Economic Impact Analysis of Outdoor Recreation in Warren County

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Final Report

UC ECONOMICS CENTER
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Executive Summary

Outdoor recreation refers to leisure activities undertaken in publicly accessible outdoor settings, including parks, trails, and natural areas. These activities include hiking, fishing, boating, outdoor sports, and the enjoyment of open green spaces. In Warren County, this study focuses on publicly owned parks, trails, natural areas, and selected nonprofit recreation facilities. The analysis excludes Kings Island, which is a commercial entertainment attraction, and the Warren County Sports Park, which primarily serves tournament and event activities rather than everyday community outdoor recreation.

Warren County's outdoor recreation areas play an important role in supporting quality of life, economic vitality, and community well-being. This study evaluates approximately 12,475 acres of outdoor recreation land and 124 miles of trails across the County. The outdoor recreation area inventory consists primarily of city, village, township, and county park district sites, along with one state park, one World Heritage Site, and a small number of publicly owned golf courses and nonprofit recreation facilities.

The Economics Center conducted this study to quantify the economic, fiscal, environmental, and community benefits generated by these assets. The analysis integrates local data with established national research and modeling frameworks. All results are expressed in 2024 dollars.

Across all components analyzed in this study, outdoor recreation areas in Warren County generated an estimated $96.4 million in total economic output in 2024. This aggregate impact reflects the combined contributions of out-of-county visitor spending, outdoor recreation businesses, and operations and capital expenditures.

Economic Impact

Outdoor recreation areas in Warren County generate substantial economic value across the regional economy. In 2024, outdoor recreation areas produced approximately a total of $96.4 million in economic output, supported 1,153 jobs, generated $38.4 million in wages, and contributed $5.1 million in fiscal revenue. These impacts reflect the combined contributions of out-of-county visitor spending, outdoor recreation businesses, and annual operations and capital investments. Table 1 summarizes these economic impacts across all three components.

Table 1: Economic Impacts of Outdoor Recreation in Warren County (2024$)

Impact Category	Economic Output	Jobs Supported	Wages	Fiscal Impact
Out-of-County Visitors	$33.1 million	295	$10.9 million	$1.5 million
Outdoor Recreation Businesses	$37.0 million	230	$9.9 million	$2.8 million
Operations and Capital Expenditures	$26.3 million	628	$17.6 million	$0.8 million
Total	**$96.4 million**	**1,153**	**$38.4 million**	**$5.1 million**

Sources: Economics Center analysis.

Outdoor recreation areas generate these impacts through three major channels.

Out-of-county visitors bring new spending into the local economy. In 2024, visitors from outside Warren County made approximately 2.8 million trips to outdoor recreation areas. After adjusting for economic leakage, their spending generated $33.1 million in economic output, supported 295 full-time equivalent jobs, and produced $10.9 million in wages. Visitor activity also generated approximately $1.5 million in fiscal revenue through income, lodging, and sales taxes.

Outdoor recreation-related businesses extend the economic reach of the County's recreation amenities. In 2024, nineteen businesses across nine industries generated $24.5 million in direct sales and $12.5 million in indirect sales through supplier and household spending. These firms supported 230 jobs, produced approximately $9.9 million in wages, and contributed $2.8 million in tax revenues to local and state jurisdictions.

Annual operations and capital investments by local park and recreation entities also play a key role. In 2024, these expenditures generated $26.3 million in economic output, supported 628 full-time equivalent jobs, and produced approximately $17.6 million in wages. They also resulted in $831,081 in fiscal revenue through local and state income and sales taxes.

Outdoor Recreation Population

Based on service-area proximity and national participation patterns, approximately 98,352 Warren County residents are estimated to regularly engage in outdoor recreation. This reflects the population living within convenient access to outdoor recreation areas and trails and aligns with the County's strong outdoor amenities, household income levels, and family-oriented demographics.

Health and Environmental Cost Savings

Outdoor recreation areas in Warren County generate substantial annual savings by improving community health and reducing environmental management costs. In 2024, these combined benefits totaled $166.1 million, reflecting both reduced health care expenditures and avoided stormwater management costs. Table 2 presents the distribution of these annual savings across physical health, mental health, and stormwater runoff reduction.

Table 2: Annual Health and Environmental Cost Savings (2024$)

Benefit Category	Annual Value
Physical Health Care Savings	$5.5 million
Mental Health Care Savings	$1.1 million
Stormwater Runoff Reduction	$159.5 million
Total Annual Savings	**$166.1 million**

Sources: Economics Center analysis.

Regular use of outdoor recreation areas supports physical activity and improved mental health. These benefits reduce preventable medical costs and ease demand on local service agencies including the Mental Health Recovery Board, the Warren County Health District, the Warren County Department of Human Services, and Warren County Community Services. Outdoor recreation is estimated to generate approximately $6.6 million in annual health care cost savings, including $5.5 million from improved physical health and $1.1 million from reduced depression prevalence.

Outdoor recreation lands also help manage stormwater by capturing and absorbing runoff that would otherwise require treatment or infrastructure. These areas in Warren County absorb more than 1.8 billion cubic feet of stormwater annually, representing $159.5 million in avoided stormwater management costs. This natural function reduces the burden on public infrastructure and helps protect local waterways.

Property Value and Tax Revenue Increases

Outdoor recreation areas in Warren County generate substantial residential property value gains and recurring tax benefits. Parcels located within one mile of parks and outdoor recreation areas receive an estimated $854.8 million increase in market value, resulting in approximately $17.0 million in additional annual property tax revenue for local jurisdictions. Table 3 summarizes these enhanced property values and associated tax revenues.

Table 3: Property Value and Tax Revenue Increases (2024$)

Category	Enhanced Property Value	Enhanced Annual Tax Revenue
Vacant Land	$10.2 million	$0.3 million
Single-Family	$782.3 million	$15.5 million
Multi-Family	$62.2 million	$1.2 million
Total[1]	**$854.8 million**	**$17.0 million**

Sources: Economics Center analysis.

Proximity to outdoor recreation enhances neighborhood desirability, supports higher home values, and strengthens the local tax base. These increases represent ongoing fiscal benefits to schools, municipalities, and county services. The results highlight the long-term value of maintaining and expanding high-quality outdoor recreation amenities throughout Warren County.

Summary

Outdoor recreation areas in Warren County are critical components of the County's economic, environmental, and social infrastructure. These spaces support more than one thousand jobs, generate millions in public revenue, improve resident health, protect environmental quality, and enhance the County's long-term fiscal resilience. Continued investment in outdoor recreation will reinforce Warren County's position as a vibrant, healthy, and desirable place to live, work, and visit.

[1] Totals may not equal the sum of individual categories due to rounding.

Introduction

Outdoor recreation areas play a vital role in supporting local economies, health, and the environment. In Warren County, the park and recreation system is an essential public asset that contributes to community identity, environmental stewardship, and overall quality of life. Managed by the Warren County Park District and supported by other local park and recreation entities, the system includes natural areas, athletic fields, trails, playgrounds, and open spaces that serve residents and attract visitors.

This report provides a comprehensive assessment of the public value generated by outdoor recreation areas in Warren County. It measures how these amenities contribute to economic activity, reduce public costs, and improve the quality of life. The analysis evaluates impacts across key areas, including local park and recreation expenditures, out-of-county visitor spending, recreation-related businesses, health care cost savings, environmental benefits, and property value premiums linked to park proximity. The findings will help local leaders and partners better understand the County's return on investment in outdoor recreation.

For the purposes of this study, outdoor recreation focuses on publicly accessible, non-commercial outdoor amenities in Warren County. The analysis includes publicly owned parks, trails, natural areas, and selected nonprofit recreation facilities, and excludes large commercial entertainment attractions and tournament-oriented sports venues. This scope is applied consistently throughout the report.

Study Area

This study examines the outdoor recreation areas located within Warren County, as shown in Figure 1. The study area includes approximately 12,475 acres of outdoor recreation land and 124 miles of trails distributed across the county.

The outdoor recreation land represents a diverse set of sites owned and managed by local governments and nonprofit organizations, supporting many different outdoor activities and experiences. Key recreation assets within the study area include Fort Ancient Earthworks, a UNESCO World Heritage Site; Caesar Creek State Park; eight regional parks; two golf facilities designated as special recreation areas; and numerous community parks that primarily serve nearby neighborhoods.

Two cross-county parks extend beyond Warren County's boundaries. Caesar Creek State Park has 7,684 acres within Warren County, including 2,627 acres of lake area, and continues into Clinton County. Twin Creek MetroPark, which spans into Butler County, contains 449 acres within Warren County. This analysis includes only the acreage located inside Warren County's boundaries.

