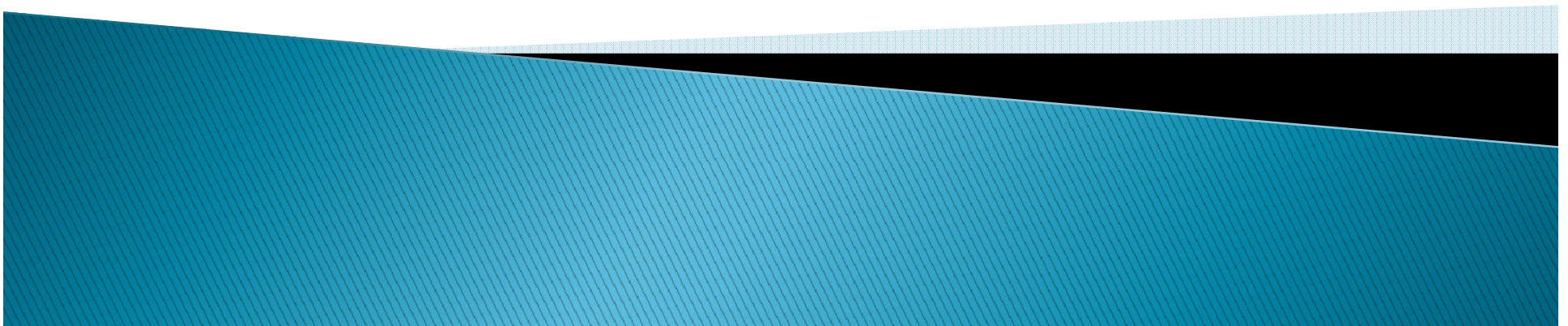
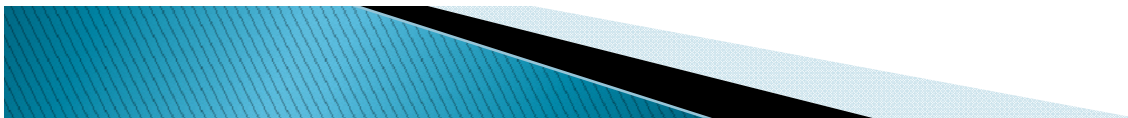
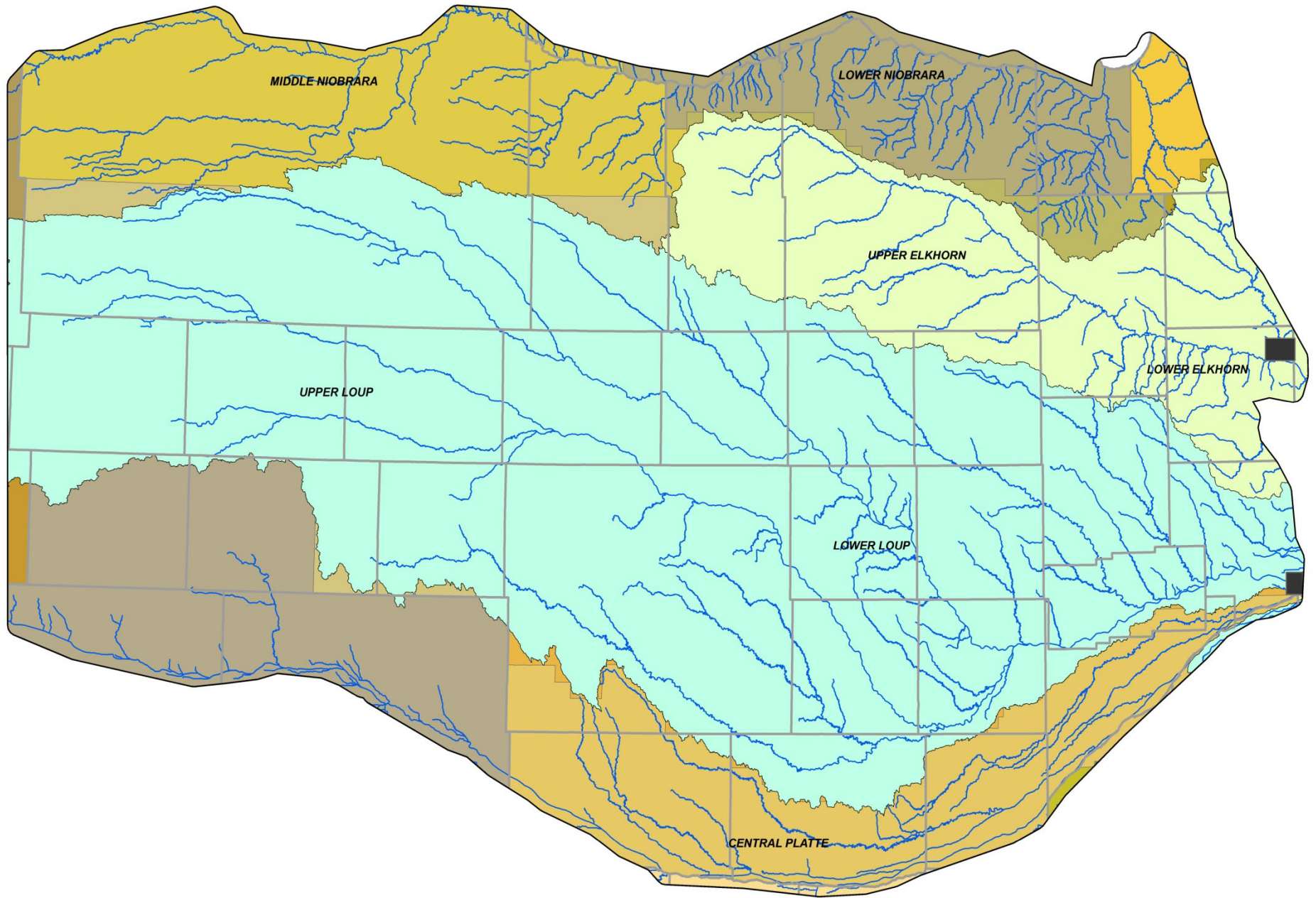


