GMD1 Practical Saturated Thickness Plus (PST+) Project

Jim Butler and Brownie Wilson

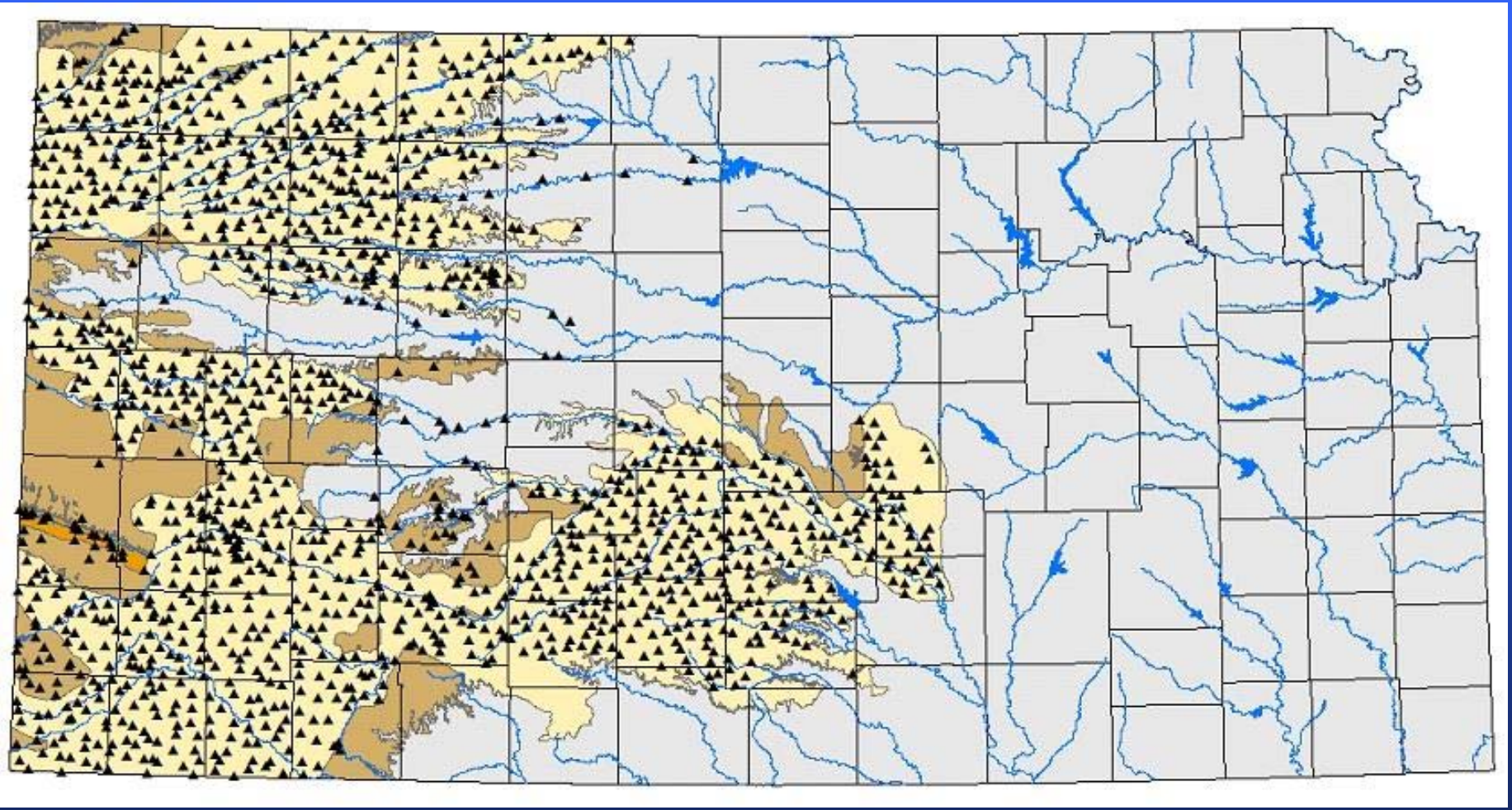
KU KANSAS GEOLOGICAL SURVEY
The University of Kansas

