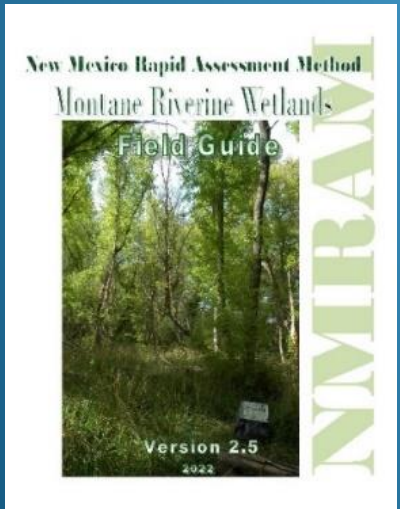
New Mexico Environment Department

# New Mexico Rapid Assessment Method (NMRAM)

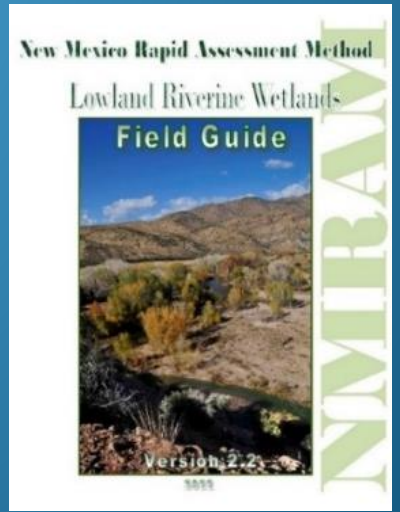
## *Riverine Wetlands*

# Floodplain Hydrologic Connectivity - Lowland




New Mexico Environment Department
Surface Water Quality Bureau
Wetlands Program

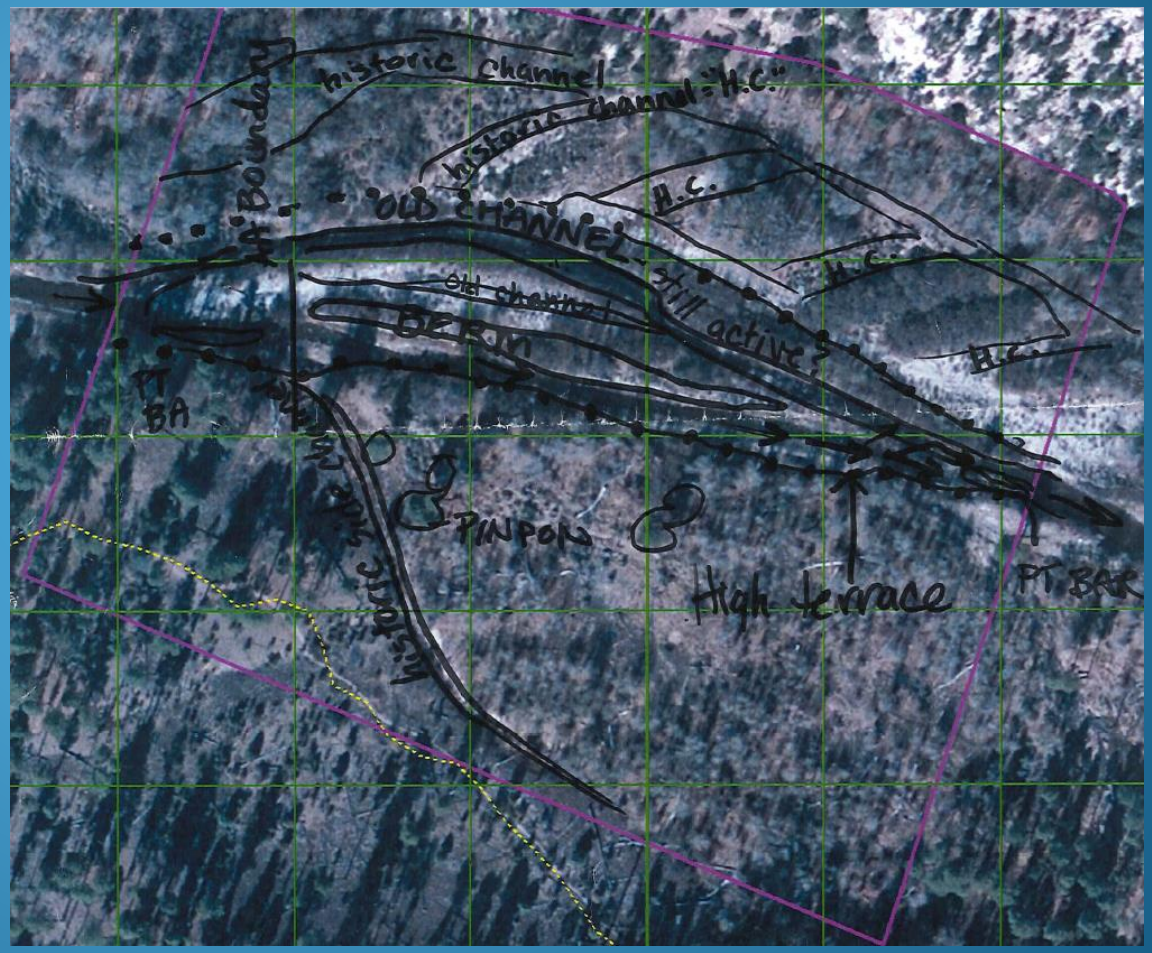
Natural Heritage New Mexico
University of New Mexico



