Estimating the location of undisturbed lands using the USDA Cropland Data Layer

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Introduction

- Only 5 percent of the original prairie in the United States remains
- The Sodsaver provision of the 2014 Farm Bill creates a federal disincentive for converting native prairie to cropland in the Prairie Pothole states of North Dakota, South Dakota, Montana, Iowa, Minnesota and Nebraska

Challenge: How to map undisturbed (native) grassland, wetland, and forests in the Prairie Pothole Region

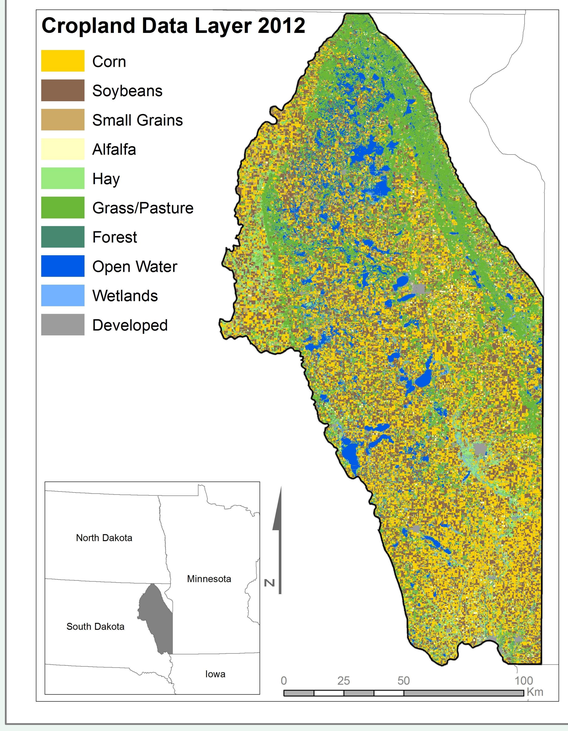
Approach: Use the USDA's Cropland Data Layer (CDL) to identify native prairie and other vegetation that has never been plowed (undisturbed lands)

Hypothesis: Lands mapped as natural land cover continuously from 2006 to 2012 are undisturbed lands

Study Site

- The Prairie Coteau is a wedge shaped plateau located in Eastern South Dakota
- Mix of agriculture, grassland and wetlands
- Largest remaining tract of native northern tallgrass prairie in the United States

Land Cover Classes of the Prairie Coteau



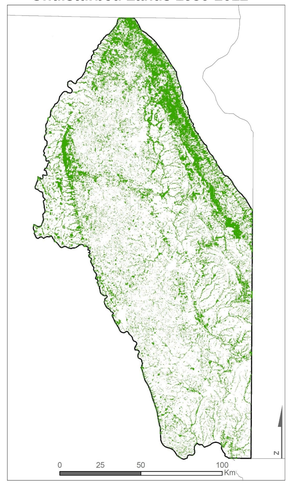
Methods

Undisturbed Lands (UDL)

(Bauman et al. 2014)

- Used as ground truth
- Uses crop history from 1950-2012 to define areas that are most likely undisturbed.
- Uses aerial photos to confirm land use
- Masks out all water bodies (as defined by the SD Game Fish and Parks) and developed areas
- Additionally, we masked all development from the 2006-2012 CDL

Undisturbed Lands 1950-2012

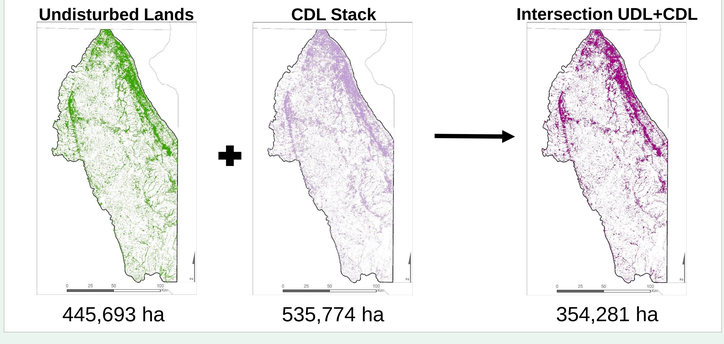


Cropland Data Layer Stack

- We used the CDL to define "natural" areas by combining select natural classes from 2006-2012
- Natural areas include grasslands, forests, wetlands, open water
- Hay and pasture was also included because it can be difficult to distinguish from grass in satellite imagery

CDL Class	Selected classes
Corn	
Soybeans	
Small Grains	
Fallow/Idle	X
Hay/Pasture	X
Grass	X
Forest	X
Open Water	X
Wetlands	X
Barren	X
Developed	

We intersected the UDL and CDL stacks to determine how well the CDL stack captured undisturbed lands



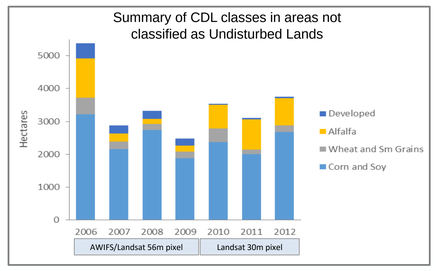
Results:

- The CDL stack captured 79% of the undisturbed lands in the Prairie Coteau

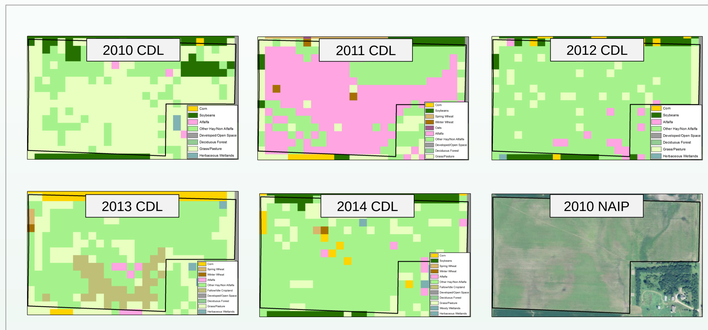
	Hectares
Land correctly mapped as undisturbed by CDL stack	354,281
Disturbed land incorrectly mapped as undisturbed by CDL stack	90,080
Undisturbed land incorrectly mapped as disturbed by CDL stack	91,413

Discussion

- In 2012, the CDL identified 93.8% of the UDL area as a natural cover
- Where the CDL stack did not capture undisturbed lands it was most likely to be classified as corn or soy
- Misclassification varies by year and may be affected by pixel size and satellite sensor



- Over 50% of the misclassified CDL area in 2006 was classified as a natural class in all subsequent years. We recommend discarding 2006 CDL data from the stack.



CDL data from 2010-2014 and a 2010 NAIP image of a hayfield associated with the Brookings FluxNet tower. The entire field was planted to cool-season grasses in 2004, and it has been annually mowed for hay ever since. Note the color variations in the image due to differences in vegetation cover and soil wetness. The "speckle" in the raster CDL map is consistent with these real differences in land-cover that occur within the field, whereas the FSA CLU vector maps show the uniform land-use (i.e., hayland).

Conclusion: Stacked CDL layers of combined natural and hay classes identified most but not all undisturbed lands

Benefit: the use of stacked CDL layers to identify undisturbed lands could provide a cost savings over time-consuming visual interpretation methods

Future research: will evaluate causes of the underestimate by the stacked CDL Layers and determine if removing the 2006 CDL improves the results

Acknowledgements:

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Bauman, P., Blastick, J., Grewing, C., Smart, A. (2014) Quantifying undisturbed land on South Dakota's Prairie Coteau. Brookings, SD, South Dakota State University.