

# Climate Signals and Ecological Impacts in Coastal Plain Headwater Seepage Wetlands

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# Headwater Seepage wetlands



- Occur at or near the base of slopes and bluffs
- Typically at the outer edge of a stream corridor
- Primary water source is emerging subsurface water

# Seepage wetland hydrology

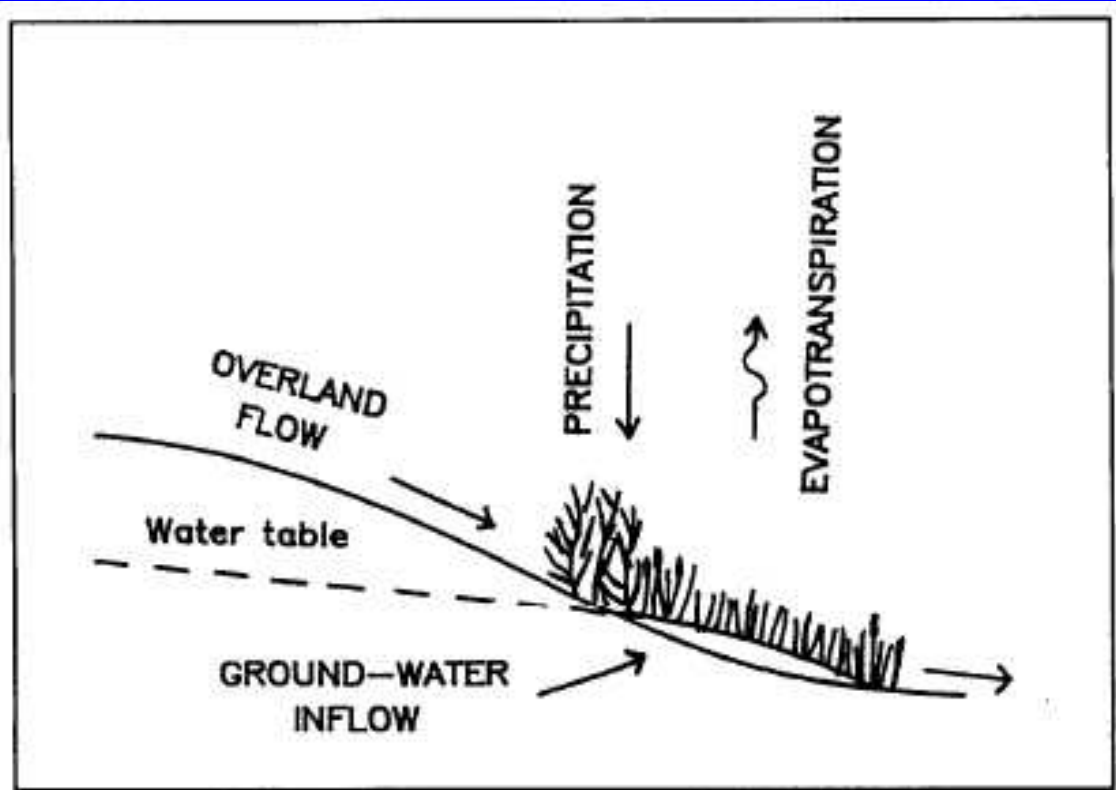
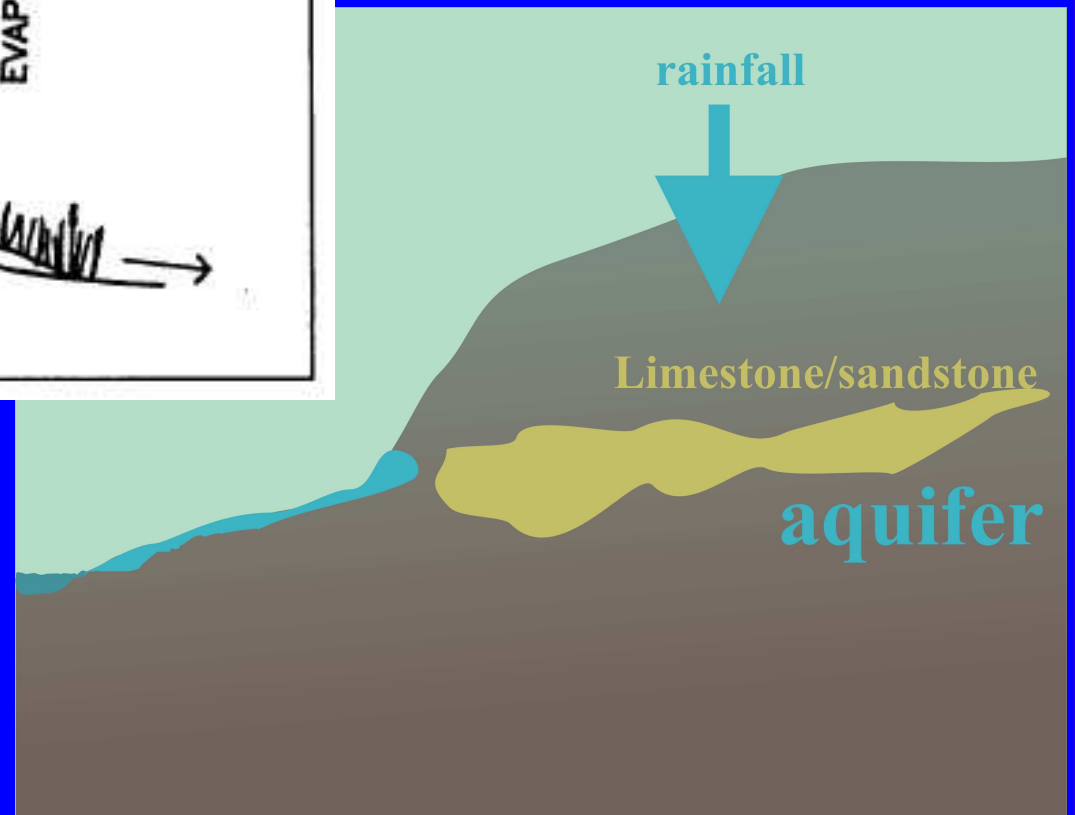
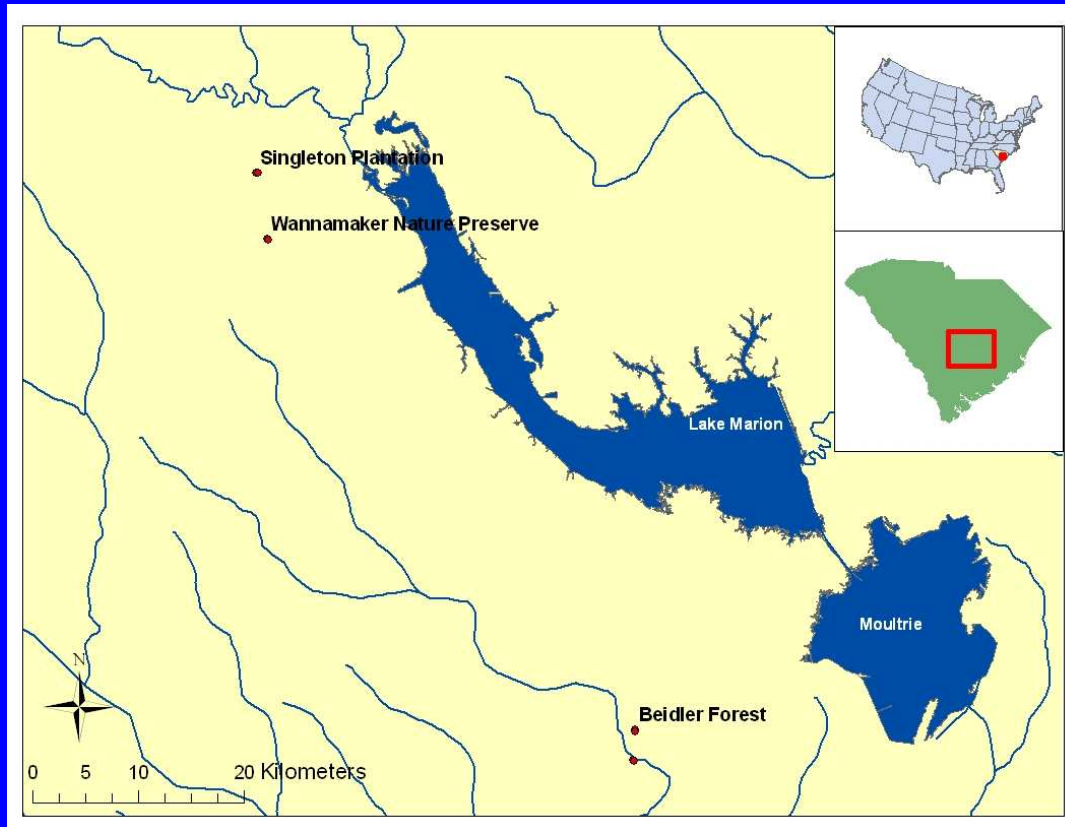


