

Detection of Foreclosure-related Landscape Management Changes Using Landsat

Michael Minn*, Jonathan A. Greenberg†, Nathan Pavlovic†, Jennifer M. Fraterrigo*, V. Kelly Turner‡, Bethany B. Cutts*

*Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign; †Department of Geography and GIS, University of Illinois at Urbana-Champaign; ‡Department of Geography, Kent State University

Does Foreclosure Lead to A Dead Lawn?

The sheer volume of properties affected by foreclosure over the past decade suggests the potential for broad change in the social-ecological relationships that govern single family homes. Yet, the idiosyncrasy of specific events, the temporal asynchrony of foreclosures, and the relatively small footprint of the outdoor space associated with many single family homes presents challenges to measuring change reliably and comprehensively.

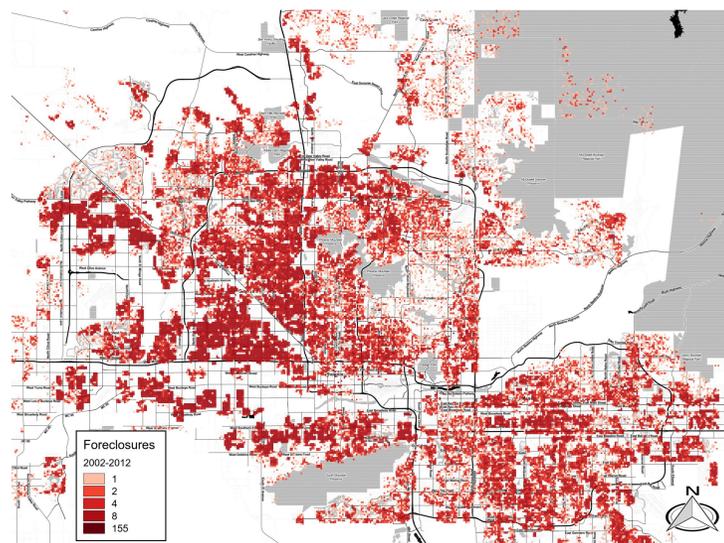
This poster presents a methodology for synoptic detection of foreclosure-coincident landscape management changes at the parcel level using Landsat Normalized Difference Vegetation Index (NDVI) data in conjunction with county foreclosure records and parcel-level geospatial boundaries.

Using parcel-level residential foreclosures in Maricopa County, Arizona, we develop a methodology intended to identify changes coincident with foreclosure, but independent of changes due to the timing of foreclosure, the variability of weather, and the small area of individual residential parcels.

To account for the influence of weather differences and social context (e.g. norms), we compare the difference in deviation between the parcel NDVI for one year before the foreclosure notice of sale and for one year afterward.

We demonstrate this methodology using data from Maricopa County, which had a large number of foreclosures during the foreclosure crisis, and whose arid climate means that landscape maintenance requires significant water inputs and, thus, its complete absence should be visible using NDVI derived from remote sensing.

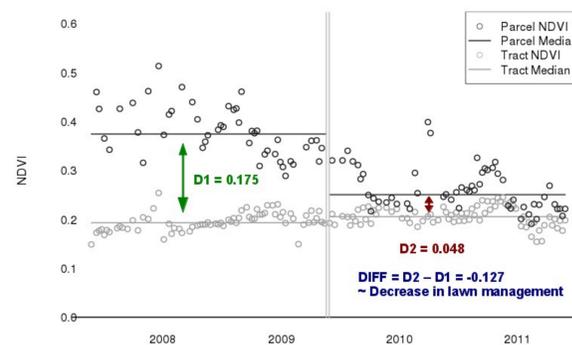
Foreclosures in Maricopa County 2002-2012



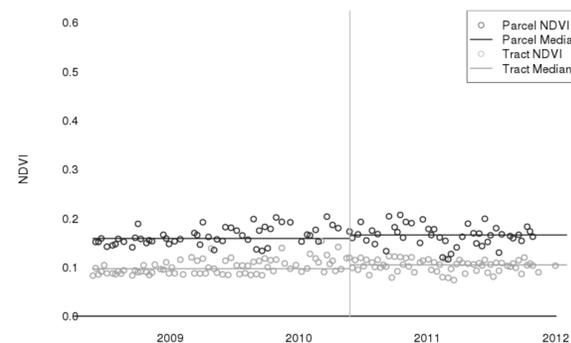
Methods

We used 438 scenes of Landsat 5 and 7 NDVI data (row 37, path 37) covering most of the urban residential area in Maricopa County over the analysis period 2002 to 2012. To estimate the NDVI for each parcel, we took an area-weighted mean of all pixels covering each of the approximately 154,000 parcels that passed through foreclosure during the analysis period. For each parcel, we calculate the median NDVI for one year prior to foreclosure and one year after foreclosure and calculate difference in deviation of values to pre- and post-foreclosure median NDVI values for the census tract encompassing the parcel.

Example Parcel With Detected Change



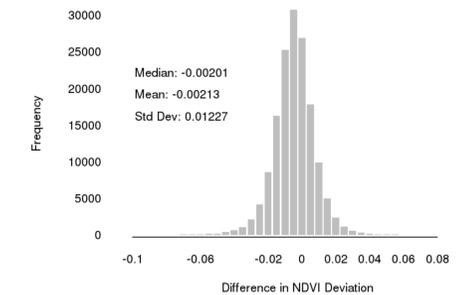
Example Parcel With No Observable Change



Results and Conclusions

- 1) Most parcels have little change in NDVI coincident with foreclosure, indicating that foreclosure does not usually result in large changes that are consistent with large declines in vegetation (dead lawns).

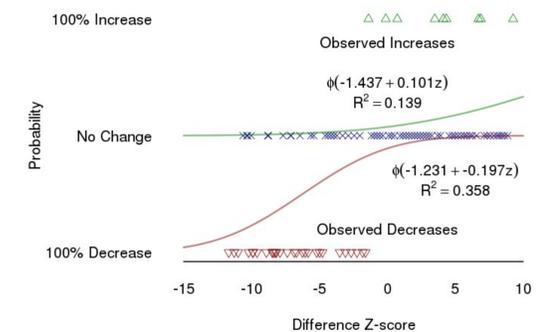
Distribution of Pre-/Post-Foreclosure NDVI Differences



- 2) Visual coding of Google Earth historical imagery before and after foreclosure on 100 regularly-sampled parcels indicates that observable vegetation changes sometimes occur.

- 3) The Probit models (graphed below) multiplied by parcel NDVI difference in deviation result in an estimate that as many as 17,000 parcels may have undergone an observable declines in yard vegetation and landscape management from 2002-2012.

Probit Models of Observed Landscape Management Change



- 5) This methodology provides a foundation for additional research to explain the spatial, temporal, and social-ecological differences that may correspond with higher probabilities of change.

Acknowledgments

This material is based upon work supported by the University of Illinois Campus Research Board, and the USDA through ILLU-875-919. Any opinions, findings and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of United States Department of Agriculture.