Long Term Management of the Kansas High Plains Aquifer

January 9, 2014

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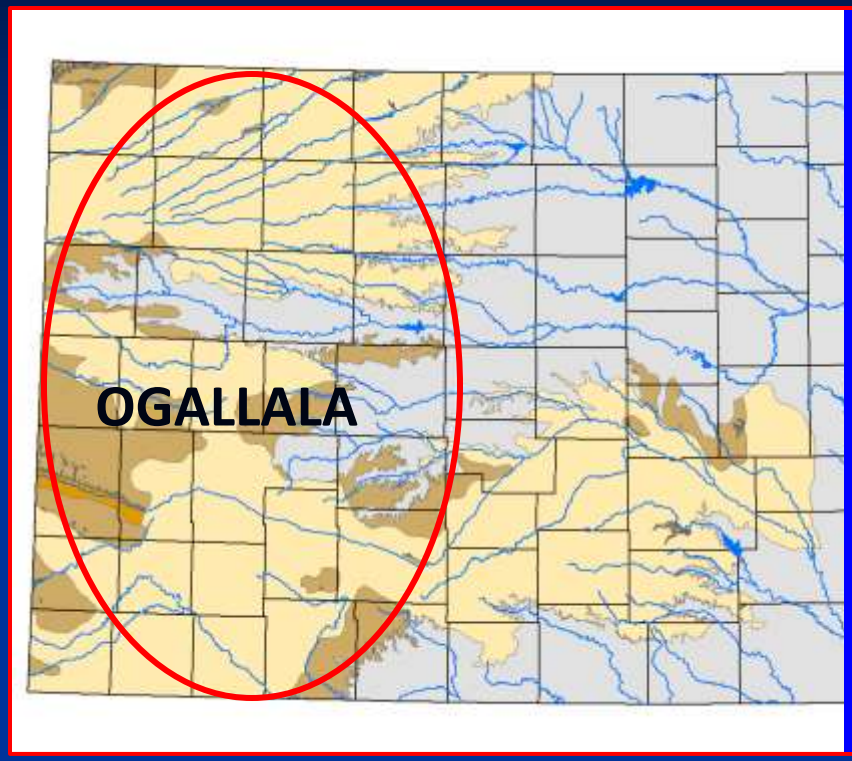
Kansas Water Office

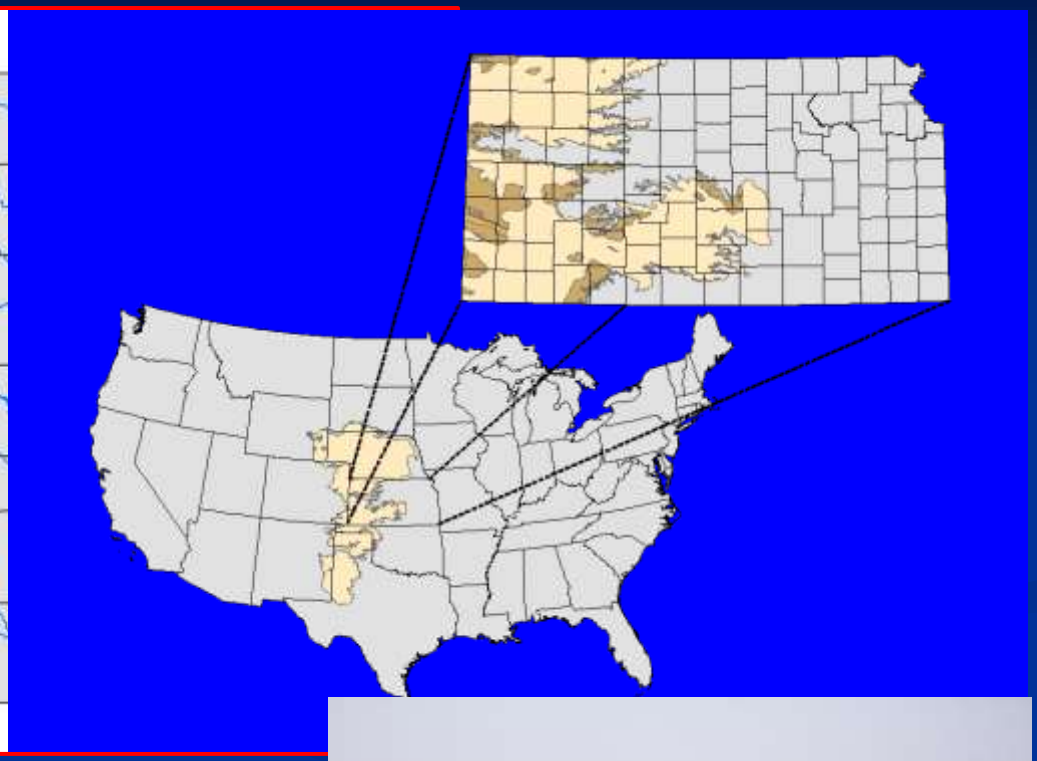
1) Drought in Kansas: A Long History

2) Reliance on a Declining Aquifer

3) Vision for Future of the High Plains Aquifer

Kansas High Plains Aquifer





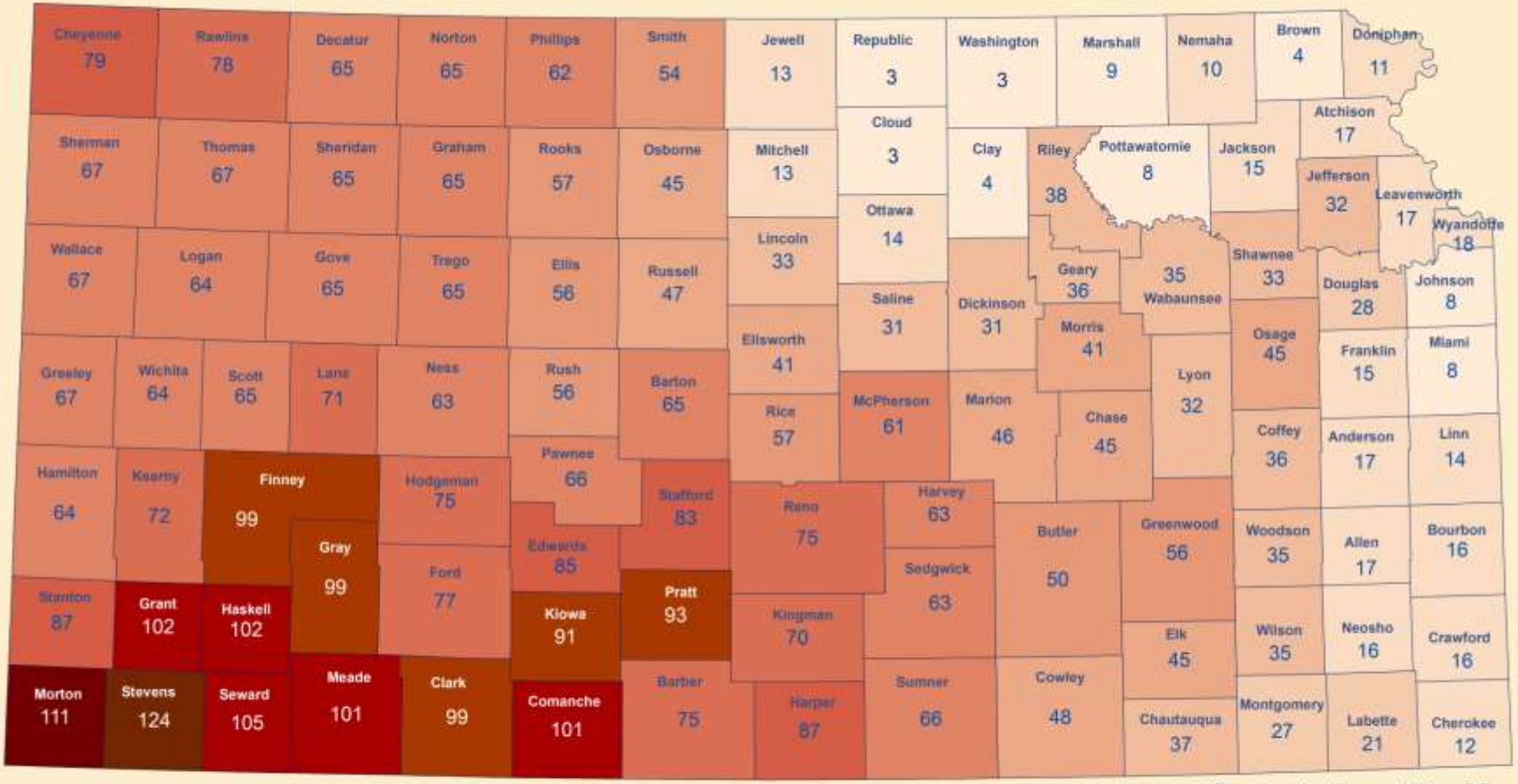
1. Western Ks is semi-arid
2. Limited surface water
3. Extensively developed groundwater
4. Prior Appropriation State

Kansas has a history of Drought with the 1930s and 1950s iconic

The drought of 2011, 2012 and 2013 also has taken a toll

Weeks of Extreme and Exceptional Drought

April 19, 2011- December 31, 2013 (133 weeks)



