

RECLAMATION

Managing Water in the West



TRUCKEE BASIN STUDY

Technical Advisory Group Water Supply Workshop

June 24, 2013



Agenda

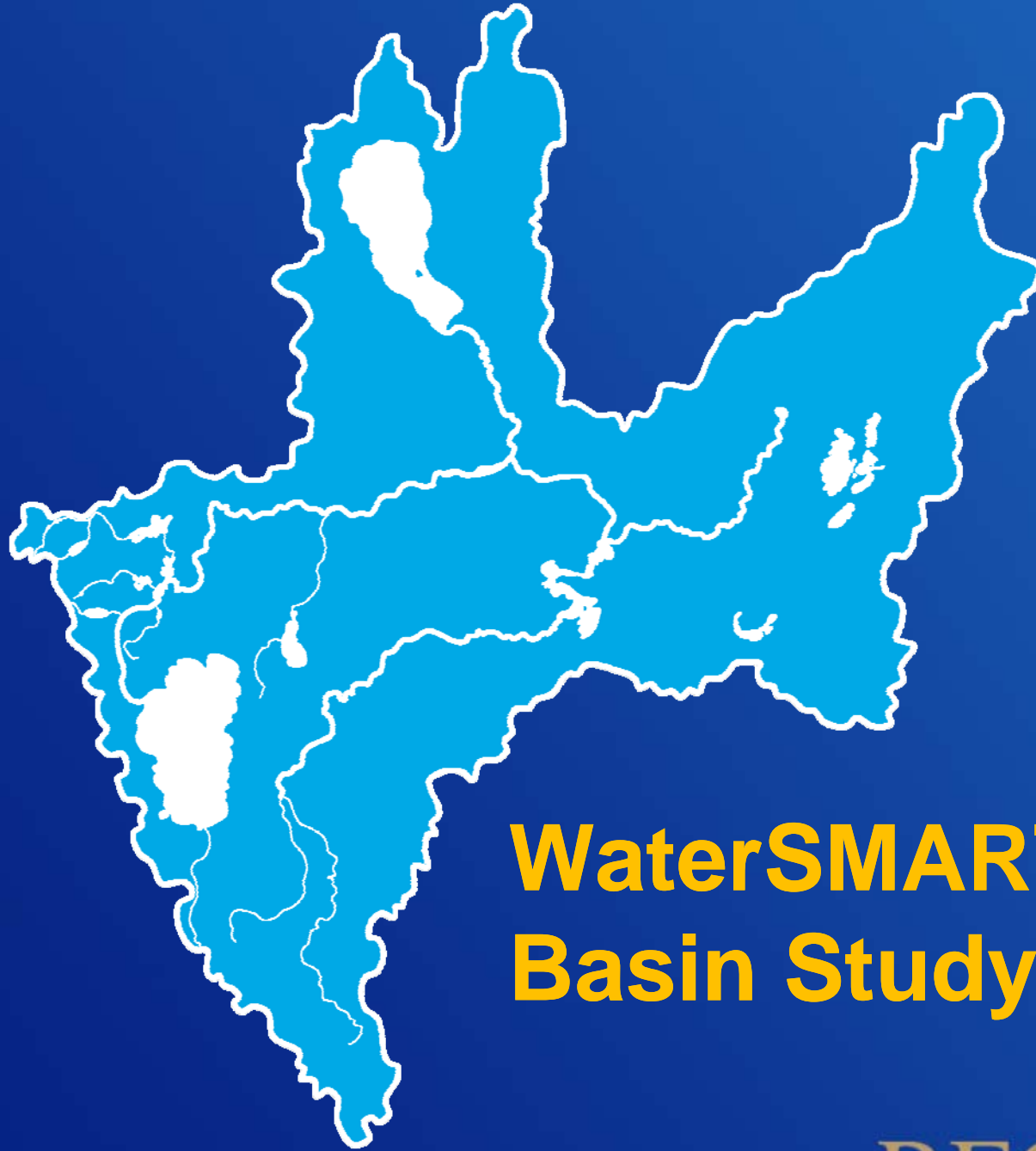
- **Welcome and Introductions**
- **WaterSMART and Basin Study Programs**
- **Truckee Basin Study Overview**
- **Workshop Focus: Water Supply Scenarios**
- **Technical Advisory Group Discussion**
- **Ongoing and Future Basin Study Activities**

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Meeting Format

- Participants will be on “silent” mode, except during discussion period.
- Participants can ask questions at any time by using the webinar “chat” function.
- Reclamation will respond to questions during the meeting and, if needed, post follow-up responses on the Basin Study website.
- Technical Advisory Group discussion will follow a presentation on supply.
- Webinar, voice and chat are being recorded, and will be posted online along with other materials.

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WaterSMART and the Basin Study Programs

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WaterSMART Program

- Implements SECURE Water Act, Public Law 111-11
- Established in 2010 by Secretary Salazar to...
 - Help water resource managers make sound decisions about water use
 - Develop strategies to ensure sufficient water supplies for multiple uses
 - Develop adaptive measures to climate change
 - Improve water conservation
 - Promote sustainability



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Basin Study Program

- **West-Wide Climate Risk Assessments**
- **Basin Studies**
 - Basin Studies
 - Secure Water Act follow-up Feasibility or Special studies
- **Landscape Conservation Cooperatives**



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West-Wide Climate Risk Assessments

- **Conducted by Reclamation**
- **Reconnaissance-level water supply and demand analyses in eight Reclamation river basins**
- **Projections of climate change impacts to water supply and demand and baseline risk assessments to evaluate impacts of climate change to water uses**
- **Baseline for more in-depth analyses performed through Basin Studies**

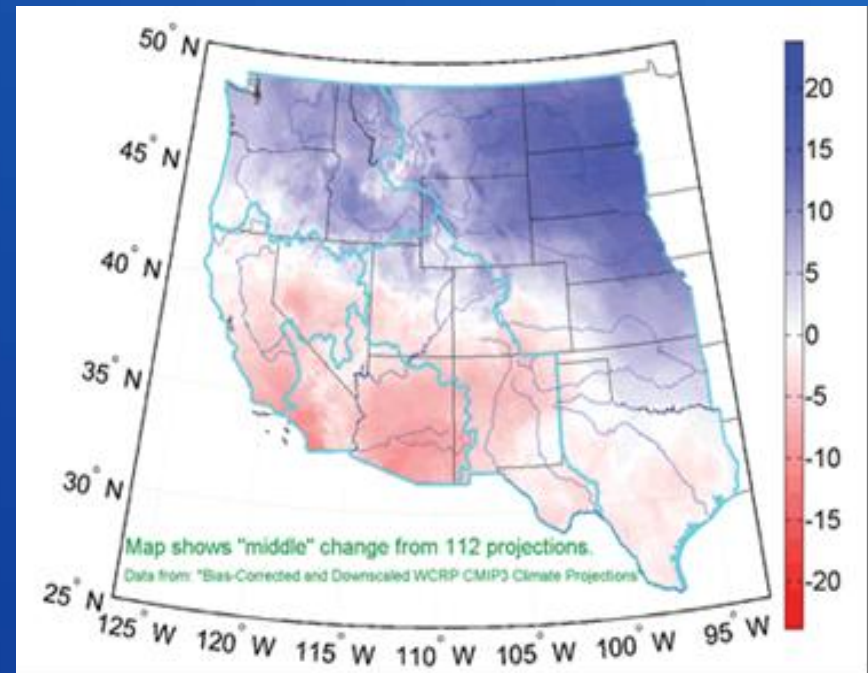
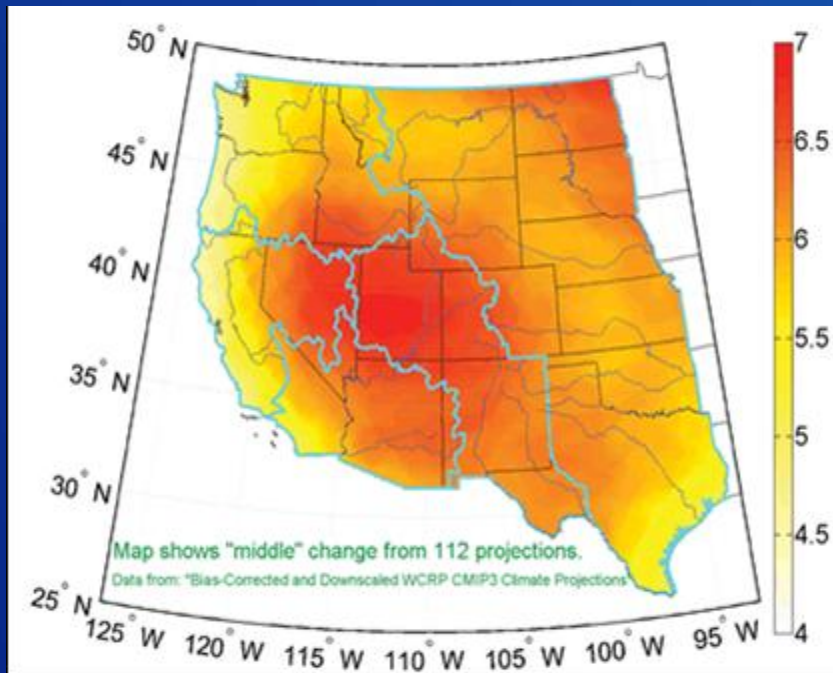
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**SECURE Water
Act Section
9503(c) –
Reclamation
Climate Change
and Water –
April 2011**



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SECURE Water Act Section 9503(c) – Reclamation Climate Change and Water – April 2011



Projected median temperature (°F) and precipitation (%) changes at the end of 21st century (2070–2099) relative to historic conditions (1950–1979)

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Basin Studies

As guided by the SECURE Water Act (Public Law 111-11, Title IX, Subtitle F):

- **Purpose**
 - Work with state and local partners in 17 Western States to evaluate future water supply and demand imbalances in a changing climate
- **Outcomes**
 - Assessment of current and potential future water supply and demand in the basin, taking into account risks to water supply from climate change.
 - Analysis of water supply reliability given potential future conditions, such as population and climate change.
 - Potential strategies and options to address basin-wide water supply imbalances.
 - Analysis of the options identified (performance, cost, environmental impact, institutional requirements, etc.) and formulate solutions.
 - Potential subsequent feasibility or special studies.

