Disappearing lakes: Groundwater levels in central Wisconsin

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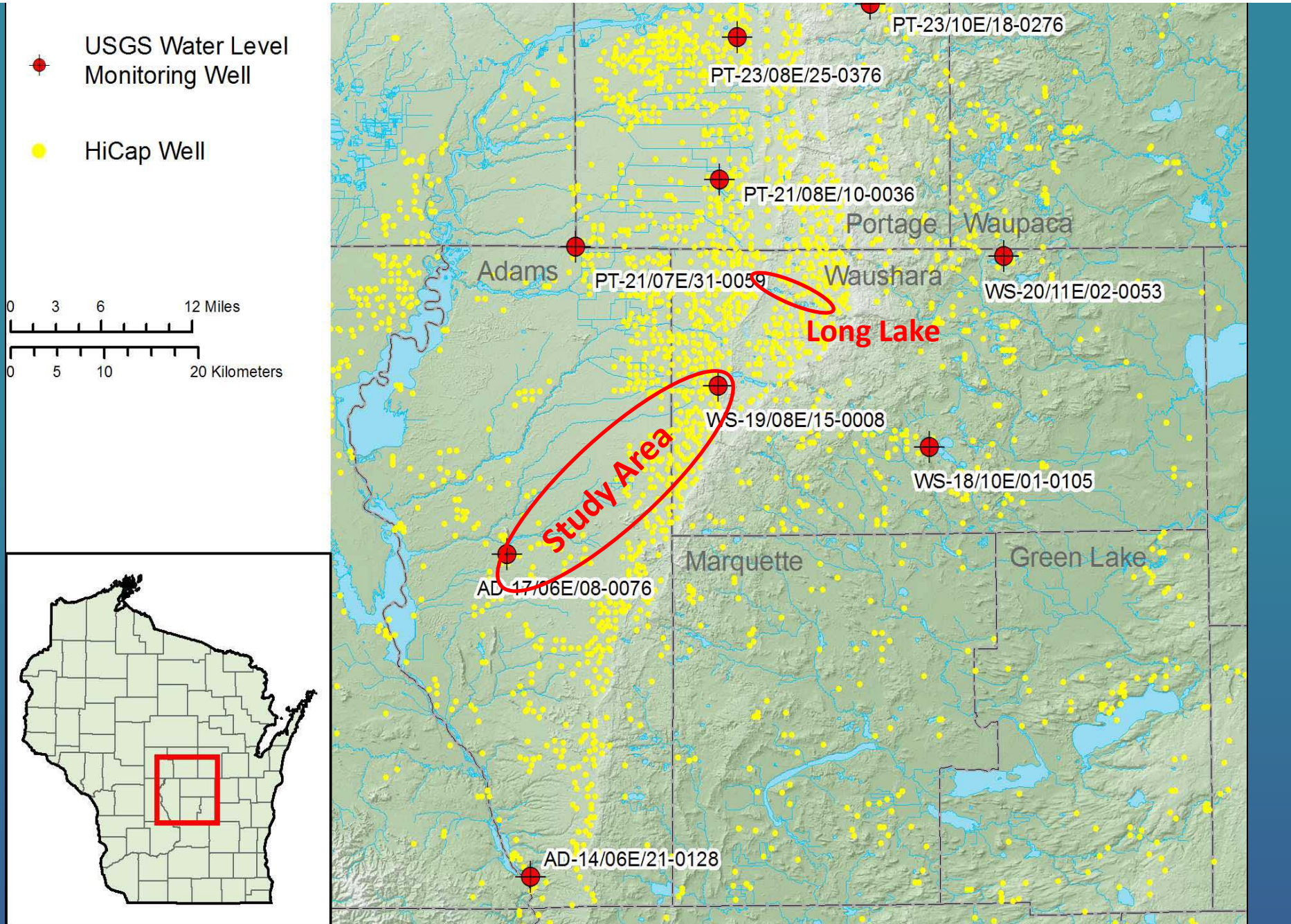
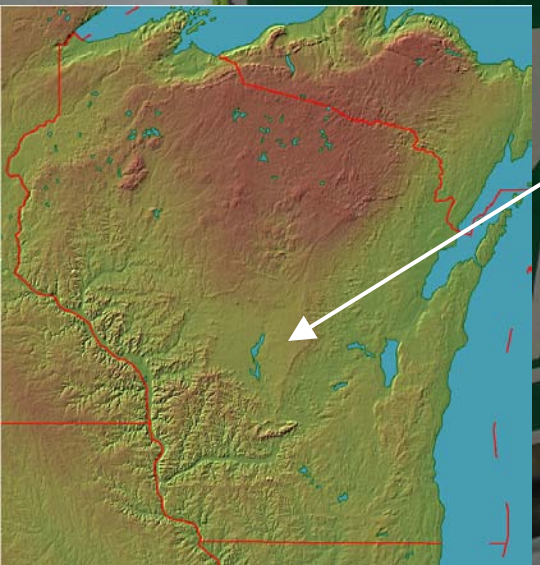
Outline

