Approved: February 20, 2009
Date

MINUTES OF THE HOUSE VISION 2020 COMMITTEE

The meeting was called to order by Chairman Tom Sloan at 1:30 p.m. on January 21, 2009, in Room 711 of the Docking State Office Building.

All members were present except:
Representative Raj Goyle- excused

Committee staff present:
Art Griggs, Office of the Revisor of Statutes
Scott Wells, Office of the Revisor of Statutes
Corey Carnahan, Kansas Legislative Research Department
Chris Courtwright, Kansas Legislative Research Department
Mary Koles, Committee Assistant

Conferees appearing before the committee:
Edward A. Martinko, Kansas Biological Survey
Ed Carney, Kansas Department of Health & Environment
Jim Whisenant, City of Horton, Kansas
Earl Lewis, Kansas Water Office

Others attending:
See attached list.

Chairman Tom Sloan welcomed the conferees. He introduced the moderator, Ed Martinko, Kansas Biological Survey, and asked him to introduce the conferees as they spoke during their collaborative Power Point presentation (Attachment 1).

Dr. Edward A. Martinko, State Biologist and Director, Kansas Biological Survey, outlined the current state, trend, and spatial variability of sediment in Kansas reservoirs (Attachment 1, pages 1-21). He noted that the last time he addressed a Legislative committee was eleven years ago when he appeared before the House Utilities and Natural Resources Committee.

Ed Carney, Kansas Department of Health & Environment, Bureau of Environmental Field Services, described the impacts of sedimentation on water quality and the role of the state in ensuring public water supply quality (Attachment 1, pages 22-29).

Jim Whisenant, City Administrator, City of Horton, Kansas, discussed the City of Horton's ongoing project to restore the public water supply which has on RFP the dredging phase (Attachment 1, pages 30-37).

Earl Lewis, Assistant Director, Kansas Water Office, delineated the current status of Kansas' public water supply infrastructure (Attachment 1, pages 37-39).

The conferees distributed the following supportive documents to each committee member: Sedimentation in Our Reservoirs: Causes and Solutions, Executive Summary, Kansas State University, June 2008; Sedimentation in Our Reservoirs: Causes and Solutions, Kansas State University, June 2008, contribution no. 08-250 from the Kansas Agricultural Experiment Station; Kansas Water Authority, 2009 Annual Report to the Governor and Legislature.

Following the presentations, Chairman Sloan invited the committee to ask questions. Questions were asked by Chairman Sloan and Representatives Clay Aurand, Barbara Craft, Bill Feurborn, Doug Gatewood, Sean Gatewood, Pat George, Tom Hawk, Don Hineman, Melanie Meier, Joe Seiwert, Lee Tafanelli, and Kay Wolf.

Responses were given by the appropriate conferee or, in several instances, several conferees.

Chairman Sloan again thanked the conferees for appearing before Vision 2020.

MINUTES OF THE House Vision 2020 Committee at 1:30 p.m. on January 21, 2009, in Room 711 of the Docking State Office Building.

The next meeting is scheduled for January 26, 2009.

The meeting was adjourned at 3:10 p.m.

House Vision 2020 Committee Guest List

Date: Wed. January 21, 2009

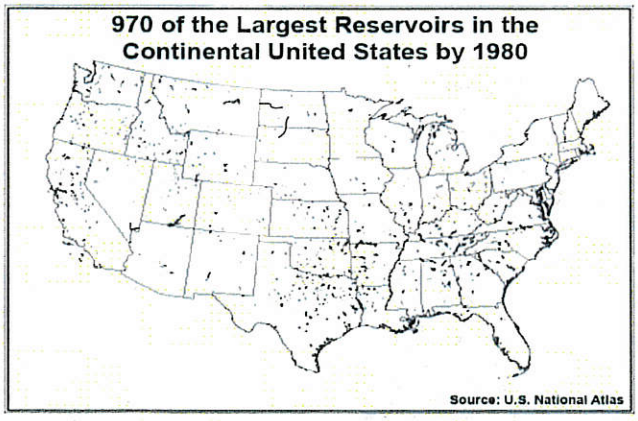
Name	Representing Client/Authority
Ed MARTINKO	KS. Biological Survey
John Mitchell	KDHE
Ed CARNEY	KDHE
Mark Jakubauskas	Ks Biological Survey
Susan Metzger	Kansas Water Office
Ann Bell	Kansas Water Office
Scott Campbell	Kansas Biological Survey
Dennis Kriesel	Kansas Association of Counties
Kent Askren	Ks Farm Bureau
Dan Korber	Kansas Inc.
John Selk	Landplan Engineering
Jim WITTSEMAUT	CITY OF HORTON, KS
Lindsey Douglas	KDA
Leslie Kaufman	KS Co-op Council
Steve Lukert	
Jennifer Welshear	Kansas Clwice Alliance

Dr. Edward Martinko

Current state, trend, and spatial variability of sediment in Kansas reservoirs

Kansas Biological Survey

The reservoir as a resource in nature



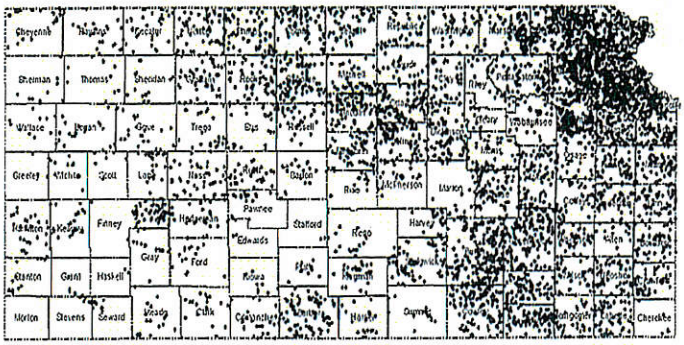
More than two million reservoirs of all sizes
1,275 federal reservoirs, the largest being 307,000 acres

So what about Kansas?

House Vision 2020
1-21-2009
Attachment 1-1

Federal, State, and Local Reservoirs in Kansas

5847 on the National Inventory of Dams

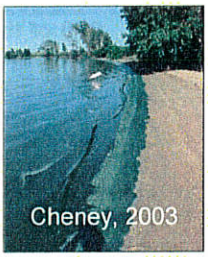


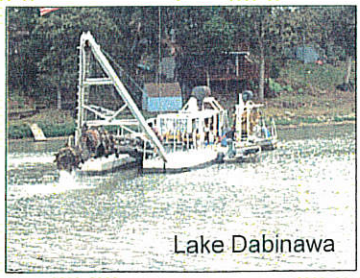
- 120,000 reservoirs of all sizes, incl. farm ponds
- Drinking water for more than 60% of Kansans
- More than $6 billion estimated construction costs in today's dollars

- Reservoirs used for drinking water: 93
  - Average age = >50 years old
- Designed life expectancy 50-100 years

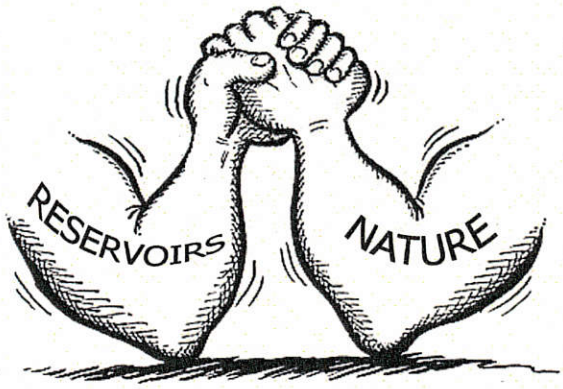
Sedimentation-related problems are occurring in nearly every reservoir in the state


Kanopolis, 2006


Cheney, 2003


Lake Dabinawa

"What's the Problem ?"



VERY few natural lakes in Kansas

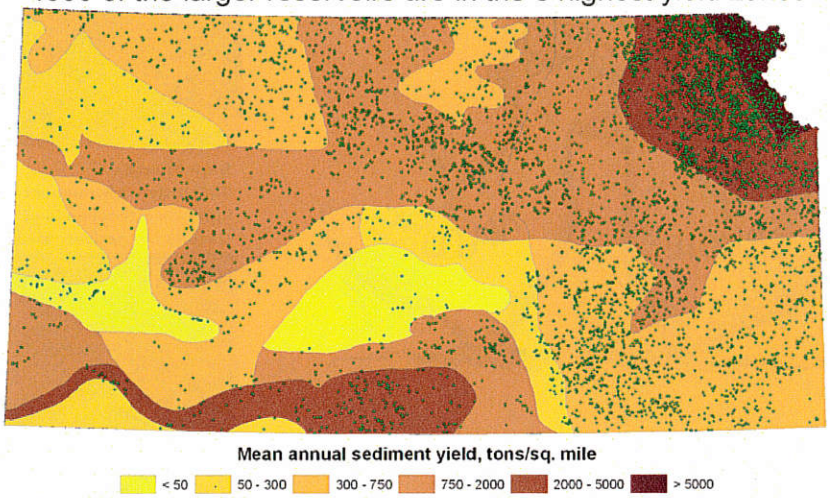
Natural origin
Supportive environment
Lifespan ~ thousands of years
Usually not actively managed

Artificial origin (constructed)
Less supportive environment
Lifespan ~ 50-100 years
Active management

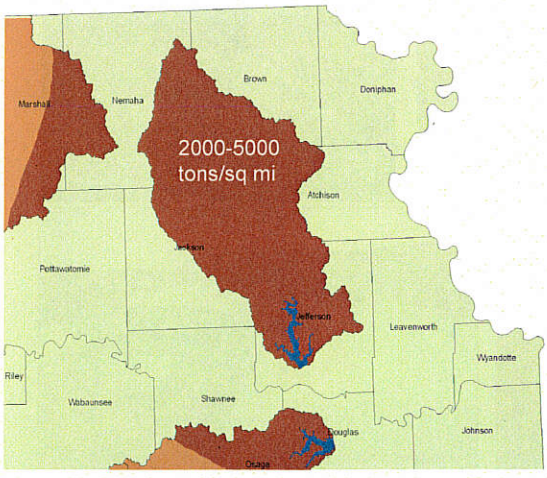
Thousands of years before cultivation and reservoirs, stream valleys in Kansas were naturally filling with soil and clay.

