

DOES PERMANENT FARMLAND PRESERVATION FURTHER GENERAL OPEN SPACE PRESERVATION GOALS? A CASE STUDY IN HUNTERDON COUNTY, NEW JERSEY

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ABSTRACT: *Farmland preservation is an important component of many land preservation programs, defined here as programs that permanently preserved land from development through the purchase of development rights or property. In New Jersey, the primary goal of farmland preservation is to ensure the economic viability of agriculture as an industry. However, proponents of farmland preservation often describe it as having benefits beyond this primary goal. These include many of the benefits typically associated with non-farmland land preservation, such as retaining aesthetic landscape values, providing wildlife habitat, protecting water quality and other environmental amenities. A case study of Hunterdon County, New Jersey, was undertaken to understand how the county's permanent farmland preservation program furthers its non-farmland land preservation goals. The county's ten environmentally oriented open space preservation goals were spatially represented using GIS and compared to the areas of the county eligible for permanent farmland preservation. Only 2 are furthered by the county's farmland preservation program. Furthermore, the full potential for farmland preservation to further these goals depends on farm-specific management techniques. These findings suggest that more integration between farmland and non-farmland preservation programs is needed if farmland preservation is to provide the benefits that many of its proponents claim it already does. The potential for this integration is then explored.*

Keywords: *Open space preservation, Farmland preservation, GIS, Environmental planning*

INTRODUCTION

Farmland preservation programs affect the spatial qualities and arrangement of both agricultural and non-agricultural lands in areas where they have been implemented. To date, only a few studies have examined the spatial consequences of any agricultural policy (e.g., Johnson and Maxwell, 2001). Those studies that have examined this issue focus primarily on the agricultural implications of these consequences (Brabec and Smith, 2002). Recently, researchers have investigated the environmental impact of other agricultural policies using geospatial technologies (Musacchio and Coulson, 2001). This lack of research is a concern because the environmental consequences of farmland preservation are likely to be significant. This is especially true in situations where preserved farmland represents a significant repository of undeveloped land in otherwise rapidly urbanizing areas.

When the environmental consequences of farmland preservation are considered at all, it is often by proponents of farmland preservation seeking to generate support for preservation by implying that its

environmental effects are positive. For instance, in the Governor's and Agriculture Secretary's opening messages to the New Jersey State Agricultural Development Committee's (NJSADC) FY 2000 annual report (NJSADC, 2000), farmland preservation is lauded as being "green and clean", and a vital component of open space preservation. However, certain structural elements of New Jersey's farmland preservation program and common farming practices call into question the validity of the implied connection between "green and clean" open space preservation and farmland preservation. For instance, under the NJSADC standard deed easement for preserved farmland, farmers can convert their preserved agricultural fields to greenhouses, eliminating in many people's eyes the scenic qualities of the landscape that is supposed to be one of the benefits of farmland preservation.

Given that, in New Jersey (NJSADC, 2000), the primary goal of farmland preservation is to preserve agriculture as a viable industry, disjunctures between farmland preservation implementation and the benefits that it supposedly provides to the non-farming residents of the state who pay for it are perhaps not surprising. In his review of thirty years of farmland preservation, Bunce (1998) identifies two

main ideological streams, environmentalism and agrarianism, that have shaped farmland preservation discourse. Within each of these ideologies he points to two conflicting sets of values that have impacted the discourse. He sees environmentalism as contributing both a resourcist perspective and a general ecological perspective. The former promotes farmland preservation in order to retain a resource base for food production while the latter argues for farmland preservation as part of the framework for general environmental protection. The conflicting sets of values within the agrarian stream stem from the progressive interest that promotes the importance of agriculture to national security and from the romantic notion that emphasizes the culture of farming and its importance to connecting nature and humans through land use.

By equating the benefits of farmland preservation with those of general open space preservation, farmland preservation proponents attempt to tap into what Bunce (1998) terms the general ecological protection current of the environmentalist ideological stream. This creates the potential for conflict between farmland preservation and general open space protection if farmland preservation programs are structured and administered in ways that fail to support general ecological protection goals. Some of this conflict may be unavoidable because the goals of these two preservation processes do not completely overlap (Daniels, 2000). However, these conflicts arise in part out of the lack of coordination between farmland and open space preservation. This lack of coordination represents a failure to maximize the potential complementarity between these two processes.

