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Cross-Sections and Longitudinal Profiles

Great Lakes Hydraulics and Hydrology Office

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Why Monitor Streams for Sediment?

1. To measure the effects of some land-use change or sediment-producing activity:
   a) Dam removal
   b) Dam construction
   c) Urbanization
   d) Change in agricultural practice
      - No Till
      - Buffer Strips
      - Cover Crop
      - Crop residue
   e) Climate change
   f) Timber harvest activities
   g) Effectiveness of sediment traps
   h) Water diversions
   i) Stream-bank stabilization

Monitoring should be done downstream of activity

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Why Monitor Streams for Sediment? (cont.)

2. **To measure the general state of the stream.**

   Rivers can rarely be treated as controlled experiments. They usually have several sediment-influencing activities going on simultaneously. Monitoring over time allows you to see what direction the river is trending and at what rate.

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What can be Monitored

1. Cross-section (riffle)
   - Lateral migration of channel
   - Aggradation (build-up of sediment) trends
   - Degradation (erosion of the bed) trends
   - Change in width/depth over time (sediment transport capacity)

2. Longitudinal Profile (Long-Pro)
   - Changes in slope of the stream-bed and water surface
   - Filling in of pools
   - Downstream riffle/pool migration
   - Movement of sediment waves (dunes, et c.) of sediment through your study reach

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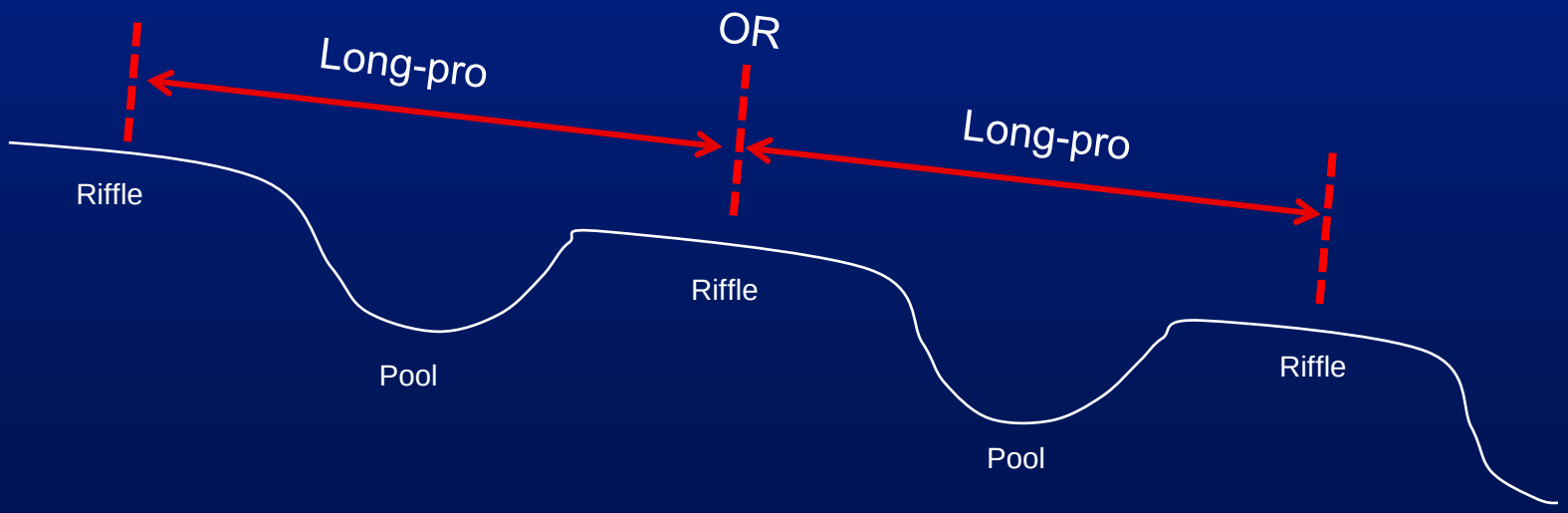
What to Monitor

