



2022 // RETURN ON ENVIRONMENT STUDY

Monroe County



Photo: Dax Roggio



Photo: Ben Goodman

Paddlers enjoy the colors of the early fall season on pristine Brady's Lake.

01 // INTRODUCTION

Monroe County's natural resources – its greatest and most prominent assets

The rich landscapes that define Monroe County—the forests of the Kittatinny Ridge and glaciated Pocono Plateau, the natural stream corridors etched through the uplands leading to the Delaware River, along with the unique habitats and clean water they provide—have been a major part of the region's cultural legacy and heritage for many generations. These abundant and scenic natural resources, in conjunction with the County's proximity to major metropolitan areas, create a thriving tourism and recreation economy. They are assets to residents, businesses, and visitors.

People live in and visit Monroe County for the quality of life that nature provides, including: scenic views, easy access to greenways and parks, hunting and fishing, bird watching, the Delaware Water Gap National Recreation Area, Appalachian National Scenic Trail, and Big Pocono State Park. In addition, people benefit from many nature-based recreation activities including ski resorts, adventure parks, waterparks, golf courses, numerous cultural resources, and other outdoor recreation attractions. The community values its natural and scenic resources and the support they provide to the local economy. According to the Monroe County Economic Scorecard conducted in 2019,¹ natural beauty is the most popular reason people choose to live in the County.

The value that natural resources provide has also been a primary focus for planning initiatives. Programs have highlighted the integral relationship of natural resources to the community and its economy, and policies have been adopted around the vision of maintaining a “sustainable economy” tied to natural resources. To date, wise planning initiatives have helped establish and support projects to conserve valuable resources. However, as indicated by the subtitle of the County's recent Monroe 2030 Comprehensive Plan Update, the “Challenge Continues.”



Photo: Jerry Jaworowski

The Delaware Water Gap provides a flourishing habitat for nesting Bald Eagles.

02 // WHY AN ROE?

Defining nature's value

“We can’t solve problems by using the same kind of thinking we used when we created them.”

– Albert Einstein

While preparing the Monroe 2020 Comprehensive Plan, community leaders cited significant challenges due to population growth and development pressure, loss of open land, and severe strains on the tax base. The discussions highlighted the concern that natural resources, the area’s greatest assets, were in jeopardy and new approaches were essential. Goals to achieve the defined vision of protecting natural resources, while addressing fiscal imbalances, led to initiatives (financial incentives, technical support, and establishment of regional programs) to address the identified challenges. Since adoption, the initiatives have resulted in numerous achievements: refinements have been applied to address changes, and work has continued with the adoption of the Monroe 2030 Comprehensive Plan Update.

Among the suggested refinements was a recommendation to define the value of natural resources, as described in the following excerpt from the 2014 Monroe County Open Space, Greenway & Recreation Plan:

“Monroe County of all the northeastern Pennsylvania counties is a prime laboratory to advance the science of valuating open space. Monroe has all the important factors—including significant remaining green areas; proximity to growth areas; critical environmental resources; heavy visitor demand, a thriving environmentally-based economy, and an alert local population. If there was a region in Pennsylvania to specifically study the economic impact of open space, Monroe should be high on the list.”

This Return on Environment (ROE) study provides information on nature’s financial value in terms everyone can understand. ROE evaluations do not explain nature’s intrinsic value, but rather what people have been willing to pay to replace these cost-free services once nature is disrupted or destroyed. As a result, policymakers, businesses, and residents can see natural systems as a portfolio of financial assets rather than as a commodity or added expense. By understanding this financial value,

Monroe County is better equipped to strike an effective balance between maintaining open spaces and supporting smart growth to ensure a sustainable economy.

ROE METHODOLOGY

Just as financial analysts project return on investment, ROE studies explain nature's invisible financial value. Building on previous valuation studies, and using standard economic analysis techniques, ROE studies estimate the financial value of open space by measuring the financial impacts of avoided costs from natural system services and air pollution removal, outdoor recreation revenues, avoided healthcare costs as a result of increased exercise, and increased property values due to proximity to open space.

Natural system services represent the benefits that human populations derive, directly or indirectly and free of charge, from ecosystem functions such as groundwater, stormwater and flood mitigation, carbon sequestration, air-pollution removal, wildlife habitat, aquatic habitat, erosion prevention, habitat regeneration, pollination, biological control, and nutrient uptake. The values depend on landcover type (cropland, forest, pasture, developed land) and functions associated with features such as wetlands, floodplains, and forests that support habitats. Most natural system services do not have established markets, making estimates difficult. Results in this study are based primarily on the transfer of data from peer-reviewed studies, as well as data from regulatory fines, nutrient trading, forest replanting, habitat replacement costs, tax benefits, and conservation easement values.

The economic benefits presented in this report provide a new perspective on the value of natural system services, which can inform decisions concerning economic development, infrastructure, land use planning, safety, tourism, and recreation. The goods and services that flow from Monroe County's existing open spaces and natural systems save residents, communities, and businesses over \$1 billion annually (see Chapter 4) in avoided costs from natural system services, generate outdoor recreation revenue, and reduce healthcare costs.

The process followed a basic framework:

1. Identify and consider the free services that nature provides.
2. Apply processes to calculate the economic benefits of these services.
3. Evaluate how participation in outdoor recreation impacts the local economy.
4. Determine the monetary value of reduced healthcare costs due to outdoor activity.
5. Assess Monroe County's long-term open space and conservation issues.
6. Determine how ROE can help meet Monroe County's future goals.

FIGURE 01 // ROE VALUATION BENEFITS

- // Nature's complex system is conveyed in a simple bottom line that is understandable to a broad audience.
- // Dollars, as a financial measure, underscore nature's connection to quality of life, health, cost of living, economy, and sense of place, while conveying a level of significance or priority that allows for a better trade-off analysis.
- // Monetary estimates of the value of natural system services can be applied within decision frameworks related to land use, tourism, and economic development.
- // Discussion of natural system cover types, services, and their values engages stakeholders in an educational process that can help organizations in their missions and raise awareness among policymakers and citizens.
- // Environmental health benefits can be measured and incorporated into local decision-making processes.
- // Economic valuation of natural system services and biological diversity can help policymakers, investors, and homeowners understand the value of protecting them.

A more in-depth description of the ROE methodology and terms used for this study can be found online at <https://kittatinnyridge.org/wp-content/uploads/2019/09/ROEMethodologydocx.pdf>.

"The only thing that is constant is change."

– Heraclitus

ISSUES AND OPPORTUNITIES

Successful planning programs anticipate and provide guidance on inevitable changes that impact local conditions. Effective strategies address environmental, societal, and economic impacts in unison to help prepare for a more sustainable community. Some key factors that Monroe County will need to consider as it evaluates ROE are introduced in this section.

Land Use: The greatest impact on sustainable environmental and economic health is land use. Negative consequences, such as flooding, diminished water quality, or decline in biological diversity, are tied to decisions that promote or permit sprawl, development in riparian areas, and forest fragmentation. ROE studies can help decision-makers promote conservation techniques and land uses to avoid excessive costs and unintended consequences and help achieve the community's vision.

Water: Water is an invaluable resource that provides numerous benefits locally and throughout the region. As described in Chapter 3, water is critically connected to natural system services and recreation activities and provides some of the highest value to the

community. The benefits attributed to water, however, are also easily susceptible to degradation due to overuse, contamination, and other land use-related activities. Without adequate water management, problems arise that can be very disruptive and expensive to resolve. Monroe County community leaders and partners have worked diligently over the years to address these problems; however, challenges remain due to increased use and the impact of changing climate conditions. ROE information can help decision-makers identify areas of concern and evaluate the trade-offs.

Forests and Woodlands: Forests and woodlands, like water, provide significant natural system benefits, that are described in Chapters 3 and 4. Large forested areas, such as those in Monroe County, provide significant natural system benefits: they help maintain healthy watersheds and water quality, filter air pollutants, moderate weather extremes, and provide important wildlife habitats. While past concerns, such as over-harvesting from logging, have improved with conservation practices, additional concerns remain. Encroachments have increased—fragmenting forested areas. Healthy forests also are threatened by the introduction of invasive species and disease. Conservation opportunities exist to help maintain forests and preserve their ecological benefits. ROE information can help decision-makers with these evaluations.

Temperature: Pennsylvania as a region is getting wetter and warmer. In the last century, the temperature in Pennsylvania has increased 1.8°F and is expected to warm another 5.4°F by 2050.² Residents will see many more days above 90°F by mid-century compared to 2000. Temperature increases may result in lower lake levels due to increased evapotranspiration, the potential for drought conditions, and a reduction in available outdoor water-based recreation. Higher water temperatures can also lead to changes in water composition, potentially resulting in a reduction or shift of keystone species. Milder winters can also lead to fewer winter recreation activities, such as ice fishing, snowmobiling, and skiing.

Air Quality: In Monroe County, 94.2% of air quality percentage levels are rated as “good.”³ Ratings are based according to the Environmental Protection Agency’s (EPA) Air Quality Index (AQI) which measures five primary pollutants. Results range from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. Ratings are broken into five categories related to health concerns, “good” (a rating of 0 to 50) represents the lowest level of concern with air quality being satisfactory and air pollution posing little or no health risk. The Monroe County area falls within the “good” rating for most days of the year in the latest reports from the Pennsylvania Department of Environmental Protection (DEP)⁴ and EPA.⁵ However, the effects of climate change—influenced by land management activities, forest health, and tree productivity—are reducing the ability of forest ecosystems to absorb and sequester carbon emissions, which can diminish air quality in the future.

Biological Diversity and Wildlife: Natural aquatic and terrestrial areas in Monroe County provide an exceptionally diverse biological landscape that supports many important and valued (and in several cases endangered) habitats. The abundance and diversity of wildlife and vegetation sustain critical natural systems, support outdoor recreation activities, and attract tourists who benefit the local economy. The vast forests on the Pocono Plateau and forested ridges of the Kittatinny Ridge are renowned habitat and migration areas for birds and wildlife. The Kittatinny Ridge is a Globally Important Bird Area (IBA), one of eight Conservation Landscapes in Pennsylvania, and regarded by conservation scientists as an essential habitat reserve—an area where many native plants and animals face better odds of surviving while adjusting to climate change stresses. Conservation decisions in Monroe County are therefore key to local and worldwide ecology.

