

APPENDIX VI

ELECTRONIC ONLY (CD ATTACHED)

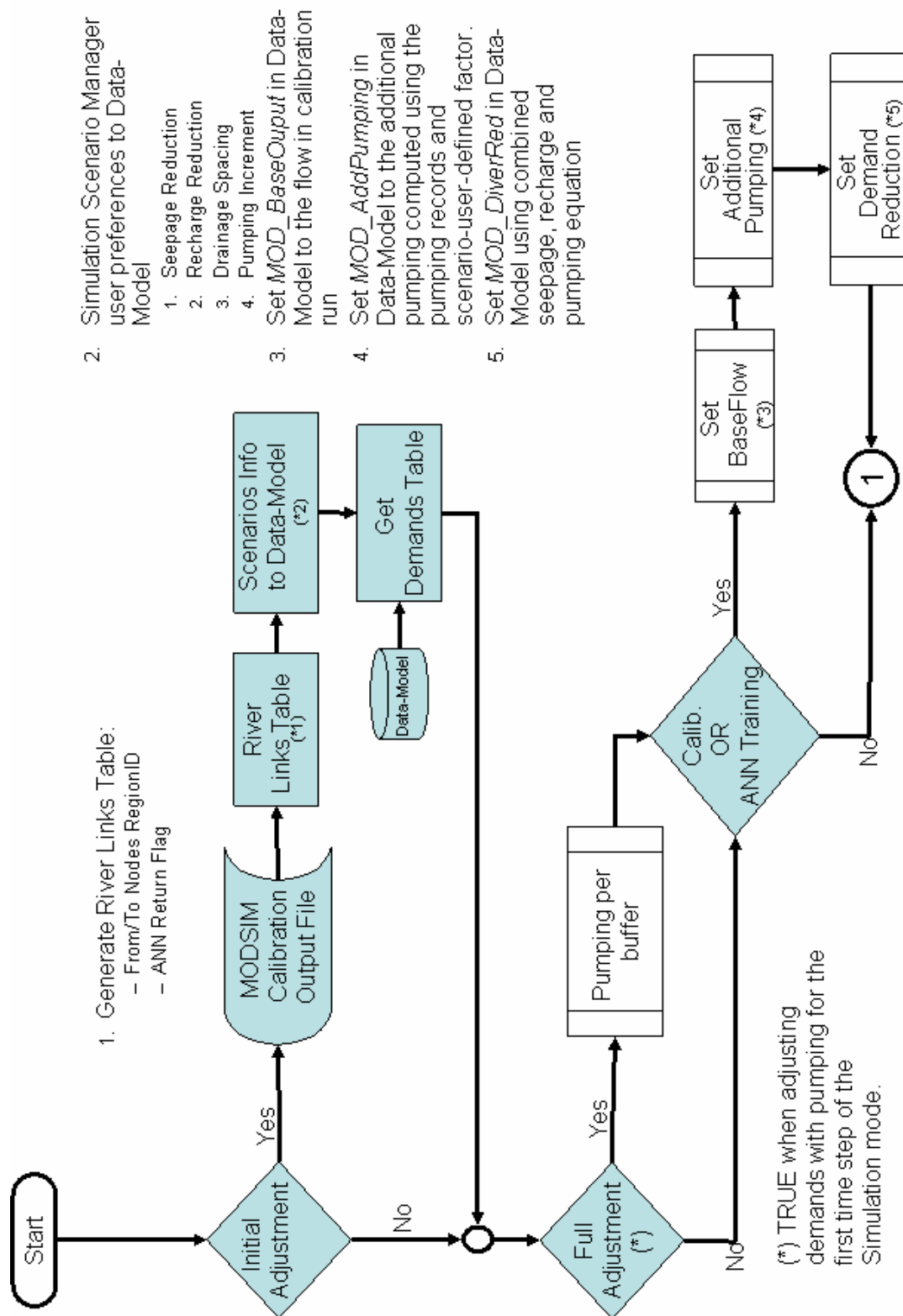
MODELING SALINITY AND WATERLOGGING MANAGEMENT ALTERNATIVES IN THE LOWER ARKANSAS RIVER BASIN

This appendix presents detailed procedures and results in modeling the salinity and waterlogging management alternatives in the *LAR GeoDSS*.

MANAGEMENT ALTERNATIVE DEMAND REDUCTION

The modeling of salinity and waterlogging remediation strategies at basin scale requires the adjustment of the water demand at the diversion points. The adjustment of the demand is a key aspect in the basin scale modeling because the management alternatives implementation should guarantee that is in compliance with the water rights and river compact and nobody is negatively affected by the measures.

The demand reduction takes place in several instances of the modeling: (1) ANN training dataset generation, and (2) at the beginning of the Geo-MODSIM simulation. The following flow charts show the steps for the *LAR GeoDSS* demands adjustment implementation.



MANAGEMENT ALTERNATIVES DETAILED ANALYSIS

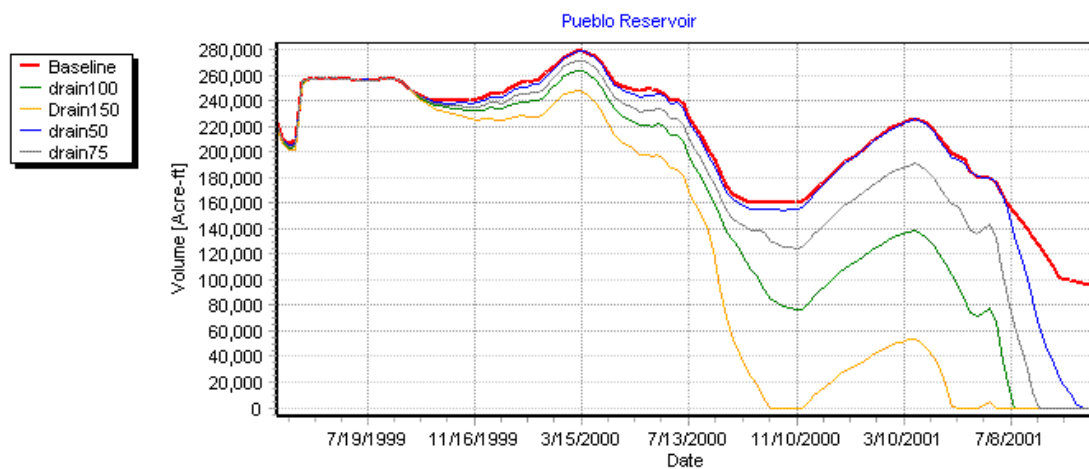
This section presents time series plots of the system-wide simulation performance elements (totals per time step). The plots include diverted water, average diversion concentration, water demand shortage, computed canal seepage, stream-aquifer interaction summary and flow and concentration to Kansas. The plots are grouped by type of alternative with special groups for alternatives combinations. The results are presented for both reservoir operational mode A and B.

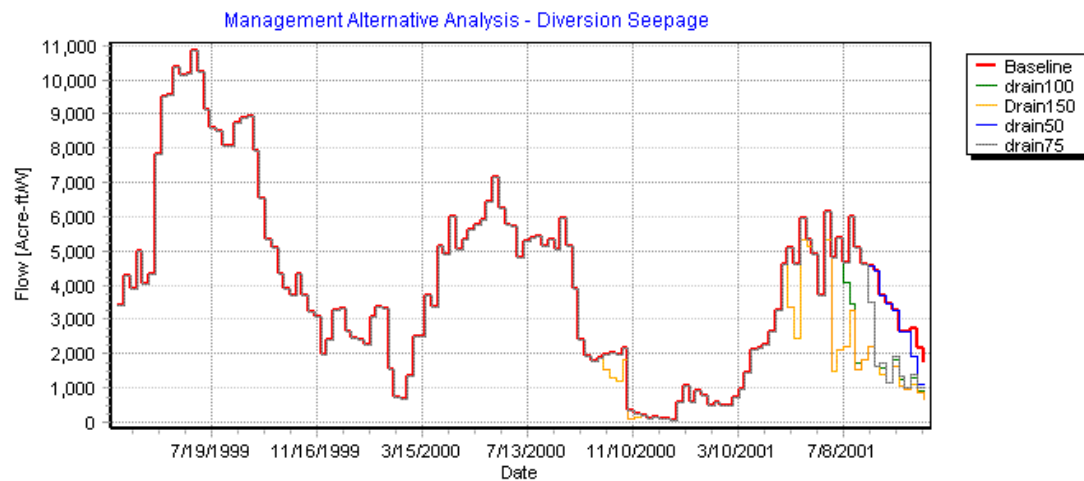
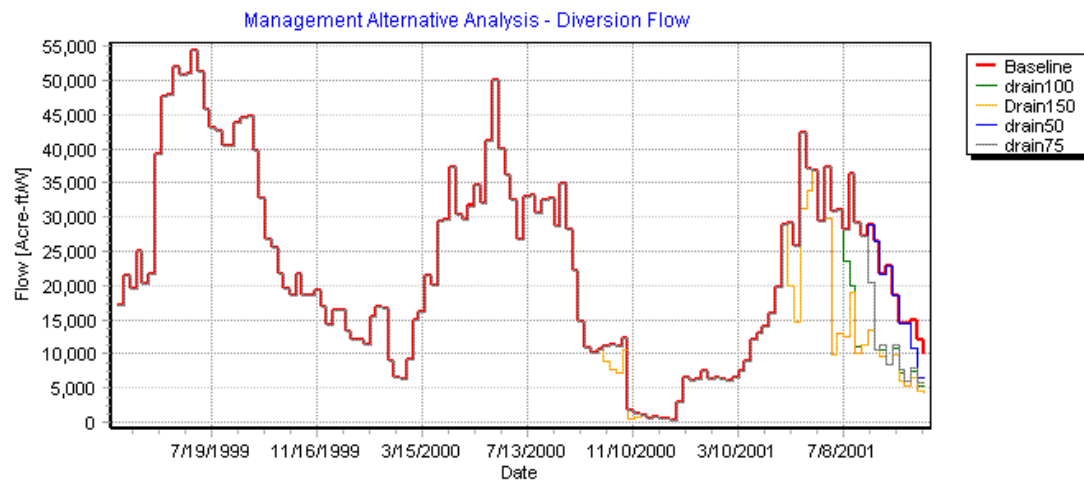
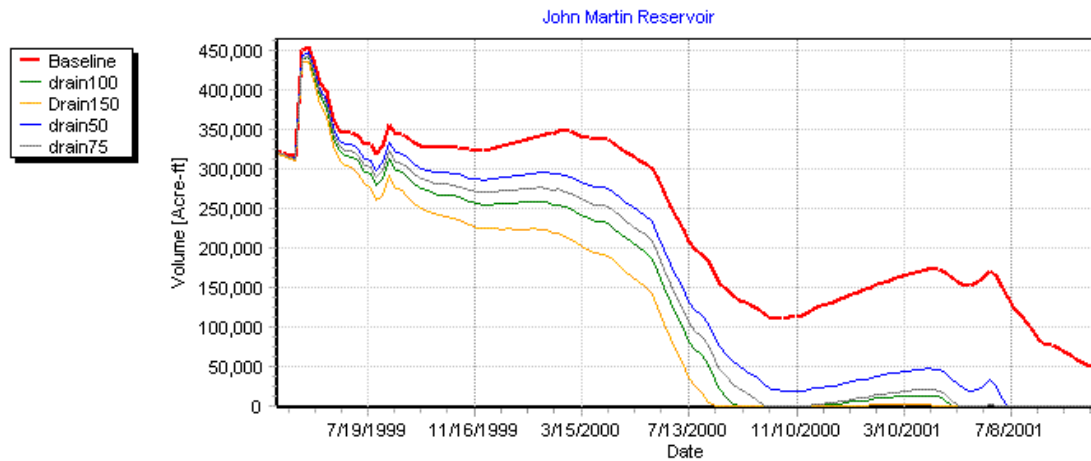
Reservoir Operational mode A

The following results correspond to the reservoir operational mode A.

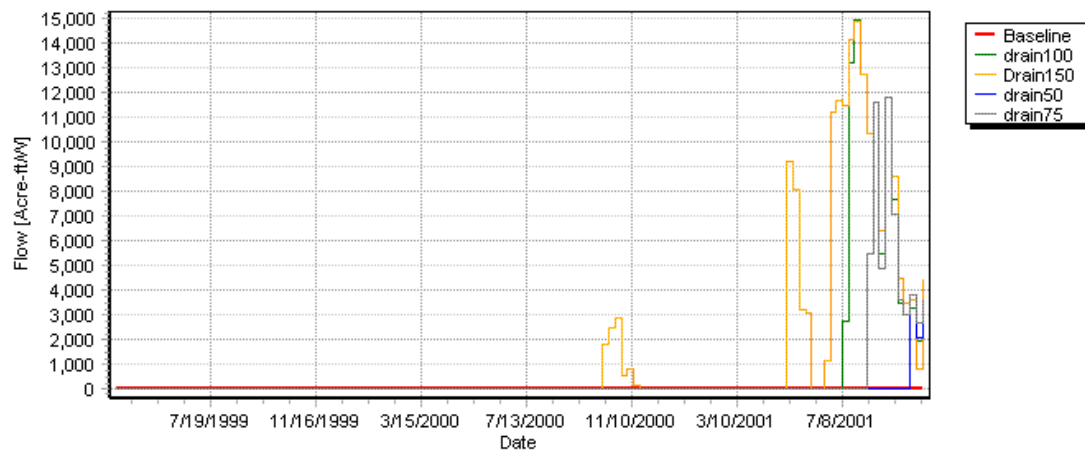
Drainage Improvement Alternatives

The first group of plots corresponds to alternatives with different degrees of drainage improvements. The reservoir storage plots shows water “borrowed” from the reservoir never recovers making these alternatives infeasible under the current modeling conditions.

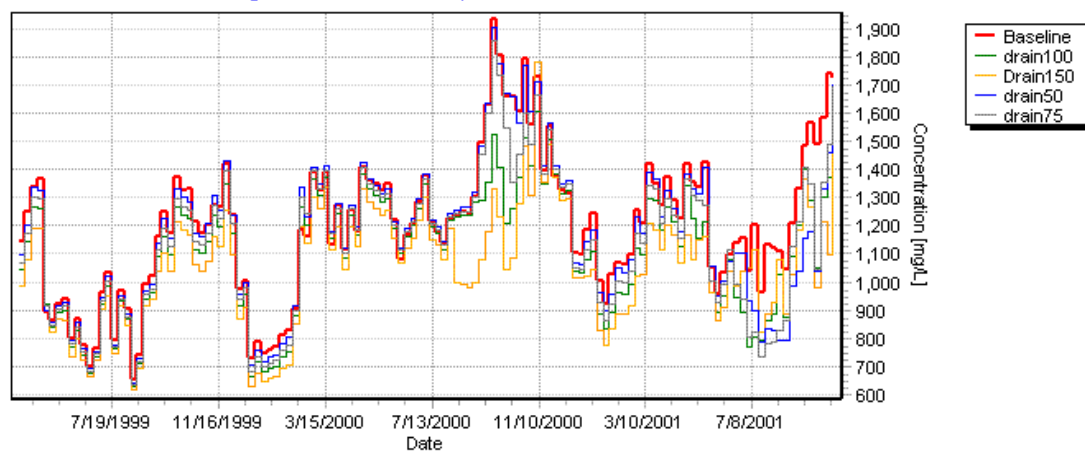




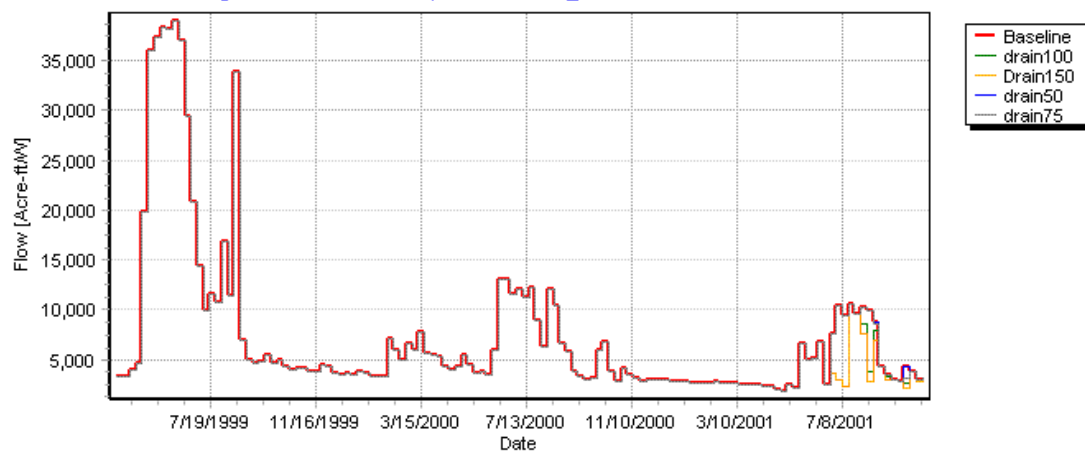
Management Alternative Analysis - Diversion Shortage



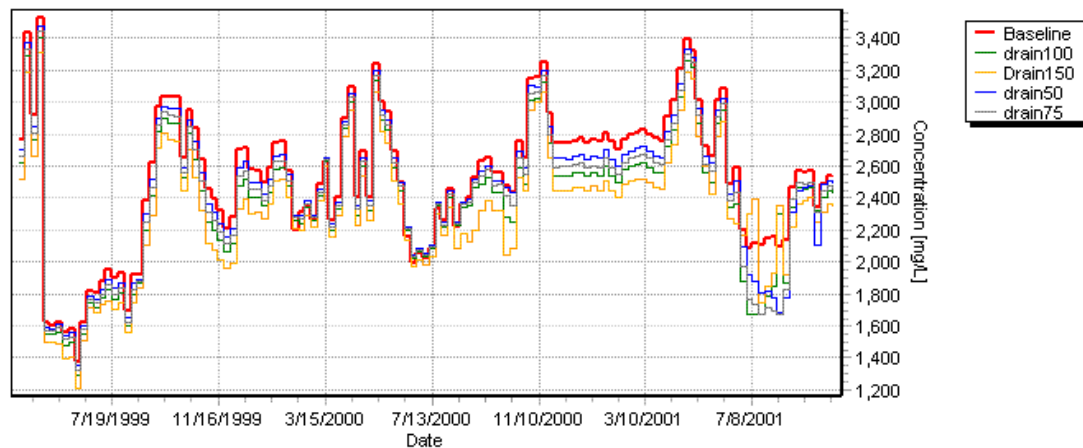
Management Alternative Analysis - Diversion Concentration



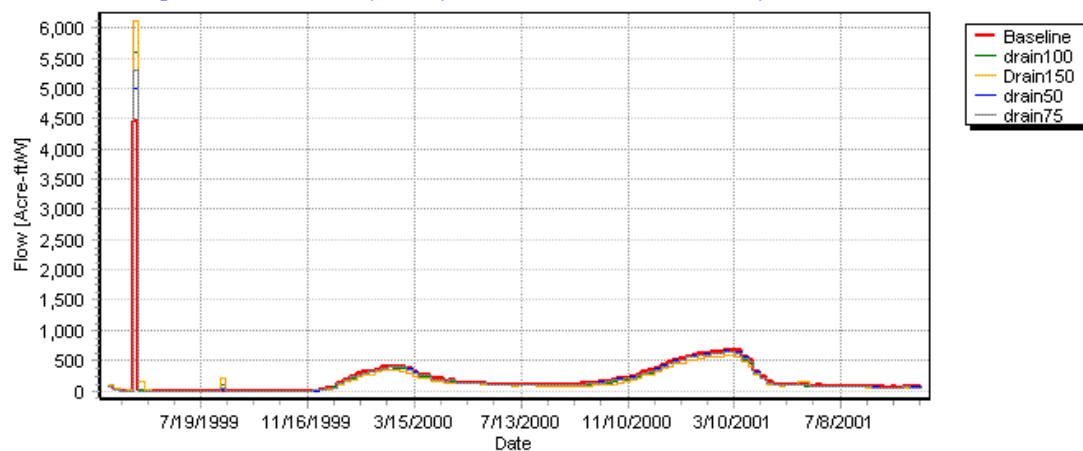
Management Alternative Analysis - Colorado_Kansas Border Flow



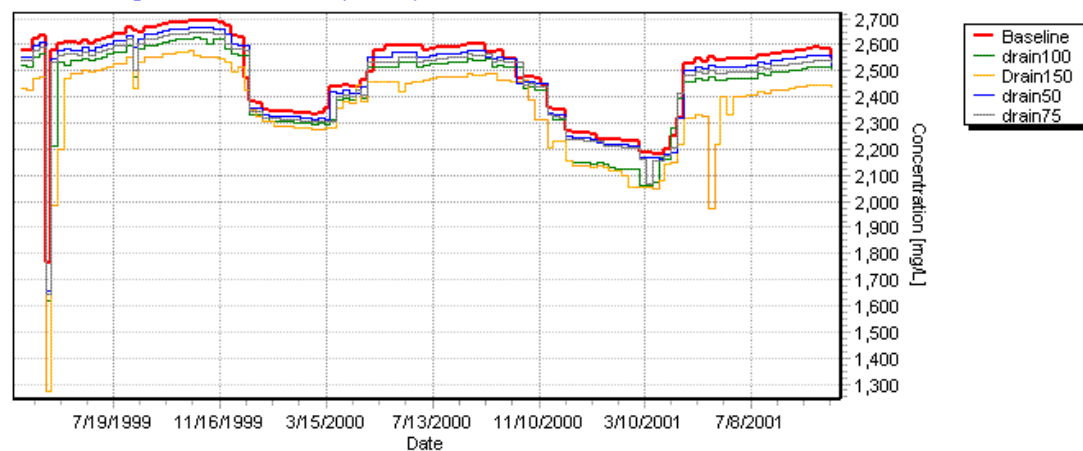
Management Alternative Analysis - Colorado_Kansas Border Concentration

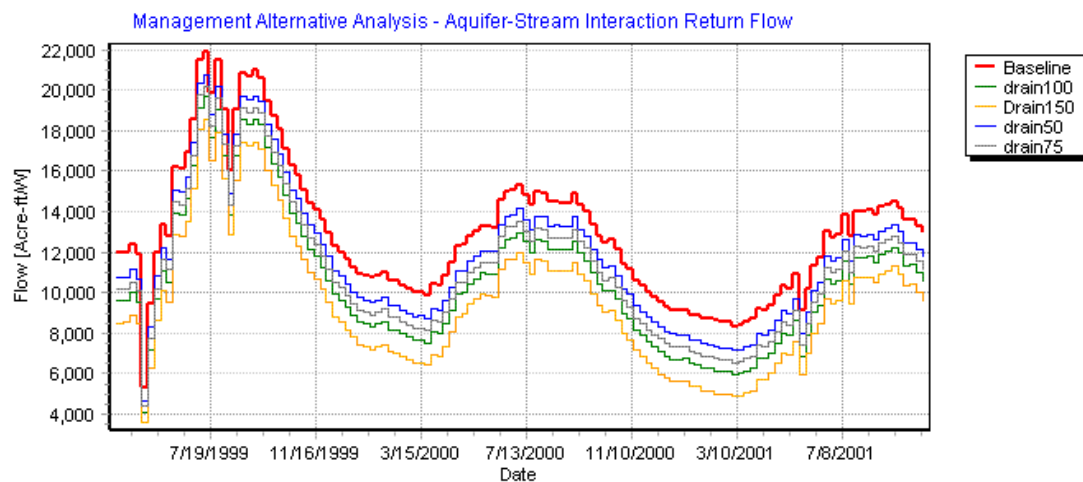


Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion



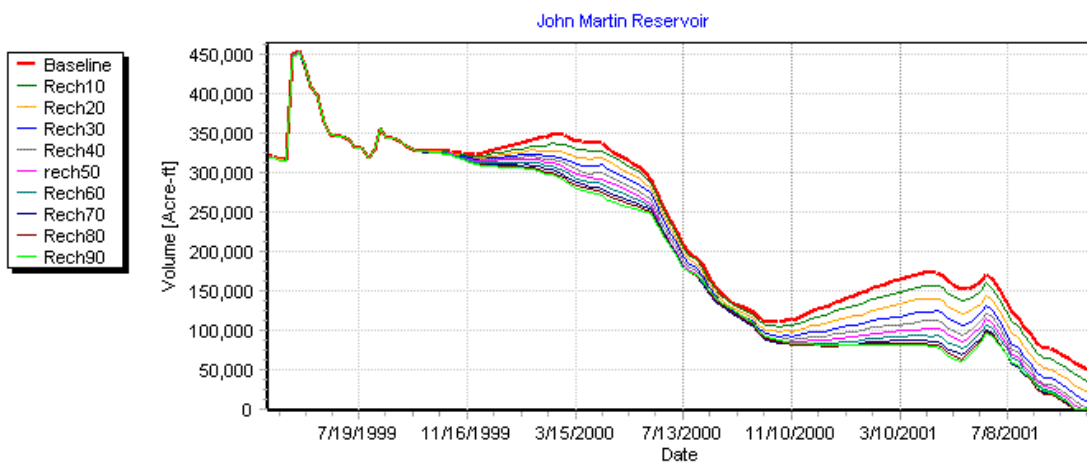
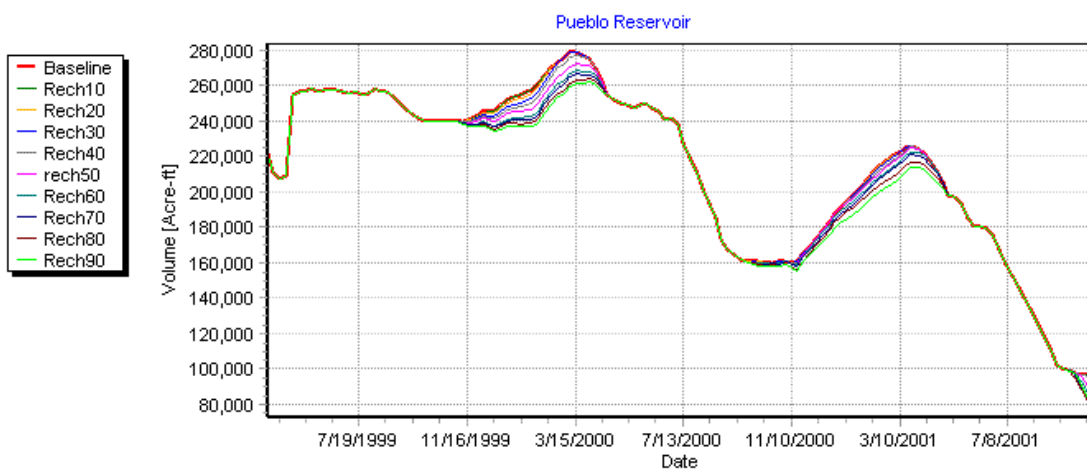
Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration



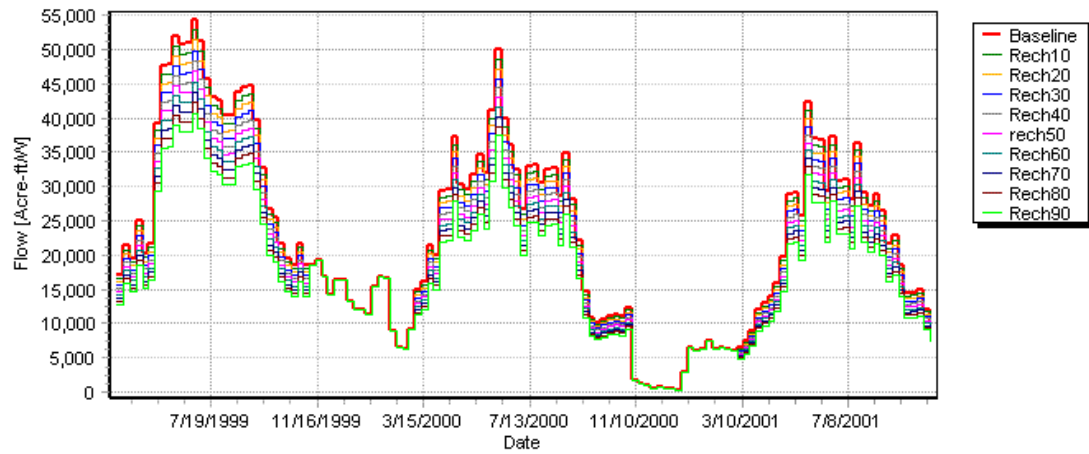


Recharge Reduction Alternatives

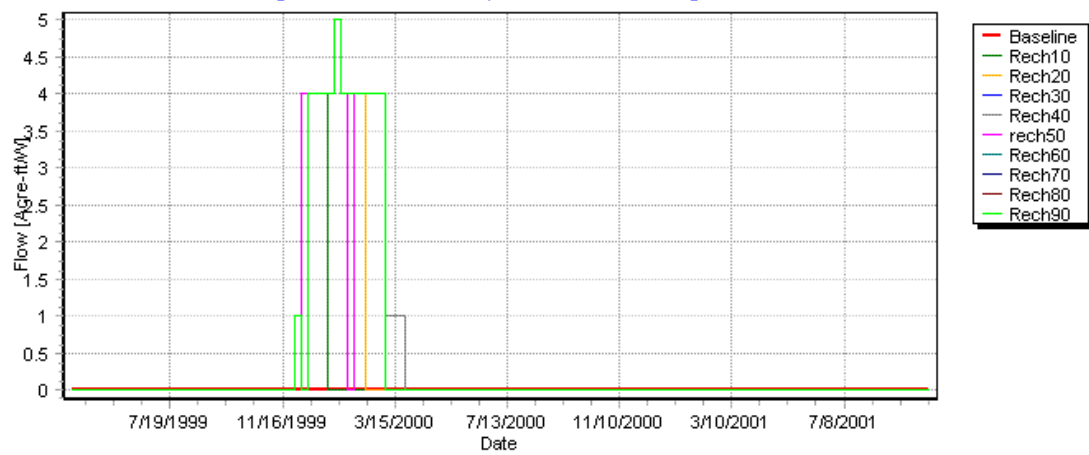
The following results group alternatives that include aquifer recharge reduction.



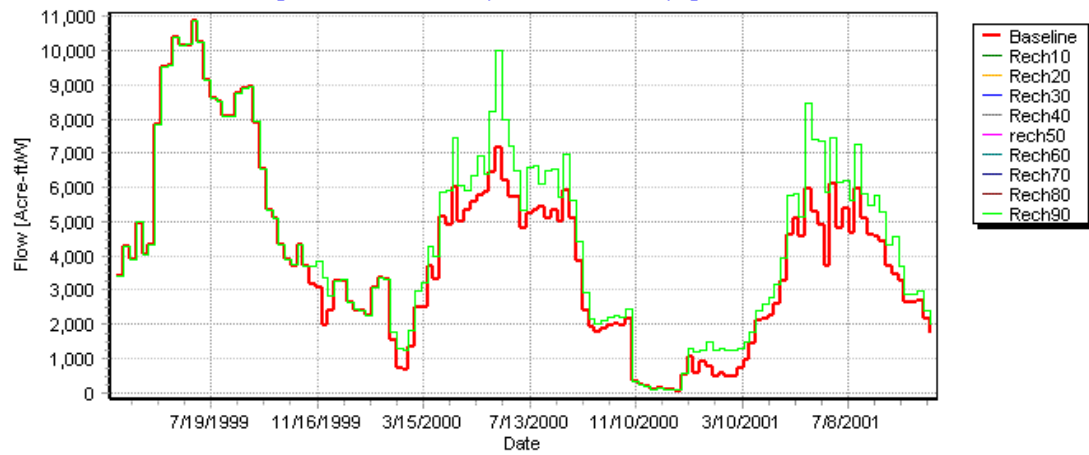
Management Alternative Analysis - Diversion Flow



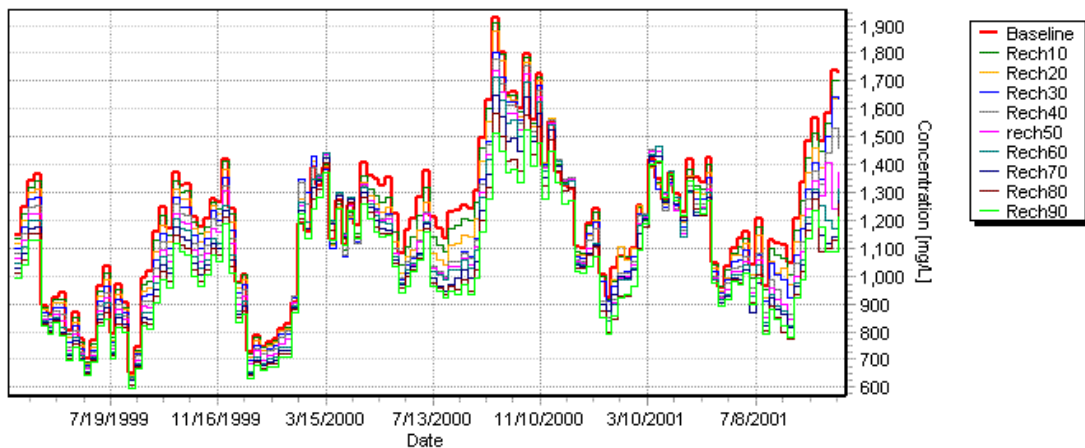
Management Alternative Analysis - Diversion Shortage



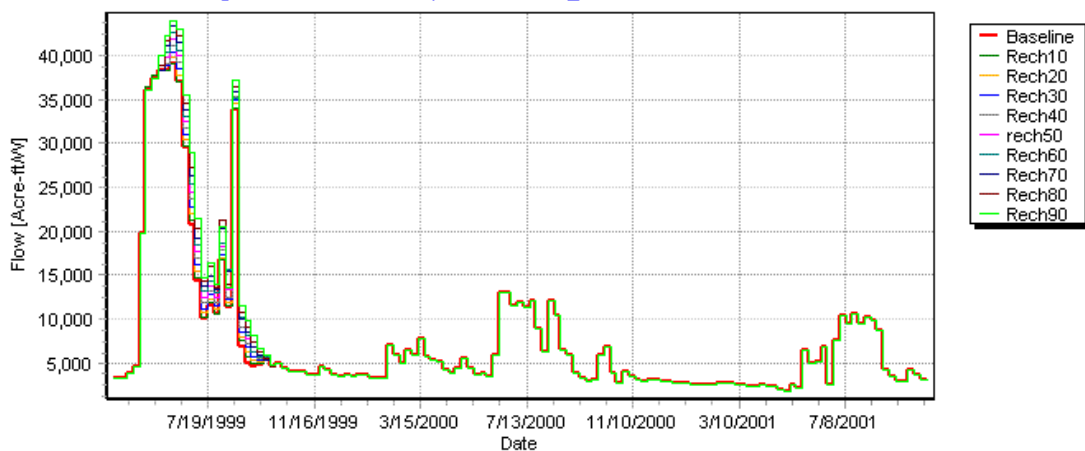
Management Alternative Analysis - Diversion Seepage



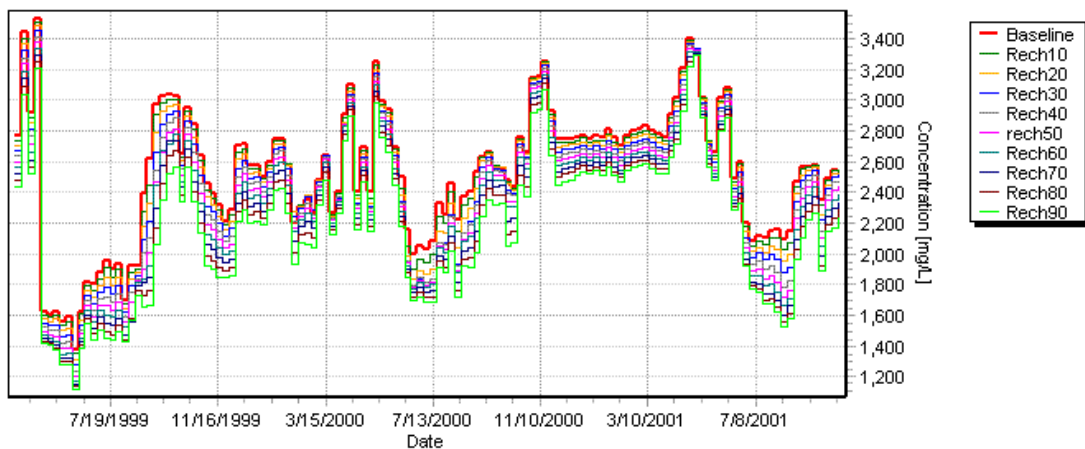
Management Alternative Analysis - Diversion Concentration



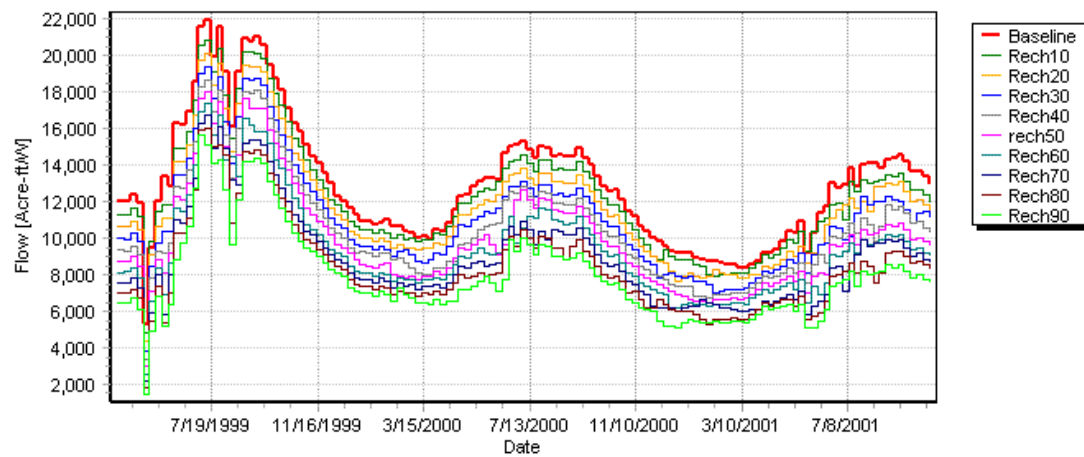
Management Alternative Analysis - Colorado_Kansas Border Flow



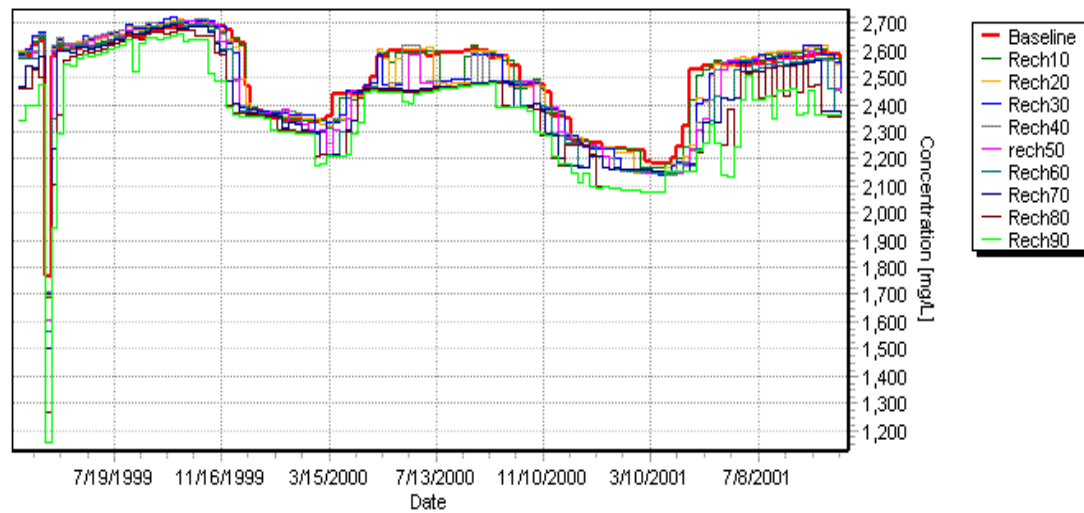
Management Alternative Analysis - Colorado_Kansas Border Concentration



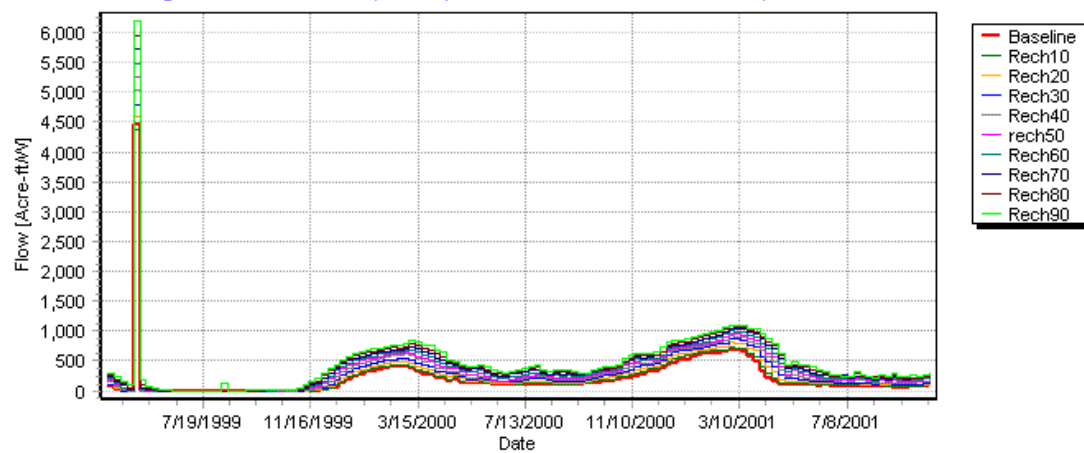
Management Alternative Analysis - Aquifer-Stream Interaction Return Flow



Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration

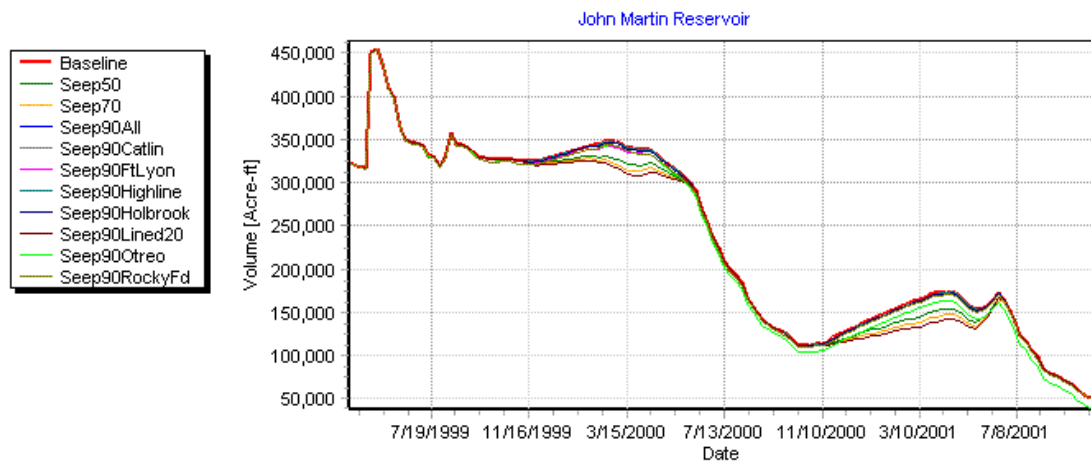
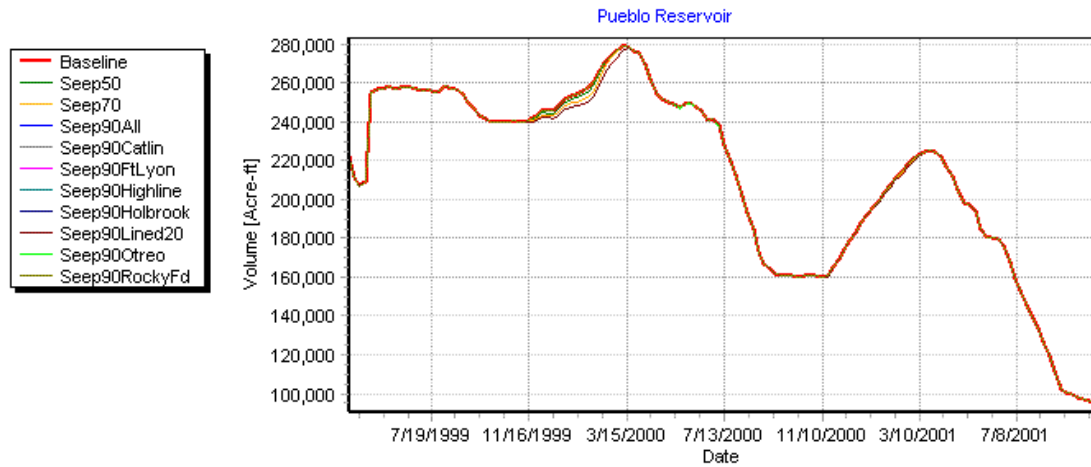


Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion

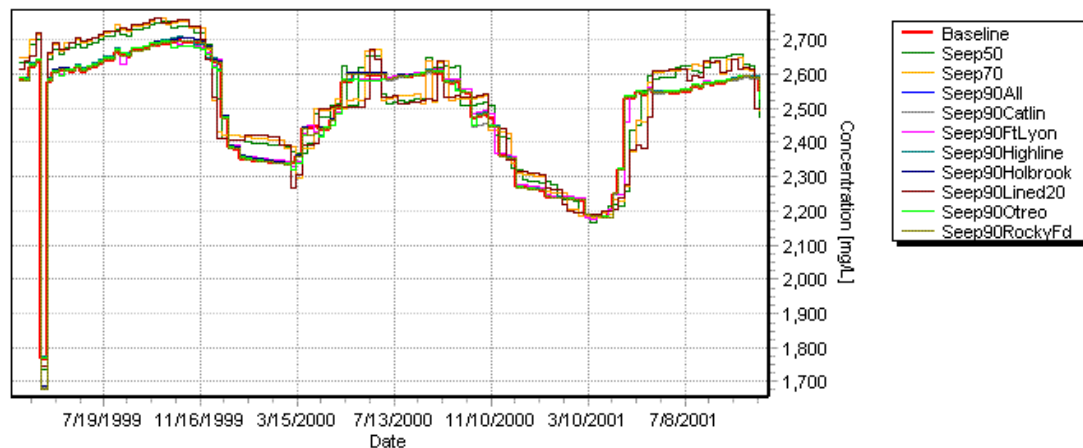


Seepage Reduction Alternatives

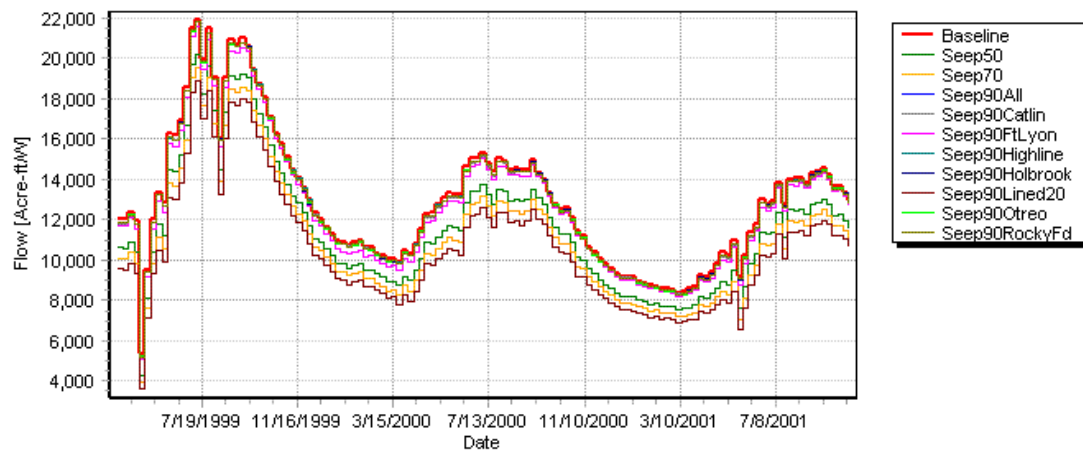
The following results correspond to alternatives involving seepage reduction



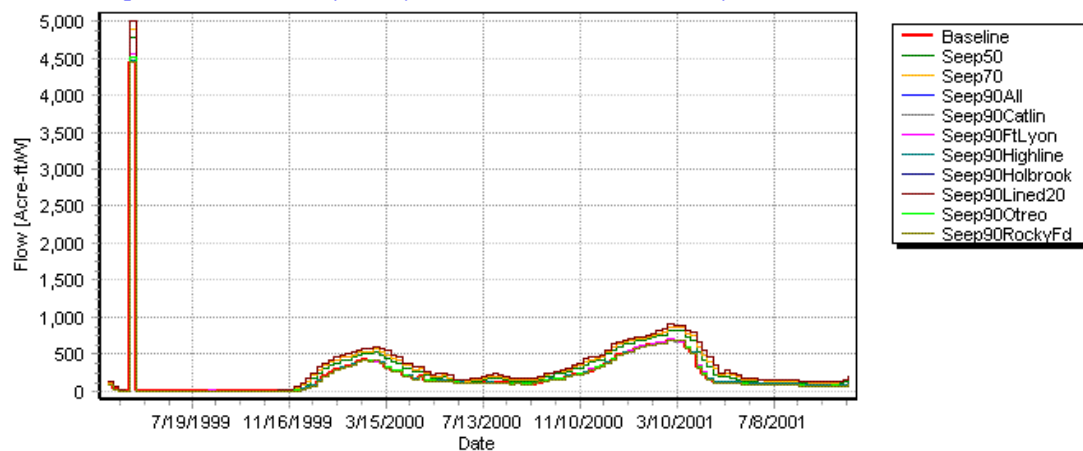
Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration



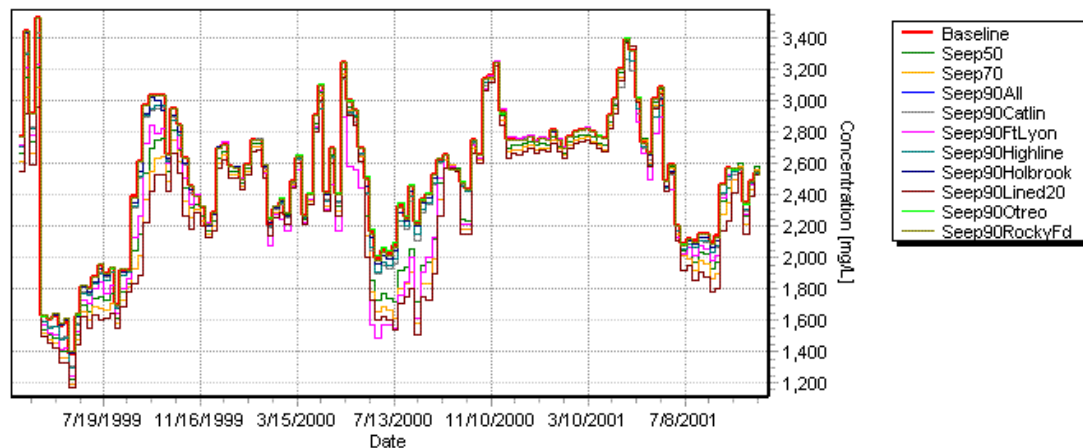
Management Alternative Analysis - Aquifer-Stream Interaction Return Flow