- 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

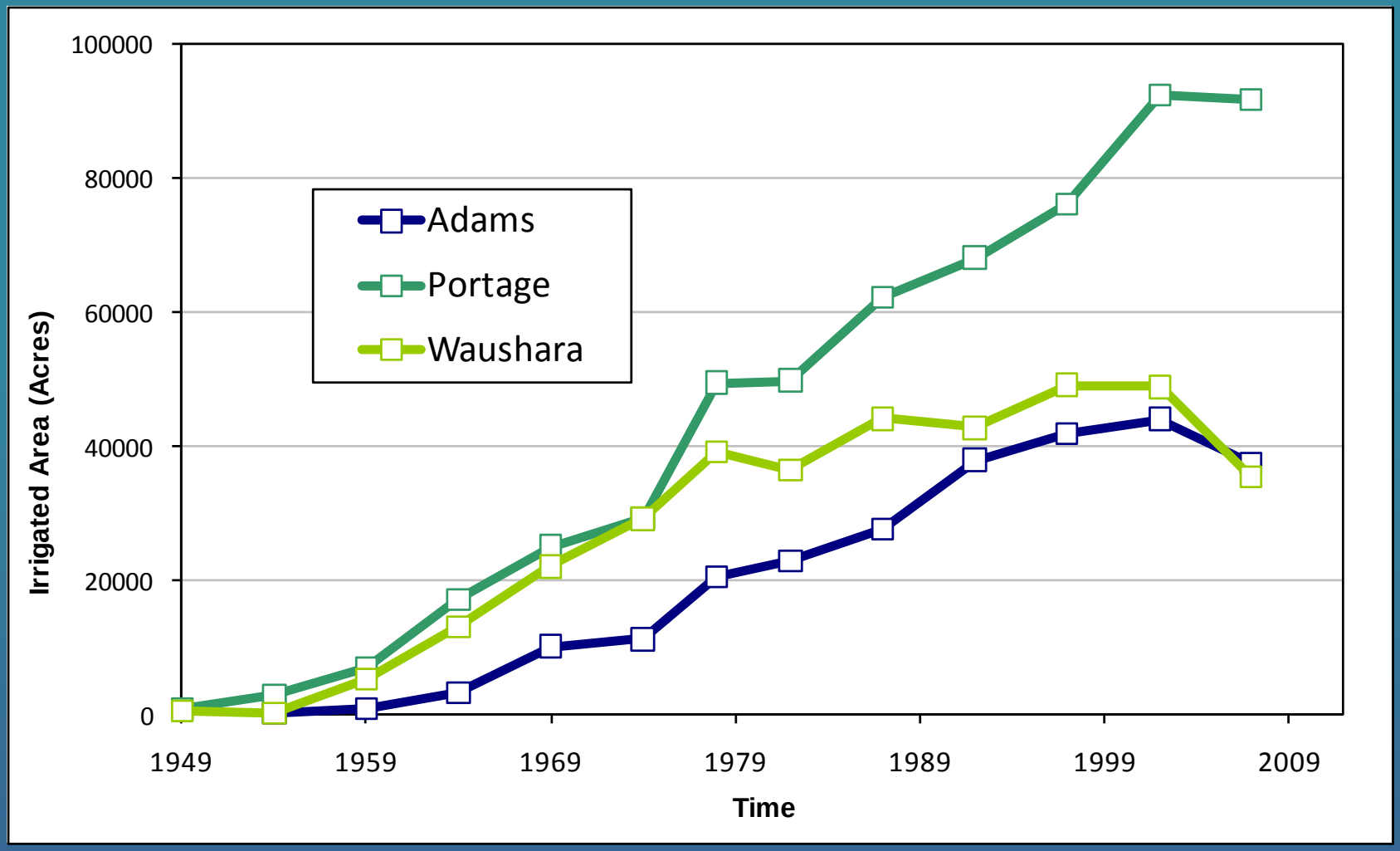


Long Lake, Waushara County, WI

