A note on trends in Soil Dryness Index in Western Australian forests 2000-2015

Allan Wills

Introduction

Soil dryness index (SDI) calculations are a key tool for predicting behaviour of prescribed fires in Western Australia (Burrows 1987). The Mediterranean climate of southwest Western Australia dictates seasonal phases of moisture and dryness in the annual cycle of SDI. Climate trends of increasing mean temperatures and decreasing annual rainfall (Bates et al. 2008) affect the periodicity and duration of moist and dry phases of the annual cycle of SDI. Appropriate prescribed fire has beneficial outcomes to biodiversity by creating mosaics of habitat under conditions of moisture differentials across the landscape (Burrows et al in submission). Thus, opportunities for conducting prescribed fire at times advantageous to biological outcomes are affected by interannual variation in the wetting and drying cycle and long-term trends in the annual cycle. In this brief note trends in the duration of moist and dry phases of the annual SDI cycle are documented for some forest sites.

Methods

Daily data from the following meteorological stations were considered: Pearce RAAF, Bickley, Dwellingup Forestry, Bridgetown, Pemberton. The time frame considered was from 1 July 1999 to 30 June 2015. Arbitrary thresholds were set on the beginning and end of wet and dry phases. The number of days in each annual cycle of the moist (SDI< 50) and the dry phases (SDI>150) were determined.

Results

Onset of soil wetting and drying varied from year to year at each station (See Figure 1 for Pemberton). The number of days with SDI<50 and SDI>150 varied from year to year and this variation was large in comparison to trends over time (Figure 2). Trends over time in the number of days with SDI<50 tended to be small or non-existent (Figures 2 and 3). Trends in days with SDI>150 showed a gradient according to latitude with decreases in dry conditions at Pearce RAAF and increases at Pemberton in the south (Figure 4). Over 15 years the underlying trend showed an increase of 26 days at Pemberton in number of days when SDI was greater than 150.

Discussion

While only stations representing trends in SWWA forests are presented here other stations may be under local influences such as proximity to Southern or Indian Oceans and present contradictory trends. In addition, the period of 15 years is relatively short for indicating underlying trends and discriminating cyclic phenomena. Its clear from the data however, that there was a trend of increasing time span of dry conditions developed in the southern forest area during the period 2000 to 2014. There were also outlier years with winter phases of short duration across the forest such as the winter of 2010. Interannual variability in the span and conditions suitable for prescribed burning means that planned burning programmes must allow some flexibility and burning must be cognisant of actual SDI conditions rather than be fixed to a calendar of events. Longer term planning of burning regimes needs to consider both trend in the length of burning seasons and its variation across the forest.

References

Bates, B.C., Hope, P., Ryan, B., Smith, I. and Charles, S., 2008. Key findings from the Indian Ocean Climate Initiative and their impact on policy development in Australia. *Climatic Change*, *89*(3-4), pp.339-354.

Burrows, N.D., 1987. The Soil Dryness Index for use in fire control in the south-west of Western Australia. *Technical Report-Western Australian Department of Conservation and Land Management (Australia)*.

