

Geomorphic Assessment Methods for Rivers and Streams

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TOWARD FALLS BRIDGE NOV. 4 '27
-SLADE-







THE MAINE MALL

GM POLLACK & SONS
CELEBRATE
OUR 48TH YEAR!

Hannaford

Food Drug

TJ-MAXX

CVT

LOWE'S

Goodbye

295







HELLEKOLE



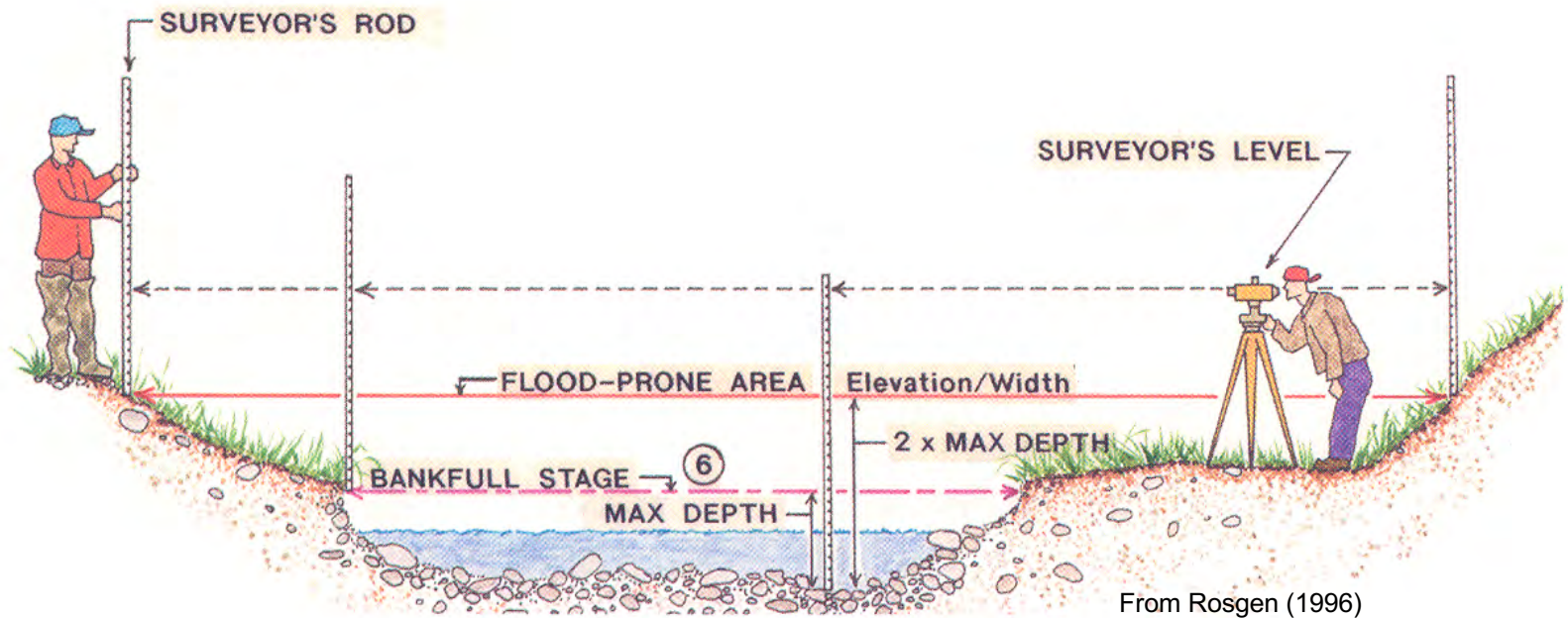


Geomorphic Assessment Methods

- Rosgen method
- Vermont protocols
- Maine rapid geomorphic assessment

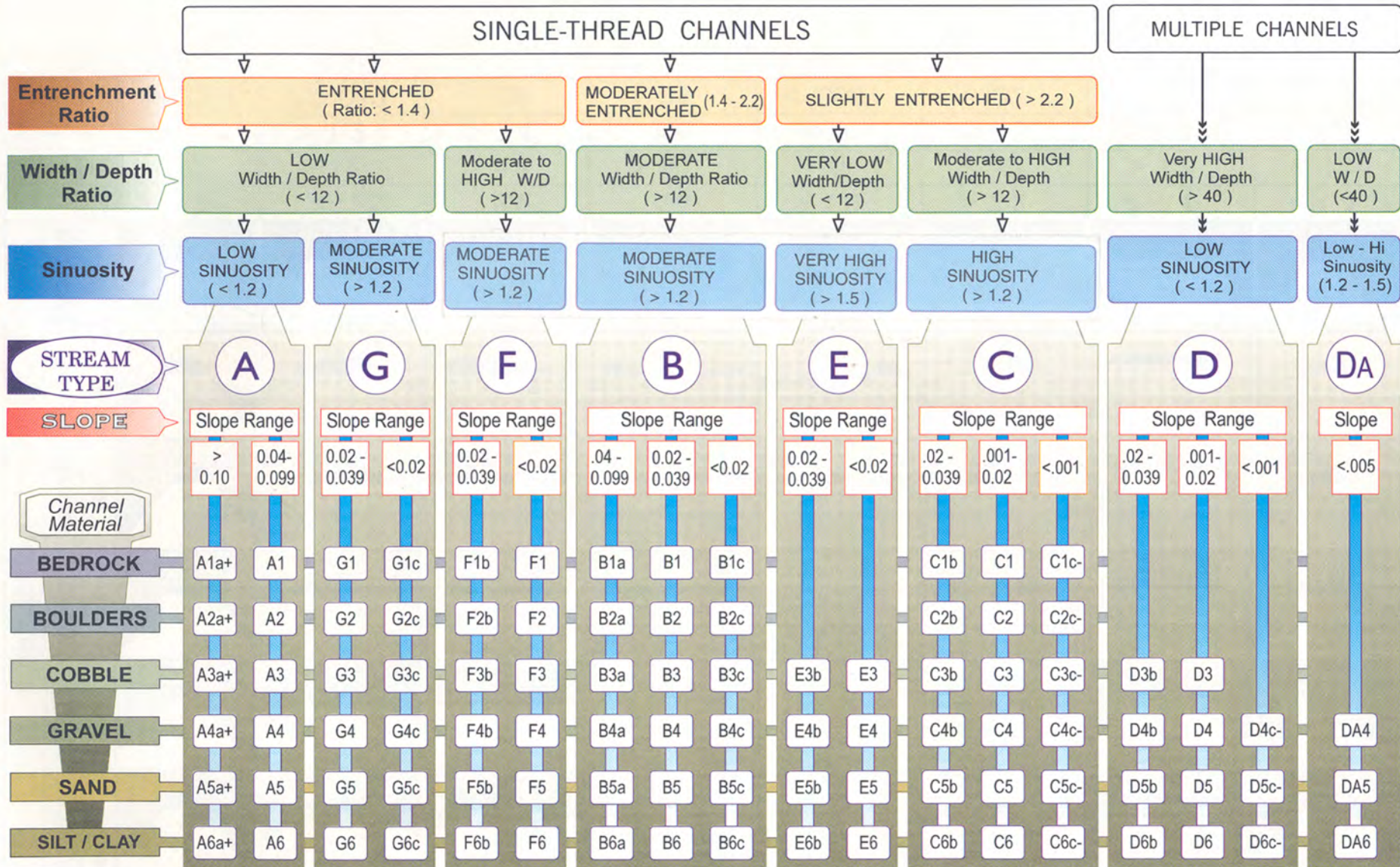
Table 11-3 Reference reach summary data form