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Truckee Basin Study Overview

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Basin Study Partners



50-50 cost share between Reclamation and partners

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Study Management Structure

Water Smart Basin Studies

Reclamation



Truckee Basin Study Project Steering Team



Reclamation
Mid-Pacific



Cost Share Partners

Executive Committee



Study Team



Technical Advisory Group

Technical Experts & Regional Stakeholders

Workshop Topics

Supply Scenarios

Demand Scenarios

Metrics

Options

Strategies

Tribes


Public

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Basin Study Phases

- **Phase I & II**
 - Assess Basin Supplies
 - Assess Basin Demands
- **Phase III**
 - Evaluate Reliability
 - Assess Risks
- **Phase IV**
 - Review of Adaptation Options
 - Recommendation of Strategies

Truckee River Basin Study
Climate Change and Water Resources Assessment
Plan of Study



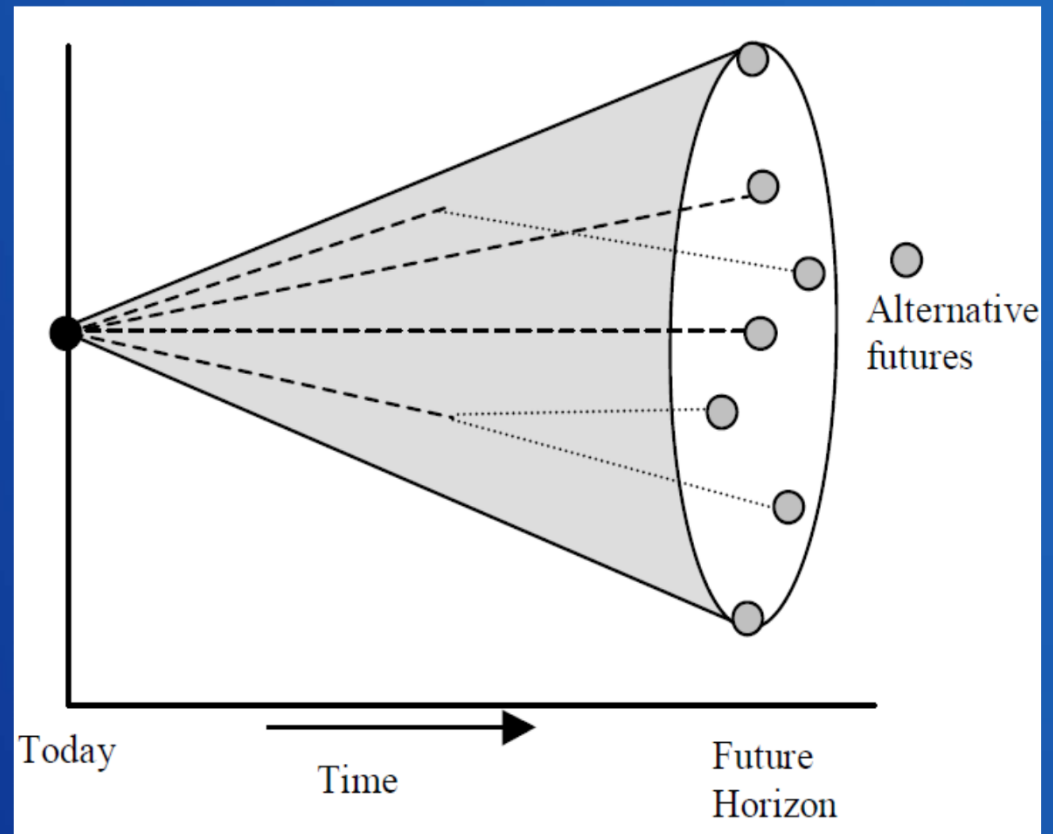
With Cost-Share Participation by these Major Study Partners:



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Phase I: Scenario Development

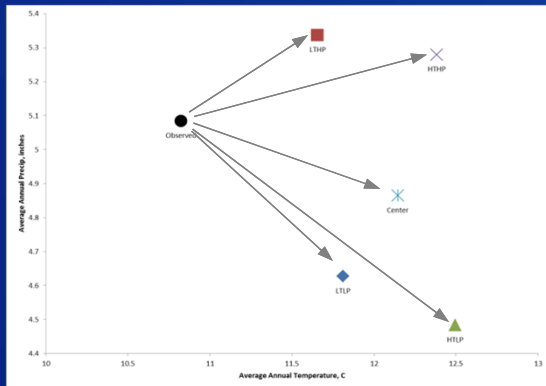
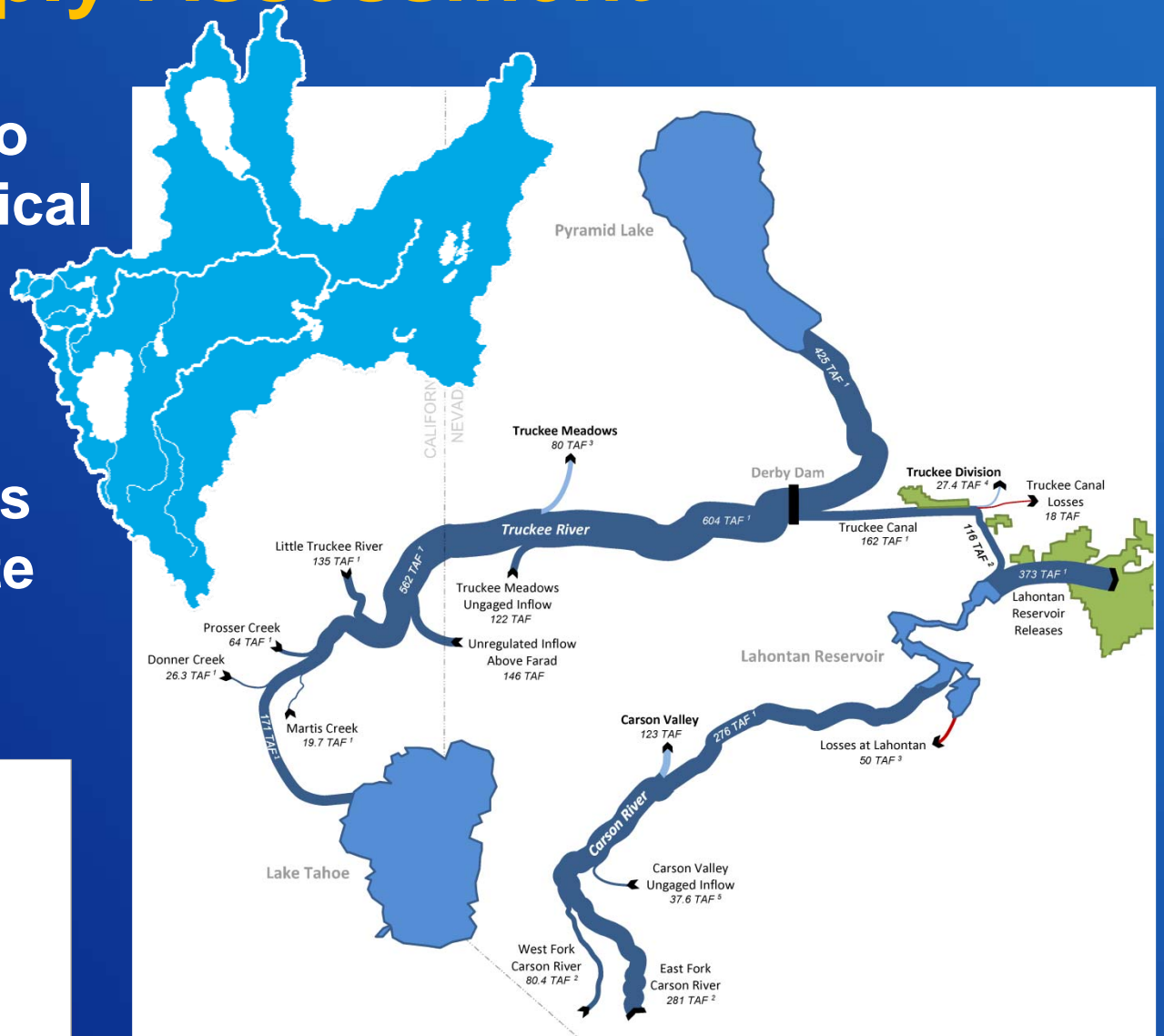
- Effective treatment of uncertainty is key to Basin Study
- Uncertainty is addressed through 'Scenarios'



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Water Supply Assessment

- Current scenario based on historical gage records
- Future scenarios based on climate projections



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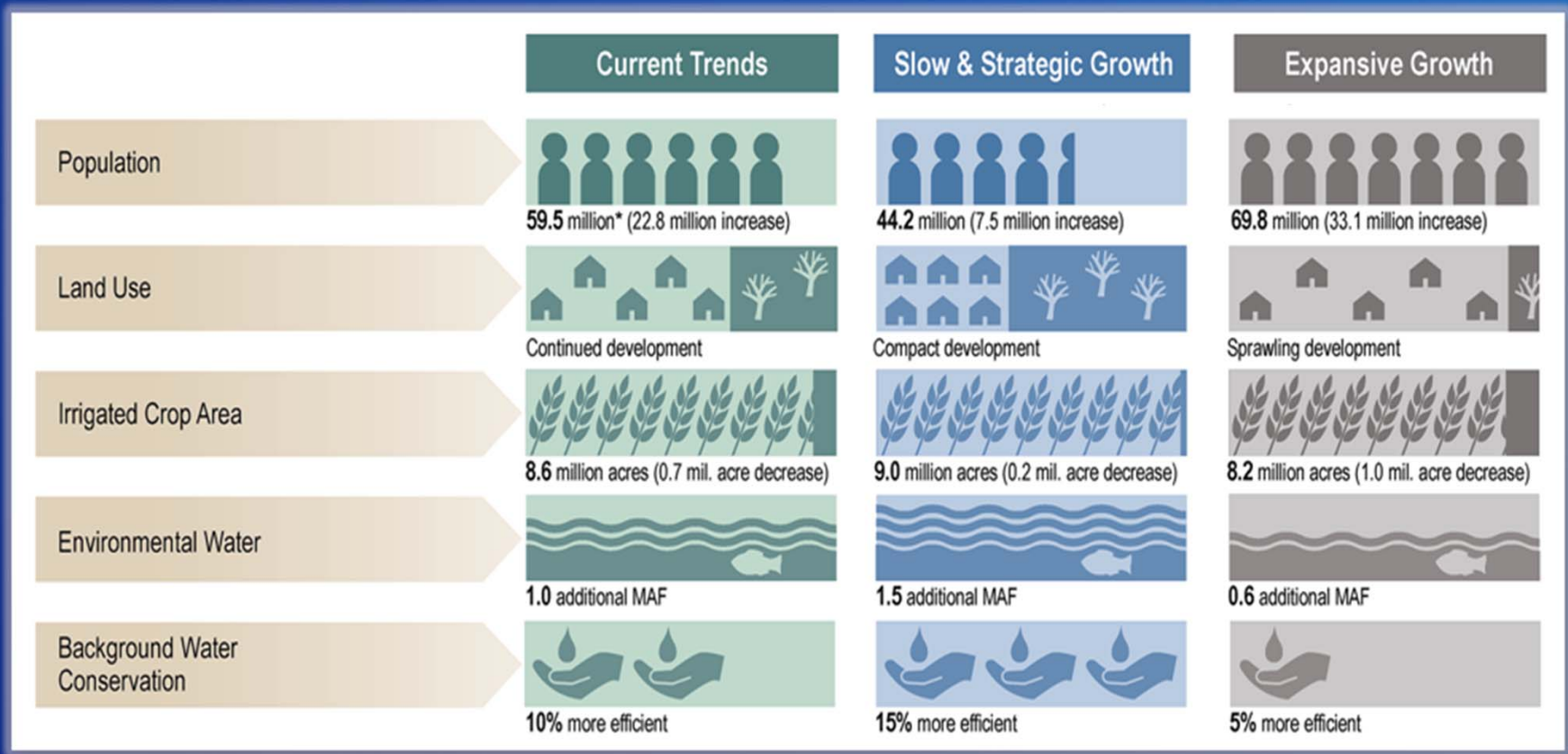
Water Demand Assessments



- **Current Scenario based on information from a regional water supply Planning Model**
 - Developed collaboratively by regional stakeholders
 - Intended for use in TROA studies
- **Future Scenarios to be developed in Phase II**
 - Will consider various sources of demand
 - Will establish up to three “Storylines”
 - Basin Study Team will seek input on Demand Storylines from Cost-Share Partners and Technical Advisory Group

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Water Demand Scenarios (example)