Image from Steve Bennett



From Brinson et al. 1993

# Study area



- Two seepage wetlands at each site
- Two sites in early 2005; two more in late 2006
- Two different level 3 and 4 ecoregions
- Hydrology, WQ, herps, vegetation

# Headwater seepage wetland study

- Herps and flora
  - Longitudinal and lateral sampling
  - Array of cover boards for herps
  - Marked plots for flora
- Hydrology
  - Shallow wells w/ water level and temperature recorder
  - Rain gauge nearby
- Water quality
  - YSI multiparameter sonde in situ
  - Water samples for lab analysis of nutrients, DOC

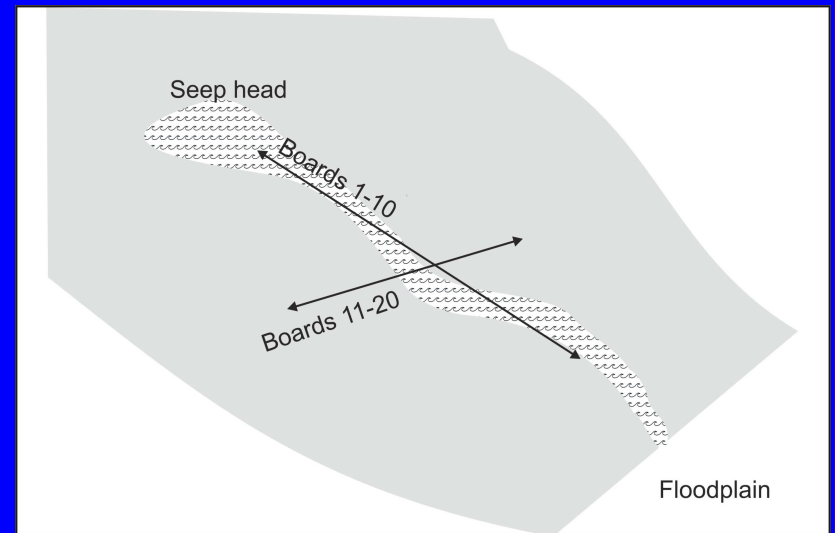
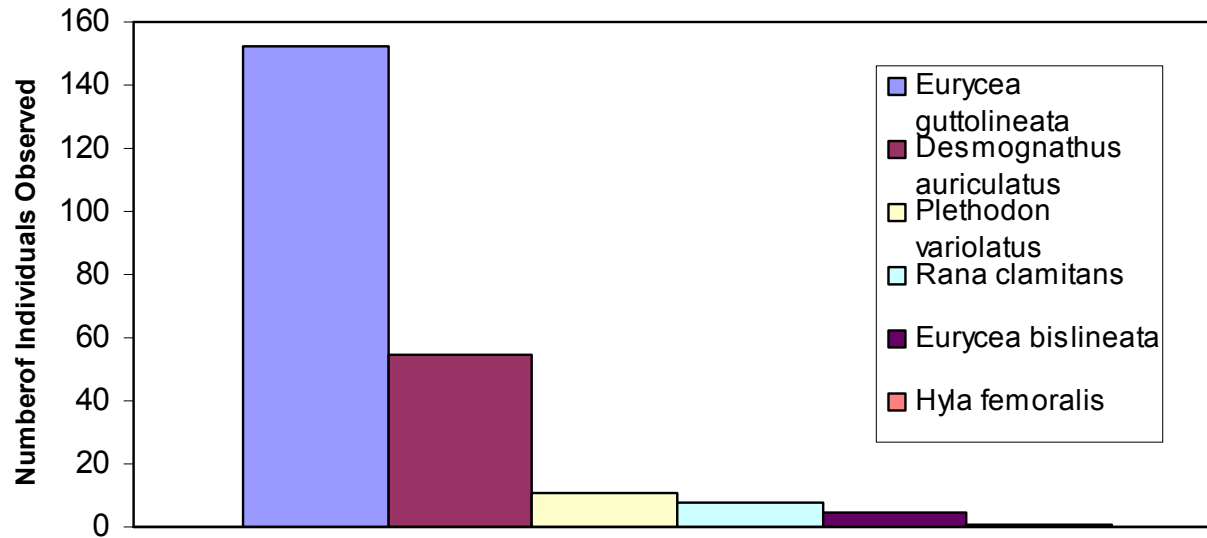


