
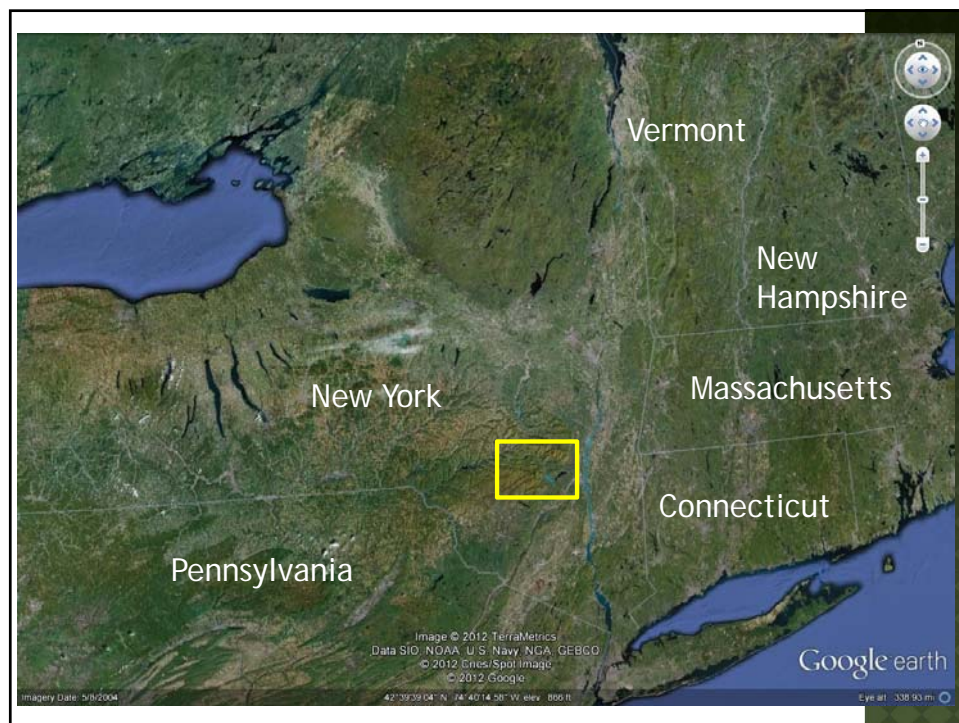


Historical 3D modeling of erosion in Stony Clove Creek for sediment volume analysis using GIS

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Environmental Science & Earth Systems
University of Massachusetts Amherst

Lawrence McGlinn
Geography
SUNY New Paltz









STONY CLOVE CREEK AT CHICHESTER SITE 2



Photo Credit:
Danny
Davis

STONY CLOVE CREEK AT CHICHESTER SITE 2



Photo Credit:
Danny
Davis

GOALS

- Quantify how much sediment has entered the stream
- Generally find out how fast it has been occurring

THE BIG PROBLEM



1900



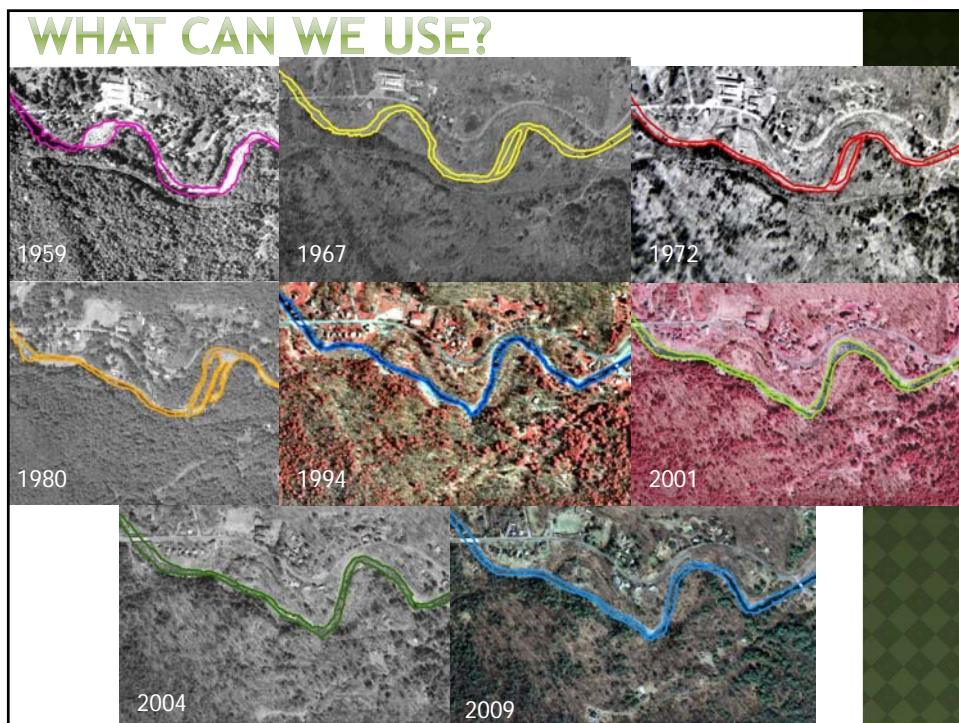
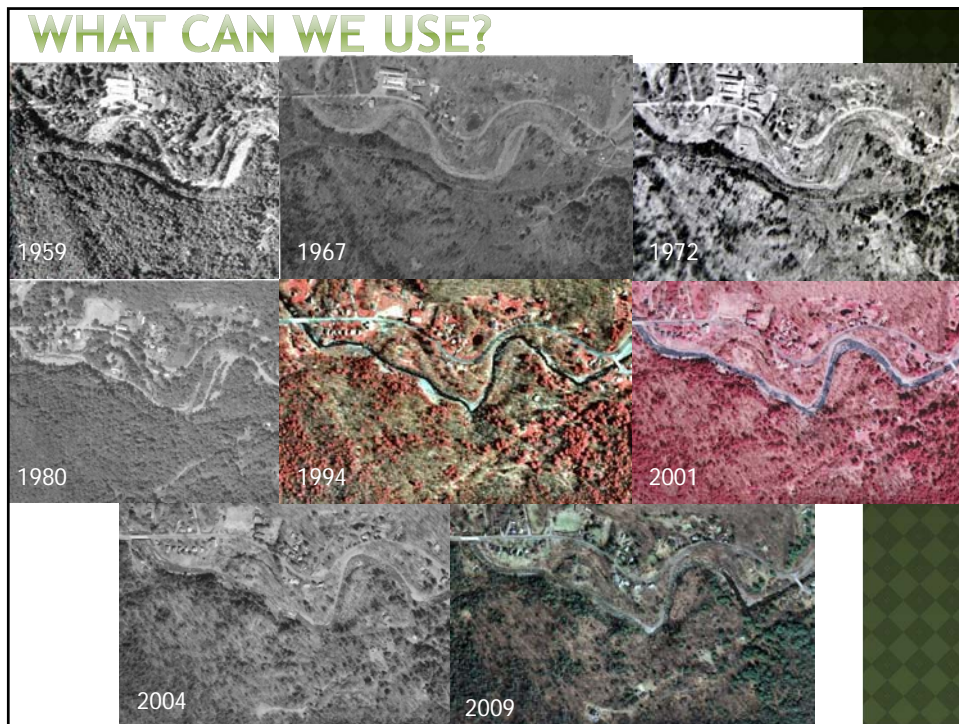
1950