Recreation: As the outdoor recreation industry grows, so too do the demands on recreation facilities and operations. According to the latest Pennsylvania state recreation plan, demand for outdoor recreation has been increasing by at least 3.1% per year for the past several years.⁶ A 2019 poll indicates that nine out of 10 Pennsylvanians participated in at least some outdoor recreation activity in the past year. In a 2013 Citizens Input Survey for the Monroe 2030 Comprehensive Plan Update, 87% of respondents reported that their households use the parks, natural areas, open space areas, or recreation facilities of Monroe County.

Outdoor recreation has always been important to Monroe County residents and visitors due to the County’s abundant natural resources and public open spaces. Emerging interests—such as maintaining healthy lifestyles, ecotourism, and seeking safe, socially distanced outdoor activities—have impacted recent use patterns. While the region offers many outdoor spaces and opportunities to participate, a 2020 study by The Trust For Public Land indicates that access is not universally accessible,⁷ and a local assessment by the Pocono, Lehigh Valley Health Network in 2020 determined that some residents who could benefit from outdoor activities are not aware of opportunities.⁸ As this ROE Study highlights, outdoor recreation provides important community benefits that support the local economy; but as demands increase, facilities should also be expanded in order to maintain optimum services for continued benefit.

These issues and opportunities all point to a region that will remain in the process of ongoing change for the foreseeable future. While the long-term effects of these changes may not be fully understood, it will be important for the County and its partners to continue evaluating challenges and establishing processes to help maintain its natural assets, quality of life, and local economy. ROE processes and results can assist with evaluations as conditions evolve to assist decision-makers.



Photo: Ben Goodman

Heckman Orchards is known throughout the Pocono Region for apple picking.

03 // THE PLACE

Nature is serious business

“The citizens of Monroe County will continue working together to sustain and improve our quality of life by ensuring that the County’s environmental, economic, and cultural assets are within reach of all its people.”

– Monroe 2030 Comprehensive Plan Update

Promoting sustainable economic growth—while maintaining a high quality of life, low cost of living, good health, and a unique sense of place—is Monroe County’s major challenge. A second, and more difficult, challenge is how to balance the health of natural systems to support a sustainable economy. This report section provides profile information on Monroe County, including its residents, economy, development trends, and natural systems, to better understand the community’s connection with its natural areas.

FIGURE 02 // MONROE COUNTY DEMOGRAPHICS PROFILE

POPULATION

The 2020 resident population for Monroe County was 168,327 persons. The median age of residents was 42.9 years. Overall population declined slightly since 2010, which was indicative of trends across the region.

HOUSEHOLDS

In 2019 the County had an estimated 81,829 housing units, with an average household size of 2.9 persons. Owner-occupied units accounted for 77% of units. Of the vacant units, many are used as seasonal or vacation homes (estimated at 12,000 or more units). The County also supports a relatively large group quarter population (over 3,500 individuals) with some 2,300-plus residents in student housing at East Stroudsburg University.

INCOME

The County’s median household annual income, from 2016 to 2020, was \$63,934.

EDUCATION

From 2016 to 2020, 89.6 % of County residents had a high school education or higher, and 24.7% had a college degree or higher.

Source: U.S. Census Bureau, 2021 QuickFacts Monroe County Pennsylvania

CLIMATE

Monroe County's temperate continental climate can be characterized as having four distinct seasons, with precipitation occurring relatively regularly throughout the year. Summer months are warm with some humidity; winter months experience below-freezing temperatures and snow events. Climate plays a significant role in local conditions, such as growing seasons and habitat suitability, energy costs, and tourism or recreation activities.

Pennsylvania Department of Conservation and Natural Resources research indicates that climate change is occurring, which can impact natural system services, tourism and outdoor activities, and their associated economic values. Very heavy precipitation and flooding have increased significantly in Pennsylvania, and precipitation is expected to increase by another 8% by 2050.⁹ Natural systems that are functioning at high levels provide greater protection or resilience against extreme change. For example, the ability of healthy forests to absorb carbon (carbon sequestration), reduce temperatures, or absorb storm water can help communities avoid extreme impacts.

LAND USE AND DEVELOPMENT

The County's numerous amenities and location have attracted many residents and visitors allowing the community to prosper. Local land use policies and programs have been adopted to accommodate change while maintaining the community's identified vision and quality of life. Between 1960 and 2010, Monroe County's population quadrupled. Residential development expanded at a rapid pace through 2000, with annual building permit activity averaging about 1,500 per year, and an estimated 5,000 new residents each year.¹⁰ Most approved lots during the period averaged between 1-2 acres per dwelling. The Monroe 2020 Plan, adopted in June 1999, cited land development concerns, resulting in the introduction of growth management policies to protect "The Assets," which the plan described as the natural beauty and diversity of the Poconos. Development activity increased after 2000 but plateaued around 2007 (associated with the economic recession, a rapid decline in demand for housing, and a glut of housing). Although the economy has since rebounded, residential activity, in terms of larger residential subdivisions, remains low.¹¹ Building permit applications, however, remain at a 10-year high, indicating continued residential in-fill development.

Development of non-residential properties and multi-family development has expanded in some areas of the County. Most non-residential development has occurred in core areas and corridors as defined in the County's future land use policies. The construction of newer resorts—including adventure activities, business meeting

space, and outdoor recreation activities—along with expansion of manufacturing businesses have helped the County meet its goal to diversify the economy and make it more resilient.¹² Although impacts related to development of large-lot residential subdivisions have decreased, evolving development trends such as large warehouses, along with increased truck traffic, require continued monitoring to ensure land use and resource objectives remain in balance. As noted in the Monroe 2020 and Monroe 2030 Comprehensive Plans, patterns of development are key to achieving a sustainable community, while protecting natural resources.

BUSINESS

Business operations choose locations due to a variety of factors. Many businesses choose to locate in Monroe County due to its proximity to markets, transportation corridors, and relatively low operation costs. The abundance of natural features and scenic open space areas in Monroe County also help build the economy because the assets:

- // Attract visitors and support numerous tourist-based recreational activities.
- // Offer access to resources such as clean, abundant water supplies essential to business operations at relatively low costs.¹³
- // Provide opportunities for businesses to attract and retain employees who value healthy lifestyles because active employees are happier, more creative, more productive, and miss less work.^{14, 15}

The quality and quantity of resources available to businesses are critical to business function. Monroe County's location and natural resources make the region very business friendly. The recreational opportunities available on open spaces benefit the region's workforce, translating into increased productivity and avoided medical expenses. The forested watersheds offer surface and groundwater resources for businesses, ensuring clean, filtered water to produce their products and to meet water-quality permit standards.

To better appreciate the economic value of natural resources and open space to business, it is useful to consider operations in terms of reliance on, or connection with, resources. One evaluation process, developed by the Keystone Conservation Trust, groups businesses into categories as described in Figure 03.

FIGURE 03 // MONROE COUNTY ROE BUSINESS TYPES

Resource-Use: Rely on access to natural resources (manufacturing, pharmaceutical, energy generation, agriculture). Local examples: Weiler Corp., Sanofi Pasteur USA, Tobyhanna Army Depot.

Resource-Based: Feature quality natural resources (breweries, bottling companies, restaurants, resorts). Local examples: Eagles Rest Cellars, Stroudsmoor Country Inn, Sorrenti Family Estate, Shawnee Inn & Golf Resort.

Recreation-Based: Involved with outdoor recreation directly or indirectly. Local examples: Edge of the Woods Outfitters, Pocono Bike Company, Naturfi, Paradise Fishing Preserve, Shawnee Mountain Ski Area.

Naturally Smart: Harness natural materials or services in environmentally friendly manner (LEED, alternative energy use). Local examples: Northampton Community College, Monroe County Transportation Authority, Shawnee Craft Brew Company.

Green Organizations: Environmentally sustainable or recycling operations. Local examples: Brodhead Creek Heritage Center, Waste Not Technology, Josie Porter Farm, Pocono Heritage Land Trust, Gould's Produce, Heckman Orchards.

TOURISM

Monroe County's various natural resources and scenic landscapes are important assets for travel and tourism. Recreational tourism has been one of the fastest-growing sectors in the local economy. Although not classified as an industry sector, Monroe County's tourism industry is its largest business sector, accounting for significant spending in the lodging, food and beverages, retail, recreation, and transportation sectors (see Figure 04). This activity represents approximately four out of every 10 jobs in the region's workforce.

FIGURE 04 // MONROE COUNTY ANNUAL TOURISM REVENUE

TRANSPORTATION	\$593.8 MILLION
FOOD	\$518.6 MILLION
RECREATION	\$484.8 MILLION
SHOPPING	\$456.1 MILLION
LODGING	\$455.9 MILLION
TOTAL SPENDING	\$2.5 BILLION

Source: PA DCED, Economic Impact of Travel and Tourism in Pennsylvania, 2019

The tourism industry in Monroe County has changed dramatically over the past 20 years due to reinvestment in existing resort facilities, the addition of new resort destinations (including active recreation activities, such as waterparks), and the expansion of meeting space. There have also been new and expanded tourism-activity types, including cultural and heritage tourism, ecotourism, and other interests

related to local attractions and experiences. One related trend involves the increasing popularity of short-term housing rentals within the local housing market, which municipalities have attempted to address by creating policies to ensure that services can be maintained as conditions evolve.

Visitation to the Poconos Region increased 13% between 2014 and 2019. Of the 27.9 million visitors to the four-county region in 2018, about 75% are attributed to Monroe County. In 2019 tourism spending in the County totaled over \$2.5 billion (over 80% higher than in 2009) and helped support approximately 14,749 jobs that year. Based on the 2014 Monroe County Open Space, Greenway & Recreation Plan, an overwhelming majority (92%) of residents believed that the visitor recreation economy is "important or very important" for Monroe County, and 90% also believed that there are economic benefits in drawing recreation visitors to the area.¹⁶

AGRICULTURE

Agriculture remains a major part of the local economy. Monroe County, while geographically diverse, contains 27,600 acres of productive farmland with 233 farms (see Figure 05).¹⁷ Most of the farmland is in the southwest portion of the county (locally referred to as the "West End") which contains fertile soils and favorable climate conditions. While less extensive in land area, compared to other Pennsylvania counties, these areas reflect the agrarian history of the region, contribute to the local economy, and provide nutritious food and valuable products.

