

# Monitoring Manual

for Grassland,  
Shrubland and  
Savanna Ecosystems

Volume II: Design, supplementary methods and  
interpretation

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Cover illustration:  
Collecting Line-point intercept data  
in a south-central New Mexico desert grassland.

## Chapter 14

# Riparian channel and gully profile

**T**he Riparian channel and gully profile provides a description of channel shape. This method can also be used to record the shape of the soil surface (e.g., covered by rills and gullies) in uplands.

### Caution!

- Stream currents can be dangerous.
- Use this method only when and where it can be safely applied.

### Materials

- Two 1.5 m (5 ft) rebar stakes
- 100 m (300 ft) roll of nylon string
- Hacksaw
- Hand sledge
- String line level
- Meter stick
- 100 m (300 ft) tape
- Clipboard, Riparian Channel Profile Data Forms and pencil(s)

### Standard Methods (rule set)

#### 1. Determine the location for the profile.

##### Rules

- 1.1 Measure the profile where the Line-point or Gap intercept crosses the channel.
- 1.2 Determine where the edge of the greenline is on each side of the channel.

#### 2. Erect rebar, string and tape.

##### Rules

- 2.1 Using the hacksaw, make a notch on both pieces of rebar about 3 cm from the end.
- 2.2 Pound one rebar in on one side of the channel at least 2 m (6 ft 7 in) in from the edge of the greenline, leaving 25-50 cm (10-20 in) exposed (Fig. 14.1). Install with the notch end up.
- 2.3 Tie the nylon string at the notch and pull it tight across the channel.

- 2.4 Determine how high the other rebar should be in order for the line to be level on the opposite side of the channel, and then pound in the other rebar.
- 2.5 Pull the string tight and tie off at the notch on the second rebar.
- 2.6 Install the line level and fine-tune the depth of either rebar until the line is perfectly level (Fig. 14.2).
- 2.7 Stretch the tape between the pieces of rebar with the 0 end on the left as you are looking upstream.



**Figure 14.1.** Installing rebar 2 m from edge of greenline.



**Figure 14.2.** Level the string across the channel.

### 3. Record the channel profile.

#### Rules

- 3.1 Beginning at the rebar at the 0 m end of the measuring tape, measure the distance from the soil surface to the string, using a meter stick (Fig. 14.3).
- 3.2 Record the position along the tape under "Tape distance" and the channel depth measurement under "Channel depth" on the data form.
- 3.3 Repeat these measurements at 50 cm (1 or 2 ft) intervals.
- 3.4 Make the final measurement at the rebar on the opposite end of the channel.
- 3.5 For riparian systems only (not gullies), record the location of the greenline (bank-full) on each side of the channel.



**Figure 14.3.** Record the channel depth every 50 cm (1 to 2 ft) for the length of the tape crossing the channel.

## Riparian channel profile and soil surface contour indicator calculations

**Note:** Due to the difficulty in defining channel width, the same person should calculate these indicators each time. Save the raw data so the indicators can be recalculated in the future. These indicators can be used to monitor relative changes. Interpretation requires a trained professional who is familiar with the area. Please see Chapter 17 for more information.

### 1. Graph the channel profile.

#### Rules

- 1.1 Mark a line at the top of the graph to represent the string. Make sure it is parallel to the "x" (horizontal) axis, and set it to "0".
- 1.2 Graph heights relative to the "y" (vertical) axis, creating a graph that looks like the shape of the channel.
- 1.3 Always draw the graph as if you are looking at the profile from downstream of it.
- 1.4 Graph each measurement as a negative number against the distance along the measuring tape.
- 1.5 If measurements are not evenly spaced or a measurement is missing and you are using a computer, be sure that the "x" axis is correct. In Microsoft® Excel, you must use the "scatter" (not the "line") graph option.

### 2. Calculate the bank angle.

#### Rules

- 2.1 On the graph, mark the base and top of the bank on the side of the channel marked by the 0 end of the tape.
- 2.2 Measure the horizontal distance between these two points.
- 2.3 Measure the vertical distance between these two points.
- 2.4 Divide the vertical distance by the horizontal distance.
- 2.5 To express the angle in percent, multiply the result of Rule 2.4 by 100.
- 2.6 To express the angle in degrees, use a calculator to calculate the arctangent of the result of Rule 2.4. Excel and some calculators report the result in radians. To convert from radians to degrees, multiply by 57.3. In Excel, the formula is:  
$$=DEGREES(ATAN(\text{result of Rule 2.4})).$$
- 2.7 Record this as the "bank angle (0-end)" in the blank provided on the data form. Include appropriate units (percent or degrees).
- 2.8 Repeat 2.1 through 2.7 for the other bank on the non-zero end of the tape and record as the "bank angle (non-0 end)." Ensure you subtract the base from the top at the non-0 end.

