Northern Arapaho Tribe

Wind River Indian Reservation and Surrounding Area Climate and Drought Summary

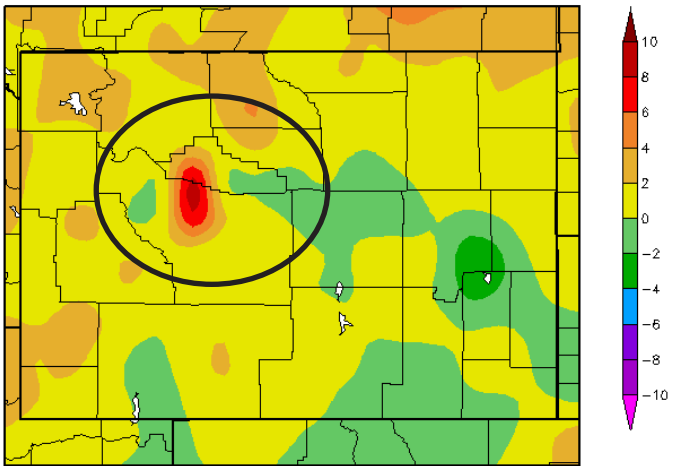
Spring Events & Summer Outlook 2016

Wet Spring Leads To Flooding

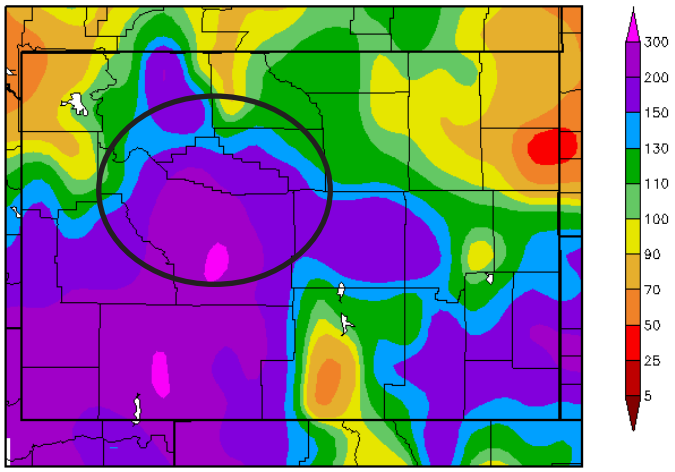
Spring was very wet across most of the Wind River Region. The reservation received about 200-300 percent of normal precipitation. Many stations across the area had a top 10 wettest spring on record, and it was the wettest spring recorded at Diversion Dam and Riverton (periods of record are on page 2). It was also very snowy in some locations, which led to the following top 10 records for snowiest spring: Riverton (4th snowiest), Burris (6th snowiest), and Black Mountain (9th snowiest). However, it was not quite as wet in the Bighorn Mountains area. Precipitation was near normal to slightly below normal, and a below normal mountain snowpack contributed to lingering drought conditions in the area. In particular, the station in Basin only recorded 1.0 inches of snowfall, making this spring the 9th least snowiest spring on record. As for spring temperatures, they were near normal throughout most of the region with the exception of the northern part of the area. For example, spring was 3.5°F above normal in Worland. Basin was 5.5°F above normal for the spring, and 2016 tied with 1934 for the warmest spring on record in Basin.

Looking at each spring month, March was very wet, especially across the reservation. Lander had its wettest March on record, in part due to a snowstorm at the end of the month that dropped a whopping 15.3 inches of snow in one day at the Lander Hunt Field Airport (period of record 1892-2016). Temperatures were slightly on the warm side in March, ranging from near normal to 4°F above normal. The wet pattern continued in April. Temperatures in April were also near normal to slightly above normal across the region. In May, the wetness was confined to the southwestern part of the region, while the northeastern part was drier. A combination of snowmelt and excessive rainfall during the early part of the month caused flooding in Lander and across the reservation. The temperature pattern shifted in May, as temperatures were slightly below normal across some parts of the region. (**Note: The Wind River Region refers to the Wind River and Upper Bighorn Basins.*)

