April 11, 2017

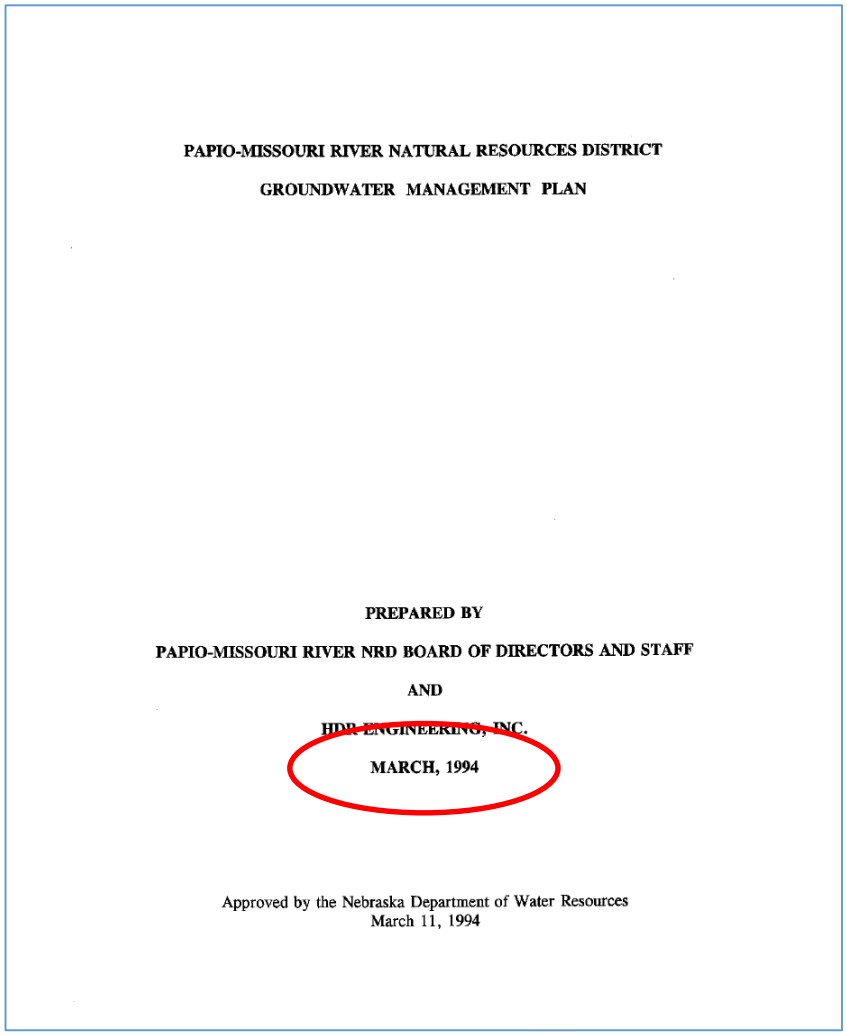
PAPIO-MISSOURI RIVER
NATURAL RESOURCES DISTRICT'S

GROUNDWATER MANAGEMENT PLAN UPDATE

Nebraska
Groundwater
Monitoring Council

OLSSON ASSOCIATES

Why update the plan?



PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT

GROUNDWATER MANAGEMENT PLAN

PREPARED BY

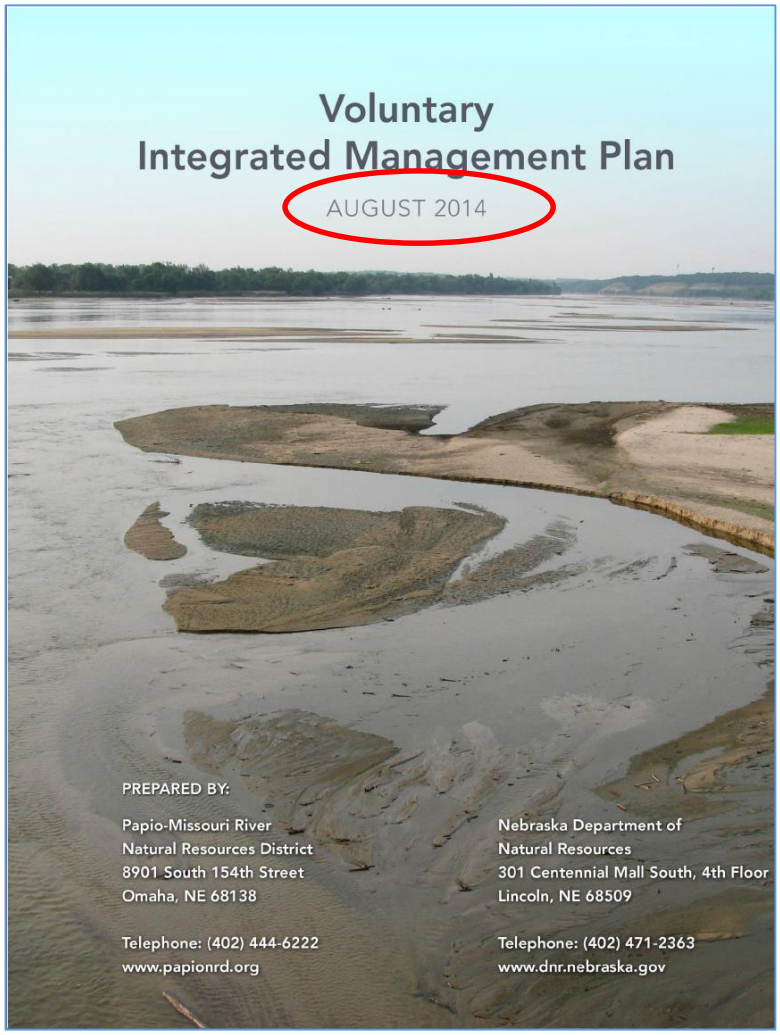
PAPIO-MISSOURI RIVER NRD BOARD OF DIRECTORS AND STAFF

AND

HDR ENGINEERING, INC.

MARCH, 1994

Approved by the Nebraska Department of Water Resources
March 11, 1994



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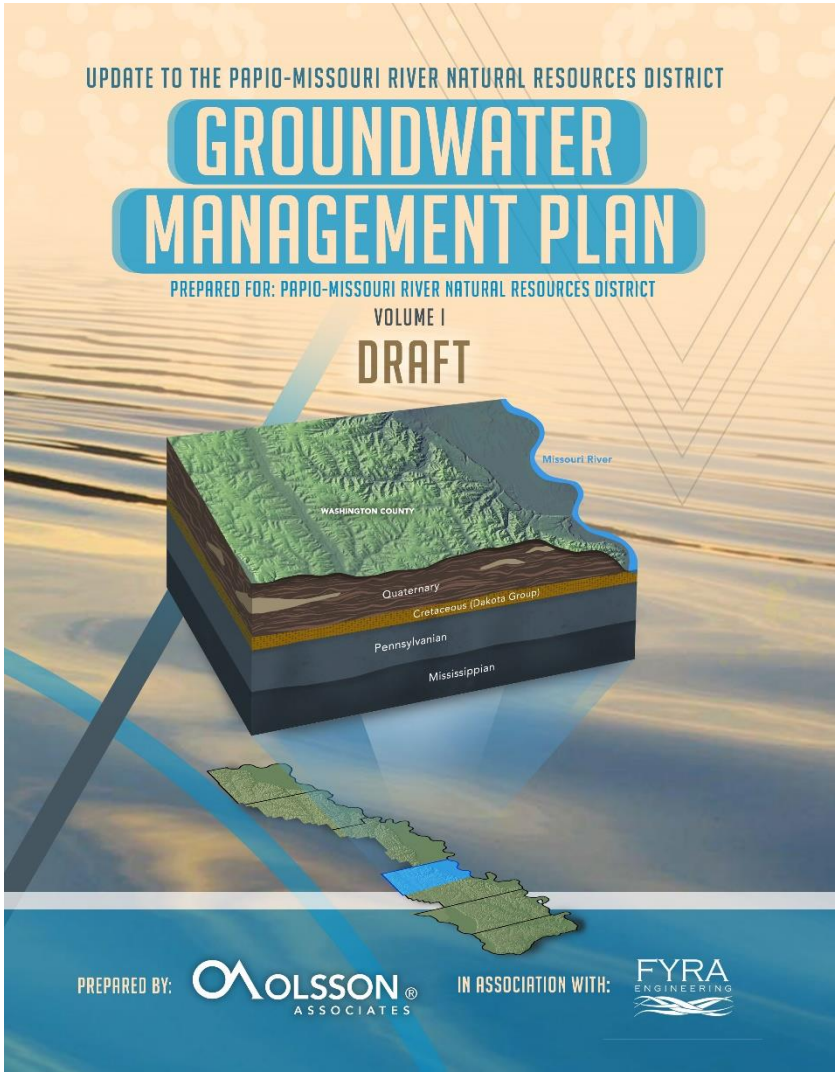
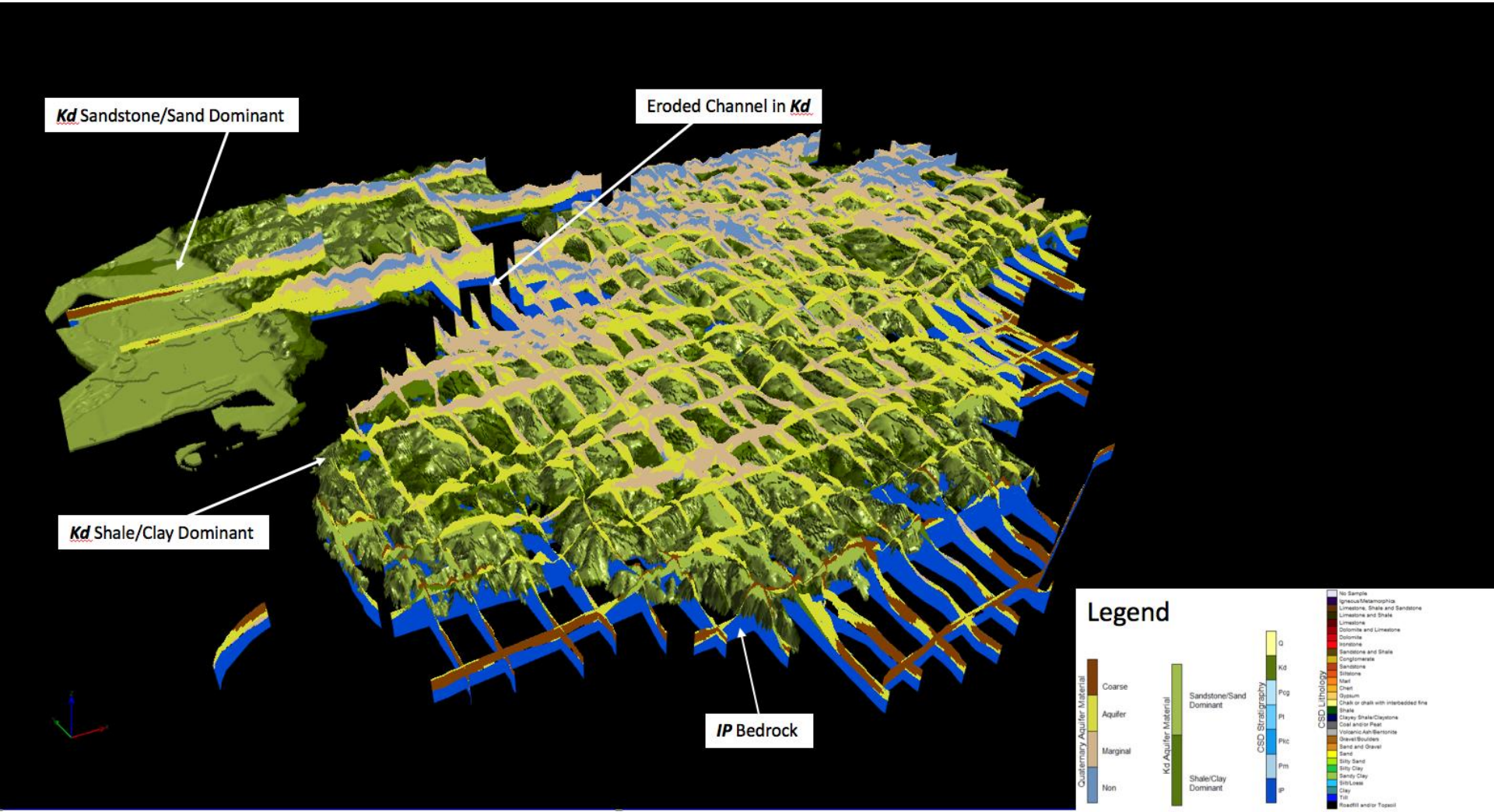
Why update the plan?

