Updated Precipitation-Runoff Modeling System in Scott Valley

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Outline

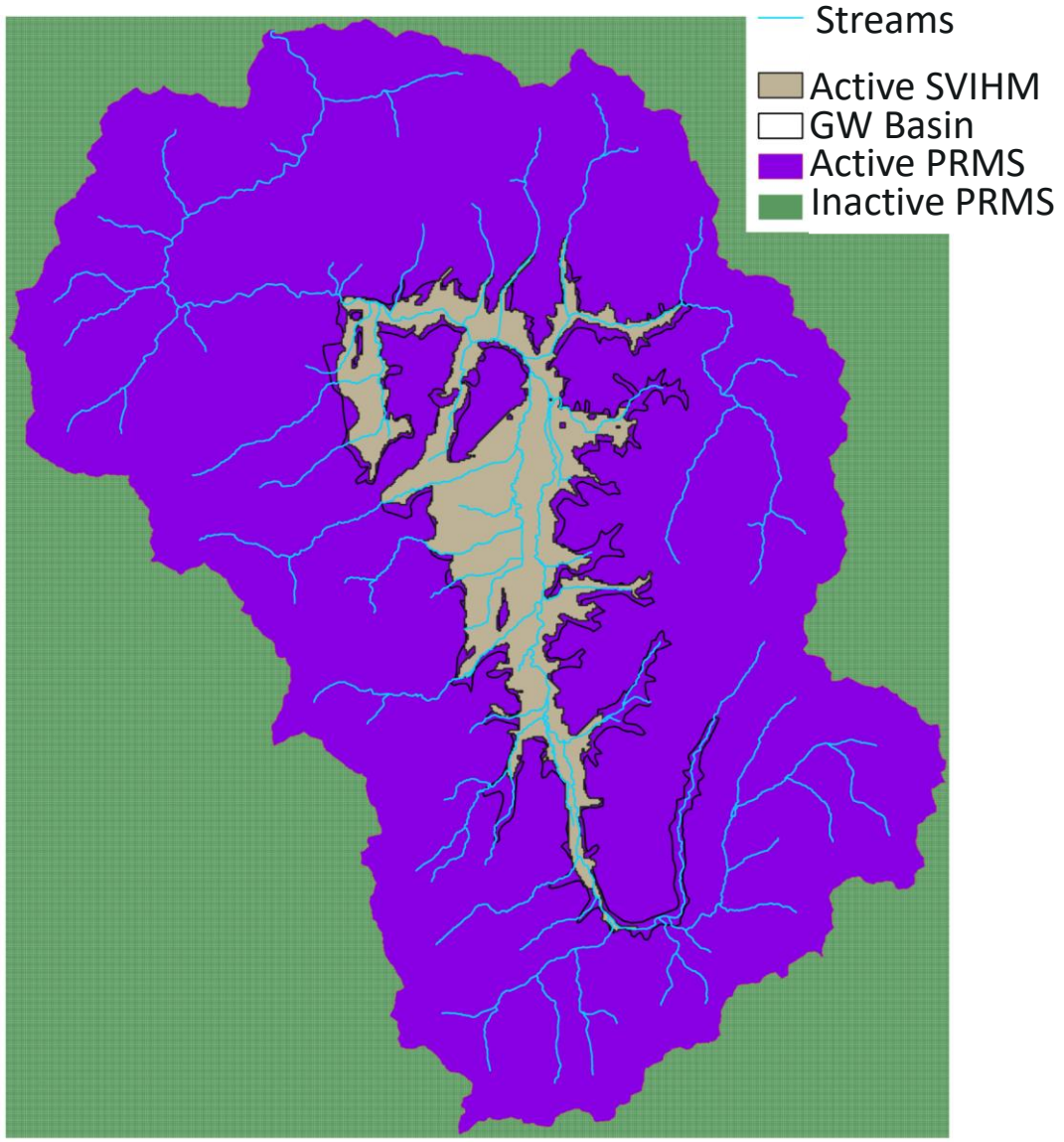
- Introduction
- Modeling needs for the Scott Valley groundwater basin
- Scott Valley Precipitation-Runoff Modeling System (PRMS)
  - Structure
  - Results
- Scenarios
  - Meadow restoration
  - Forest management
  - Effect of large wildfires

Scott Valley Groundwater Sustainability Plan

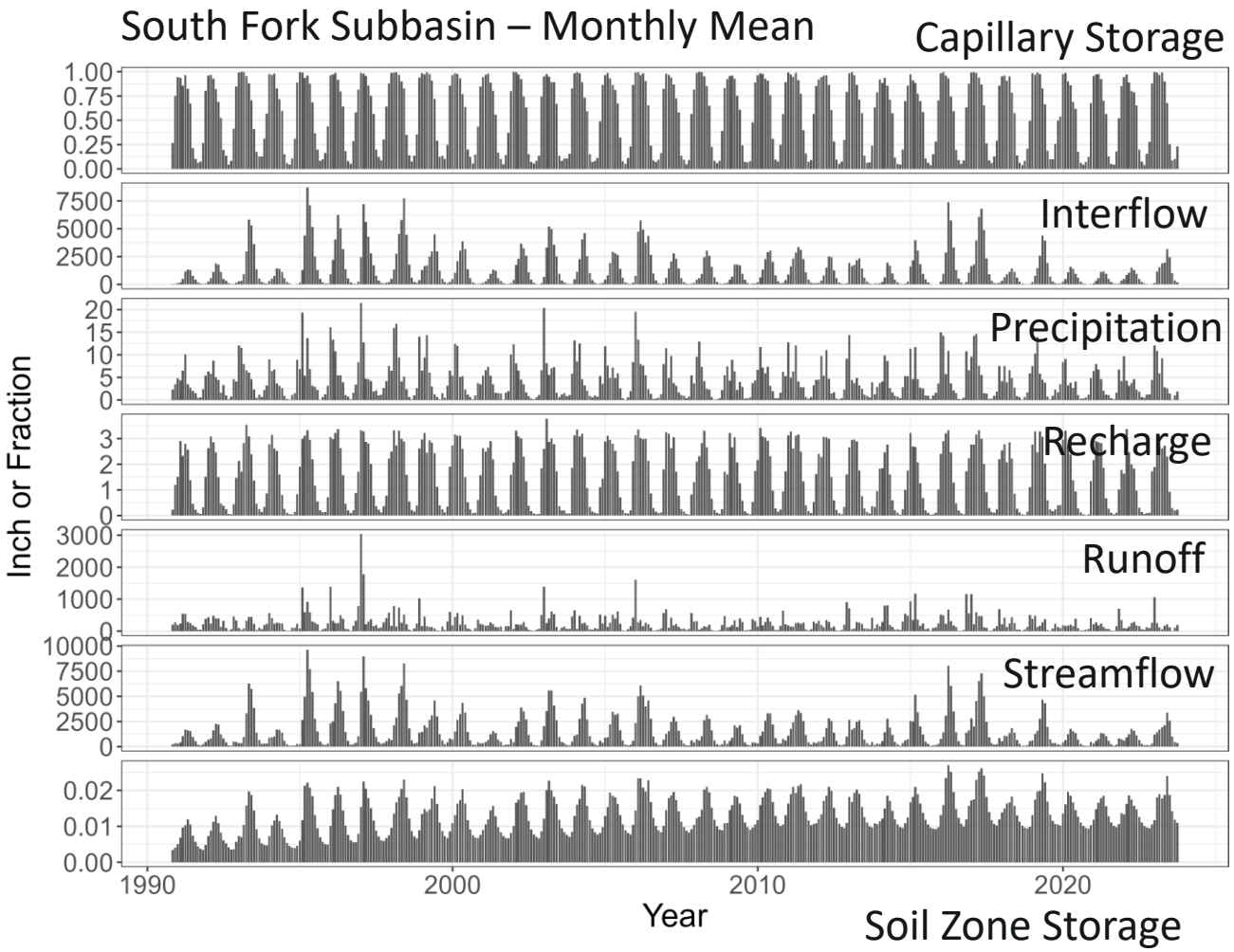
- Scott Valley MODFLOW model (SVIHM) streamflow
  - Dependent on an estimate of streamflow based on a regression of historical data.
  - Needs streamflow that can be adjusted for climate change.
  - During GSP development, stakeholders expressed the need for a system that can simulate climate change and upland management scenarios.
- Scott Valley Precipitation-Runoff Modeling System (PRMS)
  - Calibrated to local monitoring station data and diversion estimates from SVIHM
  - Input precipitation and temperature can be adjusted to simulate different climate scenarios and predict streamflow and mountain front recharge.

