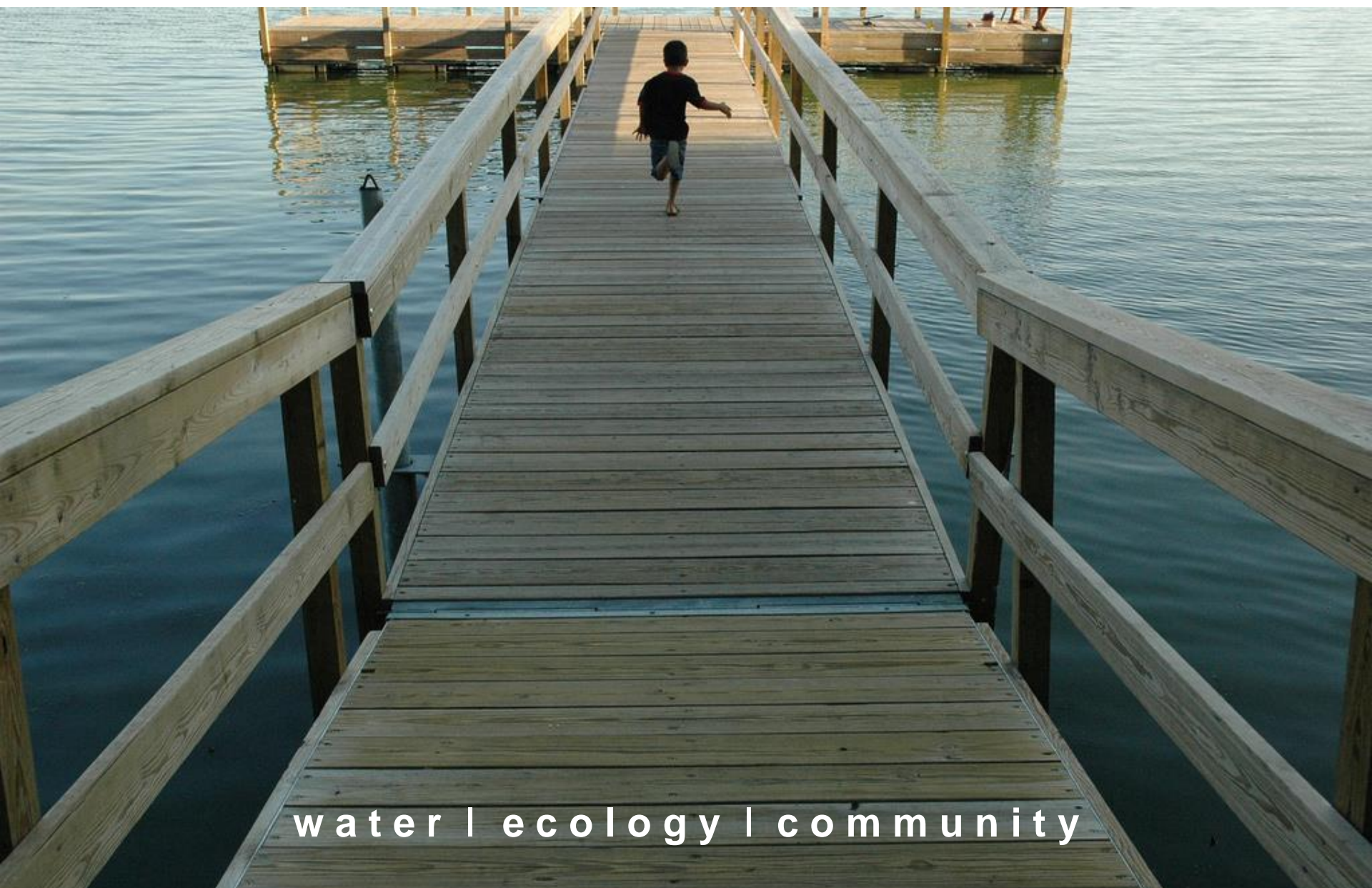
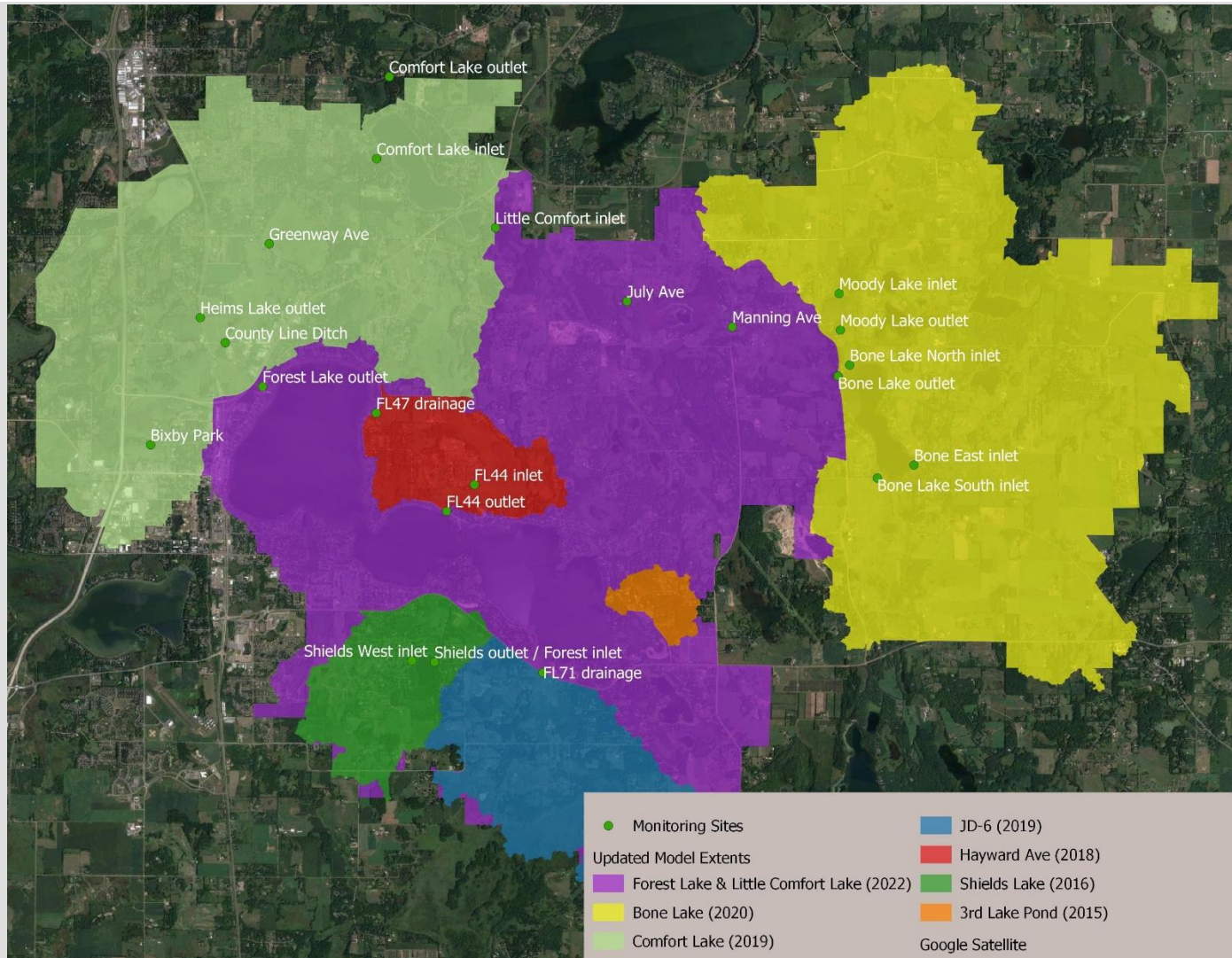


