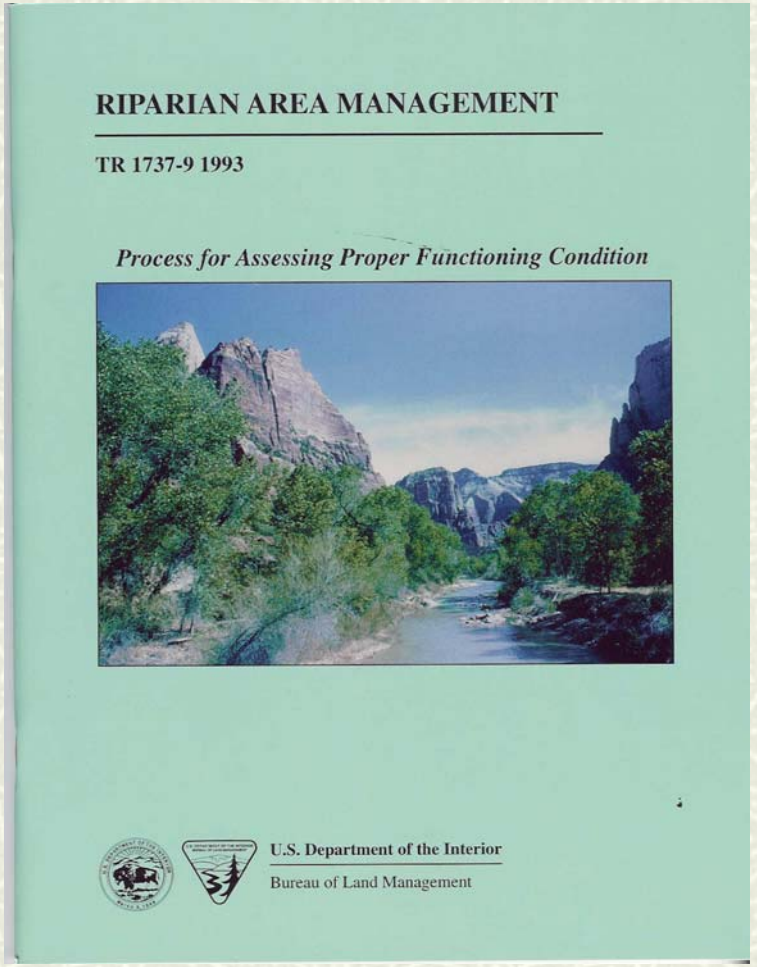
Healthy Streams Through Bringing People Together

- 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

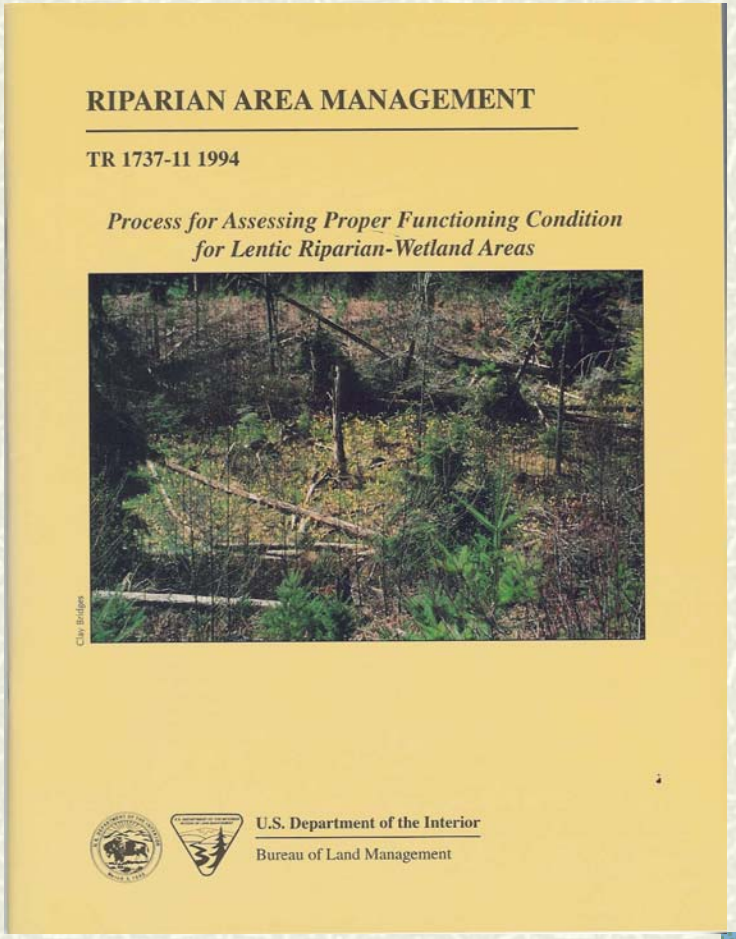
Riparian Proper Functioning Condition (PFC) Assessment

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



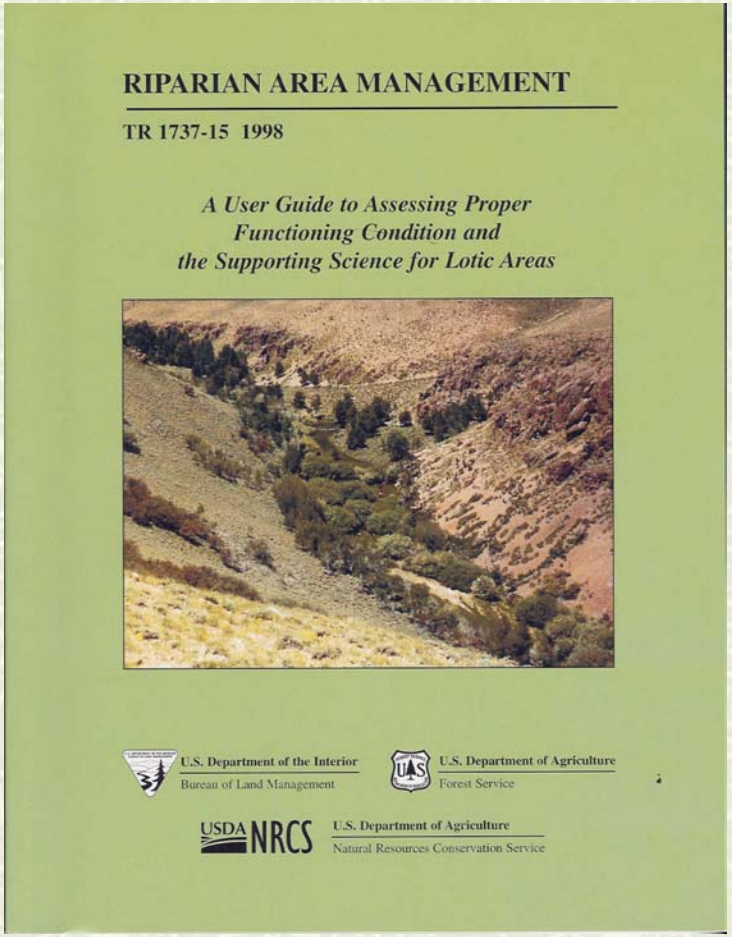
Riparian Proper Functioning Condition (PFC) Assessment

- 1994 Techincal Reference 1737-11



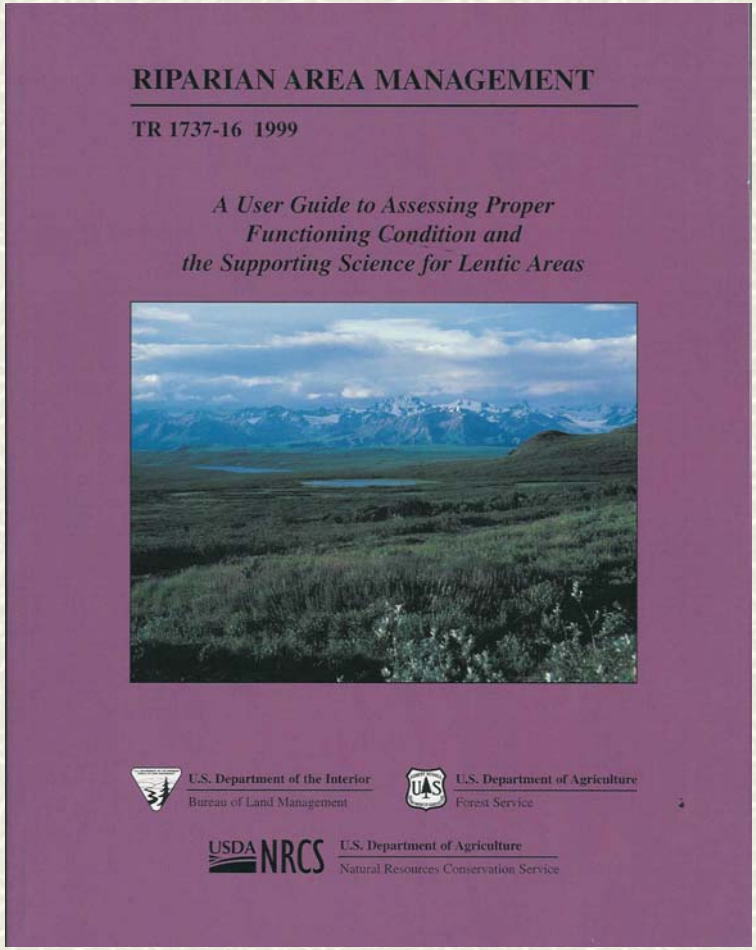
Riparian Proper Functioning Condition (PFC) Assessment

- 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 excercise

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.

