

Figure 1 – Double-mass plots of precipitation at White Bear Lake from three gridded data sets (Daymet, HIDDEN, and PRISM) versus the Minnesota Climate Division 6 average. Straight lines through the plots are shown for reference.

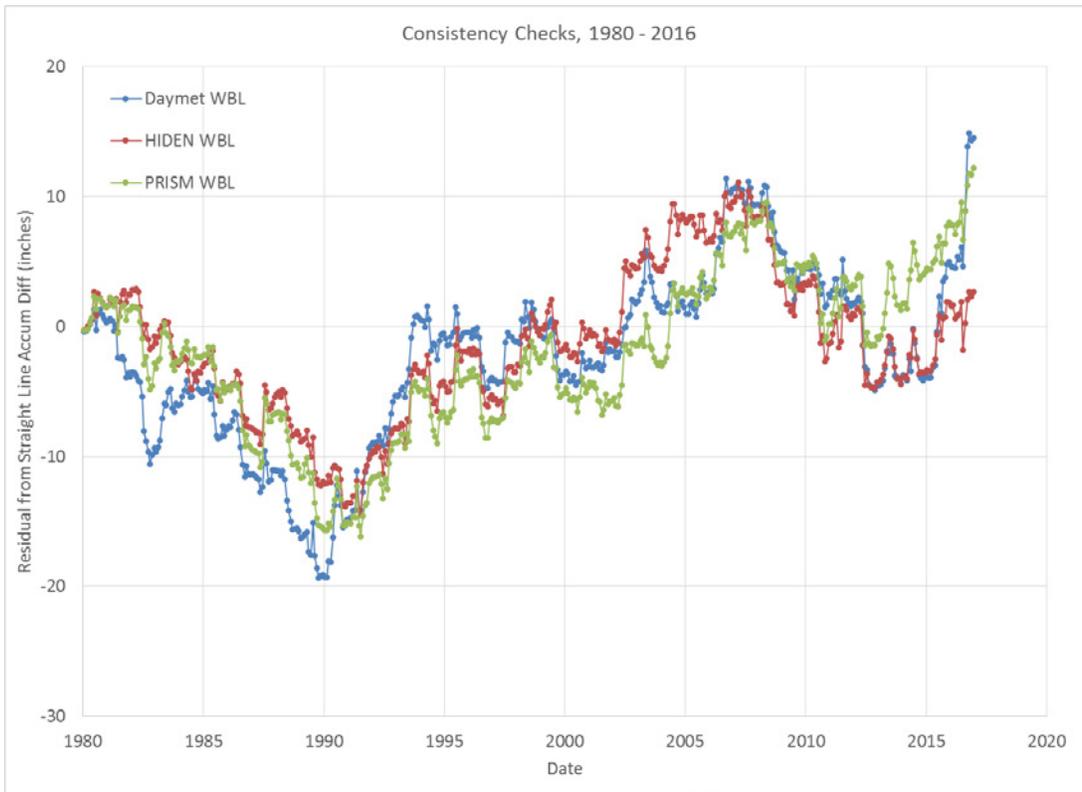


Figure 2 – Deviations of double mass plots from the straight lines shown in Figure 1.

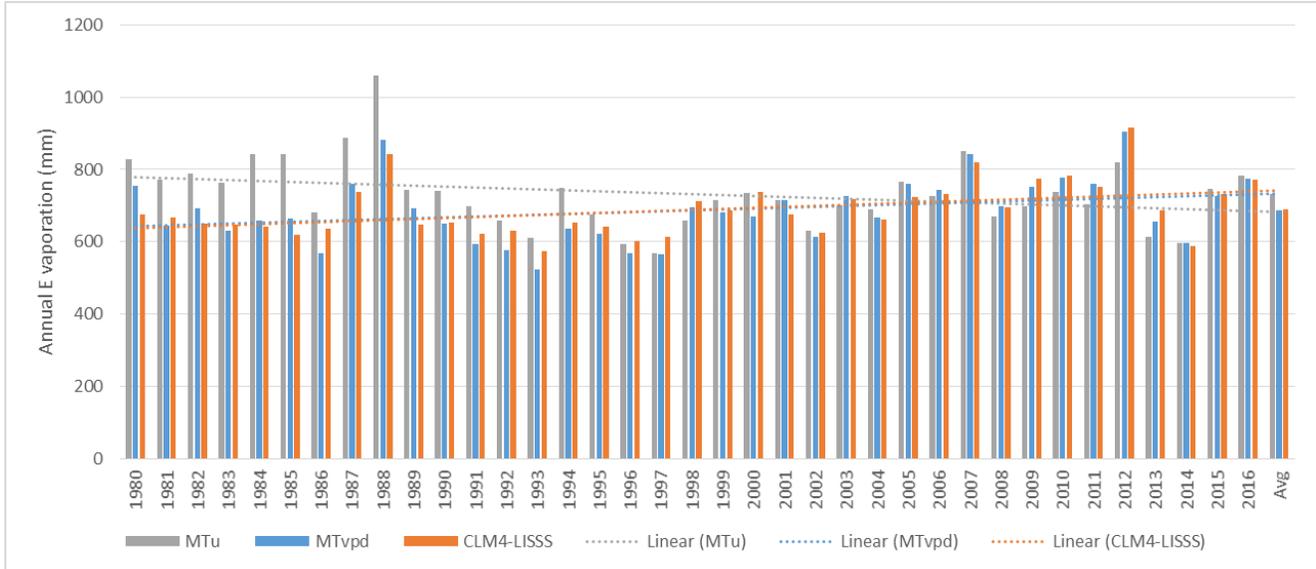


Figure 3 – Annual evaporation estimates for White Bear Lake calculated using two mass-transfer equations (MTu and MTvpd) and a physically based model (CLM4-LISSS), all with parameters fitted to EC observations in 2014-16.

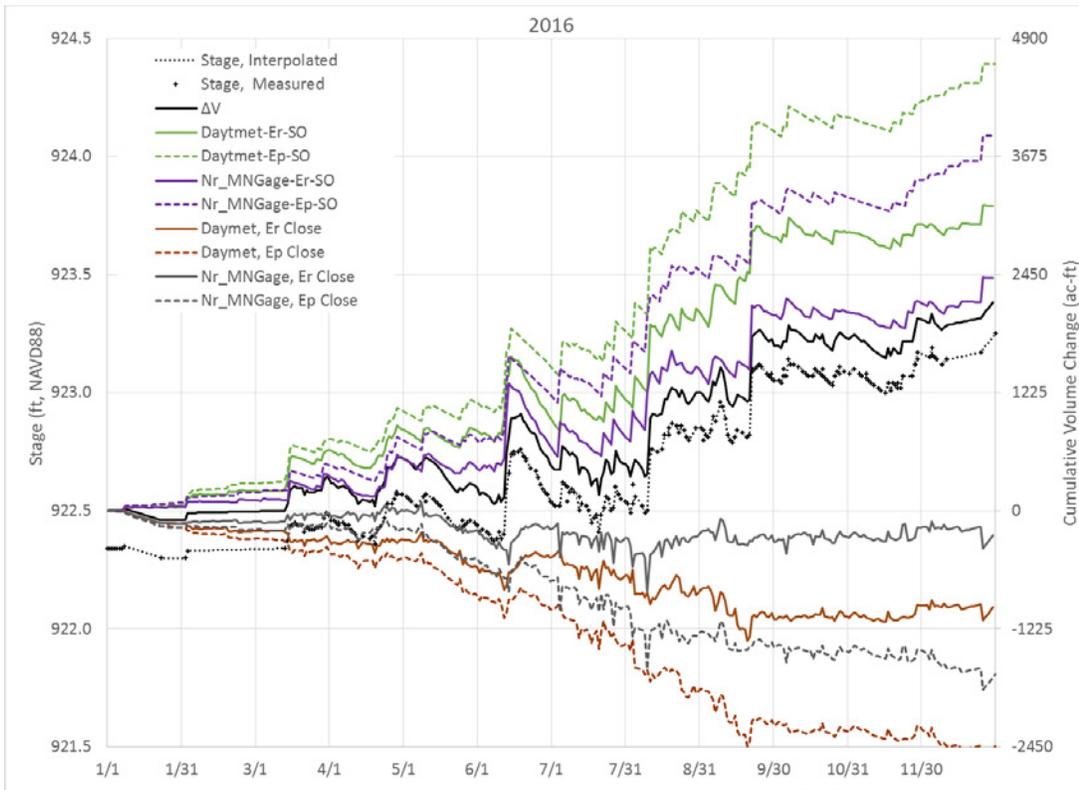


Figure 4 – Cumulative daily lake water budget and stage, White Bear Lake 2016 (See text for definitions of terms)

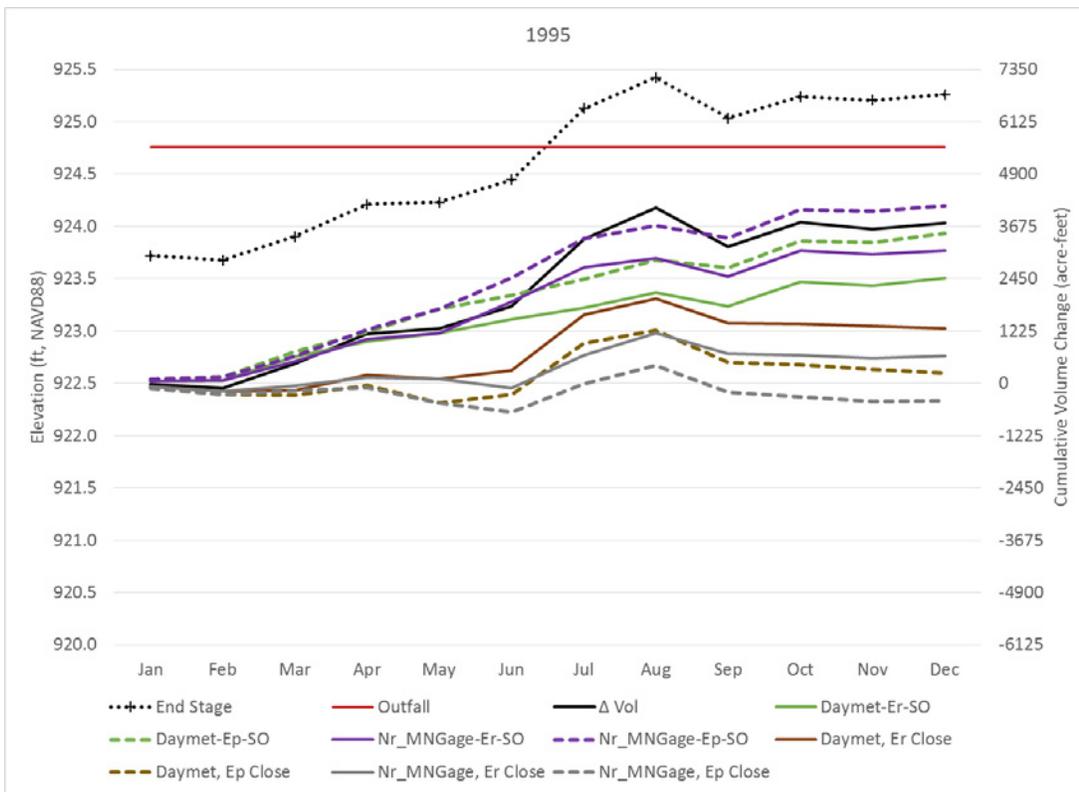


Figure 5 - Cumulative monthly lake water budget and stage, White Bear Lake 1995 (See text for definitions of terms)

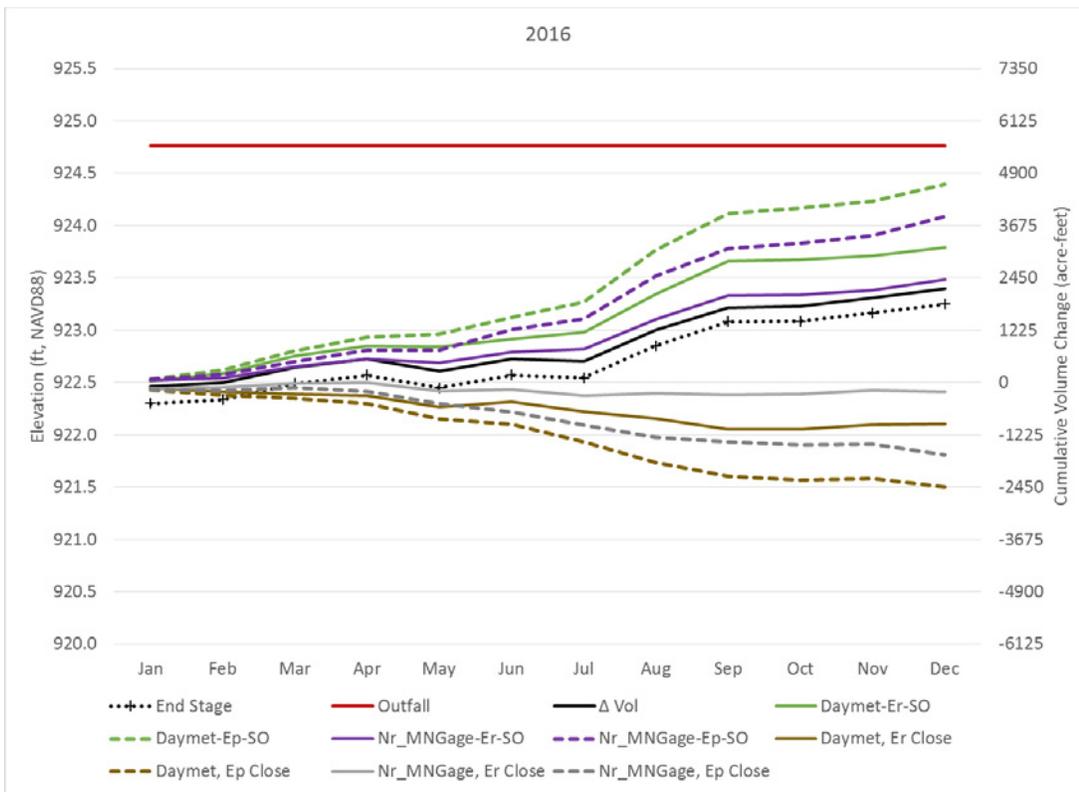


Figure 6- Cumulative monthly lake water budget and stage, White Bear Lake 2016 (See text for definitions of terms)

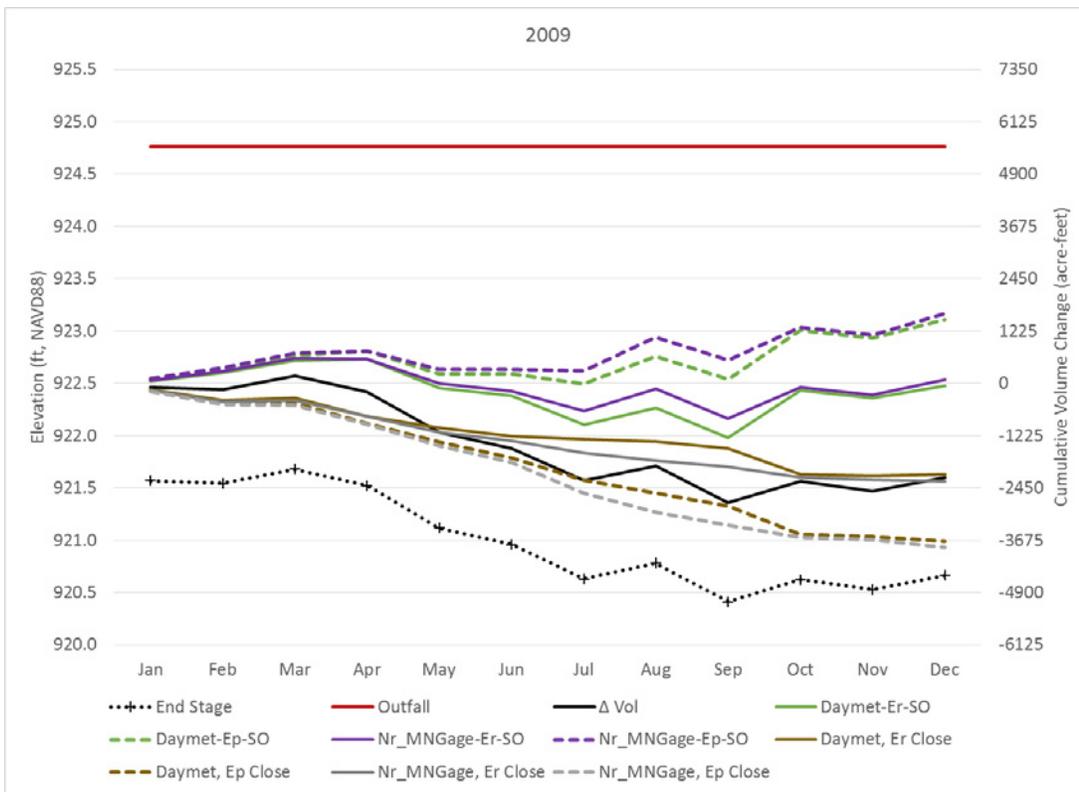


Figure 7 - Cumulative monthly lake water budget and stage, White Bear Lake 2009 (See text for definitions of terms)

