

INSIGHT: A new look at water supplies and uses in Nebraska

Presented to the
Nebraska Water Resources Association
Water Round Table

February 12, 2014

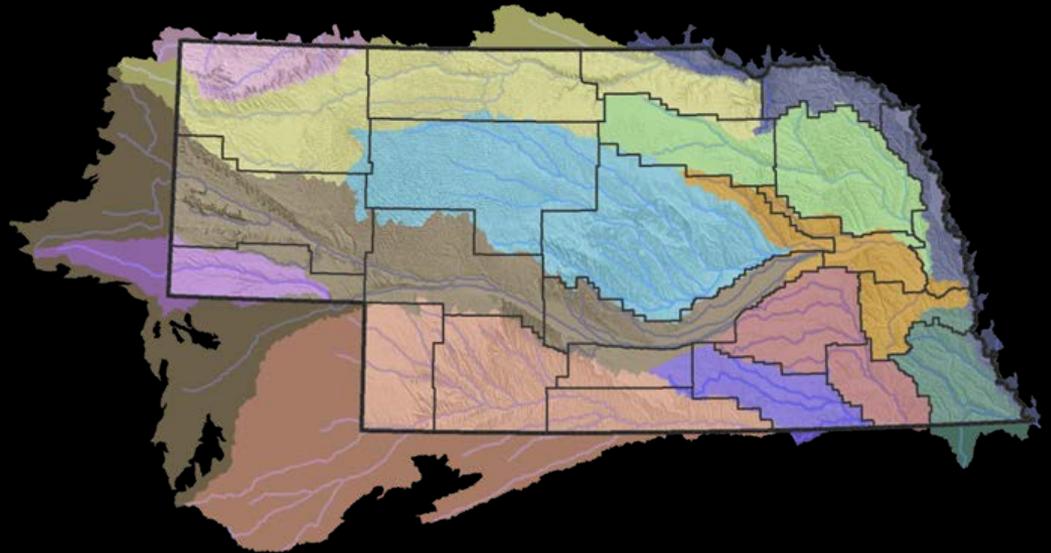
Jesse Bradley, P.G.

Nebraska Department of Natural Resources



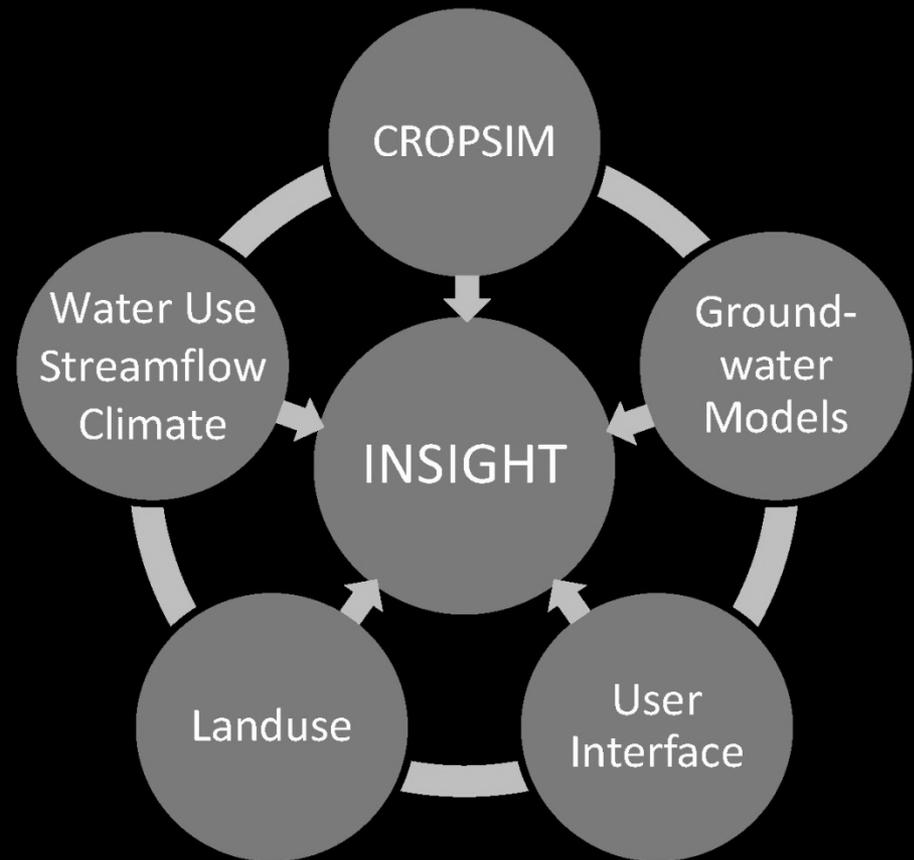
Outline

- Primary purpose of INSIGHT
- Collaborative development of INSIGHT methods
- INSIGHT demo

