Conservation

Multiple ways to drain, conserve

Editor's note: *In the March 2013 issue of* The Farmer, *a Viewpoint article written by Larry Gunderson with the Minnesota Pollution Control Agency explained various sources of excess sediment in the Minnesota River Basin. Al Kean with the Minnesota Board of Water and Soil Resources offered this article to discuss ways to address excess sediment and nutrients through multipurpose drainage management.*

Key Points

- Drainage is needed in rural and urban areas.
- Traditional, new conservation practices aid drainage.
- Cover crops are making a comeback.

By **AL KEAN**

DRAINAGE isn't a bad word. Drainage is necessary in both agricultural and urban landscapes.

However, how we manage drainage can make a big difference for achieving multiple goals on the field, on the farm, in urban areas and downstream.

Historically, agricultural drainage focused on crop production, road protection and insect reduction for public health, while urban drainage focused primarily on flood control. At present and into the future, we need to manage drainage systems for multiple purposes.

"Multipurpose drainage management" is a key approach to address multiple goals. For rural and agricultural landscapes, these goals can include:

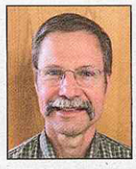
- agricultural production, including erosion reduction for topsoil sustainability
- runoff volume and peak flow reduction to reduce field, streambank, bluff and ravine erosion, as well as to reduce flood damages to crops and infrastructure
- water quality protection and improvement
- aquatic and adjacent terrestrial habitat protection and improvement

For urban landscapes, these multiple goals are the same or similar, short of agricultural production.

Ways to conserve

There are many traditional on-field and on-farm conservation practices that can help reduce runoff concentration, erosion and peak flows, such as residue management, grassed waterways, terraces, water and sediment control basins, grade stabilization structures (including side inlet controls along ditches), ponds, and wetland restorations. Similar urban practices include stormwater ponds, grade stabilization structures and, more recently, raingardens and infiltration basins. Reducing runoff concentration and peak flows helps reduce erosion from the field or urban lot downstream through drainage ditches, streams and rivers.

In recent years, a number of new conservation practices with a focus on tile drainage and water quality have been developed, including controlled subsurface drainage, denitrifying bioreactor, constructed wetland for surface and subsurface drainage water treatment and, most recently, vegetated subsurface drain outlet (aka saturated buffer).



KEAN

These conservation practices, as well as nutrient management planning, have been included in recent federal and state Drainage Water Management Initiatives. Both the federal Environmental Quality Incentive Program, administered by the USDA-Natural Resources Conservation Service, and the state Conservation Drainage Management Program, administered by the Minnesota Board of Water and Soil Resources in partnership with local government units, provide financial and technical assistance for these practices.

A not-so-new conservation practice regaining interest is cover crops. This practice is included in a current Soil Health Initiative by state and federal agencies. The connection to multipurpose drainage management is that cover crops and their roots can substantially reduce erosion, reduce soil compaction and increase infiltration.

Additionally, cover crops increase soil organic matter, which in turn can reduce runoff volume by increasing the water-holding capacity of the soil profile. More roots more of the time increases soil organic matter and water-holding capacity. Historic prairie grass roots were the key source of the typically high soil organic matter in Midwest Corn Belt soils.

Based on the methodology of B.D. Hudson (*Journal of Soil and Water Conservation*, 1994), a 1% increase in soil organic matter in the top 30 inches of typical Minnesota agricultural soils can increase the water-holding capacity by ¾ inch to 1 inch. This soil profile water is plant available water that is not drainable (i.e., it can be "banked" in the soil organic matter).

Cover crops and soil organic matter can also sequester and help process nutrients for primary crop use. Therefore, cover crops appear to have substantial potential to both improve runoff quantity and quality management, as well as improve the farmer's bottom line through more plant available water into dry periods and reduced nutrient input needs. Although use of cover crops with grain row crops in northern latitudes has not yet become mainstream, there is a growing base of research, demonstration and successes.

Excess sediment and nutrients are substantial problems for Minnesota lakes, streams and rivers. The surface and subsurface runoff that picks up and transports sediment and nutrients are some of the variables than can be managed.

Multipurpose drainage management can be a remedy for these problems, while also achieving key agricultural and urban purposes for drainage. In a future article, BWSR will provide some examples of farmers who are utilizing multipurpose drainage management practices.

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COURTESY OF RED LAKE SWCD

TRADITIONAL WAY: A side inlet grade stabilization structure into a drainage ditch helps reduce erosion and runoff concentration.

NEW WAY: Current research shows that a wood chip denitrifying bioreactor is effective in treating agricultural tile drainage.