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# Technical Programs Update

NARD Legislative Conference  
January 30, 2019  
Jesse Bradley and Carrie Wiese

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# Overview

- Why does NeDNR use hydrologic models?
    - Existing models
  - Models in development
  - Other technical projects (SUSTAIN, CIR calculator, DSS)
  - Questions
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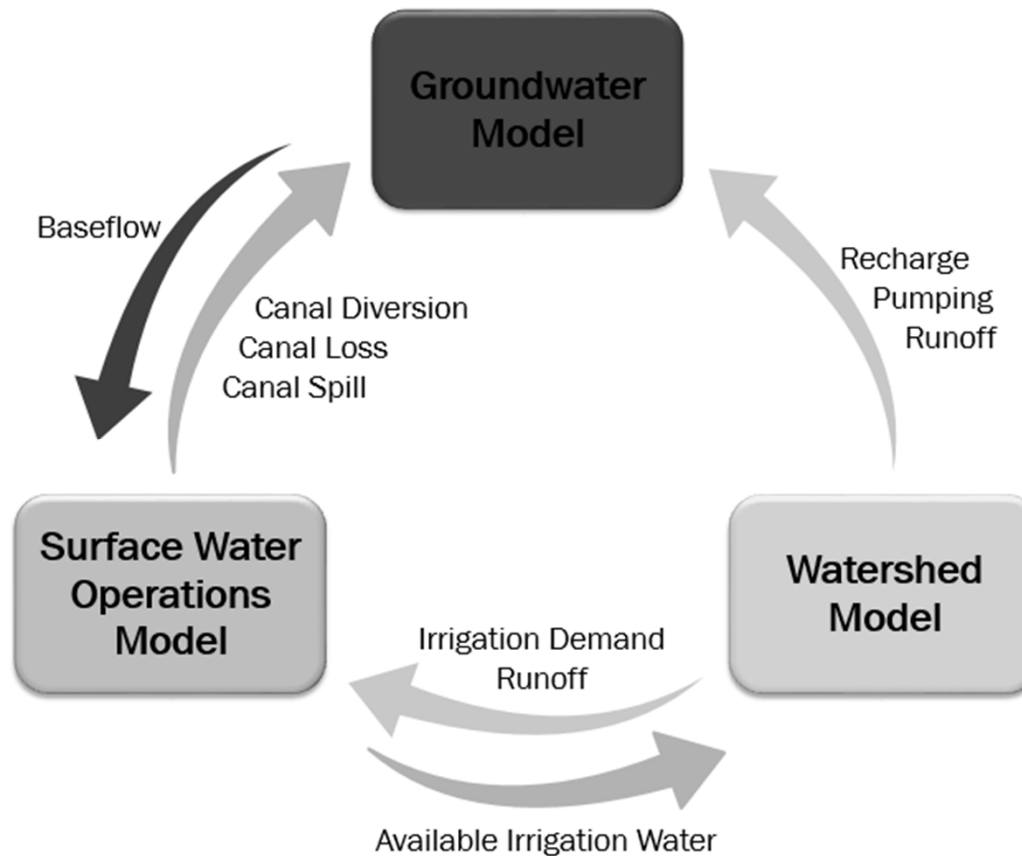
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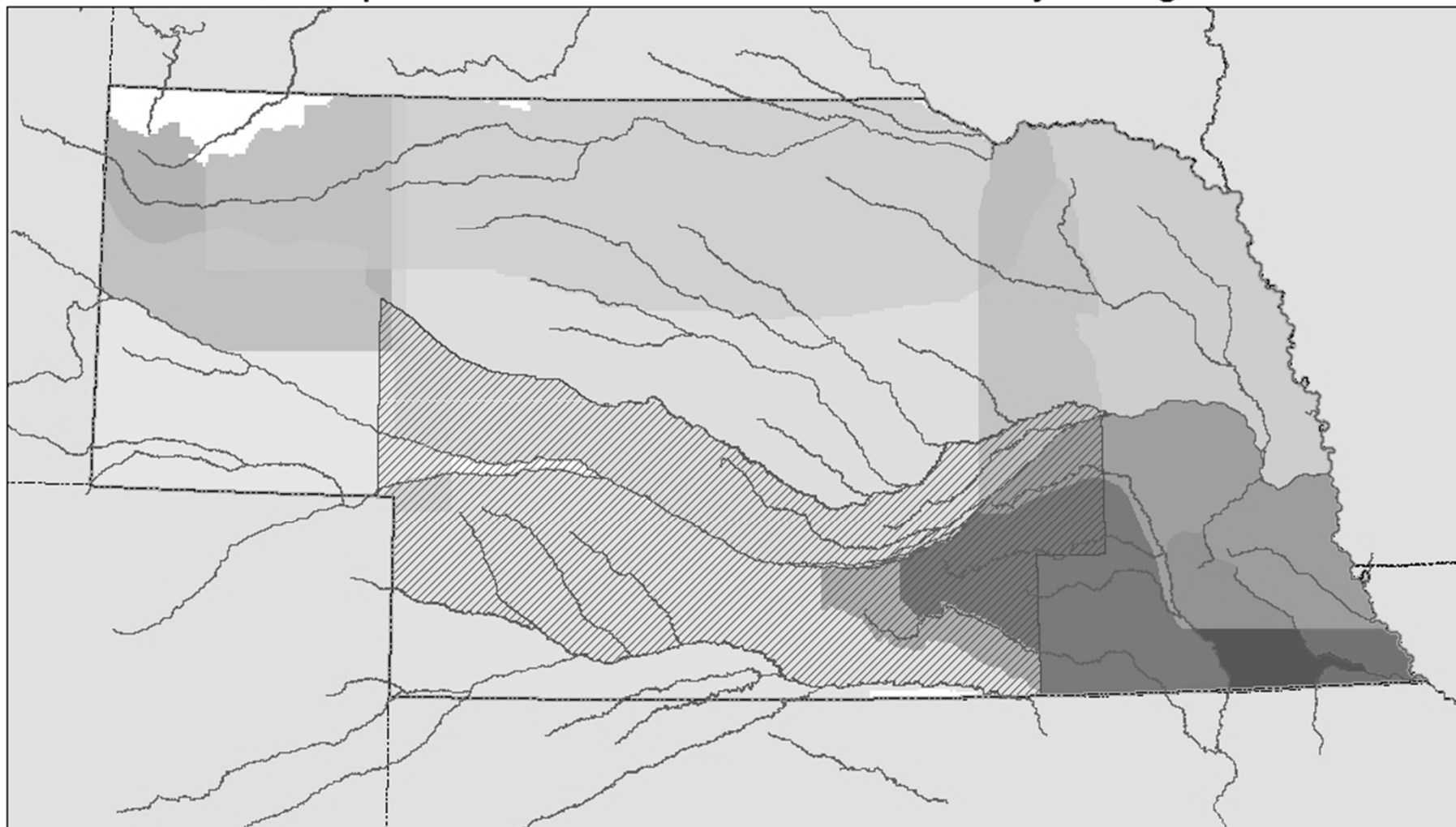
# Why does NeDNR develop hydrologic models?

- Models play important role in planning and management of Nebraska's water resources, to meet objectives of local integrated management plans, basin-wide plans, state legislation, and interstate water agreements/compacts
  - To assist with water management across Nebraska by providing a better understanding of regional hydrogeology and water availability
    - Management areas (10/50, 28/40, etc.)
    - Transfers
    - New uses
  - Evaluate water budgets – pumping and recharge
  - Each model developed in collaboration with NRDs and works to incorporate best available data
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# Integrated Hydrologic Models

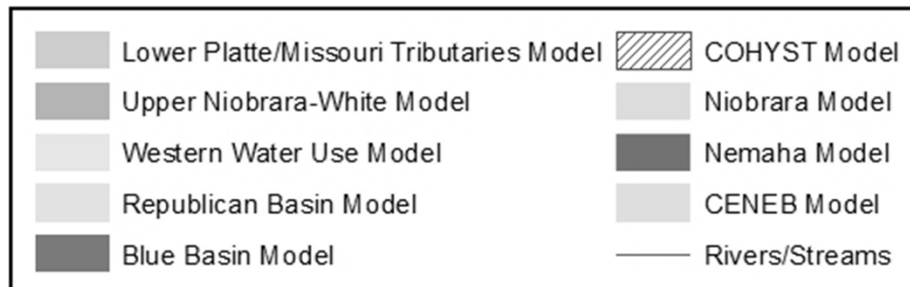
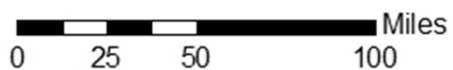


