

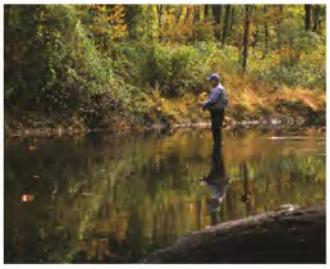





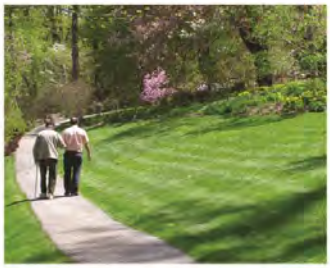


The Economic Value of Protected Open Space

in Southeastern Pennsylvania

Produced for:

GreenSpace Alliance

Delaware Valley Regional Planning Commission

By:

Economy League of Greater Philadelphia

Econsult Corporation

Keystone Conservation Trust

November 16, 2010

First Edition

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Acknowledgements

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The Economic Value of Protected Open Space

In Southeastern Pennsylvania

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es Executive Summary

Protected open spaces – public parks, preserved farmland, and private conserved lands – provide substantial economic, environmental, and public health benefits to surrounding communities. These benefits, however, are generally not well understood and are often undervalued in policy debates and investment decisions. In the interest of fostering a better understanding of these benefits, this study estimates the economic value generated by protected open space in southeastern Pennsylvania.

Approximately 14 percent of the land area in Bucks, Chester, Delaware, Montgomery, and Philadelphia counties is protected open space. This area includes parks and trails such as Ridley Creek State Park and the Schuylkill River Trail, working farms across southeastern Pennsylvania, and private land trust owned or eased lands.

Building off of previous valuation studies and using standard economic analysis techniques, this study estimates the value of protected open space in southeastern Pennsylvania by measuring impacts across four areas: (1) the effects of protected open space on residential property values, (2) the value associated with environmental services provided by southeastern Pennsylvania's protected open spaces, (3) the value of recreational activity on protected open space and associated avoided health-care costs, and (4) jobs and revenue created as a result of activity on and connected to protected open space.

This analysis indicates that protected open space adds significant value to the regional economy (see right), with benefits accruing to businesses, governments, and households. The economic benefits generated by protected open space accrue in different ways – some are direct revenue streams to individuals or governments, some represent asset appreciation value, some accrue in the form of avoided costs. Because these values differ in nature, the estimates in this study should not be added together to produce a single aggregate value of protected open space in southeastern Pennsylvania.

The estimates presented in this study should provide elected leaders, policy makers, and the general public with new perspective on the value of protected open space and contribute to informed decisions concerning future development in southeastern Pennsylvania. It is important to note, however, that this study does not analyze the costs associated with acquiring, preserving, or maintaining land as protected open space, and does not represent a cost-benefit approach.

This study estimates the economic value of protected open space in southeastern Pennsylvania by measuring impacts across four areas: property values, environmental services, recreation and health, and economic activity. Top findings include:

$16.3 billion
added to the value of southeastern Pennsylvania's housing stock

$240 million
in annual property and transfer tax revenue for local governments

$133 million
in costs avoided as a result of the natural provision of environmental services

$577 million
in annual benefit for residents who recreate on protected open space

$795 million
in annually avoided medical costs as a result of recreation that takes place on protected open space

6,900 jobs
created on or as a result of protected open space in the five-county region

Property Values

Homeowners are willing to pay a premium to live in close proximity to protected open space. As a result, southeastern Pennsylvania's existing open space adds to the overall value of its housing stock. This increased wealth is captured by citizens through higher sales values of homes near protected open space, and also generates increased government revenues via larger property tax collections and transfer taxes at time of sale. This study analyzes approximately 230,000 home sales in the five counties of southeastern Pennsylvania from 2005-2009 to estimate the effect of protected open space on residential property values and the attendant fiscal impacts. Results indicate that proximity to open space contributed a significant positive impact to residential property values both before and during the economic downturn that began in 2008. Key findings include:

$16.3 billion added to the value of southeastern Pennsylvania's housing stock

Homes in southeastern Pennsylvania as far as one mile away from protected open space capture a measurable increase in their value as a result of this proximity. When added together, the increments of value that homes in southeastern Pennsylvania capture as a result of their proximity to open space total $16.3 billion dollars.

$240 million in annual property and transfer tax revenues

By increasing the value of homes within a one-mile radius, protected open space also increases the amount of property taxes and transfer taxes that local governments and school districts receive in southeastern Pennsylvania. These increased property and transfer tax revenues equal $240 million in total per year.

Who Benefits?

Households

Nearby protected open space increases home values, resulting in increased home equity and wealth captured when the home is sold.

Governments

Property value increases attributed to nearby open space result in higher property and transfer tax revenues for local governments.

Environmental Services

Protected open space also provides value in the form of naturally occurring environmental processes. If these lands were developed, southeastern Pennsylvania would be forced to replicate vital and costly services such as flood control and air pollution mitigation through alternative methods. In relying on the natural landscapes on protected open spaces to provide these valuable services, southeastern Pennsylvania avoids significant expenses. This study estimates the avoided costs associated with several environmental services that naturally occur on southeastern Pennsylvania's protected open spaces, including water supply, flood mitigation, provision of wildlife habitat, air pollution removal, and carbon sequestration and storage. Key findings include:

$133 million in annual benefits through the provision of six environmental services.

Protected open space in the five-county region contributes an estimated $133 million in annual cost savings and economic benefits through the provision of six ecosystem services: water supply, water quality, flood mitigation, wildlife habitat, air pollution removal, and the sequestration of carbon in yearly growth of trees on protected open space. This sum represents costs avoided by not having to artificially replace vital ecosystem services currently provided by protected open space within the five-county region.

$61 million in carbon currently stored in trees on protected open space.

It is estimated that trees on southeastern Pennsylvania's protected open space store approximately $61 million in carbon within existing biomass. If the carbon currently stored in trees – both above and below ground – on protected open space were released into the air, it would cause damages due to increased carbon emissions that would cost approximately $61 million to mitigate.

Who Benefits?		
Governments	**Businesses**	**Households**
		
Local governments avoid having to spend money to artificially replicate the vital environmental functions provided by protected open space.	Businesses avoid having to pay additional taxes to replicate the environmental functions provided by protected open space.	Homeowners avoid having to pay additional taxes to replicate the environmental functions provided by protected open space and to repair damage caused by flooding and air pollution.

Recreation and Health

Park usage generates value via the consumer benefit that residents enjoy by engaging in recreation and exercise for free or at below-market rates instead of turning to private markets for the same activities. There also are considerable health cost avoidance and productivity savings related to rigorous exercise on protected open space. This study estimates these direct use and health cost savings benefits. Key findings include:

$577 million in annual benefits for residents who recreate on protected open space

Nearly $577 million in benefits accrue annually to residents who participate in recreational activities on protected open space within southeastern Pennsylvania. This value represents the additional amount of money that residents in the five-county region would be willing to spend in the private market to participate in the recreational activities that they currently enjoy on protected open space.

$795 million in medical costs avoided annually

Physically active people typically enjoy a variety of health benefits, including lower incidence of cardiovascular diseases, diabetes, depression, certain cancers, and obesity. It is estimated that the moderate and strenuous activity that takes place on protected open space in southeastern Pennsylvania accounts for $795 million in avoided medical costs annually.

$485 million in lost productivity costs avoided annually

It is estimated that businesses in southeastern Pennsylvania avoid $485 million in lost productivity costs per year as a result of the physical activities their employees engage in on protected open space in the region. This total represents the combined value of costs not incurred as a result of avoided productivity losses due to physical activity on the protected open space within the five-county region.

Who Benefits?	
Households	**Businesses**
	
Protected open space provides free and low-cost recreational activities that residents would otherwise have to pay for in the private market. Moderate and strenuous recreational activity on protected open space also results in avoided medical costs.	The recreational opportunities available on protected open space contribute to the health of the region's workforce, translating into avoided medical, workers' compensation, and lost productivity costs.

Economic Activity

Protected open space generates a variety of economic activities, ranging from agricultural activity on preserved farmland to tourist visitation to public park maintenance. This analysis estimates the spending, employment, earnings, and tax revenues associated with these activities. Key economic benefits associated with these activities on protected open space are:

$566 million in annual expenditures

It is estimated that $566 million in annual spending occurs on and because of protected open space in the five counties of southeastern Pennsylvania. Examples of these expenditures include government spending for the management and maintenance of public open space, spending for the purchase of goods made on preserved farmland, and spending related to tourism associated with protected open space. This spending – a sum of outlays by businesses and governments – represents an overall economic benefit to the five-county region.

6,900 jobs

Protected open space in southeastern Pennsylvania contributes an estimated 6,900 jobs to the regional economy. Examples of these jobs include public maintenance workers, park administrators, and rangers; farmers, distributors, and suppliers working on protected farmland; and guides and hospitality professionals catering to tourists who visit protected open space.

$299 million in annual salaries

Salaries paid to individuals working jobs on or related to protected open space in southeastern Pennsylvania total nearly $300 million per year.

$30 million in state and local taxes per year

The economic activity that takes place on and because of protected open space in southeastern Pennsylvania generates tax revenues via income and property taxes. This activity generates an estimated $30.2 million annually in state and local taxes.

Who Benefits?

Businesses

Protected open space, including farmland and public parks, is a source of commerce for businesses in the five-county region.

Governments

The economic activity spurred by protected open space generates tax revenue for local governments in the form of income and property taxes.

Households

Protected open space provides economic opportunity for residents of southeastern Pennsylvnia in the form of employment and wages.

Introduction

Protected open spaces provide substantial economic, environmental, and health benefits to surrounding communities, but these benefits are often undervalued in policy debates and investment decisions. A better understanding of these benefits can demonstrate how protected open space contributes to economic development and fiscal stability and reverse the common misconception that undeveloped or conserved land is non-productive and non-revenue producing.

Toward that end, this study estimates the economic value of protected open space in southeastern Pennsylvania, focusing on Bucks, Chester, Delaware, and Montgomery, and Philadelphia counties. The analysis that follows deals with three types of protected open space: public parks (95,744 acres in southeastern Pennsylvania), private land trust owned and eased lands (59.604 acres), and preserved farmland (42,033 acres).

The economic value of these 197,000 acres of protected open space is estimated by measuring impact in four areas:

1. the effect that protected open space has on **residential property values**;
2. the **environmental value** of southeastern Pennsylvania's protected open spaces;
3. the value generated through **recreation** on these spaces; and
4. **jobs and revenue** created as a result of activity on and connected to protected open space.

Protected Open Space in Southeastern Pennsylvania

For the purposes of this study, protected open space is defined as including public parks and trails, private land trust owned or eased lands, and preserved farmland. Table 1 presents a breakdown of these types of open space across the five-county region.

Table 1: Total Acreage of Open Space, by Type and County

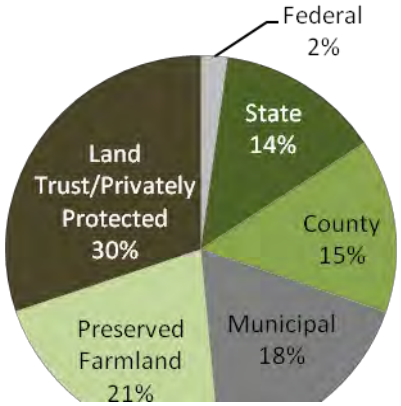
	County	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Public	Federal	0	1,288	729	1,964	373	**4,354**
	State	12,880	7,218	2,584	3,774	259	**26,715**
	County	7,919	5,956	1,659	4,899	*8,267	**28,700**
	Municipal	11,979	8,787	4,630	9,129	*1,450	**35,975**
	Total Public	**32,778**	**23,249**	**9,602**	**19,766**	**10,349**	**95,744**
Private	Preserved Farmland	9,982	24,875	236	6,940	0	**42,033**
	Land Trust/Privately Protected	8,046	44,506	2,903	3,661	488	**59,604**
	Total Private	**18,028**	**69,381**	**3,139**	**10,601**	**488**	**101,637**

Total Protected Open Space	**50,806**	**92,630**	**12,741**	**30,367**	**10,837**	**197,381**

Source: Delaware Valley Regional Planning Commission, 2007
**In Philadelphia, "county" lands are those formerly under the Fairmount Park Commission; "municipal" lands are those controlled in 2007 by the Philadelphia Department of Recreation. These two entities have since combined.*

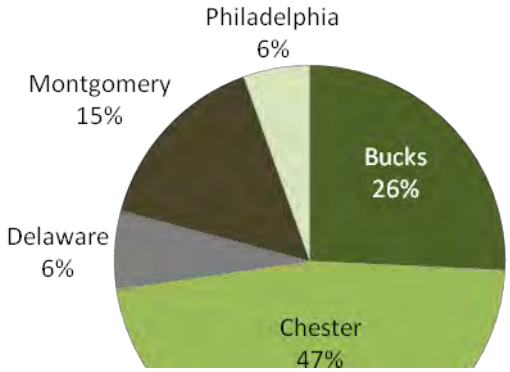
The more than 197,000 acres of protected open space in southeastern Pennsylvania is roughly evenly divided between public and private ownership (see Figure 1 below). Twenty-one percent of this total exists as privately preserved farmland and another 30 percent as other privately eased or land trust owned lands. The largest amount of publicly-owned protected open space is at the municipal level (18 percent), followed by county (15 percent), state (14 percent), and federal (2 percent). Almost three-quarters of all protected open space in southeastern Pennsylvania is within Chester (47 percent) and Bucks (26 percent) counties, followed by Montgomery (15 percent), Philadelphia, and Delaware counties (6 percent each) (see Figure 2).

Figure 1: Total Protected Open Space, by Type



Source: Delaware Valley Regional Planning Commission, 2007

Figure 2: Total Protected Open Space by County



Source: Delaware Valley Regional Planning Commission, 2007)

One-seventh (14 percent) of total land area in southeastern Pennsylvania currently is protected open space (see Table 2). On a county-by-county basis, the share of total land area that is protected open space ranges from 10 percent in Montgomery County to 19 percent in Chester County.

Table 2: Protected Open Space Compared to Total Land Area in Southeastern Pennsylvania

County	Total Sq. Mi.	Protected Sq. Mi.	% Protected
Bucks	607.4	79.4	13.1%
Chester	756.0	144.7	19.1%
Delaware	184.2	19.9	10.8%
Montgomery	483.1	47.4	9.8%
Philadelphia	135.1	16.9	12.5%
Total	**2,165.8**	**308.3**	**14.2%**

Sources: U.S. Census Bureau, Delaware Valley Regional Planning Commission.

Previous Open Space Valuation Studies

Over the past decade, a growing body of research has examined the economic value of protected open space.[1, 2, 3] These studies represent a range of approaches to quantifying the economic, environmental, health, and social benefits of protected open space.

This analysis builds off of this evolving literature, as well as previous valuation studies conducted within the Philadelphia region. Two small-scale studies within the City of Philadelphia have explored the impact of parks and greening on property values. In 1974, researchers examined the impact of proximity to Philadelphia's 1,300-acre Pennypack Park on home values and found a significant positive impact.[4] More recently, a 2004 Wharton analysis looked at the impact of greening investments in Philadelphia's New Kensington neighborhood and found vacant lot improvements and new tree plantings increased surrounding housing values by between 10 and 30 percent.[5]

In 2008, the Trust for Public Land's Center for City Park Excellence released a report that focused on the economic value generated by the 10,000 acres of parkland located within the City of Philadelphia.[6] Undertaken for the Philadelphia Parks Alliance, the study looked at seven factors – property value, tourism, direct use, health, community cohesion, clean air, and clean water – and produced dollar estimates of the value added by city parks. The Trust for Public Land found that Philadelphia's parks provide significant additional city revenues, municipal costs savings, wealth generated for residents, and cost savings for residents.

This regional study builds off of The Trust for Public Land's Philadelphia analysis, examining many of the same factors, but coming up with different values due to different methodologies and the larger study area.

Study Approach

Estimating the Economic Value of Open Space

Protected open space creates economic value in three ways : via wealth generation (e.g., higher property values and earnings from open space-related activities), tax revenues (e.g., increased property tax collections due to higher property values), and avoided costs (e.g., dollars that would be spent on the provision of environmental services such as improving water quality and removing air pollution in the absence of protected open space).

Recognizing these three types of value generation, this study examines the effect that protected open space has on property values; the value of environmental services provided by protected open space; the consumer benefit associated with recreational use on open space, including avoided health-related costs; and the jobs and revenue created as a result of activity on protected open space.

Homeowners are willing to pay a premium to live in close proximity to protected open space. As a result, southeastern Pennsylvania's existing open space adds to the overall value of its housing stock. This increased wealth is captured by citizens through higher sales values of homes near protected open space, and also generates increased government revenues via larger property tax collections and transfer taxes at time of sale. This study estimates the increase in **property values** associated with protected open space in southeastern Pennsylvania and the attendant fiscal impacts.

Protected open space also provides value in the form of naturally occurring environmental processes. If these protected lands were developed, southeastern Pennsylvania would be forced to spend money to replicate vital and costly services such as clean water supply provision, flood control, and air pollution mitigation through alternative methods. In relying on the natural landscapes on protected open spaces to provide these valuable services, southeastern Pennsylvania accrues significant savings. This study estimates the cost savings associated with several **environmental services** that naturally occur on southeastern Pennsylvania's protected open spaces, including provision of clean water supply, flood mitigation, provision of wildlife habitat, air pollution removal, and carbon sequestration and storage.

Direct use of parks generates value via the consumer benefit that residents enjoy by engaging in **recreation** and exercise for free or at below-market rates instead of turning to private markets for the same activities. There also are considerable **health cost avoidance** and productivity savings related to rigorous exercise on protected open space. This study estimates these direct use and health cost savings benefits.

Finally, protected open space generates a variety of economic activities, ranging from agricultural activity on preserved farmland to tourist visitation to public park maintenance. The analysis estimates the **spending, employment, earnings, and tax revenues** associated with these activities.

