Agricultural Drainage Well Closures (and related Groundwater Quality) in North Central Iowa

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Winter 2024 – quick update

- GWPC UIC Winter Meeting, Oklahoma City
- ADW Project in Iowa: Where are we at? WRAPPING UP!
- A little bit of discussion on why this long-term project was a success…..

Presentation Overview

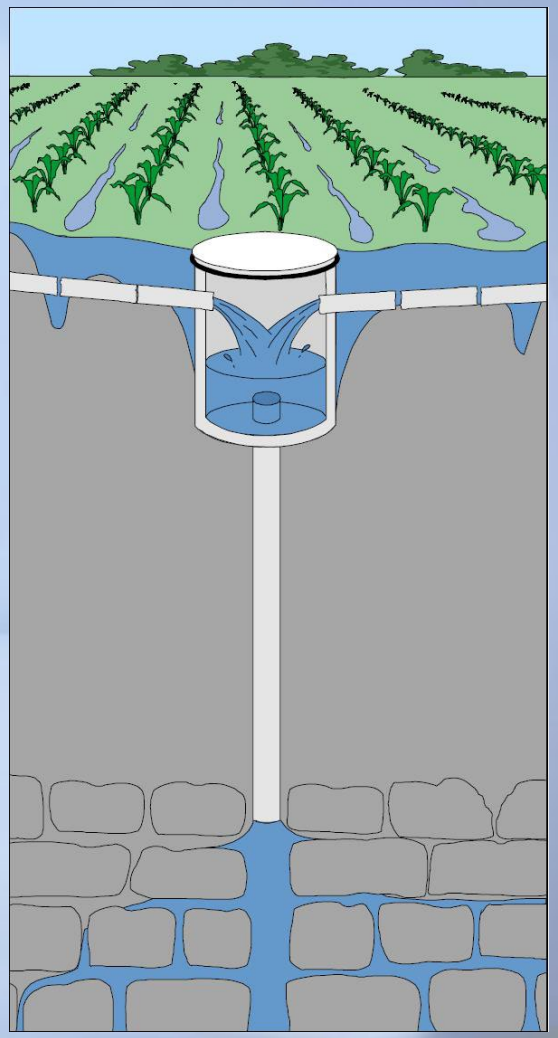
- What are Ag Drainage Wells?
- Where is the problem in Iowa?
- State's Permitting program, State's Closure program
- Quality discussions
- 2014 Update, 2022 update, Project Sunset

Overarching Concept

- Agricultural drainage wells constructed in IA in early 1900's to provide outlets for surface H_2O runoff & cropland tile drainage. A drilled shaft funnels drainage water into existing bedrock. FLAT land. In Iowa, proximity to Mississippian aquifer (Wright, Humboldt-Pocahontas Co.) & Devonian aquifer (Floyd Co.)

What are Ag Drainage Wells?

- Wells channel drainage
  - Use tiles to collect water
  - Send water downward to aquifer
- Problems arose (contamination, mostly bacteria, and also some nitrate)