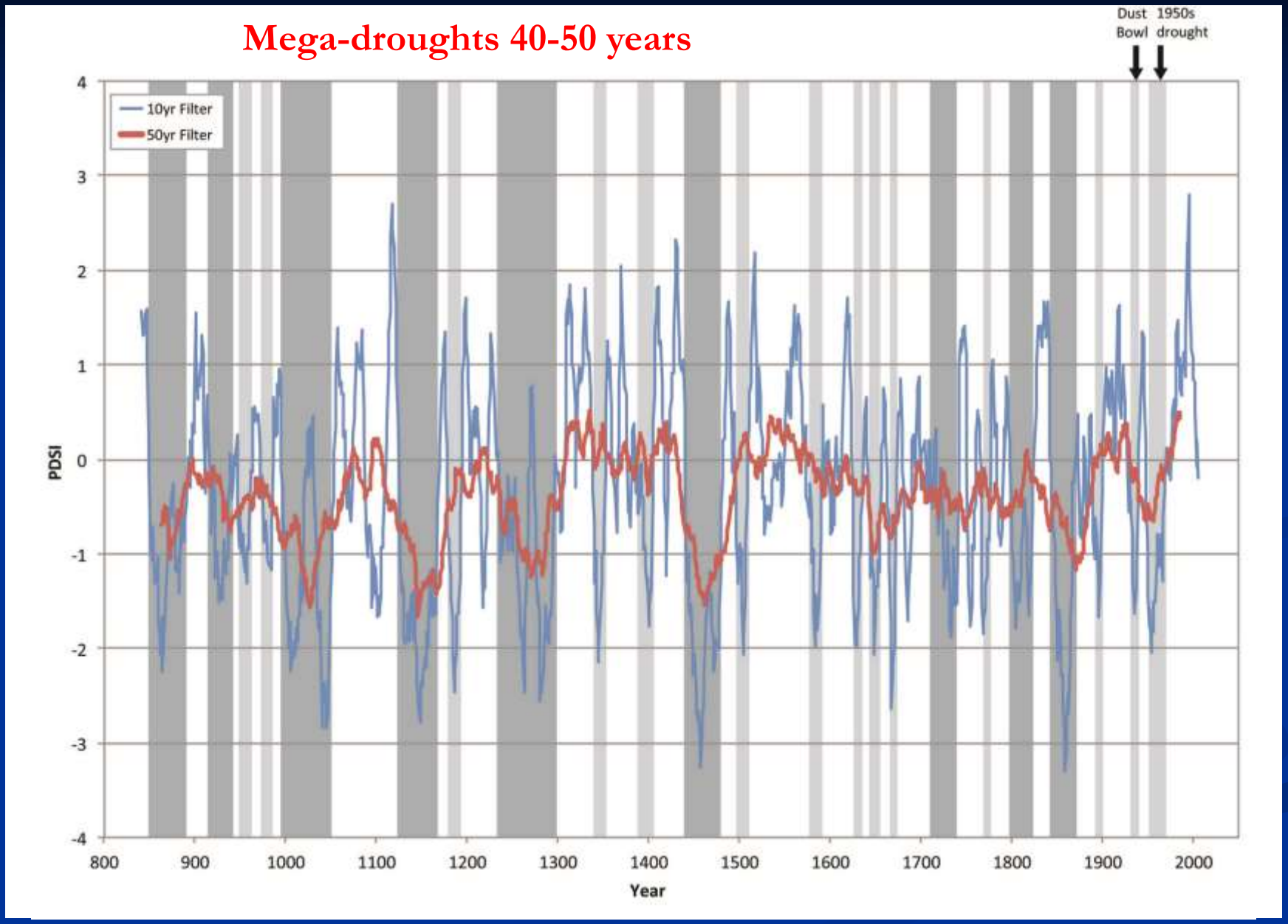
Prepared by Kansas Water Office

Weeks County in Extreme or Exceptional Drought

3 - 9 | 10 - 19 | 20 - 29 | 30 - 39 | 40 - 49 | 50 - 59 | 60 - 69 | 70 - 79 | 80 - 89 | 90 - 99 | 100 - 109 | 110 - 119 | 120 - 124

Source:U.S. Drought Monitor maps, approximately 50% of county or more in D3 or D4

Drought duration – SW Kansas

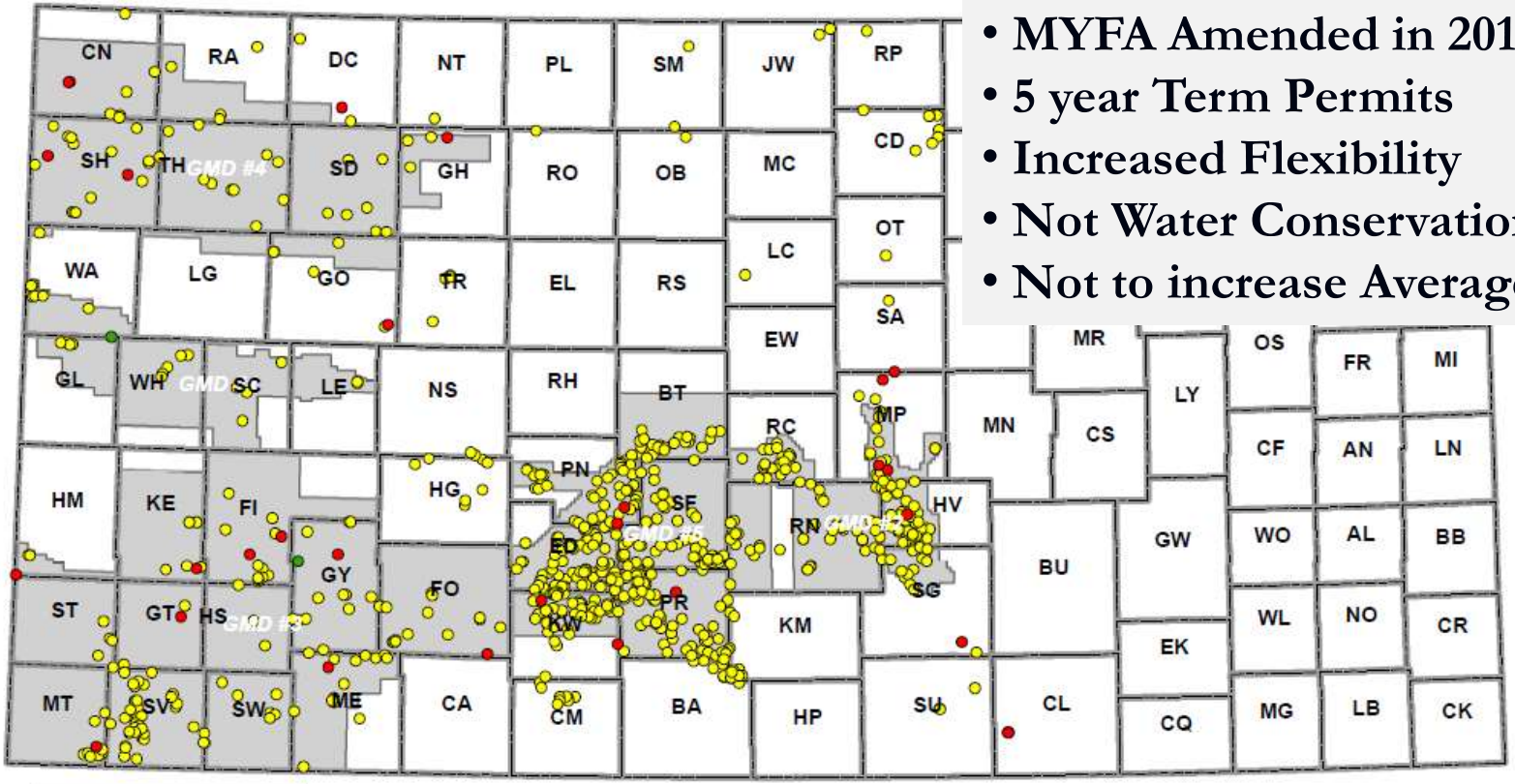


From Anthony Layzell and Catherine Evans, Kansas Geologic Survey, 2013, Public Information Circular

State's Immediate, Short Term Responses:

- Outreach to Public Water Suppliers
- Water made available for livestock from federal and state lakes
- Cost share assistance on stock water pond dredging
- Drought Term Permits (2011), Multi-year Flex Accts
- Governor's Drought Response Team – agency coordination, provide current information

Active Multi-Year Flex Accounts



- MYFA Amended in 2012
- 5 year Term Permits
- Increased Flexibility
- Not Water Conservation
- Not to increase Average Use

Active by Year
779 Total Files
- Pre 2012 - 3
- 2012 - 745
- 2013 - 31

GMD 1 - 23 Files
GMD 2 - 104 Files
GMD 3 - 139 Files
GMD 4 - 52 Files
GMD 5 - 355 Files
Non-GMD - 99 Files

