Healthy Streams Through Bringing People Together

- Accelerating Cooperative Riparian Restoration
  - Proper Functioning Condition Assessment
    - Focus attention on physical function
    - Not values that are produced
  - Collaborative planning for management
  - Meeting many of the desired resource values
  - Keeping water on the land longer
Riparian Proper Functioning Condition (PFC) Assessment

- **PFC Method** developed by BLM, USFWS, and NRCS
- **Running water (lotic)** assessment first emphasis
- **1993 First Technical Reference for lotic riparian/wetland areas**
Riparian Proper Functioning Condition (PFC) Assessment

1994 Technical Reference 1737-11
Riparian Proper Functioning Condition (PFC) Assessment

- 1996 The National Riparian Formed
  - BLM
  - Forest Service
  - NRCS Partner
- 1998 Technical Reference 1737-15
Riparian Proper Functioning Condition (PFC) Assessment

1999 Technical Reference 1737-16
Riparian Proper Functioning Condition Assessment

- Introduce and define terms
- Stratification and stream classification
- Introduce the assessment process
- Water and hydrologic attributes and processes
Riparian Proper Functioning Condition Assessment

- Vegetation functions
- Erosion and depositional processes
- Summary findings
- Exercise
- Instructions for field exercise
Riparian Proper Functioning Condition

- Term is used in two ways
  - Methodology for assessing the physical functioning of riparian-wetland areas
  - An on-the-ground condition of riparian-wetland areas
Riparian Proper Functioning Condition Assessment

- Communication Tool
- Common Vocabulary
- Based on Valid Scientific Processes
- Requires an Interdisciplinary Team
Riparian Proper Functioning Condition Assessment

- Uses Inventory Data
- Synthesis and Interpretation Tool
- Time Specific
PFC helps

- Determine potential and capability
- Define issues that need to be addressed
- Determine appropriate monitoring
- Select appropriate management practices
PFC Helps Assess

- How well the physical processes are working
- How well the riparian-wetland area will withstand the energies of a 25 to 30 year event
- The system’s ability to maintain and produce both physical and biological values
PFC isn’t

- A replacement for biological inventory or monitoring protocols
- The only methodology for determining the health of riparian or aquatic components of the riparian-wetland area
PFC may not equal

- Potential Natural Community (PNC)
- Desired Plant Community (DPC)
- Desired Future Condition (DFC)
Wetland

- Areas inundated or saturated by surface or ground water
- Supports a prevalence of vegetation suited to saturated soils
- Includes marshes, shallow swamps, sloughs, lakeshores, wet meadows, springs, seeps, and riparian areas
Riparian Area

- Transition between the aquatic (saturated) and upland areas
- Vegetation and physical (soil) characteristics reflect the influence of permanent surface or ground water
- Land along streams, ponds, marshes, springs, and seeps are examples
Riparian-Wetland Types

- **Lotic**
  - Flowing water systems (streams)
    - Defined channel
    - Gradient

- **Lentic**
  - Standing surface water
    - Lakes, reservoirs, ponds, marshes
  - Ground Water
    - Seeps and springs
    - Bogs and wet meadows
Potential

The highest ecological status an area can attain with little influence by man.
The highest ecological status a riparian-wetland area can attain given major influences by man affecting the hydrologic processes, e.g. large dam, diversions, & highways.
Proper Functioning Condition (lotic)

- Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows,
Proper Functioning Condition (lotic)

thereby:

- reduce erosion
- filter sediment
- capture bedload
- aid floodplain development
- improve flood-water retention
- improve ground water recharge
- stabilize stream banks
- develop root masses that stabilize stream banks
Proper Functioning Condition (lotic)

Resulting in Resource Values such as:

- improved water quality
- habitat, water depth, duration, and temperature for fish production
- waterfowl breeding and other uses
- greater biodiversity
Functioning-at-Risk

Riparian-wetland areas that are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation.
Functioning-at-Risk

Examples

- Kentucky bluegrass
- Streambank damage
- Unhealthy woody vegetation
Nonfunctional

