

# Climate variability and groundwater recharge in southwest Wisconsin

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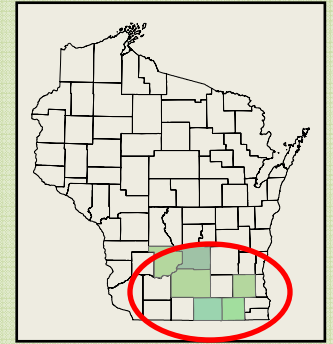
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# Motivation: *water table rise* caused long-lasting flooding in 2008



# A series of models simulate future climate conditions and groundwater recharge

- 1) Daily precipitation and temperature estimates from 8 down-scaled global circulation models (GCMs)

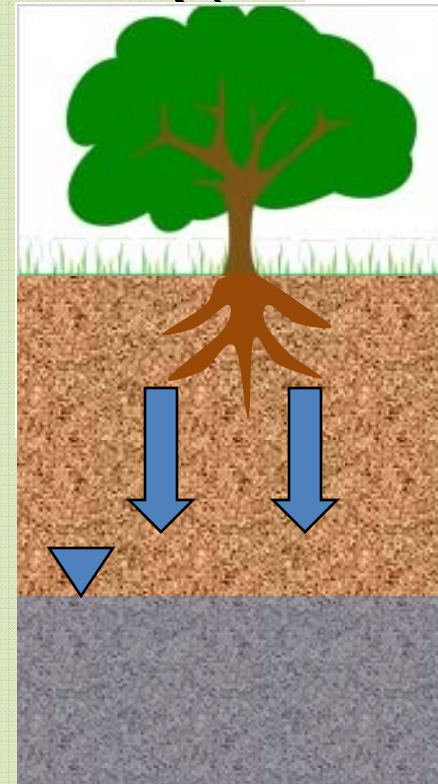
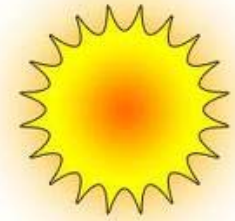
(Serbin & Kucharik, 2009.)

- 2) Soil water balance model (SWB) estimates daily runoff and infiltration over a 30-meter grid

- 3) Three-dimensional, transient MODFLOW simulates the groundwater system, water table elevation