N

Kansas Department of Agriculture

Reliance on A Declining Aquifer

Groundwater was first developed for
When It Doesn't Rain

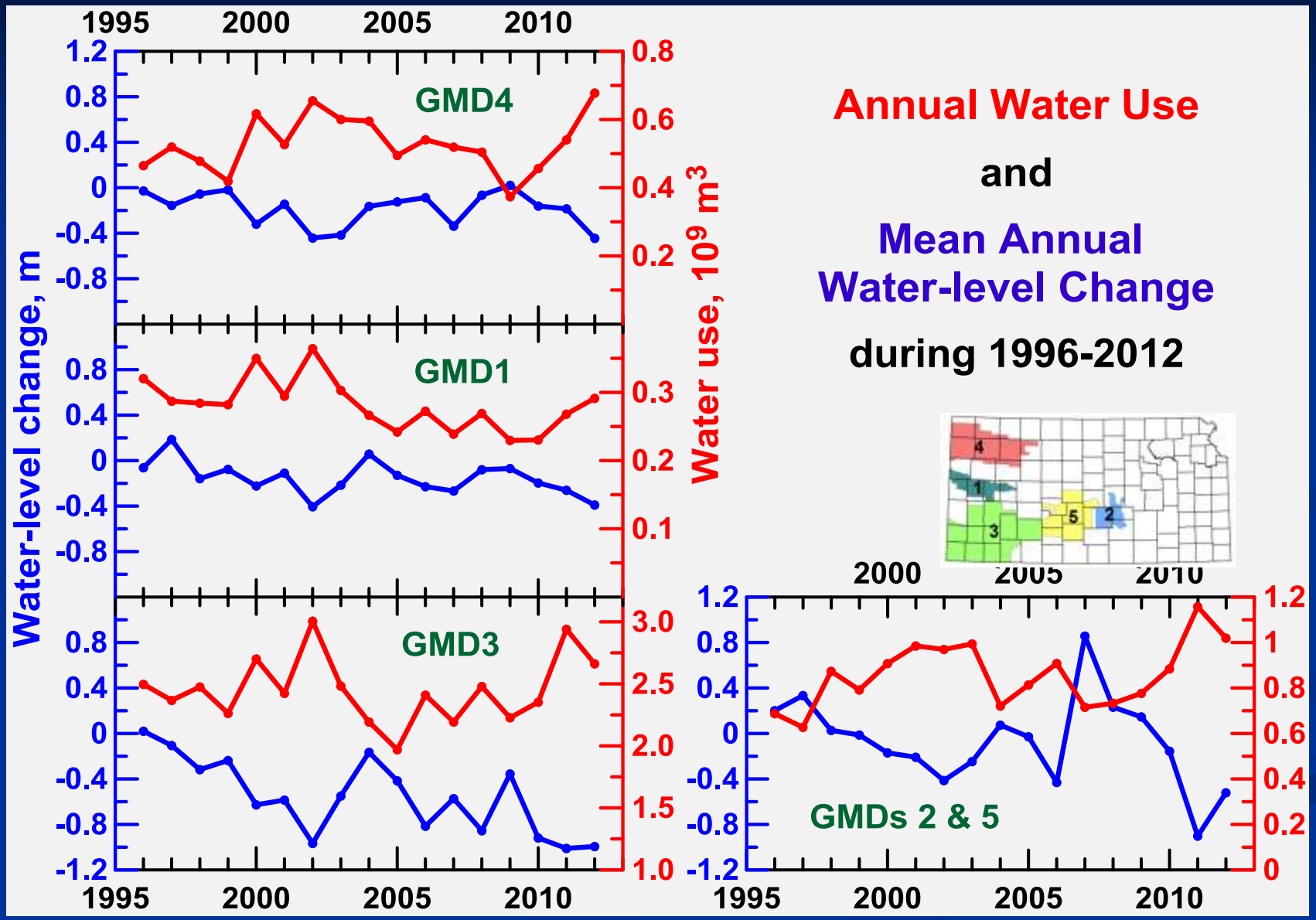
The aquifer isn't drought proof

- Well Yields may not keep up
- Water Rights limit use
- Draw downs
- Water table declines

Farmers' adaptations to declining water supply:

Reduce seed population
Invest in a more efficient irrigation system
Change tillage practice
Switch to different crops
Reduce acres irrigated

Water Use vs Water Level Change, by GMD



Long Term Challenge for western KS water:

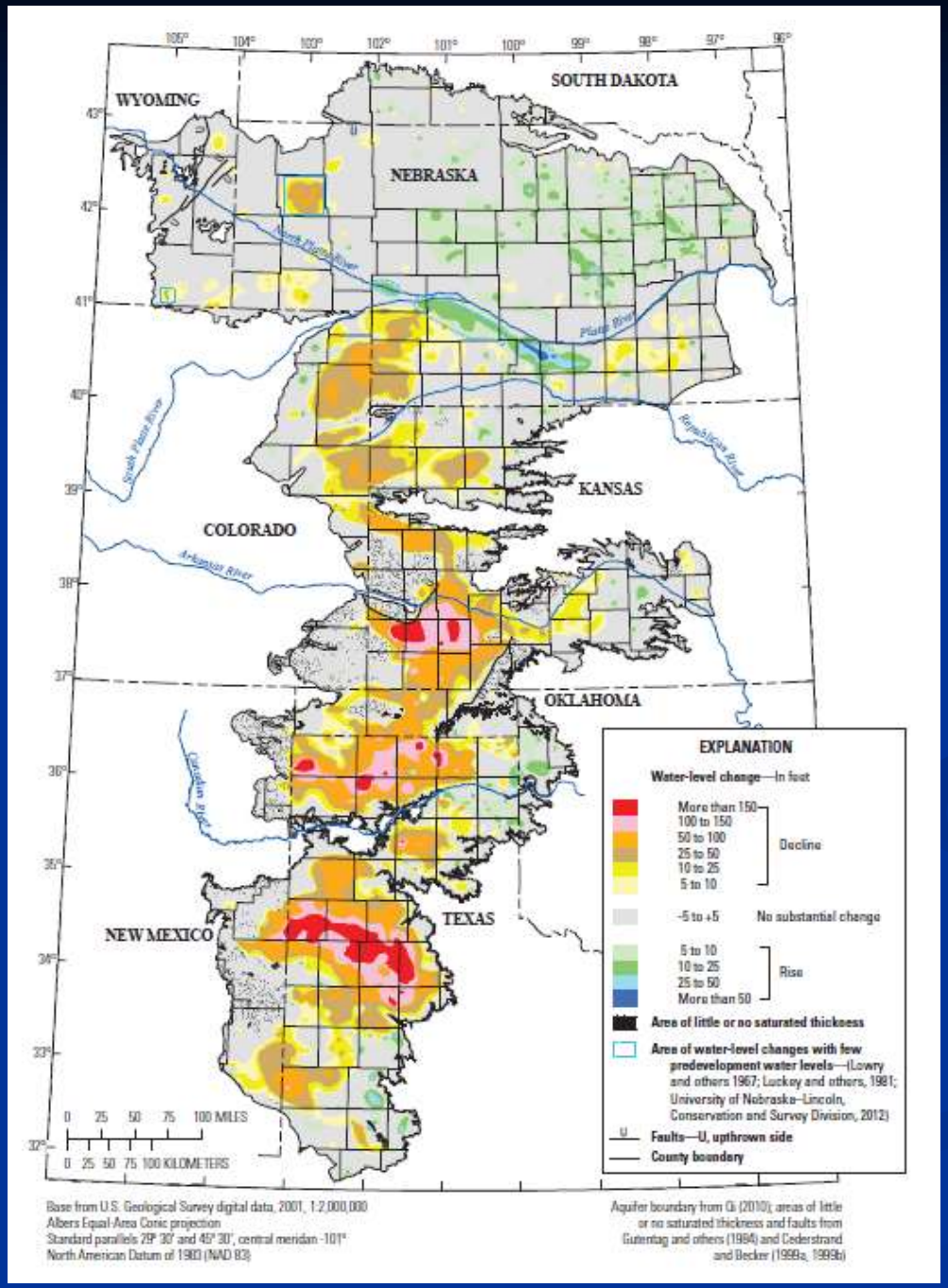
Ag Industry Complex Depends on the High Plains Aquifer

Irrigated crops → Corn → Cattle → Beef

Kansas ranks 3rd nationally with 5.85 million cattle

Irrigated cropland in Ogallala region has a $5 billion value

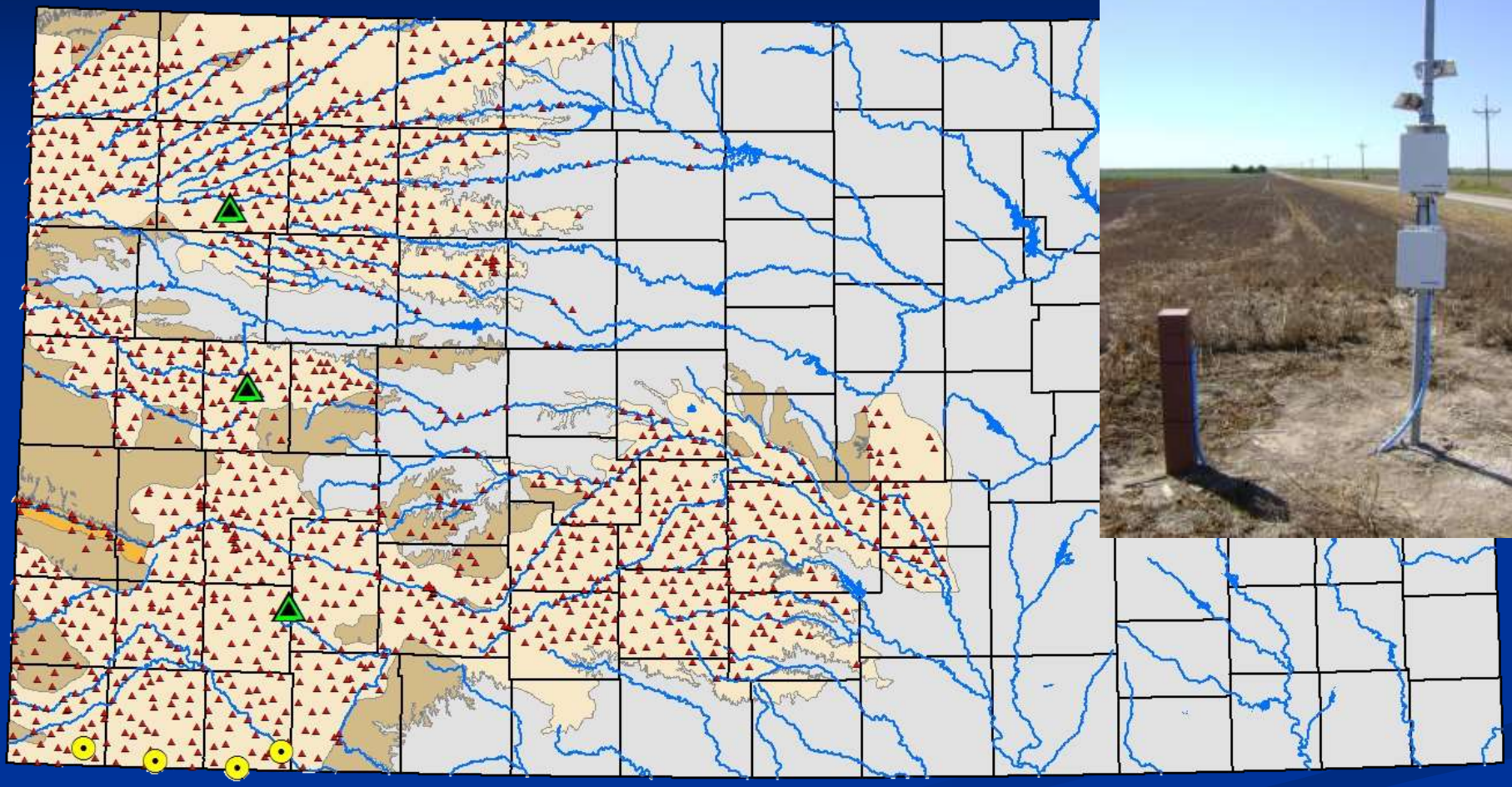
Ogallala was responsible for $1.75 billion in corn production and $2 billion in beef production



