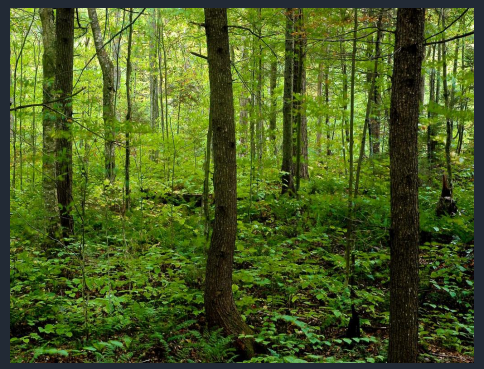
Partnering With Nature:

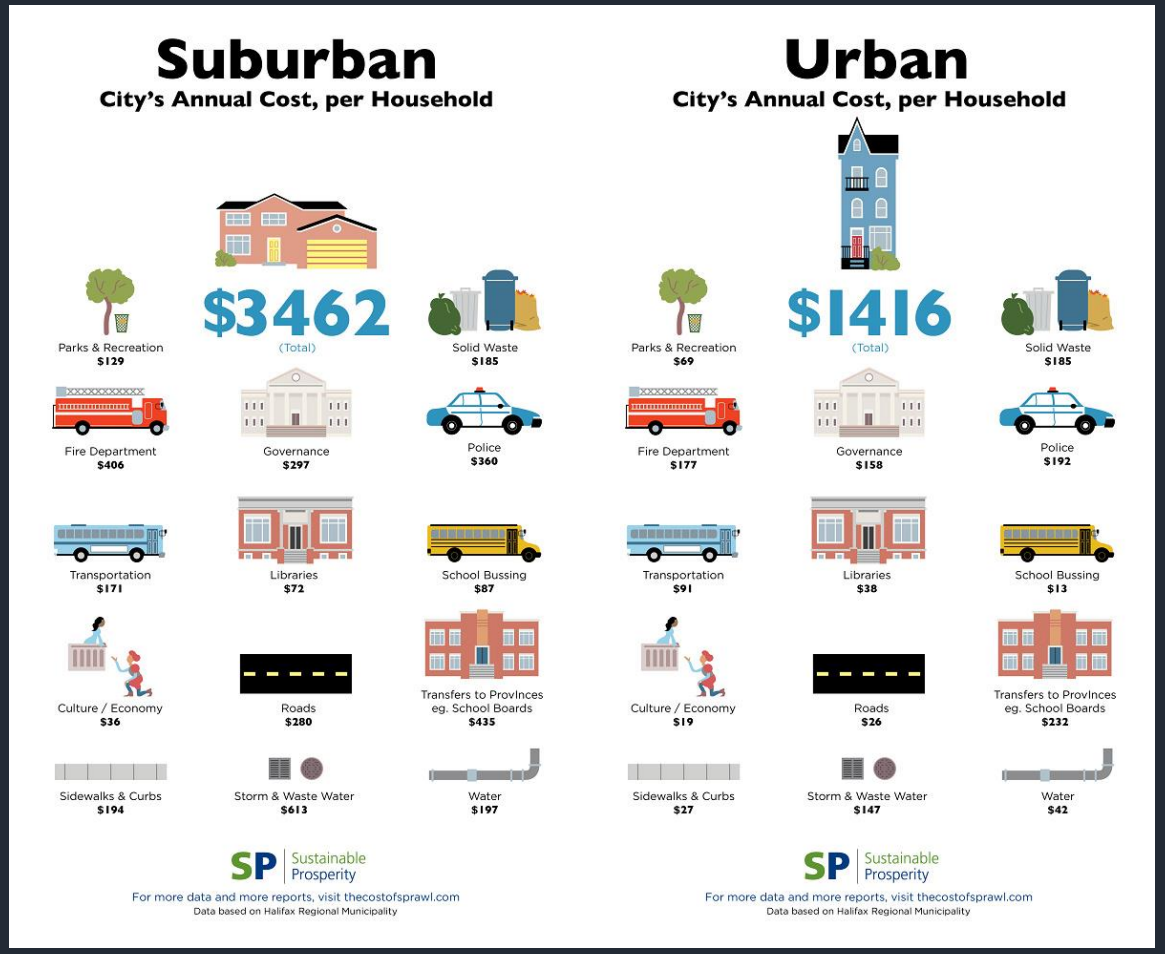
How Communities Can Get the Best Financial Return on the Environment








Economy
Quality of Life
Health
Cost of Living



Cost of Sprawl

Real Estate Research Institute

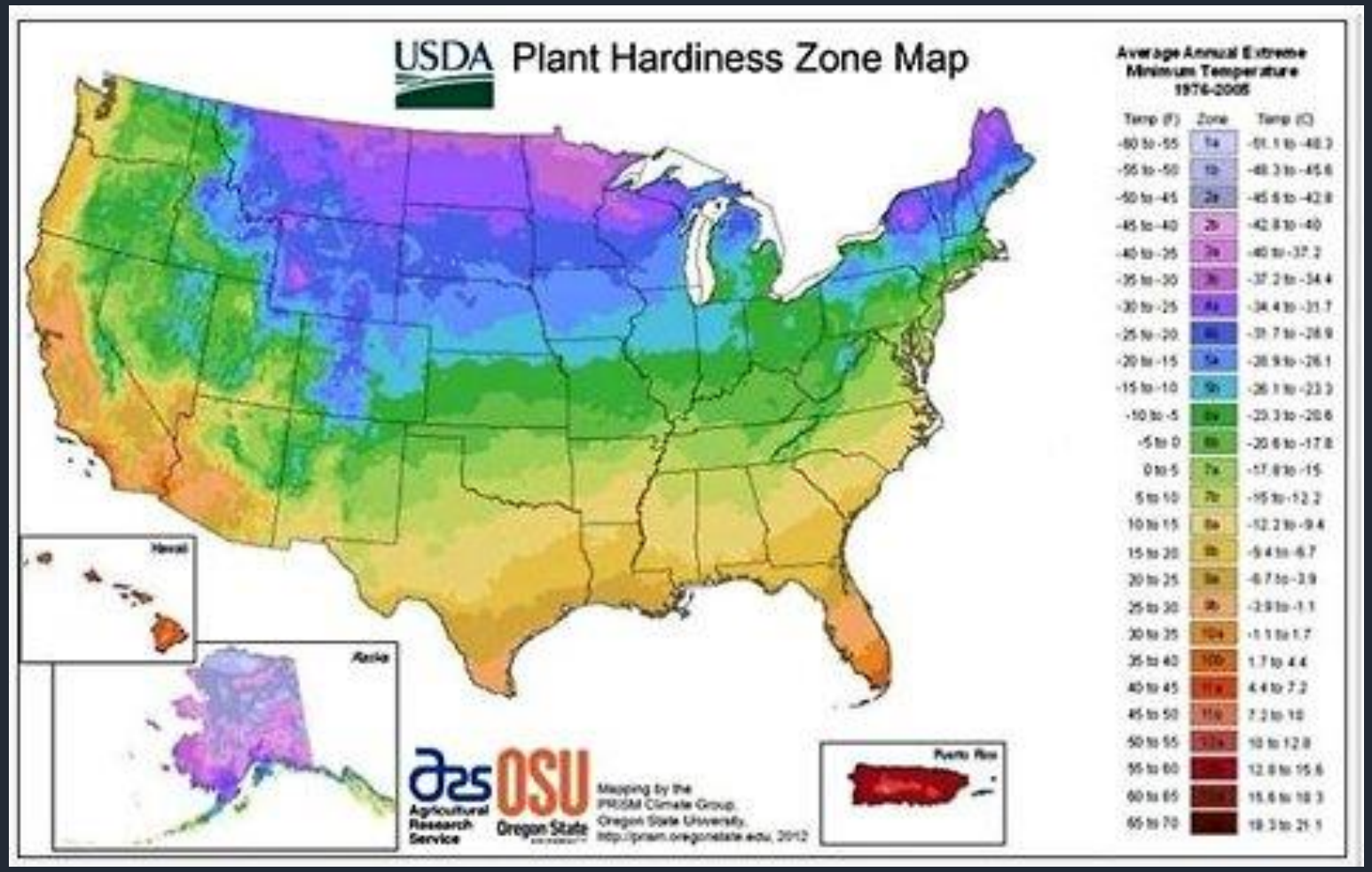
1971

There has not been a dramatic change in how the Bay region approaches the use of land

"…Procedures used throughout the Bay region for managing growth and development are inadequate. While many local jurisdictions are making valiant efforts to deal with growth, there is a dramatic need for change. The use of land is still a great environmental, social and economic challenge..."

Chesapeake Bay Executive Council, 2020 Report 1988

Plant Hardiness Zones Have Shifted from 1990 to 2006,
USDA, 2012



Chesapeake Bay Watershed loses 100 acres of forest per day.

The State of Chesapeake Bay Forests, 2006. Conservation Fund.

- Loss of CO2 offset for 100 homes each day
- Loss of water infiltration to supply 400 households each day
- Increased stormwater
- Increased flooding and mitigation expenses

Every 6 days we lose enough forest to support breeding populations of interior forest dwelling birds