Agriculture also provides open space that is valued by residents and visitors and offers environmental benefits, such as replenishing groundwater and supporting local wildlife. Economic pressures (limited profits combined with rising land values) have resulted in reductions in agriculture in favor of development in some areas. The County has adopted a successful agricultural easement program to help preserve farms and prime agricultural areas to maintain these benefits for the community. As of 2021 the County program has helped preserve approximately 8,200 acres on 122 farms.

FIGURE 05 // MONROE COUNTY AGRICULTURE

MARKET VALUE OF PRODUCTS SOLD	\$9,933,000
NUMBER OF FARMS	233
AVERAGE SIZE OF FARM	118 ACRES
LARGEST PRODUCTS	65% CROPS; 35% LIVESTOCK, POULTRY, AND PRODUCTS

Source: U.S. Department of Agriculture, National Agricultural Statistical Service, 2017



WATER

Water remains an indispensable resource, supporting enormous ecosystem services. Monroe County's water resources—consisting of groundwater, surface water, headwaters, wetlands, and riparian areas—contribute to the quality of life and local economy by:

- // Providing quality water supplies for residents and business operations.
- // Supporting local ecosystems and wildlife habitats.
- // Absorbing and channeling precipitation to reduce safety hazards and property damage.
- // Providing water from natural sources that are cost effective and reliable compared to centralized systems.*

* The EPA Healthy Watersheds Program (HWP) noted that, in some cases, natural infrastructure solutions are less expensive and more reliable than engineered solutions. By relying on nature to provide these valuable services, Monroe County can avoid significant financial impact from development, tourism, water treatment, water supply, flood remediation, infestations, air pollution removal, erosion control, outdoor recreation, and healthcare costs. (US EPA, 2012)

Water supply and quality are highly dependent on local environmental conditions. Under natural conditions, services are provided with minimal costs. When changes occur due to conditions such as land use alteration or climate change, benefits can be lost resulting in increased remediation costs and potential hazards.

Water Sources: A primary source for water in Monroe County flows from aquifers beneath the Pocono Plateau. This same source provides groundwater and surface water to both the Lehigh River and Delaware River Watersheds, making it an extremely important local and regional resource. Other aquifers include those beneath the valley and ridge areas in the County. Areas east of the Pocono Plateau drain directly to the Delaware River via the Brodhead, Bushkill, or Cherry Creeks. Areas on or south of the Plateau drain into the Lehigh River, on the way to the Delaware River, via the Tobyhanna, Pohopoco, Wallenpaupack, and Aquashicola Creeks.

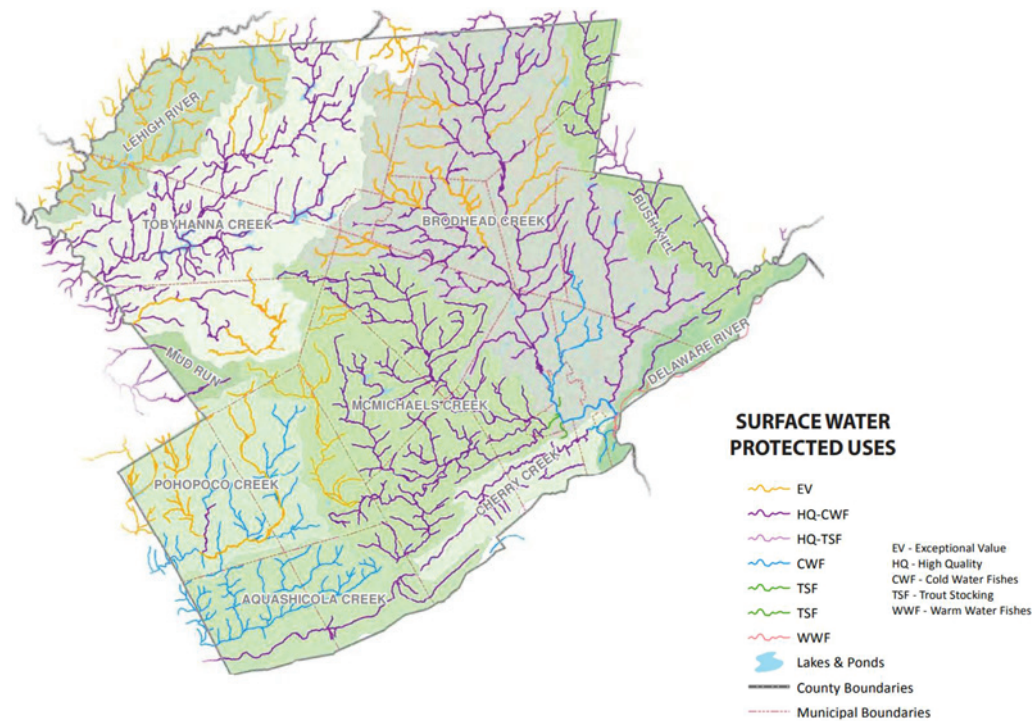
The majority of dwelling units in the County rely on individual wells. Other areas, and most of the businesses, have public water service provided by the Brodhead Creek Regional Authority, various municipal water authorities, or the PA American Water Co. While these providers use various sources (wells and stream intakes), all rely on groundwater that supplies surface water

Water Quality: Chapter 93 of the Pennsylvania Code establishes water quality standards based on uses that are to be protected, including aquatic life, water supply, recreation, and special protection. In addition, streams can be afforded special protection if they are classified as “Exceptional Value” or “High Quality.” The aquatic life classifications for local waterways are described in Figure 06 and shown on the map in Figure 07.

FIGURE 06 // PENNSYLVANIA DEP WATER QUALITY CLASSIFICATION DESCRIPTIONS

- EXCEPTIONAL VALUE (EV)**
 // SUPPORT HIGH QUALITY BIOLOGICAL COMMUNITIES
 // CLASSIFIED BY THE FISH & BOAT COMMISSION AS "WILDERNESS TROUT STREAMS" OR CLASS A WILD TROUT STREAMS
 // IN NATIONAL AND STATE PARKS, OR WITH EXCEPTIONAL RECREATIONAL SIGNIFICANCE
- HIGH QUALITY (HQ)**
 // EXCEEDS LEVELS NECESSARY TO SUPPORT PROPAGATION OF FISH, SHELLFISH, AND WILDLIFE, AND RECREATION IN AND ON THE WATER
- COLD WATER FISHERIES (CWF)**
 // SUITABLE FOR THE MAINTENANCE AND/OR PROPAGATION OF FISH SPECIES AND FLORA AND FAUNA THAT ARE NATIVE TO COLD WATER HABITATS
- TROUT STOCKED FISHERIES (TSF)**
 // SUITABLE FOR THE MAINTENANCE OF STOCKED TROUT FROM FEBRUARY 15 TO JULY 31 AND PROPAGATION OF FISH SPECIES AND FLORA AND FAUNA NATIVE TO WARM WATER HABITATS
- MIGRATORY FISHERIES (MF)**
 // SUITABLE FOR THE PASSAGE, MAINTENANCE, AND PROPAGATION OF FISHES WHICH ASCEND TO FLOWING WATERS TO COMPLETE THEIR LIFE CYCLE
- WARM WATER FISHERIES (WWF)**
 // SUITABLE FOR MAINTENANCE AND PROPAGATION OF FISH SPECIES AND FLORA AND FAUNA NATIVE TO WARM WATER HABITATS

FIGURE 07 // HIGH QUALITY STREAMS IN MONROE COUNTY



Source: The 2019 Clean Water Plan

Pennsylvania DEP also maintains an inventory of stream segments classified as “Impaired,” which do not meet water-quality standards for a designated use. In its recently released draft report of impaired streams in the Commonwealth of Pennsylvania, DEP ranked Monroe County seven out of 67 counties with the least amount of impaired stream segments.¹⁸

Local Water Resources Management: Local efforts to monitor, manage, and restore water resources—including annual stream monitoring, conducted since 1985 by the Monroe County Planning Commission and Monroe County Conservation District—have helped maintain the quality of stream networks in the County.¹⁹ Most of the 900-plus miles of stream segments are classified as EV or HQ, which affords special protection;²⁰ approximately 241 miles are classified as EV.²¹ To protect water quality, the County and its partners have participated in numerous planning programs to manage the resources at the watershed or system level. Many of the strategies have been incorporated into adopted policies or ordinance updates used to maintain water resources at the County and regional level.

The watershed-based plans cover a range of resource conservation topics across the County. Common guiding principles include:

- // Water should be maintained in the hydrologic system (watershed) and returned to the ground to recharge the aquifer.
- // The significant value of headwaters, wetlands, and riparian areas as well as forest cover in a watershed.
- // The importance of monitoring water quality and promoting special protections to avoid enormous problems.
- // Protecting water supplies from point and non-point source discharges: sediment from erosion is the greatest surface water pollutant; the largest groundwater pollutant in the County comes from malfunctioning on-lot septic systems.
- // Incorporating water resources protection into land use, sewage facilities, stormwater management, natural resources, and recreation planning.

In addition to contributions provided by local planning partners, groups in the County engage in efforts to help maintain and promote water conservation. A group of 40 partner organizations, working with PennFuture, have established an outreach program, Our Pocono Waters,²² to increase awareness of water quality and the value of protection classifications.

Water resource-protection legislation is set at the state level and administered by DEP. Local agencies, such as the County Planning Commission and Conservation District, are involved in programs to monitor and guide planning activities. Municipalities play an

important role in managing land uses through Act 247 with local ordinances (zoning, subdivision), Act 537 (sewage facilities), and Act 167 (stormwater management). Regional partners, such as the Brodhead Watershed Association, Tobyhanna Creek/Tunkhannock Creek Watershed Association, and the Aquashicola-Pohopoco Watershed Association, provide valuable assistance highlighting and conserving resources in their areas. The County also participates with neighboring counties and regional partners in programs such as the Pocono Source Water Protection Collaborative²³ that helps address concerns throughout the watersheds. The 2019 Plan for Clean Water²⁴ provides valuable information to decision-makers to help protect water resources. It includes a Surface Water-Priority Lands Map and an Aquifer Recharge-Priority Lands Map that weigh factors (e.g., erodibility, absorption, forest cover, riparian buffers, depth to groundwater) that help define suitability in terms of water resources at a specific location.