# Floodplain Hydrologic Connectivity
## Method 3 – Evidence Checklist (Lowland Only)

### Floodplain survey

- three transects
- checklists with narrative descriptions to arrive at an assessment
- sketch of major features of the floodplain on the SA abiotic map to aid in filling out the checklist and for later interpretation



# Floodplain Hydrologic Connectivity
## Method 3 – Evidence Checklist (Lowland only)

- Applicable to large lowland rivers which may be single or multi-channel systems
- Use USGS gage data
  - http://nwis.waterdata.usgs.gov/nm/nwis
- Estimate the volume of the most recent peak flow (within last 5 years)
- Calculate the recurrence interval for that peak flow
  - Detailed steps provided in **Appendix G**
- During traverse of each SA segment record indicators of hydrologic connectivity
  - Worksheet 11a – overall inundation indicators
  - Worksheet 11b – supplemental inundation indicators
- Based on observed indications of inundation rate with Table A1
  - Used rating sub-table that matches the calculated return interval

# Floodplain Hydrologic Connectivity

## Worksheet 11a1. Surface Inundation – cumulative

- For each segment (upper, middle, lower)
- Overall percentage of inundation
  - Use provided ranges
  - Indications of inundation
    - Fresh Sediment
    - Scouring
    - Wrack lines
    - Mud cracks

| 11a1. SA Surface Inundation - cumulative | | | | |
|---|---|---|---|---|
| U | M | L | % of SA | Description |
| ☐ | ☐ | ☐ | ≥ 75% | The degree that recent large flood events have inundated the SA surface depositing fresh sediments, scouring surfaces, depositing fine wrack lines, and leaving mud cracks in fine sediment. Watch for indicators during each traverse, then select the percentage range that best fits the observed evidence. |
| ☐ | ☐ | ☐ | ≥ 50% to < 75% | |
| ☐ | ☐ | ☐ | ≥ 35% to < 50% | |
| ☐ | ☐ | ☐ | ≥ 20% to < 35% | |
| ☐ | ☐ | ☐ | ≥ 10% to < 20% | |
| ☐ | ☐ | ☐ | ≥ 5% to < 10% | |
| ☐ | ☐ | ☐ | ≥ 1% to < 5% | |
| ☐ | ☐ | ☐ | > 0% to <1% | |
| ☐ | ☐ | ☐ | 0% | |