Emmons & Olivier Resources, Inc.



water | ecology | community

H&H Model Update - 2022



Forest Lake & Little Comfort Lake H&H Update

memo



Project Name | Forest Lake & Little Comfort Lake H/H Update **Date** | 11/18/2022
To / Contact info | CLFLWD Board of Managers
Cc / Contact info |
From / Contact info | Paul Naton, EIT; Mike Talbot, EIT; Cecilio Olivier, PE
Regarding | Forest Lake & Little Comfort Lake Management District H/H Model Update Documentation

1. INTRODUCTION

The purpose of this memorandum is to outline the modeling procedures used for the development of the Forest Lake & Little Comfort Lake Hydrologic/Hydraulic (H/H) Model Update. This model update pertains to the sub-watershed draining to Little Comfort Lake upstream of Itasca Avenue and the sub-watershed draining to Forest Lake.

These modeling procedures described herein are consistent with those used in other modeling updates within the Comfort Lake-Forest Lake Watershed District (CLFLWD). Modeling was completed using PCSWMM, a proprietary platform for constructing and running the U.S. Environmental Protection Agency (EPA)'s Surface Water Management Model (SWMM).

2. KEY DATASETS

2.1. Digital Elevation Model (DEM)

County-wide DEMs, available from [MnTOPO](#), were used. The MnTOPO data for Washington and Chisago counties was collected in November 2011 and is 1-meter resolution. As these datasets will be updated in the future to reflect changes in the land surface, future models should always use the most up-to-date version of these datasets.

2.2. Soils

Soils data was obtained from the 2020 Gridded Soil Survey Geographic (gSSURGO) database developed by the Natural Resources Conservation Service (NRCS). The gSSURGO dataset provides 10-meter resolution polygons and was used to determine the soil parameters necessary to simulate the area's hydrology using the Green-Ampt method.