## Channel profile

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### 3. Calculate the width:depth ratio.

#### **Rules**

- 3.1 The *width* is the horizontal (parallel to the “x” axis) distance between the points used for the bank angle at the top of each bank.
- 3.2 The *depth* is the greatest vertical distance from a straight line drawn between these two points to the bottom of the channel. The straight line between the two points will not necessarily be horizontal.
- 3.3 Divide the width by the depth and record as the “width:depth ratio” in the blank provided on the data form.

### **Sinuosity**

The level of sinuosity is an excellent indicator of stream status, particularly in relatively low gradient systems. Sinuosity is most easily quantified using aerial photograph. A simple index of sinuosity is the ratio of distance along the streambed to the straight-line distance between two points.

Example

# Riparian Channel Profile Data Form

Date: 5 October 2002

Shaded cells are for calculations

Monitoring plot: North

Line: 1

Observer: Keith Crossland

Recorder: Keith Crossland

Side of channel where line starts (N, S, E, W): E

Tape distance always starts at "0" with a reading from where the string is tied to the rebar.  
The last reading should be where the string is tied to the rebar on the opposite side of the channel.

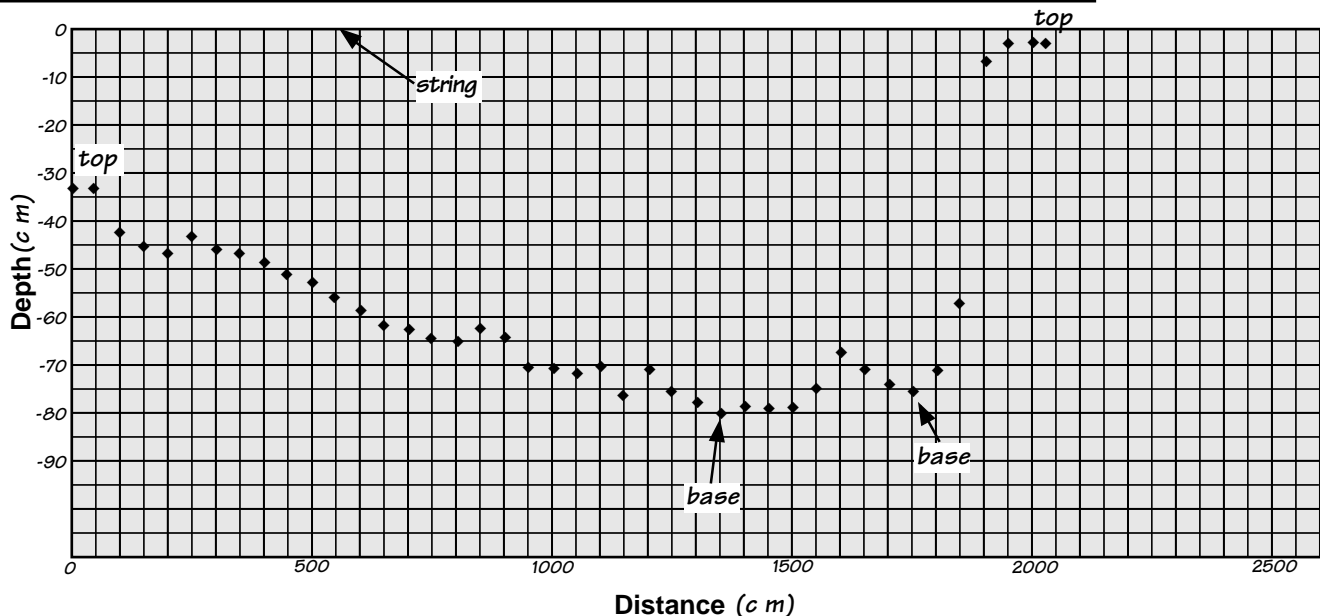
Tape distance	Channel depth (cm)	Tape distance	Channel depth (cm)	Tape distance	Channel depth (cm)	Tape distance	Channel depth (cm)
0	33.0	600	58.5	1200	71.5	1800	71.0
50	33.0	650	62.0	1250	75.5	1850	57.5
100	42.5	700	62.5	1300	77.5	1900	7.0
150	45.5	750	64.5	1350	80.0	1950	3.5
200	46.5	800	65.0	1400	78.5	2000	3.0
250	43.5	850	62.5	1450	79.0	2022	3.0
300	46.0	900	64.5	1500	78.5		
350	47.0	950	70.5	1550	75.0		
400	48.5	1000	70.5	1600	67.5		
450	51.0	1050	72.0	1650	71.0		
500	52.5	1100	70.0	1700	74.0		
550	56.0	1150	76.5	1750	75.5		