This study does not attempt to quantify the economic value of several other benefits associated with open space that prove difficult to measure or estimate. Some of these omitted benefits include more personal and subjective values, such as cultural, spiritual, aesthetic, and stress-reduction benefits, as well as benefits associated with increased civic capital or community cohesion and crime reduction. Some of these benefits, however, are addressed via the seven case study profiles included throughout the report.

Case Studies

Seven case studies of different types of protected open space from across the five-county study area are included within the report. These case studies provide specific examples of the economic and environmental benefits quantified at the regional level throughout the report, while also offering illustrations of more hard-to-quantify benefits, such as community cohesion.

The seven case studies represent the variety of different types of protected open space – parks and trails, preserved farmland, and privately conserved lands – across southeastern Pennsylvania. The case studies are of the Radnor Trail in Delaware County; the Hopewell Big Woods in Chester County; Peace Valley Park in Bucks County; the Perkiomen Trail and Glenolden Park in Montgomery County; Clark Park in Philadelphia; and Honey Brook Township in Chester County.

Figure 3: Case Studies

Source: Econsult Corporation.

Methodology

This study utilizes several different analytic techniques and data sources to estimate the values described above. A comprehensive regional property sales database provided the basis for calculations that isolated the effect that protected open space has on residential property values. Standard input-output modeling was used to estimate spending, jobs, and earnings associated with agricultural, tourism, and park management and maintenance uses on protected open space. Where primary data collection was not feasible due to budget or time constraints, value transfer methods were used, drawing upon existing research to estimate economic values and cost savings associated with ecosystem services and recreational use on protected open space. A complete account of study methodology is included in Technical Appendices A-E.

Where a range of approaches and estimates could have been used to arrive at an economic value, conservative approaches were adopted so as not to overstate values. Even with this conservative approach, however, the analysis is subject to caveats common to any economic valuation or impact analysis regarding substitution effects, double counting, and value estimation.

Substitution effect – When considering the benefits that residents enjoy by recreating and exercising on public parks as opposed to in a private facility, the substitution effect is important to keep in mind. If all open space were to be developed, it is unlikely that residents would altogether stop participating in the recreational activities they now enjoy on parkland. Instead, it is likely that residents would go elsewhere to recreate and thereby replace some of the value they currently derive from recreational activity on public parks. Because of this substitution effect, estimates of recreational value in this study should only be understood to represent the benefit that existing public parks contribute within the five-county region. These estimates should not be interpreted as the amount of money that would be lost if all public parks in southeastern Pennsylvania were to be developed.

Double counting – Double counting occurs when a value is overstated due to it being accounted for in two separate analyses. While this study aims to minimize any double counting, it is expected that some double counting exists in the evaluation of recreational and health cost savings (i.e., people account for health care savings in their willingness to pay for recreation) as well as recreational cost savings and property values (i.e., people include the convenience of recreational use on nearby open space in home sales prices). It is expected that smaller double counting may occur between the environmental services and property value impacts and the recreational cost savings and tourism spending estimates.

Value estimation – Value transfer methods are utilized where data collection proves too costly or time consuming. In surveying existing studies for benefit transfer values (e.g., How much is a ton of carbon monoxide removed from the atmosphere worth? or How much is a jog in the park worth to the average individual?), there are a range of plausible values to choose from within the research literature. This study draws upon leading researchers that have evaluated a large number of studies and, in most cases, uses an average value among the existing research to apply to the southeastern Pennsylvania analysis. The values calculated in this economic research are based on the average consumer's "willingness to pay" for a particular service or activity. These estimates are not transaction-based; instead, they estimate the amount of money the average consumer would be willing to pay for a service or activity if

it were not provided by protected open space. As such, the value estimates based on willingness to pay should not be understood as income or revenue, but rather as inherent consumer benefit gained from the free or low-cost services and opportunities provided by protected open space.

Acknowledging these limitations in the analysis, it is believed that any potential value overestimates due to substitution effects or double counting are more than compensated for by the use of conservative methods and value transfer estimates throughout the study.

Further information on the methodologies used for this study is available in the technical appendices to the study.

Interpretation

It is important to note that the economic benefits presented in this study are meant to serve as estimates, not exact values. While approximates, they are based on defensible estimation methods and represent a vast improvement over the common and incorrect implication that the economic value of protected open space is zero.

Because the estimates in this study represent different types of values – some represent wealth generation via asset appreciation or earnings, some represent additional tax revenues, some represent avoided costs – *they should not be added together to produce a single number representing the total aggregate value of protected open space in southeastern Pennsylvania*.

Furthermore, it is important to note that these estimates approximate the value of the total existing inventory of protected open space in southeastern Pennsylvania, taking into account the broad variety of land covers, economic activities, recreational activities, ecosystem services, and other factors that exist or occur on this protected open space. Because the study's estimates take such a diversity of factors into account, *they should not be used in calculations estimating the economic value of specific parcels of protected open space.*

In presenting these economic value estimates, this study makes no policy recommendations. However, the intention is that this analysis should lead to more informed land use and development decisions taking into account a more complete consideration of the economic, environmental, health, and social impacts associated with protected open space.

Property Values

The total value of a home is the sum of the values of its different features. Homeowners are familiar with the notion that the number of bedrooms in a home will, in part, determine its value, as will its structural condition, the school district it falls within, and its community's property tax rate. Changing any of these individual components will raise or lower the total value of a home.

This section of the study investigates the effect of proximity to protected open space on home values in southeastern Pennsylvania. It might stand to reason that an individual homeowner would be willing to pay more for a home that is close to a community park or trail, but, on average, are all homeowners willing to pay more for this proximity? If so, how much more are they willing to pay, and how does this value vary across southeastern Pennsylvania? If proximity to open space does contribute to an increase in property values, it will also result in higher property tax revenues for counties, municipalities, and school districts. But, how much, if any, local tax revenue can be attributed to the proximity to open space of southeastern Pennsylvania's homes?

Methodology

To answer these questions, calculations were performed using a map of all parcels of protected open space in the region and a database of approximately 230,000 arms-length residential property sales in Bucks, Chester, Delaware, Montgomery, and Philadelphia counties from 2005 to 2009.[i] These calculations analyze the effect of proximity to open space on home value by county, type of community, and distance from open space. The analysis isolates the effect on home values of proximity to open space from the effect of other variables that influence home value.

Further information on the methodology used and the findings presented in this section is available in Technical Appendix A.

Hedonic Regression Analysis

The property value analysis presented in this section relies upon hedonic regression analysis, a standard technique used by economists to analyze demand and pricing for an item. Hedonic regression is broadly used in analyzing housing prices as a way to isolate the impact that different housing components or characteristics have on home sales values within a given real estate market.

Summary of Property Value Impacts

Homes in southeastern Pennsylvania as far as one mile away from protected open space capture a measurable increase in their value as a result of this proximity. Within this one-mile radius, the closer a home is to protected open space, the more value it captures. When added together, the increments of value that homes in southeastern Pennsylvania capture as a result of their proximity to open space total $16.3 billion. In other words, if all of the protected open space in the five-county region were to be eliminated, the total value of the housing stock in the five counties of southeastern

[i] Arms-length transactions do not include transactions between family members, transactions where the buyer or seller is a state or federal government agency or bank, blanket sales, nominal sales, or sheriff sales.

Pennsylvania would decrease by $16.3 billion. This represents an average property value increase of almost $10,000 across all households in southeastern Pennsylvania due to protected open space.

By increasing the value of homes within a one-mile radius, protected open space also increases the amount of property taxes that the owners of these homes pay to county and municipal governments and to school districts in southeastern Pennsylvania. Regionally, these additional property tax revenues amount to nearly $228 million dollars per year. The increase in home values due to open space also increases transfer tax revenues that are collected when a house is sold. Using average numbers of annual home sales in the five-county region, it is estimated that $12.9 million in annual transfer tax revenues can be attributed to home value increases associated with proximity to open space. Combined, increased property and transfer tax revenues equal $240 million per year. Table 3 shows the housing value and tax revenue increases attributable to open space for each county.

Table 3: Total Economic and Fiscal Impacts of Open Space on Housing Values, by County

	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Total Property Value Added by Open Space	$2.5B	$2.1B	$2.0B	$3.3B	$6.4B	**$16.3B**
Average Per Household Property Value Added by Open Space	$10,100	$11,060	$8,980	$10,294	$9,763	**$9,960**
Total Property and Transfer Tax Revenues Added by Open Space	$40.5M	$34.9M	$42.2M	$53.3M	$69.6M	**$240.5M**
Average Per Household Property and Transfer Tax Value Added by Open Space	$165	$184	$190	$168	$106	**$147**

Sources: City of Philadelphia Department of Records, Trend MLS (courtesy of Prudential Fox & Roach), Econsult calculations.

To assess this property value increase from another perspective, an analysis of the economic and fiscal impact on housing values due to protected open space was performed according to the four planning areas defined by the Delaware Valley Regional Planning Commission (DVRPC). These planning areas include:

"Core City," which in Pennsylvania includes the cities of Philadelphia and Chester;

"Developed Community/Mature Suburb," which includes inner-ring communities adjacent to the core cities, railroad boroughs and trolley car communities, and mature suburban townships;

"Growing Suburb," which includes communities with a significant amount of developable acres that are experiencing or are forecast to experience strong population and/or employment growth; and

"Rural Area," which includes the region's agricultural communities and communities with large remaining natural areas.[7]

Figure 4 presents a map of these planning areas and all protected open space in southeastern Pennsylvania.

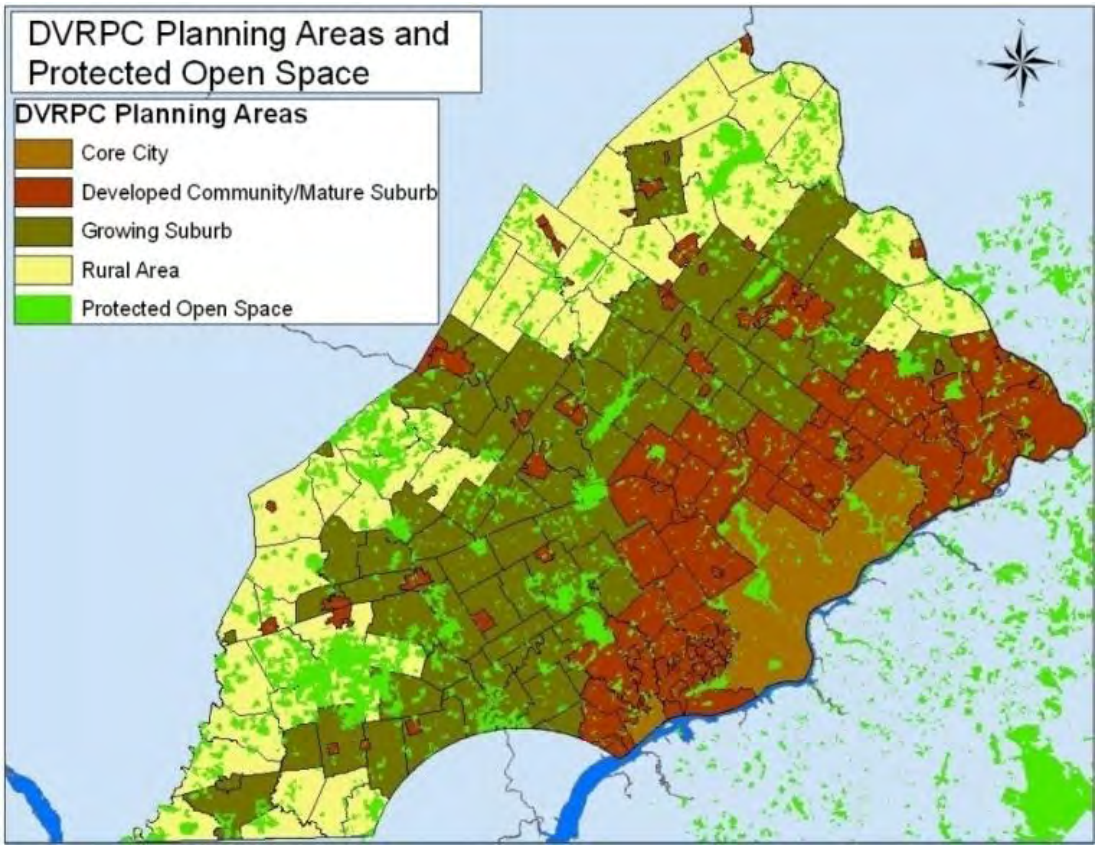


Figure 4

An analysis of the additional housing value generated by protected open space within these four different types of development patterns reveals that homes in Southeastern Pennsylvania's core cities and developed communities capture more than three-quarters of the housing value attributable to open space in the five-county area, totaling nearly $12.5 billion. Table 4 presents the breakdown of the housing value generated by protected open space by planning area.[ii]

Table 4: Total Economic Impact of Open Space on Housing Values, by Planning Area

	Core City	Developed Community	Growing Suburb	Rural Area	Total
# of Housing Units	675,000	613,000	279,000	65,000	1,632,000
Property Value Added by Open Space	$6.5B	$6.0B	$3.0B	$0.8B	$16.3B
Average Per HH Value Added by Open Space	$9,610	$9,731	$10,902	$11,721	$9,960

Sources: City of Philadelphia Department of Records, Trend MLS (courtesy of Prudential Fox & Roach), Delaware Valley Regional Planning Commission, Econsult calculation.

This analysis indicates that protected open space generates more value in southeastern Pennsylvania's older, built-up communities. In these areas, higher housing densities enable more homes to capture the value created by protected open space. Because there are more homes in close proximity to open space in core cities and developed communities, these planning areas capture more total value than growing suburbs and rural areas. On a per-household basis, however, homes in growing suburbs and rural areas capture more value in dollar terms.

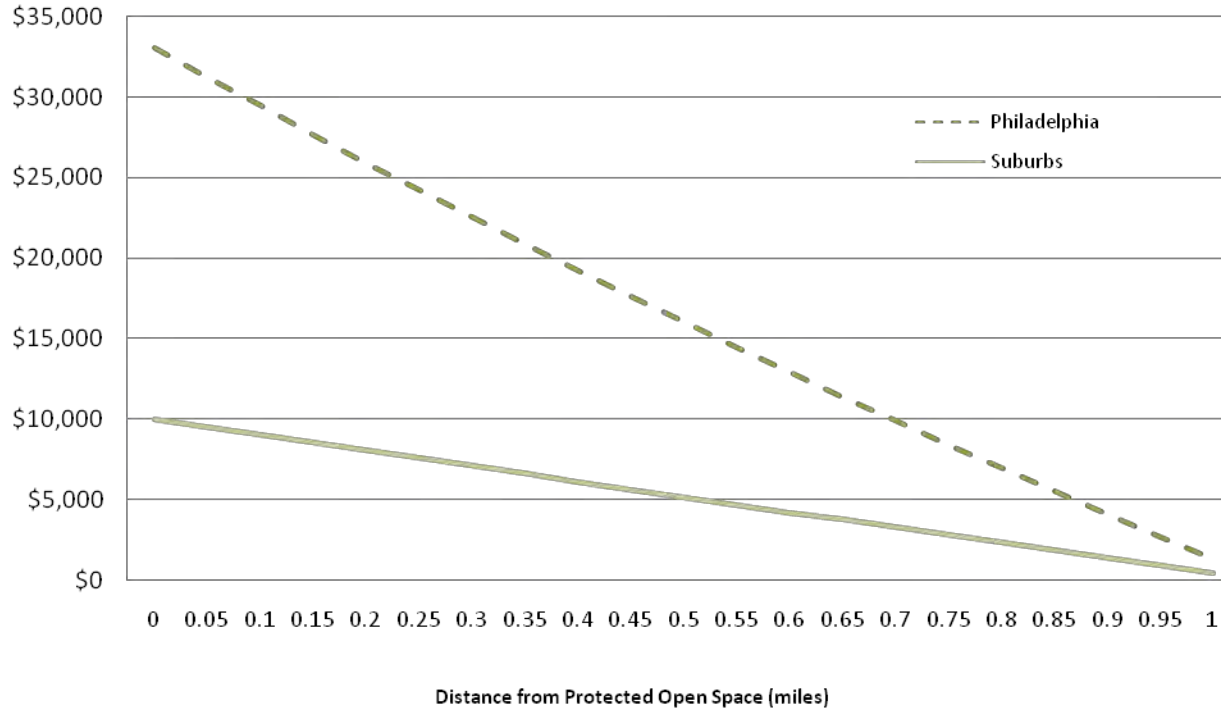
Source: Delaware Valley Regional Planning Commission, 2009.

[ii] Figures in "Property Value Added by Open Space" (Table 4) are rounded; average per HH values were calculated prior to rounding.

Effect of Proximity to Open Space

The value that a home captures as a result of its proximity to open space varies with distance, rising to its highest level for homes immediately adjacent to open space and reducing to zero at a distance of one mile. In Figure 5, these values are expressed in dollar amounts for homes in Philadelphia (dotted green line) and homes in Bucks, Chester, Delaware, and Montgomery counties (solid green line). These values were calculated using 2009 home sales values.

Figure 5: Average Increase in Home Value Due to Proximity to Open Space



Sources: City of Philadelphia Department of Records, Trend MLS (courtesy of Prudential Fox & Roach), Econsult calculations.

In Philadelphia, a home directly adjacent to a parcel of protected open space that is larger than five acres is worth an average of $35,000 more than a comparable home located more than one mile from protected open space. A city home located a half-mile from the nearest protected open space enjoys an average increase in value of $15,000 compared to a similar home located more than one mile from open space.

In Bucks, Chester, Delaware, and Montgomery counties, homes immediately adjacent to protected open space can claim an average of $10,000 in additional value over comparable homes farther than one mile from open space, and homes a half-mile from open space enjoy an average increase of $5,000.

It is likely that homes in Philadelphia capture a higher percentage increase in value compared to suburban homes due to lower average house prices and the relative scarcity of protected open space in the city. Because dense urban environments generally have less open space than suburban and rural environments, the value of proximity is higher in urban areas than outside of them, where open space generally exists in greater abundance.

