

LEGACY SEDIMENT RESTORATION

Chesapeake Bay Commission

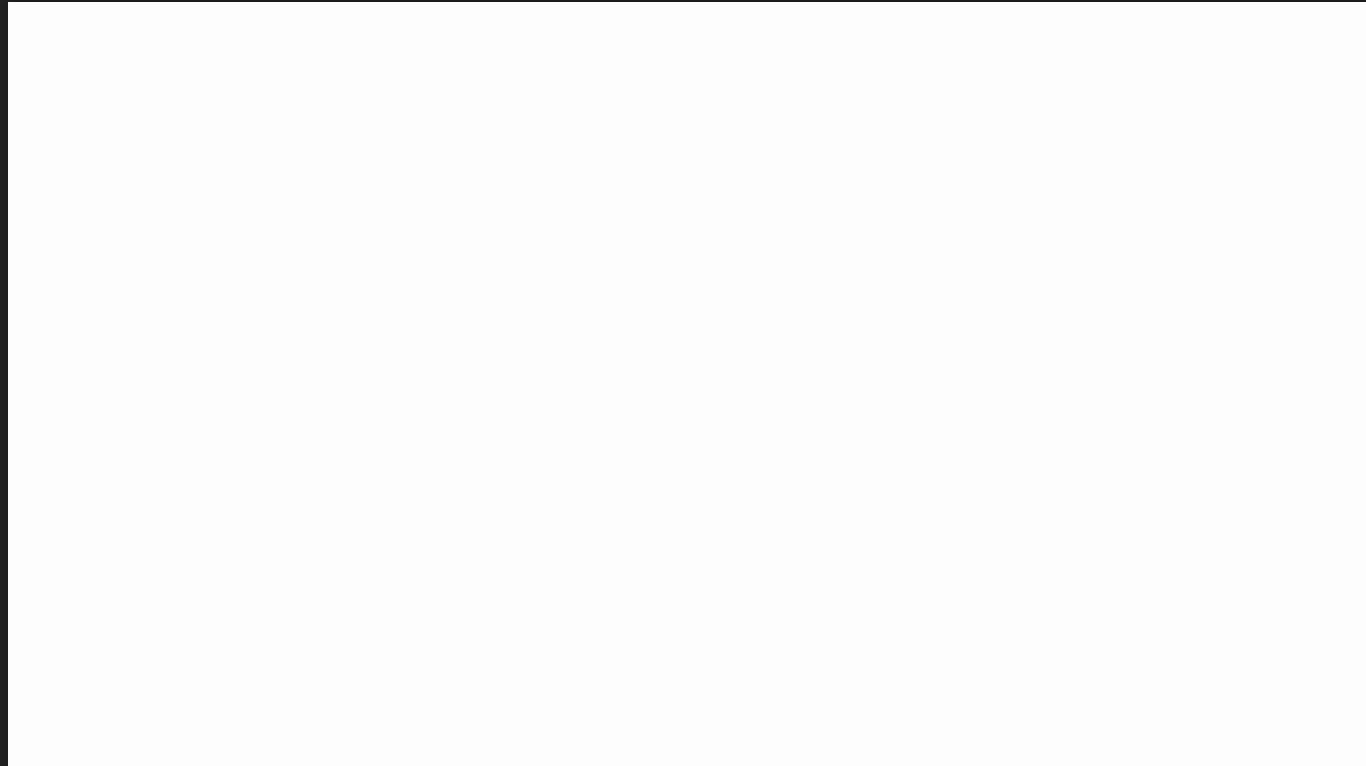
January 8th, 2016

Joseph Sweeney, Past Chair, Lancaster Farmland Trust.

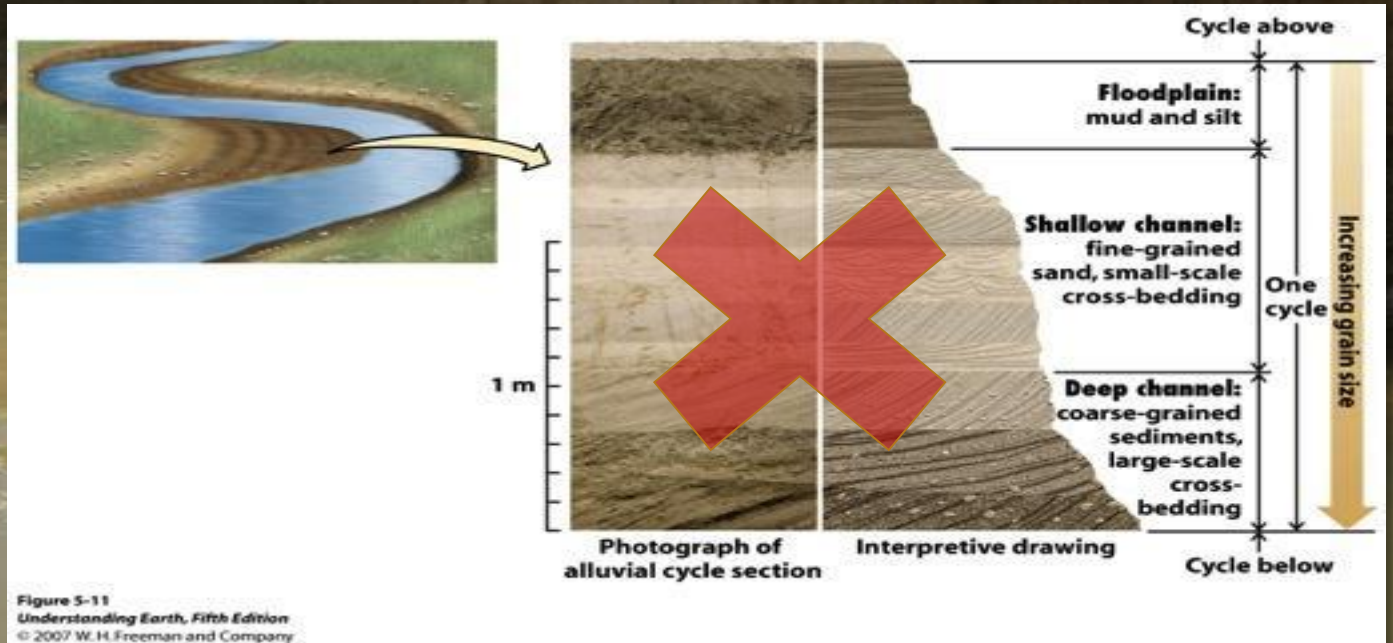
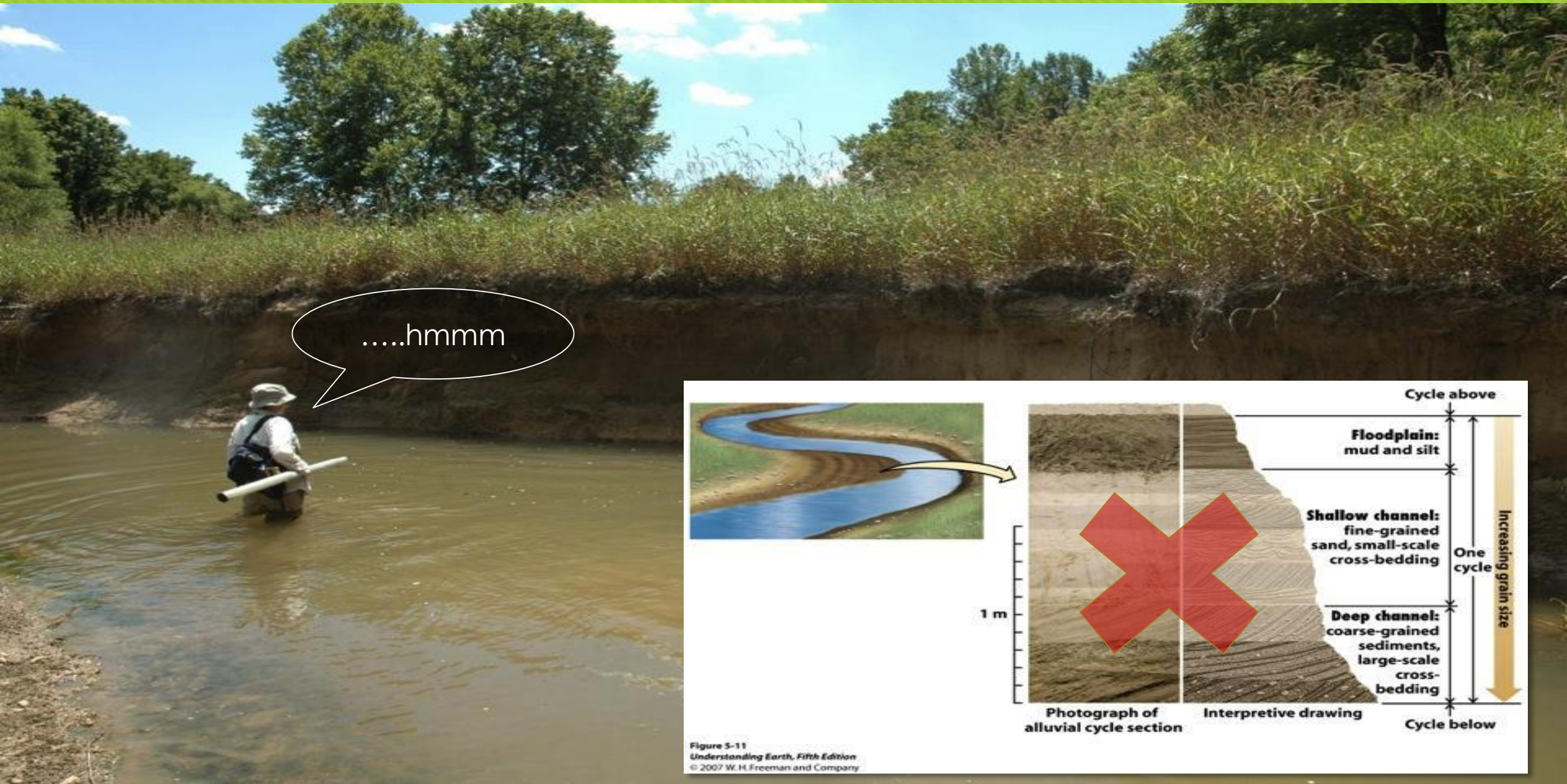
In Cooperation with:

Drs. Dorothy Merritts and Robert Walter, Franklin and Marshall College

History of streams in Mid-Atlantic U.S



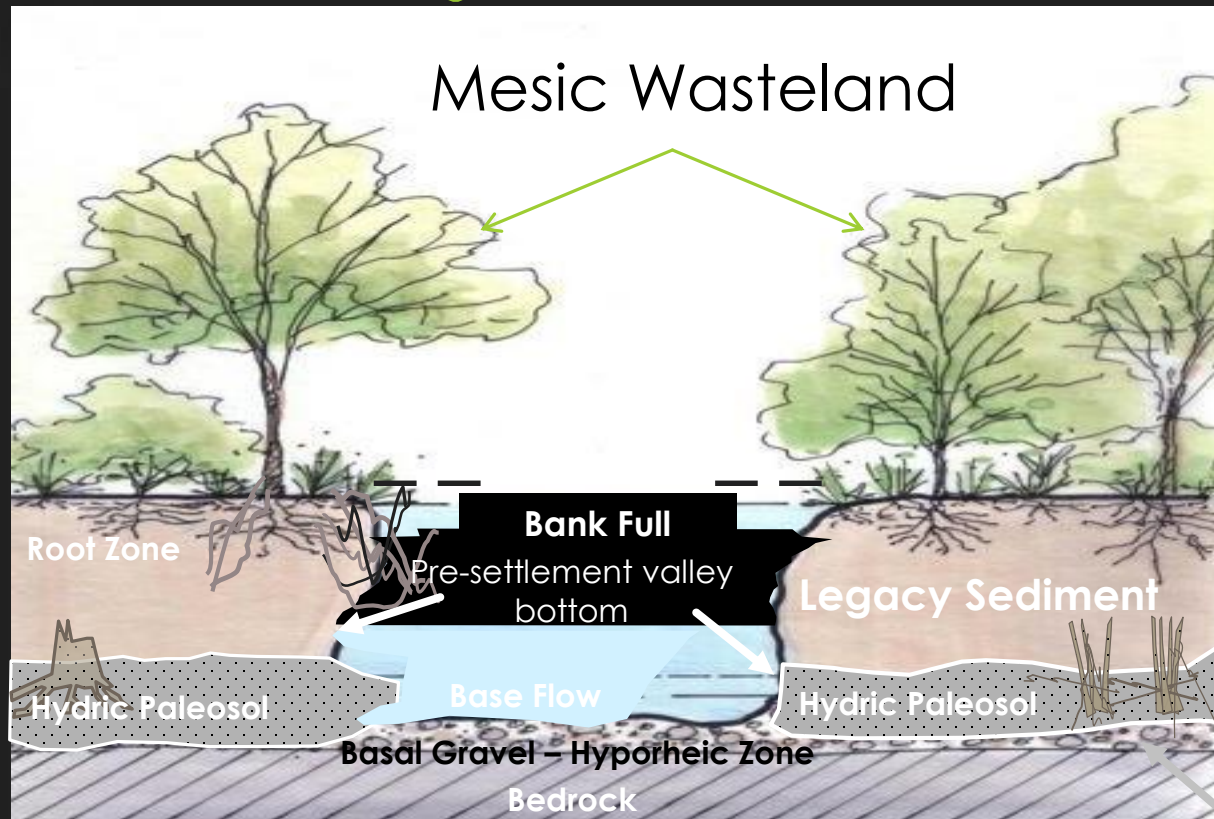
What is a “Natural Stream”? (Seneca Creek, MD)



Valley Flat $\neq$ Floodplain $\neq$ Riparian Zone

Typical Existing Conditions

Big Spring Run (Pre Restoration)



Basal Gravel & Hyporheic Zone

What did the Pre-Settlement Landscape Look Like?

Tussock-sedge wet meadows from valley wall to valley wall,
and no evidence of buried single-thread meandering stream channels.

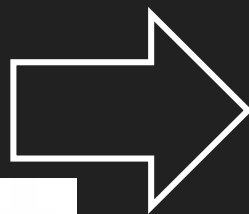
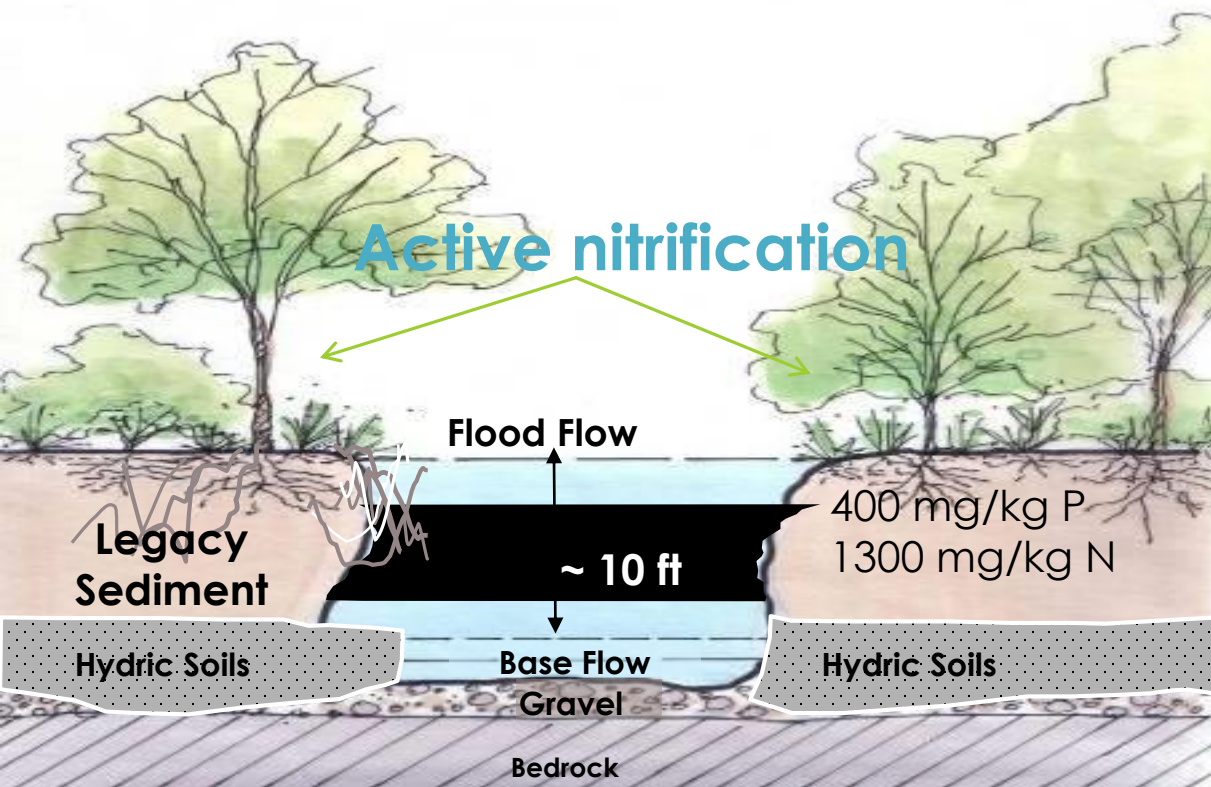


Restoration Target: Vestige of a Holocene pre-settlement landscape (Chester Co.): Never dammed, no legacy sediment, bog turtle habitat, 20 ka paleoclimate record (Martin 1958).