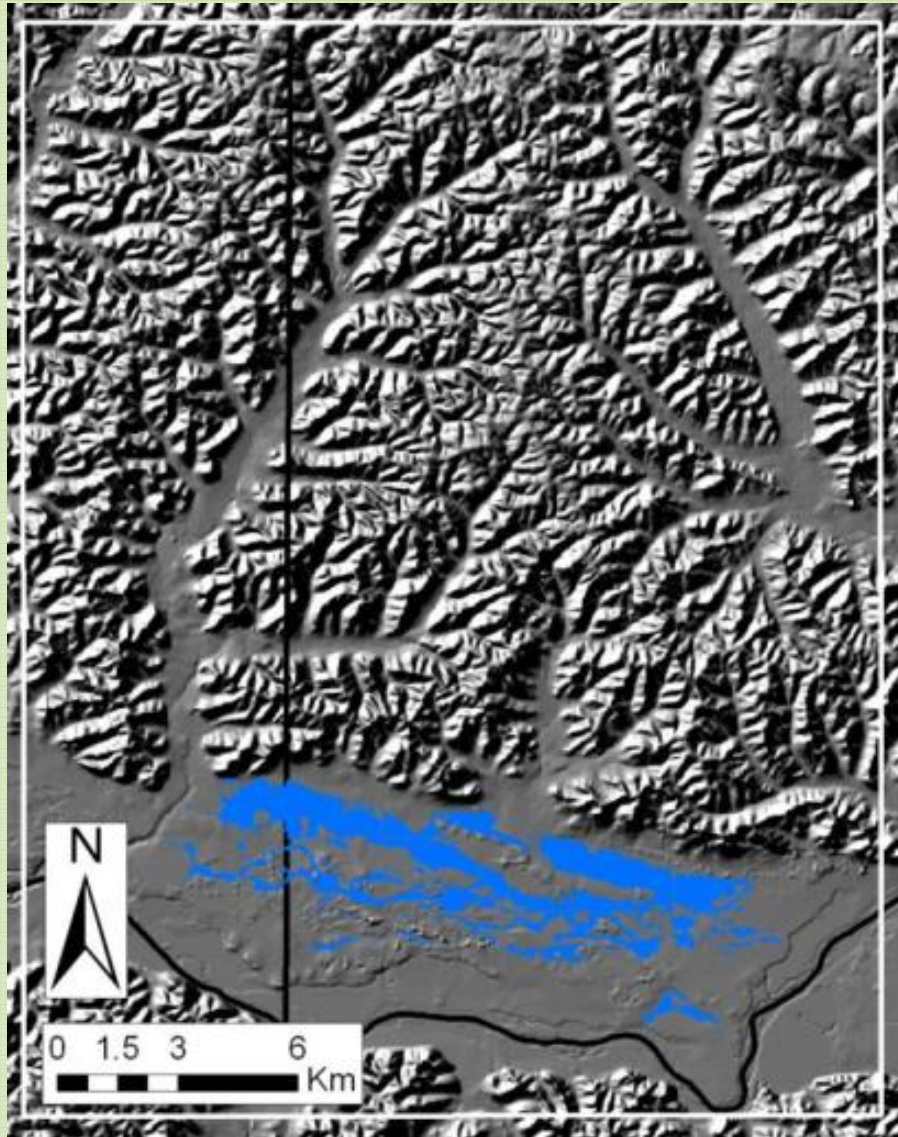
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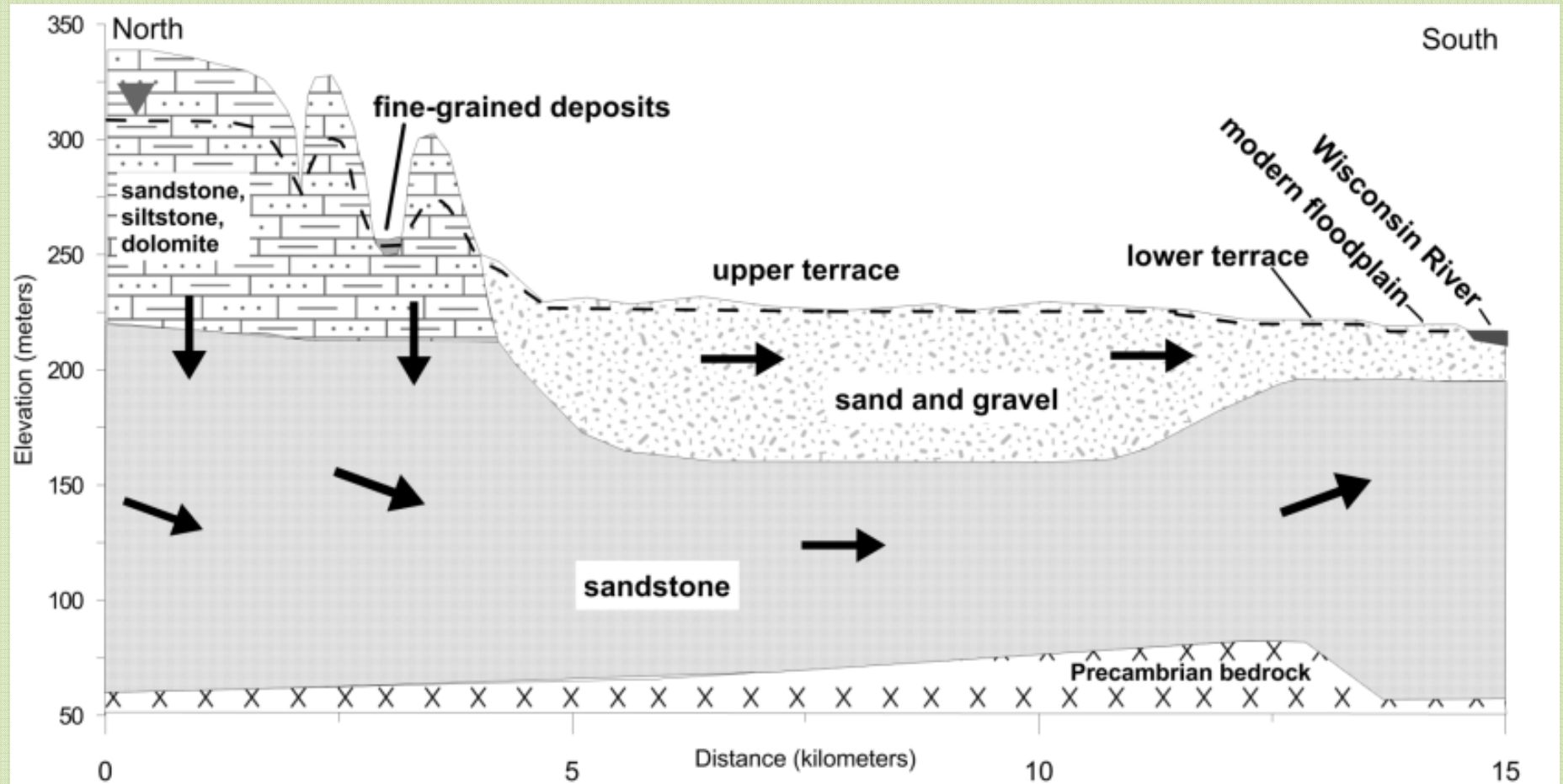
