Perfect Pitch

Simple Techniques for Determining Stream Gradients at Two Scales

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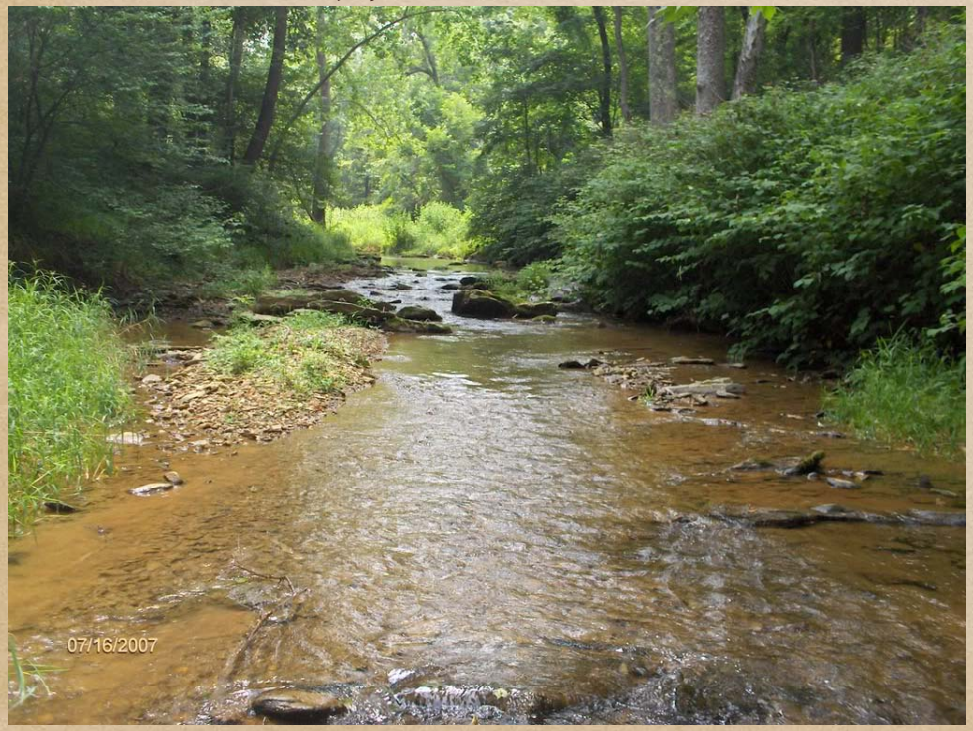
Take-aways

- A tool for choosing sampling locations representative of stream gradients
- Tips on surveying road crossing gradients & profiles

"Mountain torrent"

"Lazy river"



"Babbling brook"

