# Modeling Training for members of the Nebraska Natural Resource Districts

The training would consist of two parts:

1. Basic modeling overview for those unfamiliar with MODFLOW and GW modeling
2. A more in-depth modeling instruction for those who would like to make small changes to a groundwater model.

## Part 1: Basic Modeling Overview

The objective of this half-day seminar is to provide a basic understanding of groundwater modeling and of Standards and Guidelines of modeling and model reporting. The intended audiences for this seminar are hydrogeologists, managers, stakeholders and decision makers who interact with groundwater flow and / or transport modeling products but may not be directly conducting the modeling studies.

The seminar will include presentations of the contents described below. The format of the seminar will be informal to allow participants to ask questions during the presentation. The presenters will use their discretion in answering the questions (right away, at the end of the seminar session, or as follow-ups at a later date via emails) to keep the seminar on schedule.

Duration: 4 hours

Contents: The seminar will cover:

* Introduction
* Hydrogeology basics
* Groundwater flow modeling
  + What is a Numerical Groundwater Flow Model
  + How does the Modeling Code Work
  + Modeling Approach
  + Model Development
  + Conceptual Model Elements for Flow
  + Calibration
  + Model Applications
  + Sensitivity / Uncertainty Evaluations
  + Particle Tracking
  + Flow Model Applications
* Groundwater transport modeling
  + Introduction
  + Transport Modeling Challenges
  + Transport Modeling Codes
  + Transport Model Parameterization
  + Emerging contaminants
  + Transport Model Applications
* Other model types
  + Density dependent flow and transport models
  + Unsaturated zone flow and transport models
  + NAPL modeling
* Model reporting and deliverables
* Example Modeling Study – Lower Rio Grande Chloride study
* Concluding thoughts
  + Standards and Guidelines
  + Perception and Current Trends in Groundwater Modeling
  + Future of Groundwater Modeling

## Part 2: More In-depth Modeling Instruction

The objective of this 3-day workshop is to provide a basic capability for manipulating a groundwater model and reviewing the results. The intended audiences for this workshop are hydrogeologists and groundwater modelers at all levels of expertise who want to review models and make small changes and run / process results to evaluate impact of changes.

The workshop will include presentations, discussions and hands-on exercises on the topics described below. The format of the workshop will be informal to allow participants to ask questions during the presentations and hands-on exercises. The presenters will use their discretion in answering the questions (right away, at the end of the day, or as follow-ups at a later date via emails) to keep the workshop on schedule.

Duration: 3 days

Contents: The seminar will cover:

* Introduction
* Understanding numerical groundwater flow model to be manipulated / reviewed
  + Review model report and structure of datafiles
  + Deconstructing conceptual model from numerical model
* Understand capabilities of the software modules in the numerical model
  + MF6 raw files, pre- and post-processors
  + Input and output datasets and formats
  + Software modules that were not used but may be applied during changes
* Approaches to model review, making small changes, and analyzing results
  + Model raw datasets and output listing file
  + Model calibration review
  + GUIs to view / manipulate model and extract results from binary files
  + FloPy to view / manipulate model and extract results from binary files
* Other models
  + Particle tracking
  + Solute transport
  + Unsaturated zone (Hydrus; MF-USG)