Longitudinal Profile (Long-Pro)

- Starts and stops on a riffle and should include a pool in between
- Must include your surveyed riffle and go upstream or downstream to the next riffle



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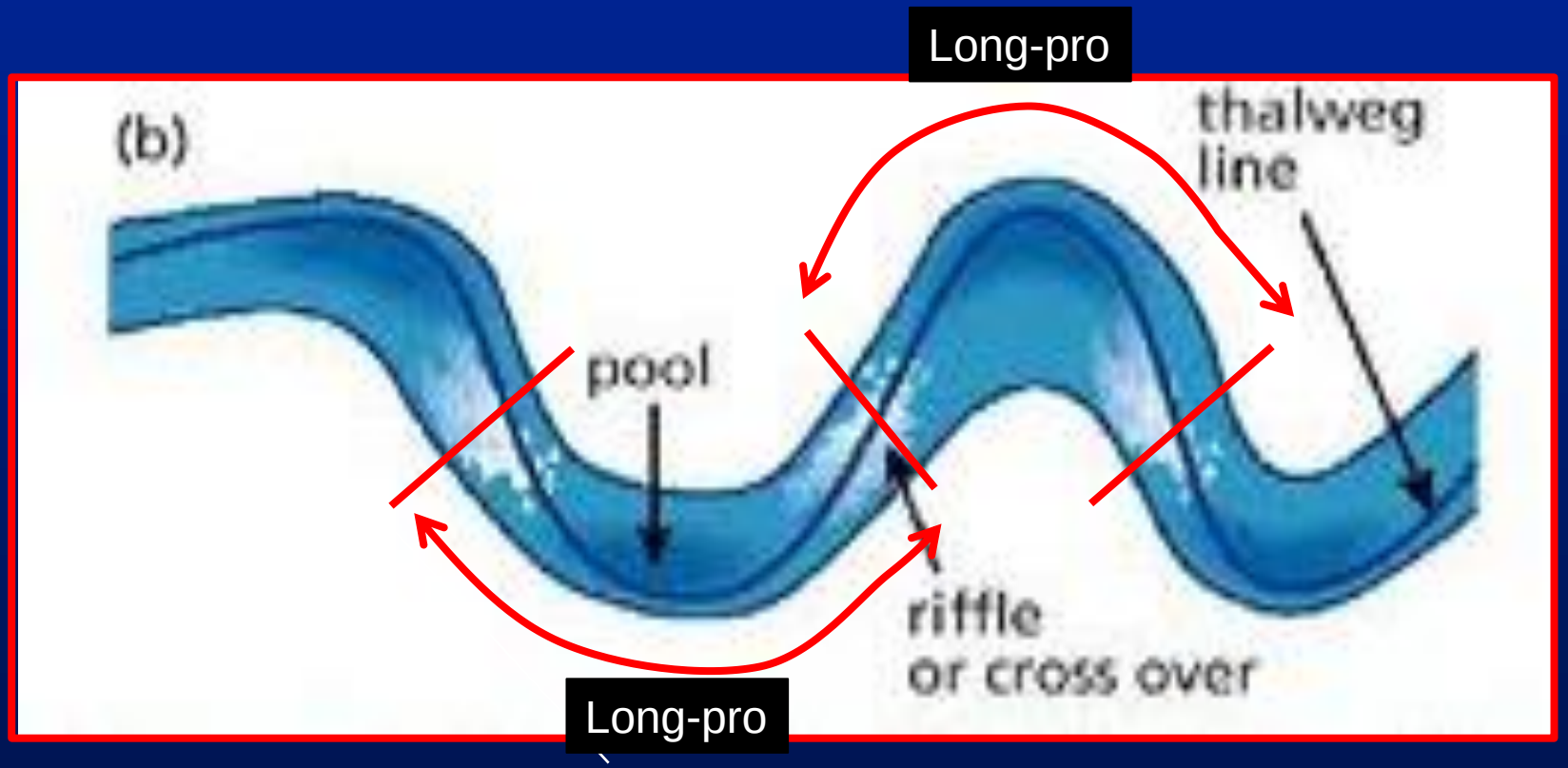
What to Monitor

