Looking at the landscape.
200,000+ Acres Protected in Southeastern Pennsylvania.

50% Public Parks

30% Privately Owned or Eased Lands

20% Preserved Farmland
The Circuit: Regional Multi-Use Trails Network

- **Circuit Trails**
  - Existing
  - In Progress
  - Planned
  - East Coast Greenway
  - Greenspace Network

- **ToR dvrcp**

- **dc**

- **ToR dwl••n**

- **ToR dlnt.**

- **ToR pu•e**

- **nd AppolacMa•**

- **Trail**

- **ToR wll1/11b)n**

- **and Wul•n...**

- **ToR 5 10**

- **ToR Reading, Potatillo, and Appalachian Trail**

- **ToR Easton, the Poconos, and Wilkes-Barre**

- **ToR Bethlehem**

- **ToR Lambertville**

- **ToR New Brunswick, Newark, and NYC**

- **ToR Atlantic Ocean**

- **ToR Wilmington, Baltimore, and Washington, DC**

- **ToR Newark**

- **ToR Columbia and Harrisburg**

- **ToR Bridgeton**

- **ToR Gloucester and Camden**

- **ToR Delaware and Chester**

- **ToR Montgomery**

- **ToR Bucks**

- **ToR Mercer**

- **ToR Burlington**

- **ToR Delaware Valley Regional Planning Commission**

- **CONNECTIONS 2040 PLAN FOR GREATER PHILADELPHIA**
Regional development patterns.

Historically our region loses 25 acres per day to development.
How can we support future preservation?
Quantifying the value.

Study Performed by:

ECONOMY LEAGUE
GREATER PHILADELPHIA
Information, Insight, Integrity

KEystone
Conservation Trust
Growing Conservation Philanthropy

FOREST SERVICE
DEPARTMENT OF AGRICULTURE

ECONSULT CORPORATION

DVRPC
DELAWARE VALLEY REGIONAL PLANNING COMMISSION

GREEN SPACE PLANS
Quantifying the value.

Open space creates economic value in four ways:

- Home and Property Values
- Environmental Services
- Health & Recreation Benefits
- Economic Activity
PROPERTY VALUES
Property Values


Open space helps sustain and improve home and property values.

- Adds $16.3 billion to our region’s housing stock
- Increases all property values by $10,000 on average
- Plays a vital role in preserving regional prosperity
Perkiomen Trail

Property Values

• Average increase of $4,766 within a quarter mile
Hopewell
Big Woods

Property Values
-Average increase of $8,270 within a quarter mile
THE ECONOMIC VALUE OF PROTECTED OPEN SPACE

Peace Valley Park

Property Values

- Average increase of $35,155 within a quarter mile

Photo courtesy of the Bucks County Dept. of Parks and Recreation
Clark Park

Property Values

• Average increase of $45,879 within a square mile
Radnor Trail

Property Values
- Average property increase of $69,139 within a quarter mile
Property Values

Open space is a marketable amenity.

$449,900
Greythorne Woods Circle
Wayne, PA 19087

This townhouse backs the Radnor Trail with a private entrance for your additional enjoyment.
ENVIRONMENTAL SERVICES
Environmental Services

Clean air. Pure water. Dry Basements.

Open space naturally protects property, filters drinking water, and cleans the air.

- Saves $132.5 million annually
Environmental Services

Clean air. Pure water. Dry Basements.

- Water Quality & Supply Services save $61 million annually
- Flood Mitigation Services save $37 million annually
- Air Pollution Services save $17 million annually
Location of Sub-Watersheds Analyzed
Benefits of Protected Open Space for Stormwater Management

If protected open space in 4 sub-watersheds was developed:

• Runoff in sub-watersheds would increase nearly 200 million cubic feet
• Capital costs for new infrastructure = $87 million
• Plus annual $2.6 million for maintenance
Recreation and Health Benefits


Physical activity on protected open space saves $1.3 billion annually.

- Saves every household $392 on average annually
- Avoids $800 million in healthcare costs
- Saves $13.8 million in worker’s compensation costs
- Avoids $485.4 million in productivity losses
JOBS AND REVENUE
Jobs and Revenue

Places that attract spending and create jobs.

Open spaces attract visitors, support local economies, and help create and sustain jobs.

