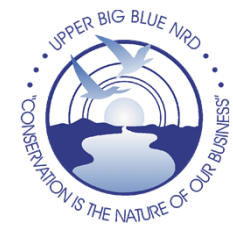




# JOINT WATER QUANTITY MANAGEMENT

Voluntary Integrated Management Plan  
Stakeholder Meeting #3  
Upper Big Blue NRD, York, NE  
September 10, 2018



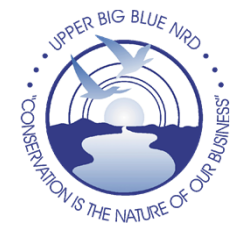
# Presentation Outline

- Groundwater Quantity Management  
Marie Krausnick, Upper Big Blue NRD
- Surface Water Quantity Management  
Jeremy Gehle, NE Dept. of Natural Resources
- Integrated Water Quantity Management  
Jennifer Schellpeper, NE Dept. of Natural Resources
- Questions for stakeholders  
Steve Wolf, JEO





# UBBNRD GROUNDWATER QUANTITY MANAGEMENT



Marie Krausnick  
Water Department Manager  
Upper Big Blue NRD

# UBBNRD Groundwater Quantity Management

- Correlative Rights
  - Share and share-alike



# UBB NRD Groundwater Quantity Management

## ➤ Groundwater Management Plan

- District Rules and Regulations
  - Set by the Board of Directors
- Does not consider surface water uses

## ➤ Voluntary Integrated Management Plan

- Developed in partnership with NeDNR
- Focus is **hydrologically connected** areas
  - Groundwater and surface water interconnectivity





# UBB NRD Groundwater Quantity Management

## ➤ Withdrawals

- Flow meters
- Annual reporting for irrigation and other uses
  - Ethanol,
  - Municipal,
  - Golf courses,
  - Etc.



# UBB NRD Groundwater Quantity Management

## ➤ Allocation

- Certified Acres & Wells
- 1<sup>st</sup> Allocation
  - 30 inches over 3 years
- 2<sup>nd</sup> Allocation
  - 45 inches over 5 years



# UBB NRD Groundwater Quantity Management

- Programs to increase water use efficiency
  - Soil moisture measuring equipment discount
  - Variable rate irrigation





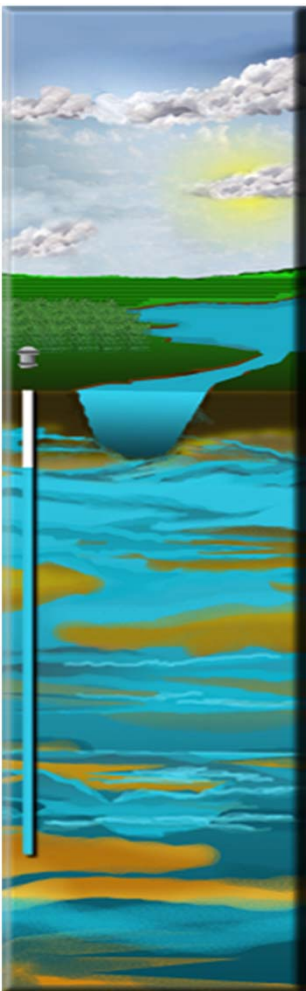


# NeDNR SURFACE WATER QUANTITY MANAGEMENT

Jeremy Gehle  
Water Administration Division Manager  
Nebraska Department of Natural Resources

# Outline

- *Surface Water Administration Division*
- *Surface Water Permitting*
- *Surface Water Administration Process*



# Surface Water Administration Overview

- Managed by the Nebraska Department of Natural Resources (NeDNR)
- Rivers, lakes, streams dependent on
  - Rain runoff
  - Groundwater base flow
- Prior appropriation doctrine
  - *First-in-time, First-in-right*
  - If supply is insufficient, junior appropriators are denied water



# Surface Water Administration Overview

- Supply considerations
  - About as reliable as the weather
  - Water not withdrawn flows downstream
  - “Here today; gone tomorrow”





# Surface Water Administration Division Offices



# Surface Water Administration Responsibilities

## ➤ Water Administration

- Blue River Compact
- Local Shortages
- Enforcement
- Adjudication

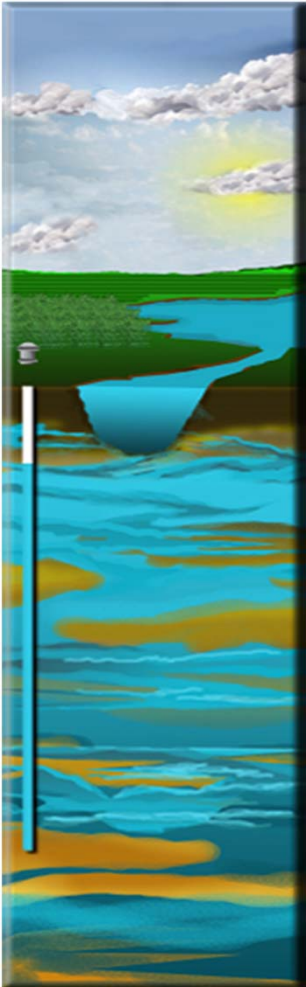
## ➤ Data Collection

- Streamgaging
- Survey
- Dam Safety Inspections
- Water Use Reporting
- Monitoring – Pump Checks



# Outline

- *Surface Water Administration Division*
- *Surface Water Permitting*
- *Surface Water Administration Process*



# Surface Water Permitting

## ➤ Application to NeDNR includes

- Priority Date
  - First in Time – First in Right
- Type of Use
  - Irrigation, Storage, Municipal, etc.
- Location of Use
  - Map of Acres Irrigated
  - Point of Diversion – Downstream Order Number
- Grant Rate of Diversion
  - based on 1 CFS (450 GPM) per 70 acres grant





# Surface Water Permitting Application Approval

- Source
- Use
- Priority Date
- Location – Map
- Construction
- Beneficial use
- Measuring device
- Annual Reports

## DEPARTMENT OF NATURAL RESOURCES

### Application Approval

#### Water Division 1-D

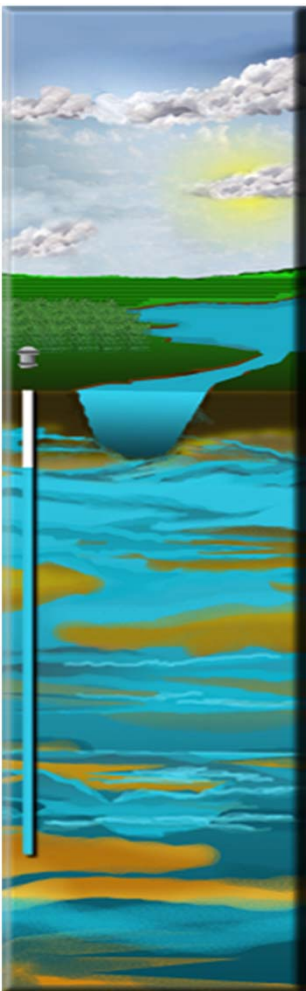
This is to certify that application A-17977 for a permit to divert water has been examined.

