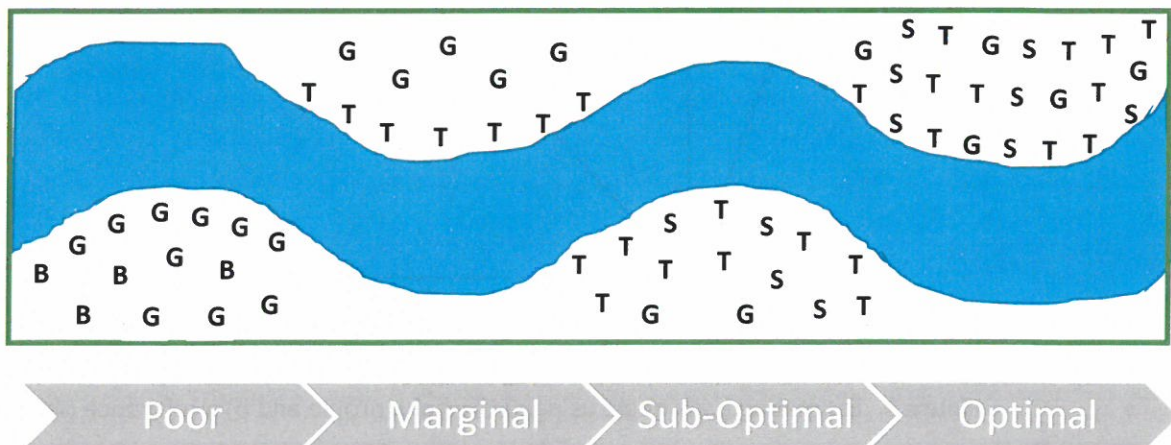
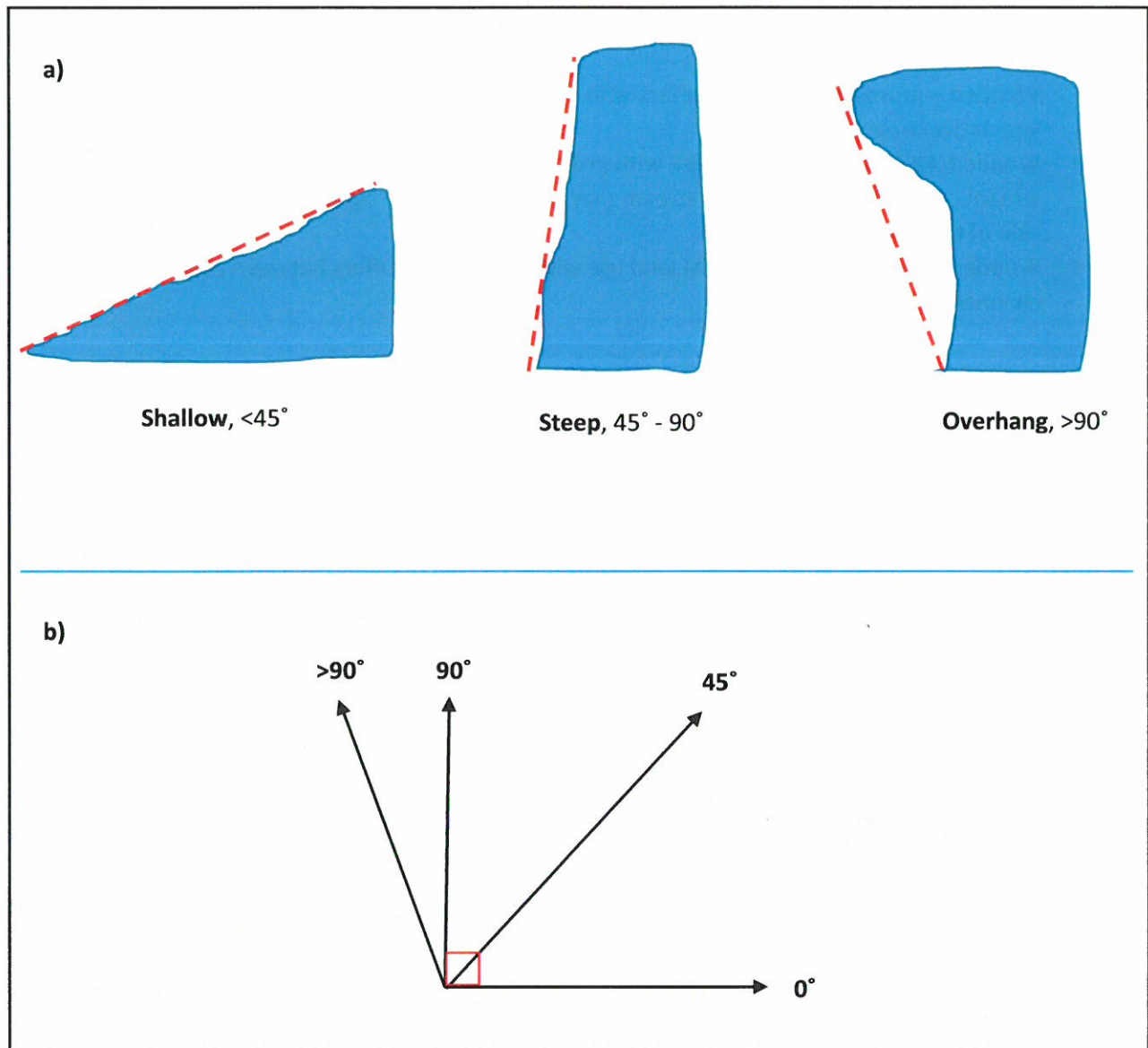


Figure 2. Riparian vegetation index. Legend: B=bare soil, G= grasses, S=shrubs, T=trees.