Riparian-wetland areas that clearly are NOT providing adequate vegetation, landform, or large woody debris to:
Nonfunctional

- Does not dissipate stream energy associated with high flows
- Does not reduce erosion
Nonfunctional

Examples

- Absence of floodplains were one should be
- Actively eroding streambanks
- Excessive soil compaction
- Upland vegetation in riparian area
Preparing to do a PFC Assessment
Natural Riparian Resources
Preparing to do a Riparian PFC Assessment

- Learn all we can about riparian-wetland area
- Collect existing information on stream
- Obtain maps, aerial photos, inventories, etc.
- Complete a preliminary stratification
Stratification

Purpose
- To divide into areas with similar characteristics
- Current condition and production
- Site potential or capability
- Limiting factors
- Reference or comparison sites
- Monitoring sites
Stratification

- Geology
  - Stream order or confluence
  - Valley bottom type
  - Stream gradient
  - Stream type (Rosgen)

- Soils
- Vegetation
- Hydrologic controls
- Land uses
Stream Classification

Ordering of streams into sets based on their similarities or relationships

Objectives

- Predict river’s behavior
- Provides hydraulic and sediment relationships
- Extrapolate site specific data to similar streams
- Consistent framework for communications
Rosgen Stream Classification

Stream Characterization

- Channel Pattern
  - Single Thread
  - Multiple Thread
  - Anastomosed (network)
  - Channel Slope
  - Sinuosity
Rosgen Stream Classification

Sinuosity

Sinuosity = Stream Length / Valley Length

1.9  370’  195’
Rosgen Stream Classification

Sinuosity

\[
\text{Sinuosity} = \frac{\text{Stream Length}}{\text{Valley Bottom Length}}
\]

\[
1 = \frac{100'}{100'}
\]
Rosgen Stream Classification
Slope or Gradient

Elevation at upper end

Elevation at lower end

% Mean Slope = \[ \frac{\text{Elevation Difference}}{\text{Stream channel length}} \times 100 \]

Elevation = 5031
Elevation Difference = 6’
Length = 560’
Gradient = 1.1%

Elevation = 5025

Elevation = 5031
Elevation Difference = 6’
Length = 400’
Gradient = 1.5%

Elevation = 5025
Rosgen Stream Classification

Stream Characterization

- Channel Characteristics
  - Width to Depth Ratio
  - Entrenchment Ratio
  - Channel Material
Rosgen Stream Classification
Width/Depth Ratio

Bankfull Width / Average Bankfull Depth

Bankfull

Base Flow
Rosgen Stream Classification
Entrenchment Ratio

- **Floodprone width/Bankfull Width**
- **Floodprone Area**
- **2 X Maximum Bankfull Depth**
- **Bankfull**
- **Base Flow**
# Rosgen Stream Types

## Longitudinal, Cross-Sectional and Plan Views of Major Stream Types

<table>
<thead>
<tr>
<th>Stream Type</th>
<th>Plan View</th>
<th>Cross Section</th>
<th>Dominant Slope</th>
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<tbody>
<tr>
<td>Aa+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>&gt; 10%</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>4 - 10%</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>2 - 4%</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>&lt; 2%</td>
<td></td>
</tr>
<tr>
<td>DA</td>
<td></td>
<td>&lt; 4%</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>&lt; 0.5%</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>&lt; 2%</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>&lt; 2%</td>
<td>2 - 4%</td>
</tr>
</tbody>
</table>

Rosgen, 1996
A Type
B Type
C Type
DA Type
D Type
E Type
F Type
Rosgen Stream Classification
Channel Material (substrate)

