

RECLAMATION

Managing Water in the West

Hood River Basin Study

Surface Water Modeling (DHSVM)

Water Resource Modeling (MODSIM)

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U.S. Department of the Interior
Bureau of Reclamation

Goals of Climate Change Modeling

- Investigate relative changes to:
 - Quantity and timing of runoff
 - *Snow and glacier dynamics*
 - Reservoir storage
 - Hydropower production
 - Consumptive use shortages
 - Minimum flow shortages

Metrics of Climate Change Modeling

- Compare across all scenarios:
 - *Changes in snowpack and glacier volume/extent*
 - *Basin-averaged values*
 - *Changes to seasonal and annual runoff volumes*
 - *Along mainstem and three forks*
 - *Changes to reservoir inflows and storage volumes*
 - *Changes to consumptive use shortages*
 - *Lumped by irrigation district; potable uses grouped together*
 - *Changes to minimum flow shortages*
 - *Along mainstem and three forks*
 - *Changes to hydropower production*
 - *Lumped by irrigation district*

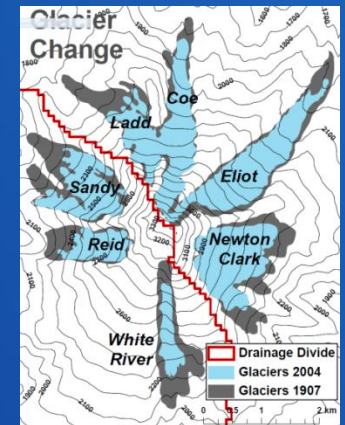
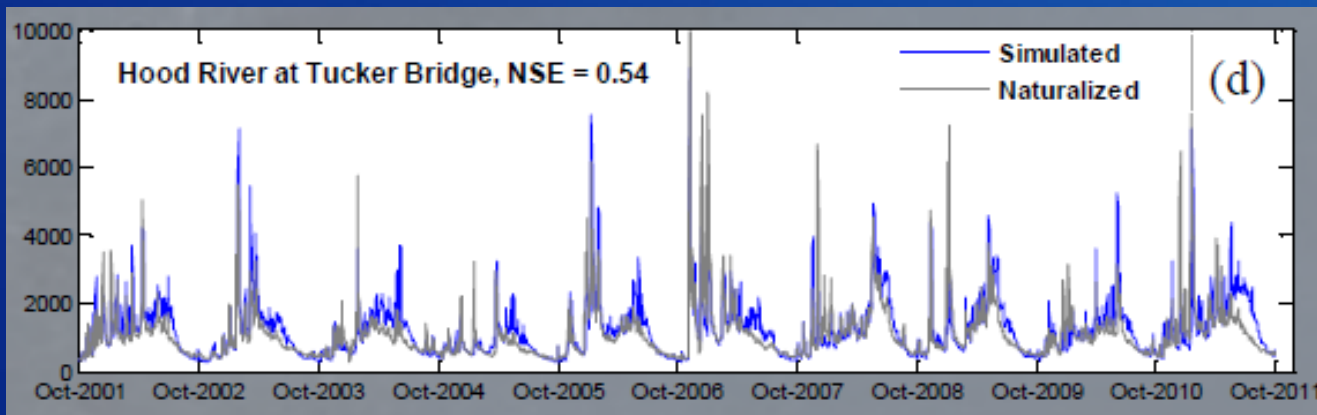
DHSVM

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Hood River DHSVM

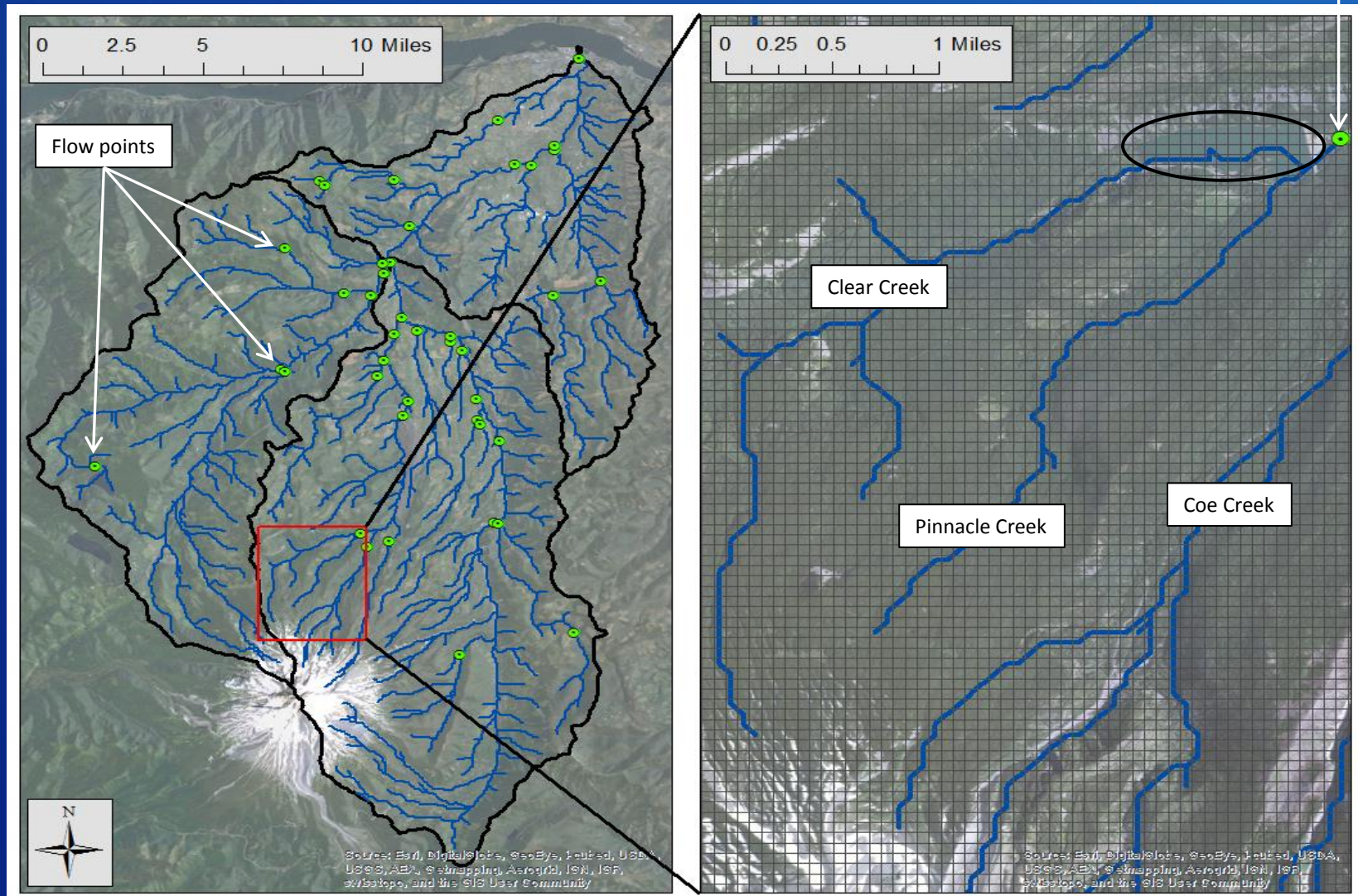
- Collaborated with UW to obtain dynamic glacier DHSVM model for the Hood River Basin
 - Calibrated to naturalized long-term downstream gauges
 - *West Fork Hood River near Dee, Hood River at Tucker Bridge*

Figures courtesy of
C. Frans, UW

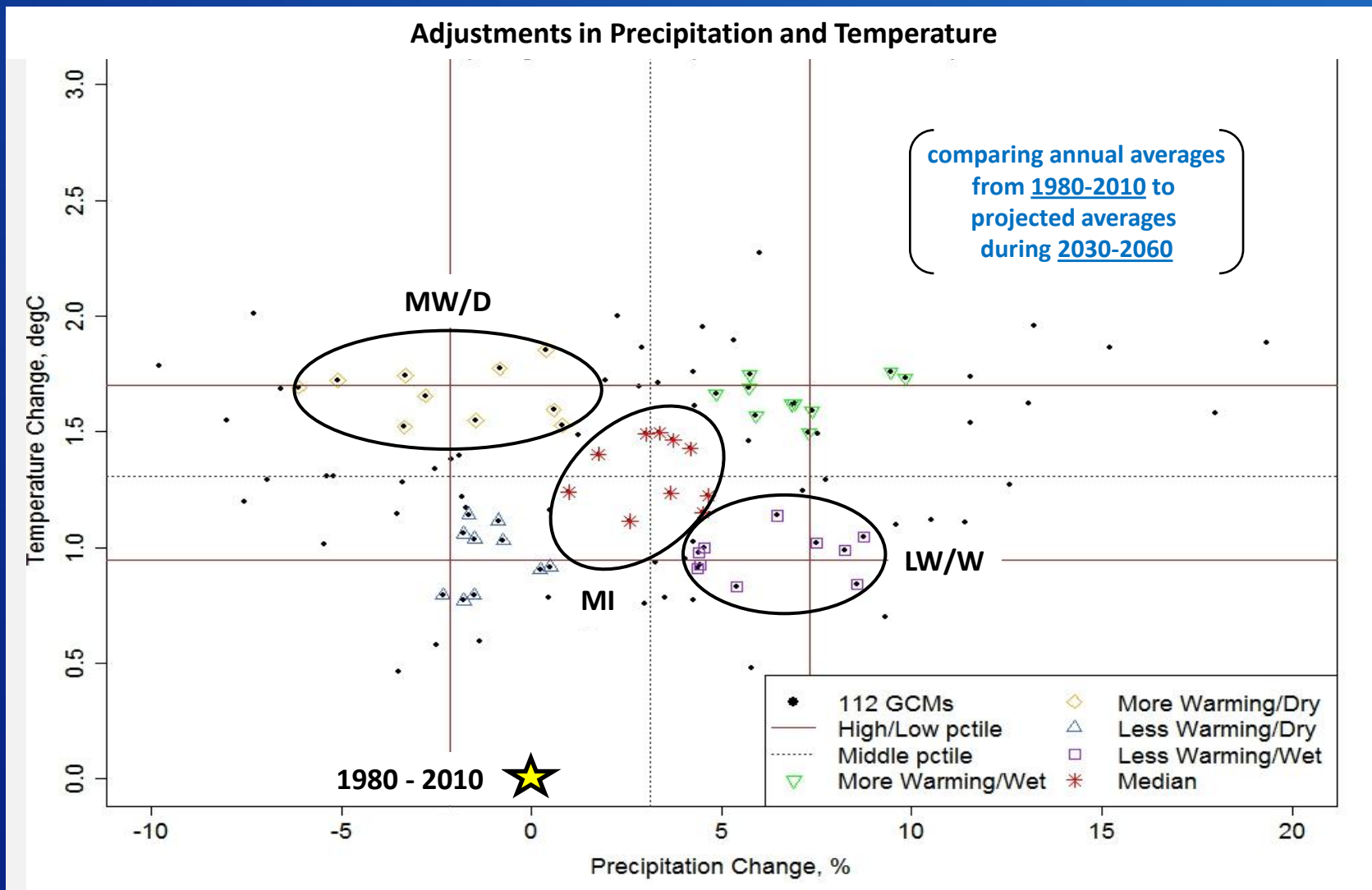


- Calibrated to historical observations of Mt. Hood glacier volume and extent
 - *Ladd, Coe, Eliot, and Newton Clark glaciers*