River Reach Summary Data												
Channel dimension	Mean riffle depth (d_{bkr})		ft	Riffle width (W_{bkr})		ft	Riffle area (A_{bkr})		ft ²			
	Mean pool depth (d_{bkfp})		ft	Pool width (W_{bkfp})		ft	Pool area (A_{bkfp})		ft ²			
	Mean pool depth/mean riffle depth		$d_{bkfp}/(d_{bkr})$	Pool width/riffle width		W_{bkfp}/W_{bkr}	Pool area/riffle area		A_{bkfp}/A_{bkr}			
	Max riffle depth (d_{mbkr})		ft	Max pool depth (d_{mbkfp})		ft	Max riffle depth/mean riffle depth					
	Max pool depth/mean riffle depth						Point bar slope					
	Streamflow: estimated mean velocity at bankfull stage (u_{bkr})			ft/s	Estimation method							
	Streamflow: estimated discharge at bankfull stage (Q_{bkr})			ft ³ /s	Drainage area				mi ²			
Channel pattern	Geometry			Mean	Min.	Max.	Dimensionless geometry ratios			Mean	Min.	Max.
	Meander length (L_m)					ft	Meander length ratio (L_m/W_{bkr})					
	Radius of curvature (R_c)					ft	Radius of curvature/riffle width (R_c/W_{bkr})					
	Belt width (W_{bt})					ft	Meander width ratio (W_{bt}/W_{bkr})					
	Individual pool length					ft	Pool length/riffle width					
	Pool to pool spacing					ft	Pool to pool spacing/riffle width					
Site	Valley slope (VS)			ft/ft	Average water surface slope (S)			ft/ft	Sinuosity (VS/S)			
	Stream length (SL)			ft	Valley length (VL)			ft	Sinuosity (SL/VL)			
	Low bank height (LBH)	start		ft	Max riffle depth	start		ft	Bank height ratio (LBH/max riffle depth)	start		
		end		ft		end		ft		end		
	Facet slopes			Mean	Min.	Max.	Dimensionless geometry ratios			Mean	Min.	Max.
Riffle slope (S_{rif})				ft/ft	Riffle slope/average water surface slope (S_{rif}/S)							
Run slope (S_{run})				ft/ft	Run slope/average water surface slope (S_{run}/S)							



From Rosgen (1996)

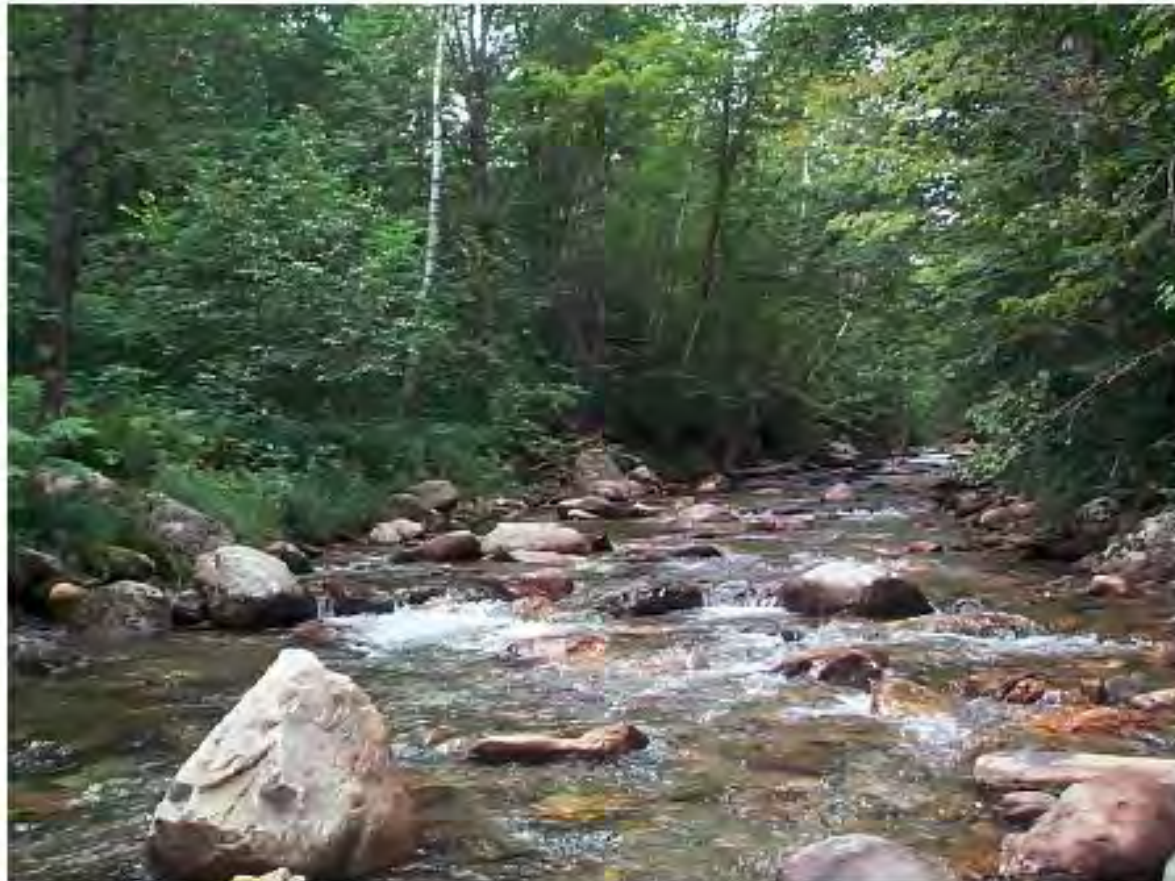
Rosgen Classification System



KEY to the **ROSGEN** CLASSIFICATION of NATURAL RIVERS. As a function of the "continuum of physical variables" within stream reaches, values of **Entrenchment** and **Sinuosity** ratios can vary by +/- 0.2 units; while values for **Width / Depth** ratios can vary by +/- 2.0 units.

**Vermont Stream Geomorphic Assessment
Phase 2 Handbook**

**RAPID
STREAM ASSESSMENT**



Project: Trout River Mouth
 Stream: Unnamed 3 to M2
 Organization: Johnson Company
 Segment Length (ft): 1,700

Phase 2 Segment Summary page 1 of 2
 Reach # M2S3.01 Segment: 0
 Observers: Adam Robtoy, Paul Stanley Why Not assessed:
 Segment Location: From confluence with Trout to just upstream of Longley Bridge Road

March 20, 2007 FIT: Yes
 Completion Date: September 20, 2006
 Rain: Yes

<u>Step 1. Valley and Floodplain</u>		
1.1 Segmentation	None	
1.2 Alluvial Fan	No	
<u>1.3 Corridor Encroachments</u>		
	<u>Length (ft)</u>	<u>One</u> <u>Both</u>
Berms	0	0
Roads	0	49
Railroads	0	0
Improved Paths	0	0
Development	0	0
<u>1.4 Adjacent Side</u>		
	<u>Left</u>	<u>Right</u>
Hillside Slope	Steep	Steep
Continuous w/	Sometimes	Sometimes
W/in 1 Bankfill	Sometimes	Sometimes
	<u>Texture</u>	<u>Bedrock</u> <u>Bedrock</u>
<u>1.5 Valley Features</u>		
Valley Width (ft)	537	
Width Determination	Measured	
Confinement Type	Very Broad	
Rock Gorge?	No	
Human-caused changed valley width?	no	

