



# Missouri Basin Climate & Drought Activities

Missouri River Association of States and Tribes &  
Western States Water Council Fall Meeting  
Deadwood, SD - October  
Doug Kluck, NOAA



# Discussion Items

- Upper Missouri Basin Soil Moisture & Snow Monitoring
- Drought Early Warning and Preparedness for the Missouri Basin (NIDIS)
- Missouri Basin Quarterly Climate Summary
- NOAA Tribal Engagement in the Missouri Basin
- Fall/Winter Outlook



# Upper Basin Monitoring

- Response to post-2011 flood independent panel call for monitoring (soil moisture/snow) in the plains (SD, ND, MT, WY)
- Technical Team of state, federal and academic experts
  - Technical Paper – February 2013
- WRDA bill introduced and passed in Senate (from WY)
- House bill lacks language (discussions ongoing)
- Technical team still interested in helping where we can
- Seeking discussion of alternate solutions (Plan B & C) with states and others

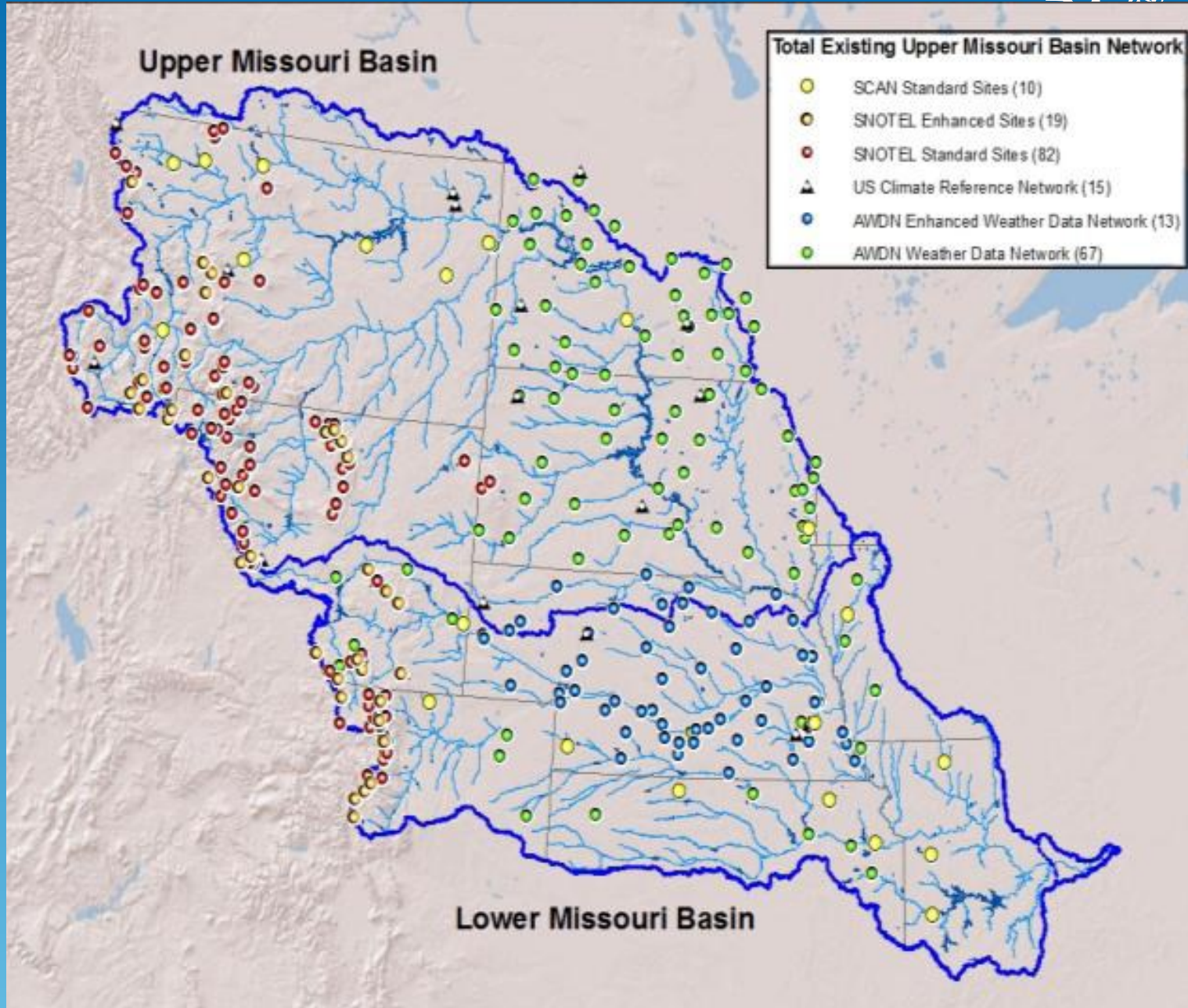


# Upper Missouri Basin

## Total Existing Upper Missouri Basin Network

- SCAN Standard Sites (10)
- SNOTEL Enhanced Sites (19)
- SNOTEL Standard Sites (82)
- ▲ US Climate Reference Network (15)
- AWDN Enhanced Weather Data Network (13)
- AWDN Weather Data Network (67)

# Lower Missouri Basin

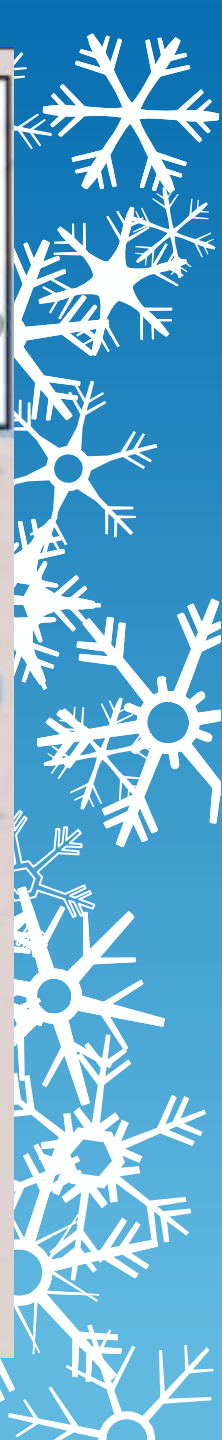
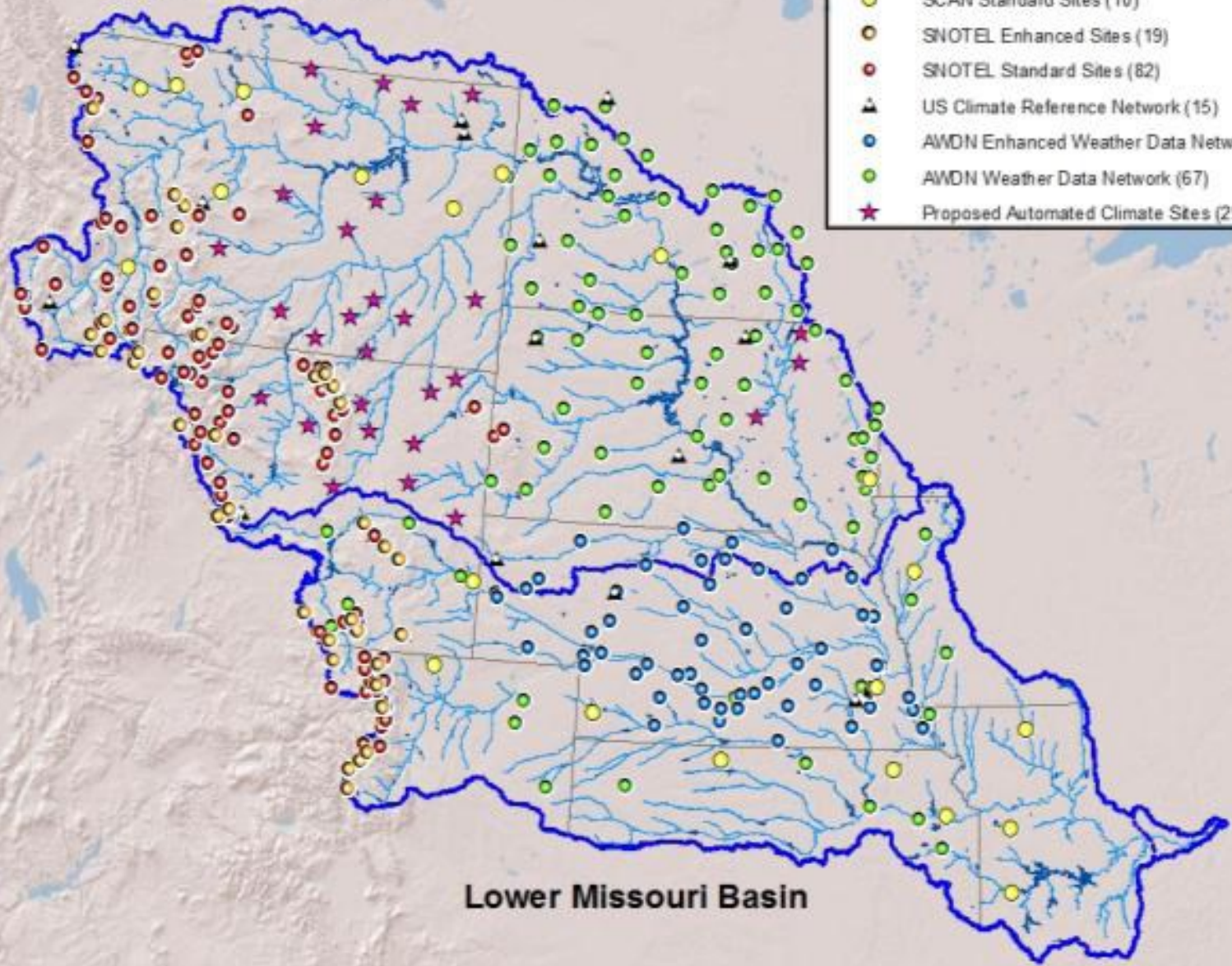