2.3. Land Cover

Two datasets are available for land cover:

- The National Land Cover Dataset (NLCD) is a 30-meter resolution national dataset developed by the U.S. Geological Survey (USGS). The NLCD dataset was updated in 2019 and includes both land cover classifications and percent of impervious surfaces.
- The University of Minnesota (UMN) has also developed a 1-meter land cover dataset for the Twin Cities Metropolitan Area, Duluth, and Rochester. The UMN dataset was developed using aerial

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- **Digital Elevation Model (DEM)**
 - 1-m, 2011
 - Updated Lidar expected soon
- **Soils**
 - 10-m, 2020
- **Land Cover**
 - NLCD (30-m, 2019)
 - UMN (1-m, 2009-2015)



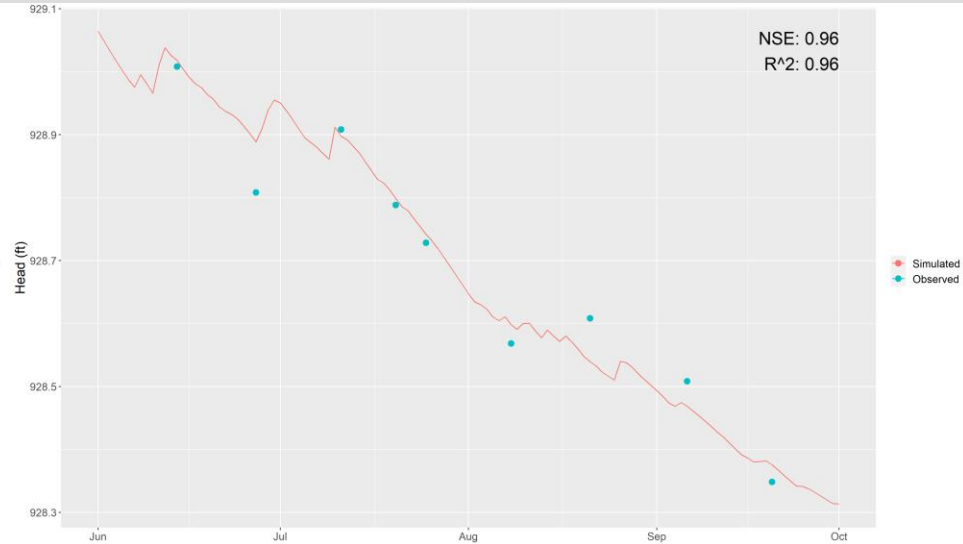
- **Stormwater Infrastructure**
 - Forest Lake Survey Data
 - EOR Survey Data
 - Development Plan Sets