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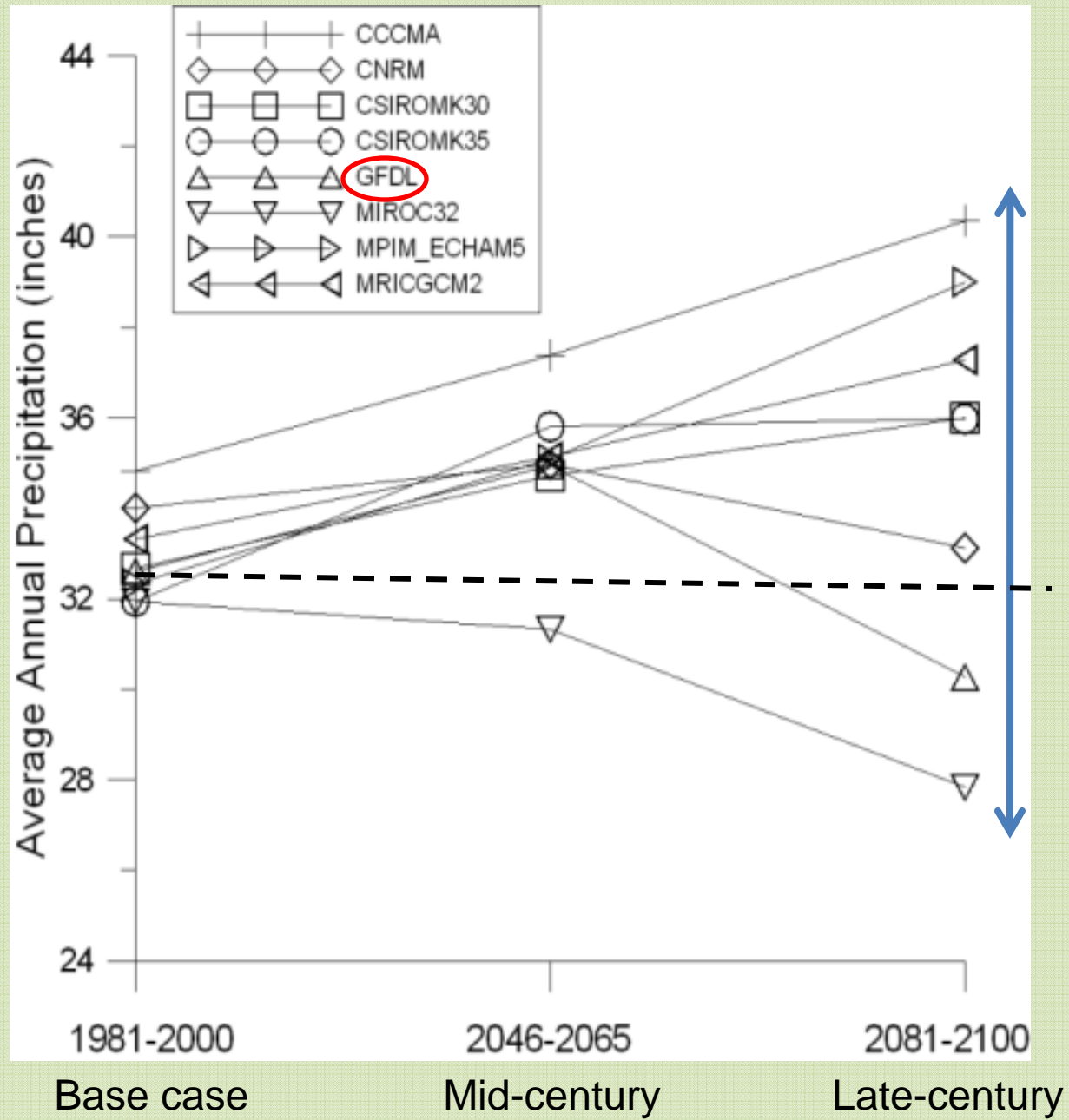
# Spring Green, Wisconsin