Long-Pro – Plan View



Source: epa with modifications

Note: Shorter than Harrelson guidance

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Site Selection

Site should be representative of the river in your study area. Walk the reach and select an “average” looking reach to monitor. Look at several riffles to get an idea of what a “normal” riffle looks like. Avoid:

- Bends that are tighter than average (use GoogleEarth)
- Site with unusual looking hydraulics
- Sites that are unusually narrow or wide
- Sites that are unusually affected by vegetation/log-jams

Site selection is **very important**. This is the site you will be monitoring for the next 20+ year (hopefully!). We can assist you with site selection.

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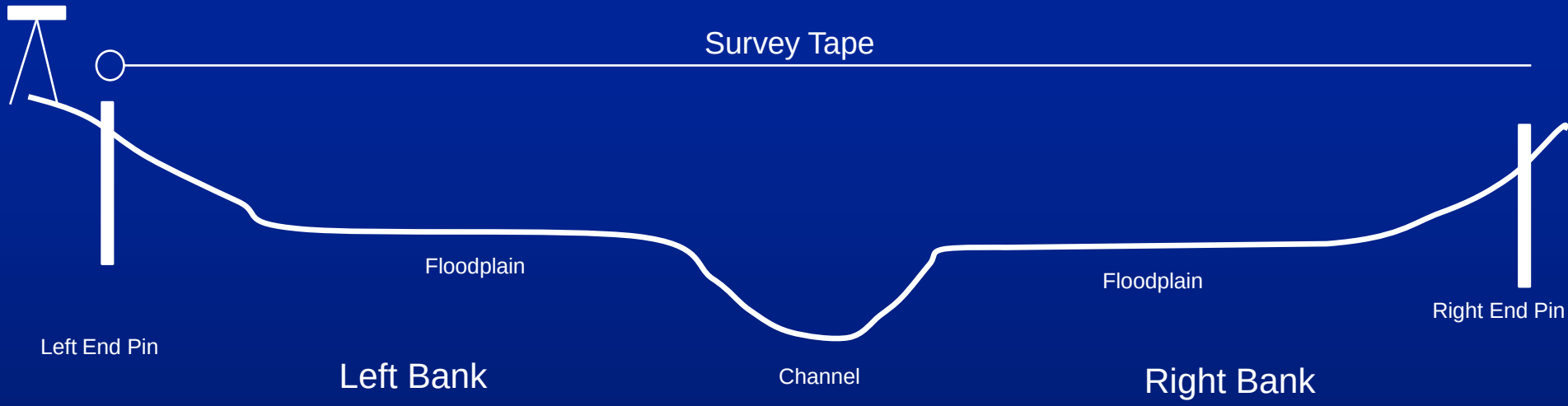
Cross-Sections



- End pins (rebar) should be above the flood-prone area
- Stretch tape from left end pin to right end pin (zero always on left bank)
- Set up level so you can see entire x-section and begin surveying
- Points should be close enough together to resolve the topography and bathymetry
  - If floodplain is fairly flat, points are typically 5-10 ft apart
  - On stream-bed, points are typically 1-5 ft apart

