

Integrated Water Management:

Implementing Nebraska's Water Policies

for

Integrated Surface Water / Groundwater Management

State of Nebraska, USA

Expert Consultation on Consumption Based Water Management

Beijing China, October 2019

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Water Planning Division Manager

NEBRASKA

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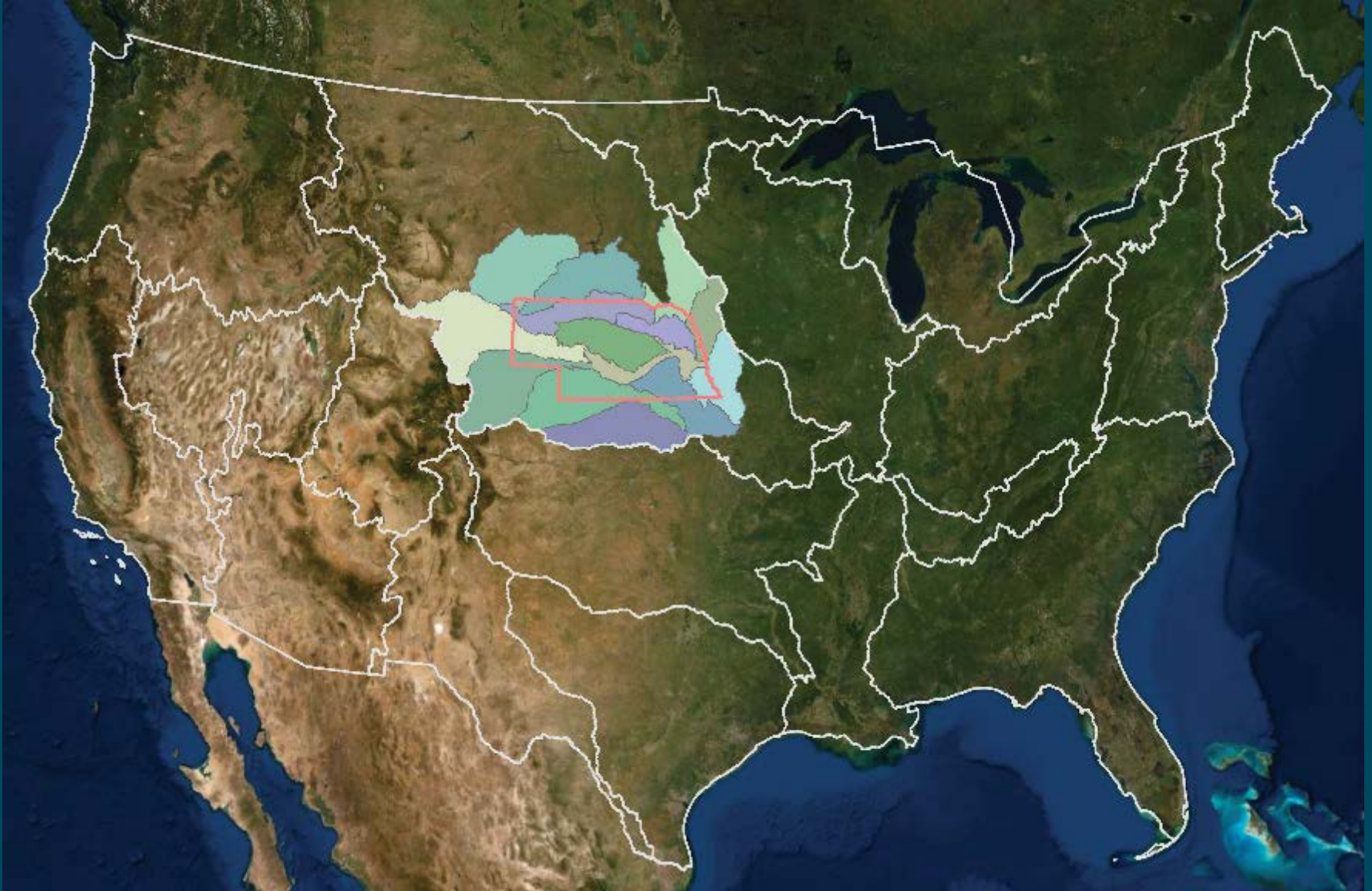
DEPT. OF NATURAL RESOURCES

Overview

- Resource Conditions
- Governance of Water
 - History
 - Legislative Toolbox Highlights
 - Clearly Defined Boundaries
 - Nested Tiers of Governance
 - Planning Process
 - Science Foundation
 - Stakeholder Engagement
 - Implementation and Monitoring
 - Conclusions



Location: Nebraska, United States



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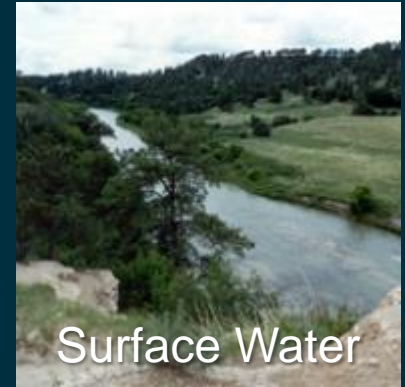
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Providing the sound science and support for managing Nebraska's most precious resource



Water Planning
and Integrated
Management



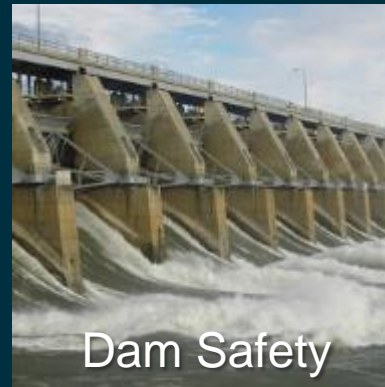
Surface Water



Groundwater



Floodplain
Management

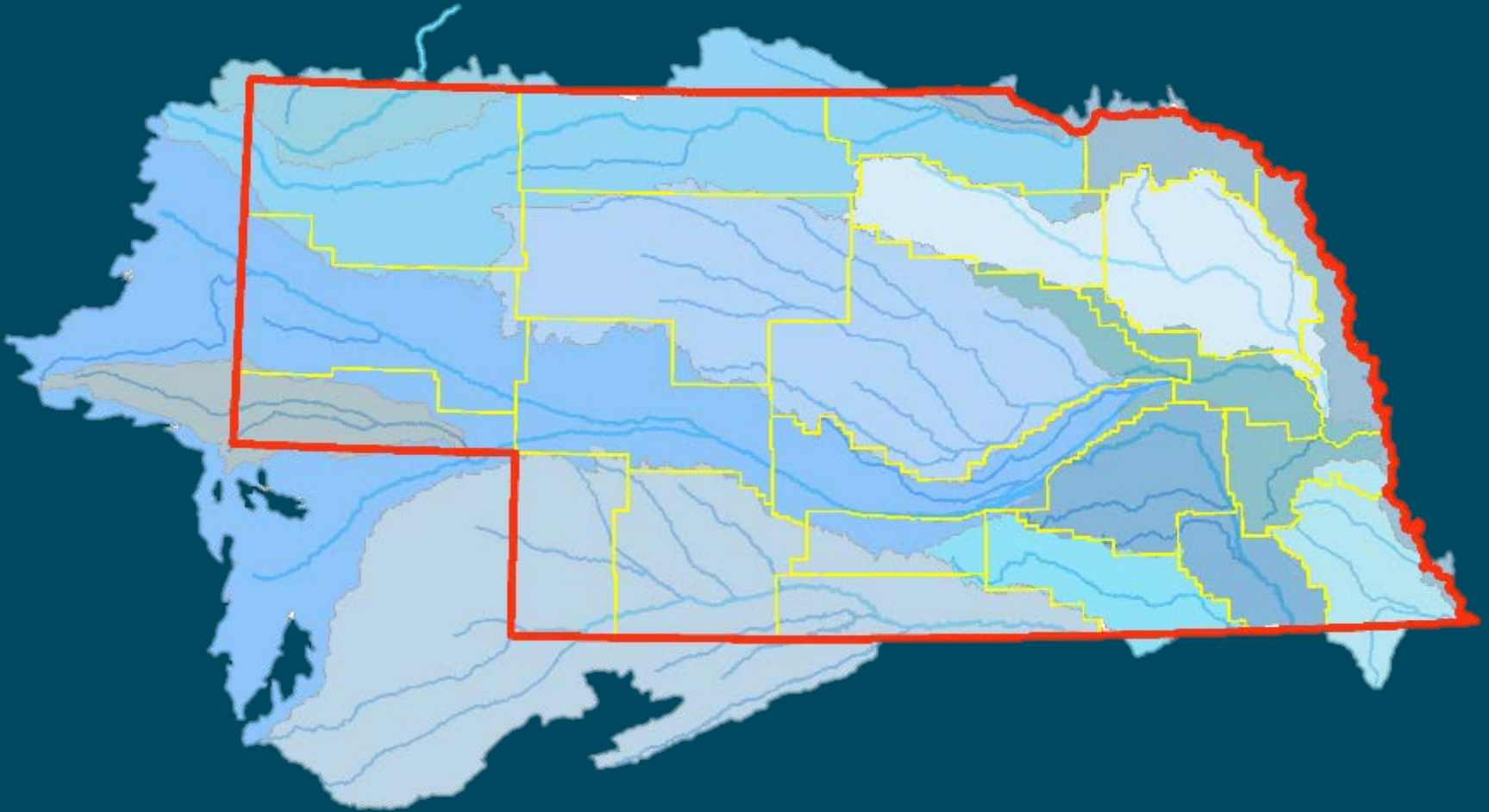


Dam Safety



Field Offices

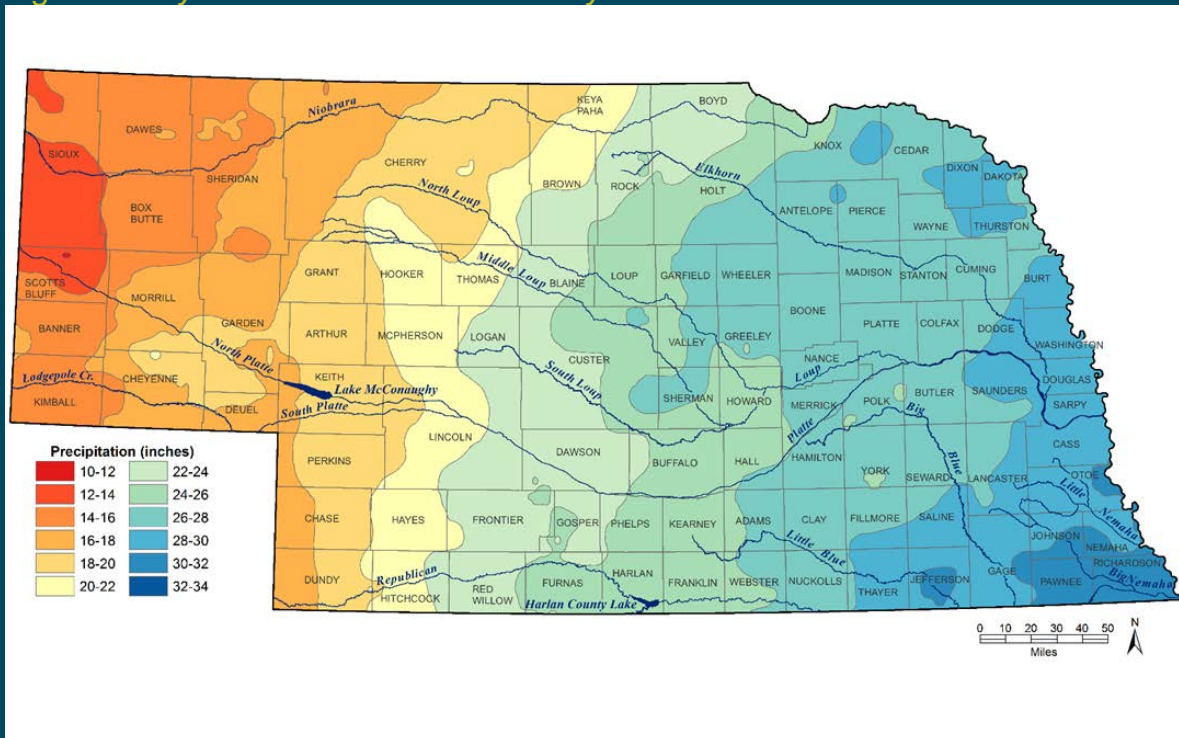
Nebraska River Basins and Natural Resource District Management Boundaries