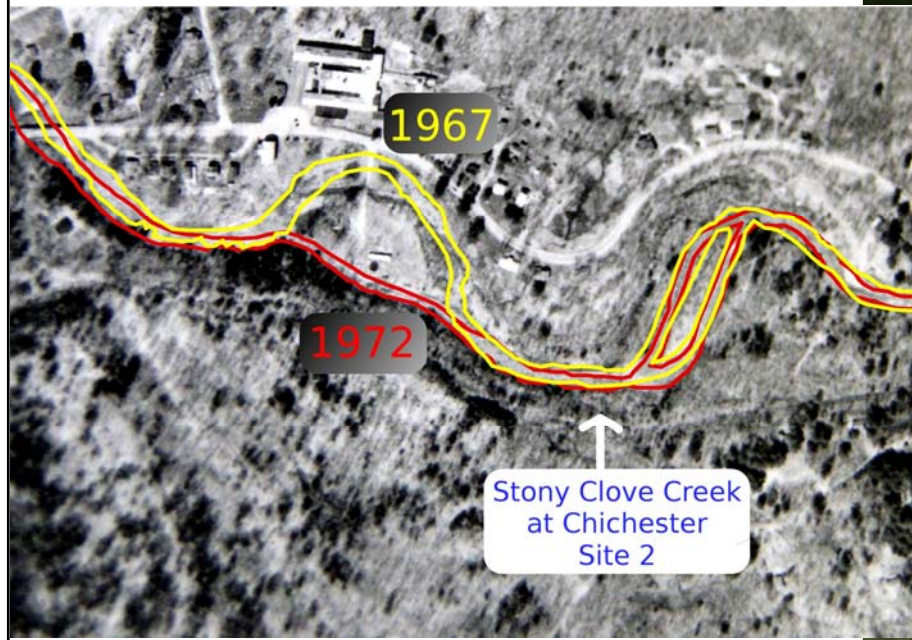
1975



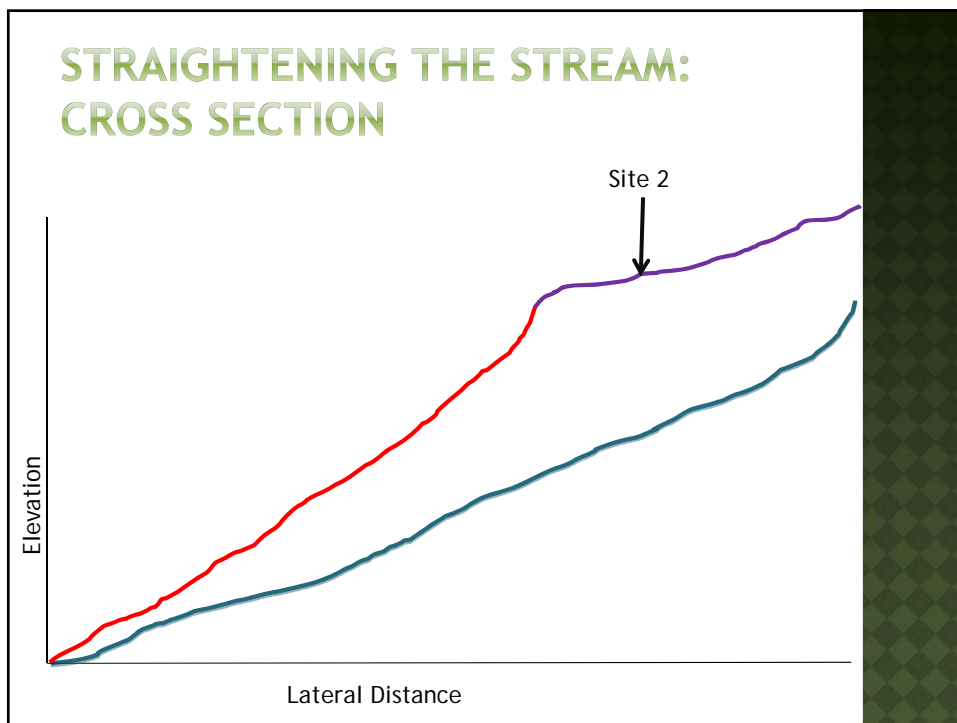