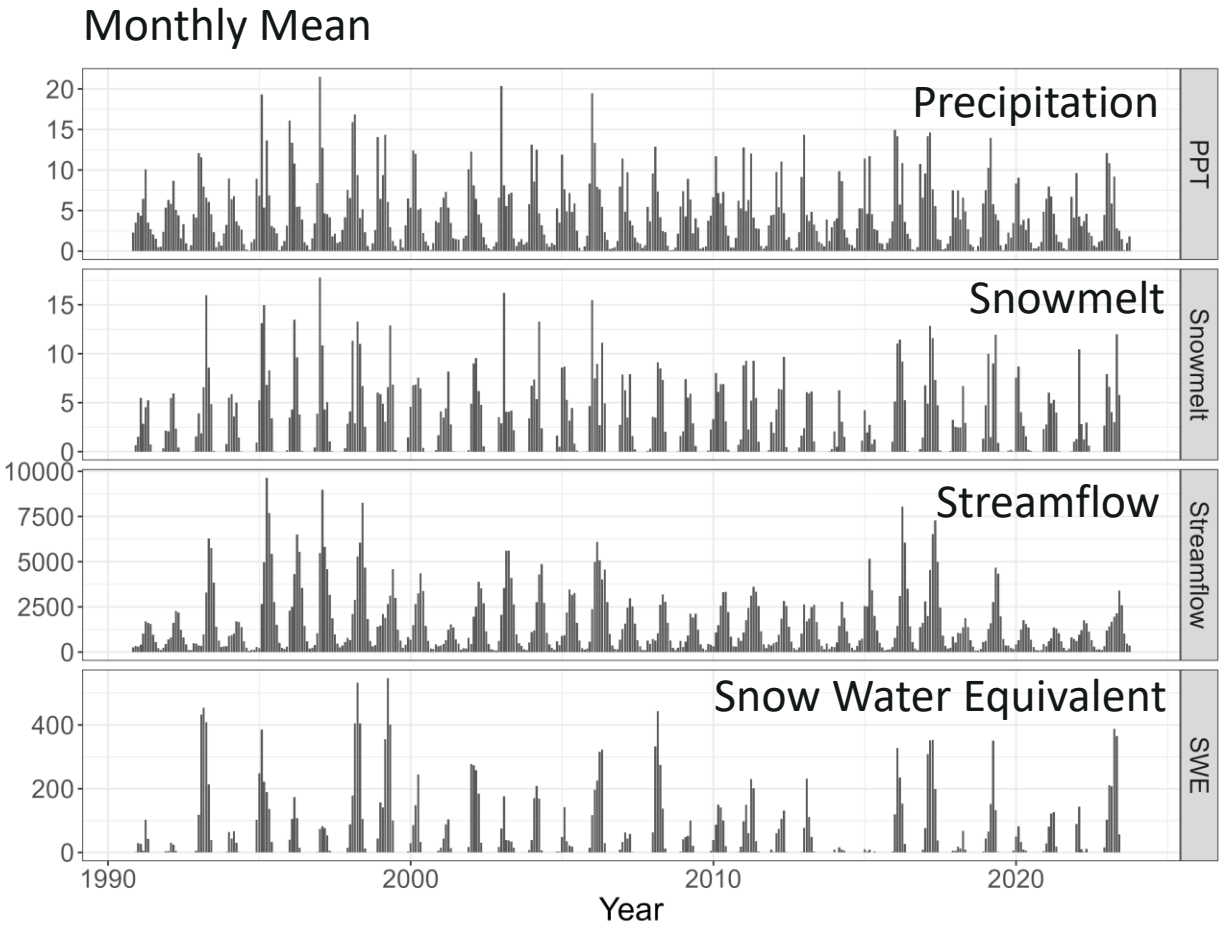
Scott Valley PRMS

- PRMS calculates streamflow while considering snowpack, runoff, plant canopy, soil zone, and other parameters.
- Watershed scale
- Time-dependent streamflow from October 1990 to August 2023
  - Low flow and high flows
  - Daily streamflow
- Grid cell size of 100 by 100 meters