# Using the Elkhorn–Loup Model For Groundwater Management

Tylr Naprstek – Water Modeling Coordinator  
Lower Loup Natural Resources District

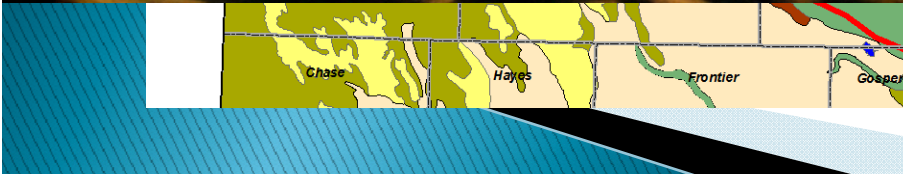
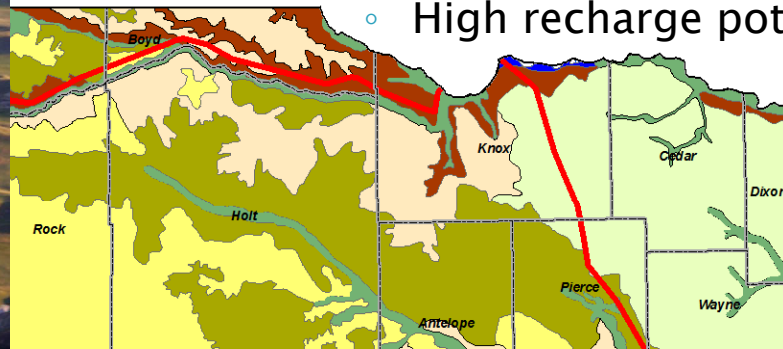






# ology

- ▶ Encompasses most of the sandhills region
  - Unique to Nebraska
  - Abundant Aquifer (1,200 ft)
  - High recharge potential



# A Specific & Unique Situation... just like everyone else!

- ▶ Elkhorn & Loup originate and end in Nebraska
  - No Interstate Compacts
- ▶ In-Stream Flow Requirement
  - Appropriation A-17331, NGPC
  - 3,700 cfs @ Louisville, NE. (11/30/1993)
- ▶ Goal: Develop a water budget for the region
- ▶ Determine long-term stream impacts to a basin and the Stream Depletion Factor
  - State determined line for hydrologically connected areas resulting in additional management
  - (10%–50 year line)





# Partnerships involved with ELM

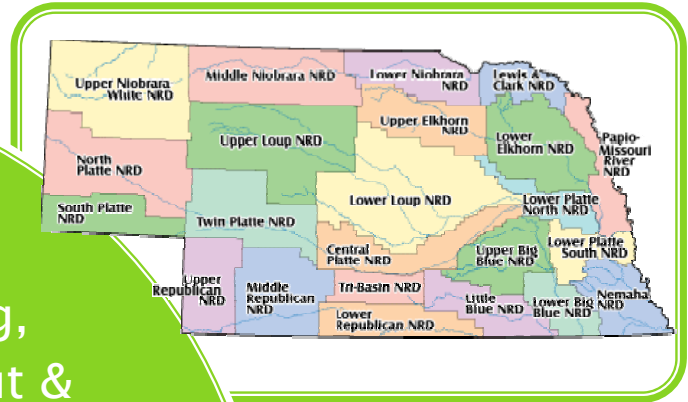


Model Work,  
Funding, &  
Data

Funding,  
Data Input &  
Management  
Use

Funding &  
Data Input

Technical  
Data



UNL School of Natural  
Resources  
Conservation and  
Survey Division (CSD)