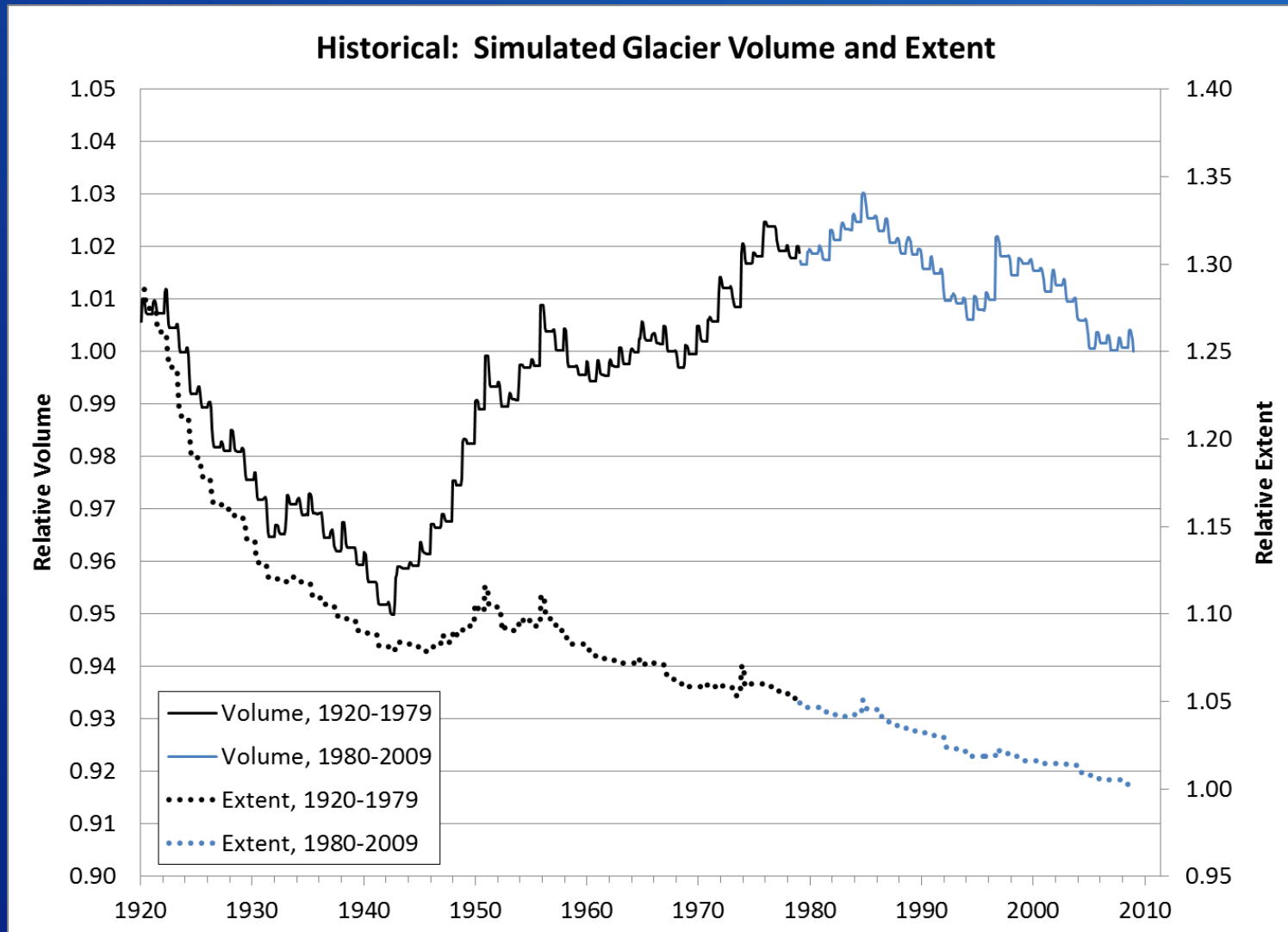
Hood River DHSVM



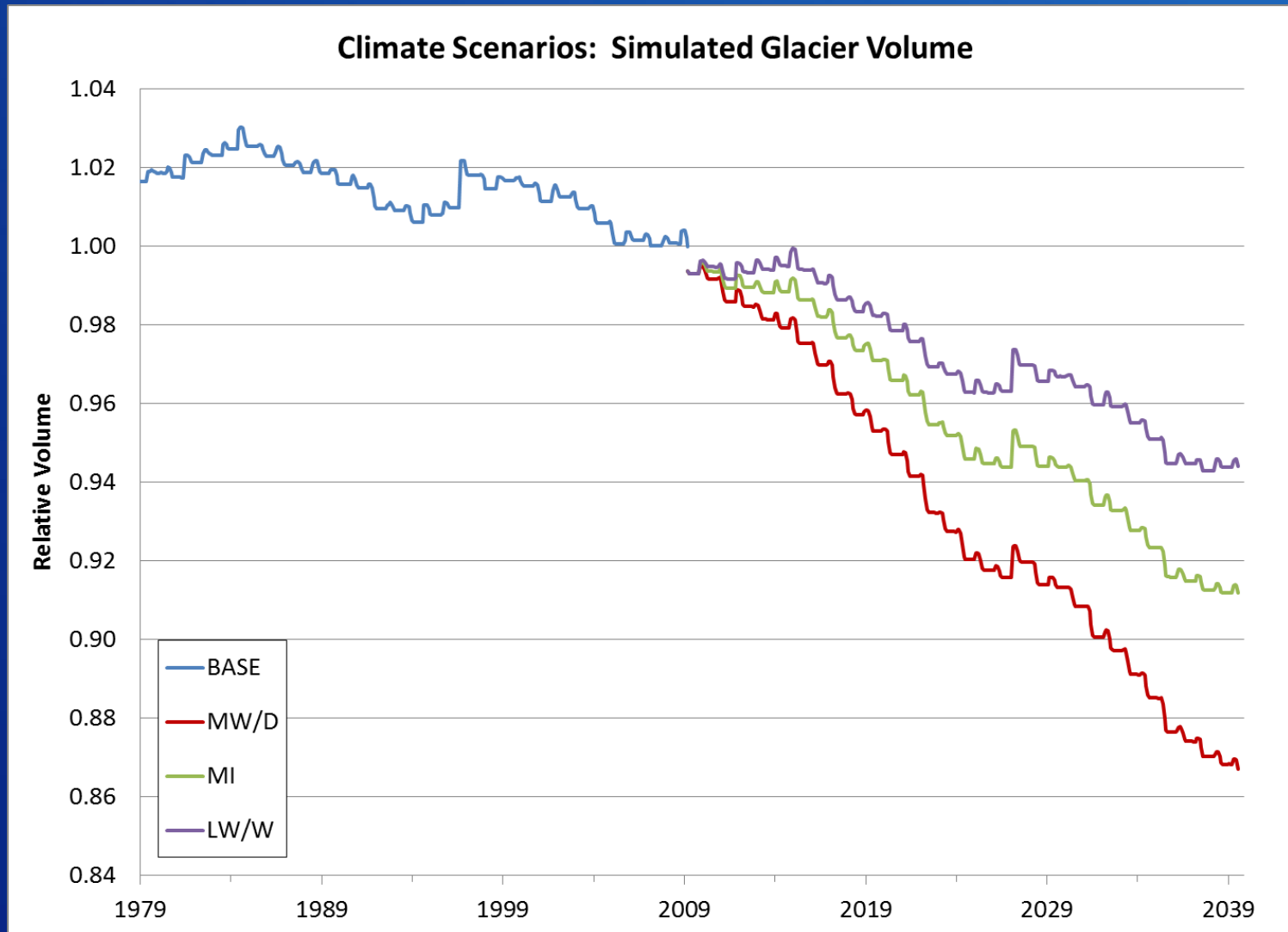
Climate Scenario Selection



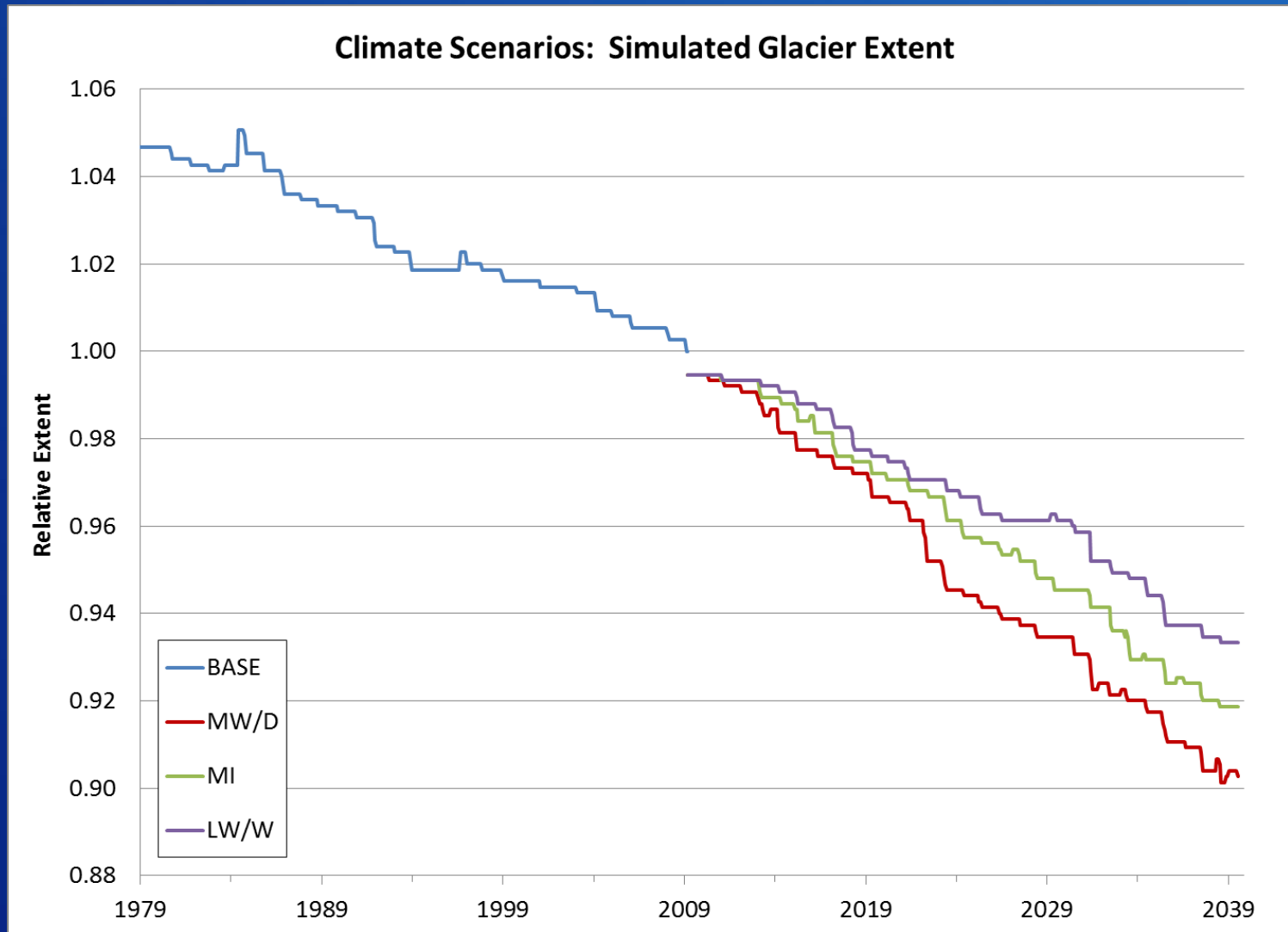
Glacier Analysis



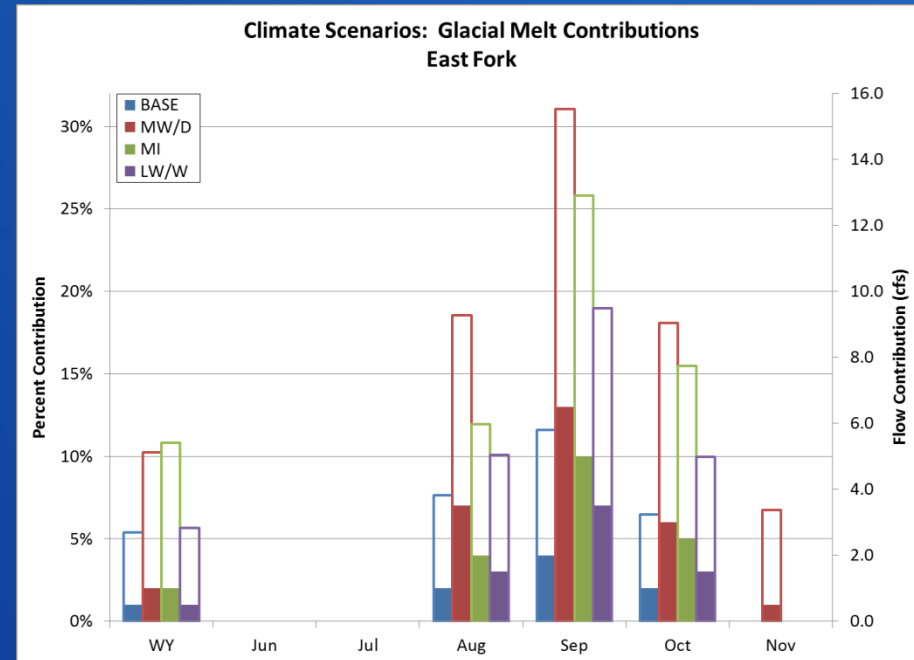
