



TBNRD IMP

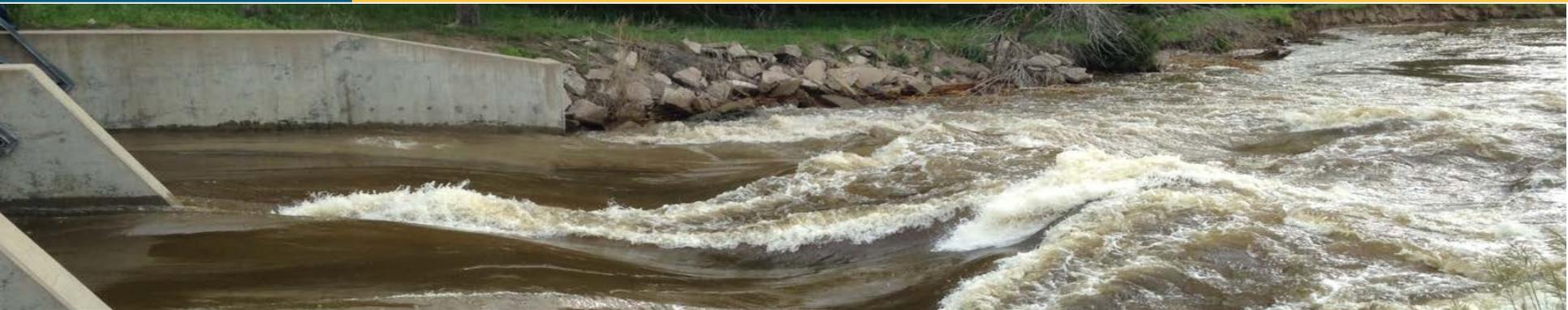
Meeting 1

TODAY'S AGENDA

- Welcome
- Who are we?
- Why are we here?
- How did we get here?
- What has been done?
- Tri-Basin NRD IMP
 - Tri-Basin NRD Projects
 - Stream depletions 101
 - COHYST Data & Modeling
 - Lessons learned
- Stakeholder discussion
- Next Steps
- Public comment

WELCOME

- Open meeting notice
- Safety & logistics
- Introductions



WHO ARE WE?

Tri-Basin Natural Resources District (TBNRD)
Nebraska Department of Natural Resources (NeDNR)

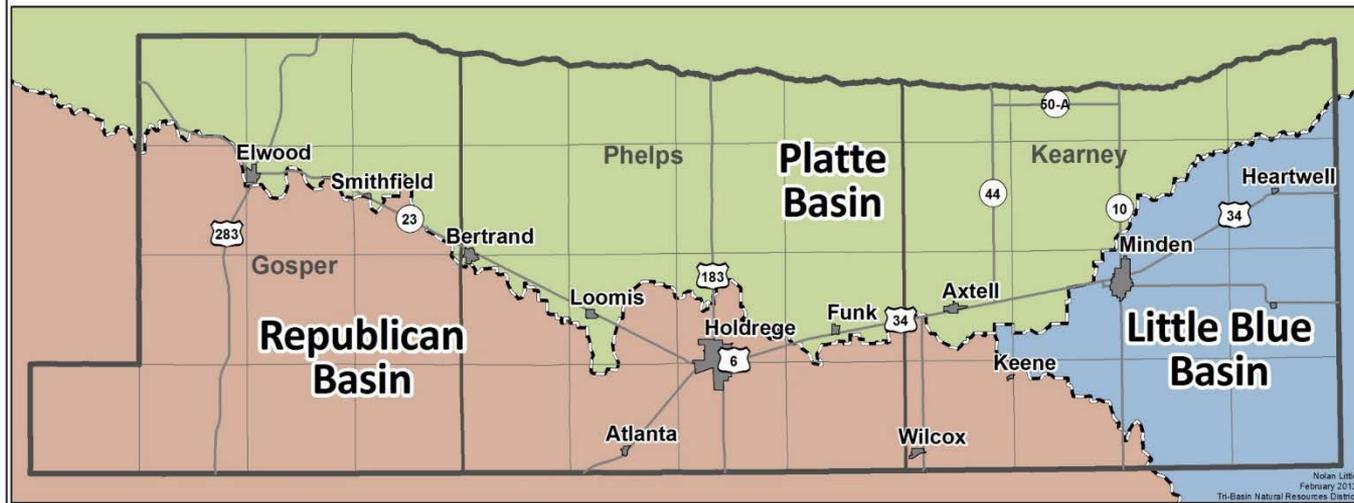


Tri-Basin NRD

- Responsible for protecting soil and water resources of Gosper, Phelps and Kearney counties
- Governed by a 13-member board of directors
- District includes portions of Platte, Republican and Little Blue river basins

Tri-Basin Natural Resources District

Basin Boundaries



What does Tri-Basin do?



We plant trees and shrubs



We create and maintain wildlife habitat



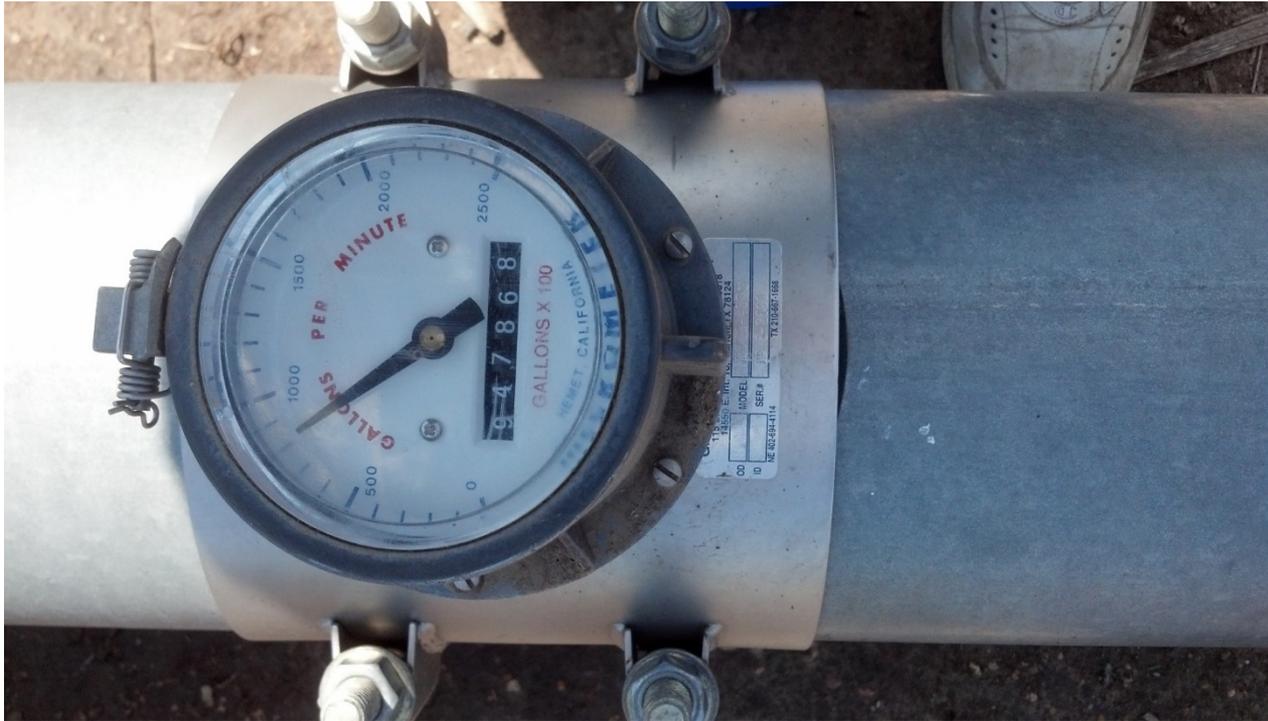
We operate seven drainage improvement projects (IPAs)



We educate students and the public about natural resources conservation



We provide cost-share to landowners for soil and water conservation practices



We enforce state laws prohibiting human-caused erosion damage



We enforce state laws prohibiting excessive irrigation runoff



We protect groundwater



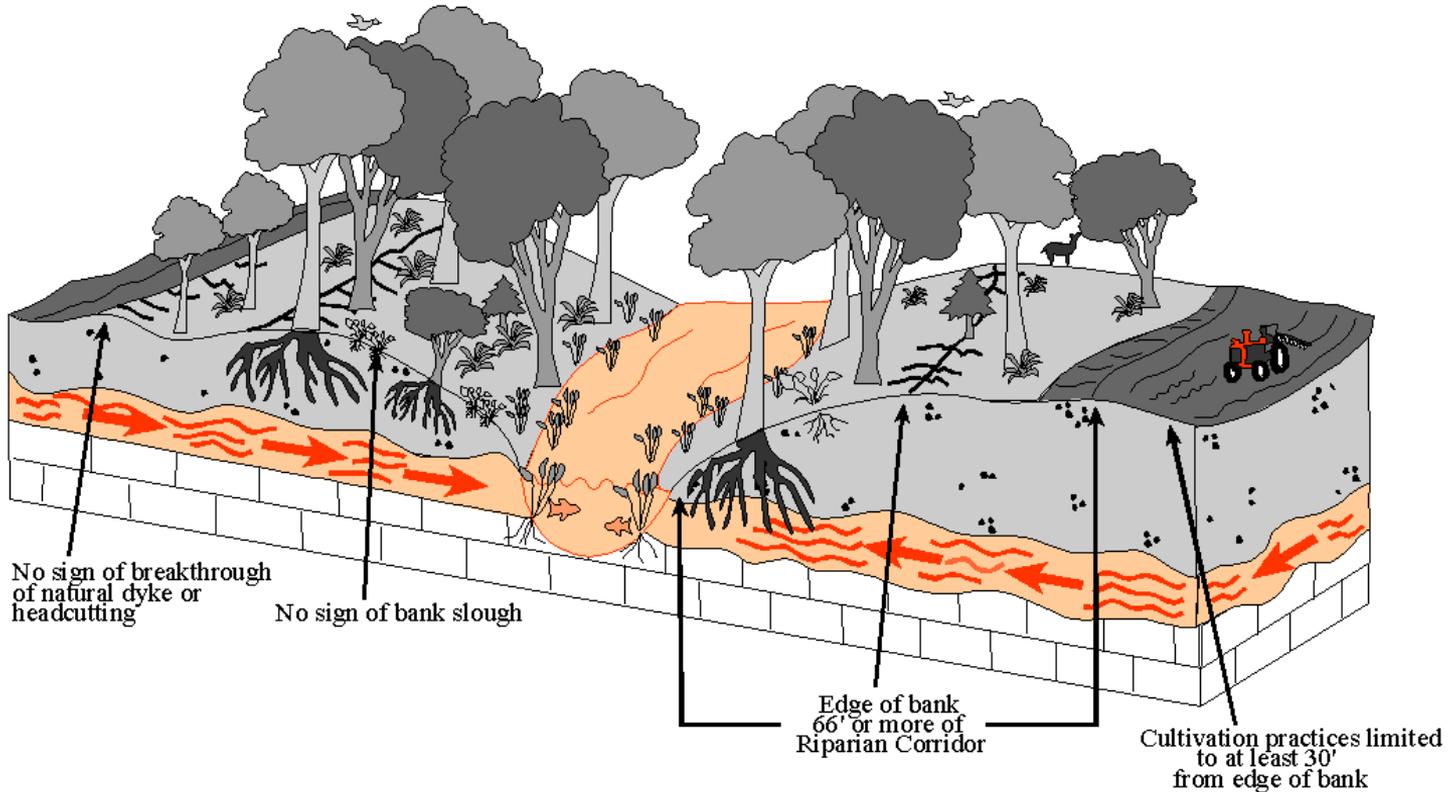
We protect it from diminishment



We protect it from contamination



We protect streamflows



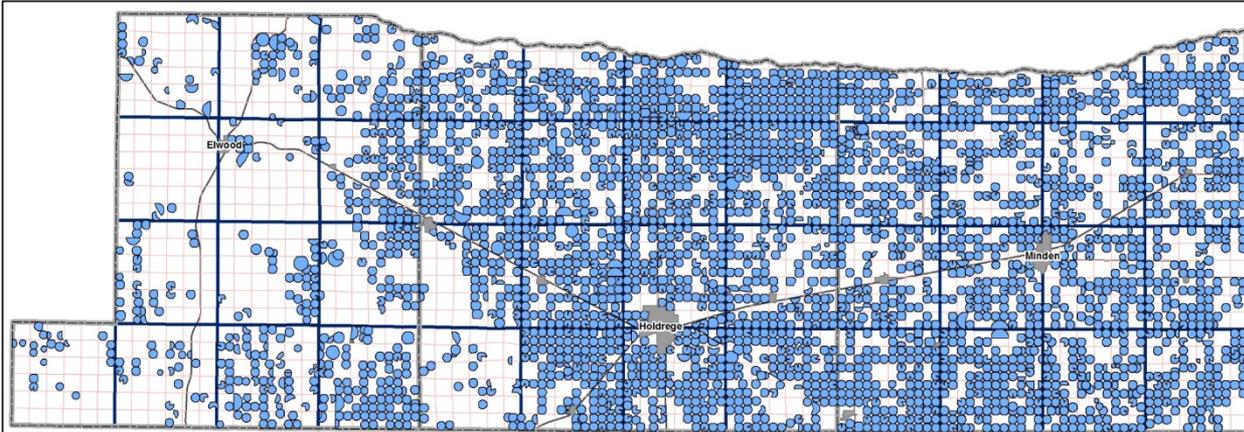
Nebraska Groundwater Law

- Groundwater and surface water are owned by The People (the state)
- Landowners have the right to use groundwater for beneficial purposes on their own property
- Groundwater use is governed by correlative rights (all users share in a shortage) and regulated by NRDs
- Surface water use is governed by prior appropriation (first in time, first in right) and regulated by state Department of Natural Resources

