Linking Growth Management to Urban Conservation: Geodesign as a Tool for Identifying Regeneration Sites

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Abstract

Rapid land conversion of peripheral areas helped facilitate both relocation of populations and land use from many heritage areas, leaving numerous historic districts replete with non-functional and unmaintained structures. Many once-vital structures were removed while others abandoned, left to decay – a process known as demolition by neglect. While new historic preservation policies attempt to salvage these structures, such policies tend to be based primarily on local ordinances. In response to growing concerns about the climbing rate of neglected historic structures, this paper investigates connections between peripheral growth management (specifically agricultural preservation) and its effects on deterring demolition by neglect. Newman's model (in press) of measuring neglect is utilized to compare neglect rates in 3 historic urban boroughs in Bucks County Pennsylvania. The research utilized three scales of analysis: a micro scale using descriptive statistics of measures applied to variables contributing to neglect, a macro scale analysis using Pearson's correlation method to evaluate significance of variables, and a cross case spatial analysis combining geocoding, attribute reclassification, Inverse Distance Weighted interpolation, Hot Spot, and Weighted Suitability analyses. Results show that as amount of preserved farmland increases, the rate of demolition by neglect decreases.

1 Demolition by Neglect + Heritage Management

The impact of centrifugal development on inner-city, historic structures – while both vitality (people) and viability (function) have fled to the periphery – has been dire, leaving many historic structures to rot as vacant, unused shells of their former selves. As cities expand across countless parcels of the American landscape, they leave in their wakes – especially in historic centers – vacant lands, derelict lands, and building stock no longer suitable for their original purposes (TRIEB 2006). This expansion often accelerates the removal of heritage structures that have deteriorated due to a lack of use, a process known as demolition by neglect (DBN). DBN can be defined as the destruction of a heritage landscape or area through abandonment or lack of maintenance (MOSHEN & LEATHERBARROW 1993). It has become an epidemic within historic areas and a challenging issue for state and local authorities. DBN can contradict the traditional philosophy of historic presservation in America (COOK 1996), the salient reason that oftentimes not enough is

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done to prevent this condition. Most American historic structures are regulated on a unit-by-unit basis – even those within historic districts – and are assessed primarily according to their ability to look as they did at a particular historic point. According to JIGYSAU (2002), historic structures have two fundamental dimensions: the first deals with aspects of historic integrity, but the second deals with their relationships to the living environment in which they exist. It is important to examine both the historic structure itself and its dynamic regional context to understand the process of DBN fully.

Decentralized growth is spreading a homogenous form across the landscape, destroying multiple layers of cultural history (YAHNER & NADENICEK 1997). Historic areas have not received the support necessary to maintain their viability, protect their structural integrity and heritage values, and stimulate their local economic base as populations and occupancies continue to undergo various incremental transformation processes. These transformations are tied largely to regional growth patterns as many peripheral lands that serve as the settings to historic structures have also become threatened. *"People must begin to look beyond traditional preservation ordinances and landmark commissions to address the planning forces that have the most influence over their city's future development"* (COLLINS, WATERS & DOTSON 1991, p. 8). The ability of preservation standards to support both the historic character of sites and their viability depends increasingly on effective processes for examining changes within the larger town or urban context (ALDERSON 2006), but since contexts are constantly in flux, form and function rarely coincide sustainably in any environment (JACKSON 1997). According to historic preservation theory, the contemporary tendency is to give priority to form by means of thorough documentation and in-depth historic interpretation. An unfortunate fallacy to this premise is that when building function dissolves, too often the building form itself is simply removed or rebuilt. Although aesthetics add character to cities, the inability of many of these historic structures to attract future investment – not lack of historic integrity – is what leads to removal. The solution to preserving historic structures lies not only with managing individual buildings and infrastructures (internally) where historic preservationists attempt to address the quandary, but also with managing rapidly developing regional landscapes outside of cities (externally) to which the structures connect inescapably.

