The Future of Energy and Minnesota's Water Resources

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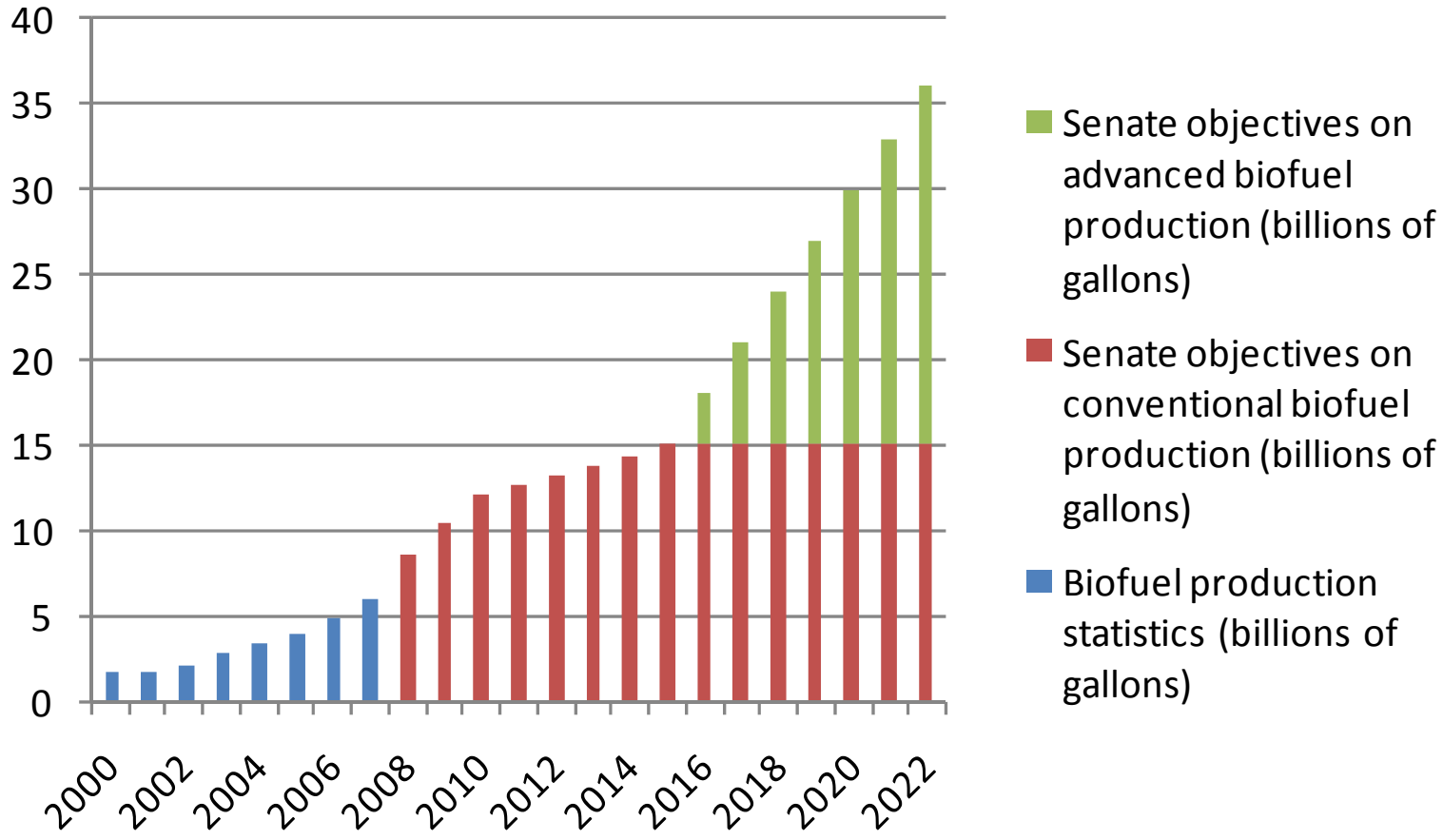
- Q & A