#### 4.3.5 Streambank Condition

Note observable erosion (e.g. undercuts, slumping, exposed roots), bank surface protection, and estimated bank angle.

- Bank surface protection – percentage of the bank covered by rocks, logs, roots, grasses, etc.
- Estimated bank angle – incline of the bank profile (shallow, steep, or overhang), **Figure 3**



**Figure 3.** Estimating bank angle using a) the bank profile and b) a reference plane.



#### 4.3.6 Flow Condition

Indicate the level of stream flow (dry, stagnant, slow, moderate, or fast).

#### 4.3.7 Site Location/Map (optional)

A hand-drawn map is useful to illustrate major landmarks or features of the channel morphology or orientation, vegetative zone, buildings, etc. that might be used in data interpretation.

#### 4.3.8 Additional Comments

Note any additional information such as odors and appearance associated with the water in the survey site.

### 5.0 QUALITY CONTROL/QUALITY ASSURANCE

Duplicates will be collected to evaluate precision and repeatability of the technique and the sampling crew. The sites will be selected randomly by using a random numbers table or other random numbering method. The number of sites selected for replicate sampling is based on the total number of sites in the study area/watershed. Replicates will be collected by the same sampling crew within the same sampling period. Results will be considered acceptable if the measurements are within 10% of the original measurement. If this does not occur, all biologists will meet to assess the issue and take corrective actions which will be documented with other QA files.

### 6.0 TERMS

*Bank Height* – the top of the bank for a nearly vertical streambank, the top of the first flat feature, usually connects to floodplain

*Channel Depth* – measured as the vertical distance from the top of the streambank to the channel bottom at its maximum depth (thalweg).

*Channel Length* – longitudinal distance measurement along the thalweg of the channel

*Eroded Bank Length* – length of the bank that has observable erosion (e.g. undercuts, slumping, exposed roots)

*Riparian Buffer* – the lateral extent of woody vegetation along the banks of rivers, streams, creeks, or other water networks

*River Left* – the left side of the stream channel when facing downstream.

*River Right* – the right side of the stream channel when facing downstream.

*Streambank Buffer* – the lateral extent of woody vegetation along the banks of rivers, streams, creeks, or other water networks; similar to a riparian buffer but focused on vegetation within 5m of the streambank

*Thalweg* – point of maximum depth in a stream channel; the deepest point in any given cross-section

## **7.0 REFERENCES**

New Mexico Environmental Department (NMED). 2011. Stream flow measurement. New Mexico Environmental Department, Surface Water Quality Bureau, Santa Fe, New Mexico.

Kentucky Division of Water (KDOW). 2011. Methods for assessing habitat in wadable waters. Kentucky Department for Environmental Protection, Division of Water, Frankfort, Kentucky.

**APPENDIX 1: Streambank Erosion Data Sheet – Measurement and Observation**

**STREAMBANK EROSION DATA SHEET - Measurement and Observation**

**Header Information**

Watershed/Stream Name: \_\_\_\_\_ Date: \_\_\_\_\_

Location: \_\_\_\_\_

GPS waypoint ID: \_\_\_\_\_ GPS Lat/Long: \_\_\_\_\_

Data Collectors: \_\_\_\_\_

Current weather:                      Precipitation                      No Precipitation  
 Past weather (last 24hrs):        Precipitation                      No Precipitation

**Streambank/Channel Observations**

<i>Predominant Land Uses</i>	Agriculture	Open	Mixed	Residential	Wooded
	agricultural lands with minimal riparian buffers	open space such as parks and golf courses	highly impervious areas (industrial land use, parking lots, STPs, etc.)	individual houses or housing developments with large open lawns; minimal riparian buffer width	prominent riparian buffers with minimal human impact (no development, lots of woody vegetation)
<i>Flow Condition</i>	Dry	Stagnant	Slow	Moderate	Fast
	no water in the channel	very little water in the channel, mostly present as standing pools; no visual flow	Water moving slowly, with a smooth, unbroken surface	Water moving, with small ripples, waves and eddies	Water movement rapid and turbulent, surface with intermittent whitewater with breaking waves
<i>Riparian Vegetation</i>	Optimal	Sub-Optimal	Marginal	Poor	
	Surrounding area consists of several sizes of trees, shrubs, and grasses; streambank buffer width >5m	Surrounding area consists of several sizes of trees, shrubs, and grasses; streambank buffer width 1-5m	Surrounding area consists of either trees OR shrubs; buffer ranges from 1m to >5m	Surrounding area consists of short grasses and/or bare soil; no streambank buffer	
<i>Bank Angle</i>	Shallow	Steep	Overhang		
	0 - 45 degrees	45 - 90 degrees	> 90 degrees		
<i>Surface Protection</i>	0 - 50%	> 50%			

*Additional Comments (note water appearance, odor, algal growth, substrate embeddedness)*

**Streambank/Channel Measurements**

Channel Depth (m) \_\_\_\_\_ Estimated Channel Length (m) \_\_\_\_\_

**APPENDIX 2: Streambank Erosion Data Sheet – Photos**

STREAMBANK EROSION DATA SHEET - Photo		
<b>Header Information</b>		
Photo ID:	_____	
GPS waypoint ID:	_____	
Direction, <i>circle one</i>	Upstream	Downstream
Bank, <i>circle one</i> (facing downstream)	River Left	River Right
Photo description:	_____	
	_____	
	_____	