Groundwater Quantity Management

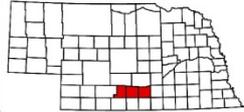
TRI BASIN NATURAL RESOURCES DISTRICT

CENTER PIVOT IRRIGATION



1:445,000

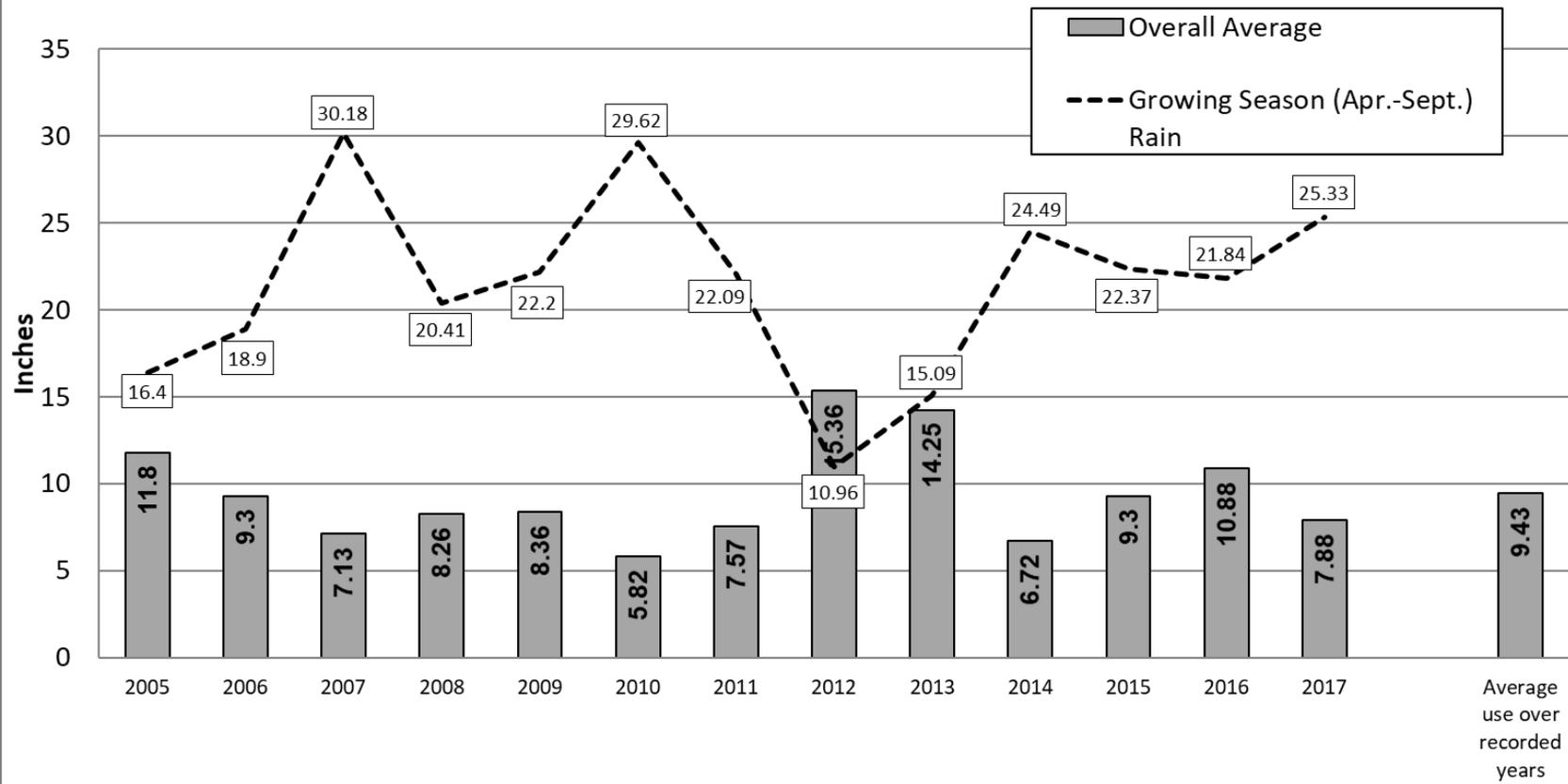
Represented Area Shown in Red



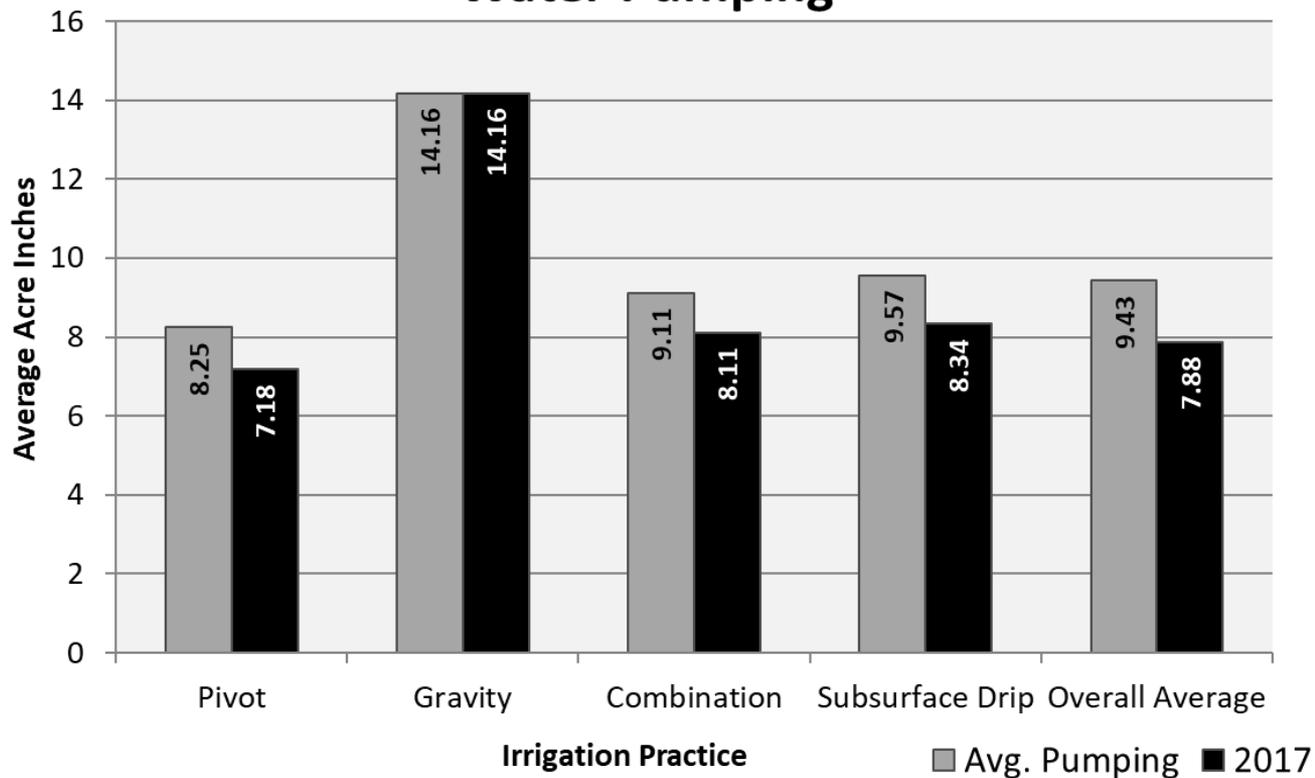
Nolan Little
November 2012
Tri-Basin Natural Resources District

Natural Resources District

Tri-Basin NRD Republican Basin Average Irrigation Pumping

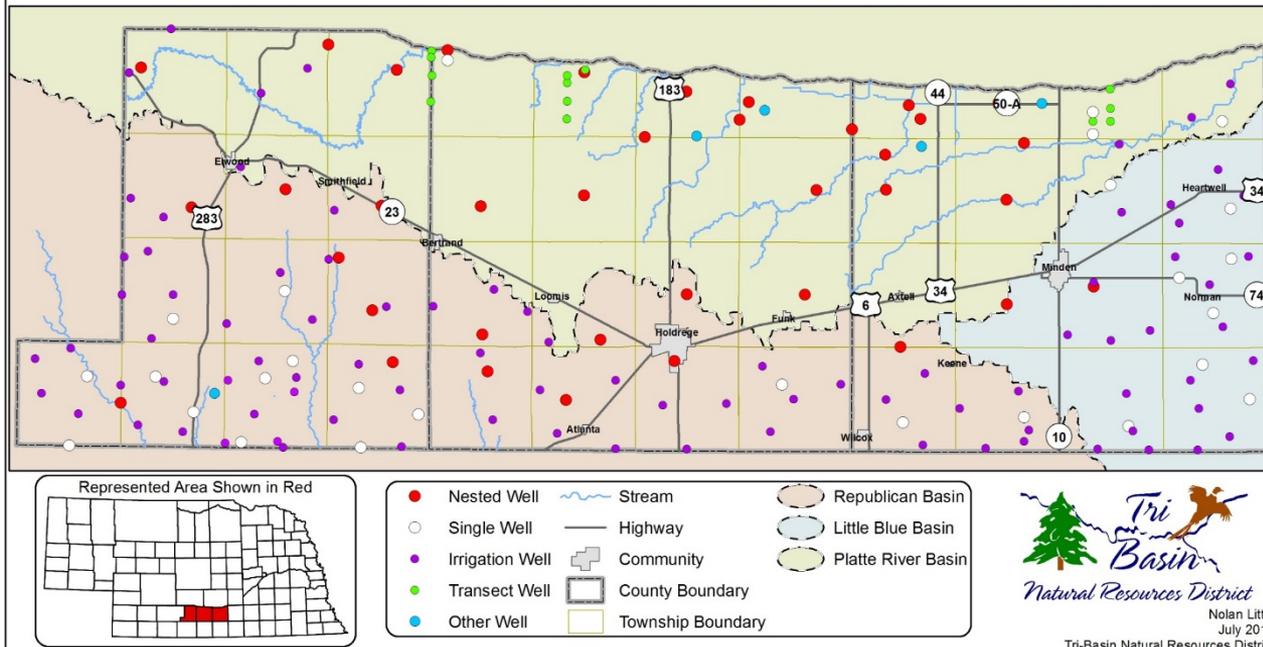


Tri-Basin NRD Republican Basin Irrigation Water Pumping



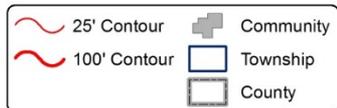
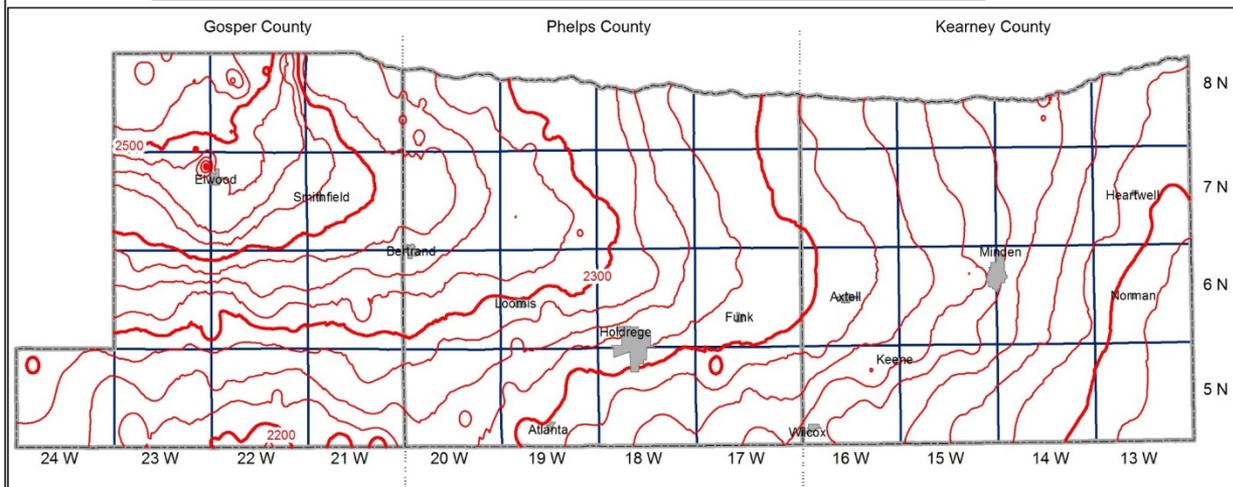
Tri-Basin Natural Resources District

Observation Well Network



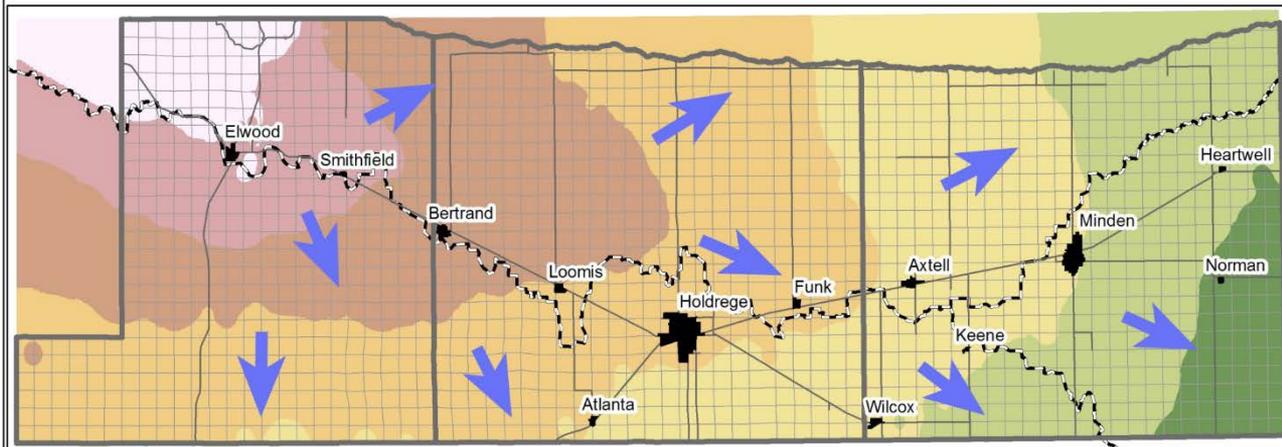
Tri-Basin Natural Resources District

2007-2009 Groundwater Elevation Contour



Tri-Basin Natural Resources District

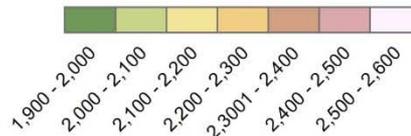
Groundwater Elevation



Represented Area



Groundwater Elevation in Feet



-  Community
-  Paved Road
-  Drainage Basin
-  Section
-  County Boundary

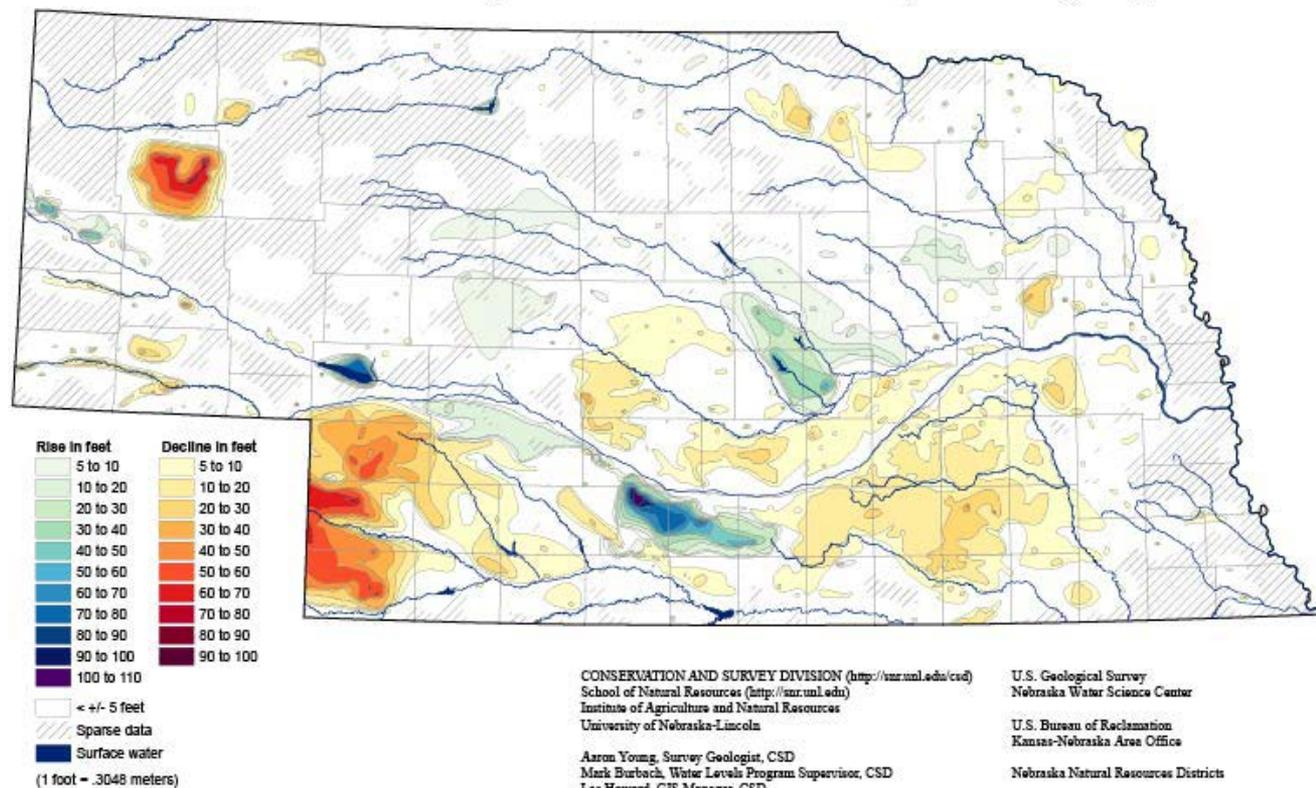


Nolan Little
January 2013

Tri-Basin Natural Resources District



Groundwater-level Changes in Nebraska - Predevelopment to Spring 2014



CONSERVATION AND SURVEY DIVISION (<http://snr.unl.edu/csd>)
 School of Natural Resources (<http://snr.unl.edu>)
 Institute of Agriculture and Natural Resources
 University of Nebraska-Lincoln

Aaron Young, Survey Geologist, CSD
 Mark Burbach, Water Levels Program Supervisor, CSD
 Les Howard, GIS Manager, CSD

U.S. Geological Survey
 Nebraska Water Science Center

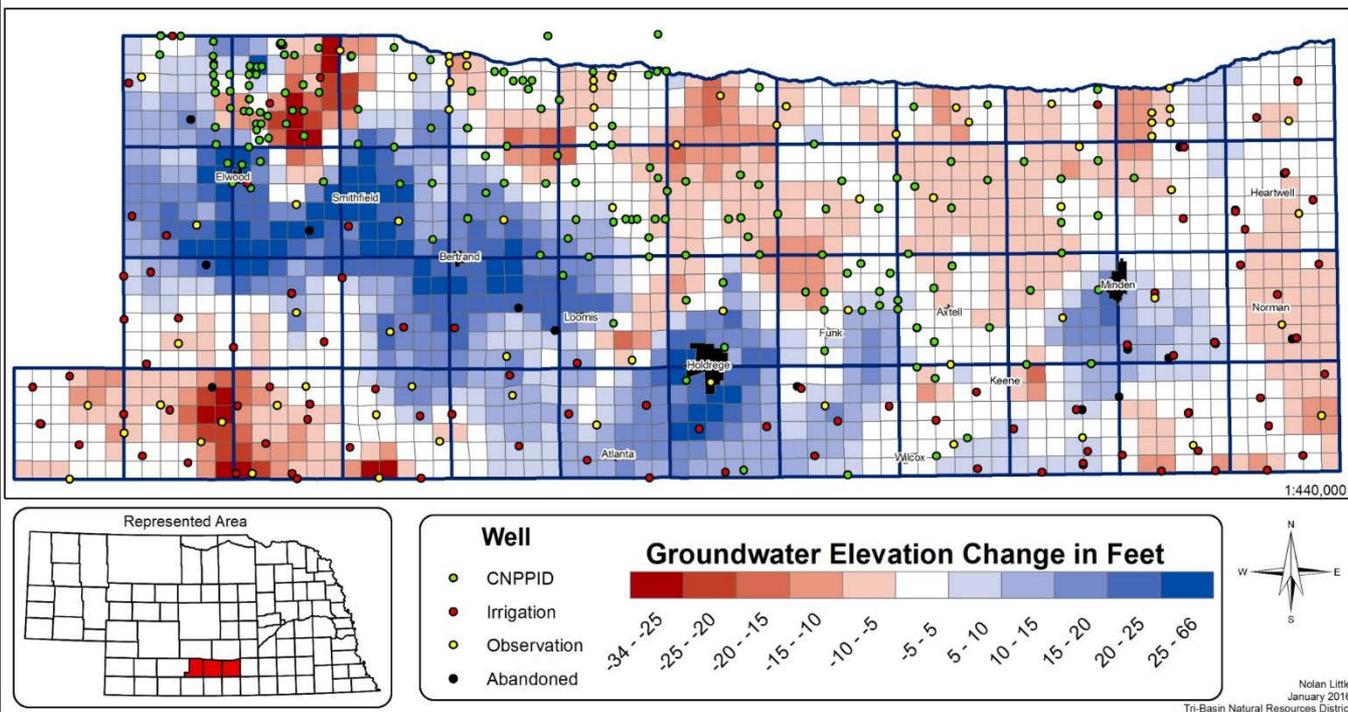
U.S. Bureau of Reclamation
 Kansas-Nebraska Area Office