Proximity to and Size of Open Space

The analysis also indicates that proximity to open space has a greater impact on property values than quantity of open space. Each additional acre of protected open space in southeastern Pennsylvania is associated with an increase in home values of approximately 0.002 percent. This percentage is marginally higher in Philadelphia than it is in the other four counties studied. These results indicate that it takes very large quantities of protected open space to have a meaningful impact on house values. In dollar terms, if the acreage of open space within a quarter-mile of a home in Philadelphia were increased from one acre to five hundred acres, the home would capture an additional $1,239, or 0.9 percent of the 2009 median house value. In Bucks, Chester, Delaware, and Montgomery counties, a similar increase in the size of protected open space within a quarter-mile would yield $2,505, or 0.8 percent, in additional value per home.

This suggests that the presence of many small protected open spaces will have a greater positive impact on home values than the presence of a few large protected open spaces. It is important to note, however, that this property value finding stands in contrast to some of the other impacts evaluated in this report – in particular, several ecosystem services benefits – that realize greater value with larger open space parcels.

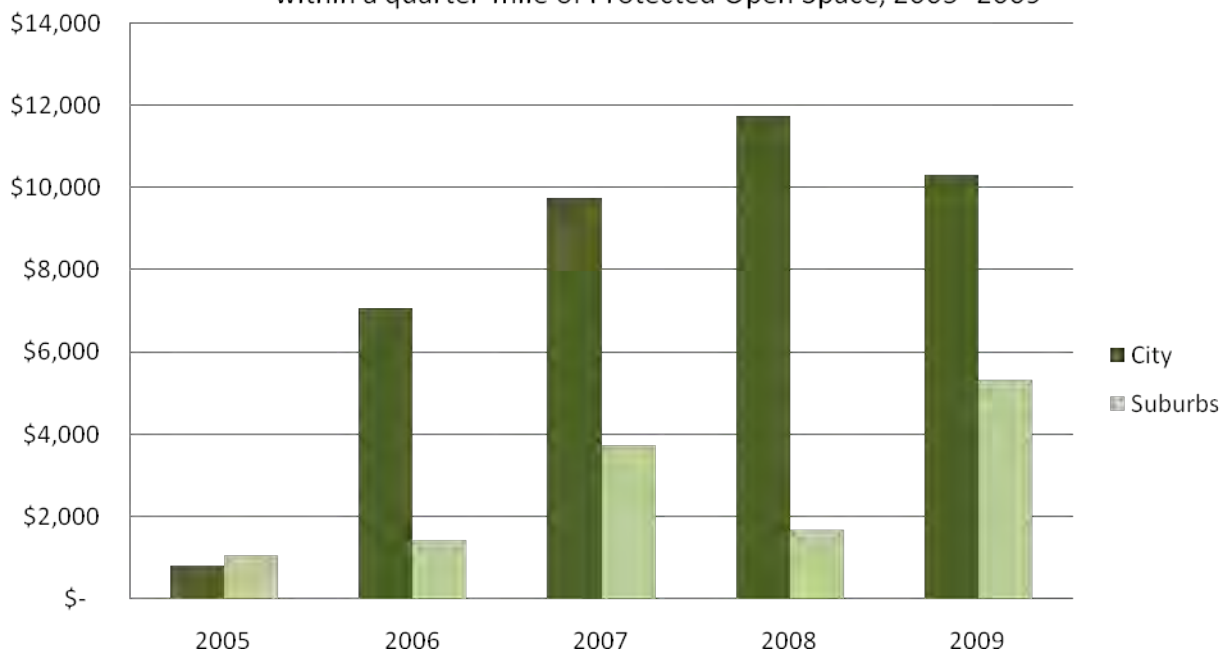
Effect of Walking Distance

Further analysis estimates the average increase in value for homes within a five-minute walk, or a quarter-mile, of protected open space. In Philadelphia, homes within this distance of a protected open space that is larger than five acres capture an average additional value of 7 percent. Homes within a five-minute walk of protected open space in Bucks, Chester, Delaware, and Montgomery counties capture an average additional value of 5.5 percent. This additional value is an increase over the value of a comparable home that is farther than one mile from protected open space.

Property Value Impacts over Time

A year-by-year analysis of regional home sales data reveals that the value of being within walking distance of protected open space has risen from 2005 to 2009 (See Figure 6). For Philadelphia homes within a quarter-mile of protected open space, the value associated with this proximity rose by an average of $2,732 per year since 2005. In Bucks, Chester, Delaware, and Montgomery counties, this value rose by an average of $876 per year. While it is not possible to draw a conclusion about future trends based on these five years alone, the home sales data indicate that proximity to open space has had a clear and positive impact on home values both before and during the economic downturn that began in 2008.

Figure 6: Change in Value of Homes
within a quarter-mile of Protected Open Space, 2005 -2009



Sources: City of Philadelphia Department of Records, Trend MLS (courtesy of Prudential Fox & Roach), Econsult calculations.

Conclusion

It is clear from this analysis that homeowners in southeastern Pennsylvania recognize protected open space as an amenity and are willing to pay a premium to live within close proximity to it. By supporting the value of the housing stock in the five counties of southeastern Pennsylvania, protected open space plays a vital role in preserving regional economic prosperity. If recent trends continue and the value of proximity to open space continues to rise, its role will only become more prominent in the years to come.

The Radnor Trail

Case Study: The Radnor Trail

Boosting Physical Activity and Property Values

- *Delaware County*
- *2.4 miles*

Created in 2005, the 2.4-mile Radnor Trail in Delaware County provides a recreational outlet for an estimated 150,000 users annually. It serves as a community gathering place that encourages physical activity among township residents and provides an alternative way to get from one place to another in Radnor. Despite strong resistance to the creation of the Trail among some homeowners, the Radnor Trail is now widely viewed as a major community amenity – and one that has significantly boosted property values for nearby properties.

Recreation

No study has been conducted or counters installed to measure trail use, but John Fischer of the Friends of Radnor Trails estimates that the Trail can see between 200 and 600 users per day.[8] It is estimated that the Trail has more than 150,000 day uses every year, mostly from Radnor and neighboring townships, as well as of the City of Philadelphia.[9] The Trail is used primarily for recreation and fitness. Activities such as walking, jogging, bicycling, rollerblading and dog walking are its most visible uses.

> *"The Trail is probably the most frequently used recreational facility in Radnor Township. Whenever I'm on the Trail, I see people smiling."*
>
> - Mary Coe, Friends of Radnor Trails

The asphalt-paved Trail spans 2.4 miles from Radnor Township's Encke Park to the shopping center at Sugartown Road and Route 30, winding through largely wooded and well-kept residential areas. There are several access points, including the Radnor Township Building, Encke Park, the Wayne Arts Center, and now the Friends of Radnor Trails Park, which opened in 2009 off of Liberty Lane. Planners strategically placed Trail access points so that users could walk to school, to Downtown Wayne shops and restaurants, and other destinations, such as the Whole Foods Market on Lancaster Avenue in Wayne.[10] According to Mary Coe of the Friends of Radnor Trails, with this improved connectivity, a greater number of residents who live within walking distance of the Trail are opting to walk rather than use their cars to run errands.[11]

Usage is further encouraged by trailhead lots where visitors can park their cars at Conestoga Road and Brookside Avenue, at the Township Building lot, at Odorisio Park off of West Wayne Avenue, and at the Friends of Radnor Trails Park.

Community Cohesion

Before the Trail became a place for area residents to come together to jog, bike, or stroll, the process of proposing and developing the Radnor Trail itself served to bring area residents together – both for and against. Advocates of paving over the former Stafford Branch of the Philadelphia and Western railway started their grassroots effort to build a multi-use trail in 1992. As the idea gained momentum, it also served to catalyze a group of fervent opponents who worried that a new trail would allow users from outside of Radnor to walk too closely to their homes, compromising privacy and safety. The non-profit Friends of Radnor Trails, formed in 1993, worked with the township's Department of Parks and

Recreation to raise support and funds and to hold extensive one-on-one meetings with concerned homeowners to allay apprehension and sell the concept to residents.

As part of a compromise negotiated with homeowners who were originally in opposition to the proposal, a tall wooden fence was installed along the Trail, blocking the view of many residents' backyards. Since the Radnor Trail's construction, township officials say that the community has responded in an overwhelmingly positive way and that their original safety concerns failed to materialize.[12]

In fact, the Trail may have helped to stop some minor crimes and vandalism. Before it was built, abandoned cars, appliances, trash, and broken glass were commonly found along the long-unused train tracks.[13] Now, with hundreds of people using Radnor Trail daily and ongoing maintenance by the township, the area is cleaner and constantly monitored by users and township staff.

Physical Activity

Before the Radnor Trail's construction, the primary local options for joggers and walkers were the high school track or township roads.[14] The Trail provides a convenient additional outlet for exercise, contributing to a healthier community.

Aside from individuals who use the Radnor Trail for personal fitness and recreation, organized groups also take advantage of it. The high school track team utilizes it for practices, and the Radnor Township Parks and Recreation Department offers exercise classes for adults along the Trail, including a stroller fitness class for mothers. Additionally, several private fitness instructors meet clients along the Trail for training sessions.[15]

Revenue Generation

Local businesses benefit from the Trail's presence, as well. A Wawa convenience store located near the trailhead at Sugartown Road in Wayne benefits from an increase in its customer base due to Trail traffic and makes regular donations to the Friends of Radnor Trails.[16] Local businesses and community groups often post advertisements and signs along the Trail's fence and gates in order to reach a larger audience. The popularity of classes offered by the Radnor Township Department of Parks and Recreation has raised enough fee revenues to allow the department to offer more diverse programming.

Property Values

The Radnor Trail's presence has helped to increase already strong property values in the desirable Main Line communities surrounding it. According to analysis of real estate sales within a quarter-mile of the Trail, proximity to the Radnor Trail equates to an average property enhancement of $69,139.

The Trail is also often mentioned as an amenity in real estate listings. Duffy Real Estate, a listing service covering a 13-county area in southeastern Pennsylvania, specifically touts the Radnor Trail in an online description of the Radnor and Wayne areas as "an outlet for any sports enthusiast." Recent $900,000 and $335,000 home listings have

Effect on Property Value

$69,139

Calculations based on home sales within Radnor show that homes within a quarter-mile of the Radnor Trail can attribute an estimated $69,139 dollars of additional value to this proximity.

characterized properties as “very convenient to the town of Wayne, parks, the Radnor Trail and major roadways” and as a “desirable location across from park, Radnor walking trail.”[17]

People who walk along the Trail notice that many homeowners of adjacent properties have installed steps, gates, or small pathways outside of their properties for Trail access. People also strategically place for-sale signs facing the Trail when putting their properties on the market.[18]

Conclusion

The upwards of 150,000 people who use the Radnor Trail annually speak to the direct-use value of the Trail. The hundreds of thousands of dollars in improved property values, the fitness classes that have sprung up, and the new parks and facilities now available because of the Trail are revenue generators for local government. And because the Trail itself has brought residents together, both to use the Trail and to advocate for the Trail, it has been a valuable source of community cohesion.

Environmental Services

The natural landscapes of protected open space confer myriad environmental benefits to the five-county region. This section draws on established research to place a dollar value on six types of ecosystem services provided by protected open space: water supply provision, water quality, flood mitigation, wildlife habitat, air pollution removal, and carbon sequestration and storage. These represent ecosystem functions that, if lost, would require costly measures to replicate. The analysis that follows estimates the value of these functions.

Methodology

Estimates in this section draw upon established research estimating the recurring value of the natural functions of water supply provision, water quality, flood mitigation, wildlife habitat, air pollution removal, and carbon sequestration, as well as the non-recurring value of carbon storage.[19, 20] The intensity and value of these functions, which are commonly referred to as "ecosystem services," vary depending on the type of land cover present in a given area. Estimates of land cover variation on protected open space in southeastern Pennsylvania were applied to the values associated with each of the ecosystem services to produce total value estimates. Dollar values approximating the economic value of each of these services are based on peer-reviewed estimates of value on a per-acre basis.[iii] These total value estimates represent the costs avoided in southeastern Pennsylvania by not having to artificially replace the ecosystem services currently provided by protected open space in the five-county region.

Further information on the methodology used and the findings presented in this section is available in Technical Appendix B.

Summary of Environmental Impacts

Southeastern Pennsylvania's approximately 200,000 acres of protected open space contribute an estimated $132.5 million in annual cost savings and economic benefits through the provision of six ecosystem services: water supply, water quality, flood mitigation, wildlife habitat, air pollution removal, and carbon sequestration.

Table 5 shows the composition of these environmental benefits. Because Chester and Bucks counties lead southeastern Pennsylvania in open space acreage, it follows that they capture the largest share – more than 70 percent of the total – of associated environmental benefits.

Ecosystem Services

Costanza et al. (2006) compiled more than 100 academic studies that estimated the average per-acre value of more than 10 different ecosystem services. The analysis presented below draws upon this research. To ensure conservative estimates, this study does not include several ecosystem service benefits frequently quantified by Costanza and other experts. For example, while the ecosystem services of soil formation, pollination, and biological control are not included in Table 6, it is estimated that together they account for at least $15 million in annual avoided costs on protected open space in southeastern Pennsylvania.

[iii] Mean estimates are presented in this section of the report. A full explanation of estimates and the methodologies used in calculating them is available in Technical Appendix B.

In addition to the annual environmental benefits listed in Table 5, existing trees on the five-county region's protected open spaces store an estimated $61.4 million in carbon. All dollar values in this section aside from these carbon storage benefits presented in Table 13 are annual and recurring.

Table 5: Total Environmental Benefits, by Type and County ($M per Year)

Ecosystem Service	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Water Supply	$16.3	$17.9	$4.8	$6.2	$5.0	**$50.2**
Water Quality	$3.1	$4.8	$0.9	$1.3	$0.8	**$10.9**
Flood Mitigation	$13.8	$12.8	$4.2	$3.3	$3.4	**$37.5**
Wildlife Habitat	$5.5	$7.6	$0.7	$2.8	$0.3	**$16.9**
Air Pollution Removal	$4.2	$6.1	$1.4	$2.5	$0.9	**$15.1**
Carbon Sequestration	$0.5	$0.8	$0.2	$0.3	$0.1	**$1.9**
Total	**$43.4**	**$50.0**	**$12.2**	**$16.4**	**$10.5**	**$132.5**

Sources: Costanza et al., 2006; Nowak et al., 2006; Nowak et al., 2007; U.S. Department of Agriculture, 2010; Econsult calculations.

Water Supply

The soil of undeveloped land stores water, replenishing streams, reservoirs, and aquifers. This natural system provides for the continuous recharge of the five-county region's fresh and clean water supply. Were this ecosystem service to fail, southeastern Pennsylvania would be forced to import water from elsewhere or more extensively treat local water, both of which are costly endeavors.[21] Forests and wetlands are particularly productive land covers for water supply provision. The larger the land cover, the greater the benefits derived.

Southeastern Pennsylvania realizes more than $50 million in annual cost savings from natural water supply services on protected open space. Table 6 displays the value of water supply services by county and by type of protected open space.

Table 6: Water Supply Service Benefit, by Type of Open Space and County ($M per Year)

Open Space Type	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Federal	-	$0.3	$1.3	$0.4	$0.6	**$2.6**
State	$5.4	$2.6	$0.5	$0.8	*$0.0	**$9.3**
County	$3.7	$2.4	$0.3	$1.8	$4.2	**$12.4**
Municipal	$4.4	$2.3	$1.8	$1.8	$0.1	**$10.4**
Preserved Farmland	$1.0	$2.7	*$0.0	$0.5	-	**$4.2**
Privately Protected	$1.8	$7.6	$0.9	$0.9	$0.1	**$11.3**
Total	**$16.3**	**$17.9**	**$4.8**	**$6.2**	**$5.0**	**$50.2**

Sources: Costanza et al., 2006; Econsult calculations.
**Value is greater than zero, less than $50,000*

Water Quality

Forests and wetlands provide a natural protective buffer between human activities and water supplies. This buffer prevents several types of waste, including pathogens, excess nutrients, metals, and sediments, from entering the water supply. Annually, southeastern Pennsylvania receives $10.9 million in economic benefit from the ability of protected open space to naturally enhance water quality. This service is driven largely by the proportion of forest, wetland, and riparian buffer on southeastern Pennsylvania's protected open spaces. Without protected open space, the residents of the five-county area would be forced to pay for alternative groundwater filtration or water treatment methods. Table 7 presents a breakdown of the regional benefit derived from water quality services by county and type of open space.

Table 7: Water Quality Service Benefit, by Type of Open Space and County ($M per Year)

Open Space Type	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Federal	-	$0.1	$0.2	$0.1	$0.1	**$0.5**
State	$1.0	$0.5	$0.1	$0.2	*$0.0	**$1.8**
County	$0.6	$0.5	$0.1	$0.3	$0.7	**$2.2**
Municipal	$0.8	$0.5	$0.3	$0.3	*$0.0	**$1.9**
Preserved Farmland	$0.3	$1.0	*$0.0	$0.2	-	**$1.5**
Privately Protected	$0.4	$2.2	$0.2	$0.2	*$0.0	**$3.0**
Total	**$3.1**	**$4.8**	**$0.9**	**$1.3**	**$0.8**	**$10.9**

Sources: Costanza et al., 2006; Econsult calculations.
**Value is greater than zero, less than $50,000*

Flood Mitigation

Many natural landscapes serve as a buffer protecting people and properties from destructive natural events, such as flooding. The absorptive capacity of protected open space in southeastern Pennsylvania helps to mitigate the risk of flood during storm events by trapping and containing storm water. Were the five-county region to be deprived of this natural service, residents and local governments would be forced to undertake costly measures to protect the built environment from further damage as a result of flooding, such as constructing dams and reservoirs. The total annual benefit to southeastern Pennsylvania generated by natural flood mitigation services is equal to $37 million. Table 8 displays the breakdown of this benefit by county and by open space type.