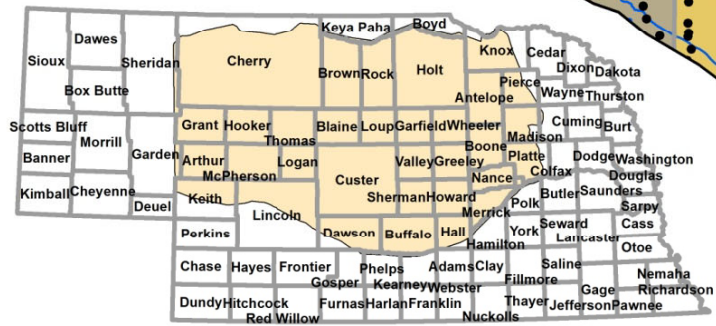
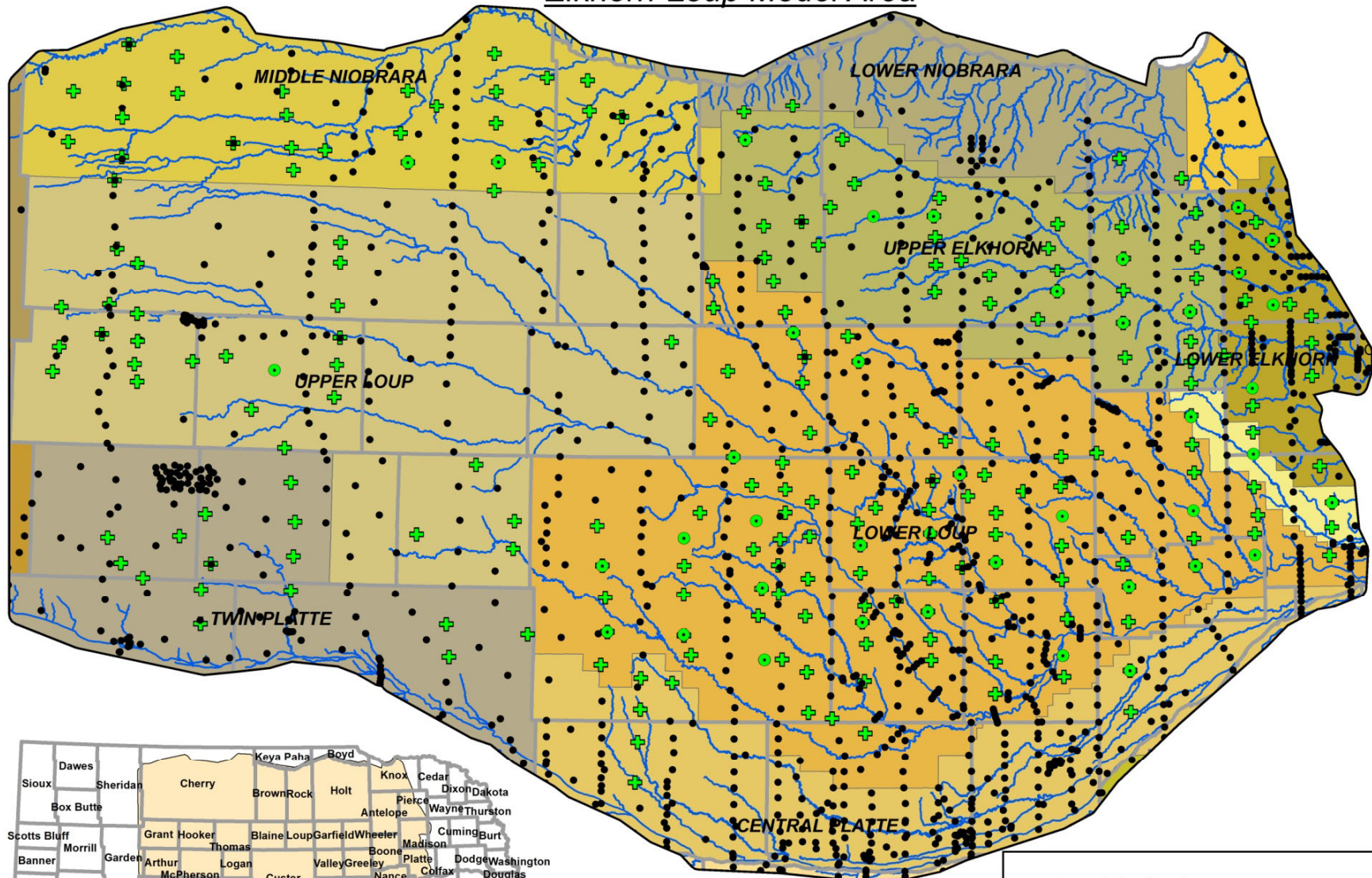
# Primary Datasets for Modeling Input

- ▶ Streamflow measurements
  - Gage Data
  - 2006 Measurements
  - NHD dataset
- ▶ CSD testholes
- ▶ Groundwater Level Change
- ▶ Additional testhole & Geophysics work
- ▶ Water Level Readings
- ▶ Irrigation Wells & Canal Datasets
- ▶ Historical Precipitation Records