Nebraska Natural Resources Districts

Central Nebraska Public Power and Irrigation District

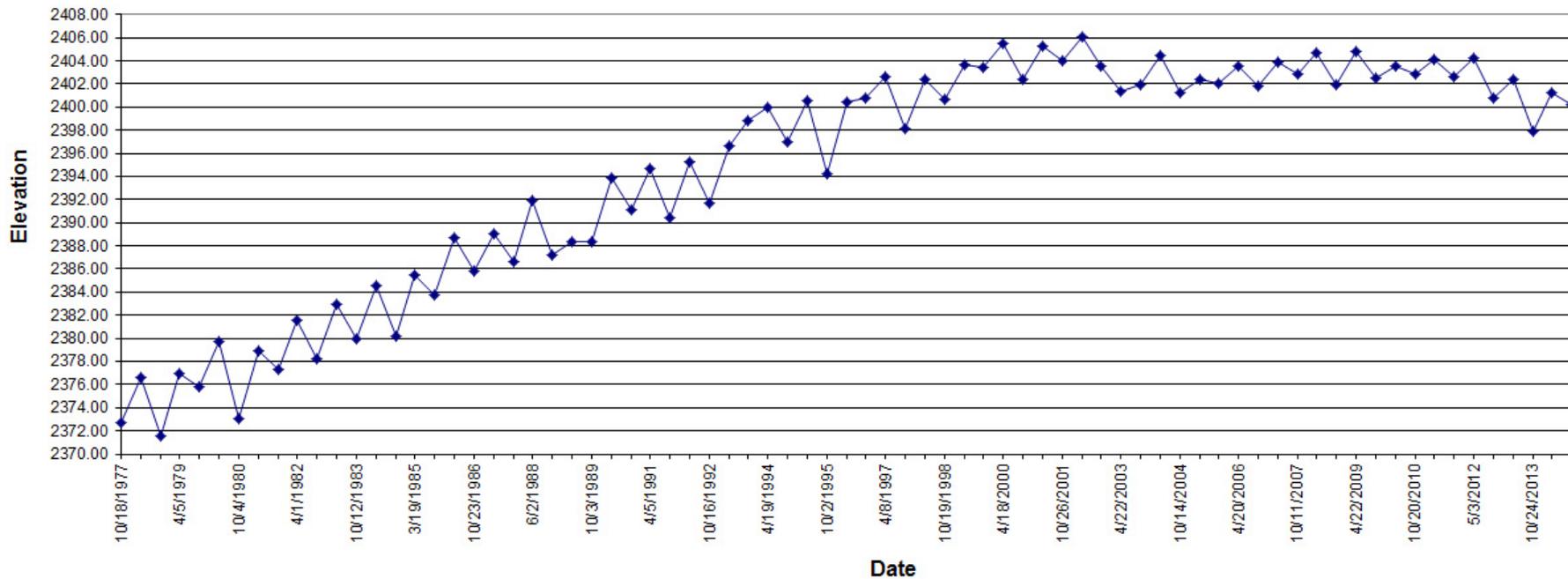
Tri-Basin Natural Resources District

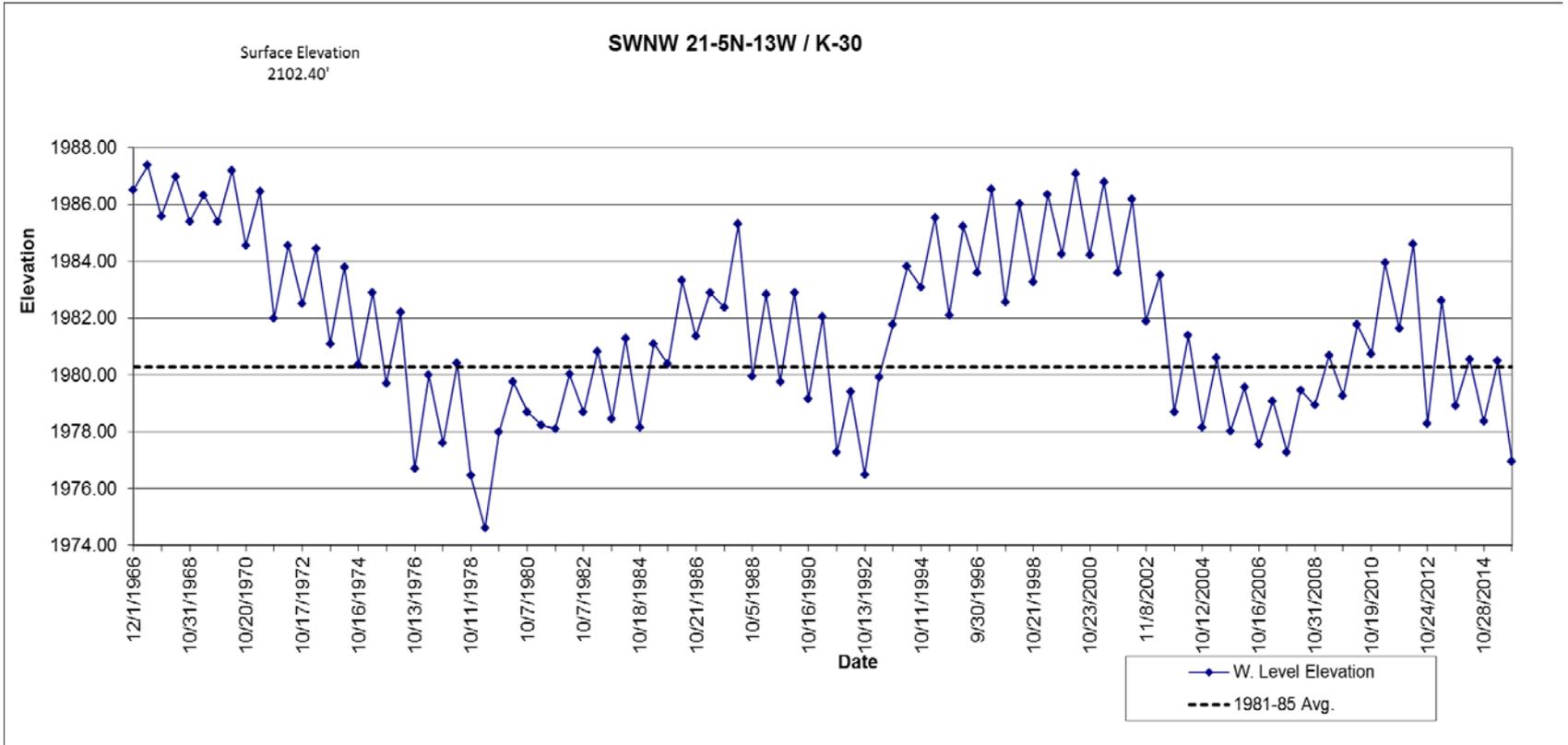
Change in Groundwater Elevation 2013-2015 Average vs 1981-1985 Average



Surface Elevation
2573.10'

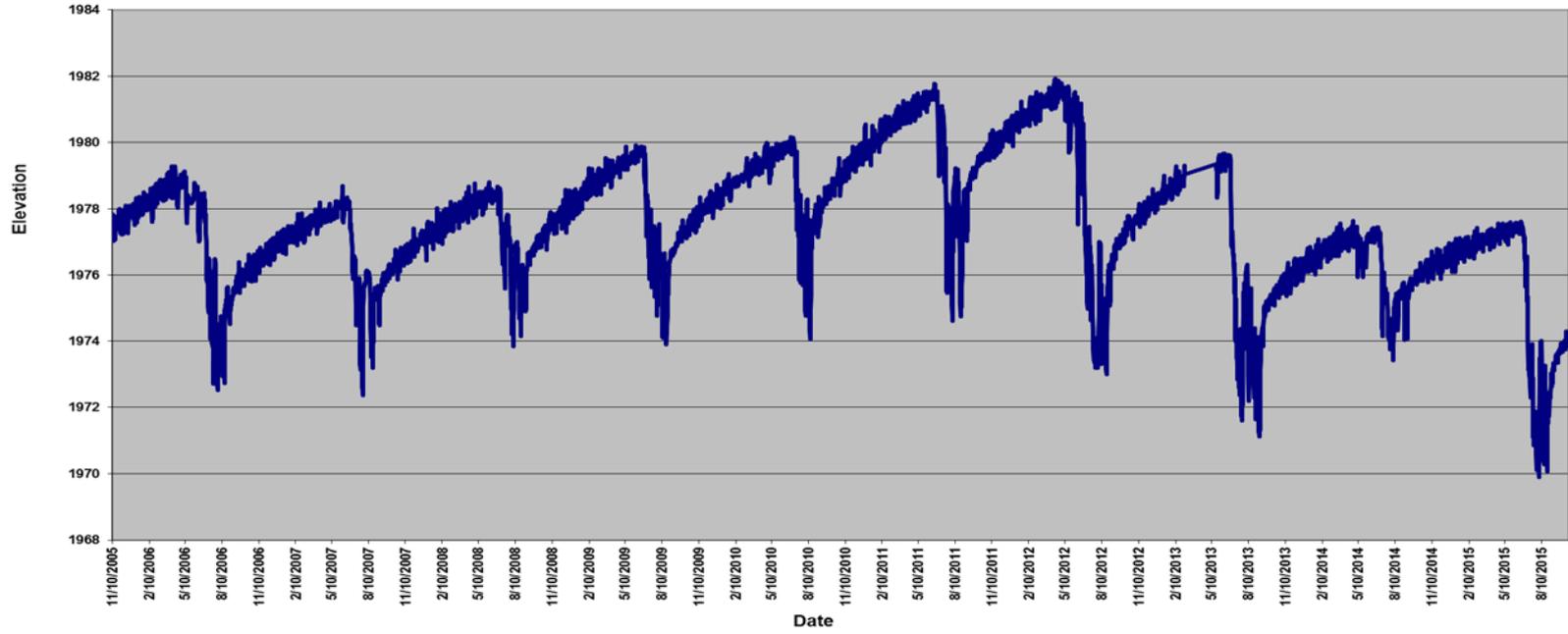
SWNE 30-7N-21W / G-08





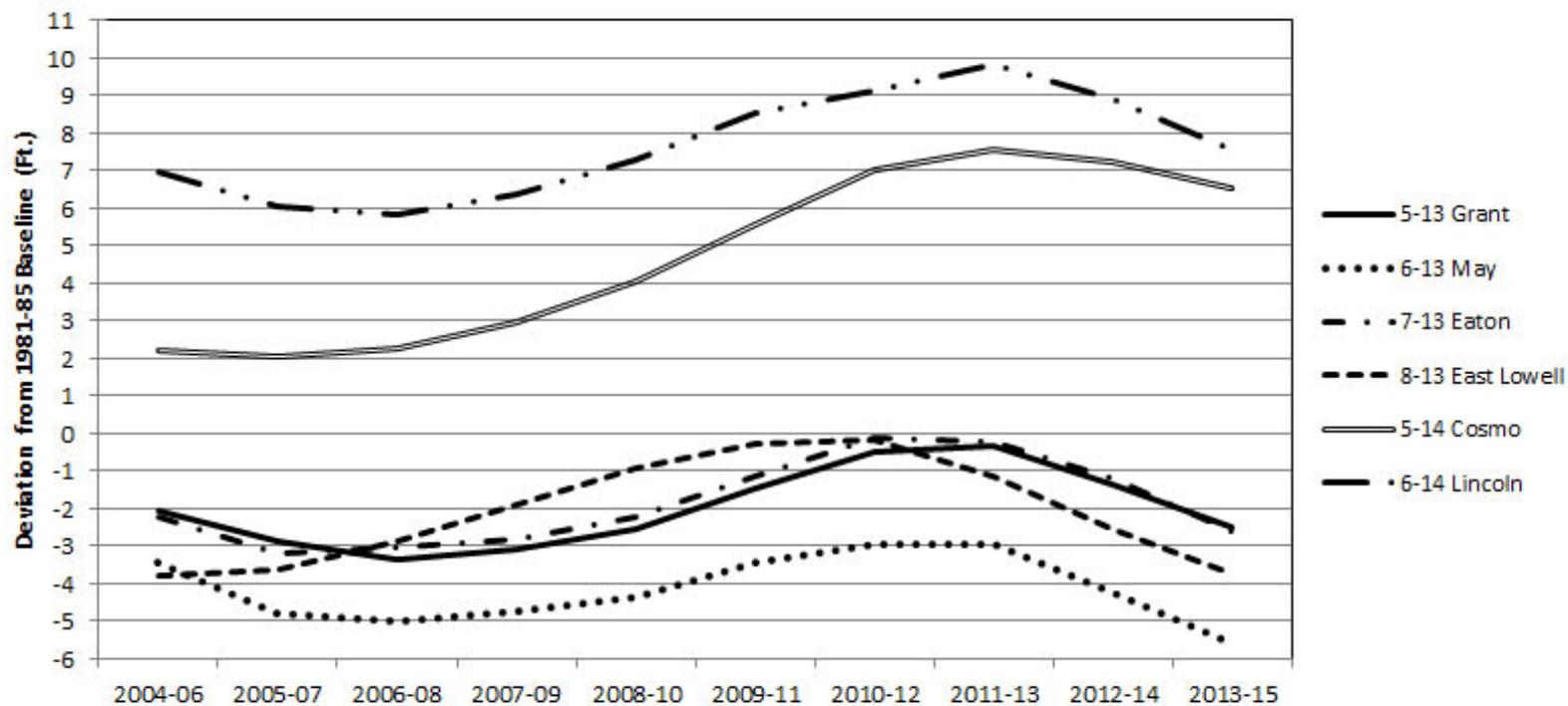
Surface Elevation
2077.60'

NENE 28-6N-13W K-113

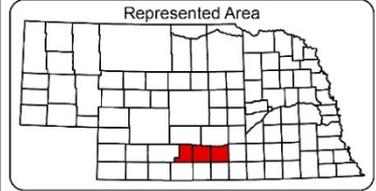
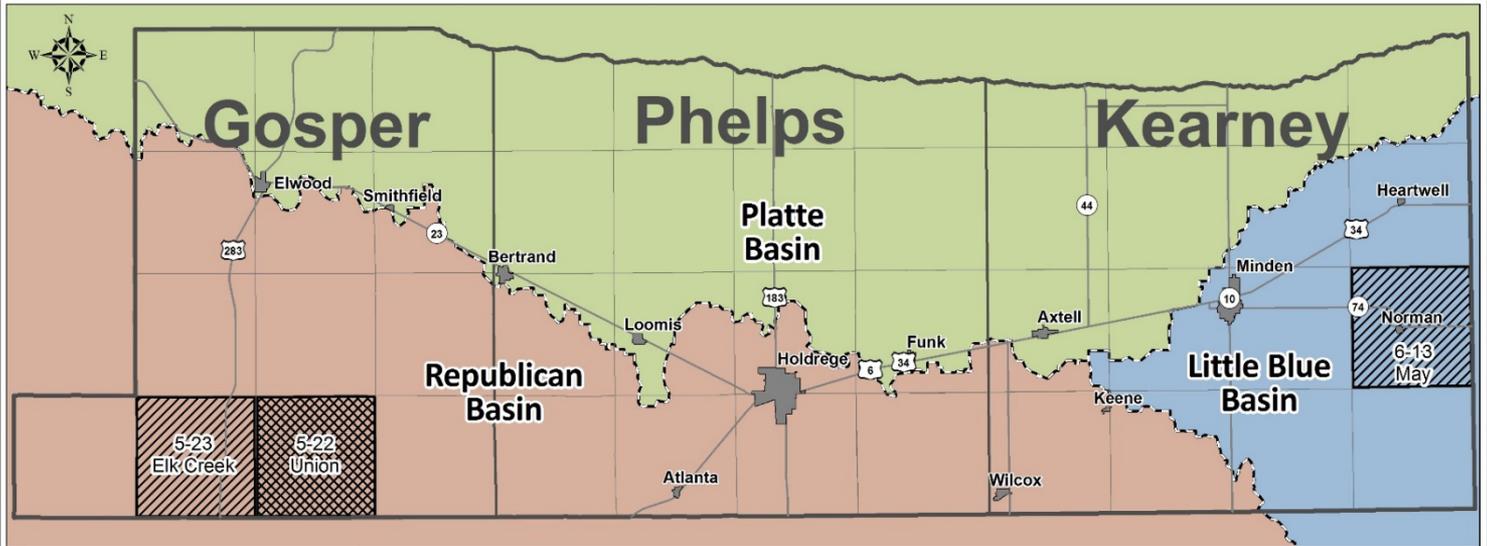


Series1

Tri-Basin NRD Eastern Kearney County Groundwater Levels



Tri-Basin Natural Resources District Groundwater Quantity Management



	Community		Platte Basin		Phase II
	Highway		Little Blue Basin		Phase III
	Township Boundary		Republican Basin		
	County Boundary				

*The entire District is regulated under Phase I regulations.

