

Project Report for
Property Value/Desirability Effects of Bike Paths
Adjacent to Residential Areas

prepared for

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and

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by

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Introduction

Studies and surveys in other parts of the country have shown that bicycle paths (trails, greenways) can contribute to areas where they are established by providing recreation, transportation, a sense of community, increased property values, and lower crime. On the other hand, in some cases with many new initiatives for the creation of walking and biking paths there is resistance by members of the community who worry that property values may be negatively impacted, that there will be loss of privacy, and the potential for more crime in their neighborhood. Success of bike and walking trail projects depends often on planners understanding and communicating what is known about the impacts of bike and walk ways in a community.

This project examined the literature and presents what is known concerning the impacts on property values with the introduction of bicycle paths and also presents some information about crime in relation to bicycle and pedestrian paths. In addition a statistical model was developed in this project using Delaware property data to examine the impact of bicycle paths on nearby housing.

In addition to being used by bicycles, “bike paths” are typically designated for use also by pedestrians, skaters, and other non-motorized uses and are typically referred to as paths, trails, or greenways. Bike lanes addressed in this project were for the most part, dedicated paths rather than portions of the public roadway simply striped or designated as a suggested bike way due to extra road width or shoulders. There is no information to suggest that a bike path designated as such by only the presence of a shoulder in the road would impact property values in Delaware as they are for the most part indistinguishable from the road corridor itself and are more a feature of the existing road rather than the neighboring properties.

Part One, Studies Addressing Impacts of Bike Paths

Some bike path initiatives around the country to create bicycle or pedestrian paths have been encouraged and facilitated by the local communities, while in other communities, such facilities have encountered resistance where residents fear that the introduction of a path or trail will lead to decrease in property values and/or increase in crime that would adversely effect the quality of life. Some property owners bordering proposed bike paths or greenways have shown opposition to trails in “their back yards”. There is a large debate as to whether pedestrian and bicycle trails effect property values and negatively impact the quality of life. Increasingly, projects such as “Rails to Trails” program, greenways initiatives, and a variety of bike path projects, site the need to address the economic impact question in order to gain crucial public support for their projects. A literature review was undertaken for this project to identify previous studies on the issue.

In the last two decades a number of studies covering a wide spectrum of bike path related issues at local, regional and national levels have been conducted. Federal Highway Administration (FHA) on the national level and various departments of transportation at state level are the major funding agencies for such studies. The following portion of this section explores studies related to the economic impacts of bike paths on property values.

Colorado Study

One of the most often referenced studies is “The Effect of Greenways on Property Values and Public Safety”^{*} in Colorado. It involves a survey of residents adjacent to a variety of trails in Metro-Denver. This study found that the effect of the trails on neighboring property was beneficial rather than detrimental. For residents of single family homes adjacent to the trail, 29% of residents believed that location of the trail would increase the selling price of their homes. 7% of the residents felt that the trail would make the home easier to sell, 29% were positively influenced by the trail in their decision to buy their

^{*} “The Effect of Greenways On Property Values and Public Safety”, A Joint Study by : The Conservation Fund and Colorado State Parks State Trails Program, Colorado State Parks, State Trails Program, Sydney Shafroth Macy, Stuart H. Macdonald, March 1995.

home. For residents of town homes, apartments, and condominiums adjacent to the trail, 42% felt it would increase the selling price of their home and 17% were influenced by the trail to move to the area. No public safety issues could be directly linked to the trail. Police interviewed as part of the study doubted there was a concern for public safety during day light hours due to the constant passage of people on or around the trails.

Burke-Gilman Trail Study

Another study examining a trail's effect on property values is outlined in evaluation of the Burke-Gilman trail's effect On Property Values and Crime** in Seattle metropolitan area. The Burke-Gilman trail is an 8 to 10 foot wide, 12.1 mile, multipurpose trail that follows an abandoned railroad right of way and passes through residential neighborhoods. Data was collected via telephone by interviewing, residents near and adjacent to the trail, real estate agents who buy and sell homes near the trail, and police officers who patrol neighborhoods adjacent to the trail. According to real estate agents, property near but not immediately adjacent to the trail is significantly easier to sell, and on average sells for six percent or more. Property immediately adjacent to the trail, however, is only slightly easier to sell. Almost two thirds of the residents felt the trail increased the quality of life in the neighborhood and there is a very high level of public acceptance and support for the trail. The study concluded that concerns about decreased property values, increased crime, and a lower quality of life due to the trails was unfounded, and in fact the opposite was true, that multi-use trails are an amenity that help sell homes, increase property values and improve the quality of life.

The National Association of Reversionary Property Owners (NARPO)

The National Association of Reversionary Property Owners (NARPO) is “a group of property owners who have joined together to educate all landowners in the United States about the true ownership of railroad, utility, road and other governmental types of Rights-Of-Way (ROW).” (<http://home.earthlink.net/~dick156/row.htm>) The group argues that groups, in particular rail-to-trail groups, are unconstitutionally taking abutting property

** “Evaluation Of The Burke-Gilman Trail's Effect on Property Values and Crime” , Seattle Engineering Department and Office of Planning, Gary Zarker, James M. Bourey, May 1987

ownership rights to abandoned right of ways. They argue that none of the rail trails have been beneficial for abutting property owners, and that some have disturbed property owners both emotionally and economically. NARPO is a very staunch opponent to trails programs. The NARPO website brings attention to news and court decisions about property rights, references studies that show that owning land near or next to a trail or park devalues property, and includes a large list of references from the national news media that week by week site crimes in parks and on trails. The view one would get from this group is that all pedestrian trails are very dangerous and generally of no benefit except to about 1% or so of the population many of whom are deviants or perverts, or at least persons that should get exercise or outdoor exposure in another manner, and that the paths exist at the expense of endangered local populations and trampled property rights.