Departure from Normal Temperature (°F)
March 1, 2016 - May 31, 2016



Percent of Normal Precipitation (%)
March 1, 2016 - May 31, 2016



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

Summary Of Station Data (March 2016 - May 2016)

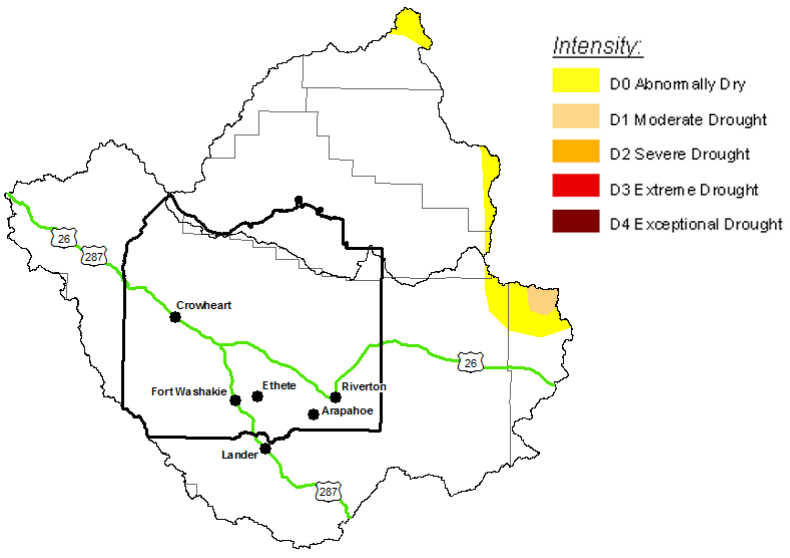
Station	Average Temp. (°F)	Dep. from Normal Temp. (°F)	Temp. Rank	Total Precip. (in.)	Dep. from Normal Precip. (in.)	Percent of Normal Precip.	Precip. Rank	Period of Record
Basin	52.5	5.5	WARMEST	2.59	0.20	108	near normal	1898-present
Black Mtn[1]	44.6	-0.7	-	9.26	3.95	174	2nd wettest	1963-present
Boysen Dam	46.5	0.6	-	6.68	3.44	206	4th wettest	1948-present
Burris	42.2*	0.6	-	6.36	3.30	208	5th wettest	1963-present
Diversion Dam	-	-	-	8.36	4.80	235	WETTEST	1920-present
Dubois	-	-	-	4.45*	1.31	142	10th wettest	1905-present
Lander 1N	43.1	1.0	-	11.98	7.83	289	-	1999-present
Riverton	45.6	0.2	near normal	9.11	6.12	305	WETTEST	1907-present
Thermopolis	48.6	-0.7	-	6.87*	2.68	164	9th wettest	1899-present
Worland	50.0	3.5	-	5.07	2.33	185	8th 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
[1]The Black Mtn station is east of Thermopolis and does not refer to Black Mountain in the Wind River Range.

A Wet Spring Alleviated Drought Conditions

Drought conditions improved significantly during the spring, thanks to heavy precipitation throughout much of the region. At the end of February, the entire Wind River Region was experiencing at least abnormally dry (D0) conditions, while just over a quarter of the area was in moderate drought (D1). Due to a very wet March, and especially the snowstorm that occurred at the end of the month, drought conditions were alleviated by April. A continuation of the wet pattern allowed for further reduction in dryness and drought conditions. By the end of May, D0 and D1 were confined to a small area in the eastern part of the region, and the reservation was free of dryness.