Local approaches to regulating heritage structures is more likely to attract investors into the heritage conservation market, but due to weaknesses in broader conservation regulations, the result is the potential loss of important non-renewable heritage resources (PICKERELL & ARMITAGE 2009). A survey conducted in 1996 on growth management and statewide comprehensive land-use planning listed acts in only 12 states which including historic presservation as a primary goal (LISTOKIN 1997). Rethinking spatial planning to enhance more proactive forms of heritage management has been an iterative process since the nascence of historic preservation. Historic preservationists continue the effort to create a more flexible discipline regarding management of the local built environment based on larger scale factors (LISTOKIN et al. 1998). The approach of American preservationists differs from European heritage management by remaining primarily locally regulated, while European cities, especially in the United Kingdom and the Netherlands, practice an area-based approach when managing the historic built environment (DORATLI 2005). Similar to this area-based approach, LISTOKIN's (1997) theory posits that growth management and historic preservation are intrinsically linked but the connections between the two are not fully understood. PICKERILL & PICKARD (2007) postulate within this connection, local authorities alone do not sufficiently meet the needs of conservation of built heritage. Case study

evidence from historic areas in Germany has shown the constraints imposed by wider economic and political contexts have a significant impact on preserved structures, demonstrating the need for integrating historic preservation projects with a comprehensive urban planning framework (ALBERTS & BRINDA 2005). More contemporary research has shown a disjuncture between preservation and the broader land use and building policies necessary for this integration, specifically in regards to the long term sustainability of preserved structures (AVRAMI 2012). Historic preservation is an integral component of a larger system and must align its aims with those of this larger system if the process of neglect is to be stymied.

2 Study Area and Methodology

The historic colonial boroughs under investigation – Doylestown, Quakertown, and Bristol – are all located in Bucks County, Pennsylvania. Bucks Co. is replete with heritage landscapes, and the state of PA has adopted the practice of agricultural preservation to aid in conserving the historic distinctiveness that characterizes its townships and boroughs. Agriculture is both the leading industry and a deeply held symbol of heritage in the region (BOURKE, JACOB & LULOFF 1996). These two characteristics have made Pennsylvania the nation's leader in agricultural preservation in terms of amount of monetary resources devoted to farmland preservation. Bucks County, PA is under deep suburban developmental pressures. Once a destination in its own right, the county is currently absorbing the exurban developments of both New York City and Philadelphia. Located 45 minutes north of Philadelphia and 1.5 hours from New York City, rural Bucks County is absorbing much of the exurban development of the neighboring two metropolises. The county lost 70% of its farmland between 1950 and 1997, a drop in acreage from over 260,000 to less than 84,000 (U.S. DEPARTMENT OF AGRICULTURE 2005). The region is also ranked number two on a list of the nation's 20 most threatened agricultural lands (OLSON & LYSON 1999).

Studying units of analysis within the same political boundary (Bucks County) with similar sizes, populations, and ages helps to control for other intervening variables. Each borough practices similar methods of agricultural preservation. To calculate the amount of preserved farmland surrounding each borough, central place theory (KING 1984) was used to define a hinterland boundary of the area which highly impacts towns of this particular size and population. Each borough is listed on the National Register of Historic Places (NATIONAL TRUST FOR HISTORIC PRESERVATION 2008). Moreover, each town practices similar strategies of agricultural preservation, including purchase of development rights.

This paper seeks to understand if regional based approaches to regulating heritage structures in the United States directly affect demolition by neglect or if they simply have an indirect influence. Although many other causal mechanisms can contribute to DBN (such as local leadership, ownership attitude, neglect by policy, land use management strategies, political leadership, internal economic needs, grassroots support, economic condition of the towns, external funding, and reinvention of civic image, etc…) this research is searching for a correlation, not causation. Has the preservation of peripheral agricultural lands directly aided in decreasing the rate of demolition by neglect? This paper hypothesizes that preserving peripheral agricultural lands as a land use management scheme aids in decreasing the rate of DBN of historic structures within town centers and that as amount of peripheral preserved farmland increases, there is a lower frequency of neglect in historic structures.

PETER NIJKAMP (1991) states when evaluation measurements in conservation planning are conducted, impacts have to be measured on multiple scales which are appropriate for meaningful analysis. He posits that the cultural sector often faces situations where limited precision is presented and that ordinal, nominal, or cardinal scales can be employed to more precisely evaluate more subjective topics, especially issues such as urban degradation. Newman's model (in press) of measuring neglect was applied to statistical and spatial analysis tools using Geographic Information Systems, combining existing models using historic integrity and structural viability into five explanatory variables: time frame of construction (the time frame in which the structure was erected), architectural modification (whether or not the structure has been altered), land use change (the consistency of building function), physical condition (the quality of the condition or appearance of each structure), and assessed value (the fair market value of each structure sampled). Enough buildings were surveyed within each borough to obtain a 95% confidence level. Results were analyzed using a clustered, non-independent random-spatial sampling method known as multi-stage area sampling (MONTELLO & SUTTON 2006). Each variable was then divided into three categories which are used as measures to compare neglect rates in 3 historic urban boroughs in Bucks County Pennsylvania.