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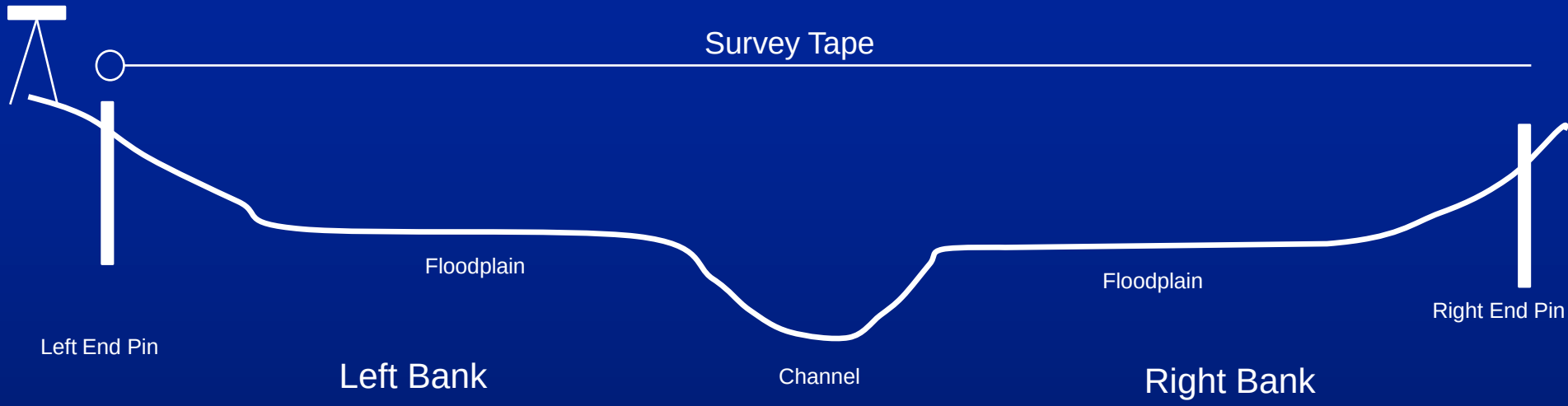
Cross-Sections



- Be sure to survey end pins and any benchmarks in the area
- Survey water-surface at two points along x-section (should be about the same)
- Close survey loop to within 0.02 ft

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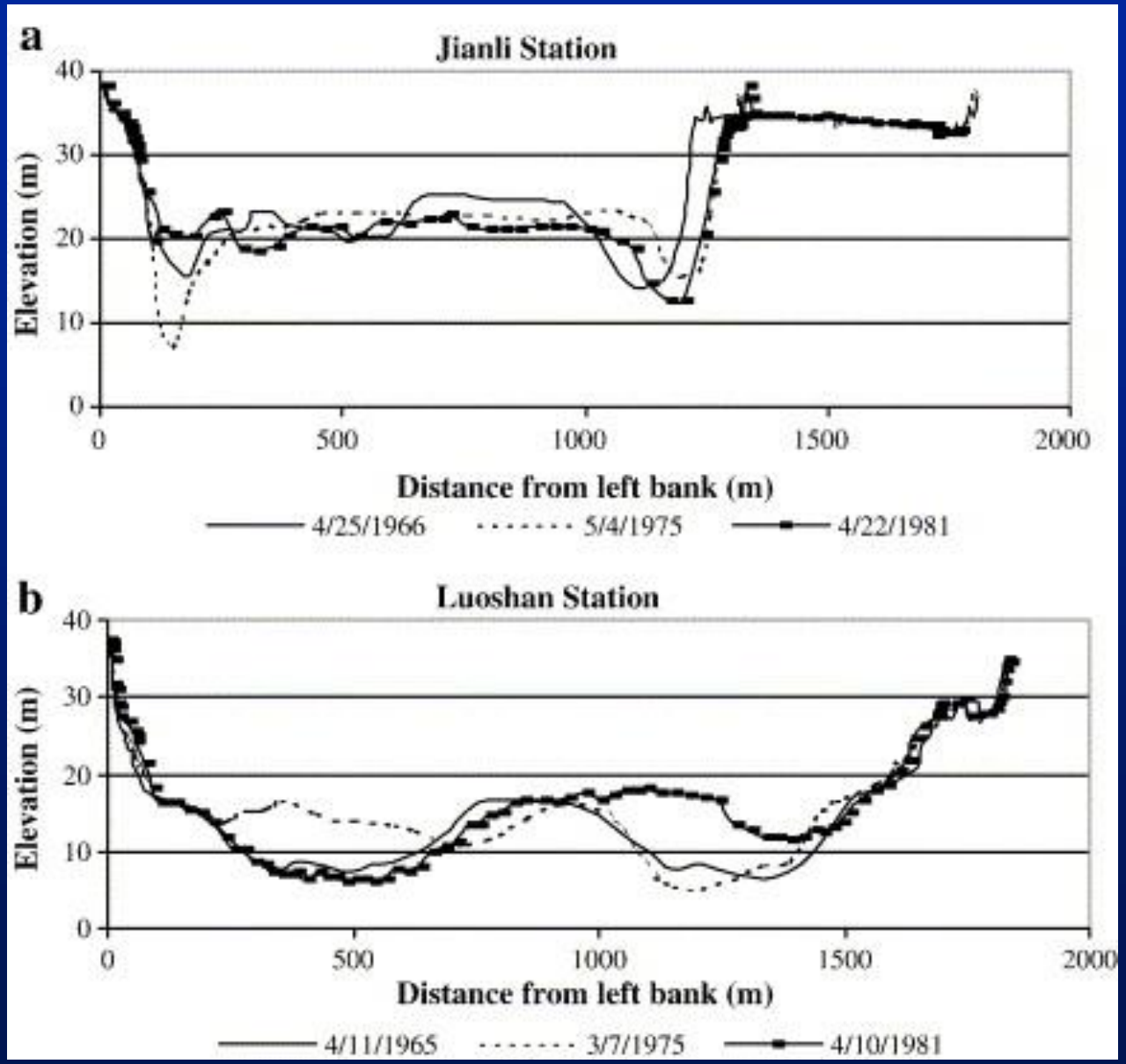
Surveyed Cross-Section



