Hypoxia From A Farmer's Point of View

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Topics

- Iowa CREP
- Pilot Project for Water Quality Wetlands
- Iowa Hydrology

Iowa CREP

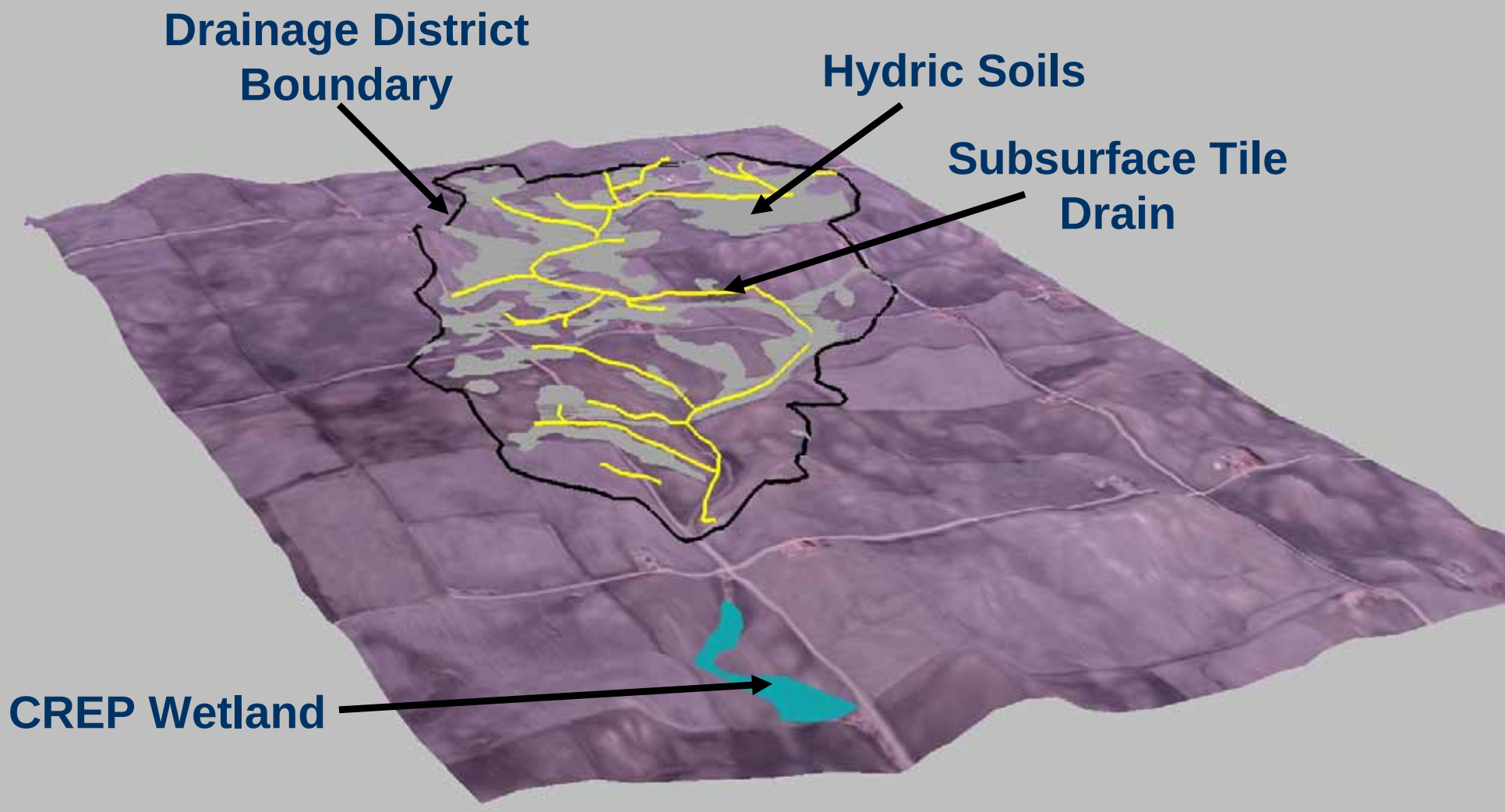
What is the IOWA CREP?

- State, federal, local, and private partnership to establish wetlands for water quality improvement
- GOAL: Reduce nitrogen loads from croplands to streams and rivers.
- Research at ISU has demonstrated that strategically sited and designed wetlands can remove 40-90% of nitrates and over 90% of herbicides from cropland drainage waters.

