

History of Water Laws and Groundwater Modeling in Nebraska

Brian P. Dunnigan, PE
James C. Schneider, PhD

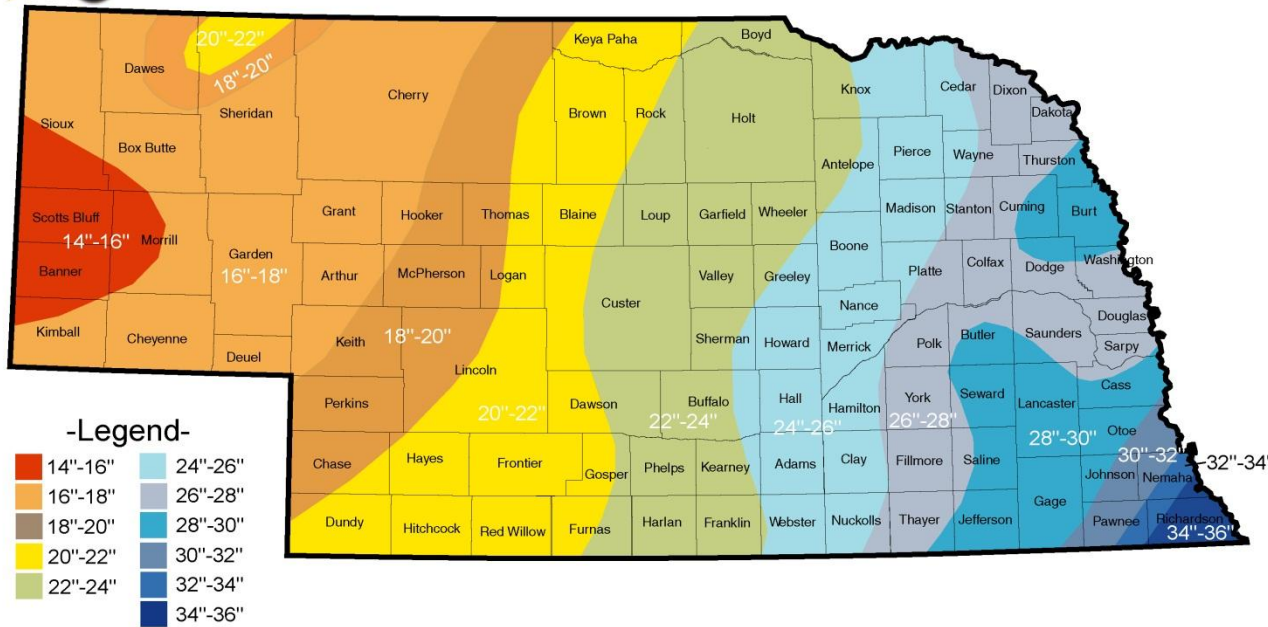
Overview

- Nebraska
 - Basic hydrologic setting
 - Initial legal setting
- Groundwater development and modeling
- Conflict brings changes
- Integrated Management Planning

Variable Availability



Mean Annual Precipitation (in inches) From 1900-1979



**14-36 inches
of rainfall**

**Uncertainty
in annual
availability**



Compiled and printed by
Nebraska Department of Natural Resources
August 21, 2003

Source: This map was reproduced using data from "An Analysis of Nebraska's Precipitation Climatology with Emphasis on Occurrence of Dry Conditions," Agricultural Experiment Station, UN-L, Wilhite, D., 1981.

Variable Availability: Surface Water



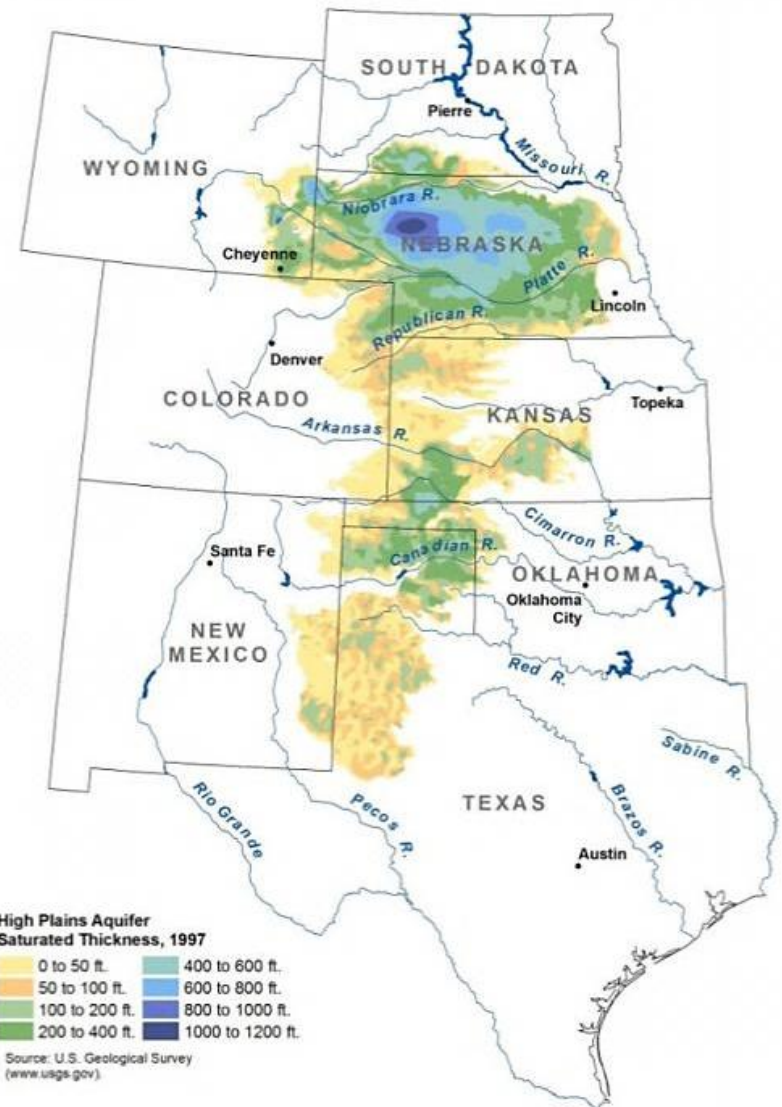
**Average Annual
Streamflow**
Total Flow In 1,000,000 AF
Total Flowing Out 7,100,000 AF

Average Annual Precipitation 86,000,000 AF

River discharge indicated by line width

Variable Availability: Groundwater

Total in Storage in Nebraska
2,000,000,000 AF



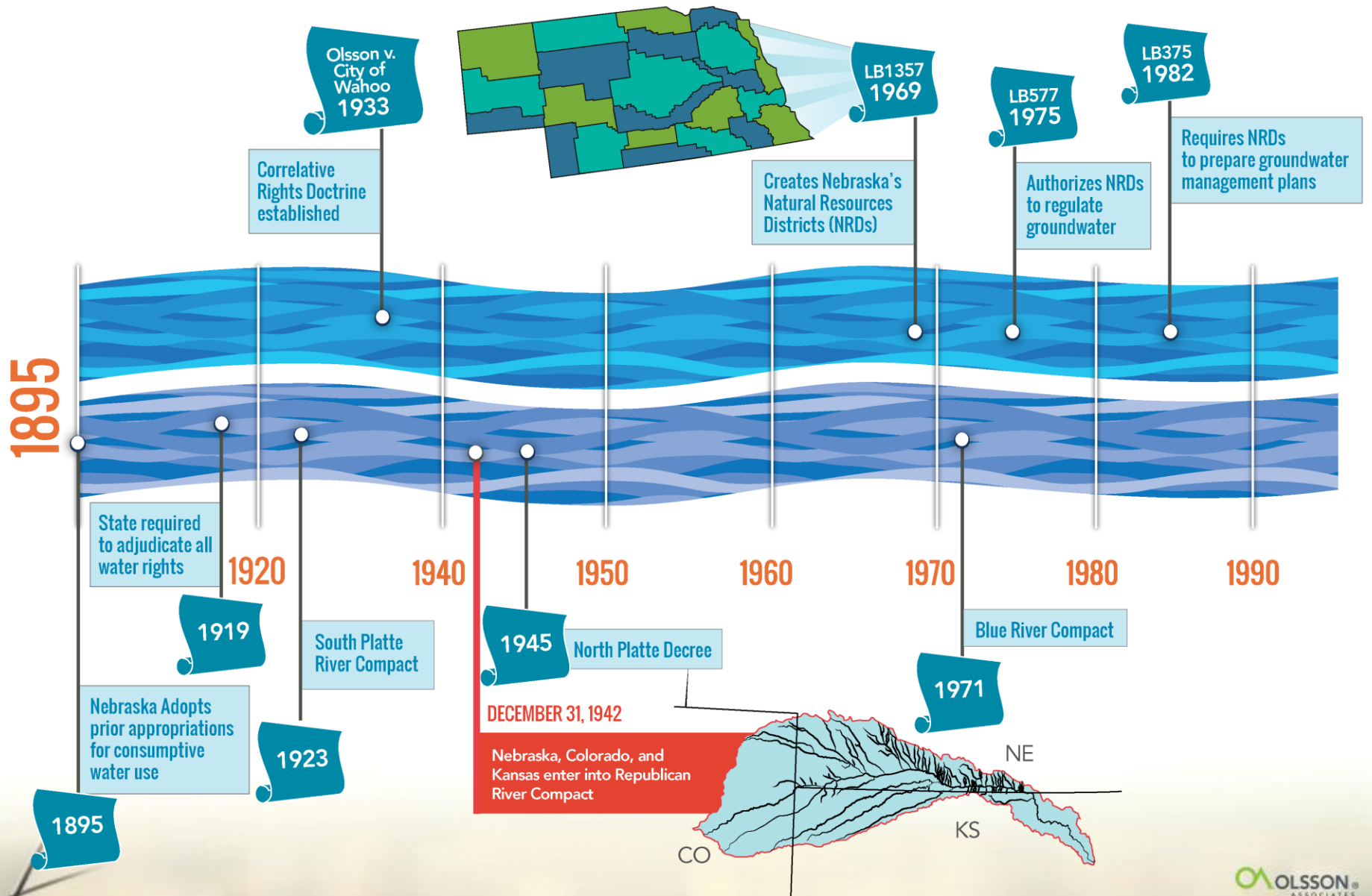
University of
Nebraska
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This map was produced by the University of Nebraska-Lincoln.
For additional information and an interactive version of this map
visit <http://water.unl.edu>

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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 nebraskamaps.unl.edu. Any questions or comments

