

Wind River Indian Reservation and Surrounding Area Climate and Drought Summary

Winter Events & Spring Outlook 2016-2017



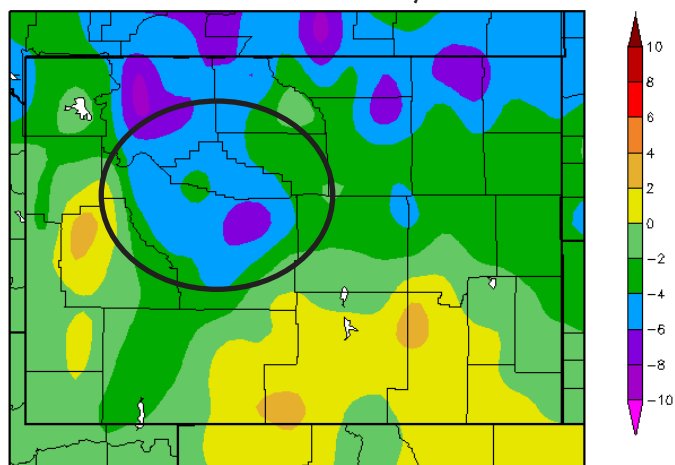
Cool Temperatures and Record-Breaking Wetness During Winter

It was a cool and very wet winter throughout the Wind River Region*. Average temperatures were generally 4-6°F below normal (see map below left). It was the 7th coldest winter for Riverton and 16th coldest for the Basin station (see data table at the top of Page 2). The wetness of the fall continued into the winter months around the region. Most locations received 200-400 percent of normal precipitation (see map below right), and records were impressive. By the end of the season, many locations had experienced one of their wettest and snowiest winters on record. For instance, both Riverton and Dubois had their wettest and snowiest winter. Dubois received an astounding 81.6 inches of snow, crushing its old record by nearly 40 inches! For comparison, Dubois' normal winter snowfall is only 14.7 inches.

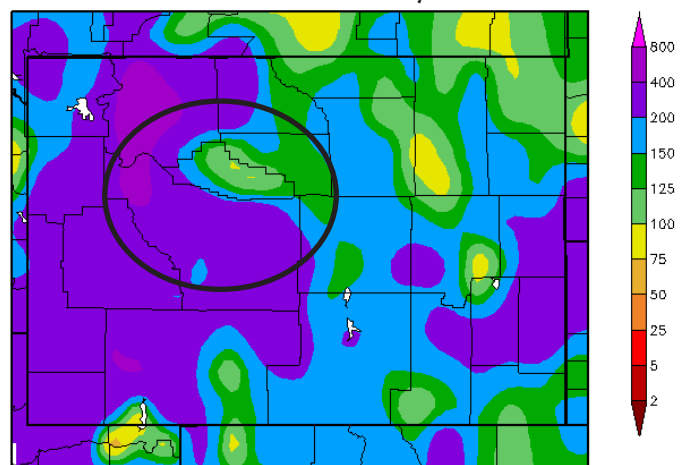
Looking at each month of the winter season, December and January were cooler than normal while February temperatures were near normal to slightly above normal. Temperature departures were greatest in January, ranging from 9-12°F below normal. Locations that ranked in the top 10 for coldest January included Burris (2nd), Diversion Dam (4th), Riverton (7th), and Basin (10th). As for precipitation, each winter month was wetter than normal and precipitation exceeded 200 percent of normal. Each winter month was among the top 10 wettest on record for Riverton, Diversion Dam, and Burris. For instance, Riverton had its 3rd wettest December, 2nd wettest January, and 5th wettest February on record.

The wet winter boosted snowpack in the Wind River Range so that it was well above normal by the start of spring, despite getting off to a slow start this season due to the warm fall. Warmer temperatures in February caused melting snow and ice jams in some rivers, creating flooding issues in places such as Worland. However, the wetness kept the region out of drought the entire winter. (*Note: The Wind River Region refers to the Wind River and Upper Bighorn Basins.)