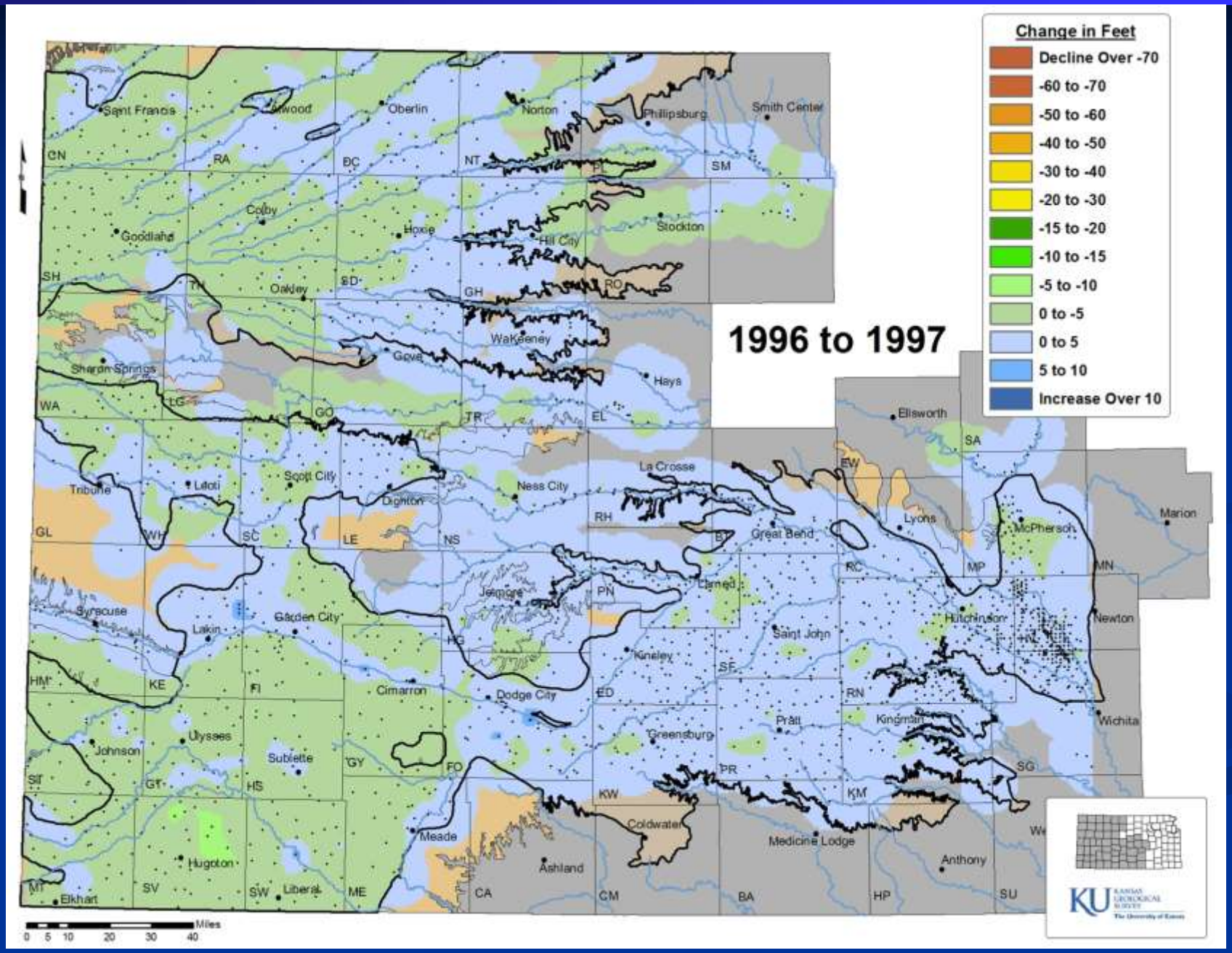
USGS declines in High Plains Aquifer predevelopment to 2011

USGS Scientific Investigations Report 2012 - 5291

Index Well Program- Continuous Water-Level Monitoring



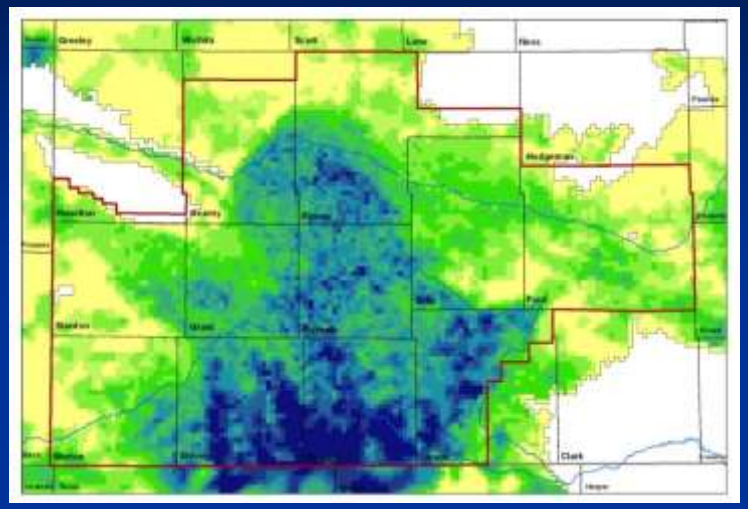
Accumulated Water Level Change, 1996 to 2012

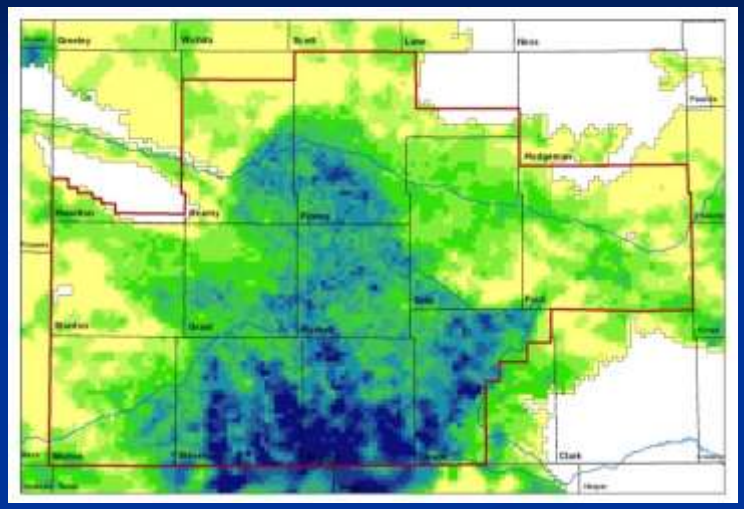


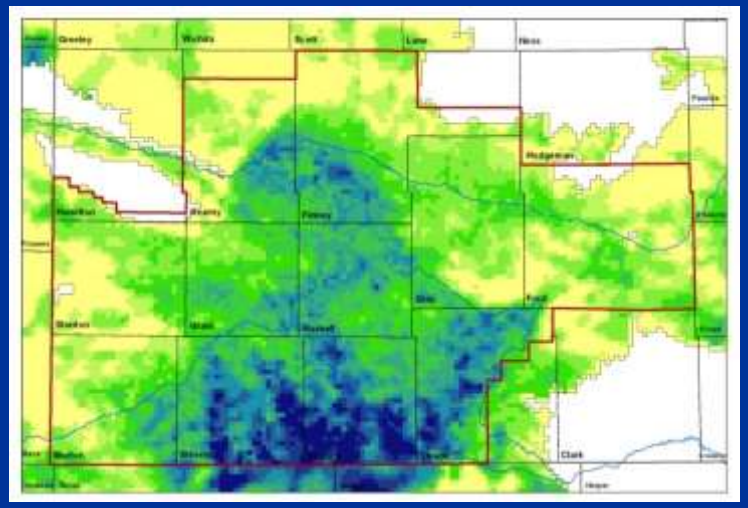
Modeled GMD3 change in storage with current pumping

