Regional Stormwater Management

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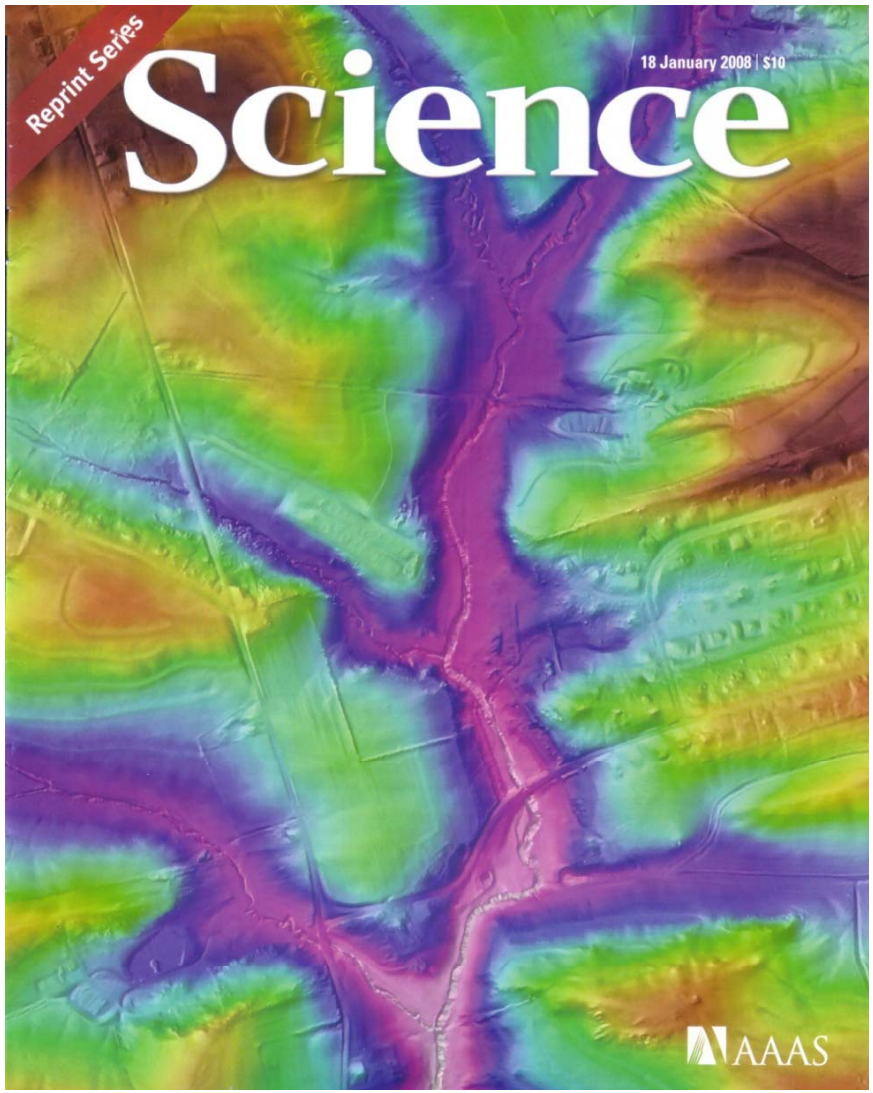
Lancaster County Clean Water Consortium

Joint Public Hearing on Issues Related to Flood Mitigation Through Stormwater Management
November 15, 2011

Introduction:

Impact of Legacy Sediment



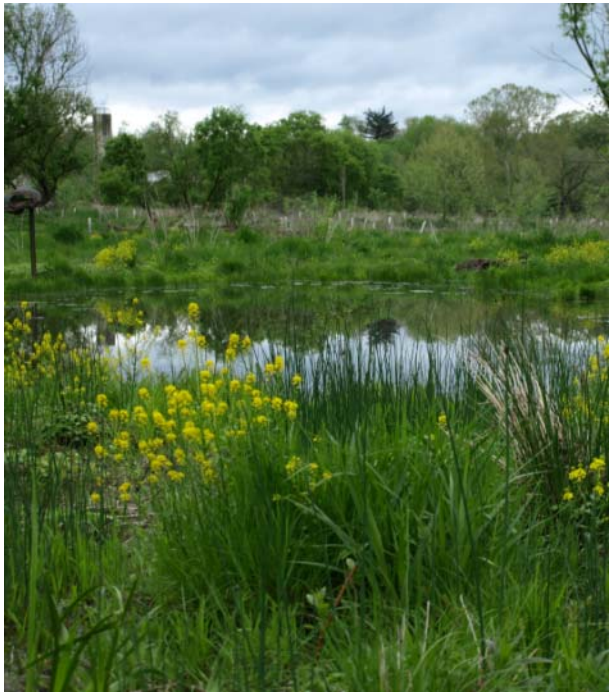
Introduction:

Benefit Stacking

Single Function

Multiple Function

Conventional Stormwater Basin

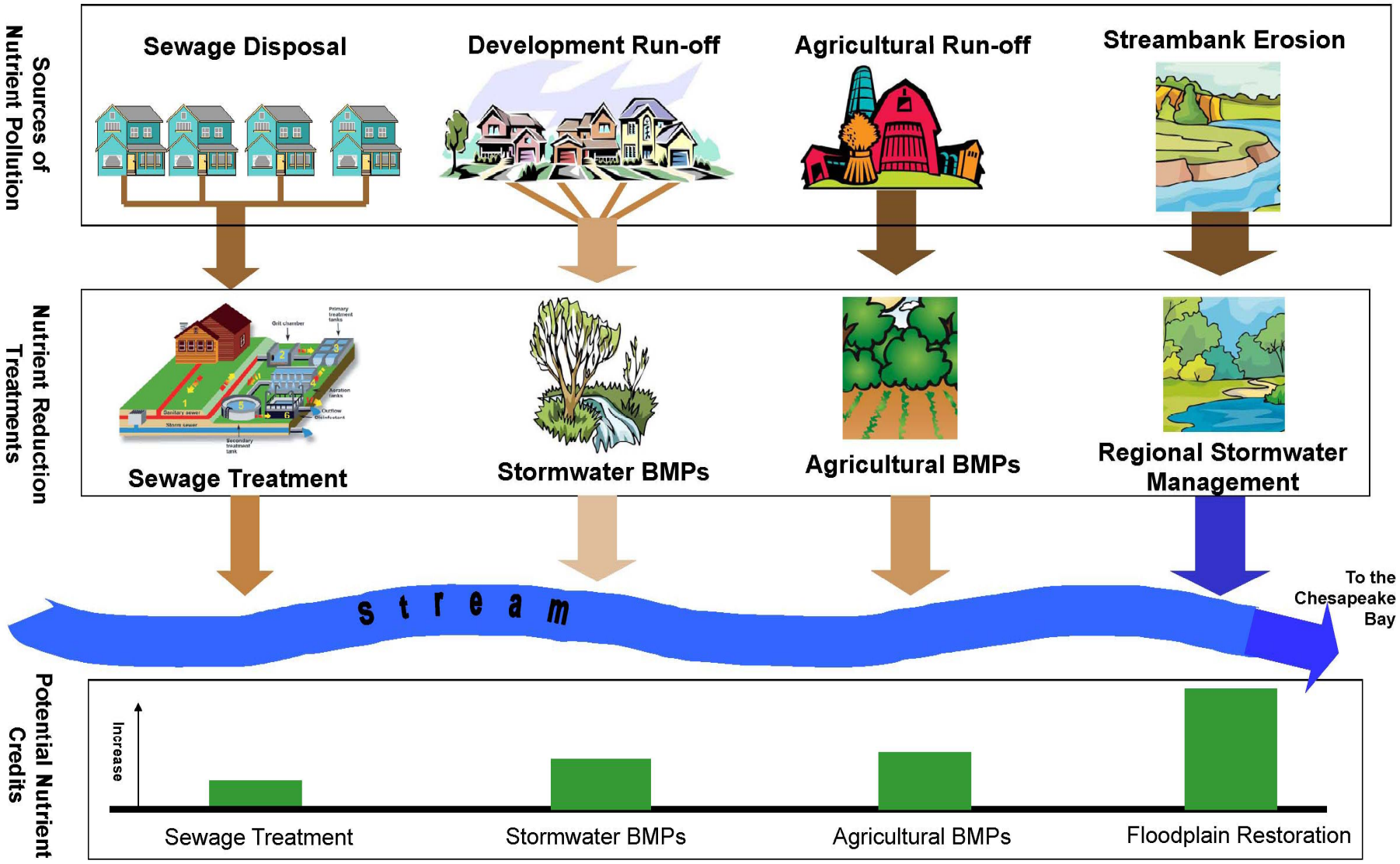


Restored Floodplain

Introduction:

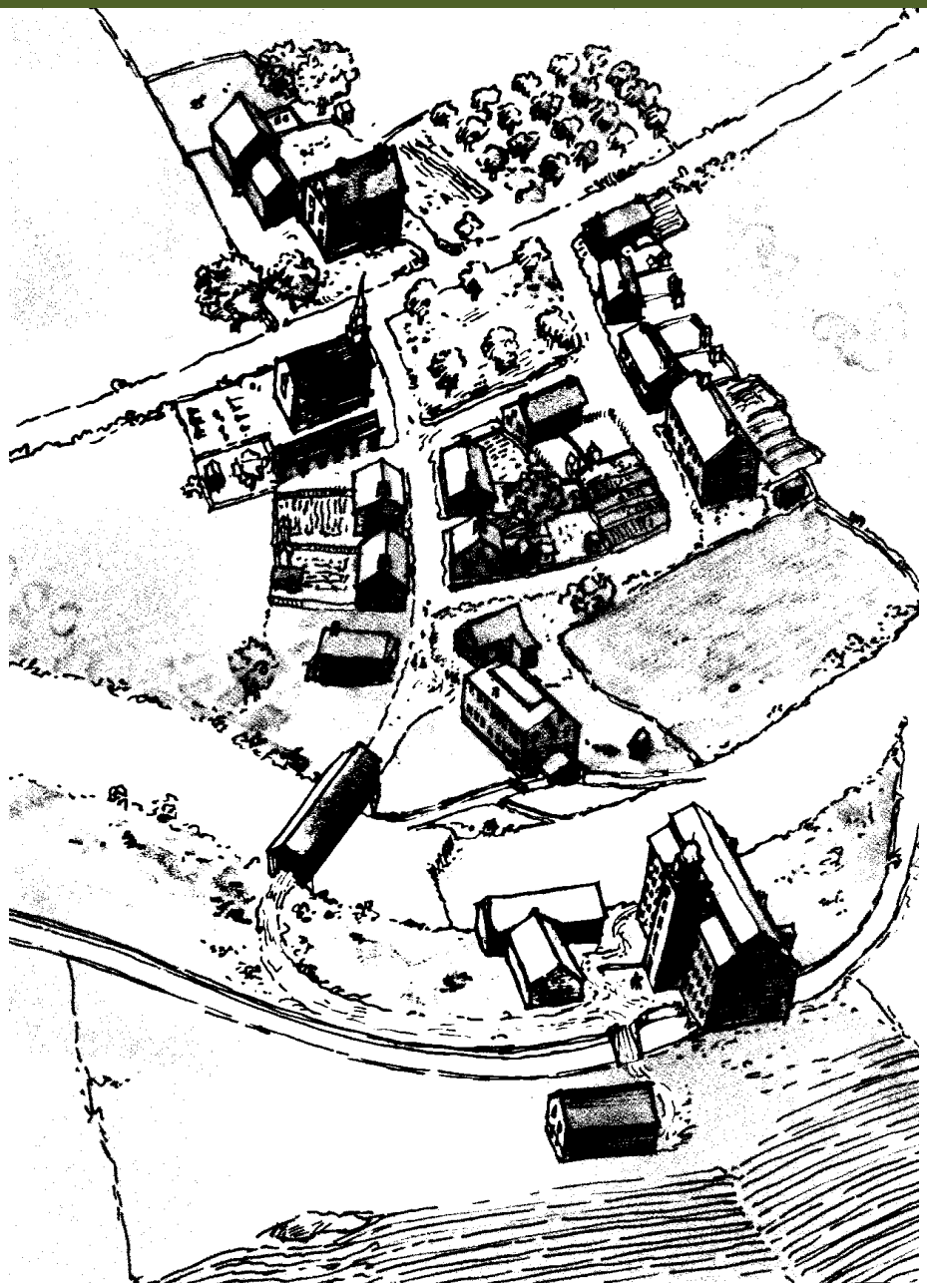
Regulatory Compliance

Nutrient Credits – Sources and Treatment Comparison

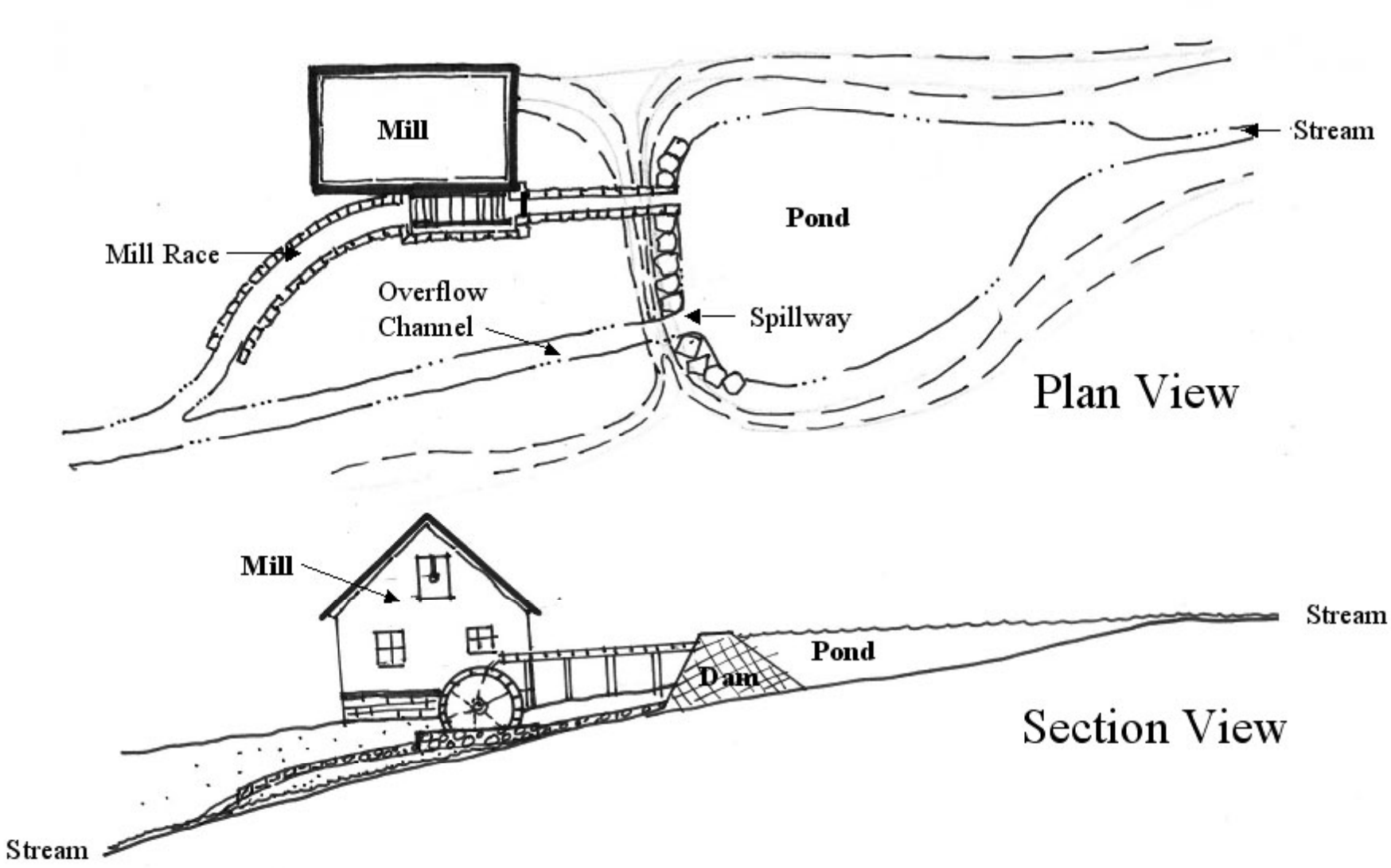


Why many of our Floodplains do not function……

Historical Impacts

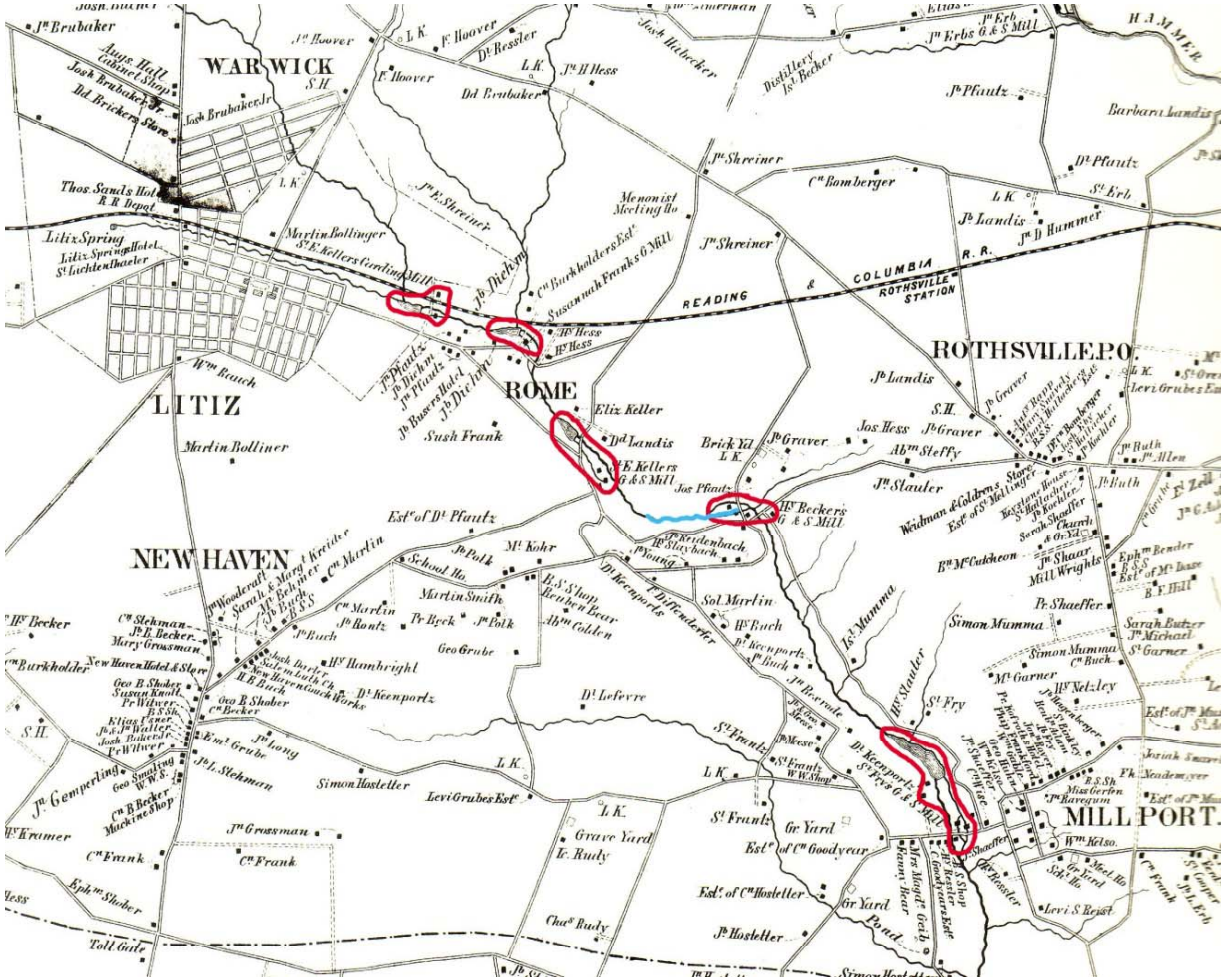


Sediment trapped behind mill dams



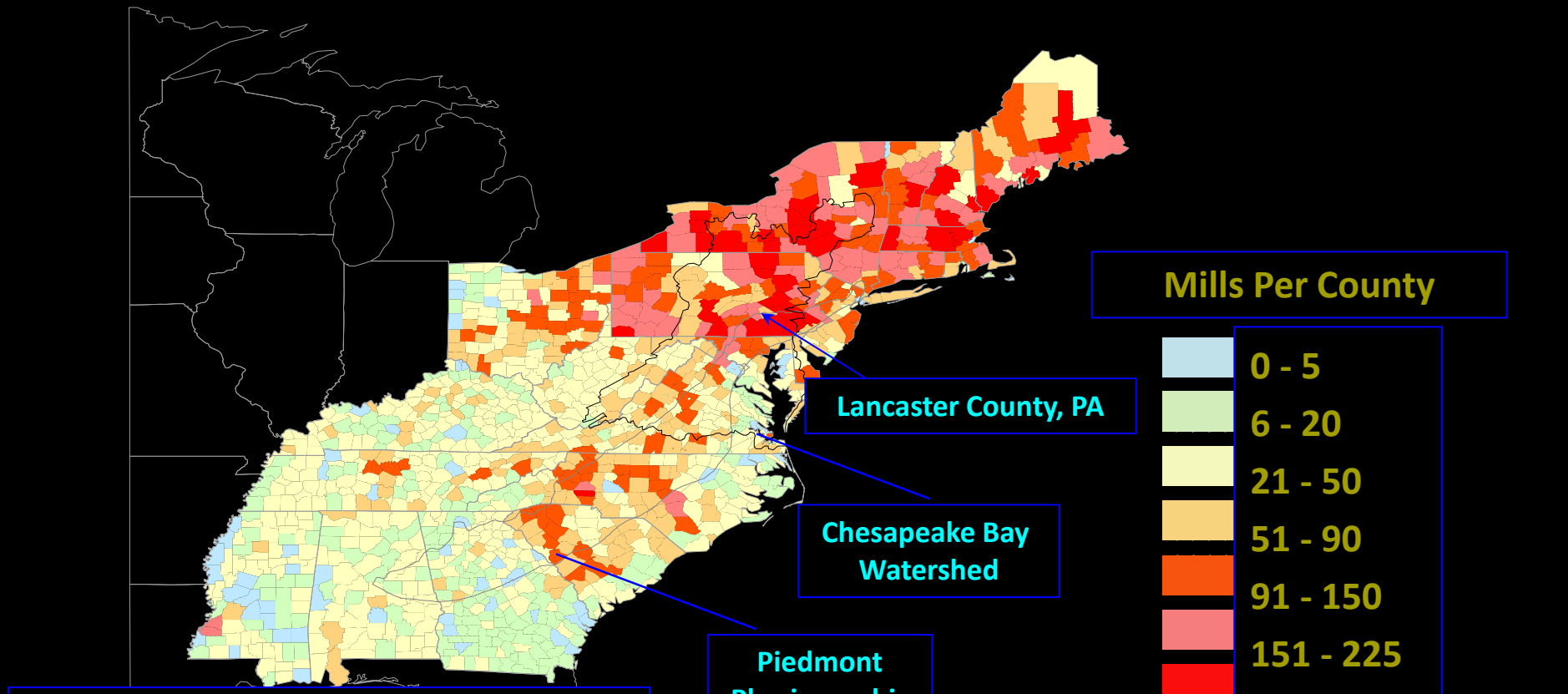