Source: J of Geomorphology, 2007

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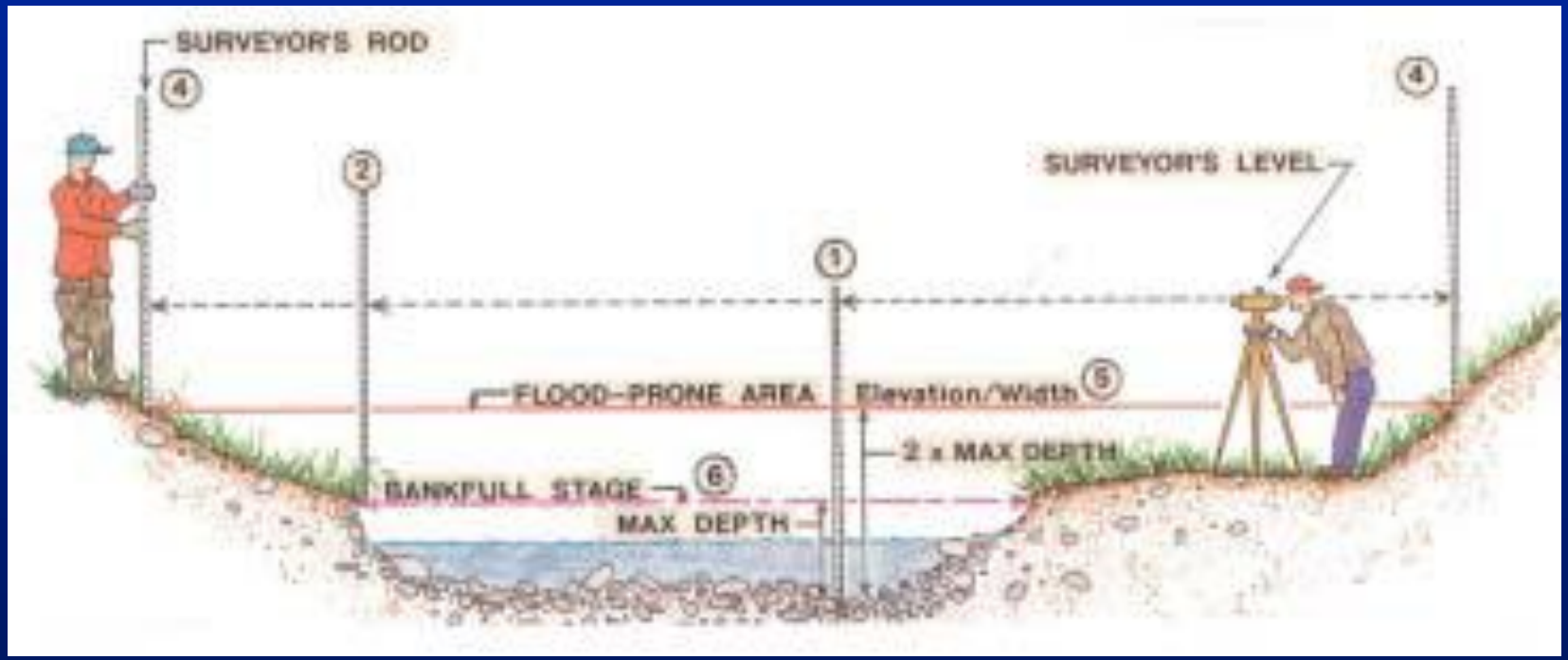
Flood-prone Area