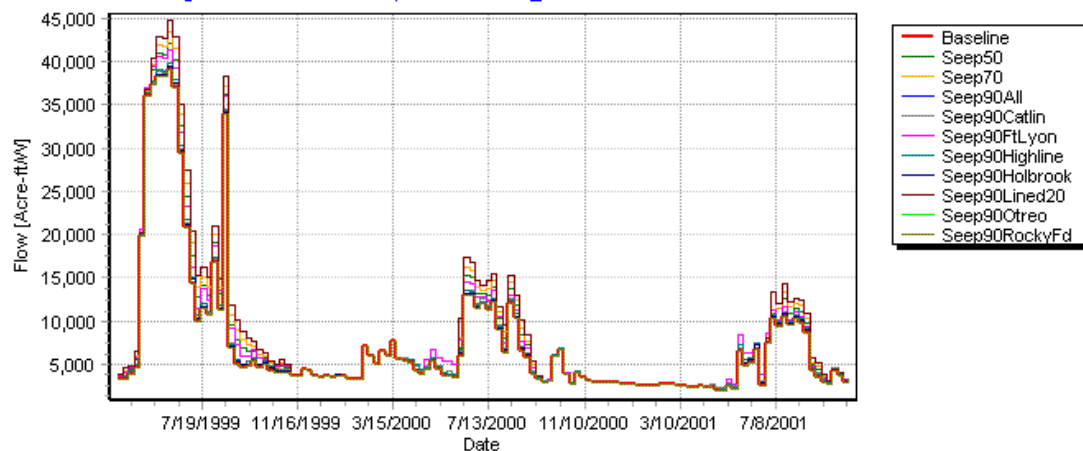
Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion



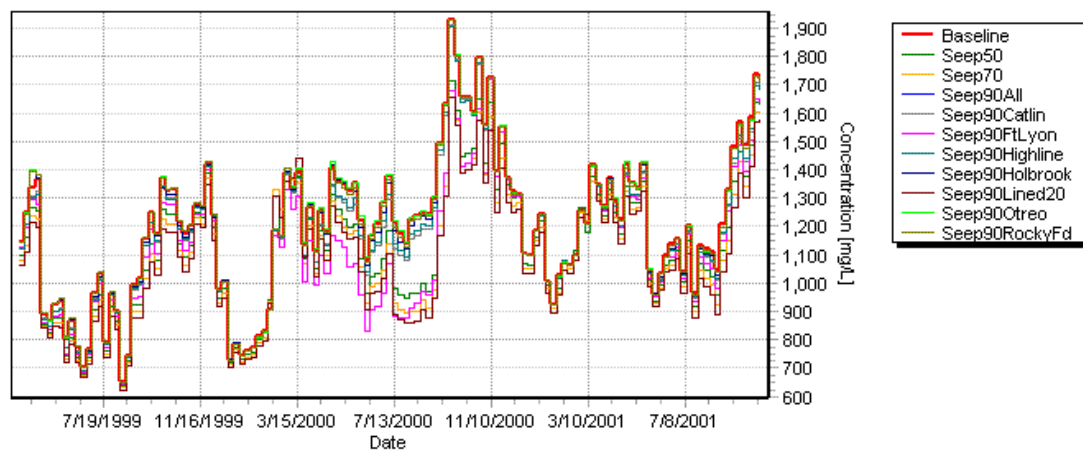
Management Alternative Analysis - Colorado_Kansas Border Concentration



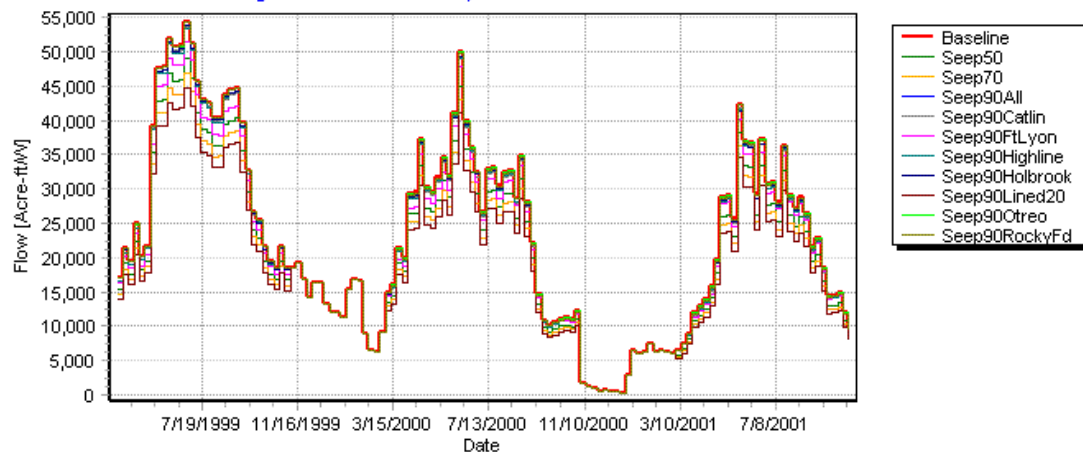
Management Alternative Analysis - Colorado_Kansas Border Flow



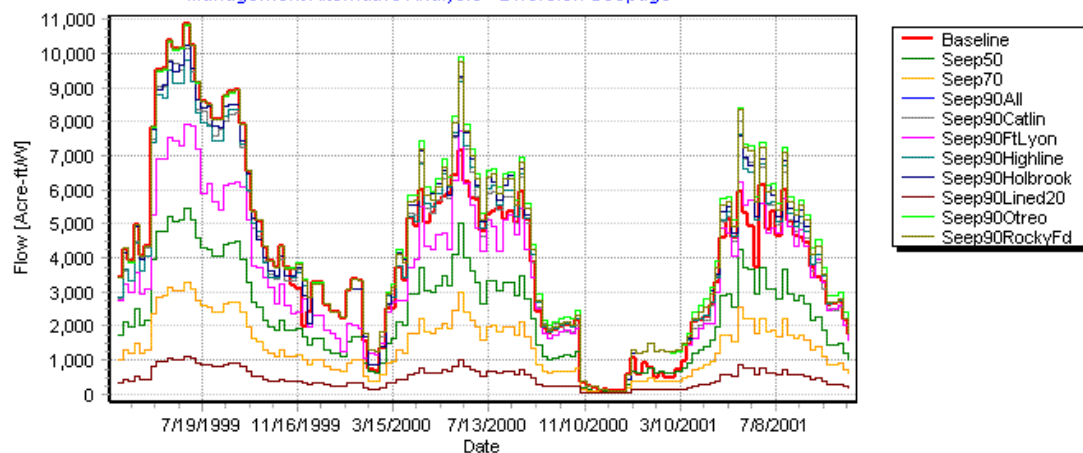
Management Alternative Analysis - Diversion Concentration



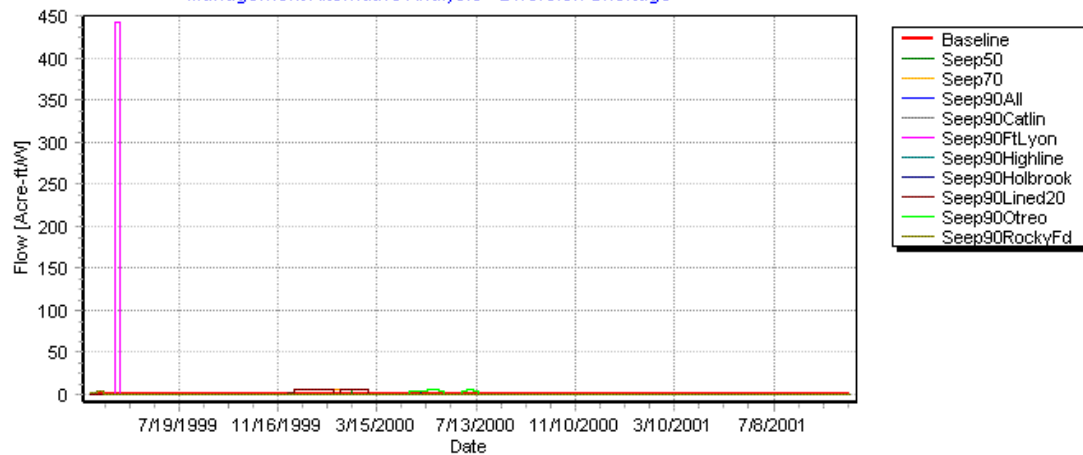
Management Alternative Analysis - Diversion Flow



Management Alternative Analysis - Diversion Seepage

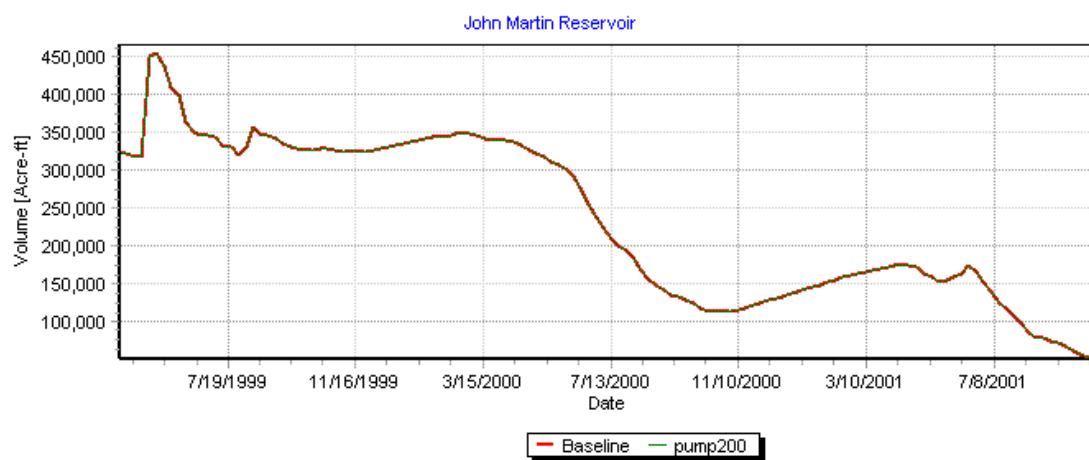
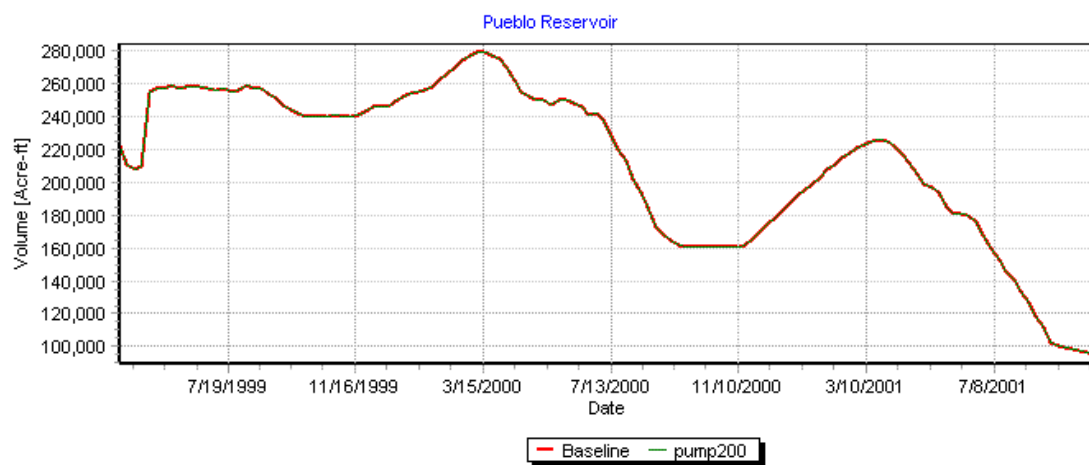


Management Alternative Analysis - Diversion Shortage

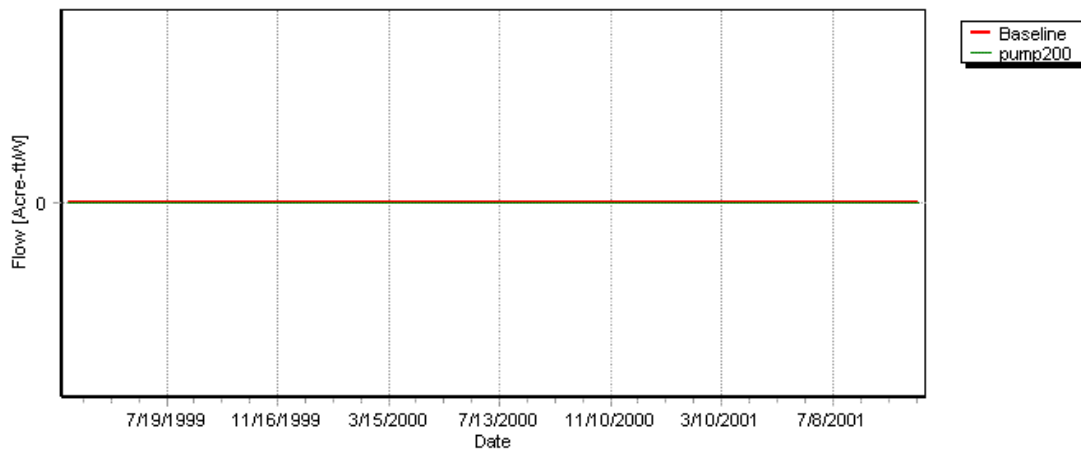


Vertical Drainage Management Alternative

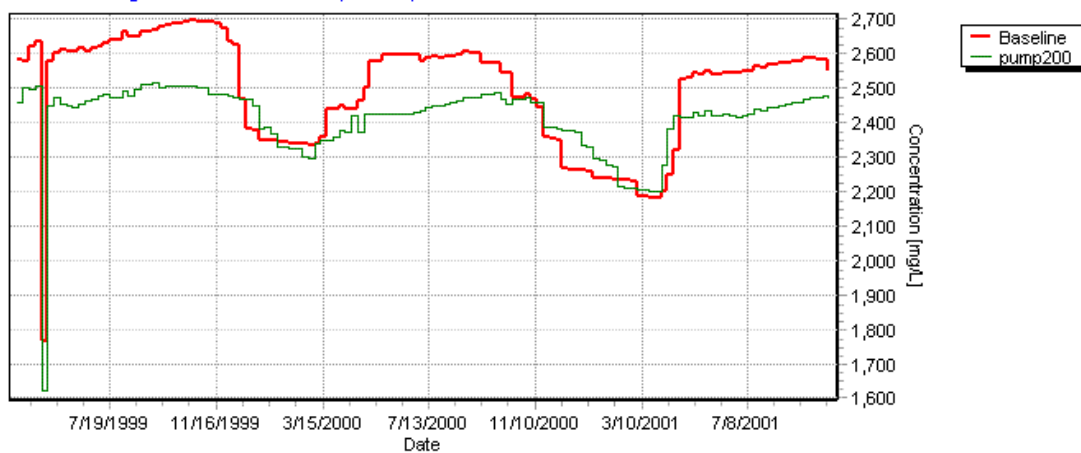
These plots summarize the vertical drainage management alternative simulation



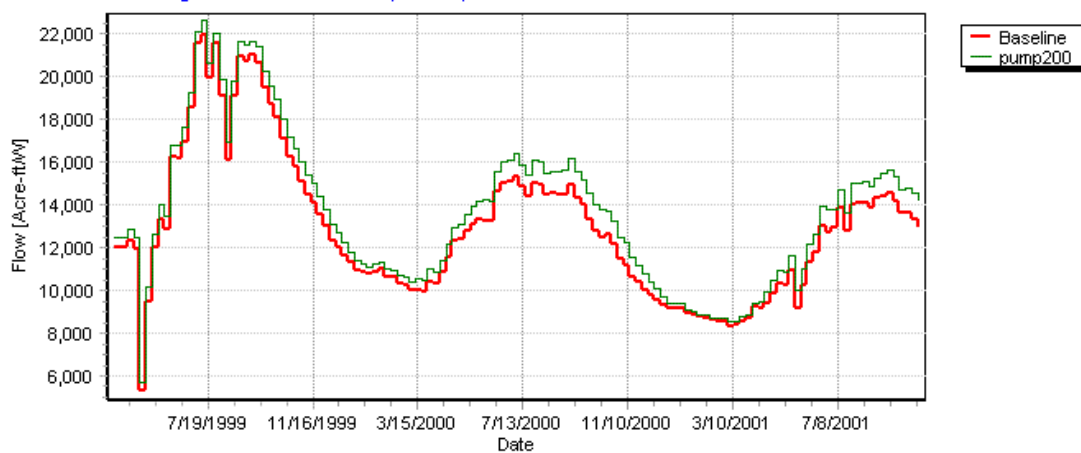
Management Alternative Analysis - Diversion Shortage



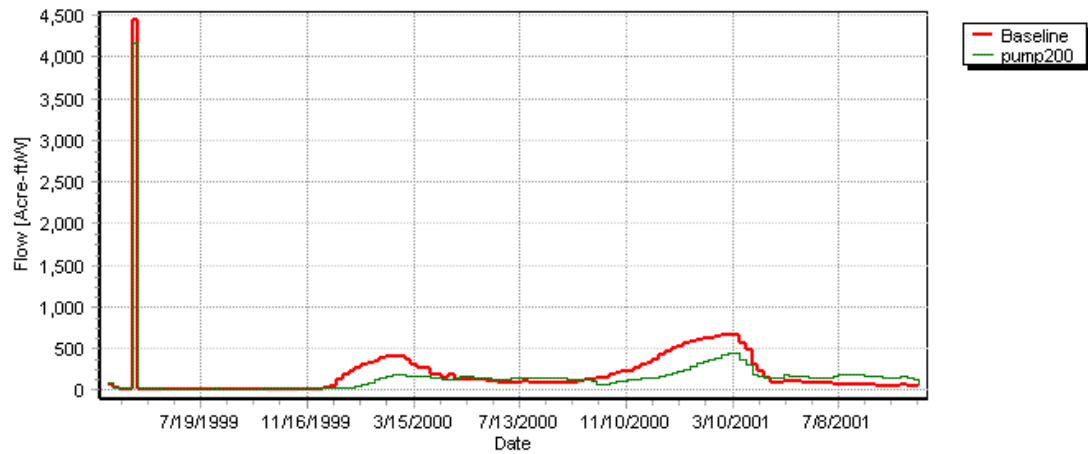
Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration



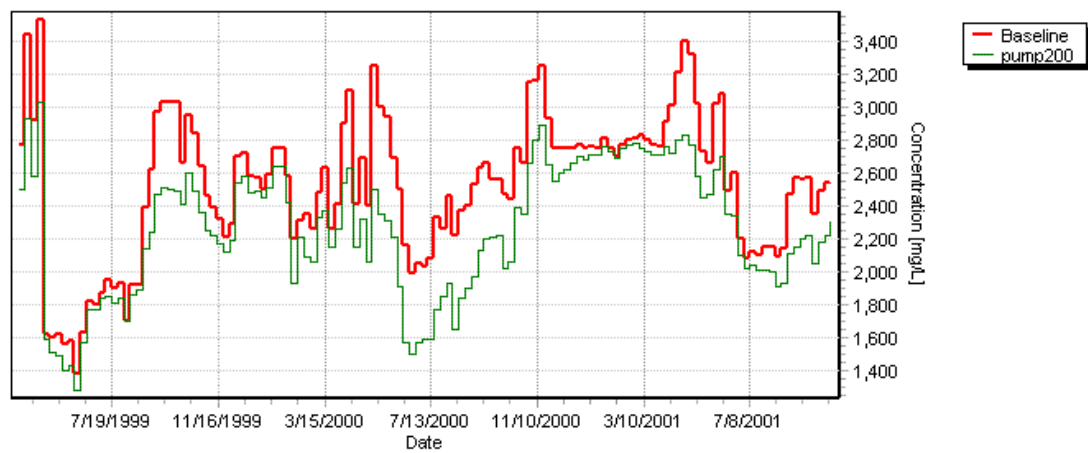
Management Alternative Analysis - Aquifer-Stream Interaction Return Flow



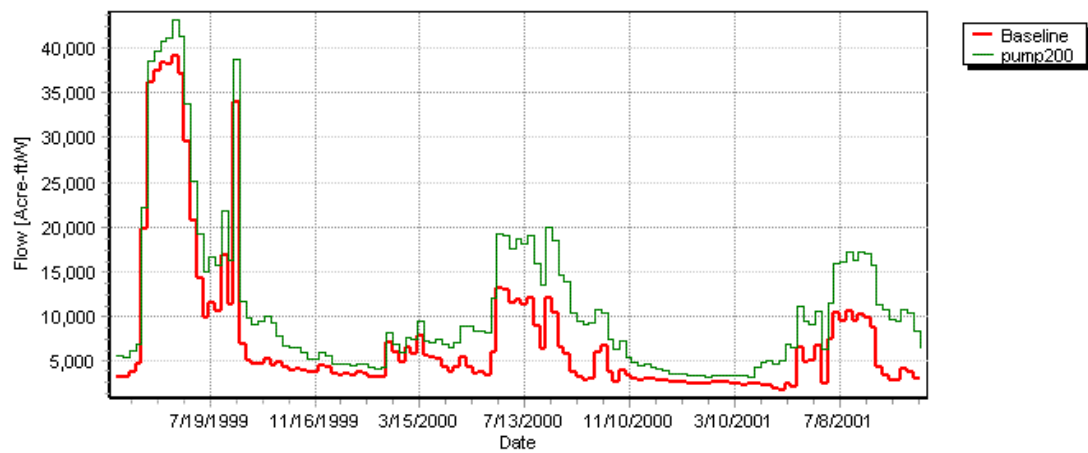
Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion



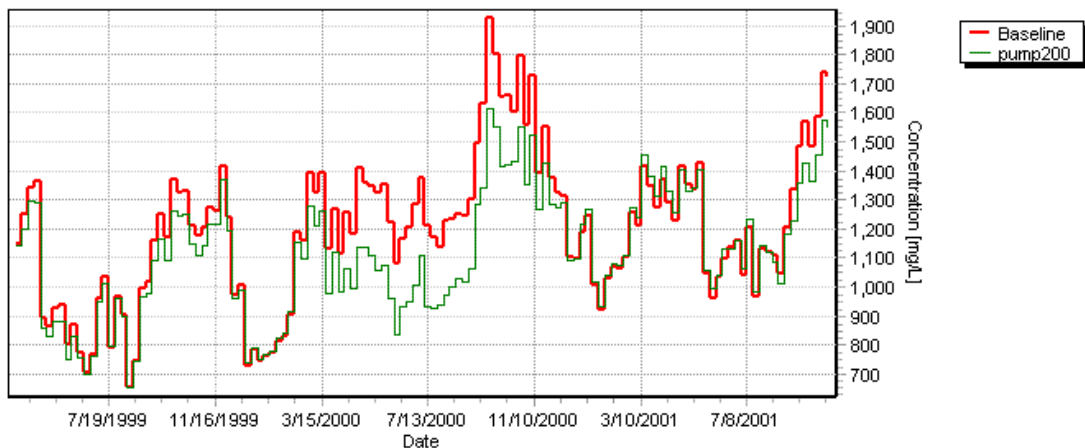
Management Alternative Analysis - Colorado_Kansas Border Concentration



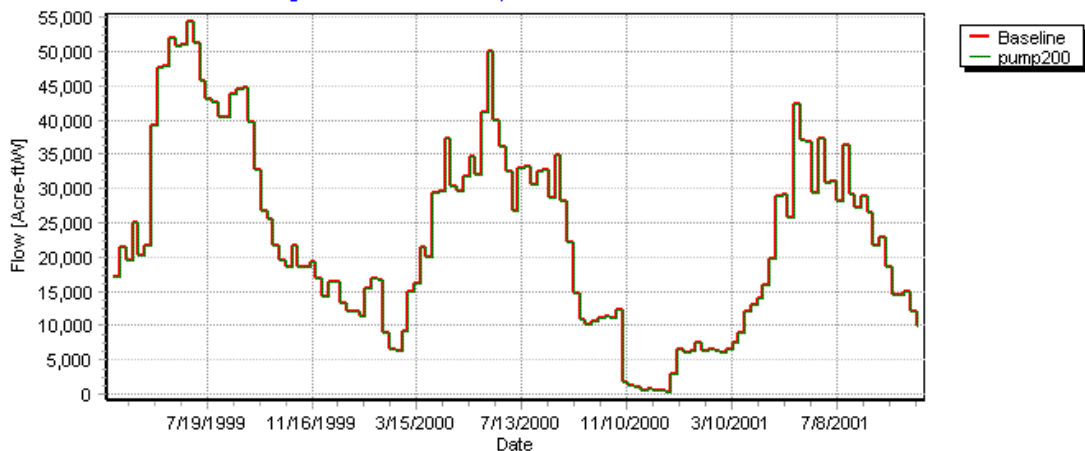
Management Alternative Analysis - Colorado_Kansas Border Flow



