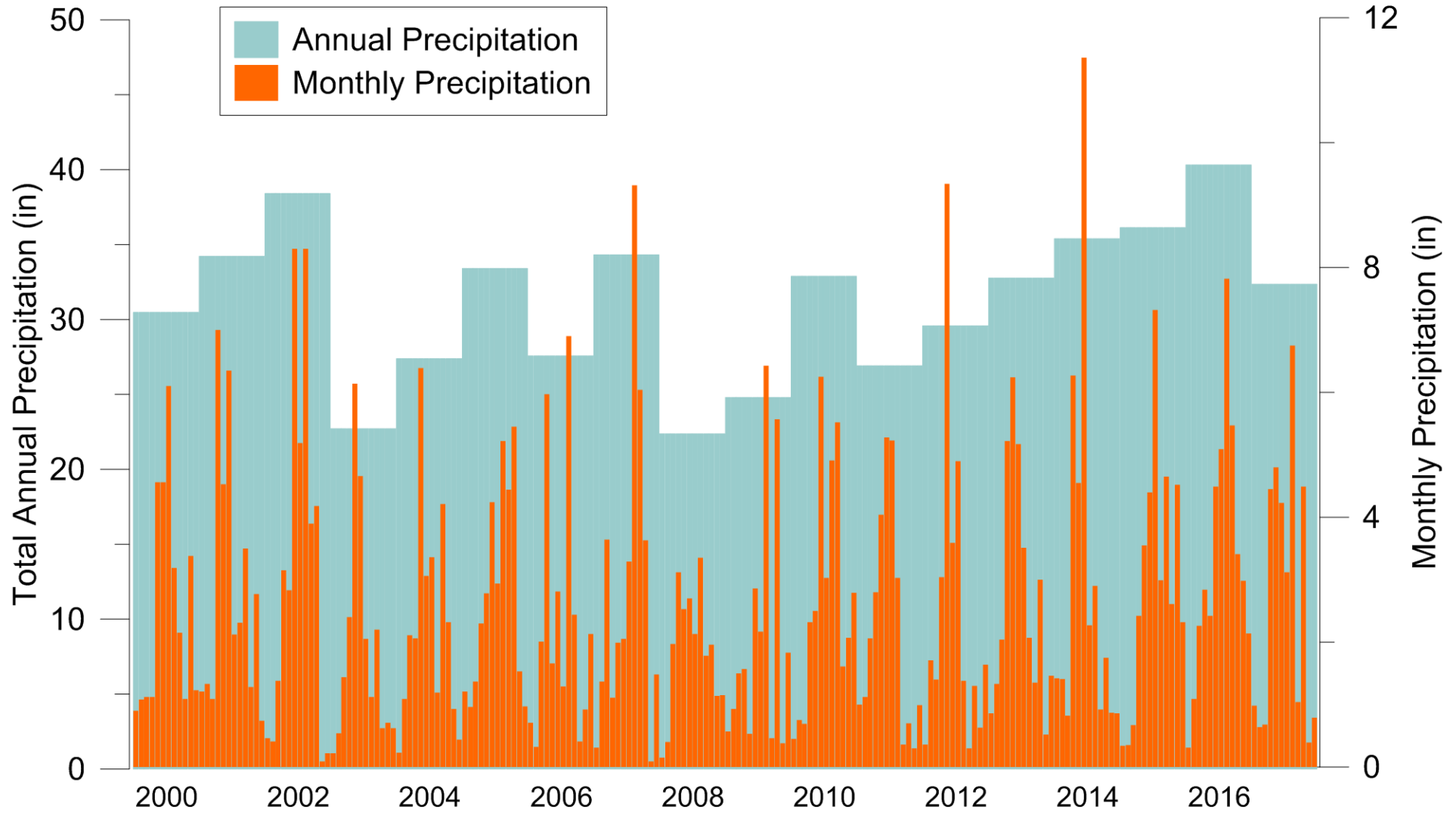


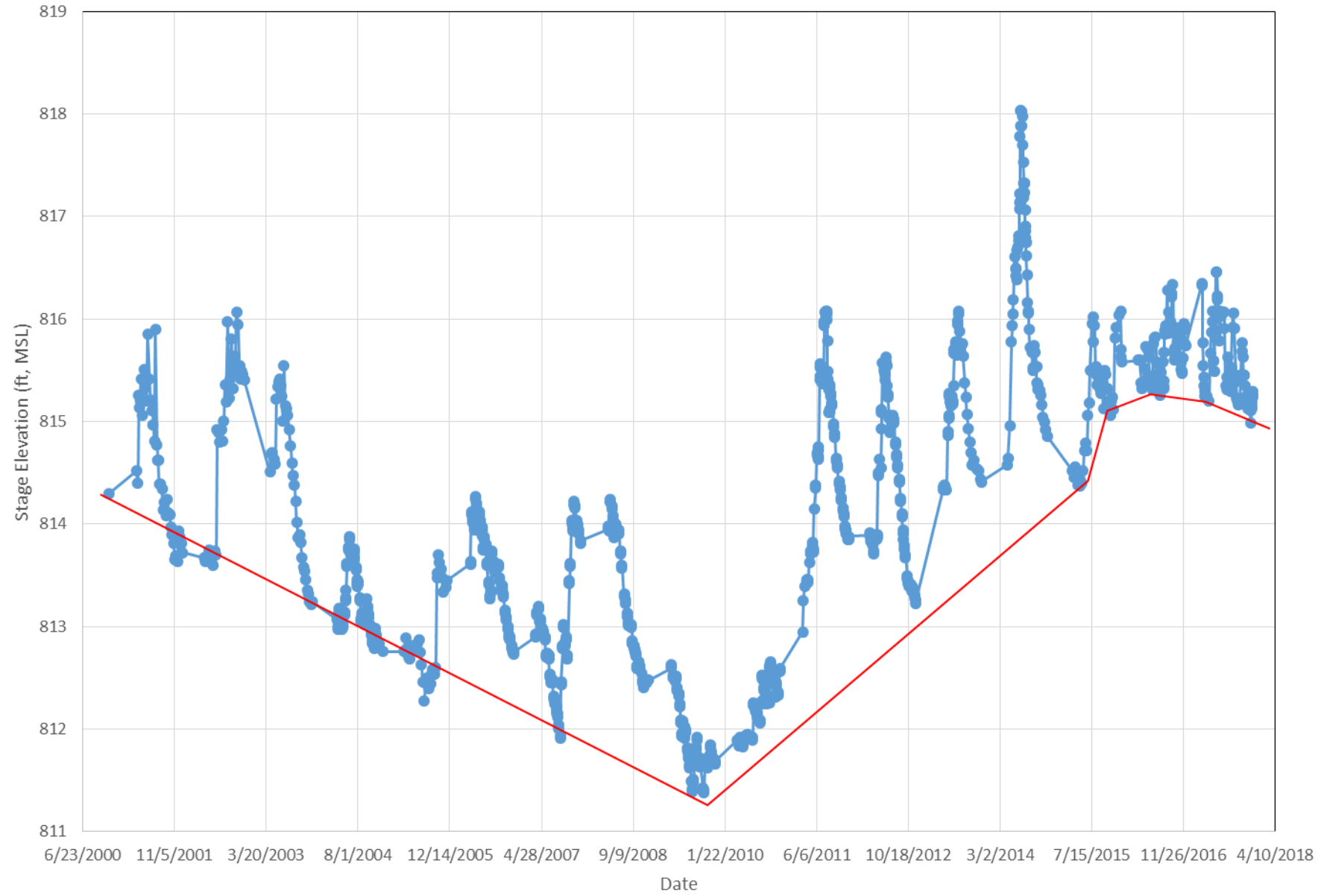
Preliminary Findings of Nokomis
Area Groundwater Level Causes
Based on Transient Version of
Metro Model 3

