

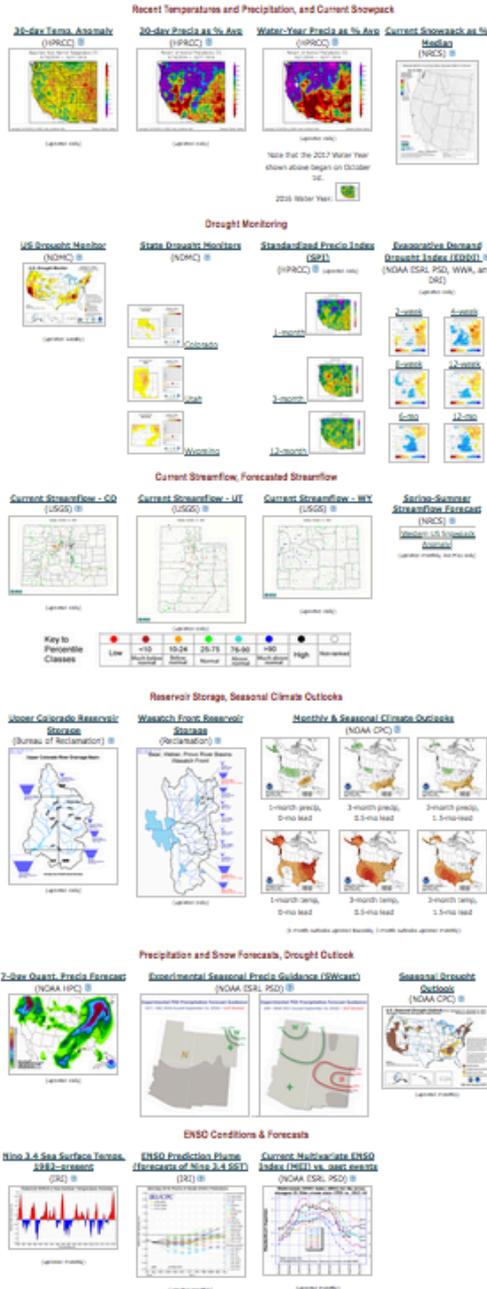


Drought Monitoring from the Western Water Assessment and friends for CO, UT, WY

Jeff Lukas, WWA, University of Colorado Boulder

Intermountain West Drought Early Warning System
Drought & Climate Outlook

October 25, 2016 – Denver, CO



Intermountain West Climate Dashboard

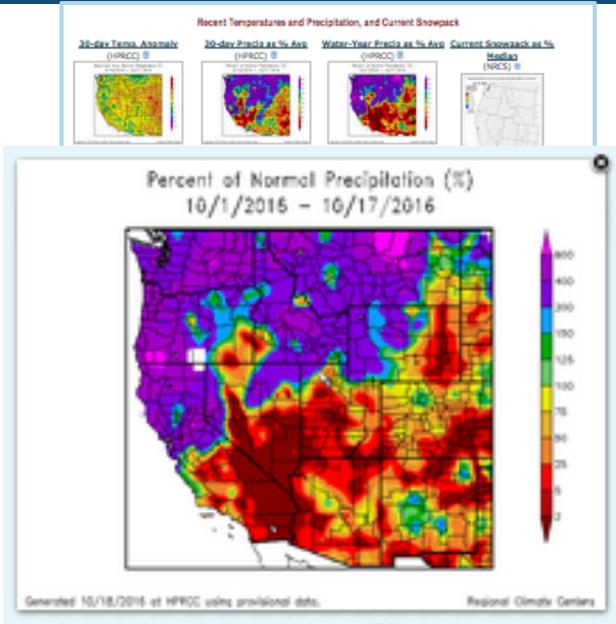
<http://www.colorado.edu/climate/dashboard.html>

Auto-updating (daily for most) array of ~30 climate, water, and weather data graphics focusing on Colorado, Utah, Wyoming

- recent Temp & Precip
- current Snowpack
- current Drought (USDM, SPI, EDDI)
- current Streamflows
- Runoff Forecasts
- Reservoir Storage
- Seasonal Climate Outlooks
- Seasonal Drought Outlook
- 7-day Precip Forecast
- ENSO Status & Forecasts