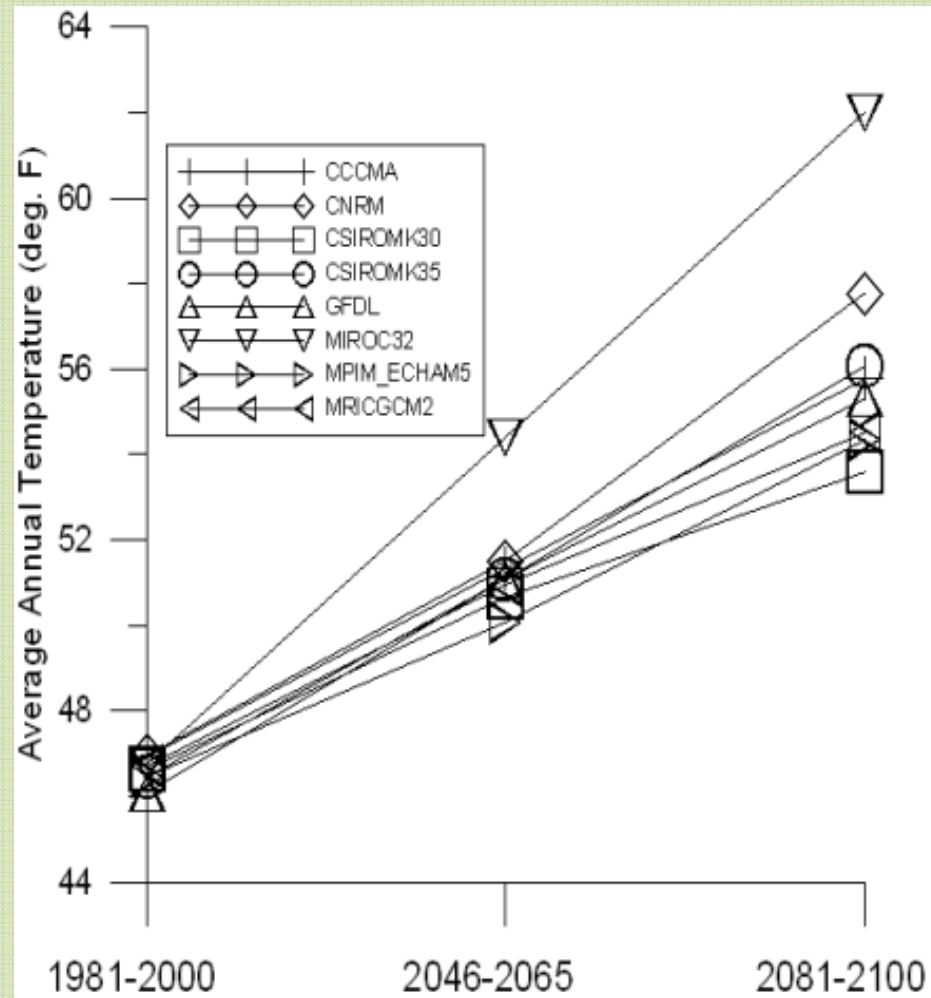
# Hydrogeologic conceptual model



GCM results:  
12-inch range  
in annual  
average  
precipitation



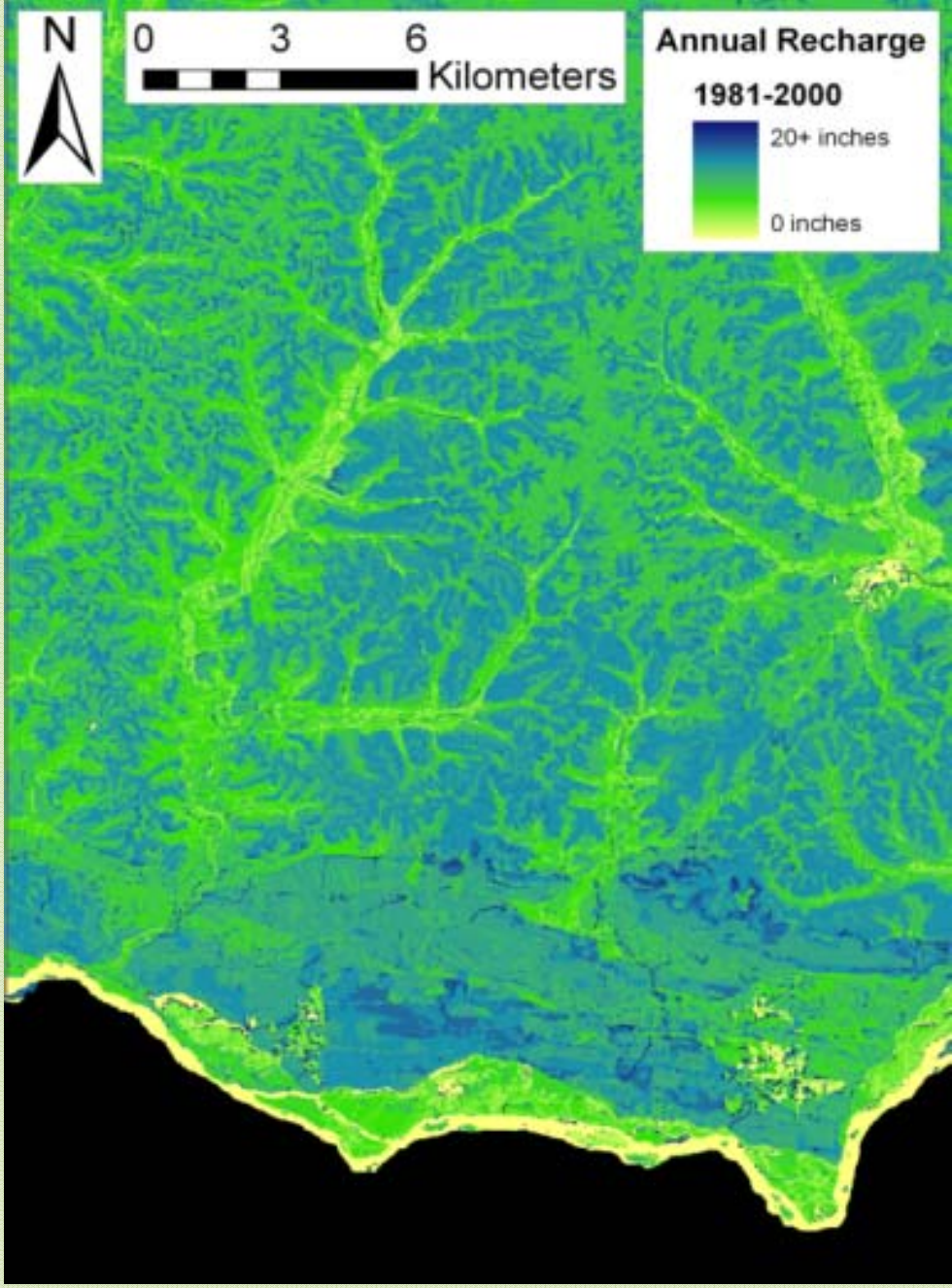
# GCMs predict at least 6° increase in average annual temperature