Following consultation with the Nebraska Game and Parks Commission, the Department finds the project will not jeopardize endangered or threatened species. Application A-17977 is hereby APPROVED subject to the following limitations, conditions and notice:

1. The source of water is Lincoln Creek.
2. The water shall be used for irrigation purposes.
3. The priority date is April 23, 2001.
4. Map No. 15970 shows the lands proposed for irrigation under this permit.
5. Construction of the diversion works must begin by November 24, 2001. The Applicant must proceed diligently with the construction unless interrupted by some unavoidable and natural cause.
6. Construction of the project must be completed by April 24, 2002.
7. The amount of water shall be limited to one-seventieth (1/70) of a cubic foot per second for each acre of land irrigated by September 1, 2003.
8. A measuring device must be installed.
9. Annual reports may be required as provided by §§ 46-261 and 61-206, R.R.S., 1943, as amended.
10. Use of water under A-17977 may be denied in order of priority when water supplies do not meet the demands of downstream appropriators.

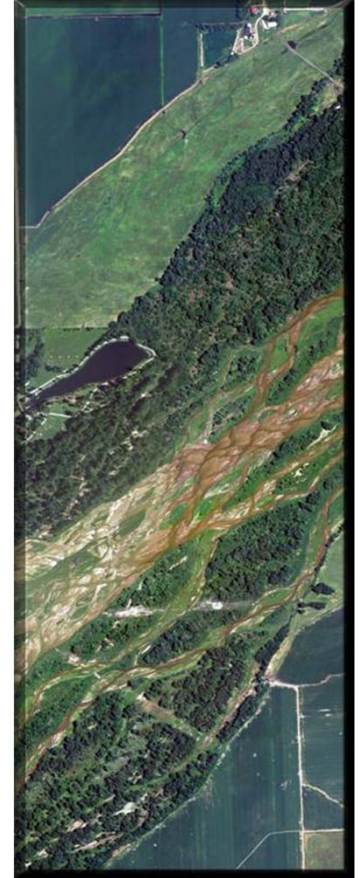
# Outline

- *Surface Water Administration Division*
- *Surface Water Permitting*
- *Surface Water Administration Process*

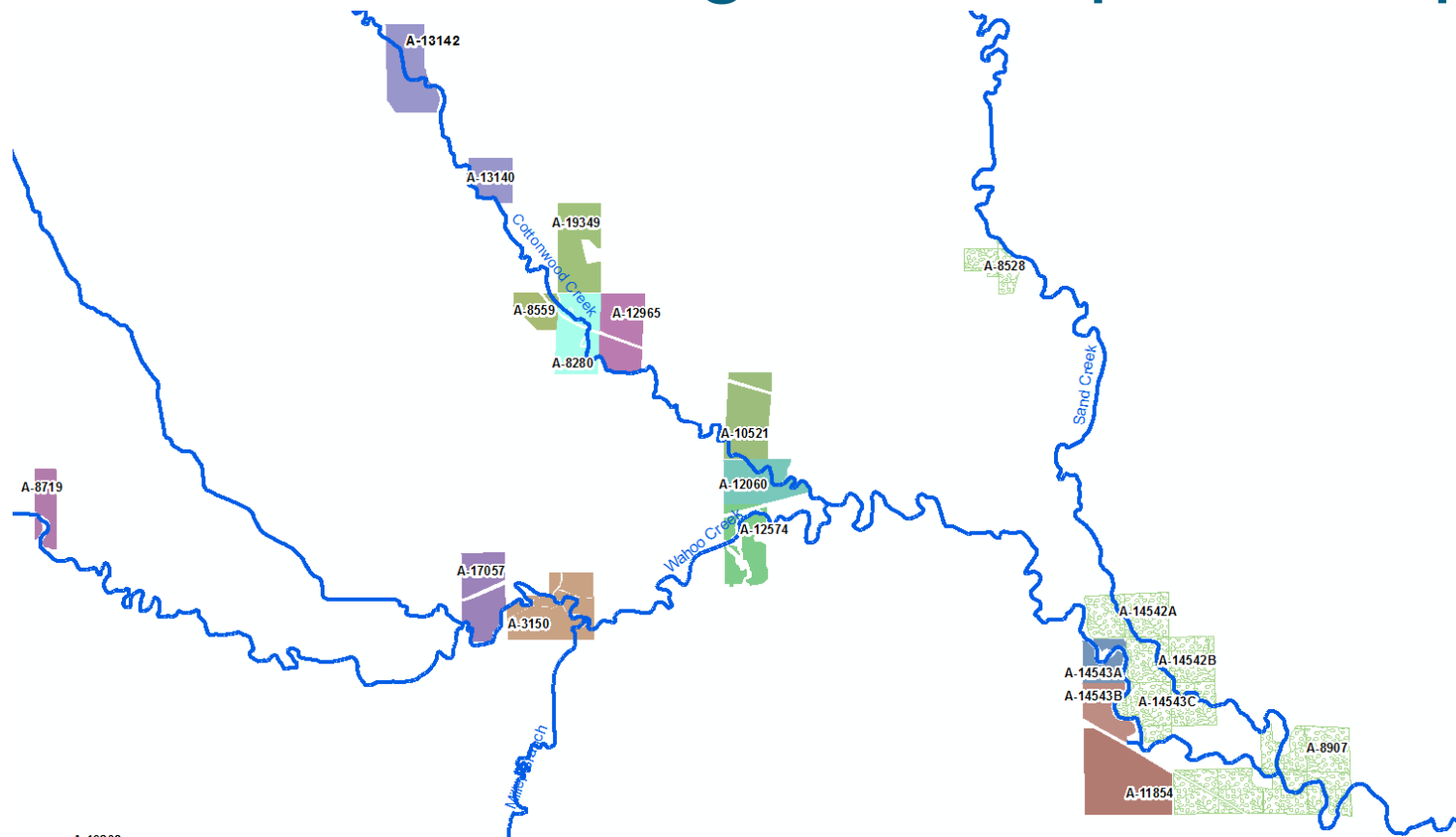


# Surface Water Administration Process

- (1) Appropriator “Calls” and requests administration.
- (2) NeDNR Staff are sent to the site to make a streamflow measurement to verify shortage.
  - If sufficient water was measured at the point of the call, no action is taken. It is the duty of the appropriator to make use of the available supply
  - If there is NOT enough water at the point of the call, Field Office Personnel begin reconnaissance of the basin upstream of the point of call.