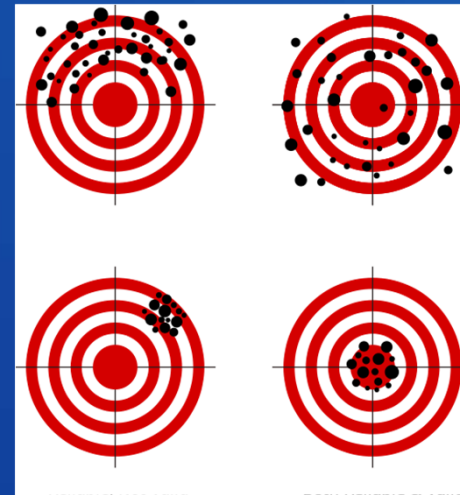
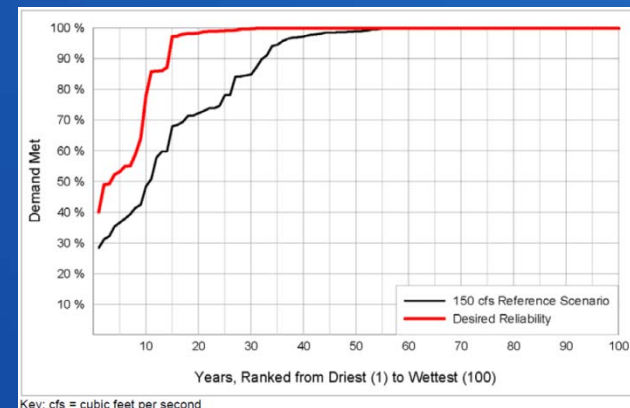


* Example taken from 2009 California Water Plan Update

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Phase III - System Reliability and Risk Assessment

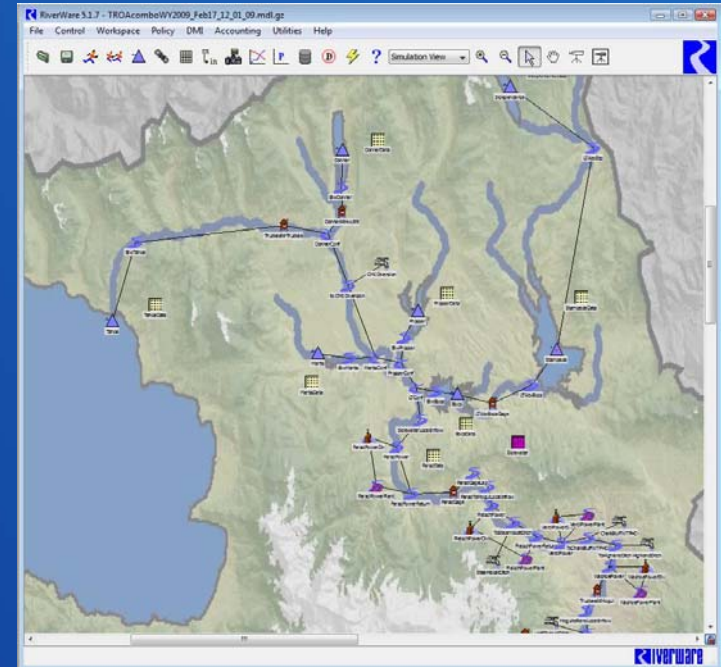
- Identify system reliability metrics with Cost Share Partners and this Technical Advisory Group
- Evaluate reliability for metrics, across combination of Supply and Demand scenarios



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Planning Model

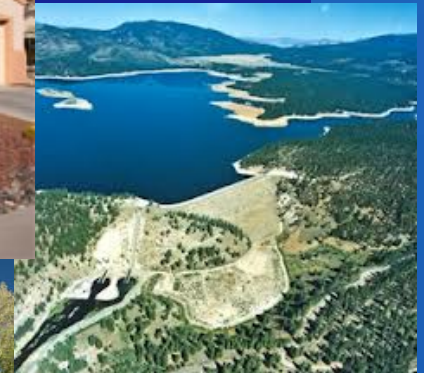
- **Platform – RiverWare**
 - 100+ years in extent
 - Has been used for Reclamation Studies
- **Collaborative Development (2009-present)**
 - USBR – Lahontan Basin Area Office
 - Truckee Meadows Water Authority
 - State of California (Dept. Water Resources)
 - State of Nevada (State Engineer)
 - Pyramid Lake Paiute Tribe
 - Federal Water Master
 - City of Fernley
 - Precision Water Resources Engineering
- **Models all significant operations in the basin**
 - Pre-TROA regulatory conditions are available
 - TROA regulatory conditions will be available in 2014
- **Appropriate for characterizing risks for Basin Studies**
 - Supply and Demand Scenarios are inputs
 - Operations and infrastructure are customizable



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Development and Evaluation of Adaptation Strategies

- Identify and screen potential options
- Assess the multi-resource reliability of each short-listed options
- Evaluate the relative benefits of each option and portfolios of options (strategies)



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**Workshop Focus:
Water Supply Scenarios**

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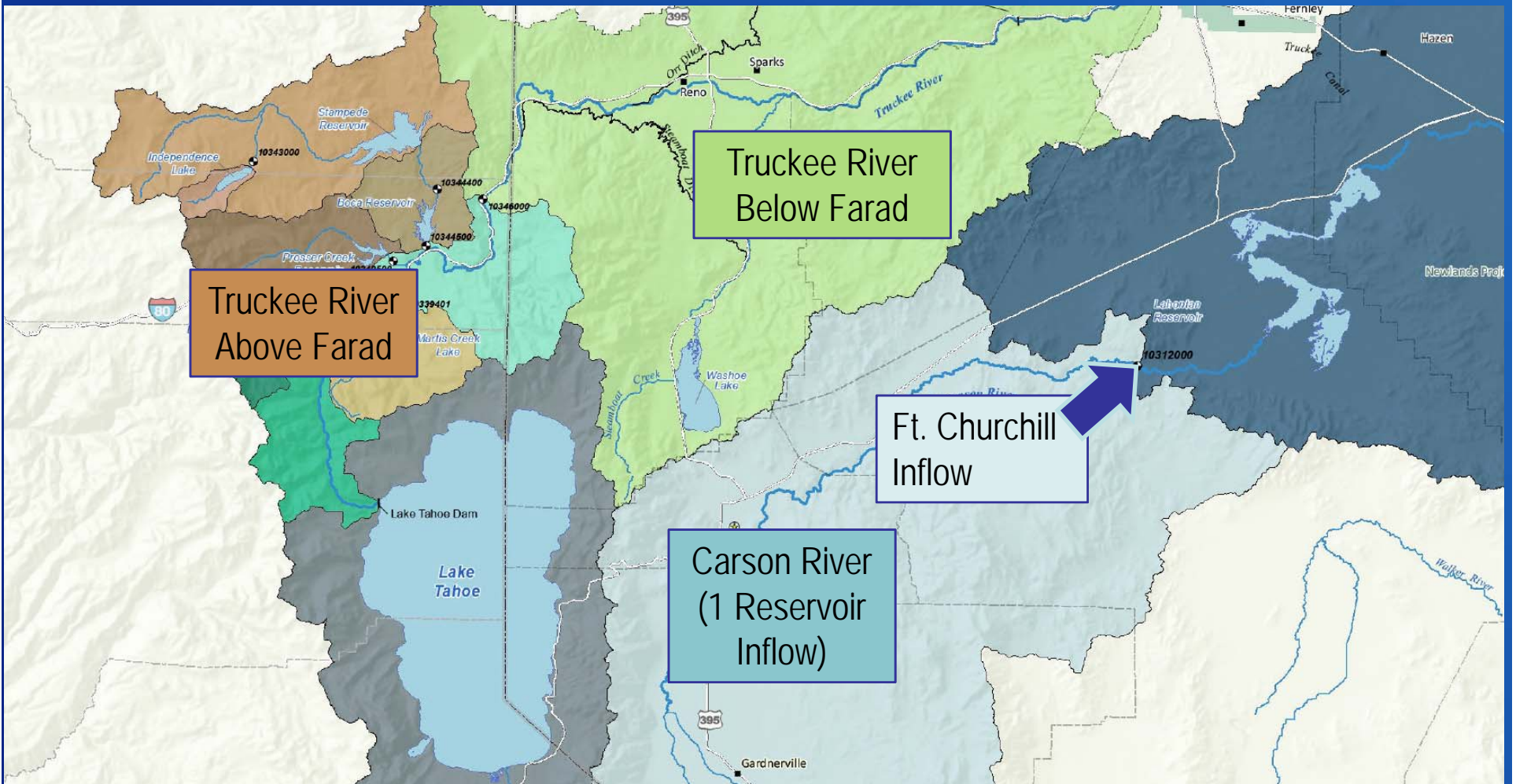
Water Supply in the Truckee Basin Study

- Water Supply Scenarios developed for use in the Truckee Basin Study
- Context for use of Supply Scenarios in Risk and Reliability assessments
- Approach for Developing Supply Scenarios
 - Current Supply Scenario
 - Future Supply Scenarios

Supply Scenarios

- **Current Supply Scenario**
 - Sets baseline for comparisons in risk and reliability assessments
 - Based on 100 years of historical flow gage records (1900-2000)
 - Considers hydrology at locations for important for infrastructure (i.e. dams) or operations (i.e. meeting Floriston rates)
- **Future Supply Scenarios**
 - Consider the range of potential future hydrologic conditions resulting from climate change
 - Based on 100 years of projected climatic conditions in the Truckee and Carson basins
 - Performed using refined hydrology model at UNR, Desert Research Institute

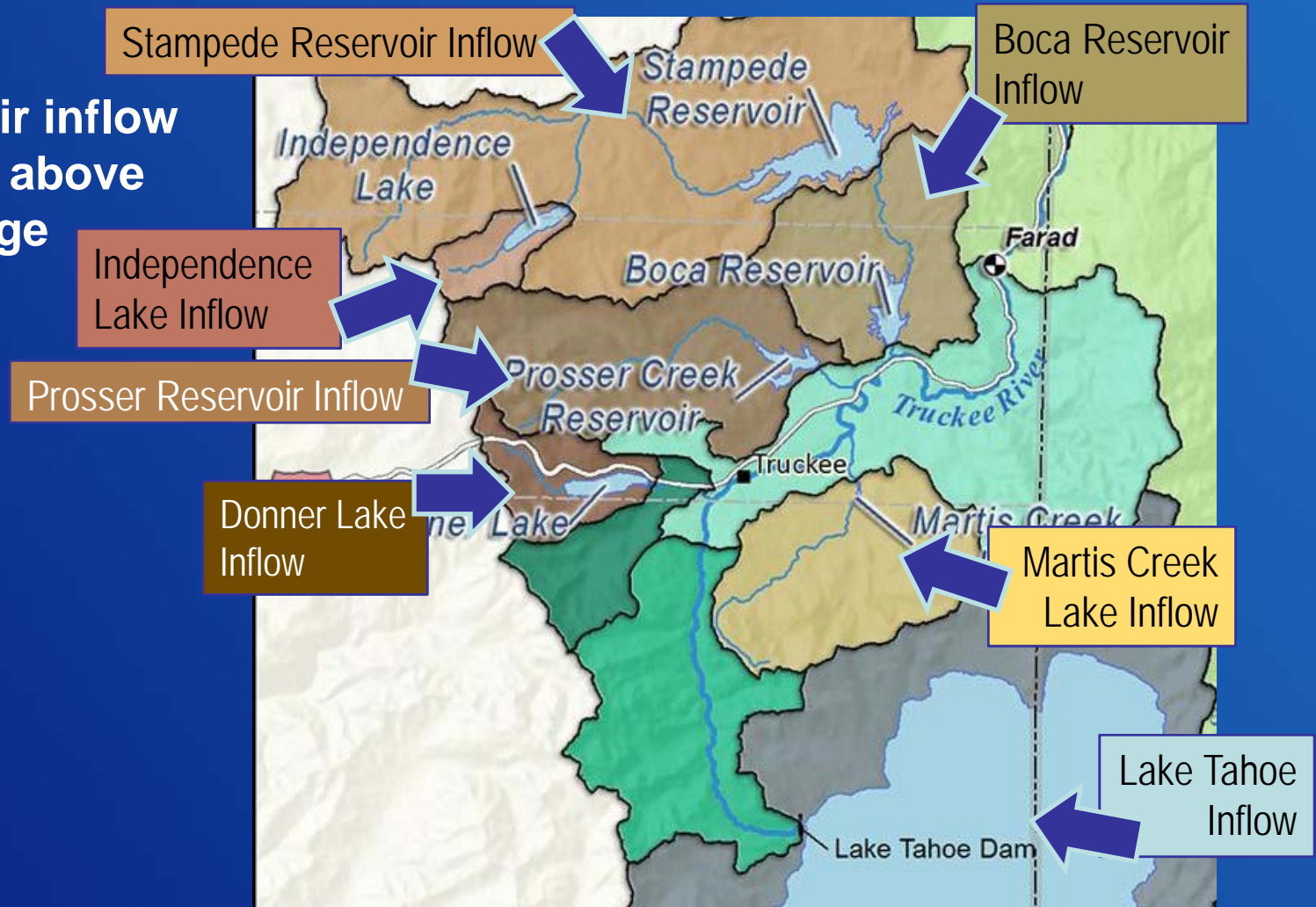
Supply in Planning Model



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Supply in Planning Model (cont'd)