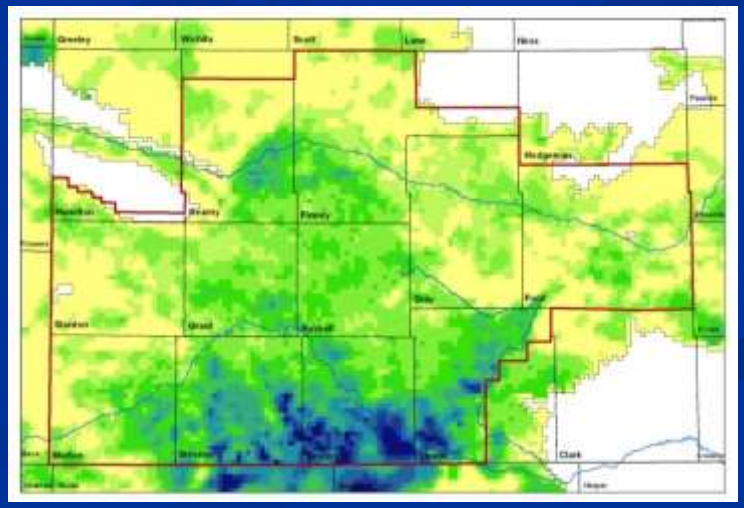
2008 to 2018

2008 to 2028

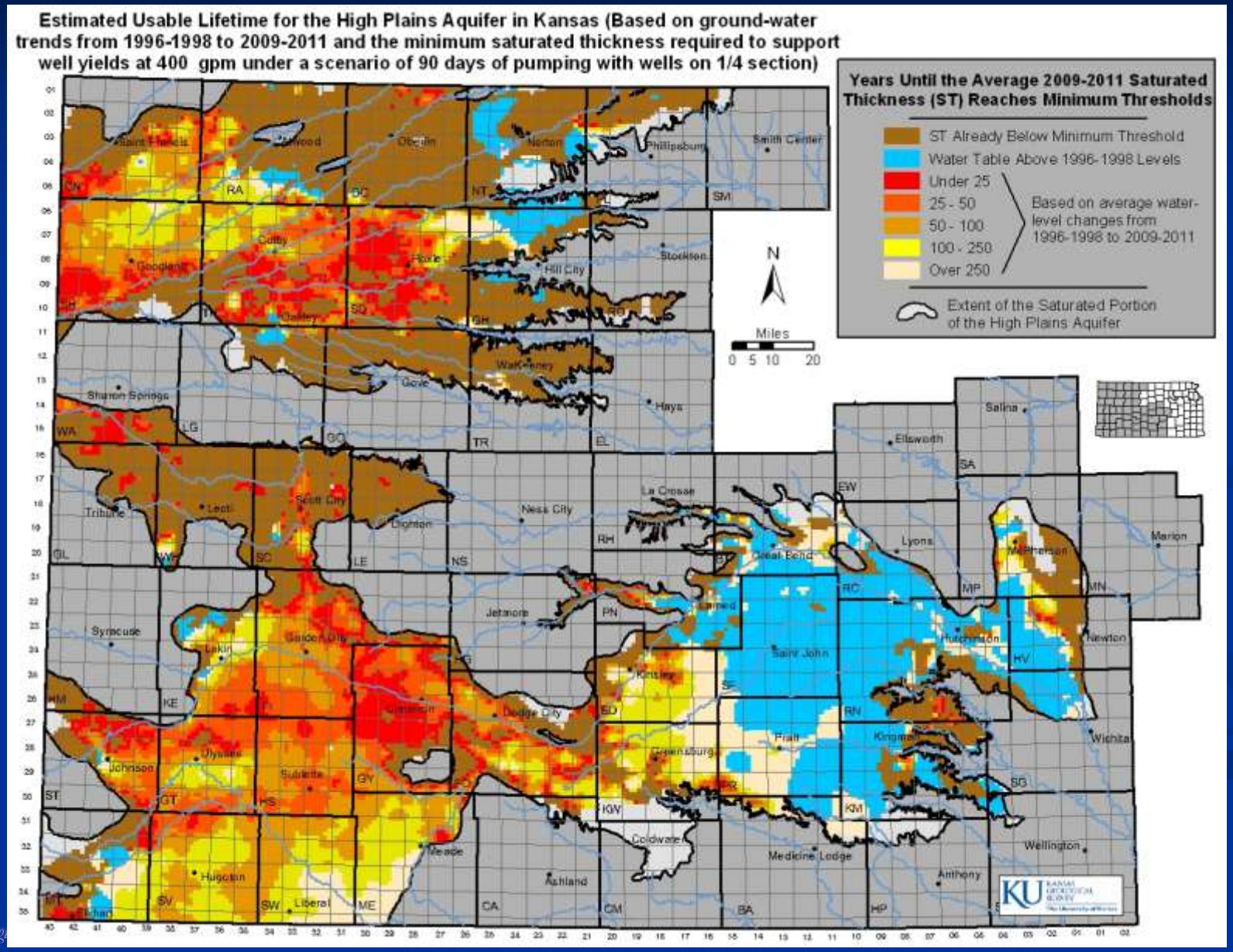








Communicating the Aquifer Conditions: Estimated Usable Lifetime



Well Logs –

What they indicate about the subsurface, water storage and movement

USE TYPEWRITER OR BALL POINT PEN-PRESS FIRMLY, PRINT CLEARLY.

WATER WELL RECORD
KSA 82a-1201-1215

T R EW sec 1/4 1/4 1/4 No.

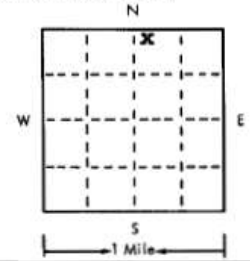
Kansas State Dept. Of Health
(Water Well Contractors)
Forbes-Bldg. 740
Topeka, Kansas 66620

1 Location of well:	County	Township name	Fraction	Section number	Town number	Range number
	Haskell		NW, NW, NW	19	29S	31W

Distance and direction from nearest town or city: 6 miles E, 1 N and ½ E of Sublette
Street address of well location if in city:

3 Owner of well: Mike Sherwood
Address: Sublette Kansas

Locate with "X" in section below:



Sketch map: Well drilled neat test hole 1-75 which is located 120' S of NW corner of NE¼, Sec. 19, T29S, R31W Haskell County, Kansas

4 Well depth: 425 ft. Date of completion 7-23-75
Well diameter 28 in.

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☐ Bored ☒ Reverse rotary

6 Use: ☐ Domestic ☐ Public supply ☐ Industry ☒ Irrigation ☐ Air conditioning ☐ Commercial ☐ Test well ☐

7 Casing: Material Stl Height: above/below Surface 12 in.
Threaded ☐ Welded ☒ Weight 37 lbs./ft.
Diam. 16 in. to 258 ft. depth Drive shoe? ☐ Yes ☒ No
___ in. to ___ ft. depth

8 Screen: Manufacturer Foster, Brown, Cook
Type Millslot, Louver wire wrap Dia. 16
Slot/gauze 1/8" Length 167
Set between 258 ft. and 425 ft.
Fittings:
Gravel pack ☒ Yes ☐ No Size range of material 1.2mm to 9mm

9 Static water level: 195 ft. below land surface Date 8-23,75

10 Pumping level below land surface: No test
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.
Estimated maximum yield ___ g.p.m.

11 Water sample submitted: ☐ Yes ☒ No Date ___

12 Well head completion: ☐ Pitless adapter ☒ Inches above grade

13 Well grouted? ☒ Yes ☐ No
☐ Neat cement ☒ Bentonite ☐
Depth: From 0 ft. to 10 ft.

14 Nearest source of possible contamination: unk
ft. ___ Direction ___ Type ___
Well disinfected upon completion? ☒ Yes ☐ No

