The WAsatch Dendroclimatology Research (WADR) group:

Multi-disciplinary investigations into the paleo-hydroclimatology of Northern Utah as recorded in tree-ring response

WADR Group Members:

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Research objectives of WADR are to:

1) collect and analyze tree-ring chronologies from northern Utah in order to reconstruct climate-related variables such as stream flow, precipitation, temperature and vapor deficit

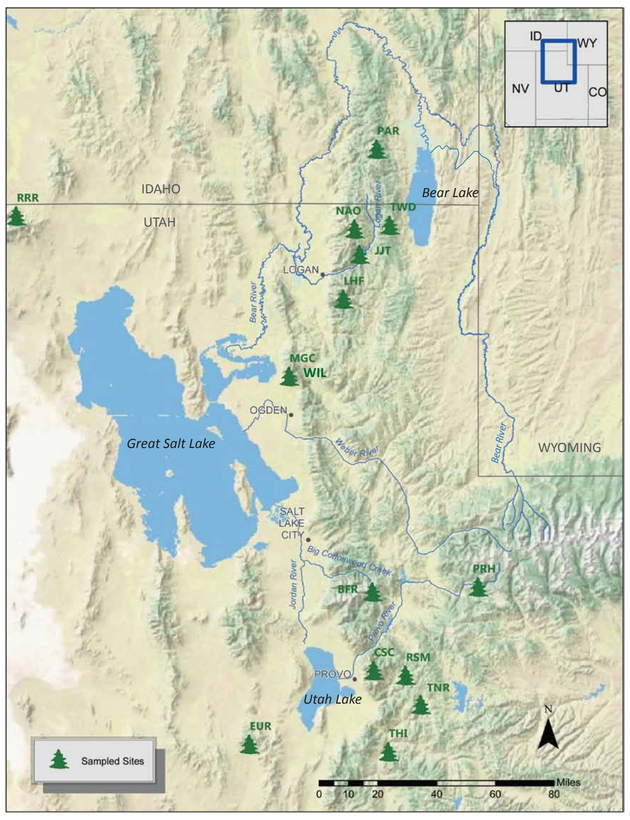
2) understand how plant physiological responses affect the relationship between tree rings and climate

3) analyze the resultant tree-ring chronologies for broader regional and temporal climate signals and relationships to Pacific Ocean conditions, in order improve understanding of large-scale climate forcing and past hydrologic extremes and variability.

Specific research goals include the development of stream-flow reconstructions for the major rivers supplying the water needs of rapidly growing urban population centers and major agricultural areas along the Wasatch Front (e.g. Logan, Weber, Jordan, Provo and Bear Rivers), as well as reconstructing Bear Lake and Great Salt Lake water levels.

Reconstructions will be analyzed to document the cyclic nature of drought and other hydrologic extreme events, in order to provide improvements in risk-management strategies for regional water-supply districts that are tasked with managing increasing water demands in a region with high inter-annual hydroclimatic variability.

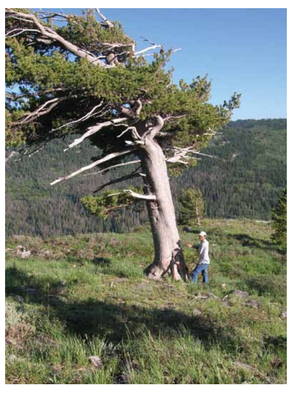
Location of sites for tree-ring collection by WADR group



Tree-ring collections were focused on climate-sensitive species from sites selected for reconstruction of mean annual river flow and precipitation

WADR Tree-ring chronologies from northern Utah and the Wasatch Range.