Legacy Sediment Removal Restore Functioning Wet Meadow Ecosystem

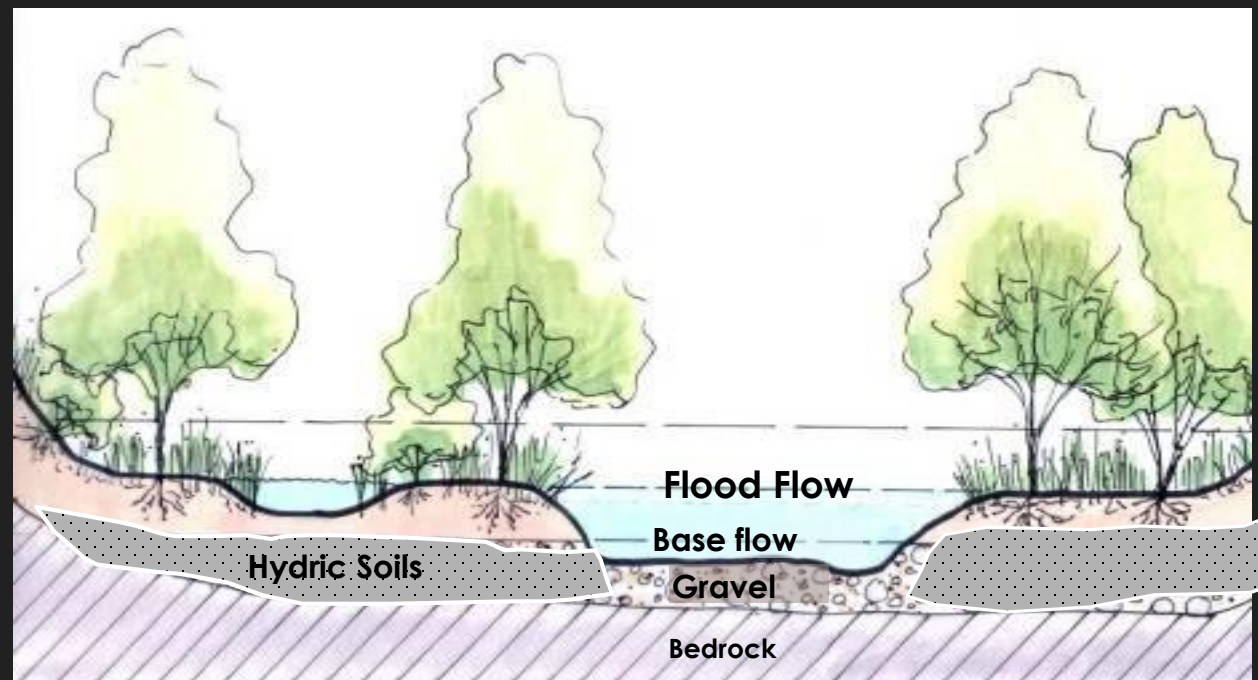
Existing Condition

Mesic Wasteland



Restoration Target

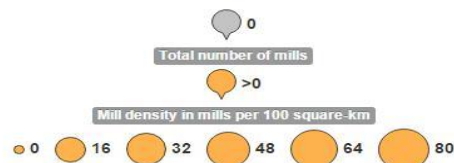
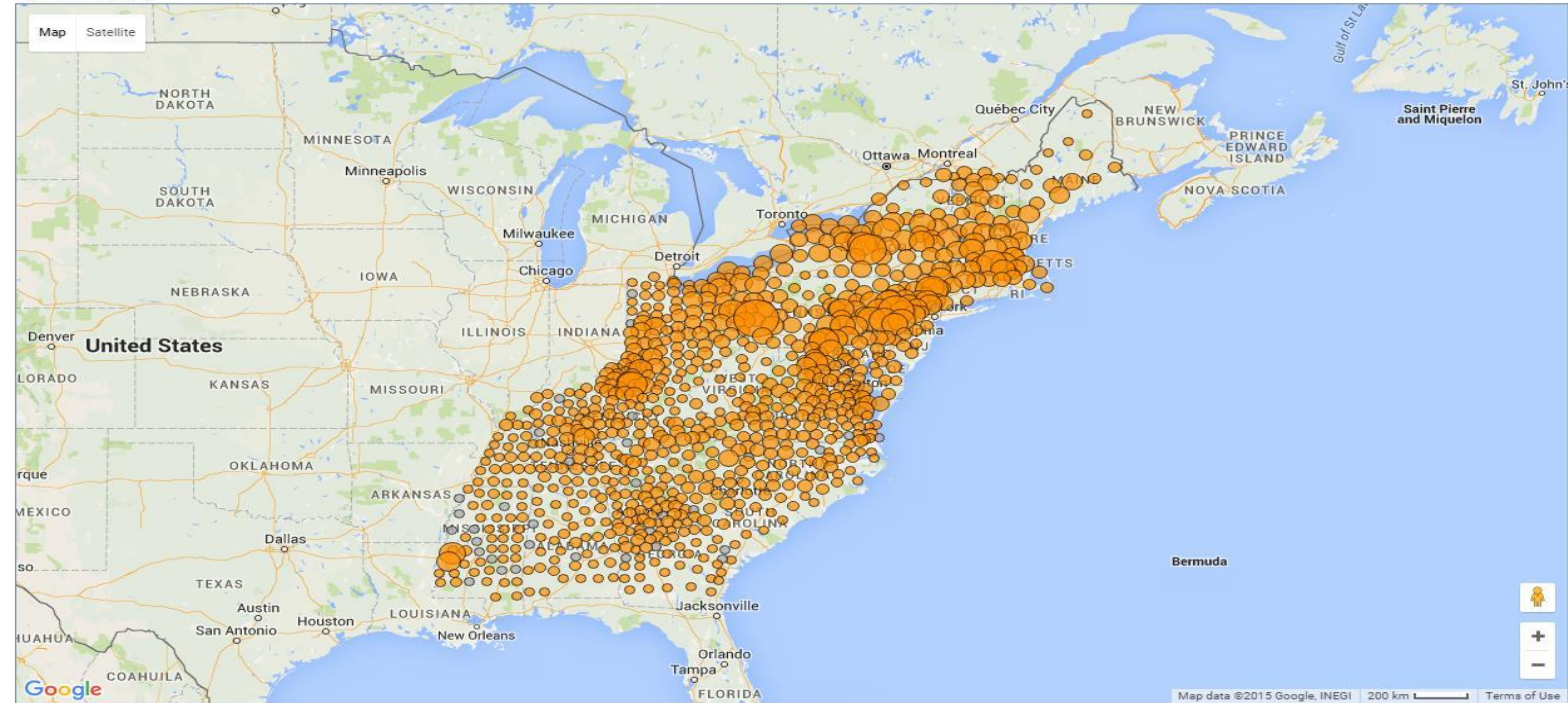
Tussock-Sedge Wet Meadow



Map of Mill Density by County

United States Census of 1840: Map of mill density by county

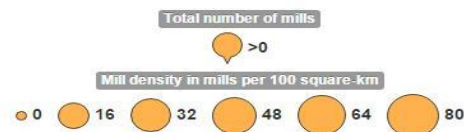
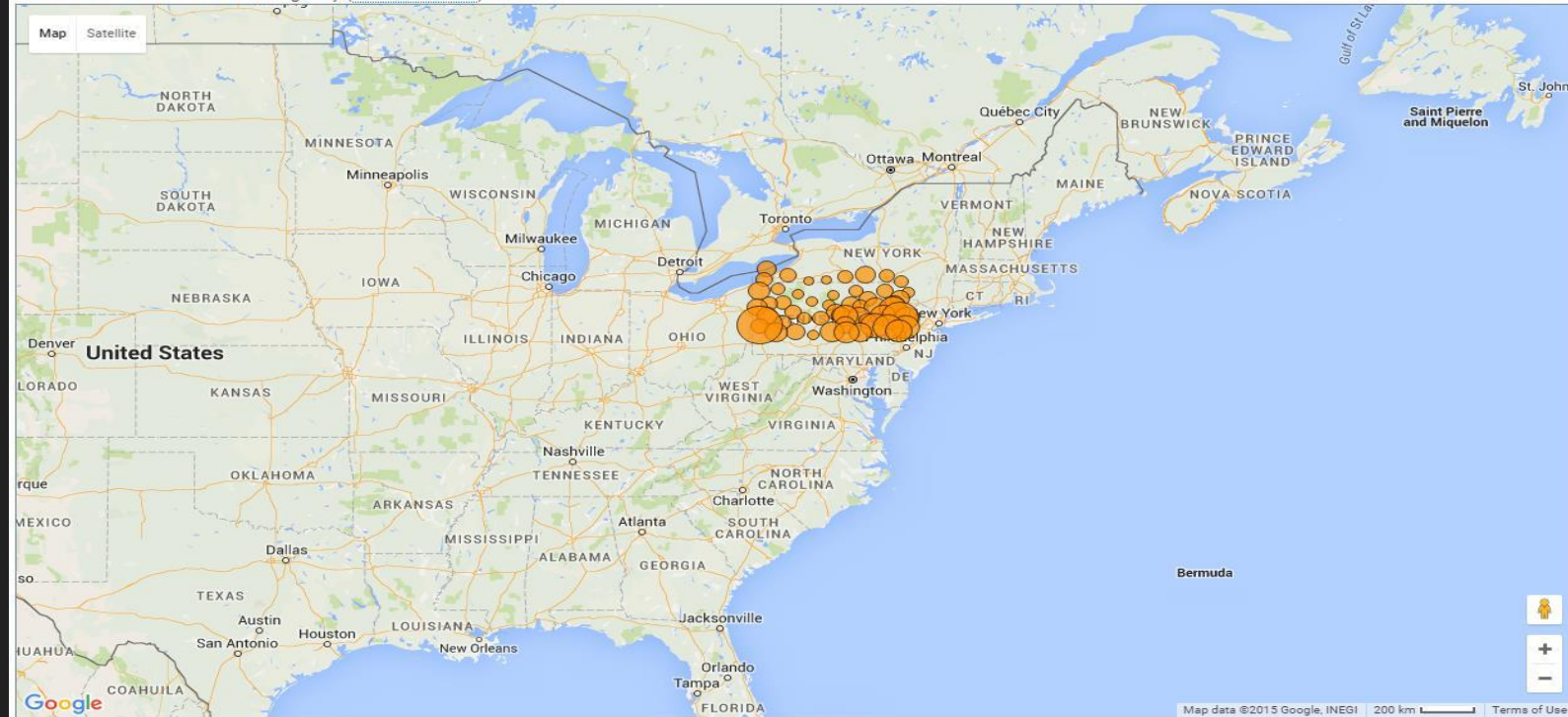
872 Counties