Background and objectives

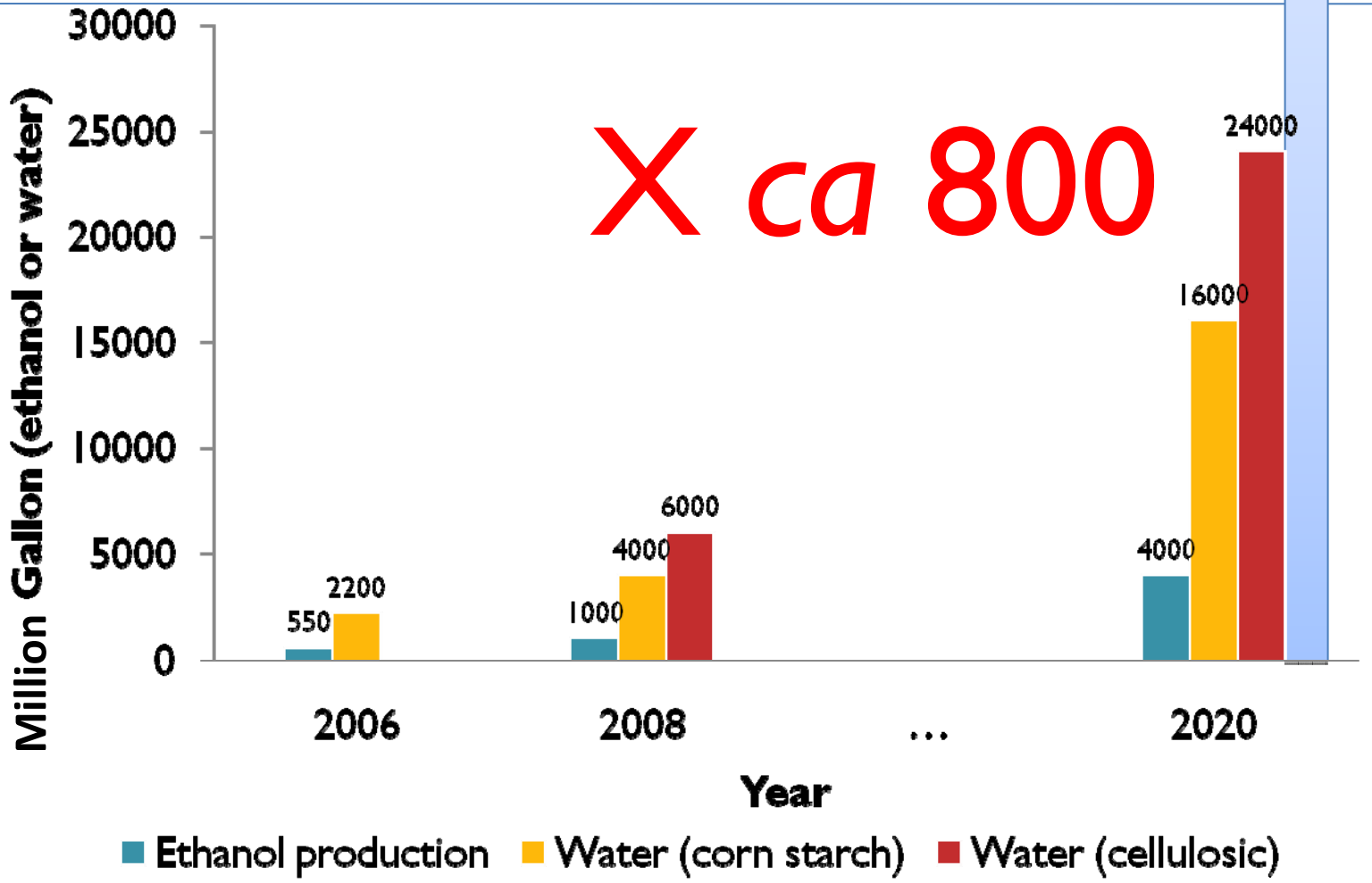
- Widespread public concerns on biofuel's water implication.
- Future energy environment will have significant implications on MN's water resource.
- We will bring up-to-date science and trends to better understand the future of MN's water resource under various water demand scenarios.

