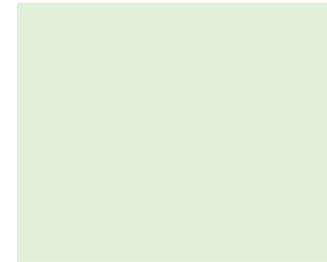
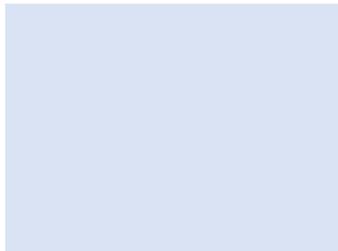
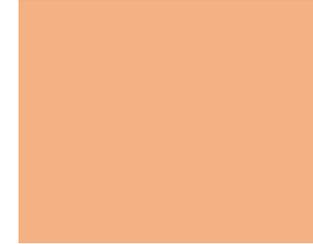


2017

Warrington Township



Environmental, Social and Economic Benefits Provided by Nature

Return on Environment Report

This report was developed by Keystone Conservation Trust
for the Warrington Township Environmental Advisory Council

John Rogers



The Pennsylvania Constitution imposes a duty to conserve and to maintain public natural resources for this generation and generations to come.

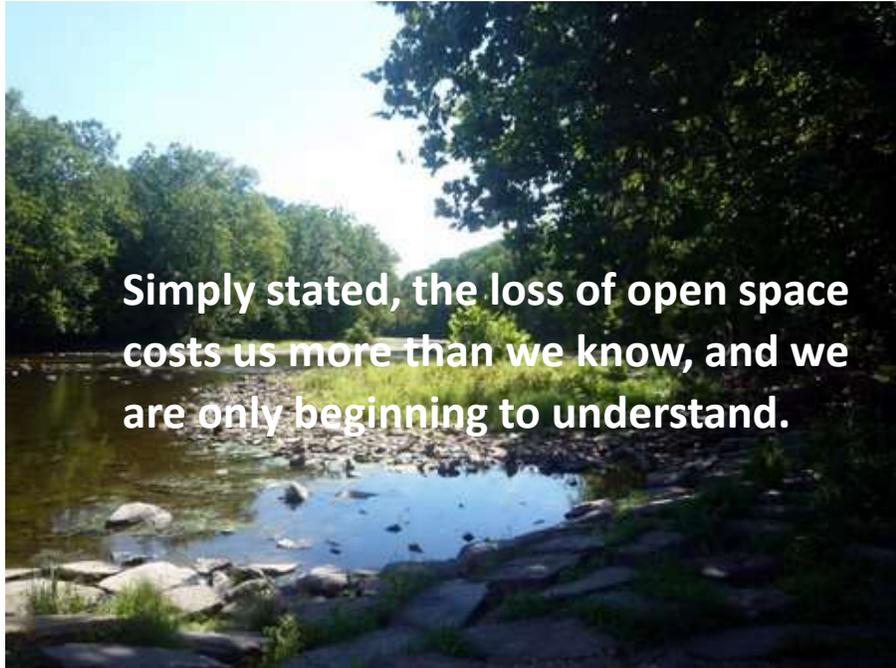
Challenge

Because Mother Nature doesn't write receipts, nature's invisible financial value is often overlooked or undervalued in policy debates, business decisions and personal choices.

A major challenge for Warrington Township is how to balance growth with the community's existing quality of life, health, low cost of living, sense of place and economic value that is provided by open space.

Determining "what nature is worth" is not about intrinsic value, rather it explains what governments and people have been willing to pay for the services nature provides—free of charge.

Communities that understand the economic benefits of trees, streams and wetlands are better equipped to make strategic decisions on the use of land, economic development, infrastructure, water resources, safety, tourism and recreation.



Simply stated, the loss of open space costs us more than we know, and we are only beginning to understand.

What is the value of our clean air, water and open space? What happens to our quality of life if we continue to lose forest, streams and wetlands?