In addition to headwaters, wetlands, and riparian areas, water quality is significantly impacted by the amount of forest cover within a drainage area. In a study of 27 U.S. water suppliers, researchers (Petal and Thompson, 2005) found that protecting forested watersheds used for drinking water sources can reduce capital, operational, and maintenance costs for drinking water treatment: costs were twice as high for a watershed with only 30% forested cover as compared to 60%.²⁵ In recognition of the benefits of forest cover, the Borough of East Stroudsburg and Bethlehem Authority use source water-protection measures such as forest cover to help maintain their supplies.²⁶

FORESTS AND WOODLANDS

The northeastern United States is part of the Eastern Deciduous Forest Biome. Approximately 80% of Monroe County is covered by tree canopy, while over 60% contains areas of intact forests that provide some of nature's most valued services, including:

- // Supporting diverse wildlife habitats.
- // Absorbing storm water and nutrients.
- // Buffering winds and climate extremes.
- // Capturing air and water pollutants.
- // Supporting numerous recreation activities.

The vast amount of forest cover and size of intact forests account for a significant share of ROE values for Monroe County. Natural system services help maintain water quality and air quality. Based on iTree research findings, County forests help reduce health problems by removing significant amounts of air pollutants: nitrogen dioxide (NO₂), sulfur dioxide (SO₂), carbon monoxide (CO), ozone (O₃), and particulate matter (PM).²⁷

Forests and understory areas are home to 80% of the world's terrestrial biological diversity. In terms of habitat, it is important to understand that the size, location, and types of woodland cover affect the value they provide. Forests that are larger than 750 acres provide the habitat required to sustain breeding populations of wildlife. A broad-winged hawk, for example, uses a breeding area of mostly forest (80%); and of that forest, half or more of it is core, which equates to around 750 total acres.²⁸ Areas over 500 acres are needed by migrating songbirds. Tolerance to forest fragmentation varies, and the amount of edge can affect a forest's quality. For instance, forests less than 150 acres, or formed in long strips, are lower quality than forests 150 acres square.²⁹

As with other natural resources, forests and woodlands are susceptible to impacts that can reduce the benefits or values they provide. Finding ways to protect or expand the forests, and interconnect them with riparian corridors or upland corridors, is essential for ensuring a healthy environment. Although our understanding of the value of forest management practices has increased significantly, loss and fragmentation of forests, as well as the spread of non-native species, require continued attention to maintain services. According to results from a recent Monroe County land cover survey, areas classified as forests (primarily deciduous) decreased by approximately 10 square miles due to development over the past 20 years.³⁰

WILDLIFE AND BIOLOGICAL DIVERSITY

Monroe County's pristine forested uplands, ridgelines, and stream valleys support valuable ecosystems and wildlife habitats found in very few places. These abundant natural resource areas provide a competitive advantage by attracting many people to the area and contributing to the quality of life. Figure 08 lists significant natural resources within the County.

FIGURE 08 // MONROE COUNTY HIGH-QUALITY NATURAL RESOURCES

IMPORTANT BIRD AREAS (IBA)	6 AREAS
PROTECTED LANDS	482 TRACTS; 127,661.1 ACRES
NATURAL HERITAGE AREAS	128 SITES
EXCEPTIONAL VALUE (EV) STREAMS	241.1 MILES
CLASS A STREAMS	68.5 MILES
WILD TROUT STREAMS	23.1 MILES

Source: PA DCNR 2021 Conservation Planning Report³¹

Large forests, as well as the stream corridors that connect them, allow nature to regenerate and sustain itself. Connecting and expanding ecosystems ensures healthy and resilient biological habitats that boost natural system services, including:

- // Biological control: Ecosystems help control invasive, undesirable species and maintain healthy populations of natural species.
- // Soil formation: Plant communities help enrich soil through weathering and soil retention.
- // Shelter/Nutrition: Ecosystems provide sources of nutrition and shelter essential to species survival. A key consideration: native vegetation supports 29 times the biological diversity as non-native plants.³²
- // Pollination: Natural areas support pollination required for local agricultural operations.

Monroe County contains valuable habitat types—vegetated riparian areas, wooded headwaters, boreal bogs, and forested ridgelines—that support wildlife communities including black bears, numerous raptors, native trout, otters, and others. Habitat size, shape, and location matter in terms of maintaining sustainable populations of wildlife. Habitat connectivity is also important to ensure biological diversity and ecosystem health.

Monroe County's Natural Heritage Areas Inventory (NAI)³³ identified 128 areas warranting conservation as critical habitats for species of special concern. Additional work by the Nature Conservancy (TNC) and partners provides valuable information on terrestrial and aquatic habitats and ecosystem descriptions—including data on connectors that help maintain communities—to assist decision-makers in evaluating conservation needs. Pennsylvania's Wildlife Action Plan³⁴ provides updated information on species of greatest conservation need, detailed descriptions of local habitat conditions, and guidelines for conservation actions. The companion Conservation Opportunity Area Tool³⁵ provides an online resource to support conservation planning initiatives.

Due to its location within the Appalachian Mountain Ridge and Valley Region, Monroe County is an integral part of the internationally recognized Atlantic Flyway and contains several Important Bird Area (IBA) habitats. This corridor supports migrating and resident birds essential to the ecology of both North and South America. A recent study³⁶ found that since 1970, North America has lost nearly 3 billion birds—or 29% of its avian population. According to Audubon Mid-Atlantic, over 40% of migrating birds are in conservation need, meaning they lack adequate habitat.³⁷

Threats to habitat involve land use change, introduction of invasive species (such as the Emerald Ash Borer), and effects of climate change that can remove, fragment, isolate, or stress healthy ecosystems. Native species composition is expected to change—as some decline, increase, hybridize, and move up from the south³⁸—which will alter native ecosystems, diminish resilience to change, reduce species diversity, and increase the potential for species decline. To confront these changes, it will be important to develop effective conservation strategies using information on habitat conditions, types of threats, and ways to mitigate negative impacts.

PARKS, TRAILS, AND GREENWAYS

Protecting natural resources, preserving open space, and providing recreational activities have all been important concerns to the Monroe County community. While the County benefits from the presence of valuable federal and state properties, many additional properties have been obtained for public parks and trails as part of a collaborative County/local open space program established in conjunction with the adoption of Monroe 2020 and the County Open Space and Recreation Plan of 2001. Currently over 30% of Monroe County contains public open space (see Figure 09) that helps meet the needs for outdoor recreation.

FIGURE 09 // MONROE COUNTY MAJOR NATURAL ASSETS AND PROTECTED OPEN SPACE

- // Delaware Water Gap National Recreation Area
- // 3 State Parks (Big Pocono State Park, Gouldsboro State Park, Tobyhanna State Park)
- // 2 State Forest Areas (Delaware State Forest and Pinchot State Forest)
- // 9 State Game Land Tracts
- // Appalachian Trail and Cherry Valley National Wildlife Refuge
- // Over 22,000 acres of local parks, conservancy lands, agricultural easements, and natural areas
- // Numerous local trails and greenways throughout the County

Source: Monroe County Open Space, Greenways & Recreation Plan, 2014

In response to concerns over development, previous planning initiatives have included the formulation of open space strategies and the issuance of open space bonds to preserve open space. Those actions led to the establishment of six regional recreation programs and adoption of multiple regional open space & recreation plans. The initiatives were supported by incentives in the form of technical (Municipal Partnership Program [MPP]) and financial assistance (Financial Assistance Program [FAP I & II]) to encourage participation and achieve objectives. After the first 12 years, over 20,000 acres had been preserved.

Although preservation and conservation efforts—including technical support—have continued, financial support had not been renewed after the initial rounds, limiting opportunities to acquire public open space at the same pace. When the County's 2014 Open Space, Greenways & Recreation Plan was prepared, it outlined the value of achievements and ongoing needs, identified opportunities (partners and available grant programs), and refined strategies. Some strategies were reflected in the Areas of Interest for Preservation Map, which was intended to serve as a tool for protecting open space by the County, its regional commission partners, municipalities, and land trusts. The 2014 Plan contained implementation strategies to help address identified

needs, including: securing alignments and connecting trail gaps, pursuing inter-county programs, promoting green infrastructure, and recommitting to open space funding opportunities to help protect priority areas. The 2014 Plan also recommended identifying the value of natural areas and open space, which the ROE Study is intended to address.

DELAWARE RIVER WATERSHED INITIATIVE (DRWI)

The DRWI is a collaborative effort involving more than 50 leading nonprofit organizations with a shared mission to reduce pollution, protect headwaters, and promote water-smart practices and policies. Their efforts involve protecting the rivers and streams throughout the Delaware River basin to provide clean water for more than 15 million people across four states. The work is conducted in cluster areas, with Monroe County situated between the Upper Lehigh Cluster³⁹ and the Pocono-Kittatinny Cluster.⁴⁰ Organizations working in these clusters develop shared priorities to accelerate land protection and restoration in the areas with the greatest potential for safeguarding or improving water quality.

The DRWI work includes participation in efforts such as:

- // Assisting with support for permanently protecting open space through donations and purchases (properties or easements).
- // Supporting pilot projects for wetlands and floodplain restoration.
- // Providing technical planning assistance to municipalities (emphasis on water resources protection).
- // Assistance with using/installing green stormwater infrastructure.
- // Promoting economic benefit of open space.
- // Assisting residents with conservation activities.

The DRWI has provided support and guidance for this ROE Study as part of its work to assist partners across the basin engaged in conservation planning involving water resources-protection strategies that reduce pollution, protect headwaters, and promote water-smart practices and policies.



Photo: Ben Goodman



Photo: Dax Roggio

Morning fog settles in the valley below scenic Big Pocono State Park.

04 // CONCLUSIONS

Protecting Monroe County's open spaces protects our future

“The environment, after all, is where we all meet, where we all have a mutual interest. It is one thing that all of us share.”

– Lady Bird Johnson

Open spaces are where natural systems function and where most benefits are provided. The first rule of ecology is that everything is connected to everything else. Natural systems provide a significant economic asset since they operate 24 hours a day, 365 days a year, free of charge. Avoiding costs for services that nature already provides for free allows more money to circulate in the economy and creates jobs. While nature can eventually replace itself, once disrupted or destroyed, natural system services will be diminished for 50 to 120 years before they again reach full capacity. The Monroe County ROE Study results in Figure 10 highlight the significance of protecting Monroe County's natural resources, worth over \$1.5 billion annually, to support the community and its economy.