Gradient determines hydraulic diversity

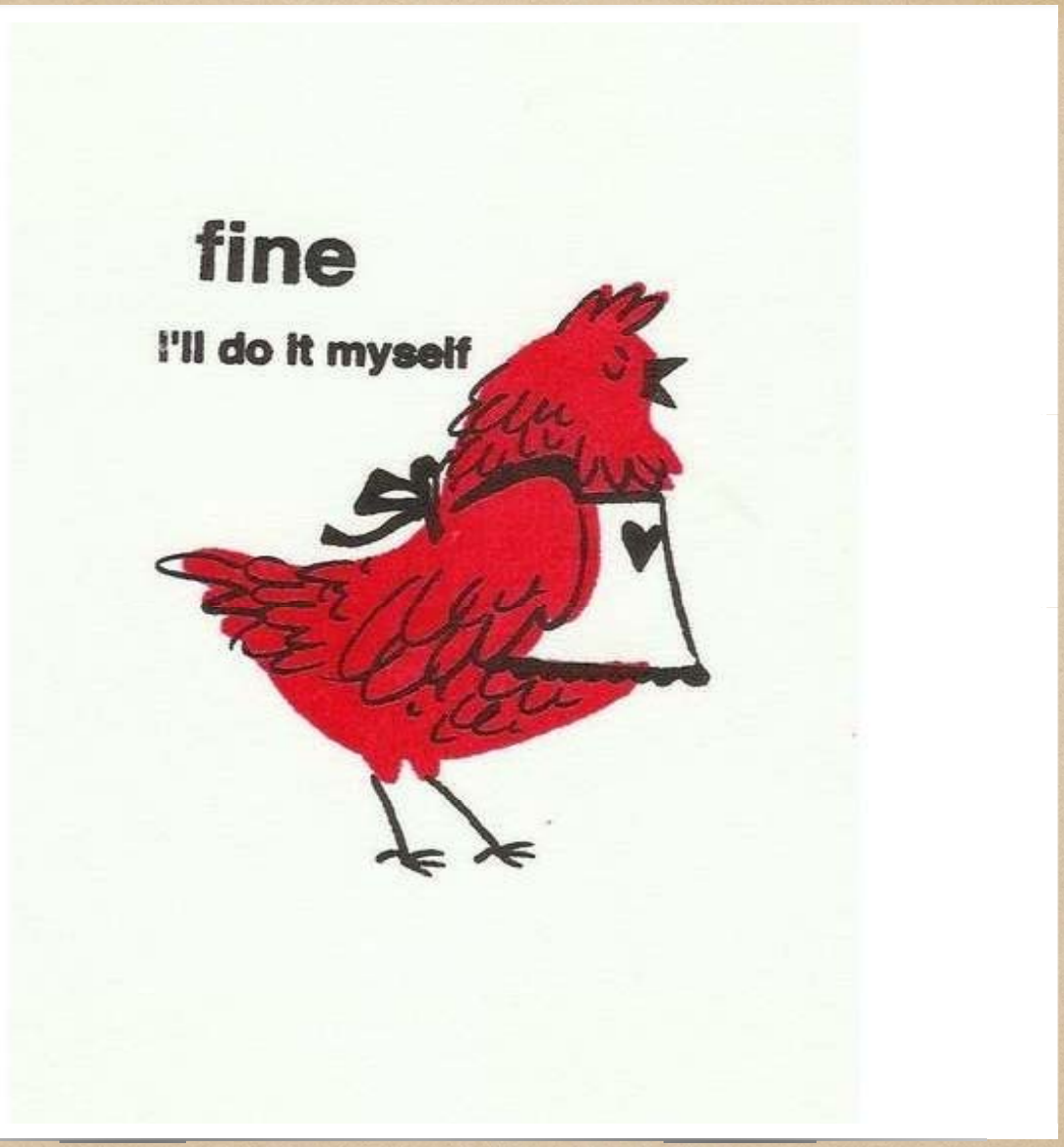
Habitat type and diversity depend on hydraulic diversity

Gradient "sets the stage"

Determining gradients on a scale of miles

Option	Comments
GIS	$$; expertise
On-the-ground surveys*	Equipment; expertise; time
Topographic maps	Low precision
Google Earth-based tools	Online; how to implement?
Satellite-based tools	Check with NOAA/NASA