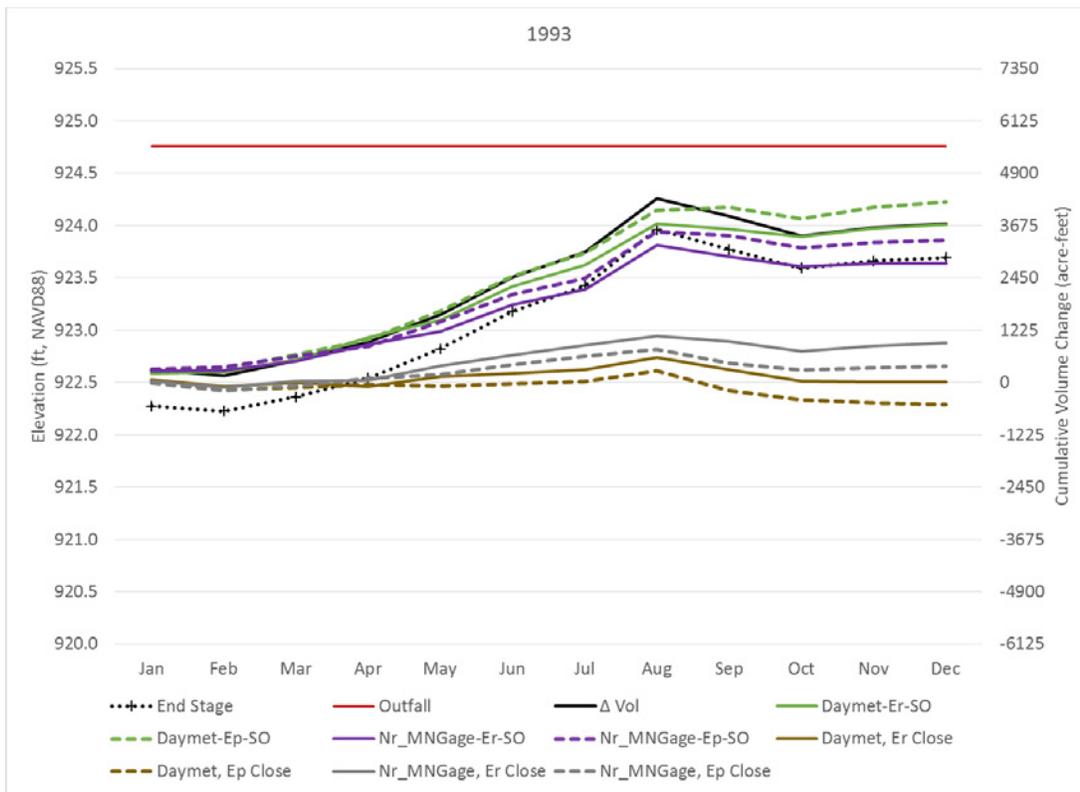


Figure 8 - Cumulative monthly lake water budget and stage, White Bear Lake 1993 (See text for definitions of terms)

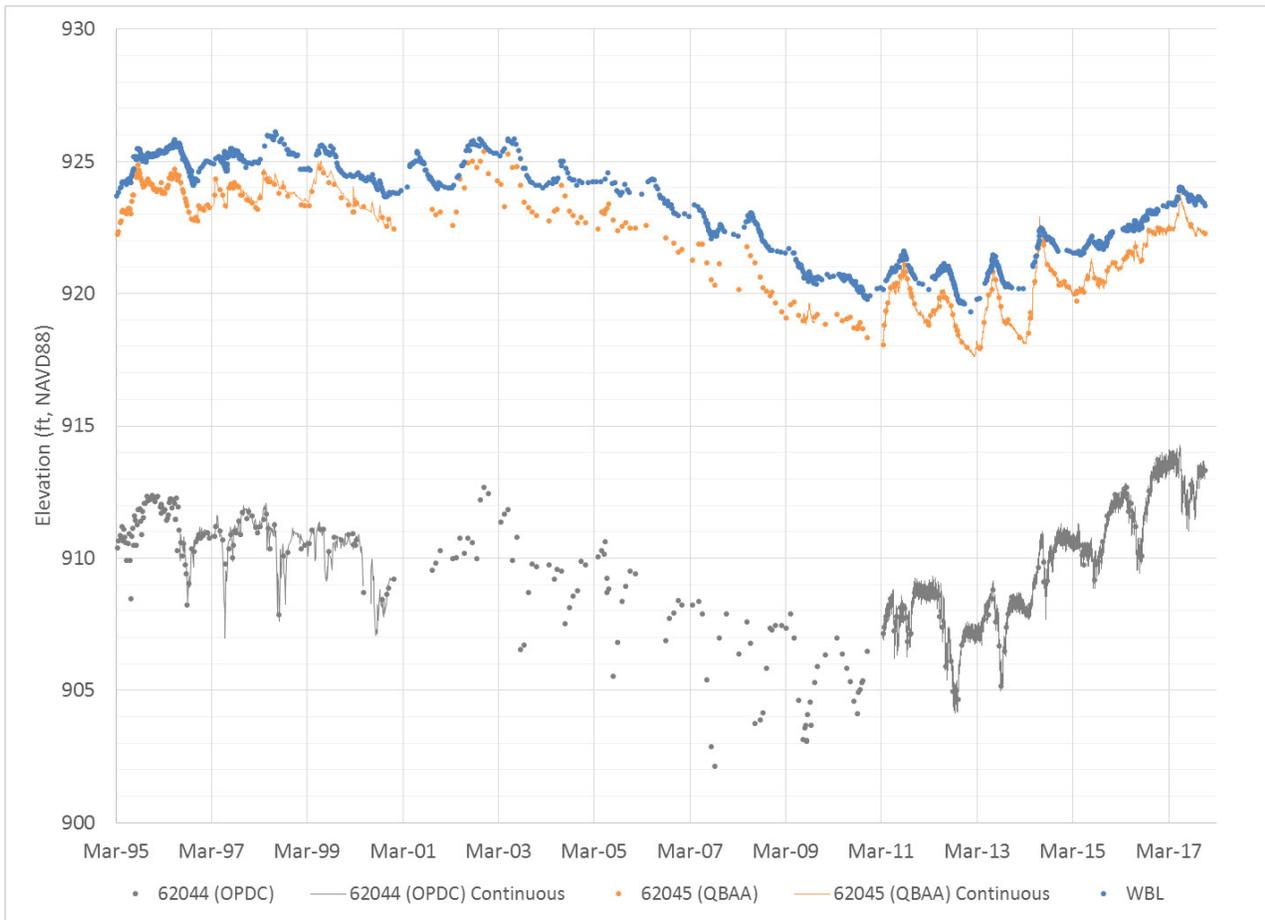


Figure 9 – Hydrograph of DNR observation wells 62044 (OPDC) and 62045 (QBAA) and White Bear Lake (WBL)

