How Effective Are Sediment and Turbidity Reduction Projects in the Stony Clove Creek Watershed?

CATSKILL ENVIRONMENTAL RESEARCH MONITORING CONFERENCE
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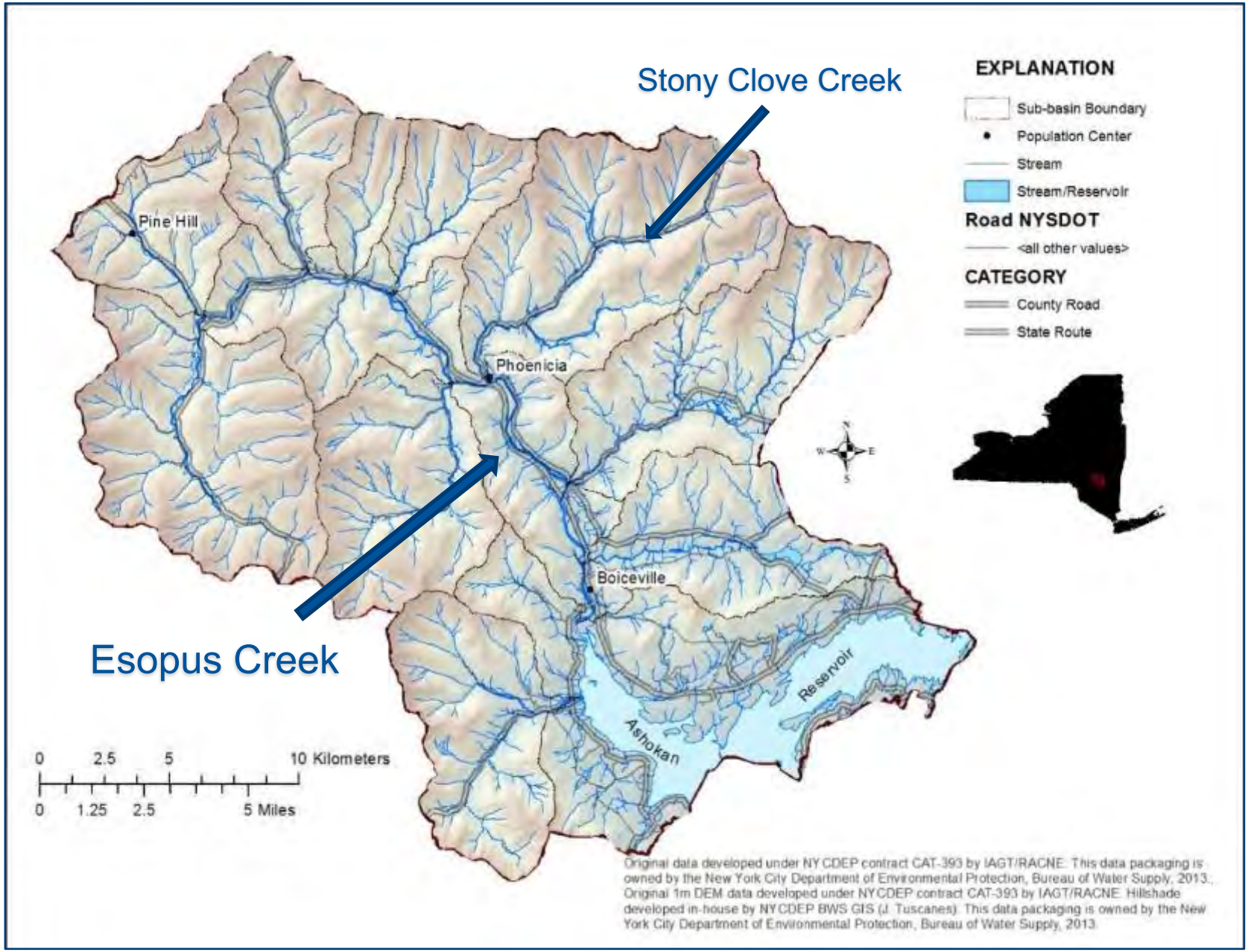
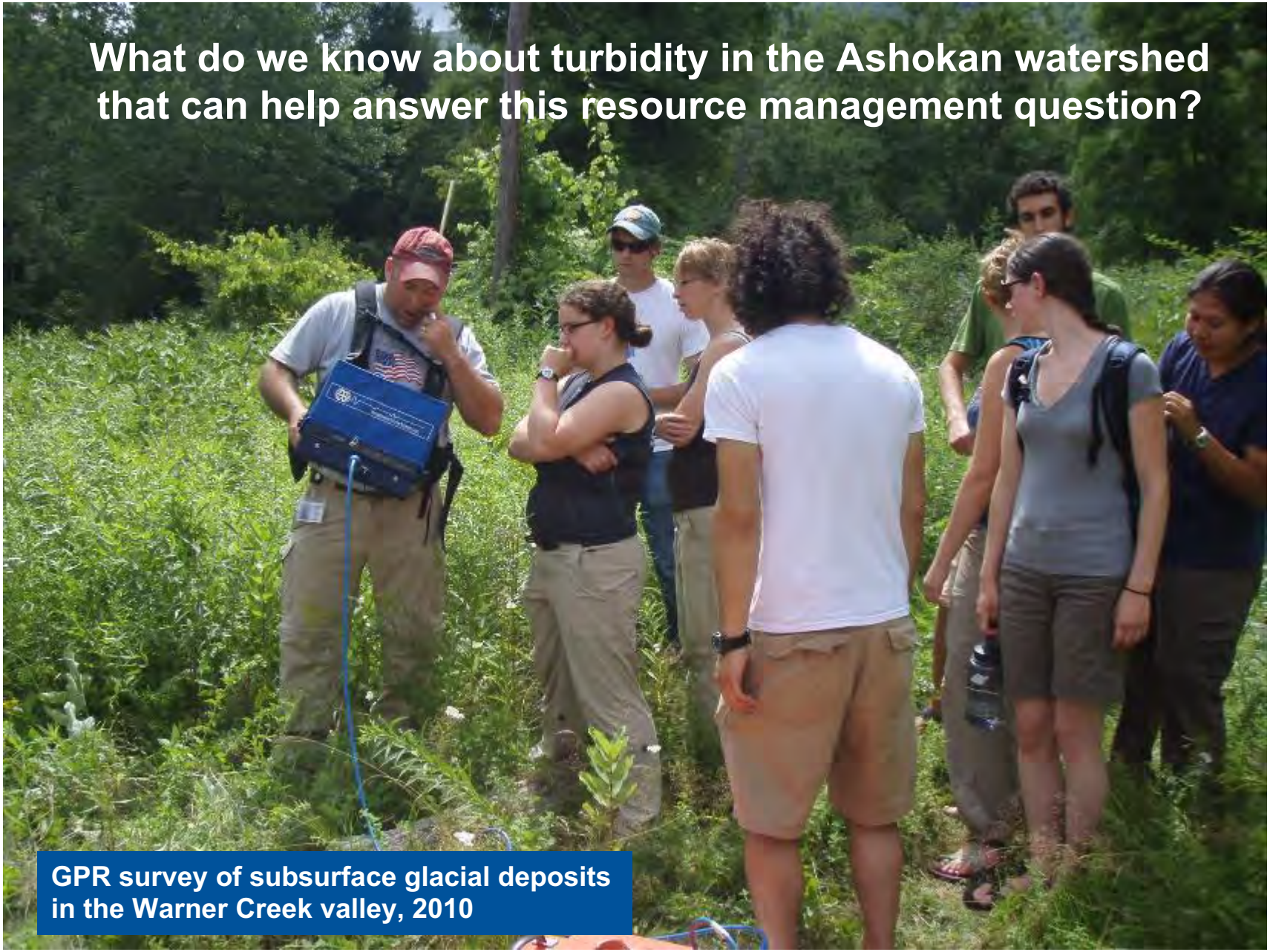
Danyelle Davis (NYCDEP)
Jason Siemion (USGS)
Michael R McHale (USGS)