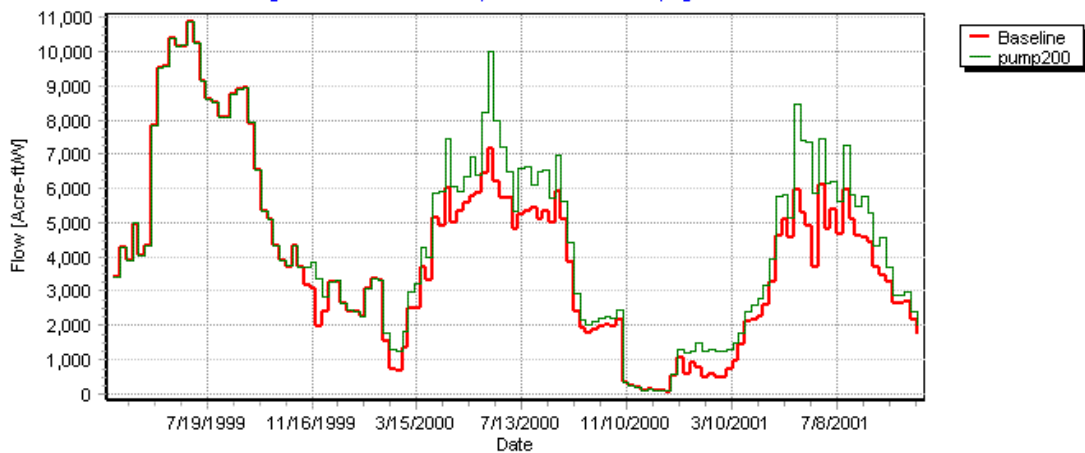
Management Alternative Analysis - Diversion Concentration



Management Alternative Analysis - Diversion Flow

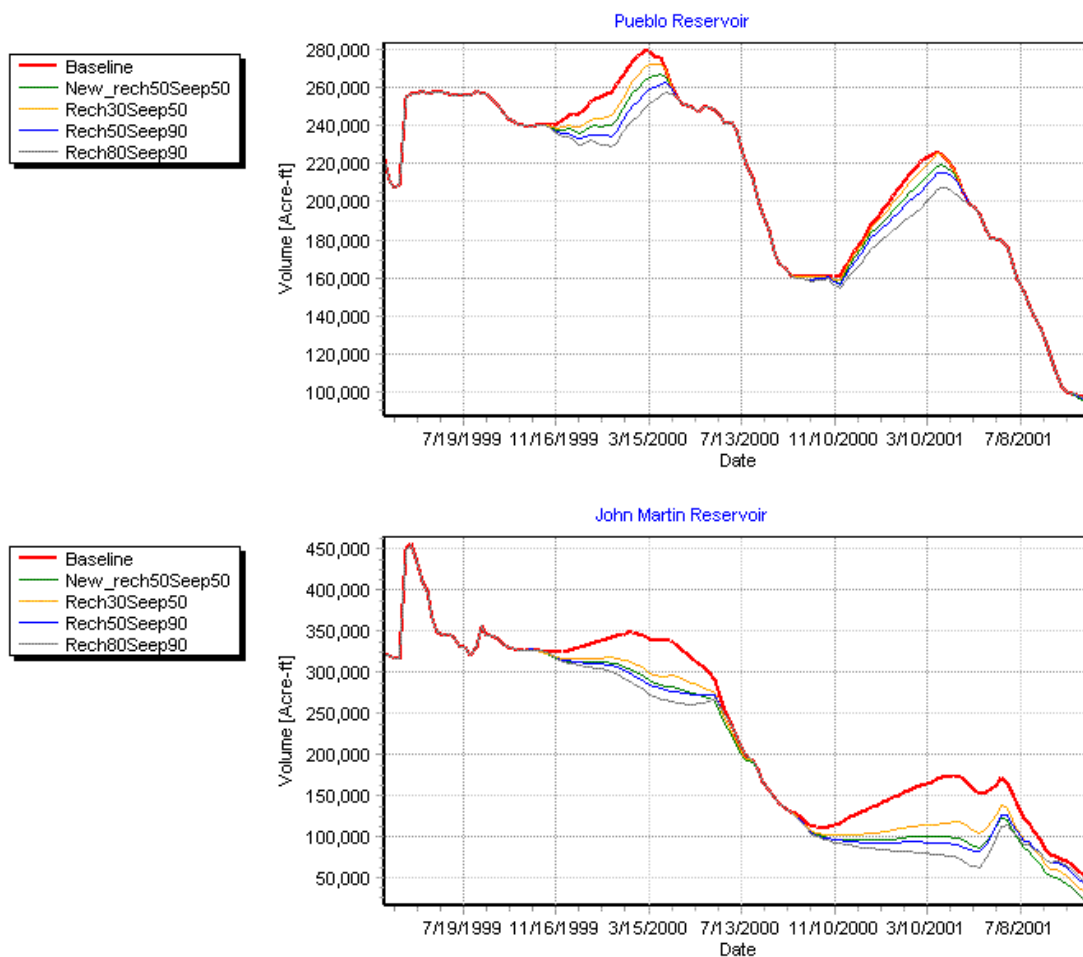


Management Alternative Analysis - Diversion Seepage

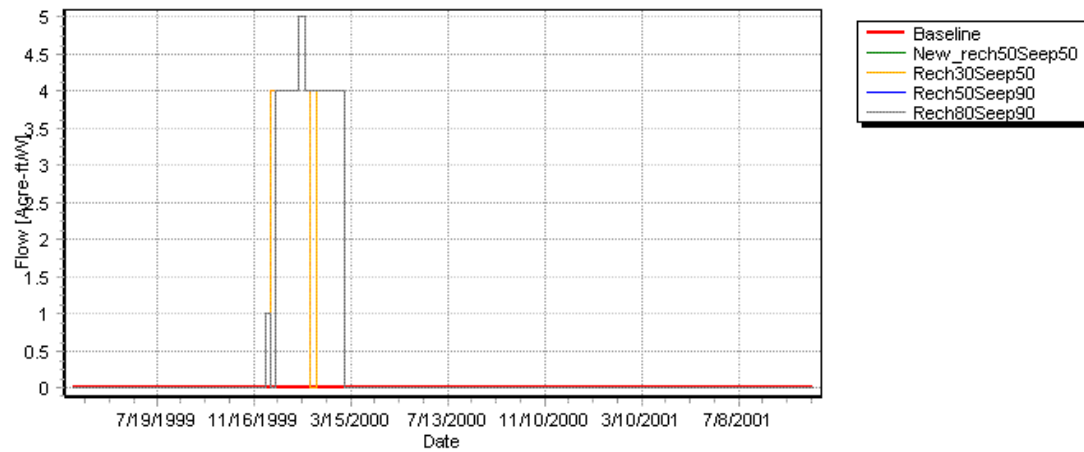


Combined Recharge and Seepage Management Alternatives

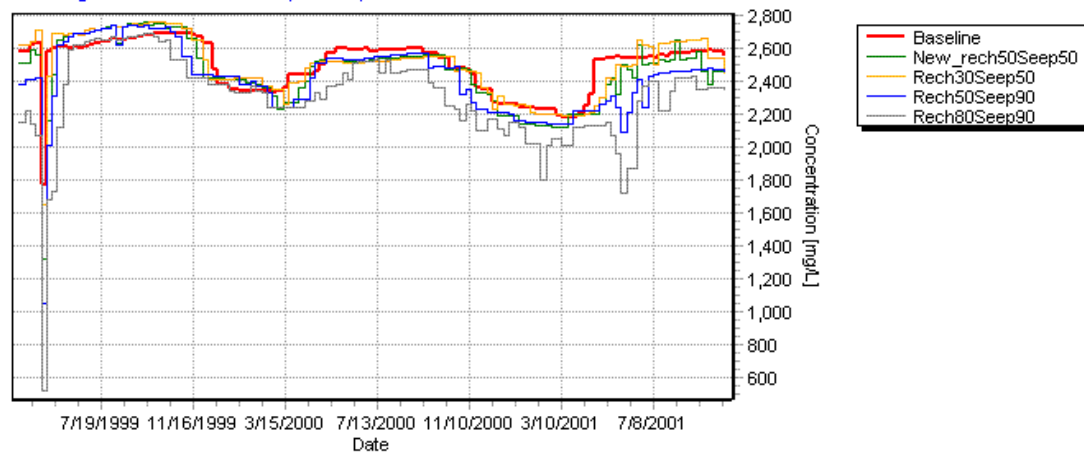
The following results correspond to alternatives with recharge and seepage reduction combined management options.



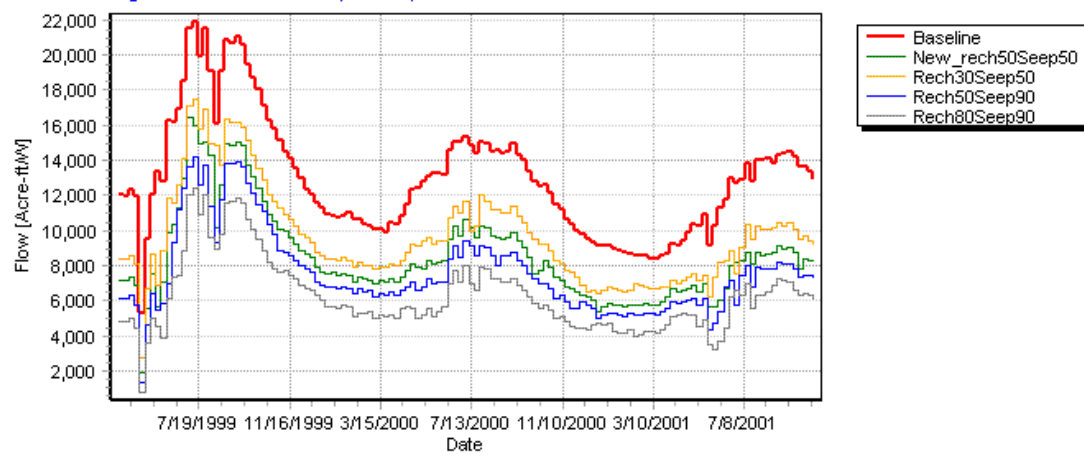
Management Alternative Analysis - Diversion Shortage



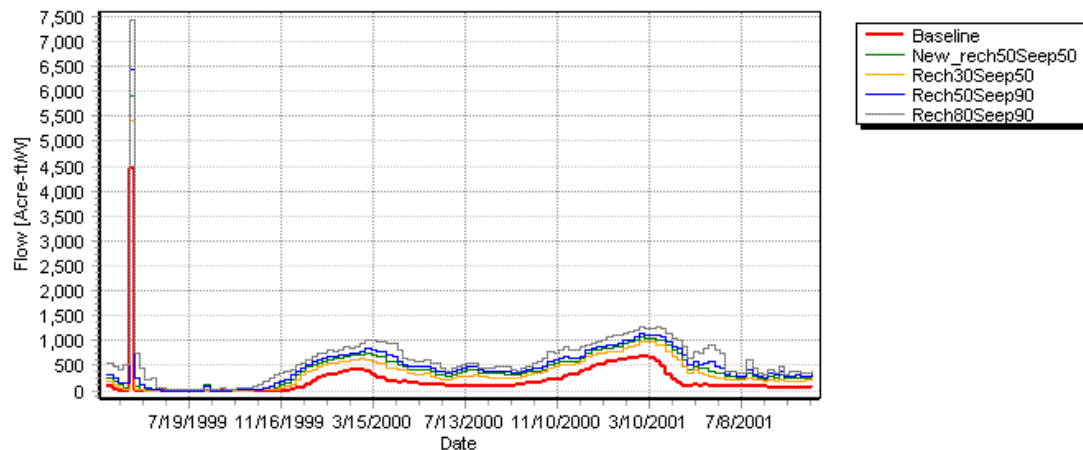
Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration



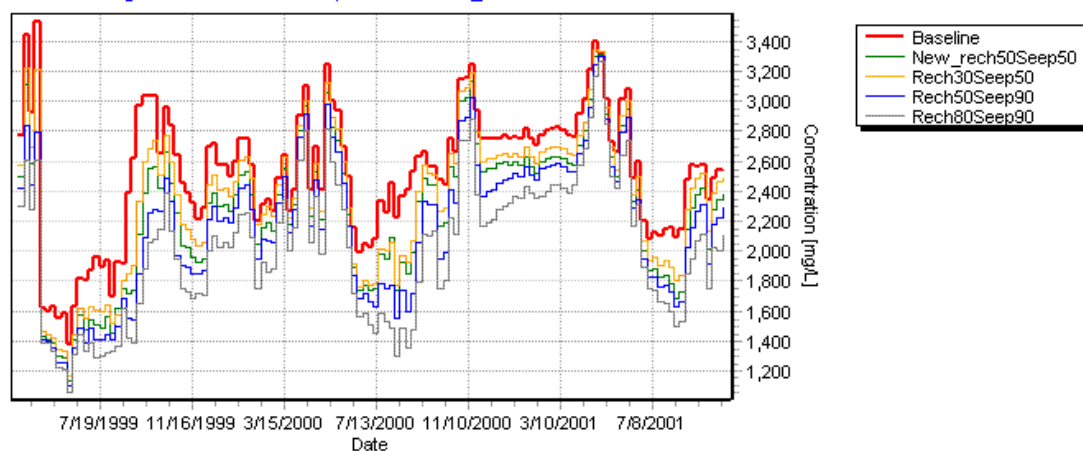
Management Alternative Analysis - Aquifer-Stream Interaction Return Flow



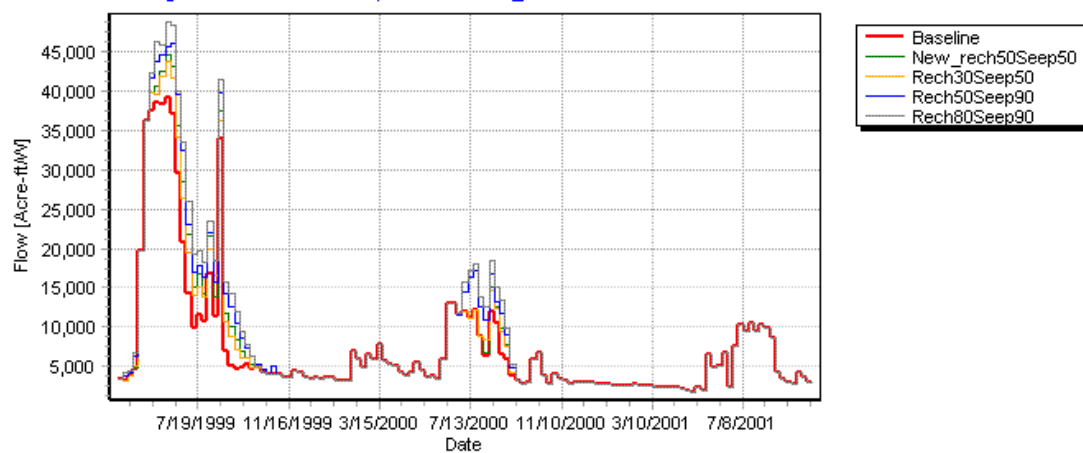
Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion



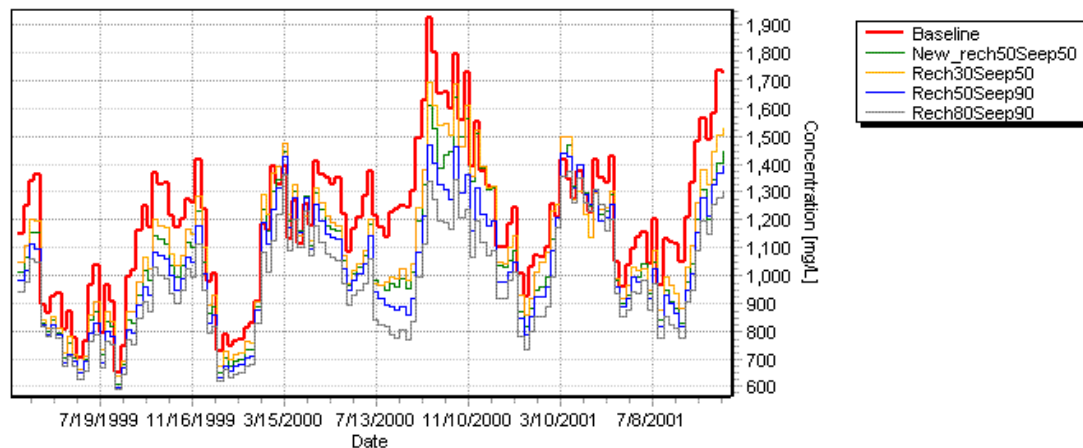
Management Alternative Analysis - Colorado_Kansas Border Concentration



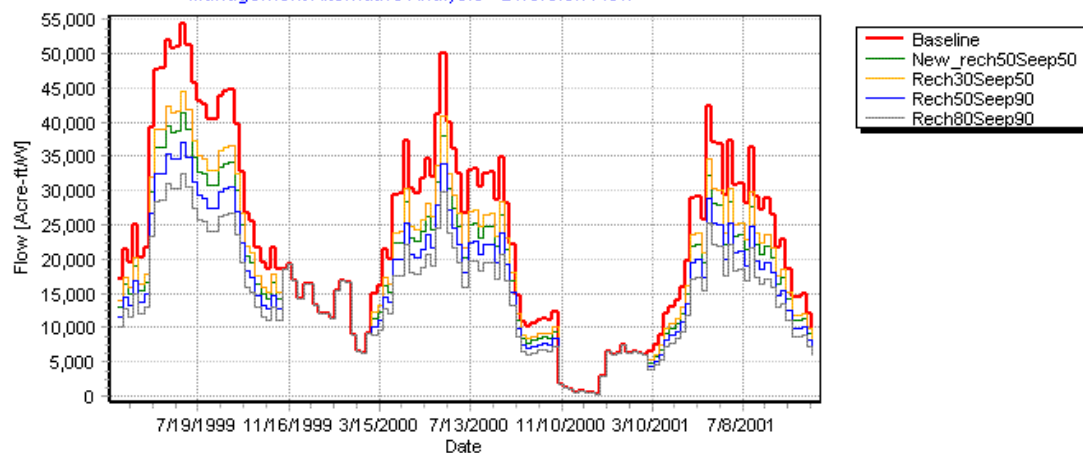
Management Alternative Analysis - Colorado_Kansas Border Flow



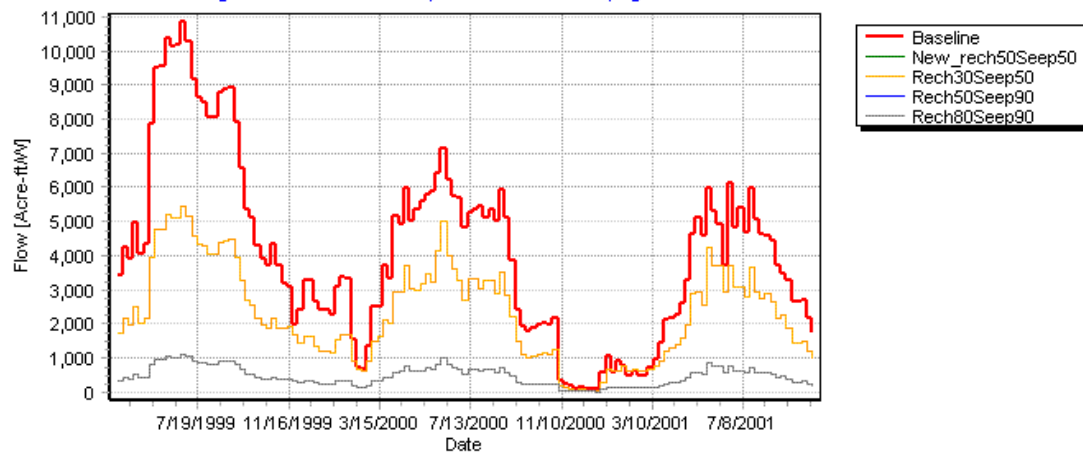
Management Alternative Analysis - Diversion Concentration



Management Alternative Analysis - Diversion Flow

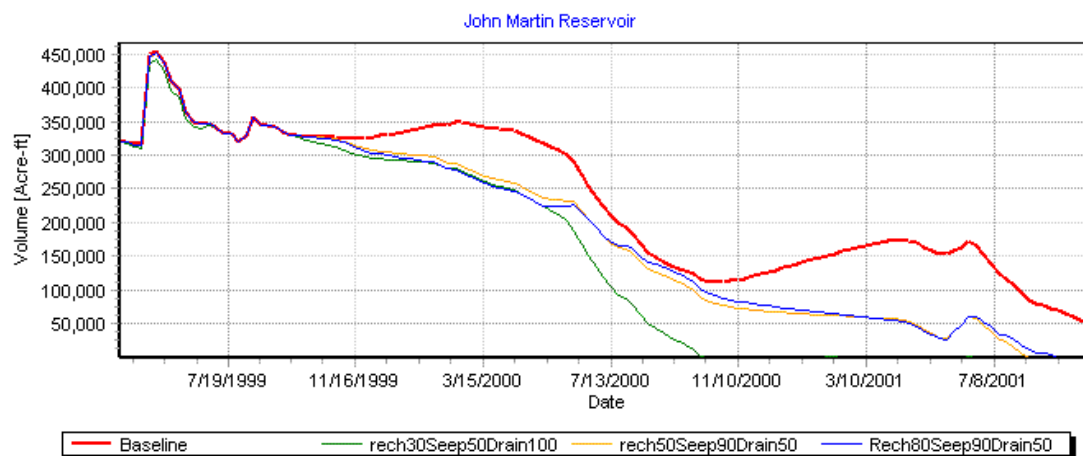
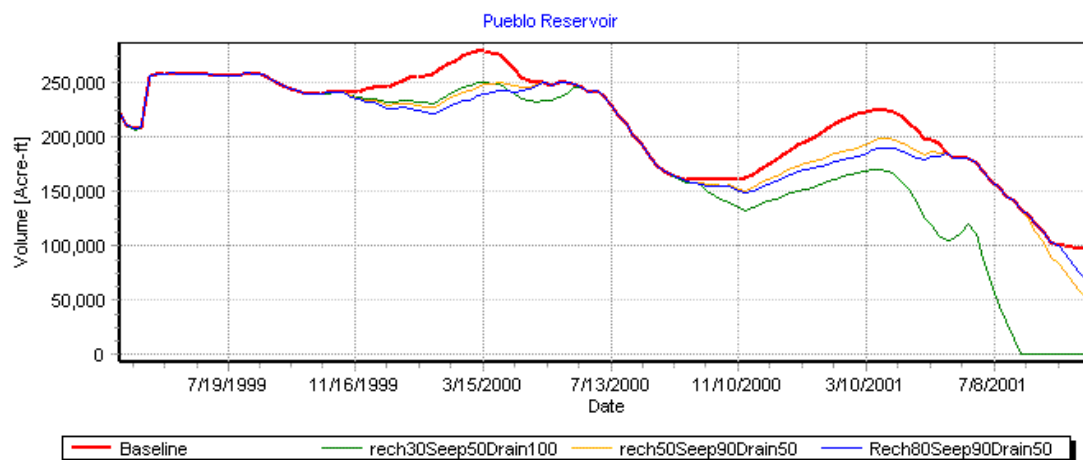


Management Alternative Analysis - Diversion Seepage

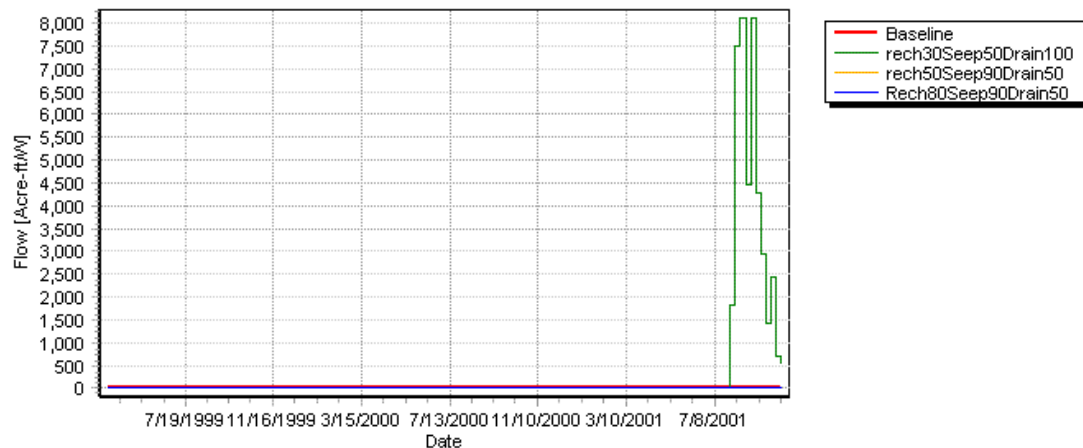


Combined All Management Alternatives

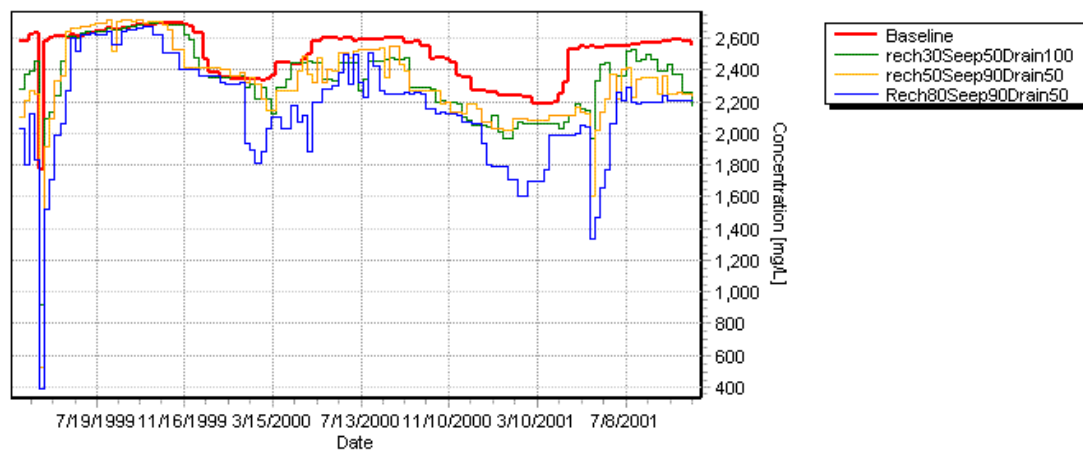
The following results correspond to alternatives with recharge reduction, seepage reduction and drainage improvement combined management options.