- Consistency with adjacent NRDs
- Increased population and pressure on groundwater
- Refine plan to fit the hydrogeology



New Data - Sarpy AEM Survey

- Report just released

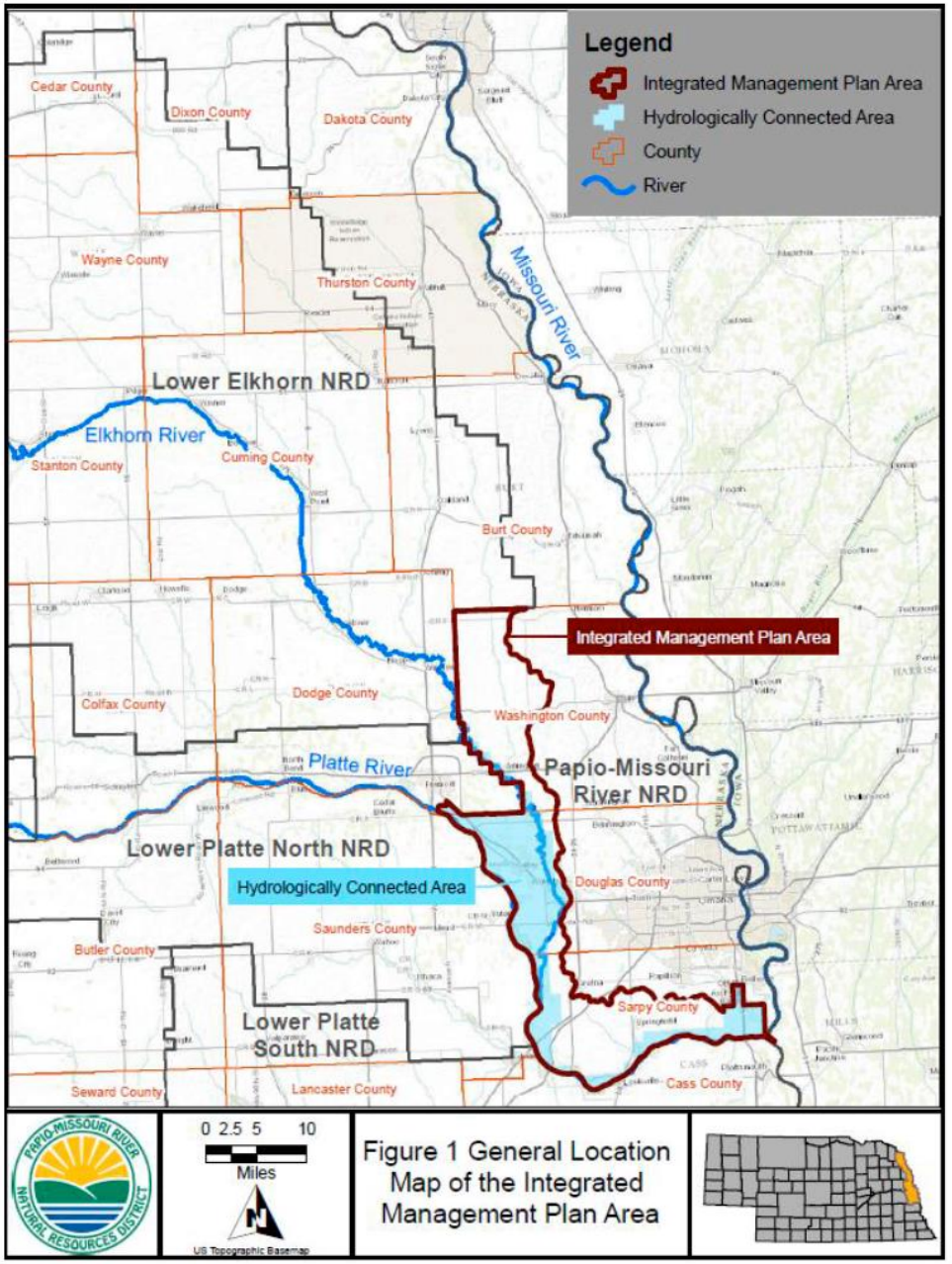


Primary Points

- Introduction
  - *Statutory Requirements*
- Groundwater Supply and Demand
  - *What we learned developing the plan*
- Current Groundwater Monitoring
  - *USGS, P-MRNRD, and others - WL and WQ*
- Stakeholder Involvement
  - *What proposed actions may the P-MRNRD adopt as new rules and regulations?*
- Proposed New Rules – Triggers and Actions
  - *Consistent with surrounding NRDs (where appropriate)*
- What's next!!

IMPs vs GMPs

- IMPs written to manage the areas where groundwater and surface water are interconnected
- Jointly implemented by the NRD and NDNR
- GMP includes entire District and addresses quality and quantity



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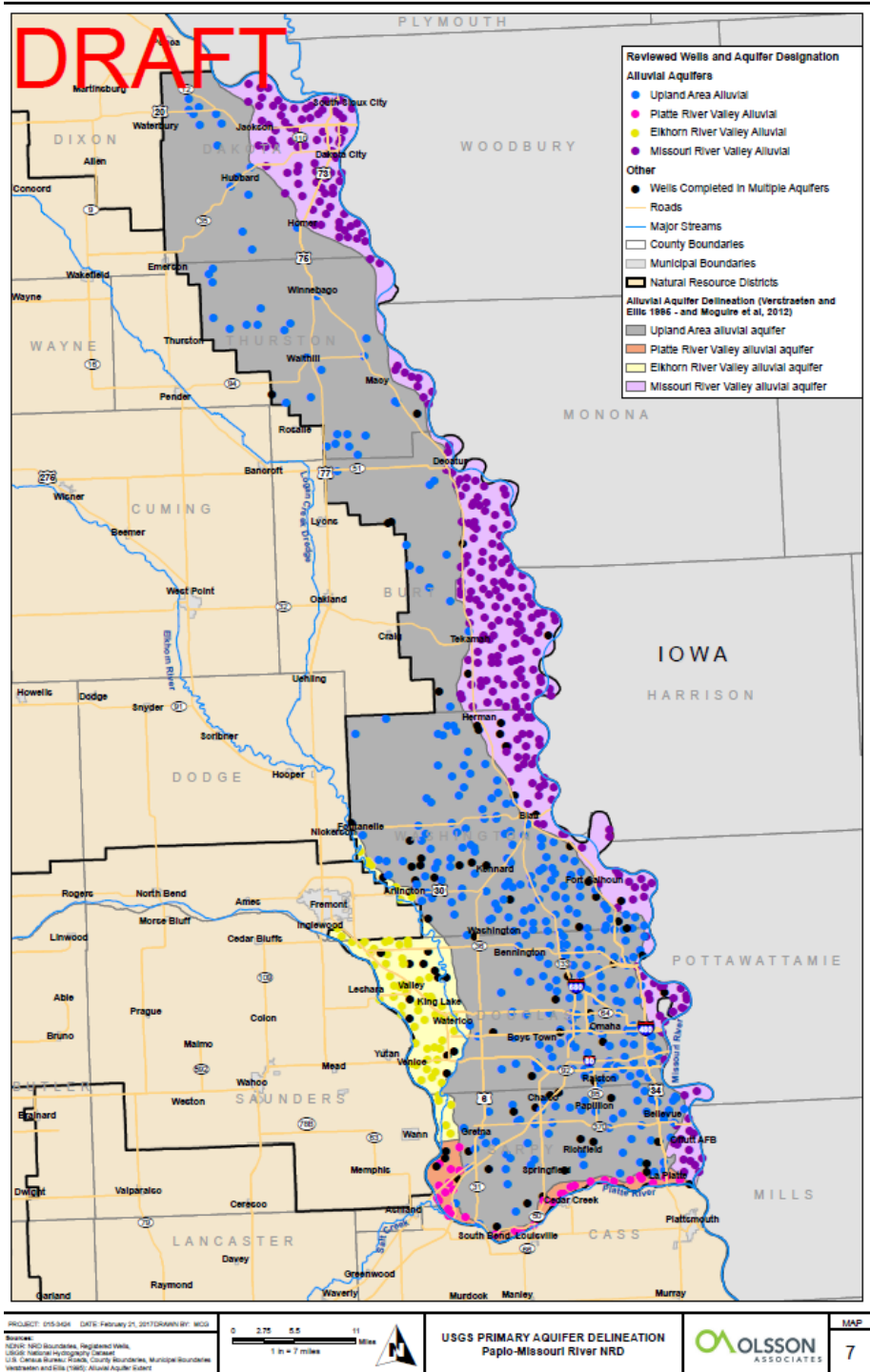
GMP Requirements