Areas of mean annual sediment yield and reservoirs in Kansas

4000 of the larger reservoirs are in the 3 highest yield zones



Case Study: Perry Lake Upper Basin Sedimentation

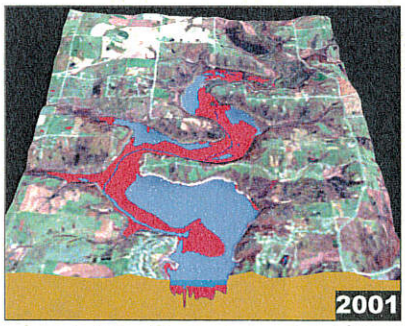


Case Study: Perry Lake Upper Basin Sedimentation

Accumulation since construction in 1969

Estimated 1000+ acres surface area lost
91.5 million cubic yards of sediment
18% of water storage capacity lost (2005)

Case Study: Perry Lake Upper Basin Sedimentation



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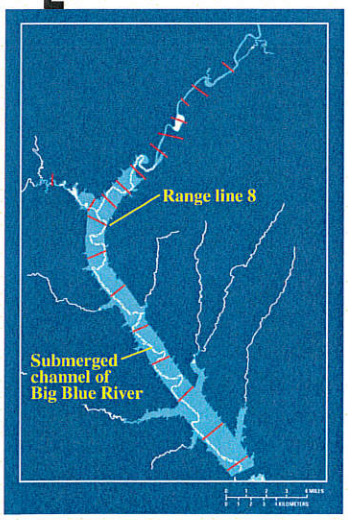
Case Study: Perry Lake Upper Basin Sedimentation

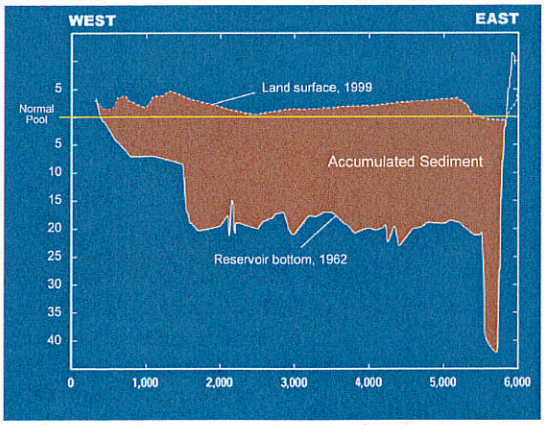
Accumulation since construction in 1969

Estimated 1000+ acres surface area lost
91.5 million cubic yards of sediment
18% of water storage capacity lost (2005)

Tuttle Creek: Severe sedimentation in places



Over 20 feet of sediment has accumulated in some parts of the reservoir



"The reservoirs still have plenty of water in them"

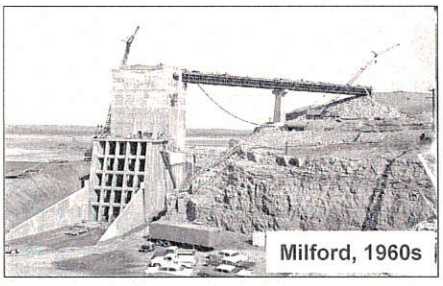
Some do.....

...Some don't...

...but that's only part of the problem.....

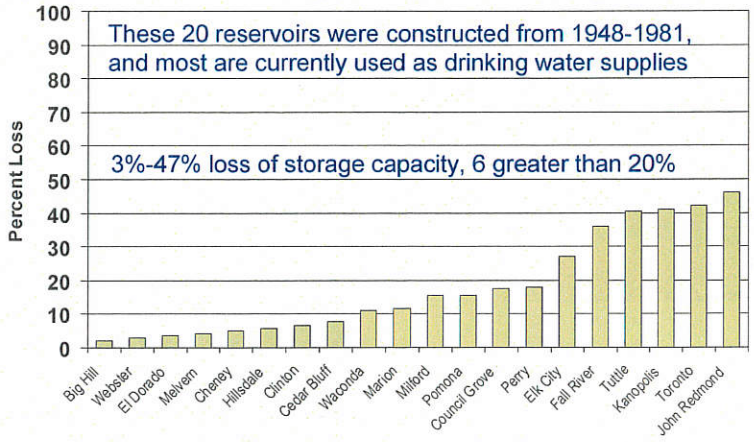
Federal reservoirs were originally built for specific purposes

- Flood control
- Irrigation
- Hydropower
- Recreation



- BUT – **Drinking water** has become a critical resource supplied by these reservoirs

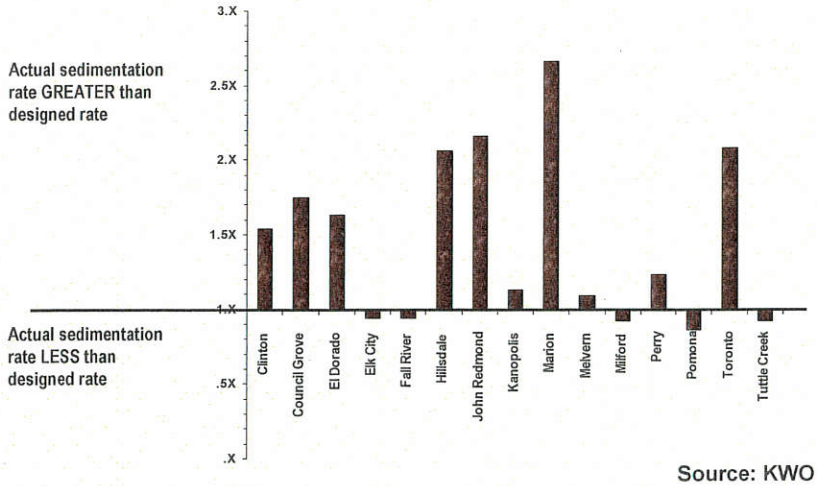
Kansas Federal Reservoirs
Loss of Capacity, Multi-Purpose Pool



Remember, most U.S. natural lakes are greater than 10,000 years old

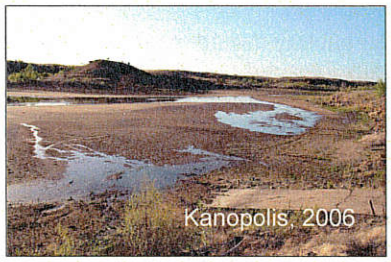
Source: KWO

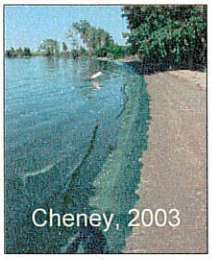
Many Kansas reservoirs are silting in faster than originally anticipated



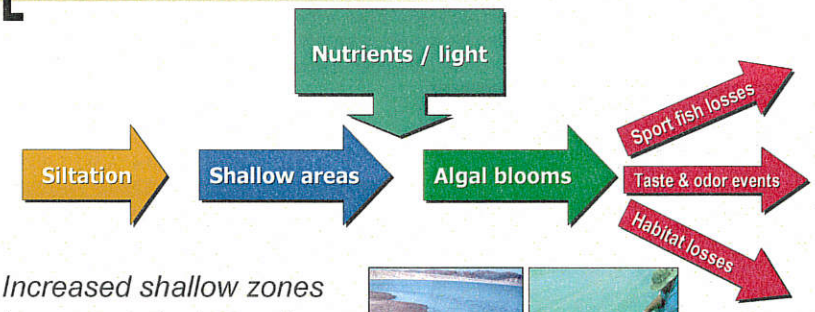
Source: KWO

Sedimentation-related problems are occurring in nearly every reservoir in the state





Sedimentation triggers numerous problems in the reservoir, even if overall capacity is not reduced significantly.



- *Increased shallow zones*
- *Increased plant growth*
- *Drinking water impairment*
- *Effects on fish populations*
- *Recreation impairment*
- *Loss of water storage*
- *Decreased flood control*

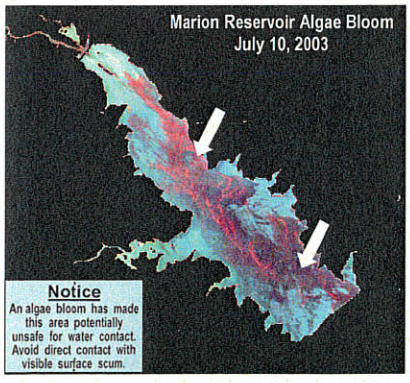
National Water Quality Inventory: 1998 Report to Congress

In Kansas, 193 of 240 (80%) publicly owned reservoirs were considered to be water-quality impaired.

Cheney, 2003

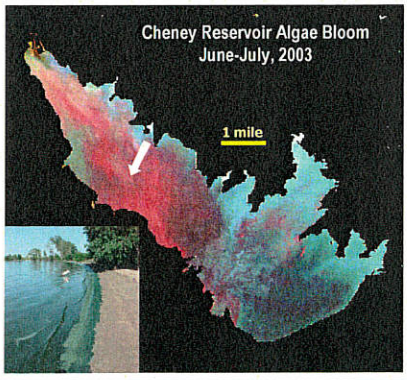
Problems triggered by sedimentation can affect thousands of Kansas citizens

"Following a three-week ordeal with anabaena algae in the Marion Reservoir, the water plants in Hillsboro and Marion were able to restore service in early July."
(Kansas Municipal Utilities Newsletter, August 2003)



Color-infrared satellite imagery detects algae blooms, shown in red on images.