Cornell Lab of Ornithology

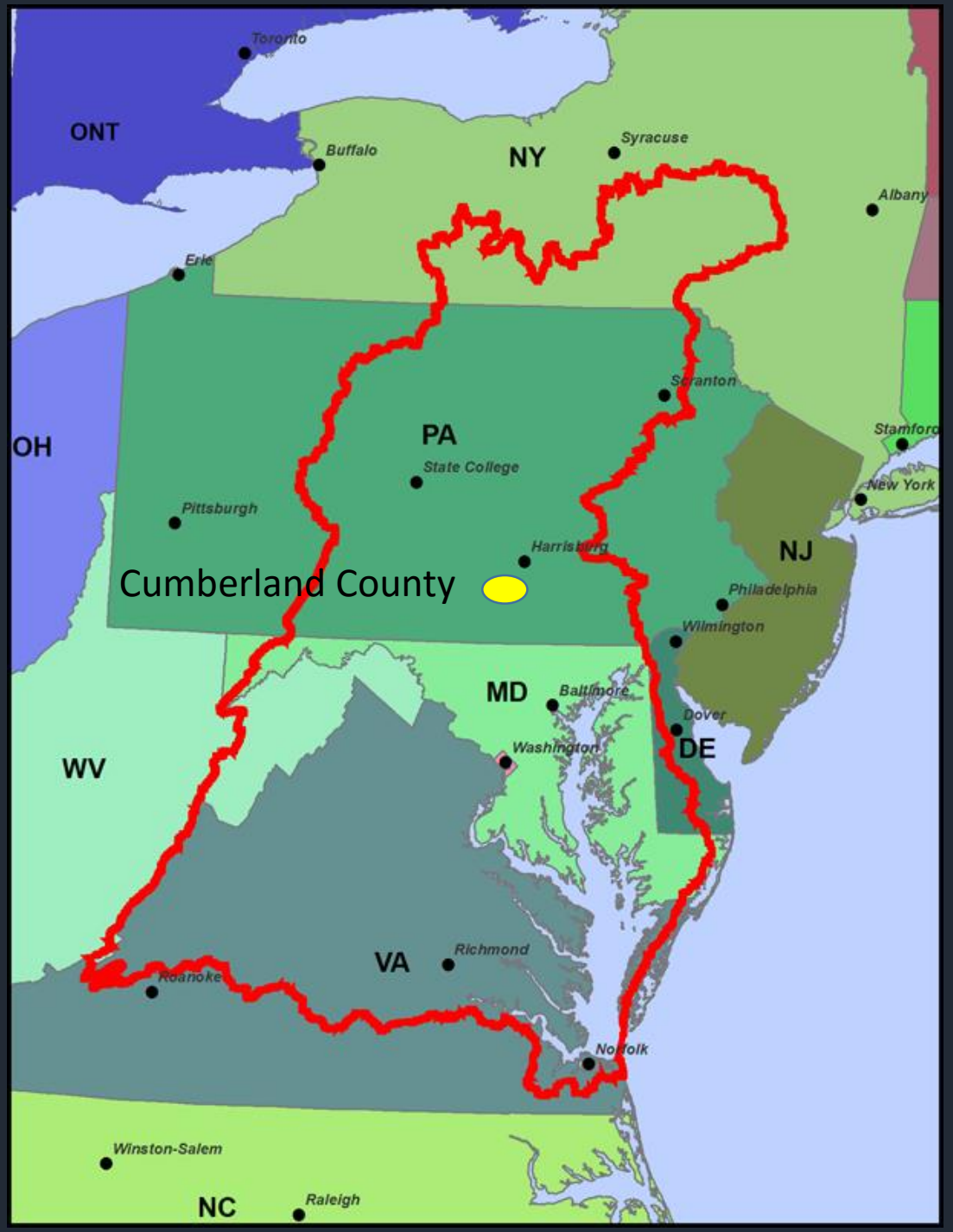
Scarlet Tanager

Wood Thrush

Only 40% of current forests are unfragmented.

The State of Chesapeake Bay Forests, 2006. Conservation Fund.

Between 2006 and 2011 Cumberland County lost $ million in natural system services.



In the Chesapeake Bay Watershed, 36% of forests are vulnerable to development

The State of Chesapeake Bay Forests, 2006. Conservation Fund.

A CEO of any organization would never ignore a major revenue stream, a way to avoid unnecessary costs or a chance to maintain or enhance their brand.

Level the Playing Field

Communicate the Value of Natural Resources to the Local Economy

- Economic Development
- Water Treatment and Supply
- Resource Dependent Industry
- Recreation Industry
- Agriculture
- Green Corporations
- Health
- Cost of Living
- Green Infrastructure

Change the Rules of the Game

Keep it local

Nature was the major source of goods and services that created Pennsylvania's initial economy

Land Use Planning is our highest value BMP

Peter Clagette, USGS, 2015

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 to the Chesapeake Bay.

Chesapeake Bay Journal, 2012

The rate of learning about stewardship on Main Street is not keeping pace with the rate of environmental change.

Expand and Enhance Existing Cost Free Services
(Protect and Restore)

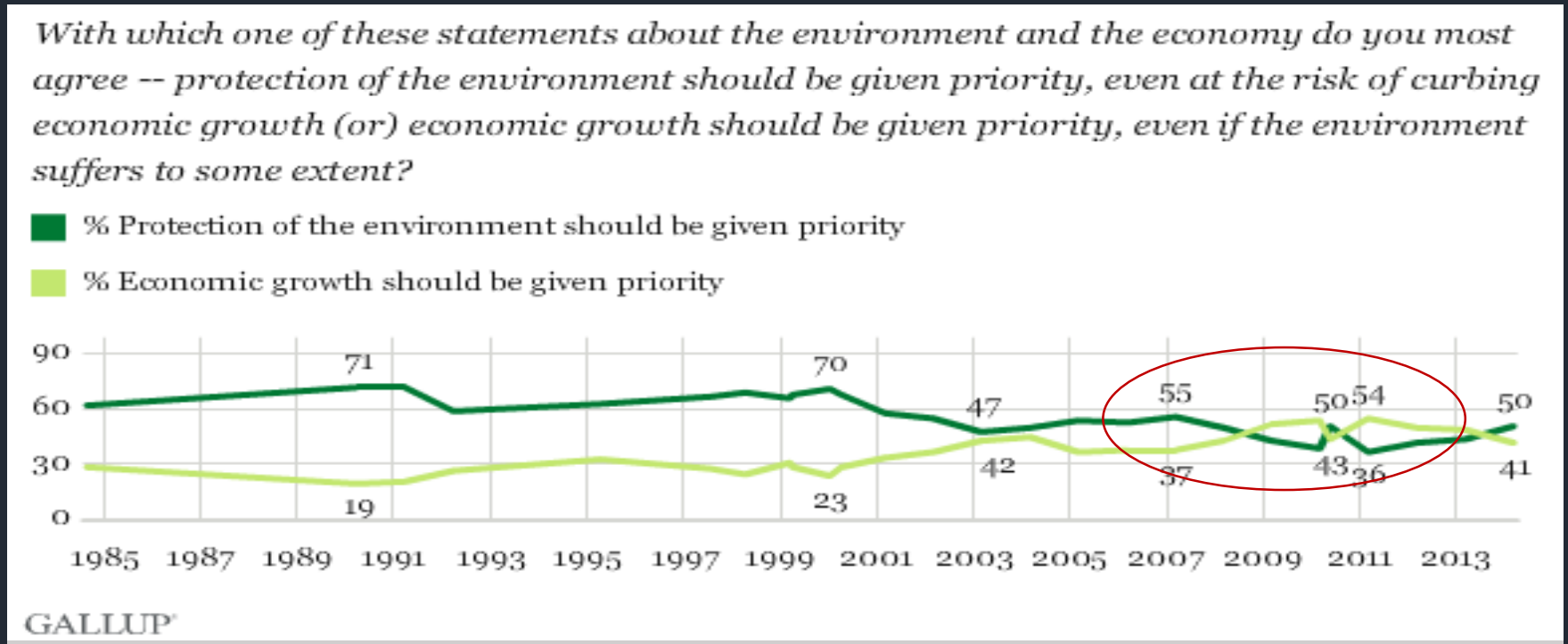
Atlantic Flyway

Chesapeake Bay

40% of birds in the Atlantic Flyway are in “conservation need.”

Audubon, 2012

People Over 65 Years of Age are Less Interested in the Environment Than Before.



Gallup Poll Trends

Money Talks

Why do people have an emotional attachment to where they live?

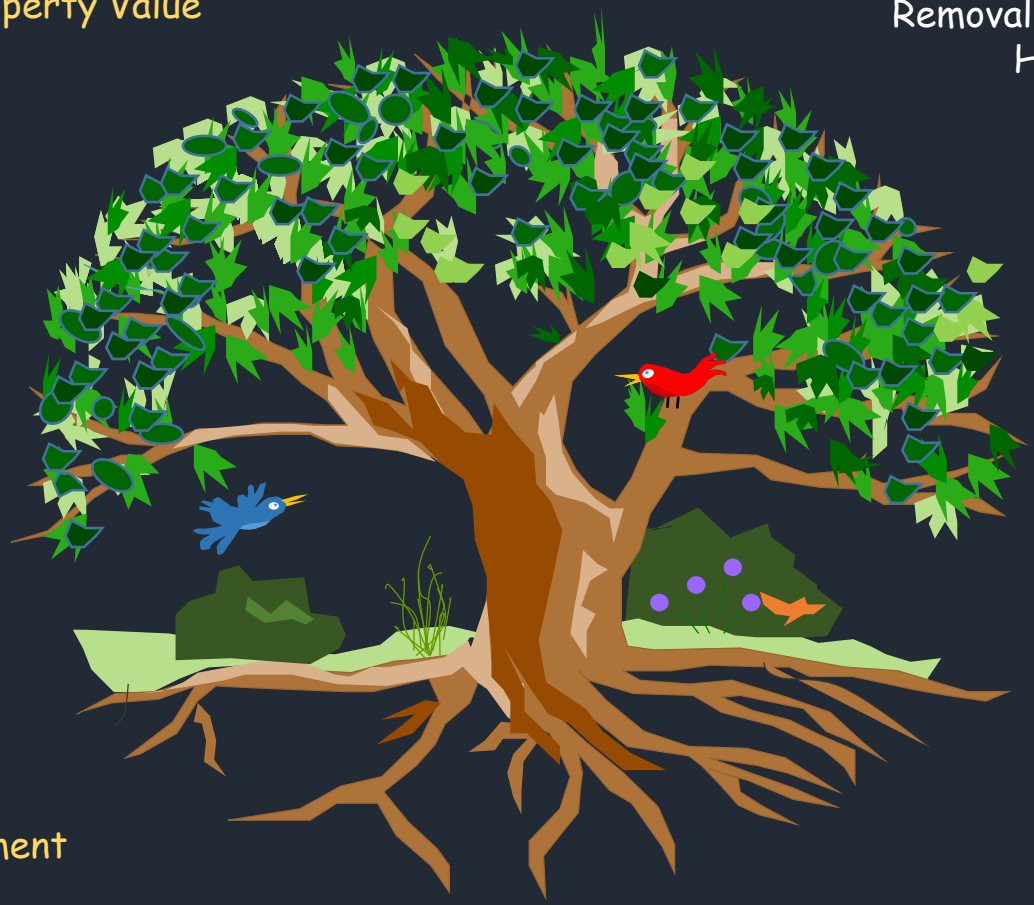
KNIGHT Soul of the Community
A PROJECT OF JOHN S. AND JAMES L. KNIGHT FOUNDATION
in partnership with GALLUP

1. Openness and welcoming
2. Social offerings
3. Lots of beauty and greenery

Economic Development

It is very difficult to have a strong economy without a healthy environment, plenty of open space and quality habitat.

Habitat Provides Many Natural, Social and Economic Services



The first rule of ecology is everything is connected to everything else.

What are the fastest growing outdoor recreation activities?

75% of people in Pennsylvania participate in some form of outdoor activity each year and those, ages 40-65 and young professionals want to spend more time outdoors.