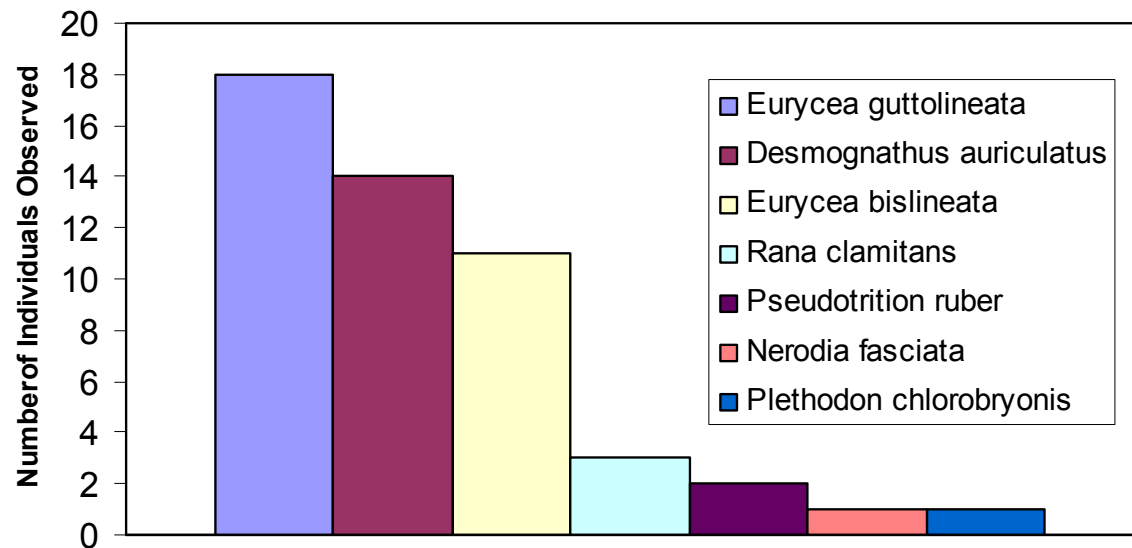
Figure 1. Placement of cover-board transects at seep.



### Total Observations by Species at Beidler Forest



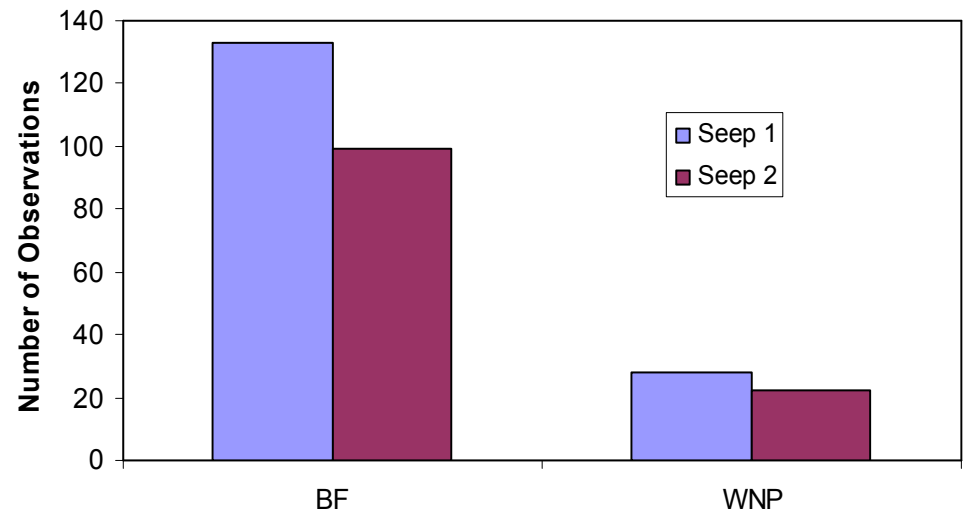
### Total Observations by Species at Wannamaker Nature Preserve



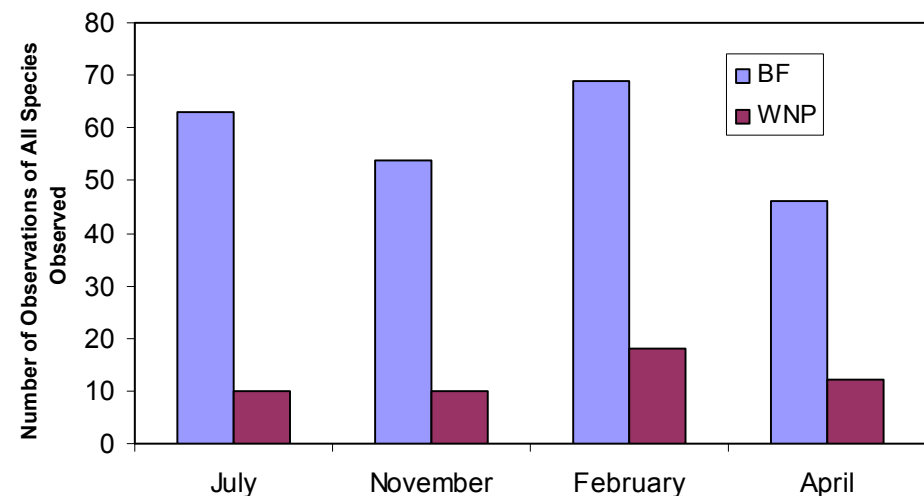
# Headwater seepage wetlands

- Inter-site differences may be due to more disperse habitat at WNP
- Intra-site differences suggests microsite habitat differentiation
- No seasonality in counts
  - Size classes may be different
  - Stable environment
- Some species appear to favor the head of seep

