

Minutes

Meeting of

Nebraska Department of Natural Resources (NDNR)

Wyoming State Engineer's Office (WSEO)

Technical Group

10:00 a.m. Central Time / 9:00 a.m. Mountain Time

April 7th, 2014

Conference Call – GoTo Meeting

Agenda Items:

1. Introductions

Jesse Bradley	NDNR	John Harju	WSEO
Brandi Flyr	NDNR	Wray Lovitt	WSEO
Tom Hayden	NDNR – Bridgeport	Sue Lowry	WSEO
Ruopu Li	NDNR	Jodee Pring	WSEO
Melissa Mosier	NDNR	Brian Pugsley	WSEO
Mahesh Pun	NDNR	Philip Stuckert	WSEO

2. Updates

a. Nebraska

i. Box Butte Reservoir update (Hayden)

Tom Hayden reported that due to over a dozen inches of snow and frozen ground conditions, the streamflow of the Niobrara River and volume of water within Box Butte Reservoir are currently higher than expected. The streamgage at Box Butte Reservoir averaged 160 cfs between March 6 and March 23, 2014, and the volume of Box Butte Reservoir increased from 6,200 acre-feet at the end of the 2013 water year to 13,000 acre-feet between February 28 and March 2, 2014. The current volume in the Reservoir as of April 9, 2014, is about 14,000 acre-feet. The volume of water in Box Butte Reservoir does not frequently approach 20,000 acre-

feet, so the current volume will be of great benefit to the irrigators who use this water.

b. Wyoming

- i. John Harju discussed a spreadsheet (Attachment A) he put together that lists every permit approved in the Wyoming portion of the Niobrara River Basin since the spring 2013 Niobrara Compact meeting. Wyoming does not have a de minimus limit: all wells, except monitoring wells, require a permit. Similar to the observations made by Tom Hayden, Wyoming reported that a good amount of moisture and higher than expected streamflows were seen within the Niobrara River Basin since the fall 2013 Niobrara Compact meeting.

3. Niobrara Basin WaterSMART Grant

Mahesh Pun provided an update on the Upper Niobrara-White groundwater model (Attachment B). There are multiple uses for this model: 1) a tool to assist in the development and implementation of the Upper Niobrara White NRD IMP, 2) to help analyze water use and availability within the basin, 3) to help the NDNR in the determination of the hydrologically connected area of the basin and the development of different management scenarios. This integrated model incorporates both a groundwater model, a surface water operations model, and a watershed model. Future applications of the model to assist with management decision-making include different climate variability scenarios, change in irrigated acreage scenarios, and various allocation scenarios.

Brandi Flyr showed the group the NDNR's new website and the INSIGHT website that is now available. INSIGHT summarizes water supply and demand for many basins within the state (including the Niobrara Basin), as well as statewide water supply and demand data. NDNR has invested a lot of time into INSIGHT over the past two years and hopes that it will provide interested parties with a better understanding of the water that is available, when it is available, and how it is being used across the state and across different basins. The INSIGHT website also offers visitors access to the raw data that was used in its development, and summarizations of that data and how it was used. The Upper

Niobrara White groundwater model was used to develop some of the data for the Niobrara Basin analysis found on INSIGHT.

The WaterSMART project was delayed for a bit last year and the contract has now been extended to the end of this calendar year. Work has resumed with the Mirage Flats Irrigation District to gain more stakeholder input and develop additional scenarios. The anticipated completion date for the WaterSMART project is January 15, 2015.

4. Topics for the next Niobrara River Compact Meeting

The fall 2014 Niobrara Compact meeting date will be set once the NPDC fall meeting is scheduled.

5. Adjourn

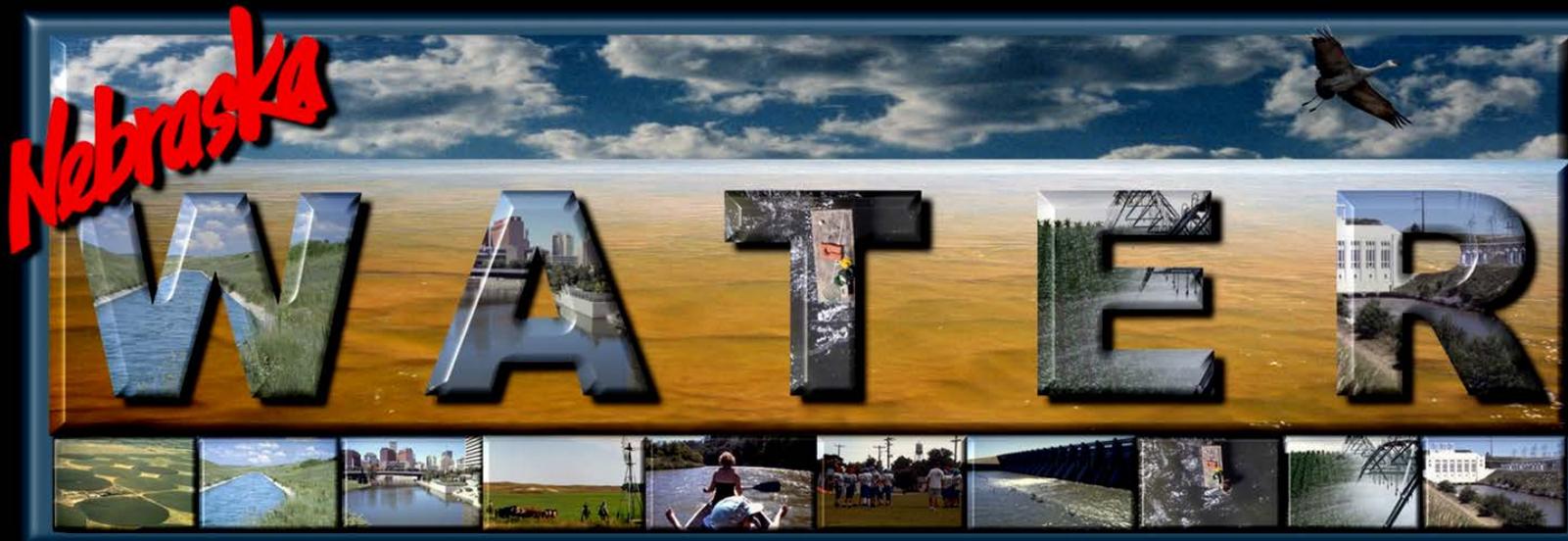
The meeting adjourned at 11:02 a.m. Central Time / 10:02 a.m. Mountain Time.

Attachment A

**Permits approved in Niobrara River Basin in Wyoming
Since Last Spring Meeting on April 24, 2013**

Attachment B

Upper Niobrara White Groundwater Modeling Presentation Given by the Nebraska Department of Natural Resources



Upper Niobrara White Groundwater Modeling

Niobrara Spring Tech Conference

April 7, 2014

Mahesh Pun, EIT

Integrated Water Management Analyst

Nebraska Department of Natural Resources

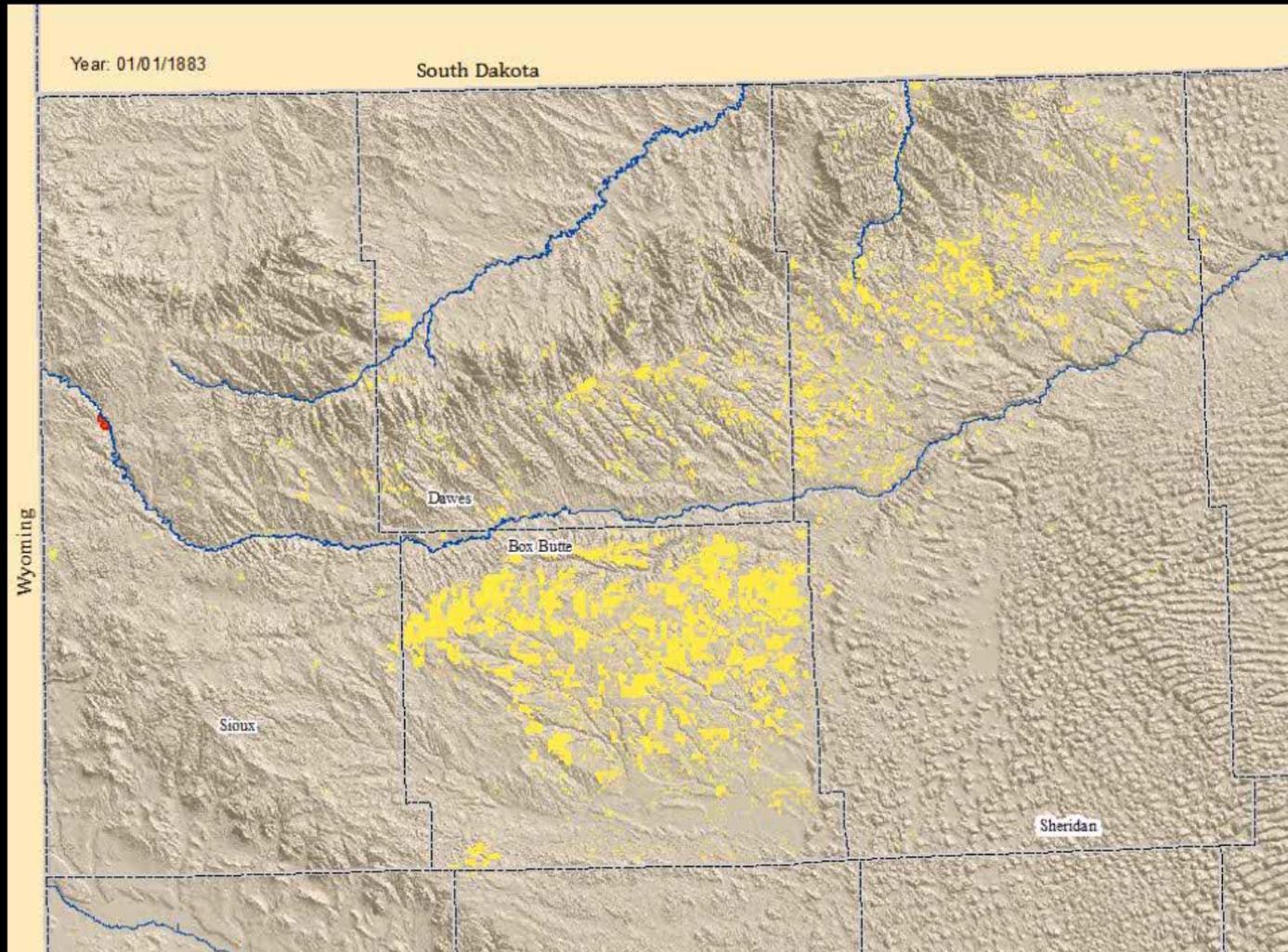
Nebraska
Department of Natural Resources



Introduction and Background

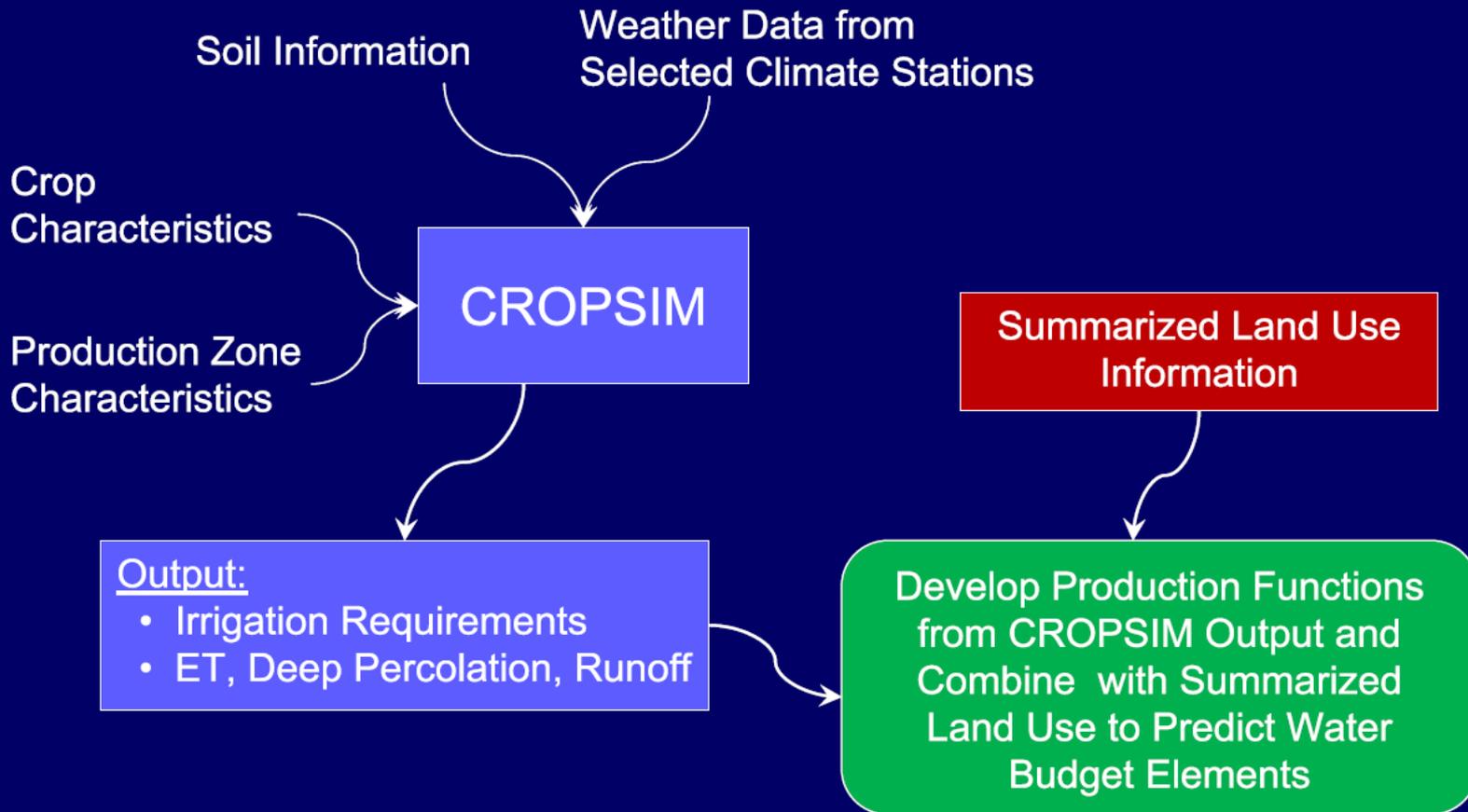
- Development and implementation of an Integrated Management Plan (IMP) by NDNR and UNW NRD
- Groundwater model as a tool in assisting IMP process
- Model use for analysis of water supplies and uses in upper portion of Niobrara River Basin
- Model for evaluation of hydrologically connected areas and management scenarios