# Elkhorn-Loup Model Area

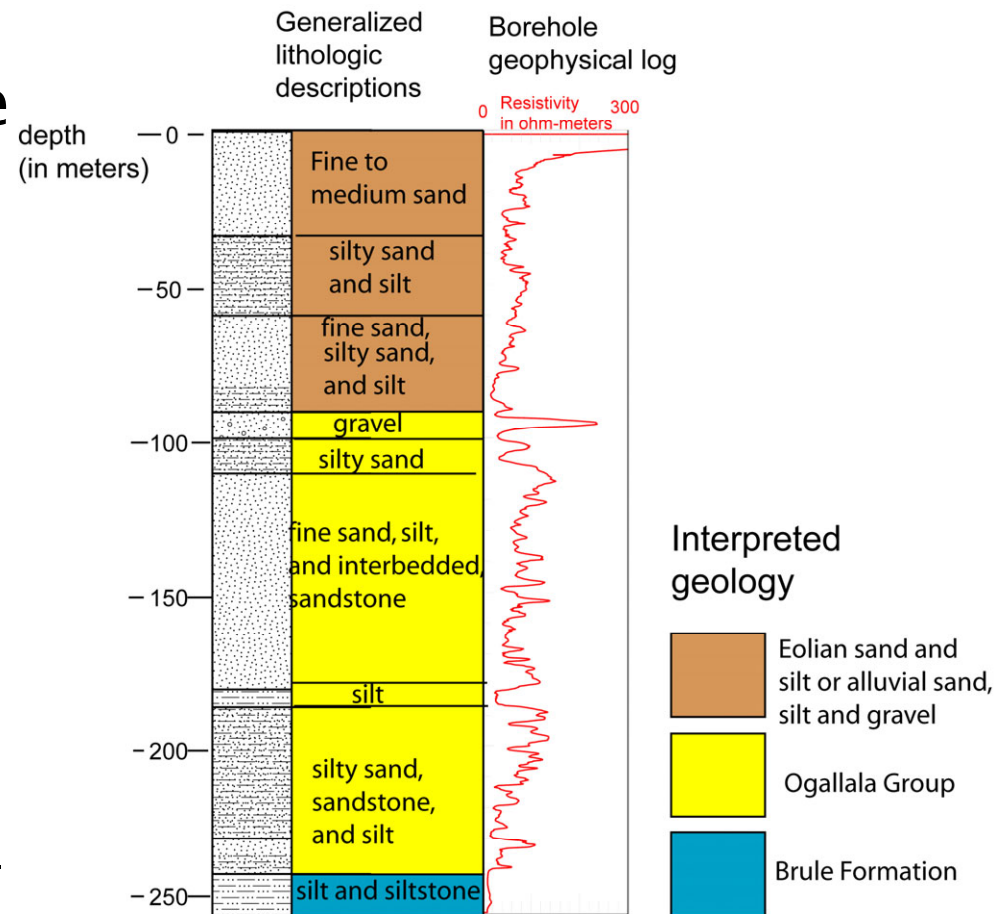


- Testholes
- + Geophysics
- CSD/USGS Testholes

# Test Hole & Geophysical Target

- ▶ Top of Brule or Pierre (and in some cases Niobrara)
- ▶ High electrical conductivity
- ▶ Low hydraulic conductivity
- ▶ Need to see through thick stack of sand + Ogallala

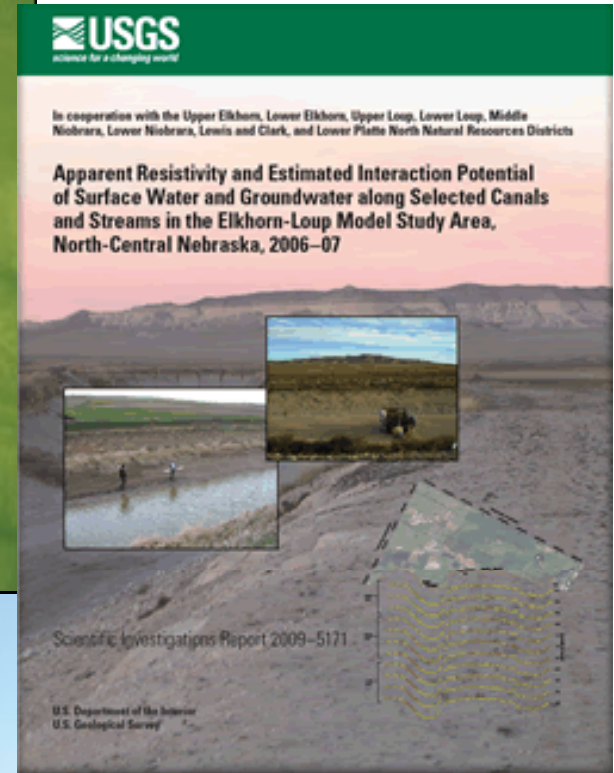
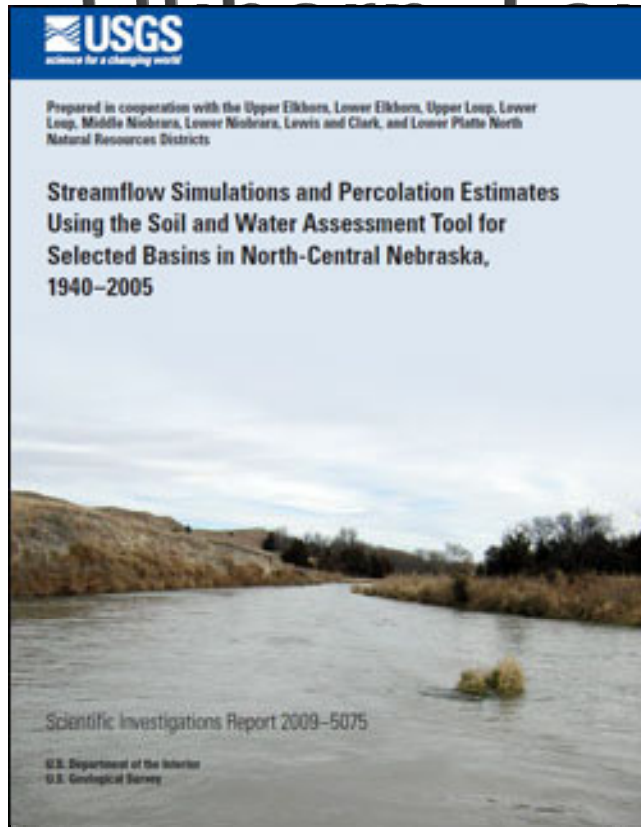
Digitized records for entire State!





