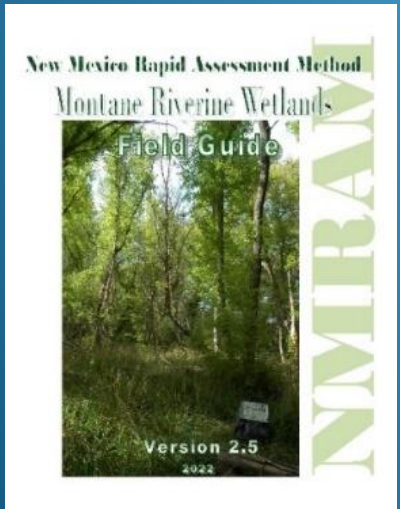
New Mexico Environment Department

New Mexico Rapid Assessment Method (NMRAM)

Riverine Wetlands

Floodplain Hydrologic Connectivity – Intro and Montane



New Mexico Environment Department
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Wetlands Program

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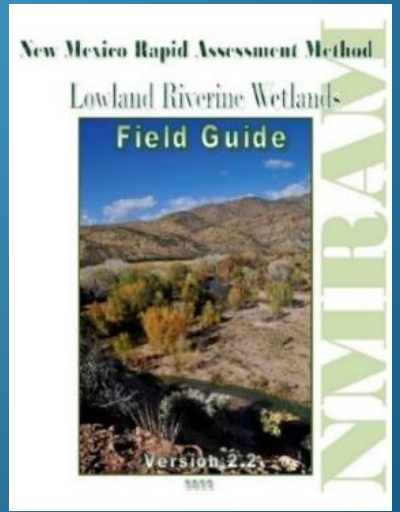


Floodplain Hydrologic Connectivity

Definition: Hydrologic Connectivity is an assessment of the ability of water to flow into or out of the wetland or to inundate adjacent areas.

Rationale: The hydrologic connectivity between the river and the riverine wetlands formed on its floodplain supports ecologic function and plant and wildlife habitat diversity by promoting exchange of water, sediment, nutrients and organic carbon.

Three Methods:

1.) Entrenchment ratio (Montane)

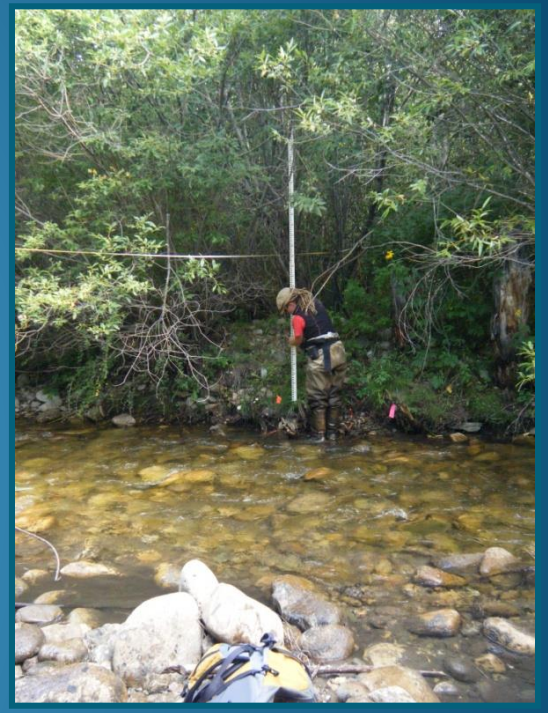
2.) Narrative (Montane)

3.) Evidence Checklist (Lowland)

Floodplain Hydrologic Connectivity
Method 1 – Entrenchment Ratio (montane only)

- Applicable to Rosgen C (riffle-pool) or Rosgen B (step-pool) channel types
- Requires two field technicians
  - Identify bankfull

    Bankfull: The incipient elevation on the bank where flooding begins, associated with moderately frequent flow event
    - See additional videos on bankfull identification
- Measured at three locations in each SA
- Measurement in riffle sections
  - between meander bends
    - Never in pools or on river bends
  - one cross-section per riffle section



