

Turbidity TMDL assumptions & generally accepted processes

Information to be presented was “vultured” from existing presentations regarding the Minnesota River Turbidity TMDL

There is nothing new or groundbreaking to follow, but it does give you the information about where we are starting from and what we have to work with

Critical issues related to agriculture

- Property Rights
- Attainable Goals
- Landscape Modification
- Strategic Research
- Climate Change
- Natural Background
- Education
- The Human Condition – What is this?

The Human Condition?

- Social & Cultural influences
 - Cultural Change
 - Population Growth
 - Special Interests / Agendas
 - Lack of understanding of rural issues
 - People who are unwilling to accept reality of their world. Having an idealistic vision of the world.
 - Allowing for a strong voice from real stakeholders
 - Farmers representing farmers
 - Keeping contributions voluntary, not regulatory

Definition of Natural Background

- “Natural background means pollution resulting from the multiplicity of factors in nature, including climate and ecosystem dynamics that affect the physical, chemical and biological conditions in a water body, but does not include measurable and distinguishable pollution that is attributable to human activity or influence.”

Examples

- Natural
 - Wildlife
 - Young Geology
 - Climatic Variability
 - Global Warming?
 - Natural Features
 - Vegetation
 - Fires
- Human Induced
 - Livestock
 - Enhanced Drainage
 - Water Use
 - Global Warming?
 - Landuse / Cover
 - Crops
 - Impervious
 - Wastewater

Lake Pepin Sediment Source Identification

- Sedimentation in Lake Pepin has increased by ten times over pre-settlement times
- Non-field sediment sources have increased as both a % of total sediment and in total quantity of sediment
- Field sources have fallen as a % of total sediment, but have held steady or slightly fallen as measured by total quantity of sediment contributed to Lake Pepin

From MN River Turbidity TMDL Fingerprinting Sediment Sources

Climatic/Hydrologic Changes

- Overall upward trend in MN streamflow (~1%/yr for 36 stations – 1900's thru 2002)
- No change noted in snow-melt runoff (spring flooding)
- Higher base-flows
- More higher flow days
- Change was much stronger after 1980

Novotny & Stefan (2006)

Ravine/Bluff/Streambank Study

- In a “graded stream” streambank erosion can be viewed as a natural process
 - A “graded stream” is one that is balanced between sediment inputs and outputs.
- Anthropogenic changes to the landscape and direct channel modifications are believed to have altered the balance between erosion and deposition in many rivers
 - Widely recognized that changes to land cover, drainage of wetlands and ditch construction have changed stream hydrology

Ravine/Bluff/Streambank Study

- These changes to land-use, drainage and climate have created hydrologic changes to the water budget and increased flow in the MN River and its tributaries.
- This increase in flow has likely increased the rate of channel erosion (ravine, bluffs and streambanks) in tributaries to MN River.
- Mean monthly flows have increased by 1.5 to 3 times the pre-1980's era in many southern MN streams.

Ravine/Bluff/Streambank Study

- Estimated sediment load in MN River from *Minnesota* ravines (0.4% of area) consists mostly (71%) of sediment production from ravines from Upper MN, Lower MN, Middle MN and Hawk Creek – Yellow Medicine watersheds along the main channel of the Minnesota River Valley.

Ravine/Bluff/Streambank Study

- Slumping bluff sediment is concentrated in the Le Sueur River and Blue Earth River watersheds
- Estimated that 70% of slumping bluff sediment in the MN River is from these two watersheds

Ravine/Bluff/Streambank Study

- Estimated that the highest rates of sediment loading from streambank erosion is on the Minnesota River mainstem and not its tributaries
- Minnesota River streambanks are highly erodible because of low shear and cohesive strength typical of sandy alluvial materials and lack of structure (horizon development) found in upland soils.

Ravine/Bluff/Streambank Study

- Items of note:
 - MN River mainstem sinuosity has declined from ~1.5 in 1855 to ~1.3 today
 - MN River mainstem channel width has increased significantly since 1938 between Mankato and St. Paul
 - Averaging 67 cross sections, the average width increased from 229 feet to 339 feet, a 58% increase in channel width

MN River Scenario Report

- Reports the results of HSPF Modeling scenarios
- Finds that sediment loads derive equally from:
 - Surface erosion = 1/3
 - Ravines = 1/3
 - Channel bed, banks & bluffs = 1/3

MN River Scenario Report

- **Recommended Reduction Activities**
 - Increase in pasture, Conservation Reserve and perennial crop lands.
 - Increased adoption of conservation tillage
 - Elimination of surface tile drain inlets
 - Reduction in ravine erosion through use of drop structures on tile drain outlets
 - Detention of the first inch of runoff from cropland near the source area
 - Infiltration of the first inch of runoff from urban land in MS4 areas
 - Reduction in sediment load from urban land outside MS4 boundaries
 - Reduction in rates of bluff collapse
 - Rehabilitation of channels to reduce bed and bank erosion in the bluff reaches