Ground Water Management District #1

Annual Meeting

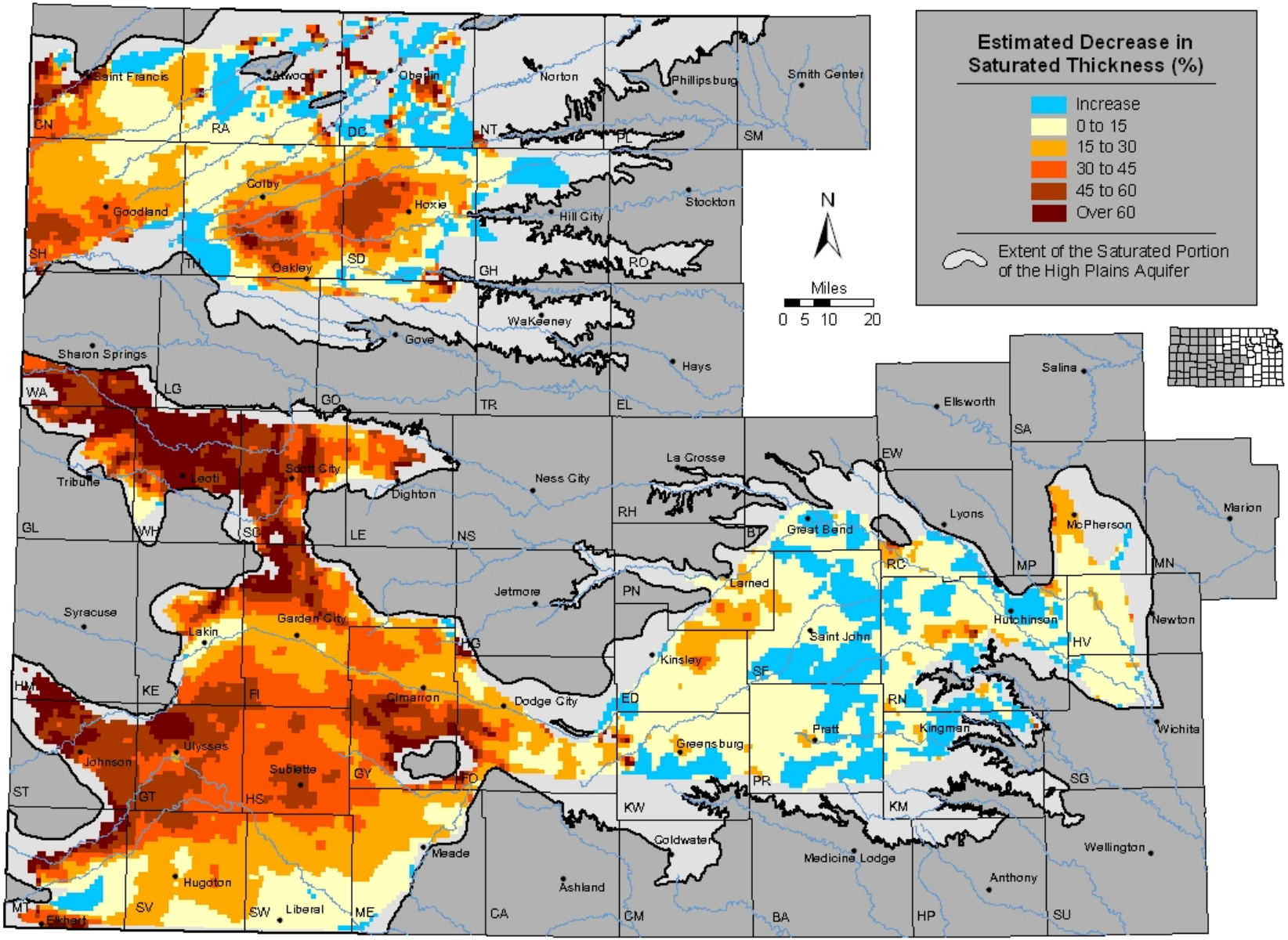
Tribune - March 15, 2011

Annual Water Level Measurement Program



- approx. 2200 wells measured each January

Percent Change in Saturated Thickness for the High Plains Aquifer
Predevelopment to Average 2007-2009



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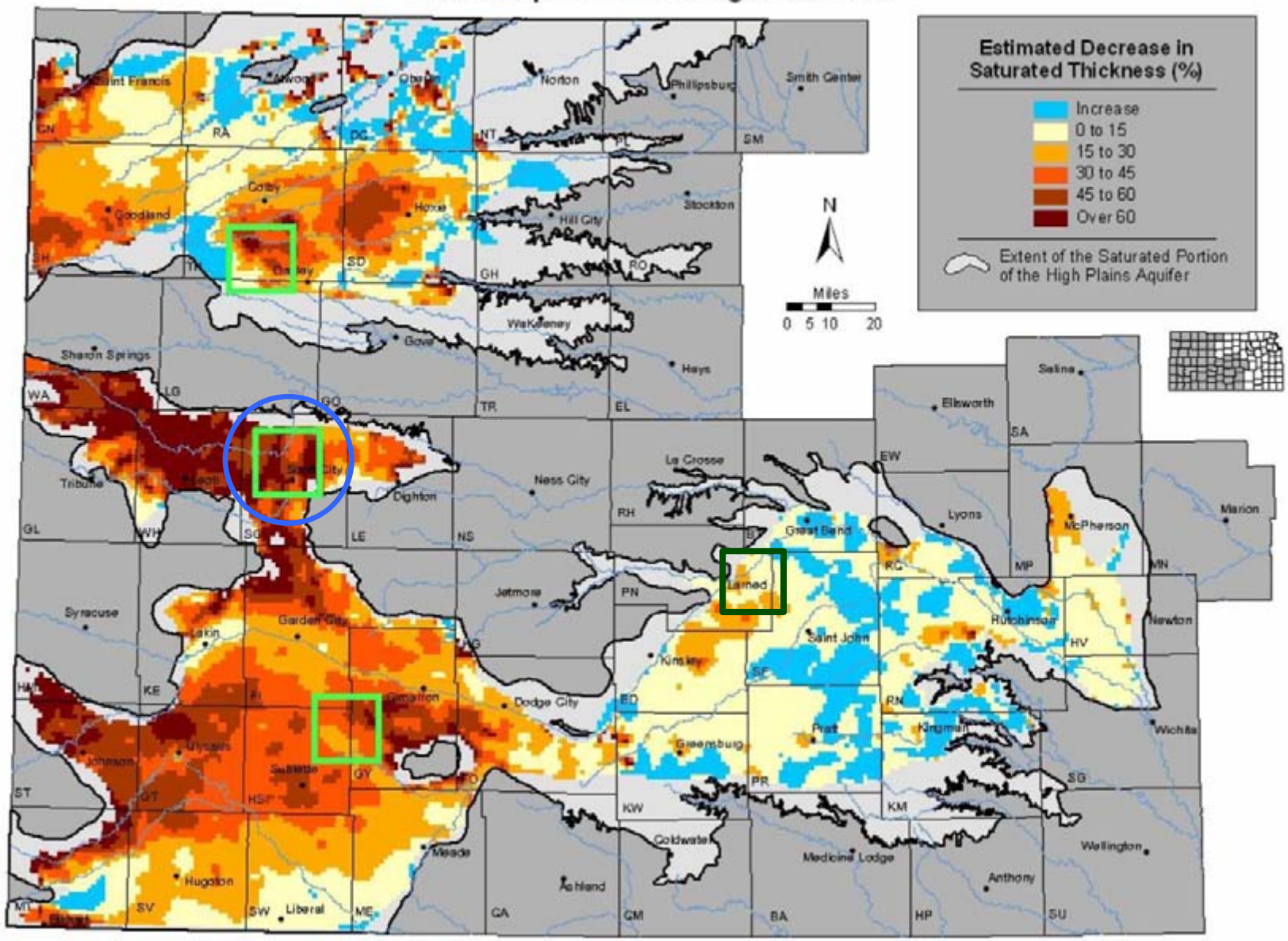