* Best choice for short reaches; to be discussed later


fine
I'll do it myself

Daft Logic Inc. online tools provide elevations and distances along channel

Elevations

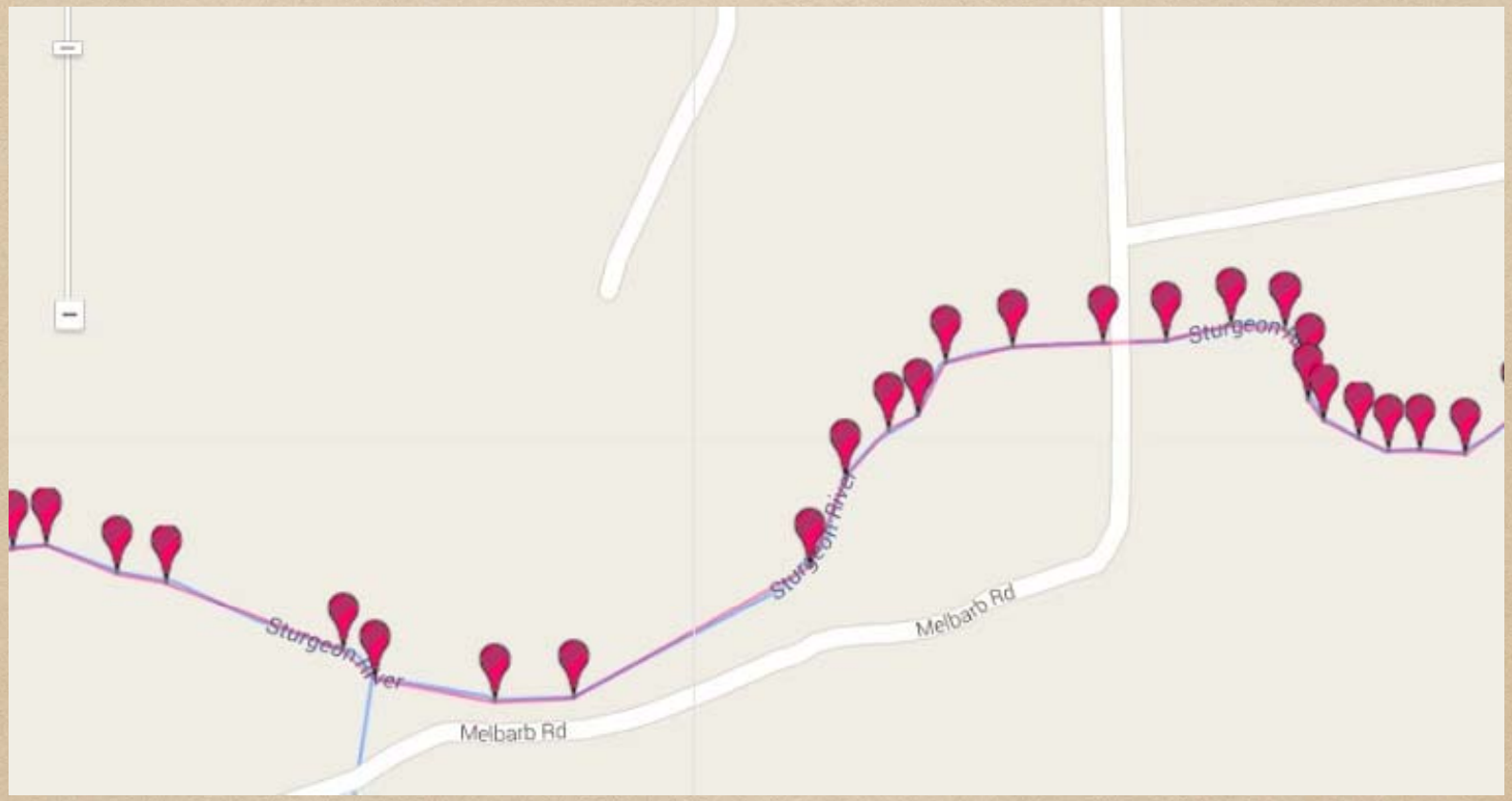
http://www.daftlogic.com/sandbox-google-maps-find-altitude.htm

Navigate to map location and read altitude (displayed to 6-7 significant figures)

