Water Quality Wetlands in Iowa

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IowaNREC.org
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Outline:
• Performance Monitoring & Research
• Siting & Design
• Program Vehicles & Market Driven Opportunities
Wetlands Research
Factors Affecting Wetland Performance

Wetland dynamics
- Vegetation, temperature, dissolved oxygen
- Residence time
- Hydraulic loading rate
- Nitrogen loading rate
NPS Nitrate Loading and Nitrate Loss in Wetlands

Despite a wide range in nitrate loads, all of the wetlands monitored were net sinks for nitrate and total nitrogen.

Examples from 2007 to 2009 monitoring

- Observed nitrate-N inflow (mg/L)
- Observed nitrate-N outflow (mg/L)
- Model expected outflow nitrate range
- Inflow
Measured and Modeled Wetland Performance

Hydraulic loading rate, nitrate concentration, and temperature are primary determinants of wetland performance.

Predicted long term average nitrate removal (52%) for 27 CREP wetlands with an average wetland:watershed ratio of 0.785.

$R^2 = 0.85$
Strategic Wetland Targeting

- Watershed area between 500-4000 acres
- Wetland sized at 0.5% to 2% of watershed area, i.e. a 1,000 acre watershed would require a wetland between 5-20 acres in size
- To maintain wetland vegetation, no more than 25% of the wetland should be >3 feet in depth
- Designed so that placement of the wetland does not adversely impact drainage rights of upstream and downstream landowners
- Strategic placement of wetlands is crucial to achieve significant reductions in nitrate
Hydric Depressions

Drainage Tile

Tile Outlet

Water Quality Wetland
Topographic Siting Options
- N Remove Wetlands

Pumped Drainage Wetland
Excavated Wetland
Break-Point Topography Wetland
Floodplain Wetland
Flood Level

D. Lemke
TA DEPT AG & LAND STEWARDSHIP
Benefits of Integrated Drainage and Wetland Systems

• Reduce the loss of nitrate
• Increase habitat and ecological functions of the landscape
• Reduce N$_2$O greenhouse gas emissions
• Reduce surface runoff
• Reduce loss of surface runoff contaminants (e.g. phosphorus, pesticides, sediment)
• Optimize crop production, yield, and profitability
For More Information

http://iowalandscapeinitiative.com/
Future Need Under Iowa NRS

• 4,000-7,000 wetlands (in addition to other practices) to meet scenarios of Iowa Nutrient Reduction Strategy for achieving 45% N reduction

• Resulting In:
  • 40,000-70,000 acres of wetland
  • N removal of 60M-105M lbs/yr
Program Vehicles & Market Drivers

State/Federal Programs
- Iowa Conservation Reserve Enhancement Program (CREP) – IDALS/FSA
- Iowa Water Quality Initiative - IDALS
- State Revolving Fund Sponsored Projects - DNR
- Environmental Quality Incentives Program (EQIP) – NRCS

Market Driven Opportunities
- Farmed wetland mitigation needs
- Nutrient credit markets
Thank You!

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