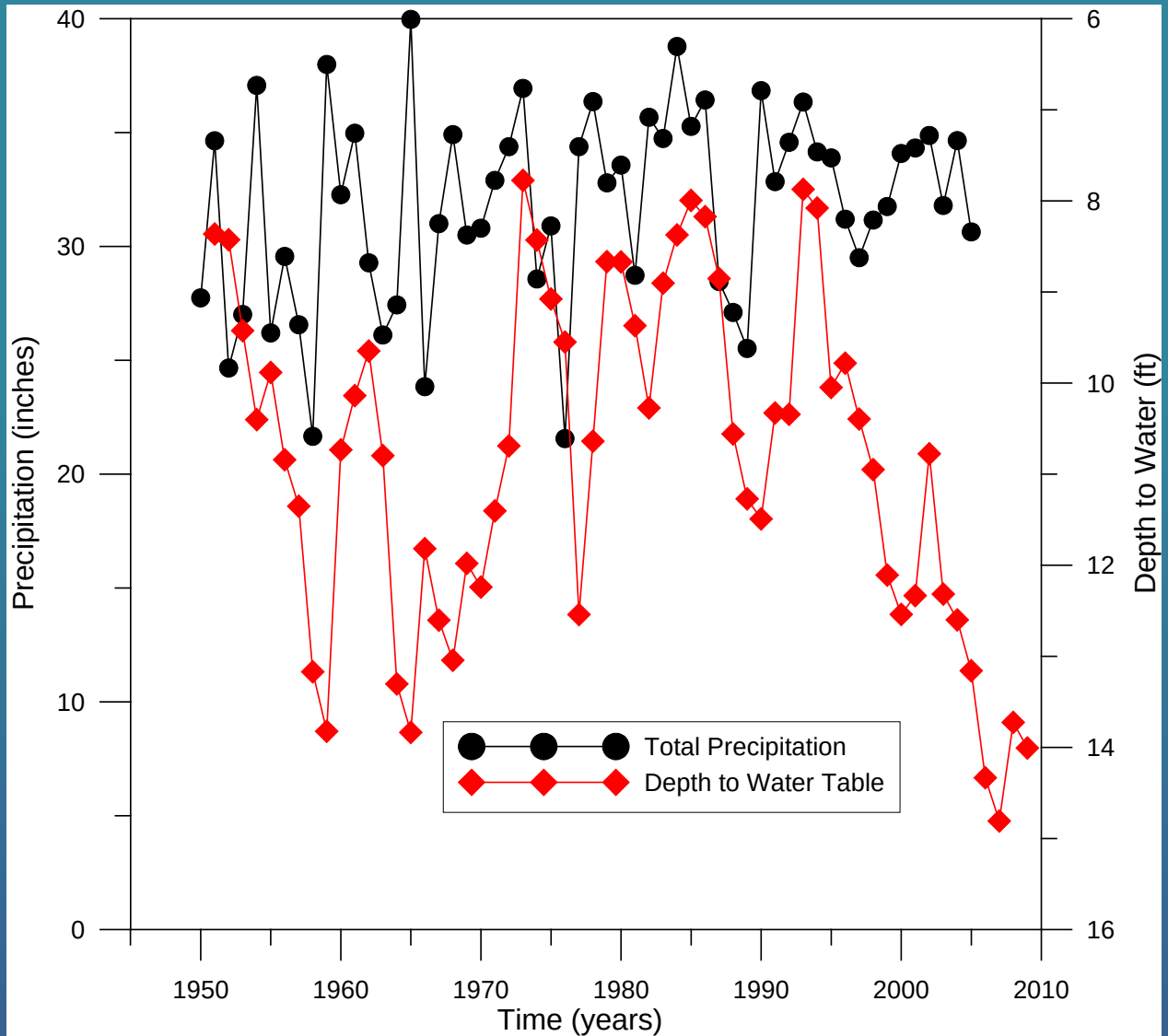


May 2008

Irrigated Acreage in the Central Sand Plain



Relationship between precipitation and depth to water?