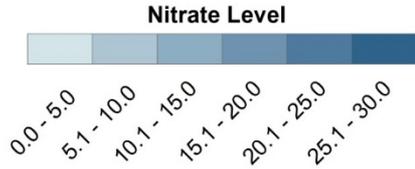
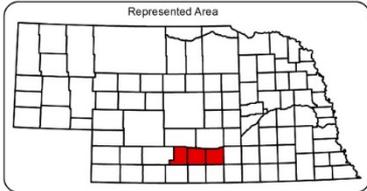
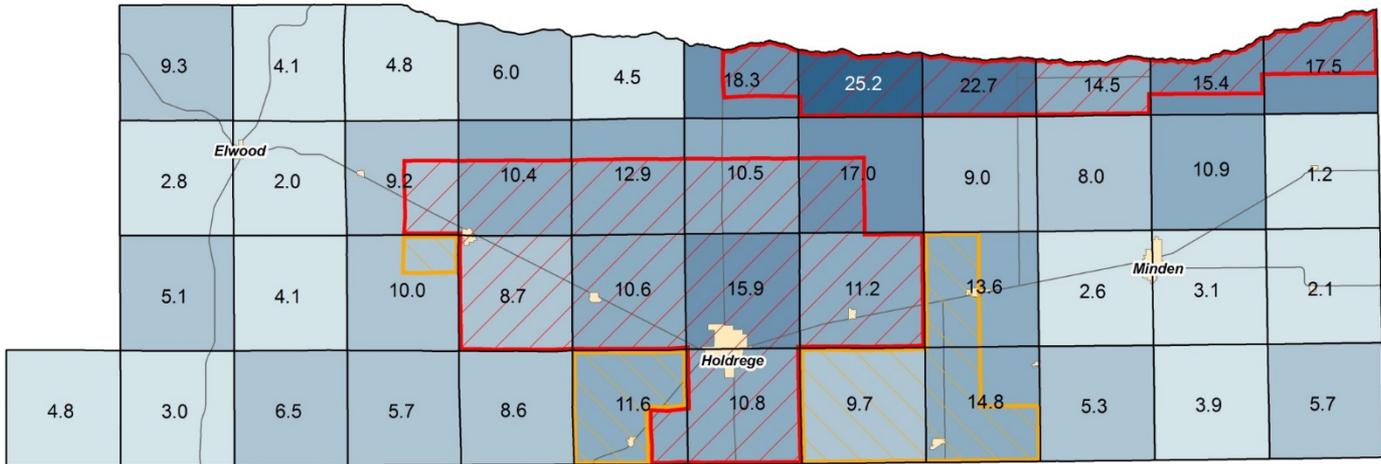


Nolan Little
January 2016
Tri-Basin Natural Resources District

Groundwater Quality Management

Tri-Basin Natural Resources District

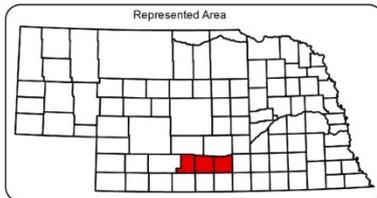
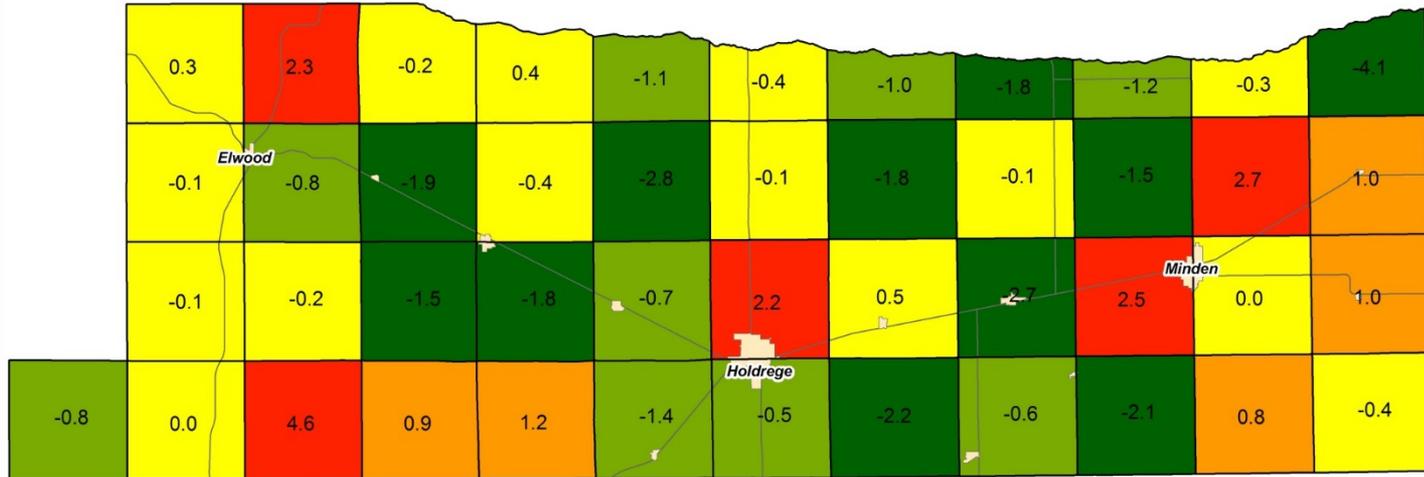
2015 Average Sampled Nitrate Level by Township



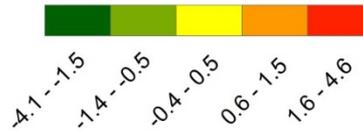
Notan Little
February 2016
Tri-Basin Natural Resources District

Tri-Basin Natural Resources District

Change in Average Sampled Nitrate Level: 2014-2015



Change in Nitrate Level



Integrated Water Resources Management

Integrated water resources management

- Managing groundwater to protect streamflows.
- Required by state law (LB 962-2004)
- Also required to help Nebraska meet requirements of interstate agreements (e.g., Republican River Compact)

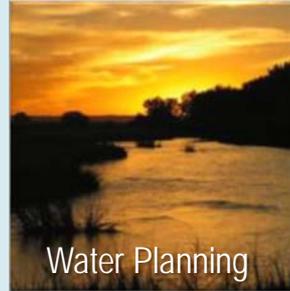
Integrated water resources management (continued)

- Regulation is based on meeting requirements of joint integrated management plans (IMPs) in Platte and Republican basins.
- Current Platte IMP runs through 2019.
- Current Rep. Basin IMP runs through 2021.
- IMP for the Little Blue portion of the District is under development

NEBRASKA

Good Life. Great Water.

DEPT. OF NATURAL RESOURCES



Water Planning



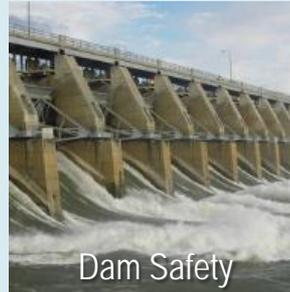
Surface Water



Groundwater



Floodplain Management



Dam Safety



Field Offices

Agency Mission

VISION

- The DNR is dedicated to working with Nebraska's citizens and leaders for the effective management and conservation of the State's water and land resources.

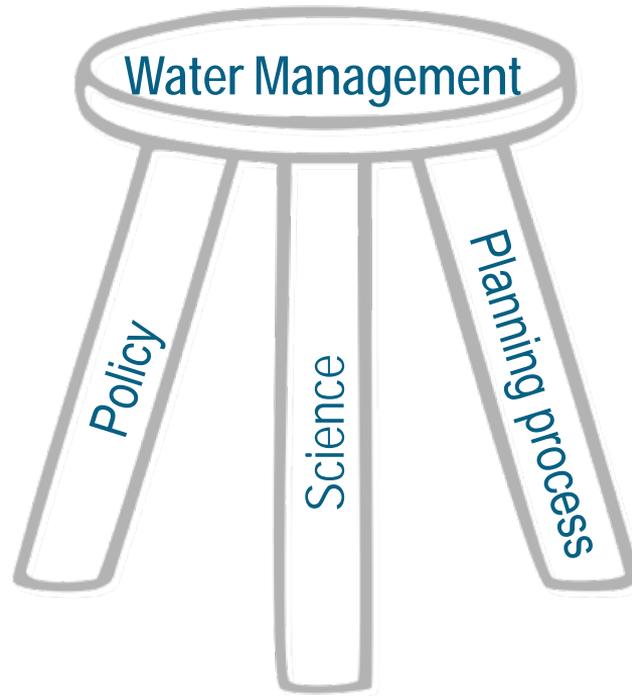
MISSION

- Committed to perform our statutory responsibility to manage and conserve the State's water and land resources.

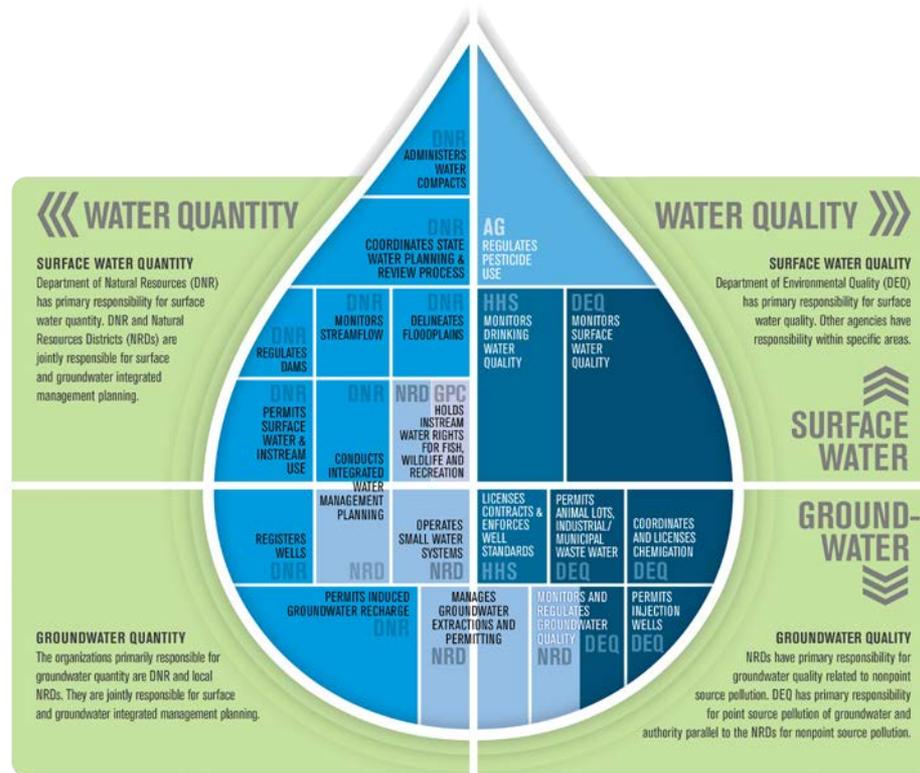
Available Information

- New Website Design - <http://dnr.ne.gov/>
- Statewide Water Planning - <https://dnr.nebraska.gov/water-planning/statewide-water-planning>
- Streamgaging - <https://dnr.nebraska.gov/surface-water/streamgaging>
- NERain - <https://nednr.nebraska.gov/nerain>
- Ice Jam Monitoring - <https://dnr.nebraska.gov/floodplain/ice-jam-reporting>
- INSIGHT - <https://nednr.nebraska.gov/INSIGHT/>

Three Pillars of Water Management



Nebraska's Water Policy



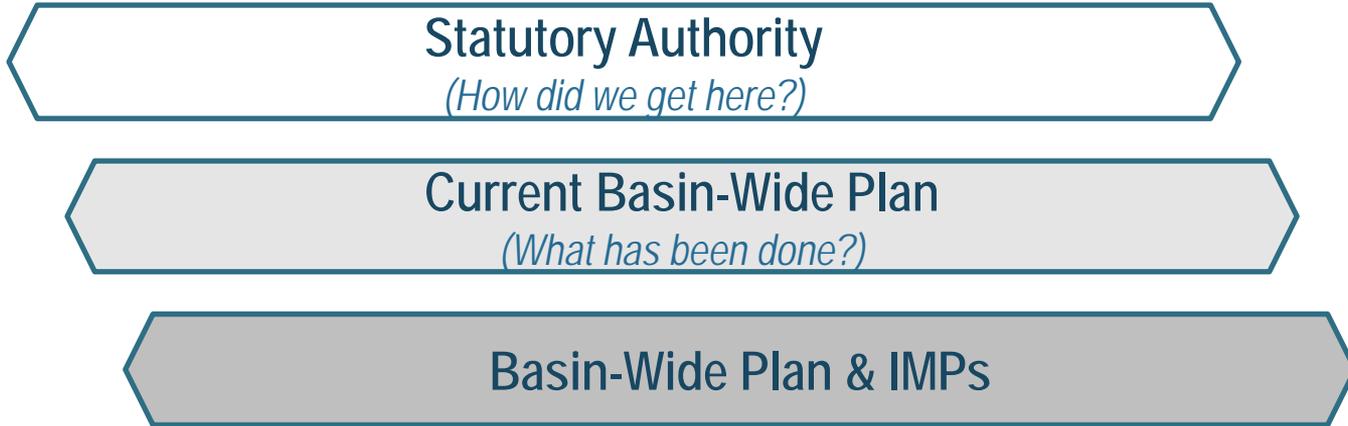


WHY ARE WE HERE?