Resource Conditions - Rainfall

Average Annual Precipitation in Nebraska (2000-2009)

Figure courtesy of UNL's Conservation and Survey Division

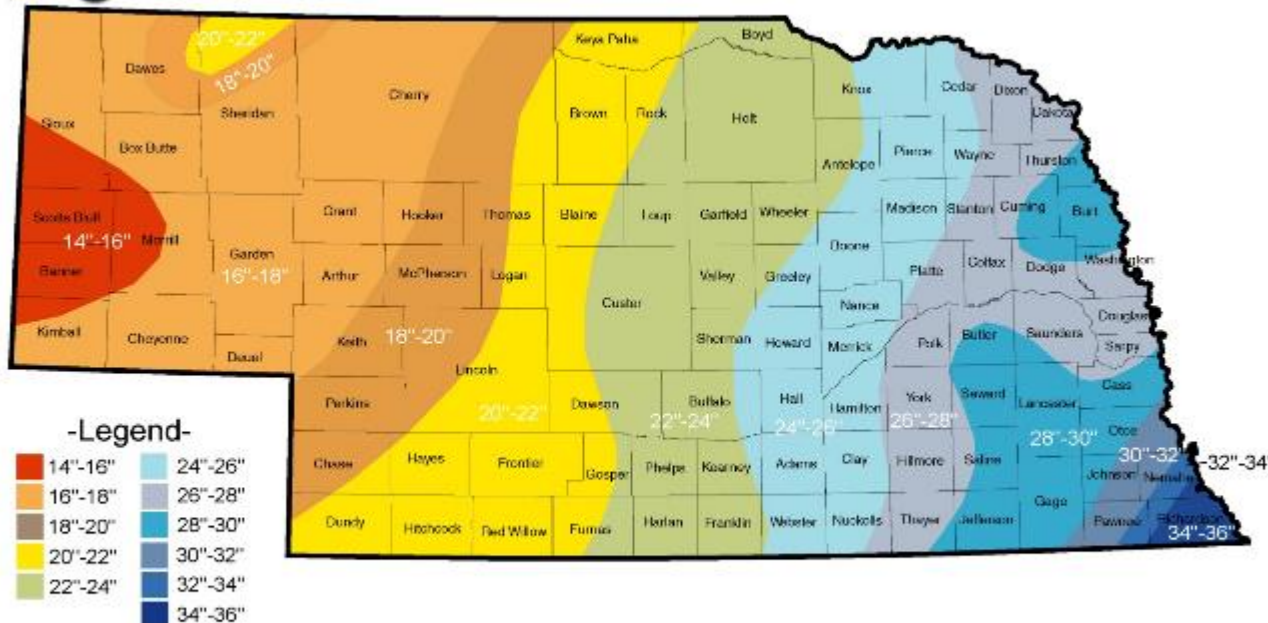


- 10 to 34 inches of rainfall
- Uncertainty in annual availability

Resource Conditions - Rainfall



Mean Annual Precipitation (in inches) From 1900-1979



- 14 to 36 inches of rainfall
- Uncertainty in annual availability



Resource Conditions - Streamflow

Average Annual Precipitation

86,000,000 Acre feet

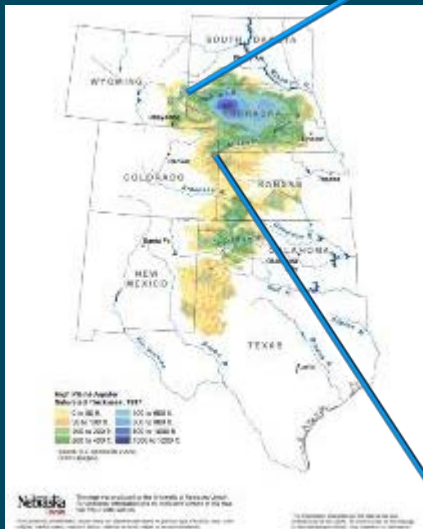
Average Annual Streamflow

Total Flow In = 1,000,000 Acre-feet

Total Flowing Out = 7,100,000 Acre-feet

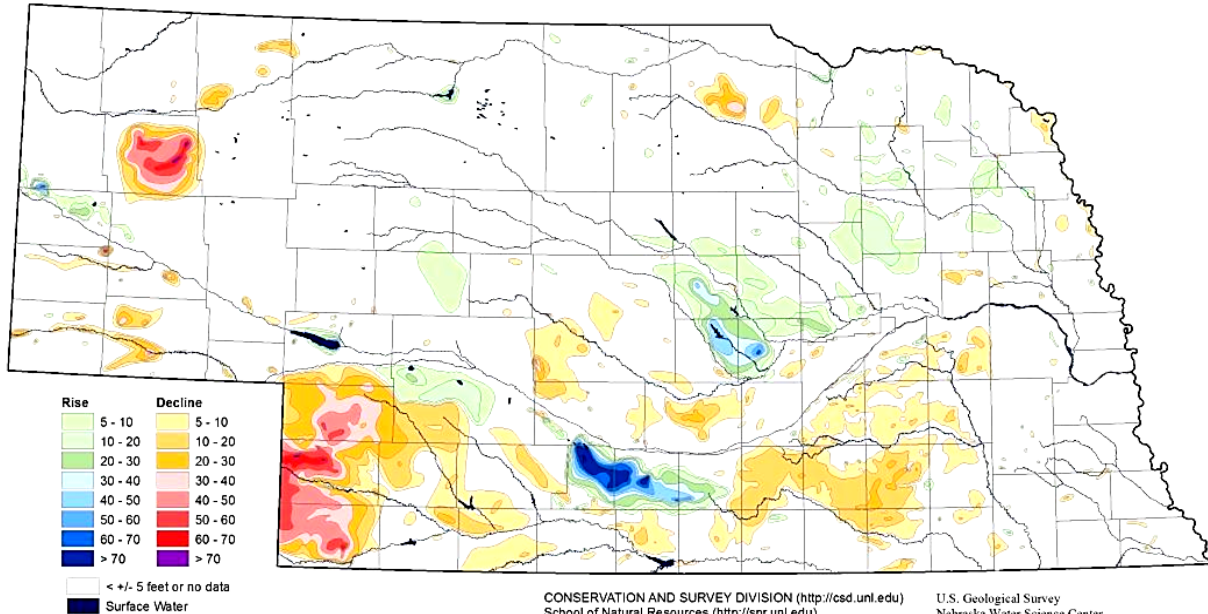


Resource Conditions - Groundwater



Resource Conditions - Groundwater

Groundwater-level Changes in Nebraska - Predevelopment to Spring 2009



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

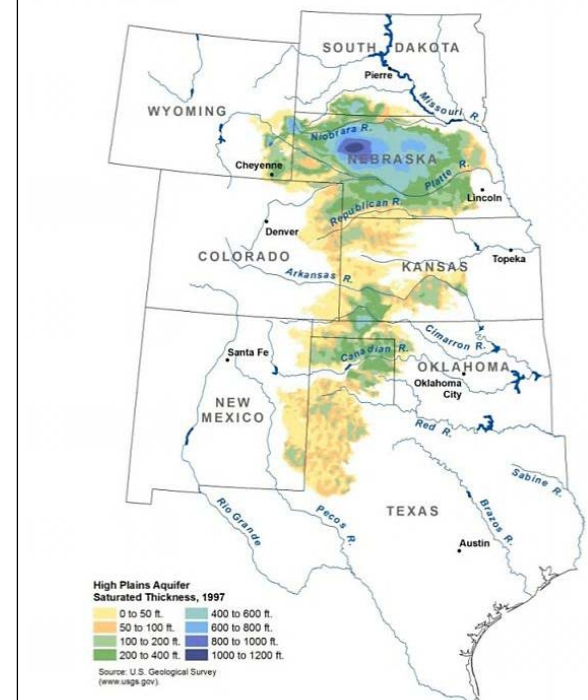
Jesse Korus, Groundwater Resources Coordinator, CSD
 Mark Burbach, Water Levels Program Supervisor, CSD

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



This map was produced by the University of Nebraska-Lincoln. For additional information and an interactive version of this map visit <http://water.unl.edu>

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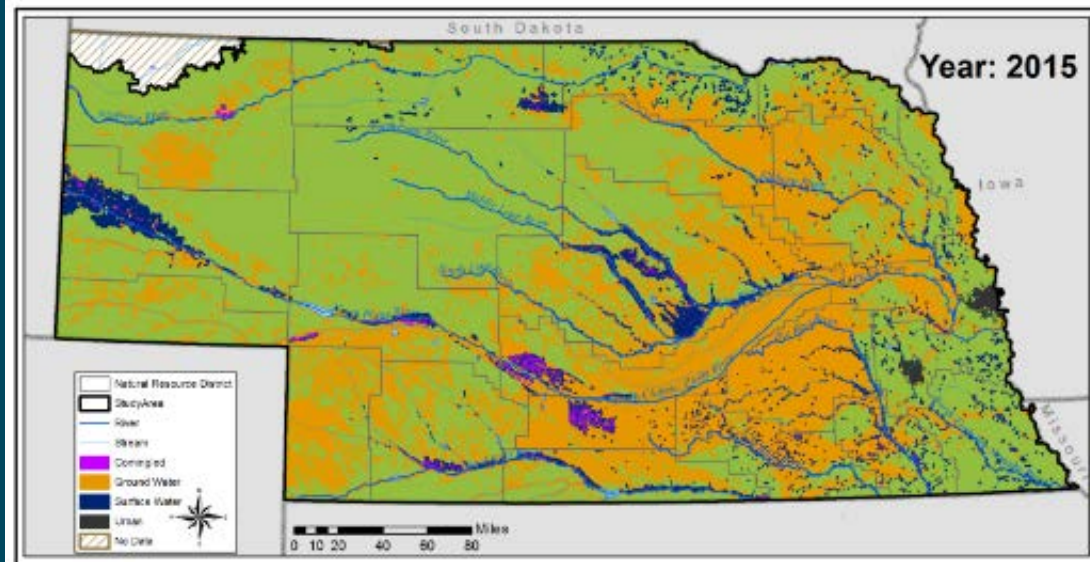
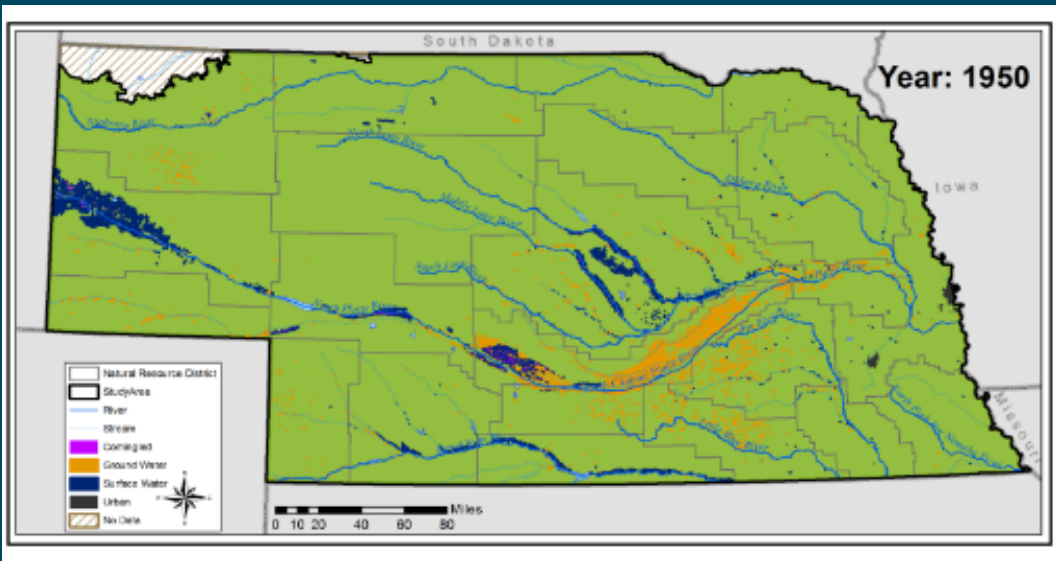
The information presented on this map is the best available as of July 2008. To order a copy of this map go to water.unl.edu. Any questions or comments