# Timeline & D

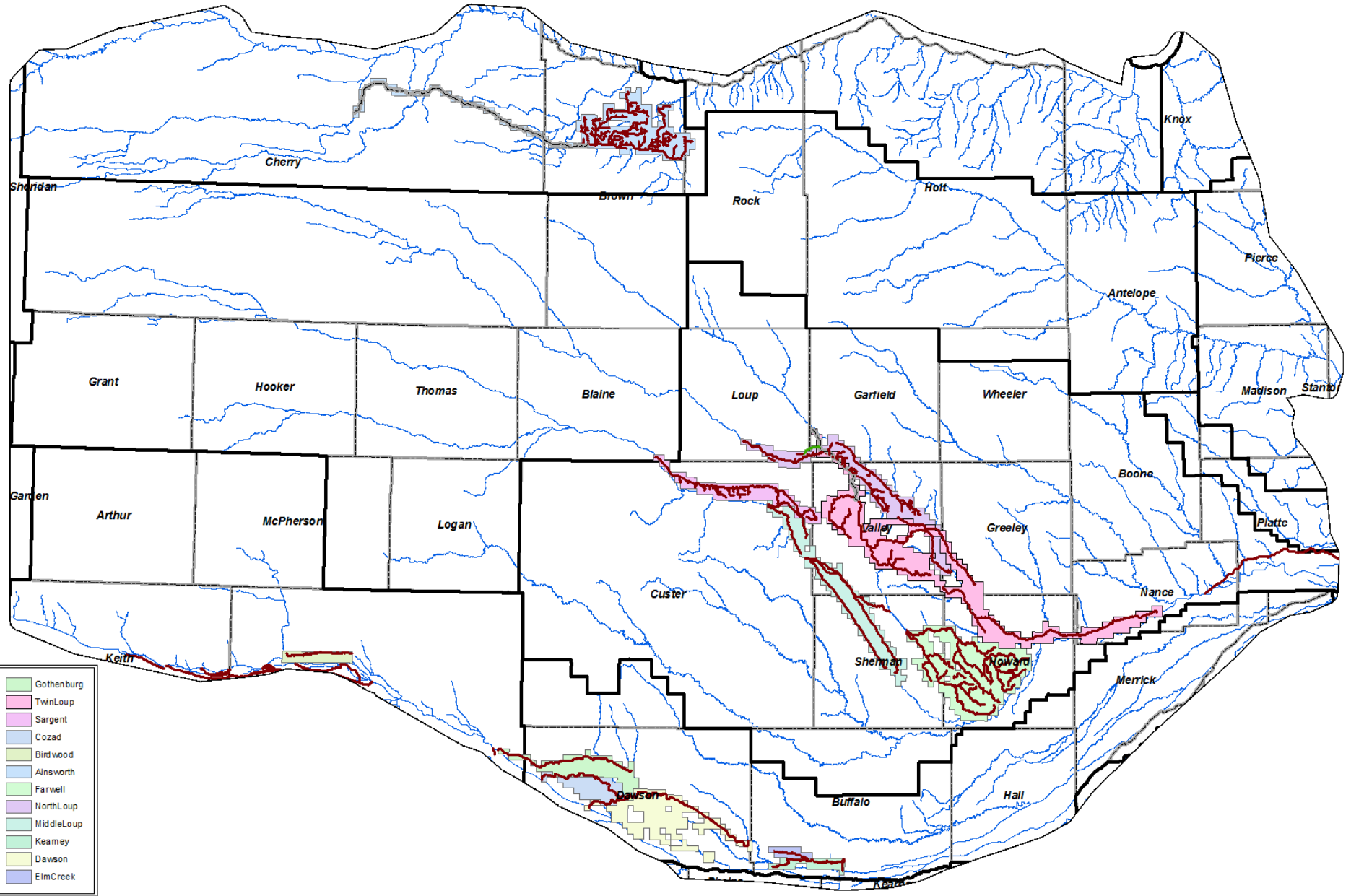
# of



## Calibration