NARPO studied the Burke-Gilman Trail and property values and refuted claims of a study done by the Seattle Engineering Department. The NARPO study focused on properties next to the trail and showed that property values along the trail corridor had declined or had not risen in value similar to what comparable properties had between 1979 and 1988. Between 1988 and 1997 the abutting, adjacent properties had increased by about 100% but this was not as much as the 140% increase sited for similar properties in the area. NARPO argues that the only reason for differences in figures was due to the presence of the trail. Perhaps this is an example where property values were affected negatively. Figures were based on the assessed value of the land as kept by the assessment office rather than the total value of the property or actual selling prices. The truth of such an analysis would depend on the frequency and method of reassessment. Some assessment offices are known for keeping figures that are out of date, and sometimes not reflective of actual selling price, and non-suitable for certain kinds of analysis.

Omaha Study

Omaha, Nebraska has developed a system that contained 67 miles of paved recreational trails in the year 2000 with 35 miles scheduled for completion by 2008. A study of the impact of trails on property values and public safety was conducted, focusing on residents

living within one-block of each of three targeted trail segments. A telephone and mail survey addressed three distinct issues of interest: property values, public safety, and trail use.* In regards to impact of the neighboring trail on the sale of a home, 81% of the residents near the trail felt that the trail would have a positive effect or no effect on the sale of their homes, with only 2% saying it would be more difficult (20% don't know). A clear majority of residents (63.8%) who bought their homes after the construction of the trails reported that the trail had positively influenced their purchase decision with no respondents saying that the trail negatively influenced their decision. 77% of those surveyed said that the trail increased their quality of life with only 2% saying it decreased quality of life. More positive responses were found in neighborhoods with newer and higher priced housing. In older sections of Omaha the trails generated a more guarded optimism.

Portland Study

An independent study examined the effect of environmental zoning and natural resource amenities on property values in Portland, Oregon.** This study estimated that the location of a trail within 200 feet of a property would on average decrease a property's sale price by 6.8%. The report suggest that the negative trail effect might reflect the types of trails included in the study which were primarily large regional trails many of which are located along rail rights-of-way that are located in or close to industrial areas. The report recommends analysis that includes a factor for proximity to industrial areas to determine if that was a factor influencing the analysis.

City of Vancouver

In the City of Vancouver attempts were made to determine whether the assessed value and selling price of homes in three study areas had changed due to their location on a bikeway. An opinion survey was mailed to 250 real estate agents with 66 responding.***

* Omaha Recreational Trails: Their Effect on Property Values and Public Safety, Donald L. Greer, University of Nebraska at Omaha, June 2000

** "The Effect of Environmental Zoning and Amenities on Property Values: Portland, Oregon, City of Portland Bureau of Planning, May 2003, by Noelwah Netusil, Reed College

*** City of Vancouver, Bicycle Plan 1999. Reviewing the Past, Planning the Future, 5.1.8 Bikeways and Property Values

Results of the survey indicate that 85% of realtors feel that bicycle routes are an amenity to the community around them and that 65% would use the route as a selling feature of the home. Respondents indicated that the presence of a bike route has no effect on the selling price of the homes or on their ease of sale.

Monmouth County

In Monmouth County, information distributed on the county parks website concerning the development of the Hudson Trail provided the following answer to the question of “How will the trail effect property values?”.

“ Existing studies of the effect of trails on property values have been statistically varied and inconclusive. For example, individuals opposing and supporting the trail have referenced the same study as proving that trails do and do not adversely affect property values. Few real estate features are universally appealing or repulsive. Prospective homebuyers may find the trail an asset while others may view it as a liability. The corridor is and has been a public right-of-way since the late 1800s with portions of this line active as recently as 1979. A well-managed recreation facility is more likely to be a better neighboring land use than either an abandoned and unkempt property or an active rail line. Part of the Park System's mission is to provide a range of quality regional recreational services, programs, and places that can enhance and enrich the lives of the people in Monmouth County. Trails are an important component of a comprehensive, well-rounded regional park system. Walking, running, hiking, skating, and biking are recreational uses popular with and available to people of all ages, skills and socioeconomic levels. These activities encourage and reinforce healthy lifestyles among our citizens..... The Park System has met on request with 21% of the trail neighbors to consider and evaluate individual property situations. Staff is addressing those concerns on an individual basis..”