# Surface Water Rights Compiled Map





# Water Administration Process.... Continued

## ➤ (3) Take Action

- Close all storage appropriations above the point of the CALL
- Begin closing junior appropriators upstream from the CALL in reverse order of priority to ensure the permitted grant is available at the point of the CALL
- Check on the rate of diversion of senior appropriators and set pumping schedules if they are pumping at a rate greater than their grant.

# Water Administration Process.... Continued

## ➤ (4) Monitor

- Monitor daily the point of the “CALL” to ensure that no more than the permitted grant is allowed to pass.
- Monitor other diversions upstream and downstream from the “CALL”
- Stream gages
- Weather



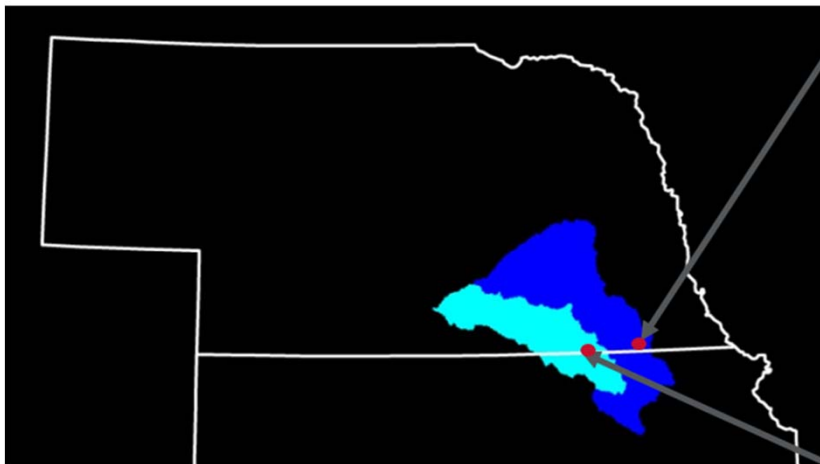
- (5) As excess water becomes available, the next oldest appropriations are opened, and allowed to pump.
- (6) When and If the CALL is satisfied, then all junior appropriators and storage appropriations will be opened

# Blue River Compact

- Established by Congress in 1972
- November 1, 1968 Priority Date
- Promotes good relations between Nebraska and Kansas on water issues.
- Promotes orderly development of the Big Blue River Basin between Kansas and Nebraska and works to divide its waters fairly
- Encourages ongoing programs to stop water pollution in the two states and to reduce natural and man-made pollution of the Big Blue River Basin

# Blue River Compact Water Administration

*Blue River Compact – 11/01/1968*



## Big Blue River

May .....	45 cfs
June .....	45 cfs
July .....	80 cfs
August .....	90 cfs
September .. ...	65 cfs

## Little Blue River

May .....	45 cfs
June .....	45 cfs
July .....	75 cfs
August .....	80 cfs
September .....	60 cfs

## Blue River Compact

*1.8 The term "natural flow" means that portion of the flow in a natural stream that consists of direct runoff from precipitation on the land surface, ground-water infiltration to the stream, return flows to the natural stream from municipal, agricultural, or other uses, and releases from storage for no designated beneficial use;*

*5.2 (4) Regulate, in the same manner that diversion of natural flows is regulated, withdrawals of water from irrigation wells installed after November 1, 1968, except equivalent wells drilled to replace wells installed before that date, in the alluvium and valley side terrace deposits within one mile from the thread of the river and between the mouth of Walnut creek and the Kansas-Nebraska state line on the Little Blue river.*



# Blue River Compact Water Administration

Year	Days Closed for the Blue River Compact in the Big Blue River Basin
2002	8*
2003	19
2004	
2005	6
2006	25
2007	
2008	
2009	
2010	
2011	
2012	83
2013	37
2014	14
2015	
2016	
2017	
2018	

\* 2002 was the first year for Administering for the Blue River Compact since it was signed, DNR worked with Lower Big Blue NRD to release Storage water from reservoirs to keep flows at Barneston over targets for an additional 10 days.

# Differences between Groundwater and Surface Water

- Number of surface water appropriations vs registered groundwater irrigation wells

Upper Big Blue NRD	SW Irrigation Appropriations (Priority Date) (Active)	GW Irrigation Wells (Completion Date) (Active)
Through 12/31/1949	60	238
1/1/1950 - 12/31/1959	93	2,464
1/1/1960 - 12/31/1969	55	1,942
1/1/1970 - 12/31/1979	109	3,055
1/1/1980 - 12/31/1989	24	857
1/1/1990 - 12/31/1999	14	953
1/1/2000 - 12/31/2009	18	1,490
1/1/2010 - Present	10	1,325
Total	383	12,324

Acres

18,261

1,200,000

1.5% of irrigated acres in the Upper Big Blue NRD are irrigated with Surface Water