Table 8: Flood Mitigation Service Benefit, by Type of Open Space and County ($M per Year)

Open Space Type	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Federal	-	$0.2	$1.7	$0.4	$0.8	**$3.1**
State	$4.7	$1.9	*$0.0	$0.3	*$0.0	**$6.9**
County	$2.0	$1.3	$0.1	$0.9	$2.5	**$6.8**
Municipal	$4.7	$1.6	$1.7	$0.9	$0.1	**$9.0**
Preserved Farmland	$0.8	$2.3	*$0.0	$0.4	-	**$3.5**
Privately Protected	$1.6	$5.5	$0.7	$0.4	*$0.0	**$8.2**
Total	**$13.8**	**$12.8**	**$4.2**	**$3.3**	**$3.4**	**$37.5**

Sources: Costanza et al., 2006; Econsult calculations.
**Value is greater than zero, less than $50,000*

Wildlife Habitat

Many of southeastern Pennsylvania's protected open spaces serve as habitats for a diverse array of plants and animals. Intact forests and wetlands harbor species that people value for both aesthetic and functional purposes. Values in this section estimate the amount of money that people would be willing to pay to preserve wildlife on protected open space in southeastern Pennsylvania. It is important to note that the value associated with wildlife habitat is of a different nature than the values associated with the other ecosystem services included in this section - it does not represent an avoided cost. To ensure a conservative valuation of the benefit derived from the preservation of wildlife habitat on protected open space, the estimates in this section are based on minimum willingness-to-pay values from the research literature.[22] An analysis using these values reveals that wildlife habitat on protected open space in southeastern Pennsylvania has an estimated annual value of nearly $17 million. Table 9 presents county values for these wildlife habitat benefits in addition to values for each type of open space.

Table 9: Wildlife Habitat Service Benefit, by Type of Open Space and County ($M per Year)

Open Space Type	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Federal	$0.0	$0.2	*$0.0	$0.4	*$0.0	**$0.6**
State	$0.5	$0.3	$0.1	$0.3	$0.1	**$1.2**
County	$0.6	$0.4	$0.1	$0.5	$0.1	**$1.7**
Municipal	$0.9	$0.6	$0.2	$0.5	*$0.0	**$2.3**
Preserved Farmland	$2.2	$2.9	*$0.0	$0.9	$0.0	**$6.1**
Privately Protected	$1.3	$3.3	$0.2	$0.2	*$0.0	**$5.0**
Total	**$5.5**	**$7.7**	**$0.6**	**$2.8**	**$0.2**	**$16.9**

Sources: Costanza et al., 2006; Econsult calculations.
**Value is greater than zero, less than $50,000*

Air Pollution Removal

Poor air quality is common in many urban and suburban areas and can lead to a variety of human health problems, including asthma and other respiratory ailments. The pollutants that compromise air quality also can damage buildings and plants, give rise to smog, and disrupt the ecosystem. Trees mitigate significant amounts of air pollution through botanic respiration processes that remove pollutants from the air. This naturally occurring air pollution removal process contributes to environmental quality and health**.**

An analysis of regional satellite imagery reveals that protected open space in southeastern Pennsylvania contains more than 72,400 acres of tree canopy—37 percent of all protected open space. Table 10 presents tree canopy acreage by open space type and by county.

Table 10: Acreage of Tree Canopy Cover, by Type of Open Space and County

Tree Canopy Cover	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Federal	0	623	103	677	154	**1,557**
State	8,364	4,477	1,955	2,206	59	**17,061**
County	3,642	3,229	594	2,332	3,774	**13,571**
Municipal	3,959	3,716	1,861	3,673	115	**13,324**
Preserved Farmland	1,387	3,267	568	709	0	**5,931**
Privately Protected	2,838	14,065	1,421	2,450	254	**21,028**
Total	**20,190**	**29,377**	**6,502**	**12,047**	**4,356**	**72,472**

Sources: U.S. Department of Agriculture, 2010; Econsult calculations.

Using this total tree canopy acreage figure and established estimates of the per-ton benefits of removing various airborne pollutants, it is estimated that trees on protected open space annually provide $15 million in air pollution removal services in southeastern Pennsylvania.[23] If all protected open space in southeastern Pennsylvania were developed, this is the sum that would have to be spent to maintain the current level of air quality.

This analysis includes benefits derived from the removal of five different pollutants: ozone (O_3), particulate matter (PM-10), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and carbon monoxide (CO). Table 11 presents the benefit generated for the removal of each pollutant, by county and for southeastern Pennsylvania as a whole.

Table 11: Air Pollution Removal Benefits ($M per Year)

Pollutant	$ / ton	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
O_3	*+$6,752*	$1.8	$2.6	$0.6	$1.1	$0.4	**$6.5**
PM-10	*+$4,508*	$1.3	$2.0	$0.4	$0.8	$0.3	**$4.8**
NO_2	*+$6,752*	$0.9	$1.3	$0.3	$0.5	$0.2	**$3.2**
SO_2	*+$1,653*	$0.2	$0.2	$0.05	$0.09	$0.03	**$0.6**
CO	*+$959*	$0.02	$0.02	$0.01	$0.01	*$0.0	**$0.06**
Total		**$4.2**	**$6.1**	**$1.4**	**$2.5**	**$0.9**	**$15.1**

Sources: Nowak et al., 2006; Nowak et al., 2007; U.S. Forest Service, 2010; Econsult calculations.
**Value is greater than zero, less than $50,000*
+Figures not in $M

Carbon Sequestration and Storage

Trees mitigate the impacts of climate change by sequestering and storing atmospheric carbon from carbon dioxide. Carbon storage is an estimate of the total amount of carbon stored in the existing biomass of trees, both above and below ground. Using a $21 per-ton value of the social cost of carbon, it is estimated that trees on southeastern Pennsylvania's protected open space store $61.4 million in carbon within existing biomass.[24] This value approximates the dollar value of damages associated with an increase in carbon emissions in a given year.[25] In other words, if the

carbon currently stored in trees on protected open space were released into the air, it would cause damages that would cost $61.4 million to mitigate. It is important to note that the estimate of the value of stored carbon is not annual. The storage of carbon in a tree represents a one-time benefit—the carbon is kept out of the atmosphere until the tree dies.

As a tree grows, it pulls carbon from the air. New growth on trees is responsible for carbon sequestration, which is measured on an annual basis. Every year, new growth on the trees on protected open space in southeastern Pennsylvania sequesters an additional $2 million in carbon. This estimate controls for the yearly release of stored carbon through the death and decay of trees. Like the carbon storage estimate, this estimate measures the monetary damages associated with each ton of carbon that is sequestered. Because this carbon is taken out of the air by trees on protected open space, these damages are avoided, representing savings for the five-county area.

Table 12 presents estimates of the tons of carbon sequestered and stored by trees on the protected open space in southeastern Pennsylvania. Table 13 presents a county-by-county breakdown of the benefits derived from the storage and sequestration of carbon by trees on protected open space.

Table 12: Estimated Carbon Sequestration and Storage Amounts (Tons)

Pollutant	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Carbon Sequestration	25,794	37,533	8,306	15,392	5,566	**92,591**
Carbon Storage	814,174	1,184,724	262,193	485,848	175,685	**2,922,624**

Sources: Nowak et al., 2006; Nowak et al., 2007; U.S. Forest Service, 2010; Econsult calculations.

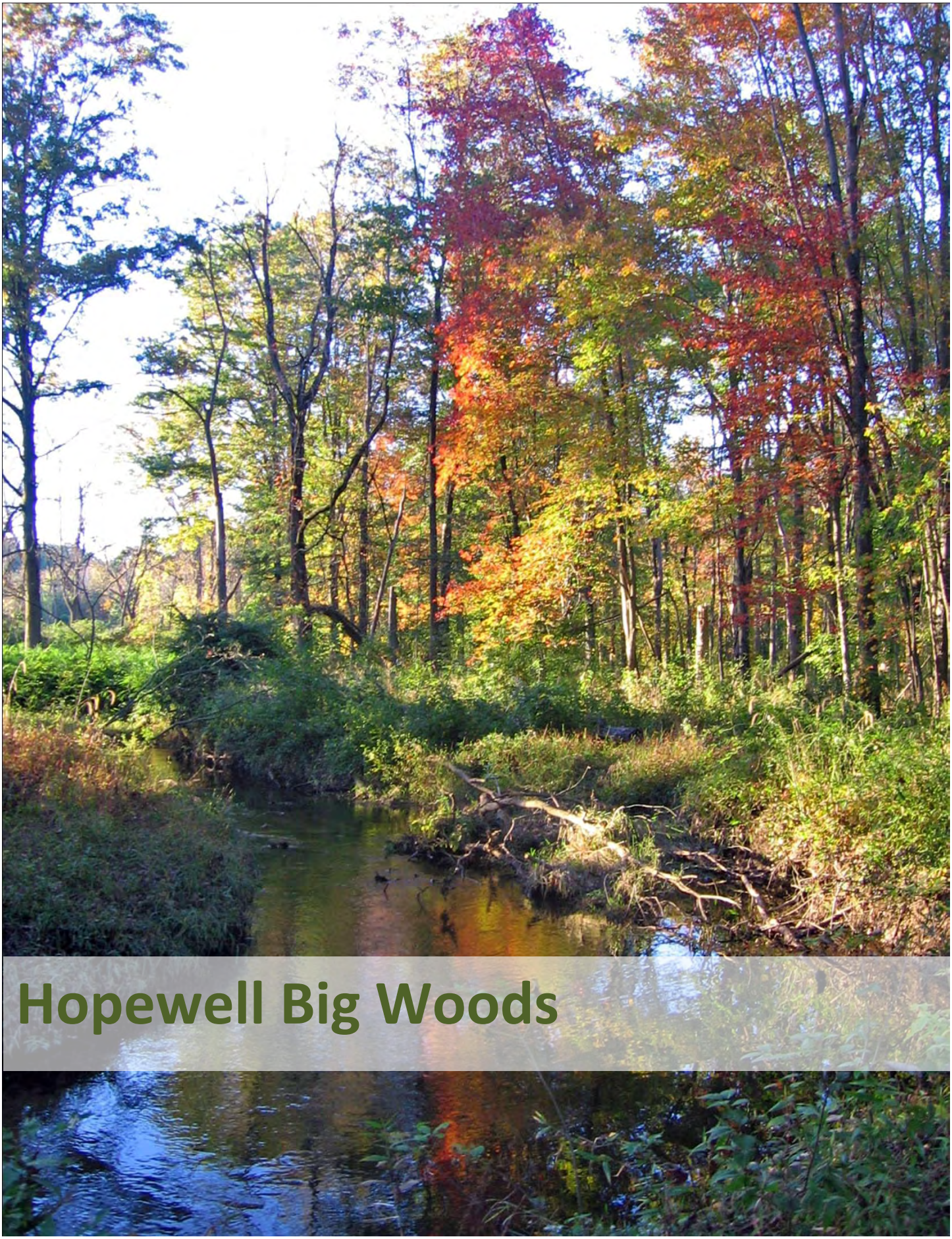
Table 13: Carbon Sequestration and Storage Benefits ($M)

Pollutant	$ / ton	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Carbon Sequestration	[+]*$21*	$0.5	$0.8	$0.2	$0.3	$0.1	**$1.9**
Carbon Storage*	[+]*$21*	$17.1	$24.9	$5.5	$10.2	$3.7	**$61.4**

Sources: Nowak et al., 2006; Nowak et al., 2007; U.S. Forest Service, 2010; Econsult calculations.

[+] *Figures not in $M*

[*] *Carbon storage figures are not annual*



Hopewell Big Woods

Case Study: Hopewell Big Woods

Large Conservation Area Leads to Big Environmental Benefits

- *Chester and Berks Counties*
- *Large-scale conservation area*
- *Approximately 13,000 acres of preserved land*

> *"The Big Woods encompass a world class natural area and provide a wide variety of outdoor recreation opportunities in close proximity to six million people."*
>
> - Jim Thorne, Natural Lands Trust

The Hopewell Big Woods is the largest unbroken stretch of forest in southeastern Pennsylvania. Covering 73,000 acres in Berks and Chester counties, the Big Woods encompasses several popular sites, including the Hopewell Furnace National Historic Site, French Creek State Park, Warwick County Park, Birdsboro Waters, the Natural Land Trust's Crow's Nest Preserve, and State Game Lands 43. The Big Woods is a focus area of the nationally recognized Highlands region, which cuts across Connecticut, New York, New Jersey, and Pennsylvania. In 2004, the U.S. Congress passed the Highlands Conservation Act, which authorized federal assistance for the conservation of land within the Highlands region. In concert with federal conservation goals, the Hopewell Big Woods Partnership, a coalition of more than 35 private and public sector organizations, aims to permanently protect "at least 15,000 acres of unbroken forest in and around French Creek State Park."[26] The preservation of this contiguous forest protects a vast diversity of wildlife and pristine waterways – valuable natural assets that are scarce in close proximity to large metropolitan areas.

Wildlife Habitat

The scale of the Big Woods provides for a substantial amount of biodiversity, offering refuge to wildlife rarely found in the region. What makes the Big Woods truly unique is that it combines this extensive biodiversity with proximity to human population. A 90-minute drive from Center City Philadelphia, Hopewell Big Woods is within easy reach of nearly six million people. At least 45 of the 62 mammal species native to Pennsylvania inhabit the Big Woods, including black bear, bobcat, and gray fox.[27] In recognition of this diversity, the Big Woods has been designated an Important Mammal Area by the Pennsylvania Important Mammal Area Project.[28] There also exist two contiguous Audubon Important Bird Areas (IBA) within the Big Woods. The Glen Morgan Lake IBA and the Hay Creek - French Creek Forest Block IBA are home to a staggering variety of birds, including the bald eagle and the scarlet tanager, as well as forest interior species of birds that depend on large blocks of forest for their prime habitat.

Effect on Property Value

$8,270

Calculations based on home sales near the Hopewell Big Woods show that homes within a quarter-mile of the conservation area can attribute an estimated $8,270 dollars of additional value to this proximity.

Drinking Water and Watershed Protection

The Big Woods encompasses two watersheds that have been recognized for their water quality and are protected under state law. The French Creek watershed drains a 70.2-square-mile area south of the Schuylkill River.[29] Flowing 22 miles, French Creek originates in French Creek State Park and runs in an easterly direction until its confluence with the Schuylkill River in Phoenixville.[30] The section of French Creek within the Big Woods includes its headwaters and was designated as an Exceptional Value (EV) stream by the Pennsylvania Department of Environmental Protection for its outstanding water quality and diversity of aquatic life.[31] Much of Hay Creek, whose 12.8 miles fall almost entirely within the Big Woods, also enjoys the EV designation, which is reserved for the state's most pristine streams and includes only 3 percent of stream miles in Pennsylvania.[32] Both the Hay Creek watershed and the north branch of the French Creek watershed that falls within the Big Woods have been designated as priority conservation areas by the Highlands Coalition for their role in supplying drinking water to surrounding communities and supporting rich aquatic ecosystems.[33] Together, these areas have also been recognized as a Priority Area in the GreenSpace Alliance's Regional GreenPlan and a Conservation Focus Area by DVRPC. [34, 35]

$47 Million

in Annual Environmental Benefits

Employing the same methodology used to quantify the environmental impact generated by all of the protected open space in the region, the environmental benefits provided by the 73,000 acres of protected and unprotected lands that make up the entire Hopewell Big Woods area are valued at an estimated $46.5 million annually. The trees on these acres store carbon valued at approximately $18 million.

Currently protected lands within the Hopewell Big Woods – approximately 13,000 acres – provide environmental benefits valued at an estimated $16.7 million on a yearly basis and are home to trees storing approximately $6.7 million in carbon.

Education and Recreation

In addition to accommodating a variety of wildlife and providing for the preservation of important aquatic and terrestrial ecosystems, the Hopewell Big Woods offers a wide array of outdoor recreational opportunities. The parks, preserves, and trails in the Big Woods are popular for hiking, cycling, fishing, hunting, camping, rock climbing, horseback riding, birding, and more. The Crow's Nest Preserve, operated by the Natural Lands Trust, offers nature-oriented educational programming for children, while the Hopewell Furnace National Historic Site attracts visitors interested in the history of iron making during the Revolutionary era. St. Peter's Village, a late-nineteenth century mining town on the banks of the French Creek within the Big Woods, is listed on the National Register of Historic Places and is a draw for regional tourists. In 2009, the Hopewell Big Woods Partnership completed a trails and recreation concept plan for the conservation area to further capitalize on the unique recreational value of the Big Woods.

Conclusion

The state of nature that exists within the Hopewell Big Woods is increasingly difficult to find in close proximity to America's urban areas. The protection of the Big Woods' native ecosystems, including watersheds that supply drinking water to communities in southeastern Pennsylvania, allows for the continued provision of everyday natural processes vital to the environmental health of the five-county region.