- 7,000 jobs in the public and private sectors
- $566 million in expenditures
- $300 million in annual earnings
- $30.2 million in revenue collections
RETURN ON ENVIRONMENT

Case Studies
Location of Case Studies

- Peace Valley Park
- Hopewell Big Woods
- Perkiomen Trail
- Honey Brook Twp
- Radnor Trail
- Clark Park
- Glenolden Park
THE ECONOMIC VALUE OF PROTECTED OPEN SPACE

Case Study: Perkiomen Trail
Perkiomen Trail

“Perkiomen Trail makes Montgomery County a better place to live and work.”

—John Wood

- 20-mile long trail in Montgomery County
- Connects County Parks with Historic Sites
- Estimated 50,000 users monthly
Perkiomen Trail

Extensive Use and Connections Create Value

Recreation

• Estimated $19.8 million in savings
• 400,000 unique visits annually

Revenue Generation

• Benefits numerous businesses
• Bike shop, restaurant and ice cream parlor serve trail users
WHERE DO WE GO FROM HERE?
Read the Report.

www.dvrpc.org
www.greenspacealliance.org
THE ECONOMIC VALUE OF PROTECTED OPEN SPACE

Recognize the Value.
THE ECONOMIC VALUE OF PROTECTED OPEN SPACE

Share the Story.

Open space: Financial as well as aesthetic boon

In 2010, the Chester County Commissioners added almost $20 million in open space preservation spending to the 2010 budget. This was a support recognition spending to the preserved 2010 levels and to continue spending on open space preservation under sustainable fiscal plans.

Study: Open space good for economy, health

According to a study from the Delaware Valley Regional Planning Commission, open space provides many benefits beyond simply leading greener places.

Attention Chester County Taxpayers — Budget Alert Pay Now, or Pay A Lot More Later

Open Space Preservation significantly saves Chester County money and dollars in the future.

Report: Open spaces have positive financial impact

New study calculates monetary advantages of land preservation

Crunching the numbers on the economic benefits of open space preservation in Chester County.

Show us the money from saving open space

Chester County's leading financial sources

The Economics of Open Space

Valley Forge — Projects the benefits of the Hidden Valley Land Park. The benefits of open space preservation are multiple and far-reaching. Purchase of the Hidden Valley Land Park by Chester County will provide benefits to the community and the environment for centuries to come.

The Valley Forge Land Trust is raising funds to purchase the Hidden Valley Land Park. The funds raised will be used to protect the park and preserve its natural beauty for future generations.

The Hidden Valley Land Park is located in the heart of the Pocono Mountains. The park features a variety of trails for hiking, biking, and cross-country skiing. The park is also home to a variety of wildlife, including deer, turkeys, and black bears. The Hidden Valley Land Park is a great place to enjoy the outdoors and connect with nature.

The Hidden Valley Land Park is a great place to enjoy the outdoors and connect with nature. The park features a variety of trails for hiking, biking, and cross-country skiing. The Hidden Valley Land Park is a great place to enjoy the outdoors and connect with nature.
Support Open Space Initiatives.
Locally Funded Open Space Programs

2013 Active Programs

- Municipal Funding - Dedicated Tax
- Municipal Funding - Bond
- Municipal Funding - Tax and Bond
- County Funding - Dedicated Tax
- County Funding - Bond
- County Funding - Tax and Bond
- County Funding - Other

Note: Municipalities that previously issued bonds dedicated for open space and are using the funds are not shown.
More than pretty places.

Open spaces generate hundreds of millions of dollars in economic benefits for our region.
Quantifying the Economic Value of Protected Open Space in Southeastern Pennsylvania

Download the full report at www.dvrpc.org or www.greenspacealliance.org.
Green City, Clean Waters

Five years of green stormwater management in Philadelphia

Christopher Anderson
Watersheds Program Manager
Public Affairs Division
The City of Philadelphia’s 25 year, $2 billion program to manage stormwater primarily through the use of “green infrastructure”

Our Guiding Principles:

1. Thinking of rainwater as a resource to be used where it falls, rather than a problem to be dealt with by collecting and treating it elsewhere.

2. Being strategic and cost-effective in the maintenance and upgrading of one of the nation’s oldest water and wastewater infrastructure systems.