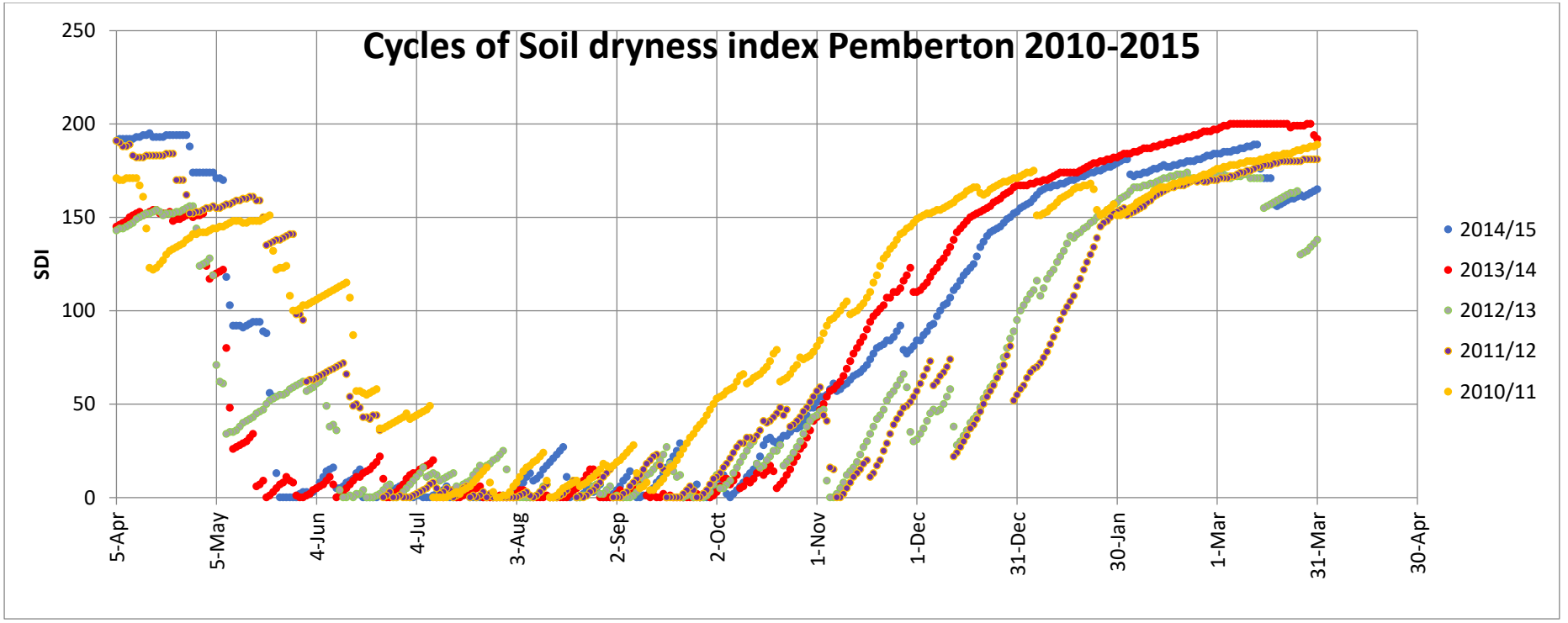

Figure 1. The course of SDI at Pemberton over the period April to March for the years 2010 to 2015.