# Nebraska Department of Natural Resources Hydrologic Models



# NEBRASKA

DEPT. OF NATURAL RESOURCES



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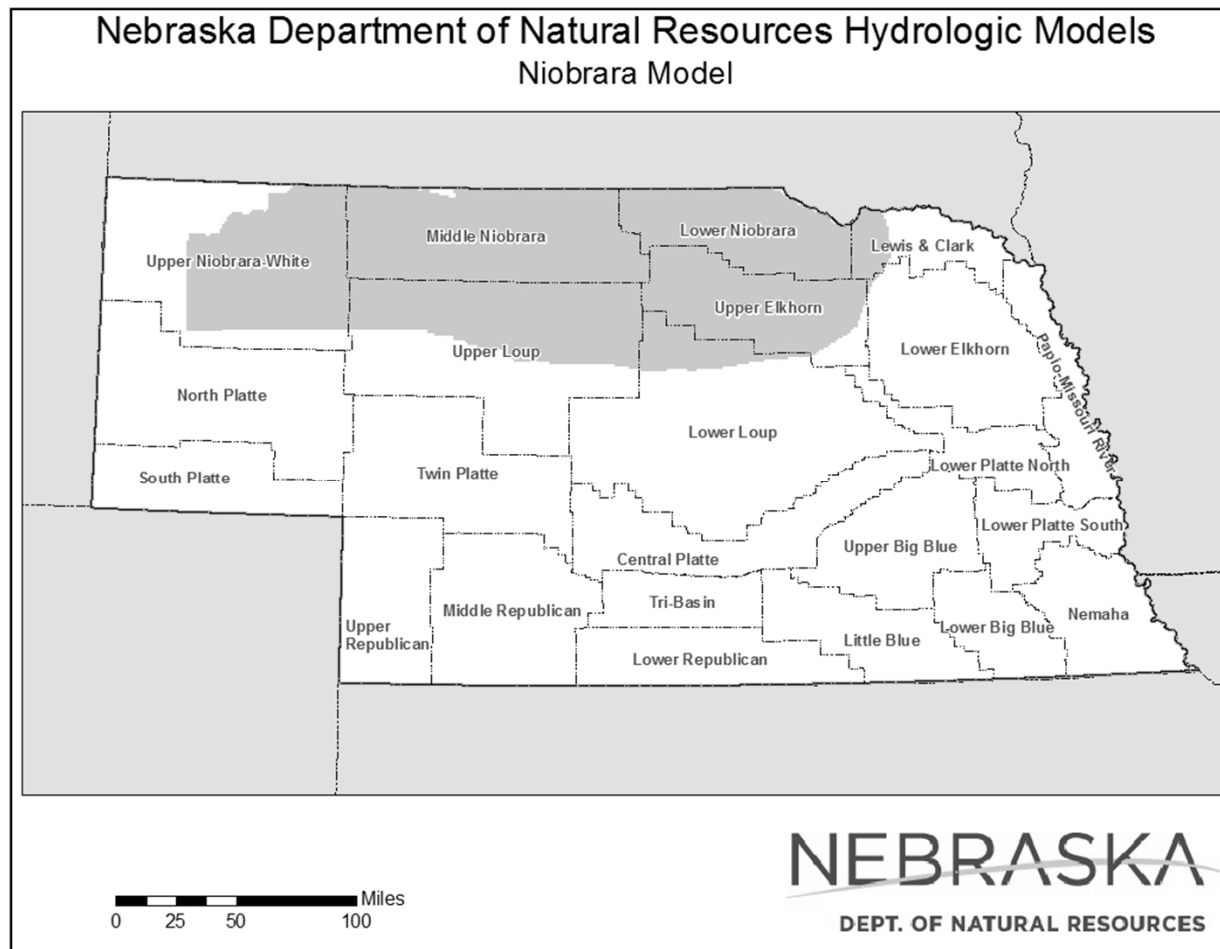
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# Models in Development

Carrie Wiese



# Niobrara Model



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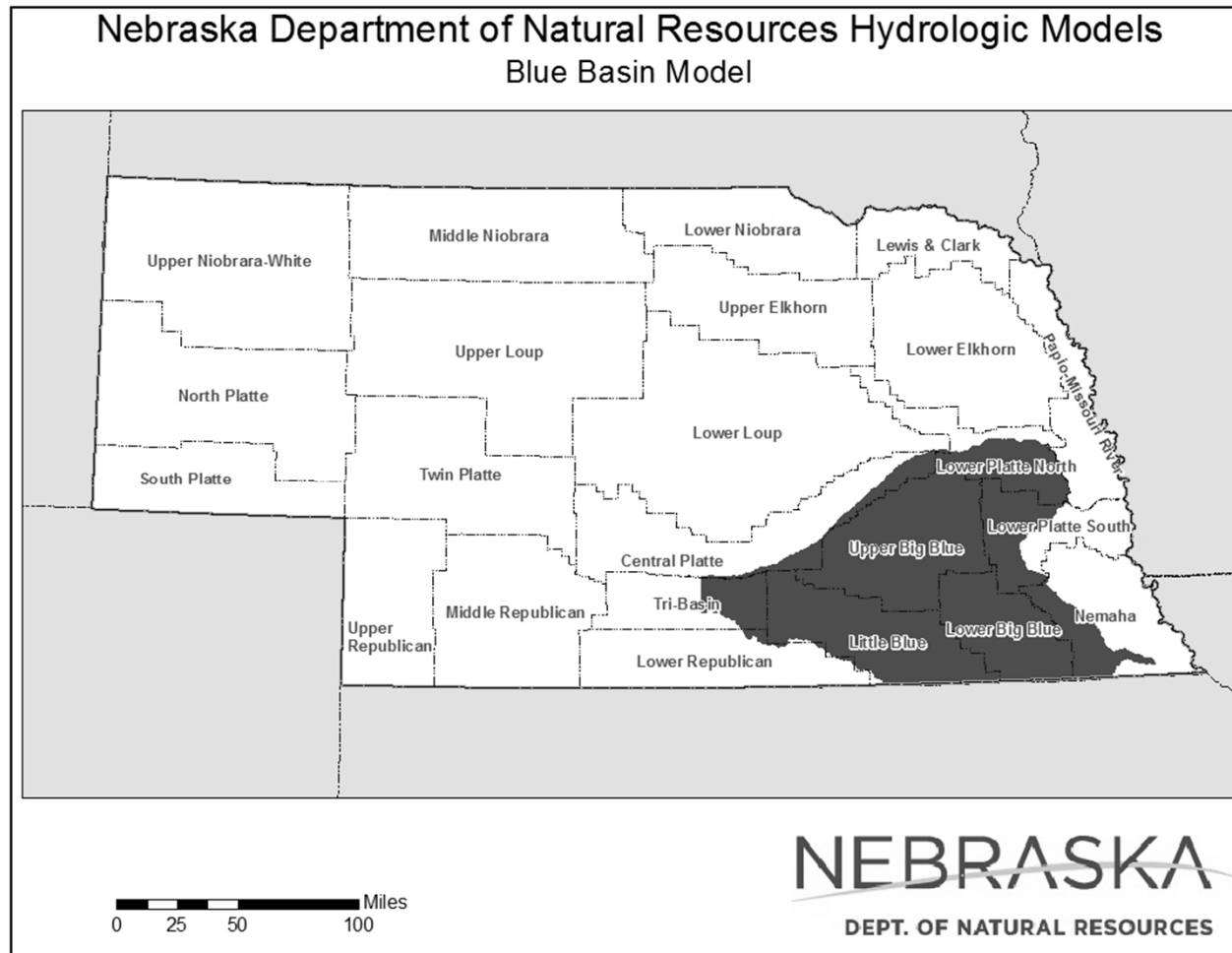
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## Niobrara Model

- NeDNR initiated development with Olsson Associates (now Olsson) in 2018
  - Disagreement between UNW and CENEB models in areas of overlap (models were built to do different things)
  - New model will provide unified modeling approach to Niobrara basin downstream of Box Butte Reservoir
  - Olsson is testing model output dependent on inclusion of stream reaches, NeDNR has developed land use dataset
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# Blue River Basin Model