DCNR Outdoor Recreation Participation Survey 2014

Number One Destination in the Commonwealth of Pennsylvania

Health Benefits From Contact With Nature

Inspires exercise

Reduces stress and depression

Connects people to their community

Reduces blood pressure

Increases concentration and creativity and learning

Cost Savings and Active Lifestyles

Active women have 40% less medical claims than inactive women

$1,810/ year per woman

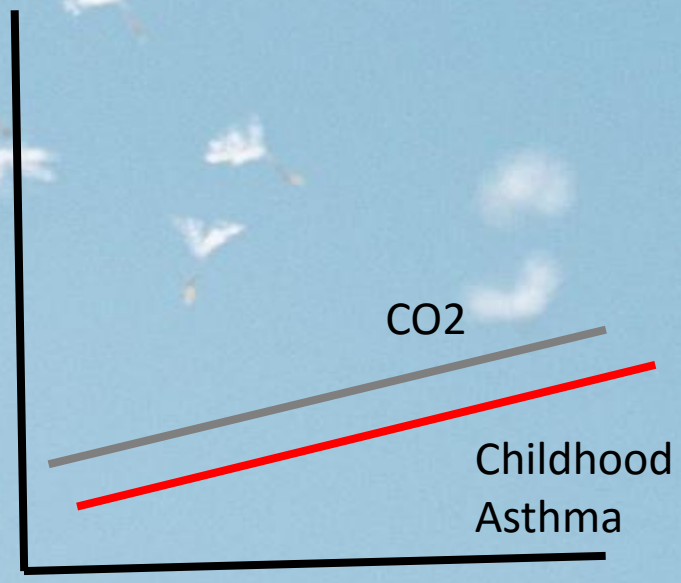
Active men have 36% less medical claims than inactive men

$1,907/ year per man

J. Bachman MD. and S. Steinbaum, MD 2012

1% increase every 7 years

Children living in wooded environments had 29% less incidence of asthma.



Source: Center for Disease Control and Prevention, 2012

Green Infrastructure

Reduces cost of stormwater management

Reduces waste water fees by 22%-44%

Drought protection

For every 10% increase in forest, water treatment costs go down by 20%

Water quality and sediment reduction

Reduces cost of flooding

Natural Systems Economics (Money Talks)

Avoided costs

- Stormwater management
- Flood mitigation
- Water pollution
- Air pollution (greenhouse gases)
- Air pollution (carbon sequestration)
- Chemical biological control
- Pollination
- Habitat restoration
- Soil formation

Revenues

- Recreation
  - Hunting
  - Fishing
  - Wildlife watching
  - Birding
  - Bicycling
  - Running
  - Walking
  - Camping
  - Kayacking
  - Outdoor exercise

Appreciated Assets

- Property value

Lehigh Valley Return On Environment Study 2014

Natural System Services	Air Quality Mitigation	Outdoor Recreation	Real Estate Value
Avoided costs $849 million/year	Avoided costs $181 million/year	Revenues $795 million/year	Added Value to Home $14,600 within ¼ mile of protected open space $1.8 billion in Lehigh Valley

Lehigh Valley Business Opportunities

2014

Resource Based	Recreation Based	Green Corporations	Naturally Smart Businesses
• Nestlé Water • Sam Adams Brewery • Pharmaceutical Companies • Electric Utilities	• Olympus Camera • L.L. Bean • Aardvark Sporting Goods • Genesis Bike Shop • Emmaus Running Shop	• Air Products • Knoll Furniture • Waste Management • Martin Guitar	Bethlehem Water Authority

The Economic Benefits of Natural Systems (in $ millions)

PA County	Natural System Services (annual avoided costs in $millions)	Air Quality Services (annual avoided costs in $millions)	Recreational Value (annual revenues in $millions)	Property Value (impact at sale of property in $millions)
Berks County	$804	$234	$ 460	NA
Cumberland County	$940	$125.1	$337.83	NA
Lehigh County	$388.8	$86.5	$317	$932
Northampton County	$460.8	$95.3	$351	$937

[1] The Business of Nature. 2011, Berks Conservancy, Keystone Conservation Trust, ECONSULT and 4WARD PLANNING.
[2] Cumberland County's *Return on Environment Study*, 2015 Keystone Conservation Trust, ECONSULT and 4WARD PLANNING.
[3] Lehigh Valley's *Return on Environment Study*, 2014. Lehigh Valley Planning Commission. Keystone Conservation Trust, ECONSULT and 4WARD PLANNING.

Natural Systems Economics

Natural systems provide these benefits free of charge. Once lost, they are expensive and very difficult to replace.

Northampton County put $2.2 million back into their budget based on these data.

Natural Systems Provide a Form of Insurance or Risk Management

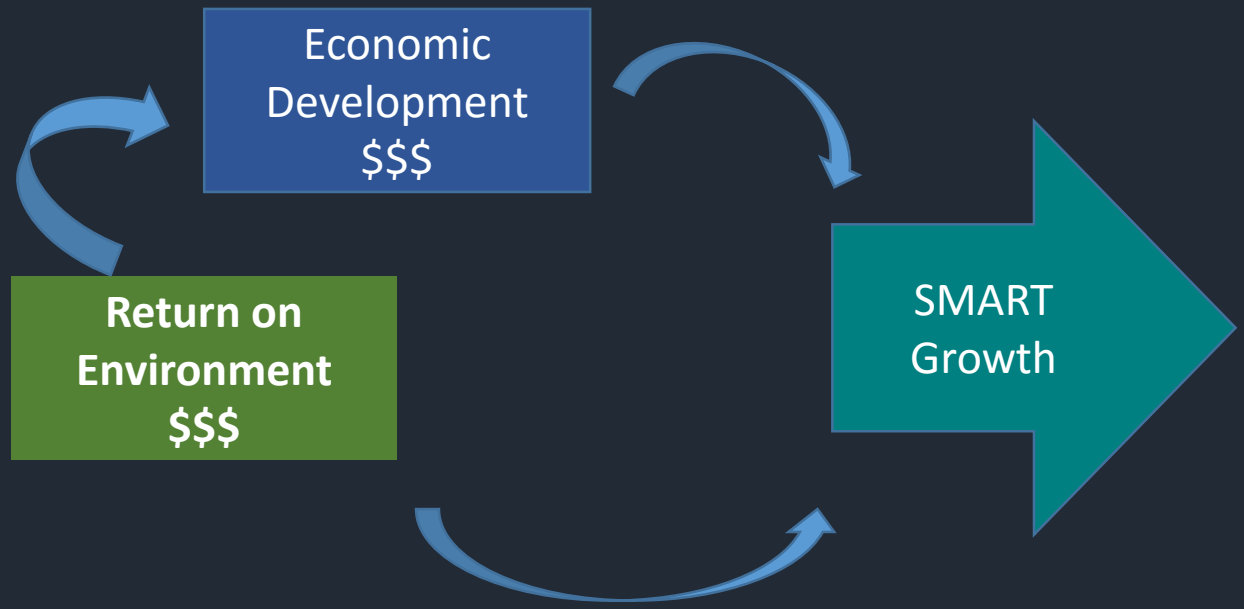
Natural systems work 24 hours a day, 365 days a year and have been doing so for over 10,000 years.

Many natural system services are more reliable and effective than engineered solutions.

EPA, Healthy Watershed Program, 2012

Natural Systems Economics

It makes sense to start land use planning at all levels with a clear understanding of the value nature is providing and the economic consequences if it is lost.

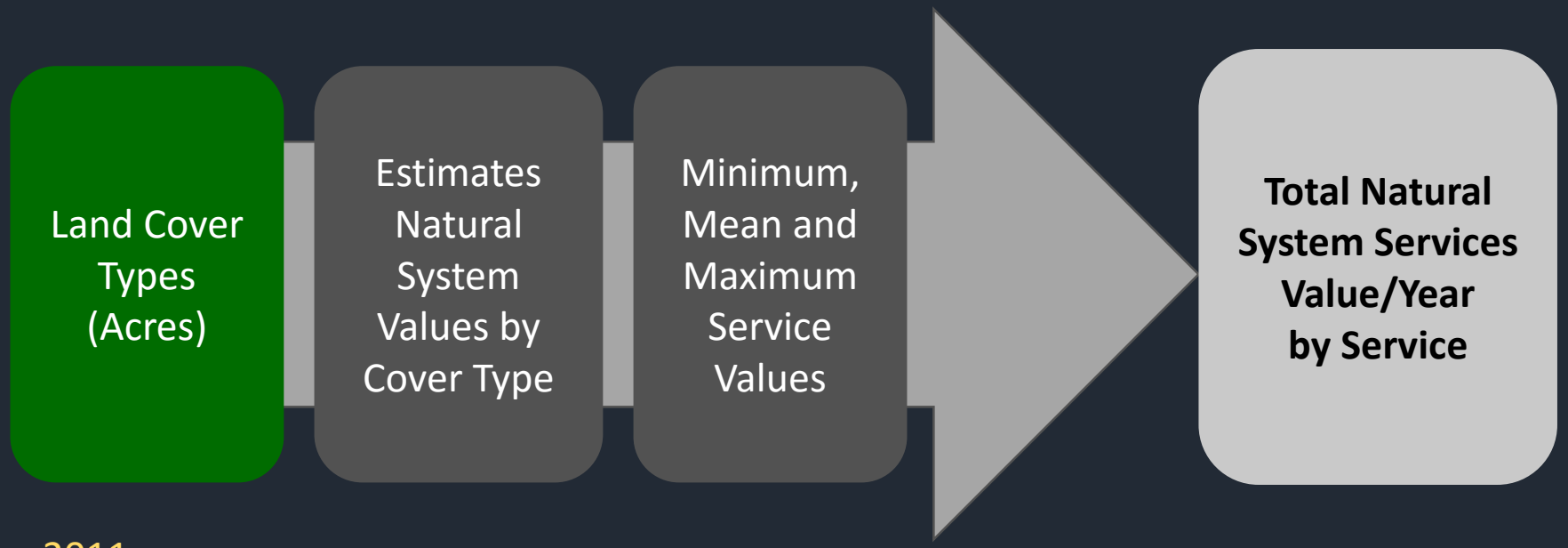


Places Where People Love to Live

- High Quality of Life
- Healthy Living
- Lowest Cost of Living
- Sustained Economic Growth
- Enhanced Natural System Services