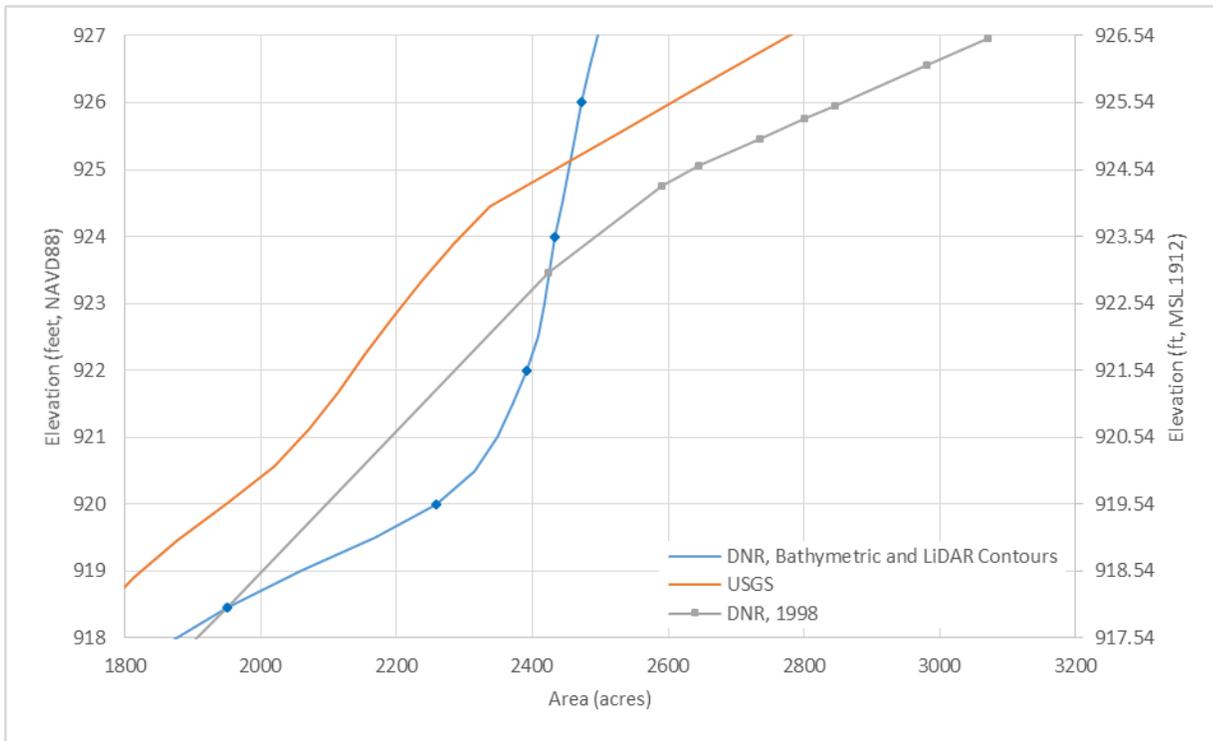


Figure 10 – Stage versus area curves for White Bear Lake

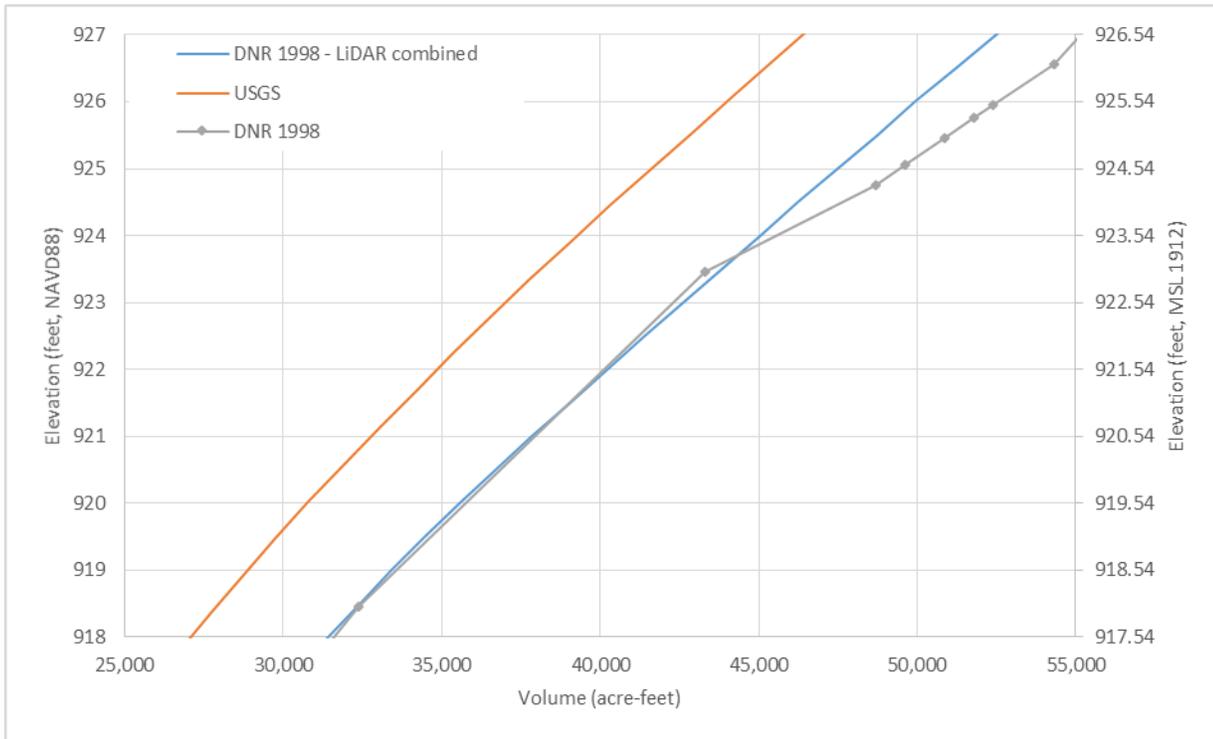


Figure 11 – Stage versus volume curves for White Bear Lake

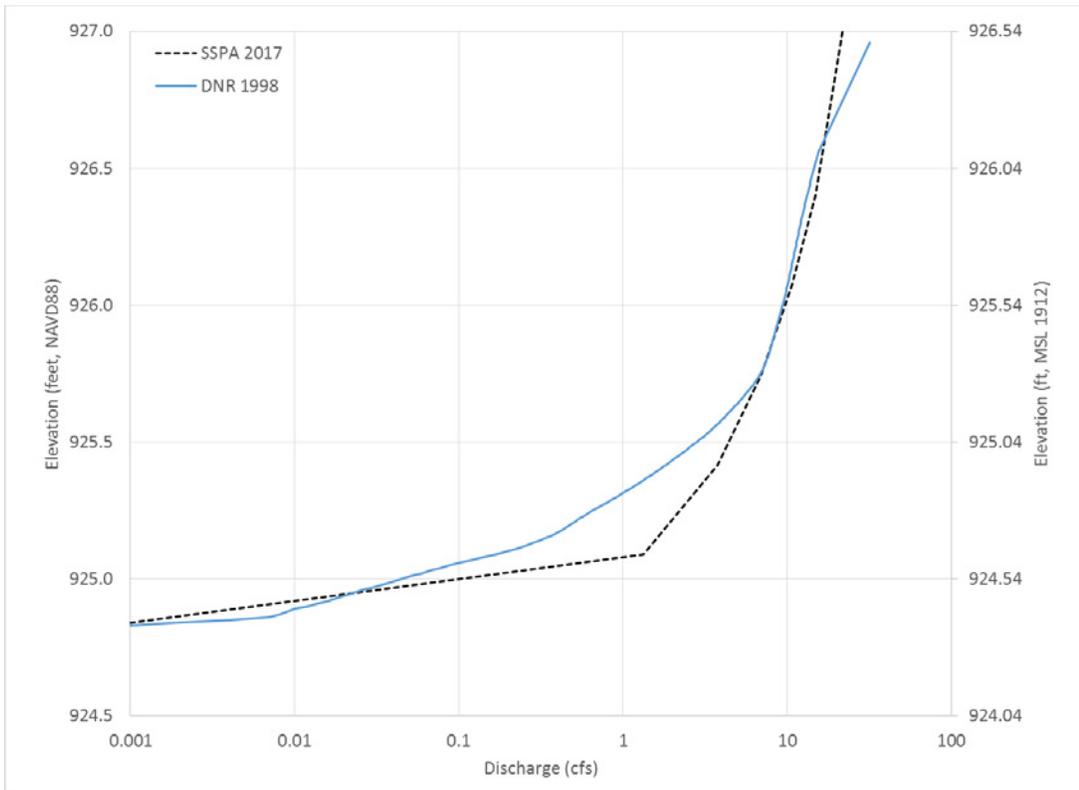


Figure 12 – Stage-discharge rating curves for the White Bear Lake outlet

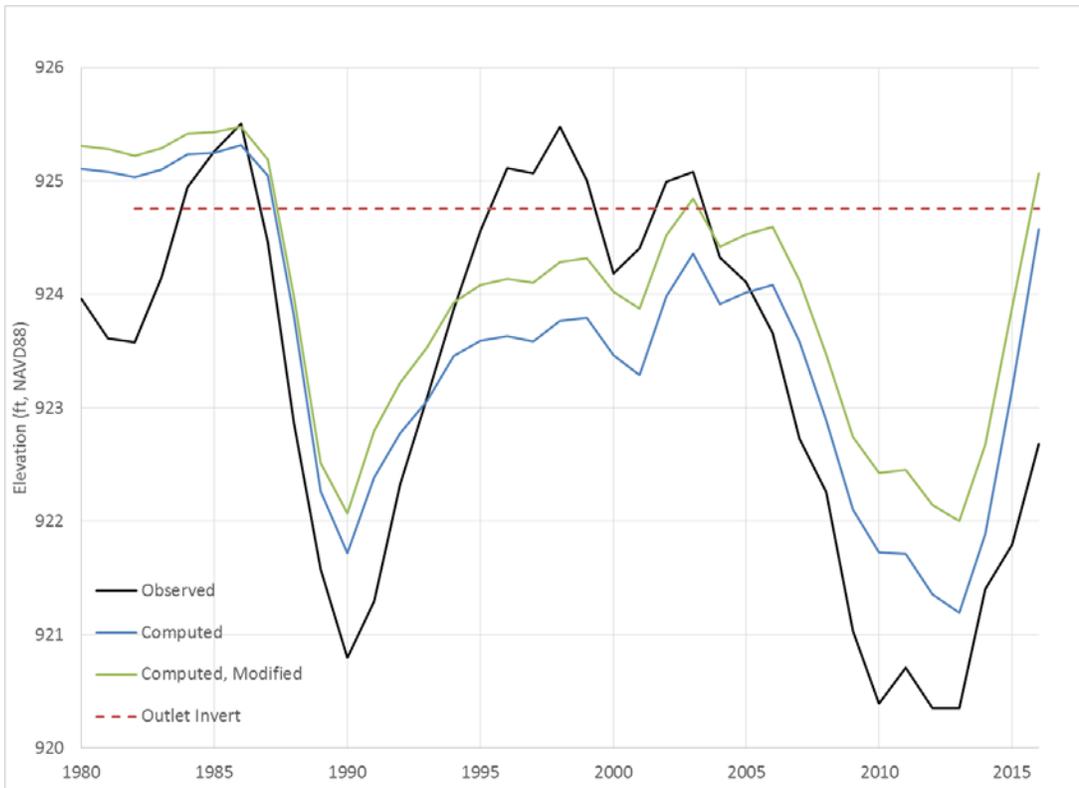


Figure 13 – White Bear Lake stage computed by the annual model and by the model with modified stage-volume-area table and outlet rating

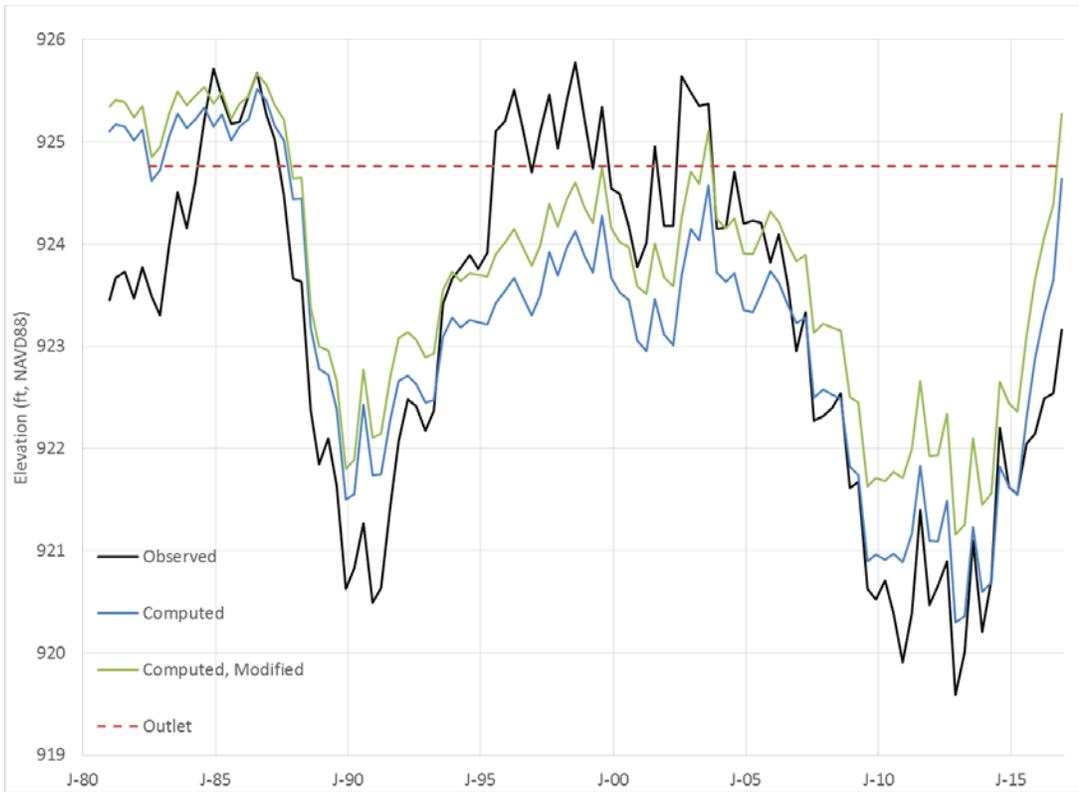


Figure 14 – White Bear Lake stage computed by the triannual model and by the model with modified stage-volume-area table and outlet rating

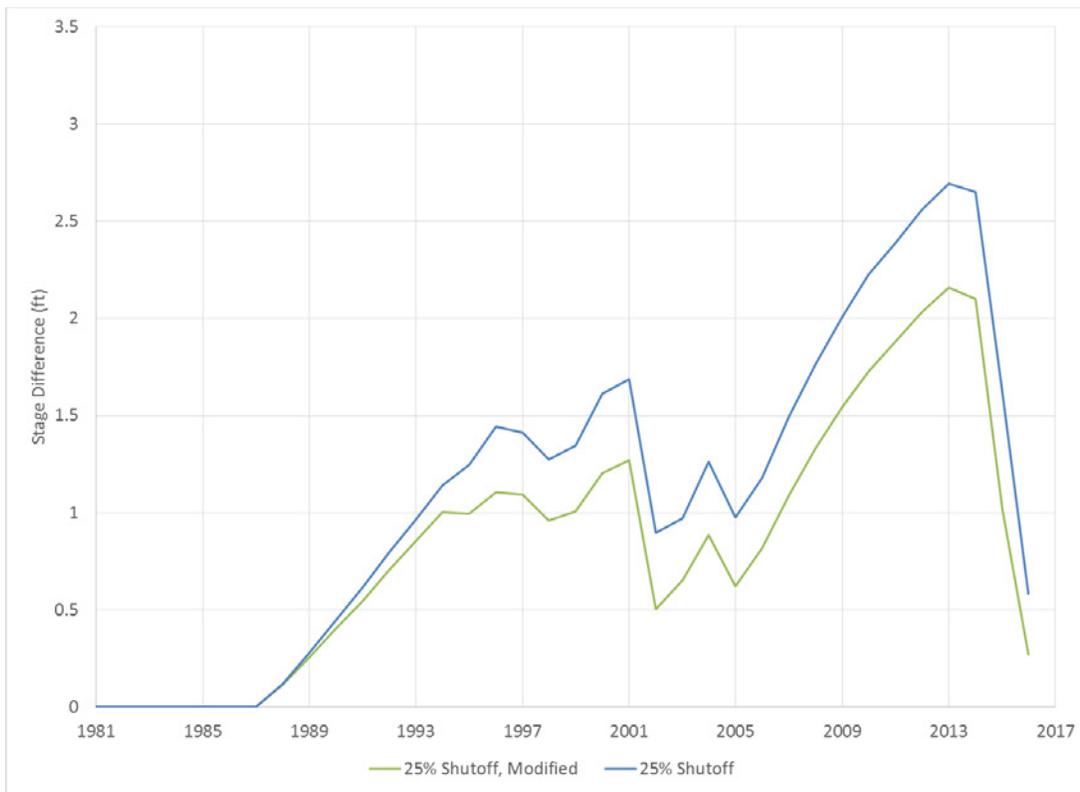


Figure 15 – Computed difference in lake stage for the 25% shutoff scenario computed by the annual model and the model with modified stage-volume-area table and outlet rating

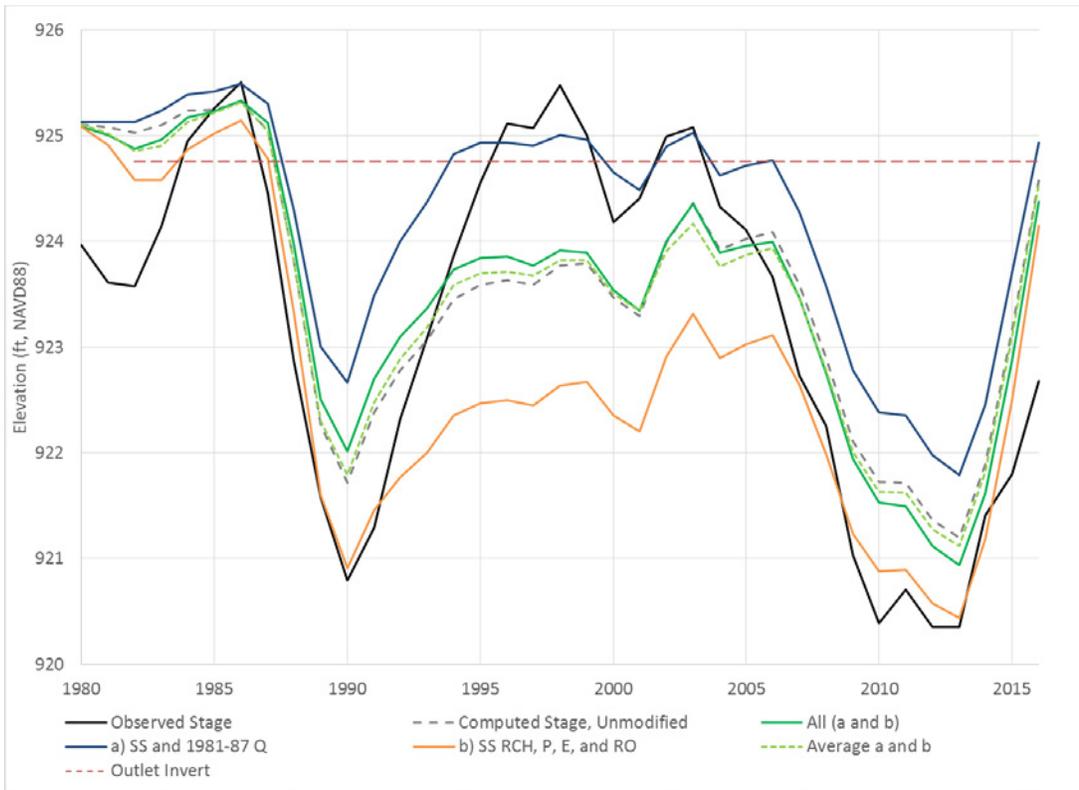


Figure 16 – Computed White Bear Lake stage for the annual model and for combinations of changes to recharge/climate and pumping inputs during the steady-state and warm-up (1981-87) periods (See text for definitions of terms)

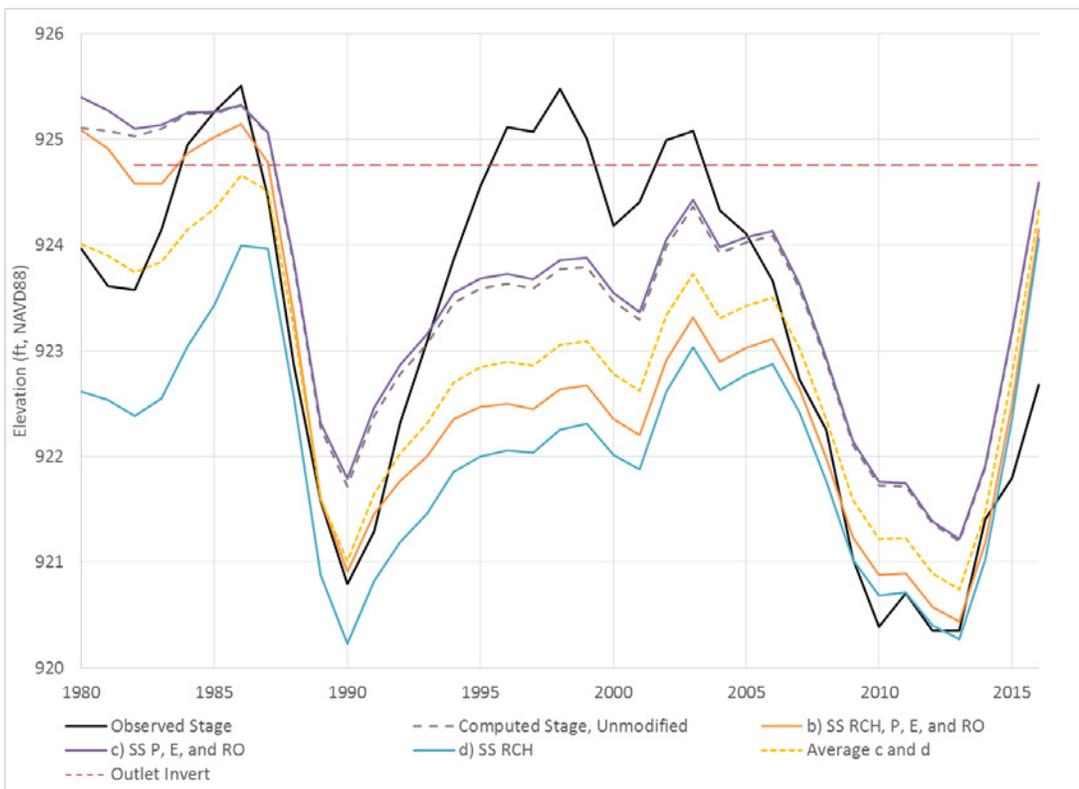


Figure 17 - Computed White Bear Lake stage for the annual model and for combinations of changes to recharge/climate inputs during the steady-state period (See text for definitions of terms)

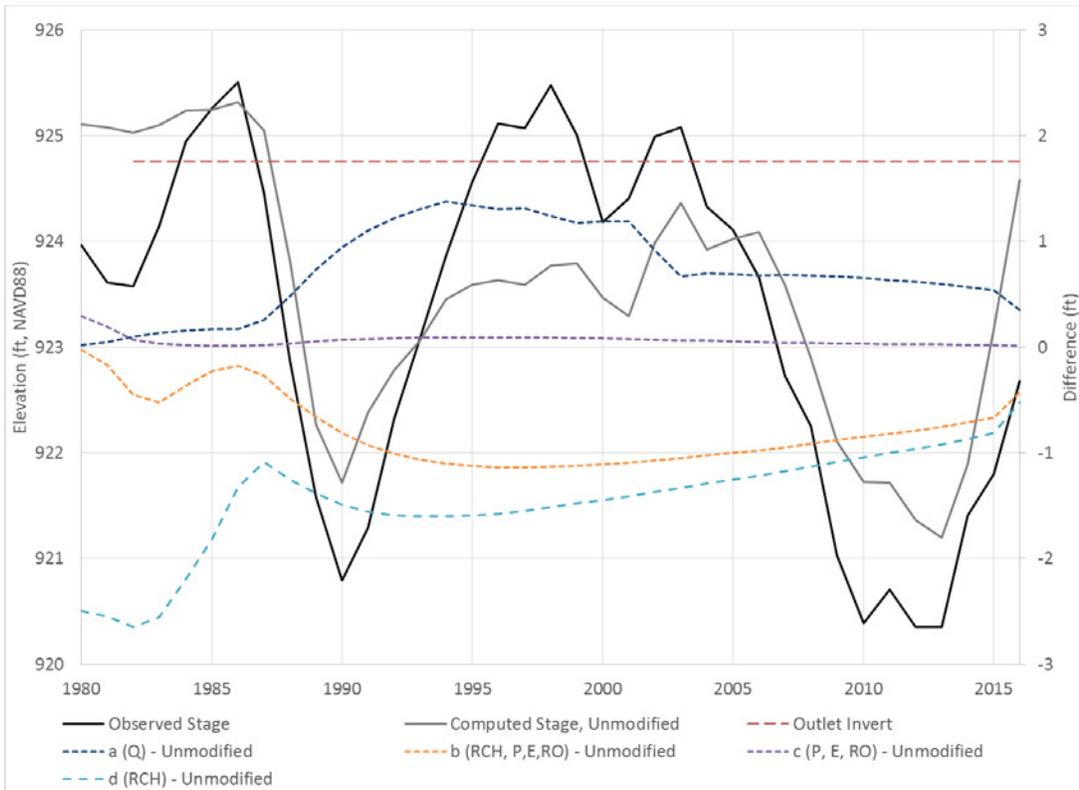


Figure 18 – Differences in computed stage between model tests with modified inputs during the steady-state and warm-up (1981-87) periods and the original annual model (See text for definitions of terms)

