

Bluff Profile Changes over 40 Years on Wisconsin's Lake Michigan Shoreline

Dave Mickelson, Jason Hochschild,
Caitlin Wolters, and Jeff Stone



Thanks to

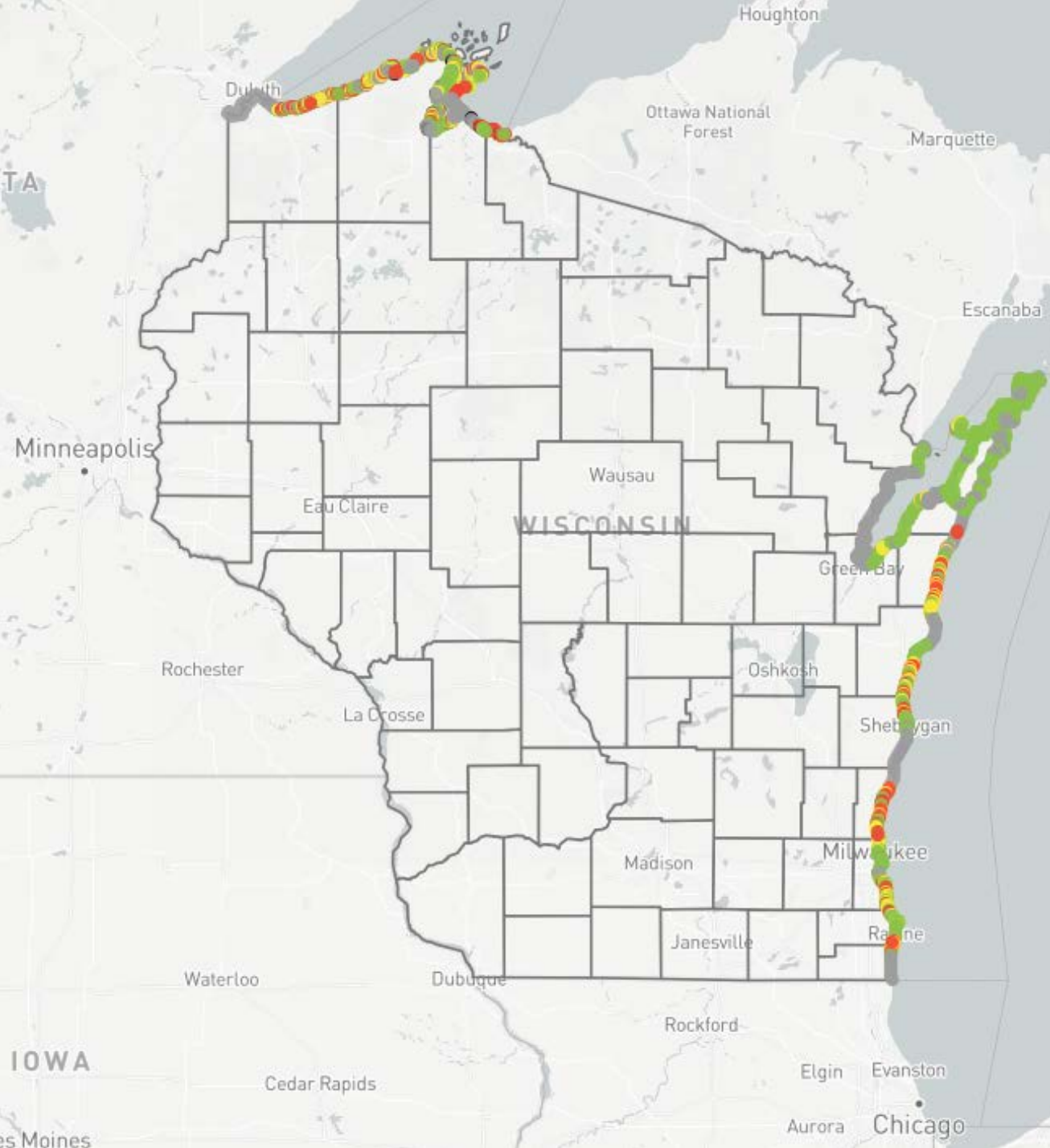


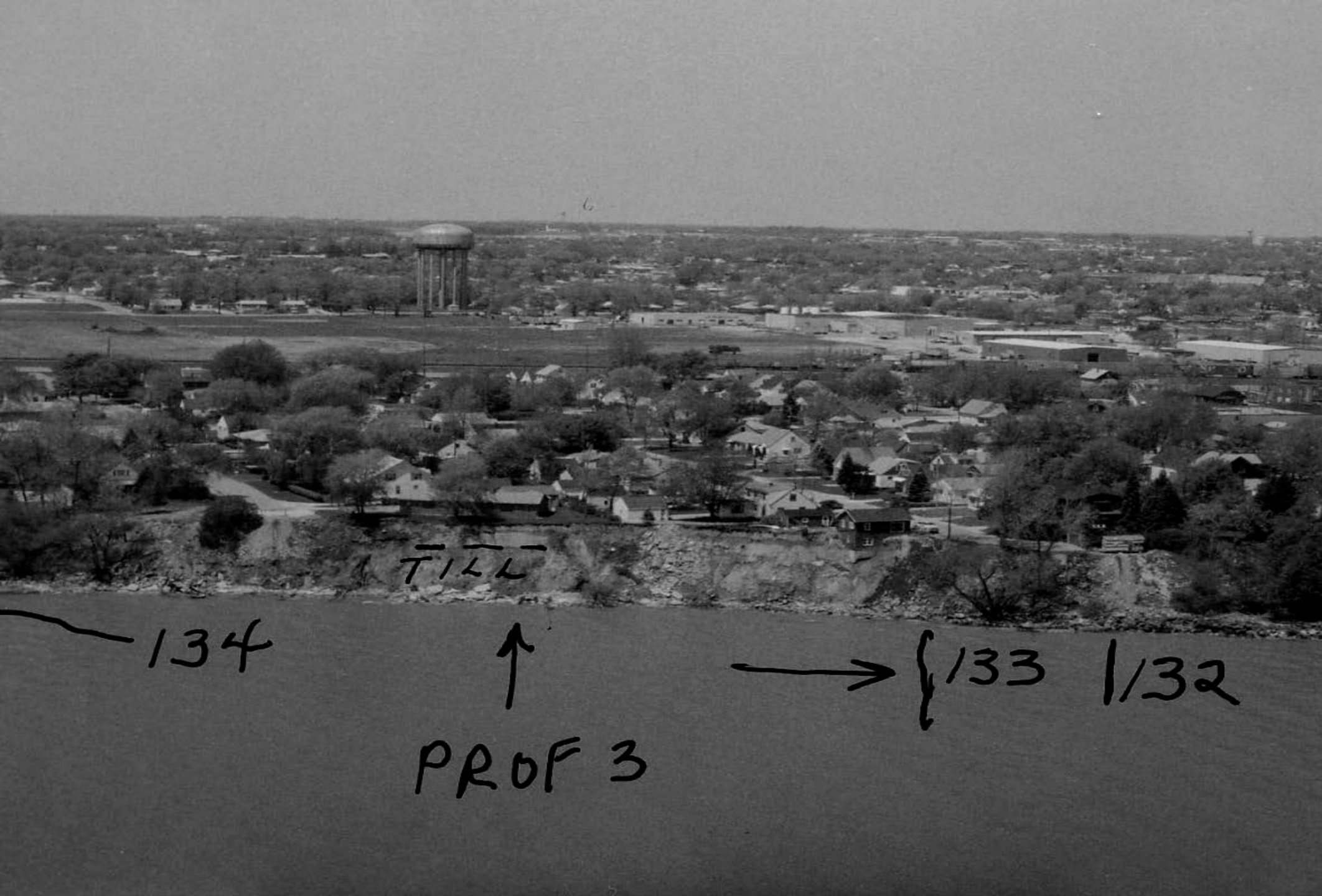
Association of State
Floodplain Managers