Nielsen Lake

Calibration

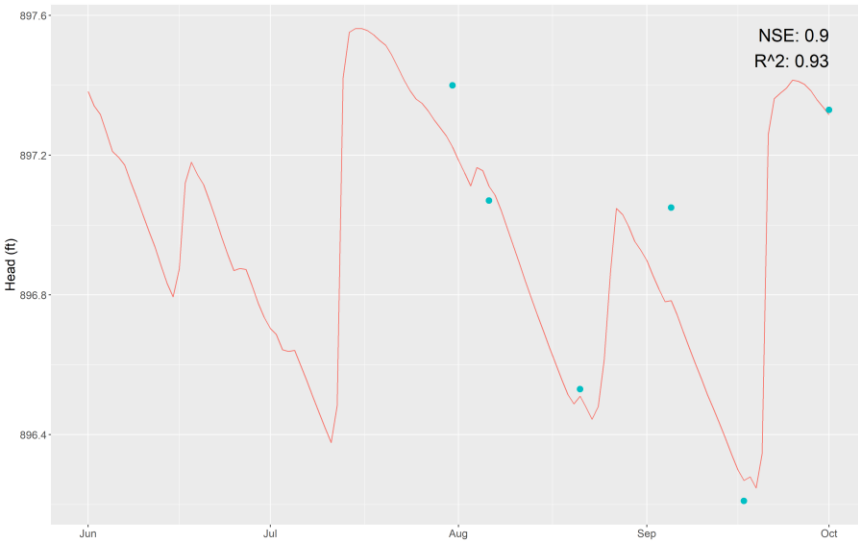


Validation

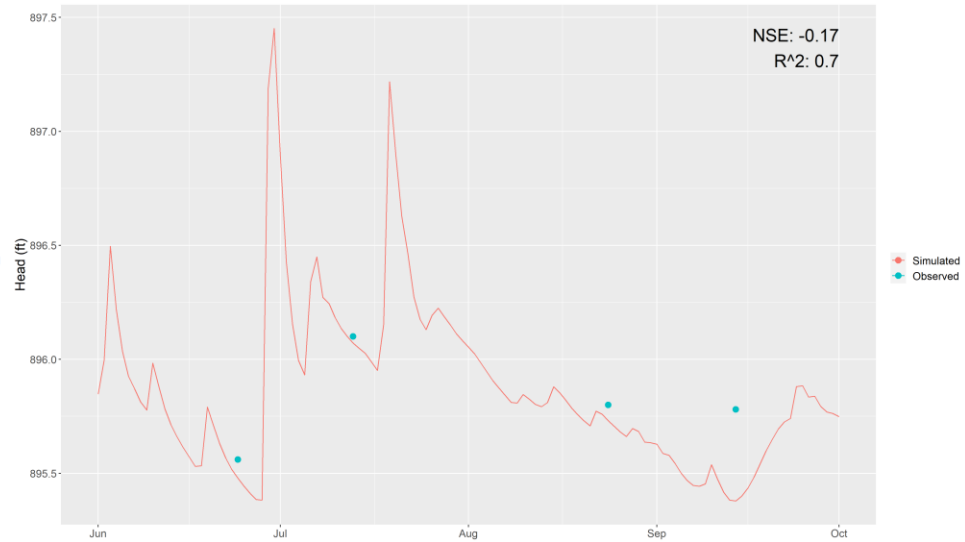


Birch Lake

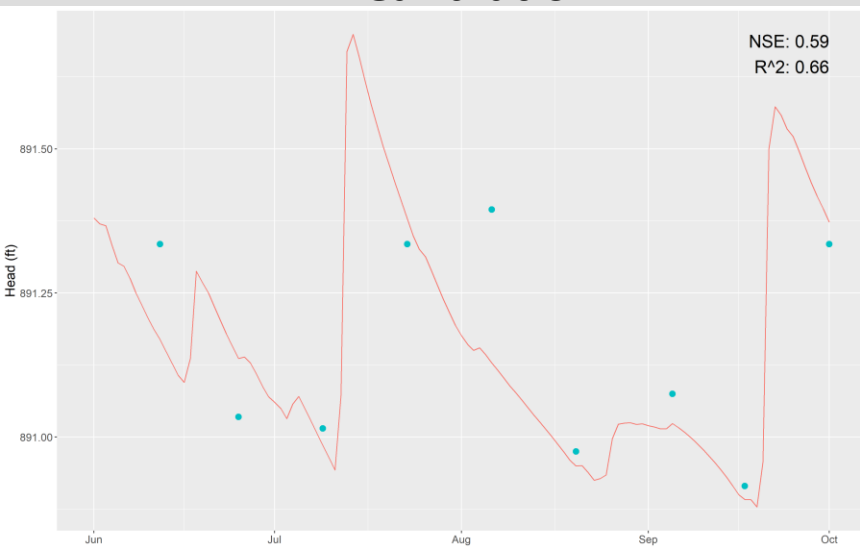
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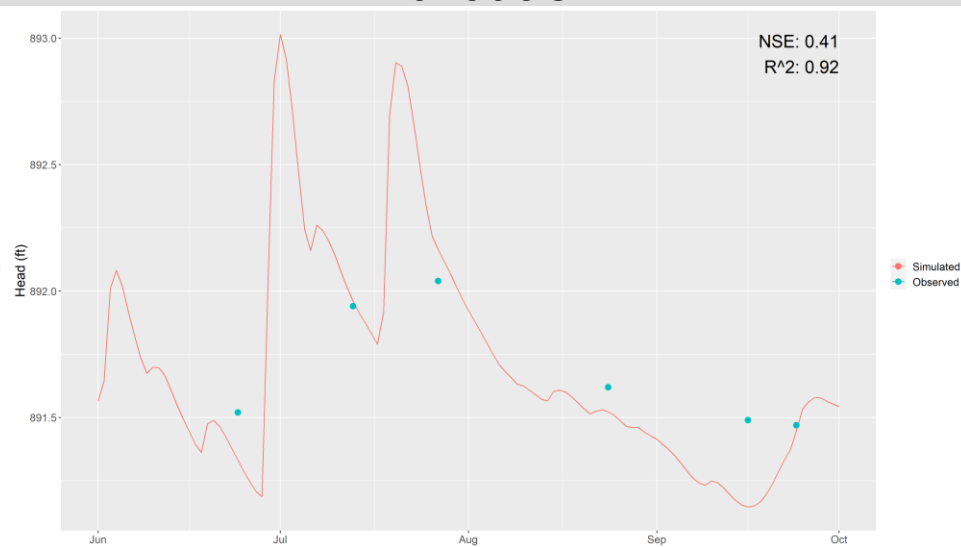