MSP Airport Precipitation





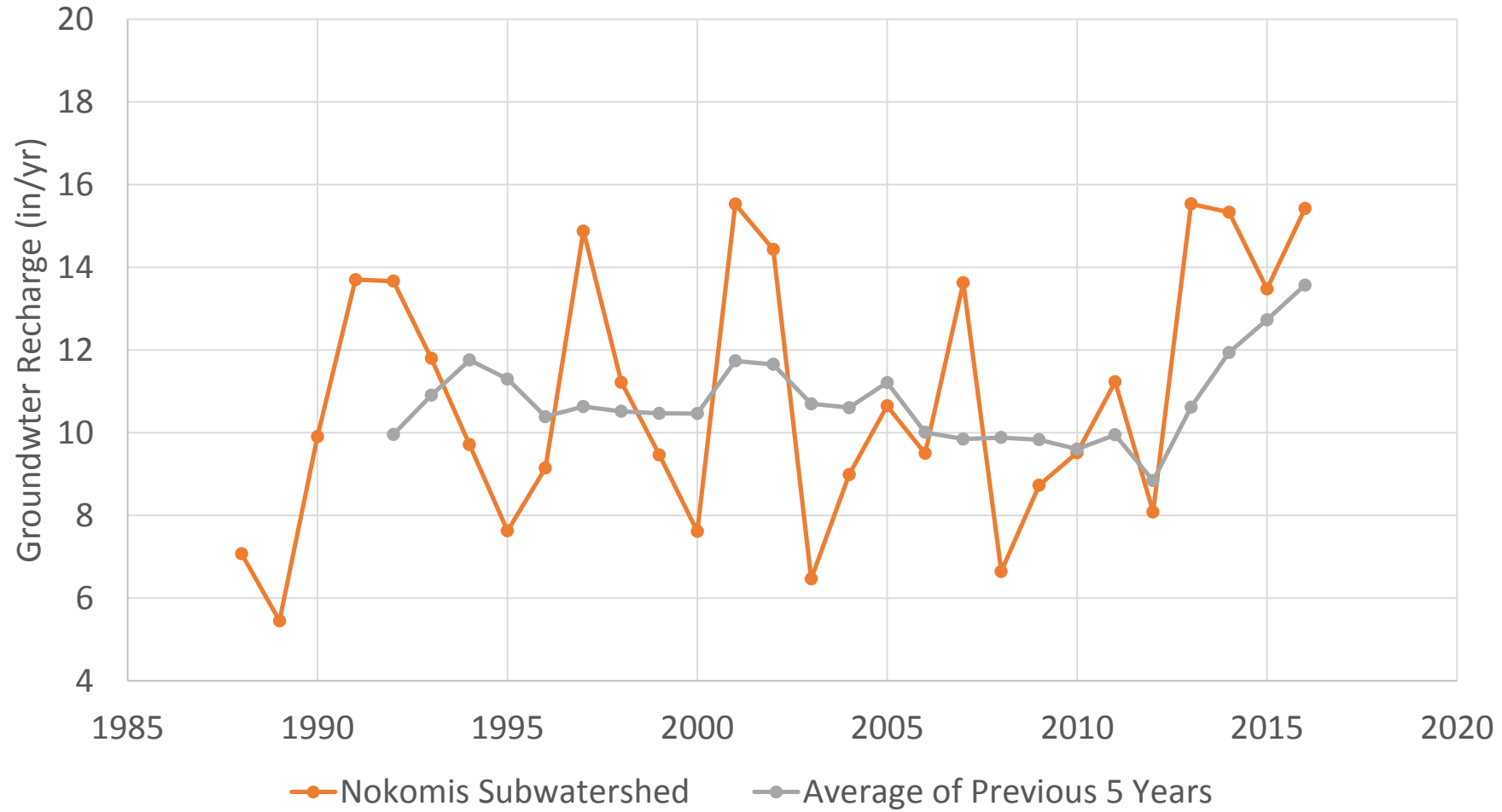
Nokomis Stage (ft, MSL)