"Sick of that musty, earthy odor that has become all too familiar in Wichita's tap water?"
(Wichita Eagle, July 20, 2003)

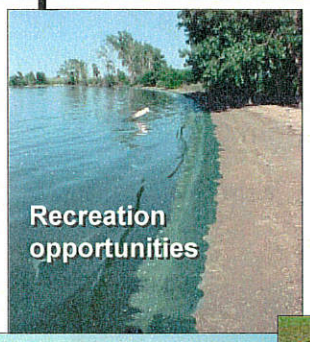


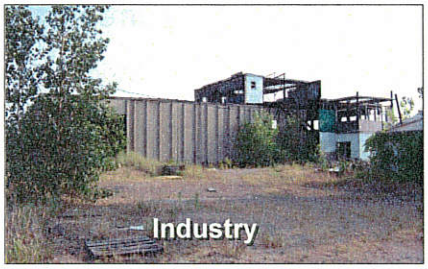
Some Real Costs of Reservoir Impairment in Kansas

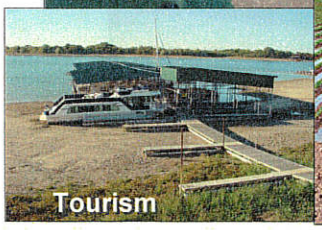
Treating taste and odor issues in drinking water

- City of Wichita –
  - $750,000/year additional for drinking water treatment.
  - $3.5 million for treatment plant changes.
  - $7.5 million for new ozone plant.
- City of Lawrence –
  - $500,000/year in potential additional costs for continuous drinking water treatment.
- City of Hillsboro –
  - ~ $25,000/year in potential additional costs for continuous drinking water treatment.

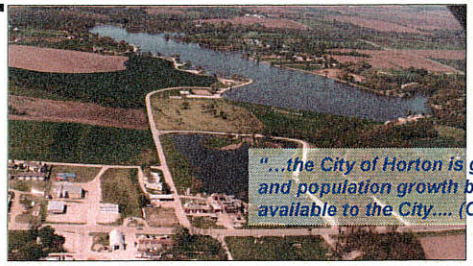
Direct and indirect economic consequences of siltation in our reservoirs may well exceed the flood control value







Reservoirs should be thought of as *critical economic infrastructure*: a multi-billion dollar investment



"…the City of Horton is going to be limited in economic and population growth by the amount of water that is available to the City…. (City of Horton, 2006)

By comparison:

"Area transportation planners have identified $732 million worth of road projects needed in Douglas County between now and 2030." (Lawrence Journal-World, 2/2/08)

Basic questions concerning reservoir conditions

- ✓ What is the current state of our reservoirs ?
- ✓ How fast is siltation occurring ?
- ✓ Where is the sediment coming from ?
- ✓ What is the supply and quality of drinking water ?
- ✓ How much time do we have left ?

Answers to basic questions: What is the current state of our reservoirs?

Reservoir	Date of closure	Date of last survey	Years since last survey
Kanopolis	1948	1982	**26***
Marion	1968	1982	**26***
Wilson	1964	1984	**24***
Council Grove	1964	1985	**23***
Melvern	1972	1985	22
Pomona	1963	1989	18
Fall River	1949	1990	17
Toronto	1960	1990	17
Clinton	1977	1991	16
Big Hill	1981	1992	15
Elk City	1966	1992	15
Milford	1967	1994	13
Hillsdale	1981	1996	11
Cheney	1964	1998	9
Tuttle Creek	1962	2000	7
Perry	1969	2001	6
El Dorado	1981	2005	2
John Redmond	1964	2007	0

* New reservoir depth and sediment assessments, 2007-08

Planned Reservoir Surveys Through FY2012

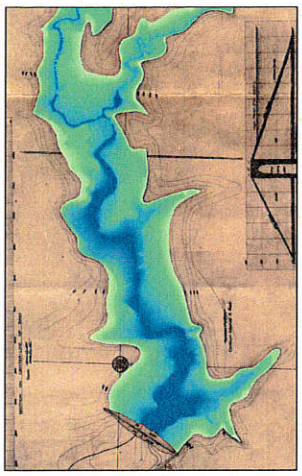
Kansas Biological Survey and Kansas Water Office

FY08	FY09	FY10	FY11	FY12
Kanopolis	Clinton	Toronto	Tuttle	Lovewell
Wilson	Pomona	Fall River	Perry	Waconda
Marion	Hillsdale	Elk City	Milford	Sebelius
Council Grove	Melvern	Big Hill	Cheney	Cedar Bluff
Herington	Miola	Centralia	Lake Afton	Anthony City
Wabaunsee	Louisburg SFL	Banner Creek	Wyandotte Co.	Cedar Creek
Bone Creek	Osage City	Atchison SFL	Strowbridge	Augusta City
Wellington	Rock Creek	Yates Center (New)	Polk Daniels (Elk Co SFL)	Augusta Santa Fe
Winfield	Ft. Scott City	Pony Creek	Lake Meade	Thayer City Lake (Old and New)
Council Grove City Lk	Madison City	Lake Shawnee	Ford Co.	Pleasanton
Parsons	Wolf Creek	Pottawatomie Co. Lk#1	Coldwater	Alma

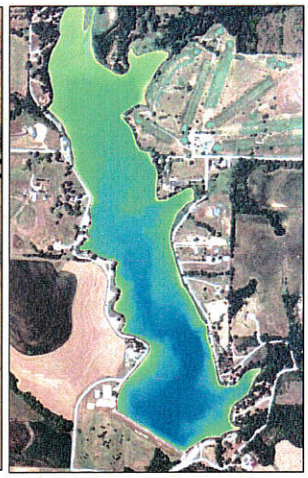
This list includes only about 10% of the publicly-owned reservoirs in Kansas

Measuring current state of sediment accumulation

Pre-impoundment maps compared to new reservoir depth maps



1923: 1866 acre/feet



2007: 1035 acre/feet

Mission Lake

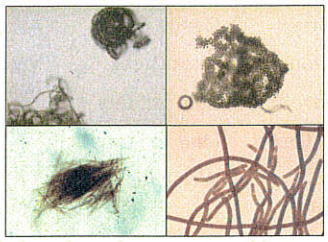
45% of the original basin has filled with sediment

"The economic viability of the City of Horton is dependent upon the dredging of Mission Lake" (City of Horton, 2006)

45% loss of volume in 84 years

Measuring current state of reservoir water quality

Monitoring accelerated growth of certain types of plants commonly associated with drinking water taste and odor problems



KDHE monitors water quality in 112 reservoirs at 3-year intervals

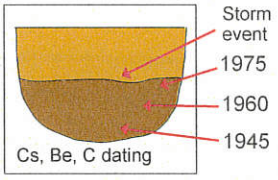
Answers to basic questions: How fast is siltation occurring?

Sedimentation rates measured by repeated reservoir depth mapping



Sedimentation rates measured by core layer dating



Answers to basic questions: Where is the sediment coming from?

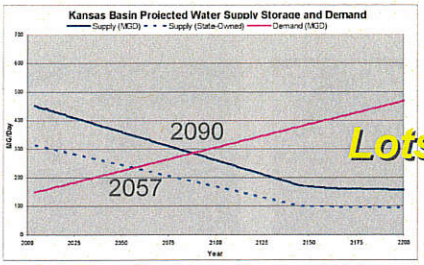
Over-land erosion ?

Channel erosion ?

In fact, stream channel erosion is increasingly recognized as a significant source of reservoir sediment

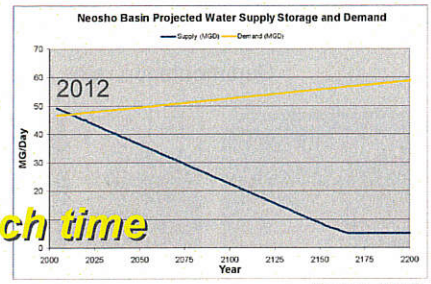
Higher N^{15} : N^{14} ratios indicate channel sources and lower ratios indicate surface land sources.

Answers to basic questions: How much time do we have left?



Lots of time....

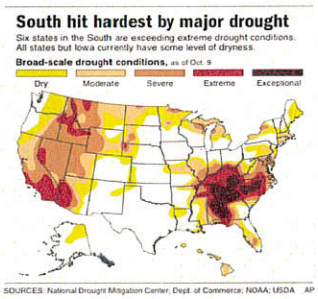
...not much time

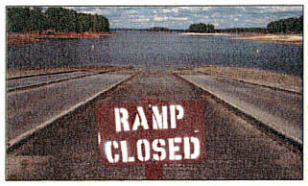


Source: KWO

Cities dependent upon reservoirs for drinking water can be crippled by water shortages

Has time run out for Lake Lanier ?