3. Activating citizens, advocacy groups, the business community, public sector and regulatory partners to come together on strategies that simultaneously achieve environmental, economic, and regulatory objectives.
One Pipe for All – A Combined Sewer
The Scope of Philadelphia’s Stormwater Needs

Combined Sewer Service Area in Philadelphia

Impervious Area within Combined Sewer Service Area

Key
- = Approximate area of Philadelphia
- = Combined Sewer Service Area
- = Impervious Area

Each dot represents about 30 acres.

These dots represent an area of 270 acres, the approximate area of UPenn’s campus in University City.
Green Stormwater Infrastructure
uncovering the green beneath our feet
Our First Five Years

a collaborative approach to managing Philadelphia’s stormwater

- 141 Public Stormwater Projects
- 266 Private Development Projects
- 38 Stormwater Grant Projects
- Total of 445 completed projects
Our First Five Years
a collaborative approach to managing Philadelphia’s stormwater

1.5 Billion Gallons
Reduction in Combined Sewer discharge volume

6,000 Tons of Trash & Debris
Removed from Philadelphia’s waterways through skimming & clean up events

$51 Million
Grant funds from public and private sources invested in our parks, streets, schools and communities as a result of leveraged GSI investments

10.3%
Estimated property value gain from proximity to GSI investment

308,759 Citizens Engaged
Approximate since 2011

430 New Jobs & 14% Growth
In Greater Philadelphia green stormwater infrastructure industry
The Triple Bottom Line

Social Benefits
- Recreation
- Aesthetics
- Public Health
- Equity

Environmental Benefits
- Fishable & Swimmable
- Habitat Enhancement
- Air Quality
- Energy Savings

Economic Benefits
- Property Values
- Job Creation
- Competitive City

Advantages of the Green Approach
Investment in Community
Our study indicates that Philadelphia’s GSI program has had an effect on safety in nearby areas. Our models found significant reductions in certain crimes over an average 4-year follow-up period, indicating that a relatively long-term impact might be expected. We found that construction of GSI projects was associated most strongly and consistently with reductions in occurrence of narcotics possession. Possession indicates the buying as opposed to the selling of narcotics. We did not test the specific mechanisms underlying this association; however, previous theories and empirical studies provide excellent insight into these mechanisms as well as hypotheses to test in future studies.

Title: “The Impact of Green Stormwater Infrastructure on Surrounding Health & Safety”
American Journal of Public Health, January 2015
Green Infrastructure as a Private Amenity

Philadelphia Water offers grant funding to non-residential PWD customers for the design and construction of stormwater projects

• **Stormwater Management Incentives Program (SMIP):**
  - Supports the design and construction of stormwater mitigation measures projects on a single property.

• **Greened Acre Retrofit Program (GARP):**
  - Supports the design and construction of stormwater mitigation measures projects across multiple properties. (minimum size of 10 acres)

For more information about the SMIP Grant go to:
www.phila.gov/swgrant
Green Infrastructure in Private Development

Every time property is developed in Philadelphia we can improve the water quality in our rivers and streams. Federal and State law require PWD to regulate stormwater runoff from private development.

**Stormwater Management Regulation Components:**

**Water Quality:** Remove pollutants from stormwater and reduce the volume of water entering sewers. This is achieved by letting the water soak into the ground or through a stormwater management practice. (First 1.5” of runoff)

**Flood Control:** Manage the rate of runoff from a property to prevent localized flooding. (Reduce peak rate of runoff)

**Channel Protection:** Protect stream banks by minimizing the rate of erosion from stormwater runoff. (Slow release of stormwater ~ 1 yr. storm)

All development projects that disturb more than 15,000 square feet of earth must meet PWD’s Stormwater Management Regulations.

www.pwdplanreview.org
Green Jobs

• PowerCorpsPHL
  – Designed to provide at-risk Philadelphia youth with short-term work opportunities within city government.
  – 87 Corps members have participated with PWD
  – Total investment by PWD of $600,000
  – 15 Corps members hired by PWD to date with more finding work with private firms.
Why Green Homes?