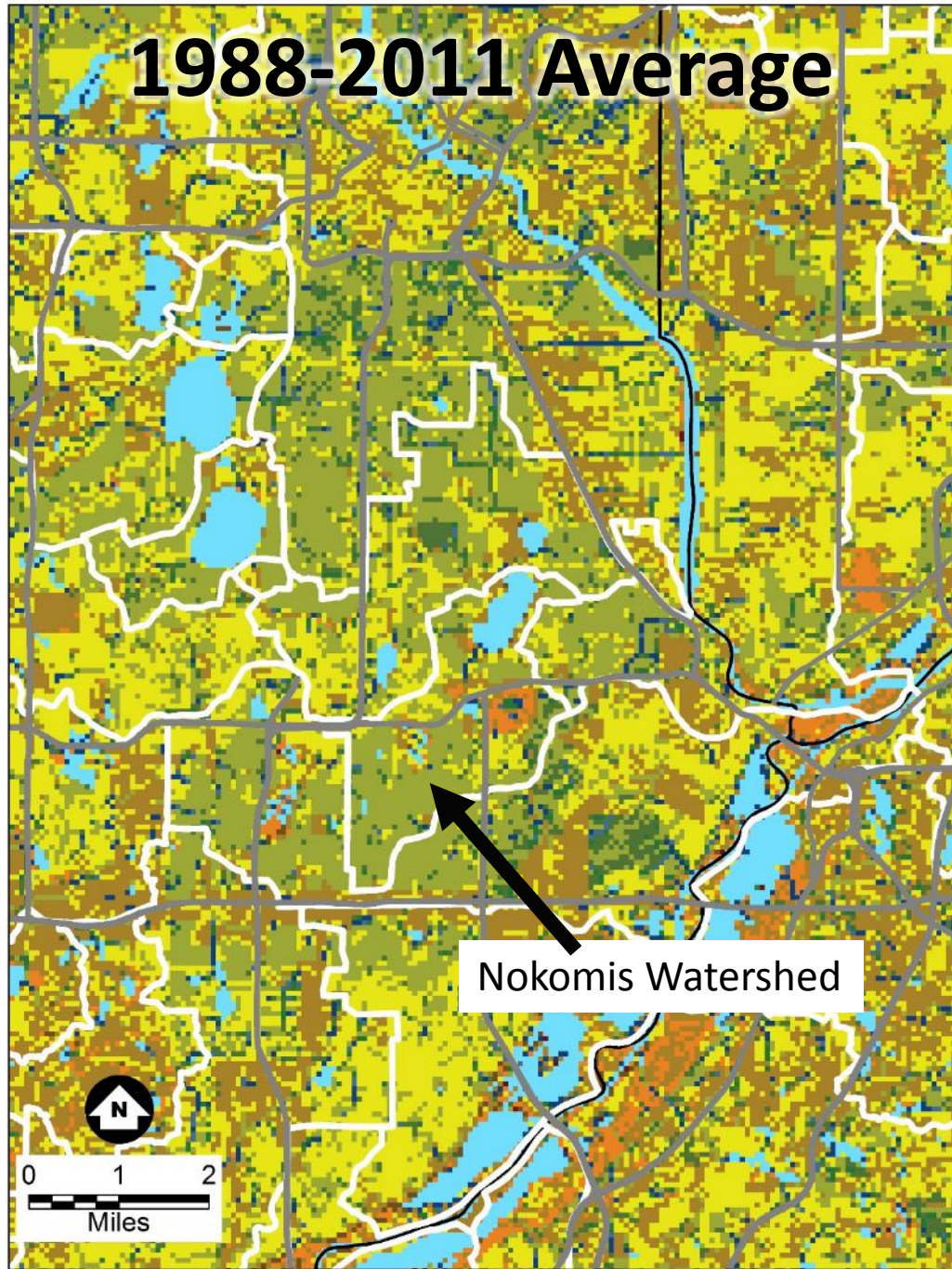


Nokomis Watershed Metro Model 3 Annual Recharge

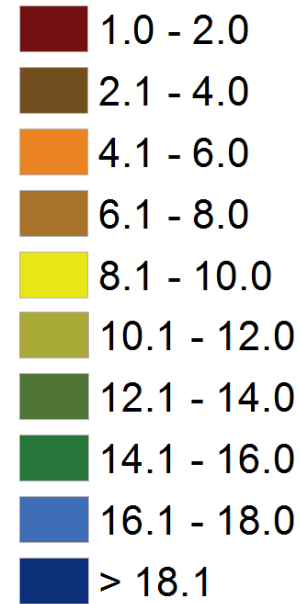
Simulated Annual Groundwater Recharge



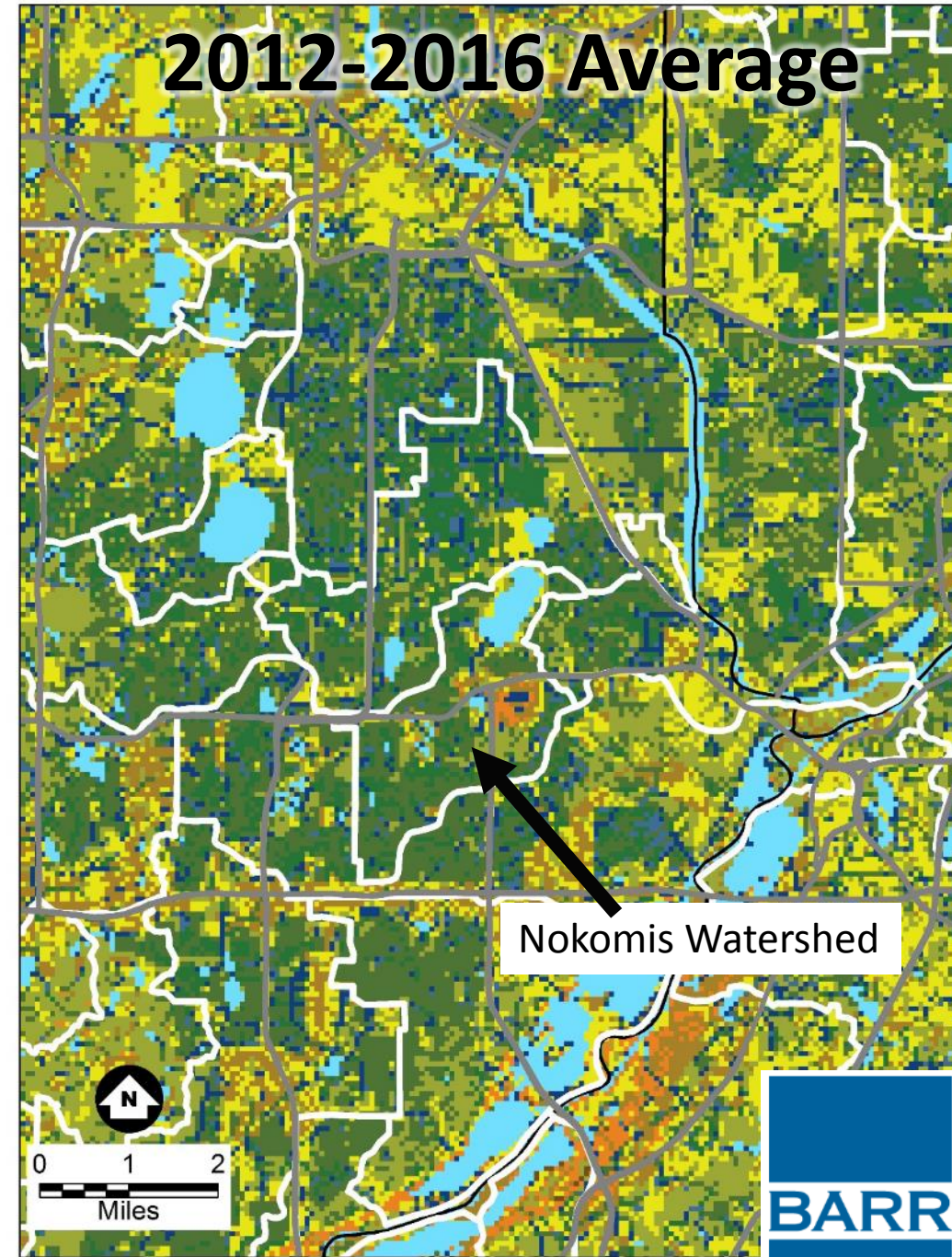
1988-2011 Average

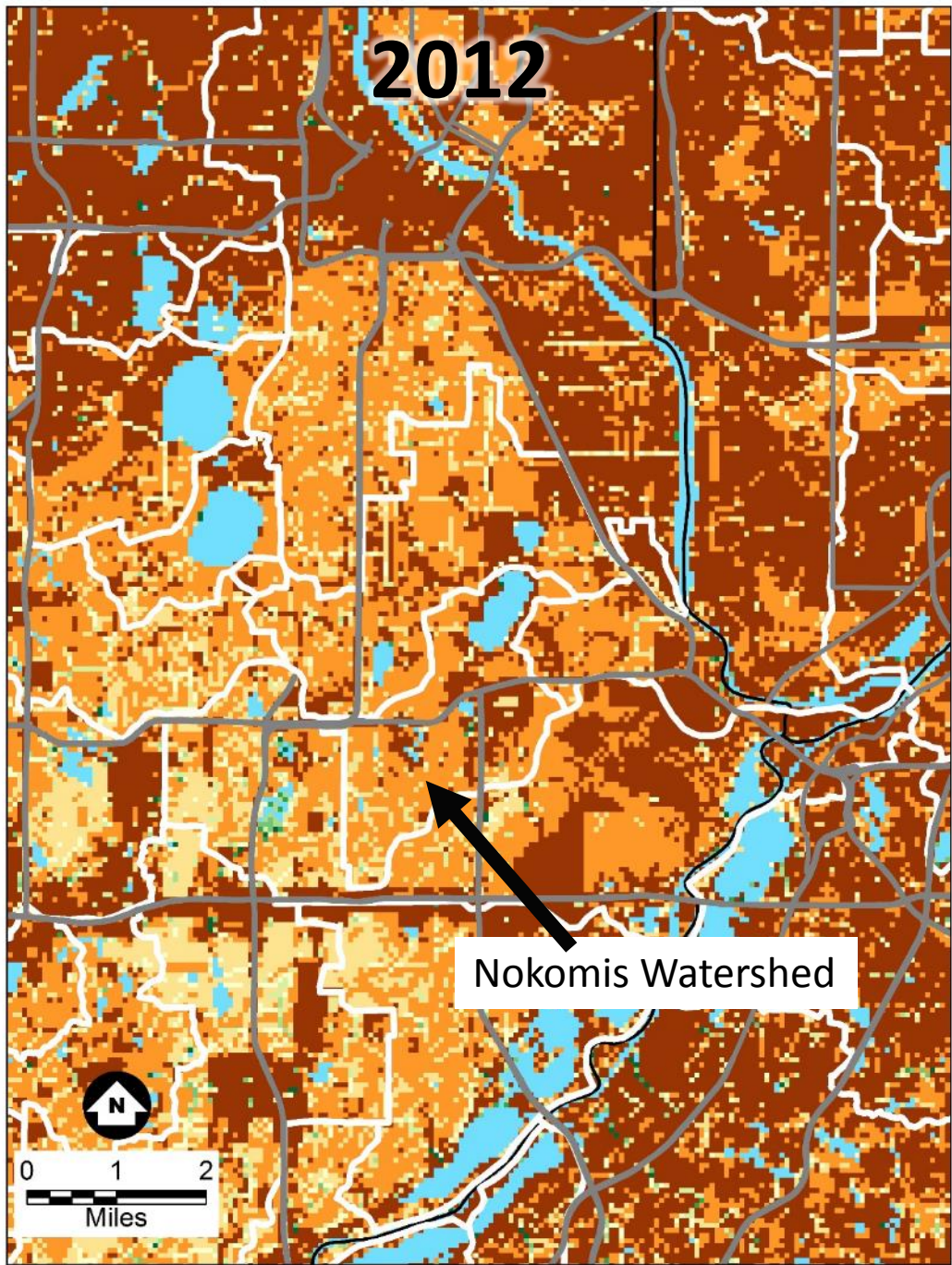


Groundwater Recharge (in/yr)