Such a failure may have several significant consequences. By not coordinating efforts to preserve farmland and open space, farmland preservation administrators may be jeopardizing the long-term viability of their programs. In a review of farmland preservation in six nations, Alterman (1997) concludes that countries that have redefined farmland preservation as an element of countryside protection have been more successful at preserving farmland than countries that have based farmland preservation strictly on the grounds of agricultural economics. Kline and Wichelns (1998) point out that public support for land preservation initiatives is based on a complex of preferences, and it may undermine long-term support of farmland preservation efforts if they are being justified on the basis of environmental and aesthetic benefits they have not been designed to provide. This is especially true if the public is more supportive of general open space preservation and its attendant benefits than of farmland preservation

(Kline and Wichelns, 1996). This study attempts to gauge whether and how farmland preservation might help further open space preservation goals. It does so by focusing on the county administered farmland and open space preservation programs in Hunterdon County, New Jersey (Figure 1). Both of these programs seek to preserve land permanently, through the purchase of development rights in the case of the farmland preservation program or the fee simple purchase of property in the case of the open space preservation program. The farmland preservation program focuses on preserving active farmland for agricultural purposes while the open space programs focuses on preserving areas of conservation and recreational value. Although other mechanisms such as zoning and tax relief for owners of agricultural lands are used to prevent or slow the conversion of agricultural or other lands to developed uses, only the acquisition of development rights or property by conservation oriented agencies and organization ensures long-term preservation. The county is not the only organization involved in permanent land preservation in the study area, but by comparing programs run by the same organization, it is hoped that any current or potential synergies between the two programs can be more easily maintained and strengthened.



Figure 1. Hunterdon County, New Jersey.

FARMLAND PRESERVATION IN NEW JERSEY

Statewide effort aimed at retaining working farmland began in New Jersey in 1985, with the implementation of the State Agriculture Retention and Development Act of 1983. This legislation permitted the use of permanent easements to prevent the development of farmland and tasked the New Jersey State Agricultural Development Committee (NJSADC) with managing farmland preservation for the purpose of maintaining agriculture as a viable industry in New Jersey. Through 2005, the NJSADC has administered the preservation of 141,866 acres of farmland (NJSADC, 2006). The NJSADC makes the final determination of what farms will be preserved with state funding. However, each county seeking to preserve farmland uses its county agricultural development board (CADB) to solicit and rank initial applicant farmland according to county criteria. The NJSADC then ranks the top applicants submitted by each county based on its own criteria. Some counties, such as Hunterdon follow this ranking scheme closely while others deviate substantially.

FARMLAND PRESERVATION IN HUNTERDON COUNTY

Hunterdon County, located in the northwestern quadrant of New Jersey, had been predominantly rural until the 1970s. Rapid suburbanization and leapfrog development since then has led to a countywide interest in preserving farmland and general open space. The county's farmland preservation program is one of the most successful in the state and longest running in the state. It was started in 1984, a year before the state began coordinating farmland preservation. Since then, 17,196 acres of farmland have been permanently preserved under its auspices (Hunterdon County CADB, 2006). Hunterdon has set a goal of preserving a total of 50,000 acres by 2010 (Hunterdon County, 2000).

In order to be eligible for preservation through Hunterdon's program, a farm must meet three criteria (Hunterdon CADB, 2006). It must be equal to or greater than 40 acres, no more than 50% wooded and fall within both an Agricultural Development Area (ADA) and an agricultural district. ADAs are areas deemed likely to be able to support agriculture over the long term. They must contain a predominance of high-quality farming soils and not contain a large amount of new development.

Originally delineated in the early 1980s, ADAs have been amended and added since. An agricultural district is an area of farms totaling at least 250 acres that are within one mile of each other and have applied for or enrolled in the farmland preservation program.

Eligible farms that apply for preservation are ranked based on various characteristics. Hunterdon's program gives strong weight to high-quality farming soils, surrounding land uses that do not conflict with agriculture, size of the farm and proximity to preserved farmland. All of these factors were chosen to increase the probability of building core agricultural areas within ADAs that promote the economic viability of agriculture.

Although techniques to apply this ranking scheme to all farmland in the county have been developed (Tulloch et al., 2003), this study uses farmland that is eligible for preservation as the basis for understanding how farmland preservation may contribute to general open space preservation goals. There are two reasons for this. First, using GIS methodology to select those parcels that are eligible for preservation indicates that slightly over 48,000 acres are eligible for preservation. This is less than Hunterdon's stated goal of 50,000 acres. Consequently, all eligible farmland will be preserved if the criteria do not change and the county comes as close as possible to meeting its goal. However, even if the number of eligible acres exceeded the goal, the eligible farmland would still better represent the potential for farmland preservation's contribution to open space preservation goals than any selection of highly ranked farms. Without a means to select farms likely to apply for preservation, any selection of highly ranked farms would be arbitrary.