2012

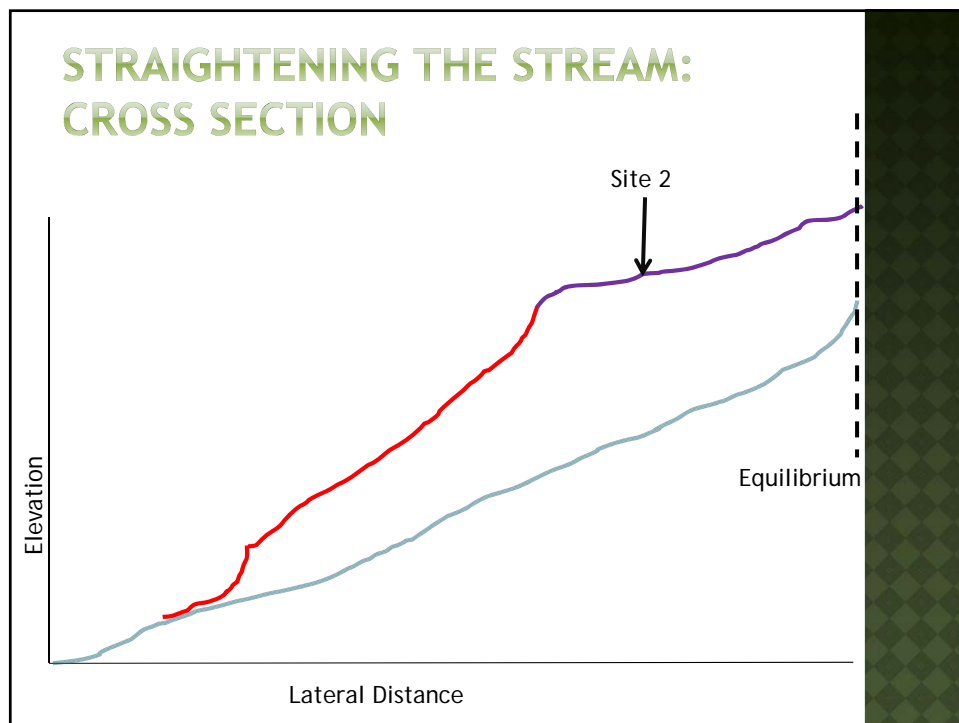
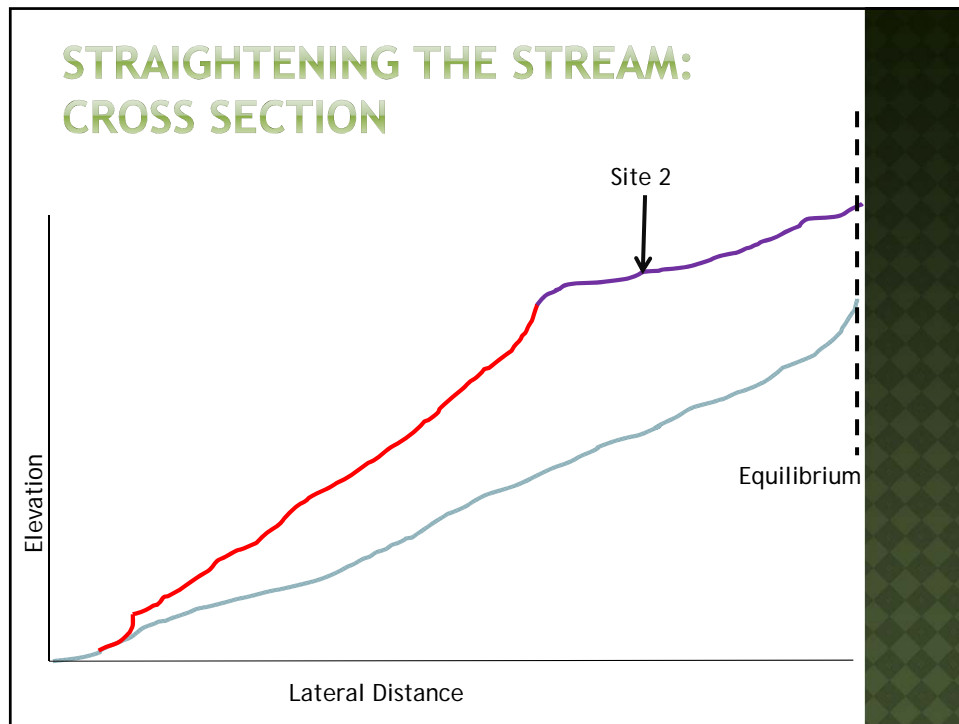