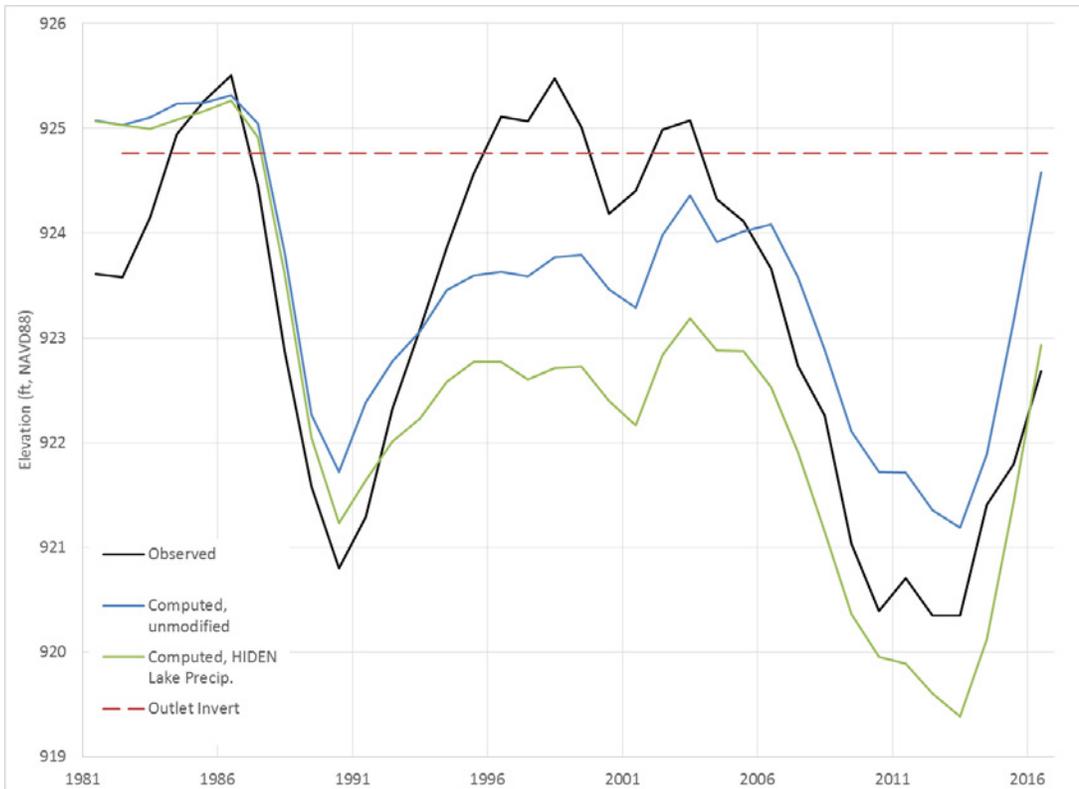


Figure 19 – White Bear Lake stage computed by the annual model and the model with lake precipitation taken from the gridded HIDDEN data set.

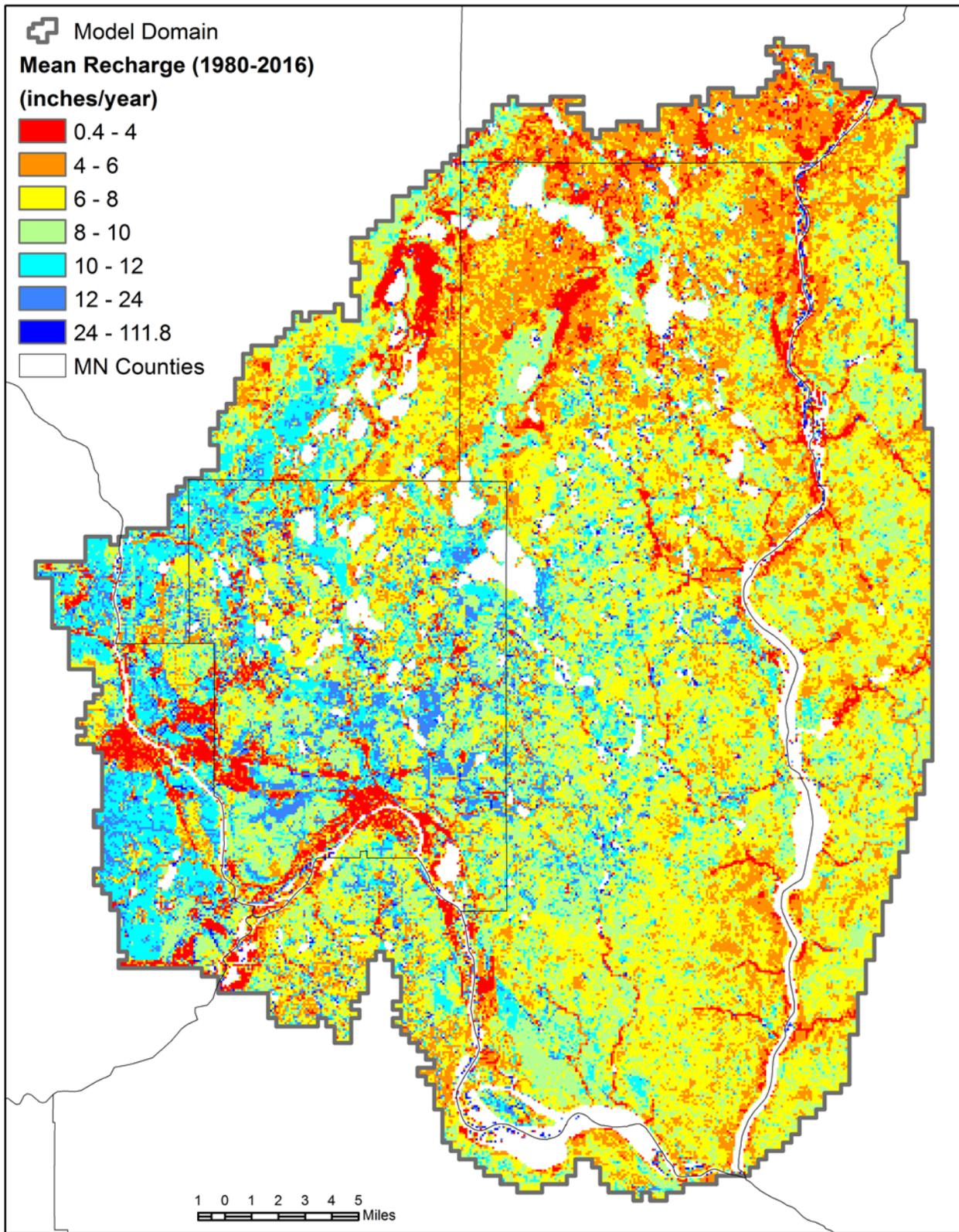


Figure 20 – Average groundwater recharge rates computed by the Revised SWB model (1980-2016)

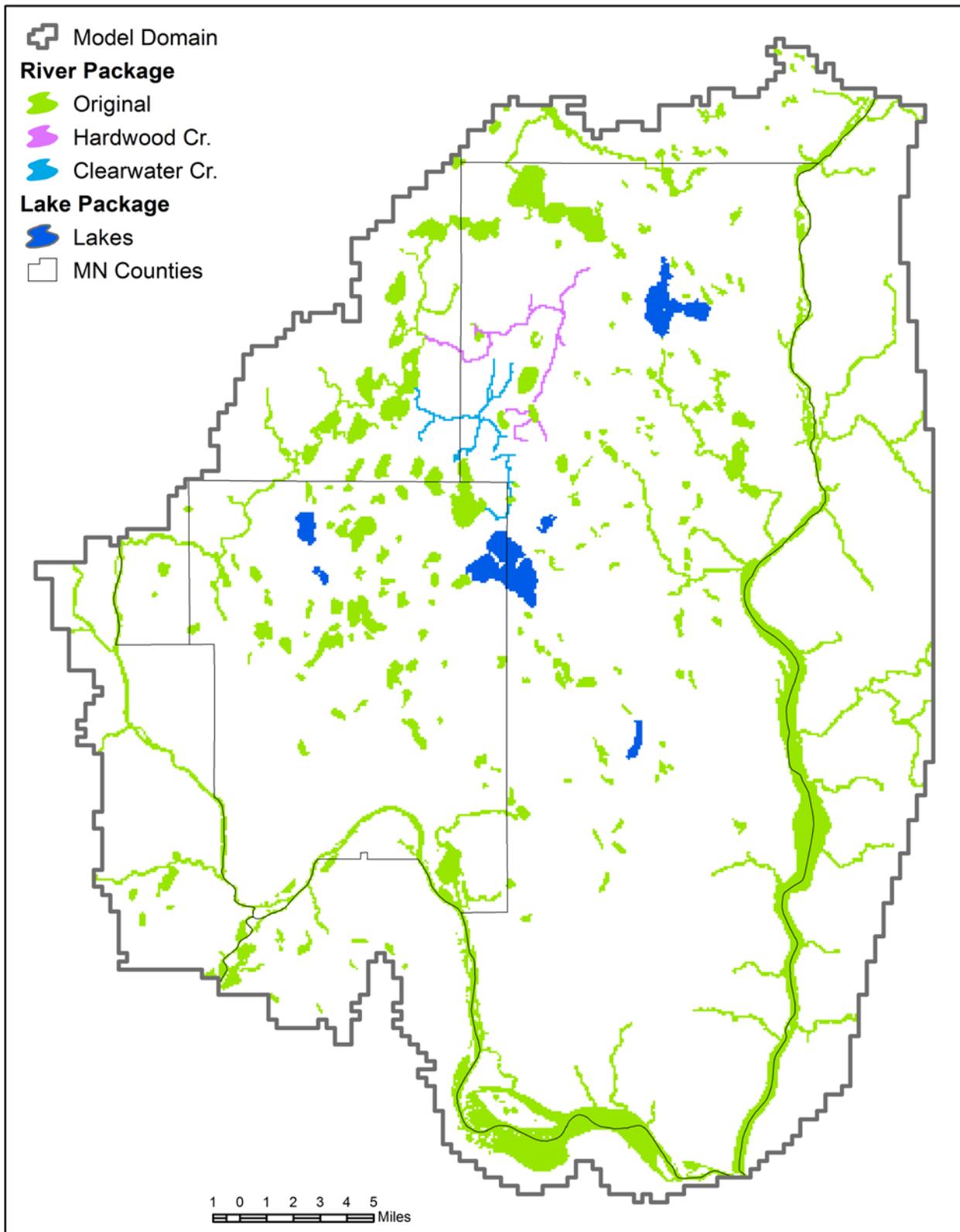


Figure 21 – Model cells representing the addition of Hardwood Cr. and Clearwater Cr. to the River Package, all other River Package cells representing surface waters, and Lake Package cells

