

ABSTRACT

Title of dissertation: DO SMART GROWTH INSTRUMENTS IN MARYLAND MAKE A DIFFERENCE?

Rebecca Lewis, Doctor of Philosophy, 2011

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In 1997, Maryland passed a package of legislation collectively referred to as “smart growth.” This innovative “inside/outside” approach to managing growth relies on targeting state resources to encourage growth and investment in existing urbanized areas and areas planned for development (Priority Funding Areas) while discouraging growth and encouraging the preservation of rural areas (Rural Legacy Areas.) Maryland’s approach to managing growth relies on the targeting of resources into these spatially designated areas through state programs. Additionally, the state also created or re-designed several revitalization programs to spatially target resources to encourage revitalization and redevelopment.

In three related essays, my dissertation examines the efficacy of three smart growth instruments in Maryland: Priority Funding Areas, Rural Legacy Areas, and Community Legacy Areas. In studying the implementation and outcomes of smart growth instruments, I consider the impact of these policies on development, preservation, and redevelopment patterns. I explore whether targeting resources through the Priority Funding Areas program has been effective in directing development into Priority Funding Areas. I examine whether directing conservation funds into Rural Legacy Areas has restricted development in Rural Legacy Areas. Finally, I examine whether Community Legacy Areas have been effective at encouraging renovation in targeted areas.

Overall, I found that the performance of these instruments has been mixed. Because implementation was inconsistent and because the instruments were not well integrated with local planning statutes, smart growth in Maryland has fallen short of expectations. In most cases and with some exceptions, the impact of smart growth instruments on development, preservation, and redevelopment patterns has been slight. To improve performance in these policy areas, the state should consider better integration with local planning statutes and state budgeting processes. For states considering a spatially targeted incentive approach, I suggest that it is important to analyze the impact of state spending on development decisions and carefully consider how spatial targeting will be nested in existing state and local processes. But in the face of high development pressure and lacking strong local planning, it is unlikely that the state budget alone will be enough to impact development, redevelopment, and preservation decisions.

DO SMART GROWTH INSTRUMENTS IN MARYLAND MAKE A DIFFERENCE?

by

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TABLE OF CONTENTS

List of Tables.....	iv
List of Figures.....	v
Introduction.....	1
Literature Review.....	3
Conceptual Framework.....	11
Essay #1: Managing Growth with Priority Funding Areas: A Good Idea Whose Time is Yet to Come.....	18
<i>Statutory Context</i>	22
<i>Horizontal Integration</i>	28
<i>Vertical Integration</i>	42
<i>Development Patterns</i>	48
<i>Regression Analysis</i>	64
<i>Summary and Conclusions</i>	68
Essay #2: Maryland's Rural Legacy Program: Evaluating An Incentive-Based Approach to Discouraging Development.....	73
<i>Statutory Context</i>	81
<i>Implementation</i>	86
<i>Measures of Development and Preservation</i>	98
<i>Development Patterns</i>	113
<i>Spatial Patterns of Development</i>	128
<i>Summary and Conclusions</i>	138
Essay #3: Does Maryland's Community Legacy Program Influence Redevelopment Decisions?.....	143
<i>Statutory Context</i>	149
<i>Community Legacy Areas in Baltimore City</i>	151
<i>Impact of Community Legacy Areas on Renovation</i>	158
<i>Spatial Patterns of Renovation</i>	186
<i>Summary and Conclusions</i>	192
Policy Implications.....	195
Appendix: Letter to Dean of the Graduate School.....	203
References.....	204

LIST OF TABLES

Table 1: “Growth-Related” Projects and Exceptions by Agency.....	27
Table 2: “Growth-Related” Expenditures by Agency by Year in Total and Percentages.....	37
Table 3: Maryland Department of Transportation Growth-Related Funds by Smart Growth Status category FY99-FY09.....	38
Table 4: Exceptions Reviewed by Smart Growth Coordinating Committee 2000-2009.....	40
Table 5: Exceptions Reviewed by Smart Growth Coordinating Committee 2000-2009.....	40
Table 6: Average Annual Parcels Developed 1990-2007.....	57
Table 7: Average Annual Acres Developed 1990-2007.....	59
Table 8: Average Annual Parcel Size for Parcels Developed 1990-2007.....	62
Table 9: Data Sources for Priority Funding Areas Regression Analysis.....	65
Table 10: Priority Funding Area Regression Result.....	67
Table 11: Rural Legacy Program Grants Awarded 1999-2009.....	92
Table 12: Applications and Funding Decisions by Year.....	93
Table 13: Funding by Year in Rural Legacy Areas.....	94
Table 14: Zoning Summary by Rural Legacy Area.....	97
Table 15: Average Parcels and Acres Developed in Rural Legacy Area Before and After Act.....	126
Table 16: Average and Difference in Global Moran’s I Values by Rural Legacy Area.....	133
Table 17: Funding by Community Legacy Area FY2002-FY2009.....	154
Table 18: Community Legacy Area Regression Data and Sources.....	159
Table 19: Policy Areas in Baltimore City.....	164
Table 20: Descriptive Statistics.....	168
Table 21: Probit Model Regression Results (Models 1-3).....	173
Table 22: Probit Model Regression Results (Models 4,6,7).....	174
Table 23: Probit Model Regression Results (Model 5).....	175
Table 24: Tobit Model Regression Results (Models 1-3).....	176
Table 25: Tobit Model Regression Results (Models 4,6,7).....	177
Table 26: Tobit Model Regression Results (Model 5).....	178
Table 27: Likelihood Ratio Test.....	179
Table 28: Expected Signs v. Actual Signs.....	180
Table 29: Prediction Value of Models.....	184

LIST OF FIGURES

Figure 1: Effect of Priority Funding Areas and Community Legacy Areas in Urban Economics Framework.....	15
Figure 2: Effect of Rural Legacy Areas in an Urban Economic Framework.....	17
Figure 3: Priority Funding Areas in Maryland.....	19
Figure 4: Total “Growth-Related” Capital and Transportation Appropriations by Agency FY 1999-FY2009.....	33
Figure 5: Average Percent of “Growth-Related” Funds FY 1999-FY2009.....	33
Figure 6: MDOT Construction Spending by Agency FY1999-FY2009.....	36
Figure 7: MDOT Spending by Smart Growth Status FY 1999-2009.....	36
Figure 8: Priority Funding Areas in Select Counties.....	46
Figure 9: Parcels Developed Outside PFA 1990-2007.....	52
Figure 10: Parcels Developed Outside PFA 1990-2007.....	52
Figure 11: Parcel Size Inside and Outside PFA 1990-2007.....	53
Figure 12: Rural Legacy Areas in Maryland.....	75
Figure 13: Protected Lands in Maryland.....	76
Figure 14: Rural Legacy Application Process.....	84
Figure 15: Potential for Contiguity.....	104
Figure 16: Percent of Acreage Preserved by Rural Legacy Area.....	105
Figure 17: Percent of Parcels in Rural Legacy Area by Acreage Range – Designation Year.....	106
Figure 18: Percent of Parcels in Rural Legacy Areas by Acreage Range -2008.....	107
Figure 19: Fragmentation in Rural Legacy Area – Designation Year and 2008.....	109
Figure 20: Percent of Parcels Developed by Rural Legacy Area.....	110
Figure 21: Percent of Acres Developed by Rural Legacy Area.....	111
Figure 22: Total Parcels Developed in Rural Legacy Areas.....	116
Figure 23: Total Acres Developed in Rural Legacy Areas.....	116
Figure 24: Total Parcels Developed in Rural Legacy Areas by Region.....	117
Figure 25: Total Acres Developed in Rural Legacy Areas by Region.....	117
Figure 26: Changes in spatial concentration within Rural Legacy Areas.....	132
Figure 27: Spatial Patterns of Development in Upper Patuxent-Howard and Montgomery.....	134
Figure 28: Spatial Patterns of Development in Foreman Branch and Land’s End.....	135
Figure 29: Spatial Patterns of Development in Piney Run.....	136
Figure 30: Spatial Patterns of Development in Carrollton Manor.....	137
Figure 31: Community Legacy Areas in Maryland.....	145
Figure 32: Community Legacy Area Designation Dates.....	155
Figure 33: Community Legacy Area State Funding FY2002-FY2009.....	156
Figure 34: Community Legacy Area Categorization.....	157
Figure 35: Residential Properties in Baltimore City.....	165
Figure 36: Neighborhood Amenities.....	166
Figure 37: Policy Areas.....	167
Figure 38: Local Moran’s Index.....	190
Figure 39: Hotspots and Cold Spots.....	191

Introduction

Maryland burst onto the state land use planning scene in 1997 with a package of legislation collectively referred to as smart growth. By targeting state resources, the state sought to encourage growth inside certain areas (called Priority Funding Areas) while discouraging growth and encouraging preservation of rural areas (called Rural Legacy Areas). Early state growth management programs were regulatory in orientation and this “Inside/Outside” model offered an innovative, incentive-based approach to managing growth. (Knaap & Frece, 2007)

The crux of Maryland’s smart growth program relies on spatially targeting financial resources into certain areas for specific purposes. In three related essays, this dissertation explores the efficacy of three smart growth instruments in Maryland: Priority Funding Areas, Rural Legacy Areas, and Community Legacy Areas.

In the first essay, I evaluate the centerpiece of the smart growth legislation: Priority Funding Areas. To encourage development in Priority Funding Areas (PFAs), the state spatially targets certain types of state spending to locally designated, state reviewed growth areas, which are considered suitable for development based on existing and planned densities and infrastructure capacity.

In the second essay, I evaluate the complementary instrument to Priority Funding areas: Rural Legacy Areas (RLAs). Seeking to protect critical agricultural, cultural, and resource lands and inhibit growth in locally sponsored, state-approved Rural Legacy Areas, the state targets conservation spending to these areas.

In the third essay, I consider the impacts of revitalization programs on redevelopment in Maryland. Under the banner of smart growth, several revitalization programs were created or re-designed to spatially target state spending. A leader in smart growth efforts in the state, the Department of Housing and Community Development targets financial resources in several programs to designated areas called Community Legacy Areas (CLAs), Neighborhood Revitalization Areas, and Neighborhood Conservation Areas. The Department of Business and Economic Development provides tax credits to encourage investment in Enterprise Zones, or areas targeted for revitalization. I focus on the Community Legacy Program, which provides funding to locally sponsored, state designated areas for projects designed to strengthen existing communities through business retention and attraction and by encouraging commercial and residential revitalization.

This comprehensive, incentive-based strategy employed by Maryland seeks to alter development, preservation, and redevelopment decisions. If smart growth policies in Maryland have been effective, I expect that development will be more likely inside PFAs after the implementation of the Smart Growth Areas Act and less likely inside RLAs after the implementation of the Rural Legacy Program legislation. Additionally, I expect that redevelopment will be higher in areas designated as Community Legacy Areas. Beyond examining the impacts of these policies on development and redevelopment patterns in Maryland, I also study the implementation of these programs. In policy analysis, researchers often conduct analyses under the assumption that after a policy is enacted, it is implemented. (Smith, 1973) However, the implementation of public policies impacts the ability of these programs to reach stated or implicit goals.

This dissertation offers insights into the effectiveness of a spatially targeted incentive-based approach to managing growth at the state level. This analysis is not only relevant to Maryland, but to the many other states that have implemented incentive-based growth management programs and to states looking for an effective way to manage growth at the state level. This research also offers valuable findings for federal and local programs that target funding for specific purposes and provides lessons for other types of federal financing which have not been spatially targeted in the past, like stimulus (or American Recovery and Reinvestment Act) funding for infrastructure and energy investment. These decisions also impact development patterns. I offer insights into whether incentives are strong enough impact development, preservation, and redevelopment patterns and how programs should be designed within political realities to effectively manage growth.

Literature Review

State Growth Management

As early as the 1960s, planning in some states shifted from the local level to state level as state growth management programs were instituted across the country. The process, design, and effects of each of these programs have varied tremendously. As pointed out by Bollens (1993), state growth management programs take many forms and serve diverse purposes. The reasons for state involvement in land use are debatable, but most scholars agree that state planning emerged as a means of mediating problems spilling over jurisdictional boundaries. (Healy and Rosenberg, 1979) Initially, the aims of state

growth management programs were primarily environmental, though the focus has broadened over the years. (DeGrove, 1984; DeGrove, 2005)

John DeGrove explains the evolution of state land use policy in three waves from growth management of the 1970s to modern smart growth programs. (DeGrove, 1984; DeGrove, 1992; DeGrove, 2005) The first wave of growth management in the 1970s was rooted in concern for environmental protection and land preservation. This first wave of growth management programs was dubbed “the quiet revolution” by Bosselman and Callies in their seminal 1971 book on heightened state land use activity in the 1960s. (Bosselman & Callies, 1971) Seven states including Oregon, Hawaii, California, North Carolina, Vermont, Florida, and Colorado, enacted “first-wave” programs and these programs were primarily regulatory. Only in Hawaii and Oregon were the programs geographically comprehensive in encompassing the entire state rather than regions or coastal areas. Since the 1970s, many of these early programs have changed dramatically or have been repealed entirely. In the second wave of growth management in the 1980s and early 1990s, the language and content of the programs shifted from limiting growth to planning for growth. Infrastructure was also identified by these states as an important planning tool. Florida, New Jersey, Vermont, Main, Rhode Island, Georgia, and Washington enacted growth management legislation of this type. (DeGrove, 1992) The third wave, called “smart growth,” gained speed in the late 1990s following Maryland’s example. These programs are growth accommodating not growth restrictive, and rather than using regulatory instruments like growth boundaries and requirements for local plans, states use incentives and disincentives to encourage revitalization in cities and preservation of farms and forests. Though Maryland was the first state to pass smart growth legislation,

in recent years, Massachusetts, Minnesota, Utah, Pennsylvania, Tennessee, and Connecticut have passed similar legislation. (DeGrove, 2005; Lewis, Knaap & Sohn, 2009; Ingram et. al., 2009)

Throughout the 1970s, 1980s, and 1990s, scholars conducted numerous comparative qualitative reviews and case studies of growth management programs, comparing these programs, both in design and implementation. Only recently have quantitative studies evaluating comparative outcomes of growth management emerged.

Qualitative evaluations of state growth management programs emerged as early as 1971 with the seminal and often cited Bosselman and Callies piece *The Quiet Revolution in Land Use Control*. (Bosselman & Callies, 1971) This book focused on the shift from local land use control to state and regional laws, highlighting case studies of state level activity in the 1960s and early 1970s in Hawaii, Vermont, Massachusetts, and Maine and other regional or single-issue programs emerging during this time period. Analyzing the existing programs in 1971, the authors provide insights on the future of state planning and highlight potential trends. (Bosselman & Callies, 1971) This legislation of the “quiet revolution” falls under DeGrove’s “first-wave.” (DeGrove, 1984; Ingram et. al., 2009) In later work, Callies (1996) revisits these original cases, highlighting changes to the program and adding a case about Maryland. Healy & Rosenberg (1979) explore case studies of California, Florida, and Vermont, outlining factors leading up to state involvement in land use. The authors relate state actions to the 1976 American Law Institute Model Land Development Code. Comparing across states, the authors highlight factors contributing to alternative approaches to state involvement in land use in the three states. Attention is paid to issues arising in implementing state land use controls, and the

authors provide recommendations for crafting policies at the state level, making the case that mandatory local planning and review of local land use decisions are quintessential to effective state-level growth management programs. It is these criteria that many later point to as the definitive components of state growth management programs. DeGrove (1984; 1992; 2005) presents extensive case studies on several growth management programs in three different volumes. DeGrove synthesizes the knowledge gained from case studies to identify common issues and offer general conclusions, noting the critical role of gubernatorial attention to the success of state growth management efforts.

In recent years, as data has become available for analysis, several quantitative studies of growth management programs have been published. Comparing non-growth management states to growth management states, some studies find growth management to have insignificant, even negative, effects (Anthony, 2004), while others find growth management to be effective in achieving desirable outcomes (Yin & Sun, 2007; Nelson, 1999; Wassmer, 2006.) In studies that compare among growth management states, certain components of growth management programs are identified as important. Consistency and enforcement intensity are two such components (Carruthers, 2002.) Horizontal and vertical consistency were found to have negative impacts on the size of the urbanized area, but internal consistency were found to have a stronger positive impact on the size of urbanized area. (Wassmer, 2006) Programs with strong implementation efforts were found to curtail sprawl more than programs with weak or moderate implementation. Moderate intensity states were found to have higher levels of sprawl, as compared with national statistics. (Howell-Moroney, 2007) Some studies found that the duration of the program is not important to impacting development patterns (Anthony, 2004; Yin & Sun,

2007) but others conclude that it is important. (Nelson, 1999) Dawkins & Nelson (2003) found that state growth management programs resulted in a higher share of construction in central cities.

Since the first growth management programs of the 1960s and 1970s, the literature on individual states has been extensive, and there have been a number of studies and debates about what constitutes a growth management program. In an extant review of the state growth management planning, Weitz (1999) provides a summary of the literature on state-specific growth management plans. Weitz focuses on identifying growth management programs and determining which states should be considered growth management states. This review is also supplemented by an extensive annotated bibliography including over 300 books, articles, and reports about state growth management.

Land Use Policy and Smart Growth in Maryland

Though Maryland did not pass legislation early compared to other states in the first and second waves, in recent years Maryland has been perceived as a leader among growth management states. However,, like states in the first-wave of growth management, early land use policies in Maryland were rooted in environmental concerns. As the gatekeeper to the Chesapeake Bay, the health of the bay has been instrumental in pushing land use and environmental policy in Maryland since the 1980s. (Knaap & Lewis, 2009) The 1984 Critical Areas Act, which limits the type and quantity of development within 1,000 feet of the Chesapeake Bay, was passed in the wake of the 1983 EPA report. A 1988 report by the Year 2020 Panel served as the impetus for stronger local planning

requirements in Maryland's 1992 Economic Growth, Resource Protection, and Planning Act. (Knaap & Lewis, 2009; Cohen, 2002)

At the time, the 1992 Act was Maryland's most significant piece of state planning legislation in the "growth management era." Though Maryland had the first statewide planning commission in the 1930s and the General Assembly outlined guidelines for a state development plan in 1974, the state commission was later absolved and such a plan has never been completed, though a state development plan is currently in the works. (Knaap & Lewis, 2009)

Under the 1992 Act, local governments were required to revise comprehensive plans to address seven visions, which were phrased as broad statements of principle. (Cohen, 2002) These visions were later updated to include an eighth, and were replaced by twelve new visions crafted by the Task Force on the Future of Growth and Development in 2009. (Maryland Department of Planning, 2008) Under the 1992 act, local governments were also required to consider sensitive areas and update their plans every six years. Local comprehensive plans are reviewed by MDP but the department does not have approval authority over local plans. Also important to the 1992 Act, according to the statute, state spending must be consistent with local plans.

While the 1992 Act strengthened requirements for local planning, it did not fundamentally alter the structure of land use governance; instead it served as a platform for broader land use reform five years later. (Knaap & Frece, 2007; Knaap & Lewis, 2009)

Governor Parris N. Glendening introduced the idea of smart growth in 1996, stating a commitment to a comprehensive package of legislation to strengthen the state's capacity to alter growth, preservation, and revitalization decisions. (Cohen, 2002) Underlying these policies was the presumption that the state should not subsidize sprawl development and resources should be targeted into areas with existing infrastructure. (Cohen, 2002) Passed in the next legislative session, the 1997 Smart Growth and Neighborhood Conservation Initiative included five components (Knaap, 2005; Knaap & Frece, 2007; Cohen, 2002):

- The Smart Growth Areas Act (or Priority Funding Areas): State funding for new water and sewer infrastructure, new roads, and some housing, and economic development programs are limited to developed areas or areas planned for growth (Priority Funding Areas).
- Rural Legacy Program: State funding for preservation is targeted to Rural Legacy Areas which are areas with high agricultural, forestry, natural and cultural value and threatened by development.
- Brownfields Voluntary Cleanup and Revitalization Program: Provides financial incentives and technical assistance for redevelopment and clean up of abandoned or underutilized properties.
- Job Creation Tax Credit Act: Provides tax credits to businesses that create over 25 jobs within Priority Funding Areas.
- Live Near Your Work Program: Provides incentives for employees buying homes in proximity to their workplace.

These programs are incentive-based rather than regulatory and were intended to alter the way the state spends money on growth, community revitalization, and land preservation. The strongest components of the package representing the “inside/outside approach” are Priority Funding Areas and Rural Legacy Area. (Knaap & Frece, 2007) The Live Near Your Work Program was a short-lived pilot program and funding for the brownfields program waned after the initial years of the program. (Knaap & Frece, 2007; Knaap & Lewis, 2007)

After the original act in 1997, the state created and passed additional programs to support the original smart growth initiatives. In 2001, the legislature passed bills creating the Community Legacy Program and the GreenPrint Program. The Community Legacy program was created to provide funding for activities in Community Legacy Areas that stimulate reinvestment and strengthen neighborhoods. The GreenPrint program was a land conservation tool designed to protect land based on ecological value, targeting “hubs” larger than 300 acres in size and the “corridors” that connected these hubs. The GreenPrint program provided funding for land conservation from FY2002 to FY2005 when it sunset, and awarded \$52 million for land conservation during this span. (Maryland Department of Agriculture, 2008)

Since the smart growth legislation passed in 1997, much has been written in the press and academic literature about the program. Many of the published studies and books about Maryland’s smart growth program are largely descriptive, focusing on the political arrangements that led to the type of land use policy that exists in Maryland, offering guidance on how to implement the policy in the early years, and in later years, providing recommendations for policy reform. (Haeuber, 1999; Frece, 2001; Glendening, 2001;

Glendening, 2002; Cohen, 2002; Glendening, 2004; Knaap, 2004; Frece, 2005; Knaap, 2005; Knaap & Frece, 2007; Frece, 2008)

The few empirical studies of smart growth in Maryland have often focused on a single component of the smart growth program. Knaap & Lewis (2007), Lewis, Knaap & Sohn (2009), Hanlon, Howland & McGuire (2009), Howland & Sohn (2007) and Sohn (2008) examine aspects of the Priority Funding Areas program. Sohn & Knaap (2005) examine Job Creation Tax Credit incentives in Priority Funding Areas. Howland (2003) and Guignet & Alberini (2010) focus on the Brownfields Revitalization Program. Shen & Zhang (2007) examine both Priority Funding Areas and Rural Legacy Areas. Lynch & Liu (2007) and Liu & Lynch (2009) focus on the Rural Legacy program. Tassone et al. (2004) and Lynch (2009) discuss several land conservation programs including the Rural Legacy Program. I will discuss the findings of these studies in greater detail in setting up individual essays. State agencies within Maryland often publish data related to smart growth legislation, but less often published comprehensive reports and research. Beyond meeting statutory requirements for reports, state agencies seldom evaluate themselves and their policies.

Conceptual Framework

Policy Analysis: Implementation Framework

Many policy analyses skip the question of implementation and focus exclusively on the outcomes of legislation. (Smith, 1973) However, the implementation of programs and policies affects the ability of programs to reach stated goals and outcomes. To study the implementation of smart growth programs in Maryland, I follow the general guidance of

Mazmanian & Sabatier (1989) who draw a distinction between 1) formulation and adoption of policy; 2) implementation by administrative agencies; and 3) reformulation by the policymaker based on successes and difficulties of administration. In examining the implementation of these policies, I study the original intent of the law, how the laws were supposed to be enacted according to the statutes, and how the laws changed (or failed to change) the way state and local agencies make decisions. This information provides a framework for evaluating the outcomes of smart growth instruments in Maryland. Because these programs are incentive based, I also examine the level of funding and expected impact of the funding on development patterns.

Mazmanian & Sabatier (1989) offer several potential evaluative criteria for framing implementation analysis. In evaluating smart growth instruments in Maryland, because the program is incentive-based rather than regulatory, the most appropriate evaluative criteria is the original policymakers' intent. Collectively, these policies were designed to curtail sprawl development in Maryland. Specifically, the Priority Funding Areas legislation focuses on directing growth to existing and planned areas for development; the Rural Legacy Program focuses on limiting development on critical resource lands; and the Community Legacy Program focuses on revitalizing urban cores. In evaluating implementation, it is important to consider that while counties were all required to designate Priority Funding Areas that were reviewed by the state, Rural Legacy and Community Legacy designation is optional and has occurred incrementally since the statutes went into effect. Applicants to these two programs are encouraged to submit areas for designation in order to receive incentives. This critical distinction impacts the implementation and outcomes of the programs.

Development Patterns: Urban Economic Framework

The success of smart growth instruments in Maryland hinges on the ability of state financial incentives to increase development inside Priority Funding Areas, decrease development in Rural Legacy Areas, and increase redevelopment in revitalization areas. These outcomes are dependent on the implementation of the policies and programs as noted above, and the level of incentives provided. The Priority Funding Areas Act and Community Legacy Program provide incentives for building or redeveloping in certain areas while the Rural Legacy Program provides incentives to landowners not to develop.

If Priority Funding Areas are designed to fund public infrastructure in targeted areas, the effects of PFAs can be considered in a simplified urban economic framework. In standard urban economics, the bid rent curve shows that land rents are a decreasing function of distance to the urban core. That is,

$r = r(d)$, where r = rents; d = distance to cbd; and $\delta r / \delta d < 0$.

Assume that the level of private investment in capital per acre (or structural density) is an increasing function of r and public investment. That is,

$k = k(r(d), I)$, where k = private capital; I = public investment per acre; and $\delta k / \delta r$ and $\delta k / \delta I > 0$.

Finally, suppose that the level of public investment inside Priority Funding Areas is greater than outside. That is, $I_i > I_0$, where I_i = public investment inside Priority Funding Areas and I_0 = public investment outside Priority Funding Areas. Under these conditions

private capital will be greater inside Priority Funding Areas than outside as long as $I_i > I_0$ and $\delta k / \delta I > 0$.

This simple model is shown graphically in Figure 1. To keep the model simple, I use linear relationships to represent the expected impacts of these policies, though it is likely that the impacts are not linear. Priority Funding Areas are illustrated by the blue line. Along the x-axis, to the left of the blue line, is within the Priority Funding Area. The density gradient inside the Priority Funding Area shifts upwards to $k = f(I_i, r(d))$ because of the availability of public investment funding within this area. In the figure, structural density falls continuously with distance from the CBD if there are no Priority Funding Areas, as shown by the line $k = f(I, r(d))$. Assuming that spatial growth areas are circumferential around a central urban core, the introduction of a Priority Funding Area causes a kink in the structural density gradients because there is a discontinuous gap in the level of public investment.

On the graph, Community Legacy Areas are illustrated by the maroon line. Along the x-axis, to the left of the maroon line, is within the Community Legacy Area. According to state policy, Community Legacy Areas must be located inside Priority Funding Areas. Suppose that the level of public investment inside Community Legacy Areas is greater than outside.

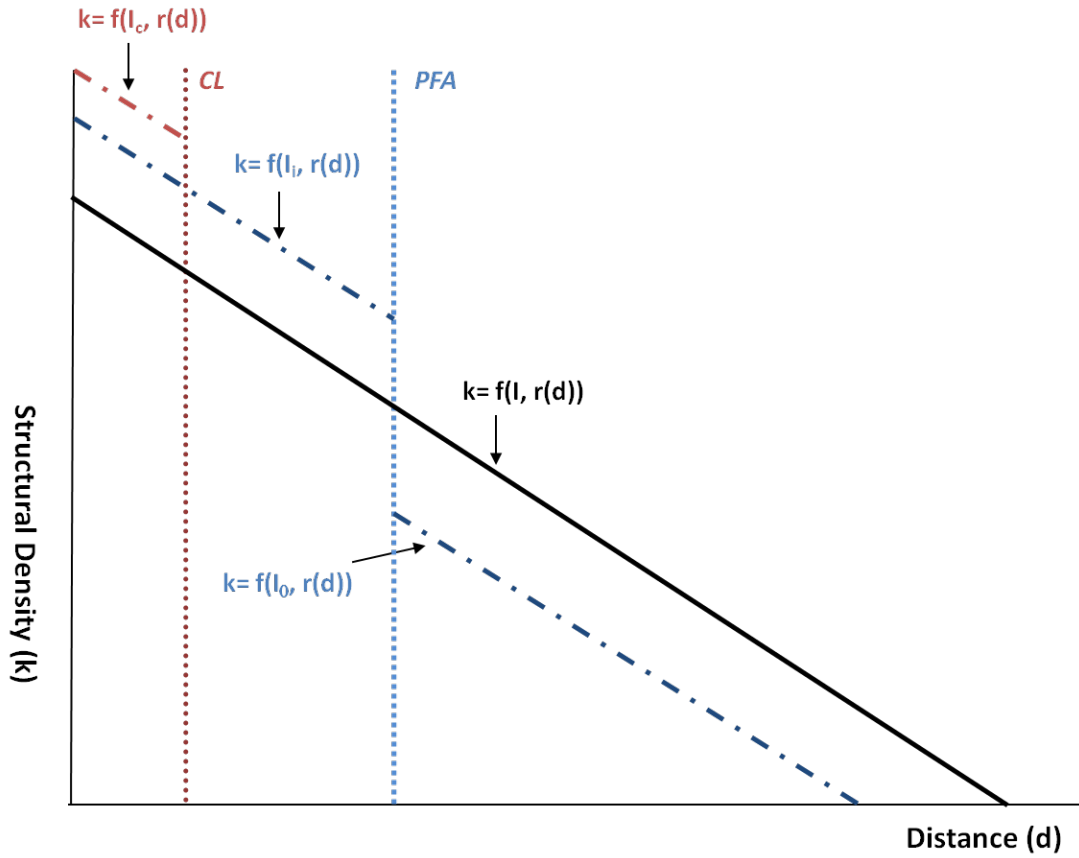


Figure 1: Effect of Priority Funding Areas and Community Legacy Areas in Urban Economics Framework

In considering Community Legacy Areas, I_c = public investment inside Community Legacy Areas. The new density gradient inside the Community Legacy Area shifts upwards to $k = f(I_c, r(d))$ because of the availability of additional public investment funding within this area. Because Community Legacy Areas are already developed (as opposed to Priority Funding Areas, which contain 20 years of development capacity) to obtain this densification inside Community Legacy Areas, it is likely that redevelopment or reinvestment will be necessary.

The effects of Rural Legacy Areas can be considered using density gradients and rent functions. In Figure 2, the Rural Legacy Area is denoted by the green line. Along the x-

axis, assume that to the right of the green line falls within the Rural Legacy Area. The bid rent curve shows that land rents are a decreasing function of distance to the urban core. That is, $r = r(d)$, where r = rents; d = distance to cbd; $r(a)$ = agricultural rents; and $\delta r / \delta d < 0$. The density gradient $r(d)$ falls as distance to the urban core increases. The Rural Legacy Program provides financial incentives to landowners to keep their land in rural use. Along the graph, development (or the urban/rural boundary) occurs when urban rents or $r(d)$ are equal to agricultural rents $r(a)$. The provision of the incentives to individual parcels inside the Rural Legacy Area shifts the agricultural rents $r(a)$ upwards to $r(a_{RL})$ beyond the Rural Legacy boundary, moving the intersection of the urban and agricultural rent gradients and thus urban/rural boundary closer to the central business district. Further, development in the Rural Legacy Area diminishes because of this effect. Because not all development in the Rural Legacy Area is prohibited, the $r(a_{RL})$ does not shift as high as the intersection of agricultural and urban rents.

In evaluating smart growth in Maryland, the relationship between implementation and outcomes is critical. The design of the law, implementation by state agencies, and level of incentives will impact the trends in development patterns over time. By studying both implementation and outcomes, I am able to make connections between the impact of program design and implementation on trends in development patterns over time.

Theoretically, incentives should impact development patterns in a desirable manner, consistent with the intention of the program. But if the incentives are negligible, if the policy was not designed coherently, or if the policy was not implemented, these smart growth instruments may not have an impact on development patterns. In explaining outcomes and trends, I refer to data on funding and implementation to explain results.

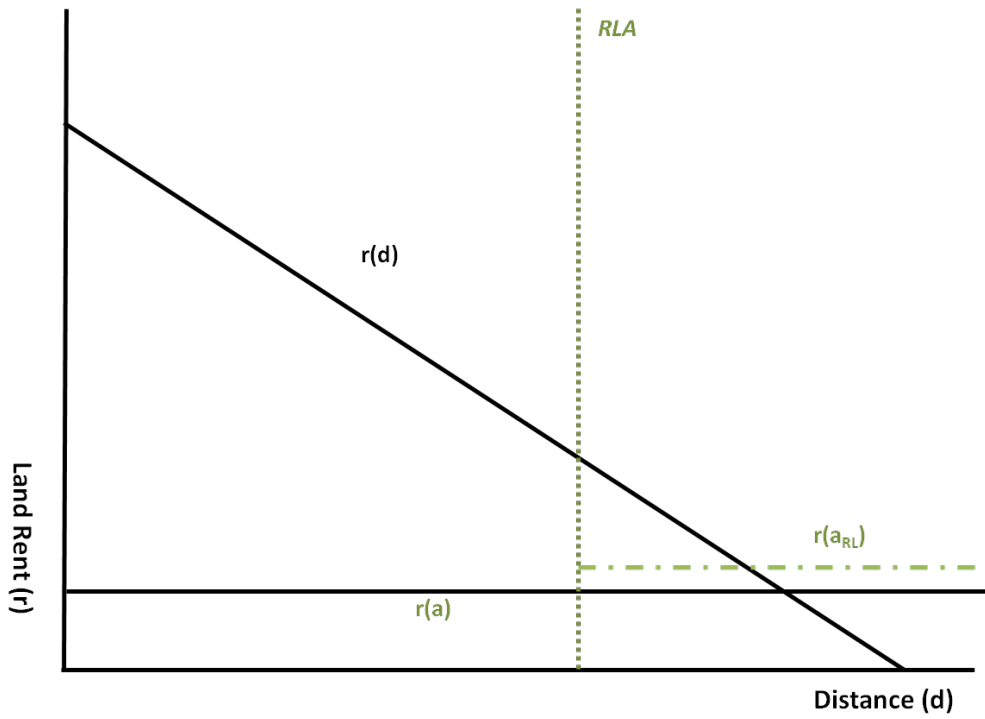
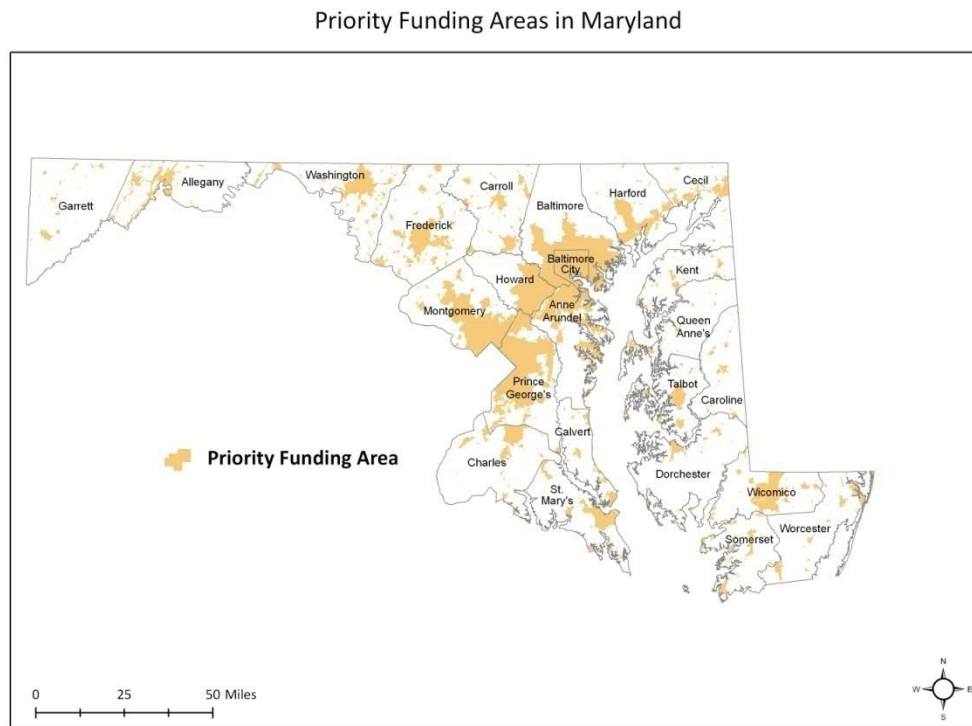


Figure 2: Effect of Rural Legacy Areas in an Urban Economic Framework

Essay #1: Managing Growth With Priority Funding Areas: A Good Idea Whose Time Has Yet to Come

In this essay, I examine the cornerstone of Maryland’s smart growth program: Priority Funding Areas. As required by the statute, all counties must designate Priority Funding Areas and these areas are reviewed by the Maryland Department of Planning. Under the Act, unless an exception or exemption is granted, PFAs are the only places where the state spends growth-related funds for new infrastructure and some revitalization and economic development programs. According to state statute, PFAs automatically include certain areas of the state—Baltimore City, other incorporated municipalities, areas within the Baltimore and Washington Beltways, and designated neighborhoods, enterprise zones, and heritage areas. In addition to areas designated as PFAs by statute, local governments can designate additional areas as PFAs if they meet certain criteria, based on existing and planned densities and infrastructure. (Maryland Code Annotated: State Finance & Procurement Article, §§ 5-7B-01 to -10, 2010) A map of PFAs is shown in Figure 3. Specific categories of spending for roads, housing programs, water and sewer infrastructure, state buildings, and certain economic development incentives are defined by the statute as “growth-related.” (See Table 1) Certain types of spending for five agencies are subject to the PFA law: the Department of Transportation, the Department of Housing and Community Development, the Department of Environment, the Department of General Services, and the Department of Business and Economic Development. (Maryland Code Annotated: State Finance & Procurement Article, §§ 5-7B-01 to -10, 2010)

Though Priority Funding Areas have been the subject of much criticism and praise, empirical studies have been limited. Using land use and land cover data, Shen, Liao & Zhang (2005) and Shen & Zhang (2005) examined the effects of PFA and Rural Legacy Areas on land use conversion in Maryland from 1992 to 1997 and 1997 to 2002. Using a logit model and land use land cover data, the authors found that after the passage of smart growth legislation in 1997 urban development was more likely inside PFAs and less likely in Rural Legacy Areas though the effects varied by county.



Map created July 2010 by Rebecca Lewis
Data Sources: U.S. Census; Maryland Department of Planning

Figure 3: Priority Funding Areas in Maryland (Source: Maryland Department of Planning; U.S. Census)

Howland & Sohn (2007) examined the effects of PFAs on investments in wastewater infrastructure concluding that investments in water and sewer infrastructure were more

likely inside than outside PFAs between 1997 and 2002. They also found counties that received more state funding were more likely to invest in water and sewer infrastructure projects inside the PFA. Additionally, however, they found that investments in infrastructure continued outside PFAs even with funds provided by the state. Sohn & Knaap (2005) examined the effects of PFAs on job growth in Maryland. Although job creation tax credits are available throughout the state, since 1997, greater credits are available within PFAs and fewer jobs need to be created to be eligible for tax credits inside PFAs. Using three different econometric models, Sohn & Knaap found that more jobs were created inside PFAs after 1997 holding all other things constant. The differential in job growth across the PFA, however, was small and occurred only in a few selected industries. More recently, Hanlon, Howland & McGuire (2007) examined the effects of PFAs on the probability of land development in Frederick County from 2000 to 2004. They concluded that parcels inside PFAs were more likely to be developed than parcels outside, holding all else equal.

Priority Funding Areas are similar to other types of growth instruments like urban growth boundaries and enterprise zones. Urban growth boundaries (UGBs) are regulatory instruments that identify where urban growth is allowed to occur and where it is not. These tools have been the subjects of extensive analysis, though most of the research has focused on the land and housing price effects of UGBs (Knaap, 2001; Bae 2006; Nelson & Dawkins, 2004). There seems to be some consensus that the effects of UGBs depend on how tightly they contain urban growth and how frequently they are expanded (Pendall, Martin & Fulton, 2002). Enterprise zones are areas where taxes are lower and regulations are relaxed to encourage economic development (Green, 1991). Enterprise zones are less

urban containment tools than economic development instruments (Wilder & Rubin, 1996). Analyses on the effects of these instruments are also mixed but there is growing support indicating that enterprise zones can alter the location of economic development activity even if the total amount of such activity is not affected. (Boarnet, 2001; Sohn & Knaap, 2005) If PFAs represent some combination of these instruments, there is reason to believe they might succeed at containing urban growth.

The logic behind PFAs presumes that the state pays a significant portion of the cost of infrastructure and that investment in infrastructure, particularly for sewers and roads, shapes the rate and location of urban growth. While state governments do play a role in infrastructure finance (U.S. Census, 2000), the effects of state infrastructure spending on urban growth remains highly uncertain. Most water and sewer infrastructure projects are funded by local governments; however, in some cases in Maryland, local governments substitute state funding for water and sewer infrastructure. (Howland & Sohn, 2007) Persky, Kurban & Lester (2000) found only small impacts of state and federal spending on land absorption in the Chicago metropolitan area. Knaap & Talen (2003) found that state spending on wastewater infrastructure had only a minor impact on urban development patterns in Illinois. Thus, while the logic of limiting state spending on urban infrastructure to limit urban growth is sound, there is very little evidence from previous studies that this approach will work. Further, it is often difficult to track the disaggregated sources of funding for infrastructure projects.

The research to date suggests that policy instruments designed to concentrate growth in spatially designated areas can be influential. The extent of the influence depends critically on the strength of the incentive or regulation and the institutional context in

which the instrument is imposed. The limited research on the effects of PFAs is mixed. There is some evidence that PFAs indeed serve to concentrate urban development, job growth, and investments in wastewater infrastructure. But, the extent of concentration in PFAs varies by county, by industry, and by the extent to which local governments rely on state funds.

This essay examines the implementation and performance of Priority Funding Areas for the twelve-year period after the law went into effect. In examining implementation of the Act, this essay focuses on the statutory context and the horizontal and vertical integration of the statutes in assessing the process by which PFAs were created, the resulting pattern of PFAs, and the relationship of PFAs to local comprehensive plans. To examine outcomes of the program, I also discuss the extent to which PFAs altered state spending and residential development patterns. Priority Funding Areas make development inside the Priority Funding Area more attractive by increasing the level of public capital within that boundary after the implementation of the act and thus making the cost of development within the boundary less than the cost of development outside the boundary, when all else is equal. State spending in Priority Funding Areas should lower the cost of development in these areas leading to higher levels of development inside Priority Funding Areas, after implementation of the act relative to before. The validity of this hypothesis is subject to the magnitude of incentives and the degree of implementation.

Statutory Context

Priority Funding Areas are perhaps the centerpiece and the most innovative of the Maryland smart growth tools. Unlike urban growth boundaries in Oregon, which impose direct restrictions on urban development, the 1997 Smart Growth Areas Act merely

restricts state spending on statutorily defined “growth-related” programs to areas designated for urban growth. According to the Maryland Department of Planning (MDP):

The 1997 Priority Funding Areas Act capitalizes on the influence of State expenditures on economic growth and development. This legislation directs State spending to Priority Funding Areas. Priority Funding Areas are existing communities and places where local governments want State investment to support future growth. (Maryland Department of Planning, 2009a)

Geographic Scope

By statute, PFAs automatically include certain areas of the state: Baltimore City, incorporated municipalities, areas within the Baltimore and Washington beltways, and areas designated by the Department of Housing and Community Development for revitalization, enterprise zones, and heritage areas. In addition to areas designated as PFAs by statute, local governments can designate additional areas as PFAs if they meet certain criteria. (Maryland Code Annotated: State Finance & Procurement Article, §§ 5-7B-01 to -10, 2010)

Counties may designate additional areas as PFAs based on land use, developed density, zoned density, and water and sewer service criteria. Specifically, counties may include:

- (a) areas inside locally designated growth areas zoned for industrial use by January 1, 1997, or served by public sewer;
- (b) employment areas inside locally designated growth areas served by or planned for water and sewer;
- (c) a community existing prior to 1997 that is located within a locally-designated growth area, served by a public/community

sewer or water system, and has an allowed, average residential density of ≥ 2.0 units per net acre; (d) an area outside the developed portion of an existing community, if the area has an allowed, average build-out density of ≥ 3.5 units per net acre; (e) areas beyond the periphery of the developed portion of existing development that is scheduled for public water and sewer service, and have a permitted residential density of ≥ 3.5 units per net acre, and (f) rural villages included in the comprehensive plan before July 1, 1998.

Counties may designate “areas other than existing communities” as PFAs based on analyses of supply and demand. That is, counties must analyze land capacity and demand for the present and future, and PFAs must match the amount of land needed for a clearly defined planning horizon. (Maryland Department of Planning, 1997) While the statutes did not specify a particular planning horizon, MDP used a 20-year horizon as a standard benchmark.

Criteria for delineating PFAs are based on both actual and permitted densities. The density criteria established in the 1997 bill were the subject of much debate and have been the subject of criticism (Cohen, 2002; Knaap & Frece, 2007). The original version of the bill established a permitted density threshold at 5.0 units per net acre, but this was amended to a permitted density of 3.5 units per net acre with urging from the Maryland Association of Counties. The smart growth advocacy organization 1000 Friends of Maryland argued that the threshold was too low, given that actual densities are often lower than permitted densities (Cohen, 2002; Knaap & Frece, 2007). Although the legislation contains language stating that land can be designated for inclusion in PFAs if “the designation represents a long-term development policy for promoting the orderly expansion of urban growth and an efficient use of land and public services,” (Maryland

Code Annotated: State Finance & Procurement Article, §§ 5-7B-01 to -10, 2010) the primary criteria for designating PFAs is based on existing or zoned densities and infrastructure capacity, rather than “orderly” plans for future urban growth.

“Growth-Related” Expenditures

As mentioned, PFAs are intended to affect growth patterns by concentrating state spending on “growth-related” projects in PFAs. This “growth-related” spending consists of specific programs by Maryland Department of Environment (MDE), Department of Housing and Community Development (DHCD), Department of Business and Economic Development (DBED), and Maryland Department of Transportation (MDOT). By statute, a “growth-related” expenditure is “any form of assurance, guarantee, grant payment, credit, tax credit, or other assistance, including a loan, loan guarantee, or reduction in the principal obligation of, or rate of interest payable on, a loan or a portion of a loan.” (Maryland Code Annotated: State Finance & Procurement Article, §§ 5-7B-01 to -10, 2010) Specific “growth-related” programs are listed in Table 1.

Reporting Requirements by State Agencies

The Smart Growth Areas Act requires that each agency report annually to the Maryland Department of Planning regarding the implementation of the Act in a form explicated by that department. The Smart Growth Areas Act requires: “(f) Annual report. - Each State agency subject to this subtitle shall report annually to the Department of Planning on the implementation of this subtitle in a form approved by the Department of Planning.”

(Maryland Code Annotated: State Finance & Procurement Article, §§ 5-7B-01 to -10, 2010) This reporting requirement was bolstered by former Gov. Parris N. Glendening in

Executive Order No. 01.01.1998.04, Section F, Smart Growth and Neighborhood Conservation Policy. In 2001, when the Office of Smart Growth was established and the Smart Growth Subcabinet was codified, responsibility for receiving reports from state agencies and issuing a report was assigned to the Smart Growth Subcabinet. (Maryland Code Annotated, State Government Article §§ 9-1406, 2010). Specifically, Executive Order 01.01.1998.04, states:

F. Procedures for Annual Reports. *The Office of Planning (Maryland Department of Planning), with the assistance of all affected State agencies, will evaluate and report annually to the Governor, the General Assembly, and the State Economic Growth, Resource Protection Act:*

(1) Agencies will provide an annual report to the Office of Planning on the implementation of the Smart Growth Areas Act. The Annual Report should include the following:

(a) A description of projects/programs and costs of activities located in Priority Funding Areas;

(b) A description of projects/programs and costs of activities funded under the exceptions allowed in §5-7B-06 of the State Finance and Procurement Article;

(c) Projects submitted to the Board of Public Works for funding outside Priority Funding Areas under the extraordinary circumstances exception in accordance with §5-7B-05, of the State Finance and Procurement Article and the impact of these projects upon this policy;

(d) A list of programs and policies reviewed and changed to ensure compliance with the Policy; and

(e) A list of projects or programs approved and funded under Section 2 of Chapter 759 of the Acts of 1997. (Executive Order No. 01.01.1998.04, Section F, Smart Growth and Neighborhood Conservation Policy, 1998)

Summary

State statutes and subsequent executive orders outlined explicit criteria and procedures for designation, specific categories of spending that must be subject to the law, and reporting requirements for state agencies. These criteria were based primarily on existing or zoned densities rather than well thought future plans for urban expansion. In the next two sections on horizontal and vertical integration, I will discuss compliance with these statutes.