GROUNDWATER MANAGEMENT & SURFACE WATER MANAGEMENT



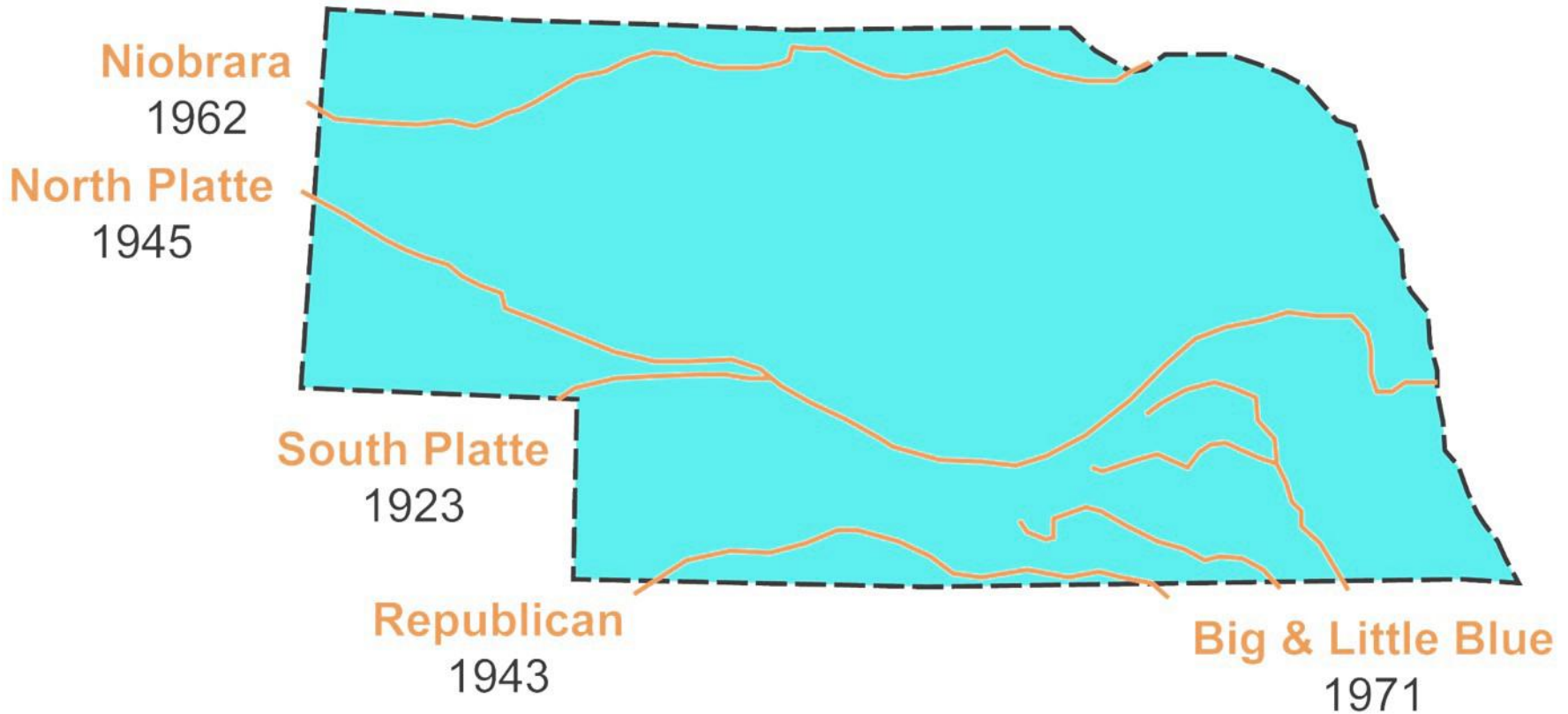
In the beginning...Surface Water Law

1850s – First record of irrigation ditches on the Platte River

1889 – Prior appropriation system adopted

1984 – Instream Flow appropriations available

Interstate Compacts and Decrees

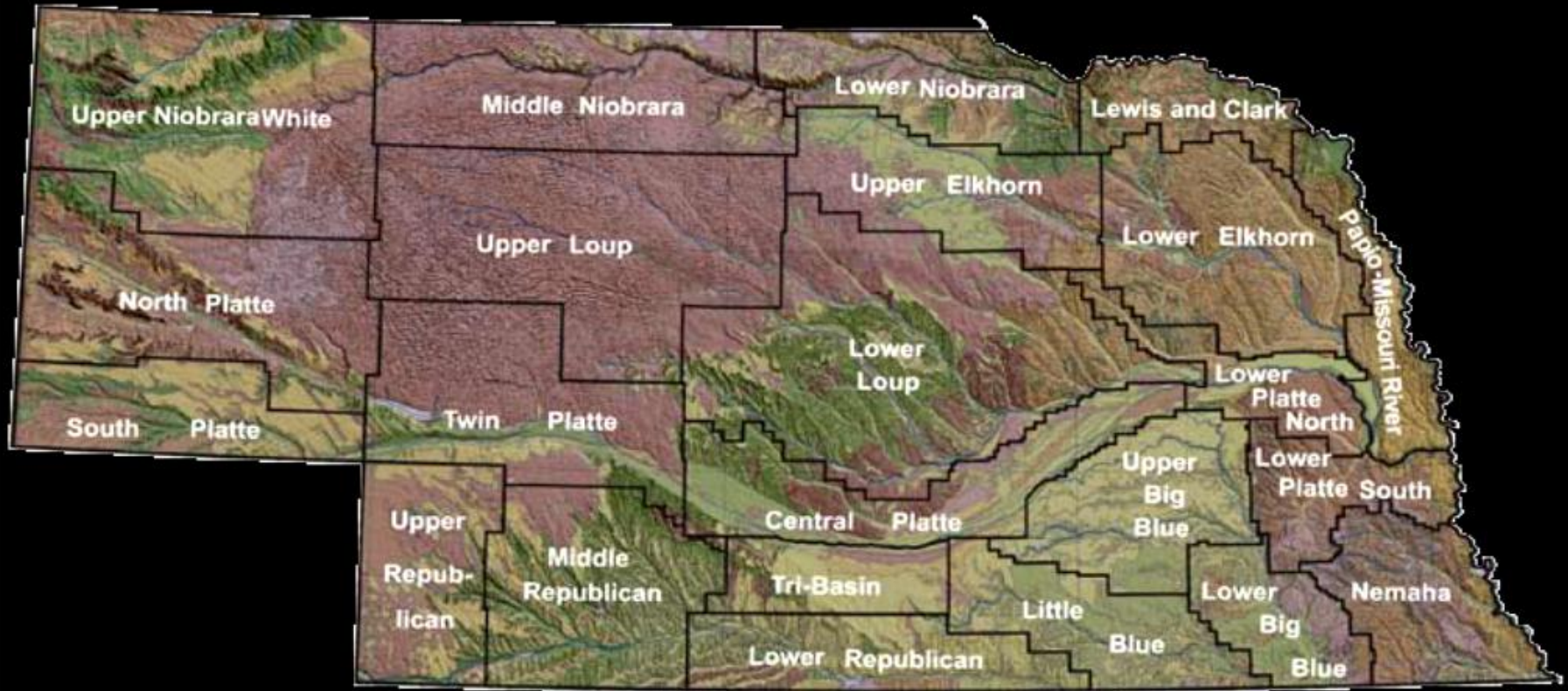




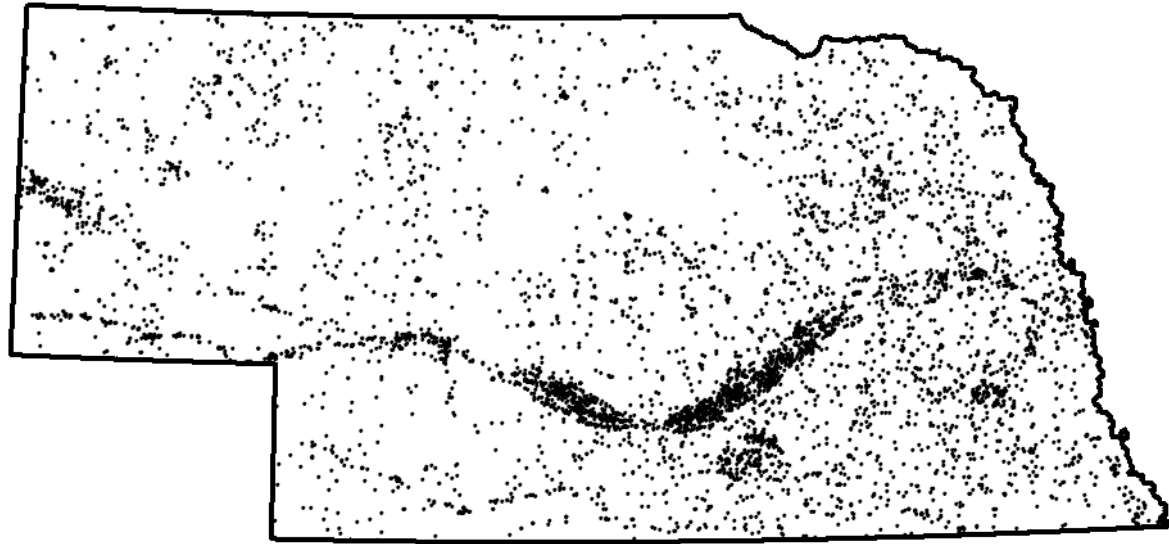
Groundwater Regulation

- 1867 to 1933 – essentially no Nebraska law,
- 1933 – Olson v. City of Wahoo
- Overlying landowner has right to reasonable use subject to correlative rights of other landowners
- 1975 – Groundwater Management and Protection Act
- Delegates regulation to Natural Resources Districts