01 // WHY

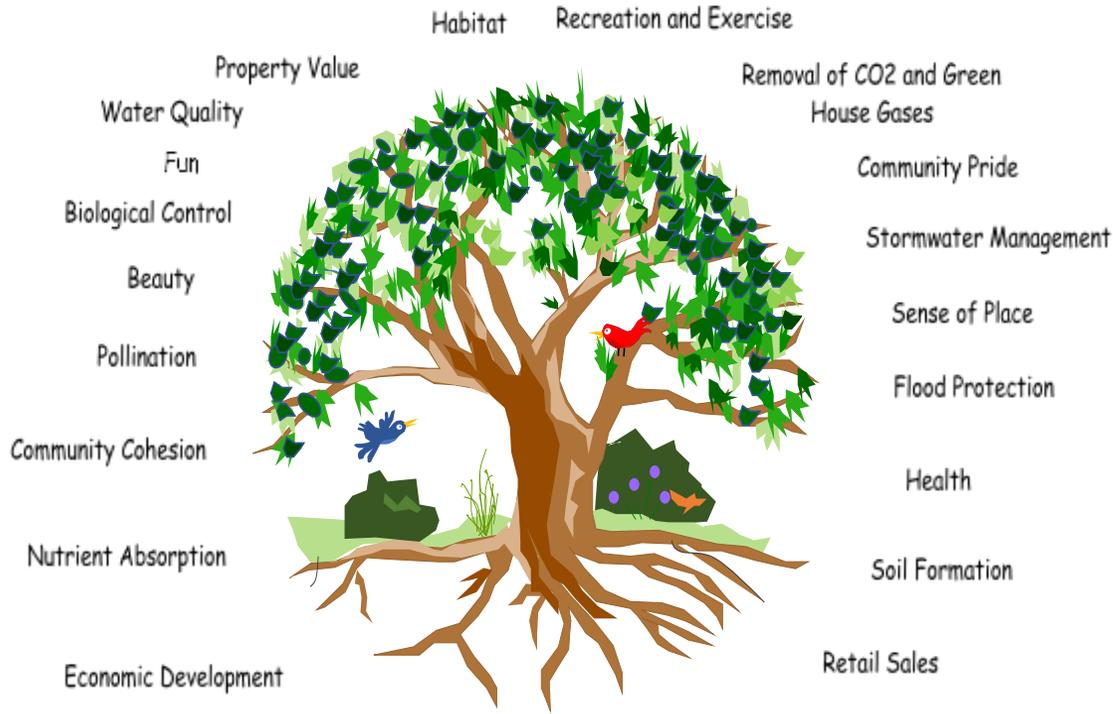
RETURN ON ENVIRONMENT?

Albert Einstein said, "We can't solve problems by using the same kind of thinking we used when we created them."

Just like business people use return on investment tools to assess the value of any decision or investment, we now have a way to estimate a Return on Environment (ROE). ROE explains conservation in a language everyone can understand and put immediately to use. It also connects nature to a community's quality of life and welfare and expresses nature's significant benefits. As a result, policy makers, businesses and residents stop taking nature for granted and begin to see natural systems as a portfolio of financial assets, rather than a commodity or added expense.

To ensure responsible asset management, every resource-based decision process should begin with a clear understanding of Warrington Township's Return on Environment.

OUR NATURAL ASSETS ARE ESSENTIAL TO OUR EVERYDAY LIFE



Replacing these services is difficult and can take 50-100 years. In the meantime, these services are replaced at the taxpayers' expense.

02 // OVERALL ECONOMIC IMPACT

Nature is Serious Business.

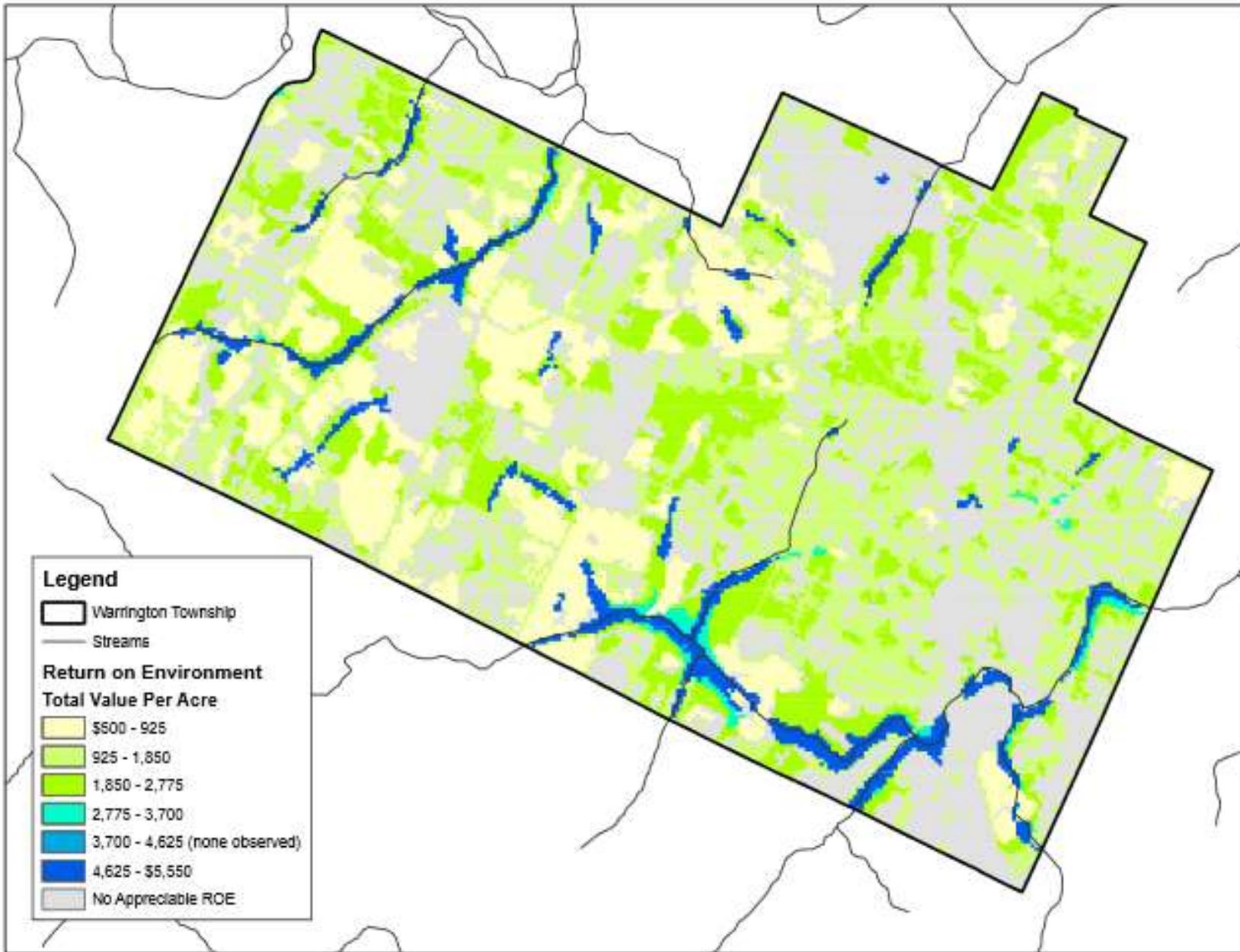
Warrington Township's open spaces provide natural system services and recreational benefits estimated at nearly **\$57.6 million annually**.