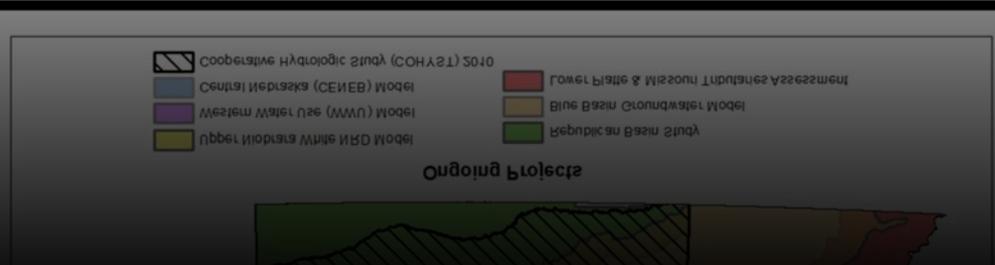
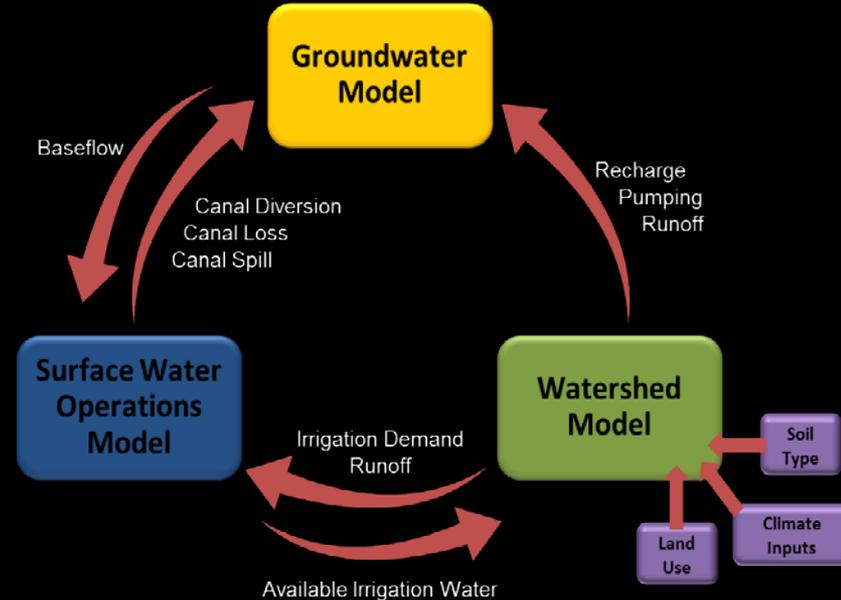
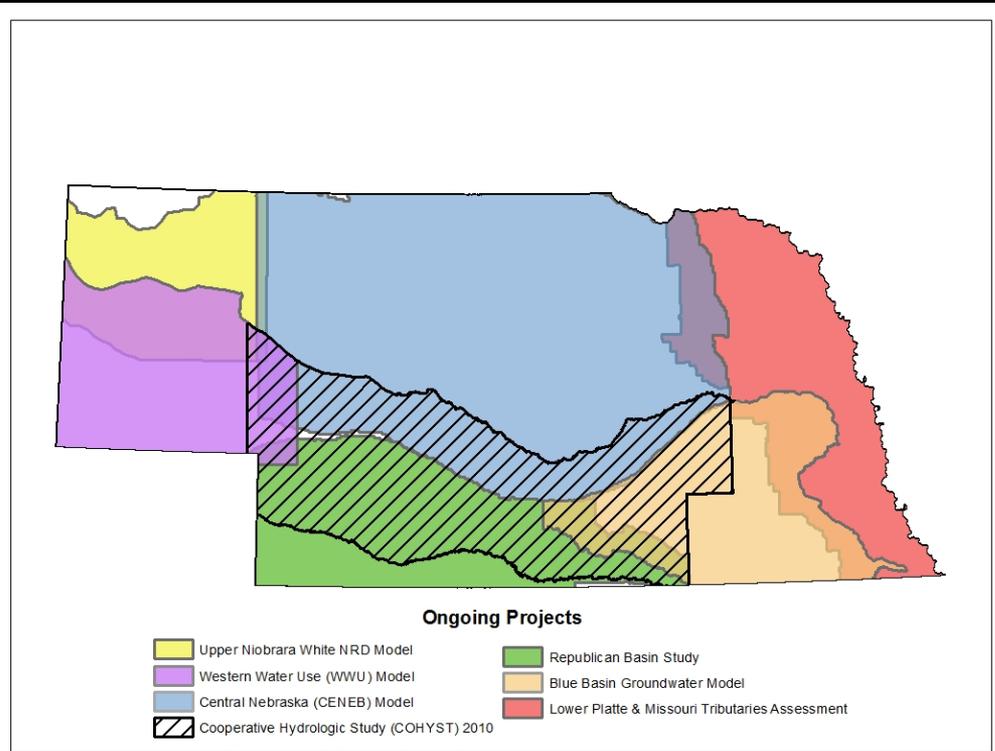


INSIGHT – *Integrated Network of Scientific Information & GeoHydrologic Tools*

- An **annual snapshot** of water conditions across the state
- An **educational tool** for water managers and the public
- A tool to help **evaluate** water management options



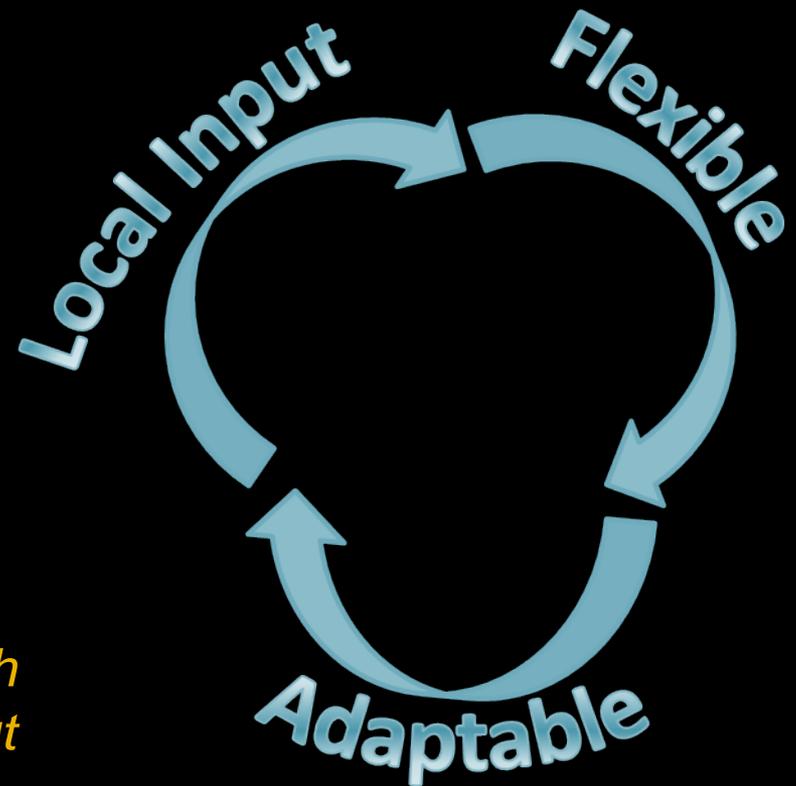
Integration of Modeling Data



Collaboration with Stakeholders

- The Department and stakeholders collaborated through:
 - Public Q&A sessions
 - Public hearings
 - Public comment period
 - Stakeholder interviews

Stakeholders were provided with various means of providing input (e.g., written/public comments)