Capability

- 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 streambanks

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:

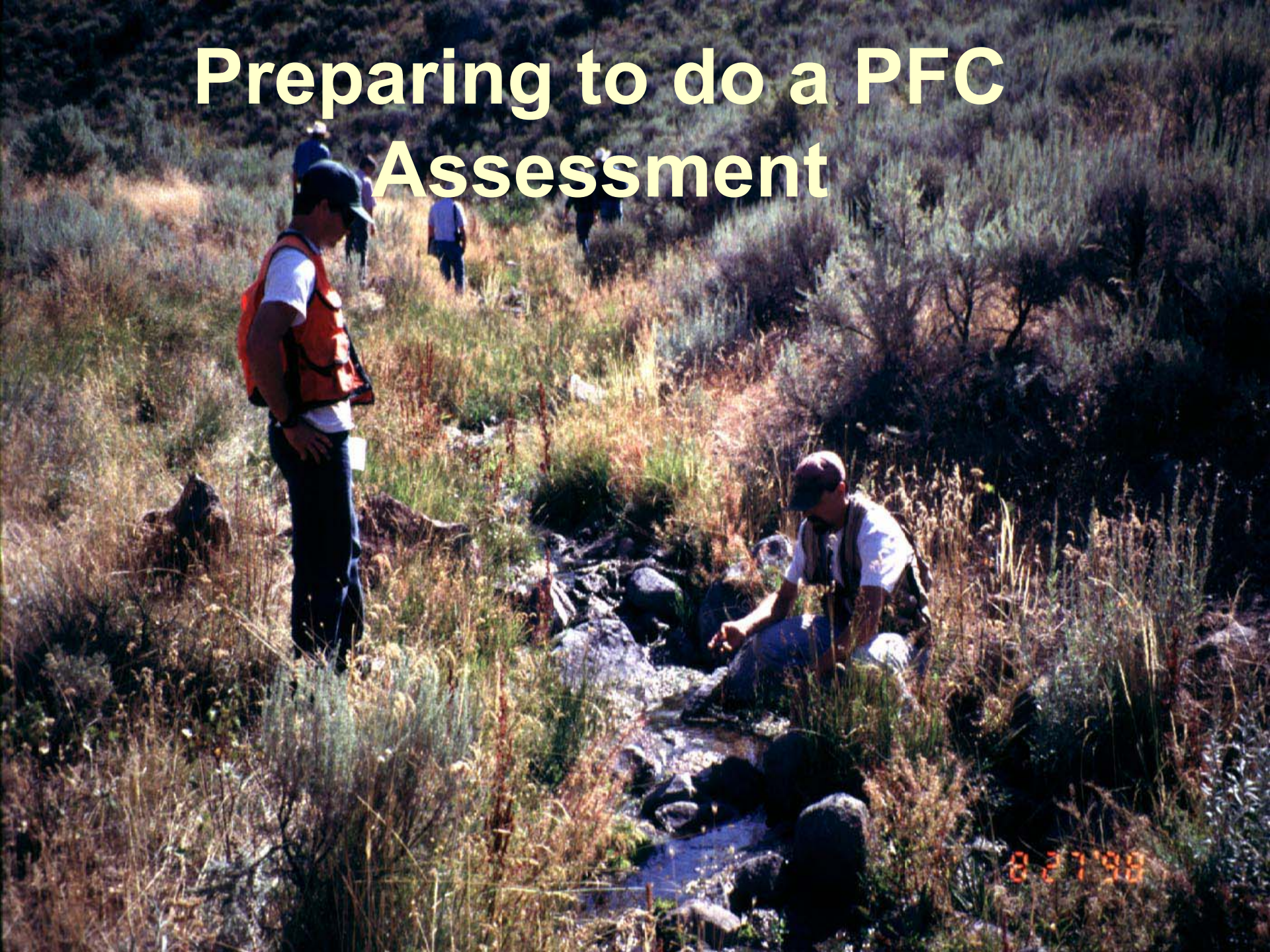
Nonfunctional

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

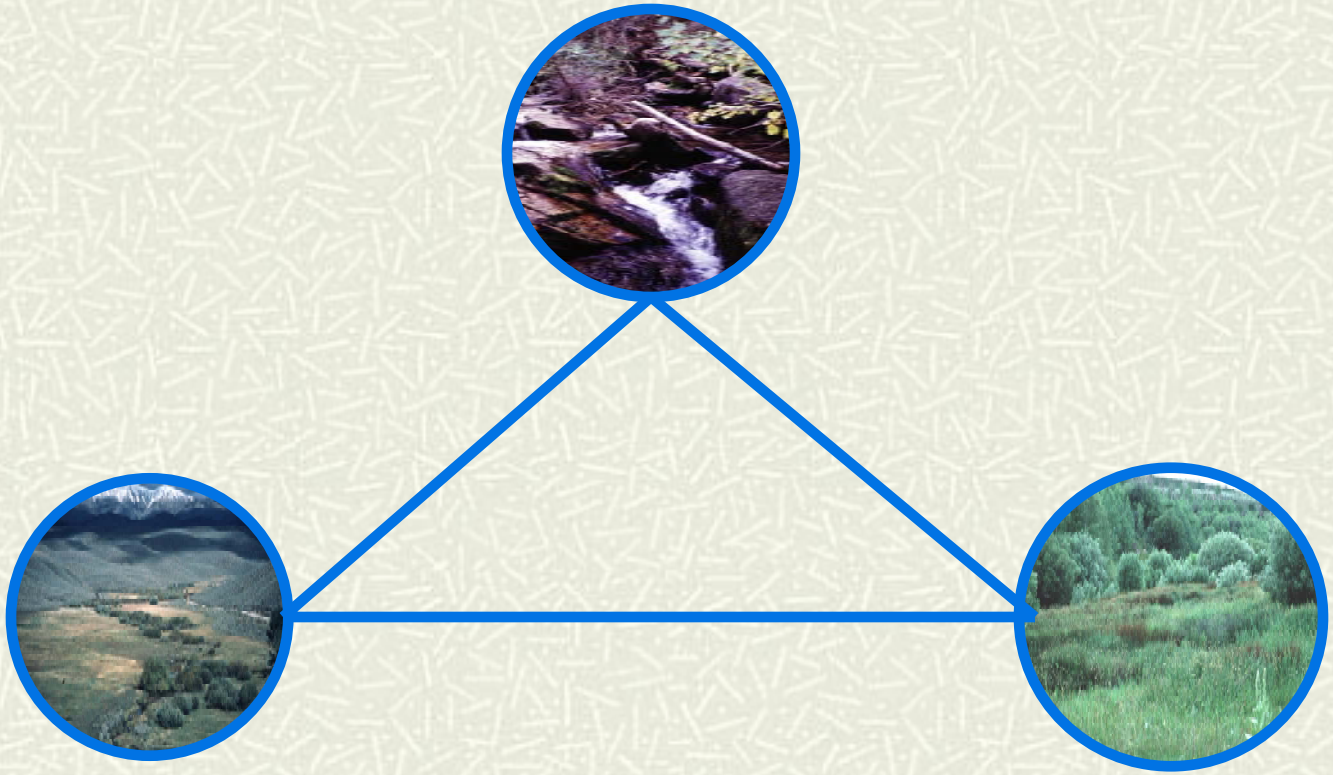
Nonfunctional

- 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

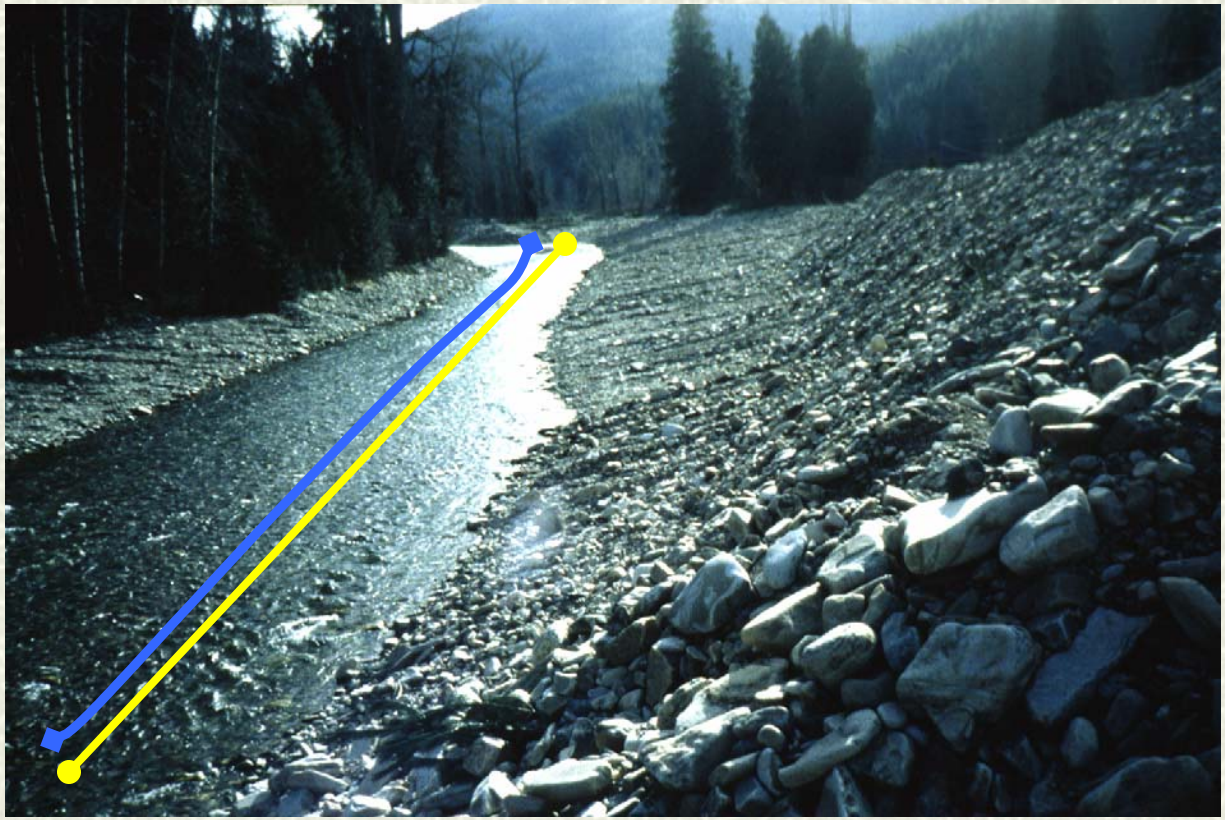
- Stream Characterization
  - Channel Pattern
    - Single Thread
    - Multiple Thread
    - Anastomosed (network)