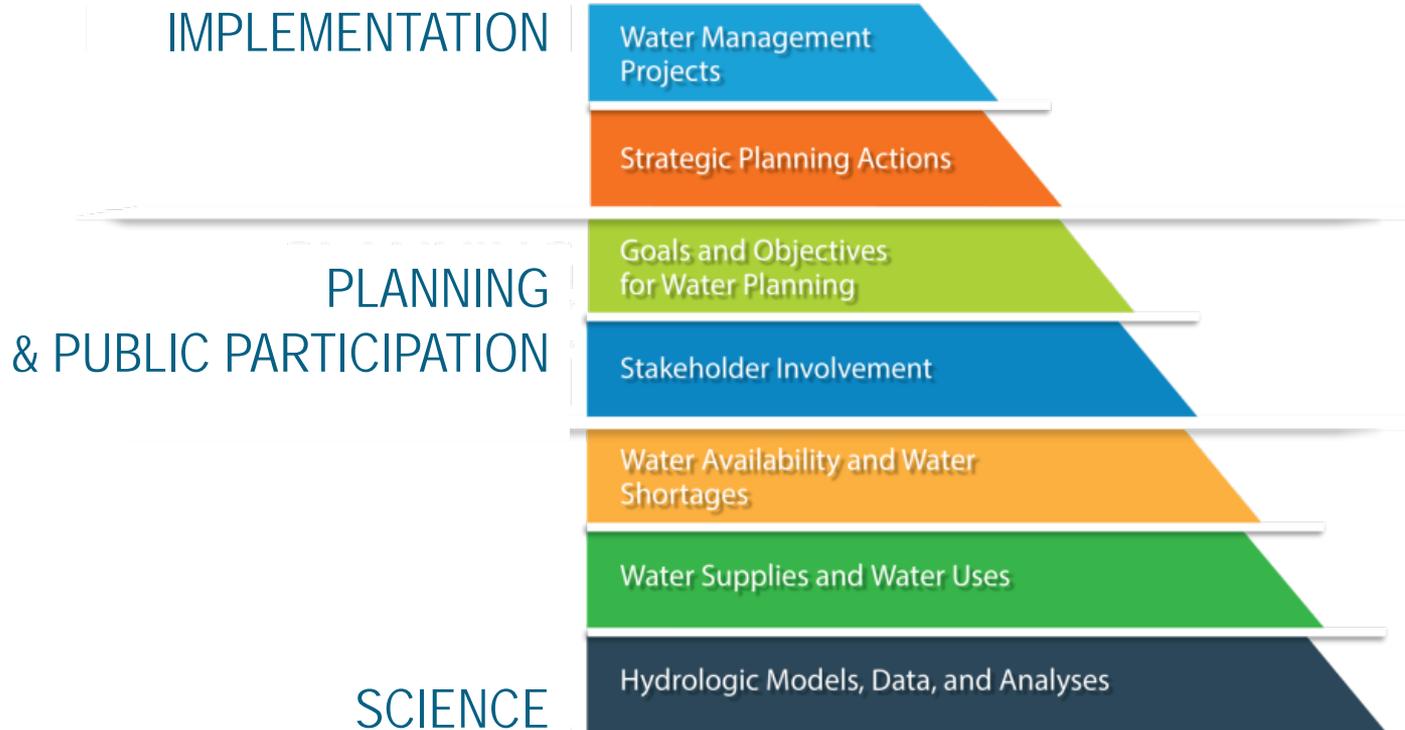
Process Summary

PROCESS SUMMARY

Upper Platte Basin-Wide Planning



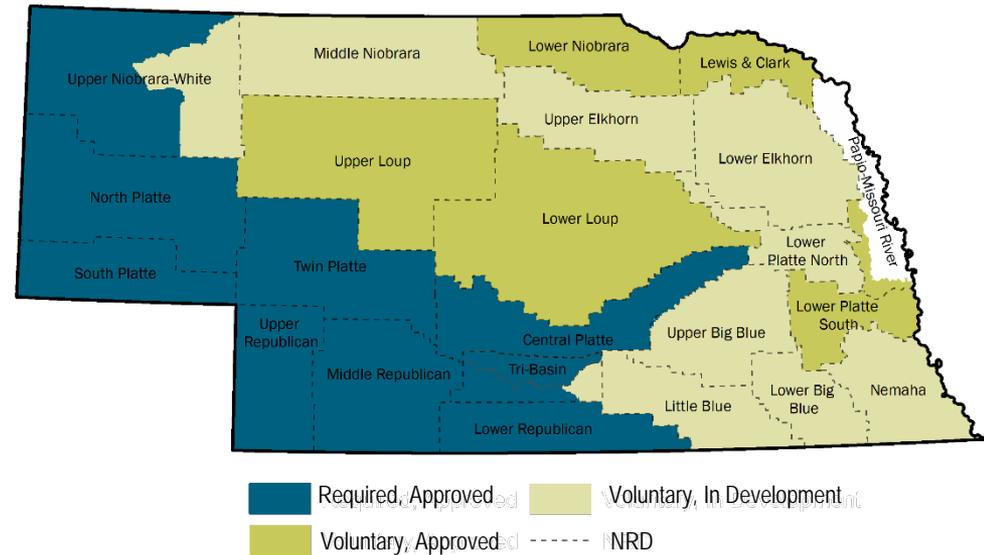
INTEGRATED WATER MANAGEMENT



INTEGRATED MANAGEMENT PLANNING IS A COLLABORATIVE PROCESS

- NeDNR + a Natural Resources District (NRD)
 - IMP development
 - Plan implementation

- Stakeholder collaboration (seeking agreement)



STAKEHOLDER ROLES

- Convey local water issues/concerns
- Guide development of goals and objectives
- Disseminate information to local groups about IMP
- Attend meetings



NRD & NeDNR ROLES

- Acquire/disseminate information/data needed for stakeholder process
- Help formulate goals and objectives with stakeholders
- Coordinate with each other, stakeholders, facilitators throughout IMP process
- Help determine/convey feasible actions for plan implementation
- Write the Integrated Water Management Plan





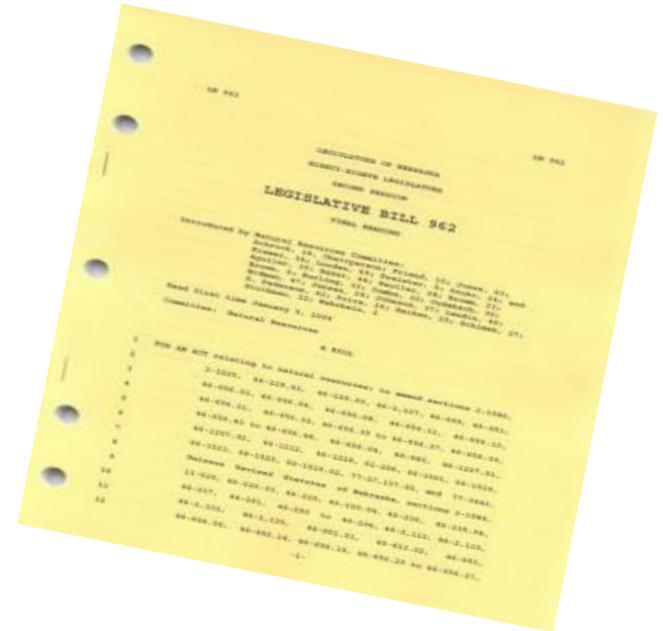
HOW DID WE GET HERE?

Statutory Authority

LB 962

Platte Overappropriated Area Basin-Wide Plan

- New Nebraska State Law
 - Legislative Bill 962 passed in 2004
- Groundwater Management and Protection Act



STATUTORY DEFINITION § 46-713(4)(a)

Platte Overappropriated Area Basin-Wide Plan

Why?

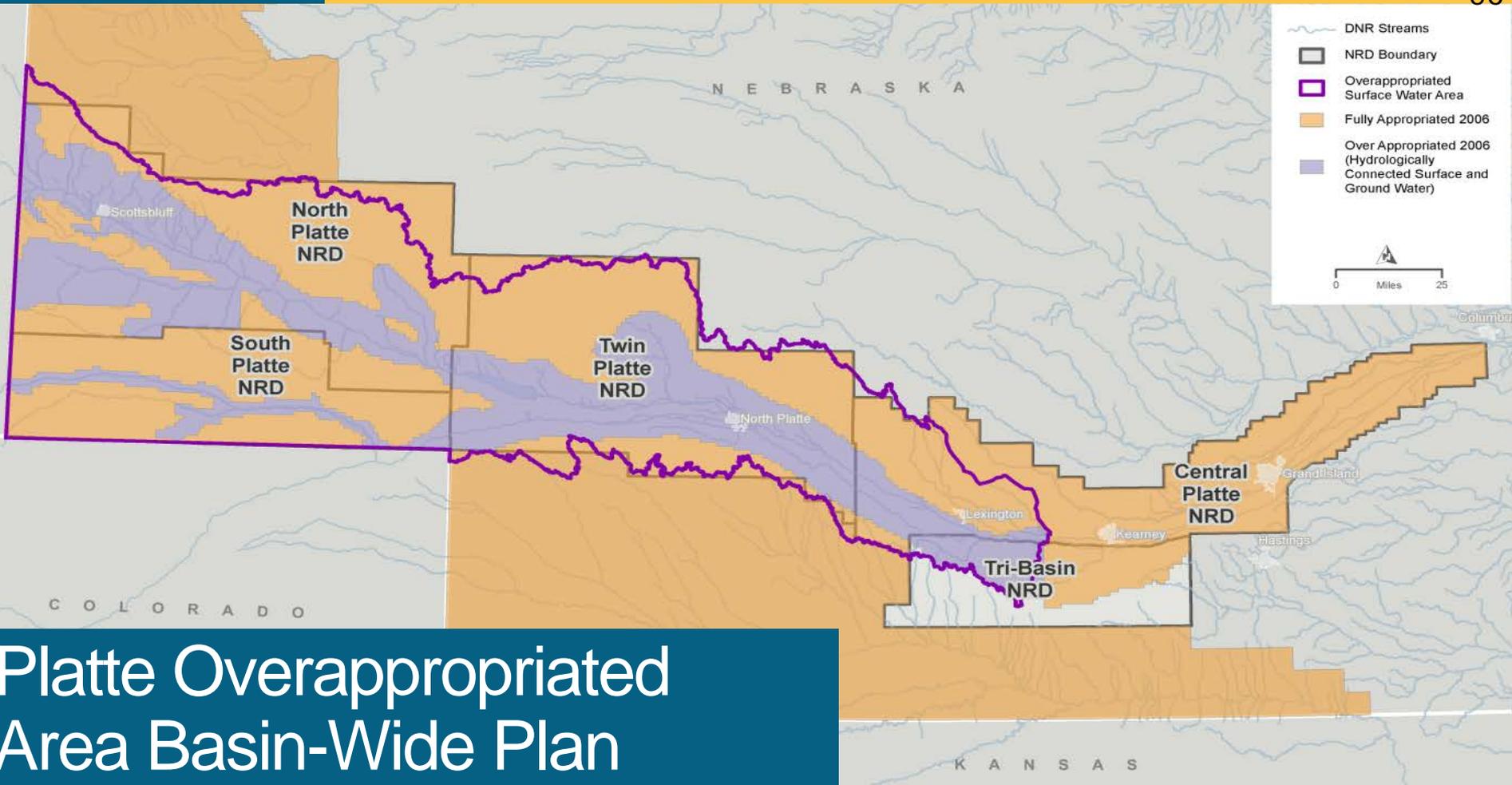
- Criteria for an overappropriated basin designation
 - Interstate agreement
 - Moratorium on surface water appropriations
 - Stays on well construction

When?

- Designated in September 2004

Where?

- Above Kearney Canal diversion



Platte Overappropriated Area Basin-Wide Plan

STATUTORY REQUIREMENTS § 46-715(2)(a)

The plan shall include **clear goals and objectives** with a purpose of sustaining a **balance** between water uses and water supplies so that the **economic** viability, **social** and **environmental** health, safety, and welfare of the basin can be achieved and maintained for both the **near term** and the **long term**.

STATUTORY REQUIREMENTS § 46-715(2)(b) – (e)

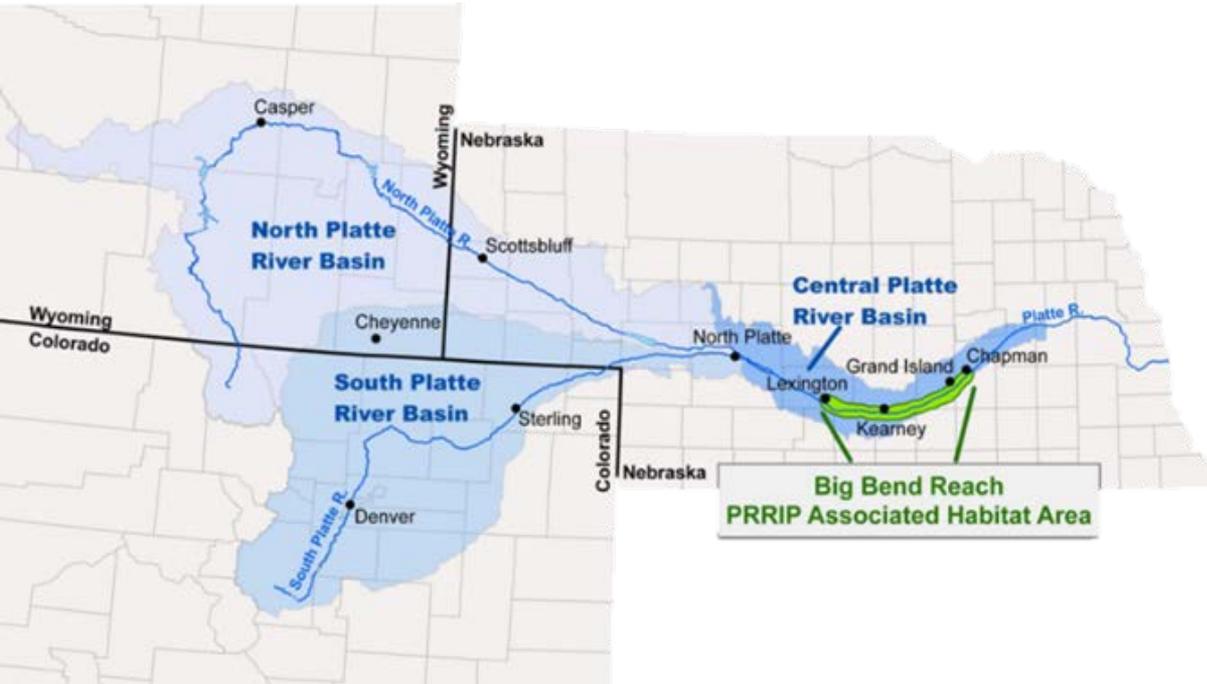
- A **map** of the area subject to the integrated management plan;
- At least one **ground water control** and at least one **surface water control**
- A **monitoring plan**
 - Plan to gather and evaluate data, information, and methodologies to increase understanding of the surface water and hydrologically connected ground water system, and test the validity of the conclusions and information upon which the integrated management plan is based.

STATUTORY REQUIREMENTS § 46-715(4)

- Ground water and surface water controls shall
 - a. Be consistent with the goals and objectives of the plan
 - b. Ensure Nebraska compliance with interstate agreement
 - c. Protect existing users (groundwater and surface water) from new uses

INTERSTATE AGREEMENT – PRRIP

Platte River Recovery Implementation Program; § 46-715(4)(b)



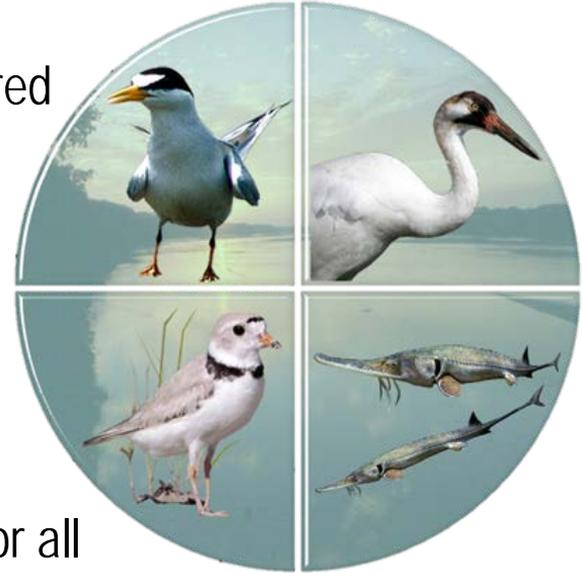
- Began January 1, 2007
- Basin-wide effort by Department of Interior, Colorado, Wyoming, and Nebraska
- Implementation of PRRIP is incremental.
 - The first increment is 13 years (2007-2019), extension through 2032 is expected.

INTERSTATE AGREEMENT – PRRIP

Platte River Recovery Implementation Program; § 46-715(4)(b)

➤ Endangered species

- Improve habitat for four threatened and endangered species
 - Whooping Crane
 - Piping Plover
 - Least Tern
 - Pallid Sturgeon
- Provide ESA Section 7 and Section 9 coverage for all water users in the basin
 - Avoid use of alternative ESA enforcement measures

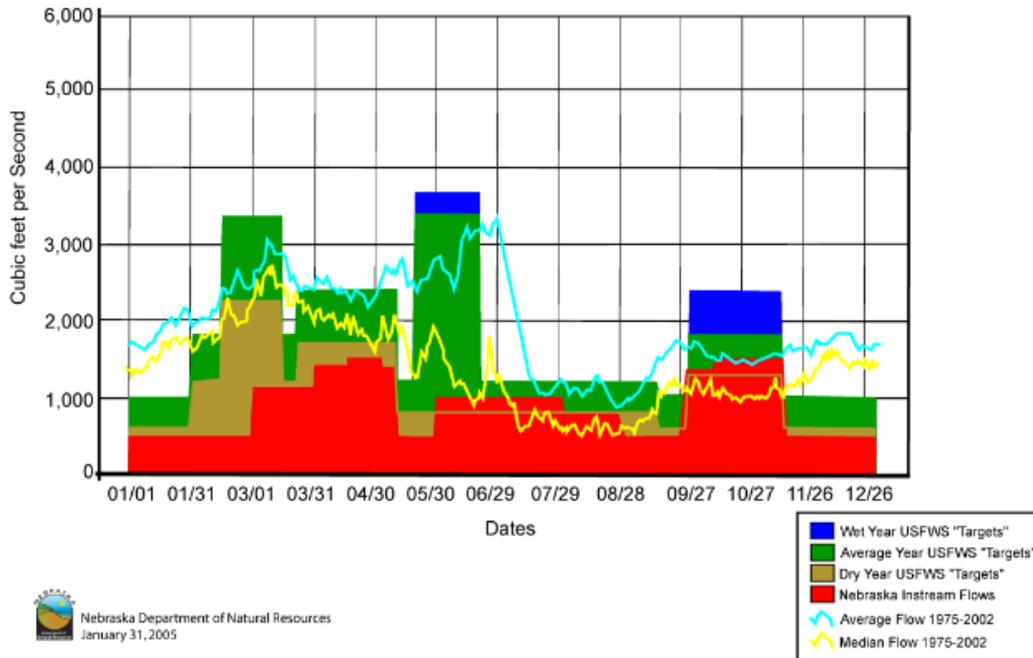


INTERSTATE AGREEMENT – PRRIP

Platte River Recovery Implementation Program; § 46-715(4)(b)

Comparison

USF&WS "Target Flows", Nebraska "Instream Flows",
Average and Median Flows/
Platte River at Grand Island



- Target & state-protected flows
 - Reducing deficits to FWS Target Flows by average annual of 130,000 to 150,000 AFY
 - "Pulse" flows for adaptive management

STATUTORY REQUIREMENTS § 46-715(5)(a)

➤ Basin-Wide Plan

- When the designated **overappropriated area** lies within **two or more natural resources districts**, the department and the affected natural resources districts shall **jointly develop** a basin-wide plan for the area designated as overappropriated
- Such plan shall be developed using the **consultation and collaboration** process
- Shall be developed **concurrently** with the development of the integrated management plan
- Shall be designed to achieve, in an **incremental manner** described the goals and objectives described in 46-715(2)
- The basin-wide plan shall be **adopted after hearings** by the department and the affected natural resources districts.