The research utilized three scales of analysis: a micro scale using descriptive statistics of measures applied to variables contributing to neglect, a macro scale analysis using Pearson's correlation method to evaluate significance of variables, and a cross case spatial analysis combining geocoding, attribute reclassification, Inverse Distance Weighted interpolation, Hot Spot, and Weighted Suitability analyses. The micro scale determined which measures impacted the variables, the macro scales examined which variables impacted the rate of neglect most significantly, and the cross case comparison analyzed whether or not neglect rates rose or fell as amount of preserved farmland increased. The micro analysis assessed each case by examining the measures using a nominal scale (1's and 0's) and calculating percentages of accepted characteristics of each measure per variable to evaluate using descriptive statistics. The macro analysis assesses the explanatory variables utilizing an ordinal scale (1's, 2's, and 3's). Each measure was placed on a gradient where a score of "1" indicated high neglect, "2" indicated moderate neglect, and "3" indicated low neglect. Higher scores indicated lower neglect in occurrence. The relationship with each variable to neglect was considered linear in that as the totals increased, neglect decreased so Pearson's correlation method was used to test causality on a macro scale. The cross case comparison used overall neglect rates and hot spot analyses overlay mappings to determine neglected portions of the historic built environment and areas for potential regeneration. The rate of neglect was calculated by taking the ratio of the total score from the macro analysis (actual condition) divided by the total of all points possible (assuming no neglect in occurrence).The result from this calculation was subtracted from 100% to determine an overall neglect rate. Hot spot analysis was then performed for each spatially located variable and then equally weighted suitability analyses were created from each hot spot analysis to create a composite mapping.

3 Findings

The micro scale inventoried the condition of the existing historic built environment based on three different measures for each explanatory variable which were scored from 1 to 3

(the higher the score, the lower the neglect). The sum score of each structure could therefore fall between 5 (all measures scoring 1) to 15 (all measures scoring 3).

Table 1: Variables and Measure Scores Utilized

Score	Time Frame of Const.	Land Use Change	Architectural Modification	Building Condition	Assessed Value
1	1970-present	Vacant	Modern	Dilapidated	$ 0-81,000
2	1941-1970	Alternate Use	Modified	Moderate	$ 82,000 – 162,000
3	1900-1940	Continuous	Authentic	Well Composed	$ 163,000 – 243,000

All three towns showed similar trends in their structural inventory of the historic built environment. Doylestown showed the highest proportion of structures built between 1971 to present (60%) and a large portion of structures proved to be vacant (69%). Over 1/2 of the samples structures had been adaptively reused (60%) and a high ratio was in good condition (86%). Quakertown showed the highest proportion of historic structures built between 1940 and 1970 (36%) many of which were vacant (64%) and / or dilapidated (74%). Those that are not seem to an assessed value above the market mean (47%). In Bristol, only 44% of surveyed structures were built between 1971 to present but the town has the highest amount of vacant buildings (80%). Nearly 1/3 of them had been renovated (65%) and another 1/3 were dilapidated (67%). However, Bristol did have the highest proportion of high valued structures (93%)