Species Sampled		Collected	Chronology Location		Eleva-	Approx.
Scientific	Common	By	Watershed	Identifier	tion, ft	Age from
Pseudotsuga menziesii	Douglas-fir	USU	Bear River	NAO	9200	1400's
Pseudotsuga menziesii	Douglas-fir	BYU	Am Fork River	BFR	9800	1300's
Pseudotsuga menziesii	Douglas-fir	USU	Bear River	JJT	6900	1700's
Pseudotsuga menziesii	Douglas-fir	USU	Weber River	MGC	7000	1700's
Pseudotsuga menziesii	Douglas-fir	USU	Weber River	WIL	9000	1700's
Pseudotsuga menziesii	Douglas-fir	USU	Bear River	PAR	9000	1800's
Pinus flexilis	Limber pine	BYU	Am Fork River	BFR	9800	1200's
Pinus flexilis	Limber pine	USU	Weber River	MGC	7000	1600's
Pinus flexilis	Limber pine	USU	Bear River	JJT	6900	1600's
Pinus flexilis	Limber pine	USU	Bear River	PAR	9000	1700's
Pinus flexilis	Limber pine	USU	Weber River	WIL	9000	1700's
Pinus flexilis	Limber pine	BYU	Provo River	CSC	9600	1500's
Pinus monophylla	Pinyon pine	BYU	Utah Lake	EUR	6700	1500's
Pinus edulis	Pinyon pine	BYU	Hobble Creek	RSM	6800	1500's
Pinus monophylla	Pinyon pine	USU	Raft River	RRR	6000	1800's
Pinus ponderosa	Ponderosa pine	BYU	Sp Fork River	THI	5500	1600's
Pinus ponderosa	Ponderosa pine	BYU	Provo River	PRH	7800	1600's
Juniperus scopularum	Rocky Mtn Juniper	USU	Bear River	LHF	6500	1700's
Juniperus scopularum	Rocky Mtn Juniper	USU	Bear River	JJT	6900	1400's
Juniperus osteosperma	Utah Juniper	USU	Bear River	LHF	6500	1800's
Populus tremuloides	Quaking aspen	USU	Bear River	LOG	8500	1700's
Cercocarpus ledifolius	Mtn mahogany	USU	Bear River	LOG	7000	1800's