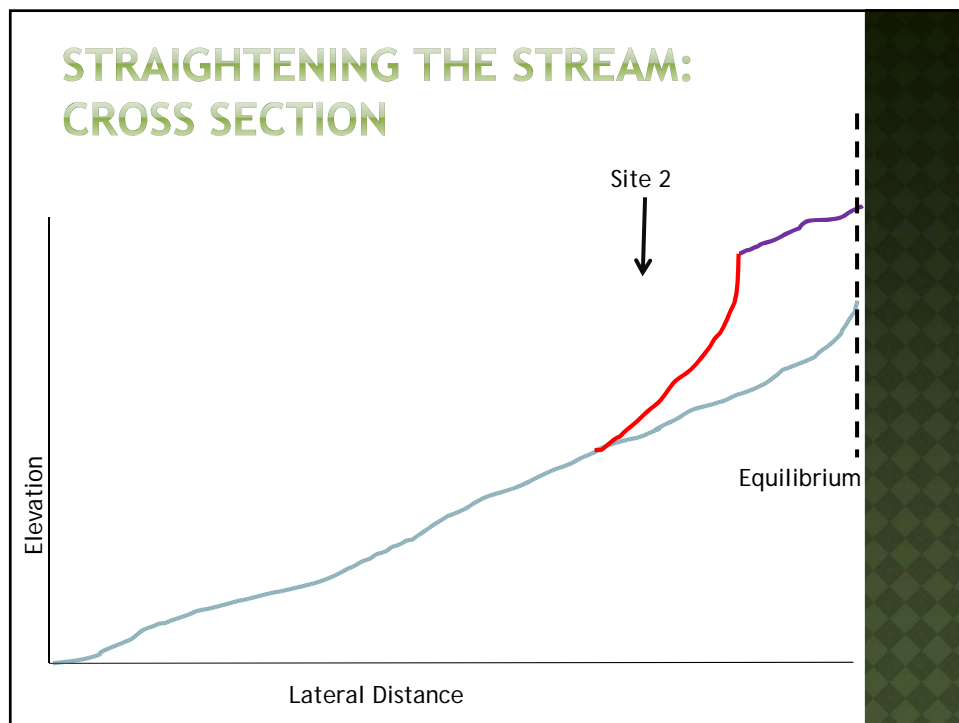
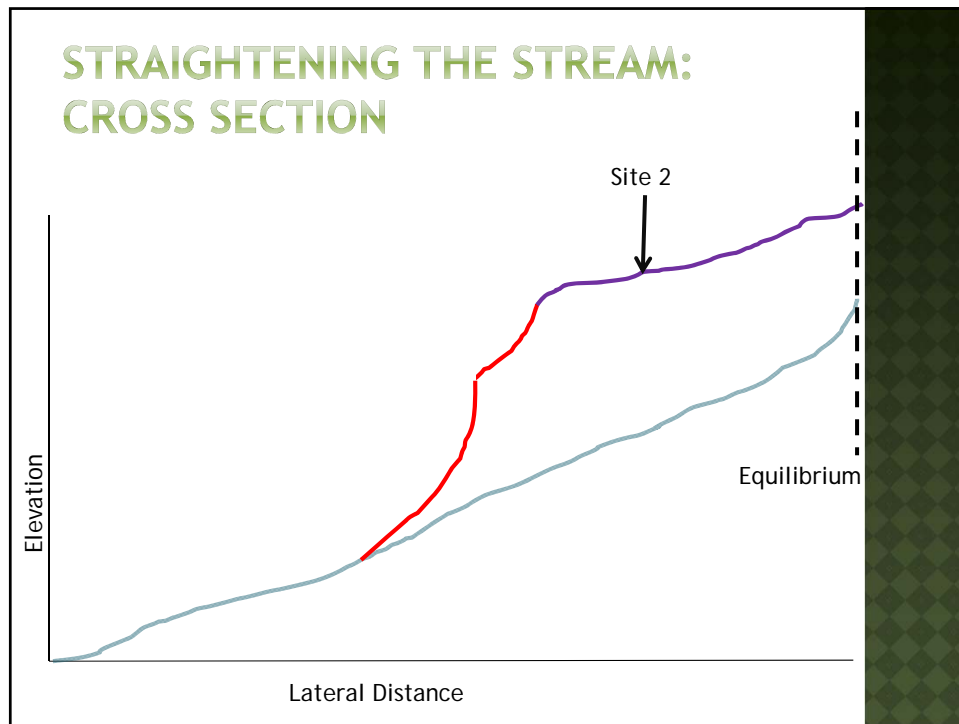
STRAIGHTENING THE STREAM