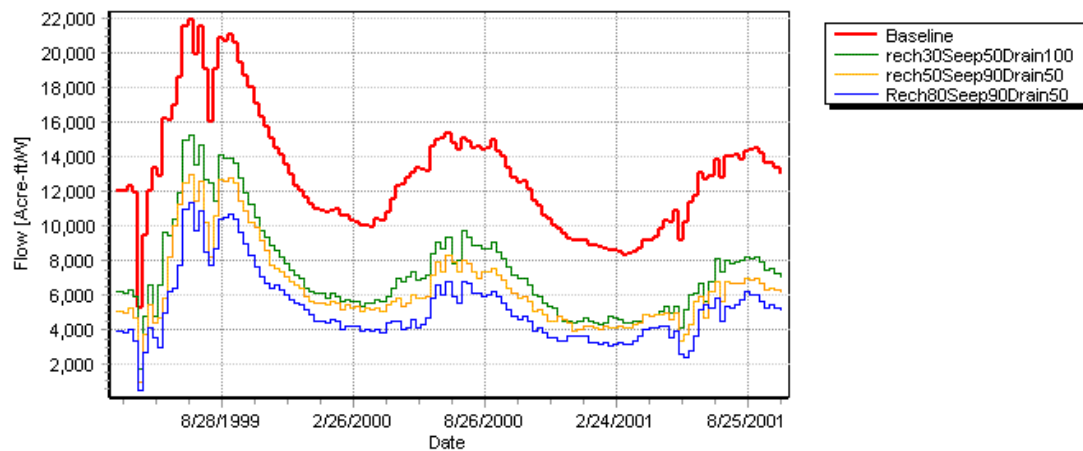
Management Alternative Analysis - Diversion Shortage



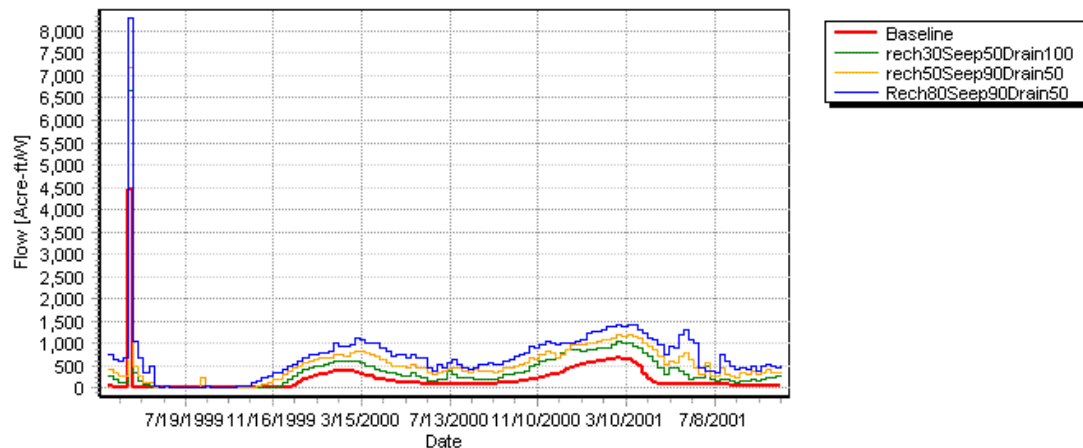
Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration



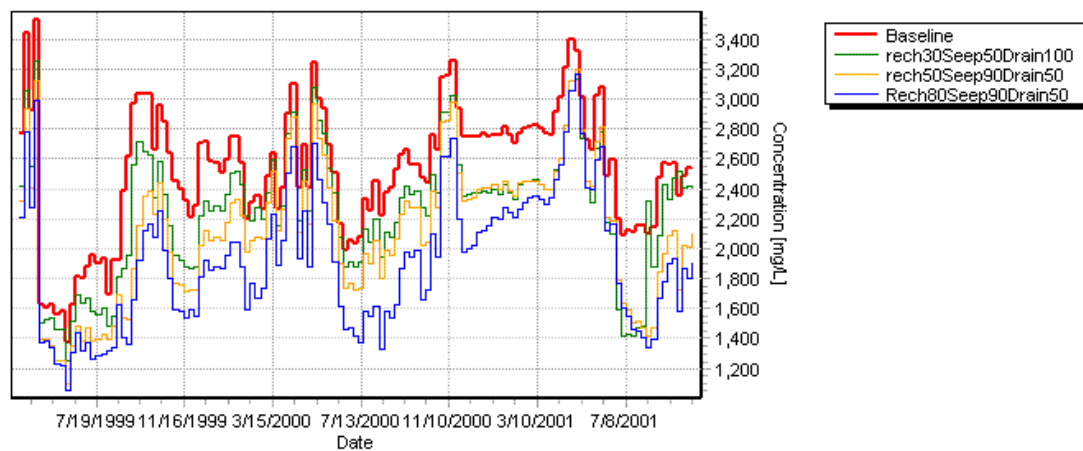
Management Alternative Analysis - Aquifer-Stream Interaction Return Flow



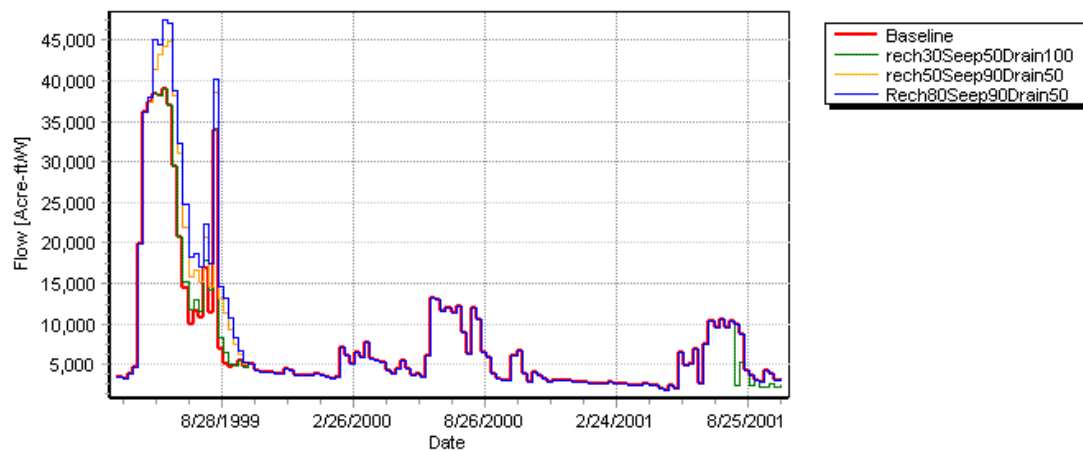
Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion



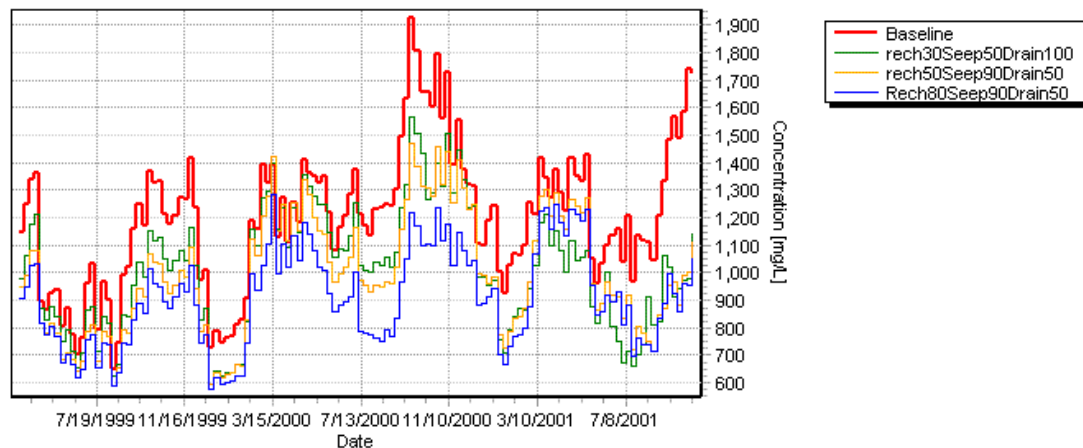
Management Alternative Analysis - Colorado_Kansas Border Concentration



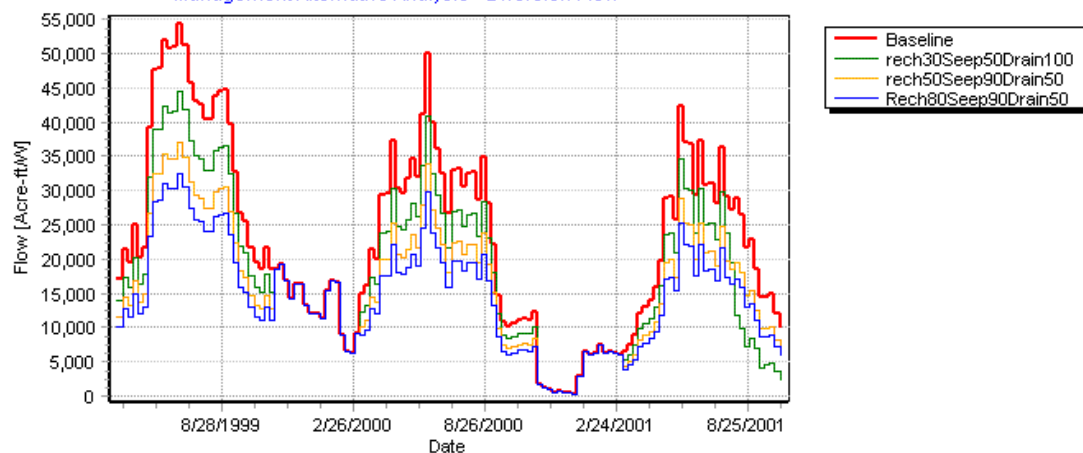
Management Alternative Analysis - Colorado_Kansas Border Flow



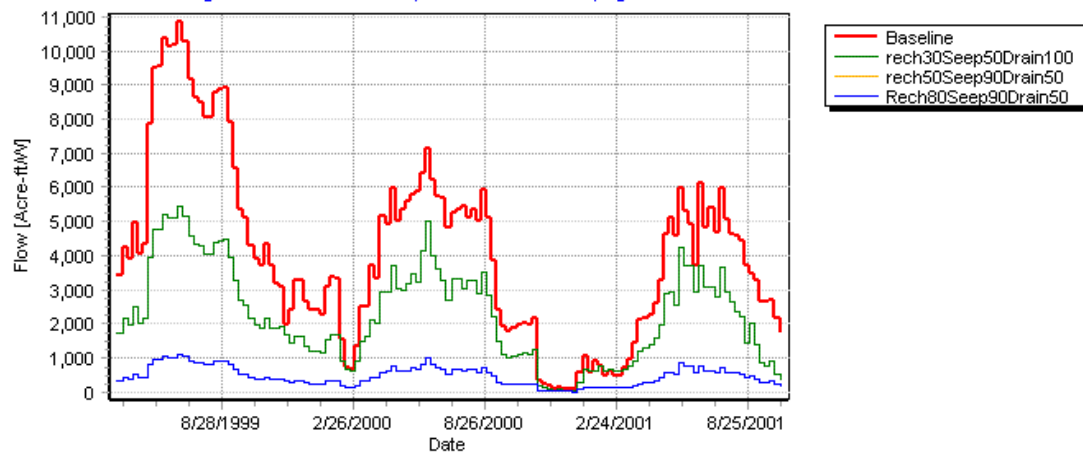
Management Alternative Analysis - Diversion Concentration



Management Alternative Analysis - Diversion Flow



Management Alternative Analysis - Diversion Seepage

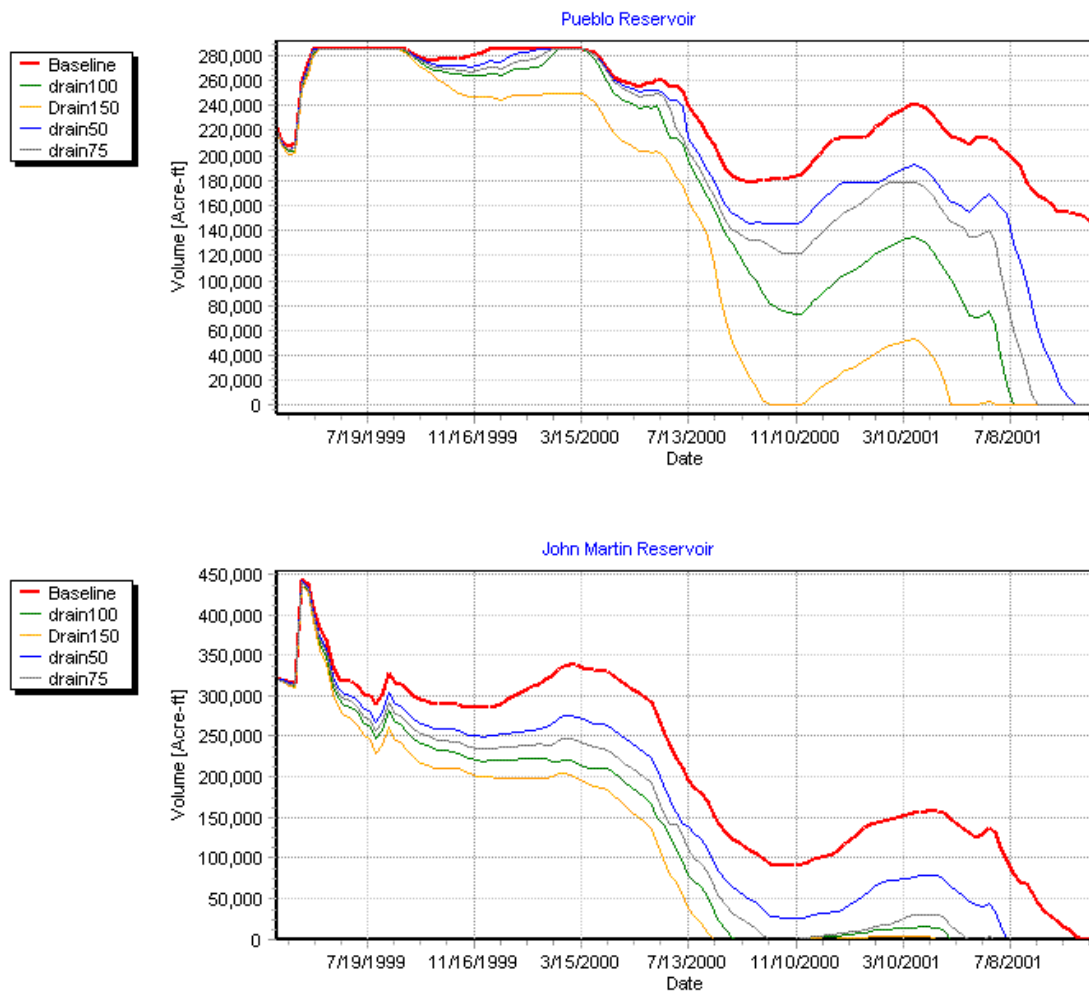


Reservoir Operational mode B

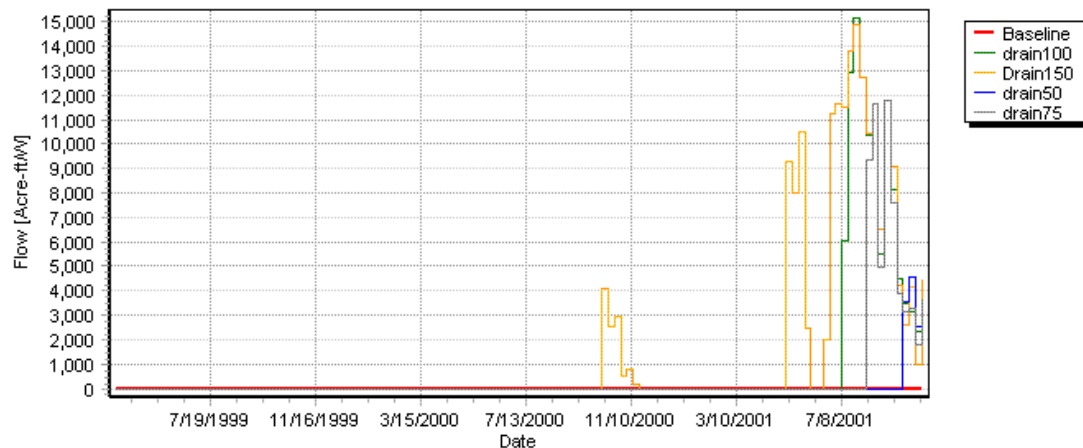
The following results were obtained from the management alternatives simulation in system operational mode B.

Drainage Improvement Alternatives

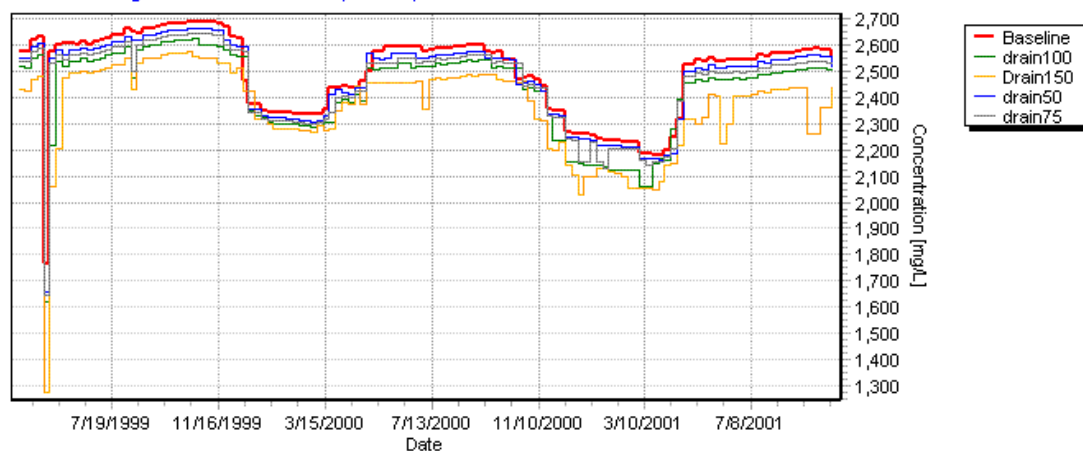
The following results show the management alternatives that improve drainage only.



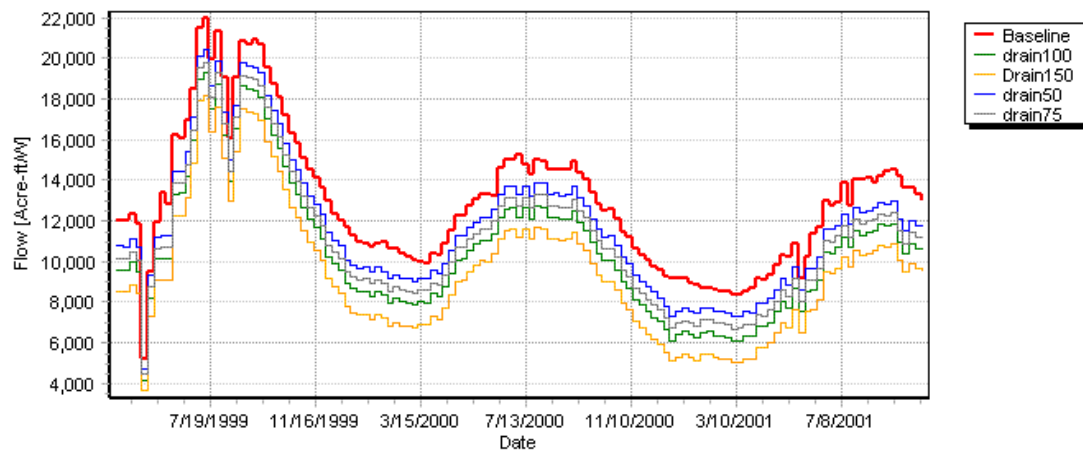
Management Alternative Analysis - Diversion Shortage



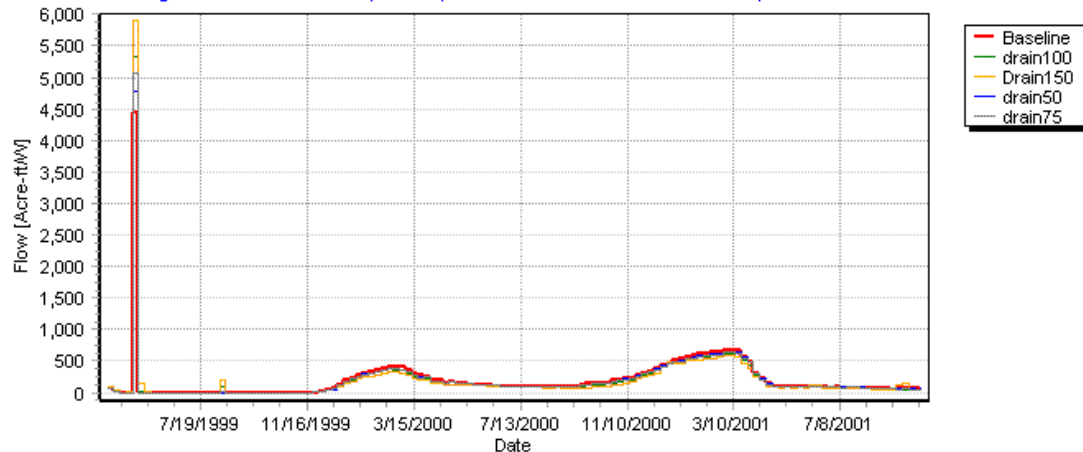
Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration



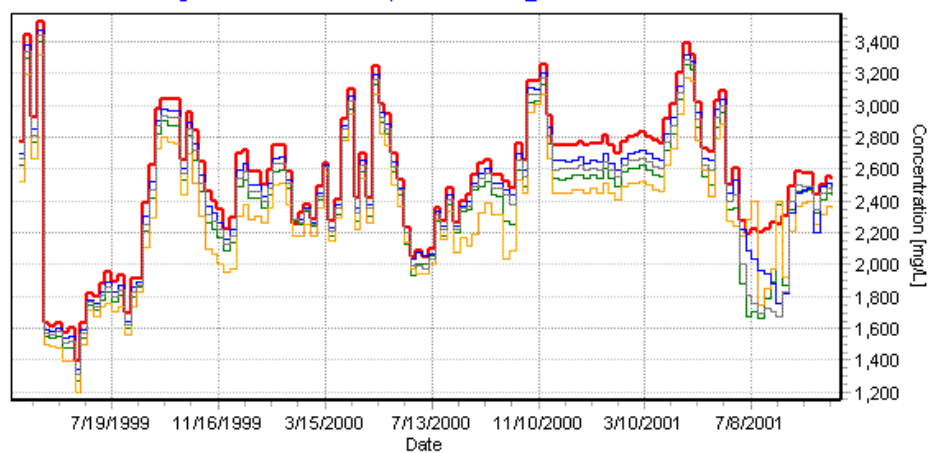
Management Alternative Analysis - Aquifer-Stream Interaction Return Flow



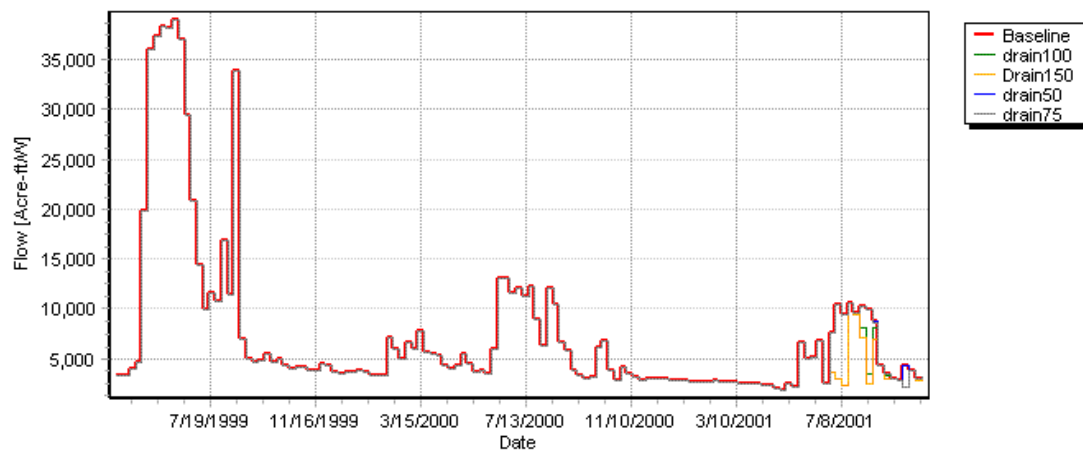
Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion



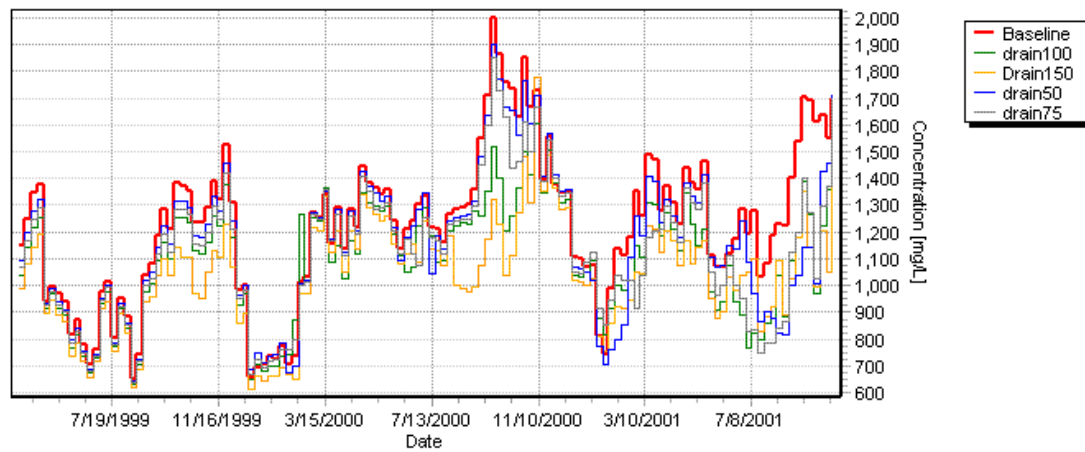
Management Alternative Analysis - Colorado_Kansas Border Concentration



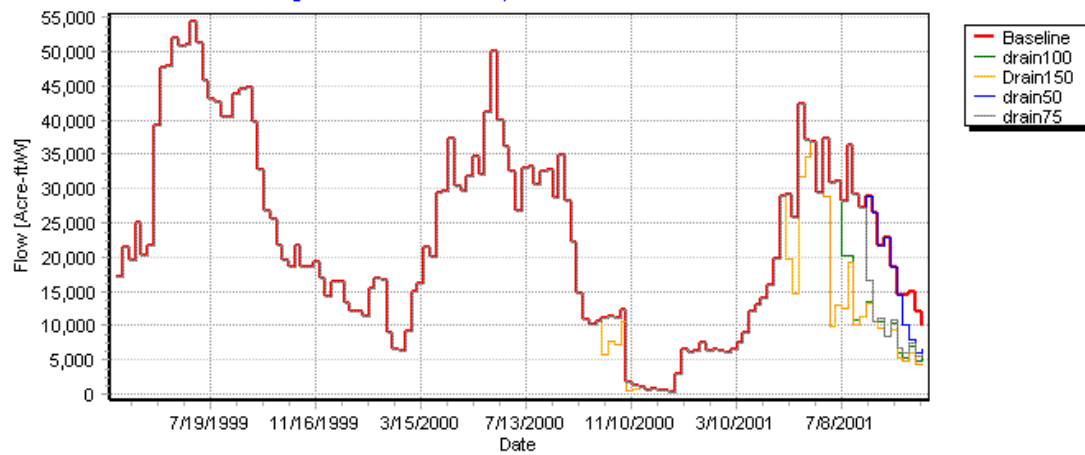
Management Alternative Analysis - Colorado_Kansas Border Flow



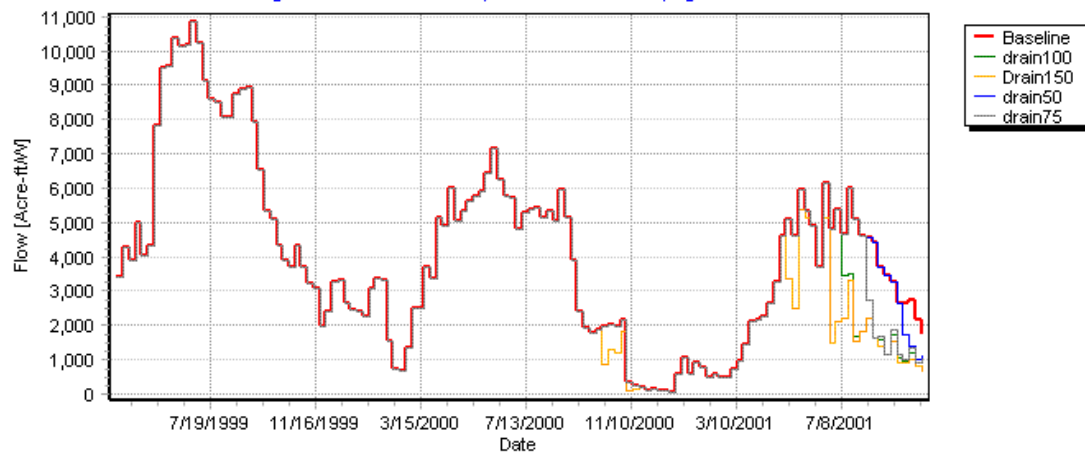
Management Alternative Analysis - Diversion Concentration



Management Alternative Analysis - Diversion Flow

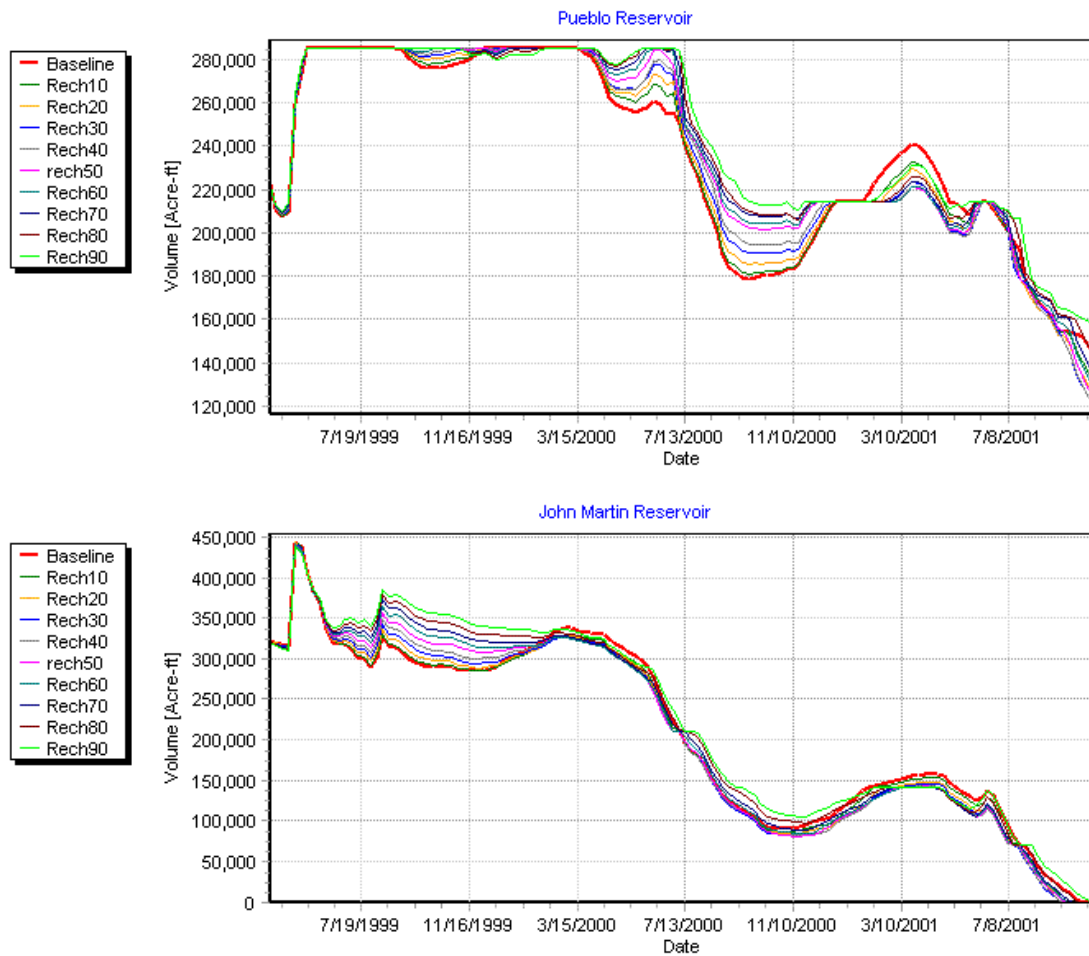


Management Alternative Analysis - Diversion Seepage

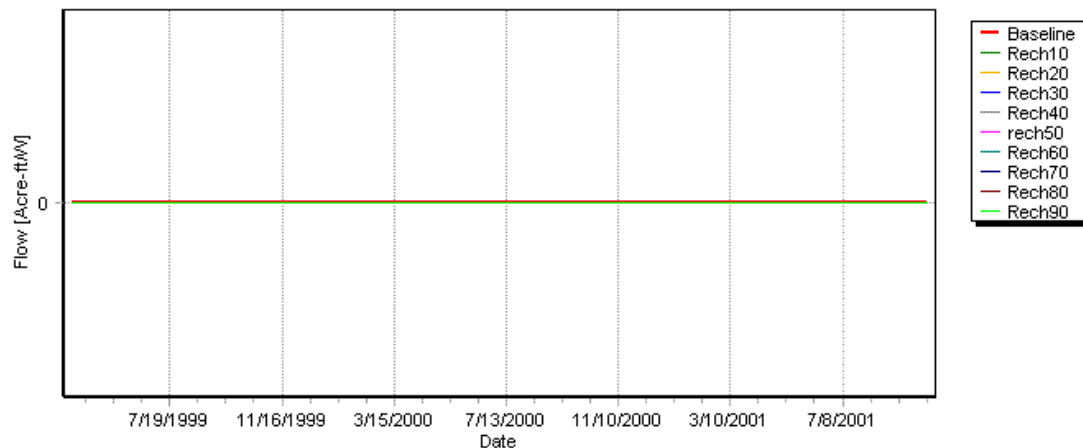


Recharge Reduction Alternative

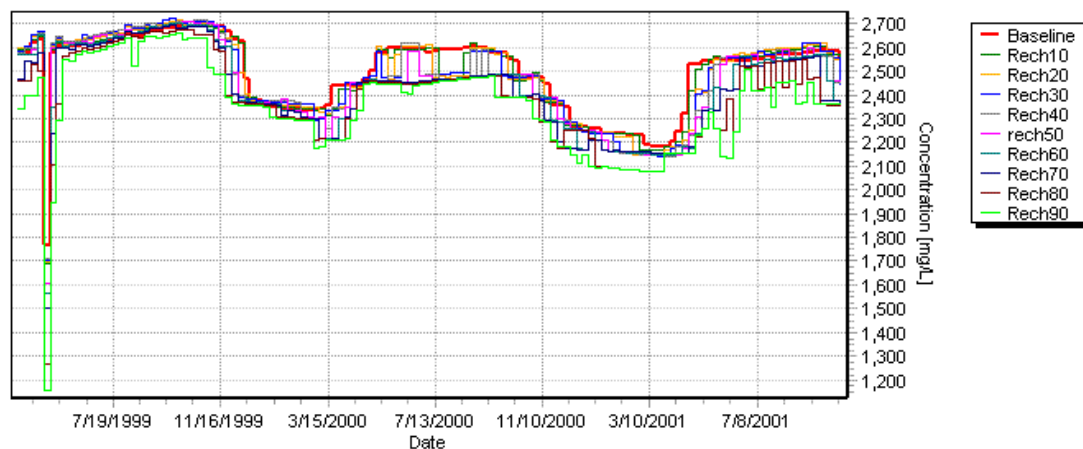
The following results correspond to management alternatives involving recharge reduction only.



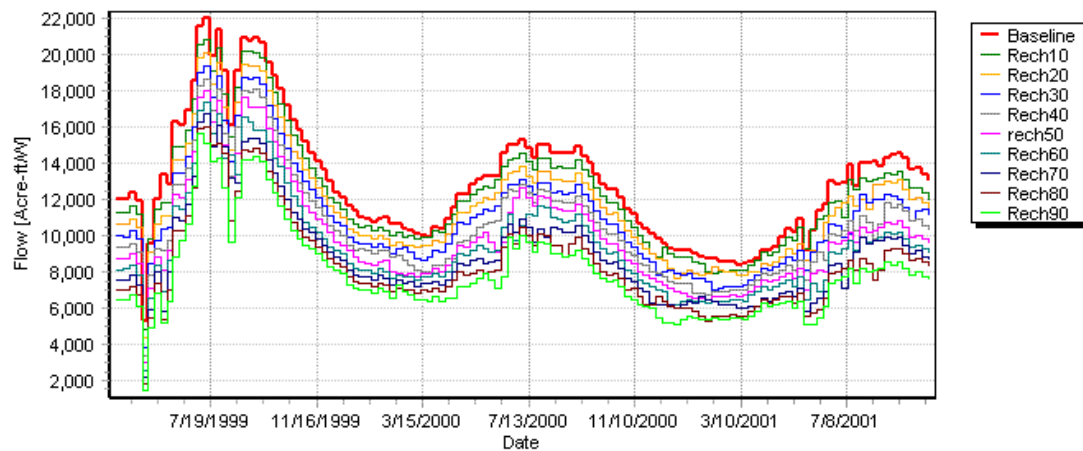
Management Alternative Analysis - Diversion Shortage



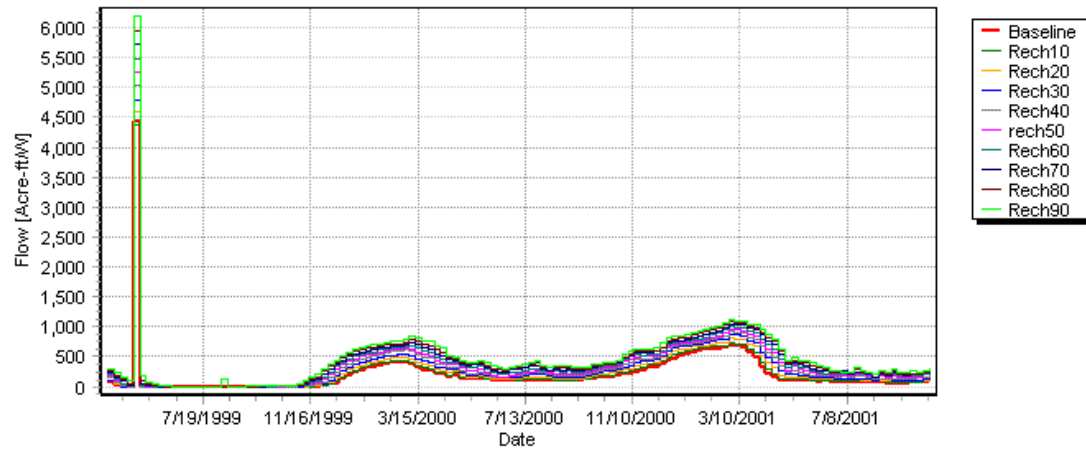
Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration



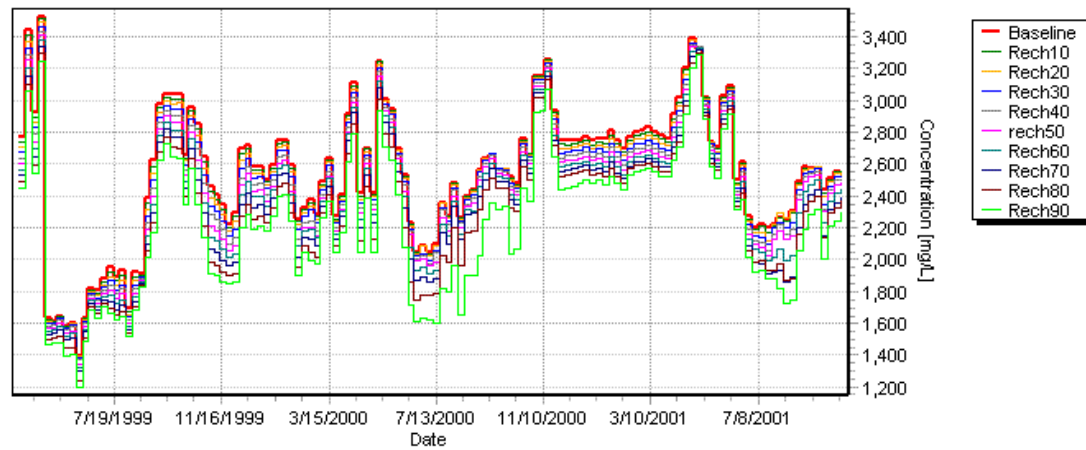
Management Alternative Analysis - Aquifer-Stream Interaction Return Flow



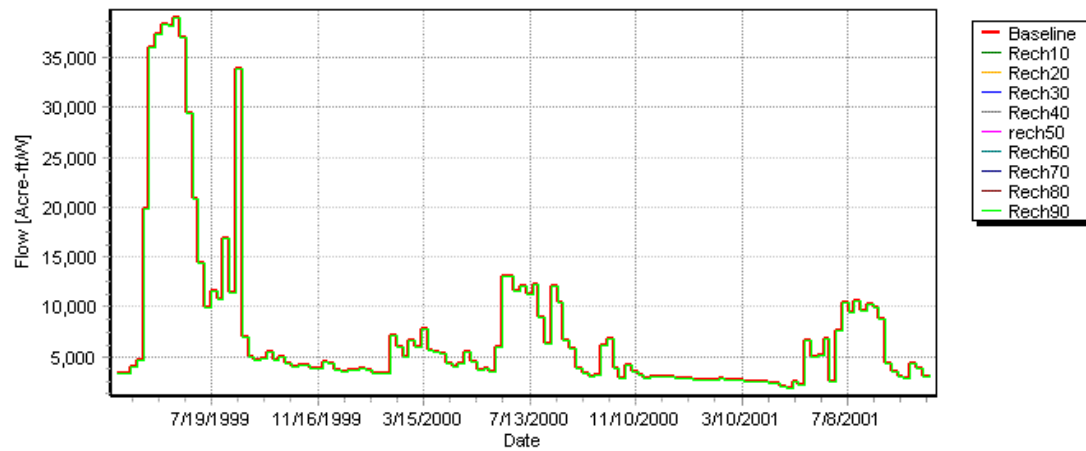
Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion



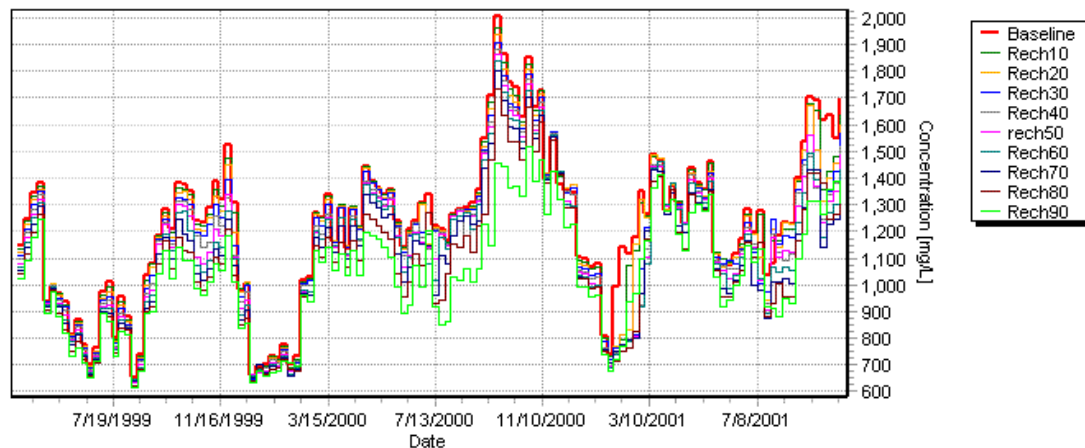
Management Alternative Analysis - Colorado_Kansas Border Concentration



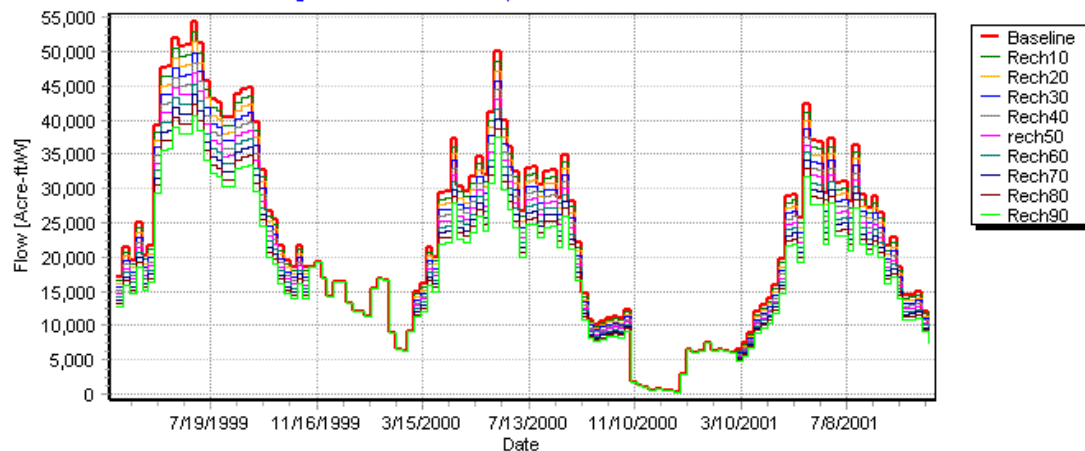
Management Alternative Analysis - Colorado_Kansas Border Flow



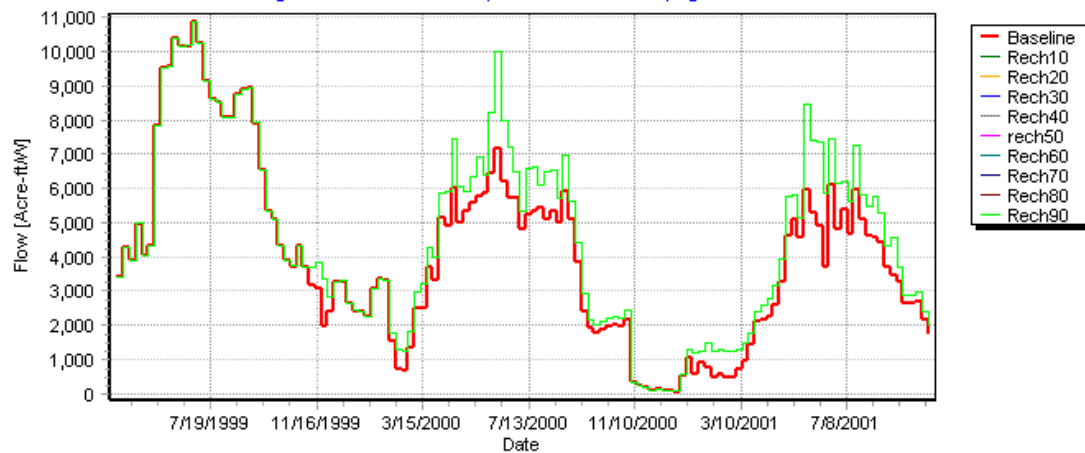
Management Alternative Analysis - Diversion Concentration



Management Alternative Analysis - Diversion Flow

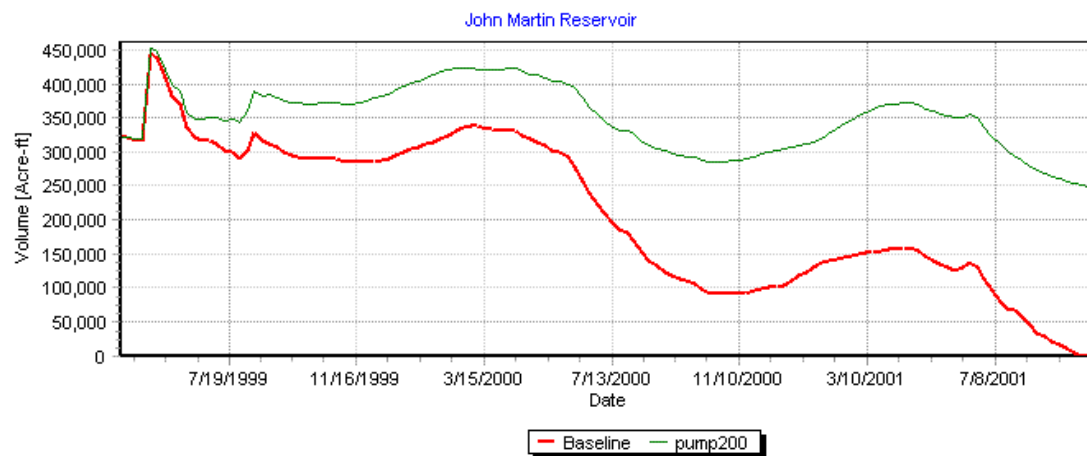
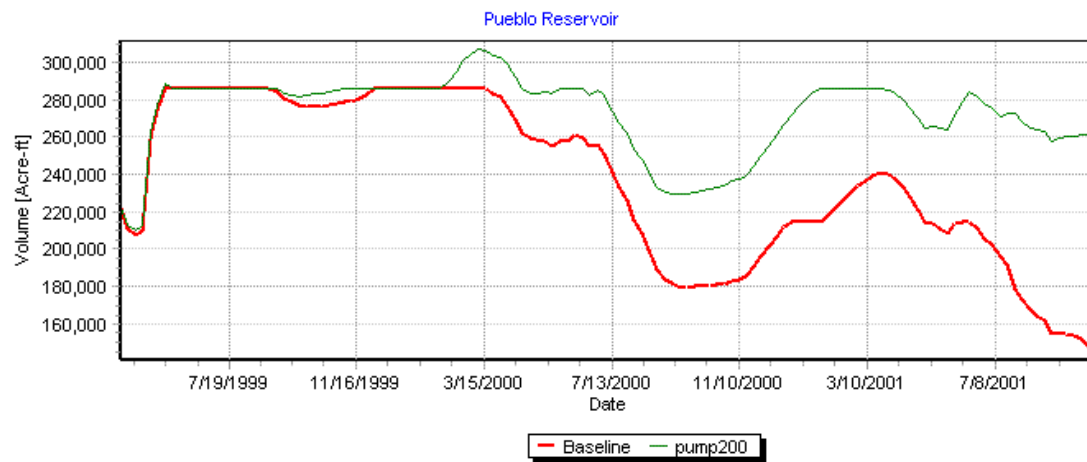


