

Anna Haines, Ph.D. and Dan McFarlane
University of Wisconsin – Stevens Point

Introduction

The process of rural land division provides an ongoing challenge for planners targeting both habitat and farmland preservation. In developing a research approach that entailed mapping historic parcelization patterns, we used past trends to understand key factors driving land subdivision.

Communities rich with natural amenities, such as lakes and forestland, are experiencing high growth rates and, in these areas, land subdivision for recreation and retirement are common. Surprisingly, few people have accurately tracked the parcelization process both spatially and over time.

Examining the spatial pattern of parcel creation and its relationship to land use variables over time in six rural Wisconsin communities allowed us to assess the features that appeared to drive parcelization.

Using the identified push/pull variables, we created an amenity index and applied these values to parcels. Undivided parcels were considered prime candidates for targeting subdivision policy.

Aim

- Create a spatial record of historical parcel and land use layers to establish baseline trends of parcelization and fragmentation in two non-metro WI counties
- Use past spatial and temporal parcelization patterns to identify key factors driving rural land subdivision
- Apply additive/weighted overlay amenity index to help forecast future land parcelization
- Measure significance of each variable using spatial autocorrelation analysis
- Identify likely prime candidates (parcels) that will subdivide in the future
- Explore new rules for zoning and subdivision policy
- Provide community outreach on our research findings



Figure 1. Counties participating in parcelization study. We included communities representing WI's northwood's lake region and southern agricultural district. Three townships were selected from each county.

Methods

- Research archival plat books and tax assessment rolls, identifying parcel splits
- The current digital parcel layer was used to spatially reconstruct accurate parcel boundaries at various time periods
- Historic land use/cover data was mapped by analyzing historic aerial photos and the WI Bordner Survey
- Selected landscape fragmentation metrics will be used to measure the degree of agricultural perforation over time
- Hypothesized amenity features will be combined in a weighted overlay layer, assigned to parcels, and tested for each time period

Town of West Point, WI - 1953



Figure 2a. Parcelization pattern in 1953 for the Township of West Point. At this time, most tax parcels were still forties, with some subdivision along Lake Wisconsin.

Town of West Point, WI - 2005



Figure 2b. 2005 parcelization pattern in the Township of West Point. Subdivision has occurred along much of the Wisconsin River. Clusters of small parcels away from water also exist.

Note: Light green is forested land
White is agricultural

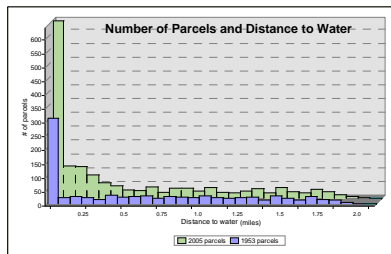


Figure 3. Over 50% of all parcels are within a 1/4 mile of water. This histogram shows that water influences parcelization out to a 1/2 mile. After that, the number of parcels level out.

Preliminary Results

Figures 2a and 2b illustrate the past and current parcel pattern within the Town of West Point. One can see that the trend is near-lakeshore lot development (Figure 3).

Most of the parcelization has been in the 0-2 acre size class, indicating residential development (Figure 4).

Landscape metrics indicate that agriculture core areas are being perforated by small lot creation and subsequent residential development.

A weighted overlay of hypothesized factors driving parcelization is being developed to identify areas of candidates for subdivision policy (Figure 5).

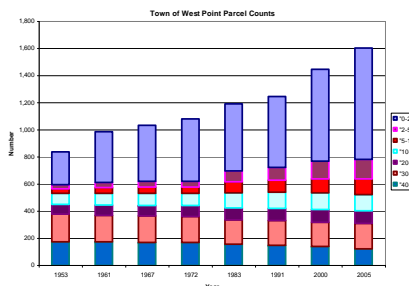


Figure 4. Actual number of parcels for the years 1963-2005, arranged by size class.

Some of our hypothesized amenities are dynamic (forest, roads, services), therefore we will generate the index at multiple dates (1940, 1968, 2005).

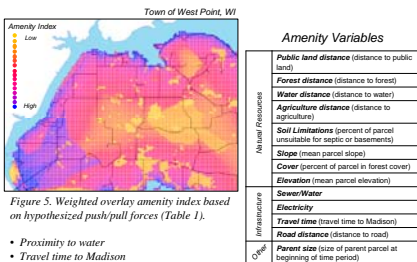


Figure 5. Weighted overlay amenity index based on hypothesized push/pull forces (Table 1).

- Proximity to water
- Travel time to Madison
- View to water
- Hydric soils / soil limitations

Table 1. A list of variables for generating amenity index. Historic data was built using archived aerial photos and public consultation.

Amenity Index vs Property Values

Note the differences in the figures below to understand our parcelization model at the sub-parcel level.

Land values were not used as an amenity surrogate because:

- assessment criteria has changed over the years, making land values difficult to track
- a single value per acre belies the potential amenity gradient within a parcel (Figure 6)

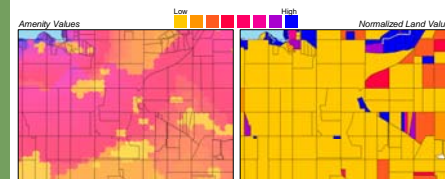


Figure 6. Amenity index (left) and normalized land values (by acre) (right). Our amenity index has sub-parcel resolution, allowing us to precisely locate potential development within a parcel.

Policy Implications:

Ultimately, this research should help us and others design better local rules to accomplish identified planning goals, such as farmland preservation.

This research is leading us to further questions and how we might address them. Many of our current tools use density as a measure of spatial closeness, but, are other measures better? In addition, are current land development techniques (zoning, land division regulations, PDR, TDR, and others) the best tools to use for development or are there others?

Contact:

Dr. Anna Haines ahaines@uwsp.edu
Dan McFarlane dmcf072@uwsp.edu
Eric Olson el Olson@uwsp.edu



Center for Land Use Education
(715) 346 - 3783

<http://www.uwsp.edu/cnr/landcenter/landcenter.html>