Departure from Normal Temperature (°F)
December 1, 2016 - February 28, 2017



Percent of Normal Precipitation (%)
December 1, 2016 - February 28, 2017



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

Summary Of Station Data (December 2016-February 2017)

Station	Average Temp. (°F)	Dep. from Normal Temp. (°F)	Temp. Rank	Total Precip. (in.)	Dep. from Normal Precip. (in.)	Percent of Normal Precip.	Precip. Rank	Period of Record
Basin	18.0	-1.7	16th coolest	1.41	0.58	170	13th wettest	1898-present
Black Mtn ¹	24.5	-4.0	-	2.65	0.82	145	7th wettest	1963-present
Boysen Dam	14.7	-5.6	-	1.22	0.34	139	11th wettest	1948-present
Burris	20.7*	-3.7	-	1.88*	1.20	276	WETTEST	1963-present
Diversion Dam	16.1	-6.3	-	2.42	1.95	515	WETTEST	1920-present
Dubois	20.0*	-4.0	-	3.95*	3.05	439	WETTEST	1905-present
Lander 1N	15.7*	-4.3	-	3.27	1.79	221	-	1999-present
Riverton	13.6	-6.5	7th coolest	3.01	2.16	354	WETTEST	1907-present
Thermopolis	23.3	-4.0	-	1.26	0	100	near normal	1899-present
Worland	18.1	-2.0	-	1.61	0.90	227	6th wettest	1907-present

A dash (-) indicates insufficient data for calculation. An asterisk (*) indicates some missing data for this period.

All data are preliminary and subject to change.

Data were retrieved from the Applied Climate Information System (ACIS): rcc-acis.org

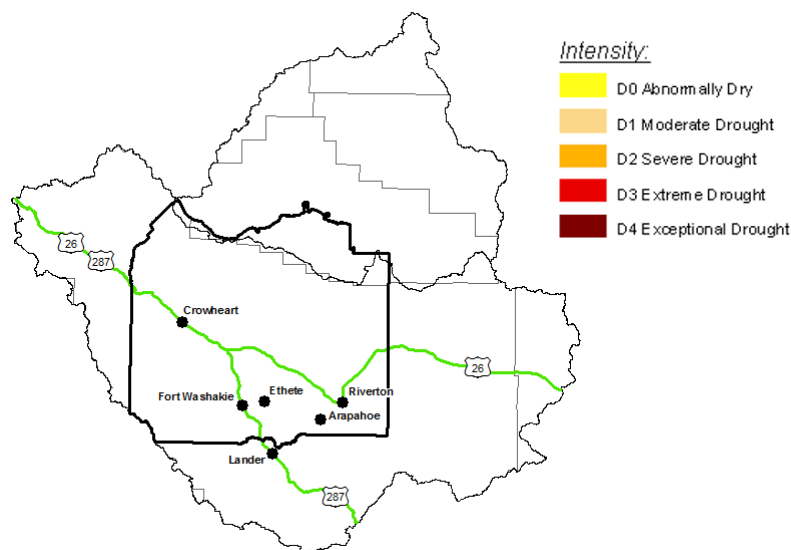
¹The Black Mtn station is east of Thermopolis and does not refer to Black Mountain in the Owl Creek Mountains (northwest part of the reservation).

High Snowfall Kept Region Out Of Drought This Winter

A series of snowstorms bringing precipitation throughout December, January, and February had the Wind River Indian Reservation, Wind River Basin, and lower part of the Bighorn Basin at a classification of “none” on the U.S. Drought Monitor at the end of February, meaning that no drought or abnormal dryness was present throughout the area. No changes were made to the Drought Monitor throughout the winter months, as the region continued to be drought-free. As we transition into spring, the rate of melting of the above-average snowpack should be monitored closely. With high snowpack and saturated soils in place, flooding could be a concern. In comparison, the entire Wind River Region was in D0 (abnormally dry conditions) or D1 (moderate drought) this time last year.

U.S. Drought Monitor of the Wind River Indian Reservation and Surrounding Area - February 28, 2017

Released March 2, 2017 Valid 7 a.m. EST



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	100.00	0.00	0.00	0.00	0.00	0.00
Last Week 02-21-2017	100.00	0.00	0.00	0.00	0.00	0.00
3 Months Ago 11-29-2016	100.00	0.00	0.00	0.00	0.00	0.00
Start of Calendar Year 01-03-2017	100.00	0.00	0.00	0.00	0.00	0.00
Start of Water Year 09-27-2016	81.20	18.80	2.19	0.00	0.00	0.00
One Year Ago 03-01-2016	0.00	100.00	35.66	0.58	0.00	0.00