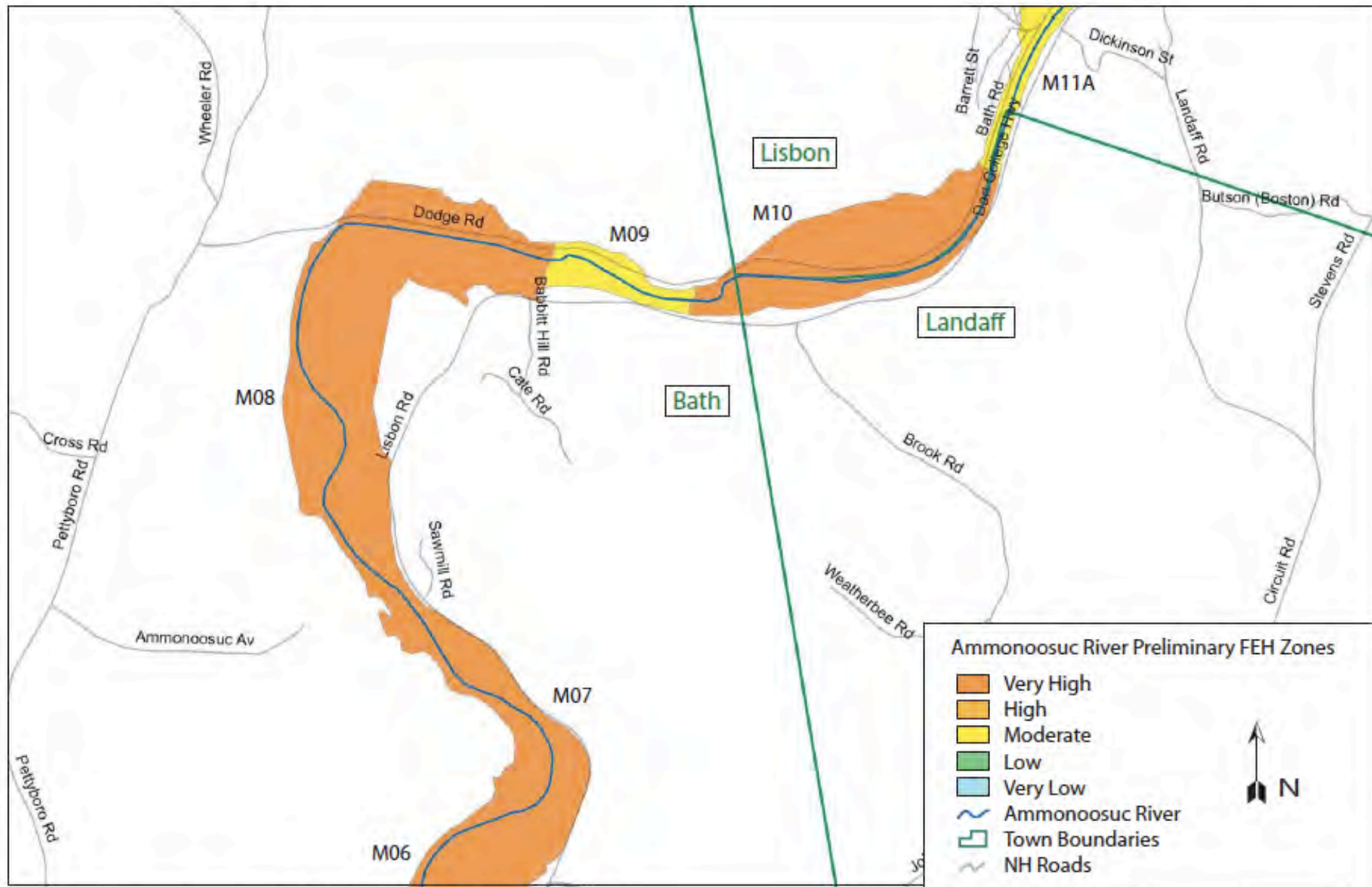
Notes:
 upper 300 feet of reach above culvert on Longley Bridge Road is steeper and should be included in M2S3.02. This portion was not segmented as it was so short and so similar to M2S3.02

bankful indicators included benches along both banks at similar heights, and the top of gravel bar

<u>Step 2. Stream Channel</u>	
2.1 Bankfull Width	15
2.2 Max Depth (ft)	1.70
2.3 Mean Depth (ft)	1.00
2.4 Floodprone Width (ft)	36
2.5 Aband. Floodpln	2.80
2.6 Width/Depth Ratio	15.00
2.7 Entrenchment Ratio	2.40
2.8 Incision Ratio	1.65
2.9 Sinuosity	Low
2.10 Riffles Type	Complete
2.11 Riffle/Step Spacing (ft)	50
<u>2.12 Substrate Composition</u>	
Bedrock	0 %
Boulder	4 %
Cobble	49 %
Coarse Gravel	26 %
Fine Gravel	18 %
Sand	3 %
Silt/Clay Present?	No
Detritus	20 %
# Large Woody	7
<u>2.13 Average Largest Particle on</u>	
Bed	150.0 mm
Bar	120.0 mm
<u>2.14 Stream Type</u>	
Stream Type:	B
Bed Material:	Cobble
Subclass Slope:	None
Bed Form:	Step-Pool
<u>2.15 Reference Stream Type</u>	
(if different from Phase 1)	

<u>Step 3. Riparian Features</u>		
<u>3.1 Stream Banks</u>		
Typical Bank Slope	Steep	
Bank Texture	<u>Left</u>	<u>Right</u>
Upper		
Material Type	Gravel	Gravel
Consistency	Non-cohesive	Non-cohesive
Lower		
Material Type	Boulder/Cobble	Boulder/Cobble
Consistency	Non-cohesive	Non-cohesive
Bank Erosion	<u>Left</u>	<u>Right</u>
Erosion Length (ft)	46	59
Erosion Height (ft)	3.00	4.00
Revetmt. Type	Rip-Rap	Rip-Rap
Revetmt. Length (ft)	248	186
Near Bank Veg. Type	<u>Left</u>	<u>Right</u>
Dominant	Herbaceous	Herbaceous
Sub-dominant	Deciduous	Pasture
Bank Canopy	<u>Left</u>	<u>Right</u>
Canopy %	1-25	1-25
Mid-Channel Canopy	Open	
<u>3.2 Riparian Buffer</u>		
Buffer Width	<u>Left</u>	<u>Right</u>
Dominant	5-25	<5
Sub-dominant	26-50	5-25
Buffer Veg. Type	<u>Left</u>	<u>Right</u>
Dominant	Mixed Trees	Mixed Trees
Sub-dominant	Herbaceous	Herbaceous
<u>3.3 Riparian Corridor</u>		
Corridor Land	<u>Left</u>	<u>Right</u>
Dominant	Pasture	Pasture
Sub-dominant	Hay	Hay
	<u>Amount</u>	<u>Mean Height</u>
Mass Failures	None	0.00
Gullies	None	0.00

<u>Step 4. Flow & Flow Modifiers</u>			
4.1 Springs / Seeps	None		
4.2 Adjacent Wetlands	None		
4.3 Flow Status	Moderate		
4.4 # of Debris Jams	0		
4.5 Impoundments	None		
Impoundmt. Location			
4.6 # of Stormwater Inputs	0		
4.7 Upstream Flow	None		
4.9 # of Beaver Dams	0		
Affected Length (ft)	0		
<u>Step 5. Channel Bed and Planform Changes</u>			
<u>5.1 Bar Types</u>			
	<u>Mid</u>	<u>Point</u>	<u>Side</u>
	0	6	3
	<u>Diagonal</u>	<u>Delta</u>	<u>Island</u>
	0	1	0
<u>5.2 Other Features</u>			
Flood	<u>Neck Cutoff</u>	<u>Avulsion</u>	<u>Braiding</u>
0	0	0	0
<u>5.3 Steep Riffles and Head Cuts</u>			
Steep Riffles	<u>Head Cuts</u>	<u>Trib Rejuv.</u>	
0	0	No	
<u>5.4 Stream Ford or Animal</u>			
Yes			
<u>5.5 Straightening</u>			
No			
Straightening Length: 0			
<u>5.5 Dredging</u>			
None			
Note: Step 1.6 - Grade Controls and Step 4.8 - Channel Constrictions are on The second page of this report - Steps 6 through 7.			