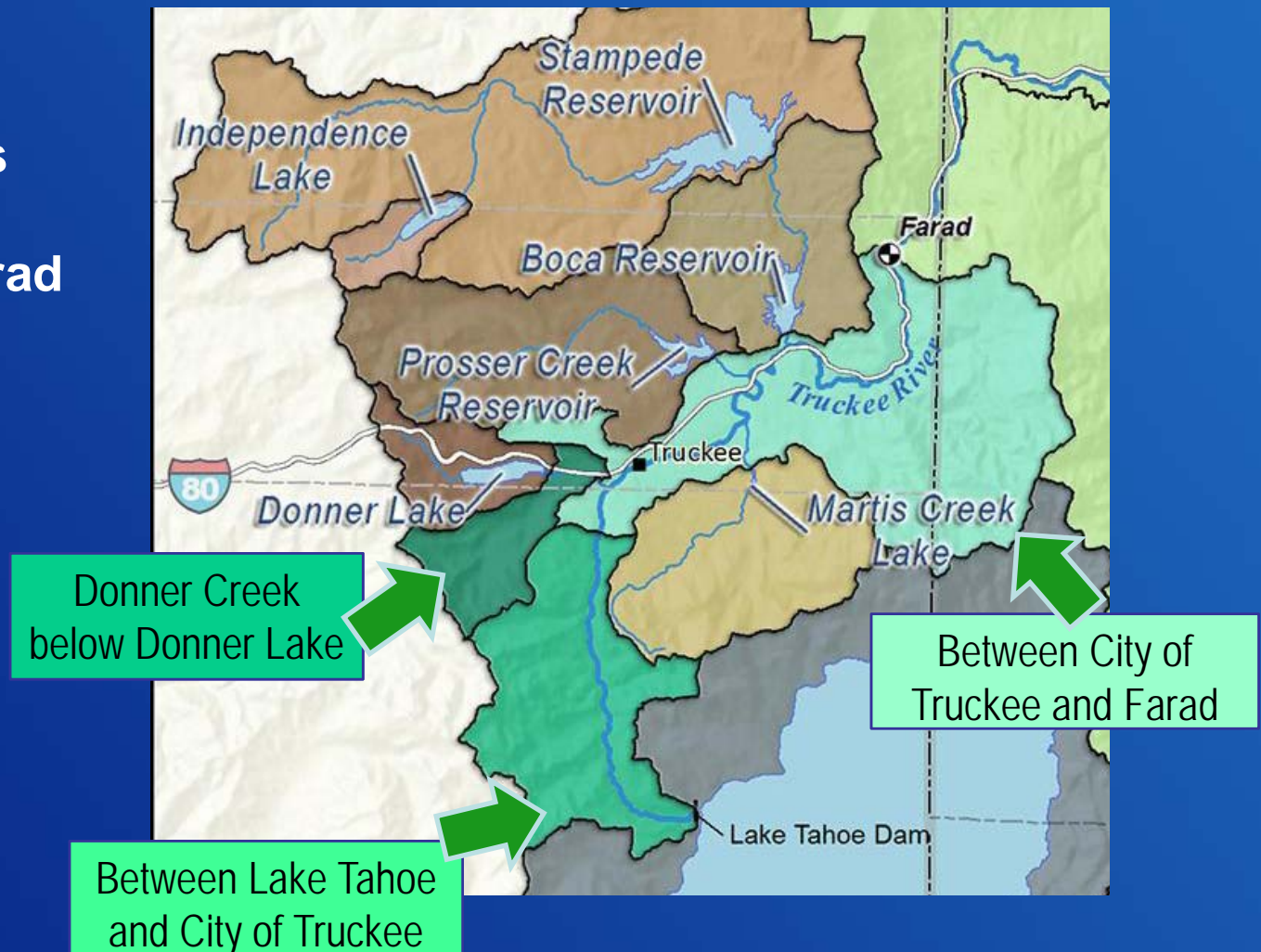
- 7 reservoir inflow locations above Farad Gage



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Supply in Planning Model (cont'd)

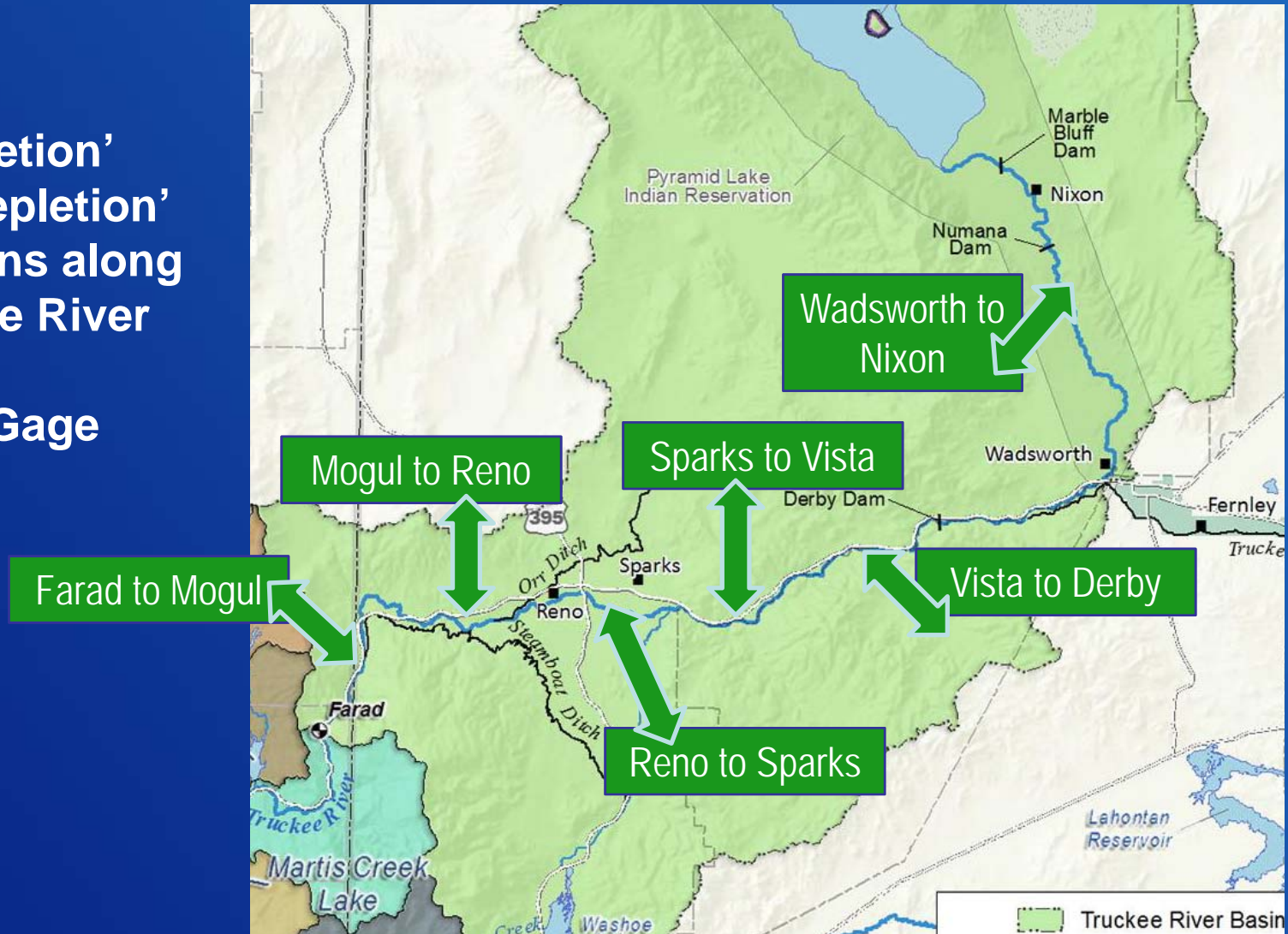
- 3 unregulated inflow locations along Truckee River above Farad Gage



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Supply in Planning Model (cont'd)

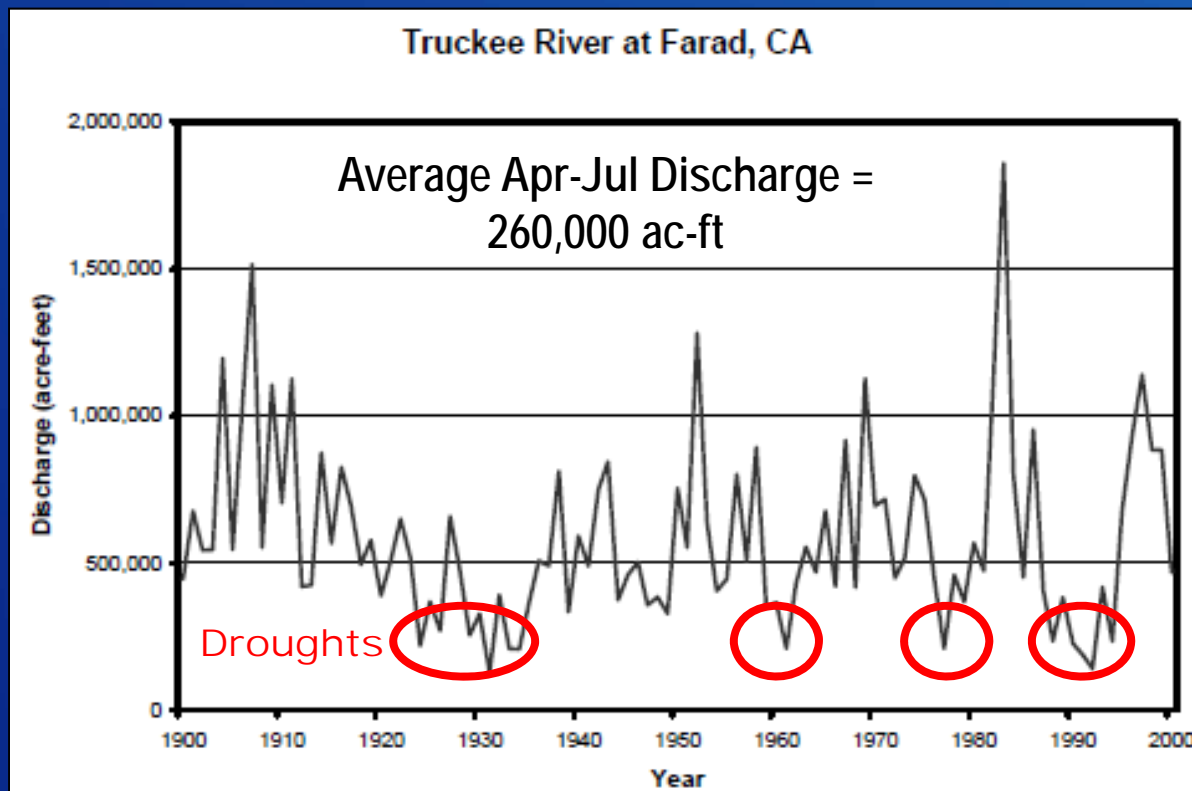
- 6 'accretion' and 'depletion' locations along Truckee River below Farad Gage