- Technical
- Policy
- Public Involvement
- Review and Approval

- Description of groundwater reservoirs
- Setting management area boundaries
- Groundwater reservoir life goal (quantity and/or quality) and objectives to meet that goal.
- Solicit Public Involvement
- NDNR – NDEQ, DHHS, UNL-CSD

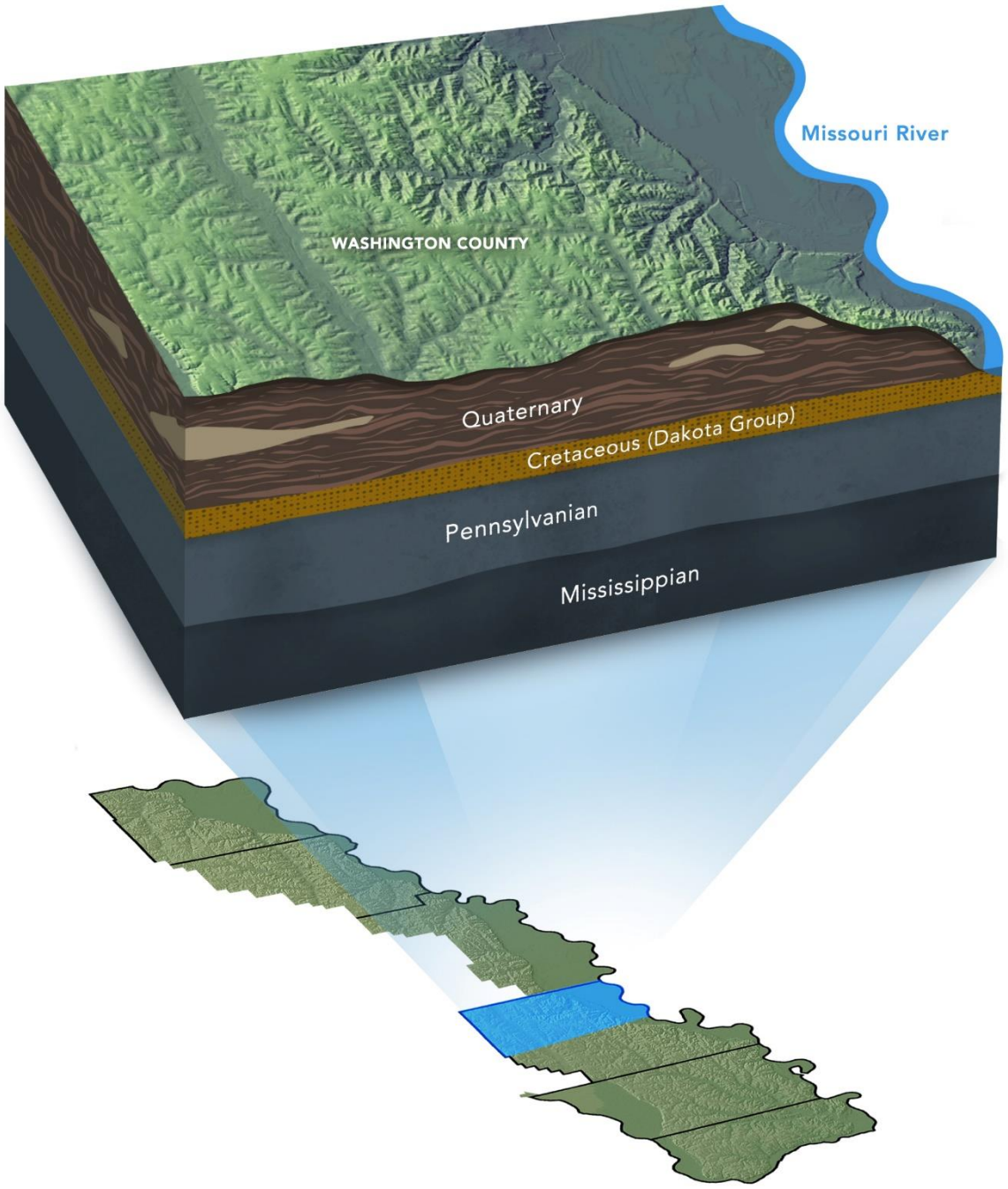
Primary Groundwater Reservoirs

- Based on well review
- Missouri River Alluvium
- Platte and Elkhorn Alluvium
- Upland Area
  - Isolated, disconnected aquifers



Secondary Groundwater Reservoirs

- Beneath Primary Aquifer
- Accessed where primary aquifer is not sufficient



SECONDARY AQUIFER DISTRIBUTION
Papio-Missouri River NRD

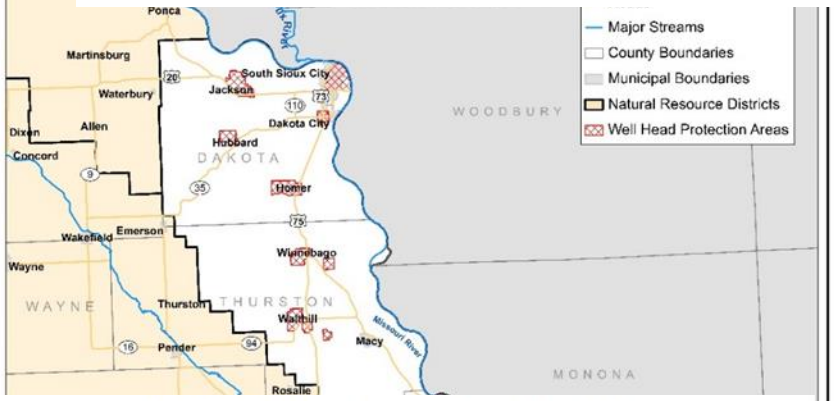
Groundwater Demand

Category of Water Use	Nebraska Withdrawals (mgpd)	Percentage (%) of total Groundwater Use in Nebraska	P-MRNRD Withdrawals (mgpd)	Percentage (%) of total Groundwater Use in P-MRNRD
Groundwater Irrigation	7,310	94.8	29.0	30.2
Public Supply	236	3.1	46.4	48.3
Livestock	88.2	1.1	1.9	2.0
Self-Supplied Domestic	52.1	0.7	17.6	18.3
Self-Supplied Industrial	11.3	0.1	1.13	1.2
Aquaculture	8.63	0.1	0.0	0.0
Thermoelectric Power	7.86	0.1	0.0	0.0
Mining	0.17	0.0	0.0	0.0

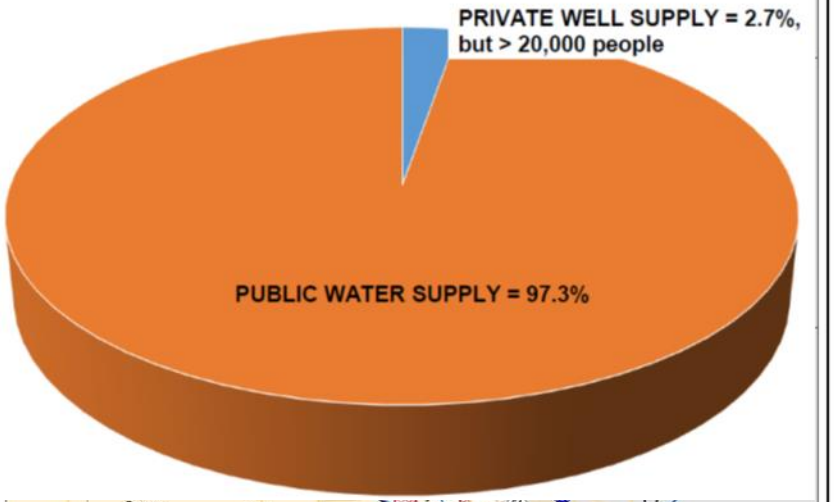
mgpd = million gallons per day

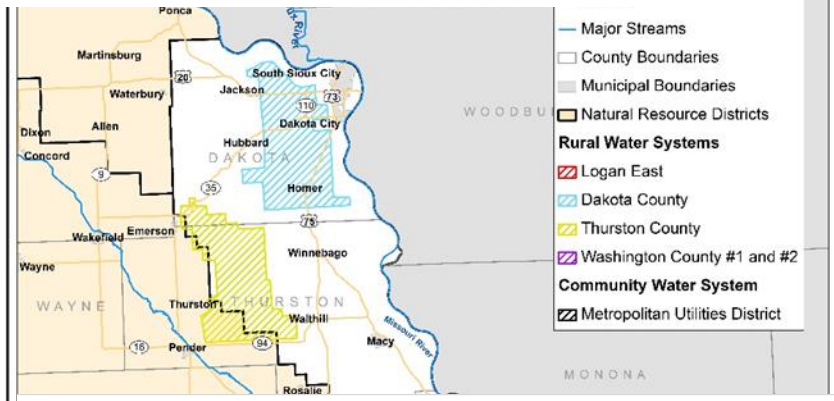
Source: USGS 2009, Estimated water use in the United States, 2005 Summary