Ammonoosuc River Preliminary FEH Zones - Bath, Landaff and Lisbon (3 of 13).



Rapid Geomorphic Assessment (RGA)



Date:
Location:

Site:

Crew:
Recorder:

Form/ Process	Geomorphic Indicator		Present		Score*
	Num	Description	No	Yes	
Evidence of Aggradation (AI)	1	Lateral bars			
	2	Coarse materials in riffles embedded			
	3	Siltation in pools			
	4	Mid-channel bars			
	5	Deposition on point bars			
	6	Poor longitudinal sorting of bed materials			
	7	Soft, unconsolidated bed			
	8	Evidence of deposition in/around structures			
	9	Deposition in the overbank zone			
Sum of Indices:					

Evidence of Degradation (DI)	1	Channel incision into undisturbed overburden / bedrock			
	2	Elevated tree roots/root fan above channel bed			
	3	Bank height increases			
	4	Absence of depositional features (no bars)			
	5	Cut face on bar forms			
	6	Head cutting due to knick point migration			
	7	Suspended armour layer visible in bank			
Sum of Indices:					

Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc			
	2	Occurrence of large organic debris			
	3	Exposed tree roots			
	4	Basal scour on inside meander banks			
	5	Toe erosion on both sides of channel through riffle			
	6	Steep bank angles through most of reach			
	7	Length of bank scour >50% through subject reach			
	8	Fracture lines along top of bank			
Sum of Indices:					

Evidence of Planimetric Form Adjustment (PI)	1	Formation of chutes			
	2	Single thread channel to multiple channel			
	3	Evolution of pool-riffle form to low bed relief form			
	4	Cut-off channel(s)			
	5	Formation of island(s)			
	6	Thalweg alignment out of phase meander form			
	7	Bar forms poorly formed / reworked / removed			
Sum of Indices:					

Stability Index:

Condition:

Evidence of Widening (WI)	1	Fallen / leaning trees / fence posts / etc	
	2	Occurrence of large organic debris	
	3	Exposed tree roots	
	4	Basal scour on inside meander bends	
	5	Toe erosion on both sides of channel through riffle	
	6	Steep bank angles through most of reach	
	7	Length of bank scour >50% through subject reach	
	8	Fracture lines along top of bank	
Sum of Indices:			