WISCONSIN COASTAL
MANAGEMENT PROGRAM







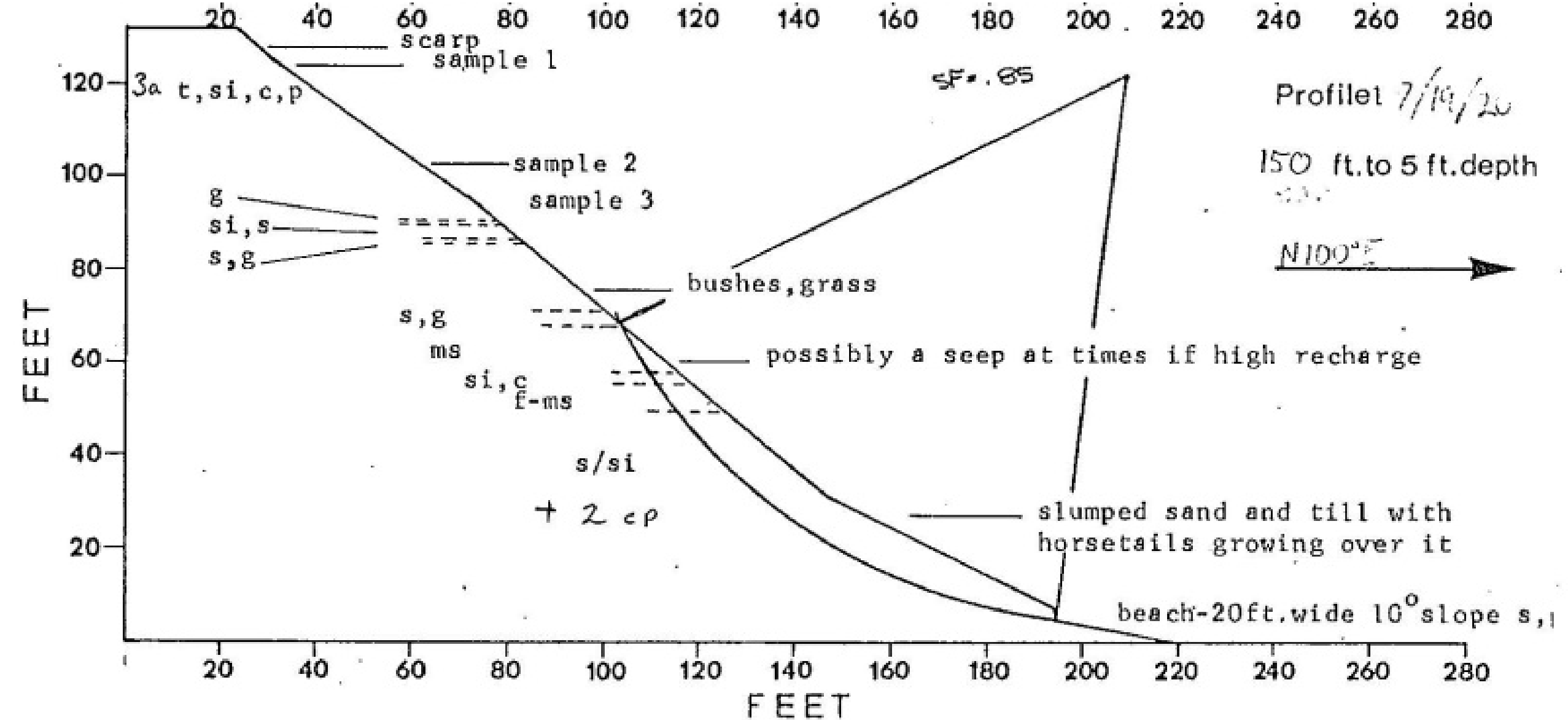
134

TILL

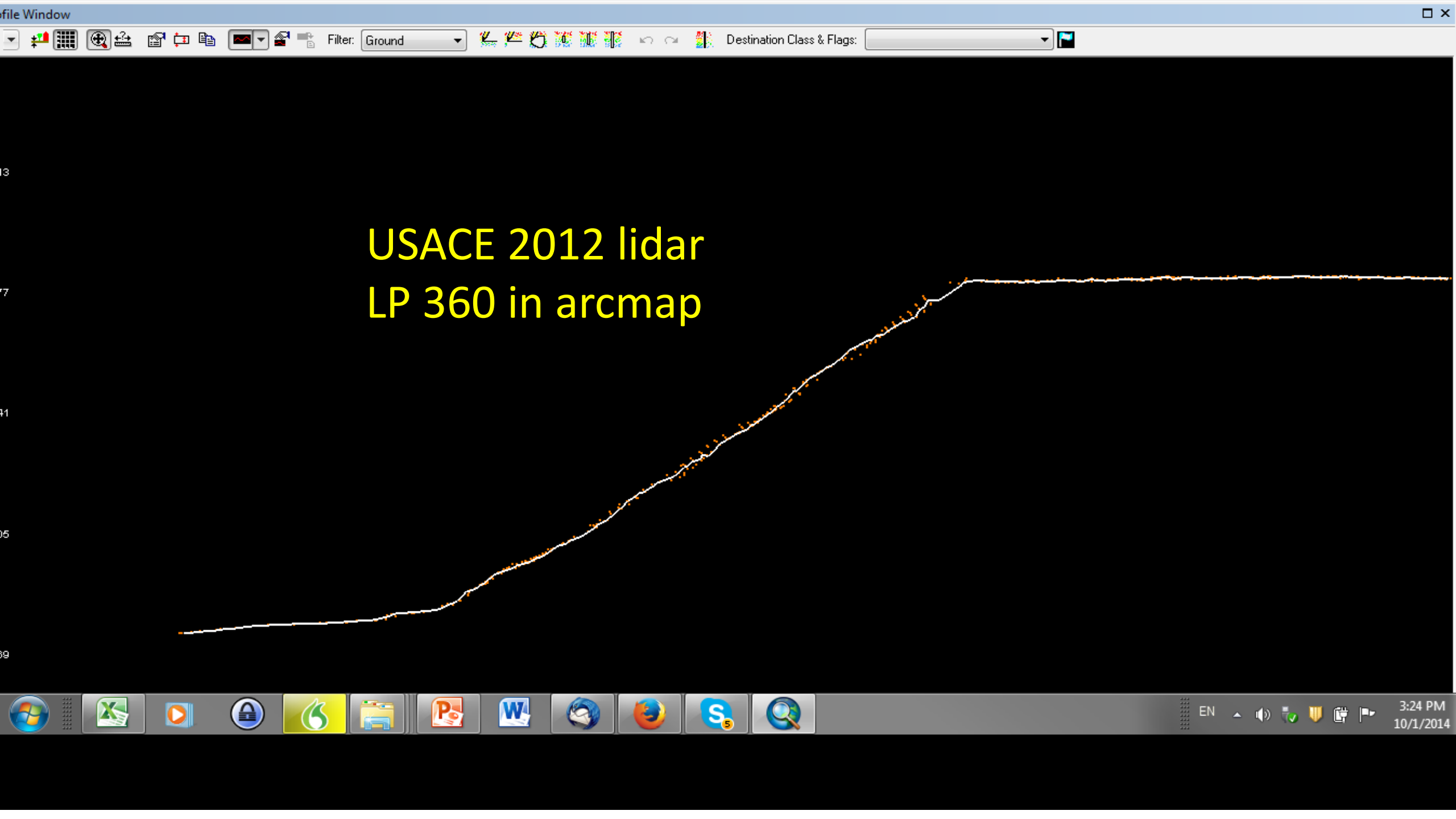


PROF 3

→ { 133 1/32

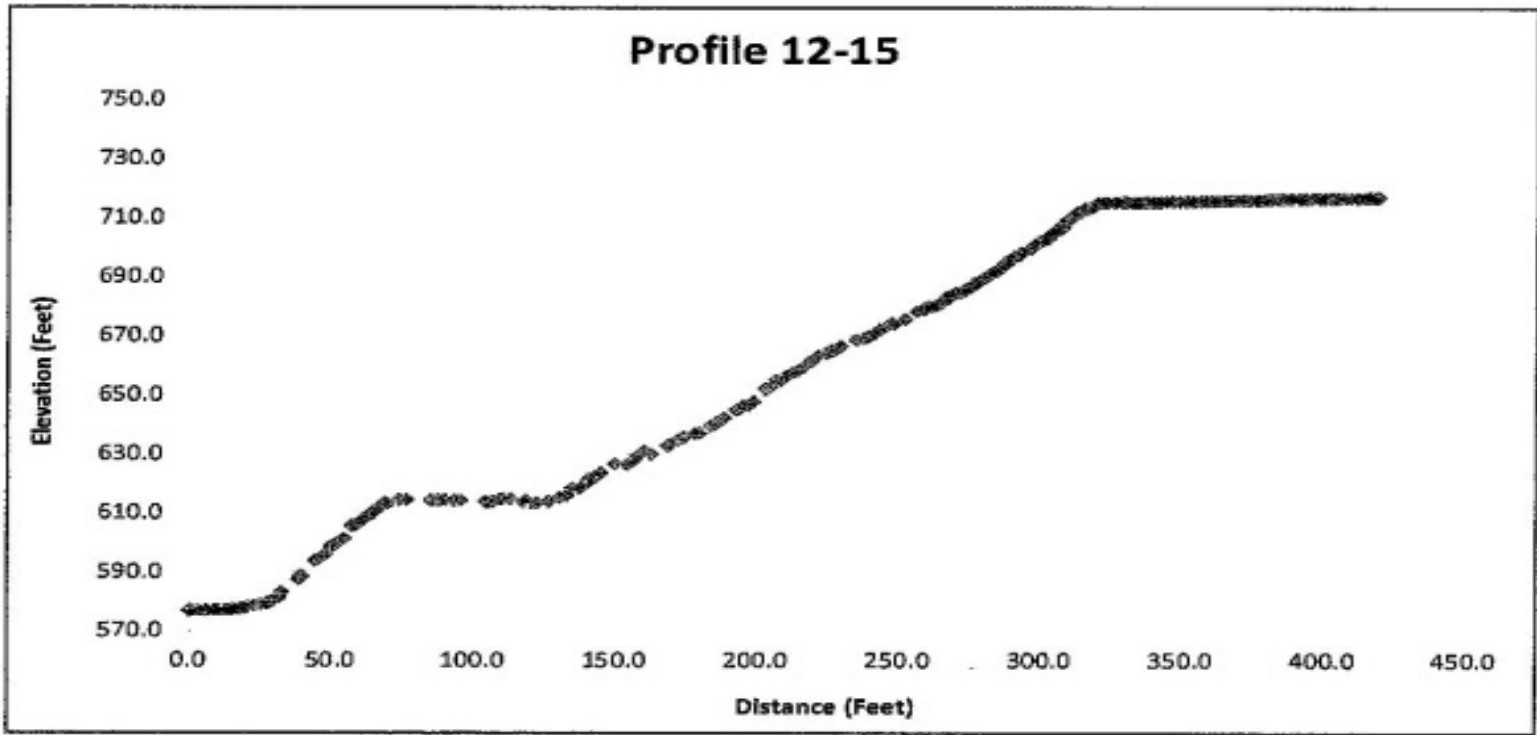


1976 and again in 1995

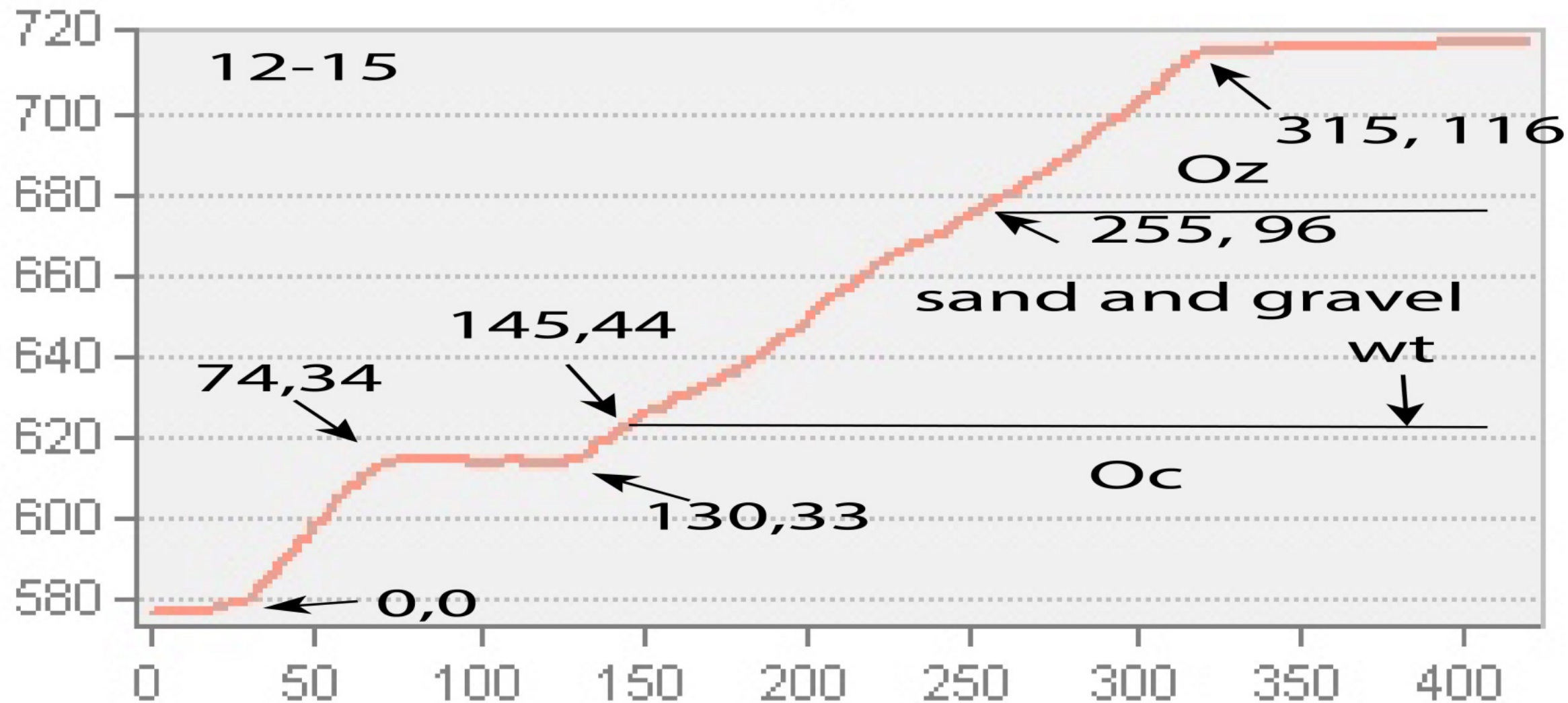


X	Y
419.2	717.1
419.2	717.1
419.1	717.1
418.3	717.1
416.6	717.0
417.7	717.0
416.1	717.0
414.6	717.0
413.9	717.0
412.1	716.9
411.5	716.9
411.5	716.9
411.7	716.9
411.4	716.9
409.3	716.9
408.9	716.9
406.4	716.9
406.9	716.9
407.5	716.9
405.3	716.8
404.6	716.8
404.5	716.8
403.8	716.8
402.3	716.8
402.8	716.8

(many points not shown in this figure)