Impact of Mill Dams and Deforestation

Bridgen's 1864 Atlas | Lancaster County, Warwick Township



~ 60,000 mills in 1840

Mill Dams per US Census in Eastern US



Average dam ht 2.4 m

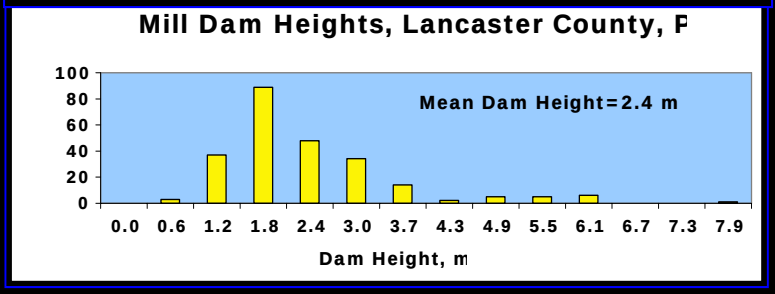
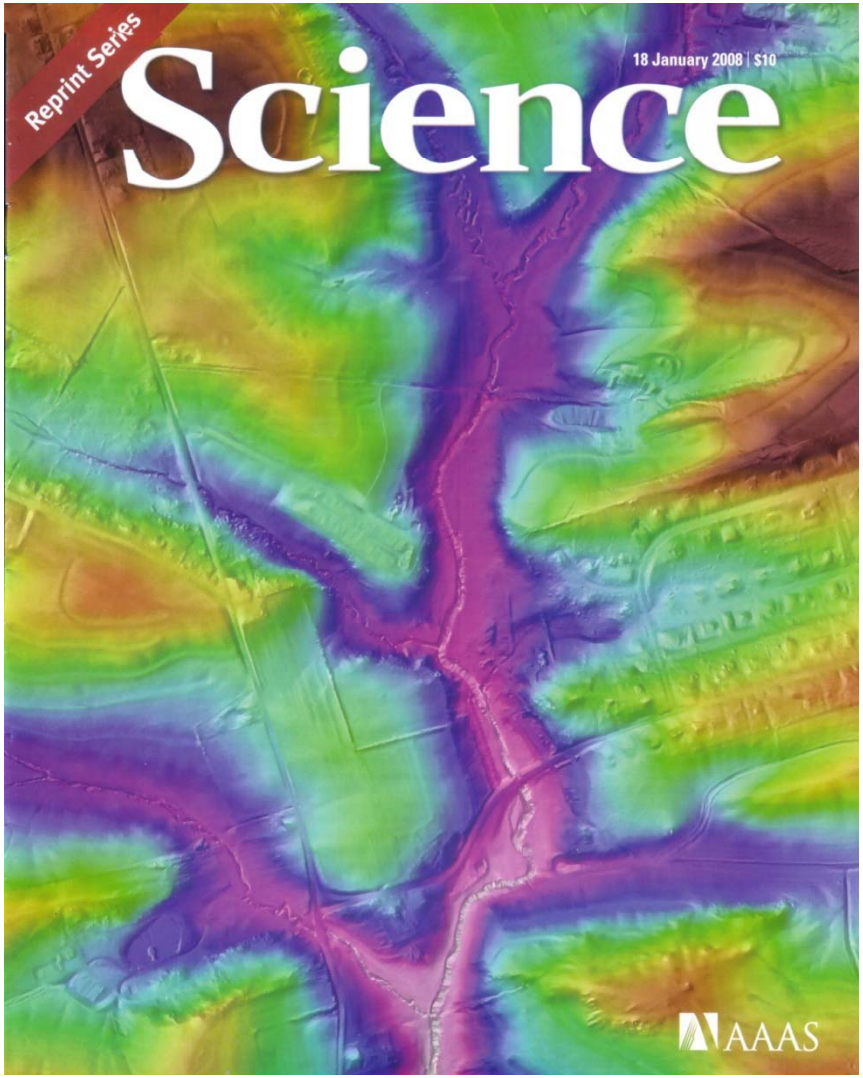
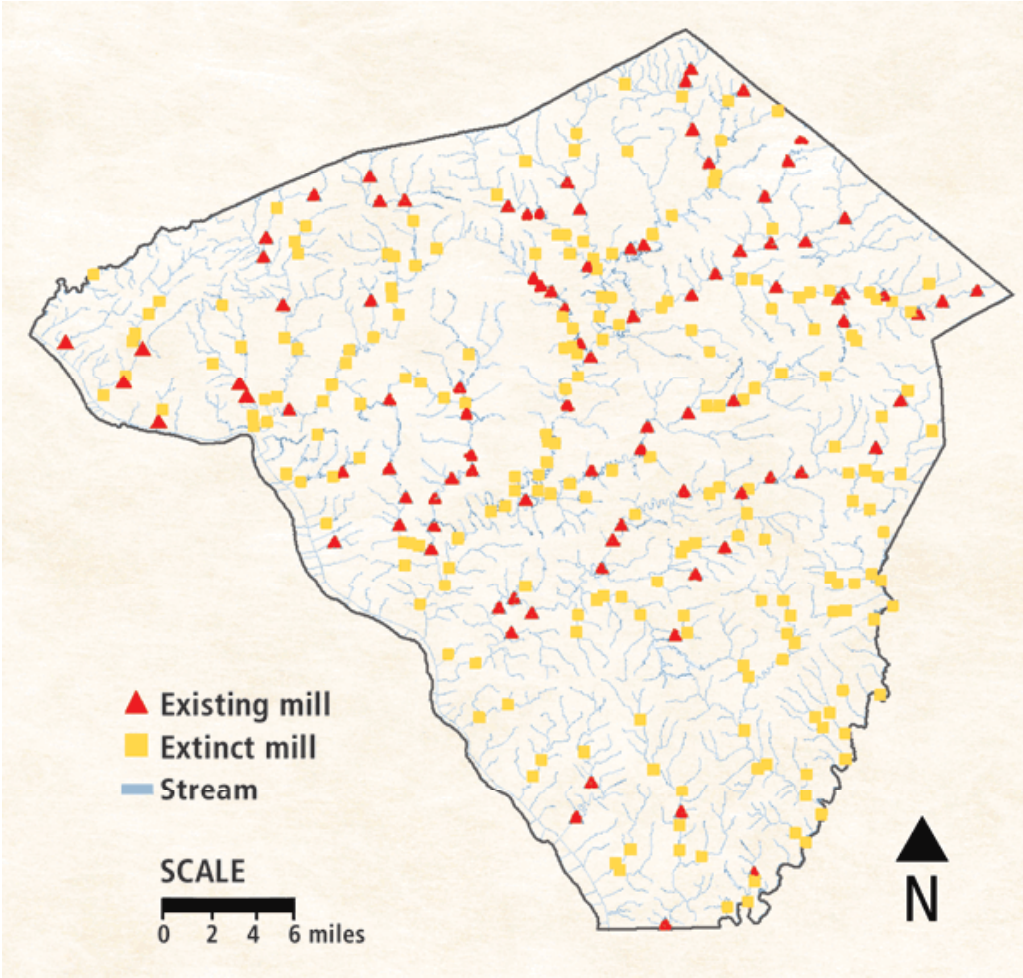