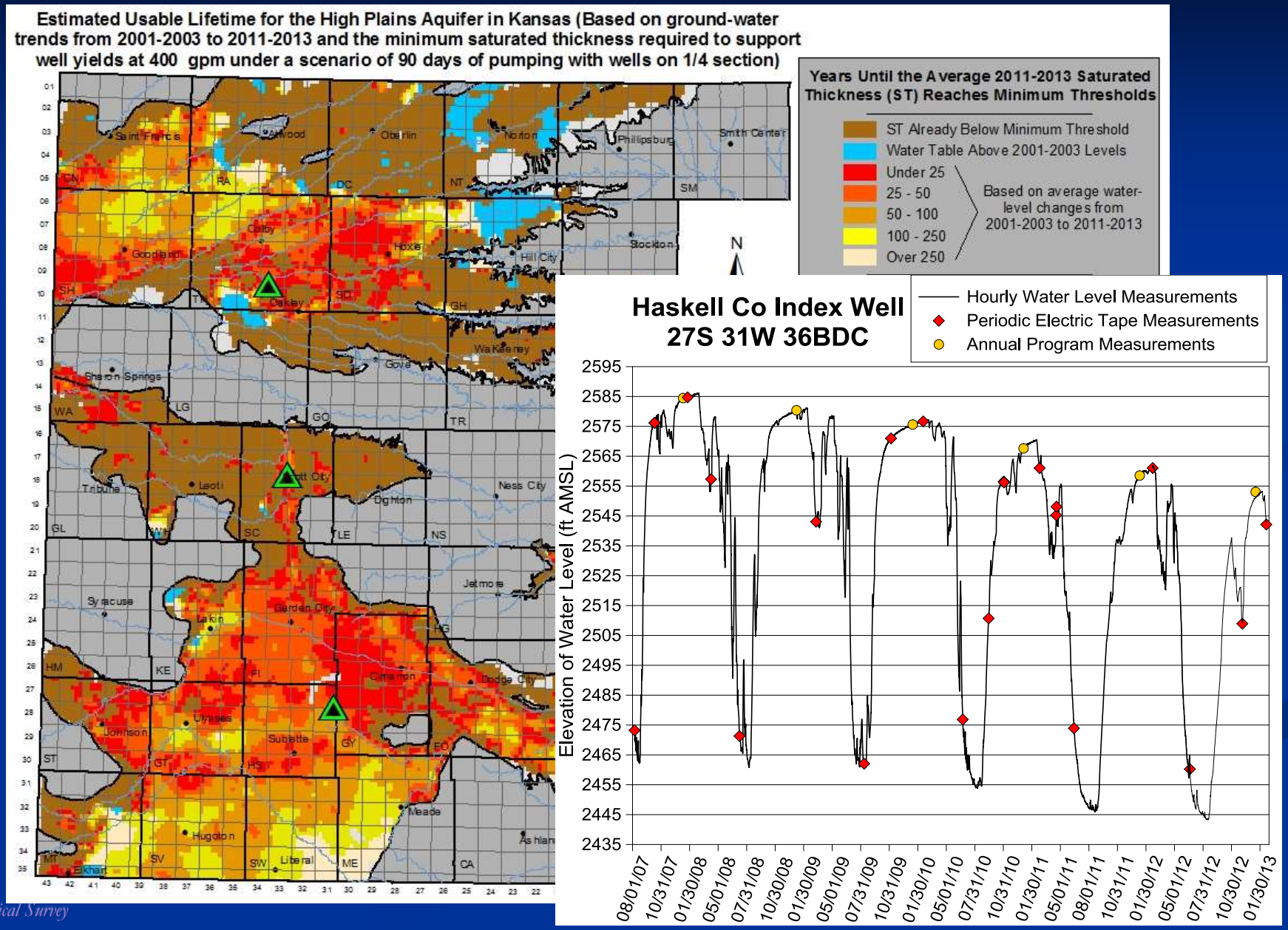
15 Pump: ☐ Not installed
Manufacturer's name Peerless
Model number ___ HP ___ Volts ___
Length of drop pipe 240 ft. capacity 1400 g.p.m.
Type: ☐ Submersible ☒ Turbine ☐ Jet ☐ Reciprocating ☐ Centrifugal ☐ Other

2 Type and color of material	From	To
Top soil	0	4
Tan clay with fine sand	4	45
Fine sand and clay	45	70
Fine sand	70	80
Sandy tan clay and sand	80	105
Fine to medium sand	105	140
Fine to coarse sand medium gravel	140	225
Yellow clay with sand streaks	225	245
Blue clay	245	258
Medium sand and gravel	258	328
Blue clay	328	345
Fine to medium sand and gravel	345	358
Blue clay	358	380
Sandy tan clay and sand	380	395
Medium sand to coarse gravel clay streaks	395	425
Sandy tan clay little fine sand	425	500

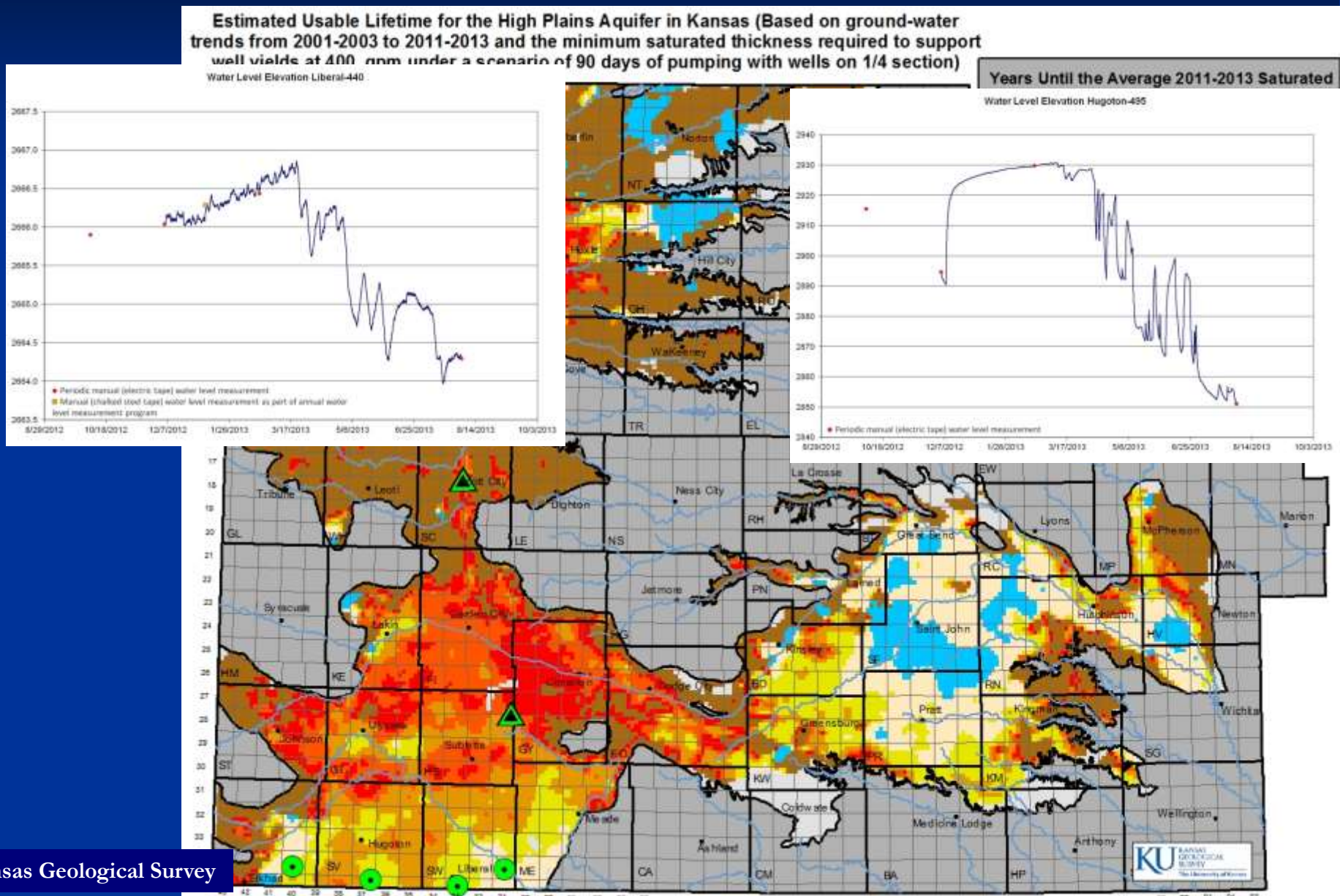
(use a second sheet if needed)

Topsoil
Clay, Fine Sand
Fine Sand, Clay
Fine Sand
Sandy clay, Sand
Find to Medium Sand
Fine to Coarse Sand, Medium Gravel
Clay, Sand
Clay
Medium Sand and Gravel
Clay
Fine to Medium Sand, Gravel
Clay
Sandy clay, Sand
Medium to Coarse Sand, Fine to Coarse Gravel, Clay
Sandy clay, Fine Sand

Static Versus Pumping Water Levels- Haskell Co Index Well



Static Versus Pumping Water Levels- Border Wells



Visions for Future of High Plains Aquifer

Common pool aquifer management considerations

- Each well subtracts from total water resource
- Impact of a single user, conservation or abuse, has small impact to long term viability.

Prior appropriation administration

- Senior rights have priority when not enough water
  - Establishing which wells impacts senior right takes time
  - Can be a harsh remedy
  - May not alter regional decline trend

Regional Conservation Plans

- A water users' regional plan can significantly extend the usable life of the aquifer.
- With conservation goals set, more efficient irrigation systems, crop water management tools, and increased options can help producers.