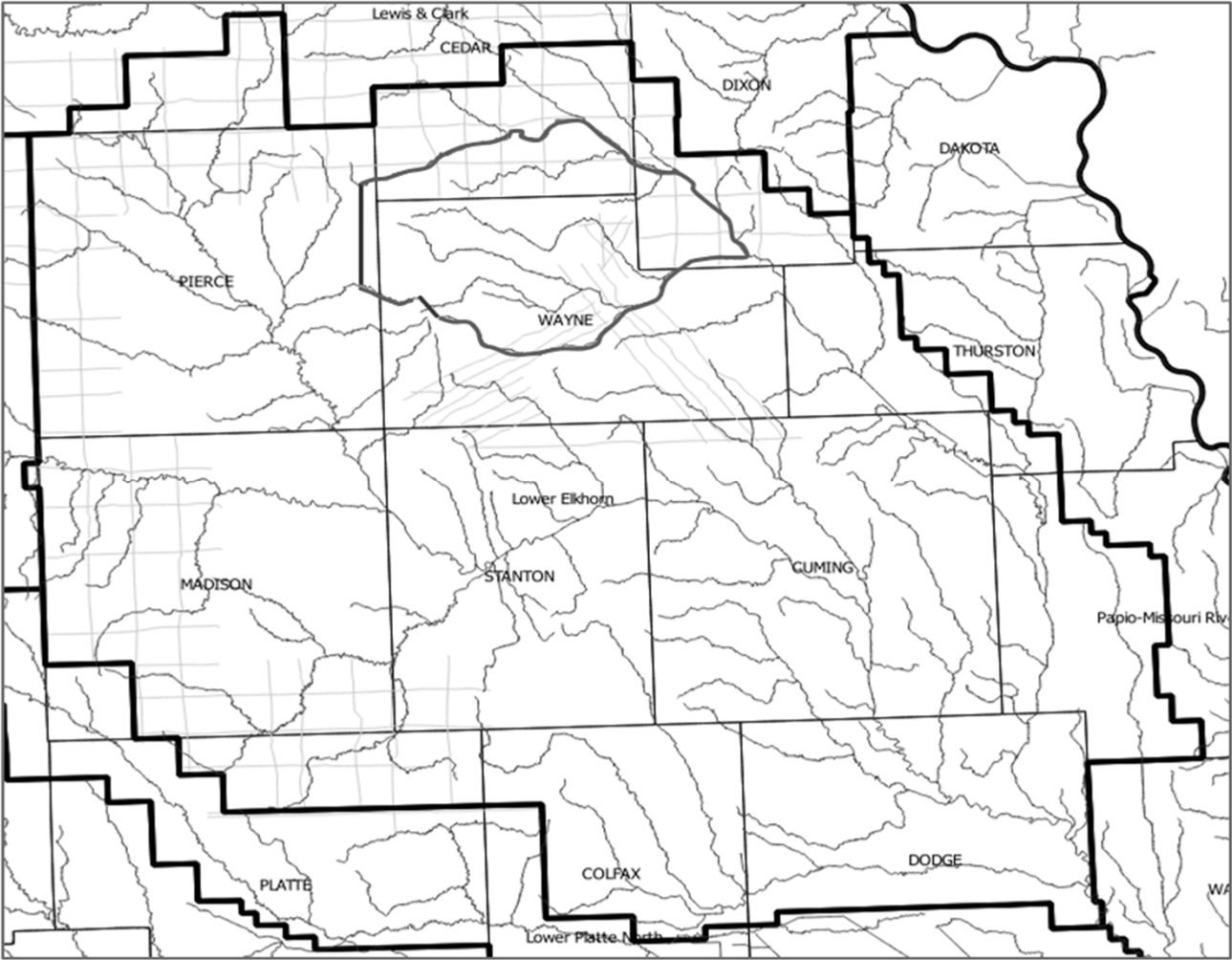
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## Blue River Basin Model

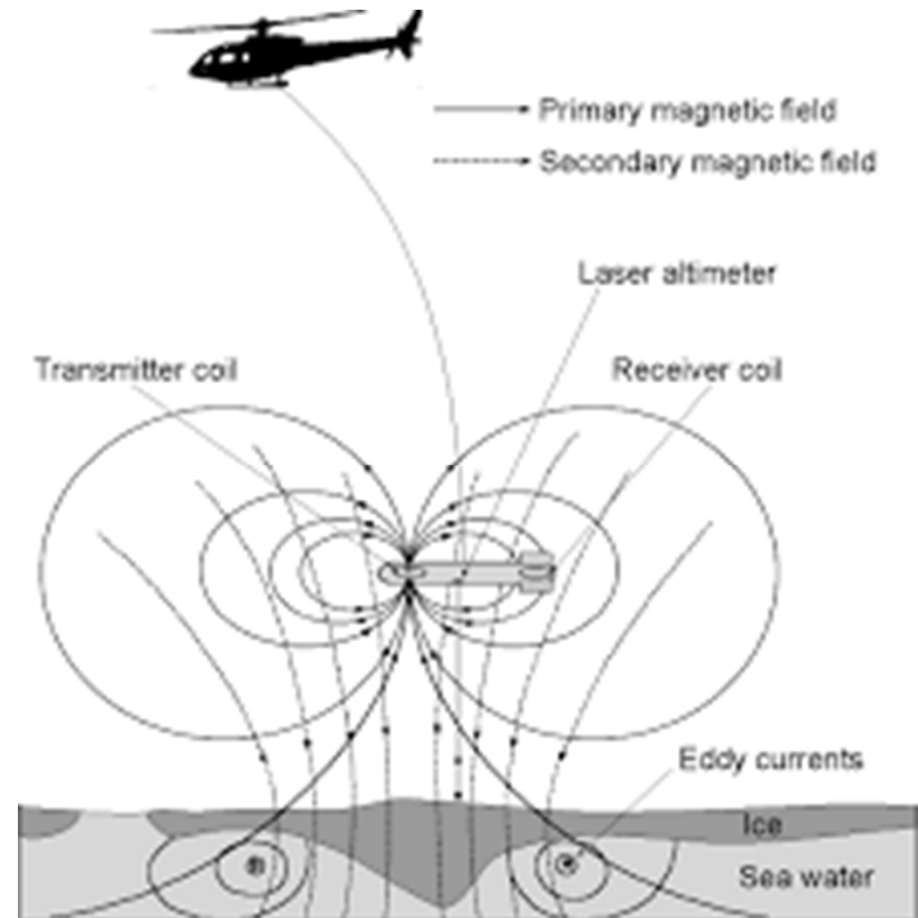
- NeDNR worked with HDR to develop a model – finalized and calibrated in 2013 – to evaluate appropriation status of the basin and impacts of groundwater well pumping on stream baseflow
  - NRDs also developed groundwater models to answer more localized questions, like well-to-well interference and water quality concerns
  - UBBNRD, LBBNRD, LBNRD, TBNRD and NeDNR partnered beginning in 2018 to develop sub-regional model to better satisfy both regional and more localized needs
  - Development of the sub-regional model expected to be ongoing for the next few years
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# Lower Elkhorn NRD (LENRD) Sub-regional Pilot Study