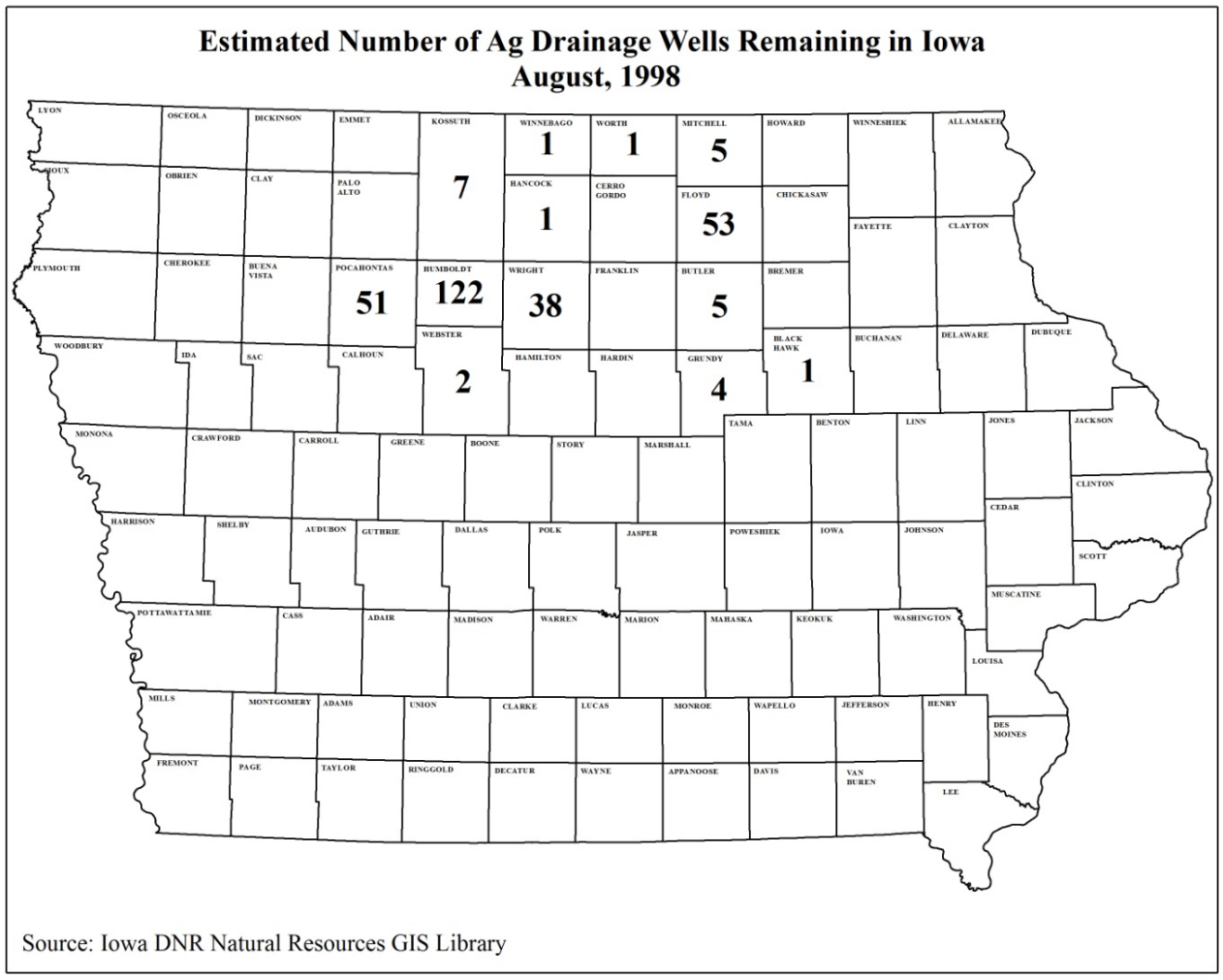
EPA role

- EPA has authority over ADWs under SDWA's Underground Injection Control (UIC) program. ADWs are considered Class V injection wells, & DNR has not assumed primacy in IA. EPA required the registration of ADWs, but didn't pursue specific action to close or modify ADWs, as EPA generally considers Iowa ADWs to be a somewhat low risk. The presence of a specific State program helped.

Iowa Geography

- Glacial Advance
  - Left Fertile Land
  - Poor Drainage
- Karst Topography
  - Limestone Aquifer
  - 12,700 Sinkholes

Problem in IOWA)



Floyd Co. ADW Research

Floyd County Closure Project

- Contaminant Levels
  NO_3 Pesticides/herbicides
- Three ADWs closed by Iowa DNR
- Groundwater monitored
  - Bedrock piezometers
  - Private Wells in Proximity