    - Channel Slope
    - Sinuosity

Rosgen Stream Classification
Sinuosity

Sinuosity = Stream Length/ Valley Length

1.9 370’ 195’

Rosgen Stream Classification
Sinuosity

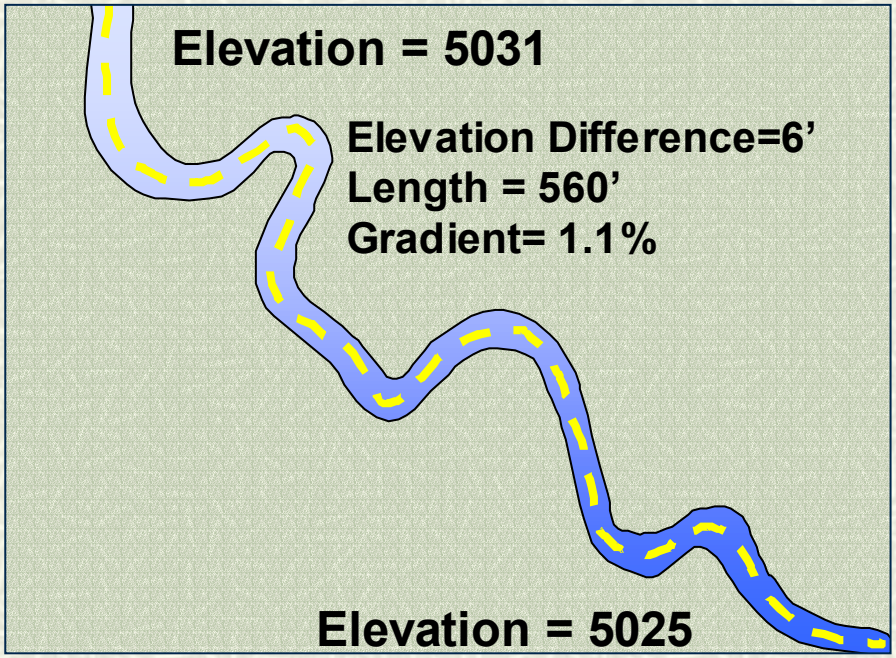


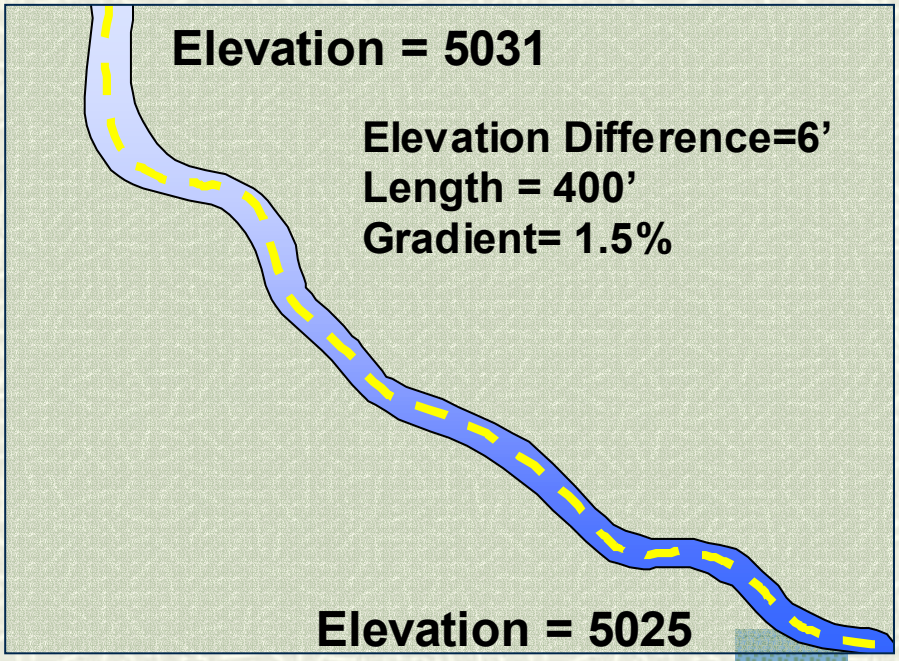
Sinuosity = Stream Length / Valley Bottom Length

1 = 100’ / 100’

Rosgen Stream Classification
Slope or Gradient

$$\% \text{ Mean Slope} = \frac{\text{Elevation at upper end} - \text{Elevation at lower end}}{\text{Stream channel length}} * 100$$

