Evaluation of catchment pairs and the seasonal effects of drought on source water in forested mountain streams

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Overview

Project Background

- *What is the **Sierra Nevada Adaptive Management Project**?*

Catchment Comparison

- *What do the similarities or difference between study catchment water sources, discharge patterns, and chemistry imply about **paired catchment study design**?*

Drought Patterns

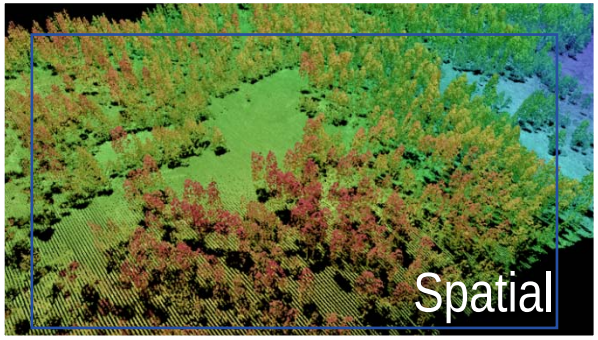
- *How did the **recent/current drought** affect discharge, water chemistry, and source waters?*

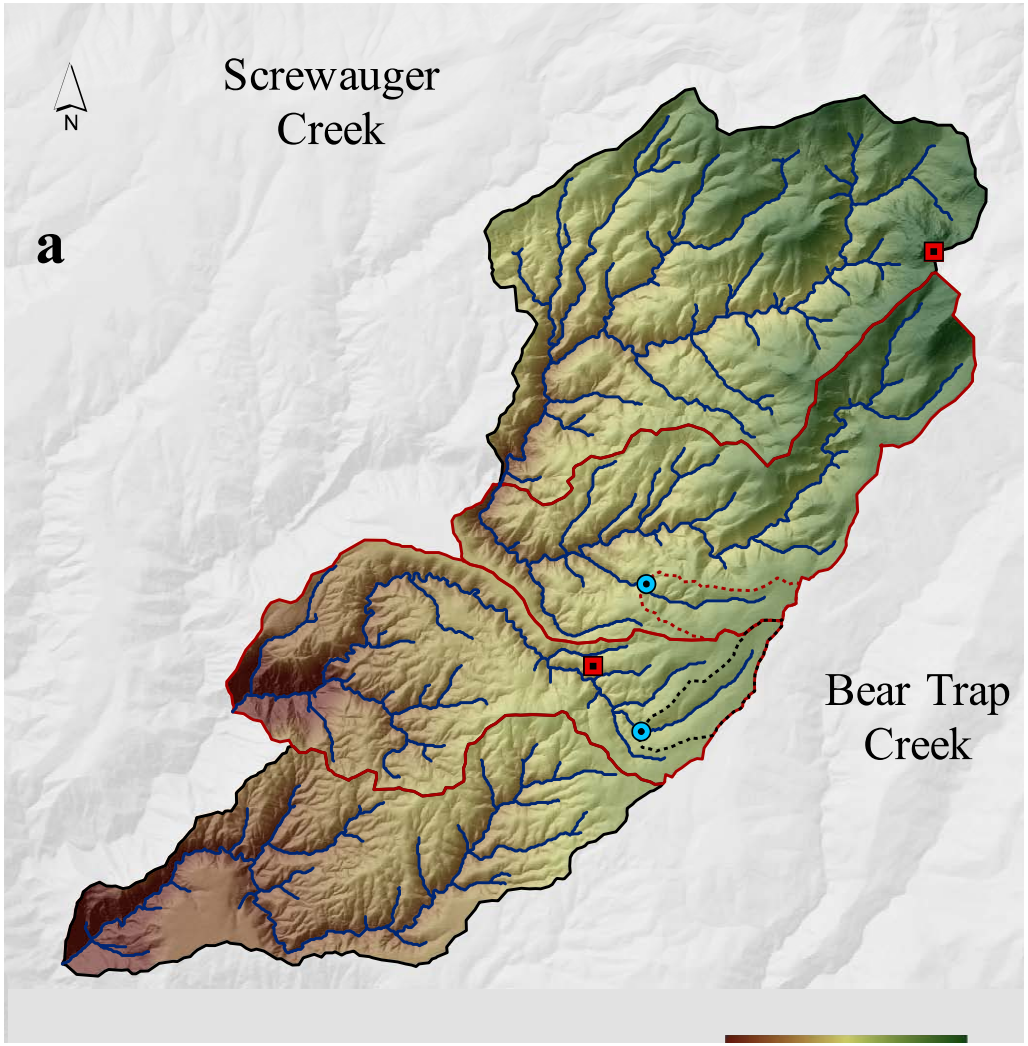
Sierra Nevada Adaptive Management Project

- **CONSENSUS** that forests are at risk
- **CONTROVERSY** over USFS management
- **UNCERTAINTY** on how to best reduce risk
- Acknowledged **NEED** to learn more

What are the ecosystem effects of USFS fuels treatments?