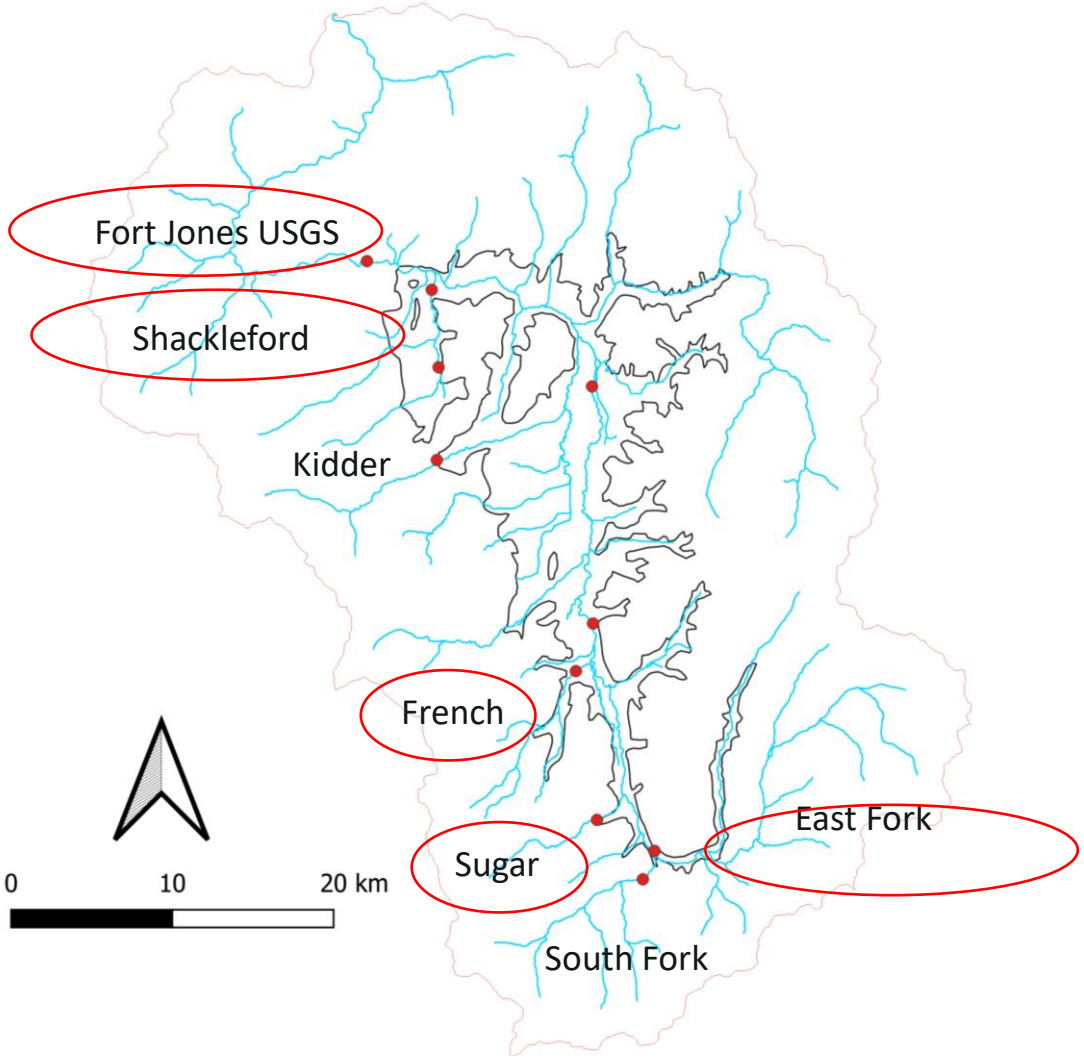


Example PRMS Output

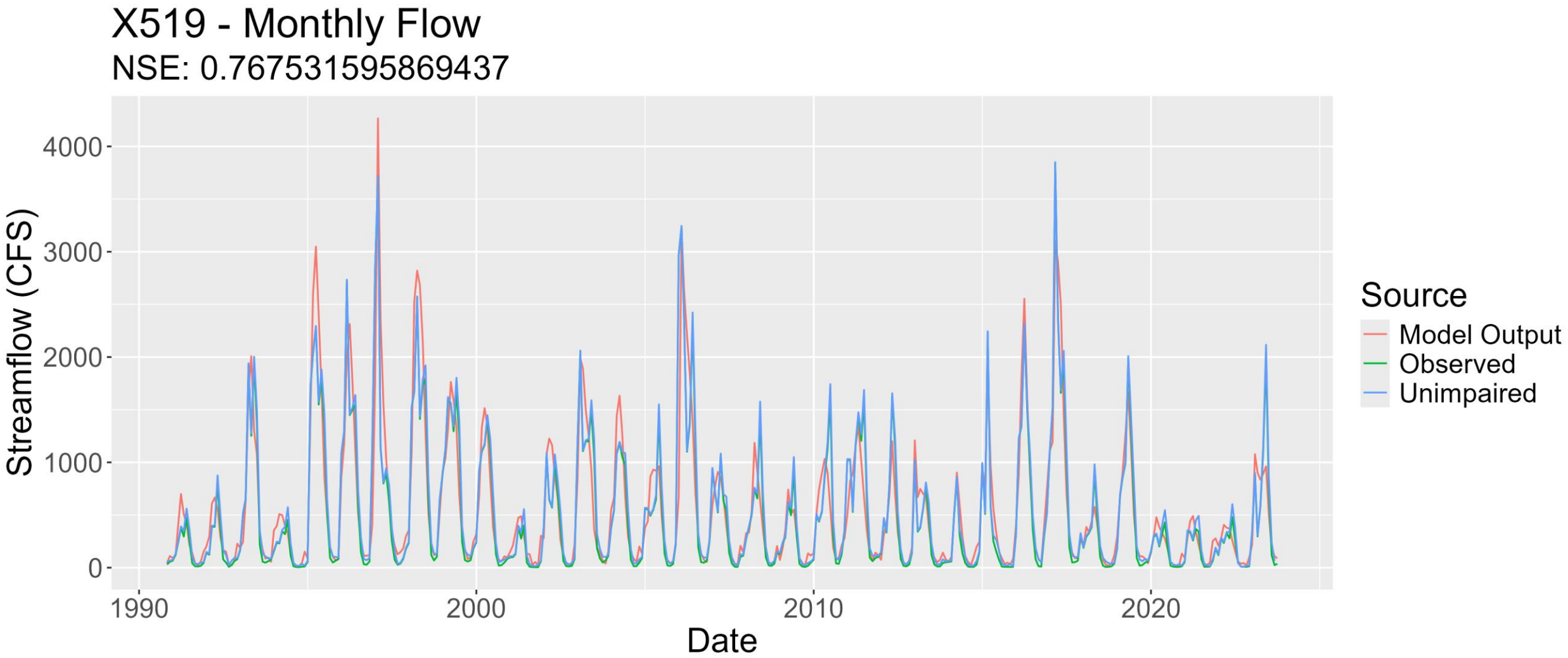