Peace Valley Park

Case Study: Peace Valley Park

Recreation, Environmental Education, and Flood Mitigation

- *New Britain Township, Bucks County*
- *County Park*
- *1,500 acres around Lake Galena*

The largest park in the Bucks County Department of Parks and Recreation, Peace Valley Park occupies 1,500 acres around Lake Galena in New Britain Township. Just northwest of Doylestown, the Park was established in 1973 following the creation of Lake Galena through the damming of the North Branch of Neshaminy Creek. Today, Peace Valley offers a multitude of activities to several hundred thousand annual users and is a fixture for outdoor recreation and education in Bucks County.[36]

Flood Control and Drinking Water Supply

Lake Galena is one of four reservoirs created in the 1970s as a part of the Neshaminy Basin Flood Control System.[37] Located on the North Branch of Neshaminy Creek, Lake Galena mitigates the risk of flood in the surrounding developed area by controlling the flow of the creek. Lake Galena also is the source of drinking water for nearby communities, serving as the reservoir for the North Penn Water Authority's Forest Park Water treatment facility in Chalfont. The Forest Park Water facility provides approximately 80 percent of the water that the North Penn Water Authority delivers to its 30,000 customers, meaning that water passing through Lake Galena is used by roughly 24,000 residents of Bucks and Montgomery counties.[38]

Education and Recreation

Peace Valley Park's most evident value lies in the diversity of activities it offers. Visitors flock to Lake Galena and the park around it to exercise, enjoy nature, and socialize. The Peace Valley Nature Center, one of the Park's main attractions, is situated on the northeastern end of the Park in a rustic facility that once served as a dog kennel. Established in 1975, the Nature Center is operated by a dedicated non-profit organization that provides educational programming for approximately 23,000 elementary school students every year, and serves as the destination for nearby high school students seeking to fulfill community service requirements. The Center conducts many programs, including bird walks, a maple sugar festival, star watches, "Naturalist's Forays," week-long "summer nature adventures" for children, and more. All told, more than 14,000 families participate in the Nature Center's programs, and approximately 200,000 people visit it each year.[39, 40]

> *"Peace Valley Park enhances visitors' quality of life, offering the opportunity for inner peace and satisfaction."*
>
> - Bill Mitchell, Bucks County Department of Parks and Recreation

Around the Nature Center, 14 miles of trails offer visitors the opportunity to observe wildlife firsthand. (Bird watchers have sighted more than 250 species of bird on these trails.) A paved hike and bike path circles Lake Galena and is popular with dog walkers, joggers, cyclists, and people simply taking a stroll. The lake itself, which covers 365 acres, is a

destination for kayaking, canoeing, sailing, and fishing. Bucks County offers non-motorized boat rentals, sailing lessons and camps, and kayaking courses – including guided moonlight kayak and canoe tours. In warm-weather months, the Park's six picnic pavilions are hubs of outdoor social activity for family reunions, birthday parties, and company picnics.

Economic Activity

The Peace Valley Nature Center employs three full-time staff in addition to more than 20 part-time environmental educators and 194 volunteers. The non-profit that runs the Nature Center has an operating budget of more than $200,000, much of which is spent locally. The Bucks County Department of Parks and Recreation employs seven people to man the boat rental operations, teach boating lessons, and run the sailing camps. The county depends on a variety of fee-based activities and permits in Peace Valley Park for revenue. The county collects money for mooring permits on the lake at $80 per vessel. Boat rentals and lessons generate approximately $100,000 in annual revenue for the County. Picnic pavilion rental, another source of County income, ranges from $50 - $100 per day. These fees support staff at Peace Valley Park and contribute to the financial solvency of the Bucks County Parks and Recreation Department.

Effect on Property Value

$35,155

Calculations based on home sales near Peace Valley Park show that homes within a quarter-mile of the Park can attribute an estimated $35,155 dollars of additional value to this proximity.

Conclusion

Peace Valley Park provides several different types of value to surrounding communities. The most obvious value consists of the numerous recreational and educational activities offered at the Park, but the extent of its contribution does not end there. Lake Galena's function as a flood mitigation system and drinking water supply reservoir may go unnoticed by visitors, but its importance to the well-being of the five-county region is significant.

Recreation and Health

Protected open space in southeastern Pennsylvania provides a multitude of free and low-cost recreational activities to residents. Many of these activities consist of strenuous or moderate exercise, which contributes to physical well-being and defrays health-care costs. This section estimates the economic value that regional residents capture from the use of protected open space, analyzing both the value users would be willing to pay to participate in recreational activities on protected open space as well as the economic value of avoided health-care costs as a result of users' participation in strenuous and moderate exercise.

Methodology

This analysis focuses on publicly owned parks as a location for recreational activity. Preserved farmland and conservation areas were not included in this analysis, as, in the case of the former, public access is rarely allowed, and, in the case of the latter, limited data is available regarding the nature of the recreational activity that takes place there. Estimates of the intensity and value of recreational activity on public parks draw from a 2005 U.S. Forest Service study that gathered information on how much money individuals would be willing to pay to participate in various outdoor activities above what they already pay.[41] These values are otherwise known as "willingness-to-pay" estimates, as they are not based on actual transactions, but a general indication of the economic value an individual associates with a particular activity.[iv] It is important to note that the total values presented in this section estimate the value that residents derive from recreational activity on southeastern Pennsylvania's existing public parks. If all of these spaces were to be developed, it is likely that residents would go elsewhere to recreate and thereby replace some of the value they currently derive from recreational activity on public parks.

Willingness to Pay

The estimates in this section are based on research evaluating the average consumer's willingness to pay for a service or activity. These willingness-to-pay values are not based on actual transactions—they estimate the amount of money the average consumer would be willing to pay for a service or activity if it were not provided by protected open space. As such, the values in this section should not be understood as income, but benefit enjoyed as a result of the free or low-cost recreational opportunities provided by protected open space.

Loomis (2005) collected responses from surveys conducted across the United States that asked people how much they would be willing to pay to participate in a variety of recreational activities offered on protected open space. A selection of these values serves as the basis for the estimated value of recreation in this section.

To estimate the value of health-related cost savings linked to the physical activity that takes place on public parks, data was used from several studies that estimated the per-capita economic consequences of physical inactivity, specifically in the areas of medical costs, workers' compensation costs, and costs associated with lost productivity.[42, 43] These values were applied to an estimated total of physically active individuals who participate in recreational activity on public parks in the five-county region. These individuals, who derive their physical fitness in part from the exercise they get on public parks, are

[iv] These estimates are "net" willingness-to-pay values; they approximate the average consumer surplus for a particular activity.

less prone to illness, medical conditions, and missed time at work. As such, it follows that the recreational activity performed on parks in the five-county region generates savings by avoiding the health-related costs that would arise if people were not able to recreate on these spaces. These savings accrue to insurance companies in the form of avoided claims, employers in the form of reduced insurance premiums, and individuals in the form of lower premiums and reduced out-of-pocket medical expenses. Again, it is important to note that the total estimates of health-related savings in this section quantify the value of southeastern Pennsylvania's existing public parks; if these lands were developed, residents would likely find other recreational opportunities to replace at least some of the activity they currently enjoy on parkland.

Estimates in this section, unlike those in the environmental impact section, are tied to the number of residents that visit protected open space in the five-county region, not to the size of protected open space.

Further information on the methodology used and the findings presented in this section is available in Technical Appendices C and D.

Recreational Use

Total Benefit

Nearly $577 million in benefits accrue annually to residents who participate in recreational activities on protected open space within southeastern Pennsylvania. This value represents the additional amount of money that the residents of southeastern Pennsylvania would be willing to spend in the private market to participate in the recreational activities they currently enjoy on protected open space. The figures in Table 14 present a breakdown of recreational value by county and type of open space. They were derived from calculations using average willingness-to-pay values, estimates of total outdoor recreational activities per year, and estimates of how frequently residents visit different types of protected open space to participate in recreational activities.

Table 14: Total Economic Value of Recreational Activity on Protected Open Space, by Type and County ($M per Year)

Open Space Type	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Federal	$17.6	$13.6	$15.9	$23.2	$43.7	**$114.0**
State	$37.5	$28.8	$33.8	$49.3	$92.8	**$242.2**
County	$24.2	$18.6	$21.9	$31.9	$60.0	**$156.6**
Local/Municipal	$9.9	$7.6	$9.0	$13.1	$24.6	**$64.2**
Total	**$89.2**	**$68.6**	**$80.6**	**$117.5**	**$221.1**	**$577.0**

Sources: Loomis, 2005; DCNR Bureau of State Parks; Econsult calculations.

Estimates of the number of yearly outdoor recreational activities in the five-county region are based on response data from the 2009 *Outdoor Recreation in Pennsylvania Resident* survey conducted on behalf of the Pennsylvania Department of Conservation and Natural Resources (DCNR).[44] An analysis of 302 responses from people living within the five-county

region found that the average household in southeastern Pennsylvania participates in outdoor activities 36 times per year. Multiplying this number by the most recent count of households in each county results in nearly 53 million instances of outdoor recreation in the five-county region. Table 15 presents total estimates of recreational activities by county and for southeastern Pennsylvania as a whole.

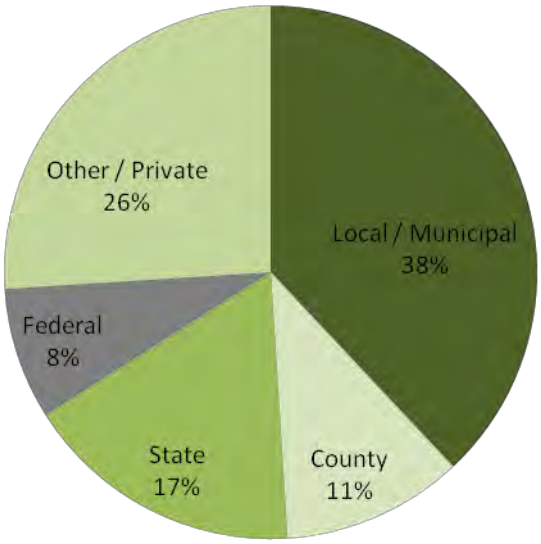
Table 15: Estimated Household Outdoor Recreational Activities

County	Total Households	Number of Times Participating in Recreational Activities
Bucks	227,655	8,195,580
Chester	175,047	6,301,692
Delaware	205,194	7,386,984
Montgomery	299,280	10,774,080
Philadelphia	563,837	20,298,132
Total	**1,471,013**	**52,956,468**

Sources: U.S. Census Bureau; Graefe et al., 2009.

The DCNR survey asked respondents to indicate what types of protected open space they visited when participating in recreation activities: federal, state, county, local/municipal, and other/private. This data was used to estimate the proportionate breakdown of recreational activity in the five-county region by type of protected open space, as demonstrated in Figure 7.

Figure 7: Location of Outdoor Recreation Time



Source: Graefe et al., 2009.

In calculating the value of recreational use in parks in southeastern Pennsylvania, usage statistics were collected from state parks in southeastern Pennsylvania for 2007, 2008, and 2009. These data includes statistics for a variety of recreational activities, including picnicking, swimming, boating, fishing, trail use, bike riding, hunting, winter sports, summer sports, wildlife viewing, and camping. Usage statistics were applied to mean estimated values of individuals' willingness to pay for each activity. [45, v] These values indicate the amount of money that visitors are willing to pay to participate in an activity beyond what they must already pay. As such, the values take into account the many recreational activities on protected open space that are fee-based.

Per-Household Recreation Benefit

$392 per household

The $577 million annual value of recreational activity on protected open space in the region is the equivalent of $392 per household, per year. This value represents how much the average household would be willing to pay in the private market to participate in the recreational activities its members now enjoy on protected open space.

Health-Care Cost Savings

It is well documented that engaging in moderate and strenuous activity contributes to physical well-being and reduces the risk of health problems. Physically active people typically enjoy a variety of health benefits, including lower incidence of cardiovascular diseases, diabetes, depression, certain cancers, and obesity.[46] This section estimates the health-related cost savings that result from the physical activity that residents engage in on southeastern Pennsylvania's protected open space. In total, this physical activity results in avoided costs totaling $1.3 billion per year. This figure includes avoided medical costs, workers' compensation costs, and costs related to lost productivity (See Table 16). These impacts, in turn, translate into lower insurance costs and improved productivity.[vi]

Table 16: Total Health-Related Cost Savings, by Open Space Type and County ($M per Year)

Open Space Type	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Direct Medical Cost Savings	$34.1	$26.1	$29.6	$42.6	$66.4	**$198.8**
Indirect Medical Cost Savings	$102.3	$78.2	$88.8	$127.7	$199.2	**$596.2**
Direct Workers' Comp. Savings	$0.5	$0.4	$0.4	$0.6	$0.7	**$2.6**
Indirect Workers' Comp. Savings	$1.9	$1.5	$1.5	$2.4	$2.9	**$10.2**
Lost Productivity	$90.0	$69.8	$72.7	$113.5	$139.4	**$485.4**
Total	**$228.8**	**$176.0**	**$193.0**	**$286.8**	**$408.6**	**$1,293.2**

Sources: Chenoweth and Bortz, 2005; Graefe et al., 2009; Econsult calculations.

[v] Calculations based on minimum and maximum estimates are available in Technical Appendix C.
[vi] Figure based on mean estimates of the costs of physical inactivity. Figures based on low and high estimates are available in Technical Appendix D.

Research has established the link between physical inactivity and demand for health care and demonstrated that there is a positive relationship between the number of recreational opportunities available to an individual and the frequency of his or her participation in physical activity.[47] Following this logic, it is likely that the opportunities to engage in physical activity made available by the southeastern Pennsylvania's protected open spaces have a positive impact on residents' physical health.

Physical Activity on Protected Open Space

41%

Analysis of responses to the 2009 Outdoor Recreation in Pennsylvania Resident survey conducted by the Pennsylvania DCNR reveals that, on average, regional residents perform 41 percent of all moderate or strenuous physical activity in a park or on a trail.

Individuals who engage in at least one half-hour of moderate or strenuous exercise three or more times a week are considered to be physically active. According to an analysis of regional responses to the 2009 Outdoor Recreation in Pennsylvania Resident Survey, 38 percent of residents living in Bucks, Chester, Delaware, and Montgomery counties and 33 percent of Philadelphia residents meet these criteria. This percentage was applied to the total number of residents in southeastern Pennsylvania that are 20 years old or older to arrive at an estimate of 1.02 million individuals in southeastern Pennsylvania who engage in moderate or strenuous exercise at least three times a week.[48] Of these individuals, approximately 617,000 participate in the labor force. These statistics were used as the basis for estimating the medical costs, workers' compensation costs, and lost productivity costs that are avoided as a result of *all* physical activity in southeastern Pennsylvania.

The 2009 outdoor recreation survey indicates that, on average, 41 percent of moderate or strenuous physical activity in southeastern Pennsylvania is performed in a park or on a trail. The estimates that follow apply this percentage to determine the amount of health care and labor cost savings attributable to moderate or strenuous physical activity on protected open space in the five-county region.

Medical Cost Savings

Direct medical costs are those costs incurred for treatment of illnesses or medical conditions caused and/or exacerbated by physical inactivity. These costs cover preventive, diagnostic, and treatment services administered at hospitals and in other medical facilities. Illnesses linked in part to physical inactivity include cardiovascular diseases, diabetes, depression, and certain cancers. Obesity has also been connected with physical inactivity. Using inflation-adjusted estimates of average per-capita annual savings in direct medical costs, it is estimated that southeastern Pennsylvania avoids a total of $199 million per year in direct medical cost.[49]

Indirect medical costs estimate the impact that adverse health conditions resulting from physical inactivity have on an individual's quality of life. These costs place a dollar value on pain and suffering associated with medical conditions linked to physical inactivity, reduction in quality of life, and shorter life expectancy attributable to physical inactivity. Existing research approximates the ratio of indirect medical costs to direct medical costs at 3:1.[50] Using this ratio, the estimated savings in indirect medical costs amount to $596 million per year.

Together, avoided direct and indirect medical costs produce regional savings of $795 million per year.

Workers' Compensation Cost Savings

Research indicates that physical inactivity leads to an increased risk of suffering strains and sprains and prolongs the recovery period from injury.[51] When individuals incur injuries at the workplace, they can be eligible to collect workers' compensation payments. Research estimates the average per-worker cost of workers' compensation payments as a result of physical inactivity to be between $6 and $12.[52] Using a median per-worker estimate, it is estimated that workers who participate in physical activity on protected open space are responsible for $2.6 million in avoided direct workers' compensation costs. Because employers pay private insurers to cover workers' compensation benefits, these insurance companies are likely the primary beneficiaries of avoided workers' compensation costs, with employers likely benefiting through foregone rate increases.

Indirect workers' compensation costs are administrative costs that an employer incurs due to workers' compensation claims. Research estimates that the relationship between these costs and direct workers' compensation costs is 4:1.[53] Using this ratio, it is estimated that employers avoided $10.2 million in indirect workers' compensation costs as a result of the physical activities their employees participated in on protected open space in southeastern Pennsylvania.

Lost Productivity Cost Savings

Direct costs to businesses as a result of lost productivity are a significant contributor to overall costs of physical inactivity. Research describes lost productivity as occurring in two ways: through absenteeism, defined as, "not being present or attending to duty or work " and "presenteeism," defined as - "being at work when you should be at home, either because you are ill or because you are too tired to be effective." [54]

Using a per-worker annual lost productivity cost estimate, it is estimated that businesses in southeastern Pennsylvania avoid $485.4 million in costs per year as a result of the physical activities their employees engage in on protected open space in the region. This total represents the combined value of costs not incurred as a result of avoided absenteeism and presenteeism due to physical activity on protected open space in southeastern Pennsylvania.

The Perkiomen Trail

Case Study: The Perkiomen Trail

Extensive Use and Connections Create Value

- *Montgomery County*
- *Nearly 20 miles*
- *Connects County Parks and Historic Sites*

At 19 miles in length, the Perkiomen Trail is the second-longest trail in Montgomery County (the Schuylkill River Trail is longer.) The Trail runs along a section of the former rail bed of the Reading Railroad's Perkiomen Branch from the village of Oaks at the southern end to Green Lane Borough at the northern end. Traversing 10 municipalities, the Perkiomen Trail serves as a link between three county parks, two county historic sites, and two downtowns.

Recreation

The dedication of the Perkiomen Trail in 2004 was the culmination of a decades-long process to convert a passenger and freight rail line right-of-way into a multi-use recreational trail.[55] Today, the Perkiomen Trail sees more than 50,000 users per month during the height of the summer, including cyclists, hikers, joggers, equestrians, and dog walkers.[56] Sports teams from Ursinus College and Perkiomen Valley High School train on the Trail. The pharmaceutical company Pfizer operates a campus adjacent to the Trail and recently constructed a connector path to facilitate employee access to the Trail.[57] Usage in the three county parks linked by the Trail has increased, and Green Lane Park and Lower Perkiomen Valley Park, situated on opposite ends of the Trail, have become well-used trailheads for cyclists and joggers. Central Perkiomen Valley Park is also a popular entry point. The Trail crosses through two Montgomery County historic sites: Mill Grove, the first American home of nineteenth century ornithologist and artist John James Audubon; and Pennypacker Mills, the summer estate of early twentieth century Pennsylvania Governor Samuel W. Pennypacker.

