

# Corn Planting and Suitable Lands in Iowa

## Overview

Environmental economists worry that significant increases in agricultural commodity prices will result in the planting of fragile lands. In one analysis, Secchi and Babcock (2007) predicted that corn prices at \$3 per bushel would result in one million additional planted acres in the state of Iowa, many of which would not be suited to production. In the summer 2008, prices briefly spiked over \$7/bushel. The USDA estimated the annual average, however, at about \$4/bushel – slightly lower than in 2007.

Recent corn planting in Iowa is thus a good test case for Secchi and Babcock's hypothesis. I sought to analyze:

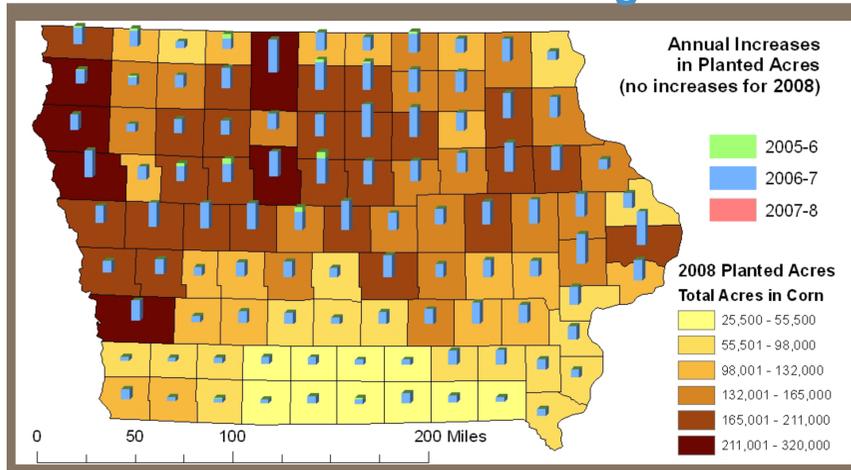
- 1) Trends in acres planted with corn, and
- 2) Environmental suitability of lands for agriculture

Because planting data are only available by county in order to protect farmer privacy, the analysis was split into two parts.

## Planting analysis

A map of Iowa counties was joined to tabular data from the USDA Economic Research Service, which tracks acres planted in corn each year. As shown below, planted acres fluctuated annually. 2007 had the greatest jump over the prior year with an average of 16,161 additional acres planted in corn per county. In 2006 and 2008, however, corn planting declined by 2,020 and 9,090 acres, respectively. Since corn is not planted continuously due to soil nutrient depletion, an average of the three time periods may be most appropriate measure. From 2005-8, an additional 500,000 acres were planted in corn for a total 4% increase—far fewer than predicted by the economic model. Moreover, counties with major spikes in planted acres already had a density of corn. As shown at right, these lands are largely suitable to agriculture.

## Planted Acres 2008 & Planting Increases

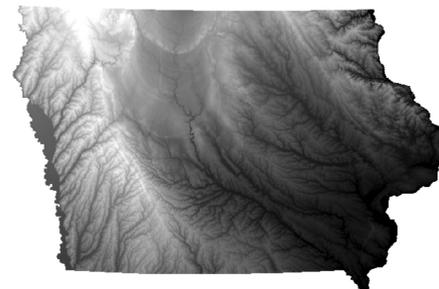


## Methodology

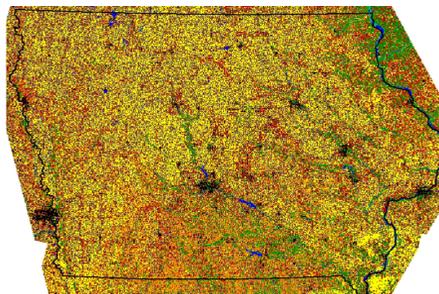
All vector map layers were converted to raster datasets using the NAD83 UTM 15N projection. Each layer was reclassified, assigning high values to suitable areas and low values to others. The raster calculator was then used to multiply each layer, giving double weight to the soil layers to account for their vital importance to agricultural uses.

## Layers of Analysis: Corn Suitability

**Elevation:** slopes were derived from the national elevation maps. Low slopes are preferable for agricultural planting to minimize runoff, so the slopes were graded accordingly. The lighter areas at right show higher elevations—but Iowa is fairly flat.