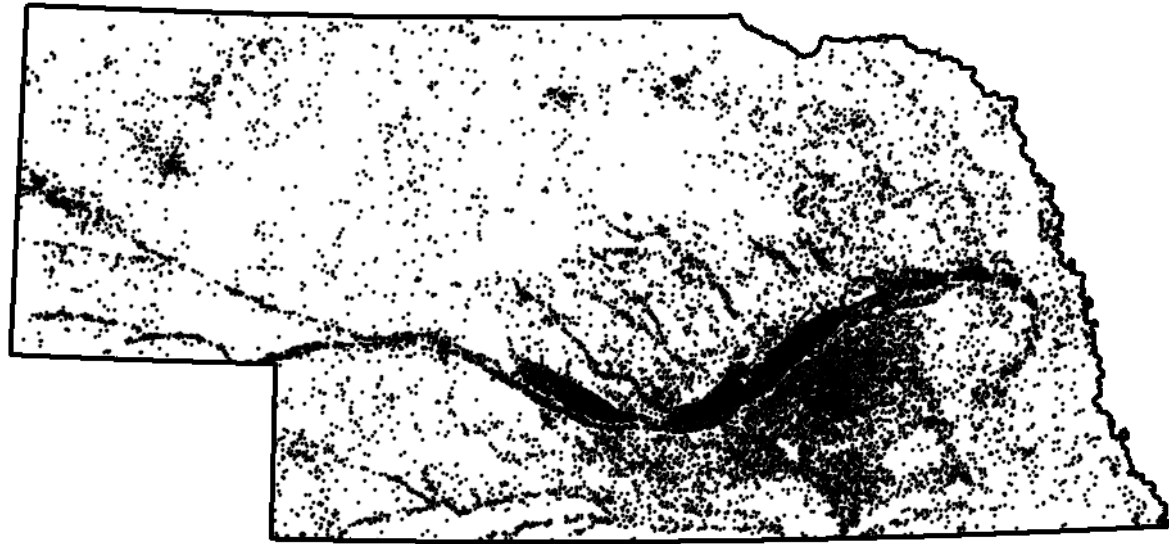
Nebraska's NRDs



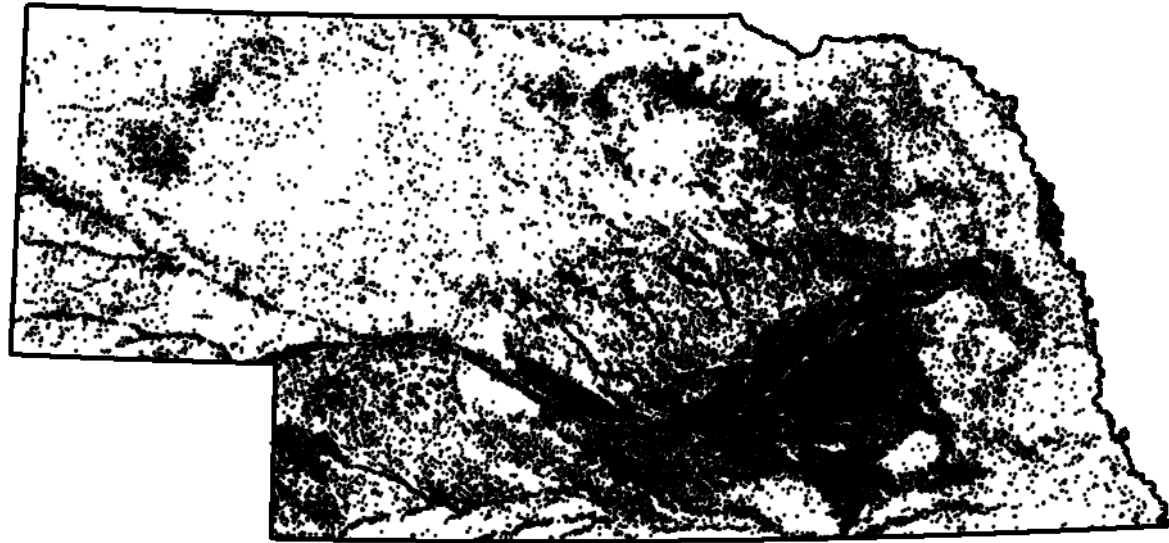
Groundwater Development, 1940



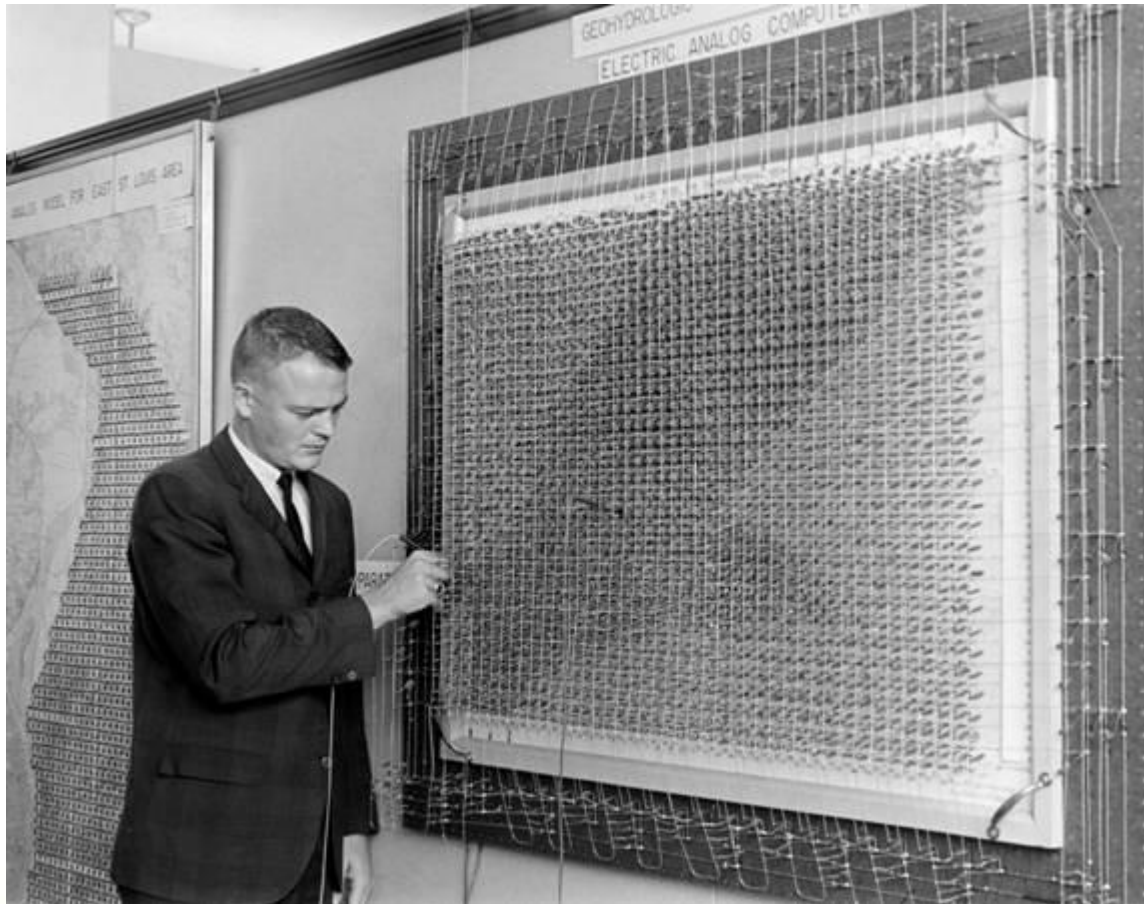
Groundwater Development, 1960



Groundwater Development, 1980



Early Groundwater Modeling Efforts



www.isws.uiuc.edu/hilites/achieve/gwmodpic.asp?p=06

Digital Simulation of Ground-Water Flow in the High Plains Aquifer in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming

By RICHARD R. LUCKEY, EDWIN D. GUTENTAG, FREDERICK J. HEIMES,
and JOHN B. WEEKS

REGIONAL AQUIFER-SYSTEM ANALYSIS

U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1400-D



UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1986

Effects of Future Ground-Water Pumpage On the High Plains Aquifer in Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming

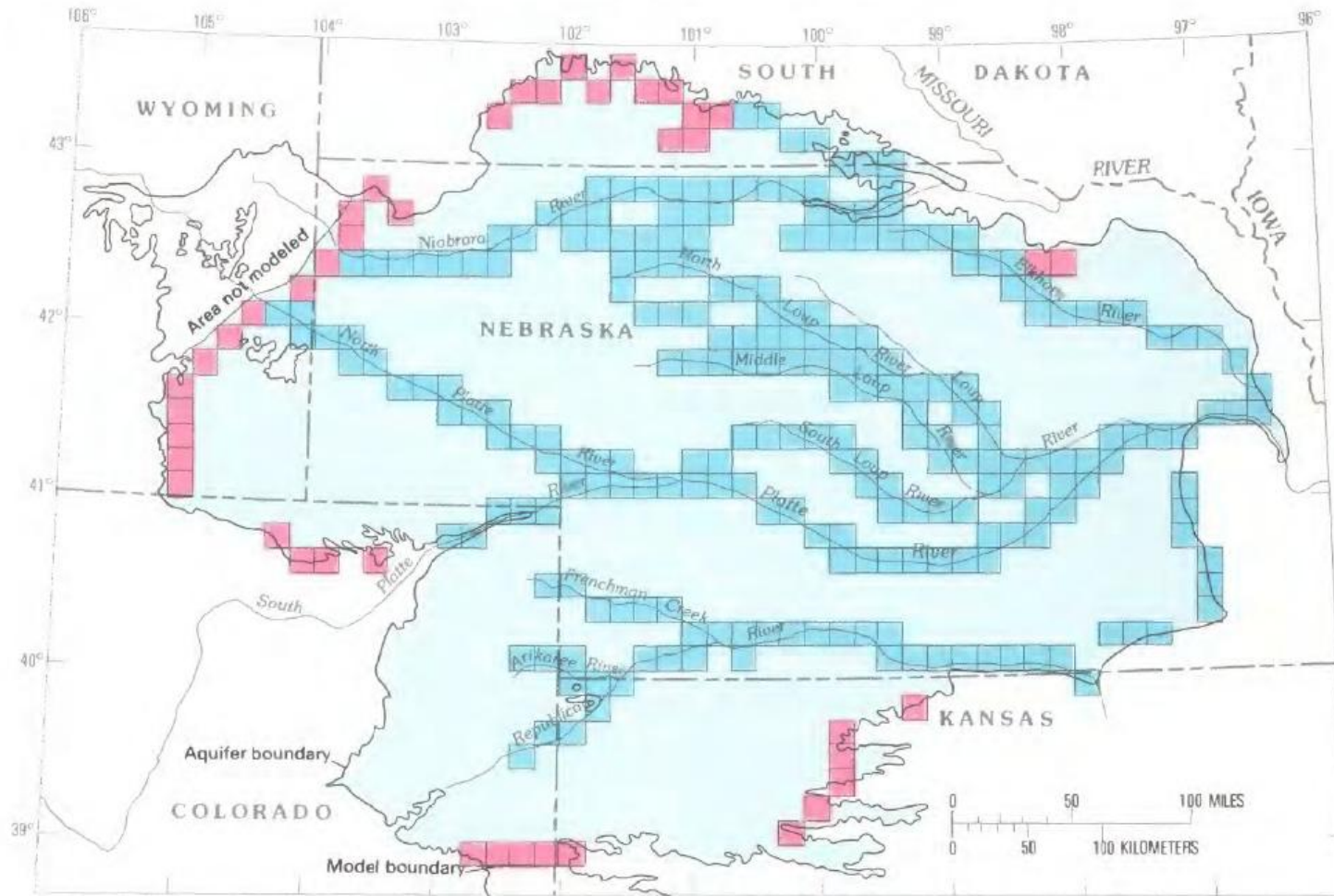
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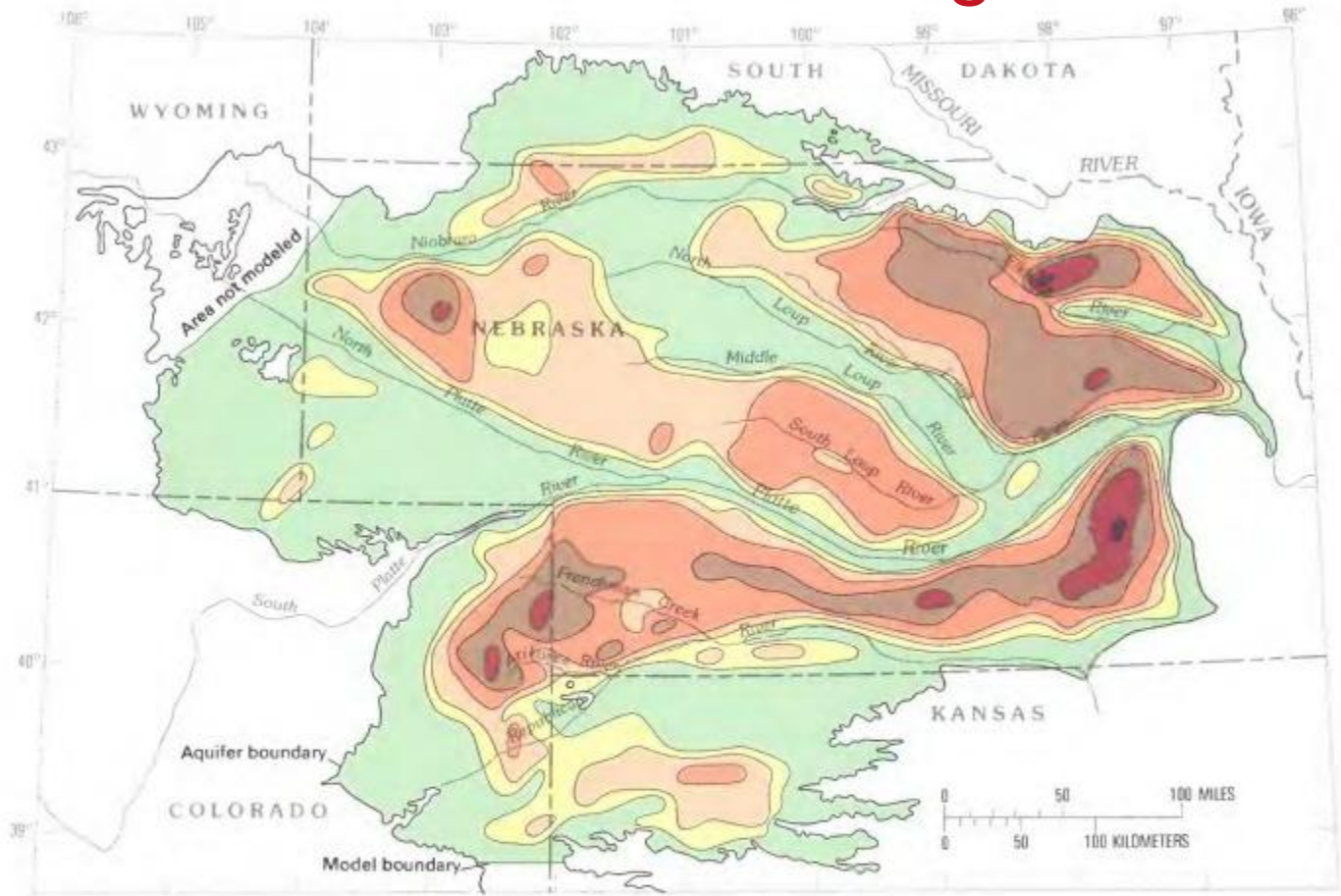
Northern High Plains Model Grid