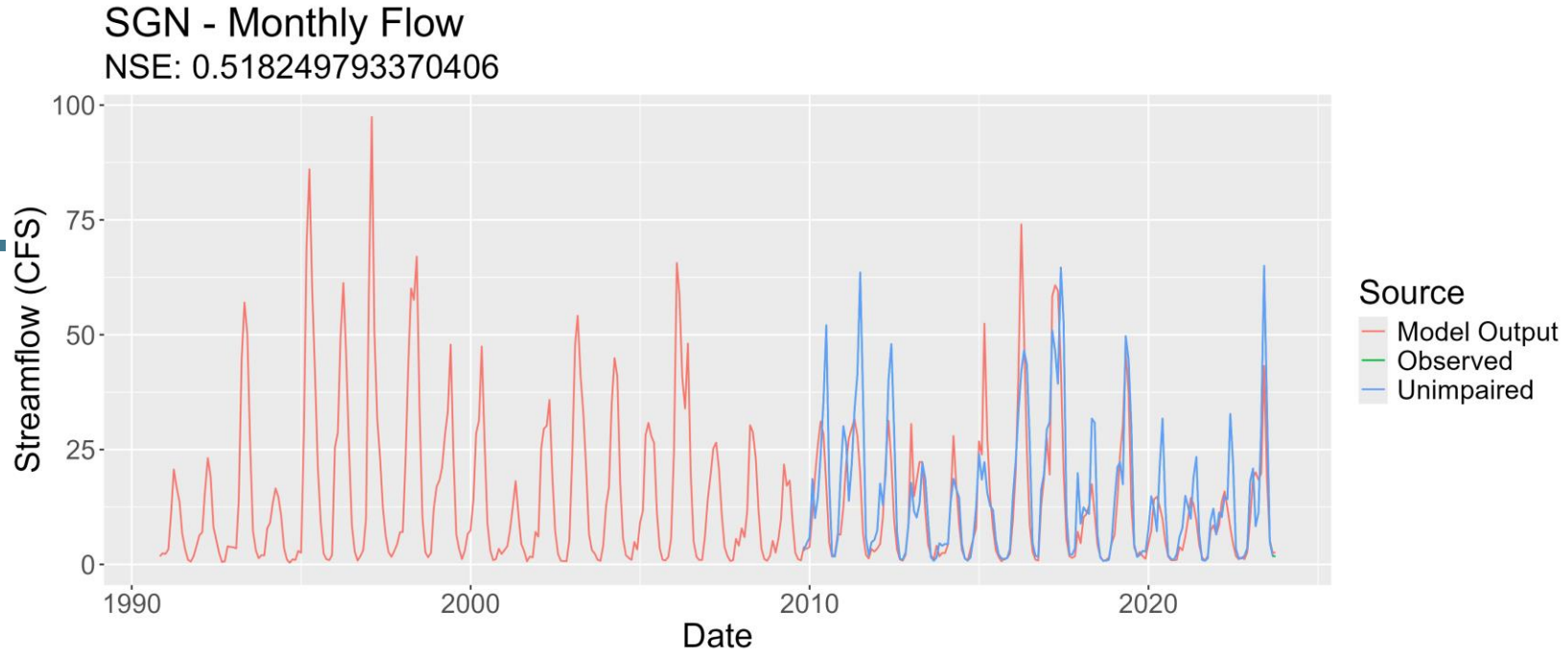
Selected Results



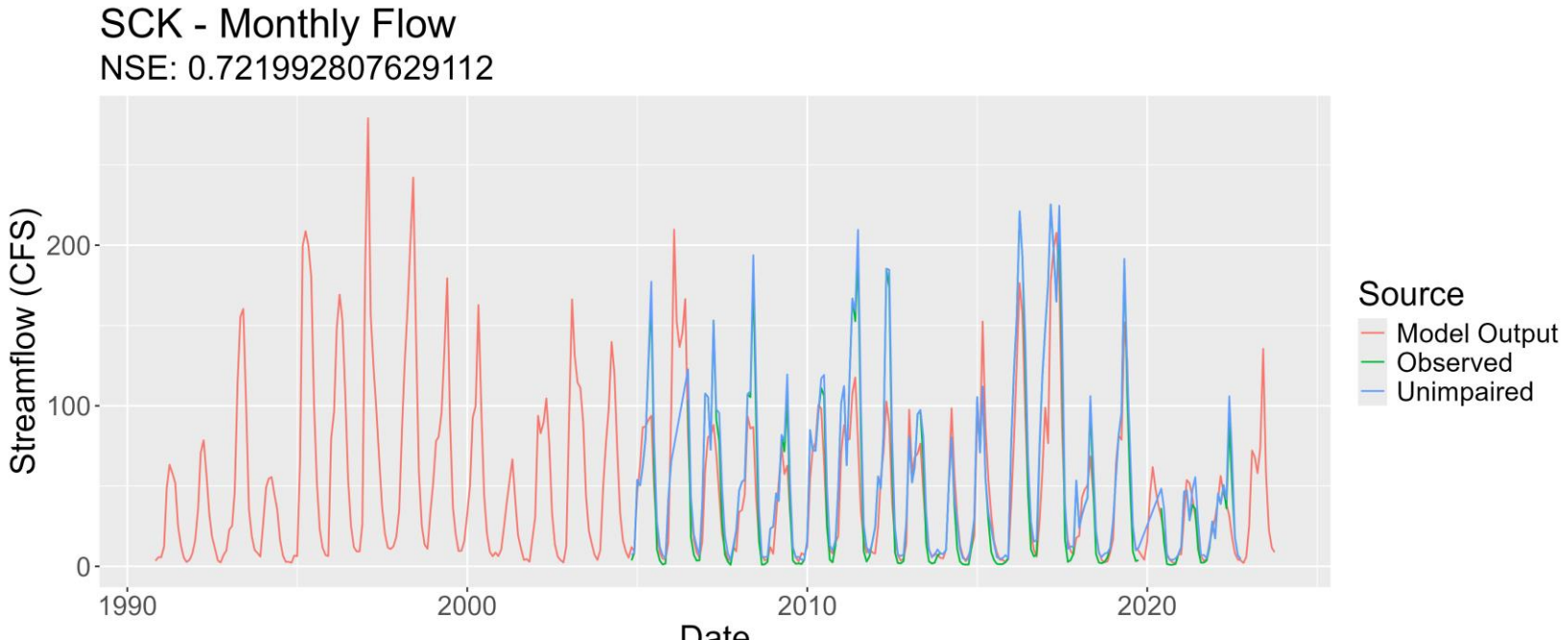
Results *Fort Jones USGS on Scott River*