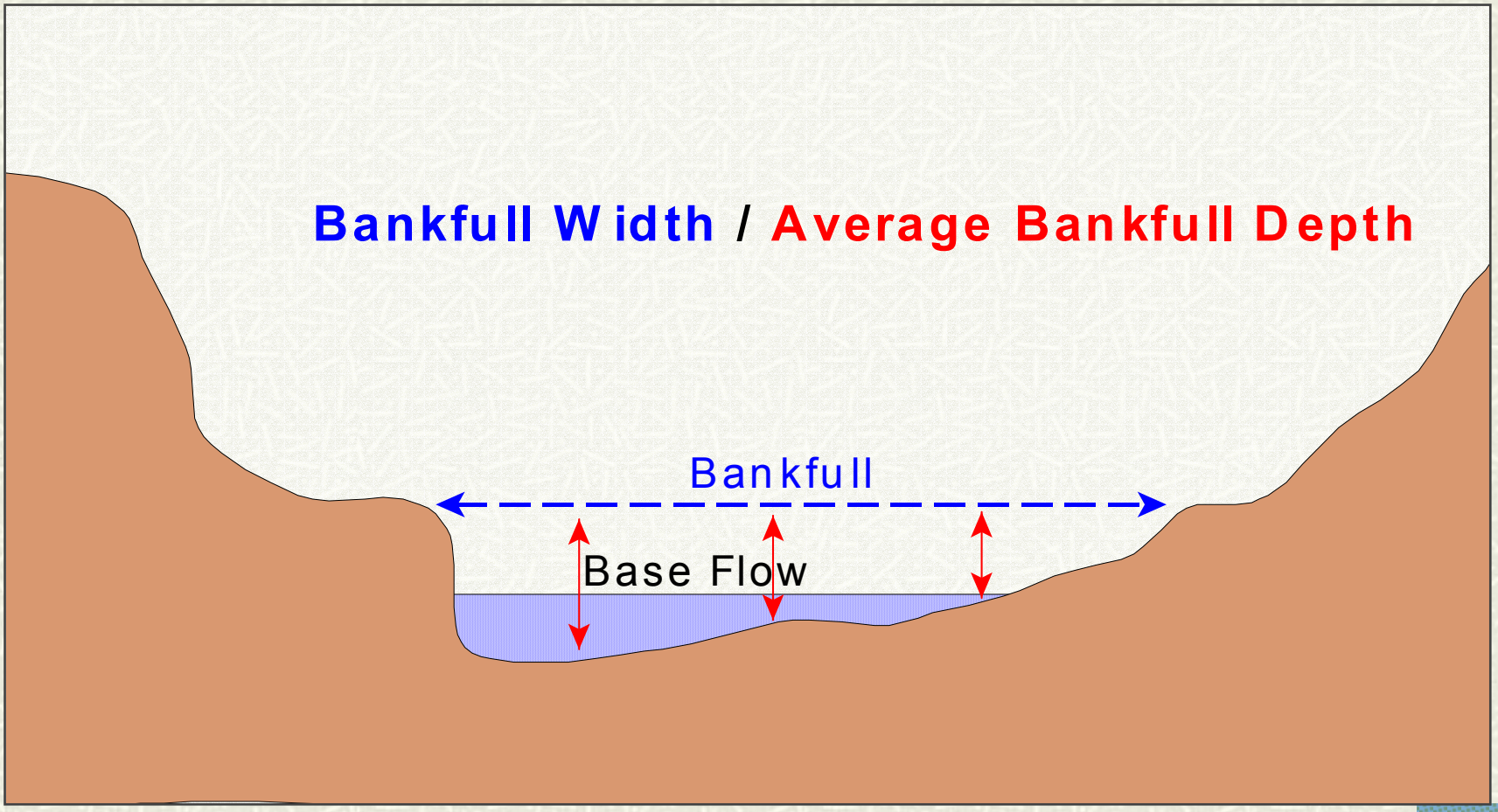




Rosgen Stream Classification

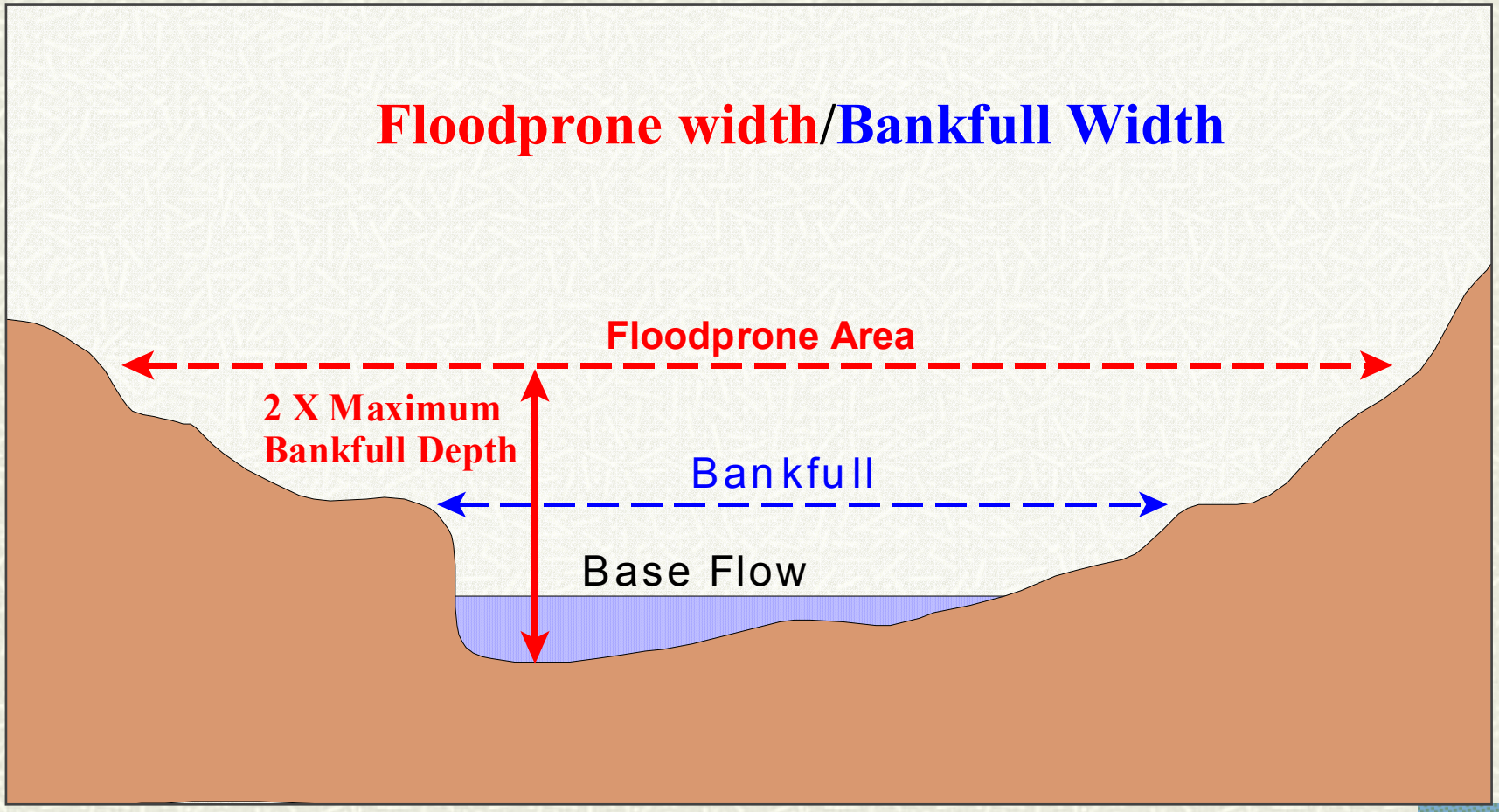
- Stream Characterization
  - Channel Characteristics
    - Width to Depth Ratio
    - Entrenchment Ratio
    - Channel Material