# Differences between Groundwater and Surface Water

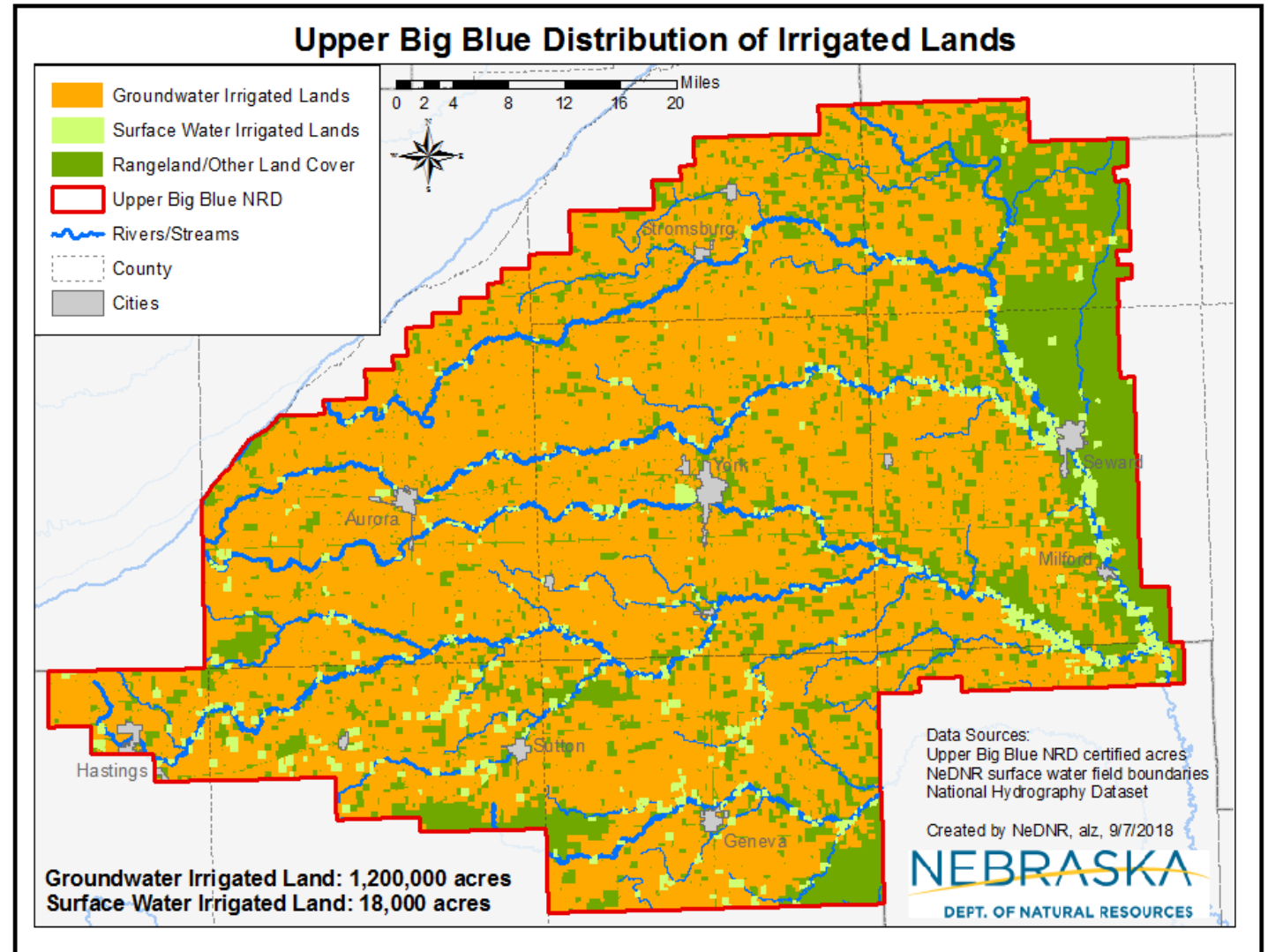
## ➤ Groundwater - NRD

- Correlative Rights Doctrine - “Rule of Reasonable Use”
- Supply dependent on aquifer storage capacity
- If supply is insufficient, all users can be put on an allocation
- Certified Acres

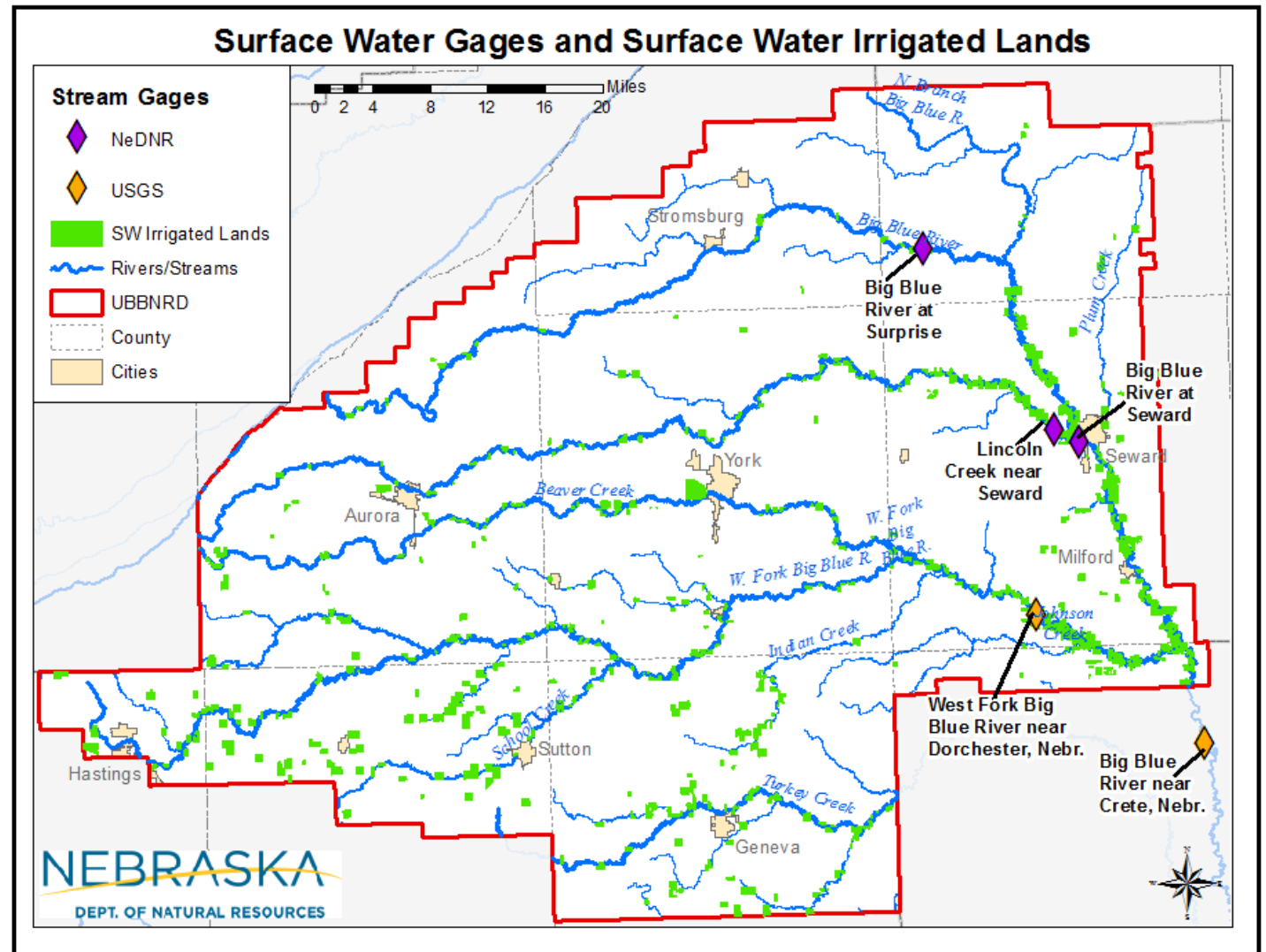
## ➤ Surface Water - NeDNR

- Prior Appropriation Doctrine - “First-in-time, First-in-Right”
- Supply dependent upon precipitation and groundwater base flow
- If the supply is insufficient, junior appropriators are denied water.
- “Approved Map” – Sets limit on Acres, Location, and the “Grant”