METHODS

A GIS-based investigation was conducted in order to understand the potential of Hunterdon County's farmland preservation program to further the county's general open space preservation goals. This investigation involved a four step process. First, the general open space preservation goals were translated into criteria that can be mapped as target areas for preservation. Second, the farmland eligible for preservation under current farmland preservation eligibility criteria was determined. Then the areas of overlap between the open space target areas and the projected preserved farmland were calculated. Finally, these areas of overlap were examined to see if they over- or underrepresented the target areas compared to the county as a whole.

Mapping Open Space Target Areas

The Hunterdon County Open Space, Farmland and Historic Preservation Trust Fund Plan (Hunterdon County, 2000) (subsequently referred to as The Plan) details the characteristics of lands targeted by the county's general open space preservation program. The Plan specifies seven open space preservation characteristics relevant to this study. These are conservation zones (e.g. areas of unique conservation value, including river corridors), fragile/rare flora habitat, habitat of endangered and threatened animals, properties adjacent to existing parks, properties in the viewshed of existing parks, and greenway linkages between parks and trail corridors. The characteristics were translated into 10 separate GIS layers, representing target areas for open space preservation, that were analyzed in conjunction with the farmland preservation landscapes as described below.

The conservation zones target area was broken into a layer delineating river corridors and a layer representing the rest of the conservation zones. Four Landscape Project layers represent the endangered and threatened animal habitat, while the Natural Heritage Program Priority Sites layer represents sensitive flora habitat. Adjacency to existing parks, viewshed protection and greenway links were digitized in separate layers.

To determine which areas contained fragile or endangered flora that could not be preserved through other means, the Natural Heritage Programs Priority Sites (NJ Natural Heritage Program, 1999) data layer was used. The Endangered and Nongame Species Program Landscape Project (Niles et al., 2004) data was used to determine areas known to be used by endangered and threatened animals. Those areas defined by the Landscape Project as containing sightings of endangered or threatened animals were extracted from the data layers and combined into a single layer delineating threatened and endangered species habitat.

The adjacency criterion was represented by selecting parcels within 75 feet of an existing county park from the digital parcel data layer available for Hunterdon County. That distance was chosen because other work that has shown it adequately accounts for parcels separated by roads (Tulloch et al., 2003).

The Plan provides no definition of what constitutes a major viewshed of a county park, so the following was implemented. Using 20 ft contour lines derived by the NJDEP from the USGS 100m lattice DEM, the highest point in each county park area was digitized. If there were local maxima, such as a ridge line with two peaks separated by a saddle,

both the local and global maxima were digitized. Most preserved areas had only one point digitized. A single layer indicating areas that could be seen from these points was derived using the USGS 100m DEM and the viewshed function of ArcView 9.1's Spatial Analyst extension.

As a basis for The Plan Hunterdon County (2000) does provide a map of trail priorities. The potential trails were digitized on-screen as lines at a scale of 1:24000 using municipal boundaries, streams and rivers, major roads and preserved open space as base layers. A buffer of 0.25 mile was placed around the line to define the potential trail corridors. To identify linkage areas, lines were digitized connecting preserved open space to other preserved areas or the digitized trail corridors if they were 1 mile or closer at their nearest point. A 0.5 mile buffer was placed around these linkages to define the linkage area.

Farmland Preservation Eligibility

Once the open space preservation characteristics were translated into mapped target areas, the next step was to determine what farmland was eligible for preservation. The Hunterdon County farmland preservation program currently has three prerequisites that a property must meet in order to be eligible for permanent preservation. To be preserved, properties must be in an agricultural development area, at least 40 acres and at least 50% tillable. As described previously, agricultural development areas are areas where agriculture is thought to have the best chance of being economically viable. These prerequisites were used to filter out the ineligible parcels to create a data layer consisting of parcels eligible for preservation under the current preservation eligibility criteria.

RESULTS

The results of the analysis are summarized in Table 1. Difference values in bold denote the amount by which the proportion of eligible farmland exceeds the county at large for the particular target area. Only two of the general open space preservation target areas, grassland critical habitats and river corridors, occupy a higher proportion of the eligible farmland than of the county as a whole. Of those, only the grassland critical habitat goal is considerably overrepresented. Additionally, the priority sites target area is nearly equally represented in both the county and the eligible farmland.