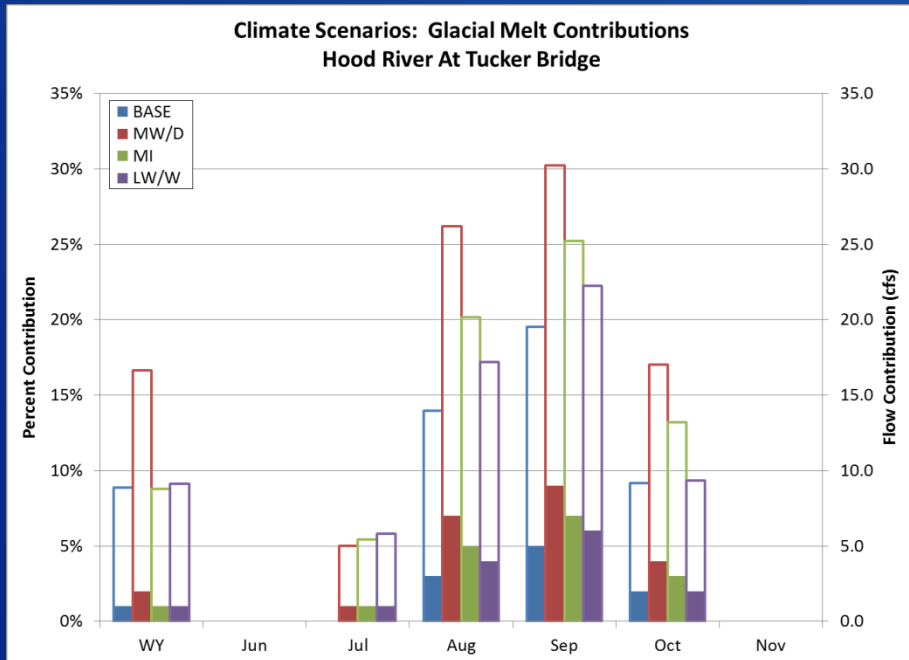
Glacier Analysis



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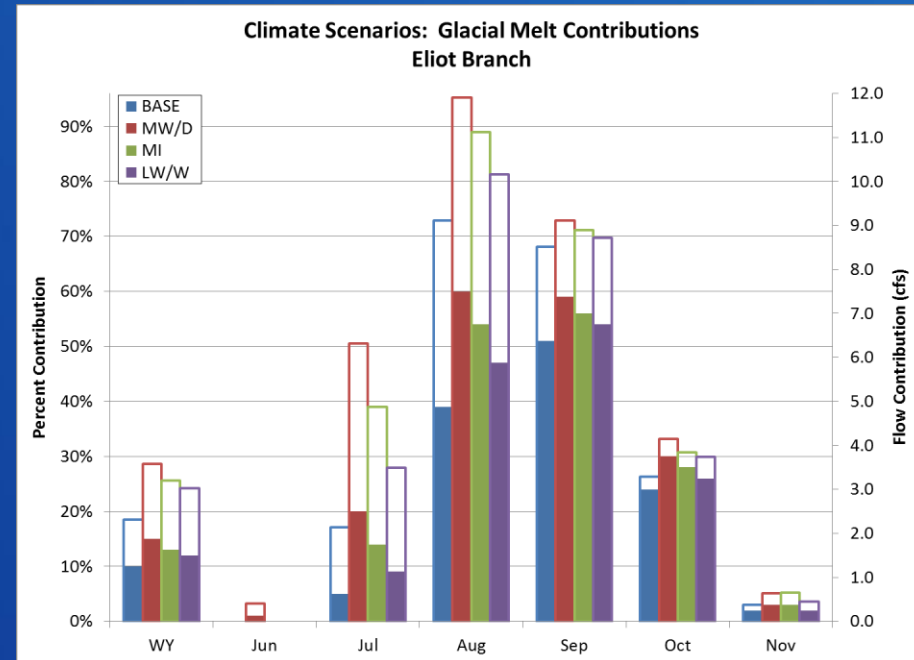
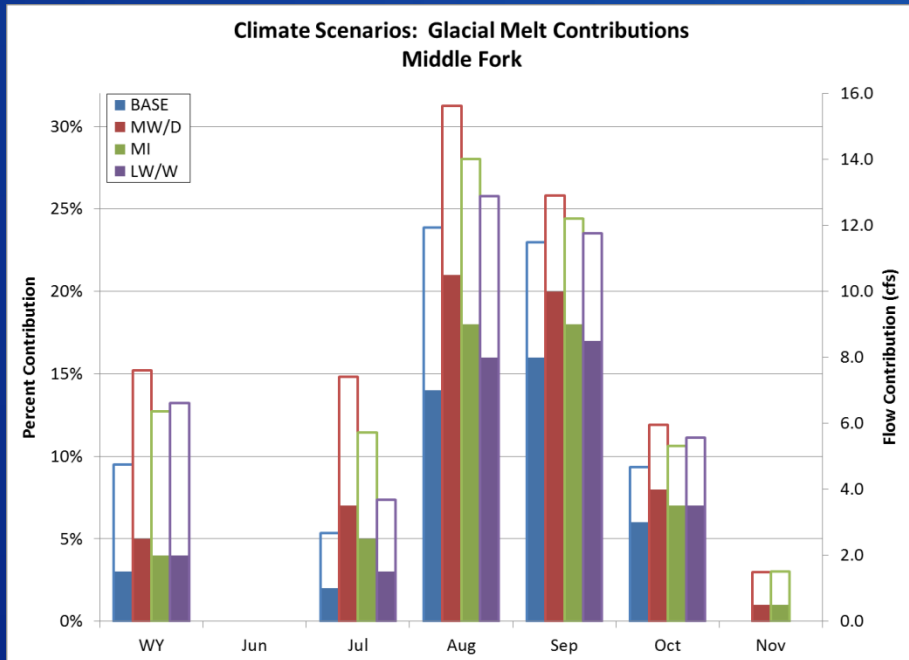