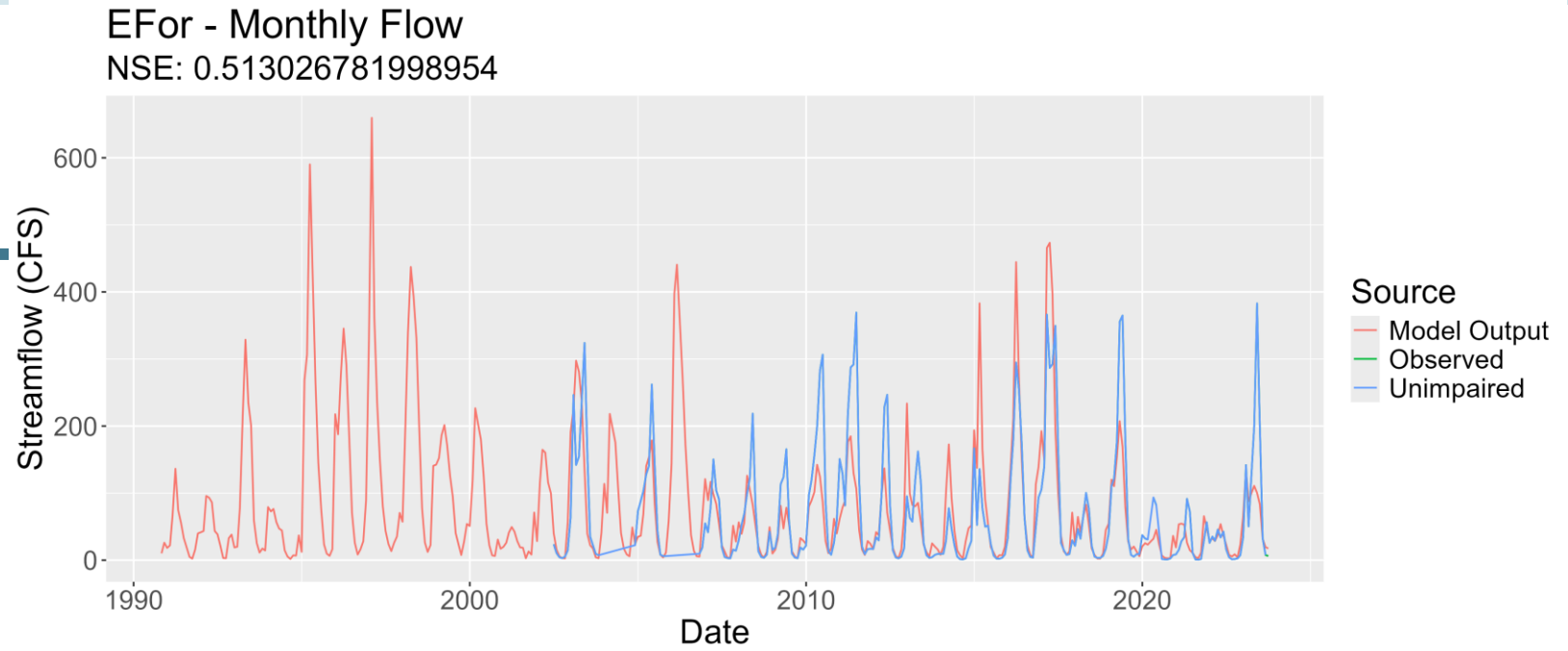
Sugar Creek



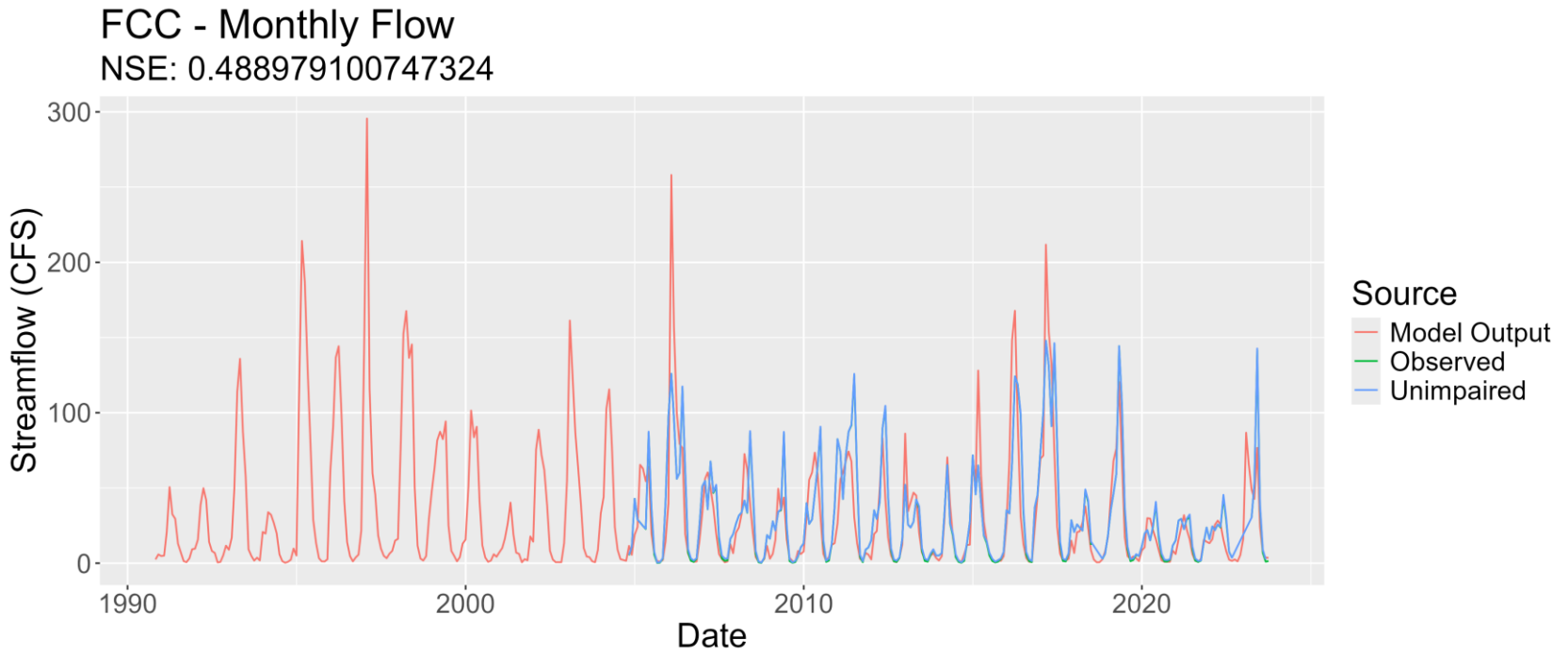
Shackleford Creek



East Fork



French Creek



Using PRMS to Simulate Different Scenarios

- Scenarios
  - Climate Change Driven Scenarios
  - Management Driven Scenarios
    - Impact of wildfire
    - Forest thinning / timber harvest
    - Meadow restoration