Agency	Description of Agency	Projects Subject to PFA Law	Specifically Exempt from the Law	Board of Public Works Exceptions	Exceptions Permitted without Review by the Board of Public Works
Maryland Department of Transportation (MDOT)	Includes five modal agencies: State Highway Administration, Maryland Transit Authority, Maryland Transportation Authority, Maryland Port Authority, and Maryland Aviation Authority.	All major projects in the construction program.	Projects administered by the Maryland Transportation Authority, which administers all toll facilities. PFA status need not be a consideration for system preservation, minor projects, and projects in the development and evaluation phase.	Exceptions can be granted by the Board of Public Works when a project connects PFAs, maintains the current transportation system without increasing capacity, has the purpose of giving the Maryland Department of Transportation control or access along an existing corridor, or operational characteristics require that the project be located outside of a PFA.	
Department of Housing and Community Development (DHCD)	Administers a wide range of programs generally focused on the health and vitality of communities and neighborhoods.	Programs and projects related to the construction, purchase, and loans for new single-family homes, new multi-family homes, and the funding of neighborhood revitalization projects.	Funding for any project financed with federal moneys used to purchase or rehabilitate existing single or multifamily housing or project financed with the proceeds of revenue bonds issued by the Community Development Administration.	The Board of Public Works can grant exceptions for "extraordinary circumstances" defined as extreme inequity, hardship or disadvantages outweighing the benefits from locating a project in a PFA and for which there is no reasonable alternative for a project in a PFA in another location within the county or an adjacent county.	Granted for health and safety, to permit adherence with federal laws, and for projects which demand location outside of PFAs because of operational or physical characteristics, including: natural resource based industries; agriculture, forestry and mining; industries proximate to airports, ports, railroads, transit, major highway interchanges; and tourism facilities.
Department of Business and Economic Development (DBED)	Involved in attracting new businesses to the state, creating jobs, and retaining existing businesses.	Grants and loans to industrial development, small businesses, and a revolving "Sunny Day" fund providing assistance for economic development projects.		The Board of Public Works can grant exceptions for "extraordinary circumstances" defined as extreme inequity, hardship or disadvantages outweighing the benefits from locating a project in a PFA and for which there is no reasonable alternative for a project in a PFA in another location within the county or an adjacent county.	Granted for health and safety, to permit adherence with federal laws, and for projects which demand location outside of PFAs because of operational or physical characteristics, including: natural resource based industries; agriculture, forestry and mining; industries proximate to airports, ports, railroads, transit, major highway interchanges; and tourism facilities.
Maryland Department of Environment (MDE)	The regulatory agency that enforces drinking and wastewater regulations and administers several grant and loan programs that fund water and wastewater infrastructure.	Water quality and water supply revolving funds, in addition to a supplemental assistance grant program for failing sewage and wastewater infrastructure.	Funding for sewer systems in existing communities beyond the periphery of the developed portion of the community if the expansion has a permitted average density of at least 3.5 units per acre.	The Board of Public Works can grant exceptions for "extraordinary circumstances" defined as extreme inequity, hardship or disadvantages outweighing the benefits from locating a project in a PFA and for which there is no reasonable alternative for a project in a PFA in another location within the county or an adjacent county.	Granted for health and safety, to permit adherence with federal laws, and for projects which demand location outside of PFAs because of operational or physical characteristics, including: natural resource based industries; agriculture, forestry and mining; industries proximate to airports, ports, railroads, transit, major highway interchanges; and tourism facilities.
Department of General Services (DGS)	Responsible for construction management, facilities maintenance, property acquisition, and real estate services for state government.	Land acquisition, real estate, and public improvements.	Projects related to maintenance, repair, additions, or renovations to existing facilities, acquiring land for telecommunications towers, parks, conservation and open space, and agricultural, conservation, and historic easements.	The Board of Public Works can grant exceptions for "extraordinary circumstances" defined as extreme inequity, hardship or disadvantages outweighing the benefits from locating a project in a PFA and for which there is no reasonable alternative for a project in a PFA in another location within the county or an adjacent county.	Granted for health and safety, to permit adherence with federal laws, and for projects which demand location outside of PFAs because of operational or physical characteristics, including: natural resource based industries; agriculture, forestry and mining; industries proximate to airports, ports, railroads, transit, major highway interchanges; and tourism facilities.

Table 1: "Growth-Related" Projects and Exceptions by Agency (Source: Maryland Code Annotated, State Finance and Procurement Article, §§ 5-7B)

Horizontal Integration

The Priority Funding Areas legislation relies on the notion that state agencies spatially target growth-related funding into PFAs. Horizontal integration refers to the way the act was integrated in state agency decision-making. Specifically, five agencies were required to alter the way they allocate funding under certain programs. A sixth agency, the Maryland Department of Planning, was given several responsibilities relating to PFAs including collecting annual reports from other state agencies. This relationship makes the administration of the law institutionally complex. Though MDP is responsible for overseeing and implementing the law, other state agencies are responsible for making funding decisions subject to the law. Thus, the integration of PFAs into state spending decisions and horizontal integration of agency decision-making is relevant to the impacts of PFAs.

In this section, I analyze state agency compliance with the law after 1997 and reporting requirements under the law. To evaluate the implementation of PFAs at the state level, I first examine the extent to which state agencies complied with the reporting requirements specified by statute and executive order. Next, I estimate how much funding is defined as “growth-related” and thus by law must be spent within PFAs. Then, for the only agency for which project-level spending data were available, the Maryland Department of Transportation, I examine how much of this growth-related funding was, in fact, spent within PFAs as prescribed by the law.

This section focuses on whether the Smart Growth Areas Act has been effective in directing state resources into PFAs. Whether PFAs can serve as an effective tool for managing growth

depends on the level of funding provided by the state, and whether state agencies have been compliant with the law.

Compliance with Reporting Requirements

As discussed above, state agencies were required by law to submit annual reports to the MDP on the implementation of PFAs. Agency reports were obtained from the Maryland Department of Planning and the Department of Legislative Services. Compliance with reporting requirements under the Act and subsequent executive order varied extensively over time, but was consistently incomplete. During the Parris N. Glendening administration there was a clear attempt by several agencies to provide the required information to MDP and a clear attempt by MDP to compile the information in a comprehensive report. Agency reports were filed with MDP in 1999 and 2000. The most complete comprehensive report was prepared in FY2002 by the Office of Smart Growth on behalf of the Smart Growth Subcabinet. Even this report, however, did not contain a full accounting of how much spending was “growth-related” and how much was actually spent inside PFAs. During the Robert Ehrlich administration, Office of Smart Growth annual reports contained no data on agency funding and little data on exceptions. Following the 2007 National Center for Smart Growth report on state spending under the Smart Growth Areas Act, in FY2009 and FY2010 the Smart Growth Subcabinet published more complete annual reports. Prior to the FY2010 report, the Legislature asked the Subcabinet to report spending data for FY2006-FY2009. (Knaap & Lewis, 2007) On par with many of the requirements of Glendening’s executive order, the reports include a breakdown of spending that is: inside the PFA, not location specific, and outside the PFA by program by agency. (Maryland Department of Planning, 2008b;

2009b) The annual reports also list exceptions approved by the Coordinating Committee and Board of Public Works. Despite attempts to file annual reports immediately after the legislation passed and the recent efforts to report annually, because reporting requirements were not met consistently over time and because the types of information reported changed dramatically over time, it is difficult to rely on agency reports to determine whether or how much state agencies restricted their spending in conformance with the Smart Growth Areas Act or the extent to which state agency spending serves to contain urban growth.

State Spending Under the Smart Growth Areas Act

Although state agencies did not consistently file reports required under the Smart Growth Areas Act and Executive Order No. 01.01.1998.04, it is possible to estimate total “growth-related” appropriations in the capital and transportation budgets each year and thus gain some insights into how much spending by state agencies is subject to PFA review. Specifically, information on “growth-related” appropriations is available from the following documents:

- The Department of Management and Budget’s “White Book” of capital appropriations;
- The Maryland Department of Transportation’s Consolidated Transportation Program; and
- Budget of State Government Appropriations Summary obtained from the Maryland State Archives.

According to the Smart Growth Areas Act, the state will not fund “growth-related” projects outside of PFAs, with few exceptions. Funding is defined as “any form of assurance, guarantee, grant payment, credit, tax credit, or other assistance, including a loan, loan guarantee, or

reduction in the principal obligation of, or rate of interest payable on, a loan or a portion of a loan.” The data I present on “growth-related” appropriations includes only funds appropriated by the General Assembly in the capital budget and major projects in the construction program in the Consolidated Transportation Program. The data presented in Figures 4 and 5 do not include tax credits, operating appropriations, or bonds issued directly by agencies which are separate from budget appropriations.

Based on data from these sources, total “growth-related” capital and transportation appropriations by state agency by year are presented in Figure 4. “Growth-related” appropriations include capital appropriations to Maryland Department of Environment, Department of Housing and Community Development, and Department of Business and Economic Development, and transportation appropriations by the Maryland Department of Transportation. Because the Department of General Services is listed solely in the operating budget, and provides support to other agencies for real estate, procurement, and facilities, I do not attempt to determine the percentage of projects and programs administered by General Services that were subject to PFA review. Thus, I exclude the Department of General Services from this analysis.

As shown, project spending by MDOT represents about 85 percent of all “growth-related” capital and transportation appropriations that are legislatively targeted to PFAs under the Smart Growth initiative. Further, while transportation appropriations have nearly doubled over the study period (without adjusting for inflation), capital appropriations to all other agencies have remained relatively constant (also without adjusting for inflation).

Over the period from FY1999 to FY2009, “growth-related” capital and transportation appropriations averaged approximately \$1.1 billion per year. On average, transportation comprised approximately \$920 million per year, while all other agencies combined totaled \$165 million per year.

Capital appropriations subject to PFA review since 1998 equal approximately \$165 million per year, which equals approximately 14 percent of annual capital budgets over the same period.

Total transportation appropriations subject to PFA review equals approximately \$920 million per year, which represents approximately 53 percent of annual transportation spending.

Transportation appropriations by MDOT represent 85 percent of all restricted “growth-related” capital and transportation appropriations over the same period. “Growth-related” capital and transportation appropriations equal approximately five percent of the annual state budget. Thus, the total amount of state money that is earmarked for spending on projects within PFAs is a relatively small portion of the overall appropriated state budget and is dominated by spending on transportation projects.

Table 2 shows annual “growth-related” spending by agency by year. “Growth-related” spending by DBED has declined the most over time as many of the programs subject to PFA review were repealed. Funding for DHCD and MDE fluctuated between \$33 million and \$100 million, but there were no clear trends coinciding with changes in gubernatorial administration or business cycles. In percentage terms, the share of the capital and total state budgets subject to PFAs were relatively consistent over time.

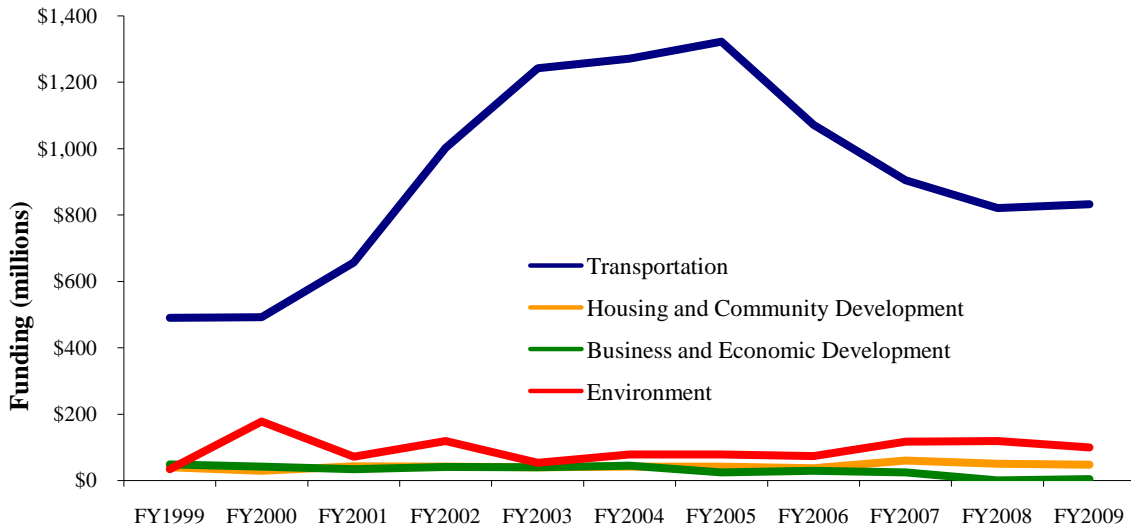


Figure 4: Total “Growth-Related” Capital and Transportation Appropriations by Agency FY1999-FY2009
Sources: Maryland Department of Transportation, Maryland Consolidated Transportation Program (FY1999-2009); Capital Improvements Authorized by the General Assembly 1999 through 2008, Maryland Department of Management and Budget, July 2008.

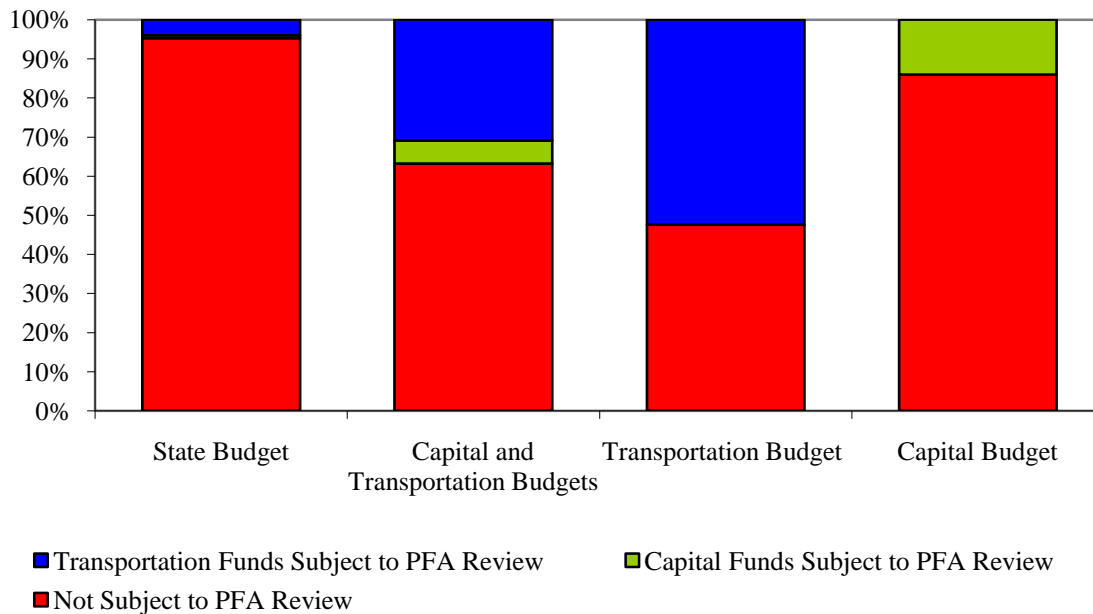


Figure 5: Average Percent of “Growth-Related” Funds FY1999-FY2009.
Sources: Maryland Consolidated Transportation Program (FY1999-2009); Capital Improvements Authorized by the General Assembly 1999 through 2008, Maryland Department of Management and Budget, July 2008; Maryland State Archives Budget of State Government Appropriations Summary (FY1999-2009.)

Spending by the Maryland Department of Transportation

Of state agencies subject to PFA review, MDOT is the only agency that consistently published budgets indicating the specific location of projects relative to PFAs. The Consolidated Transportation Program indicates PFA status for each project funded by MDOT. From these reports, it is possible to estimate how much has been spent inside and outside of PFAs by MDOT. Spending by the Maryland Transportation Authority, which oversees the state's toll facilities, has been specifically exempted from PFA review since the legislation was enacted. The Smart Growth Areas Act explicitly exempts all existing toll facilities, such as the Chesapeake Bay Bridge or the Fort McHenry Tunnel, from the requirements of PFA review. The total appropriations by Maryland Transportation Authority have increased over time relative to other transportation agencies. As seen in Figure 6, this trend is particularly striking from FY2006-2009 when the Intercounty Connector (ICC) moved from the State Highway Administration budget to the Maryland Transportation Authority. Spending for Maryland Transportation Authority construction projects equaled approximately six percent of total transportation spending subject to PFA Review in FY1999, but rose to equal about 52 percent in FY2009. The exemption of Maryland Transportation Authority projects represents a potentially large omission from the Smart Growth Areas Act, particularly in FY2007, when spending by Maryland Transportation Authority represented the largest share of total transportation appropriations. (See Figure 6)

Spending by MDOT is presented in Figure 7 for each year for the following categories: (1) Inside PFA; (2) Grandfathered; (3) Outside PFA and Subject to Exception; (4) Exception

Approved by MDOT/BPW; (5) Not Location Specific or Not Determined. Also shown are appropriations for three large transportation projects: the Addison Road Metro Extension; BWI airport extension; and the Woodrow Wilson Bridge. Note that these categories are not mutually exclusive.

Over the eleven-year period, spending on transportation projects identified as inside PFAs averaged 53 percent. As shown in Figure 7 and Table 3, however, the share of spending inside PFAs rose then fell over time. The low share at the beginning of the study period reflects a low share of appropriations for road projects and a large share of grandfathered projects in the period immediately after the passage of the Act. From FY1999 to FY2003, the share of road spending inside PFAs increased and spending increased on the Addison Road Metrorail Extension, projects at Baltimore-Washington International (BWI) Airport and the Woodrow Wilson Bridge, all of which are inside PFAs. After FY2003, the share of spending inside PFAs began to decline because spending on the Addison Road project and BWI airport projects diminished while spending on not-location-specific transit projects increased. (See Figure 7 and Table 3.)

Over the past eleven years, the share of grandfathered transportation projects declined from 53 percent to 15 percent. Approximately two and a half percent of “growth-related” spending by MDOT was provided for projects outside PFAs with exceptions approved or pending approval by the Board of Public Works. (See Table 3)

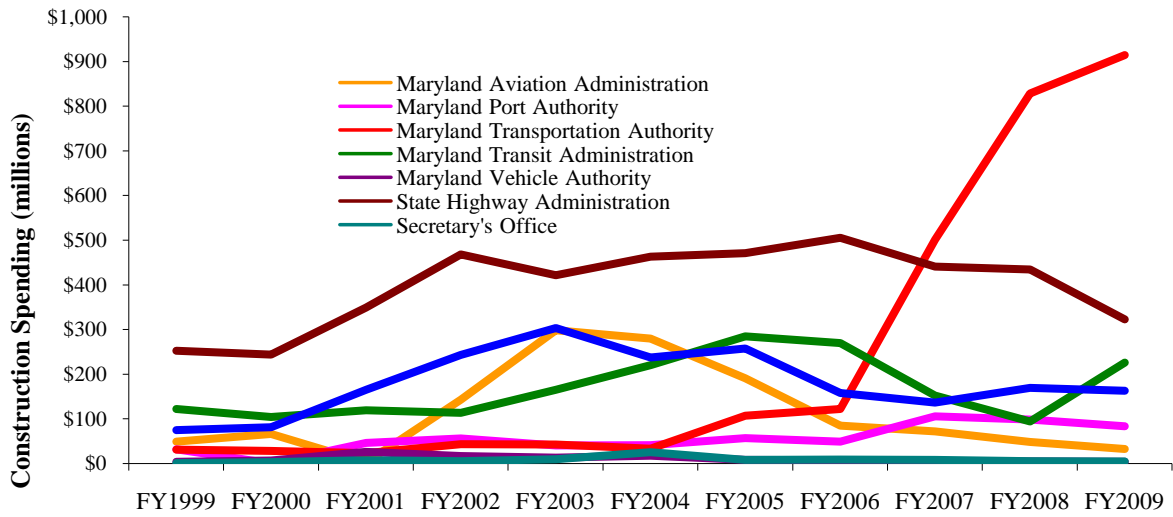


Figure 6: MDOT Construction Spending by Agency FY1999-FY2009.
Sources: Maryland Consolidated Transportation Program (FY1999-2009).

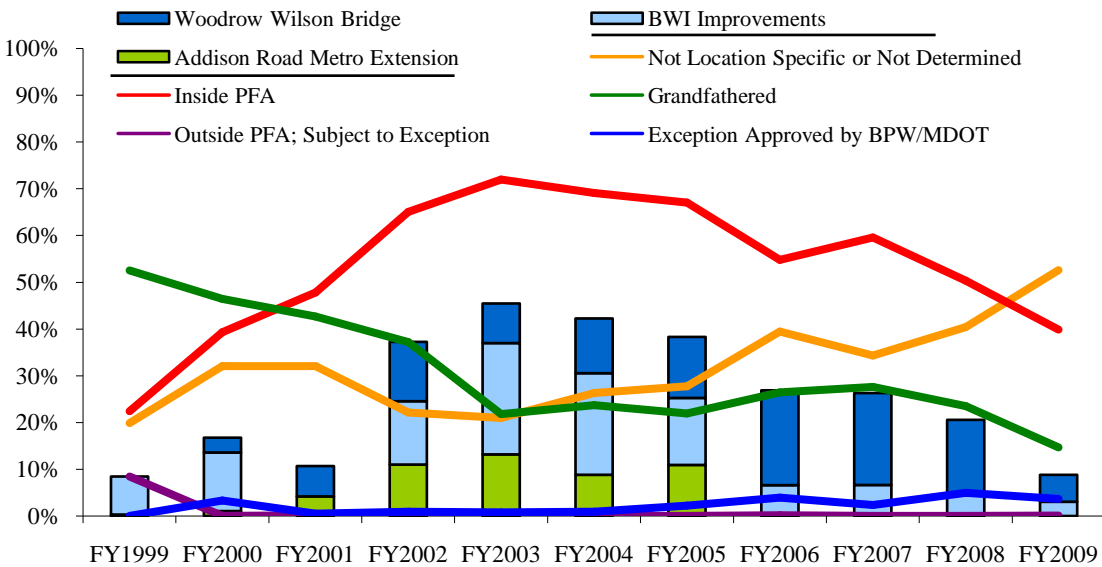


Figure 7: MDOT Spending by Smart Growth Status FY 1999-FY2009. Sources: Maryland Consolidated Transportation Program (FY1999-2009). NOTE: PFA status categories are not mutually exclusive. Some projects fall in multiple categories.

<i>FUNDING IN MILLIONS</i>	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	FY1999-FY2007	AVERAGE
Maryland Department of Transportation	\$490	\$491	\$657	\$1,002	\$1,243	\$1,271	\$1,323	\$1,072	\$905	\$821	\$832	\$10,107	\$919
<i>MdTA</i>	\$30	\$29	\$27	\$48	\$42	\$33	\$107	\$122	\$502	\$828	\$914	\$2,682	\$244
Department of Housing and Community Development	\$39	\$29	\$43	\$41	\$40	\$41	\$41	\$36	\$60	\$50	\$47	\$467	\$42
Department of Business and Economic Development	\$48	\$41	\$34	\$41	\$40	\$44	\$24	\$29	\$24	\$0	\$4	\$329	\$30
Maryland Department of Environment	\$33	\$177	\$71	\$118	\$53	\$78	\$78	\$73	\$116	\$118	\$99	\$1,014	\$92
Department of General Services	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Transportation Subject to PFA	\$490	\$491	\$657	\$1,002	\$1,243	\$1,271	\$1,323	\$1,072	\$905	\$821	\$832	\$10,107	\$919
Total Capital Funds Subject to PFA	\$121	\$247	\$147	\$200	\$132	\$163	\$143	\$139	\$200	\$168	\$150	\$1,810	\$165
Total Funds Subject to PFA	\$611	\$738	\$804	\$1,202	\$1,375	\$1,435	\$1,465	\$1,210	\$1,105	\$990	\$982	\$11,917	\$1,083
Total Transportation Funds	\$1,056	\$973	\$1,249	\$1,634	\$1,867	\$2,596	\$2,816	\$1,964	\$1,744	\$1,684	\$1,679	\$19,263	\$1,751
Total Capital Funds	\$803	\$1,095	\$1,292	\$1,472	\$1,059	\$974	\$822	\$1,023	\$1,573	\$1,378	\$1,368	\$12,860	\$1,169
Total Funds Transportation and Capital Funds	\$1,859	\$2,068	\$2,541	\$3,106	\$2,926	\$3,570	\$3,638	\$2,987	\$3,317	\$3,062	\$3,047	\$32,123	\$2,920
Total State Budget	\$15,079	\$15,941	\$17,794	\$21,712	\$22,473	\$22,975	\$23,605	\$25,790	\$29,009	\$30,038	\$31,249	\$255,665	\$23,242
%age of Total Transportation Funds Subject to PFA	46%	51%	53%	61%	67%	49%	47%	55%	52%	49%	50%	52%	53%
%age of Total Capital Subject to PFA	15%	23%	11%	14%	12%	17%	17%	14%	13%	12%	11%	14%	14%
Transportation Funds Subject to PFA which are Transportation	80%	67%	82%	83%	90%	89%	90%	89%	82%	83%	85%	85%	84%
Transportation Funds Subject to PFA	33%	36%	32%	39%	47%	40%	40%	41%	33%	32%	32%	37%	37%
%age of Total State Budget Subject to PFA	4%	5%	5%	6%	6%	6%	6%	5%	4%	3%	3%	5%	5%

Table 2: “Growth-related” Expenditures by Agency by Year in Total and Percentages. (Funding in Millions)

Sources: Maryland Consolidated Transportation Program (FY1999-2009); Capital Improvements Authorized by the General Assembly 1999 through 2008, Maryland Department of Management and Budget, July 2008; Maryland State Archives Budget of State Government Appropriations Summary (FY1999-2009.)

<i>Not Location Specific or Not Determined</i>												
	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	AVERAGE
No	80%	68%	68%	78%	79%	74%	72%	61%	66%	60%	47%	68%
Yes	20%	32%	32%	22%	21%	26%	28%	39%	34%	40%	53%	32%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<i>Inside PFA</i>												
	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	AVERAGE
No	78%	61%	52%	35%	28%	31%	33%	45%	40%	50%	60%	47%
Yes	22%	39%	48%	65%	72%	69%	67%	55%	60%	50%	40%	53%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<i>Grandfathered</i>												
	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	AVERAGE
No	47%	54%	57%	63%	78%	76%	78%	74%	72%	77%	85%	69%
Yes	53%	46%	43%	37%	22%	24%	22%	26%	28%	23%	15%	31%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<i>Outside PFA; Subject to Exemption</i>												
	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	AVERAGE
No	92%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	99%
Yes	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<i>Exemption Approved by BPW/MDOT</i>												
	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009	AVERAGE
No	100%	97%	100%	99%	99%	99%	98%	96%	98%	95%	96%	98%
Yes	0%	3%	0%	1%	1%	1%	2%	4%	2%	5%	4%	2%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 3: Maryland Department of Transportation Growth-Related Funds by Smart Growth Status category FY99-FY09 (NOTE: Categories are not mutually exclusive.)
Source: Maryland Consolidated Transportation Plan FY 1999-FY2009.

Exceptions

Data on exceptions granted by the Smart Growth Coordinating Committee were provided in annual reports and from internal records maintained by the Maryland Department of Planning. For some exceptions, funding data were not available, making it difficult to evaluate the significance of these projects. Since 1998, all 100 projects reviewed by the Coordinating Committee have been granted exceptions to the Smart Growth Areas Act, according to staff of the Maryland Department of Planning. The Maryland Department of Planning does not maintain records of exceptions granted by the Smart Growth Subcabinet or the Board of Public Works. From published Board of Public Works meeting minutes, I determined that at least four projects related to the Smart Growth Areas Act have been reviewed by the Board. These four projects were MDOT projects and all exceptions were approved: the Manchester Bypass, the ICC, MD 32, and the Lusby Connector. Three were MDOT projects during the Ehrlich Administration, and the fourth project, also an MDOT project – the Manchester Bypass – was granted by the Board of Public Works but did not receive funding in Governor Glendening’s budget. Of exceptions reviewed by the Smart Growth Coordinating Committee, exceptions for Department of Environment projects are the most common, representing 55 of the 100 projects approved. Exceptions by MDE have increased over time while DBED exceptions have declined, likely because the number of programs subject to PFA review diminished. The Departments of Housing and Community Development and General Services have not been granted any exceptions. Most of the exceptions for Maryland Department of Environment appear to be for studies or for water or sewer extension outside of PFAs and justified for “health” reasons. Only four exceptions reviewed by the

Coordinating Committee were for transportation projects. Many of the exceptions granted by the Coordinating Committee were for loans, grants, or studies. Interestingly, the number of exceptions reviewed by the Coordinating Committee has risen over time from just 4 to 5 in 2000 and 2001 to nearly 20 in 2008 and 2009. See Tables 4 and 5.

Total Exceptions By Agency	
Dept.	Total
DBED	41
MDE	55
MDOT	4
Total	100

Table 4: Exceptions Reviewed by Smart Growth Coordinating Committee 2000-2009. Source: Maryland Department of Planning, 2008b, 2009b.

Total Exceptions By Year	
Year	Total
2000	5
2001	4
2002	11
2003	10
2004	12
2005	8
2006	8
2007	4
2008	19
2009	19
Total	100

Table 5: Exceptions Reviewed by Smart Growth Coordinating Committee 2000-2009. Source: Maryland Department of Planning, 2008b, 2009b.

Summary

To examine the implementation of Maryland’s Smart Growth Areas Act, I sought to identify how much spending by state agencies was subject to PFA review and how much of that spending was, in fact, for projects inside PFAs. I had only limited success.

The share of state appropriations subject to PFA review is not large, in relative terms, and is dominated by appropriations to the Maryland Department Transportation. “Growth-related” appropriations by state agencies subject to PFA review averaged five percent of the state budget per year for the nine-year period since 1998. Of the approximately \$1.1 billion growth-related spending per year and subject to PFA review, approximately \$920 million or 85 percent is spending by MDOT. Of the \$920 million in spending by MDOT, approximately 52 percent was spent on projects identified as within PFAs. The remainder was spent on projects grandfathered, not location specific, or granted an exception. Spending by the Maryland Transportation Authority is rising faster than any other agency and is not subject to PFA review. This could result in fewer transportation projects becoming subject to PFA review as tolling becomes more prevalent. Nearly 50 percent of MDOT appropriations subject to PFA review are for projects not identified as inside PFAs – and for legitimate reasons. That may be the case for other state agencies as well. Unfortunately, there are insufficient data available to determine this.

Data from the Maryland Department of Planning indicate that 100 projects were funded through the exception process, though all projects for which I have data were approved, both by the Smart Growth Coordinating Committee and the Board of Public Works.

Due to the lack of consistent reporting by state agencies, it is impossible to determine the share of “growth-related” spending that was spent for projects within PFAs for every year since the Act was passed. As a result it is impossible to assess what, if any, effect state spending has had on urban development patterns.

These findings suggest there is substantial potential for improving the administration of the Smart Growth Areas Act. Such improvement might begin with a reevaluation of process of accounting for “growth-related” spending and the respective roles of the Maryland Department of Planning and Smart Growth Subcabinet.

Vertical Integration

Because land use policy in Maryland depends primarily on the policies and plans of local governments, I examine the degree to which Priority Funding Areas have impacted local decision-making. Vertical integration refers to the way the act is integrated with local planning statutes. Because Priority Funding Areas do not restrict development outside the boundary but instead incentivize growth inside in the boundary, whether PFAs are effective in altering local land use patterns hinges on the integration of PFAs into local land use planning. If the state’s PFAs are not consistent with local growth areas and local zoning, PFAs are unlikely to affect development patterns. If “growth-related” spending by the state is important to local governments in planning for growth, I expect that PFAs will be considered in local planning processes.

In this section I examine the relationship between local governments and the Smart Growth Areas Act. Through content analysis, I describe how county governments went about constructing PFAs and the resulting spatial pattern of PFAs across the state. I analyze the PFA review process and dialogue between local governments and the Maryland Department of Planning during PFA construction. I also describe the relationship between PFAs and local comprehensive plans. To examine this relationship, I conducted content analysis of local comprehensive plans for counties in Maryland.

The construction and configuration of PFAs

According to the 1997 legislation, local governments were required to submit PFA boundaries to MDP by October 1, 1998. MDP provided historical files on the creation and configuration of Priority Funding Areas by local governments, and describing the review process for each county. As of January 1999, certification was complete for only 13 counties. By 2002, MDP had accepted, sometimes after identifying comment areas, the PFAs of all 23 counties. Some counties submitted PFAs with few issues, some in a piecemeal fashion, and some following extensive dialogue with MDP. Although the process varied for each county, the certification process generally went one of three ways – some counties based PFAs on existing growth areas which yielded a relatively contiguous pattern; some counties submitted all qualifying areas resulting in a highly discontinuous pattern; and some counties drew PFAs much larger than the area necessary to accommodate growth projections, at least according to MDP.

As shown above in Figure 3, PFAs cover much of the already heavily developed Baltimore-Washington corridor, the Interstate 270 corridor from Montgomery County northwest toward Frederick, and the Interstate 95 corridor that extends from Washington, D.C., northeast through Maryland toward Wilmington, Delaware. The other largest PFAs are around the cities of Frederick, Hagerstown, Salisbury, and Waldorf. In addition, there are many smaller PFAs, starting with cities such as Easton, Cambridge, Westminster, the Solomons-Leonardtown area near the Patuxent Naval Air Station, and the Oakland-Deep Creek area. A closer inspection, however, shows tiny PFAs in all parts of the state, usually representing small municipalities or areas served by water and sewer designated as PFAs by counties.

Some counties, particularly those in the central corridor with strong growth management programs, simply submitted PFAs based on existing growth areas and implicit urban growth boundaries. This is conveyed in Figure 8 by Howard County, which submitted a single PFA based on existing growth areas that MDP certified without comment in 1997. The PFAs for these counties were sometimes drawn to accommodate less growth than forecasted for a 20-year period, but MDP accepted the proposed designations. The resulting configuration is logical and relatively contiguous, reflecting longstanding plans based on “wedges and corridors” (Knaap & Frece, 2007). The irregular shape of PFAs in Montgomery County largely reflects existing development patterns shaped by longstanding plans based on the concept of preservation wedges and development corridors. Similarly, the PFA in Baltimore County reflects that jurisdiction’s longstanding Urban-Rural Demarcation Line.

Some counties, specifically more rural or exurban counties in Western Maryland submitted PFAs including almost all areas meeting the statutory criteria for designation as PFAs. Qualified industrial or employment parcels, rural villages, and all areas with existing or planned sewer were included. Rural villages are primarily residential centers with historic qualities, located in otherwise rural or agricultural areas where new growth would derive primarily from infill development or limited peripheral expansion (Maryland Code Annotated, State Finance & Procurement Article, §§ 5-7B-01 to -10, 2010)

Small rural villages are more prevalent in the Western portion of the state than in any other. The resulting pattern of PFAs is discontinuous, with small PFA islands dotting the landscape. The prevalence of rural villages in Frederick County is evident in Figure 8.

Finally, some counties on the Eastern Shore submitted large PFAs around cities anticipating extensive growth. MDP deemed many of these PFAs too large, as they contained over 20 years of growth, and requested that the counties resubmit smaller PFAs. Because the counties did not comply, MDP denoted portions of the PFAs as “comment areas” which are described by MDP as “County Certified Area; Area Not Meeting Criteria” (Knaap & Frece, 2007). In practice, at least during the Glendening and O’Malley administrations, state agencies have not provided funding for “growth-related” projects in comment areas. These areas are shown in Wicomico County in Figure 8. The pattern of PFAs in these counties is contiguous in clusters, but the size of these areas exceeds what the county determined, and MDP confirmed, is needed for 20 years of growth.

With few exceptions, the delineation of PFAs was completed relatively quickly and without extensive political conflict. It was also completed, however, without much public participation. Some counties held local hearings but only three state interest groups – the Sierra Club, Chesapeake Bay Foundation and 1000 Friends of Maryland – participated in the certification process. Though developers and local civic organizations were extensively involved in crafting the legislation, they were distinctly less involved in the process of designating PFAs. Given the notably contentious legislative process it took to pass the Smart Growth Areas Act, the lack of participation by developers and other housing interest groups is surprising.

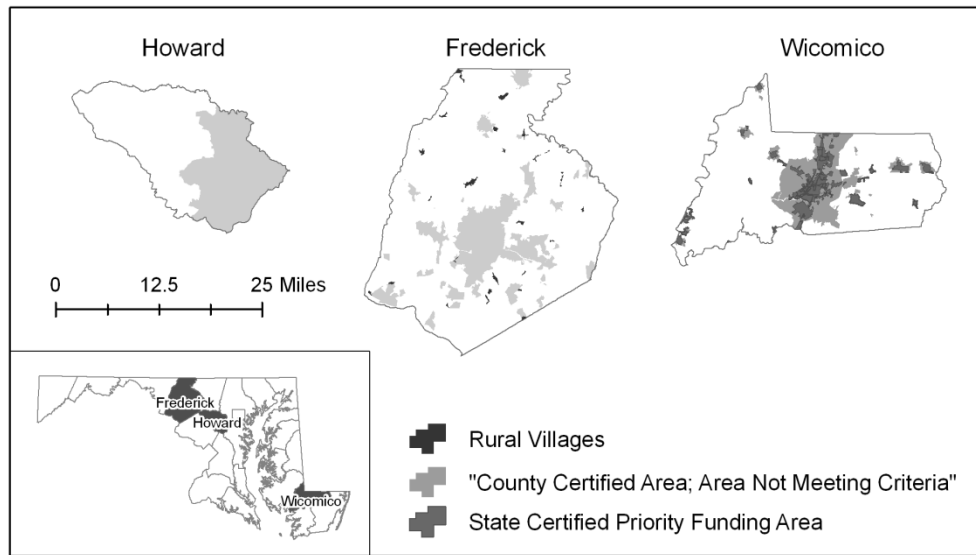


Figure 8: Priority Funding Areas in Select Counties (Source of data: Maryland Department of Planning)

Since first drawn, PFAs have changed little over time. According to MDP, total area within PFAs has grown approximately two percent from 2000 to 2005. The only major expansions occurred in St. Mary’s, Somerset, Anne Arundel, Queen Anne’s, and Dorchester Counties, and most involved municipal annexations. The single largest addition to PFAs was the Naval Air Station in St. Mary’s County, which was added in 2004.

PFAs and comprehensive plans

Because the PFA law is directed at spending by state agencies, all the provisions that govern PFAs are found in the State Finance and Procurement Article of the Maryland Code: State Planning – Priority Funding Areas (5-7B). The statutes that govern planning and zoning are found in Article 66B: Land Use. Thus there are no explicit requirements

that PFAs appear in comprehensive plans. This literal separation of state and local planning statutes epitomizes the disconnect between state and local planning. Thus, the extent to which PFAs influence planning and zoning at the local level depends entirely on local discretion.

According to Article 66B, counties and municipalities must update their comprehensive plans every six years and submit the plans to MDP for review. To determine how local governments have incorporated PFAs in their comprehensive plans I conducted a content analysis of each county's comprehensive plan. Though the comprehensive plans of most jurisdictions have been updated since 1998, as of fall 2007, at least five counties had not updated their comprehensive plans since the adoption of the PFA statute, despite the legal requirement to do so (Maryland Department of Planning, 2009c). Some counties update comprehensive plans by geographic sector and have not updated the county-wide plan in over ten years. Most of the county comprehensive plans reference PFAs somewhere in the comprehensive plan although in eight counties that had updated their plans since 1998, the PFA boundaries do not appear in plan designation or zoning maps. At least three counties fail to mention PFAs in their comprehensive plans at all. Judging by the omission of PFAs in county comprehensive plans, it is clear PFAs are not consistently incorporated in local land use plans. As a result PFAs are not, therefore, an integral part of the statutory framework that governs land use planning, zoning, subdivision regulations, and appeals processes. When developers or citizens apply for permits to develop their properties, there is not a screening tool used at the local level to determine whether the parcel is inside the PFA.

Summary

Priority Funding Areas were drawn relatively quickly and with little public or advocacy involvement. In this way, PFAs are much different than local comprehensive plans which are approved after a lengthy process and extensive public involvement. The way that local governments drew PFAs differed extensively across the state despite identical criteria, and as a result, the spatial configuration of PFAs varies across the state. While PFAs reflect longstanding growth management programs in some counties, other counties attempted to draw the PFAs very large or submit all areas that qualified in order to maximize the amount of land eligible for state infrastructure spending.

In examining local tools for directing growth, it is clear that PFAs are not a primary consideration of most local governments. In fact, some counties fail to mention PFAs in their local comprehensive plans. If the bodies that approve development and subdivision activity are not attentive to PFAs (perhaps because the amount of state spending subject to the law is insignificant), it is unlikely that these instruments will be effective in influencing development patterns.

Development Patterns

The above analysis demonstrates that the implementation of PFAs is imperfect. But that is the case with any state land use program. The ultimate question is whether the program achieved its intended results. If the primary objective of the Maryland program is to redirect growth from outside to inside PFAs, such a change in development patterns can be measured in a number of ways. Using data on residential development patterns before and after the law, I examine the extent to which Priority Funding Areas affected

development patterns. I measure development patterns as the number of parcels and acres developed inside and outside PFAs, the share of parcels and acres developed outside PFAs, and the average size of parcels inside and outside PFAs. Though not an explicit policy objective, it is reasonable to infer that among the reasons for diverting growth inside PFAs is to increase urban densities (reduce lot sizes in the single family case), increase lot sizes outside urban areas, and to mitigate agricultural and habitat fragmentation.

Testing for changes in any of these variables can also be performed in a number of ways. Here I present t-tests of differences in means before and after the adoption of the state smart growth program. If Priority Funding Areas are having intended effects I would expect development inside Priority Funding Areas to increase after the Smart Growth Areas Act was passed while I would expect of development outside PFAs to decline after the passage of the Act.

In the literature on program evaluation, tests of differences in means are sometimes viewed as weak tests of program influence, however, because they fail to control for the influence of countervailing factors (Felbinger & Langbein, 2006). In this case, for example, PFAs may appear to have no apparent effect on development patterns because growth pressure increased after their adoption or development capacity inside PFAs became depleted over time. Under these conditions, PFAs may have slowed growth outside PFAs but the effect was more than offset by rapid growth or depleted growth capacity. Alternatively, because PFAs were drawn based on existing infrastructure and zoning, the instruments may have just reiterated current trends, biasing trends upwards inside PFAs. For a number of reasons, however, I argue that a difference in means (or

proportion) of growth inside or outside PFAs is an appropriate test of program success. First, by statute, PFAs were drawn to accommodate anticipated growth; thus, if growth overwhelmed development capacity, then the PFAs were poorly drawn. Second, according to MDP estimates, PFAs in each county in the state contained approximately 20 years of development capacity in 2003, more than enough to accommodate growth over the study period. (Maryland Department of Planning, 2004) Third, the important policy question facing Maryland decision makers today is not whether to eliminate PFAs but whether they are strong enough to achieve their intended purpose. A test for a difference in development patterns—regardless of changes in external factors—is thus the best test of programmatic success. Finally, as shown in the next section, results do not change even when I control for changes in external factors. Because county-specific data for all external factors is not available, I present t-tests below. At the county level, simple tests provide easy to interpret, county-specific knowledge. Because planning in Maryland is dominated by county comprehensive plans that vary tremendously across counties, I report data by counties.

Data produced by MDP provide an opportunity for close examination of development trends before and after the enactment of Maryland's smart growth laws. The data include information on every new parcel developed for attached or detached single family use less than 20 acres in size from 1990 to 2007, after development. Using these data, I am able to evaluate trends in the period before PFAs (1990-1998) and after PFAs (1999-2007). Because PFAs were required to be submitted to MDP by October of 1998, I treat 1990-1998 as the period before PFAs and 1999-2007 as the period after PFAs. While these data offer many useful insights, it is important to note that they offer little or no

information on multifamily development, nonresidential development, or developments on parcels greater than 20 acres in size. According to MDP, “development” is defined as an increase in improved value exceeding \$10,000. Developments on parcels greater than 20 acres are not captured unless and until improvements are made on parcels that are subdivided to a size smaller than 20 acres in size. For these reasons, the data cannot be used to analyze trends in the commercial sectors of urban areas or most of the agricultural sectors of rural areas. Still, the insights they provide are quite revealing.

Trends in the number of parcels newly developed for residential use, the acres of land newly developed for residential use, and the size of parcels developed for residential use are illustrated in Figures 9 to 11 below. As shown in Figure 9, the annual percent of parcels developed outside PFAs rises from approximately 24 percent in 1990 to 32 percent in 2004 and fluctuated between 28-29 percent from 2005-2007. As shown in Figure 10, the acres of land developed for residential use outside PFAs rose from approximately 75 percent in 1990 to a high of 77 percent in 2004, but fluctuated between 73 to 77 percent throughout the period. Finally, as displayed in Figure 11, the average size of parcels outside PFAs fell from approximately 2.40 acres in 1990 to 1.90 acres in 2007 and the average size of parcels inside PFAs rose from 0.25 acres in 1990 to 0.27 acres in 2007. If the intent of PFAs is to concentrate development and raise densities inside PFAs, and protect land from development in large parcels outside PFAs, then all of these trends are going in the wrong direction.

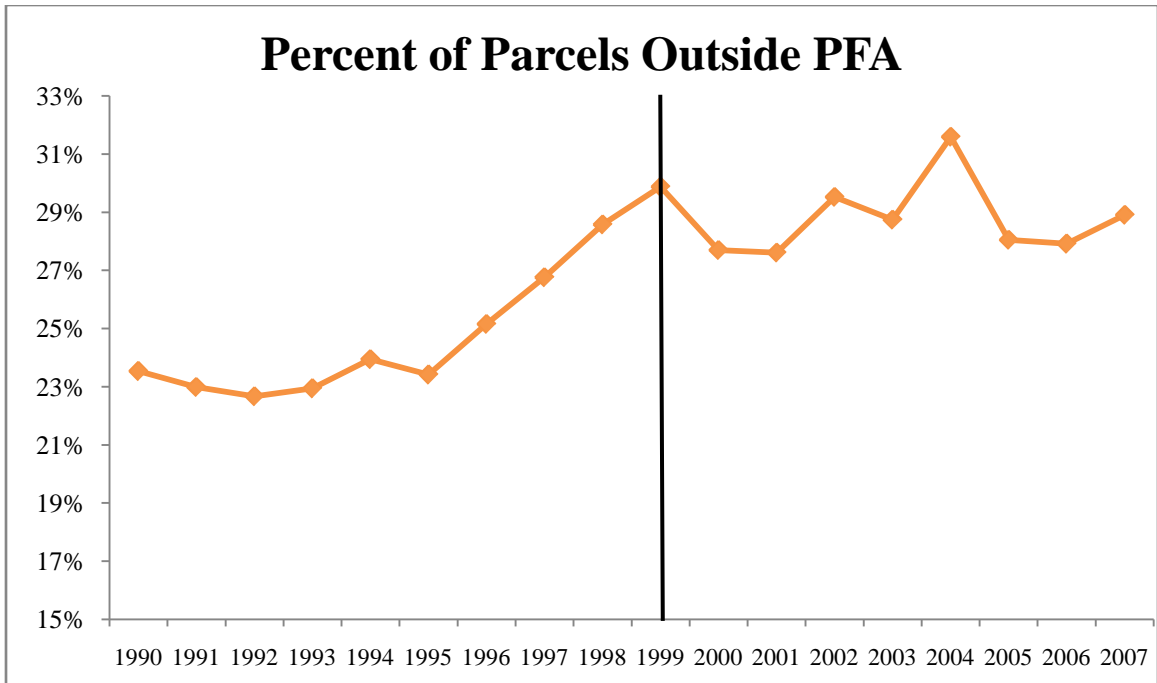


Figure 9: Parcels Developed Outside PFA 1990-2007. Source of data: Maryland Department of Planning: Planning Data Services (Maryland PropertyView).

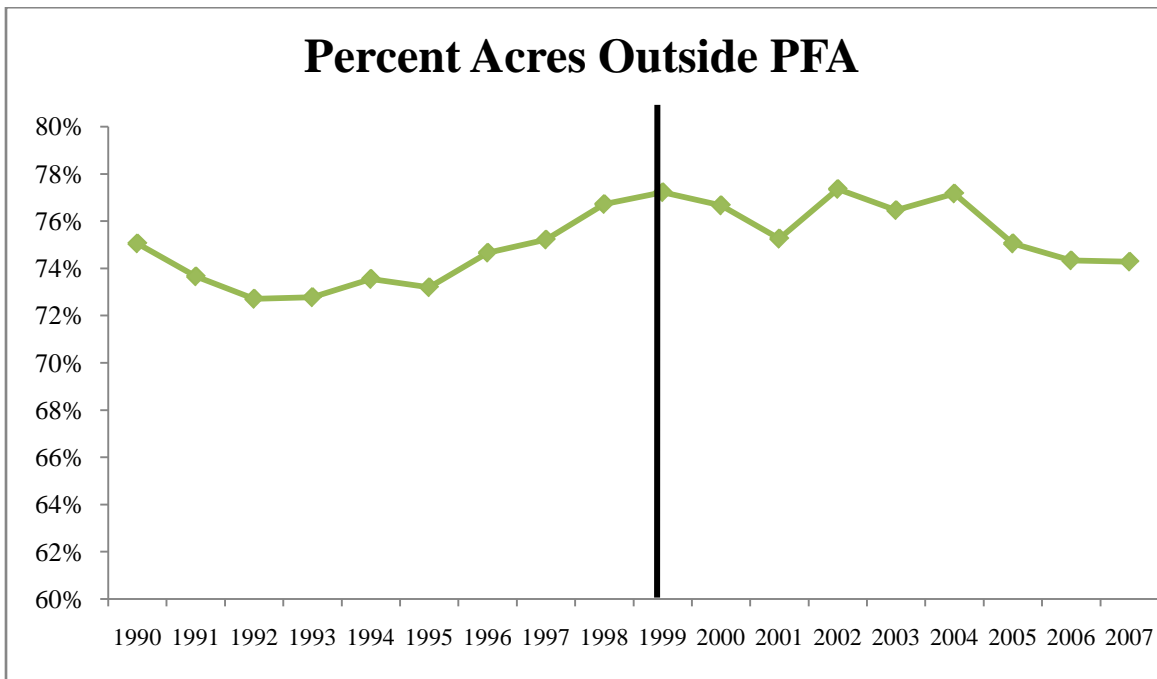


Figure 10: Acres Developed Outside PFA 1990-2007. Source of data: Maryland Department of Planning: Planning Data Services (Maryland PropertyView).

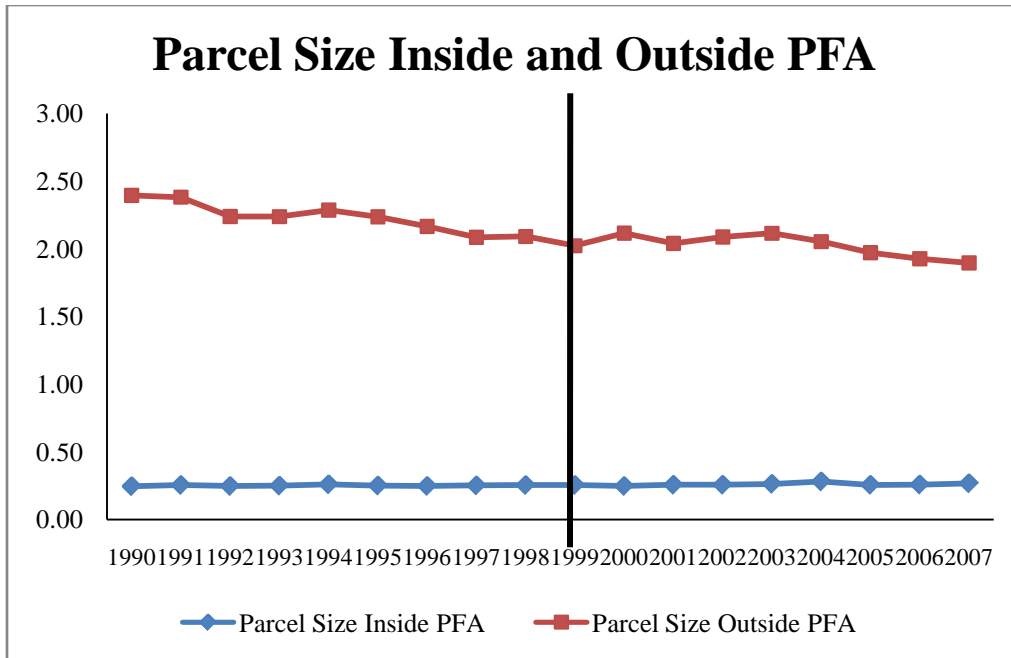


Figure 11: Parcel Size Inside and Outside PFA 1990-2007. Source of data: Maryland Department of Planning: Planning Data Services (Maryland PropertyView).