Assessment techniques

- Topographic maps
- Aerial photographs
- Field mapping
- Topographic surveys

Subdivide rivers into reaches

- Changes in slope
- Changes in valley width
- Changes in watershed area



Pettyboro

GILMAN

HILL

ROAD

YOUNG

Gravel Pit

Babbitt Hill

632

509

540

579

Cem

580

700

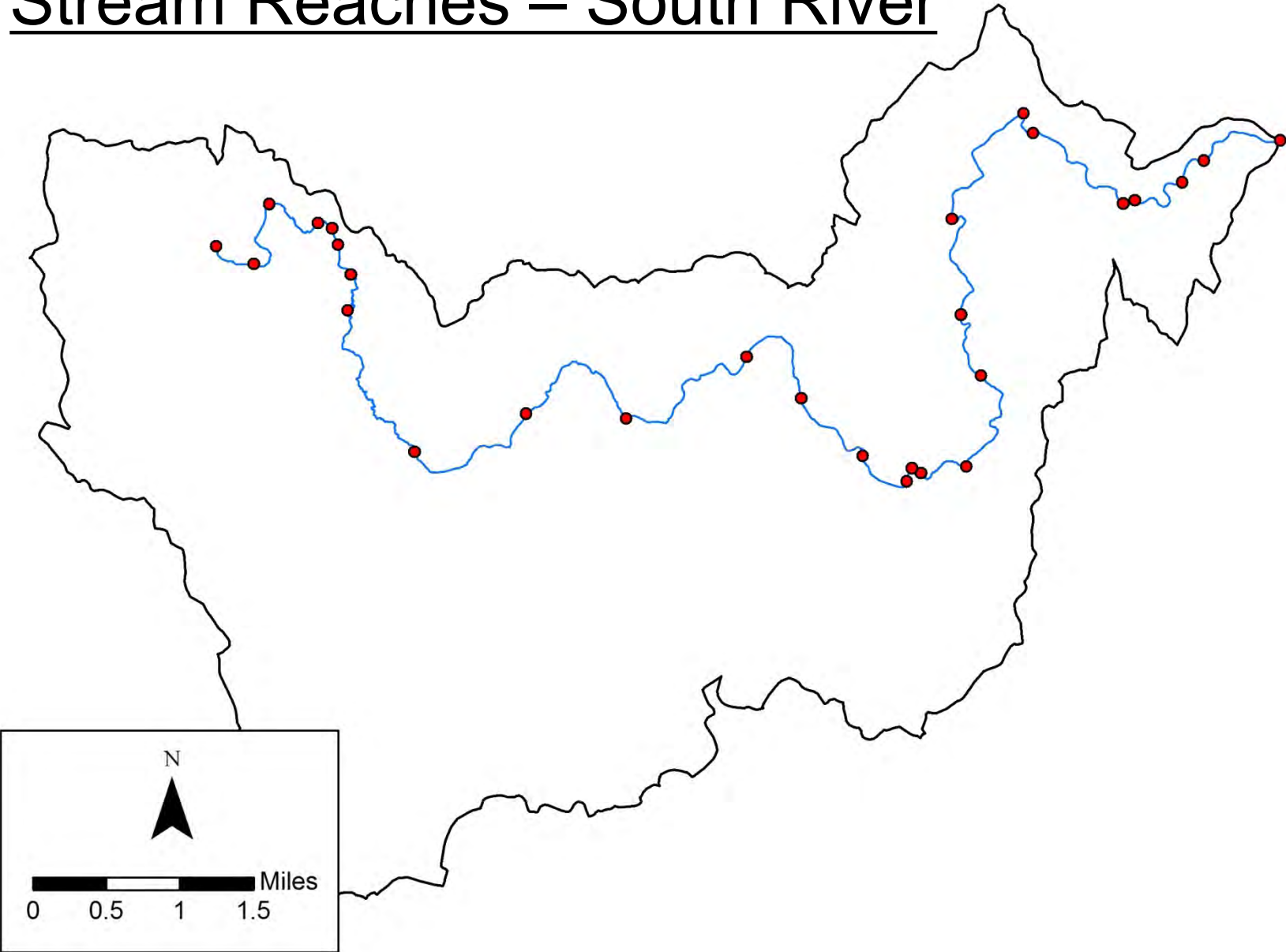




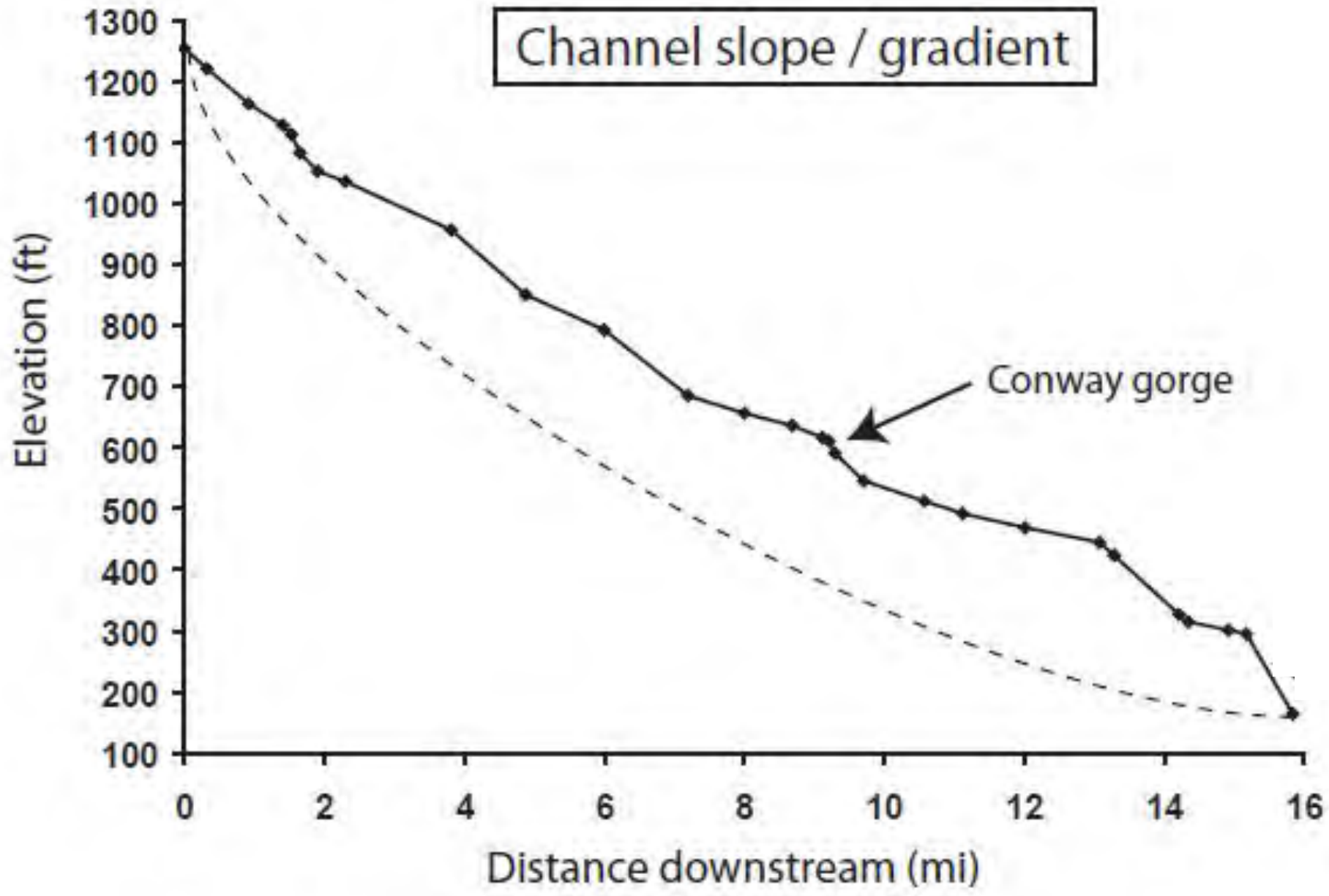




Stream Reaches – South River



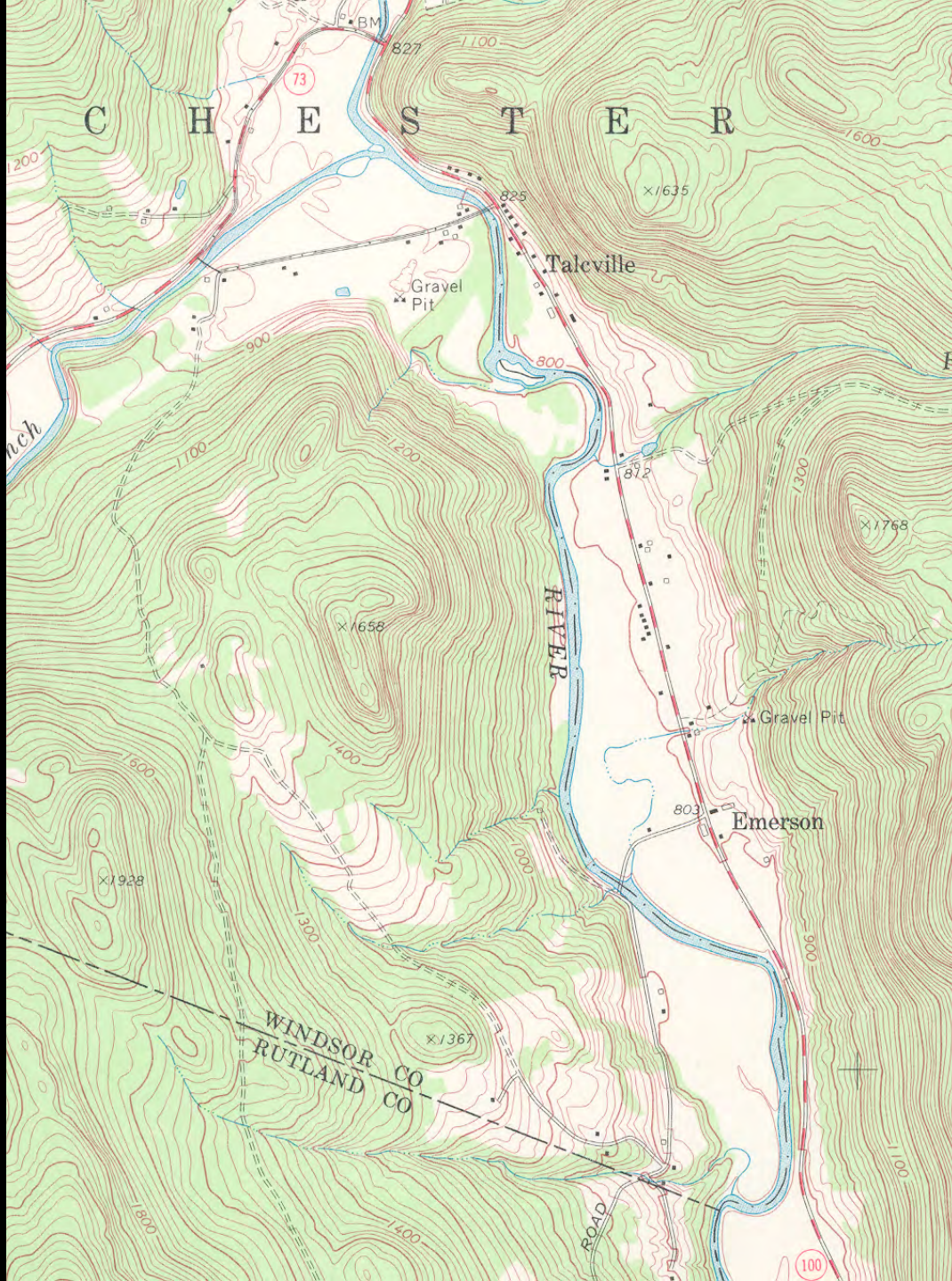
Channel slope / gradient





From Gould (1975)