Pennsylvania Mill Density

United States Census of 1840: Map of mill density by county

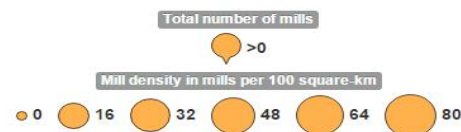
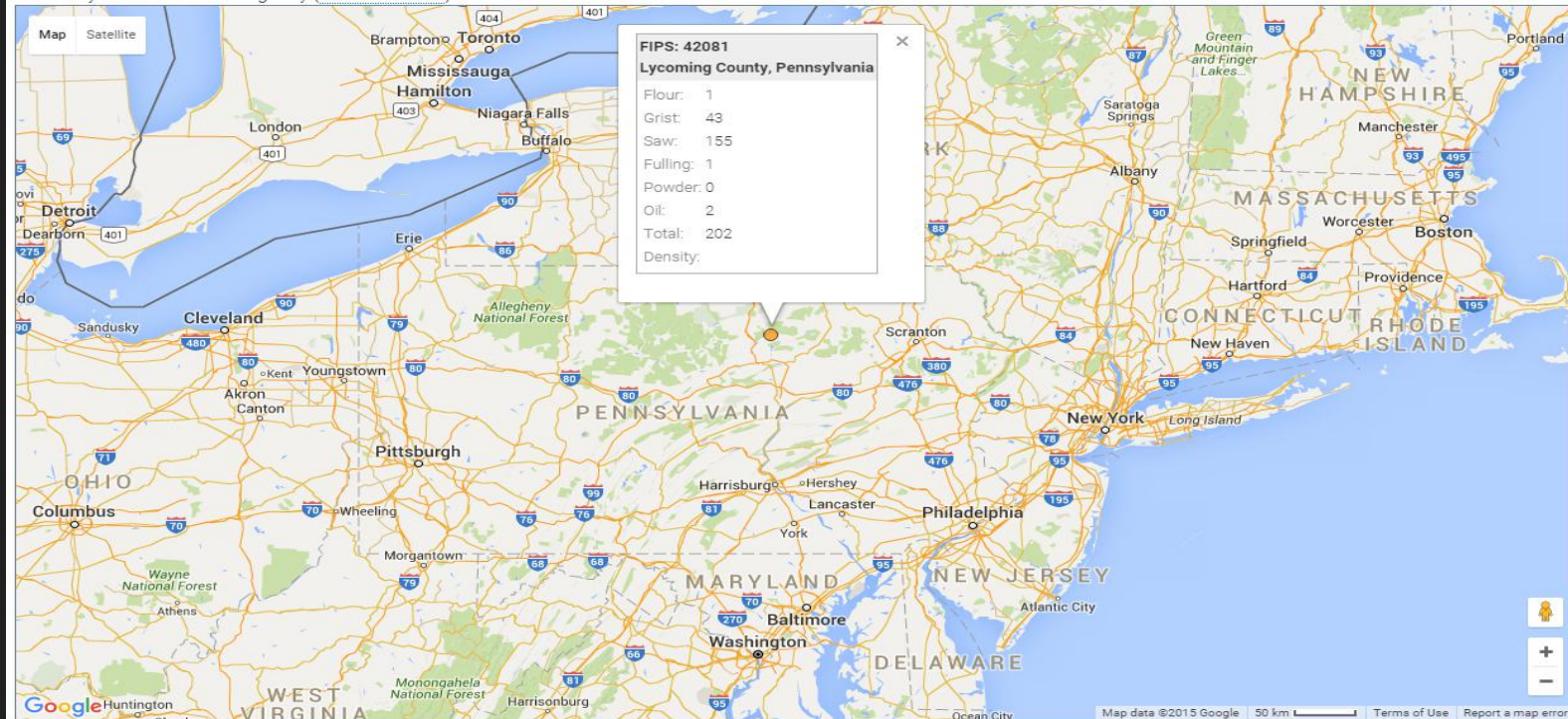
54 Counties filtered from 872 originally (Reset All Filters)



Lycoming County Mill Density

United States Census of 1840: Map of mill density by county

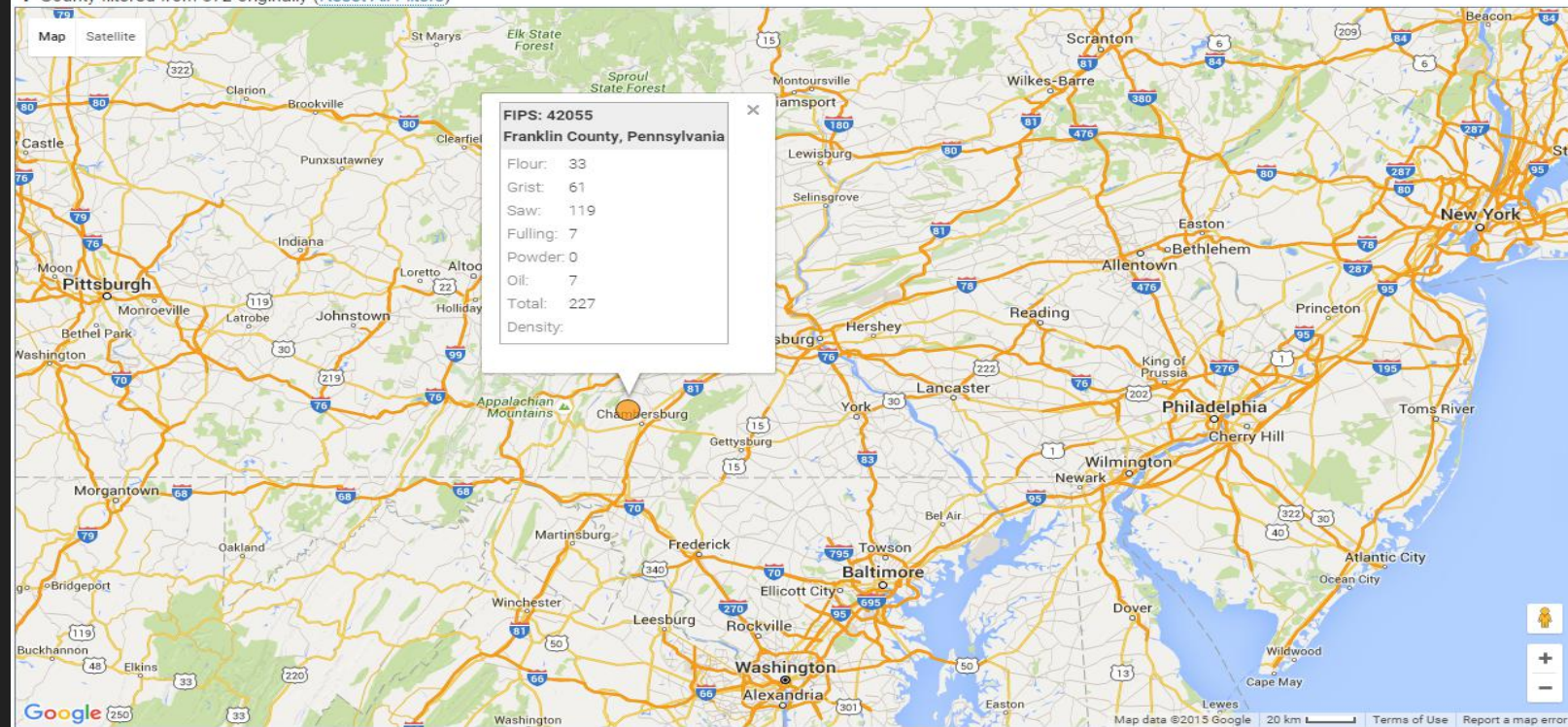
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Franklin County Mill Density

United States Census of 1840: Map of mill density by county

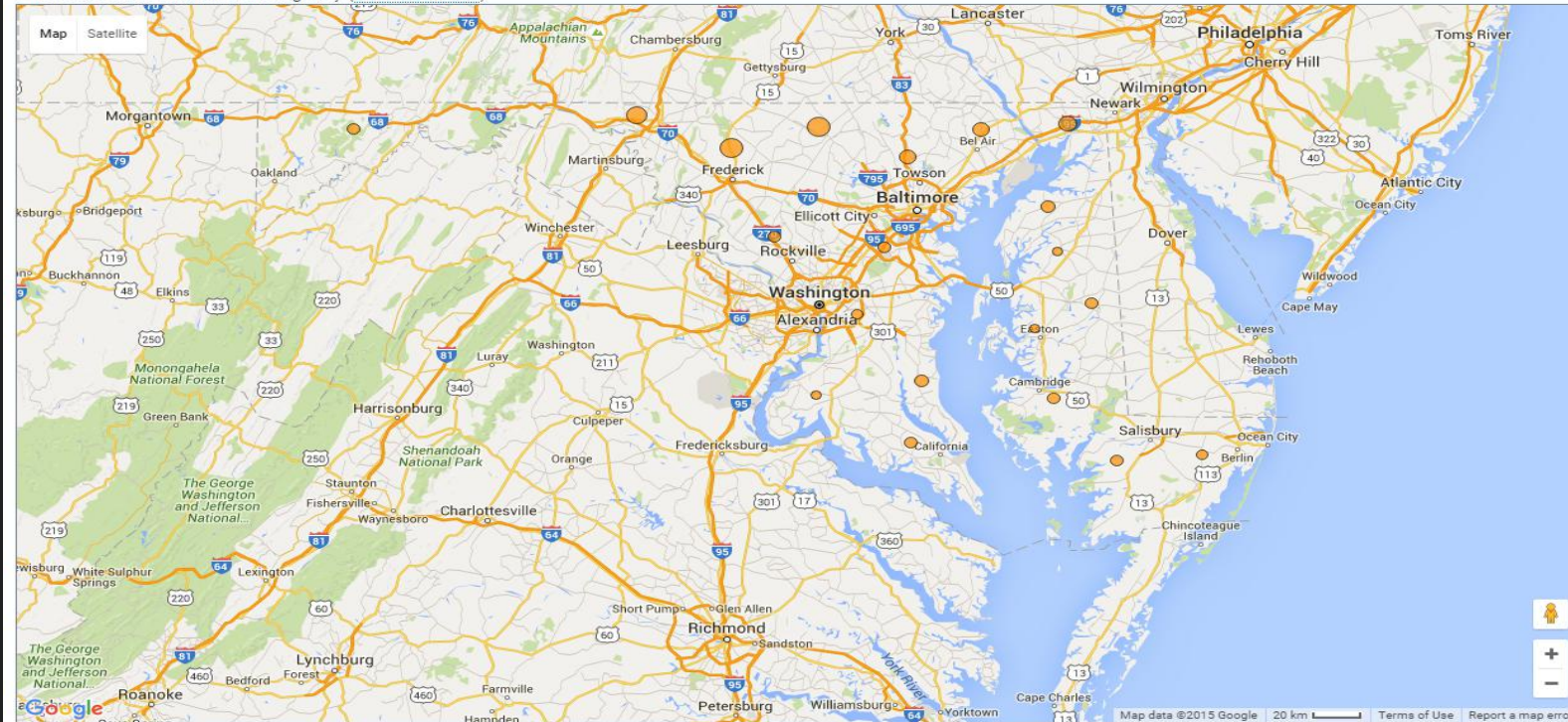
1 County filtered from 872 originally ([Reset All Filters](#))



