Sustainable Survival in Context of Hydrologic Trends (or Vice Versa)?



Energy & Environmental Research Center

Content

- Reconstruction of paleohydrologic history of the Devils Lake for recent 2000 years
- Evaluation of climatic trends based on available modern day records
- Evaluation of regional climatic trends and their socio-economic implications
- Sustainable survival I Implementation barriers
- Sustainable survival II Hydrologic science

Devils Lake and Red River Watershed



J.Solc, 2005

Lake Level Hydrograph



Recent Precipitation Trends



Devils Lake Cores,			Cores, N	larch 2002,	Livingston Series		s B
	B1 1383-	B2 1484-	B3 1585-	B4 1686-	B5 1787-	B6 1888-	B7 1989
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Core Characterization

Photographic Magnetic Susceptibility - LOI Dating (Pb²¹⁰, Cs¹³⁷, C¹⁴) Pollen Analyses Age Model Sampling Diatom Separation Diatom Analyses

Diatom Cyclotella Quillensis



Inferred Salinity



Location of Lakes Used for Reconstruction of Paleohydrologic History



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Regional Record of Climatic Change



Conclusions |

- Frequent climatic fluctuations resulting in alternating periods of drought and wet conditions are typical for Northern Great Plains.
- Transition between extremes occurs rapidly (decades).
- High water demand in the primary economic sectors makes regional economy extremely vulnerable to climatic extremes.
- Long-term periods of drought will limit socio-economic development in the region and may threaten even sustainability of current conditions (regardless of conservation based water management policies...that are largely ignored anyway).

Sustainable Survival – I

- Infrastructure development and planning
- Water resource management
- Projections assuming resources that are not available (credit cards?)
- Implementation barriers and costly errors
- Science and engineering
- Information transfer
- Decision makers and professionals
- Decision timeline

Population Trend – Fargo, ND



Raw Water Demand for Red River Valley 1994 38.8 MM m³ (10.2 billion gallons) 2050 105.4 MM m³ (27.7 billion gallons)

Water Use, ND (Mgd)

	2000		1995	
Energy	902	79%	880	79%
Agriculture	145	13%	117	10%
Public Supply	64	6%	73	7%
Total	1140		1120	

Groundwater – Moorhead Aquifer



ROAD

CLOSED











Sustainable Survival II – Our Science

- Are we speaking clearly and do we have (receptive) audience?
- Are we good marketers and ambassadors of our science? IT IS OUR DUTY!
- Our science is often driven by self-fulfilling interests of science *per se* without its application as a primary objective.
- Academic interests detached from reality; need for interdisciplinary integration.

Sustainable Survival II – Our Science

 Without admitting the need to change and to accept today's dynamic reality in presentation and (yes) marketing (no matter how poorly and "unscientific" does it sound) we may risk that our science becomes obsolete and irrelevant.