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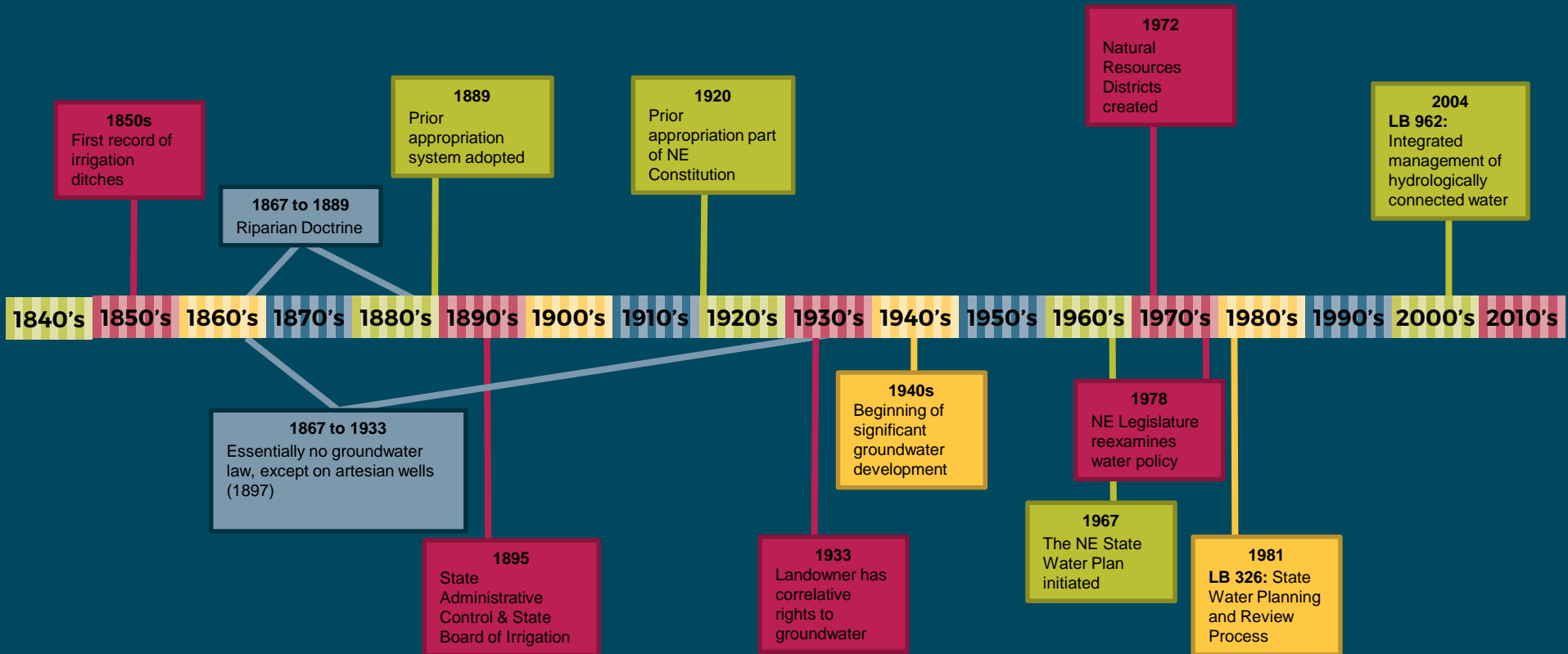
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September 2009

Resource Conditions - Irrigation Development



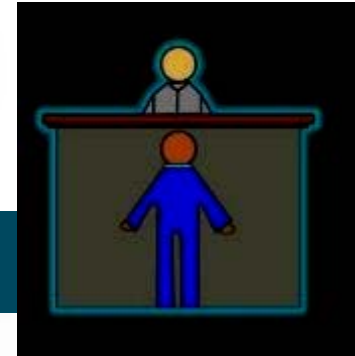
Governance of Water - History



Governance of Water – History

NE Water Policy Task Force

- Created in 2002 by the Nebraska Legislature
 - Consensus-based decision-making process
 - Evaluate law governing integrated water management
 - Inter- and intra- state lawsuits
- Developed LB962 (2004)
 - Recognized hydrologic connection of surface and groundwater
 - Established joint planning process (IMPs)
 - Goal to sustain a balance between water use and water supply
 - Use best available science



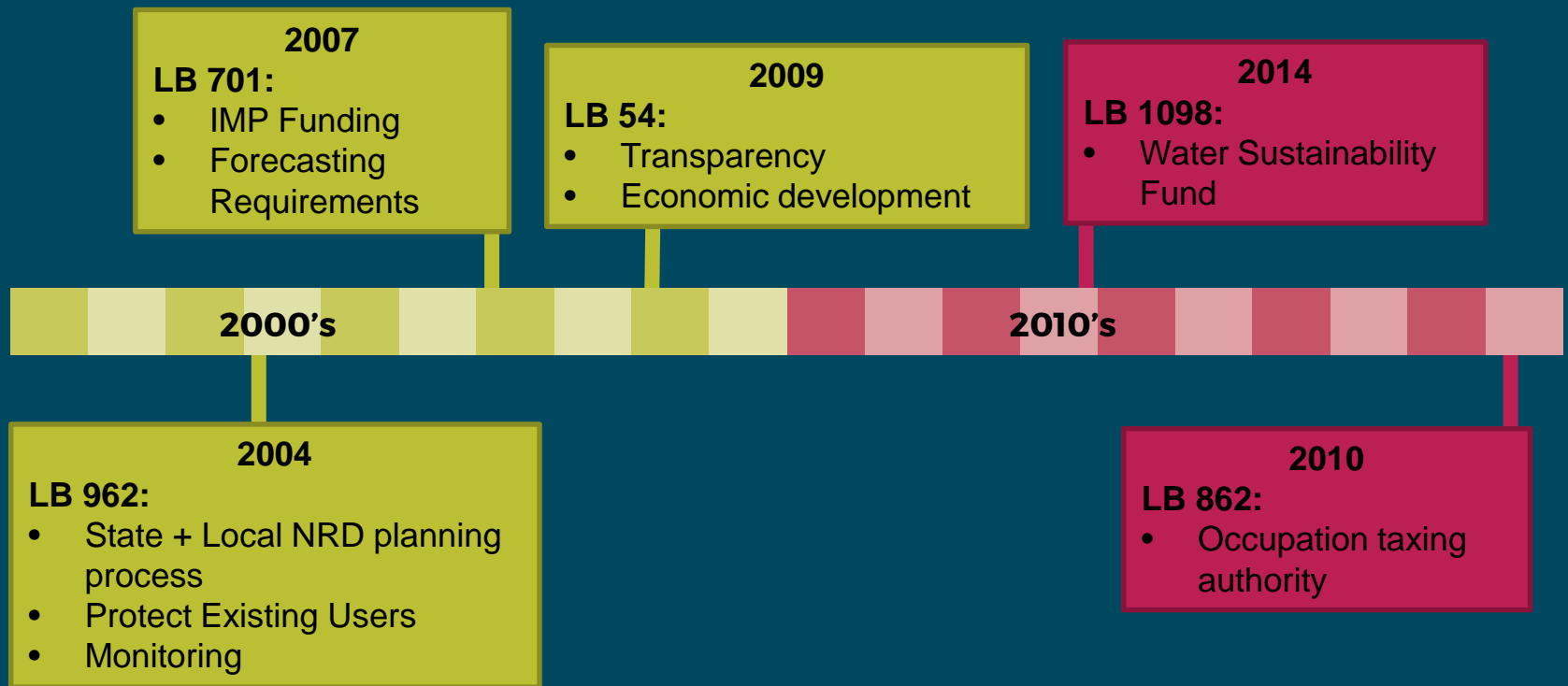
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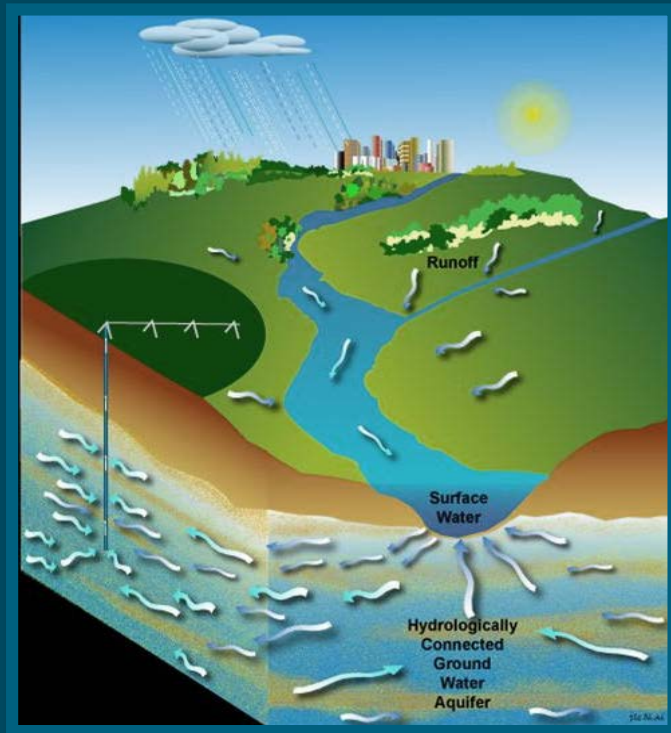
Governance of Water – History

Additional Tools



Governance of Water – Current Setting

Integrated Water Management



Surface Water

- Regulated by NeDNR
- Prior appropriations
- First in time is first in right



Groundwater

- Regulated by NRDs
- Correlative rights
- Share and share alike

Governance of Water – Legislative Toolbox

Elinor Ostrom's Principles for Managing a Commons

Nebraska Water Planning

Clear boundaries ✓ Defined Acres, Defined Allocations, Defined Resource Areas, Defined Authorities

✓ Local Natural Resources Districts

Rules match local needs and conditions ✓ Stakeholder Participation

Affected user participate in rule making ✓ Stakeholders Participation

Local rules respected by outside authorities ✓ Local Natural Resources Districts

Member system to monitor ✓ Monitoring (Local, State, Federal)