Sierra Nevada Adaptive Management Project





Site Characteristics	BTP	FRZ
Elev (m)	1560	1605
Area (km^2)	1.76	1.68
Aspect	southwest	west
Soil	sandy loam / loam	
Bedrock	Miocene –Pliocene andesitic volcanics; sandstones/ siltstones/slates	
Vegetation	mixed conifer	

Last Chance Site

Site Characteristics	BSN	SPK
Elev (m)	1778	1719
Area (km2)	2.47	1.62
Aspect	southwest	northwest
Soil	loamy sand/ sand	
Bedrock	tonalite	
Vegetation	mixed conifer	

b

Fireshed treatment
Fireshed control
Headwater treatment
Headwater control

Sugar Pine Site

der
Creek

0 2 4
Kilometers

Measurements

15-minute

Stage

Temperature

Conductivity

Precipitation

Snow depth

Soil Moisture

Grab Samples (weekly to bi-monthly)

Conductivity

Temperature

Major ions

Stable Isotopes

Additional Measurements

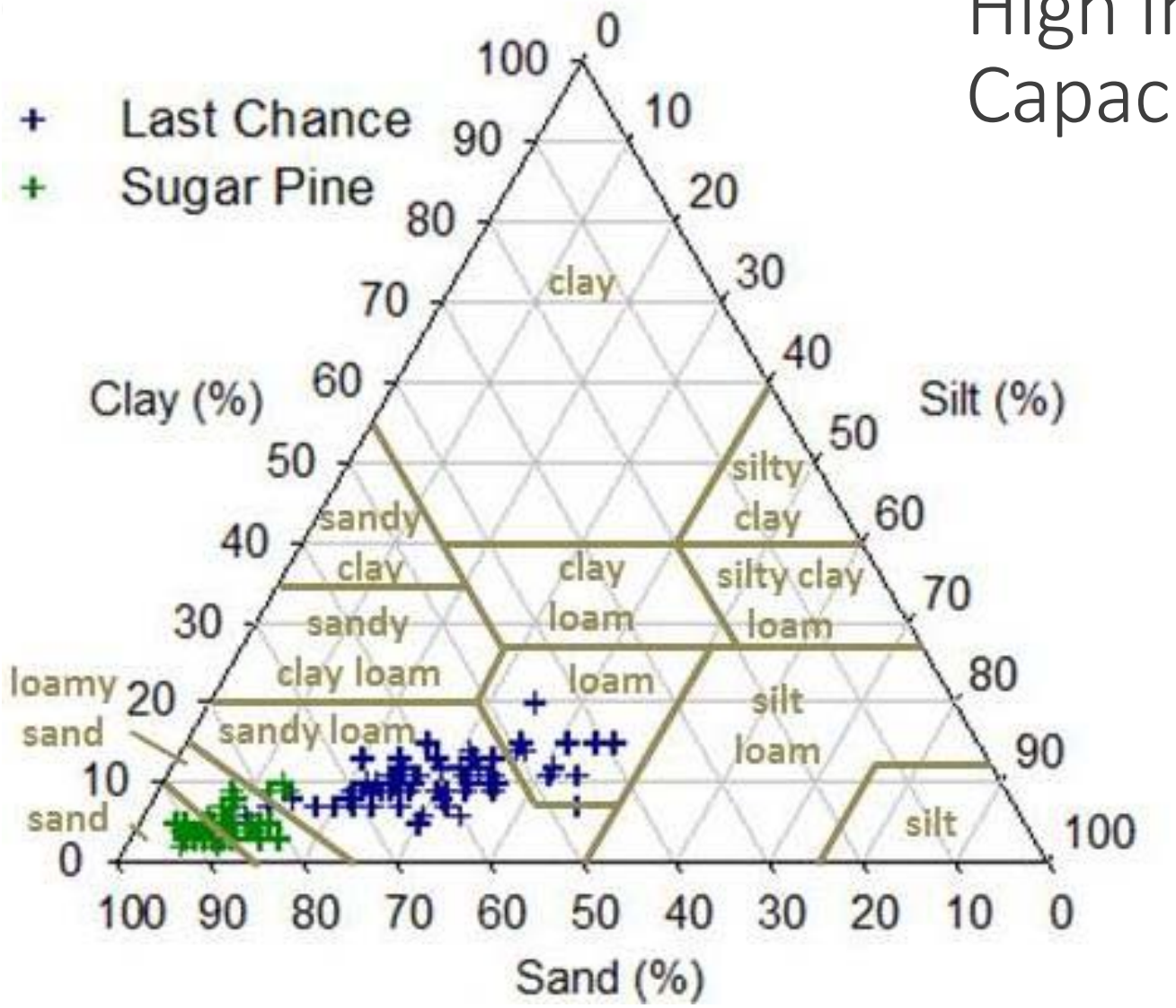
Snow chemistry

Spring samples

Groundwater well samples

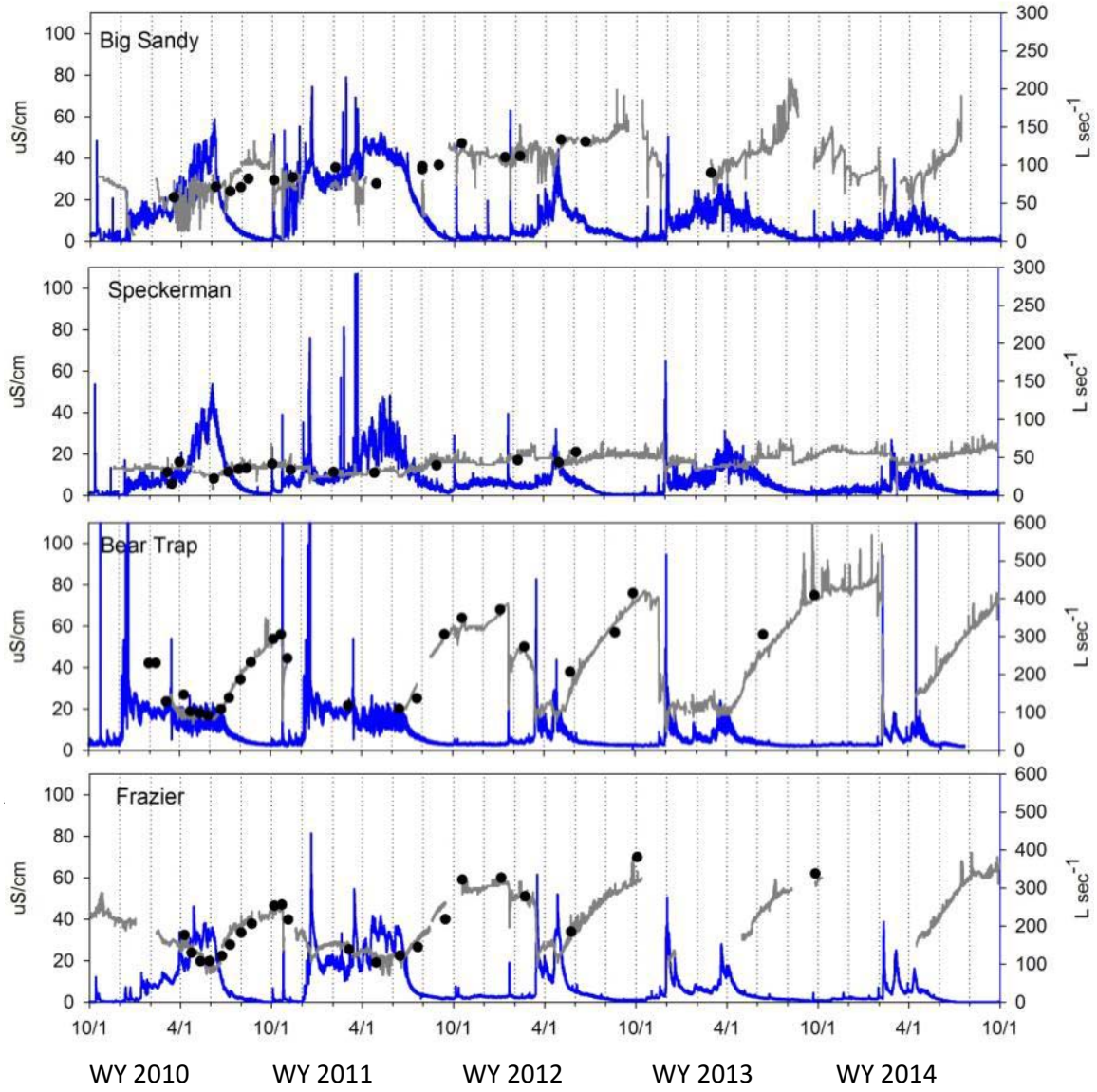
Soil texture

High Infiltration Capacities



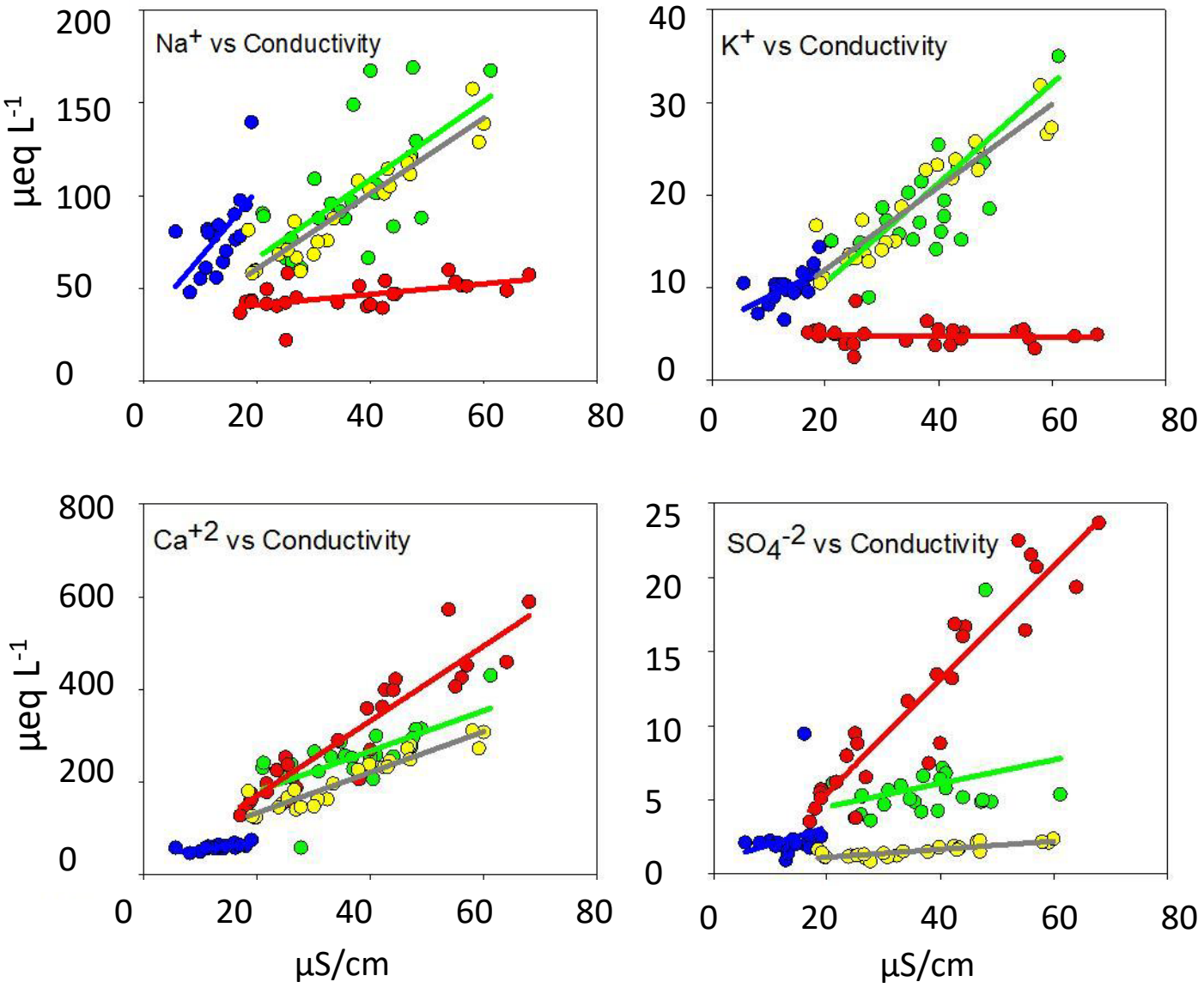
Catchment Comparison

Specific Conductivity & Discharge



discharge
specific conductivity(continuous)
specific conductivity(manual)