Reservoirs…a vanishing resource

These actions have been or will be deployed in the state:

- Watershed and channel management (state-wide)
- Raise water levels (John Redmond)
- Build secondary dams (Wellington Lake)
- Dredging (Mission Lake Pilot Project)
- Build new reservoirs (Bone Creek)

Watershed and channel management

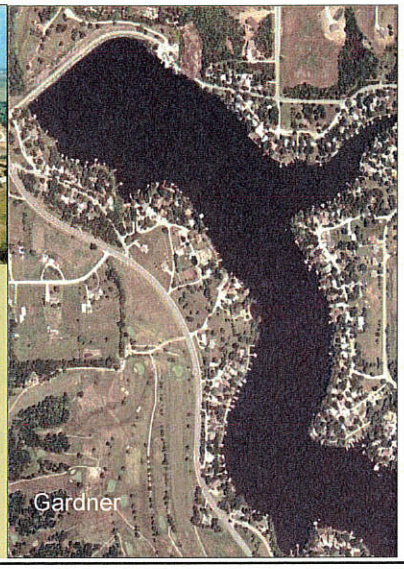
Challenges:

- Multiple jurisdictions
- Multiple landowners
- Cost
- Prioritization
- Action effectiveness

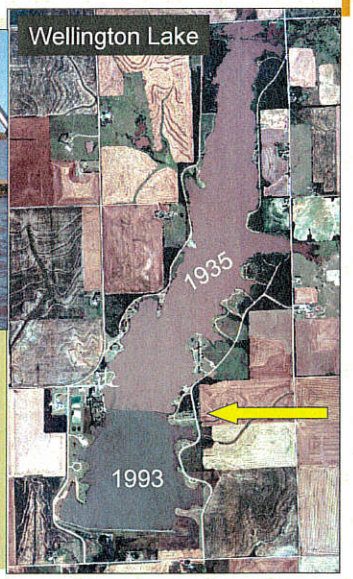
Raise water levels

Challenges:

- Multiple jurisdictions
- Policy changes
- Effects on surrounding infrastructure
- Development around reservoirs
- Engineering considerations



Build secondary dams



Challenges:

- Effects on surrounding infrastructure
- Development around lakes
- Appropriateness for site
- Engineering considerations

Dredging

Challenges:

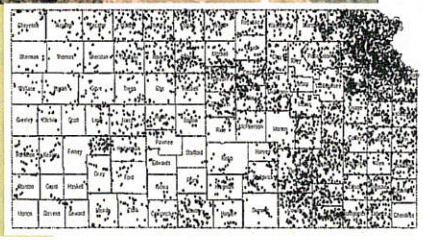
- Multiple jurisdictions
- Public concerns
- Effects on quality of water supplies
- Trace contaminants released
- Location of dredging spoil piles
- Costs 30X original construction

"The economic viability of the City of Horton is dependent upon the dredging of Mission Lake"
(City of Horton, 2006)

Build new reservoirs

Challenges:

- Availability of locations
- Multiple jurisdictions
- Environmental concerns
- Existing developments
- Public concerns



"The problem is too big/expensive/unmanageable/____"

No.

Unlike many potential problems we face:

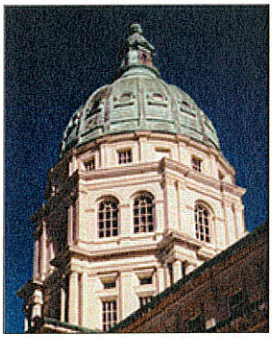
- Multiple causes
- Unclear effects
- Uncertain consequences
- Unknown solutions

Siltation is a TANGIBLE Problem:

- Known causes
- Known effects
- Known consequences
- Known solutions

"The problem is too big/expensive/unmanageable/____"

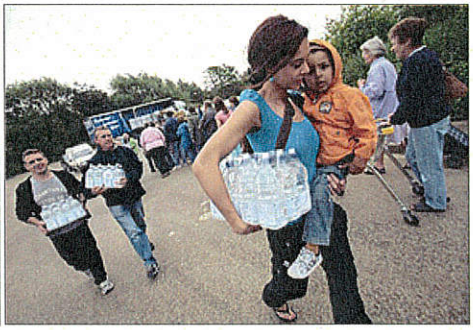
Much can be accomplished:



- ***Policy and Politics:***
  - *Reservoir sedimentation and water supply/quality issues cross state, local, and federal jurisdictions.*
  - *Creative solutions*
  - *Intelligent planning and policies*
  - *Supported by good science and accurate information (ASTRA*)*

*Applied Science and Technology for Reservoir Assessment Program, Kansas Biological Survey and the Kansas Water Office

Of course, we can TRY to ignore the problem….



….but we have a good idea of the eventual consequences

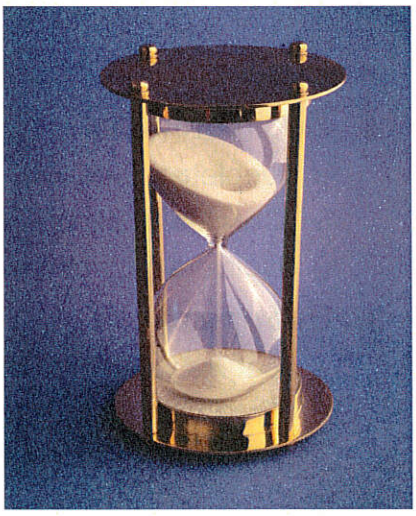
Sedimentation in our Reservoirs:

Are They Half Full

or

Half Empty ?

YES.



Edward Carney

Impacts of Sedimentation and Nutrient Load on Water Quality: Ensuring Water Supply Quality of Kansas Lakes and Reservoirs

Kansas Department of Health and Environment

Sedimentation and Eutrophication

- Impacts and Occurrences are Linked
- Sedimentation…
  - Depletes Lake Volume Over Time
  - Creates Shallow Areas, Especially Upstream
  - Delivers Nutrients with Physical Sediment
- Eutrophication…
  - Begins with Nutrient Load from Watershed
  - Ends with Increased Trophic Status, Algae Blooms, and Impacts to Many Beneficial Uses

Eutrophication Process

- Watershed Delivers Nutrients (P and N) From Point and Nonpoint Sources
- Lakes Receive These Nutrients
- Lake Hydrology and Morphometry Combine to Develop Water Column Light and Nutrient Regimes
- Algae (Phytoplankton Primarily) Grow to Limits Imposed by Those Regimes

Eutrophication Process

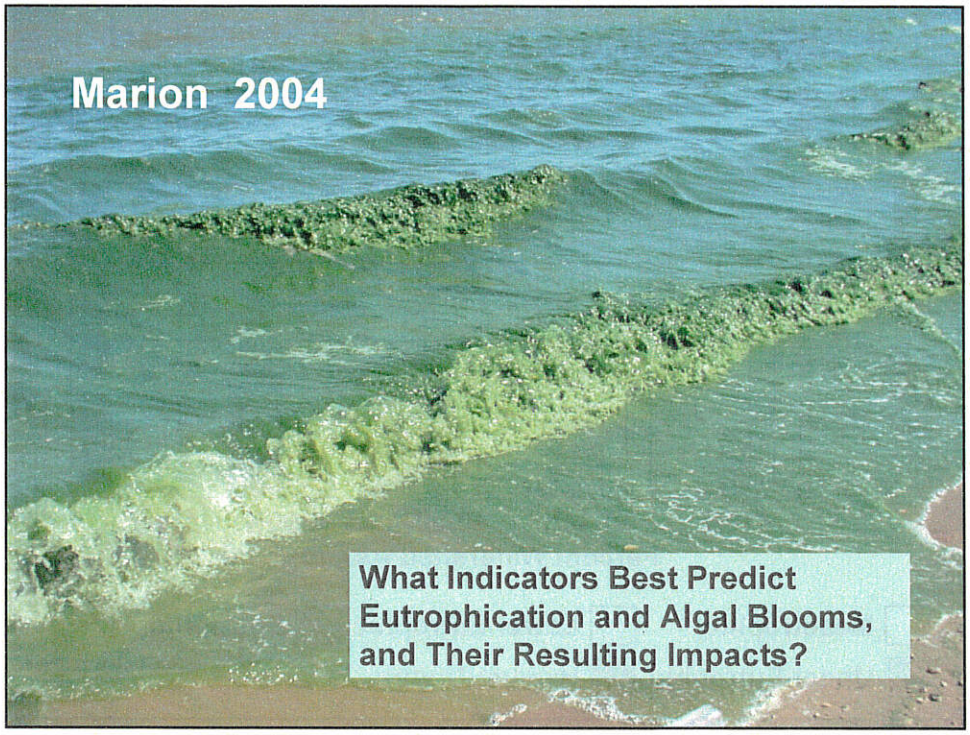
- More Nutrient/Sediment Inputs = Greater Potential for Algal Biomass
- Greater Algal Biomass (Higher Trophic Status) = Greater Number of Impacts on Beneficial Uses
- Physical Sedimentation Exacerbates Eutrophication by Creating Additional Shallow Habitat Along Shorelines and Headwaters