Program Benefits

- Up to 15 years of annual rental payments from USDA for all enrolled 100% cost-share for wetland restoration and buffer establishment
- A one-time, up-front incentive payment to enter into either a 30-year or perpetual easement
- Landowners retain ownership of land entered into program

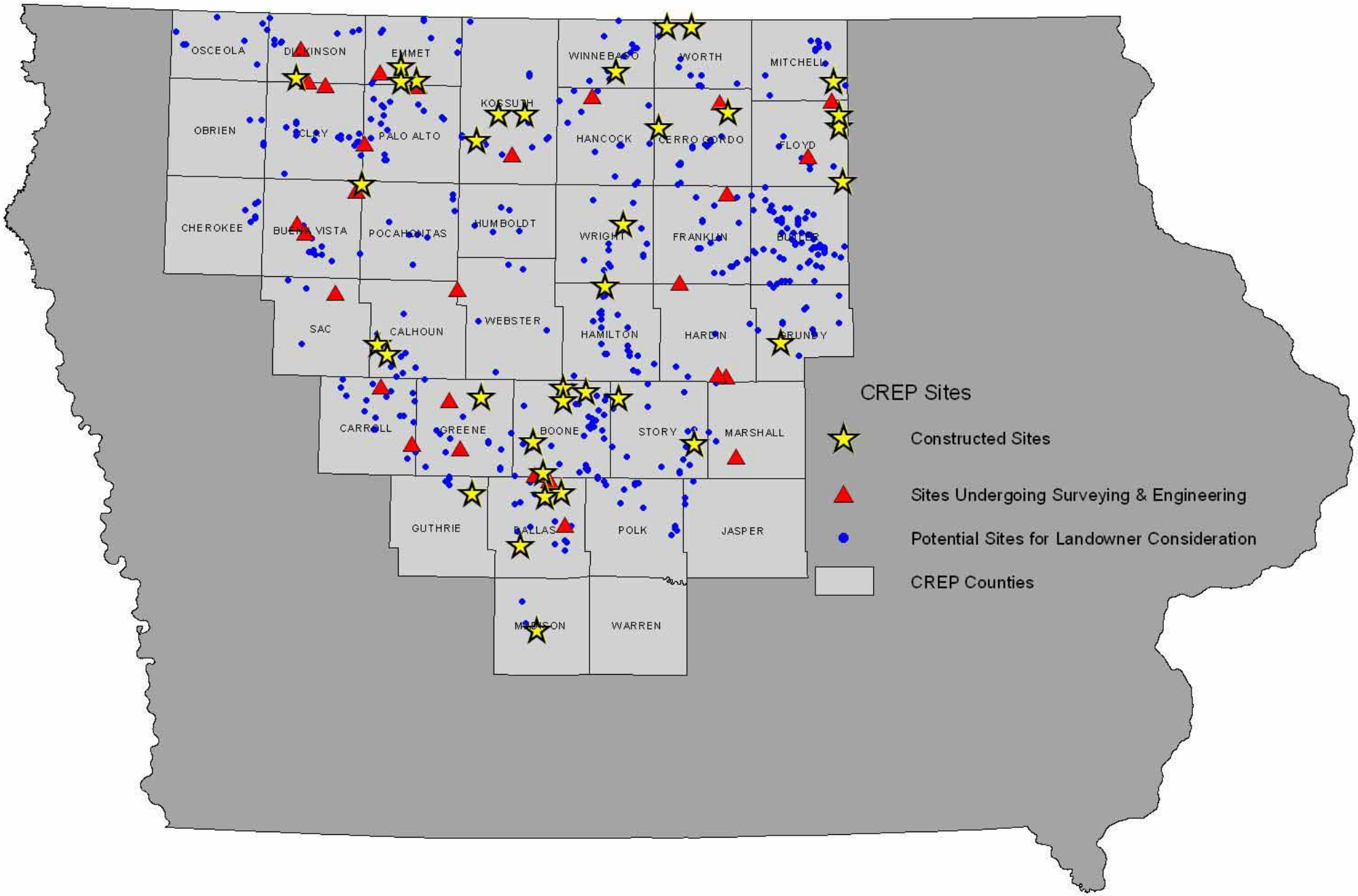
Iowa Conservation Reserve Enhancement Program



Iowa CREP Status

- 35 wetlands restored/constructed
- Current ‘waiting list’ of landowners for enrolling
- 72 wetlands restored, under construction or design
  - 715 acres total wetland pool
  - Remove 40-90% of nitrate from 86,100 acres
  - Estimated nitrate removal over practice lifetime is 53,600 tons
  - Nitrogen removal cost $0.23/lb, below current cost of fertilizer N