1 – Bedrock
2 – Boulder (10+ inches)
3 – Cobble (2.5 to 10 inches)
4 – Gravel (.08 to 2.5 inches)
5 – Sand (.062 to 2 millimeters)
6 – Silt/Clay (< .062 millimeters)
<table>
<thead>
<tr>
<th>TYPE</th>
<th>SENSITIVITY TO DISTURBANCE</th>
<th>RECOVERY POTENTIAL</th>
<th>SEDIMENT SUPPLY</th>
<th>STREAMBANK EROSION POTENTIAL</th>
<th>VEGETATION CONTROLLING INFLUENCE</th>
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<tbody>
<tr>
<td>A3</td>
<td>very low</td>
<td>excellent</td>
<td>very low</td>
<td>very low</td>
<td>negligible</td>
</tr>
<tr>
<td>A5</td>
<td>extreme</td>
<td>very poor</td>
<td>very high</td>
<td>very high</td>
<td>negligible</td>
</tr>
<tr>
<td>B3</td>
<td>low</td>
<td>excellent</td>
<td>low</td>
<td>low</td>
<td>moderate</td>
</tr>
<tr>
<td>B5</td>
<td>moderate</td>
<td>excellent</td>
<td>moderate</td>
<td>moderate</td>
<td>moderate</td>
</tr>
<tr>
<td>C3</td>
<td>moderate</td>
<td>good</td>
<td>moderate</td>
<td>moderate</td>
<td>very high</td>
</tr>
<tr>
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<td>fair</td>
<td>very high</td>
<td>very high</td>
<td>very high</td>
</tr>
<tr>
<td>G3</td>
<td>very high</td>
<td>poor</td>
<td>very high</td>
<td>very high</td>
<td>high</td>
</tr>
<tr>
<td>G5</td>
<td>extreme</td>
<td>very poor</td>
<td>very poor</td>
<td>very high</td>
<td>high</td>
</tr>
</tbody>
</table>

Rosgen, 1996
Stratification (Example)

Hardtrigger and Little Hardtrigger Creeks

Hardtrigger Creek

Stratification (Example)
Hardtrigger #1

Hardtrigger Creek
Hardtrigger #2
Hardtrigger #3
Hardtrigger #4
Attributes and Process List (lotic)

**Hydrogeomorphic**
- Ground water discharge
- Active floodplain
- Ground-water recharge
- Flood storage & release
- Flood modification
- Bankfull width
- Width/depth ratio
- Sinuosity
- Gradient
- Stream power
- Hydraulic controls
- Bed elevation

**Vegetation**
- Community types
- Community type distribution
- Surface Density
- Canopy
- Recruitment/reproduction
- Survival
- Community dynamics & succession
- Sediment
Attributes and Process List (lotic)

- **Erosion/Deposition**
  - Bank stability
  - Bed stability (bed transport rate)
  - Depositional features

- **Soils**
  - Soil type
  - Distribution of aerobic/anaerobic soils
  - Capillarity
  - Annual pattern of soil water states
Determination of Capability and Potential

- Hydrology, duration & frequency of flooding or ponding
- Current vegetation, compare to historic
- Entire watershed condition and major landforms
- Limiting factors, both human caused and natural & determine if they can be or need to be modified
Determination of Capability and Potential

- relict areas (e.g., preserves)
- Historic photos, survey notes, and/or other documents
- Species lists (animal & plant) historic and present
- Species habitat (animal & plant) needs, historic & present
- Determine if soils were saturated at one time
Riparian Proper Functioning Condition Assessment (Lotic)

- Designed to help interpret data and observations
- Interdisciplinary team
- Evaluated against the potential or capability
- Summary determination
Types of Channel Adjustment

- Channel evolution
- Normal channel dynamics
- Rapid channel response
Normal channel dynamics

- Adjustments as a part of normal channel/riparian function
- Incremental or periodic adjustments under high flow conditions
- Involves channel & riparian interaction
- Dynamic equilibrium or stable state
Rapid channel response

- Channel adjustments that occur rapidly in response to sudden changes
  - Water discharge
  - Sediment delivery
  - Channel/floodplain conditions
  - Vegetation changes
  - Instream structures
Stages of channel incision

- Pre-incision
- Incision
- Channel widening
- Dynamic stability
States of Channel Succession

Dynamic Stability
State A

Pre-incision
State B

Incision
State C

Channel Widening
State D

Channel Widening
State E

Dynamic Stability
State F

States:
- State A: Wet Meadow / Marsh → Mesic Meadow
- State B: Mesic Meadow → Sagebrush / Upland
- State C: Sagebrush Terrace
- State D: Sagebrush Terrace
- State E: Mesic Meadow
- State F: Wet Meadow / Marsh → Sagebrush Terrace
State A

Wet Meadow/Marsh

Meso Meadow

Sand Creek
State B

Mesic Meadow

Sagebrush/Upland

Eight Mile Creek
State E

Mesic/Wet Meadow

Sagebrush Terrace

Shoshone Creek
General Instructions

This checklist constitutes the Minimum National Standard required to determine proper functioning condition of lotic riparian-wetland areas.

