Science Museum of Minnesota

St. Croix Watershed Research Station

SCWRS Fact Sheet, 2009

Nonpoint-source pollution in the Upper Midwest:
Investigations by St. Croix Watershed Research Station

Summary

• **Nonpoint-source pollution -- runoff from rural and urban settings that delivers eroded soil and excess nutrients to our waterways -- is the greatest threat to the health of our rivers and lakes. Since 1995, the St. Croix Watershed Research Station (SCWRS) has led projects investigating the magnitude and causes of non-point source pollution, and possible solutions to the problem.**

Who we are

• The St. Croix Watershed Research Station (SCWRS) is the environmental research department of the Science Museum of Minnesota – which is not a state agency, but a private, non-profit institution dedicated to promoting the scientific literacy of our citizens. The SCWRS has projects of both national and international scope; nonetheless, most of our research falls within the Upper Midwest and our home, the St. Croix Basin.

Projects investigating nonpoint-source pollution

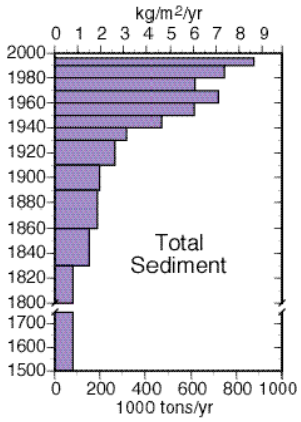

Fig.1 – Lake Pepin sediment accumulation documenting erosion in the Upper Mississippi River basin.

• **Lake Pepin *(Fig. 1)*** – Lake sediments, which record the environmental history of their watersheds, were cored in Lake Pepin and dated to times preceding European settlers. These cores have allowed us to (a) define the natural state of the waters in the Upper Mississippi Basin above Lake Pepin, (b) demonstrate that sediment and nutrient loadings have increased by a factor of 7 to 10 times above natural rates, and (c) show that these rates have not declined in recent decades despite efforts to reduce agricultural impacts. Debate continues about whether the sustained erosion rates are because of increased precipitation or increased agricultural drainage. *(Funding & partners: Met Council, USACE, & UM)*

• **Lake St. Croix *(Fig. 2)*** – Similarly, sediment core work has shown a 3- to 4-fold increase in sediment and nutrient loading from the St. Croix Basin. Thus, contrary to popular belief, the St. Croix River is not pristine but significantly degraded by excess nutrients. Consequently both Minnesota and Wisconsin have declared the St. Croix an impaired waterway and have formally agreed to a goal of reducing phosphorus inputs by 20%. The sediment core work suggests that this reduction would return the St. Croix to an improved biological state with clear-water conditions similar to those in the 1940s. *(Funding & partners: Met Council, MPCA, UM)*

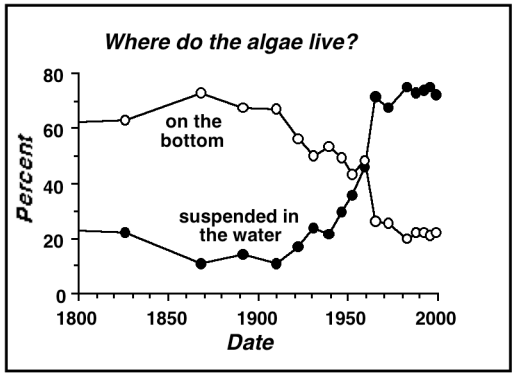

Fig.2 – Lake St. Croix shifted in the 1940s from bottom-dwelling algae denoting clear water to planktonic algae denoting murky water.

• **Sediment fingerprinting** – We've demonstrated that Lake Pepin and Lake St. Croix are filling with sediment at unnatural rates. Where, exactly, is this sediment coming from? How much comes from fields, and how much from non-field sources (gullies, ravines, and stream banks)? Use of radioisotopes is helping to fingerprint the source of the continued erosion within the Upper Mississippi Basin. Preliminary data indicate a mix between the two source categories that has changed over time, with more sediment from fields earlier in the 20th century and more from non-field sources in recent decades. *(Funding & partners: LCMR, MPCA)*

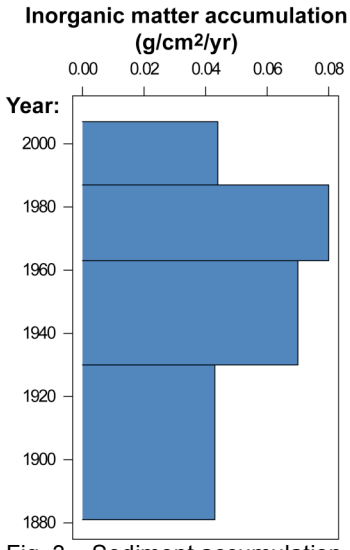

Fig. 3 – Sediment accumulation in a western Minnesota lake showing reduction in erosion following 1986 when CRP began (preliminary data)

• **Conservation grasslands** ***(Fig. 3)*** – Plowing the prairies has clearly destabilized soils and allowed erosion to occur at accelerated rates. Returning some of our corn and soybean fields to perennial grasses should reduce such erosion – yet our agricultural rivers still run muddy with suspended sediment. How much can erosion be reduced on a watershed scale by establishing conservation grasslands with programs such as CRP and CREP? Once again, the SCWRS is using lake-sediment cores to document landscape erosion rates. Preliminary evidence supports the positive effect of CRP grasslands in reducing erosion but also recognizes that landscape position of CRP grasslands is critical. *(Funding & partners: LCCMR, UM)*

• **Tile and flow** – Despite conservation efforts, soil erosion in the Upper Mississippi Basin continues far above the natural rates. Is this just because rainfall has increased slightly since the dustbowl 1930s – or is it because ditching and tiling have drained virtually every wetland and increased the direct hydrologic connection between fields and rivers by several orders of magnitude? A new project by the SCWRS will investigate how ditching and tiling have affected river hydrology and erosion of our agricultural lands. *(Funding & partners: LCCMR, MPCA, Minn. State Univ.-Mankato)*

• **Watershed modeling** ***(Fig. 4)*** – What can be done to reduce nonpoint-source pollution? To answer this question, the SCWRS is applying the Soil and Water Assessment Tool (SWAT) model to impaired tributaries (Willow River, WI, and Sunrise River, MN) as well as to the entire St. Croix Basin. *(Funding & partners: NPS, LCMR, WDNR, UM, Texas A&M)*

Conclusions

• The SCWRS is doing critical, unique research to identify and quantify problems over time scales exceeding centuries and spatial scales encompassing the Upper Mississippi Basin. But more, the SCWRS is using models to propose solutions to these problems that will serve future generations.

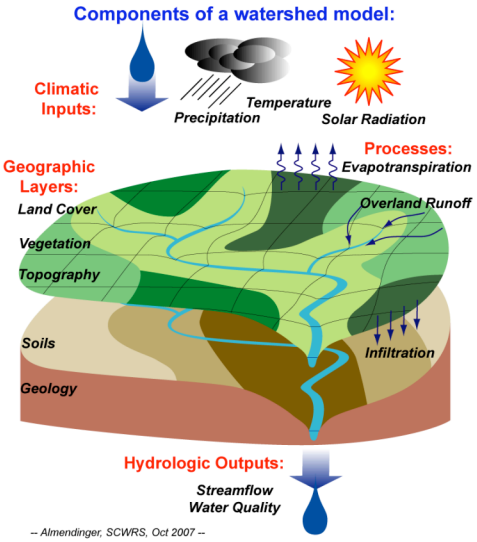

Fig. 4 -- Components of a watershed model.

Further information: SCWRS senior staff

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