STATUTE § 46-715 INTERPRETATION

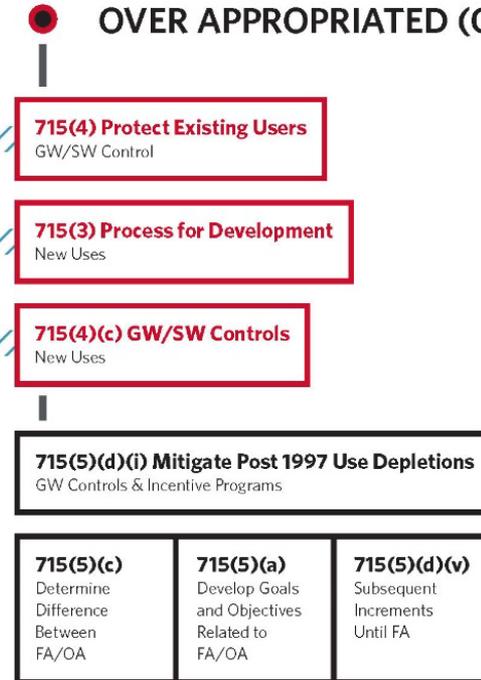
FULLY APPROPRIATED (FA)



NO ADDITIONAL
REQUIREMENTS



OVER APPROPRIATED (OA)



BASIN-WIDE PLAN VS. INTEGRATED MANAGEMENT PLAN

- Statute calls for a Basin-wide Plan (BWP) and individual Integrated Management Plans (IMP) in NRDs that have overappropriated area
- BWP is for the area designated as overappropriated
- IMP encompasses both overappropriated and fully appropriated areas
- Both BWP and IMPs must be adopted and take effect by September 2019
- 2nd increment Basin-wide Plan process began in 2016 with stakeholders

THEY ARE SIMILAR BUT DIFFERENT

Basin-Wide Plan

- All basin NRDs & NeDNR
- Overappropriated Area
- Goals & objectives
 - Focused on regional, cross-boundary issues and opportunities
 - Consistency and collaboration among basin NRDs
 - A broad framework

Integrated Management Plan

- 1 NRD & NeDNR
- Overappropriated and fully appropriated areas
- Goals, objectives, & controls
 - Specific to one NRD
 - Tailored to local issues and opportunities
 - Specific targets and actions that each NRD will use to meet the goals of the Basin-Wide Plan as well as individual Integrated Management Plan goals

INTEGRATED MANAGEMENT PLANNING - SUMMARY

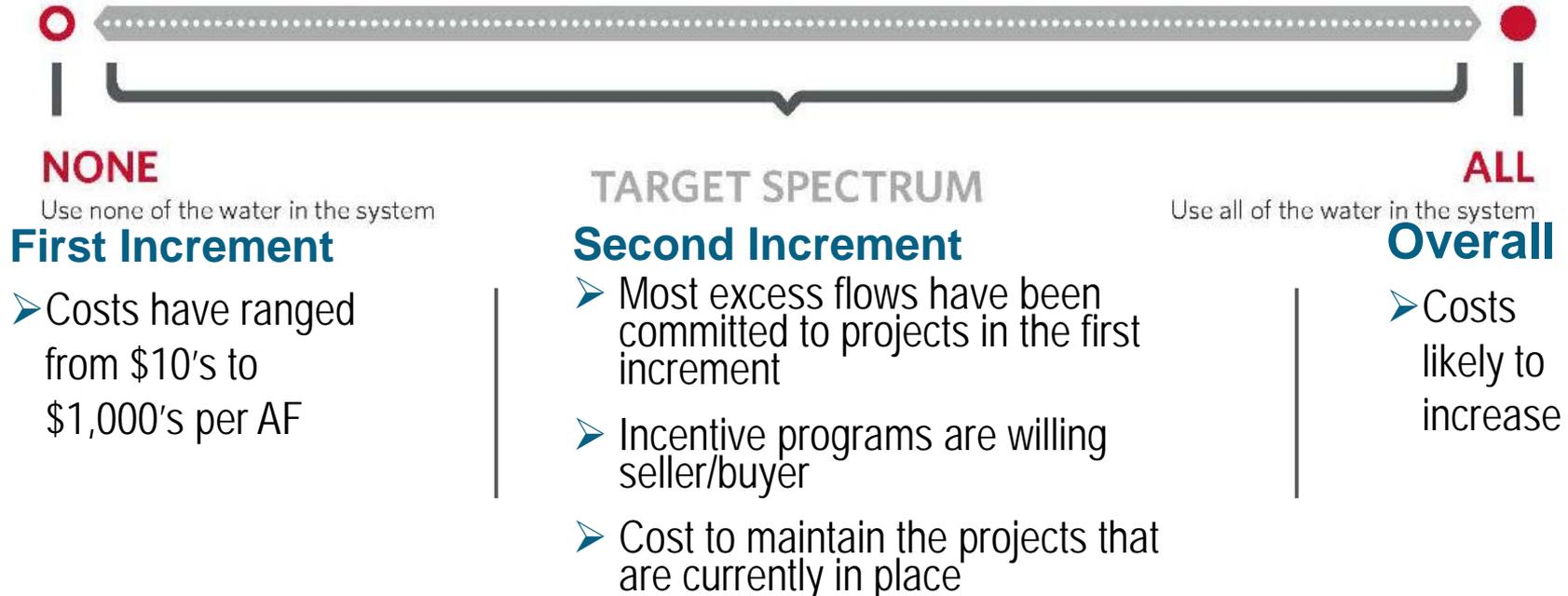


- Surface water and groundwater management
- Proactive
- Protects existing users



- Adaptive management
- Jointly developed between NRD and NeDNR
- Suited to local conditions

STAKEHOLDER CHARGE | What are you willing to do?



§ 46-715(2)(a) - The plan shall include **clear goals and objectives** with a purpose of sustaining a **balance** between water uses and water supplies so that the **economic** viability, **social** and **environmental** health, safety, and welfare of the basin can be achieved and maintained for both the **near term** and the **long term**.



WHAT HAS BEEN DONE?

Current Plan

UPPER PLATTE BASIN-WIDE PLAN

- 1st increment basin-wide plan
 - Current plan went into effect in September 2009

- 2nd increment basin-wide plan
 - Current process to incorporate stakeholder input into 2nd increment basin-wide plan
 - Will present draft 2nd increment plan to stakeholders in September 2018
 - 2nd increment plan will go effect in September 2019

Goals	1: Incrementally achieve and sustain a fully appropriated condition	2: Work to maintain economic viability of the basin while implementing this plan	3: Prevent or mitigate human-induced reductions in the flow of a river or stream that would cause noncompliance with an interstate compact or decree or other formal state contract or agreement.
Objectives	Offset impacts of streamflow depletions... to the extent those depletions are due to water use initiated after July 1, 1997	Understand the economic impacts of supply variability on water users	Prevent human-induced streamflow depletions that would cause noncompliance by Nebraska with the Nebraska New Depletions Plan (NDP) included within the Platte River Recovery Implementation Program (Program), for as long as the Program exists.
	Maintain first increment mitigation efforts	Assess short and long-term basin water supply and demand	
	Conduct a technical analysis...to determine whether the controls are sufficient...	Explore potential measures to mitigate impacts of basin supply variability on surface water and groundwater users	
	Use available funds and actively pursue new funding opportunities to...implement this Plan	Develop a basin drought contingency plan for management of supplies during times of shortage	
	Update and continue implementing IMPs in each Platte River Basin NRD		

<p>Goals</p>	<p>4: Partner with municipalities and industries to maximize conservation and water use efficiency</p>	<p>5: Work cooperatively to identify and investigate disputes between groundwater users and surface water appropriators and, if determined appropriate, implement management solutions to address such issues.</p>	<p>6: Keep the Upper Platte River Basin-Wide Plan current and keep stakeholders informed.</p>
<p>Objectives</p>	<p>Continue to collect data on water use and existing conservation plans of municipalities and industries within the Basin</p>	<p>Identify disputes between groundwater users and surface water appropriators.</p>	<p>Meet at least annually to review progress toward achieving the goals and objectives of this Upper Platte River Basin-Wide Plan and those portions of individual NRD IMPs that implement this plan.</p>
	<p>Invite municipalities and industries to the annual meetings</p>	<p>Investigate and address issues between groundwater users and surface water appropriators, based on investigation results.</p>	<p>Gather and evaluate data and information to measure the effectiveness of controls, incentives, and other programs in the individual NRD IMPs used to implement this Upper Platte River Basin-Wide Plan.</p>
	<p>Establish baseline water use levels and reasonable water use levels for each municipal and industrial user by January 1, 2026.</p>		<p>Improve information sharing with interested stakeholders</p>



TRI-BASIN NRD IMP

TBNRD IMP

TBNRD Projects

Stream Depletions 101

COHYST Data & Modeling

Lessons learned

INTEGRATED MANAGEMENT PLAN

- Map of the Areas
 - Overappropriated
 - Fully appropriated
- Incentives
- Water banking
- Monitoring
- Studies
- Controls
 - Moratorium/certified acres
 - Transfers
 - Municipal and industrial



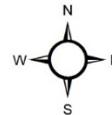
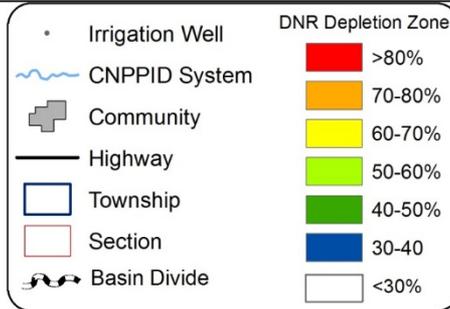
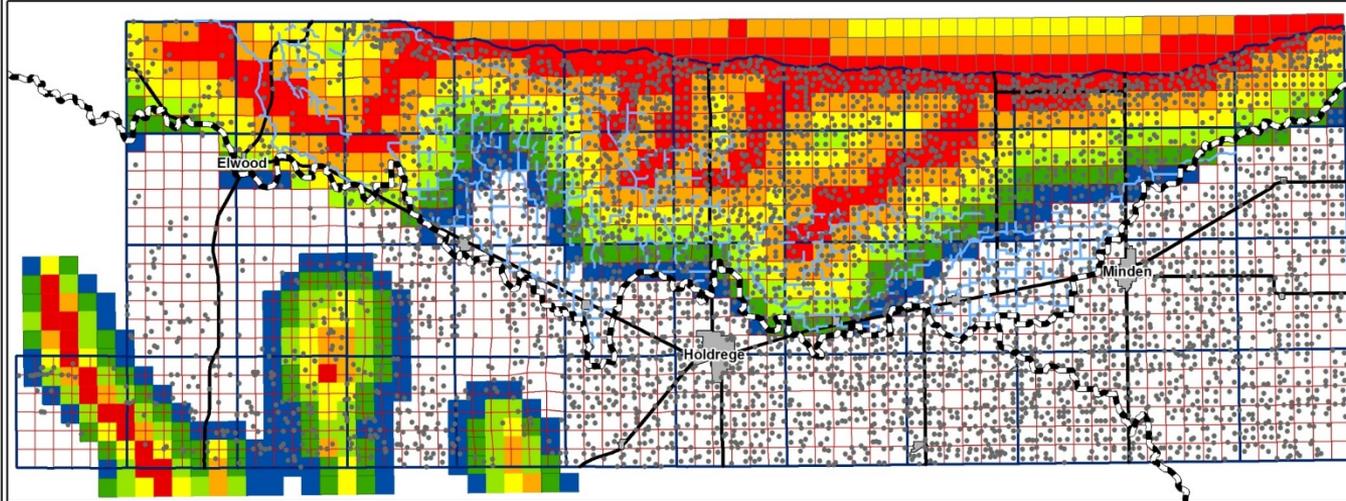
TBNRD PROJECTS



Turkey Creek
West Branch

Tri-Basin Natural Resources District

Stream Depletions



Nolan Little
September 2011
Tri-Basin Natural Resources District



TBNRD regulatory actions to protect streamflows

- All groundwater-irrigated acres must be certified.
- Transfers of certified irrigated acres are regulated.
- Transfers of certified irrigated acres are pro-rated if the destination field has higher rate of stream depletion than originating field.
- Increases in water use for large commercial and industrial uses are also regulated and must be offset.
- TBNRD agrees to offset depletions to streamflows resulting from groundwater pumping as part of our IMPs.

TBNRD Platte Basin IMP requirements

- TBNRD includes both overappropriated and fully appropriated portions of Platte basin.
- TBNRD IMP streamflow depletion reduction requirements to return to 1997 levels of depletions:
 - OA Basin (W of US Hwy. 183) 1775 a-f/Yr. by 2020
 - FA Basin (E of US Hwy. 183) 1760 a-f/Yr. by 2020
 - Total offset requirement= 3535 a-f/Yr. by 2020

Tri-Basin depletion offset projects

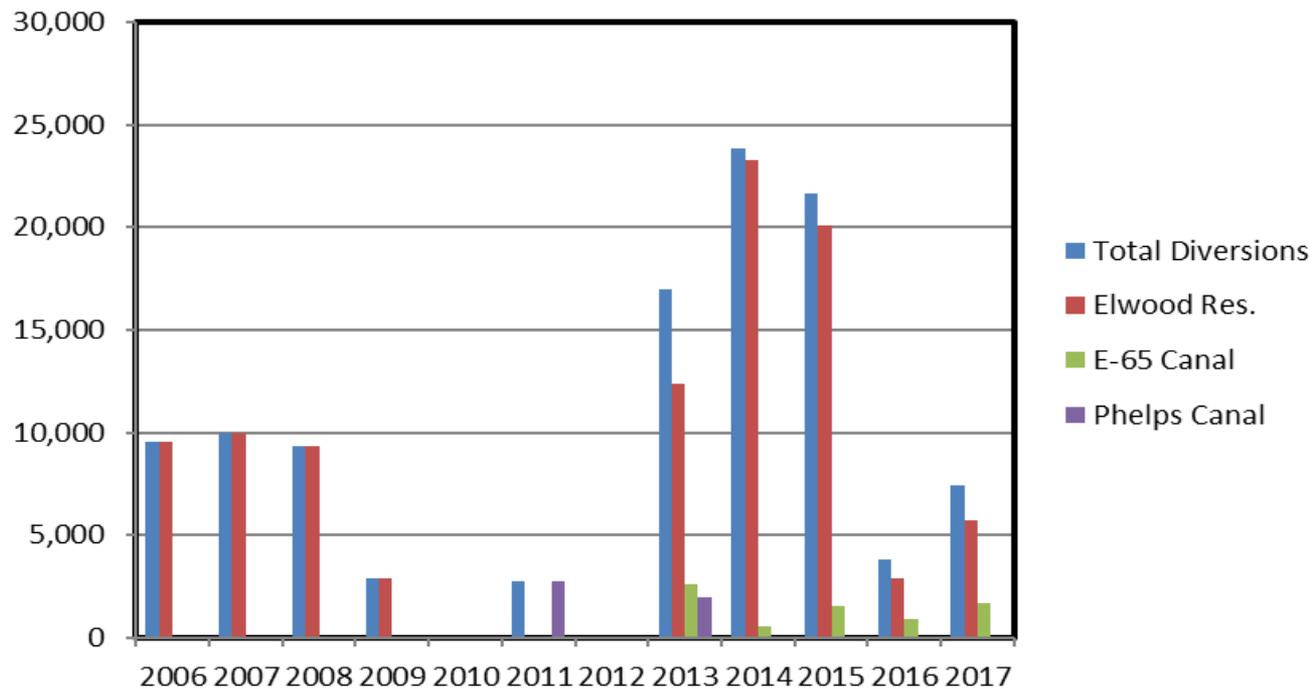
CNPPID High Flow Diversions

- TBNRD works with CNPPID to divert high Platte flows into canals, Elwood reservoir.
- Over 107,800 acre-feet diverted since first diversions in 2006.
- Over 80,800 creditable a-f at NRD cost of \$8-\$25 per a-f (DNR pays half cost).
- Diversions into Elwood Reservoir and E-65 Canal benefit both Platte and Republican Basins.

Elwood Reservoir



GW Recharge Diversions by CNPPID for TBNRD and NDNR



Cost of High Flow Diversions

- Tri-Basin needs to divert an average of 12,000 acre-feet of water per year to meet all IMP offset requirements
- CNPPID charges approximately \$42 per acre-foot to divert water
- $12,000 * 42 = \$504,000$ per year
- So far, State of Nebraska has paid half the cost of diversions

Streamflow augmentation vs. Regulation

- Augmentation can be accomplished directly or indirectly.
- Direct augmentation=pumping water into a stream or releasing water from a reservoir.
- Indirect augmentation=diverting water into canals and reservoirs and allowing it to seep into the ground.