Graduated sanctions for violators ✓ Phase I, II, and III areas

Accessible dispute resolution ✓ Dispute resolution process optional

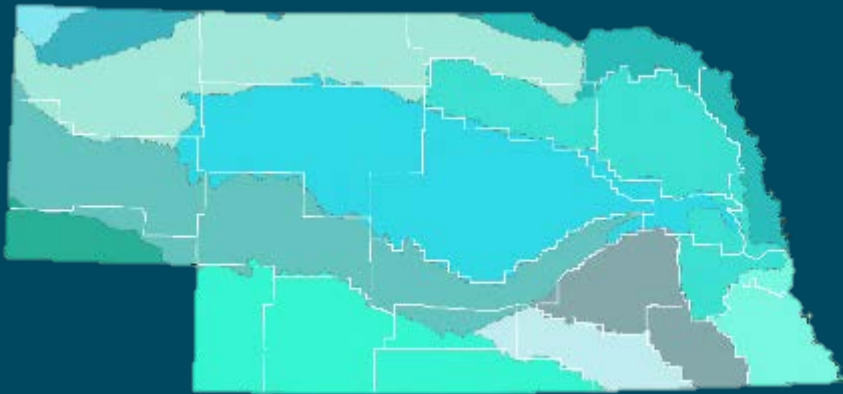
Nested tiers of governing responsibility ✓ Nested tiers (NRD, State, Federal)

Effective communication & trust ✓ Trust and communication (Leadership)

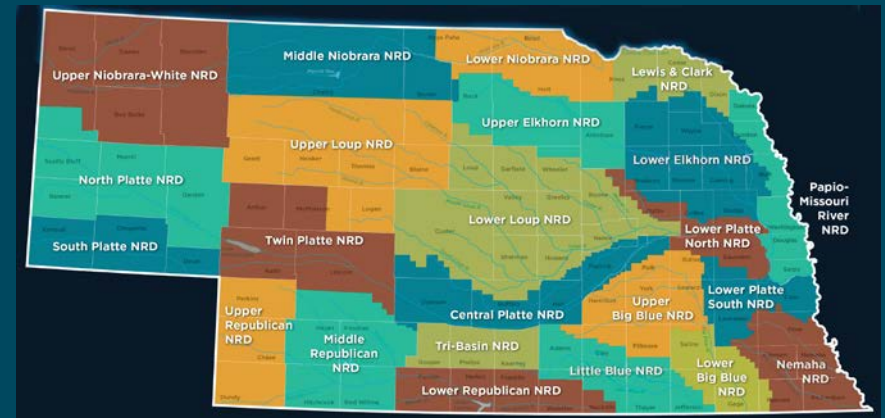
Toolbox – Clear Boundaries

Local Control and Resource Areas

State Surface Water Administrative Areas



Local Natural Resources Districts



Statute 46-715(2)(b): IMP must contain a map clearly delineating the geographic area subject to the integrated management plan

Toolbox – Clear Boundaries

Authorized Users

- Certification of Use
 - Surface Water Permits

Basin	SW Irrigation Permits	Irrigated Acres	Other Permits	Other Use Majority
Republican FA	429	107,900	215	storage
Upper Niobrara FA	454	58,500	176	storage
Upper Platte OA	464	434,000	185	storage

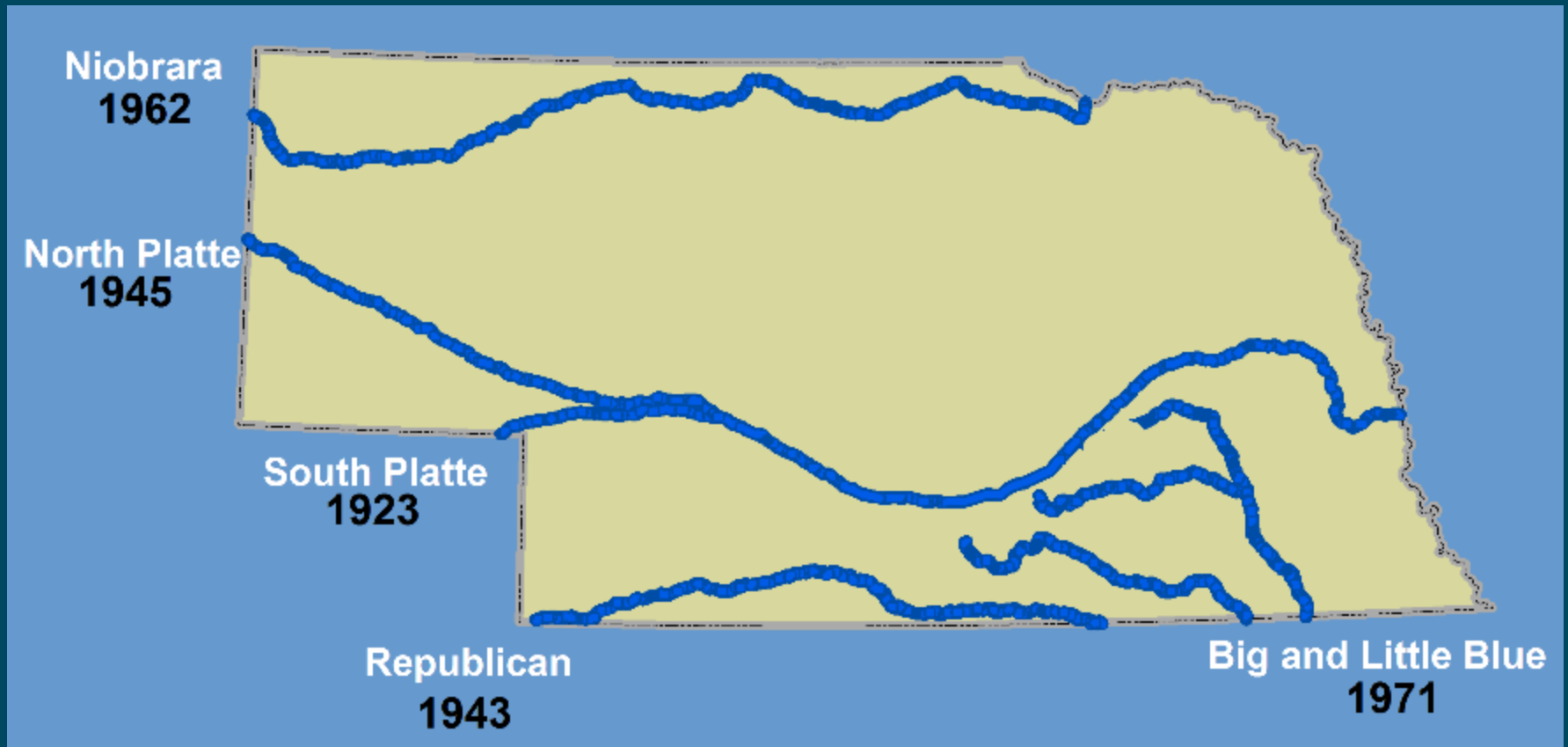
- Certified Groundwater Acres

Basin	Total Irrigation Wells	Irrigated Acres	Other Wells	Other Use Majority
Republican FA	9,800	1,021,500	5,500	Domestic, monitoring, livestock
Upper Niobrara FA	1,500	179,400	6,800	Injection, monitoring, recovery, livestock
Upper Platte OA	11,500	1,068,300	13,000	Domestic, monitoring, livestock

Toolbox – Nested Governing Tiers

Interstate Agreements

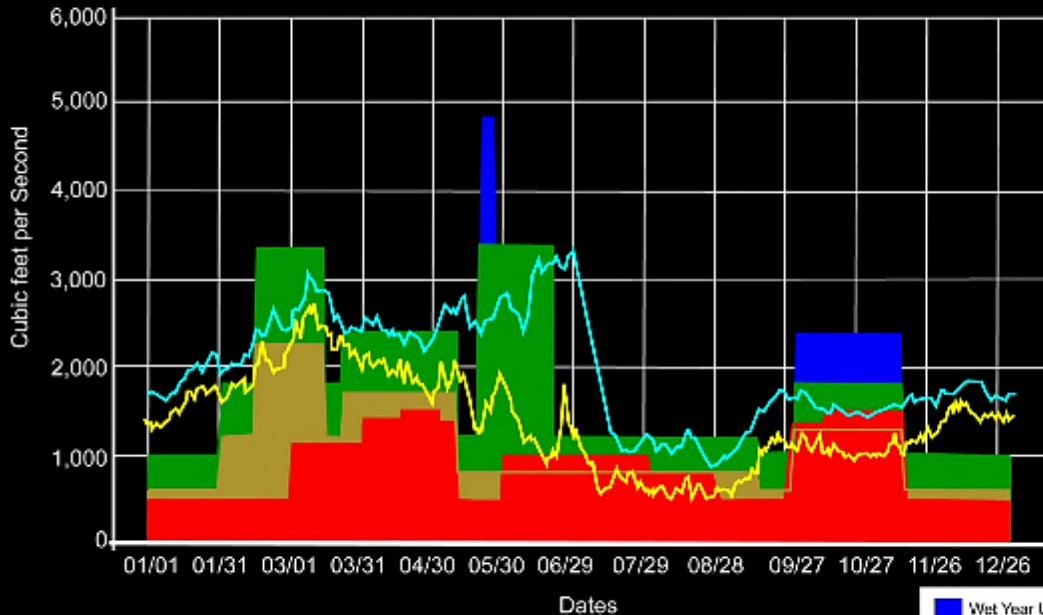
Statute 46-715(4)(b): IMPs must keep the State in compliance with Interstate Agreements, Compacts, Decrees



