

Lehigh Valley Return on Environment



Lehigh Valley Planning Commission
2014



The work that provided the basis for this publication was supported by funding through Lehigh Valley Economic Development Corporation under an award with the U.S. Department of Housing and Urban Development. The substance and findings of the work are dedicated to the public. The author and publisher are solely responsible for the accuracy of the statements and interpretations contained in this publication. Such interpretations do not necessarily reflect the views of the Government.

INTRODUCTION

- Open space influences life—supplies basic human needs, health and well-being, jobs and the economy, and supporting plant and animal diversity.
- The LVPC, Lehigh and Northampton counties and municipalities appreciate the environmental and social value of open space.
 - *LVPC Comprehensive Plan*
 - Actively preserving farmland, acquiring open space, and providing recreational opportunities.
- What has been lacking—an economic valuation of the benefits provided by open space.

OBJECTIVES

To document:

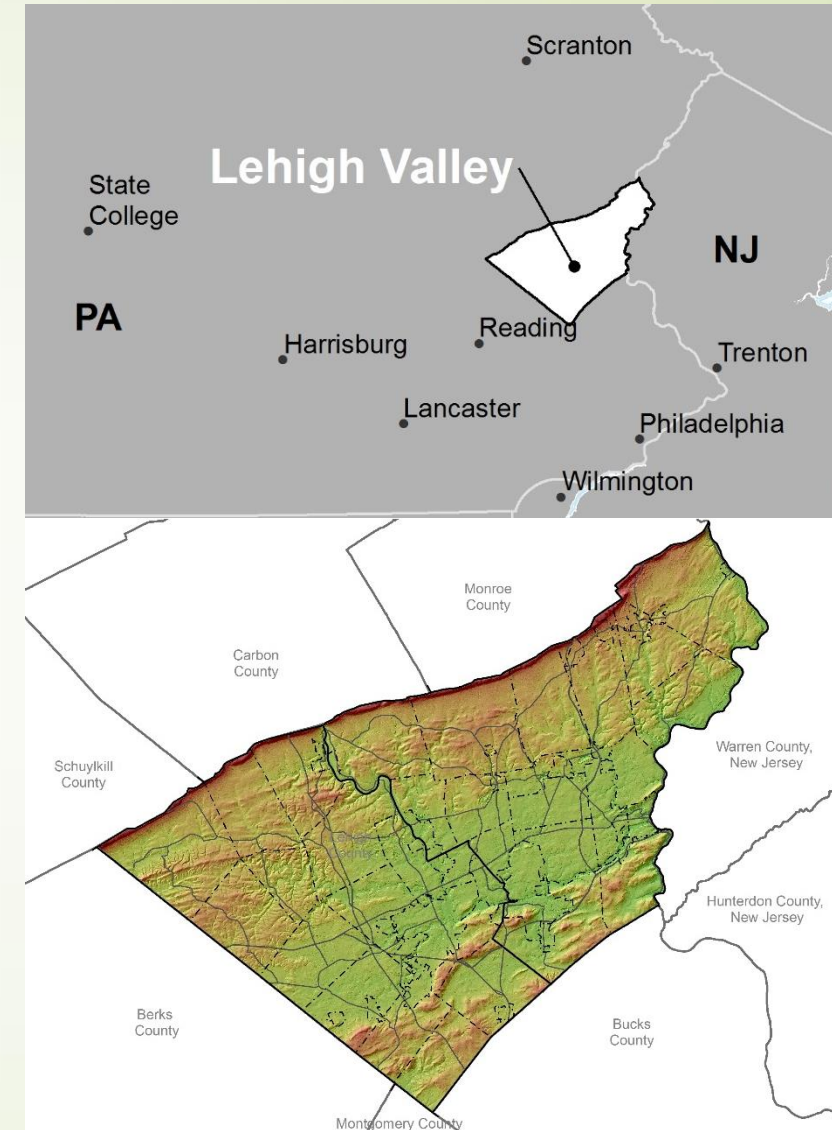
1. The current state of the environment
2. The monetary value of natural system services
3. The monetary value of outdoor recreation and the number of participants
4. The monetary value of improved air quality through reduced healthcare costs
5. The increased property values due to proximity to open space

USE OF RESULTS

- To inform land use policy and decisions
- To provide information for open space purchase or easement investment decisions
- To reinforce landscape approaches for habitat connectivity and protection
- To inform strategies to reduce flooding and protect water quality and water supply
- To inform strategies for economic development

THE PLACE

- Lehigh Valley—one of the fastest growing regions in the Commonwealth.
- The Kittatinny Ridge
 - Internationally-recognized for its role in bird migration in the Atlantic Flyway
 - Part of one of Pennsylvania's largest Important Bird Areas
- Important resources are documented within the Natural Resources element of the *Comprehensive Plan The Lehigh Valley...2030*.



OPEN SPACE CONSUMERS

- ▶ In 2010, 647,232 people were living in the Lehigh Valley.
- ▶ LVPC projects that the population will be 873,954 by 2040—35% increase over three decades.
- ▶ About 75% participated in some form of outdoor recreation within the past 12 months (DCNR/Penn State University, April 2015).
- ▶ Quality and quantity of open space resources available to businesses are critical to business function.
 - Recreational opportunities contribute to the health of the region's workforce—translates into avoided medical, workers compensation and lost productivity costs.

STATE OF THE ENVIRONMENT

- Air Quality
- Water Quality
- Land Cover and Habitat
- Wildlife

STATE OF THE ENVIRONMENT

► Air Quality

- Lehigh Valley fails to meet Federal Clean Air Act standards
- 2013 State of the Air report
 - High levels of year-round and daily pollution
 - Allentown-Bethlehem-Easton Metropolitan Statistical Area:
 - 14th worst – Year round particle pollution
 - 22nd worst for short-term particle pollution
- Annual average levels are decreasing