# Floodplain Hydrologic Connectivity

## Worksheet 11a2. Surface Inundation – extent

- For each segment (upper, middle, lower)
- Locations of inundation
  - Estimated percentage by general location
    - Channel edge
    - SA Center
    - Outer edge
  - Rough estimate of number of inundated features by segment (Many, Few, Absent)
    - Overbank Flow
    - Active Side Channels
    - High flow channels
    - Abandoned channels

| 11a2. SA Surface Inundation - extent | | | | |
|---|---|---|---|---|
| % U | % M | %L | General Location | Description |
| | | | Channel edge | The extent (location) of SA wetting and pathways for inundation. Lowland systems evidence of flooding should be many across the floodplain. Use the Abiotic SA Map to estimate unvisited locations. Note that abandoned side channels can be inundated through hyporheic (local water table) connections (oxbows) or abandoned through channel avulsion showing no indicators of recent flow. |
| | | | SA Center | |
| | | | Outer edge | |
| **SA Inundation Features: enter a M if many indicators occur, F if few occur, or A if indicators are absent in the SA for each transect from the Abiotic SA Map.** | | | | |
| | | | Overbank flow | |
| | | | Active side channels | |
| | | | High flow channels | |
| | | | Abandoned channels | |

# Floodplain Hydrologic Connectivity

## Worksheet 11b. Supplemental Inundation Indicators

- For each segment (upper, middle, lower)
- Presence of supplemental indictors by category
  - Recent flood deposited large woody debris (FDLWD)
  - Side Channel Wetting
  - SA Surface Litter

**Worksheet 11b** - Floodplain Hydrologic Connectivity Supplemental Inundation Indicators - For each supplemental indicator estimate the rating for each segment using the rating description. If no indicators are present, check the X box for the segment.

| U | M | L | Rating | Rating Description | Supplemental Indicator |
|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | 4 | Fresh FDLWD found scattered throughout the SA | **A. Recent Flood Deposited Large Woody Debris(FDLWD):** Presence of FDLWD that looks recently transported by flow (i.e., minimal disturbance from animals, no recent termite infestation, etc). Does not include non-fluvial woody debris piles (slash, deadfall, etc); does include reworked or old woody debris with new deposits on top. Woody debris must be >4" diameter to count as large. |
| ☐ | ☐ | ☐ | 3 | Fresh FDLWD has limited distribution across SA; only near large active side channels or main channel | |
| ☐ | ☐ | ☐ | 2 | Fresh FDLWD rare and close to the main channel | |
| ☐ | ☐ | ☐ | 1 | FDLWD present, but no fresh deposits | |
| ☐ | ☐ | ☐ | X | No FDLWD of any kind present in SA | |
| ☐ | ☐ | ☐ | 4 | Side channels have indicators of recent flow throughout SA | **B. Side Channel Wetting:** Side channels, when present, should be actively connected to the main channel, i.e. one or more side channels disperse peak flows across the floodplain. Indicators of active flow within the channels are recently deposited or scoured sediments, ripple-marks, pushed over or recently buried vegetation, fine wrack, lack of litter, or litter buried by sediment. |
| ☐ | ☐ | ☐ | 3 | Some side channels show indications of flow, but limited in extent or volume | |
| ☐ | ☐ | ☐ | 2 | Side channels show indications of very limited flow extent and volume | |
| ☐ | ☐ | ☐ | 1 | Side channels show no indications of flow | |
| ☐ | ☐ | ☐ | X | No side channels present | |
| ☐ | ☐ | ☐ | 4 | Minimal litter present, or litter very recent or covered by sediment | **C. SA Surface Litter:** Recent flooding will reduce natural tree and shrub litter, most litter is either decomposed rapidly under moist conditions or is covered by sediment, or removed downstream. Rate litter depth only on portions of SA were litter producing woody species are present. |
| ☐ | ☐ | ☐ | 3 | Litter layers scattered in small patches; not deep (< 2 cm thick) | |
| ☐ | ☐ | ☐ | 2 | Litter layers moderately thick (2-5 cm) and generally large patches | |
| ☐ | ☐ | ☐ | 1 | Litter layers very thick (>5 cm) and distributed over large areas. | |
| ☐ | ☐ | ☐ | X | Minimal or no litter producing woody species present, or litter removed by human activity | |