Rosgen Stream Classification
Width/Depth Ratio

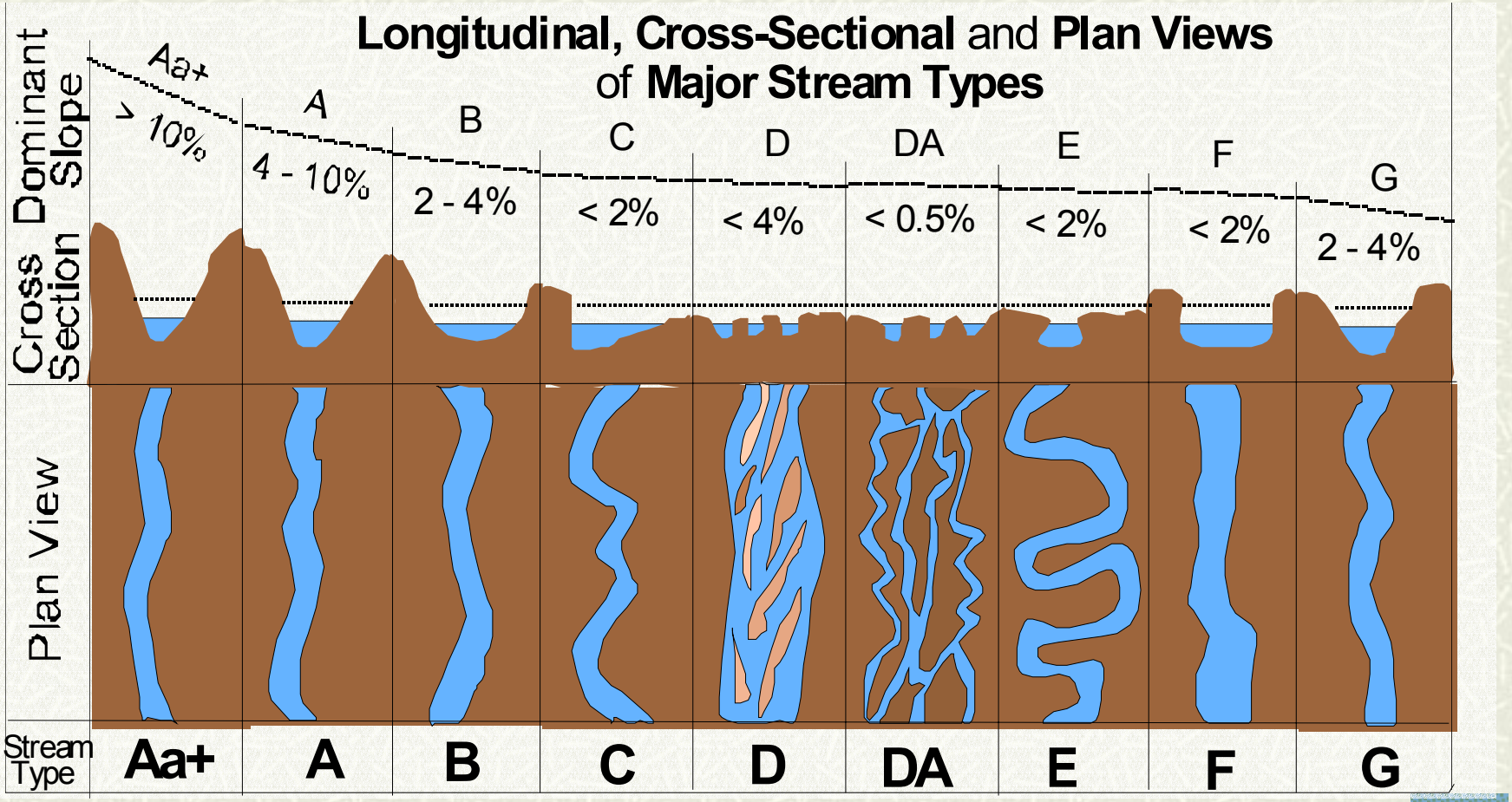


Rosgen Stream Classification

Entrenchment Ratio



Rosgen Stream Types



Rosgen, 1996

Aa+

A Type

B Type

C Type

DA Type

D Type

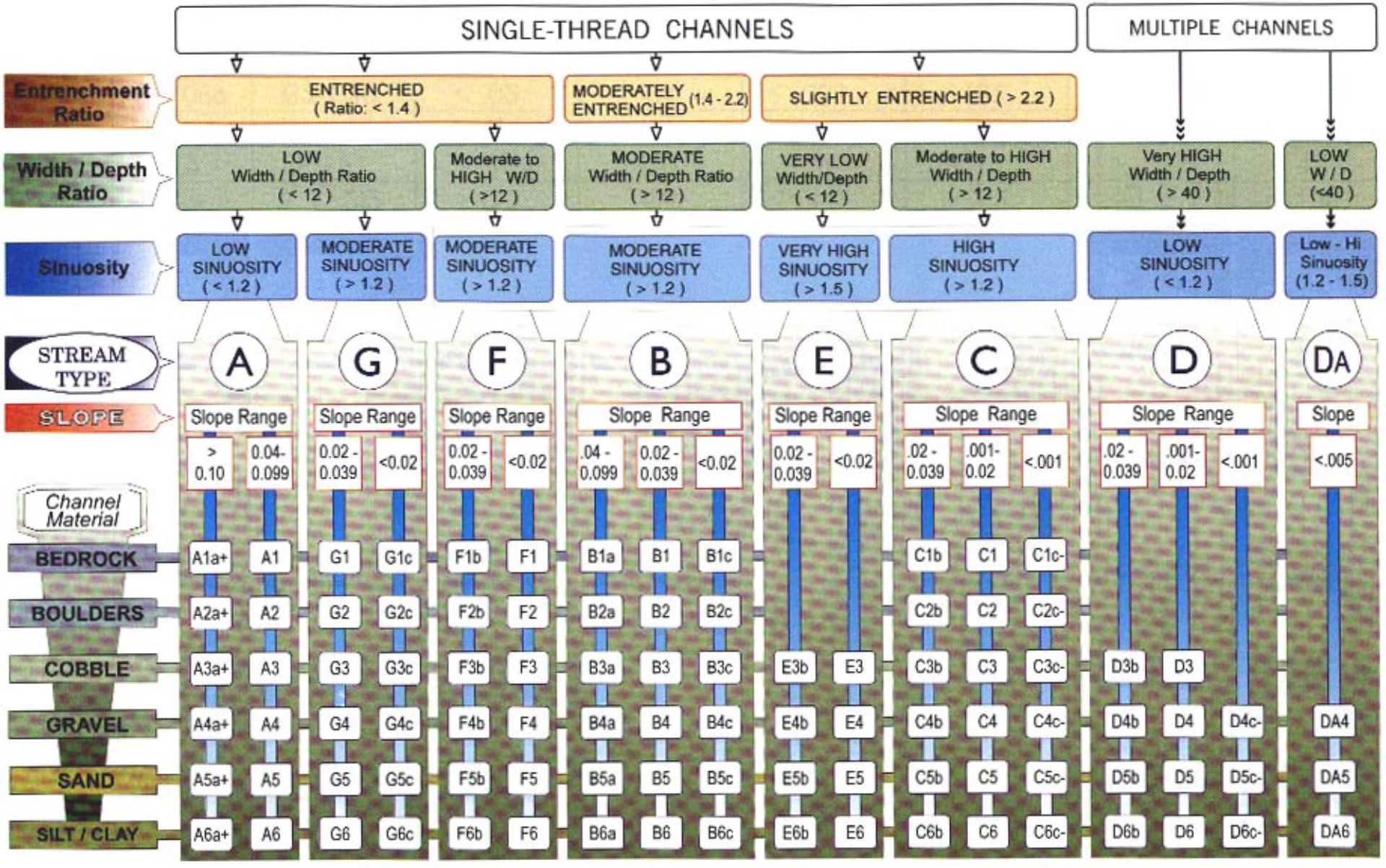
E Type

F Type

G 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)


SINGLE-THREAD CHANNELS
MULTIPLE CHANNELS
Entrenchment Ratio
ENTRENCHED (Ratio: < 1.4)
MODERATELY ENTRENCHED (1.4 - 2.2)
SLIGHTLY ENTRENCHED (> 2.2)
Width / Depth Ratio
LOW Width / Depth Ratio (< 12)
Moderate to HIGH W/D (>12)
MODERATE Width / Depth Ratio (> 12)
VERY LOW Width/Depth (< 12)
Moderate to HIGH Width / Depth (> 12)
Very HIGH Width / Depth (> 40)
LOW W / D (<40)
Sinuosity
LOW SINUOSITY (< 1.2)
MODERATE SINUOSITY (> 1.2)
MODERATE SINUOSITY (> 1.2)
MODERATE SINUOSITY (> 1.2)
VERY HIGH SINUOSITY (> 1.5)
HIGH SINUOSITY (> 1.2)
LOW SINUOSITY (< 1.2)
Low - Hi Sinuosity (1.2 - 1.5)
STREAM TYPE
A
G
F
B
E
C
D
DA
SLOPE
Slope Range
Slope Range
Slope Range
Slope Range
Slope Range
Slope Range
Slope Range
Slope
> 0.10
0.04- 0.099
0.02 - 0.039
<0.02
0.02 - 0.039
<0.02
.04 - 0.099
0.02 - 0.039
<0.02
0.02 - 0.039
<0.02
.02 - 0.039
.001- 0.02
<.001
.02 - 0.039
.001- 0.02
<.001
<.005
Channel Material
BEDROCK
BOULDERS
COBBLE
GRAVEL
SAND
SILT / CLAY
A1a+ A1 G1 G1c F1b F1 B1a B1 B1c C1b C1 C1c- D3b D3 DA4
A2a+ A2 G2 G2c F2b F2 B2a B2 B2c C2b C2 C2c- D4b D4 D4c- DA5
A3a+ A3 G3 G3c F3b F3 B3a B3 B3c E3b E3 C3b C3 C3c- D5b D5 D5c- DA6
A4a+ A4 G4 G4c F4b F4 B4a B4 B4c E4b E4 C4b C4 C4c- D6b D6 D6c-
A5a+ A5 G5 G5c F5b F5 B5a B5 B5c E5b E5 C5b C5 C5c-
A6a+ A6 G6 G6c F6b F6 B6a B6 B6c E6b E6 C6b C6 C6c-

