

APPENDIX K—Streambank Stability

Definitions

Base Flow: The typical low flow water level in a stream late in the season is usually in the late summer and fall after the spring snowmelt.

Covered Streambank: Perennial or sod-forming vegetation covers at least 50 percent of the height streambank (the vegetation line is usually at least 20 cm (6 in.) wide and 50 cm (20 in.), cobbles, six inches or larger, anchored large woody debris (LWD) with a diameter of four inches or greater, or a combination of the vegetation, rock, and/or LWD is at least 50 percent).

Crack: A visible fracture that has not separated two portions of a streambank. Cracks indicate a high risk of breakdown.

Depositional Bank: A streambank associated with sand, silt, clay, or gravel deposited by the stream.

False Bank: Streambanks have slumped in the past but have been stabilized by relatively shallow-rooted vegetation. These banks are usually lower than the terrace. False banks vegetated with deep-rooted riparian vegetation may be considered stable and should be counted separately and added to the stable category.

Floodplain Line: The upper limit of the streambank. The floodplain line is the level at which water first spills onto the lowest terrace or floodplain.

Fracture: A crack is visibly obvious on the bank indicating that the block of bank is about to slump or move into the stream.

Scour Bank: That part of the streambank subject to the erosive energy of the stream. Depositional features are absent.

Scour Line: The lower elevational limit of a streambank. The scour line is the elevation of the ceiling of undercut banks along streambanks. On depositional banks, the scour line is the lower limit of sod-forming or perennial vegetation. On small streams, it is generally the base flow.

Slough (Sluff): Soil breaking or crumbling or falling away from a bank (see Illustrations 1 and 2).

Slumping Bank: A streambank that has obviously slipped down. Cracks may or may not be obvious, but the slump feature is obvious.

Streambank: Morphological features of the stream channel created by the erosion and deposition forces of stream flow which control the lateral movement of water (Platts *et al* 1987). Streambanks are that part of a channel between the edge of the 1st terrace and the scour line. Streambanks are the steeper-sloped sides of the stream channel and are most susceptible

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to erosion during high-flow events (Platts *et al.* 1987). Streambanks form above the streambed where vegetation, roots, rocks, and other obstructions cause resistance to the flow energy (Rosgen 1996). Streambanks are subject to instability primarily from the edge of the 1st terrace/floodplain down to the scour line because bankfull discharges occur almost every year (Leopold 1994). Streambanks are the area between the edge of the 1st terrace/floodplain and the scour line.

Terrace: A relatively flat area adjacent to a stream or lake with an abrupt steeper face adjoining the edge of the stream.

1st Terrace: The first relatively flat area adjacent to and above the scour line or at the edge of the water. It may be an active floodplain or an area too high for the water to reach under the current climate and channel conditions (see Figures 1 and 2).

2nd Terrace: The next elevated relatively flat area above the 1st terrace, with a distinctly steeper slope facing the stream (see Figure 2).

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STREAMBANK STABILITY CLASSIFICATION KEY

- I. Streambank Absent (side channel, tributary, slew, road, etc.)..... UN
- II. Streambank present or should be present
 - A. Streambank depositional
 - 1. Streambank not present due to excessive deposition UN
 - 2. Streambank is present (deposition not excessive)
 - a. Bank Covered..... CS
 - b. Bank NOT Covered (Bar) UU
 - B. Streambank erosional or a scour bank
 - 1. Streambank not fractured or the streambank is fractured with the slump block no longer attached to the streambank, and is either lying adjacent to the breakage or is no longer present
 - a. No crack is visible from the scour line up to a point 15 cm behind the top of the streambank
 - (1) Bank covered
 - (a) No evidence of disturbance CS
 - (b) Evidence of disturbance (e.g., erosion, slumping, bank shearing)..... CU
 - (2) Bank **NOT** covered
 - (a) Bank angle within 10 degrees (22%) of vertical or slough actively entering stream UU
 - (b) Bank angle NOT within 10 degrees (22%) of vertical or slough is **not** actively entering stream..... US
 - b. A crack or fracture feature is visible within 15 cm (6 inches) of the top of the streambank—slump block is not attached to the bank
 - (1) Bank is Covered..... CU
 - (2) Bank is NOT Covered UU
 - 2. Streambank is fractured *with* the slump block feature still attached
 - a. The bottom of the slump block feature is below (elevationally) the scour line (view only the fracture feature behind the slump block)
 - (1) Bank NOT covered
 - (a) Bank angle is within 10 degrees (22 %) of vertical or slough actively entering stream UU
 - (b) Bank angle is NOT within 10 degrees (22%) of vertical or slough is **not** actively entering the stream..... US
 - (2) Bank covered CS
 - b. The bottom of the fracture feature behind the slump block is above (elevationally) the scour line (view the bank as a slump block and the fracture feature as a vertical, exposed bank)
 - (1) Bank or fracture feature NOT covered..... UU
 - (2) Bank or fracture feature covered
 - (a) Fracture feature not covered CU
 - (b) Fracture feature covered and reconnected FB

