Northern Arapaho Tribe

Wind River Indian Reservation and Surrounding Area Climate and Drought Summary

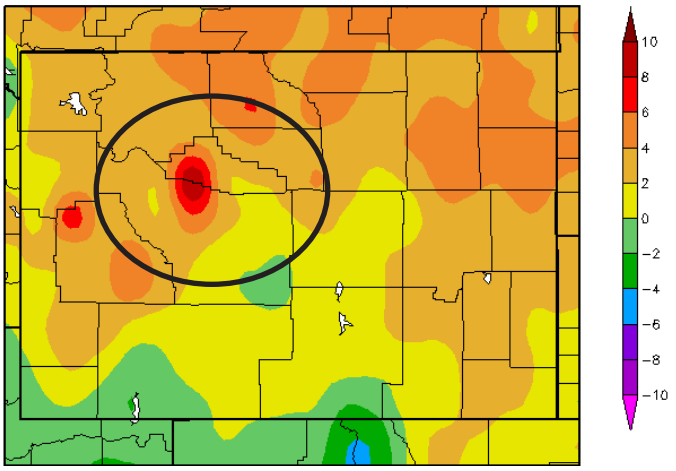
Winter Events & Spring Outlook 2015-2016

Winter Was Warm And Dry

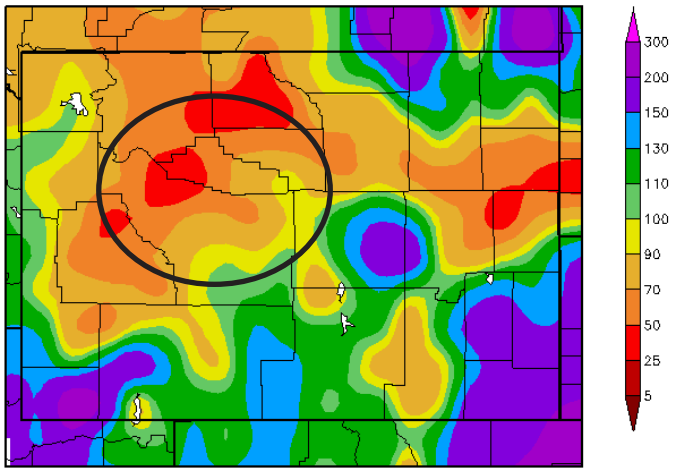
Winter was warm and dry for the Wind River Region*. Temperatures across much of the area were 2-4°F above normal, but it was especially warm in the northern part of the region (see map below left). Basin, Wyoming was 8.0°F above normal for the winter, which was the location's 4th warmest winter (please see periods of record on page 2). The winter was also rather dry, as many locations only received about 50-90 percent of normal precipitation (see map below right). Burris had its 7th driest winter, while the winter in Basin was 9th driest. Basin also had its 9th least snowiest winter on record. Basin received only 5 inches of snow during the winter, which was 5 inches below normal and only 50 percent of normal. Warm and dry conditions caused snowpack in Wyoming to suffer, particularly in the Bighorn Mountains. As a result, drought developed in this region during December and intensified throughout the winter. The presence of El Niño is partly to blame for the warmth and low snowpack.

Breaking down the winter climate conditions by month, December temperatures varied across the Wind River Region, with warmer temperatures to the north and east and cooler temperatures to the south and west. Most locations were also rather dry in December. January temperatures were warmer to the north and west and cooler to the south and east. January was a bit wetter except in the northern part of the region. For example, Worland only received 0.03 inches of precipitation and had its 6th driest January on record. February, on the other hand, was very warm and dry across the area, accounting for much of the winter warmth and dryness. Temperatures were at least 4°F above normal in the region. The following locations had a top 10 warmest February on record: Basin (warmest), Burris (2nd warmest), Thermopolis (6th warmest), Boysen Dam (7th warmest), Diversion Dam (7th warmest), and Riverton (9th warmest). It was also a very dry month. Basin only recorded a trace of precipitation the entire month, making February 2016 the 2nd driest on record. (**Note: The Wind River Region refers to the Wind River and Upper Bighorn Basins.*)

Departure from Normal Temperature (°F)
December 1, 2015 - February 29, 2016



Percent of Normal Precipitation (%)
December 1, 2015 - February 29, 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 (December 2015-February 2016)