# Distribution of Groundwater and Surface Water Irrigated Lands



# Surface Water Monitoring Stream Gages





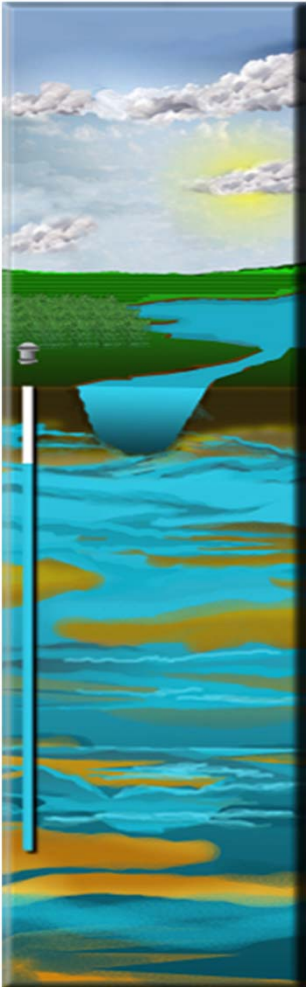


# INTEGRATED WATER QUANTITY MANAGEMENT

Jennifer J. Schellpeper  
Water Planning Division Manager  
Nebraska Department of Natural Resources

# Outline

- *INSIGHT Analysis*
- *Stream Depletions*
- *Joint Groundwater Modeling*



# INTEGRATED MANAGEMENT PLANNING - SUMMARY

## IMPLEMENTATION

Water Management  
Projects

Strategic Planning Actions

## PLANNING AND PUBLIC PARTICIPATION

Goals and Objectives  
for Water Planning

Stakeholder Involvement

Water Availability and  
Water Shortages

Water Supplies and Water Uses

## SCIENCE

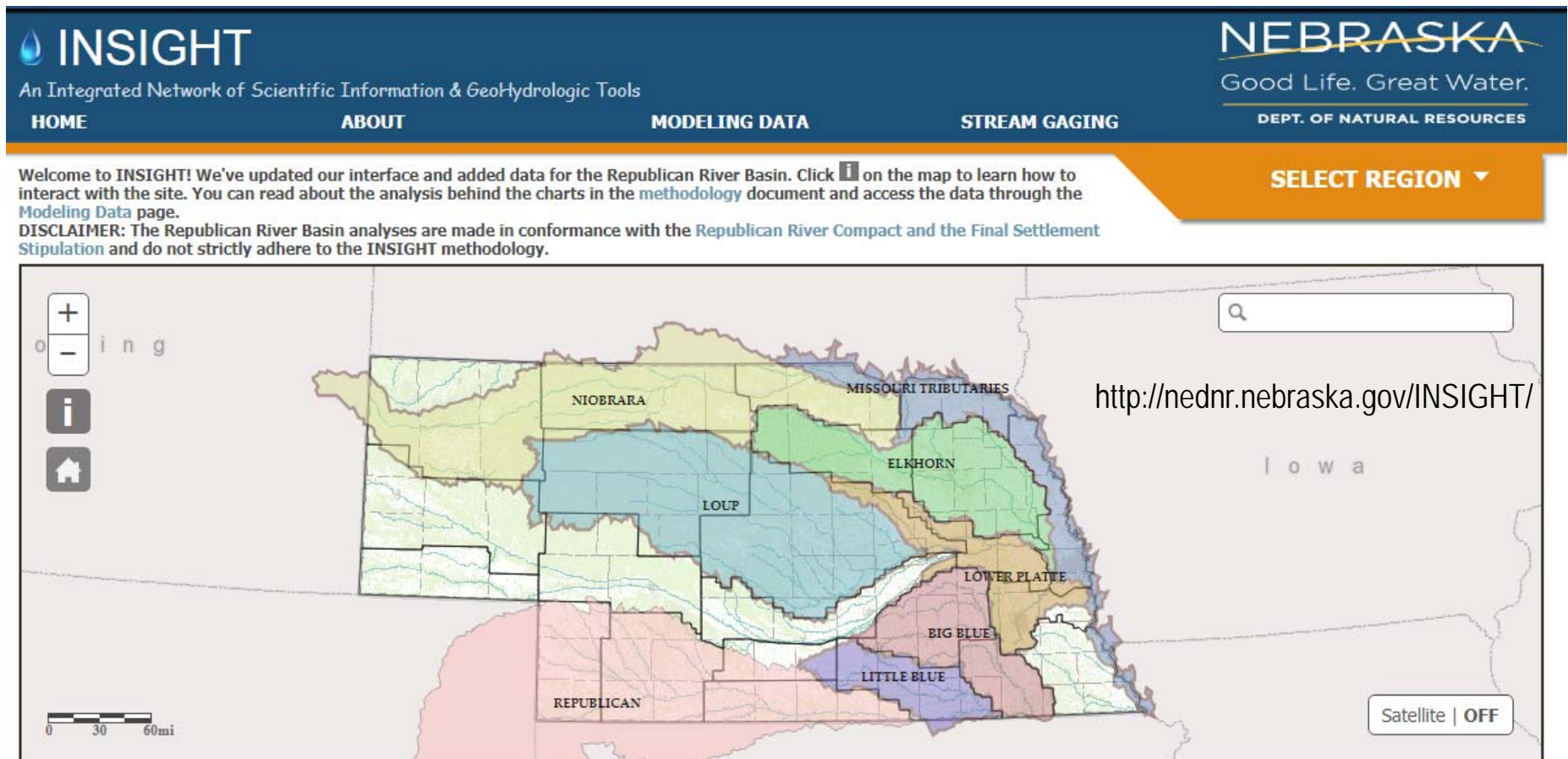
Hydrologic Models, Data, and Analyses



- Surface water and groundwater management
- Jointly developed between NRD and NeDNR
- Protects existing users
- Adaptive management
- Suited to local conditions
- Proactive