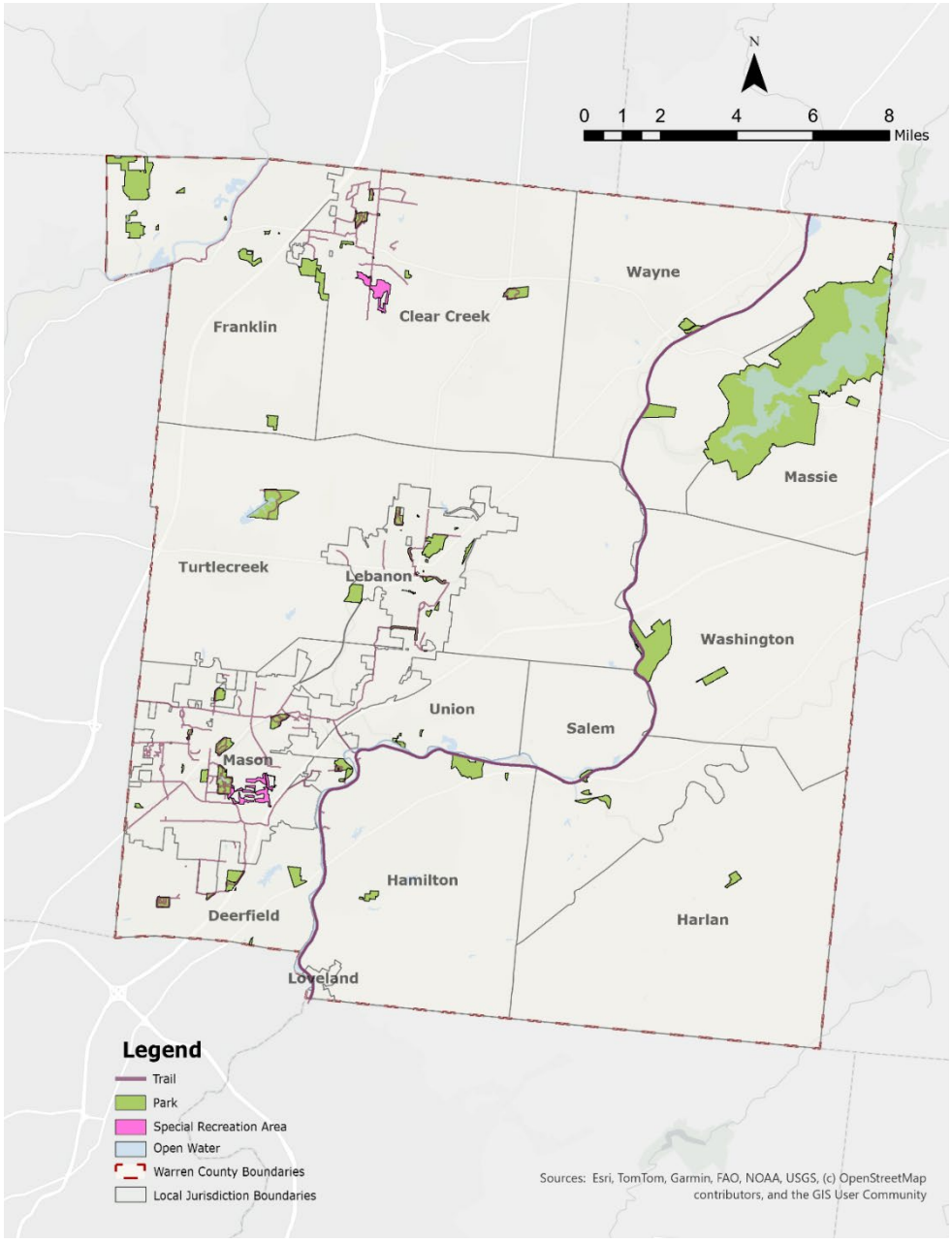
Warren County also maintains an extensive trail network that supports walking, running, and bicycling. The system includes local multi-use paths, shared-use road connections, bike lanes, and regional trail corridors that link parks, neighborhoods, and commercial areas. The Little Miami Scenic Trail serves as the County's primary regional trail spine. It is one of the longest multi-use trails in the Miami Valley and Ohio and provides direct connections to parks, riverfront areas, and communities throughout the region. Other major trail corridors include segments of the Great Miami River Trail, and the Lebanon-Turtle Creek Trails Initiative, which is a connected trail system linking the City of Lebanon, Turtle Creek Township, and the Little Miami Scenic Trail. Additional trail networks in the City of Mason, Springboro, and other townships provide local access and connections to these larger regional routes.

Report Structure

This report includes eight main sections that evaluate the public value of outdoor recreation in Warren County. The Literature Review summarizes national, state, and local research on the economic, health, and environmental benefits of outdoor recreation. The Methodology section describes the data sources and analytical models used in this study. Subsequent sections present the results of the Economic

Impact Analysis, including visitor spending, outdoor recreation businesses, operations, and capital investments. Additional sections assess the Outdoor Recreation Population, Health Care Cost Savings, Stormwater Runoff Reduction, and Property Market Benefits. The report concludes with a summary of key findings that highlight the economic, environmental, and community value of outdoor recreation in Warren County.

Figure 1: Warren County Park and Outdoor Recreation Areas



Sources: Warren County Park District and local parks and recreation entities; map prepared by the Economics Center.

Literature Review

Public outdoor recreation areas provide opportunities that generate economic, health, and environmental benefits for both residents and visitors. In recent years, these benefits have become a central focus of public policy, land use planning, and community development across the United States. This section summarizes findings from recent studies at the national, state, regional, and local levels. Organized by benefit category, the review illustrates how investments in outdoor recreation amenities, including parks, trails, waterways, bike paths, and nature preserves, support a wide range of activities and contribute to stronger, healthier communities.

Visitor Spending

Visitor spending is a driver of economic impact associated with outdoor recreation. Spending is typically divided between local and non-local visitors, with non-local visitors bringing new money into the local economy. Activities such as boating, kayaking, fishing, and cycling often generate additional spending through equipment rentals, fuel purchases, and trail-related services such as bike maintenance or café stops near popular routes.

In national parks, average per-party spending ranged from $45 for local day-trippers to more than $500 for guests staying at in-park lodges.[2] A similar pattern appears at the state level. In 2023, Virginia State Parks generated $188.9 million in visitor spending, with overnight guests spending substantially more per day than local visitors.[3]

Local evidence shows that trail users and paddlers often spend on dining, supplies, and transportation before or after their activities, creating cumulative effects similar to other recreation spending patterns. In Dodge County, visitors to parks and the Wild Goose State Trail contributed to more than $8.0 million in local business activity in 2023, particularly benefiting dining, retail, and lodging establishments.[4] In New York City, recreational users generate an estimated $681.0 million in annual household spending on sports and recreation equipment, including $113.0 million on bicycles and related gear.[5] In Toledo, new mountain bike trails led to increased local bike shop sales as riders purchased gear, used repair services, and visited nearby restaurants.[6] Similarly, Plano, Texas' trail system supports steady recreation spending, with residents purchasing $32.7 million in sports and recreation equipment annually and an average of $53.5 per household spent on bicycles.[7]

Visitor spending at regional parks is typically higher than spending at smaller community parks. National and state data show that visitors to large destinations, such as state parks, regional parks, and trail systems, spend more per trip because these sites support activities that generate additional purchases, including dining, fuel, supplies, lodging, and recreation-related equipment. For example, spending at Virginia State Parks ranges from $17.7 for local visitors to $69.3 for non-resident visitors.[3] These patterns are consistent with regional park use in Warren County, where trails, water recreation areas, and large natural sites attract visitors who often make purchases related to food, fuel, rentals, or gear before or after their visit. This distinction is reflected in the economic activity analysis, which applies higher spending assumptions for regional park visitors to accurately estimate their contribution to Warren County's economy.

[2] (Cullinane Thomas, Koontz, and Cornachione 2024)
[3] (Virginia Tech 2023)
[4] (Dodge County 2024)
[5] (Trust for Public Land 2022)
[6] (Trust for Public Land 2019)
[7] (Trust for Public Land 2017)

Outdoor Recreation Business Economic Impacts

The outdoor recreation economy represents a substantial and expanding sector of the U.S. economy, generating $1.2 trillion in total gross output and supporting 5.0 million jobs nationwide in 2023. It accounted for 2.3 percent of the national gross domestic product (GDP) and 3.1 percent of total employment. The sector demonstrated strong growth between 2022 and 2023, with real GDP increasing 3.6 percent compared to 2.9 percent for the overall U.S. economy, and employment rising 3.3 percent compared to 1.8 percent across all industries.[8]

This sector includes a wide range of occupations across multiple industries, from guides and outfitters to retail and customer service, manufacturing, and business operations. Multiple studies confirm that outdoor recreation contributes meaningfully to local economic activity and employment. For example, North Carolina welcomed White River Marine Group to Craven County for a boat manufacturing facility supporting 500 jobs. Michigan helped recruit Carhartt, a manufacturer of premium workwear and outdoor apparel, in an expansion expected to create 125 jobs with $4.7 million in capital investment.[9] In Plano, Texas, residents spend $32.7 million annually on sports, recreation, and exercise equipment, which, along with related purchases, supports fifty-four sporting goods stores generating $109 million in annual sales and providing 605 jobs.[10] In Lucas County, Ohio, Metroparks Toledo strengthens a regional recreation economy that includes twenty-two sporting goods stores supporting 80 jobs and $18.0 million in sales, with new mountain bike trails increasing local bike shop sales by at least 20.0 percent.[11] In New York City, the recreation industry generates more than $600 million annually, supporting 4,366 employees across 479 sporting goods businesses as of 2019.[12]

These findings demonstrate that thriving outdoor amenities drive demand for recreation gear, sporting goods, and related services across a range of urban contexts. In communities with extensive trail systems and access to lakes and rivers, water-sport outfitters and bicycle retailers represent particularly strong sub-sectors of the recreation economy.