Management Alternative Analysis - Diversion Seepage

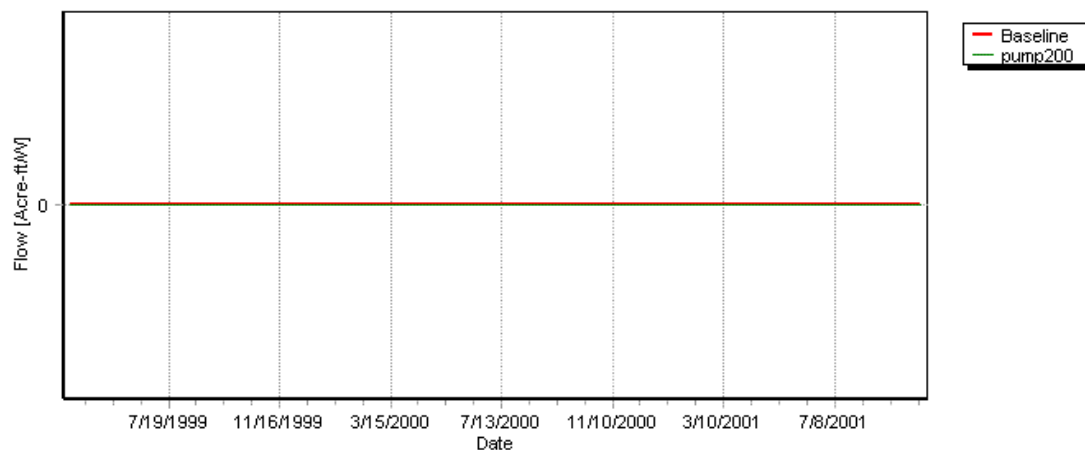


Vertical Drainage Alternative

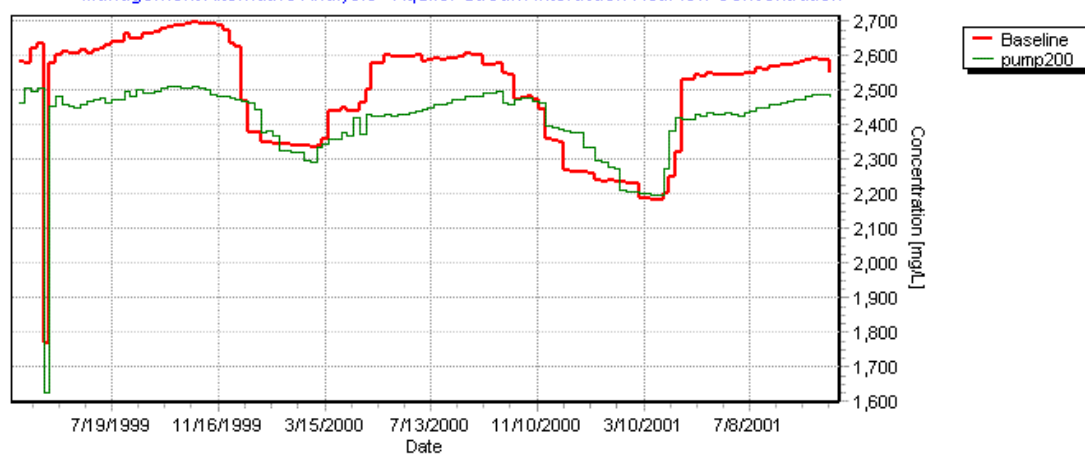
The Following plots illustrate the results of the vertical drainage management alternative simulation with return of the pumped volume to the stream in the same time step.



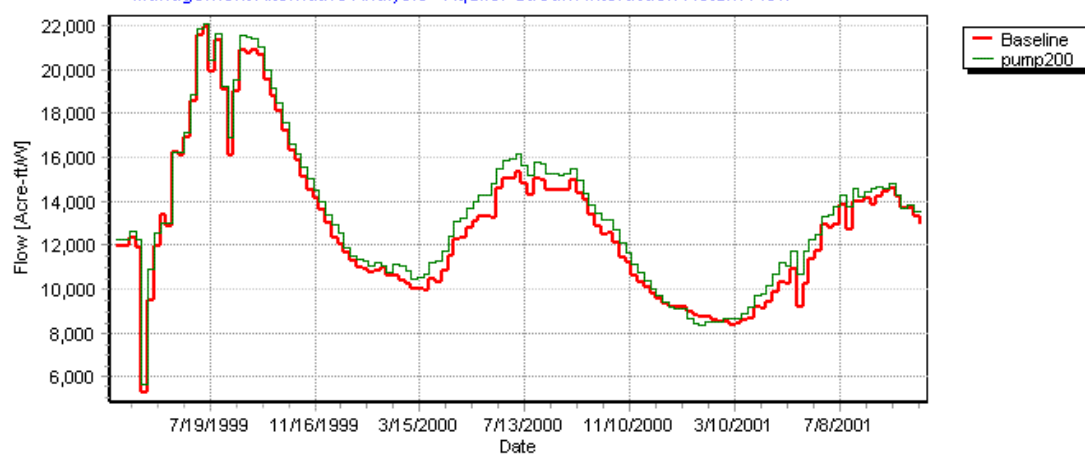
Management Alternative Analysis - Diversion Shortage



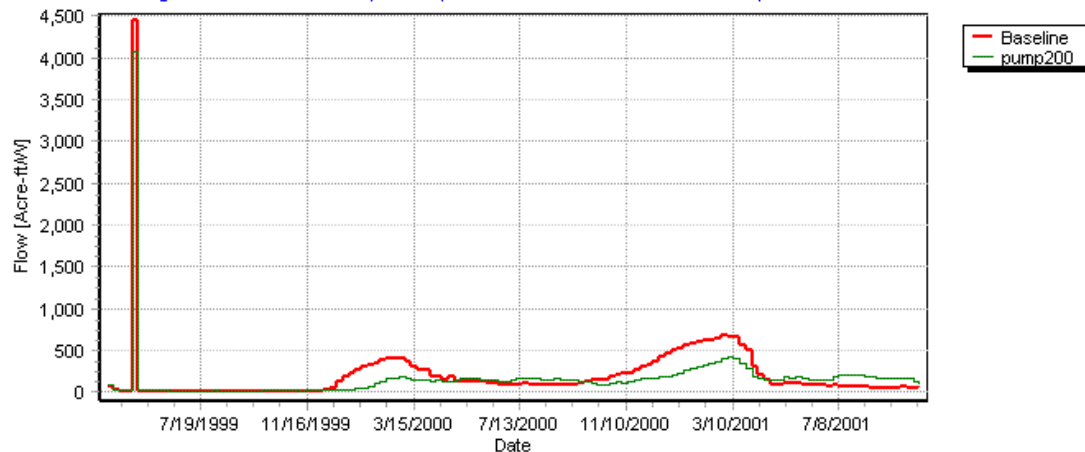
Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration



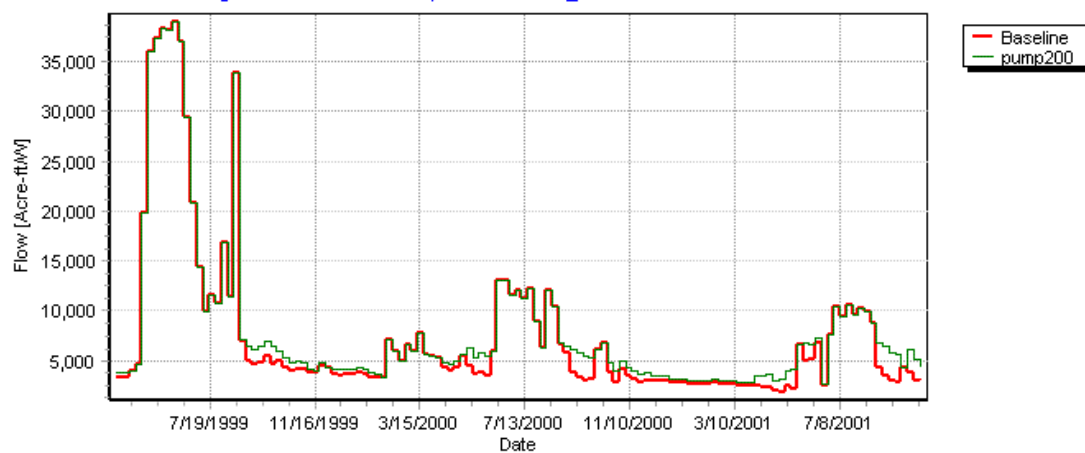
Management Alternative Analysis - Aquifer-Stream Interaction Return Flow



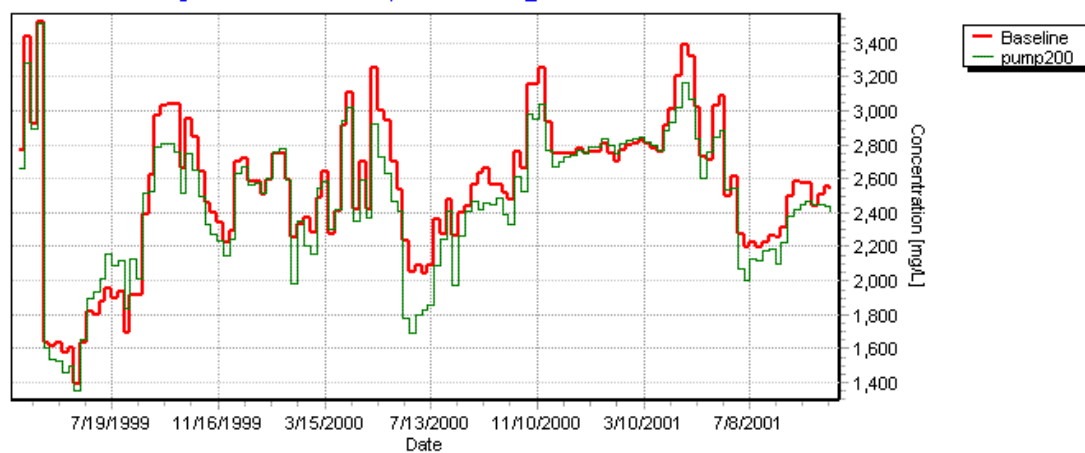
Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion



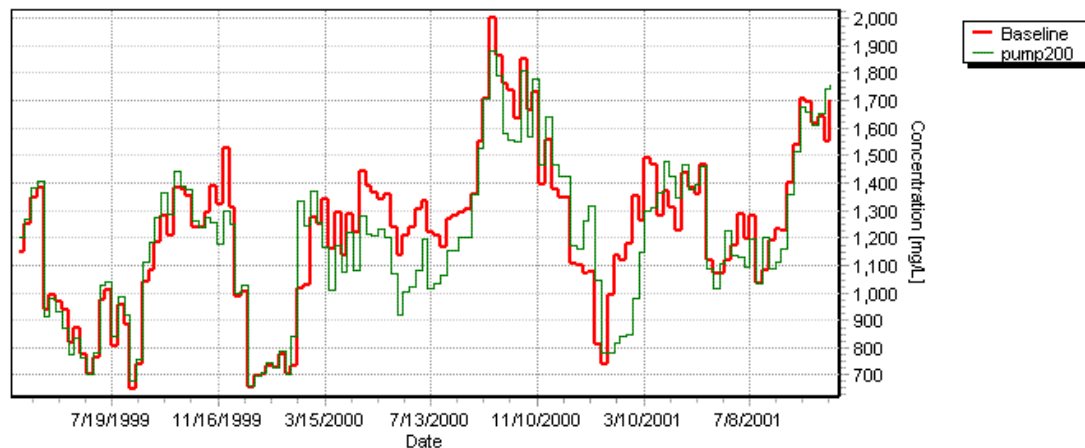
Management Alternative Analysis - Colorado_Kansas Border Flow



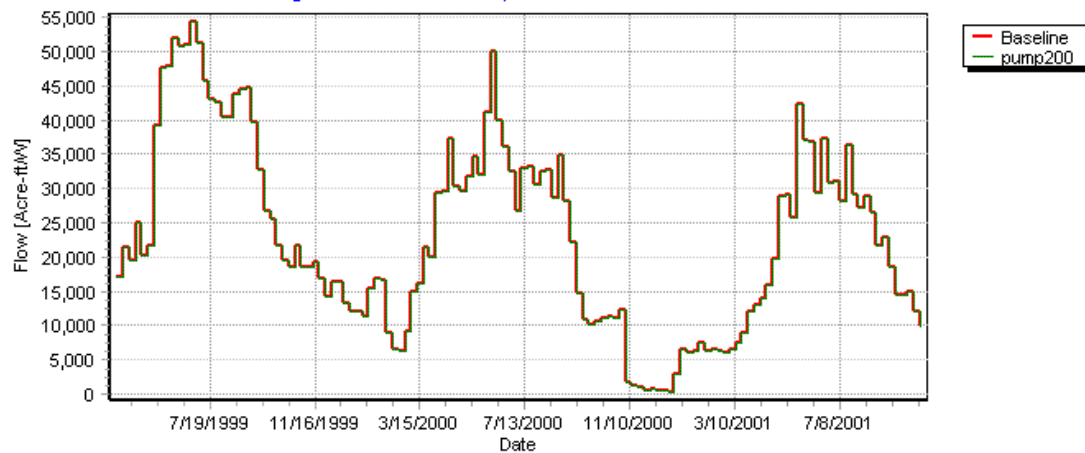
Management Alternative Analysis - Colorado_Kansas Border Concentration



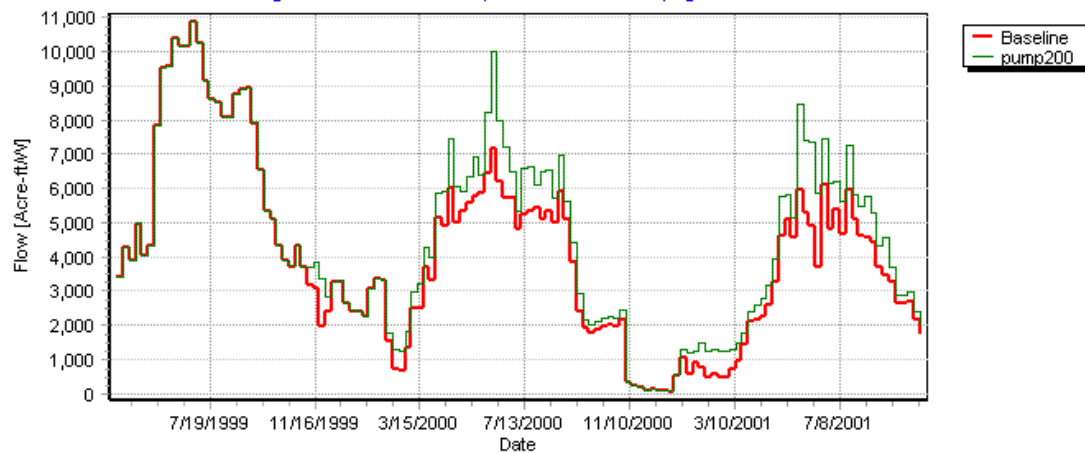
Management Alternative Analysis - Diversion Concentration



Management Alternative Analysis - Diversion Flow

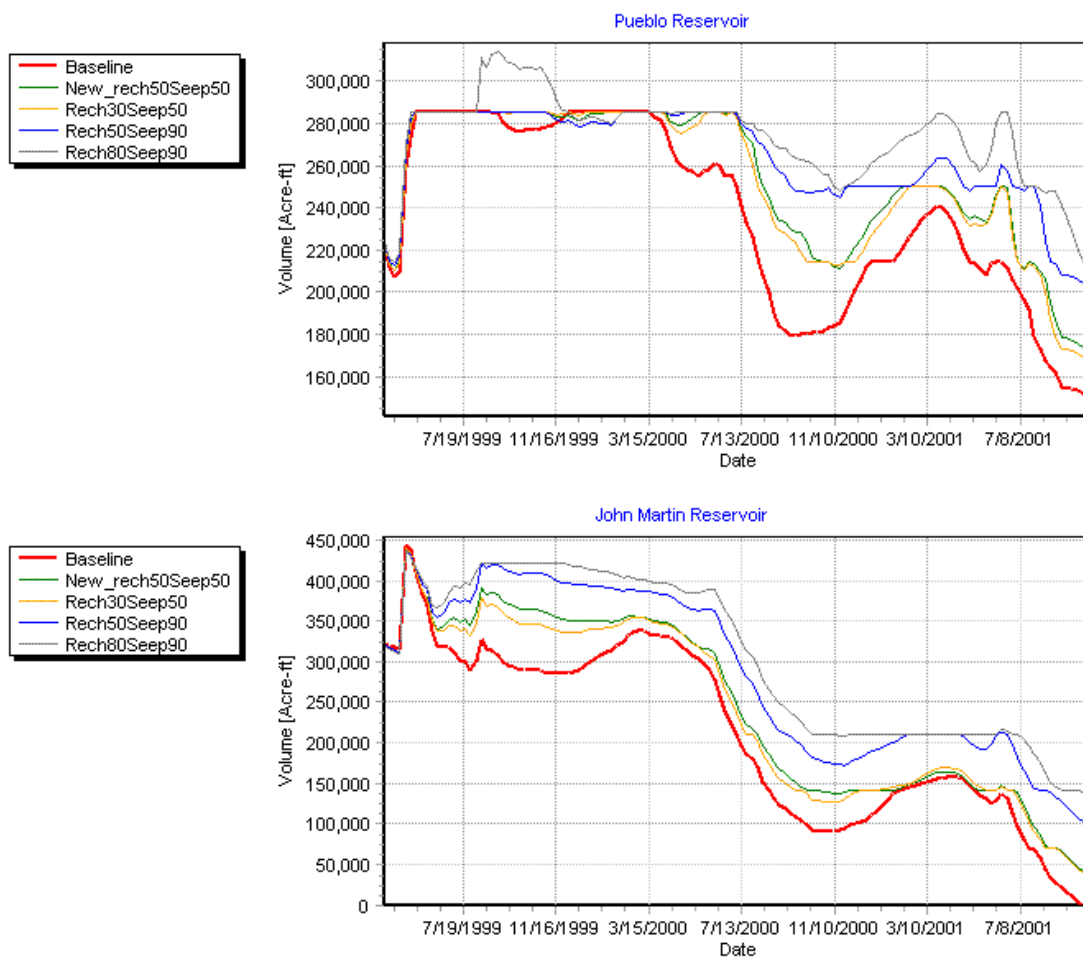


Management Alternative Analysis - Diversion Seepage

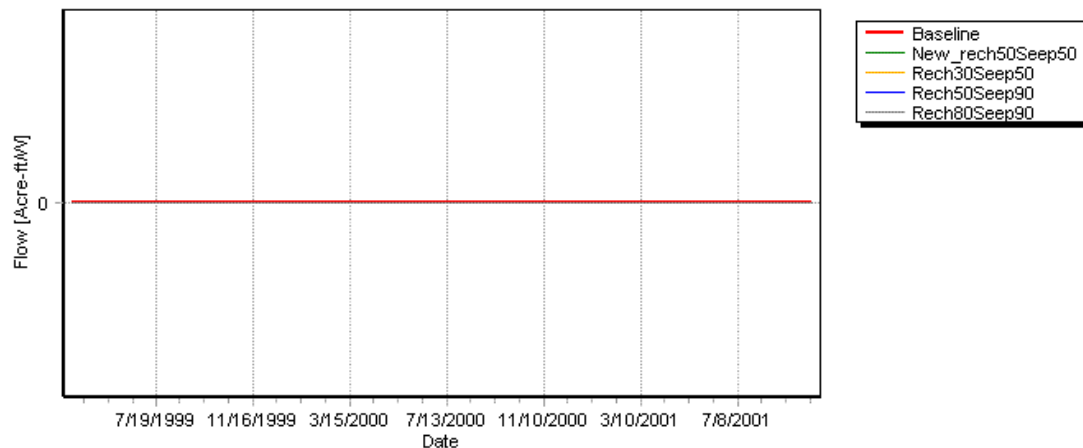


Combined Recharge and Seepage Management Alternatives

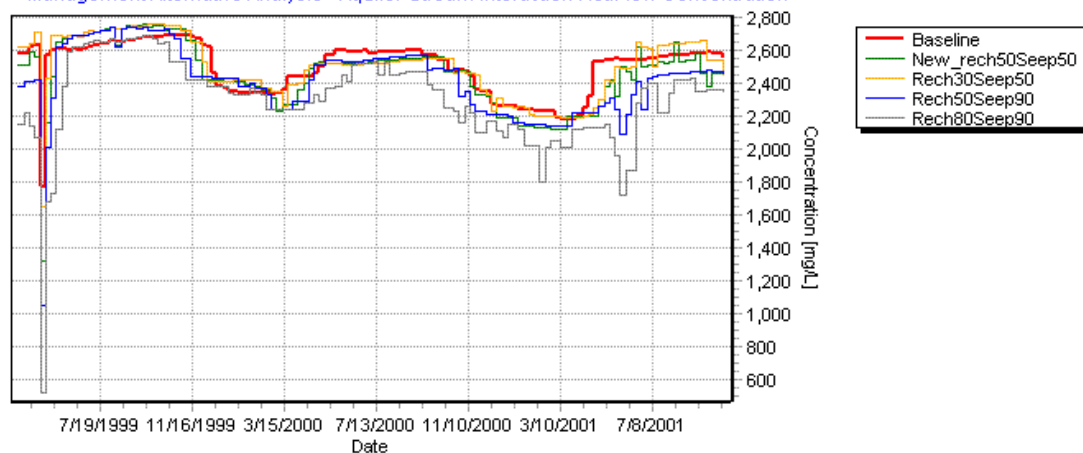
These plots contain the results of the management alternatives that combine recharge and seepage reduction.