EXPLANATION

- CONSTANT-HEAD NODE
- RIVER NODE

Predicted Water Level Change 1980-2020

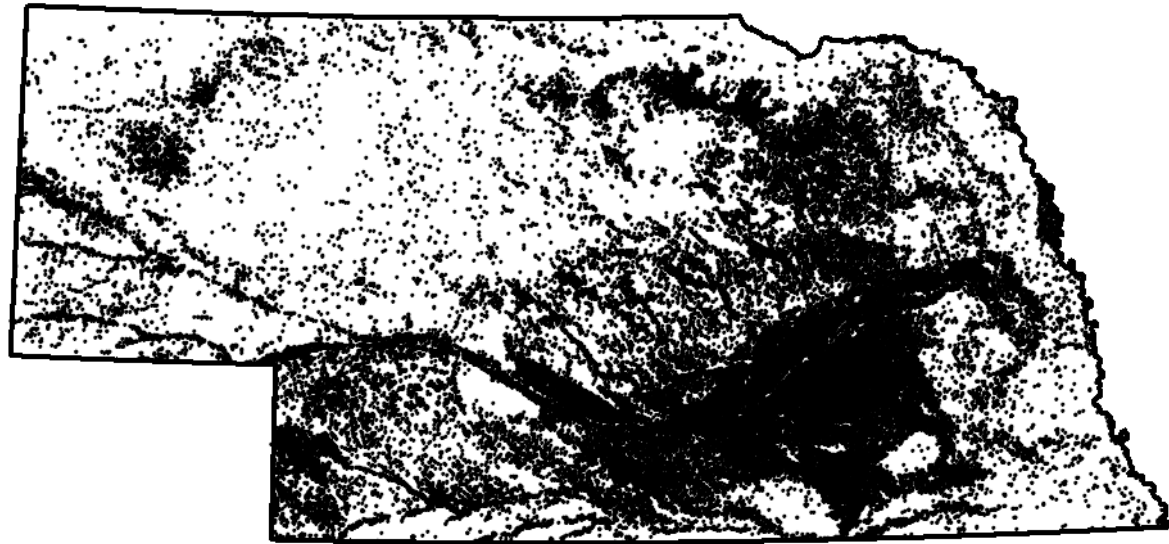


EXPLANATION

Water - level change,
in feet



Groundwater Development, 1980



Groundwater Development, 2000

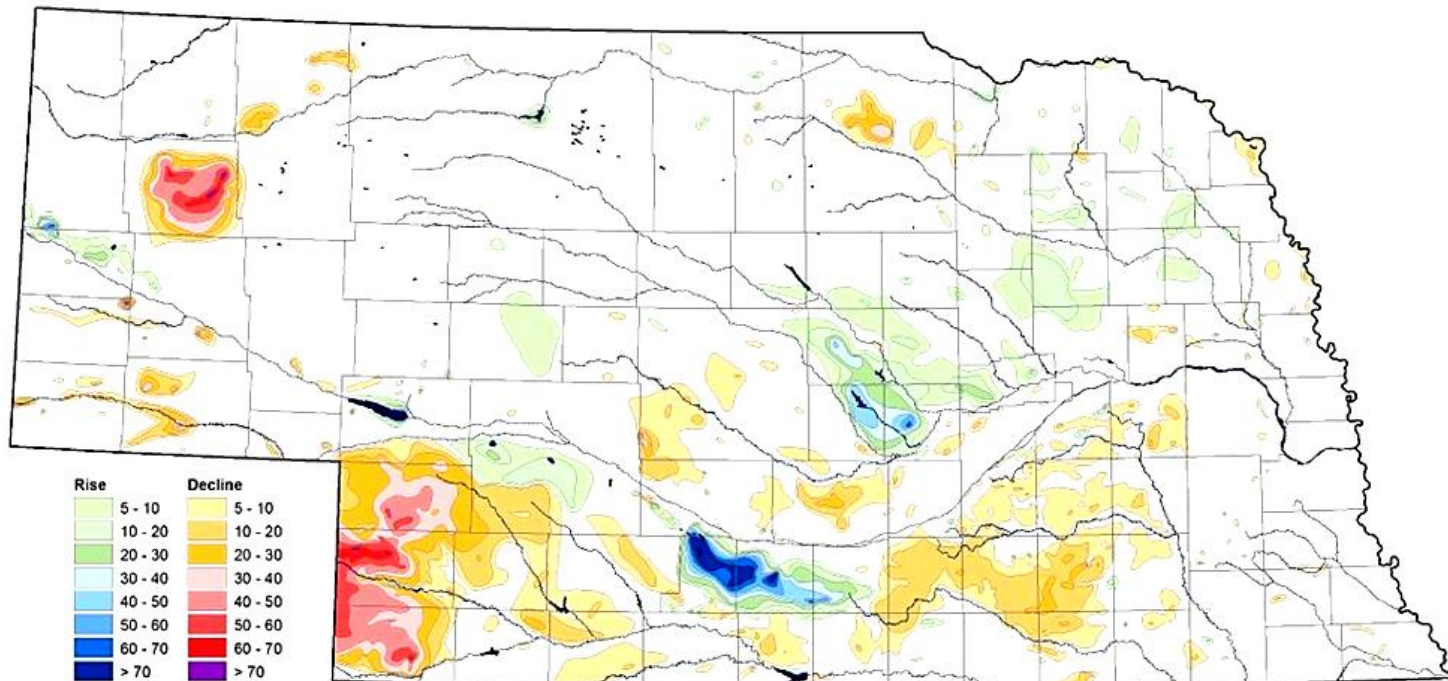


Groundwater Development, 2009



Actual Water Level Changes

Groundwater-level Changes in Nebraska - Predevelopment to Spring 2009



CONSERVATION AND SURVEY DIVISION (<http://csd.unl.edu>)
 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


 School of Natural Resources
 Institute of Agriculture and Natural Resources
 IANR University of Nebraska-Lincoln