- Recommendation of the public advocate during 2008 rate hearing process
- About 80% of PWD’s customers are residential
- Provides a way for residents to participate in stormwater management
Rain Check

Two Program Tracks

Cost Share

Rain Barrel

Rain Garden

Masonry (De-paving & Porous Paving)

Downspout Planter

Over 4,000 barrels distributed since 2006!
PHILADELPHIA WATER | GREEN CITY, CLEAN WATERS: STRATEGIES FOR BUILDING A DIALOGUE DURING A LONG-TERM PROJECT
Where are we now?
aggregating our progress over the last five years

A recent study by the Sustainable Business Network of Philadelphia projected that our City’s GSI industry represents:

- $146.8 Million in annual revenue
- 430 Jobs supported annually
- $860,000 in tax revenue generated for the City of...
Learn More
connecting with *Green City, Clean Waters*

Sustainable Business Network of Philadelphia

Green Stormwater Infrastructure Partners Program
http://gsipartners.sbnphiladelphia.org/resources/
Learn More
connecting with Green City, Clean Waters

PWD on Social Media:

@Phillyh2o or @Green City, Clean Waters

@Phillyh2o

@Phillyh2o

http://vimeo.com/phillywatersheds

www.flickr.com/photos/philadelphiawater

Visit our Websites:

www.phila.gov/water

www.phillywatersheds.org
Questions?

Christopher Anderson
Watersheds Program Manager
215-683-3238
christopher.anderson@phila.gov

Paseo Verde – Lower North Philadelphia
Return on Environment
The Economic Benefits of Protecting and Restoring Natural Systems

John Rogers
Keystone Conservation Trust
The Chesapeake Bay Watershed loses 100 acres of forest every day.

**Business as usual is not working**

- Water to supply for over 500 homes with clean filtered water is lost each day.
- Offset of CO2 for 100 homes is lost each day.

Conservation Fund 2006, The State of Chesapeake Bay Forests

Figure 2. Land cover in the Chesapeake Bay watershed (Gutierrez-Magness and others, 1997).
Mother Nature doesn’t write receipts
The Pennsylvania state Constitution imposes a duty to conserve and to maintain public natural resources for this generation and generations yet to come.
Are nature’s contributions to our welfare being adequately and accurately reflected in political, business and personal decisions?
ROE can serve the interest of:

Conservation
Economy
Society as a whole
Return on Environment Studies

Portfolio of Financial Assets
Habitat Provides Many Natural, Social and Economic Services

- Property Value
- Water Quality
- Fun
- Biological Control
- Beauty
- Pollination
- Community Cohesion
- Nutrient Absorption
- Economic Development
- Recreation and Exercise
- Removal of CO2 and Green House Gases
- Community Pride
- Stormwater Management
- Sense of Place
- Flood Protection
- Health
- Soil Formation
- Retail Sales

The first rule of ecology is everything is connected to everything else.
Benefits of Return on Environment Studies (ROE)

1. Nature’s complex system is conveyed in a simple, bottom line understandable to a broad audience.

2. Dollars, as a financial measure, underscore nature’s connection to our quality of life, health, cost of living, economy and sense of place.

3. Dollars also convey a level of significance or priority.

4. Monetary estimates of the value of natural system services can be applied within decision frameworks related to land use, tourism and economic development.

5. Discussion of natural system cover types and natural system values engages key stakeholders in an educational process that can help other organizations in their missions.

6. While any numeric model will engender healthy skeptics, the discussion about nature’s value finally puts this issue on the table in full view so policy makers and citizens are aware of its relative importance.
Natural systems provide these benefits free of charge. Once lost, they are expensive and very difficult to replace. It can take 50-100 years to replace this capacity.
Natural Systems Provide a Form of Insurance or Risk Management

Natural Systems work 24 hours a day, 365 days a year and have been doing so for over 10,000 years. Many of these natural system services are more reliable and effective than engineered solutions.

EPA, Healthy Watershed Program, 2012
Our job is not just to protect, but expand natural system services.
Green Corridors

Without connected habitats and corridors, the full value of open space and natural system services may not be realized, and these precious benefits may be significantly diminished or lost.
Protecting Natural Areas Can be a Good Business Strategy
Nature is Serious Business!
Value versus Price

Eco-pricing
# The Economic Benefits of Natural Systems (in $ millions)

<table>
<thead>
<tr>
<th>PA County</th>
<th>Natural System Services (annual avoided costs in $millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berks County</td>
<td>$804</td>
</tr>
<tr>
<td>Cumberland County</td>
<td>$739.13</td>
</tr>
<tr>
<td>Lehigh County</td>
<td>$388.8</td>
</tr>
<tr>
<td>Northampton County</td>
<td>$460.8</td>
</tr>
</tbody>
</table>

