Nitrogen Tracking and Reporting System Task Force

Nebraska: Central Platte Valley Groundwater

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*Source data & graphics courtesy of Dr. Richard Ferguson, University of Nebraska-Lincoln
Problem

- Non-point source groundwater pollution
- Major corn production region
- High elevated NO$_3^-$ N concentrations
- Heavy fertilizer and irrigation application
- Threats to main source of drinking water
- Coarse sandy, silt, loam soils
- Shallow groundwater levels (10-30 feet)
Solution

- 1984 Education of producers
  - Nitrogen and Irrigation Management Project
- 1986 Nebraska Ground Water Management and Protection Act
- 1987 Central Platte Natural Resources Districts (NRD) develop comprehensive Groundwater Management Areas (GWMA)
- Regulation of producers
NRD GWMA

Purpose

- Reduce nitrate nitrogen concentrations in shallow groundwater aquifers.

Expected Outcome

- Improve water quality in affected aquifers with the targeted application of University approved management practices.
Data Elements

- Phase I (0-7.5 ppm NO$_3^-$ N)
- Phase II (7.6-15 ppm NO$_3^-$ N)
- Phase III (>15 ppm NO$_3^-$ N)
- Phase IV (groundwater NO$_3^-$ N levels not declining at acceptable rate)
Phase I (0-7.5 ppm $\text{NO}_3^-$ N)

- Fall and winter N application banned on sandy soils.
- N application allowed on heavier-textured soils after November 1.
- No reporting.
Phase II (7.6-15 ppm NO$_3^-$ N)

- No N fertilizer allowed until after March 1.
- Annual soil and irrigation water tests required.
- Lab analysis and nutrient accounting is required if manure is to be applied.
- Legume credits must be considered.
- Certification by NRD every 4 years.
- Measurement of irrigation water applied to each field.
- Annual reporting of crop grown, N credits, recommended N rate, nitrification inhibitor use, soil & water analyses, N fertilizer and water applied & crop yield.
Phase III (> 15 ppm NO$_3^-$ N)

- All requirements of Phase II, plus –
- Split N application, or use of a nitrification inhibitor, or sidedress application.
Phase IV

- Groundwater NO$_3^-$ N levels not declining at acceptable rate.
- All requirements of Phase III, plus-
- Expected yield set by NRD.
- Nitrogen application rates must not exceed the District’s recommendation.
- NRD staff will work with University staff and producers on best management practices.
Reporting Mechanism

- Paper reporting currently.
- Producers, Independent Crop Consultants, Fertilizer Dealers, and Certified Crop Advisors
- Regulated by NRD for water quality protection and improvement.
Scale

- Field Level, some 6,000 fields
- 300,000 acres for Central Platte

Cooperative Nature

- NRD, University, Growers and Crop Advisors
- Good relationships and attitudes
- Education
Economic Costs & Impact

- Producers respond to trends in NO$_3$ - N concentrations.
- Nitrogen & Irrigation Demonstration Project 1984-2002
  - Expected Yield: 176 bu/acre
  - Actual Yield: 171 bu/acre
  - Recommended N rate: 129 lb/acre
  - Grain Yield -50% N: 162 bu/acre
  - Grain Yield +50% N: 174 bu/acre
  - Soil N credit: 67 lb/acre
  - Irrigation water N credit: 28 lb/acre
Measures of Success: Yield

Trends in the Central Platte Valley

Source: Central Platte Natural Resources District and the University of Nebraska-Lincoln Dr. Richard Ferguson
Measures of Success: N Rate

Trends In the Central Platte Valley

Source: Central Platte Natural Resources District and the University of Nebraska-Lincoln Dr. Richard Ferguson
Measures of Success: H₂O Quality

Trends in the Central Platte Valley

Source: Central Platte Natural Resources District and the University of Nebraska-Lincoln Dr. Richard Ferguson
Measures of Success: Data

Central Platte Natural Resources District – Groundwater Management Area (GWMA) - 2010

Availability of the database has allowed both research and education to be targeted to soil/aquifer/cropping systems which are more challenging to manage.

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Benefits and Challenges

- Nitrogen & Irrigation Demonstration Project 1984-2002
  - Extensive outreach & education on BMP adoption
  - Economic and environmental benefits
- Regulatory Impact of monitoring & data collection
- WUE $\uparrow$ + NUE $\uparrow$ =
  - Conversion: furrow $\rightarrow$ center pivot
  - Soil water sensors $\rightarrow$ irrigation scheduling
  - Crop canopy sensors $\rightarrow$ inhibitors & CRF
  - Shallow Aquifers NO$_3^-$ N concentrations improving
- Protecting deeper aquifers from NO$_3^-$ N concentrations