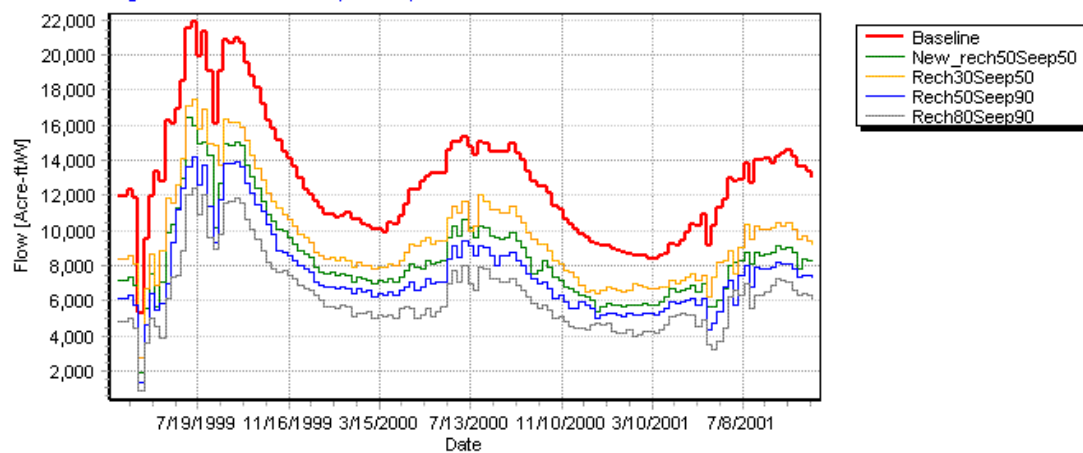
Management Alternative Analysis - Diversion Shortage



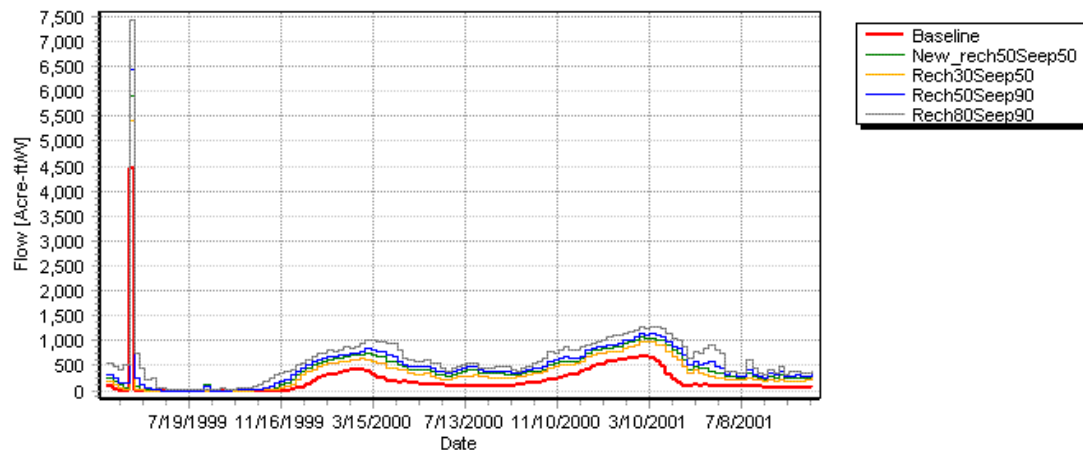
Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration



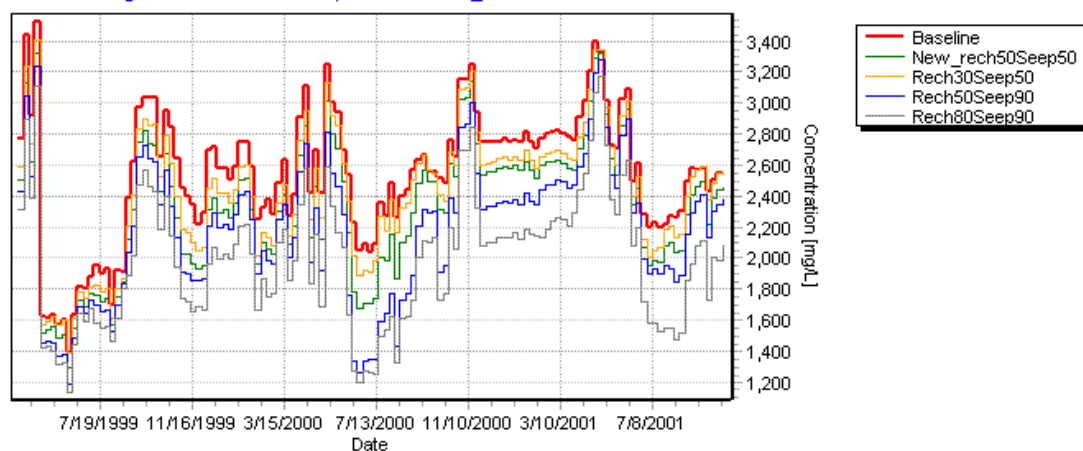
Management Alternative Analysis - Aquifer-Stream Interaction Return Flow



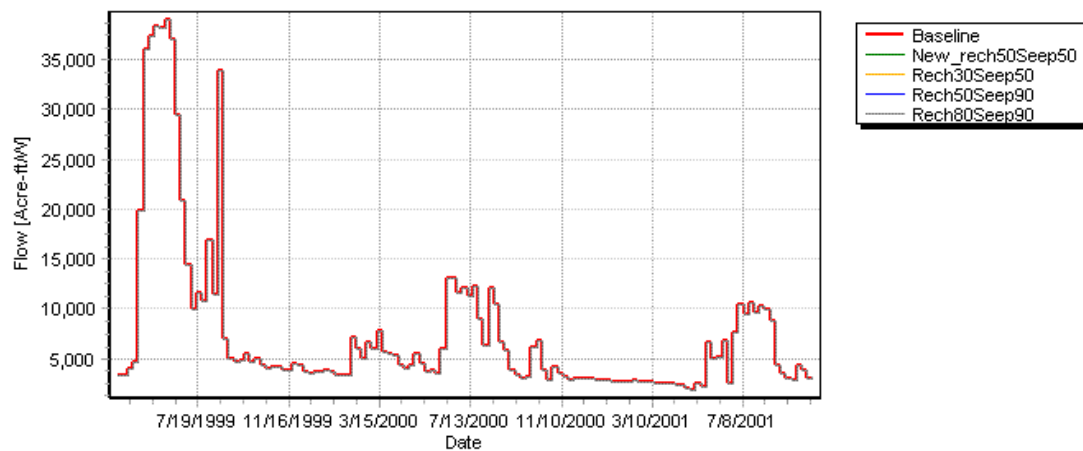
Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion



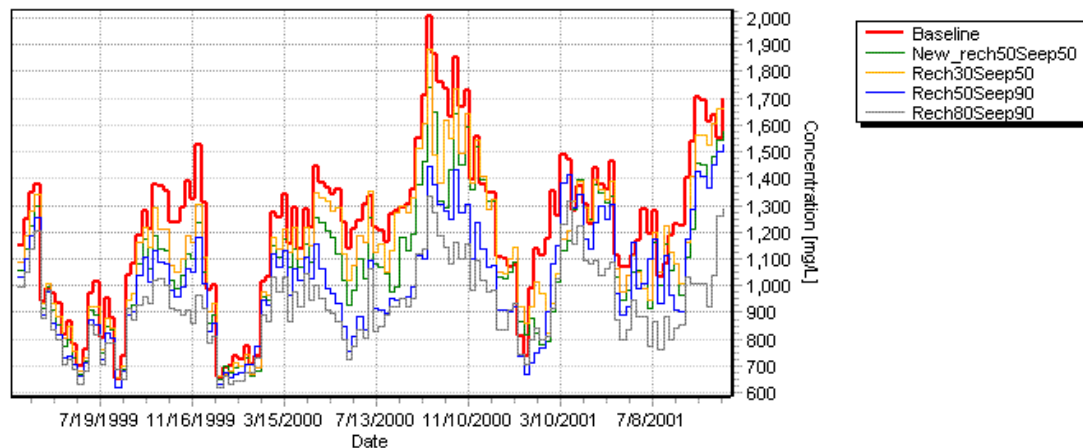
Management Alternative Analysis - Colorado_Kansas Border Concentration



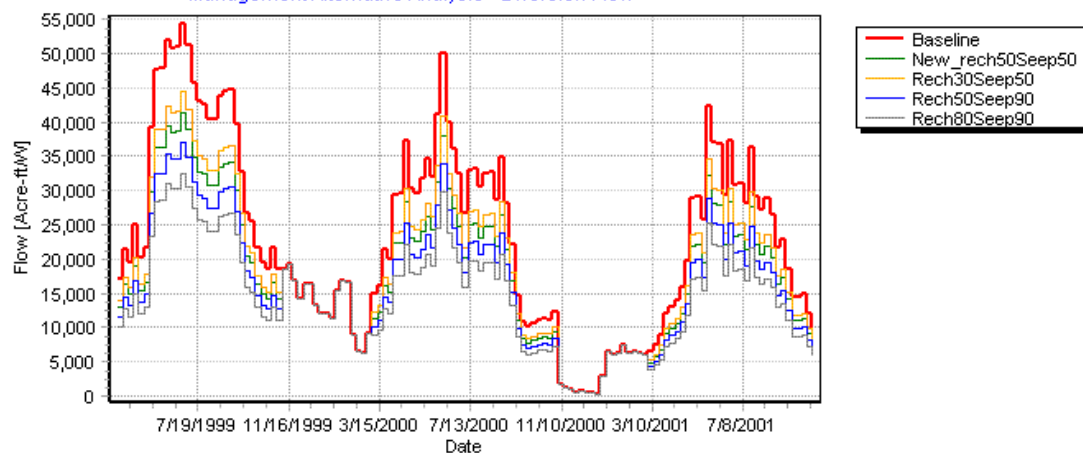
Management Alternative Analysis - Colorado_Kansas Border Flow



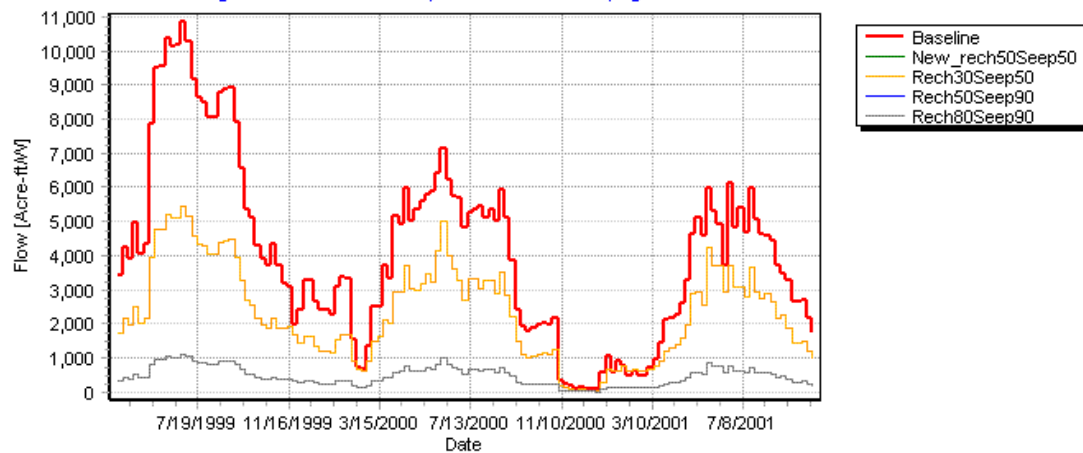
Management Alternative Analysis - Diversion Concentration



Management Alternative Analysis - Diversion Flow

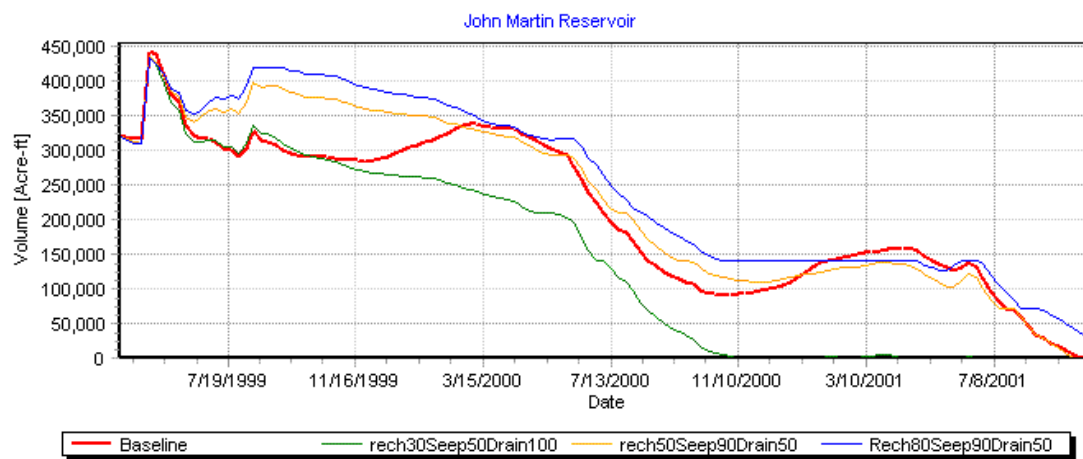
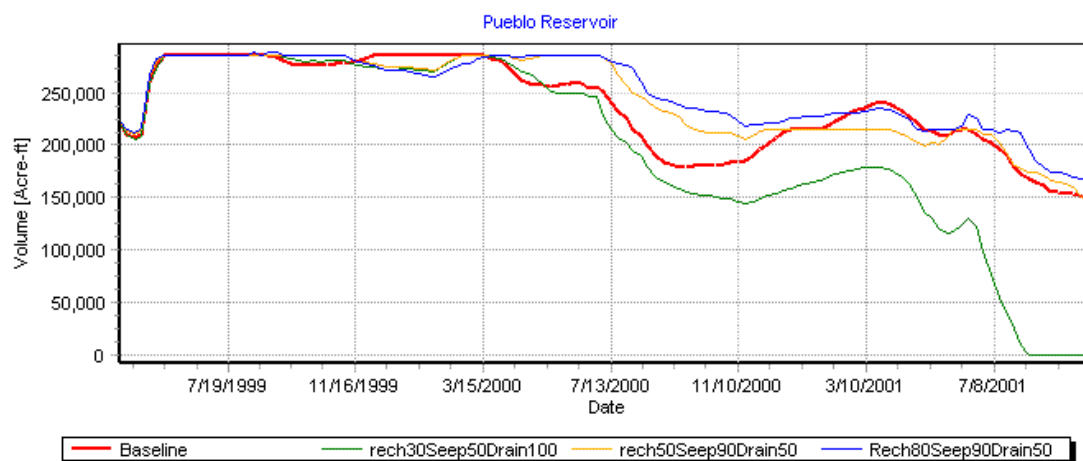


Management Alternative Analysis - Diversion Seepage

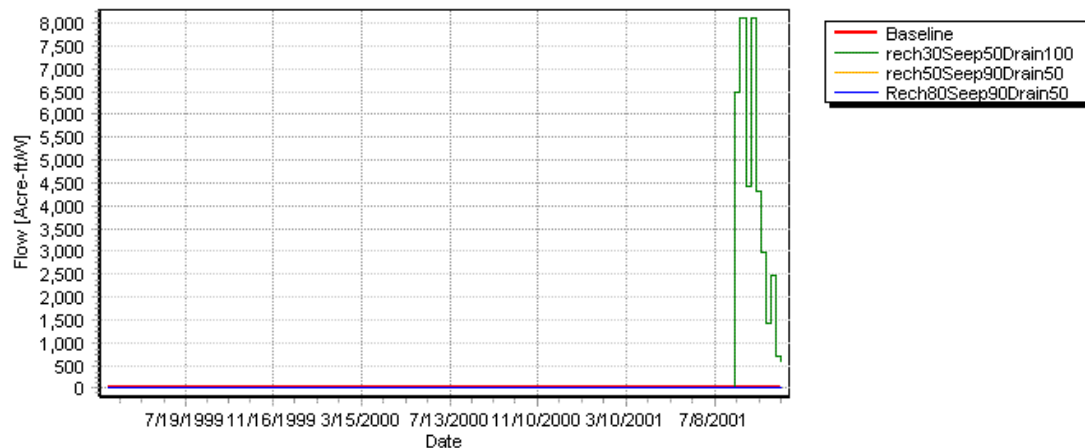


Combined All Management Alternatives

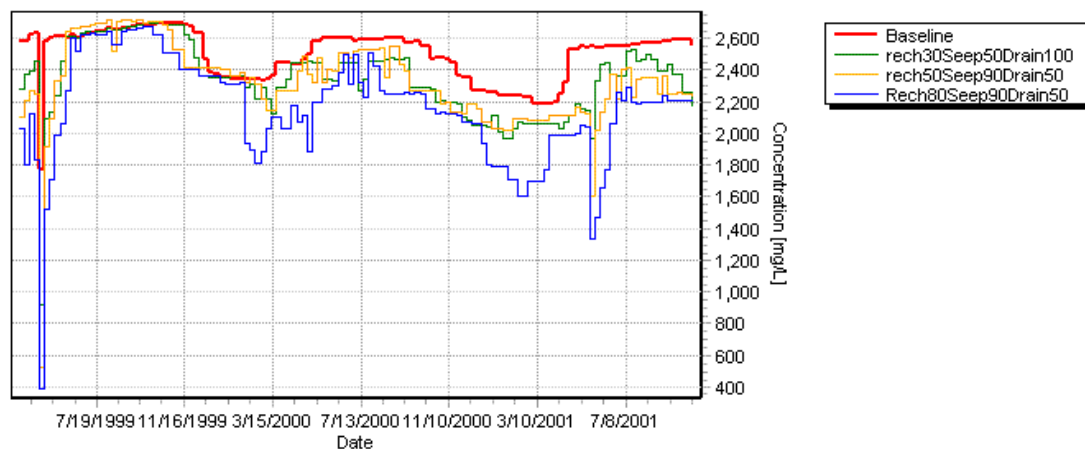
The following plots contain the results of the management alternatives that include combination of recharge reduction, seepage reduction and drainage improvements.



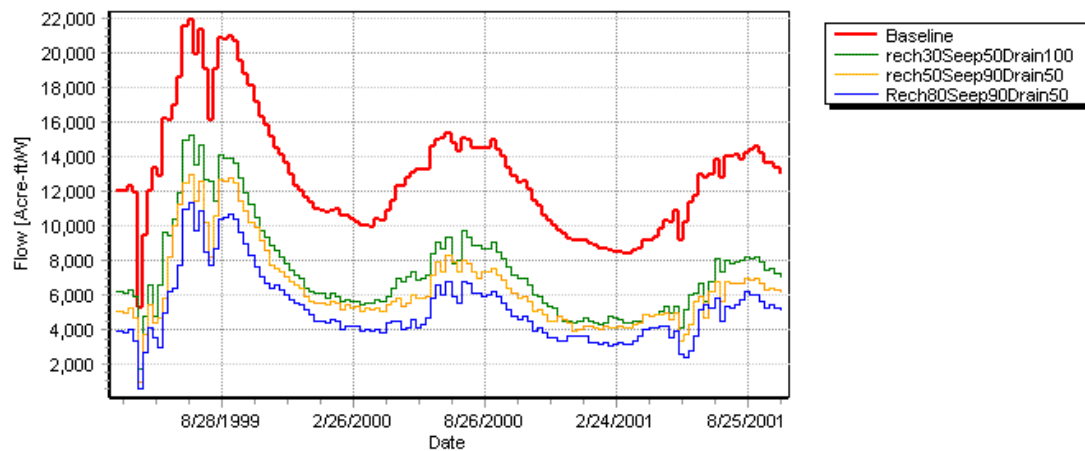
Management Alternative Analysis - Diversion Shortage



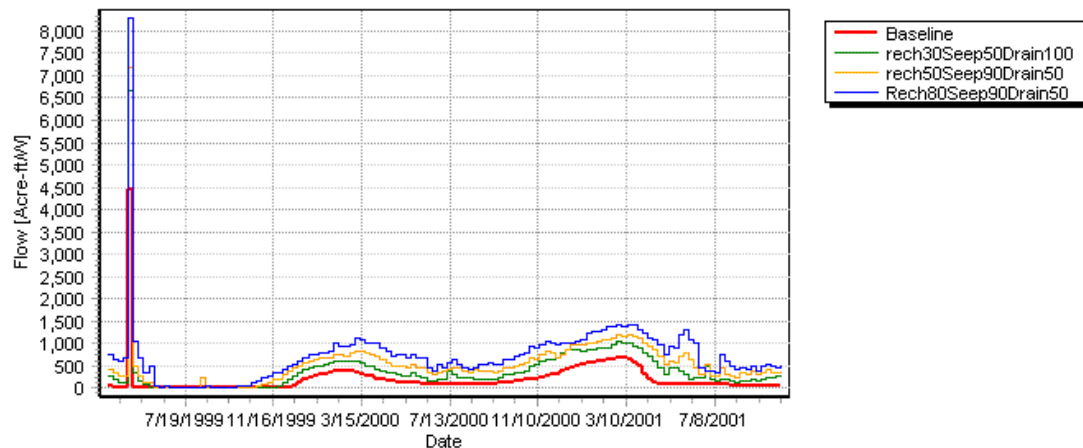
Management Alternative Analysis - Aquifer-Stream Interaction Ret.Flow Concentration



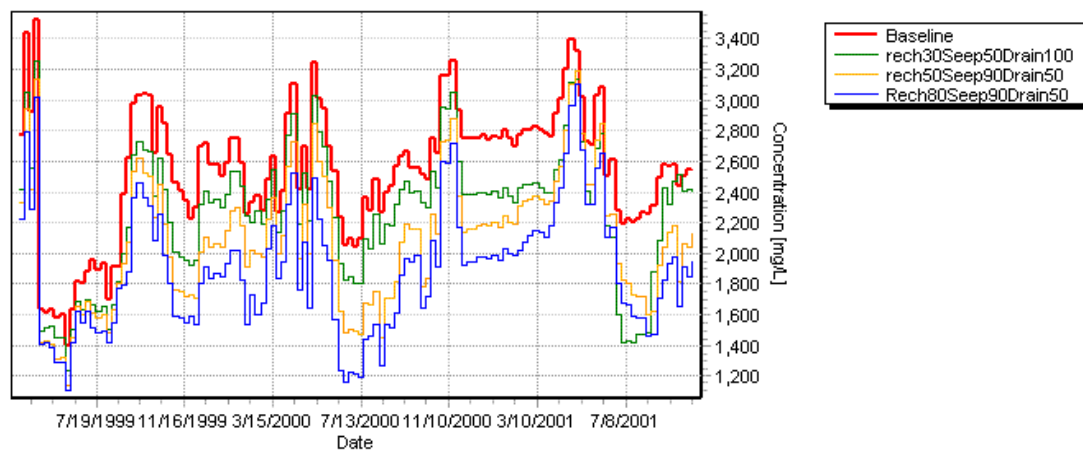
Management Alternative Analysis - Aquifer-Stream Interaction Return Flow



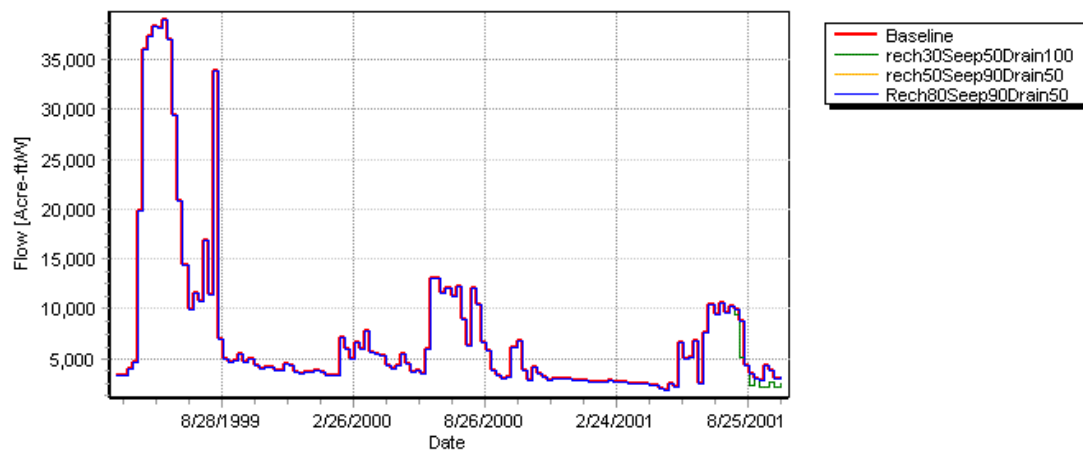
Management Alternative Analysis - Aquifer-Stream Interaction Stream Depletion



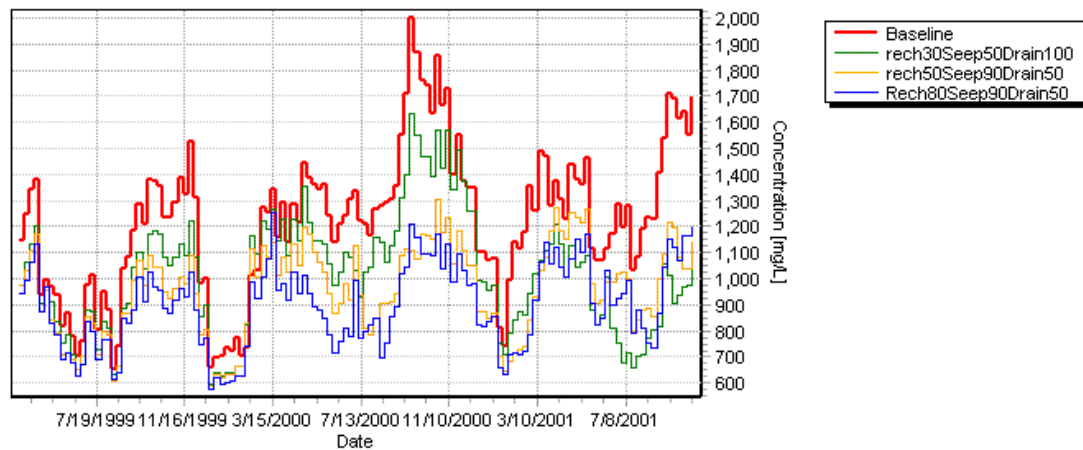
Management Alternative Analysis - Colorado_Kansas Border Concentration



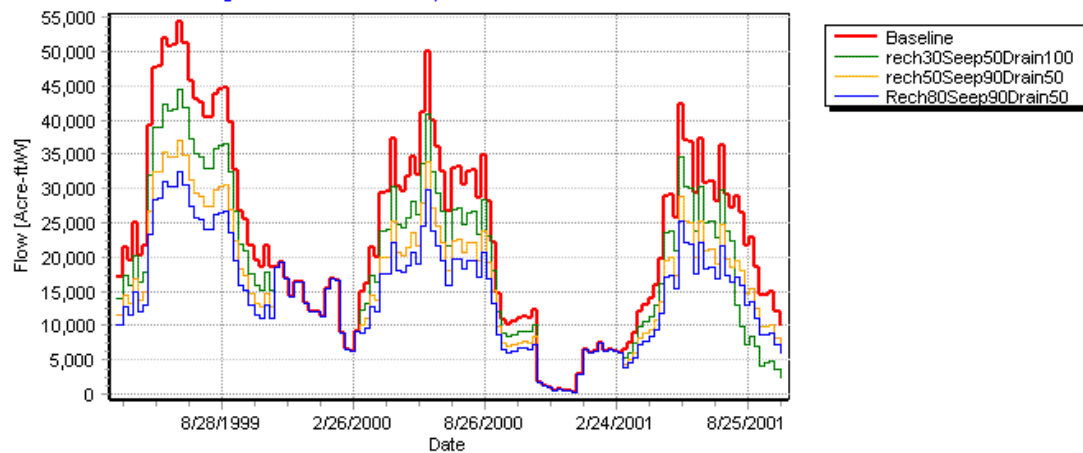
Management Alternative Analysis - Colorado_Kansas Border Flow



Management Alternative Analysis - Diversion Concentration



Management Alternative Analysis - Diversion Flow



Management Alternative Analysis - Diversion Seepage

