Cheatgrass-wildfire relationship summary

Currently the code in STEPWAT2 uses a threshold of 12.5% cover for which cheatgrass will begin to affect fire probability, derived from Whisenant 1990. However, current studies (e.g. Bradley 2018) suggest that cheatgrass may begin to increase fire frequency at as low as 1-5% cover. Additionally, there is concern that the use of MODIS fire data underestimates fire return intervals (FRI), further altering these relationships. Therefore, we have used fire data collected via MODIS and the USGS in Balch et al. 2013 to scale our current estimates of fire probability for the underestimation of MODIS. The following relationship was derived:

Table 3. Re-scaled FRIs and annual fire probabilities based on the relationship between FRI between MODIS and USGS fire data.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cheatgrass % cover** | **% burned** | **Annual fire probability** | **Annual fire probability USGS** | **FRI** | **FRI USGS** |
| **0** | 0.049 | **0.003** | 0.007 | 306 | 151 |
| **0.5** | 0.07 | **0.005** | 0.009 | 214 | 106 |
| **2.5** | 0.13 | **0.009** | 0.018 | 115 | 57 |
| **7.5** | 0.125 | **0.008** | 0.017 | 120 | 59 |
| **12.5** | 0.159 | **0.011** | 0.021 | 94 | 47 |
| **15** | 0.143 | **0.010** | 0.019 | 105 | 52 |

These values (bolded) were graphed and fit to an equation:

This gives us the final equation of y = 0.0074x0.0649 for cheatgrass vs fire probability.

Cited:

Balch, J. K., B. A. Bradley, C. M. D’Antonio, and J. Gómez-Dans. 2013. Introduced annual grass increases regional fire activity across the arid western USA (1980–2009). Global Change Biology 19:173–183.

Bradley, B. A. *et al.* (2018). Cheatgrass (Bromus tectorum) distribution in the intermountain Western United States and its relationship to fire frequency, seasonality, and ignitions. *Biol Invasions* 20, 1493–1506.

Whisenant, Steve G. (1990). Changing fire frequencies on Idaho's Snake River Plains: ecological and management implications. Pages 4-10 In: McArthur, E. Durant; Romney, Evan M.; Smith, Stanley D.; Tueller, Paul T. (eds.). Proceedings - Symposium on cheatgrass invasion, shrub die-off, and other aspects of shrub biology and management. General Technical Report INT-GTR-276. Ogden, UT: USDA Forest Service.