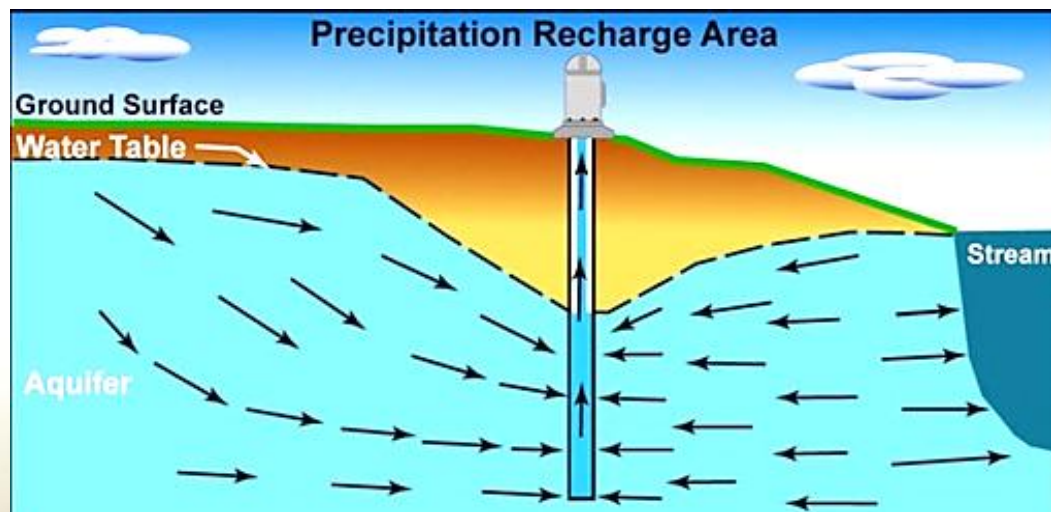
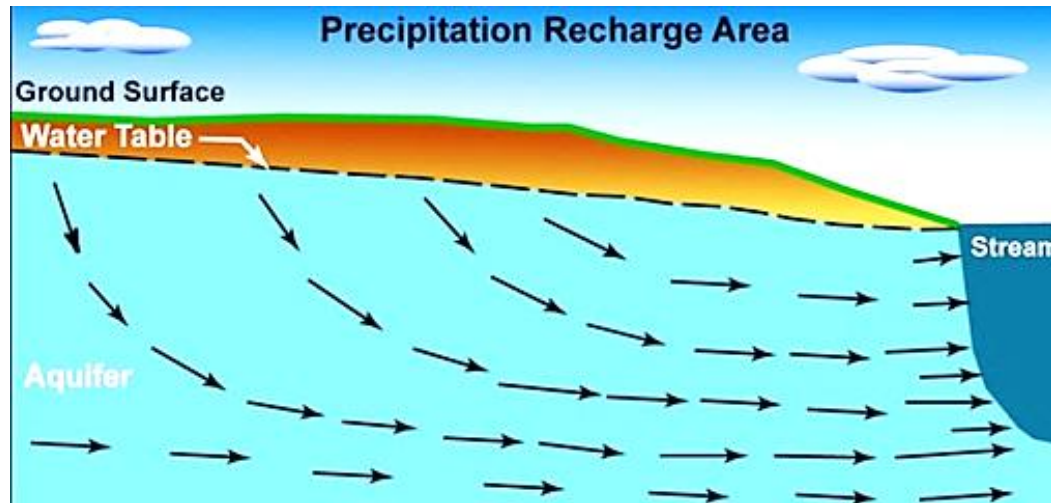
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September 2009

What Happened?

- The model inputs did not reflect the future that actually occurred.
- Representation of rivers in model very crude.
- Similar simulations of the Central and Southern High Plains aquifers provided results that were much closer to what has actually happened.
- The difference: Management and flowing streams.

Hydrologically Connected Surface Water and Groundwater

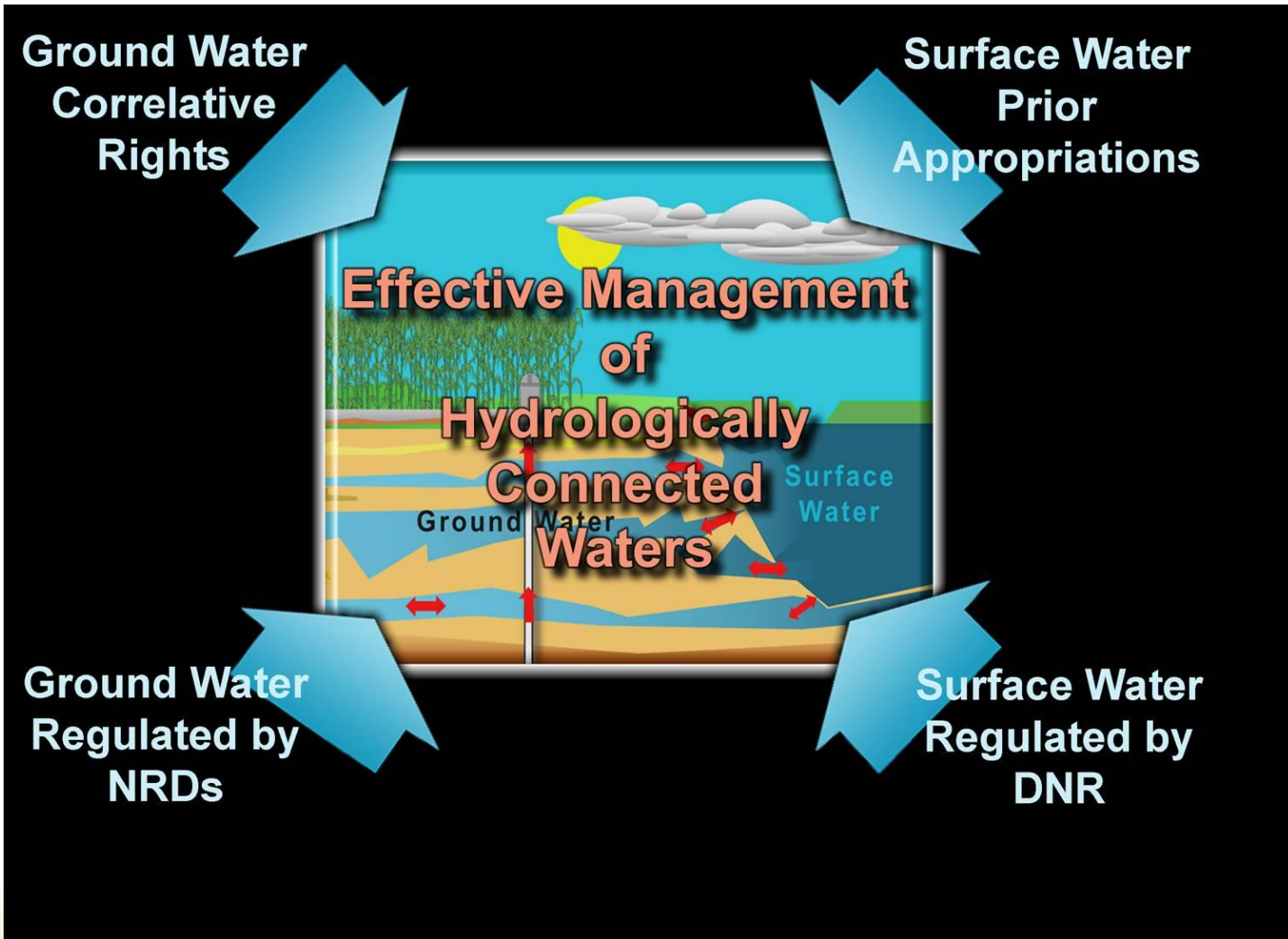




Conflict Drives Change

- Kansas v. Nebraska Original 126
 - Republican River Compact
 - Nebraska: “Groundwater doesn’t count!”
 - US Supreme Court: “Oh yes it does.”
- Spear T v. Nebraska DNR
 - NDNR can’t protect surface water users from groundwater users
 - Must sue individual users for relief

Nebraska's Dual Regulatory Structure



Integrated Water Management

- LB962 was signed by then Governor Johanns on April 15, 2004
- Provides a mechanism for deliberate management and development of both surface water and groundwater through a proactive planning process
- Basins designated “fully appropriated”



LB 962

LEGISLATURE OF NEBRASKA
NINETY-EIGHTH LEGISLATURE
SECOND SESSION
LEGISLATIVE BILL 962
FINAL READING

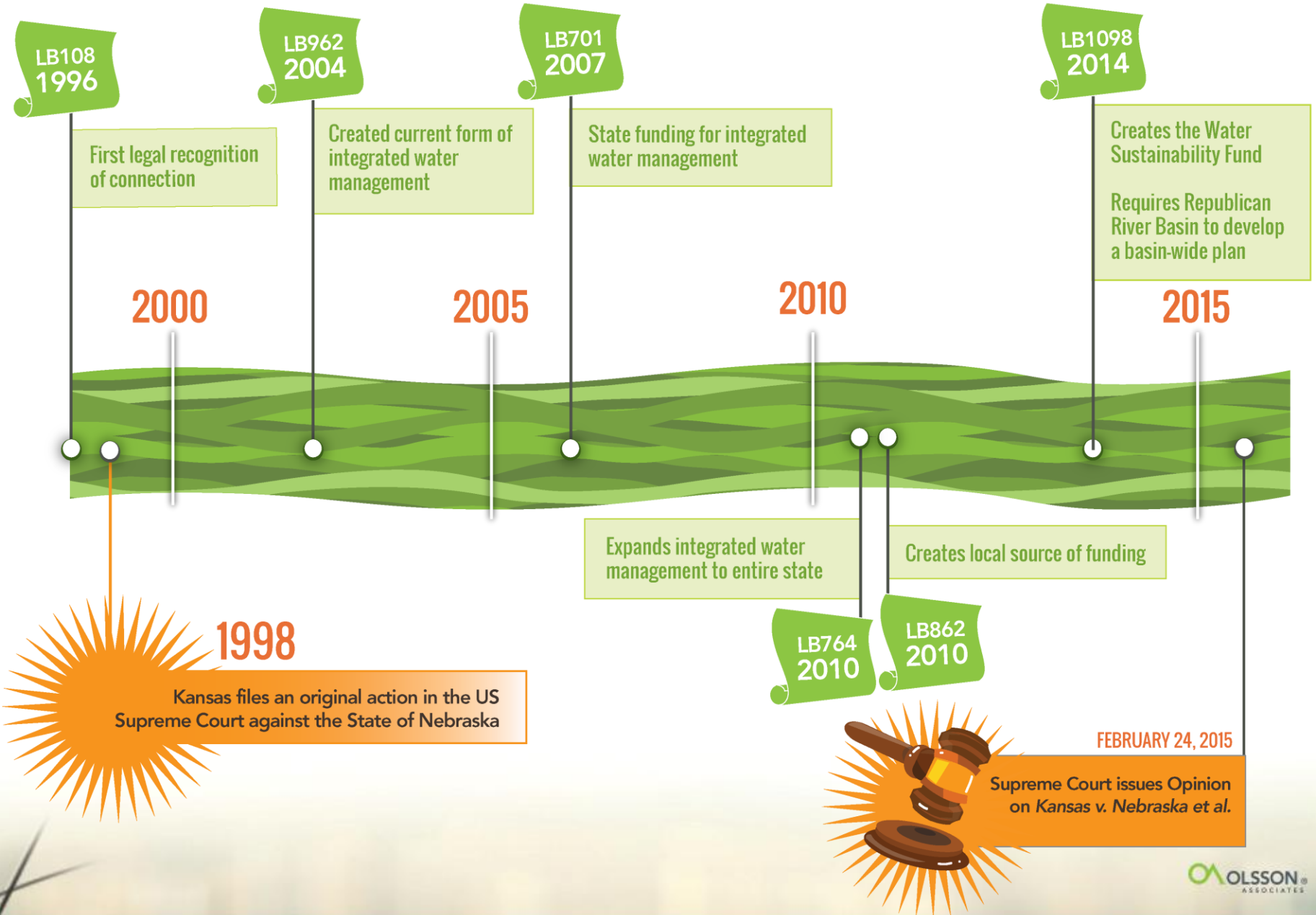
Introduced by Natural Resources Committee:
Schrook, 38; Chairperson: Friend, 10; Jones, 43;
Fremser, 34; Louden, 45; Freiliter, 5; Stuhr, 24; and
Aguilar, 15; Baker, 44; Reutler, 28; Brown, 21;
Brown, 6; Barling, 33; Combs, 32; Cudaback, 36;
Hrdman, 47; Jensen, 20; Johnson, 37; Landis, 46;
D. Pederson, 42; Price, 26; Raikes, 25; Schimek, 27;
Stuthman, 22; Wehrlein, 2