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Current Supply Assessment

- Current supply is what our society has become accustomed to and what we have planned for



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Future Supply Assessment

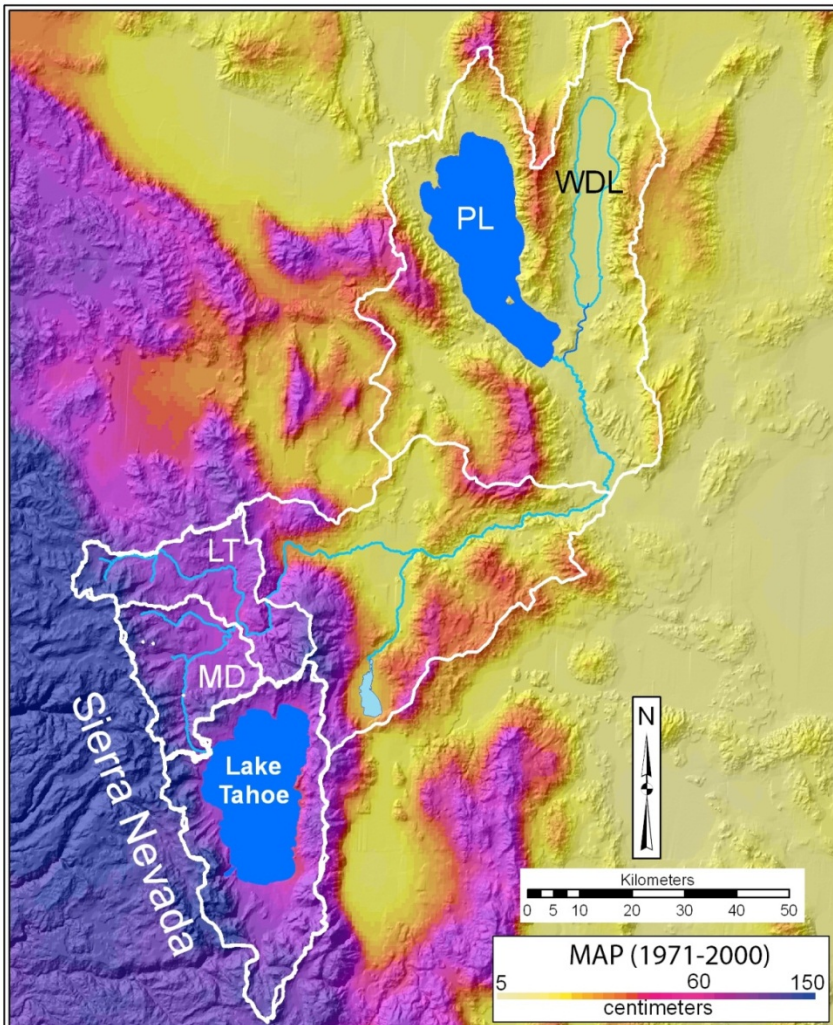


Figure 1. Map of the Truckee River basin showing the distribution of mean annual precipitation (MAP) in relation to the different modeling domains. The modeling domains of Lake Tahoe, Martis-Donner (MD), and Little Truckee (LT) are where most of the precipitation falls in this basin. Evaporation from Pyramid Lake (PL) and Winnemucca Dry Lake (WDL) is responsible for most of the water loss.

Future supply based on three basin-scale PRMS models of the Upper Truckee watershed: Lake Tahoe, Little Truckee and Martis-Donner Basins.

These models encompass the Truckee River watershed from Lake Tahoe down to the Farad Gage – this region accounts for the vast majority flow to the Truckee River.

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PRMS Watershed Model

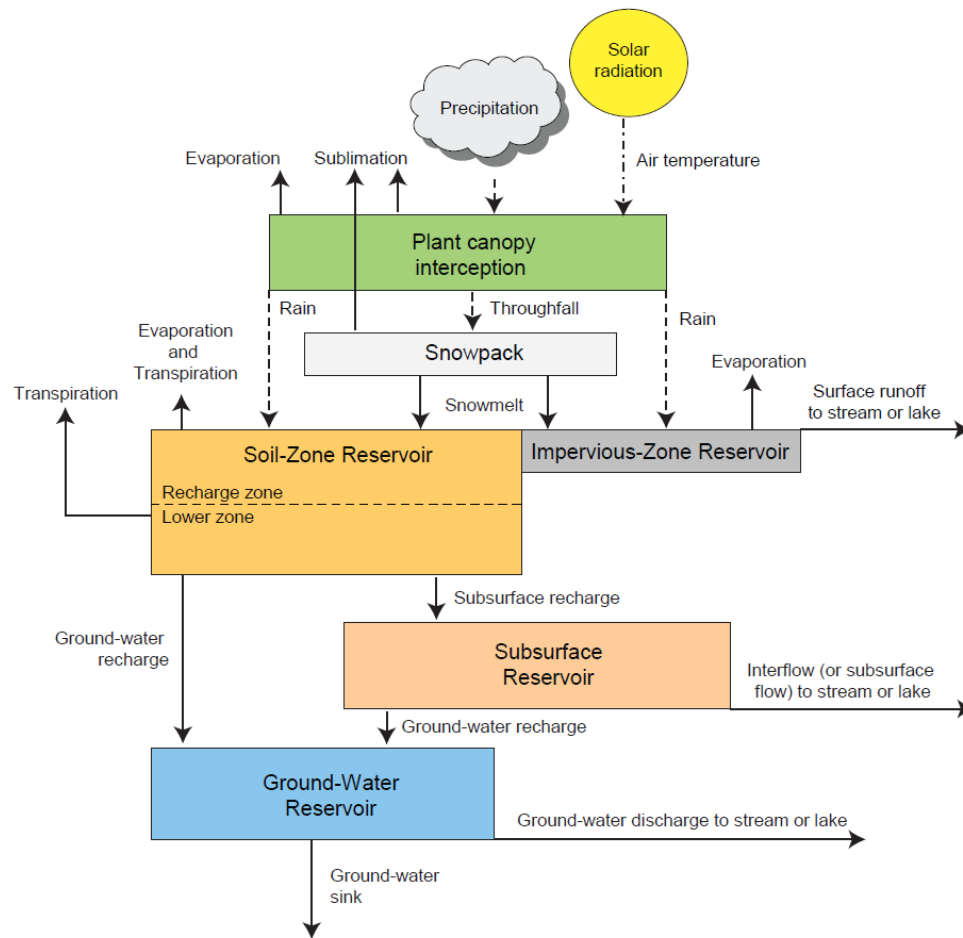


Figure 2. Schematic diagram of a watershed and its climate inputs (precipitation, air temperature, and solar radiation) simulated by PRMS (modified from Leavesley and others, 1983).

From Markstrom et al., 2008

The USGS code Precipitation-Runoff Modeling System (PRMS) simulates the dominant watershed processes affecting streamflow (with the exception of groundwater discharge).

The output of interest is streamflow, which serve as inputs into to the Truckee Basin Planning Model.

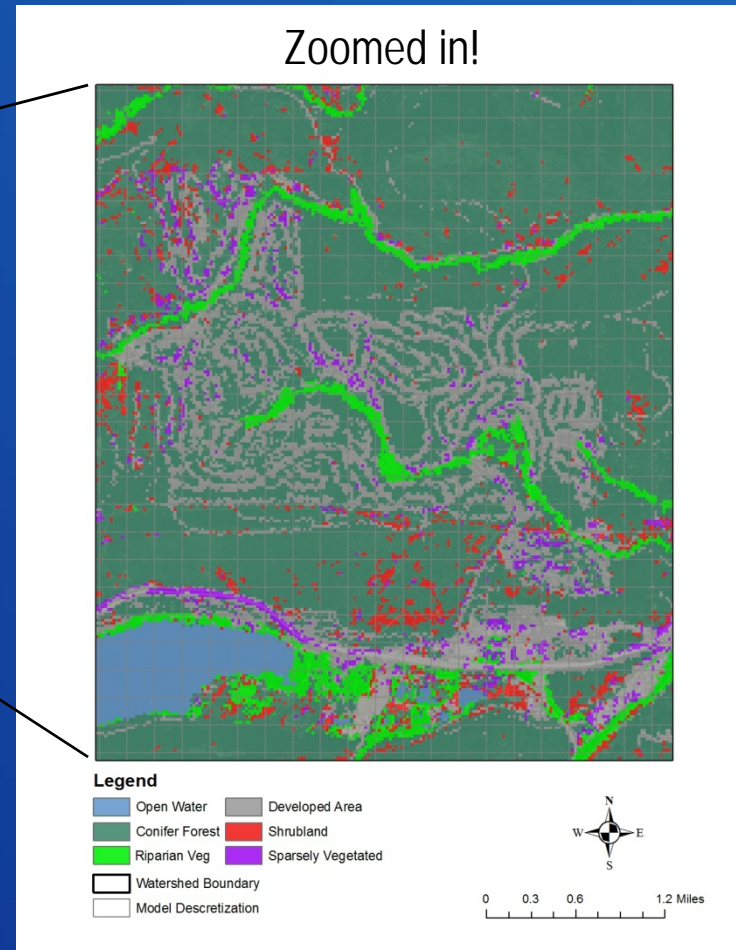
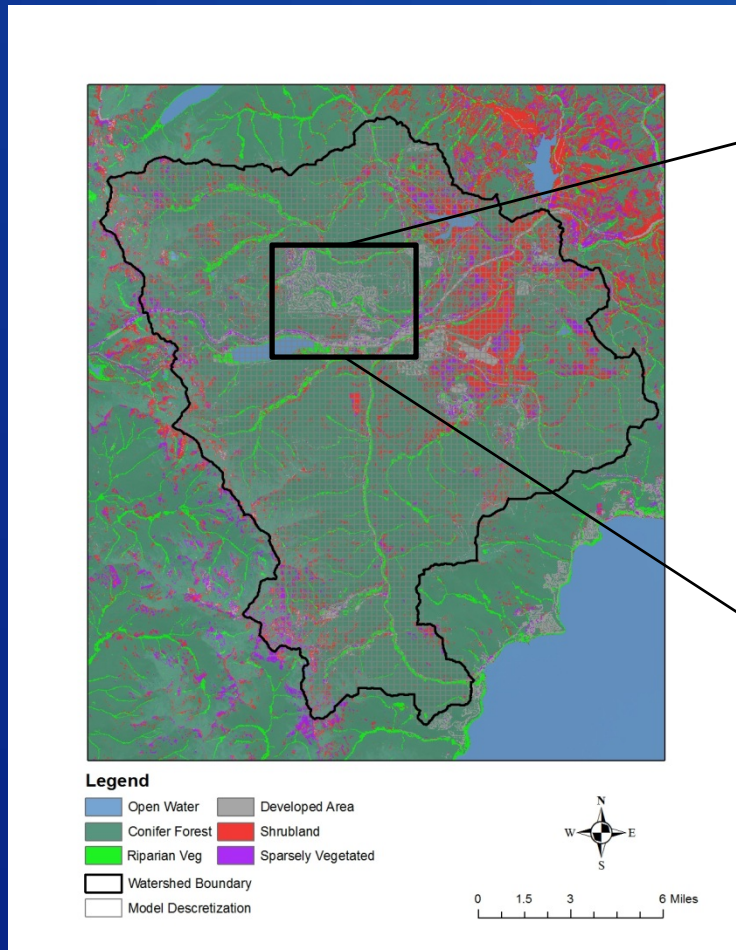
The model is forced with climate according to selected weather stations in the basin.