STATE OF THE ENVIRONMENT

Water Quality

Protected Use Classifications

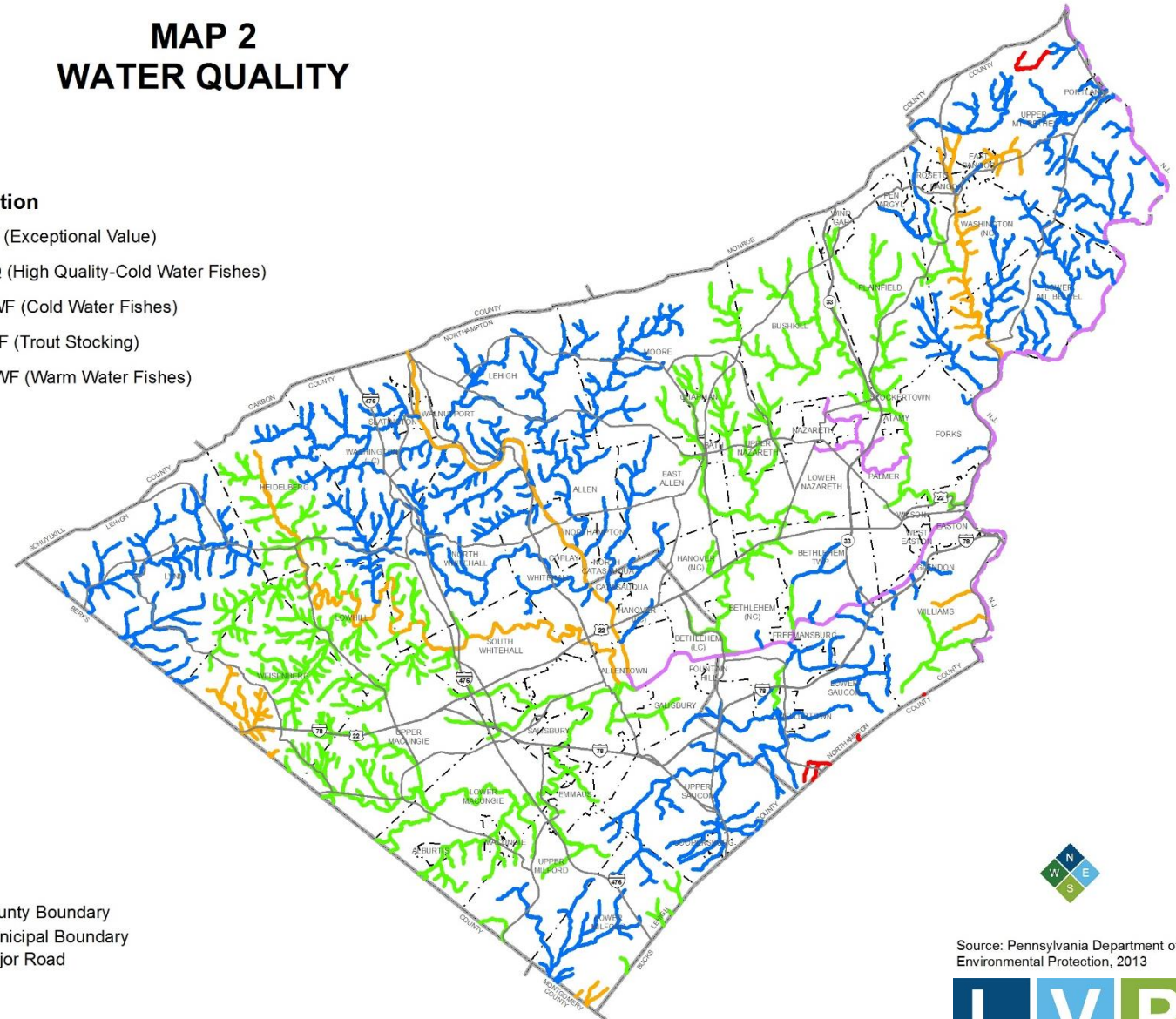
- Aquatic Life
- Water Supply
- Recreation and Fish Consumption
- Special Protection

**MAP 2
WATER QUALITY**

Designation

- EV (Exceptional Value)
- HQ (High Quality-Cold Water Fishes)
- CWF (Cold Water Fishes)
- TSF (Trout Stocking)
- WWF (Warm Water Fishes)

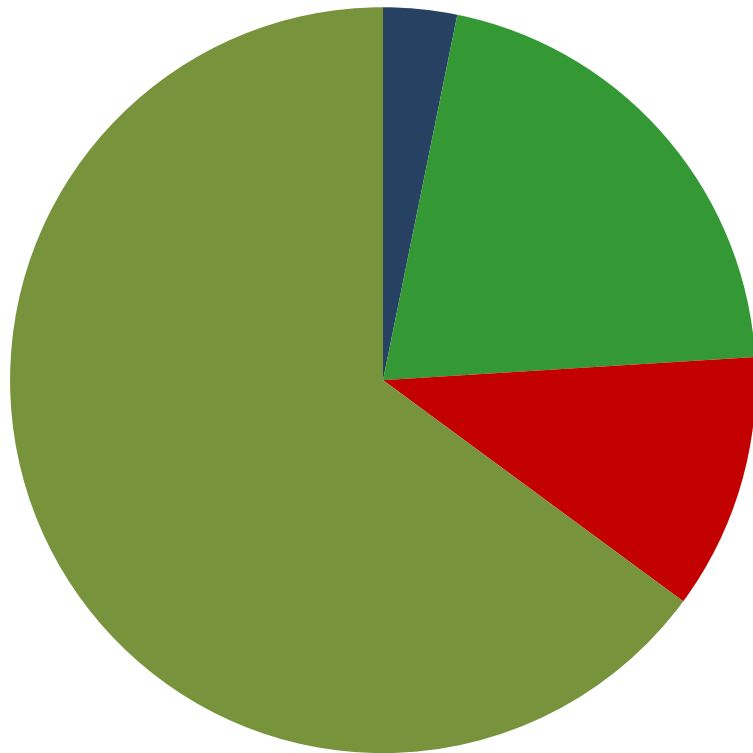
- County Boundary
- - - Municipal Boundary
- Major Road



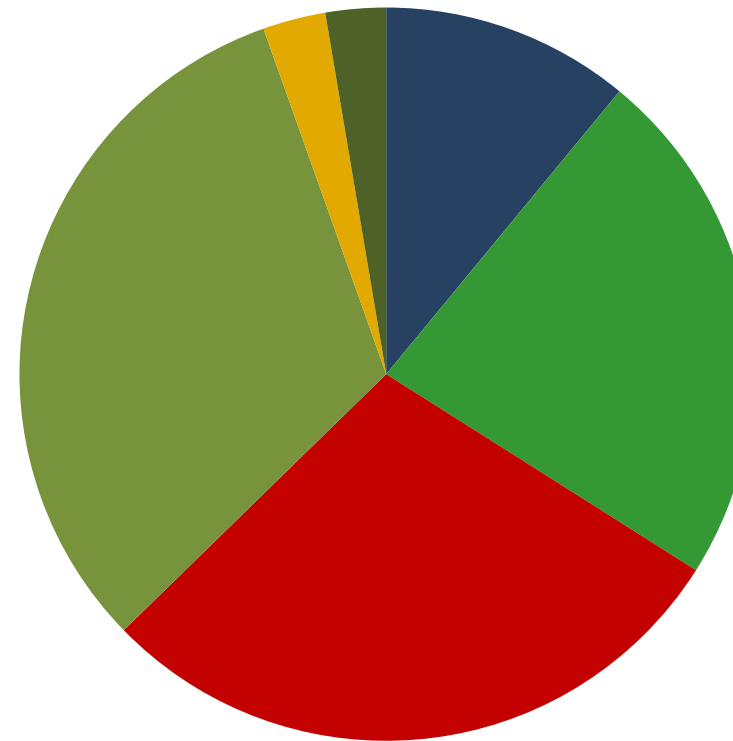
Source: Pennsylvania Department of Environmental Protection, 2013

STATE OF THE ENVIRONMENT

➤ Water Quality Impairment



- Fish Consumption
3.2%
- Aquatic Life
20.9%
- Recreational
11.2%
- Attaining
64.7%



- AMD/Metals
10.9%
- Agriculture
23.1%
- Urban Runoff / Stormwater
28.7%
- Pathogens
31.8%
- Hydromodification
2.8%
- PCBs
2.7%

STATE OF THE ENVIRONMENT

► Water Quality

➤ Class A Wild Trout Streams

- Designated by PA Fish & Boat Commission, 34 stream miles

➤ Aquatic Communities

- Analysis included in the 2013 Natural Heritage Inventory Update
- Identified conservation and restoration priorities based on 8 land cover variables