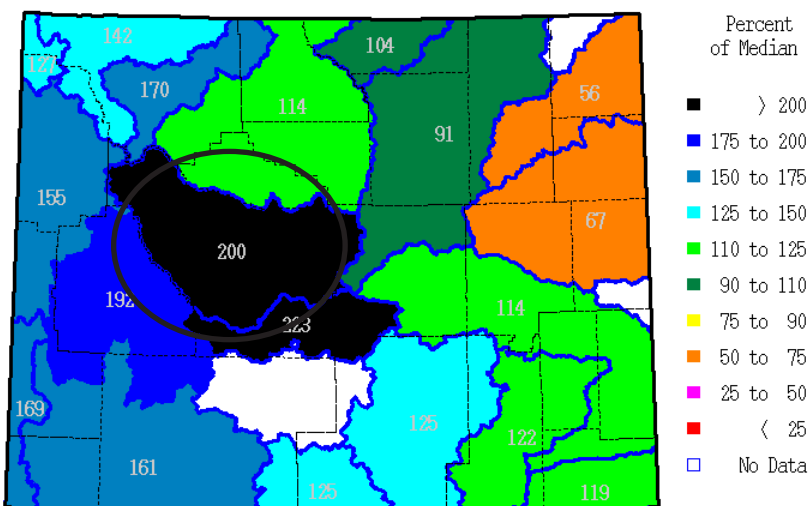
(Note: Statistics are for reservation and surrounding area.)

The U.S. Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map courtesy of NDMC-UNL. For more information on the U.S. Drought Monitor, go to: <http://droughtmonitor.unl.edu>

Snowy Winter Led To Above-Normal Mountain Snowpack

Despite mountain snowpack getting off to a slow start during the fall, ample snowfall during the winter months caused snowpack to catch up rather quickly. In fact, snowpack was above normal for most of the winter season in the Wind River Region. As of February 27th, the Snow Water Equivalent (SWE*) was 200 percent of median in the Wind River Basin and 114 percent of median in the Bighorn Basin, and all SNOTEL sites in the area were reporting above-normal SWE (see map and corresponding data below). The above-normal snowpack within the Wind River Basin was due to numerous storm systems that brought high amounts of snowfall to the region. This winter season was in stark contrast to last year, as snowpack was well below normal and the region was contending with drought conditions. The high snowpack caused some impacts around the region. For example, snow was so deep in places, it displaced wildlife onto the roads looking for food. Warm temperatures in February resulted in ice jams along the Bighorn and Popo Agie Rivers, which caused flooding in Worland and Hudson. Flooding occurred along the Wind River on the reservation as well. The Wyoming Governor declared a state of emergency partly in response to these flood conditions. (*Note: SWE is the amount of water contained within the snowpack. It can be thought of as the depth of water that would theoretically result if you melted the entire snowpack instantaneously. Median is a common descriptor used to express a “middle” value in a set of data. Median better represents SWE than does the “average.” Source: Natural Resources Conservation Service.)

Snow Water Equivalent (SWE) % of Median by Basin and SNOTEL Site (Wyoming) as of February 27, 2017



SNOTEL Site	SWE (% of median)
Cold Springs	215
Deer Park	251
Hobbs Park	226
Owl Creek	171
St. Lawrence ALT	148

On the map above, the percent of median value for the Wind River Basin is based on all reporting SNOTEL sites in the basin. The table above lists SWE by SNOTEL site in and around the Wind River Reservation. Reference period for average comparison is 1981-2010. Map provided by the Wyoming Water Resources Data System: <http://www.wrds.uwyo.edu/wrds/nrcs/snowrept/snowrept.html>. SNOTEL data provided by the Natural Resources Conservation Service: <http://www.wcc.nrcs.usda.gov/snow/>.

Reservoir Data as of February 28, 2017

Reservoir Name	Reservoir Elevation (feet)	Reservoir Storage (acre-feet)	Reservoir % Full	Reservoir Name	Reservoir Elevation (feet)	Reservoir Storage (acre-feet)	Reservoir % Full
Anchor	6,365.23	640	3.7	Pilot Butte	5,455.01	29,360	87.1
Boysen	4,720.67	660,295	89.0	Ray Lake	5522.81	no data	no data
Bull Lake	5,764.98	46,750	30.7	Washakie	6347.06	no data	no data
Dinwoody	no data	no data	no data				