Ashokan Reservoir

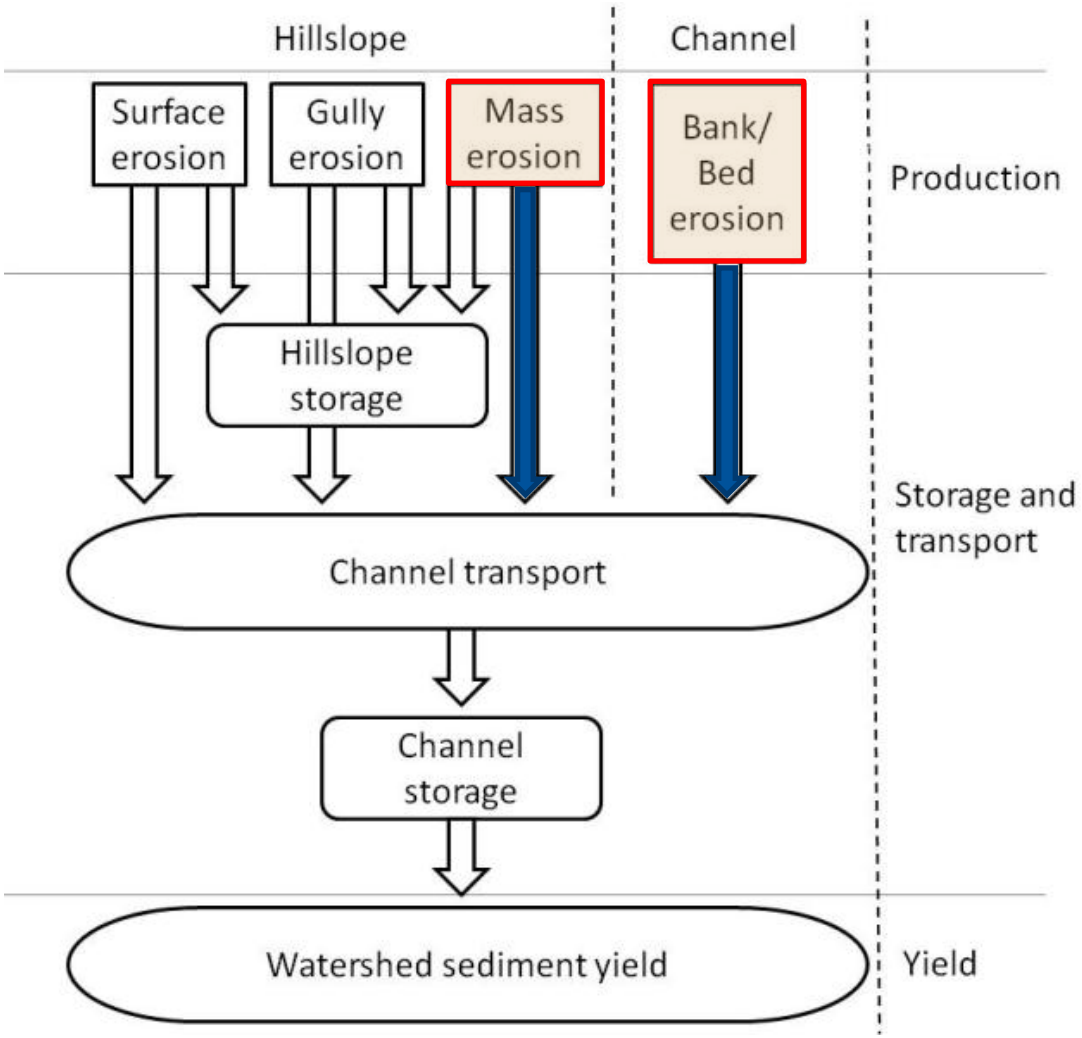
Ashokan Reservoir Watershed



Turbidity in the Ashokan Watershed



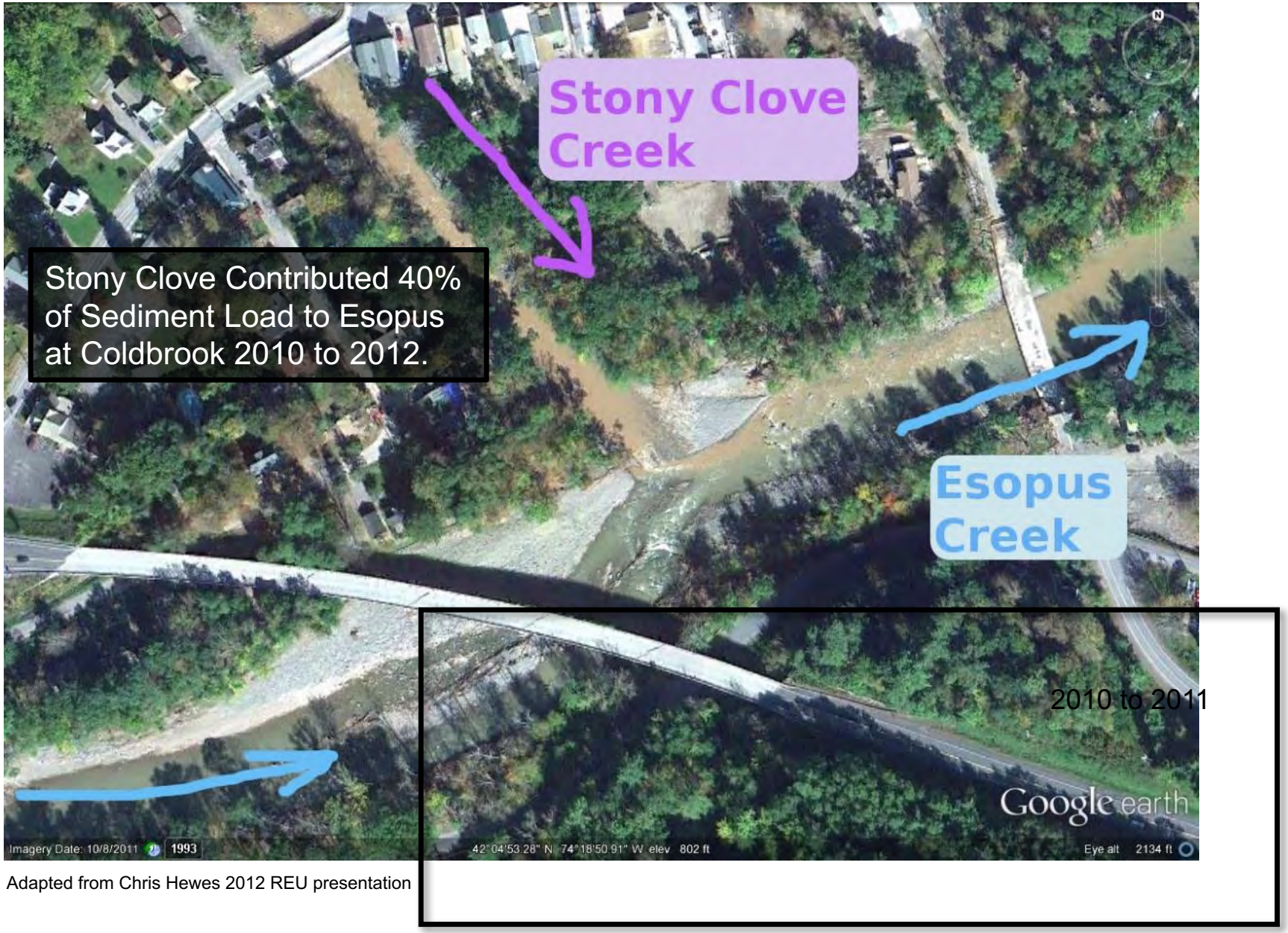
Sources of Turbidity



Sedimentation process (Modified from EPA,1999)