Floodplain Hydrologic Connectivity
Method 1 – Entrenchment Ratio

Identifying bankfull and measuring entrenchment ratio

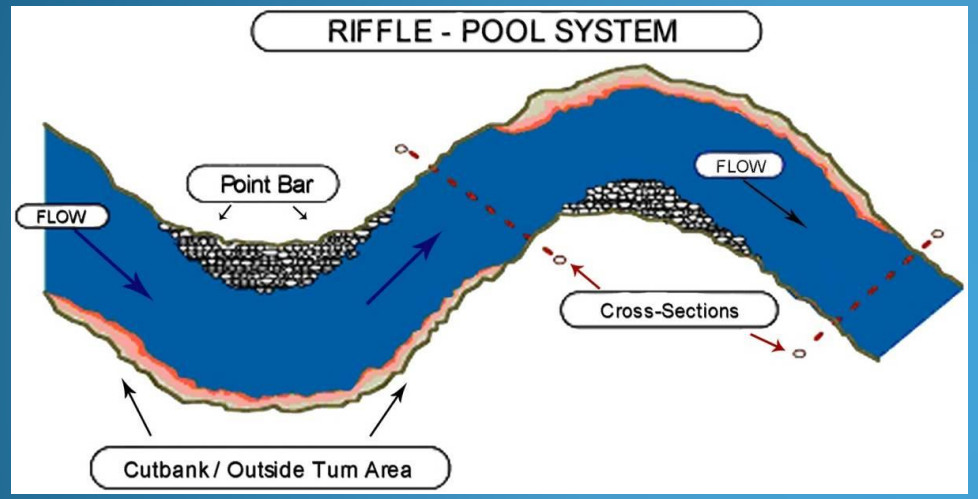
- NMRAM field video guides on this website
  - Follow in order listed on website

- Publicly available resources:
  - USDA Forest Service video - A Guide to Field Identification of Bankfull Stage in The Western United States:
    - https://www.fs.usda.gov/biology/nsaec/products-videoswebinars.html

    Also available on

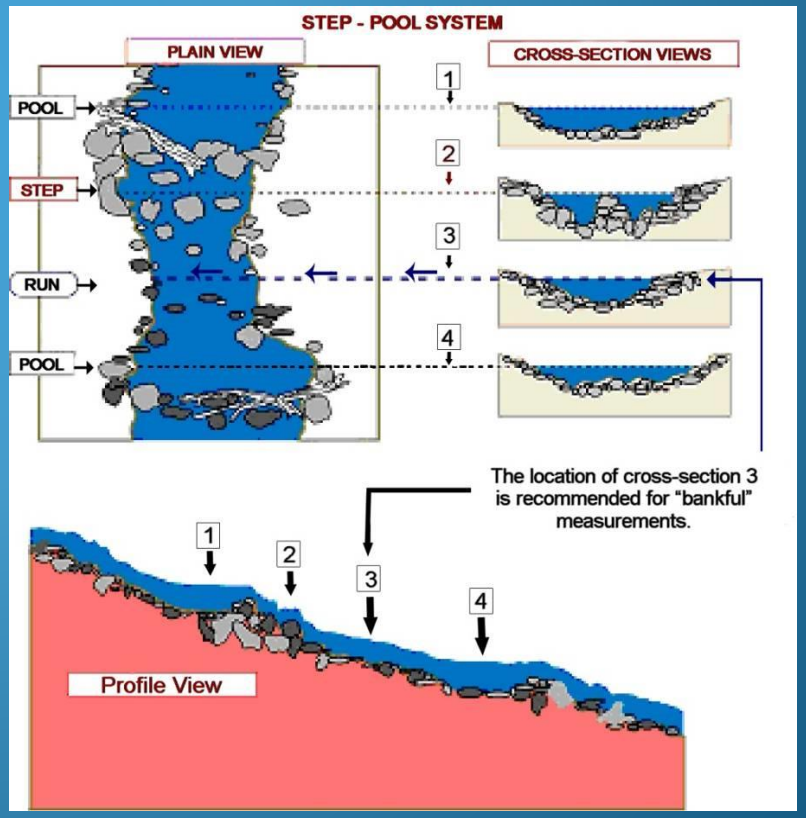
    https://www.youtube.com/watch?v=UuS7H2NxJIM