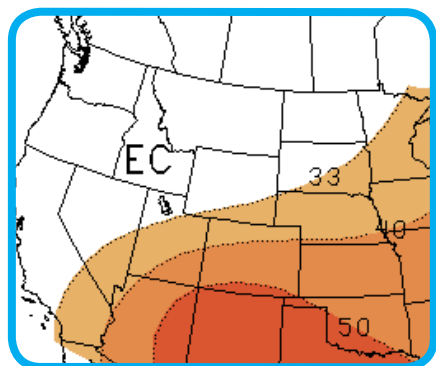
Data sources: Bureau of Indian Affairs (not available online), Bureau of Reclamation (http://www.usbr.gov/gp/lakes_reservoirs/wyoming_lakes.htm)

Wet Conditions Expected To Continue Into Spring

La Niña has ended and ENSO-neutral conditions are present in the Pacific. ENSO-neutral conditions are expected through spring with increasing chances for El Niño development into the fall. The Climate Prediction Center is calling for equal chances of above-, below-, or near-normal temperatures for the Wind River Region (see map below left). Above-normal precipitation is expected for the next three months (see map below center). Drought is not expected to develop through May in the region (see map below right). The National Weather Service long-range flood outlook calls for a greater than 50 percent chance of moderate flooding on the Wind River near Dubois and minor flooding on the Wind River at Riverton this spring. The National Interagency Fire Center predicts wildfire potential to be normal for the Wind River Region through June. CPC outlooks are available at: <http://www.cpc.ncep.noaa.gov/>

3-Month Temperature Outlook

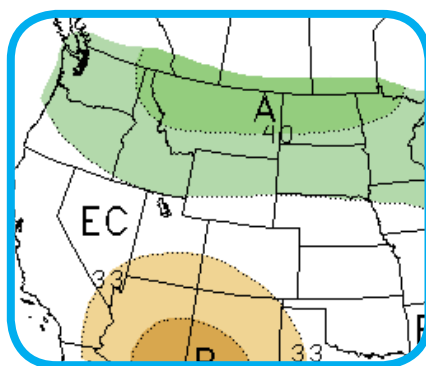
Valid March - May 2017



EC: Equal chances of above, near, or below normal
A: Above normal B: Below normal

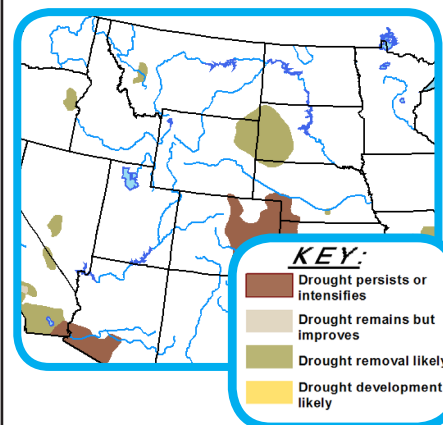
3-Month Precipitation Outlook

Valid March - May 2017



U.S. Seasonal Drought Outlook

Valid Feb. 16 - May 31, 2017



Drought Outlook explanation:

The Climate Prediction Center issues a seasonal drought outlook for the U.S. that is based on probabilities for drought development, persistence and intensification, improvement, and removal at a large scale. Local-scale changes in drought conditions may not be captured by this outlook. “On-going” drought areas are based on the U.S. Drought Monitor areas (intensities of D1 to D4). The tan areas on the map imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period, although drought will remain. The green areas imply drought removal by the end of the period (D0 or none). The white areas imply no drought present.

Three-Month Temperature and Precipitation Outlook explanation:

Each month, the Climate Prediction Center issues a new three-month outlook for temperatures and precipitation for the lower 48 states and Alaska. These outlooks indicate the probability of temperatures and precipitation being above, near, or below normal. (“Normal” is what is expected based on average temperatures and precipitation during the period of 1981-2010.) In general, the colors on the map will indicate warmer/cooler or wetter/drier conditions. In the temperature outlook, the oranges signify above normal temperatures, while the blues signify below normal temperatures. In the precipitation outlook, the greens indicate above normal precipitation, while the browns indicate below normal precipitation. You will also see probabilities on the map (e.g. 33, 40, 50, 60, 70, and 80). For a location and season, forecasters divide the 30 observations from 1981-2010 into thirds: 1/3 is the coldest or driest, 1/3 is the warmest or wettest, and 1/3 is in between. When forecasters indicate that an area will have above normal precipitation, for example, they are saying that the probability is greater than 33 percent. The outlooks are for the 3-month period as a whole and do not indicate when certain conditions would occur or the duration and intensity of any particular event. Areas of white are marked by “EC,” which means equal chances of above, near, or below normal temperatures/precipitation. EC does not mean near normal.