Maryland Mill Density

United States Census of 1840: Map of mill density by county

20 Counties filtered from 872 originally ([Reset All Filters](#))



Total number of mills

>0

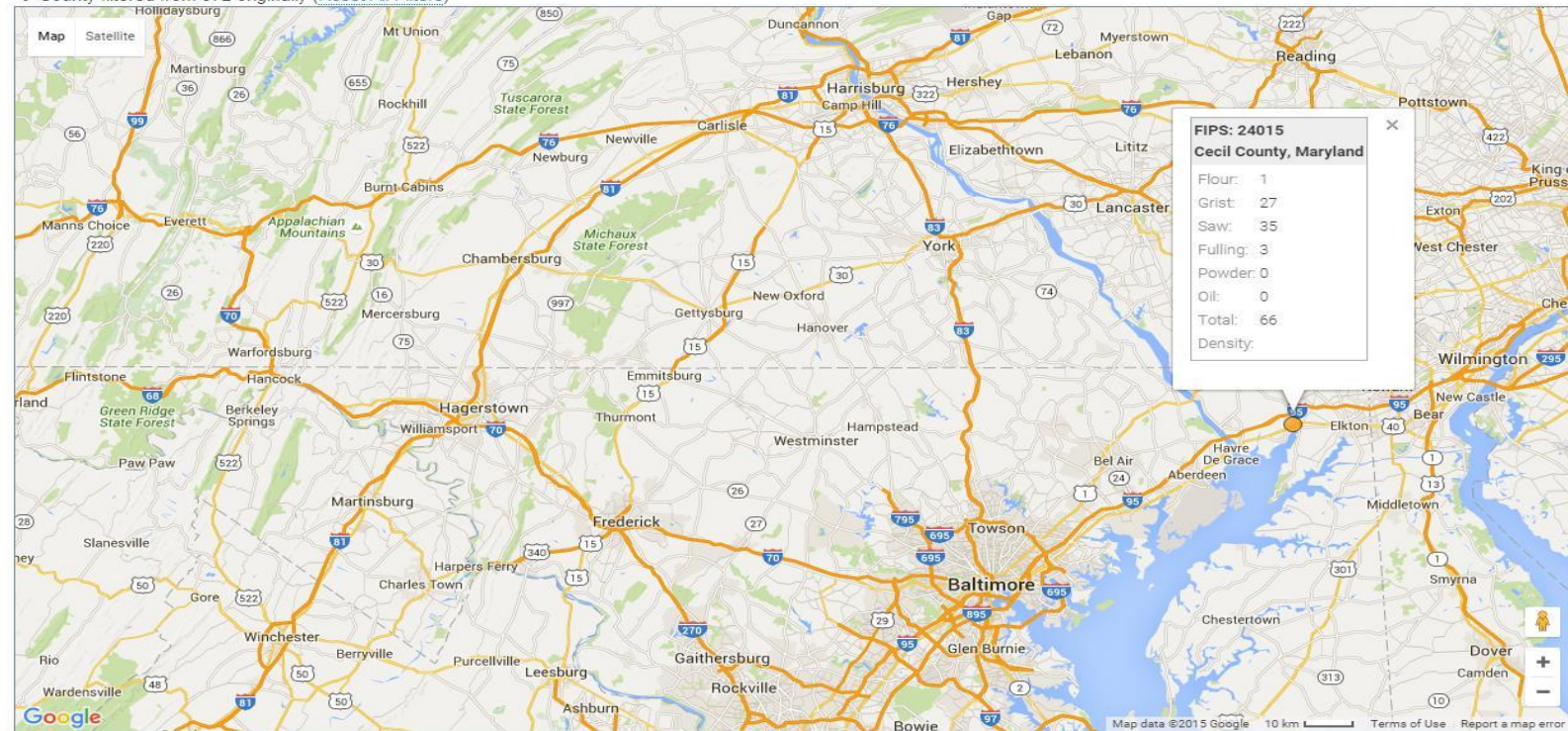
Mill density in mills per 100 square-km

0 16 32 48 64 80

Cecil County Mill Density

United States Census of 1840: Map of mill density by county

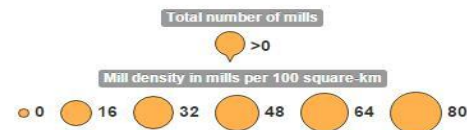
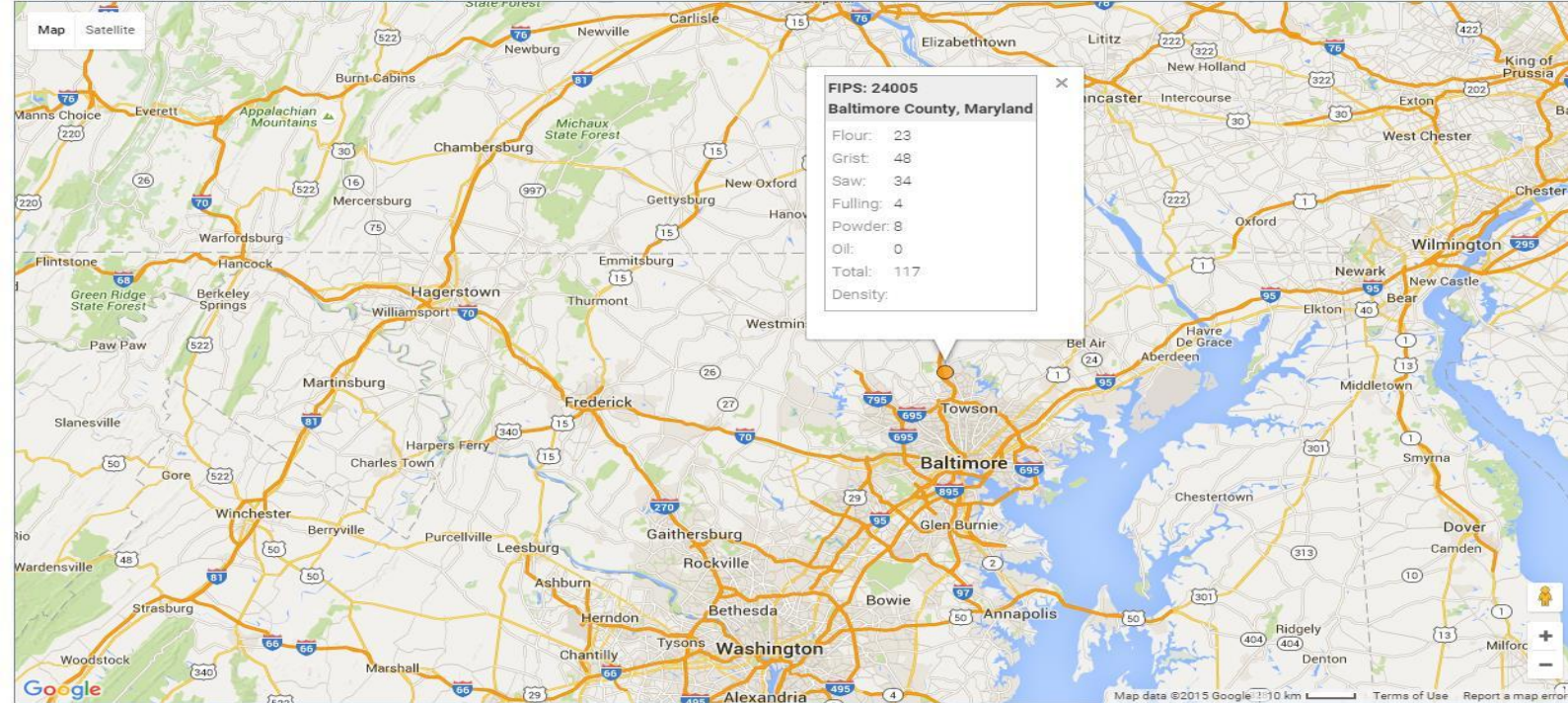
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Baltimore County Mill Density