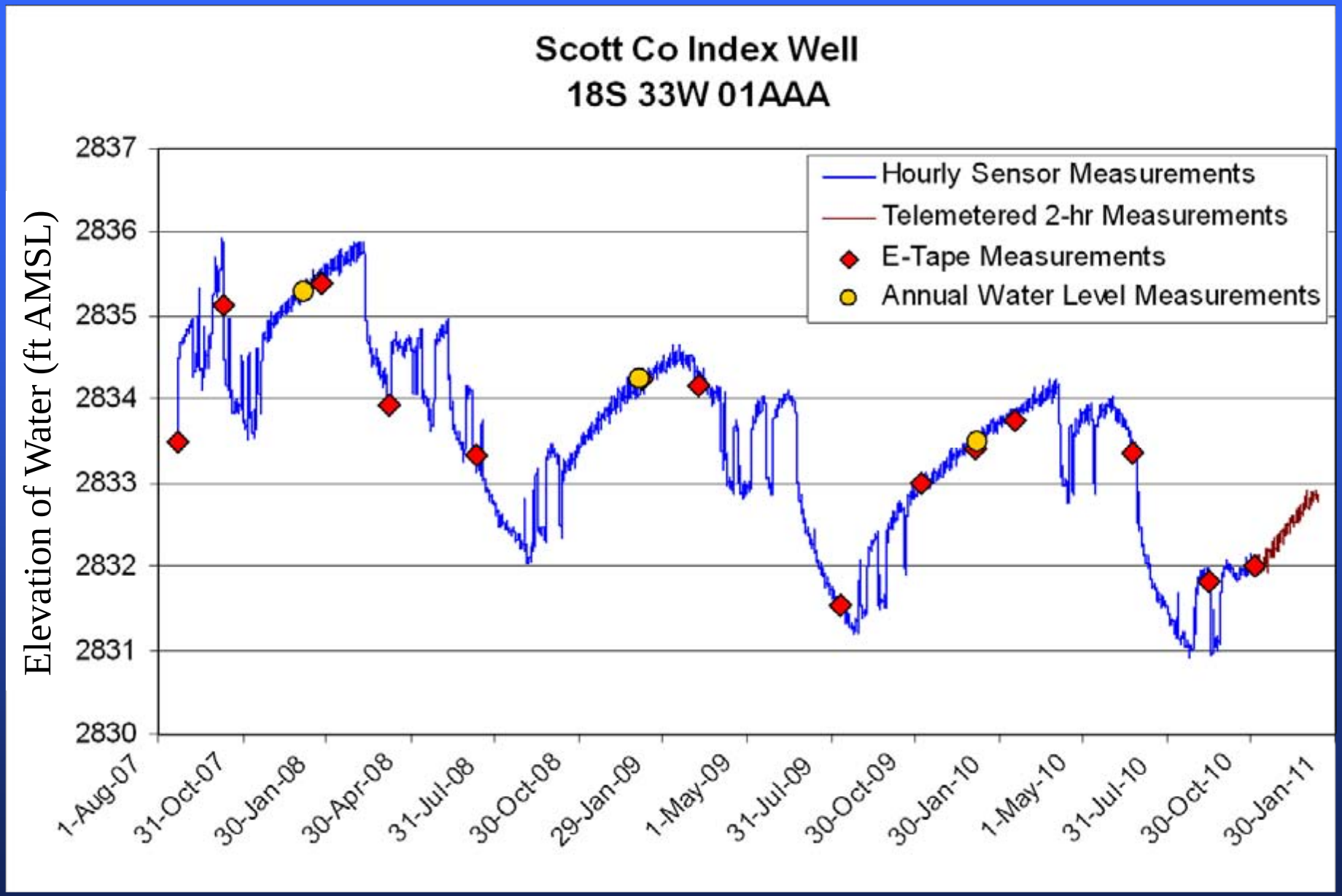

www.kgs.ku.edu/HighPlains/OHP/index_program/index.shtml

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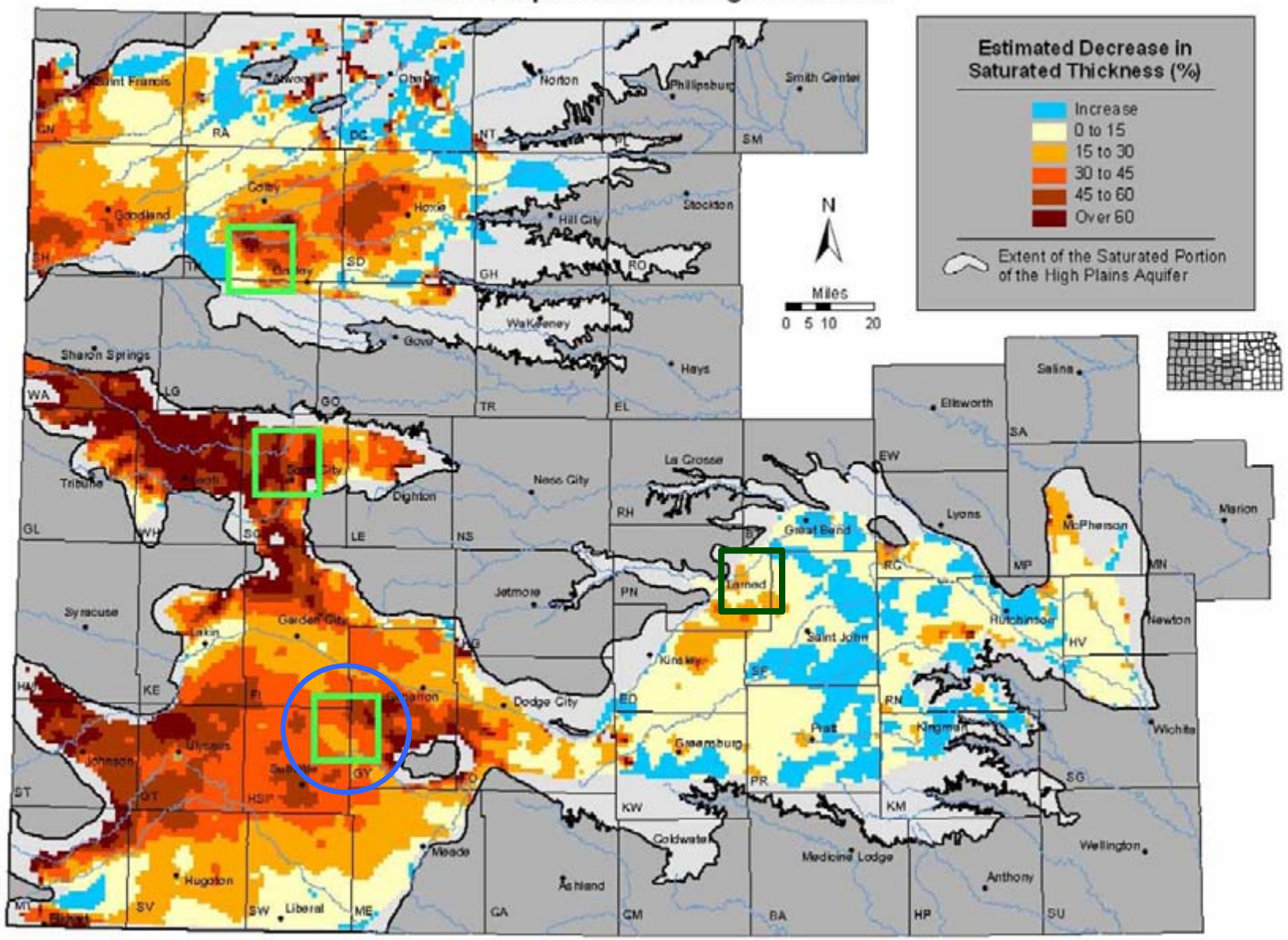
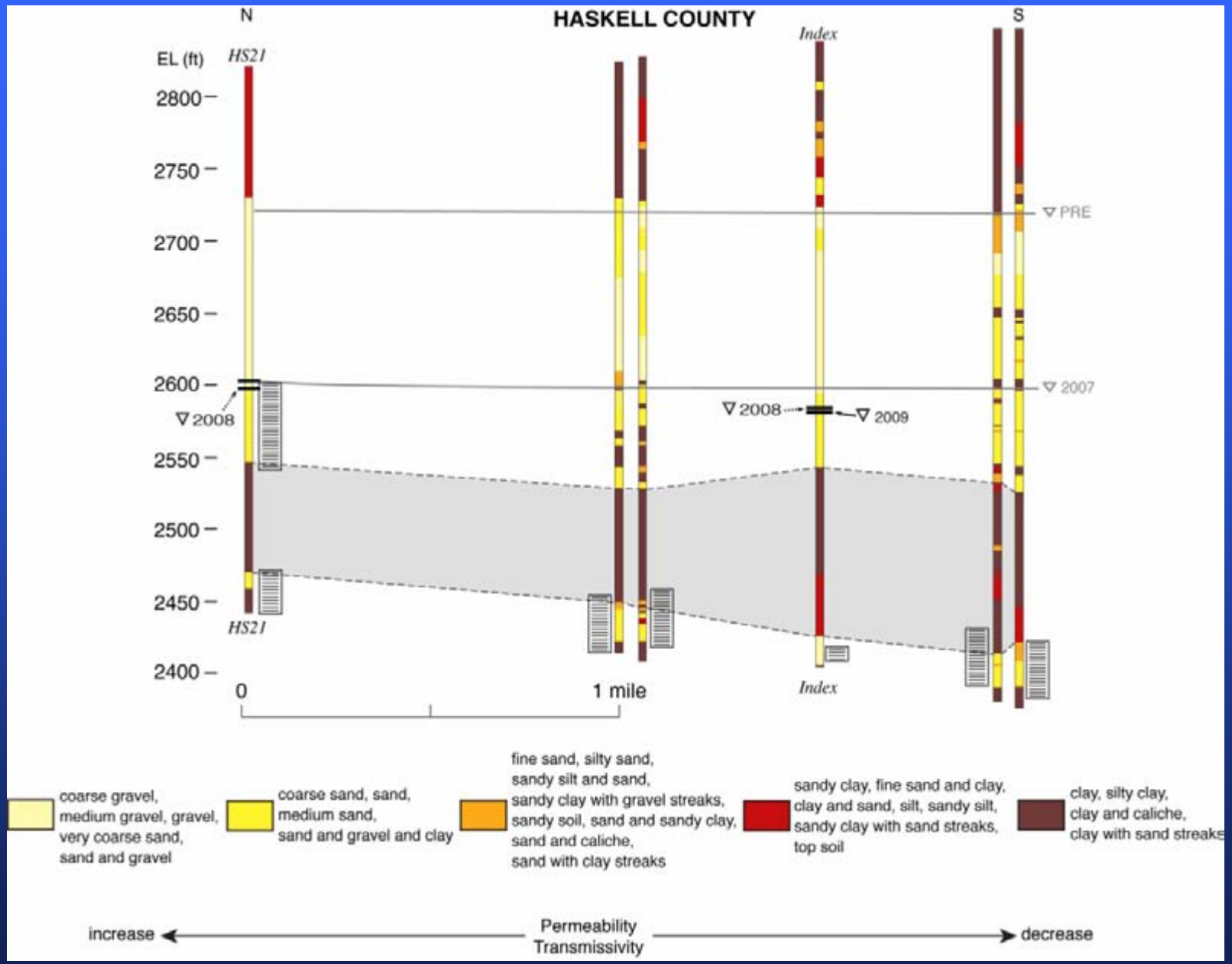



HASKELL COUNTY
N
S
EL (ft)
2800
2750
2700
2650
2600
2550
2500
2450
2400
HS21
HS21
Index
Index
PRE
2007
2008
2008
2009
0
1 mile
coarse gravel, medium gravel, gravel, very coarse sand, sand and gravel
coarse sand, sand, medium sand, sand and gravel and clay
fine sand, silty sand, sandy silt and sand, sandy clay with gravel streaks, sandy soil, sand and sandy clay, sand and caliche, sand with clay streaks
sandy clay, fine sand and clay, clay and sand, silt, sandy silt, sandy clay with sand streaks, top soil
clay, silty clay, clay and caliche, clay with sand streaks
increase
Permeability
Transmissivity
decrease

PRACTICAL SATURATED THICKNESS (PST)

Estimated Predevelopment Depth to Water 214 ft

Saturated Thickness (ST) = 393 ft)

2004 Estimated Depth to Bedrock

Lithologic Log	
From: 0 ft. **to** 2 ft.	**Type**: CLAY
From: 2 ft. **to** 80 ft.	**Type**: SANDY CLAY
From: 80 ft. **to** 104 ft.	**Type**: SAND
From: 104 ft. **to** 120 ft.	**Type**: CLAY
From: 120 ft. **to** 170 ft.	**Type**: SAND & GRAVEL
From: 170 ft. **to** 197 ft.	**Type**: SHALE & LIMESTONE
From: 197 ft. **to** 210 ft.	**Type**: SAND & GRAVEL
From: 210 ft. **to** 219 ft.	**Type**: SHALE & LIMESTONE
From: 219 ft. **to** 237 ft.	**Type**: CLAY
From: 237 ft. **to** 263 ft.	**Type**: SAND & GRAVEL