Parcels developed

County and region specific information on the number of parcels developed for residential use in each Maryland county and four regions is presented in Table 6. In Table 6, column 1 shows the average number of parcels developed before and column 2 presents the average number of parcels developed after PFAs were adopted in 1998. Column 3 presents the ratio formed by dividing column 1 by column 2. Column 4 presents the share of parcels developed inside PFAs before 1998 and column 5 presents the share of parcels developed inside PFAs after 1998. Column 6 presents the ratio formed by dividing column 5 by column 6. An asterisk indicates that a ratio is statistically significant at a 95 percent confidence level using a difference-in-means t-test, meaning that the share or level of parcels developed inside PFAs before the Smart Growth Areas Act was significantly different than the share of parcels developed inside PFAs after the Smart Growth Areas Act.

As shown, the average total number of parcels developed per year in the entire state was about 23,000 before PFA and about 21,500 after PFAs (last row of columns 1 and 2). The average number of parcels developed for residential use, however, increased in some counties but decreased in others. Total growth in residential parcels over the entire period increased most in the outlying counties including Dorchester, Kent, Talbot, and Washington Counties.

At the state level, the number of parcels inside PFAs fell from 17,462 per year on average before 1998 to 15,264 on average per year after 1998, a statistically significant change. At the regional level, the number of parcels inside PFAs fell by a statistically significant amount in Central Maryland and the number rose by a statistically significant amount on the Eastern Shore. The number of parcels developed per year inside PFAs fell by a statistically significant amount in Allegany, Anne Arundel, Baltimore, Calvert, Harford, Howard, and Prince George counties and increased by a statistically significant amount in Cecil, Dorchester, Garrett, Kent, St. Mary's, Somerset, Talbot, Washington, and Worcester counties. Similarly, the average number of parcels developed for residential use per year outside PFAs in the entire state rose from 5,632 over the period before 1998 to 6,197 over the period after 1998, an increase by a statistically insignificant amount. The average number of parcels developed outside after 1998 was significantly higher in Charles, Harford, and Prince George's counties.

The share of parcels developed for residential use inside PFAs over the entire state fell from 76 to 71 percent after PFAs were adopted, although the share of parcels developed inside PFAs continued to vary widely, from only 14 percent in outlying Garrett County to 93 percent in central corridor Prince George's County. The share of parcels inside the

PFA fell by statistically significant amount in Southern Maryland. The share of parcels developed inside PFAs increased by a statistically significant amount in the outlying counties of Dorchester, Cecil, Somerset, Talbot, and Worcester counties, but decreased in many of the central and southern counties, including Anne Arundel, Baltimore, Calvert, Charles, Howard, Harford, Prince George's, and St. Mary's counties. The share of parcels inside PFAs also decreased by a statistically significant amount in Allegany County in Western Maryland where average development over the period also fell.

In sum, there was a statistically significant decrease in parcels inside the PFA at the state level and a significant decrease of the share inside and increase of the share outside PFAs after the act relative to before. The number of parcels developed inside PFAs fell by a statistically significant amount for many Central Maryland counties as well as Allegany county in Western Maryland and Calvert county in Southern Maryland. But the number of parcels developed inside PFAs increased for many Eastern Shore counties and the Western Maryland counties of Garrett and Washington. The share inside PFAs increased by a statistically significant amount in Eastern Shore counties and St. Mary's county in Southern Maryland, but decreased by a statistically significant amount in Central Maryland, Allegany County in Western Maryland and Charles and Calvert Counties in Southern Maryland. Thus, though the trends in Western and Southern Maryland are mixed, the trends in central Maryland are moving in the wrong direction while trends on the Eastern Shore are moving in the right direction. In many of the largest counties like Prince George's, Howard, Harford, Anne Arundel, and Baltimore counties, the number of parcels and the share of parcels developed for residential use outside PFAs went up after the PFA law went into effect. And in many of these counties, the number of parcels

developed for residential use continued after the PFA law at above or nearly 500 parcels per year.

Acres Developed

Information on trends in acres of land developed for single-family use in each Maryland county is presented in Table 7. An asterisk indicates that a ratio is statistically significant at a 95 percent confidence level using a difference-in-means t-test, meaning that the acres developed inside PFAs before the Smart Growth Areas Act was significantly different than the acreage of parcels developed inside PFAs after the Smart Growth Areas Act. As shown in the bottom row, the total number of acres developed per year was about 16,945 before 1998 and 16,554 after 1998, however, the average number of acres increased in some counties but decreased in others. At the regional level, the number and share of acres in PFAs fell by a statistically significant amount in Central Maryland and rose by a statistically significant amount on the Eastern Shore.

The number of acres inside PFAs fell from 4,376 per year before 1998 to 3,951 per year after 1998, a statistically insignificant change. The number of acres developed per year inside PFAs fell by a statistically significant amount in Allegany, Anne Arundel, Baltimore, Calvert, and Howard counties and increased by a statistically significant amount in Cecil, Dorchester, Somerset, and Worcester counties. Similarly, the average number of acres developed for residential use per year outside PFAs in the entire state rose from 12,569 over the period before 1998 to 12,603 over the period after 1998, a statistically insignificant amount. Meanwhile, the average number of acres developed outside after 1998 was significantly higher in Prince George's and Worcester counties.

County	Average Annual Number of Parcels														
	Total			Inside PFA			Outside PFA			Share (Inside)			Share (Outside)		
	Pre-PFA	Post-PFA	Ratio (Post/Pre)	Pre-PFA	Post-PFA	Ratio (Post/Pre)	Pre-PFA	Post-PFA	Ratio (Post/Pre)	Pre-PFA	Post-PFA	Ratio (Post/Pre)	Pre-PFA	Post-PFA	Ratio (Post/Pre)
Allegany	134	106	0.79*	95	67	0.70*	40	39	0.98	70%	63%	0.90*	30%	37%	1.24*
Frederick	1,573	1,544	0.98	1295	1292	1.00	277	252	0.91	82%	84%	1.02	18%	16%	0.91
Garrett	221	259	1.17	30	39	1.29*	190	220	1.16	14%	15%	1.07	86%	85%	0.99
Washington	570	788	1.38*	374	548	1.46*	195	240	1.23	66%	70%	1.05	34%	30%	0.90
Western Maryland	2,497	2,696	1.08	1795	1945	1.08	702	751	1.07	72%	72%	1.00	28%	28%	0.99
Anne Arundel	2,781	2,128	0.77*	2187	1503	0.69*	594	625	1.05	79%	71%	0.89*	21%	29%	1.40*
Baltimore	2,571	1,863	0.72*	2170	1479	0.68*	400	384	0.96	84%	79%	0.94*	16%	21%	1.29*
Baltimore City	93	259	2.79*	93	259	2.79*	0	0	0.00	100%	100%	1.00	0%	0%	0.00
Carroll	1,036	903	0.87	632	566	0.90	403	337	0.84	61%	63%	1.03	39%	37%	0.96
Harford	1,610	1,437	0.89	1360	1123	0.83*	249	314	1.26*	85%	78%	0.92*	15%	22%	1.46*
Howard	1,769	1,363	0.77*	1478	1050	0.71*	291	313	1.08	84%	77%	0.92*	16%	23%	1.44*
Montgomery	2,422	2,320	0.96	2027	1884	0.93	395	436	1.10	84%	81%	0.97	16%	19%	1.17
Prince George's	3,209	2,760	0.86	2971	2242	0.75*	238	518	2.18*	93%	81%	0.87*	7%	19%	2.68*
Central Maryland	15,490	13,034	0.84*	12920	10106	0.78*	2571	2928	1.14	83%	78%	0.93	17%	22%	1.35
Calvert	830	719	0.87	434	284	0.65*	396	387	0.98	52%	44%	0.85*	48%	61%	1.26*
Charles	977	1,094	1.12	654	615	0.94	323	479	1.48*	67%	56%	0.84*	33%	44%	1.33*
St. Mary's	645	765	1.19*	252	354	1.40*	393	412	1.05	39%	46%	1.19*	61%	54%	0.88*
Southern Maryland	2,452	2,530	1.03	1341	1253	0.93	1111	1277	1.15	55%	50%	0.89*	45%	50%	1.09*
Caroline	157	199	1.27	38	79	2.07	119	120	1.01	24%	40%	1.65	76%	60%	0.80
Cecil	599	663	1.11	221	318	1.44*	378	345	0.91	37%	48%	1.30*	63%	52%	0.83*
Dorchester	120	209	1.74*	26	107	4.12*	94	102	1.09	22%	51%	2.33*	78%	49%	0.63*
Kent	98	132	1.35*	47	75	1.59*	51	57	1.13	48%	56%	1.18	52%	44%	0.84
Queen Anne's	334	363	1.09	163	183	1.12	171	179	1.05	49%	51%	1.03	51%	49%	0.97
Somerset	92	115	1.25	41	69	1.68*	51	46	0.90	45%	60%	1.33*	55%	40%	0.73*
Talbot	236	333	1.41*	144	241	1.68*	92	92	1.00	61%	72%	1.19*	39%	28%	0.71*
Wicomico	437	533	1.22	312	400	1.28	125	133	1.07	71%	75%	1.06	29%	25%	0.86
Worcester	581	654	1.13	414	489	1.18*	167	165	0.99	71%	75%	1.05	29%	25%	0.87
Eastern Shore	2,654	3,202	1.21*	1406	1961	1.39*	1248	1241	0.99	53%	61%	1.16	47%	39%	0.82
State Total	23,094	21,461	0.93	17462	15264	0.87*	5632	6197	1.10	76%	71%	0.93*	24%	29%	1.21*

Table 6: Average Annual Parcels Developed 1990-2007, * denotes statistically significant at 95 percent confidence level. Source of data: Maryland Department of Planning: Planning Data Services (Maryland PropertyView).

Finally, the share of acres inside PFAs in the entire state fell from 26 percent before 1998 to 24 percent after 1998, a statistically significant change. The share also fell by a statistically significant amount in Allegany, Anne Arundel, Calvert, and Montgomery counties, however, the share increased by a statistically significant amount in Cecil and Worcester counties.

Perhaps what is most significant is that the total acres developed for residential use outside PFAs increased for over half of the state's counties after the PFA law went into effect. And at the state level, the share of acres inside the PFA fell by a statistically significant amount from 26 percent to 24 percent. The trends were most negative in Prince George's, Anne Arundel, Allegany, and Calvert where both the number of acres and share of acres developed fell inside the PFA by a statistically significant amount after the act relative to before. The Eastern shore counties of Cecil and Dorchester were the only two counties to show a statistically significant increase in total acres and share of acres developed after the act relative to before. The annual average number of residential acres developed for residential uses outside PFAs remains above 700 acres per year for many of the central corridor counties, including some counties with nationally prominent growth management programs like Baltimore County and the acres developed in Southern Maryland exceeded 900 per year in some Southern Maryland counties like Charles and St. Mary's.

County	Average Annual Acreage														
	Total			Inside PFA			Outside PFA			Share (Inside)			Share (Outside)		
	Pre-PFA	Post-PFA	Ratio (Post/Pre)	Pre-PFA	Post-PFA	Ratio (Post/Pre)	Pre-PFA	Post-PFA	Ratio (Post/Pre)	Pre-PFA	Post-PFA	Ratio (Post/Pre)	Pre-PFA	Post-PFA	Ratio (Post/Pre)
Allegany	254	237	0.93	81	58	0.72*	173	179	1.03	32%	24%	0.77*	68%	76%	1.11*
Frederick	1,073	1,023	0.95	325	297	0.91	748	726	0.97	30%	29%	0.96	70%	71%	1.02
Garrett	507	557	1.10	19	22	1.15	488	535	1.10	4%	4%	1.05	96%	96%	1.00
Washington	700	797	1.14	161	200	1.24	539	597	1.11	23%	25%	1.09	77%	75%	0.97
Western Maryland	2,534	2,613	1.03	586	577	0.98	1948	2036	1.05	23%	22%	0.95	77%	78%	1.01
Anne Arundel	1,072	1,047	0.98	372	275	0.74*	700	771	1.10	35%	26%	0.76*	65%	74%	1.13*
Baltimore	1,387	1,180	0.85*	374	324	0.87*	1013	855	0.84	27%	27%	1.02	73%	73%	0.99
Baltimore City	10	16	1.61	10	16	1.61	0	0	0.00	100%	100%	1.00	0%	0%	0.00
Carroll	1,250	1,058	0.85	257	197	0.77	993	860	0.87	21%	19%	0.91	79%	81%	1.02
Harford	1,076	1,135	1.06	274	243	0.89	802	893	1.11	25%	21%	0.84*	75%	79%	1.05*
Howard	1,150	809	0.70*	357	241	0.68*	794	567	0.71*	31%	30%	0.96	69%	70%	1.02
Montgomery	1,118	1,072	0.96	383	326	0.85	735	746	1.01	34%	30%	0.89	66%	70%	1.06
Prince George's	1,012	1,161	1.15	642	590	0.92	370	570	1.54*	63%	51%	0.80*	37%	49%	1.34*
Central Maryland	8,075	7,477	0.93	2668	2213	0.83*	5407	5263	0.97	33%	30%	0.90*	67%	70%	1.05*
Calvert	976	763	0.78*	216	116	0.54*	759	647	0.85	22%	15%	0.68*	78%	85%	1.09*
Charles	1,095	1,247	1.14	141	145	1.03	954	1102	1.15	13%	12%	0.91	87%	88%	1.01
St. Mary's	1,044	1,206	1.15	108	144	1.33	936	1062	1.13	10%	12%	1.15	90%	88%	0.98
Southern Maryland	3,115	3,216	1.03	466	405	0.87	2649	2811	1.06	15%	13%	0.84	85%	87%	1.03
Caroline	357	330	0.92	18	22	1.23	339	308	0.91	5%	7%	1.33	95%	93%	0.98
Cecil	756	712	0.94	53	93	1.76*	704	619	0.88	7%	13%	1.86*	93%	87%	0.93*
Dorchester	249	276	1.11	15	43	2.88*	234	233	1.00	6%	16%	2.59*	94%	84%	0.90*
Kent	132	160	1.21	29	40	1.37	103	120	1.17	22%	25%	1.13	78%	75%	0.96
Queen Anne's	359	334	0.93	50	57	1.15	309	277	0.90	14%	17%	1.23	86%	83%	0.96
Somerset	167	206	1.23	46	70	1.52*	122	136	1.12	28%	34%	1.23	72%	66%	0.91
Talbot	394	391	0.99	96	103	1.07	299	288	0.96	24%	26%	1.08	76%	74%	0.97
Wicomico	487	451	0.93	237	205	0.87	250	245	0.98	49%	46%	0.94	51%	54%	1.06
Worcester	306	389	1.27*	99	123	1.24*	207	266	1.29*	32%	32%	0.97	68%	68%	1.01
Eastern Shore	3,207	3,249	1.01	641	756	1.18*	2566	2493	0.97	20%	23%	1.16*	80%	77%	0.96*
State Total	16,945	16,554	0.98	4376	3951	0.90	12569	12603	1.00	26%	24%	0.92*	74%	76%	1.03*

Table 7: Average Annual Acres Developed 1990-2007, * denotes statistically significant at 95 percent confidence level. Source of data: Maryland Department of Planning: Planning Data Services (Maryland PropertyView).

Parcel Size

Finally, information about the average size of parcels inside and outside PFAs is presented in Table 8, which shows the ratio of the parcel size for parcels developed before and after PFAs and whether the ratio increased or decreased. An asterisk indicates that a ratio is statistically significant at a 95 percent confidence level using a difference-in-means t-test, meaning that the size of parcels developed inside PFAs before the Smart Growth Areas Act was significantly different than the size of parcels developed inside PFAs after the Smart Growth Areas Act. As shown, the average size of parcels developed was about 0.73 acres before 1998 and 0.77 acres after 1998, though this varied across counties. At the regional level, the size of parcels inside PFAs fell by a statistically significant amount in Central, Eastern Shore, and Western Maryland. The size of parcels outside the PFA rose by a statistically significant amount in Southern Maryland and fell by a statistically significant amount in central Maryland. Average parcel size inside PFAs rose from 0.25 acres before 1998 to 0.26 acres after 1998, a statistically insignificant change. Because these trends are measuring new single-family development, this increase in parcel size cannot be attributed to land assembly, but is likely tied to consumer demand for larger lots. The size of parcels inside PFAs fell by a statistically significant amount in outlying Talbot, Montgomery, and Wicomico counties, but increased by a statistically significant amount in central corridor Baltimore, Charles, Harford and Prince George's counties. Similarly, the average size of parcels developed for residential use outside PFAs in the entire state fell from 2.24 acres over the period before 1998 to 2.03 acres over the period after 1998, a decrease of a statistically significant amount. Average parcel size developed inside the PFA was higher in

Baltimore, Charles, and Prince George's counties by a statistically significant amount and lower in Montgomery, Talbot, and Wicomico counties. Average parcel size outside PFAs was higher in Worcester by a statistically significant amount and lower in Baltimore, Calvert, Harford, Howard, and Prince George's counties.

Though the interpretation of trends in parcel size are somewhat ambiguous, because the intent of the smart growth program in Maryland is targeting growth into PFAs while preserving rural lands, it seems that if PFAs were working the parcel size within PFAs would decline while parcel size outside PFAs would increase or stay the same. At the state level, parcel size outside the PFAs declined by a statistically significant amount after the act. Under these assumptions, parcel size inside and outside the PFA is going the wrong direction by a statistically significant amount in Prince George's, Harford and Baltimore counties. The trends are positive in Montgomery, Talbot, and Wicomico where parcel size decreased by a statistically significant amount inside the PFA and Worcester where parcel size outside the PFA increased after the Act.

County	Average Annual Parcel Size (Acreage/Parcels)								
	Total			Inside PFA			Outside PFA		
	Pre-PFA	Post-PFA	Ratio (Post/Pre)	Pre-PFA	Post-PFA	Ratio (Post/Pre)	Pre-PFA	Post-PFA	Ratio (Post/Pre)
Allegany	1.90	2.24	1.18*	0.85	0.88	1.03	4.36	4.52	1.04
Frederick	0.69	0.68	0.98	0.26	0.23	0.90	2.72	3.01	1.11
Garrett	2.30	2.18	0.95	0.65	0.59	0.91	2.57	2.46	0.96
Washington	1.24	1.03	0.83	0.43	0.38	0.86	2.76	2.53	0.92
Western Maryland	1.02	0.98	0.96	0.33	0.30	0.90*	2.77	2.72	0.98
Anne Arundel	0.39	0.49	1.27*	0.17	0.19	1.11	1.20	1.27	1.06
Baltimore	0.54	0.64	1.18*	0.17	0.22	1.32*	2.54	2.22	0.88*
Baltimore City	0.11	0.06	0.57*	0.11	0.06	0.57*	0.00	0.00	0.00
Carroll	1.22	1.20	0.99	0.41	0.35	0.86	2.46	2.56	1.04
Harford	0.67	0.80	1.18*	0.20	0.22	1.06*	3.21	2.87	0.89*
Howard	0.65	0.59	0.90	0.24	0.24	0.98	2.83	1.78	0.63*
Montgomery	0.46	0.46	1.00	0.19	0.18	0.92*	1.86	1.79	0.96
Prince George's	0.32	0.43	1.34*	0.22	0.27	1.23*	1.58	1.16	0.73*
Central Maryland	0.52	0.57	1.10*	0.21	0.22	1.07*	2.11	1.79	0.85*
Calvert	1.18	1.14	0.96	0.50	0.41	0.82	1.92	1.72	0.90*
Charles	1.14	1.12	0.99	0.22	0.24	1.08*	3.11	2.28	0.73
St. Mary's	1.63	1.58	0.97	0.46	0.43	0.94	2.38	2.58	1.08
Southern Maryland	1.27	1.25	0.99	0.35	0.32	0.92	2.39	2.18	0.91*
Caroline	2.26	1.85	0.82	0.46	0.37	0.81	2.84	2.61	0.92
Cecil	1.26	1.06	0.84	0.24	0.30	1.26	1.86	1.76	0.95
Dorchester	2.08	1.47	0.71*	0.57	0.57	1.00	2.50	2.33	0.93
Kent	1.35	1.28	0.94	0.63	0.58	0.92	2.04	2.10	1.03
Queen Anne's	1.10	0.93	0.85	0.30	0.31	1.03	1.82	1.58	0.87
Somerset	1.83	1.83	1.00	1.17	1.07	0.92	2.41	2.97	1.23
Talbot	1.72	1.21	0.70*	0.71	0.43	0.61*	3.30	3.10	0.94
Wicomico	1.12	0.87	0.78*	0.77	0.53	0.70*	1.99	1.86	0.93
Worcester	0.53	0.60	1.14	0.24	0.25	1.04	1.30	1.64	1.27*
Eastern Shore	1.21	1.03	0.85*	0.46	0.39	0.85*	2.06	2.01	0.98
State Total	0.73	0.77	1.05*	0.25	0.26	1.04	2.24	2.03	0.91*

Table 8: Average Annual Parcel Size for Parcels Developed 1990-2007, * denotes statistically significant at 95 percent confidence level. Source of data: Maryland Department of Planning: Planning Data Services (Maryland PropertyView).

Summary

Overall the trends in parcels, acres, and size of parcels developed for residential use are not consistent with PFA objectives. While development patterns may have changed in some areas and in dimensions not captured in the MDP data, in the period after the enactment of Maryland smart growth laws the number of parcels developed for residential use inside PFAs fell and parcels increased in size while the number of parcels developed outside PFAs increased and the parcels decreased in size. Statewide, and in most counties, these changes are quite small; but in general, trends in the number of parcels developed, the acres of land developed, and the average size of parcels are all moving in the wrong direction.

Perhaps most interestingly, development trends within counties were most adverse for the central and Southern Maryland counties including Anne Arundel, Baltimore, Calvert, Charles, Harford, Howard, and Prince George's counties and most favorable for the outlying counties of Cecil, Dorchester, St. Mary's, Somerset, Talbot, and Worcester counties, though outlying counties are some of the fastest growing. Whether these general differences in development trends across regions of the state are the result of state policy, however, is uncertain. In the outlying counties, there is less opposition to growth, more room to grow in PFAs, and more frequent expansions of PFAs. These are the more likely causes of such differences. The statistically significant increase in parcels and acres inside PFAs in Eastern Shore counties is not surprising given housing market trends in these areas after 1999 which resulted in construction of more dense development in PFAs. Additionally, as mentioned above, Eastern Shore counties often had large

“comment areas” around PFAs. In these data and analyses, “comment areas” are considered PFAs.

Regression Analysis

To further explore the effect of PFAs on development patterns, I estimated several regression models using counties as units of analysis and controlled for potential countervailing factors. While this analysis does not address the potential endogeneity of PFAs, it does present a simple test of a counterfactual. Endogeneity is a concern when criteria used to designate policy areas impacts the outcome measure. Using planned and zoned densities and infrastructure to define PFAs is expected to have an impact on development patterns. Endogeneity might bias the level of development inside PFAs upwards because the areas were drawn to reflect existing infrastructure provision and zoning, or it might bias the level of development trends downwards because many PFAs are already developed and do not contain capacity for growth. I do not attempt to address endogeneity in this analysis but acknowledge that it may be an issue.

This analysis includes four dependent variables: total parcels developed outside PFAs, percent of parcels developed outside PFAs, total acres developed outside PFAs, and percent of acres developed outside PFAs. I include five independent variables: real gas prices (at the national level), real income (measured in thousands at the county level), time (measured in years), and the total number of parcels developed (at the county level). The dependent variables relate to trends reported on development patterns inside and outside PFAs before and after the act and provide a measure of whether the PFA program is having its intended effects. Real gas prices serve as a proxy for transportation costs. It

is expected that higher transportation costs would lead individuals to choose housing closer to employment in central cities, and thus, more likely in PFAs. Real income provides a measure of income elasticity related to rural residency. It is expected that higher incomes will lead consumers to purchase larger housing on larger lots, presumably outside the PFA. Time provides a control for trends and exogenous business cycles on development patterns in each year for the panel of observations. Finally, the total number of parcels developed reflects total development pressure in the county. The variable of interest is a dummy variable, denoting “PFA in effect” for 1999-2007 observations.

Data	Unit of Analysis	Year	Source
Development inside and outside PFAs	County	1990-2007	Maryland Department of Planning
Real gas prices	National	1990-2007	U.S. Energy Information Administration
Real personal income	County	1990-2007	U.S. Bureau of Economic Analysis
Total parcels developed	County	1990-2007	Maryland Department of Planning
Consumer price index (to obtain real prices)	Metropolitan	1990-2007	U.S. Bureau of Labor Statistics

Table 9: Data Sources for Priority Funding Areas Regression Analysis

Using panel data by county for each year from 1990-2007, I control for county-specific fixed effects by including dummy variables for each of the 23 counties. Baltimore City is omitted from this analysis because 100 percent of the city is a PFA. If PFAs are having their intended effects, residential development outside PFAs should decrease after PFAs went into effect. Specifically, a time and entity fixed effects regression is used, where α_i is the entity fixed effect (county) and λ_t is the time fixed effect (year).

$$Y_{it} = X_{it}\beta + \alpha_i + \delta_t + \varepsilon_{it}$$

Regression results are shown in Table 10. The regression models produced plausible and

robust results. The results suggest that the share and number of both acres and parcels developed outside PFAs increased consistently over time and with real county income levels. This might reflect the effects of dwindling development capacity inside PFAs and a positive income elasticity of demand for rural residency. The share and number of acres developed outside PFAs decreased consistently with real gas prices, which probably reflects standard assumptions about tradeoffs between accessibility and housing demand. Finally, the number of acres and parcels developed outside PFAs increased with total parcels developed but the share of areas and parcels developed outside PFAs fell with total parcels developed. This implies that in the years in which there was a high level of development activity in a county, development outside PFAs went up; but because development inside PFAs went up faster than development outside PFAs, the share of development outside PFAs declined.

These results are robust, consistent with expectations, and conform to results presented earlier on development patterns. The effect of the PFA variable is insignificant in every regression. Most importantly, these results suggest that the Smart Growth Areas Act and the other set of policies adopted in 1997 have not significantly served to redirect growth inside PFAs, even after controlling for countervailing factors.

	Dependent: Percent Parcels Outside PFA		Dependent: Total Parcels Outside PFA		Dependent: Percent Acres Outside PFA		Dependent: Total Acres Outside PFA	
	Model 1		Model 2		Model 3		Model 4	
	B	t	B	t	B	t	B	t
(Constant)	1.838***	5.49	1681.331***	5.03	1.336***	5.43	3574.169***	6.98
After PFA	0.019	1.12	3.382	0.20	0.014	1.09	24.389	0.95
Time	0.038***	3.29	53.372***	4.64	0.016**	1.88	104.004***	5.91
Real Income / 1000	0.000***	3.40	0.004***	4.89	0.000**	2.05	0.004***	3.54
Real Gas	-1.367***	-4.10	-1626.038***	-4.88	-0.559**	-2.28	-3327.544***	-6.52
Total Parcels Developed / 1000	-0.058***	-3.69	169.553***	10.82	-0.018	-1.58	301.118***	12.54
n	414		414		414		414	
Adj R2	0.8634		0.8029		0.8256		0.8705	

Table 10: Priority Funding Area Regression Results *** indicates statistically significant at 99% confidence level. ** indicates statistically significant at 95% confidence level

Summary and Conclusions

Given the above trends in residential development patterns, lack of attentiveness by state agencies and lack of integration into local planning, it is easy to be critical of the PFA approach. But it is important to note the limitations of the evidence to date. Ten years is not a long time for land use policy evaluation, the data are not complete, and it is difficult to ascertain what would have happened had the Maryland smart growth policies not been adopted. That said, it is clear that PFAs have not over the last ten years produced their intended effects. Also, the trends in Central Maryland are the worst in the state while trends in fast-growing Eastern Shore are less negative. PFAs were also inflated on the Eastern Shore because of several “county-certified areas” (or comment areas) that did not meet the state’s criteria but are included in this analysis.

While the logic of restricting growth-related funds to designated growth areas is conceptually sound, PFAs in Maryland have both conceptual and practical limitations. On the practical level, the implementation of PFAs has had a number of problems. Specifically, information about what programs are “growth-related” is vague and not carefully monitored as programs change and new programs are created; the process for reviewing funding requests for consistency with PFAs is poorly designed; and state agencies have been lax in meeting reporting requirements. Despite the focus on mapping and tracking spending by the state in recent years, projects subject to PFAs are not mapped in the application, funding, or reporting stage. Further, it is difficult to ascertain how state spending for “growth-related” projects affects individual development decisions.

Despite these limitations, PFAs have had some important, if ephemeral, benefits. Specifically, PFAs have provided a framework for discussion between the state and local governments. After ten years, PFAs have become well-understood elements of the Maryland landscape; despite differences in approaches to PFAs across the state, there is little confusion about what PFAs are intended to achieve or where they are located. As a corollary, PFAs provide useful benchmarks. That is, measures of how much growth is occurring inside and outside PFAs, as reported here, are useful benchmarks of whether growth patterns are changing. Despite several ephemeral benefits, however, PFAs as currently used in Maryland, have conceptual limitations that will require more extensive change. These limitations include:

- The statutory criteria for drawing PFAs are based on existing densities, infrastructure capacities, and municipal boundaries, not on careful plans that consider where future growth should occur.
- The process by which the existing PFAs were constructed was completed extremely quickly and without public participation.
- MDP can do no more than comment on PFAs it deems as too large. MDP does not have strong approval authority or mechanisms to force local governments to revise PFAs.
- PFAs are not well integrated with local plans. PFAs are not required elements in local comprehensive plans or the development review process and in some existing comprehensive plans, PFAs are not even mentioned.

- The funds allocated to PFAs are perhaps too small to make a significant difference in development trends.
- There is no requirement that PFAs be reviewed periodically and updated as needed.

For Maryland, the recognition of these limitations should form the foundation for further refinement of the PFA concept and its implementation. Based on these limitations of the Smart Growth Areas Act, I recommend that the governor and the General Assembly initiate a comprehensive reexamination of the how PFAs are drawn and used to guide state and local land use decisions. Specifically, I recommend that legislation be passed that achieves the following:

- Integrate PFAs into comprehensive plans by authorizing the Maryland Department of Planning to review and recertify PFAs along with comprehensive plans on the current six-year cycle.
- Require that PFAs are coterminous with growth areas in local comprehensive plans.
- Require local governments to complete a public participation process and a development capacity analysis before the Maryland Department of Planning recertifies their PFAs.
- Make growth-related spending by state agencies for local governments contingent upon having their comprehensive plans certified by the Maryland Department of Planning.
- Make funds for transportation and wastewater infrastructure projects contingent upon consistency with a carefully considered state development plan, not existing

PFAs, as requiring that linear features like sewers and roads lie within PFA polygon boundaries makes little sense.

If consensus in the General Assembly on the above recommendations cannot be achieved, I am not optimistic that current development trends will change. Even then, however, I believe the use of PFAs to guide state spending can be vastly improved without legislative action. Specifically, I recommend that the O'Malley administration issue an executive order that requires the Smart Growth Subcabinet to complete the following:

- Review and clarify of the set of programs that are subject to PFA review.
- Reevaluate the procedure through which projects are screened for meeting PFA requirements. In particular, consider a requirement that state agency funds for local projects be contingent upon certification by the state Department of Budget and Management or the State Clearinghouse.
- Require that requests for “growth-related” spending are mapped in the application, funding, and reporting process.
- Improve the process of accounting for appropriations inside and outside PFAs by each of the state agencies.
- Faithfully meet the reporting requirements established in state law.

For other states considering the PFA approach to growth management, however, the lessons are perhaps more fundamental. First, it is important that PFAs be fully embedded in state planning law. As the Maryland experience suggests, without statutory requirements, tools that matter to the state are not always those that matter to local

governments. Second, a targeted state spending approach requires a careful reconsideration of the state's budgeting processes. Without developing an allocation process that considers how funds are allocated spatially, it is unlikely state agencies will take the steps needed to make the targeting strategy meaningful. Finally, it is unclear that a targeted state spending strategy alone will be sufficient to alter state growth patterns. There is widespread evidence that incentives can serve as effective policy instruments in certain policy contexts. But it is unclear any state will ever have enough resources to significantly contain urban growth. This is particularly true in states under significant development pressure where developers and local governments are able to pass expenses for infrastructure along to homebuyers.

Essay #2: Maryland's Rural Legacy Program: Evaluating An Incentive-Based Approach to Discouraging Development

This essay focuses on the Rural Legacy Program, which is the tool the state uses to target preservation funding and discourage development in locally sponsored, state approved Rural Legacy Areas. The Rural Legacy Program was established to protect natural resources, farms, forests, and sensitive areas and maintain resource based industries. To receive Rural Legacy Area designation, local sponsors submit applications to the statutorily created Rural Legacy Board. Rural Legacy Areas are selected by the Board based on the significance of agricultural, forestry and natural resources for protection, the threat of development, the significance and extent of cultural resources in the area, the economic values of resource based industries, the strength of land conservation partnerships in the area, and the expected ability of the local applicant to carry out the Rural Legacy plan. (Gustanski & Squires, 2000) Upon designation, Rural Legacy Area sponsors are eligible for state funding to purchase real property and fee simple easements. Over the life of the program, \$229 million in funding has been awarded through the Rural Legacy program to preserve nearly 69,000 acres through easements. A map of Rural Legacy Areas is shown in Figure 12. Figure 13 shows a map of protected lands in Maryland, highlighting properties purchases through the Rural Legacy Program. As of 2009, there were 30 Rural Legacy Areas, and nearly all counties have at least one Rural Legacy Area though some areas cross county boundaries. Designation of the areas is optional to local sponsors (governments or land conservancies) and landowner participation is voluntary. Baltimore City and Allegany County are the only two counties

in the state without Rural Legacy Areas, but a Rural Legacy Area was recently (FY10) designated in Allegany County.

As expressed in the statute, the legislative intent of the Rural Legacy program was to limit sprawl development on rich natural resource lands. (Maryland Code Annotated, Natural Resources Article, §§ 5-9A-01 to -09, 2010) The statute text discusses the insufficiency of current programs in mitigating such sprawl development. New funding was not set aside with the Rural Legacy program, but existing funding was targeted to Rural Legacy Areas and procedures were expedited in order to protect valuable natural and environmental resources. Specifically, five percent of the Real Estate Transfer Tax is dedicated to the Rural Legacy Program. (Maryland Department of Planning, 2009d) Section 5-9A-09 in the Natural Resources Article of the Maryland State Code specifies that the governor should include no less than \$5 million in funding for the Rural Legacy Program per year. A stated goal of the program is to preserve 200,000 acres by 2011. (Maryland Department of Natural Resources (a), n.d.)

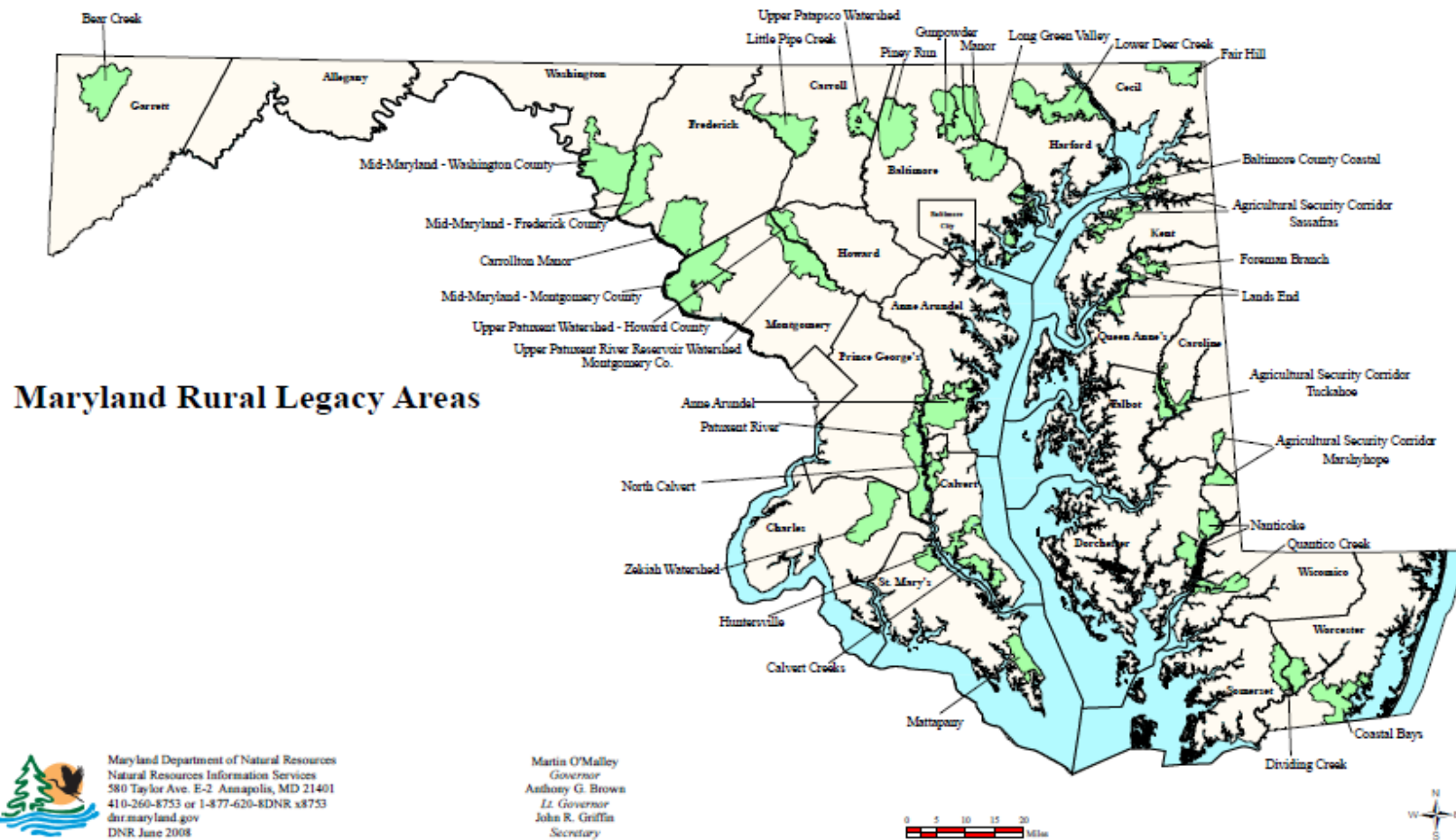


Figure 12: Rural Legacy Areas in Maryland (Source: Maryland Department of Natural Resources)

Protected Lands in Maryland

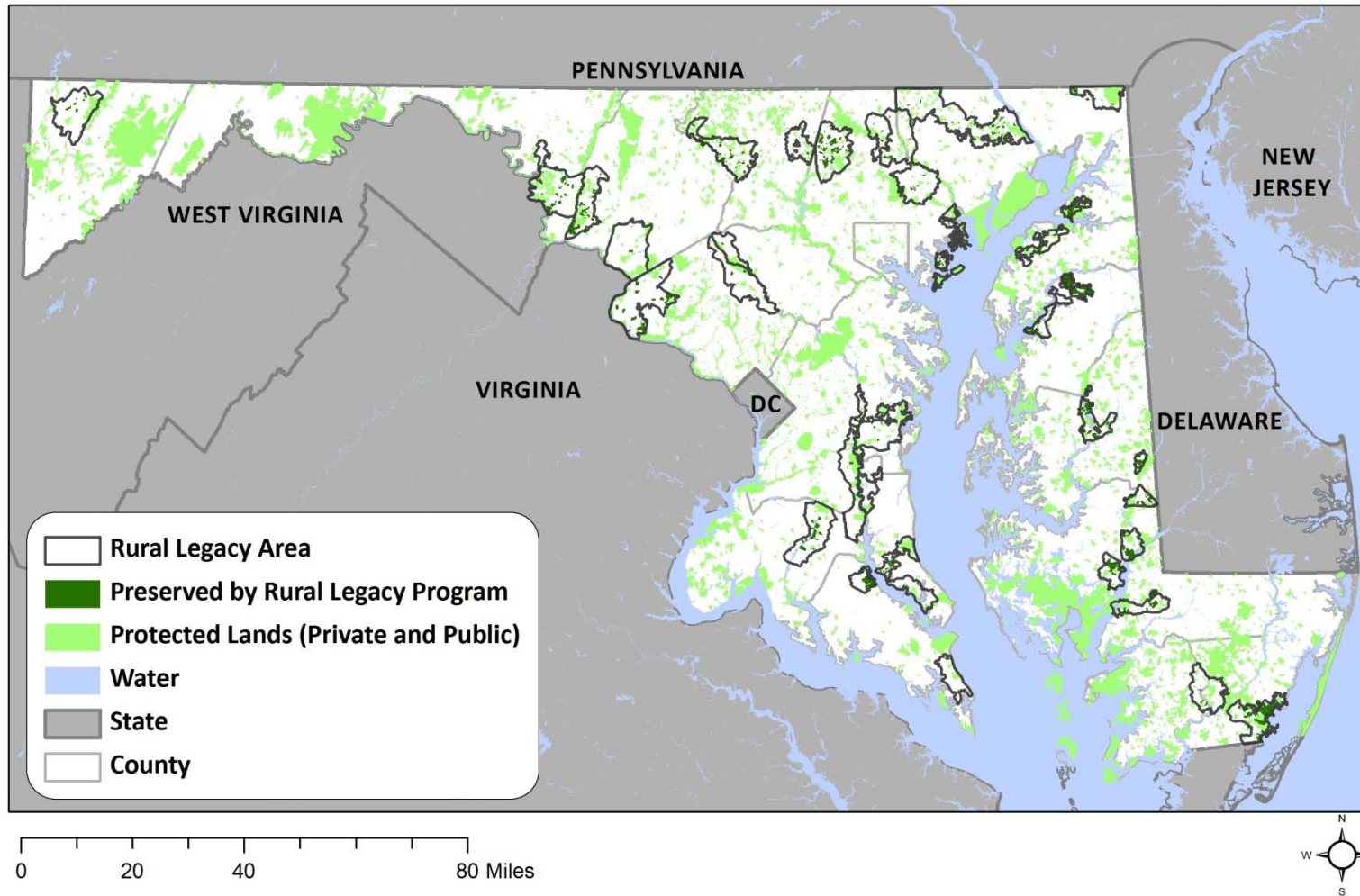


Figure 13: Protected Lands in Maryland (Source of Data: Maryland Department of Natural Resources; Maryland Department of Planning)

Rural Legacy Areas in Maryland are one of many tools for preserving land in the state. The Maryland Agricultural Land Preservation Foundation (MALPF), introduced in 1977, finances agricultural easements for prime farm and forest land. As of 2009, MALPF has provided \$556 million in funding to preserve 274,948 acres since the program was created. (Maryland Department of Agriculture, 2009) Program Open Space (POS), operated by the Department of Natural Resources, is a purchase of development rights program, which began in 1969. As of 2010, POS has preserved 352,192 acres. (Maryland Department of Natural Resources (b), n.d.) The GreenPrint Program provided \$52 million to preserve nearly 22,000 acres of ecologically significant land from 2002-2006. (Frece, 2005; Maryland Department of Agriculture, 2008) Since 1967, the Maryland Environmental Trust (MET) has provided tax benefits for landowners donating easements. As of 2010, 122,000 acres have been preserved through MET. (Maryland Department of Natural Resources, 2010) Additionally, Maryland's counties operate land conservation programs at the local level. The Rural Legacy Program was not meant to supersede or replace these programs but encourage spatial targeting within these prime resource areas.

Previous research on the Rural Legacy Program has been relatively limited. In a comprehensive but early review, Tassone et al. (2004) examined several performance measures of Rural Legacy Areas including fragmentation, contiguity, development, and preservation as of 2003. This analysis considered these measures for only one point of time and did not evaluate trends over time. Shen & Zhang (2007) examined the effects of Rural Legacy Areas on land use conversion from 1992 to 1997 and from 1997 to 2002

using land use land cover data. Comparing the two periods using a logit model, the authors determined that urban development, as defined by the “urban” land classification in land use land cover data, was less likely in Rural Legacy Areas and more likely inside Priority Funding Areas after 1997, though results varied across counties. Lynch & Liu (2007) examined the rate of preservation and the rate of conversion inside and outside of Rural Legacy Areas before and after the act for three counties in Maryland: Calvert, St. Mary’s, and Charles. Lynch & Liu (2007) did not find an impact on the rate of conversion from rural to urban before and after the passage of the act, but did find that preservation was more likely in Rural Legacy Areas than other areas in the county. Liu & Lynch (2009) extend 2007 work to examine the “crowding” effect of land conservation programs in Maryland. Specifically, they consider whether the Rural Legacy program causes shifts in funding for existing programs into or out of Rural Legacy Areas for three southern Maryland counties. Liu & Lynch (2009) found a “crowding in” effect, meaning that the likelihood of preservation in Rural Legacy Areas increases by about 10 percent and the average preserved acres by about 3 percent which indicates that other agricultural preservation programs tend to be concentrating funding in Rural Legacy Areas as well. Daniels (2007) compares the Rural Legacy Program and MALPF in Maryland to land preservation programs in Pennsylvania finding that both states have been relatively effective at preservation but noting Maryland’s programs would benefit from more integration. Lynch (2009) compares cost effectiveness of four programs (MET, Rural Legacy, MALPF, and county level programs) in Maryland for three counties: Frederick, Carroll, and Baltimore. Using land use land cover data, Lynch (2009) finds that relative to county and MALPF programs, and similar to the MET program, the Rural Legacy

Program enrolls parcels with more habitat, wetlands, and forests while MAPLF and county programs enroll more cropland. This is not surprising given the intent of the program. Further, the Rural Legacy program enrolls parcels that are closer together. (Lynch, 2009) Several other studies have used Rural Legacy Areas as an explanatory or descriptive variable in analysis though the primary focus of research lies elsewhere. (Irwin et. al. 2003; Lynch, Gray & Geoghegan, 2007; Lynch & Lovell, 2002)

The idea of spatially targeted preservation is not new, but has risen in popularity recently as spatial data and analysis have become more readily available. However, most of the literature on spatial targeting focuses on site selection instead of targeting to large regions. Additionally, much of the existing research focuses on targeting for ecological values rather than preventing development in rural areas. In a study that focused on preservation to support growth management objectives, Stoms et al. (2009) define spatial targeting as “geographic targeting to form large blocks of permanently preserved agricultural land in locations that are consistent with and help define the desired pattern of future growth according to principles of smart growth.” Stoms et al. (2009) explore the use of agricultural conservation easements to reinforce growth boundaries or preserve large contiguous blocks of land. Specifically, the authors examine whether easement programs can complement growth management programs the way Rural Legacy was intended to complement the Priority Funding Areas program. Applying a multi-criteria framework for preservation and focusing on reinforcement of growth management policies, Stoms et al. (2009) find that existing easement programs are ineffective in complementing growth management programs, though the allocation of easements is consistent with local plans. While this means that typical purchase of development rights

programs do not do a good job at targeting to support growth management and provides advice for targeting, the study by Stoms et al (2009) does not evaluate whether existing targeting policies have been effective.

Much of the additional research on spatial targeting focuses on site selection for greatest benefits, benefit cost, or benefit loss. (Newburn et. al., 2004) These approaches use spatial analysis, environmental benefits indices, land use change models, and valuation of development right models to identify which sites to target. While the Rural Legacy program uses multiple criteria to target funding to sites within the Rural Legacy Area, the Rural Legacy program is fundamentally different than other spatial targeting approaches in focusing on a large defined spatial area rather individual sites.

This essay differs from existing research in many ways. Many previous studies focused on relative costs and impacts on other land conservation programs in Maryland while less emphasis has been placed on the program's impacts on diminishing sprawl in rural areas. (Liu & Lynch, 2009; Lynch & Liu, 2007) The two studies that consider development (Shen & Zhang, 2007; Lynch & Liu, 2007) use older land use land cover data and focus on conversion of farmland or the probability of development rather than sprawl development. Few studies have explored the contiguity of preservation, though Lynch (2009) considered distance to preserved parcels in her analysis.

In this analysis, I focus on the implementation of Rural Legacy Areas, measures of development and preservation within Rural Legacy Areas over time, impacts on trends in development patterns, and the spatial pattern of development. If the state has been allocating preservation funding to Rural Legacy Areas to prevent development on some

parcels, I expect that the rate of development in Rural Legacy Areas will be lower after the passage of the act relative to before. But some research has shown that preserving farmland provides an amenity for new residents that might attract new development. (Roe et. al. 2004) I will consider this finding in my analysis. I expect that the level of dispersed development within Rural Legacy Areas will decline after the implementation of the program, and I expect preservation to increase after designation of Rural Legacy Areas. Whether the Rural Legacy Program is effective at curtailing sprawl and protecting natural resources will depend on the level of incentives and implementation of the act.

Statutory Context

Though the state and county government have several programs designed for land preservation, the Rural Legacy Program was designed for a specific purpose – to target preservation in valuable, vulnerable rural areas. This section describes how the program was designed according to the statute.

The Rural Legacy Program serves as the state’s incentive-based mechanism for controlling sprawl in Rural Areas. While Priority Funding Areas focus on targeting infrastructure funding into designated growth zones, the focus of Rural Legacy Areas lies in targeting preservation dollars.

Administration of the Program

According the statue, local sponsors submit applications along with a Rural Legacy Plan to the Department of Natural Resources (DNR) for designation of Rural Legacy Areas and funding of individual easements on parcels identified in the Rural Legacy Plan.

