**MOTIVATION, OBJECTIVES and APPROACH**

- Seasonal streamflow forecasts of spring runoff (e.g., April-July water supply forecasts) are critical for anticipating and managing water systems in snowmelt-dependent regions.
- Operational seasonal streamflow forecasts in the US use two primary approaches, both of which leverage initial watershed conditions but not climate forecast information:
  1. regress future streamflow on point observations of rainfall, snow water equivalent, river flow
  2. run ensemble hydrologic model simulations that combine initial watershed moisture states with historically observed weather sequences for the forecast period (called ESP, ensemble streamflow prediction)
- New opportunities – eg., climate prediction datasets (e.g., CFSv2, CFSR), physically-explicit hydrologic models, and statistical techniques – have emerged that could improve current practice.
- There is a need for a systematic intercomparison of alternative streamflow forecasting approaches to assess the marginal benefit of different types of information in water supply prediction.
- We are conducting seasonal streamflow hindcasts in selected case study watersheds to assess and intercompare strategies

**SEASONAL AND SPRING RUNOFF PREDICTABILITY**

Runoff forecasts are driven by initial hydrologic conditions (IHCs) and future seasonal climate (SCF) (Wood and Lettenmaier, 2008). The impact of skill in each predictability source varies greatly throughout the year. **Plot**: runoff predictions initialized in each month (Wood et al, 2015) with varying levels of uncertainty in each predictability source.

**DATA AND MODELS**

- ESP runs
  - The Sacramento, Snow17 and Unit Hydrograph models for streamflow simulation were implemented for 31 years of ensemble hindcasts using forcings from Daymet.
- Custom Streamflow Prediction Indices (eg figures to right)
  - NCEP/NCAR reanalyses were used to derive correlated time-averaged climate variables (eg PWAT, GPH, SST, SLP, SAT, U&W Winds Speeds)
  - Index derivation was k-fold cross-validated, as were all regressions
- Climate Model Forecasts
  - NCEP Climate Forecast System v2 (CFSv2) monthly precipitation and temperature forecasts

**SAMPLE RESULTS AND FINDINGS**

Hindcast timeseries for Jan 1 predictions of Apr-July runoff, showing individual event performance

A multi-model combination of IHC prediction (BC-ESP) and CFSR-based prediction

Performance statistics for method alternatives, showing skill for Apr-July runoff prediction at different lead times

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