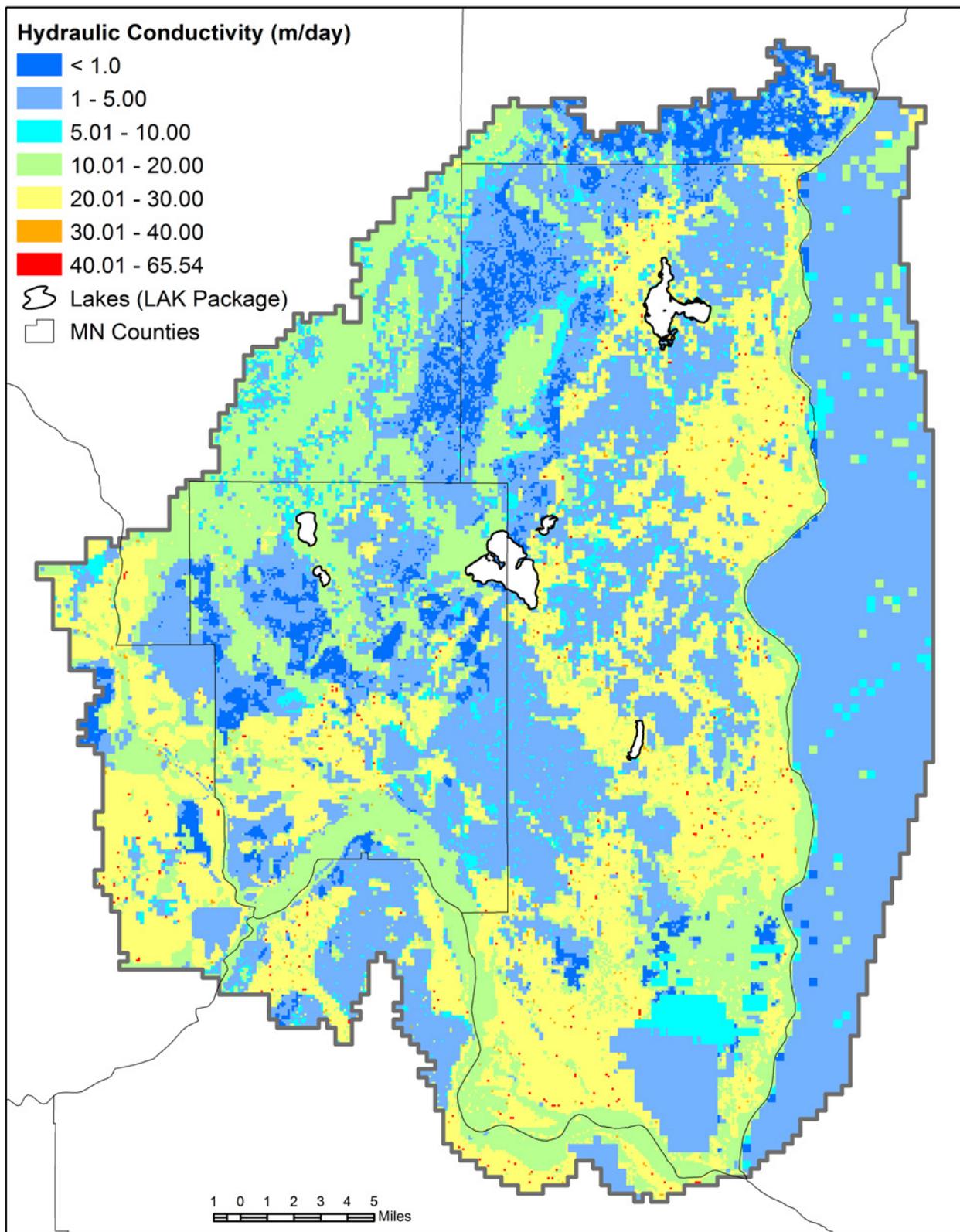


Figure 22 – Horizontal hydraulic conductivity in Revised model layer 1

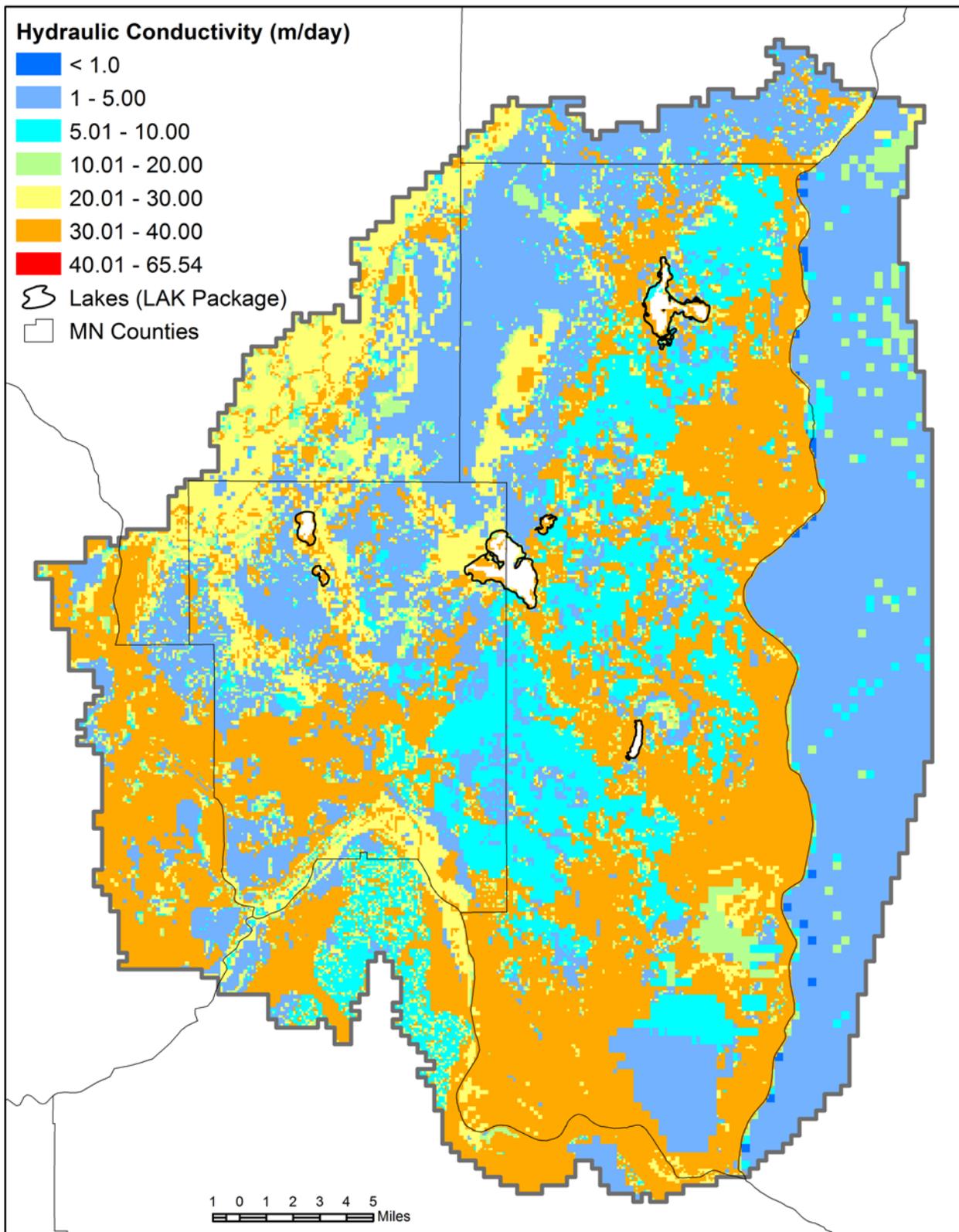


Figure 23 – Horizontal hydraulic conductivity in Revised model layer 2

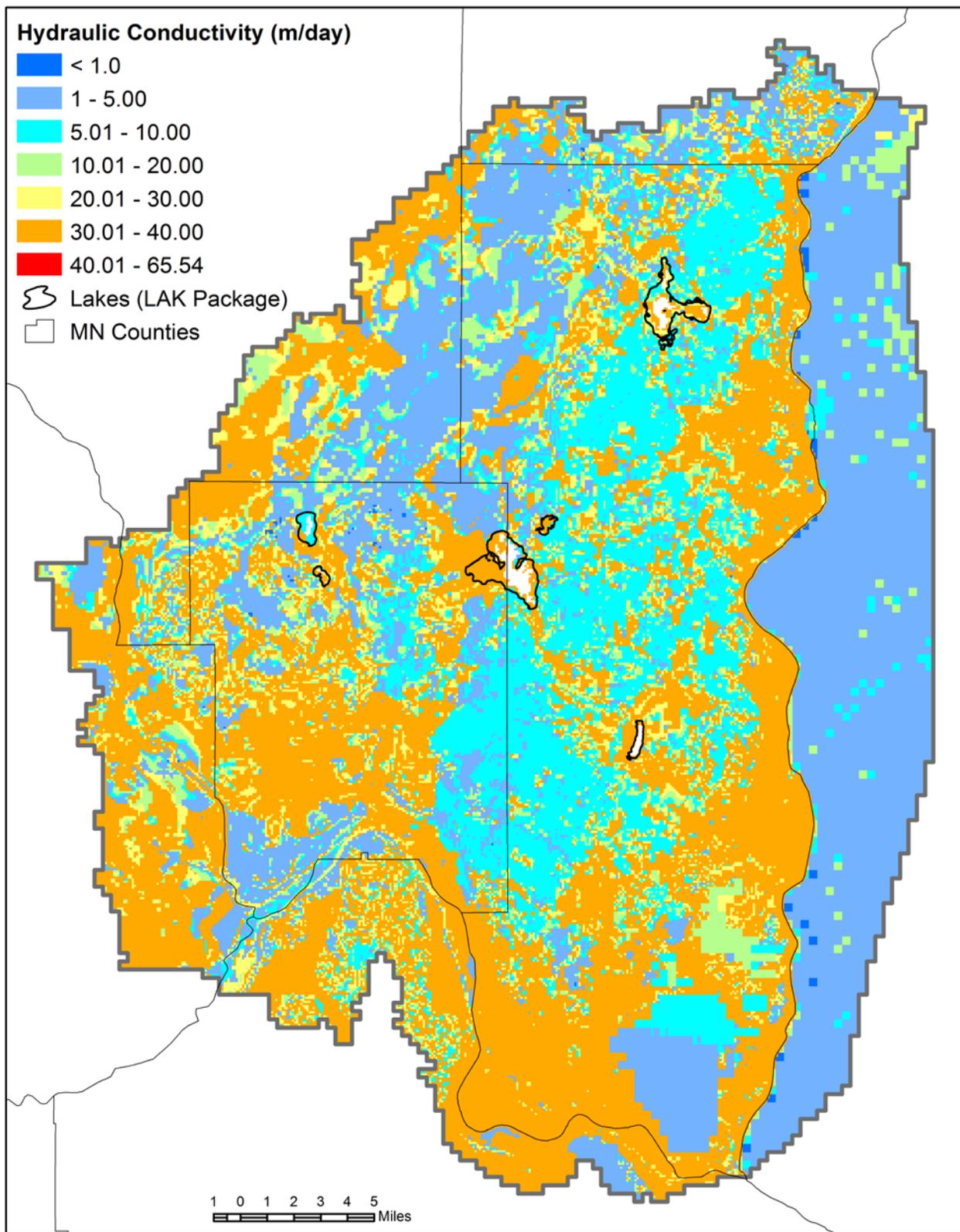


Figure 24 – Horizontal hydraulic conductivity in Revised model layer 3

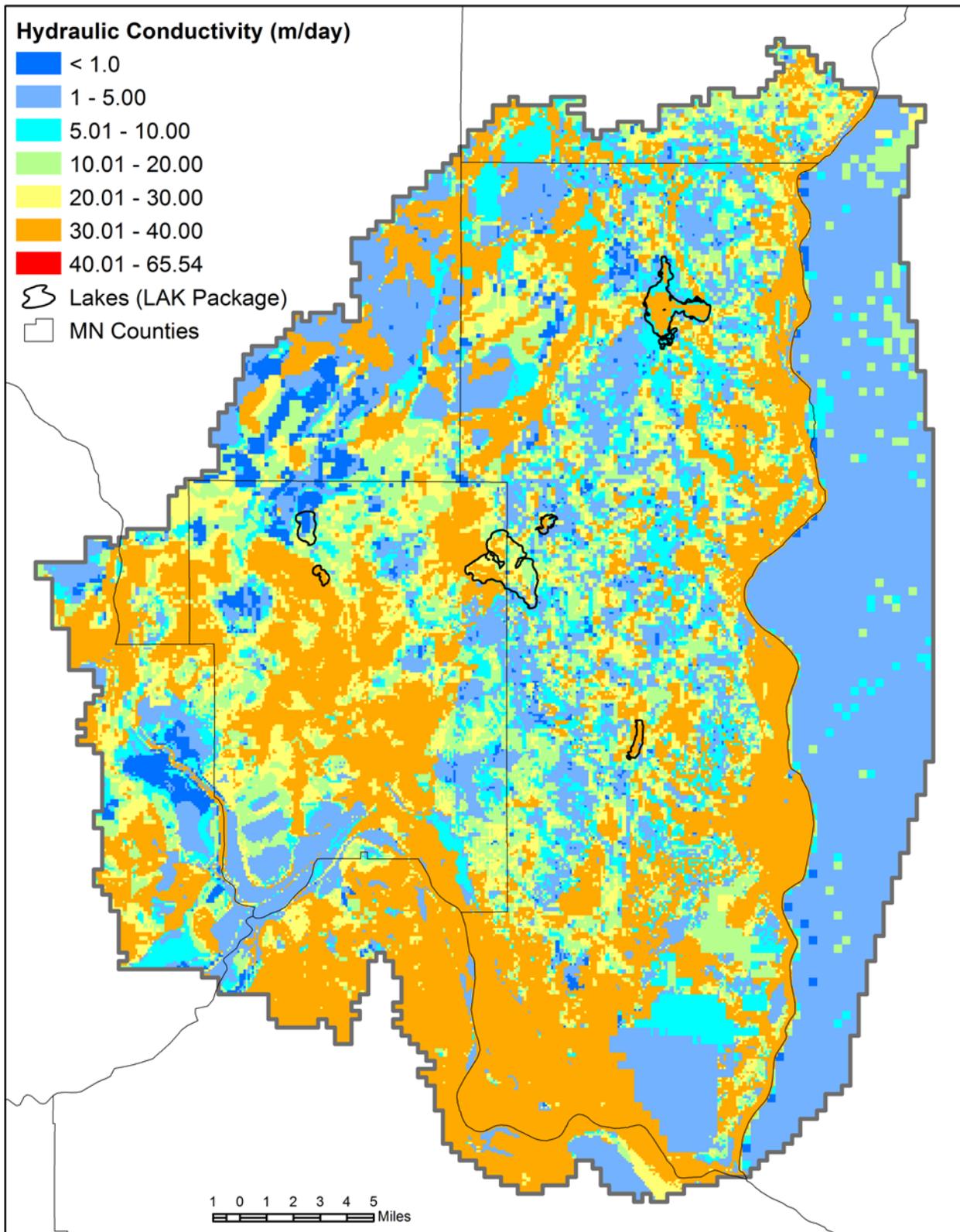


Figure 25 – Horizontal hydraulic conductivity in Revised model layer 4

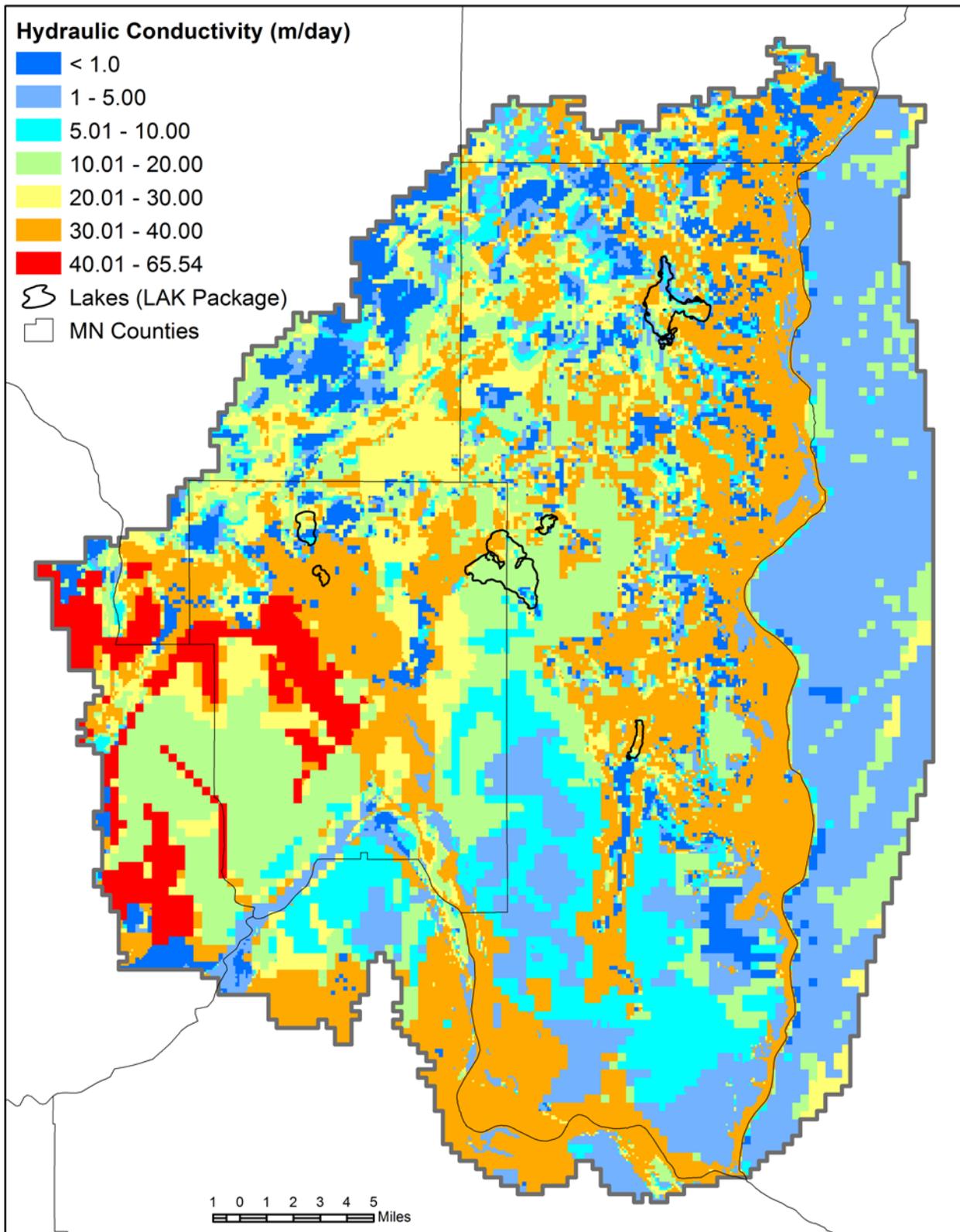


Figure 26 – Horizontal hydraulic conductivity in Revised model layer 5

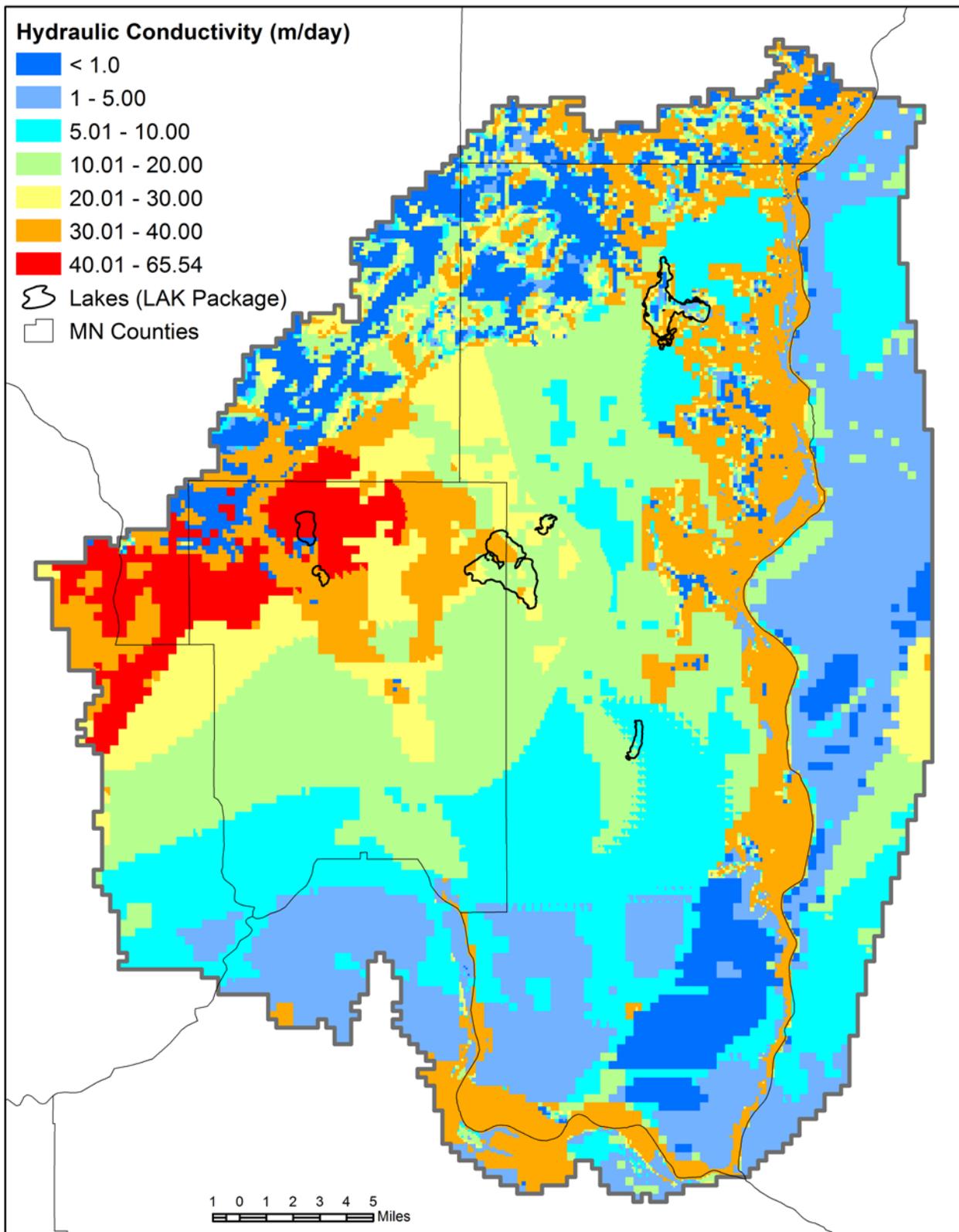