Some basic facts



3,140,000

Some basic facts



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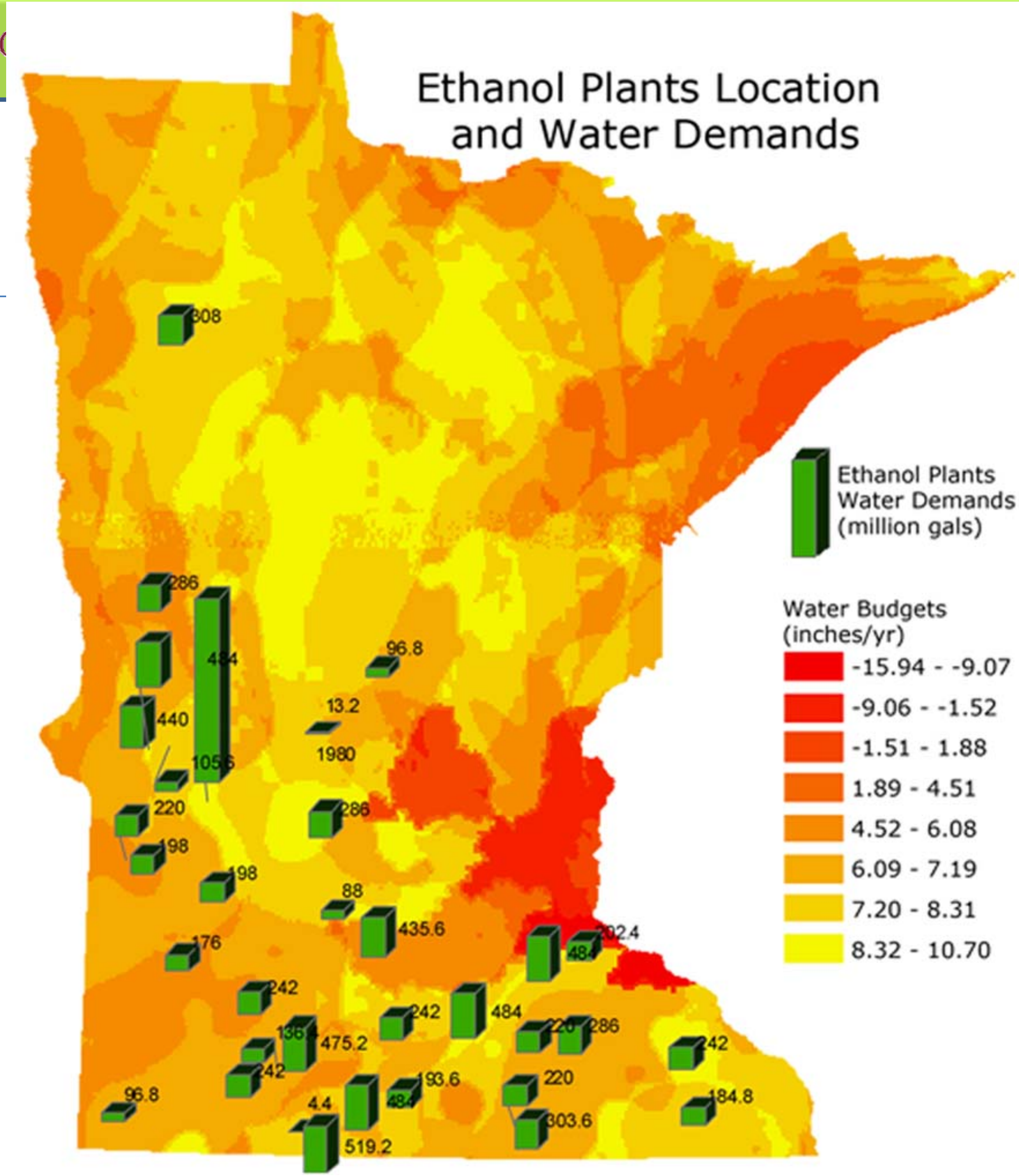

Ethanol Plants Location
and Water Demands
Ethanol Plants
Water Demands
(million gals)
Water Budgets
(inches/yr)
-15.94 - -9.07
-9.06 - -1.52
-1.51 - 1.88
1.89 - 4.51
4.52 - 6.08
6.09 - 7.19
7.20 - 8.31
8.32 - 10.70
308
286
484
440
105.6
220
198
198
96.8
13.2
1980
286
88
435.6
176
242
475.2
242
484
242
202.4
286
242
220
193.6
184.8
96.8
4.4
519.2
303.6