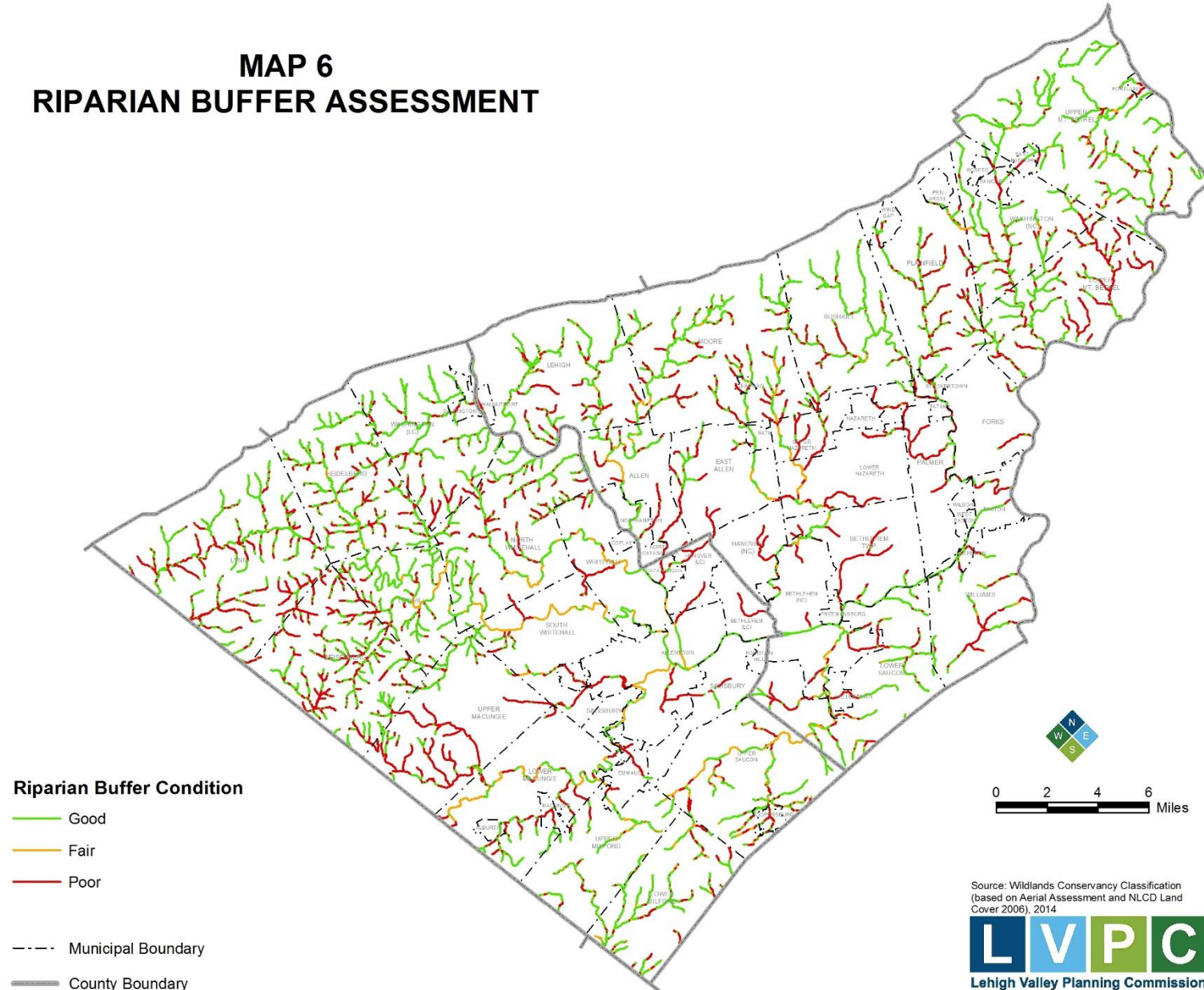
STATE OF THE ENVIRONMENT

Water Quality

Restoration Needs and Strategies

- Dam Removal – approx. 50 existing dams, 13 removed past few years
- Riparian Buffer Re-Establishment