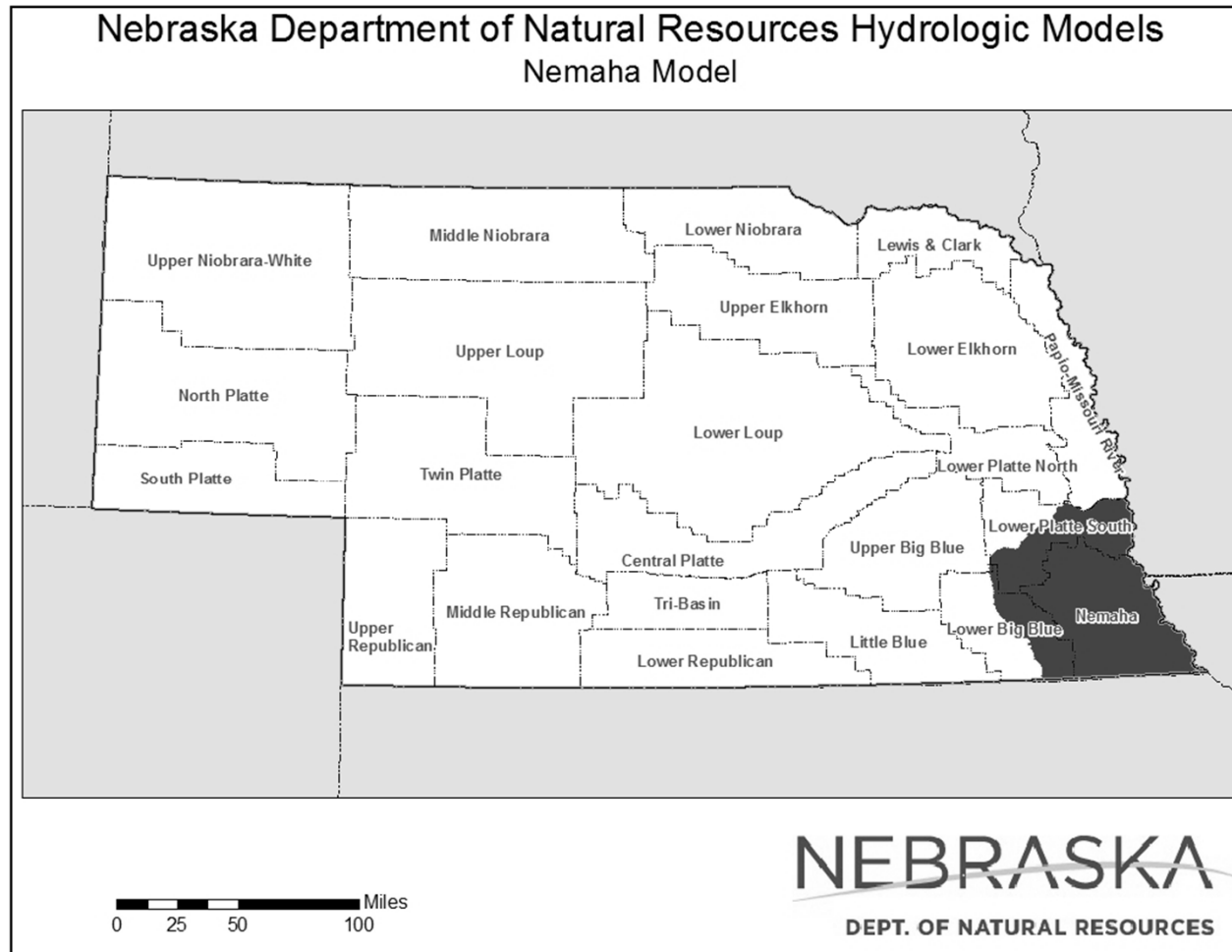


# LENRD Sub-regional Pilot Study

- NeDNR is partnering with LENRD and JEO on development of a sub-regional pilot study/model
- Incorporating AEM data



# Nemaha Model (to be developed)



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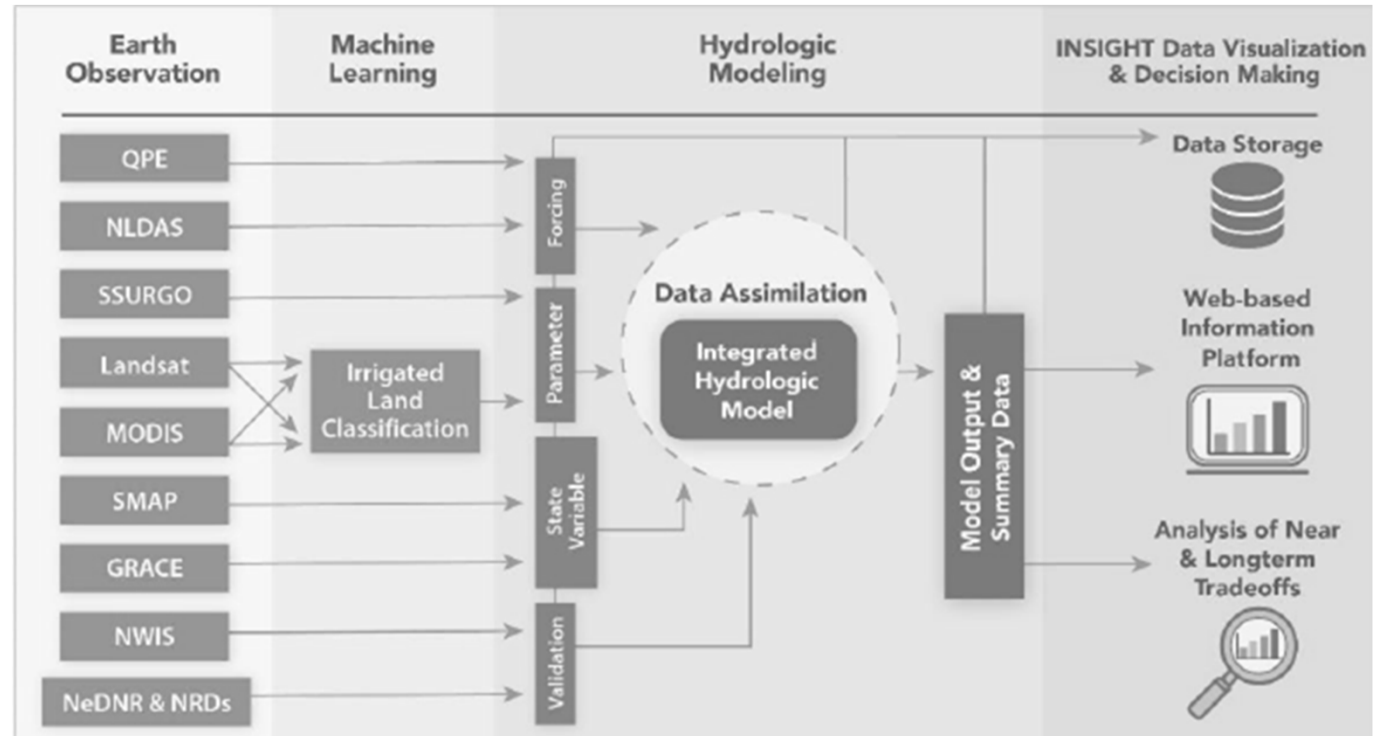


# Other Technical Projects

Jesse Bradley

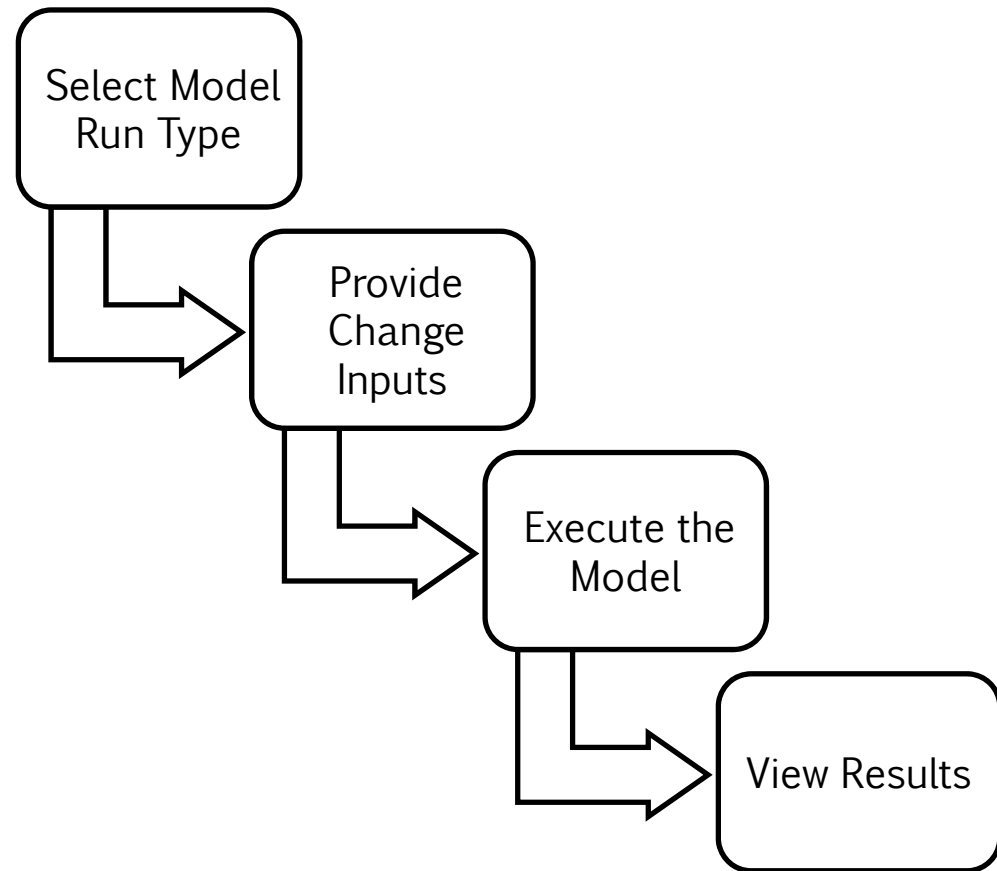
# Data Integration Projects

- Leverage available earth observation data
- NRD/NeDNR data
- Improve efficient in data formatting and data processing
- Output to visualization platforms



# SUSTAIN

- Improve access to watershed model results (land use, pumping, recharge)
- GUI for model analysis (recharge and pumping changes)
- View results at the county, NRD, or user defined level





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# SUSTAIN

## SUSTAIN is:

- a software program developed by NeDNR to allow access to watershed model data and groundwater models
- intended to increase transparency and water manager's evaluation of options

## SUSTAIN allows NRDs and water managers to:

- access regional data used in watershed and groundwater models
  - make maps and graphs displaying model input and output data
  - evaluate management scenarios
  - run regional groundwater model
  - process scenario results
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# SUSTAIN

- Models planned to be included in SUSTAIN in the near future:
    - UNW
    - LPMT
    - CENEB
  - Continuing work:
    - New release February/March (when LPMT is fully implemented)
    - Incorporating CENEB this spring
    - Offer training spring/summer (local, at request)
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## CIR Calculator