In 2023, Ohio's outdoor recreation economy generated $19.3 billion in value added, ranking seventh nationally in total contribution. The sector supported 147,986 jobs and $8.0 billion in compensation, ranking eighth in employment and tenth in earnings. Outdoor recreation accounted for 1.9 percent of Ohio's gross domestic product (GDP), slightly below the national average of 2.3 percent. [13] The highest-value activities were boating and fishing ($1.15 billion), recreational vehicle travel ($843.0 million), hunting, shooting, and trapping ($613.0 million), and motorcycling and all-terrain vehicle recreation ($512.0 million). Although Ohio ranked forty-second nationally in growth rate, 6.5 percent value-added growth compared to the 9.0 percent national average, outdoor recreation continues to generate wider economic benefits by improving quality of life and strengthening regional competitiveness for business investment and workforce attraction. [14]

Operations and Capital Impacts

Operations and capital investments in park systems generate important economic activity at the local, regional, and national levels. The Economics Center reviewed the economic benefits associated with the Warren County outdoor recreation system, including employment, visitor spending, and business

[8] (U.S. Bureau of Economic Analysis 2024)
[9] (Outdoor Recreation Roundtable 2024)
[10] (Trust for Public Land 2017)
[11] (Trust for Public Land 2019)
[12] (Trust for Public Land 2022)
[13] (U.S. Bureau of Economic Analysis 2024)
[14] (Outdoor Recreation Roundtable 2024)

activity. These impacts are typically measured using economic modeling tools such as input-output models.

Employment

Outdoor recreation supports employment across multiple sectors of the economy. Jobs in this area include direct positions such as park staff, guides, and specialized roles related to water recreation and trail maintenance; indirect positions such as suppliers and vendors; and induced jobs supported by the household spending of those directly and indirectly employed. Although outdoor recreation is not a primary source of employment, it contributes significantly to local job creation and workforce stability.

At the national level, outdoor recreation supported between 5.0 million and 7.6 million jobs, reflecting this full range of employment effects.[15] In Ohio, the sector accounted for 147,986 jobs in 2023, representing 2.6 percent of the state's total employment.[16]

To capture the full employment impact, studies often use employment multipliers, which measure how many additional jobs are created in the broader economy for each direct job in outdoor recreation. For example, the National Park Service reports a national multiplier of 1.68, meaning each direct park job supports an additional 0.68 jobs elsewhere, while other contexts show values ranging from 1.22 in Mississippi parks to as high as 1.91 for trail-based sports nationally.[17] These findings show that investments in outdoor recreation not only create direct employment, but also support broader job growth throughout local and regional economies.

Health Care Benefits for Residents

In addition to the economic benefits, parks and outdoor spaces support both physical and mental health, contributing to long-term community well-being. From an economic perspective, Economics Center reviewed studies on the health impacts of increased outdoor activity, with a focus on potential health care cost savings for participants.

Physical Health Impacts and Cost Savings

Outdoor recreation supports physical activity, which helps prevent chronic conditions such as heart disease, stroke, diabetes, and hypertension. Water-based recreation and trail cycling provide moderate-to-vigorous physical activity that supports cardiovascular health and muscle endurance. These outcomes highlight the role of outdoor recreation areas in promoting preventive health. Several local governments have formally recognized this connection by incorporating park systems into public health strategies. For example, Virginia State Parks promote physical activity through trail access and youth wellness programs.[18] In Mesa County, Colorado, outdoor recreation serves as a key component of public health planning.[19] Dodge County, Wisconsin also promotes park use as a way to encourage healthy behaviors.[20]

Wilson and Xiao (2023) applied a novel ecohealth framework to estimate that a 1.2-acre park generated CAD$109,877 in annual Health care savings from physical activity. Their study linked small-scale urban greening to reduced incidence of chronic diseases.

[15] (State Outdoor Business Alliance Network 2024)
[16] (U.S. Bureau of Economic Analysis 2024)
[17] (University of Northern Iowa 2011; Choi and Jeon 2021; Outdoor Industry Association 2012; Cullinane Thomas, Koontz, and Cornachione 2024).
[18] (Virginia Tech 2023)
[19] (Colorado Mesa University 2022)
[20] (Dodge County 2024)

The Trust for Public Land calculates savings by applying a national average savings rate (1.0%-3.0%) to average health care costs, a method grounded in peer-reviewed research.[21] A foundational study by Pratt, Macera, and Wang (2000) found that physically active adults incur $330 less in annual health care costs than inactive adults. More recent studies provide updated and region-specific insights. For example, Van Den Eeden et al. (2022) found that people in greener neighborhoods had $374 lower annual health care costs, largely due to reduced hospitalizations and emergency visits. Ding et al. (2016) estimated that inactivity accounts for 1.0 percent to 3.0 percent of total health care costs in high-income countries.

Current benchmarks from Milliman (2024) indicate that annual health care spending averages $7,151 for adults ages 18 to 64 and $12,000 to $13,000 for those 65 and older. Applying a 1.0 to 3.0 percent savings rate yields annual savings of $72 to $215 per adult ages 18 to 64 and $120 to $390 per adult ages 65 and older. These estimates account for physical health conditions linked to inactivity, including cardiovascular disease, diabetes, and certain cancers.

Mental Health Impacts and Cost Savings

Increased outdoor activity also supports improved mental health. At the national level, approximately 23.0 percent of adults experience mental health issues annually, with treatment costs averaging $1,080 per person per year in the United States.[22] In Ohio, 24.5 percent of adults report mental health challenges each year.[23] Notably, approximately 22.0 percent of Ohio adults have been formally diagnosed with depression by a health care provider, a rate higher than the national average.[24]

The Outdoor Industry Association describes outdoor activities as essential for emotional resilience and coping with social isolation.[25] Access to natural environments provides emotional and psychological benefits that support overall mental well-being. The National Recreation and Park Association reports that outdoor recreation areas help reduce anxiety and depression, particularly among older adults and individuals experiencing chronic stress.[26]

Recent studies have quantified the mental health benefits of outdoor recreation. Shanahan et al. (2016) found that spending at least 30 minutes per week in parks could reduce the prevalence of depression by 7.0 percent. This finding supports estimates of health care savings linked to expanded park access and use.

Wilson and Xiao (2023) estimated CAD$23,084 in annual health care savings from mental health improvements associated with a small urban park. Their findings align with evidence from Van Den Eeden et al. (2022), who reported that green cover reduces health care spending. These effects persisted even after accounting for socioeconomic and health-related variables.

Environmental Benefits

Outdoor recreation spaces also provide environmental benefits by preserving ecosystems, improving air and water quality, and enhancing community resilience to climate change. Trails, parks, and green infrastructure often intersect with sensitive habitats and support long-term environmental stewardship. The following sections summarize research findings related to conservation, pollution reduction, and climate adaptation.

[21] (Trust for Public Land 2019)
[22] (Tebra 2024)
[23] (Mental Health America 2024)
[24] (Health Policy Institute of Ohio 2023)
[25] (Outdoor Industry Association 2017)
[26] (NRPA 2023)

Stormwater Runoff Reduction

Outdoor recreation spaces support stormwater management by reducing impervious surface coverage and promoting natural infiltration. Trees, native vegetation, and permeable surfaces in parks help capture and filter rainwater, decreasing both runoff volume and pollutant load.

Studies by the Trust for Public Land have provided quantitative evidence of these benefits. In Toledo, the Metroparks system reduces stormwater runoff by 116.0 million cubic feet each year, which is valued at $5.5 million in avoided stormwater infrastructure costs.[27] In New York City, parks reduce runoff by 4.5 billion gallons annually, avoiding $9.0 million in wastewater treatment costs and up to $2.4 billion in avoided green infrastructure construction.[28]

Air Quality

Green infrastructures and natural areas help improve air quality by reducing vehicle use and increasing vegetation that filters pollutants. In Wisconsin, researchers estimated that replacing 20.0 percent of short car trips in Milwaukee and Madison with bicycle trips would reduce annual concentrations of fine particulate matter (PM2.5) by 0.3 micrograms per cubic meter. This shift would generate more than $85.8 million in public health benefits, including reductions in mortality, asthma, and other health conditions. Ozone reductions would yield an additional $3.4 million in avoided health impacts.[29]

In New York City, park vegetation improves air quality by removing 278 tons of ground-level ozone and 15.2 tons of PM2.5 each year. These reductions translate into annual health care savings of $6.2 million for ozone, and $20.3 million for PM2.5.[30] In Lucas County, Ohio, Metroparks Toledo removes approximately 411,000 pounds of air pollutants annually, resulting in an estimated $1.5 million in combined Health care and pollution control savings.[31]

Effects on Property Values and Local Tax Base

Investments in outdoor recreation and related infrastructure increase nearby residential property values and contribute to the long-term fiscal health of local governments. A large body of research confirms the existence of a "value premium," in which homes located near parks and natural areas sell at higher prices. These higher values also expand the local property tax base and generate recurring public revenue.