STRAIGHTENING THE STREAM: CROSS SECTION







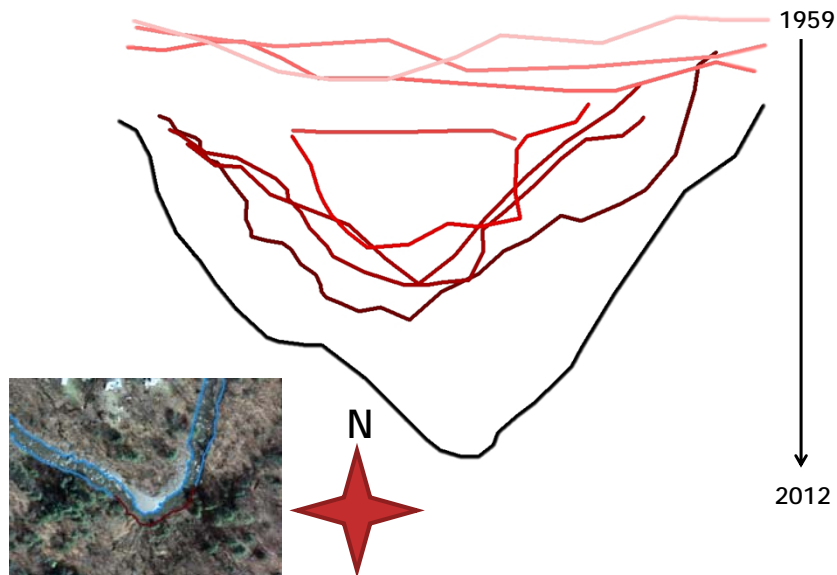
STRAIGHTENING THE STREAM: CROSS SECTION

Stage III. Degradation
 $h < h_c$



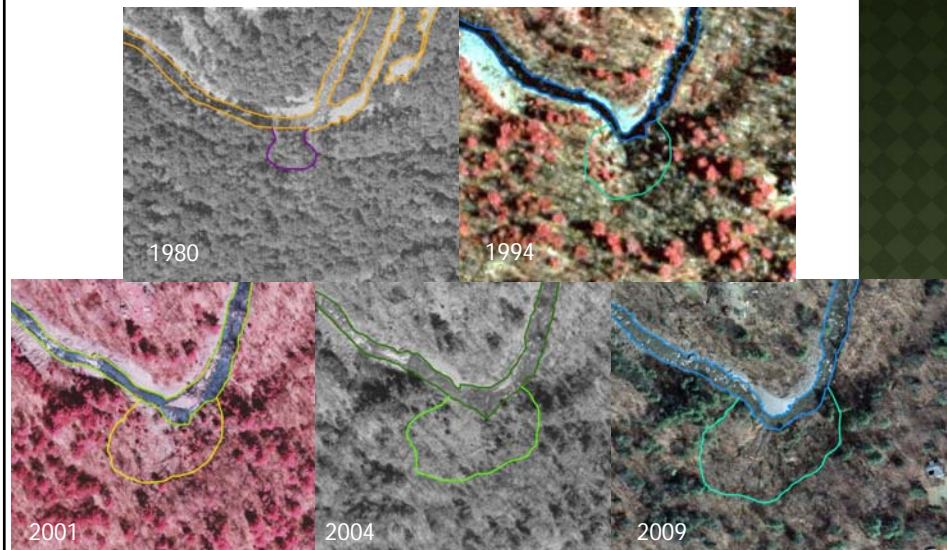
Credit: A. Simon, 1989

SOUTH BANK EROSION: MAP VIEW

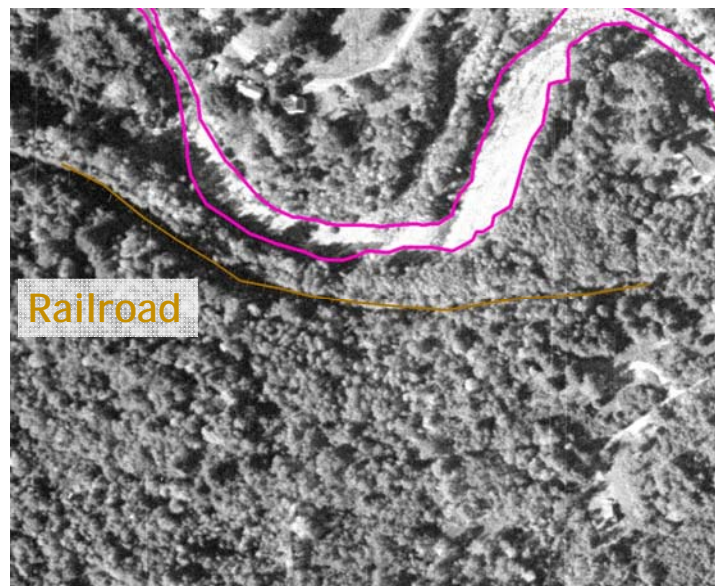




EDGE OF THE EROSION



1959



EARLY CHICHESTER

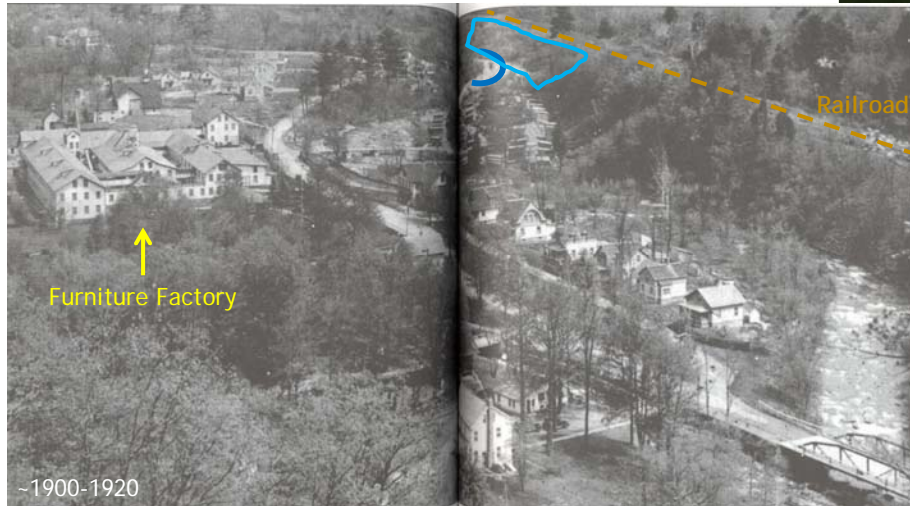


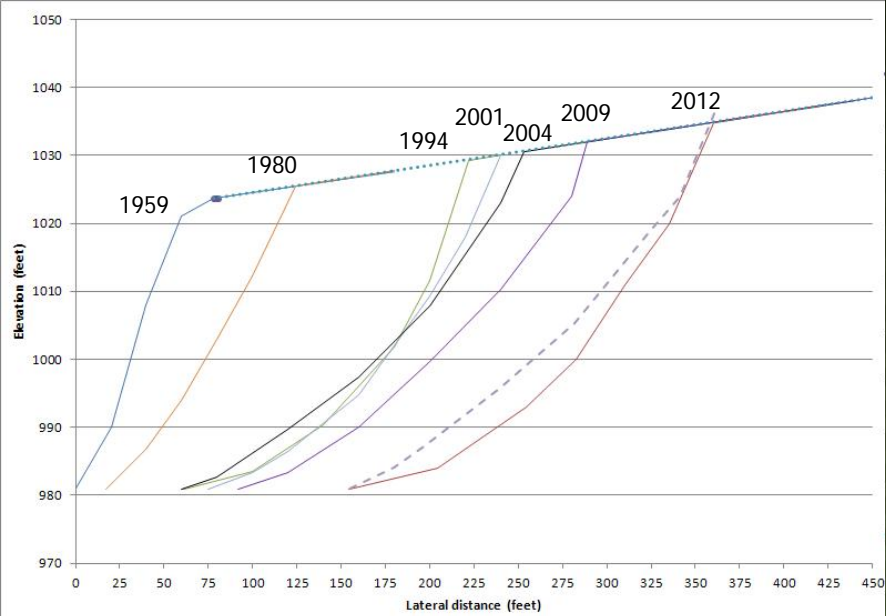
Photo Source: The Mountains Look Down: A History of Chichester, a Company Town in the Catskills