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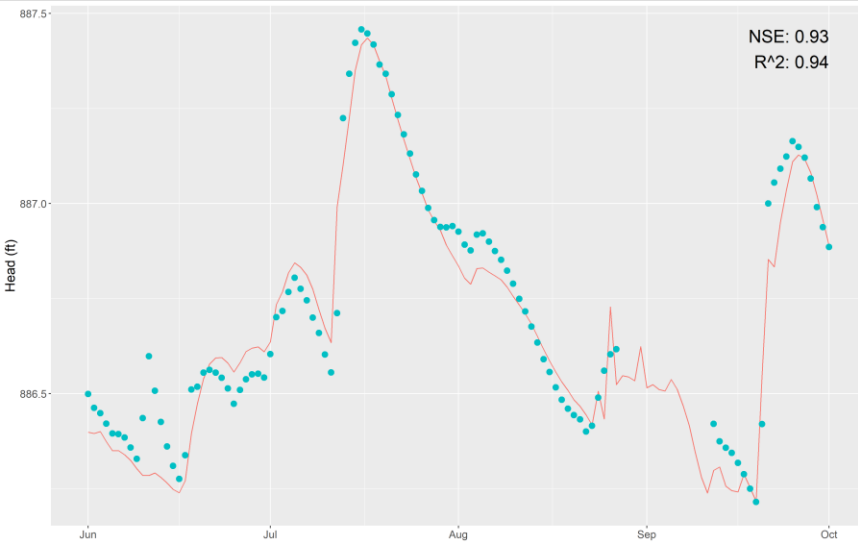
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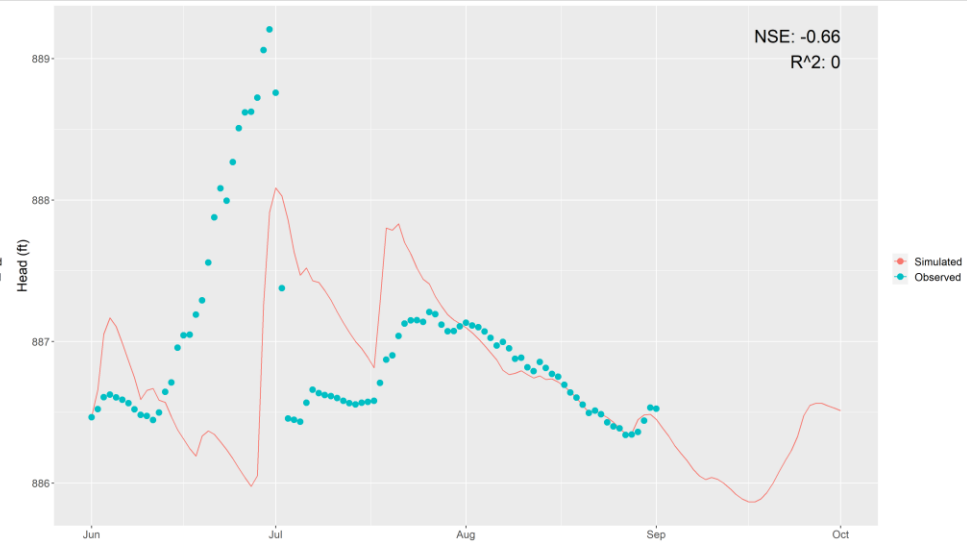
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