# Upper Missouri Basin

# Lower Missouri Basin

## Proposed Upper Missouri Basin Network

- SCAN Standard Sites (10)
- SNOTEL Enhanced Sites (19)
- SNOTEL Standard Sites (82)
- ▲ US Climate Reference Network (15)
- AWDN Enhanced Weather Data Network (13)
- AWDN Weather Data Network (67)
- ★ Proposed Automated Climate Sites (29)



# Monitoring

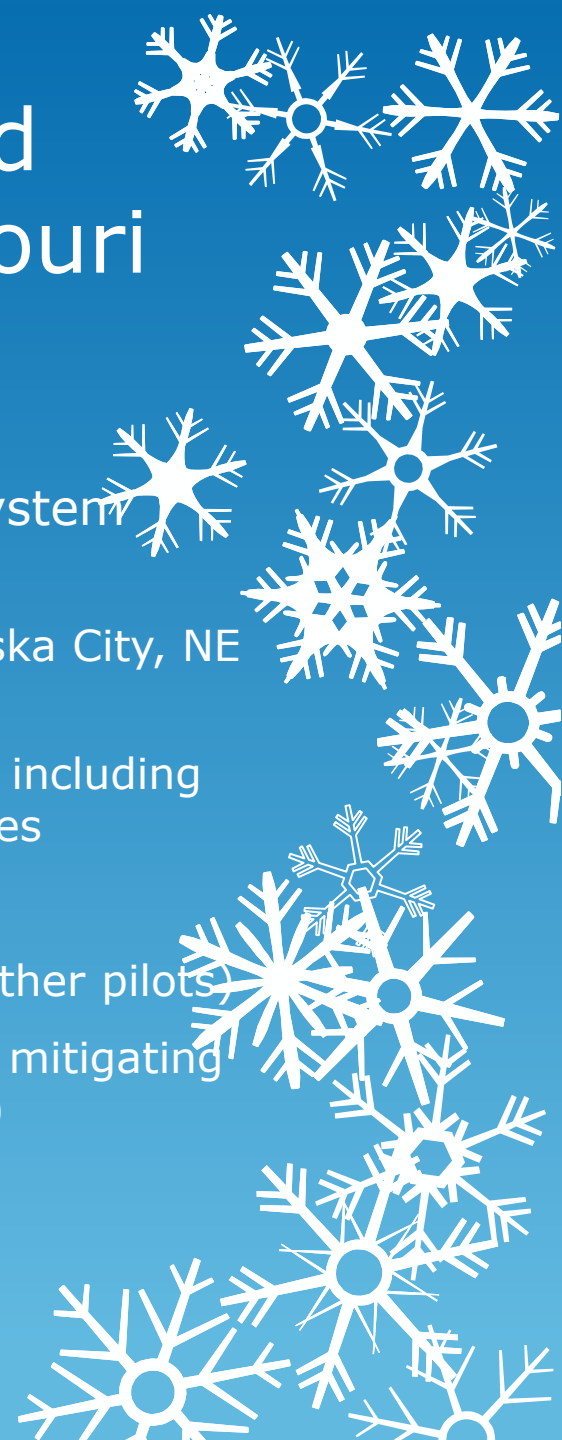
- Snow pack and soil moisture monitoring for flood and drought
- Augment existing in-situ monitoring
- Add stations to fill holes – soil moisture
- Snow pack - state coordinator
  - Help train and coordinate volunteers
  - Augment snow monitoring as needed