The value premium is most pronounced for homes within walking distance of outdoor recreation areas. Karadeniz (2008) found that each additional foot of distance from the Little Miami Scenic Trail reduced a home's sale price by $7.05. This suggests that homes within 1,000 feet of the trail sold for approximately $9,000 more than similar properties farther away.

Many studies adopt conservative assumptions when modeling these effects. The Trust for Public Land (2019) consistently uses a 5.0 percent premium in its valuations. Some research also indicates that the influence of larger parks extends beyond the immediate area.[32] Studies by Bolitzer and Netusil (2000), Adelaja et al. (2008), and Crompton and Nicholls (2020) found that the value premium from major or

[27] (Trust for Public Land 2019)
[28] (Trust for Public Land 2022)
[29] (University of Wisconsin-Madison 2010)
[30] (Trust for Public Land 2022)
[31] (Trust for Public Land 2019)
[32] In this study, "larger parks" refers to community, regional, or major parks over 40 acres, consistent with common U.S. park classification standards. Such parks serve a wider area, offer destination-level amenities, and attract users from across a city or county.

regional parks can reach distances of up to 1.0 mile, although the effect diminishes to approximately 2.0 percent at that range.

Crompton and Nicholls (2020), in a synthesis of 33 studies, found that homes near larger or passive parks can receive an 8.0 to 10.0 percent premium. The study emphasizes that distance alone cannot fully explain this effect and recommends a more comprehensive approach that considers factors such as accessibility, surrounding natural space, park size and type, views, lot size, and neighborhood characteristics.

Further, higher home values translate into greater property tax revenues. In Plano, Texas, a study by the Trust for Public Land (2017) found that park-related property value increases generated $6.1 million in additional annual tax revenue. These gains benefited multiple jurisdictions, including the city, county, school districts, and a local college. In Lucas County, Ohio, Metroparks Toledo contributed to a $40.8 million increase in residential property values, resulting in $1.1 million in additional annual property tax revenue. [33]

Other Benefits of Outdoor Recreation Areas

Beyond the measurable economic, health, and environmental impacts analyzed in this report, outdoor recreation areas also provide broader social and ecological benefits that are well-documented in existing literature. Parks and open spaces serve as important habitats for wildlife, wetlands, and native vegetation, supporting biodiversity and promoting long-term environmental stewardship. [34] They also strengthen community identity and social connection by offering inclusive public spaces for cultural events, recreation programs, and civic gatherings. In addition, outdoor environments create valuable opportunities for youth education and skill development through nature-based programs, experiential learning, and workforce training initiatives. [35] While these benefits are not quantified in this study due to data limitations or their qualitative nature, they represent essential contributions to community well-being, environmental sustainability, and intergenerational learning.

Summary

The literature confirms that parks and outdoor recreation areas generate wide-ranging public benefits across economic, health, and environmental dimensions. The key findings from existing research show that investments in park operations, capital improvements, and amenities support local employment, stimulate outdoor recreation businesses, enhance nearby property values, and produce recurring fiscal returns. Expanded access to trails, bike paths, and water-based recreation encourages physical activity and improves mental well-being, while outdoor systems contribute to air quality improvements and stormwater management, helping communities reduce public infrastructure costs.

[33] (Trust for Public Land 2019)
[34] (State Outdoor Business Alliance Network 2024; Outdoor Industry Association 2017; Choi and Jeon 2021; Marathon County 2024).
[35] (Youth Outdoor Policy Partnership 2023; YMCA of the USA 2025)

Methodology

This report uses a data-driven analytical framework to evaluate the economic, health, environmental, and property-related impacts of outdoor recreation areas in Warren County. The analysis integrates multiple datasets and modeling techniques to ensure accuracy, transparency, and alignment with established research and planning standards. Each component of the study draws on verified data sources and nationally recognized models to quantify both direct and indirect benefits of the County's outdoor recreation system.

Data Sources

The study draws on a comprehensive mix of local, regional, and national datasets to quantify the economic, health, environmental, and property-related impacts of outdoor recreation areas in Warren County. These data sources provide both localized detail and broader context to ensure the results are accurate, comparable, and aligned with established research and planning practices.

Local Data

Local datasets were central to the analysis. Operations and capital expenditure records, employment counts, and wage data were provided by the Warren County Park District and supplemented with information collected from the financial reports of other local government entities. Financial information for nonprofit recreation and conservation organizations was drawn from IRS Form 990 filings.

Industry-specific multipliers from Lightcast and employment data from the Ohio ES-202 database were applied in the input-output model to estimate total economic impacts from operations, capital investments, visitor spending, and outdoor recreation-related businesses.

Visitor data were sourced from Placer.ai, which provided attendance records for the Warren County Park District by ZIP code. Visitor spending profiles were adapted from the Virginia State Parks Economic Impact Report (2019) to reflect typical expenditures by trip type and duration.

Parcel-level assessed values and property tax data from the Warren County Auditor supported the property market analysis. Geospatial data for outdoor recreation areas were obtained from the Warren County Park District and various Warren County Communities in 2025.

Regional and National Data

Regional and national datasets were incorporated to supplement local information and maintain consistency with recognized standards in economic, health, and environmental impact analysis.

Demographic data were obtained from the 2020 U.S. Census at the block level and the 2023 American Community Survey (ACS) five-year estimates at the tract and county levels. These datasets provided the population counts and demographic characteristics used in the outdoor recreation population analysis.

Recreation participation rates were obtained from the 2024 Participation Trends Report by the Outdoor Foundation and the 2023 Participation Report by the Outdoor Industry Association, which provide the most recent national-level data on outdoor activity by population group, gender, and race.

Health care expenditure benchmarks were drawn from Milliman (2024) and the Mental Health Data Snapshot (2023), with additional parameters informed by peer-reviewed studies by Pratt, Macera, and Wang (2000), Van Den Eeden et al. (2022), and Ding et al. (2016). Together, these sources supported estimates of both physical and mental health care cost savings linked to outdoor recreation.

Environmental valuation data were derived from the U.S. Forest Service's i-Tree Landscape database, which informed the estimation of air quality benefits, and from the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS). The NRCS's Soil Conservation Service (SCS) hydrologic parameters and the Soil Survey Geographic (SSURGO) database provided the foundation for the stormwater management analysis. Combined with the methods outlined in Urban Hydrology for Small Watersheds (Technical Release 55, TR-55), these data supported calculations of stormwater infiltration and avoided infrastructure costs.

Analysis Methodology

This study uses multiple analytical methods to quantify the economic, fiscal, health, environmental, and property market impacts of outdoor recreation areas in Warren County. Each method is selected based on its relevance to the available data and its established application in comparable research. The analyses combine local observations with nationally recognized frameworks to ensure the results are both locally grounded and methodologically robust.

Economic Impact Analysis

Input-output analysis was used to estimate the total economic impact of operations, capital expenditures, visitor spending, and outdoor recreation businesses. Direct impacts represent the initial spending, employment, and wages supported by local park and recreation entities. Indirect impacts capture the broader ripple effects that occur as spending circulates through supplier industries and household expenditures.

Industry-specific multipliers from Lightcast were applied to translate direct impacts into total county-level effects. All dollar figures were adjusted to 2024 dollars using the Consumer Price Index (CPI). This approach measures how each dollar of spending associated with outdoor recreation activities supports additional output, income, and employment within Warren County's economy.

When some expenditure components were unavailable, estimates were derived using the average expenditure shares from entities with complete data, including the Cities of Franklin, Lebanon, and Monroe, and the Warren County Park District. Employment was estimated, when necessary, by dividing total wages by the Park District's 2024 average wage. This ensured that all inputs for the input-output model reflected consistent and locally grounded assumptions.

Fiscal Impact Analysis

The fiscal impact analysis estimates the tax revenues generated by jobs supported through outdoor recreation activities, out-of-county visitor spending, and sales from service-based outdoor recreation businesses.

Income tax revenue was calculated at both the local and state levels using average wages and Ohio's effective income tax rates. Commuting pattern data from Lightcast show that approximately 98.5 percent of supported workers reside in Ohio, and this share was applied to state-level estimates. Local income tax revenue was assigned to jurisdictions within Warren County where the supported jobs are located.