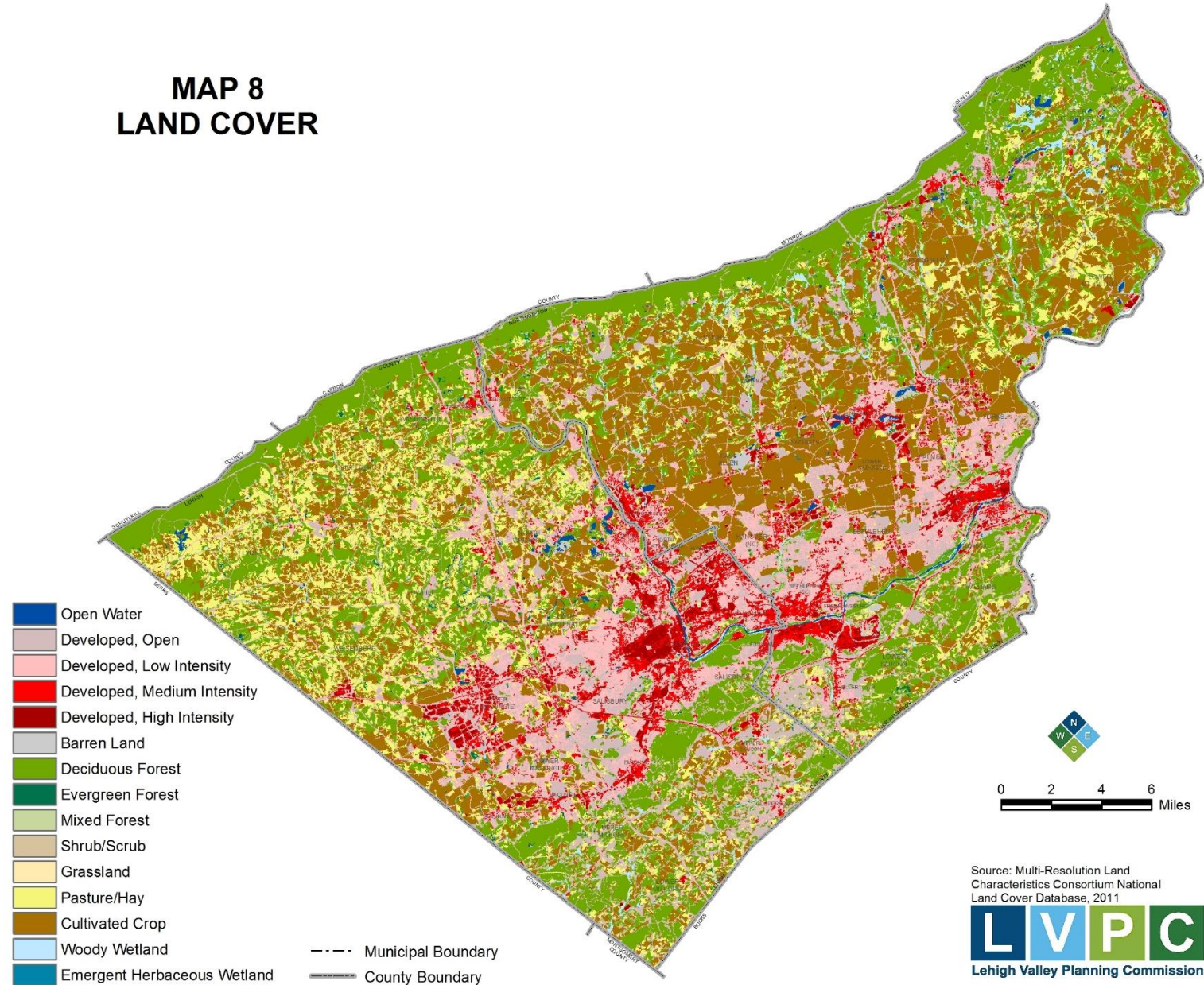
**MAP 6
RIPARIAN BUFFER ASSESSMENT**



STATE OF THE ENVIRONMENT

Land Cover and Habitat

**MAP 8
LAND COVER**



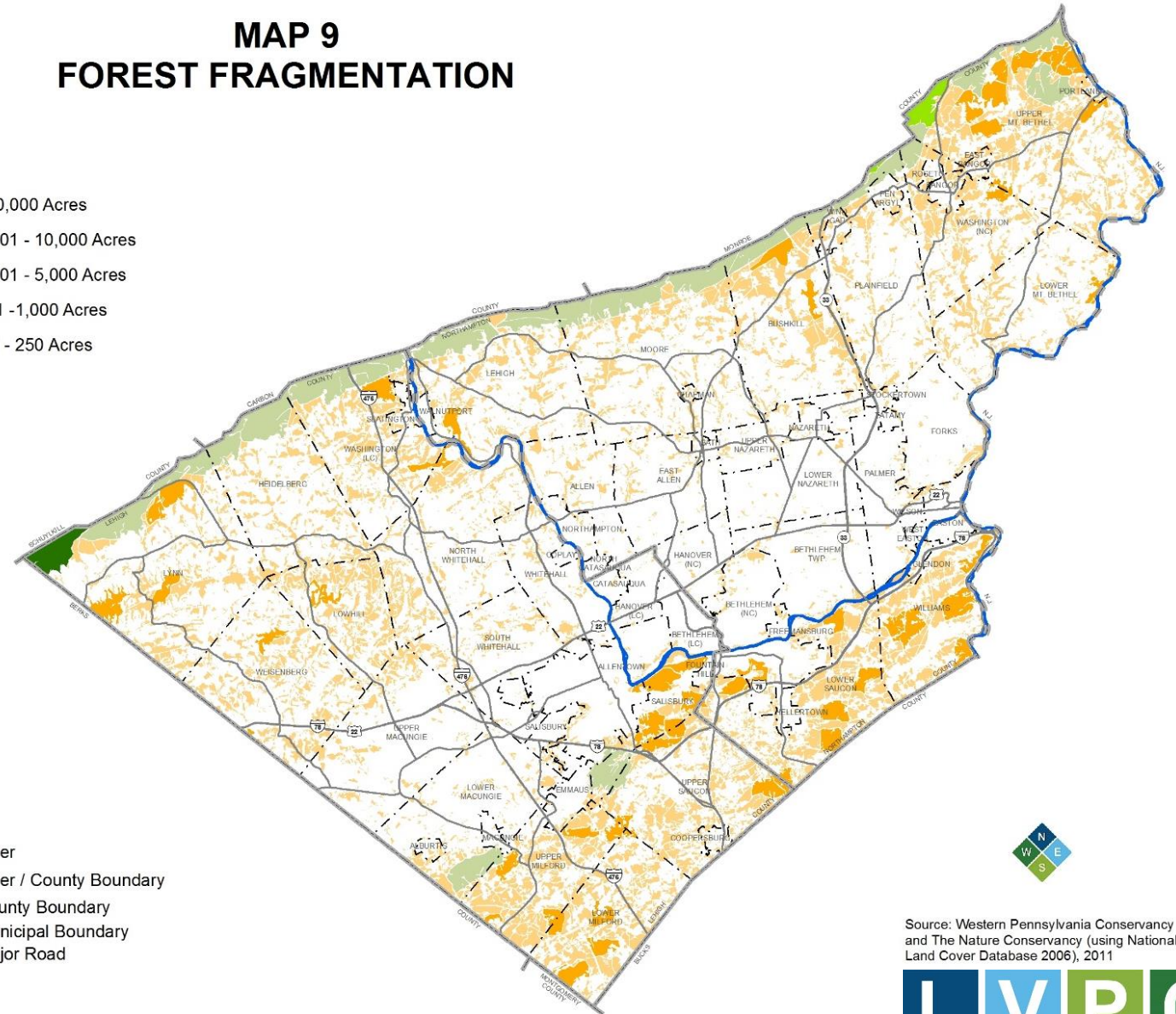
STATE OF THE ENVIRONMENT

Land Cover and Habitat

Forest Fragmentation & Wildlife Impacts

Forest Health and Natural Resource Management

**MAP 9
FOREST FRAGMENTATION**



Source: Western Pennsylvania Conservancy and The Nature Conservancy (using National Land Cover Database 2006), 2011

STATE OF THE ENVIRONMENT

► Land Cover and Habitat

➤ Wetlands

- Rare, threatened and endangered species habitat
- Nearly 4,700 acres in the Lehigh Valley

➤ Steep Slopes

- Prevent erosion and protect water quality
- High biodiversity – micro-habitats and microclimate gradients
- LVPC offers a steep slope model regulation