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PRMS Model Development

- PRMS models have already been developed by DRI for the Lake Tahoe and Martis-Donner Basins – Little Truckee Basin PRMS model will be developed for this project using the exact same methodology used to develop and calibrate the other two PRMS models.
- These models are developed from extensive datasets describing soils, vegetation, elevation, slope, aspect, etc. and are forced by temperature and precipitation.
- Model calibration consists of matching simulated and historic (observed) streamflows within internal watershed gages.

Cover Type

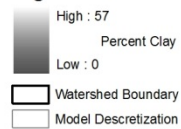


Soils Map

Percent Clay



Legend



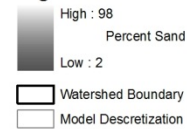
0 1.5 3 6 Miles



Percent Sand



Legend

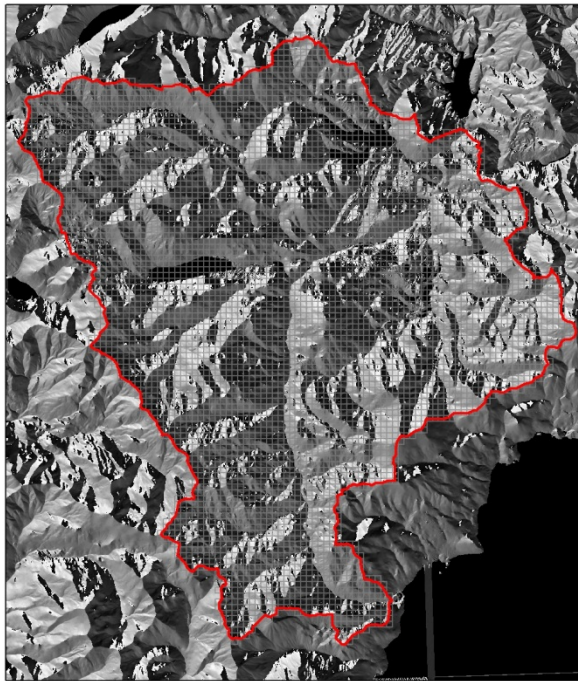


0 1.5 3 6 Miles

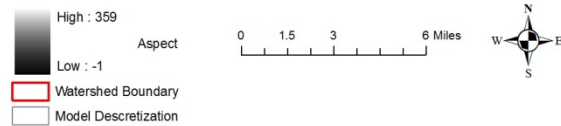


Aspect and Slope Map

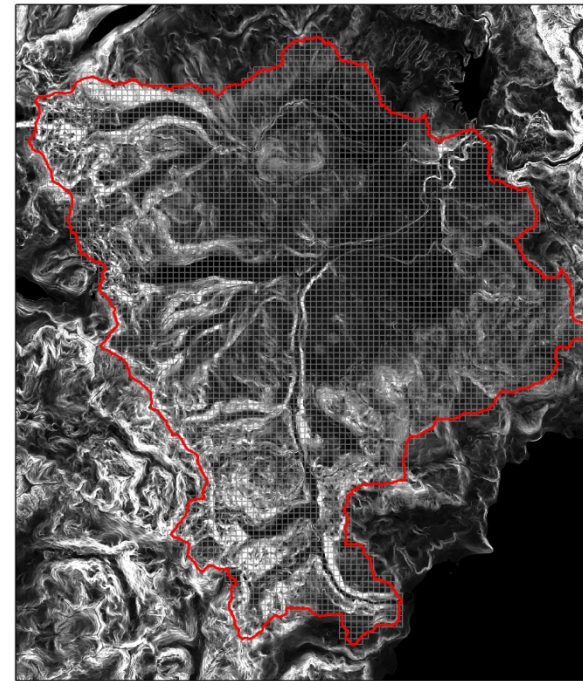
Aspect



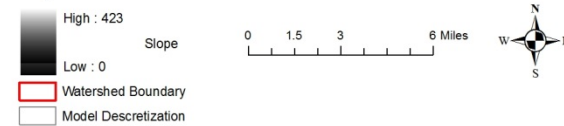
Legend



Slope

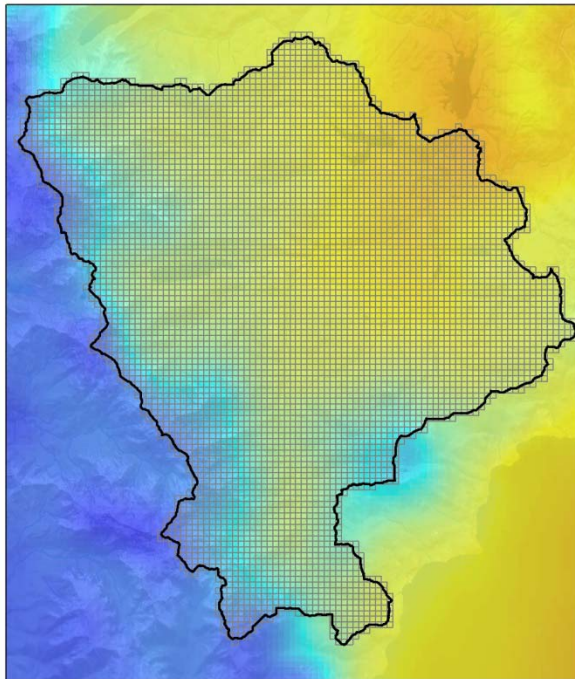


Legend



Martis-Donner Average Annual PPT, Tmax, Tmin (PRISM Projected: 1980-2011)

Precipitation

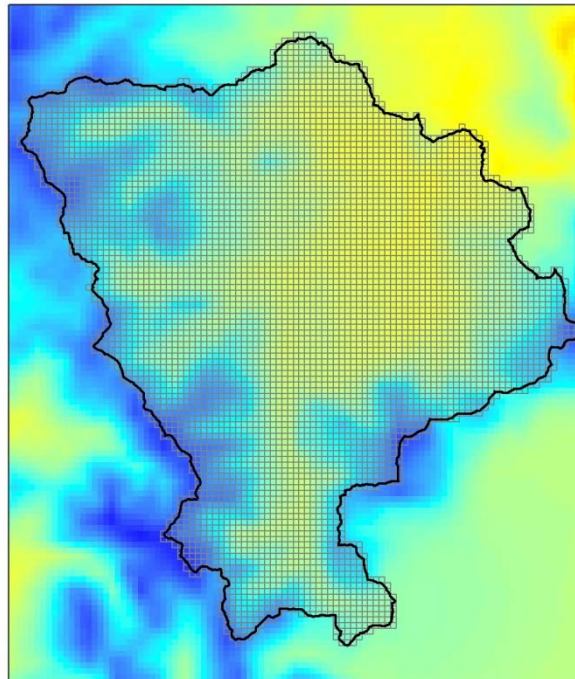


Legend

- High : 1.91453
- Annual Precipitation
- Low : 0.219366
- Watershed Boundary
- Model Discretization

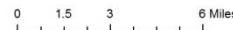


Tmax

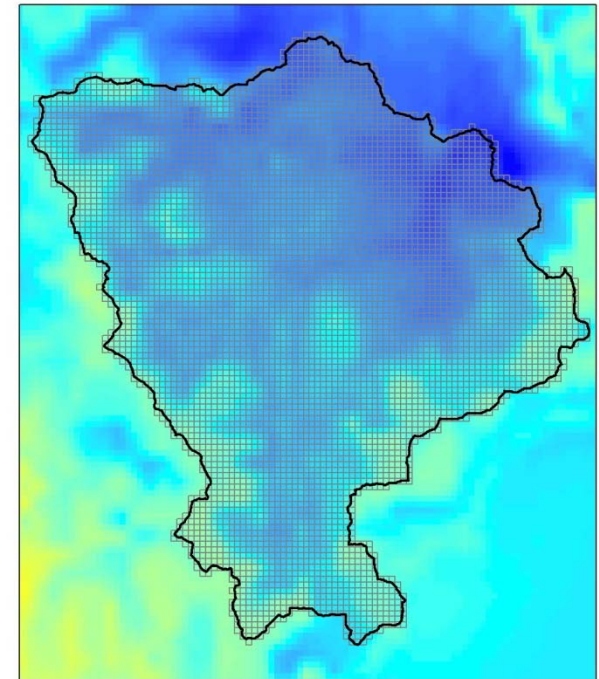


Legend

- High : 21.4052
- Annual Tmax
- Low : 6.78807
- Watershed Boundary
- Model Discretization

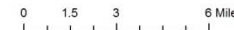


Tmin

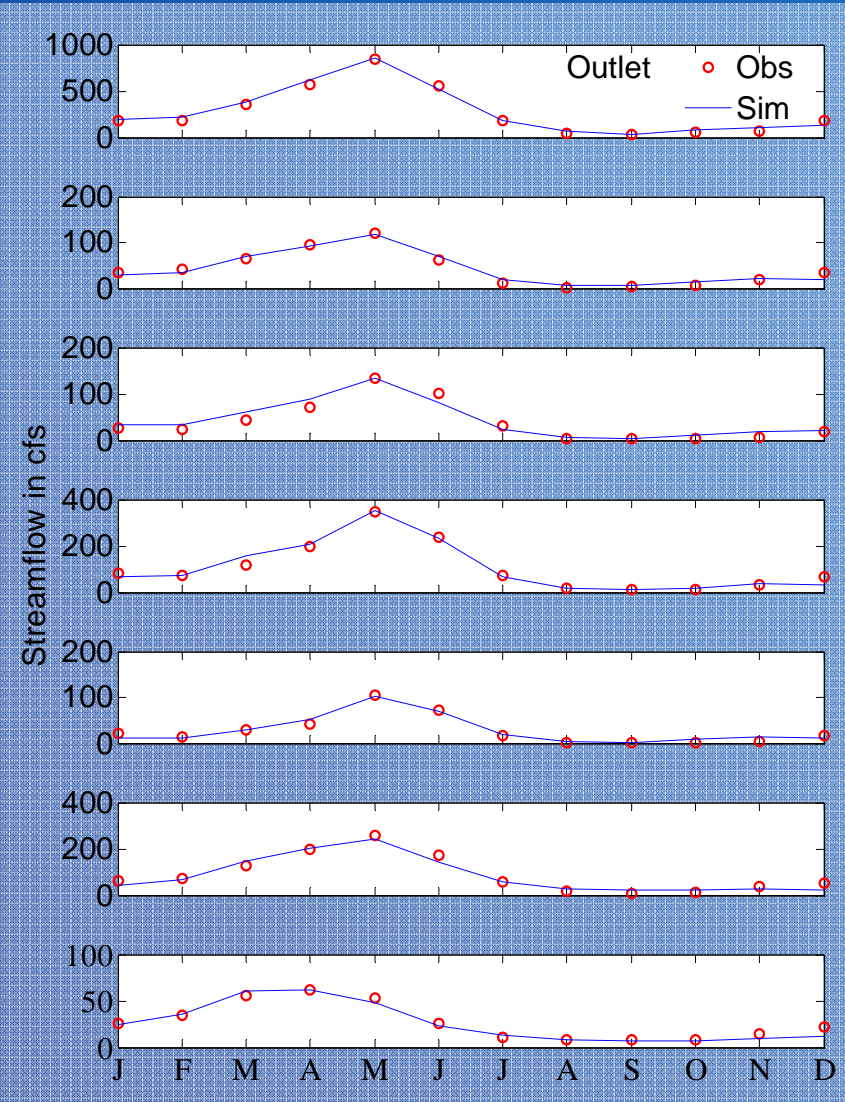
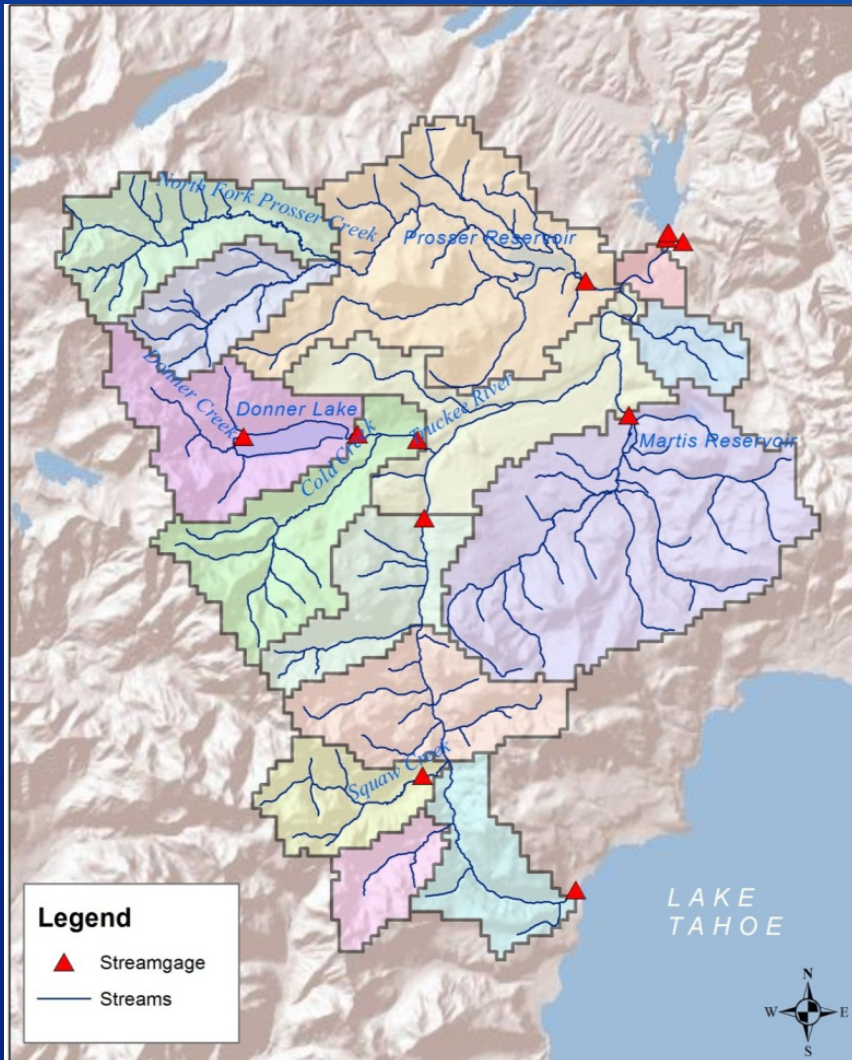