FIGURE 10 // MONROE COUNTY ANNUAL ROE VALUE

AVOIDED COSTS

// Natural system services: \$1.1 billion

EXPECTED OUTDOOR RECREATION CONTRIBUTIONS*

// Outdoor recreation: \$368 million

// Jobs: 2,755

// Tax revenue: \$26.9 million

AVOIDED HEALTHCARE COSTS DUE TO INCREASED EXERCISE

// \$67 million

* Values provided for expected spending, jobs, and tax revenue. Exclusive of travel and tourism-related spending.

Monroe County's overall economy is approximately \$7 billion a year, according to a 2021 JOBSeq economic report.⁴¹ Figure 11 lists annual contributions to the local economy from activities and services tied to nature and open space. The County's location and natural resources drive local tourism, the County's largest business sector. As Figure 11 illustrates, projected values for services and activities associated with natural areas and open space also provide significant economic savings and revenue. These contributions illustrate why it would be difficult in Monroe County to maintain a strong economy without protecting open space and natural resources that provide a resilient environment, clean water, and healthy habitats.

FIGURE 11 // MONROE COUNTY ANNUAL ECONOMIC CONTRIBUTIONS

TOURISM SPENDING	\$2.5 BILLION
NATURAL SYSTEM SERVICES (AVOIDED COSTS)	\$1.1 BILLION
OUTDOOR RECREATION SPENDING	\$368 MILLION
HEALTHCARE SAVINGS	\$67 MILLION
AGRICULTURE SALES	\$10 MILLION

Source: U.S. Department of Agriculture, PA. Department of Community and Economic Development, Monroe County ROE model, 2022

NATURAL SYSTEM SERVICES

The Monroe County ROE Study identified 10 natural system services that occur on 14 different land cover types: eight apply to upland areas and streams, and two apply to air quality. While not comprehensive, the list in Figure 12 includes major services that nature provides, which helps estimate nature's economic value.

FIGURE 12 // MONROE COUNTY ANNUAL AVOIDED NATURAL SYSTEM SERVICES COSTS

HABITAT	\$477,816,245
STORMWATER	\$322,064,698
NUTRIENT UPTAKE	\$119,107,520
AQUATIC RESOURCES	\$61,526,704
WATER SUPPLY	\$51,834,039
BIOLOGICAL CONTROL	\$21,268,551
POLLINATION	\$20,467,974
CARBON SEQUESTRATION	\$13,278,488
AIR POLLUTION REMOVAL	\$11,336,043
EROSION CONTROL	\$1,977,395
TOTAL	\$1,100,677,657

Figure 13 shows the values of land cover types based on the natural system services each provides. These categories illustrate the high, relative value of wet forested areas—like headwaters, riparian corridors, and floodplains—that support habitat, maintain water quality, absorb precipitation, and uptake nutrients. Large forests in

upland locations also provide valuable services, such as habitat support, absorption of runoff, carbon sequestration, and air pollutant removal. ROE Values for Monroe County are displayed in Figure 14. An online application allows visitors to explore and interact with the project maps.*

* Monroe County ROE application: <https://wplan.maps.arcgis.com/apps/webappviewer/index.html?id=af575fc79cb4496983f36a8c6d18e2b6>

FIGURE 13 // ANNUAL ROE VALUE BY LAND COVER TYPE (\$ PER ACRE)

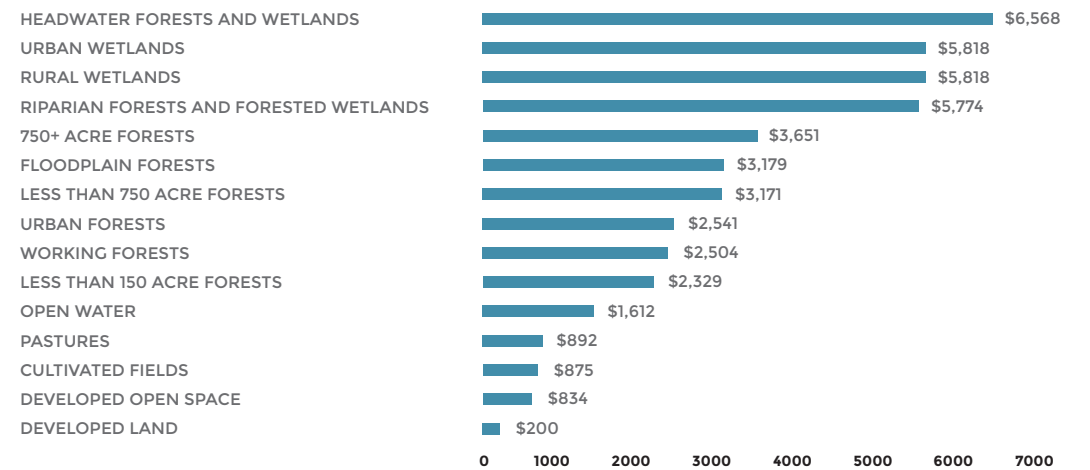
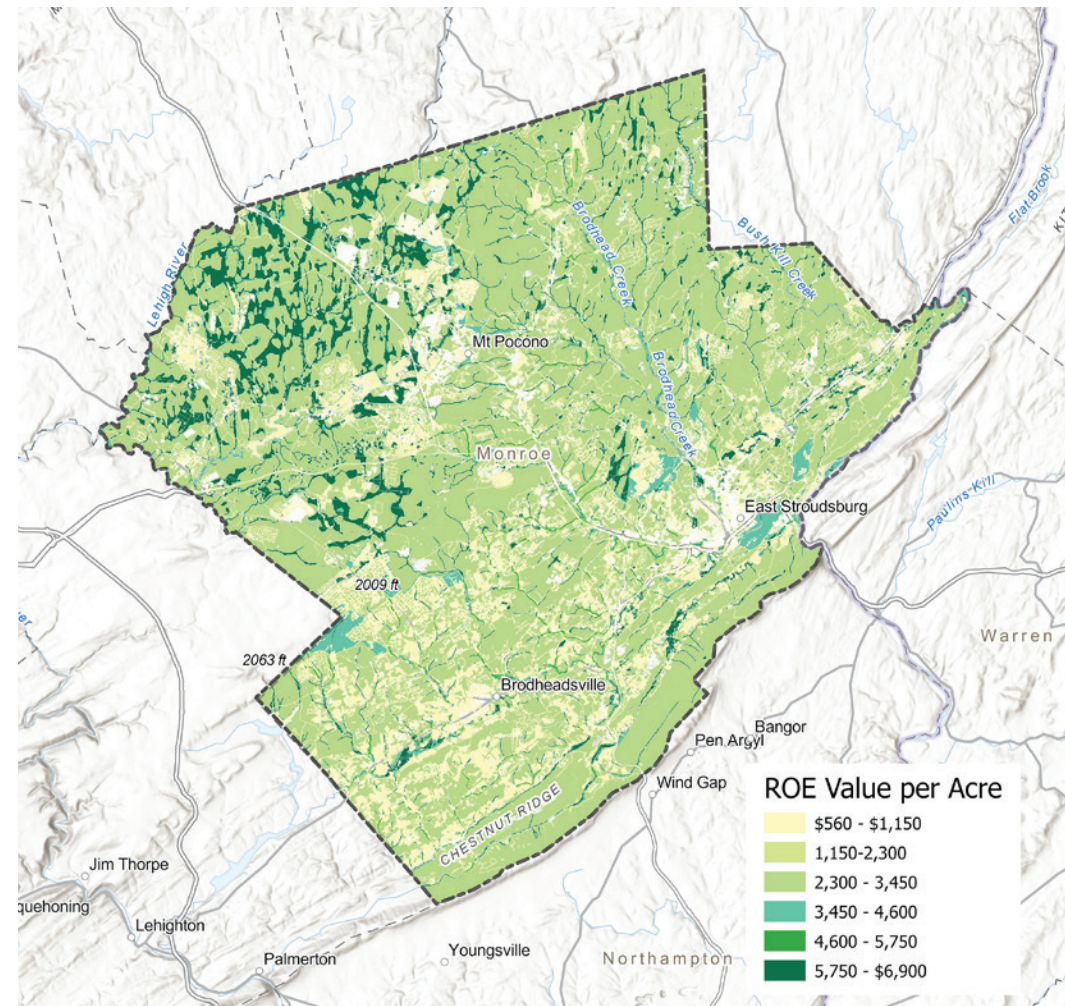


FIGURE 14 // MONROE COUNTY ROE MAP



CONSERVATION AND ROE STRATEGIES

Monroe County residents and visitors want to experience nature at its best. In response to significant residential development pressure, Monroe County developed policies to maintain a stable community and economy based on its greatest asset, natural resources. The strategies, adopted in conjunction with Monroe 2020 and the 2001 Open Space Plan, sought to:

- // Channel development into defined core areas and corridors.
- // Promote regional open space and recreation.
- // Assist municipalities with planning programs.
- // Establish funding mechanisms to help achieve the initiatives.

The strategies had significant success, but with an economic recession starting in 2007, residential subdivision activity dramatically decreased as did budgets used to fund many open space initiatives.

Although residential subdivision development activity leveled off, it could resume with regional housing shortages, planned transportation improvements, and evolving workplace arrangements. In-fill residential development has continued as homes have been built on lots in previously approved subdivisions. While the resident population has not increased in recent years, the number of visitors staying in expanded resort facilities, using second homes, staying in short-term rentals, or visiting for the day has risen steadily. As consumers of open space and recreation increase, the demand and impacts on capacities provided by natural areas will require ongoing vigilance.

To maintain a stable community and economy based on natural resources, Monroe County will need to continue exploring opportunities to protect natural resources while accommodating essential activities and change. Continued integration and synchronization of land use planning, resource protection, and economic development policies can help address challenges and ensure sustainable solutions. Recent plan updates from nearby communities coping with development pressures, such as plans developed for the Lehigh Valley⁴² and Chester County,⁴³ illustrate the significance of promoting sustainable communities. For example, policies and actions promoting preservation are linked to incentives for investment and appropriate redevelopment in defined core areas. This ensures that these locations can attract and support growth instead of outlying areas where conservation policies take precedence.