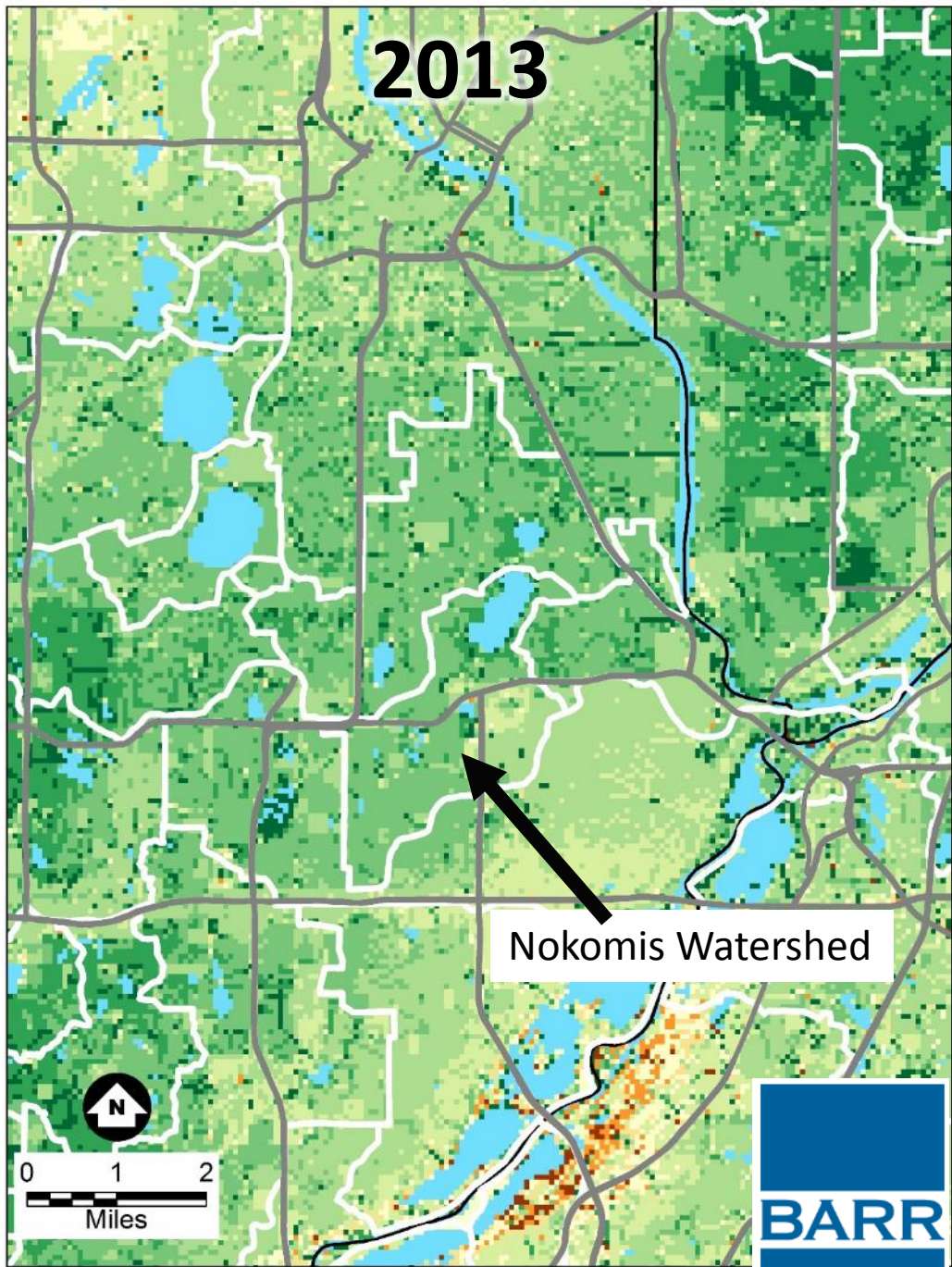
2012-2016 Average





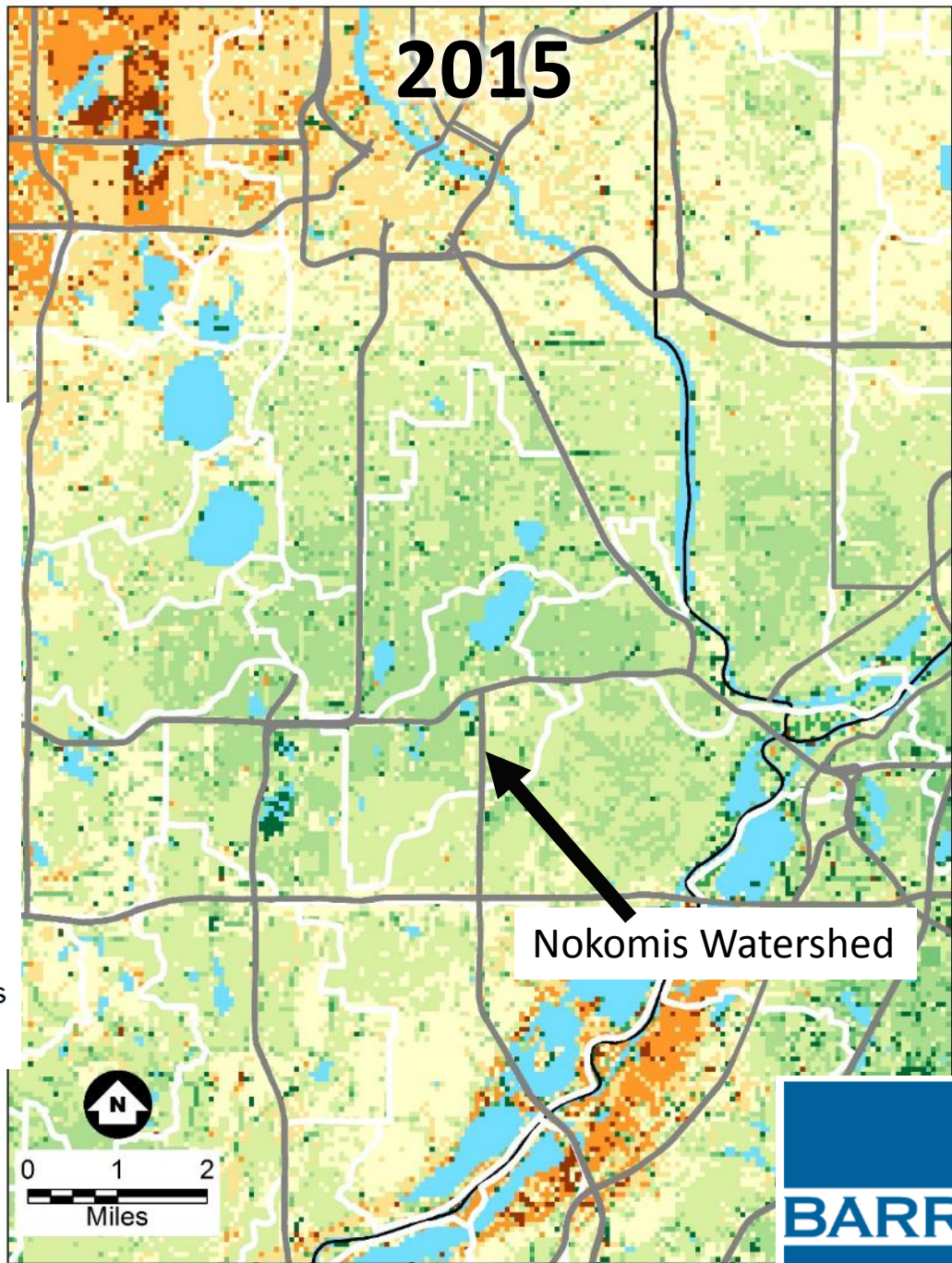
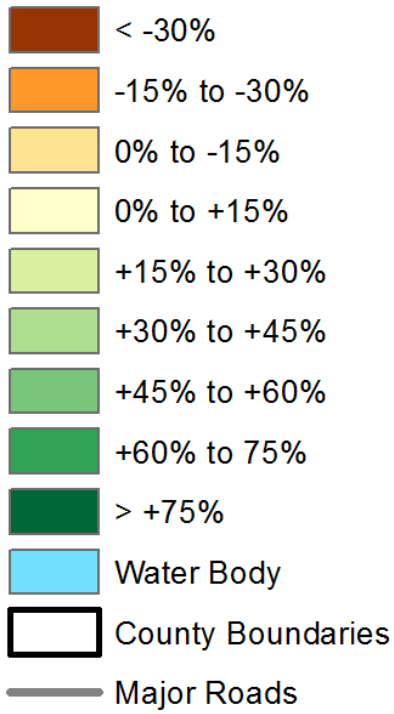
Percent Change from Avg. 1988-2011