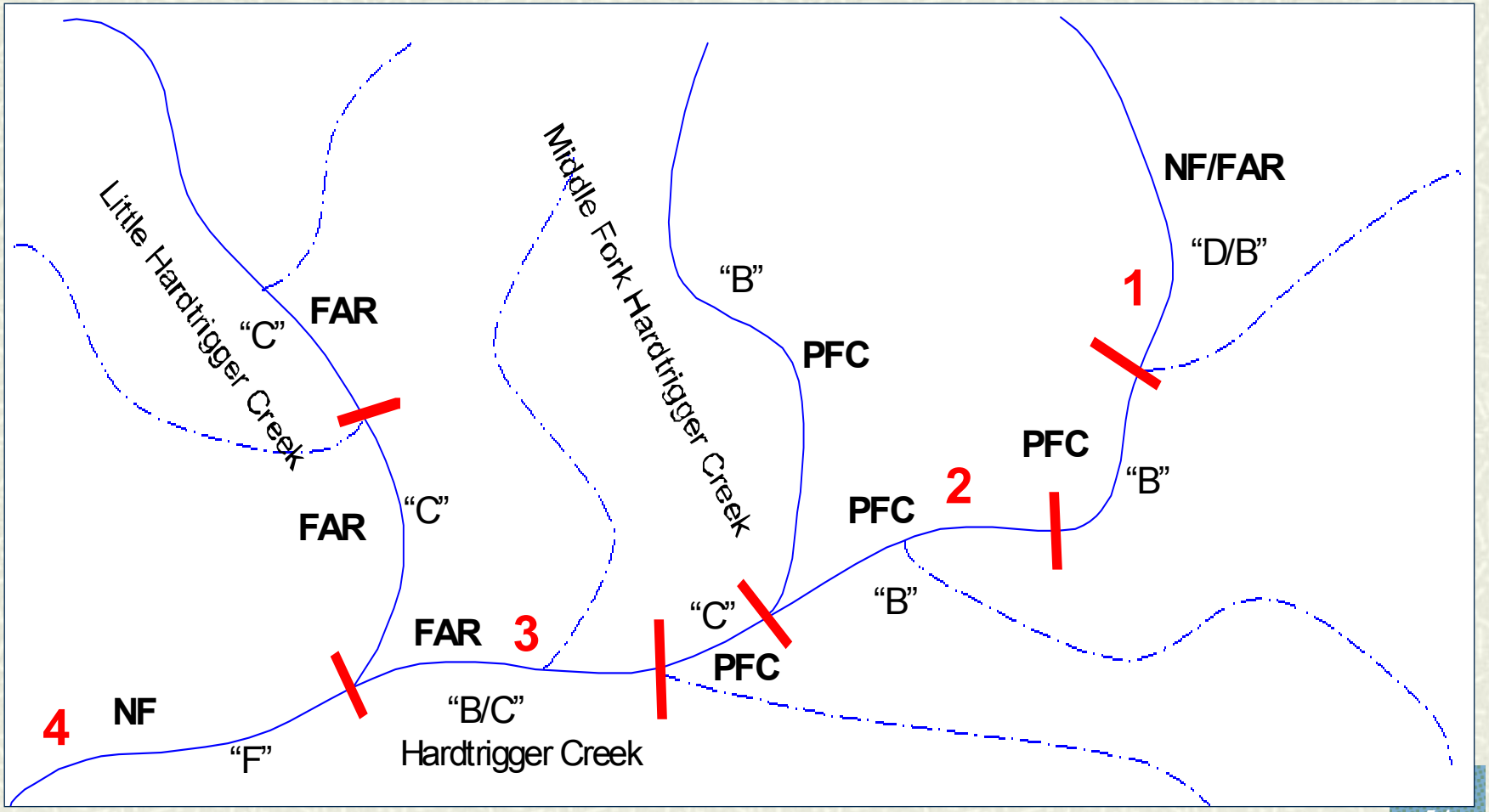
Management Interpretations

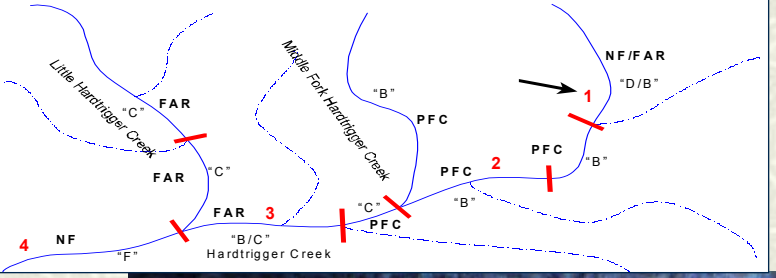
TYPE	SENSITIVITY TO DISTURBANCE	RECOVERY POTENTIAL	SEDIMENT SUPPLY	STREAMBANK EROSION POTENTIAL	VEGETATION CONTROLLING INFLUENCE
A3	very low	excellent	very low	very low	negligible
A5	extreme	very poor	very high	very high	negligible
B3	low	excellent	low	low	moderate
B5	moderate	excellent	moderate	moderate	moderate
C3	moderate	good	moderate	moderate	very high
C5	very high	fair	very high	very high	very high
G3	very high	poor	very high	very high	high
G5	extreme	very poor	very poor	very high	high

Rosgen, 1996

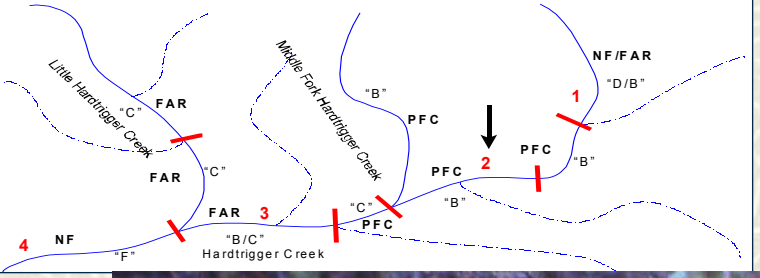
Stratification (Example)