U.S. Drought Monitor of the Wind River Indian Reservation and Surrounding Area - May 31, 2016
Released June 2, 2016 Valid 8 a.m. EDT



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	96.91	3.09	0.42	0.00	0.00	0.00
Last Week *05-24-2016*	96.91	3.09	0.42	0.00	0.00	0.00
3 Months Ago *03-01-2016*	0.00	100.00	35.66	0.58	0.00	0.00
Start of Calendar Year *12-29-2015*	53.84	46.16	0.00	0.00	0.00	0.00
Start of Water Year *09-29-2015*	74.90	25.10	0.00	0.00	0.00	0.00
One Year Ago *06-02-2015*	99.55	0.45	0.00	0.00	0.00	0.00

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

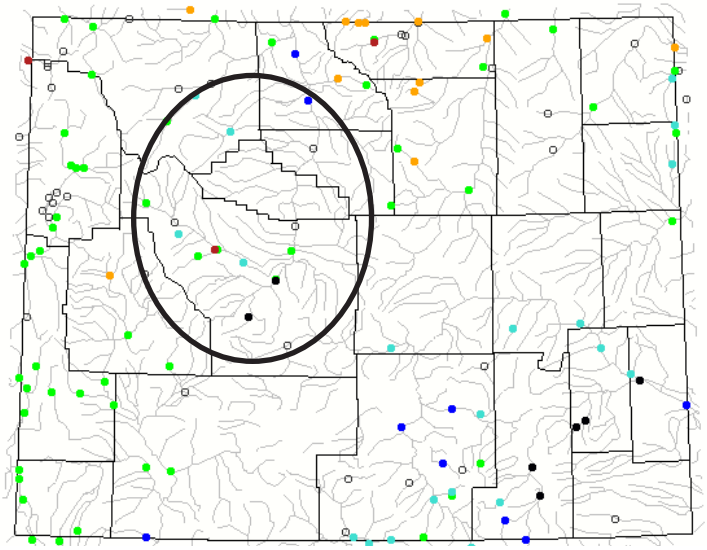
The U.S. Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map courtesy of NDMC-UNL. For more information on the U.S. Drought Monitor,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

Spring Wetness Aided In Snowpack Recovery But Caused High Streamflows

Mountain snowpack recovered significantly in the Wind River Range during the latter half of the snowpack season, due to the wet spring. Snowpack peaked in early May in the Wind River Basin, which was about a month later than normal. Snow water equivalent (SWE*) was still above median as of the end of May. Snowpack in the Bighorn Mountains had a brief recovery in early May, but SWE remained much below median for most of the snowpack season, as this area experienced less precipitation and warmer temperatures during spring. Like the Wind River Basin, snowpack in the Bighorn River Basin peaked late, but SWE was below median again at the end of May. (**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*)

Snowmelt and heavy rainfall in early May caused flooding across the reservation and in Lander. In fact, Lander Regional Hospital had to be evacuated due to rising flood waters. As a result, streamflows were running high around the region, especially at the Little Wind River near Riverton and the Little Popo Agie River near Lander.

28-Day Average Streamflow Compared To Historical Streamflow For May 31 (Wyoming)



Stream Gauge	Percentile
Wind River near Dubois	65th
Wind River above Red Creek, near Dubois	78th (NR*)
Dinwoody Creek above lakes, near Burris	80th
Bull Lake Creek above Bull Lake	73rd
Bull Lake Creek near Lenore	6th
Wind River near Crowheart	39th
Wind River near Kinnear	81st
Wind River at Riverton	62nd
South Fork Little Wind ab Washakie Reservoir	67th**
Little Wind River near Riverton	98th
Little Popo Agie River near Lander	98th
Fivemile Creek near Shoshoni	66th
Wind River below Boysen Reservoir	N/A
Bighorn River at Worland	83rd (NR*)
Bighorn River at Basin	93rd

*NR=Not Ranked. **Data are real-time. A percentile is a value on a scale of one hundred that indicates the percent of a distribution that is equal to or below it. The streamflow data and map shown represent 28-day average streamflow compared to historical streamflow for the day of the year (May 31). Streamflow data and map provided by the U.S. Geological Survey: http://waterwatch.usgs.gov