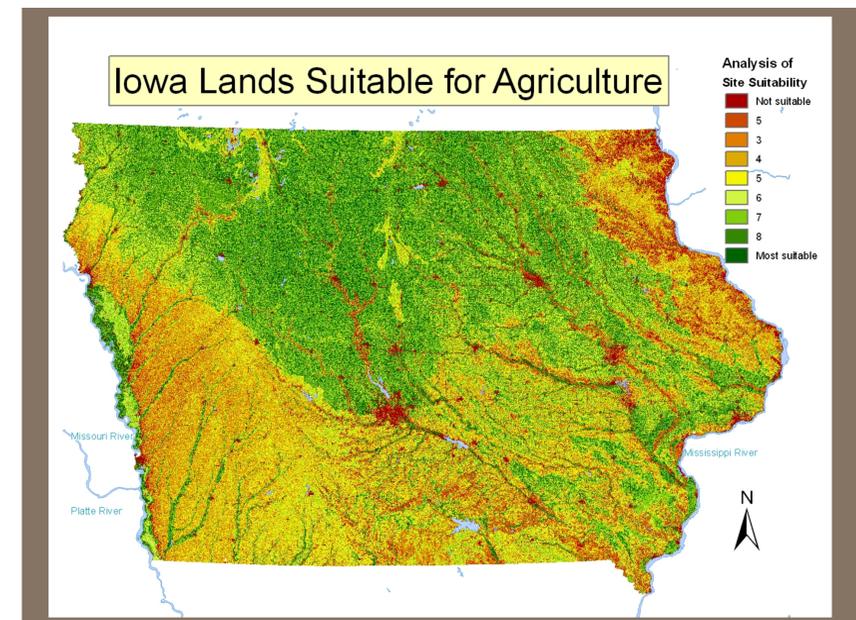
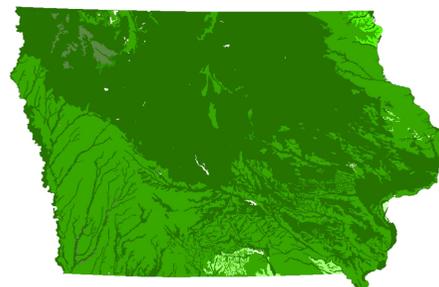
**Land cover:** water bodies, roads, residential and industrial properties (shown in black) were excluded. Wetlands and forests (green) were given a low suitability rating, since their planting would increase environmental vulnerability. Areas in brown and yellow represent corn & soy, the most suitable lands. Orange areas are grasses and cover crops.



**Soil erodibility:** soil characteristics are rated by the USDA's Universal Soil Loss Equation. Darker colors at right represent highly erodible soils. USLE analyzes soil types, rainfall, topography, land cover, and management practices.

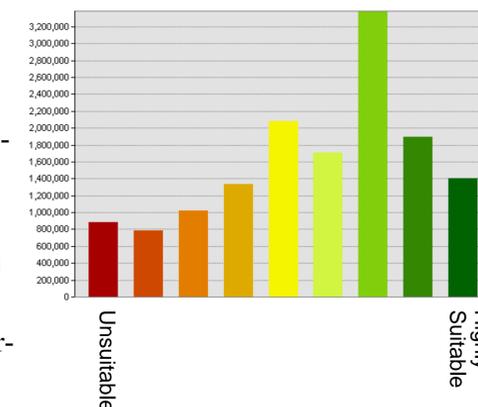


**Soil classification:** soils are also classified based on their productive capabilities from 1 (no restrictions on use) to 8 (precluding plant production). Darker colors at right represent the soil with the fewest restrictions. The majority of Iowa's soils are highly productive.



As this histogram shows, most soils in Iowa are suitable for production. This distribution is fairly similar to the Iowa Extension Service's estimates of Corn Suitability Ratings. The best lands for agricultural are in the north-central region of the state, with the worst in the southern and northeastern regions. It appears that suitable lands correspond approximately with increased planting.

## Relative Density of Suitable Soils



## Conclusions

Planting trends followed the original predictions, but on a reduced scale. The model projected more than one million new acres in production by 2007 due to price spikes and significant corn increases in the southern and northeastern regions. The results suggest that high prices will not result in the significant use of fragile lands, but that appropriate lands will be used more intensively.

## Sources

- Iowa Department of Natural Resources GIS Library 2009
- Secchi, S. and B. Babcock (2007). *Impact of High Crop Prices on Environmental Quality: A Case of Iowa and the Conservation Reserve Program*. Working Paper 07-WP 447. Ames, IA: Center for Agricultural and Rural Development, Iowa State University.
- USDA-Economic Research Service. *Feed Yearbook: Corn*. (2009). <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1274>
- USDA-Economic Research Service. *Farm Program Acres*. (2009) <http://www.ers.usda.gov/data/baseacres/>
- USDA Geospatial Data Gateway 2009

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