Cumulative point-to-point distances

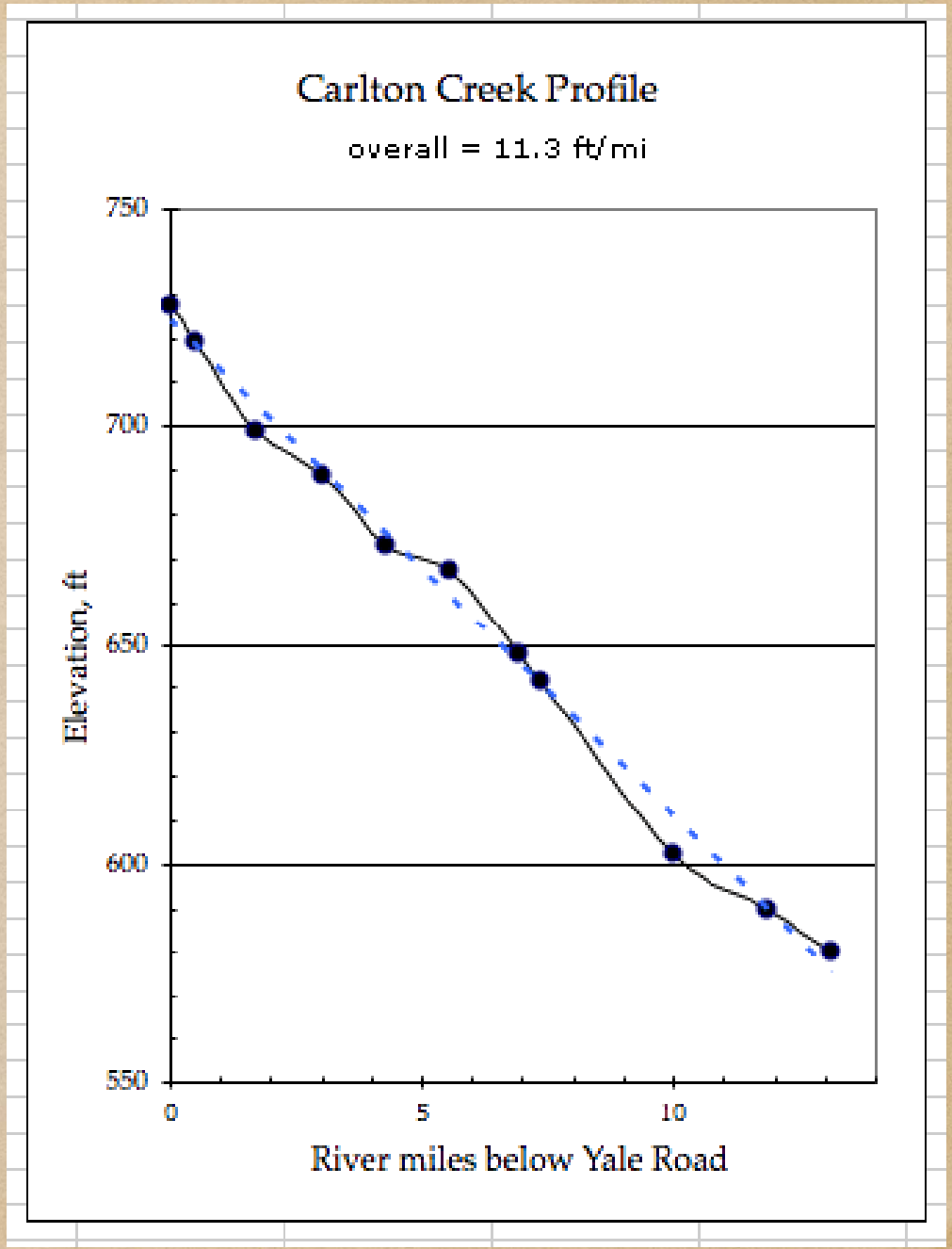
http://www.daftlogic.com/projects-google-maps-distances-calculator.htm