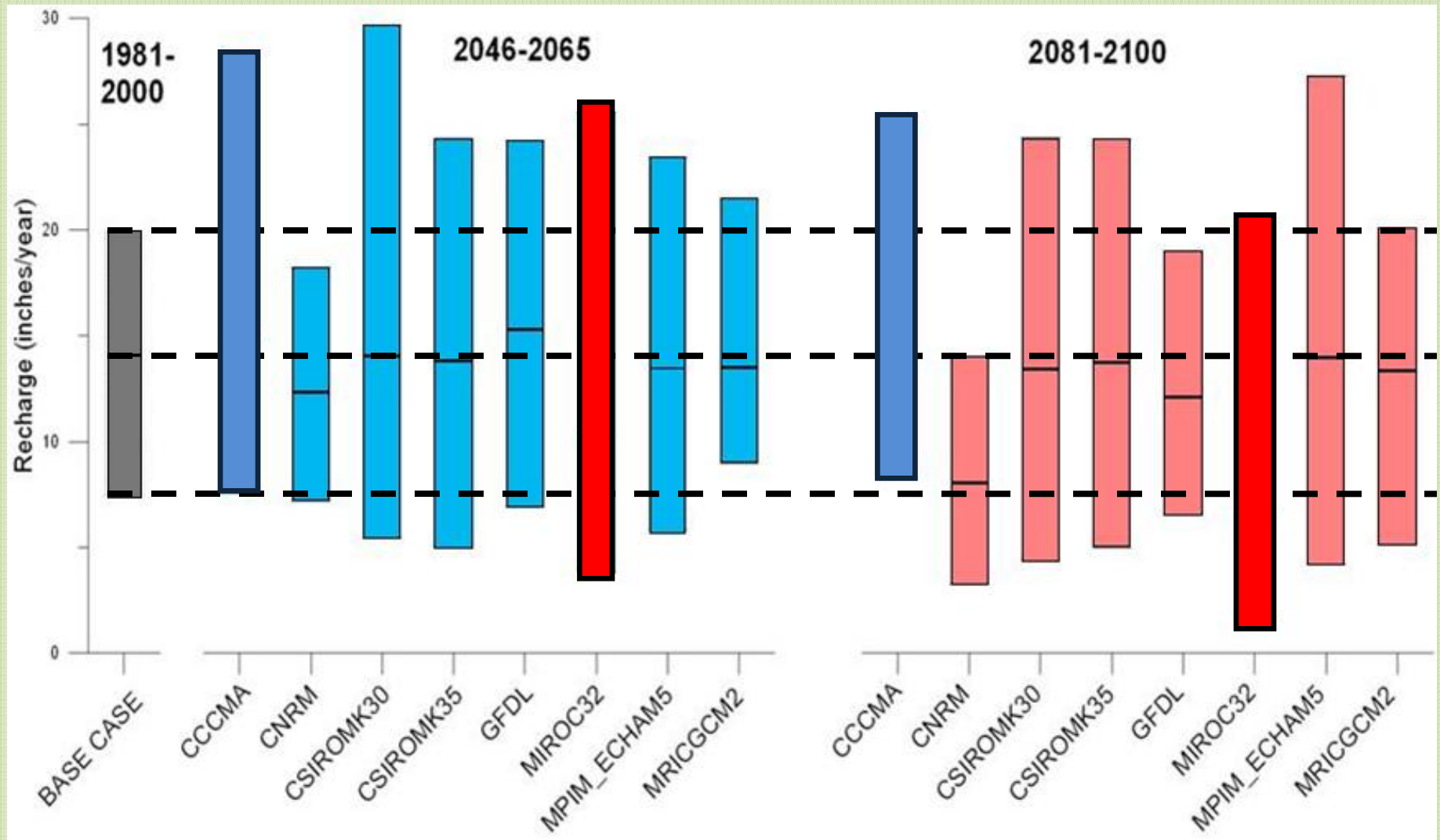


# Annual recharge

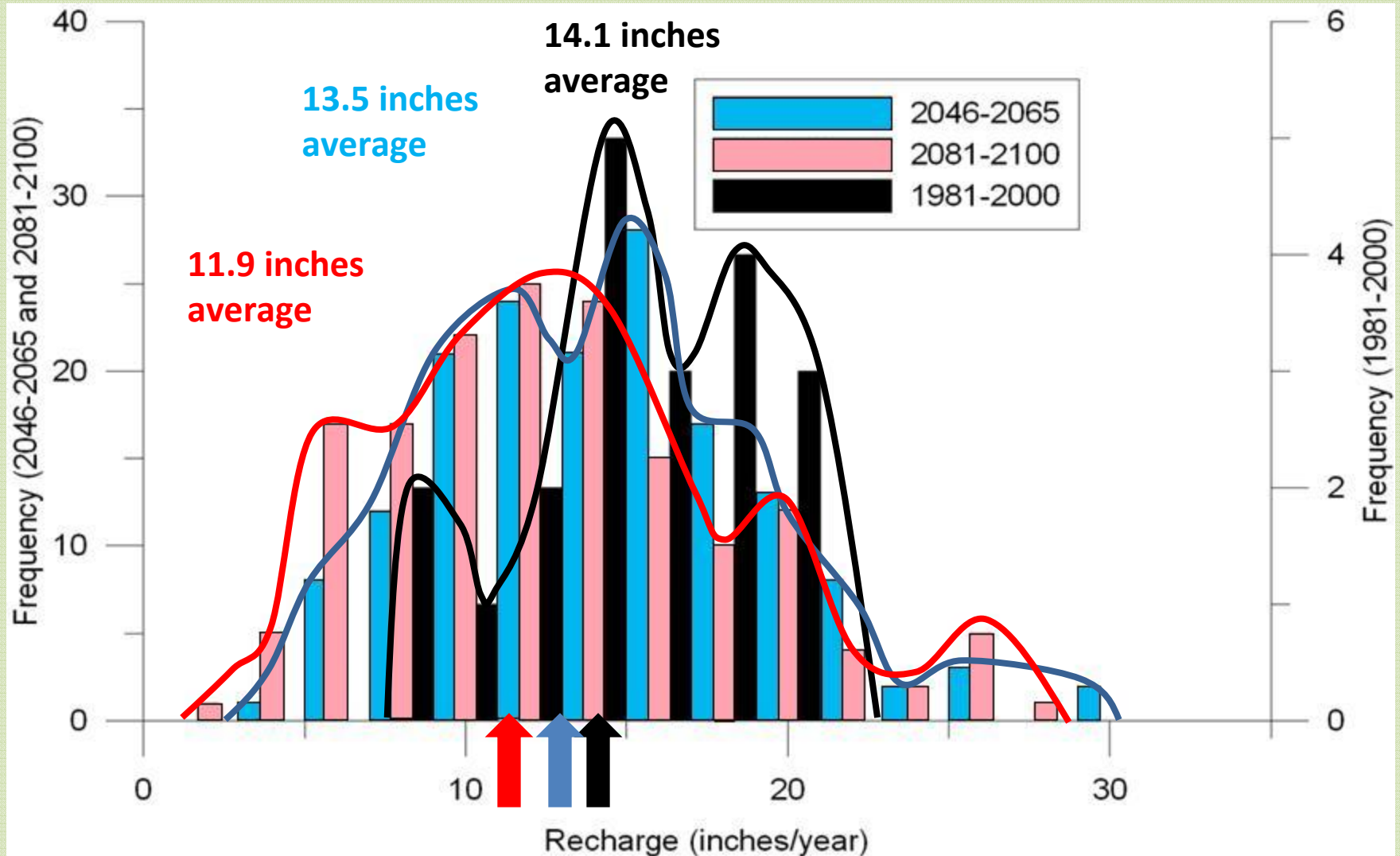
“Base case” conditions,  
14 inches/year on  
average, ranging from  
about 2 to 20 in/yr