Value Transfer Model for Natural System Services

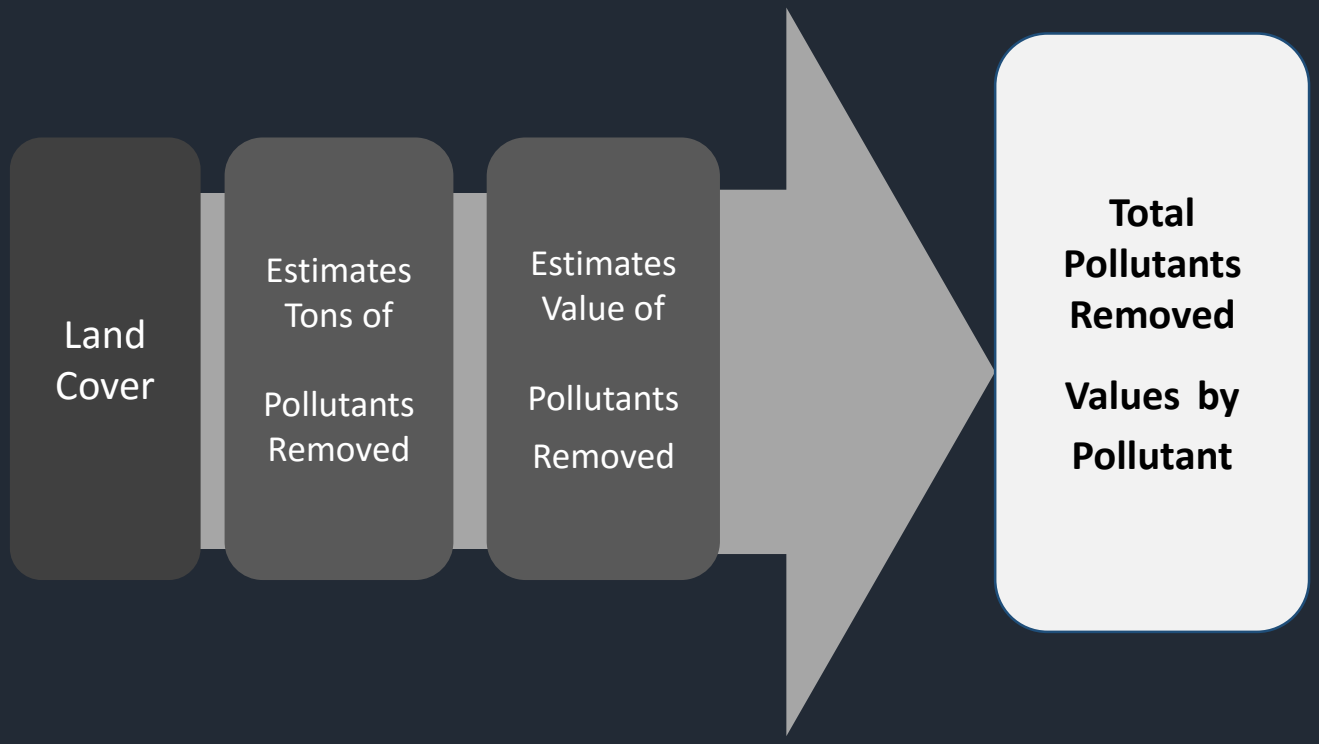
Source: Robert Costanza et.al. 2006



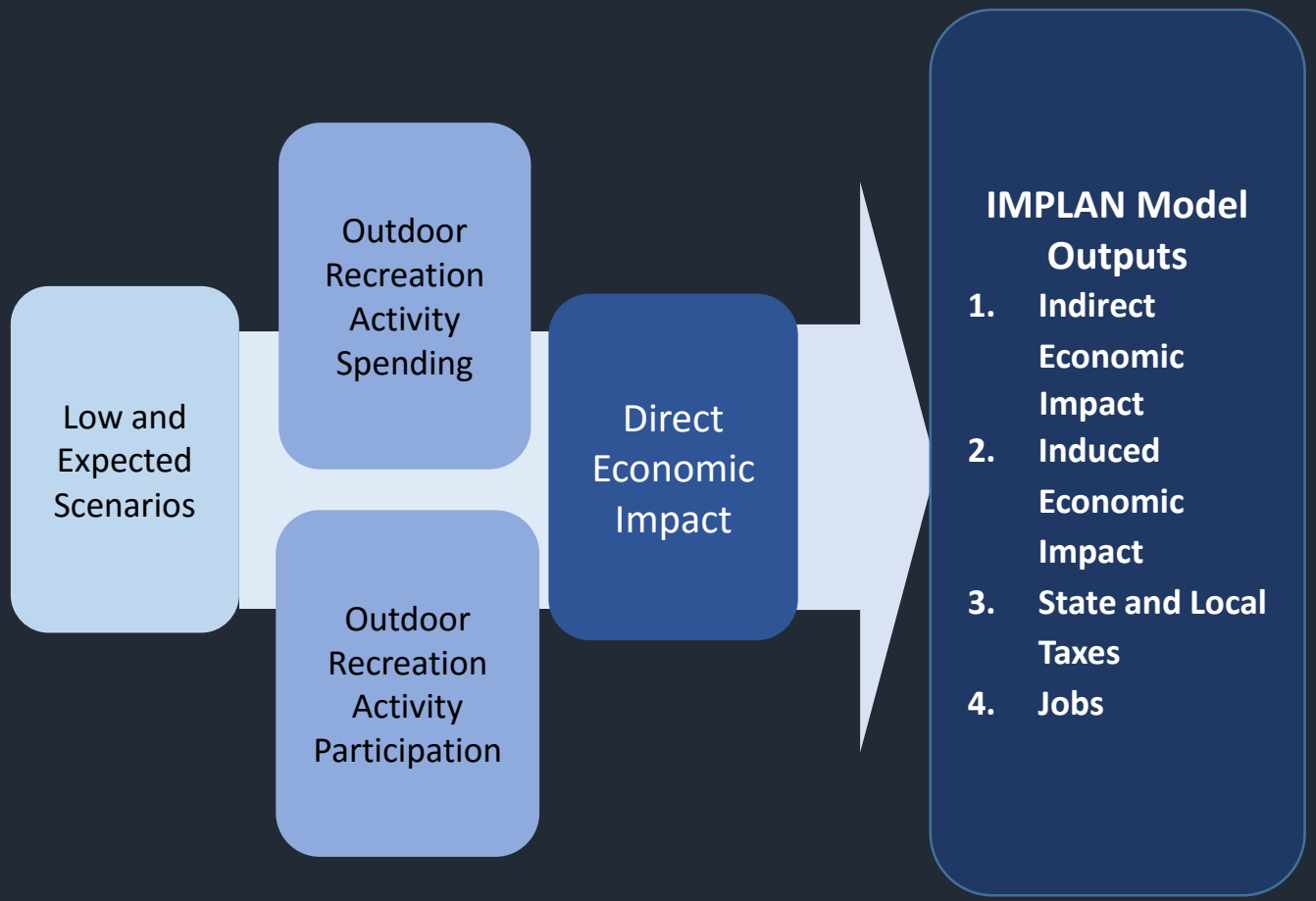
2011,
GIS data

I Tree Model Process

U.S. Forest Service



IMPLAN Economic Impact Assessment Tool



Lehigh Valley ROE Economic Contribution Analysis								
Outdoor Recreation Activity	Participation Rate minimum	Number of Participants	Minimum Spending	Minimum Direct Economic Impact	Participation Rate Expected	Number of Participants	Expected Spending	Expected Direct Economic Impact
Low Economic Contribution Scenario					Expected Economic Contribution Scenario			
Walking	0.60	388,339	$96	$37,280,563	0.6	388,339	$96	$37,280,563
Fishing	0.11	71,196	$409	$29,118,967	0.14	90,612	$409	$37,060,504
Hunting	0.05	32,362	$687	$22,232,419	0.11	71,196	$1,207	$85,932,992
Birding/Bird Watching	0.05	32,362	$211	$6,828,297	0.31	200,642	$329	$66,011,191
Wildlife Watching	0.08	51,779	$308	$15,947,796	0.35	226,531	$308	$69,771,609
Camping	0.06	38,834	$600	$23,300,352	0.06	38,834	$600	$23,300,352
Kayaking/	0.03	19,417	$375	$7,281,360	0.14	90,612	$375	$33,979,680
Bicycling	0.16	103,557	$453	$46,911,375	0.17	110,029	$600	$66,017,664
Hiking	0.10	64,723	$280	$18,122,496	0.1	64,723	$458	$29,643,225
Jogging/ Running	0.16	103,557	$196	$20,297,195	0.16	103,557	$900	$93,201,408
Nature Study	0.09	58,251	$150	$8,737,632	0.14	90,612	$150	$13,591,872
Totals				$236,058,455				$555,791,063

Lehigh Valley Economic Contribution

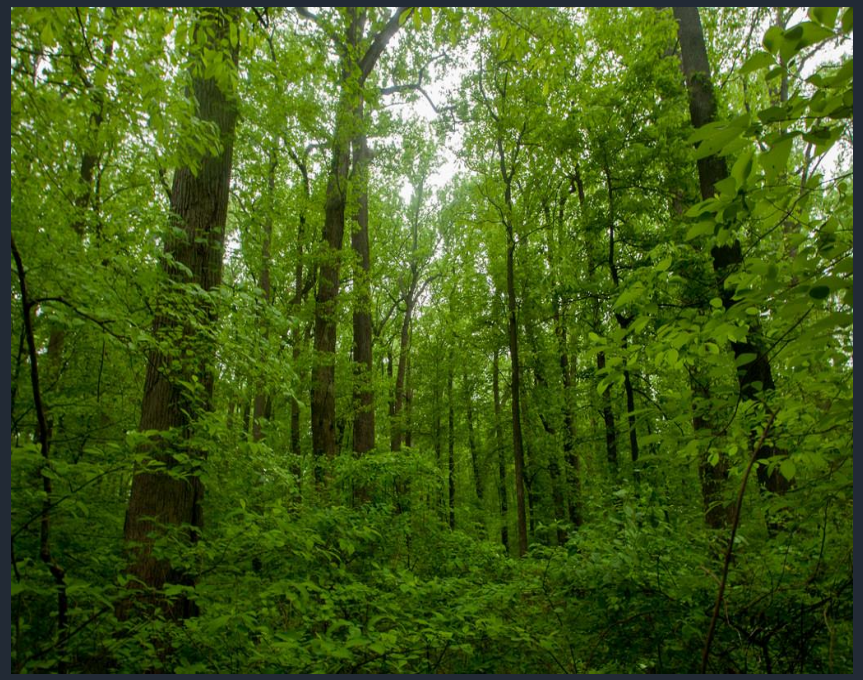
Low Impact Scenario

Activity	Direct Impact	Output (million)	Employment	State and Local Taxes
Walking	$37,280,563	$53.3	741	$4,054,840
Fishing	$29,118,967	$41.6	579	$3,167,141
Hunting	$22,232,419	$31.7	442	$2,418,122
Birding/Bird Watching	$6,828,297	$9.7	78	$718,503
Wildlife Watching	$15,947,796	$22.6	181	$1,678,097
Camping	$23,300,352	$36.6	376	$1,494,972
Kayaking/	$7,281,360	$10.8	144	$791,960
Bicycling	$46,911,375	$67.0	932	$5,102,340
Hiking	$18,122,496	$22.6	318	$1,971,103
Jogging/ Running	$20,297,195	$27.3	381	$2,207,635
Nature Study	$8,737,632	$12.5	99	$919,413
Totals	$236,058,455.04	$340,283,873	4,334	$24,524,126