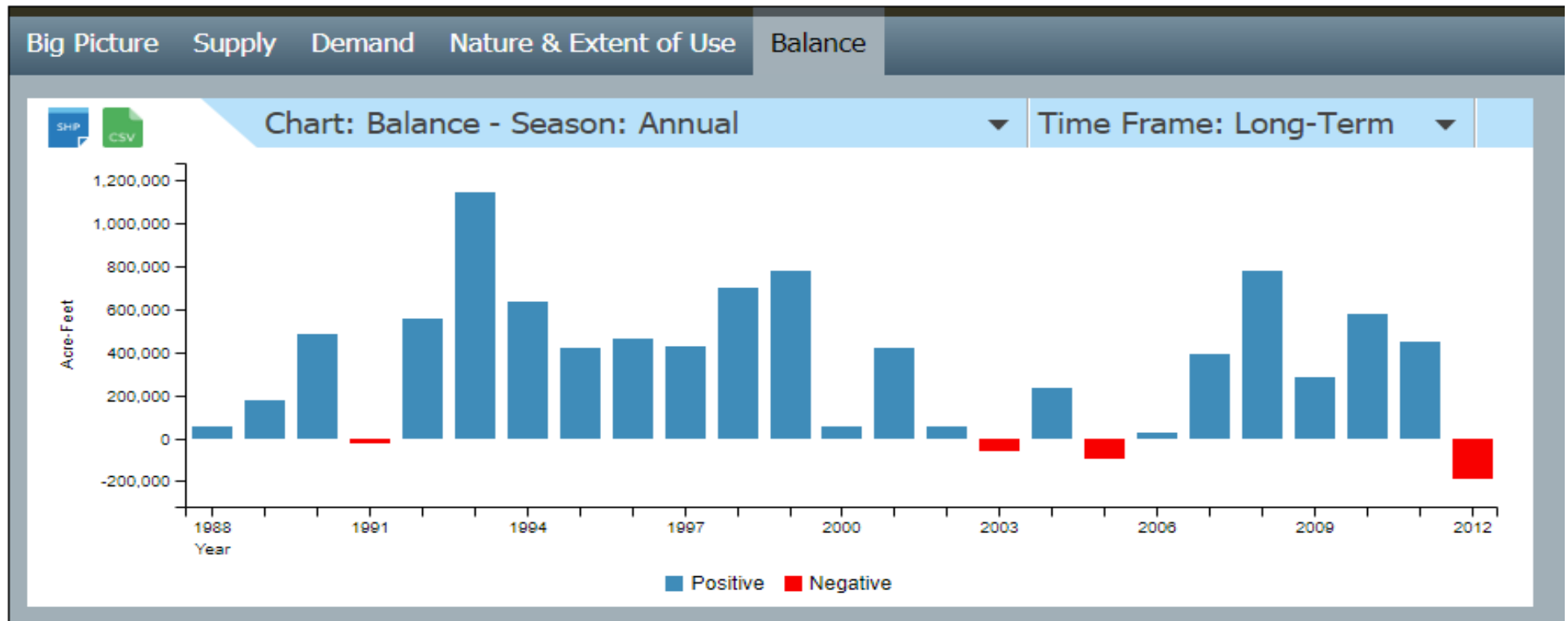


# INSIGHT: Water Supplies, Uses and Balance





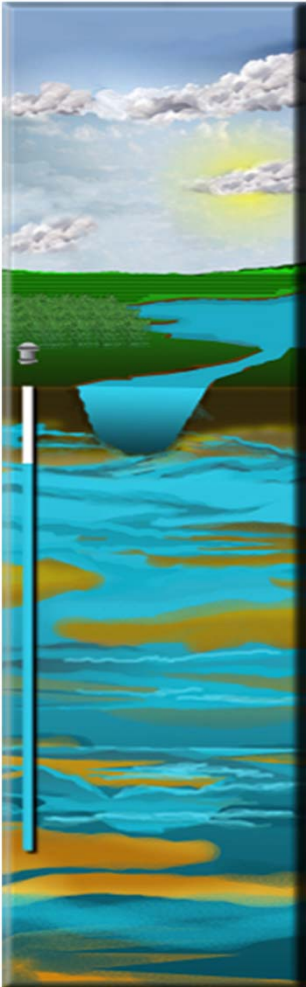
# INSIGHT: Water Supplies, Uses, and Balance