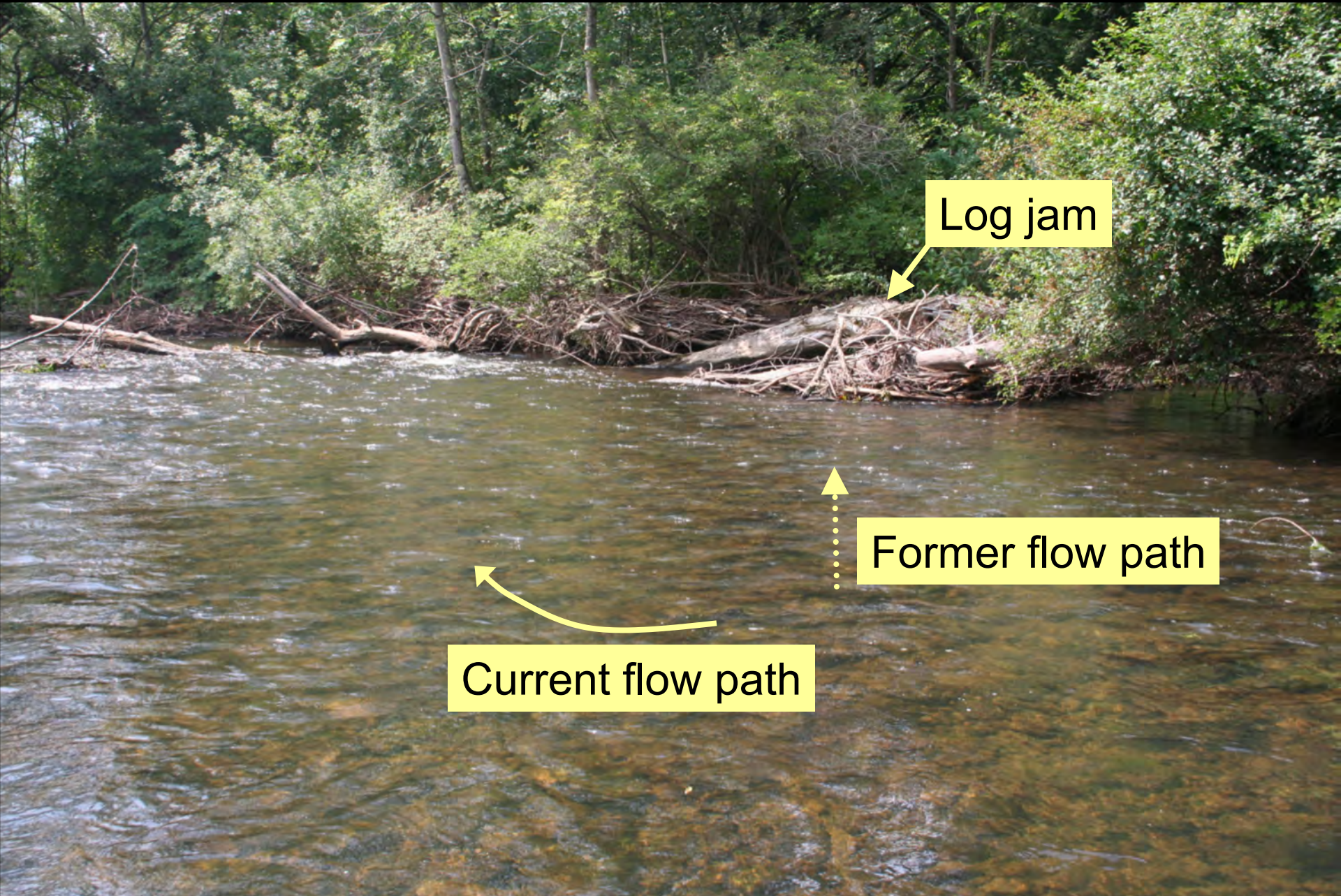
1950's

1980's



Assessment techniques

- Topographic maps
- Aerial photographs
- Field mapping
- Topographic surveys



Log jam

Former flow path

Current flow path



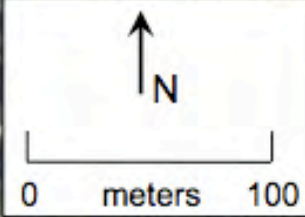
Abandoned portion of straightened channel