Hardtrigger and Little Hardtrigger Creeks

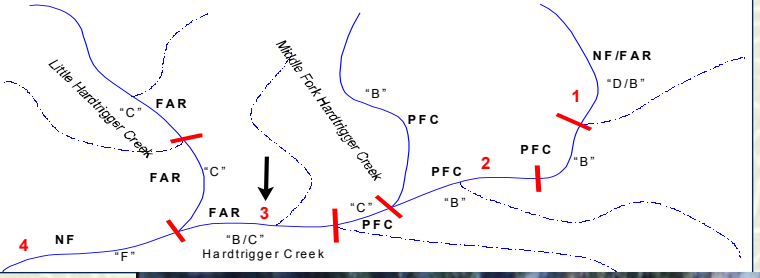




Hardtrigger #1

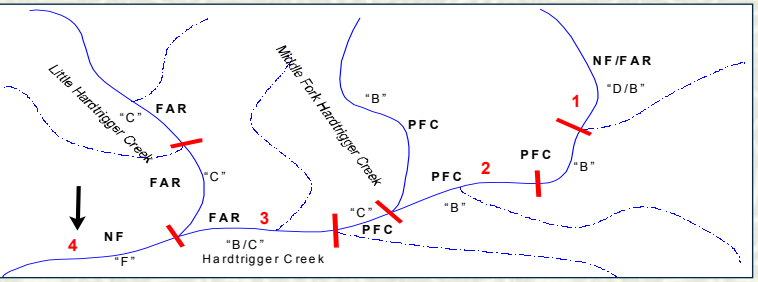


Hardtrigger #2



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

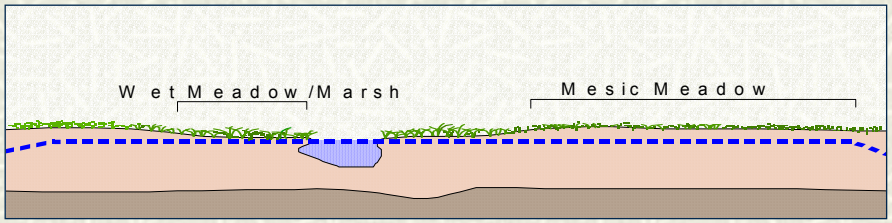
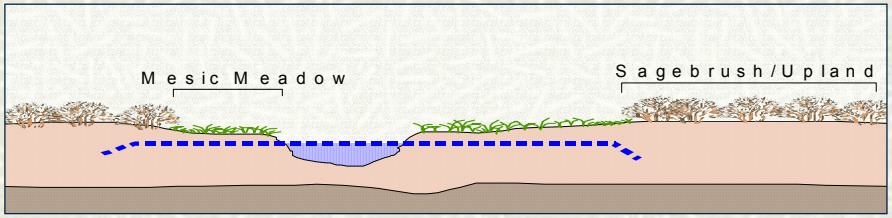
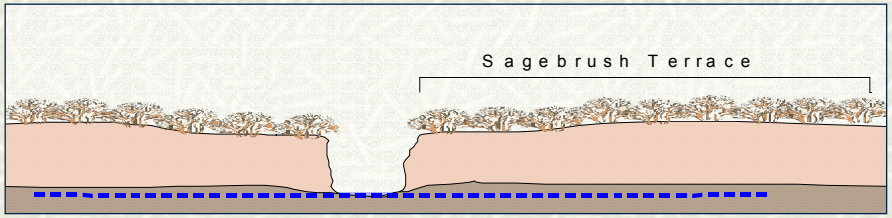
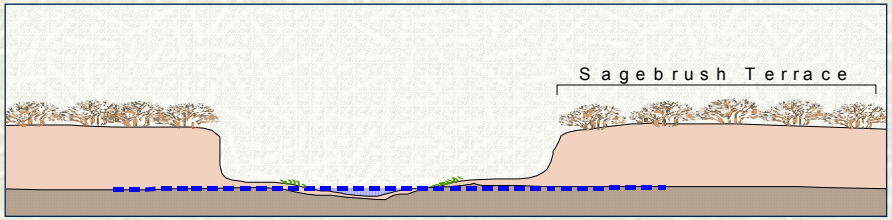
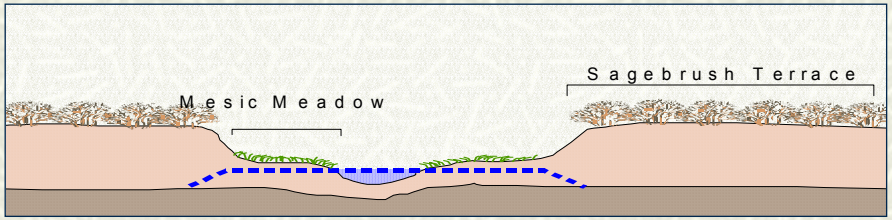
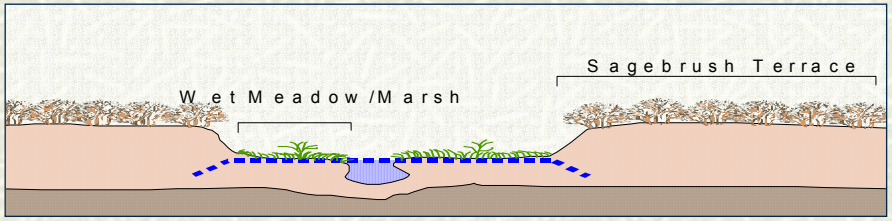
Rapid channel response

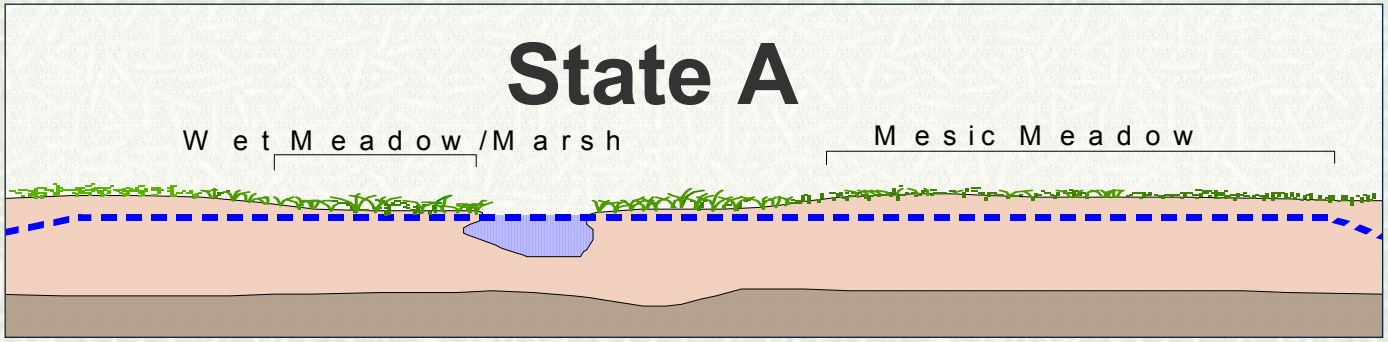
- Channel adjustments that occur rapidly in response to sudden changes
  - Water discharge
  - Sediment delivery
  - Channel/floodplain conditions
  - Vegetation changes
  - Instream structures