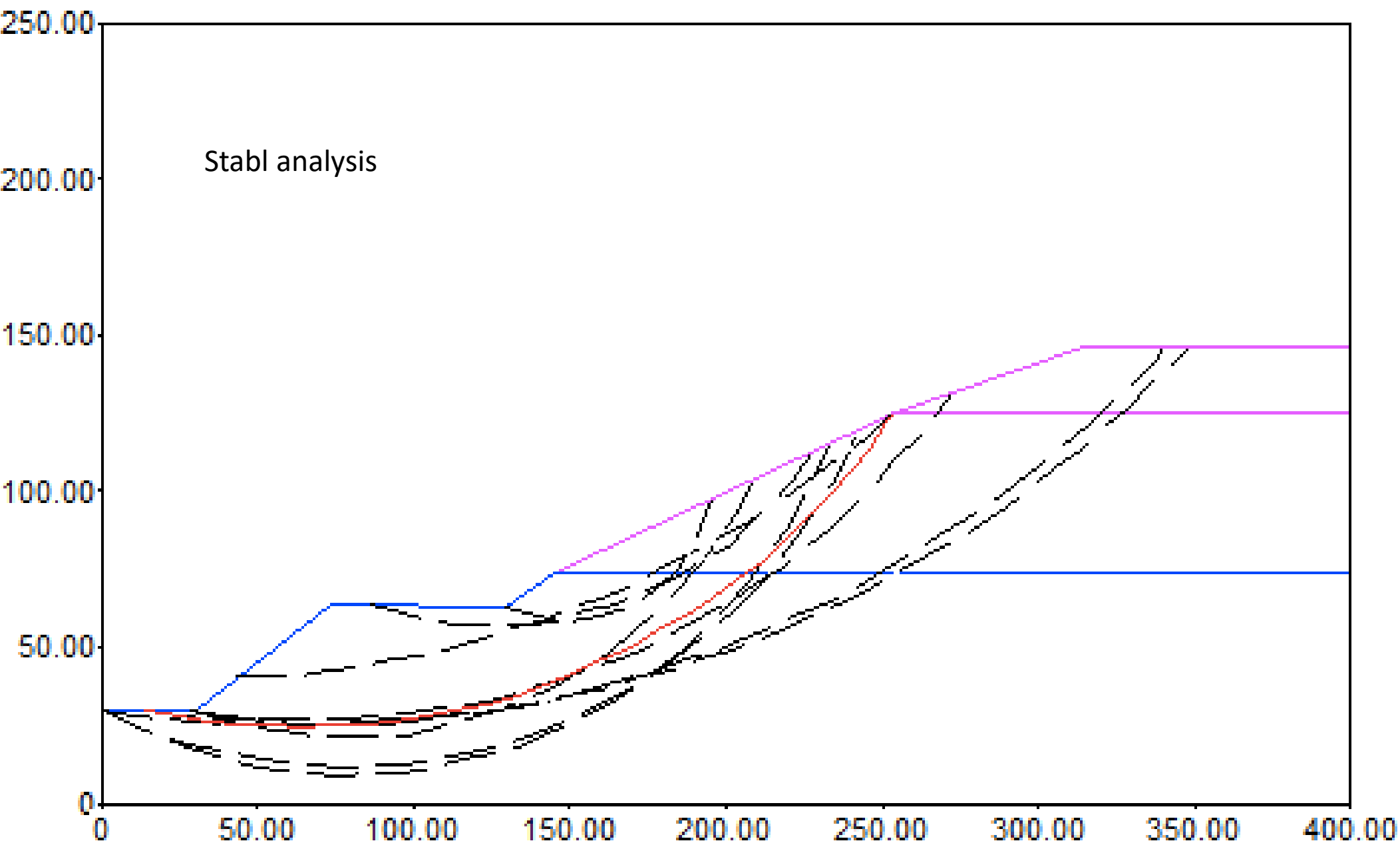
Profile Graph Title



Profile Graph Subtitle

22E-Sec 5 2014 Profile 1

Safety Factors



1.19

1.22

1.26

1.29

1.30

1.33

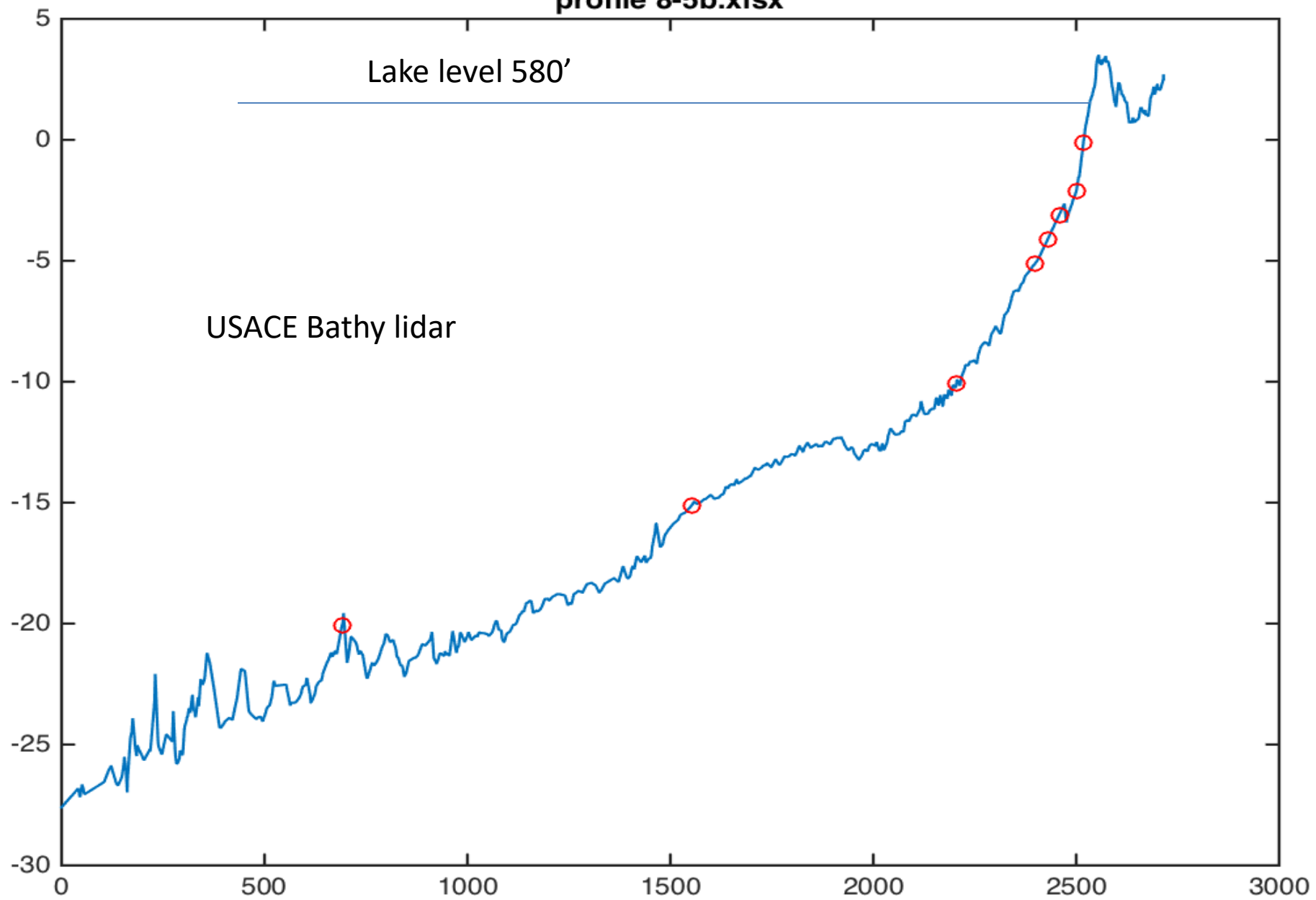
1.34

1.36

1.38

1.38

profile 8-5b.xlsx