Intermountain West Climate Dashboard

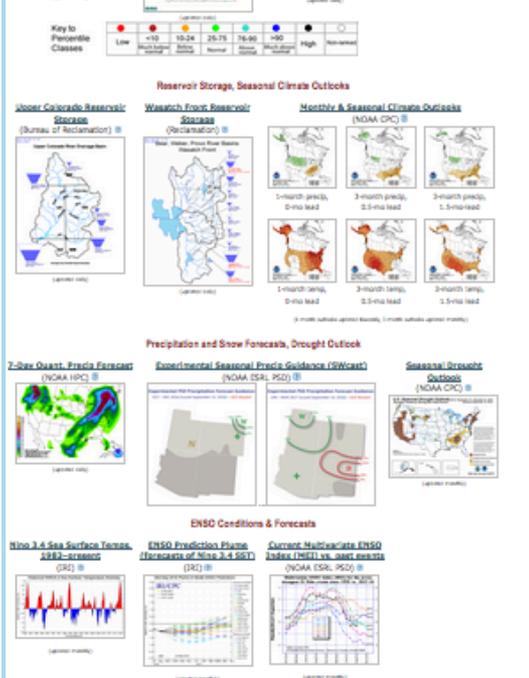
- Click on any graphic to upsize it, and move it around
- Monthly text briefing covers the most important trends and conditions



Latest Monthly Briefing - September 7, 2016 (Micro-Briefing)

Highlights

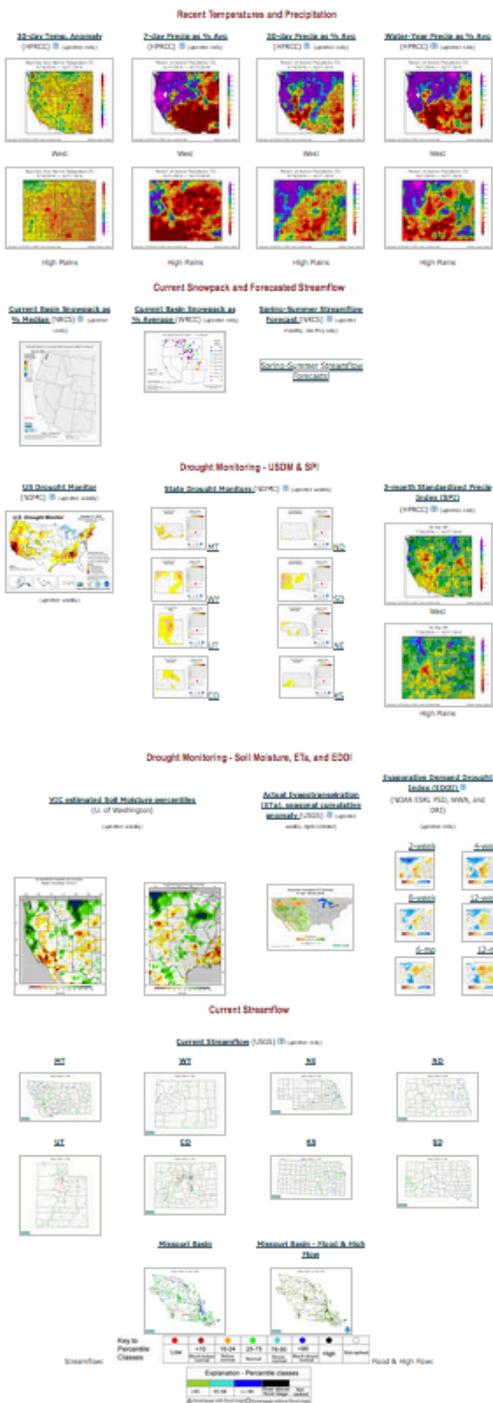
- September was much drier than normal for Colorado, southeastern Utah, and southeastern Wyoming. The rest of Utah and Wyoming was much wetter than normal. Statewide, Colorado was in the 30th percentile for precipitation, while Utah was in the 91st percentile, and Wyoming, the 89th percentile.
- For Water Year 2016 that ended on September 30, all three states ended up slightly wetter than average, with Utah in the 69th percentile (105% of the 1981-2010 normal), Colorado in the 69th percentile (103% of normal) and Wyoming in the 55th percentile (103% of normal). Temperatures were unusually warm across the region, continuing the overall warming trend. Wyoming was in the 96th percentile for the water year, Colorado was in the 95th percentile, and Utah was in the 93rd percentile.
- Since early August, drought conditions have eased in northeastern and north-central Wyoming, eastern Utah, and southwestern Colorado, while worsening and/or expanding in northwestern Wyoming, northwestern and central Utah, and north-central Colorado, with little overall net change for the region over the past two months.
- Despite below-average inflows to Lake Powell for Water Year 2016, total Colorado River system storage as of September 30 was the same as one year ago, at 51% of capacity. Lake Powell was at 12.82 MAF, 53% of capacity. Lake Mead was at 9.63 MAF, 37% of capacity, and flirting with the 1075' level that is a trigger for declared Lower Basin shortage.
- While sea-surface temperatures in the tropical Pacific have recently cooled to weak-La Niña territory, the official ENSO status remains ENSO-neutral. ENSO model forecasts have shifted away from the previous consensus towards a La Niña event, with more than half of the models now forecasting ENSO-neutral conditions through the winter.