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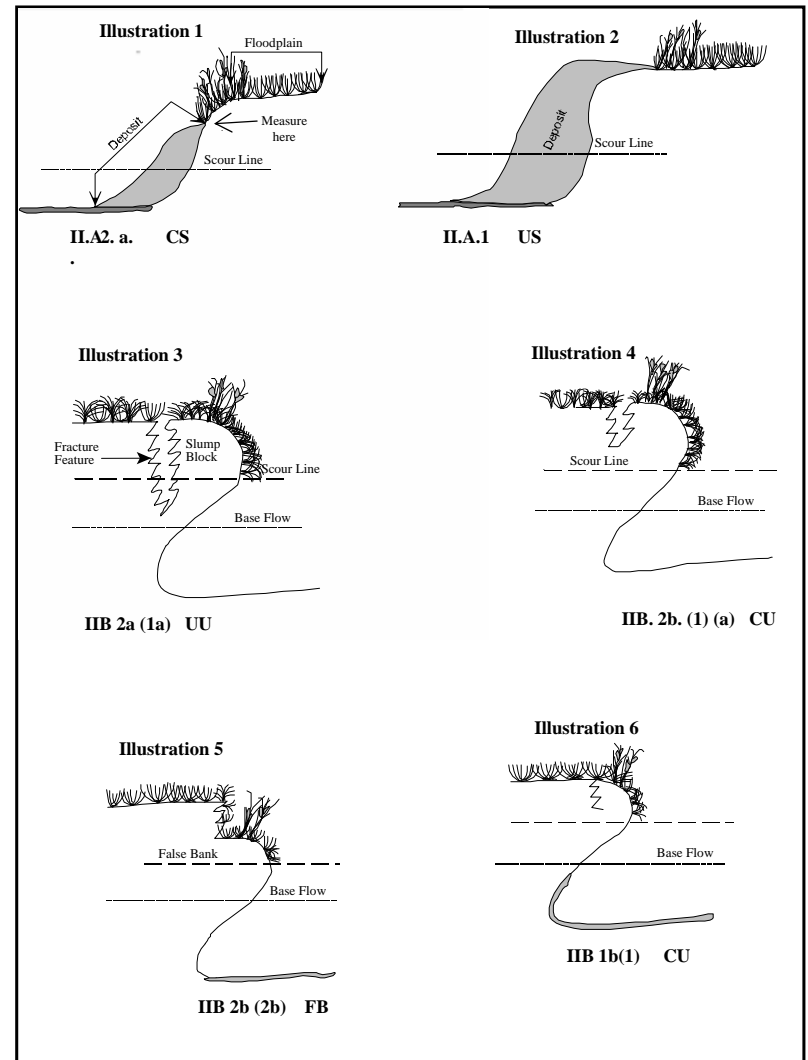


Figure 1—Illustrations of streambank stability classes - Covered stable(CS), Uncovered stable (US), Covered unstable (CU), and Uncovered unstable (UU). Adapted from Kershner *et al.* 2004

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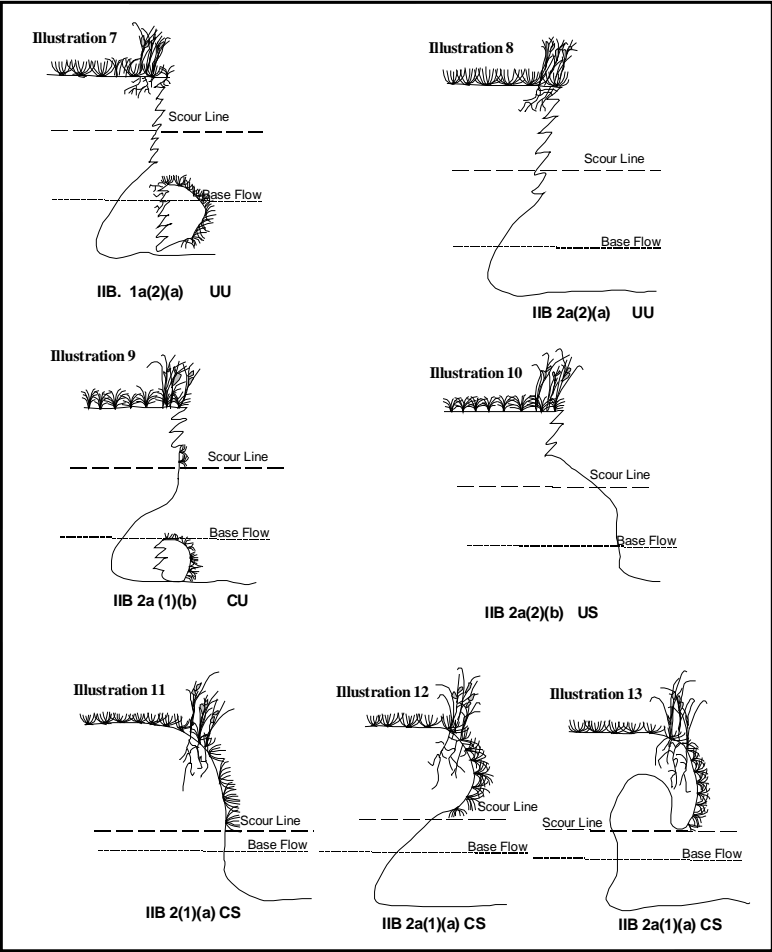