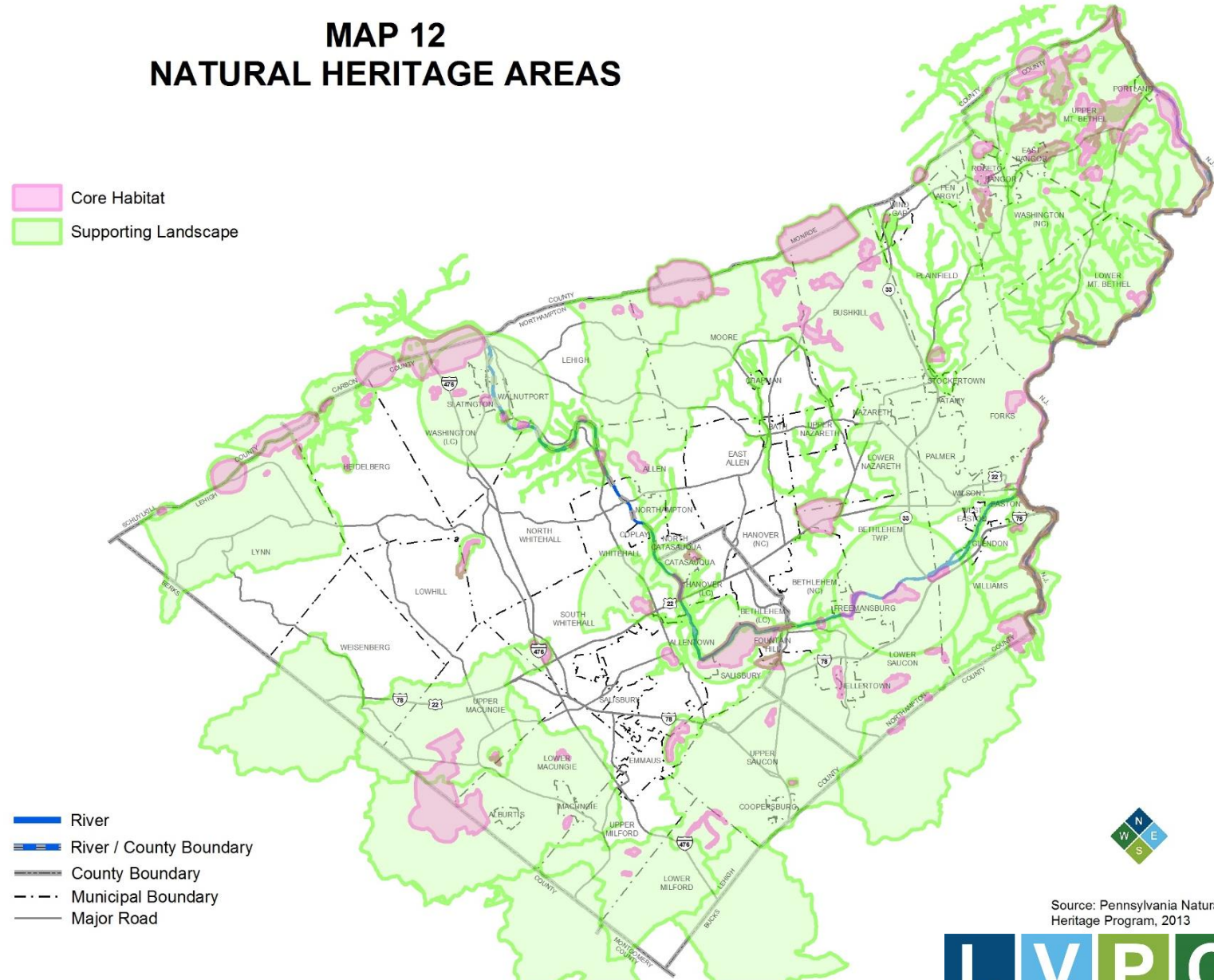
STATE OF THE ENVIRONMENT

► Land Cover and Habitat

➤ Important Natural Areas

- Natural Heritage Inventory – 111 species of concern and 8 high quality natural communities at 123 sites
- Kittatinny Ridge

**MAP 12
NATURAL HERITAGE AREAS**



Source: Pennsylvania Natural Heritage Program, 2013

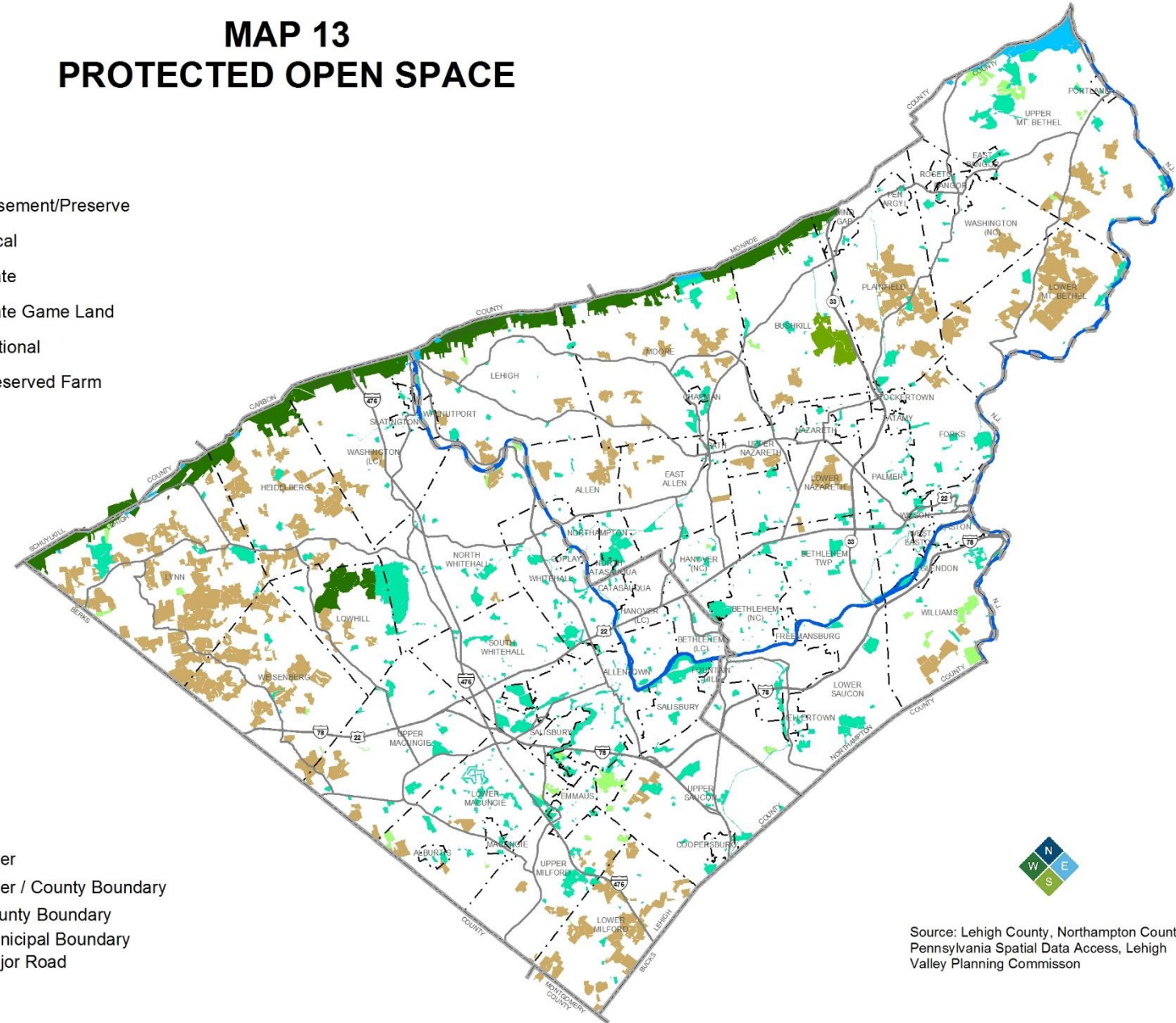
STATE OF THE ENVIRONMENT

- Land Cover and Habitat
- Land Protection

MAP 13 PROTECTED OPEN SPACE

-  Easement/Preserve
-  Local
-  State
-  State Game Land
-  National
-  Preserved Farm

-  River
-  River / County Boundary
-  County Boundary
-  Municipal Boundary
-  Major Road



Source: Lehigh County, Northampton County, Pennsylvania Spatial Data Access, Lehigh Valley Planning Commission

STATE OF THE ENVIRONMENT

► Land Cover and Habitat

➤ Land Preservation Strategies

- Connectivity
- Rare, Threatened and Endangered Species Protection
- Water Quality Protection