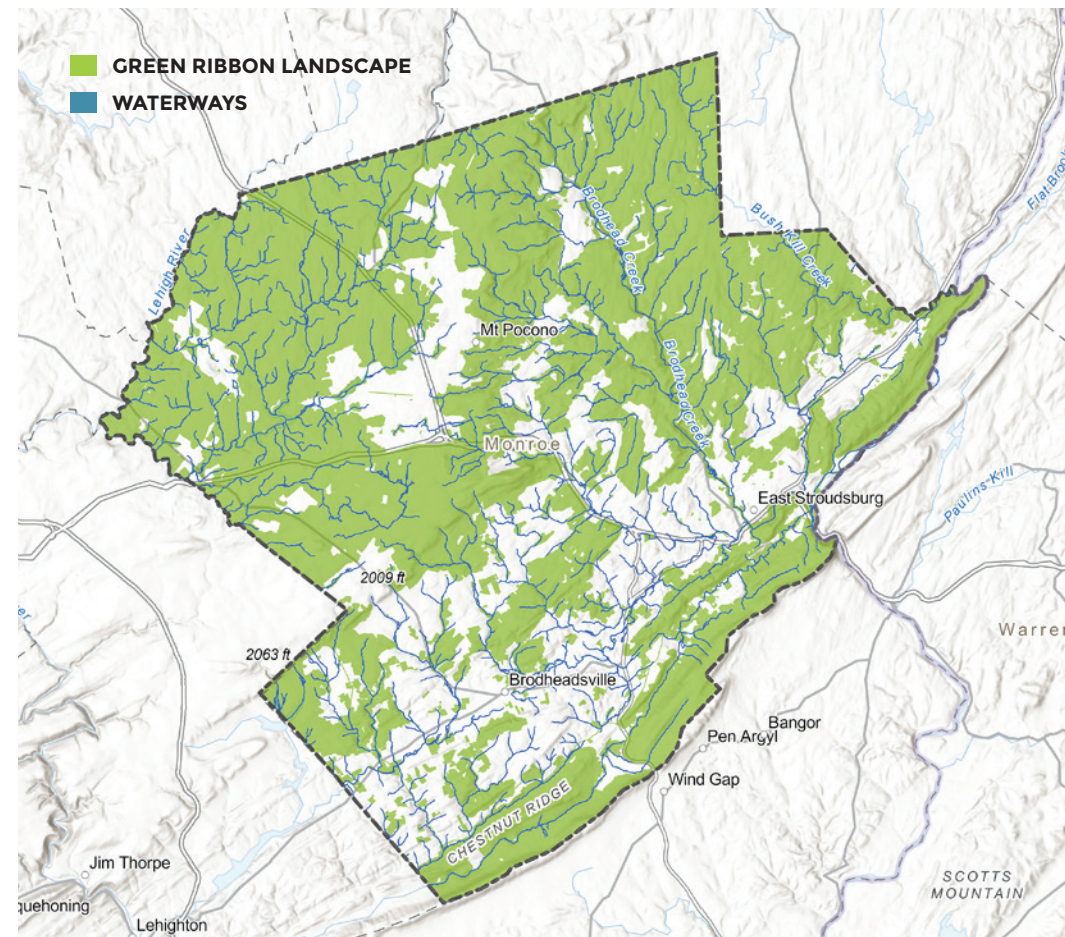
Monroe 2030, which incorporates land use, open space, and economic development plans and collective strategies, provides a similar framework. To address challenges (from change and resource limitations), Monroe County should continue to build on its framework to integrate the policies, so that actions and decisions can work in unison to ensure a mutually successful and sustainable community. ROE strategies, based upon economic value, can help link environmental and economic policies to achieve defined outcomes.

ROE information can help achieve goals through outreach efforts that promote conservation stewardship. As part of the ROE project, promotional material has been generated for this purpose. One tool is the Green Ribbon Landscape (GRL) map. A key concept to mention is the distinction between the GRL map and other maps used to denote areas of permanently protected open space. While public or protected open space is typically included, the Green Ribbon Landscape encompasses all areas, including public and private properties, where conservation will have the greatest impact. Since many properties key to maintaining natural system services are privately owned, the

GRL map provides a useful way to engage all stakeholders. The map helps identify areas to target for conservation, including areas that provide the greatest environmental benefit (highest ROE value), contain protected open space, or achieve landscape connectivity, which research shows maximizes the value of natural system services. Using ROE information to engage all stakeholders helps Monroe County achieve conservation objectives to maintain a sustainable environment and growing economy.

To achieve common goals, businesses, governments, and households will need to work together to manage natural areas and open spaces in ways that result in the highest ROE. The GRL map provides a framework to apply conservation strategies, in conjunction with ROE data, to help achieve defined goals, increase the community's ROE, and maintain a sustainable environment and growing economy.

FIGURE 15 // MONROE COUNTY GREEN RIBBON LANDSCAPE (GRL) MAP



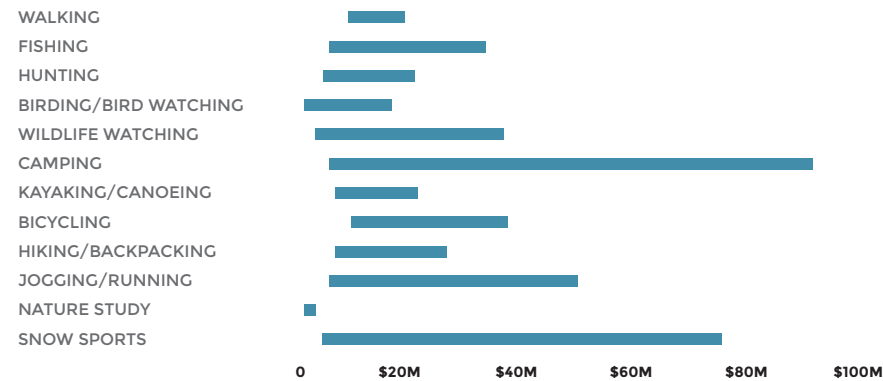
Key Findings:

- // Monroe County's open spaces provide economic benefits—currently estimated at over \$1 billion per year—that human populations derive, directly or indirectly, free of charge, from ecosystem functions such as groundwater, stormwater and flood mitigation, carbon sequestration, air-pollution removal, wildlife habitat, aquatic habitat, erosion prevention, habitat regeneration, pollination, biological control, and nutrient uptake.
- // The benefits help control cost-of-living expenses by avoiding the unnecessary cost of replacing and restoring vital ecosystem services currently provided by open space.
- // The financial value of natural system services within riparian buffers (100 feet from edge of water body) in the County is \$164.3 million per year.
- // The land areas with the highest ROE are headwater forests and wetlands, rural wetlands, riparian forests, forested wetlands, urban wetlands, and upland forests over 750 acres.
- // Habitat-related avoided costs amount to over \$500 million annually. This includes habitat, pollination, biological control, and aquatic resources (habitat).
- // The total value of air pollution control is \$24.6 million per year.
- // The largest avoided costs are for habitat support, stormwater and flood mitigation, and nutrient uptake.
- // Maintaining connected habitats and corridors allows the full value of open space to be realized and sustainable. When preserved and operating at capacity, these precious resources provide support for a more resilient environment during changing climatic conditions.

OUTDOOR RECREATION

Monroe County's open spaces provide desirable places for numerous free and low-cost recreational activities that enhance the quality of life and health for residents. This section identifies the value, in terms of spending by residents, that outdoor recreation supplies to the economy. The estimates are based on residents' levels of participation and spending estimates across 13 major recreational activity categories (see Figure 16). The estimates come from survey results (national, state, and local) that have been reviewed by experts familiar with local activities. In the Monroe County ROE Study, outdoor recreation includes activities that can be performed by County residents in a natural setting without causing harm to the environment. These values do not include recreation spending based on travel and tourism, which is described in the tourism section of Chapter 3.

FIGURE 16 // MONROE COUNTY ANNUAL LOW TO EXPECTED OUTDOOR RECREATION SPENDING



Source: Monroe County ROE Outdoor Recreation Model using participation and spending estimates, 2022

Figure 16 represents annual direct spending for outdoor recreation in Monroe County. Evaluations using IMPLAN (economic impact assessment software) indicate that outdoor recreation in Monroe County generates an additional \$15.5–\$76 million each year in indirect spending, supports 574 to 2,755 jobs, and provides \$5.5 to \$26.9 million in tax revenue each year.⁴⁴

Outdoor recreation also provides numerous health benefits important to maintaining quality of life and the economy. In recent decades, national healthcare costs have increased dramatically, from below 10% to approximately 18% of U.S. GDP.⁴⁵ Approximately 11% of the \$4 trillion dollar spent on health care in the U.S. annually is attributed to inactivity. Decreasing levels of physical activity have been associated with increasing levels of obesity and degenerative diseases. Sedentary lifestyles, limited access to recreation facilities, and lack of awareness of recreation opportunities have been cited as contributing factors in a 2020 U.S. Department of Agriculture study⁴⁶ and focus group discussions.

Research indicates that physical activity, especially outdoor recreation, is associated with improved health.⁴⁷ Findings suggest that being in contact with nature in parks, trails, and gardens motivates people to remain active and avoid related health problems.⁴⁸ Health care providers are increasingly advising patients and the public to increase outdoor physical activity to improve and maintain health. For example, the Lehigh Valley Health Network and Wildlands Conservancy partnered to develop Get Out for Wellness⁴⁹ to promote a healthier community through outdoor recreation activities. St. Luke’s similarly maintains their online WellNOW⁵⁰ website to promote healthy lifestyles, including outdoors programs such as “Get Your Tail on Trail.” Many communities have come to embrace the concept, described in Richard Louv’s research⁵¹ on the benefits of contact with nature, by linking land conservation efforts to strategies to improve public health and achieve sustainable community goals.

Outdoor recreation participants in Monroe County benefit from exercise and save roughly \$66.96 million annually in avoided healthcare costs. This number is based on participation rates in Monroe County as shown in Figure 17 and associated healthcare cost savings benefits described in Figure 18.