From: 263 ft. **to** 271 ft.	**Type**: SANDY CLAY
From: 271 ft. **to** 297 ft.	**Type**: SAND & GRAVEL
From: 297 ft. **to** 350 ft.	**Type**: SANDY CLAY
From: 350 ft. **to** 360 ft.	**Type**: FINE SAND
From: 360 ft. **to** 370 ft.	**Type**: SANDY CLAY
From: 370 ft. **to** 380 ft.	**Type**: LIMESTONE
From: 380 ft. **to** 440 ft.	**Type**: CLAY
From: 440 ft. **to** 556 ft.	**Type**: SANDY CLAY
From: 556 ft. **to** 585 ft.	**Type**: SAND & GRAVEL
From: 585 ft. **to** 587 ft.	**Type**: CLAY
From: 587 ft. **to** 593 ft.	**Type**: SANDSTONE
From: 593 ft. **to** 607 ft.	**Type**: SHALE & LIMESTONE
From: 607 ft. **to** 620 ft.	**Type**: SHALE

PST = 155 ft
or approx. 40% of ST

Categorizing Process

Synonymy

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

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

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

WATER WELL RECORD
KSA 82a-1201-1215

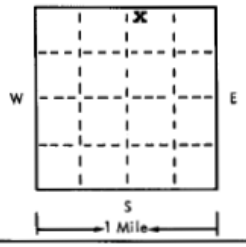
Kansas State Dept. Of Health
(Water Well Contractors)
Forbes-Bldg. 740
Topeka, Kansas 66620

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

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)

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
Threaded ☐ Welded ☒ Surface 12 in.
Diam. Weight 37 lbs./ft.
16 in. to 258 ft. depth Drive shoe? ☐ Yes ☒ No
in. to ft. depth

8 Screen: Foster, Brown, Cook
Manufacturer
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 surfaces: 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.