WARRINGTON TOWNSHIP'S ANNUAL RETURN ON ENVIRONMENT

| | |
|---|-----------------------|
| Conserving our land avoided costs: | \$ 4.1 million |
| Providing safe, clean water resources: | \$ 5.71 million |
| Improving our air quality annual avoided costs: | \$.64 million |
| Annual Total Avoided Costs | \$10.4 million |
| Annual Health Care Savings | \$16.6 million |
| Recreation Spending | \$30.6 million |

Homes in Bucks County that are located within 1 mile of protected open space are worth \$10,100 more, on average.

[\[1\]](#)



03 //

WARRINGTON TOWNSHIP'S ROE

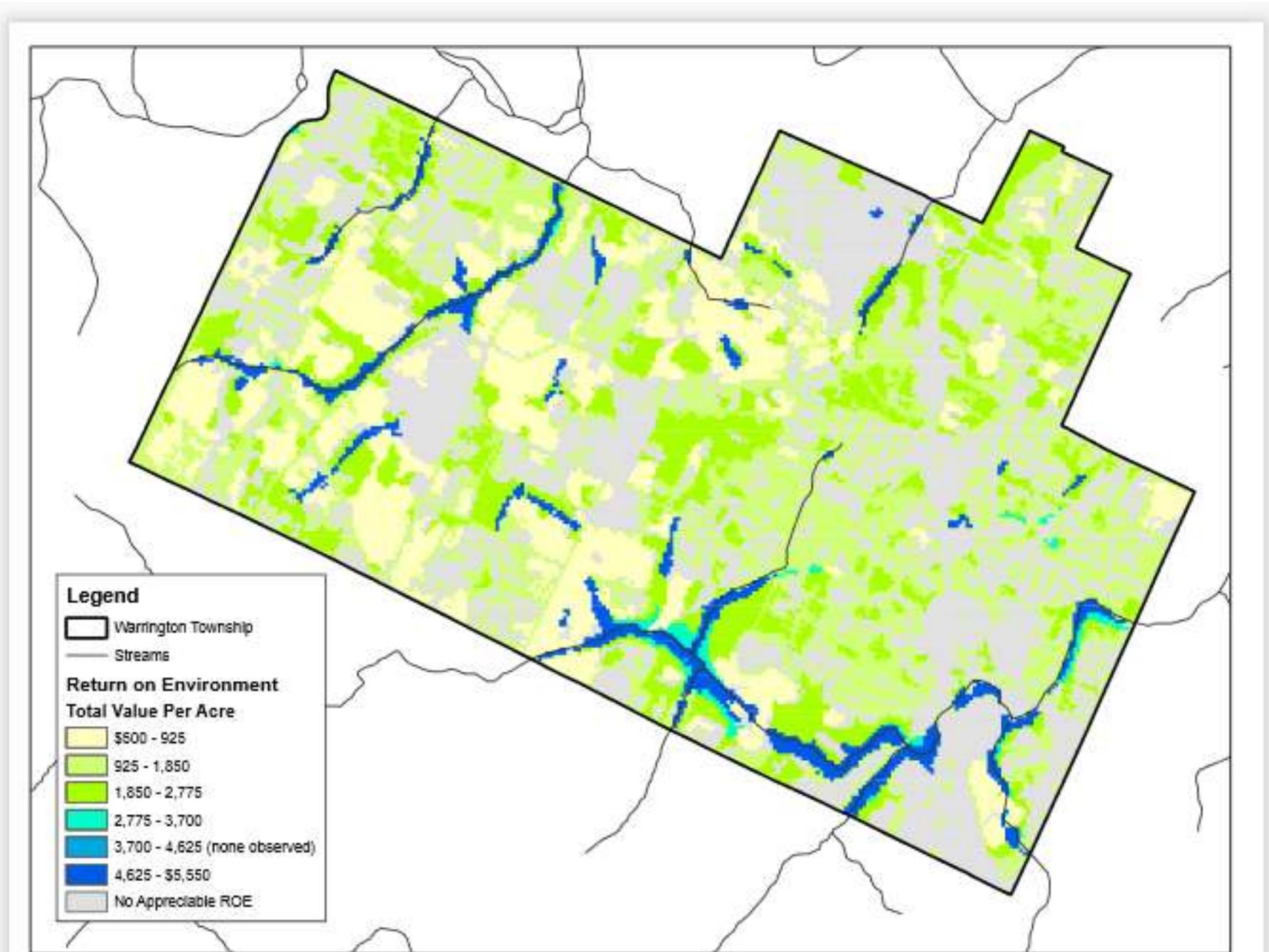
**We have a lot worth
protecting.**

**Areas shown in blue are high in
value and need to be protected
or managed.**

**If you live adjacent to these
areas, you can help expand
Warrington Township's ROE.**

Riparian areas in Warrington Township provide \$2.2 million in avoided costs each year.