FIGURE 17 // FREQUENCY OF PARTICIPATION IN OUTDOOR RECREATION IN MONROE COUNTY

DO NOT EXERCISE AT ALL	7%
LESS THAN ONCE PER WEEK	58%
MORE THAN ONCE PER WEEK	14%
MORE THAN TWICE PER WEEK	21%

Source: Lion Poll, Center for Survey Research (CSR) at Penn State Harrisburg, 2019

FIGURE 18 // MONROE COUNTY AVOIDED HEALTHCARE COSTS DUE TO EXERCISE*

AT LEAST ONCE PER WEEK	\$16.68 MILLION
MORE THAN TWICE PER WEEK	\$50.28 MILLION
TOTAL	\$66.96 MILLION

* Results based on study estimating annual healthcare cost savings of \$713 for individuals who exercise at least once per week and \$1,436 for individuals who engage in outdoor activities two or more times per week. The estimates are combined with the 2020 Monroe County population count of 168,327 and the frequency of participation figures from 2019 to provide identified cost savings due to exercise from outdoor recreation activity.

Key Findings:

- // Based on a 2019 Lion Poll, approximately 90% of Pennsylvania residents participate in outdoor recreation at least once per year. More than 20% of respondents indicated that they participate in outdoor recreation two or more times per week.⁵²
- // Contact with nature has many health benefits. According to a 2020 National Recreation and Parks Association Survey, four out of five U.S. adults agree that visiting local parks, trails, and nature preserves is essential for their mental and physical well-being during the COVID-19 pandemic.⁵³
- // Demand for outdoor recreation is increasing by at least 3.1% per year. However, the Pennsylvania Department of Conservation and Natural Resources (DCNR) found that from Spring 2019–Spring 2020, state park visitation was up 36%, trail users were up 62%, and state park camping was up 139%.⁵⁴
- // Walking remains the most popular local outdoor recreation activity (62%), followed by wildlife watching (35%), bird watching (30%), camping (24%), bicycling (22%), hiking (20%), running (17%), kayaking/canoeing (17%), fishing (12%), snow sports (11%), nature study (11%), and hunting (10%).
- // According to a 2019 report, among adults 20 years or older in Monroe County, 24.5% (or 32,261 individuals) said that they did not participate in any physical activities or exercise, such as running, calisthenics, golf, gardening, or walking; this compares to 22% in the state and 21.8% nationally.⁵⁵ Among focus group and interview participants, a primary reason for lower participation is a lack of affordable or no-cost public spaces for working out and increasing physical activity.
- // Increasing awareness of physical inactivity has led to programs to increase walkability by improving pedestrian infrastructure and related connections. The Eastern Monroe Active Transportation Plan⁵⁶ explores opportunities to connect and raise awareness of the existing regional active transportation network and promote increased use.

PROPERTY VALUES

ROE evaluations can identify premiums or increases in property values related to nearby open space or natural areas, providing another form of economic benefit. Although the bulk of these benefits will be realized by property owners, such premiums can lead to increased spending and higher tax revenues which support the local economy. Studies in other Pennsylvania counties found measurable increases related to such property premiums. Calculations are based on evaluations of property values for locations near protected open space (value transfer) or defined natural areas.

Results from previous evaluations reveal patterns related to factors such as community type (urban, suburban, rural), size of open space, and distance from open space. Communities with distinctive urban, suburban, and rural areas illustrated clear patterns of added value related to open space proximity, especially in more developed areas. In sparsely populated areas with a significant amount of open, forested, or natural landscape, advantages due to open space proximity were negligible. Those areas, however, did exhibit higher property premiums for homes located near places with distinctive scenic qualities (waterfront, water view, or scenic landscapes). For example, recent ROE findings for neighboring Carbon County revealed no significant increase in property values near open space; premiums, however, were reported for properties near water bodies. In Northampton County, properties in developed areas close to protected open space were reported to have higher property values, ranging from 5% in suburban areas to 17% in urban areas.

In Monroe County, the ROE evaluation used assessment values for properties near or adjacent to public open space. The evaluation considered all single-family residential properties in Monroe County; non-residential or multi-family properties were excluded to avoid discrepancies associated with property type and unit count. The evaluation divided areas into urban and rural, based upon the current urban area designations maintained by the Census Bureau. Figure 19 shows that properties in more developed areas of Monroe County do exhibit property value increases from nearby protected open space; however, properties in more rural settings do not exhibit similar property value increases.

FIGURE 19 // OPEN SPACE PREMIUM ON PROPERTY VALUE

OPEN SPACE	# LOTS	PREMIUM	TOTAL \$/LOT	TOTAL VALUE
URBAN: WITHIN 1/4 MILE	15,094	0.5%	\$770	\$11,622,380
URBAN: ADJACENT	1,496	15.6%	\$22,578	\$33,776,688
RURAL: WITHIN 1/4 MILE	14,756	NEGLIGIBLE	N/A	N/A
RURAL: ADJACENT	3,331	NEGLIGIBLE	N/A	N/A

The evaluations indicate that protected open space can have a positive effect on nearby property values in more developed areas, which can help with decisions on investing in or protecting open space in those areas. Findings from a similar value transfer analysis for properties that are close to existing water bodies (Figure 20) show property value benefits in both rural and developed areas. In both evaluations, total values are impacted by proximity and the number of lots.

FIGURE 20 // WATER FEATURE PREMIUM ON PROPERTY VALUE

WATER BODY	# LOTS	PREMIUM	TOTAL \$/LOT	TOTAL VALUE
URBAN: WITHIN 1/4 MILE	18,196	5%	\$7,173	\$130,519,908
URBAN: ADJACENT	907	27%	\$38,573	\$34,985,711
RURAL: WITHIN 1/4 MILE	17,281	4%	\$7,309	\$126,306,829
RURAL: ADJACENT	1,242	50%	\$85,339	\$105,991,038

In most instances, proximity to a water body is fixed (meaning the community would not typically invest in expanding water bodies). This previous research also indicates that property values are impacted by water quality and may decrease if conditions deteriorate.⁵⁷

PUTTING ROE TO WORK

Addressing the scope of challenges facing Monroe County at all levels will require concerted, collaborative action. As acknowledged in Monroe 2030, the challenge continues, resources remain limited, and new issues (economic fluctuations, health crisis, and changing climate) have shifted priorities. It is equally clear that conservation challenges are increasingly complex and comprise multi-faceted social, institutional, and ecological factors that have local and global impact. Communities that understand the financial value of nature have a better chance of striking an effective balance between the challenges of smart growth and maintaining connected, climate-resilient landscapes that support a strong economy.

Monroe County's ROE results show that conservation and the economy are inextricably linked, and that it is exceedingly difficult to have a strong economy without a healthy environment, clean water, quality habitat, and plenty of open space. For the economy of Monroe County to remain strong, environmental stewardship will need to remain an important part of everyday decisions (land use, transportation, economic, health care, budget) among all sectors (government, business community, residents, visitors). This study provides ROE data identifying the value of natural areas and open spaces to help address their significance in decision-making processes.

The County and its partners have already established programs and policies that have helped achieve the shared vision of preserving natural resources while supporting the local economy. ROE information can provide additional support for decisions under existing programs and supplement actions through new initiatives. Figure 21 provides initial suggestions for ROE use opportunities identified during Steering Committee workshops to help achieve the adopted vision.

FIGURE 21 // WAYS TO USE ROE TO PRESERVE NATURAL RESOURCES AND ENSURE A SUSTAINABLE ECONOMY

- // Use ROE information and resources to help synchronize land use, natural resources, and economic development planning policies to achieve sustainable planning goals.
 - o Current policies in Monroe 2030 include a Future Land Use Plan (Map 4), The WHERE of Economic Development (p.79), an Areas of Interest for Preservation Map (incorporated from the Open Space, Greenways & Recreation Plan) and related policies that establish guidelines to help achieve the County's vision. ROE information and tools can be used to help incorporate, support, or refine these policies to ensure they provide the necessary guidance to achieve the County vision.
 - o Municipalities and regional planning organizations can also employ the same recommendation during updates to their planning documents.
- // Evaluate opportunities to use ROE to obtain funding and support to help achieve adopted policies.
 - o ROE information can be used to evaluate opportunities to renew or refine the County's Financial Assistance Program using data that: 1) demonstrates the return on investments; and 2) can help define objectives to achieve the County's vision.
 - o Data and tools describing ROE values can be used by partners involved in requesting or evaluating applications by providing site information and related data that is required as part of most grant applications.
 - o ROE information can be used to help prioritize areas to protect or conserve.
- // Incorporate ROE into processes and guidelines that inform land use and development decisions by:
 - o Including the information and tools into development review processes (Act 247, 537, 167).
 - o Promoting use of information by municipalities in site designs through model ordinance or technical support initiatives.
 - o Encouraging municipalities to pass conservation-oriented ordinances, including native plant and conservation subdivision design ordinances.
 - o Using ROE information as part of community revitalization or public services planning initiatives.
- // Encourage regional planning partners (e.g., recreation, economic development, water resources, transit, healthcare, utility service providers, etc.) to promote and use ROE information and tools in decisions to help achieve the County's vision, increase awareness of opportunities to obtain or support services, or help reinforce the values or benefits that natural areas and open space provide to the community and its shared vision.

- // Promote community-wide conservation stewardship as part of collaboration and public outreach efforts. Employ ROE Study products (Monroe County ROE report, video, Green Ribbon Landscape map, fact sheet) to jump start a campaign to increase awareness of resources, their impact on the local economy, and benefits to individual property owners and the community.
- // Establish a public conservation portal: Using available technology, build a conveniently accessible online public portal or hub that visitors can use to locate information and tools (many referenced in this report) that achieve the conservation and sustainable planning objectives to help achieve the County's vision.
 - o Use the portal as a clearinghouse for public outreach by including descriptions of programs, resources, and techniques that all stakeholders (public or private) can use to achieve conservation objectives and collectively contribute to ROE strategies.
 - o Include decision-support resources into the portal so that users can conveniently access the tools to help make informed decisions. Consider including many of the tools discussed in this report, including but not limited to:
 - Monroe 2030 and referenced documents, including direct links to:
 - Future Land Use Plan (Map 4)
 - The WHERE of Economic Development (p.79)
 - Areas of Interest for Preservation Map
 - The Plan for Clean Water and mapping
 - Conservation Opportunity Area Tool
 - ROE Report and mapping links
- // Continue working closely with regional planning partners by using ROE information and tools to assist them with their programs. Explore ways that ROE can be used during periodic discussions on identified regional implementation strategies to assist with programs and help ensure that actions are collectively achieving shared visions as efficiently as possible.
- // Apply universal guidelines to promote using ROE information, including:
 - o Restore riparian forests to protect water quality at its source in headwaters, wetlands, and along riparian areas.
 - o Protect and expand large forests (especially over 150 acres), connect riparian forests to large upland forests, and maintain and restore tree-canopy cover (Green Ribbon Landscape).
 - o Remove invasive plants by minimizing disturbances (edges, clearings) in natural areas.
 - o Remove obsolete dams to improve water quality and aquatic habitats.
 - o Minimize impermeable surfaces and limit turf grass to areas essential for recreation and landscape access.
 - o Practice good stewardship and incentivize the use of native plants in the landscape surrounding parks, preserves, riparian areas, and trails.