Esopus Creek Watershed Turbidity

Stony Clove Creek as a Chronic Turbidity Source

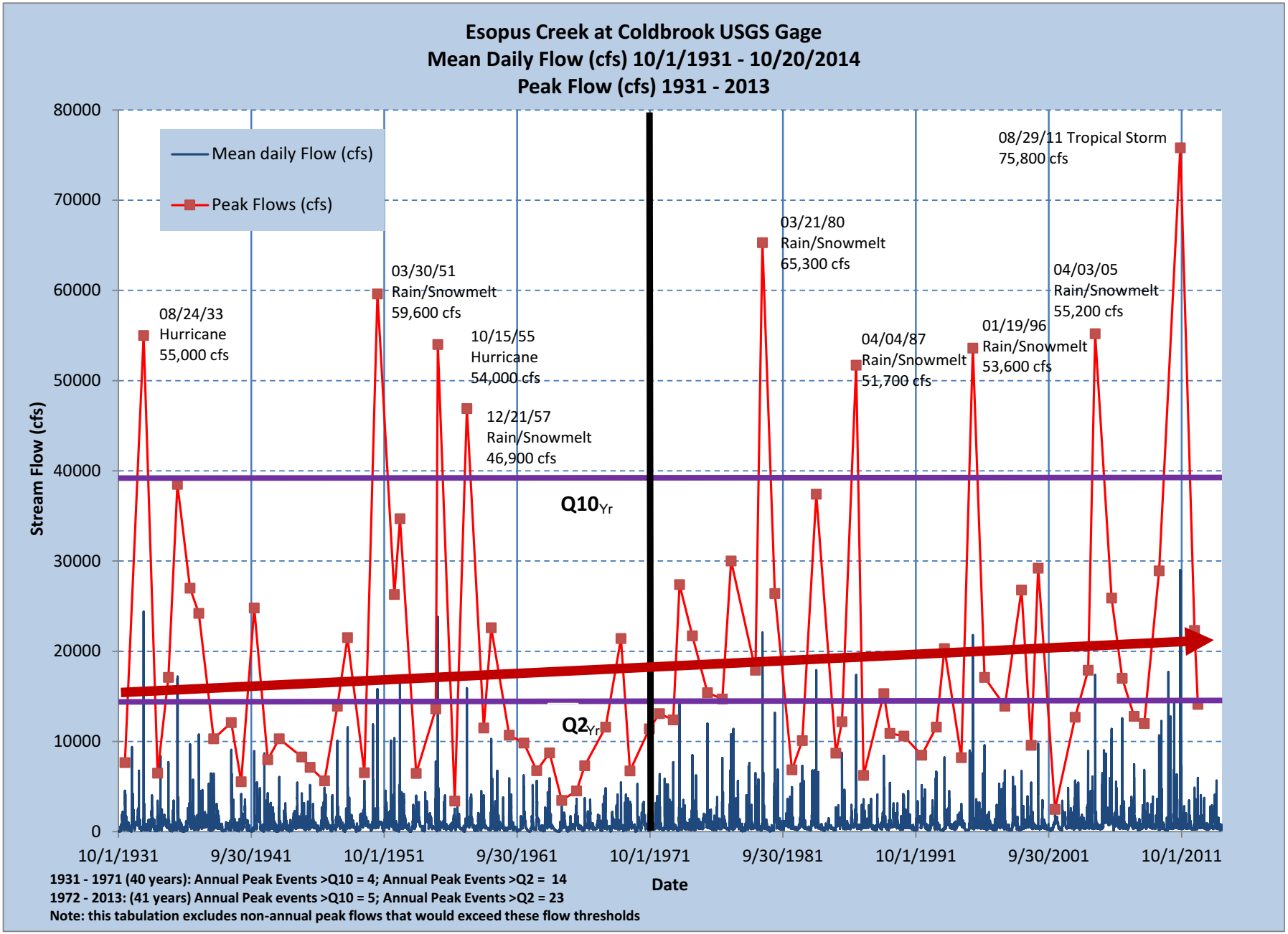


Adapted from Chris Hewes 2012 REU presentation

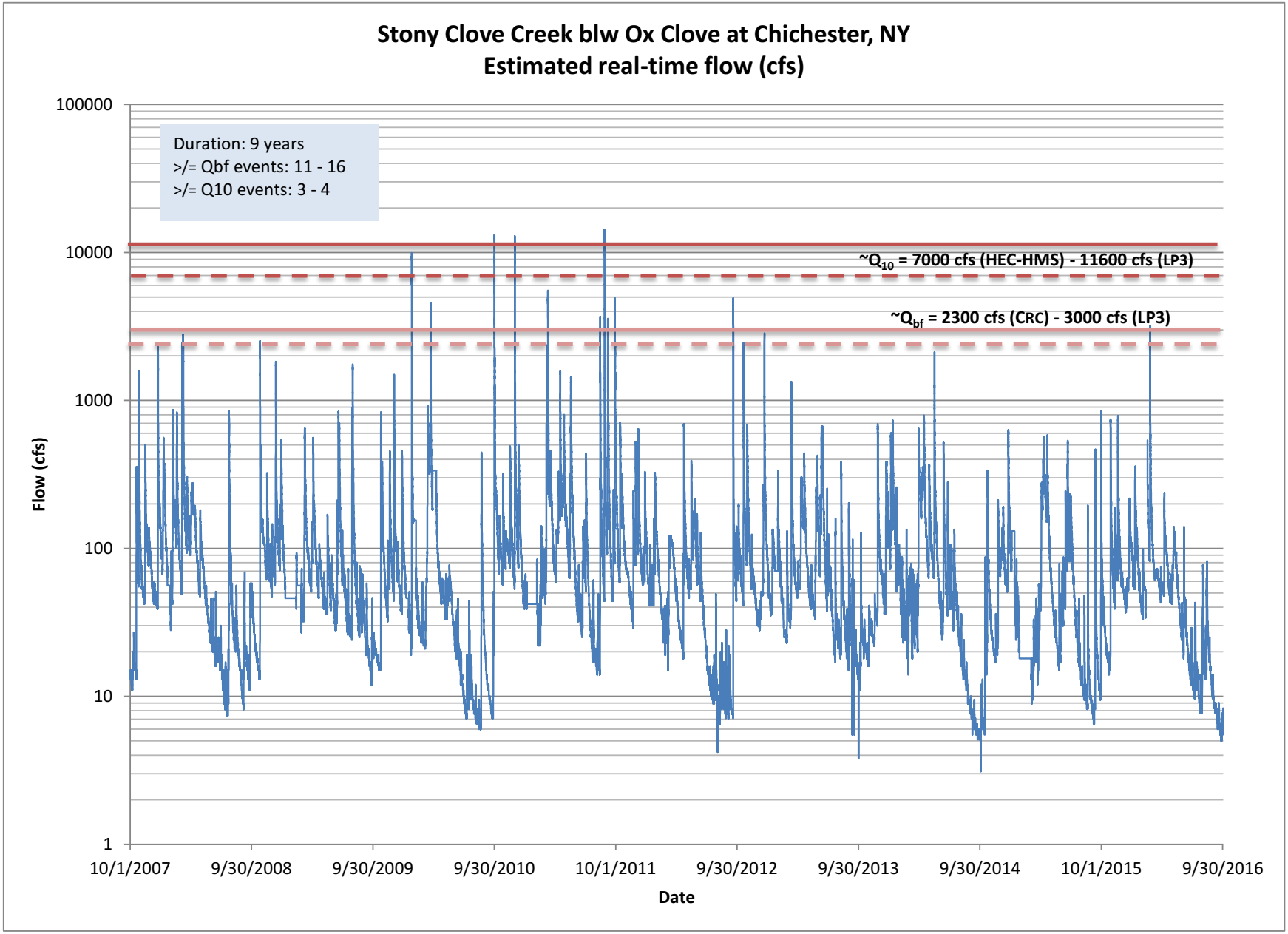
Understanding Watershed Hydrology

Stony Clove Creek at Chichester during a
~ 2 year return period runoff event 6/26/2006