It is very difficult to have a strong economy without a healthy environment, plenty of open space and quality habitat.
Most people would agree that losing millions of dollars year after year is poor asset management.
The CEO of any business would never overlook a revenue stream, miss an avoided cost or allow anyone to tarnish their brand.
Northampton County Commissioners replaced $2.2 million in their open space budget in 2015.
How do we Measure Nature’s Value?
ROE Methodology

- Natural System Services
  - Value Transfer
    - Dr. Elliott Campbell
    - Dr. Robert Costanzia
    - PA. Fish and Boat Administration
    - PA Game Commission
    - PA Forestry Department

- Air Pollution Reduction
  - i-Tree Model
    - Natural Forest Service
    - Dr. David Nowak

- Outdoor Recreation
  - 2014 DCNR Outdoor Recreation Participation Survey
  - Expert interviews
  - IMPLAN model

- Property Value
  - Assessment of changes in property value in proximity to protected open space

- Avoided Costs
- Revenues
- Real-estate Premiums
Green Infrastructure

Reduces cost of stormwater management
Reduces waste water fees by 22%-44%

For every 10% increase in forest, water treatment costs go down by 20%
Water quality and sediment reduction

Reduces cost of flooding

Drought protection
Watershed Protection is less expensive than building new “gray infrastructure”

<table>
<thead>
<tr>
<th>Natural System Service</th>
<th>Min</th>
<th>Mean</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat</td>
<td>$29.14</td>
<td>$165.69</td>
<td>$481.77</td>
</tr>
<tr>
<td>Water Supply</td>
<td>$1.10</td>
<td>$45.03</td>
<td>$174.79</td>
</tr>
<tr>
<td>Flood Protection</td>
<td>$12.90</td>
<td>$23.86</td>
<td>$35.15</td>
</tr>
<tr>
<td>Pollination</td>
<td>$7.90</td>
<td>$20.76</td>
<td>$32.72</td>
</tr>
<tr>
<td>Water Quality</td>
<td>$8.10</td>
<td>$11.40</td>
<td>$11.50</td>
</tr>
<tr>
<td>Biological Control</td>
<td>$2.10</td>
<td>$2.10</td>
<td>$2.10</td>
</tr>
<tr>
<td>Soil Formation</td>
<td>$0.66</td>
<td>$0.80</td>
<td>$1.10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$61.90</td>
<td>$269.64</td>
<td>$739.13</td>
</tr>
</tbody>
</table>
Cover Type Values