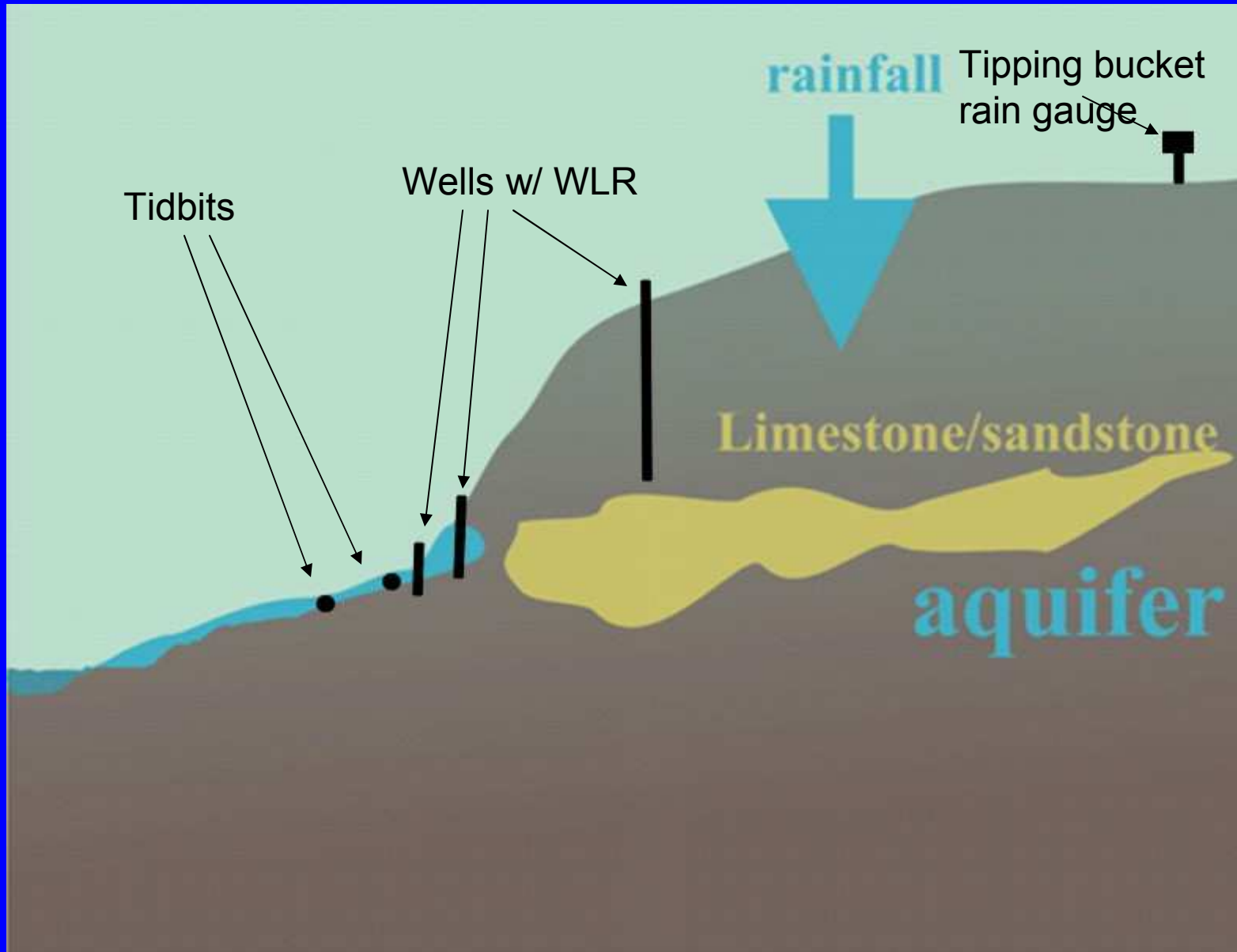
Total Observations by Seep and Site



Individual Observations by Site and Date