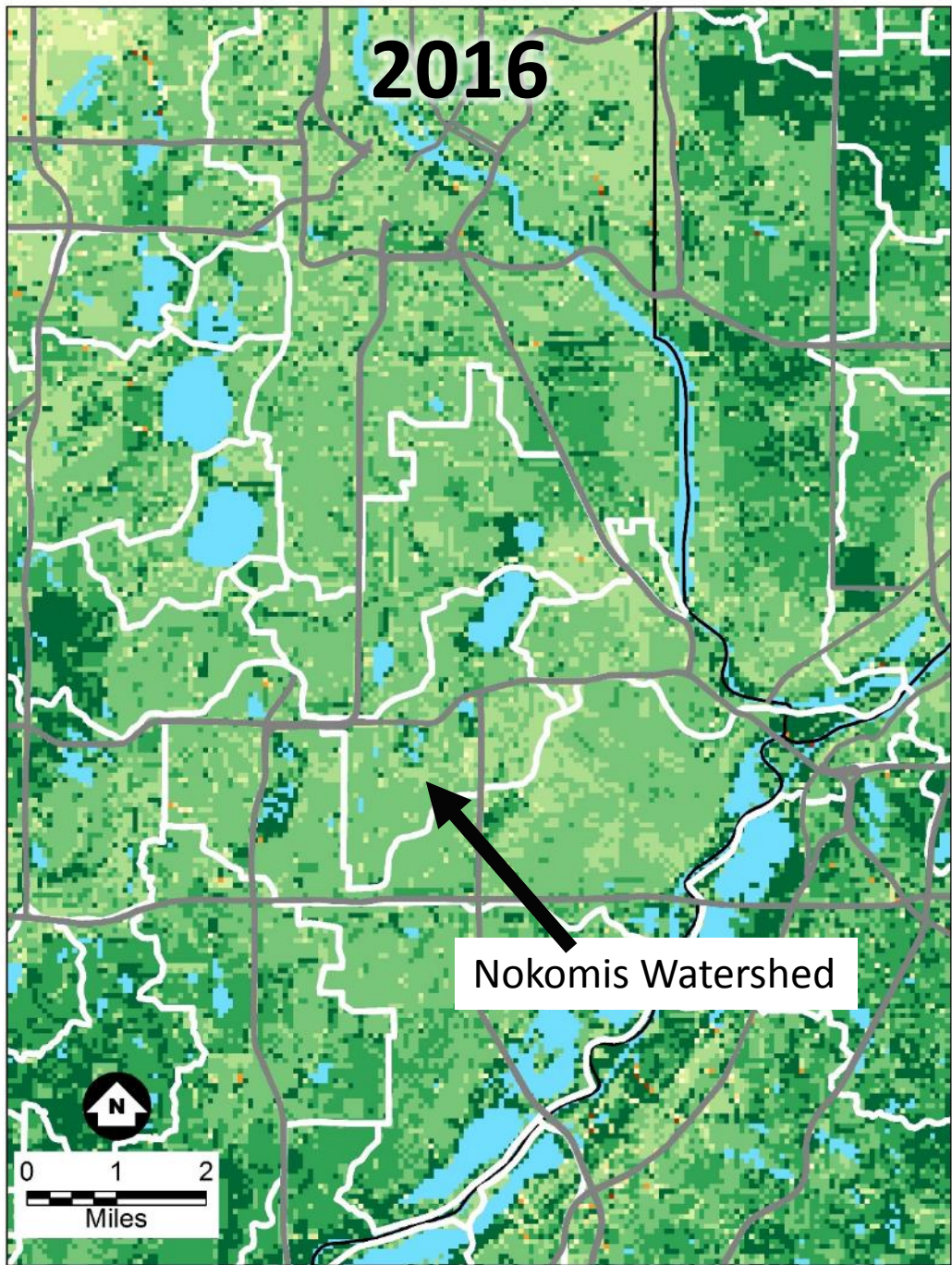
-  < -30%
-  -15% to -30%
-  0% to -15%
-  0% to +15%
-  +15% to +30%
-  +30% to +45%
-  +45% to +60%
-  +60% to 75%
-  > +75%
-  Water Body
-  County Boundaries
-  Major Roads



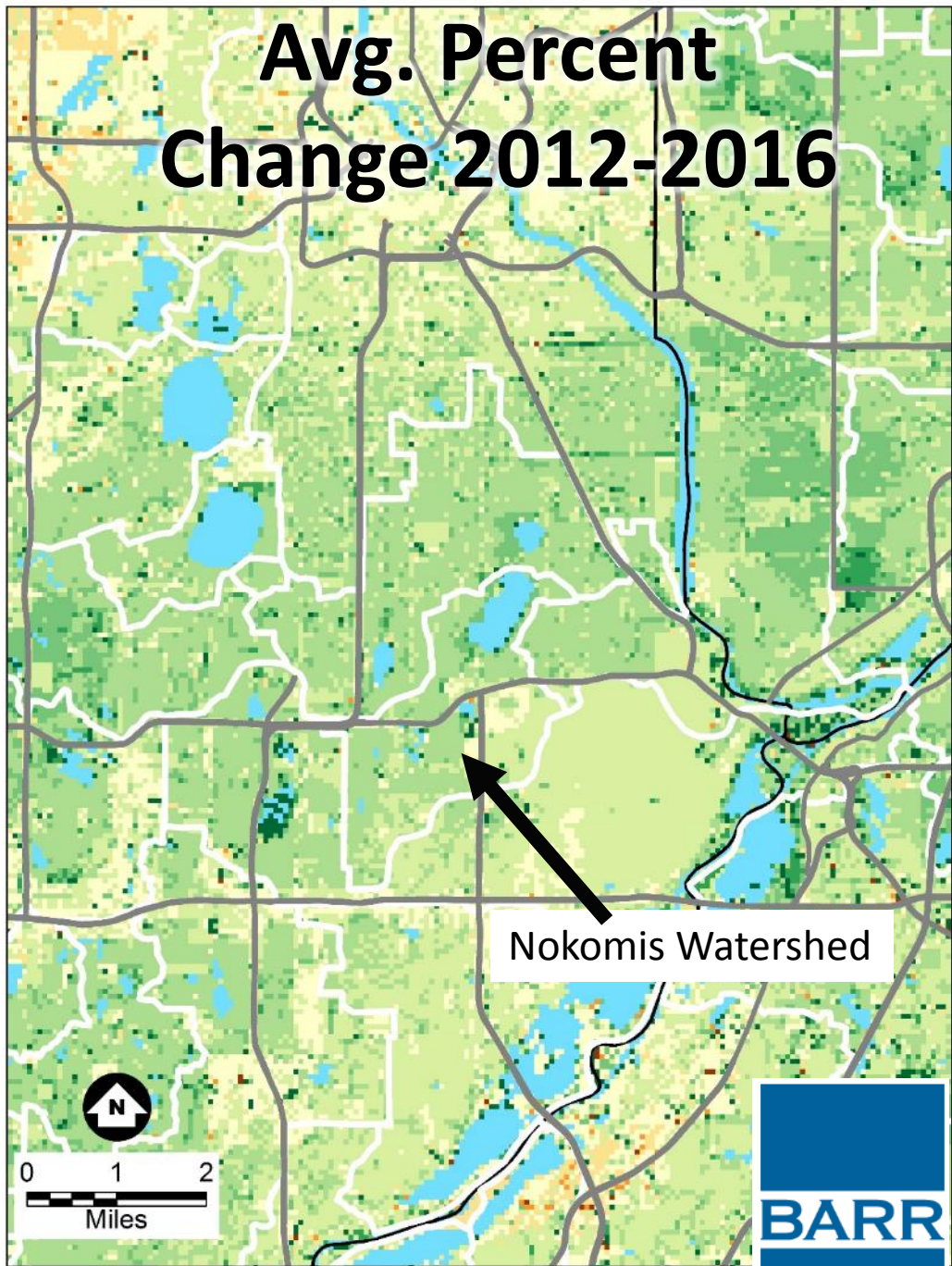
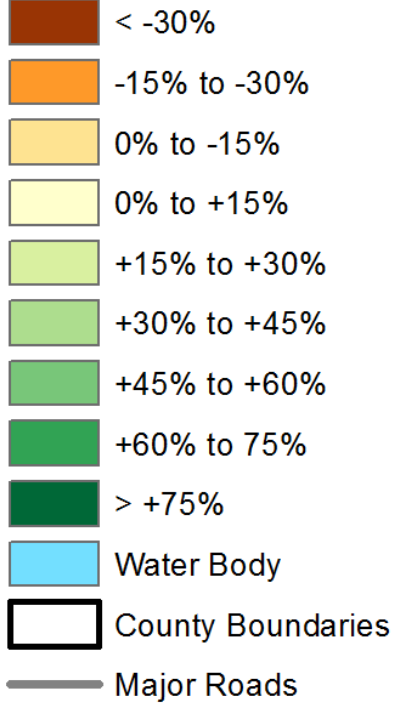