Annual $$/acre

- Headwater forests and wetlands
- Riparian forest and forested wetlands
- Urban wetlands
- Urban forest
- Large undisturbed forests
- Working forests
- Small forests
- Developed open space
- Cultivated field
- Open water
- Pasture
### Table 17. Economic Impact Summary in Terms of Jobs and State and Local Taxes.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Direct Impact</th>
<th>Output</th>
<th>Employment</th>
<th>State and Local Taxes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOW</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>$13,893,811</td>
<td>$20,658,192</td>
<td>303</td>
<td>$1,631,069</td>
</tr>
<tr>
<td>Fishing</td>
<td>$10,852,128</td>
<td>$16,135,626</td>
<td>237</td>
<td>$1,273,989</td>
</tr>
<tr>
<td>Hunting</td>
<td>$8,285,632</td>
<td>$12,319,599</td>
<td>181</td>
<td>$972,695</td>
</tr>
<tr>
<td>Bird Watching</td>
<td>$2,544,787</td>
<td>$3,767,466</td>
<td>29</td>
<td>$270,570</td>
</tr>
<tr>
<td>Wildlife Watching</td>
<td>$5,720,584</td>
<td>$8,264,554</td>
<td>65</td>
<td>$608,232</td>
</tr>
<tr>
<td>Camping</td>
<td>$54,274,630</td>
<td>$88,445,373</td>
<td>930</td>
<td>$6,509,579</td>
</tr>
<tr>
<td>Kayaking/Canoeing</td>
<td>$3,255,397</td>
<td>$4,840,329</td>
<td>71</td>
<td>$356,248</td>
</tr>
<tr>
<td>Bicycling</td>
<td>$17,920,122</td>
<td>$26,644,765</td>
<td>391</td>
<td>$1,961,055</td>
</tr>
<tr>
<td>Hiking</td>
<td>$8,104,723</td>
<td>$12,050,612</td>
<td>177</td>
<td>$886,925</td>
</tr>
<tr>
<td>Jogging/Running</td>
<td>$6,335,192</td>
<td>$9,419,561</td>
<td>138</td>
<td>$693,280</td>
</tr>
<tr>
<td>Nature Study</td>
<td>$1,519,636</td>
<td>$2,195,425</td>
<td>18</td>
<td>$161,583</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>$132,706,641</strong></td>
<td><strong>$204,650,503</strong></td>
<td><strong>2,539</strong></td>
<td><strong>$15,325,225</strong></td>
</tr>
<tr>
<td><strong>EXPECTED</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>$14,611,658</td>
<td>$21,725,532</td>
<td>319</td>
<td>$1,715,341</td>
</tr>
<tr>
<td>Fishing</td>
<td>$12,726,586</td>
<td>$18,922,689</td>
<td>277</td>
<td>$1,494,042</td>
</tr>
<tr>
<td>Hunting</td>
<td>$36,392,861</td>
<td>$54,111,193</td>
<td>794</td>
<td>$4,272,353</td>
</tr>
<tr>
<td>Bird Watching</td>
<td>$24,680,571</td>
<td>$35,656,142</td>
<td>279</td>
<td>$2,624,119</td>
</tr>
<tr>
<td>Wildlife Watching</td>
<td>$26,968,466</td>
<td>$38,961,470</td>
<td>307</td>
<td>$2,867,378</td>
</tr>
<tr>
<td>Camping</td>
<td>$68,322,817</td>
<td>$111,338,153</td>
<td>1170</td>
<td>$8,194,488</td>
</tr>
<tr>
<td>Kayaking/Canoeing</td>
<td>$15,463,136</td>
<td>$22,991,564</td>
<td>337</td>
<td>$1,692,179</td>
</tr>
<tr>
<td>Bicycling</td>
<td>$58,274,890</td>
<td>$86,646,772</td>
<td>1273</td>
<td>$6,377,202</td>
</tr>
<tr>
<td>Hiking</td>
<td>$78,264,852</td>
<td>$116,369,105</td>
<td>1705</td>
<td>$8,564,766</td>
</tr>
<tr>
<td>Jogging/Running</td>
<td>$7,692,733</td>
<td>$11,439,039</td>
<td>168</td>
<td>$841,840</td>
</tr>
<tr>
<td>Nature Study</td>
<td>$2,279,453</td>
<td>$3,293,135</td>
<td>27</td>
<td>$242,375</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>$345,678,023</strong></td>
<td><strong>$521,453,787</strong></td>
<td><strong>6,656</strong></td>
<td><strong>$38,886,089</strong></td>
</tr>
</tbody>
</table>
Table 9. Cumberland County Air Pollution Benefit Values ($millions/year)
Source: ESI (2014)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Min</th>
<th>Mean</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>O$_3$</td>
<td>$4.5</td>
<td>$17.0</td>
<td>$21.9</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>$4.7</td>
<td>$11.9</td>
<td>$18.5</td>
</tr>
<tr>
<td>NO$_2$</td>
<td>$4.2</td>
<td>$8.5</td>
<td>$11.3</td>
</tr>
<tr>
<td>SO$_2$</td>
<td>$0.5</td>
<td>$0.9</td>
<td>$1.5</td>
</tr>
<tr>
<td>CO</td>
<td>$0.1</td>
<td>$0.1</td>
<td>$0.1</td>
</tr>
<tr>
<td>Total</td>
<td>$14.0</td>
<td>$38.5</td>
<td>$53.4</td>
</tr>
</tbody>
</table>
Table 11. Cumberland County Carbon Storage and Sequestration Benefits (millions/year)


The dollar value estimates were derived using the social cost of carbon.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Min</th>
<th>Mean</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Sequestration</td>
<td>$2.7</td>
<td>$2.8</td>
<td>$3.0</td>
</tr>
<tr>
<td>Carbon Storage</td>
<td>$89.2</td>
<td>$89.8</td>
<td>$90.4</td>
</tr>
<tr>
<td>Total</td>
<td>$91.9</td>
<td>$92.6</td>
<td>$93.4</td>
</tr>
</tbody>
</table>
How do municipalities, property owners and businesses get the best financial return on the environment?