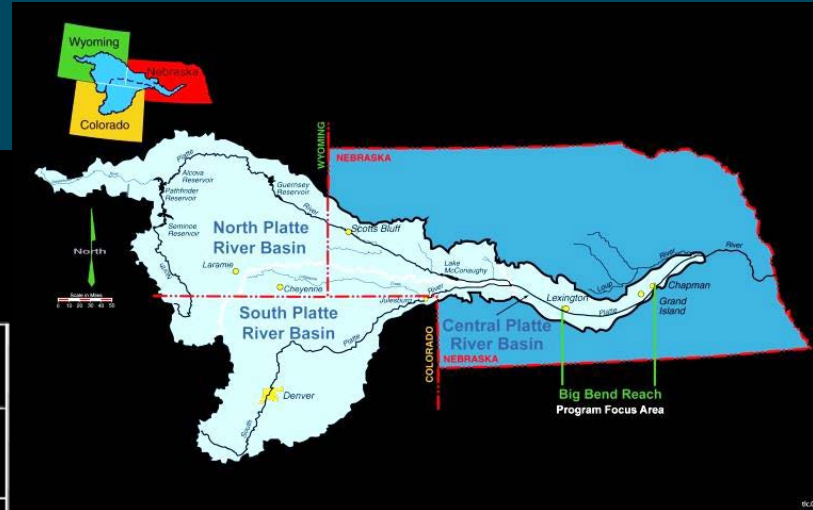
Toolbox – Nested Governing Tiers

Interstate Agreement – Platte River

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

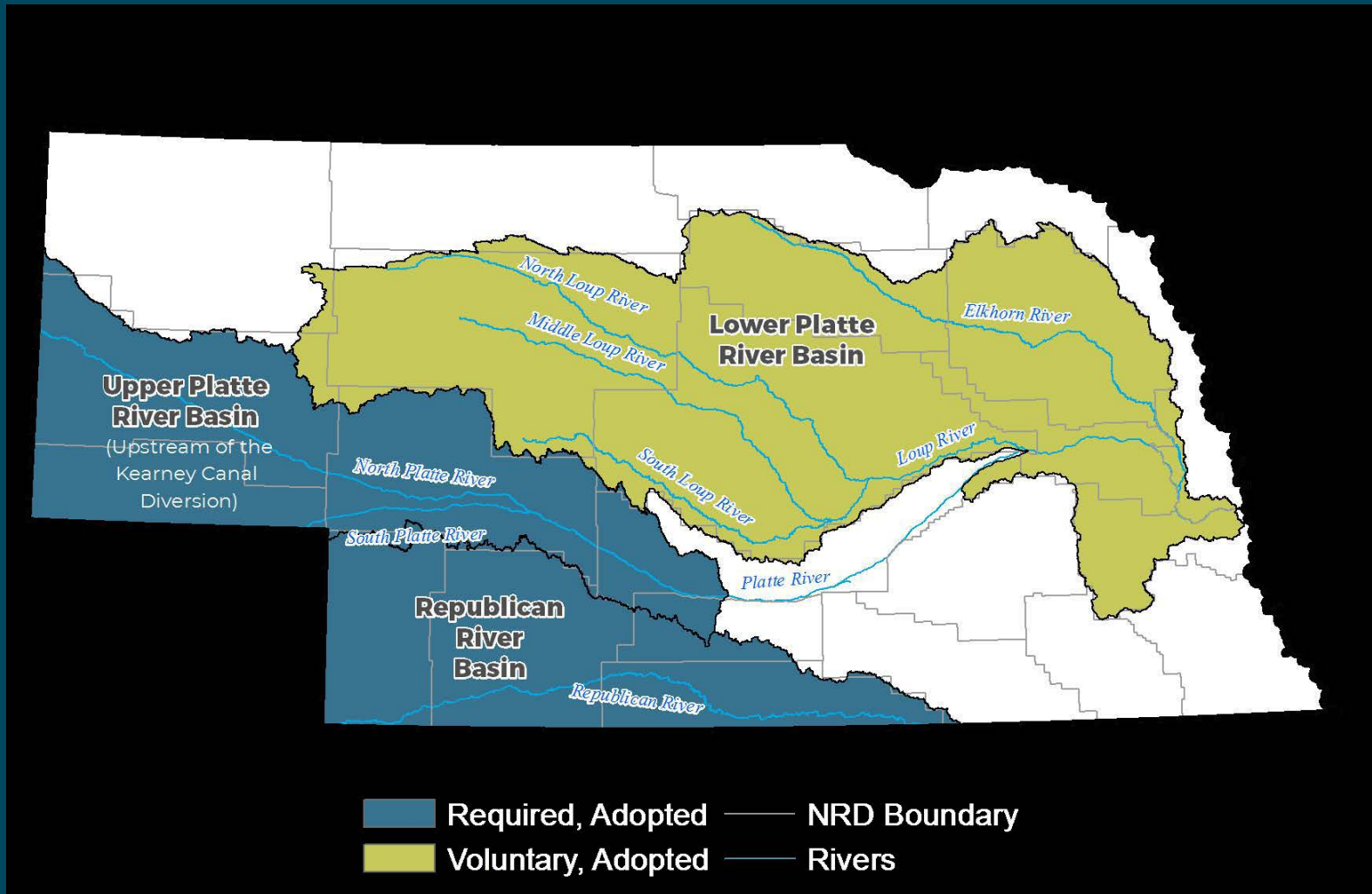


- Wet Year USFWS "Targets"
- Average Year USFWS "Targets"
- Dry Year USFWS "Targets"
- Nebraska Instream Flows
- Average Flow 1975-2002
- Median Flow 1975-2002



