

5-Drought Indices

Most current drought severity indices are reviewed in this paper. They are the Bhalme and Mooly Drought Index (BMDI; Bhalme and Mooley 1980), Crop Moisture Index (CMI; Palmer, 1968), Deciles (Gibbs and Maher 1967), National Rainfall Index (RI; Gommers and Petrassi 1994), Palmer Drought Severity Index (PDSI; Palmer 1965), Percent Normal (PN; Willeke et al. 1994), Rainfall Anomaly Index (RAI; Rooy 1965), Reclamation Drought Index (RDI; Weghorst 1996), Standardized Precipitation Index (SPI; Mckee et al. 1993, 1995), Surface Water Supply Index (SWSI; Shafer and Dezman 1982), etc. Recently, the Soil Moisture Drought Index (SMDI; Hollinger et al. 1993) and Crop-Specific Drought Index (CSDI; Meyer et al. 1993; Meyer and Hubbard 1995) appeared after the CMI. Furthermore, CSDI is divided into a Corn Drought Index (Meyer et al. 1993) and Soybean Drought Index (Meyer and Hubbard 1995). Except these, the indices made by Penman (1948), Thornthwaite (1948, 1963), Keetch and Byrum (1968) had been used (Steila 1983, 1986; Hayes 1996). The characteristics of each index are summarized in Table 1. It is recognized that the PDSI is still the most widely used index and more advanced and scientific one is needed. This study starts assessing the usefulness and pertinency of each index, explores the weak points of them, and finally, new indices are presented as a solution.

Table 1: Characteristics of current drought indices

	Factors used	Time scale	Main concept
PDSI	r, t, et, sm, rf	m	Based on moisture inflow, outflow and storage.
SWSI	P, sn	m	Like the PDSI except considering sn.
PN	r	m	Dividing actual r by the normal value
Deciles	r	m	Dividing the distribution of the occurrences over a long term r record into sections each representing ten percent.
SPI	r	3m, 6m, 12m, 24m, 48m	Difference of r from the mean for a particular time and dividing it by the standard deviation.
CMI	r, t	w	Like the PDSI except considering available moisture in top 5 feet of soil profile.
SMDI	sm	y	Summation of daily sm for a year.
CSDI	ev	s	Summation of the value of calculated ev divided into possible ev during the growth of specific crops.
RI	r	y, c	Patterns and abnormalities of r on a continental scale.
RAI	r	m, y	r compared to arbitrary value of +3 and -3, which is assigned to the mean of ten extreme + and - anomalies of r.
BMDI	r	m, y	Percent departure of r from the long term mean.

Abbreviations :

P: factors used in PDSI, r: precipitation, et: evapotranspiration, ev: evaporation, t: temperature, sm: soil moisture, rf: runoff, sn: snow pack, w: week, m: month, s: season, y: year, c: century, 3m: 3 months, etc.

6-Drought Prediction

Empirical studies conducted over the past century have shown that meteorological drought is never the result of a single cause. It is the result of many causes, often synergistic in nature.

A great deal of research has been conducted in recent years on the role of interacting systems, or teleconnections, in explaining regional and even global patterns of climatic variability. These patterns tend to recur periodically with enough frequency and with similar characteristics over a sufficient length of time that they offer opportunities to improve our ability for long-range climate prediction, particularly in the tropics. One such teleconnection is the El Niño/Southern Oscillation

(ENSO).(Dr.Michael j. Hayes,The National Drought Mitigation
Center.U.S.A.