As a minimum, an Interdisciplinary (ID) Team will use the checklist to determine the degree of function.

The ID team must review existing documents, data, and information, so the team has the information necessary to complete the rating.
General Instructions

- The ID team must determine the attributes and processes important to the riparian-wetland area they are assessing.

- Mark one box for each element. Elements are numbered for reference and does NOT constitute a priority or importance.
General Instructions

- The **ID Team** will determine a finding for each item, record the finding on the form, and record the rationale.

- Based on the ID Team’s discussion, *Functional Rating* will be resolved and the checklist summary section completed.

- Establish photo points where possible to document the site.
Riparian Proper Functioning Condition Checklist (Lotic)

- Write-up area descriptions
- 17 Questions
  - Hydrology
  - Vegetation
  - Erosion and Deposition
- Summary Determination
- Contributing Factors
## Standard Checklist (Lotic)

**Name of Riparian-Wetland Area:** ____________________  **Date** ______________

**Area/Segment ID:** ______________  **Location:** _____________________________

**Aerial Photo:** ___________________  **ID Team Observers:** _______________

### HYDROLOGIC

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1) Floodplain above bankfull inundated in “relatively frequent” events</td>
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<tr>
<td></td>
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<td></td>
<td>2) Where beaver dams are present they are active and stable</td>
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<tr>
<td></td>
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<td>3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)</td>
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<td>4) Riparian-wetland area is widening or has achieved potential extent</td>
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<tr>
<td></td>
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<td>5) Upland watershed is not contributing to riparian degradation</td>
</tr>
</tbody>
</table>

### VEGETATIVE

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)</td>
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<td>7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)</td>
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<td>8) Species present indicate maintenance of riparian soil moisture characteristics</td>
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<td></td>
<td>9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events</td>
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<td>10) Riparian-wetland plants exhibit high vigor</td>
</tr>
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<td></td>
<td></td>
<td>11) Adequate riparian-wetland vegetative cover present to protect banks and dissipate energy during high flows</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12) Plant Communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td><strong>EROSION/DEPOSITION</strong></td>
</tr>
<tr>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>13) Flood plain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rationale</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14) Point bars are revegetating with riparian-wetland vegetation</td>
</tr>
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<td></td>
<td></td>
<td>Rationale</td>
</tr>
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<td></td>
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<td></td>
<td>15) Lateral stream movement is associated with natural sinuosity</td>
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<td></td>
<td></td>
<td>Rationale</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16) System is vertically stable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rationale</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Rationale</td>
</tr>
</tbody>
</table>

**SUMMARY DETERMINATION**

<table>
<thead>
<tr>
<th>Functioning Rating</th>
<th>Condition within the functional rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Functioning Condition _______</td>
<td>High</td>
</tr>
<tr>
<td>Functional--At Risk _______</td>
<td></td>
</tr>
<tr>
<td>Nonfunctional _______</td>
<td>Low</td>
</tr>
</tbody>
</table>

Rationale: Overwidened channel, lack of riparian-wetland vegetation in appropriate areas, poor vigor in the herbaceous plant areas.

**Apparent Trend for Functional — At Risk**

- Upward _______
- Downward _______
- Not Apparent _______

Rationale:

Are factors contributing to unacceptable conditions outside the manager’s control or management?

- Yes ____  No ____  If yes, what are those factors?
  - Flow Regulation
  - Upstream channel conditions
  - Road encroachment
  - Recreational Activities
  - Other (specify)

Remarks:
Natural Riparian Resources

Water

Landscape & Soil

Vegetation