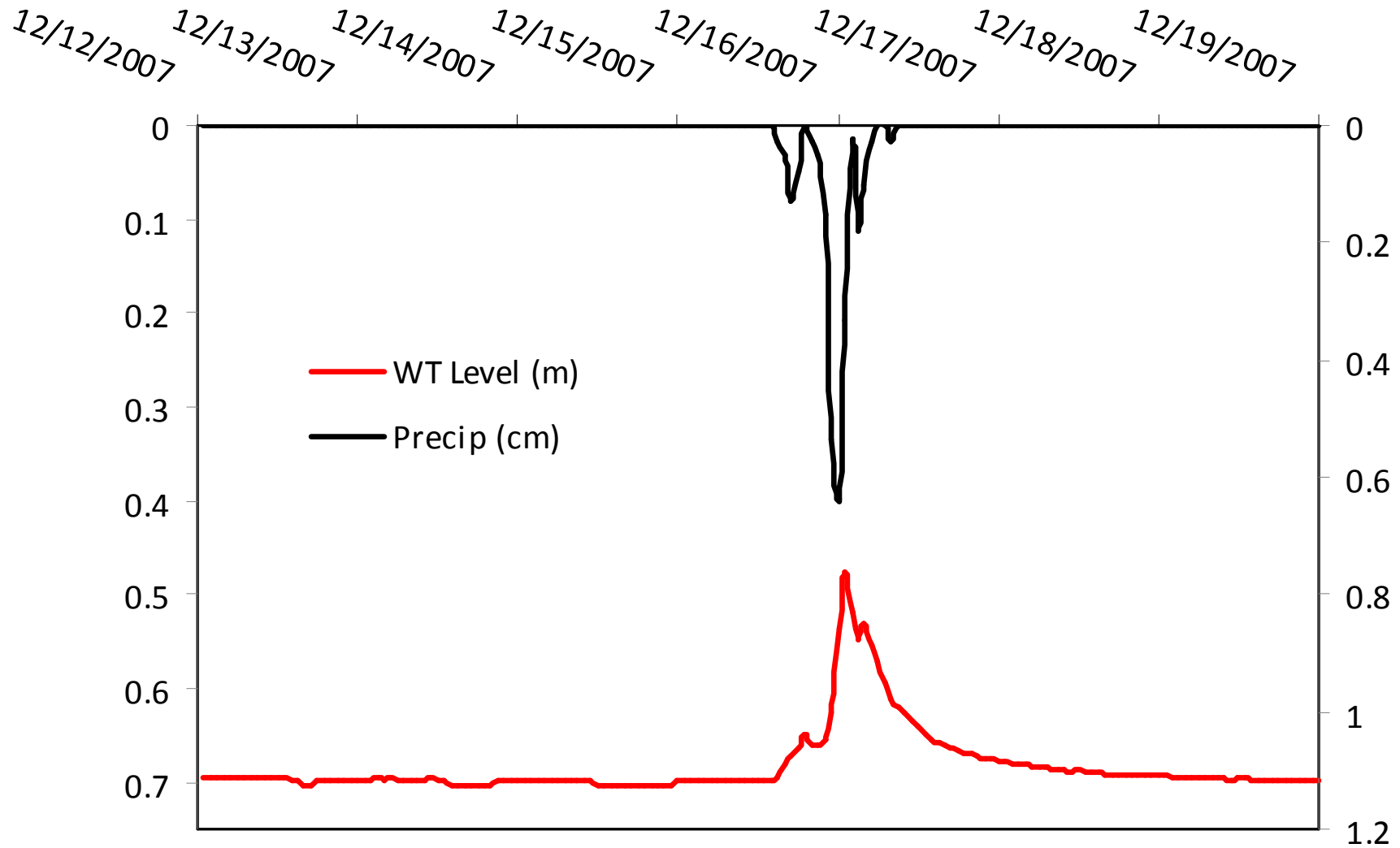


# Instrumentation

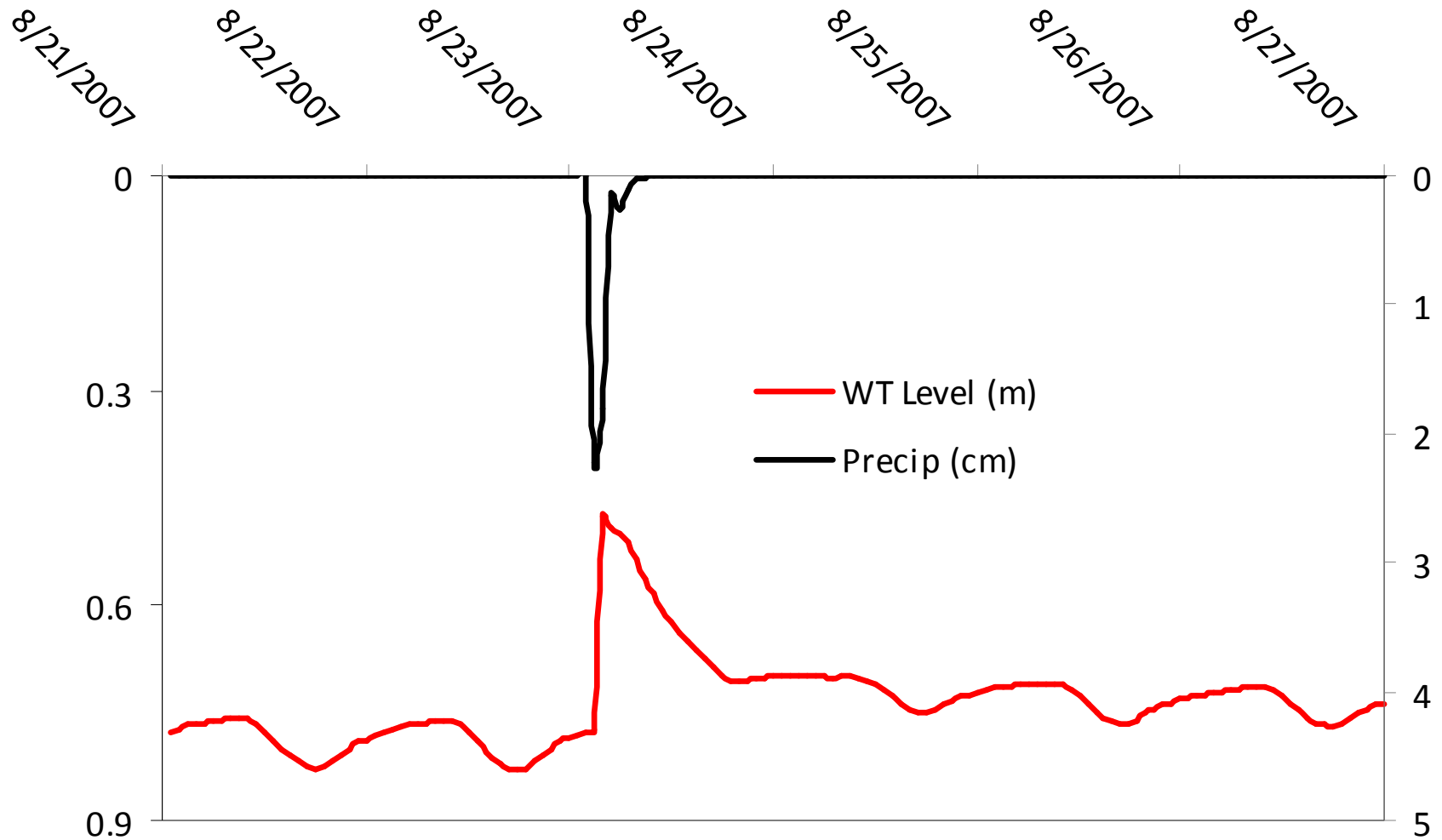




# Water table profile - winter

