Paleohydrologic Research in the Wasatch



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Rationale

- Streamflow has not been reconstructed for Utah's most populous areas
- Few tree-ring chronologies in northern Utah



Objectives

- Extend spatial & temporal coverage of tree-ring data along the Wasatch Front
- Reconstruct streamflow beyond historical records
- Compare streamflow variation in the Wasatch to surrounding areas









Methods

- Study Site
 - GIS model to help locate sites
 - Big Flat Ridge
 - Limber pine &
 Douglas-fir

American Fork Canyon







Detrending

• Detrending

- Open Canopy
- Conservative Approach: negative exponential curves or straight line



The Chronology

- "Arstan" chronology
- Subsample signal strength > 0.75 at 1178 (9 series)



Climate-Growth Relationships



• Tree rings and streamflow are both integrators of climatic factors

• Limber pine and autocorrelation



D Meko, LTRR, U. AZ

Climate-Growth Relationships

American Fork River



Streamflow in winter months prior to growing season Showed the strongest relationship





Tibble Fork Reservoir

- Constructed 1966
- 259 acre-feet
- Mean depth 3.4 feet
- Only N fork is impeded

Silver Lake Flat Reservoir

- Constructed 1971
- 1040 acre-feet
- Dams one tributary of north fork



Calibration

- Stepwise multiple linear regression
 - "Arstan" chronology +/- one, two and three years as predictors of water year streamflow



Best predictor: tree growth in previous year

Calibration



Best predictors: tree growth in current and previous year

Verification Statistics

• "PRESS" method ("leave one out")

	Adj. R ²	Correlation	Sign Test	RE
		Coefficient	(hit/miss)	
AF River	0.52	0.72	40/22	0.52
		P < 0.001	P < 0.05	P < 0.001
Jordan River	0.44	0.68	35/19	0.46
		P < 0.001	P < 0.05	P < 0.001

Reconstruction



Discussion

 Ashley Creek (S. Uinta Mtns.) streamflow (Carson & Munroe 2005)

– Little agreement

- Colorado River at Lees Ferry (Woodhouse et al 2006)
 - Some similarities in extreme low flows (late 16th, mid-17^{th,} late 19th-early 20th centuries) but many differences
- Uinta Basin Precipitation (Gray et al 2004)

Comparison with Uinta Basin Precipitation



Management Implications

- Regional vs. local droughts
- Jordan River Drainage Basin has seen highermagnitude and longer-term droughts than is reflected in historical streamflow records

Prospects for Future Work

- A successful reconstruction from one site and chronology
 - More potential sites, including Douglas-fir and pinyon pine
 - More remnant material available
 - Possibilities for cleaner streamflow data?

Questions?

