

# Thinking Long Term: Land Use Planning in Dane County, WI

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## Abstract

Typical land use planning seeks to envision what a community might be like in ten to twenty years. However, by looking at planning horizons of 50 or more years, Dane County has recognized that the planning luxury of “open and undeveloped” land will not last. Within a few decades, all land in the county will either be developed or be protected from development through various programs such as public acquisition, transfer or purchase of development rights, or farmland protection programs. To make sure that the best or most appropriate lands are slotted into these categories, we have developed a series of suitability models for ecosystem services, farmland protection, landscape amenities, and housing suitability. The results of these models are then fed into impact analysis models such as WhatIf? and CommunityViz to determine optimal mixes of future land uses and to describe the potential impacts of various scenarios.

## Introduction

“The most common concerns I hear from Dane County citizens are the issues of sprawl – increasing traffic congestion, loss of farmland and special natural areas, (and) one community growing into another...” (Kathleen Falk, Dane County Executive, 2004)

Typical land use planning seeks to envision what a community might be like in ten to twenty years. However, by looking at planning horizons of 50 or more years, Dane County has recognized that the planning luxury of “open and undeveloped” land will not last. Within a few decades, all land in the county will either be developed or be protected from development through various programs such as public acquisition, transfer or purchase of development rights, or farmland protection programs.

The University of Wisconsin-Madison Land Information and Computer Graphics Facility (LICGF) has been involved in using Land and Geographic Information System tools to help address land use planning issues for over 20 years.

To make sure that the best or most appropriate lands are slotted into these categories, LICGF is doing suitability modeling, long term growth analysis and impact assessments on a county-wide scale.

## **Suitability Modeling**

LICGF has developed four suitability models to help identify areas that are most suitable for protection and development and where those interests conflict. The four models are: ecosystem services, farmland protection, landscape amenities, and housing suitability.

### **Farmland Protection**

The farmland protection models are based on the NRCS LESA (Land Evaluation and Site Assessment Model). The LESA model has two components. The LE score represents biophysical conditions, primarily soil quality, that make land more or less suitable for farming. The SA score represents socio-economic conditions that make farming viable over the long term. Typically, it is looking at land economic factors indicating propensity to convert land from agriculture to other uses. Each composite LESA score can be comprised of several factors that are individually "weighted" (assigned a relative importance value). Weighting can be adjusted according to evidence and opinion about what may be more important factors in farm viability.

We created four different LESA models, for cash-grain, animal-based, fresh market, and hobby farm agriculture. Results were aggregated to "tracts" (farms), as identified in LCD tract and field data base for cash grain and animal-based agriculture, or to parcels for fresh market and hobby farm agriculture.

### **Ecosystem Services**

Ecosystem services is a term that has been used to describe the benefits derived by people from healthy ecosystems. Ideally, these are unimpaired natural ecosystems, but even severely impacted ecosystems can provide some services. Daily et al. (<http://esa.sdsc.edu/daily.htm>) listed these services: purification of air and water, mitigation of droughts and floods, generation and preservation of soils and renewal of their fertility, detoxification and decomposition of wastes, pollination of crops and natural vegetation, dispersal of seeds, cycling and movement of nutrients, control of potential agricultural pests, maintenance of biodiversity, protection of coastal shores from erosion by waves, protection from the sun's harmful ultraviolet rays, partial stabilization of

climate, moderation of weather extremes and their impacts, provision of aesthetic beauty and intellectual stimulation that lift the human spirit.

We considered a subset of these services in the Dane County land use context that could be relevant and for which we have useable information. These include flood protection, groundwater recharge, water quality protection, habitat protection (biodiversity maintenance) and waste disposal (e.g., land-spreading of animal waste, yard waste, sewage sludge, etc.). "Aesthetic beauty and intellectual stimulation" are considered as part of the landscape amenities analysis.

For our analysis, we divided each of these factors into three categories – critical areas, contributing areas, and non-service areas.

*protect* critical or high-quality resources. Typically, this entails exclusion of most forms of development;

*investigate* potential for restoration or preservation. These are areas that warrant site-by-site investigation to determine if they should be protected or restored in order to maintain or improve ecosystem services;

*manage* areas that could be developed. These are areas that where development could occur if negative impacts on resources within or nearby are mitigated through careful development and management.

## **Landscape amenities**

Landscape amenities are those aspects of the rural landscape that directly enhance human experiences in recreational, cultural, spiritual, or aesthetic terms. In simple terms, these benefits are primarily generated from open, undeveloped land, though it must be recognized that some developed features such as churches, traditional farmsteads, and other cultural icons contribute. Conversely, some forms of development such as quarries, landfills, some industries have particularly strong negative amenity value from a personal perspective. We created an "amenity factor" surface similar to the "land/rental cost" surface created for Farmland Protection. Land Cover/Use information formed the base levels; positive amenities raised and negative amenities lowered the general Land Cover/Use surface.

## **Housing Suitability**

In over-simplified terms, developers will be working with what is left over from the previous analyses – land that is a lower priority for protection based on agricultural or resource criteria. However, this provides little guidance on the sequencing of development or on the how policy

signals could influence patterns and densities of development. To assist in those patterns we have created a “gravity model” (distance-weighted surface), based on

- \* major transportation corridors, particularly rail lines that might ultimately support a commuter rail system (transportation basis);
- \* existing developed areas, particularly incorporated cities and villages providing sewer and water services (density basis);
- \* employment and commerce centers of the county (economic basis).

The suitability analysis was done using a variety of methods including: overlay analysis with shapefiles in ArcGIS and using Model Builder in ArcMap 9.0 for raster and vector weighted overlays.

## **Growth Analysis**

Growth scenarios were done in WhatIf? Software for 25-year growth increments out to the year 2100. Different growth rates, densities and levels of land protection were explored.

## **Impact Assessment**

Impact Assessments were done for different growth scenarios using CommunityViz software including but not limited to:

- Number of new school-age kids
- Loss of prime farmland
- Traffic implications
- Impervious surface areas created
- Environmental impacts
- Cold water fishery impacts

**For a final and more detailed version of this paper with all the graphics please visit our website at [www.lic.wisc.edu](http://www.lic.wisc.edu) or contact Tom McClintock below.**

## References

Falk, Kathleen. 2004. Presentation to Special Joint Meeting of the Comprehensive Planning Steering Committee and the Strategic Growth Management Committee.

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