Expected Impact Scenario

Activity	Direct Impact	Output	Employment	State and Local Taxes
Walking	$37,280,563	$53.3	741	$4,054,840
Fishing	$37,060,504	$53.0	736	$4,030,906
Hunting	$85,932,992	$122.8	1,708	$9,346,547
Birding/Bird Watching	$66,011,191	$93.5	746	$6,945,987
Wildlife Watching	$69,771,609	$98.8	788	$7,341,676
Camping	$23,300,352	$36.6	376	$1,494,972
Kayaking/	$33,979,680	$48.5	675	$3,695,819
Bicycling	$66,017,664	$94.4	1,313	$7,180,447
Hiking	$29,643,225	$42.4	590	$2,841,624
Jogging/ Running	$93,201,408	$133.2	1,852	$6,453,123
Nature Study	$13,591,872	$19.3	154	$1,430,197
Totals	$555,791,063	$795,717,067	9,678	$58,882,653

Green Corridors

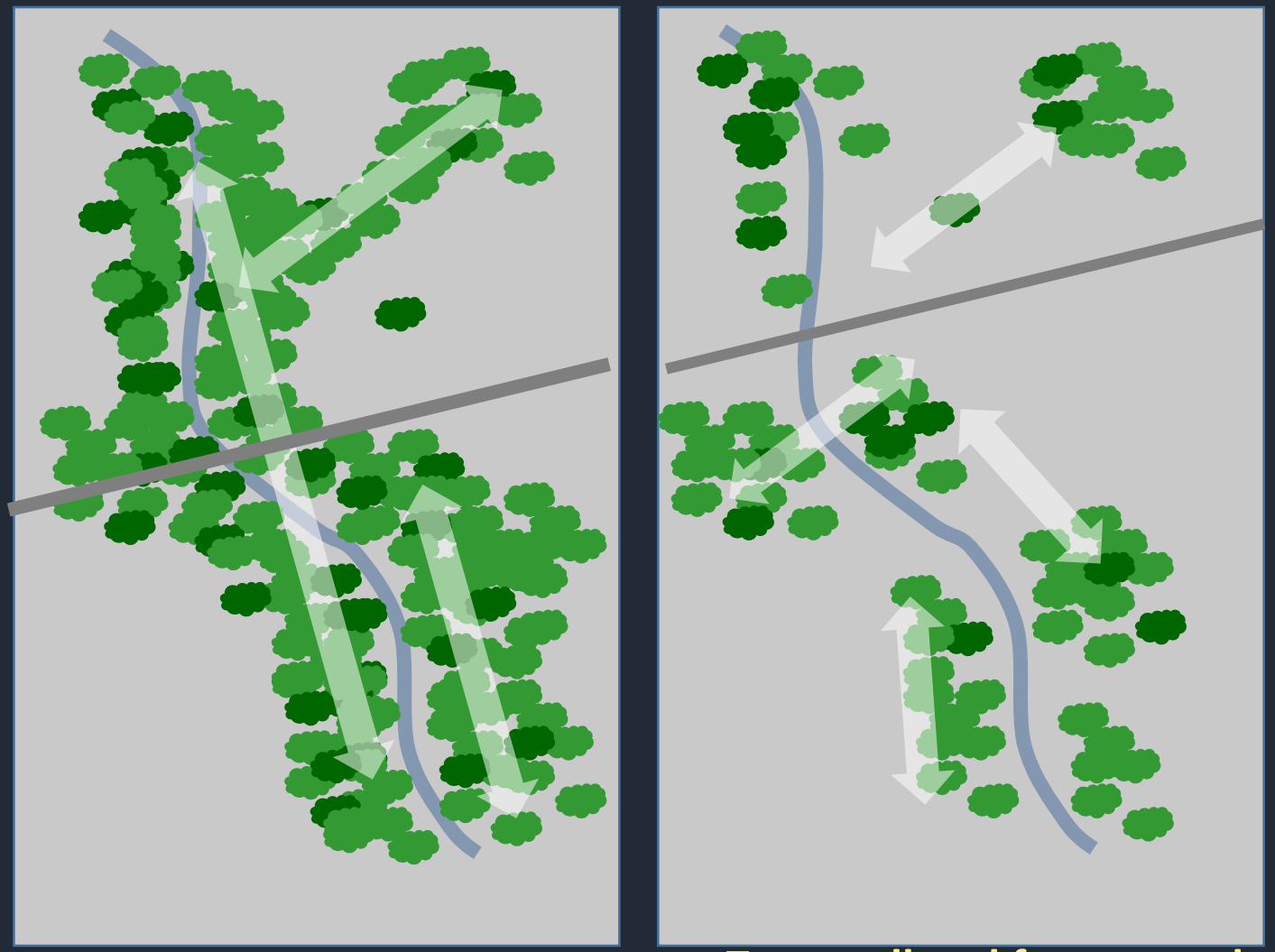


Without connected habitats and corridors, the full value of open space and natural system services may not be realized, and the benefits may be significantly diminished or lost forever.

In Most Communities, Open Space is Fragmented

Protected riparian corridors are more resilient to the anticipated effects of climate change.