Innovation that inspires policy and personal choices
Engaging People in Habitat Creation, Restoration and Stewardship

1. ROE
2. Expand Habitat
3. Compute Value of Tools
4. Green Community and Natural Parks
5. Backyard Conservation Design
6. Nature Literacy

Leveling The Playing Field

Changing the Rules of The Game

Culture Change
Leveling the Playing Field
Innovation

1. Begin every land use, economic development, tourism and recreation planning process with a clear understating of the financial value of nature’s current financial portfolio of assets. Ask what is needed to sustain these avoided costs.

2. Map the relative financial values of natural system services to reflect financial priorities and to develop protection and risk management strategies to maintain these assets.

3. Develop stewardship buffer zones (green corridors) along riparian areas and around parks, trails and natural preserves that expand natural system services by incentivizing the use of native plants and good stewardship practices.
<table>
<thead>
<tr>
<th>Natural System Services, Air Quality and Recreation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological Control</td>
<td>$13,941</td>
</tr>
<tr>
<td>Pollination</td>
<td>$428,576</td>
</tr>
<tr>
<td>Wildlife Conservation</td>
<td>$5,540,340</td>
</tr>
<tr>
<td>Soil Formation</td>
<td>$12,372</td>
</tr>
<tr>
<td>Waste Treatment</td>
<td>$212,598</td>
</tr>
<tr>
<td>Flood Prevention</td>
<td>$1,371,062</td>
</tr>
<tr>
<td>Water Supply</td>
<td>$6,368,694</td>
</tr>
</tbody>
</table>
Total Value - Ecosystem Service, Air Pollution, Carbon Sequestration

$ per acre

Legend

Value

Low $0/acre

High $10,950/acre
Change the Rules of the Game-Innovation

1. Estimating the annual return on environment for all new proposed ordinances like, riparian buffer zones, cluster development, tax incentives and open space referendums

2. Develop a stewardship pro forma for every new development proposal that reflects the full cost of benefits in the form of tax revenues and jobs and the true cost of services over time as well the loss in natural system services that will be paid by tax payers.

3. Chronicle the ROE losses and report them to all interested agencies.

4. Create incentives to protect and restore critical natural system services like green corridors, stream buffers and cluster development, using native plants in backyard design.
Change the Rules of the Game - Innovation

5. Train all residents in backyard conservation design and stewardship, particularly in stewardship buffer zones.

6. Create a habitat benefits calculator to help residents understand the value of backyard stewardship. Chronicle the potential benefits of backyard conservation design and stewardship and provide this information to neighborhoods and all interested agencies.

7. Teach the principles of good stewardship to land owners along with a clear idea of what the financial value is for them and the community as a whole.
Sense of Place

Percent Canopy Cover in Relation to Neighborhood Stability

50% want to leave
15%

60% 80% want to stay
The Value of Proximity to Open Space is Positive and Significant

According to a detailed analysis conducted by the Delaware Valley Regional Planning Commission (2011), homes in southeastern Pennsylvania located near protected open space captured a measurable increase in their value because of their proximity.

Suburban properties located less than one mile from protected open space captured an average measurable increase in their value of up to $10,000.

In the Lehigh Valley ROE Report (2015), homes within ¼ mile of protected open space on average had a premium of $14,600.
The trends are not always nature’s friend.
People Over 65 Years of Age are Less Interested in the Environment Than Before.
The Largest Crop in the Chesapeake Bay Watershed in 2009

Increased development across the watershed has made stormwater runoff (also called polluted runoff) the fastest growing source of pollution in The Chesapeake Bay.

Chesapeake Bay Journal, 2012
Why do people have an emotional attachment to where they live?

1. Openness and welcoming
2. Social offerings
3. Lots of beauty and greenery
Return on Environment
The Economic Benefits of Protecting and Restoring Natural Systems

Nature’s value is real, significant and impacts a wide range of stakeholders

ROE can help level the playing field and change the rules of the game in conservation, economic development,
1. Consider the services nature provides and quantify the biophysical information for each ecosystem service;

2. Collect data on what people are willing to pay to replace these services by observing how people have paid for the service previously in markets, through regulation, or to replace it (the eco-price).

3. Calculate the economic benefits of those services by land cover/habitat type on a per acre basis;

4. Map the economic value of natural system services across the urban-rural gradient of the landscape;

5. Develop a plan to create sustainable patterns of habitats and corridors to maintain or enhance habitat and economic value (green corridors);

6. Create a strategy that protects or enhances natural system services based on their true value to quality of life, health, cost of living, sense of place and local economy.