Agricultural Impacts on the MN River

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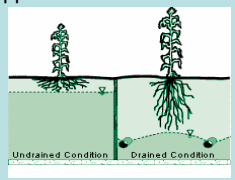
Agricultural Drainage Systems

Drainage systems are used to remove excess water from soil to create optimal agricultural conditions and enhance crop production. They are crucial in Minnesotan agriculture because while the roots of most crops grown in the state cannot tolerate excessively wet conditions, soil in the Upper Midwest tends to have very poor natural internal drainage.



http://134.84.92.126/distribution/cropsystems/DC7644.html

Potential environmental impacts of drainage systems:
Nutrient loss (especially nitrates)
Pesticide and fertilizer runoff,
Erosion and sediment contamination,
Loss of wetlands

Techniques for **surface drainage** include land leveling, constructing surface inlets to drains, and constructing ditches and waterways. The most common technique for **subsurface drainage** is tile drainage, a system of perforated tubes 2 to 4 feet below the surface that lower the water table to the level of the tiles.

Possible solution:
Tile drainage is highly effective in keeping the water table low enough so that topsoil is not flooded. Tile drainage allows for strong, healthy root growth. [1]

Soil Erosion and Sediment in the Minnesota River

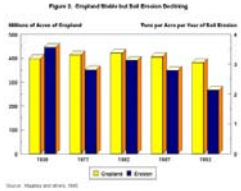
http://www.plant/materials.nrcs.usda.gov

"Approximately 625,000 tons per year of total suspended solids, largely sediment, are transported by the Minnesota River at its mouth at Fort Snelling." [2]

Problematic because:
*Blocks Sunlight (decrease in photosynthesis)
*Carries in pesticides, herbicides, and insecticides
*Harmful to aquatic species (disrupts habitat)

Can be mitigated by:
*Riparian Buffers
*Conservation Tillage
*Crop Rotation
*Strip Cropping

Legislation/Active Groups:
*Conservation Enhancement and Reserve Program (CREP)
*EPA
*Pollution Control Agency
* MN DNR



http://www.ers.usda.gov/briefing/AgChemicals/Images/suside2.gilf

Background Information

- 92% of the Minnesota River Basin area is occupied by production agriculture. [5]
- "The most polluted river in the state, the Minnesota is fouled primarily from soil, pesticides, and fertilizer washing in from the surrounding 37-county watershed, which is the state's most intensively farmed region." [6]
- The Minnesota River drains about 15,000 square miles in Minnesota [7]

Sustainable Agriculture

What is sustainable agriculture?
There are many definitions of sustainable agriculture. The USDA definition of sustainable includes a system of agriculture that satisfies human needs, sustains economic viability, and makes efficient use of resources over the long term.

Benefits
Non-point source pollution from industrial agriculture makes the Minnesota River one of the top 20 most polluted in the United States. Agricultural changes like reducing pesticide use and improving drainage systems would better the water quality.

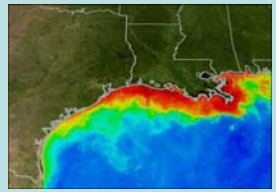
Suggestions for Change
Partnerships forged between small, commmunity-based organizations and land-grant universities committed to sustainability would allow resources to be shared and implemented on a large scale. Organizations such as the Minnesota Institute for Sustainable Agriculture represent efforts in this direction.

Fertilizers and Pesticides

Algal Blooms and Oxygen Content

Nitrogen and phosphorus from fertilizers wash into the Minnesota River, causing eutrophication in both local regions downstream and in the Gulf of Mexico. A 6,000 square mile Dead Zone marks where eutrophication has killed off a large amount of marine life.

Health Effects
Increased nitrogen content in drinking water causes methemoglobinemia, or blue baby syndrome. Both phosphorus and nitrogen stimulate the growth of toxic blue-green algae.



http://static.howstuffworks.com/gif/dead-zone-1.jpg

Recreational Effects
Nitrogen and phosphorus from fertilizers cause major fish kills, consequentially restricting fishing opportunities. Furthermore, poor water quality presents health risks for swimmers.

Potential Solutions
-Implement tax on fertilizer and pesticide use
-Provide grants for farmers who limit chemical usage
-Crop rotation/intercropping [3]

Costs and Benefits of Industrial vs. Sustainable Agriculture

The entire economic cost of industrial agriculture is not represented by the price we pay at the grocery store. Many externalities are present which are not included in that price, but are paid by taxpayers just the same. Some of these externalities include, but are not limited to:

- Water pollution from farm waste
- Loss of landscape and biodiversity
- Food-borne diseases
- Air pollution from gaseous emissions
- Unnecessary transportation of food
- Human dislocation from rural to urban
- Rural community decline
- Poor human diets and obesity
- Cost of direct government subsidies

www.grinningplanet.com/.../agriculture-farm.jpg

In contrast, while products grown using sustainable agricultural methods often cost more than their industrial counterparts, they also bring with them many environmental and social benefits, including:

www.sustainablestuff.co.uk/images/1653.jpg

- Landscape aesthetics
- Biodiversity
- Clean water
- Wetland benefits
- Carbon sequestration
- Rural economy and community cohesion
- Energy savings on transportation [4]

References: [1] United States Environmental Protection Agency. "Ag 101: Drainage." 2007. <http://www.epa.gov/agriculture/ag101/cropdrainage.html>.
[2] United States Department of Agriculture. "Agricultural Chemicals and Production Technology: Sustainability and Production Systems. 2005. <http://www.ers.usda.gov/briefing/AgChemicals/sustainability.htm>.
[3] Minnesota River Basin Data Center. "State of the Minnesota River." 2000. <http://mrbdc.mnsu.edu/mnbasin/fact_sheets/stateofriver_2000.html>.
[4] Cozart, Thayne. "Industrial vs. Sustainable Agriculture." *Acres: A Voice for Eco-Agriculture.* 2003. <http://www.acresusa.com/toolbox/reprints/Indust%20vs%20sustain_dec03.pdf>.
[5]University of Minnesota. "Impact Statement: Focus on the Minnesota River." <http://134.84.92.126/distribution/naturalresources/DD6649.html>.
[6] "Feds grant state $163 million for river restoration: New program to buffer Minnesota River from polluted runoff." <_http://files.dnr.state.mn.us/publications/fwt/1998/bigfedgr.pdf >.
[7] "Minnesota River Basin." < http://www.soils.umn.edu/research/mn-river/doc/mbtext.html>.
[8] Warner, Keith Douglass. *Agroecology in Action: Extending Alternative Agriculture through Social Networks*. Cambridge: MIT Press, 2007.
[9]www.misa.umn.edu

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