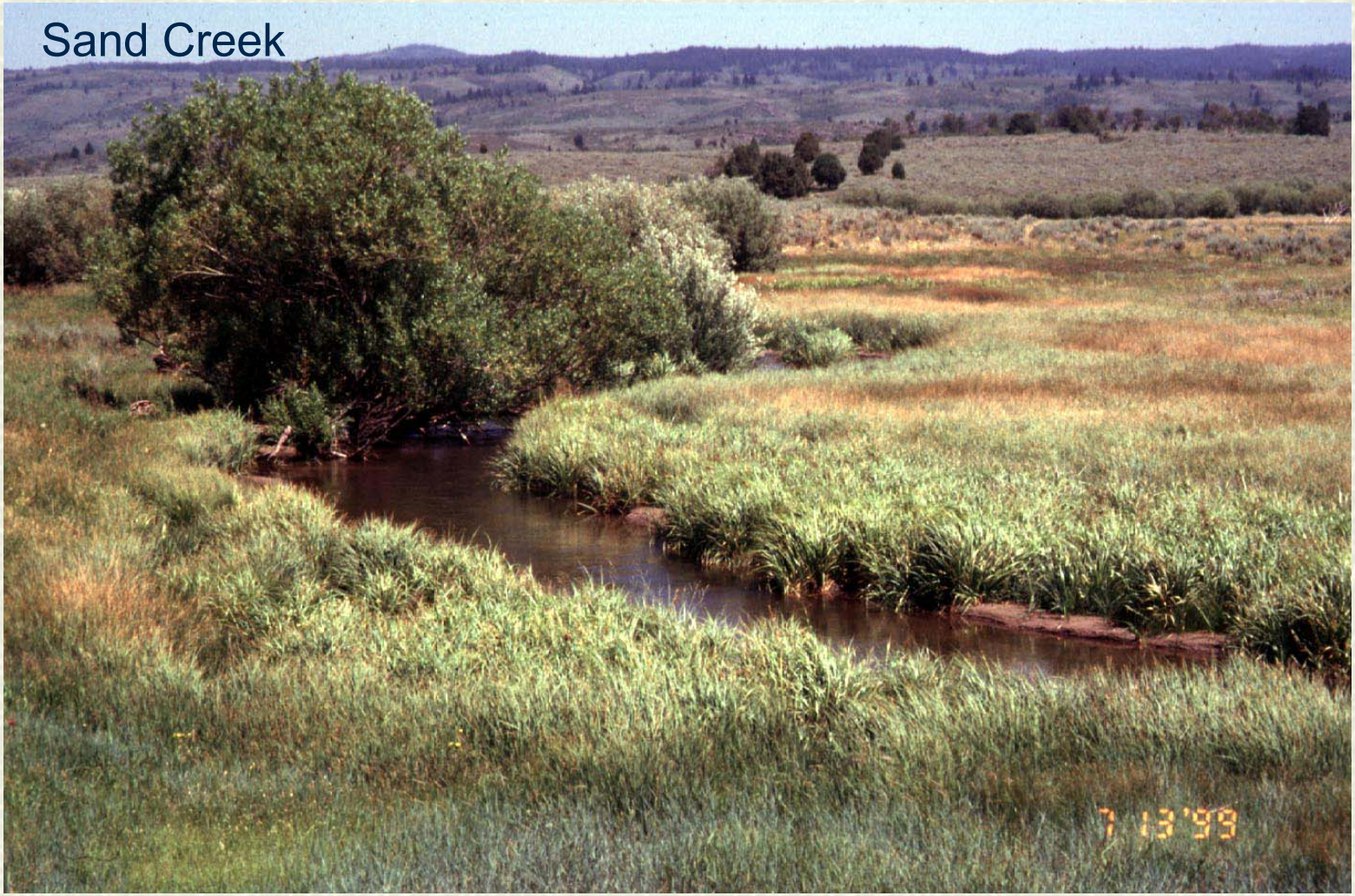
Stages of channel incision

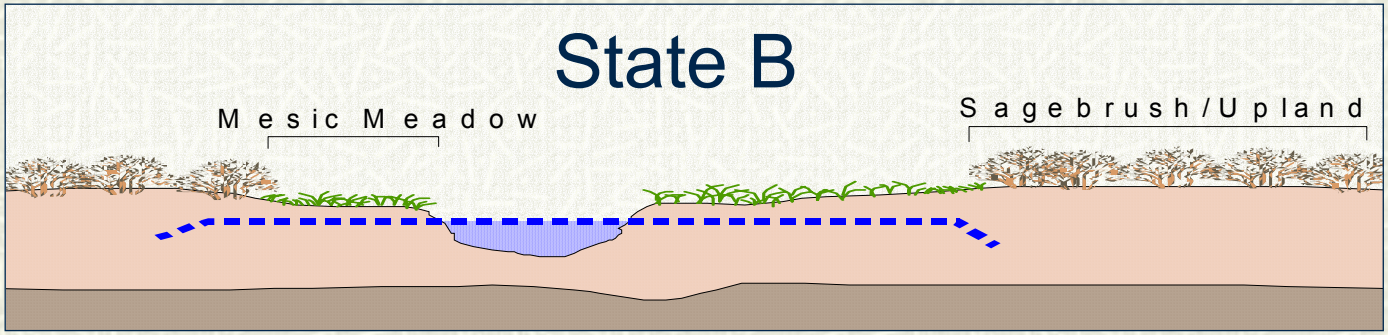
- Pre-incision
- Incision
- Channel widening
- Dynamic stability

States of Channel Succession

Dynamic Stability	State A		PFC
Pre-incision	State B		FAR
Incision	State C		NF
Channel Widening	State D		NF
Channel Widening	State E		FAR
Dynamic Stability	State F		PFC


State A
Wet Meadow/Marsh
Mesic Meadow


Sand Creek
7 13'99

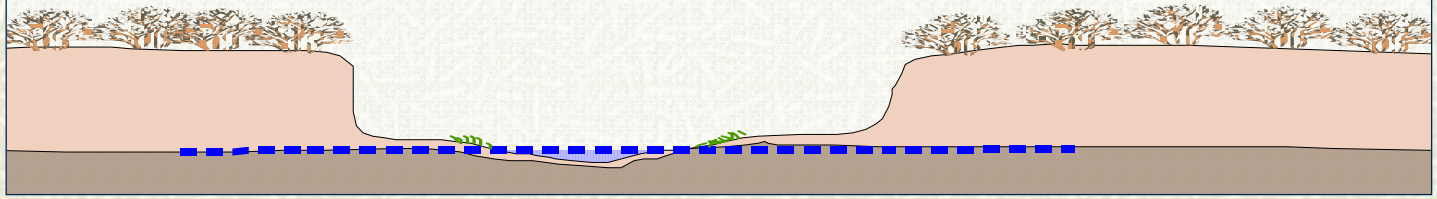

State B
Mesic Meadow
Sagebrush/Upland


Eight Mile Creek
7 14 98

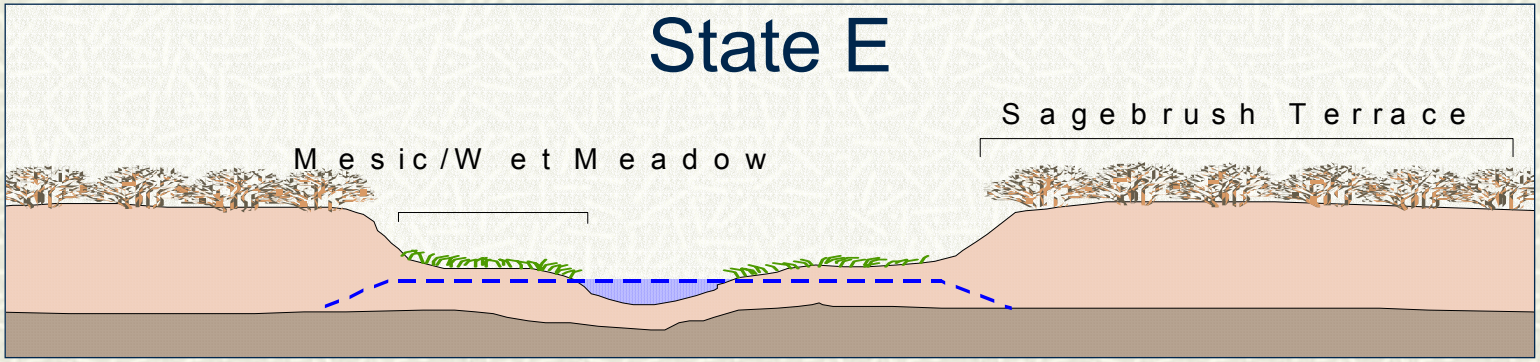
State C

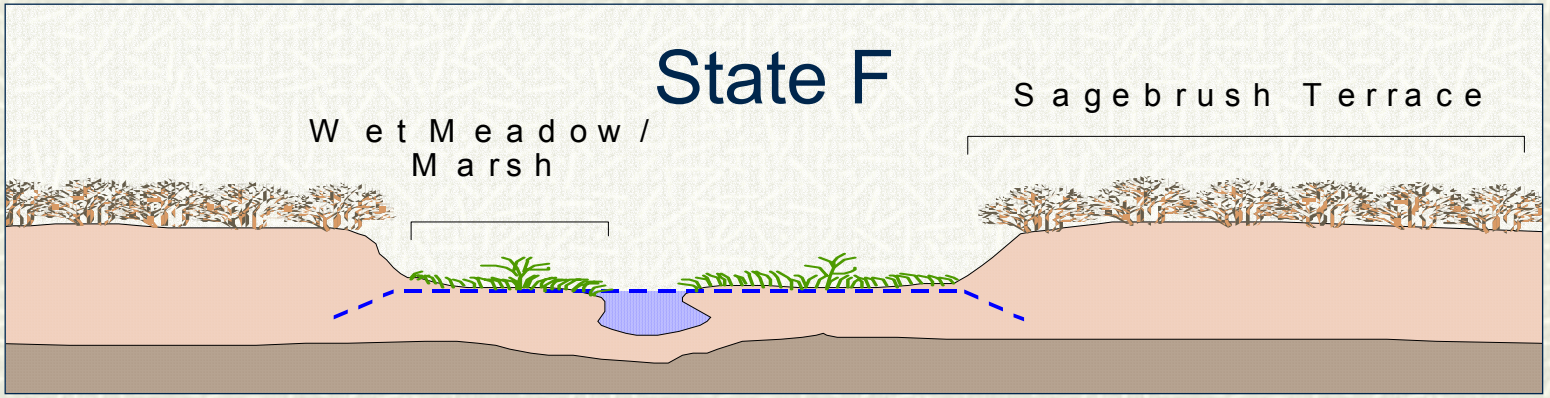
Sagebrush Terrace

State D



State E




State F
Wet Meadow / Marsh
Sagebrush Terrace


Birch Creek
6 2'98

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: _____

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

Yes	No	N/A	VEGETATIVE
			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
Rationale			
			7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
Rationale			
			8) Species present indicate maintenance of riparian soil moisture characteristics
Rationale			
			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
Rationale			
			10) Riparian-wetland plants exhibit high vigor
Rationale			
			11) Adequate riparian-wetland vegetative cover present to protect banks and dissipate energy during high flows
Rationale			
			12) Plant Communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)
Rationale			

Standard Checklist (Lotic)

Yes	No	N/A	EROSION/DEPOSITION
			13) Flood plain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
Rationale			
			14) Point bars are revegetating with riparian-wetland vegetation
Rationale			
			15) Lateral stream movement is associated with natural sinuosity
Rationale			
			16) System is vertically stable
Rationale			
			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)
Rationale			

Remarks:

SUMMARY DETERMINATION

Functioning Rating

Condition within the functional rating

High

Proper Functioning Condition _____

Functional--At Risk _____

Nonfunctional _____

Low

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)

_____ Mining Activities
_____ Channelization
_____ Augmentation flows
_____ Agricultural Activities

Remarks:

Natural Riparian Resources

Water

Landscape & Soil

Vegetation