Floodplain Hydrologic Connectivity
Method 1 – Entrenchment Ratio – channel types



- Rosgen C (riffle-pool)
  - < 2% slope
  - Meandering

- Rosgen B (step-pool)
  - 2-4% slope
  - Less channel sinuosity

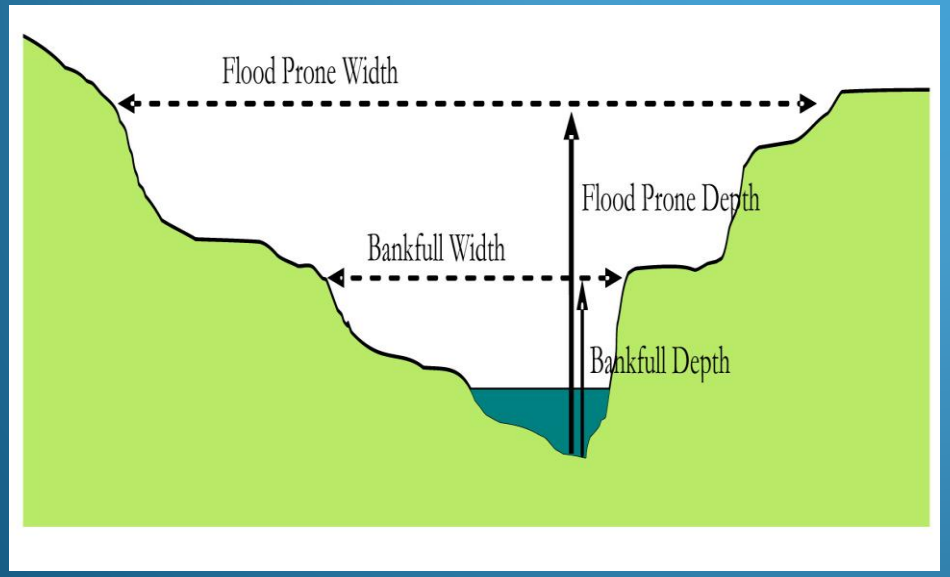


Floodplain Hydrologic Connectivity

Method 1 – Entrenchment Ratio

1. Identify bankfull
2. Measure the bankfull width
3. Measure the bankfull depth at the thalweg
4. Double the bankfull depth (flood prone depth)
5. Measure the flood prone width at the flood prone depth
6. Calculate Entrenchment Ratio

   Flood prone width/bankfull width
7. Rate using Table A1a for riffle-pool systems, or Table A1b for step-pool systems