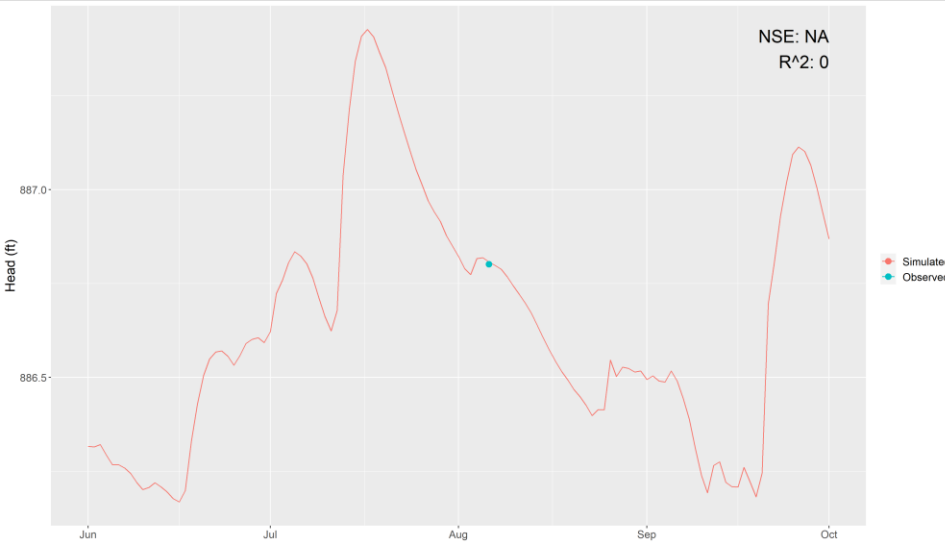
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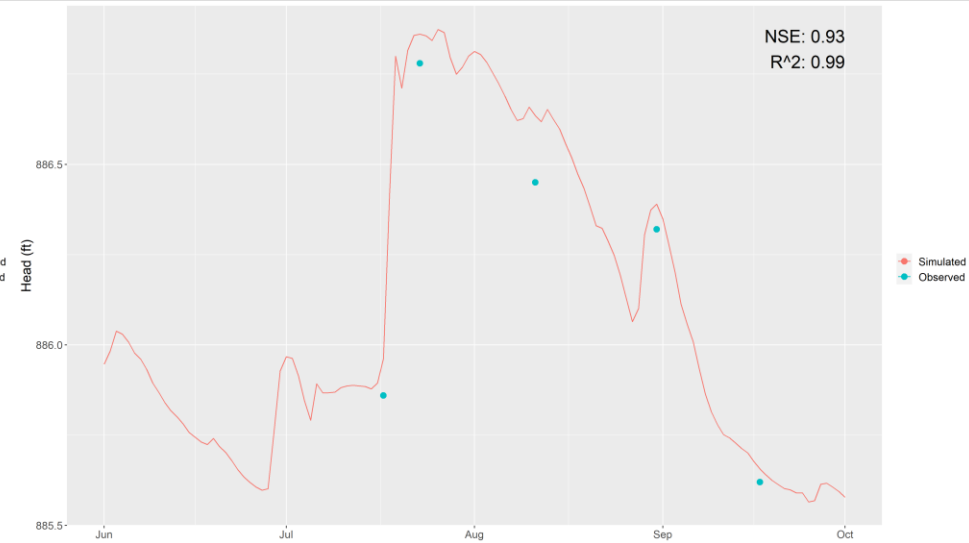
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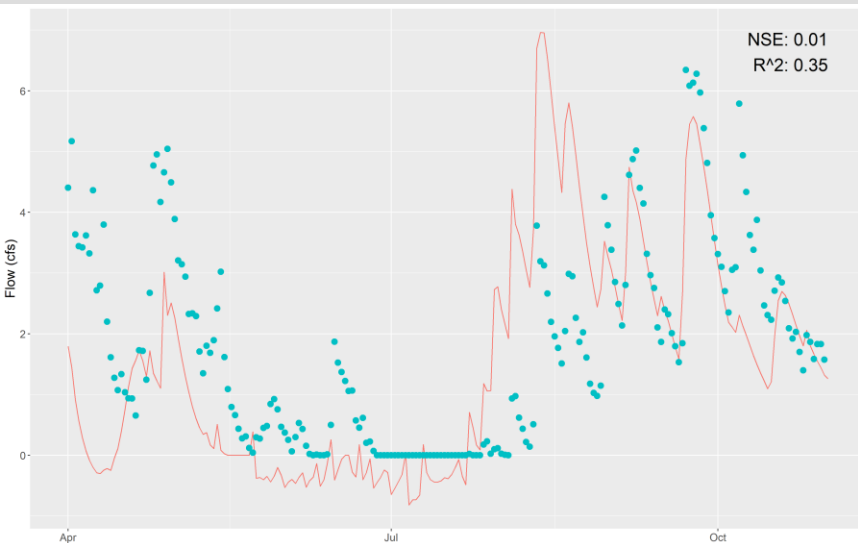
Comfort Lake - Calibration