- NRD accounts will be able to access online
  - Uses available model data (COHYST/LPMT soon!)
    - Pumping
    - Recharge
    - SDF (stream depletion factor)
  - Assess new uses and transferred uses with simple inputs of location and crop type
  - Store information and generate reports for IMPs and Basin Planning (future release)
  - Goal to develop additional connections to groundwater model updates and INSIGHT updates.
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# CIR Calculator

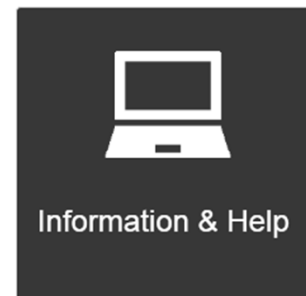
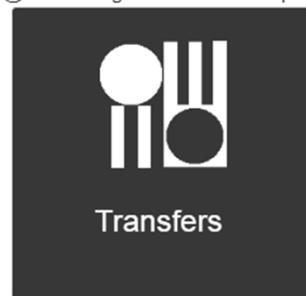
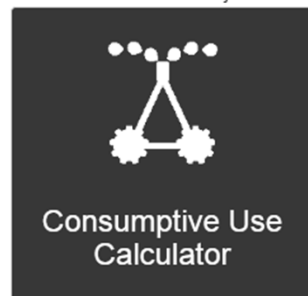
- Structured for individual NRD accounts with log-in



## Crop Irrigation Requirement (CIR) Calculator



jesse.bradley@nebraska.gov - Nebraska Department of Natural Resources



# CIR Calculator

- Determine current use and transferred use location/crop type

The screenshot shows the Nebraska CIR Calculator web application. At the top is a dark navigation bar with the following links: ABOUT, DATA, FORMS, NEBRASKA DEPT. OF NATURAL RESOURCES, SERVICES, and CONTACT. Below the navigation bar is the main content area, which is a form titled "Transfers". The form is divided into two main sections: "Enter Present Conditions" and "Enter Future Conditions". Each section contains a table with columns for "Section", "Township", "Range", "Crop", and "Acres". The "Crop" column has a dropdown menu with a "Choose..." option. The "Acres" column has a text input field and a minus sign button. The "Enter Present Conditions" section has a "New Use Location" label above it. The "Enter Future Conditions" section has a "New Use Location" label above it. At the bottom of the form are two buttons: "Calculate" and "Clear". A dropdown menu is open over the "Crop" column of the "Enter Present Conditions" table, showing a list of crop types: Choose..., Irrigated Corn, Irrigated Sugar Beets, Irrigated Soybeans, Irrigated Sorghum (Milo, Sudan), Irrigated Dry Edible Beans, Irrigated Potatoes, Irrigated Alfalfa, Irrigated Small Grains, Range/Pasture/Grass (Brome, Hay, CRP), Urban Land, Open Water, Riparian Forest and Woodlands, Wetlands, Other Agricultural Lands (Farmsteads, Feedlots, etc.), Irrigated Sunflower, Summer Fallow, Roads, Dryland Corn, and Dryland Soybeans.

# CIR Calculator

- Present conditions and future conditions
- Results (CIR, Recharge, GW withdrawal, Stream Depletion %, and Estimated depletions)



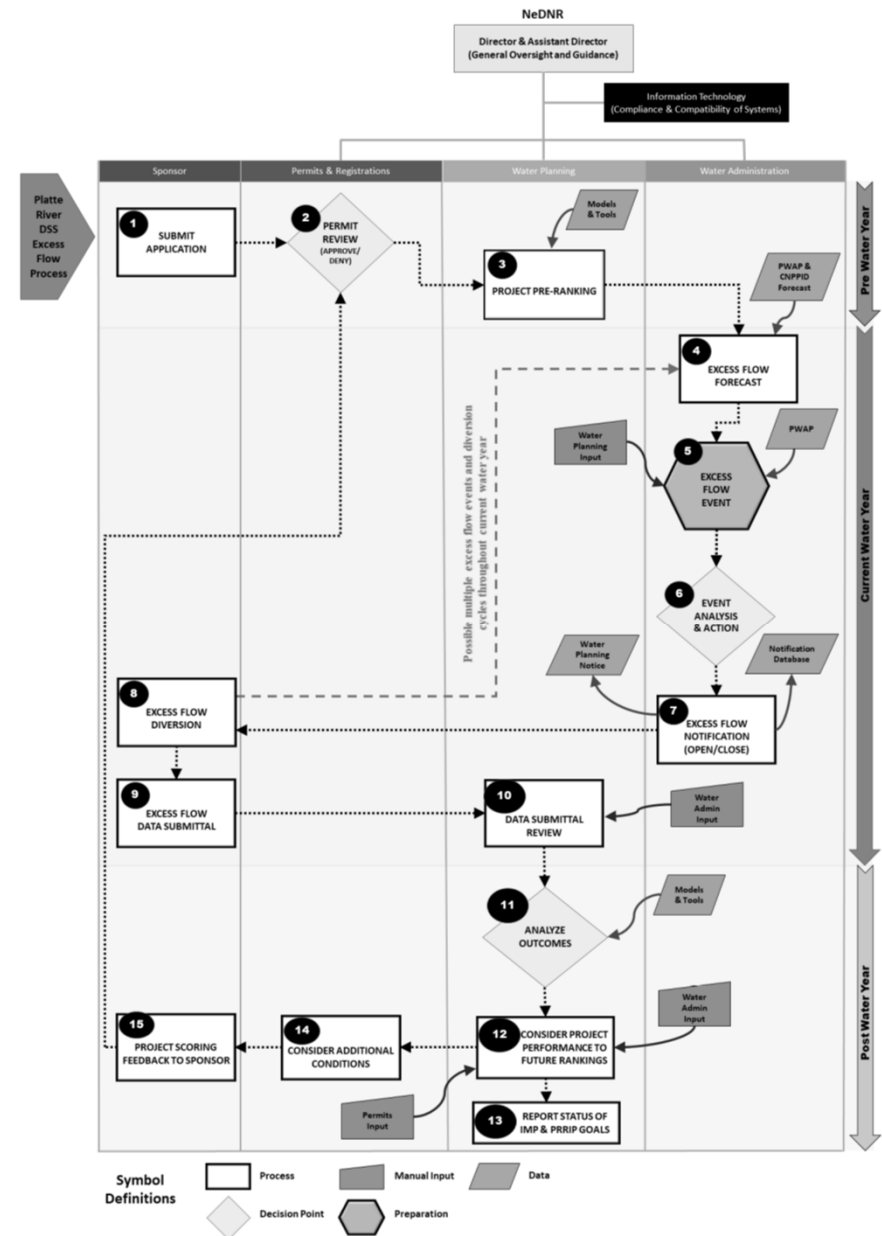
| Results                                 |          |       |                |       |          |               |                    |                      |                              |
|---|----------|-------|----------------|-------|----------|---------------|--------------------|----------------------|------------------------------|
| Section                                 | Township | Range | Crop           | Acres | CIR (in) | Recharge (in) | GW withdrawal (af) | Stream depletion (%) | Estimated net depletion (af) |
| Present Conditions                      |          |       |                |       |          |               |                    |                      |                              |
| 10                                      | 10       | 10    | Irrigated Corn | 100   | 14.66    | 5.52          | 76.17              | 8                    | 6.09                         |
| <b>Total</b>                            |          |       |                | 100   |          |               | 76.17              |                      | 6.09                         |
| Future Conditions                       |          |       |                |       |          |               |                    |                      |                              |
| 10                                      | 10       | 9     | Irrigated Corn | 100   | 16.12    | 4.67          | 95.42              | 7                    | 6.68                         |
| <b>Total</b>                            |          |       |                | 100   |          |               | 95.42              |                      | 6.68                         |
| <b>Net Impact to Stream (Acre-Feet)</b> |          |       |                |       |          |               |                    |                      | 0.59                         |