Legend

- High : 6.64387
- Annual Tmin
- Low : -5.45006
- Watershed Boundary
- Model Discretization



Model Calibration

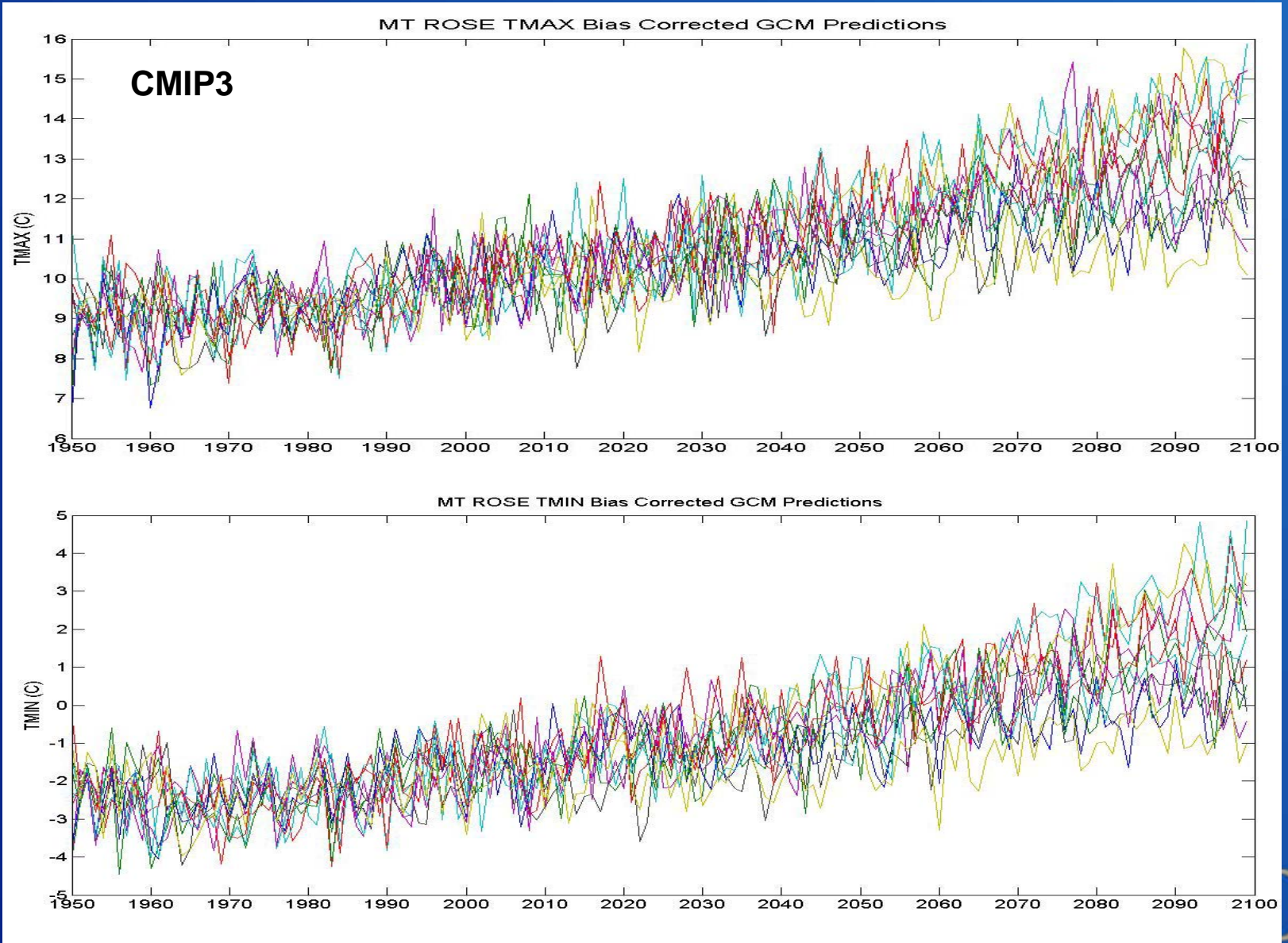


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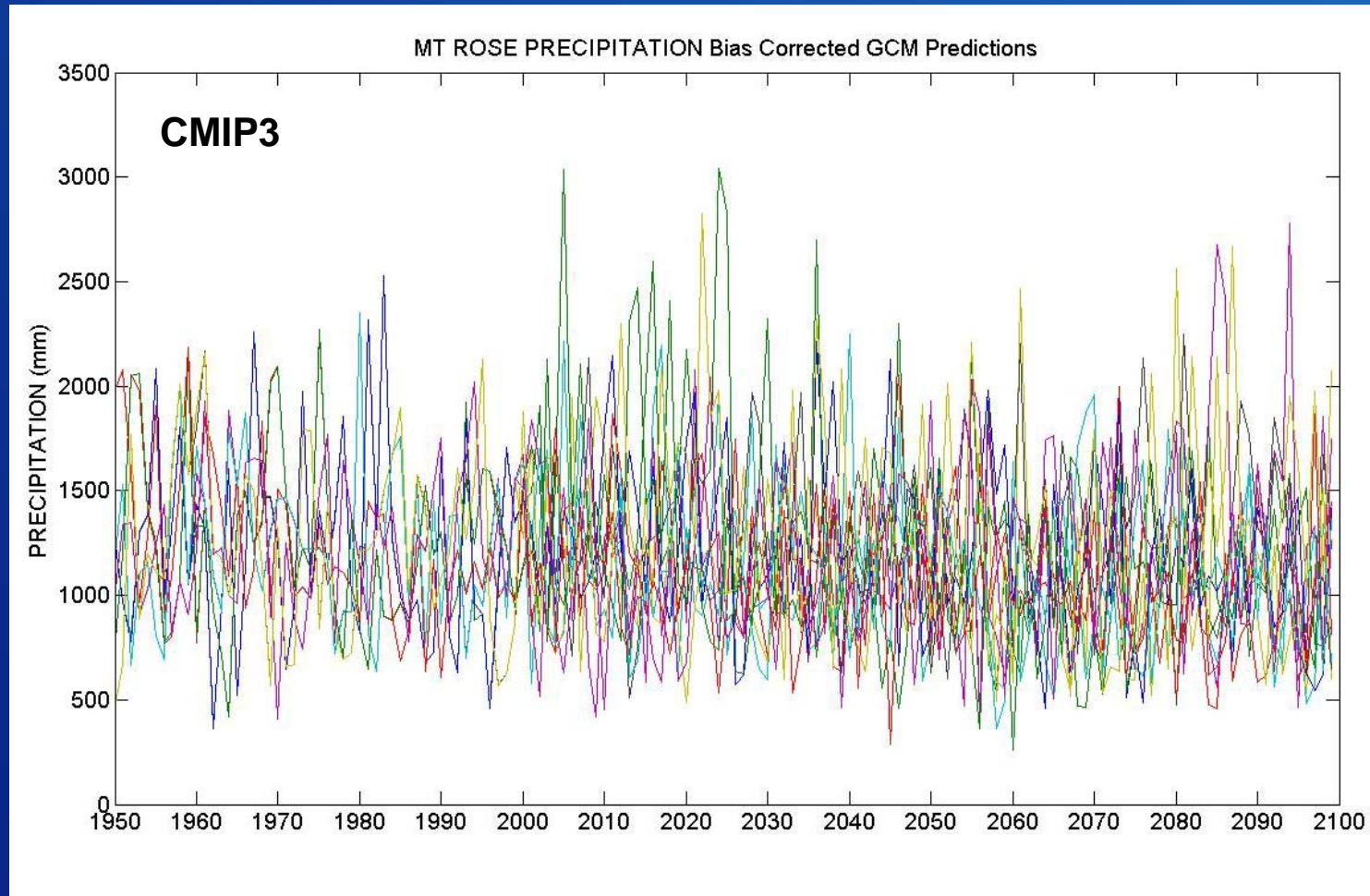
Climate Projections

- **Future climate and its variability based on Global Circulation Model (GCM) projections.**
- **Specifically, Coupled Model Intercomparison Project Phase 3 (CMIP3) or Phase 5 (CMIP5) will be used.**
- **Both suites are bias-corrected and spatially-disaggregated (BCSD) by the BOR to a 12 km grid as part of the West-Wide Climate Risk Assessment.**

Mt. Rose Station (Tmax and Tmin, 112 GCM)