100-foot wide buffers on each side of the stream provide the highest water quality and habitat value.
(Stroud Labs)



04 // PROVIDING SAFE, CLEAN WATER RESOURCES

We need to clean things up at the source.

Infiltration of rainwater helps prevent flooding and provides clean water to streams at a consistent temperature of 55 degrees Fahrenheit-the temperature most suitable for aquatic life.^[5] Streams that travel through woodlands provide spawning habitats for fish, and trees and woody debris provides valuable cover for fish and other aquatic organisms along the water's edge. Degradation of any portion of our streams can have profound effects on living resources downstream.

The current green infrastructure along streams in Warrington Township reduces tax burdens by avoiding annual expenditures of:

| | |
|--|---------------------|
| Stormwater and Flood Protection | \$ 4,492,883 |
| Water Supply | \$ 500,615 |
| Water Quality | \$ 841,108 |
| Aquatic Resources | \$ 306,300 |
| Total | \$ 5,711,261 |



Protecting wetlands, riparian forests and headwaters is essential to controlling surface water treatment costs and maintaining basic water quality and healthy aquatic ecosystems.

- *EVERY 10% INCREASE IN CANOPY COVER REDUCES WATER TREATMENT COSTS BY 20%.^[2]*
- *Seven to eight trees will infiltrate enough water to equal the water used by one household each year.^[3]*
- *60% canopy cover helps ensure maximum useful infiltration and water quality.^[4]*

^[2] Ernst, Caryn. 2004. [Protecting the Source. Land Conservation and the Future of America's Drinking Water.](#) The Trust for Public Land and the American Water Works Association. San Francisco, CA.

^[3] Designing With Natives DWTN.net

^[4] Ernst, Caryn. 2004. [Protecting the Source. Land Conservation and the Future of America's Drinking Water.](#) The Trust for Public Land and the American Water Works Association. San Francisco, CA.

^[5] Sweeney, Bernard W. and J. Dennis Newbold. 2014. Streamside Forest Buffer Width Needed to Protect Stream Water Quality, Habitat, and Organisms: A Literature Review. *Journal of the American Water Resources Association* 50:560-584.

05 // IMPROVING OUR AIR QUALITY

Our trees are critical to our survival.

Today, Warrington Township faces substantial air quality challenges, which can lead to a variety of human health problems including asthma and other respiratory ailments. Air pollution damages buildings and plants, disrupts natural system services and causes smog and reduced visibility. Because trees remove significant amounts of air pollution (in particular, nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone, and particulate matter), protected open spaces, forests and woodlands can improve environmental quality and overall human health.

In Warrington Township, the estimated avoided healthcare costs for air pollution annually are as follows:

| | |
|-----------------------|------------------|
| Carbon Dioxide | \$160,467 |
| Air Pollutants | \$478,115 |
| Total | \$638,582 |



Trees impact our air and water quality, habitat, health, sense of place and the economy.

Children in urban areas with solid tree canopy had 24-29% fewer cases of childhood asthma.^[6]

In a study in Baltimore, MD of residents who lived in neighborhoods with 60% canopy cover found that 80% of people planned to stay where they lived. When canopy cover was only 15%, 50% of residents said they wanted to find another place to live.^[7]

- 2-3 acres of trees will offset the carbon load for one home.^[8]
- One acre of trees will offset the carbon of one car traveling 26,000 miles.^[9]

^[6]Gina Lovasi, Ph.D., (2013) [Built Environment and Health, Cardiovascular and Pulmonary Disease Epidemiology](#) in the *Journal of Epidemiology and Community Health*

^[7] Morgan Graves, et.al., 2004. Demographic and socioeconomic research team: Research Highlights. Baltimore Ecosystem Study.

^[8] U.S. Forest Service I-tree Landscape Model

^[9] Maryland Department of Natural Resources, 2014



Forested areas less than 100 acres allow invasive plants to penetrate the core of the forest, causing difficulty in forest regeneration, biological diversity and natural system services. [\[10\]](#)

06 // CONSERVING OUR LAND

Protecting, restoring and connecting habitat is the best approach to a sustainable environment and local economy.

Annual Return on Environment

| | |
|--------------------|--------------------|
| Habitat | \$3,529,095 |
| Pollination | \$ 509,282 |
| Regeneration | \$ 18,832 |
| Biological Control | \$ 25,935 |
| Total | \$4,083,143 |

[\[10\]](#) Jones, C., J. McCann, and S. McConville. 2000. *A Guide to the Conservation of Forest Interior Dwelling Birds in the Chesapeake Bay Critical Area*. Chesapeake Bay Critical Area Commission, Annapolis, MD. 63 pp.