Figure credit: Franklin & Marshall College, Lancaster, PA.

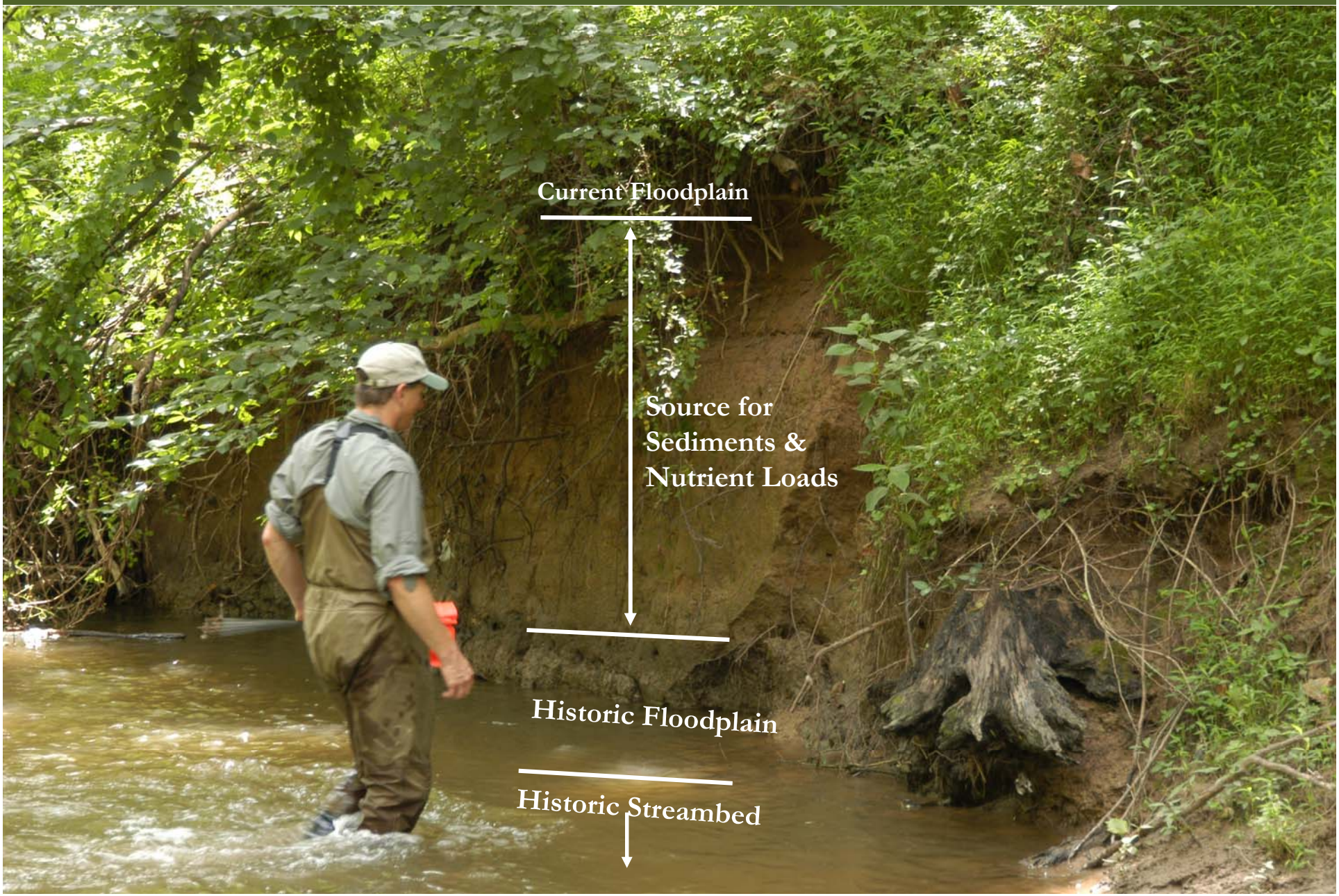
Natural Streams and the Legacy of Water-Powered Mills

Robert C. Walter and Dorothy J. Merritts





Post-Settlement Sedimentation

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Floodplain Restoration

What it is and why it is important

Issue: **Legacy Sediment**

Material that eroded during the 18th through early 20th century due to large-scale forest clearing and poor farming practices dumping millions of tons of soil into streams, valleys and floodplains

Solution: **Floodplain Restoration**

Returning floodplains to their historic elevations including the size and quantity of bed/sediment load, downstream base-level controls, and streambank materials

Floodplain Restoration Design Approach

Effects of Legacy Sediment

- Unstable stream banks (source of sediment, nutrients)
- Streams detached from floodplain and groundwater
- Reduced flood storage
- Impaired aquatic and riparian habitat

Floodplain Restoration as a Stormwater Management Tool

Stormwater Management Functions

- Peak Rates
- Runoff Volume
- Water Quality

Applications and Benefits

- Land Development
- Karst
- TMDLs
- Others

Floodplain Restoration
Stormwater Management Functions

Peak Discharge Rate Attenuation

- Removal of legacy sediment results in increased flood storage
- Increased flood storage results in reduced flood peak rates