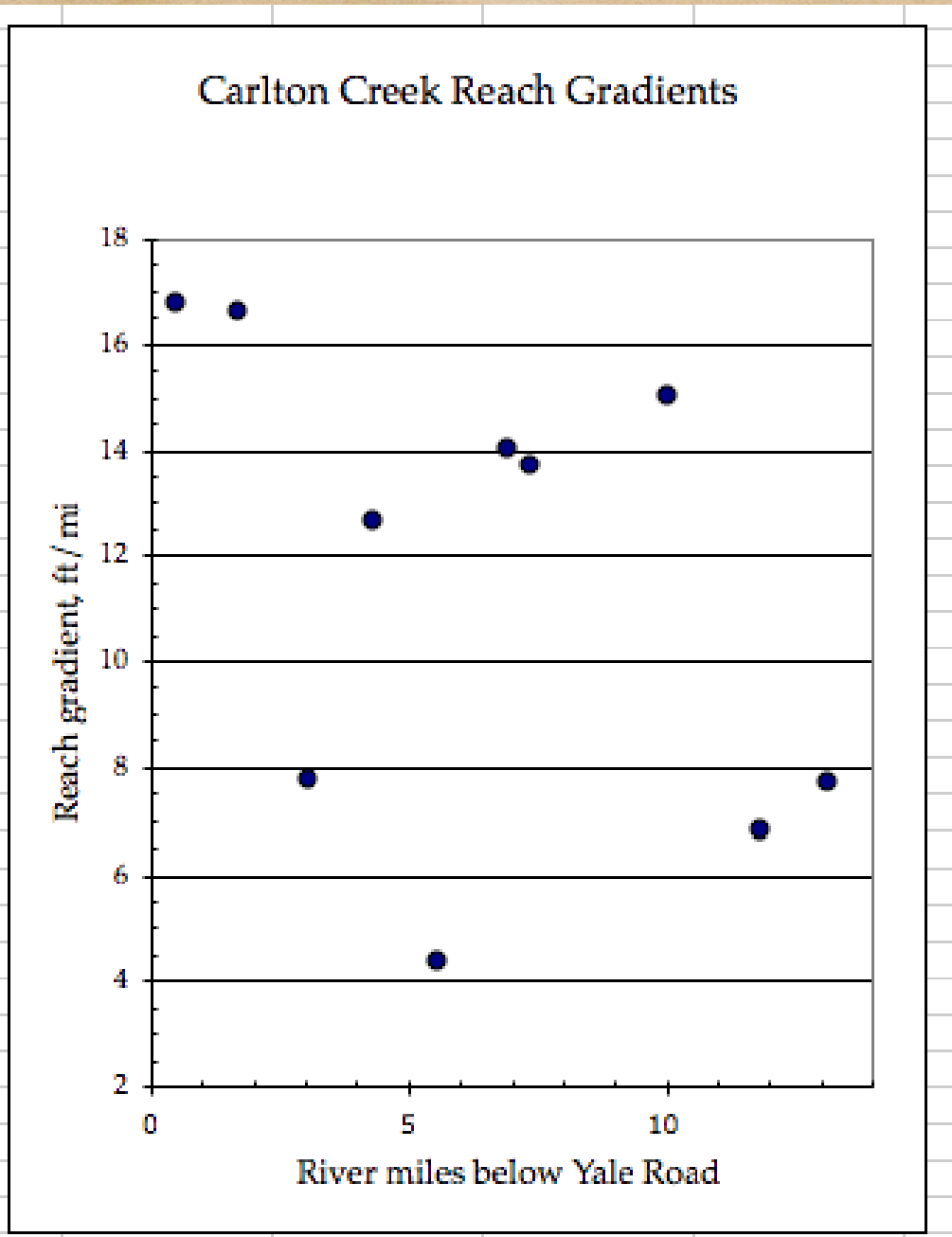
Point and click at multiple locations along stream channel (cumulative distance displayed to 3 - 7 significant figures, depending on units)