2012

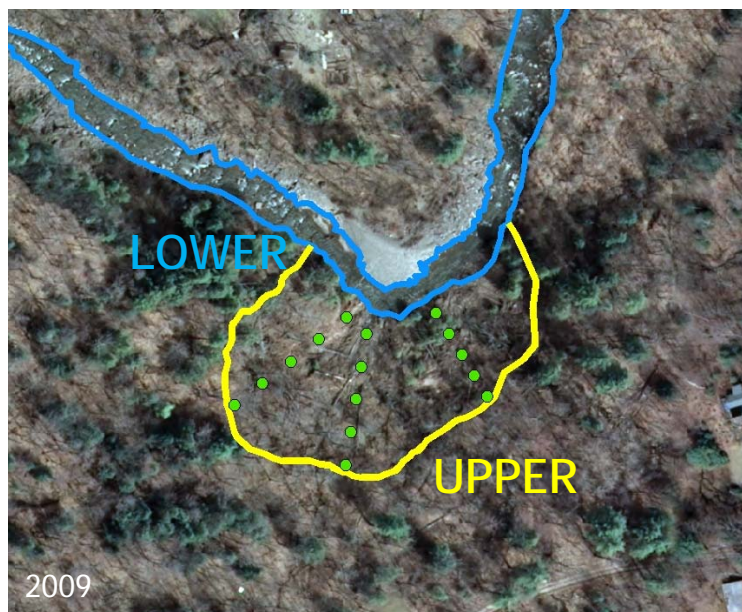


Aerial photo: Google Earth Images, 10/8/11

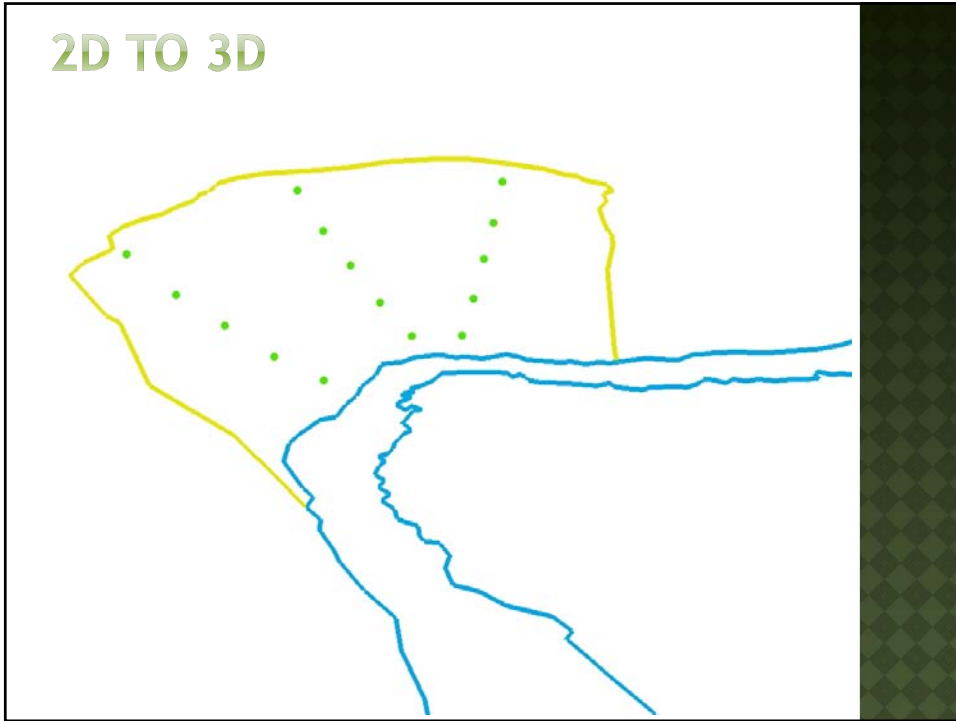
CROSS SECTIONS FOR SLOPE



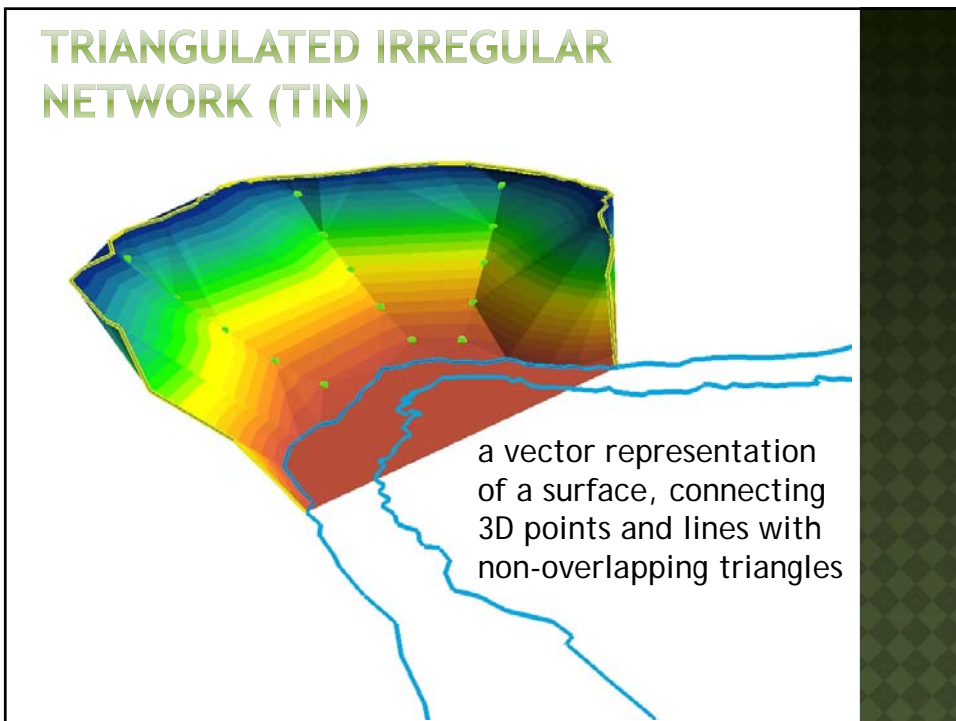
2D TO 3D



2D TO 3D



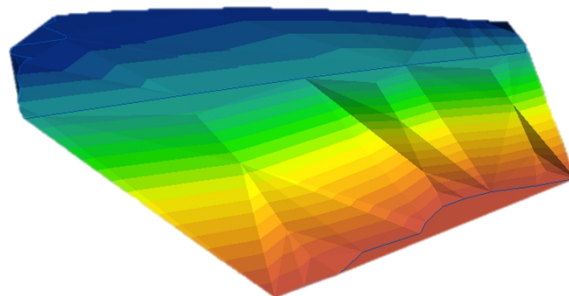
TRIANGULATED IRREGULAR NETWORK (TIN)



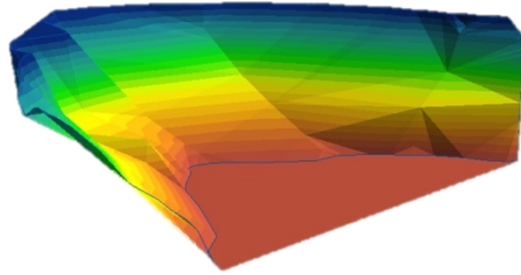
MODEL VISUALIZATION

3D model can be viewed at:
<http://vimeo.com/48302895>

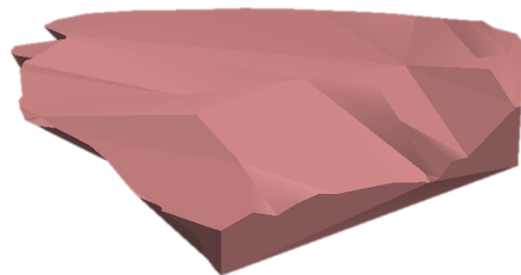
SEDIMENT VOLUME ANALYSIS



SEDIMENT VOLUME ANALYSIS

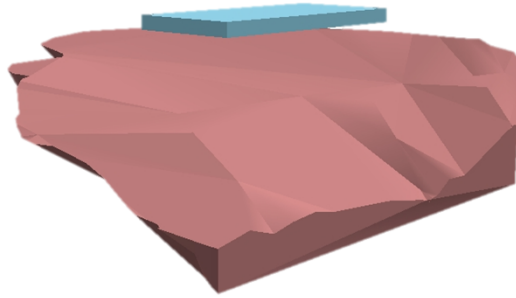


SEDIMENT VOLUME ANALYSIS



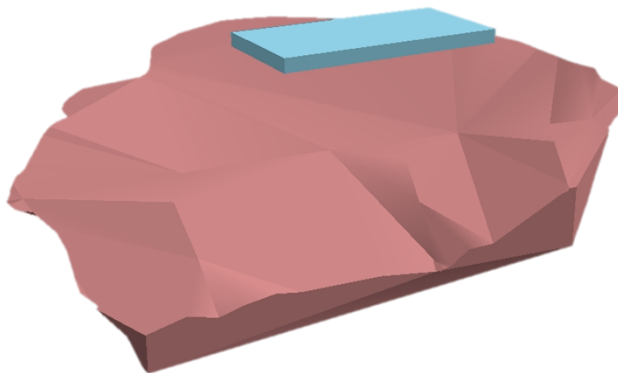
2,410,106 cubic feet of
sediment lost 1970-Present

SEDIMENT VOLUME ANALYSIS



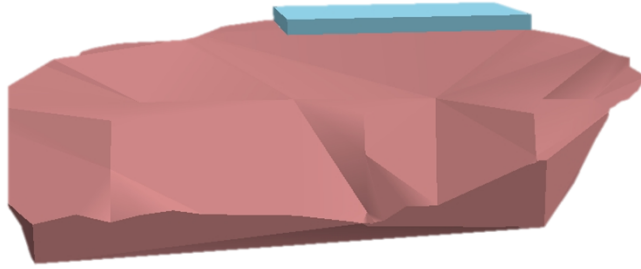
(~27 olympic-sized swimming pools)