Public Drinking Water Supply

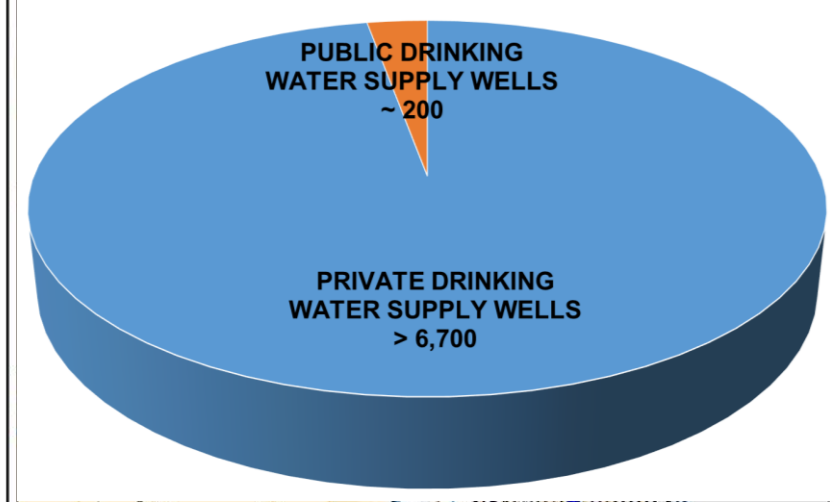


Drinking Water Supply by Population

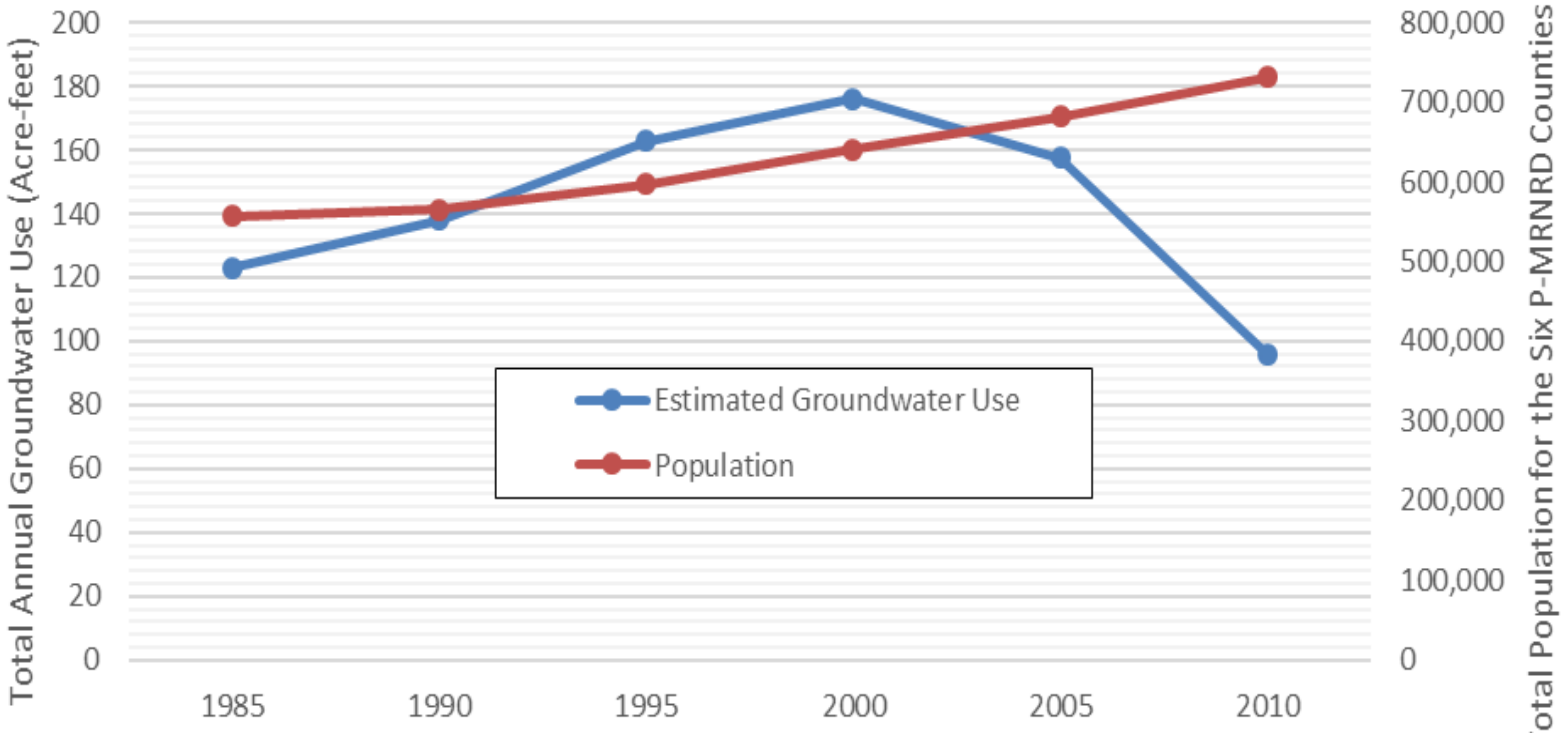




GROUNDWATER DRINKING SUPPLY WELLS



Groundwater Demand



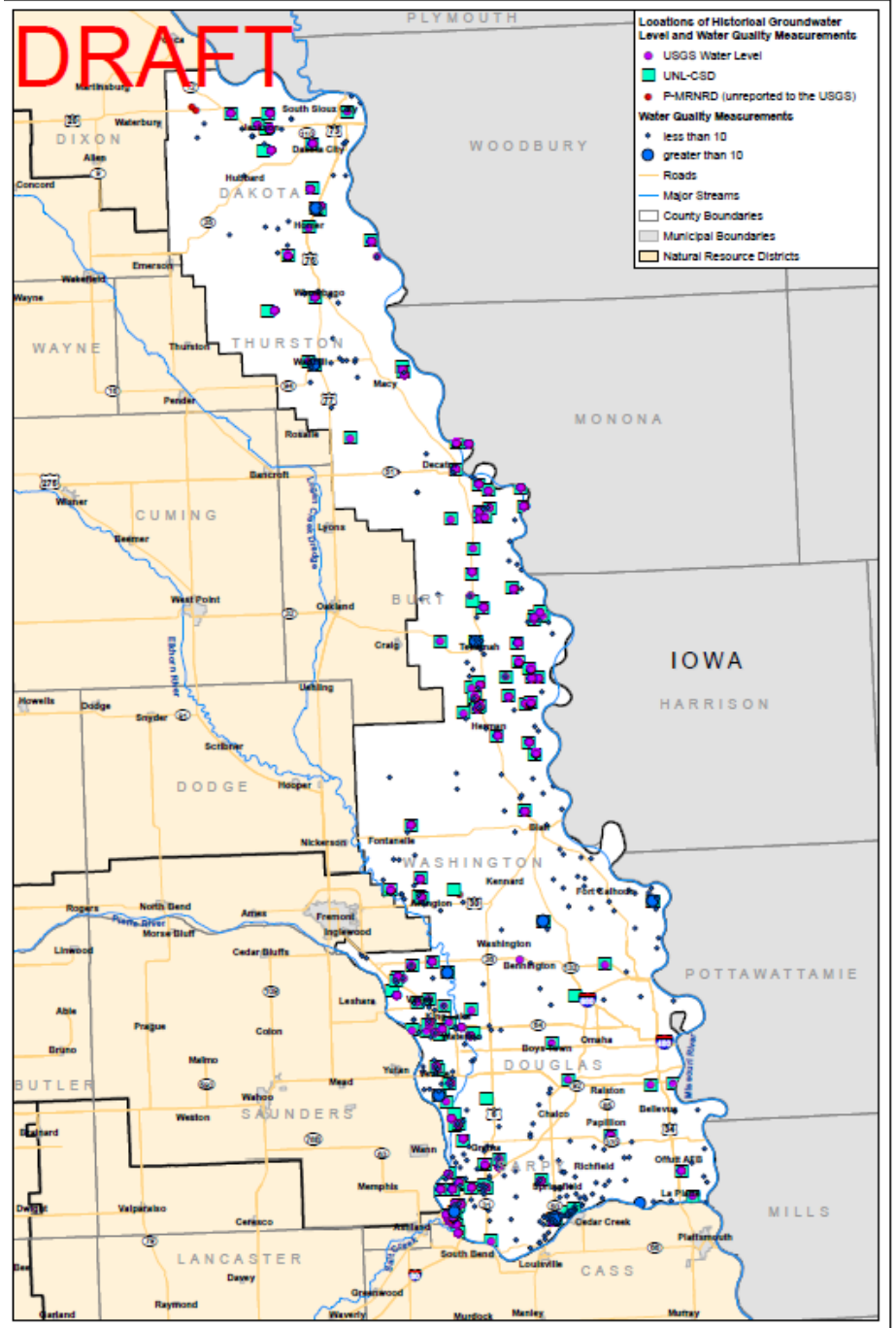
Data Source: USGS Water Data for the Nation,
https://water.usgs.gov/watuse/data/2010/index.html

Groundwater Monitoring

Quantity and Quality

Monitoring by Multiple Agencies

- USGS
- P-MRNRD
- UNL-CSD
- ENWRA
- NDEQ
- DHHS
- Public Water Suppliers
- NE Dept. of Agriculture



Stakeholder Advisory Committee

- Municipal Water Suppliers
- Agricultural Water Users
- Industrial Water Users
- County Representatives

Advisory Members:

Department of Health & Human Services DHHS NEBRASKA

USGS science for a changing world

NRCS Natural Resources Conservation Service

Nebraska Department of Natural Resources

University of Nebraska Lincoln

NEBRASKA GAME PARKS

Nebraska Department of Environmental Quality

University of Nebraska Lincoln EXTENSION

Lower Elkhorn Natural Resources District

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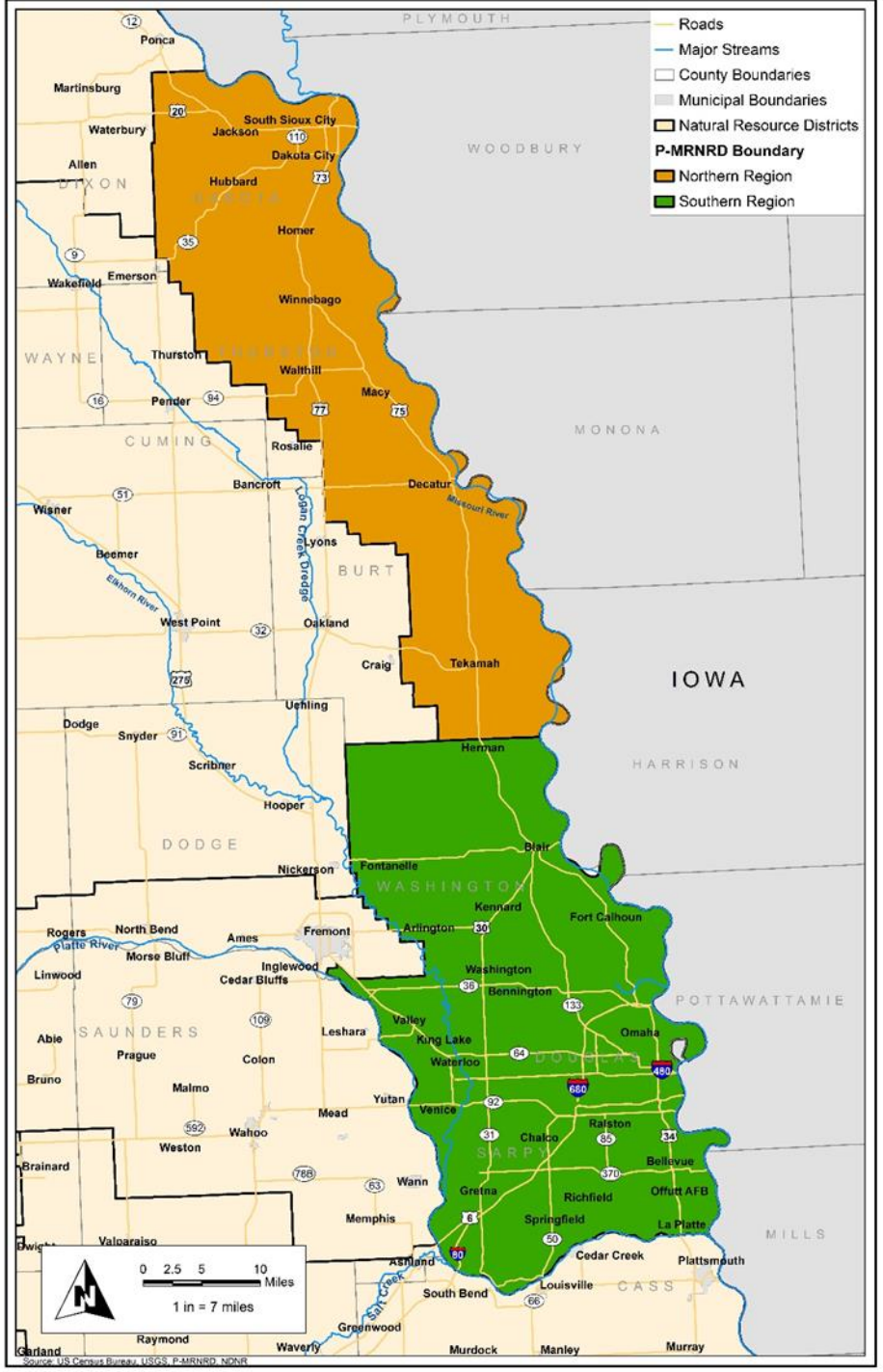