Sturgeon River
Melbarb Rd
Sturgeon River
Melbarb Rd

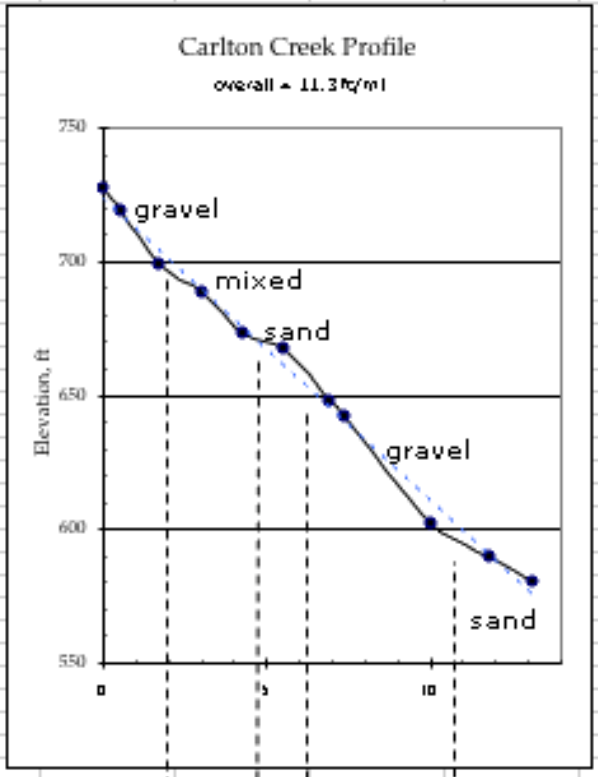
Carlton Creek				
Oceana & Muskegon Counties				
	Location	Elevation, ft	River miles	Gradient, ft/mi
	Yale Road	727.360	0.000	
	Arthur Road	718.858	0.507	-16.8
	W. Cleveland Road	699.090	1.695	-16.6
	Michigan Ave. (N)	688.732	3.027	-7.8
	Winston Road	672.857	4.283	-12.6
	South 92nd Ave.	667.351	5.541	-4.4
	South 96th Ave. (N)	647.926	6.925	-14.0
	W. Roosevelt Road	641.676	7.381	-13.7
	Skeels Road	602.214	10.010	-15.0
	W. Fruitvale Road	589.821	11.833	-6.8
	White River confluence	579.993	13.108	-7.7

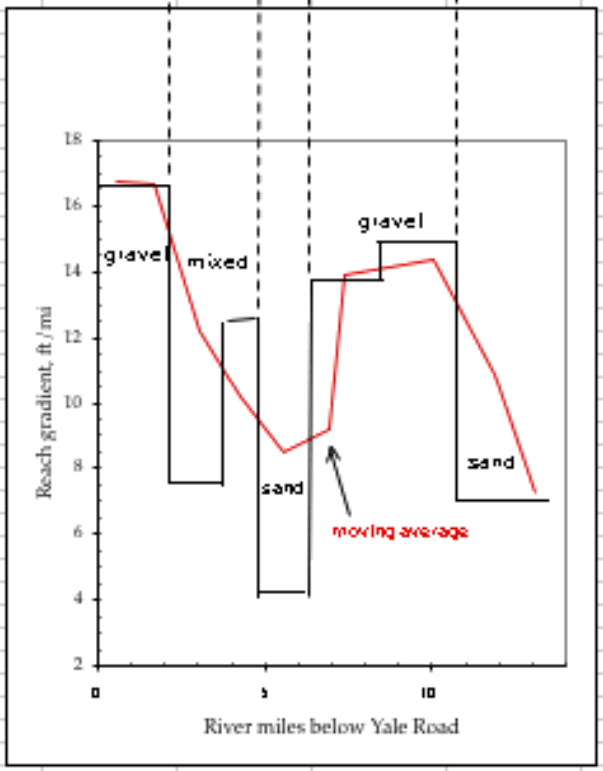
Looks rather uniform, but variations are significant





Gradient	Type	Hydraulic diversity
11 - 70	Riffle/pool established	Excellent
6 - 10.9	Riffle/pool developing	Good
3 - 5.9	Few riffles	Moderate
0 - 2.9	Runs	Low





Ground truth?

No uphill flow!