(http://www.monmouthcountyparks.com/parks/faq_hudson_henry_trail.asp)

Bush Creek Trail

A study at Bush Creek trail, Santa Rosa, California to determine the impact of a bicycle/pedestrian trail on property values and crime surveyed 75 property owners, as well as apartment and mobile home park managers near the trail, real estate agents, and law enforcement agencies. Fifteen other cities were contacted for information on surveys regarding the effect of trails on property values and crime* . The study shows neither

* “The Impact of the Brush Creek Trail on Property Values and Crime”, Santa Rosa, CA, Michelle Miller Murphy, Sonoma State University, April 13, 1992.

increased crime nor decreased property values due to trails. The overwhelming opinion was that the trail had a positive effect on the quality of life of the neighborhood. Sixty one percent of real estate agents said they use proximity to trails as selling points. The survey of cities showed only a small number of minor infractions such as illegal motorized vehicles, litter, and unleashed pets. 33% of residents said the trail would make their homes easier to sell, with 48% saying no effect. 23% said the trail would make their home sell for more, with 69% saying “no effect”.

Rails To Trails Conservancy

The Rails To Trails Conservancy conducted a survey of 372 trails representing a diverse set of trail types, lengths, and geographic locations from 38 states. The motivation for the study was to address the wide range of safety concerns that local residents often voice during the development phase of a trail’s introduction. The study sites how often trail opponents refer to stories of trails attracting drug dealers, murderers, and rapists with only a handful of newspaper headlines to back up their assertions rather than empirical research. While referencing many studies that have shown that trails have not caused any increase in crime, the study goes much further by providing incident statistics for years 1995 and 1996 and comparing these to national crime rates. The study shows that occurrence of major crimes committed affecting the estimated 5 million trail users across the country, is vastly below national rates for those crimes. For somewhere between 10 to 15% of the trails surveyed, the types of problems that were most often associated with trails are litter, illegal motor vehicle use, and disruptive noise (almost half of the users surveyed said these were not problems at all.) Figure 1 shows statistics for major crimes.

This study concludes that crime on rail-trails is minimal and must be considered in perspective with risks associated with other activities. The way to minimize crime on trails is to ensure that users exercise proper safety precautions, keep the trail well maintained, and boost trail use.

Figure 1, Comparison of Major Crime Rates between Rail Trails and the Nation
(rates per 100,000 population), Source: Rails To Trails Conservancy.

CRIME	URBAN		SUBURBAN		RURAL	
	1995 National ¹	Rails-Trails ²	1995 National ¹	Rails-Trails ²	1995 National ¹	Rails-Trails ²
Mugging	335	0.53	102	0.00	19	0.0
Assault	531	0.58	293	0.02	203	0.01
Forcible Rape	43	.04	29	0.00	26	0.01
Murder	11	.04	4	0.01	5	9.01

1. Rates per 100,000 Population. FBI Uniform Crime Reports for 1995

2. Rates per 100,000 users, RTC survey results 1995

Three Trails Studied by the National Park Service

Three trails were studied by the National Park Service, The Heritage Trail, a 26 mile rural trail in Iowa, the St.Marks Trail, a 16 mile paved trail passing through small communities and forests in Florida, and the Lafayette/Moraga Trail a 7.6 mile paved trail 25 miles east of San Francisco that passes through developed suburban areas. Goals were to explore benefits of rail-trails to their surrounding communities, examine effects on adjacent and nearby property values, determine the types and extent of trail-related problems experienced by trail neighbors, and to develop a profile of trail users. Usable mail surveys were obtained from 1,705 trail users and 663 property owners, and interviews with 71 realtors and appraisers were conducted*.

Overall , trail neighbors had experienced relatively few problems as a result of the trails over the year of the survey. Problems reported were mostly unleashed and roaming pets, litter, and illegal motor vehicle use. The majority of owners reported that there had been no increase in problems since the trails had been established, and that living near the trails was better than living near the unused railroad lines before trails were constructed.

* The Impacts of Rail-Trails: A Study of the Users and Property Owners From Three Trails, by Rivers, Trails, and Conservation Assistance Program, National Park Service, Washington, D.C. February 1992

Landowners along all three trails reported that their proximity to the trails had not adversely affected the desirability or values of their properties. Of those who purchased property along the trails after the trails had been constructed, the majority reported that the trails either had no effect on the property's appeal or added to its appeal. The vast majority of real estate professionals interviewed felt the trails had no negative effect on property sales adjacent to or near the trails. Trail users and landowners reported that the trails benefited their communities in many ways. Health, fitness, and recreation opportunities were considered the most important benefits by the landowners, and health fitness, aesthetic beauty and good use of undeveloped open space were benefits most cited by users. The rates of occurrence and seriousness of problems affecting those living adjacent to the trails were relatively low.

National Parks Service, Economic Impacts of Rivers, Trails and Greenways

The National Parks Service provides information to help those promoting trails address the effects on property values** and references to studies and quotes from this literature follow. The information primarily focuses on parks. A few studies dealing with trails and greenbelts are referenced and mentioned below. While referencing many positive effects the information also references the possible effect of decrease in property value due to proximity to highly developed parks with nuisance factors. "Increases in nearby property values depend upon the ability of developers, planners and greenway proponents to successfully integrate neighborhood development and open space. Designing greenways to minimize potential homeowner-park user conflicts can help avoid a decrease in property values of immediately adjacent properties." The same could be assumed about bicycle trails, proper planning to address issues is crucial to a successful result.