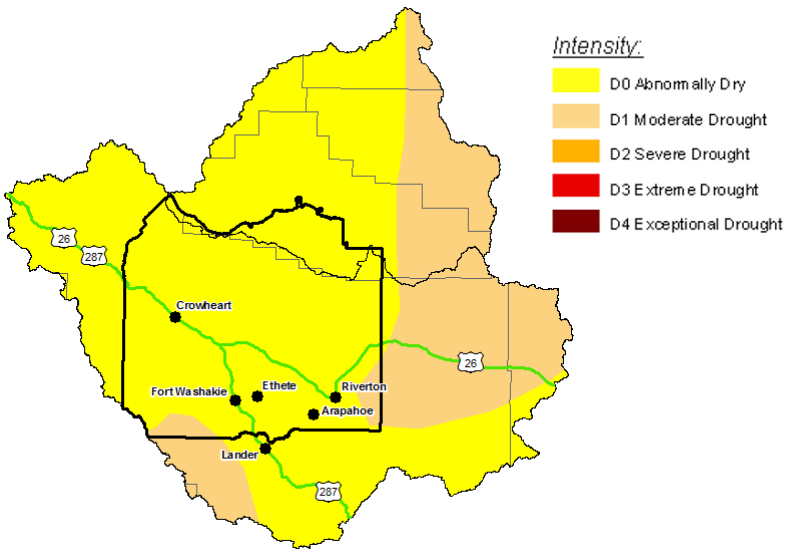
Station	Average Temp. (°F)	Dep. from Normal Temp. (°F)	Temp. Rank	Total Precip. (in.)	Dep. from Normal Precip. (in.)	Percent of Normal Precip.	Precip. Rank	Period of Record
Basin	27.7	8.0	4th warmest	0.30	-0.53	36	9th driest	1898-present
Black Mtn[1]	30.7	2.2	-	1.82	-0.01	99	near normal	1963-present
Boysen Dam	23.6	3.3	-	0.51	-0.37	58	17th driest	1948-present
Burris	27.2	2.8	-	0.23	-0.45	34	7th driest	1963-present
Diversion Dam	23.9	1.5	-	0.46	-0.01	98	near normal	1920-present
Dubois	-	-	-	-	-	-	-	1905-present
Lander 1N	-	-	-	-	-	-	-	1999-present
Riverton	20.8	0.7	14th warmest	0.77	-0.08	91	near normal	1907-present
Thermopolis	29.3	2.0	-	0.90*	-0.36	71	-	1899-present
Worland	25.1*	5.0	-	0.70*	-0.01	99	near normal	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.

Drought Developed In The Region During The Winter

Dry conditions continue to persist in the Wind River Region. The dry spell continued throughout the winter months with minimal snowpack and precipitation. The Drought Monitor continued to trend higher as the region is now in moderate drought (D1) in the northeast part of the region. According to the February 23rd U.S. Drought Monitor, D1 was introduced to the southern part of the reservation. A recent snow storm brought snow across the Wind River Basin, which temporarily boosted the snowpack and alleviated some dryness in the basin. Dry conditions have persisted since September and began to intensify as we progressed into March. This time last year the Wind River Region was clear of any dryness or drought. As we continue into the spring months, drought should be monitored closely.

U.S. Drought Monitor of the Wind River Indian Reservation and Surrounding Area - February 23, 2016
Released February 25, 2016 Valid 7 a.m. EST



Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	26.78	0.00	0.00	0.00
Last Week *02-16-2016*	0.00	100.00	27.18	0.00	0.00	0.00
3 Months Ago *11-24-2015*	53.84	46.16	0.00	0.00	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 *02-24-2015*	100.00	0.00	0.00	0.00	0.00	0.00

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

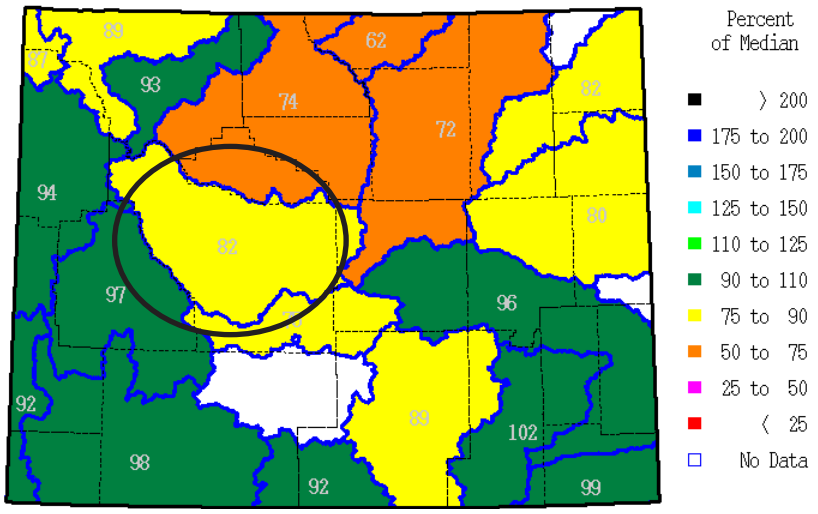
The U.S. Drought Monitor is jointly produced by the National Drought Mitigation Center at the University of Nebraska-Lincoln, the United States Department of Agriculture, and the National Oceanic and Atmospheric Administration. Map courtesy of NDMC-UNL. For more information on the U.S. Drought Monitor,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