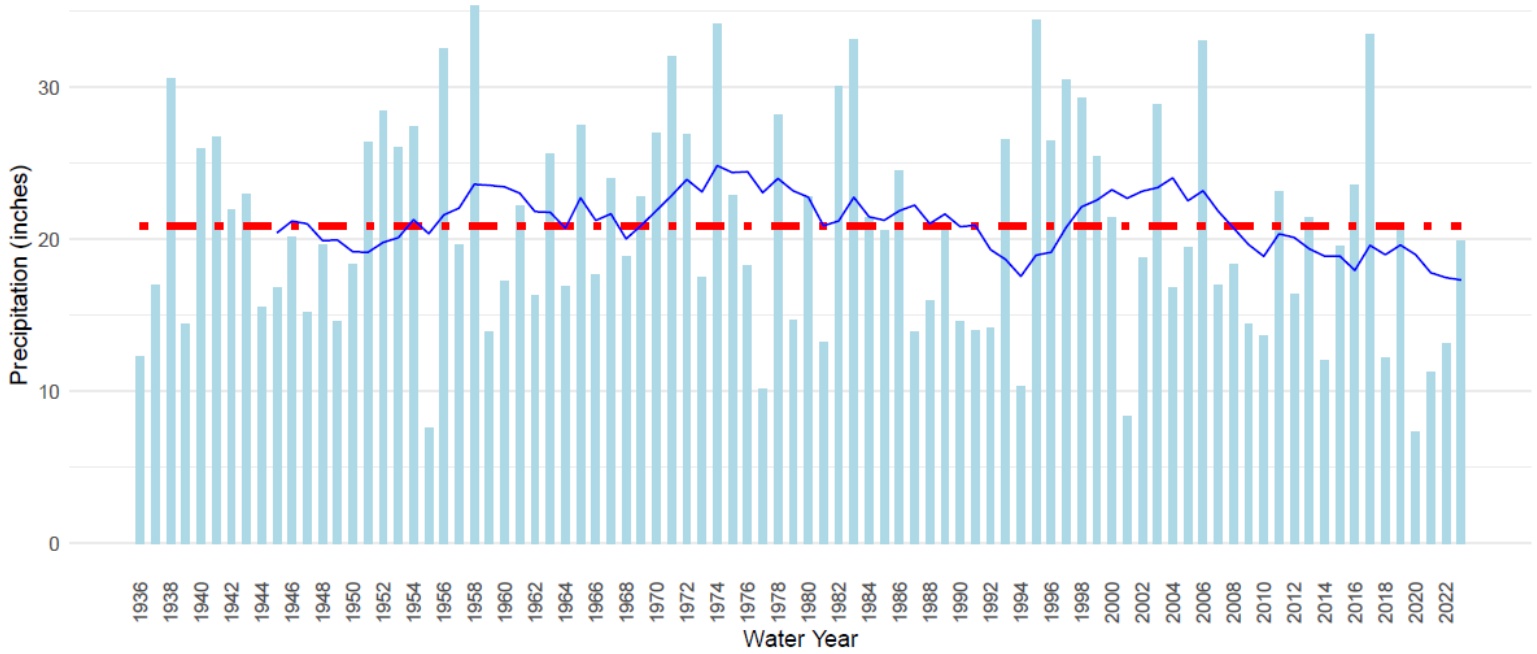


Figure 1.3: Fort Jones annual precipitation, water year 1936 to 2023, according to CDEC data. The long-term mean is shown as a red dashed line, and the ten year rolling mean is the blue trendline.