In 1995 American Lives, Inc conducted research for the real estate industry, and it was found that 77.7% of all home buyers and shoppers in the study rated natural open space as either "essential" or "very important" in planned communities. Walking and bicycling paths ranked third. A study of property values near greenbelts in Boulder, Colorado,

** "Economic Impacts Of Rivers, Trails and Greenways", National Parks Service, <http://www.nps.gov/pwro/rtca/propval.htm>

noted that housing prices declined an average of \$4.20 for each foot of distance from a greenbelt up to 3,200 feet. In one neighborhood, this figure was \$10.20 for each foot of distance. The same study determined that, other variables being equal, the average value of property adjacent to the greenbelt would be 32 percent higher than those 3,200 feet away (Correll, Lillydahl, and Singell, 1978).

In a survey of adjacent landowners along the Luce Line rail-trail in Minnesota, the majority of owners (87 percent) believed the trail increased or had no effect on the value of their property. Fifty six percent of farmland residents thought the trail had no effect on their land values. However, 61 percent of the suburban residential owners noted an increase in their property value as a result of the trail. New owners felt the trail had a more positive effect on adjacent property values than did continuing owners. Appraisers and real estate agents claimed that trails were a positive selling point for suburban residential property, hobby farms, farmland proposed for development, and some types of small town commercial property (Mazour, 1988).

A survey of Denver residential neighborhoods by the Rocky Mountain Research Institute shows the public's increasing interest in greenways and trails. From 1980 to 1990, those who said they would pay extra for greenbelts and parks in their neighborhood rose from 16 percent to 48 percent (Rocky Mountain Research Institute, 1991).

Marion County

A study by Lindsey et al. in the year 2004 used hedonic pricing models to determine property values and recreations values as related to urban greenways. *Residential real estate sales data from 1999 was used. Some but not all greenways studied showed a positive, significant effect on property values ranging from 2 to up to 14 percent (Monon Trail) of the sales price. For other trails studied, being within a half mile of a trail or greenway had a negative but insignificant effect on property values, so the effect of a particular nearby trail or greenway is expected to vary. The study concludes that the

* "Property Values, Recreation Values, and Urban Greenways", Gregg Lindsey, Joyce Man, Seth Payton, Kelly Dickson, Journal of Park and Recreation Administration, Fall 2004, Volume 22 Number 3, PP 69-90

results are in line with opinion-based findings which indicate that greenways generally have positive or neutral effects on property values with quantitative measures based on a large sample of real estate transactions. While the magnitude of benefits may be of issue, from a policy perspective in response to concerns about ill effects of greenways or recreational areas, it seems clear that the trails do not have significant adverse effects.

Other Studies

Crompton^{**} in 2001 looked at nine studies that addressed the impact of greenway trails on property values and noted a broad consensus that trails have no negative impact on either a property's value or ease of sale. One study found that lots adjacent to a trail in a development sold for higher prices than lots not bordering the trail. Eight of these studies were attitude and opinion studies though with the prevailing sentiment being that trails have a neutral impact on the value of a property.

Summary Opinion of Research Review

The majority of studies indicate that the presence of a bike path/trail either increases property values and ease of sale slightly or has no effect. Studies have shown that neighbors of many bike paths/trails feel that the quality of life of their neighborhood has been improved, that the trails were a good use of open space, and in the case of abandoned railways were an improvement from before the trails went in. There is definitely a large portion of the population that sees bike paths as an amenity and will seek out residences near trails, parks, and other natural resource areas. Some studies express that those recently moving into areas near bike paths are generally more favorable to the paths than those who have lived in neighborhoods before the construction of a trail. In some areas a large majority of neighbors are very happy with the trails, even some who were originally opposed to their construction.

^{**} Crompton, J.L. (2001). "Perceptions of how the presence of greenway trails affects the value of proximate properties." *Journal of Park and Recreation Administration* 19(3) 114-132

There are some who say the properties values of those bordering/abutting trails are negatively affected by the presence of trails and there are a couple studies that indicate that trails have a negative effect on property value and quality of life. There is a distinction between being “near” the trails and “on/abutting” the trail, and some argue that previous studies did not focus exclusively on those on the trail but rather nearby (like within a few blocks away). The most opposition to trail development comes from those who will border a trail, who are concerned with potential decreased privacy, safety, and property values. Many of the studies involved surveys and opinion polls of residents and this is less preferred than a study that looks at and compares actual housing sale values. As buyers and there preferences are realized in housing prices this survey data is of value though. From a policy standpoint when faced with concern over new bike path projects the answer would seem to be that bike paths have no effect on housing values or a very small to insignificant effect, usually positive, and there are other determining factors such as the design and maintenance plan.

Crime on trails and parks certainly could effect people’s perception of an area and would make property less desirable. Types of problems that were most often associated with trails are litter, illegal motor vehicle use, and disruptive noise. Crime on bike and pedestrian trails is minimal and must be considered in perspective with risks associated with other activities. The amount of crime present in and around recreational facilities is often very correlated with the amount of crime in the neighboring area.