Water balance of an ethanol plant

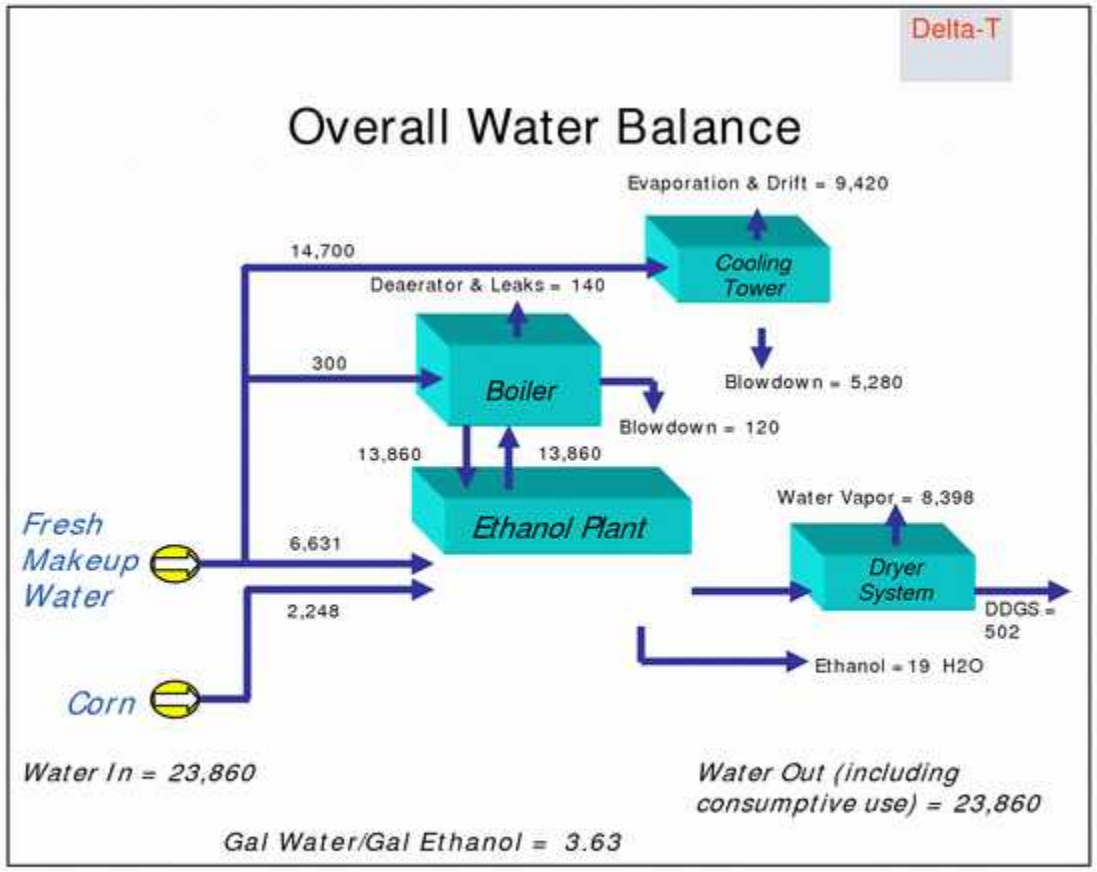


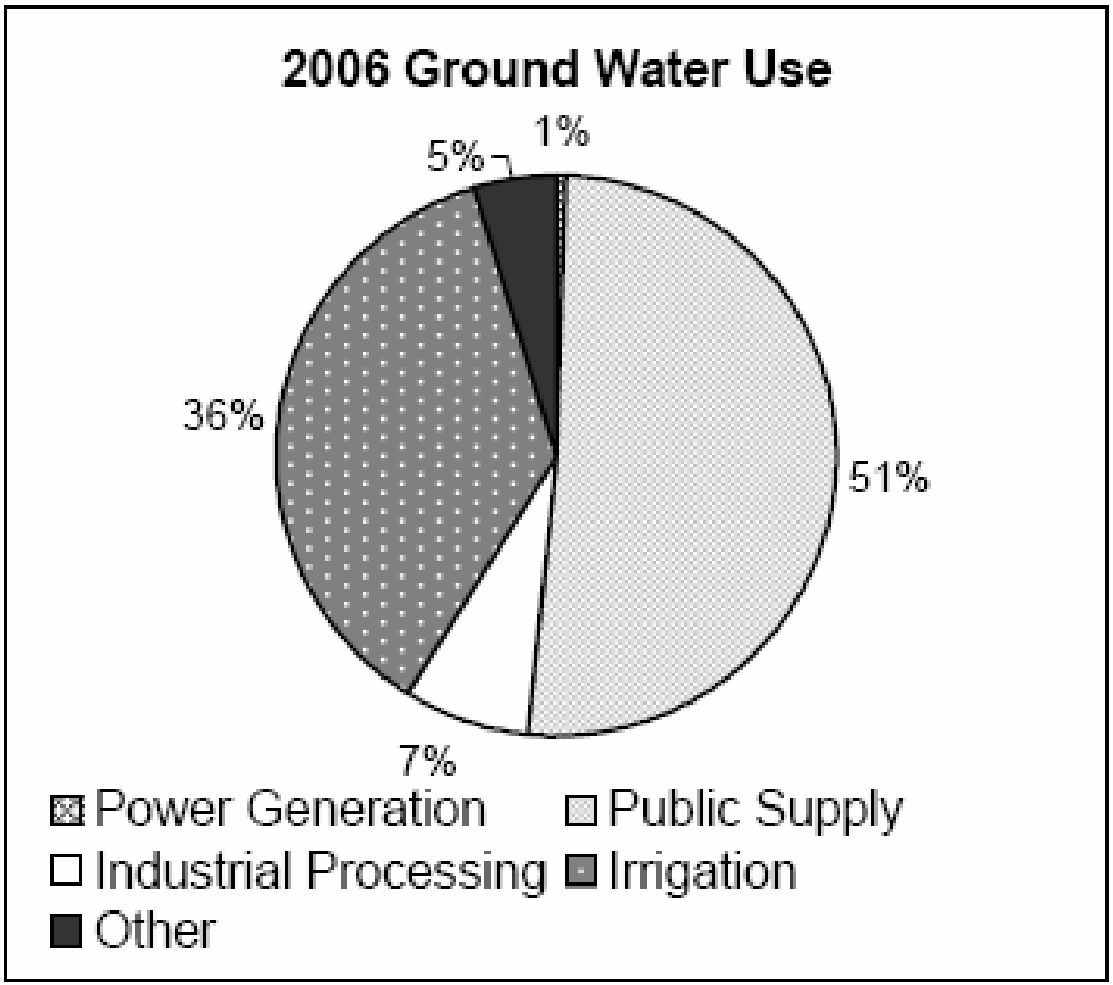
FIGURE 5-2 The overall water balance of a typical 50 million gallon per year corn-based Dry Mill ethanol production facility. All figures are in gallons per hour. SOURCE: Reprinted, with permission, from Courtesy of Delta-T Corp.

Source: Delta-T corp.

Some basic fact

- 16 – 24 billion gallon: just how much is that?
  - Total water withdrawal in MN reached 1.4 trillion gallon in 2005 (243 bil gal ground water, 2006).
  - Over 60% of it was for power plants.
  - But ethanol plants consumes drinking quality water.
  - Total public supply of water in MN in 2007 was 220 billion gal (DNR, 2008).
  - A non-conservative estimation is still < 10%.

Ground water use in 2006 (DNR)



Some basic facts

- So, where is the problem?
  - Water availability is inherently a local problem.
  - The intensity of water use by ethanol plant matters.
  - Water withdrawal by a 100 million gal/year of ethanol facility is more or less equivalent to a town with 5,000 residence.