Table 2: Inventory of measures accepted of structures sampled per town

		Doylestown			Quakertown			Bristol		
		Count	Rate	%	Count	Rate	%	Count	Rate	%
Time	a1 = 1900-1940	12	0.185	18%	23	0.348	35%	12	0.218	22%
Frame	a2 = 1941-1970	14	0.215	22%	24	0.364	36%	19	0.345	35%
of	a3 = 1971-present	39	0.6	60%	19	0.288	29%	24	0.436	44%
Construction	Total	65	1	100%	66	1	100%	55	1	100%
Land	b1 = Continuous	2	0.031	3%	9	0.136	14%	7	0.127	13%
Use	b2 = Alternate Use	18	0.277	28%	15	0.227	23%	4	0.073	7%
Change	b3 = Vacant	45	0.692	69%	42	0.636	64%	44	0.8	80%
	Total	65	1	100%	66	1	100%	55	1	100%
Architectural	c1 = Authentic	11	0.169	17%	20	0.303	30%	9	0.164	16%
Modification	c2 = Reconstruction/ Adaptive Reuse	39	0.6	60%	39	0.591	59%	36	0.655	65%
	c3 = Modern	15	0.231	23%	7	0.106	11%	10	0.182	18%
	Total	65	1	100%	66	1	100%	55	1	100%
Building	d1 = Well Composed	56	0.862	86%	2	0.03	3%	5	0.091	9%
Condition	d2 = Moderate	9	0.138	14%	15	0.227	23%	13	0.236	24%
	d3 = Dilapidated	0	0	0%	49	0.742	74%	37	0.673	67%
	Total	65	1	100%	66	1	100%	55	1	100%
Assessed	e1 = $163,000 - 243,	52	0.8	80%	31	0.47	47%	51	0.927	93%
Value	e2 = $82,000 - 162,0	10	0.154	15%	26	0.394	39%	1	0.018	2%
	e3 = $0 - 81,000	3	0.046	5%	9	0.136	14%	3	0.055	5%
	Total	65	1	100%	66	1	100%	55	1	100%

Each structure sampled was given a total score (according to the nominal scale utilized) and mapped as a point value according to this score. Neglected structures were categorized as points with scores of 5-8, transitory structures had a score of 9-12, and viable structures had a score of 13-15. Doylestown had the smallest ratio of neglected structures (1.5%), followed by Quakertown (3.1%), and then Bristol (9.1%). However, Bristol had the largest portion of transitory structures (81.8%) followed by Doylestown (almost same portion with 80%), and then Quakertown (78.5%). Doylestown and Quakertown had similar portions of viable structures (18.5%) with Bristol having only 9.1% viable.

The macro scale study analyzed the relationship between the score of each structure to each variable under investigation to assess each variable's effect on each point's mapped value using the Statistical Package for Social Science (SPSS). This analysis examined the relationship between the value of each point and the 5 variables used to measure neglect. According to the results of the Pearson Correlation analyses, when analyzed individually by town, 2-3 different variables show a significant relationship to the total score. Collectively, time-frame of construction (0.750) has the strongest positive relationship, followed by architectural modification (0.581), and then assessed-value (0.368). Land-use change (0.360) and building condition (0.307) also showed a moderate positive relationship with total score.

Table 3: Collective Pearson Correlation Analysis Output

		Time Frame of Construction	Land Use Change	Architectural Modification	Building Condition	Assessed Value	Total Score
Time Frame	Pearson Correlation	1	-0.003	**.574****	0	0.078	**.750****
	Sig. (2-tailed)		0.967	0	0.996	0.29	0
	N	185	185	184	185	185	185
Land Use	Pearson Correlation		1	-0.076	.189*	-.164*	**.360****
	Sig. (2-tailed)			0.308	0.01	0.025	0
	N		185	184	185	185	185
Architectural Modification	Pearson Correlation			1	-.175*	-0.02	**.581****
	Sig. (2-tailed)				0.018	0.783	0
	N			184	184	184	184
Building Condition	Pearson Correlation				1	-0.024	**.307****
	Sig. (2-tailed)					0.742	0
	N				185	185	185
Assessed Value	Pearson Correlation					1	**.368****
	Sig. (2-tailed)						0
	N					185	185
Total Score	Pearson Correlation						1
	Sig. (2-tailed)						
	N						185

**. Correlation is significant at the 0.01 level (2-tailed).

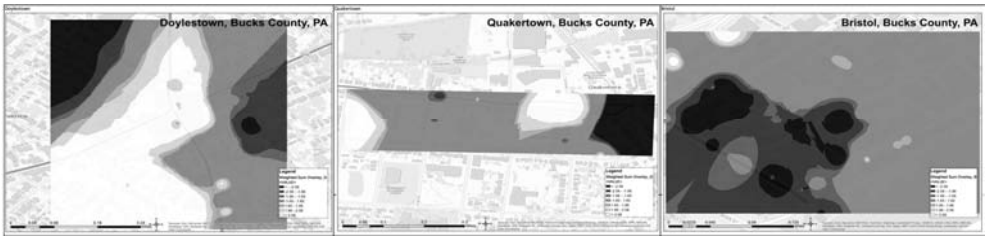
*. Correlation is significant at the 0.05 level (2-tailed).