Development of a trail must have a clear plan for maintenance and addressing issues. A poorly planned facility can cause problems, as much as a well planned one can improve the quality of life in a neighborhood and make an area a more desirable place to live. Perhaps the most relevant comment is from the National Parks Service in reference to parks and greenways: “Increases in nearby property values depend upon the ability of developers, planners and greenway proponents to successfully integrate neighborhood development and open space. Designing greenways to minimize potential homeowner-park user conflicts can help avoid a decrease in property values of immediately adjacent properties.”

PART TWO, An Examination of Impact Using Delaware Data

Bike paths are valued for their discrete characteristics and the benefits they provide. These benefits include but are not limited to recreation, health benefits, alternate transportation routes, conservation and biodiversity, economic development and aesthetic amenities. A variety of models are used to measure the utility derived from the different uses. For example, the recreational value evaluating the use of bike paths for walking, jogging, cycling, skating or nature observation is often valued using the travel cost methods. The effect of bike paths on property prices, i.e. reflecting people's willingness to pay for the amenity values provided by the facility, has been evaluated through the use of the hedonic price method using statistical analysis of property values. Other models have also been used to study the impact of bike paths. Of the different amenities, this study focuses on the impact of bike paths on property prices. Having reviewed studies found in the literature of the impact of bicycle paths on property values, the next step in this study was to determine what could be found using data specific to Delaware.

The methodology for this study combines the use of Geographical Information Systems (GIS) with a hedonic pricing model. A Hedonic pricing model is a revealed preference model which means that preferences for environmental goods can be inferred from observed behavior in actual market transactions. Revealed preference methods draw statistical inferences on values from actual choices people make within the market. For instance, if air quality varies throughout the city, what can the variation in property prices tell us about how people value clean air? Hedonic pricing models, also commonly known as property value models, are used to infer the premium that households pay to purchase a property near an environmental amenity or away from an environmental dis-amenity. In this project the value of the environmental quality 'revealed' in property values is the proximity to the bike paths. Hedonic price models have been deployed extensively in housing market research.

In absence of a comprehensive bike path map for Delaware, the first step was to delineate bike paths in the State. ESRI ArcGIS software was used to map the bike routes. Bike path

data was obtained from the Center for Applied Demography and Survey Research (CADSR) at the University of Delaware, the Delaware Department of Transportation (DelDOT), and Whitman, Requardt & Associates, a Baltimore based consultant hired by DELDOT to create a bike map for the State. The data was based primarily on information from three different sources; greenway data from the Delaware Department of Natural Resources and Environmental Control (DNREC), the metropolitan planning organization for the New Castle County, DE, and Cecil County, MD (WILMPCO), and a bike path facility from Newark Bicycle Plan digitized into GIS. Mapping showed that most of the existing bike paths are located in New Castle County. From a sampling perspective, a decision was made to only consider bike paths in New Castle County. Figure 2 shows a map of the bike paths in the State and shows the concentration of the bike paths in New Castle County.

The second layer to be added to the bike path project was the tax parcel map for New Castle County, obtained from New Castle County Department of Planning. The mapping of bike paths and tax parcels set the stage for further analysis. Since, only tax parcels adjacent to, and in close vicinity of the bike paths are relevant for this project, the tax parcels in a 50 meter buffer range were outlined and included for analysis, while the rest of the tax parcels were removed from consideration. Fifty meters is a smaller buffer size than as used in other studies and was expected to include a larger percentage of properties that would abut the path. Property data for New Castle County Tax parcels was accessed from Center for Applied Demography and Survey Research (CADSR) at the University of Delaware. The dataset included 63 variables and more than 150,000 data entries. Only variables that highlighted the characteristic of the housing property and its proximity to the bike path were included in the dataset. Some of the important independent variables included in the dataset are listed in figure 4:

Figure 2: Bike Path Map of Delaware

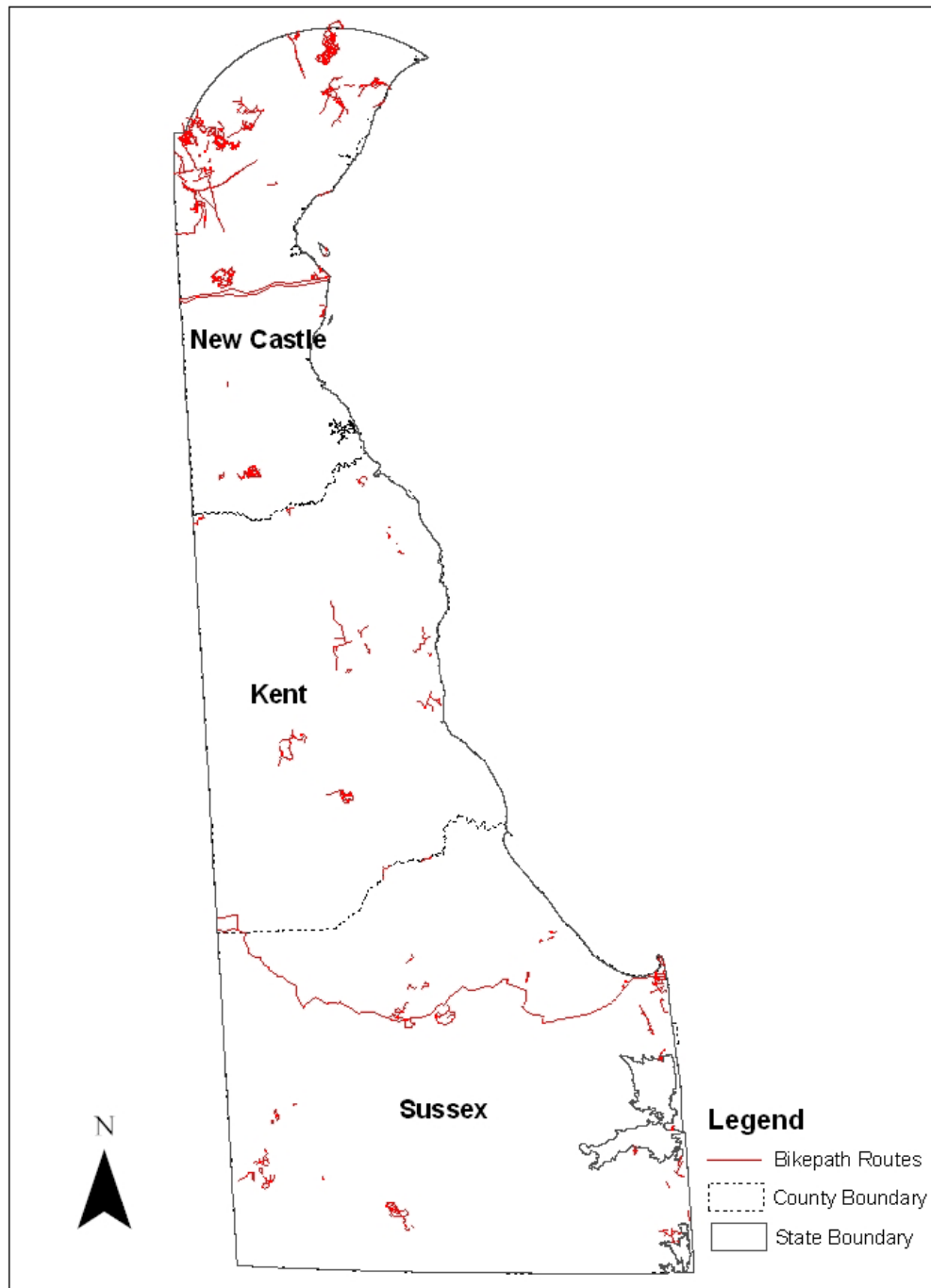
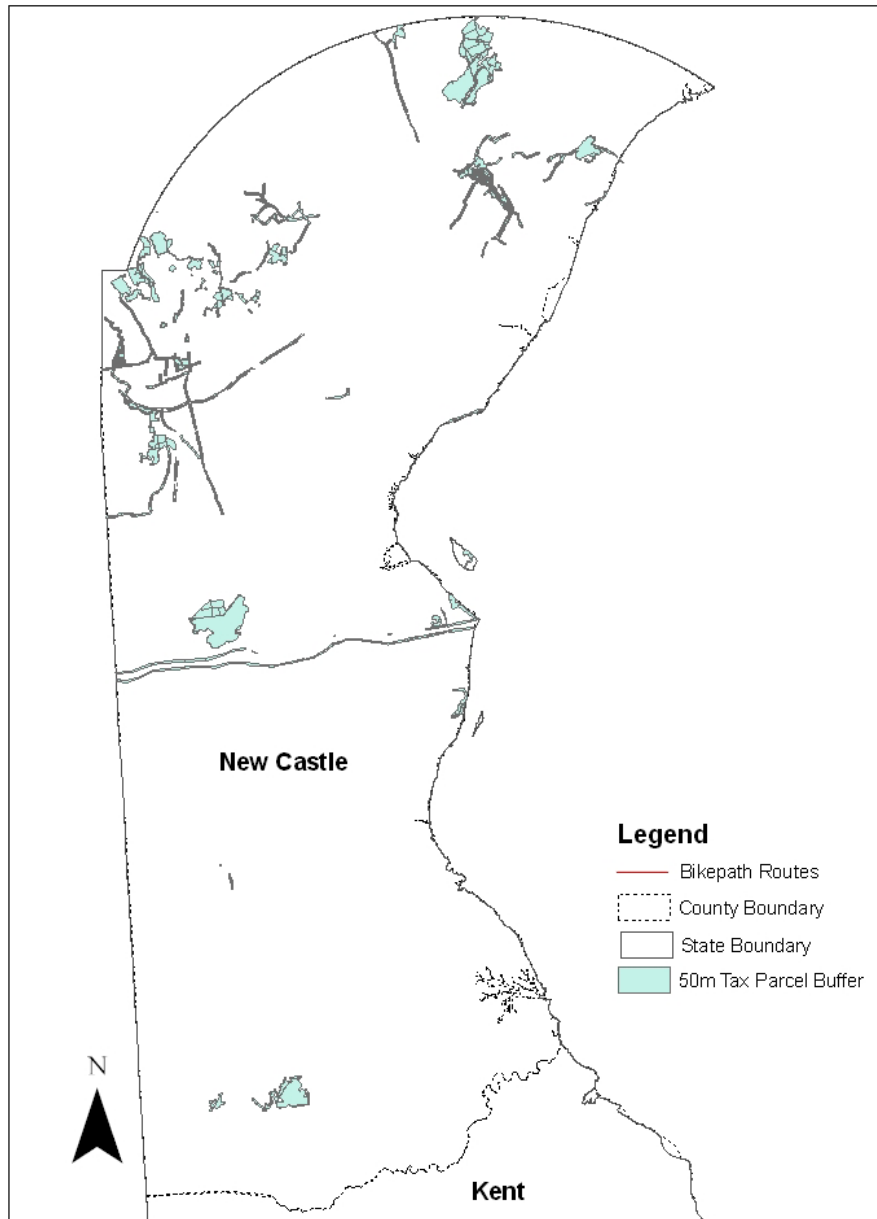