Glacier Analysis



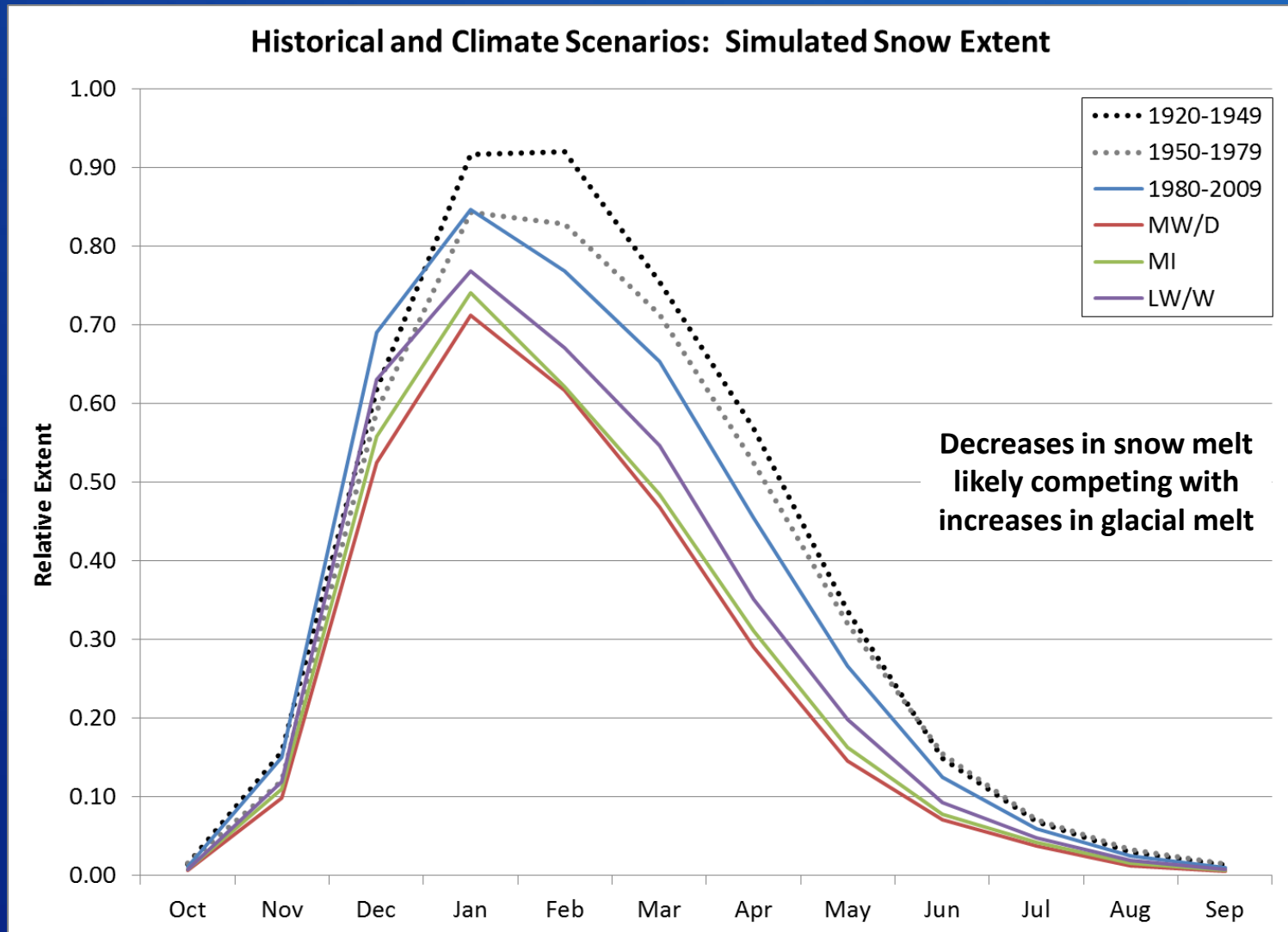
- Late summer Increases in glacial melt contributions to stream flows
 - Nearly 10% of mainstem flow (30 cfs)
 - Nearly 15% of EF flow (15 cfs)

Glacier Analysis

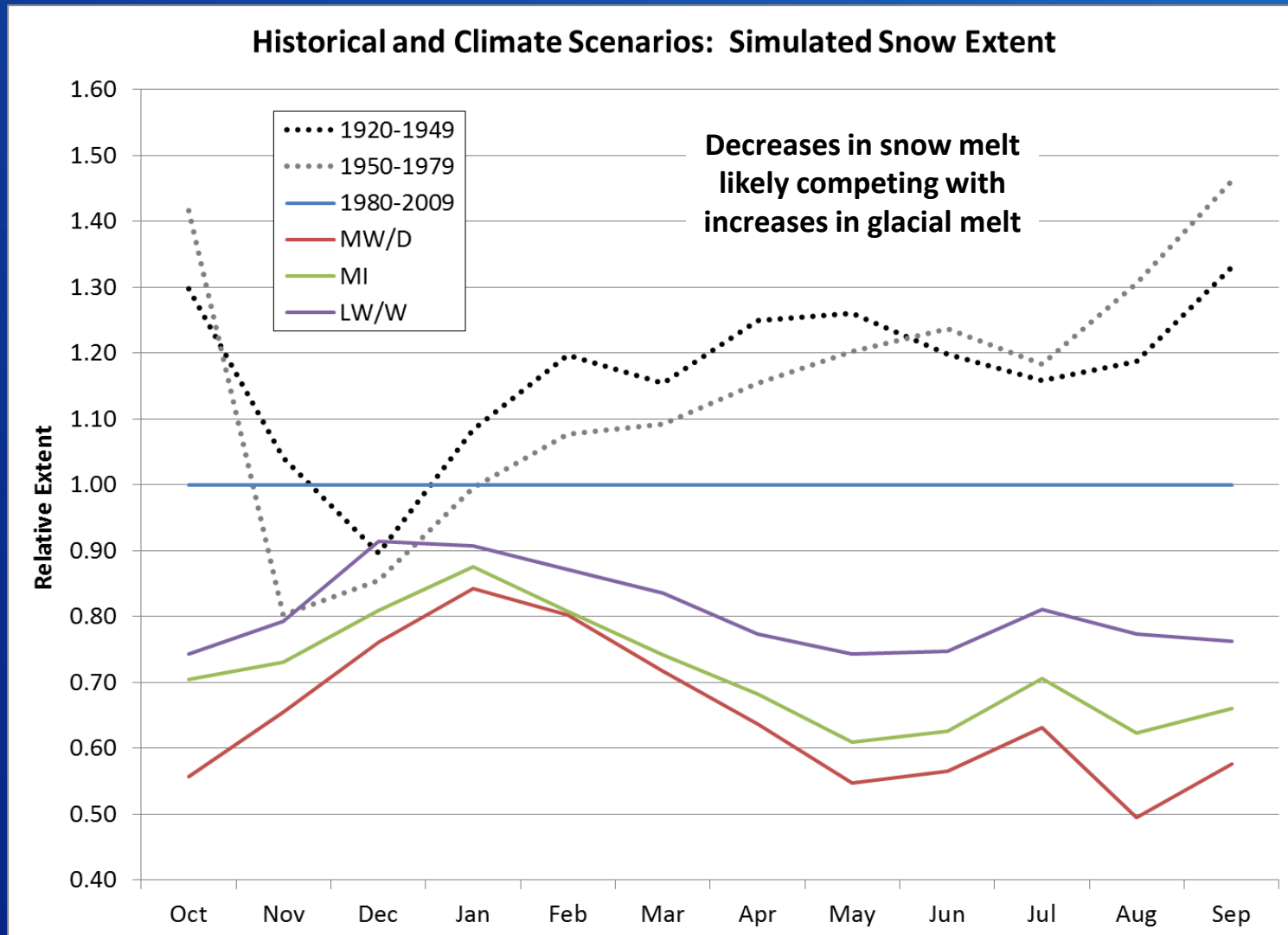


- Late summer Increases in glacial melt contributions to stream flows
 - *More than 20% of MF flow (16 cfs)*
 - *Nearly 60% of headwater flow (12 cfs)*