Though DNR serves as the lead agency, the Departments of Agriculture and Planning are

integral in designation process as well. In the application, the sponsor must identify existing protected lands, state the expected level of landowner participation and the amount of funding requested in addition to providing information relating to several criteria reviewed by the Rural Legacy Board. These criteria include the significance of agricultural, forestry and natural resources pertaining to the location, proximity and size of contiguous blocks of preserved land, the importance of the land area to be protected, and the public and economic value of the land. Additional criteria relate to the degree of threat to the resources and character of the area, cultural resources, and the economic value of resources. Several criteria relate to the quality and completeness of the Rural Legacy Plan. Specifically, these criteria include the protection offered by current growth management policies, consistency with the local comprehensive plan, coordination with other conservation programs, the contiguity of preservation provided by proposed acquisitions, how a sponsor manages and prioritizes easements, the proposed titleholder for easements, and the quality of program for holding easements in perpetuity. Finally, several criteria assess the strength and quality of partnerships with state, federal and local governments and organizations including the level of financial support, dedication of staff and resources, the commitment of local land conservation policies, and matching funds by federal and other grant programs. The sponsor's ability to carry out the Rural Legacy Plan is also assessed and the level of public participation is described and assessed. After FY2000, Rural Legacy Areas already approved by the Rural Legacy Board were only required to submit a renewal application each year the sponsor sought funding. Only new Rural Legacy Areas had to submit complete applications, and a separate process was developed for expansions.

The application process is depicted in Figure 14. After applications are received by the Department of Natural Resources, staff from the Departments of Agriculture, Natural Resources, and Planning assess the applications according to the criteria described.

Agency review is very important to the process as this review informs the decisions made by the Advisory Committee and Rural Legacy Board. Over time, this review process has become more quantitative. While descriptive narratives were prepared in early years, in later years, the applications have been scored according to the criteria listed in the statute.

The Advisory Committee then reviews applications for Rural Legacy Areas and makes recommendations to the Rural Legacy Board. According to the statute, the Advisory Committee includes 11 members representing MALPF, MET, the agriculture industry, nonprofit land conservation organizations, nonprofit environmental organizations, the forest industry, county governments, business, private landowners, mineral resources, and municipalities. These members are appointed by the Governor with advice and consent of the State Senate and serve three-year terms.

The Rural Legacy Board includes the Secretaries of Natural Resources (chair), Planning, and Agriculture. Based on the recommendations provided by the Advisory Committee on funding relating to the criteria evaluated by state agencies, the Rural Legacy Board decides which applications best carry forward the goals and objectives of the Program and decide how much funding to allocate to each applicant.

The decisions of the Rural Legacy Board regarding designation and funding must be approved by the Board of Public Works, which is a three-member body consisting of the Governor, Comptroller, and State Treasurer.

Upon approval by the Board of Public Works, it is the responsibility of the local sponsor, sometimes in conjunction with state agencies, to use the funding provided to purchase real or fee-simple property as listed in the sponsor's Rural Legacy Plan.

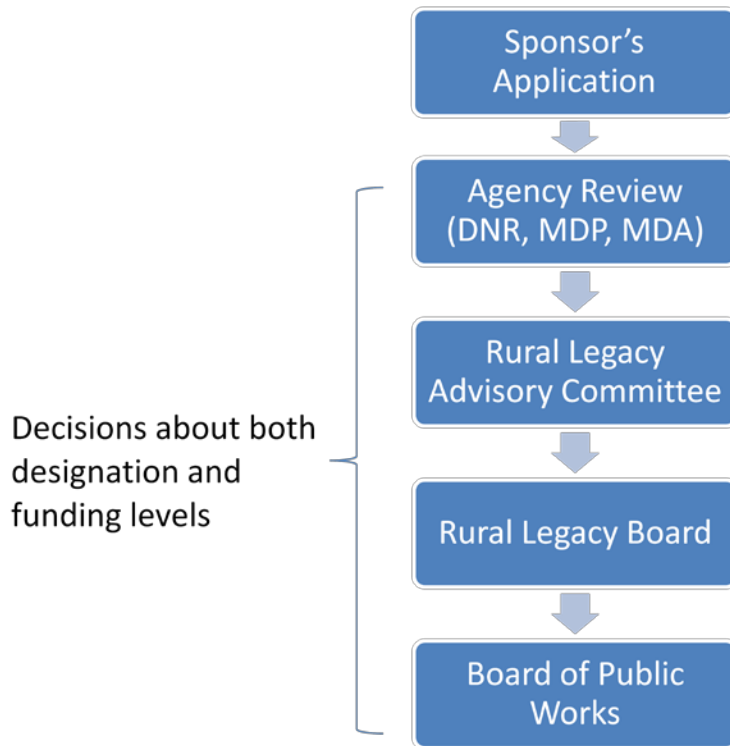


Figure 14: Rural Legacy Application Process

Rural Legacy Annual Reports

According to the statutes, the Rural Legacy Board is required to report annually on the financial status of the program, the number of applications received, the number and location of Rural Legacy Areas designated, and the Rural Legacy Program's progress in contributing to land preservation efforts. These reports have been filed annually since the program's inception.

Reports include elements required by the statutes, but also provide brief descriptions characterizing each Rural Legacy Area in addition to information about a sampling of parcels preserved across the state. Early reports provided valuable information about prioritization of funding decisions and why certain areas were not approved or not funded in that year. In later years, reports also provided information about expired funding that local sponsors returned to the Rural Legacy Program when the funds could not be utilized. This funding was then reallocated to other Rural Legacy Areas. This funding is listed below in Table 11. In the transition year between the Glendening and Ehrlich administrations (FY2003), the report was less extensive than previous years because of internal staffing changes. After FY2003 (when Governor Ehrlich took office) and continuing through the O'Malley administration, reports became less detailed and lacked appendix materials present in early reports. However, reports across all years included legislatively mandated information and often additional information.

Summary

The Rural Legacy Program was established to protect critical resource lands facing development pressure. Unlike designating PFAs, applying for Rural Legacy designation is optional, but all counties have submitted applications for designation. Though statutes outline specific criteria regarding designation and both state agencies and the Advisory Committee provide valuable analysis of each Rural Legacy Area, the administration of the program is somewhat subjective and varied over the course of the program. The Department of Natural Resources was diligent in filing reports annually, though the reports became less detailed over time. In the next section I examine how Rural Legacy

statutes have been implemented by state agencies and how the program has worked to preserve prime rural land.

Implementation

In this section, I discuss how the law has been implemented. Specifically, I discuss the application process, characterize areas that have been approved, discuss expansions over time, and comment on the funding, and amount of land preserved through the Rural Legacy Program over time. I use data on state spending to determine how the state has been spending money within Rural Legacy Areas and report how and when Rural Legacy Areas were approved for designation. Using descriptive data, I examine spending over time within each individual Rural Legacy Area and describe relative costs per acre within each Rural Legacy Area and each county. I describe the levels of preservation occurring within Rural Legacy Areas through the Rural Legacy Program. I expect that urban counties will have more expensive costs per acre than less urban counties. This largely descriptive section on implementation informs later analysis on development patterns in Rural Legacy Areas.

Much of the data and information used in this section was obtained from the Department of Natural Resources including funding data by fiscal year for each Rural Legacy Area for FY1998 to FY2010. The Department of Natural Resources website provides detailed descriptions of each Rural Legacy Area and information about sponsors in addition to GIS shapefiles of Rural Legacy boundaries and parcels preserved through the Rural Legacy Program. The boundary shapefile provides information about boundary expansion and designation dates. Application and renewal files in addition to agency

review documents and meeting minutes, archived at DNR, were used to inform the sections on applications, expansions and funding.

Applications

Since 1998, there have been over 40 applications for designation as Rural Legacy Areas. Only 30 of these applications were approved by the Rural Legacy Board and received funding approved by the Board of Public Works. In the first year, 27 applications were received and 15 were approved. In the second year (FY2000), 5 additional areas were approved. Since FY2001, 10 new areas have been approved (see Table 11).

Some counties have several Rural Legacy Areas like Baltimore, Calvert, Carroll, Frederick, Queen Anne's, and Montgomery Counties. Some areas overlap county boundaries. The Rural Legacy Areas spanning multiple counties are typically sponsored by a land conservancy nonprofit rather than a local government. When counties have more than one area, the county government must provide a ranking of their priorities to the Advisory Committee each year to help the Board make funding decisions. Many counties like Anne Arundel, Charles, Cecil, Washington, and Dorchester have only one area, and Baltimore county has five Rural Legacy Areas, all of which were designated in the first three years of the program.

Some of the areas, like Upper Patapsco in Carroll County and Quantico in Wicomico County applied to the Rural Legacy Program several consecutive years before finally receiving approval and funding. When an area is rejected, the state provides justification for why an area was rejected and provides the sponsor with feedback about how to improve the application in later years. Some areas were never approved, often because of

the character of the area like Magothy River, Green Cathedral, and Cat Tail Creek, which were already heavily developed or because a sponsor submitted a single parcel for designation as a Rural Legacy area, like the Smith Property in Howard County. Some areas, like St. Mary's River, did not receive designation because the local sponsor, which administered a different area (in this case Huntersville), had not shown tremendous competence with existing Rural Legacy Areas (see Table 12).

According to program administrators, applications that were approved in early years like Baltimore Coastal would likely not have received designation today, and were designated for primarily political reasons. This is an area where there is a high level of existing development, few valuable natural resources, and less restrictive zoning throughout the area. However, as the application review process became more quantitative, though Baltimore Coastal has submitted an application nearly every year, the area has not received funding since FY 2002. Some areas like Upper Patuxent in Howard and Montgomery Counties have not submitted renewal applications in several years. Many sponsors were diligent about submitting applications consistently in the early years of the program, but stopped submitting applications for a few years and have started to submit applications again in recent years, like Foreman Branch and Land's End. Some areas like Agricultural Security Corridor, Calvert Creeks, Deer Creek, Gunpowder, Fair Hill, Little Pipe Creek, Long Green Valley, Mid-Maryland Frederick, Mid-Maryland Montgomery, Piney Run, and Zekiah Watershed have submitted renewal applications every year since the inception of the program. Also, Bear Creek Carrollton Manor, Dividing Creek, Manor, Mattapany, North Calvert, and Upper Patapsco have applied every year since the areas were designated.

Adjustments to Rural Legacy Areas

The size of many RLAs has not been consistent over time. In the first funding cycle, the Rural Legacy Plan area and Rural Legacy area were different sizes, and the Plan area was often rather large. Some areas, like Anne Arundel and Agricultural Security Corridor submitted areas that were considered excessively large. Sponsors in Agricultural Security Corridor and Anne Arundel South were asked to revise their areas and submit smaller geographic areas. In FY2001, Little Pipe Creek, Long Green Valley, Piney Run, and Upper Patuxent-Howard County reduced the size of the original areas to concentrate on a smaller area. Over the life of the program, 16 of the 30 Rural Legacy Areas have expanded at some point (see Table 11). Some areas, like Anne Arundel South, Calvert Creeks, Coastal Bays, and Huntersville requested expansions on several occasions. All requests for expansion were eventually honored, if not in the initial year requested, in a later funding year. Areas like Baltimore Coastal and Long Green Valley expanded to an area over three times their initial size like Mid-Maryland Frederick and Foreman Branch expanded only slightly – by only about 1,000 acres.

Funding Rural Legacy Projects and Preserving Land

Over time, \$229 million in funding has been approved by the Board of Public Works for the Rural Legacy Program (see Table 13). The highest funding years were in the first five years of the program under Governor Glendening and in FY2007, when current Governor Martin O'Malley first came into office and before the economic downturn set in. The lowest funding years occurred during the Ehrlich Administration in FY2004-FY2005. In FY05, only \$2.5 million was approved for the program, merely half of the

statutory required minimum. While many sponsors submitted applications annually over the life of the program and designation of the area, only the Agricultural Security Corridor has received funding in each year since the program's inception. Cumulatively, the Agricultural Security Corridor and Piney Run have received the most funding over the life of the program at around \$20 million each. Only North Calvert and Upper Patuxent-Howard received less than \$1 million over the life of the program and some funding in Upper Patuxent-Howard expired and was re-allocated (see Table 11.) Several areas had funding reallocated because sponsors were not able to expend the funds before their agreements expired. This happened in Calvert Creeks, Coastal Bays, Manor, North Calvert, Patuxent-Prince George's, Quantico, Upper Patapsco, and Upper Patuxent-Howard.

For many areas, funding has been inconsistent over time. Agricultural Security Corridor, Bear Creek, Coastal Bays, Deer Creek, Dividing Creek, Little Pipe Creek, Mattapany, Mid-Maryland Frederick, Mid-Maryland-Washington, Piney Run, Upper Patapsco and Zekiah Watershed have received funding consistently since receiving designation. Baltimore Coastal, Calvert Creeks, Fair Hill, Huntersville, Long Green Valley, North Calvert and Patuxent-Prince George's have received less consistent funding since designation.

Preservation within Rural Legacy Areas averaged \$3,328 per acre over time across all Rural Legacy Areas. (See Table 11) On average, Mattapany, Patuxent-Prince George's, Upper Patapsco and Upper Patuxent-Montgomery have been most expensive in cost per acre while Coastal Bays, Nanticoke, Quantico Creek, Foreman Branch, and Agricultural Security Corridor have been least expensive per acre. It is not surprising that it is most

expensive to preserve central Maryland and least expensive to preserve the Eastern Shore. The highest amounts of land preserved through the Rural Legacy Program since the inception of the program occurred in Agricultural Security Corridor, Coastal Bays, Foreman Branch, and Nanticoke while the least amount of land has been preserved in North Calvert where no easements have been purchased and Upper Patuxent-Howard and Carrollton Manor where less than 200 acres were purchased.

Rural Legacy Program Grants Awarded										
Sponsor	Counties	Designated	Expansion Requests	Initial Size	Acres in 2009	Total Funding Approved	Funding Reallocated	Total Funds Expended	Total Acres Preserved Through RLA as of October 2010	Average Cost/Acre as of October 2010
Agricultural Security Corridor	Caroline, Cecil, Dorchester, Kent, Talbot	FY98/99	-		43,674	\$20,450,000	\$0	\$20,450,000	9872	\$2,072
Anne Arundel County (south)	Anne Arundel	FY00	FY02/FY05/ FY10	17,960	32,421	\$6,033,590	\$0	\$6,033,590	1235	\$4,885
Baltimore Coastal	Baltimore County	FY98/99	FY02	3,900	14,711	\$3,800,000	\$0	\$3,800,000	889	\$4,274
Bear Creek	Garrett	FY03	-		31,437	\$4,521,705	\$0	\$4,521,705	1113	\$4,063
Calvert Creeks	Calvert	FY98/99	FY01 /FY03	8,500	20,527	\$7,621,636	\$528,264	\$7,093,371	1664	\$4,263
Carrollton Manor	Frederick	FY04	-		38,265	\$1,007,591	\$0	\$1,007,591	185	\$5,446
Coastal Bays	Worcester	FY98/99	FY03/FY05	15,400	26,110	\$9,950,563	\$812,617	\$9,137,946	7254	\$1,260
Deer Creek (Lower Deer Creek)	Harford	FY00	FY09	40,092	66,701	\$10,550,000	\$0	\$10,550,000	1909	\$5,526
Dividing Creek	Somerset and Worcester	FY08	-		23,000	\$3,100,000	\$0	\$3,100,000	405	\$7,654
Fair Hill	Cecil	FY00	-		15,045	\$6,900,000	\$0	\$6,900,000	1022	\$6,751
Foreman Branch (Chino Farms)	Queen Anne's County	FY01	FY08	6,880	7,718	\$8,683,590	\$0	\$8,683,590	5867	\$1,480
Gunpowder	Baltimore County	FY00	FY07	4,568	13,432	\$4,575,000	\$0	\$4,575,000	837	\$5,466
Huntersville	St. Mary's	FY98/99	FY01/FY05	2,815	8,357	\$9,964,305	\$0	\$9,964,305	2823	\$3,530
Lands End	Queen Anne's County	FY98/99	FY08	3,752	10,394	\$4,050,000	\$0	\$4,050,000	616	\$6,575
Little Pipe Creek	Carroll County	FY98/99	-		24,941	\$9,866,275	\$0	\$9,866,275	2692	\$3,665
Long Green Valley	Baltimore County	FY00	FY07	6,000	25,252	\$2,356,903	\$43,082	\$2,313,822	454	\$5,097
Manor	Baltimore and Harford	FY01	FY07	17,027	28,434	\$3,650,000	\$0	\$3,650,000	635	\$5,748
Mattapany	St. Mary's	FY06	-		13,703	\$4,000,000	\$0	\$4,000,000	395	\$10,127
Mid-Md Frederick	Frederick	FY98/99	FY02	24,800	26,351	\$14,125,000	\$0	\$14,125,000	3912	\$3,611
Mid-Md Montgomery	Montgomery	FY98/99	FY03	42,350	49,907	\$16,950,000	\$0	\$16,950,000	4441	\$3,817
Mid-Md Washington	Washington	FY98/99	FY06	37,500	42,849	\$12,360,700	\$0	\$12,360,700	4245	\$2,912
Nanticoke	Dorchester	FY02	-		21,250	\$10,150,000	\$0	\$10,150,000	5037	\$2,015
North Calvert	Calvert	FY04	-		10,515	\$833,590	\$833,590	0	-	-
Patuxent-Prince George's	Prince George's	FY98/99	-		34,984	\$9,601,959	\$1,292,443	\$8,309,516	874	\$9,507
Piney Run	Baltimore County	FY98/99	FY03	19,722	32,320	\$21,950,000	\$0	\$21,950,000	5024	\$4,369
Quantico Creek	Wicomico	FY01	-		13,637	\$4,662,012	\$40	\$4,661,972	2205	\$2,114
Upper Patapsco	Carroll County	FY04	-		14,145	\$2,800,000	\$50,000	\$2,750,000	323	\$8,514
Upper Patuxent-Howard Co.	Howard	FY00	-		11,322	\$344,134	\$55,866	\$288,268	83	\$3,473
Upper Patuxent-Montgomery Co.	Montgomery	FY98/99	-		30,000	\$2,350,000	\$0	\$2,350,000	285	\$8,246
Zekiah Watershed	Charles	FY98/99	FY01	17,325	31,000	\$11,952,219	\$0	\$11,952,219	2628	\$4,548
Total					762,402	\$229,381,539	\$3,615,902		68,924	\$3,328

Table 11: Rural Legacy Program Grants Awarded 1999-2009. Sources of Data: Maryland Department of Natural Resources.

Rural Legacy Area Applications and Funding by Year													
LEGEND:	x= funded	application not funded											
			fy98/99	fy00	fy01	fy02	fy03	fy04	fy05	fy06	fy07	fy08	fy09
Designated/Funded Areas	Designated												
Agricultural Security Corridor	FY98/99	x	x	x	x	x	x	x	x	x	x	x	x
Anne Arundel County (south)	FY00		x	x		x						x	x
Baltimore Coastal	FY98/99	x			x								
Bear Creek	FY03					x	x		x	x	x	x	
Calvert Creeks	FY98/99	x	x	x		x	x					x	
Carrollton Manor	FY04							x	x	x			
Coastal Bays	FY98/99	x	x		x	x			x	x	x	x	x
Deer Creek (Lower Deer Creek)	FY00		x	x	x	x	x		x	x	x	x	x
Dividing Creek	FY08											x	x
Fair Hill	FY00		x	x			x		x	x			x
Foreman Branch (Chino Farms)	FY01			x	x					x	x	x	
Gunpowder	FY00		x	x			x		x	x	x	x	x
Huntersville	FY98/99	x	x	x	x				x			x	
Lands End	FY98/99	x					x			x	x	x	x
Little Pipe Creek	FY98/99	x	x	x	x		x		x	x	x	x	x
Long Green Valley	FY00		x	x			x		x				
Manor	FY01			x	x	x	x		x		x		
Mattapany	FY06								x	x	x		x
Mid-Md Frederick	FY98/99	x	x	x	x	x	x		x	x	x	x	
Mid-Md Montgomery	FY98/99	x	x	x	x	x			x	x			
Mid-Md Washington	FY98/99	x	x	x	x	x	x		x	x	x	x	x
Nanticoke	FY02				x	x	x		x	x	x	x	x
North Calvert	FY04											x	
Patuxent-Prince George's	FY98/99	x	x	x	x	x					x	x	
Piney Run	FY98/99	x	x	x	x	x	x		x	x	x	x	
Quantico Creek	FY01			x			x		x	x	x	x	x
Upper Patapsco	FY04							x	x	x		x	x
Upper Patuxent-Howard Co.	FY00		x	x									
Upper Patuxent-Montgomery Co.	FY98/99	x				x							
Zekiah Watershed	FY98/99	x	x	x	x	x	x		x	x	x	x	x
Areas Never Approved:													
Catoctin	N/A												
Susquehanna River	N/A												
St.Mary's River	N/A												
Smith Property	N/A												
Upper Patuxent -Sandy Spring	N/A												
Anne Arundel -Green Cathedral	N/A												
Cat Tail Creek	N/A												
St. Leonard's Creek	N/A												
Magothy	N/A												
Mountain Ridge	N/A												

Table 12: Applications and Funding Decisions by Year. Sources of dData: Maryland Department of Natural Resources.

Rural Legacy Program Grants Awarded													
Sponsor	Total Funding Approved	fy98/99	fy00	fy01	fy02	fy03	fy04	fy05	fy06	fy07	fy08	fy09	fy10
Agricultural Security Corridor	\$20,450,000	\$3,000,000	\$3,500,000	\$4,000,000	\$500,000	\$2,000,000	\$850,000	\$2,000,000	\$500,000	\$750,000	\$2,100,000	\$1,000,000	\$250,000
Anne Arundel County (south)	\$6,033,590		\$1,200,000	\$2,000,000		\$1,200,000					\$833,590		\$800,000
Baltimore Coastal	\$3,800,000	\$1,500,000			\$2,300,000								
Bear Creek	\$4,521,705					\$750,000	\$300,000		\$371,705	\$1,000,000	\$1,600,000	\$500,000	
Calvert Creeks	\$7,621,636	\$1,500,000	\$2,000,000	\$1,800,000		\$1,500,000	\$71,636				\$750,000		
Carrollton Manor	\$1,007,591							\$207,591	\$300,000	\$500,000			
Coastal Bays	\$9,950,563	\$3,000,000	\$2,000,000		\$950,563	\$1,250,000			\$250,000	\$250,000	\$750,000	\$500,000	\$1,000,000
Deer Creek (Lower Deer Creek)	\$10,550,000		\$1,750,000	\$1,000,000	\$1,000,000	\$1,000,000	\$350,000		\$600,000	\$2,000,000	\$1,600,000	\$500,000	\$750,000
Dividing Creek	\$3,100,000										\$1,600,000	\$1,000,000	\$500,000
Fair Hill	\$6,900,000		\$500,000	\$750,000			\$450,000		\$700,000	\$3,000,000			\$1,500,000
Foreman Branch (Chino Farms)	\$8,683,590			\$3,000,000	\$2,000,000					\$750,000	\$1,933,590	\$1,000,000	
Gunpowder	\$4,575,000		\$750,000	\$900,000			\$375,000		\$300,000	\$500,000	\$750,000	\$500,000	\$500,000
Huntersville	\$9,964,305	\$3,000,000	\$1,500,000	\$800,000	\$3,864,305				\$300,000			\$500,000	
Lands End	\$4,050,000	\$400,000					\$900,000			\$1,000,000	\$750,000	\$500,000	\$500,000
Little Pipe Creek	\$9,866,275	\$1,500,000	\$750,000	\$1,500,000	\$1,336,821		\$750,000		\$1,000,000	\$1,000,000	\$700,000	\$829,454	\$500,000
Long Green Valley	\$2,356,903		\$500,000	\$750,000			\$650,000		\$456,903				
Manor	\$3,650,000			\$750,000	\$750,000	\$1,000,000	\$100,000		\$300,000		\$750,000		
Mattapany	\$4,000,000								\$1,500,000	\$1,500,000	\$500,000		\$500,000
Mid-Md Frederick	\$14,125,000	\$2,750,000	\$2,000,000	\$1,000,000	\$2,575,000	\$2,000,000	\$600,000		\$700,000	\$750,000	\$750,000	\$1,000,000	
Mid-Md Montgomery	\$16,950,000	\$3,700,000	\$2,000,000	\$2,000,000	\$4,800,000	\$2,050,000			\$1,200,000	\$1,200,000			
Mid-Md Washington	\$12,360,700	\$1,800,000	\$1,300,000	\$1,400,000	\$750,000	\$1,800,000	\$300,000		\$1,000,000	\$1,800,000	\$750,000	\$460,700	\$1,000,000
Nanticoke	\$10,150,000				\$750,000	\$1,750,000	\$450,000		\$1,000,000	\$2,100,000	\$1,600,000	\$1,000,000	\$1,500,000
North Calvert	\$833,590										\$833,590		
Patuxent-Prince George's	\$9,601,959	\$1,500,000	\$1,500,000	\$2,000,000	\$1,351,959	\$2,000,000					\$750,000	\$500,000	
Piney Run	\$21,950,000	\$3,000,000	\$1,750,000	\$2,200,000	\$4,450,000	\$2,000,000	\$750,000		\$1,500,000	\$3,700,000	\$1,600,000	\$1,000,000	
Quantico Creek	\$4,662,012			\$750,000			\$399,960		\$750,000	\$750,000	\$500,000	\$999,800	\$512,252
Upper Patapsco	\$2,800,000							\$300,000	\$500,000	\$500,000		\$500,000	\$1,000,000
Upper Patuxent-Howard Co.	\$344,134			\$344,134									
Upper Patuxent-Montgomery Co.	\$2,350,000	\$850,000				\$1,500,000							
Zekiah Watershed	\$11,952,219	\$1,500,000	\$500,000	\$1,000,000	\$1,500,000	\$1,000,000	\$202,219		\$750,000	\$3,000,000	\$500,000	\$1,000,000	\$1,000,000
Total	\$229,381,539	\$29,000,000	\$23,500,000	\$27,944,134	\$28,878,647	\$22,800,000	\$7,498,814	\$2,507,591	\$13,978,608	\$26,050,000	\$21,950,769	\$13,460,723	\$11,812,252

Table 13: Funding by Year in Rural Legacy Areas. Sources of Data: Maryland Department of Natural Resources.

Characterization of Areas

Because development patterns are often shaped by local zoning, I summarize zoning by Rural Legacy Area. Using the generalized zoning layer produced by the Maryland Department of Planning, I calculate the percentage by category within each zone. Using local zoning ordinances, the Department of Planning classifies individual zones into “generalized” categories which are comparable at the state level. The Maryland Department of Planning classifies protective zones as “least, moderately and most” protective. Most protective zones allow less than 0.05 dwelling units per acre, while moderately protective zones allow between 0.05 and 0.1 dwelling units per acre and least protective zones allow between 0.1 and 1.0 dwelling units per acre. I report percentages by residential, protective (by type), and non-residential (or commercial and industrial) zoning categories. As shown in Table 14, most of the areas are dominated by “protective zoning.” With the exception of Upper Patuxent- Montgomery, Baltimore Coastal, Fair Hill, Carrollton Manor and Long Green Valley, all of the areas have over 90 percent of the land in protective zones. These have relatively higher percentages in residential zones, or in the case of Baltimore Coastal and Carrollton Manor, a relatively high percentage (over 4 percent) in commercial or industrial (non-residential zones). Several areas, including Upper Patuxent Howard, North Calvert, Piney Run, Huntersville, Foreman Branch, Dividing Creek, Nanticoke, Manor, Patuxent-Prince George’s, and Anne Arundel South are over 99 percent protective. But Upper Patuxent Howard, Huntersville, and Patuxent-Prince George’s are predominantly “least protective.”

Summary

Since the Rural Legacy Program went into effect in 1998, nearly 69,000 acres have been preserved through the program. About three-quarters of the areas that local sponsors submitted for designation were ultimately approved. Though all areas were allocated funding to purchase easements throughout the time period, the consistency and levels of funding varied dramatically across areas. Areas like Agricultural Security Corridor and Piney Run saw consistent, high levels of funding while North Calvert and Upper Patuxent Howard County received little and inconsistent funding over time. Several areas were unable to expend funding allocated and this funding was then reallocated by the program to other Rural Legacy Areas. The largest amount of land preserved through the program was in Agricultural Security Corridor, Foreman Branch, Coastal Bays, and Nanticoke. These areas were some of the least expensive in costs per acre. Some central Maryland Rural Legacy Areas including Patuxent Prince George's, Mid-Maryland Montgomery, and Upper Patapsco were most expensive in cost per acre. Though the same criteria apply across the state, it is clear that the program has not operated identically across the state. On the Eastern Shore where land costs and development pressure are lower, funding has been more consistent and more land has been preserved. In central Maryland, funding levels and applications have been less consistent and less land was preserved at a higher cost.

Though the zoning is highly supportive of the goals of the Rural Legacy in many areas, a few areas have more than 15 percent of land zoned residential or non-residential including Baltimore Coastal, Carrollton Manor, Fair Hill, Long Green Valley, and Upper Patuxent-Montgomery.

	Residential	Protective				Non-Residential or Protective
		Least	Moderately	Most	Total Protective	
Rural Legacy Area						
Agricultural Security Corridor	2.8%	28.0%	58.0%	11.0%	97.1%	0.2%
Anne Arundel County (south)	0.4%	0.0%	82.9%	16.1%	99.0%	0.6%
Baltimore Coastal	23.7%	0.6%	0.0%	71.9%	72.5%	3.8%
Bear Creek	1.7%	98.1%	0.0%	0.0%	98.1%	0.3%
Calvert Creeks	3.5%	7.7%	84.6%	3.8%	96.1%	0.4%
Carrollton Manor	6.5%	24.1%	0.0%	59.1%	83.2%	10.3%
Coastal Bays	3.4%	0.0%	18.3%	78.2%	96.5%	0.1%
Deer Creek (Lower Deer Creek)	1.4%	97.3%	0.0%	0.0%	97.4%	1.3%
Dividing Creek	0.3%	50.1%	10.6%	39.0%	99.7%	0.0%
Fair Hill	16.3%	48.1%	0.0%	34.9%	82.9%	0.7%
Foreman Branch (Chino Farms)	0.3%	0.0%	88.3%	11.5%	99.7%	0.0%
Gunpowder	6.1%	23.4%	0.0%	69.8%	93.2%	0.7%
Huntersville	0.1%	99.8%	0.0%	0.0%	99.8%	0.1%
Land's End	1.8%	0.0%	26.2%	71.7%	97.9%	0.3%
Little Pipe Creek	2.0%	2.3%	90.4%	0.2%	93.0%	5.1%
Long Green Valley	14.0%	21.8%	0.0%	63.8%	85.6%	0.4%
Manor	0.4%	43.8%	0.0%	55.5%	99.3%	0.3%
Mattapany	4.3%	95.5%	0.0%	0.0%	95.5%	0.3%
Mid-Md Frederick	1.5%	25.3%	0.0%	69.5%	94.8%	3.7%
Mid-Md Montgomery	5.1%	0.0%	0.0%	93.4%	93.5%	1.5%
Mid-Md Washington	0.6%	97.8%	0.0%	0.0%	97.8%	1.6%
Nanticoke	0.5%	63.6%	0.0%	35.9%	99.5%	0.0%
North Calvert	0.0%	3.5%	84.7%	11.7%	99.9%	0.1%
Patuxent-Prince George's	0.3%	99.0%	0.0%	0.2%	99.2%	0.4%
Piney Run	0.1%	0.3%	0.0%	99.5%	99.8%	0.1%
Quantico Creek	2.4%	97.6%	0.0%	0.0%	97.6%	0.0%
Upper Patapsco	3.8%	9.9%	86.1%	0.2%	96.2%	0.0%
Upper Patuxent-Howard Co.	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%
Upper Patuxent-Montgomery Co.	36.6%	0.5%	0.0%	62.9%	63.4%	0.0%
Zekiah Watershed	0.7%	98.9%	0.0%	0.0%	98.9%	0.4%

Table 14: Zoning Summary by Rural Legacy Area (Sources of Data: Maryland Department of Planning; Maryland Department of Natural Resources)

Descriptive Measures of Development and Preservation

In this section, I calculate measures of contiguity, fragmentation, preservation, and development within Rural Legacy Areas. In addition, I look at the change in preserved land, change in parcelization, and total development within the Rural Legacy Area. Protecting parcels that are connected to other protected parcels preserves valuable resource industries like farming and forestry, and facilitates environmental protection through agglomeration. (Brabec & Smith, 2002) Research also has shown that isolated rural resource lands that are not contiguous are negatively influenced by complaints from neighbors, lack of support by neighbors, and management issues. (Brabec & Smith, 2002; Bryant & Johnston, 1992; Scarfo, 1990) As Tassone et al. (2004) note, one of the objectives of the Rural Legacy program emphasizes preservation of large, contiguous rural parcels in rural areas rich in natural and cultural resources as well as resource-based industries. Thus, if land conservation efforts are contiguous, then natural resource, agricultural, forestry, and environmental protection have the potential to be enhanced, as is a stated objective of the program. In meeting preservation goals, having less fragmentation and greater congruity also concentrates preservation efforts to large parcels and diminishes transaction costs of preserving multiple small parcels. The contiguity and fragmentation of development are calculated to serve as a proxy for enhancement of these rural lands.

These analyses use Maryland Property View data between 2000 and 2008. Specifically, I use the acreage, year built, and improvement value over \$10,000 as reported in PropertyView. Because PropertyView is a parcel point data set rather than parcel

boundaries, I am constrained in the types of analyses I can conduct. Though I would like to also examine patterns of preservation within Rural Legacy Areas since designation, consistent, time-series polygon data is not available. In calculating these indicators, I use the date of designation (or 2000 if designated in FY98/99) as the first point in time and 2008 as the last point time. Because Dividing Creek was designated in 2008, only one year of data is reported.

Potential for Contiguity

Contiguity explains the spatial connectedness of parcels. In this case, contiguity is used to determine the potential for preserving large contiguous groups of parcels. (Tassone et al., 2004; Brabec & Smith, 2002) Tassone et al. (2004) measure contiguity by calculating the total percentage of unprotected land that lies in parcels that are greater than 20 acres in size. This serves as a proxy because adjacency cannot be calculated in a straightforward manner using parcel point data.

To determine the contiguity of preserved parcels within Rural Legacy Areas, I replicate the technique used by Tassone et al. (2004) using data on parcel size and development for the designation year and 2008 within each Rural Legacy Area. Using the method employed by Tassone et al. (2004) provides information about the potential for the preservation of larger blocks of resource land. By calculating the percentage of acreage in unpreserved parcels that are greater than 20 acres in size, I measure the potential for contiguity within the Rural Legacy Area. The greater the percentage of unpreserved acreage in parcels over 20 acres, the greater the potential for contiguity. To complement

this analysis, I also examine the change in total percent of the Rural Legacy Area preserved and total percent of the Rural Legacy Area development.

This analysis uses Maryland PropertyView data between 2000 and 2008 in addition to the Maryland Department of Planning data reporting the number of preserved acres in the first application year and 2008 to calculate total unpreserved acres and the percent of unpreserved acres in parcels over 20 acres in size. Preserved acres include parcels in state, local or federal ownership in addition to preserved land held in private ownership under easements through MALPF, MET, and other land preservation programs including Rural Legacy.

Figure 15 shows the percentage of unpreserved acres in parcels greater than 20 acres in size in the designation year and 2008. In the designation year, the greatest potential for contiguity was in Foreman Branch, Nanticoke, Agricultural Security Corridor, Coastal Bays, Land's End where over 75 percent of the acreage fell in unpreserved parcels over 20 acres in size. These Rural Legacy Areas are all on the Eastern Shore. The least potential for contiguity in 2000 was in Upper Patuxent-Howard, Upper Patuxent-Montgomery and Fair Hill, which are all in more urban central Maryland or developing Cecil county. Additionally, these areas were already highly parcelized in the designation year. By 2008, the percentage fell in many areas. A decline in the potential for contiguity might occur because of an increase in preservation or parcelization. The decline was most drastic in Foreman Branch, Huntersville, Manor, Coastal Bays and Agricultural Security Corridor, where the potential for contiguity fell by 20 percent. All of these areas also rose in percent preserved during the period. In some areas, the potential for contiguity was relatively stagnant between designation and 2008. This was

the case in Fair Hill, Baltimore Coastal, and Upper Patuxent-Montgomery. These were places where little preservation took place between designation and 2008 (See Table 11 and Figure 16).

Preservation

Preservation provides a measure of how state and local programs have preserved land in Rural Legacy Areas over the period. The Rural Legacy Program is not the only program working to preserve land in Maryland and these figures show that other programs have been instrumental in preserving land in these areas as well. One of the goals of the Rural Legacy Program was to greater focus (but not confine) state resources for all state preservation programs into Rural Legacy Areas. While disaggregate data by program and year preserved were not available, data provided by MDP provide a measure of the success of the program in meeting this objective. Additionally, these data complement analysis presented on contiguity potential and fragmentation. As noted above, an increase in preservation might diminish the potential for contiguity. Because consistent preservation data were not available over time, this analysis relies on MDP's reporting of preserved parcels in the designation year (or 2002) and 2008. Figure 16 displays total percent of land preserved in the Rural Legacy Area at the time of designation (or 2002 – the first year for which MDP provided data) and in 2008. Though sponsors self-reported existing preserved acreage in annual application files, those figures often differ from spatial information maintained by MDP. To maintain consistency, I use the numbers reported by MDP.

For many Rural Legacy Areas, the percentage preserved increased considerably between designation year and 2008. Foreman Branch, Huntersville, Manor, Coastal Bays, and Agricultural Security Corridor, had the largest total percentage increase in preservation. Meanwhile, Bear Creek, Mattapany, Carrollton Manor, Anne Arundel South, North Calvert, and Quantico Creek saw the least change.

Parcelization

Parcelization provides a measure of the configuration of land in Rural Legacy Areas. Because these are rural areas targeted for preservation, I would expect that the areas would be dominated by large parcels rather than small parcels. Using Maryland PropertyView data, I categorized all parcels by acreage ranges including: 0-1, 1-2, 2-5, 5-10, 10-20 and over 20 acres. If the Rural Legacy Program is having its intended effects, I would expect that the distribution would remain consistent over time or because of agglomeration, the percentage of parcels over 20 acres would increase. Additionally, I would expect that the areas designated were primarily dominated by larger parcel sizes. Rural Legacy Areas with more parcels in the lower bins would be more difficult to preserve because of transaction costs in acquiring several easements. Having more parcels in larger bins makes preservation easier and potentially more contiguous rather than scattered. Figures 17 and 18 show parcel size as a percentage of total parcels in acreage ranges. Consistent with zoning, in the designation year, Baltimore Coastal, Calvert Creeks, Carrollton Manor, Fair Hill, and Little Pipe Creek had the highest percentage of parcels in the 0-1 bin, which would make preservation in these areas difficult. Agricultural Security Corridor, Coastal Bays, Dividing Creek, Foreman Branch, Land's End, and Nanticoke had the highest percent in large parcels in 2000. In

2008, the distribution was largely similar in most Rural Legacy Areas, but Baltimore Coastal stood out as becoming overly parcelized while Land's End and Nanticoke resisted parcelization and maintained a high percentage of parcels in the >20 acre bin.

Fragmentation

Fragmentation describes the degree of dispersion of parcels. Fragmentation is highly correlated with contiguity and parcelization, but explains a contrasting attribute.

(Tassone et al. 2004) Tassone and colleagues measure fragmentation by counting the average number of parcels less than 20 acres per 1,000 acres of unprotected land. Using Maryland Property View data, I replicate the methods employed by Tassone et al. (2004) to examine the relative fragmentation of each Rural Legacy Area using more recent data and examining trends over time.

In Figure 19, I show fragmentation by Rural Legacy Area in the designation year and 2008. As expected, results are consistent with findings on contiguity. Rural Legacy Areas in urban counties like Baltimore Coastal, Long Green Valley, Carrollton Manor, Mattapany, Fair Hill, Gunpowder, Upper Patapsco and Upper Patuxent-Montgomery were highly fragmented. In the designation year, Foreman Branch, Nanticoke, Dividing Creek, and Land's End were the least fragmented. As conveyed in Figure 19, the least fragmented areas stayed the same between the designation year and 2008. All areas became at least slightly more fragmented in 2008, but the changes were very slight in Quantico, Piney Run, Nanticoke, Mid-Maryland Montgomery, Land's End, and Coastal Bays. Huntersville, Carrollton Manor, Baltimore Coastal, Zekiah Watershed, and Upper Patuxent Howard became considerably more fragmented by 2008.

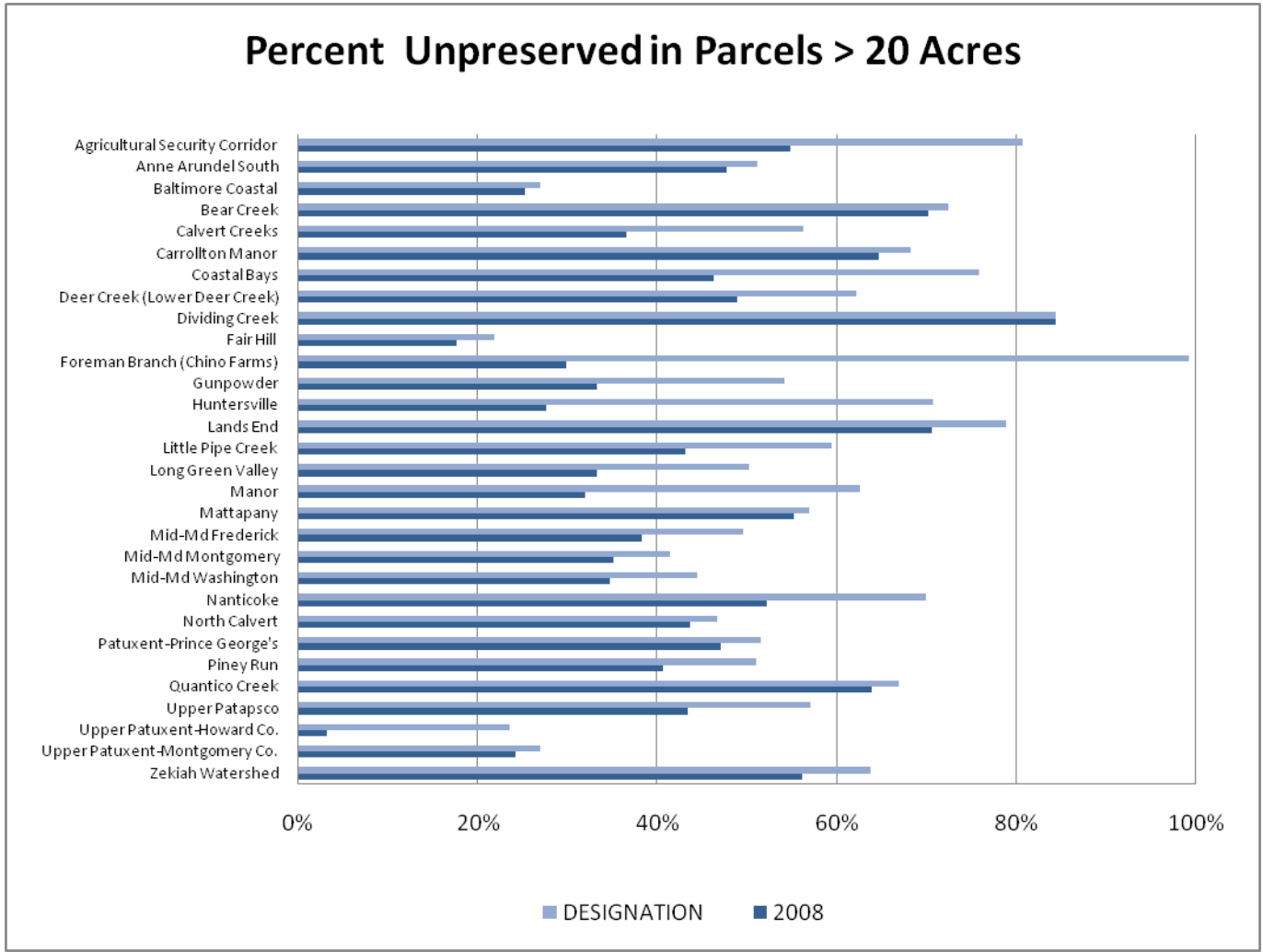


Figure 15: Potential for Contiguity. (Sources of Data: Maryland Department of Planning; Department of Natural Resources: Maryland PropertyView)

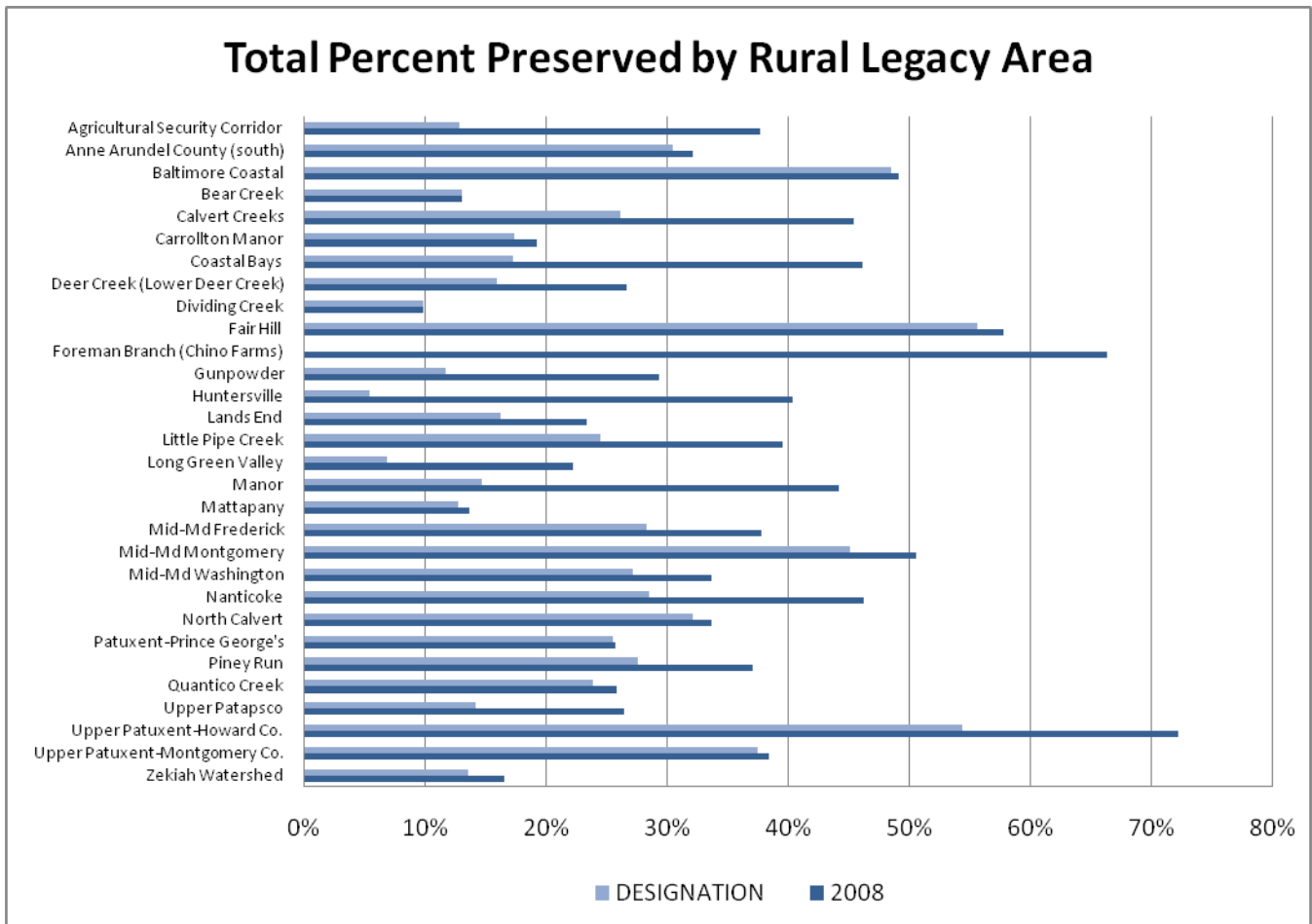


Figure 16: Percent of Acreage Preserved by Rural Legacy Area. (Sources of Data: Maryland Department of Planning; Department of Natural Resources: Maryland PropertyView)

Percent of Parcels in Rural Legacy by Acreage Range - Designation Year

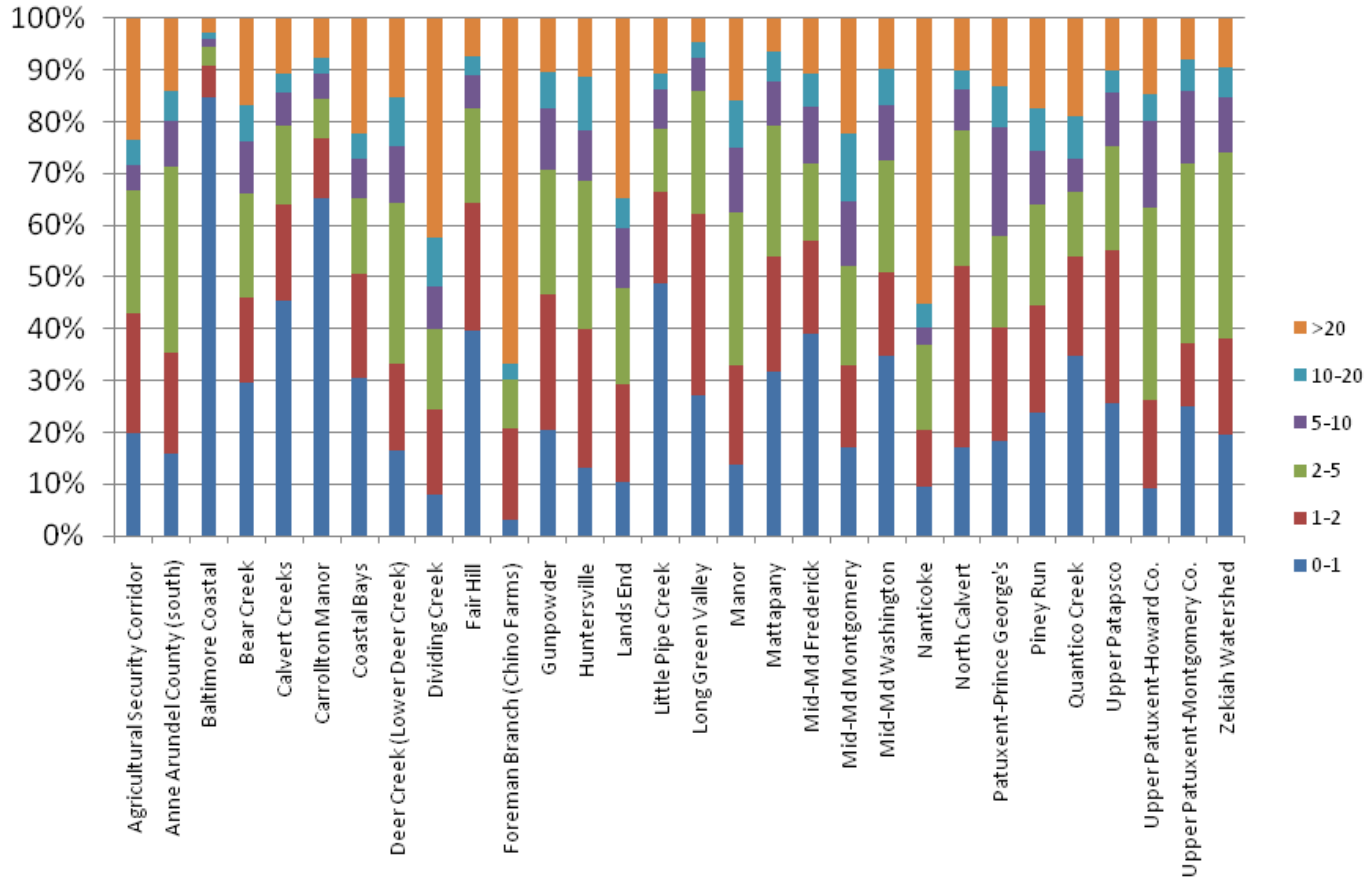


Figure 17: Percent of Parcels in Rural Legacy Areas by Acreage Range – Designation Year. (Sources of Data: Maryland PropertyView)

Percent of Parcels in Rural Legacy by Acreage Range - 2008

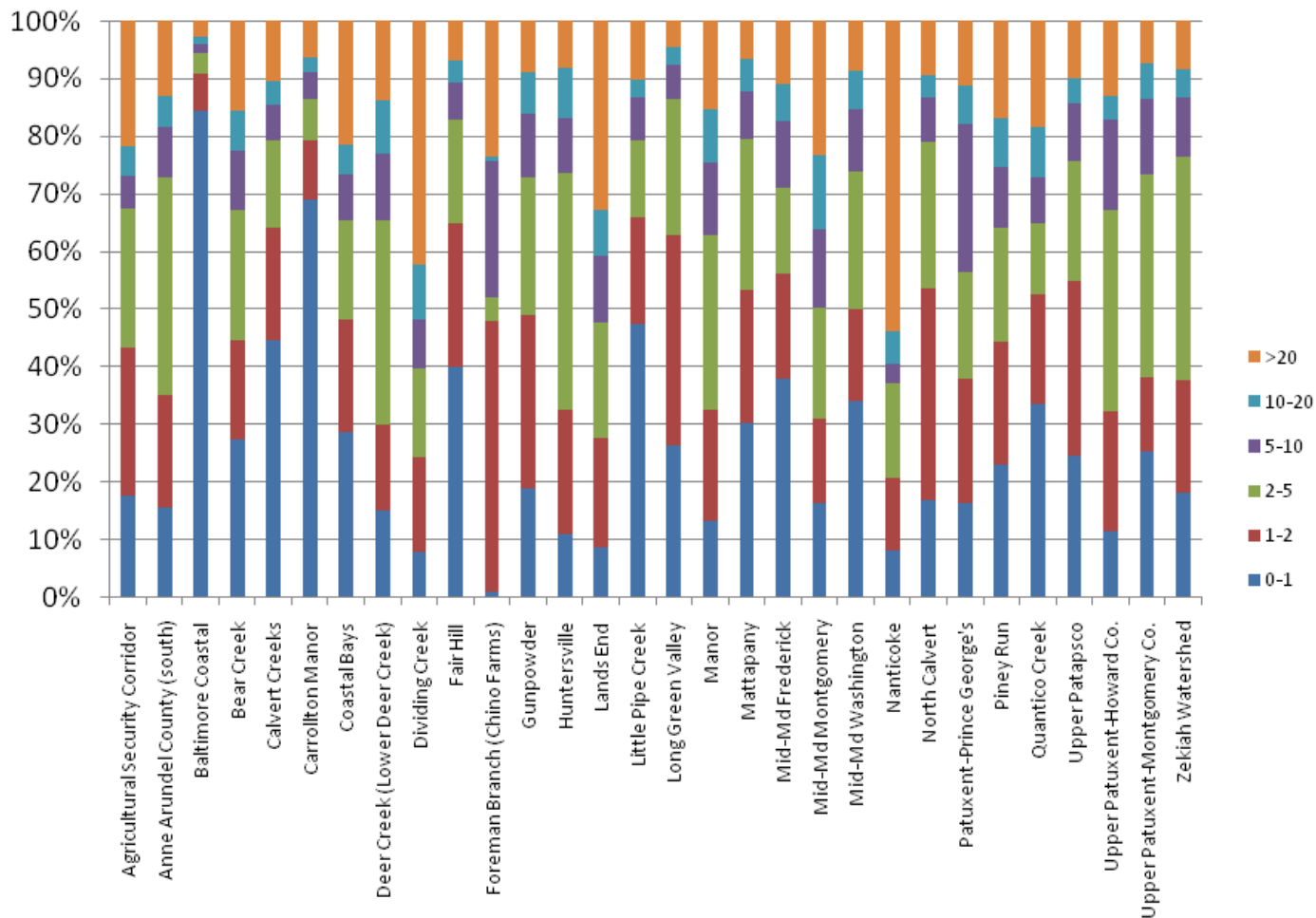


Figure 18: Percent of Parcels in Rural Legacy Areas by Acreage Range - 2008 (Sources of Data: Maryland PropertyView)

Total Development

Finally, I examine total percent of parcels and acres developed in the Rural Legacy Area. The cumulative percentage of development conveys the overall level fragmentation over time and the change in fragmentation over time. I use Maryland PropertyView data and consider developed parcels as having an improvement value greater than \$10,000 and a parcel size less than 20 acres. Figures 20 and 21 show total percentage developed by Rural Legacy Area for parcels and acres, respectively. As shown in Figure 20, Upper Patapsco, Carrollton Manor, Fair Hill, Long Green Valley, Baltimore County Coastal, Mid Maryland-Frederick, and Zekiah Watershed had the greatest percentage of parcels developed at over 70 percent in both the designation year and 2008. Foreman Branch, Nanticoke, and Dividing Creek, had the least at less than 40 percent. From the designation year to 2008, the percentage of parcels developed in Zekiah Watershed, Mattapany, Huntersville, Foreman Branch and Carrollton Manor actually decreased. This is likely because large lots subdivided but have not yet been developed. The percentage developed increased the most in Mid Maryland – Washington, Land’s End, Upper Patuxent – Montgomery, Quantico Creek, Calvert Creeks and Agricultural Security Corridor. Figure 21 shows that Long Green Valley, Gunpowder, Mattapany, Upper Patuxent – Montgomery, and Upper Patapsco are the most developed in terms of acreage at over 20 percent in both periods. Upper Patuxent-Montgomery, Huntersville, Gunpowder, Mid-Maryland Washington, and Zekiah Watershed increased the most in percentage of acres developed. Quantico Creek, North Calvert, Nanticoke, Mid-Maryland Montgomery, Mattapany, Foreman Branch, Dividing Creek, Coastal Bays and Agricultural Security Sector changed the least in percentage of acres developed.