Read first time January 9, 2004
Committee: Natural Resources

A BILL

1 FOR AN ACT relating to natural resources; to amend sections 2-1586,
2 2-3225, 46-229.02, 46-229.03, 46-2,127, 46-609, 46-651,
3 46-656.03, 46-656.04, 46-656.08, 46-656.11, 46-656.13,
4 46-656.21, 46-656.32, 46-656.35 to 46-656.37, 46-656.39,
5 46-656.41 to 46-656.48, 46-656.64, 46-680, 46-1207.01,
6 46-1207.02, 46-1212, 46-1228, 61-206, 66-1501, 66-1519,
7 66-1523, 66-1525, 66-1529.02, 77-27,137.02, and 77-3442,
8 Reissue Revised Statutes of Nebraska, sections 2-1588,
9 13-920, 46-226.03, 46-229, 46-229.04, 46-230, 46-235.04,
10 46-237, 46-261, 46-290 to 46-296, 46-2,112, 46-2,119,
11 46-2,132, 46-2,135, 46-601.01, 46-613.02, 46-653,
12 46-656.05, 46-656.14, 46-656.19, 46-656.25 to 46-656.27,
-1-

INTEGRATED WATER MANAGEMENT



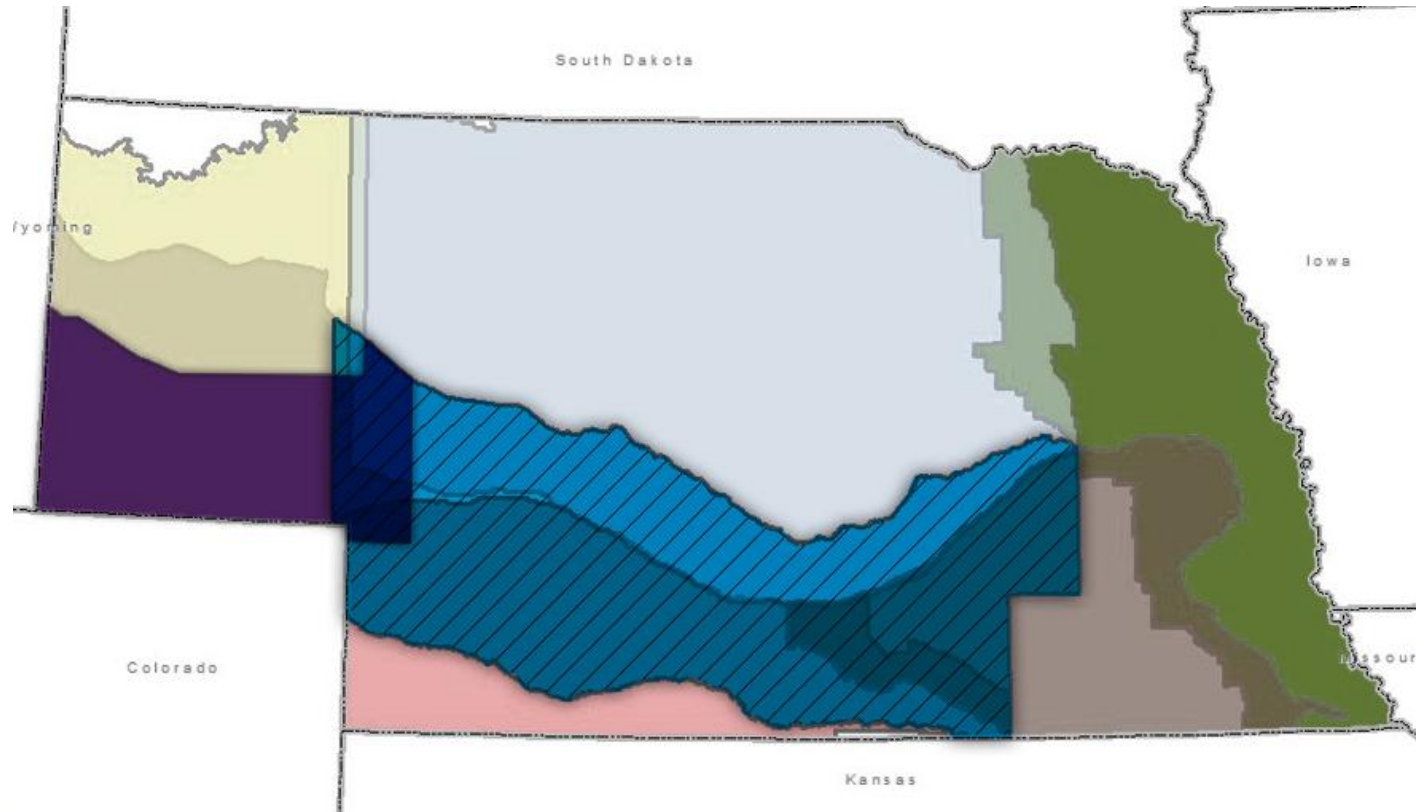
Benefits of Combined Approach

- Supported at the State level
- Integrates local considerations/insights
- Combines state and local funding sources.
- Recognizes heterogeneity of the state