Statewide Data

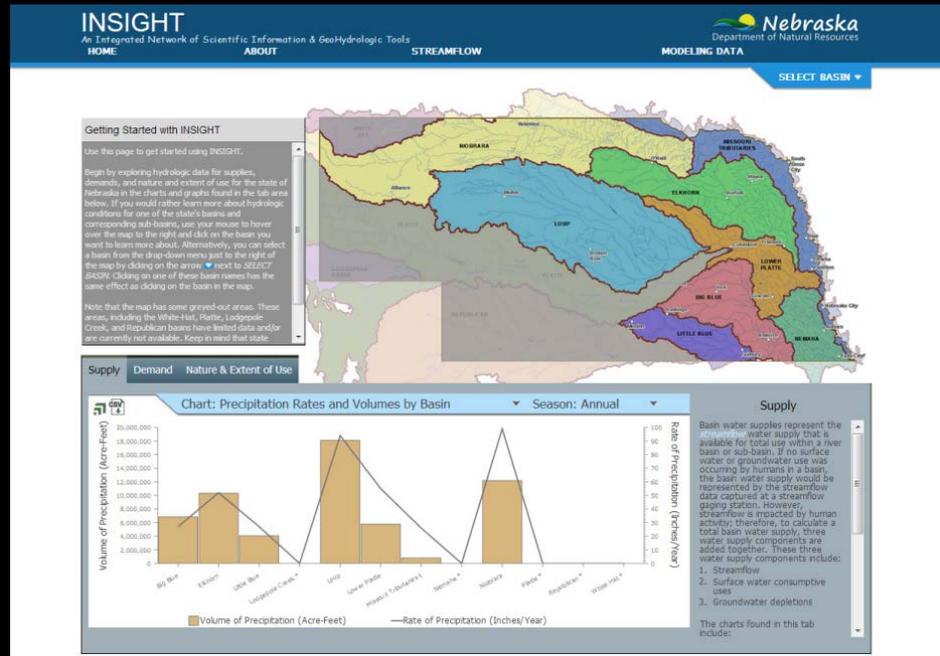
Basin-to-Basin Comparisons

Information available:

- ✓ Supply
- ✓ Demand
- ✓ Nature & Extent of Use

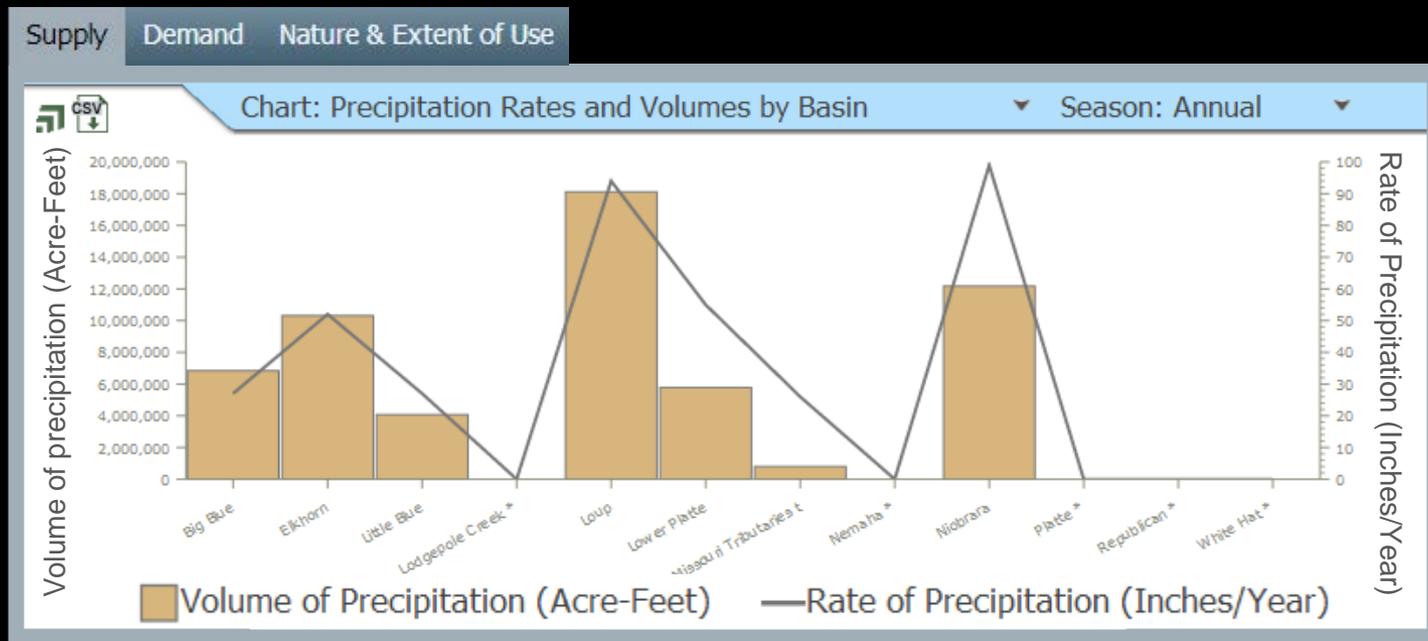
Seasons available:

- ✓ Annual
- ✓ Peak
- ✓ Non-Peak



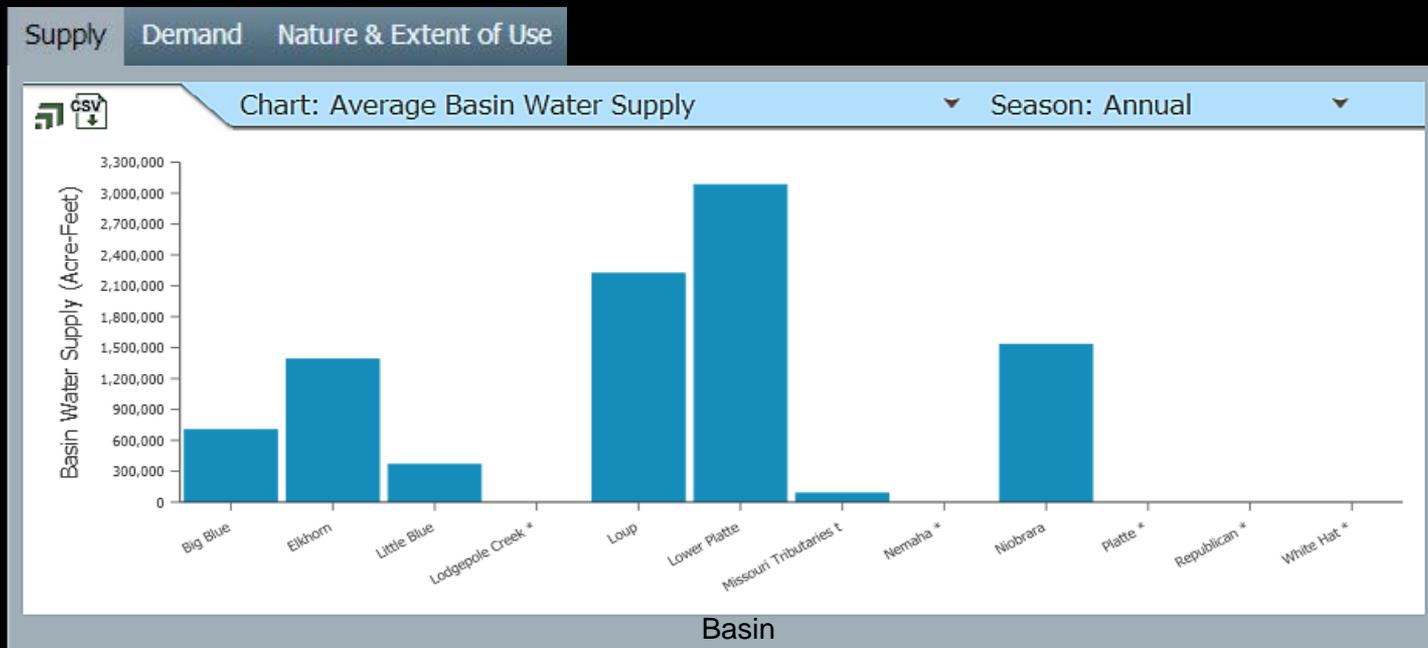
Statewide Data: Supply

Precipitation Rates and Volumes by Basin



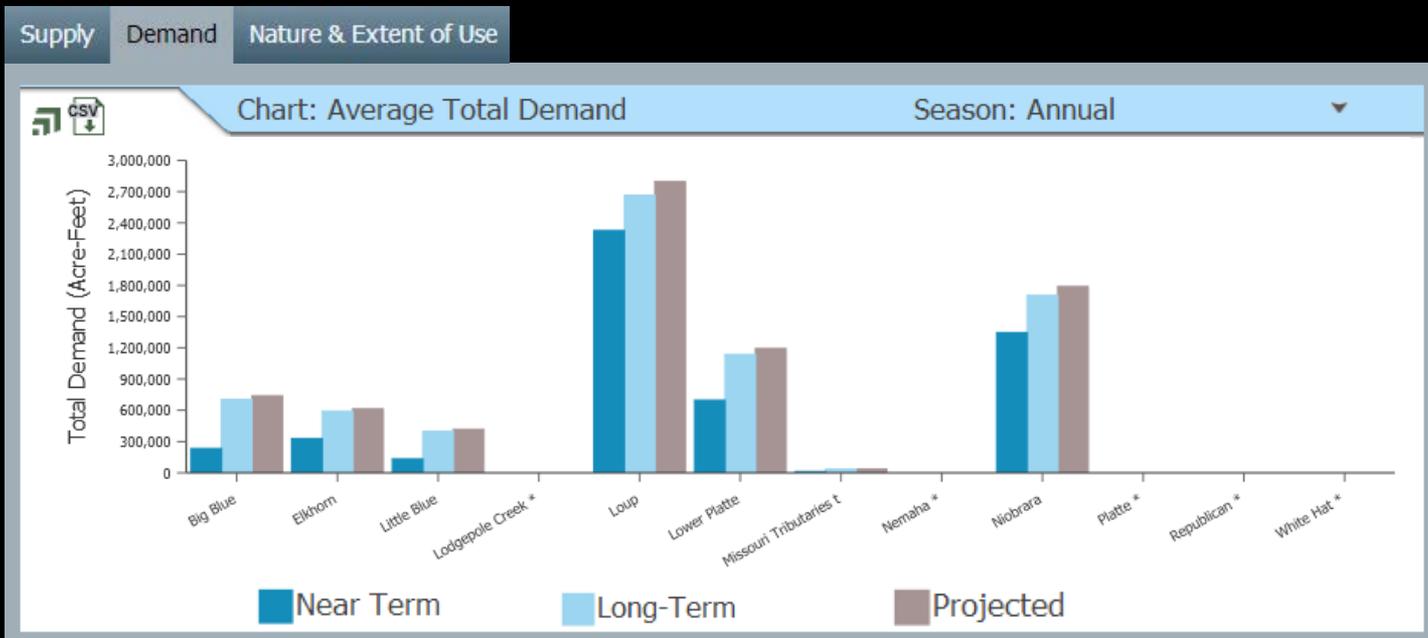
Statewide Data: Supply

Average Basin Water Supply

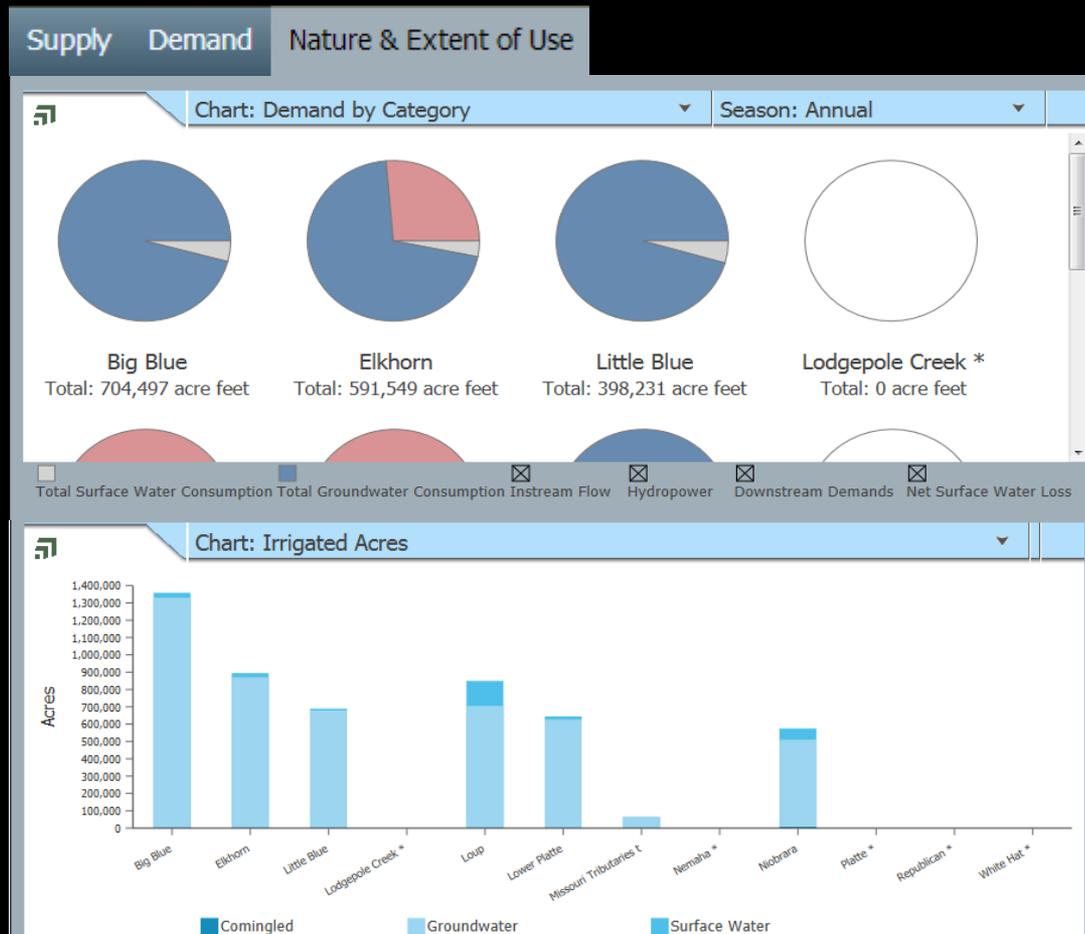


Statewide Data: Demand

Average Total Demand



Statewide Data: Nature & Extent of Use



Average Long-Term
Total Demand by
Basin by Category

Irrigated Acres by
Basin by Source

Basin and Subbasin Data

A More Detailed Picture

Information available

- ✓ Basin Overview
- ✓ Big Picture
- ✓ Supply
- ✓ Demand
- ✓ Nature & Extent of Use
- ✓ Balance

Seasons available

- ✓ Annual
- ✓ Non-Peak
- ✓ Peak

The screenshot shows the INSIGHT web application interface. At the top, there is a navigation bar with 'HOME', 'ABOUT', 'STREAM LOW', and 'MODELING DATA'. A 'SELECT BASIN' dropdown menu is visible. The main content area is titled 'Explore the Loup Basin' and includes a map of the Loup Basin with sub-basins labeled: Middle Loup River, North Loup River, LOUP, South Loup River, and Lower Loup River. Below the map, there are tabs for 'Basin Overview', 'Big Picture', 'Supply', 'Demand', 'Nature & Extent of Use', and 'Balance'. The 'Basin Overview' tab is active, displaying a table of basin statistics and a text description of the basin's location and characteristics.

At a Glance

Basin	Loup	
Approximate Area	14,200 square miles	
Basin Water Supply	1,863,863 acre-feet/year	
Near-Term Water Demand	1,899,735 acre-feet/year	
Long-Term Water Demand	1,986,915 acre-feet/year	
Projected Water Demand	1,293,872 acre-feet/year	
Number of Irrigated Acres	221,096 acres	

Average Consumption by Sector (Acre-Feet)

	Surface Water	Groundwater
Agriculture	11,802 100%	107,792 99%