United States Census of 1840: Map of mill density by county

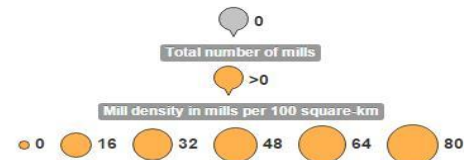
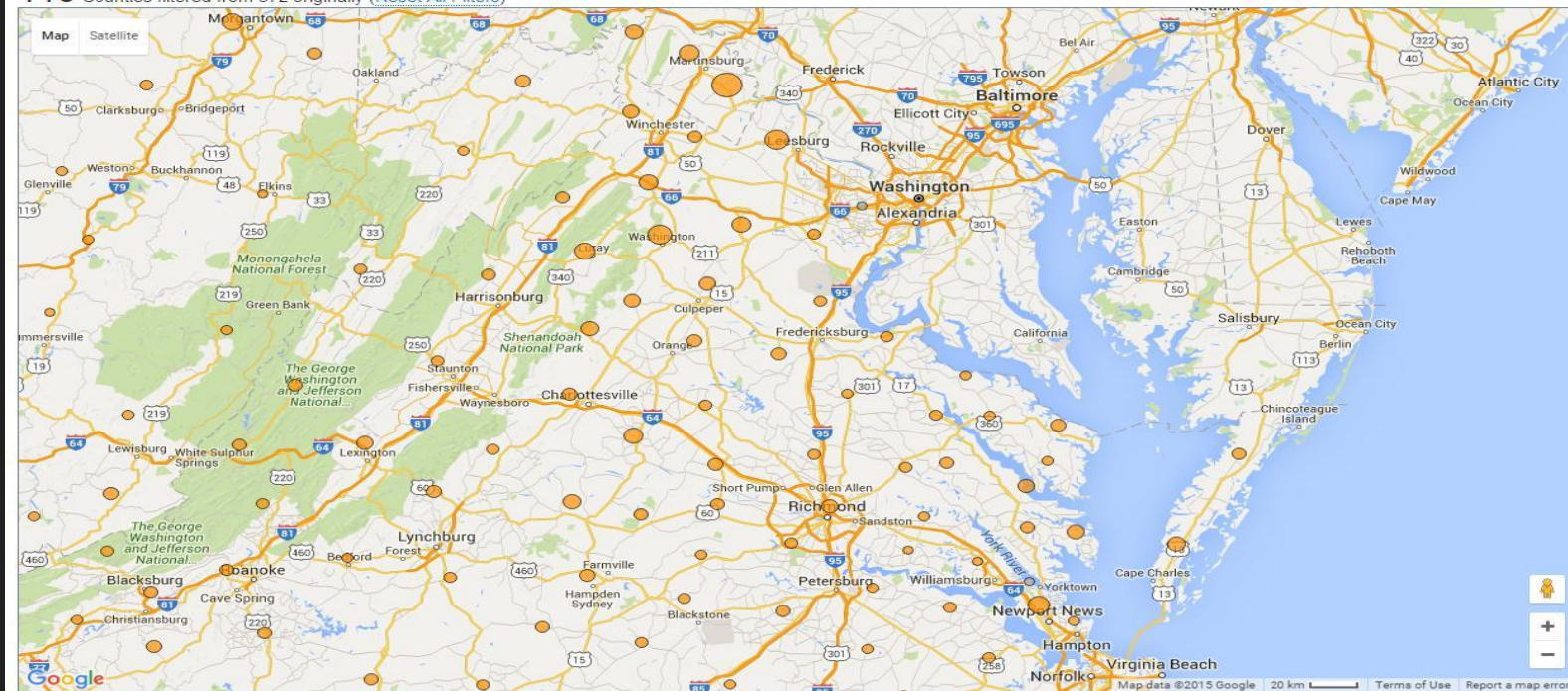
1 County filtered from 872 originally ([Reset All Filters](#))



Virginia Mill Density

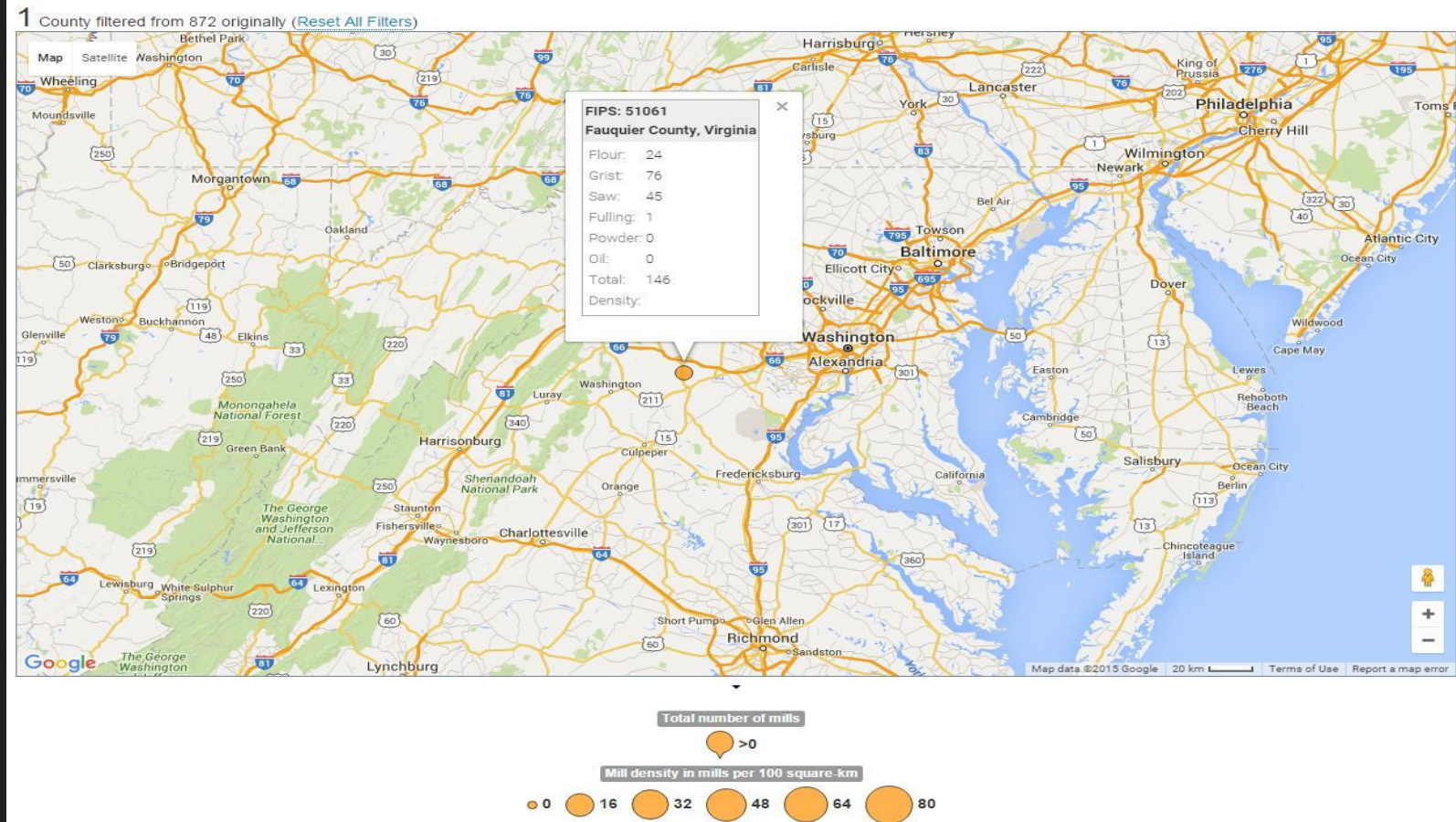
United States Census of 1840: Map of mill density by county