$$\text{Bank angle (0 end)} = \frac{\text{vertical distance}}{\text{horizontal distance}} \times 100\% = \frac{47}{1300} \times 100\% = 3.6\%$$

$$\text{Bank angle (non-0 end)} = \frac{\text{vertical distance}}{\text{horizontal distance}} \times 100\% = \frac{75.5}{272} \times 100\% = 27.8\%$$

$$\text{Width:depth ratio} = \frac{\text{width}}{\text{depth}} = \frac{1750}{80} = 21.9$$

Remember for this end:  
2022 - 1750 = 272



# Riparian Channel Profile Data Form

Date: \_\_\_\_\_

**Shaded cells are for calculations**

**Monitoring plot:** \_\_\_\_\_

Line: \_\_\_\_\_

Observer: \_\_\_\_\_

Recorder: \_\_\_\_\_

Side of channel where line starts (N, S, E, W): \_\_\_\_\_

Tape distance always starts at "0" with a reading from where the string is tied to the rebar.

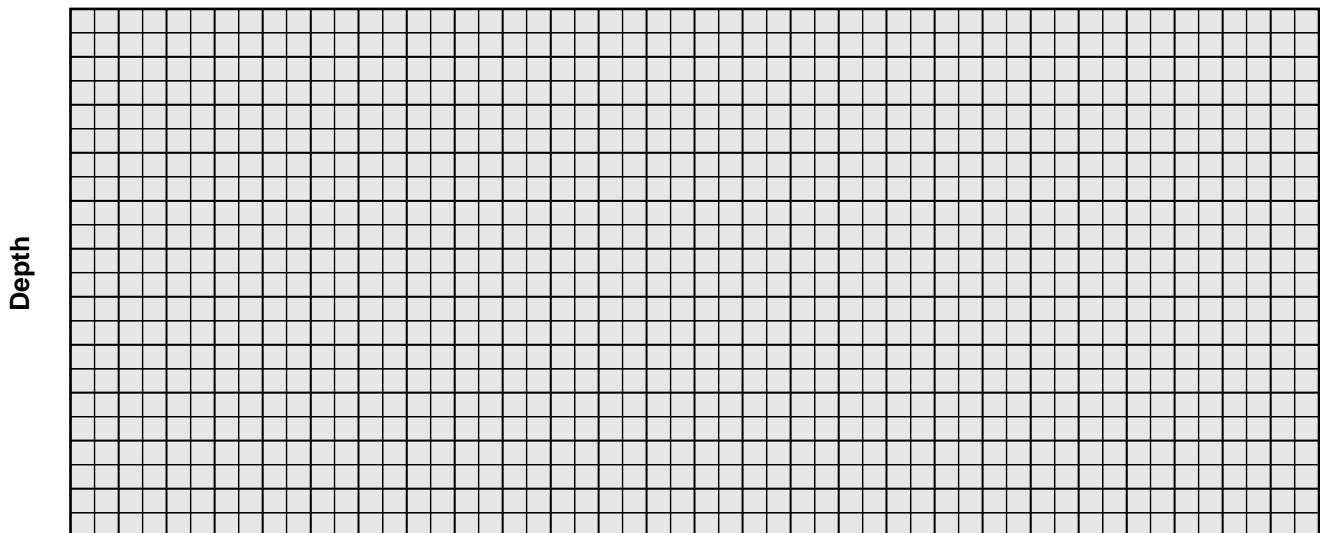
The last reading should be where the string is tied to the rebar on the opposite side of the channel.

[illegible]

$$\text{Bank angle (0 end)} = \frac{\text{vertical distance}}{\text{horizontal distance}} \times 100\% = \frac{\boxed{\phantom{000}}}{\boxed{\phantom{000}}} \times 100\% = \underline{\hspace{2cm}} \%$$

$$\text{Bank angle (non-0 end)} = \frac{\text{vertical distance}}{\text{horizontal distance}} \times 100\% = \frac{\boxed{\phantom{000}}}{\boxed{\phantom{000}}} \times 100\% = \underline{\hspace{2cm}}\%$$

$$\text{Width:depth ratio} = \frac{\text{width}}{\text{depth}} = \frac{\boxed{\phantom{000}}}{\boxed{\phantom{000}}} = \underline{\hspace{2cm}}$$



## Distance