The bluffs have definitely become more stable since 1976.

In 1976, the mean lowest factor of safety of 113 profiles was 0.85.

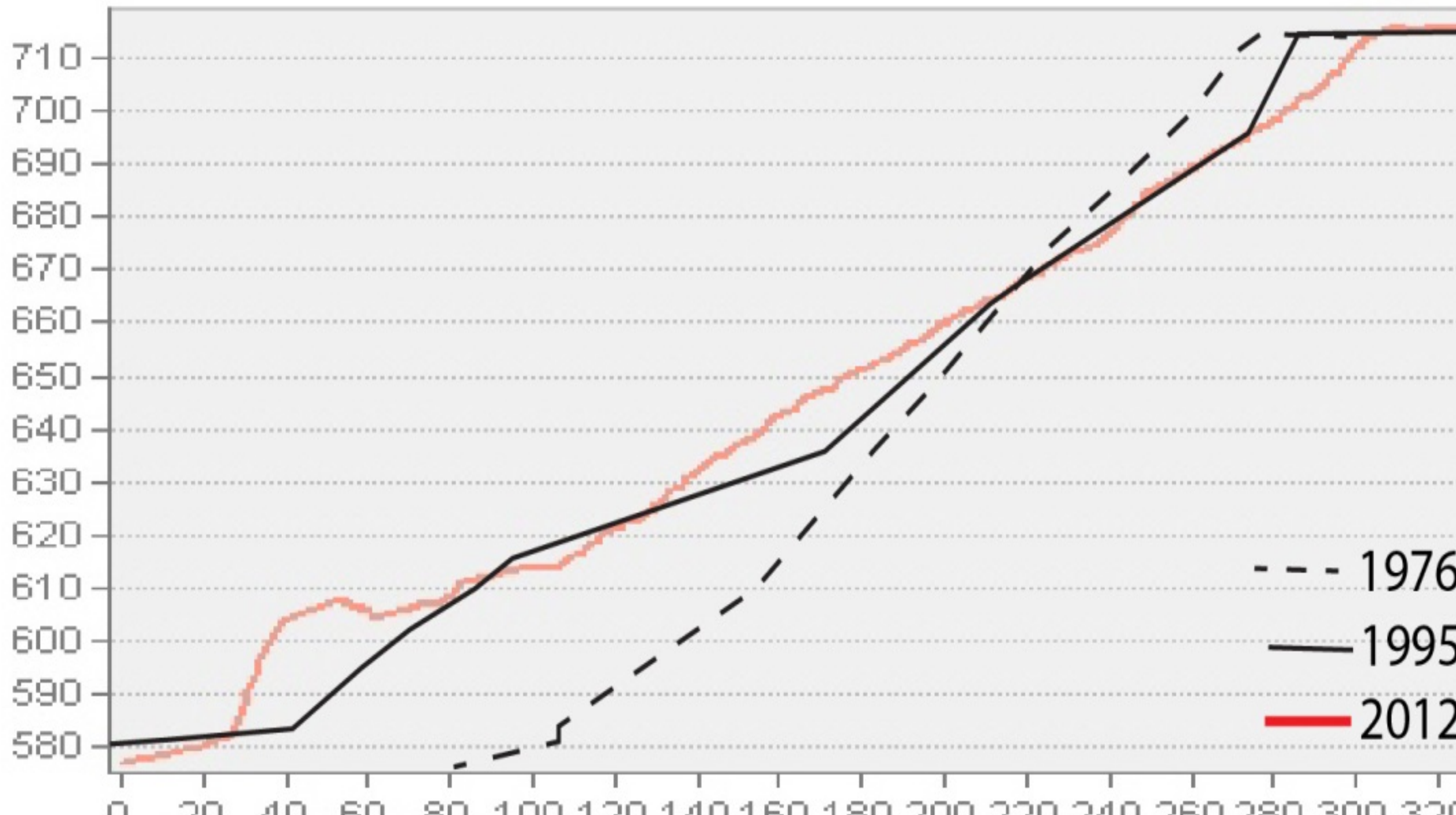
By 1995, the 148 profiles analyzed had a mean lowest factor of safety of 1.28.