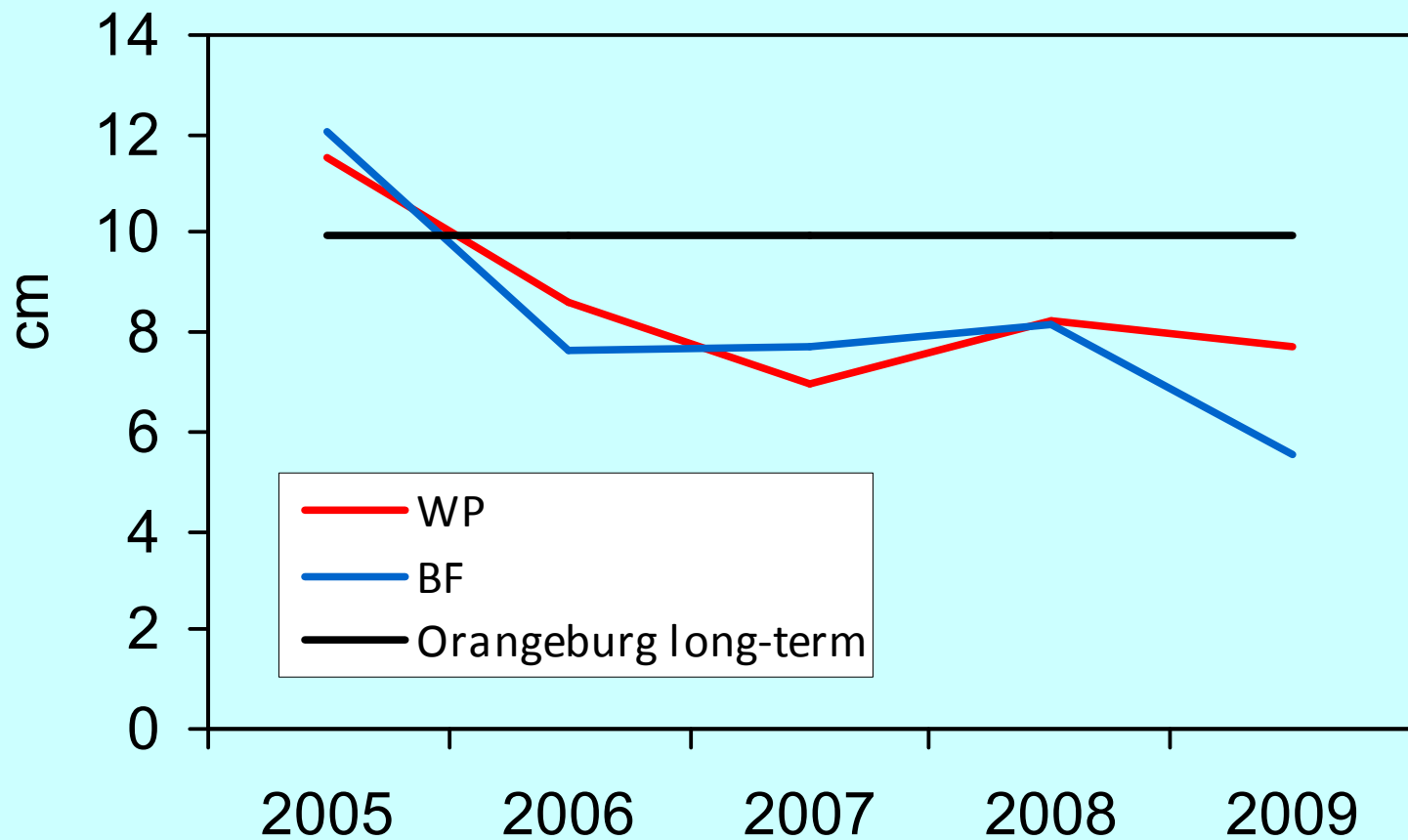


# Water table profile - summer

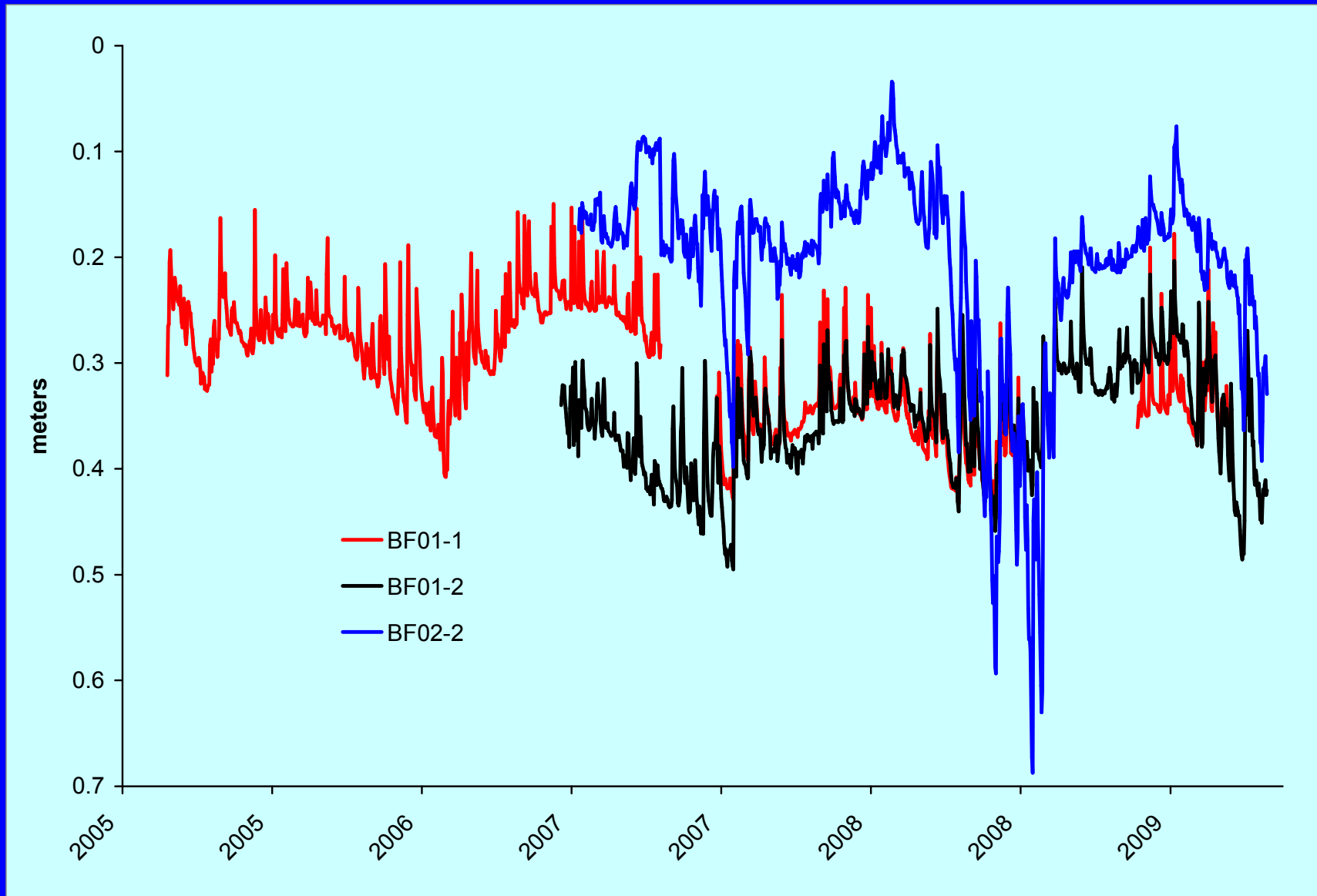


# Precipitation summary

Annual Monthly