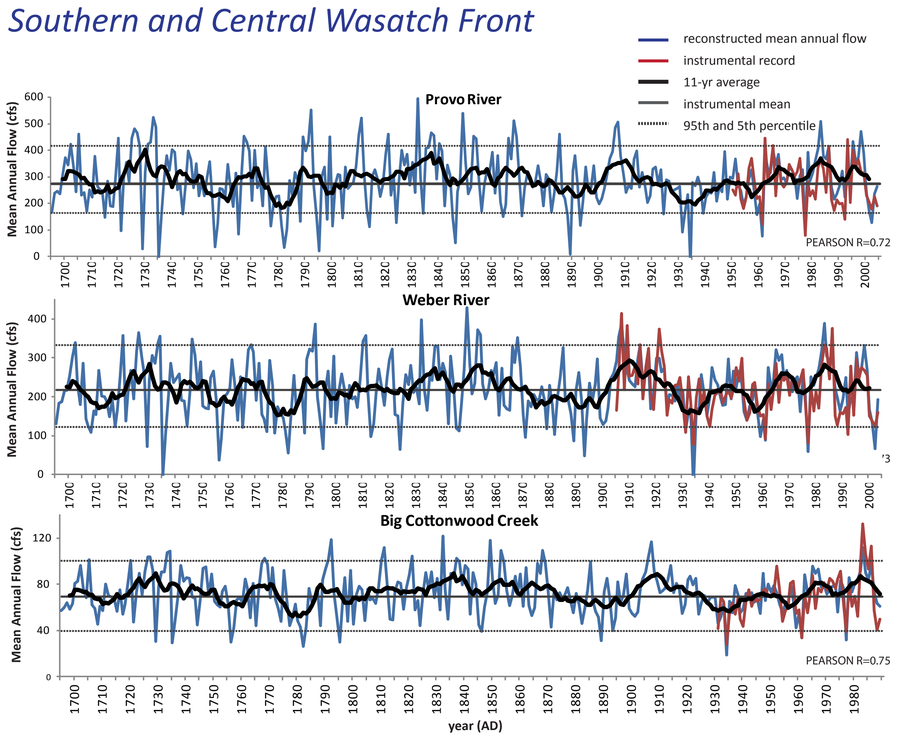


2012 Spring Runoff Conference Schedule of WADR Talks

TUESDAY APRIL 3RD **TREE RINGS** (ECC AUDITORIUM)	
1:30 pm	**Lukas, Jeff**, *CIRES Western Water Assessment, University of Colorado* **TreeFlow: Tree-ring Paleohydrology Across the Western U.S. and its Application to Water Management**
1:50 pm	**Bekker, Matthew**, *Brigham Young University* | **Allen, Eric**, *Department of Geology, Utah State University* | **Buckley, Brendan**, *Lamont-Doherty Earth Observatory, Columbia University* | **DeRose, Justin**, *Rocky Mountain Research Station, USDA Forest Service* | **Kjelgren, Roger**, *Department of Plants, Soils and Climate, Utah State University* | **Rittenour, Tammy**, *Dept. of Geology, Utah State University* **Streamflow Reconstruction from Tree Rings for the Southern and Central Wasatch Front**
2:10 pm	**Allen, Eric**, *Department of Geology, Utah State University* | **Bekker, Matthew**, *Brigham Young University* | **Buckley, Brendan**, *Lamont-Doherty Earth Observatory, Columbia University* | **DeRose, Justin**, *Rocky Mountain Research Station, USDA Forest Service* | **Kjelgren, Roger**, *Department of Plants, Soils and Climate, Utah State University*| **Rittenour, Tammy**, *Dept. of Geology, Utah State University* **Reconstructed Flows of the Logan River, Utah**
2:30 pm	**Hipps, Lawrence**, *Utah State University* **Intra-annual Patterns of Precipitation and Temperature and Relations to Wet-Dry Cycles in Northern Utah**
2:50 pm	**Wang, S-Y (Simon)**, *Utah Climate Center* **Decadal and Paleo-climate Research Leading to Longer-term Prediction for the Great Salt Lake Hydrological Cycle**

Bekker (BYU) et al.

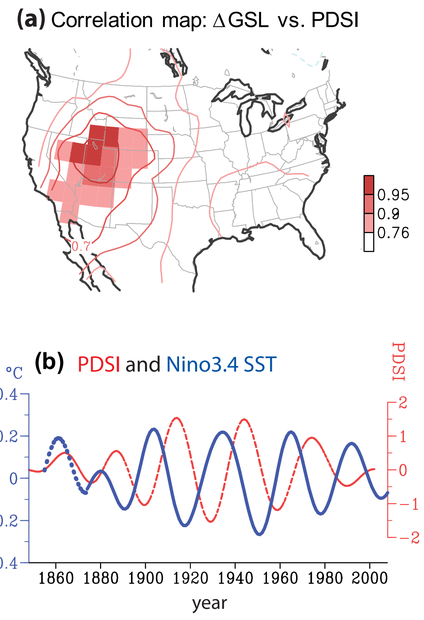
Streamflow Reconstruction from Tree Rings for the Southern and Central Wasatch Front



Reconstructed stream flow for the Provo and Weber Rivers and Big Cottonwood Creek in the central and southern Wasatch Front for the last 300 years. The chronologies used for streamflow reconstruction are primarily from pinyon pine (Pinus edulis and P. monophylla), but also include Douglas-fir (Pseudotsuga menziesii), and Rocky Mountain juniper (Juniperus scopulorum). Principal components analysis was used to extract the major mode of variability from the suite of chronologies, which was then used as the predictor of streamflow in a linear regression equation. Results suggest variability in streamflow that exceeds the extremes of historical records

Wang (USU)