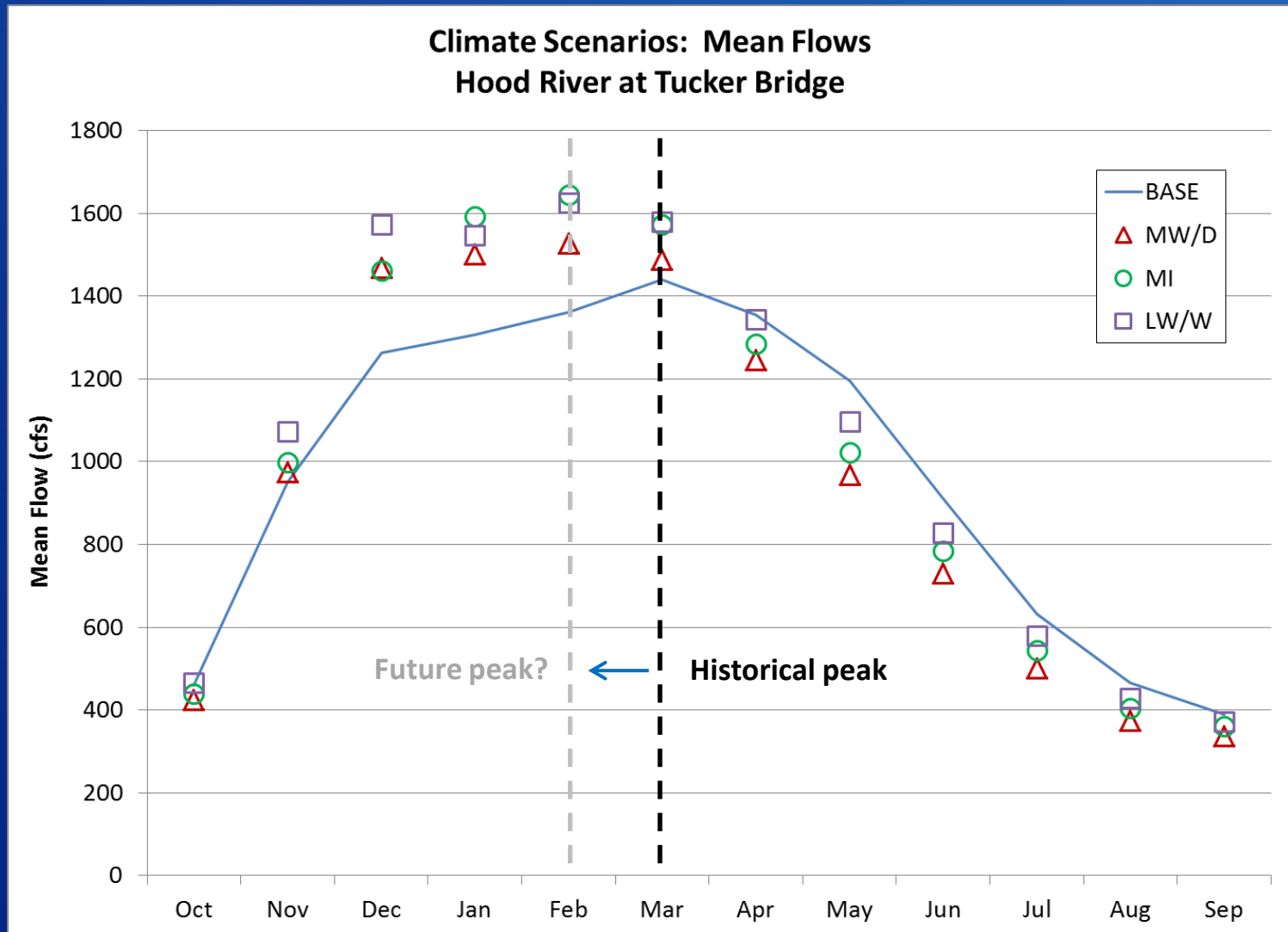
Snowpack Analysis



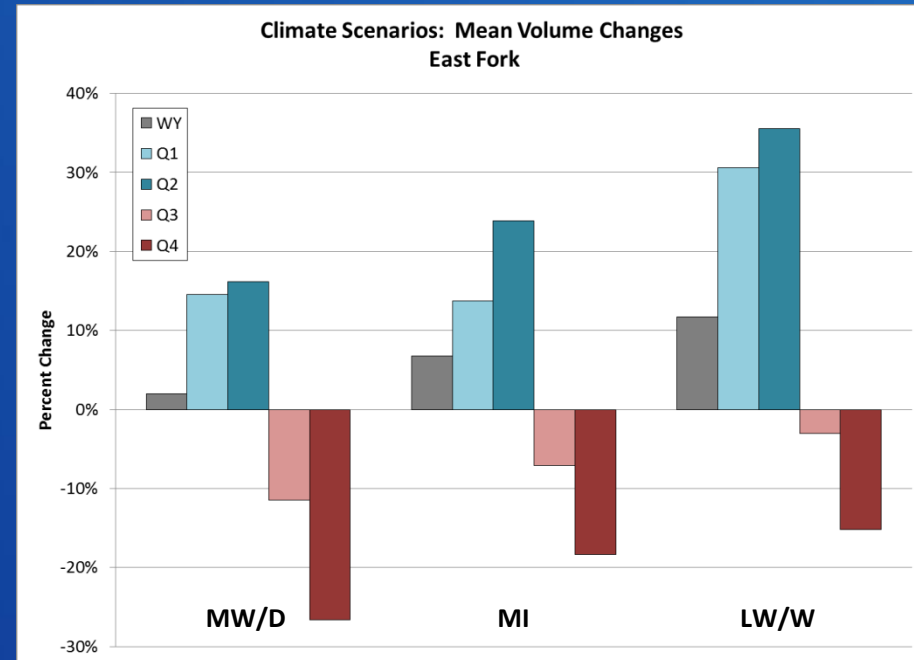
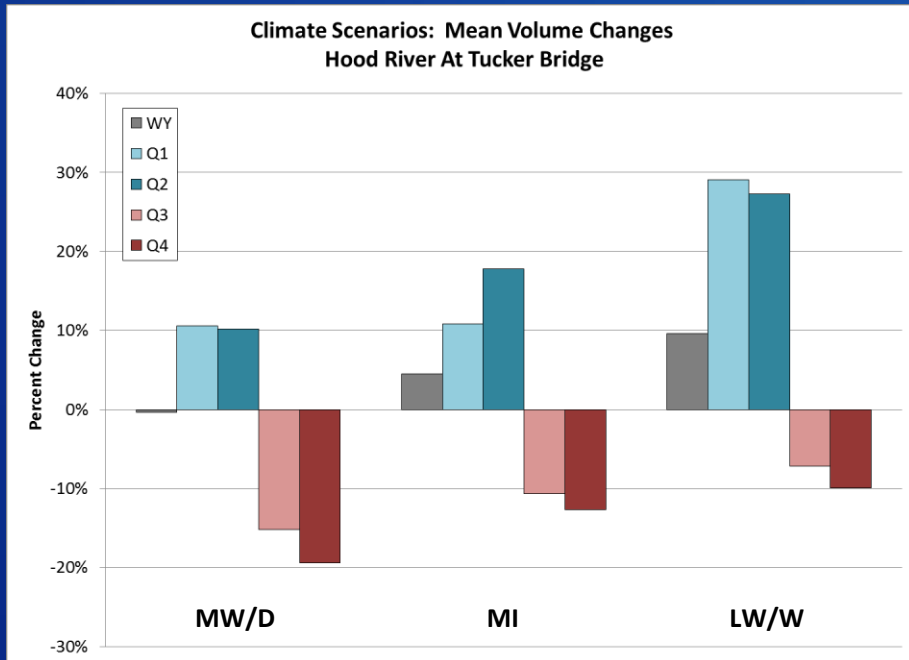
Snowpack Analysis



Natural Flows

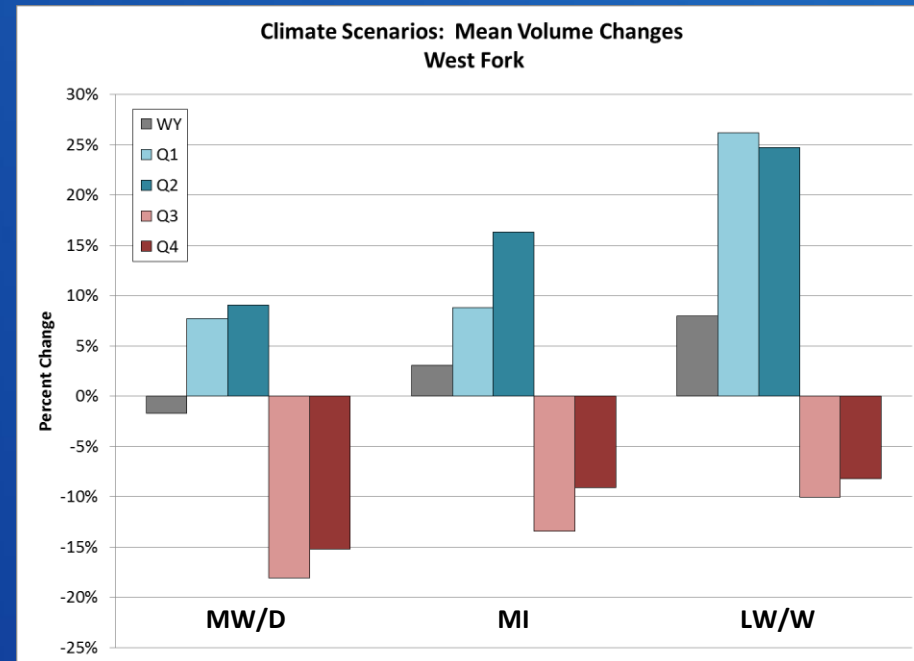
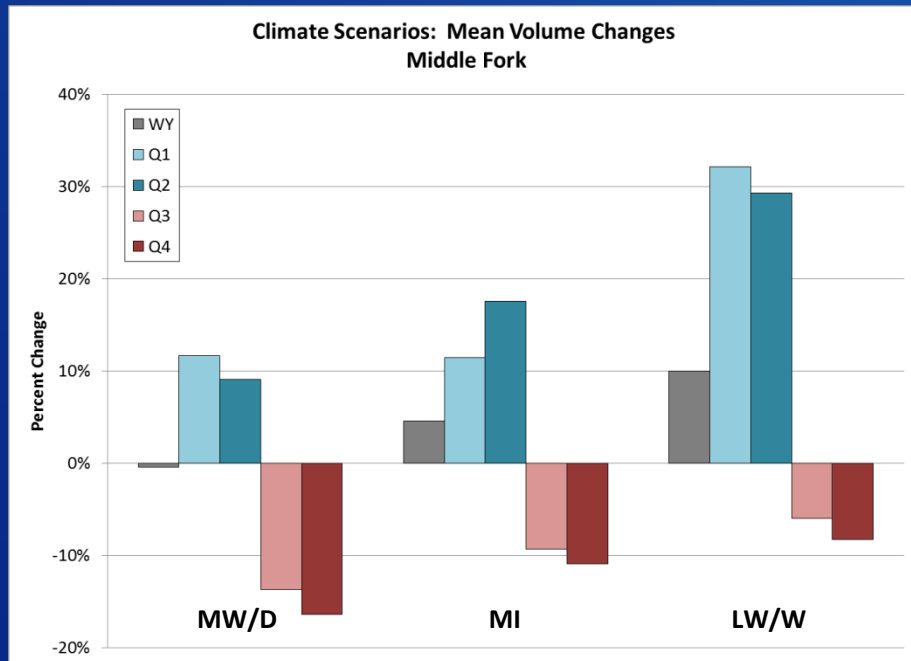


Natural Volumes



- Annual volume changes projected to be negligible, or slightly positive
- However, spring and summer volumes projected to decrease
 - *Increases expected to occur during irrigation off-season*