Stakeholder Meetings

- Three in Dakota City Office
- Three in the Omaha Office

Quotes:

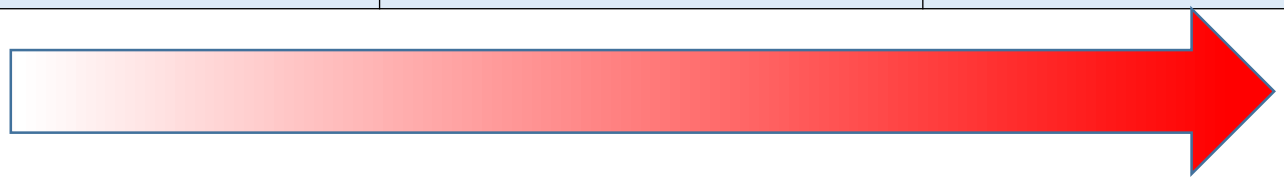
- *QUANTITY: "Groundwater availability varies greatly in the area. I think that groundwater management should be adjusted to a smaller area rather than a plan to fit the whole area."*
- *QUALITY: "The main issue would be nitrates."*

Current Groundwater Quality Rules and Regulations

		Lower Elkhorn	Lower Platte North	Lewis and Clark	Lower Platte South	Papio-Missouri
Quality Phase Triggers	**Phase I**	0 - 5 ppm*	0 - 8 ppm	0 - 5 ppm	< 5 ppm	0-5 ppm
	Phase II	>5 - 9 ppm	>8 - 10 ppm	>5 - 9 ppm	5 - 8 ppm	>5 ppm
	Phase III	>9 ppm	>10 ppm	>9 ppm	>8 ppm	TBD
	Phase IV	At Board Discretion	NA	NA	NA	NA
Quality Controls	Fertilizer Application Date Restrictions	Yes	Yes	Yes	Yes	No
	Irrigation Well Flow Meter Requirements	Yes	Yes	No	Yes	No
	Operator Training Requirements	Yes	Yes	Yes	Yes	No
	Soil Sampling Requirements	Yes	Yes	Yes	Yes	No
	Water Sampling Requirements	Yes	Yes	Yes	No	No

Preliminarily Proposed Groundwater Quality Triggers

Phase I	Phase II	Phase III
0 - 5 ppm nitrate *or < 50% of any MCL in 50% of the samples*	***> 5 - 9 ppm nitrate*** *or 50 - 90 % of any MCL in 50% of the samples*	***> 9 ppm nitrate*** *or > 90% of any MCL in 50% of the samples*

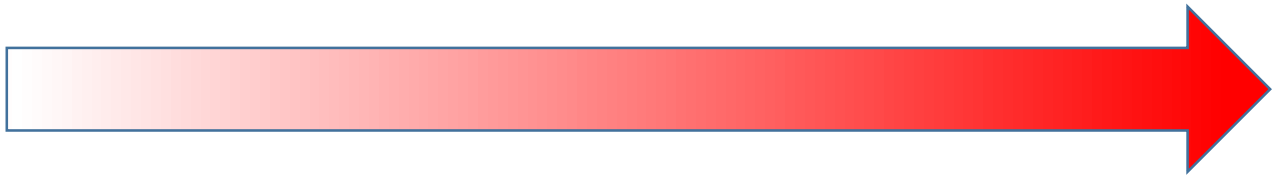


Current Groundwater Quantity Rules

		Lower Elkhorn	Lower Platte North	Lewis and Clark	Lower Platte South	Papio-Missouri
Quantity Phase Triggers	**Level I**	One well ≥ 15 ft. below pre-development level for 2 of 3 years	The entire district	The entire district	The entire district	The entire district
	Level II	> 9 % decline in 50% of wells measured	10 % Declines in Alluvial, 7% Declines in Confined	> 9 % decline in 50% of wells measured	8% declines in 30% of wells	>25 ft decline
	Level III	At Board Discretion	15% Declines in Alluvial, 10% Declines in Confined	Below the 1991 waterlevel for more than 2 years	15% declines in 50% of wells	TBD
Quantity Controls	Flow Meters	Yes	Yes	Yes	Yes	No
	Well Drilling Moratorium	No	Yes	No	No	No
	Required Water Use Reports	Yes	Yes	Yes	Yes	No
	Allocation	Yes	Yes	No	Yes	No

Preliminarily Proposed Groundwater Quantity Triggers

Level I	Level II	Level III
All areas (Entire NRD)	*Average 10% decline in saturated thickness of an unconfined aquifer in 50% of wells in a sub-area for 3 consecutive years**	*Average 15% decline in saturated thickness of unconfined aquifer in 50% of a sub-area for 3 consecutive years**



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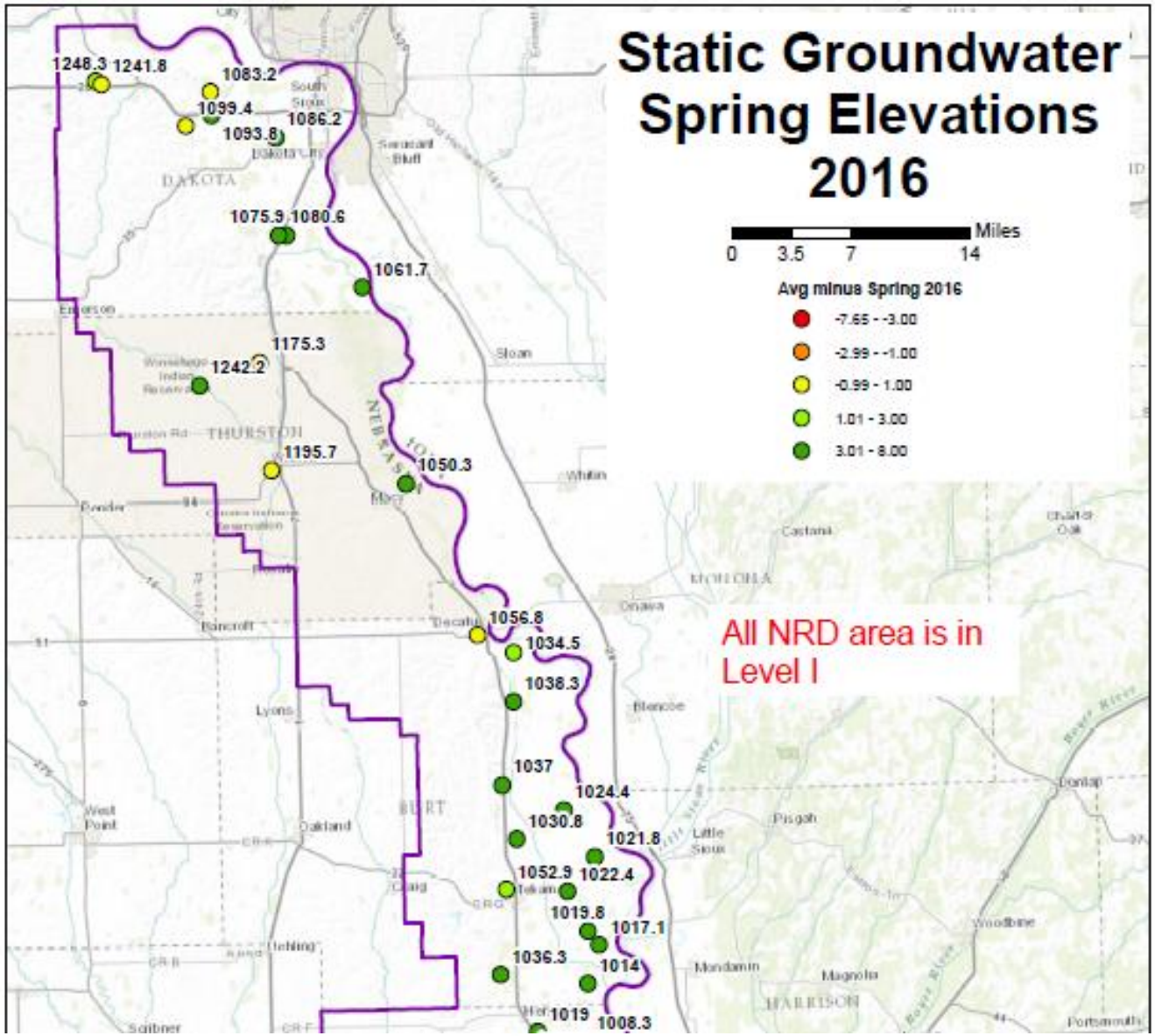
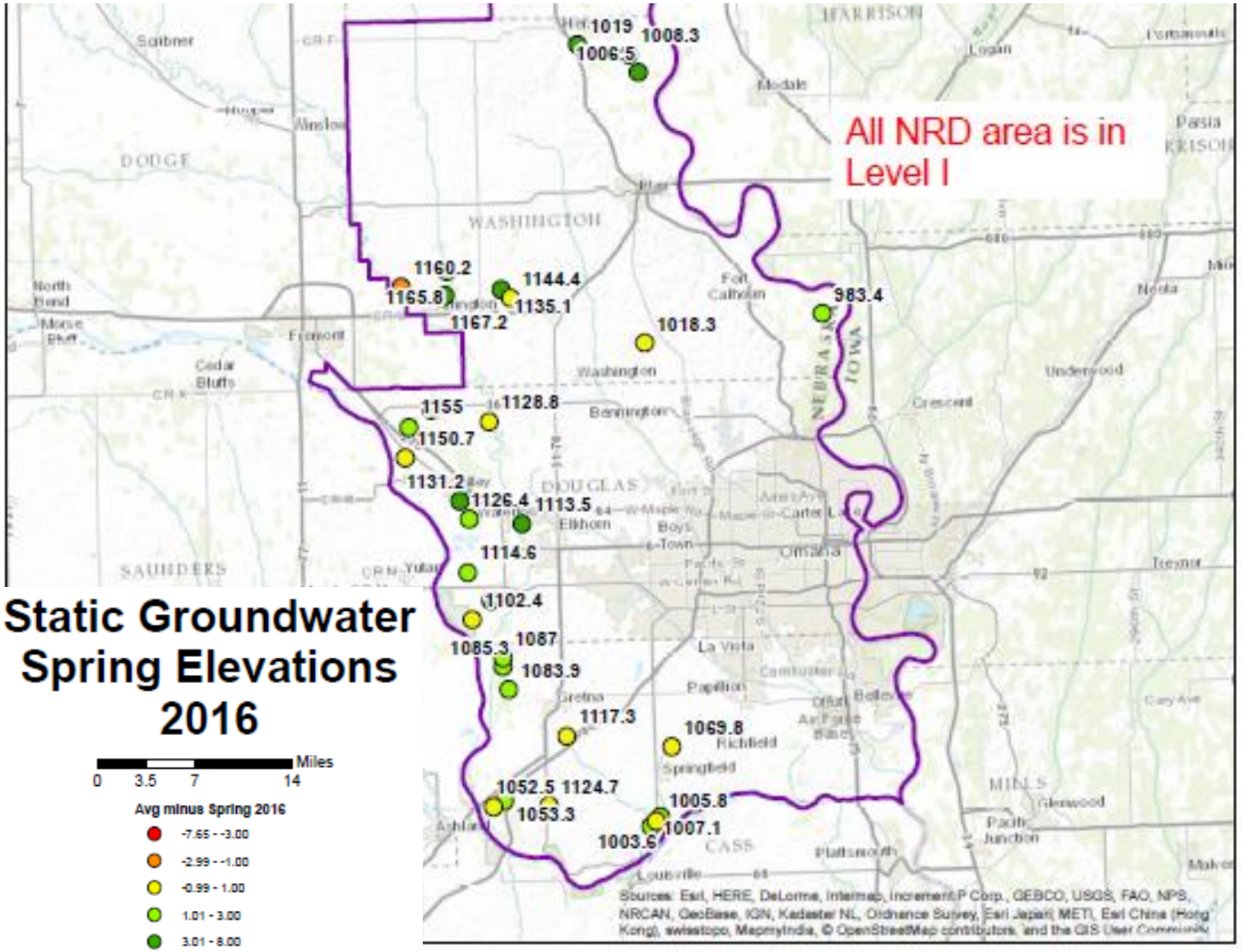
Groundwater Quantity Analysis