Figure 27 – Horizontal hydraulic conductivity in Revised model layer 6

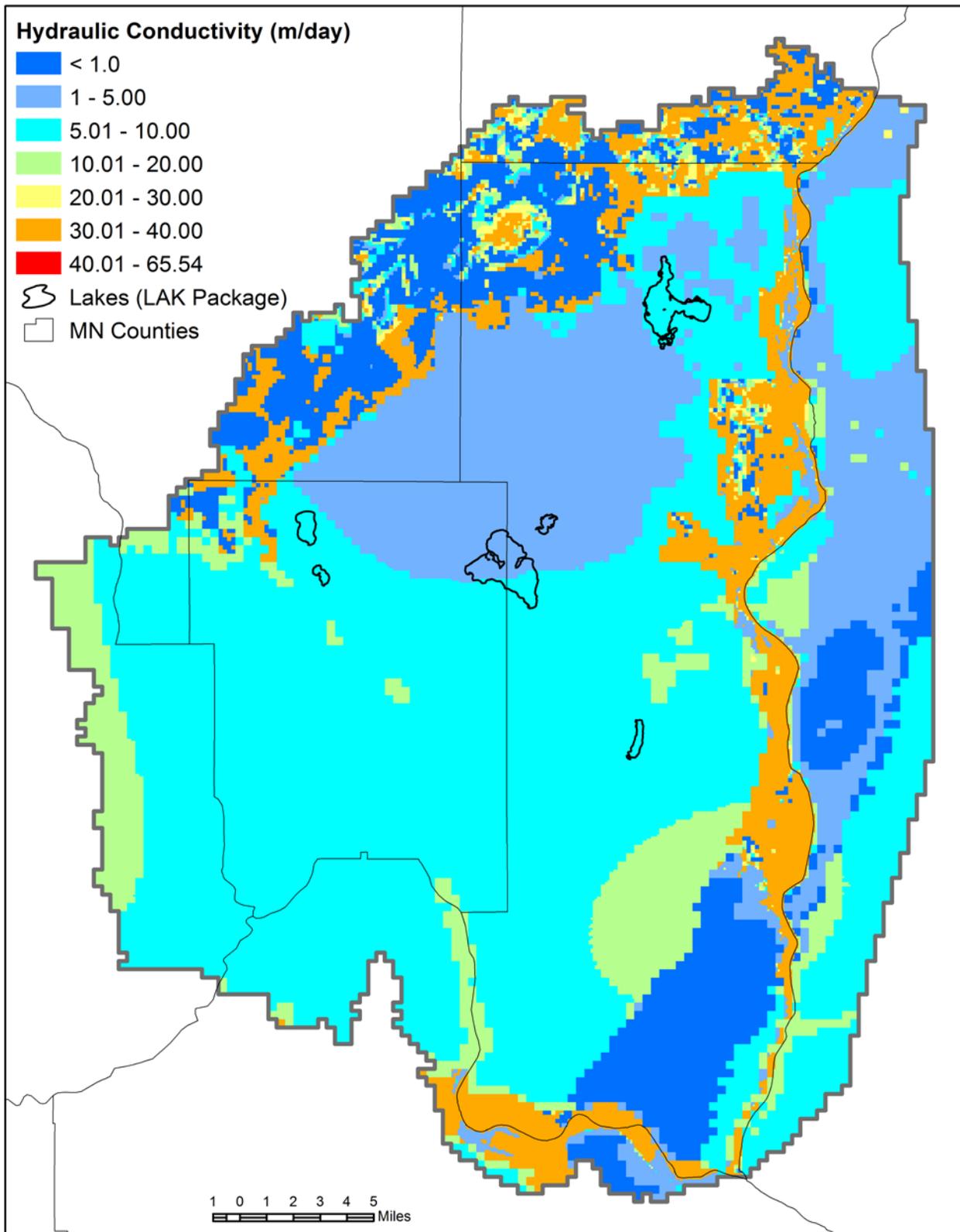


Figure 28 – Horizontal hydraulic conductivity in Revised model layer 7

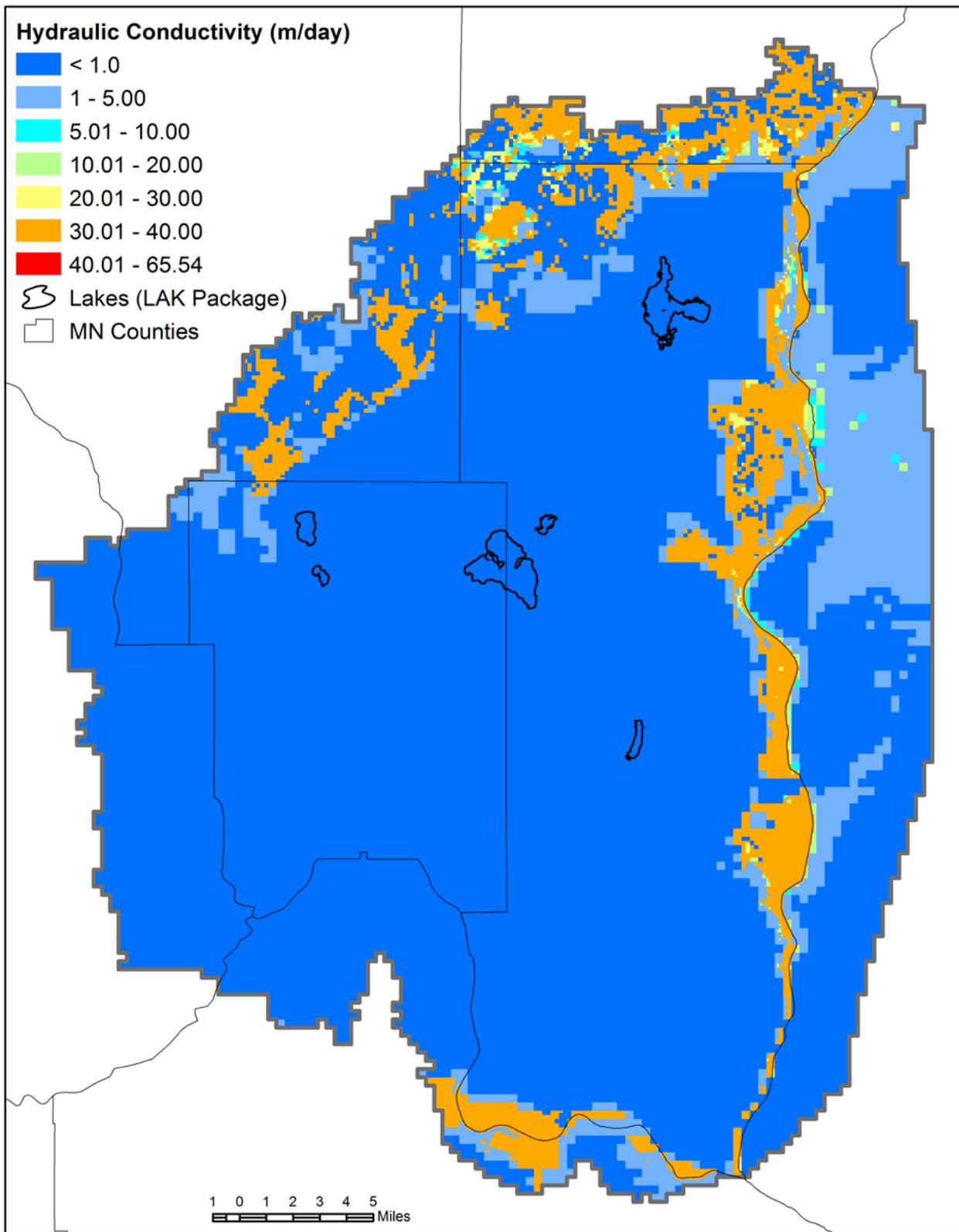


Figure 29 – Horizontal hydraulic conductivity in Revised model layer 8

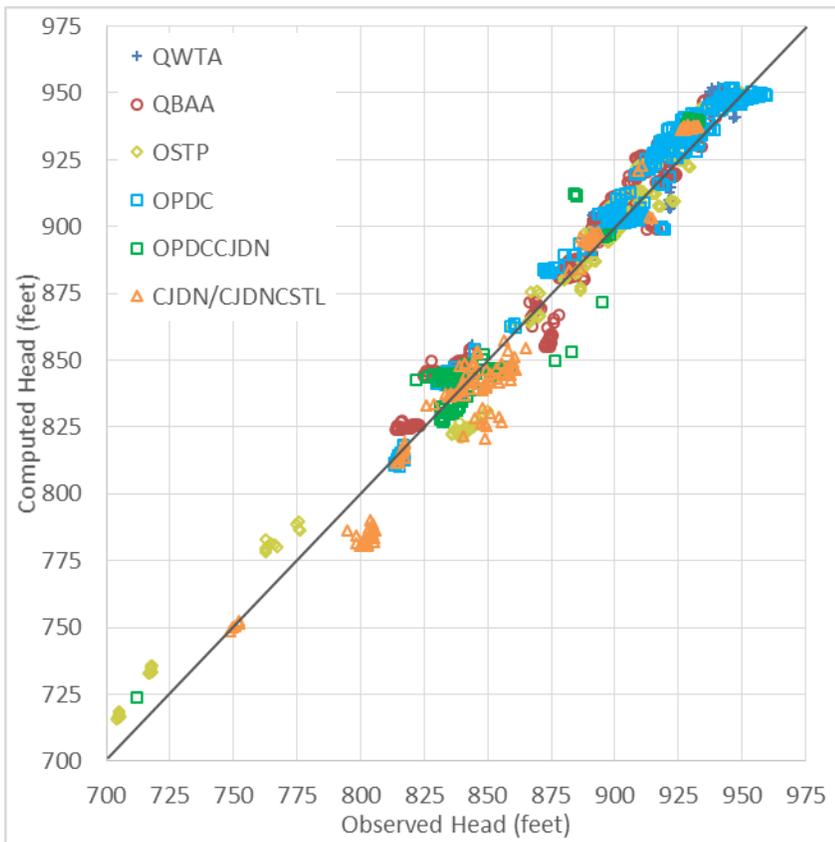


Figure 30 – Computed versus observed heads in the upper aquifers in the annual model of SSPA (2017)

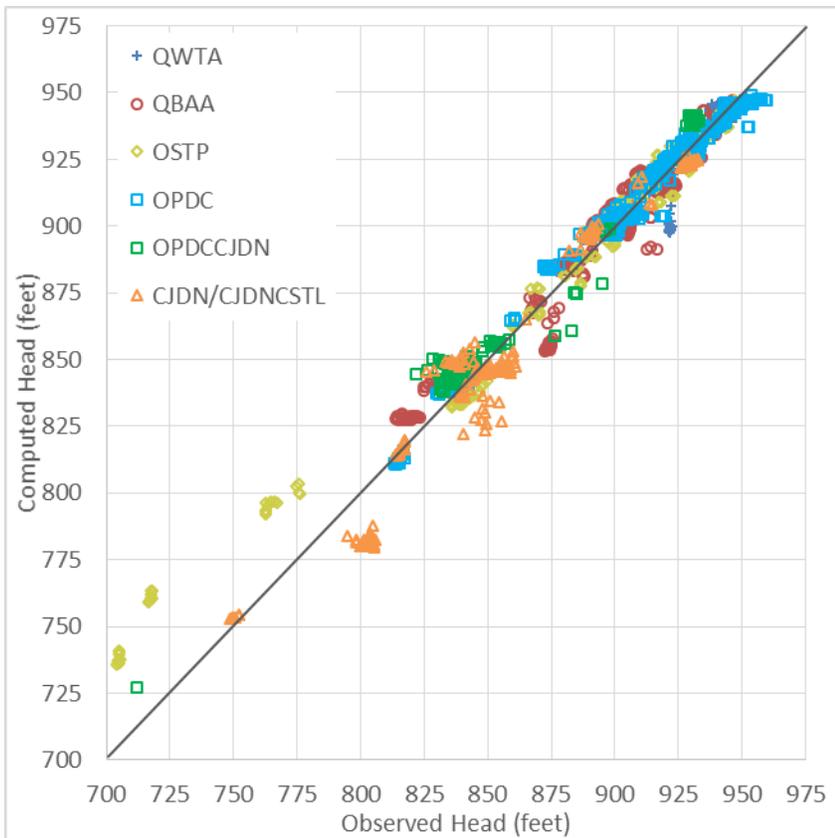


Figure 31 – Computed versus observed heads in the upper aquifers in the Revised annual model