What are alternatives to augmentation?

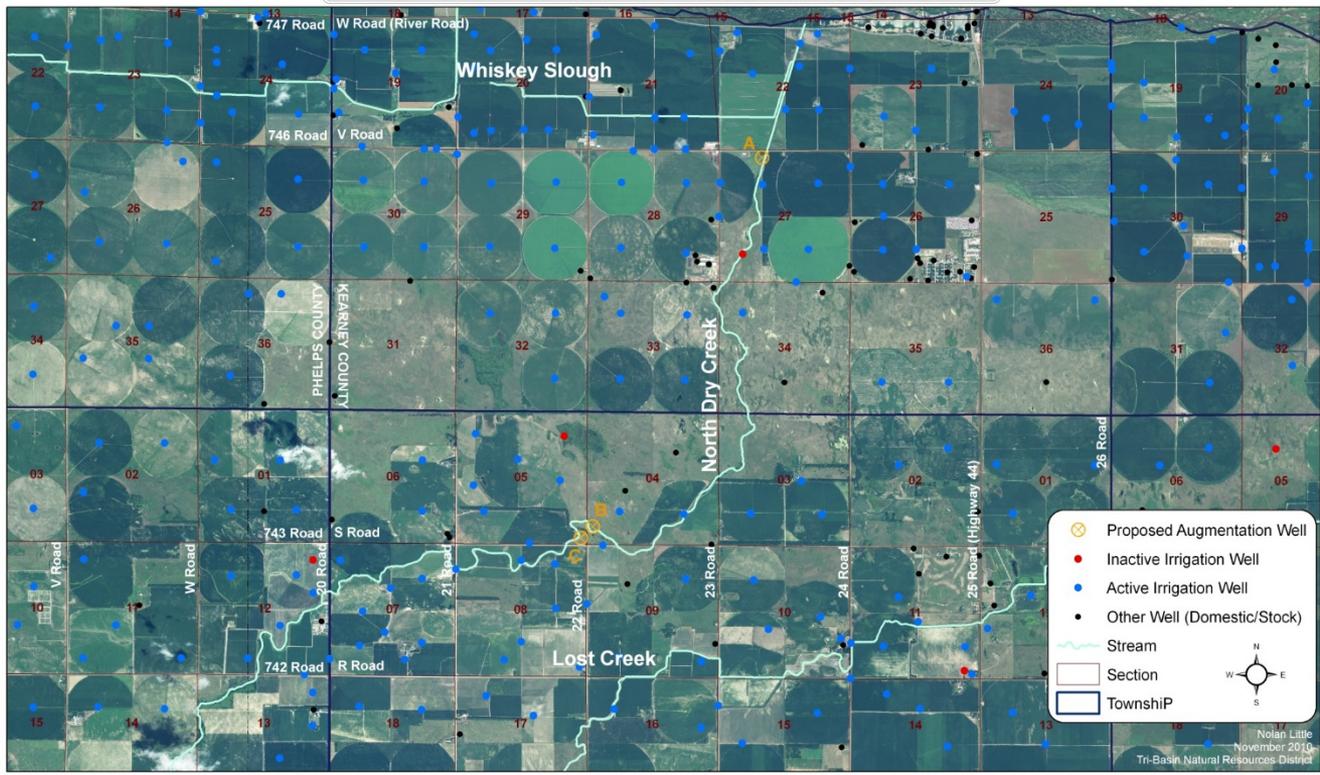
- Pay farmers not to irrigate
 - Needed reductions can be achieved by acquiring easements
 - Easements can be acquired from willing sellers or by eminent domain (using condemnation enables targeting areas of greatest benefit)
 - NRD would need to retire irrigation on at least 50,000 acres in Platte basin and 10,000 acres in Rep. Basin
 - Cost=at least \$4000/ acre, \$24 million total

North Dry Creek Streamflow Augmentation Project



Tri-Basin Natural Resources District

North Dry Creek Streamflow Augmentation Project



North Dry Creek Streamflow Augmentation Project

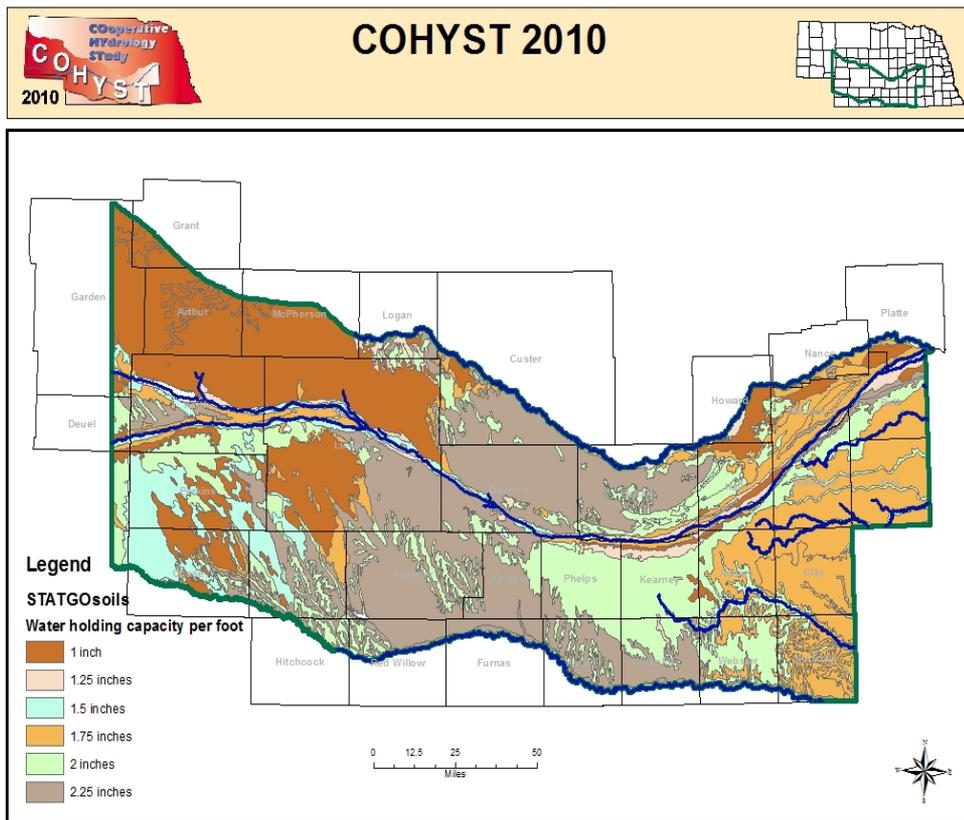
- TBNRD developed first streamflow augmentation well project in Nebraska.
- Located on North Dry Creek (Platte Trib. Near Kearney).
- First well completed in 2011, second well in 2014.
- DNR paid 50% of cost.
- Anticipate \$11-12 per creditable a-f cost.



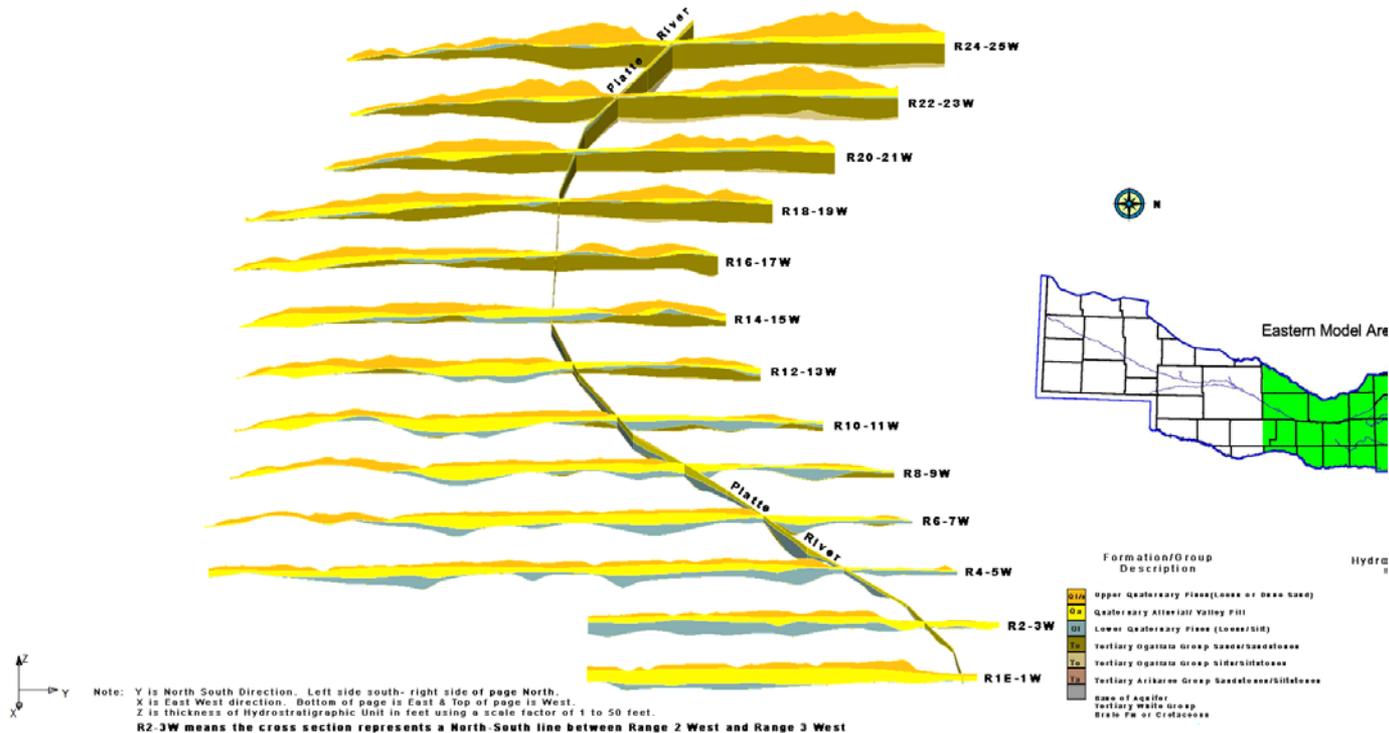
COHYST DATA & MODELING

Overview

Hydrogeologic Inputs - Soils

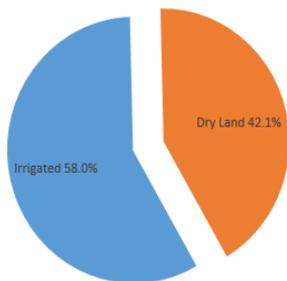


Aquifer Variability - Lateral and Vertical

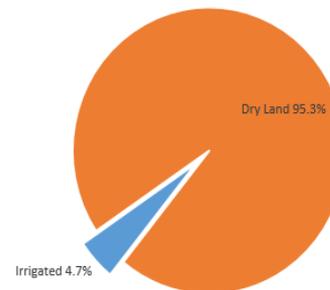


Transient .

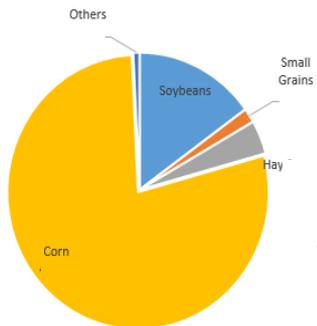
2007 Census Crop Distribution



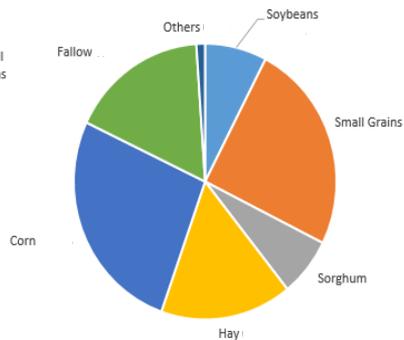
1950 Census Crop Distribution



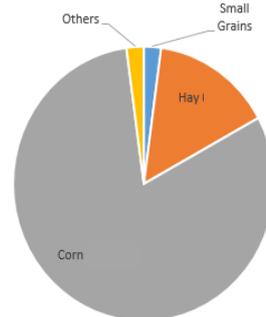
Irrigated Crops



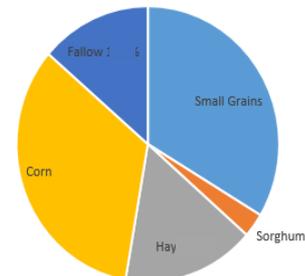
Dry Land Crops



Irrigated Crops

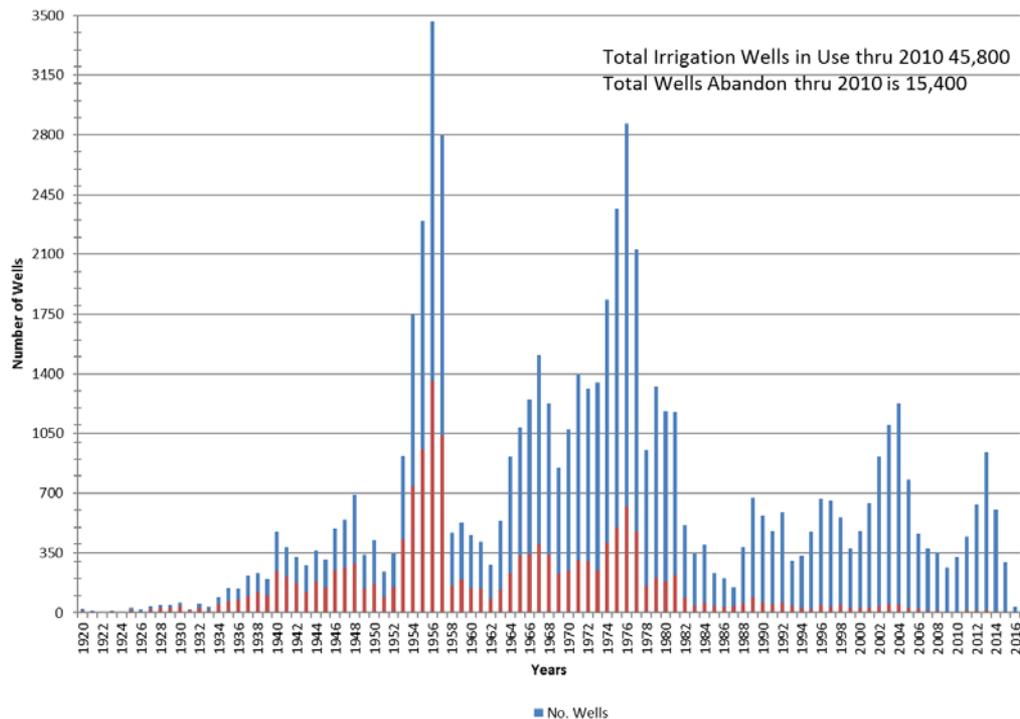


Dry Land Crops



Groundwater Irrigation Development

Irrigation Wells Developed and Abandoned each Year in COHYST Model Area



Active Irrigation Wells in COHYST Area thru June 2001

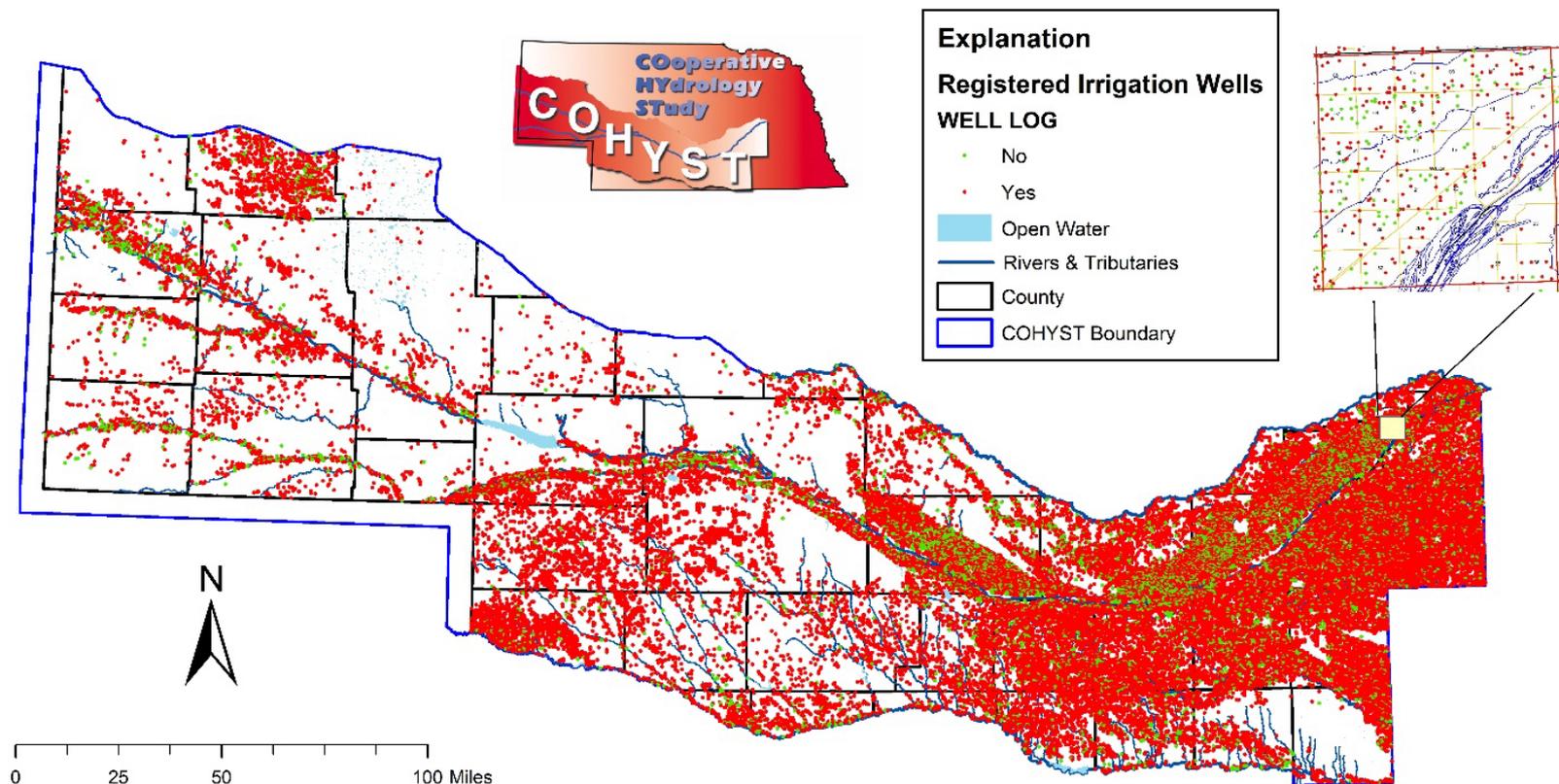


Figure 16. Registered Irrigation Wells with Lithologic Logs some of which were selected to develop Hydrostratigraphic Units