Print Results

# Platte River DSS

## Initial Phases

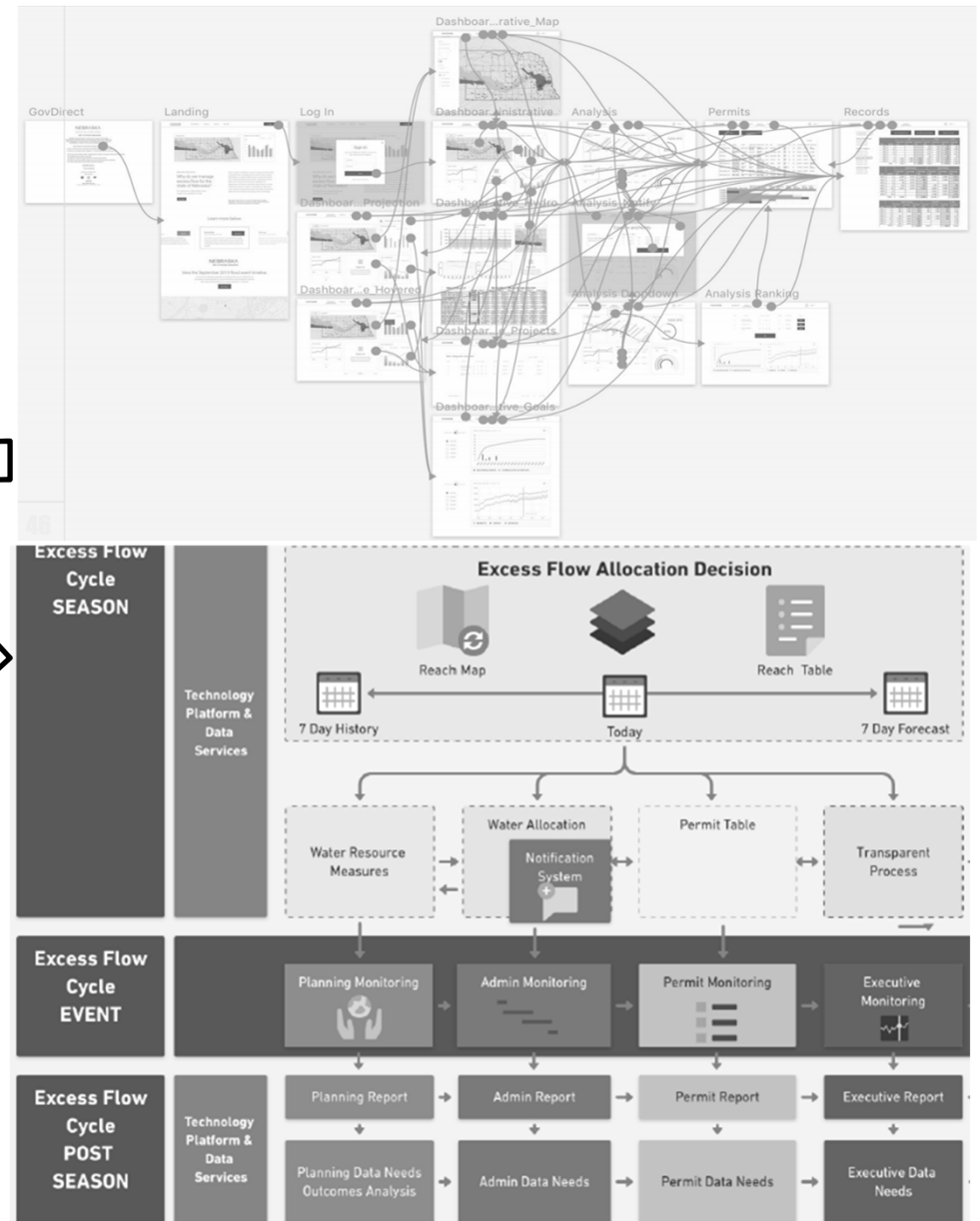
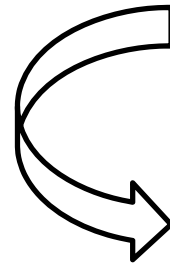
- Ensure “excess flows” are being most effectively used for IMP/PRRIP purposes
- Support timely administration of excess flow permits
- Connect water administration activities in the Upper Platte and Lower Platte
- Create transparent guidelines for excess flow rankings
- Improving tracking and reporting of benefits achieved through excess flow diversions



# Platte River DSS

## Initial Phases

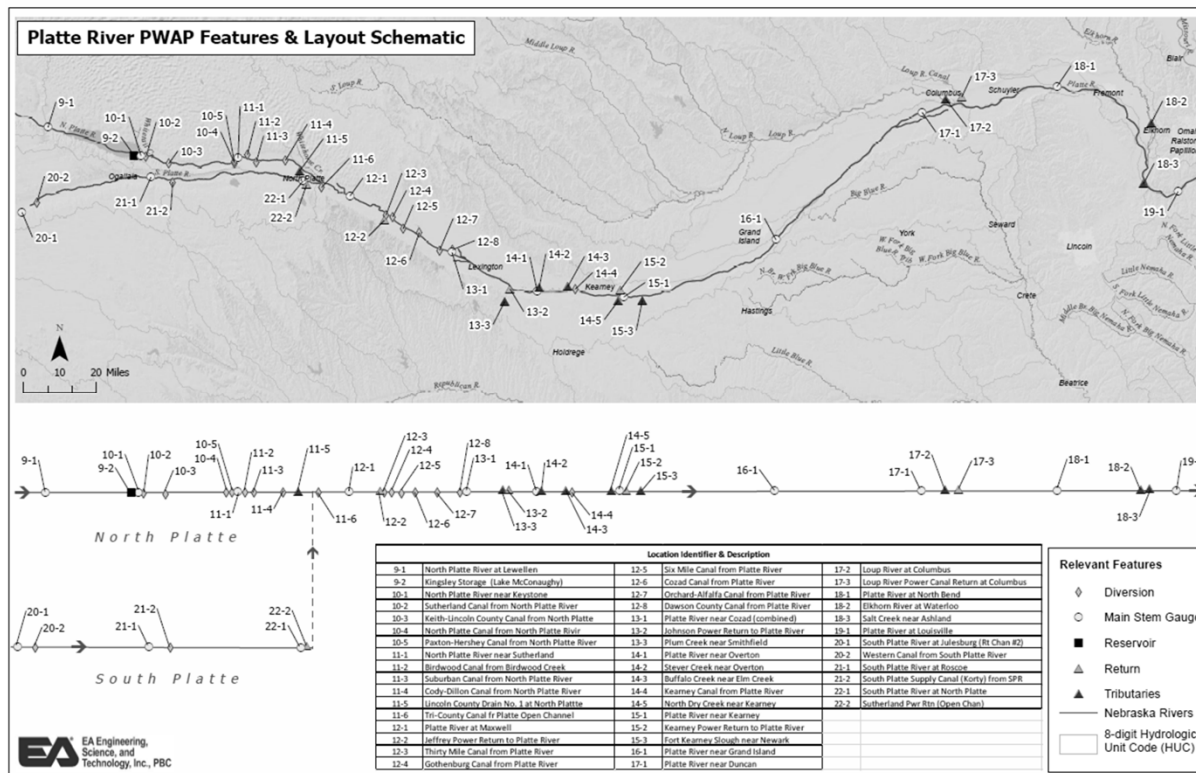
- Efficiently connect multiple data sources and platforms through one platform
- Leverage existing data and models (no new models are being developed)
- Put tools and data into the center of decision making





# Platte River DSS

## Initial Phases




- Goal is for initial phases to role out in late 2019
- Future phases will add additional features (reports, post-audit evaluations, model updates, etc.)
- Establish information and data management platform that can be expanded to other basins in the future