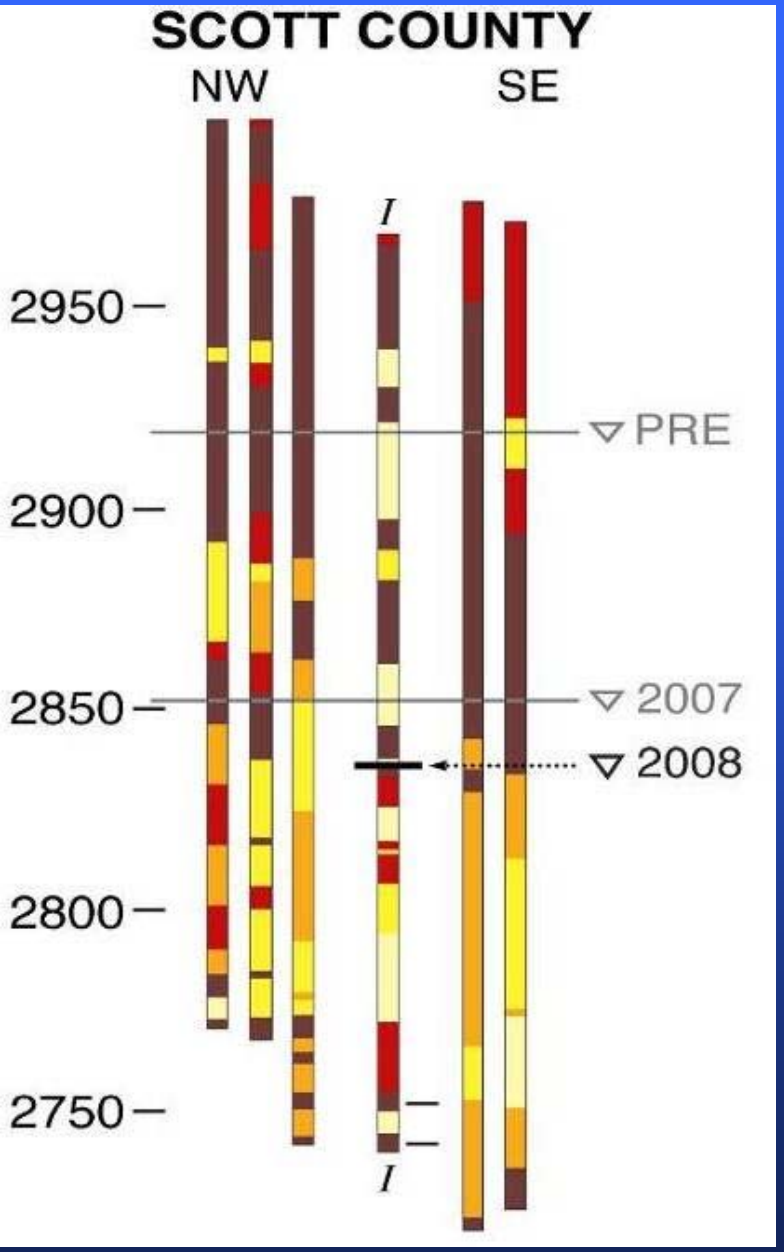
14 Nearest source of possible contamination: unk
ft. Direction Type
Well disinfected upon completion? ☒ Yes ☐ No

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

Multi-layer Breakdown

	Percentage by Grouping					
Number of Synonymies	1	2	3	4	5	6
1	100%					
2	60%	40%				
3	50%	30%	20%			
4	40%	30%	20%	10%		
5	30%	25%	20%	15%	10%	
6	30%	25%	20%	12%	8%	5%