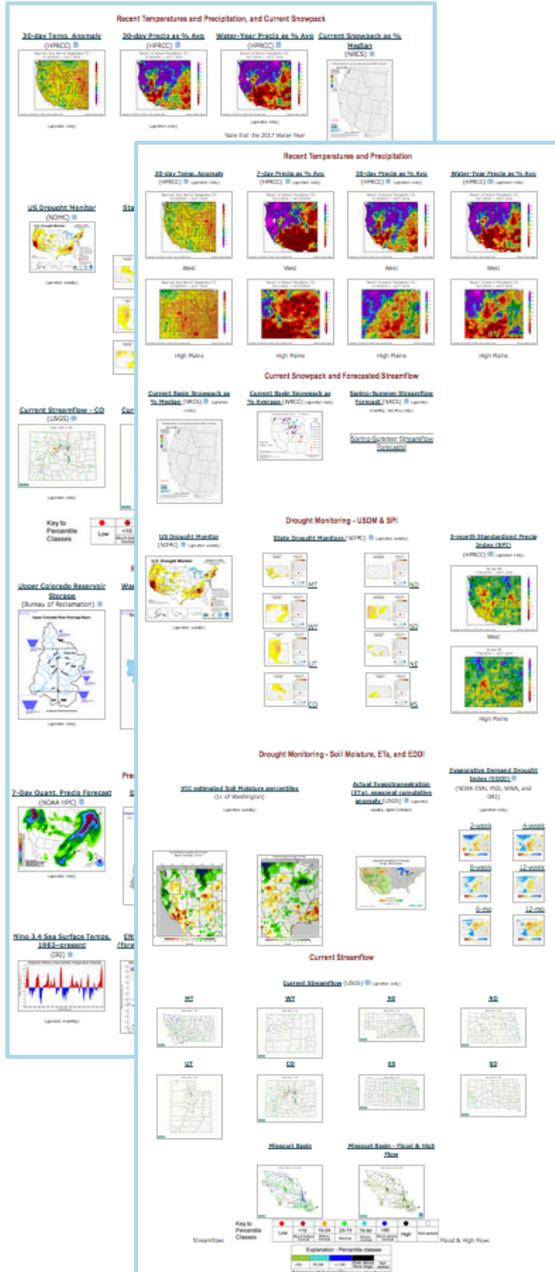


Rocky Mountain – High Plains Climate Dashboard

<http://www.colorado.edu/climate/dashboard2.html>



- Same concept, slightly different execution
- Covers 8 states: MT, WY, ND, SD, UT, CO, NE, KS (i.e., WWA, North-Central Climate Science Center, Northern Plains Regional Climate Hub)
- Over 50 data graphics
- Adds several ag-focused graphics (soil moisture, cumulative ETa)