> *"The Perkiomen Trail makes Montgomery County a better place to live and work."*
>
> - John Wood

In 2008, the Rails-to-Trails Conservancy tracked usage on the Perkiomen Trail and arrived at an annual estimate of nearly 400,000 unique visits.[58] These figures indicate that users of the Perkiomen Trail enjoy an estimated annual benefit of $19.8 million from the activities they participate in while using the Trail.[59]

Revenue Generation

A handful of local businesses, primarily in Schwenksville and Collegeville, benefit from the Trail's popularity. Among these is Tailwind Bicycles, a bike shop in Schwenksville that advertises itself as "right on the Perkiomen Trail" and promotes the Trail as one of the "Top 10 Reasons to Buy from Tailwind."[60] Tailwind also organizes weekly rides along the Trail. Moccia's Train Stop, an Italian restaurant and ice cream parlor adjacent to the Perkiomen Trail in downtown Schwenksville, enjoys the business of many Trail

Recreational Value

$19.8 million

In 2008, the Rails-to-Trails Conservancy tracked usage on the Perkiomen Trail and arrived at an annual estimate of nearly 400,000 unique visits.[i] Applying this figure to the minimum estimated willingness-to-pay value for trail use in Loomis (2005) indicates that users of the Perkiomen Trail enjoy an estimated annual benefit of $19.8 million from the activities they participate in while using the Trail.

users and boasts a painted sign encouraging visitors to "Enjoy the trail!" The Collegeville Diner, directly adjacent to the Trail, is another frequent pit stop for Trail users. According to Rich Wood, Trails Manager for the Montgomery County Parks & Heritage Services Department, several area businesses have inquired about placing advertisements on the Trail to capture the attention of its hundreds of thousands of annual visitors.

Connectivity

Beyond serving the communities that directly surround it, the Perkiomen Trail has significantly expanded access to the existing network of trails in southeastern Pennsylvania. The recent completion of the Green Lane Extension Trail connects the Perkiomen Trail to 18 more miles of trails and a host of other amenities within Green Lane Park. The connection in the village of Oaks between the Perkiomen Trail and the popular Schuylkill River Trail provides direct access to Valley Forge National Historic Park as well as Center City Philadelphia through an additional 20 miles of trail. The Skippack Trail provides a connection between the Perkiomen Trail and Evansburg State Park, as well as the popular Skippack Village. Once plans for the full development of trails in Montgomery County are realized, the Perkiomen Trail will be part of a network of trails covering more than 160 combined miles. This network will provide an alternative mode of accessing parks, historic sites, and communities in Montgomery County, Philadelphia, and beyond.

Effect on Property Value

$4,766

Calculations based on home sales near the Perkiomen Trail show that homes within a quarter-mile of the Trail can attribute an estimated $4,766 dollars of additional value to this proximity.

Conclusion

In reinventing a vacant rail bed slicing through Montgomery County, the Perkiomen Trail has had a profound effect on the quality of life in communities like Collegeville, Schwenksville, and others nearby. The nearly 400,000 estimated annual visits to the Trail speak volumes about the value that residents place on it. That the Trail shows up in real estate listings and business advertisements only confirms that this recently created open space has established itself as an undeniable amenity to the region.

Glenolden Park

Case Study: Glenolden Park

A Densely Developed Community's Outdoor Living Room

- *Delaware County*
- *Glenolden Borough*
- *22.9-acre park*

At nearly 23 acres, Glenolden Park is the verdant epicenter of its community. Located in Glenolden Borough, a densely populated first-ring suburb three miles southwest of Philadelphia, Glenolden Park's value lies in its versatility and convenience. So much of Glenolden's community life revolves around the Park that Borough Manager Brian Hoover describes it as "a focal point for the community." As the largest public open space in the borough, the Glenolden Park serves as a sort of outdoor living room for the nearly 7,500 residents of Glenolden, as well as those who live in the nearby Delaware County communities of Folcroft, Norwood, and Prospect Park. The Borough of Glenolden covers just one square mile and is approximately 95 percent built out.[61] This level of density is characteristic of many of the surrounding towns, making Glenolden Park a green oasis in an extensively developed part of southeastern Pennsylvania.

Recreation

> *"Glenolden Park is a focal point for the community."*
> - Brian Hoover, Borough of Glenolden

The Park's 23 acres play host to a broad range of activities, running the gamut from tee ball to fishing and bird watching. The two baseball fields and tee ball field inside the Park get heavy use from area youth leagues and groups playing pick-up games. Families and daycare programs bring young children to the playground, which Hoover describes as "packed" on nice days. The Glenolden Library fronts the Park on Llanwellyn Avenue, and library patrons make use of its peaceful atmosphere to relax and read. Youth from nearby communities come to fish for catfish and bluegills in Muckinipates Creek, a tributary of Darby Creek that runs through the Park. Newlyweds and prom-goers stage photo shoots in the Park's pavilion. On snowy days, sledders flock to Monument Hill. In the warmer months, residents take to the trails in the hope of catching a glimpse of the Cooper's hawks that have recently made their home in the Park.

These myriad uses make Glenolden Park the site of constant activity – an outdoor living room for the densely populated suburban communities that surround it. While attendance and usage numbers are not kept for the Park, Borough Manager Hoover maintains that it's the "central focus" of Glenolden and that it plays a factor in convincing families to move into the borough. As the largest of the few remaining undeveloped parcels in Glenolden, the Park represents residents' best option for nearby outdoor recreation and leisure. It is the type of outdoor space that is in short supply and high demand, and is not easily replicable given the extent of development in this part of Delaware County.[*]

Community Cohesion

In addition to the daily uses described above, Glenolden Park serves as the venue for a variety of community events and efforts that bring residents together and help to build a sense of community in this corner of the region. The Park is home to a number of annual events that draw attendees from Glenolden and nearby towns, including annual community days, classic car shows, Easter egg hunts, and Independence Day festivities. The Park enjoys a level of continual use that speaks to its value to the community.

[*] *An analysis of the effect of proximity to Glenolden Park on property values did not return statistically significant results.*

Economic Activity

Southeastern Pennsylvania's existing protected open space drives a significant amount of economic activity. This section estimates the economic and fiscal impact of direct and indirect economic activity associated with protected open space in the five-county region. These estimates are the result of analysis of agricultural activity on *privately* protected open space, management and maintenance of *publicly* protected open space, and tourism associated with *all* open space. Economic impact is measured in terms of expenditures, employment, earnings, and tax revenues.

Methodology

This economic impact analysis takes into account direct, indirect, and induced economic activity. Direct economic activity—such as growing crops on protected farmland—takes place on protected open space itself. Indirect economic activity arises from all intermediate rounds of production in the supply of goods and services. For example, economic activity on private farmland supports various contractors, who have to make their own purchases of materials from suppliers, who thereby indirectly benefit from economic activity on protected open space. Induced economic activity, on the other hand, measures the impact of the spending of wages generated by the direct activities as well as by the indirect activities of supplying firms. For example, workers on private farmland will themselves spend their earnings on various items, such as food, clothing, and housing.

Taking these levels of impact into account, estimates of total economic and fiscal values were calculated for three distinct types of economic activity associated with protected open space in southeastern Pennsylvania.

Agricultural Activity on Privately Owned Protected Open Space

Job and revenue generation estimates associated with privately owned protected open space are based on the agricultural activity that takes place on this acreage. Preserved farmland in the five-county region occupies approximately 42,000 acres, and open space held by land trusts or that is otherwise privately protected covers an additional 59,600 acres.[62] To ensure a conservative estimate of the economic impact of agricultural activity on protected open space, the analysis did not include preserved farmland acreage covered by forest or wetland nor did it include forests, wetlands, and pastures on land trust or private protected space. Subtracting this land cover from the aforementioned acreage totals yielded the basis for analysis: 35,700 acres of preserved farmland and 14,600 acres of otherwise privately protected open space, or 50,300 acres total of protected farmland. The analysis assumes that the agricultural activity that takes place on protected open space is as intensive, in terms of commercial activity and employment density, as other agricultural activity in the five-county region.

Maintenance of Publicly Protected Open Space

Public parks make up half the protected open space in southeastern Pennsylvania (approximately 95,700 acres).[63] Economic activity on this land results from the management and maintenance of federal, state, county,

and local/municipal parks. The federally controlled parks included in the analysis were Hopewell Furnace National Historic Site and Valley Forge National Historic Park.[vii] Independence National Historical Park in Philadelphia was excluded, as much of its grounds would not be considered open space. Budget data from 12 state parks was included: Delaware Canal State Park, Neshaminy State Park, Nockamixon State Park, Ralph Stover State Park, and Tyler State Park in Bucks County; Marsh Creek State Park, French Creek State Park, White Clay Creek State Park in Chester County; Ridley Creek State Park in Delaware County; Evansburg State Park and Fort Washington State Park in Montgomery County; and Benjamin Rush State Park in Philadelphia. Budget data for county and municipal parks departments also were analyzed.

Tourism Associated with Protected Open Space

Southeastern Pennsylvania's protected open space is a draw for tourists. The Outdoor Recreation Coalition of America estimated that outdoor recreation generated $40 billion in national tourism expenditures in the United States in 1996, of which approximately $20 billion were direct expenditures. This accounts for approximately 3-4 percent of national direct tourism expenditures, which hover around $600 billion annually. Because not all outdoor recreation takes place on protected open space, calculations in this section conservatively estimate that 2 percent of tourism activity was attributable to protected open space in southeastern Pennsylvania.

The impact of these three types of economic activity was assessed across four categories: expenditures, employment, earnings, and tax revenues.

Further information on the methodology used and the findings presented in this section is available in Technical Appendix E.

Summary of Economic Activity Impacts

As seen in Table 17, economic activity associated with protected open space in southeastern Pennsylvania results in more than 6,900 jobs, $566 million in annual expenditures, $299 million in annual earnings, and more than $30 million in annual state and local tax revenues. Further discussion of each of these estimates is provided below.

Table 17: Total Annual Economic and Fiscal Impacts Associated with Protected Open Space ($M per Year)

	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Total Expenditures	$75.5	$225.7	$42.4	$91.7	$131.1	**$566.4**
Total Employment (jobs)	989	3,225	523	1,119	1,055	**6,911**
Total Earnings	$36.3	$153.6	$18.8	$44.0	$46.1	**$298.8**
Total Taxes	$3.3	$10.7	$1.9	$4.0	$10.3	**$30.2**

Sources: U.S. Department of Agriculture, 2007; various municipality budgets, 2009, 2010; Greater Philadelphia Tourism Marketing Corporation, 2009; Econsult calculations.

[vii] One-third of activity in Hopewell Furnace was assigned to Chester County, as two-thirds of the Park's acreage fall in Berks County, outside of the region. Heinz National Wildlife Refuge is not included in the analysis, as no data was available.

Expenditures

Table 18 estimates the spending that occurs on and because of protected open space in the five counties of southeastern Pennsylvania. Examples include government spending for the management and maintenance of public open space, spending for the purchase of goods made on preserved farmland, and spending related to tourism associated with protected open space. The U.S. Department of Agriculture estimates that total annual expenditures in the five-county region associated with protected open space equal $566 million. Of this total, $174 million, or 31 percent, is attributable to spending associated with the management and maintenance of publicly protected open space; $206 million, or 36 percent, accounts for agricultural sales associated with protected farmland; and $187 million, or 33 percent, is generated through tourist activity.

Table 18: Total Annual Expenditures Associated with All Protected Open Space ($M per Year)

	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Total Expenditures Associated with Public Parks	$39.5	$33.6	$24.1	$52.9	$24.0	**$174.1**
Total Agricultural Sales Associated with Protected Farmland	$19.0	$174.5	$3.1	$8.6	$0.5	**$205.7**
Total Tourism Expenditures Associated with Protected Open Space	$17.0	$17.6	$15.2	$30.2	$106.6	**$186.6**
Total	**$75.5**	**$225.7**	**$42.4**	**$91.7**	**$131.1**	**$566.4**

Sources: U.S. Department of Agriculture, 2007; various municipality budgets, 2009, 2010; Greater Philadelphia Tourism Marketing Corporation, 2009; Econsult calculations.

Direct public expenditures on publicly protected open space—money spent for the management and maintenance of these spaces—account for an estimated $92 million. This economic activity – which also represents a government expense – supports an additional $82.5 in indirect and induced expenditures. Table 19 presents a county-by-county look at these expenditures.

Table 19: Annual Expenditures Associated with Publicly Protected Open Space ($M per Year)

	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Direct Expenditures on Public Parks	$20.8	$17.7	$12.7	$27.8	$12.6	**$91.6**
Total Indirect and Induced Expenditures	$18.7	$15.9	$11.4	$25.1	$11.4	**$82.5**
Total Expenditures	**$39.5**	**$33.6**	**$24.1**	**$52.9**	**$24.0**	**$174.1**

Sources: Municipal budgets, 2009, 2010; Econsult calculations.

Agricultural activity on the 50,300 acres of protected farmland included in the analysis generates $119 million in direct sales and supports an additional $86 million in indirect and induced expenditures. Table 20 displays county and regional totals for this spending.

Table 20: Annual Agricultural Sales Associated with Protected Farmland ($M per Year)

	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Direct Agricultural Sales on Protected Farmland	$11.0	$101.3	$1.8	$5.0	$0.3	**$119.4**
Total Indirect and Induced Expenditures	$8.0	$73.2	$1.3	$3.6	$0.2	**$86.3**
Total Expenditures	**$19.0**	**$174.5**	**$3.1**	**$8.6**	**$0.5**	**$205.7**

Sources: U.S. Department of Agriculture, 2007; Econsult calculations.

In addition, tourist activity associated with protected open space generates approximately $116 million in annual direct expenditures, which in turn support an additional $70 million in indirect and induced expenditures (See Table 21).

Table 21: Annual Tourism Expenditures Associated with Protected Open Space ($M per Year)

	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Direct Expenditures	$10.6	$11.0	$9.4	$18.8	$66.4	**$116.2**
Indirect Expenditures	$6.4	$6.6	$5.8	$11.4	$40.2	**$70.4**
Total	**$17.0**	**$17.6**	**$15.2**	**$30.2**	**$106.6**	**$186.6**

Sources: Greater Philadelphia Tourism and Marketing Corporation, 2009; Econsult calculations.

Employment

Protected open space in southeastern Pennsylvania contributes an estimated 6,900 jobs to the regional economy (See Table 22). Examples of these jobs include public maintenance workers, park administrators, and rangers; farmers, distributors, and suppliers working on protected farmland; and guides and hospitality professionals catering to tourists who visit protected open space.

Table 22: Total Employment Associated with Protected Open Space (Jobs)

	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Total Employment Associated with Public Parks	468	398	285	626	283	**2,060**
Total Agricultural Employment Associated with Protected Farmland	287	2,635	46	129	8	**3,105**
Total Tourism Employment	234	192	192	364	764	**1,746**
Total	**989**	**3,225**	**523**	**1,119**	**1,055**	**6,911**

Sources: U.S. Department of Agriculture, 2007; various municipality budgets, 2009, 2010; Greater Philadelphia Tourism Marketing Corporation, 2009; Econsult calculations.

Jobs related to the management and administration of public parks account for 30 percent of all employment associated with protected open space, or approximately 2,060 positions. This estimate includes jobs that take place directly on or because of public parks, including park rangers, groundskeepers, and public administrators. It also accounts for indirect employment associated with public parks, examples of which include jobs selling and repairing equipment used for park maintenance, and jobs arising from private concessions run on public parkland.

Agricultural jobs associated with protected farmland make up 45 percent of employment related to protected open space in southeastern Pennsylvania, totaling 3,100 jobs. This total estimate comprises direct and indirect jobs related to agricultural activity on protected farmland. Examples of direct jobs include farmers, laborers, and administrators directly involved in agricultural production on protected farmland. Indirect employment in this sense includes jobs supplying equipment and materials to the farmers and jobs related to the transport and distribution of agricultural goods produced on protected farmland.

Jobs in southeastern Pennsylvania's tourism industry that can be attributed to protected open space account for an estimated 1,750 positions, or 25 percent of all employment associated with protected open space. These jobs include employment directly related to tourism on protected open space, such as tour guides at historic sites on protected open space, jobs at travel agencies that offer packages related to southeastern Pennsylvania's national and state parks, and jobs in agritourism. This figure also includes jobs in the tourism industry that indirectly arise as a result of protected open space. Examples include jobs at bed and breakfasts or hotels that host visitors to protected open space and jobs at restaurants or other retail establishments that cater to the same clientele.

Earnings

Table 23 shows that the salaries associated with the jobs discussed above total nearly $300 million annually. Earnings for workers with jobs related to the management and maintenance of local public parks make for an estimated $93 million per year, accounting for 31 percent of all earnings related to protected open space in southeastern Pennsylvania. Salaries paid to workers in jobs related to the agricultural activity that takes place on protected farmland total approximately $149 million per year, making up one-half of all earnings related to protected open space. Employees in the tourism industry earn approximately $57 million annually as a result of the tourist draw of local protected open spaces. This total accounts for 19 percent of all earnings associated with southeastern Pennsylvania's protected open space.

Table 23: Total Annual Salaries Associated with Protected Open Space ($M per Year)

	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Total Salaries Associated with Public Parks	$19.3	$19.5	$12.1	$28.5	$13.9	**$93.3**
Total Salaries Associated with Agricultural Activity on Protected Farmland	$11.8	$128.9	$1.9	$5.9	$0.4	**$148.9**
Total Salaries from Related Tourism	$5.2	$5.2	$4.8	$9.6	$31.8	**$56.6**
Total	**$36.3**	**$153.6**	**$18.8**	**$44.0**	**$46.1**	**$298.8**

Source: Econsult calculations.

Taxes

The economic activity discussed above generates tax revenues via income, sales, and business taxes.[viii] All economic activity associated with protected open space in southeastern Pennsylvania generates an estimated $30.2 million annually in state and local taxes. State tax revenues make up 72 percent of this estimate; local tax revenues account for the remaining 28 percent.

