

Section 3

Drought Monitoring

The Drought Plan establishes a continuous monitoring and reporting system. Drought-related monitoring and reporting activities provide a baseline of information and, more importantly, provide a barometer of change in climatic conditions that may indicate the inception of drought. Implementing a relatively simple monitoring program would help avoid a late diagnosis of an upcoming drought. The Drought Task Force is responsible for monitoring and reporting hydrologic conditions throughout the water year with increased activity during drought.

Drought indicators synthesize complex water availability data for planners and decision-makers. Because a single indicator does not easily assess drought, the County could utilize several indicators, including:

- Standardized Precipitation Index (SPI);
- Surface Water Supply Index (SWSI); and
- Palmer Drought Index (PDI requires soil moisture data and may be more difficult to use).

The following sections include a brief description of these indicators.

3.1 Standardized Precipitation Index (SPI)

The Colorado Climate Center uses the SPI (Colorado Climate Center 2004), which measures the precipitation deviation from the average for a particular location. The SPI quantifies the precipitation deficit over multiple time scales, typically three, six, twelve, and twenty-four month periods. The SPI provides an early warning of drought and an intensity level for each month in which the drought occurs. Table 3-1 displays the SPI for various drought levels.

2.0 and greater	Extremely Moist
1.5 to 1.99	Very Moist
1.0 to 1.49	Unusually Moist
0.99 to -0.99	Near Normal
-1.0 to -1.49	Moderate Drought
-1.50 to -1.99	Severe Drought
-2.0 and less	Extreme Drought

This index would be relatively easy to quantify for several weather stations in Butte County, including those stations used in the Butte County Water Inventory and Analysis (CDM 2001) and two at higher elevations. The stations include:

- Chico University Farm, 185 feet above mean sea level (msl);

- Oroville, 171 feet above msl;
- Paradise, 1750 feet above msl;
- De Sabla, 2,710 feet above msl;
- Forbestown, 2,840 feet above msl; and
- Brush Creek, 3,560 feet above msl.

3.2 Surface Water Supply Index (SWSI)

The SWSI is an indicator of surface water conditions for a major river basin. Table 3-2 lists the rating for varying surface water conditions. The index summarizes snow pack, stream flow, precipitation, and reservoir storage for a particular month. The weighting factors change from winter to summer as follows:

November-April SWSI = observed reservoir storage + precipitation + snow pack + April - July stream flow forecast; and

May-October SWSI = observed reservoir storage + precipitation + stream flow.

4.0 and more	Extremely Moist
3.0 to 3.9	Very Moist
2.0 to 2.9	Unusually Moist
1.9 to -1.9	Near Normal
-2.0 to -2.9	Moderate Drought
-3.0 to -3.9	Severe Drought
-4.0 and less	Extreme Drought

For the Sacramento River Basin the stream flow component of SWSI is calculated using the Sacramento Valley Water Year Type Index (or 40-30-30 Index), available from DWR's Division of Flood Management, Cooperative Snow Surveys through the California Data Exchange Center (CDEC). The Index equals 40 percent of the current April-July unimpaired runoff, plus 30 percent of the October-March unimpaired runoff plus 30 percent of the previous year's index.¹

The Index calculates runoff as the sum of unimpaired flows from the Sacramento, Feather, Yuba, and American River Basins, and sets a maximum for the previous year's index at 10 million acre feet (AF). The water year type is characterized as wet, above normal, below normal, dry, or critically dry and historically range between 3.1

¹ Unimpaired runoff represents the natural water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds (DWR Bulletin 120-4-03, May 1,2003).

million AF (1977) and 15.3 million AF (1983) with a 1951-2000 average of 8.5 million AF. Table 3-3 illustrates the type of water year in relation to unimpaired runoff.

Table 3-3 Water Year Classification and Unimpaired Runoff	
Wet	= to or > 9.2 MAF
Above Normal	> 7.8 MAF and < 9.2 MAF
Below Normal	> 6.5 MAF and = to or < 7.8 MAF
Dry	> 5.4 MAF and = to or < 6.5 MAF
Critical	= to or < 5.4 MAF

MAF – million acre feet

The County could work with DWR to analyze the SWSI index with more focus on the Feather River Basin. This step would require additional effort; however, once established, this index would be relatively easy to use and update.

3.3 Palmer Drought Index (PDI)

The Palmer Drought Index is widely used across the United States primarily to gauge impacts on agriculture. It is based on precipitation and temperature data and the available-water content of local soils. This index was developed for areas of the country with more homogeneous climates than Butte County. Agencies such as the U.S. Department of Agriculture may use the PDI, and once calculated, the County could report the PDI with minimal effort. Otherwise, the PDI should not be considered as an active part of the Butte County's drought planning.