Land Use Development



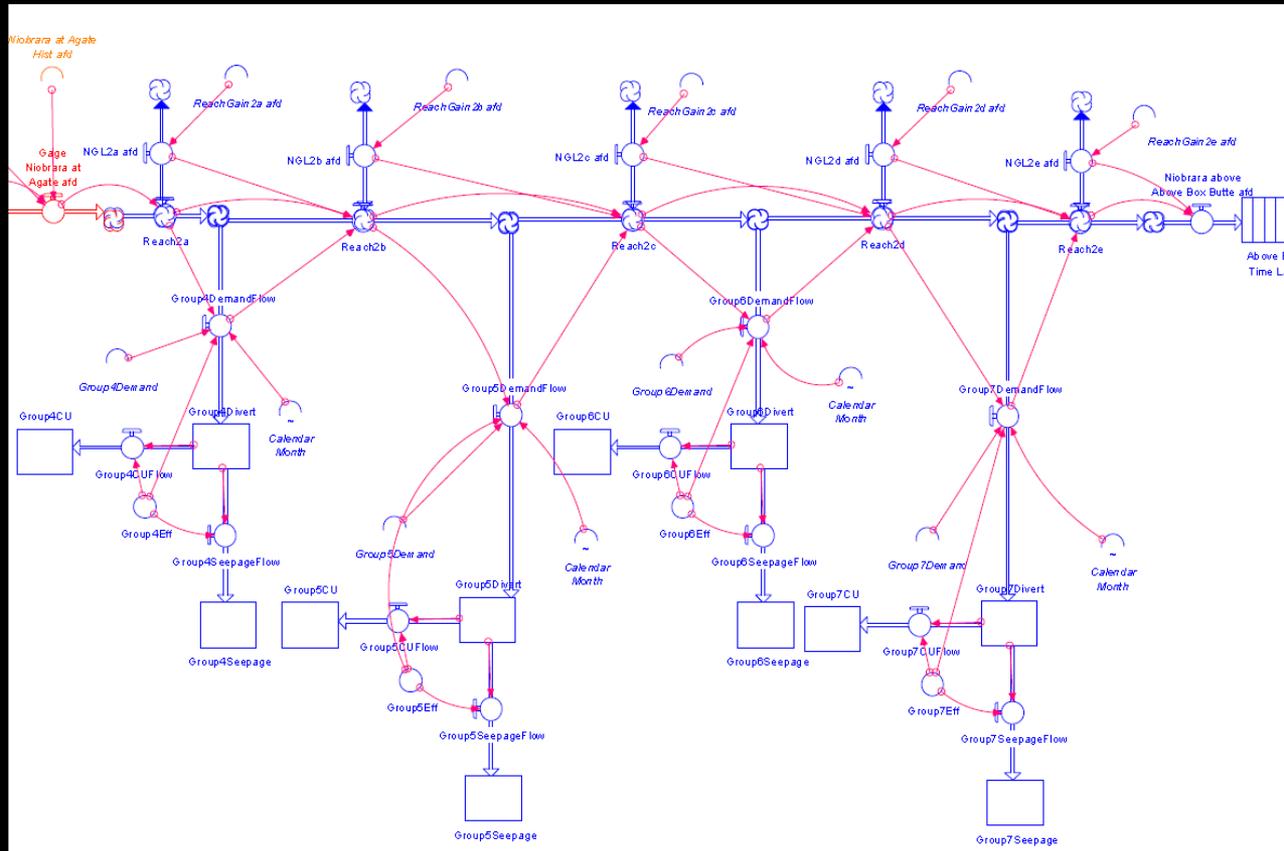
Watershed Model

GENERAL APPROACH

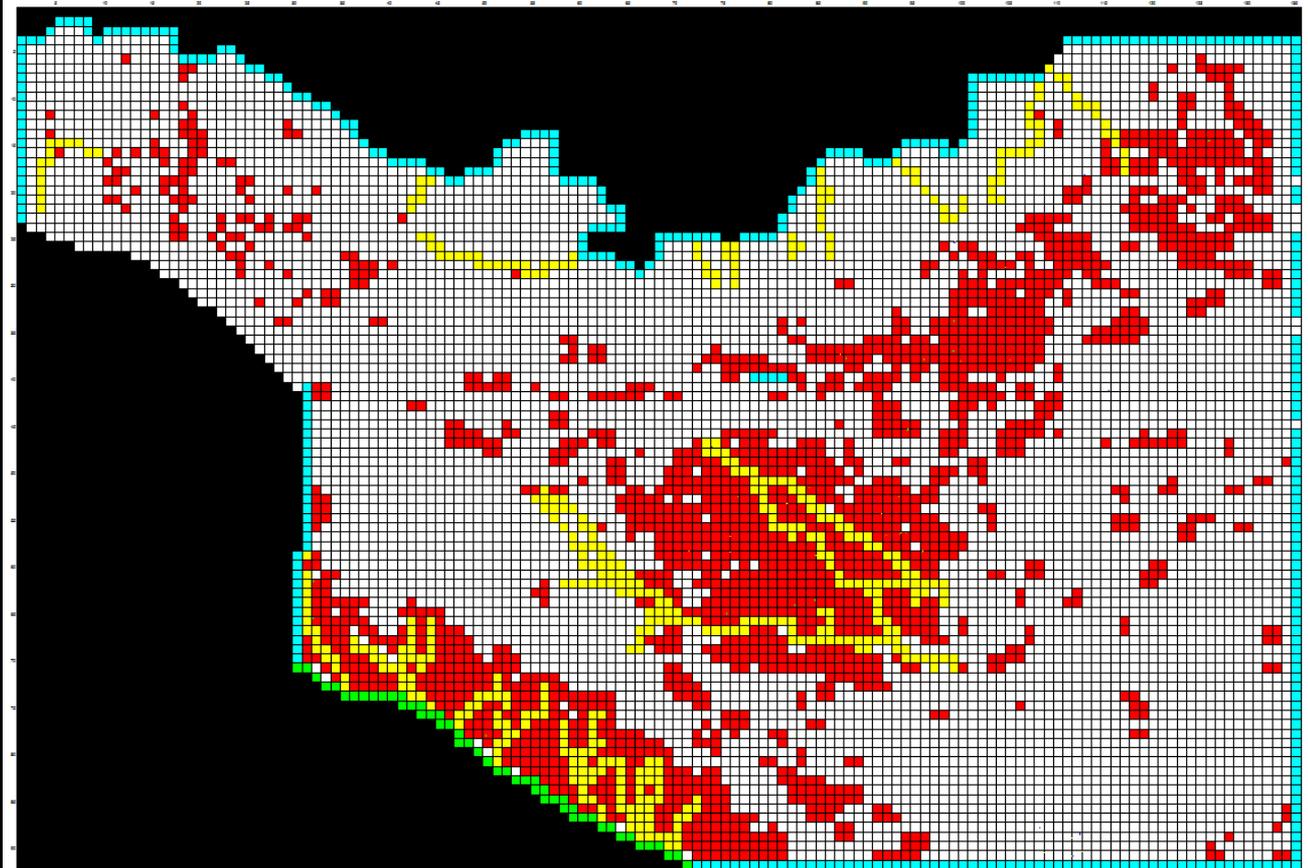


Surface Water Operations Model

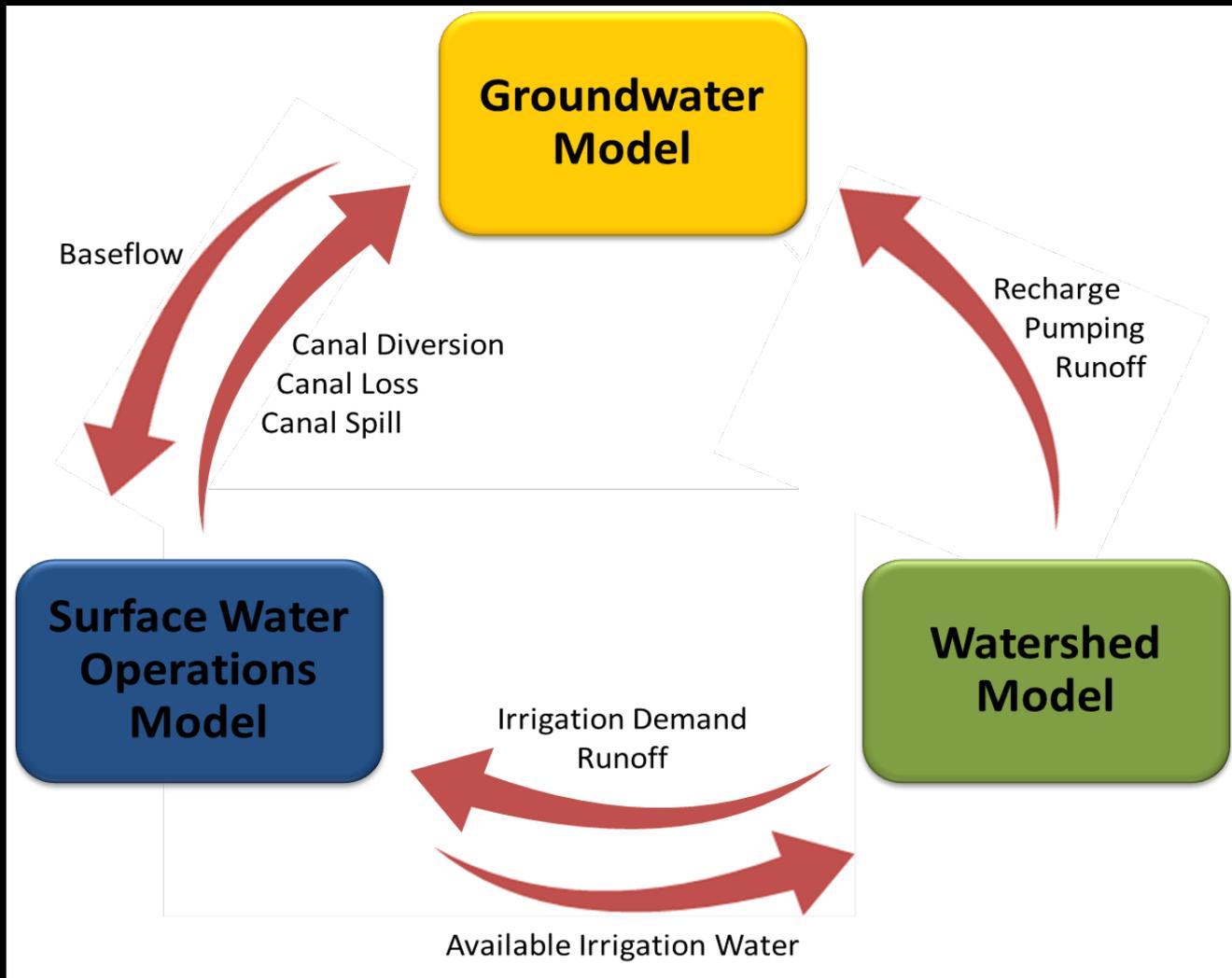
- Surface water operations model incorporated in modeling process
- Assess the effect of reservoir and canal operations, and surface water administration in hydrology of the basin



Groundwater Model

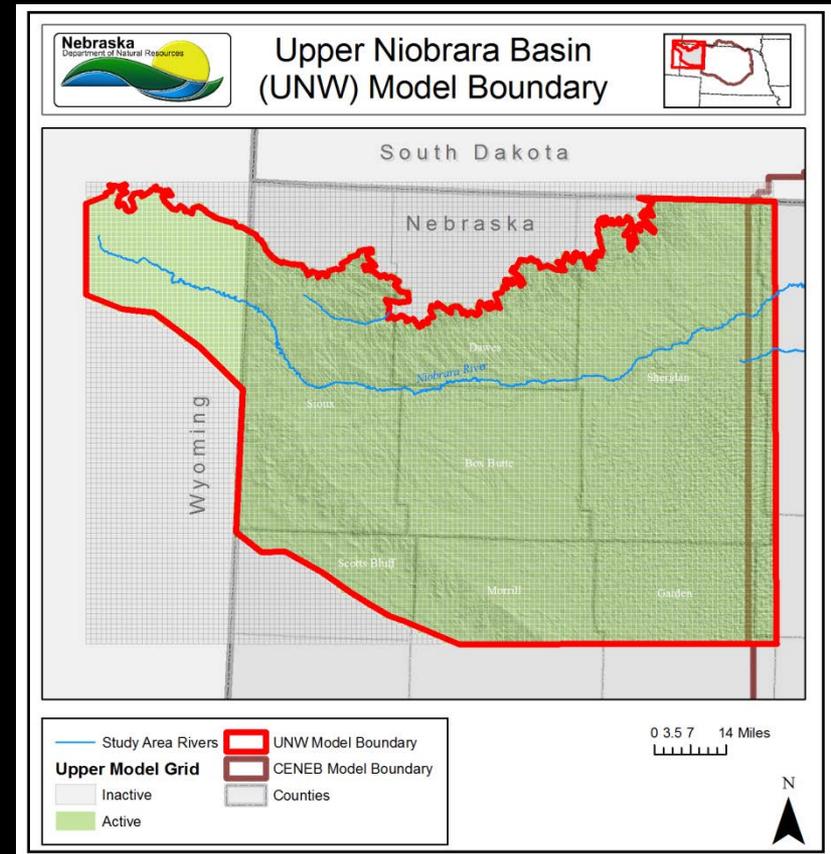


Model Interactions



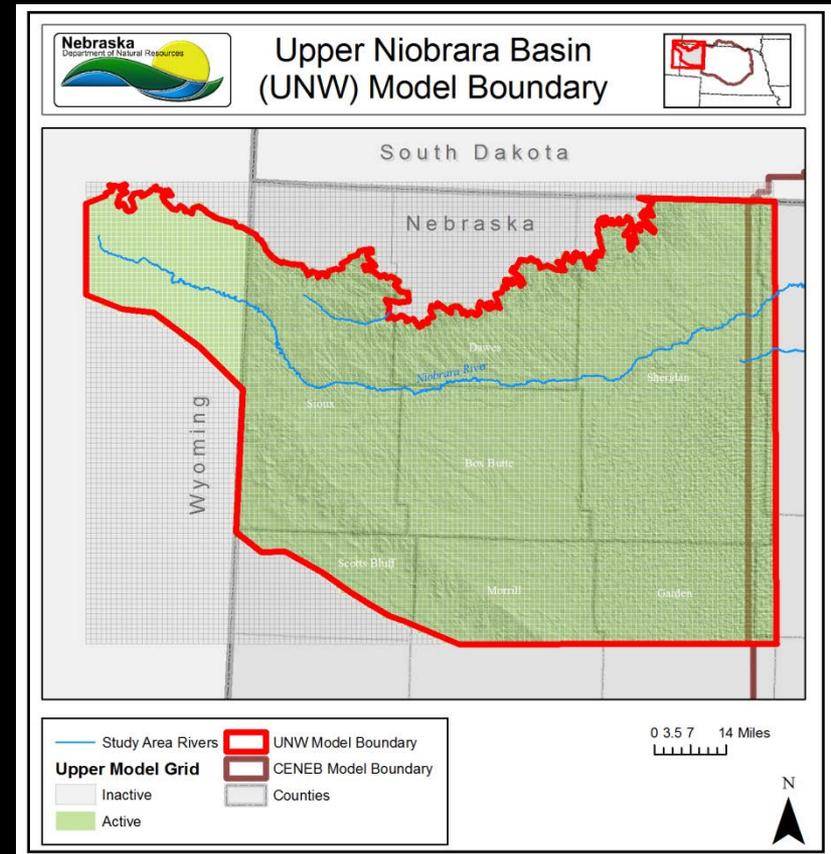
Upper Niobrara White GW Model

- Model study area:
 - Portion of Niobrara River Basin
 - Beginning at the headwaters of the Niobrara River near the town of Manville, Wyoming



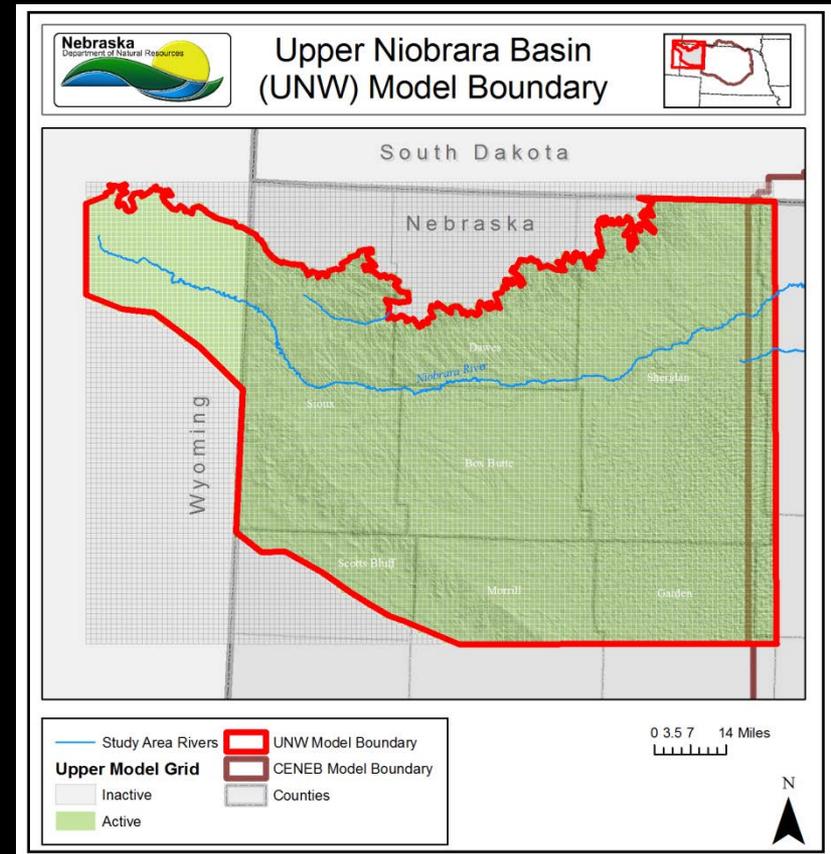
Upper Niobrara White GW Model

- Model study area:
 - End at the east to a line roughly coincident with the boundary of Sheridan and Cherry Counties in Nebraska



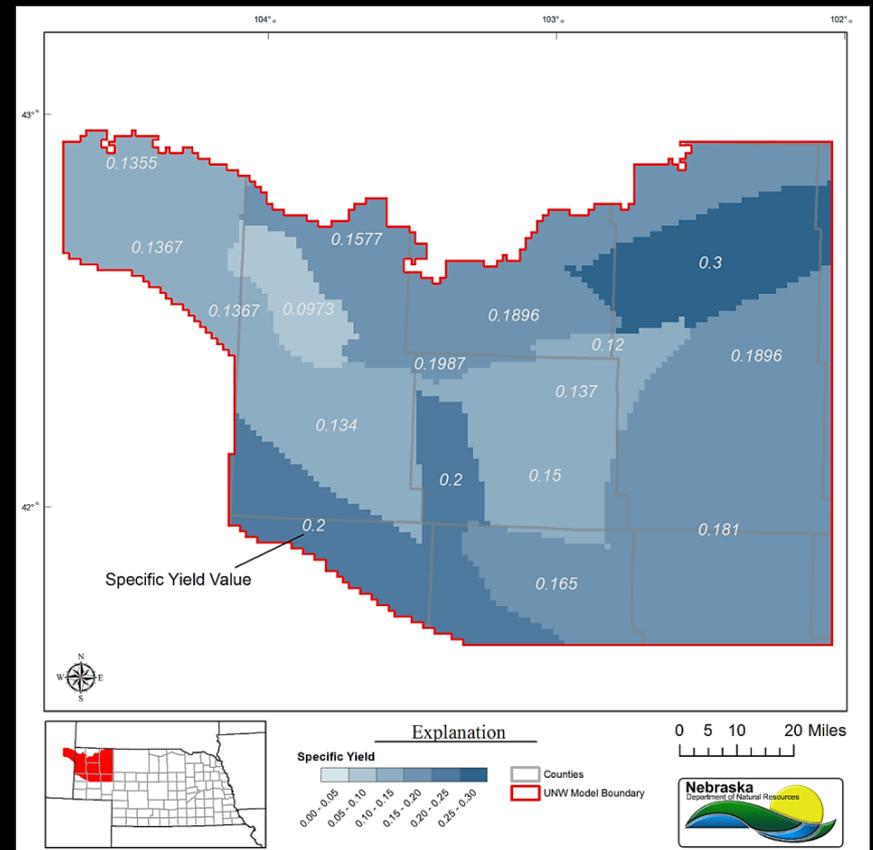
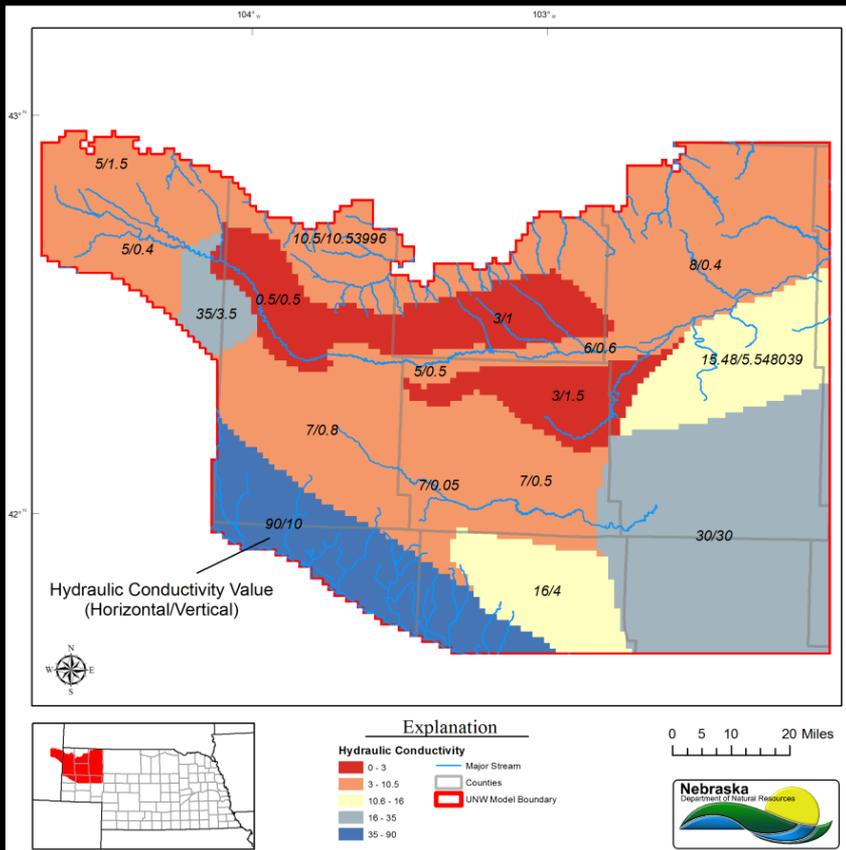
Upper Niobrara White GW Model