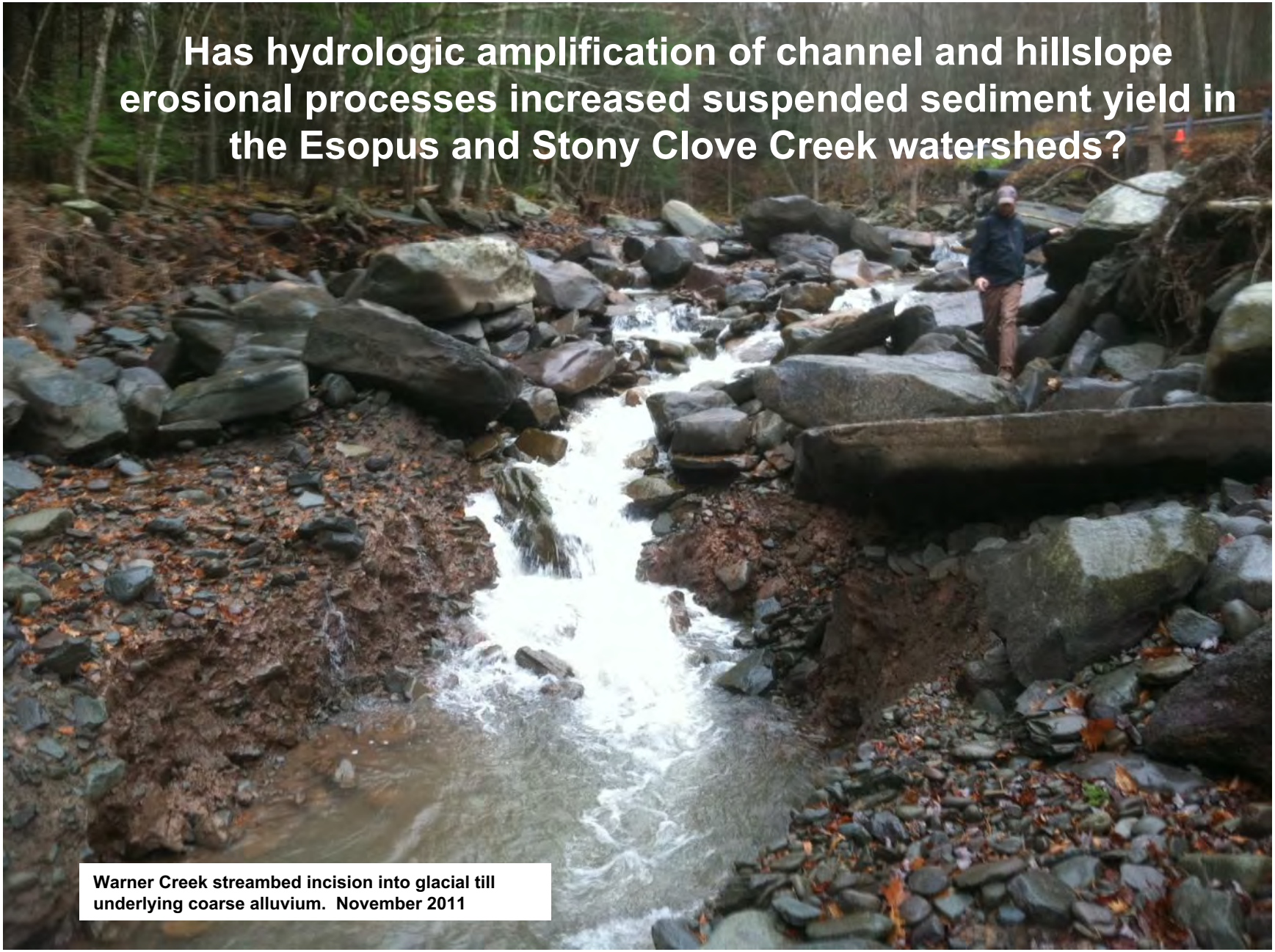
Esopus Creek Peak Flow Record



Stony Clove Creek Hydrology: Temporal Variability



Stream Channel Geomorphic Response



Warner Creek streambed incision into glacial till underlying coarse alluvium. November 2011