Iowa CREP - Nitrate Removal Wetlands (2008)



A Pilot Program for Integrated Drainage and Wetland Landscape Systems

Targeted Water Quality Wetlands Pilot

Situation

- To reduce the size of the Gulf of Mexico Hypoxic Zone - at least **45% reductions** in both riverine total nitrogen flux and riverine total phosphorus flux are needed
- Nitrate removal wetlands shown to be effective in removing nitrate
- Optimal drainage capacity has the potential to reduce surface runoff, phosphorus & other SRO contaminants
- Market driven, public/private partnerships will be essential to achieve these nutrient reductions at full landscape scale

Current Conditions

- Deteriorating drainage infrastructure that will need replacement in next 10-30 years
- Most farmed wetlands have drainage installed, but the drainage system capacity is too low to provide adequate drainage for good crop growth
- Farmed wetlands result in high losses of nitrogen fertilizer as result of denitrification
- “Worst of both worlds”- Poor crop production- Little wetland function

Future Vision

- “Engineer” the watershed for better drainage and wetland function
- Set aside areas where wetlands can be established.
- Allow wetlands to be used for mitigation of farmed wetlands in the watershed
- Allow higher capacity outlet systems to be installed to provide better crop production
- “Best of both worlds”- a win-win situation

Goals

- Reduce the loss of subsurface flow contaminants (primarily nitrate)
- Reduce surface runoff and loss of surface runoff contaminants (e.g. phosphorus, pesticides, sediment, and micro-organisms)
- Optimize crop production, yield, and profitability
- Increase habitat and ecological functions of the landscape
- Reduce N_2O greenhouse gas emissions

Drainage Design

- Majority of Des Moines Lobe is artificially drained with tile drainage systems installed in early to mid-1900's
- From surveys performed in 1980's many drainage systems have a drainage coefficient of <0.25 in/day (some <0.10 in/day)
- Modern drainage systems will be designed with a drainage coefficient of 0.5-1.0 in/day

Pothole Depression Typical of Farmed Wetland May 2007

Same Pothole Depression June 2007

Kossuth County – 0.4 Acre Farmed Wetland with Crop Loss Spring 2007

Public/Private Partnership for Achieving Full Landscape Scale

Iowa Drainage Districts

- 3000 drainage districts in Iowa manage common-outlet drains for 6 million acres
- Governing boards of trustees (typically county board of supervisors)
- Extensive statutory & case law base
- Taxing powers
- Power of eminent domain
- Construct and maintain drains

Wetland mitigation with “in-kind farmed wetlands” paid by landowners enhanced to achieve nutrient removal with CREP $