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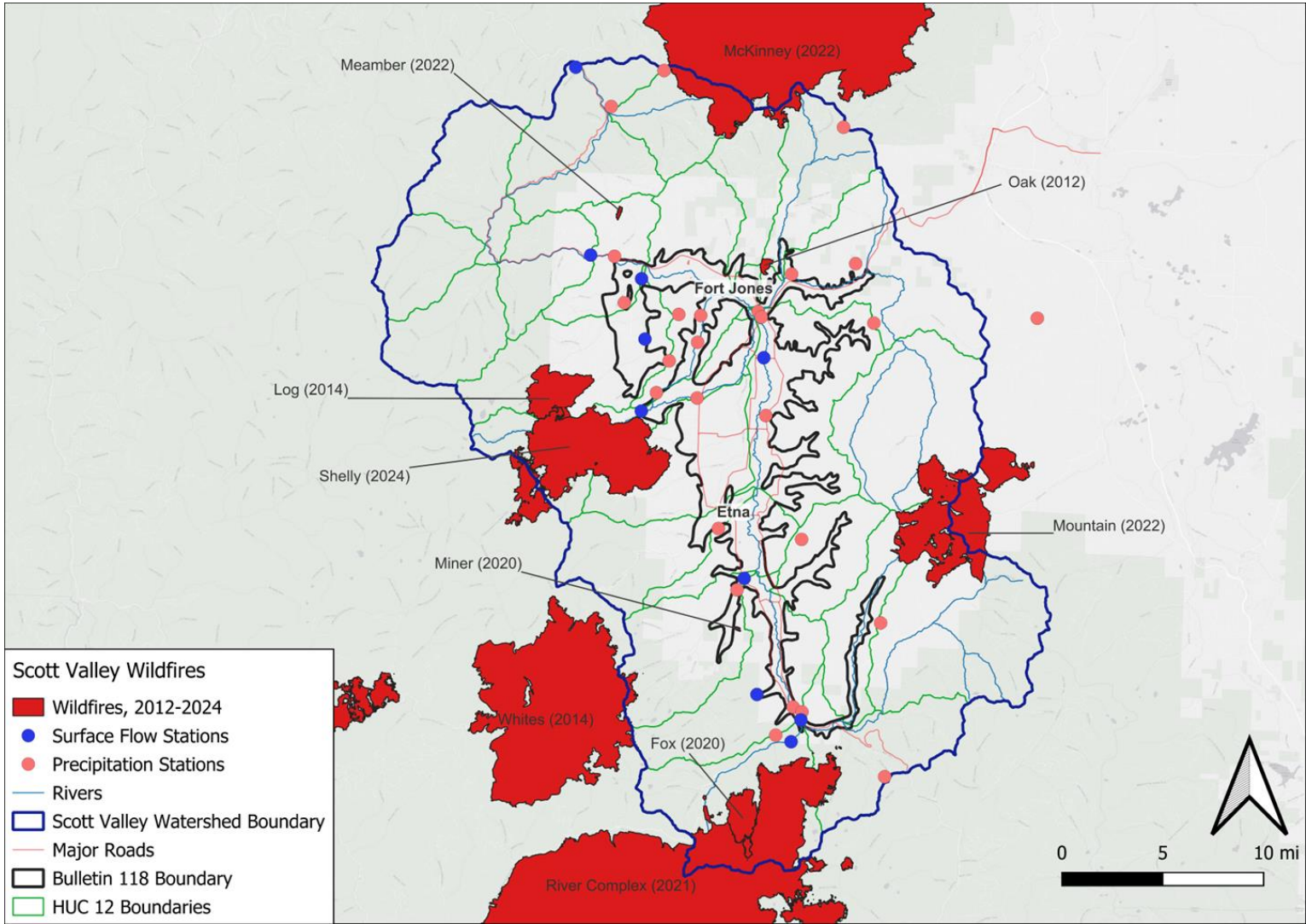
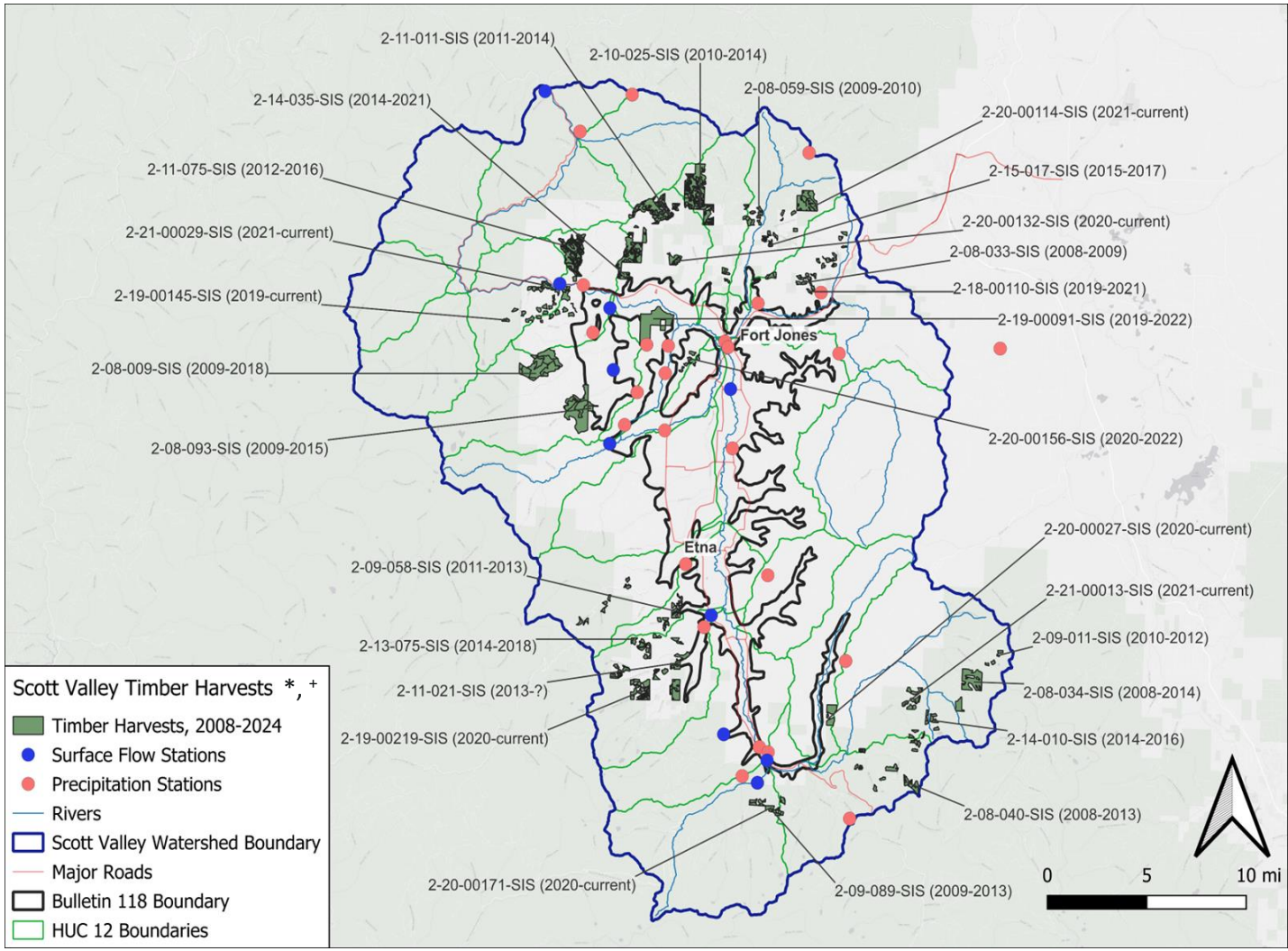


PRMS Model Scenarios

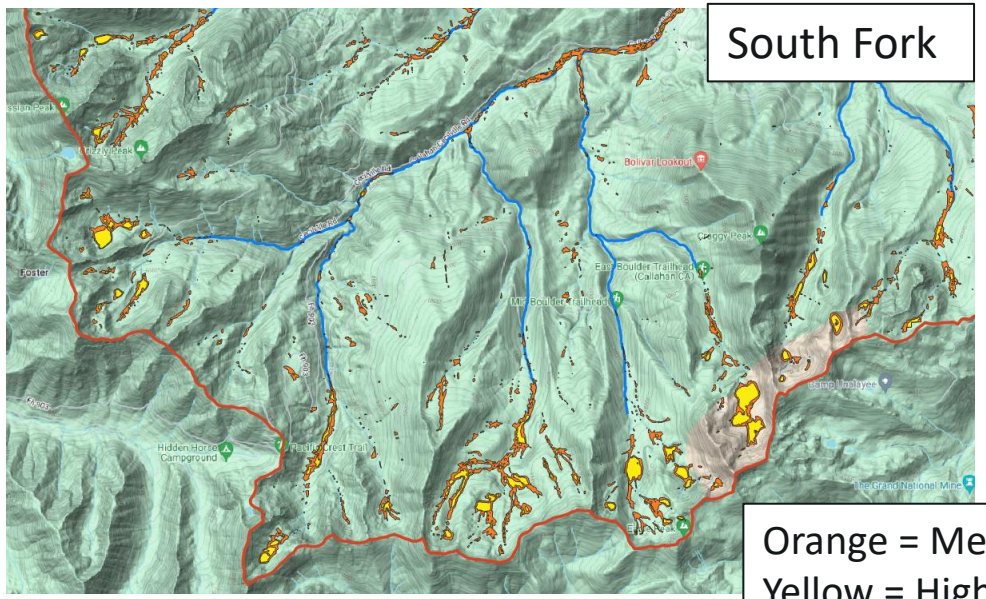
- Management Driven Scenarios
  - Impact of wildfire
  - Forest thinning / timber harvest
    - Timber Harvesting Plans (THPs), approved by CAL FIRE for commercial purposes on non-federal land
    - Only includes THPs upstream of stream gages with measurement during the harvest.
  - Meadow restoration