By 2012, this number had risen to an average of 1.47 for 154 profiles analyzed.

In 1976, 82 of the 118 profiles analyzed, or 73%, had a lowest factor of safety less than 1.00.

In 1995, 57 of the 148 profiles, or 38%, had a lowest factor of safety's less than 1.00.

In 2012, 21 of 154 profiles, or 14%, had a lowest factor of safety less than 1.00.

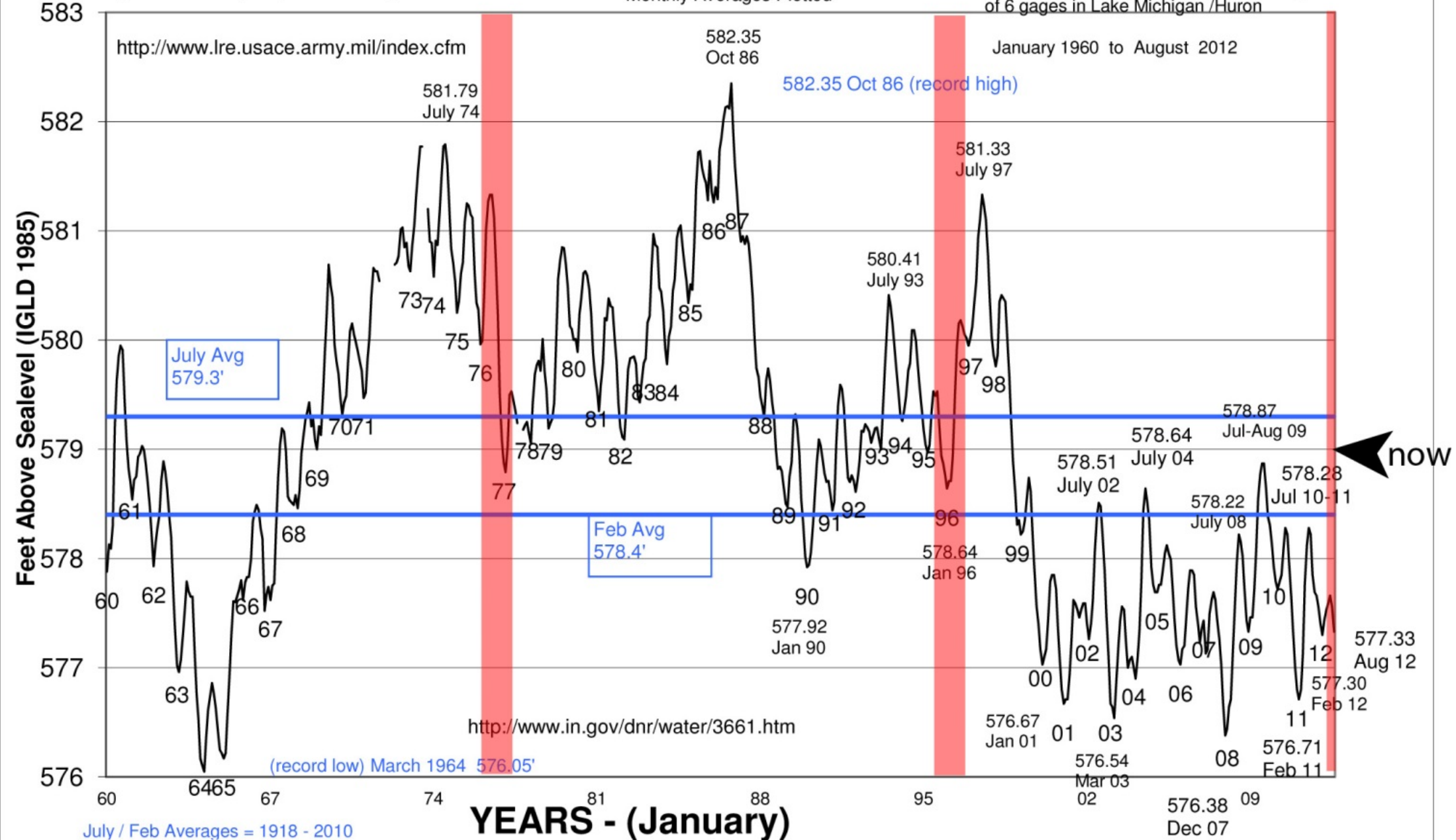


LAKE MICHIGAN LAKE LEVELS 1960 - 2012

Corps of Engineers Monthly Report for "Michigan - Huron"