Sales tax revenue was estimated from three taxable spending sources: employee spending generated by supported jobs, out-of-county visitor purchases, and sales from service-based outdoor recreation businesses. All spending totals were adjusted for economic leakage to exclude purchases occurring outside Warren County. The resulting taxable spending and sales were then multiplied by the applicable Warren County and Ohio sales tax rates to estimate total sales tax revenue generated by outdoor recreation activity.

Outdoor Recreation Population Analysis

A spatial analysis was conducted to estimate the number of Warren County residents with convenient access to outdoor recreation areas. The primary service area was defined as residents living within 0.5 mile of a public outdoor recreation area, a distance that represents an average ten-minute walk and is nationally recognized as the benchmark for neighborhood park access.

For larger outdoor recreation areas exceeding 40 acres, the service area was extended to include residents living between 0.5 and 1.0 mile from their boundaries. These larger areas provide extensive natural features and amenities that attract users from beyond nearby neighborhoods. Trail service areas were defined separately. A 0.5-mile buffer was applied to the Little Miami Scenic Trail, while other trails were assigned buffers ranging from 0.1 to 0.25 mile based on their functional characteristics and whether they were off-road or aligned with shared road corridors.

Using a Geographic Information System (GIS), block-level population data from the U.S. Census were spatially joined with the defined service areas to determine the population living within each zone. Recreation participation rates from the Outdoor Industry Association were applied by total population, gender, and race, and the average of these estimates was used as the final participation rate. This produced a demographically informed estimate of residents likely to engage in outdoor recreation within the County.

Health Care Cost Savings Analysis

Physical and mental health cost savings were estimated using established research-based methods to quantify avoided medical expenditures associated with outdoor recreation participation.

For physical health, the analysis applied a method developed by the Trust for Public Land, based on Pratt, Macera, and Wang (2000), which demonstrates that physically active adults incur lower annual health care costs than inactive adults. This approach was updated using findings from Van Den Eeden et al. (2022) and Ding et al. (2016), which estimate that physical inactivity accounts for 1.0 to 3.0 percent of total U.S. health care spending. National cost data from Milliman (2024) were used to calculate savings per person, reflecting the preventive health effects of outdoor activity in reducing chronic conditions such as heart disease, diabetes, and hypertension.

For mental health, the analysis combined prevalence rates with expected improvements linked to time spent outdoors and average treatment costs. Using data from Mental Health America and Shanahan et al. (2016), savings were estimated by applying a 7.0 percent reduction in depression prevalence to the adult outdoor recreation population. These estimates reflect the role of nature exposure in improving emotional well-being and reducing stress-related disorders.

Environmental Benefits Analysis

Environmental benefits were assessed through two complementary models designed to estimate air quality improvements and stormwater management value associated with outdoor recreation areas.

For stormwater runoff, spatial analysis matched land-cover types to their hydrologic soil groups and assigned Curve Numbers (CN) following the Soil Conservation Service (SCS) CN method. Using an annual rainfall depth of 44.1 inches, the avoided runoff volume was valued using an updated benefit rate of $0.09 per cubic foot, adjusted from the i-Tree model's standard value to reflect 2024 dollars. [36] This value represents the avoided costs of runoff treatment and infrastructure. The overall framework

[36] The $0.09 per cubic foot rate reflects an inflation-adjusted estimate based on the i-Tree model's standard benefit value of $0.07, originally benchmarked to 2015–2017 dollars.

follows the methodology used in the Metroparks Toledo Economic Benefits Report and is adapted for Warren County's local conditions and data. [37]

For air quality, the U.S. Forest Service's i-Tree Canopy model was used to estimate annual removal of major pollutants, including ozone (O_3), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), and carbon monoxide (CO). Pollutant-specific removal rates (pounds per acre per year) were applied to Warren County's outdoor recreation land area, and economic values were calculated based on avoided pollution control costs.

Property Market Impact Analysis

Property market effects were evaluated using a spatial hedonic framework to estimate the value premium associated with proximity to outdoor recreation areas in Warren County. The model included residential parcels located within the designated service area buffers surrounding outdoor recreation assets.

Key variables capture how accessibility, neighborhood context, and environmental features influence residential property values. These include distance to the nearest park, property type, lot area, community park coverage. Distance to the nearest park carries the highest weight (35.0%) and reflects the premium associated with convenience and accessibility, with scores declining as distance increases. Property type accounts for 25.0 percent and assigns higher scores to multi-family and condominium units, which tend to derive greater benefit from nearby outdoor recreation areas than single-family homes or vacant parcels. Lot area represents 15.0 percent of the score, with smaller parcels rated higher because they depend more heavily on publicly accessible recreation space. Community park coverage (25.0%) measures scarcity value in neighborhoods with limited outdoor recreation opportunities.

Each variable was weighted to reflect its relative influence on property values, and the resulting scores were combined into a composite index representing overall amenity proximity. The composite index was then converted into a percentage premium using a calibrated linear transformation expressed as:

$$\text{Premium (\%)} = \beta_1 \times \text{Composite Score} + \beta_0$$

where

β_1 is the scaling coefficient, and

β_0 is the local market adjustment factor.

The estimated premiums were applied to parcel-level assessed values and property tax data from the Warren County Auditor to determine the total increase in property value and corresponding tax revenue associated with proximity to outdoor recreation areas.

[37] (Trust for Public Land 2019)

Economic Impact of Out-of-County Visitor Spending

Outdoor recreation areas in Warren County contribute to the local economy through visitor spending, employment, wages, and tax revenue. This section evaluates the economic impact of out-of-county visitors drawn to Warren County's outdoor recreation areas, in addition to the impacts of operations and capital investments made by local park and recreation entities. By quantifying both the direct effects and the broader ripple effects throughout the economy, this analysis provides a comprehensive view of how outdoor recreation supports economic growth in Warren County.

Visitor Origins and Volume

Warren County's recreation areas attract visitors from within the County as well as from surrounding areas, including Hamilton County, the broader Cincinnati Metropolitan Statistical Area (MSA), and regions beyond. The spending of out-of-county visitors represents new money entering the Warren County economy as a direct result of its outdoor recreation amenities. These impacts include not only spending within the outdoor recreation areas but also additional purchases made throughout the County, such as lodging, dining, retail, and transportation services.

Overall, Warren County outdoor recreation areas had approximately 4.5 million visits in 2024. Using Placer.ai data provided by the Warren County Park District, the Economics Center estimated the distribution of visits to outdoor recreation areas by visitor origin.

Table 4 summarizes the distribution of visits of Warren County recreation areas by location of residence. Warren County residents represented approximately 37.8 percent of visits in 2024. Residents from elsewhere in the Cincinnati Metropolitan Statistical Area (MSA) represented 58.3 percent of visits, while residents from elsewhere in the Tri-State Region represented 0.6 percent of visits.[38] Additionally, residents from outside of the region represented 3.3 percent visits in 2024.

Table 4: Warren County Outdoor Recreation Areas Attendance by Location of Residence, FY 2024

Location	Total Visits	Percent of Visits
Warren County	1,709,096	37.8%
Other Cincinnati MSA	2,632,518	58.3%
Tri-State	28,975	0.6%
Non-Resident	148,611	3.3%
Total	**4,519,200**	**100.0%**

Sources: Economics Center analysis of Placer.ai data provided by Warren County Park District.

Visitor Spending and Economic Effects

To estimate visitor spending impacts, the analysis required detailed per-person expenditure profiles that match the types of recreation activities available in Warren County. The Virginia State Parks economic impact report provides detailed spending profiles across multiple visitor types and expenditure categories and is widely used in park economic analyses, as shown in Table 5. This dataset was selected

[38] A Metropolitan Statistical Area (MSA) is an area comprised of different communities with close economic ties to one another. The Cincinnati MSA encompasses five counties in Ohio: Brown, Butler, Clermont, Hamilton, and Warren; seven counties in Kentucky: Boone, Bracken, Campbell, Gallatin, Grant, Kenton, and Pendleton; and three counties in Indiana: Dearborn, Franklin, and Ohio.

as a reference source because it reflects spending patterns for day visitors, overnight guests, and non-resident travelers engaging in activities similar to those available in Warren County.

Table 5: Virginia State Parks Visitor Spending Estimates by Spending Category and Type of Visitor, 2019 (2019$)[39]

Spending Category	Day Visitors			Overnight Visitors	
	Local Day Visitor	Resident Day Visitor	Non-Resident Day Visitor	Resident Camping Guest	Non-Resident Camping Guest
Hotels, motels, cabins and B&B	$0.61	$9.58	$20.59	$1.41	$2.77
Camping fees and charges	$0.15	$1.76	$1.51	$8.20	$10.31
Restaurants and bars	$3.52	$12.95	$12.82	$3.15	$8.47
Groceries and convenience items	$3.80	$8.10	$5.27	$6.80	$5.02
Gas and oil (auto, RV, boat, etc.)	$2.53	$8.35	$8.33	$4.23	$5.22
Transportation expenses (other)	$0.34	$0.75	$2.51	$0.73	$1.97
Clothing	$0.55	$1.06	$1.58	$0.37	$0.51
Sporting goods	$0.94	$0.86	$1.70	$7.45	$1.86
Souvenirs and other expenditures	$5.21	$9.64	$14.96	$2.88	$4.12
Total per visitor	**$17.65**	**$53.05**	**$69.27**	**$35.22**	**$40.25**

Sources: Virginia State Parks Economic Impact Report 2019.