Acknowledgments

This ROE Study was guided by a Steering Committee that attended multiple workshops over the course of several months. Valuable feedback was also provided by participants at focus group meetings.

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References

- 1 Monroe County Economic Scorecard 2019. East Stroudsburg University Economic Outlook. East Stroudsburg University. 2019. https://issuu.com/esupublications/docs/economic_outlook_scorecard_-_final_single_pages_12
- 2 Climate Change Adaptation and Mitigation Plan. Pennsylvania Department of Conservation and Natural Resources. 2018.
- 3 Homefacts. <https://www.homefacts.com/city/Pennsylvania/Monroe-County/Stroudsburg.html#enviroHazards>, last updated 2021.
- 4 Air Quality Index Reports, Pa. Department of Environmental Quality (DEP). Updated February 2022. <https://www.dep.pa.gov/Business/Air/BAQ/MonitoringTopics/AirQualityIndex/Pages/default.aspx>
- 5 AIRNOW, U.S. Environmental Protection Agency (EPA). Updated February 2022. <https://www.airnow.gov/?city=Stroudsburg&state=PA&country=USA>
- 6 PENNSYLVANIA STATEWIDE COMPREHENSIVE OUTDOOR RECREATION PLAN, 2020-2024, Pa. DCNR, 2021.
- 7 Access to Pennsylvania's Outdoor Recreation Areas, Methods and Key Findings by The Trust for Public Land, The Trust for Public Land. 2020. [elibrary.dcnr.pa.gov/GetDocument?docid=1750650&DocName=PASCORP_TPL_FinalReport.pdf](https://www.elibrary.dcnr.pa.gov/GetDocument?docid=1750650&DocName=PASCORP_TPL_FinalReport.pdf)
- 8 2019 Community Health Needs Assessment Health Profile, Lehigh Valley Hospital-Pocono, Lehigh Valley Health Network. 2020. https://www.lvhn.org/sites/default/files/2019-04/N06055_CHNA_MonroeCounty_FINAL.pdf
- 9 Climate Change Adaptation and Mitigation Plan. Pennsylvania Department of Conservation and Natural Resources. 2018.
- 10 Monroe 2020, Monroe County Comprehensive Plan. Monroe County Planning Commission. 1999.
- 11 Staff interview. Monroe County Planning Commission. 2021.
- 12 Looker, Rachel. Counties shape economy in Pocono region. County News. National Association of Counties (NACO). 2019. <https://www.naco.org/articles/counties-shape-economy-pocono-region>
- 13 Beers, J. 2019. City of Lebanon Authority, personal communication.
- 14 Henderson, K. Director of Economic Development, Carbon Chamber and Economic Development Corporation. 2018.
- 15 Bisbing, M., Director of Marketing, Pocono Mountain Economic Development Corporation. 2022.
- 16 2014 Monroe County Open Space, Greenway & Recreation Plan, Monroe County Planning Commission. 2014.
- 17 U.S. Department of Agriculture, National Agricultural Statistical Service. 2017.
- 18 Draft 2022 Pennsylvania Integrated Water Quality Report. Pennsylvanian Department of Environmental Protection. 2022. <https://storymaps.arcgis.com/stories/b9746eec807f48d99dec3a583eede12>
- 19 2015 Water Quality Study, Monroe County Planning Commission, 2015WQStudyReport.pdf (monroecountypa.gov).
- 20 Monroe County Water Quality Study, Monroe County Planning Commission and Monroe County Conservation District. 2020.
- 21 Conservation Planning Report for Monroe County, Pennsylvania Department of Conservation and Natural Resources. 2021.
- 22 Our Pocono Waters. Group collaboration working with PennFuture. <https://www.pennfuture.org/ourpoconowaters>. 2022.
- 23 Pocono Source Water Collaborative, https://sourcewaterpa-rchive.prwa.com/index.html%3Fpage_id=3626.html
- 24 Plan for Clean Water, A MUNICIPAL GUIDE TO PROTECTING LAND THAT PROTECTS WATER. 2019. <https://brodheadwatershed.org/plan-for-clean-water/>
- 25 Petal, Sandra L. and Barton H. Thompson. 2005. Watershed protection capturing the benefits of nature's water supply service. Natural Resource Forum: Issue 29, pp. 98-108.
- 26 Plan for Clean Water, A MUNICIPAL GUIDE TO PROTECTING LAND THAT PROTECTS WATER, Technical Report 1. 2019. <https://brodheadwatershed.org/plan-for-clean-water/>
- 27 iTree. USDA Forest Service. 2021.
- 28 Laurie Greenrich.2017. Hawk Mountain Director of Long-Term Monitoring.
- 29 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.
- 30 2019 Land Cover Data Sheet for Monroe County, Pa. Multi Resolution Land Characteristics Consortium (MRLC). <https://www.mrlc.gov/eva/report.html?sn=Pennsylvania&r=Monroe%20County&rt=County&geoid=42089&ys=2001&ye=2019&ext=-8956057,3826824,-8823387,3923896&hr=false>
- 31 Conservation Planning Report (Monroe County). Pennsylvania Department of Conservation and Natural Resources. 2021.
- 32 Tallamy, D., (2007). Bringing Nature Home. Algonquin Books.
- 33 A Natural Areas Inventory of Monroe County, Pennsylvania. The Nature Conservancy. 1991.
- 34 2015-2025 Pennsylvania Wildlife Action Plan, Pa. Game Commission, <https://www.pgc.pa.gov/Wildlife/WildlifeActionPlan/Pages/default.aspx#.VyEEpWTD99A>. 2022.
- 35 Conservation Opportunity Area Tool. PA. Game Commission and Fish & Boat Commission. <https://wildlifeactionmap.pa.gov/>
- 36 Rosenberg, KV et al. 2019. Decline of the North American Avifauna. Science 366: 120-124.
- 37 Pennsylvania's Important Bird Area Program. Audubon Mid-Atlantic. Pennsylvania's Important Bird Area Program | Audubon Pennsylvania.
- 38 Climate Change Adaptation and Mitigation Plan. Pennsylvania Department of Conservation and Natural Resources. 2018.
- 39 Upper Lehigh Cluster - Delaware River Watershed Initiative. <https://4states1source.org/our-work/upper-lehigh-3/>. Last updated 2022.
- 40 Poconos-Kittatinny Cluster - Delaware River Watershed Initiative. <https://4states1source.org/our-work/poconos-kittatinny-3/>. Last updated 2022.
- 41 JOBSeq. Economic Overview, Monroe County, Pennsylvania. Chmura Economics & Analytics. <https://www.pmedc.com/wp-content/uploads/2021/04/Economic-Overview-Monroe-County-Pennsylvania-April-13-2021.pdf>. 2021.
- 42 FUTURELV: REGIONAL COMPREHENSIVE PLAN UPDATE & ONE LEHIGH VALLEY SUSTAINABILITY PLAN. Lehigh Valley Planning Commission. 2021. <https://lvpc.org/comprehensive-plan.html>
- 43 Landscapes3. Comprehensive Plan Update. Chester County Planning Commission. 2018. <https://chescoplanning.org/Landscapes3/0-Vision.cfm>
- 44 Monroe County Return on Environment Impact Analysis. 4ward Planning. 2021.
- 45 U.S. Department of Health and Human Services, Centers for Medicare and Medicaid Services [USDHHS CMS]. 2018. National Health Expenditure Accounts-Historical. Washington, DC. <https://www.cms.gov/Research-StatisticsData-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.html>. (1 July 2018).
- 46 Igniting research for outdoor recreation: linking science, policy, and action, Gen. Tech. Rep. PNW-GTR-987. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 2020. <https://www.fs.usda.gov/treearch/pubs/59715>
- 47 Ibid, Chapter 6.
- 48 Thompson Coon, J.; Boddy, K.; Stein, K. [et al.]. 2011. Does participating in physical activity in outdoor natural environments have a greater effect on physical and mental well-being than physical activity indoors? A systematic review. Environmental Science and Technology. 45(5): 1761-1772.
- 49 Get Out for Wellness, Lehigh Valley Health Network, <https://www.lvhn.org/get-out-wellness>. 2022.
- 50 WellNOW, St. Luke's University Health Network, <https://www.slhn.org/wellnow/physical-activity>. 2022.
- 51 Louv, R. 2011. The Nature Principle. Algonquin Press, Chapel Hill, North Carolina.
- 52 Lion Poll, Center for Survey Research (CSR) at Penn State Harrisburg. 2019.
- 53 National Recreation and Parks Association Survey. National Recreation and Parks Association. 2020.
- 54 PENNSYLVANIA STATEWIDE COMPREHENSIVE OUTDOOR RECREATION PLAN. 2020-2024, Pa. DCNR. 2021.
- 55 2019 Community Health Needs Assessment Health Profile Lehigh Valley Hospital-Pocono, Lehigh Valley Health Network. 2020.
- 56 Eastern Monroe Active Transportation Plan. Monroe County Planning Commission. EM_ATP_Final_Web_11_20 (1).pdf (monroecountypa.gov). 2020.
- 57 Water Quality Affects Property Prices: A Case Study of Selected Maine Lakes. Holly Michael, Kevin Boyle, and Roy Bouchard. Maine Agricultural and Forest Experiment Station Misc. Report 398, Feb 1996, Univ. of Maine.

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