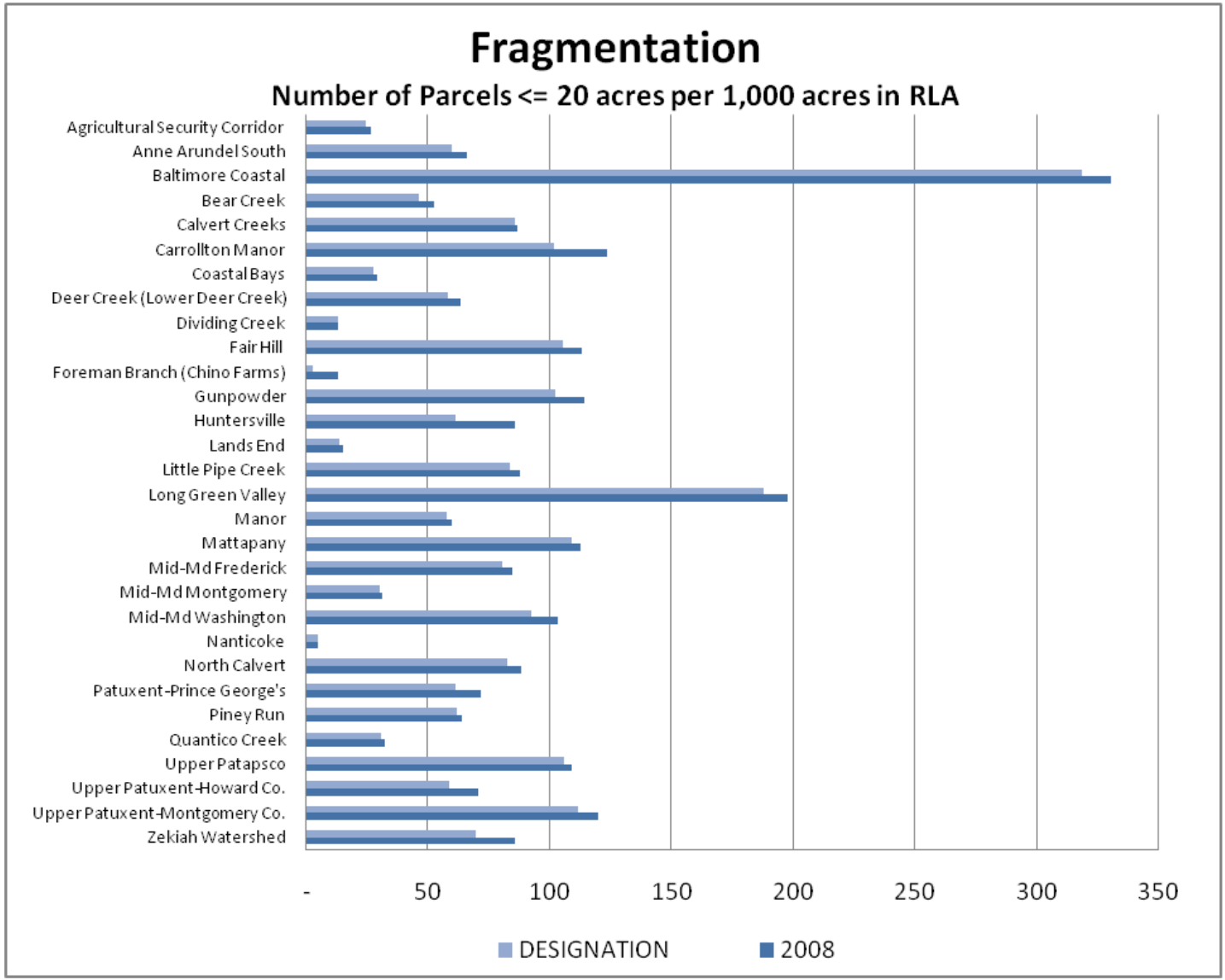


Figure 19: Fragmentation in Rural Legacy Area – Designation Year and 2008 (Sources of Data: Maryland Department of Natural Resources; Maryland PropertyView)

Total %age of Parcels (<20 acres) Developed by Rural Legacy Area

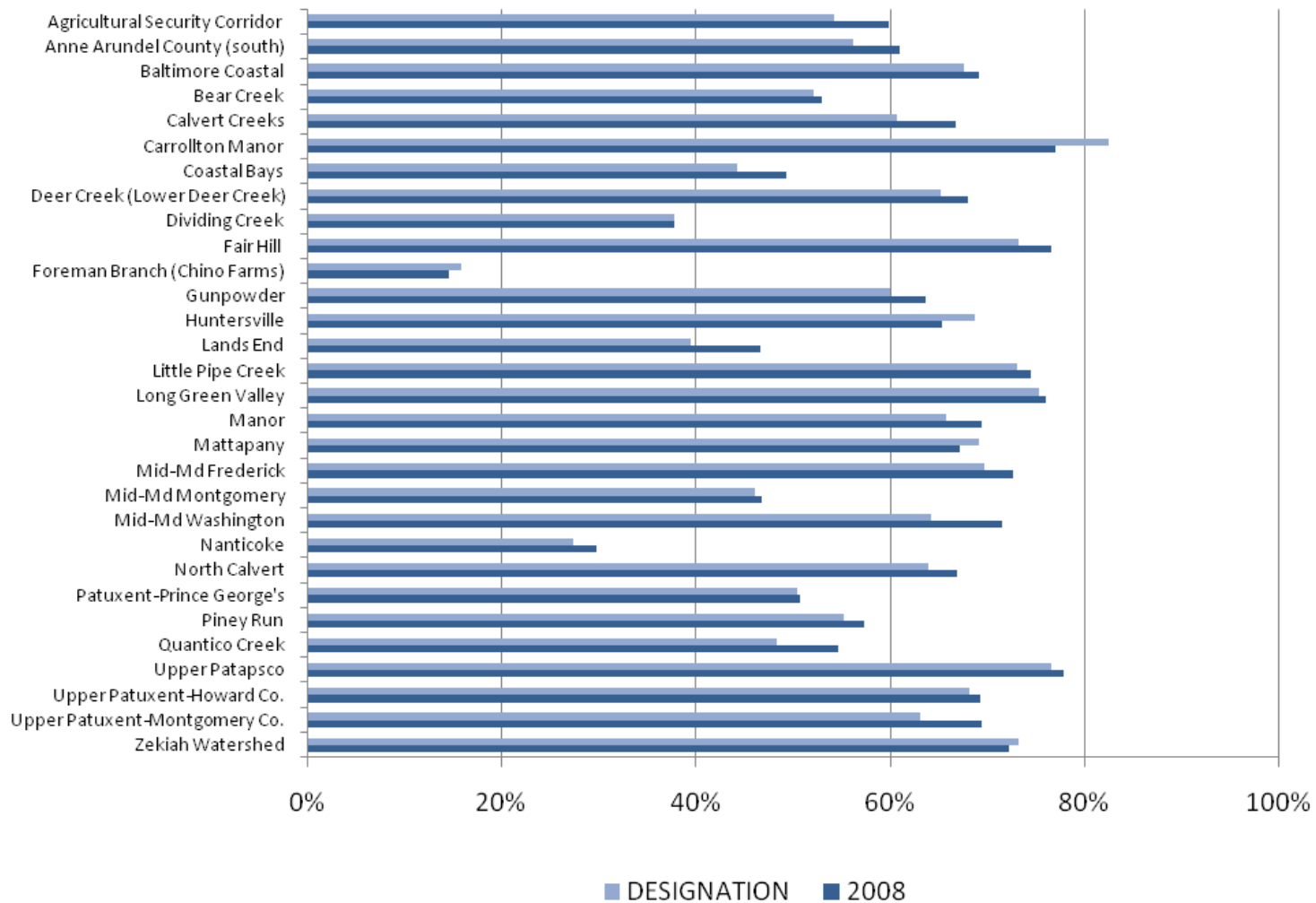


Figure 20: Percent of Parcels Developed by Rural Legacy Area. (Sources of Data: Maryland PropertyView)

Total %age of Acres (<20 acres) Developed by Rural Legacy Area

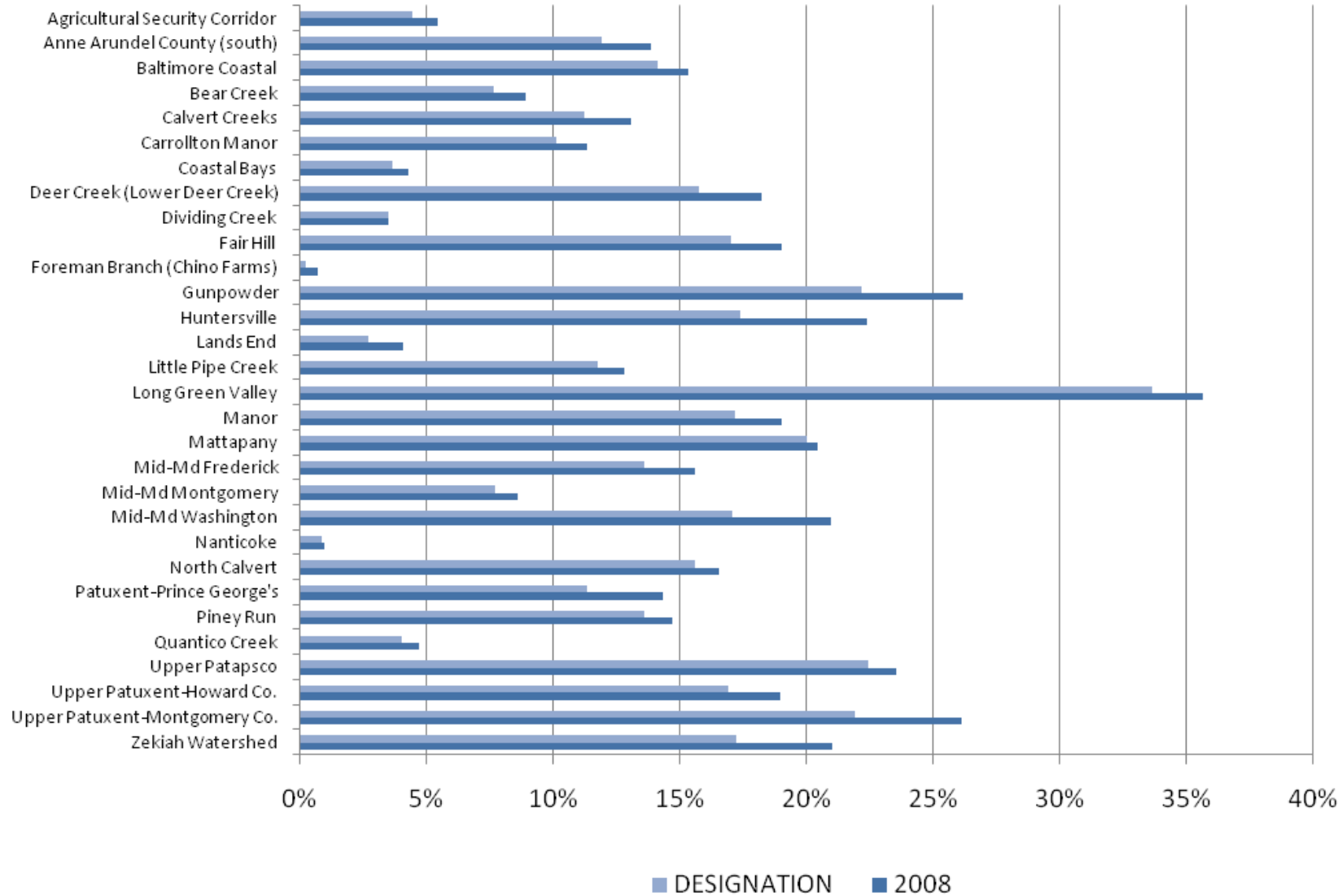


Figure 21: Percent of Acres Developed by Rural Legacy Area. (Sources of Data: Maryland PropertyView)

Summary

In this section, I calculated several measures of contiguity, fragmentation, preservation and development in the Rural Legacy Area over time. These measures are similar but capture slightly different measures of Rural Legacy Areas over time. In these analyses, I explained the relative differences among Rural Legacy Areas in the designation year and 2008 in addition to explaining change over time between the designation year and 2008, using available data. Because several areas were not designated until the later part of the period, the changes were quite slight while areas designated in FY98/99 show considerable change over time.

Across these various measures, certain trends emerge. Several areas had the greatest potential for contiguity, the least parcelization, the least fragmentation, little development, and large increases in the percent preserved. Such areas include Agricultural Security Corridor, Nanticoke, Foreman Branch, Land's End and Coastal Bays. But many Rural Legacy Areas had little potential for contiguity, were highly parcelized, developed significantly, preserved little, and were highly fragmented. Specifically, Baltimore Coastal, Patuxent-Prince George's, Carrollton Manor, Fair Hill, and Upper Patuxent-Montgomery performed poorly across several of these measures. These were all areas with high percentages of land in residential and non-residential zones, so these trends are not surprising. Many of these findings are consistent with results on implementation reported above, and development patterns and spatial patterns of development discussed in the next sections.

Development Patterns in Rural Legacy Areas

Twelve years after the Rural Legacy Program was approved by the legislature, I sought to determine whether the Program was effective at inhibiting development and sprawl in Rural Legacy Areas. Though \$229 million has been allocated to the state's 30 Rural Legacy Areas, this section examines whether the program has had its intended effect. Using data on residential development patterns, I explain the impact of the Rural Legacy Program on development inside Rural Legacy Areas before and after designation, following analysis conducted for Priority Funding Areas by Lewis, Knaap & Sohn (2009). I also compare the performance of Rural Legacy Areas to County Agricultural Zones to determine which instrument seems to be most effective at inhibiting development in rural areas. If the program is having its intended effects, development in Rural Legacy Areas should be lower after the implementation of the act, relative to before.

Maryland PropertyView provides information about parcel development. Using PropertyView data, I determined the number of new parcels and acres developed inside and outside Rural Legacy Areas from 1990-2007 in order to conduct t-tests and spatial statistics. The Maryland Department of Planning provided county agricultural zoning boundaries to use in comparison with Rural Legacy Areas. I use MDP's classification of least, moderately and most protective zones, defined above, to interpret results.

I examine residential development patterns inside and outside of Rural Legacy Areas before and after the passage of the act to determine whether the Rural Legacy Program has led to less development inside Rural Legacy Areas after designation. If the program is having its intended effect, development in Rural Legacy Areas should be lower after

designation, relative to before. I use a difference of means t-tests to determine whether there has been a statistically significant change in development of parcels and acres before and after designation. In Table 15, I report ratios of development after designation (post) over before designation (pre). Despite the expansion of many of these areas over time, I use Rural Legacy boundaries as of 2009 as detailed spatial data for each Rural Legacy area was not available over time. Because areas were designated at different times after the passage of the act, I use the year of designation to divide “before” and “after” rather than using 1998 for all Rural Legacy Areas. Thus, for areas designated in 1998, I use 9 years of data before and after designation, but for areas designated later, I use fewer years of observations to conduct t-tests. In this analysis, I separate Agricultural Security Corridor into its three parts, which are three separate polygons: Marshyhope, Sassafras and Tuckahoe. Data provided by the state did not allow me to separate these areas in funding information reported above.

Though I do not attempt to control for potential countervailing factors that might impact development, the test still provides an interesting and useful evaluation of trends in Rural Legacy Areas. Like other smart growth instruments in Maryland, this analysis is affected by a potential endogeneity problem. Criteria used to designate the Rural Legacy Areas relate to the policy impacts I am examining. In this case, one of the criteria for designation relates to development pressure within Rural Legacy Area, and I am measuring the impact of Rural Legacy Areas on development patterns. The direction of the bias could lead to more or less development in Rural Legacy Areas. Because these areas were designated with a criterion relating to risk of development, it is possible that

these areas are likely to be experiencing development pressure which may lead development to be heightened after designation relative to before regardless of the program. Additional criteria relate to the value of natural resources in these areas. Because these areas are highly valued agricultural and resource lands, the areas might have low overall development pressure as a result and the share and total level of development may change little over time. These impacts may not relate to designation as a Rural Legacy Area, but instead the high value of resources within these areas. Though I do not address potential endogeneity, it is important to acknowledge the potential for bias in either direction in this analysis.

Within Rural Legacy Areas

Figures 22 and 23 show trends in development within the Rural Legacy Area from 1990-2007. Note that these figures do not consider designation date, which varies by Rural Legacy Area, so I do not include a hash line indicating when the statutes went into effect. As shown, the total number of parcels developed in the Rural Legacy area fluctuated over time, but was increasingly steadily from 1998 to 2002, but fell after 2002 to its lowest point in 2007. Trends in acres developed were similar, with a peak occurring in 2003 and trailing after 2003. Figures 24 and 25 illustrate trends by region. These trends are largely consistent with business cycles in Maryland at the time. As shown, development on the Eastern Shore was relatively stable and low while development in Central and Western Maryland was high and fluctuated throughout the period with business cycles.

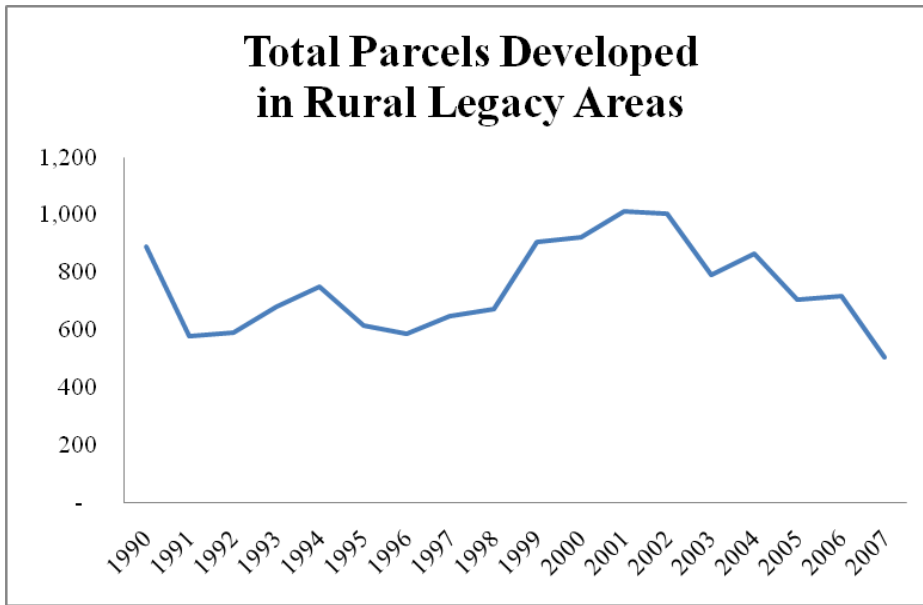


Figure 22: Total parcels developed in Rural Legacy Areas (Sources of Data: Maryland PropertyView)

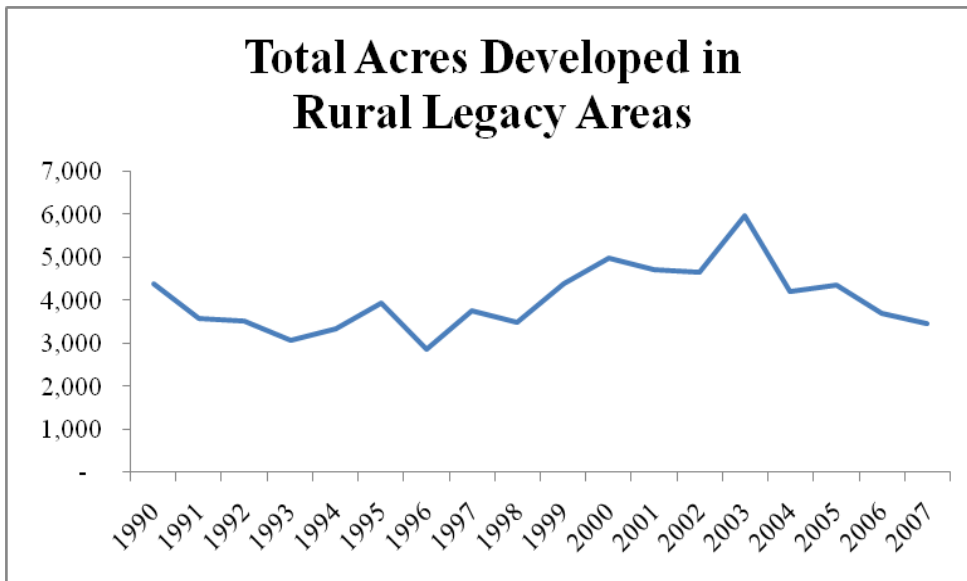


Figure 23: Total acres developed in Rural Legacy Areas (Sources of Data: Maryland PropertyView)

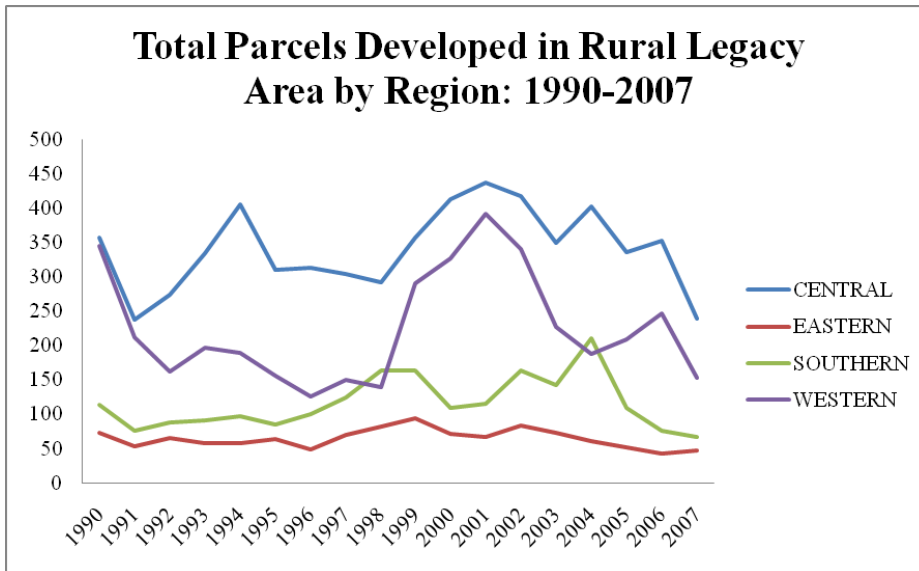


Figure 24: Total parcels developed in Rural Legacy Areas by Region (Sources of Data: Maryland PropertyView)

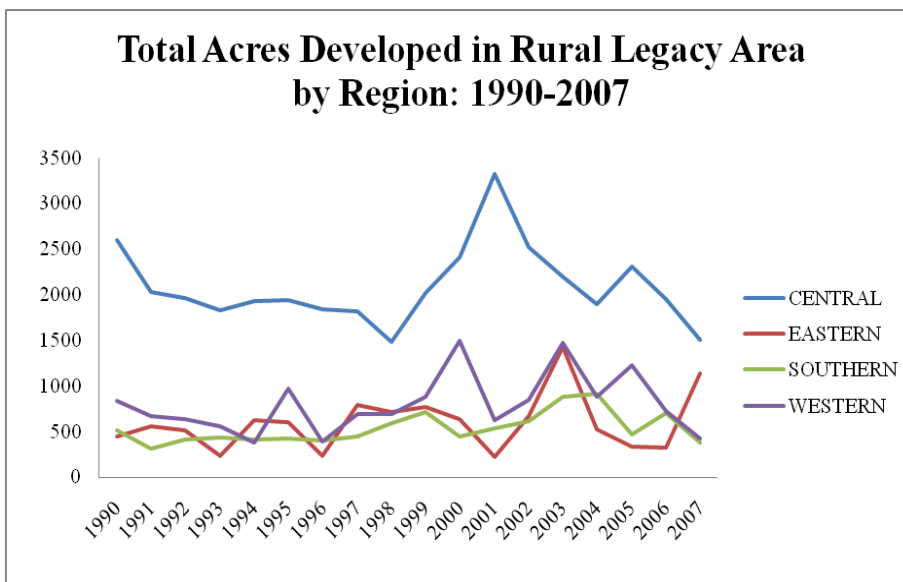


Figure 25: Total acres developed in Rural Legacy Areas by Region (Sources of Data: Maryland PropertyView)

In Table 15, I report the average parcels and acres developed in the Rural Legacy Area the before and after designation and display the ratio of parcels and acres developed before to after designation. Ratios less than one indicate that development within the

Rural Legacy Area has declined after designation while ratios greater than one indicate greater development within Rural Legacy Areas after the passage of the Act. Using a t-test of means, I determined whether the increase or decrease in development was statistically significant. Ratios with three asterisks indicate that there is a statistically significant difference at the 99 percent confidence level, two asterisks indicate 95 percent, and one asterisk indicates 90 percent confidence level.

Parcels Developed

Examining the relative levels of development across Rural Legacy Areas, in some Rural Legacy Areas like Coastal Bays, Land's End, Foreman Branch and Nanticoke, the average amount of development was rather low both before and after designation. On average, less than five parcels per year were developed in these areas before and after designation. In other areas like Carrollton Manor, Deer Creek, Baltimore Coastal, Mattapan, Mid-Maryland Frederick and Mid Maryland-Washington, the level of development was much higher. In at least one of the time periods, over 40 parcels per year were developed on average over the period.

In 16 Rural Legacy Areas, there was more development within Rural Legacy Areas after designation relative to before. A t-test of means shows that the difference was statistically significant in Baltimore County Coastal, Coastal Bays, Mid-Maryland Washington County, and Upper Patuxent-Montgomery. Baltimore County Coastal and Upper Patuxent-Montgomery are located in the central part of the state where development pressure is great. Coastal Bays and Mid-Maryland Washington received over \$4 million in funding over the life of the program, and funding was relatively

consistent over time, and overall funding in Coastal Bays was relatively low. Except for Upper Patuxent-Montgomery, all of these areas expanded considerably from their initial size. Many of the areas with statistically significant worsening trends in parcel development were approved in the first two years of the program. Despite relatively consistent levels of funding from the state for many of these areas and regardless of expansion of the areas, development trends in these areas continue to move in the wrong direction.

In 15 areas, the total level of development within Rural Legacy Areas decreased after the act relative to before. These areas were: Agricultural Security Corridor: Marshyhope, Agricultural Security Corridor: Tuckahoe, Carrollton Manor, Calvert Creeks, Fair Hill, Huntersville, Land's End, Little Pipe Creek, Long Green Valley, Mattapany, Mid-Maryland Frederick, Piney Run, Quantico Creek, Upper Patapsco, and Upper Patuxent-Howard. Only Little Pipe Creek and Long Green Valley fell by a statistically significant amount. Though many of these areas like Fair Hill, Huntersville, Agricultural Security Corridor: Marshyhope, Agricultural Security Corridor: Tuckahoe, Bear Creek and Nanticoke are situated in more rural counties with less development pressure, the remainder of these areas are located in the central part of the state.

Acres Developed

The level of acres developed differed tremendously across Rural Legacy Areas. In interpreting acreage results, it is important to remember that development in rural areas differs from urban development and that this analysis considers any parcel with a new structure as newly developed regardless of the size. That is to say that a 100-acre parcel

with a new single family home is considered developed in this analysis. The fewest average annual acres were developed in Foreman Branch followed by Baltimore Coastal and Quantico Creek. In the case of Baltimore Coastal, the high number of parcels and low level of acres developed are indicative of the development of smaller-lot subdivisions rather than large-lot rural development. In all of these areas, less than 45 acres on average was developed in both time periods.

In 19 Rural Legacy Areas, the average annual amount of acreage developed increased after designation relative to before. In Gunpowder and Upper Patuxent-Montgomery, the increase in acreage was statistically significant. These are areas located in Central Maryland and received less than \$5 million in funding over the life the program. In 12 areas the total level of acreage decreased after designation relative to before but only in Fair Hill was the decline statistically significant. This corresponds to the trends in parcels developed in Fair Hill, though the decline in parcel development was not statistically significant. Fair Hill is in a primarily agricultural county with weak zoning but moderate development pressure from the I-95 corridor and Delaware. Over time, the state has allocated \$7 million to Fair Hill. The other areas experiencing a decline in acres developed were Agricultural Security: Marshyhope, Agricultural Security: Tuckahoe, Calvert Creeks, Carrollton Manor, Foreman Branch, Huntersville, Long Green Valley, Mattapany, North Calvert, Upper Patapsco, and Upper Patuxent-Howard.

Rural Legacy Areas v. County Agricultural Zoning

To compare the performance of Rural Legacy Areas to County Agricultural Zones, I examine the share of total parcels and acres developed in Rural Legacy Areas as a

percentage of total development in the county to the share within county agricultural zones as a percentage of total development in the county. I use date of designation to determine periods of comparison and use the same periods for agricultural zones. Again, I use difference of means t-tests and ratios of development of parcels and acres after relative to before (post/pre). In Table 15, I report trends in the share of parcels and acres developed as a percentage of total development in the county (or counties) during the same period. Finally, I report trends on the share of parcels and acres developed in the county agricultural zones as a percentage of total development in the county (or counties) during the same period.

In this relatively simple analysis, I am using county agricultural zones as a type of control to compare Rural Legacy Areas. I assume that county agricultural zoning did not change during the period and thus trends should remain relatively constant or move in the same direction in both periods. I assume that the designation of Rural Legacy Areas will result in less development in Rural Legacy Areas after designation relative to before, and by a faster rate. Because county agricultural zones are much larger than Rural Legacy Areas and Rural Legacy Areas are often nested in county agricultural zones, it is important to look at the changes between the periods rather than comparing absolute shares of development. This comparison, however, illuminates the differences in agricultural zoning across counties, and provides insights into rural development pressures and trends within the counties. Because data illustrating zoning changes are not available consistently across the state and time periods, I assume that zoning is constant throughout the time period. The most recent generalized zoning layer provided by MDP for 2008 was used in this analysis.

The share of parcels in Rural Legacy Areas increased in 18 areas after designation relative to before and the increase was statistically significant in Manor, North Calvert, Patuxent-Prince George's, Upper Patapsco, and Upper Patuxent-Montgomery. The share of parcels decreased in 13 areas, and the difference was statistically significant in Agricultural Security Corridor: Marshyhope, Fair Hill, Huntersville, and Mid- Maryland Frederick. In county agricultural zones, the share of parcels developed in the agricultural zone increased in 22 areas. Note that because areas were designated in different years within counties, the following results compare the trends for individual Rural Legacy Areas to the county during the same period. The increase was statistically significant in Cecil/Kent counties (Agricultural Security-Sassafrass), Baltimore (Baltimore County Coastal, Long Green Valley, Piney Run, and Gunpowder), Calvert (Calvert Creeks), Frederick (Carrollton Manor), Harford (Deer Creek), Cecil (Fair Hill), Queen Anne's (Foreman Hill and Land's End), Prince George's (Patuxent – Prince George's) and Carroll (Upper Patapsco.) In Caroline/Dorchester (Agricultural Security Corridor – Marshyhope), Talbot/Caroline (Agricultural Security Corridor – Tuckahoe), Worcester (Coastal Bays), Washington (Mid Maryland-Washington), Dorchester (Nanticoke), Calvert (North Calvert), and Wicomico (Quantico Creek) the number of parcels developed was lower after the act relative to before by a statistically significant amount.

The share of acres in Rural Legacy areas increased in 18 areas but the difference was only statistically significant in Anne Arundel South and Upper Patuxent-Montgomery. In the remaining 13 Rural Legacy Areas, the share of acres in the Rural Legacy Area fell. This difference was statistically significant in Fair Hill and Long Green Valley. The share of acres in county agricultural zones increased in 19 places and the increase was

statistically significant in Cecil/Kent (Agricultural Security Corridor – Sassafras), Cecil (Fair Hill), Queen Anne’s (Foreman Branch and Land’s End), St. Mary’s (Huntersville), Carroll (Little Pipe Creek), Montgomery (Mid-Maryland Montgomery and Upper Patuxent-Montgomery), and Prince George’s (Patuxent-Prince George’s). The decline was statistically significant in Talbot/Caroline (Agricultural Security Corridor – Tuckahoe), Baltimore/Harford (Manor), and Washington (Mid-Maryland Washington).

In comparing the performance of Rural Legacy Areas and county agricultural zones, there are some counties in which the share of development after designation was lower than before while the relative share of development was higher in agricultural zones after RLA designation relative to before. But in some areas, the share of development was lower after relative to before in county agricultural zones and the relative share of development was higher after relative to before in Rural Legacy Areas. And in some areas, agricultural zones and Rural Legacy Areas performed in sync with one another. In Carrollton Manor, Deer Creek, Fair Hill, Long Green Valley, Huntersville, Mid Maryland-Frederick, and Upper Patuxent Howard, in Rural Legacy Areas the ratio of the share of parcels and acres developed after the act relative to before was lower than county agricultural zones in those counties. Those counties include Frederick, Baltimore, Harford, Cecil and St. Mary’s. While a portion of agricultural zones in Frederick, Baltimore County, and Cecil are designated “most protective” by the Maryland Department of Planning, zoning is not ubiquitously strong in these counties, and development pressure is high. The zoning in Harford and St. Mary’s County is designated as “least protective” across the board by MDP. However, in these Rural Legacy Areas, the program seems to be having its intended effects.

The share of development after designation of Rural Legacy Area relative to before was higher while the share in county agricultural zones was lower after relative to before in Worcester (Coastal Bays), Washington (Mid -Maryland Washington), Calvert (North Calvert), and Baltimore (Piney Run). In these counties, it could be presumed that the zoning was stronger at the county level than the incentive provided within Rural Legacy Areas. Alternatively, because Rural Legacy Areas were designated because of a high risk of development pressure, these Rural Legacy areas might have experienced greater development pressure than county agricultural zones, on the whole. In Baltimore, Worcester, and Calvert Counties, at least a portion of the county is designated “most protective.” In Washington County, however, the zoning is designated moderately or least protective. Recall that no parcels have been preserved with the Rural Legacy Program in North Calvert.

In all other Rural Legacy Areas, the trends in Rural Legacy Areas and county agricultural zones were moving in the same direction after designation relative to before. When these trends are consistently negative (which was more commonly the case), as in Montgomery County and Prince George’s County, it can be inferred that the development pressure was too great and the incentives too slight for the program to have an impact on development patterns in Rural Legacy Areas and county agricultural zones. In places where the share of development fell in both county agricultural zones and Rural Legacy Areas, like in Agricultural Security Corridor-Marshyhope and Mattapany, it can be assumed that the restrictive zoning (which likely carries to the Rural Legacy Area) or limited development pressure led to little development in both Rural Legacy Areas and county agricultural zones.

These findings are interesting and provide insight into whether Rural Legacy Areas can substitute for strong agricultural zoning in counties where political pressure has prevented stronger agricultural zoning. In general, these results support the argument that the Rural Legacy program can be effective at limiting development on critical, valuable resource land where agricultural zoning is not strong enough to prevent such development. In areas where the share of development fell in Rural Legacy Areas after designation while the share of development rose in county agricultural zones, this seems to be the story. This is consistent with findings by Sokolow (2006) that preservation programs can be used as a substitute for weak zoning.

Summary

In interpreting results on development patterns within Rural Legacy Areas, it is important to consider the level and consistency of funding within these areas relative development pressure, and the supportiveness of zoning within the Rural Legacy Area. The average development was quite low in Foreman Branch, Land's End, Nanticoke, and Coastal Bays. These are areas where the zoning is generally supportive, but the trends in development weren't always moving in the right direction after designation, as the ratio of parcels developed after designation relative to before was higher in all of these areas except Land's End. Nanticoke and Foreman Branch were areas in which the program preserved a high acreage of land and these two areas were also least expensive in costs per acre. Total parcels and acres decreased after designation in only a few areas: Agricultural Security Corridor, Calvert Creeks, Carrollton Manor, Fair Hill, Huntersville, Mattapany, Long Green Valley, Upper Patapsco, and Upper Patuxent-Howard County. Few of these differences were statistically significant, however.

Rural Legacy Area	Counties	Designation	PARCELS INSIDE RLA			ACRES INSIDE RLA			PARCELS INSIDE RLA			AVG SHARE ACRES INSIDE RLA			AVG SHARE PARCELS INSIDE AG ZONE			AVG SHARE ACRES INSIDE AG ZONE		
			PRE	POST	Ratio	PRE	POST	Ratio	PRE	POST	Ratio	PRE	POST	Ratio	PRE	POST	Ratio	PRE	POST	Ratio
Agricultural Security Corridor - Marshyhope	Caroline, Dorchester	FY98/99	6	5	0.81	95	55	0.58	2.1%	1.2%	0.56***	4.7%	2.6%	0.55	57.2%	41.3%	0.72***	87.7%	88.0%	1.00
Agricultural Security Corridor - Sassafras	Cecil, Kent	FY98/99	3	4	1.33	54	64	1.19	0.4%	0.5%	1.25	2.6%	2.7%	1.01	15.0%	21.0%	1.40***	60.5%	75.4%	1.24***
Agricultural Security Corridor - Tuckahoe	Talbot, Caroline	FY98/99	10	8	0.82	125	72	0.58	2.4%	1.6%	0.66	5.3%	2.8%	0.52	47.5%	36.1%	0.76***	89.6%	87.0%	0.97*
Anne Arundel South	Anne Arundel	FY00	20	31	1.58	126	234	1.85	0.6%	1.3%	2.20	6.2%	15.4%	2.48**	13.0%	15.7%	1.20	33.3%	39.5%	1.19
Baltimore County Coastal	Baltimore	FY98/99	22	52	2.40**	18	34	1.88	0.8%	2.4%	3.03	0.9%	1.3%	1.42	6.0%	9.1%	1.52***	55.1%	41.9%	0.76
Bear Creek	Garrett	FY03	13	18	1.39	139	208	1.50	5.3%	5.1%	0.96	9.7%	9.7%	1.00	47.8%	41.9%	0.88	86.0%	74.9%	0.87
Calvert Creeks	Calvert	FY98/99	27	23	0.87	114	107	0.94	3.1%	3.2%	1.02	10.3%	10.3%	1.00	38.6%	48.6%	1.26**	81.3%	83.1%	1.02
Carrollton Manor	Frederick	FY04	189	93	0.49*	329	273	0.83	9.0%	7.0%	0.78	11.2%	8.6%	0.77	10.3%	13.4%	1.29**	80.7%	69.9%	0.87
Coastal Bays	Worcester	FY98/99	4	7	1.59***	27	85	3.11	0.6%	0.7%	1.23	3.7%	6.1%	1.64	16.4%	10.7%	0.65***	78.6%	77.7%	0.99
Deer Creek	Harford	FY00	63	64	1.01	478	479	1.00	3.7%	3.9%	1.05	27.2%	25.5%	0.94	11.2%	13.7%	1.22***	71.7%	76.8%	1.07
Dividing Creek	Somerset, Worcester	FY08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fair Hill	Cecil	FY00	26	20	0.76	118	47	0.40**	4.0%	2.8%	0.70***	8.2%	3.4%	0.41**	14.1%	20.5%	1.46***	48.1%	66.5%	1.38***
Foreman Branch	Queen Anne's	FY01	1	2	1.50	2	2	0.98	0.1%	0.1%	2.05	0.0%	0.0%	1.03	26.9%	37.4%	1.39**	80.9%	87.9%	1.09***
Gunpowder	Baltimore	FY00	17	25	1.49	84	140	1.67*	0.6%	1.1%	1.84	4.5%	3.8%	0.84	6.3%	9.3%	1.47***	56.4%	39.5%	0.70*
Huntersville	St. Mary's	FY98/99	18	14	0.75	77	73	0.96	2.5%	1.7%	0.69**	4.2%	3.5%	0.84	38.7%	44.9%	1.16**	79.1%	86.1%	1.09***
Lands End	Queen Anne's	FY98/99	4	4	0.98	25	80	3.15	0.9%	0.9%	1.06	1.3%	7.7%	5.92	26.4%	36.5%	1.38***	83.1%	86.8%	1.04*
Little Pipe Creek	Carroll County	FY98/99	37	23	0.61*	106	127	1.19	3.5%	2.5%	0.73	4.9%	7.0%	1.43	34.4%	36.6%	1.06	81.9%	85.5%	1.04**
Long Green Valley	Baltimore	FY00	35	26	0.75*	143	123	0.86	1.3%	1.2%	0.92	7.6%	3.4%	0.45***	6.3%	9.3%	1.47***	56.4%	39.5%	0.70*
Manor	Baltimore, Harford	FY01	17	21	1.28	170	212	1.24	0.4%	0.6%	1.52*	4.5%	4.3%	0.95	8.7%	11.3%	1.29	65.6%	44.8%	0.68*
Mattapan	St. Mary's	FY06	62	25	0.41	248	227	0.92	6.7%	2.9%	0.43	10.3%	11.3%	1.10	54.0%	39.7%	0.73	90.9%	91.3%	1.00
Mid-Maryland - Frederick County	Frederick	FY98/99	41	27	0.67	138	148	1.07	2.3%	1.5%	0.63**	5.9%	5.2%	0.89	10.0%	11.5%	1.15	73.5%	75.2%	1.02
Mid-Maryland - Montgomery County	Montgomery	FY98/99	10	13	1.32	202	274	1.36	0.3%	0.4%	1.21	13.6%	15.6%	1.15	1.0%	1.2%	1.17	26.4%	38.5%	1.46**
Mid-Maryland - Washington County	Washington	FY98/99	48	75	1.56**	227	325	1.43	8.0%	8.8%	1.10	17.3%	21.7%	1.26	45.5%	36.5%	0.80***	92.5%	90.3%	0.98*
Nanticoke	Dorchester	FY02	2	2	1.25	39	259	6.71	1.1%	0.6%	0.59	2.6%	12.9%	4.89	43.0%	27.7%	0.65***	84.7%	85.1%	1.01
North Calvert	Calvert	FY04	19	25	1.27	119	75	0.63	2.3%	4.5%	1.95**	8.8%	8.3%	0.95	57.9%	38.6%	0.67***	87.0%	78.8%	0.91
Patuxent River	Prince George's	FY98/99	17	21	1.21	73	103	1.40	0.5%	0.7%	1.44*	6.9%	7.6%	1.10	3.3%	4.9%	1.50***	24.9%	32.5%	1.31**
Piney Run	Baltimore	FY98/99	14	13	0.92	141	185	1.31	0.5%	0.5%	1.10	7.1%	7.1%	1.00	6.0%	9.1%	1.52***	55.1%	41.9%	0.76
Quantico Creek	Wicomico	FY01	13	7	0.59	31	42	1.36	2.4%	1.2%	0.51	2.4%	4.9%	2.06	36.9%	24.9%	0.68***	73.6%	77.9%	1.06
Upper Patapsco Watershed	Carroll County	FY04	23	16	0.69	105	63	0.60	1.8%	2.7%	1.46*	4.9%	3.8%	0.77	34.0%	39.3%	1.16*	84.5%	87.6%	1.04
Upper Patuxent Watershed - Howard	Howard	FY00	18	11	0.61	113	59	0.52	0.9%	0.8%	0.85	8.0%	5.1%	0.64	9.1%	11.5%	1.26	44.2%	43.0%	0.97
Upper Patuxent Watershed - Montgomery	Montgomery	FY98/99	26	49	1.88**	106	210	1.98**	0.7%	1.3%	1.72**	6.8%	12.0%	1.78**	1.0%	1.2%	1.17	26.4%	38.5%	1.46**
Zekiah Watershed	Charles	FY98/99	27	38	1.42	147	194	1.32	2.7%	3.3%	1.23	8.6%	9.1%	1.05	27.3%	29.7%	1.09	88.0%	88.5%	1.01
TOTAL			27	25	0.92	126	148	0.99	2.3%	2.2%	0.94***	7.1%	7.8%	1.10	24.3%	23.6%	0.97***	68.6%	68.4%	1.00***

Table 15: Average Parcels and Acres Developed in Rural Legacy Area Before and After Act (Sources of Data: Maryland Department of Natural Resources; Maryland Department of Planning; Maryland PropertyView)

While Agricultural Security Corridor received consistent funding over the life of the program, in several of these areas, funding was inconsistent, the amount of land preserved and amount spent in these areas was quite low. Additionally, the zoning in many of these areas was often considered “least protective” or residential as was the case in Long Green Valley, Huntersville, Fair Hill, and Upper Patuxent-Howard County. Some of these areas were in regions of the state with less development pressure, but some like Upper Patuxent-Howard and Long Green Valley are in Central Maryland where development pressure is quite high.