Groundwater Quantity Analysis



Groundwater Quality Analysis

By Groundwater Reservoir:

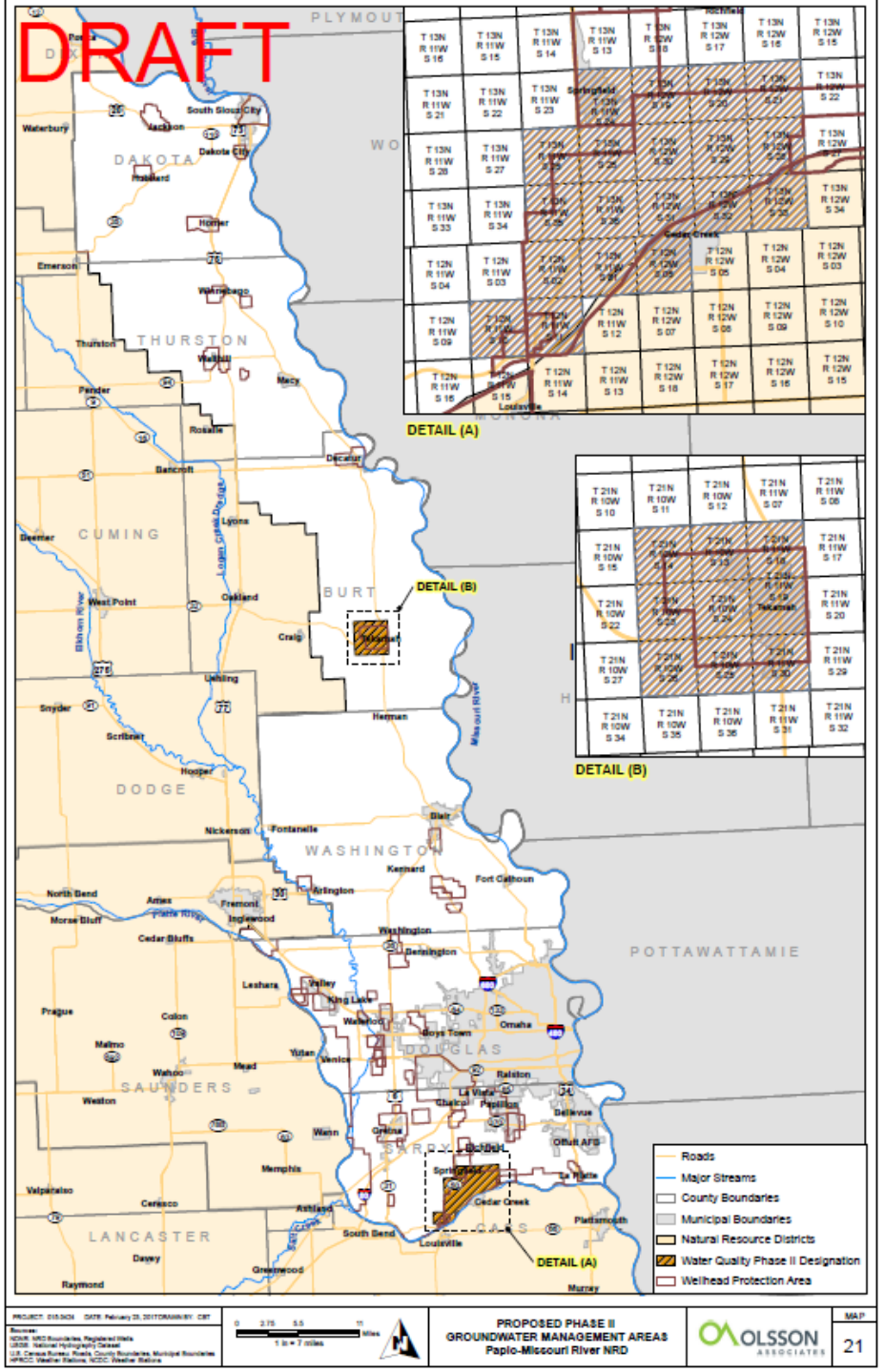
By Aquifer	Total Count	Nitrate greater than 5 mg/L	Percent greater than 5mg/L
Dakota	393	92	23%
Missouri	323	5	2%
Upland	187	26	14%
Platte/Elkhorn	722	134	19%
Platte/Elkhorn or Dakota	41	8	20%
Total	1666	265	

Groundwater Quality Analysis

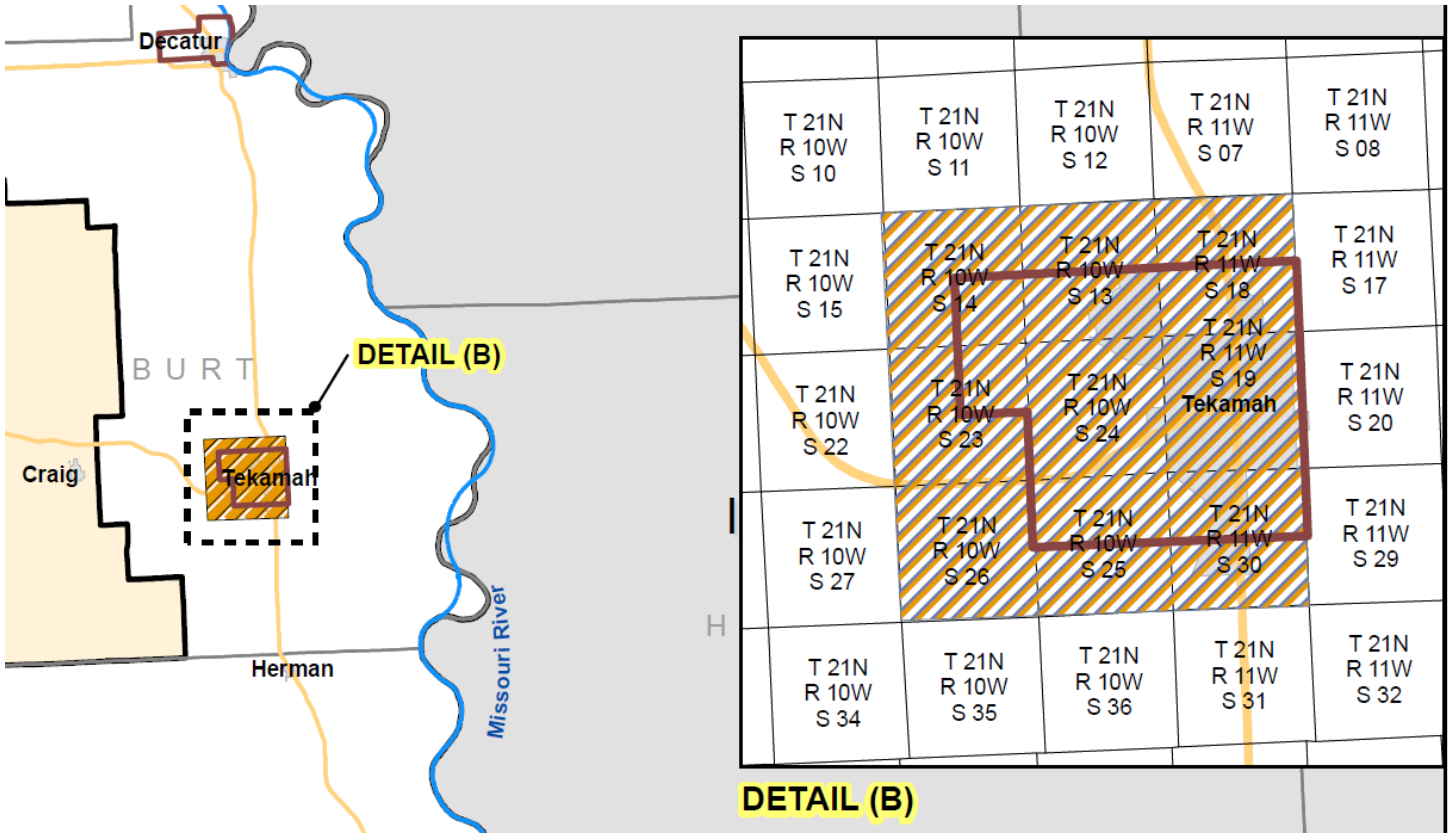
By Groundwater Reservoir Sub-Area:

Groundwater Sub-Areas of interest	Total Count	Nitrate greater than 5 mg/L	Percent greater than 5mg/L	Notes
South Central Platte, Sarpy County	269	129	48%	Increasing trend at depth in Springfield cluster
Platte/Elkhorn, Douglas and Sarpy County	469	14	3%	Venice and Ashland clusters
South Sarpy Dakota	35	11	31%	Not sampled frequently until 2013; South Sarpy and Springfield 2 cluster wells installed in 2016. Does not include wells sampled from undefined aquifers
Tekamah Cluster	174	74	43%	Med and deep wells show all 74 > 5 ppm and account for 74 out of 116 samples or 64%

Proposed Phase II Water Quality Areas



Proposed Phase II Water Quality Areas



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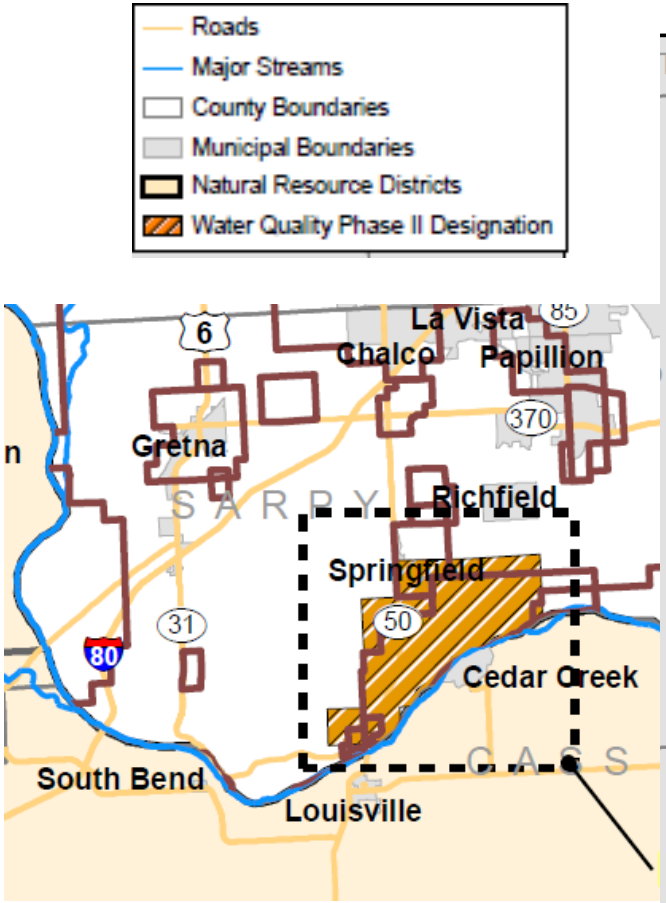
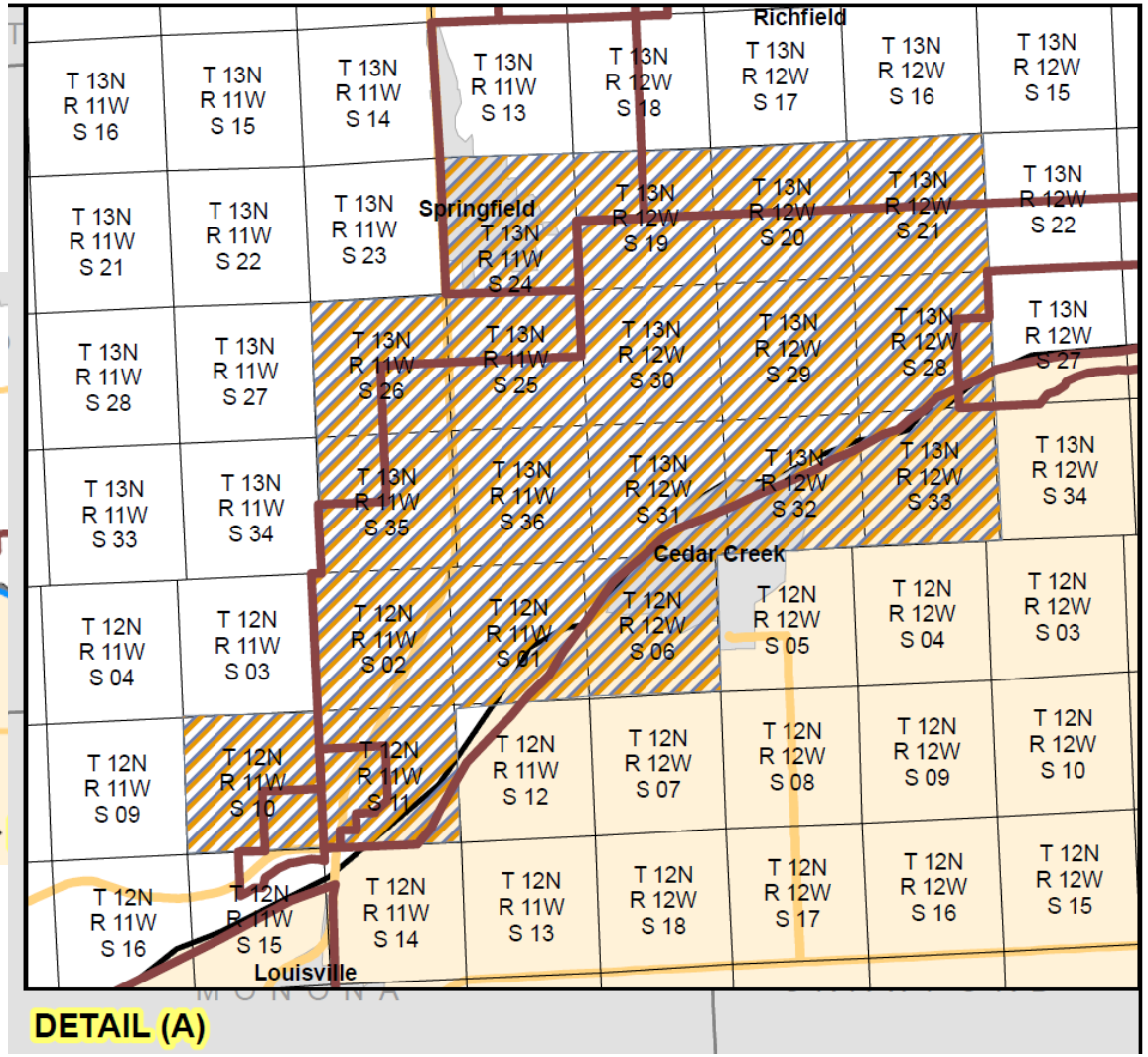
Proposed Phase II Water Quality Areas





Next Steps

Task	2015		2016												2017							
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Task 1: Project Management and Kickoff Meeting	★																					
1.1 Project Management		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1.2 Project Kickoff Meeting		★																				
Task 2: Hydrogeologic Data Review and GIS Mapping																						
2.1 Existing Data Review		■	■																			
2.2 Hydrogeologic Evaluation, Mapping and Subarea Delineation			■	■	■	■	■	■														
2.3 GIS Geodatabase Submittal																						
Task 3: Coordination and Public Involvement Meetings																						
3.1 Coordination Meetings (8)				★		★		★		★		★		★		★		★		★		★
3.2 Develop Public Involvement Plan																						
3.3 Stakeholder Advisory Committee Meetings (6)									★★		★★		★★									
3.4 Update at NRD Board Meetings (2)									★								★					
Task 4: Groundwater Management Plan Update																						
4.1 GMP Outline							■	■														
4.2 Draft GMP Preparation														■	■	■	■					
4.3 Agency Review																		■	■	■		
4.4 GMP Revisions																					■	
4.6 Proposed Final GMP																						
Task 5: Public Hearing, Comment Review and Revision																						
5.1 Prepare for Public Hearing																					■	
5.2 Public Hearing																					★	
5.3 Public Comment Review and Revision																						■

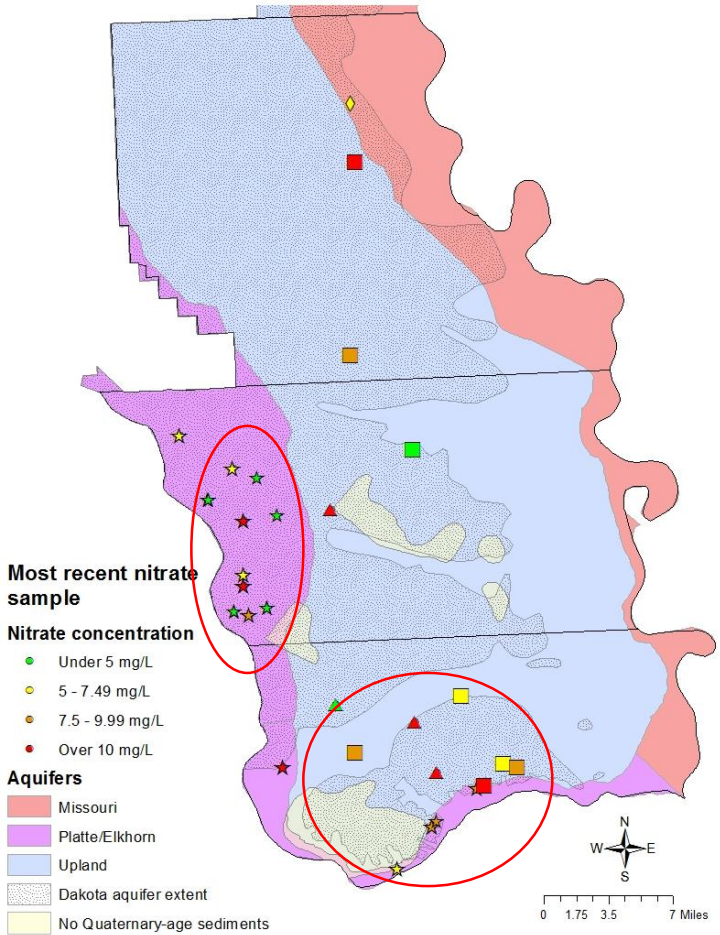
Questions?

What is the relative economic value of Water?