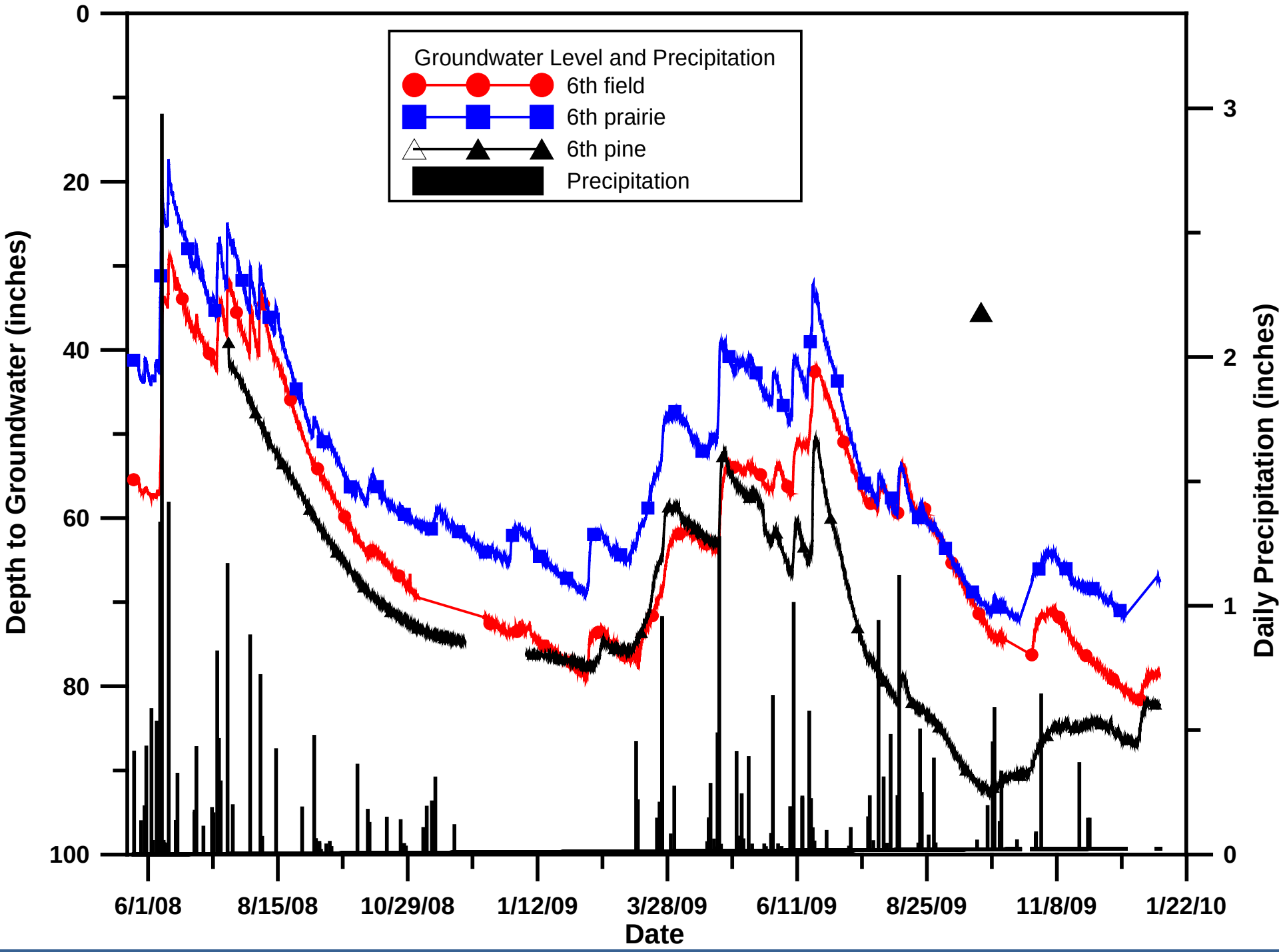


Materials and Methods

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

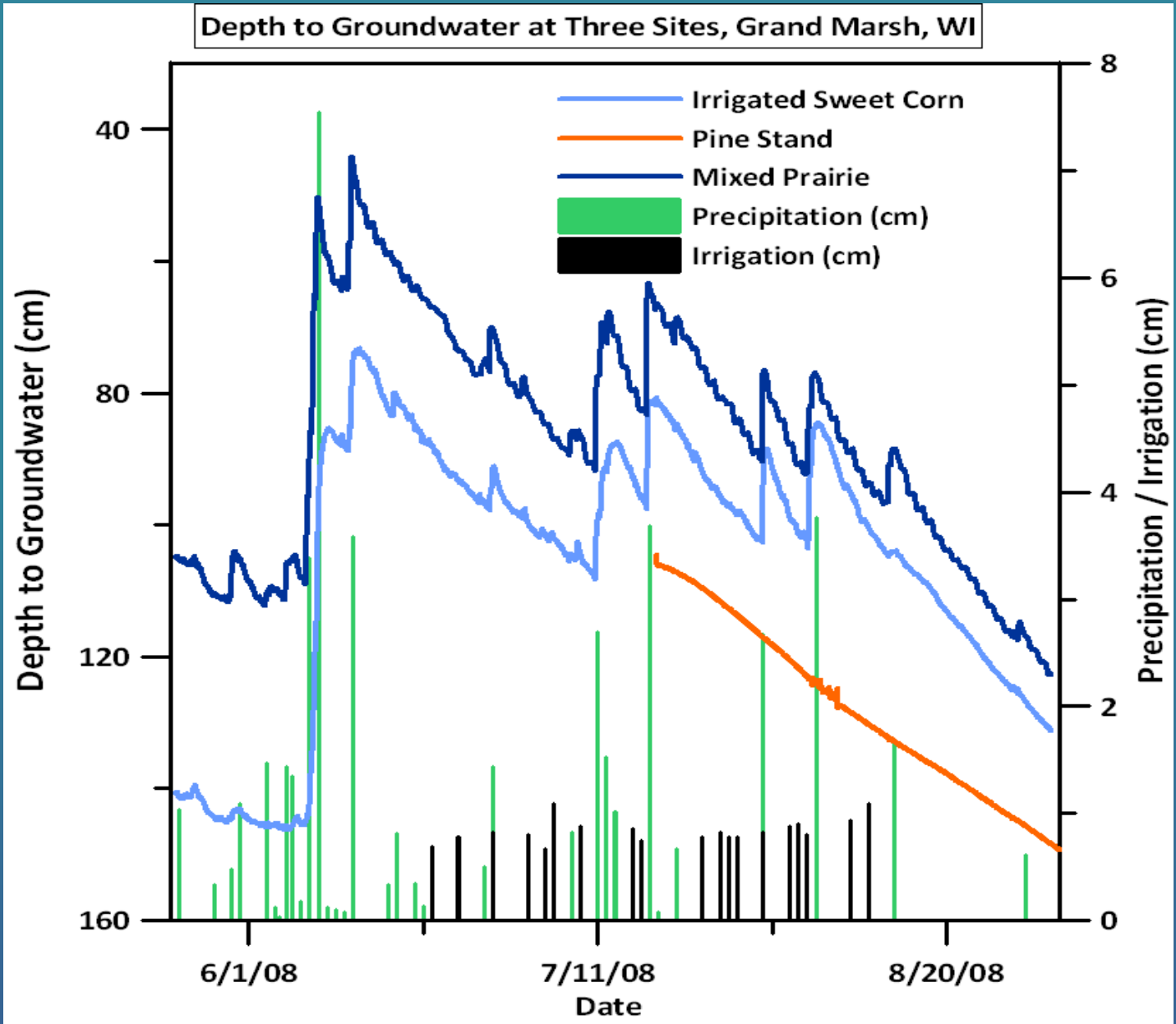
- Tipping Bucket Rain Gauge
- Pressure Transducer
- TDR Probe
- Datalogger
- 15 minute intervals

How does groundwater elevation change with the seasons?