BUDGET	Capital (Yr 1)	Annual/O&M (Yr 2 +)
Automated Monitoring		
Enhanced (92)	\$1,715,000	\$390,000
New (29)	\$1,060,000	\$105,000
Aerial Water Surveys	2,550,000	\$150,000
Manual Snow Sampling	920,000	\$810,000
<b>TOTAL</b>	<b>6,245,000</b>	<b>\$1,455,000</b>



# Drought Early Warning and Preparedness for the Missouri Basin

- National Integrated Drought Information System (NIDIS) sponsored project
  - First workshop and scoping session in Nebraska City, NE October 16-17
  - Key basin drought stakeholders and partners including federal, state, tribal, NGO and academic voices
  - Multi-year engagement process
  - Build off of current and past work (in basin/other pilots)
  - Willing partners and stakeholders to work on mitigating impacts from drought (flood to some degree)



# Missouri Basin Quarterly Climate Summary

- New effort to summarize the past season's major climate events and impacts
- Discuss unusual aspects of recent climate
- Provide a snapshot of the up coming months' climate
- Collaboration of climate partners (academic, federal, state) – High Plains Regional Climate Center leads
- We encourage others to participate
  - two calls a quarter
- We also do a Western Region version – all are here: <http://drought.gov/drought/content/resources/reports>

**National - Significant Events for June 2013 - August 2013**

**Significant Events for August and Summer 2013**

The summer contiguous U.S. temperature of 72.8°F was 1.2°F above the 20th century average and the 15th warmest summer on record for the region. The summer precipitation total for the contiguous U.S. was 9.53 inches, 1.28 inches above average. This marked the 8th wettest on record and the wettest since 2004.

**Highlights for the Basin**

Significant statewide rankings include a dry June for Colorado and Wyoming, with these states ranking as the 12th and 7th driest, respectively. Meanwhile in August, Wyoming had its 3rd warmest, Kansas had its 8th wettest, and both Iowa and Minnesota had their 7th driest.

Monsoonal moisture brought much needed precipitation to Colorado which helped alleviate some long and short term drought conditions, while also decreasing fire danger. However, the rains also caused destructive flash flooding in and around recent burn scars.

There were extremes in precipitation on the local level with many stations ranking in either the top 10 wettest or driest summers on record. For instance, Wichita, KS had its 3rd wettest summer on record, while Lincoln, NE had its 6th driest.

While this summer brought a record low number of tornadoes to the region, the Rapid City, SD National Weather Service Office issued its second highest number of severe thunderstorm warnings (442).

**Regional - Climate Overview for June 2013 - August 2013**

**Temperature and Precipitation Anomalies**  
Departure from Normal Temperature (°F) June 1 - August 31, 2013

**Drought in the Basin**  
U.S. Drought Monitor 9/17/2013

Summer temperatures were generally slightly warmer than normal in the western half of the region (Montana, Wyoming, and Colorado) and slightly lower than normal in the eastern half (North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri). The largest temperature departures occurred in Wyoming, western Montana, and pockets of Colorado where average temperatures were up to 4.0°F above normal and areas of southern Missouri where average temperatures were up to 4.0°F below normal.