Trends show residents plan to spend more time outdoors and population growth will cause demand for outdoor activities to increase. ^[13]

75% OF PEOPLE IN PENNSYLVANIA PARTICIPATE IN SOME FORM OF OUTDOOR RECREATION EACH YEAR. ^[11]

07 // CONNECTING OUR CITIZENS WITH NATURE

Demand for outdoor recreation will continue to grow with our population.

What makes a community a desirable place to live? What draws people to plan their futures there? Warrington Township residents of all ages frequent parks, trails, natural areas and waterways, to get outside, exercise, relax, recreate and experience nature.

| Recreation Activity | Annual Participation ^[132] | Annual Spending ^[13] | Total/activity |
|---------------------|---------------------------------------|---------------------------------|---------------------|
| Walking | 66.70% | \$96 | \$1,551,303 |
| Hunting | 12.30% | \$1,207 | \$3,596,765 |
| Fishing | 17.00% | \$409 | \$1,684,503 |
| Birdwatching | 24.70% | \$329 | \$1,968,759 |
| Wildlife watching | 25.30% | \$208 | \$1,274,922 |
| Camping | 11.60% | \$600 | \$1,686,199 |
| Nature center | 36.10% | \$150 | \$1,311,892 |
| Hiking | 11.10% | \$539 | \$1,449,477 |
| Bicycling | 12.40% | \$1,196 | \$3,592,961 |
| Running | 20.60% | \$1,783 | \$8,898,529 |
| Mountain Biking | 6.10% | \$1,330 | \$1,965,537 |
| Kayaking | 14.10% | \$482 | \$1,646,515 |
| Total | | | \$30,627,362 |

^[11] Pennsylvania Department of Conservation and Natural Resources (DCNR). 2014. *Outdoor Recreation Participation Survey*.

^[12] Pennsylvania Department of Conservation and Natural Resources (DCNR). 2014. *Outdoor Recreation Participation Survey*. Southeast

^[13] Keystone Conservation Trust, 2017

52% of Americans exercise 3 days a week for more than ½ hour.

Annual Healthcare Cost Savings Due to Exercise ^[14]

Men \$1,857 per year
Women \$1,810 per year

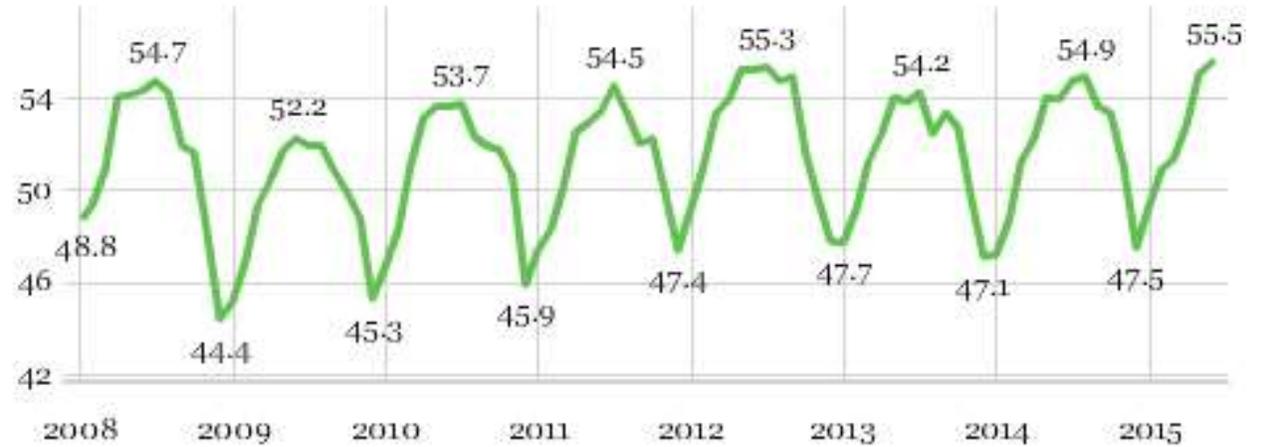
Warrington Township's 24,227 residents save on health care costs each year:

\$16,553,824

Record Number of Americans Report Exercising in June 2015

Winter low and summer high for each year shown

■ % Who exercised 30+ minutes for 3 or more days in the last week



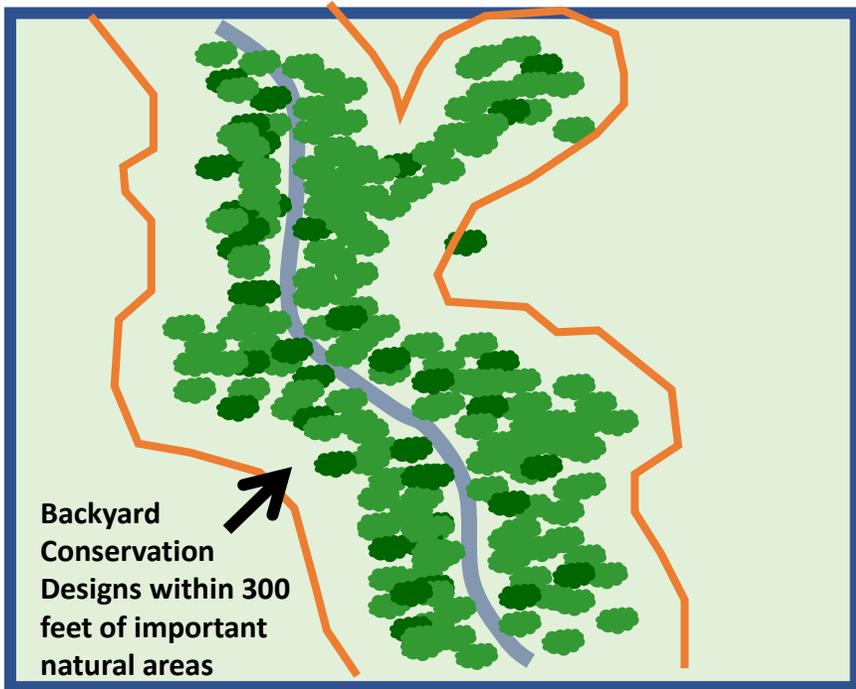
Monthly averages

Gallup-Healthways Well-Being Index

GALLUP®

^[14]Holohan, E. 2012. Fitness in middle age lowers medical costs later: study. *Health Day News*.

EXPANDING NATURAL SYSTEM SERVICES BY PLANTING NATIVE TREES, SHRUBS AND WILDFLOWERS ON ADJACENT PROPERTIES AROUND PARKS, TRAILS, STREAMS AND PRESERVES CAN SIGNIFICANTLY INCREASE THE ENVIRONMENTAL AND ECONOMIC VALUE OF WARRINGTON TOWNSHIP.



Creating sustainable habitat leads to a more sustainable economy. For every dollar invested in restoration, \$7 is added to financial value (ROE)
(Keystone Conservation Fund, 2012)

08 // *Green Ribbon Landscapes*^[15]

Planting native trees, shrubs and flowers can expand natural system services, save money and increase the quality of experiencing nature.

If you live within 300 feet of parks, streams, trails, preserves or open land, plant native trees, shrubs and wildflowers and practice good stewardship at home:

- Create 60% canopy cover with oaks, maples, tulip popular, sweetgum, black gum, sycamore, American holly or white pine trees.
- Limit turf grass (reduce your lawn by at least 25%).
- Plant 60% native species on your property.
- Plant understory trees like Redbud, Hawthorne, Serviceberry, Flowering dogwood, Crab apple.
- Plant a canopy tree on the south side of your home and save 20% in heating and air conditioning costs each year.^[16]
- Energy conservation in your home can save 20%.
- Minimize impervious surfaces (maintain less than 30%).
- Minimize the use of fertilizer and fertilize your lawn only in the fall. (use 1/5 the recommended dose).
- Restrict the use of pesticides and herbicides to very small spots. Never spray these hazardous chemicals over large areas.

^[15] Rogers John, 2017. Money Can Grow on Trees. Pennsylvania Recreation and Parks Association Magazine, Spring 2017

^[16] U.S Forest Service. <https://energysavingtrees.arborday.org/#Home>

Expand ROE

WHERE DO YOU LIVE?

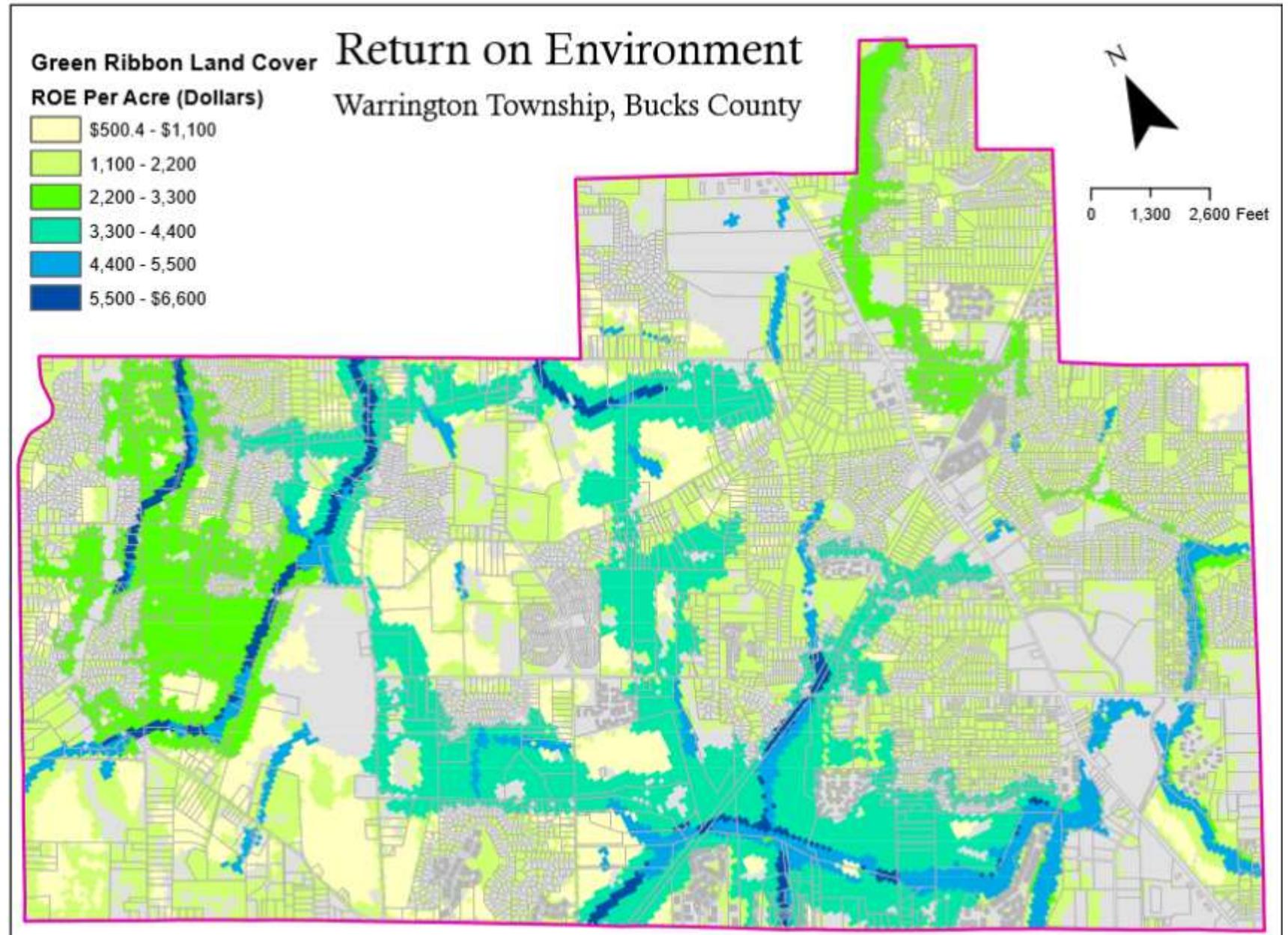
If you live near a park trail, forest or stream, what you do to your property is very important to your community.