= 60% Sandy Clay and 40% Sand



Scott County Index Well

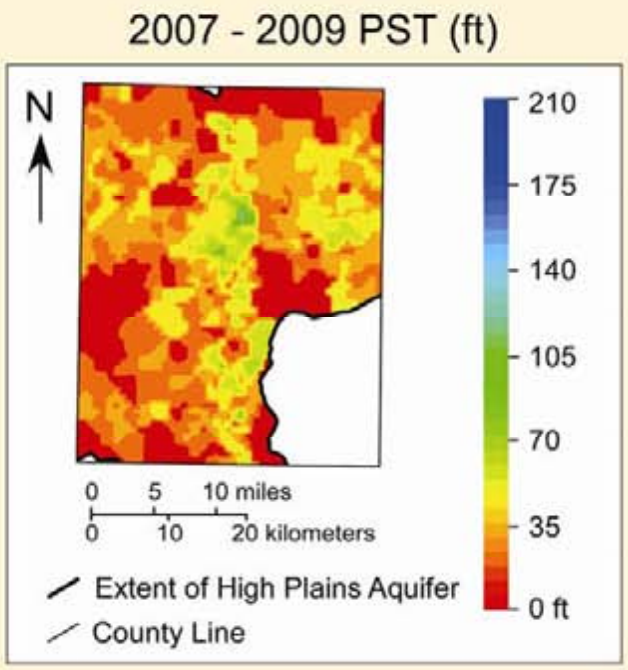
2009 ST = 90.2 ft

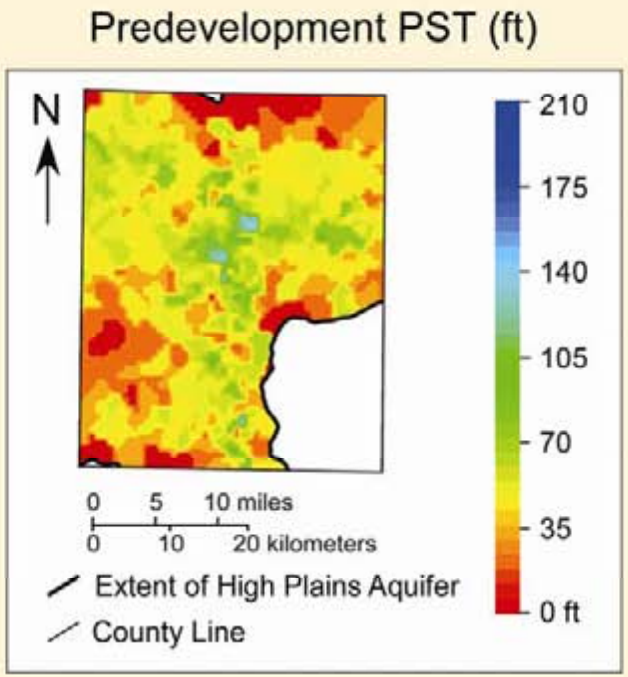
2009 PST = 54.8 ft

- thickness of water-yielding materials

- vertical distribution

Permeable (light) and impermeable (dark) zones

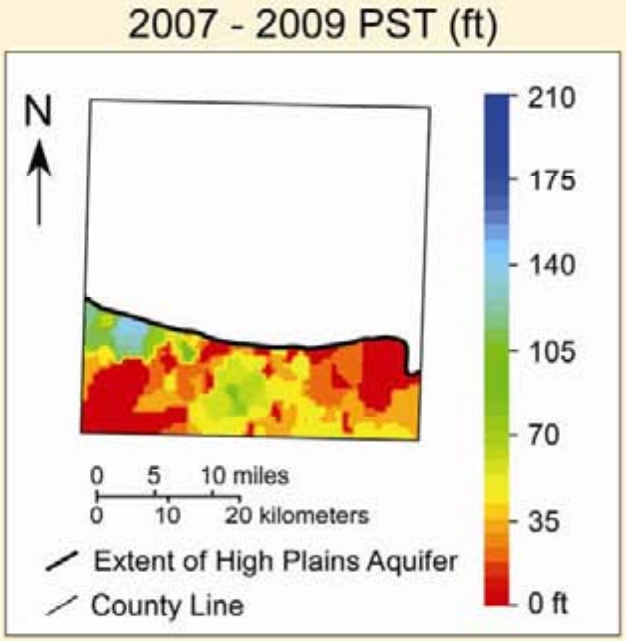


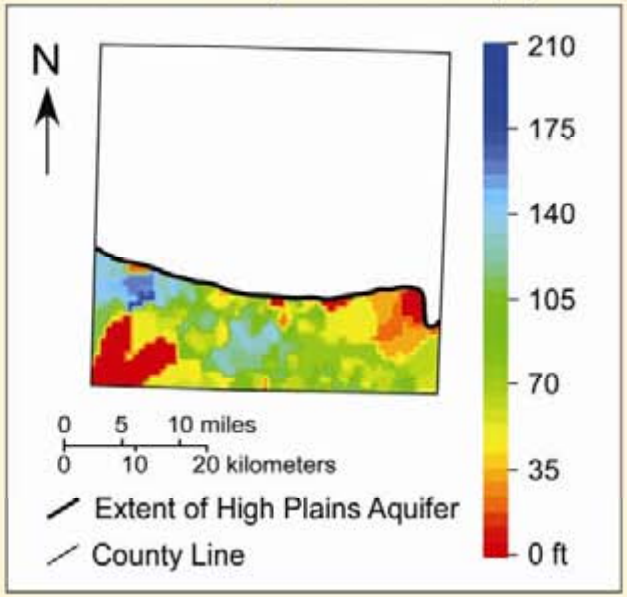


Scott County

- Average of 2007-2009 PST