Geomorphic and Geologic Investigations

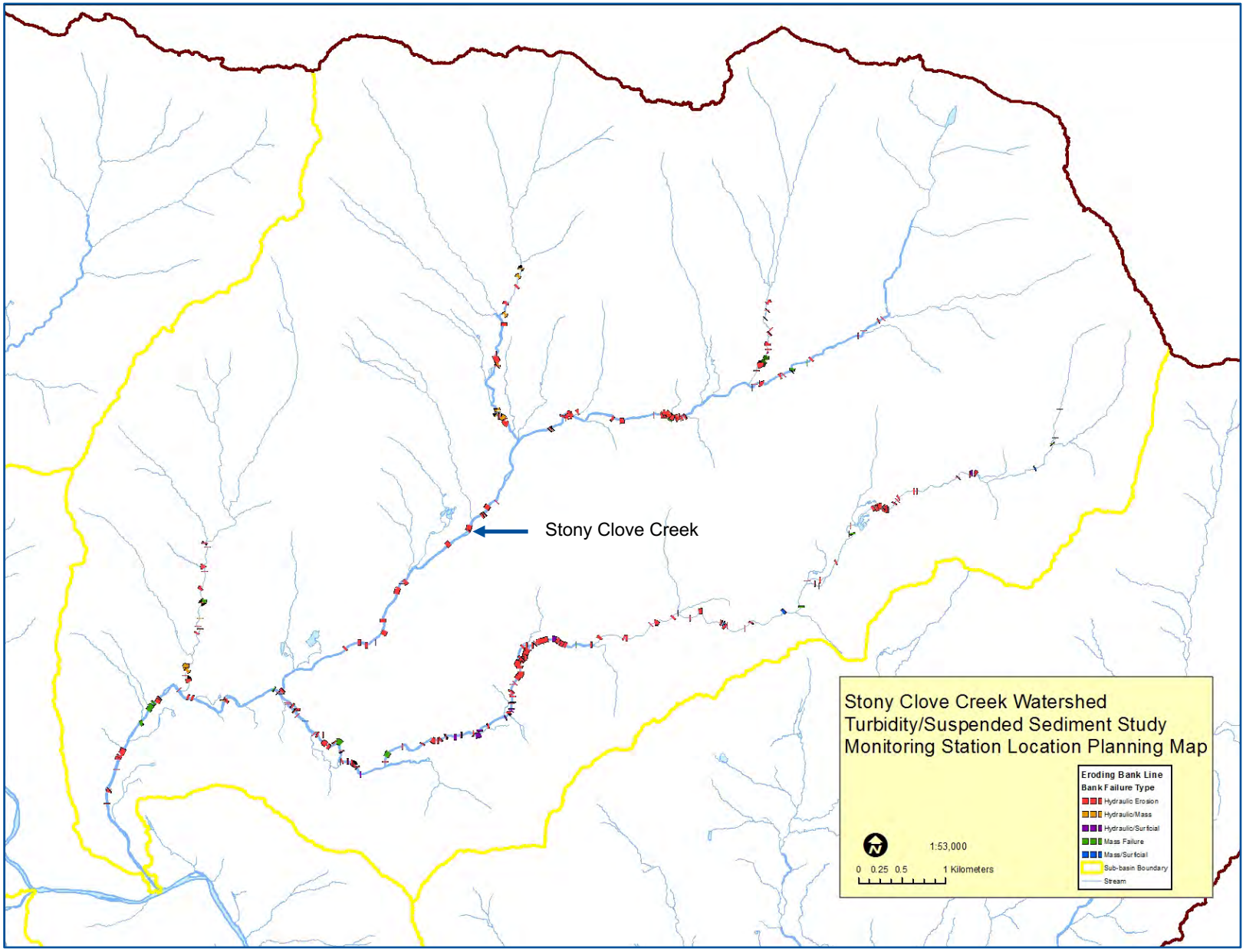
GPS-Based Stream Feature Inventories

Channel morphology surveys

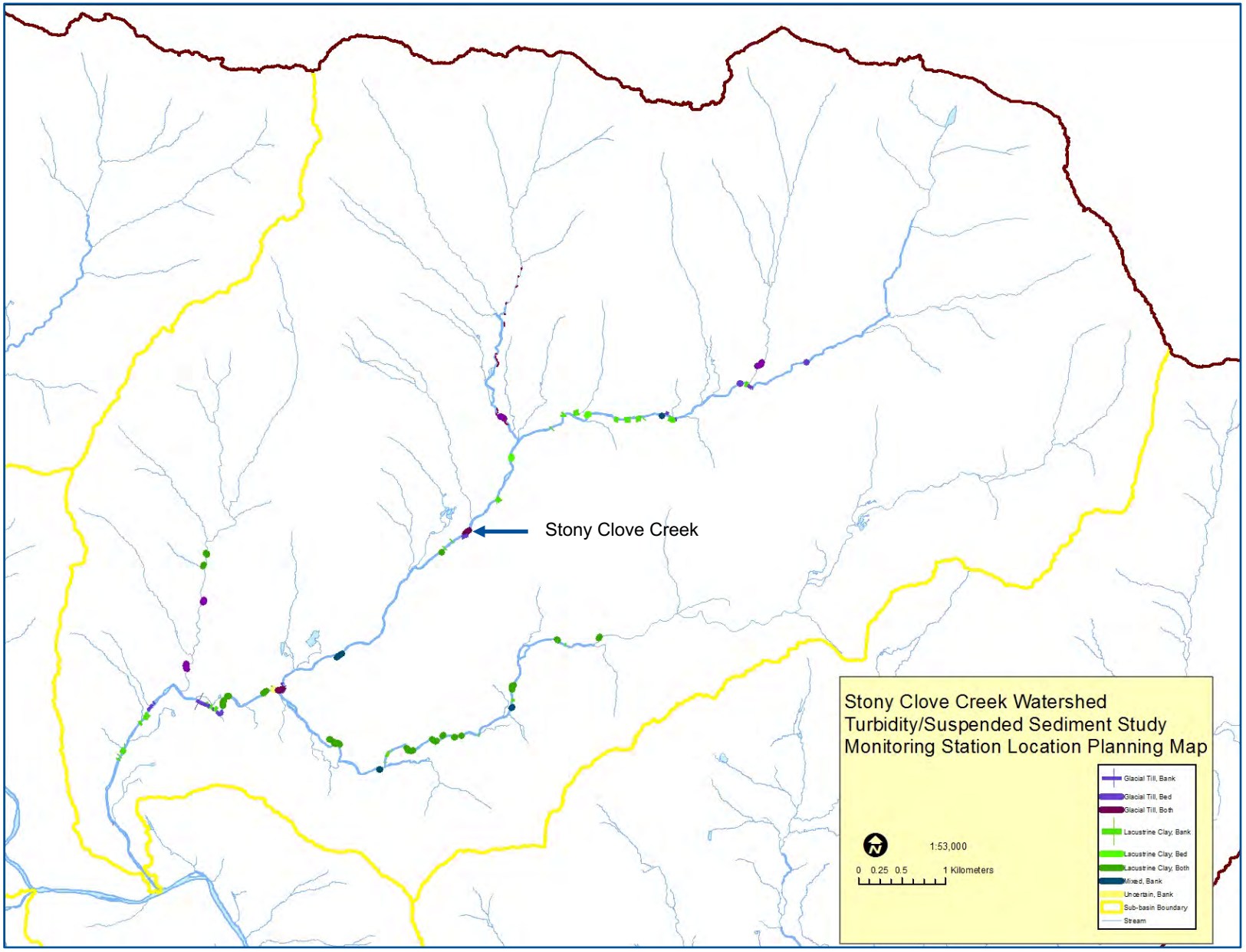
Monitoring bank erosion at sediment source sites

Geologic investigations to work out glacial stratigraphy

Stony Clove Watershed: Streambank Erosion



Stony Clove Watershed: Non-Alluvial SS Sources



Defining Sedimentologic Units

From Staley, et al, 2013.
Northeastern GSA Conference

Relating Geomorphology to SSC

2010-2011

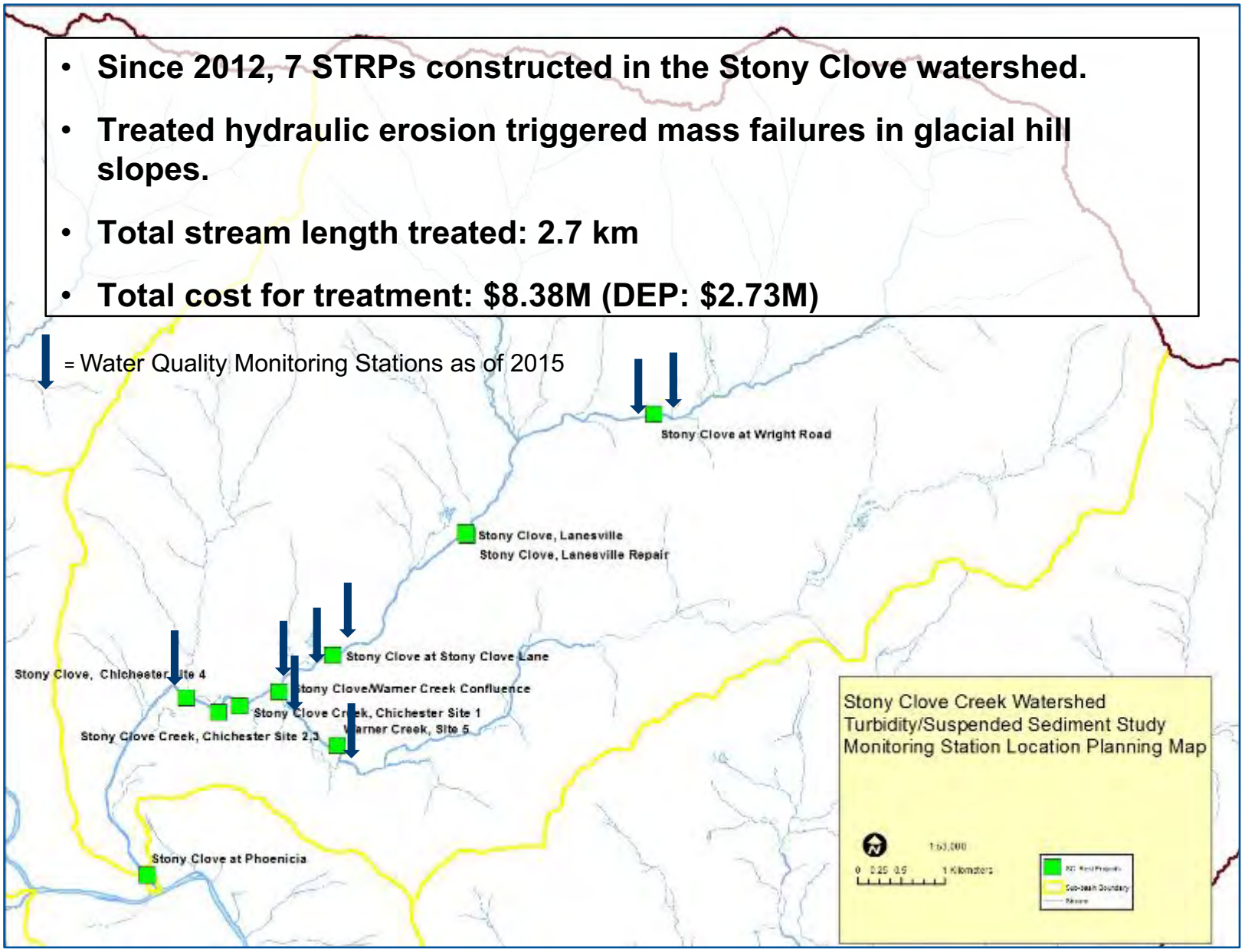
Streams dominated by lacustrine deposits