Average Precipitation



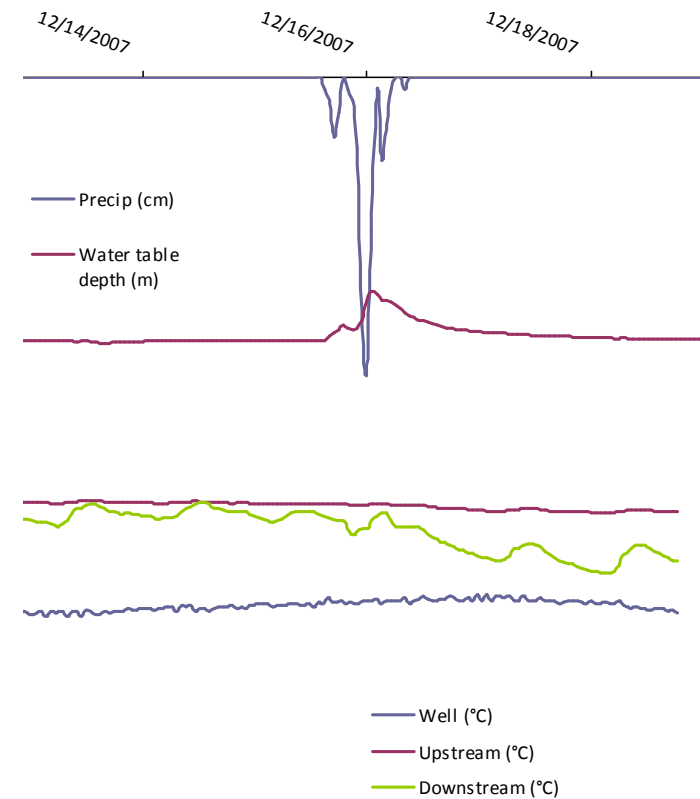
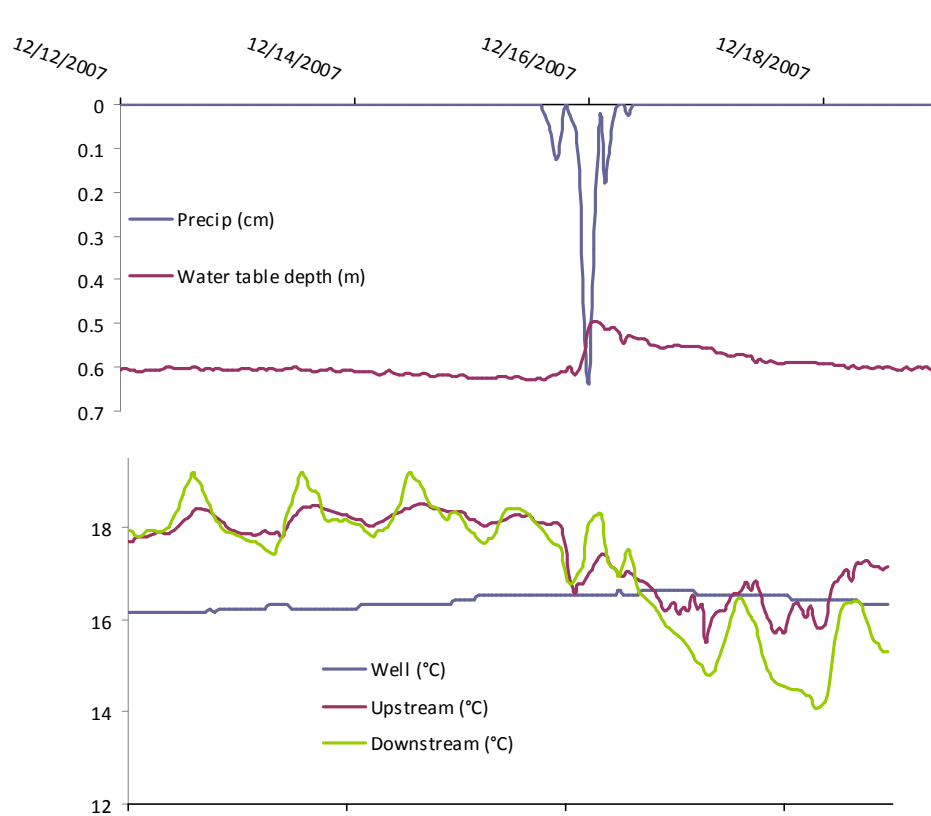
# Water table depth time series