- Model input datasets:
 - Weather data such as precipitation, temperature and evapotranspiration
 - Soil data
 - Irrigable land distribution
 - Crop types
 - Surface water diversion
 - Canal recharge



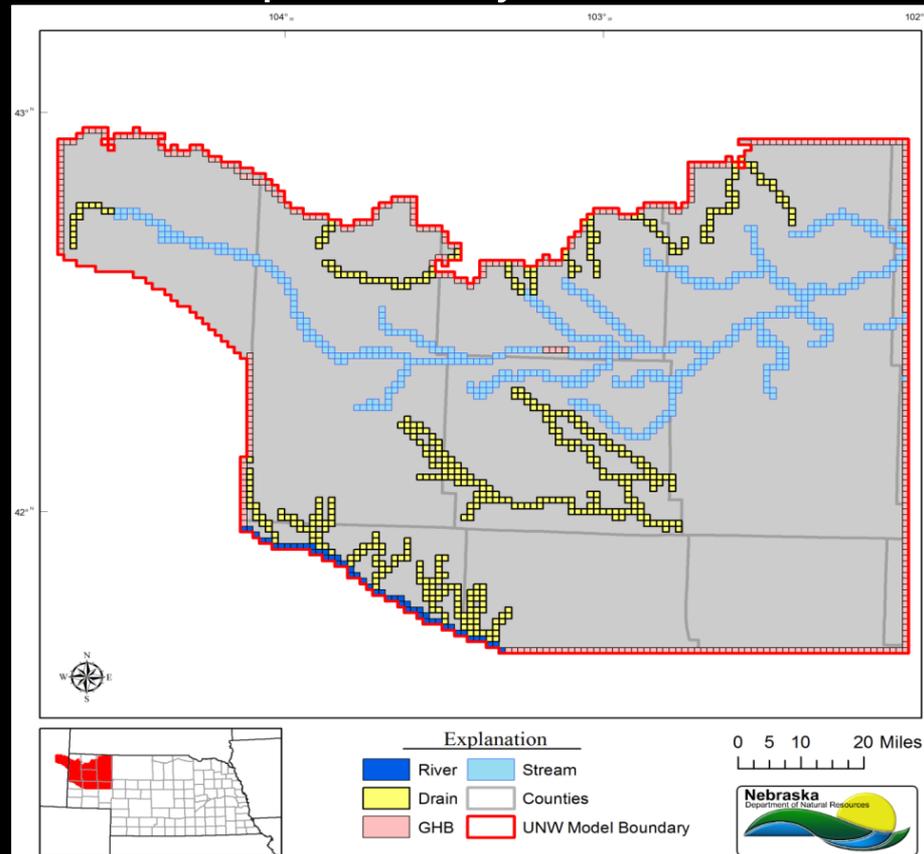
Upper Niobrara White GW Model

- Model input datasets:
 - Aquifer test holes data and data from previous study
 - Zones of hydraulic conductivity and Specific yield for model calibration



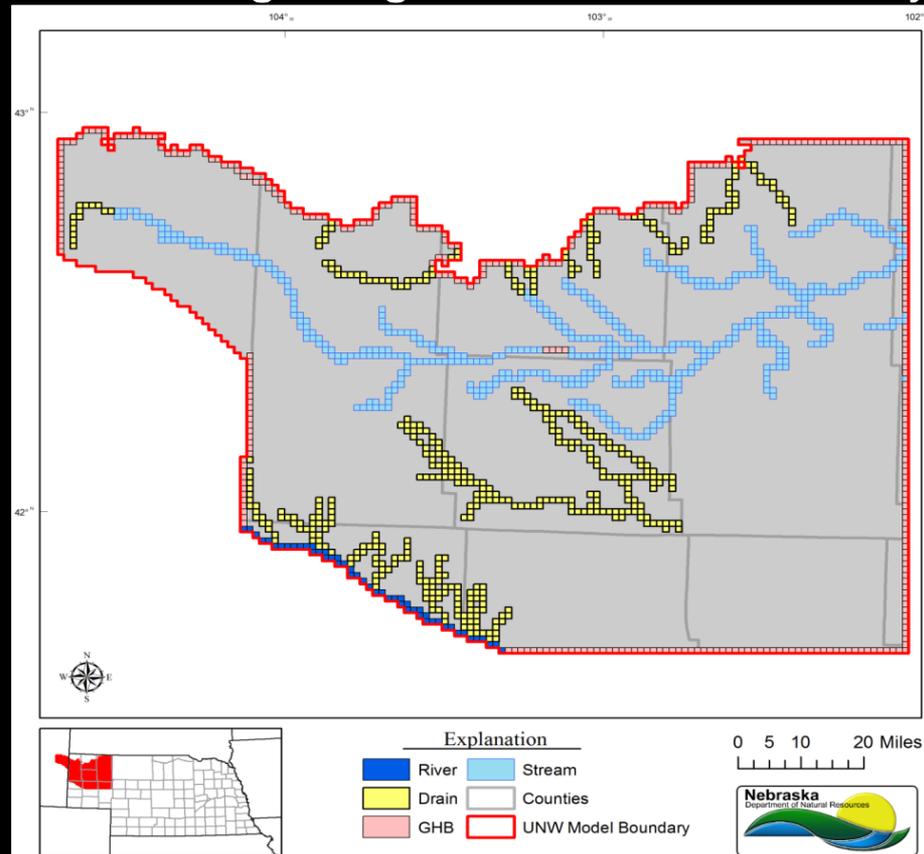
Upper Niobrara White GW Model

- Model boundary conditions:
 - Niobrara River and its tributaries as head-dependent boundaries
 - Only reaches that flowed perennially were chosen



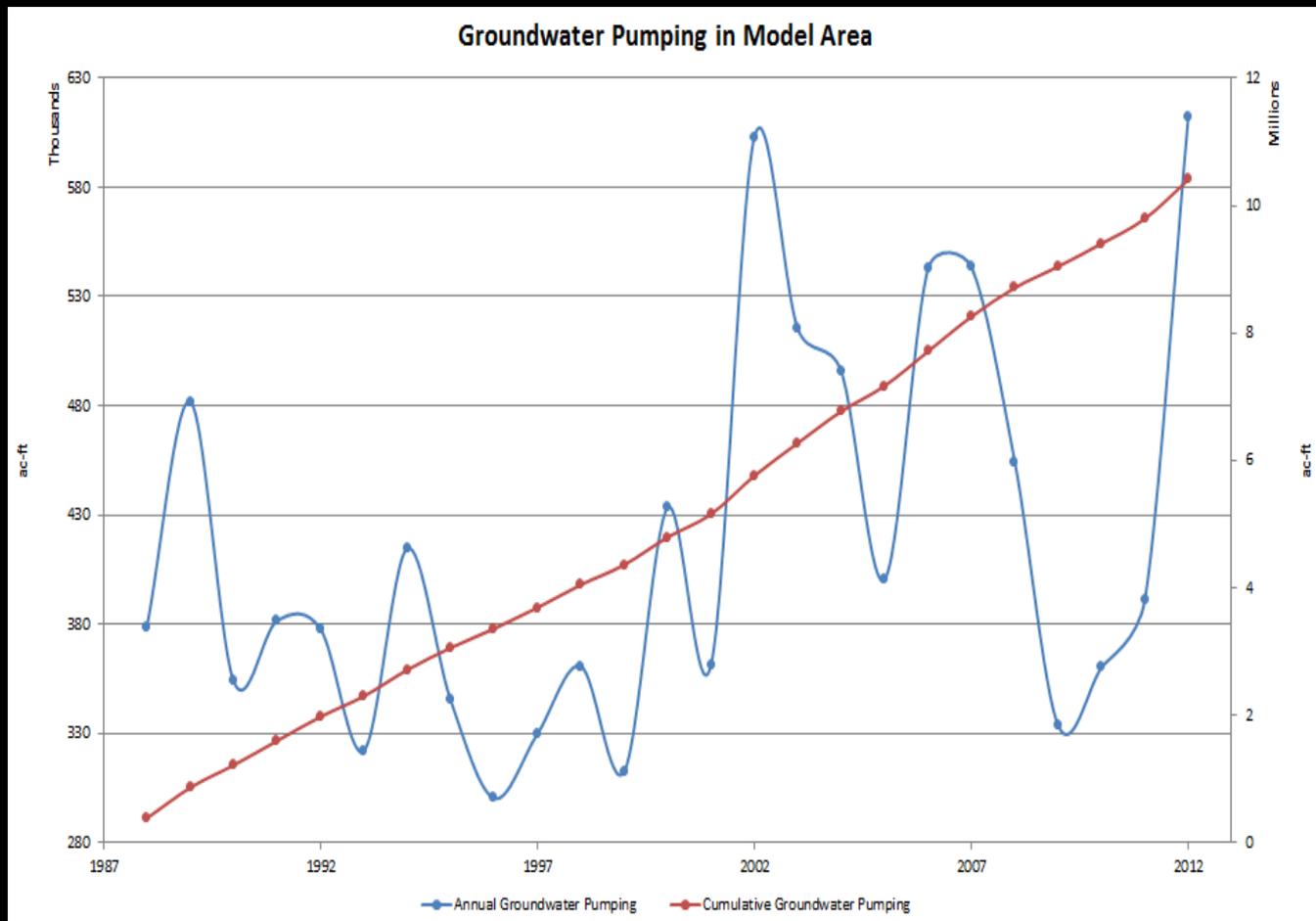
Upper Niobrara White GW Model

- Model boundary conditions:
 - North Platte River as constant head boundary
 - Box-Butte Reservoir assigned general head boundary