Figure 3: Tax Parcels within 50m buffer of Bike Paths In New Castle County



In this modeling effort the dependent variable is the dollar amount for which the property was last sold. Factors that would effect the dependent variable are the independent variables. Independent variables included in the database as listed in Figure 4 below were chosen because they have been shown to be correlated with price in previous studies or because they theoretically are believed to influence price.

Figure 4, Variables Used In The Analysis

Independent Variable	Unit/ Notes
PARCELID	Parcel Identification number
CITY	City
PZIP	Zip Code
ACRES	Acreage of Property
LAND	Land Value in \$
BLDG	Building Value in \$
TOTASS	Total Assessment in \$
TAXASS	Tax Assessment in \$
SALE1	Latest Sale Price
SALE1D	Latest Sale Date of Property
YEARBUILT	Year property was built
NSTORIES	Number of Stories
TOTROOMS	Total Number of Rooms
NBEDROOMS	Number of Bedrooms
SALE1AGE	Age of Building at Sale1
BIKEFLAG	Dummy Variable 1- adjacent to bikepath or 0

The variables used in the model are further described below.

1. PARCEL ID: Tax parcel identification number is a unique number given to each tax parcel. In Delaware, PARCEL ID is a six digit number.
2. CITY: This independent variable indicates the city in which the tax parcel is present. In a regression analysis, controlling of all other independent variables, some cities have a positive influence on the dependent variable sales1, while some cities exhibit a negative effect.
3. PZIP: This variable indicated the zip code of the property.
4. ACRES: The independent variable ACRES, indicates the lot size. The lots size influences the property price, the larger lot sizes have positive influence on dependent variable.

5. LAND: It indicates the assessed value of land in dollars. It displays positive correlation with the dependent variable.
6. BLDG: Indicates the assessed value of the building. It exhibits a positive correlation with the dependent variable sales1. As the building value increases, the variable sales1 also increases.
7. TOTASS: Total tax assessment of the property in dollars. The tax assessment in dollars and prices are positively correlated.
8. YEARBUILT: The year in which the housing stock on the property was built. In most cases, latest the housing stock, higher the sale value of the property.
9. NSTORIES: Number of stories of a property. The relationship between this independent variable and the property prices is ambiguous. Higher number of stories may not always translate into greater sales value.
10. TOTROOMS: Indicate the total number of rooms in the property. This independent variable exhibits a positive correlation with property prices; greater the number of rooms, higher the sales price.
11. NBEDROOMS: The number of bedrooms. Larger the number of bedrooms, higher is the sale values of the property, indicating a positive correlation between the two values.
12. SALE1AGE: This independent variable indicates the age of the building at sale1. There is a negative correlation between the dependent variable and the independent variable. The lower the sale1age, the higher the sales value.
13. BIKEFLAG: A dummy variable bikeflag was created to assess the proximity of the property to a bikepath. Variable '1' indicates that that property abuts a bikepath and variable '0' indicates the absence of a bikepath in its proximity.

The PARCELID from the GIS bike path map was merged with the property data to show the properties adjacent to the bike paths. The BIKEFLAG variable with value 0 indicated properties not within 50m buffer of a bike path, and value 1 for adjacent properties. Only properties within 50m of bike paths were further considered for the project.

A new variable called YEAR1 was introduced in the dataset. This variable was obtained by truncating the SALE1D date variable. The variable 'YEAR1' was the latest year for sale of the property. Subsequently, another variable called SALE1AGE was introduced. This variable represented the number of years since 2005, when the latest sale was conducted. Since, this project is focused towards the impact on residential properties, any property with more than 3 stories was deleted from the dataset.

In the next step the ratio of total assessment and latest sale price was calculated. For the obtained ratio, 25th, 50th and 75th quartiles were calculated. Values between the 25th and 75th were included in the database, while the outlier values were deleted. These steps resulted in a final dataset with 909 properties adjacent to the bike paths in New Castle County. The entire dataset used in the model contained information on 48,657 properties. The mean and standard deviation of these properties are listed in the figure below.

Figure 5. Mean and standard deviation of the properties adjacent to bike paths.

	Land Value \$ (per acre)	Building Value \$	Latest Sale Price \$	Year Built	Total Rooms	Number of Bedrooms	Acreage of Property (in acres)
N	909	909	909	909	909	909	909
Mean	15465	66626	197117	1957	7.2	3.4	.28
Std. Deviation	9778	36680	123842	37	1.7	.9	.38

The large standard deviation for latest sale price, land value, and building value signifies the broad range of properties included in the analysis. The mean age of properties is 49 years with a standard deviation of 37 years.