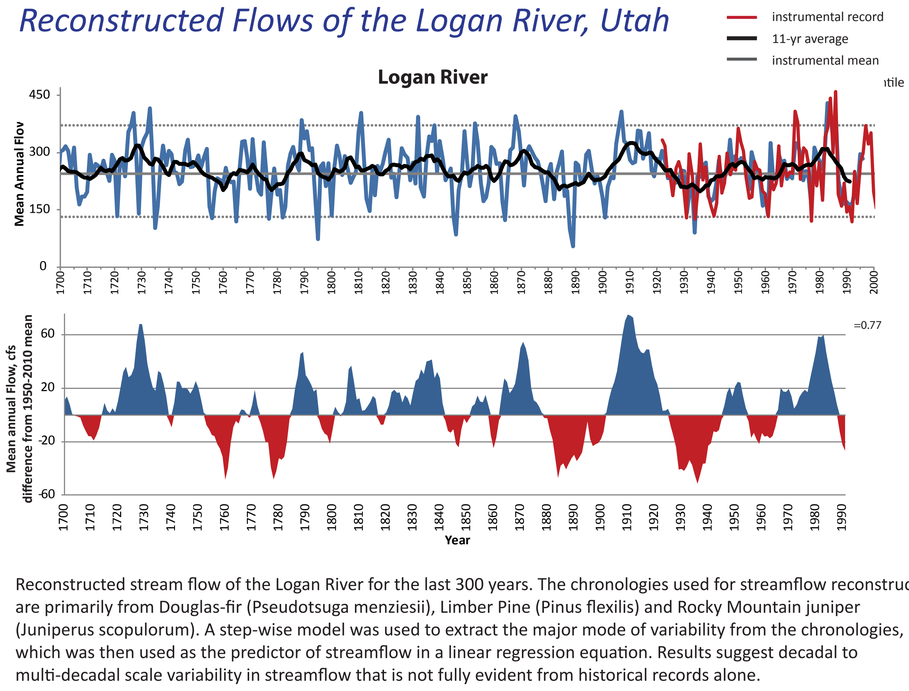
Decadal and Paleo-climate Research Leading to Longer-term Prediction for the Great Salt Lake Hydrological Cycle



(a) Correlation maps between the Great Salt Lake level change (Δ GSL) and the PDSI derived from tree rings. All data were annual means bandpassed with 20-50 years. Values that are significant at the 95% confidence interval are shaded. (b) Time series of the 20-50 year bandpassed PDSI (red dashed) and Niño3.4 sea surface temperature (SST) anomalies (blue) derived from coral reconstruction in tropical atolls; dotted line before 1873 was derived from the ERSST data. Note the quarter-phase shift between the two.

Allen et al. (USU)

Reconstructed Flows of the Logan River, Utah



Reconstructed stream flow of the Logan River for the last 300 years. The chronologies used for streamflow reconstruction are primarily from Douglas-fir (Pseudotsuga menziesii), Limber Pine (Pinus flexilis) and Rocky Mountain juniper (Juniperus scopulorum). A step-wise model was used to extract the major mode of variability from the chronologies, which was then used as the predictor of streamflow in a linear regression equation. Results suggest decadal to multi-decadal scale variability in streamflow that is not fully evident from historical records alone.

Direction of On-going and Future Research:

Use exisiting and new chronologies to:
- Reconstruct Flow in the Bear River, Great Salt Lake and Bear Lake levels
- PDSI, precipitaion and other reconstructions

Analyze new and existing chronologies to for regional climate cycles and patterns

Better understanding of tree physiological response to annual and intra-annual vapor deficit and other stressors as recorded in tree rings

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USU Water Initiative (Rittenour et al, 2009)
USU Extension (Kjelgren et al 2010)
USU Ecology Center (Allen, 2011)
Burreau of Reclamation WaterSmart (Gillies, Jin and Wang, 2011)
USU Research Catalyst Grant (Rittenour and Kjelgren, 2012)