

## Drought Risk and Adaptation in the Interior United States: Understanding the Importance of Local Context for Resource Management in Times of Drought

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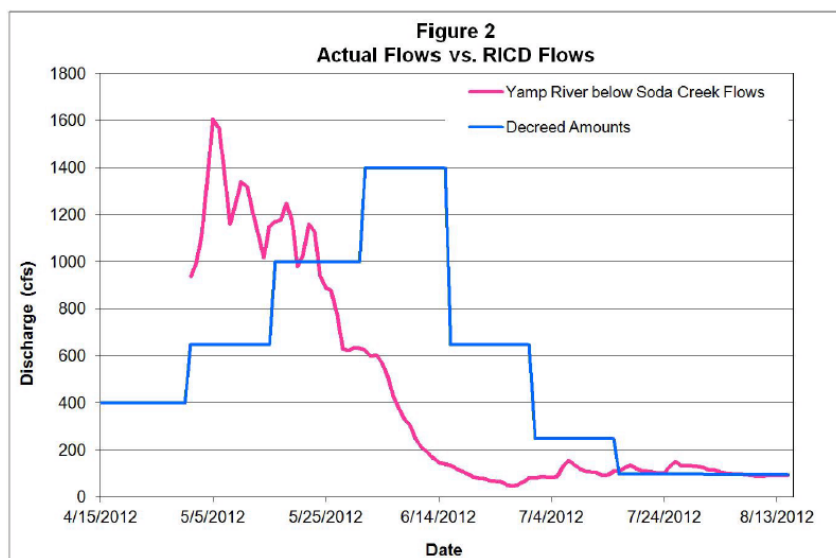
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### Supplemental Information

**Figure S1. Actual streamflow discharge compared to decreed amounts during 2012 drought.**



Streamflow discharge decreed for consumptive use compared to actual flow during the spring and summer months of 2012 drought period. The amount decreed was 2-3 times higher than the amount available in the system for several months. Source: Light, E., 2013: *Division 6 Annual Summary 2012*. Steamboat Springs, CO, 19 pp.

**Table S1. Warmest and Driest Years Ranked, Hayden, CO (Yampa River Basin)**

**Temperature - Warmest**

**TMax**

Rank	Date	Average (°F)
1	1981	62.41
2	2012	62.22
3	2007	60.44
4	1980	60.30
5	1999	60.29
6	2005	59.87
7	2003	59.80
8	2001	59.77
9	2000	59.74
10	1994	59.23

**TMin**

Rank	Date	Average (°F)
1	1981	31.19
2	2003	31.13
3	2005	31.12
4	1986	31.04
5	1998	30.95
6	2012	30.80
7	2000	30.66
8	1995	30.64
9	2004	30.53
10	2007	30.38

**Precipitation**

**Driest**

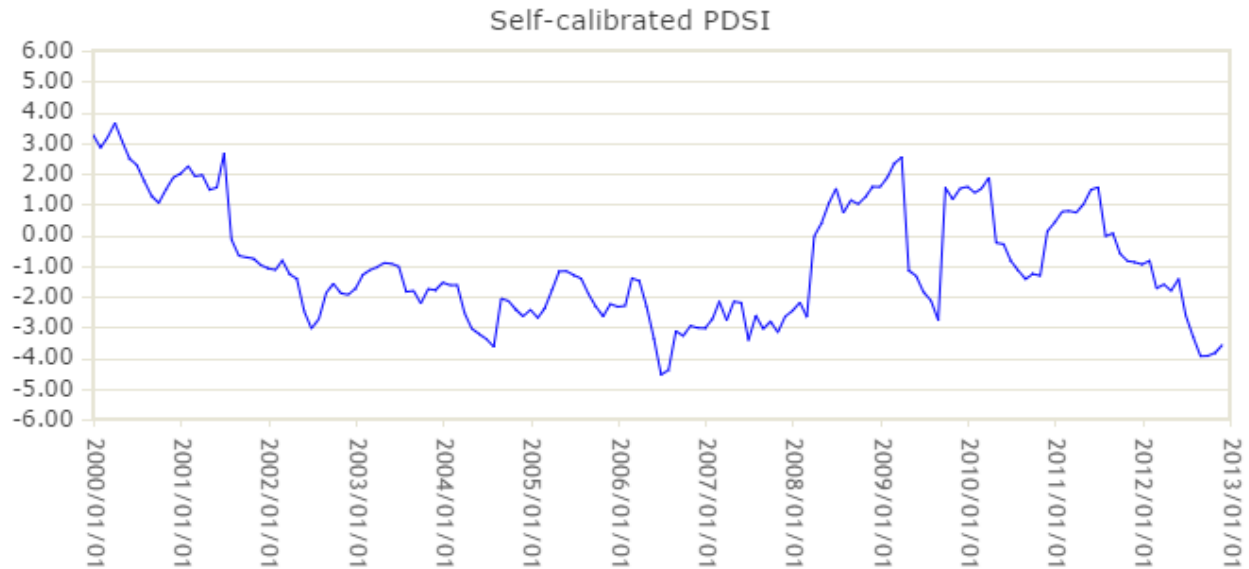
Rank	Date	Total (in.)
1	1994	12.20
2	2002	12.93
3	2012	14.08
4	2001	14.44
5	1987	14.88
6	1980	15.41
7	1988	15.64
8	1998	15.91
9	1989	16.21
10	1991	16.35

**Wettest**

Rank	Date	Total (in.)
1	1997	26.41
2	1983	23.37
3	2005	22.40
4	2011	22.22
5	1981	21.53
6	1984	21.37
7	1985	21.12
8	2010	20.74
9	1986	20.30
10	2007	20.16

Annual ranks for time period 1980-2012 to capture approximately a 30 year climatology. TMax is maximum temperature, i.e., years with the hottest temperature on record. TMin is minimum temperature, which is the warmest nighttime temperature. 2002 and 2012 were two of the driest years on record, and 2012 was one of the hottest years on record. The 2002 drought was preceded by abnormally dry years, while the 2012 drought was preceded by two of the wettest years in the 30 year period (Source: Drought Risk Atlas <http://droughtatlas.unl.edu/Data.aspx>).