SEDIMENT VOLUME ANALYSIS



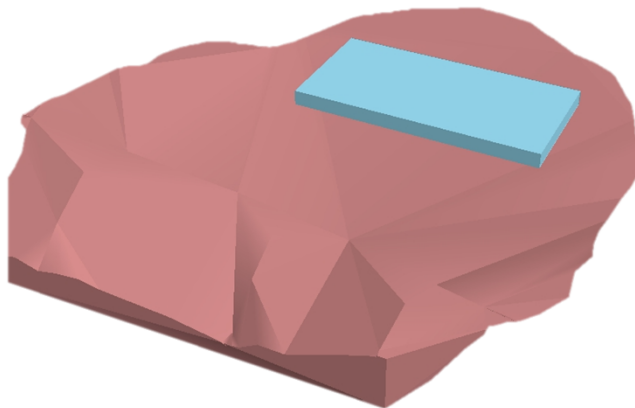
(~27 olympic-sized swimming pools)

SEDIMENT VOLUME ANALYSIS

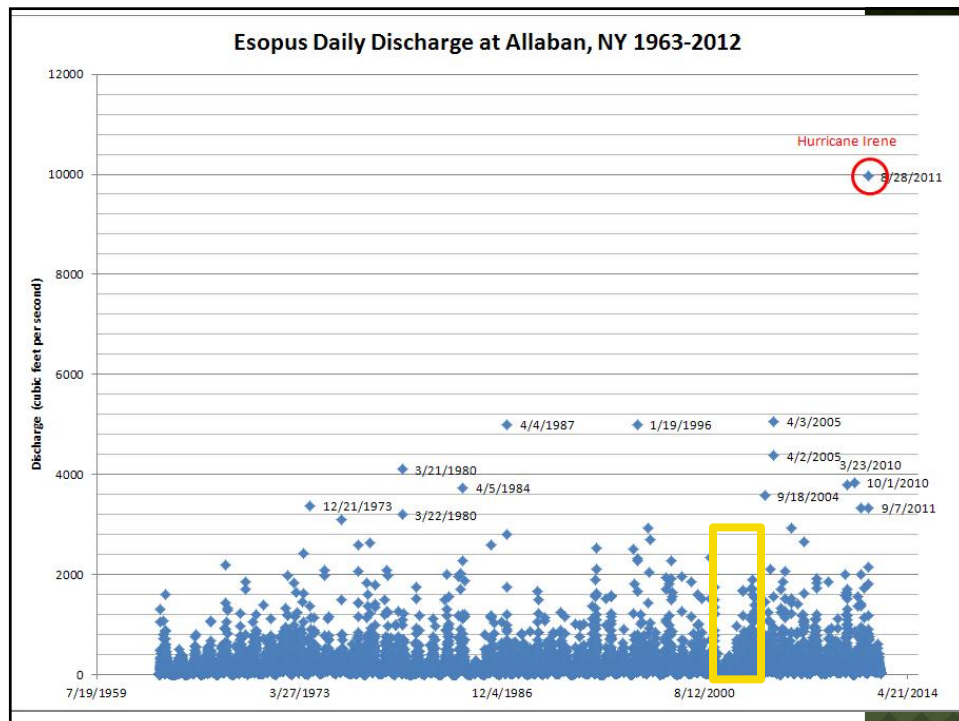
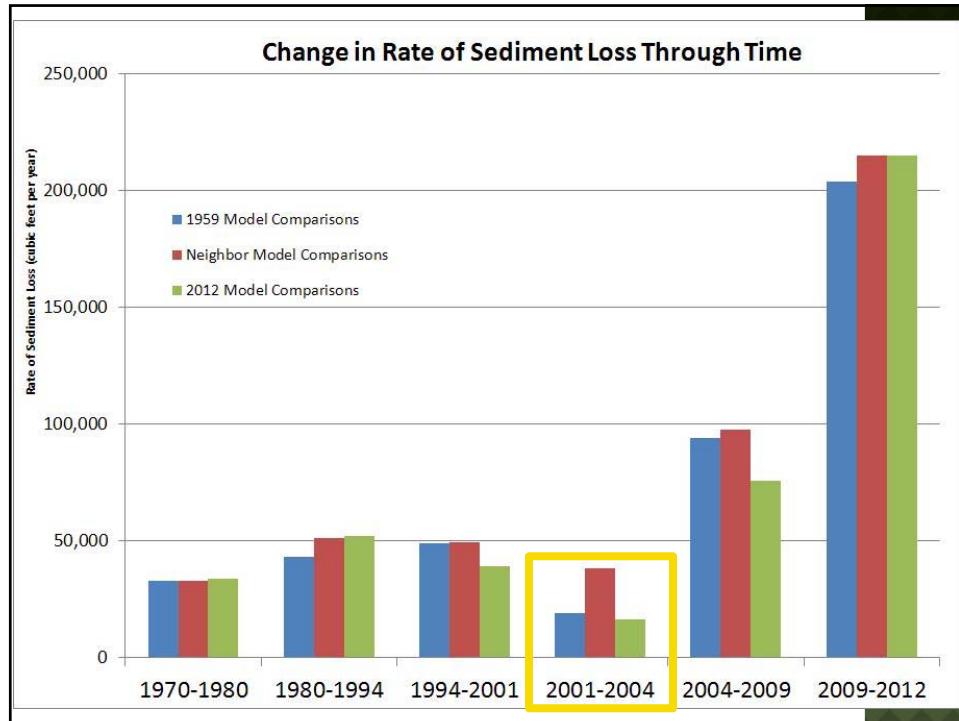


(~27 olympic-sized swimming pools)

SEDIMENT VOLUME ANALYSIS



(~27 olympic-sized swimming pools)



CONCLUSIONS

- ◉ Stony Clove Creek at Chichester Site 2 began forming after stream straightening around 1970
- ◉ From 1970-2012, the feature has contributed a very significant 2.4 million cubic feet of clay into the creek
- ◉ The rate of sediment loss is increasing

ACKNOWLEDGEMENTS

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- ◉ New York State Archives