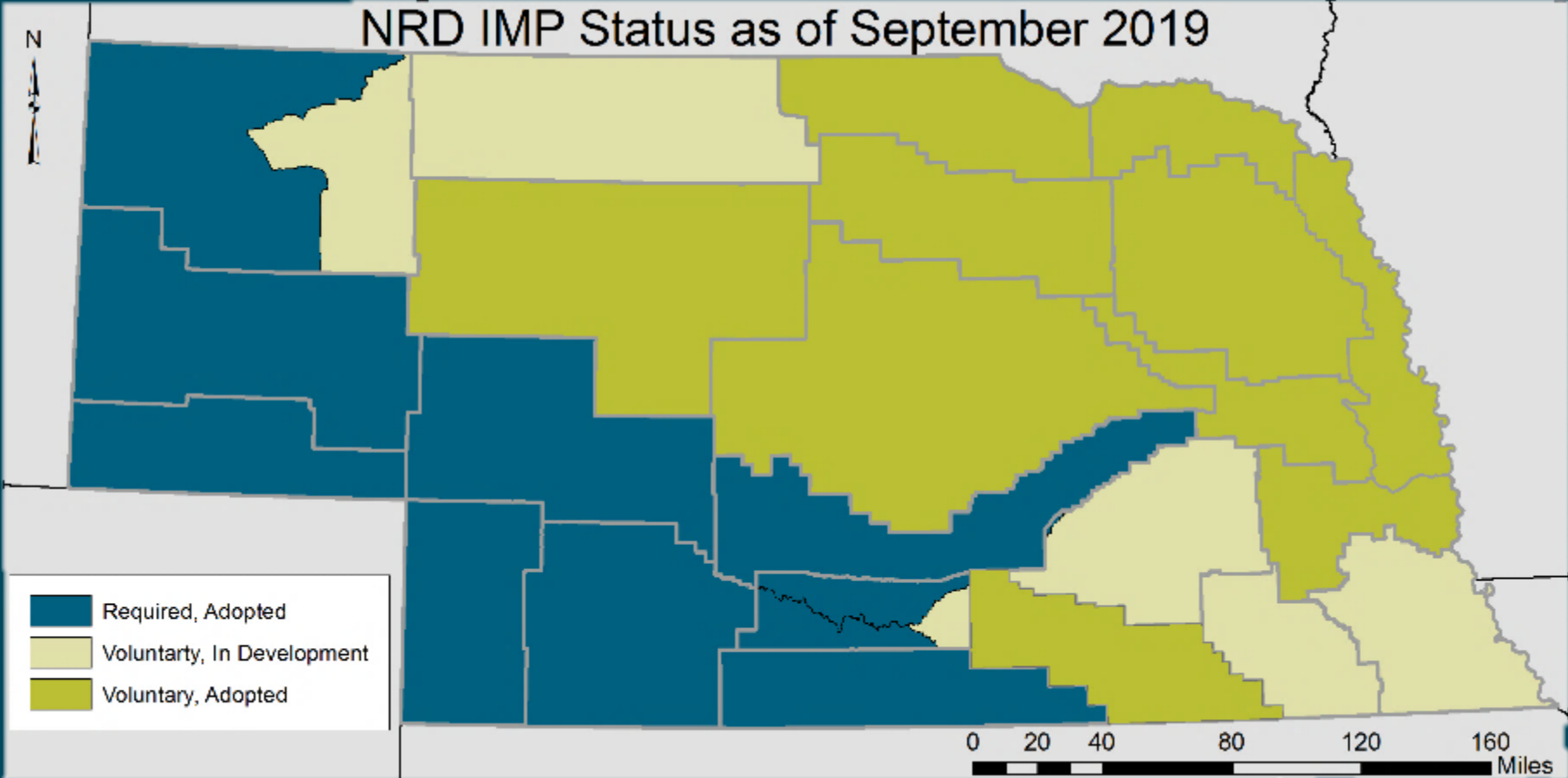
Toolbox – Nested Governing Tiers

Basin-wide Plans



Toolbox – Nested Governing Tiers

State and Local Natural Resources Districts



Toolbox – Planning Process & Monitoring

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

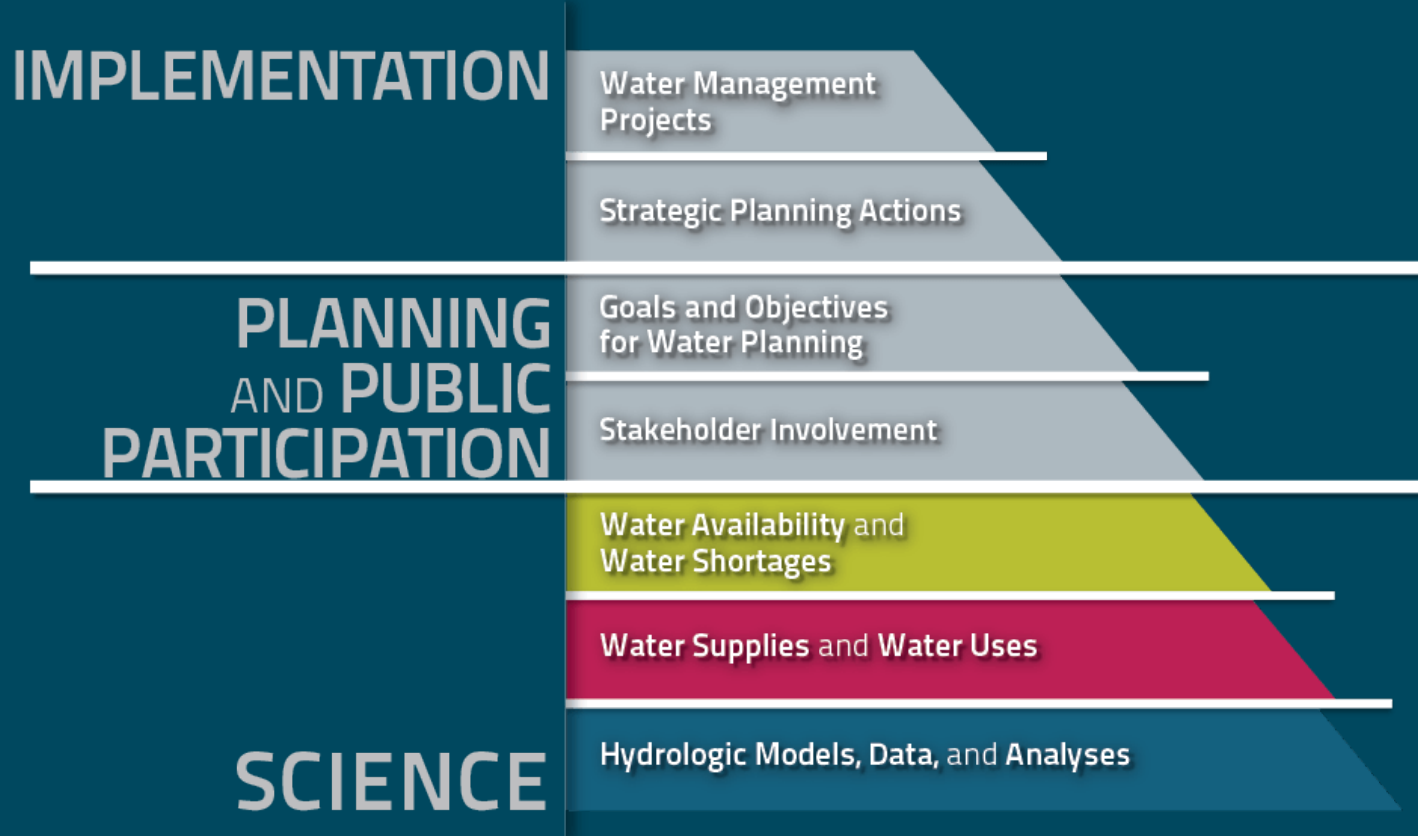
SCIENCE

Hydrologic Models, Data, and Analyses



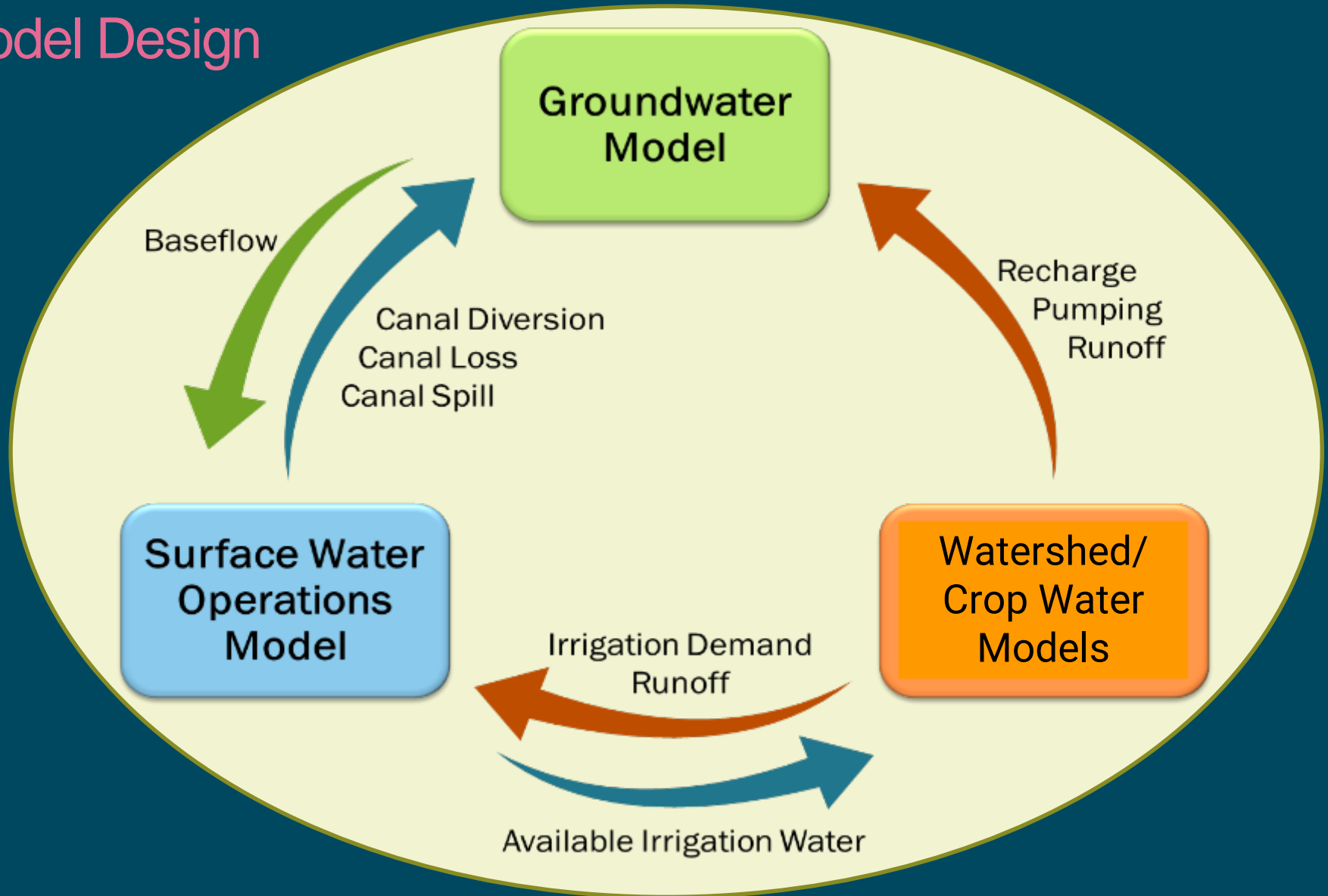
Toolbox – Science Foundation

- Statutes: 46-713(1)(d), 46-715(3)(a), 46-755(5)(a)
 - shall rely on the best scientific data, information, and methodologies readily available
 - Utilize accepted methodologies based on best available information, data, and science
 - shall utilize the best generally-accepted methodologies and available information, data, and science



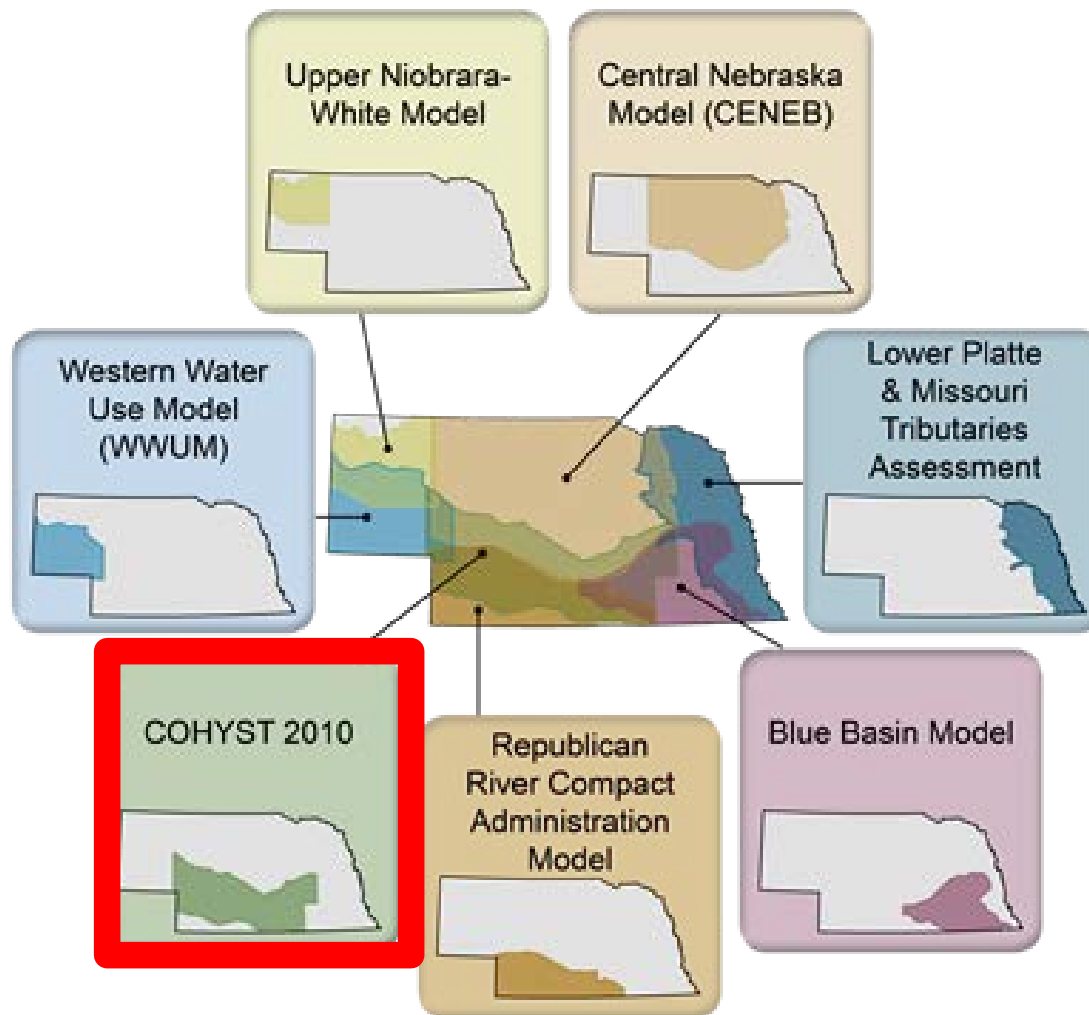
Toolbox – Science Foundation

Model Design



Toolbox – Science Foundation

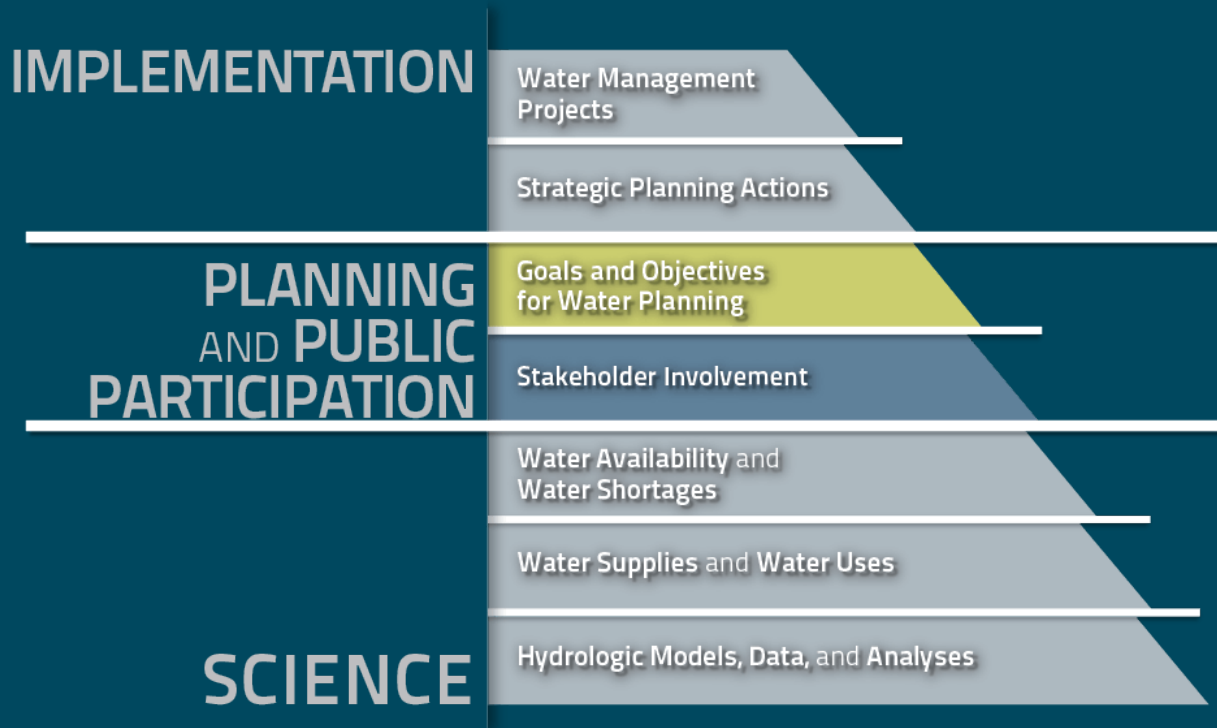
Current Model Areas



Toolbox – Stakeholder Engagement


Key Component of IMP Process

46-715(5)(b) & 46-755(5)(c) [IMP shall be developed after consultation and collaboration with stakeholders]. If agreement is reached by all parties..., the [NeDNR and NRDs] shall adopt the [plan]. & 46-717(2) [NeDNR and NRDs] shall consult with [stakeholders].