Good overall correspondence of dominant in-stream substrate types to variations in stream gradient

More detailed corroboration desirable, including pebble counts (in progress)

Gradients on the Scale of Yards:

A Closer Look at Road Crossings

USDA United States Department of Agriculture

Forest Service

Rocky Mountain Research Station

General Technical Report RM-245

Stream Channel Reference Sites:

An Illustrated Guide to Field Technique

Cheryl C. Harrelson

C. L. Rawlins

John P. Potyondy

http://www.stream.fs.fed.us/publications/PDFs/RM245E.PDF

What's needed?

Transit level

Stadia rod

Tape measures

GPS

Rebar & sledge

Waterproof notebook

Insect repellant

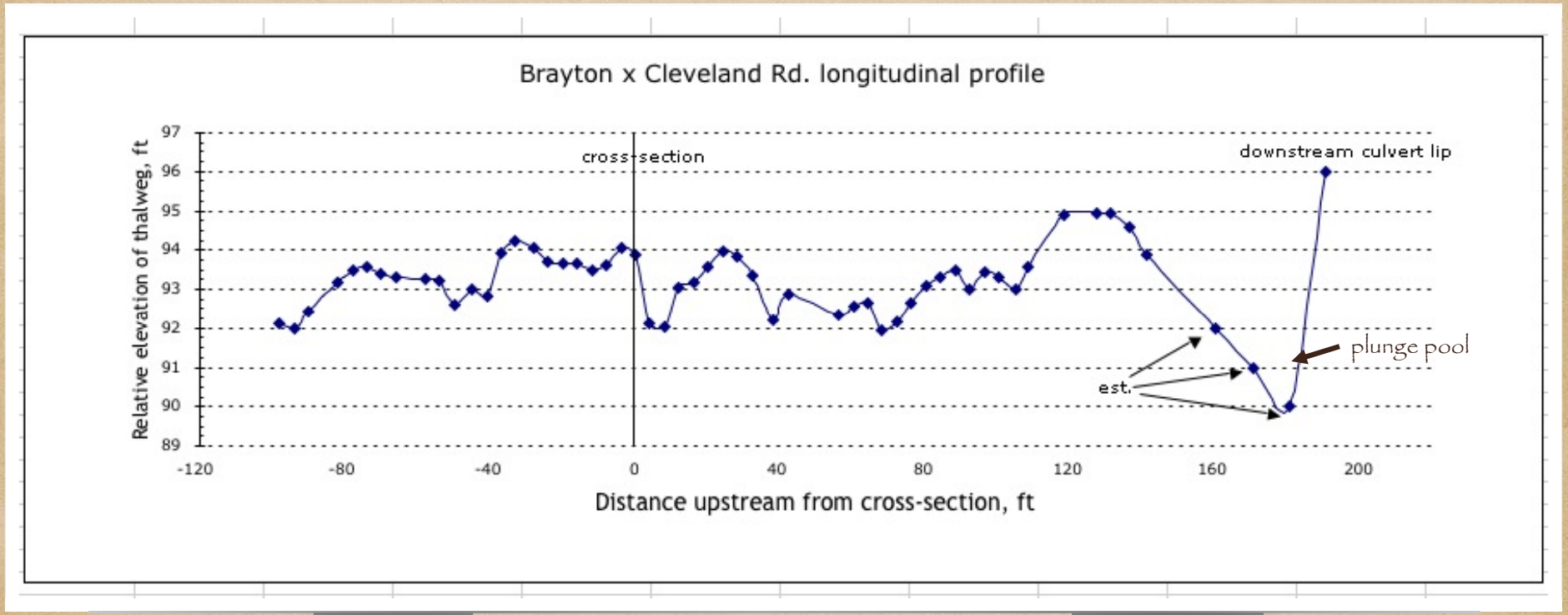
Machetes

Walkie-talkies

(+ short pants. high boots, funny hats)