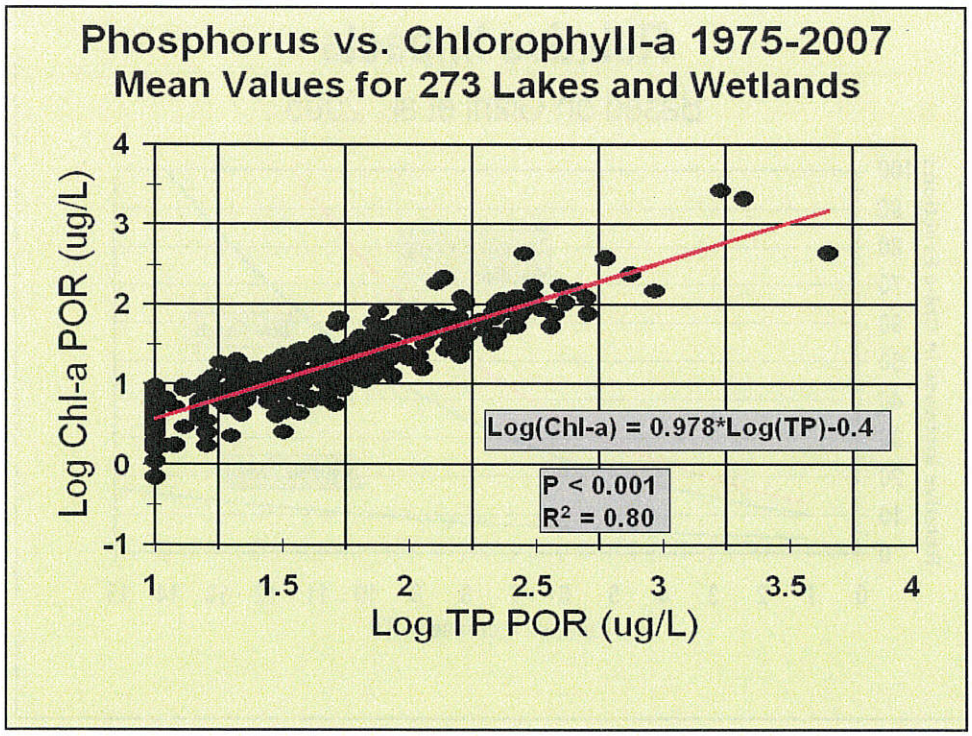
Common Eutrophication Impacts

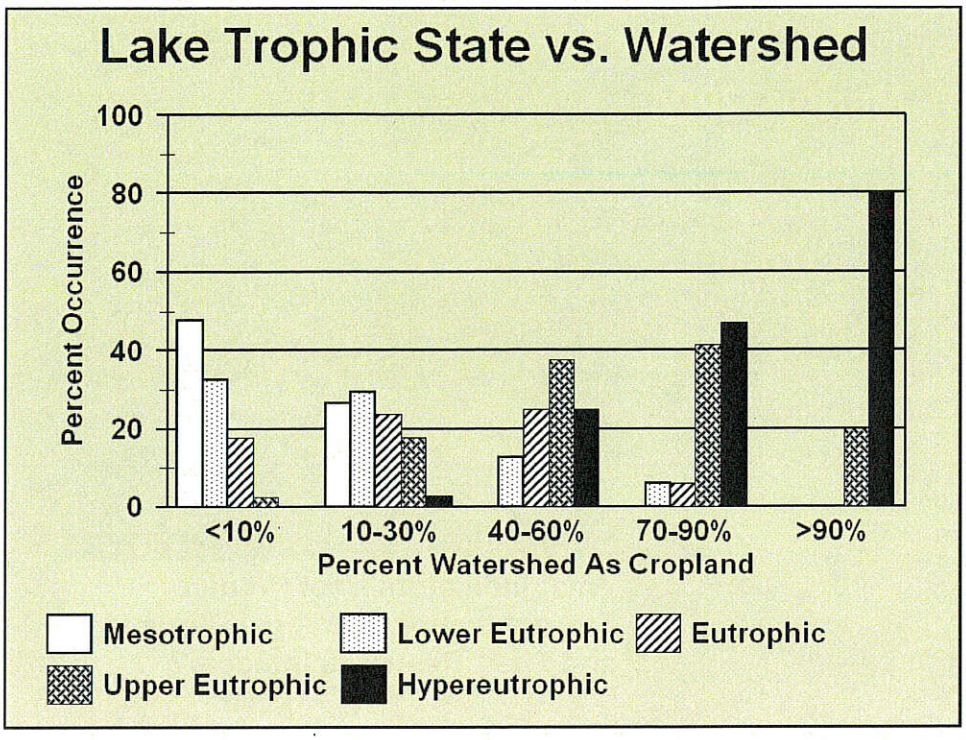
- Increased Treatment Costs
  - Includes Taste and Odor Incidents
- Decreased Recreation Use and Revenues
- Lower Aesthetic Quality & Lower Property Values
- Reduced Biotic Integrity
  - Reduced Stability, Species Richness and Diversity, and Reduced Ability To Recover From Perturbations
- Human Health
  - Algal Toxins and Blue-Green Algae Blooms

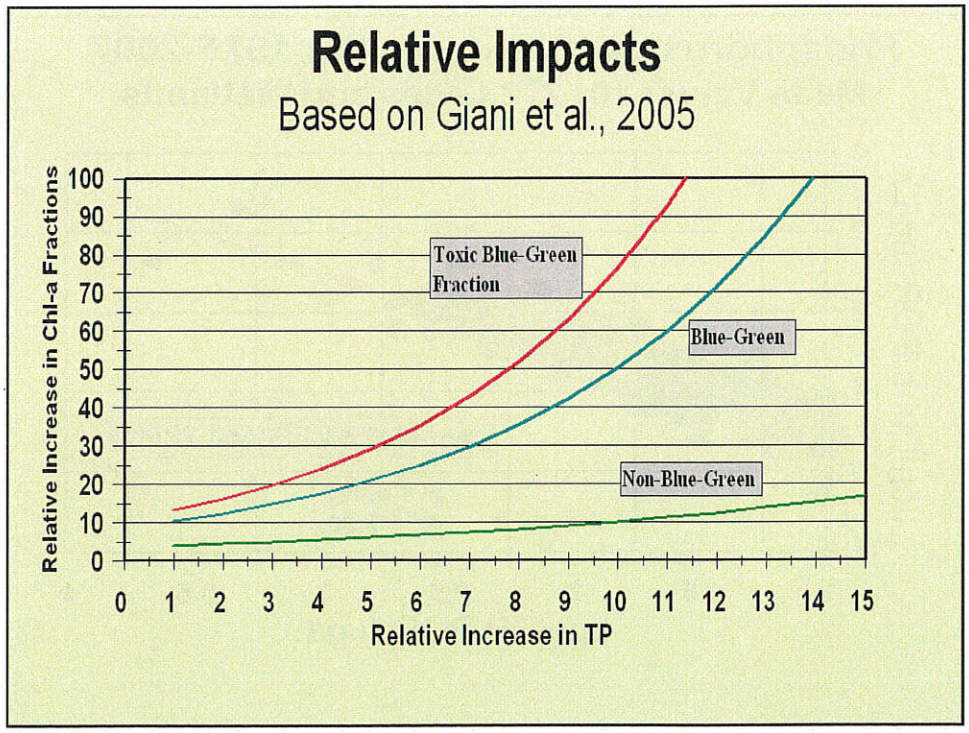
Current Trophic Status of Kansas Lakes (2008 305b)

Trophic Class	Percent of Lakes	Percent of Surface Area
Mesotrophic	15.2	6.5
Lower Eutrophic	14.6	22.9
Mid-Eutrophic	20.2	38.5
Upper Eutrophic	12.1	7.1
Hypereutrophic & Argillotrophic	29.8	23.6


Marion 2004
What Indicators Best Predict
Eutrophication and Algal Blooms,
and Their Resulting Impacts?


Phosphorus vs. Chlorophyll-a 1975-2007
Mean Values for 273 Lakes and Wetlands
Log Chl-a POR (ug/L)
4
3
2
1
0
-1
1
1.5
2
2.5
3
3.5
4
Log TP POR (ug/L)
Log(Chl-a) = 0.978*Log(TP)-0.4
P < 0.001
R2 = 0.80


Lake Trophic State vs. Watershed
Percent Occurrence
100
80
60
40
20
0
<10%
10-30%
40-60%
70-90%
>90%
Percent Watershed As Cropland
Mesotrophic
Lower Eutrophic
Eutrophic
Upper Eutrophic
Hypereutrophic


Relative Impacts
Based on Giani et al., 2005
Relative Increase in Chl-a Fractions
100
90
80
70
60
50
40
30
20
10
0
Toxic Blue-Green Fraction
Blue-Green
Non-Blue-Green
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Relative Increase in TP

Management of Eutrophication

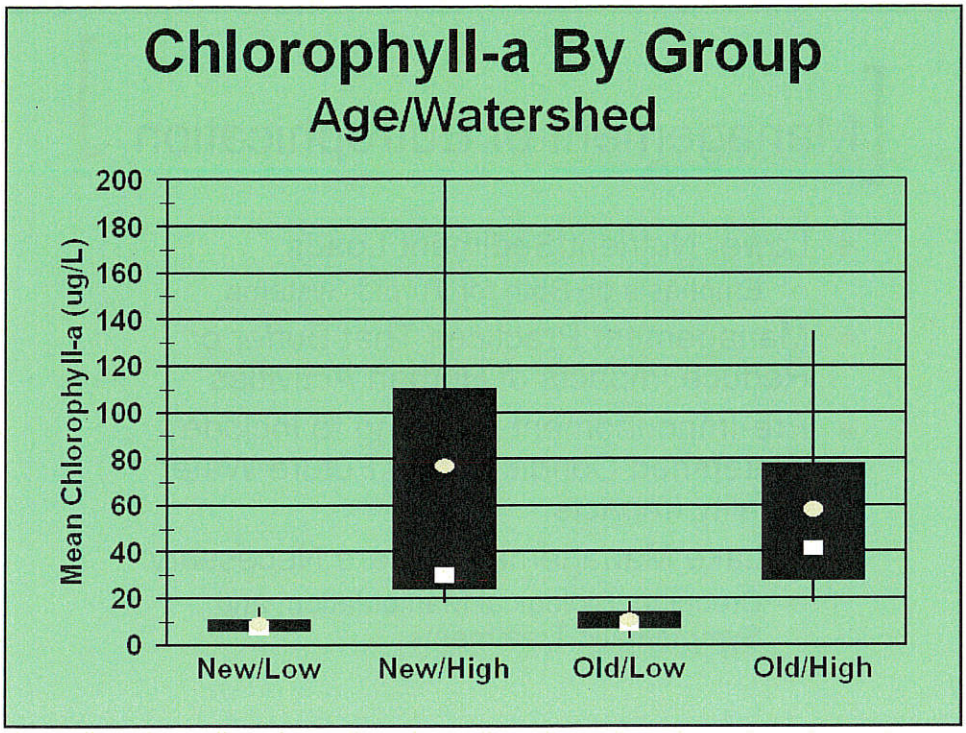
- Lower Nutrient/Sediment Loads
  - Emphasis on Both for Turbid Systems
- Management Practices That Buffer or Reduce Impacts of Human Activities
- Pre-Impoundment Planning to Include Watershed Condition and Future Water Quality Impacts
- In-Lake Management Where Necessary
  - Dredging, Biological Manipulation, and Symptomatic Treatments

Eutrophication Process

As An Ecological Process…

Wouldn't Eutrophication Lead to Excessive Trophic State Just Through Baseline Nutrient Loads and The Simple Passage of Time?