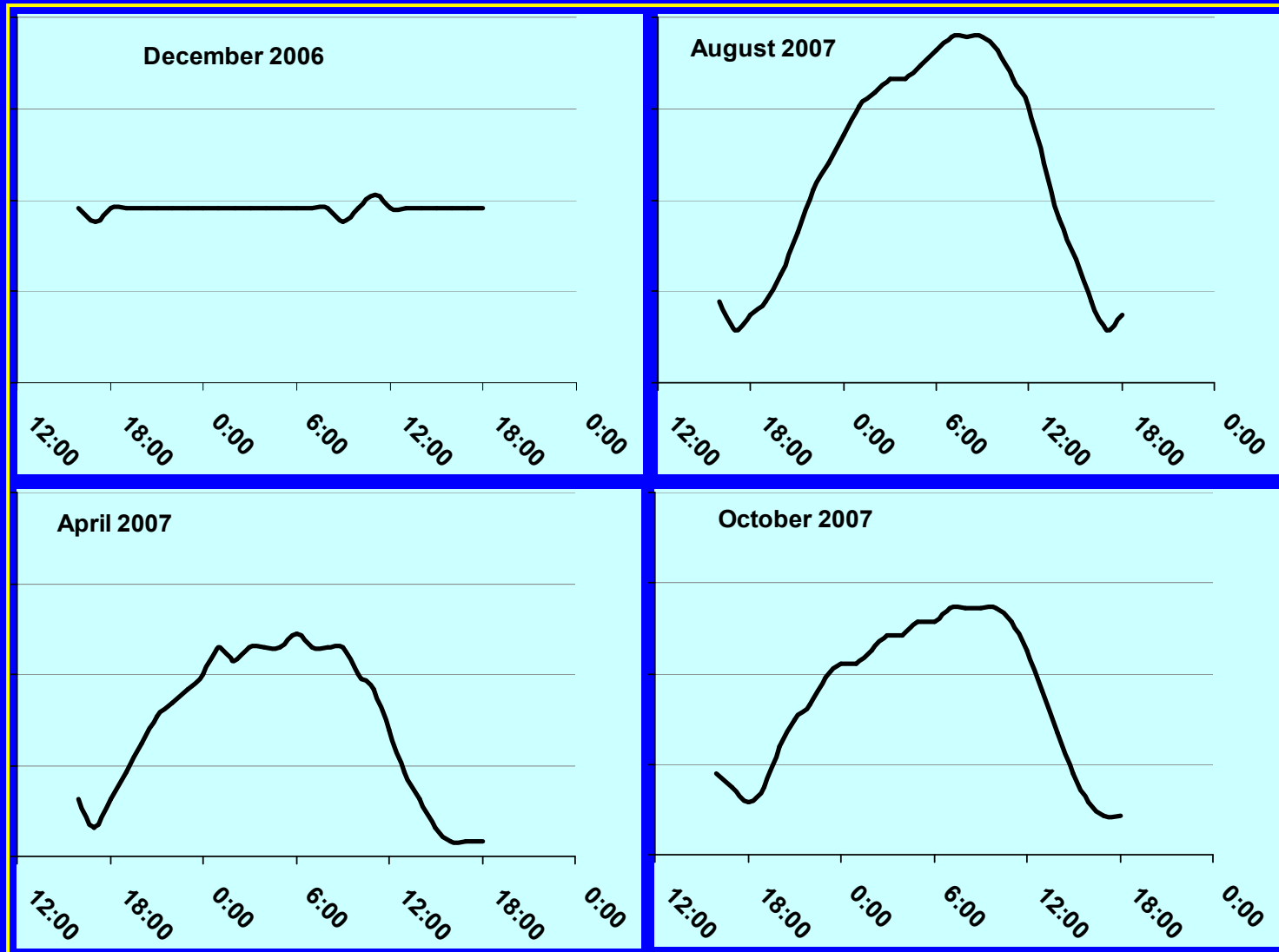
# Temperature profiles

BF01

BF04



# Diurnal pattern of water table depth



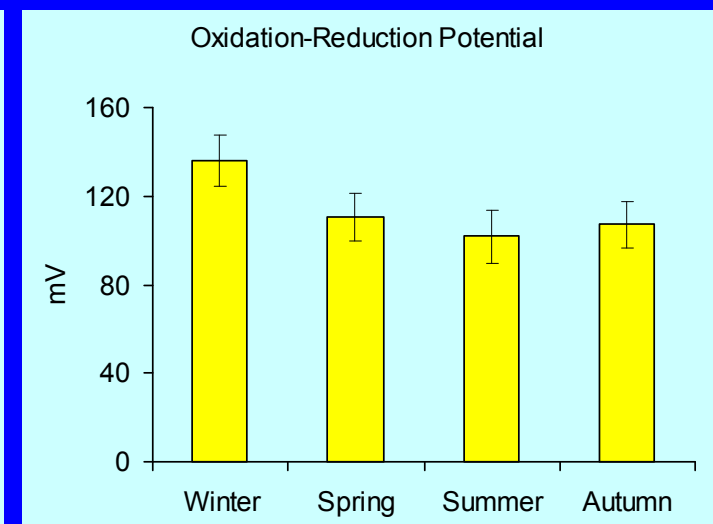
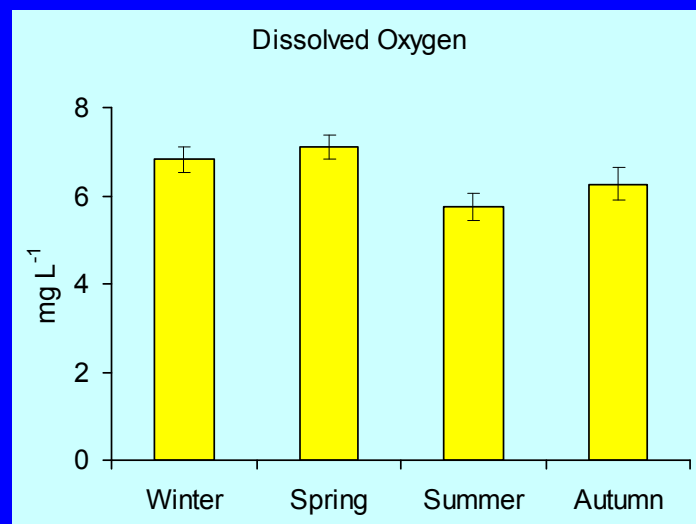
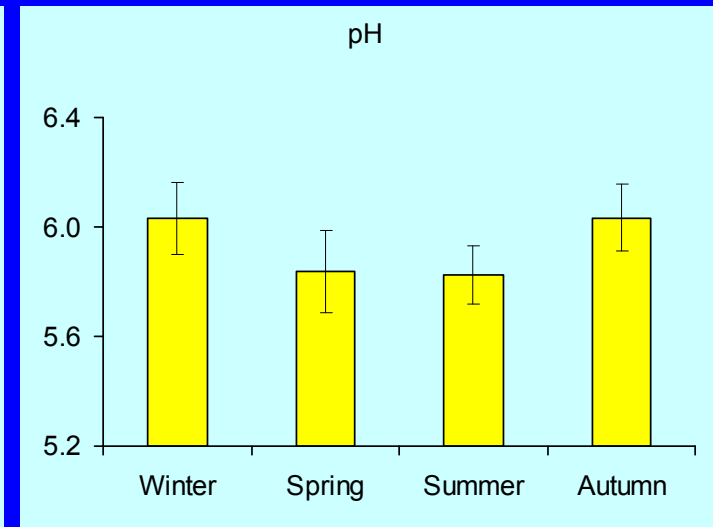
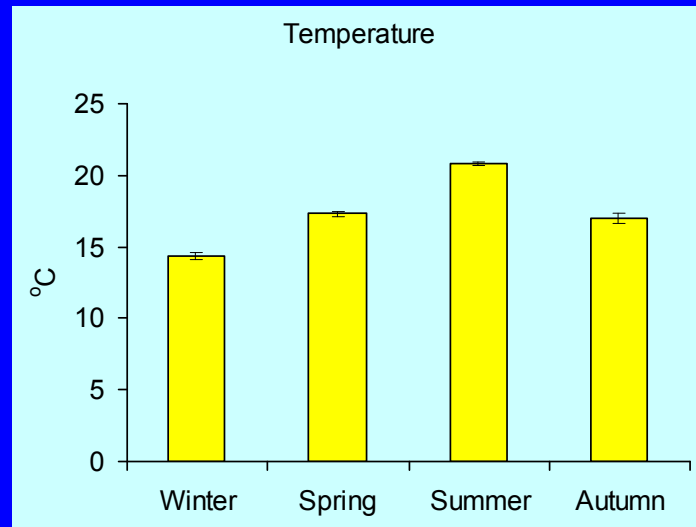
- Vertical scale is 8 cm

# Seasonality in diurnal pattern of water table depth

- Literature suggests the diurnal pattern may be a signature for forest type, age, perhaps health
  - Beidler Forest – Cypress / Tupelo
  - Singleton/Wannamaker – Bottomland hardwood
  - Upland at both are mixed hardwood
- Soils, stratigraphy also have a role

# Water Quality field parameters

- Seasonal mean  $\pm$  s.e.
- Variability among wells and sites
- Sp Cond always very low
- Also have N, P, and DOC





# Conclusions

- Data show significant variability among wetlands at both small and large spatial scales
  - May effect habitat suitability among wetlands
  - Possible driver of species distributions
  - Indicator of subsurface heterogeneity
- Inter- and intra-annual variability occurs
  - Expression of site differences in:
    - Physical / chemical drivers
    - Habitat
    - This is a major focus of current research
  - Continued monitoring to understand patterns
- Headwater seepage wetlands may be an indicator of longer-term changes in shallow groundwater field
  - Climate as a primary driver
  - Land management may be another – current work

# Acknowledgements

- John Nelson, Curator, AC Moore Herbarium at USC
- Thanks to Audubon South Carolina (ASC), Columbia Audubon Society (CAS), and Hank Stallworth for access to the study sites
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*Chamberlain's Dwarf Salamander  
(Eurycea chamberlaini)*

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