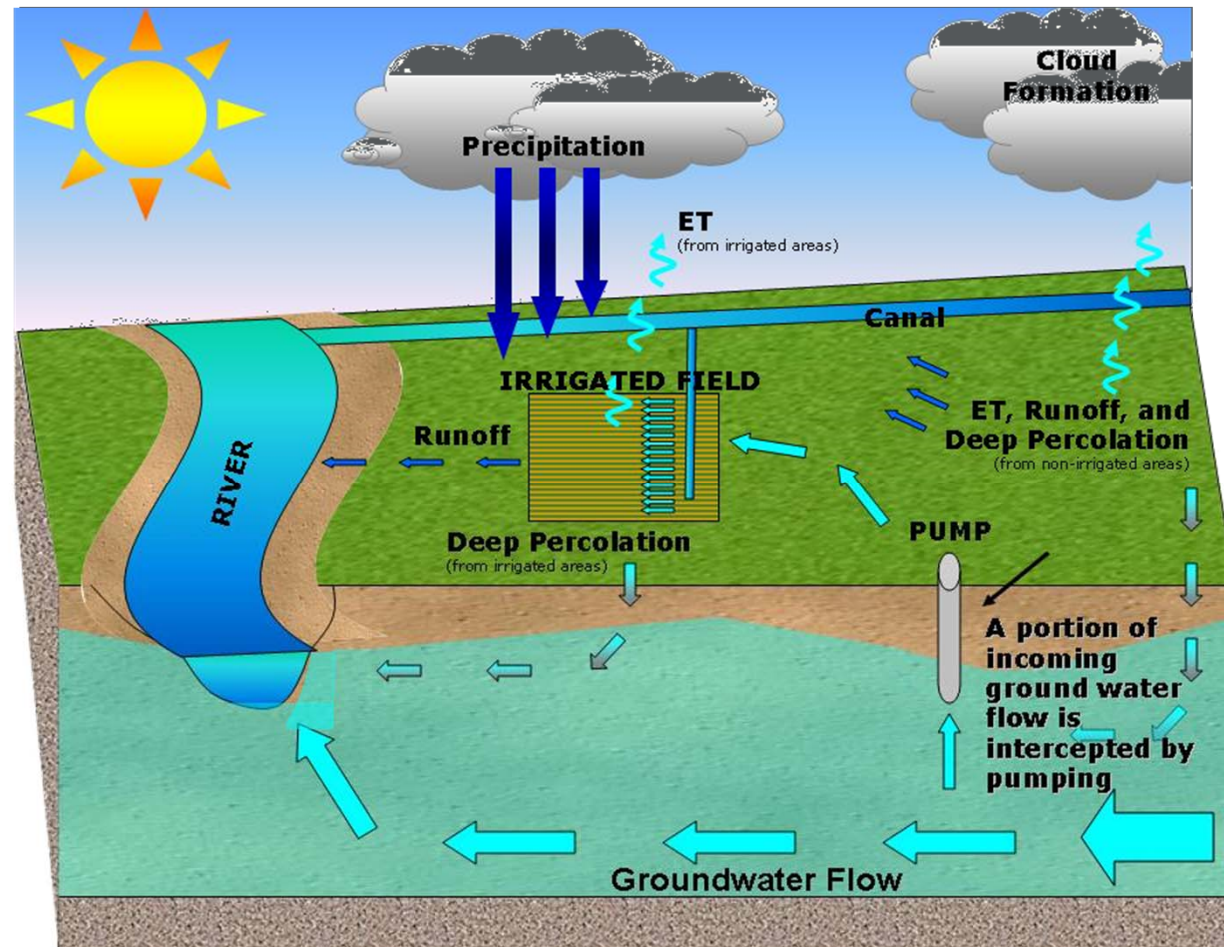
# Outline

- *INSIGHT Analysis*
- *Stream Depletions*
- *Joint Groundwater Modeling*



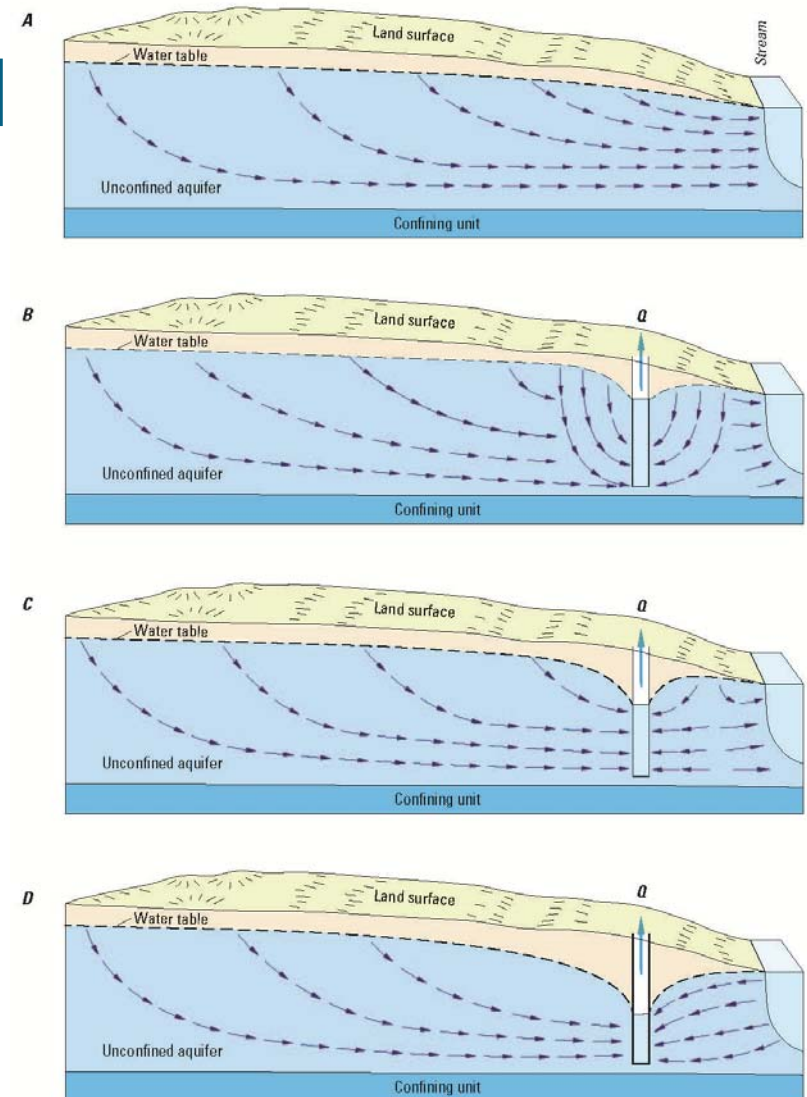
# STREAM DEPLETIONS 101

- Typical elements of ground and surface water budgets



# 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

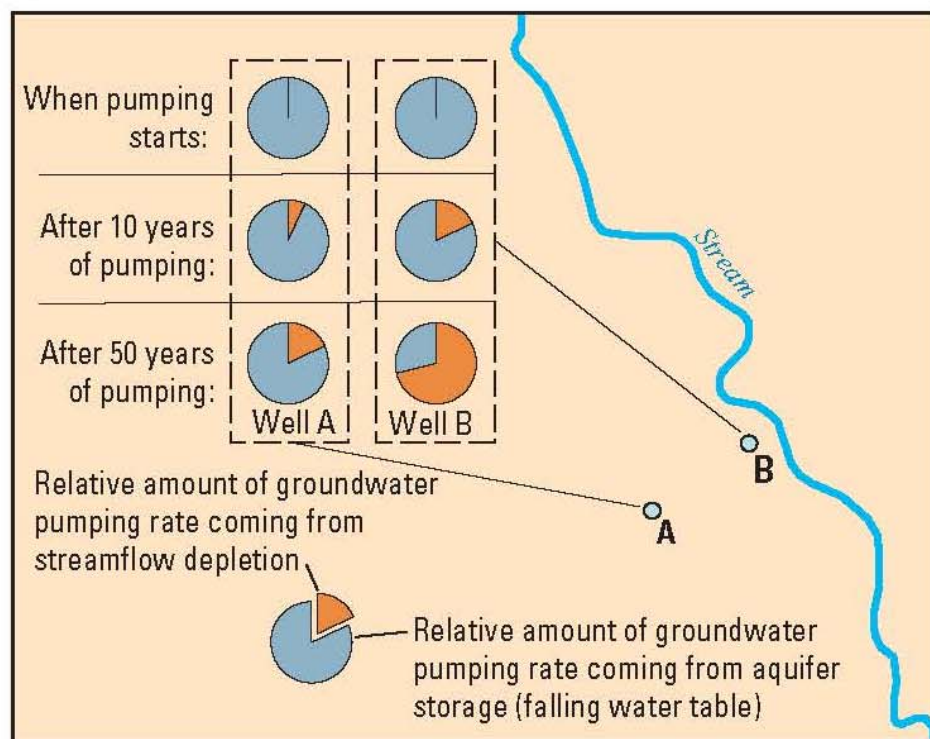


# STREAM DEPLETIONS 101

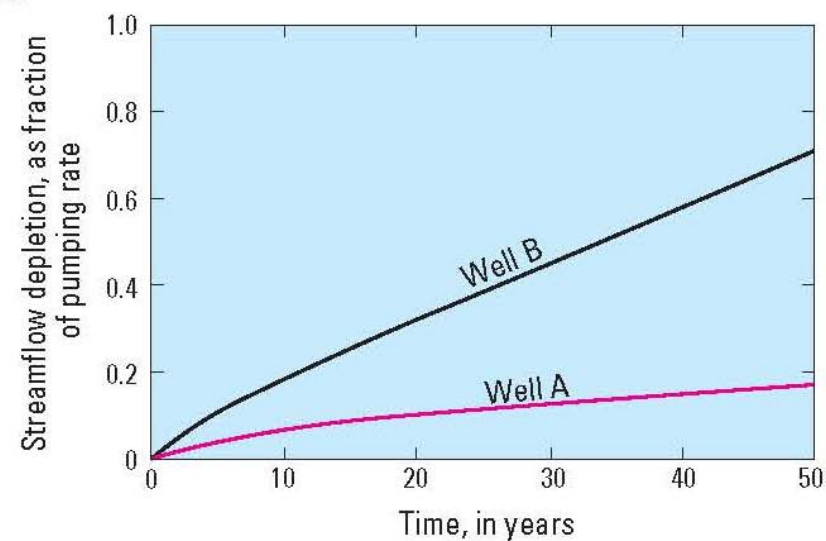
- Factors that affect timing, rates, and locations of streamflow depletion:
  - Geology and hydraulic properties of aquifer
  - Aquifer size/volume
  - Geometry of the surface water streams