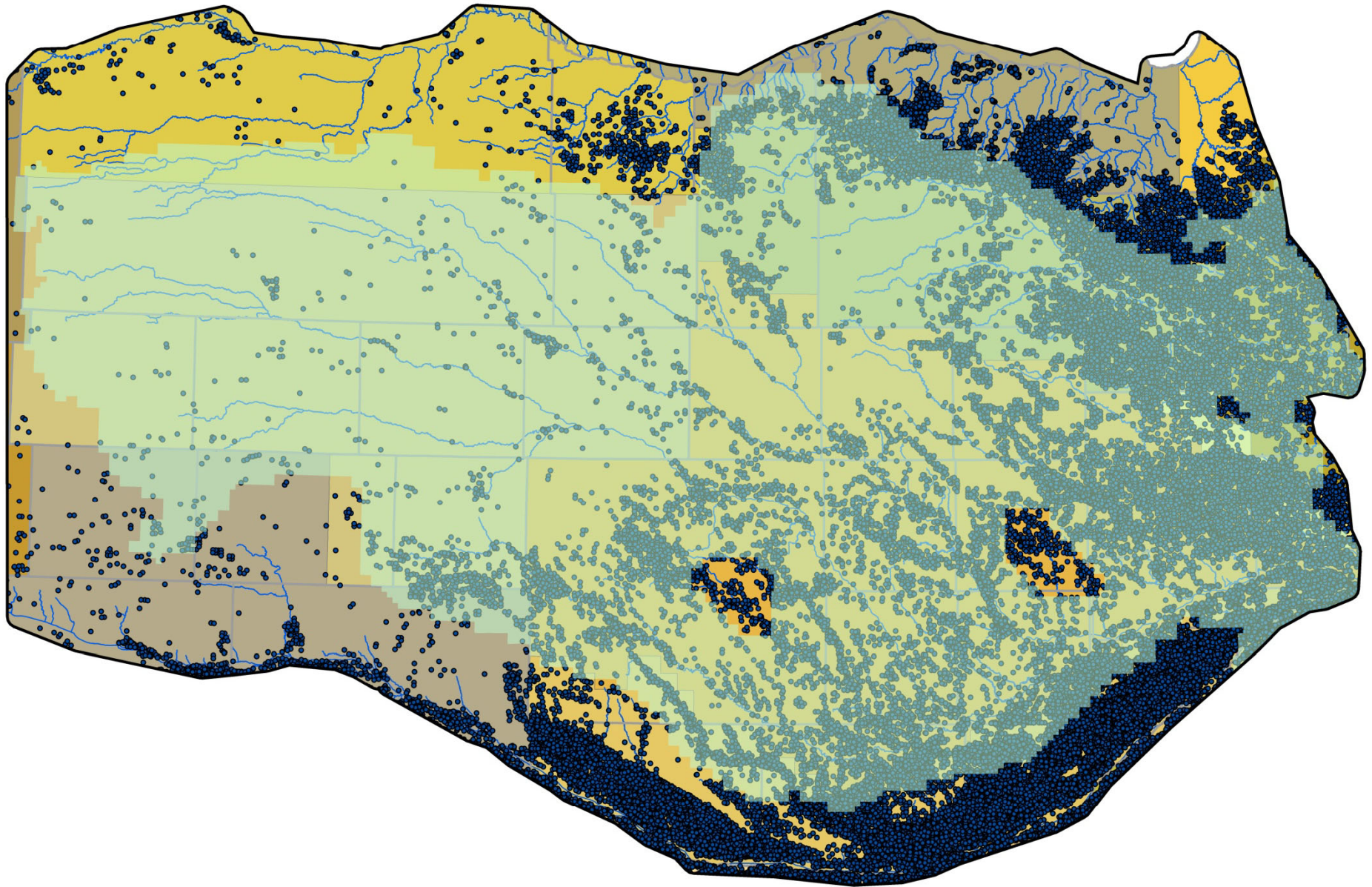
- Stream flows (Base-Flow)
- Groundwater levels
- Evapotranspiration