Flood-prone area = the width at 2 times the maximum bankfull depth

If floodplains are very flat, do not carry the survey more than 200 ft past the streambank

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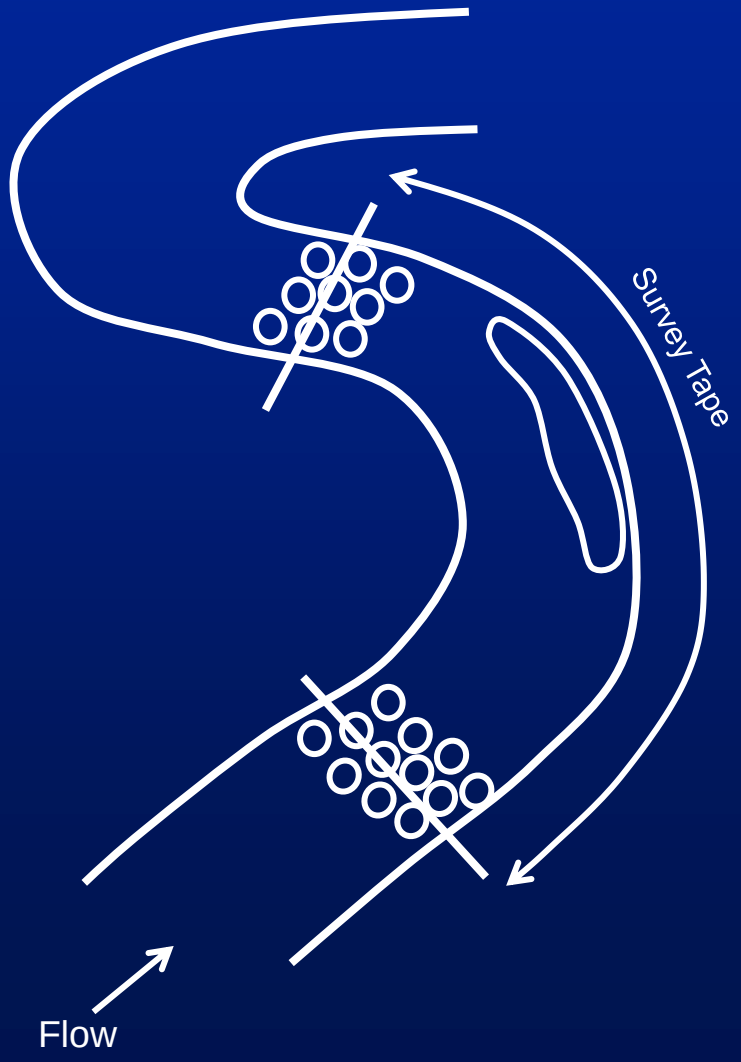
Longitudinal Profile