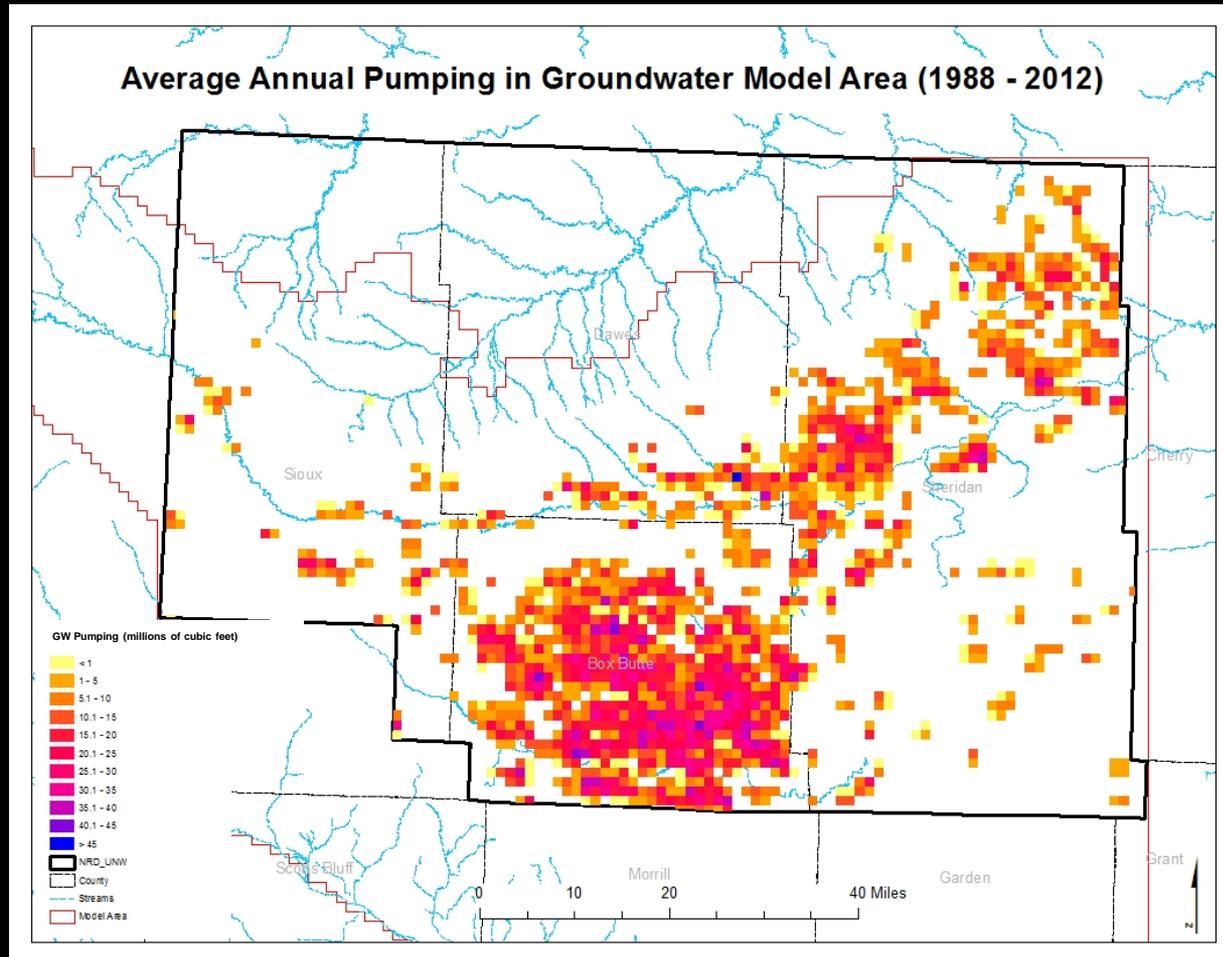
Upper Niobrara White GW Model

- Annual volume of pumping in model area



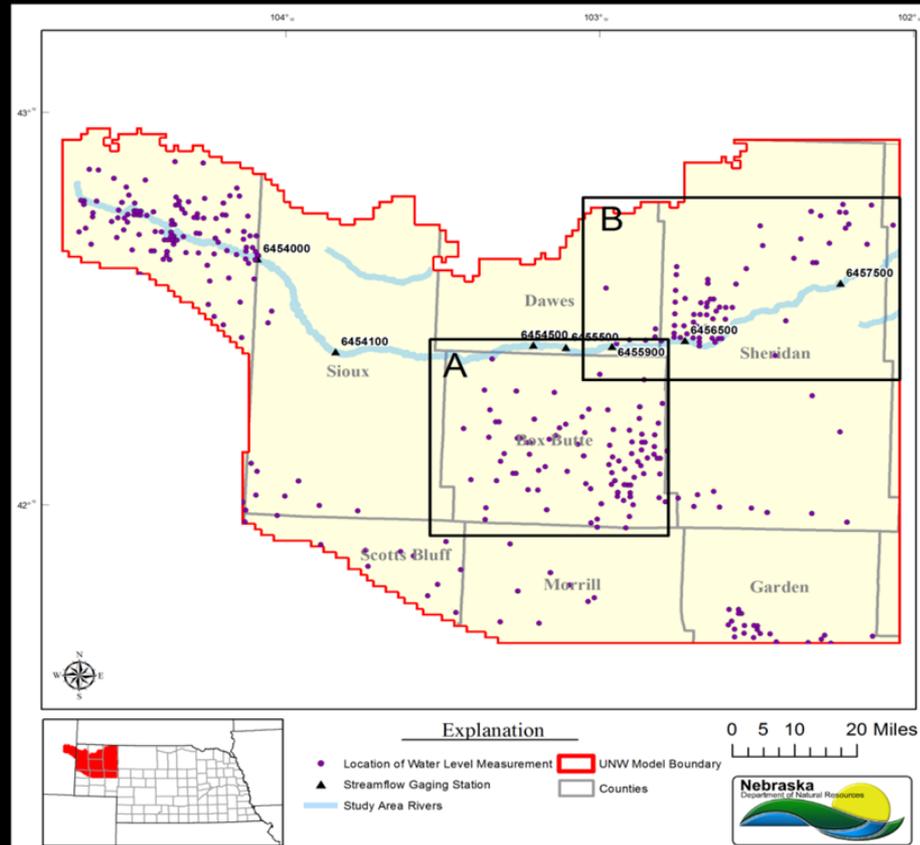
Upper Niobrara White GW Model

- Average annual volume of pumping in UNW NRD area in model



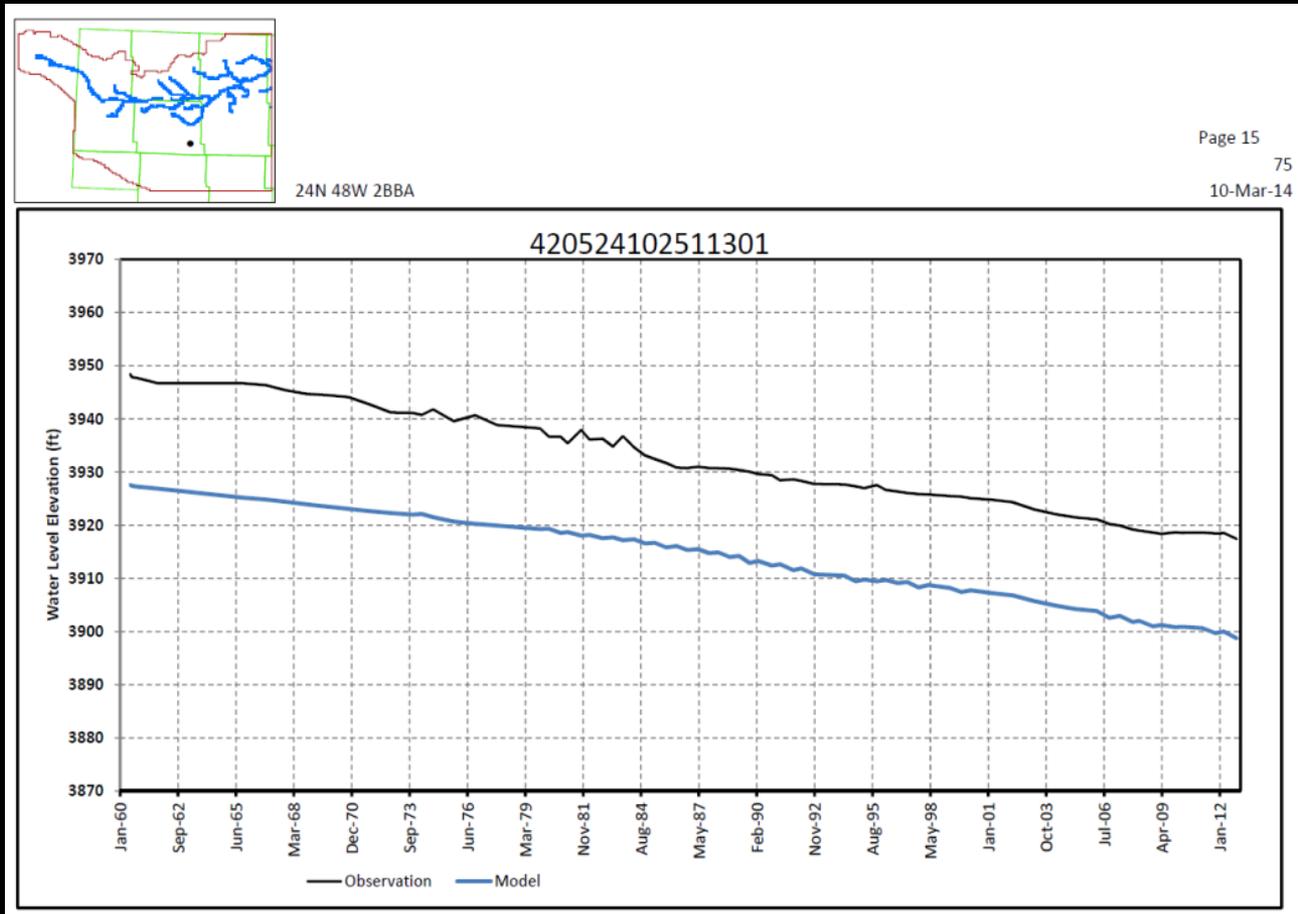
Upper Niobrara White GW Model

- Model Calibration targets and parameters:
 - Water levels of observation wells and stream baseflow as targets
 - zones of aquifer properties and stream bed conductance as parameters



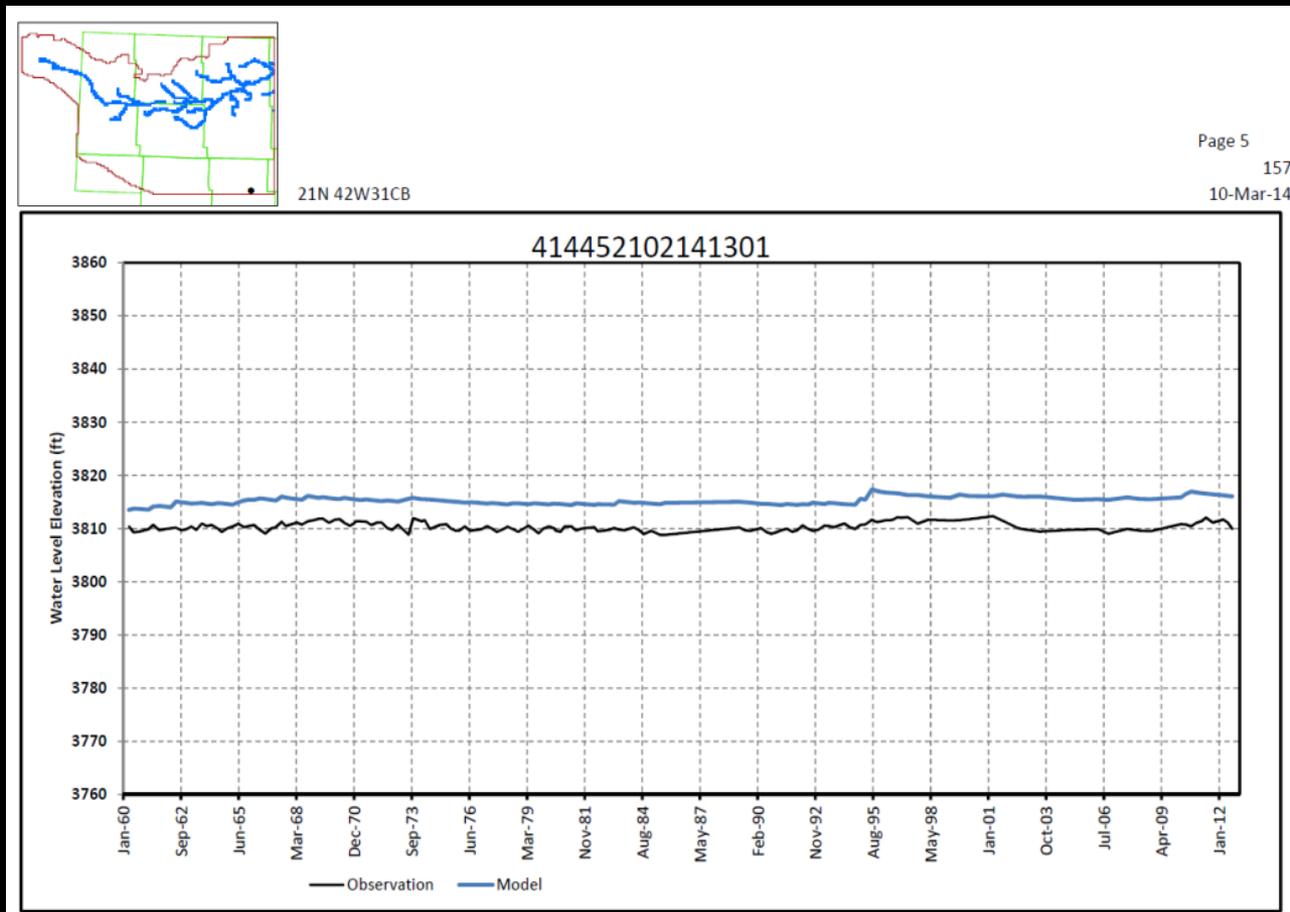
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed water level elevation



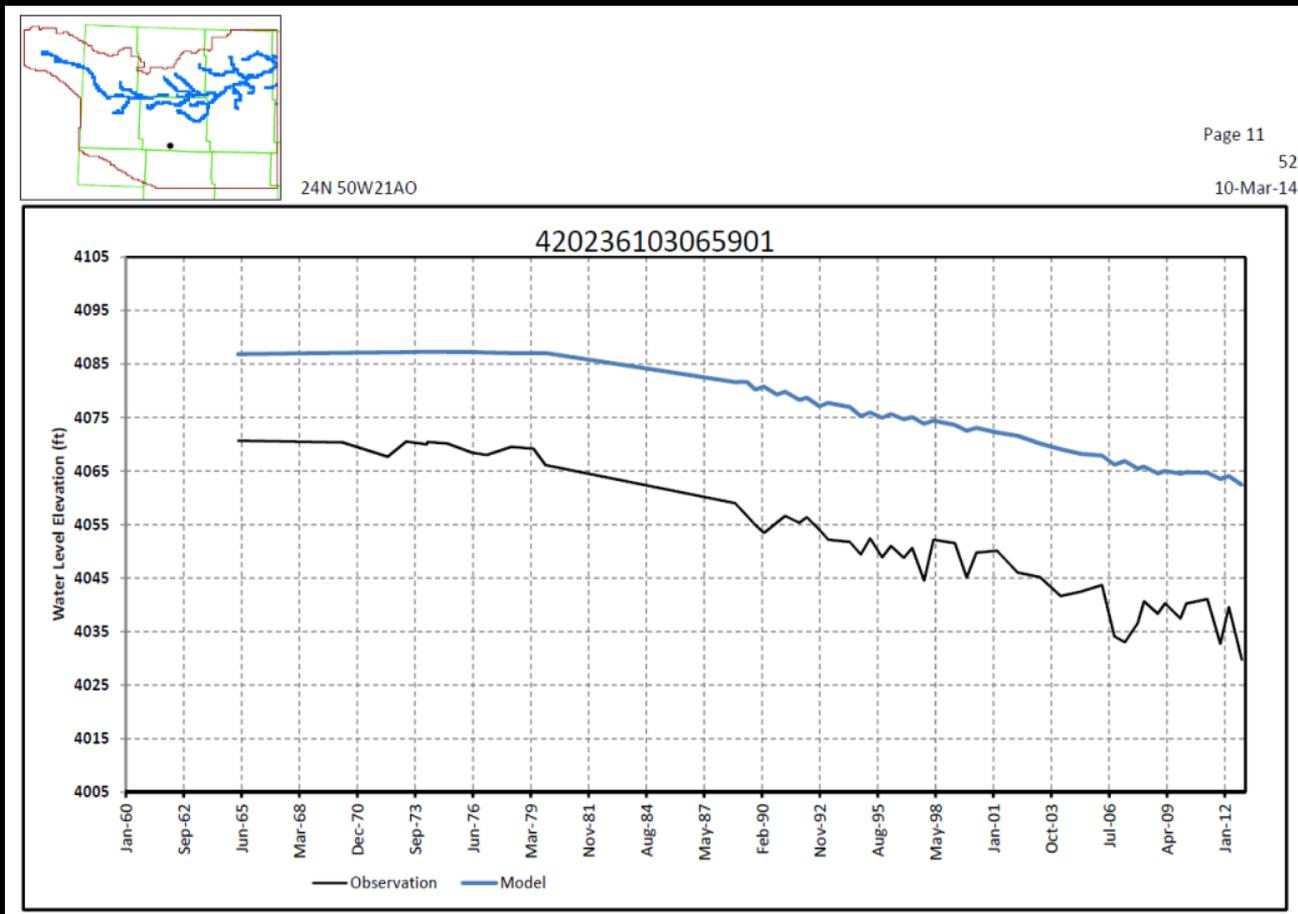
Upper Niobrara White GW Model

- Model performance:
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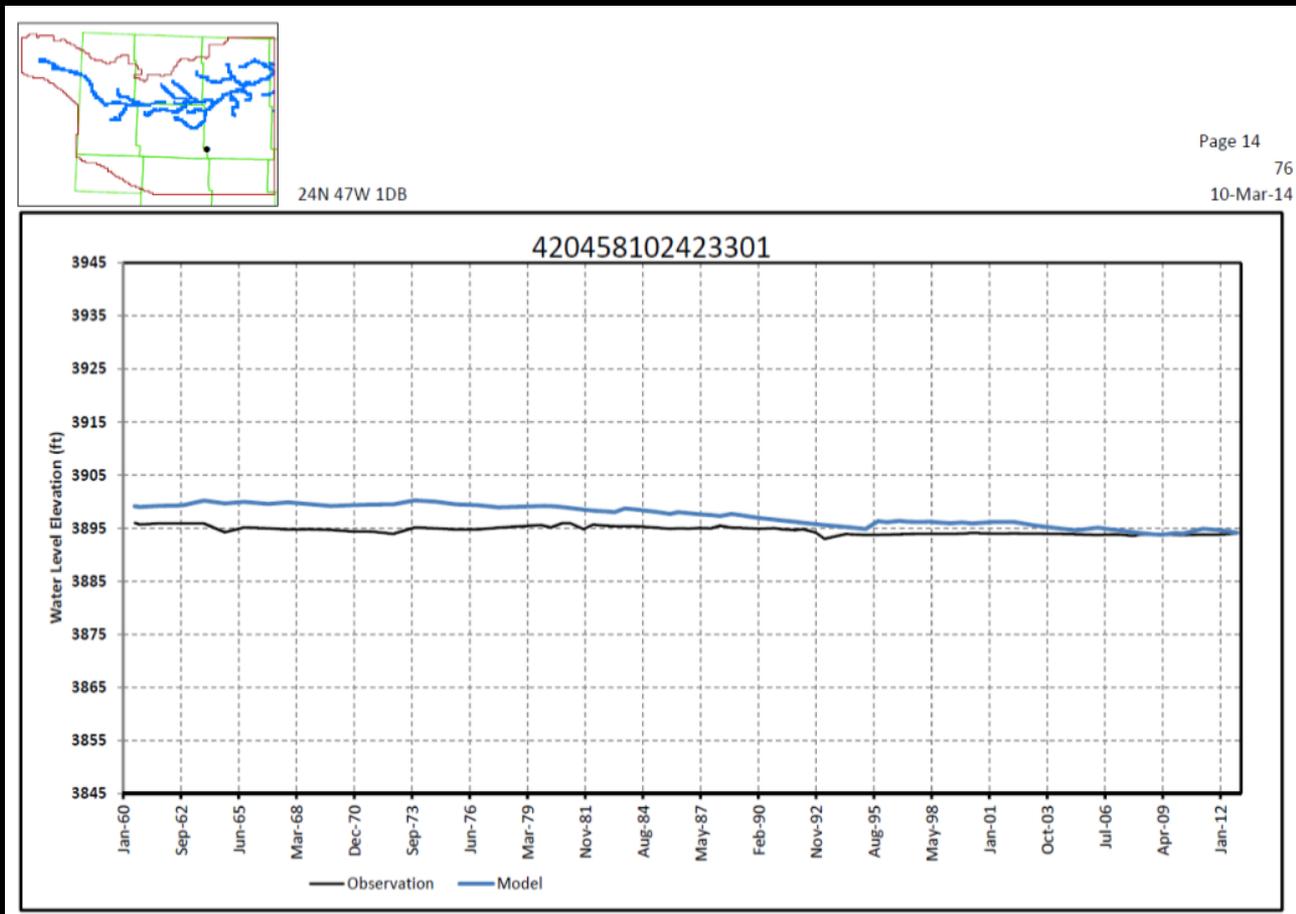
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed water level elevation



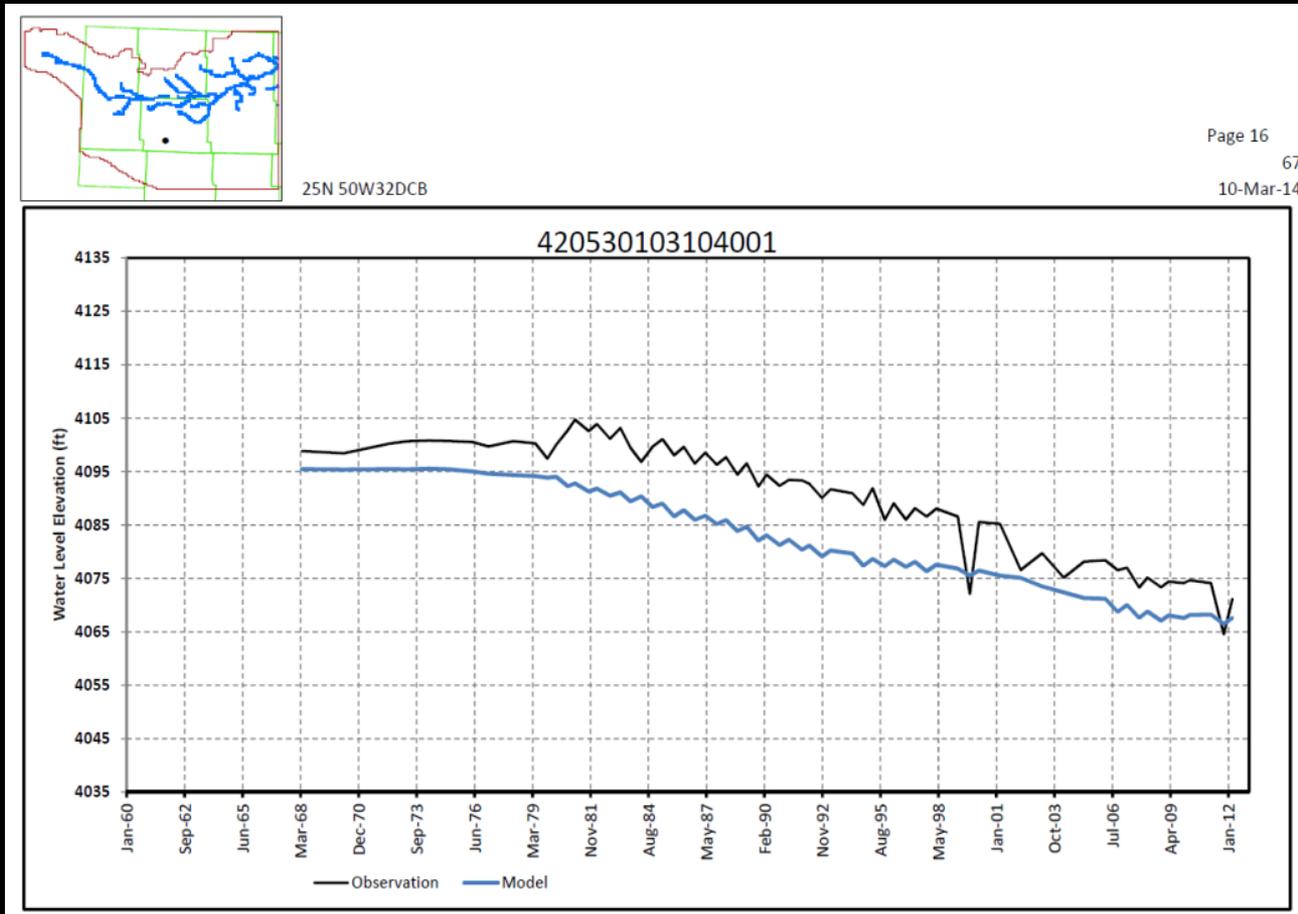
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed water level elevation