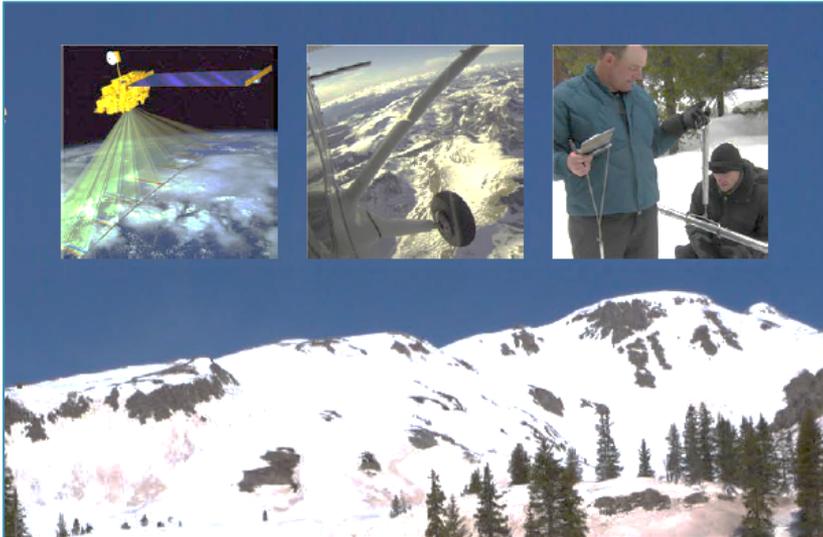


What next for the WWA Dashboards?

- Refresh design, cleaner user interface
- Expand Intermountain West Dashboard so it includes state-level graphics for AZ & NM
- Additional graphics (but is more better?)

2015 WWA Snowpack Monitoring Workshops

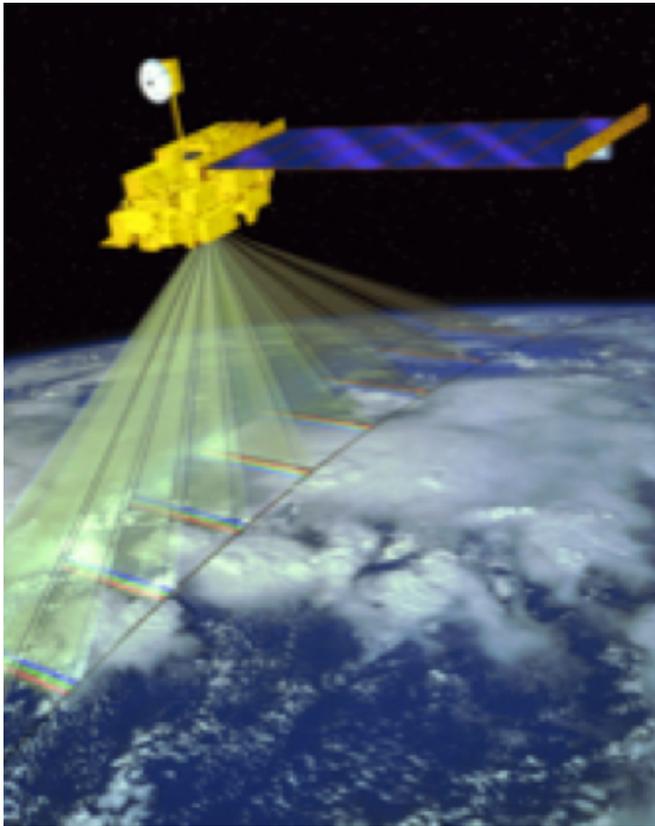
Lukas, McNie, Bardsley, Molotch, Deems, and friends



- Three one-day workshops in Utah, Wyoming, Colorado with 180 participants
- Presentations from WWA, NIDIS, CBRFC, NRCS Snow Survey, water managers
- Discussions of how to improve snowpack monitoring

MODIS-based, real-time SWE product

Noah Molotch, Dominik Schneider, Leann Lestak



- Range/region-scale moderate-resolution (500-m) spatial snow product
- Has been used operationally in California since 2012
- Used for retrospective analyses in Colorado and Wyoming
- Wyoming: pilot production of real-time SWE product for Snowy Range and Big Horn Mts.