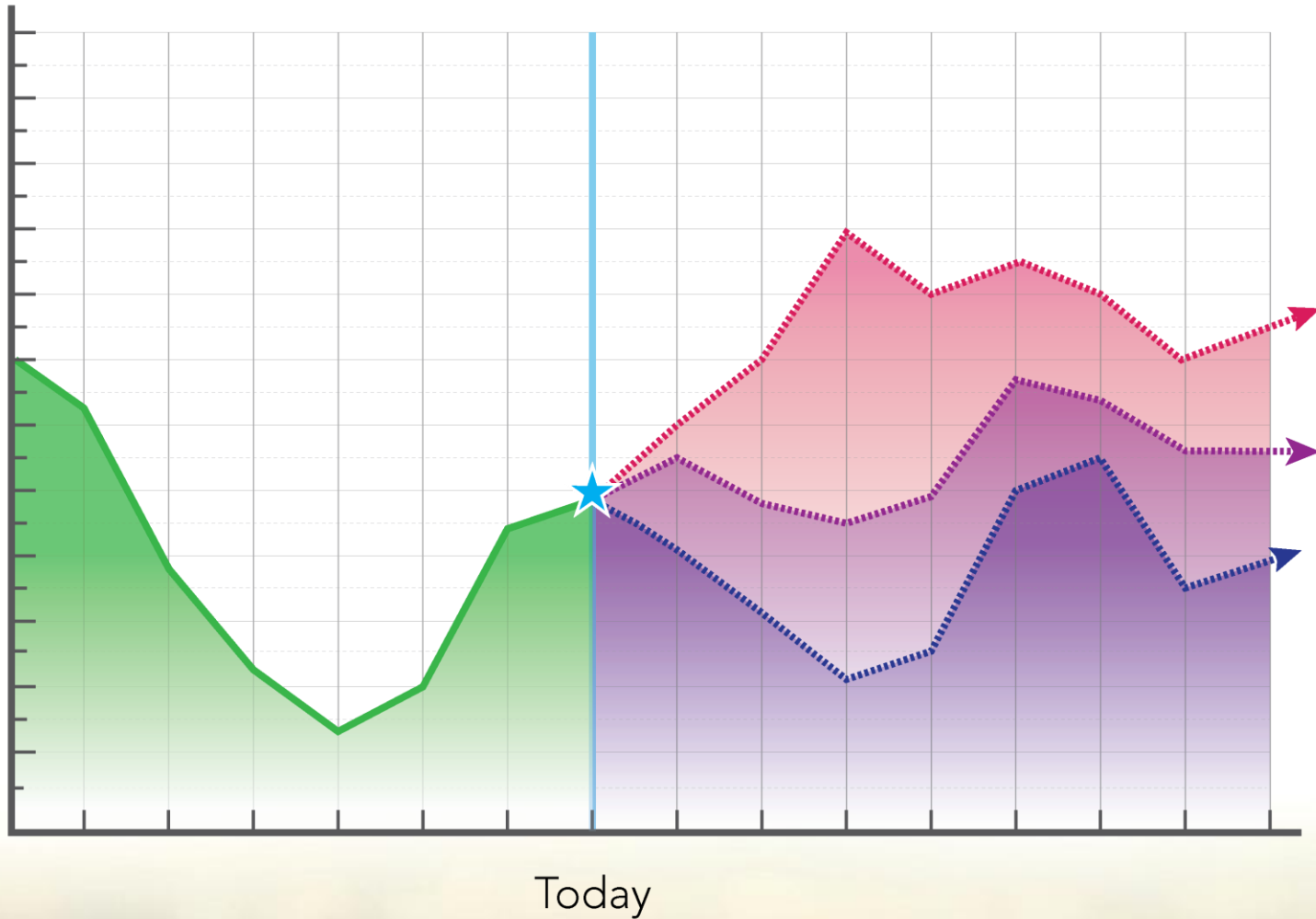
The Integrated Water Management Process



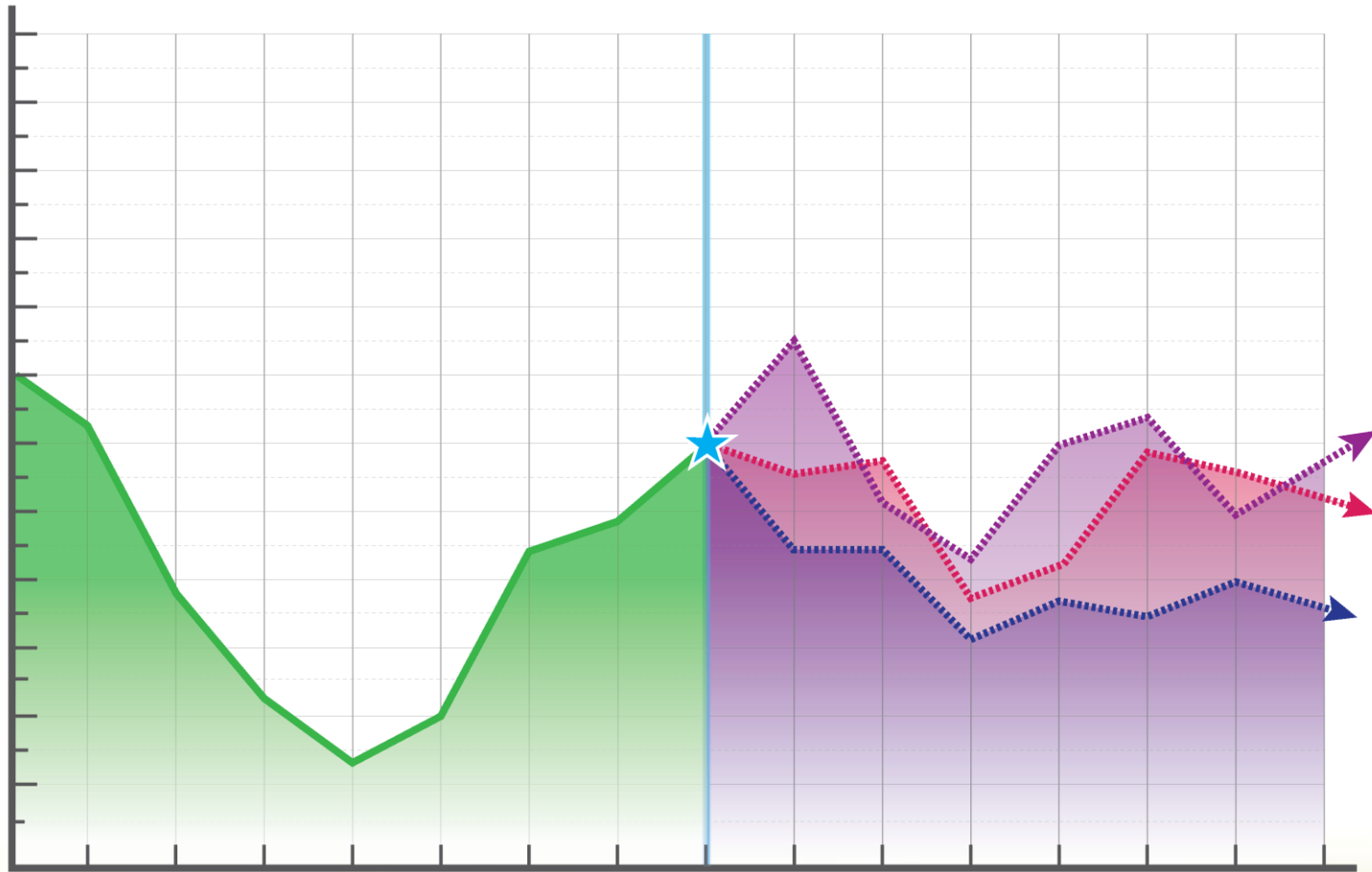
Current Modeling Tools – Regional Models