Floyd Co. results

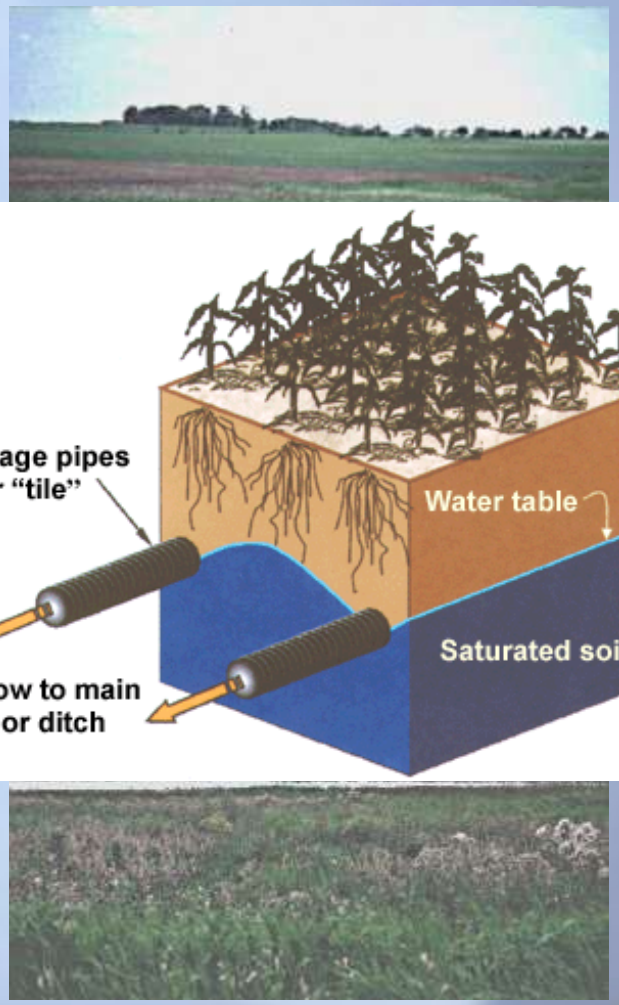
- Closure pilot project showed impact
  - Over $5.2 million to aid closure
  - All wells currently below EPA standard
  - Continue to monitor NO_3 (and other chemicals)
  - Observe infiltration through sinkholes
  - Mostly wrapped up by 2005

Switch focus to N. Central Iowa

- Switch talk focus to the funded IDALS closure project
- Grew out of the 1987 Iowa Groundwater Protection Act

"New" Solutions

- Drainage control systems
- Wetlands
  - NO3: decrease 70%
  - Herbicides: decrease 90%



Detailed N. Ctrl. geology

- Mississippian aquifer underlain by Ordovician shales. Kinderhookian Series of the Mississippian aquifer dominates.
- Top of formation is about 1050 feet MSL (100 feet beneath the surface). Aquifer thickness 200 feet.
- Limestone and cherty dolomite.

These wells suffered Benign Neglect

- Pollution potential (bacti, NO3, herbicides)
- In worst cases, road salts, oil/grease, septage, feedlot effluent
- Geographic position made access to drainage ditches difficult
- Large deliberate transfer of contaminated H_2O

Some history….

- The project represents the result of an extensive 45-year technical and regulatory effort, with two State agencies and the State Land Grant University involved.
- This series of slides will show how the target "moved" over time….

Advantages for ADW closure?

- Reduce vulnerability
- Low cost relative to alternative drainage
- Evidence of existing demonstration projects in Floyd County

- *Environmental acceptability!*

Process was driven by CAFO "vulnerability issue"

- Iowa Environmental Council
- Series of "lobbying" presentations highlighting digital photographs.
- Spearheaded in late 1990s

Iowa's Legislature.....

- Alternative drainage assistance program targeted funding (75% cost share funds).
- Developing alternative drainage outlets to surface streams.
- Well integrity concern, without specific instructions.....Iowa DNR interpreted to include berming, locked access covers, etc.

Humboldt County (wetland conversion project)

Humboldt County (alternative drainage)

Closure Project Impact

- Original universe was ~ 600 ADWs
- 292 wells in 1998. 202 permits issued by 1999.
- Dropped universe to ~ 155 by about 2002.

#'s reported to Legislature

- The process suggested there might be 350 or more ADWs in IA, but only 202 continuing use permits were issued in the 1999 – 2002 period. Some registered ADWs closed by July 2002 and some were found not to be actual ADWs. 16 were re-classified as holding basins or improved sinkholes following IDNR field verification.

Where were we fall 2008?