Ogallala Aquifer Initiative

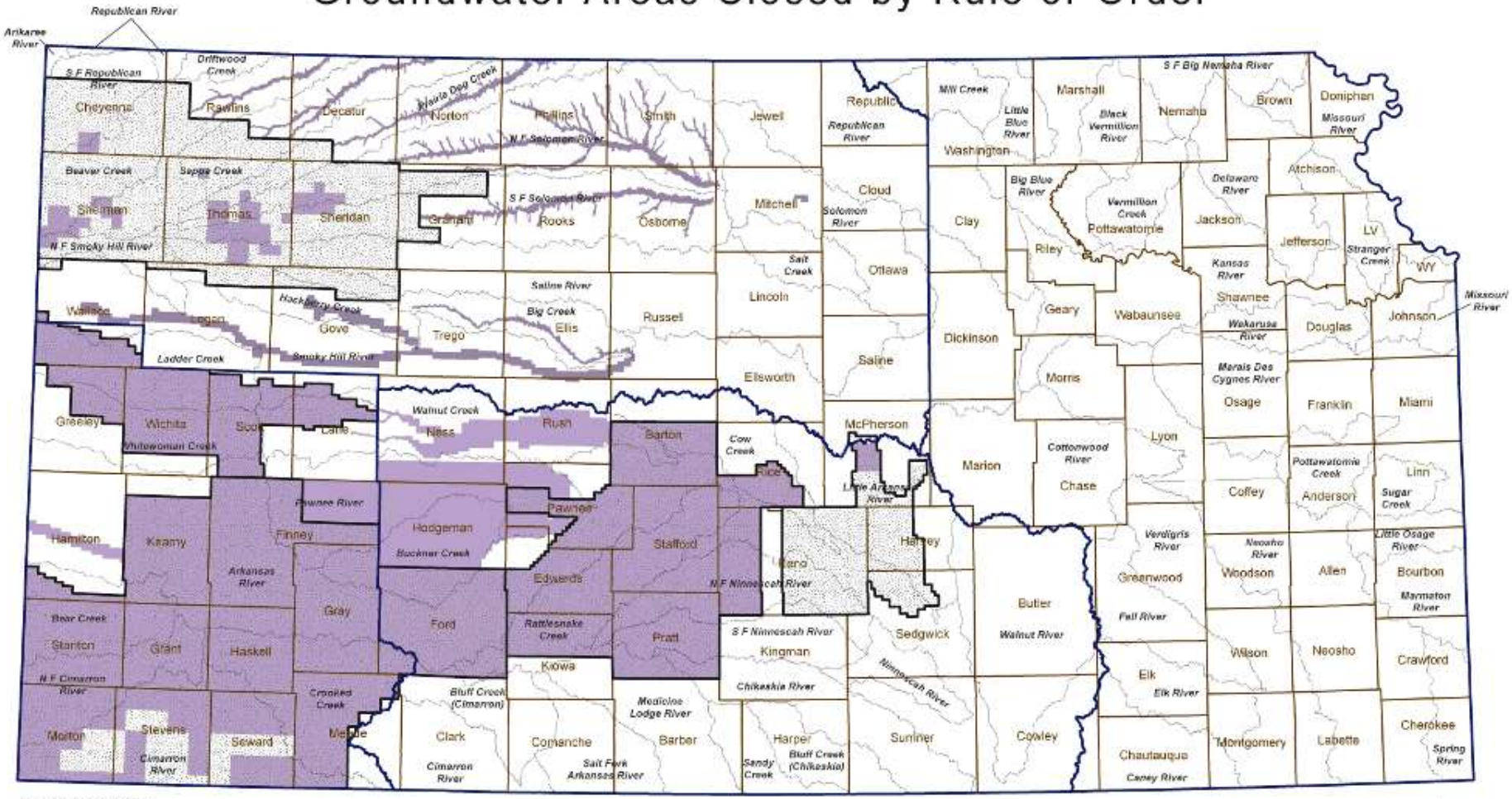
Governor Brownback provides his administration's support for Local Vision on aquifer

Public meeting in Garden City, 2012

Legislative and Regulatory Changes

- Amended MYFA (multiyear flex accts)
- Removed the “Use it or Lose it” water right requirement in Closed Areas
- Increased Penalties for Over pumpers
- Established LEMA option
- Amended Water Banks

Groundwater Areas Closed by Rule or Order



* Western Kansas Groundwater Management District No. 1 has requested rules and regulations to close the Ogallala and Niobrara formations within the district to new appropriation of water. A moratorium is in place while the rules and regulations are in the process of being adopted.

Increased Penalties for Overpumpers

Began in 2013

1st: Notice of Non Compliance

2nd: $1,000 fine and reduction of 2X overpumped in following irrigation season

3rd: $1,000/days overpumped fine (capped at $10,000) and 1 year suspension

4th: Water right revoked

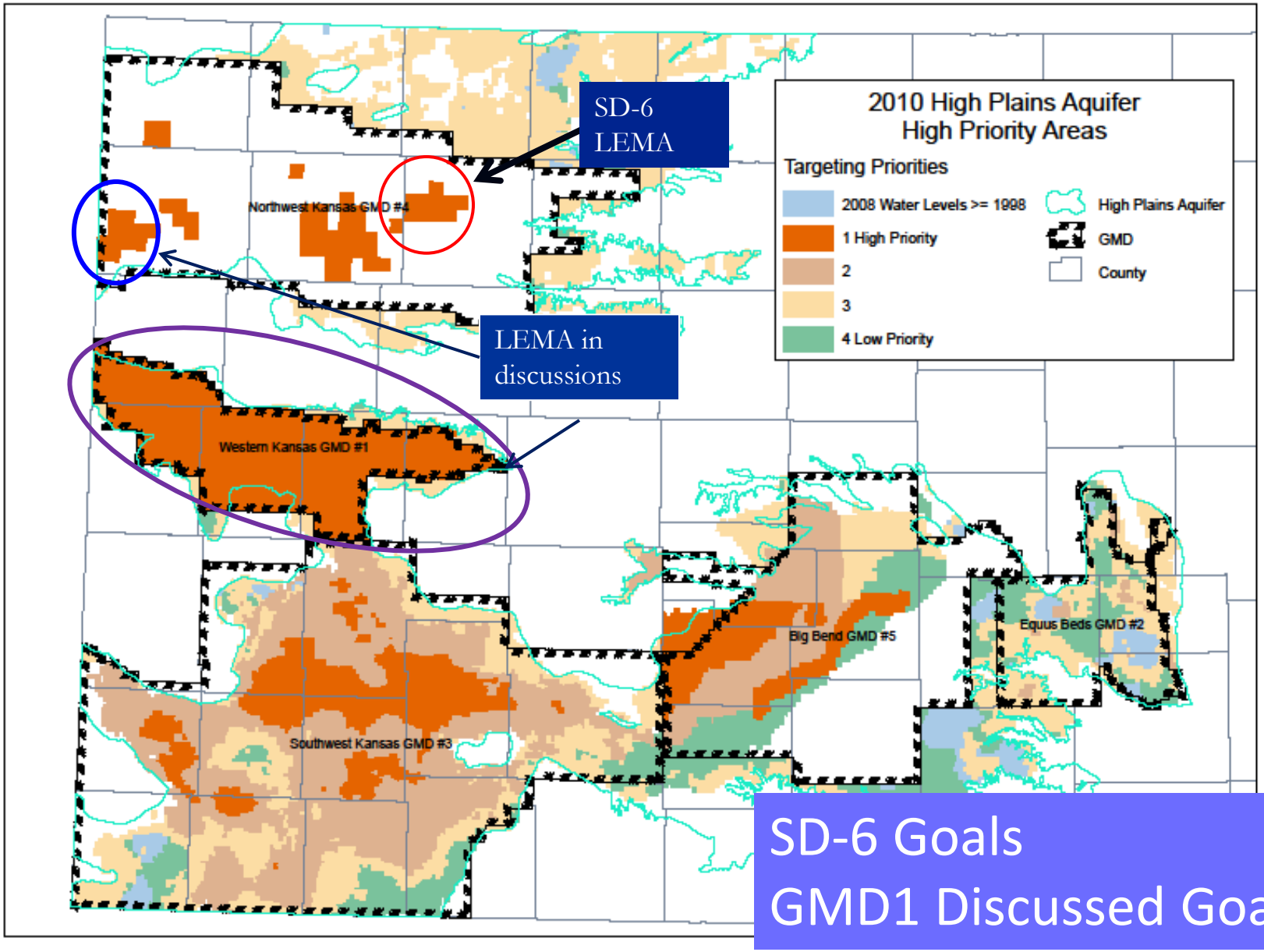
Local Enhanced Management Areas (LEMAs)
Locals Take Leadership Role