**Figure S2. Self-Calibrated Palmer Drought Severity Index, Interior, SD (near Badlands NP)**



Self-calibrated Palmer Drought Severity Index (scPDSI) for the period 2000-2012. PDSI is a drought index that is based on precipitation, temperature, and available water content. The PDSI was originally devised by Palmer (Palmer 1965). Values typically range from -4 (extreme drought) to +4 (extremely wet). The scPDSI uses the same input variables but replaces constants in the PDSI with values calibrated at point locations, and provides the means by which to more adequately represent local conditions (Wells et al. 2004). This graph indicates that conditions were abnormally dry for the period 2002-2007, which finally broke in 2008. This prolonged drought period was most severe in 2006 (Source: Drought Risk Atlas <http://droughtatlas.unl.edu/Data.aspx>).

**Table S2. Warmest and Driest Years Ranked, Hot Springs, SD (near Wind Cave NP)**

**Temperature - Warmest**

TMax			TMin		
Rank	Date	Average (°F)	Rank	Date	Average (°F)
1	2012	69.00	1	2006	35.80
2	1988	65.92	2	1981	35.77
3	1981	65.81	3	1986	35.76
4	2007	65.59	4	1987	35.62
5	1999	65.53	5	2007	35.50
6	1987	65.48	6	2012	35.44
7	2006	65.40	7	1988	35.31
8	2005	65.28	8	1991	35.25
9	1994	64.81	9	1999	34.95
10	1990	64.76	10	2005	34.90

**Precipitation**

Driest			Wettest		
Rank	Date	Total (in.)	Rank	Date	Total (in.)
1	1985	11.54	1	1998	26.83
2	2012	11.96	2	1993	25.69
3	2001	12.67	3	2010	24.98
4	2004	12.73	4	1997	23.62
5	1994	12.74	5	1982	22.10
6	1989	12.85	6	1999	21.11
7	1988	12.86	7	1996	20.84
8	2002	13.02	8	2009	20.77
9	2006	13.11	9	1995	20.14
10	1987	13.31	10	1992	19.21

Annual ranks for time period 1980-2012 to capture approximately a 30 year climatology. TMax is maximum temperature, i.e., years with the hottest temperature on record. TMin is minimum temperature, which is the warmest nighttime temperature. The drought period of 2002-2007 witnessed 3 out of 6 years of record low precipitation. 2012 was the hottest year on record and the second driest (Source: Drought Risk Atlas <http://droughtatlas.unl.edu/Data.aspx>).

**Table S3. Warmest and Driest Years Ranked, Interior, SD (Near Badlands NP)**

Temperature - Warmest					
TMax			TMin		
Rank	Date	Average (°F)	Rank	Date	Average (°F)
1	2012	69.31	1	2006	40.69
2	1981	66.51	2	2012	40.23
3	1999	66.50	3	1987	40.21
4	1987	66.30	4	1998	40.00
5	2006	66.21	5	2007	39.85
6	2007	66.16	6	1997	39.85
7	1988	66.08	7	1981	39.82
8	2005	65.80	8	1999	39.66
9	1990	65.33	9	1986	39.61
10	1980	65.21	10	1991	39.27

Precipitation					
Driest			Wettest		
Rank	Date	Total (in.)	Rank	Date	Total (in.)
1	2002	12.02	1	1998	27.07
2	1988	12.12	2	1993	25.86
3	2012	12.66	3	1982	25.54
4	1985	12.97	4	1997	25.30
5	2004	13.12	5	1999	25.10
6	2006	13.16	6	1991	24.54
7	1984	13.37	7	1986	23.76
8	1980	13.79	8	2008	23.53
9	1989	14.21	9	1995	22.46
10	1990	15.13	10	1996	21.96

Annual ranks for time period 1980-2012 to capture approximately a 30 year climatology. TMax is maximum temperature, i.e., years with the hottest temperature on record. TMin is minimum temperature, which is the warmest nighttime temperature. 2002 was the driest year on record, and the drought period of 2002-2007 witnessed 3 out of 6 years of record low precipitation. 2012 was the hottest year on record and the third driest. (Source: Drought Risk Atlas <http://droughtatlas.unl.edu/Data.aspx>).

## References

- Palmer, W. C., 1965: *Meteorological Drought*. Department of Commerce, National Oceanic and Atmospheric Administration, U.S. Weather Bureau [Available from NOAA Library and Information Services Division, Washington, DC 20852], Washington, DC, 58 pp.
- Wells, N., S. Goddard, and M. J. Hayes, 2004: A Self-Calibrating Palmer Drought Severity Index. *J. Clim.*, **17**, 2335–2351.