- Down to 141
- May, 2009 expiration of permits. All had "certification" of engineering study
- All had GIS coverage update
- Effort was made to address septage issue
- Effort to physically inspect each remaining ADW

Policy Discussions

- August 2007: DNR discuss how to proceed with ADW continued use. DNR's position is permits be renewed as long as permittees comply w/ current requirements. This needed:
  - A letter (FOs, IDPH, & county sanitarians) to all permit holders that outlined permit requirements & what DNR intends to do (done August 31, 2007)
  - Brief DSC of DNR's ADW plans. (done Sept. 2007)
  - State legislators from the impacted areas contacted simultaneously with similar information. (done Oct. 2007). Specific meetings held with Reps Sweeney and Mertz.

Septic issue

- IGS examined the 112 remaining wells and determined which might have a residence close enough to be concerned re/ septic issues. IGS also determined if any county tiles lead to ADWs. GIS maps of the closed, scheduled-to-be-closed, and remaining wells included.
- ~ 95 ADWs inspected.
- F.O. staff contacted county sanitarians and examined the DNR data, to determine if residences had approved on-site wastewater system.

Framing the septic issue

- Historically, many of the on-site wastewater systems in rural IA consisted of a septic tank with a "straight pipe" to the nearest ditch, creek or river. In the flat land drained by ADWs, surface outlets for the septic tank effluent were often unavailable, so septics were connected directly to an ADW drainage system.

Septic issue, cont.

- Letters sent to permit holders who had a residence that may drain to an ADW. Permittees allowed to offer evidence of properly functioning septic systems.
- For those residences that continued to be in question after a GIS search, consultation with the county and request for information, These alternatives may include monitoring, dye testing or other options. (Cost born by the permit holder).
- Problem far less prevalent problem then we expected.

How?

- Sampling any inflow at the ADW wellhead during winter when the ground is frozen provides an initial “screening level” assessment. If there are visible signs of inflow during winter, it suggests septic effluent inflow, especially if there are signs of septic conditions.

So where were we end of 2009?

- 85 wells left by 2009!

Let's look at quality in more detail

- Iowa DNR samples collected 06-04-2009
- Presence of Lorsban, Roundup (glyphosate)
- Moderate E. coli, followup high
- Nitrate 9.5 mg/L, 12.3 mg/L NO3 as N
- All this is now re-directed to surface waters

Politically charged?

- Let's expand the discussion --- what about lessening the nutrient loading to streams since we've shifted the discharge from subsurface to surface?
- Hypoxia a very sensitive subject in Iowa
- We've taken a lot of credit for our work here, but....
- We've also hesitated to spend more $ in Floyd