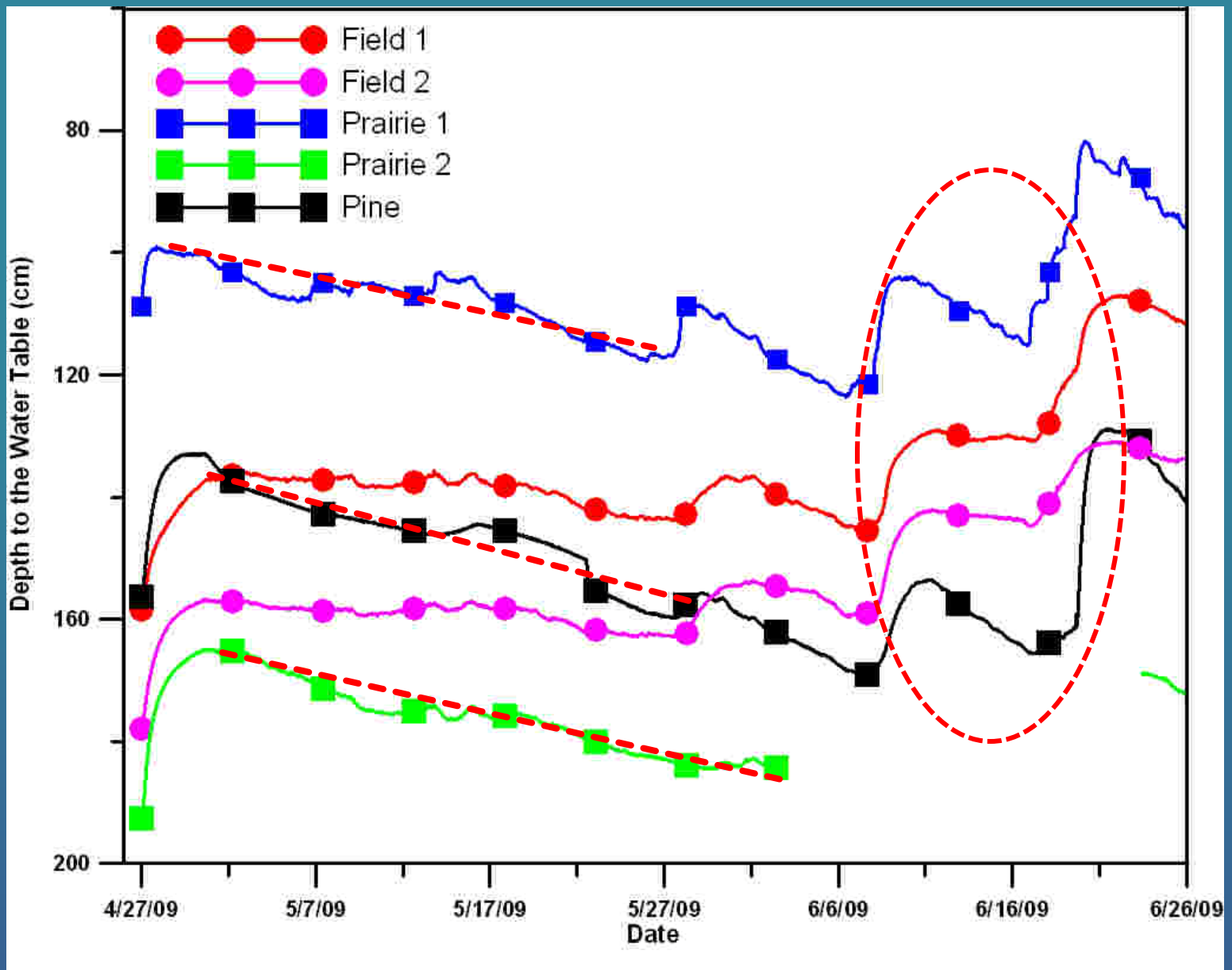

Groundwater Level and Precipitation
6th field
6th prairie
6th pine
Precipitation
Depth to Groundwater (inches)
0
20
40
60
80
100
Daily Precipitation (inches)
3
2
1
0
6/1/08
8/15/08
10/29/08
1/12/09
3/28/09
6/11/09
8/25/09
11/8/09
1/22/10
Date

How does vegetation influence recharge to the groundwater table during the growing season?