The Virginia spending estimates were then adjusted for regional price differences and inflation to align them with 2024 market conditions in Ohio. These adjusted values were applied to out-of-county visitor estimates to quantify the new spending introduced into the Warren County economy through recreation-related trips. After accounting for economic leakage, out-of-county visitors directly generated $21.8 million in economic output in Warren County in 2024 in conjunction with visiting one of the County's outdoor recreation areas, which supported 237 jobs with wages of $6.9 million. Indirectly, the spending of out-of-county visitors further supported $11.3 million in economic output, which supported 58 jobs with $4.0 million in wages. As detailed in Table 6, the spending of out-of-county visitors to Warren County outdoor recreation areas generated a total of $33.1 million in economic output and supported a total of 295 jobs with $10.9 million in wages in Warren County in 2024.

Table 6: Economic Impact of Out-of-County Visitors on Warren County, FY 2024 (2024$)

Impact Type	Output	Jobs	Wages
Direct	$21,788,939	237	$6,862,134
Indirect	$11,287,648	58	$4,011,928
Total	**$33,076,587**	**295**	**$10,874,062**

Sources: Economics Center analysis of Placer.ai data provided by Warren County Park District, multipliers retrieved from Lightcast, and visitor spending estimates from the Virginia State Parks Economic Impact Report 2019.

[39] Values adjusted for regional price differences and inflation adjusted to 2024 dollars.

Table 7 summarizes the fiscal impact of out-of-county visitor spending in Warren County in 2024. In total, visitors from outside the County generated $1.5 million in combined income, lodging, and sales tax revenue. Jobs supported by out-of-county visitor spending contributed $151,792 in local income tax revenue and $188,690 in state income tax revenue. Visitor spending on hotel accommodations generated an additional $186,679 in lodging tax revenue for Warren County. Purchases of food, beverages, and retail goods resulted in $144,388 in sales tax revenue for Warren County and $830,232 in state sales tax revenue. Together, these tax streams reflect the broader fiscal benefits associated with visitor activity in Warren County's outdoor recreation areas.

Table 7: Fiscal Impact of the Warren County's Out-of-County Visitors, FY 2024 (2024$)

Impact Type	Local Income Tax	OH State Income Tax	Lodging Tax	Warren County Sales Tax	OH State Sales Tax	Total Tax Revenue
Direct	$95,789	$101,534	$186,679	$139,459	$801,889	**$1,325,350**
Indirect	$56,003	$87,156	--	$4,929	$28,343	**$176,431**
Total	**$151,792**	**$188,690**	**$186,679**	**$144,388**	**$830,232**	**$1,501,781**

Sources: Economics Center analysis of Placer.ai data provided by Warren County Park District and visitor spending distribution from the Virginia State Parks Economic Impact Report 2019.

Economic Impact of Outdoor Recreation Businesses

With abundant outdoor recreation resources, Warren County attracts both residents and visitors, supporting a network of local businesses that serve recreation-related needs. These businesses include those providing goods and services that complement outdoor activities before and after visits to parks, trails, and water-based destinations. While much of this spending is reflected in the visitor spending analysis, this section focuses specifically on outdoor recreation businesses, defined as establishments whose primary operations support recreation participation, such as equipment retailers, rental and repair services, outfitters, and manufacturers. The analysis is limited to businesses located within Warren County that directly provide products or services associated with outdoor recreation activities.

The Economics Center used Ohio ES-202 (Quarterly Census of Employment and Wages) data to identify outdoor recreation businesses operating in Warren County, along with their industry classification, employment, and wage information. A total of 19 establishments were identified across nine industries at the six-digit NAICS level, employing approximately 167 workers. These businesses include sporting and athletic goods manufacturers, recreational equipment dealers and retailers, and organizations providing sports instruction and training.

Economic and Fiscal Impacts

The 2024 economic impact of outdoor recreation businesses in Warren County is summarized in Table 8. These businesses directly employed 167 workers who earned approximately $6.2 million in wages and generated an estimated $24.5 million in sales. The direct impacts supported an additional 63 indirect jobs, which paid $3.7 million in wages and contributed $12.5 million in secondary sales through inter-industry linkages. In total, outdoor recreation businesses in Warren County generated $37.0 million in economic output, supported 230 jobs, and produced $9.9 million in wages in 2024. The average wage for direct employment was $37,094, and indirect jobs earned an average of $58,530.

Table 8: Economic Impact of Outdoor Recreation Businesses, FY 2024 (2024$)

Impact	Sales	Jobs	Wages
Direct	$24,504,555	167	$6,194,714
Indirect	$12,524,241	63	$3,687,368
Total	**$37,028,796**	**230**	**$9,882,082**

Sources: Ohio ES-202 data, Lightcast data; Economics Center analysis.

Table 9 summarizes the fiscal impact of outdoor recreation businesses operating in Warren County in 2024. In total, these businesses generated $2.8 million in combined income and sales tax revenue. Wages paid to workers resulted in $91,391 in local income tax revenue and $89,125 in state income tax revenue. Business sales produced $384,228 in sales tax revenue for Warren County and $2.2 million in state sales tax revenue. Together, these tax streams highlight the substantial fiscal contribution of Warren County's outdoor recreation business sector.

Table 9: Fiscal Impact of the Outdoor Recreation Businesses in Warren County, FY 2024 (2024$)

Impact	Local Income Tax	OH State Income Tax	Warren County Sales Tax	OH State Sales Tax	Total Tax Revenue
Direct	$39,768	$11,012	$255,113	$1,466,899	$1,772,793
Indirect	$51,623	$78,113	$129,115	$742,413	$1,001,264
Total	**$91,391**	**$89,125**	**$384,228**	**$2,209,312**	**$2,774,056**

Sources: Ohio ES-202 data; Lightcast data; state and local tax rates (2024); Economics Center analysis.

Economic Impact of Operations and Capital Expenditures

Outdoor recreation areas in Warren County contribute to the local economy through spending, employment, wages, and tax revenue. This section evaluates the economic impact of annual operations and capital investments made by local parks and recreation entities, including the Warren County Park District and other government and nonprofit organizations that manage or support outdoor recreation. By quantifying both the direct impacts and the broader ripple effects, the analysis provides a comprehensive view of how these entities support economic growth in Warren County.

Operations Expenditures

Operations expenditures represent the day-to-day expenses of the local park and recreation entities in Warren County. As detailed in Table 10, these entities collectively spent approximately $14.4 million on operations in 2024. Wages totaled nearly $5.4 million, accounting for approximately 37.5 percent of total expenditures.

Table 10: Operations Expenditures of Local Parks and Recreation Entities, FY 2024 (2024$)

Expense	Amount
Wages	$5,380,726
Non-Wage Operating Expenditures	$9,016,616
Total	**$14,397,342**

Sources: Economics Center analysis using data provided by the Warren County Park District and local governments.

After accounting for economic leakage, the combined operations expenditures of the local parks and recreation entities directly generated nearly $11.1 million in economic output within Warren County. These expenditures produced an additional $7.8 million in indirect output through inter-industry linkages. Outdoor recreation operations directly employed 204 full-time equivalent (FTE) workers who earned $5.4 million in wages, while another 385 FTE jobs were supported indirectly, with associated wages of $8.9 million. In total, the operations expenditures generated $18.9 million in economic output, supported 589 jobs, and produced $14.3 million in wages in Warren County during fiscal year 2024, as shown in Table 11.

Table 11: Economic Impact of Operations Expenditures, FY 2024 (2024$)

Impact	Output	Jobs	Wages
Direct	$11,063,025	204	$5,380,726
Indirect	$7,842,134	385	$8,888,697
Total	**$18,905,159**	**589**	**$14,269,423**

Sources: Economics Center analysis using data provided by the Warren County Park District and data from local governments, with multipliers retrieved from Lightcast.

As detailed in Table 12, the wages supported by the operations expenditures of local park and recreation entities generated a combined $684,729 in income and sales tax revenue across all levels of government in 2024. These operations produced $193,480 in local income tax revenue for jurisdictions within Warren County and $140,434 in state income tax revenue for Ohio. In addition, taxable spending associated

with direct and indirect employment generated $31,318 in sales tax revenue for Warren County and $319,497 in state sales tax revenue. Together, these fiscal effects illustrate the ongoing tax contributions generated through the County's outdoor recreation operations.

Table 12: Fiscal Impact of Operations Expenditures, FY 2024 (2024$)

Impact	Local Income Tax	OH State Income Tax	Warren County Sales Tax	OH State Sales Tax	Total Tax Revenue
Direct	$69,402	$53,889	$11,075	$63,679	**$198,045**
Indirect	$124,078	$86,545	$20,243	$255,818	**$486,684**
Total	**$193,480**	**$140,434**	**$31,318**	**$319,497**	**$684,729**

Sources: Economics Center analysis using data provided by the Warren County Park District and data retrieved from local governments.