In the areas that performed poorly on both measures of parcels and acres like Upper Patuxent-Montgomery, Gunpowder, and Mid Maryland-Washington often had weak zoning or a high percentage of residential zoning within the Rural Legacy Area and received inconsistent or little funding through the Rural Legacy program. These areas are mostly located in Central Maryland where development pressure is high.

In examining trends in development patterns, it is useful to consider how the Rural Legacy Program was implemented and the stringency of local zoning to explain why these trends are occurring in particular Rural Legacy Areas. In some cases, this explanation is straightforward, while in other cases, the impact of state funding and local zoning is difficult to disentangle. In the next section, I will examine spatial patterns of development within Rural Legacy Areas.

Spatial Patterns of Development

I use spatial statistics to analyze the pattern of development within Rural Legacy Areas before and after the implementation of the program. Specifically, I use Global Moran's I within each individual Rural Legacy Area to determine whether development within Rural Legacy Areas has become more clustered after designation relative to before. Because the Rural Legacy Program was intended to reduce sprawl in Rural Legacy Areas by conserving large parcels, if the program is having its intended effects, development after the passage of the act should be more clustered relative to before. Meaning, development should be occurring adjacent or nearby existing development rather than dispersed throughout the Rural Legacy Area. The index values obtained from Global Moran's I must be interpreted in conjunction with descriptive data on total development as Global Moran's I, like other measures of dispersion should not serve as the sole measure of development patterns and trends. Global Moran's I provides a measure of spatial autocorrelation and estimates the degree of clustering. Specifically, Moran's I measures the degree to which nearby features (in this case parcel development) are clustered. Where n is the number of features, the Moran Index is specified as:

$$I = \frac{n \sum_i \sum_j w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_i \sum_j w_{ij} \sum_i (x_i - \bar{x})^2}$$

The index ranges from -1 to 1, where values closer to -1 are more dispersed, values closer to 1 are more clustered, and values close to 0 are random. (Mitchell, 2005) I use a user-defined distance threshold of one-half mile to permit comparison across Rural Legacy Areas. The index was calculated using parcel centroids from Maryland PropertyView to

calculate cumulative development within each Rural Legacy Area annually from 1990-2007, in two periods based on designation date and consistent with periods used above. In Table 16, I report average Moran's I Values for the period before and after designation. I also report the difference in the Moran's I value from the beginning of the period to the end of the period in addition to reporting the percentage change in the Moran's I value within the "pre" and "post" periods. Moran's I values were statistically significant for all areas except Land's End and Nanticoke. In all of the areas, the Global Moran's I coefficient exceeded 0 indicating at least slight clustering within each Rural Legacy Area. However, the coefficients varied tremendously across Rural Legacy Areas, ranging from as low as 0.03 in Land's End to 0.437 in one period in Baltimore Coastal. Thus, development in Land's End was more random than concentrated. In both periods, Baltimore Coastal, Carrollton Manor, Huntersville, and Agricultural Security-Tuckahoe were most concentrated with an index over 0.3. With indices less than 0.10 in both periods, Patuxent-Prince George's and Land's End were least concentrated. To evaluate trends over time, I examine the differences within the periods and overall percentage change within the periods before and after designation. The decline in concentration was most drastic in Little Pipe Creek, where the average index fell from 0.356 in the period before to 0.101 in the period after. Meanwhile, Foreman Branch, Piney Run, Baltimore Coastal, and Calvert Creeks had the greatest increases in concentration.

If Rural Legacy Areas were having their intended effect, development after the passage of the act would be more concentrated after designation. In Figure 26, Rural Legacy Areas are divided into four categories based on performance: more concentrated in both periods; more concentrated before designation and less concentrated after; less

concentrated before and more concentrated after; less concentrated in both periods. This hypothesis is not based on the economic conceptual framework but instead considers the intent of the law. Whether parcels will become more concentrated is contingent on the level and location of development.

Some became more concentrated in both periods including Baltimore Coastal, Calvert Creeks, Foreman Branch, Land's End, Long Green Valley, Mattapany, Nanticoke, and Piney Run. Some were trending in the wrong direction in the first period but became more concentrated after the act including Huntersville, Manor, Patuxent-Prince George's, and Quantico Creek. In some areas, while trends in development were still becoming less concentrated after the passage of the act, the rate of decline was less after the act including Little Pipe Creek, Coastal Bays, and Mid Maryland Montgomery. In Agricultural Security-Marshyhope, Agricultural Security-Tuckahoe, and Upper Patuxent-Howard, development was becoming more concentrated before the act, but became less concentrated after. The remaining 13 Rural Legacy Areas become less concentrated in both periods.

Maps (Figures 27-30) provide context for the spatial configuration of Rural Legacy Areas. In the maps, parcels coded in black were developed before both time periods; parcels in blue were never developed; parcels in green were developed in the period immediately before designation as a Rural Legacy Area and parcels in pink were developed in the period after designation. Parcels with a yellow outline existed at the time of designation. Parcels lacking a yellow outline were subdivided after the Rural Legacy Area was designated. Using Upper Patuxent-Howard and Montgomery, Land's End and Foreman Branch, Piney Run and Carrollton Manor I offer a representation of the

spatial trends observed. Upper Patuxent-Howard and Montgomery fell in the middle range of concentration, between 0.171 and 0.275. Howard became more concentrated in the first period but fell in the second, and Montgomery fell in both periods. Land's End and Foreman Branch both became more concentrated, but Land's End was the least concentrated of all Rural Legacy Areas and Foreman Branch fell in the mid-range. Piney Run became more concentrated over both time periods and fell in the mid-range in average concentration. Finally, Carrollton Manor was one of the most concentrated, but it became less concentrated over time. Carrollton Manor has the most striking level of development and several municipalities within its boundaries. Despite the existence of urban development within the Rural Legacy Area, in the original application for designation, the sponsors stressed that they did not seek Rural Legacy funding for parcels in residential subdivisions.

Summary

Examining the spatial patterns of development using Moran's I produced plausible results, but these results must be interpreted with findings on development patterns. Some findings are consistent with results on development patterns while other findings are ambiguous. For instance, in Baltimore Coastal, development of parcels increased by a statistically significant amount but development patterns were becoming more concentrated in both periods. This finding is consistent with trends in number of parcels and number of acres reported above and suggests that although total development increased, new development was likely occurring adjacent to existing development and in clusters (in subdivisions on small parcels) rather than dispersed throughout the Rural Legacy Area. Areas like Piney Run, Nanticoke, Land's End, and Little Pipe Creek

convey trends that are consistent with trends in development patterns. In these areas, development was decreasing and becoming more concentrated after the act. These results are consistent with the intent of the Rural Legacy Program. Trends in concentration in Agricultural Security Corridor and Fair Hill were surprising as total development decreased after the act; but in both periods, development was becoming less concentrated. This is likely indicative of low levels of dispersed development across the Rural Legacy Area rather than subdivision of parcels.

<p>More Concentrated Before, Less After</p> <p>PRE ↑ POST ↓</p> <p>Ag Security - Marshyhope Ag Security - Tuckahoe Upper Patuxent - Howard</p>	<p>More Concentrated in Both Periods</p> <p>PRE ↑ POST ↑</p> <p>Baltimore Coastal Calvert Creek Foreman Branch Land's End Long Green Valley Mattapany Nanticoke Piney Run</p>
<p>More Concentrated After</p> <p>PRE ↓ POST ↑</p> <p>Huntersville Manor Patuxent - Prince George's Quantico Creek <i>Trend still negative but smaller decline:</i> Coastal Bays Little Pipe Creek Mid Maryland Montgomery</p>	<p>Less Concentrated Before & After</p> <p>PRE ↓ POST ↓</p> <p>Ag Security -Sassafras Anne Arundel South Bear Creek Carrollton Manor Deer Creek Fair Hill Gunpowder Mid-Maryland Frederick Mid-Maryland Washington North Calvert Upper Patapsco Upper Patuxent - Montgomery Zekiah Watershed</p>

Figure 26: Changes in Spatial Concentration within Rural Legacy Areas.

		Average Global Moran's I Value		Difference in Global Moran's I Value		Percent Change in Global Moran's I Value	
Rural Legacy Area	Designation	PRE	POST	PRE	POST	PRE	POST
Agricultural Security Corridor(Marshyhope)	FY98/99	0.137	0.110	0.002	-0.033	1%	-25%
Agricultural Security Corridor(Sassafras)	FY98/99	0.157	0.090	-0.060	-0.072	-31%	-57%
Agricultural Security Corridor(Tuckahoe)	FY98/99	0.386	0.327	0.092	-0.152	28%	-36%
Anne Arundel County	FY00	0.268	0.221	-0.022	-0.023	-8%	-10%
Baltimore Coastal	FY98/99	0.351	0.437	0.022	0.153	6%	41%
Bear Creek	FY03	0.268	0.212	-0.067	-0.055	-22%	-23%
Calvert Creeks	FY98/99	0.226	0.251	0.023	0.028	10%	12%
Carrollton Manor	FY04	0.472	0.374	-0.082	-0.117	-15%	-27%
Coastal Bays	FY98/99	0.200	0.169	-0.012	-0.006	-6%	-3%
Deer Creek (Lower Deer Creek)	FY00	0.132	0.111	-0.022	-0.017	-15%	-15%
Dividing Creek	FY08	NA	NA	NA	NA	NA	NA
Fair Hill	FY00	0.161	0.121	-0.026	-0.058	-14%	-37%
Foreman Branch (Chino Farms)	FY01	0.157	0.183	0.010	0.035	6%	21%
Gunpowder	FY00	0.137	0.114	-0.025	-0.034	-16%	-27%
Huntersville	FY98/99	0.349	0.328	-0.048	0.014	-13%	4%
Lands End	FY98/99	0.025	0.050	0.012	0.002	39%	5%
Little Pipe Creek	FY98/99	0.356	0.101	-0.400	-0.043	-74%	-35%
Long Green Valley	FY00	0.150	0.149	0.007	0.000	5%	0%
Manor	FY01	0.156	0.105	-0.009	0.002	-6%	2%
Mattapany	FY06	0.200	0.211	0.012	0.000	6%	0%
Mid-Md Frederick	FY98/99	0.202	0.148	-0.016	-0.015	-7%	-9%
Mid-Md Montgomery	FY98/99	0.165	0.154	-0.014	-0.004	-8%	-2%
Mid-Md Washington	FY98/99	0.243	0.160	-0.014	-0.137	-6%	-59%
Nanticoke	FY02	0.128	0.162	0.020	0.088	18%	78%
North Calvert	FY04	0.456	0.298	-0.015	-0.082	-3%	-24%
Patuxent-Prince George's	FY98/99	0.080	0.082	-0.007	0.002	-8%	3%
Piney Run	FY98/99	0.145	0.162	0.008	0.018	6%	12%
Quantico Creek	FY01	0.200	0.204	-0.051	0.032	-21%	18%
Upper Patapsco	FY04	0.150	0.104	-0.042	-0.047	-24%	-37%
Upper Patuxent-Howard Co.	FY00	0.244	0.171	0.034	-0.142	14%	-52%
Upper Patuxent-Montgomery Co.	FY98/99	0.275	0.181	-0.018	-0.098	-7%	-40%
Zekiah Watershed	FY98/99	0.432	0.315	-0.074	-0.077	-16%	-22%

Global Moran's I not Statistically Significant at 95 percent confidence interval

Table 16: Average and Difference in Global Moran's I Values by Rural Legacy Area. Sources of Data: Maryland PropertyView

Spatial Patterns of Development: Upper Patuxent Howard and Montgomery

Montgomery: Average 1990-1998 = 0.275/ Average 1999-2007 Index = 0.181

Howard: Average 1992-1999 = 0.244/ Average 2000-2007 Index = 0.034

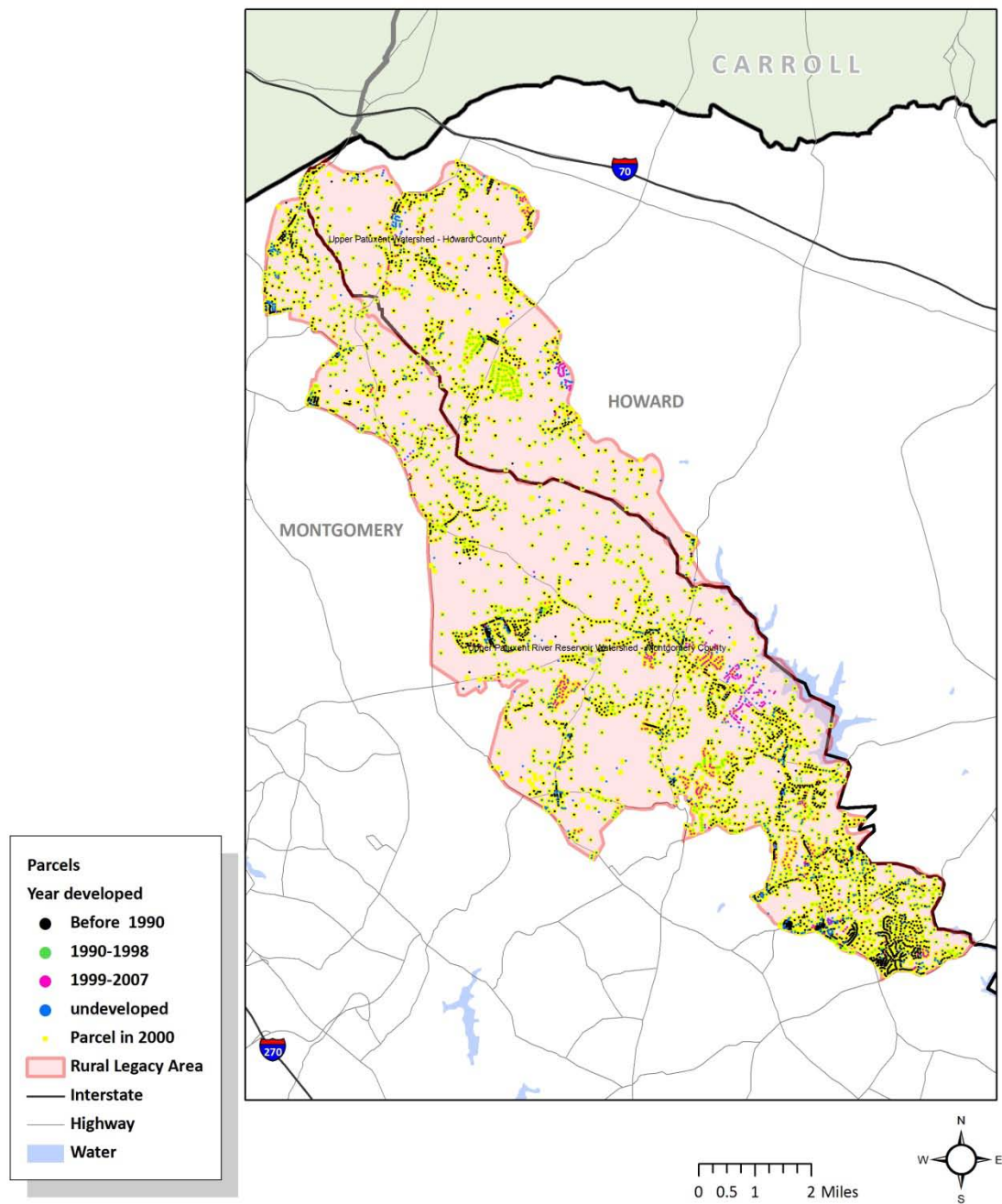


Figure 27: Spatial Patterns of Development in Upper Patuxent-Howard and Montgomery. Sources of Data: Maryland PropertyView; U.S. Census; Maryland Department of Natural Resources.

Spatial Patterns of Development: Foreman Branch and Land's End

Land's End: Average 1990-1998 = 0.025 / Average 1999-2007 Index = 0.05
 Foreman Branch: Average 1992-1999 = 0.157 / Average 2000-2007 Index = 0.183

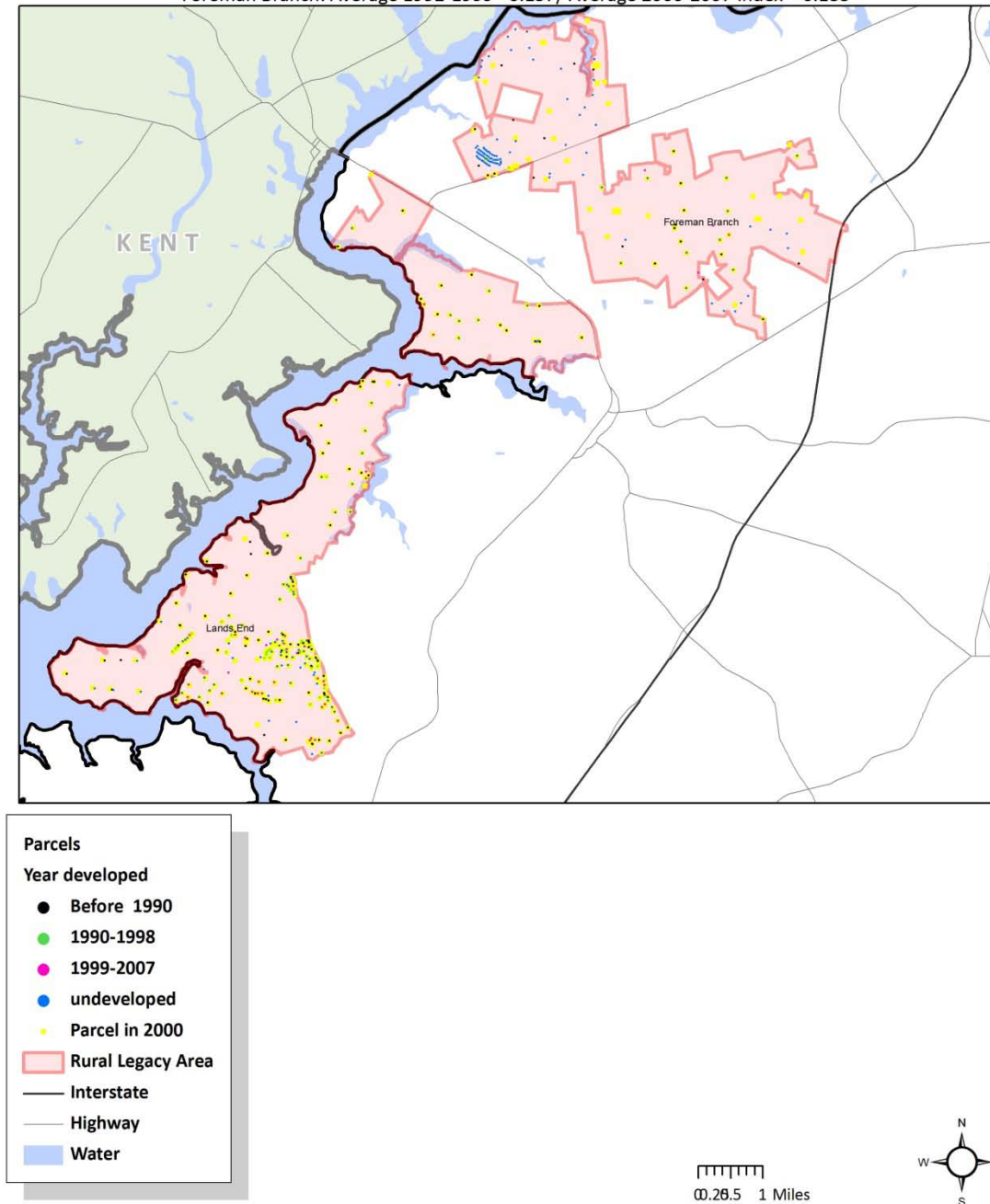


Figure 28: Spatial Patterns of Development in Foreman Branch and Land's End. Sources of Data: Maryland PropertyView; U.S. Census; Maryland Department of Natural Resources.

Spatial Patterns of Development: Piney Run

Average 1990-1998 = 0.145 / Average 1999-2007 Index = 0.162

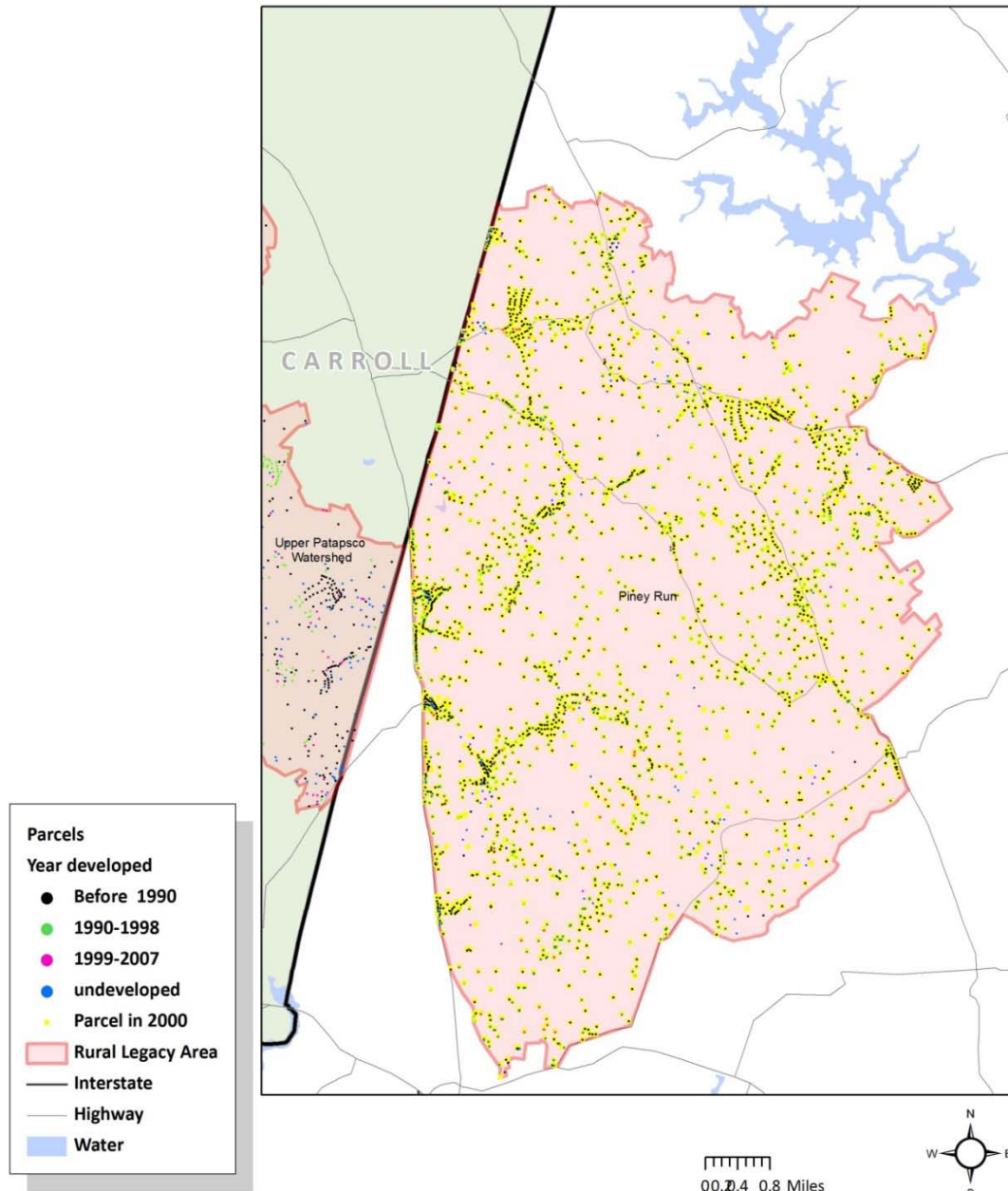


Figure 29: Spatial Patterns of Development in Piney Run. Sources of Data: Maryland PropertyView; U.S. Census; Maryland Department of Natural Resources.

Spatial Patterns of Development: Carrollton Manor

Average 2000-2003 = 0.472 / Average 2004-2007 Index = 0.374

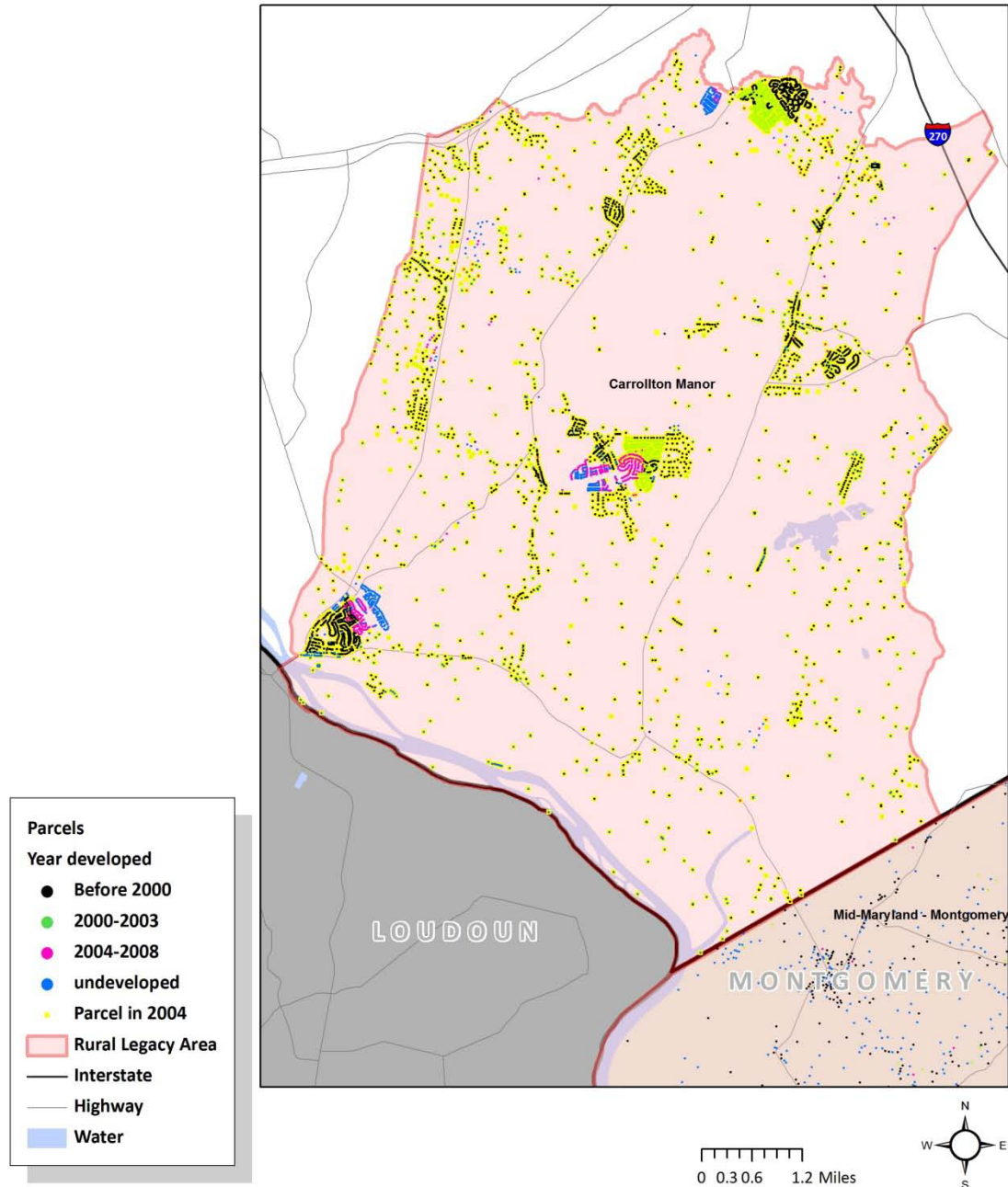


Figure 30: Spatial Patterns of Development in Carrollton Manor. Sources of Data: Maryland PropertyView; U.S. Census; Maryland Department of Natural Resources.

Summary and Conclusions

In this essay, I have evaluated the implementation and performance of one component of Maryland's Smart Growth Program: Rural Legacy Areas. These areas were identified by local sponsors and designated by the state for targeted funding of preservation in prime rural areas. The program sought to limit sprawl development in pristine rural areas by preserving individual parcels within Rural Legacy Areas. Funding was allocated to local sponsors through a careful, inclusive process based on extensive analysis and with the involvement of several key state agencies. State agencies carefully implemented the law according to statutes, though procedures and decision criteria varied over time. Though the program has preserved nearly 69,000 acres using \$229 million, the program has fallen considerably short of its goal to preserve 200,000 acres by 2011. Given that funding for the Rural Legacy Program has waxed and waned over time, consistent with gubernatorial shifts, rising land costs, and diminishing state budgets, this is not surprising.

Additionally, trends on development inside Rural Legacy Areas are generally moving in the wrong direction. Though the program sought to diminish development in Rural Legacy Areas, in half of the Rural Legacy Areas, development of parcels and acres inside Rural Legacy Areas increased after the act, though many of these results were not statistically significant at the 95 percent confidence level. It seems that preserving land in these areas might be providing an amenity value that encourages development in nearby parcels, consistent with the findings of Roe et. al. (2004). Many areas became more fragmented and parcelized over time and the total percentage of the area protected changed little.

But in some Rural Legacy Areas, the Rural Legacy Program does seem to be having its

intended effects. It is not surprising that areas that received the most funding, consistently over time, or had the most land protected were characterized by supportive zoning and performed better in measures of development patterns, fragmentation, and contiguity. Although trends indicative of diminishing development after designation were rarely statistically significant, development trends tended to be more consistent with the intent of the program in areas with consistent and high levels state funding like Agricultural Security Corridor, Little Pipe Creek, and Piney Run. Beyond diminishing total development in Rural Legacy Areas, some of the areas with consistent, high levels of state funding became more concentrated over time like Piney Run and Little Pipe Creek. Areas that received lower levels of funding, but preserved a significant amount of land and had less, more concentrated development after the act offer examples of lower cost, successful uses of the program. This was the case in Nanticoke, Foreman Branch, and Land's End. These findings show that incentive-based programs can be effective if the level of incentives is high and consistent. Rather than spreading funding thin across several Rural Legacy Areas or expending a large amount of resources in central Maryland where land costs are extremely high and development pressures are significant, with limited funding available, it seems that concentrating funding into a few areas is a more effective use of state funding.

Though some the share of development in the Rural Legacy Area rose after implementation relative to before, in some places the share developed in county agricultural zones fell more significantly during the same period. But in some counties, the Rural Legacy Program had a more significant impact the share of development after designation relative to before. This seemed to be the case in regions of the state with less

protective agricultural zoning or higher development pressure. This finding is particularly interesting and provides advice to the Rural Legacy Board about allocating funding. Rather than deeming a decision to allocate funding to a Rural Legacy Area with less protective zoning “rewarding weak policies,” instead the Board should consider the possibility that the Rural Legacy program provides an opportunity to protect prime areas in places where stronger zoning is not politically feasible.

Though the Rural Legacy Program has been relatively effective in some Rural Legacy Areas in some portions of the state, some overarching problems persist. To summarize issues and performance:

- In several areas, a portion of the land is in less protective agricultural zones, non-residential zones, or zoned for residential use. The intent of the program was not to target funding to already-developed areas but to inhibit development on prime rural lands. Further, in many of the areas that performed well, little development was occurring in the areas before designation. Statutorily the program was not designed to target highly developed areas or areas with little development pressure, but areas between these two extremes.
- Over half of the Rural Legacy Areas have expanded over time and all requests for expansion were approved.
- Several Rural Legacy Areas have not submitted applications for several years, or have consistently submitted applications but have not received funding for several years.
- Rural Legacy Areas are not incorporated into local development review

processes.

- The areas that perform best are in rural areas where development pressure is lower and land is cheaper. The state may be using its limited resources to preserve land that would not have developed anyhow.
- Despite attempts to inhibit sprawl in rural areas, many of the trends are going in the wrong direction. Preserving land may be increasing the potential for development in adjacent parcels or just beyond the Rural Legacy Area border, though I do not have adequate data to examine those effects.

For this program to become more effective in light of diminishing state monetary resources and continuing development pressure, I recommend several actions, many administrative:

- Rather than expanding Rural Legacy Areas consistently, refine the areas to focus on resource (rather than residential) lands.
- Periodically review and decertify areas over time based on performance, ranking, and lack of interest by local sponsors. This will allow the state to focus resources on critical areas.
- Prioritize Rural Legacy Areas and provide consistent funding to those with high development pressure, unsupportive agricultural zoning, and a high potential for contiguity. Refrain from allocating funding to areas with extremely high development pressure or non-protective zoning.
- Use the Rural Legacy Program to target preservation funding to areas where strong zoning or a Transfer of Development Rights program is not politically

feasible.

- Refrain from spending critical state resources in areas that are already protected by strong (1:25 or greater) acre zoning or where development pressure is limited.

While the Rural Legacy Program is not having its intended effects across the state, the program has preserved over 69,000 acres in the state. It is difficult to speculate what might have happened in these areas in the absence of the program. While regulations seem to be more effective at limiting development in some areas of the state, when funded consistently at a high level and in the absence of strong zoning or in the face of high development pressure, Rural Legacy Areas can be effective at diminishing development as well.

Essay #3: Does Maryland's Community Legacy Program Influence Redevelopment

Decisions?

The Community Legacy program was created in 2001 under the administration of Governor Parris N. Glendening and is administered by the Department of Housing and Community Development. To encourage revitalization and smart growth in Maryland, the Community Legacy program funds housing and community development projects in targeted areas. Specifically, the Community Legacy program provides grants and loans for “projects aimed at strengthening communities through activities such as business retention and attraction, encouraging homeownership and commercial revitalization.” (Maryland Department of Housing and Community Development, n.d.)

Statutorily, the purposes of the Community Legacy Program are:

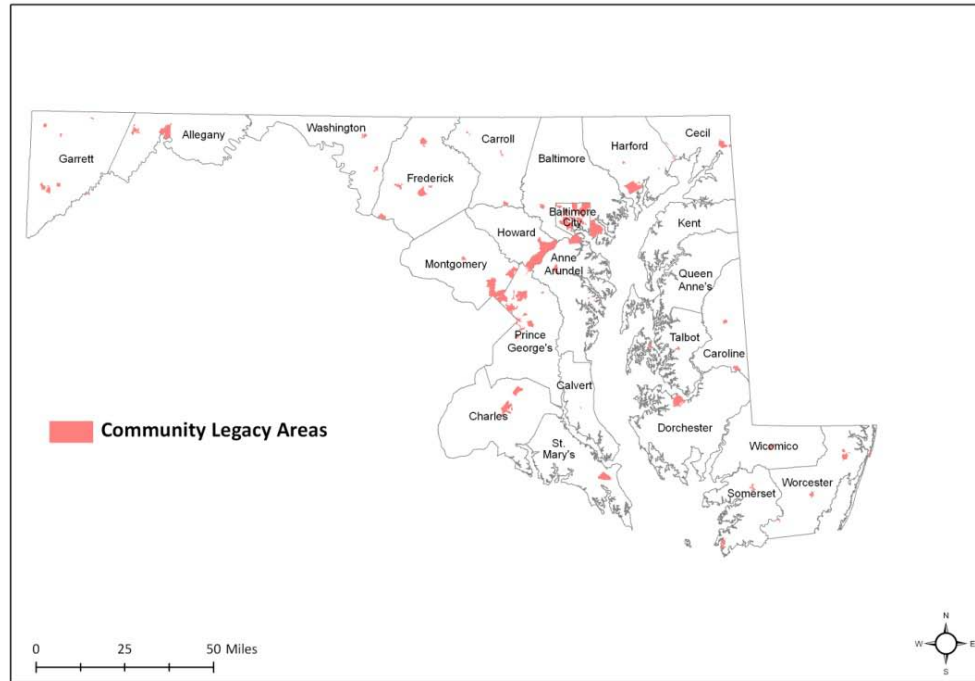
- (1) To preserve existing communities as desirable places to live and conduct business to reduce outward pressure for sprawl development; and
- (2) To provide financial assistance to sponsors or their designees to develop community legacy plans or community legacy projects. (Maryland Code Annotated, Housing & Community Development Article, §§ 6-2-01 to 213, 2010)

Like other revitalization strategies, the program was designed to target “at-risk” neighborhoods and downtown areas rather than stable or severely blighted areas, and the program was designed to give local governments flexibility in using funds and fill gaps in funding revitalization and rehabilitation projects. To obtain designation and funding, sponsors must develop a Community Legacy plan, which is a comprehensive plan identifying specific future projects and the sponsor’s revitalization strategy. Community

Legacy Areas must be located within Priority Funding Areas, and to receive designation, among more specific criteria relating to community buy-in and proximity to certain amenities sponsors must demonstrate that trends in homeownership, property values, vacancy, and private investment indicate a need for investment. Maryland Code Annotated, Housing & Community Development Article, §§ 6-2-01 to 213) There are currently 110 Community Legacy areas in Maryland (shown in Figure 31), 28 of which are in Baltimore City. Since the program was implemented in FY2002, \$56 million has been awarded across the state of which \$13 million was spent in Baltimore City. In 2010, new legislation altered the existing Community Legacy program and all existing Community Legacy Areas became Sustainable Communities, which they will remain until 2012 when sponsors must apply for re-designation. The legislation integrated the Community Legacy Program with the Neighborhood BusinessWorks program and altered the designation process such that spatial areas must be reviewed every five years. Upon designation as Sustainable Communities, these areas are eligible for grants and loans, as under the Community Legacy Program.

From FY2002 to FY2009, the uses of state funding varied across Community Legacy Areas and regions, but in Baltimore City, a high level of funding was awarded to Community Development Corporations and other neighborhood organizations for residential renovation and redevelopment. In smaller counties and municipalities, local governments often sponsor areas and projects instead.

Community Legacy Areas in Maryland



Map created July 2010 by Rebecca Lewis
Data Sources: U.S. Census; Maryland Department of Housing and Community Development

Figure 31: Community Legacy Areas in Maryland (Sources of Data: U.S. Census; Maryland Department of Housing and Community Development)

Research on Community Legacy Areas has been limited. In a case study of historic preservation efforts in Hyattsville, Grilli (2007) highlights the role of the Community Legacy Program in crafting a revitalization plan for the city. He specifically notes the role of Community Legacy grants and designation in making the city more attractive to private developers. Frece, Sartori & Lewis (2008) conducted a qualitative analysis of the impacts of the Community Legacy Program and Neighborhood BusinessWorks Programs. To examine the implementation and perceived impact of Community Legacy funding on neighborhoods and communities, Frece, et al. conducted site visits and interviews in a geographically representative sample of 12 of the then 89 Community Legacy Areas. Frece, Sartori, & Lewis (2008) found that the Community Legacy

Program had direct and indirect impacts on revitalization, but noted that these impacts are often reported anecdotally rather than quantitatively.

Spatially targeted revitalization has been the subject of many academic studies. I provide a very brief review. In an evaluation of a similar neighborhood-based revitalization program, using an adjusted-interrupted time series model to examine impacts on home values, Galster et al. (2006) found that Richmond's revitalization strategy had a positive impact in targeted areas and did not undermine other distressed neighborhoods. Success was partially attributed to applying adequate levels of resources consistently over time, which reached threshold of resource concentration and stimulated private activity. Additionally, the Richmond program was successful because it was exceptionally targeted, resulting in concentrated, sustained, and visible interventions. Previous studies have also evaluated the "threshold" level of investment, finding that expenditures do not have a noticeable impact unless they exceed \$87,000 per census tract per year over a three-year period or \$6,000 per census block per year over a five year period. (Galster et al., 2004; Galster et. al., 2006) Bleakly, Holin, Fitzpatrick & Hodes (1983) showed that under spatially targeted CDBG programs, neighborhood conditions improved with a higher-than-average expenditure per block. In measuring the relationship between CBDG expenditures and neighborhood indicators in 17 cities, however, Galster and colleagues (2004) found little evidence of impact on neighborhood conditions unless expenditures exceeded the sample mean. Several papers focus on specific spatial approaches to stimulating revitalization like enterprise zones. (Vidal, 1995; Ladd, 1994; Green, 1991; Wilder & Rubin, 1996; Boarnet, 2001) Generally, this research has

concluded that enterprise zones impact the location but not amount of activity within a city.

Though research on the Community Legacy Program in Maryland in particular has been limited, there have been four key empirical studies on urban redevelopment. In a pioneering empirical study on redevelopment in Vancouver, BC, Rosenthal & Helsley (1994) used data on single-family detached homes and vacant land to study whether existing parcels are redeveloped when the price of vacant land exceeds the value in current use. Results provide support for this hypothesis. The authors focused on predicting the price of vacant land and probit models were used to determine whether parcels are redeveloped upon sale. The authors found that access to downtown, land area, and distance to the central business district (CBD) all have a positive impact on the probability of redevelopment. Munneke (1994) provided an analysis similar to Rosenthal and Helsley (1994) but focused on commercial and industrial properties. Munneke's results support the hypothesis that land is redeveloped when improvements result in a higher value than the current use.

Weber et al. (2006) examined Chicago neighborhoods that experienced significant demolition activity between 2000 and 2003. The authors observed that demolition permits occurred frequently among older properties with frame structures and small lots. Using logit regression analysis, Weber et al. incorporated other elements in the study, including policy areas like Tax Increment Financing (TIF) districts and demographics, but found building characteristics to be the most significant factors of redevelopment.

Following a similar empirical framework, Dye & McMillen (2007) examined redevelopment in the Chicago metropolitan area, focusing on teardowns in Chicago neighborhoods and inner-ring suburbs. The results demonstrated that older homes on small lots, close to public transportation, in village centers and located in high value areas, were more likely to be torn down. The study provided support for an equilibrium model of redevelopment, which states that the sales price of teardown property is approximately equal to its land value.

There have also been several empirical studies of renovation where renovation is defined as improvement to a property without total demolition (Helms, 2003; Mayer, 1981; Melchert & Naroff, 1987; Mendelsohn, 1977; Shear, 1983; Montgomery, 1983; Galster, 1987; and Chinloy, 1980). With the exception of Helms (2003), most of these studies, however, omit building and neighborhood attributes or find that these attributes are statistically insignificant predictors of renovation activity. In several of these studies, homeowner characteristics and building age were shown to have a statistically significant impact on renovation. Helms (2003) uses building renovation permit data from Chicago from 1995-2000 in probit models to evaluate the impact of structural characteristics, neighborhood characteristics, and local amenities on the probability of renovation. Helms concludes that older, low-density homes in older, moderate density neighborhoods are most likely to be renovated. Homes closer to the CBD and transit are also more likely to be renovated. Helms analysis does not, however, examine the influence of targeted reinvestment and economic development programs.

In this essay, I examine the influence of Maryland's Community Legacy program on housing rehabilitation patterns in Baltimore, Maryland. I first evaluate the

implementation of the Community Legacy Program in Baltimore City. Because of computational challenges, data availability, and stark differences between Baltimore City and the rest of the state, this analysis focuses solely on Baltimore City. Further, Community Legacy program staff pointed out the differences in the type of Community Legacy Areas and the designation process in Baltimore City and the rest of the state. I conduct an empirical analysis of the impact of the Community Legacy Program on residential renovation in Baltimore City. This quantitative analysis moves beyond previous empirical studies by Rosenthal and Helsley (1994), Helms (2003), and Munneke (1994) in analyzing not only neighborhood characteristics that contribute to rehabilitation or redevelopment, but also the effects of state policy areas. Finally, I use spatial statistics to examine the spatial pattern of renovation in Baltimore City.

Statutory Context

According to the statutes, the purpose of the Community Legacy Program is to:

- Preserve existing communities as desirable places to live and conduct business thereby reducing outward pressure for sprawl development and,
- Provide financial assistance to sponsors or their designees for the development of Community Legacy Plans or Community Legacy Projects.
(Maryland Code Annotated, Housing & Community Development Article, §§ 6-2-01 to 213, 2010).

The program was designed to mirror the Rural Legacy Program as local sponsors submit applications to an 11 member Advisory Committee representative of stakeholders. The Advisory Committee provides recommendations to the Community Legacy Board

including cabinet secretaries from related agencies. The Community Legacy Board makes award decisions annually. The Advisory Committee consists of 11 individuals appointed by the governor, including the state representatives of four agencies or bodies in addition to seven members representing interest groups with expertise in community development and preservation. The Community Legacy Board includes secretaries of Housing and Community Development (serving as chair), Natural Resources, Planning, Transportation, and Smart Growth.

Local sponsors, which may be a local government, community development corporation or community development financial institution, must submit applications to the Community Legacy Board for designation, approval of the Community Legacy Plan, and approval and funding of the Community Legacy Project. Applications must provide details about how the sponsor intends to develop a Community Legacy plan or implement a project; the amount of type of assistance requested; the ability of the sponsor to carry out the Community Legacy Plan and provide financial and staff support in addition to commitment to smart growth; proposed benchmarks for evaluation; and describe public input. For an area to be designated and receive funding, the sponsors must show that past or current trends in homeownership, property values, vacancy and investment warrant a need to reinvest in the area. Additionally the sponsor must show one or more of the following: support from the community including pledged resources; how reinvestment will enhance the area; the presence of cultural or historic resources; proximity to a town center or transportation hub; or consistency with existing or proposed projects. Upon designation, these areas are eligible for financial assistance, which may be a grant, loan, reduction in principal, prepayment of interest, assurance, guarantee, or other credit

enhancement. I attempted to obtain application files from DHCD, but because the program no longer exists in its original form and Community Legacy Areas are transitioning to Sustainable Communities, these files were not accessible.

Community Legacy Area sponsors are required to report quarterly to the Community Legacy Board on the Community Legacy Plan progress and the implementation of projects. The Community Legacy Program is required to file annual reports with the General Assembly including: the financial status of the program, number of applications received, number of Community Legacy Areas designated, and a summary of quarterly reports. I obtained annual reports for the final three years of the program (FY08-FY10.) These reports included statutorily required elements but did not provide many details about individual Community Legacy Areas and projects.

Community Legacy Areas in Baltimore City

In this section, I describe how the Community Legacy Policy works across Baltimore. To evaluate the impacts of the Community Legacy Program, I examine state investment over time in designated Community Legacy Areas within Baltimore City. I report descriptive data on funding in these areas and use maps to convey the spatial pattern of investments. I also characterize the Community Legacy Areas based on the types of projects funded within the Community Legacy Area over time. This analysis feeds into the empirical analysis conducted in the next section. I expect that the level of state funding and type of Community Legacy Area sponsor will impact the level of redevelopment within Community Legacy Areas.

Table 17 conveys the designation date, type of Community Legacy Area (see next section), total number of projects funded by the state, total state funding provided through

the Community Legacy Program, total project cost (as reported by sponsors), and state funding by year from FY2002-FY2009. Though there are 28 Community Legacy Areas in Baltimore City, only 21 areas have ever received funding by the state and the designation year varied across the areas (see Figure 32). The level and consistency of funding varied tremendously by area. Oliver and Midtown-Calvert Street Corridor received the most funding at over \$1.5 million from FY2002 to FY2009, while Cold Spring and Woodberry received less than \$5000 in funding over the same period (see Figure 33). The areas that received zero funding from the state were Edmonson Village, Ednor Gardens, Garwyn Oaks, Greektown, Northwood, Sandtown-Winchester, and Westport Waterfront. Of these areas, three were designated in FY2009 including Edmonson Village, Northwood, and Westport Waterfront. According to state program administrators, there were several reasons these areas never received funding. Often, the areas sought designation to earn higher scores other grant applications rather than to obtain state Community Legacy funding. Because funding for the program diminished over time while applications and competition rose, some newer areas did not rank high enough to receive funding. Administrators noted that these areas likely would have received funding in earlier years.

Only a few areas including Oliver, Patterson Park, Pigtown, and Southeast Baltimore receiving funding consistently over the period but no areas received funding in every year. Coppin Heights-Rosemount, Cold Spring, Sharp-Leadenhall, and Woodberry only received funding for one year. Table 17 also shows the total project costs provided on project applications. In considering state funding as a portion of the total project costs, it is clear that in many cases, Community Legacy funding is just a small portion of

revitalization activity in many of these areas.

Based on the types of funding received, I categorize Community Legacy Areas into four categories: residential, non-residential, mixed, or not applicable (see Figure 34 and Table 17). Areas classified as residential received funding for a majority of projects for residential uses like demolitions or home repair loans. Areas classified as non-residential received funding primarily for loans for commercial buildings, façade improvement, or civic buildings. Areas classified as mixed received a balance of funding for residential and non-residential uses. Community Legacy areas that never received funding from the state are classified as not applicable. This typology was vetted with the Department of Housing and Community Development and program administrators provided feedback on categorization. Six areas are classified as residential including: Fallstaff-Glen Hills, Midtown-Calvert Street Corridor, Northeast Baltimore, Poppleton-Hollins Market, Reservoir Hill, and Southwest Baltimore. Six areas are classified as non-residential including: Cold Spring, Coppin Heights-Rosemount, Park Heights, Sharp-Leadenhall, Woodberry, and York Road Corridor North. Eight areas are classified as mixed including: Belair-Edison, Brooklyn-Curtis Bay, Fells Point, HEBCAC, Oliver, Patterson Park, Pigtown-Washington Village, and Waverly, which are all close to downtown Baltimore. According to state administrators, in general the program favors mixed neighborhoods and prefers to provide a mix of funding for different types of projects but in cases where the Community Legacy Areas are primarily residential or commercial, this is not always the case. This information is used in regression analysis to assess whether certain types of Community Legacy Areas are more likely to renovate.