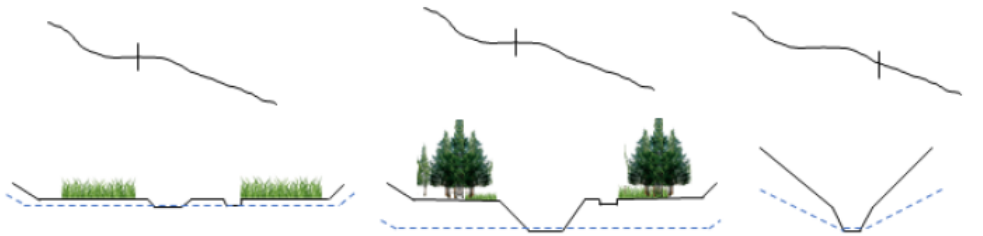


+ On non-federal land

Model Integration – Meadow Restoration

- Couple the Scott Valley Precipitation Runoff Modeling System (PRMS) and USDA/USFS Lost Meadow Model
  - Quantify impact of potential meadow restoration projects
  - Simulate restoration of meadow vegetation, (i.e., removal of juniper) and changes to water accumulation from restored floodplains and shallow channels.





Existing meadow: Wide, flat floodplain where water accumulates. Expect shallow channels, high groundwater elevation, and predominantly graminoids and forbs.

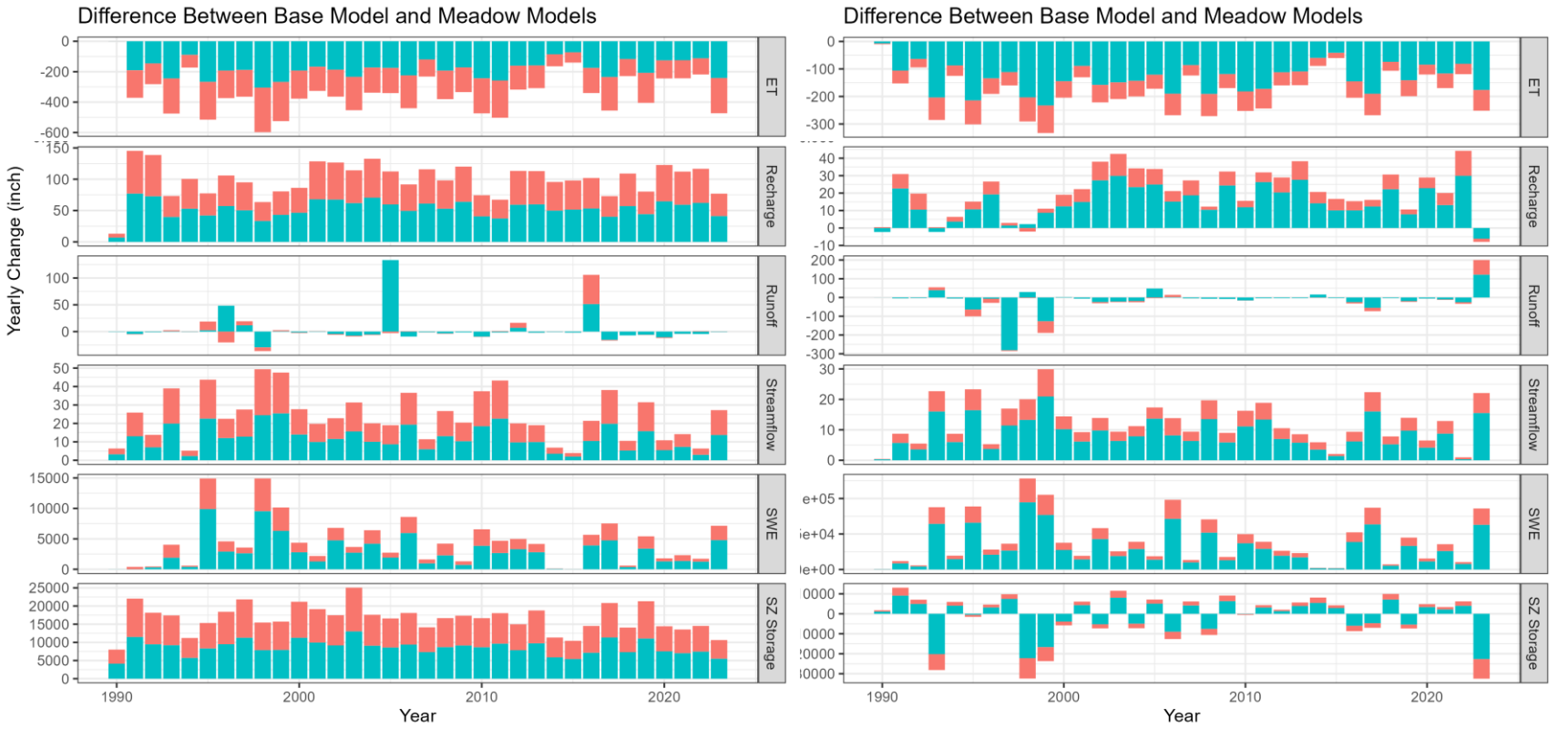
Model-predicted potential meadow: Wide, flat floodplain where water accumulates. Expect deeper channels, lower groundwater elevation and predominantly shrubs and trees.

Not predicted as meadow: Steep channel without a flat floodplain.

PRMS Preliminary Results – change in vegetation

- Additional models
  - Changes to soil zone
  - Incised streams

Shackleford Subwatershed



South Fork Subwatershed

Conclusion

- Watershed model will allow for easier development and understanding of model scenarios including forest management and climate change.
- Provides a quantitative estimate of the impact of scenarios on streamflow and can help with design of potential projects (including applying for funding).
- PRMS model is being incorporated with SVIHM and will be continued to be used for SGMA updates.

Funding and/or Technical Support

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- University of California at Davis
- State Water Resources Control Board
- Scott Valley Watershed Council
- Larry Walker Associates
- USDA - Forest Service

Thank You

Name, Title
Larry Walker Associates
Email