Figure 1 (continued)

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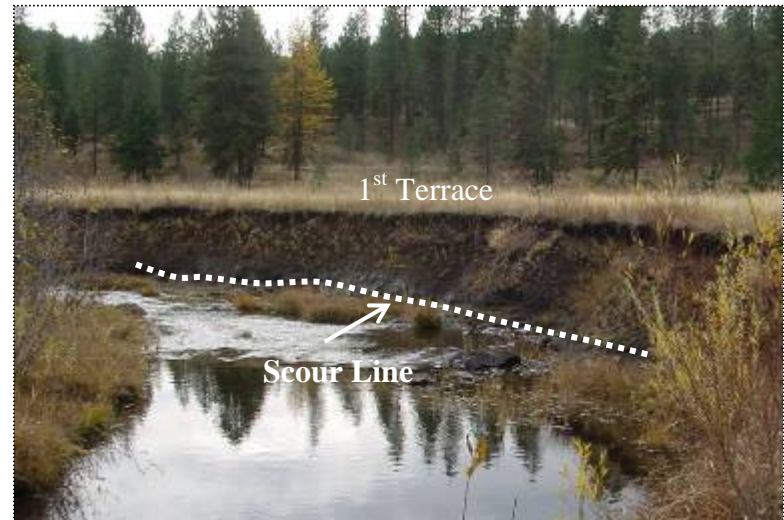


Figure 2—the 1st terrace is the first relatively flat area above the scour line or edge of the water. An abrupt steep face from the edge of the terrace to the scour line is a characteristic of a terrace. Slough from the terrace wall has direct access to the stream.

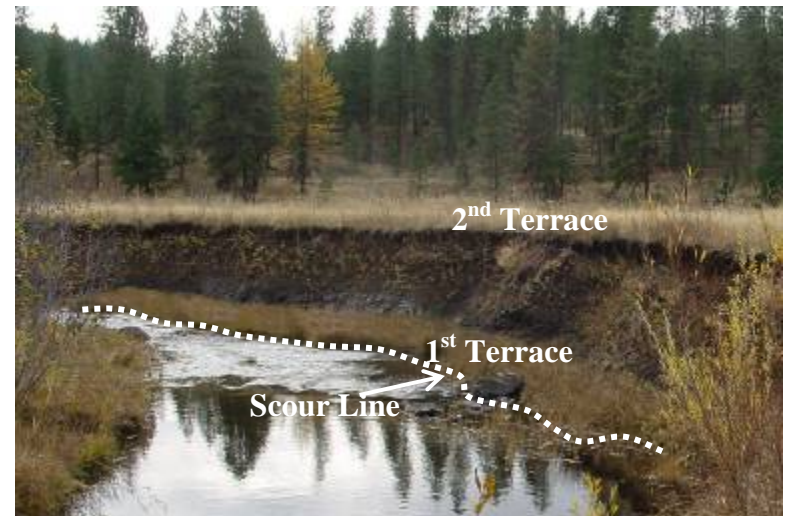


Figure 3—a new floodplain has developed creating the 1st terrace at a lower elevation. Slough from the 2nd terrace does not go directly into the stream as it is filtered by the 1st terrace.