Natural Volumes

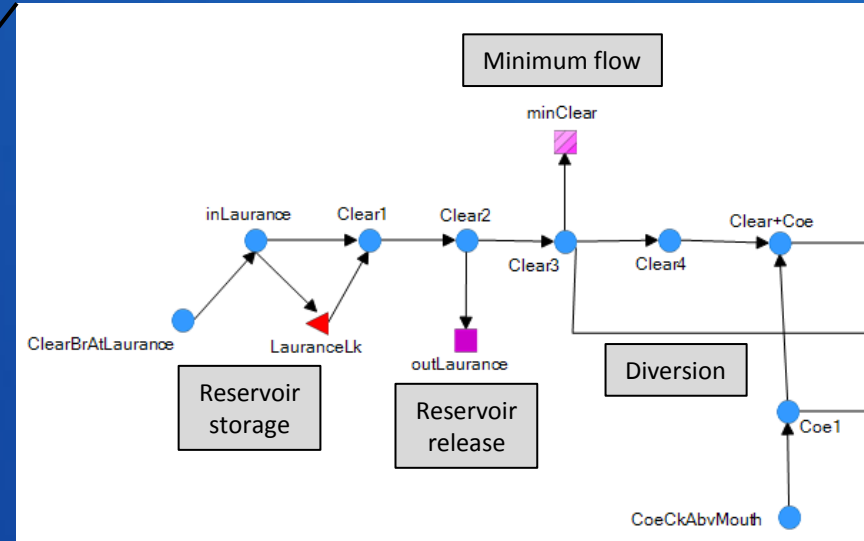
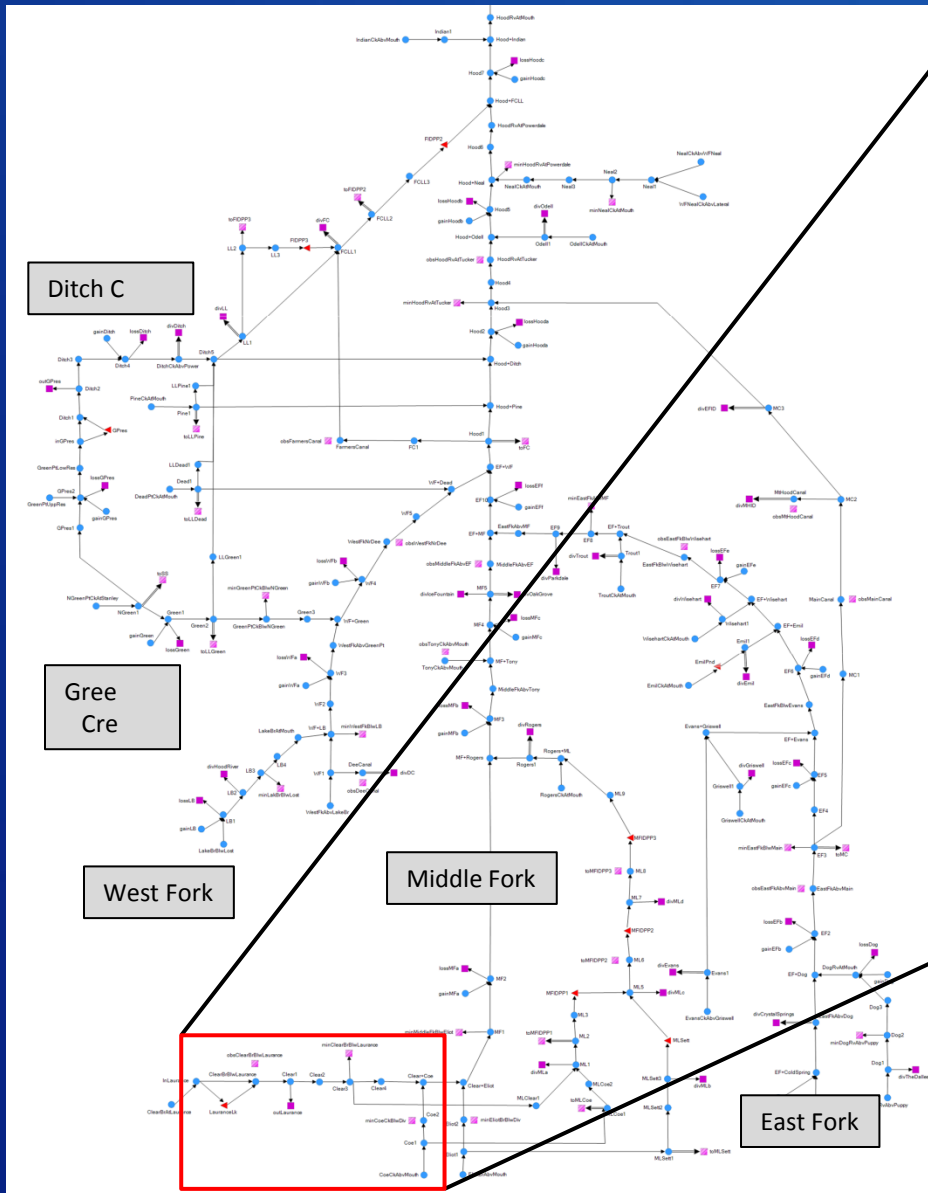


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MODSIM

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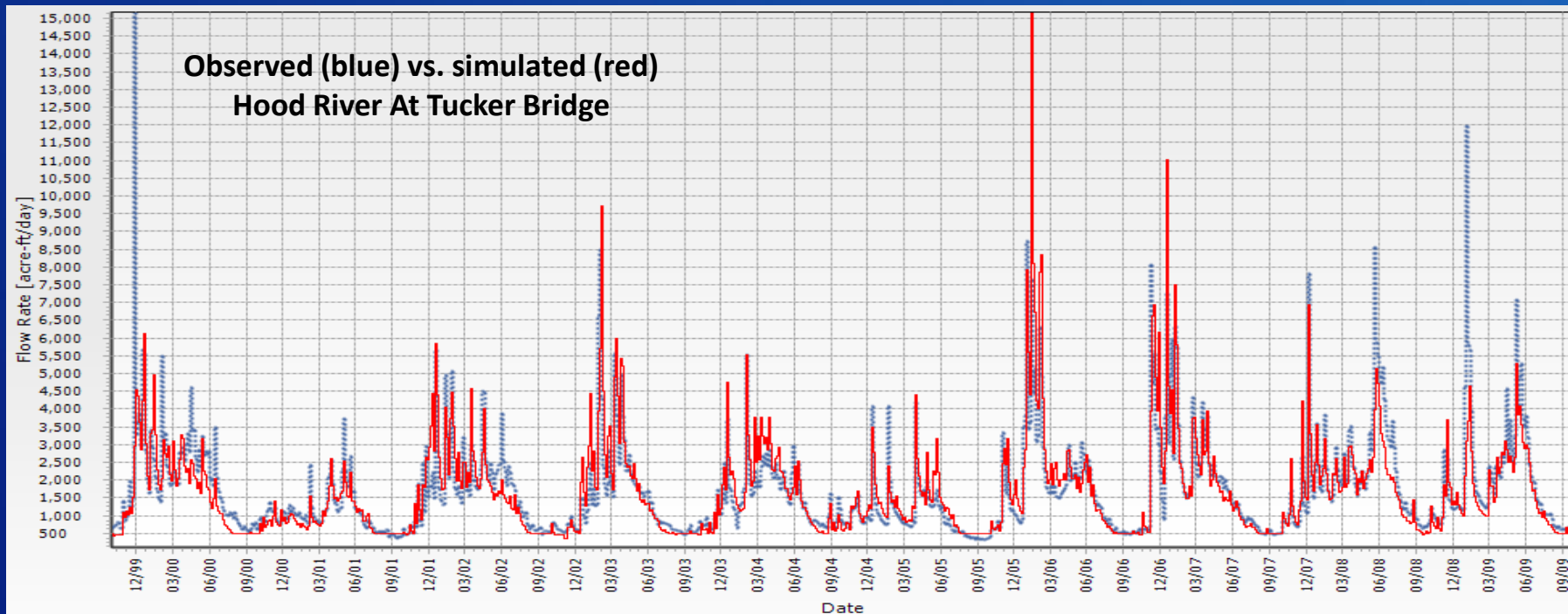
Hood River MODSIM



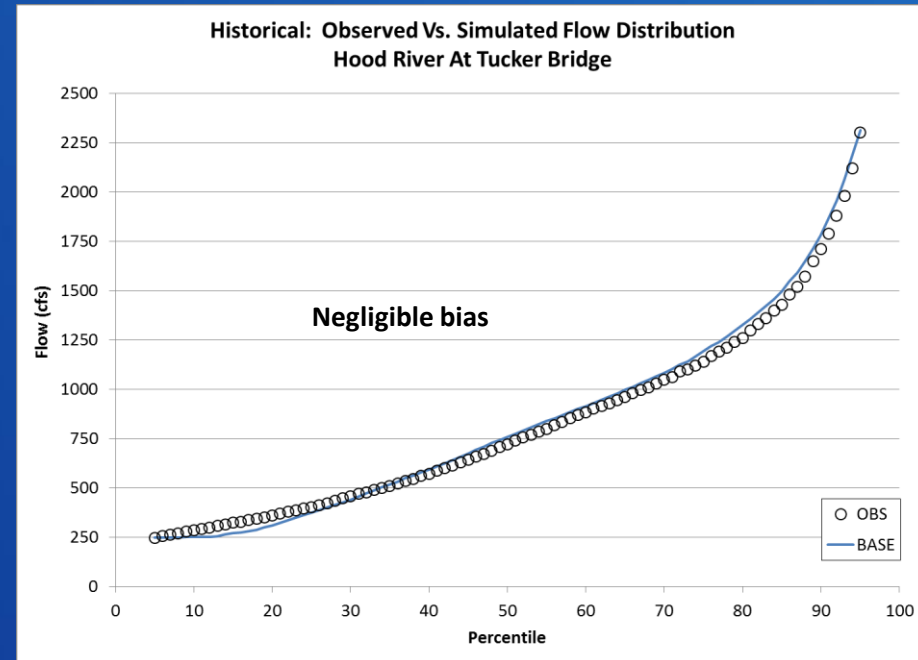
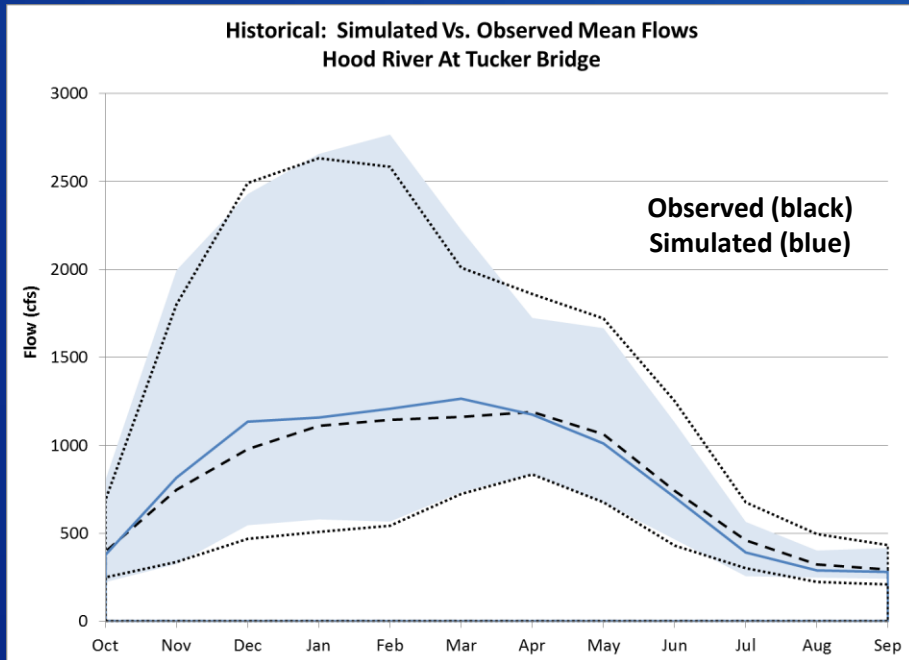
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Hood River MODSIM