Name	Designated	Type	Projects	State Funding	Total Project Cost	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008	FY2009
Belair-Edison	2002	Mixed	2	\$ 303,600	\$ 5,703,600	\$ 203,600						\$ 100,000	
Brooklyn-Curtis Bay	2002	Mixed	6	\$ 602,500	\$ 2,327,100	\$ 250,000		\$ 100,000	\$ 152,500	\$ 100,000			
Cold Spring	2002	Non-Residential	1	\$ 5,000	\$ 5,000	\$ 5,000							
Coppin Heights-Rosemount	2004	Non-Residential	1	\$ 162,500	\$ 940,500			\$ 162,500					
Edmonson Village	2009	N/A	0	\$ -	\$ -								
Ednor Gardens	2002	N/A	0	\$ -	\$ -								
Fallstaff-Glen Hills	2002	Residential	4	\$ 400,000	\$ 927,875	\$ 100,000		\$ 150,000		\$ 75,000	\$ 75,000		
Fells Point	2008	Mixed	2	\$ 100,000	\$ 128,196							\$ 15,000	\$ 85,000
Garwyn Oaks	2002	N/A	0	\$ -	\$ -								
Greektown	2003	N/A	0	\$ -	\$ -								
HEBCAC	2008	Mixed	4	\$ 410,000	\$ 12,815,000							\$ 125,000	\$ 285,000
Midtown-Calvert Street Corridor	2002	Residential	11	\$ 1,575,612	\$ 30,919,040	\$ 375,000		\$ 225,000			\$ 490,612	\$ 250,000	\$ 235,000
Northeast Baltimore	2004	Residential	2	\$ 130,750	\$ 496,750			\$ 30,750	\$ 100,000				
Northwood	2009	N/A	0	\$ -	\$ -								
Oliver	2004	Mixed	10	\$ 1,619,271	\$ 11,292,516			\$ 165,000	\$ 379,271	\$ 150,000	\$ 405,000	\$ 250,000	\$ 270,000
Park Heights	2006	Non-Residential	1	\$ 125,000	\$ 2,144,007						\$ 125,000		
Patterson Park	2002	Mixed	11	\$ 1,140,000	\$ 5,836,281	\$ 295,000	\$ 300,000	\$ 75,000	\$ 100,000	\$ 200,000	\$ 70,000	\$ 100,000	
Pigtown-Washington Village	2004	Mixed	9	\$ 1,382,004	\$ 7,107,756			\$ 556,250	\$ 205,500	\$ 100,000	\$ 270,254		\$ 250,000
Poppleton-Hollins Market	2006	Residential	3	\$ 445,000	\$ 45,550,000					\$ 265,000	\$ 180,000		
Reservoir Hill	2002	Residential	3	\$ 665,000	\$ 1,647,500	\$ 350,000			\$ 215,000	\$ 100,000			
Sandtown-Winchester	2006	N/A	0	\$ -	\$ -								
Sharp-Leadenhall	2006	Non-Residential	1	\$ 35,000	\$ 37,500					\$ 35,000			
Southwest Baltimore	2002	Residential	6	\$ 517,609	\$ 1,004,149	\$ 95,000		\$ 105,000	\$ 97,609	\$ 50,000	\$ 70,000	\$ 100,000	
Waverly Main Street	2002	Mixed	3	\$ 359,000	\$ 569,000			\$ 205,000			\$ 100,000	\$ 54,000	
Westport Waterfront	2009	N/A	0	\$ -	\$ -								
Woodberry	2002	Non-Residential	1	\$ 1,500	\$ 1,500	\$ 1,500							
York Road Corridor North	2003	Non-Residential	3	\$ 1,350,000	\$ 14,096,197		\$ 1,200,000				\$ 150,000		
Not Location Specific	-	-	9	\$ 1,663,750	\$ 2,464,740	\$ 375,000		\$ 735,000		\$ 153,750		\$ 200,000	\$ 200,000
Total			93	\$ 12,993,096	\$ 146,014,207	\$ 2,050,100	\$ 1,500,000	\$ 2,509,500	\$ 1,249,880	\$ 1,228,750	\$ 1,935,866	\$ 1,194,000	\$ 1,325,000

Table 17: Funding by Community Legacy Area FY2002-FY2009 (Sources of Data: Maryland Department of Housing and Community Development).

Baltimore City Community Legacy Areas

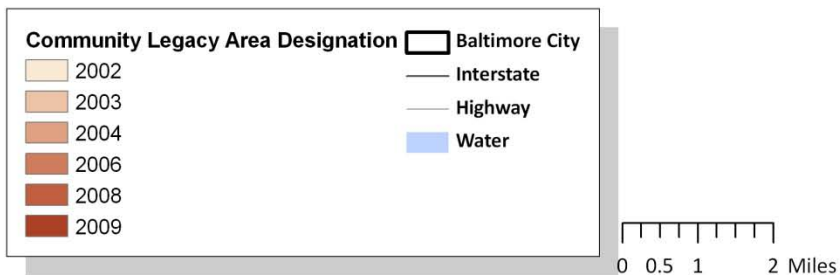
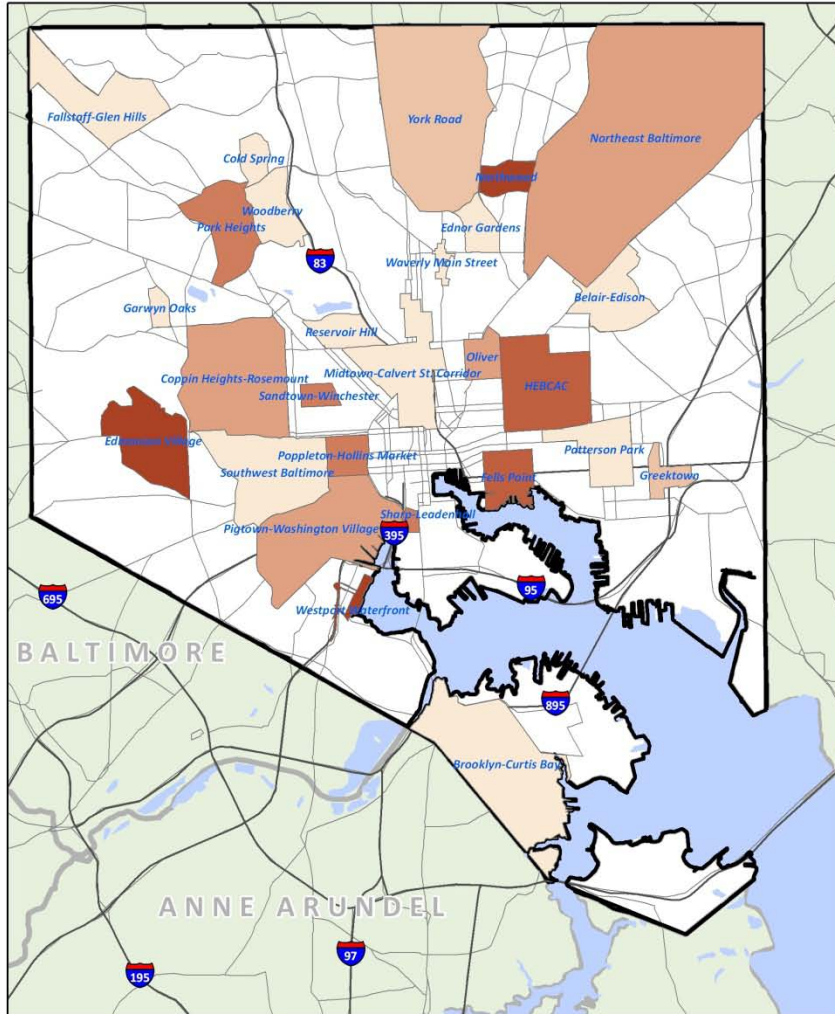


Figure 32: Community Legacy Area Designation Dates. (Sources of Data: U.S. Census; Maryland Department of Housing and Community Development).

Baltimore City Community Legacy Areas

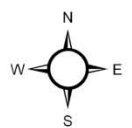
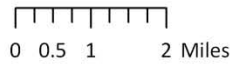
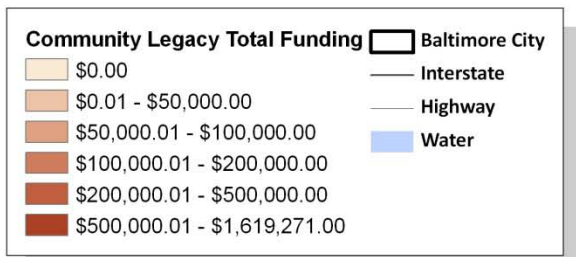
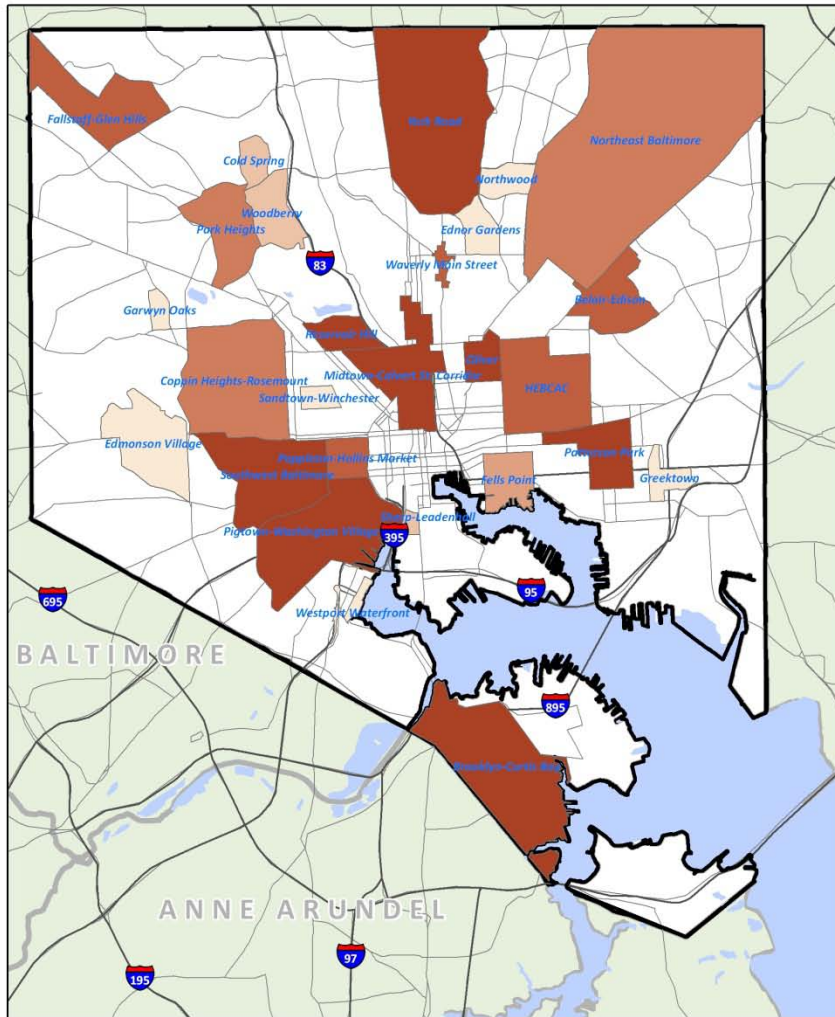


Figure 33: Community Legacy Area State Funding FY2002-FY2009. (Sources of Data: U.S. Census; Maryland Department of Housing and Community Development).

Baltimore City Community Legacy Areas

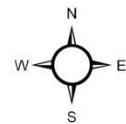
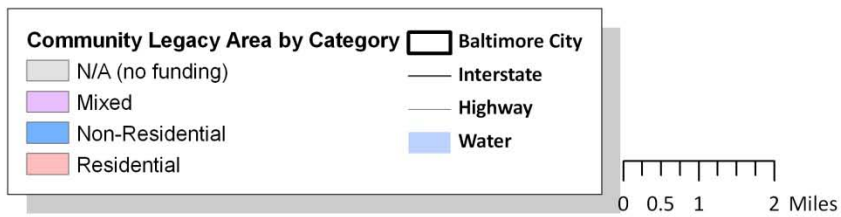
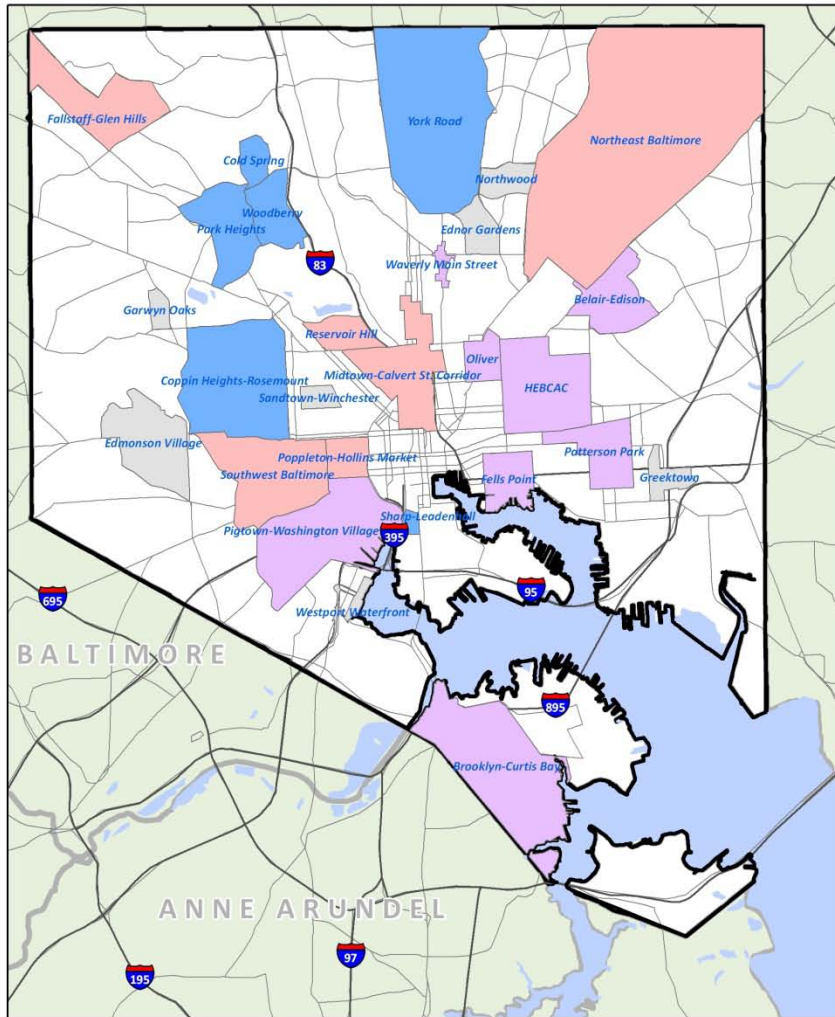


Figure 34: Community Legacy Area Categorization. (Sources of Data: U.S. Census; Maryland Department of Housing and Community Development).

Impact of Community Legacy Areas on Renovation Activity

Economic theory suggests that renovation will occur when the returns to renovation in explicit and implicit rent equal or exceed the cost of renovation. State incentives decrease the costs of renovation, which should result in higher levels of renovation in targeted revitalization areas. If policy areas are effective in influencing renovation, location within a spatial policy area will have a significant, positive effect on renovation. I explain this theory more extensively later in this section.

To determine whether Community Legacy Areas have impacted renovation decisions in Baltimore City, I estimate a probit and tobit model. Following Helms (2003), the dependent variable indicates whether a parcel obtained an alteration or renovation permit over the study period.

Data

The data for this study come from a variety of sources (see Table 18). The dependent variable, *permit*, was derived from the Baltimore Metropolitan Council's Building Permit Data System. Since 2004, the Baltimore Metropolitan Council has maintained a consistent database of alteration, renovation and repair permits including addresses and amount of permit. For the purposes of this analysis, I consider only permits for improvements greater than \$10,000 in value. Though not reported in this essay, I also explored using a \$20,000 threshold but the results using a \$10,000 threshold were more robust. From examining the incomplete description of permits in the database, this threshold seemed to be consistent with a substantial renovation for a residential parcel. Thus, I define "renovation" as having received a permit for an addition, alteration or

repair in the period between 2004 and 2008. I considered using demolition permits instead of addition, alteration and repair permits, but the coding in the dataset did not characterize demolitions adequately to allow this. Over this period, a total of 14,190 addition, alteration and repair permits were issued in Baltimore City for 10,146 properties. After dropping properties with incomplete data, my dataset includes 8,122 renovated properties. A map of these properties is presented in Figure 35.

	Variable	Source	Year
<i>Dependent</i>	Addition, Alteration or Repair Building Permit >\$10,000;	Baltimore Metropolitan Council Building Permit Data System	2004-2008
<i>Structural</i>	Age (in Years)	Maryland PropertyView	2008
	Sold 2004-2008; Sold 2000-2003	Maryland PropertyView	2008
	Square Footage	Maryland PropertyView	2008
	Number of Stories	Maryland PropertyView	2008
<i>Neighborhood</i>	Violent Crime by Block Group	Baltimore City	2004-2007
	Race, Age Group, Vacancy, Distance to Light Rail/Metro	U.S. Census MTA	2000 2007
	Distance to CBD	U.S. Census	1982
<i>Policy Areas</i>	Target Investment Zone	Baltimore City	Obtained 2008
	NRHP Zone	Baltimore City	Obtained 2008
	CHAP Zone	Baltimore City	Obtained 2008
	Heritage Zone	Baltimore City	Obtained 2008
	Healthy Neighborhood	Baltimore City	Obtained 2008
	Community Legacy Area; Amount of Funding	DHCD	2004-2008

Table 18: Community Legacy Area Regression Data and Sources

Characteristics of residential parcels were obtained from the Maryland Department of Planning PropertyView database. Though these data are highly regarded and generally thorough, residential data and particularly single-family data are more complete than for other land uses. For this reason, my sample is limited to improved residential parcels

with value of over \$10,000, including detached single-family homes, townhomes (row homes in Baltimore City), and apartments. Observations for which structural characteristics are missing (including year built and square foot of structure) are omitted from the analysis, yielding 146,396 observations (out of 202,163 residential parcels). Of these, 105,191 were single-family attached parcels (or rowhomes), 33,185 were single-family detached parcels, and 8018 were multifamily parcels. Using Property View, I determined the age of structure, number of stories, square footage, whether the parcel was sold between 2000-2003 or 2004-2008, total assessed value, and the ratio of improvement to land value. Characteristics about the neighborhood demographics were obtained from 2000 U.S. Census at the block group level. These characteristics include the percentage of the census block group that is African American, percent of the population between age 18-30, percent of the population over age 65, and percent of housing units that are vacant. These variables are included as these characteristics are often identified in the literature as drivers of gentrification and renovation. (Helms, 2003) Point level crime data was obtained from the Baltimore City Planning Department for 2004-2007. To characterize the crime rate within the block group, I calculate the average annual number of crimes to persons within the block group from 2004-2007. I omit property crimes in measuring the crime rate within the block group.

To observe the impact of certain amenities (or disamenities) and proximities, I also calculate distances to the CBD and location within a half mile of transit stations including MARC commuter rail stations, heavy rail, and light rail. I expect that proximity to the CBD and transit stations will stimulate renovation. These features are presented in Figure 36.

I also determine a parcel's location with respect to certain policy areas, obtained from Baltimore City and the Maryland Department of Housing and Community Development. Policy areas including targeted investment areas, national historic districts, locally designated historic districts, heritage areas, and healthy neighborhoods. For the purposes of analysis and to focus explicitly on the Community Legacy Program, I code these policy areas as "Other Policy Areas." Descriptions and incentives associated with these policy areas are reported in Table 19 and a map of policy areas is presented in Figure 37. The primary variable of interests relate to location within a Community Legacy Area, total state spending under the Community Legacy Program, total spending per parcel, total spending per permit, fixed effects by Community Legacy Area, and the type of Community Legacy Area.

Expected Impacts

A rent function can be used to describe a landowner's decision to renovate. Rents are a function of the interaction between structural characteristics (S) and neighborhood attributes (N) and capital cost to renovate (k). In the formula below, (R_1) illustrates the rent with capital investment (renovation) (k_1) and (R_0) illustrates rent without capital investment (renovation.)

A landowner will decide to redevelop when the present discounted value of rent after capital investment(k_1) exceeds the present discounted value of rent before capital investment(k_0). The discount function is represented by $e^{-t\theta}$.

In the equation below, p specifies the rate of the subsidy paid for parcels inside the Community Legacy area. By paying a portion of renovation expenditures, the total costs

of capital investment are offset. Because the structural and neighborhood attributes are considered constant throughout the time period, (k) impacts (R) by interacting with structural characteristics (S) and neighborhood attributes (N) of the parcel. This interaction of capital investment with neighborhood and structural characteristics determines whether the marginal benefit of renovation offsets the marginal cost of renovation.

$$\int_0^{\infty} R_1(S_i N_i k_1) e^{-ti\theta} - R_0(S_i N_i k_0) e^{-ti\theta} > (k_1 - k_0)(1 - p)$$

While it is likely that the provision of the capital subsidy through these policies might also influence the timing and intensity of investment, I do not consider these issues under this model or in this analysis. (Capozza & Li, 1994; Titman, 1985)

I expect that older homes are more likely to be renovated as buildings deteriorate over time. Thus, I expect age to have a positive impact on renovation. Square footage and stories convey information about capital intensity of the structures. Because the return for renovating larger, taller buildings is likely larger than smaller, one-story buildings, it is likely square foot and stories both have a positive impact on renovation. Though the impact of assessed value is difficult to disentangle, because of the prevalence of dilapidated housing Baltimore and the renovation costs to fully renovate these structures, I expect that total assessed value will have a positive impact on renovation. However, because the cost to renovate may also be higher with larger structures, the expected impact is somewhat ambiguous. It is expected that parcels that sold immediately before the study period (2000-2003) and during (2004-2008) are more likely to renovate than those that did not sell at all during either period. This is because renovation is usually

related to sales, whether this means buying with the intention to renovate (sale between 2000-2003) or renovating a property to sell (sale between 2004-2008.) Parcels with a higher improvement to land ratio should be less likely to renovate because the capital intensity relative to land is already high. On parcels with a lower improvement to land ratio, the land is worth more relative to the structure, so these are parcels are expected to be more likely to renovate.

I expect that the violent crime rate will have a negative impact on renovation activity because high crime rates make neighborhoods unattractive to potential homeowners and renters. Vacancy rate is expected to have a positive impact on renovation because unoccupied buildings tend to be in worse condition and easier to acquire to renovate than occupied buildings. As Helms (2003) notes, it is difficult to predict the impact of demographic variables on renovation. But in Baltimore, the perceived association of white neighborhoods with revitalization and black neighborhoods with decline means that the percentage black is expected to have a negative impact on renovation. Previous studies have shown that the percentage of young people has a positive impact on renovation while the percentage of over 65 people is expected to have a negative impact. Proximity to the central business district is expected to have a positive impact on renovation because of the amenities provided by downtown and proximity to workplaces. Proximity to light rail and metro captures the amenity value of accessibility to public transportation and is expected to have a positive impact on renovation. I considered using proximity to the Inner Harbor, interstates, and open space as additional proximity variables, but these characteristics were highly correlated with distance to the central business district in Baltimore.

Finally, because these policy areas provide incentives for renovation and economic development, which offsets the capital cost of renovation, I expect that the policy areas will have a positive impact on renovation. Additionally, the indirect impact of designation and the contagion effect of other parcels renovating through subsidies might have a positive impact on renovation activity. I have excluded additional policy areas that are more focused on commercial and industrial economic development rather than residential redevelopment. A description of all policy areas included is provided in Table 19 and Figure 37.

Area	Description
Community Legacy Areas	State program operated by Department of Housing and Community Development in existence since 2001. Provides local governments and community development organizations with funding for projects aimed at strengthening communities. Types of activities include: business retention and attraction, encouraging homeownership and commercial revitalization. Designated between 2001-2009.
National Historic District	National Register of Historic Places (NHRP) designated historical districts. Eligible for federal tax credits (20 percent) for rehabilitating housing and businesses. Program began in 1976.
Local Historic District	Baltimore City Commission for Historical and Architectural Preservation (CHAP) historical districts. Property tax benefits for restoration and rehabilitation for ten years for homeowners and business.
Heritage Area	Heritage Areas as designated by Baltimore City Commission for Historical and Architectural Preservation in 2001 as part of Maryland Heritage Areas program, operated by Maryland Heritage Areas Authority. Eligible for grants and loans, and tax incentives for rehabilitating buildings for tourism use.
Targeted Investment Area	Areas within Heritage Areas designated as priority areas into which Baltimore Heritage Area Association and partners seek to attract private investment.
Healthy Neighborhood	Grants, loans and other programs used to maintain home values and improve properties in strong but undervalued neighborhoods. Program offers below-market loans for home purchase and renovation. Program operated by nonprofit organization called Healthy Neighborhoods, Inc.

Table 19: Policy Areas in Baltimore City

Baltimore City Community Legacy Areas & Renovated Parcels

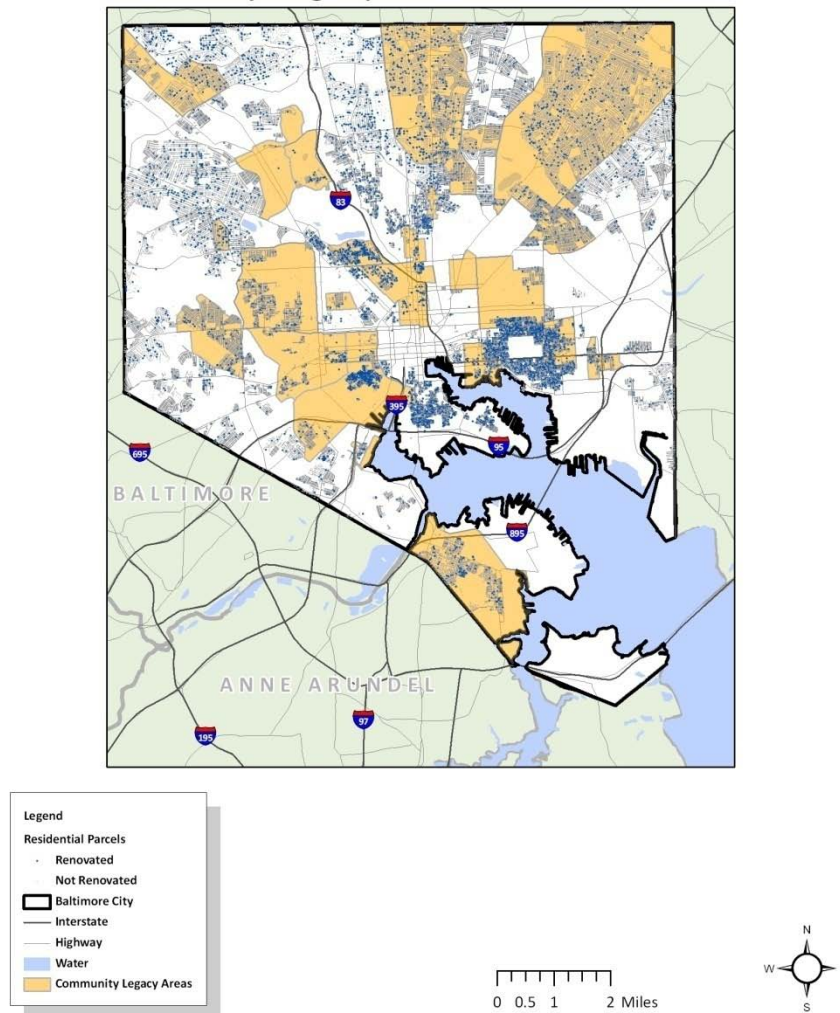


Figure 35: Residential Properties in Baltimore City. Sources of Data: Maryland Property View; Baltimore Metropolitan Council; Maryland Department of Housing and Community Development; U.S. Census.

Baltimore City Neighborhood Amenities

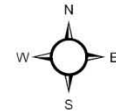
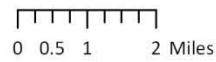
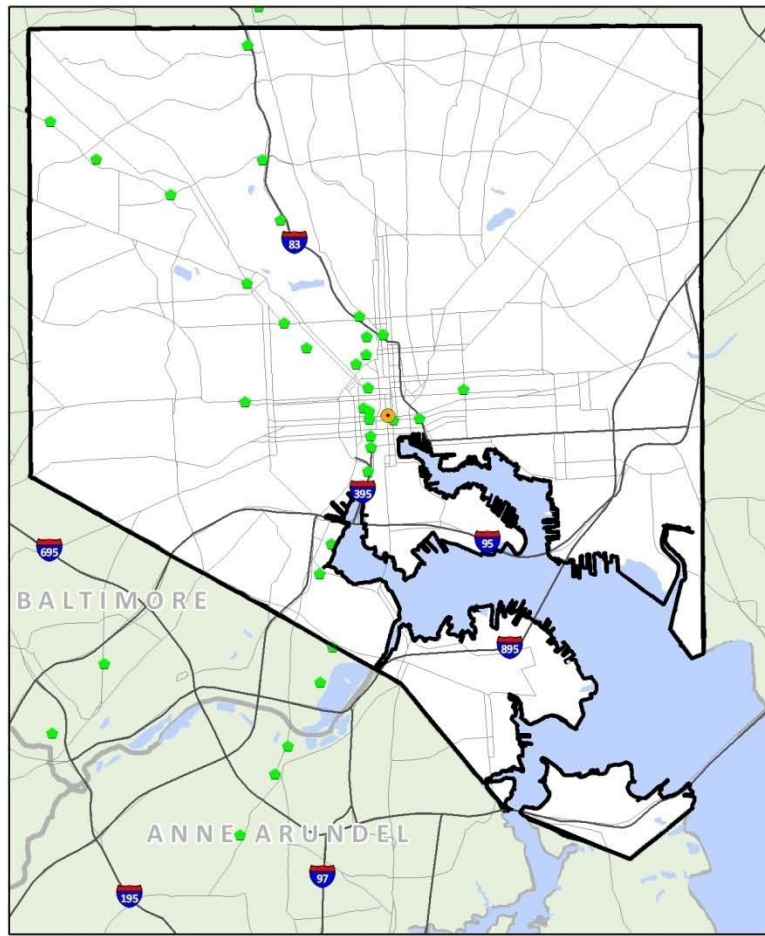


Figure 36: Neighborhood Amenities. Sources of Data: Maryland Property View; Baltimore Metropolitan Council; Maryland Department of Housing and Community Development; U.S. Census.

Baltimore City Policy Areas

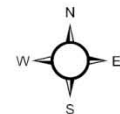
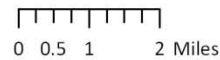
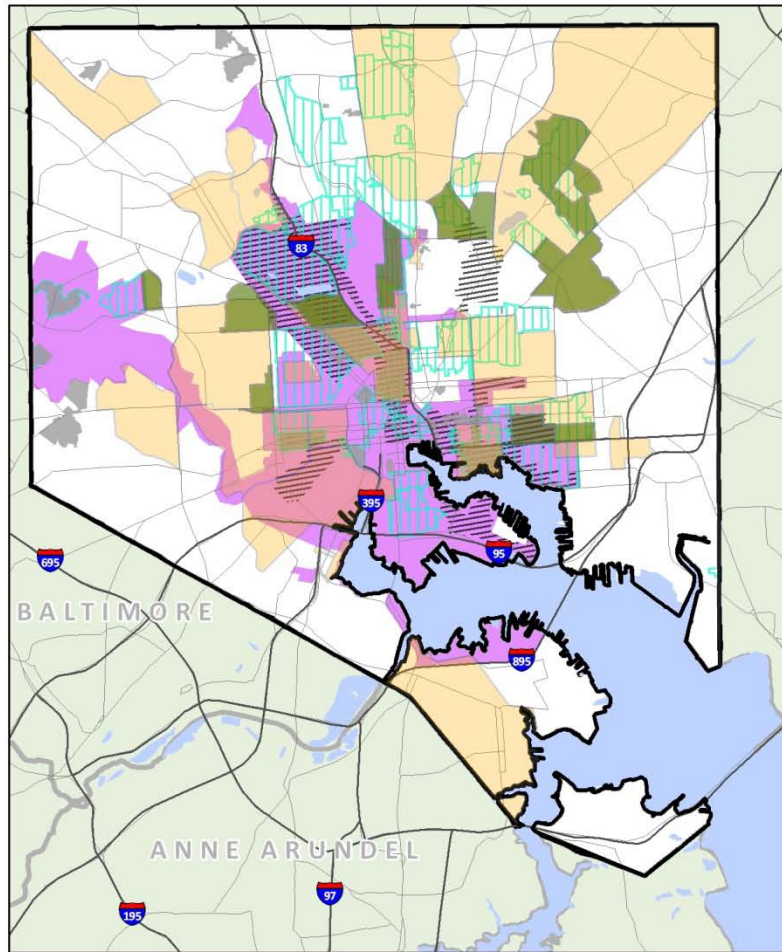


Figure 37: Policy Areas. Sources of Data: Maryland Property View; Baltimore Metropolitan Council; Maryland Department of Housing and Community Development; U.S. Census; Baltimore City Planning Department.

Descriptive Statistics

	All	Not Renovated		Renovated	Expected Sign
<i>n</i>	146,396	138,274		8,122	
Permit (0/1)	0.055	0.000	<	1.000	
Square feet of structure	1430	1415	<	1691	+
Age of structure (in 2004)	77.338	76.471	<	92.095	+
Number of stories	2.042	2.033	<	2.185	?
Total assessed value of property (\$)	\$170,179	\$ 166,883	<	\$226,279	+
Property sold 2000-2003 (0/1)	0.172	0.171	<	0.190	+
Property sold 2004-2008 (0/1)	0.272	0.253	<	0.601	+
Assessed improved value/assessed land value	2.954	2.978	>	2.533	-
Average count of crimes	15.200	15.101	<	16.890	-
Black (%)	0.540	0.547	>	0.434	-
Under 30 (%)	0.161	0.160	<	0.178	+
Over 65 (%)	0.138	0.138	>	0.131	-
Vacant (%)	0.113	0.111	<	0.147	+
Distance to cbd (miles)	1.085	1.099	>	0.854	-
Within 1/2 mile of transit (0/1)	0.129	0.127	<	0.161	+
In other policy area (0/1)	0.396	0.381	<	0.646	+
In Community Legacy area (0/1)	0.418	0.414	<	0.493	+
Community Legacy Funding (\$)	\$251,546	\$ 242,713	<	\$401,924	+
Community Legacy Area - Residential	0.151	0.152	>	0.143	+
Community Legacy Area - Non-Residential	0.098	0.099	>	0.074	?
Community Legacy Area - Mixed	0.169	0.162	<	0.276	+
Community Legacy Area - N/A	0.064	0.066	>	0.029	?
Community Legacy Funding per parcel	\$ 48	\$ 46	<	\$ 89	+
Community Legacy Funding per permit	\$ 756	\$ 747	<	\$ 914	+

Table 20: Descriptive Statistics

Summary statistics are reported for the full sample, renovated parcels and non-renovated parcels in Table 20. A difference in means t-test was conducted between renovated and non-renovated parcels, indicating that across categories, with the exception of the residential classification of Community Legacy Areas (shaded in gray), each variable is statistically different between the two samples at the 99 percent confidence level.

Comparing sample means show that, on average, renovated parcels are older, taller, larger, and have a higher total assessed value but a lower improved value to land value ratio. More renovated parcels sold between 2004-2008, and 2000-2003. It is striking that 60 percent of the parcels receiving permits sold between 2004-2008 versus just 25 percent of those that did not receive permits. On average, block groups for renovated parcels contain a lower percent of African Americans, but a higher percent of vacant units and a higher percent of young persons in 2000. The average annual count of crimes by block group is higher for areas with renovated parcels, on average. Renovated parcels are closer to the CBD and a higher percentage of renovated parcels are located within a half mile of transit stations. A higher percentage of renovated parcels are located within Other Policy Areas and Community Legacy Areas, and in areas with a higher level of state investment. A higher percentage of renovated parcels are located within mixed Community Legacy Areas, but a lower percentage are located within residential, non-residential, and areas that received no funding. The per-parcel and per-permit Community Legacy funding by the state is higher for renovated parcels. These descriptive statistics are generally consistent with expectations.

Model and Results

As stated above, economic theory suggests that renovation will occur when the present value of returns to renovation in explicit and implicit rent equal or exceed the cost of renovation. State incentives decrease the costs of renovation, which should result in higher levels of renovation in targeted revitalization areas and may also increase returns to renovation. If policy areas are effective in influencing renovation, location within a spatial policy area will have a significant, positive effect on renovation.

To determine whether the Community Legacy Areas have impacted renovation decisions in Baltimore City, I estimate a probit and tobit model. Probit models are used for binary variables and tobit models are used for truncated data, in this case occurring because only a subset of the sample underwent renovation during the period. Additionally, expenditures on renovation are non-negative. Like Helms (2003), in the probit model, my dependent variable is binary and indicates whether a parcel obtained an alteration or renovation permit for greater than \$10,000 over the study period (2004-2008). In the tobit model, my dependent variable is the dollar amount of the renovation for the parcel. In both models, I control for the impact of demographic characteristics at the census block group level, building characteristics, proximity to amenities and disamenities, and other policy areas.

Renovation is assumed to be a function of structural attributes (S), neighborhood characteristics and amenities (N), and policy areas (P). The probit and tobit models are estimated separately. In the probit model, the dependent variable tells whether the parcel underwent renovation. This model does not consider the level of expenditures by parcel:

$$\Pr(Y = 1 | S, N, P) = \Phi(\beta_0 + \beta_1 S_i + \beta_2 N_i + \beta_3 P_i + \varepsilon_i)$$

A dummy variable a reflects the presence of absence of renovation of the building:

$$a_i = \begin{cases} 1 & \text{if } \beta_0 + \beta_1 S_i + \beta_2 N_i + \beta_3 P_i + \varepsilon_i > 0 \\ 0 & \text{otherwise} \end{cases}$$

The tobit model accounts for the truncation in the dataset resulting because some properties received renovation permits, meaning expenditures for renovation were greater than zero while those not receiving permits had zero renovation expenditures. In this case, the dependent variable will be the level of expenditures used in renovation, as

reported in building permit dataset.

$$y_i^* = \beta_0 + \beta_1 S_i + \beta_2 N_i + \beta_3 P_i + \varepsilon_i,$$

$$y_i = 0 \text{ if } y_i^* \leq 0$$

$$y_i = y_i^* \text{ if } y_i^* > 0$$

The results of the probit and tobit models are presented in Tables 21-26. In the probit tables, untransformed coefficients, marginal effects, and p-values are reported for seven models. Marginal effects indicate the effect of a one-unit increase from the mean, holding all else constant. In the tobit results I provide untransformed coefficients, p-values, and three types of marginal effects. Following Helms (2003) and McDonald and Moffitt (1980), I report: (1) the change in the unconditional expected value of the “latent” dependent variable (specified above as y_i^* -- or the optimal renovation expenditure); (2) the change in the expected value of the dependent variable, conditional on the observation being uncensored (meaning the change in expected renovation expenditure only for parcels that received permits); and (3) the change in the probability that the observation will be uncensored (that it received a permit.) The third marginal effects measure can be interpreted like the probit. Marginal effects for the tobit model are interpreted as a one unit change in the independent variable on the dependent variable, which is the number of dollars expended on renovation.

I estimate seven models. The first model does not include policy variables. The second model includes policy variables as dummy variables. I only include the 21 areas that received state funding. The third model includes a Community Legacy variable measured in dollars of state investment within the Community Legacy Area, for areas

that received funding. The fourth model includes a Community Legacy variable measured in dollars of state investment per residential parcel within the Community Legacy Area, for areas that received funding. The fifth model uses dummy variables to control for effects of individual Community Legacy areas. However, Oliver was omitted because no parcels renovated, meaning that the dummy variable predicted 100 percent of the observations. Finally, the sixth model includes dummy variables to indicate the Community Legacy area characterization (residential, non-residential, mixed, or not applicable.) In this model, I include areas that did not receive funding and code these areas as “not applicable.” The seventh model considers the dollars of state investment per residential permit within the Community Legacy Area, for areas that received funding.

		Model 1			Model 2			Model 3		
		<i>Structural/Neighborhood Variables</i>			<i>Structural/Neighborhood Variables with All Policy Areas as dummy variables</i>			<i>Structural/Neighborhood Variables with Other Policy Areas as dummy variables and Community Legacy as Value of Award</i>		
Variable		Coefficient	Parameter Estimate Marginal Effects	P-Value	Coefficient	Parameter Estimate Marginal Effects	P-Value	Coefficient	Parameter Estimate Marginal Effects	P-Value
Structural	Square Foot of Structure	0.0002	0.0000	<.000	0.0002	0.0000	<.000	0.0002	0.0000	<.000
	Age (in Years)	0.0064	0.0005	<.000	0.0062	0.0005	<.000	0.0062	0.0005	<.000
	Number of Stories	-0.0632	-0.0051	0.001	-0.0655	-0.0053	<.000	-0.0625	-0.0050	0.001
	Total Assessed Value (in \$10,000)	0.0068	0.0005	<.000	0.0064	0.0005	<.000	0.0057	0.0005	<.000
	Property Sold 2000-2003	-0.0634	-0.0049	<.000	-0.0650	-0.0050	<.000	-0.0640	-0.0049	<.000
	Property Sold 2004-2008	0.6605	0.0709	<.000	0.6599	0.0706	<.000	0.6590	0.0702	<.000
	Improved/Land Assessed Value	-0.0850	-0.0068	<.000	-0.0844	-0.0068	<.000	-0.0835	-0.0067	<.000
Neighborhood	Average Count of Crimes	0.0017	0.0001	0.001	0.0012	0.0001	0.29	0.0002	0.0000	0.718
	Percent Black	-0.0614	-0.0049	0.003	-0.0370	-0.0030	0.85	-0.0417	-0.0033	0.052
	Percent Young (18-29)	-1.0001	-0.0805	<.000	-0.9142	-0.0734	<.000	-0.8588	-0.0687	<.000
	Percent Old (Age 65 and older)	-0.4350	-0.0350	<.000	-0.3515	-0.0282	0.002	-0.3380	-0.0270	0.003
	Percent Vacant	1.2272	0.0988	<.000	1.1508	0.0923	<.000	1.1072	0.0885	<.000
	Distance to CBD (miles)	-0.2574	-0.0207	<.000	-0.2162	-0.0173	<.000	-0.2053	-0.0164	<.000
	Within 1/2 Mile Transit	-0.0847	-0.0065	<.000	-0.0821	-0.0062	<.000	-0.0767	-0.0058	<.000
Policy Areas	Within other Housing Related Policy Area				0.0830	0.0068	<.000	0.0750	0.0061	<.000
	Within Community Legacy Area				0.0655	0.0053	<.000			
	Value of Community Legacy Awards (in \$10,000)							0.0014	0.0001	<.000
	Value of Community Legacy Awards Per Residential Parcel (in \$1,000)									
	Value of Community Legacy Awards Per Residential Permit (in \$1,000)									
	Community Legacy Area - Residential									
	Community Legacy Area - Non-Residential									
	Community Legacy Area - Mixed									
	Community Legacy Area - N/A									
	Constant	-2.0369		<.000	-2.1360		<.000	-2.1418		<.000
		Model 1			Model 2			Model 3		
		N	146396		N	146396		N	146396	
		LR chi(14)	8502.780		LR chi(16)	8560.990		LR chi(16)	8662.820	
		Prob> chi2	0.000		Prob> chi2	0.000		Prob> chi2	0.000	
		Log Likelihood	-27127.723		Log Likelihood	-27098.619		Log Likelihood	-26851.882	
		Pseudo R2	0.136		Pseudo R2	0.136		Pseudo R2	0.138	

Table 21: Probit Model Regression Results (Model 1-3)

		Model 4			Model 6			Model 7		
		<i>Structural/Neighborhood Variables with Other Policy Areas as dummy variables and Community Legacy as Per Parcel Expenditure</i>			<i>Structural/Neighborhood Variables with Other Policy Areas as dummy variables and Community Legacy in Categories</i>			<i>Structural/Neighborhood Variables with Other Policy Areas as dummy variables and Community Legacy as Per Permit Expenditure</i>		
	Variable	Coefficient	Parameter Estimate Marginal Effects	P-Value	Coefficient	Parameter Estimate Marginal Effects	P-Value	Coefficient	Parameter Estimate Marginal Effects	P-Value
Structural	Square Foot of Structure	0.0002	0.0000	<.000	0.0002	0.0000	<.000	0.0002	0.0000	<.000
	Age (in Years)	0.0063	0.0005	<.000	0.0063	0.0005	<.000	0.0063	0.0005	<.000
	Number of Stories	-0.0682	-0.0055	0.001	-0.0572	-0.0046	0.002	-0.0695	-0.0056	<.000
	Total Assessed Value (in \$10,000)	0.0063	0.0005	<.000	0.0065	0.0005	<.000	0.0063	0.0005	<.000
	Property Sold 2000-2003	-0.0635	-0.0049	<.000	-0.0657	-0.0051	<.000	-0.0645	-0.0050	<.000
	Property Sold 2004-2008	0.6596	0.0705	<.000	0.6561	0.0699	<.000	0.6614	0.0708	<.000
Neighborhood	Improved/Land Assessed Value	-0.0839	-0.0067	<.000	-0.0866	-0.0069	<.000	-0.0837	-0.0067	<.000
	Average Count of Crimes	0.0007	0.0001	0.182	-0.0001	0.0000	0.929	0.0015	0.0001	0.005
	Percent Black	-0.0399	-0.0032	0.063	0.0020	0.0002	0.928	-0.0399	-0.0032	0.063
	Percent Young (18-29)	-0.9362	-0.0751	<.000	-0.8756	-0.0701	<.000	-0.9699	-0.0779	<.000
	Percent Old (Age 65 and older)	-0.3576	-0.0287	0.002	-0.2414	-0.0193	0.034	-0.3764	-0.0302	0.001
	Percent Vacant	1.1620	0.0932	<.000	1.0993	0.0880	<.000	1.2049	0.0967	<.000
	Distance to CBD (miles)	-0.2002	-0.0160	<.000	-0.1909	-0.0153	<.000	-0.2094	-0.0168	<.000
	Within 1/2 Mile Transit	-0.0912	-0.0069	<.000	-0.0578	-0.0045	0.002	-0.0863	-0.0065	<.000
	Within other Housing Related Policy Area	0.0822	0.0067	<.000	0.0756	0.0061	<.000	0.0902	0.0074	<.000
	Within Community Legacy Area									
Policy Areas	Value of Community Legacy Awards (in \$10,000)									
	Value of Community Legacy Awards Per Residential Parcel (in \$1,000)	0.3609	0.0289	<.000						
	Value of Community Legacy Awards Per Residential Permit (in \$1,000)							0.0092	0.0007	0.001
	Community Legacy Area - Residential				0.0042	0.0003	0.818			
	Community Legacy Area - Non-Residential				-0.0315	-0.0025	0.158			
	Community Legacy Area - Mixed				0.1513	0.0133	<.000			
	Community Legacy Area - N/A				-0.1088	-0.0080	<.000			
	Constant	-2.1207		<.000	-2.1970		<.000	-2.1203		<.000
		Model 4			Model 6			Model 7		
		N	146396		N	146396		N	146396	
	LR chi(16)	8621.680		LR chi(19)	8614.920		LR chi(16)	8542.640		
	Prob> chi2	0.000		Prob> chi2	0.000		Prob> chi2	0.000		
	Log Likelihood	-27068.273		Log Likelihood	-27058.154		Log Likelihood	-27107.794		
	Pseudo R2	0.137		Pseudo R2	0.138		Pseudo R2	0.136		

Table 22: Probit Model Regression Results (Model 4, 6, 7)

		Model 5		
		<i>Structural/Neighborhood Variables with Community Legacy as Dummy Variables</i>		
	Variable	Coefficient	Parameter Estimate Marginal Effects	P-Value
Structural	Square Foot of Structure	0.0002	0.0000	<.000
	Age (in Years)	0.0059	0.0005	<.000
	Number of Stories	-0.0471	-0.0037	0.013
	Total Assessed Value (in \$10,000)	0.0048	0.0004	<.000
	Property Sold 2000-2003	-0.0629	-0.0048	<.000
	Property Sold 2004-2008	0.6555	0.0692	<.000
	Improved/Land Assessed Value	-0.0880	-0.0070	<.000
Neighborhood	Average Count of Crimes	0.0002	0.0000	0.716
	Percent Black	-0.0485	-0.0038	0.047
	Percent Young (18-29)	-0.7650	-0.0606	<.000
	Percent Old (Age 65 and older)	-0.4506	-0.0357	<.000
	Percent Vacant	0.9074	0.0719	<.000
	Distance to CBD (miles)	-0.0982	-0.0078	<.000
	Within 1/2 Mile Transit	-0.0992	-0.0074	<.000
Within other Housing Related Policy Area	0.1060	0.0086	<.000	
Policy Areas	Bel Air - Edison	-0.1854	-0.0126	<.000
	Brooklyn-Curtis Bay	-0.0661	-0.0050	0.129
	Cold Spring	-0.2972	-0.0180	0.55
	Coppin Heights-Rosemount	-0.1130	-0.0081	0.006
	Fallstaff-Glen Hills	0.0785	0.0067	0.157
	Fells Point	0.0377	0.0031	0.352
	HEBCAC	0.3445	0.0366	<.000
	Midtown-Calvert Street Corridor	0.1932	0.0181	<.000
	Northeast Baltimore	-0.1401	-0.0100	<.000
	Park Heights	-0.1718	-0.0117	0.5
	Patterson Park	0.3231	0.0333	<.000
	Pigtown-Washington Village	0.2791	0.0280	<.000
	Poppleton-Hollins Market	-0.1619	-0.0111	0.098
	Reservoir Hill	0.3809	0.0419	<.000
	Sharp-Leadenhall	0.5710	0.0737	<.000
	Southwest Baltimore	-0.0771	-0.0057	0.13
	Waverly Main Street	0.0564	0.0047	0.85
	Woodberry	0.0847	0.0072	0.417
	York Road Corridor North	-0.0050	-0.0004	0.858
	Constant	-2.2037		<.000
		Model 5		
		N	146393	
		LR chi(14)	8981.640	
		Prob> chi2	0.000	
		Log Likelihood	-2688.124	
		Pseudo R2	0.143	

Table 23: Probit Model Regression Results (Model 5)