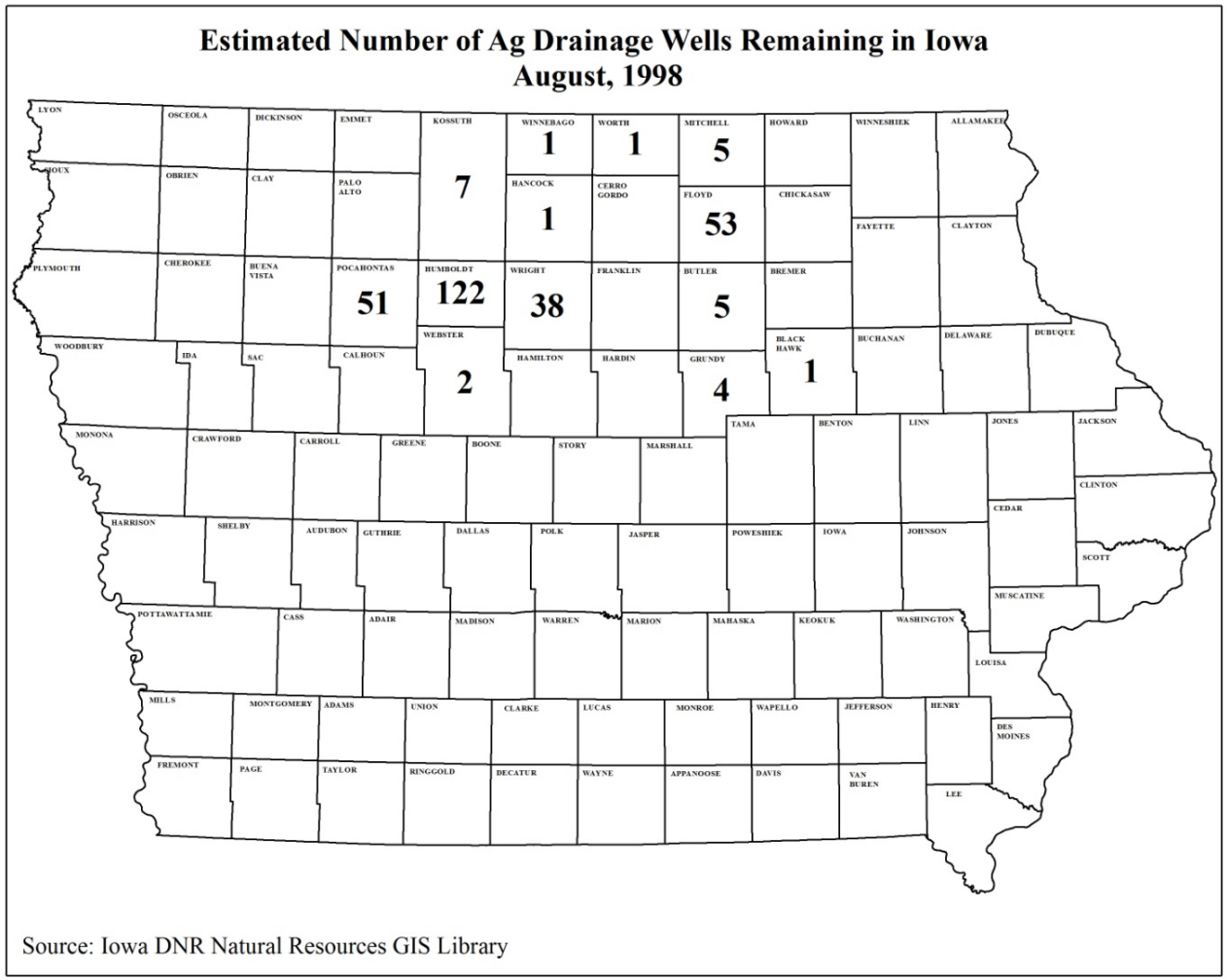
Re-channeling runoff?

- The closure of a particular ADW that drain to a shallow unconfined aquifer, for instance, might accomplish little because the presence of many sinkholes that already channel surface water flow into the aquifer. Diverting ADW drainage to a surface outlet may just change the location the water enters the aquifer.

Where were we fall 2013?