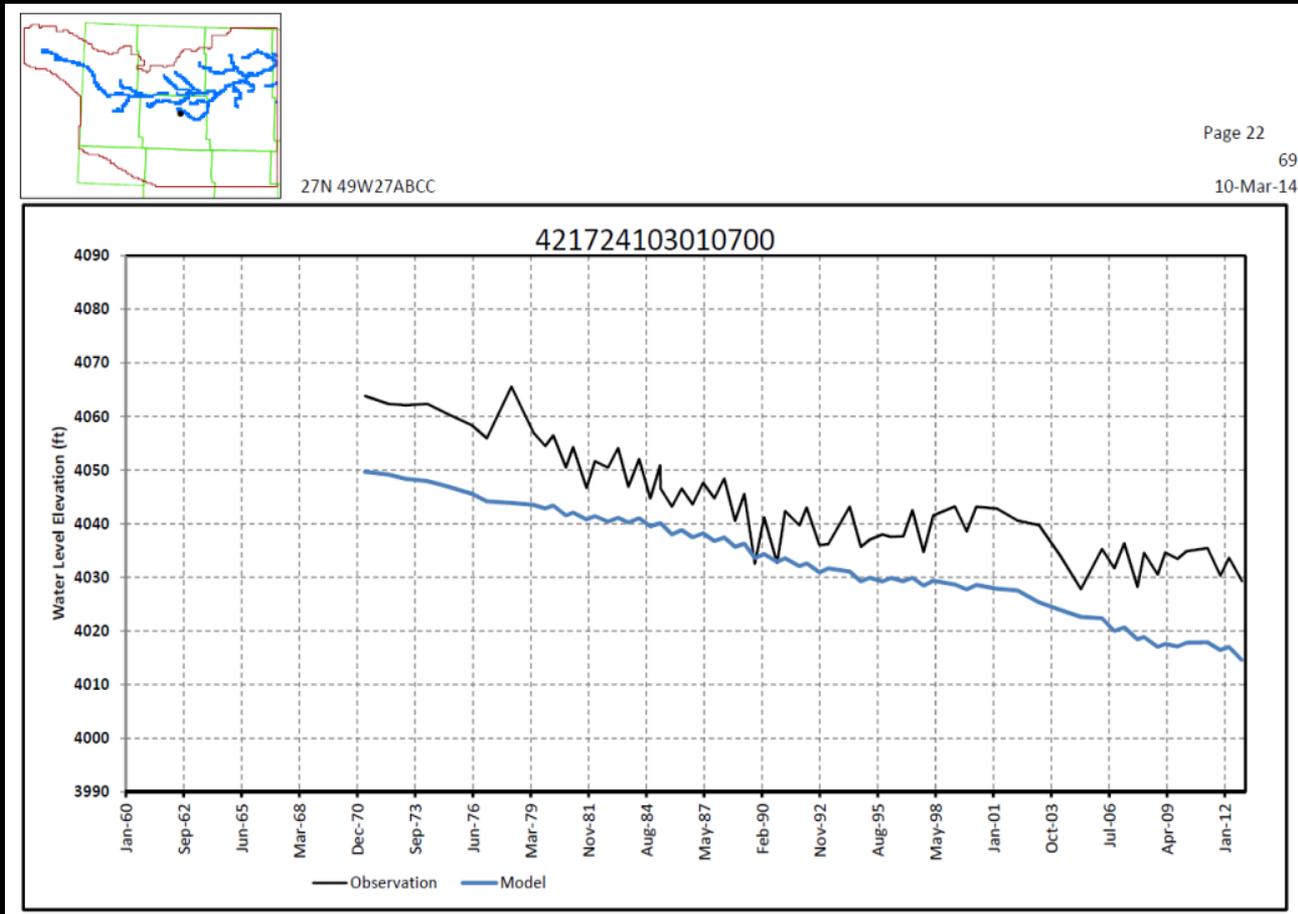
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed water level elevation



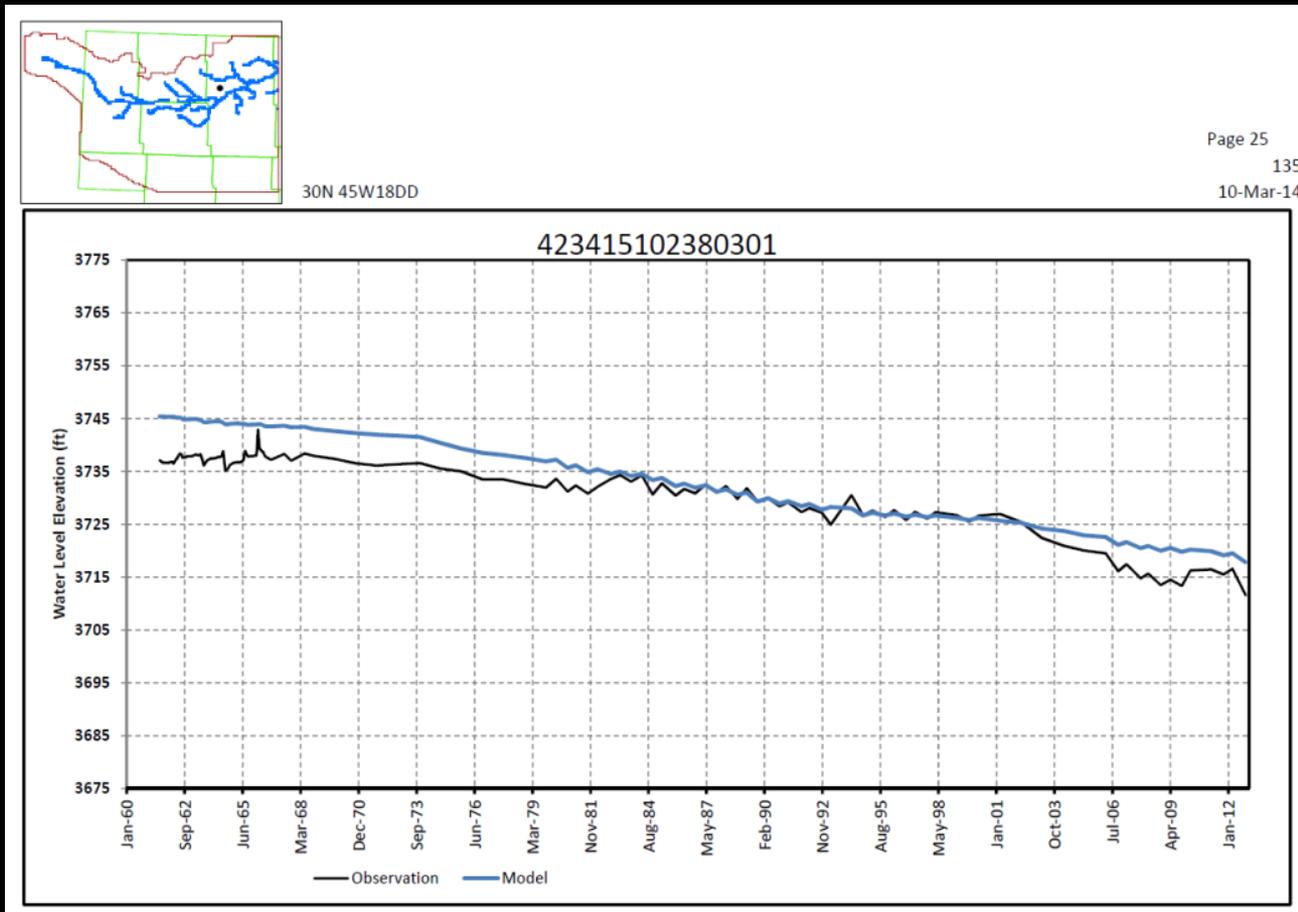
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed water level elevation



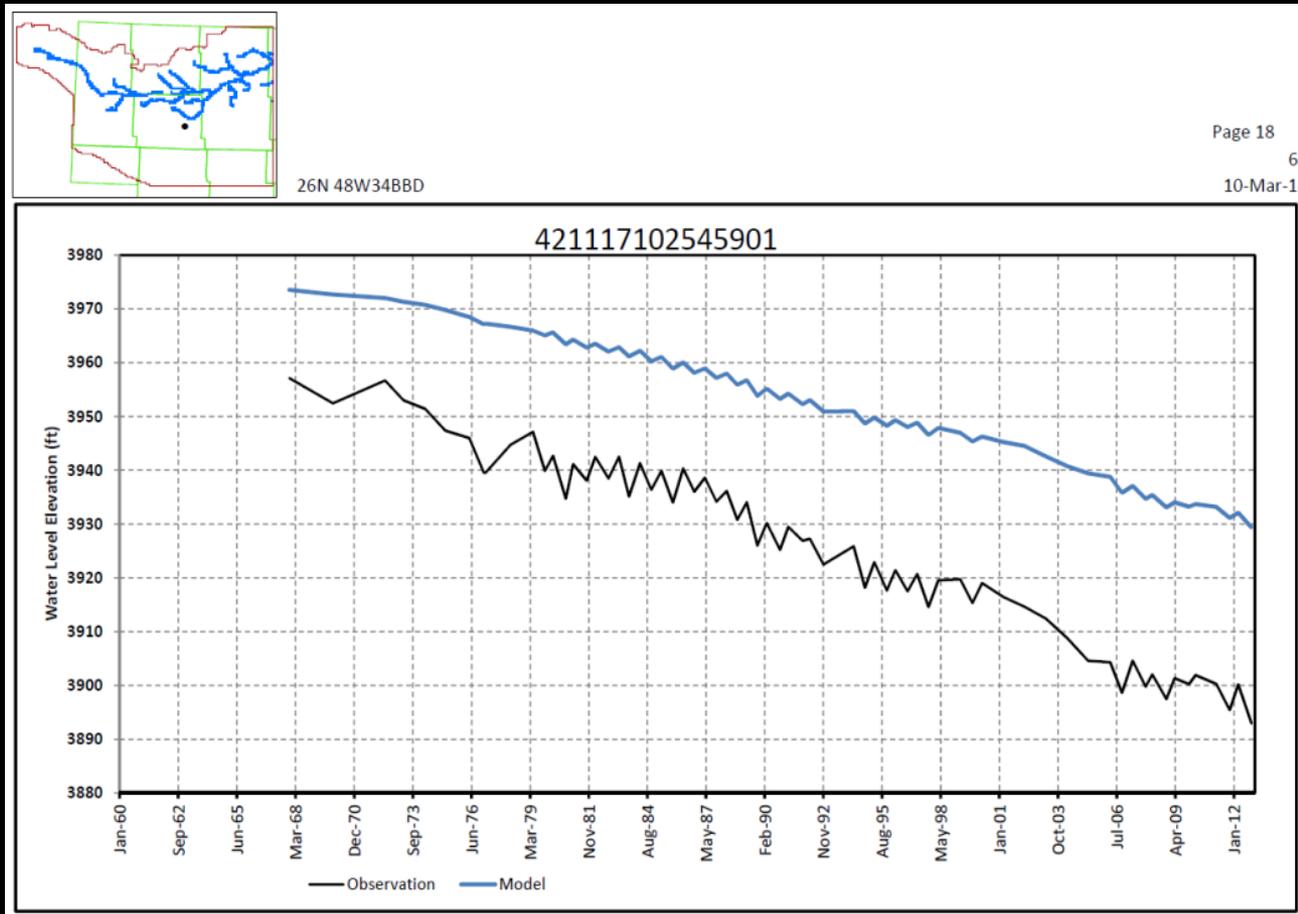
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed water level elevation



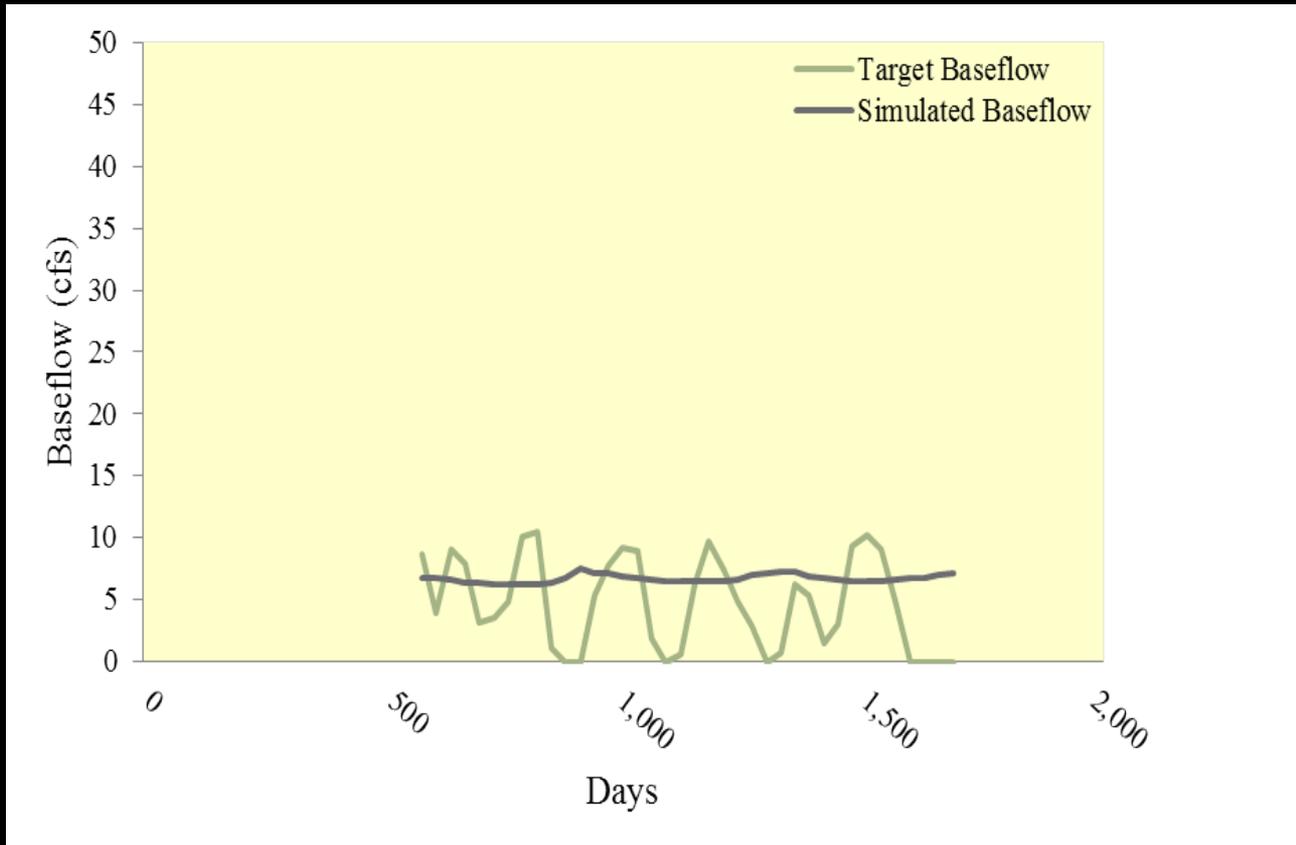
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed water level elevation



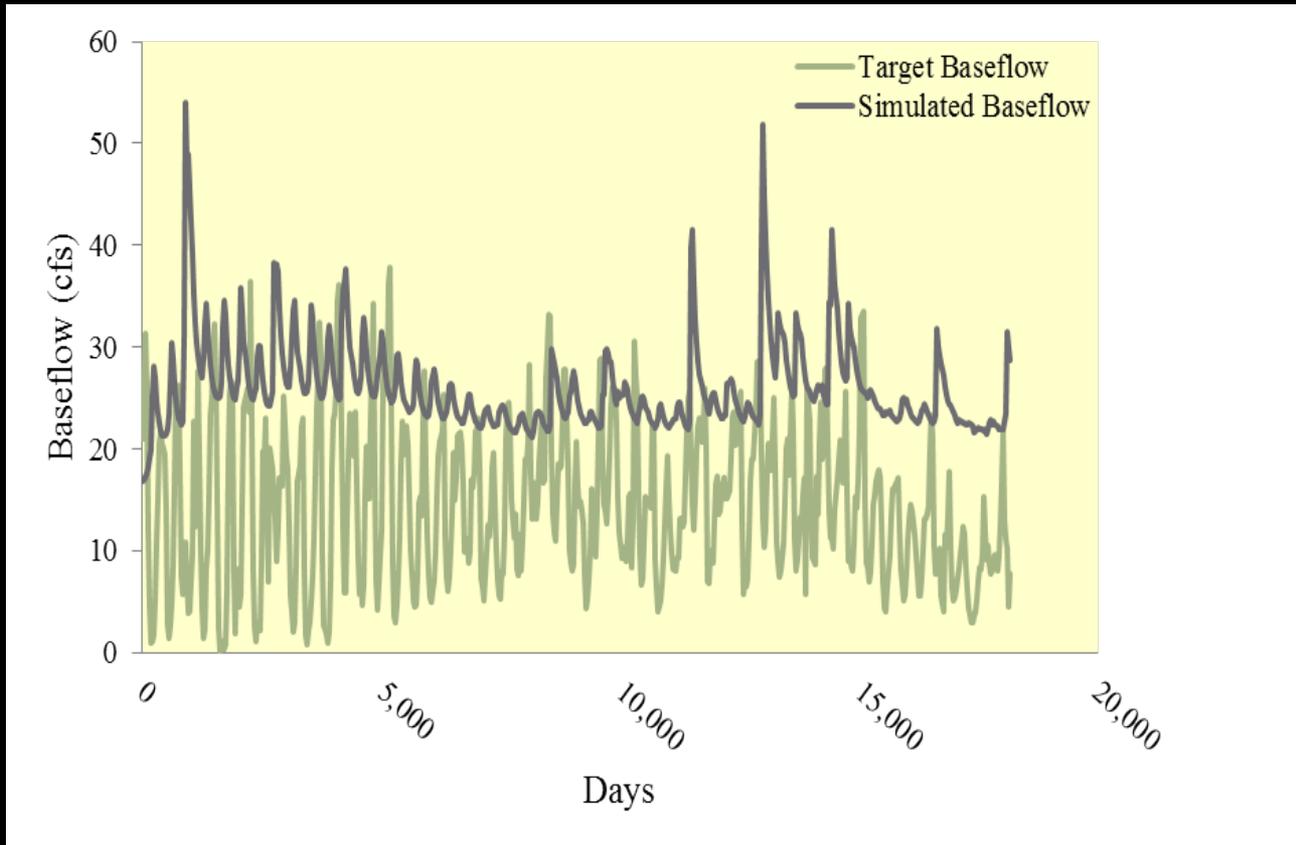
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed baseflow gain in the Duncan to Hay Springs reach