Even in Undeveloped Watersheds?



Summary

- Excessive Sediment/Nutrient Loads = Impacts to Beneficial Lake Uses
- Watershed Condition is Key to Protecting Lake Water Quality
- It Appears Entirely Possible to Have Watersheds that Protect Lake Quality While Hosting Human Endeavors (But Will Require Effort and Education)

Summary Continued

- Protection of Current Lake Resources
  - Likely More Cost Effective Than New Construction
  - Best Dam Sites Likely Already Taken
  - Where New Lakes are Built…Pre-Impoundment Predictions of Water Quality Would Have Value
- Future Data Needs Include
  - Continuation of Current Statewide Monitoring for Compliance with The Clean Water Act, Assessment of Trends, Compliance with Water Quality Goals, and Refinement of Predictive Models
  - Ability to Conduct More Intensive Studies Related to Specific TMDLs

Jim Whisenant

Assessing the Feasibility of Dredging to Restore Public Water Supply

City of Horton

A Little Background on Mission Lake

Originally constructed in 1924 to serve as the main water supply for the City of Horton, the lake also provides recreational benefits to the city in the form of boating, fishing, and other actives. At this time the lake is not used to supply water to the city, but plans are under way to resume using it as a water supply after the dredging project.

Project location

Mission Lake Dredging Project

Looking North over Horton

Many Partners are cooperating with the City of Horton on this project.

- SCC
- KWO
- KDHE
- KDWP
- KBS

Mission Lake, 1959

Mission Lake, 2005

Currently the Mission Lake is only 45-55 % of it's original volume

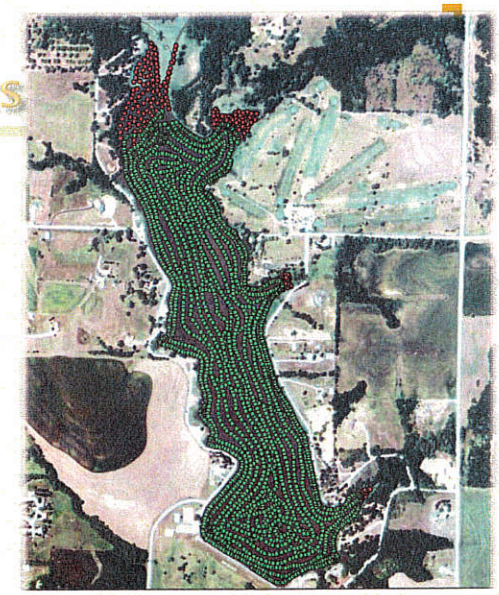
In 1924 the lake covered more than 169 acres with a water storage capacity estimated at 1,866 acre-feet.

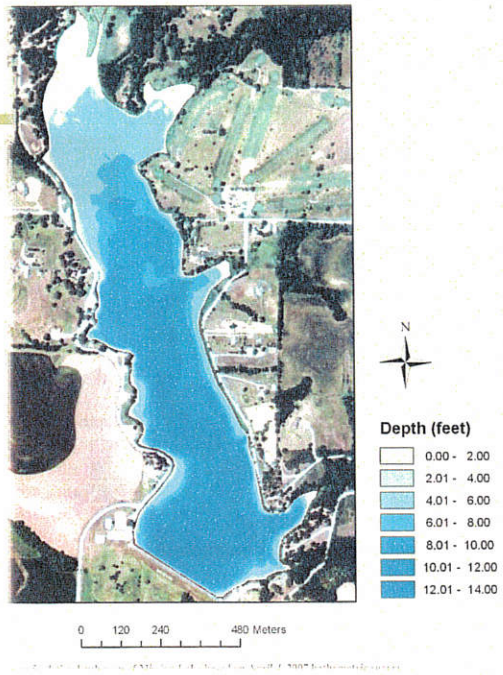
At current the lake is estimated to be covering 123 acres with a water shortage capacity estimated to be about 1,035 acre-feet.

Lake Depth Survey Points

The Kansas Biological Survey (KBS) followed their standard small-lake bathymetric survey practice. They first traced the shore line of the lake as close as the boat could without hitting anything. After the shore line was traced they traveled the lake in transect lines spaced 20 meters apart.

KBS used GPS data with a pre-planned transect pattern, on the lake after tracing the shoreline.





Lake Depth Survey

This survey was competed by both acoustic echosounding and by manually depth measurements in April 4th 2007, by The Kansas Biological Survey.

Sediment Core Sampling Locations

Core sampling was conducted on June 26, 2007 and on July 5, 2007.

During the June sampling, cores from 13 sites were extracted for determination of sediment thickness only

The numbers by each of the 13 samples is the thickness of sediment in centimeters

Sediment Thickness

Core site locations by sediment thickness in centimeters

Sediment Core Sampling Locations

On July 5th 2007, sediment sampling was again done on Mission Lake by KBS. This time 3 samples were removed just like the 13 from June 26 2007. The July sampling was conducted with and under the direction of a representative from Black and Veatch, Inc (B & V), for the preliminary engineering study being conducted by that company.

The 3 sediment core tubes were capped, labeled, and sent to Midwest Laboratories, Inc of Omaha, Nebraska for analysis.

Sediment Sampling Results

Table 1
Mission Lake sediment particle size analysis

Si e	a s Sa le o	o les	rs ravel	ine ravel	rs San	e San	ine San	ll San	Sil	lay
ML-1	1314447	0.0	0.0	0.0	0	0.1	1.3	1.4	57.4	41.2
ML-2	1314449	0.0	0.0	0.0	0	0.0	0.8	0.8	42.1	57.1
ML-3	1314451	0.0	0.0	0.0	0	0.0	0.2	0.2	29.1	70.7

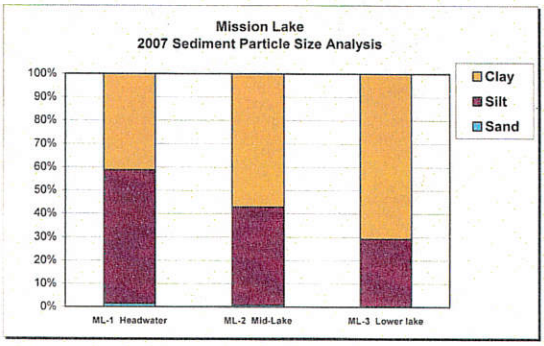


Figure 11 - Mission Lake Particle Size Analysis

Particle size analysis for Mission Lake shows some expected trends. The clay component forms the dominant fraction of the total particle sizes, and the percentage of clay increases with distance from the major inflow at the north end of the lake.

MidWest Laboratories performed additional chemical and physical analyses on the 3 sediment cores for B & V. These results and data can be found in the B & V 2007 final report.

So how much sediment could be removed from Mission Lake?

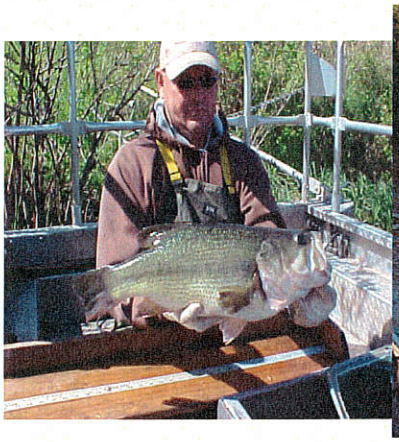
Accumulation of sediment has significantly reduced capacity of the lake to store water for the public water supply and recreational use.

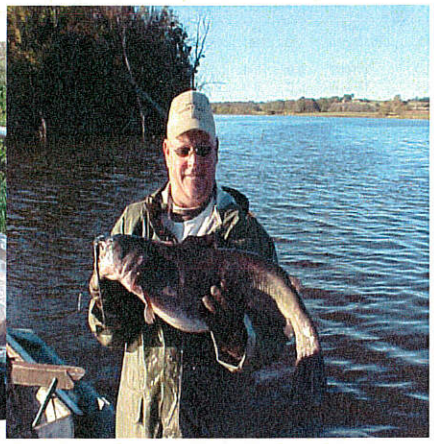
Currently the Lake volume is 45-55 % of it's original volume.

Current lake area is 73 % of the original area of 169 acres.

Sediment removal to return to the lake to it's original volume would be approximately 1.4 million cubic yards

Opportunity to Improve Fisheries





What we hope to accomplish in the next two years:

1. Select Design-Dredge Contract Team
2. Construct Confined Disposal Facility (CDF)
3. Dredge up to 1 million cubic yards of sediment
4. Improve habitat and fisheries in Mission Lake

ON BEHALF OF THE CITIZENS HORTON, THANK YOU FOR YOUR TIME AND INTEREST IN OUR PROJECT!

