UNSTABLE STREAMS
What are the Management Costs?

(Lessons Learned from Bradford County, Pennsylvania)

The Southern Tier of New York and Northern Tier of Pennsylvania are plagued by wild streams and rivers that wash out their banks and flood neighboring areas. Each county has many sites where a stream is threatening adjacent development.

It is natural for rivers and streams to overflow their banks and flood adjacent land due to heavy rainfall or melting snow. The floodplain serves as a "relief valve," allowing water to slow down and dissipate energy.

It is also natural for streams to move and change over time. Streams are dynamic systems that adapt to changing conditions in the channel and the landscape. Unfortunately, human activities often create imbalances that result in major stream adjustments. Past actions have resulted in many unstable streams that are now adapting to past disturbances or increased flow. Some streambanks may be eroding due to changes that took place decades ago. Other stream problems have more recent causes.

> ***Dynamic equilibrium*** *means that a stream moves and adjusts its shape to establish a more efficient distribution of the system's energy. The change is what makes the equilibrium dynamic.*

How Big is the Problem in Bradford County?[1]

- Assessments of 9 watersheds in Bradford County found that **13.6% of streambanks are unstable** and thus subject to excessive erosion**.**
- If these streams are representative, Bradford County has about **296 miles of actively eroding streambanks** for which erosion rates exceed "natural" conditions.
- This erosion generates an estimated **1 million tons of sediment annually** (based on a rate of 0.623 tons per foot). This is in addition to "natural" erosion and sediment sources.
- These unstable Bradford County streams may increase the **annual pollution load to the Chesapeake Bay by 243,000 tons of sediment, 608,000 pounds of nitrogen, and 243,000 pounds of phosphorus** (based on findings that about 25% of sediment from this area reaches the Bay and on the estimated nutrient content of sediment).
- **There are also very significant local costs associated with unstable streams due to property damage and infrastructure maintenance expenses caused by excessive erosion and sediment deposition.**

If this problem is addressed by removing excess sediment from stream channels, the maintenance cost would be <u>$5,000,000 per year</u> (based on $5 per ton of sediment removed). This doesn't include the cost to remove woody debris.

[1] Source: Bradford County Conservation District.

This document was prepared by Southern Tier Central Regional Planning & Development Board
for the New York State Department of State with funds provided under Title 11 of the Environmental Protection Fund.

What About the Southern Tier of New York?

Stream characteristics throughout the Susquehanna and Chemung Watersheds of New York are similar to those in Bradford County. Adjusting for county size, leads to the following estimates.

County	**Area** (square miles)	**Eroding Streambanks** (miles)	**Sediment Pollution** (tons/year)	**Short Term Maintenance Cost** (annual sediment removal)
Bradford Co., PA	1,161	296	973,000	$5 million
Broome Co., NY	715	182	599,000	$3 million
Chemung Co., NY	411	105	344,000	$2 million
Chenango Co., NY	899	229	753,000	$4 million
Cortland Co., NY	502	128	421,000	$2 million
Delaware Co., NY	1,468	374	1,230,000	$6 million
Otsego Co., NY	1,003	256	841,000	$4 million
Schuyler Co., NY	342	87	287,000	$1 million
Steuben Co., NY	1,404	358	1,177,000	$6 million
Tioga Co., NY	523	133	438,000	$2 million
Tompkins Co., NY	476	121	399,000	$2 million

How Can These Costs Be Avoided?

Although some amount of erosion is natural, human activities have significant impacts on the stability of stream systems. Excessive erosion occurs when streams respond to changes in the channel or to watershed changes that affect the amount of water reaching the channel. Recognizing that streams and rivers are complicated systems, here are a few management suggestions.

- **Don't "Ream" the Stream!** "Reaming" refers to over-dredging. In the past, streams were "hogged," straightened, and/or sometimes bermed. The thinking was that a deep, straight channel would move water out of an area fast and prevent flooding. However, this method proved to be short-sighted and has contributed to many of our current stream problems.
- **Determine the Cause of the Problem.** Excessive streambank erosion is generally a symptom of a stream system that is adjusting to change. The first step for addressing the problem is to understand what is causing this adjustment. Ask a stream professional (such as the county Soil and Water Conservation District) to assess the situation and determine the most likely source(s) of instability.
- **Address the "source" of the problem.** A poorly designed stream project can result in a less stable system that becomes a maintenance nightmare. Sometimes "fixing" one section of a stream pushes the problem downstream. Stream professionals can provide the technical assistance needed to devise an effective remediation strategy. In some cases the best solution is to leave the stream alone and let it recover naturally.
- **Give the stream "room to roam."** There is no such thing as a truly "stable" stream system. Streams constantly change, adjust, and move. They also flood. The best way to reduce conflicts is to locate development outside of the erosion zone and floodplain.
- **Manage water near where it falls.** Increased runoff from developed areas can result in streams that get bigger to accommodate the increased flow. Stream problems can be reduced by managing runoff throughout the watershed**: "Slow it down. Spread it out. Soak it in."**

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