Disappearing lakes: Groundwater levels in central Wisconsin

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Outline

• History

• Monitoring Methods

• Groundwater elevation changes with the seasons

• Vegetation influences recharge during growing season

• Vegetation impacts frozen soil and groundwater recharge

• Conclusions thus far...
The Central Sand Plain of Wisconsin
Irrigated Acreage in the Central Sand Plain

The graph illustrates the changes in irrigated acreage over time for three counties: Adams, Portage, and Waushara. The y-axis represents the irrigated area in acres, while the x-axis represents the years from 1949 to 2009.

- **Adams** shows a steady increase in irrigated acreage, starting from a low in 1949 and reaching a peak in 2009.
- **Portage** starts at a higher base in 1949 compared to Adams and follows a similar trend with a steady increase, peaking in 2009.
- **Waushara** has the highest initial irrigated area in 1949 among the three and follows a pattern of growth similar to Adams and Portage, peaking in 2009.

All three counties experienced a significant increase in irrigated acreage over the years.
Relationship between precipitation and depth to water?
Materials and Methods

• 8 Sites
  – Crops
    • Soybean (2), Sweet Corn, Potato, Oats
  – Prairie (2)
  – Pine Plantation

• Tipping Bucket Rain Gauge
• Pressure Transducer
• TDR Probe
• Datalogger
• 15 minute intervals
How does groundwater elevation change with the seasons?
Groundwater Level and Precipitation

- **6th field**
- **6th prairie**
- **6th pine**
- **Precipitation**
How does vegetation influence recharge to the groundwater table during the growing season?
Vegetation effect on recharge during irrigation season
Late spring groundwater use by plants?
Shallow groundwater and ET

- ET fluctuations apparent in soil moisture at each site
- Soil moisture constantly higher in field than in prairie
- Prairie groundwater depths also show ET fluctuations
What are the influences of vegetation and frozen soil on groundwater recharge?
Recharge under frozen soils

• Recharge volume of natural vegetation vs. harvested crop fields

• Event 1: Rain on snow December 27, 2008

• Event 2: Snowmelt (50°+ air temps) February 10, 2009
Conclusions

• Water table level monitoring at short time intervals increases understanding of interaction between vegetation, irrigation and the water table

• Tree canopy and litter layer of pine plantation inhibits precipitation from reaching the soil surface
  – Low soil water content through the summer and little to no groundwater recharge after precipitation
  – Except when soil water content is greater than field capacity after snowmelt or extended precipitation event

• Spring 2009 data shows evidence of natural vegetation using groundwater while fields are not

• Increased vegetative cover on the prairie sites insulates the soil from frost creating a greater rise in the water table in response to snowmelt events
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Questions??