



Capital Improvement Project Castle Rock Township: South Branch Vermillion River Denitrifying Woodchip Bioreactor

Improved Surface and Drinking Water

Nitrate is generally associated with non-point source runoff and can cause health issues for humans and animals. The South Branch Vermillion River subwatershed has the highest nitrate load in the watershed and contributes to contaminated drinking water in the eastern portion of the watershed due to the local geology that allows river water to enter the underlying drinking water aquifers.

When Dakota County reconstructed County Road 78, the VRWJPO took the opportunity to design and construct a nitrate treatment practice along the road. Constructing water quality treatment areas concurrent with the road project helps save on construction costs.

A denitrifying woodchip bioreactor was constructed at Castle Rock Town Hall. A trench was dug and then filled with woodchips, and agricultural drain tile was directed into and out of the trench. The woodchips provide a significant carbon source for nitrate reducing bacteria to thrive, resulting in nitrate reduction in the drain tile water.

The project will reduce total nitrate by 325 lbs./year. The project is the first denitrifying woodchip bioreactor in Dakota County. Compared to the South Branch Vermillion River Nitrate Treatment Constructed Wetland nearby, this project is an example of a practice that takes very little room to construct. It is an example of an “edge of field” practice that can be replicated and installed wherever drain tile outlets are located.



A trench filled with woodchips that is covered with soil has agricultural drain tile directed into and out of it will reduce nitrate loads, helping to improve water quality in surface and drinking water.

Vermillion River Watershed Joint Powers Organization

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Problem:

- High nitrate loads in the South Branch Vermillion River subwatershed are leading to surface water and drinking water contamination
- Concentrations of nitrate in this subwatershed show a statistically significant increasing trend

Actions:

- A trench was dug and woodchips were placed within it. Agricultural drain tile was directed into and out of the trench
- The woodchips will provide an enhanced carbon source for nitrate reducing bacteria
- Design and construction were coordinated with Dakota County's road reconstruction project at County Road 78.

Benefits:

- Reduces nitrate by 325 lbs./year in the South Branch Vermillion River
- Reduced nitrate in drinking water supplies in the eastern watershed
- Coordinated effort with Dakota County allowed for cost savings on design and construction
- Demonstration of a of nitrate treatment project not currently present in Dakota County
- Downstream benefits of nitrate and sediment reduction for the Mississippi River and Lake Pepin
- Protection of a designated trout stream, trophy brown trout population, and young-of-year trout

Costs and contributions:

- Vermillion River Watershed Joint Powers Organization: \$2,029 in cash match, design assistance, and construction oversight
- Dakota County: design assistance, and construction oversight
- Clean Water Fund: \$31,983 in grant funding
- Castle Rock Township: Granted an easement for project construction and maintenance

Bacteria will use the woodchips as a carbon source to reduce nitrate in the drain tile water



A project completed cooperatively by:

- Vermillion River Watershed Joint Powers Organization
- Dakota County
- Castle Rock Township
- Clean Water Fund Grant

A grant from the Clean Water Fund, one of four funds established by the Clean Water, Land & Legacy Amendment, supported this project. [Clean Water Stories](#) can be found on the Minnesota Board of Water and Soil Resources website.