Floodplain Hydrologic Connectivity
Method 1 – Entrenchment Ratio

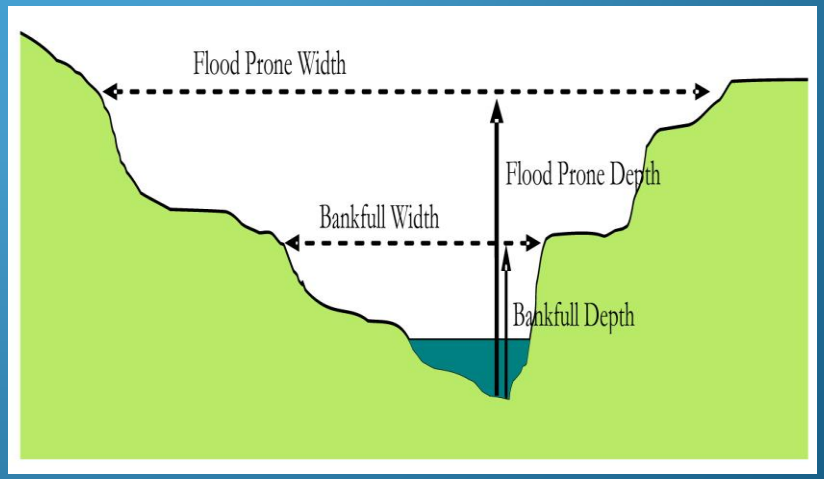
Abiotic Metrics

A1 - Floodplain Hydrologic Connectivity

Method 1

Worksheet 10a. Floodplain Hydrologic Connectivity Measurements. The following six steps are conducted at each of three cross-sections at the approximate mid-points along straight riffles and away from deep pools or meander bends. Use a measuring tape and temporary stakes for horizontal measurements, and a stadia rod or similar measuring stick for vertical measurements. If unavailable, use visual estimates. Where straight channel segments do not occur, or if there is excessive ponding or bankfull indicators are obscured, use the narrative rating approach (Method 2). Enter the rating method in the box below, either meander pool, riffle pool or narrative (Method 2) and choose the corresponding Table (A1a, A1b, or A1c) to rate Floodplain Hydrologic Connectivity. Enter the rating on the SA Rank Summary Worksheet. Photographs of each cross-section are required and recorded in Table A1d.

Steps	Description	Cross-section:	1	2	3
1: Bankfull width	This is a critical step requiring familiarity with field indicators of the bankfull contour. Measure the distance between the right and left bankfull contours with a tape.				
2: Maximum bankfull depth	Keeping the tape level between the right and left bankfull contours, measure the height of the line above the thalweg (the deepest part of the channel). A pocket line level can help here.				
3: Flood-prone depth	Double the estimate of maximum bankfull depth from Step 2.				
4: Flood-prone width	Using a tape, measure the length of a level line at a height equal to the flood prone depth from Step 3 to where it intercepts the right and left banks.				
5: Calculate Entrenchment Ratio	Divide the flood-prone width (Step 4) by the bankfull width (Step 1).				
6: Calculate average ratio	Calculate the average for Step 5 for all three replicate cross-sections. Enter the average here and rate using Table A1a. Enter the rating in the A1 box on the SA Rank Summary Worksheet.				



Floodplain Hydrologic Connectivity
Method 1 – Entrenchment Ratio

Abiotic Metrics

A1 - Floodplain Hydrologic Connectivity

Method 1

Worksheet 10a. Floodplain Hydrologic Connectivity Measurements. The following six steps are conducted at each of three cross-sections at the approximate mid-points along straight riffles and away from deep pools or meander bends. Use a measuring tape and temporary stakes for horizontal measurements, and a stadia rod or similar measuring stick for vertical measurements. If unavailable, use visual estimates. Where straight channel segments do not occur, or if there is excessive ponding or bankfull indicators are obscured, use the narrative rating approach (Method 2). Enter the rating method in the box below, either meander pool, riffle pool or narrative (Method 2) and choose the corresponding Table (A1a, A1b, or A1c) to rate Floodplain Hydrologic Connectivity. Enter the rating on the SA Rank Summary Worksheet. Photographs of each cross-section are required and recorded in Table A1d.

Steps	Description	Cross-section:	1	2	3
1: Bankfull width	This is a critical step requiring familiarity with field indicators of the bankfull contour. Measure the distance between the right and left bankfull contours with a tape.		9.08	7.64	8.74
2: Maximum bankfull depth	Keeping the tape level between the right and left bankfull contours, measure the height of the line above the thalweg (the deepest part of the channel). A pocket line level can help here.		0.75	0.52	0.46
3: Flood-prone depth	Double the estimate of maximum bankfull depth from Step 2.		1.5	1.04	0.92
4: Flood-prone width	Using a tape, measure the length of a level line at a height equal to the flood prone depth from Step 3 to where it intercepts the right and left banks.		25	50	35
5: Calculate Entrenchment Ratio	Divide the flood-prone width (Step 4) by the bankfull width (Step 1).		2.7533	6.5445	4.0045
6: Calculate average ratio	Calculate the average for Step 5 for all three replicate cross-sections. Enter the average here and rate using Table A1a. Enter the rating in the A1 box on the SA Rank Summary Worksheet.				4.4341