Some basic facts

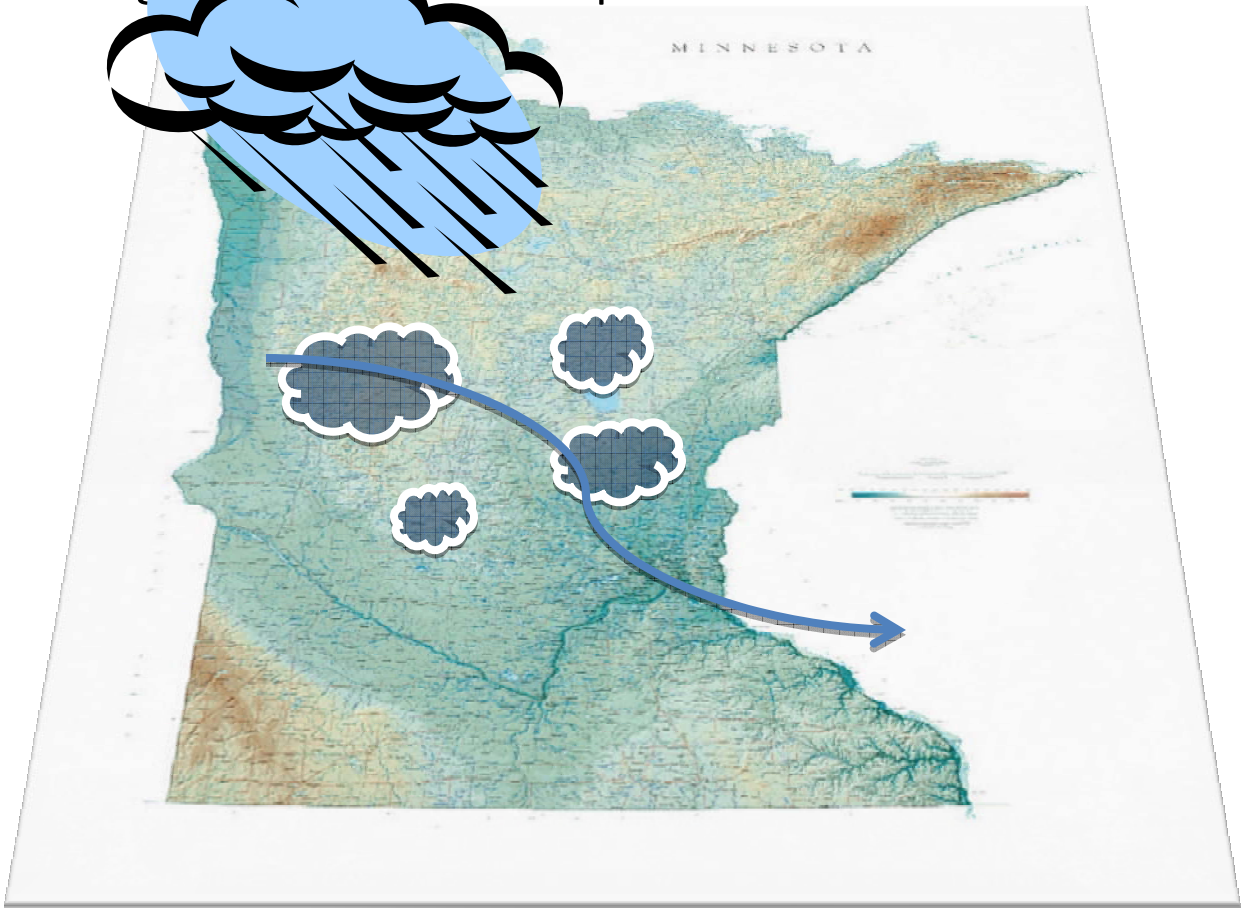
- Climate change and water availability
  - Intensification of rainfall
    - Higher run-off rate
  - Higher evapotranspiration (30 out of 37 tril gal/yr)
    - Higher evaporation rate
  - May result in water shortage depending on location-specific parameters.