Go to DWTN.net - Resource Guide which helps you calculate the benefits of your backyard design.



If you live in the top three areas (blue and blue green), you can help expand Warrington Township's ROE by planting native plants and trees in your yard. The darker the blue the higher the avoided costs.

\$4.3 million ROE increase per year.



09 // WHAT YOU CAN DO!

Outdoor Water Conservation: Water after 6PM and before 10AM; water thoroughly, not frequently, don't leave hose running, apply compost.

Design With Climate: Plant a tall deciduous tree on the south side of your home to provide shade in summer and sun in winter.

Lawn Care: Reduce the size of your lawn by at least 25%, leave clippings in the lawn, use 1/5 of recommended dose of fertilizer, use slow release fertilizer, fertilize in the fall.

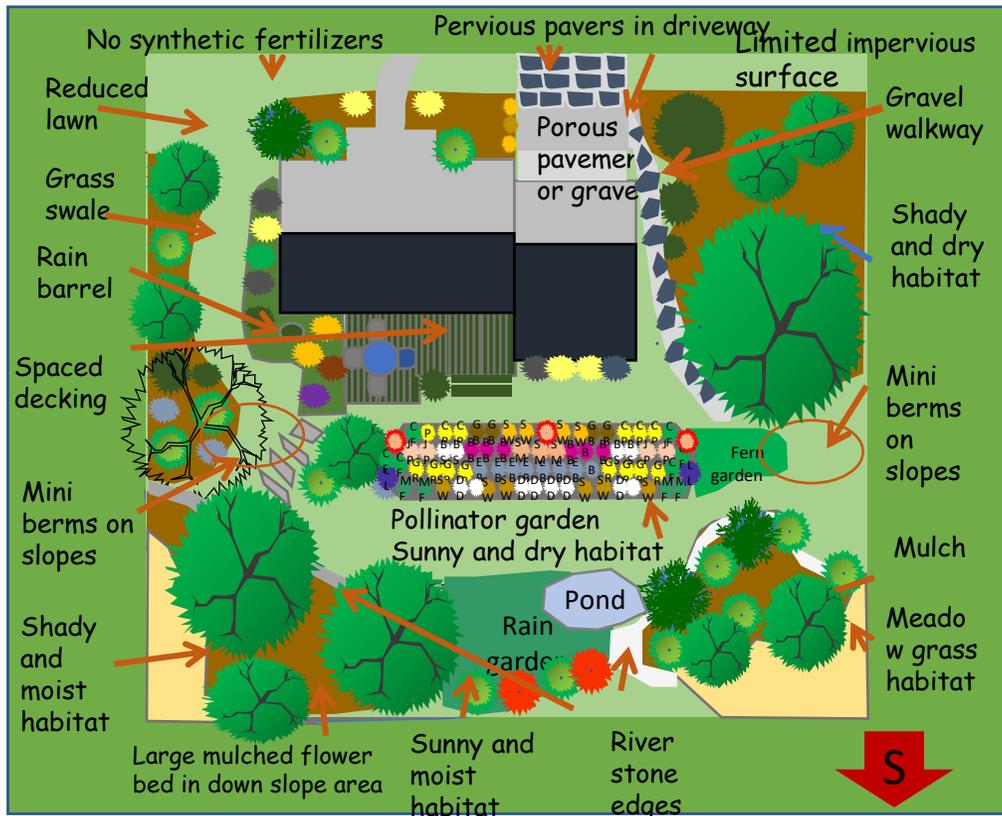
Plant Purchase: Landscape with native plants. Swap native plants with your neighbors each spring, plan your yard design, buy on sales.