Streams dominated by till deposits

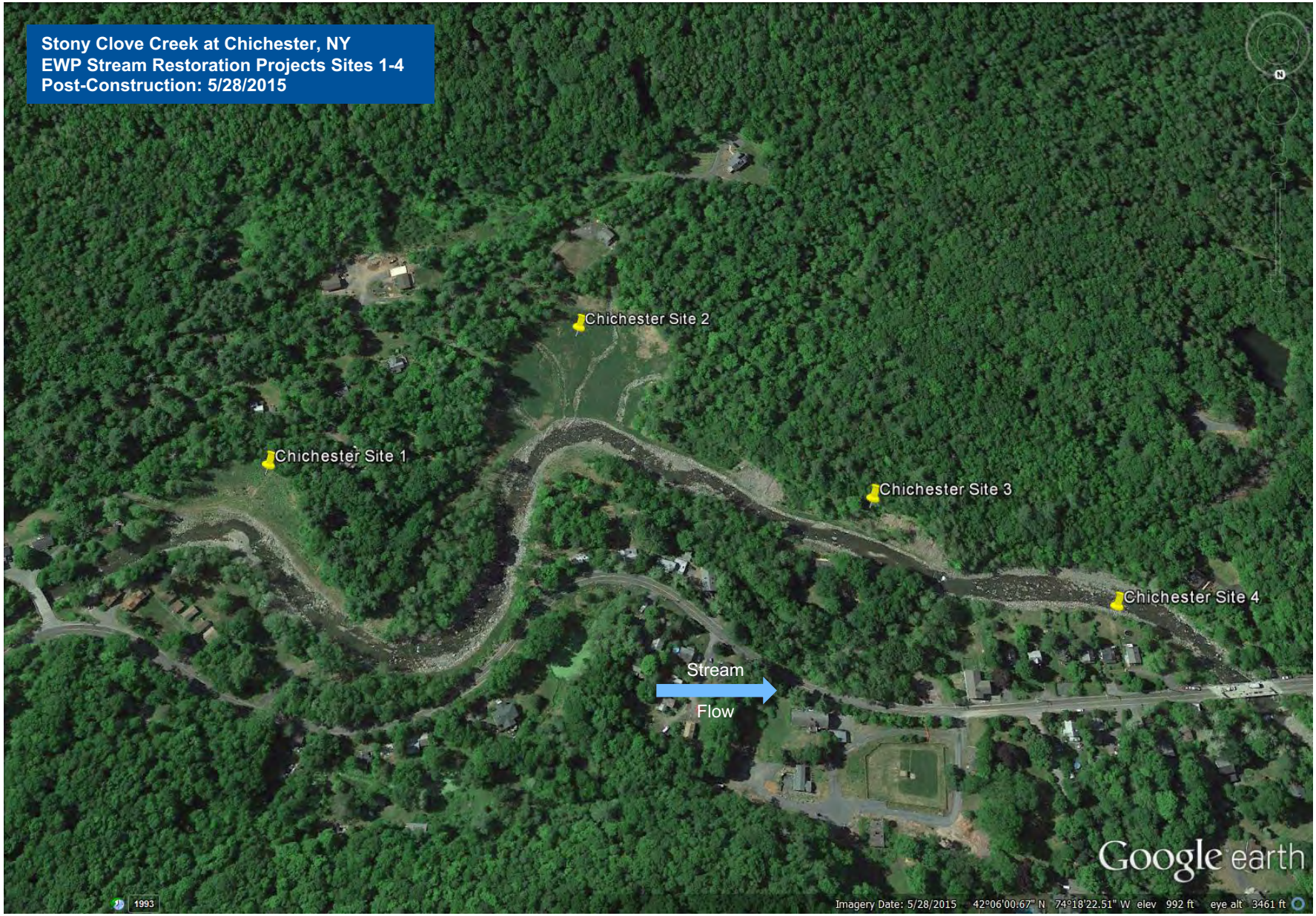
Stony Clove Chichester Sites 2 & 3 pre-construction

Stony Clove Watershed: Stream Projects 2011 - 2015

- **Since 2012, 7 STRPs constructed in the Stony Clove watershed.**
- **Treated hydraulic erosion triggered mass failures in glacial hill slopes.**
- **Total stream length treated: 2.7 km**
- **Total cost for treatment: $8.38M (DEP: $2.73M)**




Stony Clove Creek at Chichester, NY
EWP Stream Restoration Projects Sites 1-4
Pre-Construction: 10/8/2011
Chichester Site 2
Chichester Site 1
Chichester Site 3
Chichester Site 4
Stream
Flow
Google earth
1993
Imagery Date: 10/8/2011 42°06'00.67" N 74°18'22.51" W elev 992 ft eye alt 3461 ft


Stony Clove Creek at Chichester, NY
EWP Stream Restoration Projects Sites 1-4
Post-Construction: 5/28/2015
Chichester Site 2
Chichester Site 1
Chichester Site 3
Chichester Site 4
Stream
Flow
Google earth
1993
Imagery Date: 5/28/2015 42°06'00.67" N 74°18'22.51" W elev 992 ft eye alt 3461 ft