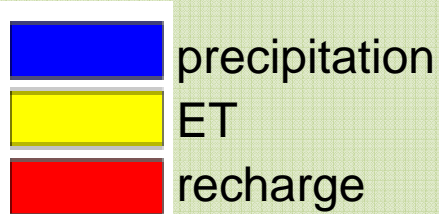
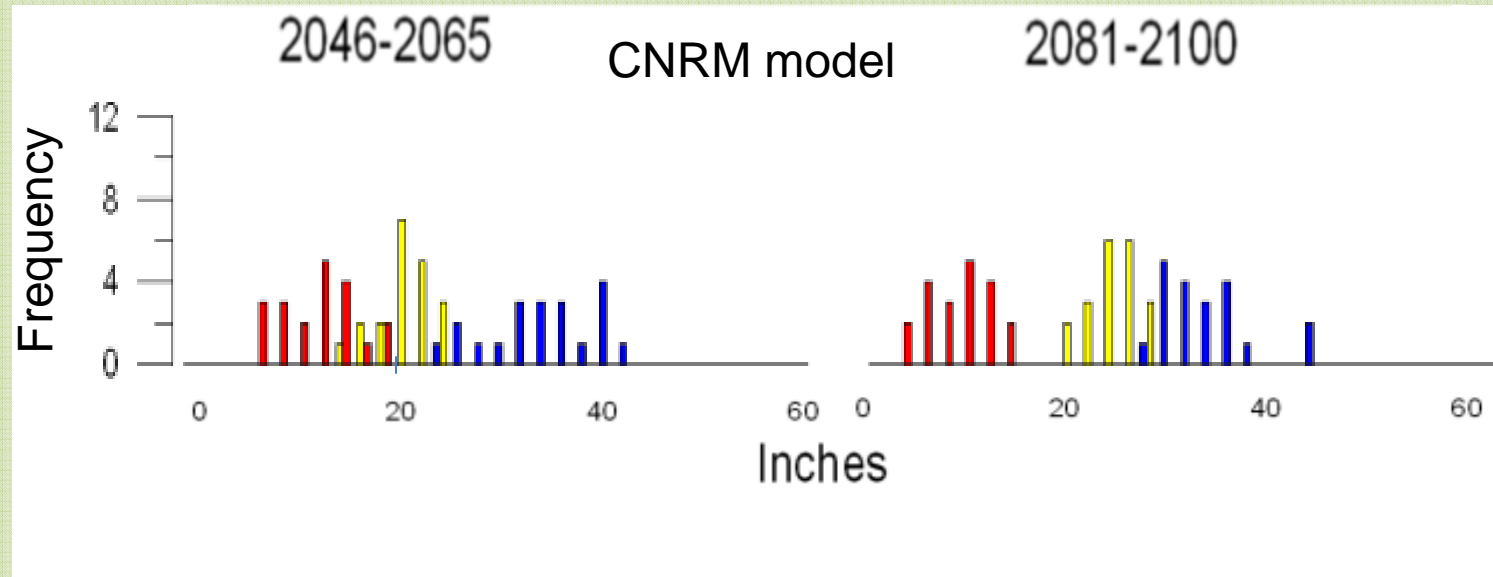
# Simulated Recharge