Dryness Caused Reduced Snowpack And Low Reservoir Levels

Snowpack has been below normal for most of the winter season in the Wind River Region. As of February 29th, the snow water equivalent (SWE*) was 82 percent of median in the Wind River Basin and only 74 percent of median in the Bighorn Basin (see map below). The only SNOTEL site in the area reporting close to normal was Cold Springs. Owl Creek and St. Lawrence ALT were faring the worst, reporting 62 and 53 percent of median, respectively. Above normal temperatures and dry conditions were the cause for the low snowpack. The warmth also resulted in some melting of the snowpack, which caused early runoff and is something that should be monitored closely. (**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*)

Current real-time streamflows of sites in the area have been in the normal percentile classes. Although some stations have not collected data due to it being wintertime, the streamflows for stations that are reporting appear to be steady with little to no fluctuation. In recent months the region has been dry as the Drought Monitor would indicate. Streamflows were better this time last year, which were in the 80-90th percentiles, while this year they were only in the 60-65th percentiles. With the expectation of spring storms in the coming months, hopefully there will be a positive difference later in the season. At this time, the lakes and reservoirs within the reservation are at low levels and also iced over (see reservoir data table below).

Snow Water Equivalent (SWE) % of Median by Basin and SNOTEL Site (Wyoming) as of February 29, 2016



SNOTEL Site	SWE (% of median)
Cold Springs	98
Deer Park	82
Hobbs Park	83
Owl Creek	62
St. Lawrence ALT	53

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 29, 2016

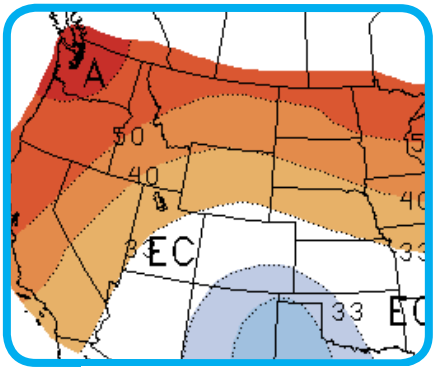
Reservoir Name	Reservoir Elevation (feet)	Reservoir Storage (acre-feet)	Reservoir % Full	Reservoir Name	Reservoir Elevation (feet)	Reservoir Storage (acre-feet)	Reservoir % Full
Anchor	no data	no data	no data	Pilot Butte	5,452.7	27,449.0	81.4
Boysen	4,716.0	581,139	78.4	Ray Lake	no data	no data	no data
Bull Lake	5,775.8	71,106.5	46.6	Washakie	no data	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)

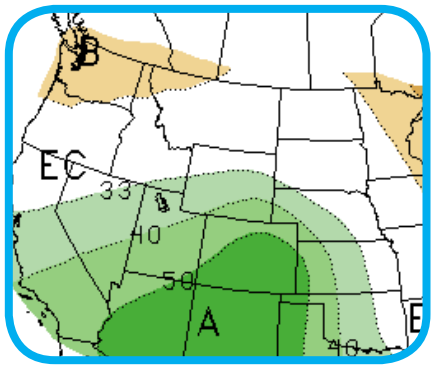
Spring Outlook Calls For Warm And Wet Conditions, Drought Removal

El Niño continued throughout the winter. It is likely to gradually diminish by late spring or early summer, with a possible transition to La Niña conditions during fall 2016. The Climate Prediction Center is calling for an increased chance of above normal temperatures for much of Wyoming this spring, including the Wind River Region (see map below left). Above normal precipitation is also expected during spring for at least the southern part of the region (see map below center). The area of drought in the Wind River Region is expected to be removed by the end of May (see map below right). The National Weather Service long-range flood outlook calls for less than a 50 percent chance of flooding through April for the upper reaches of the Wind River. The National Interagency Fire Center predicts wildfire potential to be normal for the Wind River Region through May. CPC outlooks are available at: http://www.cpc.ncep.noaa.gov/