Capital Expenditures

In addition to annual operations, local park and recreation entities in Warren County invested nearly $6.5 million in capital improvements during fiscal year 2024. After accounting for economic leakage, an estimated $5.4 million of these expenditures were made with vendors located within the County. These capital investments directly supported 29 FTE jobs and $2.7 million in wages. Inter-industry linkages generated an additional $2.0 million in indirect output, supporting 10 jobs and $678,759 in wages.

As shown in Table 13, the capital expenditures of local park and recreation entities generated a total of $7.4 million in economic output, supported 39 FTE jobs, and produced $3.4 million in wages in Warren County during fiscal year 2024.

Table 13: Economic Impact of Capital Expenditures, FY 2024 (2024$)

Impact	Output	Jobs	Wages
Direct	$5,403,516	29	$2,692,172
Indirect	$1,997,562	10	$678,759
Total	**$7,401,078**	**39**	**$3,370,931**

Sources: Economics Center analysis using data provided by the Warren County Park District and local governments, with multipliers retrieved from Lightcast.

As shown in Table 14, capital expenditures by local park and recreation entities generated a combined $146,353 in income and sales tax revenue in 2024. Wages supported through direct and indirect employment resulted in $43,076 in local income tax revenue and $77,822 in state income tax revenue. In addition, taxable spending by workers whose jobs were supported through these capital expenditures produced $3,771 in sales tax revenue for Warren County and $21,684 in state sales tax revenue. These fiscal impacts demonstrate the additional tax benefits generated through the County's capital investments in outdoor recreation infrastructure.

Table 14: Fiscal Impact of Capital Expenditures, FY 2024 (2024$)

Impact	Local Income Tax	OH State Income Tax	Warren County Sales Tax	OH State Sales Tax	Total Tax Revenue
Direct	$33,601	$62,924	$2,931	$16,854	**$116,310**
Indirect	$9,475	$14,898	$840	$4,830	**$30,043**
Total	**$43,076**	**$77,822**	**$3,771**	**$21,684**	**$146,353**

Sources: Economics Center analysis using data provided by the Warren County Park District and local governments.

Total Impact

The total economic impact of local park and recreation entities in Warren County includes the combined effects of their operations and capital expenditures. As shown in Table 15, these entities directly generated approximately $16.5 million in economic output within Warren County in fiscal year 2024. This activity also produced an additional $9.8 million in indirect output through inter-industry linkages.

Collectively, these expenditures directly supported 233 FTE jobs with wages totaling $8.1 million. Indirectly, an additional 395 FTE jobs were supported, with associated wages of $9.6 million. In total, the operations and capital expenditures of local park and recreation entities generated $26.3 million in economic output, supported 628 jobs, and produced $17.6 million in wages in Warren County during fiscal year 2024.

Table 15: Total Economic Impact of Operations and Capital Expenditures, FY 2024 (2024 $)

Impact	Output	Jobs	Wages
Direct	$16,466,542	233	$8,072,897
Indirect	$9,839,696	395	$9,567,456
Total[40]	**$26,306,238**	**628**	**$17,640,353**

Sources: Economics Center analysis using data provided by the Warren County Park District and local governments, with multipliers retrieved from Lightcast.

The fiscal impacts of combined operations and capital expenditures are summarized in Table 16. In fiscal year 2024, these activities generated a total of $831,081 in income and sales tax revenue across all levels of government. Wages supported through direct and indirect employment resulted in $236,555 in local income tax revenue for jurisdictions within Warren County and $218,257 in state income tax revenue. Taxable spending associated with supported jobs produced $35,089 in sales tax revenue for Warren County and $341,180 in state sales tax revenue. Together, these fiscal effects highlight the continued tax contributions generated by local park and recreation operations and capital expenditures.

Table 16: Total Fiscal Impact, FY 2024 (2024$)

Impact	Local Income Tax	OH State Income Tax	Warren County Sales Tax	OH State Sales Tax	Total Tax Revenue
Direct	$103,003	$116,814	$14,006	$80,532	$314,355
Indirect	$133,552	$101,443	$21,083	$260,648	$516,726
Total[40]	**$236,555**	**$218,257**	**$35,089**	**$341,180**	**$831,081**

Sources: Economics Center analysis using data provided by the Warren County Park District and local governments.

[40] Totals reflect aggregation of independently calculated operations and capital impacts. Minor differences may occur when compared to the sum of component tables due to rounding.

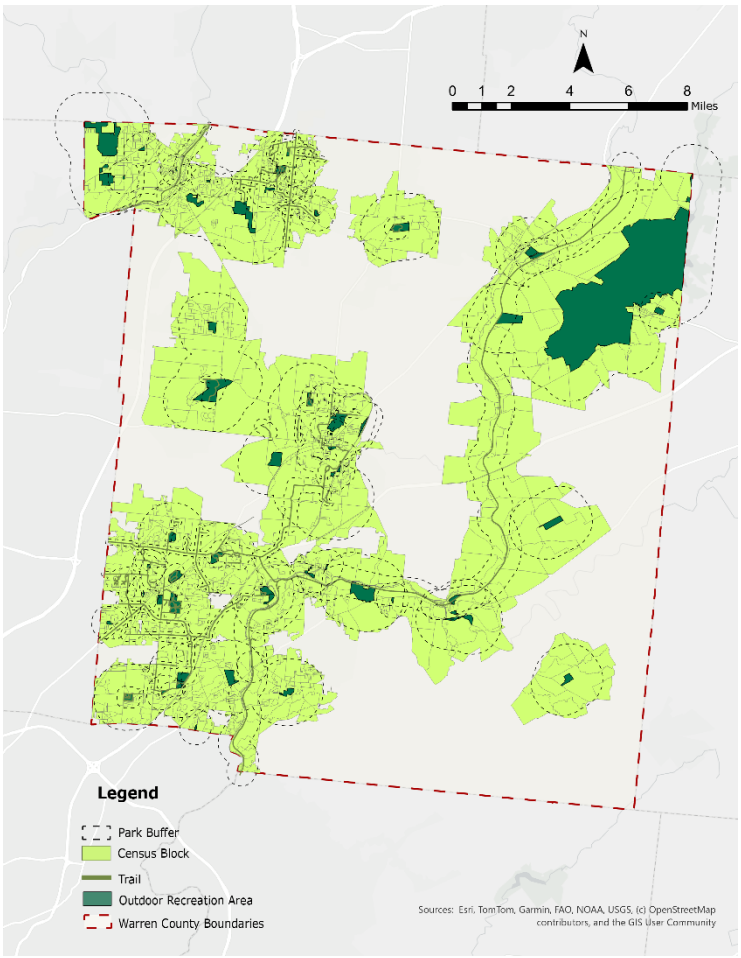
Outdoor Recreation Population Estimation

This section estimates the number of Warren County residents likely to participate in outdoor recreation by identifying those with convenient access to local outdoor recreation areas. The analysis combines spatial accessibility with national participation trends to estimate the population of regular users.[41] These estimates also provide the foundation for calculating the health care cost savings discussed later in the report.

Defining Service Area

The Economics Center applied established standards in park and transportation planning to define service areas for outdoor recreation in Warren County. As shown in Figure 2, a spatial analysis was conducted using a GIS shapefile of the County's outdoor recreation areas. [42]

Figure 2: Outdoor Recreation Service Area in Warren County



Sources: Census Block spatial data, Warren County Park District shapefile; map prepared by the Economics Center.

[41] The Economics Center received aggregate visitor count data from Warren County Park District, but the benefits detailed in this section accrue at the individual level and therefore the Economics Center quantified the number unique County residents estimated to frequent public outdoor recreation amenities in Warren County.
[42] Golf courses and the Fort Ancient Earthworks were excluded from this analysis because the focus was on regular recreation use for exercise and relaxation.

A 0.5-mile buffer was drawn around each area to represent convenient neighborhood access, and an additional 0.5- to 1.0-mile buffer was applied to larger recreation areas exceeding 40 acres to capture their broader service reach.

Trail service areas were defined separately to reflect differences in trail design and user patterns. A 0.5-mile buffer was applied to the Little Miami Scenic Trail, other trails received buffers ranging from 0.1 to 0.25 mile depending on their functions and whether they are off-road facilities or located along shared road corridors.

These buffers were then joined with block-level U.S. Census data to identify the resident population within each service zone.

Outdoor Recreation Participation Estimates

Using 2020 U.S. Census block-level data joined with the defined outdoor recreation service areas, a total of 2,305 Census blocks were identified within the buffers. The American Community Survey reports that Warren County's population grew by approximately 7.0 percent between 2020 and 2023. Adjusting for this growth, the estimated 2023 population within the service areas is 181,673. When limited to residents aged five and older, the study population totals 171,863, representing about 69.8 percent of Warren County's total population in 2023.[43]

Approach 1: Participation Estimate Based on Total Rate

According to the 2024 national-level outdoor activities survey, the Outdoor Industry Association estimated that 175.8 million Americans aged six and older participated in outdoor recreation in 2023. This figure represents 57.3 percent of the population eligible for outdoor activity participation in the United States.[44] Applying this national participation rate to the County's service population of 171,863 residents results in an estimated 98,477 likely participants in outdoor recreation.