Table 1. Open Space Preservation Target Areas as a Proportion of County vs. Proportion of Farmland Eligible for Preservation

Preservation Target Area	Acres in County	Proportion of County	Proportion Of Eligible Farmland	Difference (Farmland – County)
Greenway Links	137536	0.491	0.260	-0.231
Conservation Zones	92647	0.331	0.124	-0.207
Emergent Wetlands	2193	0.007	0.005	-0.002
Forest	73891	0.264	0.060	-0.204
Grassland	86717	0.310	0.768	0.458
Forested Wetlands	6081	0.022	0.011	-0.011
River Corridors	68203	0.243	0.248	0.005
Priority Sites	5427	0.019	0.018	-0.001
Adjacency	15951	0.059	0.027	-0.032
Viewshed	155721	0.556	0.487	-0.069

DISCUSSION

The current preservation eligibility criteria appear to provide significant protection for critical grassland habitat and, to a lesser extent, river corridor target areas, since these areas occupy a higher percentage of the preservation-eligible farmland than of the county as a whole. However, it is important to note that the value of agricultural lands as habitat for grassland species is extremely dependent on the nature and timing of agricultural activities occurring there (Niles et al., 2004). In light of this condition, the current farmland preservation program in Hunterdon County only protects areas where potential grassland habitat occurs. Because it does not specify management plans and activities that actively protect grassland species, it cannot be concluded that the current farmland preservation program will automatically protect any grassland habitat preserved under its auspices. Similarly, the actual management of river corridor areas has a significant impact on the extent to which river corridors preserved under farmland preservation will actually protect such features as riparian habitat and water quality (Cooper et al., 1987; Lowrance et al., 1997).

The research presented here suggests that current farmland preservation eligibility criteria in Hunterdon County have the potential to help further a subset of the county's general open space preservation goals. In order for this potential to be realized, there must be some effort to coordinate the management of preserved farmland so that the value of grassland habitat and river corridor areas on those farms is maximized. Of course, not all agricultural practices may be commensurable with preserving

grassland habitat or river corridor functionality. Management practices that further the protection of the resources should be encouraged. This encouragement could be in the form of technical assistance in developing management plans, perhaps coupled with financial assistance to establish or maintain beneficial practices. Such financial incentives may be especially appropriate if these practices reduce the profitability of farming. A monitoring program would need to be established to ensure that farmers receiving compensation for ecologically beneficial management were adequately following their management plans. This should not present an insurmountable burden because preserved farmlands must already be monitored for easement violations.

On the other hand, since the farmers who enter into the preservation program receive significant public funding, beneficial management goals could be integrated into the preservation ranking and application process. Farmers who pledge to manage their farms in ways that protect grassland habitat or river corridors could be given preservation priority, or paid an additional per acre bonus for those areas that they pledge to protect. Because compensation would be provided to the farmer at preservation time, a system to penalize farmers who break their management pledges in the future must be created. One way to penalize farmers who break their pledge could use the extant property tax infrastructure. Farmers who break their pledge could be required to forfeit some of their agricultural property tax reduction. Similar to the post-preservation management incentives, this system would require additional monitoring to ensure compliance.

So far the discussion has focused on the capacity of Hunterdon County's current farmland preservation eligibility criteria to further general open space preservation goals. However, another option to pursue is changing the farmland preservation eligibility criteria to better accommodate general open space preservation goals. This is obviously a more radical course of action than simply providing pre- or post-preservation incentives for management activities that reinforce the current preservation criteria's capacity to further general open space preservation goals. It is true that farmland preservation and general open space preservation programs have different goals. However, several benefits could be realized if farmland preservation criteria could be altered to further general open space preservation goals without compromising the ability of farmland preservation to preserve agriculture as a viable industry. The results of Kline and Wichelns (1998) suggest that public support of farmland preservation could be reinforced and possibly deepened by increasing its environmental benefits. Continued public support for preservation programs is important given the programs' continual need for funding. Additionally, increasing the integration between open space preservation and farmland preservation may lead to significant economic savings, since a single easement purchase may satisfy more than one purpose under a more integrated system.

Dolman et al. (2001) provide an example of how environmental concerns can be integrated into agricultural planning. They term their process whole landscape planning (from Cobb et al., 1999), which is defined as a "process of integrated planning across property boundaries, that optimizes the amount, location, configuration and management of habitats and other landscape elements, to deliver environmental, amenity and biodiversity benefits." Although their work takes place in the United Kingdom, their insights may be transferable to Hunterdon County and the rest of United States. They proceed by establishing environmental goals for a 110 sq. km agricultural area, develop four future landscape scenarios (each focusing on different goals), and solicit responses to the different scenarios from farmers and other land managers, with explicit attention given to the farm management and economy implications.