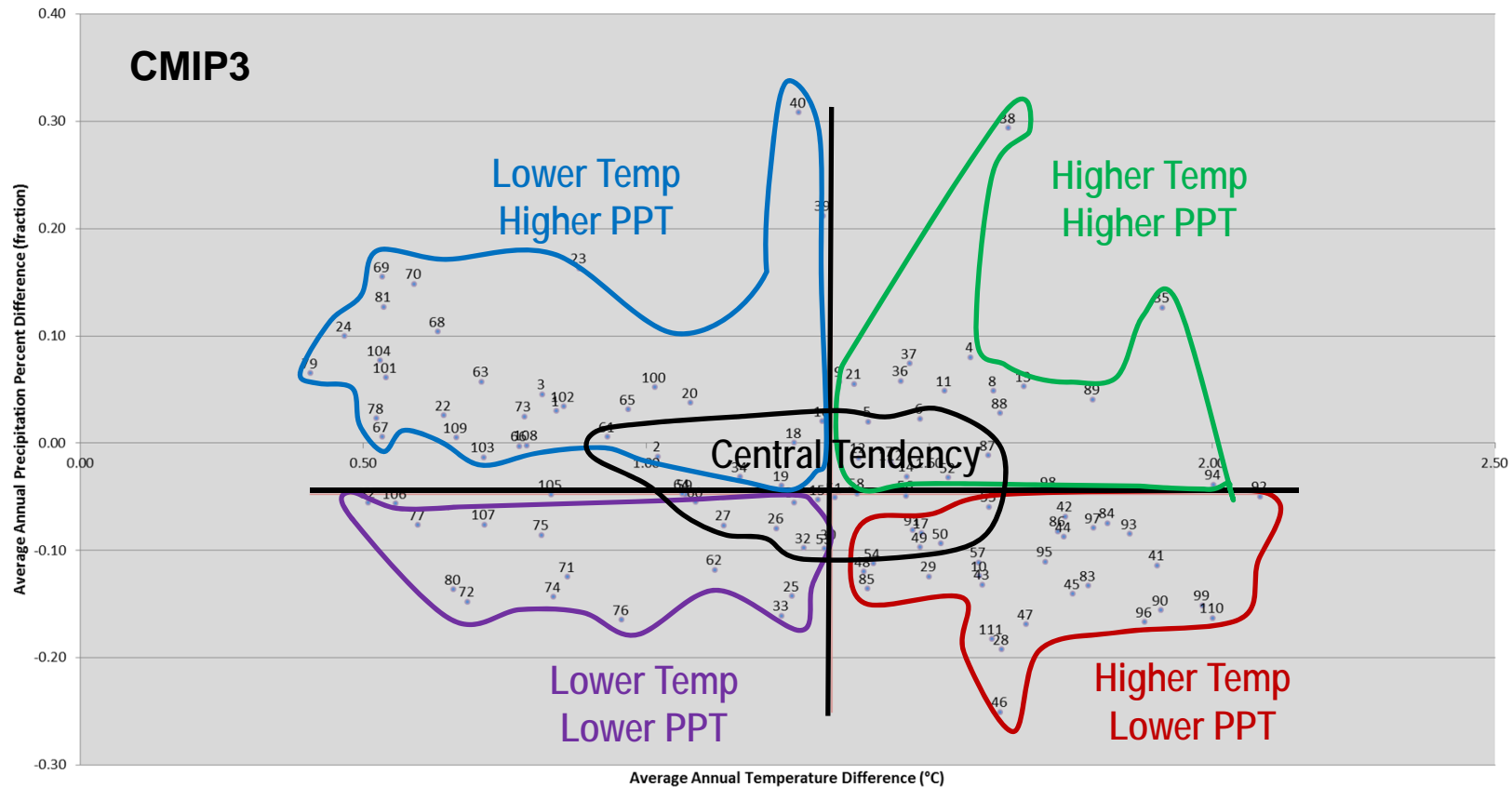
Mt. Rose Station (PPT, 112 GCM)



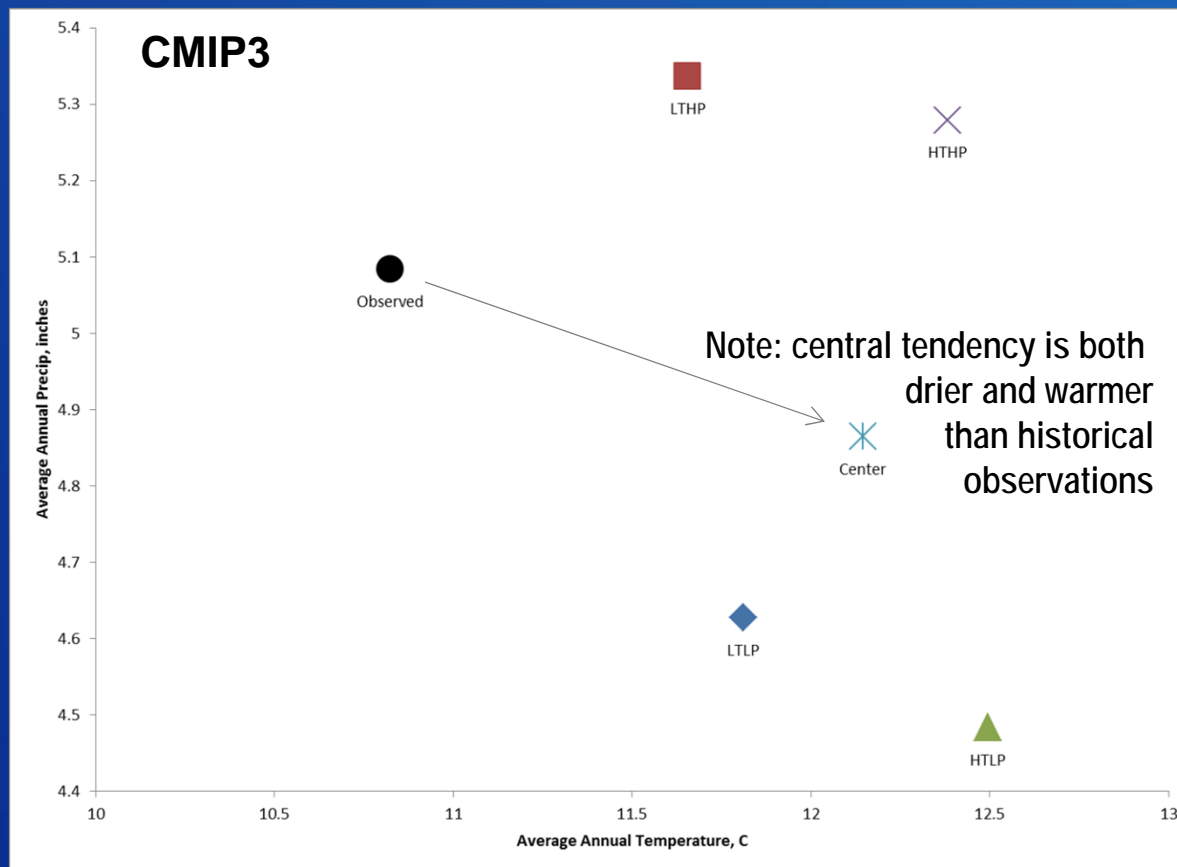
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Hybrid-Delta Ensemble (HDe)

Relationship Between Changes in Period-Mean Annual Precipitation and Temperature: (112 projections evaluated at 2010 - 2039 relative to 1950 - 1999)



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- A number of projections within each quadrant and central tendency are combined to form ensemble-averaged projections.
- These projections are then delta-corrected for ppt and temp which incorporates observed periodicities in the historic record.

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Expected Results

- Simulated future streamflows over 100 year period based on HDe climate projections computed from either CMIP3 or CMIP5 data: four quadrants, one central tendency, and one current for each of the three PRMS watersheds.
- Streamflows from each of these scenarios serve as inputs into the Truckee Basin Planning Model.



Technical Advisory Group Discussion

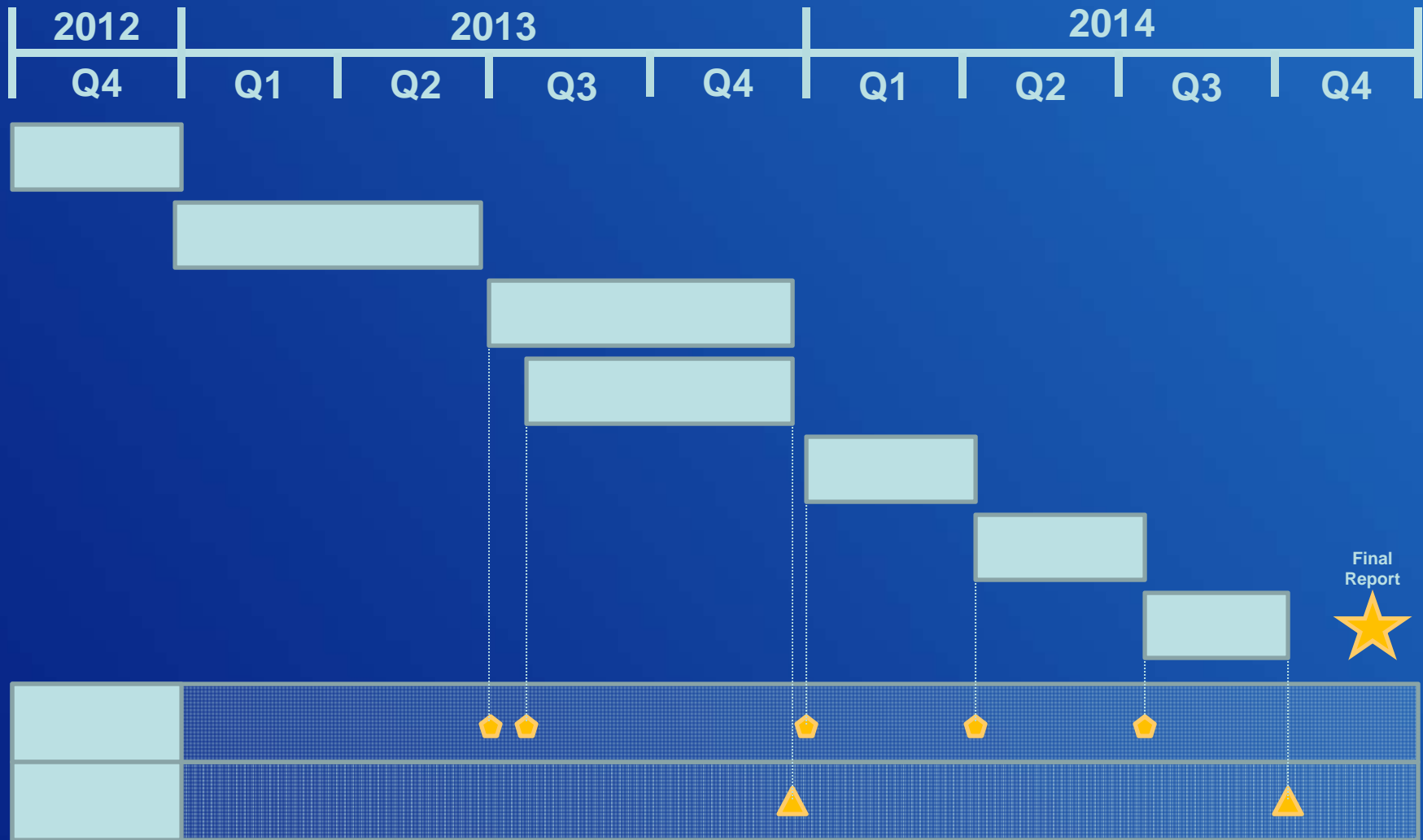
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Ongoing and Future Basin Study Activities

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Truckee Basin Study Schedule



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Planned Workshops & Presentations

- **Technical Advisory Group Meetings**
 - Demand, August 5 at 1:00 PM
 - Risk and Reliability Imbalance Metrics, Quarter 1 2014
 - Opportunities Identification, Quarter 2 2014
 - Strategy Development, Quarter 3 2014
- **Public Presentations**
 - Quarter 1 2014
 - Quarter 3 2014

Basin Study Information

- Reclamation's Basin Study Program Website
 - <http://www.usbr.gov/WaterSMART/bsp/studies.html>
- Truckee Basin Study Website
 - <http://www.usbr.gov/mp/tbstudy>
 - Public information related to Study
 - Public meetings will be archived on the site
- Additional Information, Questions, and/or Comments
 - Arlan Nickel phone: 916-978-5061 or
Shelley McGinnis phone: 916-978-4349
 - email: bor-mpr-truckeebasinstudy@usbr.gov

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