# Frequency of annual recharge

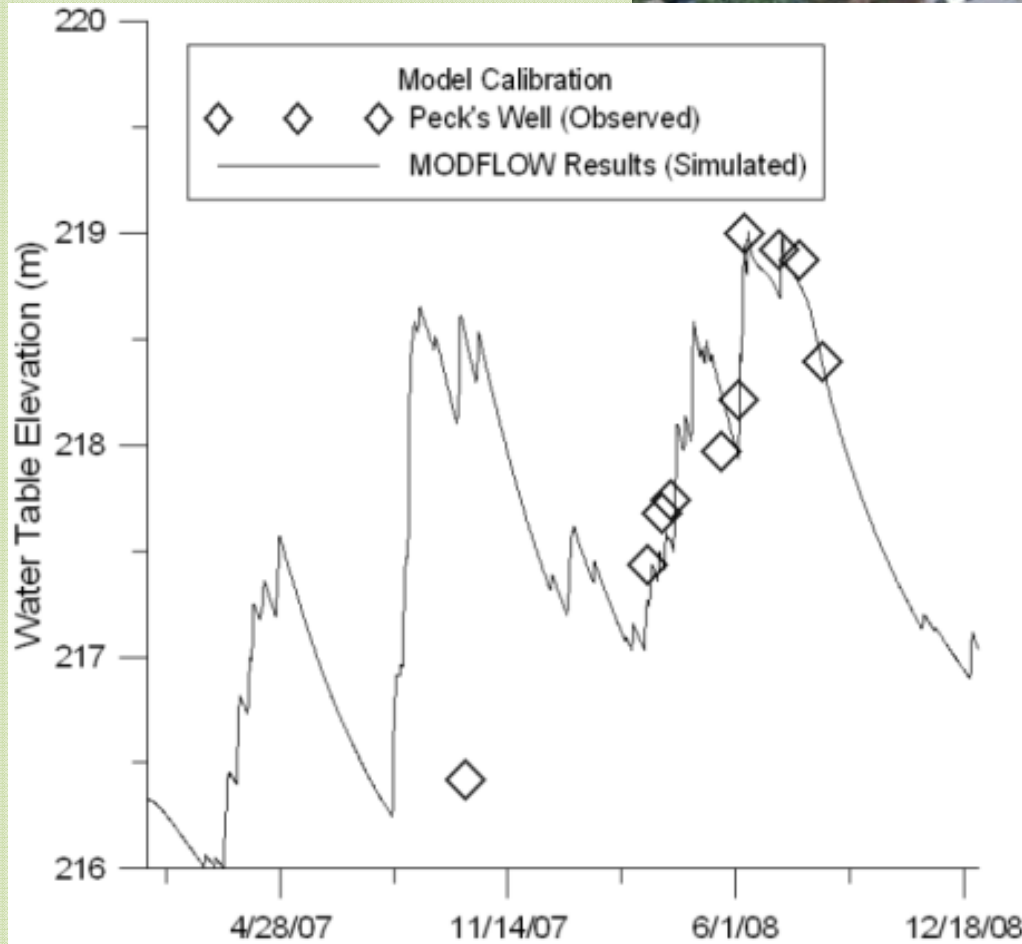


# Simulated temperature increases, driving up ET and decreasing recharge



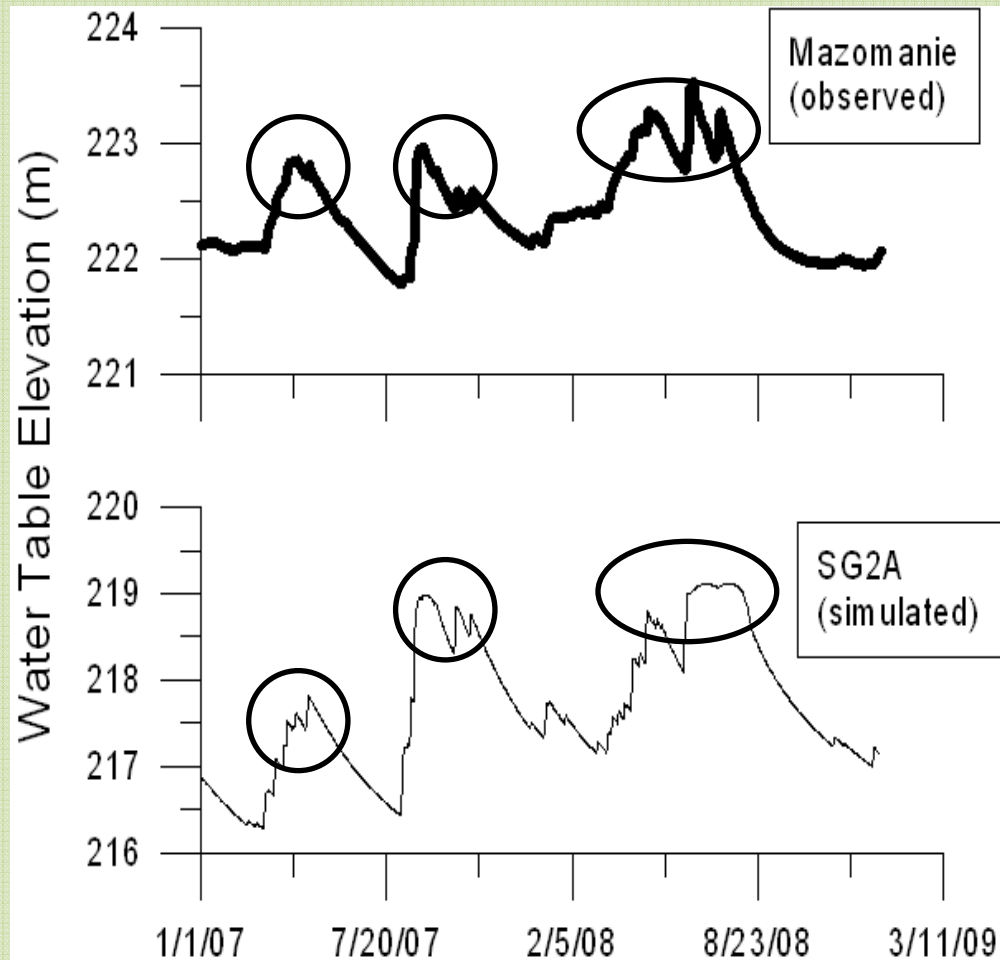
Base case average ET = 17.8 inches /year, increasing to over 21 inches/ year by 2100.