**Percent
Change from
Avg.
1988-2011**



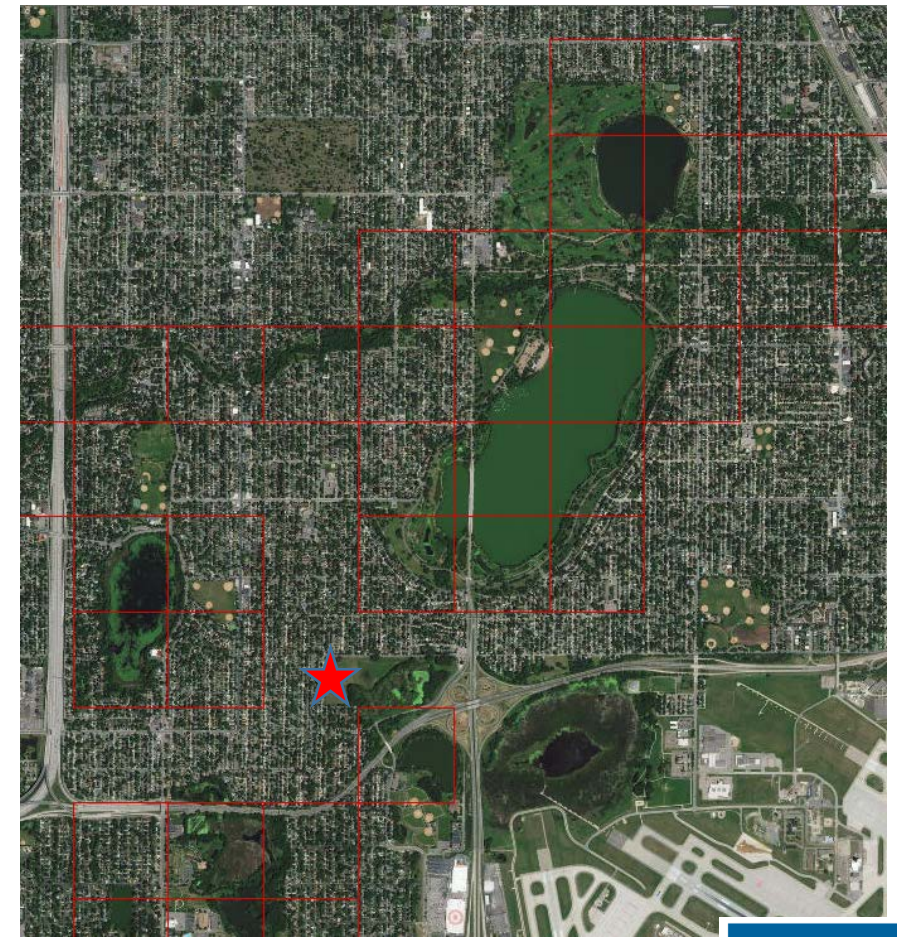
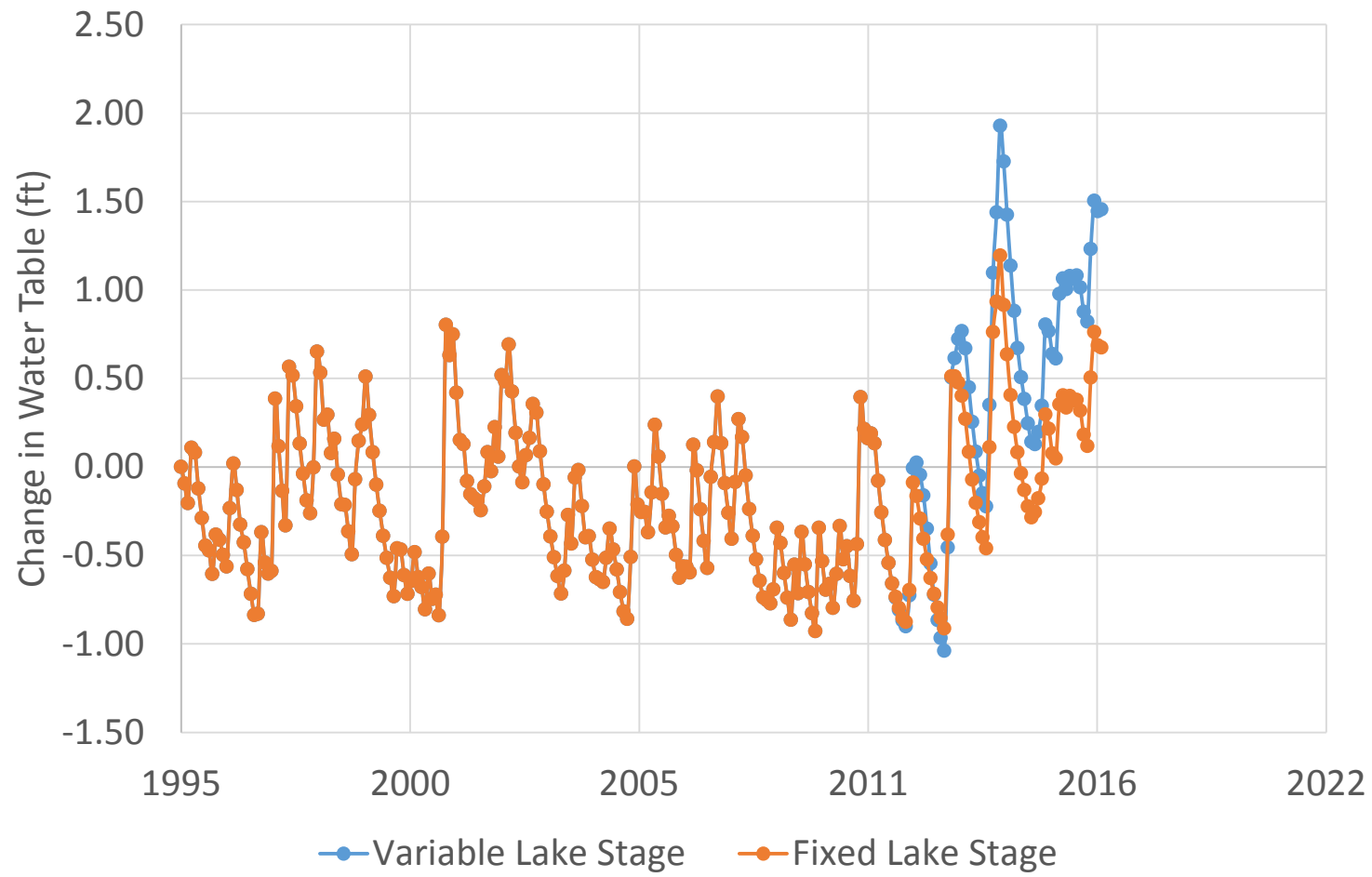