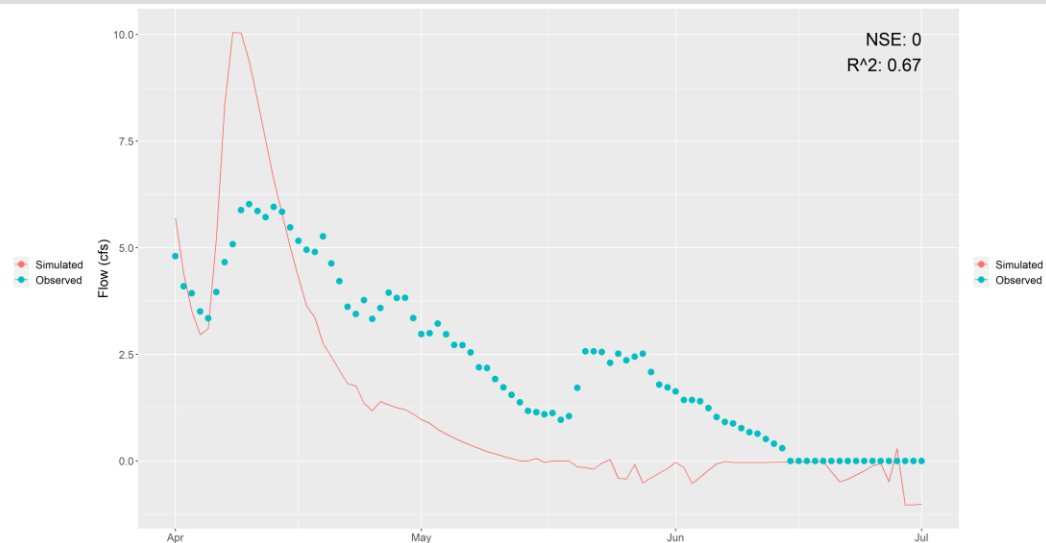
Little Comfort Lake - Validation



Calibration

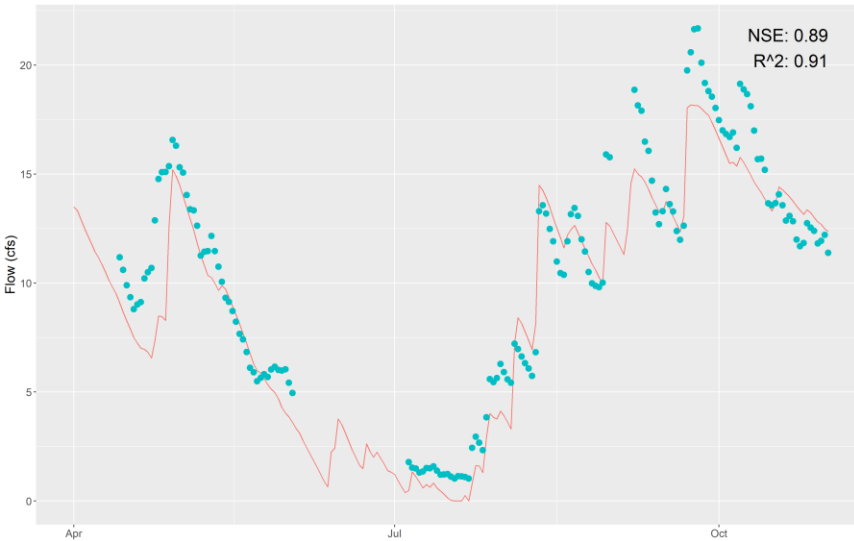


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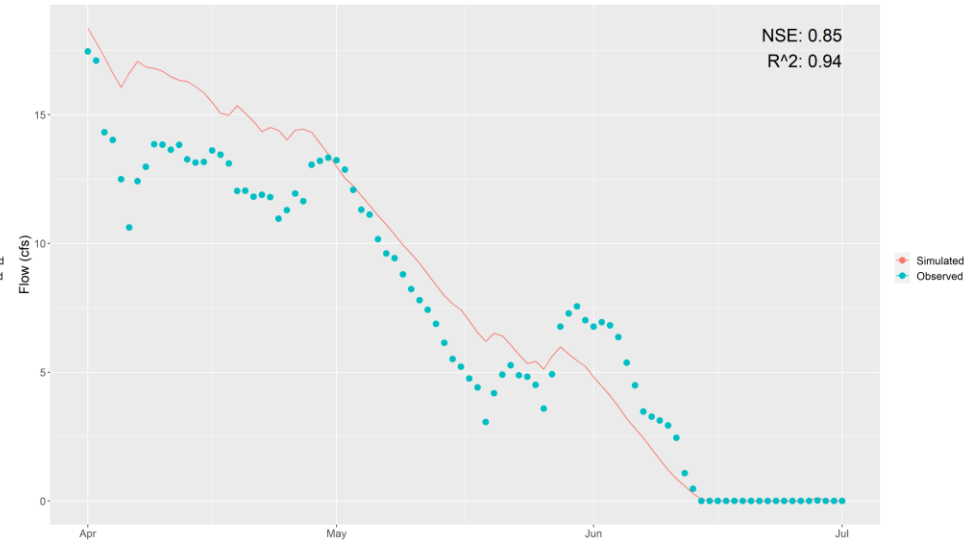


FL1 (Forest Lake Outlet)