Log jam

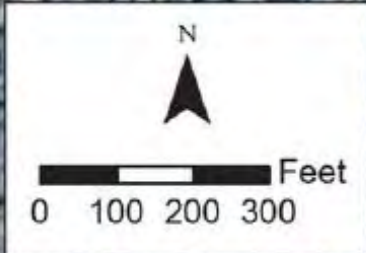
Breakout point

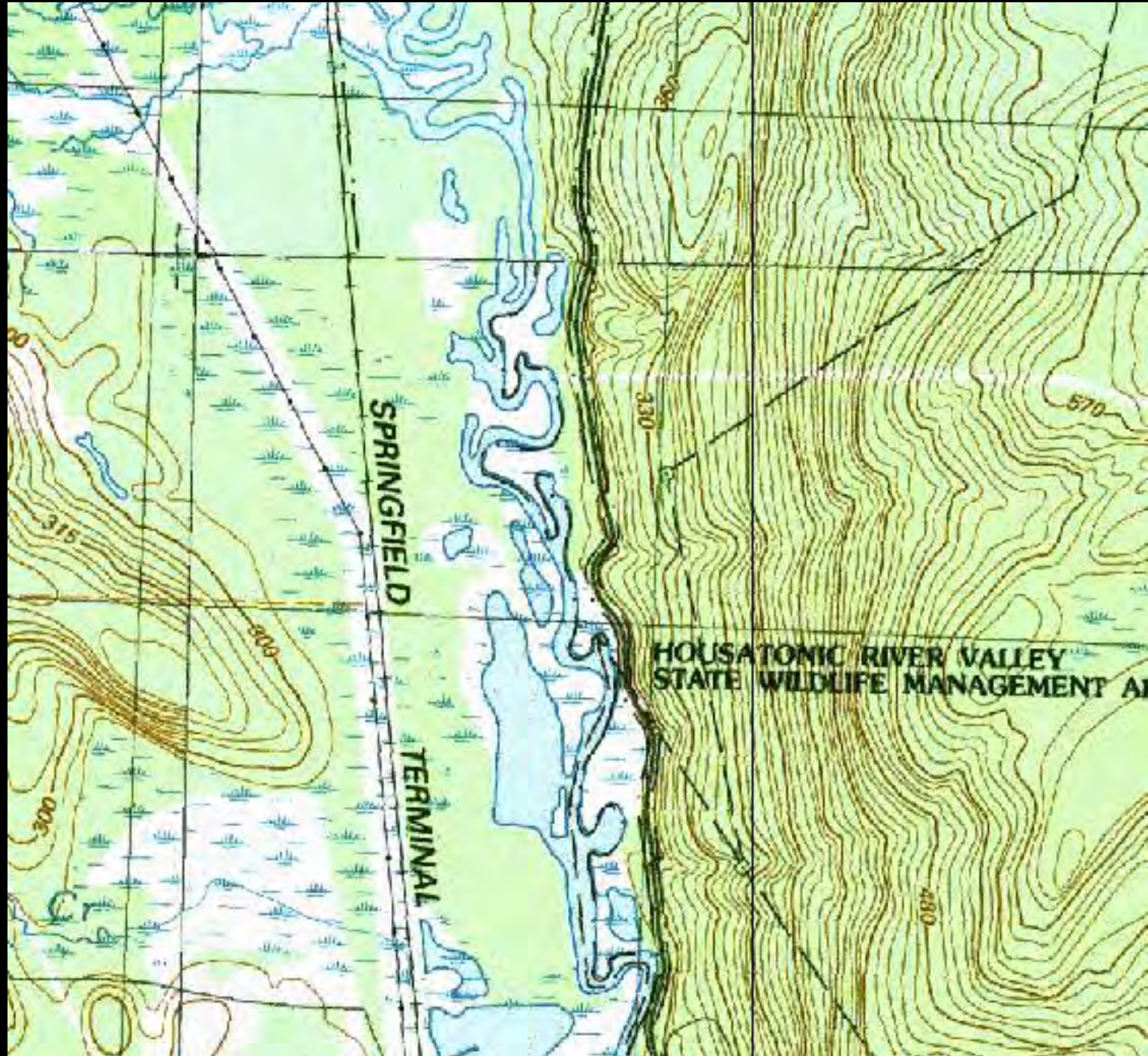
Newly created meander

Flow



Straightened channel







1950's

1980's











Oxbow

Active meander

Oxbow



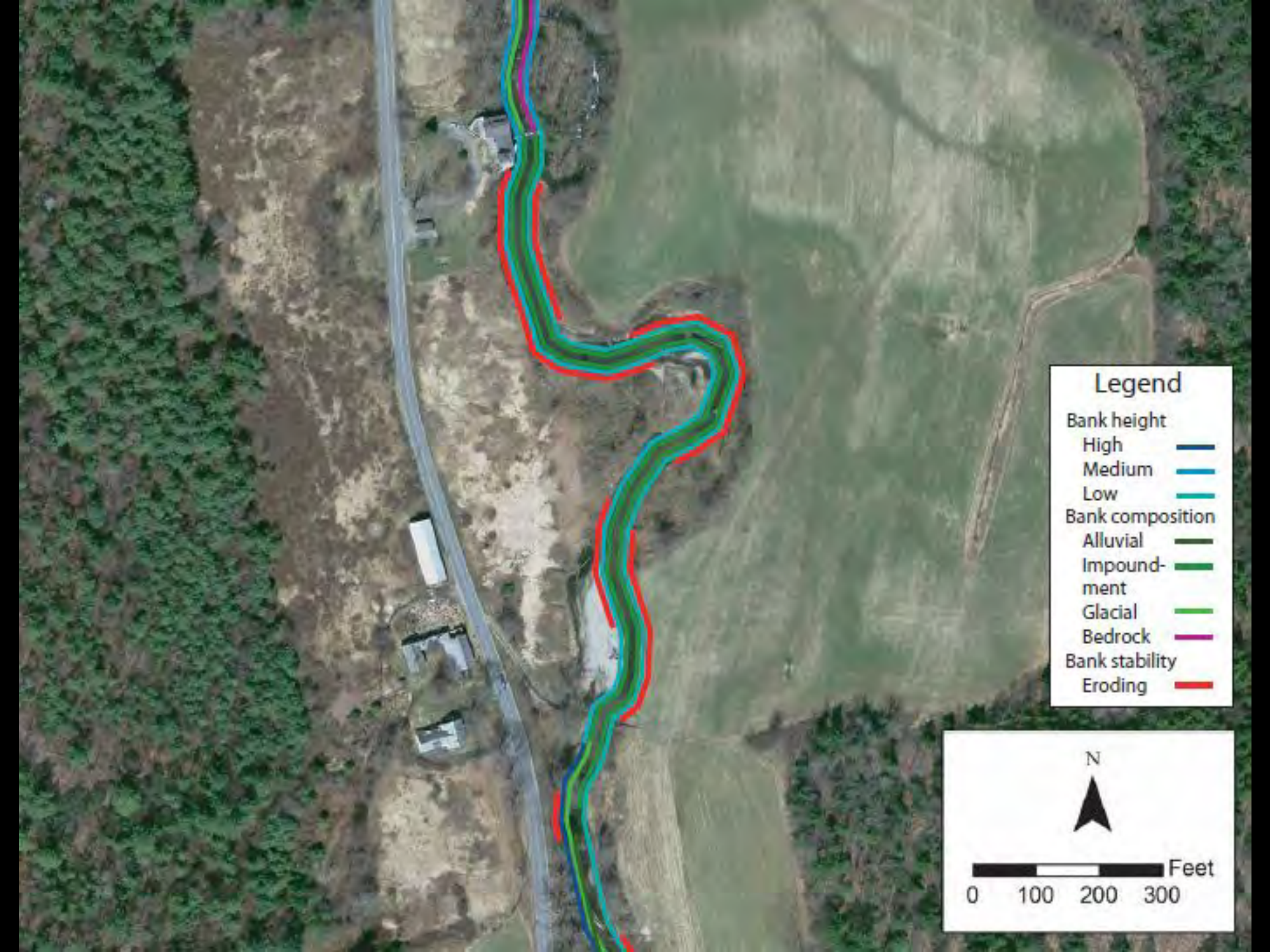
Assessment techniques

- Topographic maps
- Aerial photographs
- Field mapping
- Topographic surveys









Legend


Bank height


High 

Medium 

Low 

Bank composition


Alluvial 

Impoundment 

Glacial 

Bedrock 

Bank stability

Eroding 

N



0 100 200 300 Feet

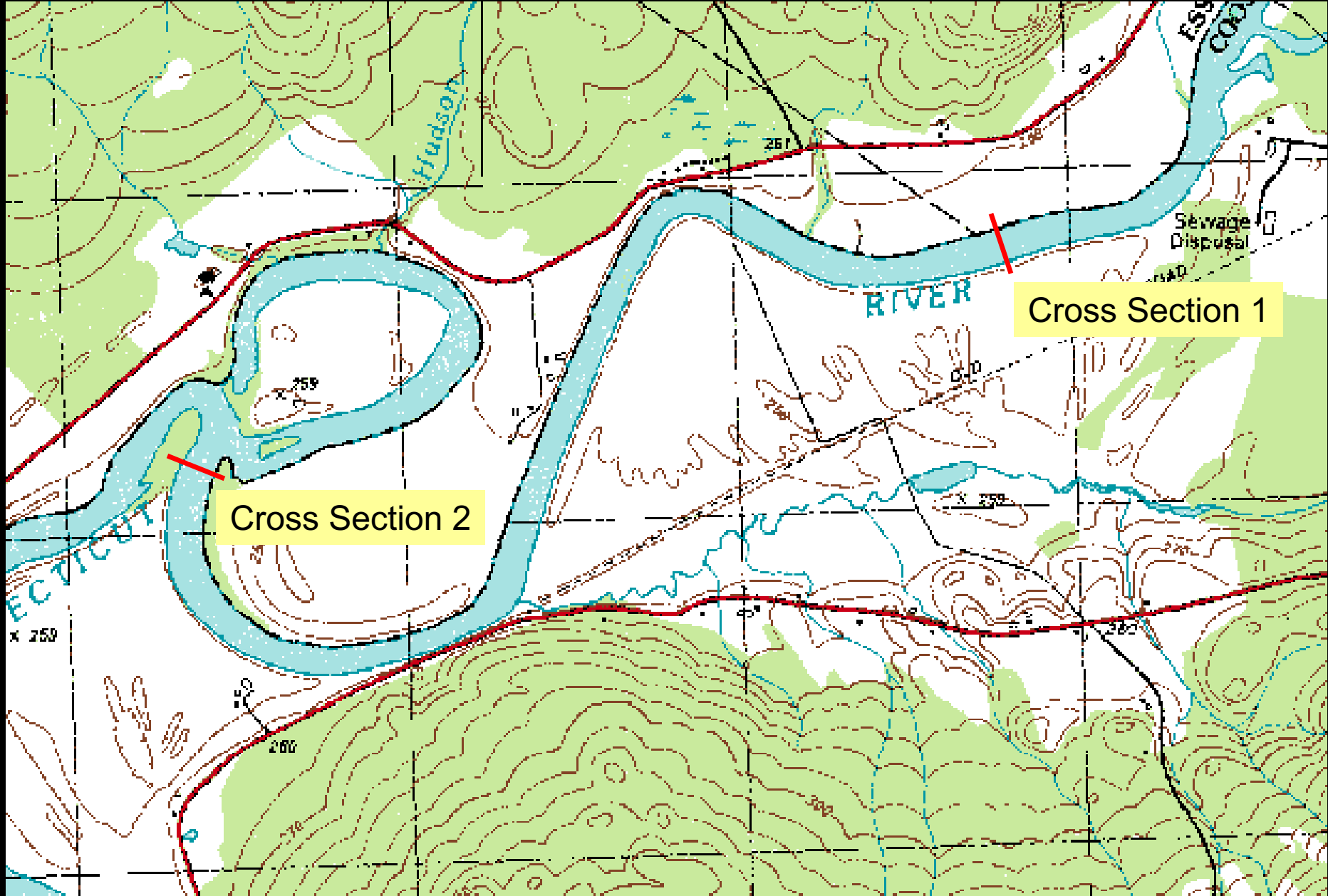
Point Features	Count	per mile
Historic dam site	30	
Bridges (active)	26	
Beaver dams	6	
Avulsions	4	
Oxbows	2	
Flood chutes	3	
Braiding	3	
Deep pool	209	
Debris jams	45	
LWD	1925	122