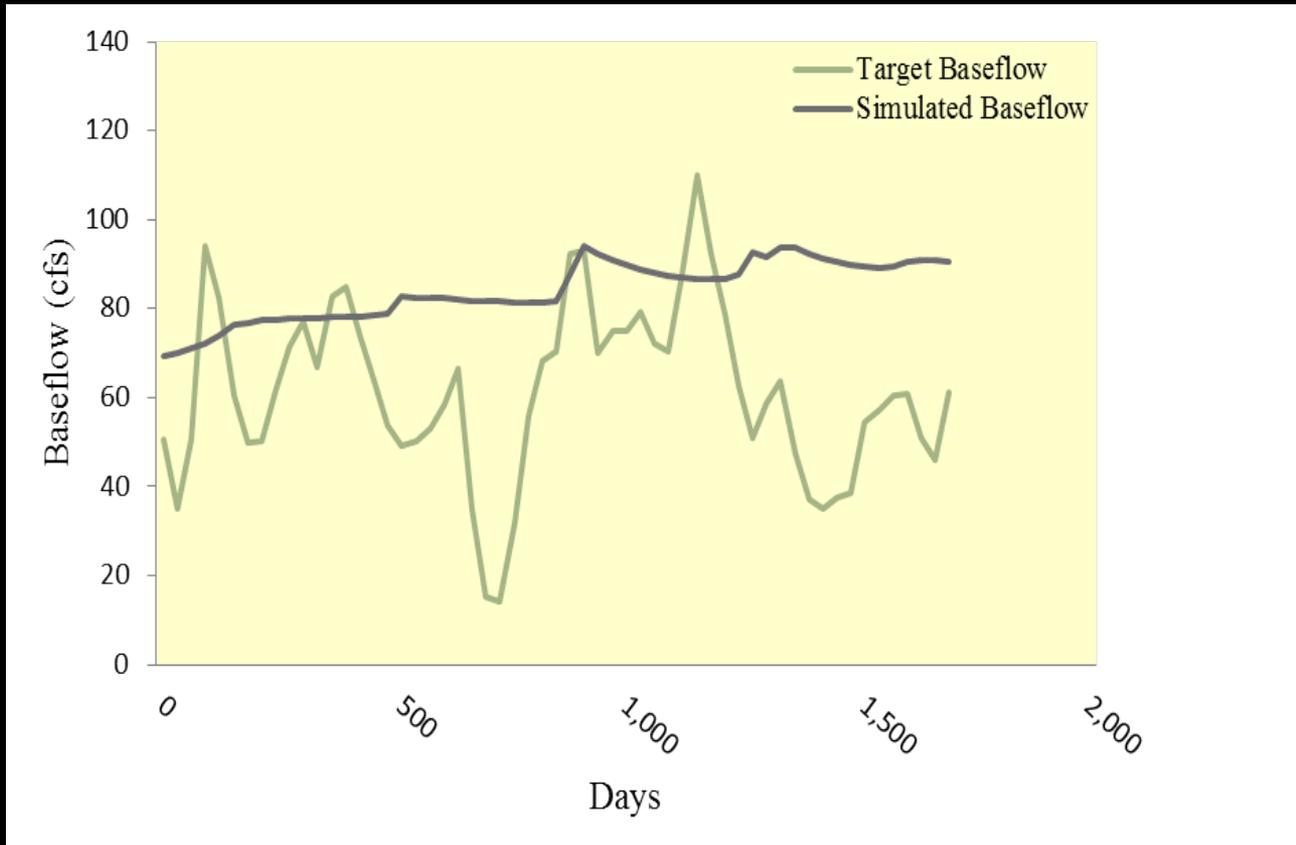
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed baseflow gain in the stateline to above Box Butte reach



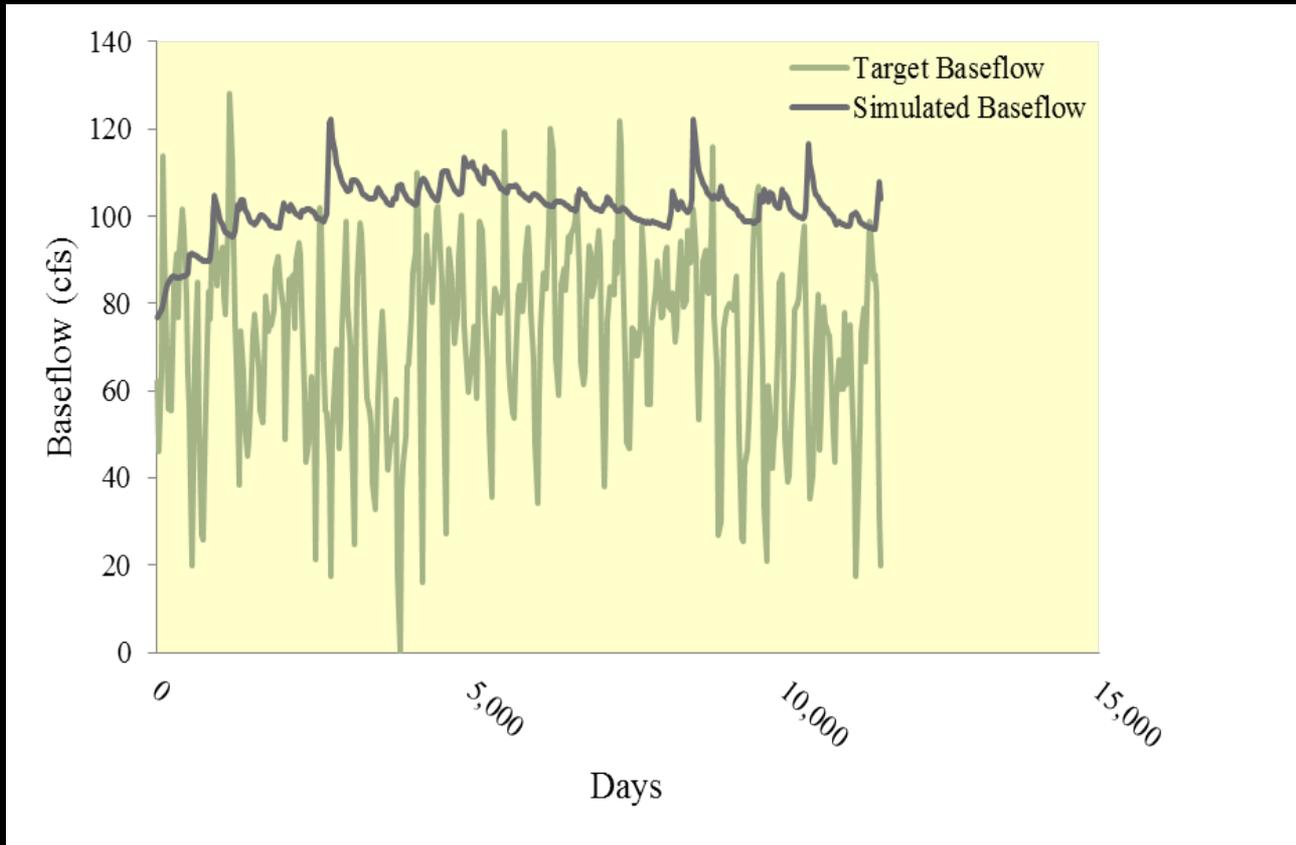
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed baseflow gain in the Hay Springs to Gordon reach



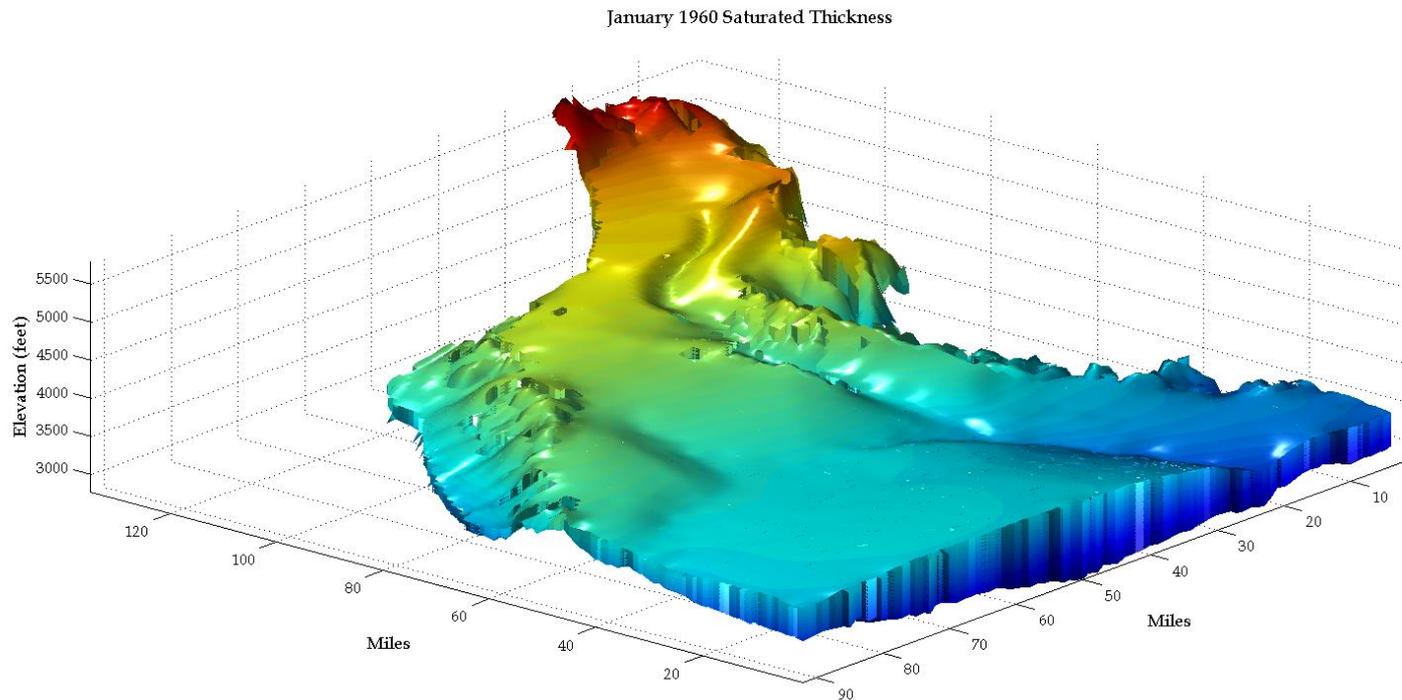
Upper Niobrara White GW Model

- Model performance:
 - Simulated vs. observed baseflow gain in the above Box Butte to above Gordon reach