Dependent Variable

The dependent variable is 'SALE1', indicating the dollar amount for which the property was last sold. This variable corresponds with the YEAR1 variable, the latest year in which the property was last sold. The independent variables such as CITY, ACRES, YEARBUILT, NSTORIES, TOTROOMS, NBEDROOMS influence the dependent variable. The data for dependent variable was obtained from the property

assessment files at Center for Applied Demography and Survey Research (CADSR), University of Delaware.

The next step was to run the regression models for dependent variable, 'SALE1' and the independent variables. To gauge the influence of these factors on latest sales price, different independent variables are controlled in different models.

Examination of Data and Results

The analysis indicates that the impact of proximity to a bike path on property prices is positive, controlling for the number of bedrooms, years since sale, acres, land, buildings, total number of rooms, total assessment. The properties within 50m of the bike paths show a positive significance of at least \$8,800 and even higher when controlled for specific variables. The hedonic pricing model also demonstrates that the other variables show significant influence in the expected direction. Number of acres, land assessment, building assessment, total number of rooms, and number of bedrooms all show positive and significant impact of property prices.

Figure 6. Model Summary

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	19638	1565		12.542	.000		
Acres	4248	1395	.011	3.044	.002	.682	1.466
Years since sale	-1996	75	-.078	-26.269	.000	.979	1.021
Bikeflag	8886	2189	.012	4.059	.000	.994	1.006
Number of Bedrooms	193	502	.001	.385	.700	.719	1.391
Land	2.1	.075	.136	27.975	.000	.362	2.764
Bldg	2.21	.018	.635	124.872	.000	.330	3.027

Dependent Variable: sale1

An example of an application for the model is as below for a particular set of values

Constant	19,638		
Acres	0.5	*	4248
Year since sale	10	*	-1996
Bike path flag	1	*	8886
Num Bedrooms	4	*	193
Land value	30,000	*	2.1
<u>Building value</u>	<u>155,000</u>	<u>*</u>	<u>2.2</u>

Estimated last sales value = \$415,460

The number of bedrooms variable in the model has little effect as that effect is taken care of in the building value variable. Likewise the acres variable has little effect because it is related to the land value. The years since sale effect is negative as expected since housing prices generally rise over time.

These variables and their effects could be debated and other more detailed models could be developed to estimate property value, but the focus of this effort is in determining the effect of proximity to a bike path. This analysis showed that the presence of a bike path has a significant effect and it is relatively small and positive. The median latest sale price in the sample was about \$200,000, so the effect of a bike path in the proximity would be about 4 percent. These results are consistent with studies by Correl, Crompton, Lindsey, and the National Parks service.

Conclusion

This project performed a literature review of past information and studies concerning property values related to the presence of bicycle and pedestrian paths. In addition Delaware property values were examined to determine how the presence of a bicycle path may affect property values.

Bike facilities are typically also for pedestrians, skaters, and other non-motorized uses and are typically referred to as paths, trails, or greenways. Bike lanes addressed in this project were for the most part, dedicated paths rather than portions of the public roadway simply striped or designated as a suggested bike way due to extra road width or shoulders.

The majority of studies examined indicate that the presence of a bike path/trail either increases property values and ease of sale slightly or has no effect. Studies have shown that neighbors of many bike paths/trails feel that the quality of life of their neighborhood has been improved, that the trails were a good use of open space, and in the case of abandoned railways were an improvement from before the trails went in. There is definitely a large portion of the population that sees bike paths as an amenity and will seek out residences near trails, parks, and other natural resource areas. Some studies express that those recently moving into areas near bike paths are generally more favorable to them than those who have lived in neighborhoods before the construction of a trail. In some areas a large majority of neighbors are very happy with the trails, even some who were originally opposed to their construction. Whether or not a bike path is generally beneficial for a locale depends on a number of factors.

Opponents to bike path and trail projects often say that property values will be adversely affected but there is not much evidence of this. The National Parks Service hits the mark when they say, "Increases in nearby property values depend upon the ability of developers, planners and greenway proponents to successfully integrate neighborhood development and open space. Designing greenways to minimize potential homeowner-park user conflicts can help avoid a decrease in property values of immediately adjacent

properties.” There are numerous examples in the literature that indicate overall success depending on attention to design and maintenance and addressing issues and problems with property owners promptly.

A model developed in this project that examined factors affecting property values in Delaware and the effects of proximity to a bike path show that a bicycle path would be expected to slightly increase property values by about \$8,800.

Related to property values is crime, and information about crime near or on bike paths is referenced in this report. Crime happens in most types of land use (e.g. parking lots, college campus, abandoned railway, street corner, stores, wooded areas, industrial parks, private homes etc) and with any recreational facility the level of crime typically is correlated with the level of crime in the surrounding area and the design of the facility. A well-managed recreation facility is more likely to be a better neighboring land use than an abandoned property. This study concludes that crime on bike paths is minimal and must be considered in perspective with risks associated with other activities. The way to minimize crime on trails is to ensure that users exercise proper safety precautions, keep the trail well maintained, and boost trail use.

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