Earl Lewis

Status of Kansas Public Water Supply Infrastructure

Kansas Water Office

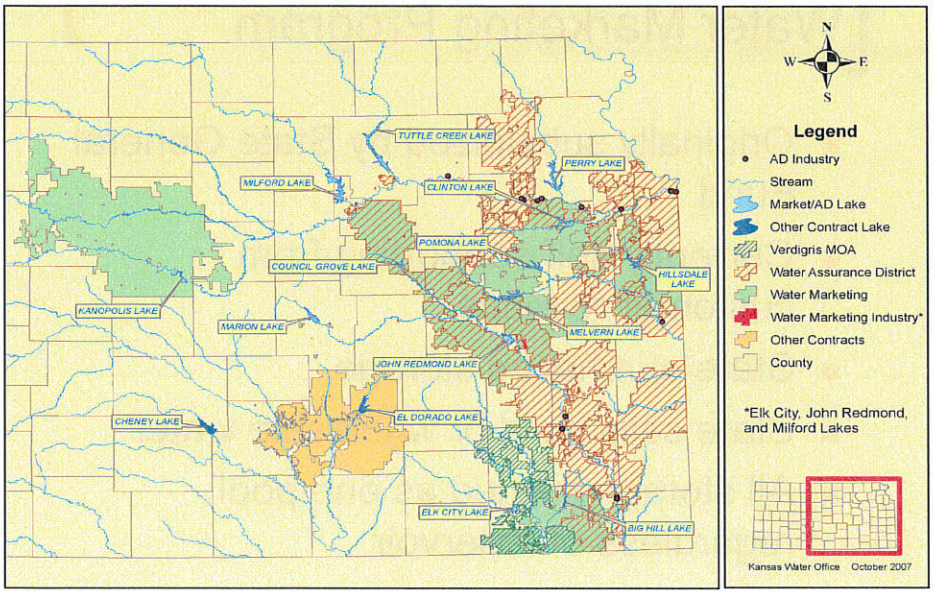
Kansas Water Office Role

- Planning – 74 - 2608
  - Develop a state plan of water resources management, conservation and development for water planning area
- Data– 74 - 2608
  - Collect and compile information pertaining to climate, water and soil as related to the usage of water for agricultural, industrial and municipal purposes and the availability of water supplies in the several watersheds of the state.
- Water Supply Reservoirs – 82a - 1333
  - The Kansas water office, with advice from basin advisory committees, eligible water right holders and the chief engineer and with approval of the Kansas water authority, may negotiate and enter into contracts for assurance storage from federal reservoirs to be used for water assurance.

Water Supply

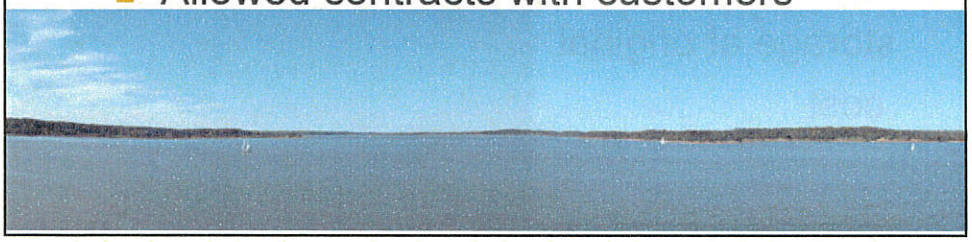
- State owned storage in Corps of Engineers lakes
- Kansas Water Office Operates two programs from state owned storage
- Wichita and El Dorado own storage
- Serve 2/3 of the Kansas population with water supply

Federal Lake Water Supply Storage Customers



Water Marketing Program

- 1974 State Water Plan Storage Act
- Allowed contracts with Corps of Engineers
- Established "Water Utility"
- Allowed contracts with customers

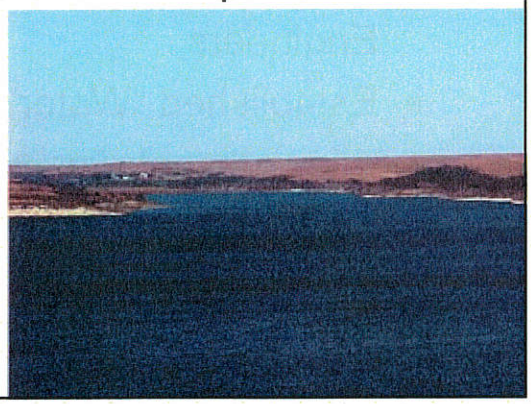


Water Marketing Program

- Originally subsidized by State General Fund
- Currently self supporting from customer revenue
- State purchases storage
- State sells yield or wholesale water
- All storage treated as one pool regardless of reservoir

Water Assurance Program

- Water Assurance Program Act (1986)
- Based on 1985 MOA with Corps of Engineers
- Allowed State to acquire additional storage at original cost



Water Assurance Program

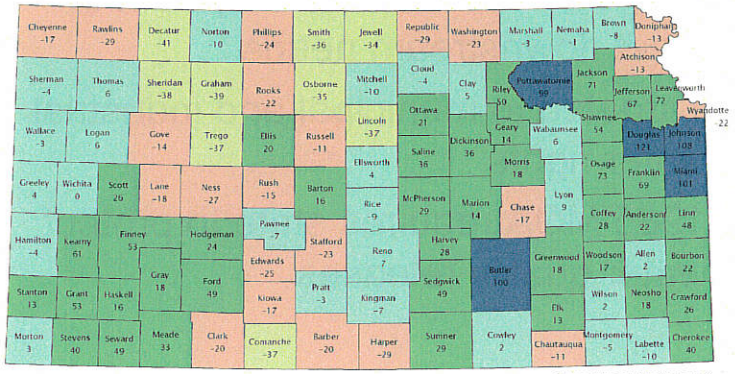
- Operate reservoirs as a system to meet downstream needs
- Targeted to municipal and industrial water rights
- 1985 MOA requires state to protect water quality releases

Background. . .

- KWO water marketing and assurance programs are committed to supplying water from storage in federal reservoirs to meet present and anticipated municipal and industrial water needs.

Population Change – Increased Urbanization

Percent Change in Population By County
Kansas, 1990 - 2040



Source: Kansas Water Office, 1998

Percent Change

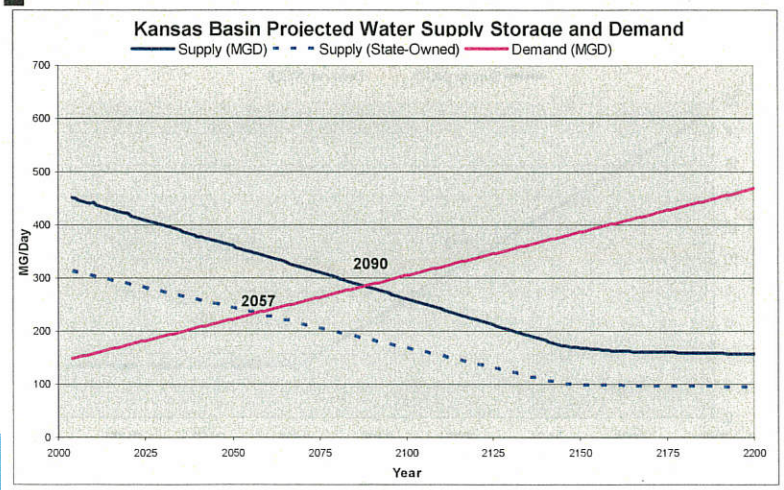
30% or more decrease | 11% to 29% decrease | 10% decrease to 10% increase | 11% to 74% increase | 75% or more increase

Objective of Study Effort

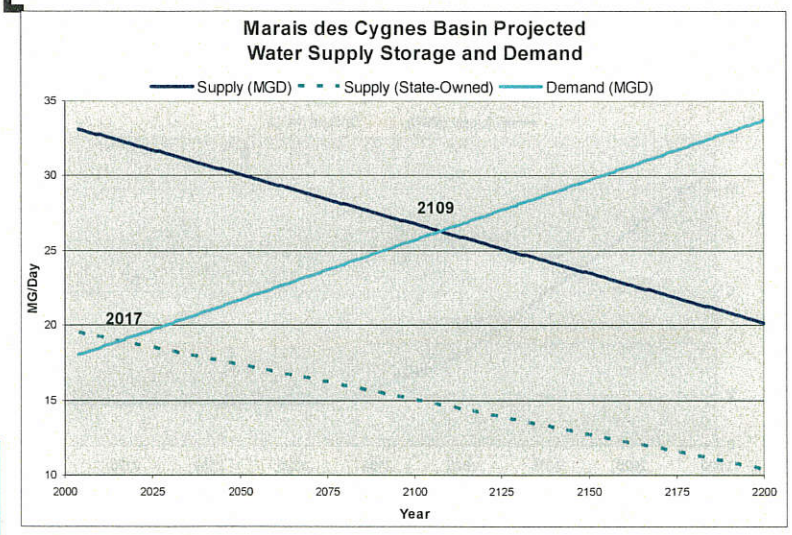
- Help identify potential problem areas
  - Problem = Demand > Supply
- Establish priority for more complicated modeling efforts. . .
  - computer model is next
- http://www.kwo.org/
  - Click the 'Reports and Publications' Link