In the case of Doylestown, time frame of construction (0.765) and architectural modification (0.751) had the strongest positive relationship with the total score and also show the strong positive relationship (0.600). Assessed value (0.527) also has a strong positive relationship while land use and building condition had no correlation with total score. The result of Quakertown shows a similar pattern with Doylestown. Time frame of construction (0.792) and architectural modification (0.735) had the strongest positive relationship with the total score. Assessed value (0.320) also had a moderate positive relationship. Land use change and building condition showed no relationship with the total score. In addition, time frame and architectural modification showed a strong positive relationship (0.739). However, land use change and assessed value had a negative relationship (-0.414). In the case of Bristol, time frame of construction (0.703) and land use change (0.653) had the strongest positive relationship with the total score. In addition, building condition (0.463) had a strong positive relationship. Architectural modification and assessed value showed no relationship with the total score. Moreover, land use change and building condition had a strong positive relationship (0.453) while time frame of construction and architectural modification also had a moderate positive relationship (0.360).

The cross case analysis was a spatial analysis, using Geographic Information Systems (GIS). The address of each structure was geocoded, attribute fields were added according to the survey analysis, neglected structures were mapped, and the Hotspot analysis tool and Inverse Distance Weighted (IDW) interpolation tool were used to spatially analyze the statistical significance of each variable examined. Larger z-scores indicated more intense the clustering of high values (hot spot = high neglect). While negative and / or smaller z-scores represented more intense clustering of low values (cold spot = low neglect). The IDW interpolation tool represented the combination of a set of surveyed points using cell values (ALLEN 2011). The results were analyzed individually per town for each variable and then combined using weighted sum overlays. This concept is based on the assumption that each feature has a relationship with its neighboring features.

While the statistical significance was based on p-value and z-scores for the Hotspot analysis, to effectively visualize the results, the Inverse Distance weighted (IDW) interpolation tool was used. Based on the IDW results, the portion of the study areas within each category was calculated. The result of the overlaid five variables analyses shows the red area (represented neglecting areas) and the blue area (represented the viable areas). Doylestown shows almost half of the study area represented viable areas (48.38%) while the neglected area is only 22.21%. Quakertown shows 24.18% of viable area and 18.37% neglected space. Bristol shows only 2.22% viable area while 37.58% area is neglected. Corollary, the overall rate of neglected structures was 25% for Doylestown, 30% for Quakertown, and 31% for Bristol.

Table 4: Output of the IDW and Percentage Breakdown



		Doylestown	Quakertown	Bristol
Black (Regenerate)	(<-2.58)	22.21%	18.37%	37.58%
	(-2.58 – -1.96)			
	(-1.96 – -1.65)			
Grey (In Transition)	(-1.65 – 1.65)	29.41%	57.45%	60.20%
White (Viable)	(1.65 – 1.96)	48.38%	24.18%	2.22%
	(1.96 – 2.58)			
	(>2.58)			
	Total	100.00%	100.00%	100.00%

4 Conclusions and Outlook

Results indicated as the amount of peripheral preserved farmland increased, the rate of demolition by neglect decreased, primarily due to the city's abilities to retain continuous land uses in structures and their increase in property values. Historic structures also tended to remain in a lower state of disrepair indicating lower vacancy rates and the ability to retain more heritage structures was increased as amount of preserved farmland increased. However, these conditions appeared to be dependent on high rates of land use change. Increases in the modification of the historic structures for maintenance purposes and high amounts of modern structures also indicated a necessary sacrifice in historic integrity for the purposes of viability.

While neglect does decrease as amount of preserved farmland increases, the particular impact on neglect is variable and fluctuates based on the town under investigation. Overall, time frame of construction and architectural modification showed the highest positive correlation with neglect. These two variables also showed strong positive correlations with one another. This suggests that the ability to retain historic structures and retain a low degree of alteration is key to preventing neglect. However, in cases where high vacancy rates are present, dilapidation sets in resulting in higher neglect. This indicates that while agricultural preservation may help the ability to retain existing historic structures and their core shape, populations and land use consistency are not specifically shown to always be positively impacted.

The Hot Spot Analysis identified areas within each city in need of regeneration. On average, around ¼ of each historic borough's historic fabric was undergoing some form of neglect, suggesting multiple adaptive reuse, retrofit, or renovation efforts are necessary to

stymie future demolition. Results from this analysis were also consistent with the hypothesis that as amount of agricultural preservation increased, the rate of neglect would decrease with Doylestown showing the highest amount of viable area followed by Quakertown and then Bristol.

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