- Start survey tape at upstream riffle
- Stretch tape along either bank, ending at downstream riffle
- If possible, set up level so you can see the entire long-pro and any benchmarks; otherwise, turning points will be necessary
- Survey the bed at 1-5 ft intervals depending on irregularity and slope breaks
- Survey the water-surface elevation every few (3-4) bed points.
- Close survey loop to 0.02 ft

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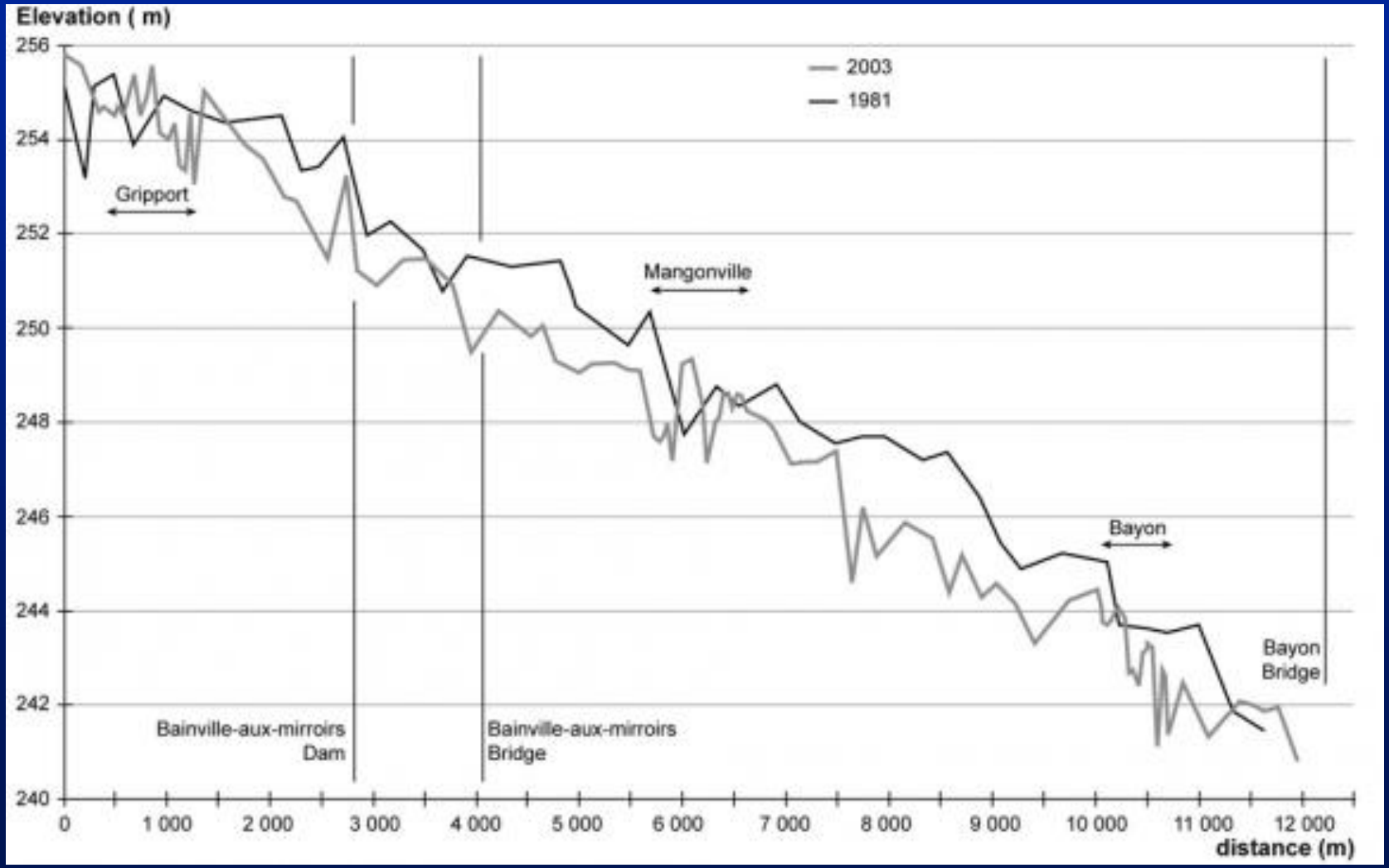
Longitudinal Profile