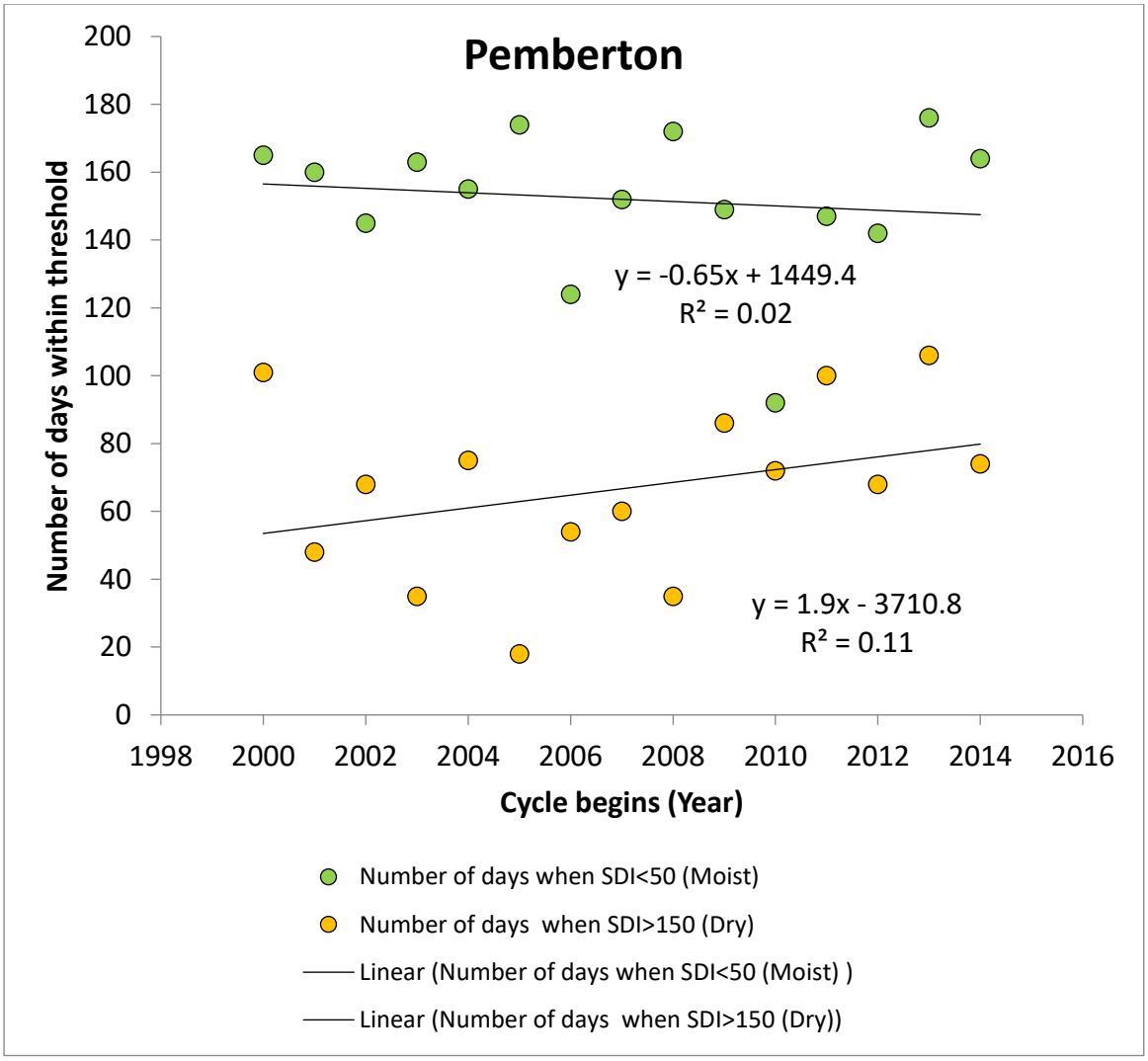

Figure 2. Number of days where SDI<50 and number of days when SDI>150 for Pemberton over the years 2000 to 2014.