Nebraska Revised Statute 46-709 (13)

Next Steps – Monitoring

Groundwater Quality Monitoring



Dedicated Monitoring Well Nests

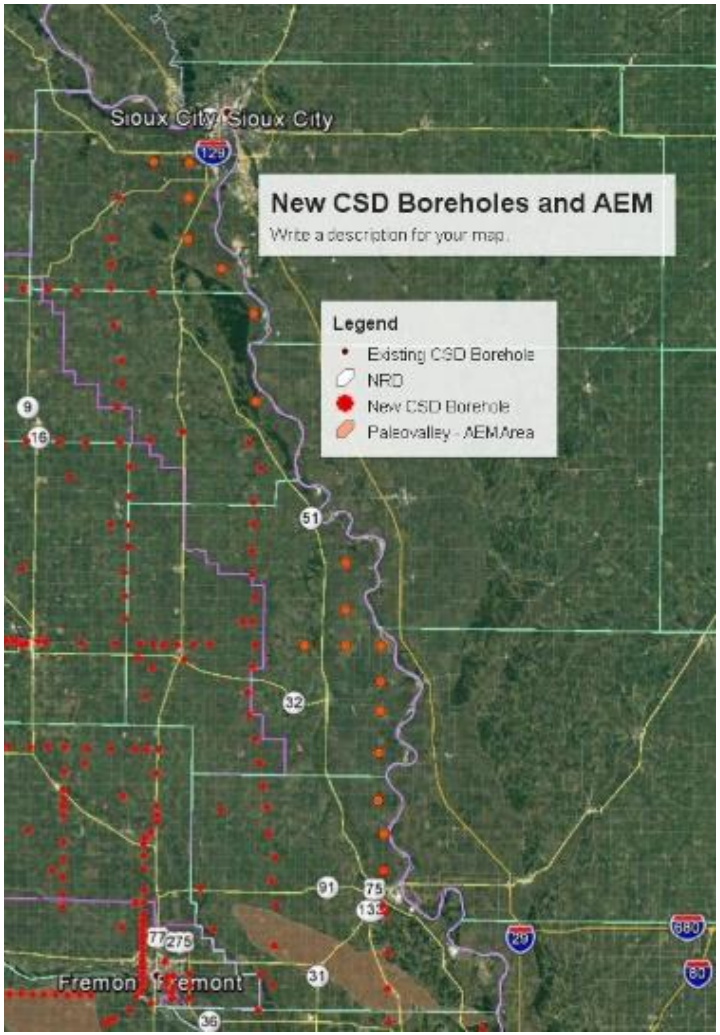
- 12 dedicated monitoring well nests for ~30 active Public Drinking Water WHPA
  - New wells for Valley, Gretna, SSC/Dakota City, MUD South?
- Focus in areas of ongoing concern

Next Steps – Monitoring

Groundwater Levels

- Continue or replace wells with long periods of record
- Add wells for new AEM areas and paleovalleys

Geologic Boreholes and AEM Surveys - ENWRA



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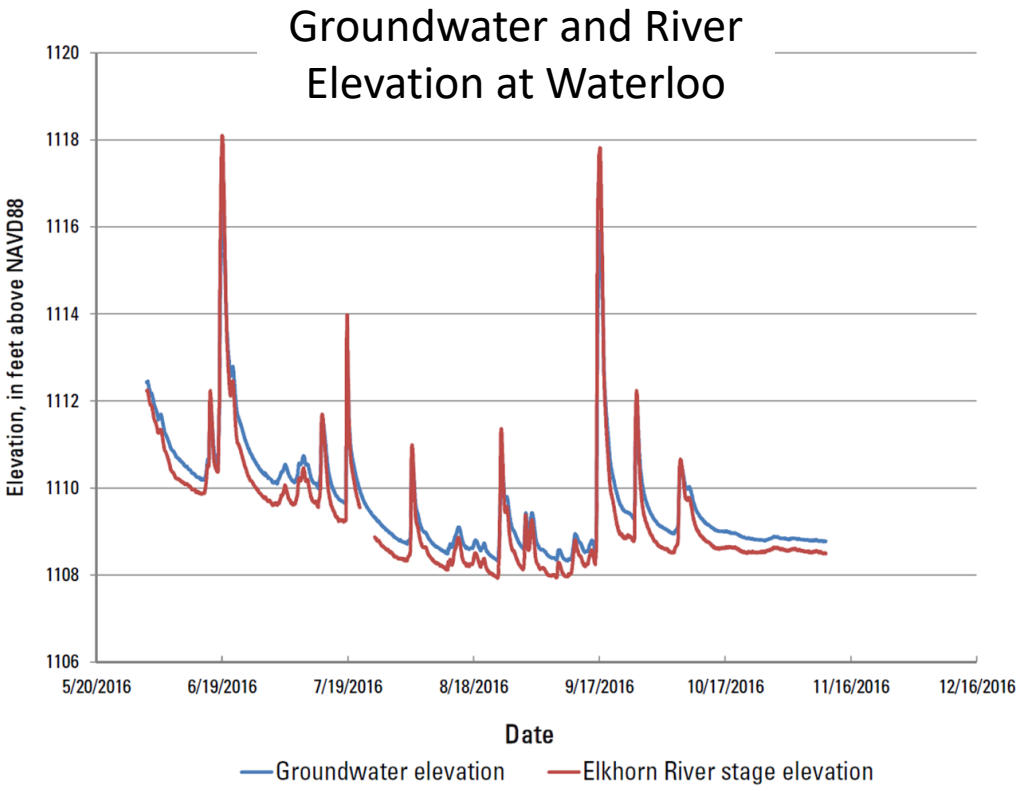
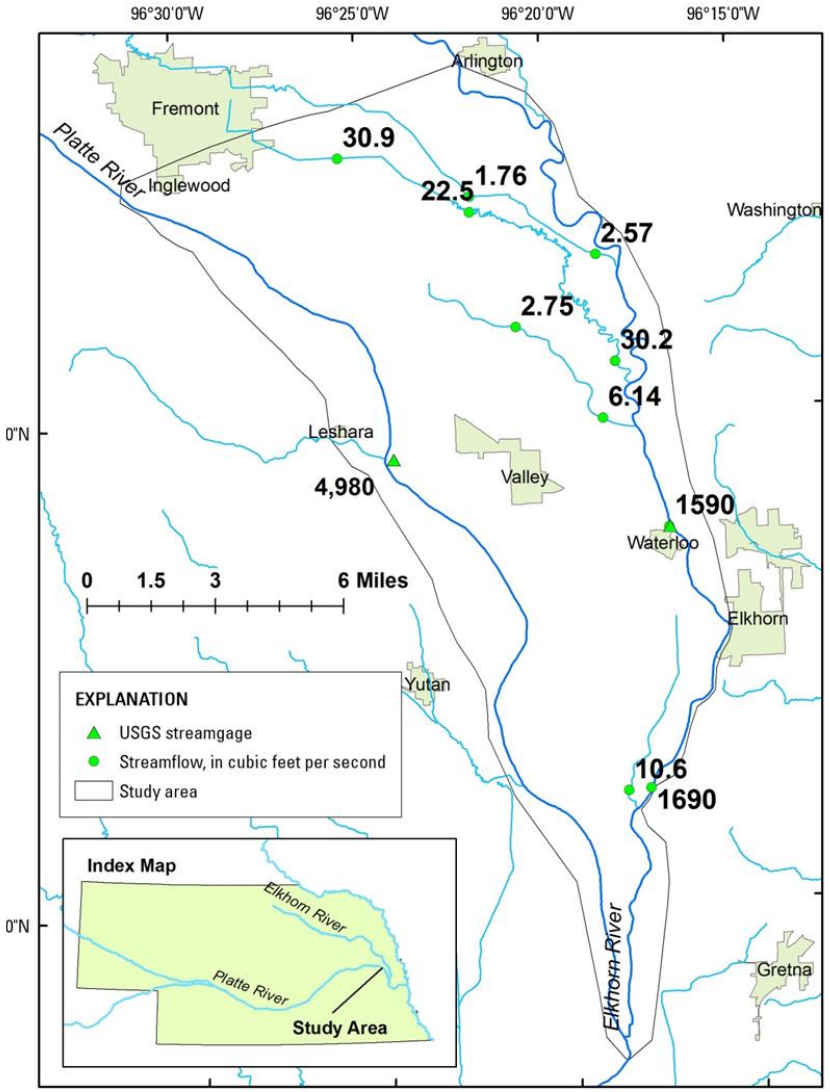
New Platte/Elkhorn River Integrated Water Monitoring

- USGS and P-MRNRD





Summary of Preliminarily Proposed Water Quality Controls

	Phase I	Phase II	Phase III
	0 - 5 ppm nitrate or < 50% of any MCL in 50% of the wells	*>5 - 9 ppm or 50 - 100 % of any MCL in 50% of the wells*	*> 9 ppm or > 100% of any MCL in 50% of the wells*
Encourage voluntary Wellhead Protection Area Plans	X	X	X
Offer both rural and urban fertilizer and irrigation management training	X	X	X
Encourage chemigation by minimizing permit fee	X	X	X
Voluntary well testing (test your well events)	X	X	X
Specify commercial fertilizer application date restrictions	X	X	X
Encourage annual groundwater nitrate testing, soil sample in root zone and fertilizer application report	X	X	X
Cost-share on Wellhead Protection Area Plans		X	X
Require fertilizer and irrigation management certification*		X	X
Cost-share on chemigation equipment or fertilizer calibration meters		X	X
NRD will collect and test additional well samples (and use results for district-wide assessments)		X	X
Require nitrogen management plan and annual groundwater nitrate testing, soil sample in root zone and fertilizer application report		X	X
NRD may implement WHPA plan and actions			X
No commercial fertilizer without inhibitor and split application			X

Summary of Preliminarily Proposed Water Quantity Controls

	Level I	Level II	Level III
	All Areas (Entire NRD)	*Average 10% decline*	*Average 15% decline*
Offer water conservation education for rural and urban users	X	X	X
Cost-share water meters and annual water use reporting	X	X	X
Require irrigated acre certification per IMP requirements	X	X	X
Limit expansion of irrigated acres per IMP requirements	X	X	X
Require minimum well spacing (600 feet from registered domestic well)**	X	X	X
Require Well Permits and High Capacity Well Evaluations for wells pumping greater than 500 acre feet per year	X	X	X
Enable water banking transactions via IMP and BWP	X	X	X
Enforce irrigation runoff rules	X	X	X
Encourage water conservation through support of urban and rural cost-share programs	X	X	X

** Current Nebraska state well spacing standards for wells under separate ownership are: 600 feet between irrigation wells, 1,000 between irrigation, commercial/industrial and public water supply wells

Summary of Proposed Water Quantity Controls

	Level I	Level II	Level III
	All Areas	*Average 10% decline*	*Average 15% decline*
Require irrigation management certification		X	X
Require water meters and annual water use report		X	X
Evaluate effects of reducing irrigated acres		X	X
Require well permits for all new wells that pump >50 gmp		X	X
Implement urban and rural BMPs		X	X
Require acre-inch allocations			X
Require reduction of irrigated acres in selected areas			X
Require specified water efficiency BMPs			X