Reply to Kline et al.: Cropland data layer provides a valid assessment of recent grassland conversion in the Western Corn Belt

Kline et al. (1) pose a series of “what-if” scenarios intended to cast doubt on our (2) findings. These scenarios arise from a critical misreading of our paper and misinterpretation of the US Department of Agriculture’s Cropland Data Layer (CDL).

First, we did not include alfalfa (*Medicago sativa*), a perennial cultivated-hay legume, in our definition of grassland (2), contrary to Kline et al.’s (1) claim. This error propagates throughout their analysis. Our grassland definition combines all CDL grass-dominated land cover types within the Western Corn Belt (WCB).

We agree that grassland increases have occurred in the WCB (3). However, Kline et al. (1) do not address important subregional variability. By our grassland definition, we find a 2.1 million ha increase in CDL grassland west of the 100th Meridian, a commonly accepted (if somewhat arbitrary) transition to the arid west. East of the 100th Meridian—where the overwhelming majority of corn/soy production occurs—total grassland area decreased by nearly 800,000 ha from 2006 to 2011. Unfortunately, grassland increases in one subregion cannot mitigate losses in distant locations.

Kline et al. (1) find a 1.2 million ha decrease in fallow/idle cropland, suggesting that increased corn/soy cultivation could be explained by expansion onto idled land. However, of the nearly 800,000 ha of grassland conversion we documented (2), only 154,000 ha originated from the CDL fallow/idle class. Inspection of the CDL shows that nearly 1.2 million ha of fallow/idle lands in 2006 were reclassified as other grassland

types in 2011. In the eastern Dakotas and southern Iowa, where we found the majority of grassland conversion (2), the fallow/idle class primarily encompasses Conservation Reserve Program lands planted to perennial grasses. Thus, reclassification of fallow/idle pixels to different grassland types at subsequent dates is not uncommon. Contrary to Kline et al.’s (1) critique, this known inconsistency is precisely why we used an aggregated grassland class.

Kline et al. (1) claim our results are biased by overestimation of grassland area in 2006, relative to the National Land Cover Dataset (NLCD). However, because the NLCD contains a mixed pasture/hay class—which includes both grass-dominated and legume-dominated land covers, such as alfalfa (4)—comparison of total grassland area between these different datasets is not possible.

Finally, Kline et al. (1) criticize use of the CDL for identifying conversion of nonagricultural grasslands, rather than the NLCD. Within the WCB, however, the CDL defaults to the NLCD when (i) a location is clearly not cropland and (ii) other noncropland grassland types cannot be identified (5). Thus, where the default NLCD classification is grassland/herbaceous we used the exact grassland data recommended by Kline et al. (1).

Although postclassification change analysis presents a number of well-recognized challenges, Kline et al.’s (1) claims of uncertainty arising from changes in CDL methods are unquantified and overstated. We conclude that Kline et al. (1) have not presented convincing arguments that land change analysis is “impossible” using the CDL. Although

“better data” is always desirable, the rate and environmental consequences of recent grassland conversion warrants judicious use of the best information currently available, the CDL.

ACKNOWLEDGMENTS. This research was supported by the US Department of Energy through the Sun Grant Initiative’s Regional Biomass Feedstock Partnership and by National Science Foundation Macrosystems Biology Program Grant 1065845.

Christopher K. Wright¹ and Michael C. Wimberly

Geographic Information Science Center of Excellence, South Dakota State University, Brookings, SD 57007

- 1** Kline KL, Singh N, Dale VH (2013) Cultivated hay and fallow/idle cropland confound analysis of grassland conversion in the Western Corn Belt. *Proc Natl Acad Sci USA* 110:E2863.
- 2** Wright CK, Wimberly MC (2013) Recent land use change in the Western Corn Belt threatens grasslands and wetlands. *Proc Natl Acad Sci USA* 110(10):4134–4139.
- 3** Claassen R, Carriazo F, Cooper JC, Hellerstein D, Ueda K (2011) *Grassland to Cropland Conversion in the Northern Plains: The Role of Crop Insurance, Commodity, and Disaster Programs. Economic Research Report No. ERR-120* (US Department of Agriculture, Washington, DC).
- 4** Multi-Resolution Characteristics Consortium (2013) National Land Cover Database 2006 (NLCD2006) Product Legend. Available at www.mrlc.gov/nlcd06_leg.php. Accessed May 1, 2013.
- 5** US Department of Agriculture, National Agriculture Statistics Service (2013) Cropland data layer metadata. Available at www.nass.usda.gov/research/Cropland/metadata/meta.htm. Accessed May 2, 2013.

Author contributions: C.K.W. analyzed data; and C.K.W. and M.C.W. wrote the paper.

The authors declare no conflict of interest.

¹To whom correspondence should be addressed. E-mail: Christopher.Wright@sdstate.edu.