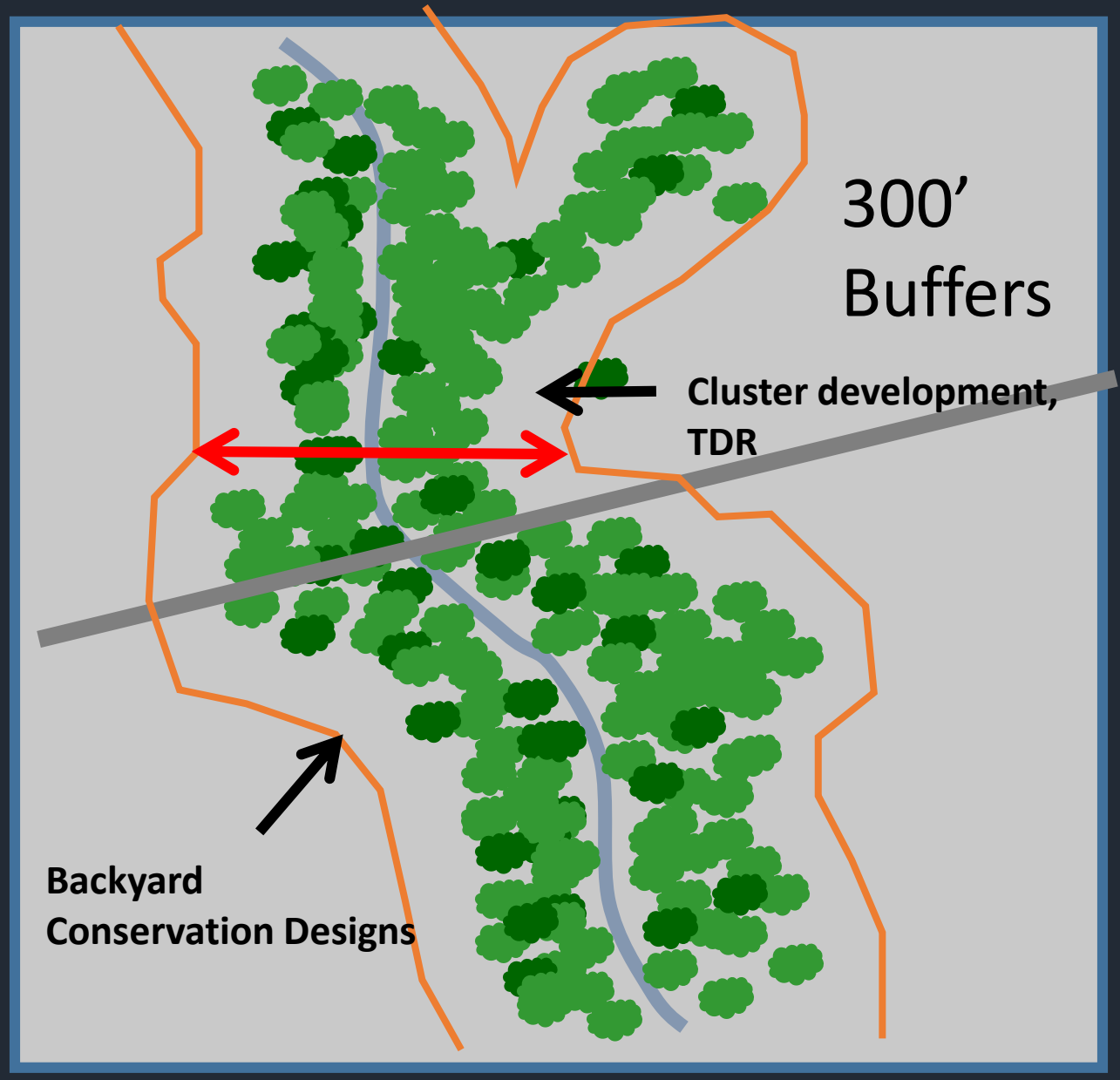
EPA, 2012 Healthy Watershed Program

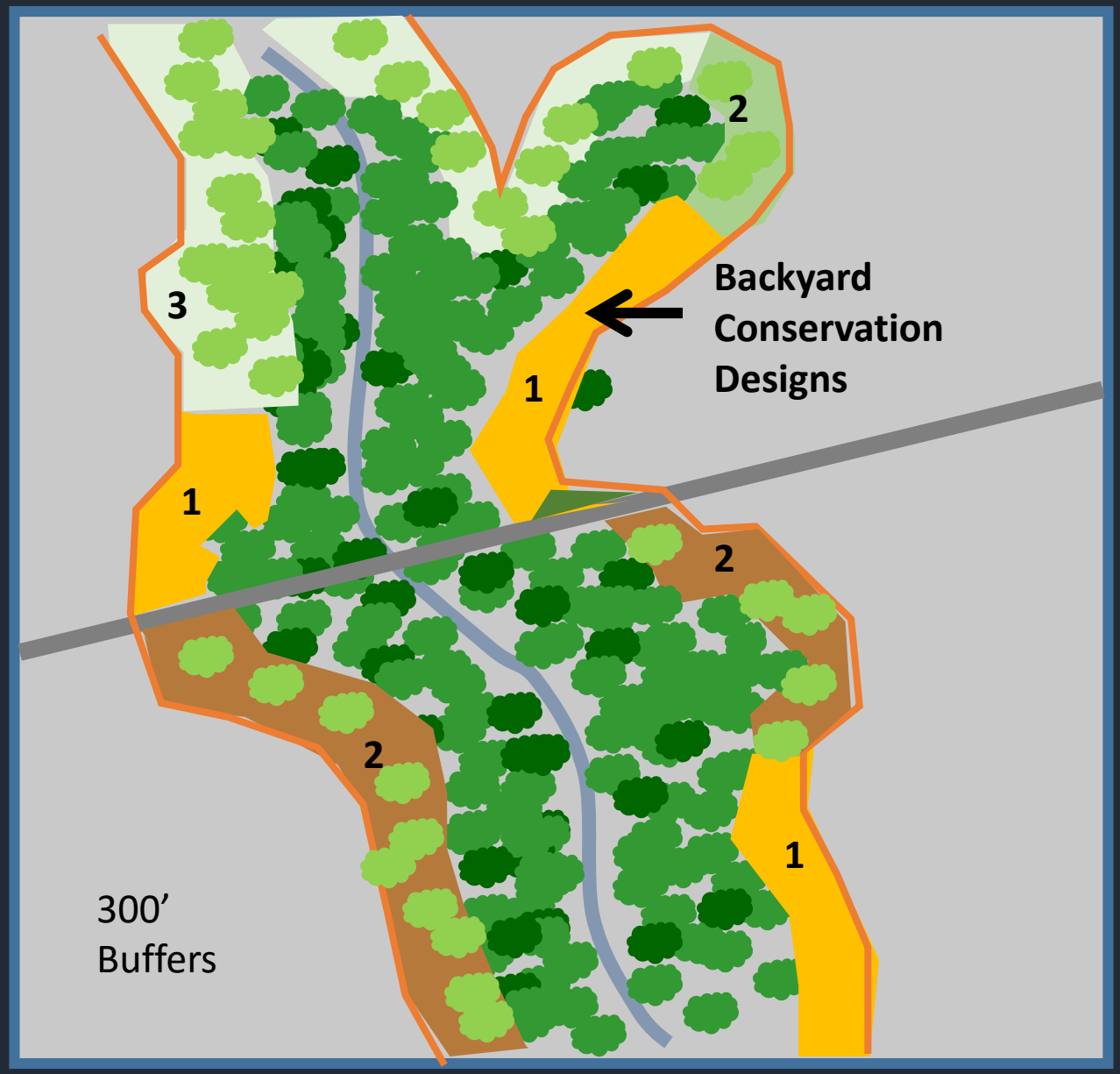


Too small and fragmented

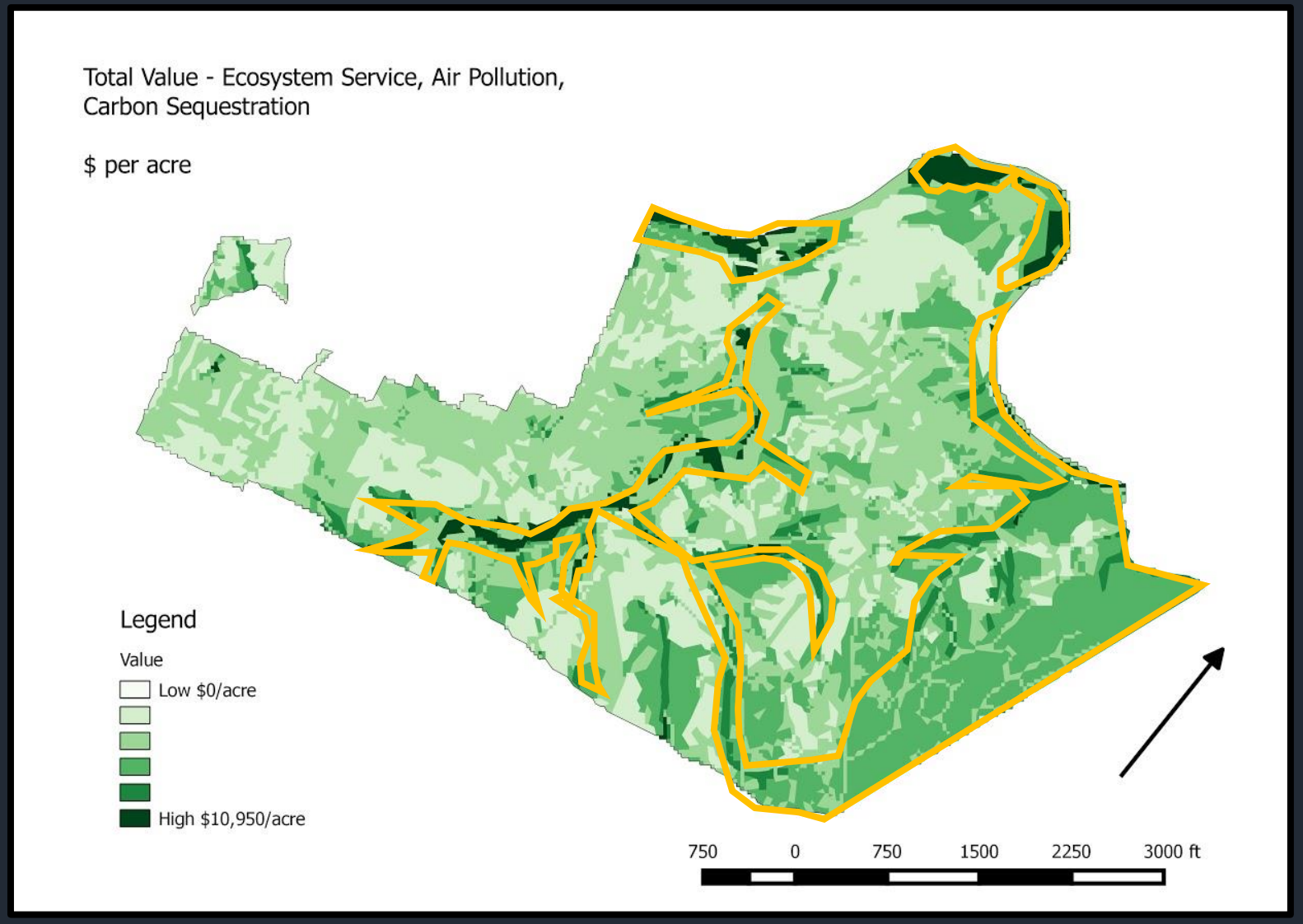
A Buffer Significantly Expands the Size of the Green Corridor and Natural System Functions.

It expands our financial benefits as well.





Prioritizing Land Within the Green Corridor is a Key to Increasing a Community's Return on Environment



Leveling the Playing Field with a Green Corridor

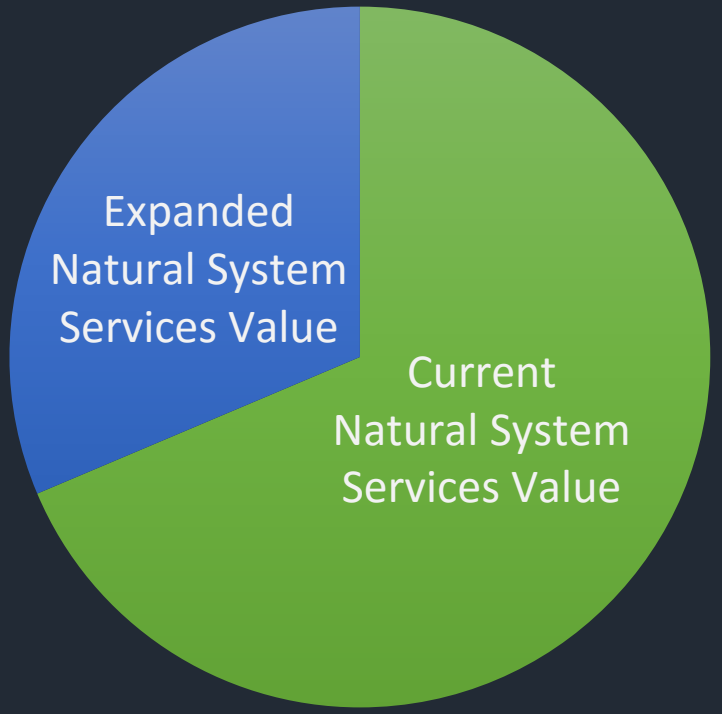
(Outlined in yellow)

Schuylkill Township Green Corridor Annual ROE

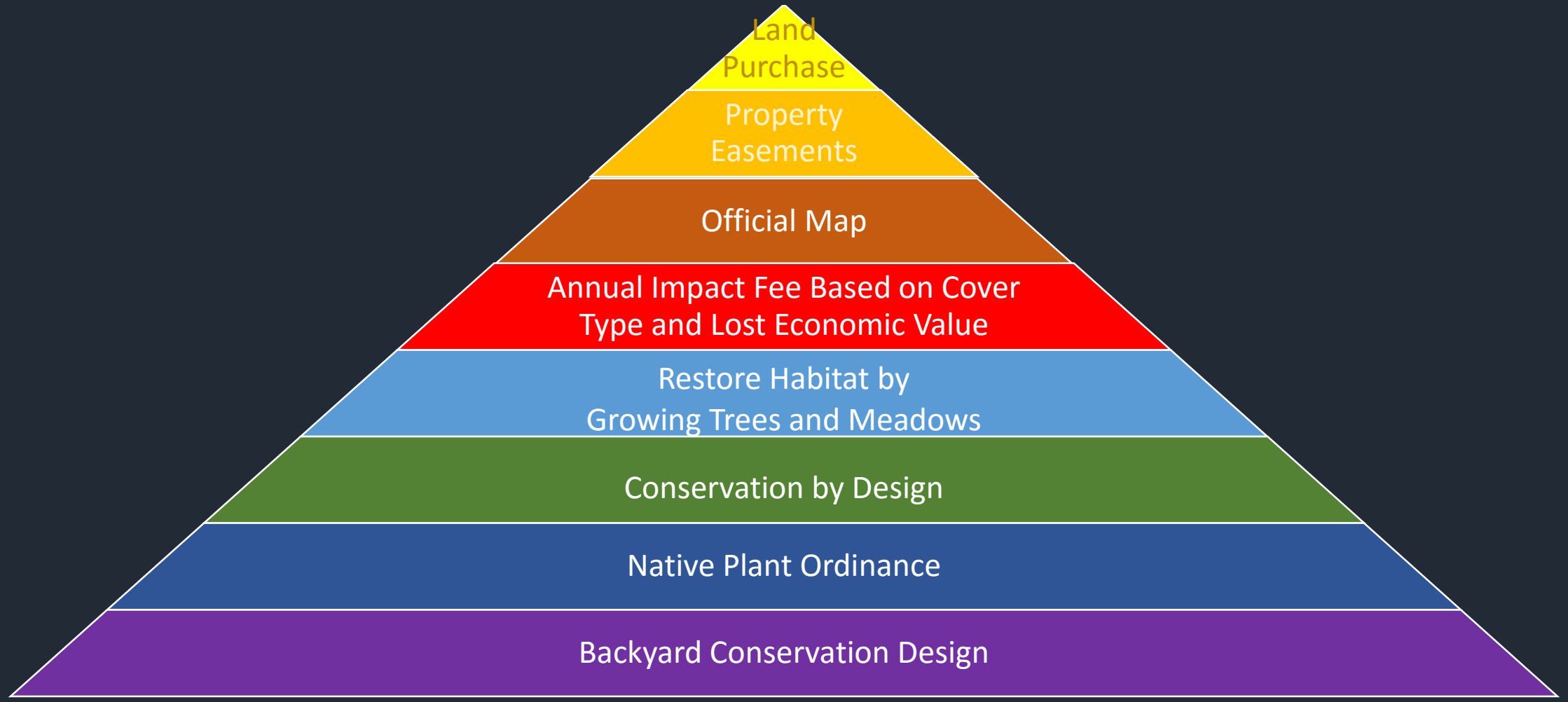
Natural System Services, Air Quality and Recreation		Value
Biological Control	$	13,941
Pollination	$	428,576
Wildlife Conservation	$	5,540,340
Soil Formation	$	12,372
Waste Treatment	$	212,598
Flood Prevention	$	1,371,062
Water Supply	$	6,368,694
Recreation	$	4,479,069
Air Pollution	$	2,056,573
Total	**$**	**20,483,226**