# Groundwater flow model calibration

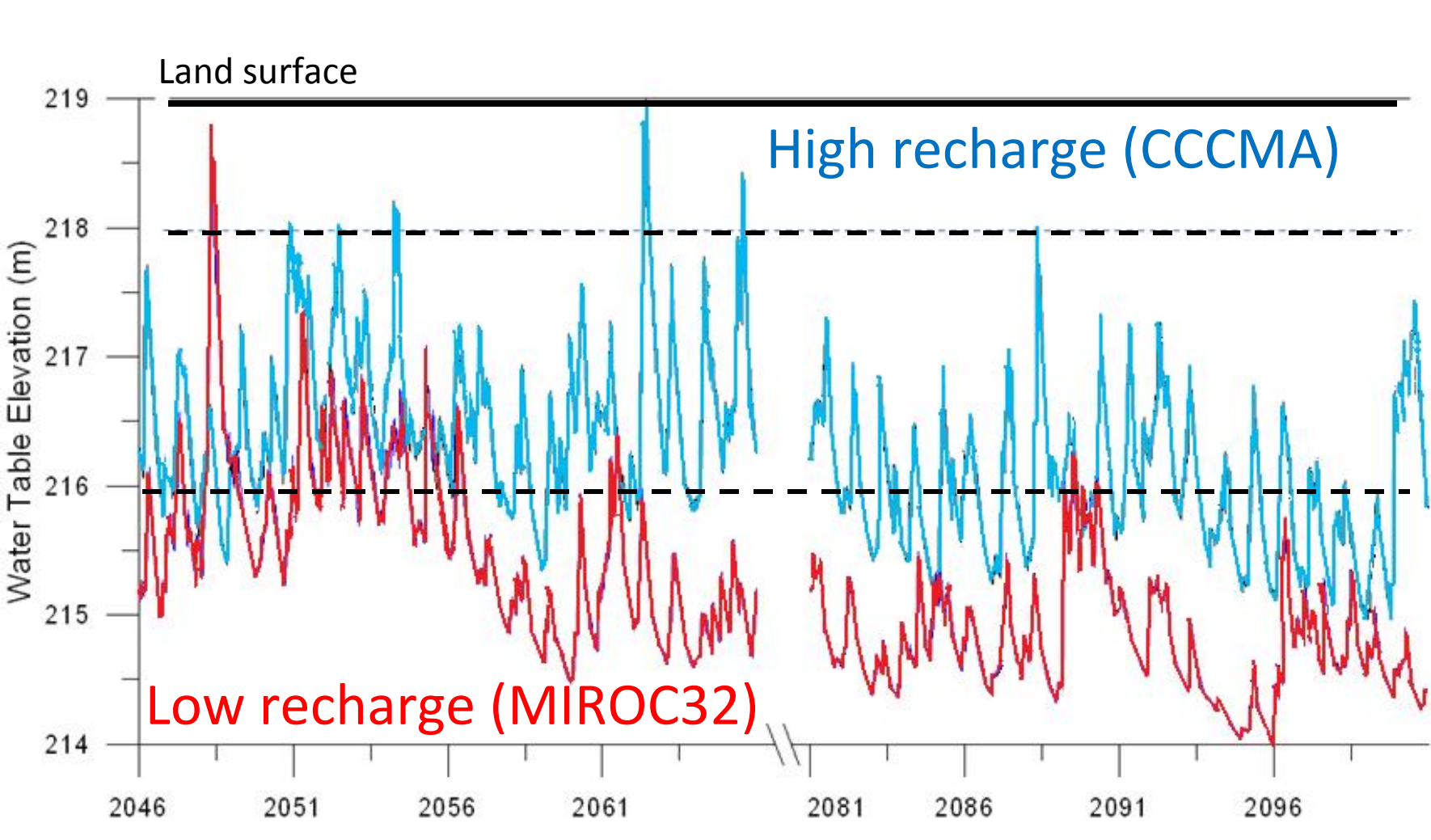


Peck's well, June 2008

# Additional observed and simulated water table response, 2008



# Simulated water table elevation



# Conclusions



- **Simulated average recharge decreases 10%, due to increase in temperature *and ET*.**
- **Variability in simulated recharge is high, and high groundwater conditions occur infrequently.**
- **Current flood mitigation efforts may prove useful to preserve *existing land use*.**