Technical Programs Update

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

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

**Groundwater Model**
- Baseflow
- Canal Diversion
- Canal Loss
- Canal Spill
- Recharge
- Pumping
- Runoff

**Surface Water Operations Model**
- Irrigation Demand
- Runoff

**Watershed Model**
- Available Irrigation Water
Models in Development
Carrie Wiese
Niobrara Model

Nebraska Department of Natural Resources Hydrologic Models
Niobrara Model

[Map showing the Niobrara Model area within Nebraska]
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
Blue River Basin Model
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.
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)
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
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
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)
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.
CIR Calculator

- Structured for individual NRD accounts with log-in
CIR Calculator

- Determine current use and transferred use location/crop type
CIR Calculator

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

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<th>Results</th>
<th>Section</th>
<th>Township</th>
<th>Range</th>
<th>Crop</th>
<th>Acres</th>
<th>CIR (in)</th>
<th>Recharge (in)</th>
<th>GW withdrawal (af)</th>
<th>Stream depletion (%)</th>
<th>Estimated net depletion (af)</th>
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</table>

Net Impact to Stream (Acre-Feet) | 0.59
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 roll 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
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
301 Centennial Mall South, 4th Floor
PO Box 94676
Lincoln, NE 68509-4676
402-471-2363
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

Nebraska Department of Natural Resources Hydrologic Models
Republican Basin Model

[Map of Nebraska showing various river basins and regions, including Upper Niobrara, Middle Niobrara, Lower Niobrara, Lewis & Clark, Upper Elkhorn, Lower Elkhorn, Upper Loup, Lower Loup, Twin Platte, Central Platte, Tri Basin, Upper Republican, Middle Republican, Upper Republican, Lower Republican, and Little Blue.]