NASA/JPL Airborne Snow Observatory (ASO)

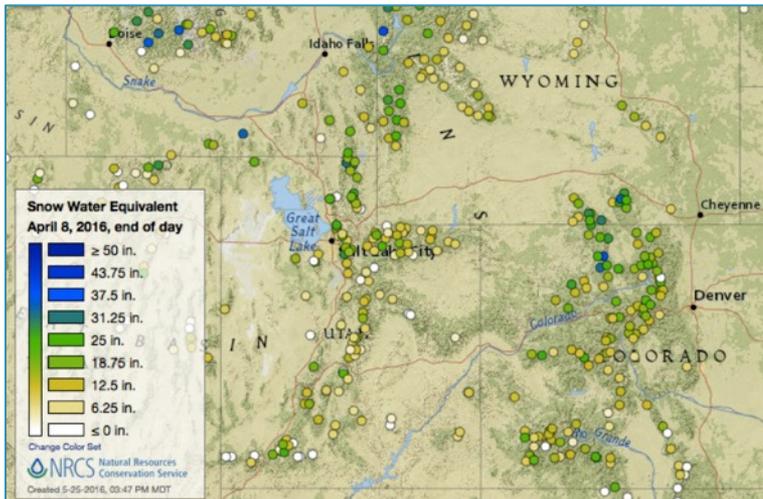
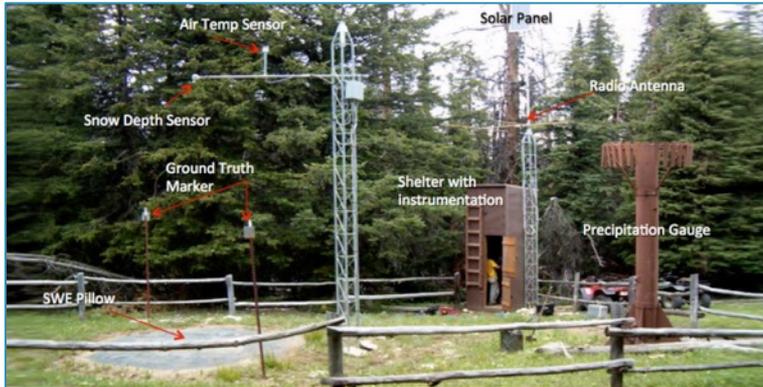
Tom Painter (JPL, former WWA), Jeff Deems, and ASO Team



- Watershed-scale, high-resolution (50-m) spatial snow product
- Colorado - Uncompahgre, Rio Grande, Grand Mesa, East River
- **Wyoming** – proposed expansion to Wind River, Wyoming, Sierra Madre, & Snowy Ranges
- Also CA, OR, WA, ID

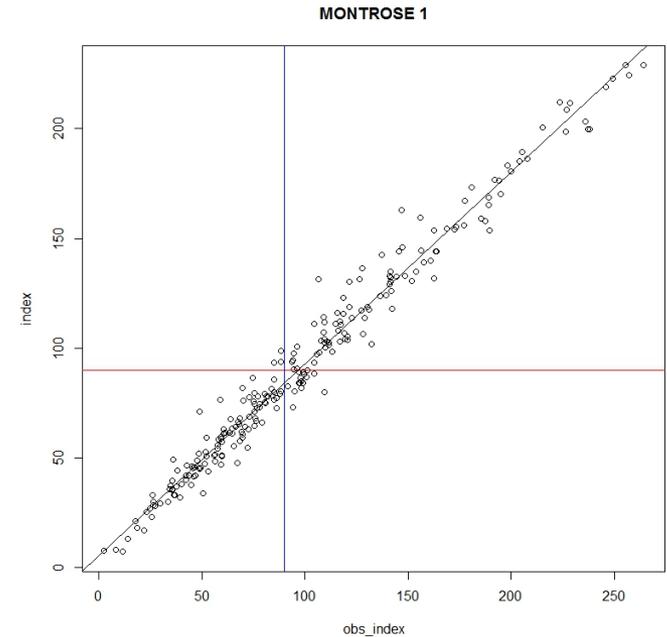
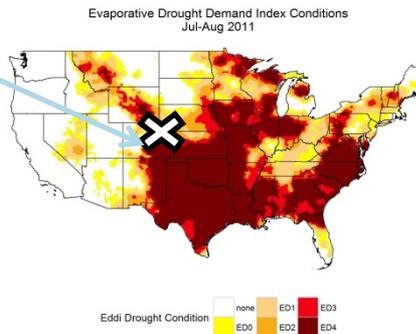
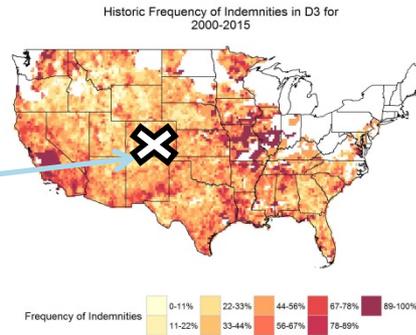
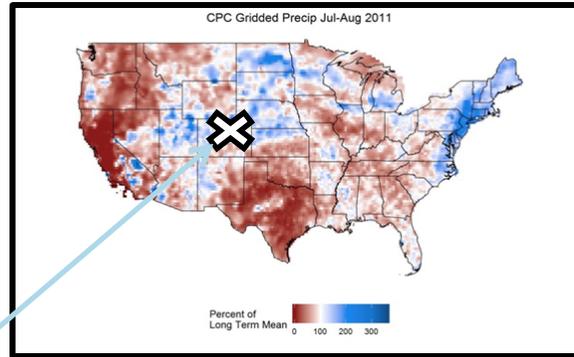
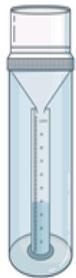
Forthcoming - Snowpack Monitoring Users' Guide