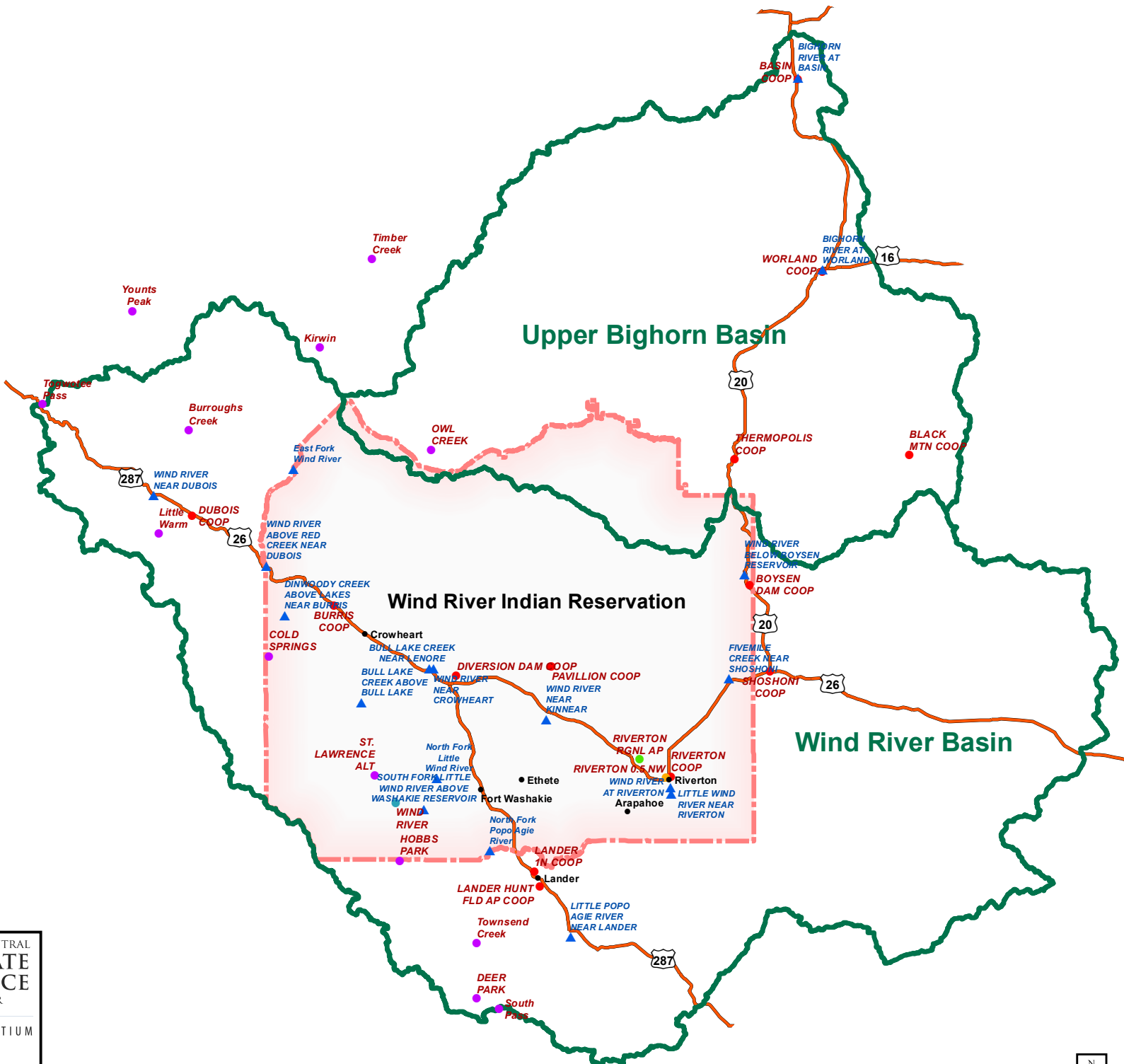
Collaborators and Partners:



Contact Information: Please direct questions and feedback on this climate summary to Al C’Bearing, Office of the Tribal Water Engineer, 307-332-6464.

Wind River Indian Reservation and Surrounding Area

Revised 6/18/2015



Legend

- WR Stream Gauges
 - ▲
- WR Weather Stations
 - COOP
 - CoCoRaHS
 - RAWS
 - SNOTEL
 - WBAN
- Basin Boundary
 - ▭



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