Vegetation effect on recharge during irrigation season

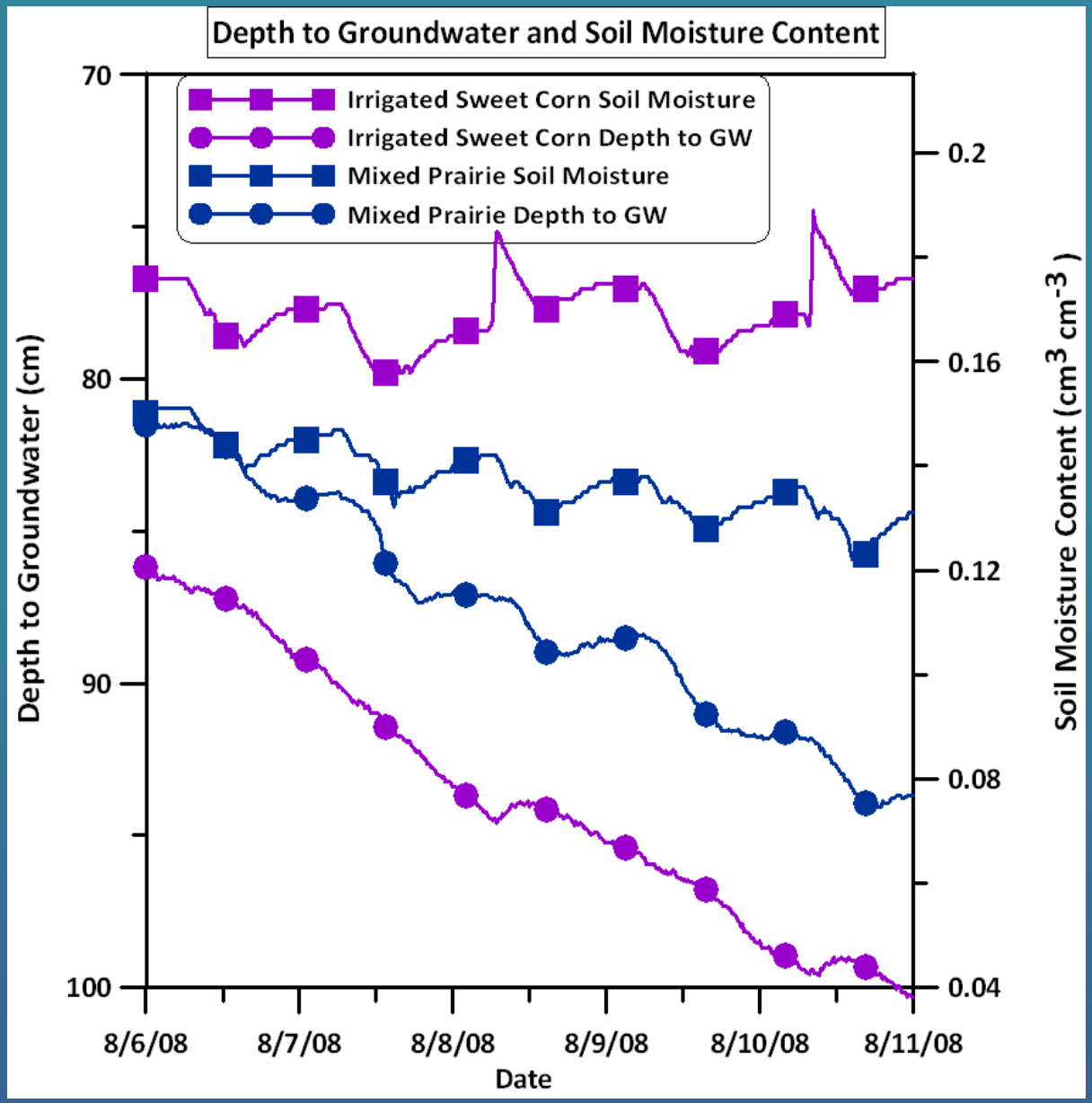


Late spring groundwater use by plants?