Photo below is an example of large woody debris that is NOT flood deposited

Photo to left is an example of flood deposited large woody debris (FDLWD)

Photo to right is an example of active side channel that was very recently inundated

Photo to left is an example of thick litter layers

# Floodplain Hydrologic Connectivity

## Table A1. Floodplain Hydrologic Connectivity Rating

**Table A1.** Floodplain Hydrologic Connectivity Ratings. Select a ratings table based on estimated return interval for the peak stream discharge that occurred on the SA within last five years. Use data from worksheets 11a1., 11a2., and 11b to help select ratings.

**>25 year recent peak discharge return interval**

| Rating | Description |
|---|---|
| 4 | Highly connected wetlands that have evidence of inundation across the majority of the SA surface (≥50%) and signs of flow in all but the oldest side channels. Active side channels are not limited to the SA bank edge. |
| 3 | Moderately connected wetlands have moderate evidence of inundation of the SA surface (25 to <50%) but still show signs of flow in the majority of side and back channels. Active side channels are not limited to the SA bank. |
| 2 | Minimally connected wetlands have limited evidence of inundation of the SA surface (10 to <25%), if active side channels exist they are only found near the channel banks. Most of the SA is dry, side channels away from the bank edge appear abandoned, rarely active, or do not exist. |
| 1 | Disconnected wetlands have minimal or no evidence of inundation across the SA surface (<10%) and no signs of flow in any side channels or side channels do not exist. ***Or*** evidence of inundation across SA but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel. |

**10-25 year recent peak flow return interval**

| Rating | Description |
|---|---|
| 4 | Highly connected wetlands have moderate evidence of inundation of the SA surface (≥25%) and signs of flow in all but the oldest side channels. Active side channels are not limited to SA bank edge. |
| 3 | Moderately connected wetlands have limited evidence of inundation of the SA surface (10% to <25%) and signs of flow in the majority of side and back channels. Active side channels are not limited to the SA bank edge. |
| 2 | Minimally connected wetlands have minimal evidence of inundation of the SA surface (5% to <10%) , If active side channels exist they are only found near the channels banks,. Most if the SA is dry, side channels away from the bank edge appear abandoned, rarely active, or do not exist. |
| 1 | Disconnected wetlands have almost no evidence of inundation across the SA surface (<5%) and no signs of flow in any side channels or side channels do not exist. ***Or*** evidence of inundation across SA but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel. |

**2-10 year recent peak discharge return interval**

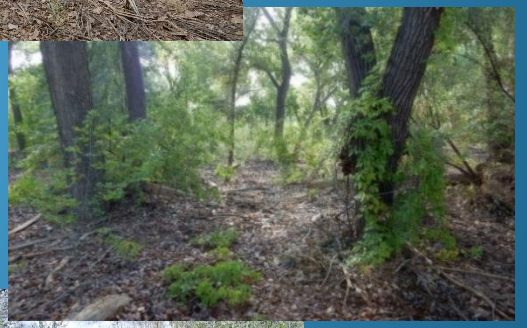
| Rating | Description |
|---|---|
| 4 | Highly connected wetlands have limited evidence of inundation of the SA surface (≥10%) and signs of flow in many side channels. Active side channels are not limited to the SA bank edge. |
| 3 | Moderately connected wetlands have minimal evidence of inundation of the SA surface ( 5% to <10%) and signs of flow in some side channels. Active side channels are not limited to the SA bank edge. |
| 2 | Minimally connected wetlands have almost no evidence of inundation of the SA surface (1% to <5%) and where active side channels exist they are only be near the channel banks. Most of the SA is dry, side channels away from the bank edge appear abandoned, rarely active, or do not exist. |
| 1 | Disconnected wetlands have no evidence of inundation across the SA surface (<1%) and no signs of flow in any side channels or side channels do not exist. ***Or*** evidence of inundation across Sa but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel. |