Runoff Volume

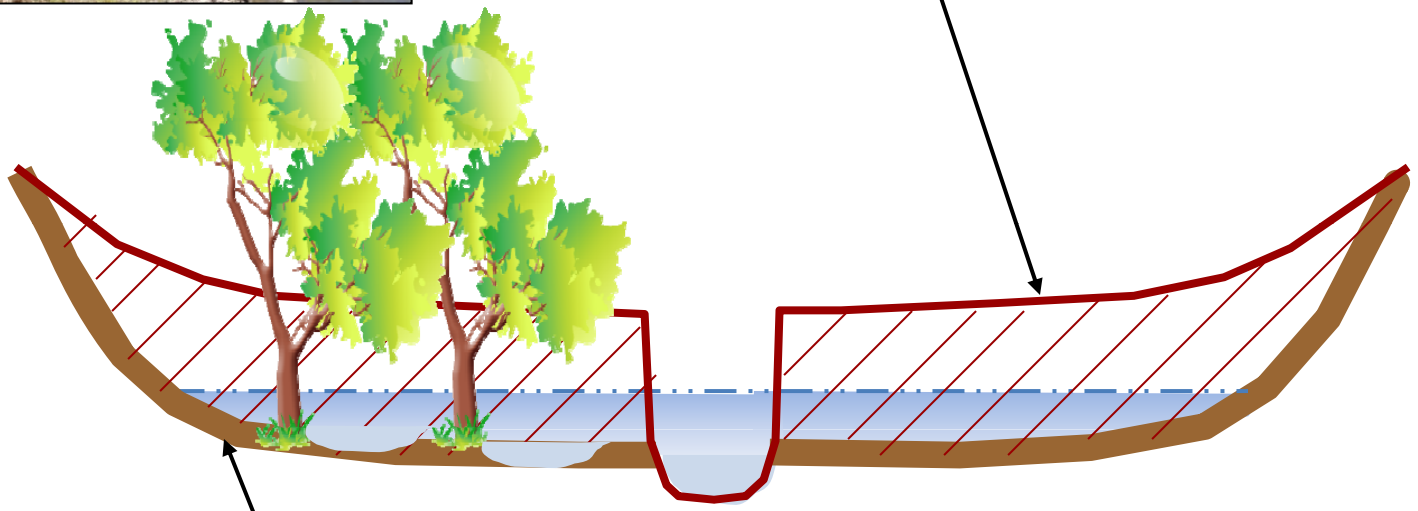
- Improved soil conditions (Clay → Organic)
- Retentive riparian wetland pockets
- Re-attach floodplain to channel (Allow the floodplain to flood)
- Improved root structure (native, deep rooted plants)
- Increased evapotranspiration due to increased vegetative cover (trees/ shrubs)

Water Quality

- Plant and soil filtration of suspended solids and uptake of nutrients (Riparian Buffer)
- SW outfalls discharge to floodplain rather than directly to stream
- Re-attach floodplain to groundwater (interaction with root zone)
- Increased frequency of flood flows accessing floodplain (filtration of upstream runoff)
- Eliminates unstable banks as a source of sediment and nutrients