Percent Change from Avg. 1988-2011



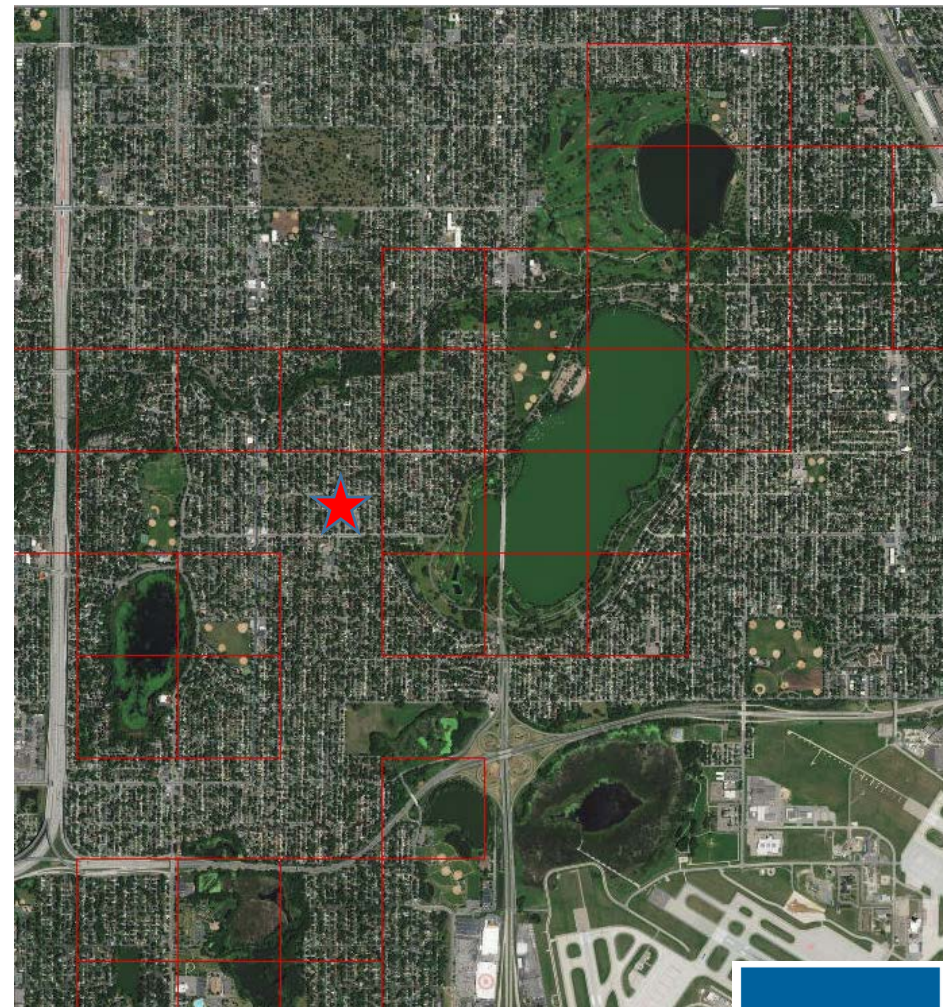
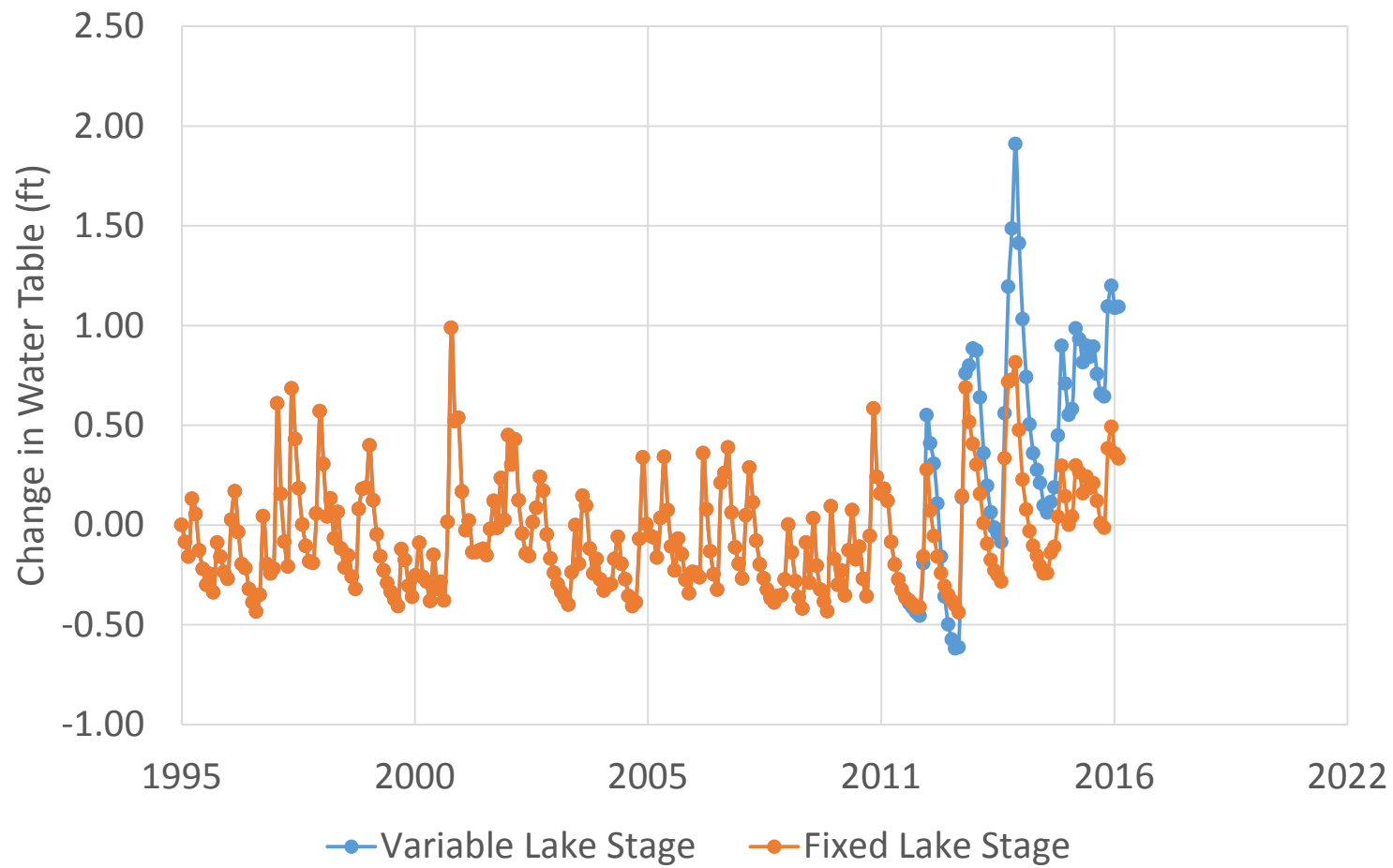


Simulated Change in Water Table



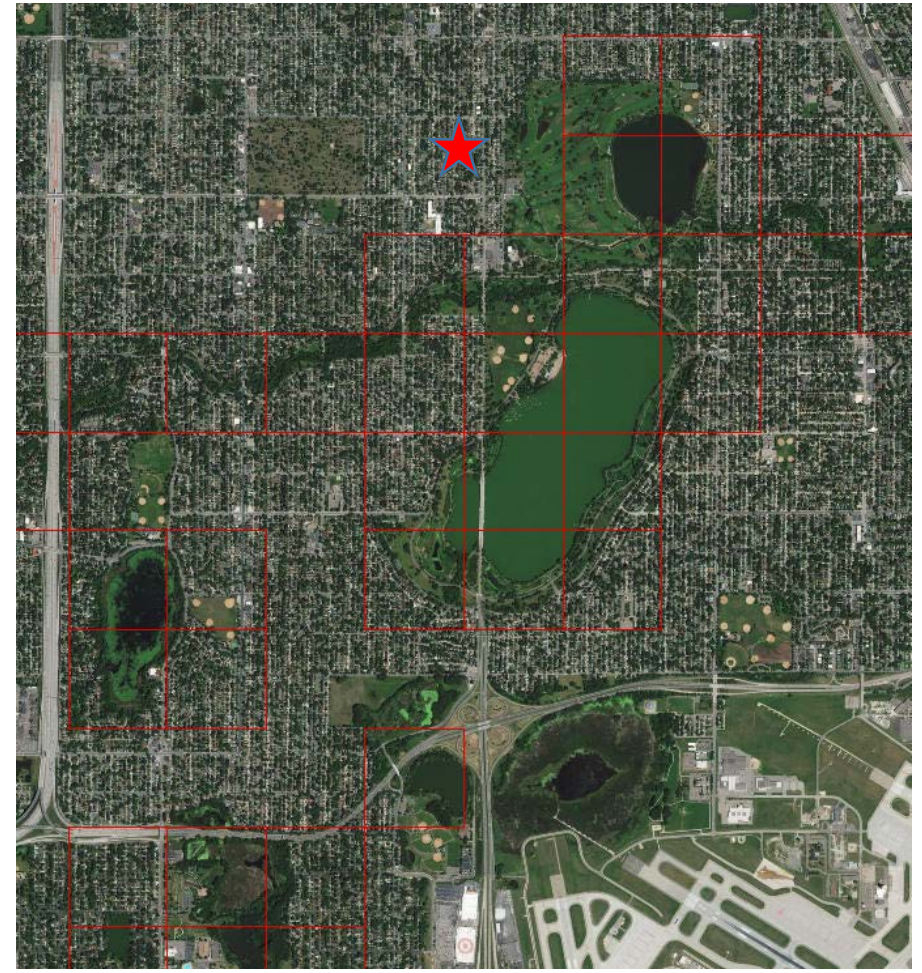
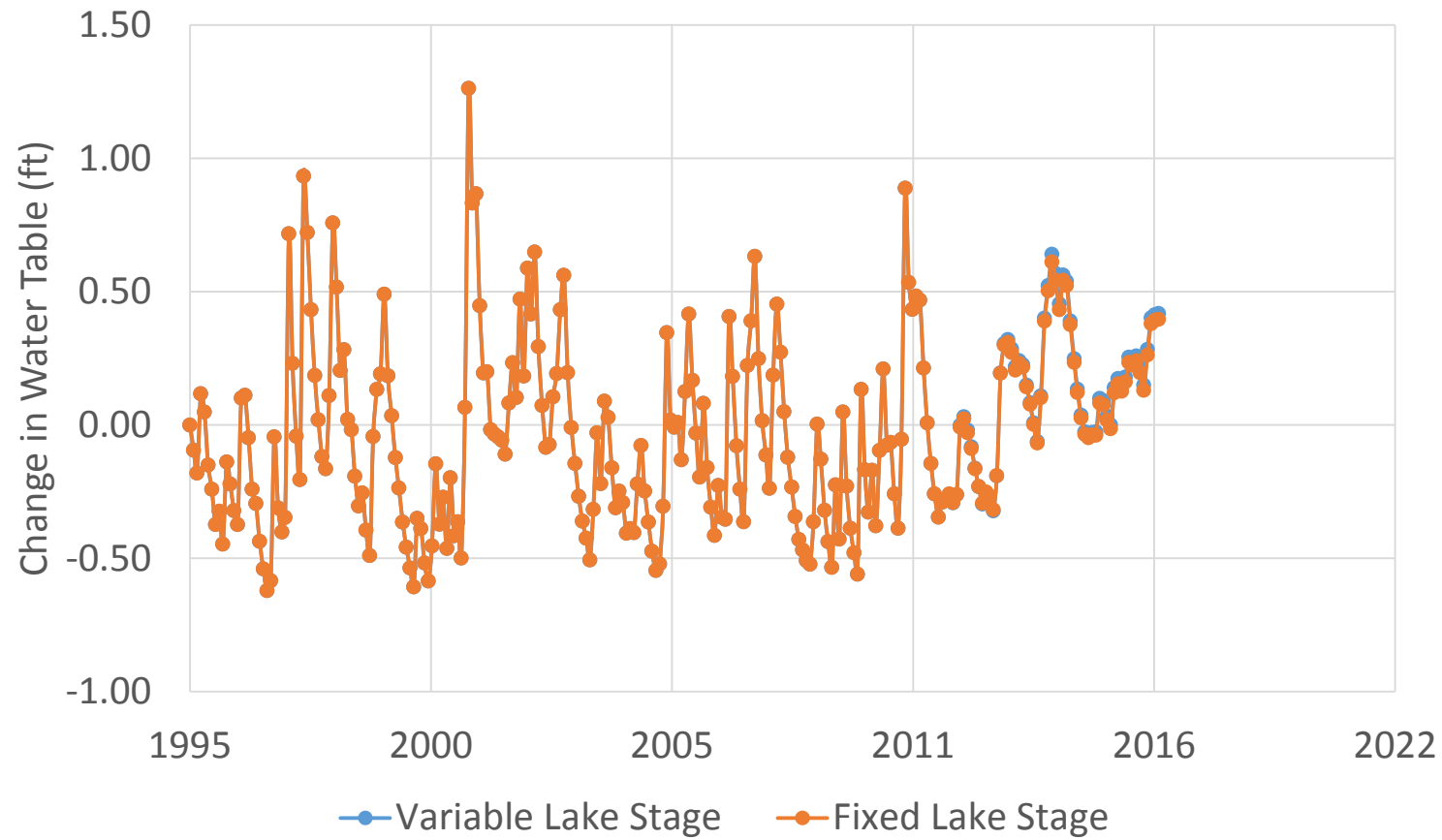