**1-2 year recent peak discharge return interval**

| Rating | Description |
|---|---|
| 4 | Highly connected wetlands have minimal evidence of inundation of the SA surface (≥5%) and signs of flow in most side channels. Active side channels are not limited to the SA bank edge. |
| 3 | Moderately connected wetlands have no evidence of inundation of the SA surface (1% to <5%), Side channels do not appear abandoned even though signs of flow maybe lacking, they are not limited to the SA bank edge. |
| 2 | Minimally connected wetlands have no evidence of inundation of the SA surface (<1%) and where active side channels exist they are only found near the channel banks. Most of the SA is dry, side channels away from the bank edge appear abandoned, or do not exist. |
| 1 | Disconnected wetlands have no evidence of inundation across the a SA surface and no signs of flow in any side channels, ***Or*** evidence of inundation across SA but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel. |

Rating Adjustment Comments (Use this box when additional flooding evidence recorded supports ratings adjustment.)

Pick rating table based on estimated return interval for peak discharge that occurred on SA within last 5 years



# Floodplain Hydrologic Connectivity

## Worksheet 11a1 and 11b

### Example SA – Tingley Beach 2019

**A1 - Floodplain Hydrologic Connectivity**

**Worksheet 11a. 1.** Based on evidence observed during the traverse of each segment (Upper (U), Middle (M), and Lower (L)), estimate the percentage of overall level of SA flood inundation **(11a1.)**. For each segment include all SA surfaces inundated due to flooding from the channel, side channels, or groundwater, but ignoring inundation from culverts (or other man-made inputs) and from non-channel sources originating outside the SA. **2.** Estimate extent (percent) of surface inundation **(11a2.)** in each segment in three locations, channel edge, SA center and outer edge. Enter M, F or A for indicators of inundation features present in each segment from Abiotic SA Map.

| 11a1. SA Surface Inundation - cumulative | | | | | 11a2. SA Surface Inundation - extent | | | | |
|---|---|---|---|---|---|---|---|---|---|
| U | M | L | % of SA | Description | % U | % M | %L | General Location | Description |
| ☐ | ☐ | ☐ | ≥ 75% | The degree that recent large flood events have inundated the SA surface depositing fresh sediments, scouring surfaces, depositing fine wrack lines, and leaving mud cracks in fine sediment. Watch for indicators during each traverse, then select the percentage range that best fits the observed evidence. | 100 | 80 | 100 | Channel edge | The extent (location) of SA wetting and pathways for inundation. Lowland systems evidence of flooding should be many across the floodplain. Use the Abiotic SA Map to estimate unvisited locations. Note that abandoned side channels can be inundated through hyporheic (local water table) connections (oxbows) or abandoned through channel avulsion showing no indicators of recent flow. |
| ☐ | ☐ | ☐ | ≥ 50% to < 75% | | 0 | 5 | 0 | SA Center | |
| ☐ | ☐ | ☐ | ≥ 35% to < 50% | | 0 | 0 | 0 | Outer edge | |
| ☒ | ☐ | ☒ | ≥ 20% to < 35% | | **SA Inundation Features: enter a M if many indicators occur, F if few occur, or A if indicators are absent in the SA for each transect from the Abiotic SA Map.** | | | | |
| ☐ | ☐ | ☐ | ≥ 10% to < 20% | | | | | | |
| ☐ | ☐ | ☐ | ≥ 5% to < 10% | | F | A | F | Overbank flow | |
| ☐ | ☒ | ☐ | ≥ 1% to < 5% | | F | A | F | Active side channels | |
| ☐ | ☐ | ☐ | > 0% to <1% | | A | A | F | High flow channels | |
| ☐ | ☐ | ☐ | 0% | | A | F | A | Abandoned channels | |