KANSAS WATER OFFICE

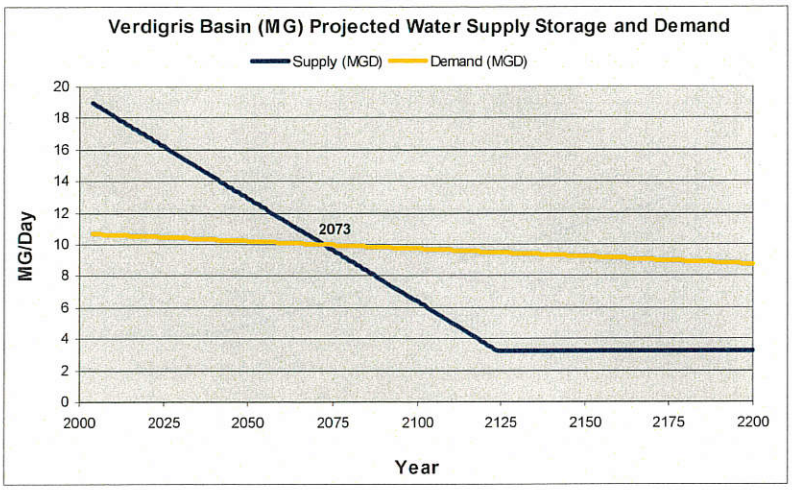
Kansas River Corridor Supply-Demand



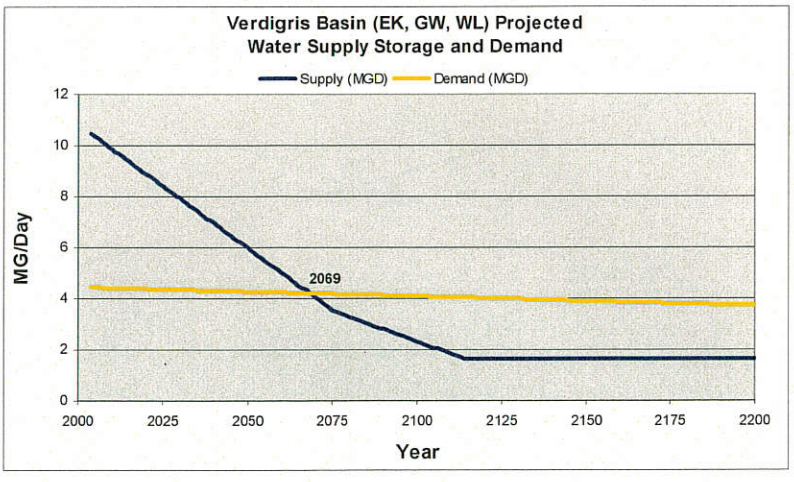
Marais des Cygnes River Corridor Supply-Demand



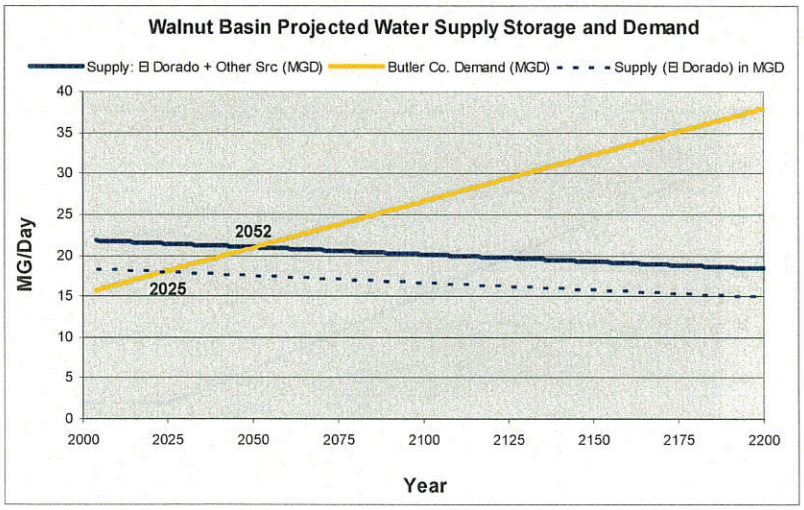
Verdigris Lower Corridor Supply-Demand



Verdigris Upper Corridor Supply-Demand



Walnut Corridor (BU County) Supply-Demand

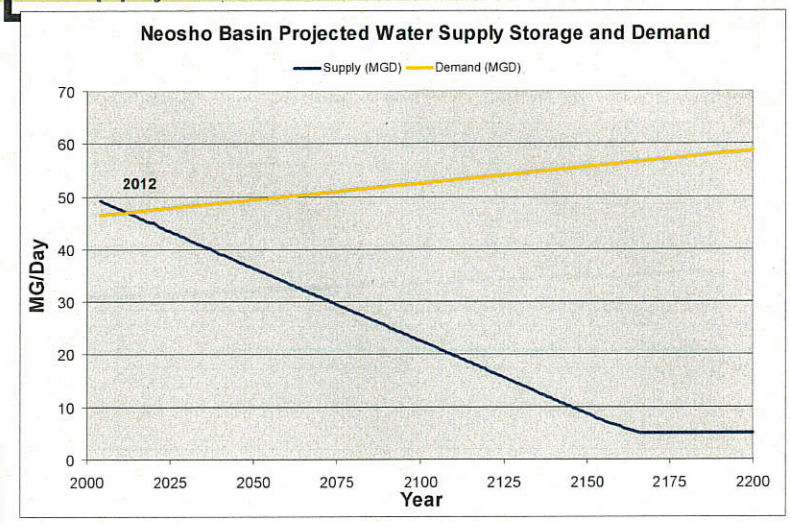


KANSAS WATER OFFICE

Neosho Supply and Demand. . .

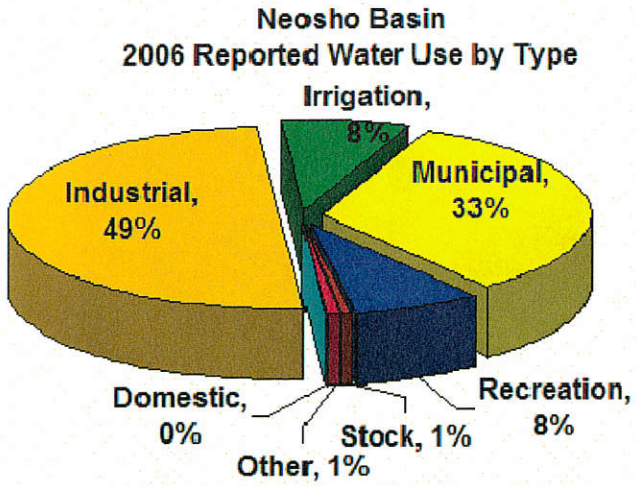
KANSAS WATER OFFICE

Neosho River Corridor Supply-Demand

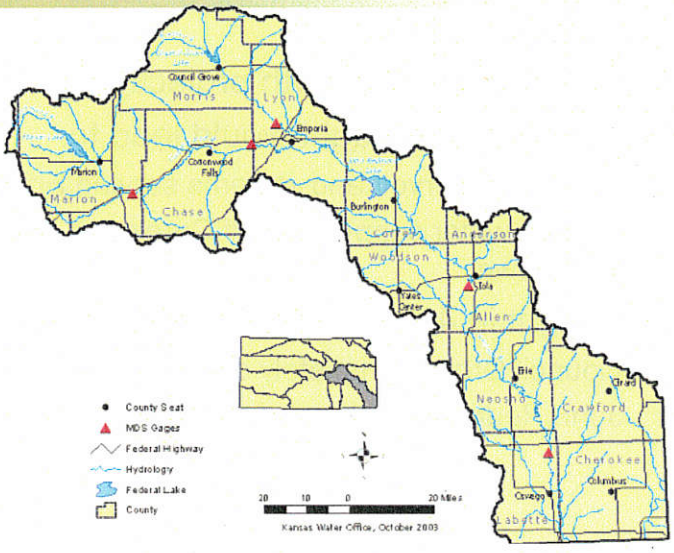


KANSAS WATER OFFICE

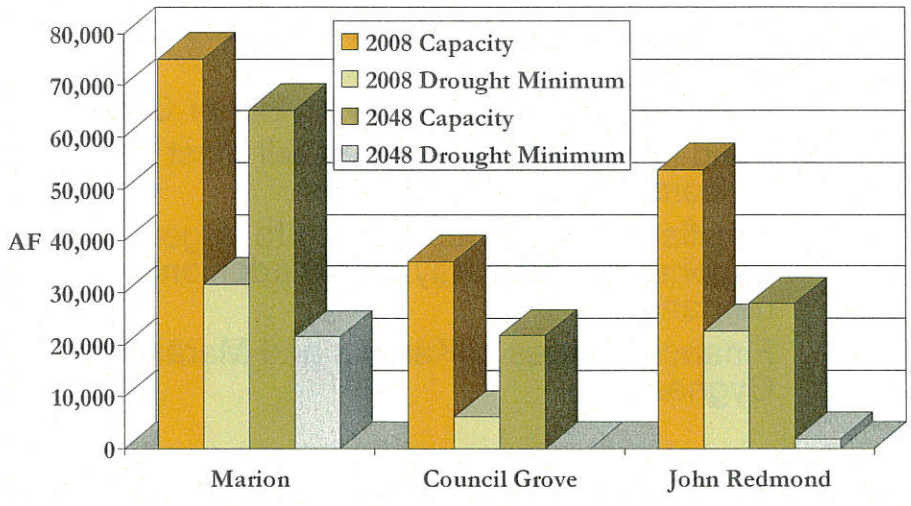
Neosho Highlights



Neosho Basin



Effects of Sedimentation



Neosho Summary

- With only modest growth projections
- A 1950's style drought would lead to:
  - very low reservoir and streams serving Emporia
  - Limited water supply to Wolf Creek and potential shut down
- A drought in 40 years would lead to:
  - Council Grove completely dry
  - John Redmond with no usable pool

Overall Summary

- Consequences of no action in Neosho severe
- Potential issues with growing Butler County
- Yield in Marais des Cygnes will most likely be committed in 10-20 years
- Smaller communities moving to larger regional systems may cause additional demand
- Financial issues in Kansas and Marais des Cygnes

Paraphrasing Dr. Theodor Geisel,
renowned Pulitzer Prize winning author and political satirist

. . . sometimes the immensity of the problem is so great, that for that reason alone, we become incapable of addressing the issue.

We cannot ignore the issue and must take action together, today.