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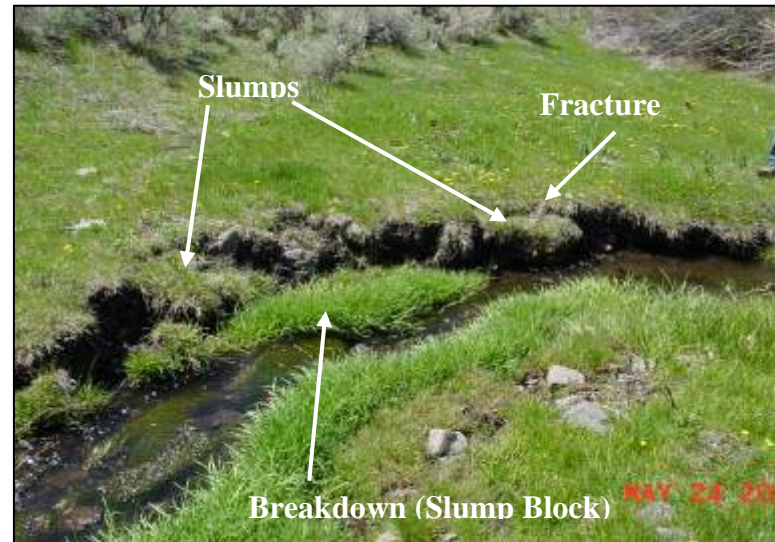


Figure 4—Erosional features help determine the stability of a streambank. Breakdown or slump blocks that are detached from the streambank are not considered part of the streambank. Slumps must be obviously sliding down of a part of the streambank. Fractures are obvious breaking of a portion of the streambank (see Illustrations 3, 4, 6 and 7 above).



Figure 5—the photo above shows a fracture and a large slump that is still attached to the streambank. Vegetation cover is at least 50 percent cover and is classified as covered/unstable (CU). (See Illustration 4.)

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Figure 6—the stream in this photo is flowing at the scour line. Slumps “A” are still attached to the bank above the scour line and would be classified as covered/unstable (CU) (see Illustration 4). “B” has no vegetation along the streambank and is uncovered/unstable (UU) (see Illustration 3).

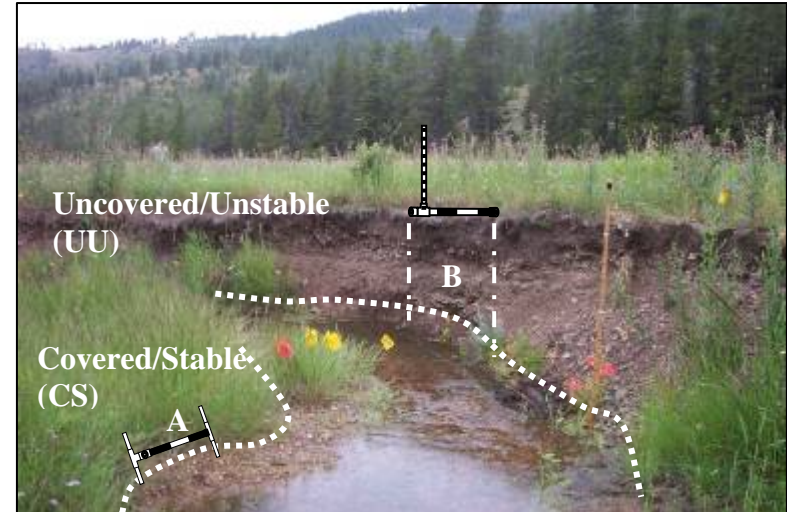


Figure 7—the dotted line represents the scour line. “A” shows a monitoring frame placed on the greenline, just above the scour line. The streambank is covered/stable (CS). Frame at “B” is located on the greenline. Since it is not usually practical to pace along or near the scour line, the length of the frame is projected to the scour line and the streambank is classified. At “B” the streambank is uncovered/unstable (UU). Photo - PIBO, U.S. Forest Service

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Figure 8—slump banks “A” are still attached to the streambank above the scour line and is classified as cover/unstable (CU). The dashed line is the greenline. Photo - PIBO, U.S. Forest Service



Figure 9—slump blocks and slumping banks with the blocks and attached bank above the scour line are covered/unstable (CU).

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Figure 9—false banks (FB) are reattached slump features covered with deep-rooted vegetation. They are an indicator of recovery and are considered stable.



Figure 11—the streambank on one side of the stream is uncovered/unstable (UU) and the other side is covered/stable (CS).

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Figure 12—the scour line is near the current water level. The streambank classification reflects the bank from scour line to first terrace. The bar is covered, therefore stable.



Figure 13—the streambank has an obvious scour line. The streambank is above the scour line to the first terrace and is uncovered/unstable (UU).

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Figure 14—the streambank is not covered with vegetation, rock, or wood. It has a bank angle of more than 10 degrees from vertical with no terrace to capture the sediment, and thus the sediment enters directly into the stream making it uncovered/unstable (UU). Banks are always classified unstable where slough enters the stream.