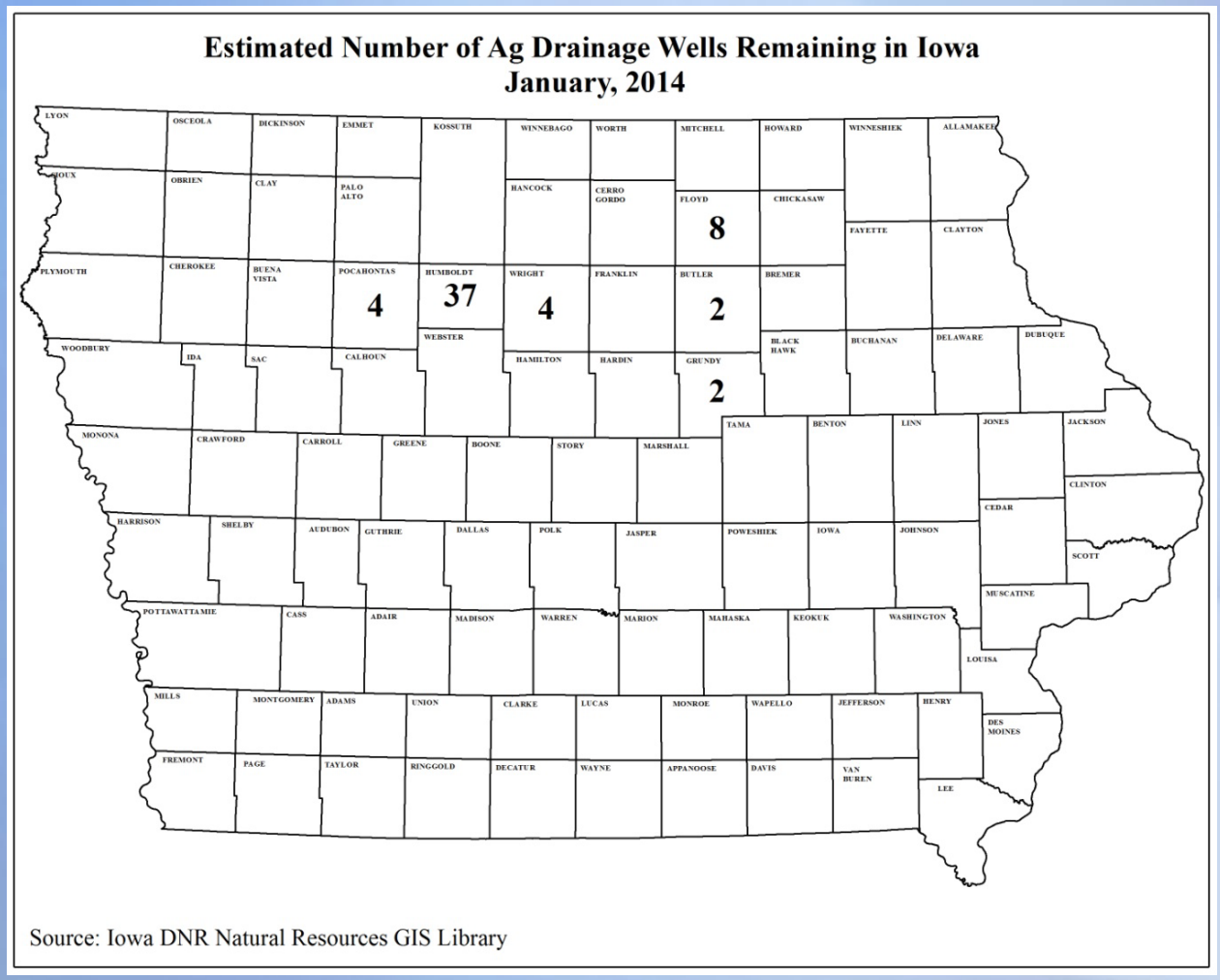
- 57 wells, will be 54 by end of 2013
- May, 2019 expiration (for most of the renewed permits…)
- Septage issue “mostly” resolved
- IDNR actually “bought” three, closed each and build a wetland reserve in each case…..number fell below 50

Where we were in '98



Source: Iowa DNR Natural Resources GIS Library

Where we were 2014



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UPDATES!

- By 2022 – 13 left.
- 7 / 13 in Floyd County. 6 closing over the fall. PROOF necessary.
- ALL "outliers" scheduled to close 09/01/2024; letters from Iowa DNR reminding of obligation.

2023-2024

- 7 remaining ADWs in Humboldt County are creating wetlands & closed. The completion date is 12/15/2024.
- 2 remaining ADWs in Wright County are constructing wetlands. Completion date for that will be 12/15/2024.
- 4 remaining ADWs in Floyd County have had 3 of the tile systems rerouted with the last one to be completed this next year. These ADW's to be closed by March 29, 2024.

SUCCESS STORY!!!

- Pollution prevention.
- Environmental risk to drinking water supplies in close proximity to earthen animal waste storages was eliminated.
- Emergency situation averted.
- IEC Lobbying. General satisfaction.
- IGS/IDALS/IDNR Cooperative effort.
- 45-year effort!

Quick Credit…

Groundwater Quality Response to closure of ADWs in Floyd County, Iowa, Geological Survey Bureau TIS 40, July 1999, Seigley, Quade, & Skopec.

Mary Skopec & Mike Gannon of IDNR-GSB, Jake Hansen, IDALS; Jack Riessen in C.O., Field Office 2 in Iowa DNR.

Michael Bourland, IDALS

Questions?

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