3-Month Temperature Outlook
Valid March-May 2016



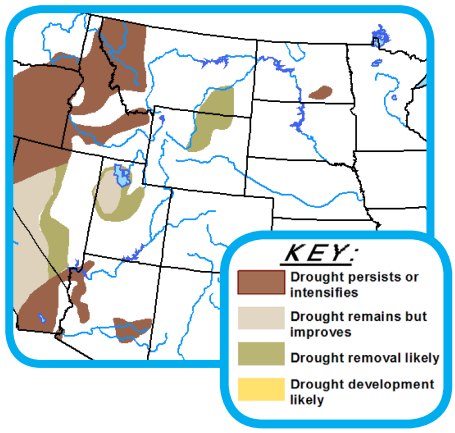
3-Month Precipitation Outlook
Valid March-May 2016



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 February 18-May 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.

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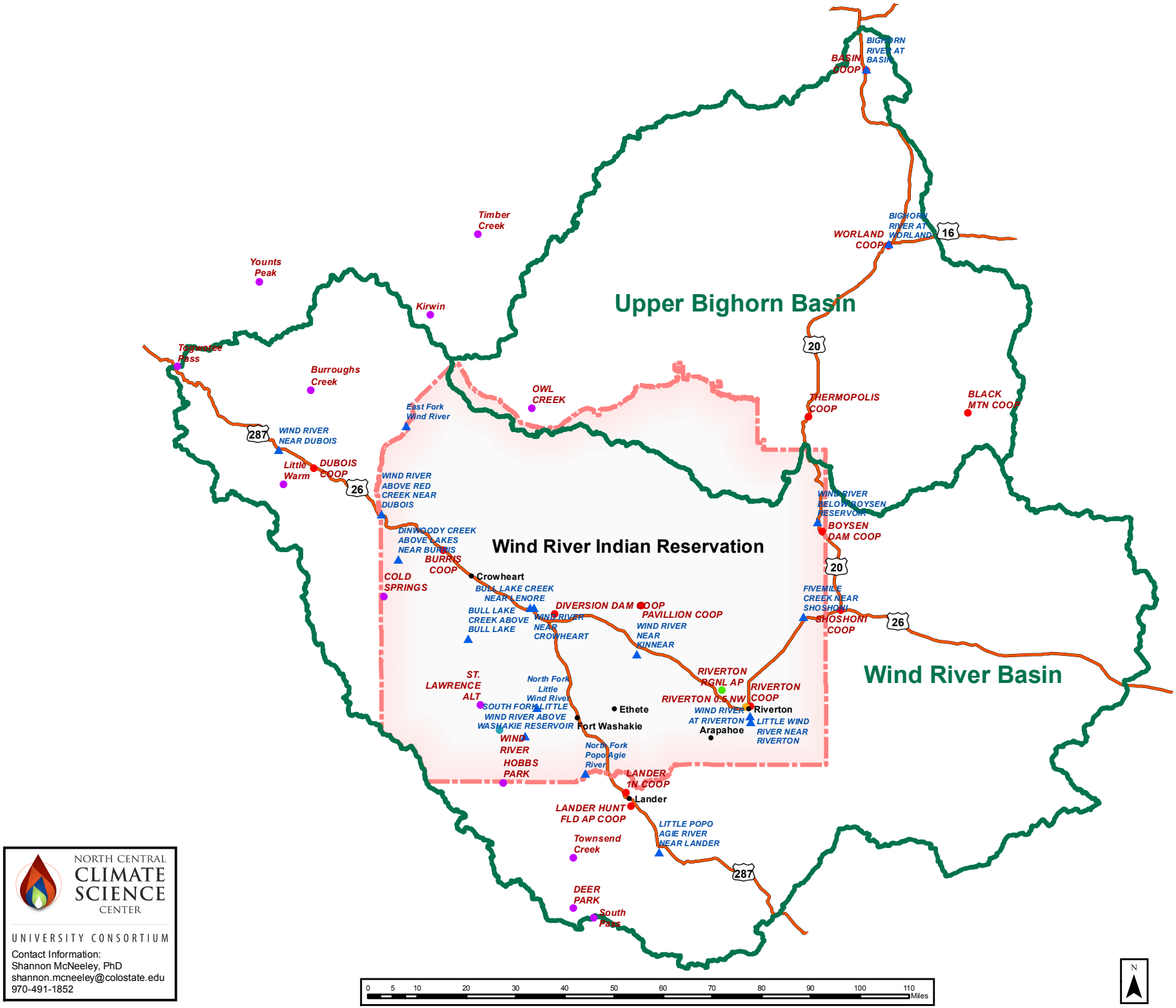
Revised 6/18/2015



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