Compare Nature's Value to New Land Use Proposals

Economic Expansion



Eight Strategies for Communities to Get the Best Financial Return on Environment

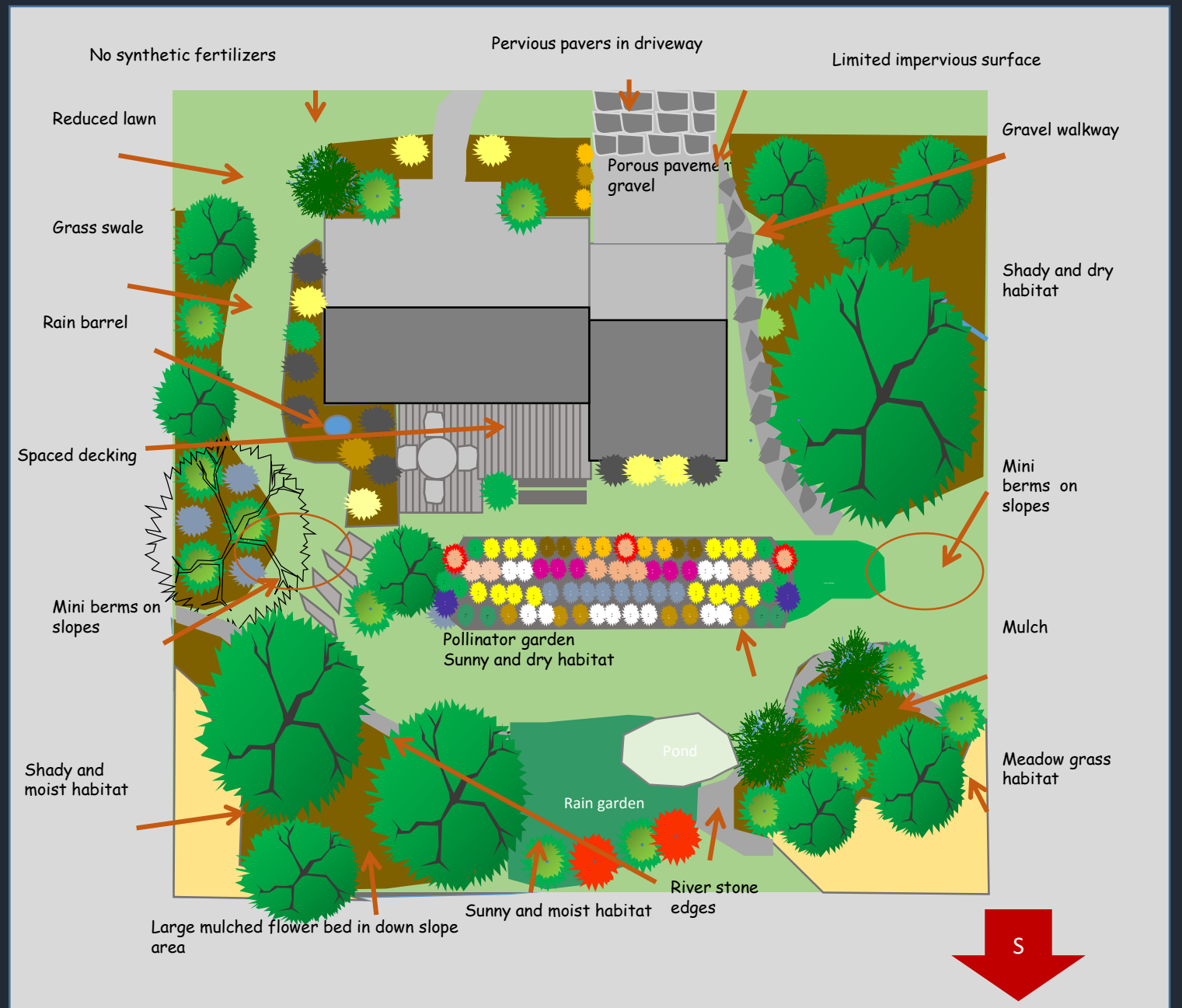


84% of land in Pennsylvania is privately owned.

Benefits of Backyard Conservation Design

- Great bird habitat 1/3 acre
  29 times the biological diversity (10 acres)
- Water management $200-500/year
  Stormwater and flood control 400,000 gal/year
  (5% tree cover decreases stormwater by 2%)
  Groundwater
    Base flow in streams 88,000 gallons
    Groundwater recharge 88,000 gallons
  Water quality
    Reduced nutrient loads 30 lbs/year
    Reduced Pesticide use 9 lbs/year
- Reduced energy use 15 /52 tons $600
- Air quality Health impacts $315/year
- Property value increase 7-20%

42 inches of rain
(average 1/3 acre property)



Backyard Conservation Design

1. Great habitat
2. Zero runoff and
3. Beauty

Radnor Township's Property Owner Engagement Estimates (22 properties)

Total Benefit of Property Owner Engagement	
211	Quality Bird Habitat Equivalents (acres)
8,800,000	Water Infiltration (gallons/year)
1,936,000	Groundwater to Stream Base Flows (gallons/year)
1,936,000	Groundwater Recharge (gallons/ year)
330	Reduced Energy Use (tons of CO2/year)
$4,400	Water Management (dollars/year)
$13,200	Energy Savings (dollars/year)
$15,939	Health Benefits From Air Quality (dollars/year)
$50,600	Health Benefits From Exercise (dollars/year)
$330,000	Property Value Increase (dollars)

Recommendations

1. Ensure the highest financial return on the environment and avoid unnecessary financial losses by providing easy access to mapped, on-line natural system services financial data to encourage its use in land use and economic development decisions;
2. Enhance infrastructure cost savings by including natural system services as part of infrastructure (official maps in Pennsylvania) as defined by green corridors or riparian buffers;
3. Buy the best and encourage conservation easements on all high valued properties;
4. Restore green corridor and riparian buffers by providing free riparian and woodland vegetation to encourage connecting forested areas as part of an open space program;
5. Expand green corridors or riparian areas and related financial benefits by:
   - Providing incentives for developing green corridors and using green infrastructure, i.e., reduced property tax for natural buffer areas;
   - Mandating clustered development and smart growth adjacent to these areas;
   - Providing incentives for native plant landscaping in all areas adjacent to green corridors or riparian areas, parks, natural areas and forests, i.e., fund or provide native plants for community native plant gardens;
6. Support all federal agency efforts to encourage similar Return on Environment action on federal projects

Each of us was put here in this time and this place to decide the future of the world. Did you think you were put here for something less?

Chief Joseph, Nez Perce 1880

Partner With Nature

Special Thanks

1. *Ann Swanson, Executive Director, Chesapeake Bay Commission*
2. *John Dawes, President, Foundation of Pennsylvania Watersheds*
3. *Marel King, Pennsylvania Director, Chesapeake Bay Commission*
4. *Ellen Bryson, US Army Corp of Engineers*
5. *Andy Loza, and Nicole Faraguna, Pennsylvania Land Trust Association*
6. *Phil Wallis and Jeanne Ortiz, Pennsylvania Audubon*
7. *Dan Miles, ECONSULT*
8. *Todd Poole, 4WARD Planning*

People Contacted

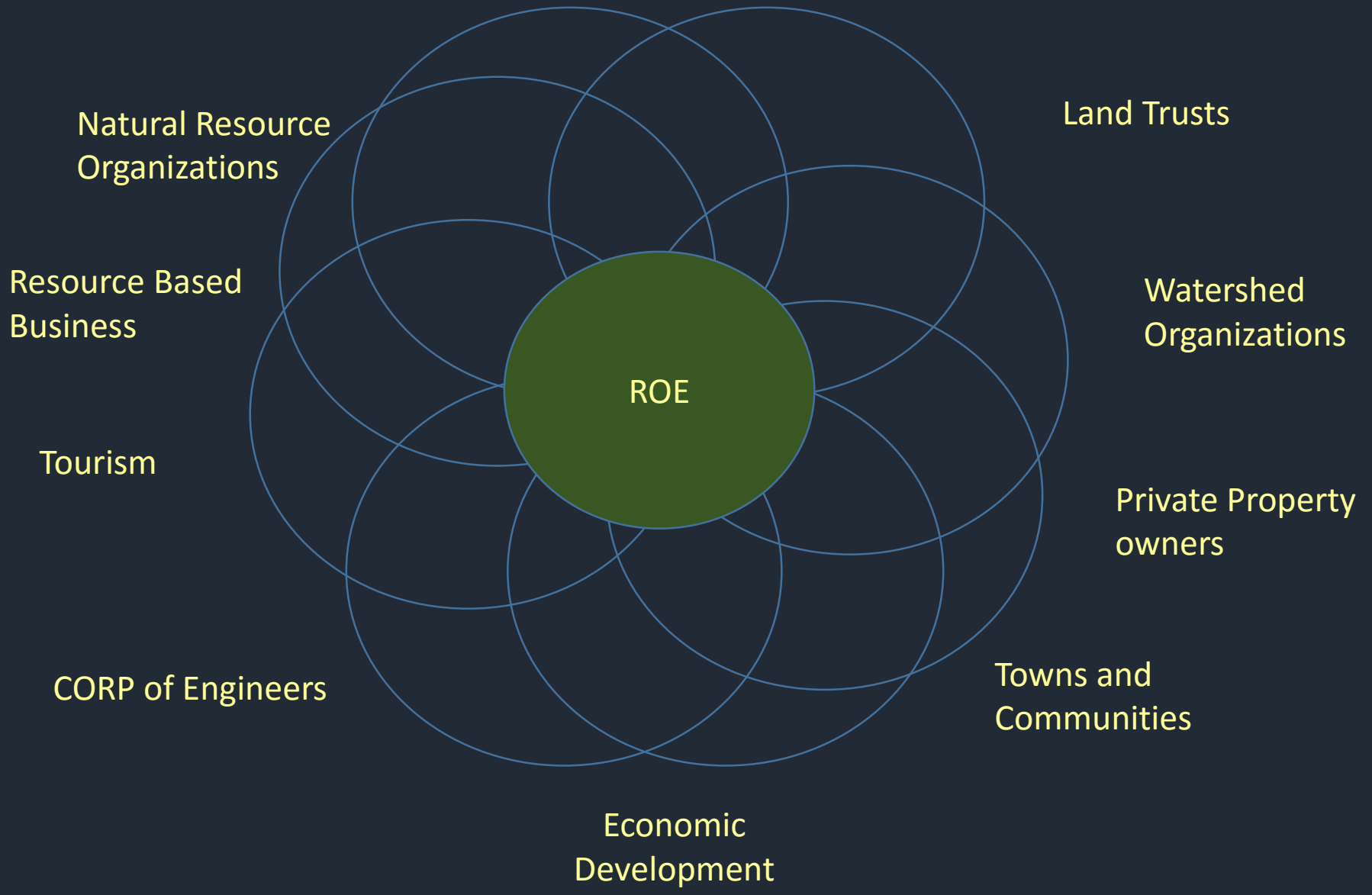
1. *Peter Clagette, Geographer, USGS*
2. *Chris Miller, President, Piedmont Environmental Council*
3. *Lee Epstein, Land Planner, Chesapeake Bay Foundation*
4. *Elliott Campbell, Maryland Department of Natural Resources*
5. *Reggie Parrish, Urban Land Specialist, U.S EPA*
6. *John Griffin, Consultant*