Rating Method: Riffle Pool Systems

Table A1a. Rating for Floodplain Hydrologic Connectivity in meandering single-channel riffle-pool systems

Rating	Description
(●) 4	Average entrenchment ratio is ≥ 2.2;
( ) 3	Average entrenchment ratio is ≥1.9 - <2.2
( ) 2	Average entrenchment ratio is ≥1.5 - <1.9
( ) 1	Average entrenchment ratio is < 1.5

Table A1b. Rating for Floodplain Hydrologic Connectivity in single-channel step-pool systems

Rating	Description
( ) 4	Average entrenchment ratio is ≥ 1.9
( ) 3	Average entrenchment ratio is ≥1.4 - <1.9
( ) 2	Average entrenchment ratio is ≥1.2 - <1.4
( ) 1	Average entrenchment ratio is < 1.2

Floodplain Hydrologic Connectivity

Method 2 – Narrative

Use in situations where bankfull can not be determined due to beaver ponds, or because cross-sections are otherwise impractical

Worksheet 10b. Floodplain Hydrologic Connectivity Indicators. Use this Worksheet in conjunction with Table A1c. Check the boxes for all that apply to each segment.

U	M	L	Indicator
☐	☐	☐	Bankful is slightly below bank height
☐	☐	☐	Bankful is well below bank height and channel is incised
☐	☐	☐	Channel widening due to bank failure
☐	☐	☐	Constructed levees preclude floodplain inundation
☐	☐	☐	Stream is straightened/channelized
☐	☐	☐	Inset floodplain formation
☐	☐	☐	Decreased peak flows due to hydrologic modification
☐	☐	☐	Bankfull indicators at point of incipient flooding of the floodplain
☐	☐	☐	Indicators of overbank flow on floodplain
☐	☐	☐	Floodplain inundation due to beaver activity

Table A1c. Narratve Floodplain Hydrologic Connectivity Rating. Select the narrative description that best describes the floodplain hydrologic connectivity. At each cross-section, use Worksheet 10b to record channel incision, bank modification, inset floodplain or other hydrologic evidence that would preclude natural floodplain inundation. Conversely, assess indicators and evidence for overbank flow and floodplain inundation. Record whether beaver activity is obscuring bankful indicators due to inundation of the floodplain. Select a rating from the table below. Use data from Worksheets 10b to help select rating. Enter Rating on SA Summary Worksheet. Photographs are required at each cross-section and recorded in Table A1d.

Rating	Description
○ 4	Fully connected to the natural floodplain. Indicators of bankfull discharge are at the bank/floodplain transition, with over-bankfull flows likely to inundate a broad area of floodplain. Floodplain supports riparian vegetation and shows signs of overbank sediment deposition. Or beaver ponds inundate the entire, normally active floodplain and preclude the identification of bankfull indicators and the active floodplain width.
○ 3	Flow access to the floodplain moderately limited by incision, channelization. Less frequent inundation than fully connected streams described above (as noted by bankfull indicators below floodplain transition). Floodplain supports a riparian overstory, but some understory plants may be upland. An inset floodplain supporting riparian vegetation may also be present.
○ 2	Incised, channelized or modified with an inset floodplain formed, which is regularly inundated and supports riparian vegetation and sediment regimes. Or the stream has minimal access to the natural floodplain due to incision, channelization, or flow modification, and the natural floodplain does not support riparian vegetation except for relatively long-lived phreatophytes (e.g., cottonwood, salt cedar, etc.).
○ 1	Fully disconnected from floodplain, either through incision, bank modification/channelization, or hydrologic modification (i.e., abandonment of floodplain due to decreased peak flows). Indicators may include upland vegetation and lack of overbank sediment deposits on the floodplain, etc.