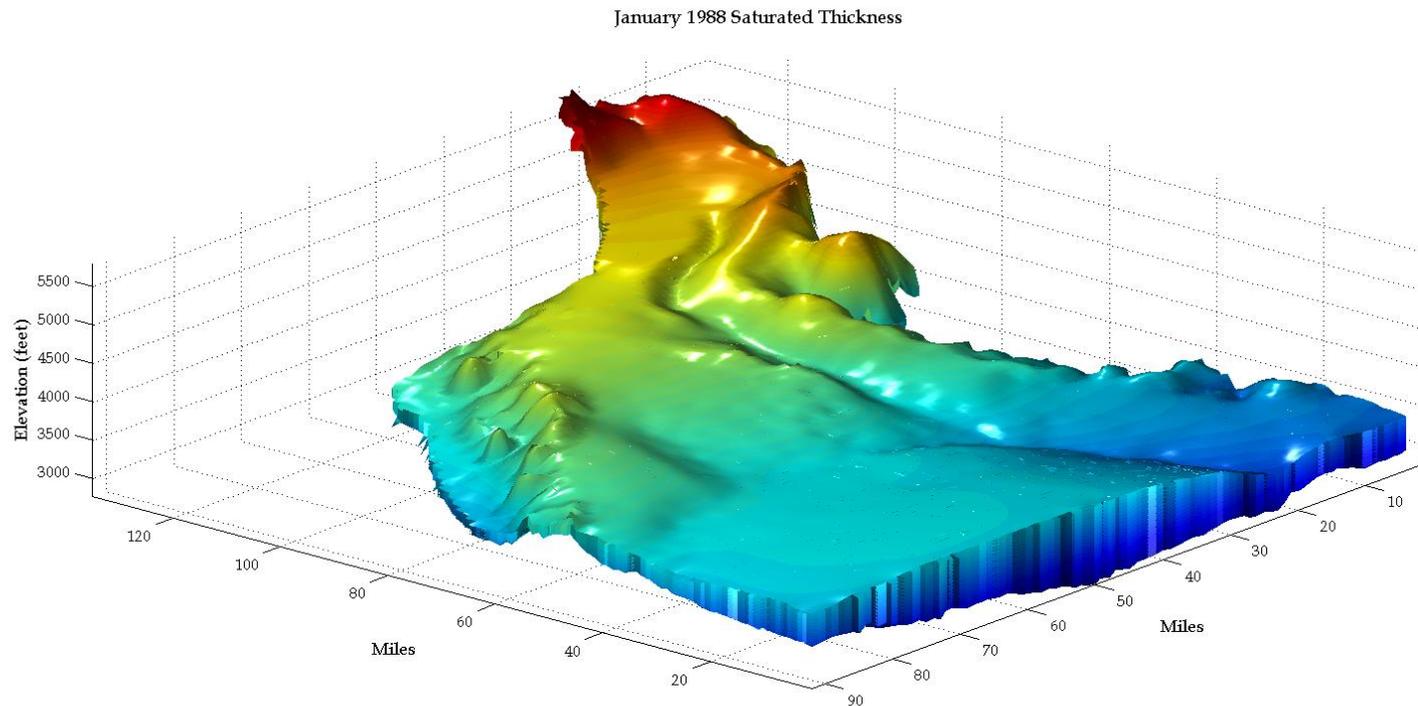
Upper Niobrara White GW Model

- Model change in groundwater elevation



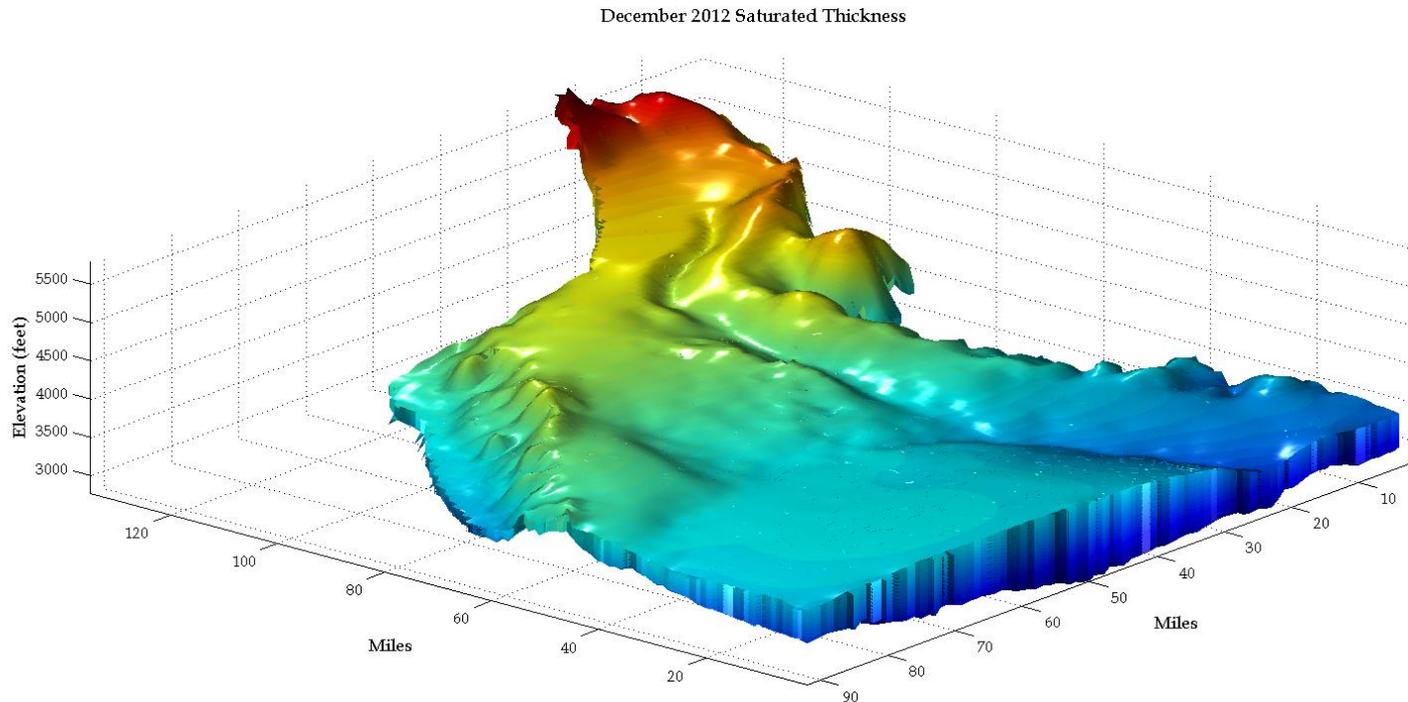
Upper Niobrara White GW Model

- Model change in groundwater elevation



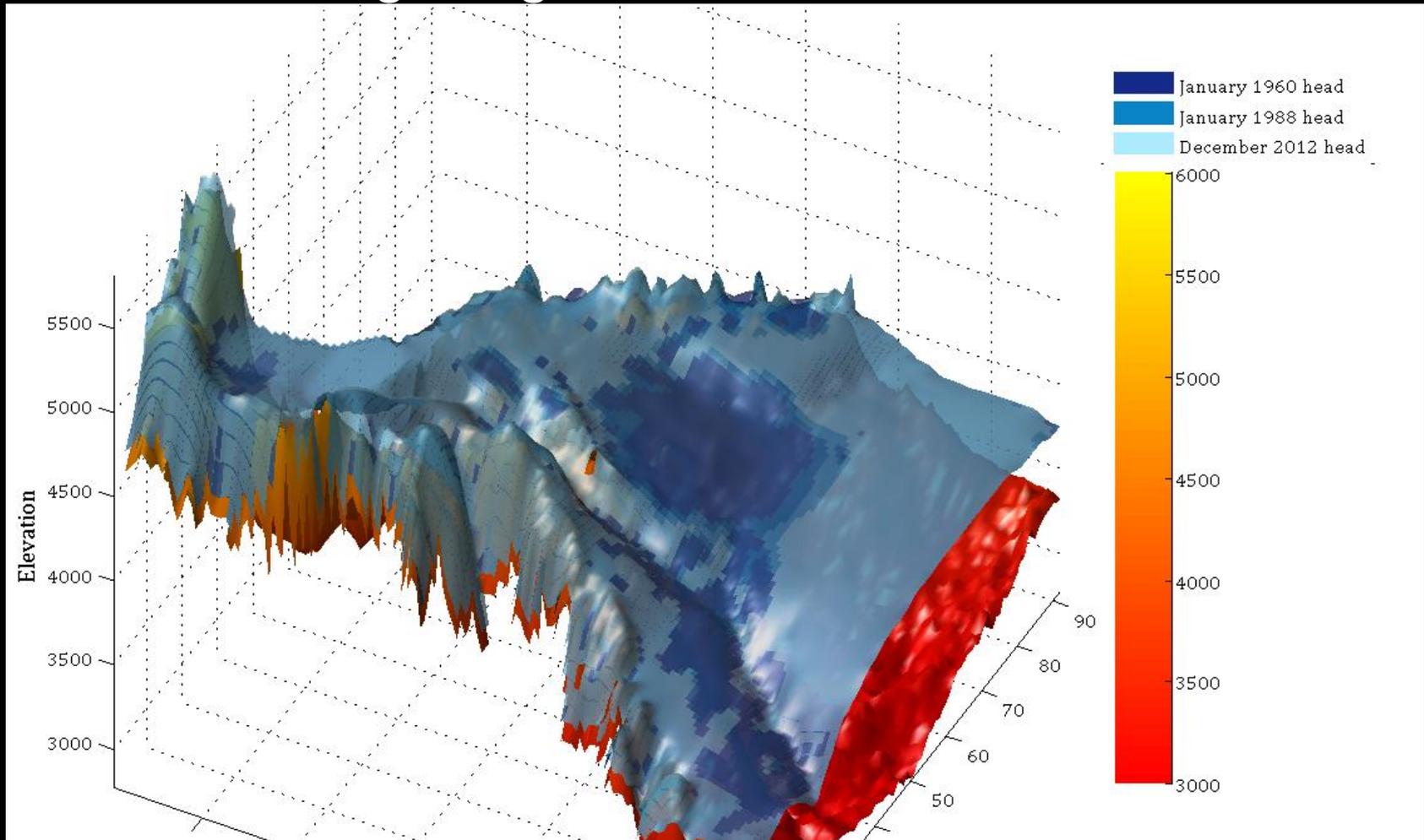
Upper Niobrara White GW Model

- Model change in groundwater elevation



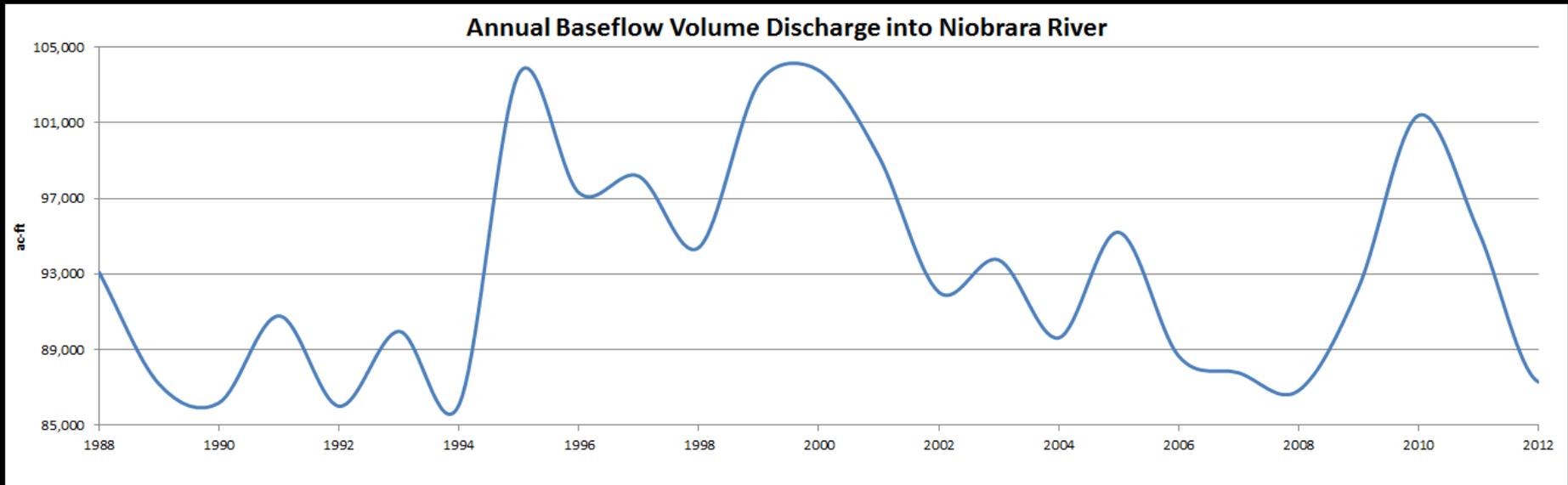
Upper Niobrara White GW Model

- Model change in groundwater elevation



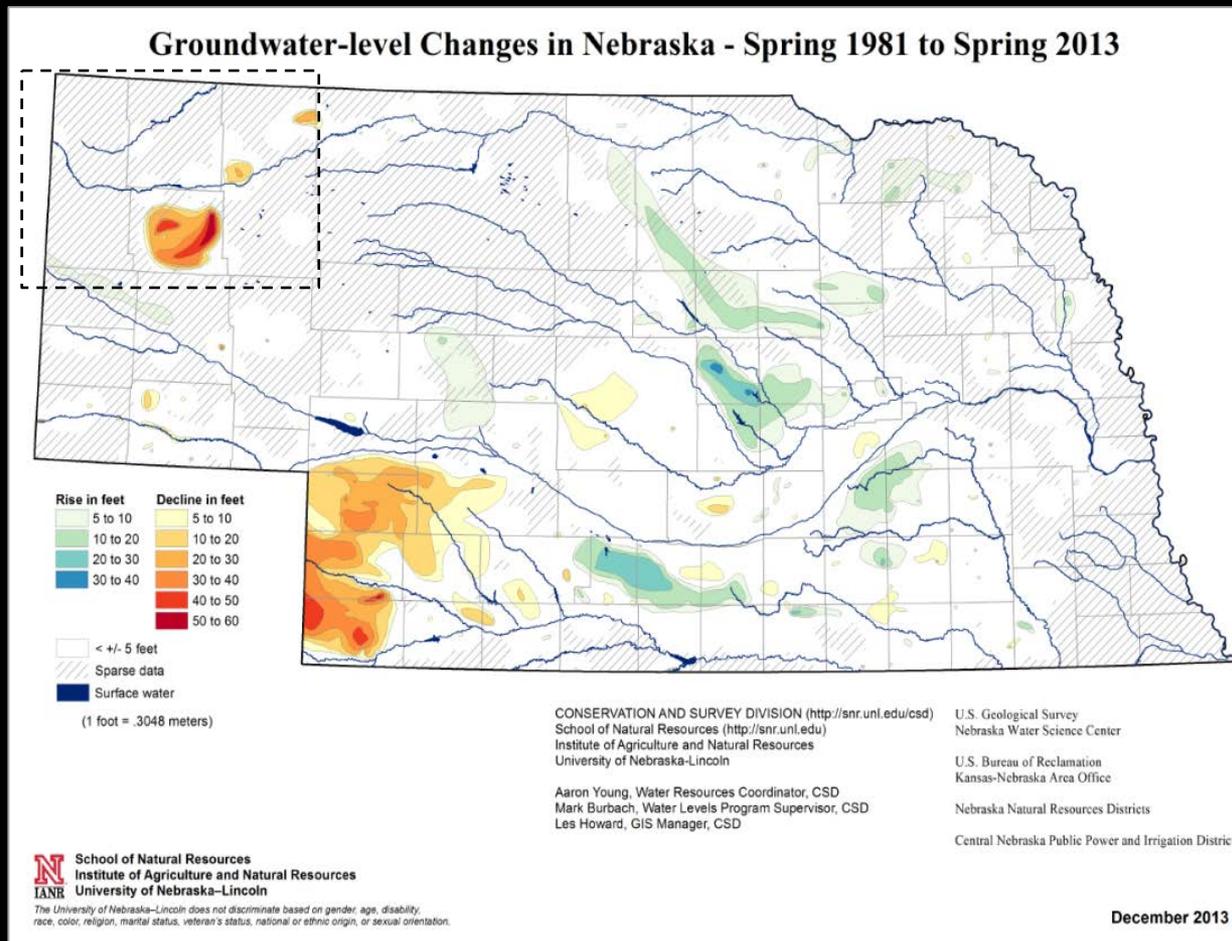
Upper Niobrara White GW Model

- Model simulated annual baseflow volume discharge into Niobrara River



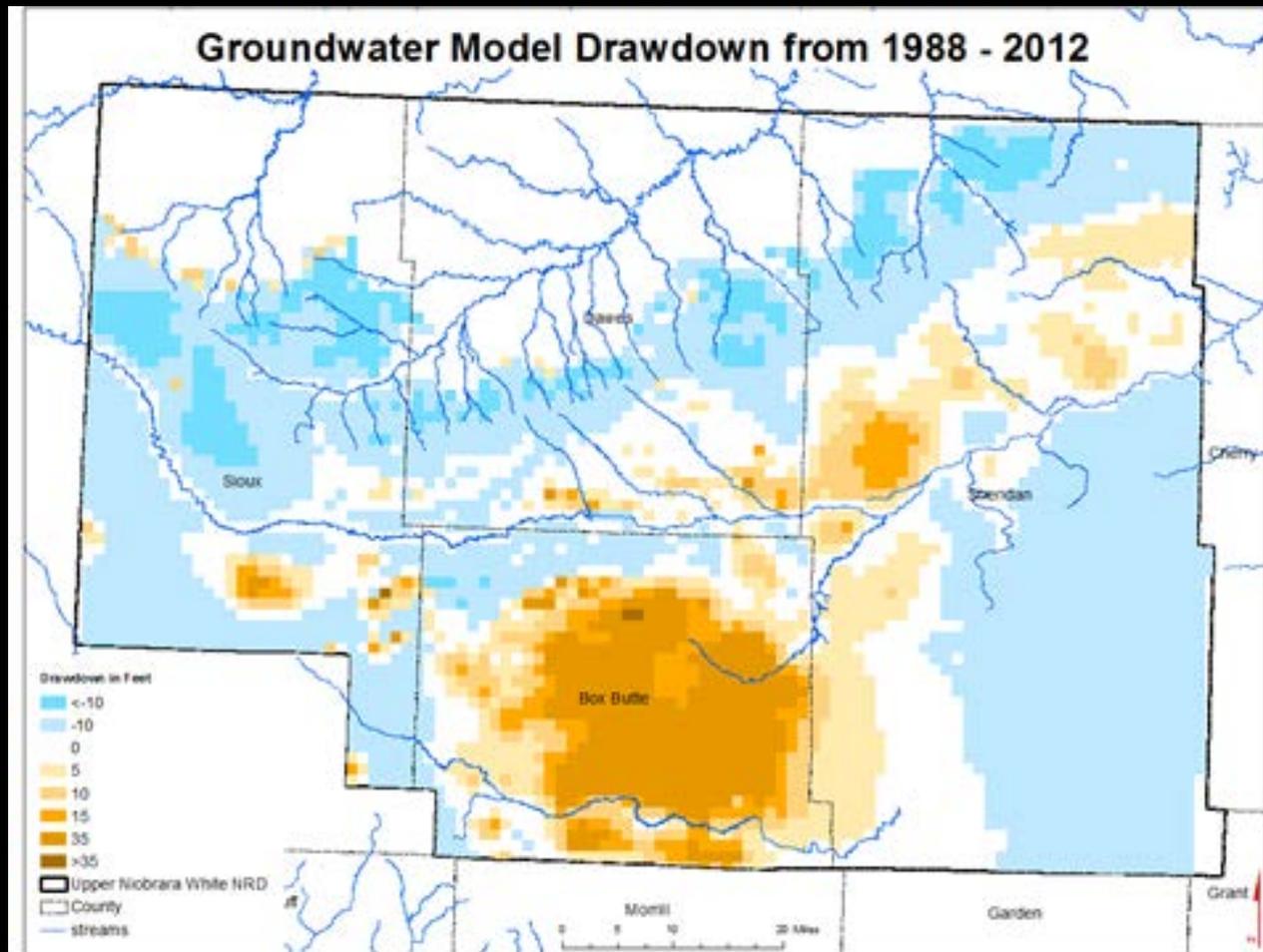
Upper Niobrara White GW Model

- Groundwater drawdown levels in Nebraska



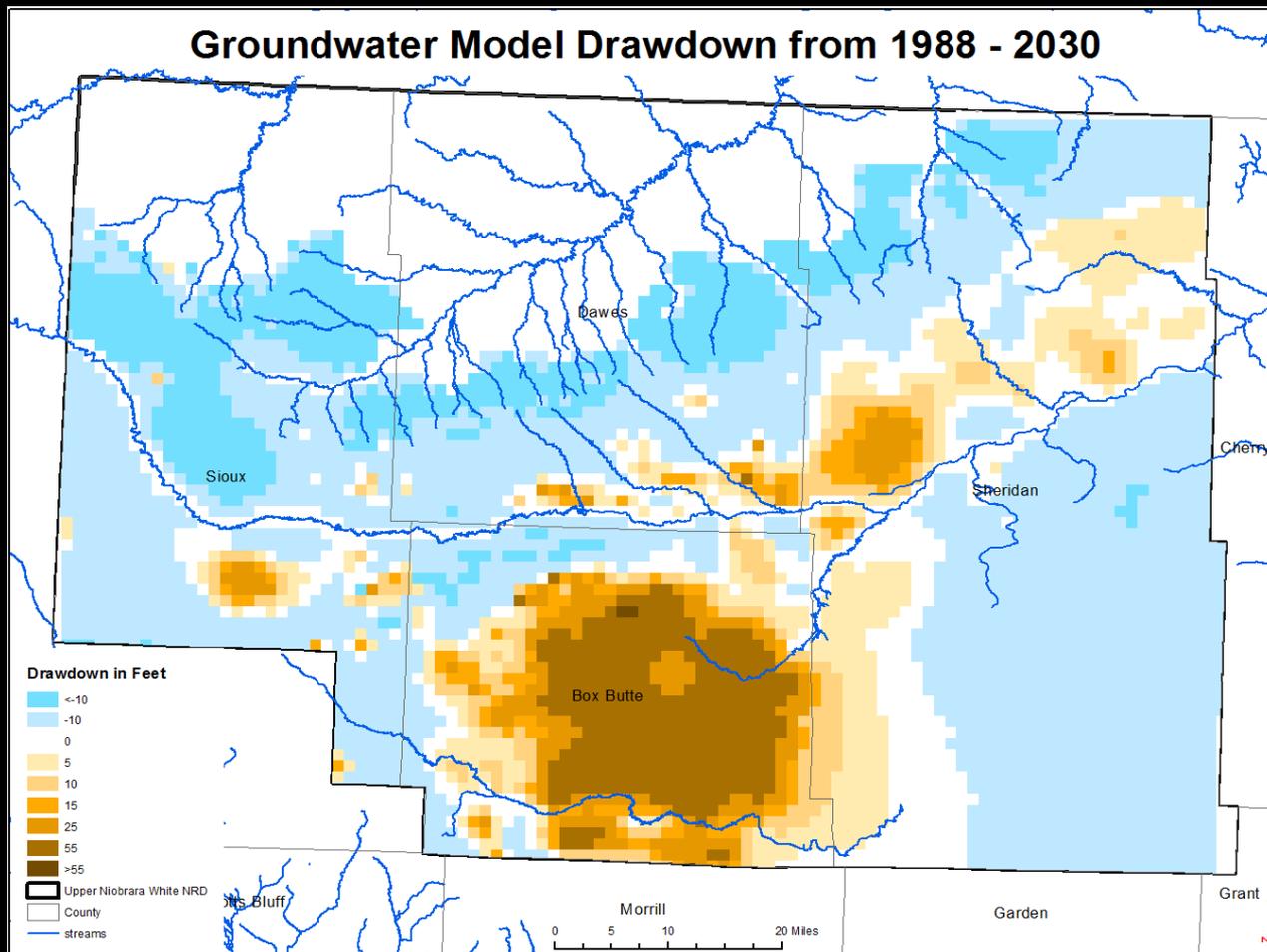
Upper Niobrara White GW Model

- Model groundwater drawdown (in feet) in 25 years



Upper Niobrara White GW Model

- Model groundwater drawdown (in feet) in 43 years



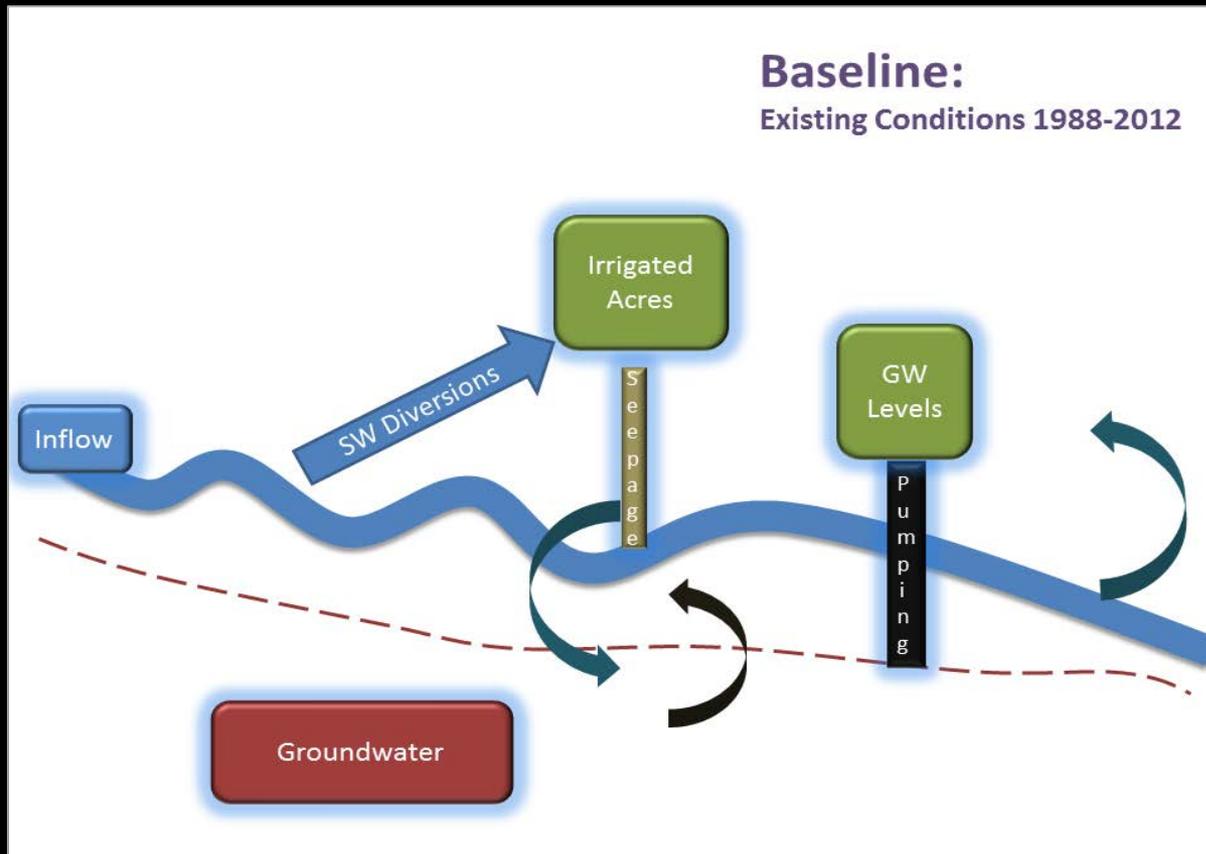
Upper Niobrara White GW Model

Future Model Applications

- Climate variability scenario