119 Counties filtered from 872 originally ([Reset All Filters](#))

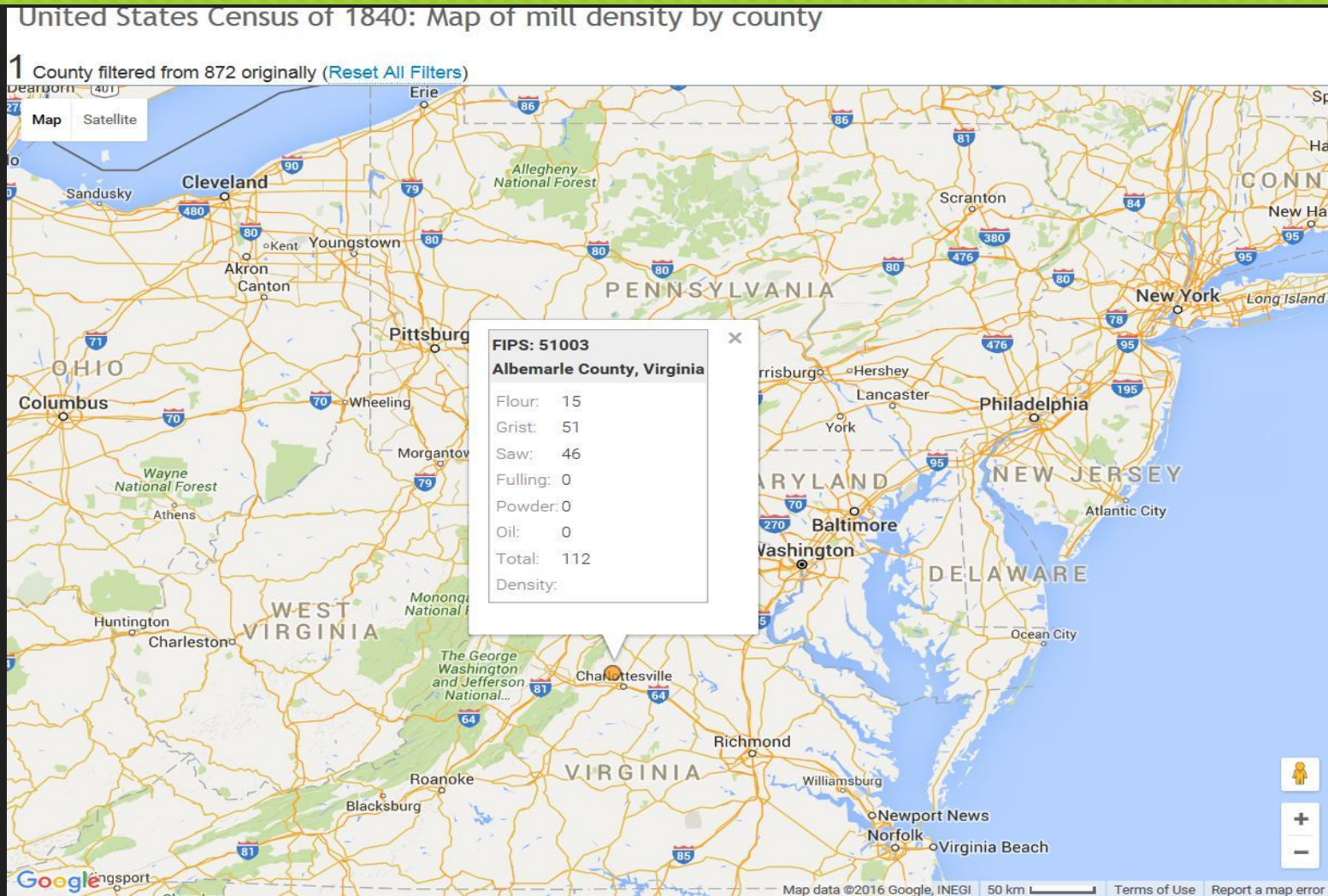


Fauquier County Mill Density

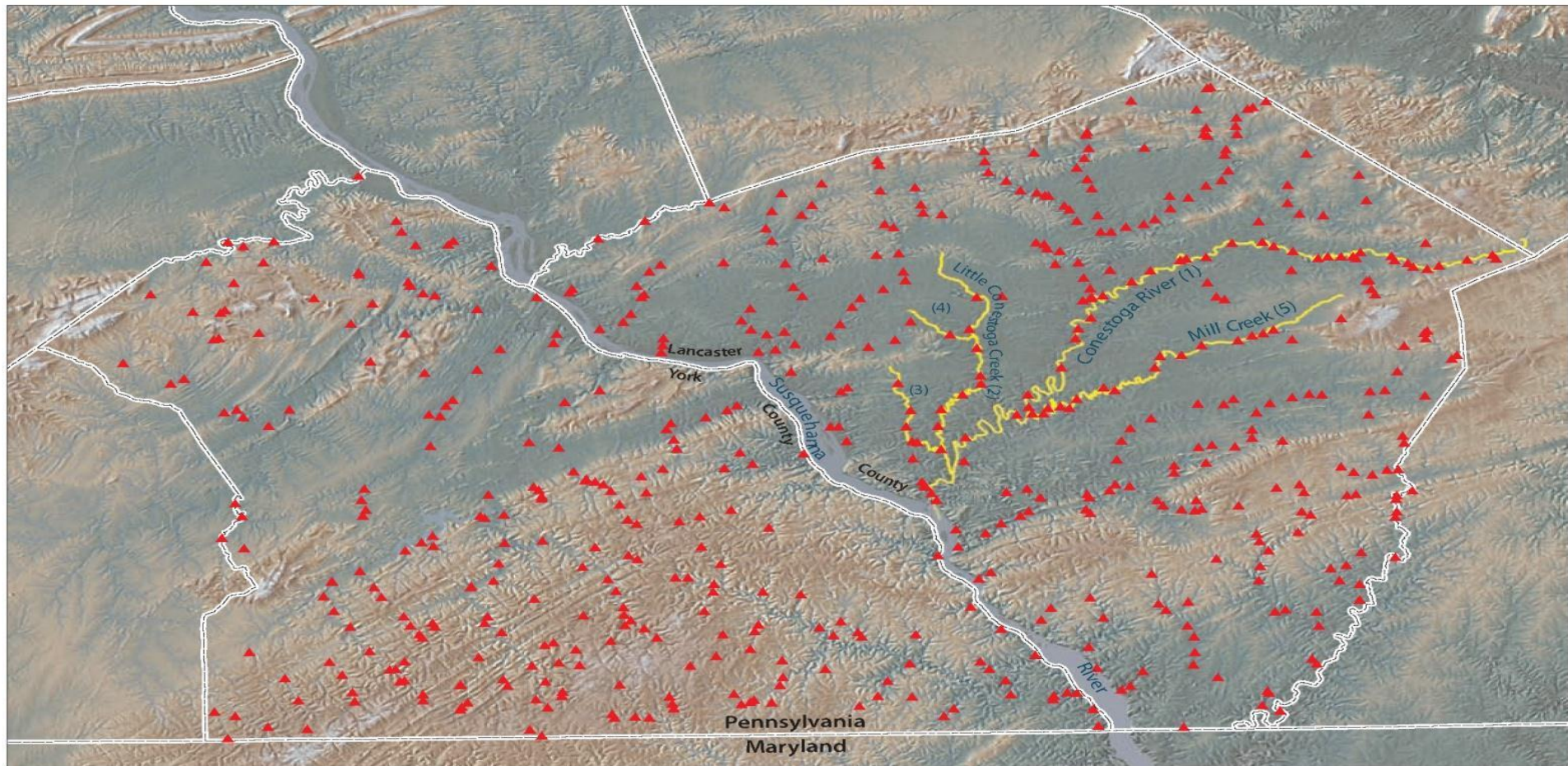
United States Census of 1840: Map of mill density by county



Albemarle County Mill Density



Map of Mills 1840 Census



The Big Spring Run Restoration Experiment 1993-2015

Long-Term Monitoring of Nutrient & Sediment Sources



**Robert Walter (F&M),
Dorothy Merritts (F&M),
Paul Mayer (US EPA),
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Michael Langland (USGS),
Daniel Galeone (USGS),
Michael Rahnis* (F&M),
Allen Gellis (USGS),
Kayla Schulte* (F&M, now US
EPA), Aaron Blair (F&M),
Julie Weitzman* (Penn State),
Douglas Smith* (Univ. Michigan),
Erin Peck* (Oregon State),
Tony Deng* (F&M)**