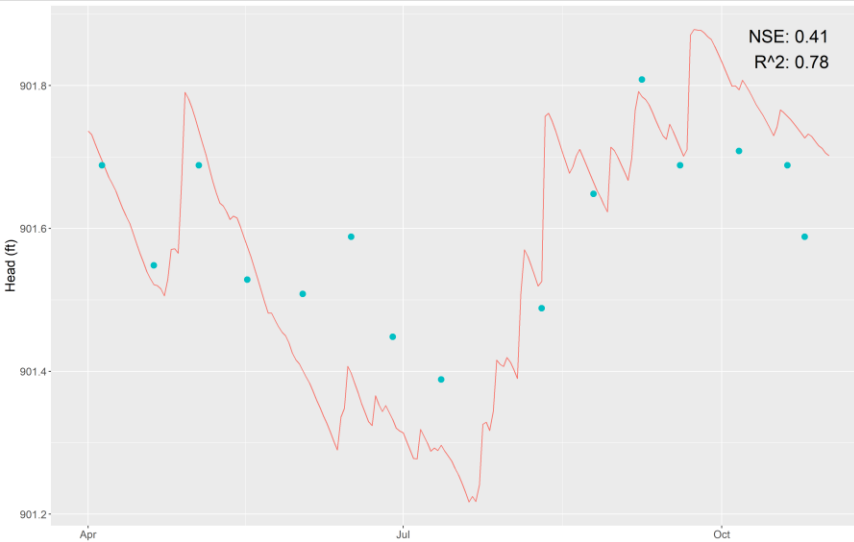
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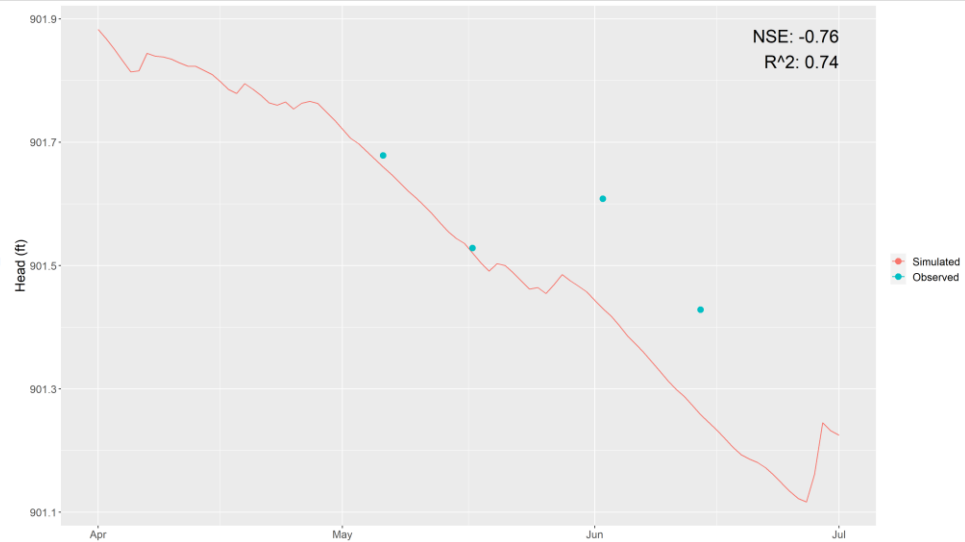
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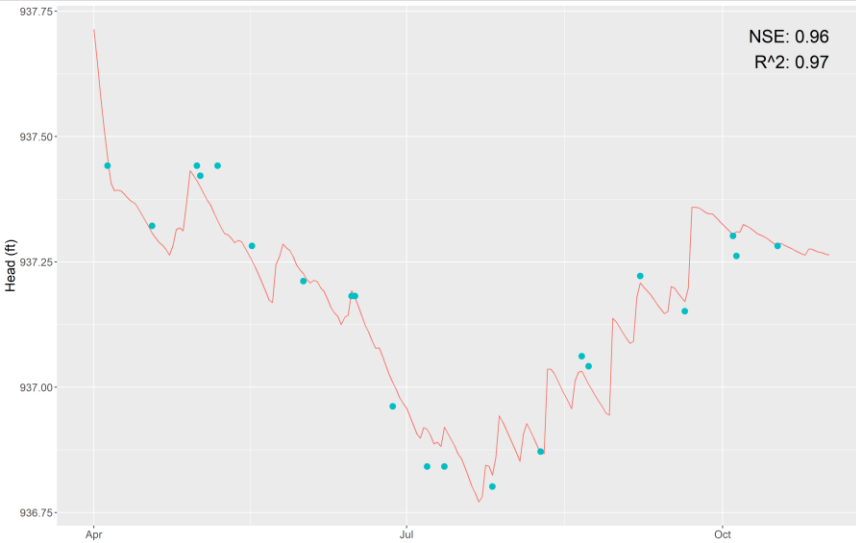


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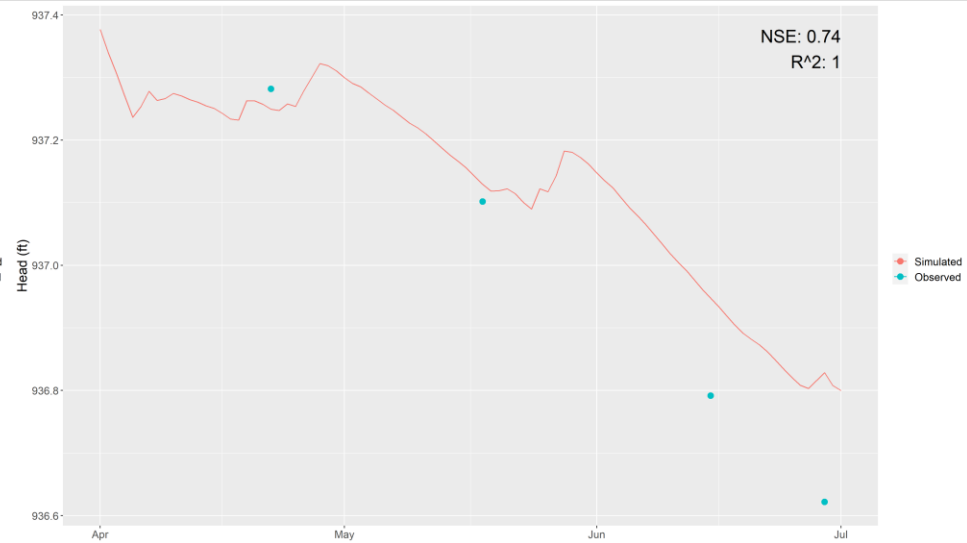


Lake Keewahtin

Calibration



Validation



- All watershed models are complete and ready to be used for future work (feasibility, design, permitting, etc.)
 - More detail may be necessary on a site-specific basis (e.g., include culverts < 24" diameter)
- Radar rainfall greatly improves ability to calibrate large-scale models
- Channel obstructions (beaver dams, culvert blockage) have large impact on Birch and School Lake water levels
- Wetlands throughout watershed limit flow to major lakes for most storm events in a given year
- Monitoring is important for future model refinement

Thank you!