  - reds and yellows

- Predevelopment
  - yellows and greens

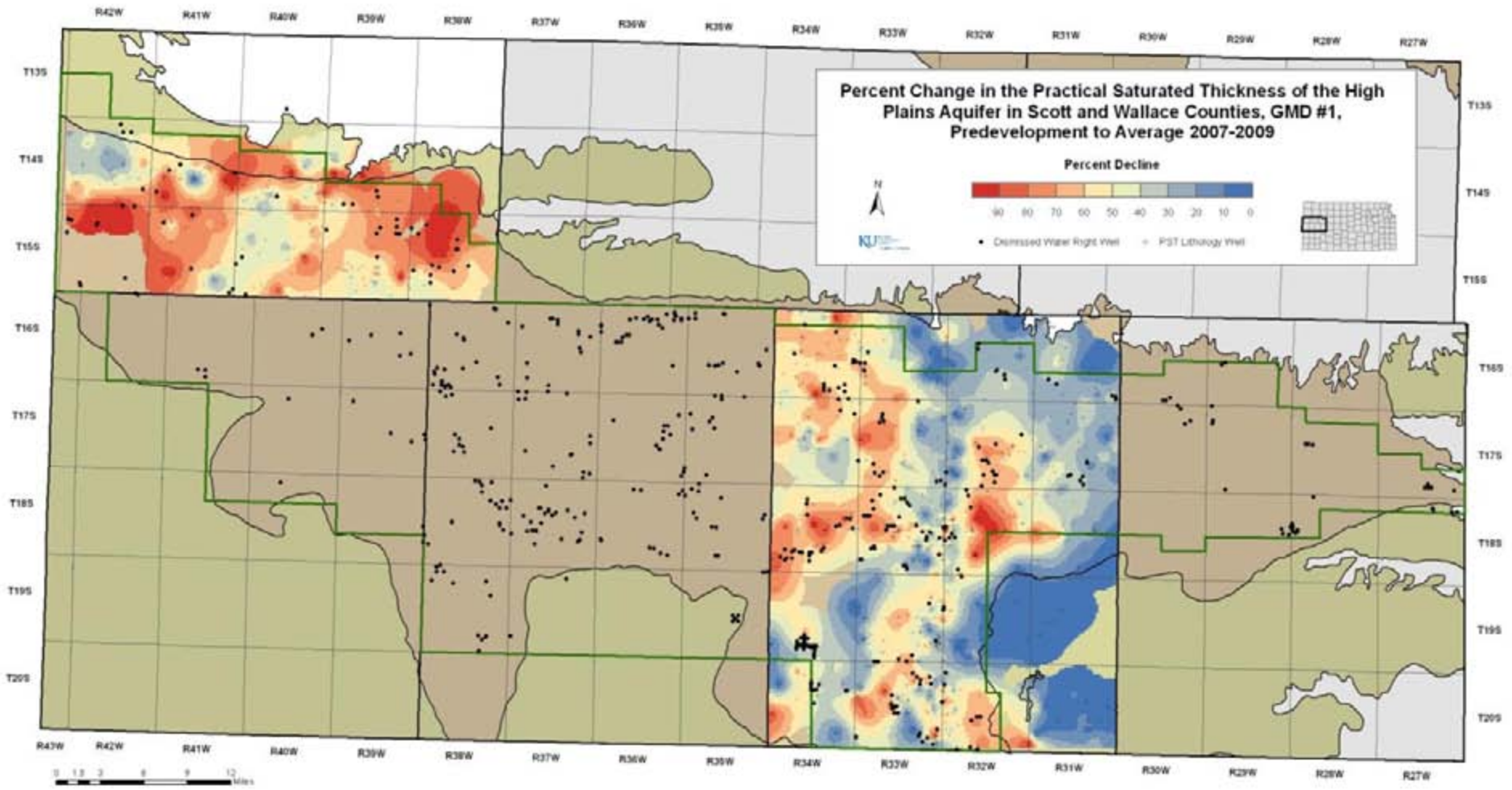




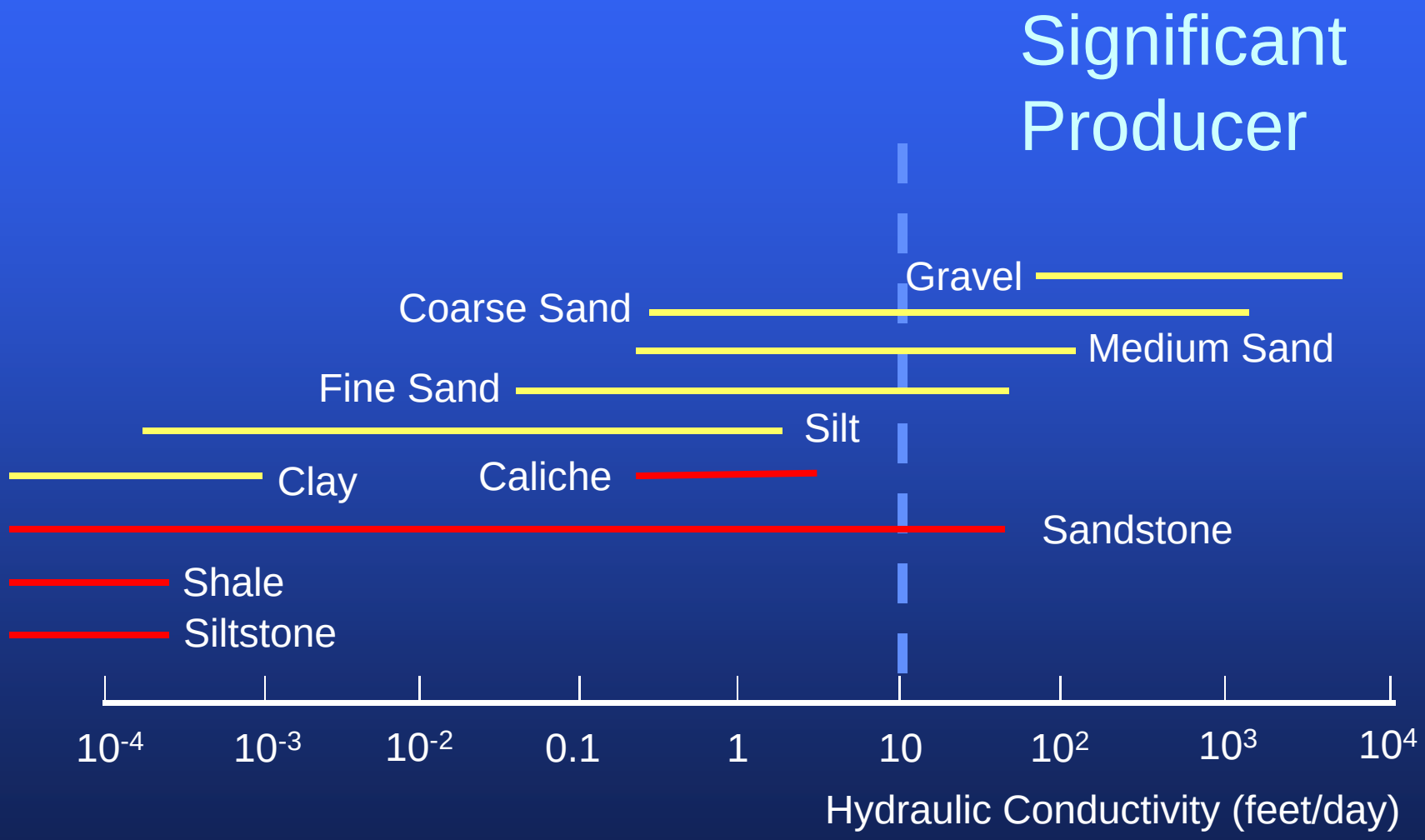
Wallace County

- Average of 2007-2009 PST
  - reds to greens

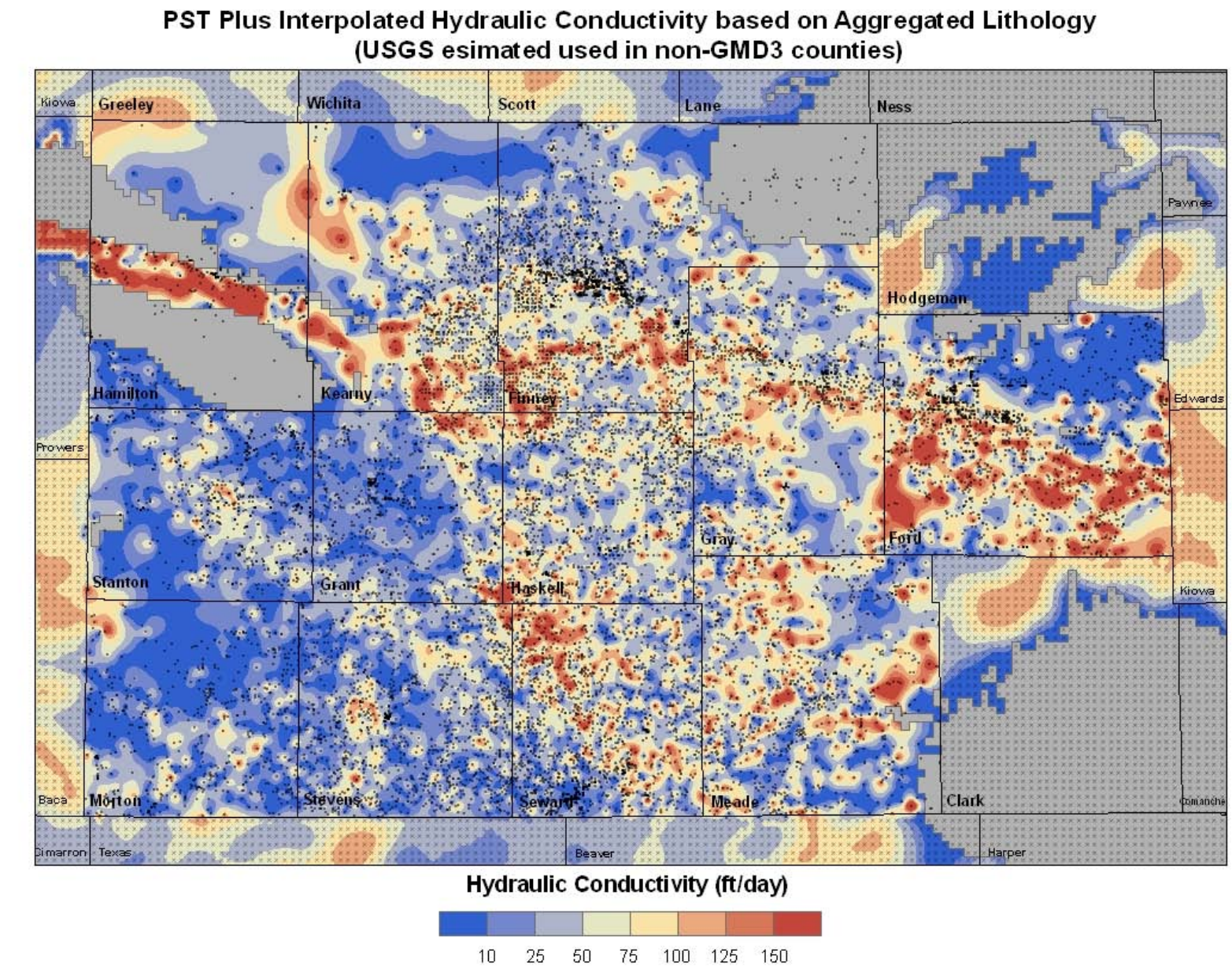
- Predevelopment
  - greens and blues

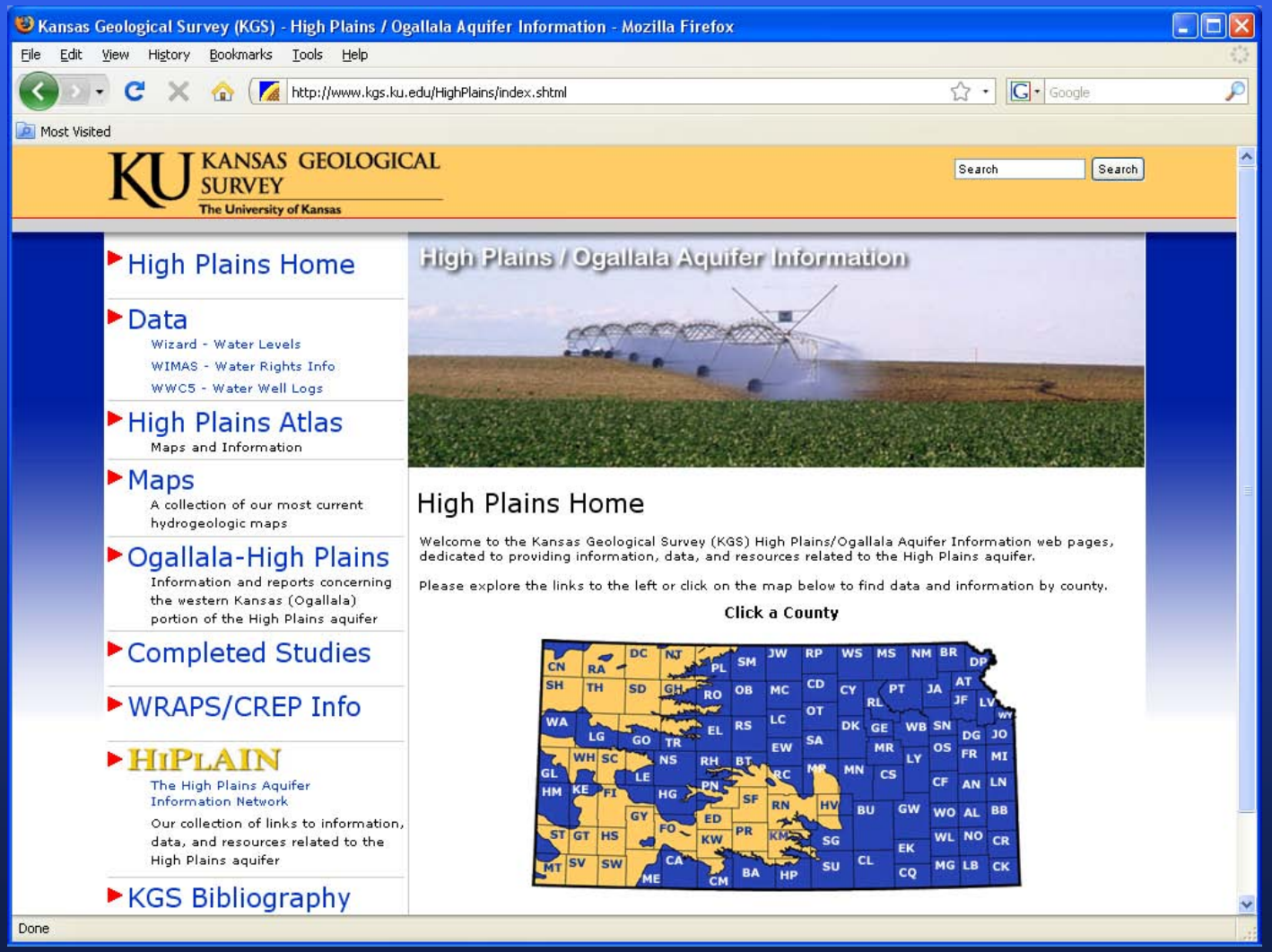

Percent Change in the Practical Saturated Thickness of the High Plains Aquifer in Scott and Wallace Counties, GMD #1, Predevelopment to Average 2007-2009
Percent Decline
90 80 70 60 50 40 30 20 10 0
N
Dismissed Water Right Well
PST Lithology Well
R42W R41W R40W R39W R38W R37W R36W R35W R34W R33W R32W R31W R30W R29W R28W R27W
T13S T14S T15S T16S T17S T18S T19S T20S
Miles

Productive/Non-Productive Sediment Types



PST + Example from Southwest Kansas



Questions????

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