Monthly Averages Plotted

Note: All of these numbers are the average of 6 gages in Lake Michigan /Huron



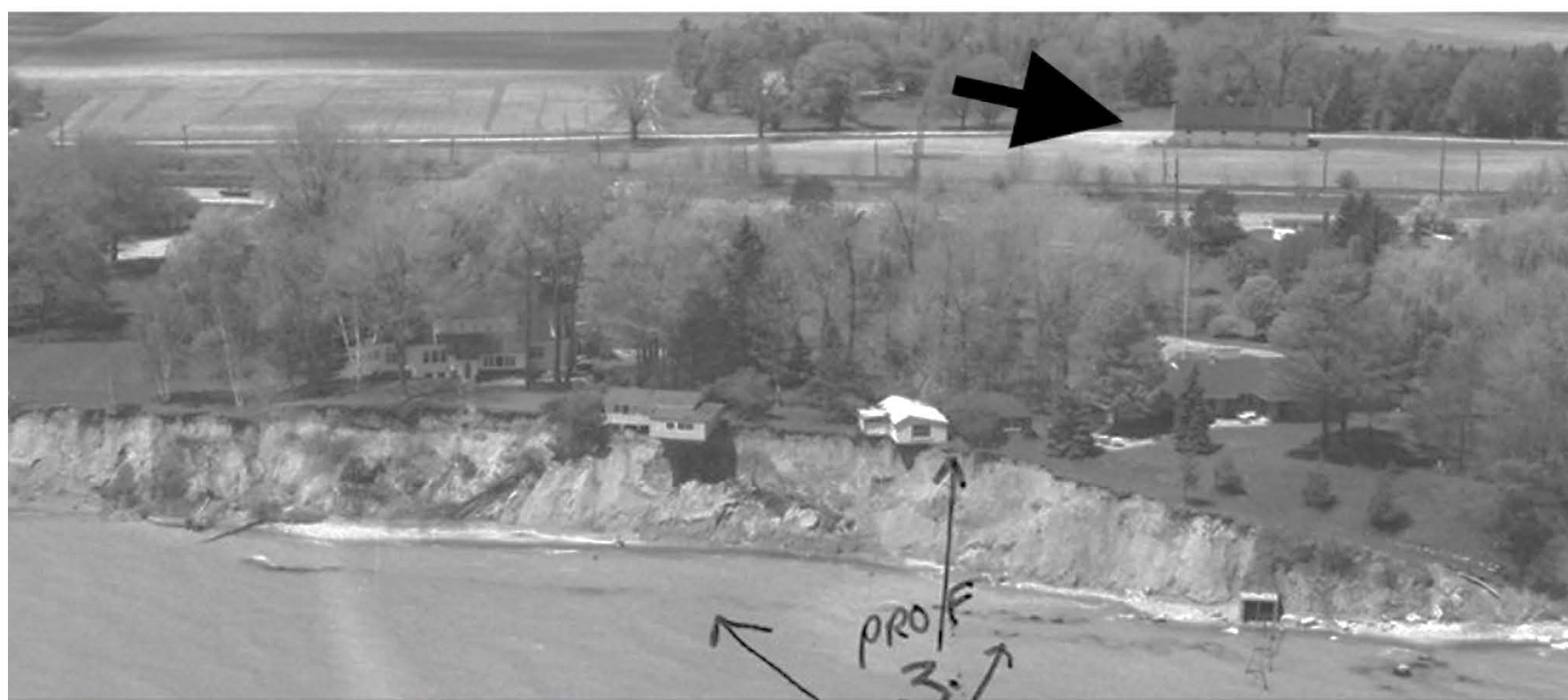


Table 3. Percent of classified shore that is armored with shore parallel, on-shore structures.

	Percent armored 1976	Percent armored 2007-08	1976-2007 change in percent armored
Marinette	na	20.1	na
Oconto	na	30.0	na
Brown	na	32.2	na
Door	na	24.0	na
Kewaunee	5.9	14.9	9.1
Manitowoc	22.4	26.6	4.2
Sheboygan	31.1	32.3	1.2
Ozaukee	9.6	27.3	17.7
Milwaukee	44.6	62.7	18.1
Racine	56.5	67.0	10.6
Kenosha	58.9	85.7	26.8
Total L. Michigan	16.6	29.8	13.2

Legend and menu

Clear all

Observations

- ☒ Lake-wide monthly average (1918-present)
- ☒ Provisional coordinated daily avgs (this month)
- ☒ Provisional coordinated avg for month to date
- ☐ Master gauge monthly average (1860-present)
- ☐ Lake-wide annual average (1918-present)
- ☐ Annual average (1860-1917)
- ☐ Master gauge annual average (1860-present)
- ☒ Average for period of record (1918-present)
- ☐ Month's average (1918-2016)
- ☐ Record highs (1918-2016)

Monthly level forecasts

Forecasts (multi-decadal)

Paleoclimate reconstructions

Default colors

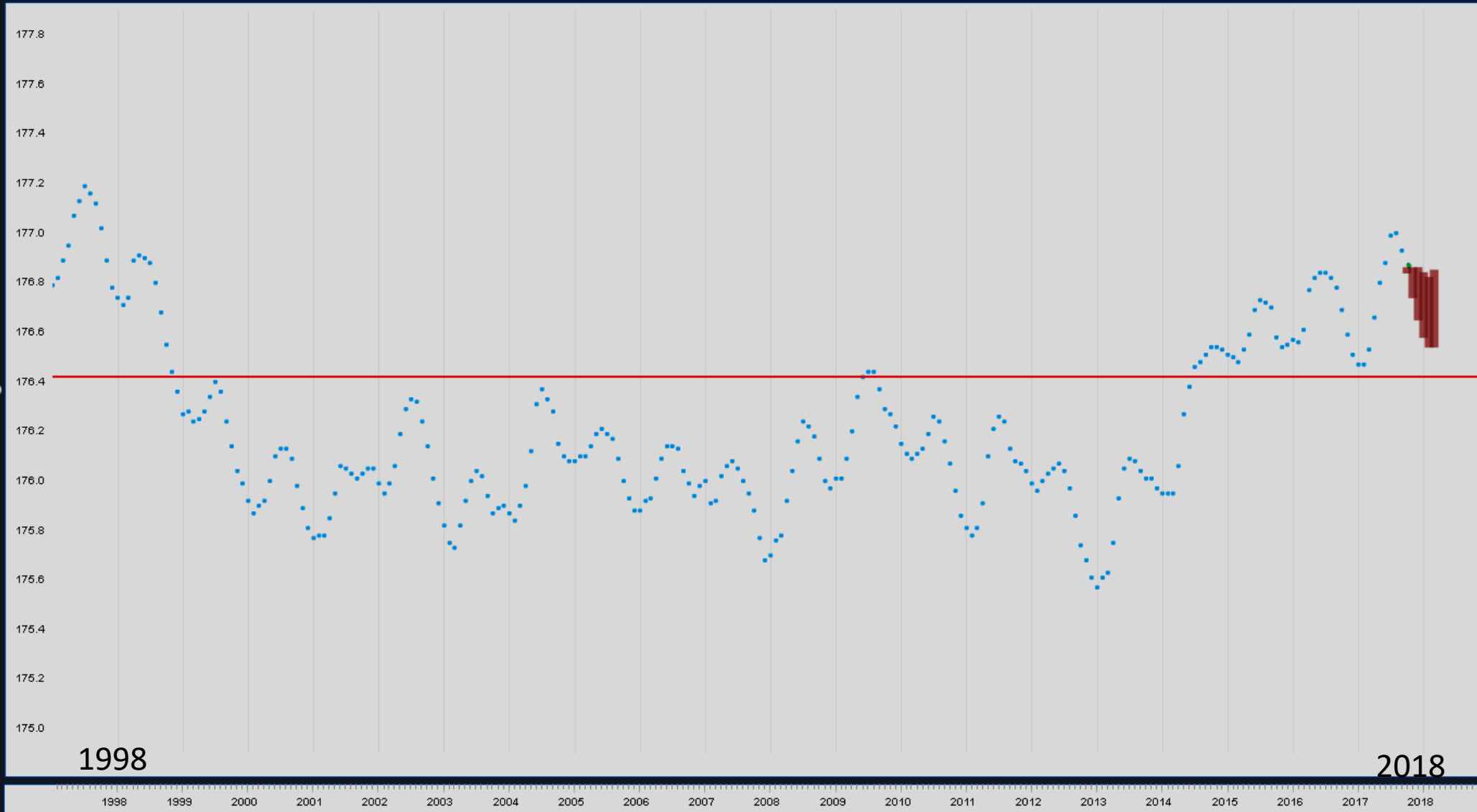
Flip series

Chart background color

Surface water elevation (meters: IGLD 85)