State tax revenues associated with protected open space total approximately $22 million per year. Economic activity associated with protected farmland accounts for 44 percent, or $9.5 milion, of these revenues. Activity in the tourism industry related to protected open space contributes 29 percent of these state taxes, and activity associated with the management and maintenance of public parks makes up the remaining 27 percent. Table 24 presents a county-by-county breakdown of state tax revenues generated from economic activity related to protected open space.

Table 24: Total State Tax Revenues Associated with Protected Open Space ($M per Year)

	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
State Tax Revenues Associated with Public Parks	$1.3	$1.1	$0.8	$1.8	$0.8	**$5.8**
State Tax Revenues Associated with Protected Farmland	$0.9	$8.1	$0.1	$0.4	$0.0	**$9.5**
State Tax Revenues Associated with Open Space-Related Tourism	$0.6	$0.6	$0.6	$1.0	$3.6	**$6.4**
Total	**$2.8**	**$9.8**	**$1.5**	**$3.2**	**$4.4**	**$21.7**

Source: Econsult calculations.

Table 25 presents a breakdown of all estimated local tax revenues. Local tax revenues associated with protected open space total an estimated $8.5 million per year. Tourism activity related to open space accounts for the majority of these revenues, making up 71 percent. Economic activity associated with public parks contributes 14 percent of local taxes, and activity related to protected farmland generates 15 percent.

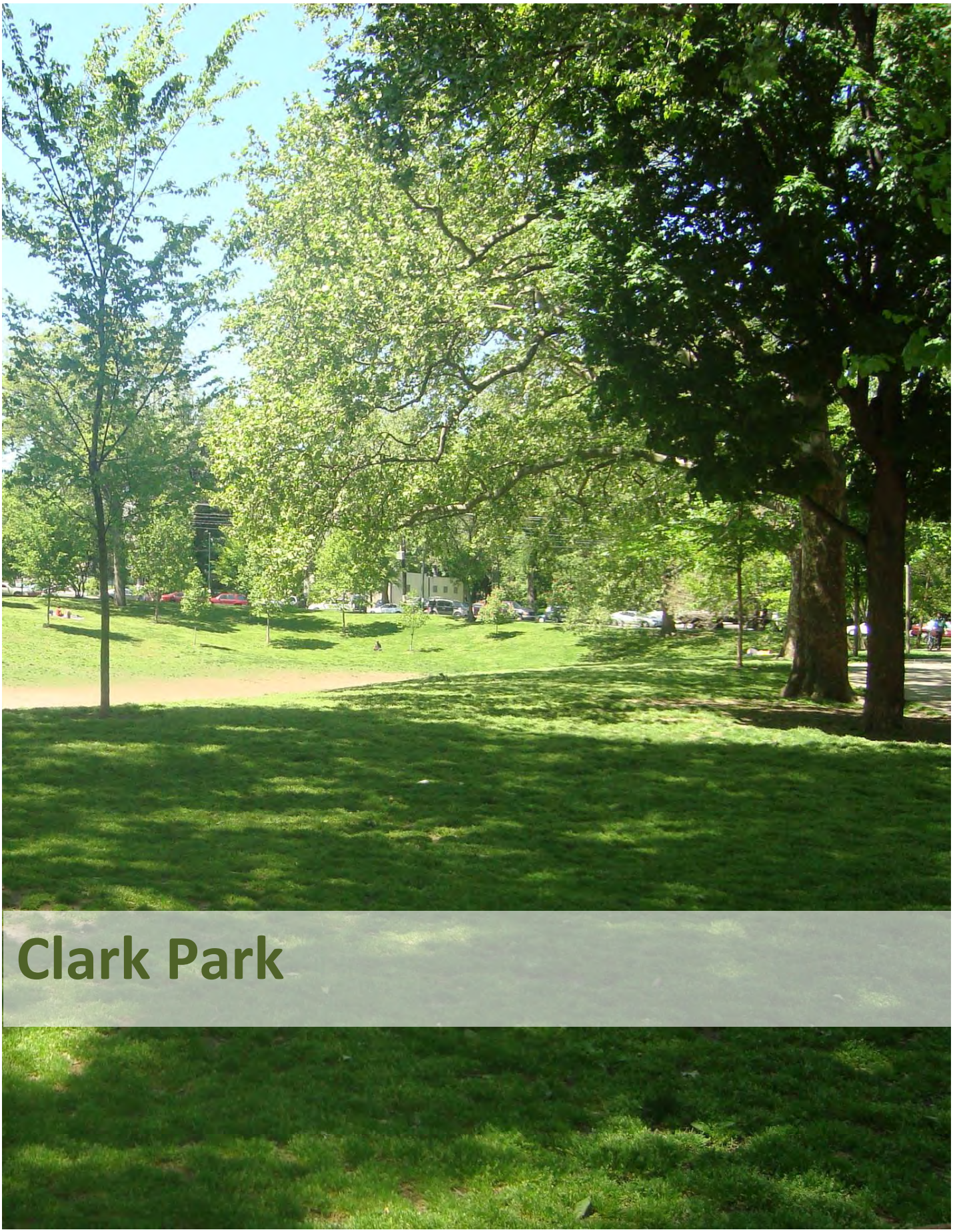
Table 25: Total Local Tax Revenues Associated with Protected Open Space ($M per Year)

	Bucks	Chester	Delaware	Montgomery	Philadelphia	Total
Local Tax Revenues Associated with Public Parks	*$0.0	$0.1	*$0.0	$0.1	$1.0	**$1.2**
Local Tax Revenues Associated with Protected Farmland	$0.1	$0.4	*$0.0	$0.1	$0.7	**$1.3**
Local Tax Revenues Associated with Open Space-Related Tourism	$0.4	$0.4	$0.4	$0.6	$4.2	**$6.0**
Total	**$0.5**	**$0.9**	**$0.4**	**$0.8**	**$5.9**	**$8.5**

**Value is greater than zero, less than $50,000*

Source: Econsult calculations.

[viii] Figures in this section do not include federal fiscal impact.



Clark Park

Case Study: Clark Park

Collaborating to Reduce Crime, Build Community, and Support Local Businesses

- *West Philadelphia*
- *9 acres*

Clark Park represents the largest green space in University City – one of Philadelphia's most ethnically and socio-economically diverse neighborhoods. Due to this diversity and the park's proximity to the University of the Sciences in Philadelphia, the University of Pennsylvania, and Drexel University, Clark Park is a natural gathering place for visitors of all ages and backgrounds. A pronounced drop in crime in the surrounding area over the last 15 years has made the park a safer place, converting it from a place that many avoided to a vibrant community magnet.

Crime Reduction

Clark Park was not always a vibrant community gathering place. Crime ran rampant in University City up until the mid-1990s, and the park was in the heart of an area known for drugs, poverty, and violence. The neighborhood and park had a turning point in 1996 after a Penn biochemist was murdered near Clark Park while walking home one night. The incident caused great alarm in University City and set in motion a coordinated effort to improve safety and cleanliness and increase homeownership in the area.[64]

> *"Clark Park gives everyone an excuse to go outside and enjoy the community."*
> - Frank Chance, The Friends of Clark Park

The University of Pennsylvania immediately increased the size and scope of its police force, hiring new officers and requiring that they patrol neighborhoods beyond the campus.[65] The University City District was formed in 1997 as a product of the Penn safety initiatives, and in its first five years was credited with helping to influence a drop in crime, an increase in property values, cleaner streets and sidewalks, and an influx of new restaurants and small businesses.[66] In 1998, Penn began offering the Penn Guaranteed Mortgage Program to employees, encouraging them to purchase homes in University City, increasing home ownership around the park.[67]

However, the most significant contributor to community improvements and home values in the area has been the opening of the Penn Alexander School in 2001. Developed as a joint venture between Penn and the Philadelphia School District, the K - 8 school has attracted young couples and families drawn by the University's commitment and strong student achievement scores.

Community Cohesion

Like many city parks, Clark Park has a non-profit Friends of Clark Park group. Formed in 1973, the Friends raise funds for maintenance and provide a forum for park patrons to share concerns and ideas.[68] The organization began with a handful of citizens and has grown to more than 170 neighbors and nearby business members. The Friends control a yearly budget of approximately $25,000, and they supplement these funds with an estimated 225 monthly volunteer hours dedicated to tree-planting and other projects.[69]

As active as it was, the Friends of Clark Park joined with the University City District and the Philadelphia Department of Recreation to form the Clark Park Partnership in 1998 to ramp up maintenance, resulting in a decrease in crime in the park and its periphery.[70] The Partnership now also includes representatives from the Philadelphia Department of Parks

and Recreation; the University of the Sciences; UC Green; the Food Trust, which runs the bi-weekly Clark Park Farmers' Markets; Uhuru, which organizes monthly flea markets; and several neighborhood organizations. For 12 years, the Partnership has held an annual "Party for the Park" fundraiser. The event is now in its twelfth year and has raised upwards of $550,000 for maintenance, programming, and a long-term endowment to help fund capital improvements.[71]

A melting pot of cultures can be observed often in the park's "bowl," formerly a mill pond, which is a popular location for pick-up games of soccer. Groups of Ethiopian, Iraqi, and Egyptian immigrants, to name a few examples, regularly convene in the bowl for games.[72]

Recreation

A 2006 study measuring park usage counted approximately 1,650 people visiting Clark Park on an average day for informal activities, with 600,000 visiting per year—perhaps the most heavily-used facility in the Philadelphia Department of Parks and Recreation's Community Park System.[73] Visitors come to use Clark Park's playing field, jogging and biking paths, basketball court, and playgrounds. Others come for the farmers' and flea markets, or just to enjoy the outdoors.

The park's recently upgraded tot lot and adjoining playground for older children are alive with activity during after-school hours and weekends.[74] The tot lot, in particular, provides networking opportunities for young families. Close to 100 members belong to the Clark Park Tot Lot Parents *Facebook* page, posting invitations for play-dates at the park or advertising for babysitters.[75]

Effect on Property Value

$45,879

While the dramatic increase in University City home values over the past decade is most attributable to the Penn Alexander School's catchment area, analysis indicates that homes within a quarter-mile of the park can attribute on average $45,879 of additional value to their proximity to Clark Park.

Beyond these everyday recreational uses, Clark Park hosts a substantial number of events that draw visitors from outside the neighborhood. The City of Philadelphia issues permits for approximately 50 special events in Clark Park annually, attracting more than 12,000 people.[76] These events vary in size and nature from the Woodland Avenue Reunion, a neighborhood fundraiser drawing more than 2,000 visitors, to the four-day Black Heritage Festival attracting 1,500 visitors, to birthday parties and Boy Scouts picnics that can draw between 30 and 50 visitors to the park. The Clark Park Youth Soccer League hosts games and tournaments for between 150 and 200 children each spring and fall. Free performances by the non-profit group Shakespeare in Clark Park lure audiences ranging into the thousands each summer. Additionally, flea markets in the spring and summer draw hundreds of customers to the park monthly.

Revenue Generation

Now in its twelfth year, the Clark Park Farmers' Market began as a once-per-week event only in the spring and summer. In response to high demand, the Food Trust, which began the market in cooperation with the University City District, holds the events year-round. The Clark Park Farmers' Market now includes 18 vendors, several of whom have been participating since its inception.[77]

According to Food Trust estimates, on a typical Saturday, between 500 and 700 customers visit the market, generating approximately $10,000 in sales for local farmers. Depending on the season, weekly sales can be as high as $30,000. Annually, the market generates about $650,000 in sales.[78]

Small businesses around Clark Park benefit greatly from its proximity. The Green Line Café adjacent to the park at 42nd Street and Baltimore Avenue is a notable example, as co-owner Daniel Thut claims that the café does about 30 to 40 percent more business than a second nearby location, attributing much of this difference to park traffic. On Thursdays and Saturdays when the farmers' market is open, the café's sales can jump to about 20 percent more than an average day.[79] A new addition to the neighborhood is the Milk and Honey Market, located at 44th Street and Baltimore Avenue. Owner Mauro Daigle estimates that about 20 to 25 percent of his sales can be attributed to foot traffic for the park and nearby Penn Alexander School.[80]

Conclusion

The network that has formed around Clark Park includes neighbors, community associations, businesses, and major institutions that have joined forces to protect and enjoy the park and make it a better place. This cohesion has given way to safety improvements and extensive recreational use, and has transformed the park into a revenue generator for neighboring businesses, regional farmers, and vendors.

Honey Brook Township

Case Study: Honey Brook Township

Preserving Farmland and a Way of Life

- *Western Chester County*
- *Agricultural land preservation*
- *More than 1,100 acres of preserved farmlands within the township*

Fertile soils and a favorable climate provide the building blocks for a long-standing agricultural tradition in Chester County. Despite ongoing development pressure, Chester County still ranks second among counties in Pennsylvania and within the top 50 counties nationally in total value of agricultural products sold.[81] Honey Brook Township, a rural community of 6,200 on the western edge of Chester County, plays an integral role in preserving this dynamic agricultural economy.

Agricultural Production

The strength of Honey Brook's agricultural tradition is derived from the extraordinarily high quality of its soils. In combination with a climate that does not require the irrigation of farmland, this rich soil generates tremendous benefit to local farmers.[82] Nearly 70 percent of Honey Brook properties of 50 acres or larger contain at least 50 percent prime agricultural soils, as designated by the U.S. Department of Agriculture.[83] Given this soil quality and the lack of the need to irrigate, Honey Brook farmers can operate much more efficiently than their competitors in other parts of the region and country. The concentration of agricultural activity in Honey Brook generates significant economic impact through local production of fruit, vegetables, dairy, and other products. Using analysis from the Pennsylvania Center for Dairy Excellence, it is estimated that the township's 55 dairy farms and 2,145 cows generate nearly $29.5 million in economic activity every year.[84]

Land Preservation in Clusters

The preservation of agricultural lands in large clusters – as practiced in Honey Brook and throughout Chester County – yields greater economic and environmental benefits than could be achieved through the preservation of geographically isolated farms. Cluster-oriented preservation policy in Honey Brook keeps the township's significant tracts of contiguous high-value agricultural soils intact, thereby maintaining the land's distinct

Snapshot: September Farm

Located within a priority land preservation area on the west side of Honey Brook, September Farm is a dairy farm that produces and sells cheese made from its Holstein milk cows. Approximately 80 acres of September Farm are permanently protected through an agricultural preservation easement filed in 2005. The legal protection of their own farmland as well as other nearby farms affords owners David and Roberta Rotelle a degree of certainty regarding the future of their business in Honey Brook. This confidence played a factor in the Rotelles' decision in 2008 to evolve their dairy operation into an award-winning cheesemaking business. The Rotelles made significant investments in their agribusiness to introduce cheesemaking into their operations, purchasing equipment and building a retail space on the farm where customers now come to sample and purchase a variety of cheeses and get a glimpse of the cheesemaking process.

Recognized as a Dairy of Distinction by the Northeast Dairy Beautification Program, September Farm has seen the economic and environmental benefits of local farmland preservation firsthand. Looking to expand these benefits, Mr. Rotelle is actively involved with agricultural land preservation efforts in Honey Brook, serving on the Township's Land Preservation Committee.

natural advantage. Furthermore, clustered agricultural activity stimulates local growth in related support businesses, such as livestock supply, seed and chemical supply, and farm equipment sale and maintenance. The presence of a readily accessible local supply chain enhances the ability of Honey Brook farms to operate profitably. This critical mass of preserved farmland and supporting businesses contributes to the stability of Honey Brook's agricultural economy.

Community Cohesion

Farming and rural living are fundamental aspects of Honey Brook's culture, and the conservation of agricultural lands in the Township helps to preserve a unique way of life. More than two thirds of Honey Brook's 25 square miles are actively farmed. The majority of this farmland is owned and worked by Amish and Mennonite families whose roots in the area stretch back multiple generations. The long-standing agrarian traditions of the Amish and Mennonite communities lend a distinct cultural flavor to Honey Brook. Residents of the township have moved to protect these traditions and the unique rural character of their community. In 2005, residents passed a referendum to raise the Township's earned income tax to generate revenue for farmland and open space preservation. The Township began collecting revenue for this program in 2006 and has since allocated nearly $4.5 million toward protecting agricultural land from development.[85] Sustained prioritization of agricultural preservation has strengthened the community's identity and unified its residents.

Ecosystem Services

In Honey Brook, the land preservation process has been used as an opportunity to increase participation in natural resource protection initiatives. As several of Honey Brook's riparian corridors and wetland areas pass through the township's farms, there exists the consistent threat of water quality degradation from cattle and agricultural runoff. When a farmer preserves his land through an agricultural conservation easement, he is required to adhere to a conservation plan that incorporates approved Best Management Practices (BMP). Included among BMPs is the creation and maintenance of a buffer between agricultural activity and riparian corridors, which helps to protect the health of waterways in the area. Preservationists in Honey Brook have educated farmers about government and non-profit programs that provide financial incentives for the establishment and maintenance of these riparian buffers, making them easier to implement. Participation in riparian corridor protection programs has increased as a result of this strategy.[86]

The protection of the Brandywine Creek, whose headwaters are located in Honey Brook, is of particular import, as it supplies drinking water to several downstream communities. Wilmington, Delaware, the largest of the communities that draw drinking water from the Brandywine, has formally recognized the importance of protecting the headwaters of the Brandywine to the integrity of its drinking water supply and has contributed funds to further the preservation of land in Honey Brook.

Property Value and Agricultural Activity

A farm can be home to a number of markedly different activities – ranging from animal production, to the industrial cultivation of cash crops, to the operation of organic orchards, to the breeding and training of horses, to the milking of dairy cows and production of milk, and beyond. As the types of materials, facilities, and management practices employed across these different agricultural activities vary greatly, it follows that a farm's impact on nearby property values will vary depending on the activities that take place on that farm. Property value impacts may differ according to odors, noise levels, traffic patterns, and management practices associated with a particular agricultural activity or farm.