Managing in real-time

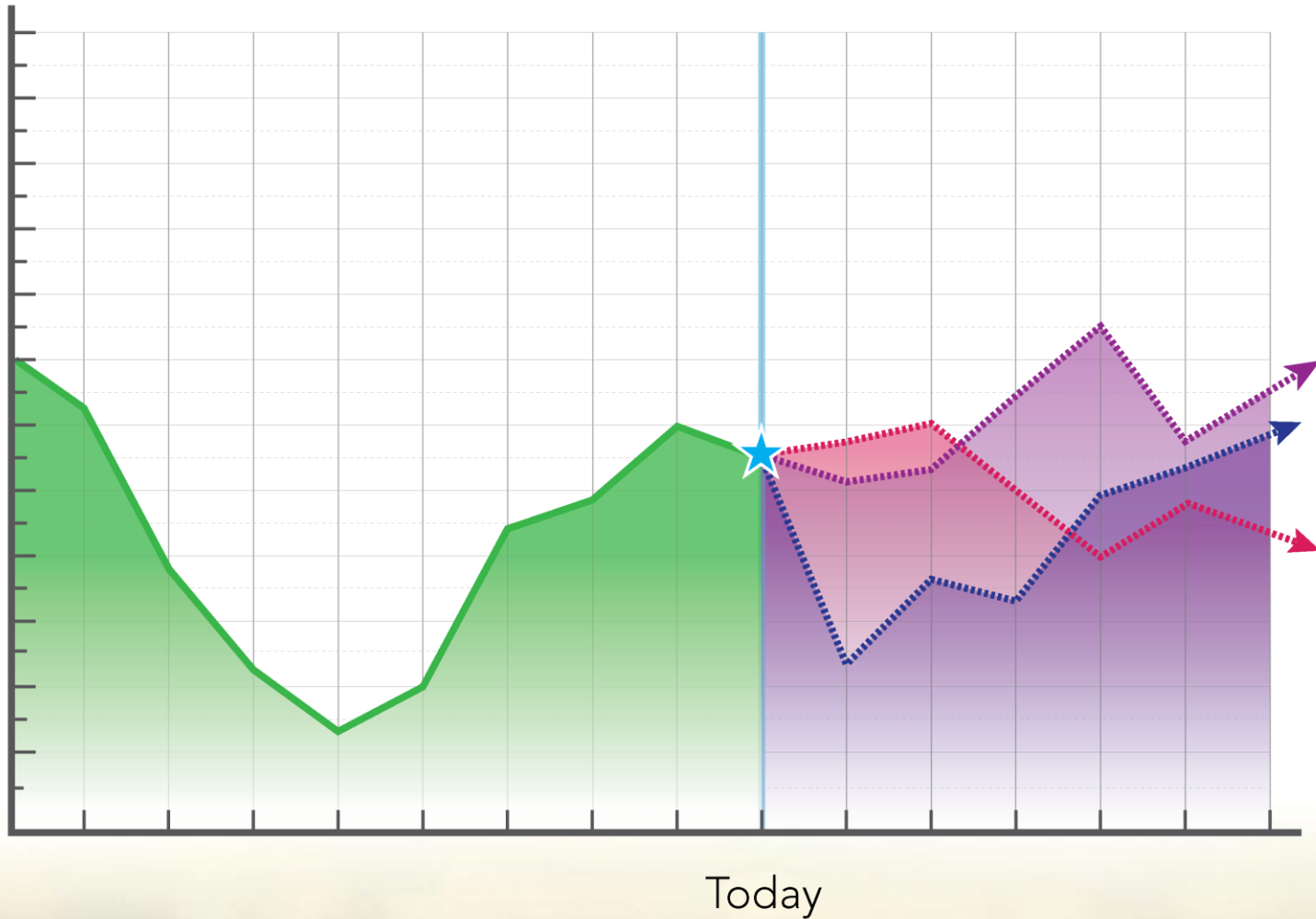


Managing in real-time

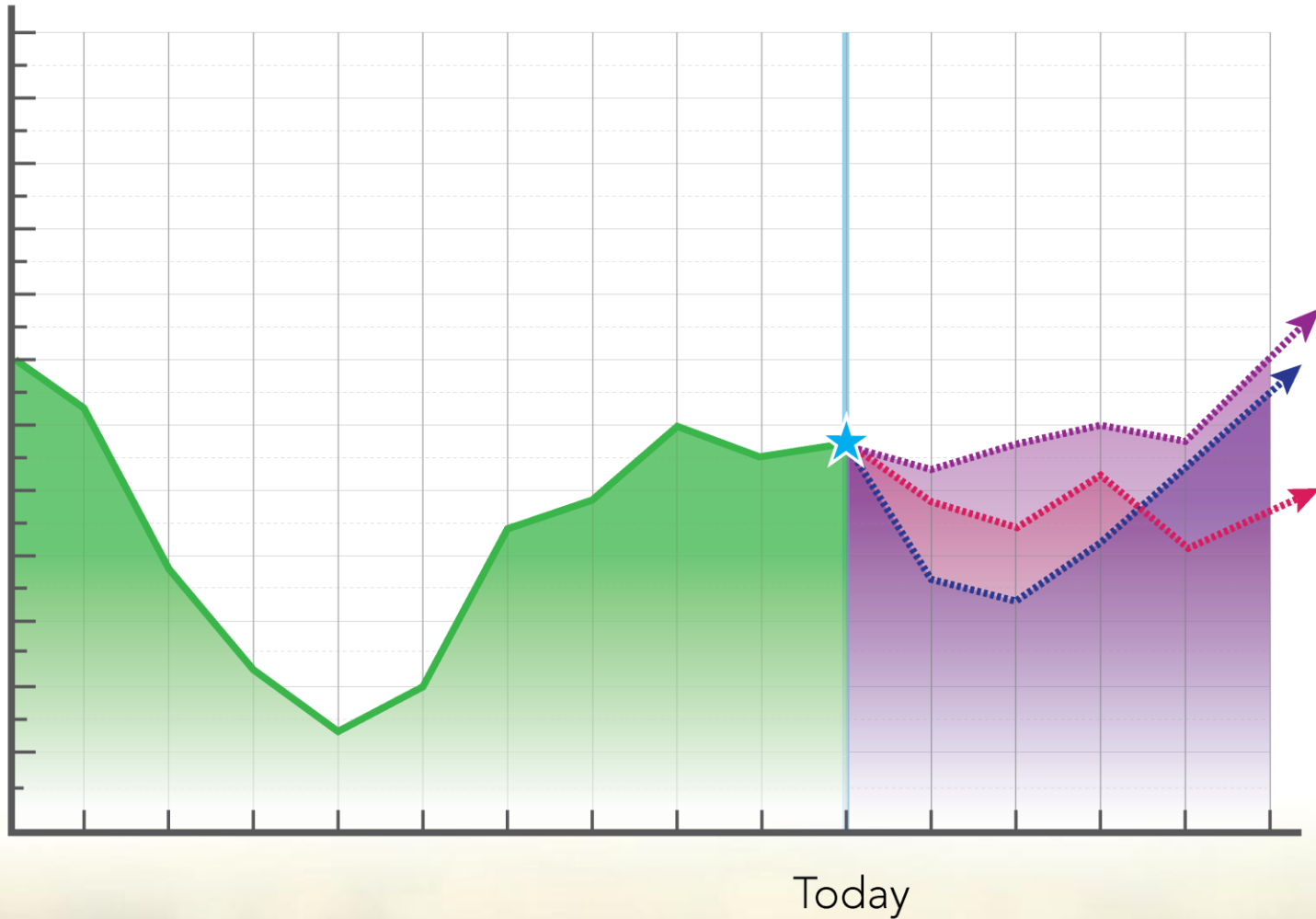


Today

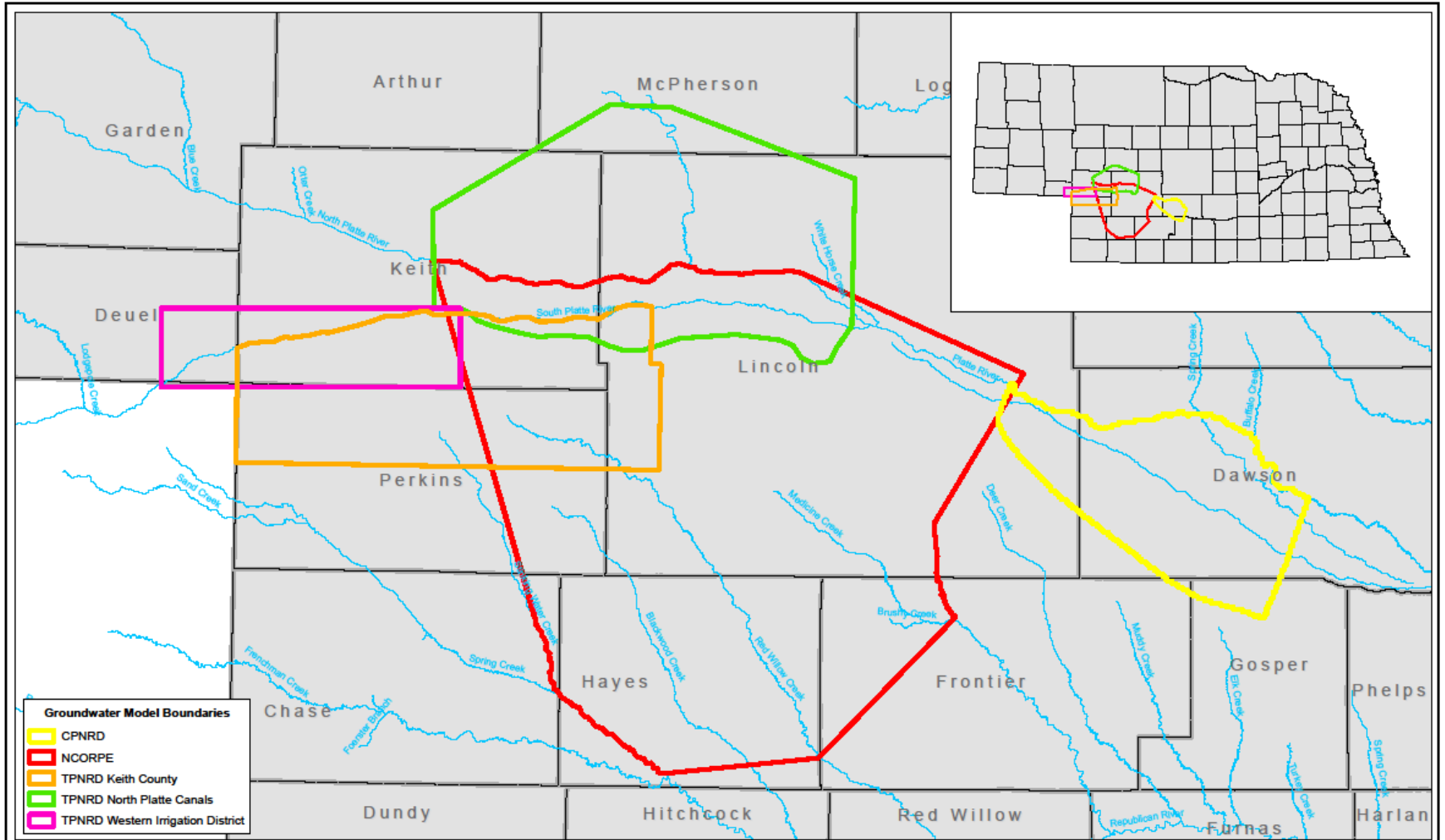
Managing in real-time



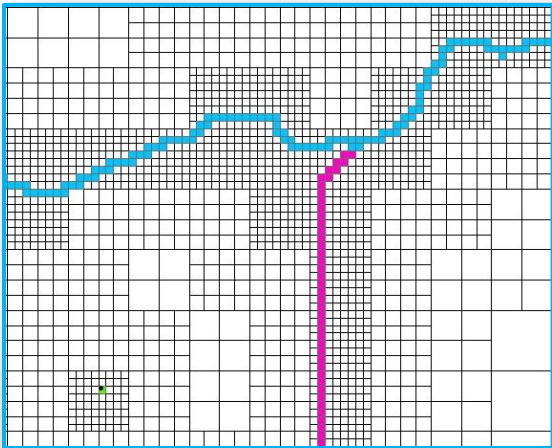
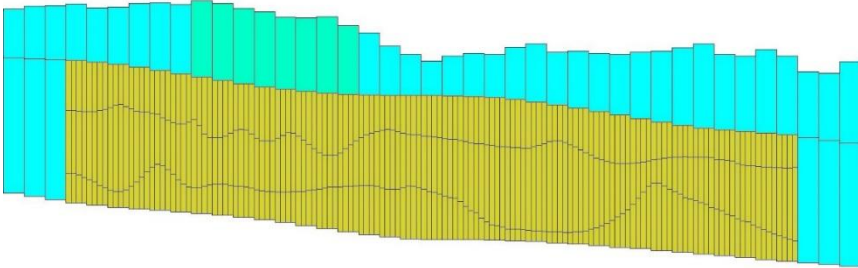
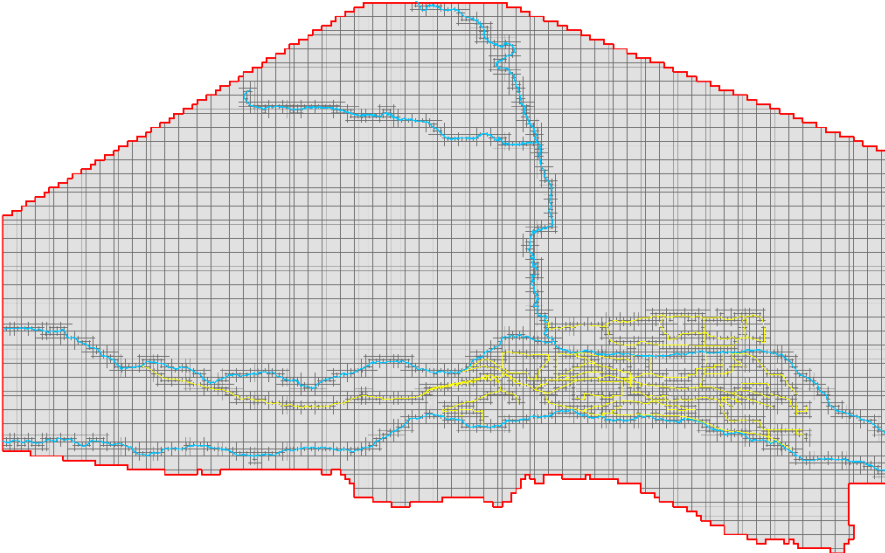
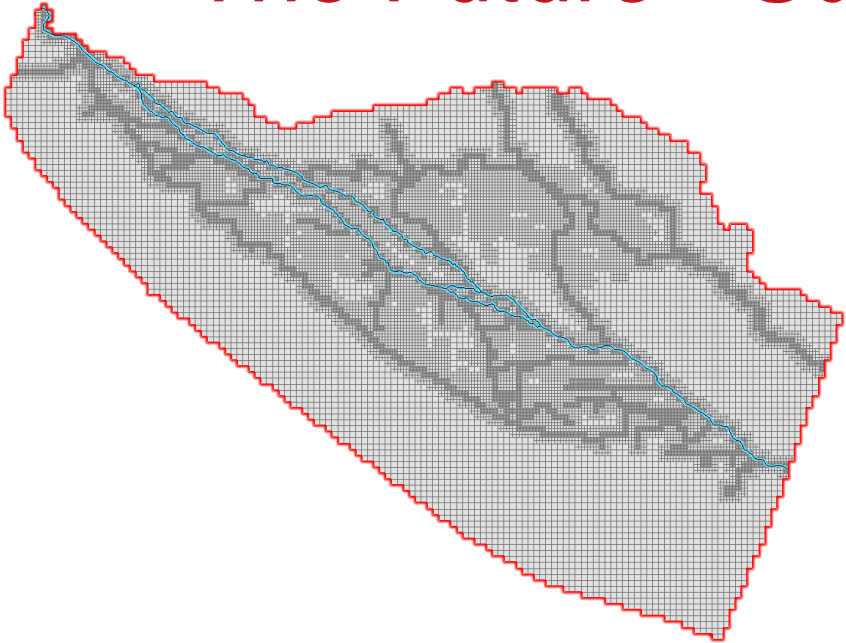
Managing in real-time



The Future - Sub-regional Models

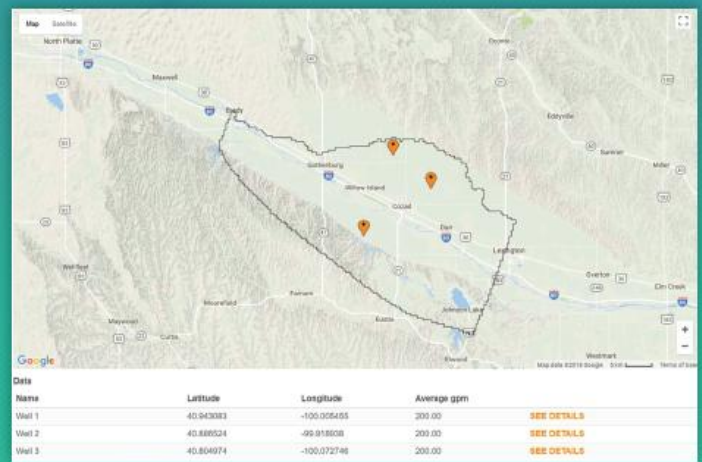


The Future - Sub-regional Models

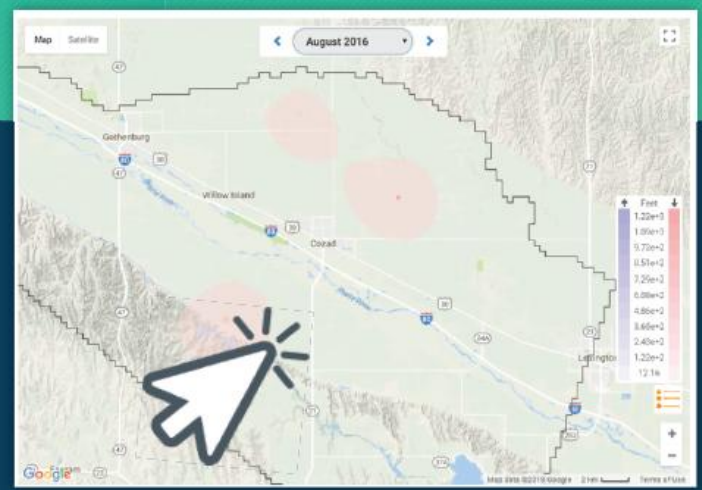


The Future – Automated Tools

INPUT
scenario
information



GET
the result
in minutes!





Questions?

Brian Dunnigan – bdunnigan@olssonassociates.com

Jim Schneider – jschneider@olssonassociates.com