Several elements serve to distinguish this approach from more segmented techniques. The goals and management schemes cross individual property boundaries. This does create complications with regard to participation, but given that resources such as habitat and rivers cross boundaries it follows that successful management scheme must also. The

impacts of the environmental goals are examined with respect to the agricultural goals of landowners and managers before any management activity is taken.

Concepts from this approach could be used in Hunterdon County to make farmland preservation and general open space preservation more integrated. As in the Dolman et al. (2001) example, care must be taken to ensure that the agricultural goals (preservation of agriculture as a viable industry, among others) are not diluted. The following discussion assumes that farmland preservation will continue to work towards substantially different goals than general open space preservation. This assumption is reasonable considering the current institutional infrastructure and funding mechanisms of farmland and open space preservation in New Jersey. It is also important to understand that the Dolman et al. (2001) project is an attempt to institute whole landscape planning into a management, as opposed to a preservation, setting. The agricultural properties involved in that project are likely to remain in agriculture without intervention of local or regional governments.

Integrating whole landscape planning concepts into Hunterdon County's farmland and open space preservation programs requires a significant shift in perspective, but could be accomplished without serious disruption to either program. Currently, farmland preservation and open space preservation proceed almost completely independently from one another in Hunterdon. Yet there exist properties that possess qualities which make them attractive targets for both farmland and general open space preservation. Using geospatial information techniques such as those implemented in this research, these properties could be identified and targeted for preservation by the County. This simple course of action would increase the efficacy of both the farmland and open space preservation programs by allowing a single purchase of property or development rights to satisfy the goals of both programs.

Just as any integration of farmland and open space preservation must take into account the primary purpose of farmland preservation, it must also see that the purposes of general open space preservation are being upheld. If properties are targeted for preservation because they meet the goals of both farmland and open space preservation, issues such as public access for passive recreation that are part of the purpose of open space preservation must be considered. Limited public access has been integrated into several properties preserved as farmland through careful negotiations between the SADC, Green Acres, and the landowners. The

previously discussed techniques for encouraging management on preserved farmland that benefits grassland species can also be seen as an example of how a single property can be managed to achieve the goals of both farmland and open space preservation.

Although the technique employed here takes advantage of the availability of Hunterdon County's high quality digital parcel data layer, the lack of such a layer should not be an impediment to the technique's extension. If it is not possible to identify the actual parcels that are eligible for preservation or likely to be preserved, it should still be possible to develop a set of layers that delineate where preservation criteria exist, similar to what was done in this study for the open space preservation goals. Instead of comparing the set of open space goal layers against the parcels eligible for farmland preservation, that set could be compared to the farmland preservation criteria set. Areas of significant overlap between layers from each set could then be delineated, and would represent areas where joint farmland/open space preservation efforts could be focused there.

CONCLUSIONS

In their current implementations, farmland preservation in Hunterdon County furthers general open space preservation goals in only limited ways. Of the ten environmentally oriented open space goals considered in this study, the current farmland preservation criteria only favored two goals beyond what would be expected from the landscape at random. Furthermore, the full potential of farmland preservation to further these two goals, preserving grassland habitats and protecting river corridors, is dependent on instituting farm-specific management techniques. Currently, no mechanisms exist within the farmland preservation program for instituting and monitoring such management regimes. Several possibilities, including tax incentives and additional financial and technical support, are suggested.

Altering the criteria used to determine eligibility may improve the capacity of farmland preservation to further general open space preservation goals, but any changes to farmland preservation criteria must respect the fact that farmland preservation is intended to preserve agriculture as a viable industry. Given that farmland preservation and general open space preservation programs have different purposes, the capacity for integration of these programs may be limited. However, by comparing where eligible farmland overlaps open space goals, areas that would benefit

from joint farmland and open space preservation efforts can be targeted, potentially increasing the efficacy and efficiency of both programs.

The use of geospatial technologies has proven instrumental in examining the effects farmland and open space preservation. Despite significant advancement in the capability and ease of use of the technologies over the past 15 years, those in charge of the preservation planning process do not seem to always avail themselves to even simple applications of the technologies. A simple analysis in this study indicated that the current farmland preservation eligibility criteria used in Hunterdon County fail to include enough acreage to meet the county's preservation goal. By highlighting such fundamental applications and providing an indication of the power of more advanced analyses, it is hoped this study will generate further investigation into the use of geospatial technologies to explore the impacts of land preservation policies.

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