  - Well location (vertical and horizontal distance from streams)
  - Pumping rates and operational characteristics

# STREAM DEPLETIONS 101

**A**



**B**



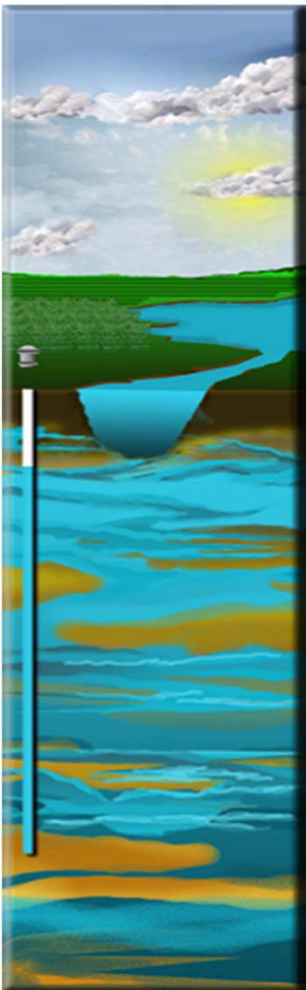


# STREAM DEPLETIONS SUMMARY

- 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

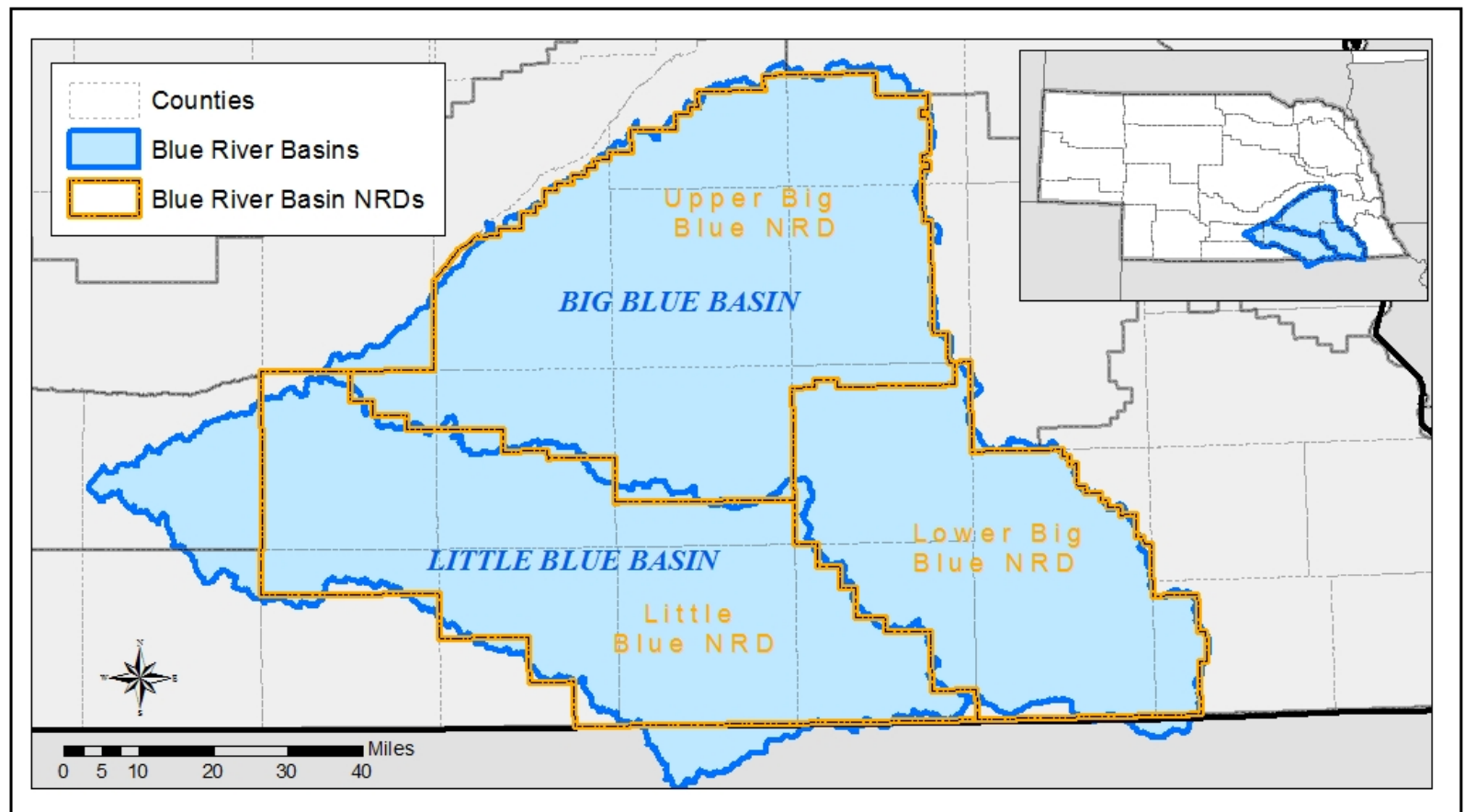
# Outline

- *INSIGHT Analysis*
- *Stream Depletions*
- *Joint Groundwater Modeling*



# Current Joint Groundwater Modeling Efforts

- Began work in fall of 2017
- Blue Basin NRDs (4)
- Multi-purpose model



## Questions?

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