Assessment techniques

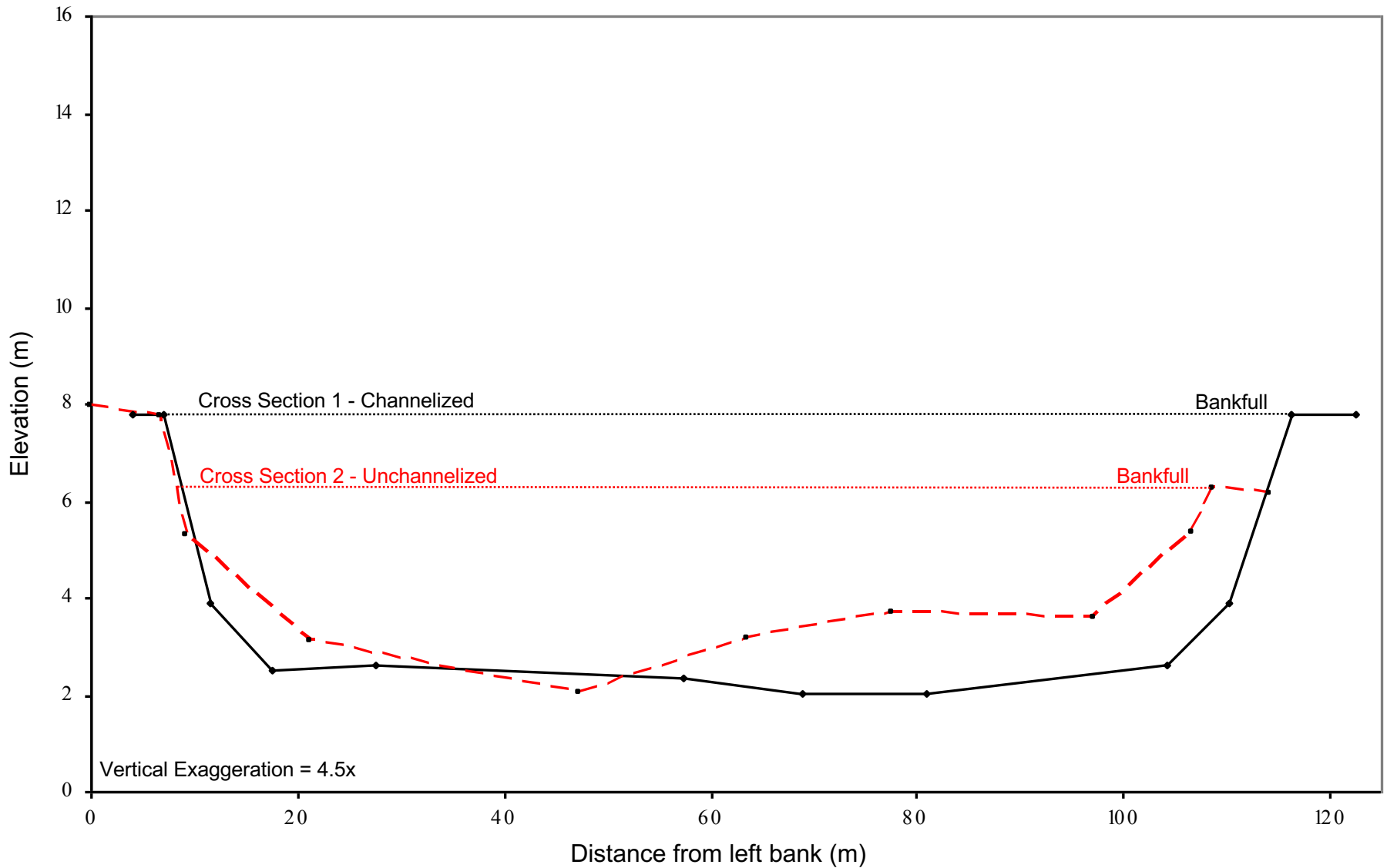
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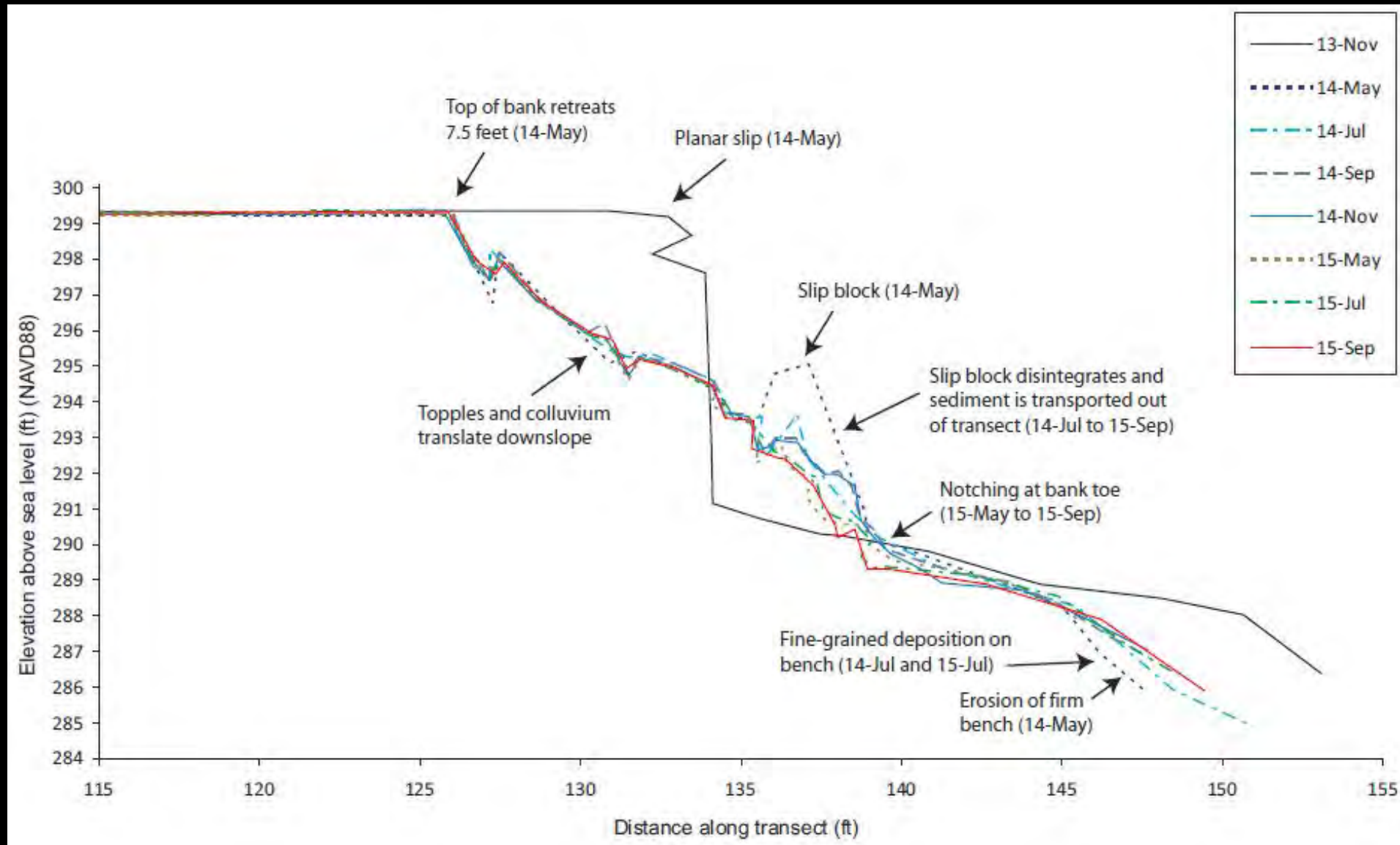


Cross Section Comparison



Comparison of Channelized and Unchannelized Segments – Reach 3





Using the Assessment Data





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