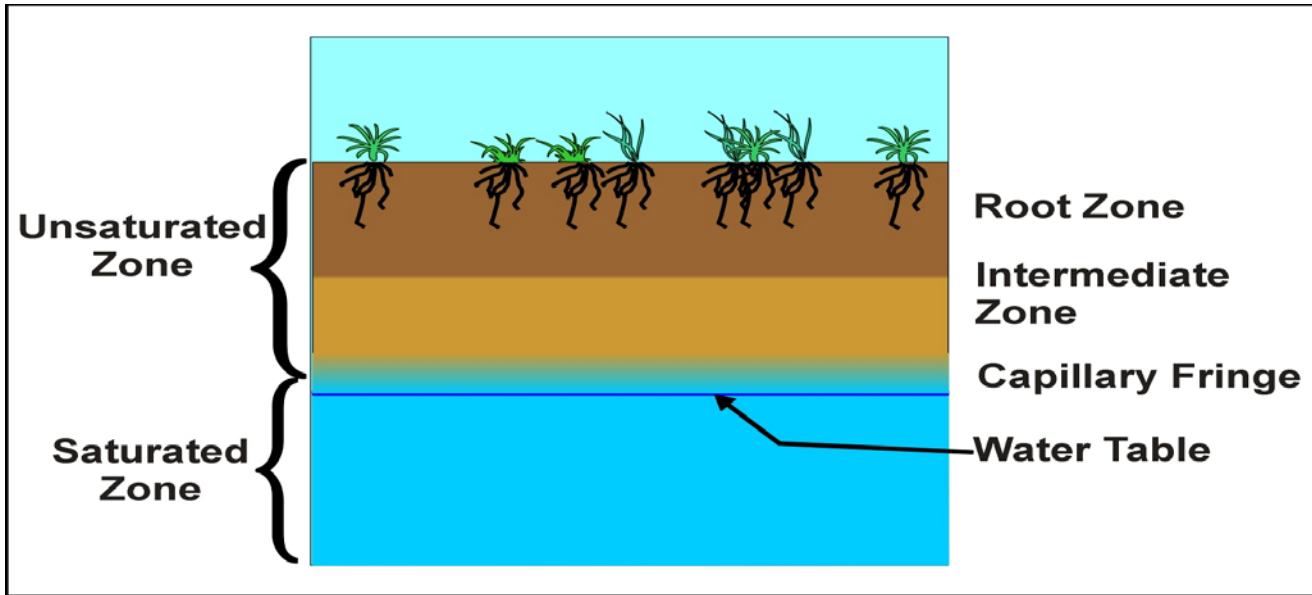
Simulated Change in Water Table



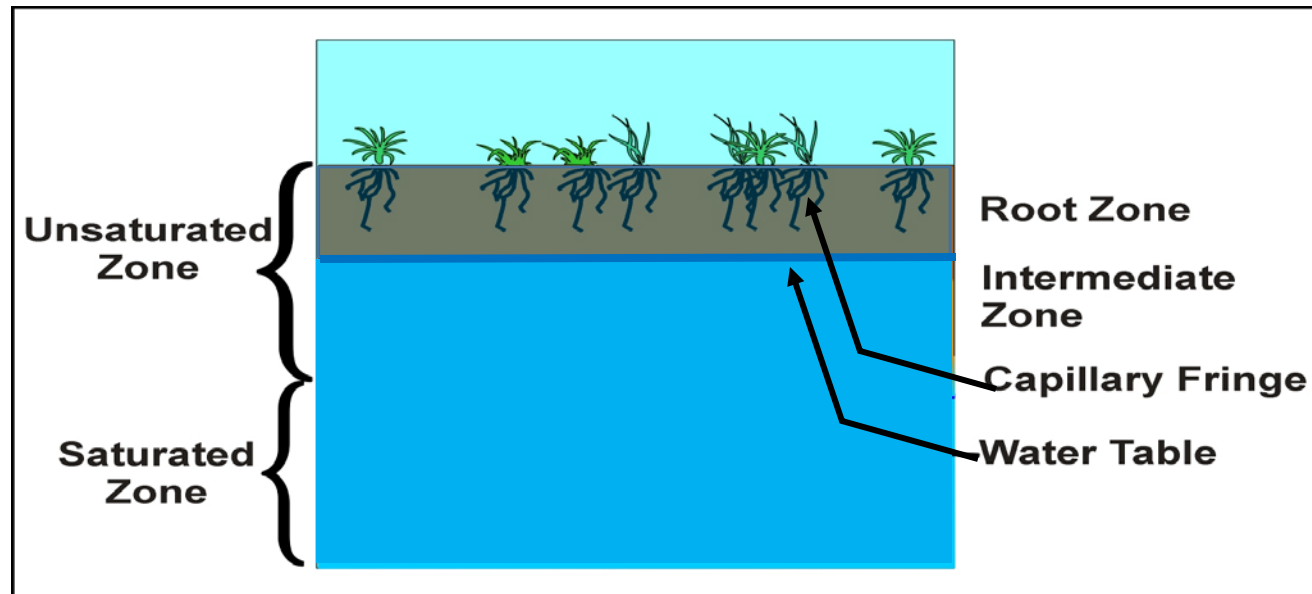


Simulated Change in Water Table





Where the water table is only a few feet below the ground surface, small (but long-term) changes in the water-table elevation can have dramatic effects



organic soils and peat typically have higher surface tension properties and thicker capillary fringes

Summary and some questions

- the last 4-5 years have had historically high recharge conditions in south Minneapolis – nothing like the previous 25 years
- historically, Nokomis stage would spike during rainfall events and snowmelt but drop during the winter
 - this hasn't seem to have been the case over the last 4-5 years. Why?
 - winter lake drops are likely very important in controlling groundwater elevations in the area – think of it as a giant seasonal drawdown well to remove built-up storage
 - Nokomis records from the Park Board give indication of when the weir is open and closed. Is the weir sized correctly (and is the crest low enough) to handle higher amounts of groundwater inflow?

Summary and some questions

- are Mother and Taft Lakes surface expressions of the water table (probably)?
 - if so, they are more likely symptoms of regional increases in recharge rather than significant sources of water
- are we focusing on the Nokomis area because of shallow depth to the water table?
 - are there other parts of south Minneapolis where similar issues may be occurring?
- is there a more automated method for controlling water levels in Nokomis (a check-valve system)?
- this may be the new normal (or a prelude to it)