**Worksheet 11b** - Floodplain Hydrologic Connectivity Supplemental Inundation Indicators - For each supplemental indicator estimate the rating for each segment using the rating description. If no indicators are present, check the X box for the segment.

| U | M | L | Rating | Rating Description | Supplemental Indicator |
|---|---|---|---|---|---|
| ☐ | ☐ | ☐ | 4 | Fresh FDLWD found scattered throughout the SA | **A. Recent Flood Deposited Large Woody Debris(FDLWD):** Presence of FDLWD that looks recently transported by flow (i.e., minimal disturbance from animals, no recent termite infestation, etc). Does not include non-fluvial woody debris piles (slash, deadfall, etc); does include reworked or old woody debris with new deposits on top. Woody debris must be >4" diameter to count as large. |
| ☐ | ☐ | ☐ | 3 | Fresh FDLWD has limited distribution across SA; only near large active side channels or main channel | |
| ☐ | ☐ | ☐ | 2 | Fresh FDLWD rare and close to the main channel | |
| ☐ | ☐ | ☒ | 1 | FDLWD present, but no fresh deposits | |
| ☒ | ☒ | ☐ | X | No FDLWD of any kind present in SA | |
| ☐ | ☐ | ☐ | 4 | Side channels have indicators of recent flow throughout SA | **B. Side Channel Wetting:** Side channels, when present, should be actively connected to the main channel, i.e. one or more side channels disperse peak flows across the floodplain. Indicators of active flow within the channels are recently deposited or scoured sediments, ripple-marks, pushed over or recently buried vegetation, fine wrack, lack of litter, or litter buried by sediment. |
| ☐ | ☐ | ☐ | 3 | Some side channels show indications of flow, but limited in extent or volume | |
| ☒ | ☐ | ☒ | 2 | Side channels show indications of very limited flow extent and volume | |
| ☐ | ☒ | ☐ | 1 | Side channels show no indications of flow | |
| ☐ | ☐ | ☐ | X | No side channels present | |
| ☐ | ☐ | ☐ | 4 | Minimal litter present, or litter very recent or covered by sediment | **C. SA Surface Litter:** Recent flooding will reduce natural tree and shrub litter, most litter is either decomposed rapidly under moist conditions or is covered by sediment, or removed downstream. Rate litter depth only on portions of SA were litter producing woody species are present. |
| ☐ | ☐ | ☐ | 3 | Litter layers scattered in small patches; not deep (< 2 cm thick) | |
| ☒ | ☐ | ☒ | 2 | Litter layers moderately thick (2-5 cm) and generally large patches | |
| ☐ | ☒ | ☐ | 1 | Litter layers very thick (>5 cm) and distributed over large areas. | |
| ☐ | ☐ | ☐ | X | Minimal or no litter producing woody species present, or litter removed by human activity | |

# Floodplain Hydrologic Connectivity

## Table A1 – Rating

### Example SA – Tingley Beach 2019

**Table A1.** Floodplain Hydrologic Connectivity Ratings. Select a ratings table based on estimated return interval for the peak stream discharge that occurred on the SA within last five years. Use data from worksheets 11a1., 11a2., and 11b to help select ratings.