Reservoir Data as of May 31, 2016

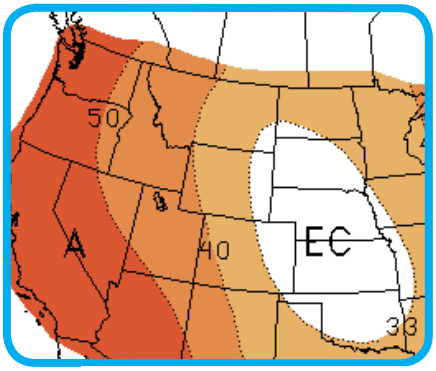
Reservoir Name	Reservoir Elevation (feet)	Reservoir Storage (acre-feet)	Reservoir % Full	Reservoir Name	Reservoir Elevation (feet)	Reservoir Storage (acre-feet)	Reservoir % Full
Anchor	6,398.9	4,264.3	24.8	Pilot Butte	5,455.8	30,032.0	89.1
Boysen	4,719.6	641,319	86.5	Ray Lake	5,524.97	no data	no data
Bull Lake	5,790.8	110,042	72.2	Washakie	6,343.82	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)

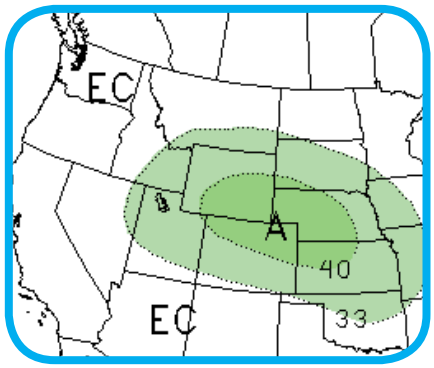
Warm And Wet Conditions Expected This Summer

El Niño is weakening in the Pacific, and La Niña is favored to develop this summer. There is a 75 percent chance that La Niña will be present during the upcoming fall and winter. The Climate Prediction Center is calling for an increased chance of above normal temperatures for the western two-thirds of Wyoming this summer, including the Wind River Region (see map below left). Above normal precipitation is also expected for the next three months (see map below center), so drought in northern Wyoming is expected to improve or be removed (see map below right). The National Weather Service long-range flood outlook calls for less than a 50 percent chance of flooding through the end of August for the upper reaches of the Wind River. The National Interagency Fire Center predicts wildfire potential to be below normal for the Wind River Region through July. CPC outlooks are available at: http://www.cpc.ncep.noaa.gov/

3-Month Temperature Outlook
Valid June-August 2016



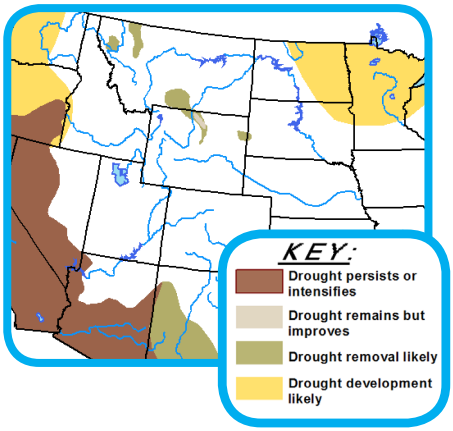
3-Month Precipitation Outlook
Valid June-August 2016



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

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.

U.S. Seasonal Drought Outlook
Valid May 19-August 31, 2016



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. "Ongoing" 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.