Big Spring Run Before Wetland Restoration



8 April 2005

Big Spring Run Stream Bank Sampling



**One day after Tropical
Storm Hanna (9/7/08)**

Big Spring Run After Wetland Restoration



**Restoration
completed
November
2011**

Big Spring Run Floodplain Wetland Restoration



Big Spring Run Floodplain Wetland Restoration



Before – April 2004



After - June 2013

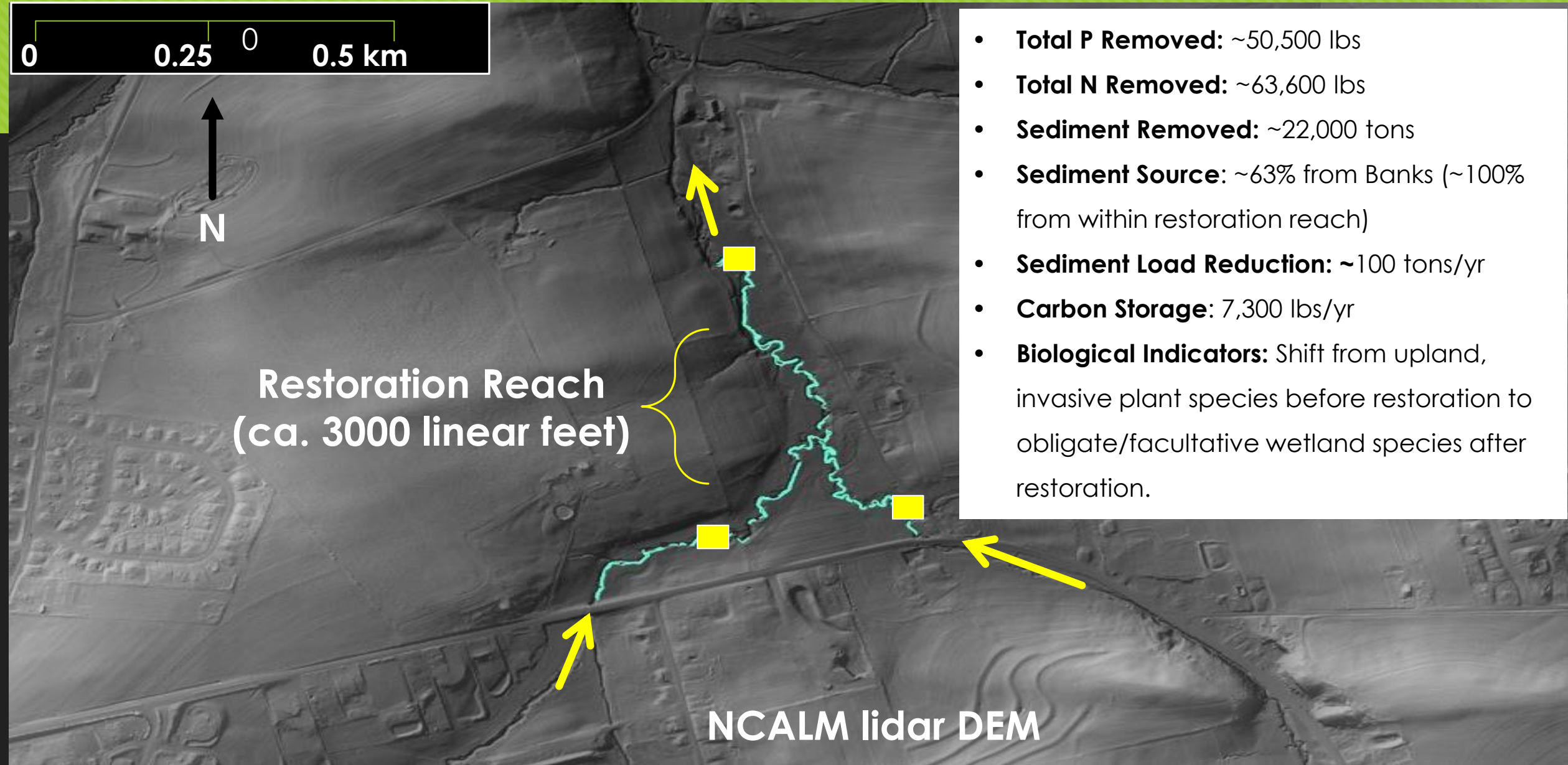
Big Spring Run June 2014



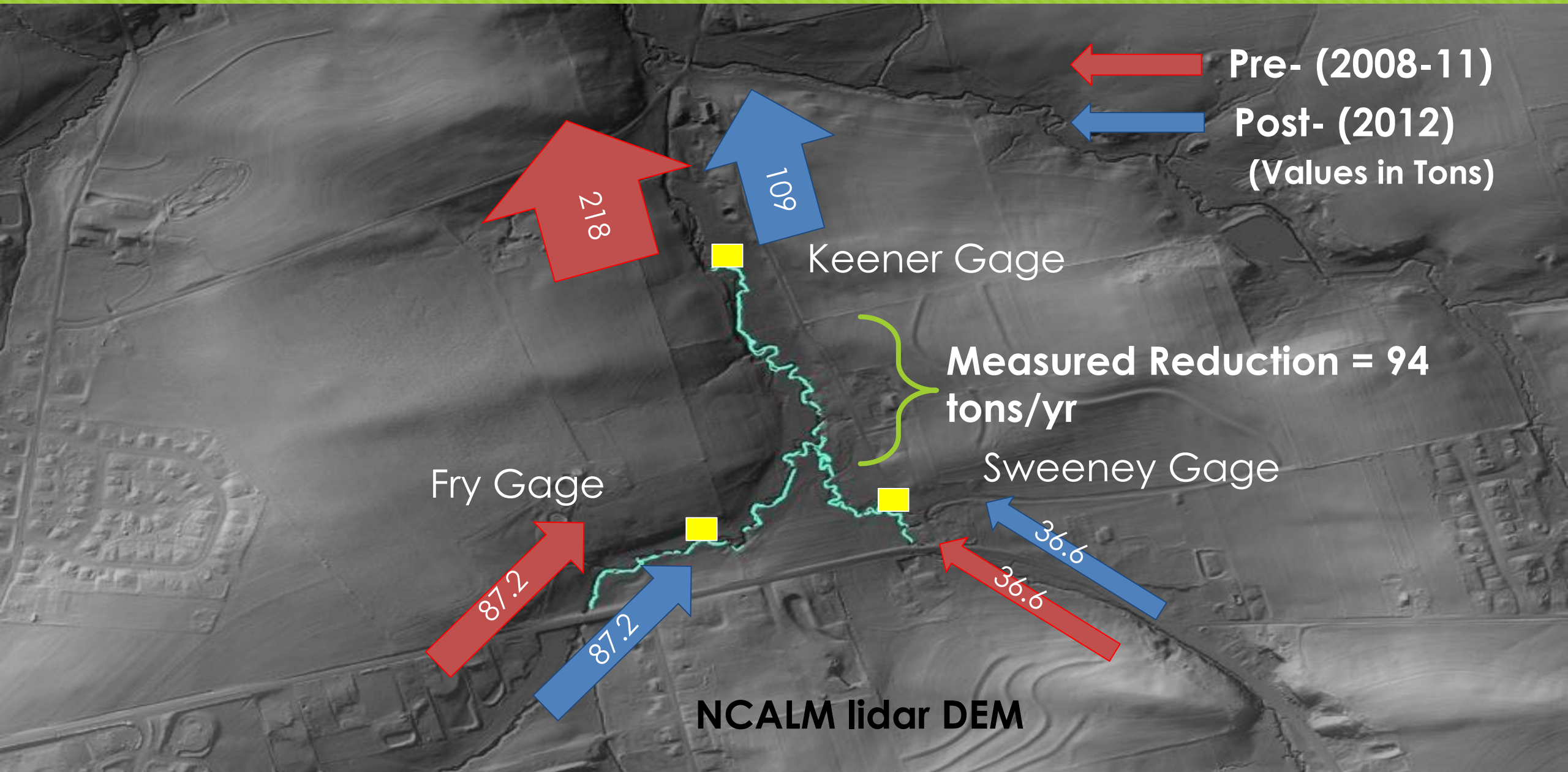
Big Spring Run June 2015



Big Spring Run Floodplain/Wetland Restoration Outcomes



BSR Pre- vs Post-Restoration Suspended Sediment Loads



PennVest

- Hard BMPs

- On-Farm Technologies

- Gray Infrastructure

- Waste H2O

- Digesters

- Manure Storage

\$3.54 Billion

Other Programs

○ Soft BMPs

○ Stream Bank Fencing

○ Rain Barrels

○ Rain Gardens

○ Green Roof

○ Riparian Buffers

○ Detention Ponds

○ Porous Paving

○ CREP

○ No Till

○ Cover Crops

\$460 Million

Source

- Ongoing Programs
 - CREP
 - Regional Ag Watershed Assessment
- Dues/Payments
 - Act 13 Conservation Districts
 - Transfer to Conservation Districts
 - Chesapeake Bay Commission Dues
- Grants & Loans
 - Chesapeake Bay Watershed Implementation Grants
 - Source Water Protection
 - Office of Surface Mining
 - Innovative Technology
 - Growing Greener
 - GG-Watershed Protection Specialists
 - GG-Energy Harvest
 - GGII Watershed Protection
 - Flood Protection
 - EPA 319
 - CBSWA
 - Set-Aside
 - SMCRA
 - Environmental Education

\$4 Billion over 30 Years

What's Not Counted?

- Voluntary Practices

- \$\$\$\$\$?

Common Factor

- Above Stream
- Edge of Field
- Policy – Prevent Entry



LEGACY SEDIMENT...

IT'S ALREADY IN THE STREAM!





APR 11 2005

Legacy Sediment Mitigation

- Verified by continuous monitoring
- Stream/Wetland Restoration
- Combines best of both Hard and Soft BMPs
- Permanence of Hard BMPs
- Includes many Soft practices



Big Spring Run Numbers

- TSS
 - 44,000,000 lbs.
- P
 - 53,000 lbs.
- N
 - 66,000 lbs.
- Wetlands
 - 4.2 acres
- Stream Length
 - 3,000 LF
- Riparian Buffer
 - 3.3 Acres



Lancaster County Numbers

- Total Sites
 - 383
- TSS
 - 16,852,000,000 lbs.
- P
 - 20,299,000 lbs.
- N
 - 25,278,000 lbs.



Lancaster, York, Adams, and Lycoming Numbers

- Total Sites
 - 1,009
- TSS
 - 44,396,000,000 lbs.
- P
 - 53,477,000 lbs.
- N
 - 66,594,000 lbs.



Context - Conowingo Dam

- Annual Load
 - TSS
 - 6,000,000,000 lbs.
 - P
 - 3,500,000 lbs.



Sediment discharged during Tropical Storm Lee

Investing in Stream Restoration

Assume $\$50\text{M} \div \$80\text{K}/\text{ac} = 625 \text{ w.ac} \div 4.2 \text{ BSR w.ac} = 149 \text{ projects over 10 yrs}$

- P
 - 7,900,000 lbs.
- N
 - 9,830,000 lbs.
- TSS
 - 6,556,000,000 lbs.
- Wetlands
 - 625 Acres
- 85 miles of stream bank
- Other BMPs
 - Storm water
 - Habitat
 - 500 Acres Riparian Buffer
 - Fencing
 - NO3/Cycle

Context

- Lancaster City \$80 to \$150 million

Context: Oyster Restoration

○ Harris Creek – 312 acres	\$26-\$31 Million	\$83,000/Acre
○ Little Choptank – 440 acres	\$29 Million	\$66,000/Acre
○ Tred Avon – 24 acres	\$2 Million	\$83,000/Acre
○ Tred Avon – 185 acres		
○ Lynn Haven – 90-200 acres		
○ Great Wicomico > 100 acres		
○ Piankatank 100s?		

Restoration Benefits

- Immediate, not 30 years
- Water Shed groups participate
- Riparian buffer
- Stream fencing and crossing
- Creates wetlands
- Reconnects ground water hydrology with uplands
- Conservation Districts participate
- Low maintenance – appreciating asset
- Reduces storm water energy
- Promotes habitat
- Denitrification/Carbon sequestration
- Retains upstream sediments and nutrients
- Improves water quality
- Economical

Policy Considerations

- Refocus on in stream
- Modify sector allocation- Urban/Rural
- Revamp trading program
- Allow storm water trading
- Review credit ratio
- Approved BMP for Cost Share
- Procurement set aside – Procurement credit program
- USDA loan guarantees for LS projects
- Wetland banking- Scale is key
- Prioritize sites – Map and measure
- Streamline permitting

Aerial Context





Home
Restoration
Research
Media Gallery
Partners

The **BSR** Project
Aquatic Ecosystems Restoration Research
Big Spring Run, Lancaster PA

www.BSR-project.org

Website launched February 2015 (designed by **Kayla B. Schulte**)