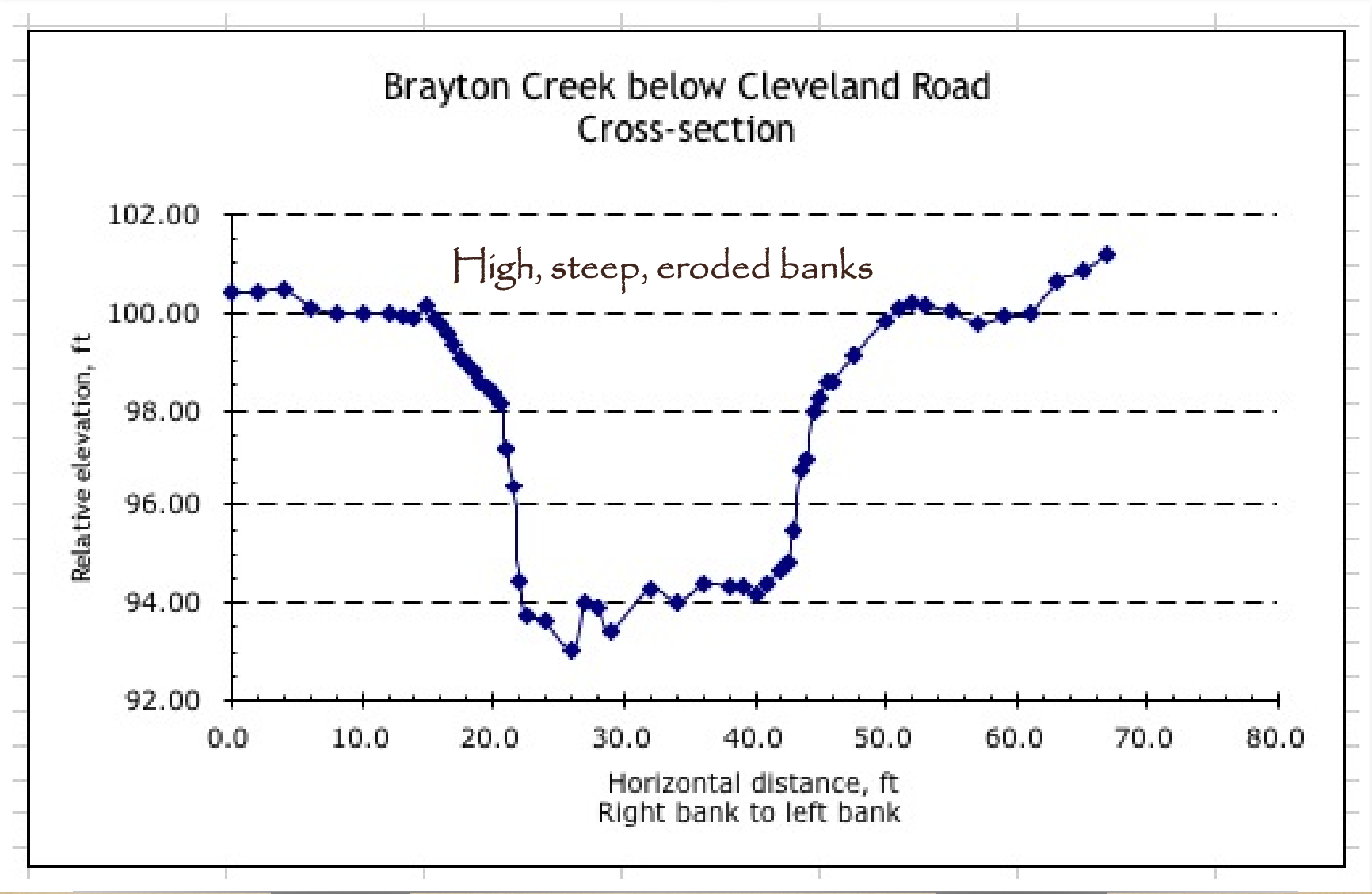
Total cost ~ $1K

Pre-improvement profiles document need for culvert replacement



Gradient immediately below culvert = 70 ft mi/mi (!)

Bottom consists of rubble and rocky ledges



Total critter count in 300 ft reach = 5

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