 - variability in precipitation and groundwater recharge
 - wet and dry years
- Change in irrigated acreages scenario
 - expansion of or retired farmlands
 - increase or decrease in groundwater pumping
- Various allocation scenario

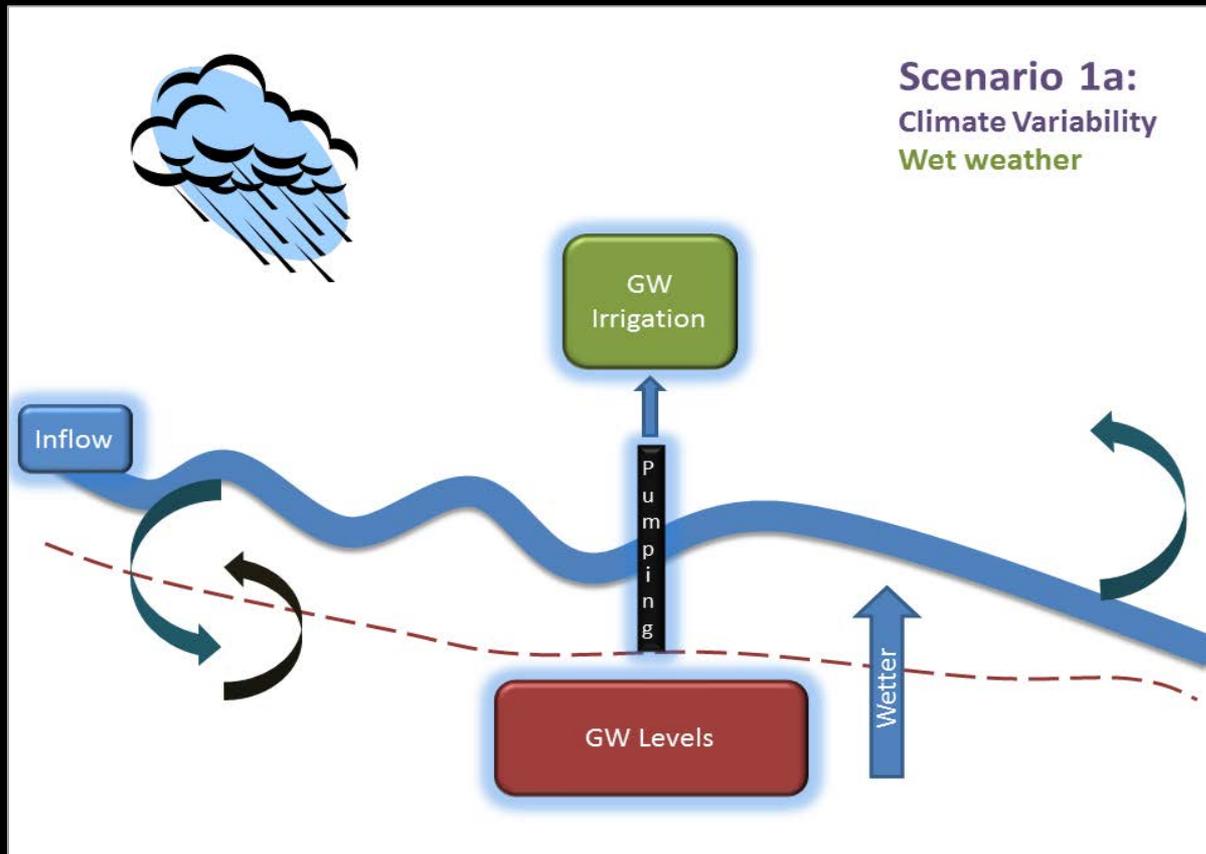
Upper Niobrara White GW Model

- Baseline scenario:
 - Model simulation of existing condition for 1988 - 2012



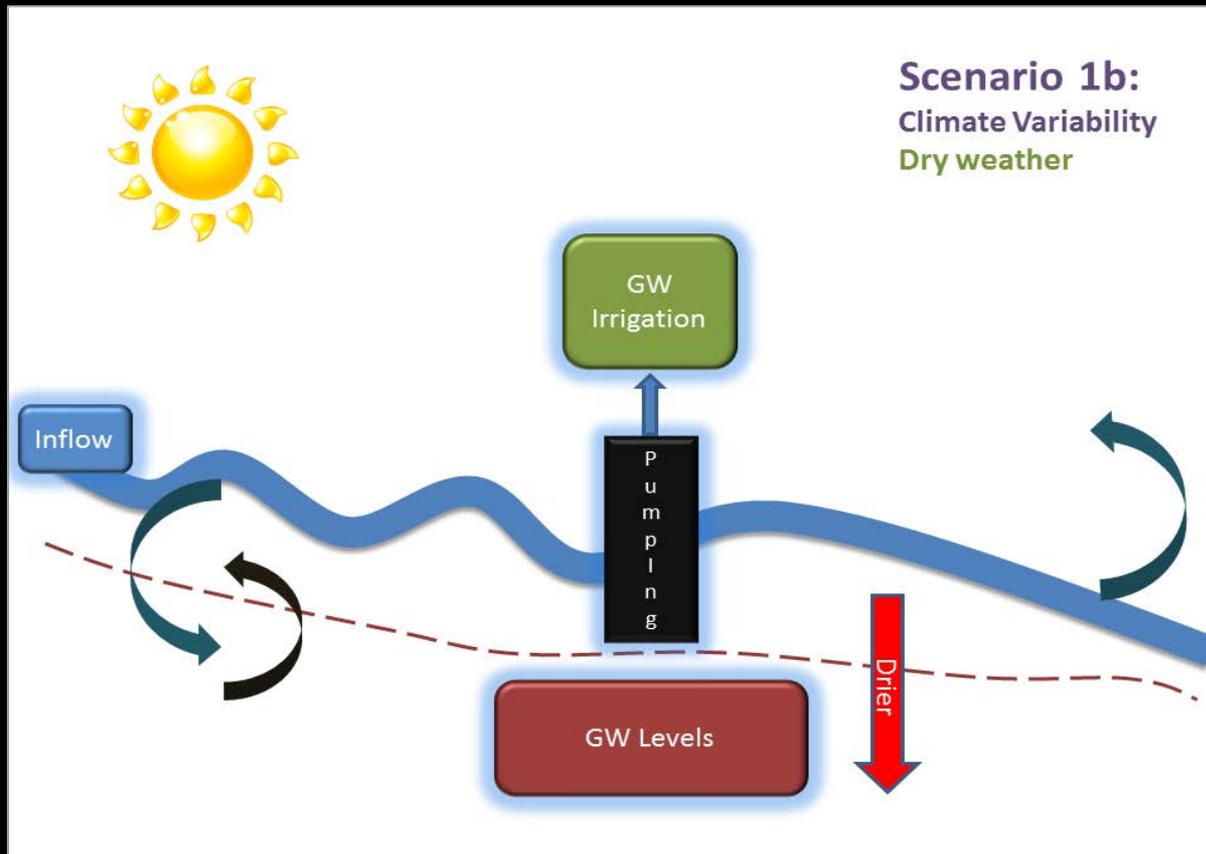
Upper Niobrara White GW Model

- Scenario 1a:
 - Model simulation of wetter weather condition



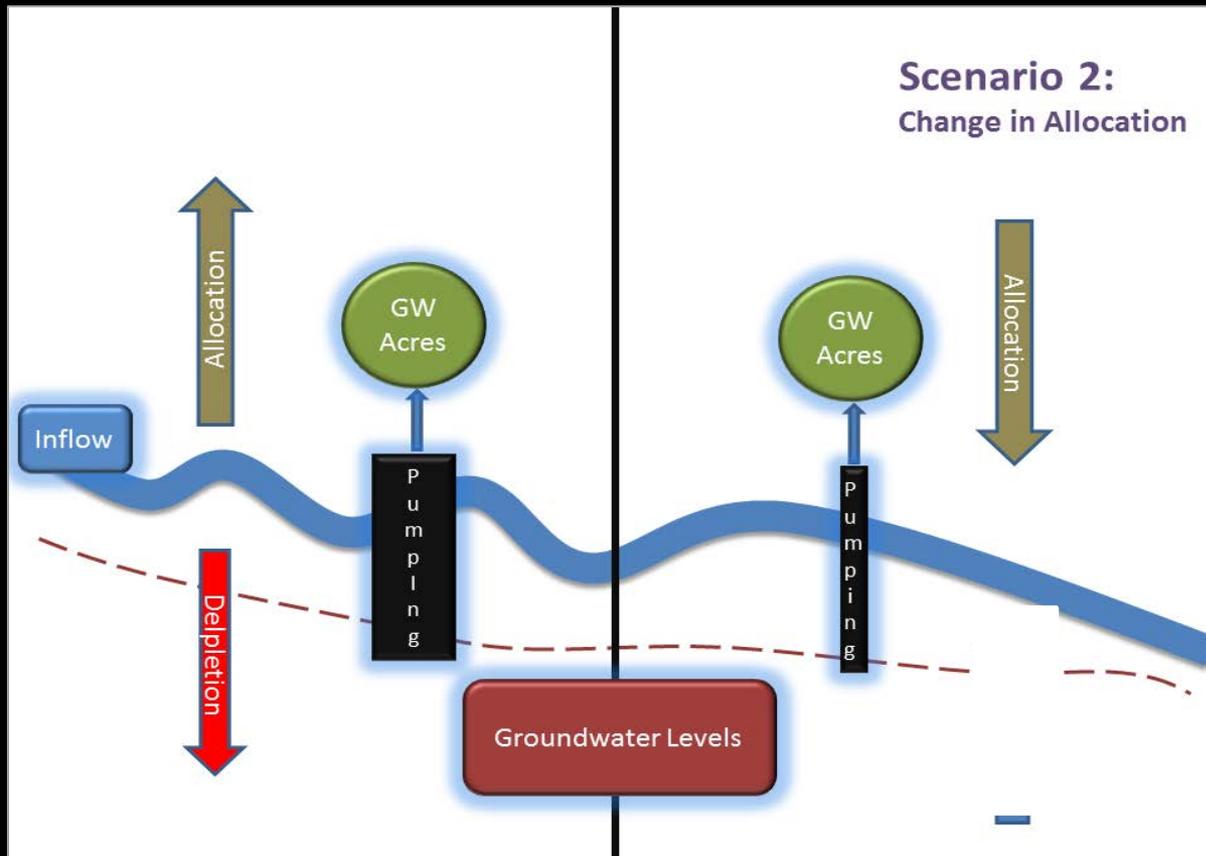
Upper Niobrara White GW Model

- Scenario 1b:
 - Model simulation of drier weather condition



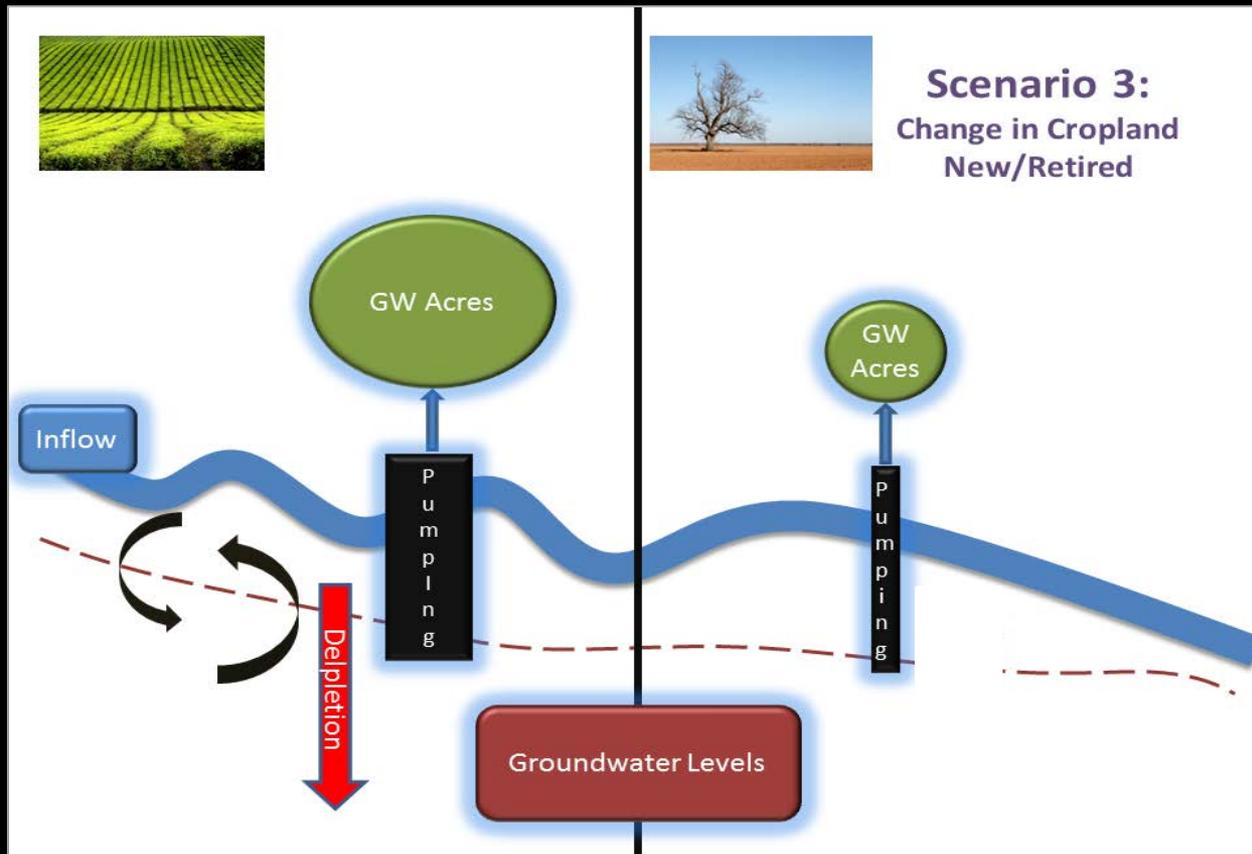
Upper Niobrara White GW Model

- Scenario 2:
 - Model simulation of change in allocated groundwater pumping condition



Upper Niobrara White GW Model

- Scenario 3:
 - Model simulation of changes in cropland condition





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Upper Niobrara White GW Model

- Model change in groundwater elevation