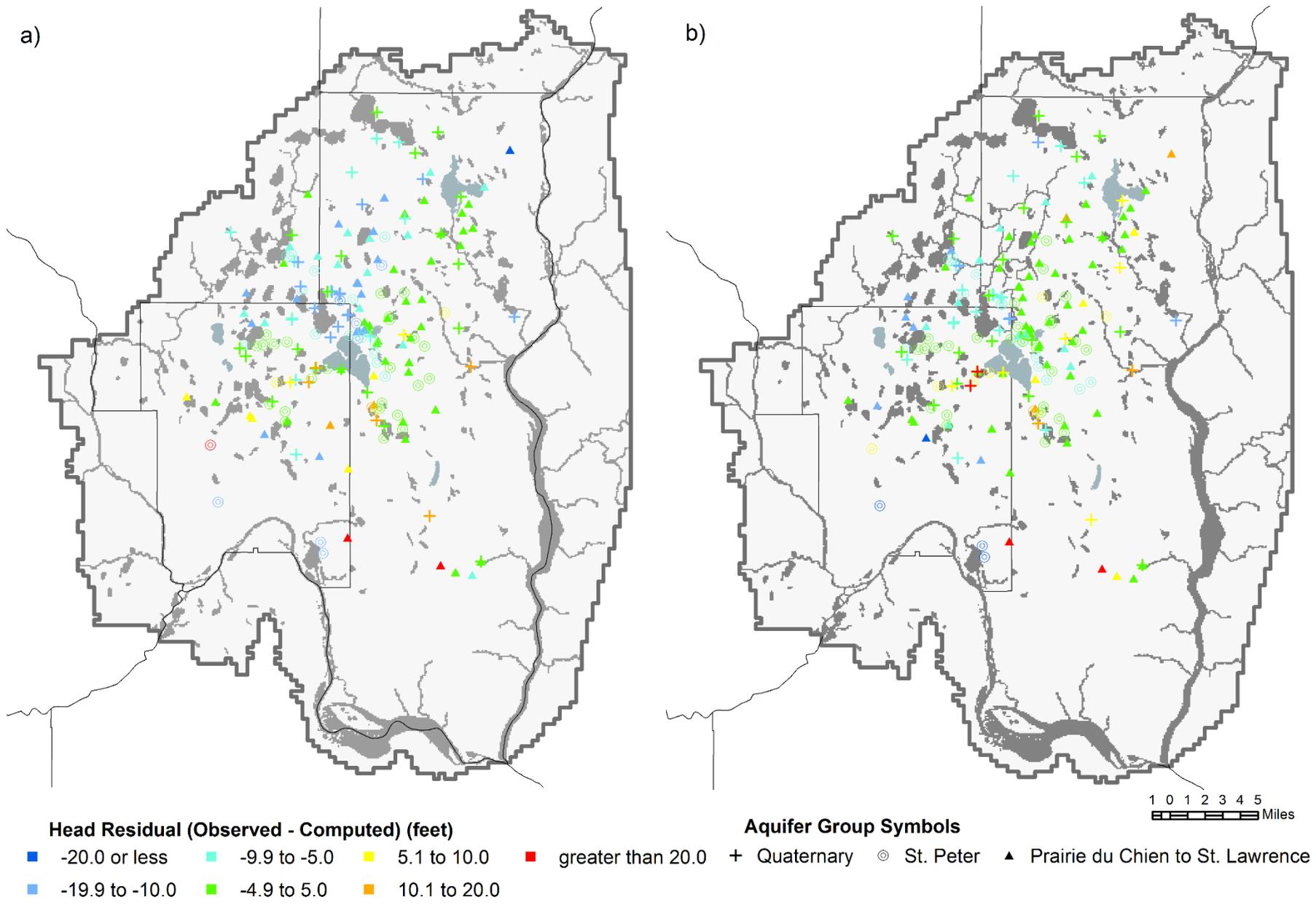


Figure 32 – Computed head residuals in the annual models for 2013: a) SSPA (2017) model and b) Revised model

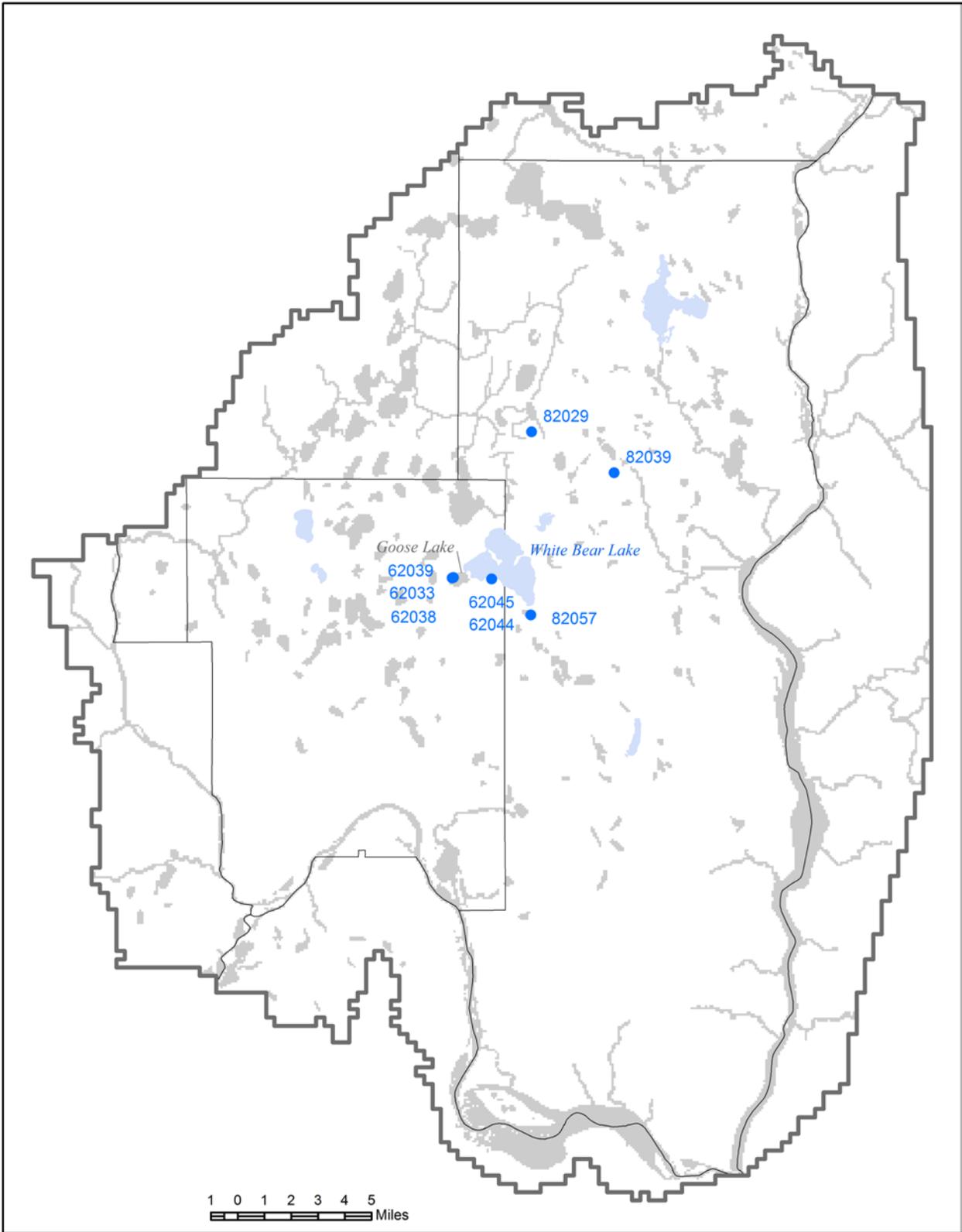


Figure 33 – Locations of DNR observation wells shown in hydrographs

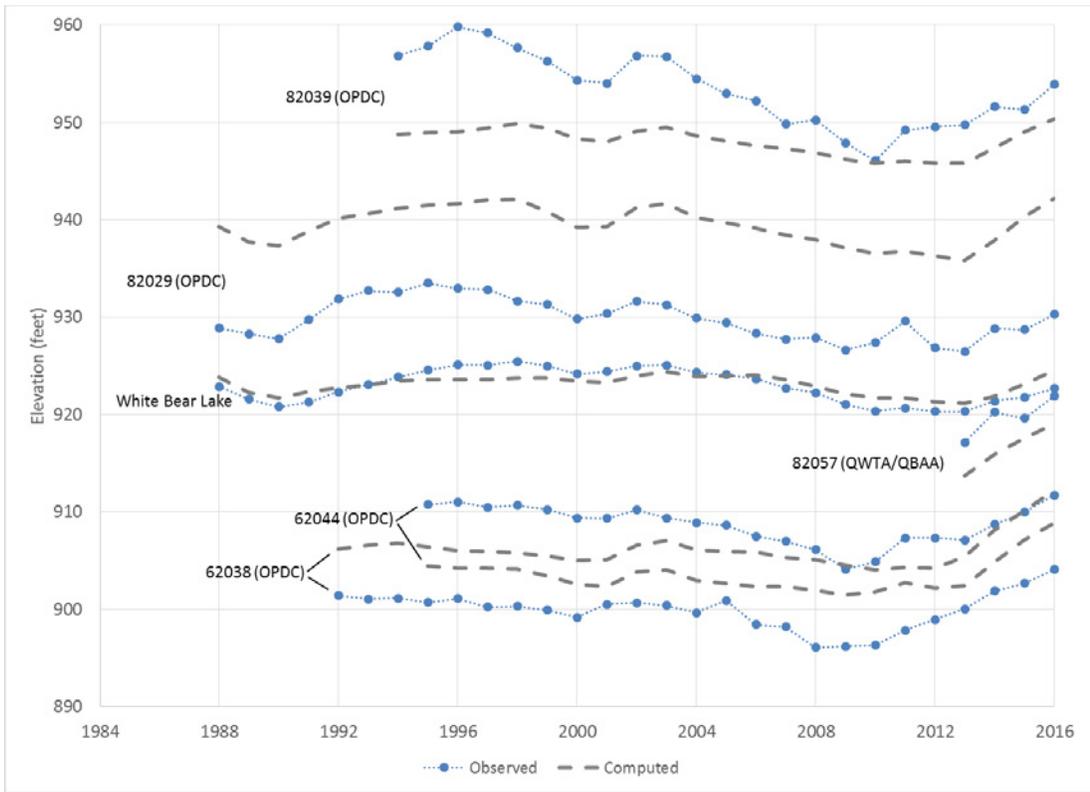


Figure 34 – SSPA (2017) annual model and observed hydrographs for deeper observation wells and White Bear Lake

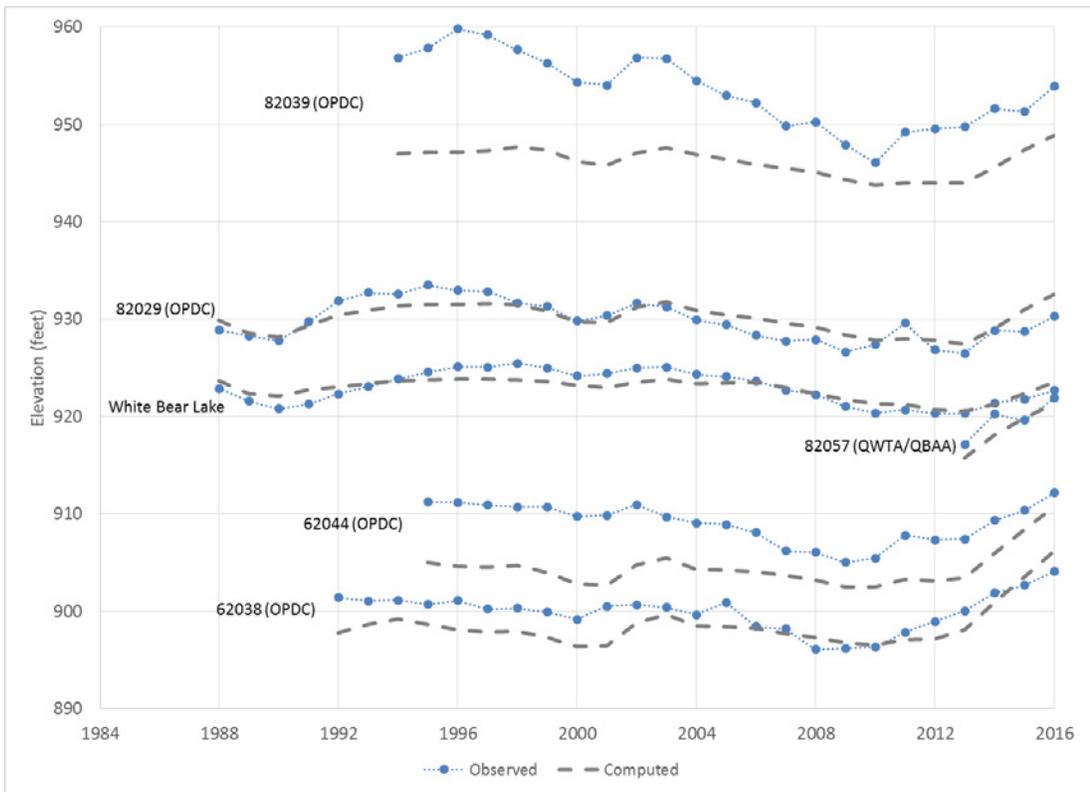


Figure 35 – Revised annual model and observed hydrographs for deeper observation wells and White Bear Lake

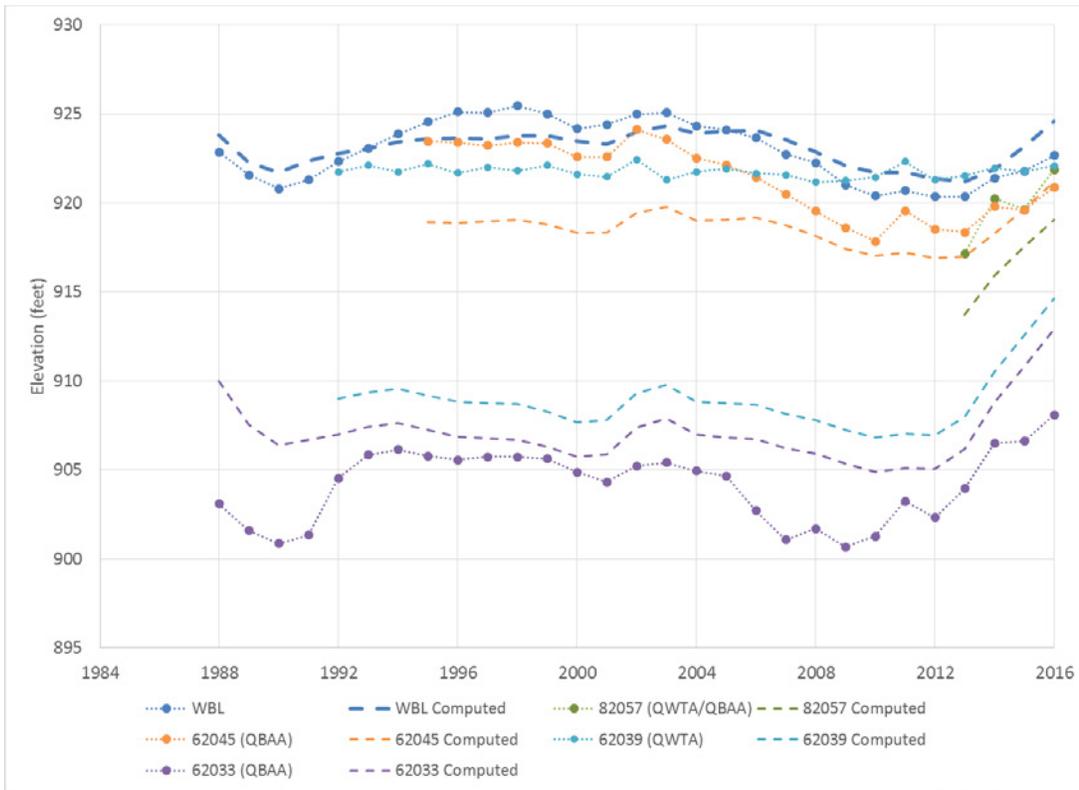


Figure 36 - SSPA (2017) annual model and observed hydrographs for Quaternary observation wells and White Bear Lake



Figure 37 - Revised annual model and observed hydrographs for Quaternary observation wells and White Bear Lake