Major Ions vs. Conductivity

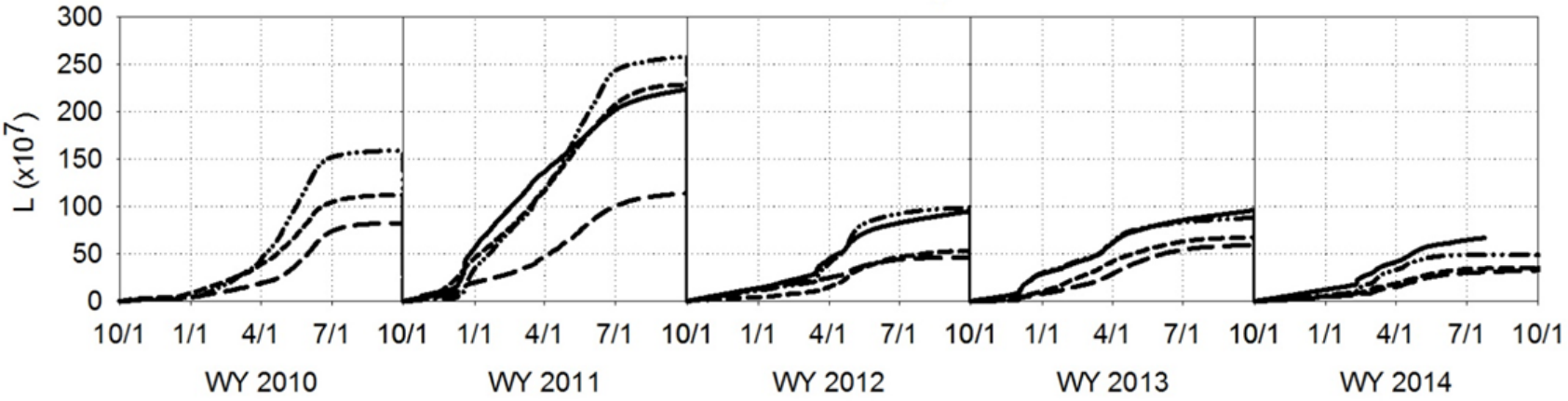


Drought

2009

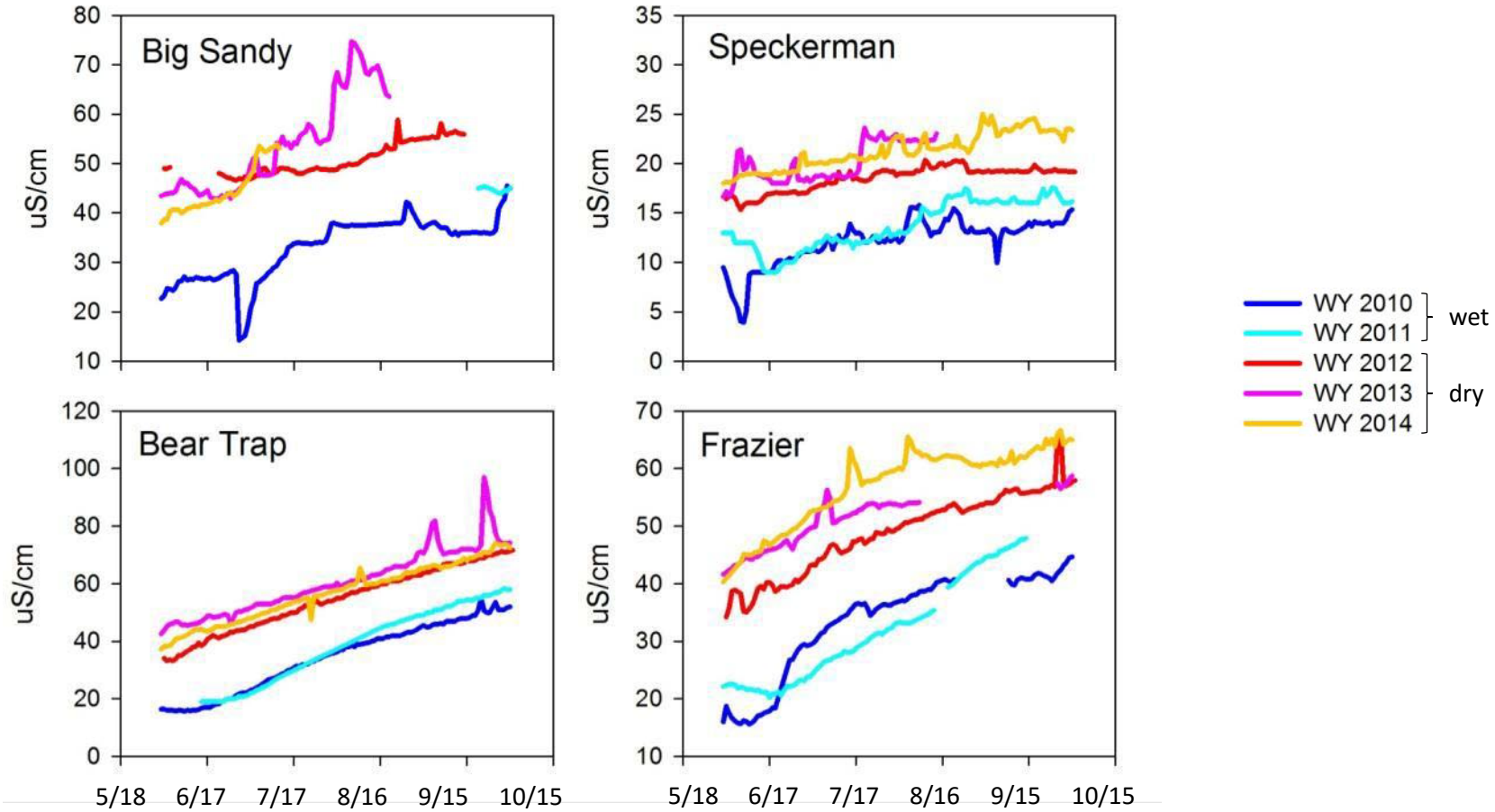
2012

Cumulative Discharge

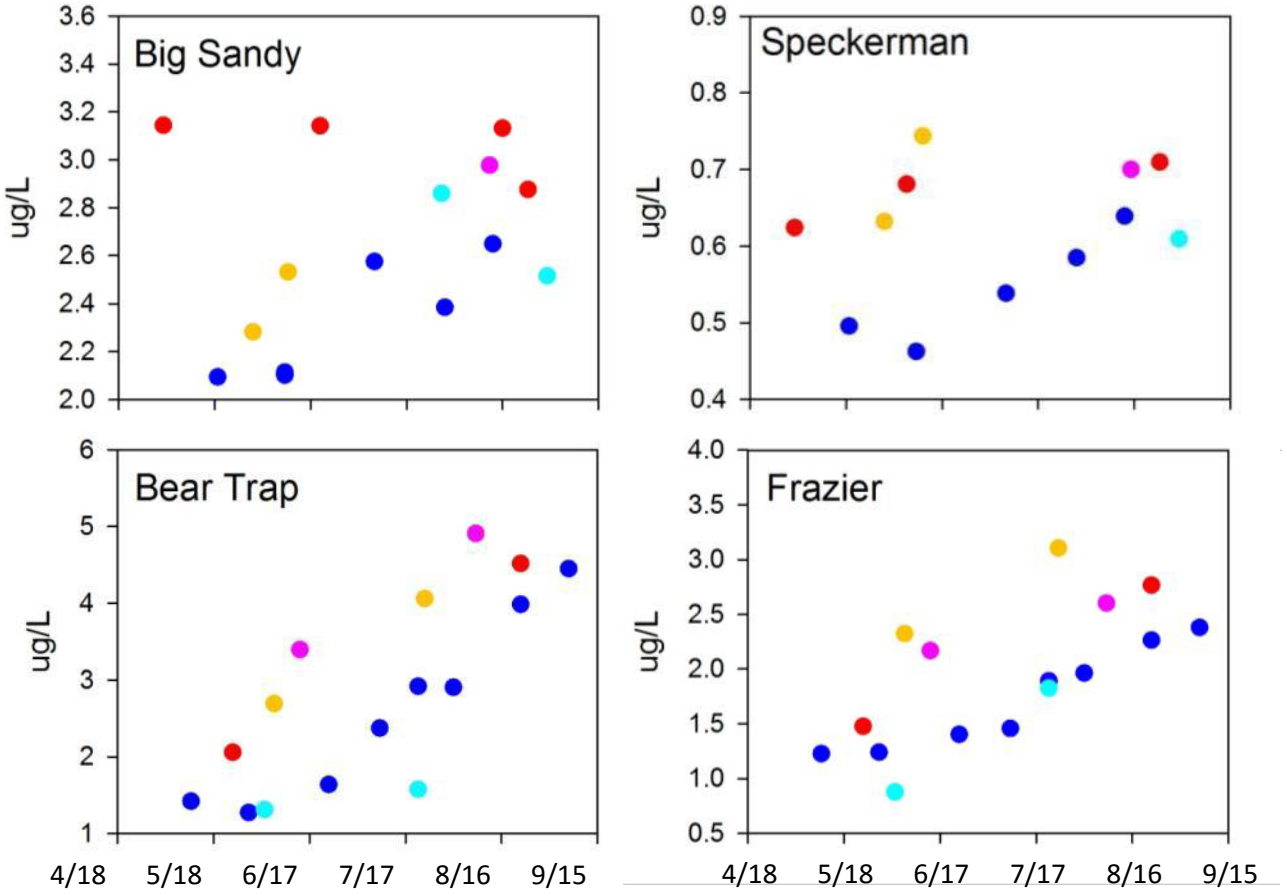


Big Sandy Creek
Speckerman Creek
Bear Trap Creek
Frazier Creek

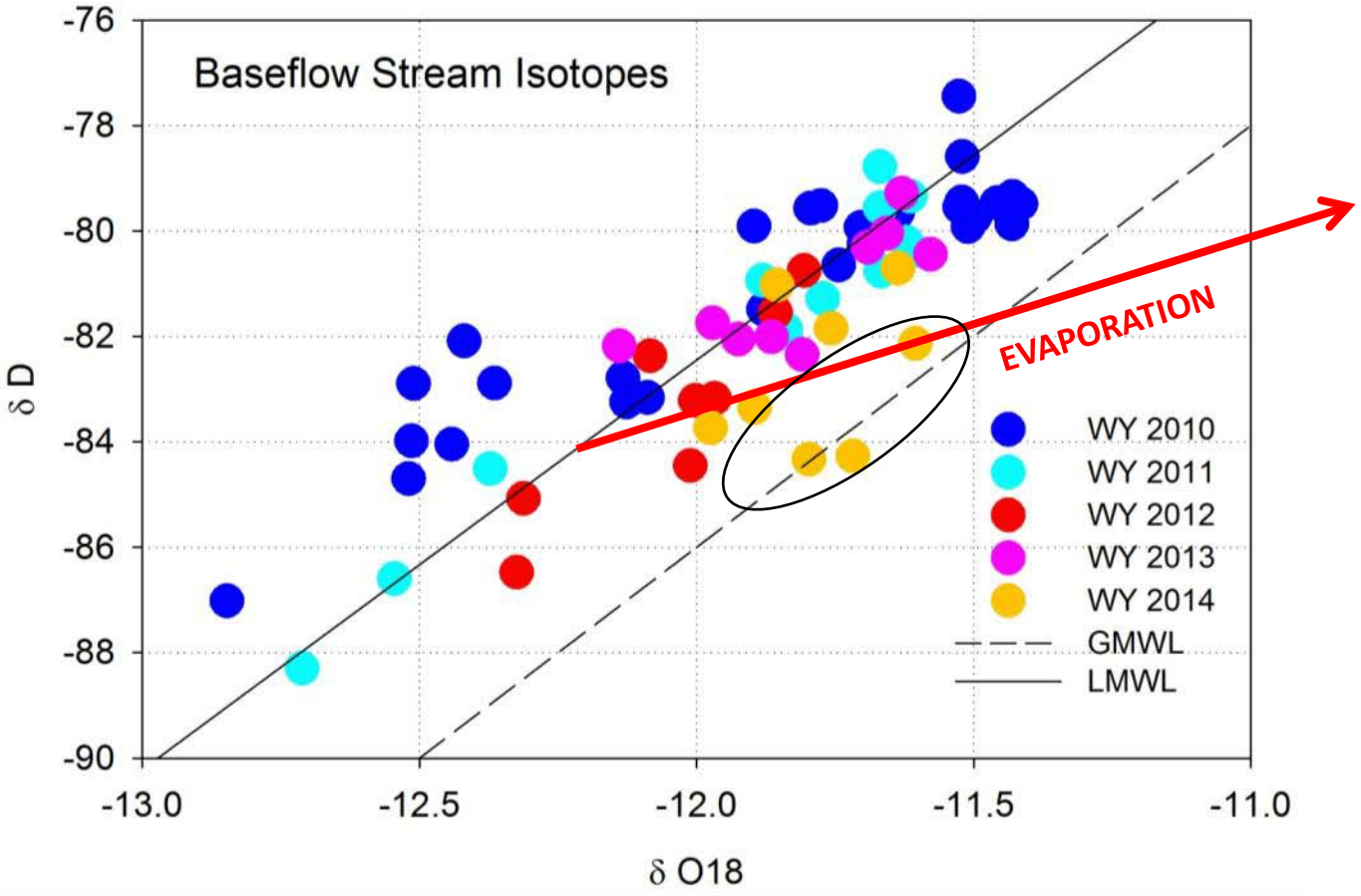