Stony Clove Chichester Sites 2 & 3 pre-construction

Stony Clove Chichester Sites 2 and 3 post-construction

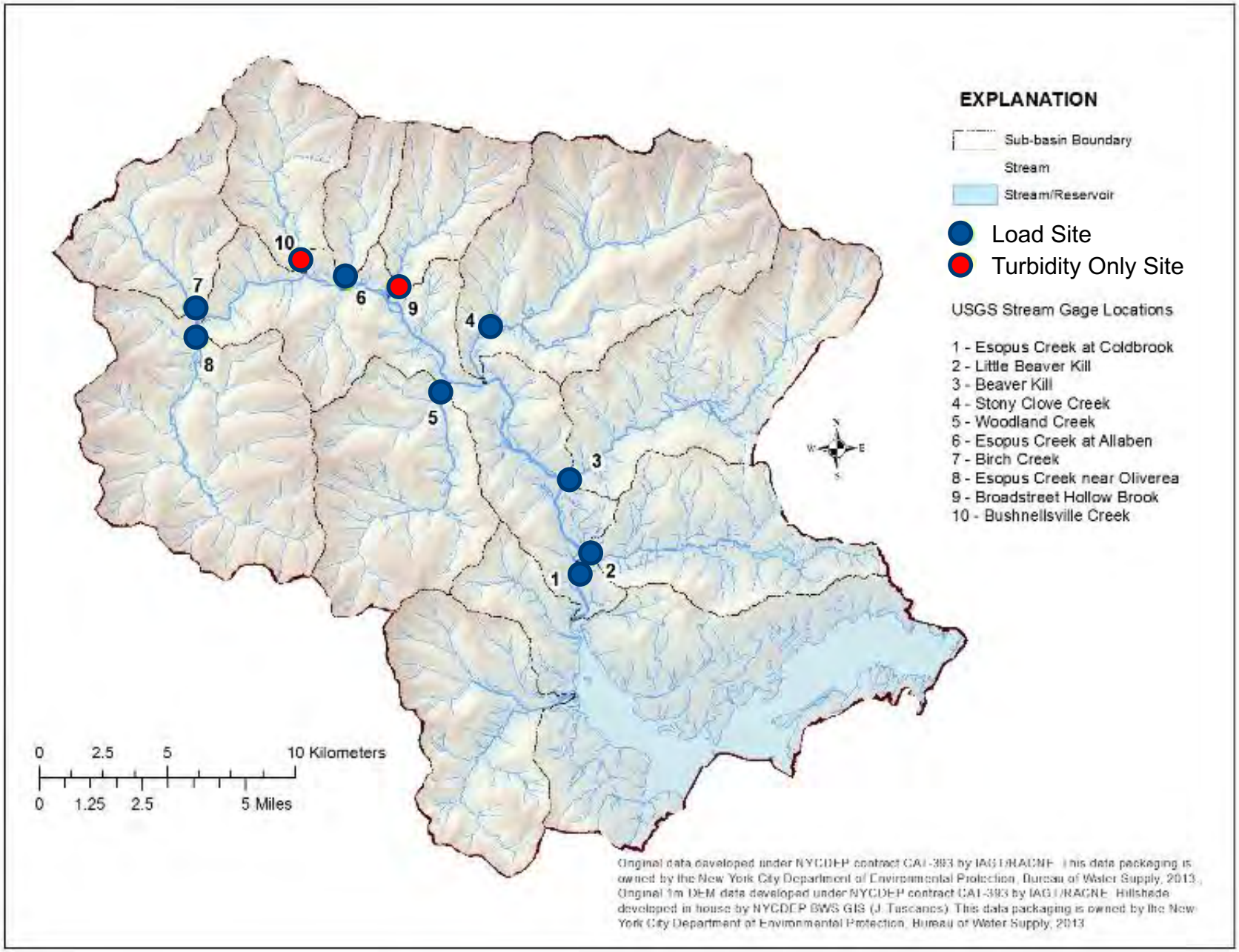
New Esopus Watershed Ten Year Monitoring Study

- NYCDEP-USGS collaboration
- Tributary and mainstem turbidity and suspended sediment monitoring
- Macro-reach scale monitoring in Stony Clove watershed

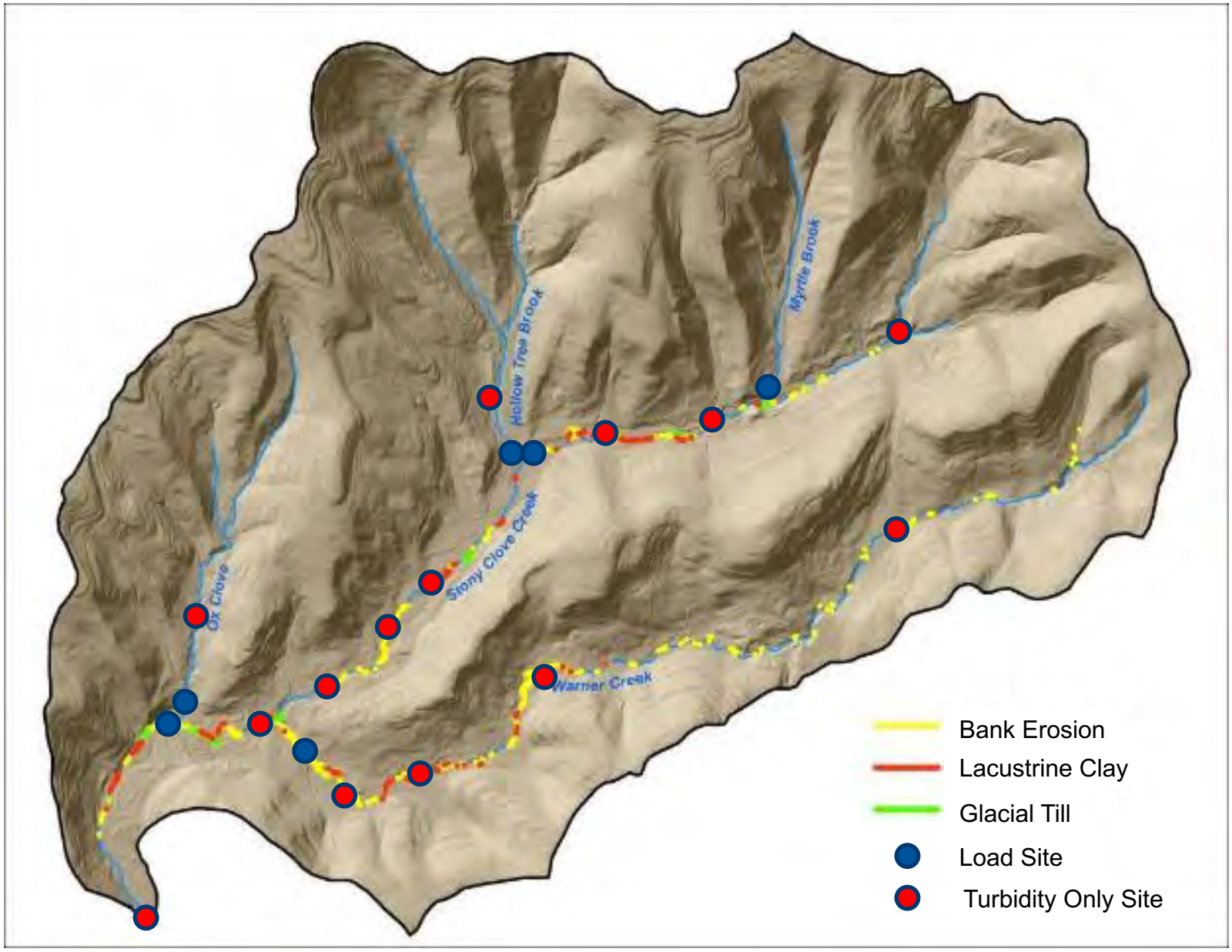
Research Questions:

1. What geologic/geomorphic conditions and processes produce the most sediment and turbidity across a range of flows?
2. What associated reach-scale metrics can we use to predict suspended sediment yield and turbidity?
3. Can we improve our ability to select stream restoration project sites to maximize potential sediment and turbidity reduction?
4. To what extent can suspended sediment yield and turbidity associated with these sources, channel conditions and processes be managed within the stream system?
5. Over what range of flows, spatial and temporal scales can we measure a reduction in turbidity and suspended sediment load in Stony Clove Creek?