Collaborators and Partners:

HPRCC

North Central Climate Science Center
University Consortium

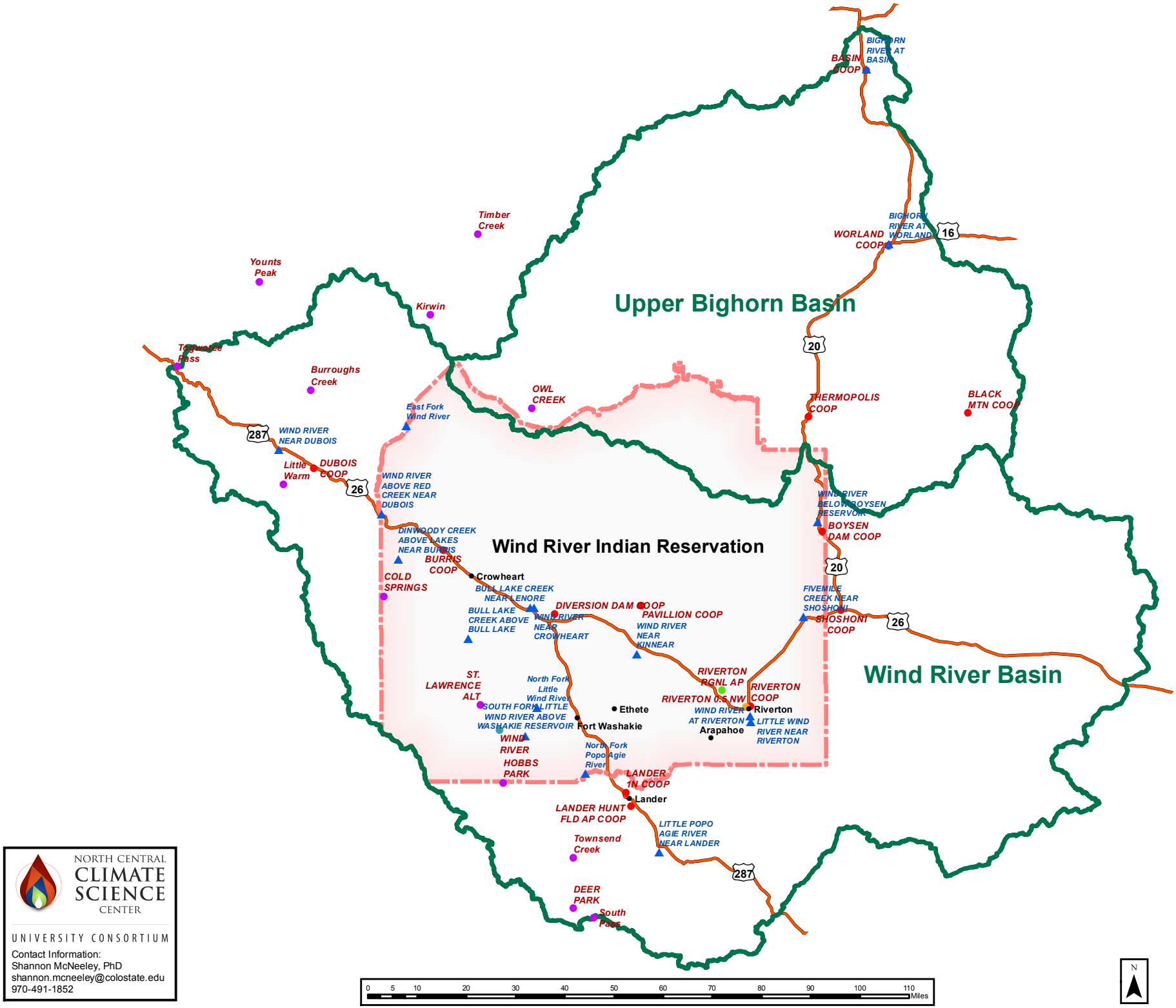
NIDIS

National Drought Mitigation Center

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



NORTH CENTRAL CLIMATE SCIENCE CENTER
UNIVERSITY CONSORTIUM
Contact Information:
Shannon McNeeley, PhD
shannon.mcneeley@colostate.edu
970-491-1852