Since the property value impacts associated with agricultural uses vary so greatly with different types of agricultural activities, providing a property value analysis for the Honey Brook case study would not be representative and, therefore, is not included.

Fiscal Impacts

According to a 2007 Penn State study, agricultural land uses typically require fewer municipal services than more highly developed residential or commercial areas, helping to keep local tax rates stable.[87] On average, agricultural land in Pennsylvania is a net fiscal contributor to municipalities and school districts, meaning that it produces more tax revenue than it requires. By choosing farmland preservation over residential development, current Honey Brook residents are effectively holding on to a higher percentage of their household incomes.[88]

"Honey Brook represents a unique opportunity to buy locally, support agriculture, and preserve land."

- Michael Brown, Honey Brook Township

Conclusion

The continued efforts of Honey Brook officials, residents, and preservation professionals from the Brandywine Conservancy and Chester County Planning Commission have provided a solid footing for agricultural land preservation in the Township. These preservation efforts provide for the continuation of the area's rich agricultural heritage, the protection of highly productive soils, the viability of Chester County's farming industry, and the protection of environmental resources including drinking water in southeastern Pennsylvania and Delaware. Nevertheless, in the face of ongoing development pressure, additional work remains for Honey Brook and surrounding communities to continue to realize these benefits.

Conclusion

Southeastern Pennsylvania's nearly 200,000 acres of protected open space generate clear and substantial economic benefits. Homeowners, businesses, and governments in the five-county region benefit economically from protected open space in numerous ways. This study demonstrates that protected open space:

- increases homeowner property values by an average of $10,000 per household;
- saves local governments and utilities more than $132 million a year in costs associated with environmental services such as drinking water filtration and flood control;
- helps residents and businesses avoid nearly $800 million in direct and indirect medical costs and saves businesses an additional $500 million in workers' compensation costs and costs related to lost productivity;
- generates more than $566 million in annual spending, $271 million in annual salaries, and $30 million in state and local tax revenue; and
- supports nearly 7,000 jobs.

These estimates should provide elected leaders, policy makers, and the general public a new perspective on the value of open space and help them make informed decisions about future development.

Endnotes

[1] (Wachter, 2004)
[2] (The Trust for Public Land, 2008)
[3] (Knoch & Tomes, 2008)
[4] (Hammer, Coughlin, & Horn IV, 1974)
[5] (Wachter, 2004)
[6] (The Trust for Public Land, 2008)
[7] (Delaware Valley Regional Planning Commission, 2009)
[8] (Fischer, 2010)
[9] (Blomstrom, 2010)
[10] (Fischer, 2010)
[11] (Coe, 2010)
[12] (Pennsylvania Recreation & Park Society, Inc., 2006)
[13] (Blomstrom, 2010)
[14] (Wallis, 2010)
[15] (Blomstrom, 2010)
[16] (Coe, 2010)
[17] (Duffy Real Estate, Inc, 2010)
[18] (Blomstrom, 2010)
[19] (Costanza, Wilson, Troy, Voinov, Liu, & D'Agostino, 2006)
[20] (Nowak, Hoehn, Crane, & Walton, 2007)
[21] (Costanza, Wilson, Troy, Voinov, Liu, & D'Agostino, 2006)
[22] (Costanza, Wilson, Troy, Voinov, Liu, & D'Agostino, 2006)
[23] (Nowak, Crane, & Stevens, 2006), (Nowak, Hoehn, Crane, & Walton, 2007), (US Forest Service, 2010)
[24] (Nowak, Crane, & Stevens, 2006)
[25] (U.S. Department of Energy, 2010)
[26] (Hopewell Big Woods Web site, 2010)
[27] (Important Mammal Area Project Web site, 2010)
[28] (Important Mammal Area Project Web site, 2010)
[29] (Pennsylvania Department of Environmental Protection, 2010)
[30] (Pennsylvania Department of Environmental Protection, 2010)
[31] (Pennsylvania Campagn for Clean Water, 2007)
[32] (Pennsylvania Campaign for Clean Water, 2010)
[33] (The Highlands Coalition, 2005)
[34] (The GreenSpace Alliance, 2007)
[35] (Delaware Valley Regional Planning Commission, 2009)
[36] (Mitchell, 2010)
[37] (Pennsylvania Department of Environmental Protection, 2010)
[38] (North Penn Water Authority, 2010)
[39] (Mitchell, 2010)
[40] (The Friends of Peace Valley Nature Center, 2009)
[41] (Loomis, 2005)
[42] (Chenoweth, 2005)
[43] (Chenoweth & Bortz, 2005)
[44] (Graefe, Mowen, Trauntevien, & Covelli, 2009)
[45] (Loomis, 2005)
[46] (Cohen, Williamson, & McKenzie, 2006)
[47] (Rosenberger, Sneh, Phipps, & Gurvitch, 2005)
[48] (US Census Bureau)
[49] (Pratt, Macera, & Wang, 2000)
[50] (Chenoweth, 2005)
[51] (Chenoweth & Bortz, 2005)

Endnotes, *continued*

[52] (Chenoweth & Bortz, 2005)
[53] (Chenoweth, 2005)
[54] (Chenoweth & Bortz, 2005)
[55] (Wood J. , 2010)
[56] (Knoch & Tomes, 2008)
[57] (Wood R. , 2010)
[58] (Knoch & Tomes, 2008)
[59] (Knoch & Tomes, 2008)
[60] (Tailwind Bicycles web site)
[61] (Hoover, 2010)
[62] (Delaware Valley Regional Planning Commission, 2009)
[63] (Delaware Valley Regional Planning Commission, 2009)
[64] (Seplow, 2010)
[65] (University of Pennsylvania, 2008)
[66] (Pennsylvania League of Cities and Municipalities, 2008)
[67] (Walsh, 1998)
[68] (The Friends of Clark Park)
[69] (Mintz, 2010)
[70] (Chance, 2010)
[71] (Mintz, 2010)
[72] (Chance, 2010)
[73] (West, Non-Programmed Usage in Clark Park and Malcolm X Park: Measuring Everyday Activity in a Community Park, 2006)
[74] (Chance, 2010)
[75] (Clark Park Tot Lot Parents, 2010)
[76] (West, Clark Park Event Permits, 2007)
[77] (Glyn, 2010)
[78] (Glyn, 2010)
[79] (Thut, 2010)
[80] (Daigle, 2010)
[81] (United States Department of Agriculture, 2007)
[82] (Honey Brook Township Comprehensive Plan Task Force, 2006)
[83] (Honey Brook Township Land Preservation Committee, 2007)
[84] (Pennsylvania Center for Dairy Excellence)
[85] (Brown, 2010)
[86] (Goodall, 2010)
[87] (Kelsey, 2007)
[88] (Honey Brook Township Comprehensive Plan Task Force, 2006)

References

Blomstrom, T. (2010, April 13). Director, Radnor Township Department of Parks and Recreation. (A. Liss, Interviewer)

Brown, M. J. (2010, April 9). Township Manager, Honey Brook Township, Pennsylvania. (N. Frontino, Interviewer)

Chance, F. (2010, April 9). President, Friends of Clark Park. (A. Liss, Interviewer)

Chenoweth, D. (2005). *The Economic Costs of Physical Inactivity, Obesity, and Overweight in California Adults: Health Care, Workers' Compensation, and Lost Productivity.* California Department of Health Services, Public Health Institute, Sacramento, CA.

Chenoweth, D., & Bortz, W. M. (2005). *Physical Inactivity Cost Calculator: How the Physical Inactivity Cost Calculator Was Developed.* East Carolina University, College of Health and Human Performance, Department of Health Education and Promotion, Greenville, NC.

Clark Park Tot Lot Parents. (2010). Retrieved May 3, 2010, from Facebook: http://www.facebook.com/group.php?gid=43198659251

Coe, M. (2010, April 26). President, Friends of Radnor Trails. (A. L. (telephone), Interviewer)

Cohen, D., Williamson, S., & McKenzie, T. L. (2006). *Park Use and Physical Activity in a Sample of Public Parks in the City of Los Angeles.* The Rand Corporation.

Costanza, R., Wilson, M., Troy, A., Voinov, A., Liu, S., & D'Agostino, J. (2006). *The Value of New Jersey's Ecosystem Services and Natural Capital.* New Jersey Department of Environmental Protection, Division of Science, Research, and Technology.

Daigle, M. (2010, April 9). Owner, Milk and Honey Market. (A. Liss, Interviewer)

Delaware Valley Regional Planning Commission. (2009). *Connections 2035: The Regional Plan for a Sustainable Future.* Philadelphia, PA: Delaware Valley Regional Planning Commission.

Duffy Real Estate, Inc. (2010, March-May). *Featured Listings.* Retrieved March 3, 2010, from Duffy Real Estate Web site: http://www.duffyrealestate.com/

Fischer, J. (2010, April 26). President, Radnor Conservancy. (A. L. (telephone, Interviewer)

Glyn, J. (2010, April 15). Manager, Clark Park Farmers' Market Program, The Food Trust. (A. Liss, Interviewer)

Goodall, J. (2010, April 14). Western Area Manager, Land Stewardship, Brandywine Conservancy. (N. Frontino, Interviewer)

Graefe, A. R., Mowen, A. J., Trauntevien, N. E., & Covelli, E. A. (2009). *Outdoor Recreation in Pennsylvania, Resident Survey.* The Pennsylvania State University, Department of Recreation, Park, and Tourism Management, State College, PA.

References, *continued*

Hammer, T. R., Coughlin, R. E., & Horn IV, E. T. (1974, July). The Effect of a Large Urban Park on Real Estate Value. *American Institute of Planning Journal* , 274-277.

Honey Brook Township Comprehensive Plan Task Force. (2006). *Comprehensive Plan Update, 2000-2020.* Honey Brook Township, Pennsylvania: Honey Brook Township.

Honey Brook Township Land Preservation Committee. (2007). *Land Preservation Plan.* Honey Brook Township, Pennsylvania: Honey Brook Township.

Hoover, B. (2010, April 6). Borough Manager, Glenolden Borough, Pennsylvania. (N. Frontino, Interviewer)

Hopewell Big Woods Web site. (2010). *Conservation Goals*. Retrieved April 13, 2010, from The Hopewell Big Woods Web site: http://www.hopewellbigwoods.org/conservation.html

Important Mammal Area Project Web site. (2010). *Important Mammal Area Project Web site*. Retrieved June 29, 2010, from Important Mammal Area Project Web site: http://www.pawildlife.org/imap.htm

Kelsey, T. W. (2007). *Fiscal Impacts of Different Land Uses: The Pennsylvania Experience in 2006.* The Pennsylvania State University, College of Agricultural Sciences, Agricultural Research and Cooperative Extension, University Park, PA.

Kitch, H. E. (2005). *Economic Guidance Memorandum, 06-03, Unit Day Values for Recreation, Fiscal Year 2006.* US Army Corps of Engineers, Washington, DC.

Knoch, C., & Tomes, P. A. (2008). *Perkiomen Trail 2008 User Survey and Economic Impact Analysis.* Rails-to-Trails Conservancy, Northeast Regional Office, Camp Hill, PA.

Loomis, J. (2005). *Updated Outdoor Recreation Use Values on National Forests and Other Public Lands.* Report Number PNW-GTR-658, US Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR.

Mintz, A. (2010, April 14). Director of Fundraising and Development. (A. Liss, Interviewer)

Mitchell, B. (2010, April 8). Director, Bucks County Department of Parks and Recreation. (N. Frontino, Interviewer)

North Penn Water Authority. (2010). *About Your Water.* Retrieved May 20, 2010, from North Penn Water Authority Web site: http://www.northpennwater.org/our_water/about_your_water/index.htm

Nowak, D. J., Crane, D. E., & Stevens, J. C. (2006). Air Pollution Removal by Urban Trees and Shrubs in the United States. *Urban Forestry and Greening , 4*, 115-123.

Nowak, D. J., Hoehn, R. E., Crane, D. E., & Walton, J. T. (2007). *Assessing Urban Forest Effects and Values.* US Department of Agriculture, US Forest Service, Northern Research Station, Syracuse, NY.

Pennsylvania Campagn for Clean Water. (2007, February). *The Effects of Special Protection Designation: A Guide for Communities*. Retrieved June 29, 2010, from Chesapeake Bay Foundation Web Site: http://www.cbf.org/Document.Doc?id=255

References, *continued*

Pennsylvania Campaign for Clean Water. (2010, March 16). *Protecting our State's Best Streams*. Retrieved June 30, 2010, from Pennsylvania Campaign for Clean Water Web site: http://www.pacleanwatercampaign.org/evstreams/protecting-our-state%E2%80%99s-best-streams/

Pennsylvania Center for Dairy Excellence. (n.d.). *Center for Dairy Excellence*. Retrieved October 1, 2010, from http://www.centerfordairyexcellence.org/

Pennsylvania Department of Environmental Protection. (2010). *Watershed Restoration Action Strategy*. Retrieved June 29, 2010, from Pennsylvania Department of Environmental Protection Web site: http://www.dep.state.pa.us/dep/deputate/watermgt/wc/subjects/WSNotebks/WRAS-03D.htm

Pennsylvania Department of Environmental Protection. (2010). *Watershed Restoration Action Strategy, State Water Plan Subbasin 02F.* Retrieved May 20, 2010, from Pennsylvania Department of Environmental Protection Web site: http://www.dep.state.pa.us/dep/deputate/watermgt/WC/Subjects/WSNoteBks/WRAS-02F.htm

Pennsylvania League of Cities and Municipalities. (2008). *Best Practices: Philadelphia's University City District.* Retrieved April 22, 2010, from Pennsylvania League of Cities and Municipalities Web site: http://www.plcm.org/index.asp?Type=B_BASIC&SEC={F3C35D8B-41DF-4E00-A538-A2E1B9961060}&DE={0FE1634E-BE13-44CA-AAD8-10763F9471DA}

Pennsylvania Recreation & Park Society, Inc. (2006, May). *Safe Trails - Safe Routes: Trails to You Newsletter.* Retrieved April 13, 2010, from sylvania Recreation & Park Society Web site: <http://www.prps.org/pdf/06-10-18trailstoyou.pdf>

Pratt, M., Macera, C. A., & Wang, G. (2000). Higher Direct Medical Costs Associated with Physical Inactivity. *The Physician and Sportsmedicine , 28m* (10), 63-70.

Rosenberger, R. S., Sneh, Y., Phipps, T. T., & Gurvitch, R. (2005). A Spatial Analysis of Linkages between Health Care Expenditures, Physical Inactivity, Obesity, and Recreation Supply. *Journal of Leisure Research , 317* (2), 216-235.

Seplow, S. (2010, April 5). Penn Neighborhood Blooms Around a Top School. *Philadelphia Inquirer* .

Tailwind Bicycles web site. (n.d.). *Welcome to Tailwind Bicycles*. Retrieved May 20, 2010, from Tailwind Bicycles web site: http://www.tailwindbicycles.com

The Friends of Clark Park. (n.d.). *About Us*. Retrieved April 5, 2010, from The Friends of Clark Park Web site: http://www.clarkpark.info/AboutUs.html

The Friends of Peace Valley Nature Center. (2009). *The Friends of Peace Valley Nature Center 2009 Annual Report.* Retrieved May 20, 2010, from Peace Valley Nature Center Web site: http://www.peacevalleynaturecenter.org/pdf/AnnualReport09.pdf

The GreenSpace Alliance. (2007). *Priority Areas*. Retrieved July 29, 2010, from Regional Greenspace Priorities of Southeastern Pennsylvania: http://www.regionalgreenplan.org/priorityareas.htm

References, *continued*

The Highlands Coalition. (2005). *The Highlands: Our Backyard Paradise, 2005 Update.* Retrieved June 30, 2010, from The Highlands Coaltion Web site: http://www.highlandscoalition.org/documents/BackyardParadise206.pdf

The Trust for Public Land. (2008). *How Much Value Does the City of Philadelphia Receive from its Park and Recreation System?* The Trust for Public Land. Philadelphia Parks Alliance.

Thut, D. (2010, April 9). Owner, The Green Line Cafe. (A. Liss, Interviewer)

U.S. Department of Energy. (2010). *Final Rule Technical Support Document (TSD): Energy Efficiency Program for Commercial and Industrial Equipment: Small Electric Motors.*

United Nations. (2005). *Millennium Ecosystem Assessment: Ecosystems and Human Well-Being, Synthesis.* Retrieved May 11, 2010, from Millennium Ecosystem Assessment Web site: http://www.millenniumassessment.org/documents/document.356.aspx.pdf

United States Department of Agriculture. (2007). *Census of Agriculture.*

University of Pennsylvania. (2008). *Penn Police: About*. Retrieved April 22, 2010, from Division of Public Safety: http://www.publicsafety.upenn.edu/PennPolice_about.asp

US Census Bureau. (n.d.).

US Forest Service. (2010). *i-Tree Vue User's Manual, Version 3.0.* US Department of Agriculture.

Wachter, S. (2004). *The Determinants of Neighborhood Transformations in Philadelphia - Identification and Analysis: The New Kensington Pilot Study.* University of Pennsylvania, The Wharton School, Philadelphia, PA.

Wallis, C. (2010, April 13). Regional Supervisor, Pennsylvania Department of Conservation and Natural Resources. (A. Liss, Interviewer)

Walsh, T. J. (1998, October 30). *Staff Taking Advantage of Penn Home Grants.* Retrieved April 22, 2010, from Philadelphia Business Journal: http://www.writing.upenn.edu/~afilreis/mortgage-plan-article.html

West, A. (2007). *Clark Park Event Permits.* Philadelphia, PA: Friends of Clark Park.

West, A. (2006). *Non-Programmed Usage in Clark Park and Malcolm X Park: Measuring Everyday Activity in a Community Park.* Philadelphia, PA: Friends of Clark Park.

Wood, J. (2010, April 1). Retired Chief of Open Space Planning, Montgomery County, Pennsylvania. (N. F. (telephone), Interviewer)

Wood, R. (2010, June 1). Regional Trails Manager, Department of Parks and Heritage Services, Montgomery County, Pennsylvania. (N. Frontino, Interviewer)