**>25 year recent peak discharge return interval** ☐

| Rating | Description |
|---|---|
| ○ 4 | Highly connected wetlands that have evidence of inundation across the majority of the SA surface (≥50%) and signs of flow in all but the oldest side channels. Active side channels are not limited to the SA bank edge. |
| ○ 3 | Moderately connected wetlands have moderate evidence of inundation of the SA surface (25 to <50%) but still show signs of flow in the majority of side and back channels. Active side channels are not limited to the SA bank. |
| ○ 2 | Minimally connected wetlands have limited evidence of inundation of the SA surface (10 to <25%), if active side channels exist they are only found near the channel banks. Most of the SA is dry, side channels away from the bank edge appear abandoned, rarely active, or do not exist. |
| ○ 1 | Disconnected wetlands have minimal or no evidence of inundation across the SA surface (<10%) and no signs of flow in any side channels or side channels do not exist. ***Or*** evidence of inundation across SA but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel. |

**10-25 year recent peak flow return interval** ☐

| Rating | Description |
|---|---|
| ○ 4 | Highly connected wetlands have moderate evidence of inundation of the SA surface (≥25%) and signs of flow in all but the oldest side channels. Active side channels are not limited to SA bank edge. |
| ○ 3 | Moderately connected wetlands have limited evidence of inundation of the SA surface (10% to <25%) and signs of flow in the majority of side and back channels. Active side channels are not limited to the SA bank edge. |
| ○ 2 | Minimally connected wetlands have minimal evidence of inundation of the SA surface (5% to <10%) , if active side channels exist they are only found near the channels banks,. Most if the SA is dry, side channels away from the bank edge appear abandoned, rarely active, or do not exist. |
| ○ 1 | Disconnected wetlands have almost no evidence of inundation across the SA surface (<5%) and no signs of flow in any side channels or side channels do not exist. ***Or*** evidence of inundation across SA but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel. |

**2-10 year recent peak discharge return interval** ☒

| Rating | Description |
|---|---|
| ○ 4 | Highly connected wetlands have limited evidence of inundation of the SA surface (≥10%) and signs of flow in many side channels. Active side channels are not limited to the SA bank edge. |
| ◉ 3 | Moderately connected wetlands have minimal evidence of inundation of the SA surface ( 5% to <10%) and signs of flow in some side channels. Active side channels are not limited to the SA bank edge. |
| ○ 2 | Minimally connected wetlands have almost no evidence of inundation of the SA surface (1% to <5%) and where active side channels exist they are only be near the channel banks. Most of the SA is dry, side channels away from the bank edge appear abandoned, rarely active, or do not exist. |
| ○ 1 | Disconnected wetlands have no evidence of inundation across the SA surface (<1%) and no signs of flow in any side channels or side channels do not exist. ***Or*** evidence of inundation across Sa but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel. |

**1-2 year recent peak discharge return interval** ☐

| Rating | Description |
|---|---|
| ○ 4 | Highly connected wetlands have minimal evidence of inundation of the SA surface (≥5%) and signs of flow in most side channels. Active side channels are not limited to the SA bank edge. |
| ○ 3 | Moderately connected wetlands have no evidence of inundation of the SA surface (1% to <5%), Side channels do not appear abandoned even though signs of flow maybe lacking, they are not limited to the SA bank edge. |
| ○ 2 | Minimally connected wetlands have no evidence of inundation of the SA surface (<1%) and where active side channels exist they are only found near the channel banks. Most of the SA is dry, side channels away from the bank edge appear abandoned, or do not exist. |
| ○ 1 | Disconnected wetlands have no evidence of inundation across the a SA surface and no signs of flow in any side channels, ***Or*** evidence of inundation across SA but SA has been artificially reduced in size by levees or development such that it is confined to a narrow fringe along the active channel. |

Rating Adjustment Comments (Use this box when additional flooding evidence recorded supports ratings adjustment.)
Even through about 10% of the SA inundates, flows are limited to the SA bank area and sidebars. None of the older cottonwood terrace is inundated, and there was no active flow in back-channels on the terrace (there was a very small amount of seepage). All side channels on the terrace side of the Jetty Jacks were abandoned or obsured. Litter disturbance on terrace is due to human activity (exotic treatments and trails.)