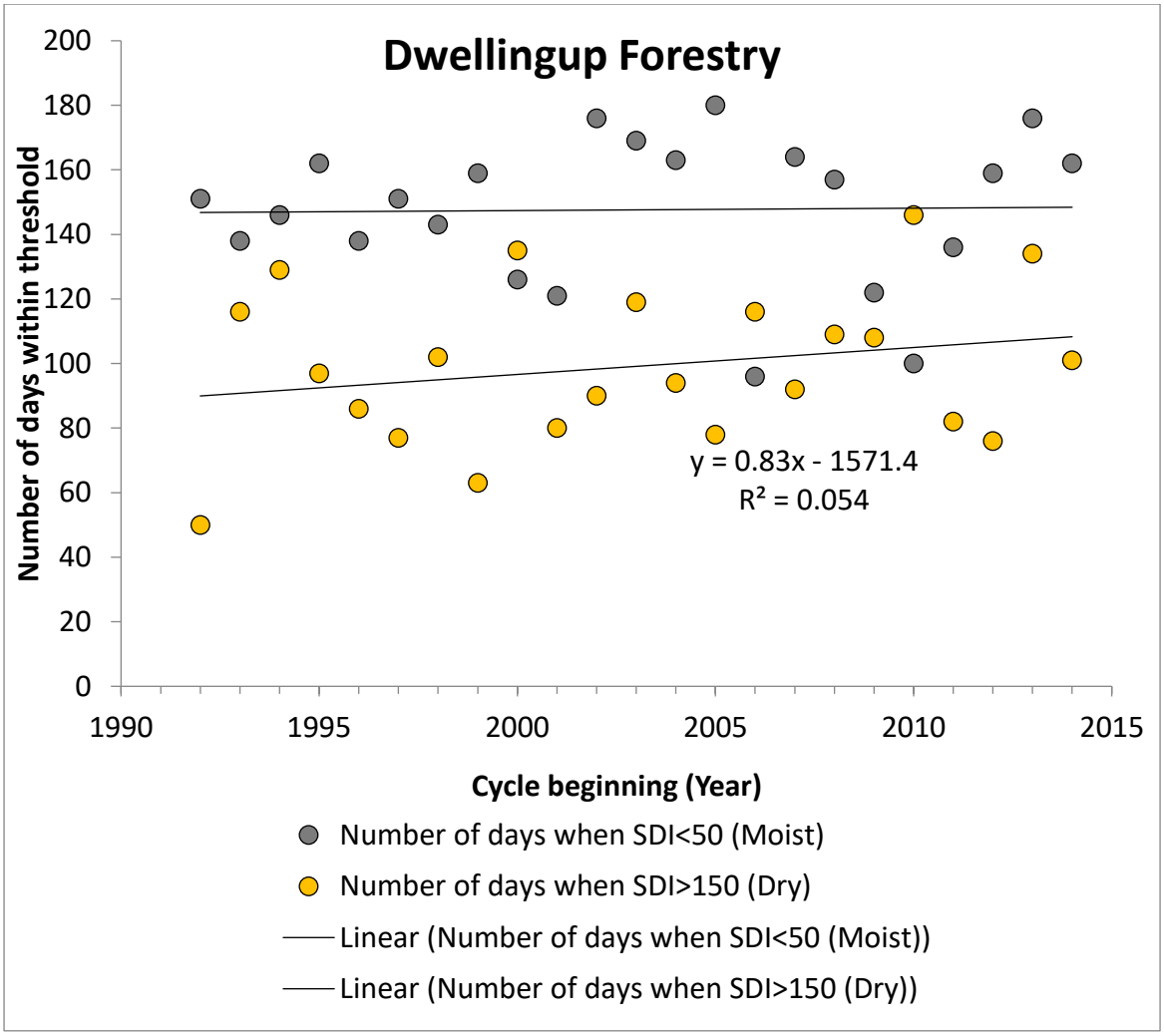

Figure 3. Number of days where SDI<50 and number of days when SDI>150 for Dwellingup over the years 2000 to 2014.

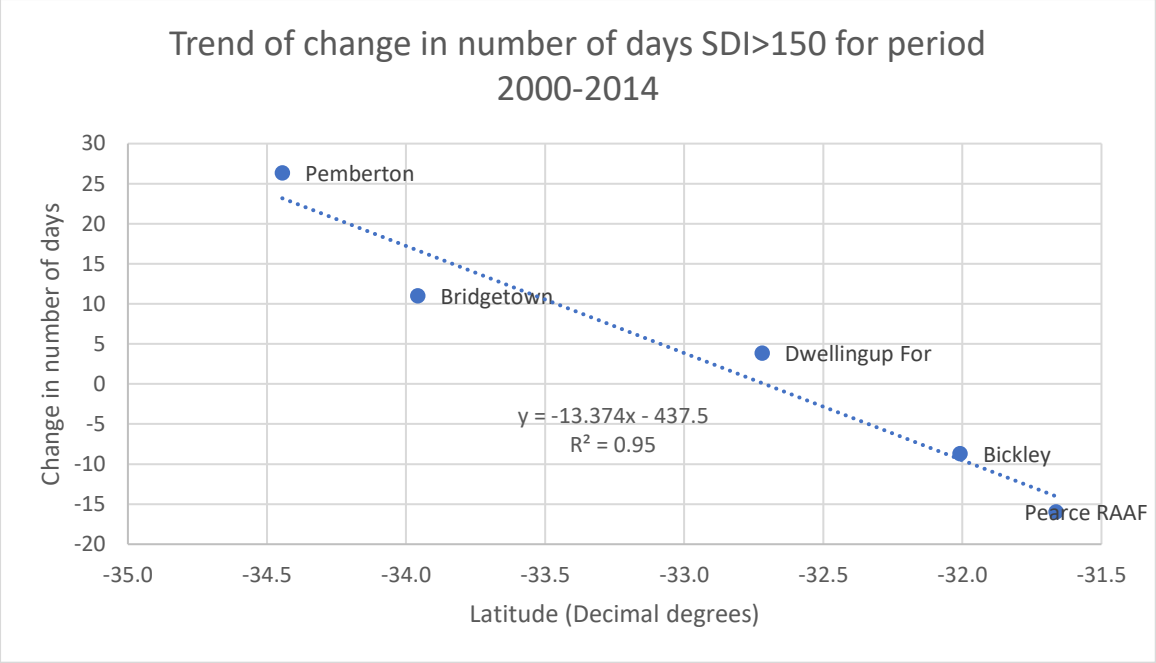

Figure 4. Underlying trend of change in the number of days where SDI >150 for the period 2000 to 2014 plotted against Latitude.