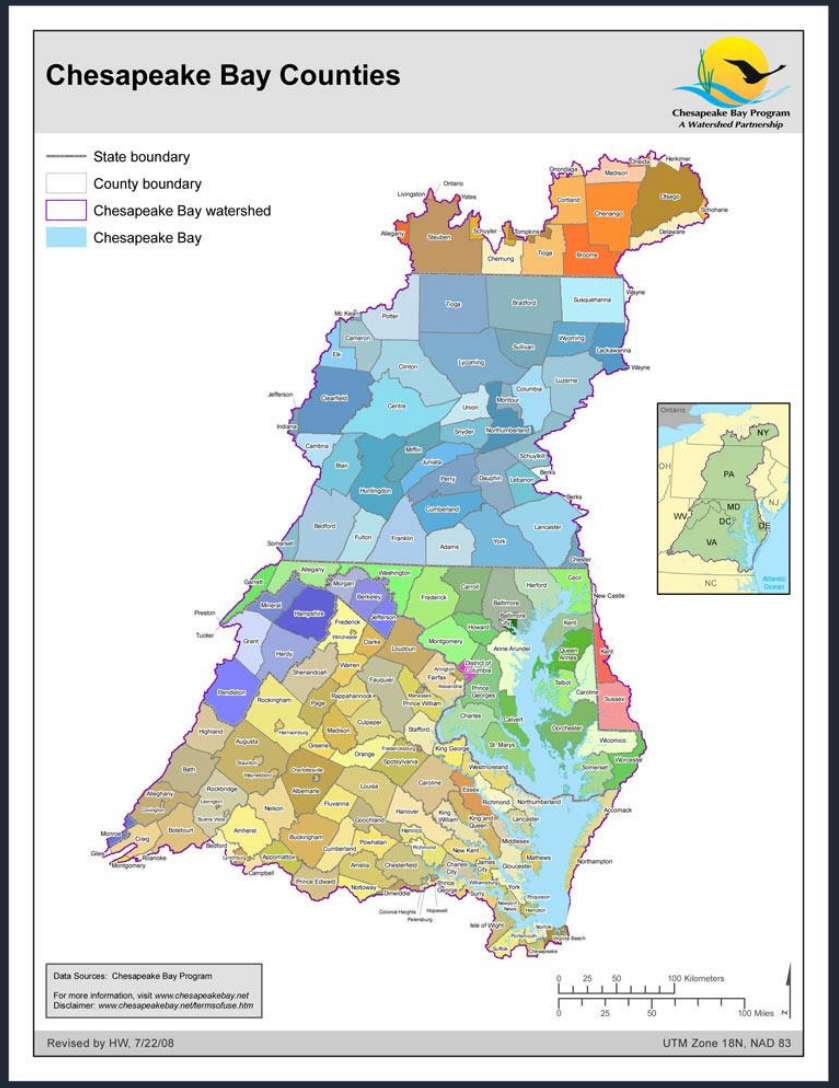
Partner With Nature

Like Chief Joseph, I personally believe that we are borrowing our planet from future generations and it is our responsibility to leave it in as good a shape as we found it.

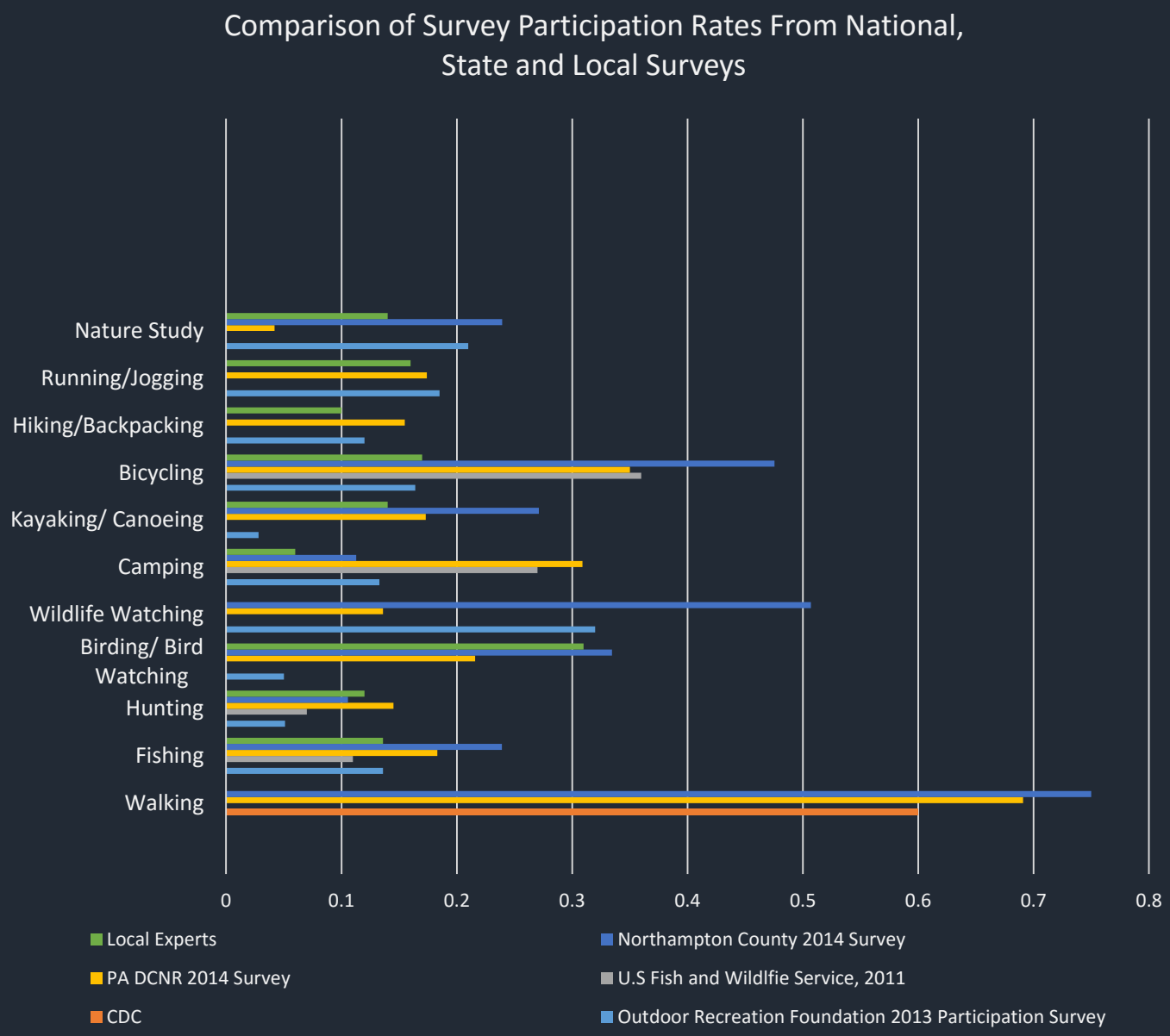
Given our track record, we need to make some dramatic changes in our land use decision process and personal choices if we plan to fulfill our promise of good stewardship. Like it or not, money talks and I believe we can level the planning field and change the rules of the game regarding the use of land if we focus on nature's benefits and recognize nature as our treasured ally, and partner—we need to become a Partner with Nature

Integrated Approach





Begin with Fastest Growing Counties in each state


Comparison of Survey Participation Rates From National, State and Local Surveys
Nature Study
Running/Jogging
Hiking/Backpacking
Bicycling
Kayaking/ Canoeing
Camping
Wildlife Watching
Birding/ Bird Watching
Hunting
Fishing
Walking
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Local Experts
Northampton County 2014 Survey
PA DCNR 2014 Survey
U.S Fish and Wildlfie Service, 2011
CDC
Outdoor Recreation Foundation 2013 Participation Survey

Lehigh Valley ROE Participation Rate Analysis

Participation data: light green is low, light blue is both low and expected and dark blue is expected spending levels)

	Outdoor Recreation Foundation 2013 Participation Survey (41)	U.S. Fish and Wildlife Service 2011 (42)	Pennsylvania Outdoor Recreation Participation Survey 2014 (43)	Northampton Outdoor Recreation Survey 2014 (40)	Interviews With Local Experts	Center for Disease Control (44)
Walking			.691	.75		.6
Fishing	.136	.11	.183	.2392	.136	
Hunting	.051	.07	.145	.1056	.12	
Birding/Bird Watching	.05	.27	.309	.3345	.30+	
Wildlife Watching	.077	.36	.35	.507		
Camping	.133		.155	.1127	.06	
Kayaking/ Canoeing	.028		.174	.2711	.14	
Bicycling	.164		.216	.4754	.17	
Hiking/ Backpacking	.12		.136		.10	
Jogging/Running	.185		.173		.16	
Nature Study	.21		.092	. .2394	.14	

Lehigh Valley ROE Spending per year, per person

(Spending data: green is low, light blue is both low and expected and dark blue is expected spending levels)

	US Fish and Wildlife Service, 2011 Recommended by Game Commission	DCNR, 2009 Recreation Resident participation Survey	Southwick National 2013 Economic Analysis	Runners World		Local Experts estimates	
Walking		$96					
Fishing	$409	$831					
Hunting	$1.207	$687					
Birding/Bird Watching	$329	$211					
Wildlife Watching	$308						
Camping		$2,529	$2,009			$600	
Kayaking/Canoeing			$482			$375	
Bicycling		$453	$1,196			$600	
Hiking/Backpacking		$280	$1114.5			$458	
Jogging/Running		$238		$196	$3,734	$900	
Nature Study						$150	

We knew 27 years ago…Procedures used throughout the bay region for managing growth and development have been inadequate. While many local jurisdictions are making valiant efforts to deal with growth, there is a dramatic need for change. The use of land is a great environmental, social and economic challenge. Society must create rational patterns, supported by adequate infrastructure and public transportation. Scattered unplanned development is wasteful, expensive and generates cost and pollution per capita than rational patterns….

Chesapeake Bay Executive Council, 1988