➤ Private Lands and Conservation

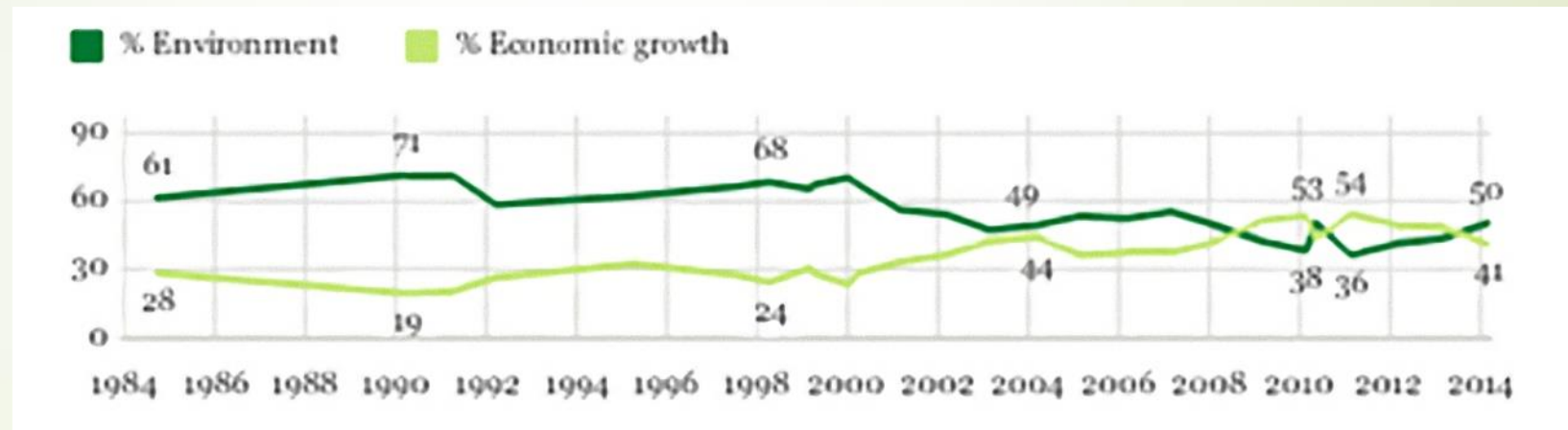
STATE OF THE ENVIRONMENT

► Wildlife

- Habitat Types – dominated by forests (27% of land cover), primarily deciduous
- Habitat Loss and Degradation – primary cause for species decline
- Mammals
- Birds
- Reptiles and Amphibians
- Fish

OPEN SPACE TRENDS

1. Attitudes about environmental protection and economic growth are evolving.



Source: Gallup, Inc., 2014

OPEN SPACE TRENDS

2. Attachment to where people live and their quality of life is impacting economic development.

Soul of the Community project, 2008:

43,000 people interviewed in 26 communities over three years

Social Offerings – Places for people to meet each other and the feeling that people in the community care about each other.

Openness – How welcoming the community is to different types of people, including families with young children, minorities and talented college graduates.

Aesthetics – The physical beauty of the community, including the availability of parks and green spaces.

Source: John S. and James L. Knight Foundation and Gallup, Inc., 2011

OPEN SPACE TRENDS

3. The “green business” trend is tied to open space.
4. Evidence shows nature’s positive impact on stress management, healthy lifestyles and well-being by providing:
 - Opportunities for exercise and outdoor activities
 - Contact with nature
 - Cleaner air
5. People are increasingly interested in outdoor recreation.
 - U.S. Forest Service reported increases in several outdoor recreation activities between 1999 – 2001 and 2005 – 2009.
 - PA DCNR’s 2009 survey – 31% of respondents said they would be increasing their outdoor activity in the next 5 years

OPEN SPACE TRENDS

- Investing in green infrastructure can be very cost-effective.

| Watershed Forest Cover | Average Annual Water Treatment Cost | Incremental Cost Decrease as Forest Cover Increases |
|------------------------|-------------------------------------|---|
| 10% | \$923,450 | -19.1% |
| 20% | \$746,790 | -21.5% |
| 30% | \$586,190 | -20.5% |
| 40% | \$465,740 | -20.7% |
| 50% | \$369,380 | -19.6% |
| 60% | \$297,110 | |

Source: Ernst, Caryn, Richard Gullick, and Kirk Nixon. 2004. "Conserving Forests to Protect Water." *Opflow* 30:1,4-7.

OPEN SPACE TRENDS

7. The pattern, size and connectivity of open space and native habitat is increasingly important.

8. Creating stewardship zones along open space boundaries increases natural system services.
 - Conservation design subdivisions – clustering home sites
 - Stewardship programs for landowners (e.g. backyard conservation actions)

OPEN SPACE TRENDS

9. Property values are positively impacted by open space.
10. Americans are showing a growing interest in organic, locally-grown food.
 - Lehigh Valley's 1,002 farms on 153,000 acres of farmland produce a market value of agricultural products of \$134.4 million annually.
 - Approximately \$17 million is the actual economic activity generated by the local food economy

ECONOMIC VALUE ANALYSIS

► Natural System Services

Water Supply, Water Quality, Disturbance (Flood) Mitigation, Pollination, Biological Control, Wildlife Habitat and Soil Formation/Retention