Source: http://geomorphologie.revues.org/7506

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Frequency of Data Collection

- Riffle cross-section and longitudinal profile should be should resurveyed each year. Ideally this would occur around the same time each year, but if the timing has to slip, data should still be usable.

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Surveying Basics

Data Sheet – X-Section

Reference Reach Field Form

Survey Data	Cross-Section	Part I
Site:		
Location:		
Staff/Notes:		

Item	Distance; Point; or Station ft.	Back-Sight BS ft.	Height of Instrument HI ft.	Fore-Sight FS ft.	Height; depth; or Elevation ft.	Notes, Comments, Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

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Surveying Basics

Data Sheet – Long Pro

Survey Data	Longitudinal Profile					Part I
Site:						
Location:						
Staff/Notes:						
Item	Distance; Point; or **Station** ft.	Back-Sight **B S** ft.	Height of Instrument **H I** ft.	Fore-Sight **F S** ft.	Height; depth; or **Elevation** ft.	**Notes, Comments, Remarks**
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

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Surveying Basics

Example

Survey Data	Longitudinal Profile				Part I
Site:					
Location:					
Staff/Notes:					

Item	Distance; Point; or Station	Back-Sight B S	Height of Instrument H I	Fore-Sight F S	Height; depth; or Elevation	Notes, Comments, Remarks
	ft.	ft.	ft.	ft.	ft.	
1					100	
2	BM	3.11	103.11			
3	0			5.68	97.43	
4	10			5.71	97.40	
5	20			5.88	97.23	
6	.					
7	.					
8	80			6.96	96.15	
9				2.11	101.00	
10	TP	3.58	104.58			
11	90			3.50	101.08	
12	100			3.58	101.00	
13	110			4.58	100.00	

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Surveying Basics

NORTH CLEAR CREEK ~ X-SECTION

5·18·93

J. POTYONDY

W. EMMETT

C. HARRELSON

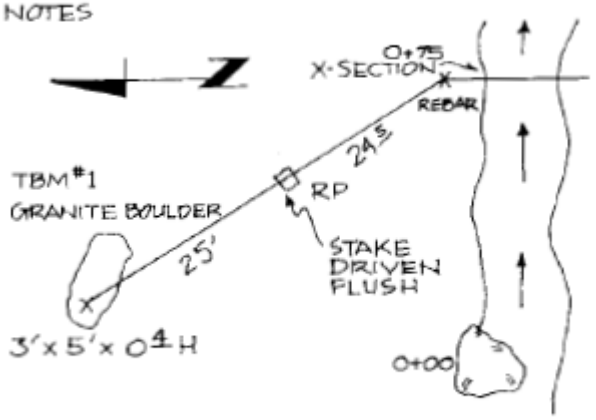
RAINING, COLD, CLOUDY

RAIN PAST 3 DAYS

CROSS-SECTION @ APPROX. STA 0+75

STA (FEET)	BS (+)	HI	FS (-)	ELEV
TBM#1	4.06	104.06		100.00
			4.91	
03LBIP				99.15
			5.25	
03GSIP				98.81
			5.35	
1.0				98.71
			5.99	
2.0				98.07
			6.39	
3.0				97.67
			6.63	
4.0				97.43
			6.68	
5.0				97.38

NOTES



LEFT BANK - IRON PIN

GROUND SURFACE - IRON PIN

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Surveying Basics

Data Transfer

Data sheets can be sent to the Corps of Engineers for archive or entered into Excel and forwarded to the Corps

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Questions