Shallow groundwater and ET

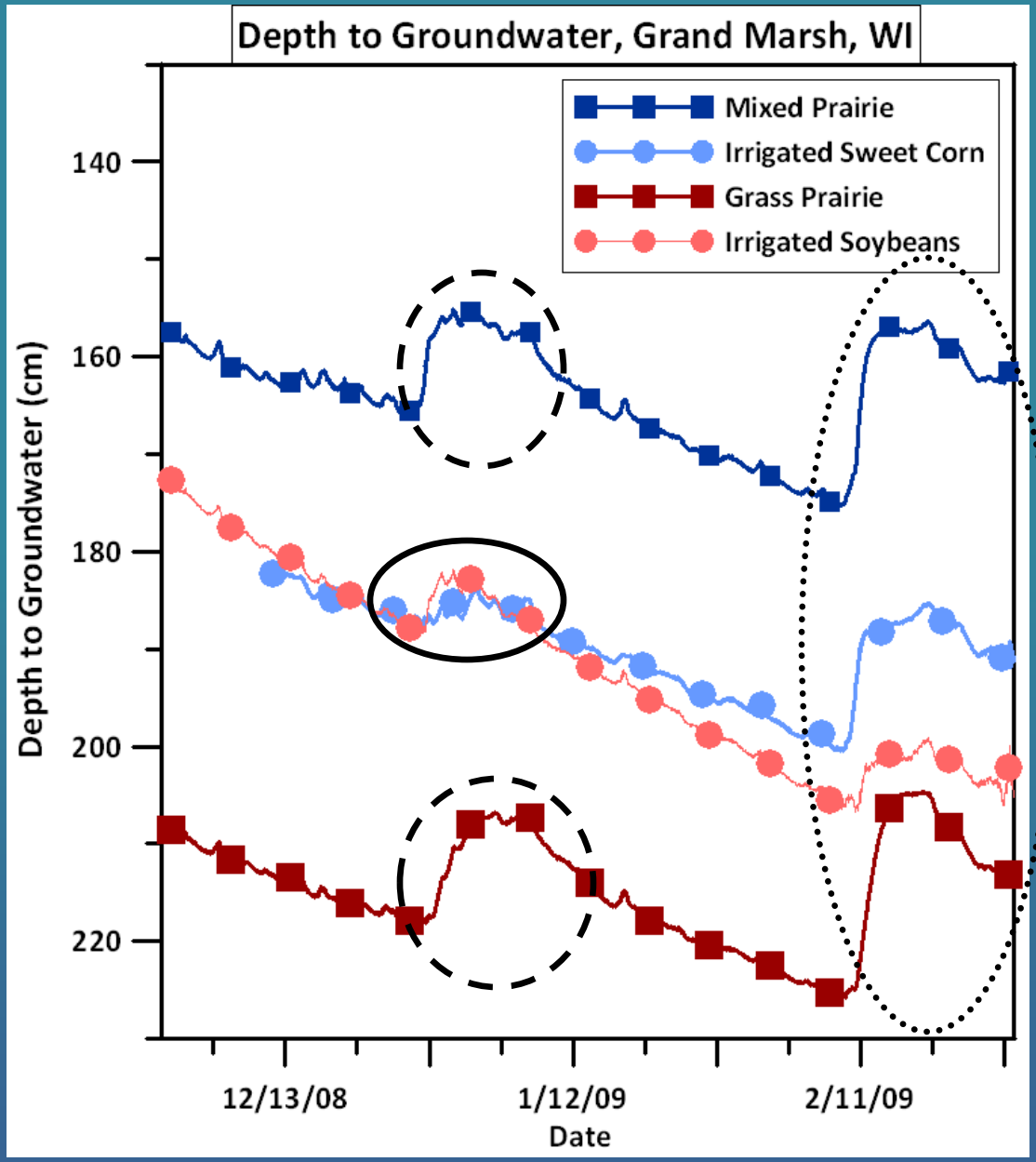
- ET fluctuations apparent in soil moisture at each site
- Soil moisture constantly higher in field than in prairie
- Prairie groundwater depths also show ET fluctuations




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??