Harvesting in Hoxie,KS

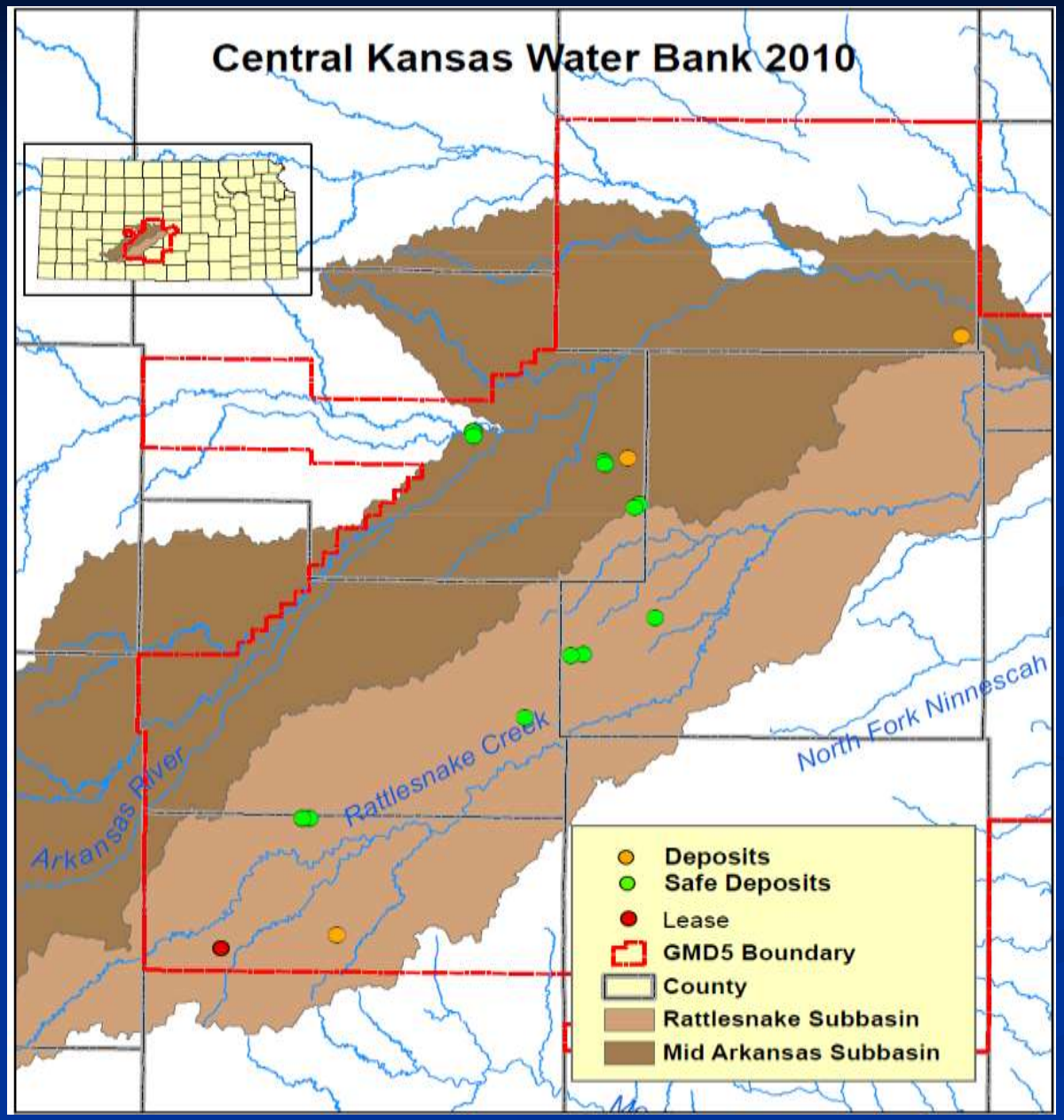
Public meeting in Leoti, KS

Local Enhanced Management Areas LEMAs

- Must be within a Groundwater Management District
- If approved by GMD, they forward to Chief Engineer
- Two public hearings
- If ordered by Chief Engineer, becomes enforceable
- Can be proposed for any size reasonable for management
- Locally proposed corrective measures for water conservation
- Flexibility to achieve water conservation goals



SD-6 Goals
GMD1 Discussed Goals



A Water Bank is a market based method to lease and move water, and save for future use.

Requires 10% conservation

Safe deposit accounts now up to > 100

Looking forward 2014

- Development of 50 year water vision
- LEMA discussions
- New Farm Bill
- Work to align state and federal programs with Kansas water goals

Any new policy or program issues to be addressed?

Thank You

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www.kwo.org

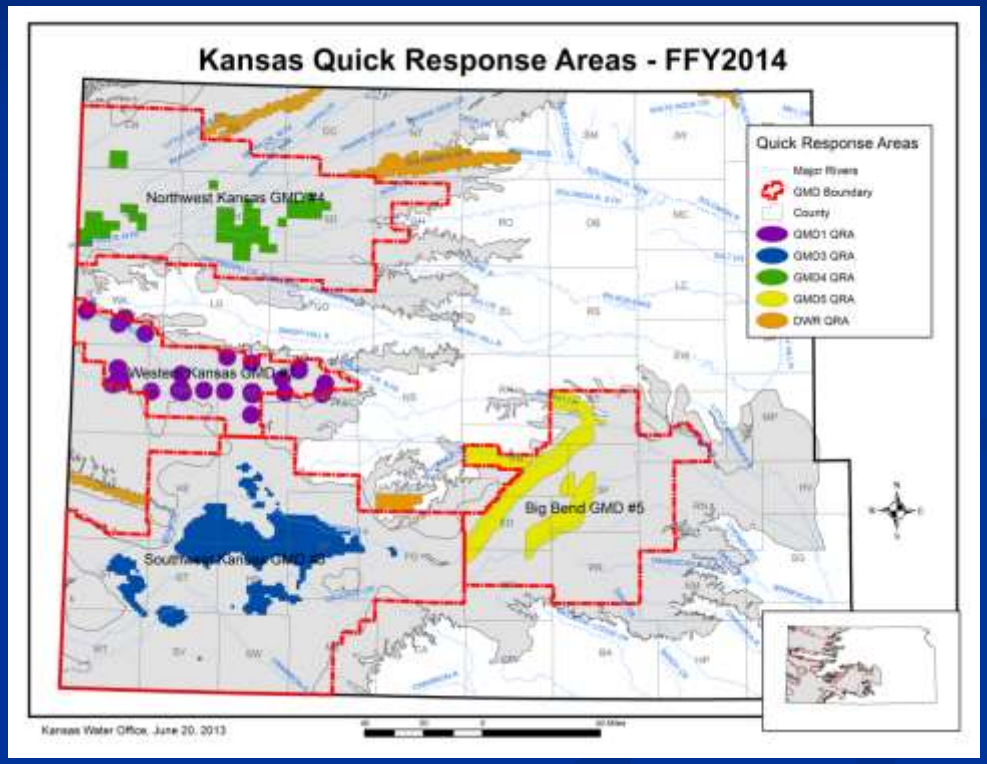
Natural Resources Conservation District (NRCS) EQIP Contracts for Water Conservation

Recommend changes:

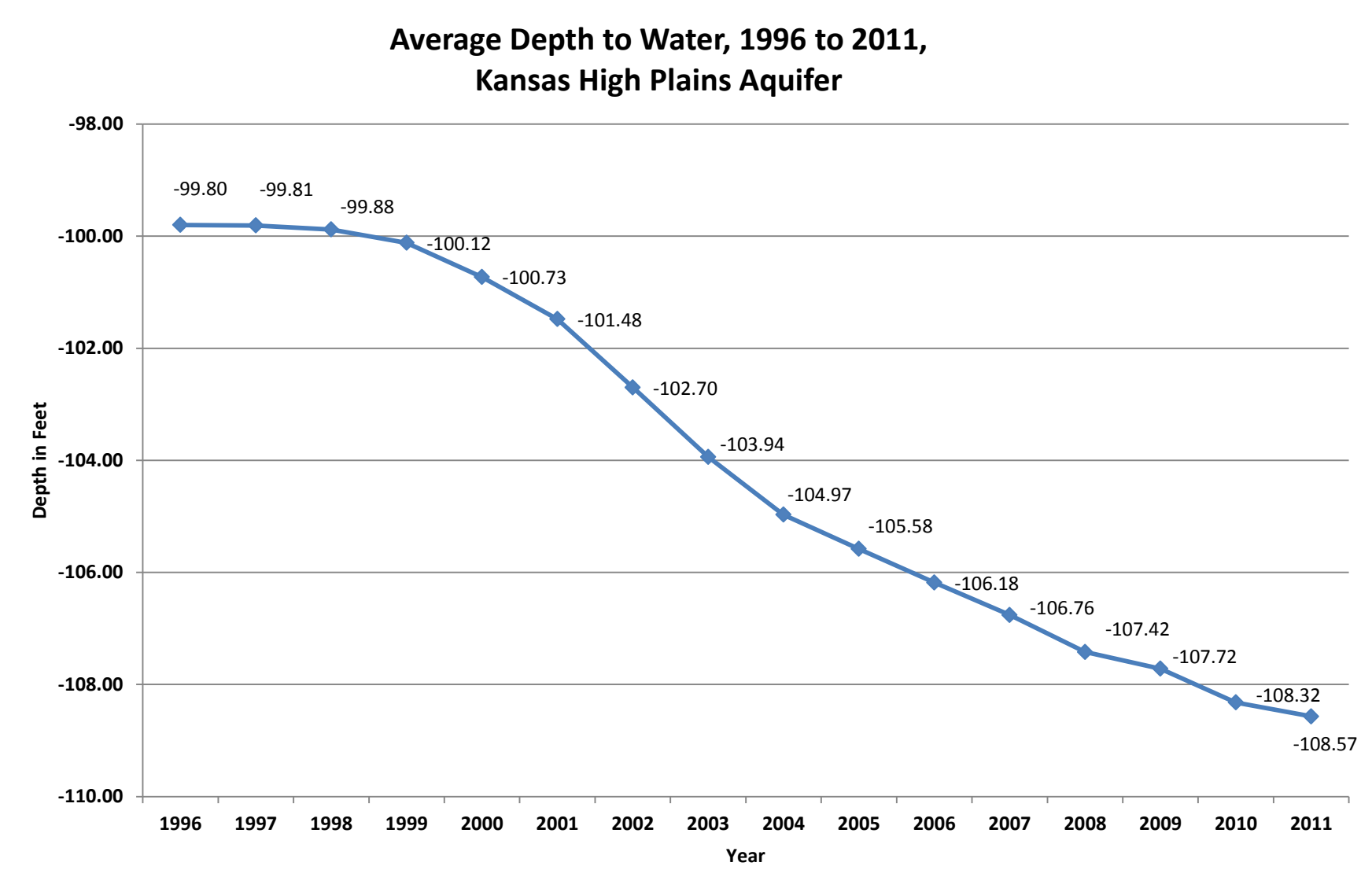
1. MYFA – allow water conservation over 5 years, not annual achievement

2. Add ranking points if enrolled into WRCP (5 or 10 years)

3. Add ranking points if in LEMA



Climate Change Adds to Challenge

- Observed:
  - Nine or more frost free days
  - Warmer, with higher nighttime maximum temps
- Projected:
  - Reduced soil moisture
  - Changes to crop cycles with warming winters
  - More variability in summer precipitation

Water Level Trends 1996 to 2011