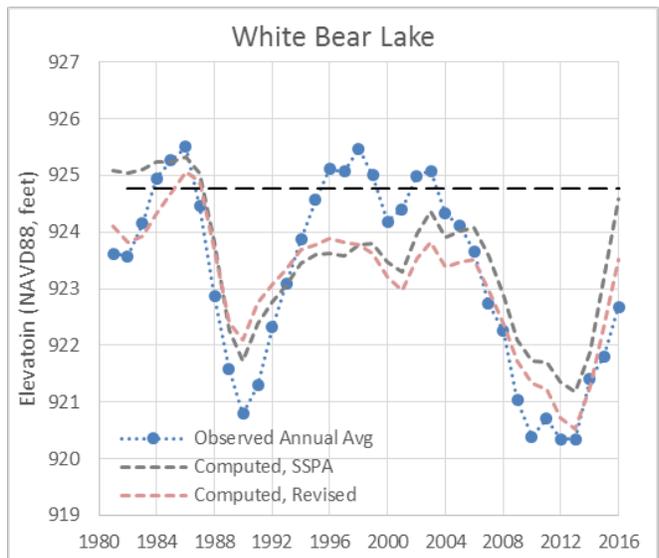
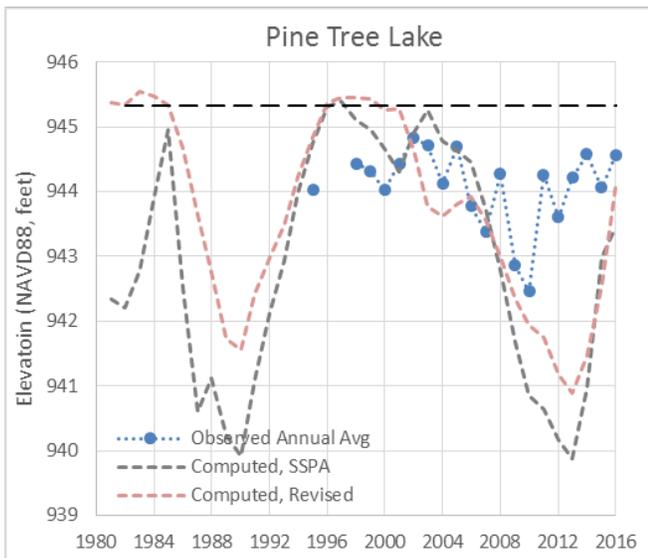
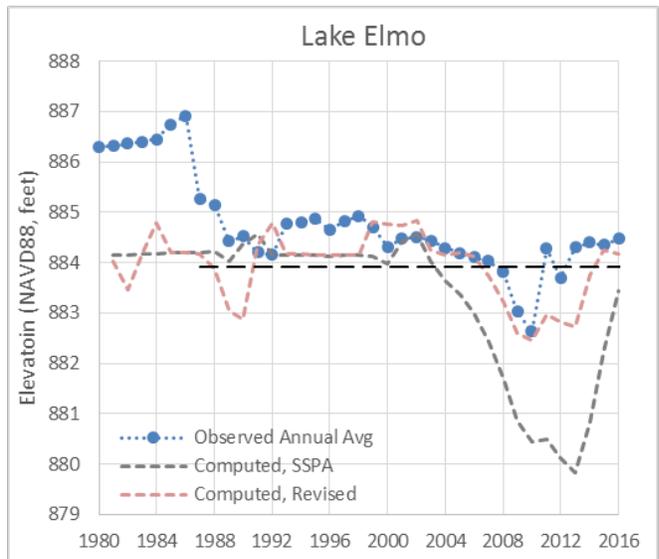
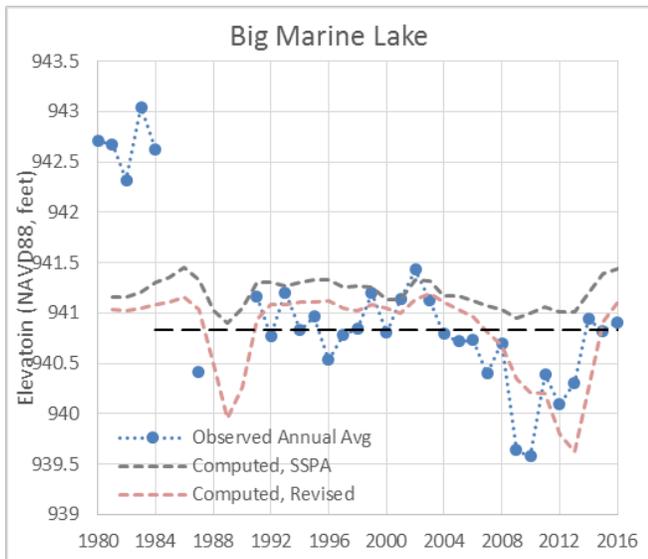
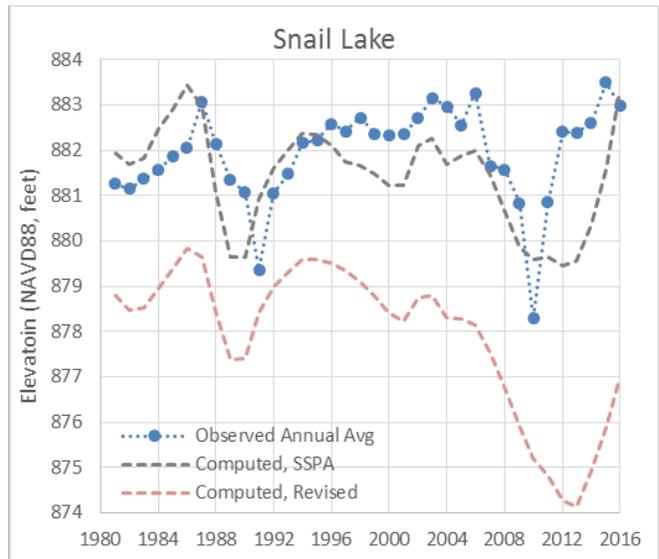
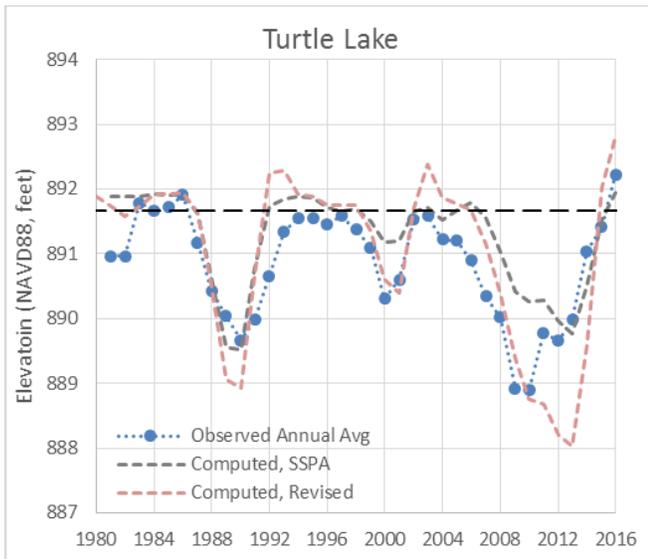


Figure 38 – Observed and computed annual average lake stages. Note that the outlet elevations were lowered for Big Marine, Elmo and White Bear lakes during the model period (1984, 1987, and 1982 respectively).

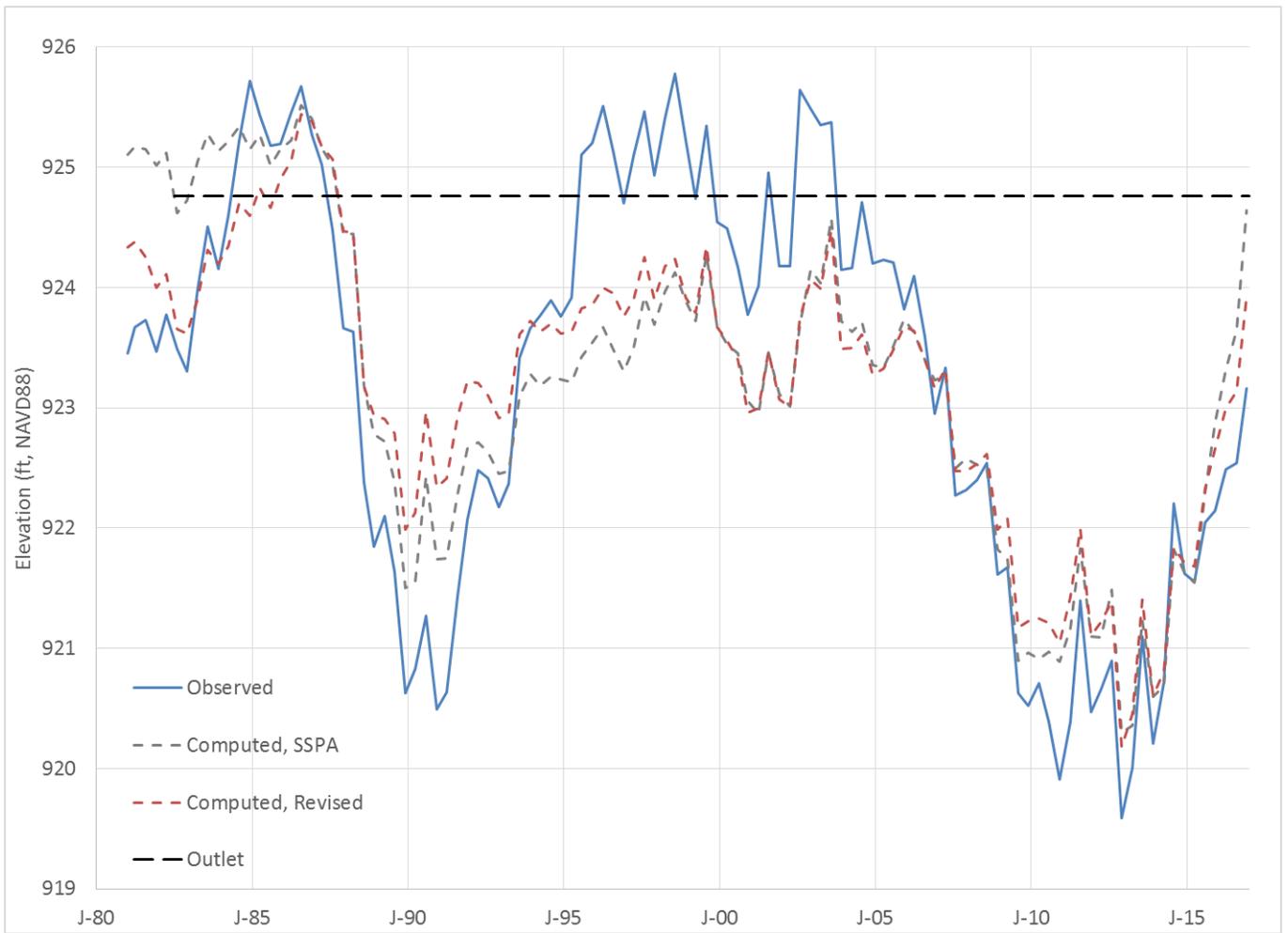


Figure 39 – Observed and computed triannual stages for White Bear Lake



Figure 40 – Computed annual-model stage differences for White Bear Lake for selected Scenario 1 permit shut-off scenarios

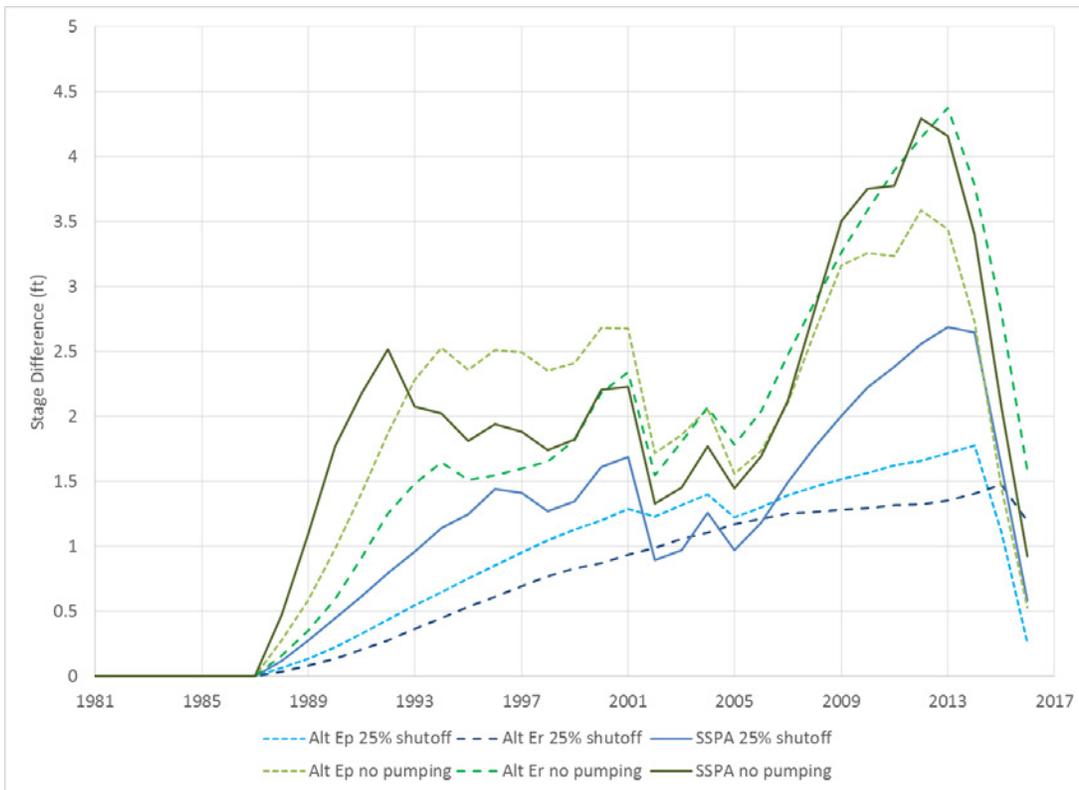


Figure 41 – Computed annual-model stage differences for White Bear Lake for selected Scenario 2 pumping reduction scenarios

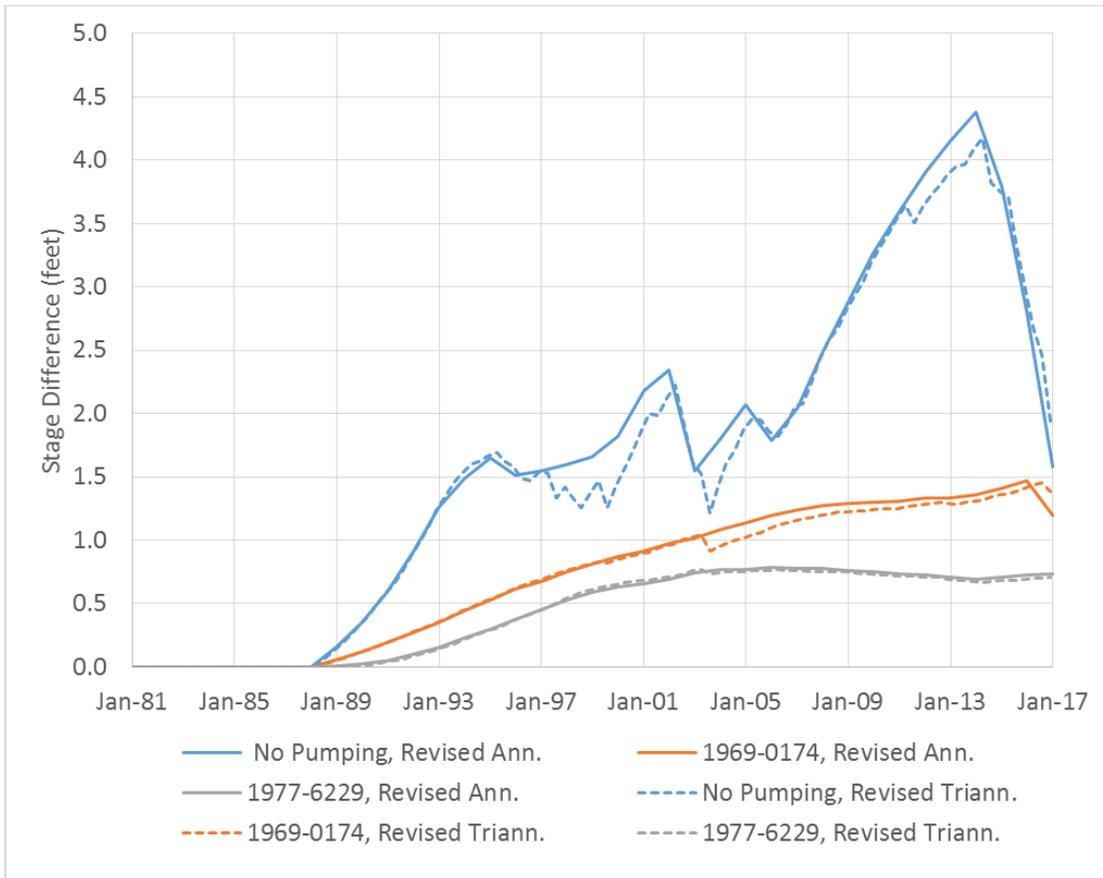


Figure 42 - Computed stage differences for White Bear Lake for selected Scenario 1 permit shut-off scenarios, annual and triannual models