# Canal Data





# LB483, an integrated process



# Ranking Criteria

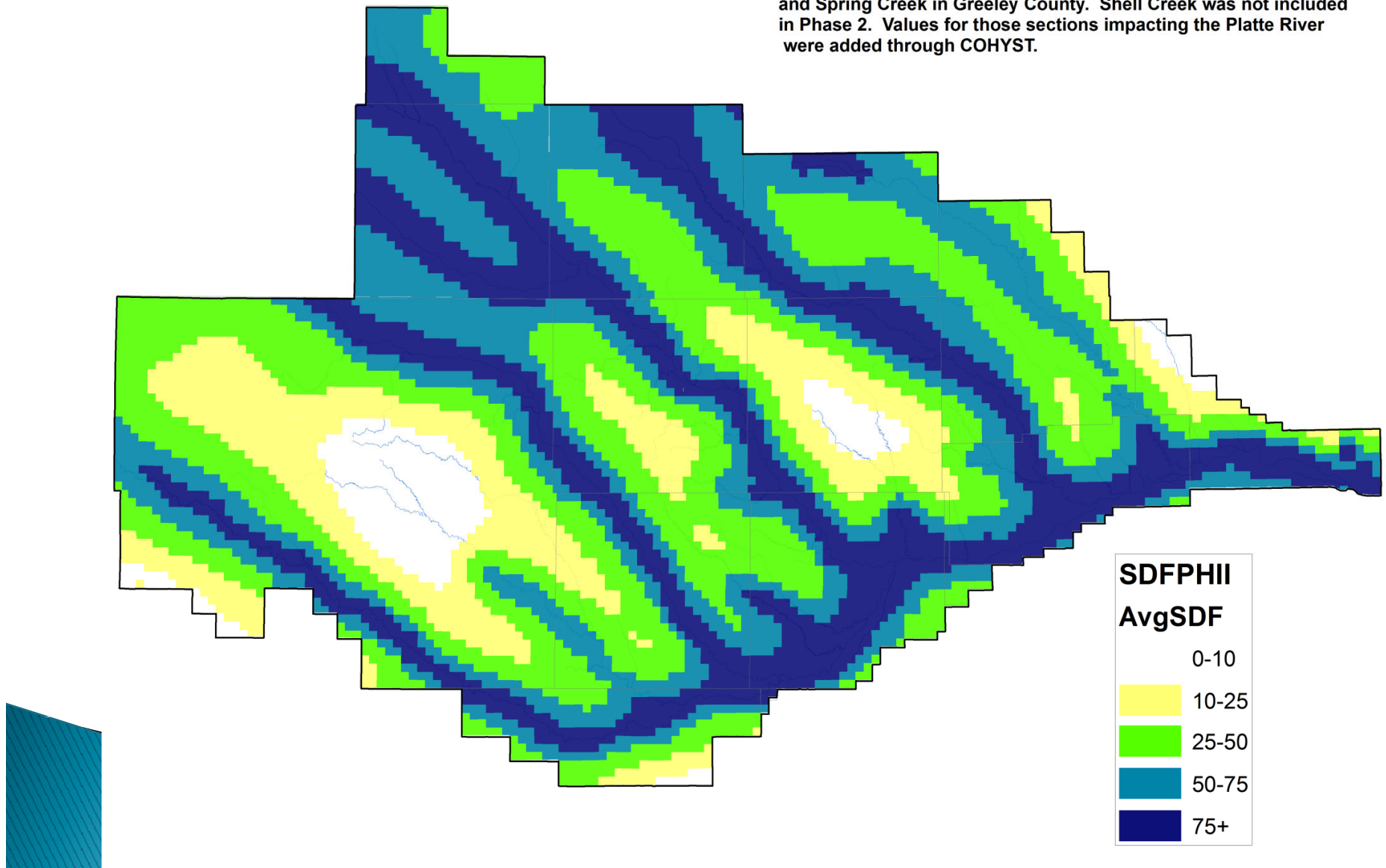
- ▶ LLNRD developed a criteria sheet for all new acre applications
  - Points are assigned based on how an application fits within criteria
  - Soils, SDF, Irrigation Density, Size
- ▶ Applications are redrawn using GIS based on landowner field boundaries on aerial photographs
  - Shapefile for each application created
- ▶ LLNRD staff apply District approved ranking sheets to score applications
  - (Unbiased, Few ties)





# Stream Depletion Factor (Phase II ELM)

Phase 2 included greater portions of Mud Creek in Custer county and Spring Creek in Greeley County. Shell Creek was not included in Phase 2. Values for those sections impacting the Platte River were added through COHYST.