Precipitation was hit or miss this summer across the Missouri River Basin states. Some areas received up to 200% of normal precipitation including north-central Montana, central Kansas, and southern Missouri. Meanwhile, others received less than 25% of normal precipitation. The dry areas included central Wyoming, northern Missouri, and east-central North Dakota. Flooding was reported in many of the wet areas while drought persisted or redeveloped in the dry areas.

Temperatures played an important role in drought this summer as many of the impacts of drier years were staved off by cool conditions. However, in mid-August, once the heat built in, drought conditions quickly emerged and/or deteriorated in the eastern parts of the Dakotas and Nebraska. Drought also re-emerged in parts of Minnesota, Iowa, and northern Missouri. Improvements were made in areas receiving ample precipitation including most of Kansas, western South Dakota, and central and eastern Colorado.

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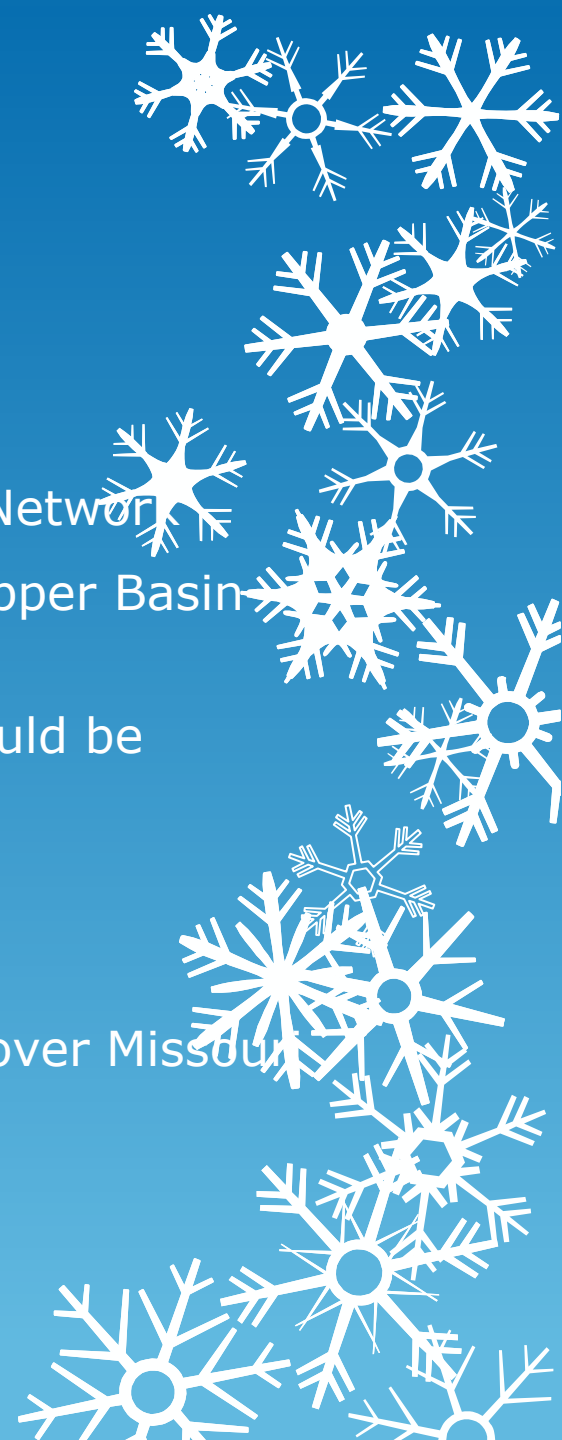
Missouri River Quarterly Climate Impacts and Outlook | September 2013  
[www.drought.gov/drought/content/resources/reports](http://www.drought.gov/drought/content/resources/reports)





# NOAA/USDA MOU

- Outcome of 2012 Drought
- Specifically calls for National Soil Moisture Network
- Uses somewhat model of collaboration in Upper Basin planning document
- Initial discussions occurring on how this would be implemented
  
- Attribution study for 2011 drought
- Predictability – new version of CFSv2 little over Missouri Basin
- Climate change And Missouri River



Thank You!



Wishful Thinking?