Energy Conservation: Use green energy suppliers and follow energy conservation tips from your electric utility.

Water Conservation in Home: Fix leaky faucets and pipes, take shorter showers.

Backyard Conservation Design: Attend a backyard design training class.

Become a Certified Backyard Conservation Designer: Help others design their yards using good stewardship practices, reduce runoff, create beauty, curb appeal and great habitat.



An average household in Warrington Township can save between \$1,000-\$3,000 annually by practicing good stewardship at home.

For more information contact DWTN.net

Good stewardship helps save money for residents

GOOD STEWARDSHIP AND USING NATIVE PLANTS IN YOUR YARD CAN SAVE THE AVERAGE HOMEOWNER \$1,153-\$2,960 EACH YEAR.

| Designing With Natives Household Savings | | | | |
|--|--|----------------|----------------|---|
| Conservation Action | Annual Homeowner Savings (per year) | | | Source |
| | Low | Medium | High | |
| Outdoor Water Conservation | \$65 | \$150 | \$410 | http://forums2.gardenweb.com/discussions/1513362/how-much-are-you-spending-in-water-bill-for-your-lawn-garden + |
| Design With Climate | \$268 | \$594 | \$929 | https://energysavingtrees.arborday.org/#Home |
| Lawn Care | \$35 | \$158 | \$600 | Homeadvisor.com/cost/lawn and garden maintenance-a lawn |
| Plant Purchase | \$100 | 200 | \$500 | http://forums.gardenweb.com/discussions/1433953/how-much-do-you-usually-spend |
| Energy Conservation | \$515 | \$515 | \$515 | https://www.energycodes.gov/sites/default/files/documents/PennsylvaniaResidentialCostEffectiveness.pdf |
| Water Conservation in Home | \$170 | \$170 | \$170 | https://www3.epa.gov/watersense/about_us/facts.html |
| Homeowner Total | \$1,153 | \$1,787 | \$2,960 | |

If you need help designing your yard for good stewardship, you have several choices:

- 1. Get help from a Certified Backyard Conservation Designer.**
- 2. Attend a class and learn how to do it yourself.**
- 3. Become a Certified Backyard Conservation Designer.**

Go to DWTN.net. - Shop

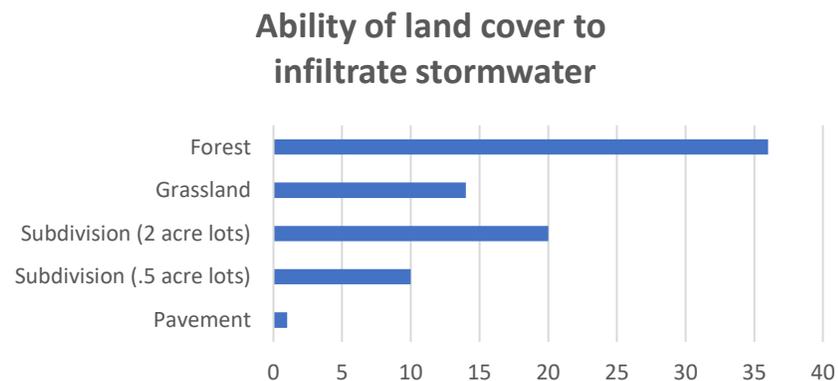


10 // TAKING COMMUNITY ACTION

Putting Return on Environment studies to work.



Forests are 36 times more effective at infiltrating stormwater than a driveway or parking lot.^[17]



1. Include Return on Environment in decision-making. Begin every land-use, economic development, tourism and recreation-planning process with a clear understanding of the financial value of nature's current assets.
2. Map the relative financial values of natural system services and develop strategies to maintain, restore and enhance them.
3. Protect and restore riparian buffers and wetlands from disturbance and connect and restore open space corridors.
4. Retain as much pre-existing, natural landscape as possible during any new construction.
5. Estimate the financial savings each year when riparian buffer and Official Map ordinances are in place.
6. Develop Green Ribbon Landscapes along riparian areas and around parks, trails and natural preserves.
7. Teach the principles of good stewardship to landowners. Go to *DWTN.net Home Owner's Calculator* and calculate the value of creating good habitat and using native plants in your own backyard.
8. Teach your park maintenance staff how to naturalize parks.
9. Involve schools. Initiate environmental education programs with multidisciplinary applications that will help students appreciate the value of nature.
10. Create Nature Literacy Programs for schools and libraries. Explain the value of nature and what people can do in their own homes.

^[17] U.S Forest Service. The Role of Trees and Forests in Healthy Watersheds

OUR NEXT STEPS

We can't afford not to protect Warrington Township's open spaces.

A strong Warrington Township economy requires a healthy natural environment and plenty of open space combined with sound land-use planning. Many communities are a patchwork of small open space areas and stream corridors. Commercial and residential growth often fragments habitat and impacts natural systems due to water pollution, flooding and stream bank erosion.

Municipal officials, policymakers, business leaders and local citizens need to join together to examine current policies and ensure sustainable environmental practices. Only then can we build a foundation for a quality environment, a vibrant, balanced economy and a healthy, desirable community for current residents and future generations.



It is extremely difficult to have a strong economy without a healthy environment and plenty of open space.