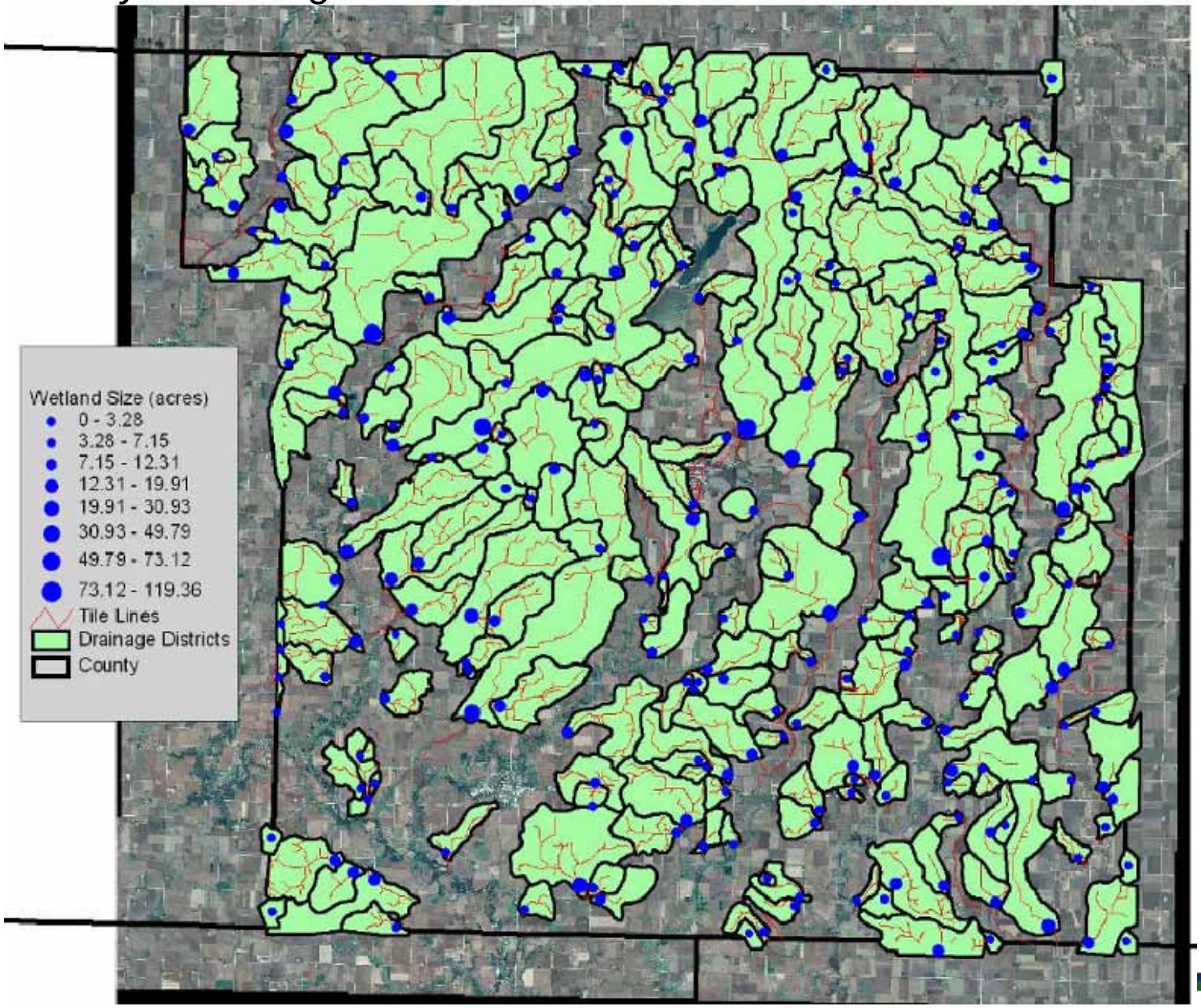
Hand digging tile, Boone Co. IA. ca 1914

Source: 'An Iowa album: a photographic history, 1860-1920' by M. J. Bennet, University of Iowa Press, Iowa City, Iowa

Pilot Demonstrations

- 2012 – 25 pilot demonstrations
  - Study sites to confirm water quality, wetland function, & crop yield benefits
- 2020 – if initial pilots successful & benefits documented, expand to additional 200 pilots
- 2050 – projected target for implementation across 6 million acres of Iowa drainage districts

Calhoun County – Drainage Districts & Potential Nitrate Removal Wetlands



Benefits For Economic Stimulus

Public funding of $31 million to cost-share 25 pilot demonstrations, will spur privately-funded infrastructure developments of

- Year 2020 – 200 pilots, $390 million infrastructure
- Year 2050 – adoption across 6 million acres & 3000 DDs, $4.05 billion infrastructure
- At 7.7% crop yield increase, $400 million/yr in additional taxable net income

Summary

- Flat, low-erosion drained landscapes are environmentally-preferred for production of row crops
- Over the next decades the existing drainage systems in Iowa's drainage districts will be replaced due to age and structural failures
- Critical Issue – will these replacement systems be designed to maintain the 'status quo' or to optimize these landscapes for both environmental benefits and crop production?

Hydrology

2008 Iowa Floods/Storm Events Lessons Learned

- Consider “hydrologic footprint” – all actions
- New water storage/infiltration initiatives
- Accelerate no-till/residue management
- Expand “conservation systems” approach
- Increase practice maintenance
- Increase planning on farm/watershed level

Union County – Hydrology

Road structures collect and store runoff water, capture sediment, and reduce the impacts of flooding.

2008 Iowa Floods/Storm Events Proposed Vision

- Flood impact prevention
  - Hydrology study – effect of practices, drainage
  - Cost-share $ to increase water storage
  - Statewide LiDAR for planning/design
- Urban practices – technical assistance
- Maintenance and restoration
  - Conservation practice repair
  - Low interest loans for maintenance
  - Increased technical support for repair and new practices

Needed Research

- Role of streambank and bed erosion on stream
  - sediment loads
  - phosphorus loads
- Questions concerning our ultimate capability to reduce sediment and P loads given stream dynamics

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