

Keetch-Byram Drought Index

John L. Keetch and George Bryam designed a drought index specifically for fire potential assessment. It is a number representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers. It is a continuous index, relating to the flammability of organic material in the ground.

The KBDI attempts to measure the amount of precipitation necessary to return the soil to full field capacity. It is a closed system ranging from 0 to 800 units and represents a moisture regime from 0 to 8 inches of water through the soil layer. At 8 inches of water, the KBDI assumes saturation. Zero is the point of no moisture deficiency and 800 is the maximum drought that is possible. At any point along the scale, the index number indicates the amount of net rainfall that is required to reduce the index to zero, or saturation.

The inputs for KBDI are weather station latitude, mean annual precipitation, maximum dry bulb temperature, and the last 24 hours of rainfall. Reduction in drought occurs only when rainfall exceeds 0.20 inches (called net rainfall). The computational steps involve reducing the drought index by the net rain amount and increasing the drought index by a drought factor. KBDI levels and its relationship to expected fire potential are reflected in the following table:

- KBDI = 0 – 200: Soil moisture and large class fuel moistures are high and do not contribute much to fire intensity. Typical of spring dormant season following winter precipitation.
- KBDI = 200 – 400: Typical of late spring, early growing season. Lower litter and duff layers are drying and beginning to contribute to fire intensity
- KBDI = 400 – 600: Typical of late summer, early fall. Lower litter and duff layers contribute to fire intensity and will burn actively.
- KBDI = 600 – 800: Often associated with more severe drought with increased wildfire occurrence. Intense, deep-burning fires with significant downwind spotting can be expected. Live fuels can also be expected to burn actively at these levels.