



TO: THE WATER ADVISORY COMMITTEE
FROM: THE EXECUTIVE DIRECTOR'S OFFICE
SUBJECT: INTERIM PERIODIC HYDROLOGIC CONDITION DESIGNATION
DATE: AUGUST 19, 2015

I. OVERVIEW

The WAC requested the Executive Director's (ED) Office investigate alternate approaches to designating the periodic hydrologic condition on the Platte River when monthly Palmer Drought Severity Index (PDSI) data is not available. The periodic hydrologic condition is used to identify which of the wet, normal, or dry target flows should be used to determine excesses in the Platte River. If Platte River flows in the associated habitat are greater than target flows, excesses may be diverted for various projects, such as groundwater recharge. The periodic hydrologic condition updates rely on monthly PDSI values in some periods; however, these values are typically not available until two weeks after the designation update is required. This creates a gap in the beginning of a new period when the hydrologic condition cannot be calculated and the corresponding target flows cannot be determined. The ED Office proposes to calculate an "interim" hydrologic condition during these times to provide a means of determining target flows and excess flows available for projects.

The ED Office suggests using the most recent weekly PDSI value during periods when the monthly PDSI is not available in order to provide an interim hydrologic condition until the monthly PDSI value is available. This will not change the periodic hydrologic condition designation; it will simply provide a standard methodology for developing an interim hydrologic condition for use in determining excesses to target flows available for Program projects. It is anticipated that the interim hydrologic condition designation will be a good predictor of the actual designation, and only occasionally would the interim and the actual designations differ.

II. BACKGROUND

The periodic hydrologic conditions consist of seven periods throughout the year comprised of one to three months, shown in **Table 1**. The hydrologic condition calculations are based on the methodology developed by Anderson and Rodney¹ and rely on a combination of seven metrics. The metrics used for the calculations and their relative weights in the calculations vary from period to period. **Table 1** shows which metrics are used in each period and the relative weight of each metric for each period. The metrics determine a hydrologic condition index for each period which is compared to threshold indices to designate the period as wet, normal, or dry. Five of the seven periods depend on the monthly PSDI from the previous month.

Monthly PDSI are calculated by the National Centers for Environmental Information (NCEI) of the National Oceanic and Atmospheric Administration (NOAA). NCEI typically updates the previous month's PDSI value near the 15th of the following month. The hydrologic condition

¹ Anderson, D.M, and Rodney, M.W. 2006. *Characterization of Hydrologic Conditions to Support Platte River Species Recovery Efforts*, Journal of the American Water Resources Association, 42(5):1391-1403.



designation for the five periods depending on the PDSI is delayed until the PDSI values are updated mid-month, resulting in a two week period without a clear hydrologic condition designation. Because the hydrologic condition dictates target flows which are in turn used to identify excesses, there is currently no clear way to determine excesses during the two week period when PDSI is not known. This leads to uncertainty in excess availability for a total of ten weeks each year.

III. RECOMMENDATIONS

To avoid the two week delay in hydrologic condition designation, the ED Office recommends using the most recent weekly PDSI in place of the monthly PDSI to calculate an interim periodic hydrologic condition designation until monthly PDSI data is available. Both monthly and weekly PDSI values are calculated by the NCEI. An overview of the weekly indices is provided on the NCEI website² and the methodology used to calculate weekly indices is explained in a 2005 publication by Heim³. The approach uses current observations and previous temperature and precipitation averages to estimate the PDSI for a given week. The weekly PDSI values will be used to calculate an interim hydrologic condition designation which will be used to set target flows until the monthly PDSI values are available. Once available, the monthly PDSI values will be used to calculate the actual hydrologic condition designation to replace the interim designation and set official target flows for the given period.

While weekly PDSI values are typically close to monthly values, they are not as representative as the monthly values and may differ when actual conditions vary significantly from average conditions. The ED Office compared the impact of weekly PDSI values on the hydrologic condition designations over a 24 year period that included 118 hydrologic condition periods and found that weekly PDSI values only changed the hydrologic condition designation in 4 of those periods, or 3.4% of the time. In two of these instances the weekly PDSI values resulted in wetter conditions (the weekly values shifted the designation from “Dry” to “Normal”) while the other two instances resulted in drier conditions (the weekly values shifted the designation from “Normal” to “Dry”). **Table 2** shows the periods where the hydrologic condition varied based on monthly and weekly PDSI values. Based on this analysis, it is unlikely that the interim hydrologic condition designation will differ from the actual designation. Any instances where a difference between the weekly and monthly PDSI results in a change in the periodic hydrologic condition designation will be clearly communicated to the recipients of the hydrologic condition designation emails and on the Program hydrologic condition webpage.

The ED Office will include a note on the hydrologic condition webpage indicating the designation is “interim” when weekly PDSI values are used and when the actual designation is expected. A similar note will be included in the hydrologic condition designation emails the ED Office sends out. The ED Office will follow up any interim designation emails with an updated actual designation once the monthly PDSI is available. The ED Office will also monitor the

² <http://www.ncdc.noaa.gov/temp-and-precip/drought/weekly-palmers.php>

³ Heim, R.R., Jr., 2005: Computing the monthly Palmer Drought Index on a weekly basis: A case study comparing data estimation techniques. *Geophys. Res. Lett.*, 32, No. 6, L06401, 18 March 2005.



performance of the interim designation into the future to confirm that the interim designation reliably predicts the actual designation with less than 5% error.

Table 1. Periodic hydrologic condition periods and designation metrics with period weights for each metric.

Hydrologic Condition Period Metric (units*)	Hydrologic Condition Periods (metric weights shown in parenthesis)						
	December to February	March to April	May	June	July	August to September	October to November
Average Previous Month's Flow Platte River near Grand Island (cfs)	X (0.579)	X (0.12)	X (0.601)	X (0.648)	X (0.237)		X (0.658)
Average Previous Month's Flow, Platte River Near Julesburg, CO (cfs)				X (0.023)	X (0.218)		
End-of-Month Content, 7 N. Platte WY Reservoirs (AF)	X (0.317)	X (0.198)			X (0.105)		
End-of-Month Content, Lake McConaughy (% capacity)	X (0.138)		X (0.271)		X (0.109)	X (0.404)	
End-of-Month Content, 3 Upper S. Platte CO Reservoirs (AF)	X (0.236)		X (0.031)				
April 1 Snow Pack, 7 WY N. Platte Sites (% of Normal)			X (0.252)	X (0.082)			
Previous Month's Palmer Drought Severity Index (PDSI)		X (0.662)		X (0.097)	X (0.441)	X (0.464)	X (0.342)

*cfs = cubic feet per second. AF = acre feet.

Table 2. Hydrologic condition designation using monthly and weekly PDSI values

Hydrologic Condition Period	Hydrologic Condition Designation (with Monthly PDSI)	Hydrologic Condition Designation (with Weekly PDSI)
June 1992	NORMAL	DRY
July 1992	NORMAL	DRY
March -April 2006	DRY	NORMAL
March -April 2008	DRY	NORMAL