Approach

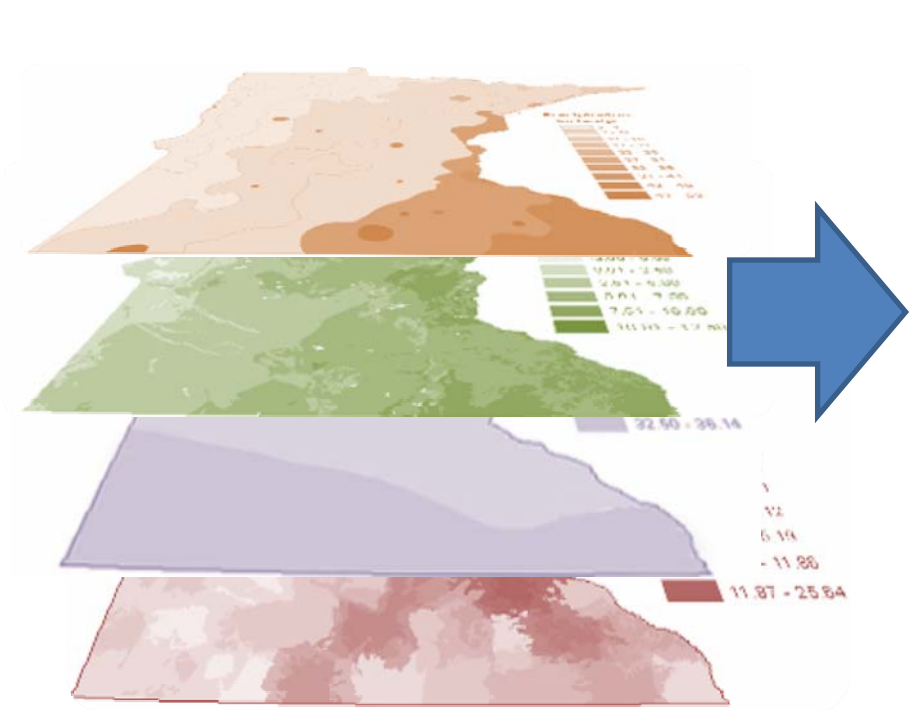

Water Balance
Water sustainability
Scenarios
GIS mapping

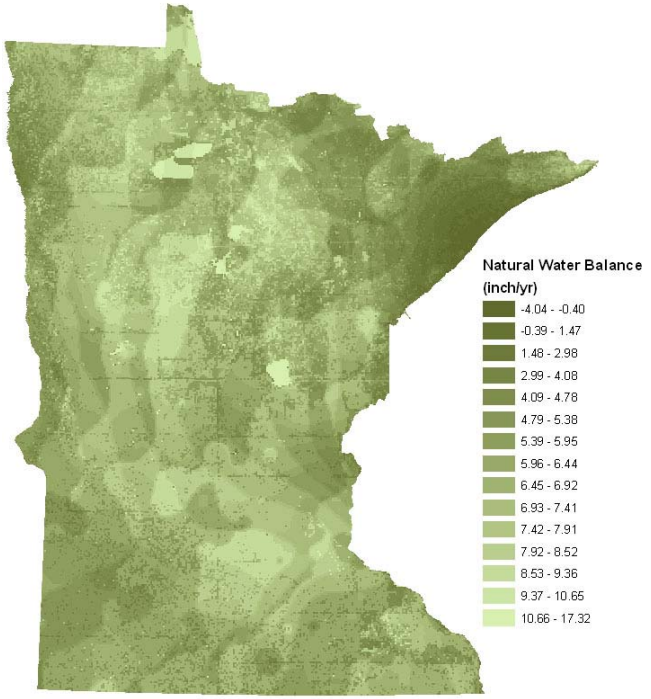
Water balance approach

- Precipitation – evapotranspiration – net run-off = water budget for groundwater recharg[illegible] consumptive uses



Integrating GIS mapping





Scenario development

- Ecosystem Science and Sustainability Initiative has been constructing scenarios for Minnesota resources (Minnesota 2050, sponsored by Bush Foundation).
  - Participatory process.
  - Regional scenario workshops have been held in various locations in MN involving local stakeholders.
  - In addition available trends, projections and policies will be utilized.

Expected outcomes

- Current MN water stress maps and analysis.
- Future water demand maps and analysis.
- Analysis of climate change implications on water budget in MN.
- Future water budget maps and analysis.
- Web site used as information clearinghouse.

Q & A