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## Summary

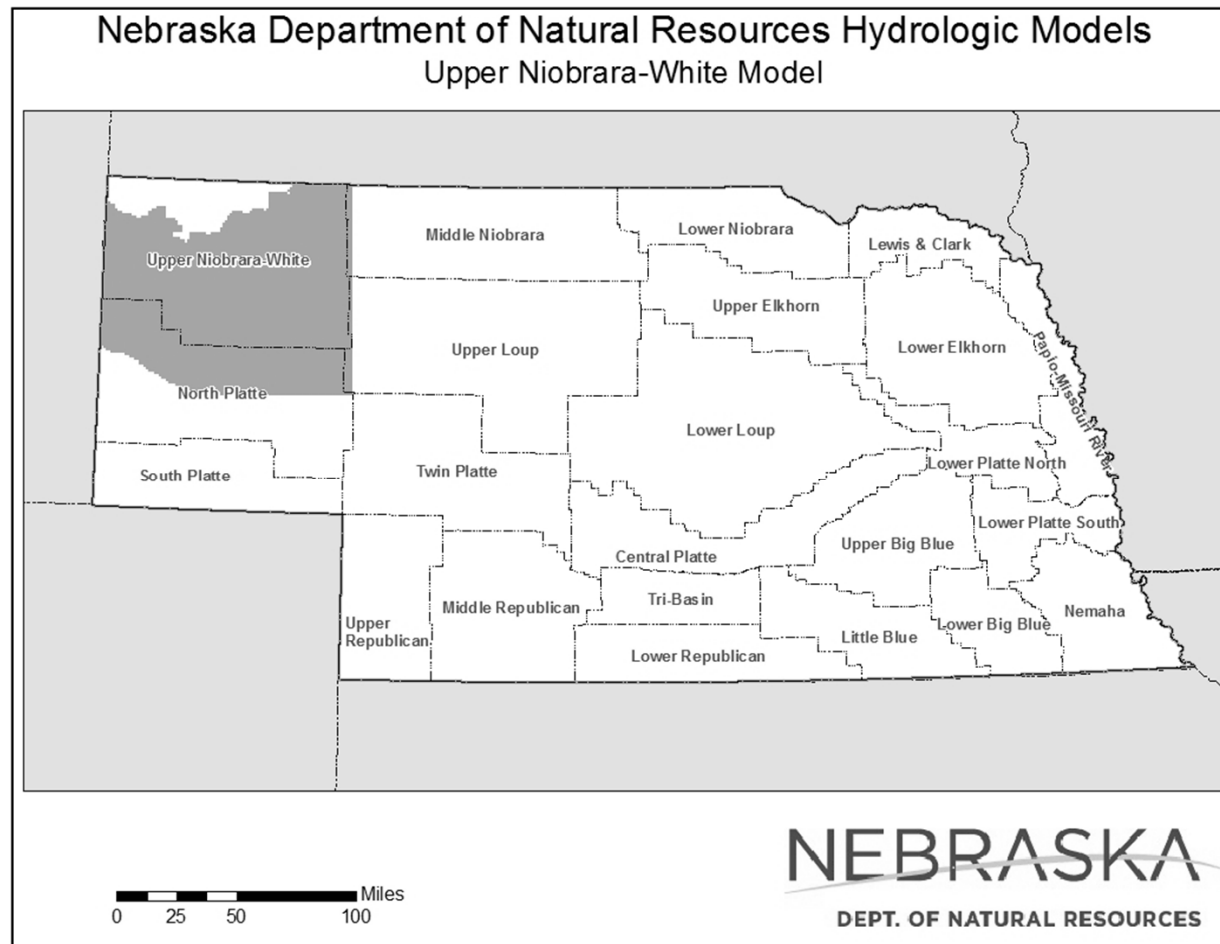
- NeDNR continues to invest significant resources in foundational tools to support IMP development and implementation
  - NRDs and other stakeholders are important partners to these efforts
  - Feedback from use of these tools is encouraged and helps guide future efforts
  - NeDNR is happy to support workshops, presentations, one-on-ones to make these tools more accessible
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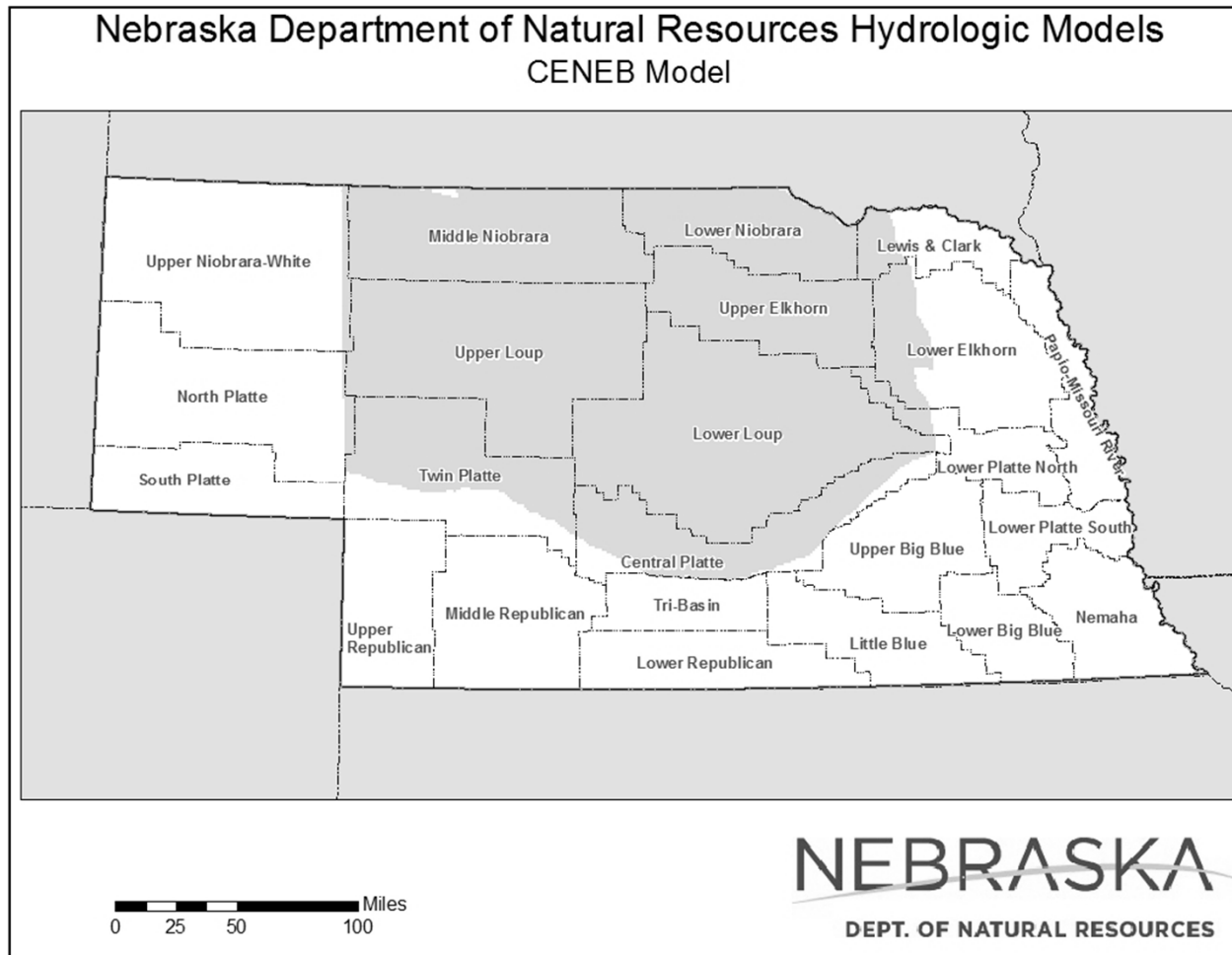
**301 Centennial Mall South, 4<sup>th</sup> Floor  
PO Box 94676  
Lincoln, NE 68509-4676  
402-471-2363**

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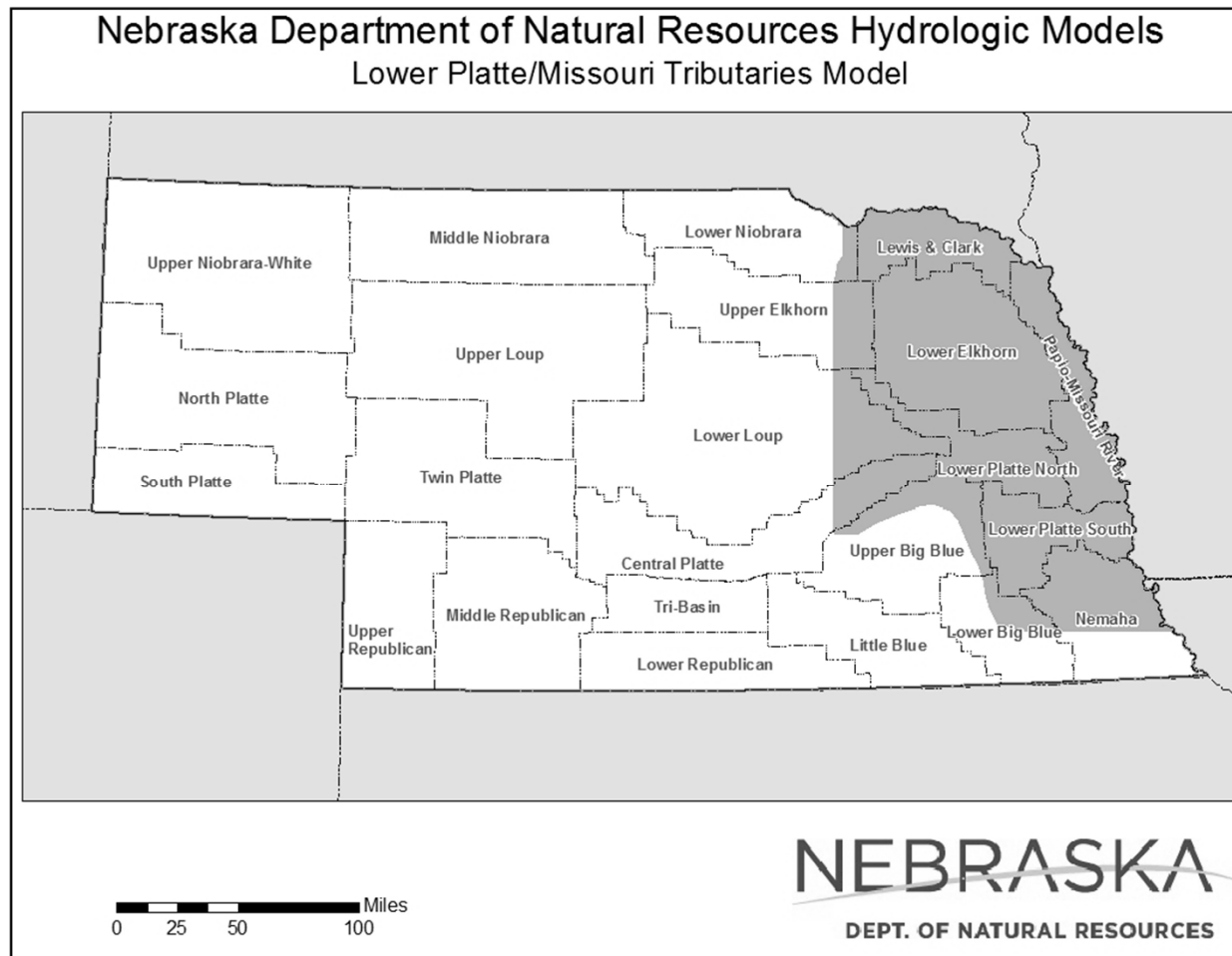
# Upper Niobrara-White Model