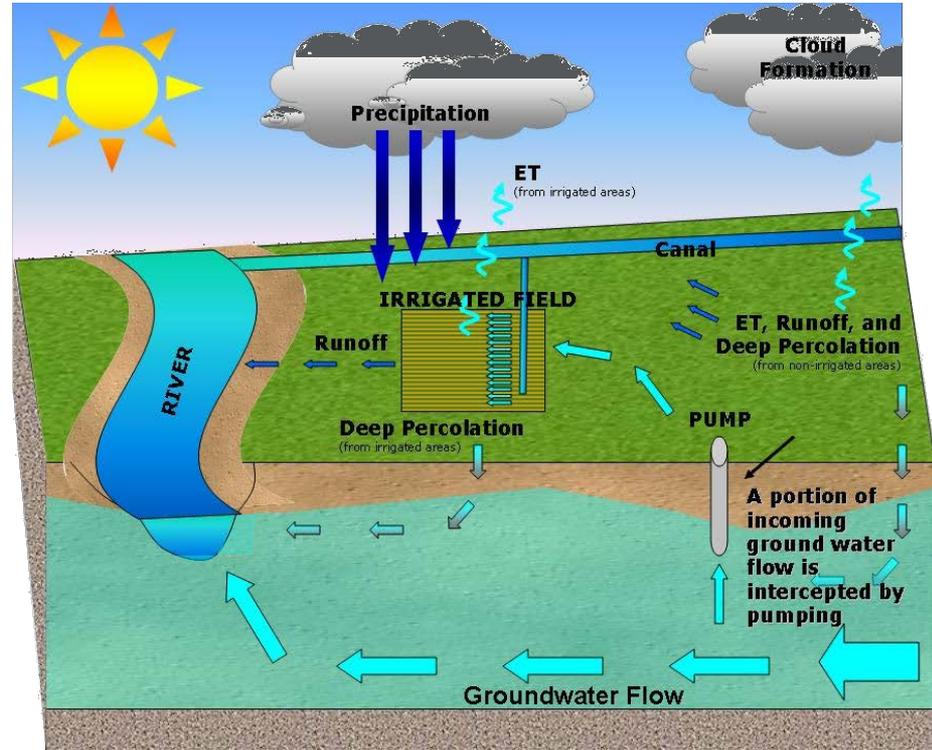
Cohyst (1998-2009)

- To predict, evaluate, and ultimately manage water resources in the Platte Basin requires essentially two elements:
 - Water supplies and uses (water budget terms)
 - Aquifer response and aquifer/stream interaction (timing)
- This is where modeling comes in....
 - Approximation of real world conditions (with reasonable assumptions and limitations)
 - Tool that enhances understanding and can be used in evaluations

Current modeling efforts

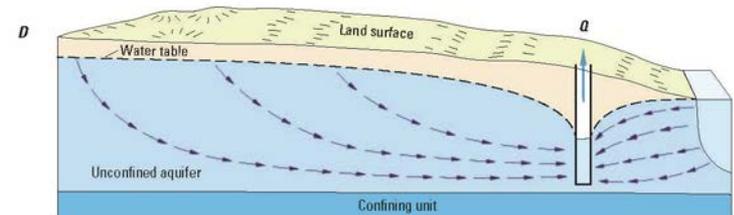
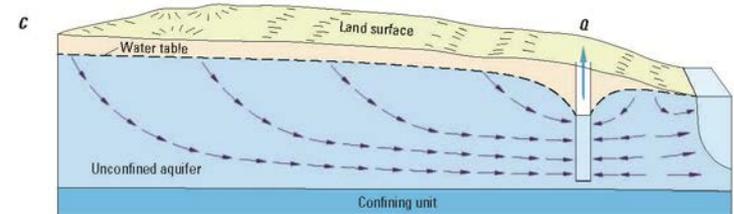
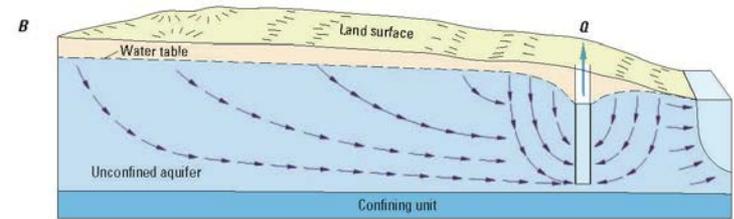
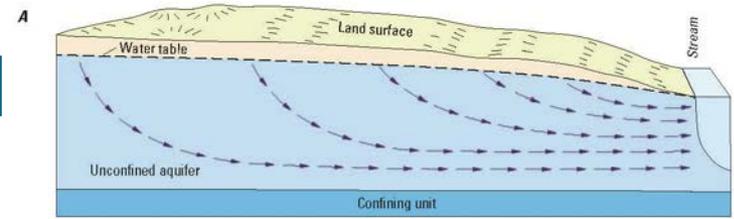
Enhancements to the original COHYST models began in 2009 and generally included:

- Represent Water Budget
- Surface water component
- Transient conditions
- Ability to evaluate management alternatives
- Incorporate new data (meters, land use, etc.)



STREAM DEPLETIONS 101

- A. Pre-development conditions
- B. Pumping from aquifer storage
- C. Interception of groundwater baseflow
- D. Interception of groundwater baseflow and induced infiltration

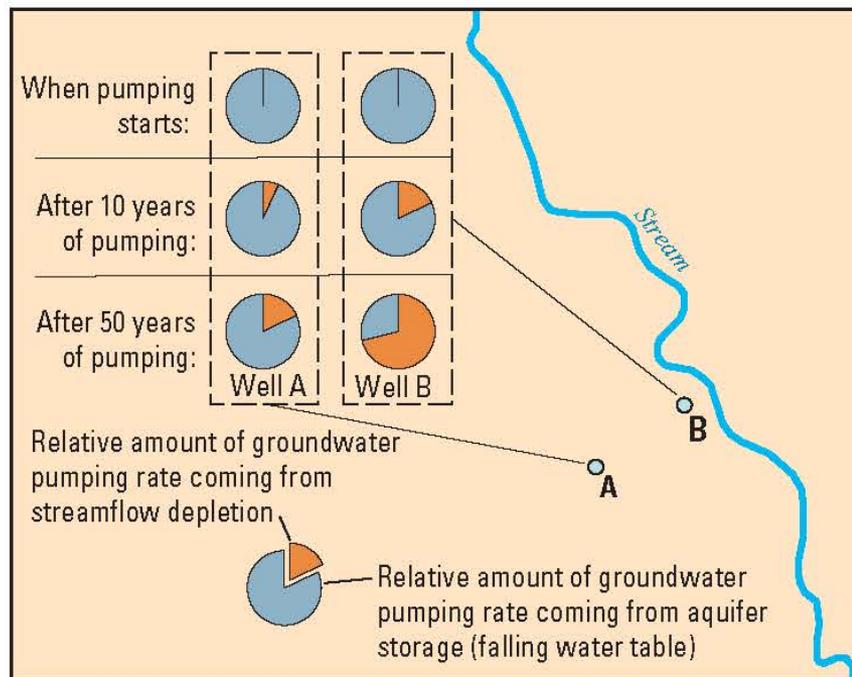


STREAM DEPLETIONS 101

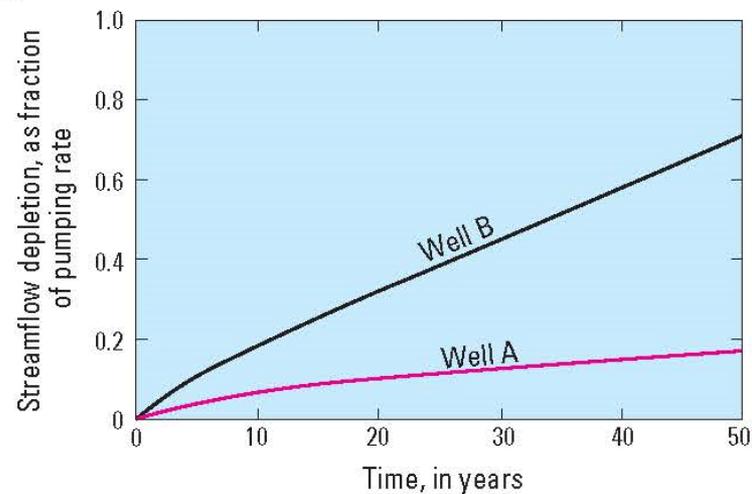
- Factors that affect timing, rates, and locations of streamflow depletion:
 - Geology and hydraulic properties of aquifer
 - Aquifer size/volume
 - Geometry of the surface water streams
 - Well location (vertical and horizontal distance from streams)
 - Pumping rates and operational characteristics

STREAM DEPLETIONS 101

A



B



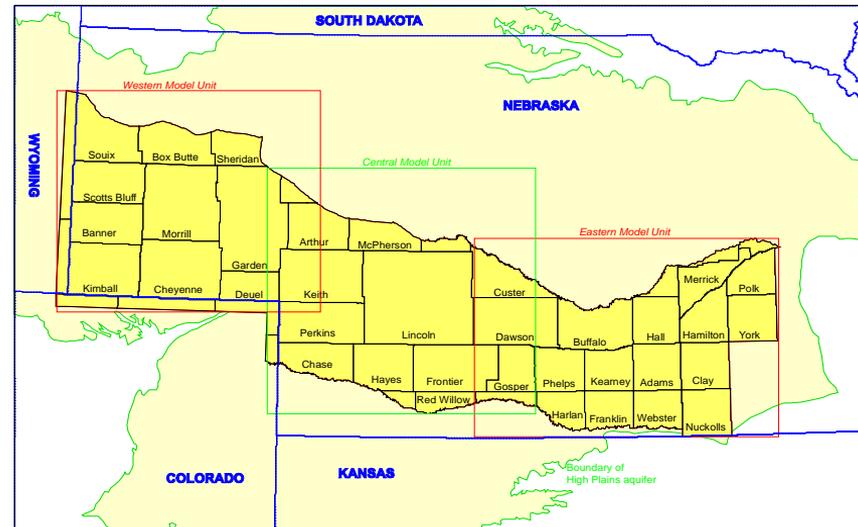
STREAM DEPLETIONS SUMMARY

- Variability in aquifer properties across basin
 - Degree of ground/surface water connection
 - Number/distribution/capacity of wells
 - Timing of well impacts on surface water/aquifer
- Physical characteristics are included and considered in water resources planning and management

Current modeling efforts

Enhancements being completed and incorporated through two modeling efforts:

- WWUM \approx Western Unit of original COHYST
- COHYST 2010 – Central and Eastern Units of original COHYST



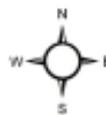
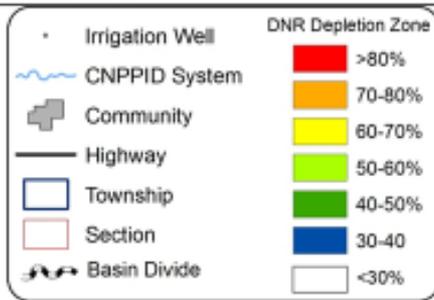
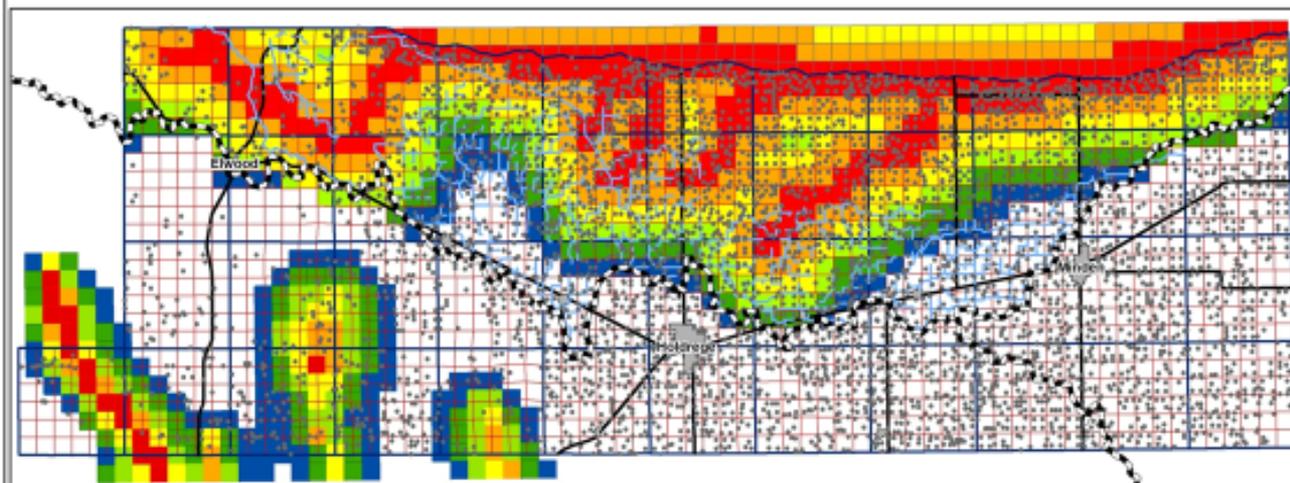
Current modeling efforts

How are these models assisting in plan development? Examples include:

1. Evaluate changes in aquifer levels and streamflow over time, and the causes thereof.
2. Quantify impacts to streamflow from uses of ground water, including post-1997 uses.
3. Assess options for bringing system into full appropriation balance:
 - a) Evaluate effects of limiting pumping per acre.
 - b) Evaluate effects of changing crops.
 - c) Evaluate effects of improved application efficiencies.
 - d) Evaluate effects of reduced surface water diversions/deliveries.
 - e) Evaluate effects of replacing surface water uses with ground water – and vice versa.
 - f) Evaluate operation of canals to recharge excess flows.

Tri-Basin Natural Resources District

Stream Depletions





LESSONS LEARNED

From the First IMP

Lessons Learned-Basinwide

- Water is expensive and not always readily available
 - Sustainability of state and federal funding is questionable
- POAC – PBC – technical and financial management
- Modeling process and technology updates
 - Need for better communication
 - Need to improve timeliness of analyses
- Education and outreach efforts need to improve

Lessons Learned- Basinwide

- Challenge in identifying fully appropriated (FA) and overappropriated (OA) distinction and defining fully appropriated
- Challenge in finding a water use and supply balance – defining possibility and sustainability
- Shortage of water is mostly a management problem

Lessons Learned-Tri-Basin specific

- Irrigated land retirement (temporary/permanent) – not very cost effective in terms of \$/acre-foot of benefit
- North Dry Creek Augmentation Project – most cost effective, but not very reliable, due to lower than anticipated stream flows
- Excess flow diversion/recharge projects – cost effective, multiple benefits, not reliably available



STAKEHOLDER DISCUSSION

Question 1

- What motivated you to participate in this planning process?

Question 2

- As a water user, what are your worries about the future?

Question 3

- As a stakeholder, what other information do we need to provide in order for you to be successful?



NEXT STEPS

MEETING DATES

- December 12, 2018
- February 13, 2019

Time: 1:00 p.m.

Location: TBNRD Office



PUBLIC COMMENT

Thank you