- Utilized detailed information provided by irrigation districts and methodically summarized in the Hood River Basin Water Use Report
 - *Water rights, irrigation networks, reservoir characteristics and operations, power plant characteristics and operations, minimum flow requirements/agreements, etc.*
- Calibrated to available/applicable stream and canal gauge records

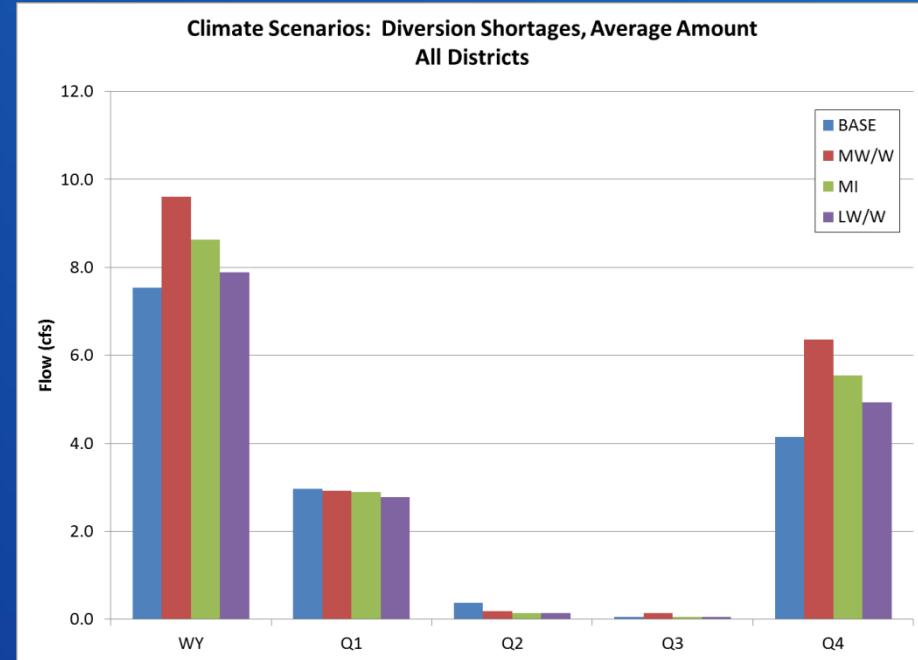
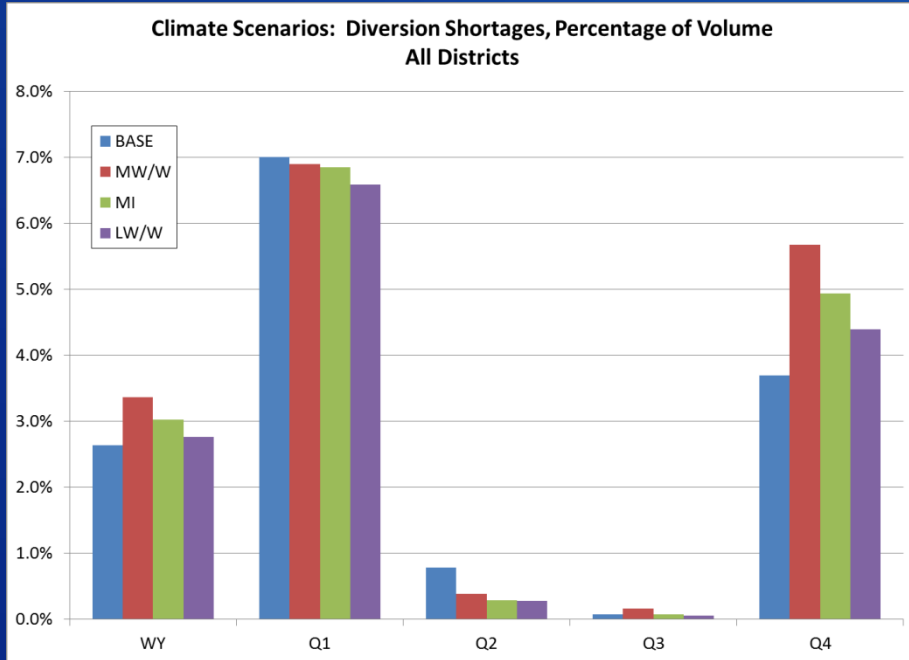


Regulated Flows



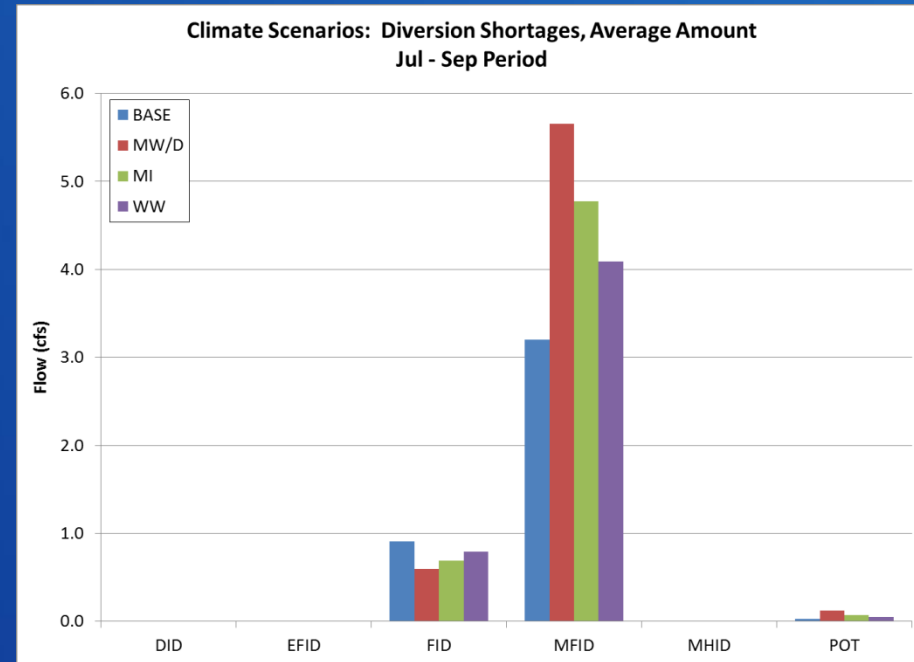
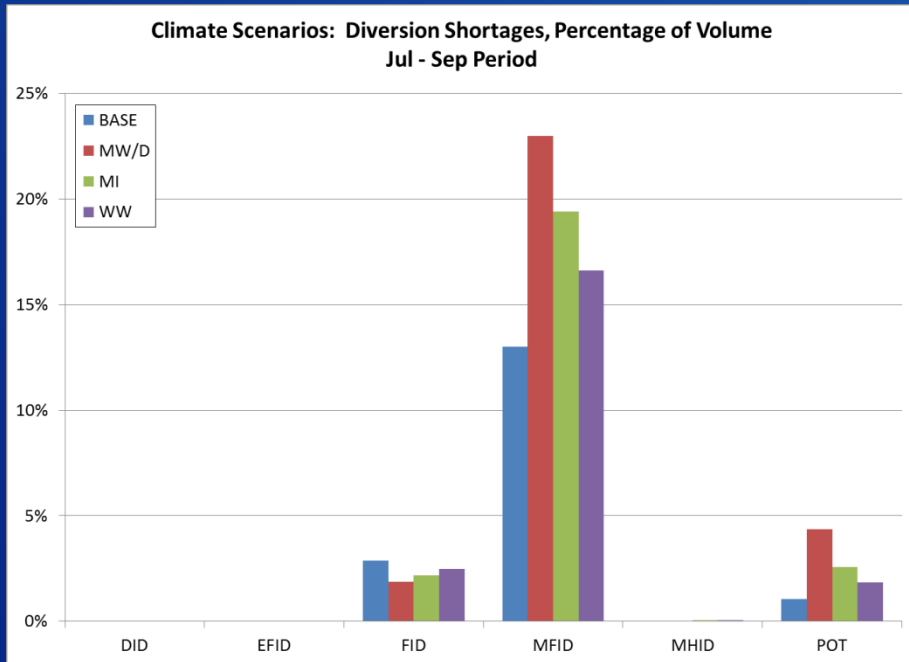
- Translation of natural flows through MODSIM suggests water usages are reasonably accounted for