Stakeholders help formulate, evaluate and recommend goals, objectives, and action items, including local controls (regulations)

Toolbox – Stakeholder Engagement Education and Outreach

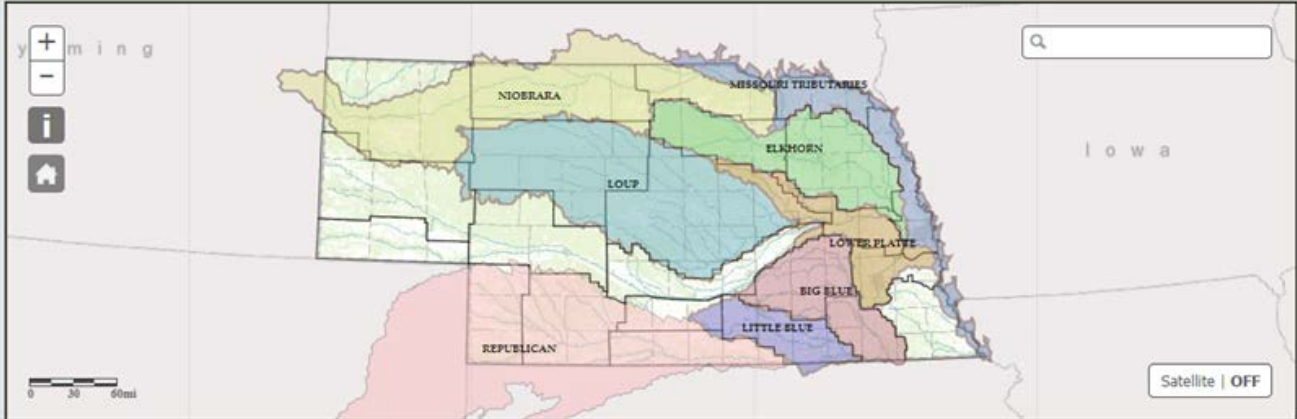


INSIGHT
An Integrated Network of Scientific Information & GeoHydrologic Tools

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HOME
ABOUT
MODELING DATA
STREAM GAGING

SELECT REGION ▾



Supply
Demand
Nature & Extent of Use



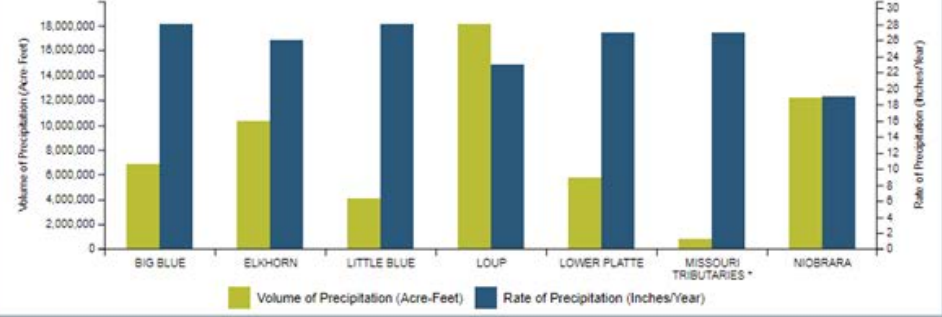



Chart: Precipitation Rates and Volumes by Basin ▾

Season: Annual ▾



Basin	Volume of Precipitation (Acre-Feet)	Rate of Precipitation (Inches/Year)
BIG BLUE	~6,000,000	~28
ELKHORN	~10,000,000	~26
LITTLE BLUE	~4,000,000	~28
LOUP	~18,000,000	~24
LOWER PLATTE	~6,000,000	~28
MISSOURI TRIBUTARIES*	~1,000,000	~28
NIORARA	~12,000,000	~20

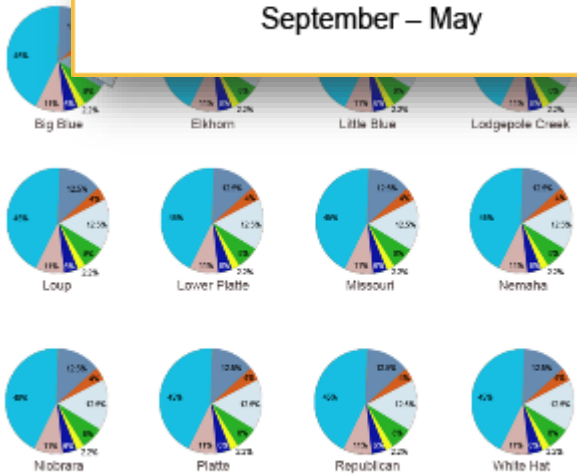
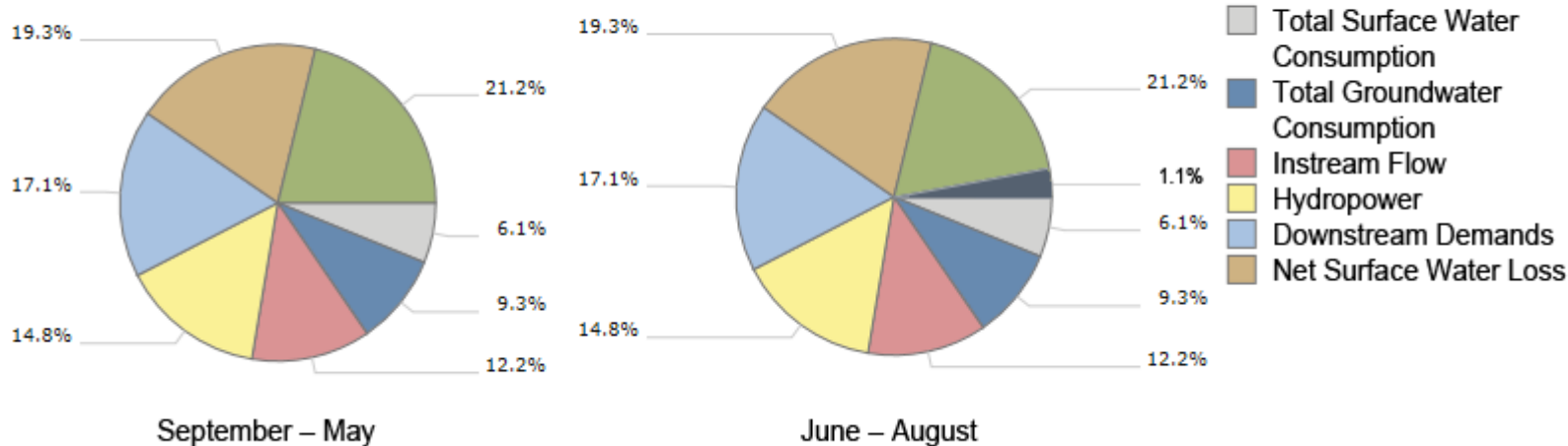
Supply

Basin water supplies represent the streamflow water supply that is available for total use within a river basin or subbasin. If no surface water or groundwater use was occurring by humans in a basin, the basin water supply would be represented by the streamflow data captured at a streamflow gaging station. However, streamflow is impacted by human activity; therefore, to calculate a total basin water supply, four water supply components are added together. These four water supply components include:

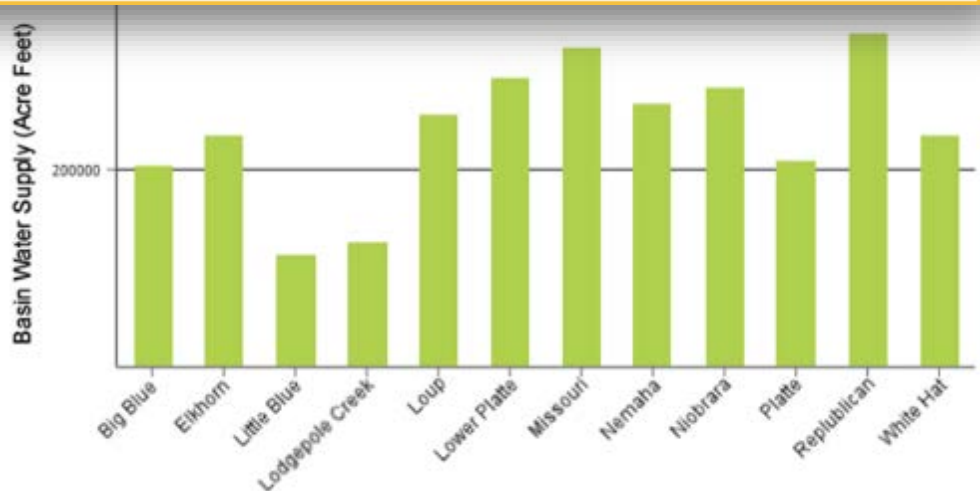
1. Streamflow +
2. Surface water consumptive

Toolbox – Stakeholder Engagement Education and Outreach

Long-Term Average Total Demand by Sector



Legend for Basin Charts:
 Total Surface Water Consumption (Light Blue), Total Groundwater Consumption (Dark Blue), Instream Flow (Red), Hydropower (Yellow), Downstream Demands (Green), Net Surface Water Loss (Brown), Other (Dark Blue).



Toolbox – Implementation and Monitoring

Statute 46-715(2)(e): a plan to gather and evaluate data, information, and methodologies [to implement, increase understanding] and test the validity of the conclusions and information [of the plan]

IMPLEMENTATION

Water Management Projects

Strategic Planning Actions

PLANNING AND PUBLIC PARTICIPATION

Goals and Objectives for Water Planning

Stakeholder Involvement

Water Availability and Water Shortages

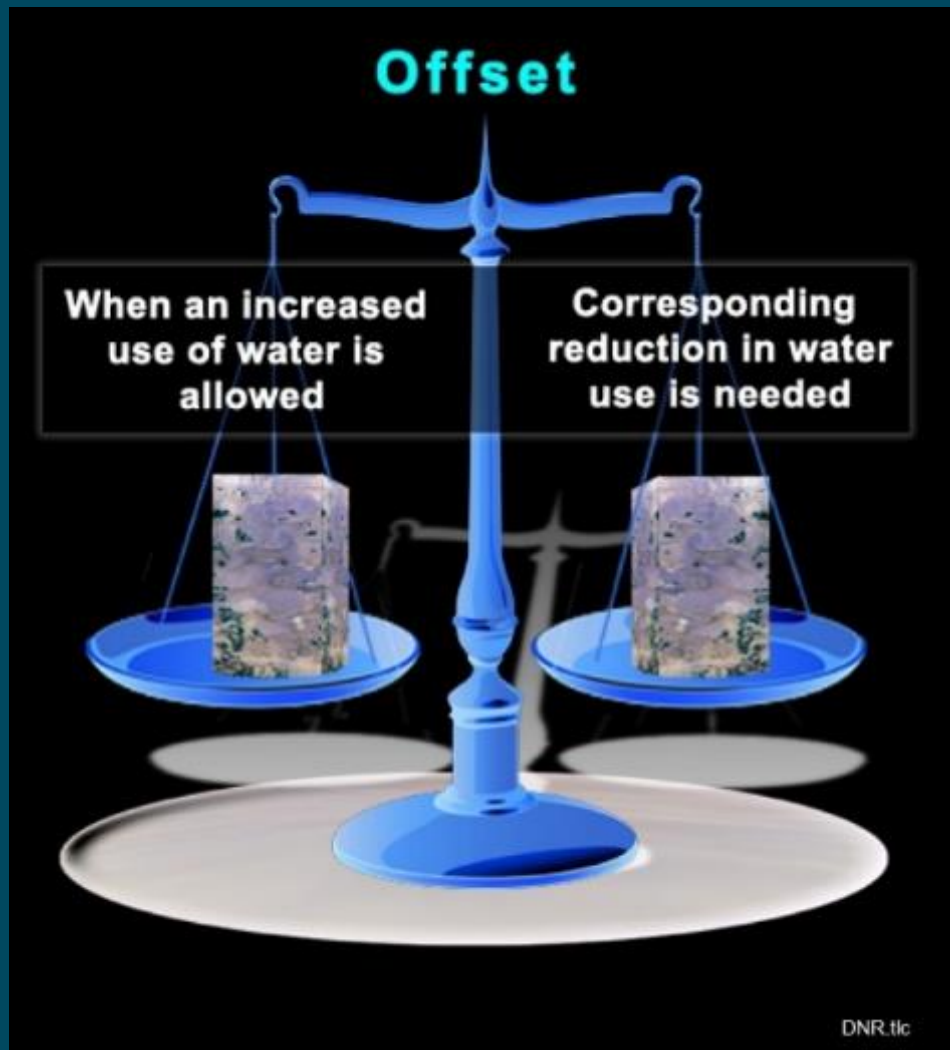
Water Supplies and Water Uses

SCIENCE

Hydrologic Models, Data, and Analyses



Toolbox – Implementation & Monitoring Regulation and Compliance



- Annual Meetings
- Annual Reports
- Regulations
 - Allocations
 - Acre Reductions
- Projects
 - Conjunctive Management
 - Water Leasing
 - Storage Facilities
 - Augmentation Pumping
- Compliance
 - Remote Sensing
 - Meters
 - Neighbors
 - Field Investigations