Municipal	0 0%	627 1%
Industry	0 0%	26 0%

The Loup Basin is located in central Nebraska, and is entirely contained within the state. The Loup Basin has an area of approximately 14,200 square miles.

At its farthest western extent, the Loup Basin boundary is about halfway between Alliance, Nebraska, and Hyams, Nebraska, in Sheridan and Garden Counties. The Loup River headwaters are about seven miles northwest of Hyams, Nebraska. The basin is defined as draining to the confluence of the Loup River and Beaver Creek, about 25 miles upstream from Columbus, Nebraska. The Loup River extends beyond the basin boundary to its junction with the Platte River at Columbus, Nebraska.

According to the 2010 U.S. Census, the largest city in the basin is Broken Bow, with a population of about 3,600. In descending order, the next largest cities include St. Paul (2,300), Ord (2,100), Ravenna (1,400), and Fullerton (1,360).

The topography of more than half of the upstream end of the Loup Basin consists of sand hills, which are sand dunes stabilized in place by a grass cover. The downstream portion of the basin consists mostly of dissected plains, with small areas of upland plains. The upland plains are land that is flat to gently rolling and dissected plains are where streams have cut into former plains creating hill land with steep slopes and sharp ridge crests, along with remnants of the plains on the hilltops. There are several valleys in the Loup basin, which are the flatting areas along the Loup River and its major tributaries.

The primary aquifer in the Loup Basin is the Ogallala Formation, which consists of poorly sorted, generally unconsolidated clay, silt, sand, and gravel. The Ogallala Formation is part of a vast system