► Air Quality

Pollutant Removal, Carbon Sequestration and Carbon Storage

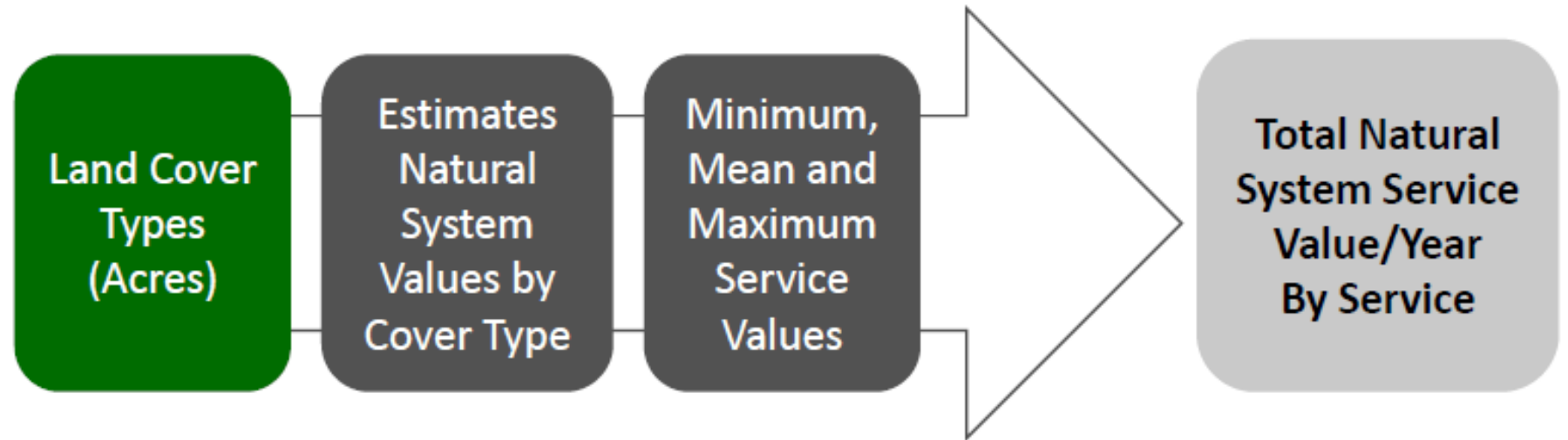
► Outdoor Recreation

Participation rates; Direct, Indirect and Induced Impacts

► Property Value

Premium attributed to living within ¼ mile of protected open space

VALUE TRANSFER MODEL FOR NATURAL SYSTEM SERVICES



2011, GIS data

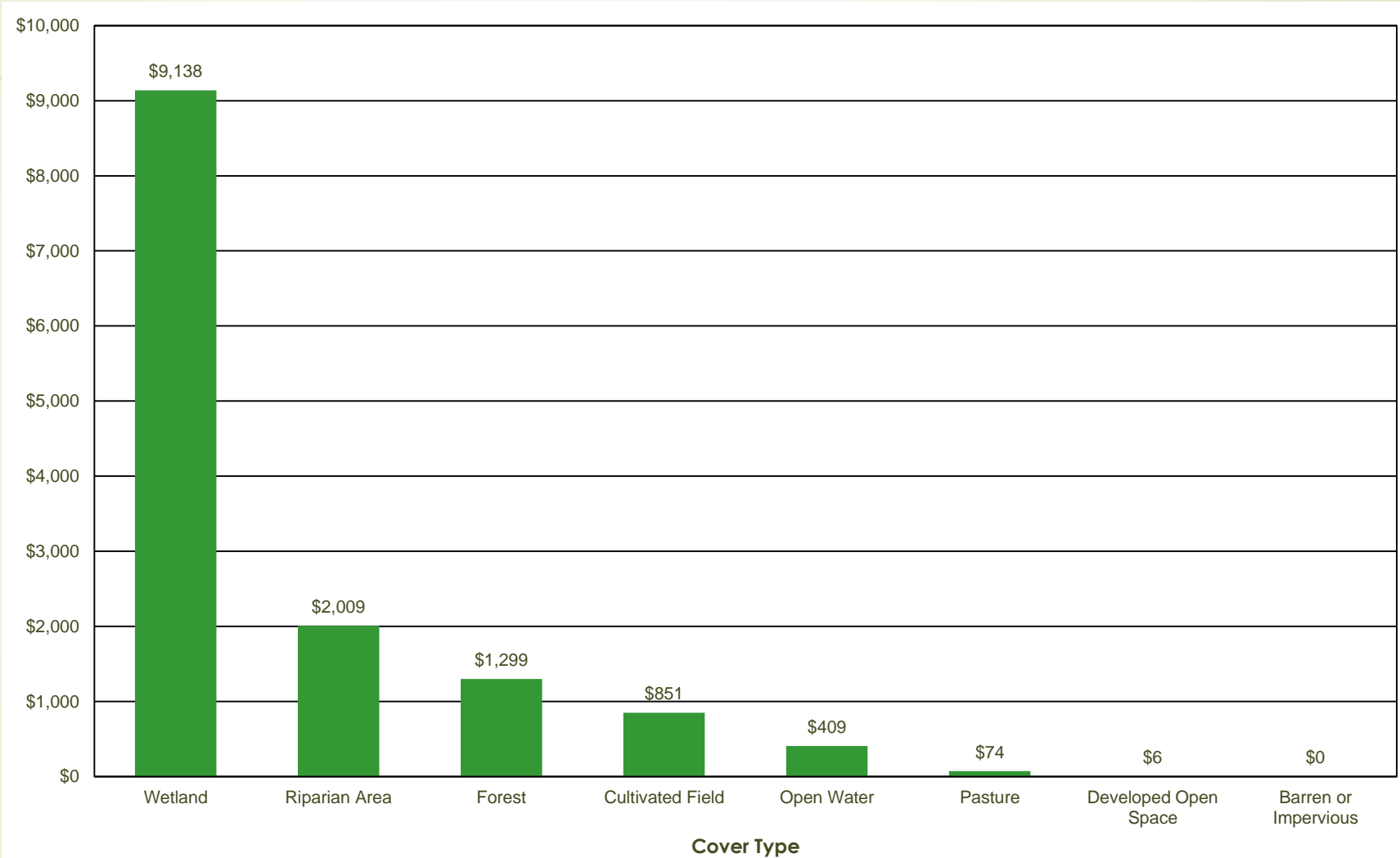
Source: Costanza, et al. 2006

LAND COVERAGE ACREAGES BY COUNTY

| Land Use | Lehigh County | Northampton County |
|----------------------------|----------------|--------------------|
| Barren | 781 | 1,232 |
| Cultivated Crops | 48,994 | 76,973 |
| Developed High Intensity | 3,842 | 3,397 |
| Developed Medium Intensity | 9,865 | 10,217 |
| Developed Low Intensity | 24,105 | 21,828 |
| Developed Open Space | 22,837 | 32,272 |
| Forest | 60,637 | 62,771 |
| Open Water | 1,369 | 2,394 |
| Pasture | 44,494 | 22,696 |
| Wetlands | 2,424 | 5,081 |
| Riparian | 3,491 | 2,630 |
| Total | 222,839 | 241,492 |

Source: Econsult Solutions, Inc., 2014

NATURAL SYSTEM SERVICES MEAN ECONOMIC VALUE PER ACRE OF LAND PER YEAR BY COVER TYPE

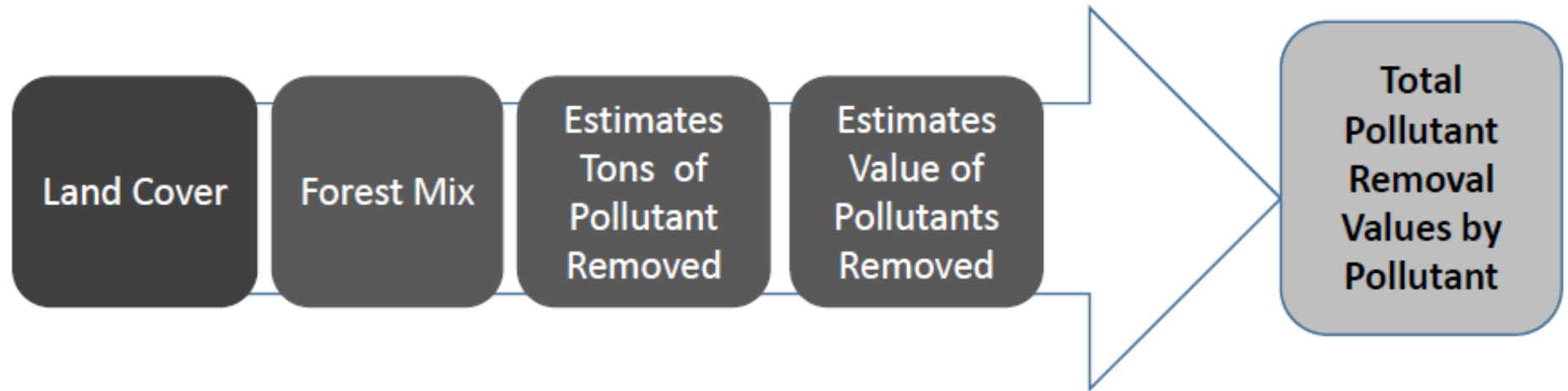


NATURAL SYSTEM SERVICES

Key Findings:

- Highest natural system services on a per acre basis—wetlands, riparian corridors and forests
- Green infrastructure along streams
 - Reduced tax dollars by avoiding more than \$110.3 million annually in expenditures
 - Water supply—\$45.0 million
 - Disturbance (flood) mitigation—\$50.6 million
 - Water quality—\$14.7 million
- Natural areas provide annually
 - \$22.4 million in pollination
 - \$2.5 million in biological control services
 - \$219.5 million in habitat for insects, birds, animals and plants
 - \$0.8 million in soil formation/retention
- Summary—natural system services on open space provide an estimated value of \$355.5 million or more each year.

