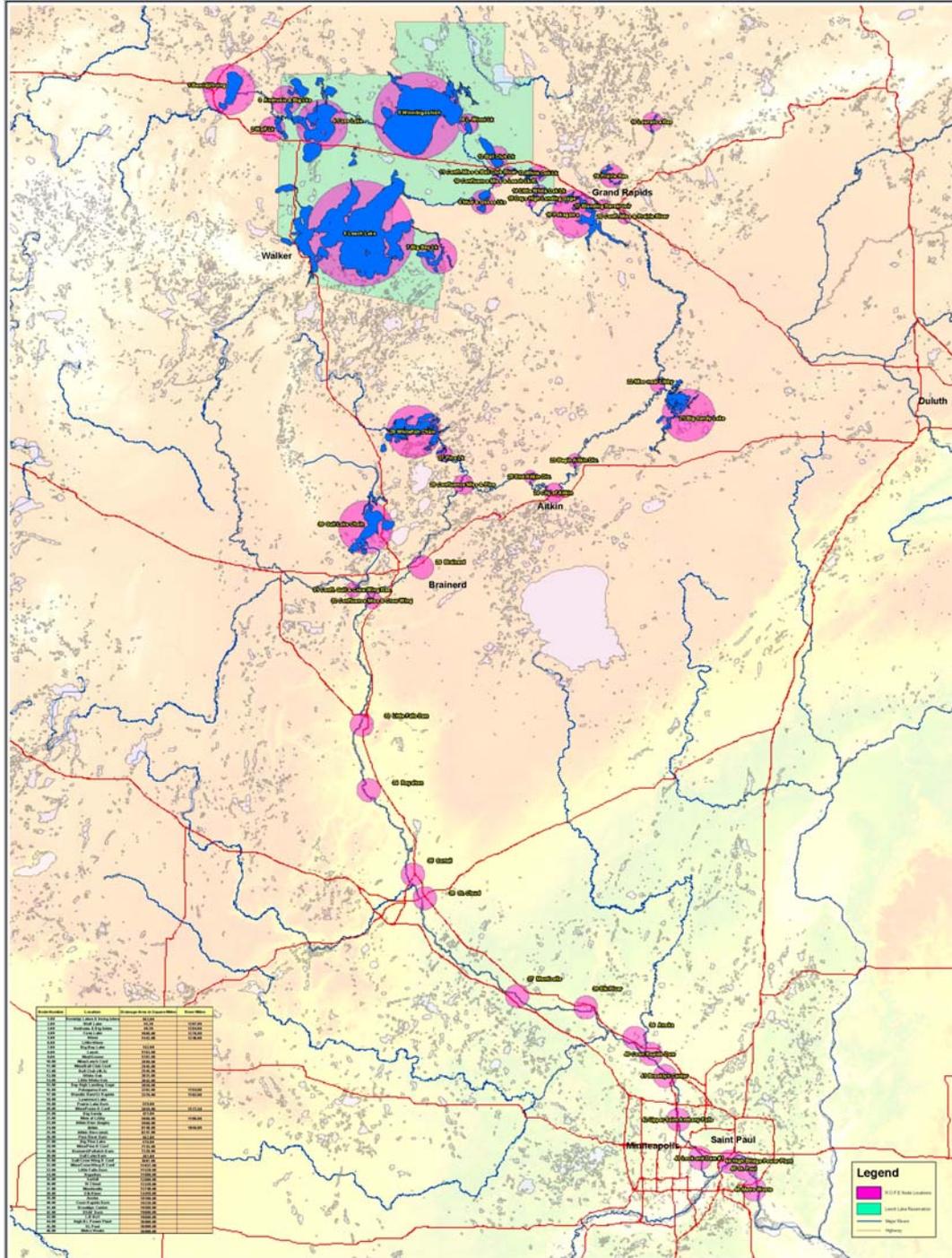


# COMPUTER MODELING OF HEADWATER OPERATIONS

## OVERVIEW

This ROPE study will use two powerful computer models to assist in evaluating the complex relationships and tradeoffs associated with a wide variety of alternative systemwide operating plans. The two models will be run iteratively and are already being populated and debugged and should be fully functional models in the summer of 2005. The first model is a simulation STELLA model (Note: this simulation model makes decisions that follow operating rules specified by the user) and the second model is an optimization model known as the Prescriptive Reservoir Model (Note: A optimization model makes decisions to maximize the benefit achieved by various objectives described by the user).



## Tasks of Simulation Model

The purpose of a simulation model is to answer "what if" questions

- ☒ The model "operates" the water system for a historical period with some set of operating rules
- ☒ Rules can be added, changed or removed in response to "what if" questions, and the model shows how the system of reservoirs would have operated with those changes
- ☒ Many "what if" questions can be asked and answered to explore ideas and suggestions

## Tasks of Optimization Model

☒ There are 2 main tasks of optimization in a multi-objective study

- ☒ The first task is to evaluate and quantify the tradeoffs between various objectives
  - ☒ ie, how much does the cost of one objective increase if the benefit to another objective is increased?
- ☒ The second task is to seek operations (and operating rules) that achieve a reasonable balance between those objectives
  - ☒ simulation aids this optimization task

## Use of Optimization and Simulation Models

- ☒ Optimization and Simulation models play a complimentary role in developing operating rules.
- ☒ Optimization models make decisions based on the benefit achieved for system objectives over time, but those decisions are difficult to make in real-time.
- ☒ Operating rules that approach those optimal operations can be developed for use in real-time.
- ☒ Simulation models help to demonstrate the outcome of proposed rules, and allow small adjustments to target the outcome achieved by the optimization.

## The Bottom Line – Symbiosis and Synergy

- ☒ The simulation provides a test of operating rules inferred from "optimal" operation
- ☒ The optimization provides a target to aim for with the simulation
- ☒ The optimization also quantifies the expense of one objective as a cost to other objectives (ie, a trade-off), which is then demonstrated with the simulation
- ☒ So -- Together the models help each