# Ranking Criteria Continued...

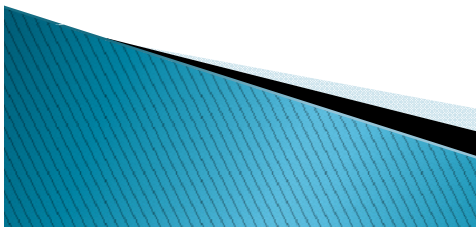
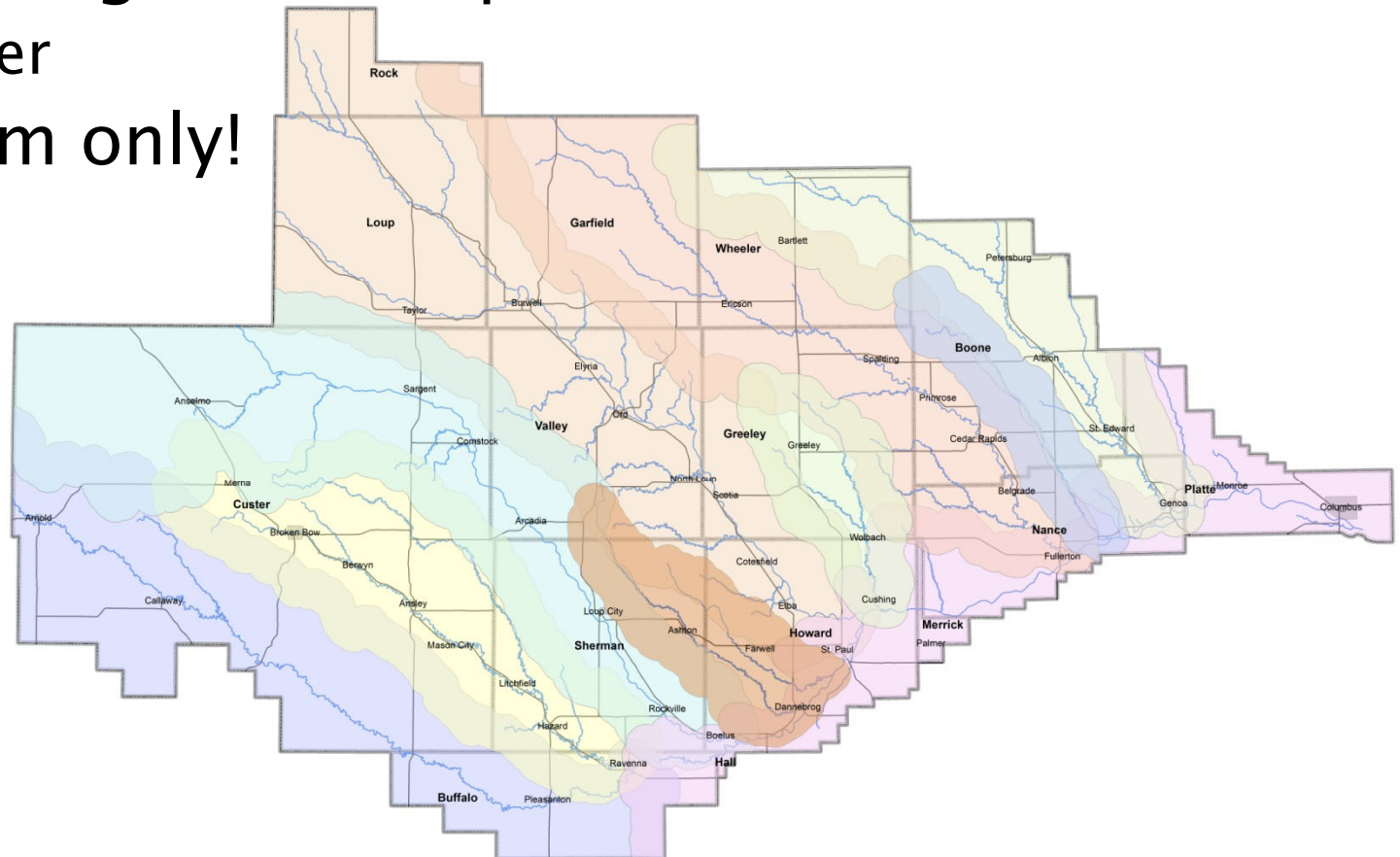
- ▶ Point totals are assigned based on each criteria
- ▶ 2009: ~13,000 applied acres
  - 2,003 approved applications scored >196.72
- ▶ 2010: ~12,000 applied acres
  - 2,002 approved applications scored > 263.2
- ▶ 2011: ~24,000 applied acres
  - 3,001 approved applications scored >283.27
- ▶ 2012: ~22,000 applied acres
- ▶ Each approved site was visited by NRD staff and field boundary added to District acre certification





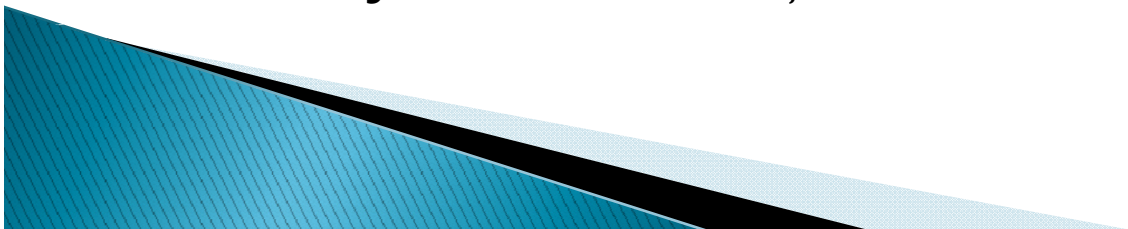
# Irrigation Rights Transfer

- ▶ Stream Depletion Factor
  - 1:1 Acres from High–Low
  - % Offset from Low–High
- ▶ USGS Hydrologic Unit Map
  - 2 Mile Buffer
- ▶ Downstream only!



# Data Availability

- ▶ Internet Search: “Elkhorn Loup Model”
  - <http://ne.water.usgs.gov/projects/elm.html>
  - Shapefiles: Base of Aquifer, Stream Depletion Factor
  - ★ Other related publication: Ground Water Journal
    - Phase 2 model with SWB-generated recharge
  
- Contacts:
  - Lower Loup Natural Resources District
    - <http://www.lnrd.org>
    - Tylr Naprstek, Coordinator (308) 728-3221
  
  - USGS Nebraska Water Science Center
    - <http://ne.water.usgs.gov>
    - Jennifer S Stanton, Water modeler (402) 261-0458





# Questions?