Toolbox – Implementation & Monitoring Regulation and Compliance

Annual Meetings

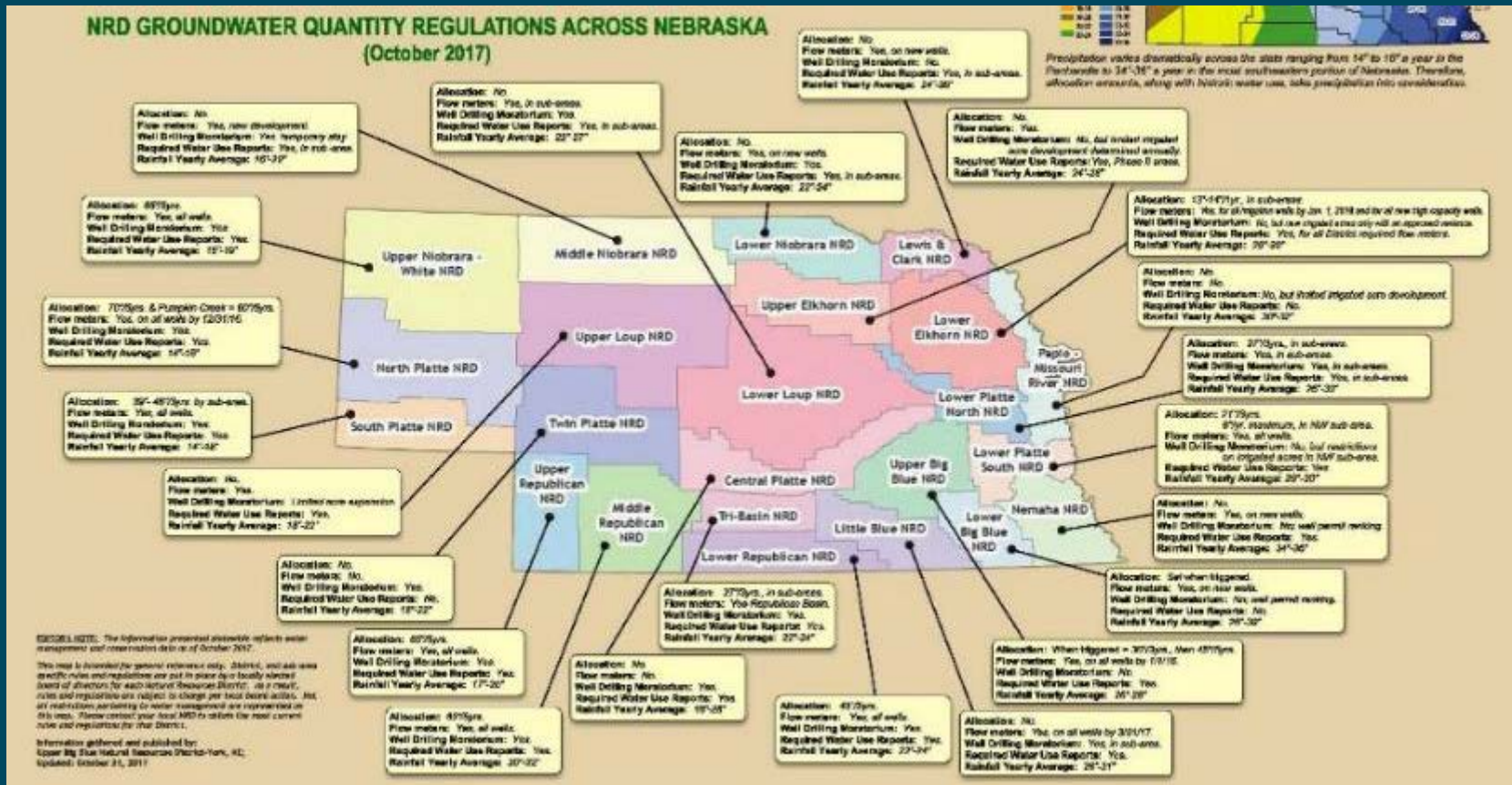
Annual Reports



Toolbox – Implementation & Monitoring Regulations

Regulations

Allocations
Acre Reductions



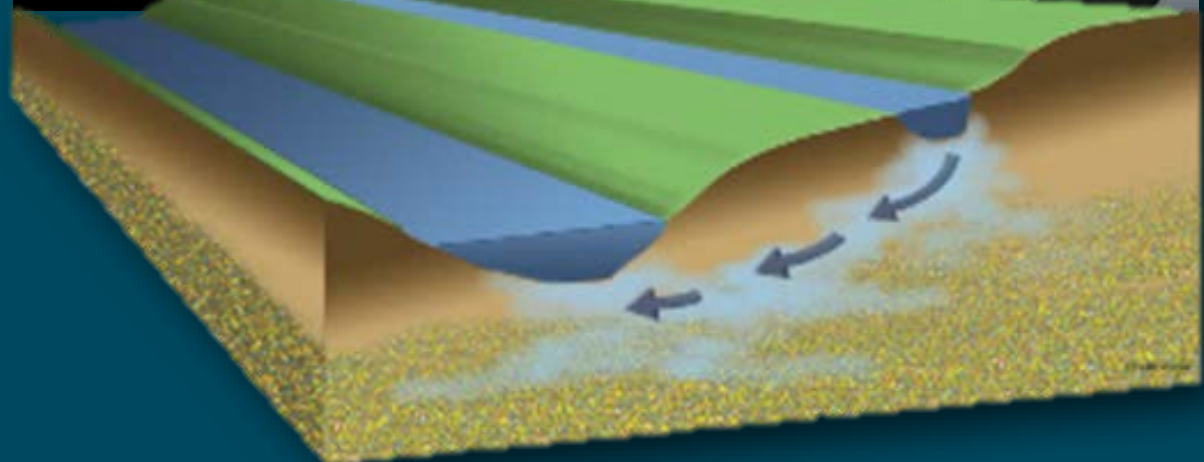
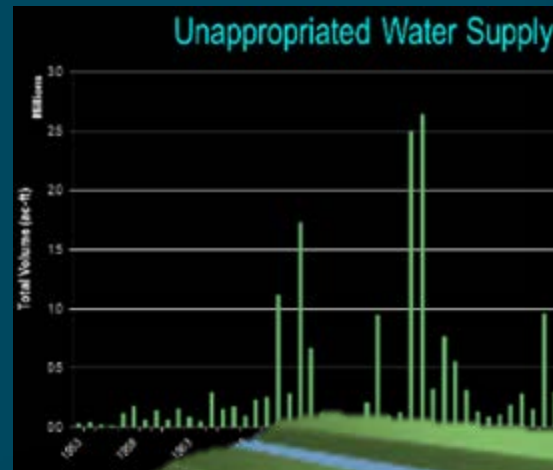
Toolbox – Implementation & Monitoring Regulation and Compliance Projects

Conjunctive Management

Water Leasing

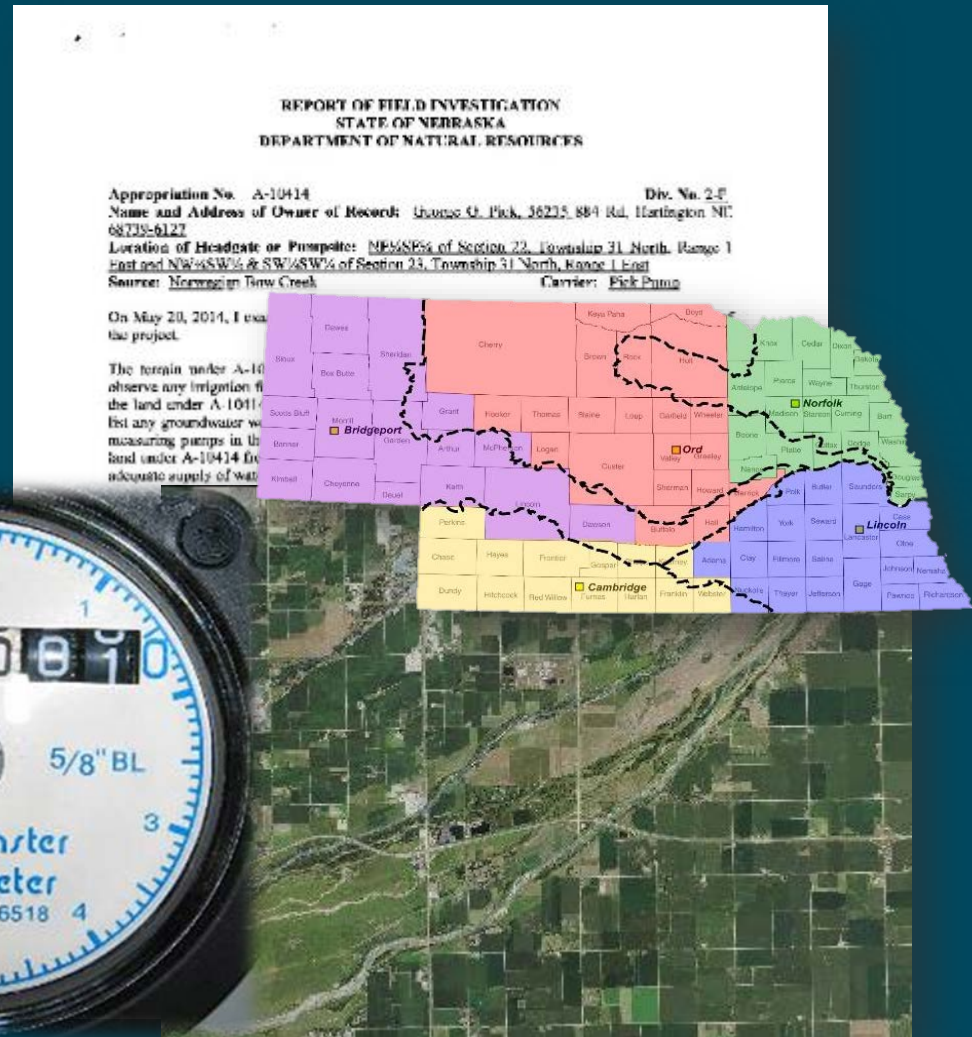
Storage Facilities

Augmentation Pumping



Toolbox – Implementation & Monitoring Regulation and Compliance Compliance

Remote Sensing
Meters
Neighbors
Field Investigations



Concluding Thoughts

- Challenge: acceptance of science and regulatory system by local producers
- Legislative Toolbox
 - Boundaries
 - Local Management
 - Nested Tiers
 - Dispute Resolution
 - Funding
 - Monitoring
 - Stakeholder Participation
- Trust and Communication – be impeccable with your word

Article in the May 2019 AWRA Water Resources IMPACT magazine

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THANK YOU

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