

Adapting Water Management in Northern Minnesota to a changing climate
Concurrent Session: Water Resources
November 28, 2007

Challenges:

1. Invasive species being introduced into other parts of the state.
2. Higher lake level fluxes
3. Water diversion of the Great Lakes
4. Population growth and the demands on water resources
5. Land use planning as it relates to water diversion
6. More frequent and intense storms; rainfall events; increased changes in precipitation amounts; models predicting larger extremes in precipitation
7. Longer stratification in lakes; higher internal phosphorus loading
8. Localized flooding/ localized drought
9. Less recharge for groundwater
10. Timing of rain events/ increased variance
11. Asynchrony with growing periods
12. Irrigation demands (ex. Park Rapids area); balancing agricultural demands on aquifers and municipal demands; agricultural management
13. Understanding feedbacks of drying wetlands
14. Lake water levels-expansion into littoral areas
15. Shorter winters- snow pack duration/ wind erosion, longer evaporation period
16. Hydrograph changes- more frequent bank full and late summer low flows; lower flows-less dilution of pollution concept
17. Increase shoreline development/ more runoff events and loss of natural buffers and wetlands
18. Loss of peat lands; higher fires
19. Developing research and data faced on future conditions as opposed to current conditions
20. Adaptive polices- governmental and NGO and coordination between them
21. Retrofitting obsolete infrastructure
22. Change in the degree of recreational impacts
23. Educating public and policy makers
24. Altering habitats for aquatic plants, fish and biota within a lake ecosystem
25. Changing storm water patterns on flood plains
26. Index of Biological Integrity (IBI) - how it changes or impacts values and other considerations regarding bioindicators
27. Changes in overall fish species/ habitats
28. Groundwater and surface water total availability
29. Wetland function and value
30. More storm events leading to erosion (storm management) and turbidity (water quality) and the affects of turbid waters on the ecological processes in a lake ecosystem, ex) fish communities; sedimentation of lakes and streams/ rivers
31. Lake flow regime- surface and groundwater; increase in isolated basins
32. Changes that will affect the nutrient cycle
33. Higher temps: low DO, algal growth, vegetation changes, evaporation (water cycle).

34. Declining water budget
35. Balancing demands on reservoir lakes (recreation and drinking water)

Opportunities:

1. To stabilize and protect river channels and reduce human occupation of flood plains
2. Different fishery resources can be developed in new areas
3. Opportunity to develop forest management in less saturated soils
4. Harvesting cellulose from prairie or aquatic systems (possibly exotics); cellulose ethanol (grassland expansion)
5. Develop technology to purify and more efficiently use scarce water
6. Shift in marketable products (improvement in innovative thinking and technology)
7. Educational opportunities to increase global warming awareness; enable people to learn the value of water; being proactive (making lifestyle changes), higher interest/ social value in water resources
8. Net increase in surface water for social and economic uses
9. Proactive planning in regards to permitting, mitigation, and wetlands planning; policies (rules, regulations, subsidies)
10. Programs to encourage water retention
11. Revisit (or not) Minnesota ditch law; ditch abandonment/ channel restoration
12. Agricultural responses
13. Environmentally- friendly landscaping (low/ no water use) or the use of rain gardens, buffer zones, etc.
14. Wetland protection/ restoration (filter function); local wetland protection
15. Carbon, phosphorus and nitrogen sequestration; manage wetlands for carbon sequestration
16. “Sentinel Lakes” in global context (changes in chemistries and nutrient budgets)
17. Longer tourist season, an increase in economic opportunities
18. Assisted migration of plant species
19. Continental scale ecosystem services
20. Greater education in terms of conservation easements
21. Collaborative research (Academic-LTER-oriented coupled with agency-applied)
22. Silvicultural practices, “green land, blue waters”
23. Whole watershed approach to phosphorus management
24. Watershed scale storm management
25. Adapt aquatic species management

Strategy One:

1. Draft public education policy
 - Links quality of life and climate change
 - Watershed approach

Techniques:

1. Curriculum in schools
2. Propose benchmarks
3. Incentive Programs (especially for lake shore owners and farmers)

Strategy Two: Implementing management projects to improve water conservation and combat or mitigate global warming

Techniques:

1. Reduce greenhouse gases as well as managing wetlands for carbon sinks