AIR QUALITY - i-TREE MODEL PROCESS



TREE CANOPY COVER BY LAND COVER (ACRES)

| Cover Type | Lehigh County | Northampton County |
|----------------------------|---------------|--------------------|
| Barren | 15 | 9 |
| Cultivated Crops | 862 | 462 |
| Developed High Intensity | 4 | 14 |
| Developed Medium Intensity | 128 | 480 |
| Developed Low Intensity | 1,808 | 3,449 |
| Developed Open Space | 4,613 | 7,648 |
| Forest | 46,383 | 53,390 |
| Open Water | 0 | 0 |
| Pasture | 185 | 425 |
| Wetlands | 12,055 | 3,461 |
| Total | 66,053 | 69,337 |

Source: Econsult Solutions, Inc., 2014 (51)

POLLUTANT REMOVAL ECONOMIC VALUES (MILLIONS/YEAR)

| Pollutant | Low | Average | High |
|-----------------------------|----------------|----------------|----------------|
| Lehigh County | | | |
| Ozone | \$2.80 | \$10.40 | \$13.40 |
| Particulate Matter 10 | \$0.20 | \$7.30 | \$11.30 |
| Nitrogen Dioxide | \$2.60 | \$5.20 | \$6.90 |
| Sulfur Dioxide | \$0.30 | \$0.60 | \$0.90 |
| Carbon Monoxide | \$0.10 | \$0.10 | \$0.10 |
| Total | \$6.00 | \$23.50 | \$32.70 |
| Northampton County | | | |
| Ozone | \$2.90 | \$10.90 | \$14.10 |
| Particulate Matter 10 | \$0.30 | \$7.60 | \$11.90 |
| Nitrogen Dioxide | \$2.70 | \$5.50 | \$7.30 |
| Sulfur Dioxide | \$0.30 | \$0.60 | \$1.00 |
| Carbon Monoxide | \$0.10 | \$0.10 | \$0.10 |
| Total | \$6.30 | \$24.70 | \$34.30 |
| Lehigh Valley Totals | \$12.30 | \$48.20 | \$69.00 |

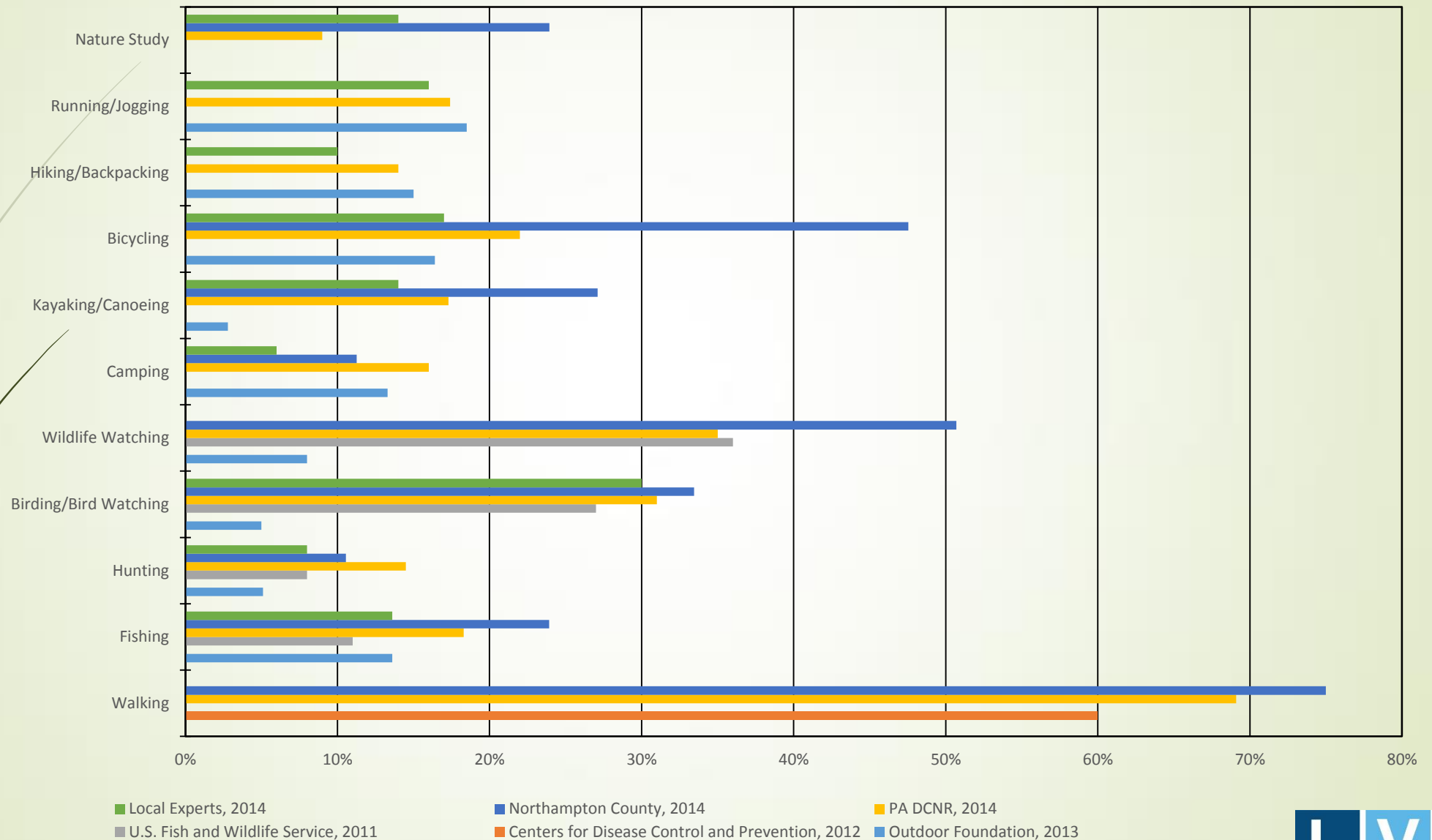
Source: Econsult Solutions, Inc., 2014

AIR QUALITY

Key Findings:

- ▶ Air pollutant removal by trees—estimated \$48.2 million annually
- ▶ Carbon storage by tree-covered open space—5,496,069 tons
- ▶ Mitigation costs for damage from carbon emissions—\$111.2 million (about \$2.2 million annually)
- ▶ Carbon sequestration by trees—181,189 tons of carbon each year, providing health and other benefits of about \$3.6 million annually
- ▶ Summary—total annual avoided healthcare costs and damage to agriculture and buildings estimated to be \$54 million.

OUTDOOR RECREATION PARTICIPATION RATE COMPARISON FROM NATIONAL, STATE, AND LOCAL SURVEYS



OUTDOOR RECREATION ANNUAL SPENDING

| Outdoor Recreational Activity | U.S. Fish and Wildlife Service, 2011 (56) | PA DCNR, 2009 (30) | Outdoor Industry Association, 2013 (59) | Runner's World, 2013 (58) | 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 | \$1,115 | | \$458 |
| Running/Jogging | | \$238 | | \$252 \$3,734 | \$900 |
| Nature Study | | | | | \$150 |

Legend:

Low

Expected

Low and Expected

OUTDOOR RECREATION

Key Findings:

- Approximately 75% of people in Pennsylvania enjoy some form of outdoor recreation on an annual basis.
- Health benefits for physically active people—lower incidence of cardiovascular diseases, diabetes, depression, certain cancers and obesity.
- *D & L Trail 2012 User Survey and Economic Impact Analysis*—estimated 68,327 people spent about \$2.5 million along the Lehigh Valley portion.
- Fastest growing outdoor recreation activities—kayaking, birding, wildlife watching, outdoor photography, running, bicycling and other sports; popularity replacing more traditional activities like hunting and fishing.
- Outdoor recreation spending and total impact—estimated \$795.7 million annually.

PROPERTY VALUE

Key Findings:

- Average premium afforded each home within ¼ mile of protected open space—\$14,600
- Number of single family homes located within a ¼ mile of protected open space—127,850
- Total real estate premium attributed to living within ¼ mile of protected open space—more than \$1.8 billion
- Average real estate premium for single family homes within ¼ mile of protected open space—lowest for homes located in rural townships (\$2,600), highest for homes located in cities and boroughs (\$28,200)

Questions?

Geoffrey A. Reese, P.E.

**Director of Environmental Planning
Lehigh Valley Planning Commission**

greese@lvpc.org

610-264-4544