Consumptive Use



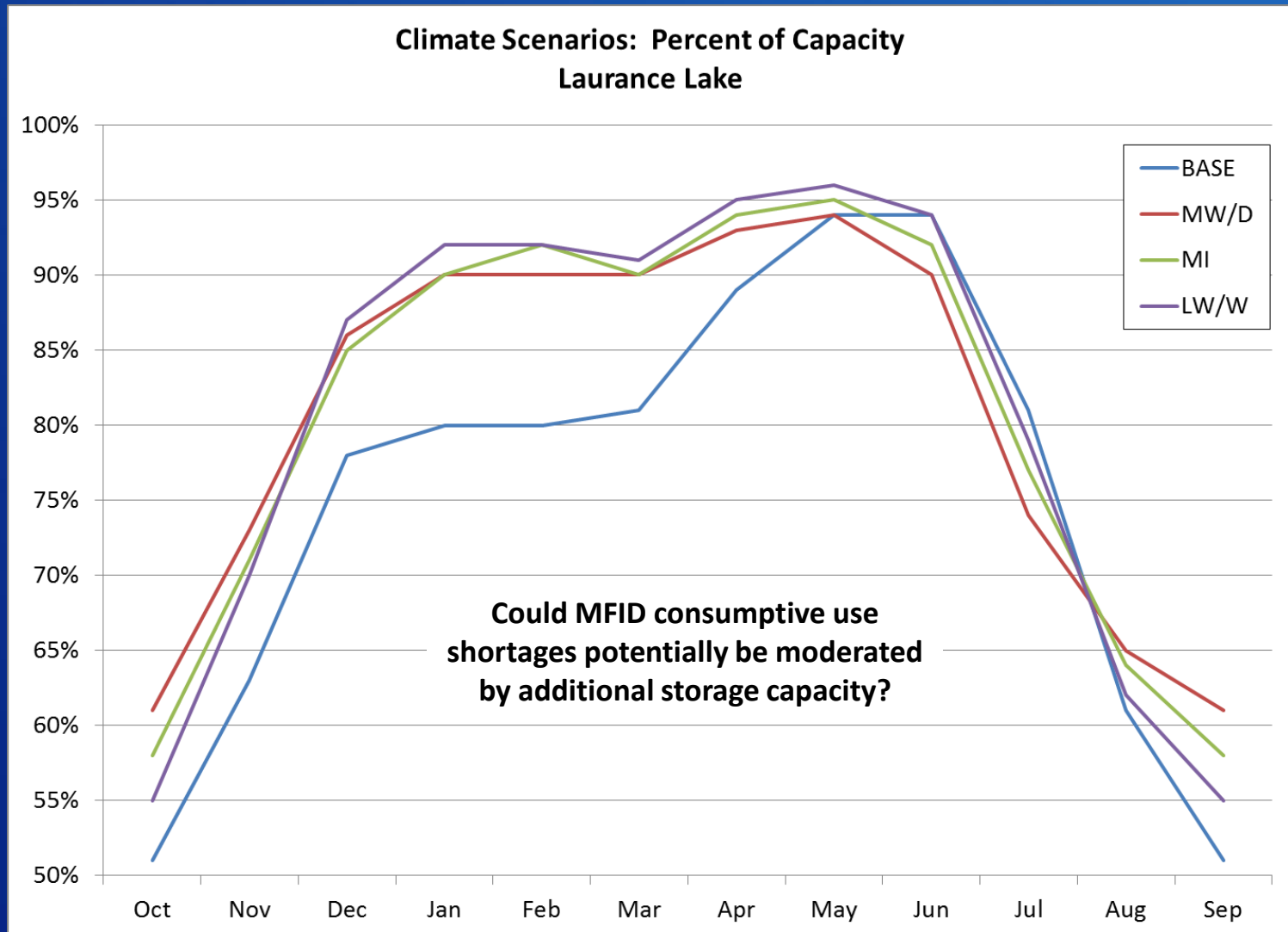
- More shortages projected during late summer, but not in all districts

Consumptive Use

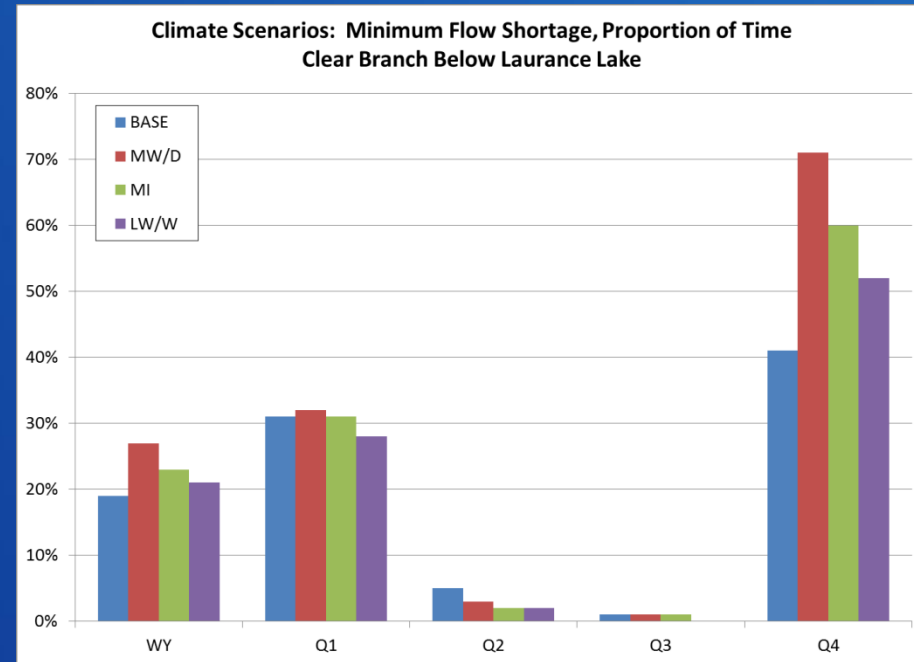
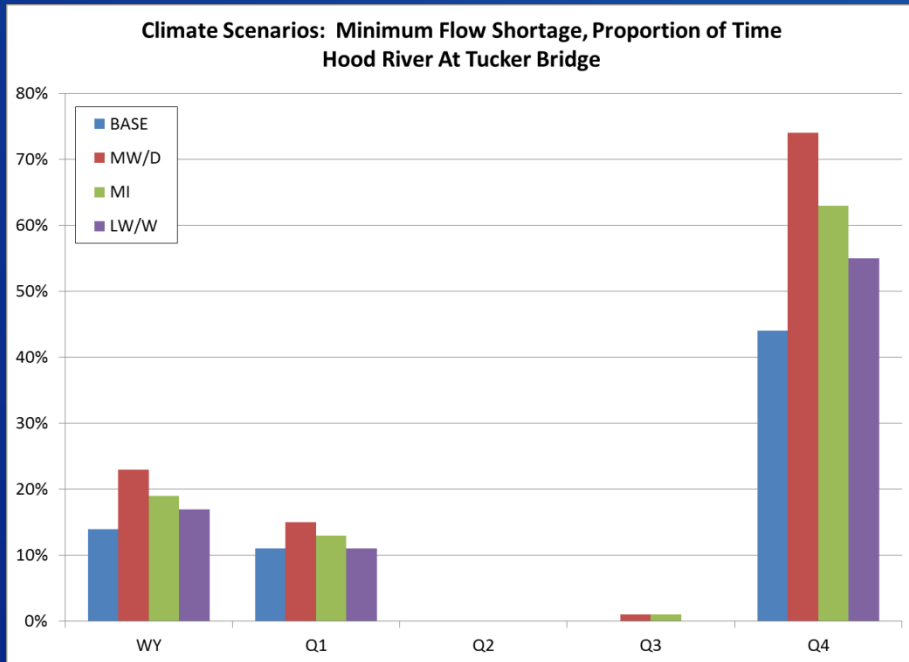


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Reservoir Storage

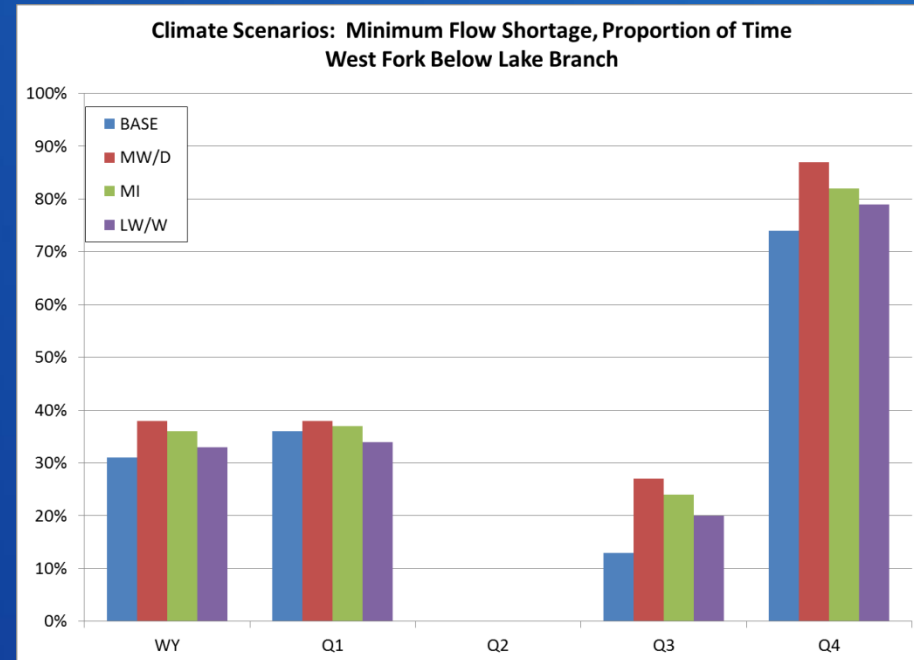
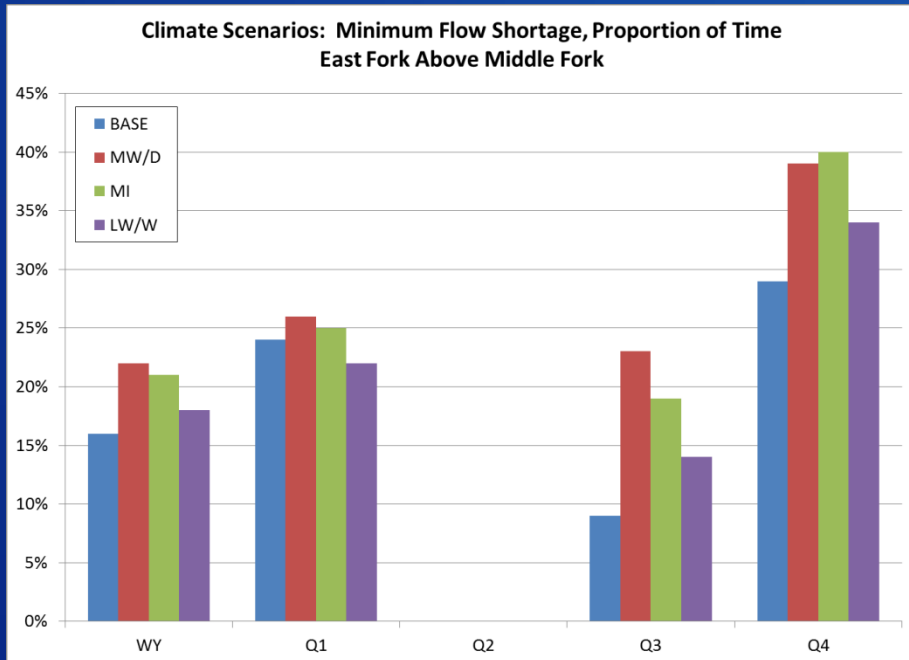


Minimum Flows



- Decreased stream flows during late summer also expected to impact minimum flow requirements/agreements

Minimum Flows



- Some impacts during Apr – Jun period also suggested along EF and WF
 - *Could EF minimum flow shortages potentially be moderated by additional storage capacity?*

Questions?

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