		Model 1					Model 2					Model 3				
		Structural/Neighborhood Variables					Structural/Neighborhood Variables with All Policy Areas as dummy variables					Structural/Neighborhood Variables with Other Policy Areas as dummy variables and Community Legacy as Value of Award				
		Marginal Effects					Marginal Effects					Marginal Effects				
Variable	Coeff.	Δ Unconditional Expected Value of "Latent" Dep. Var.	Δ in Expected Value of Dep. Var. Conditional that Obs. Uncensored	Δ Probability that Obs. Will be Uncensored	P-Val.	Coeff.	Δ Unconditional Expected Value of "Latent" Dep. Var.	Δ in Expected Value of Dep. Var. Conditional that Obs. Uncensored	Δ Probability that Obs. Will be Uncensored	P-Val.	Coeff.	Δ Unconditional Expected Value of "Latent" Dep. Var.	Δ in Expected Value of Dep. Var. Conditional that Obs. Uncensored	Δ Probability that Obs. Will be Uncensored	P-Val.	
Structural	Square Foot of Structure	12.02	0.37	1.47	0.00001	<.000	11.84	0.36	1.44	0.00001	<.000	11.87	0.36	1.45	0.00001	<.000
	Age (in Years)	426.04	13.03	52.06	0.00038	<.000	408.45	12.42	49.84	0.00037	<.000	407.79	12.35	49.72	0.00037	<.000
	Number of Stories	-3003.99	-91.90	-367.09	-0.00271	0.035	-3327.36	-101.16	-406.01	-0.00299	0.019	-3091.60	-93.65	-376.92	-0.00277	0.03
	Total Assessed Value (in \$10,000)	611.00	18.69	74.66	0.00055	<.000	573.75	17.44	70.01	0.00052	<.000	529.98	16.05	64.61	0.00048	<.000
	Property Sold 2000-2003	-4288.17	-125.91	-518.98	-0.00374	<.000	-4425.16	-128.95	-534.62	-0.00384	<.000	-4353.41	-126.47	-525.58	-0.00377	<.000
	Property Sold 2004-2008	43770.78	1874.68	5762.09	0.05137	<.000	43715.95	1861.12	5746.06	0.05109	<.000	43610.85	1848.79	5726.20	0.05080	<.000
Neighborhood	Improved/Land Assessed Value	-5820.32	-178.06	-711.24	-0.00526	<.000	-5763.65	-175.23	-703.29	-0.00518	<.000	-5728.35	-173.51	-698.38	-0.00513	<.000
	Average Count of Crimes	77.44	2.37	9.46	0.00007	0.065	42.68	1.30	5.21	0.00004	0.32	-19.14	-0.58	-2.33	-0.00002	0.66
	Percent Black	-7076.96	-216.50	-864.80	-0.00639	<.000	-4850.53	-147.47	-591.87	-0.00436	0.005	-5187.07	-157.12	-632.39	-0.00465	0.002
	Percent Young (18-29)	-76289.69	-2333.88	-9322.58	-0.06888	<.000	-70020.33	-2128.80	-8544.03	-0.06293	<.000	-66604.35	-2017.47	-8120.19	-0.05969	<.000
	Percent Old (Age 65 and older)	-36002.26	-1101.39	-4399.47	-0.03251	<.000	-29584.79	-899.45	-3610.00	-0.02659	0.001	-28928.27	-876.25	-3526.84	-0.02593	0.001
	Percent Vacant	91632.09	2803.24	11197.42	0.08273	<.000	86541.53	2631.09	10559.98	0.07778	<.000	83928.19	2542.22	10232.26	0.07522	<.000
	Distance to CBD (miles)	-15780.87	-482.77	-1928.42	-0.01425	<.000	-11484.22	-349.15	-1401.33	-0.01032	<.000	-10831.37	-328.09	-1320.53	-0.00971	<.000
	Within 1/2 Mile Transit	-3081.51	-91.16	-373.61	-0.00271	0.03	-2971.37	-87.46	-359.83	-0.00260	0.037	-2643.57	-77.80	-320.13	-0.00231	0.064
	Within other Housing Related Policy Area						8131.02	253.95	998.15	0.00747	<.000	7576.10	235.29	928.84	0.00693	<.000
	Within Community Legacy Area						4094.57	125.79	500.81	0.00371	<.000					
Policy Areas	Value of Community Legacy Awards (in \$10,000)										87.68		10.69	0.00008	<.000	
	Constant	-154671.10				<.000	-163617.00				<.000	-163775.10			<.000	
		Model 1					Model 2					Model 3				
		N	146396				N	146396				N	146396			
		LR chi(14)	6907.09	Left	139347		LR chi(16)	6968.48	Left	139347		LR chi(16)	7031.42	Left	139347	
		Prob> chi2	0.000	Uncensored	7049		Prob> chi2	0.000	Uncensored	7049		Prob> chi2	0.000	Uncensored	7049	
		Log Likelihood	-104774.780	Right	0		Log Likelihood	-104744.090	Right	0		Log Likelihood	-104712.620	Right	0	
		Pseudo R2	0.032				Pseudo R2	0.032				Pseudo R2	0.033			

Table 24: Tobit Model Regression Results (Models 1-3)

		Model 4					Model 6					Model 7				
		Structural/Neighborhood Variables with Other Policy Areas as dummy variables and Community Legacy as Per Parcel Expenditure					Structural/Neighborhood Variables with Other Policy Areas as dummy variables and Community Legacy in Categories					Structural/Neighborhood Variables with Other Policy Areas as dummy variables and Community Legacy as Per Permit Expenditure				
		Marginal Effects					Marginal Effects					Marginal Effects				
Variable	Coeff.	Δ Unconditional Expected Value of "Latent" Dep. Var.	Δ in Expected Value of Dep. Var. Conditional that Obs. Uncensored	Δ Probability that Obs. Will be Uncensored	P-Val.	Coeff.	Δ Unconditional Expected Value of "Latent" Dep. Var.	Δ in Expected Value of Dep. Var. Conditional that Obs. Uncensored	Δ Probability that Obs. Will be Uncensored	P-Val.	Coeff.	Δ Unconditional Expected Value of "Latent" Dep. Var.	Δ in Expected Value of Dep. Var. Conditional that Obs. Uncensored	Δ Probability that Obs. Will be Uncensored	P-Val.	
Structural	Square Foot of Structure	11.60	0.35	1.41	0.00001	<.000	12.29	0.37	1.50	0.00001	<.000	11.90	0.36	1.45	0.00001	<.000
	Age (in Years)	408.14	12.39	49.78	0.00037	<.000	411.42	12.46	50.16	0.00037	<.000	412.45	12.55	50.34	0.00037	<.000
	Number of Stories	-3477.47	-105.56	-424.17	-0.00312	0.015	-2735.11	-82.83	-333.44	-0.00245	0.056	-3579.57	-108.90	-436.85	-0.00322	0.012
	Total Assessed Value (in \$10,000)	561.47	17.04	68.49	0.00051	<.000	570.14	17.27	69.51	0.00051	<.000	565.23	17.20	68.98	0.00051	<.000
	Property Sold 2000-2003	-4308.14	-125.47	-520.42	-0.00374	<.000	-4495.59	-130.39	-542.54	-0.00389	<.000	-4386.81	-127.96	-530.11	-0.00381	<.000
	Property Sold 2004-2008	43624.17	1853.77	5731.36	0.05096	<.000	43429.59	1837.93	5700.23	0.05053	<.000	43817.08	1868.19	5761.34	0.05127	<.000
	Improved/Land Assessed Value	-5732.65	-174.01	-699.25	-0.00515	<.000	-5823.43	-176.36	-709.94	-0.00522	<.000	-5729.80	-174.32	-699.27	-0.00515	<.000
Neighborhood	Average Count of Crimes	3.20	0.10	0.39	0.00000	0.94	-32.64	-0.99	-3.98	-0.00003	0.465	60.59	1.84	7.40	0.00005	0.154
	Percent Black	-5084.72	-154.35	-620.22	-0.00457	0.003	-2485.00	-75.26	-302.95	-0.00223	0.16	-5000.32	-152.12	-610.24	-0.00450	0.003
	Percent Young (18-29)	-70854.38	-2150.79	-8642.64	-0.06367	<.000	-67591.90	-2046.95	-8240.18	-0.06057	<.000	-73394.59	-2232.88	-8957.17	-0.06600	<.000
	Percent Old (Age 65 and older)	-29719.06	-902.12	-3625.06	-0.02670	0.001	-22874.45	-692.73	-2788.64	-0.02050	0.011	-31112.73	-946.54	-3797.04	-0.02798	0.001
	Percent Vacant	86738.95	2632.96	10580.20	0.07794	<.000	83626.99	2532.56	10195.03	0.07494	<.000	89849.41	2733.49	10965.33	0.08080	<.000
	Distance to CBD (miles)	-10447.85	-317.14	-1274.40	-0.00939	<.000	-9756.01	-295.45	-1189.36	-0.00874	<.000	-11090.59	-337.41	-1353.51	-0.00997	<.000
	Within 1/2 Mile Transit	-3597.90	-105.01	-434.85	-0.00313	0.012	-1536.79	-45.76	-186.62	-0.00136	0.293	-3222.75	-94.66	-390.09	-0.00281	0.023
Policy Areas	Within other Housing Related Policy Area	7957.10	247.99	976.32	0.00730	<.000	7874.63	244.77	965.61	0.00721	<.000	8564.06	268.07	1051.82	0.00788	<.000
	Value of Community Legacy Awards Per Residential Parcel (in \$1,000)	25665.19	779.07	3130.57	0.02310	<.000										
	Funding Per Permit Within Community Legacy (in \$1,000)											637.30	19.39	77.78	0.00057	0.003
	Community Legacy Area - Residential						-575.93	-17.34	-70.11	-0.00051	0.691					
	Community Legacy Area - Non-Residential						-1037.89	-31.05	-126.17	-0.00092	0.553					
	Community Legacy Area - Mixed						9161.87	304.06	1140.90	0.00885	<.000					
Community Legacy Area - N/A						-10143.37	-269.98	-1199.82	-0.00816	<.000						
Constant	-162365.10				0	-167544.00				<.000	-177658.60				<.000	
		Model 4					Model 6					Model 7				
		N	146396				N	146396				N	146396			
		LR chi(16)	7024.41	Left	139347		LR chi(14)	7023.41	Left	139347		LR chi(16)	6959.06	Left	139347	
		Prob> chi2	0.000	Uncensored	7049		Prob> chi2	0.000	Uncensored	7049		Prob> chi2	0.000	Uncensored	7049	
		Log Likelihood	-104716.120	Right	0		Log Likelihood	-104716.620	Right	0		Log Likelihood	-104748.800	Right	0	
		Pseudo R2	0.033				Pseudo R2	0.032				Pseudo R2	0.032			

Table 25: Tobit Model Regression Results (Models 4, 6, 7)

		Model 5				
		<i>Structural/Neighborhood Variables with Community Legacy as Dummy Variables</i>				
		<i>Marginal Effects</i>				
	Variable	Coeff.	Δ Unconditional Expected Value of "Latent" Dep. Var.	Δ in Expected Value of Dep. Var. Conditional that Obs. Uncensored	Δ Probability that Obs. Will be Uncensored	P-Val.
			YS	E	P	
Structural	Square Foot of Structure	12.25	0.37	1.49	0.00001	<.000
	Age (in Years)	374.80	11.18	45.53	0.00033	<.000
	Number of Stories	-2320.33	-69.20	-281.87	-0.00207	0.113
	Total Assessed Value (in \$10,000)	450.27	13.43	54.70	0.00040	<.000
	Property Sold 2000-2003	-4187.29	-119.92	-503.86	-0.00361	<.000
	Property Sold 2004-2008	43074.22	1796.33	5632.51	0.04987	<.000
	Improved/Land Assessed Value	-5873.14	-175.16	-713.45	-0.00523	<.000
Neighborhood	Average Count of Crimes	0.08	0.00	0.01	0.00000	0.999
	Percent Black	-8045.53	-239.95	-977.35	-0.00717	<.000
	Percent Young (18-29)	-57873.86	-1726.06	-7030.36	-0.05157	<.000
	Percent Old (Age 65 and older)	-36656.83	-1093.27	-4452.97	-0.03266	<.000
	Percent Vacant	70400.71	2099.67	8552.08	0.06273	<.000
	Distance to CBD (miles)	-1906.19	-56.85	-231.56	-0.00170	0.337
	Within 1/2 Mile Transit	-5123.14	-144.45	-614.24	-0.00436	0.001
	Within other Housing Related Policy Area	10033.19	309.64	1228.01	0.00919	<.000
	Bel Air - Edison	-13280.58	-331.19	-1547.49	-0.01018	<.000
	Brooklyn-Curtis Bay	-9794.78	-254.80	-1152.64	-0.00778	0.006
Policy Areas	Cold Spring	-24523.45	-512.24	-2742.68	-0.01614	0.519
	Coppin Heights-Rosemount	-5006.34	-139.37	-598.50	-0.00421	0.127
	Fallstaff-Glen Hills	6106.44	199.00	757.28	0.00585	0.15
	Fells Point	3899.63	123.08	480.01	0.00364	0.213
	HEBCAC	26268.71	1150.14	3494.34	0.03189	<.000
	Midtown-Calvert Street Corridor	10299.10	357.48	1296.26	0.01039	0.005
	Northeast Baltimore	-13500.12	-343.50	-1580.12	-0.01052	<.000
	Park Heights	-18873.34	-427.23	-2150.64	-0.01332	0.405
	Patterson Park	19141.53	745.11	2475.03	0.02117	<.000
	Pigtown-Washington Village	18552.46	722.89	2399.67	0.02054	<.000
	Poppleton-Hollins Market	-10230.56	-262.56	-1200.20	-0.00804	0.186
	Reservoir Hill	34147.86	1690.58	4681.91	0.04560	<.000
	Sharp-Leadenhall	52160.22	3407.07	7681.31	0.08572	<.000
	Southwest Baltimore	-7662.72	-204.59	-907.23	-0.00622	0.063
	Waverly Main Street	9150.30	313.11	1147.84	0.00913	0.688
	Woodberry	4609.16	147.24	568.94	0.00435	0.565
	York Road Corridor North	-441.50	-13.09	-53.56	-0.00039	0.839
	Constant	-166588.80				<.000
		Model 5				
		N	146396			
		LR chi(14)	7362.44	Left	139347	
		Prob> chi2	0	Uncensored	7049	
		Log Likelihood	-104547.110	Right	0	
		Pseudo R2	0.034			

Table 26: Tobit Model Regression Results (Model 5)

Likelihood Ratio Test									
Model 1 nested in Model 2		Model 1 nested in Model 3		Model 1 nested in Model 4		Model 1 nested in Model 6		Model 1 nested in Model 7	
LR chi2(2)	58.21	LR chi2(2)	160.04	LR chi2(2)	118.9	LR chi2(2)	139.14	LR chi2(2)	39.86
Prob > chi2	0.0000	Prob > chi2	0.0000	Prob > chi2	0.0000	Prob > chi2	0.0000	Prob > chi2	0.0000

Table 27: Likelihood Ratio Test

Because the data include over 140,000 observations, the statistical significance of most of the independent variables is quite high. But because the percent of parcels renovated is low, the explanatory power of the model is quite low as well. Still, almost all of the coefficients had expected signs. Expected signs and actual signs are reported in Table 28. Likelihood ratio tests for the probit model are shown in Table 27 indicate that adding the policy areas to the model significantly adds explanatory model over model 1. This is the case for all models with policy variables.

Structural Variables

Probit and tobit results show that in every model and for nearly every variable the coefficients on the structural variables have expected signs. The probability of renovation increases with the age of the building, the size of the building, the total assessed value of the property, and for properties that were sold immediately after the renovation. Interestingly, the sign on sale immediately before the time period is negative. The alternative signs on the sale variables indicate that renovation occurs before not after sale. The probability of renovation decreased with the ratio of the improved value to land value and the number of stories in the building. These results are significant in all forms of the model, but many of the coefficients are very small. For instance, a parcel that is 10

years older is 0.5 percent more likely to renovate. But, a parcel bought between 2004 and 2008 is 7 percent more likely to renovate.

	Expected Sign	Probit Sign	Tobit Sign
Square feet of structure	+	+	+
Age of structure (in 2004)	+	+	+
Number of stories	+	-	-
Total assessed value of property (\$)	+	+	+
Property sold 2000-2003 (0/1)	+	-	-
Property sold 2004-2008 (0/1)	+	+	+
Assessed improved value/assessed land value	-	-	-
Average count of crimes	-	+	+
Black (%)	-	-	-
Under 30 (%)	+	-	-
Over 65 (%)	-	-	-
Vacant (%)	+	+	+
Distance to cbd (miles)	-	-	-
Within 1/2 mile of transit (0/1)	+	-	-
In other policy area (0/1)	+	+	+
In Community Legacy area (0/1)	+	+	+
Community Legacy Funding (\$)	+	+	+
Community Legacy Funding per parcel	+	+	+
Community Legacy Funding per permit	+	+	+
Community Legacy Area - Residential	+	+	-
Community Legacy Area - Non-Residential	?	-	-
Community Legacy Area - Mixed	+	+	+
Community Legacy Area - N/A	?	-	-

Table 28: Expected Signs v. Actual Signs

Socioeconomic and Neighborhood Variables

Nearly all the coefficients on the socioeconomic variables also had expected signs and were significant in nearly every model. The probability of rehabilitation increased with the percent of vacant properties in the block group and for properties closer to the CBD. A parcel that is 1 mile closer to the CBD is 2 percent more likely to renovate. A one percentage increase in the vacancy rate increased the probability of renovation by nearly 10 percent. The probability of renovation decreased with the population in the block group that is African American, young, and old. Since the percentage of young persons in the block was higher for parcels that received permits, and given conventional wisdom about renovation, it is surprisingly that the sign on percentage young people is negative. This might be a result of using 2000 census variables instead of capturing change in the group during the study period. Somewhat surprisingly, properties within one half mile of transit stations had a 0.6 percent lower probability of rehabilitation. This has a number of possible explanations. First, the transit stations in the Baltimore area have few residential properties within a half-mile radius; and second, the transit system in Baltimore is not very extensive in its geographic reach. Somewhat surprisingly, as well, the average count of crimes showed a positive sign indicating that properties in block groups with higher crime rates were more likely to renovate, all else equal.

Policy Areas

The policy variables also had significant and expected signs. In the model with dummy variables for the policy variables (Model 2), properties located in the Community Legacy and Other Policy Areas have higher probabilities of renovation. Location in the

Community Legacy Area increases the probability of renovation by 0.5 percent while location within one of the other policy areas increases the probability of rehabilitation by 0.7 percent. Though Community Legacy Areas have a positive impact on renovation, more long-standing spatial policies seem to have a greater impact, like federal historic preservation tax credits, which have been available since the late 1970s (see Table 19). Because the program had not been in effect long, this is not surprising, but this finding warrants further study. For parcels that received permits, tobit results show that parcels inside the Community Legacy Area spent \$501 more than parcels outside, on average. Parcels in other policy areas spent \$998 more than parcels outside, on average. Model 2 shows that the amount spent by the state within the Community Legacy area also increases the probability of rehabilitation of properties in the Community Legacy Area. In Model 3, increasing expenditure within a Community Legacy Area by a million dollars increases the probability of renovation by 1 percent. Under Model 4, each additional expenditure of \$1,000 per residential parcel within the Community Legacy Area increases the likelihood of renovation of that parcel by 3 percent. In Model 7, increasing the per-permit expenditure by \$1,000 within the Community Legacy Area increases the likelihood of renovation by 0.7 percent. Expenditure of \$1,000 per permit, on average, within the Community Legacy Areas increases the amount spent by residential parcels by \$78. In examining classification of Community Legacy Areas in Model 6, parcels in residential and mixed areas are more likely to renovate while non-residential and no funding areas are less likely to renovate. However, the signs on non-residential and residential are not statistically significant. But mixed areas are 1.3 percent more likely to renovate than parcels not in a Community Legacy Area. Mixed areas spent \$1141 more

on average than parcels in other types of areas or not in a Community Legacy Area at all. Parcels in Community Legacy Areas that did not receive funding were 0.8 percent less likely to renovate than parcels not in a Community Legacy Area. Parcels in areas that did not receive funding spent \$1200 less on renovation.

As shown under model 5, when controlling for fixed effects by Community Legacy Areas, some were more likely or less likely to renovate than parcels outside of Community Legacy Areas, and by a statistically significant amount. Coppin Heights and Northeast Baltimore showed a negative and statistically significant sign meaning parcels in these areas were less likely to renovate than parcels not in a Community Legacy Area. Parcels in HEBCAC, Midtown-Calvert, Patterson Park, Pigtown-Washington Village, Reservoir Hill, and Sharp-Leadenhall were more likely to renovate and by a statistically significant amount. Parcels in Sharp-Leadenhall were 7 percent more likely to renovate than other parcels. These findings are consistent with renovation activity shown in Figure 35.

Under the probit models, the pseudo R2 values for all models are approximately 0.14 which is not high, but weak predictive power is expected as only renovation within a five-year time period is captured. Further, this pseudo R2 is much higher than that obtained in previous studies. (Helms, 2003) The chi-square term indicates that the probability that coefficients are equal to zero is basically zero.

To evaluate the performance of the models further I present sensitivity and specificity statistics for the probit models (see Table 29). All of the models predict about 99.9 percent of non-redeveloped parcels correctly, but only 0.4 percent of renovated parcels

correctly. These models are better at predicting which parcels are not renovated than parcels that are renovated, but this is not surprising as only 6 percent of the entire sample renovated. On the aggregate, all three models predict about 94 percent of observations correctly. ROC curves illustrate the ability of the model to differentiate between renovated and non-renovated parcels. The area under the curve varies from 0.5 to 1.0 where a value of 1.0 indicates that the model has perfect discriminating power. In this analysis, the area under the ROC curves, displayed in Table 29 provides support for strength in the models, as an area under the curve around 0.8 which illustrates the ability of the model to differentiate between renovated and non-renovated parcels.

Model 1		Model 2		Model 3		Model 4	
Area Under ROC=.7793		Area Under ROC=.7795		Area Under ROC=.7802		Area Under ROC=.7805	
Classified rehab if predicted probability >= .5							
Sensitivity (Rehab Correct)	0.42%	Sensitivity (Rehab Correct)	0.41%	Sensitivity (Rehab Correct)	0.42%	Sensitivity (Rehab Correct)	0.37%
Specificity (Non Rehab Correct)	99.94%	Specificity (Non Rehab Correct)	99.95%	Specificity (Non Rehab Correct)	99.95%	Specificity (Non Rehab Correct)	99.94%
Correctly classified	94.42%	Correctly classified	94.43%	Correctly classified	94.43%	Correctly classified	94.41%
Model 5		Model 6		Model 7			
Area Under ROC=.7828		Area Under ROC=.7925		Area Under ROC=.7797			
Classified rehab if predicted probability >= .5							
Sensitivity (Rehab Correct)	0.33%	Sensitivity (Rehab Correct)	0.36%	Sensitivity (Rehab Correct)	0.38%		
Specificity (Non Rehab Correct)	99.96%	Specificity (Non Rehab Correct)	99.95%	Specificity (Non Rehab Correct)	99.95%		
Correctly classified	94.44%	Correctly classified	94.42%	Correctly classified	94.47%		

Table 29: Prediction Value of Models

Summary

Regression models produced results that were both plausible and interesting, and consistent with descriptive data about the two groups. Larger, higher valued parcels closer to the central business district that sold during the period in census block groups with higher vacancy rates and more crime are more likely to renovate. Meanwhile, parcels sold immediately before the study period with more black, young or old people and closer to transit were less likely to renovate. These results provide evidence that spatial policy areas and Maryland's Community Legacy Program have a positive impact on renovation. While the impact is slight, these results are encouraging. Perhaps most interesting, certain types of Community Legacy Areas, which received funding for mix of commercial and renovation projects, were much more likely to renovate than parcels in other types of areas. And areas that were designated as Community Legacy Areas but never received funding were less likely to redevelop than parcels there were not in a Community Legacy Area.

Limitations

Though this analysis provided interesting results and serves as a relatively simple test of the impact of the Community Legacy Program, it is important to note the potential for endogeneity related to Community Legacy Areas and renovation. Because some of the independent variables might also be predictive of a parcel being located within a Community Legacy Area, this analysis has a potential endogeneity bias. These areas were not designated randomly throughout the city but were based on a number of characteristics, some of which were unobservable. Endogeneity may have a positive or

negative bias on the Community Legacy coefficient. Specifically, based on certain characteristics, these areas might have been more likely to renovate anyhow. In this case, I am not capturing an impact of the policy but other neighborhood characteristics. This would bias the coefficients upwards. Or, because these areas were located in “at-risk” neighborhoods, these parcels were less likely to renovate because of unobservables that were not captured in this analysis. By not controlling for these unobservables, the results were biased downwards.

Spatial Patterns of Renovation

Spatial analysis provides insights into whether renovation of one structure depends on values observed at neighboring location, presenting spatial dependence (or clustering of renovation). To identify whether renovation occurs in clusters, I used techniques of spatial dependence and parcel point data representing all observations in the dataset. I use both first order and second order spatial dependence techniques to examine the degree of spatial dependence for the entire dataset (global first order measures) and the degree of spatial dependence for individual parcels (local second order measures). I use three measures: Global Moran’s I, Getis Ord-G stat, and Local Moran’s I. For these analyses, I defined a neighborhood as a radius of 450 feet or 137.16 meters based on a study in Philadelphia which concluded that a contagion effect of individual properties impacts nearby properties within 300 to 450 feet (Watcher, 2001).

Global Moran’s I

Global Moran’s I indicates whether rehabilitation is clustered, random, or dispersed.

Where n is the number of features, the Moran Index is specified as:

$$I = \frac{n \sum_i \sum_j w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_i \sum_j w_{ij} \sum_i (x_i - \bar{x})^2}$$

The index ranges from -1 to 1, where values closer to -1 are dispersed and values closer to 1 are clustered, and values close to 0 are random. It is expected that renovation permits will have a contagion effect, and thus renovation is likely to be clustered.

For this data, the Global Moran's I statistic was 0.08 indicating slight clustering, and this value was statistically significant at the 99 percent confidence level. This confirms what can be inferred from Figure 23 above.

General G Statistic

The General G Statistic measures the concentration of high and low values. (Mitchell, 2005) Higher G-statistic values indicate that highs cluster while lower values indicate lows cluster. I use renovation permits to identify whether there are "hot spots" and "cold spots" of renovation activity. Where x_i is the value of the target feature and x_j is the value of the each neighbor within d , a user-specified distance:

$$G(d) = \frac{\sum_i \sum_j w_{ij} (x_i * x_j)}{\sum_i \sum_j (x_i * x_j)}$$

The General G Statistic indicates whether high or low values are clustered. Higher values indicate that highs cluster while lower values indicate lows cluster. Here, a coefficient of 0.003 indicates high values cluster, and this value was statistically significant at the 99 percent confidence level.

Local Indicators of Spatial Analysis

Local Moran's Index tells whether dissimilar or similar values are located proximate to one another. (Mitchell, 2005) In this case, that value is a dummy variable representing whether a parcel received a building permit for alteration or renovation. While Global Moran's I simply provides a single index value, Local Moran's Index can show the spatial location of clusters. I expect to find clusters of activity illustrating a contagion effect. Higher values indicate similar values are clustered while lower values indicate dissimilar values are clustered. Z scores show which clusters are statistically significant. Each feature has a unique index value. Specifically, where s^2 is the variance, \bar{x} is the mean value, x_i is the attribute value of the target feature and x_j is the value of the neighboring feature:

$$I_i = \frac{(x_i - \bar{x})}{s^2} * \sum_j w_{ij} (x_j - \bar{x}).$$

Maps, rather than a summary index score provided with global measure, are used to interpret tests of local dependence. Local Moran's I explains whether dissimilar or similar values are located proximate to one another. Based on the Index and Z Scores indicating statistical significance, Figure 38 shows where high values cluster with other high values (renovation), where high values (renovation) are surrounded by low values and where low values are surrounded by high values (renovation). The high-high clusters of renovation occur in neighborhoods like Canton, Mount Vernon, and Federal Hill, which are generally known as stable neighborhoods in Baltimore. In more transitional neighborhoods like Patterson Park and just south of Federal Hill, low-high clusters occur. With the Getis Ord G_i^* statistic, both a Z score and p-value are calculated in analysis. Combined, the Z score and p-value help identify pockets of high and low clustering the

city. Using p-values and Z scores, Figure 39 identifies statistically significant hot spots and cold spots in addition to areas where there was no statistically significant clustering. Red indicates hot spots of renovation while blue indicates cold spots and yellow indicates no apparent clustering. The hot spots occur in transitional and stable neighborhoods like Patterson Park, Canton, and Federal Hill. Cold spots occur in southwest and northeast Baltimore where little renovation activity occurred. Interestingly, there are hot spots for renovation in some of the same places where low-high clustering occurred with Local Moran's I, like Patterson Park. This indicates that although the areas are mixed, these are the areas where the most renovated is occurring in clusters in the city. Given that only approximately 6 percent of the city renovated, this is not surprising.

Summary

While this brief exploratory analysis considers only the spatial dimension and does not consider a temporal dimension, it provides support for the contagion effect of renovation in Baltimore City. Some stable neighborhoods like Canton, Federal Hill and Mount Vernon were homogenous hotspots of renovation activity, which transitional neighborhoods and Community Legacy Areas like Patterson Park and Sharp-Leadenhall were heterogeneous in renovation activity.

Baltimore City Local Moran's Index

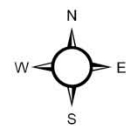
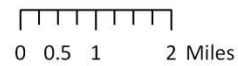
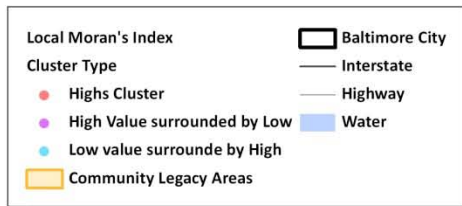
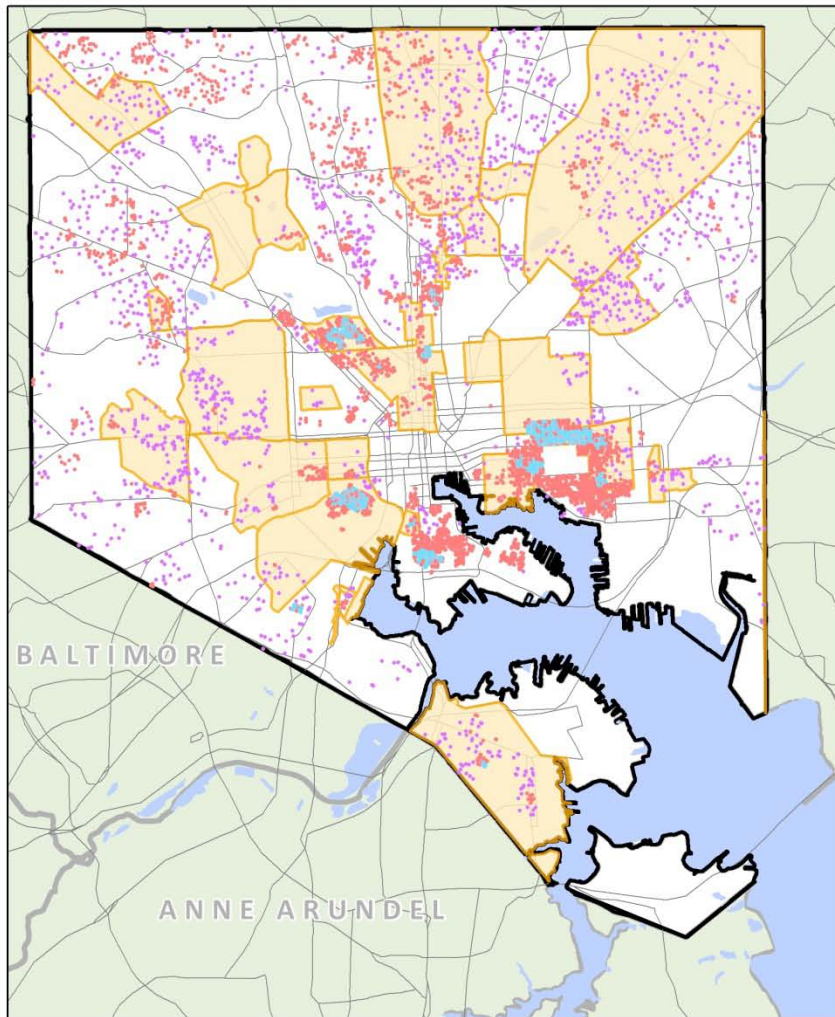


Figure 38: Local Moran's Index. Sources of Data: Maryland Property View; Baltimore Metropolitan Council; Maryland Department of Housing and Community Development; U.S. Census.

Baltimore City Hot Spots Analysis

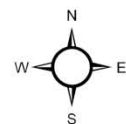
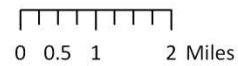
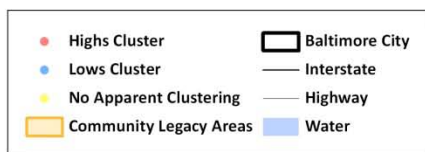
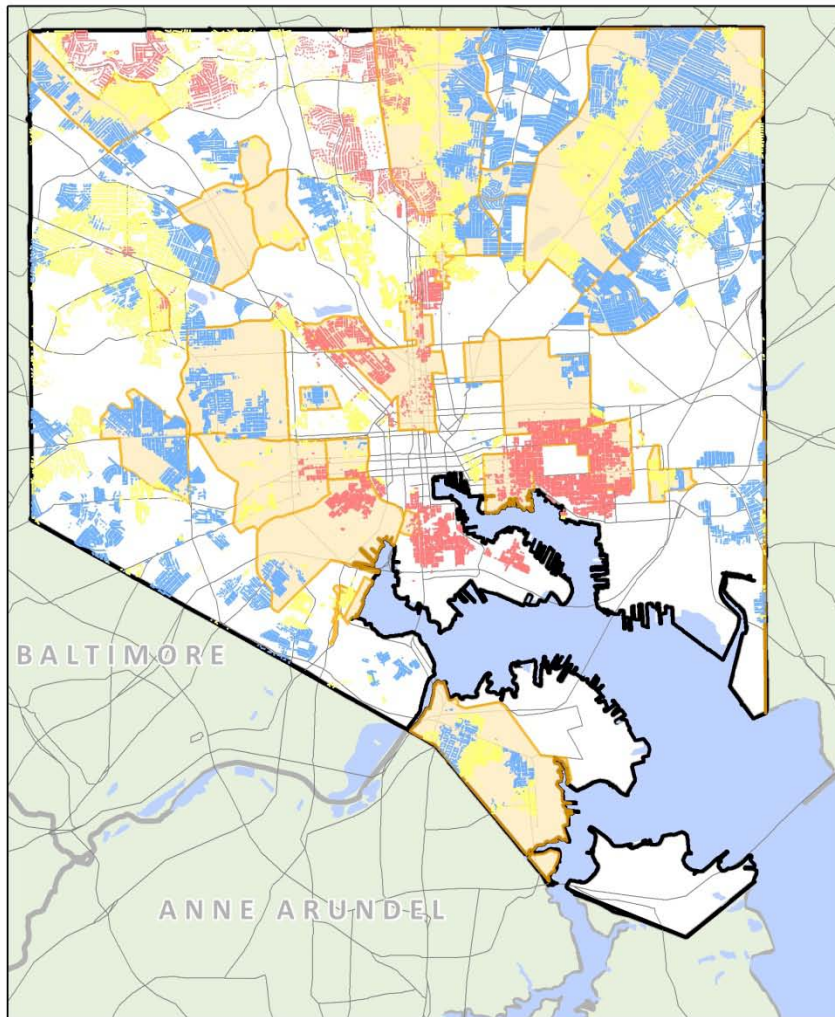


Figure 39: Hotspots and Cold Spots. Sources of Data: Maryland Property View; Baltimore Metropolitan Council; Maryland Department of Housing and Community Development; U.S. Census.

Summary and Conclusions

In this essay I examined the probability of residential renovation in Baltimore, Maryland, an old industrial city still recovering from post-war deindustrialization. In addition, I sought to examine whether the state Community Legacy program, as one of Maryland's smart growth incentive programs, has helped to stimulate investments in the existing housing stock. Like previous studies of renovation and redevelopment, the results reveal that the probability of redevelopment varies systematically with characteristics of the property and the neighborhoods in which they are located—in both expected and unexpected ways. As anticipated, I found that the probability of renovation increases with the age of the structure and decreases with the ratio of improved value to land value. Unexpectedly, however, I found that the probability of renovation was lower near transit stations and higher in areas with more crime. Also like previous research, however, the ability to predict properties that renovate is very low, largely because the percent of properties that renovate in any year is very low and, apparently, quite unpredictable. The results also reveal that the probability of renovation is higher in areas designated by the state as eligible for Community Legacy funds and the probability of renovation increases with the amount of funds spent within the Community Legacy area. These results are encouraging though modest. But while the effect of the Community Legacy Area on the probability of rehabilitation is statistically significant, it is difficult to argue they are substantively significant. Other policy areas had a more substantive impact on renovation, but many of these policies have been around for several years and the Community Legacy Program only a few short years. The probability of renovation in Community Legacy areas over the period from 2004 to 2008 was 0.5 percent higher for buildings in Community Legacy areas than those not in a policy area. Further, the

probability of renovation increases by 1 percent for every million dollars spent in the Community Legacy area. Mixed and residential Community Legacy Areas performed better than non-residential and no funding Community Legacy Areas, and not being in a Community Legacy Area. If the benefits of the Community Legacy programs are measured in the dollar value of investments in renovation alone, it is probably difficult to believe that the program would pass a cost benefit test. The overall level of spending in many of the Community Legacy Areas was quite low – much lower than the thresholds reported by Galster et al. (2006).

Renovation takes place as predicted by economic theory. More investments occur where the characteristics of the property and the neighborhood increase the return to such investments. The Community Legacy program, by subsidizing the cost of redevelopment, can also increase the probability of renovation. Thus, the performance of the Community Legacy Program provides evidence that spatially targeted incentives can serve to alter urban development patterns, though perhaps not by very much.

In administering the Community Legacy Program in Baltimore City, this research provides interesting results applicable to policy formulation, adoption and implementation:

- Mixed policy areas perform better than homogenous areas
- Consistent, high levels of funding are important. Many of the areas that received several grants or loans in the excess of \$1 million dollars performed best including, Midtown-Calvert Street, Patterson Park, and Pigtown-Washington Village.

- Areas that will not receive funding should not be designated. Designation without funding seems to have a negative impact on renovation.
- As previous studies have shown, concentrating resources seems to be more effective than spreading resources thin over several policy areas, particularly when resources are limited.

In interpreting these results, it is important to remember that the event being predicted (renovation) is only 6 percent of the total sample, so the magnitude of individual independent variables is quite small and the explanatory power of the models is not high. Further, it is important to remember the spatial dependency of the data, which shows that renovation could have a contagion effect. Still, this analysis provides interesting results and carries important policy implications. This analysis provides important information for policy makers for identifying areas to spatially target resources in order to encourage renovation.

Policy Implications

In enacting legislation that targeted state funding for growth, preservation, and redevelopment to different spatial policy areas, the state attempted to use its purse to limit sprawl development in Maryland. The state used a multi-dimensional approach to attempt to concentrate development and redevelopment in Priority Funding Areas and Community Legacy Areas while preventing development and preserving land in Rural Legacy Areas. In this dissertation, I examined the performance of these three smart growth instruments. I studied the impact of smart growth instruments on development, renovation, and redevelopment patterns in Maryland in addition to exploring the implementation and statutory context for each policy. While the results have been mixed, in general, the intended effects of Maryland's smart growth instruments have not been clearly demonstrated. Smart growth in Maryland has elevated the level of coordination among state agencies, and worked to preserve land and reinvest in central cities. But the efforts have been undermined by a lack of coordination with local governments coupled with subpar implementation by state agencies and plagued by administrative discontinuity and weak state budgets in the face of high development pressure. Though the logic of using the state's purse to alter growth, preservation, and redevelopment decisions is sound, it is unclear whether the state will ever have the resources to use incentives alone to influence development patterns.

Though Maryland garnered national attention and earned numerous awards for its novel approach to managing growth at the state level, findings suggest that the program has not lived up its expectations. It is important to remember that ten years is not long in land use policy time. Further, in land use policy analysis, it is always difficult to address the

counterfactual – or what might have happened without the policy. Across the three instruments evaluated here – Priority Funding Areas, Rural Legacy Areas, and Community Legacy Areas – the results have been mixed. There is some evidence that spatially targeted incentives can impact development, redevelopment, and preservation patterns, subject to the level of incentives and consistent implementation.

Priority Funding Areas have had little discernable impact on development patterns since the law was enacted in 1998. In fact, trends in parcels, acres, and parcel size are moving in the wrong direction at the state level and many counties across the state. Trends were encouraging on the rural Eastern Shore but rather dismal in Central Maryland. However, the level of state spending subject to Priority Funding Area review is a small percentage of the state budget and this funding is dominated by transportation. The performance of the law has been undermined by a lack of vertical integration with local planning statutes and inconsistent implementation at the state level. Further, by assigning implementation authority to MDP, original statutes gave an agency the responsibility to oversee a state spending law impacting funding decisions by other agencies. This meant that MDP, a smaller, weaker agency with no control over allocating “growth-related” spending was responsible for reporting on and implementing the act. Additionally, the laws that govern Priority Funding Areas lie within the State Finance and Procurement article of the code rather than the Land Use Planning article, though oversight belongs to MDP rather than the Department of Management and Budget. As a result, PFAs have not been well integrated with local planning statutes or state budgeting processes. Though the logic of using state infrastructure funding to alter development patterns is conceptually sound, due to the small amount of funds classified as “growth-related” and a lack of knowledge about

the impact of this funding on local development decisions, in Maryland, it is difficult to believe this program would have altered development patterns even if implementation was perfect.

Though the Rural Legacy Program worked to preserve nearly 69,000 acres in prime rural areas in the state, the program fell considerably short of the stated goal to preserve 200,000 acres by 2011. Three agencies and several stakeholders weighed several statutory criteria and performed extensive analysis to designate areas and allocate \$229 million to preserve land within 30 Rural Legacy Areas. However, annual funding for the program varied tremendously while land costs skyrocketed during a boom in the housing market in the early 2000's. Funding levels and temporal consistency differed considerably across Rural Legacy Areas. As a result of these factors, the Rural Legacy Program had little impact on development patterns after areas were designated relative to before. In over half the areas, parcels and acres developed after the act increased after relative to before. But in several Rural Legacy Areas – primarily on the Eastern Shore – the program was highly successful in preserving a significant number of acres at a relatively low cost while reducing the rate of development and fragmentation in the areas after designation. The areas that performed well across descriptive indicators and statistical tests typically received a high and consistent level of funding from the state and preserved a large number of acres through the program. But it is difficult to assess whether development levels would have remained minimal in these areas anyhow, as development levels were relatively low both before and after designation of these Rural Legacy Areas. Though development trends were moving in the wrong direction in many Central Maryland Rural Legacy Areas, there was already a high level of development in

the areas when the areas were designated and in many cases, zoning allows residential or commercial uses. In comparing the share of development after designation relative to before in agricultural zones and Rural Legacy Areas, the results were mixed. In some areas, trends were moving in the same direction, but in other cases, Rural Legacy Areas seemed to be more effective at limiting development while in a few areas, county agricultural zoning seemed to be more effective. In the face of weak agricultural zoning or strong development pressure, it seems that the Rural Legacy Program may serve as a substitute for strong zoning. This finding warrants further study.

The Community Legacy Program in Baltimore City provided more than \$10 million over seven years to support a variety of residential, commercial, and civic revitalization projects in 28 Community Legacy Areas across the city. Funding across the areas varied considerably and seven areas were never awarded funding from the program despite receiving designation. Findings show that the Community Legacy Program is having a positive but very slight impact on renovation decisions in Baltimore City. During the period of analysis, the magnitude of impact was higher in other long-standing policy areas. Sales during the period were a strong predictor of renovation decisions. These findings demand further analysis. Though the overall impact was slight, the Community Legacy Program was having its intended effects in neighborhoods that received a high, consistent level of funding for a variety of different projects.

Summarizing findings across the three instruments, though the impact of these policies on development patterns was generally negligible, trends in preservation and revitalization were generally more encouraging. In the two instruments I examined at the state level, Rural Legacy Areas and Priority Funding Areas, the Eastern Shore performed

better than Central Maryland after the implementation of the acts relative to before.

Given systematically weaker land use tools and less development pressure, this is not surprising. Though data were not available to substantiate the hypothesis, it is likely that Eastern Shore is more dependent on state funding for infrastructure and preservation than wealthy Central Maryland counties, which more often impose development impact fees or higher taxes to support development.

Implementation and consistency in meeting statutory requirements under Community Legacy and Rural Legacy Programs was better executed than under Priority Funding Areas. The institutional structure of the Community Legacy and Rural Legacy Programs relies on a lead agency with strong control over funding decisions and the support of other agencies. Alternatively, under the Smart Growth Areas Act, the Maryland Department of Planning was responsible for overseeing a state spending law and gathering annual reports from several other agencies, which were in control of funding decisions. The Community Legacy and Rural Legacy Programs were set up to meet their statutory requirements with greater ease. Under all three programs, procedures, criteria and processes have evolved and changed over time. Many decisions in the early years would not be repeated under current guidelines, according to state agency officials.

Across the three instruments evaluated, horizontal integration and consistency were more carefully considered and thus more effective than vertical integration and consistency.

Through these three instruments and other smart growth instruments in addition to the Smart Growth Sub-Cabinet and Smart Growth Coordinating Committee, state agencies are communicating more effectively regarding growth issues. But the integration at the state level has not filtered to decision-making and integration at the local level. Because

land use authority remains at the local level, this lack of integration certainly undermined the effectiveness of these programs and is reflected in trends in development patterns.

For all three programs, historical data, applications, and background information were not perfectly maintained and rarely tracked spatially, despite the focus on targeting incentives spatially. As the laws went into effect in the late 1990s and early 2000s, this lack of extensive tracking and poor maintenance of information is not surprising.

Original legislation did not provide a method for revisiting areas over time. PFAs have remained largely unchanged, several Rural Legacy Areas have stopped submitting applications, some Rural Legacy Areas have never preserved any land through the program, and several Community Legacy Areas never received state funding. Recent Sustainable Communities legislation seems to acknowledge the pitfalls of failing to build a systematic review process into the law, and requires that areas be reviewed every five years.

In Maryland, it is unlikely that the current policies will be enough to have the desired impacts on development patterns. The actual impact of the incentives on development decisions is indirect and the total amount of funding is quite negligible. But certain refinements in the policies in Maryland might improve the implementation of the act and perhaps improve trends in development patterns. At the state level, state spending decisions should be better integrated into the state's budgeting and funding process. Applications for state funding should be tracked spatially and oversight should lie within the Department of Budget and Management rather than individual agencies. Because of the lack of vertical integration which leads to duplicative efforts by the state and local governments, I suggest embedding the state's incentive based policy areas into local

comprehensive plans and zoning. This would entail making growth areas conterminous with PFAs and locally targeted preservation areas coterminous with Rural Legacy Areas. As statutes require that comprehensive plans be reviewed every six years, the state should periodically review PFAs, RLAs, and CLAs during the comprehensive planning process. The state should consider flexibility in applying smart growth policies across the state. Development pressures and local policies vary tremendously across the state and this should be taken into consideration. Trends in development patterns reiterate the differences across regions of the state. Perhaps the state should consider relaxing criteria for PFA and CLA designation in exchange for strengthening agricultural zoning. In consideration of differences across the state, the state should not attempt to obtain geographic balance in spending money by program across the state. Instead, the state should aim for overall balance but spend a greater portion of resources in specific programs in parts of the state where the money would be best utilized. Since the level and consistency of funding seems to impact the performance of RLAs and CLAs, the state should err in favor further concentration into a few areas rather than spreading funding thinly across the state.

Though these results do not provide strong support for an incentive-based approach to growth management at the state level, I did not seek to compare the effectiveness of an incentive-based approach to a regulatory approach. In most states, the political realities of the parochial nature of local governments and resistance to state control over land use issues makes an incentive based approach more politically feasible. A preference for incentives over regulations is apparent in many types of policies beyond state growth management. Maryland failed to pass a regulatory program several times in recent

decades before ultimately enacting the 1997 package of legislation known as Smart Growth. But incentives are inherently weaker instruments, and in challenging budgetary times, it is difficult to believe the state will ever have enough resources to effectively contain urban growth while preventing sprawl in prime rural areas and revitalizing downtowns.

Before states adopt a spatially targeted incentive-based approach, I recommend that states look carefully at the level of incentives and how the proposed incentives affect development decisions. In states that fund a high percentage of infrastructure at the state level or reserve a large portion of funding for land preservation and revitalization programs, this type of policy might make sense. In using a targeted incentive-based approach, states should consider the integration of the policy with state budgeting processes and an allocation process that considers how funds are distributed spatially. Additionally, instruments should be embedded in state planning laws used in conjunction rather than competition with local planning tools. Both horizontal and vertical integration are critically important to the effectiveness of incentive-based state growth management programs. In relying on incentives, it is important to apply funding consistently at high levels. As the findings suggest, it is unclear whether states have the resources to effectively alter development patterns using incentives alone.

Appendix: Letter to Dean of the Graduate School



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4/19/2011

Dr. Charles Caramello
Associate Provost for Academic Affairs and Dean of the Graduate School
2123 Lee Building
College Park, MD 20742

Dear Dr. Caramello,

I am writing to certify that the examining committee has determined that Rebecca Lewis made substantial contribution to a work previously published and included in her dissertation as one essay in a three-essay format dissertation. As Rebecca's dissertation advisor and a co-author on the piece, I can vouch for her contributions to the work. The piece, titled "Managing Growth with Priority Funding Areas: A Good Idea Whose Time is Yet to Come" was published in the October 2009 issue of the *Journal of the American Planning Association*. Rebecca Lewis was lead author on the piece coauthored by Jungyul Sohn and myself. Rebecca took part in data collection and analysis and wrote much of the article. Prior to including this piece in her dissertation, Rebecca updated previously published work and re-wrote and expanded several sections of the initial article.

The inclusion of this work in this dissertation has been approved by myself as Rebecca's dissertation advisor by Marie Howland, the PhD Program Director in Urban and Regional Planning and Design.

Sincerely,

A handwritten signature in black ink, appearing to read "Gerrit-Jan Knaap".

Gerrit-Jan Knaap
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