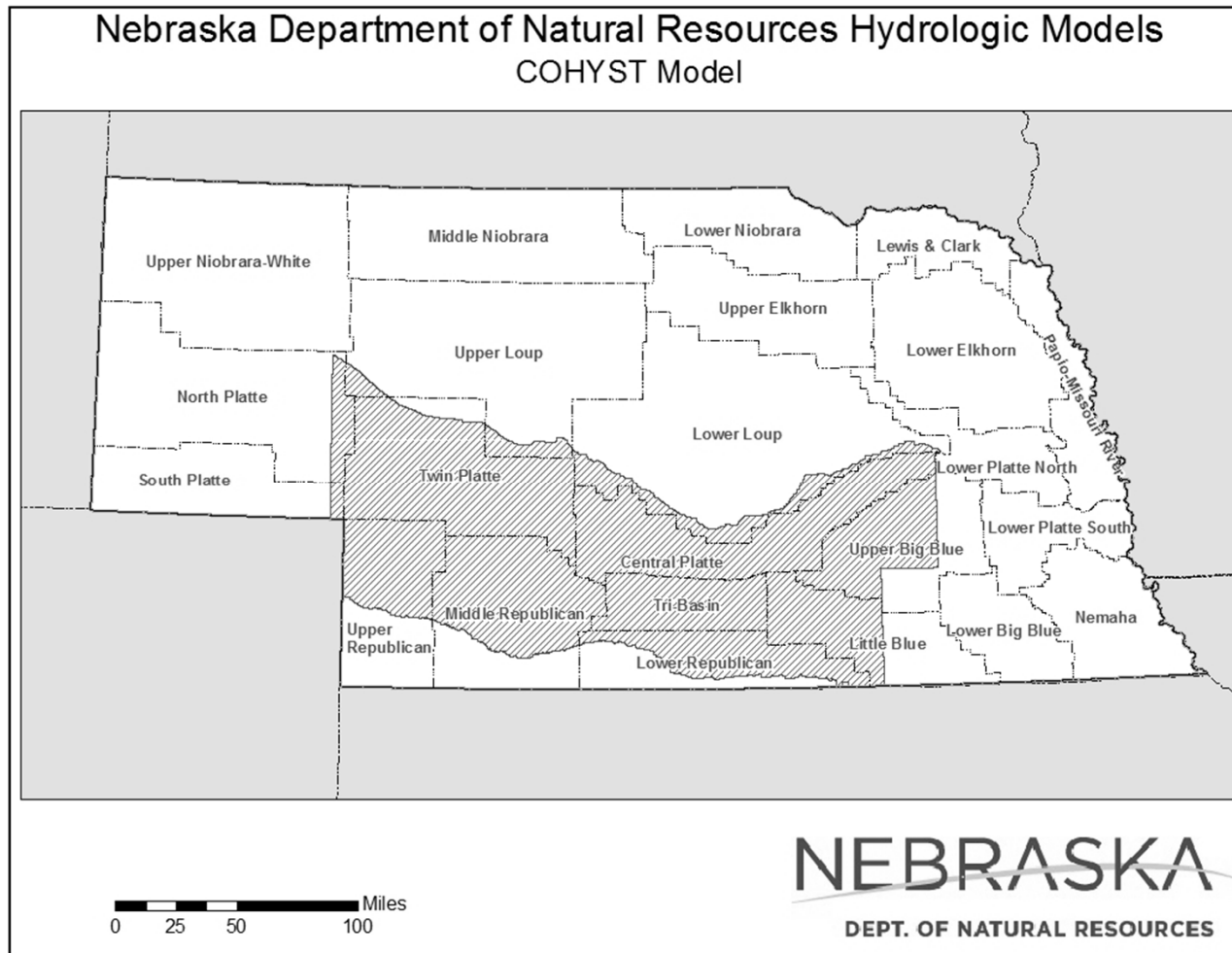
# Central Nebraska (CENEB) Model



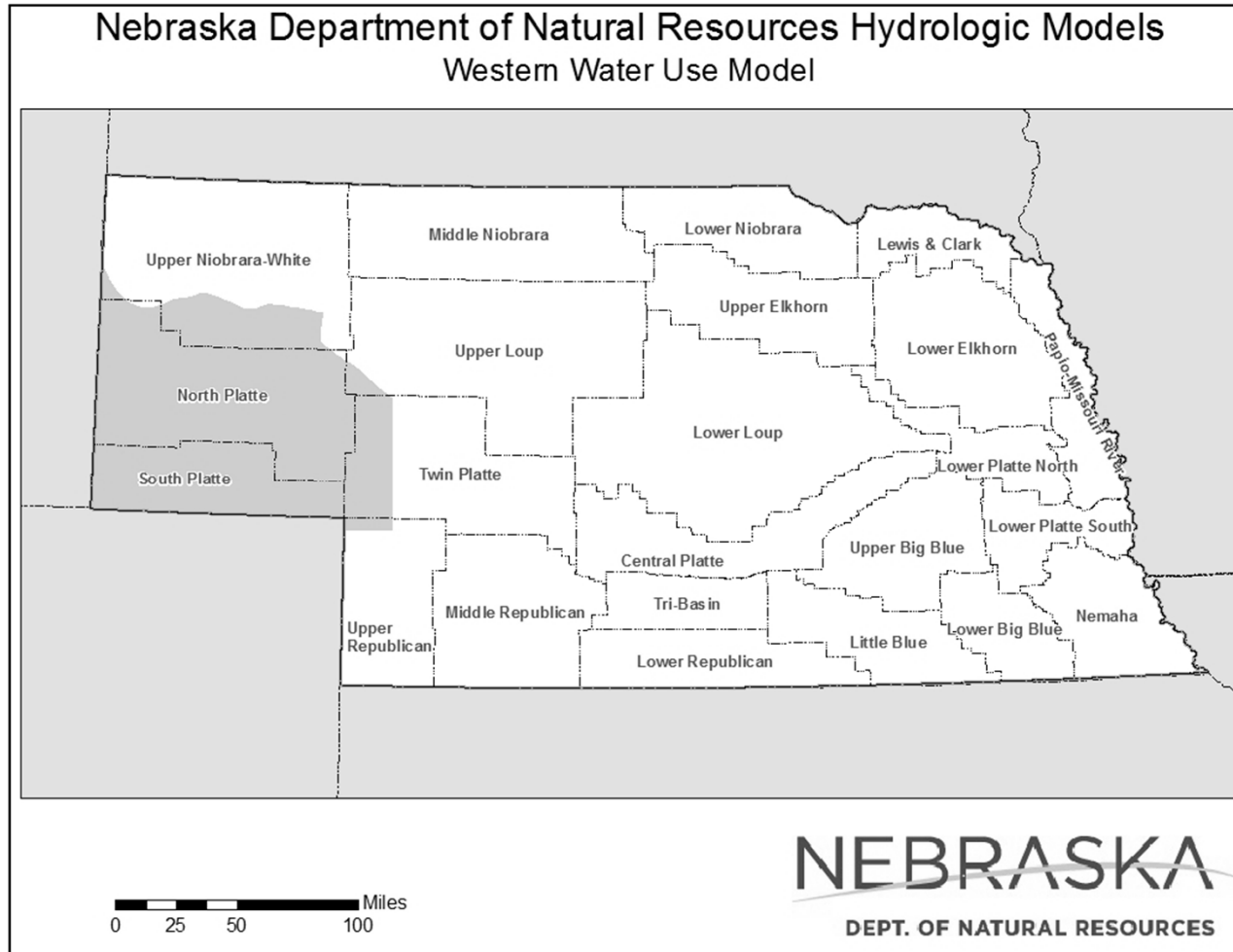
# Lower Platte-Missouri Tributaries (LPMT) Model (recently completed)



# Cooperative Hydrology Study (COHYST) Model



# Western Water Use Model (WWUM)





# Republican River Compact Administration (RRCA) Model