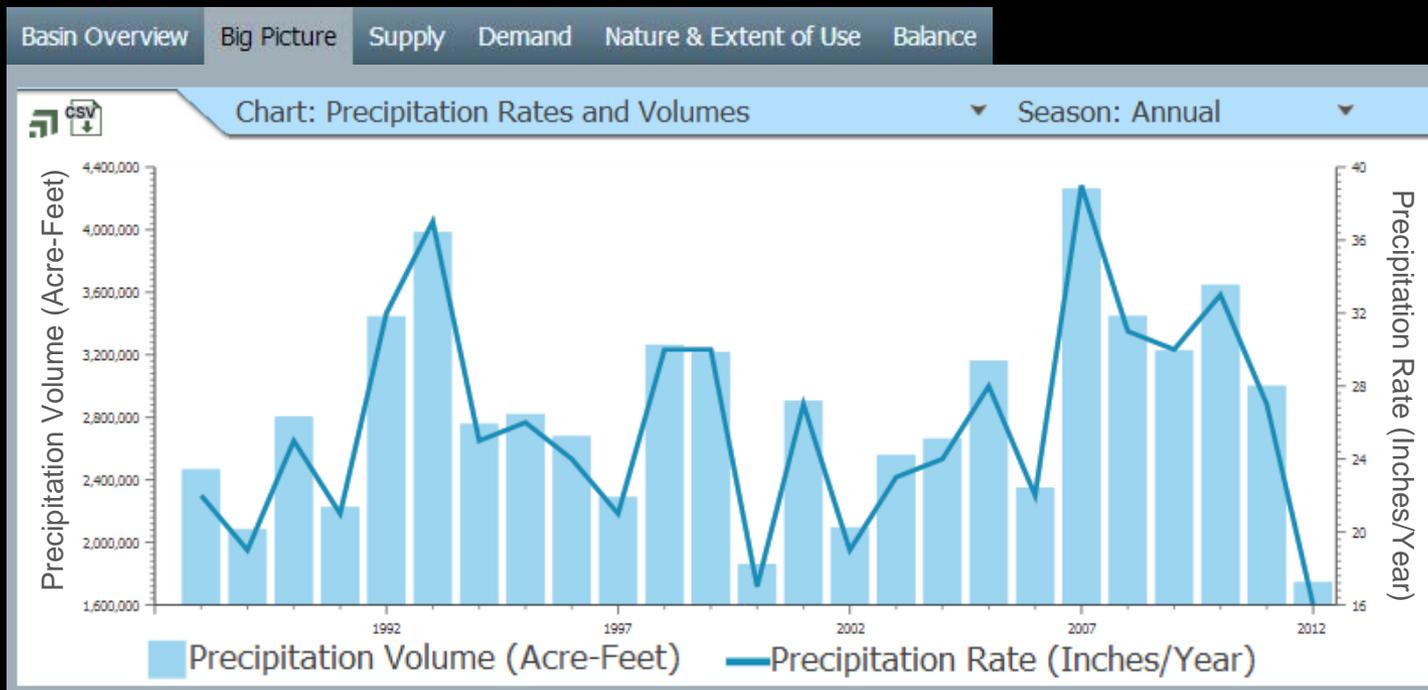
This screenshot shows a detailed view of the basin data, including a table with columns for 'Basin', 'Area (sq mi)', 'Population', and 'Water Demand (ac-ft/yr)'. The table lists several sub-basins and their respective statistics. The text below the table provides further details about the basin's characteristics and data sources.

Basin	Area (sq mi)	Population	Water Demand (ac-ft/yr)
Upper Loup	8	500	38
Middle Loup	8	500	65
Lower Loup	11,900	180,000	1,800

Basin hydrologic data for the Loup Basin is presented below. The data is presented in a table format. The table includes columns for Basin, Area (sq mi), Population, and Water Demand (ac-ft/yr). The data is presented in a table format. The table includes columns for Basin, Area (sq mi), Population, and Water Demand (ac-ft/yr). The data is presented in a table format. The table includes columns for Basin, Area (sq mi), Population, and Water Demand (ac-ft/yr).