Michigan-Huron

Zoom
Pan



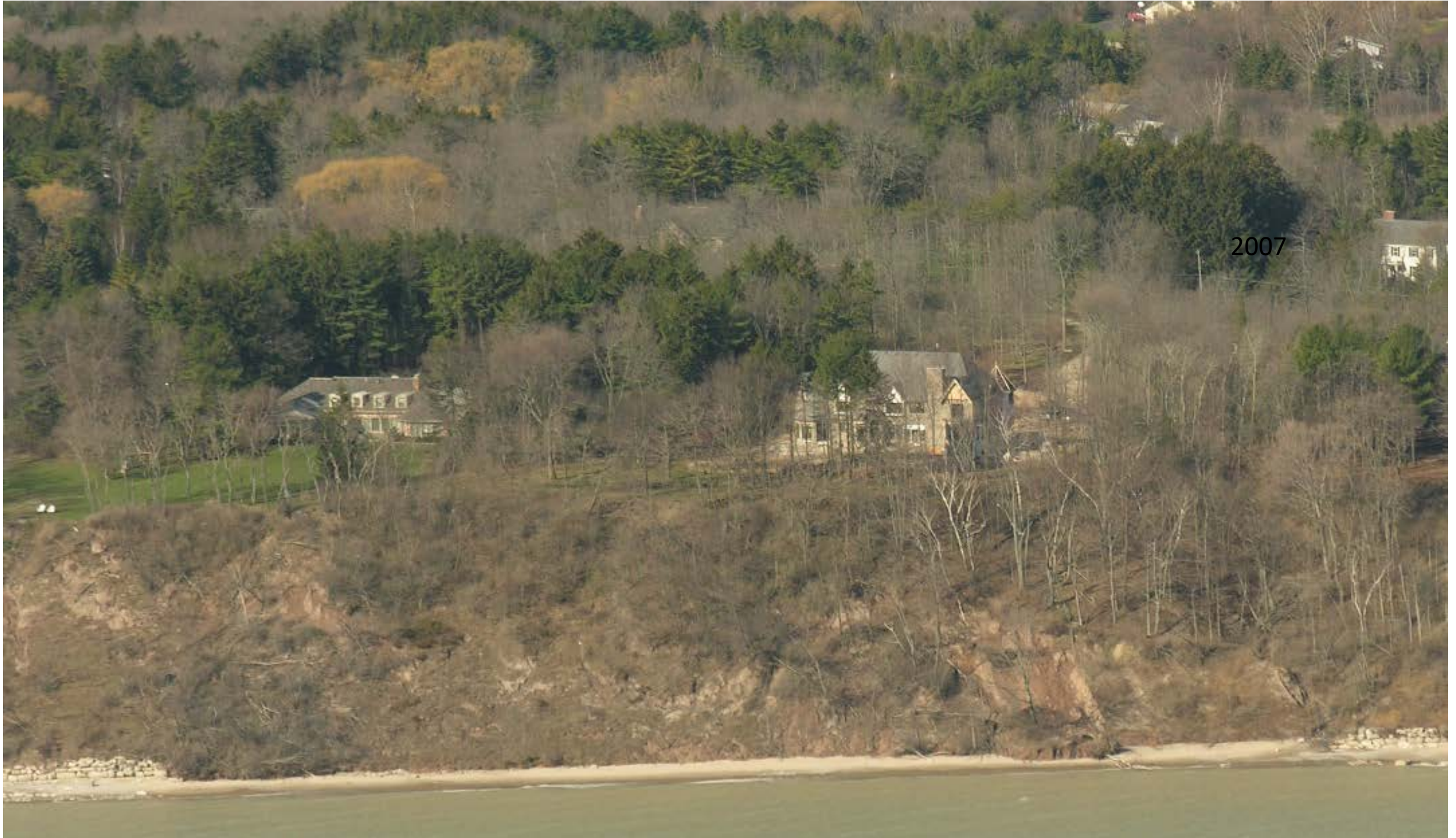
Timespan

1998

2018

Fri Oct 20 2017 10:11:40 AM

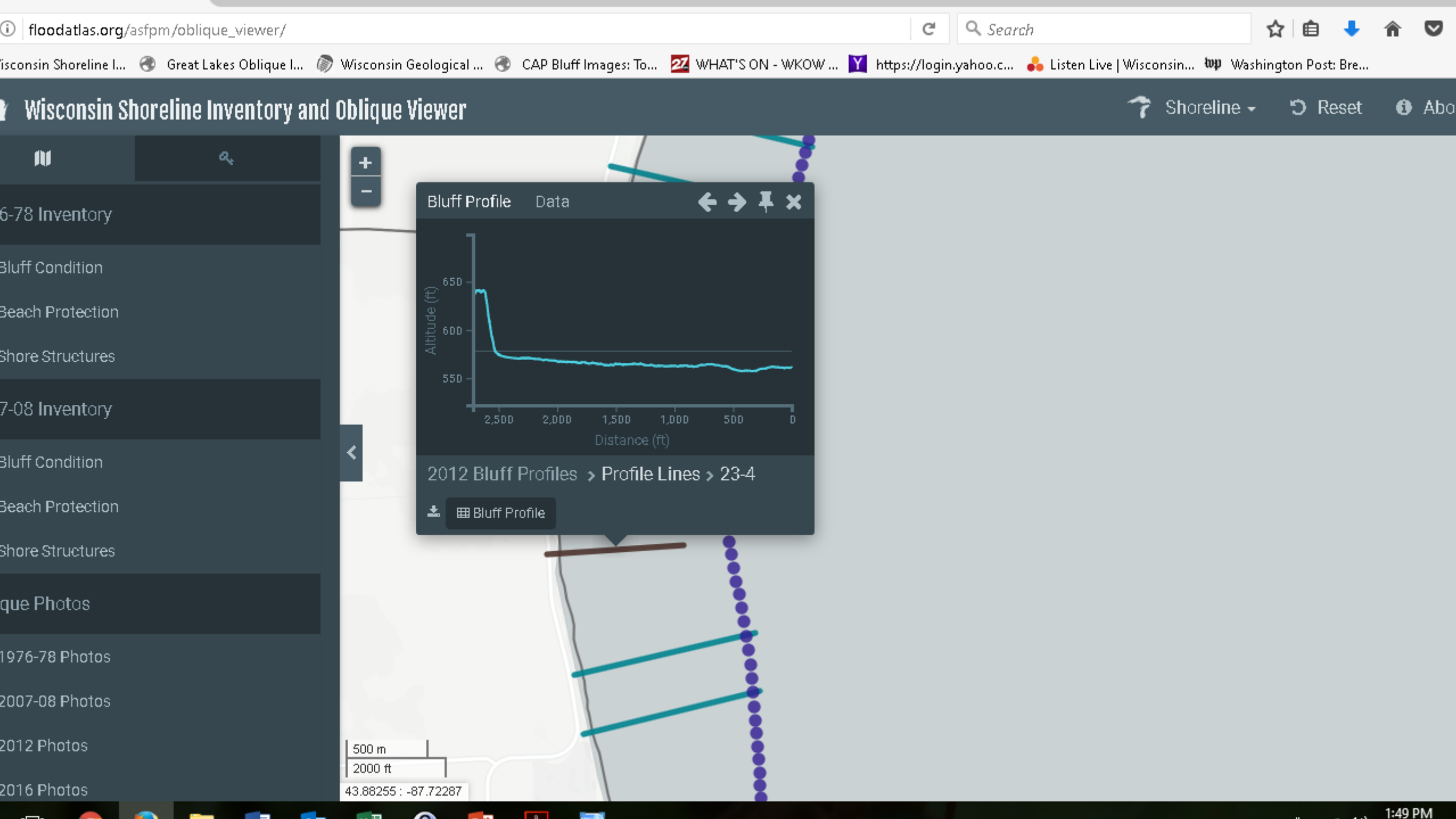




2007



2017



WAKE UP!