Lukas, NRCS, CBRFC



- Based on information and discussions from the workshops
 - Fundamentals of snowpack hydrology and monitoring
 - How to access the snow monitoring data currently available
 - How to interpret and apply the data
 - New spatial snow products
- Summer 2017 release

How does a single station, or a rancher's personal rain gage, relate to gridded precipitation, insurance payout, US Drought Monitor, EDDI?



Wind River Indian Reservation Climate and Drought Summary

N. Arapaho Tribe, E. Shoshone Tribe, NC CSC, HPRCC, NDMC, NIDIS

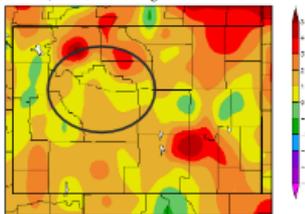


Summer Was Warm and Very Dry

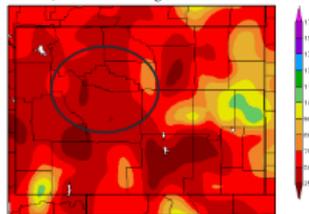
The summer was characterized by very dry conditions across the Wind River Region*. Most areas received only 50 percent of normal precipitation, at best. The following locations experienced a top 10 driest summer on record: Burris (4th driest), Riverton (6th driest), Black Mountain (8th driest), and Boyesen Dam (10th driest) (see page 2 for periods of record). As for temperatures, most of the region was 1-2°F above normal for the summer. However, it was much warmer in the northern part of the region, where temperatures ranged from 4-5°F above normal. As a result, Basin and Worland had their warmest summers on record. (*Note: The Wind River Region refers to the Wind River and Upper Bighorn Basins.)

Breaking down the summer by month, June was by far the warmest with temperatures about 4-6°F above normal. It was warmest in Basin where it was an astounding 8.4°F above normal, and Basin had its warmest June on record. June was dry, especially in the northern and eastern parts of the region where precipitation was less than 25 percent of normal. Black Mountain and Thermopolis had their 3rd driest Junes on record. July's temperatures were closer to normal, ranging from about 1°F below normal to 2°F above normal. However, the dryness continued into July and was extreme with some areas receiving less than 5 percent of normal precipitation. Burris and Lander (airport station) only received a trace of precipitation the entire month and had their driest Julys on record. August was the coolest summer month with temperatures ranging from 1-3°F below normal. Precipitation across the area ranged from 50 percent of normal in the west to 150 percent of normal in the east. The dry conditions of the summer caused streamflows to suffer across the area. The northern part of the Wind River Region in the Upper Bighorn Basin was experiencing drought conditions as of the end of August, but the reservation stayed out of drought during the summer. However, if the dryness continues, the region will have to be monitored closely for developing drought conditions.

Departure from Normal Temperature (°F)
June 1, 2016 - August 31, 2016



Percent of Normal Precipitation (%)
June 1, 2016 - August 31, 2016



Maps produced by the High Plains Regional Climate Center and are available at: <http://www.hprcc.unl.edu/maps/current>

September 2016

- Initiated in early 2015 to convey drought status and other conditions in underserved area
- Part of broader project to assess drought vulnerability, risks, and response capacity on Wind River
- 4-pagers released 8 times from March 2015 – September 2016