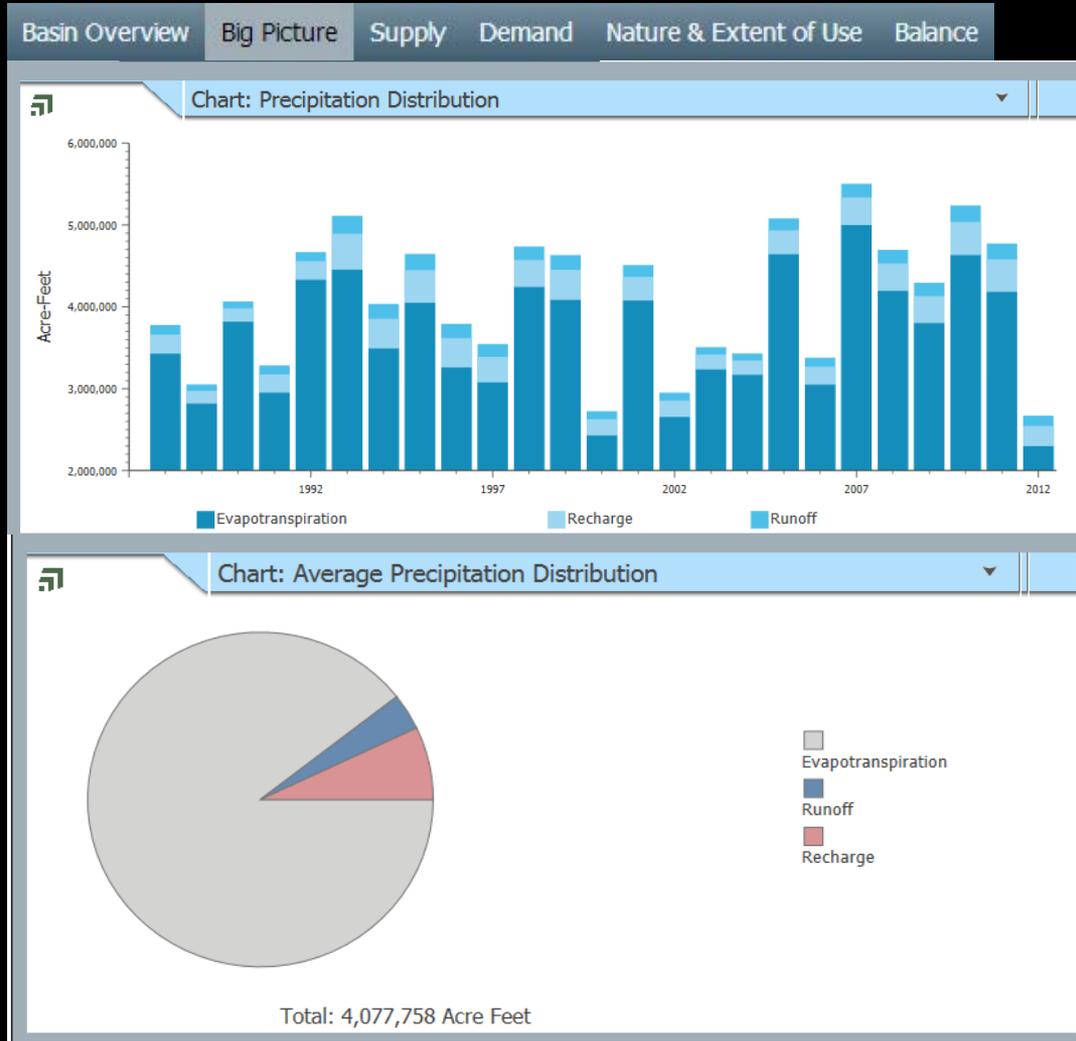
Basin/Subbasin Data: Big Picture

Precipitation Rates and Volumes



Basin/Subbasin Data: Big Picture

Precipitation Contribution

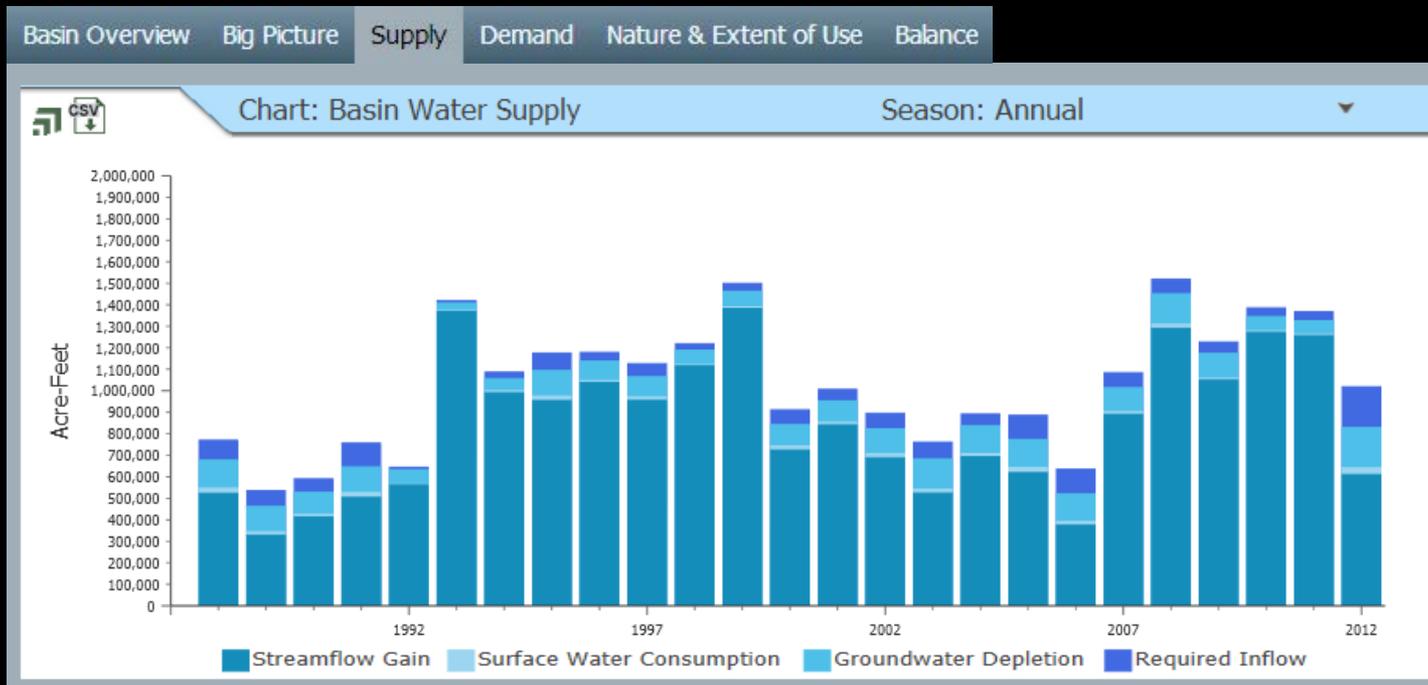


Precipitation
Distribution

Average
Precipitation
Distribution

Basin/Subbasin Data: Supply

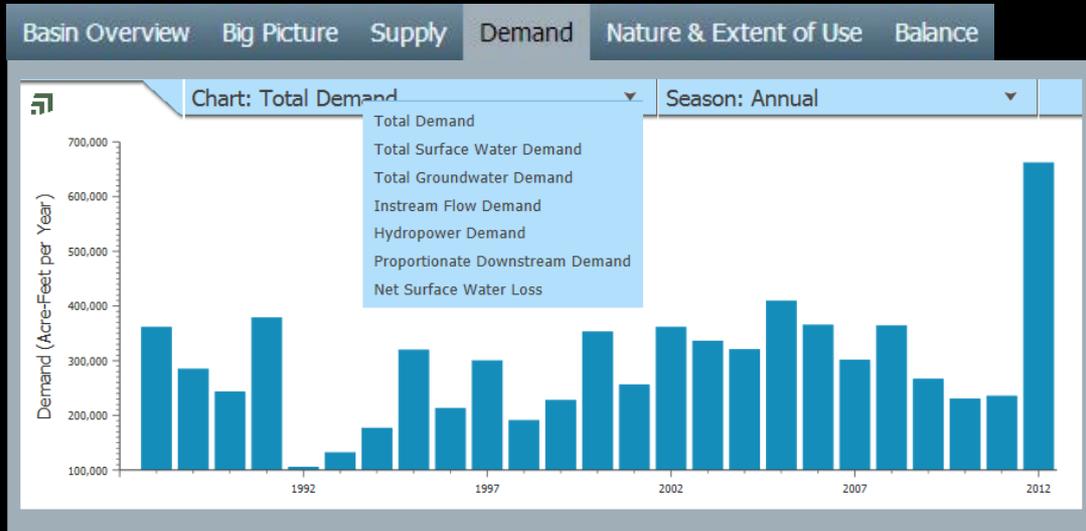
Basin Water Supply (BWS)



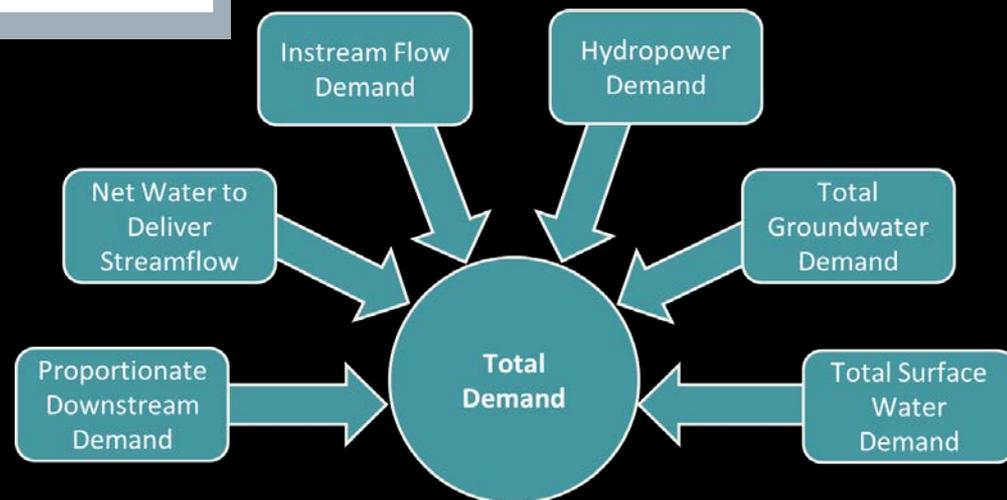
$$\text{BWS} = \text{Streamflow} + \text{Surface Water Consumption} + \text{Groundwater Depletion} + \text{Required Inflow}$$