Volume Control

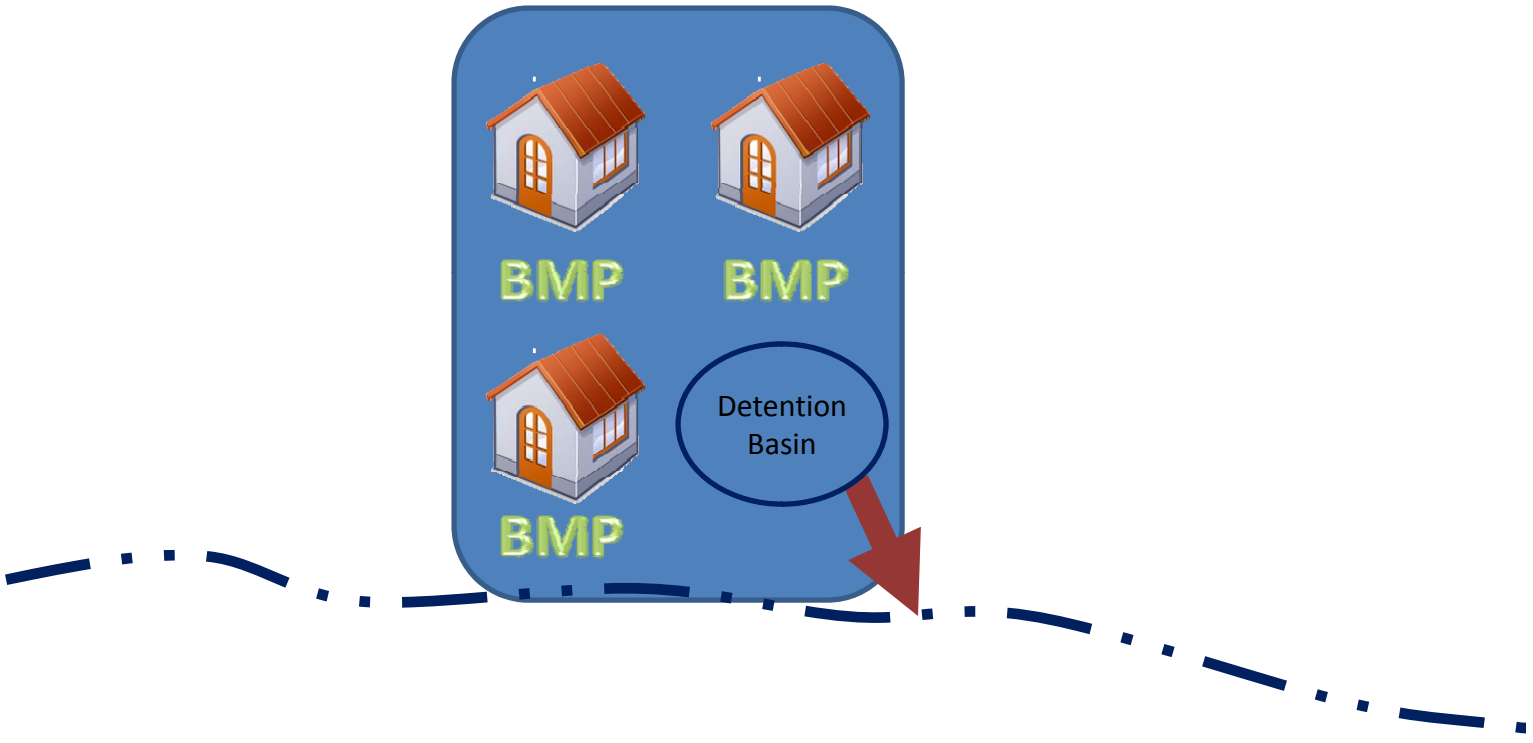
Existing Floodplain



Restored Vegetated Floodplain

Stormwater Management

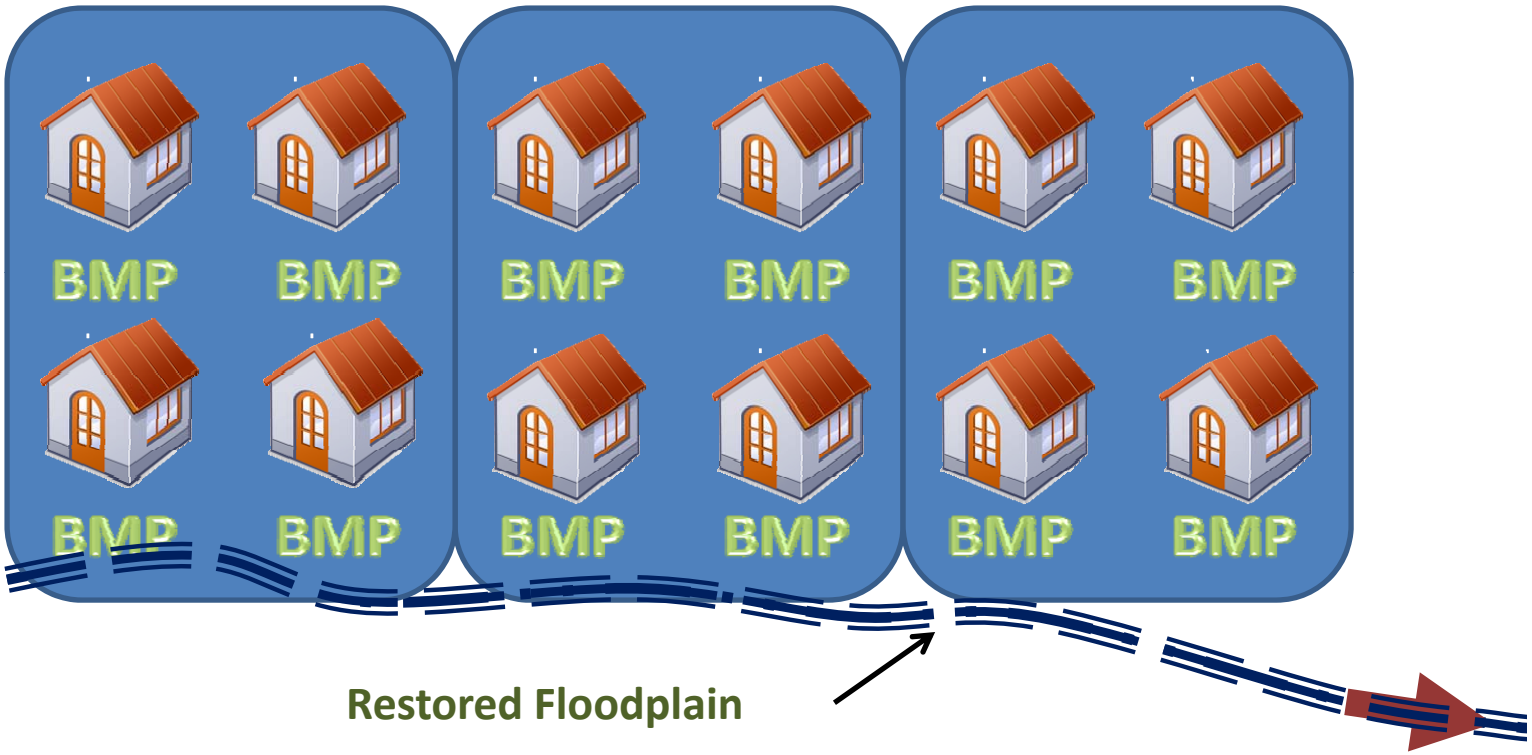
Conventional Example



- **Peak Rate Requirement:** Post Development Peak Flows must be ≤ Pre-Development Peak Flows
- **Volume Requirement**: Manage 2-yr/ 24-hr volume difference
- **Water Quality Requirement**: Provide Water Quality BMPs

Stormwater Management

Floodplain Restoration Example



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Floodplain Restoration as a Tool to Meet TMDLs

Value added as part of Stormwater Management Plan for new or re-development

- Public/ private partnership opportunities

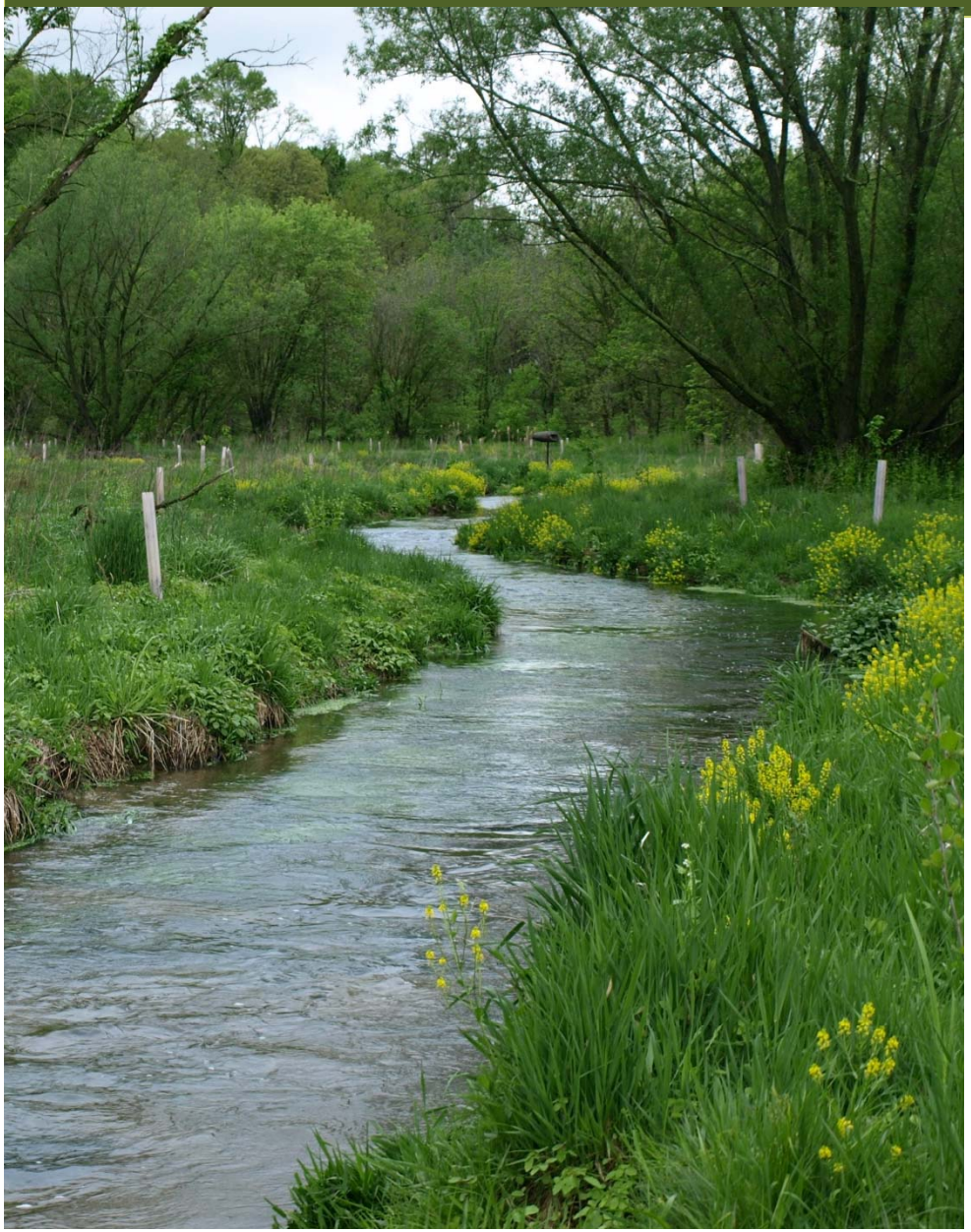
Part of TMDL Plan to meet MS-4 requirements

- Can be more cost effective than Urban/ Suburban Retrofits
- Provides increased recreation opportunities, flood reduction, and reduced maintenance costs on public land

Part of a Nutrient Trading Strategy

- Delay or eliminate need for hard infrastructure upgrades at WWTP
- Options for other point discharges

Floodplain Restoration Additional Benefits



Local and Regional Flood Management

- Protect infrastructure
- Reduce local flood elevations
- Reduce peak discharge rates

Opportunities For Wetland Mitigation/ Banking

- Potential to offset project costs
- Potential to meet local development needs with quality wetland replacement

Wildlife Habitat

- Aquatic
- Terrestrial

Recreation

- Opportunities for trails
- Wildlife observation
- Hunting/ fishing

Long-Term Stream Stability

Aesthetics

Benefits of a Collaborative Regional Approach

1 **PROVIDES FLEXIBILITY.** A county-based nutrient credit trading program provides flexibility to WWTPs, since some plants have greater cap load requirements and/or shorter compliance time frames to meet. In turn, this enables more cost-effective technical options to be explored, including planning and design collaboration between WWTPs.

2 **IMPROVES FINANCING OPTIONS.** A regional approach increases the viability of more funding options, including government sources that prefer to address environmental issues on a greater geographic scale. This will help to minimize ratepayer impact.