Baseflow Specific Conductivity

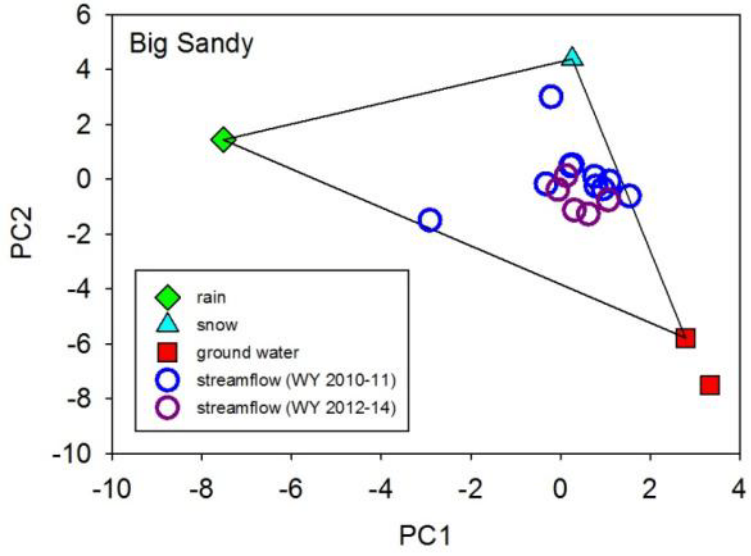


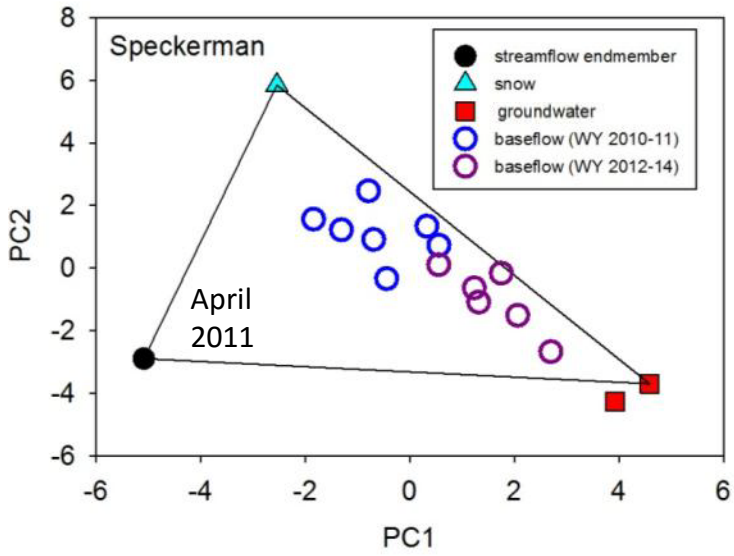
Baseflow Ca^{+2} Ion Concentrations

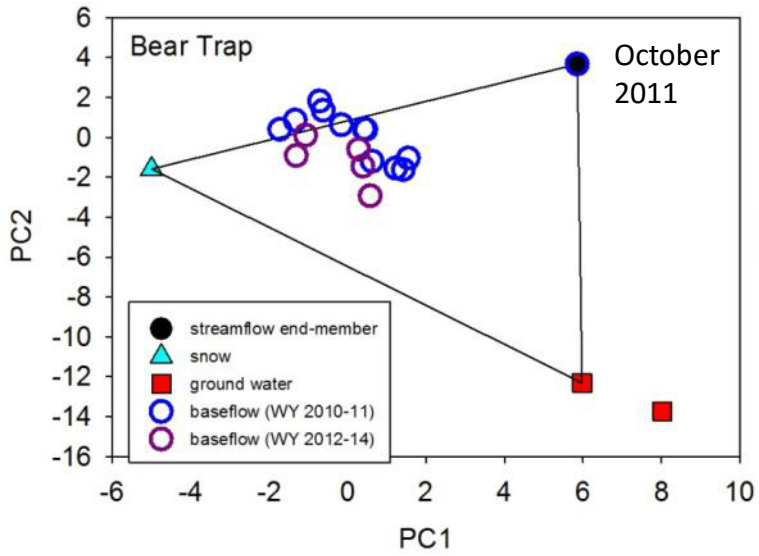


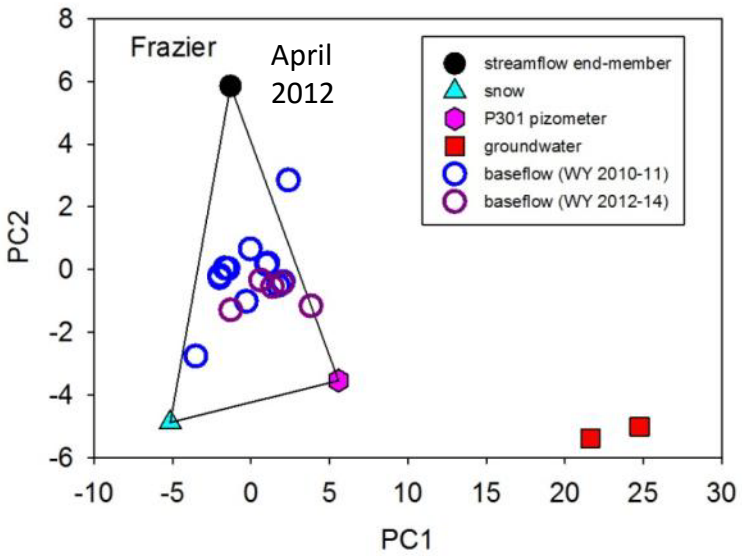
Stream Isotopes











End-Member Mixing Analysis

Implications

Paired Catchments

- Differences in chemistry and source waters
- Hydrologic pathways and biogeochemical processes should be considered along with physiographic similarities

Drought

- Greater proportion of groundwater during dry years
- Drought effects in summer low flow
- Climate change leads to less groundwater recharge and less resiliency of systems

Management Recommendations

- Caution in applying data from one catchment to model another without supporting field measurements
- Detailed, long-term field datasets highlight inter-annual variability and differences between catchments

Questions?

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