Basin/Subbasin Data: Demand

Total Demand (TD)



Includes six categories of water use



Basin/Subbasin Data: Nature & Extent of Use

Average Total Demand by Category



Average Long-Term
Total Demand by
Category

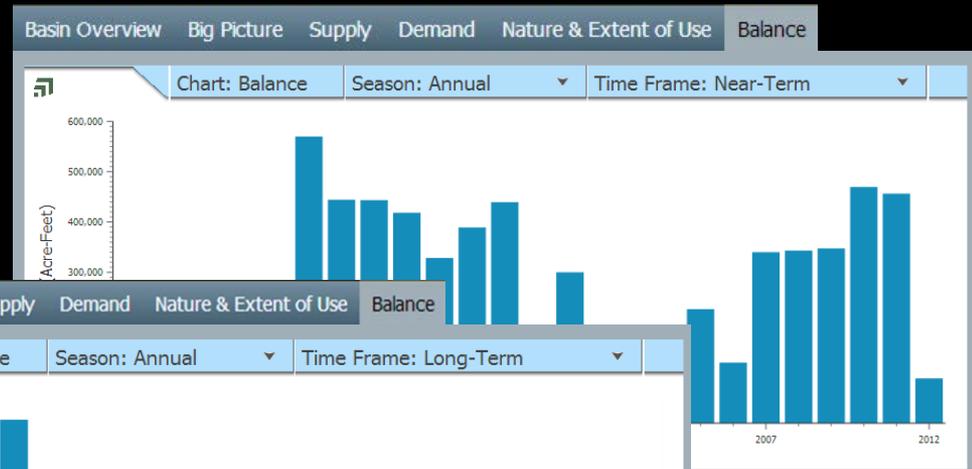
Irrigated Acres by
Source

Basin/Subbasin Data: Balance

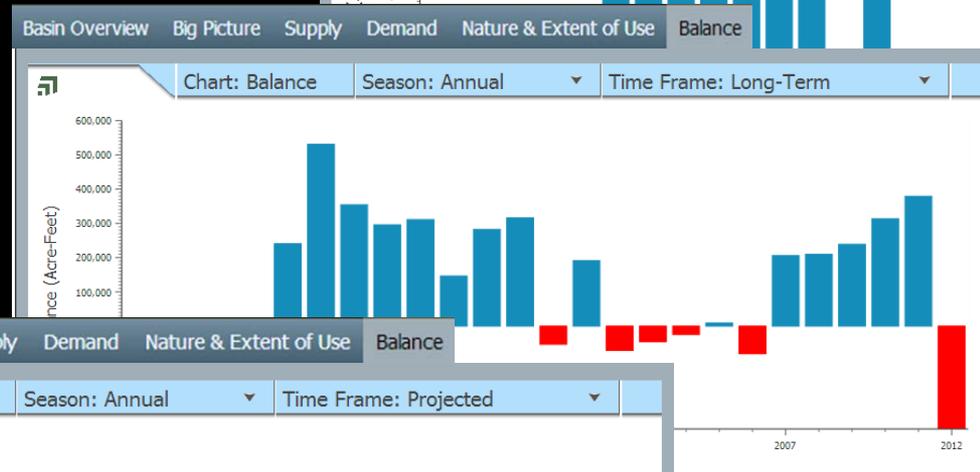
Balance of Water Supply and Demand

Balance of annual water supply and demand in three time frames:

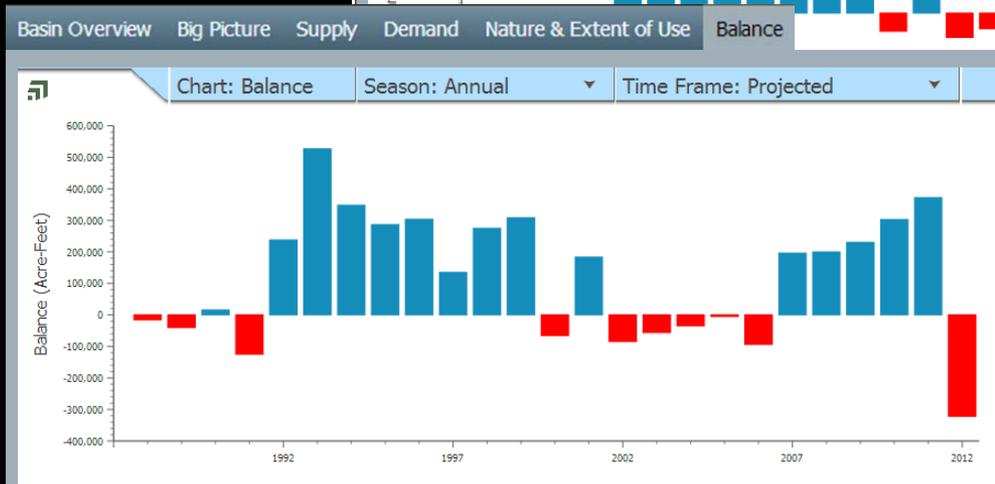
Near-Term



Long-Term



Projected



Balance =
Basin Water Supply –
Total Demand

A Professional & Public Resource

- INSIGHT is designed to be a resource for professionals and the public
 - **Professional resource** = One-stop shop for hydrologic data and analyses maintained by the Department
 - **Public resource** = Easy access to data pertaining to local basins and the water-related issues that affect them

INSIGHT is now available at
<http://dnr.nebraska.gov/insight/>



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Nebraska Department of Natural Resources