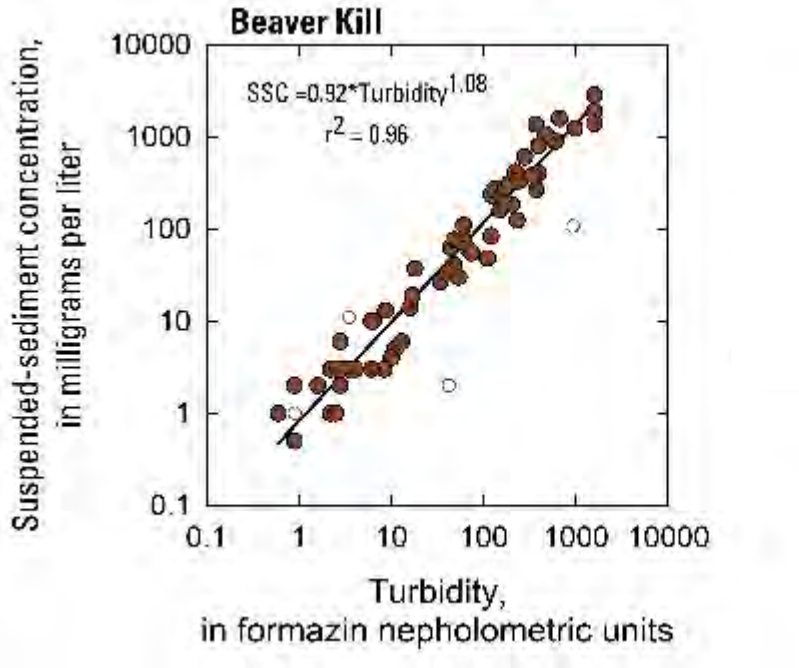
Esopus Creek and Tributary Monitoring Sites



Stony Clove Creek Monitoring Sites



Techniques



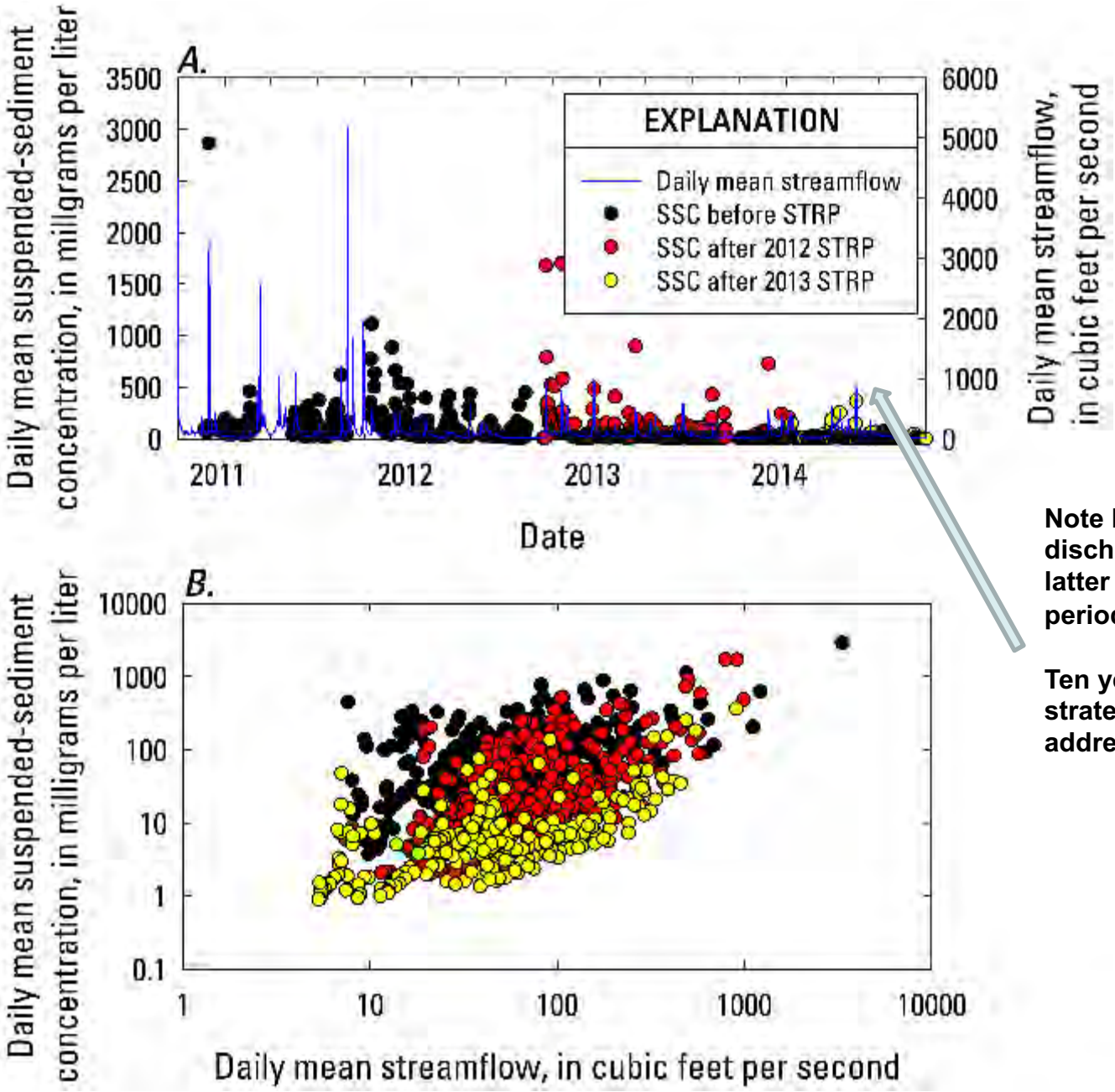
- 15 min turbidity → 15 min SSC

- 15 min SSC → Mean Daily SSC

- SSC x Streamflow = Daily Loads

- Relate SSC to streamflow, geomorphology, test effectiveness of STRP, sediment finger printing, etc.

Sediment and Turbidity Reduction Projects in Stony Clove Creek



Note lack of high discharge events in latter part of study period.

Ten year monitoring strategy will help address this issue.

Sediment and Turbidity Reduction Projects in Warner Creek

Summary

This set of turbidity/suspended sediment monitoring and source studies will enable NYCDEP to

- evaluate the production processes and conditions that influence the spatial and temporal variation in suspended sediment yield; and
- evaluate the effectiveness of turbidity reduction strategies through STRPs at the reach, sub-basin and reservoir basin scale to better inform future investment in stream restoration targeted to reduce turbidity.

Project Schedule

- **November, 2014**: DEP submits FAD deliverable describing proposed approach to evaluating distribution of turbidity sources in the Ashokan watershed and to evaluate stream project effectiveness in reducing turbidity.
- **July 7, 2016**: DEP-USGS contract start date
- **August – October 2016**: USGS instruments existing upper Esopus Creek watershed gages and establishes new Esopus Creek gage in Oliverea.
- **September – November 2016**: USGS establishes new Stony Clove Creek watershed monitoring stations.
- **Fall 2016 – Fall 2026**: USGS initiates/continues water quality monitoring
- **Fall 2016 – Summer 2026:** DEP continues geomorphic monitoring.
- **Summer 2020**: AWSMP resumes Stony Clove stream projects after baseline monitoring informed site selection.
- **Fall 2027**: Study complete

Thank You

Stony Clove Creek at Chichester
July 2013