3 **MULTIPLIES ENVIRONMENTAL BENEFITS.** Local investments in best management practices improve the county's natural habitat, recreational uses and tourism, stormwater management, and flood control. A regional approach also provides more opportunities to implement local resource management plans.

4 **ENABLES ECONOMIC GROWTH.** Businesses are attracted to a county that demonstrates innovative approaches to cost-effectively address compliance. A regional approach also increases the feasibility of brownfields (e.g., old industrial sites) redevelopment and the targeting of economic growth in planned growth corridors.

5 **DRIVES COST-EFFECTIVE COMPLIANCE AND ENABLES LOCAL CONTROL.** A county-based nutrient credit trading program offers cost-effective alternatives that drive WWTP compliance, while enabling local program control to reduce financial risks.

Chronology of Events

1972 — Federal Clean Water Act Amendments introduce a permitting system to regulate point sources of pollution and create a public works financing program for municipal sewage treatment.

2000 — Pennsylvania joins Maryland, Virginia, the District of Columbia, and others to sign the Chesapeake Bay 2000 Compact, pledging to improve water quality in the watershed.

2005 — Pennsylvania's Chesapeake Bay Tributary Strategy mandates compliance schedules.

2007 — Lycoming County begins to evaluate implications of the Bay Compact.

3/2008 — Lycoming County hosts a well-attended community stakeholder meeting. Public agreement is reached on the need for a county-based strategy.

4-9/2008 — Feasibility study documents potential to develop a viable nutrient management strategy for Lycoming County; strategy development begins.

10/2008 — DEP endorses Lycoming County's regional compliance approach and commits state funds for implementation.

Educational briefings are held for WWTPs and Community Advisory Committee.

12/2008 — Phase II strategy results to be presented to the public.

2009 — Implementation of county-based strategy begins in Lycoming County.

10/2010 - 9/2013 — Nutrient reduction compliance dates are imposed by the DEP for Lycoming County WWTPs, depending on their individual nutrient discharge levels. Compliance is mandatory and driven by regulatory order. Noncompliance threatens significant and costly penalties.

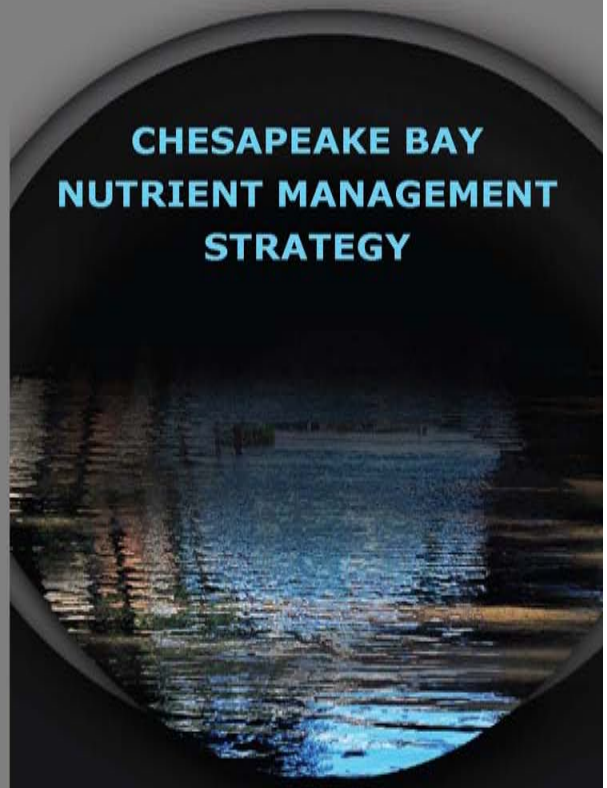
Additional funding sources for implementation will continue to be explored.

(Date of issue: 12/2008, County of Lycoming)

Understanding Issues, Exploring Options

Lycoming County

CHESAPEAKE BAY NUTRIENT MANAGEMENT STRATEGY



a collaborative, county-based approach to minimize costs and promote environmental stewardship


After


Before

Before

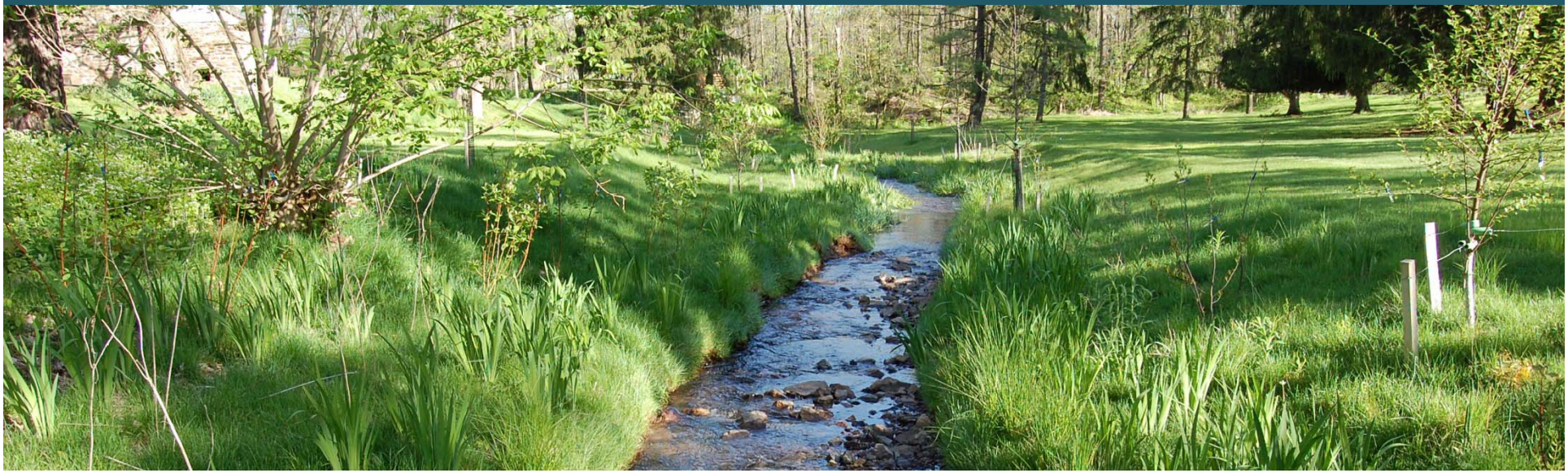
Bedford Springs Resort | Floodplain Restoration

After

Bedford Springs Resort | Floodplain Restoration

Stormwater BMP Examples

Bucks County Restoration | Floodplain Restoration



Before & During

Nutrient Trading Pilot Project | New Street Park, Lititz, PA

After

Nutrient Trading Pilot Project | New Street Park, Lititz, PA

After

Nutrient Trading Pilot Project | New Street Park, Lititz, PA

After

Bedford Springs Resort | Bedford, Pennsylvania

After

Bedford Springs Resort | Bedford, Pennsylvania

After

Bedford Springs Resort | Bedford, Pennsylvania

Stormwater BMP's

Santo Doming Regional Water Quality Facility, Lancaster County, PA

Conclusions

"…Re-establishing natural stream corridors and floodplains through local stormwater management requirements could offer more environmentally friendly flood control options than concrete structures."

"…Innovative stormwater management should be considered and incorporated as an important component of the overall flood mitigation plan."

"Shifting from traditional stormwater management methods to designs and practices that also address channel alterations and degradation, runoff quality, dry-weather flow protection, and aquifer recharge requires an underlying change in how water resource professionals do business"

PA State Water Plan Principles