Approach 2: Participation Estimate Based on Gender

According to the same national-level survey by the Outdoor Industry Association, participation rates vary by gender. In 2023, 62.9 percent of males and 51.9 percent of females participated in outdoor recreation.[45] When these gender-specific rates are applied to the County's park service population, comprising 87,021 males and 84,841 females, the estimated number of participants is 98,769, which represents 57.5 percent of the park-access population. These findings are presented in Table 17.

Table 17: Estimated Outdoor Participation by Gender

Gender	Park Service Population	Participants	Participation Rate
Male	87,021	54,736	62.9%
Female	84,841	44,033	51.9%
Total[46]	**171,863**	**98,769**	**57.5%**

Sources: Outdoor Industry Association (2023); U.S. Census Bureau; Economics Center analysis.

[43] This age group follows the Outdoor Industry Association's definition, which estimates outdoor recreation participation among Americans aged six and older. When using Census data, residents aged five and older were used to maintain consistency with available age group classifications.
[44] (Outdoor Industry Association 2023)
[45] (Outdoor Foundation 2024)
[46] Totals may not equal the sum of individual categories due to rounding.

Approach 3: Participation Estimate Based on Race and Ethnicity

According to the 2023 national-level outdoor activities survey, the Outdoor Industry Association reports participation rates by race. White residents had a participation rate of 57.3 percent, Black residents, 40.7 percent, American Indian and Alaska Native residents, 55.8 percent, and Asian residents approximately 57.0 percent.[47] These rates were weighted based on the racial composition of the County's park service population, using ACS data. The result, presented in Table 18, is an estimated 97,809 participants, or 56.9 percent of the study population.

Table 18: Estimated Outdoor Participation by Race

Race	Park Service Population	Participants	Participation Rate
White Alone	143,849	82,426	57.3%
Black or African American Alone	5,843	2,378	40.7%
Asian Alone	11,687	7,042	60.3%
American Indian and Alaska Native Alone	172	98	57.0%
Other Race	10,312	5,865	56.9%
Total	**171,863**	**97,809**	**56.9%**

Sources: Outdoor Industry Association (2023); U.S. Census Bureau; Economics Center analysis.

Comparison and Final Estimate

Using three different estimation methods based on national participation trends, the projected number of outdoor recreation participants living within the County's outdoor recreation service areas range from 97,809 to 98,769. These estimates correspond to participation rates between 56.9 percent and 57.5 percent. The average across the three methods is 98,352 participants, or 57.2 percent of the study population. These findings are summarized in Table 19.

Table 19: Outdoor Recreation Population Estimates by Approach

Estimation Approach	Estimated Participants	Participation Rate
By Total Participation Rate	98,477	57.3%
By Gender Participation Rate	98,769	57.5%
By Race Participation Rate	97,809	56.9%
Final Estimate	**98,352**	**57.2%**

Sources: Outdoor Industry Association (2024, 2023); U.S. Census Bureau; Economics Center analysis.

Summary of Outdoor Recreation Population Estimates

The Economics Center estimates the outdoor recreation population in Warren County by identifying residents with convenient access to local outdoor recreation areas and trails. Using defined service areas, the analysis identified 181,673 residents, including 171,863 residents aged five and older, living within these buffer zones. Applying national participation rates suggests that 97,809 to 98,769 of these residents are likely to engage in outdoor recreation, representing 56.8 to 57.3 percent of the service-area population. The final estimated number of likely outdoor recreation participants is 98,352 residents.

[47] (Outdoor Industry Association 2023)

Health Care Cost Savings for Residents

This section evaluates how access to outdoor recreation areas contributes to health-related economic benefits for Warren County residents. Regular participation in outdoor recreation supports physical activity and mental well-being, which are associated with lower rates of preventable chronic conditions and reduced health care utilization. These effects translate into reduced demand on local service systems, including the Mental Health Recovery Board, the Warren County Health District, the Warren County Department of Human Services, and Warren County Community Services. The analysis estimates annual health care cost savings associated with improved physical and mental health among residents who participate in outdoor recreation.

Physical Health Care Cost Savings

Outdoor recreation areas provide free and convenient opportunities for walking, jogging, biking, and other forms of physical activity. These activities help prevent chronic illnesses such as heart disease, diabetes, and certain cancers. Increased physical activity from regular park use can therefore reduce health care costs for the community.

The Economics Center estimates that physical inactivity accounts for approximately 1.0 to 3.0 percent of total U.S. health care spending. National cost benchmarks from Milliman (2024) indicate average annual medical costs of $7,151 for adults aged 18 to 64 and approximately $12,000 to $13,000 for adults aged 65 and older. Applying the 1.0 to 3.0 percent savings range to these averages yields the per-person savings estimates shown in Table 20.

Table 20: Estimated Annual Health Care Cost Savings per Person

Age Group	Average Annual Cost	1% Savings	3% Savings
18-64	$7,151	$72	$215
65 and older	$12,000-$13,000	$120	$390

Sources: Pratt, Macera, and Wang (2000); Van Den Eeden et al. (2022); Ding et al. (2016); Milliman (2024); Economics Center analysis.

Estimated Values

Based on the 2023 American Community Survey (ACS), an estimated 68,973 adults in Warren County regularly participate in outdoor recreation.[48] Of these, 57,994 are between ages 18 and 64, and 10,979 are age 65 and older. Applying the estimated annual savings per person to each group, the resulting range of health care cost savings is $4,175,568 to $12,468,710 for adults aged 18 to 64, and $1,317,480 to $4,281,810 for adults aged 65 and older. Combined, these values represent a total potential annual savings between $5,493,048 and $16,750,520, as shown in Table 21.

Although both low and high estimates are shown, the Economics Center used the 1.0 percent savings rate for final reporting. This conservative assumption aligns with best practices and avoids overstating benefits.

Table 21: Estimated Annual Health Care Cost Savings by Age Group (2024$)

Age Group	Number of Participants	Per-Person Savings (1%)	Total Savings (1%)	Per-Person Savings (3%)	Total Savings (3%)
18-64	57,994	$72	$4,175,568	$215	$12,468,710
65 and older	10,979	$120	$1,317,480	$390	$4,281,810
Total	**68,973**	**—**	**$5,493,048**	**—**	**$16,750,520**

Sources: Milliman (2024), Pratt et al. (2000), Van Den Eeden et al. (2022), and Ding et al. (2016); Economics Center analysis.

[48] The health care cost savings analysis is limited to residents aged 18 and older; therefore, the participation estimate used here differs from the age-five-and-older population reported in the outdoor recreation participation section.

Mental Health Care Cost Savings

Time spent in natural environments is associated with improved mental well-being and reduced symptoms of stress, anxiety, and depression. This section estimates potential mental health care savings resulting from regular outdoor recreation among Warren County residents.

Of the County's 68,973 adult outdoor recreation participants, approximately 22.0 percent, or 15,174 individuals, are expected to experience depression-related mental health conditions in a given year. If all regularly engaged with outdoor recreation areas, the prevalence could decline by 7.0 percent, reducing the estimated number of affected individuals to 14,139. This reduction represents 1,035 individuals who avoid depression-related mental health issues annually among adult participants.

Estimated Values

The average cost of therapy is estimated at $1,080 per person per year.[49] Multiplying the 1,035 fewer cases by the annual cost per case results in an estimated savings of $1,147,800 per year, as shown in Table 22.

Table 22: Estimated Annual Adult Mental Health Care Cost Savings

Metric	Value
Total adult population	68,973
Prevalence without park use	22.0%
Estimated adults with depression-related mental health issues without park usage	15,174
Prevalence with park use	20.5%
Estimated adults with depression-related mental health issues with park use	14,139
Reduction in cases	1,035
Average annual cost per case	$1,080
Total Annual Savings	**$1,117,800**

Sources: Mental Health America (2024); Shanahan et al. (2016); Tebra (2024); Economics Center analysis.

Total Health Care Savings

Outdoor recreation areas in Warren County support both physical activity and mental wellness, leading to measurable reductions in community health care costs. Using national cost benchmarks and peer-reviewed research, the Economics Center estimates that regular outdoor recreation produces annual savings of $5.5 million from improved physical health and $1.1 million from reduced depression prevalence. As shown in Table 23, these combined benefits generate an estimated total annual health care savings of $6.6 million for Warren County residents.

Table 23: Summary of Annual Health Care Cost Savings

Benefit Type	Estimated Annual Savings
Physical Health (1% savings)	$5,493,048
Mental Health	$1,117,800
Total	**$6,610,848**

Sources: Milliman (2024); Mental Health America (2024); Tebra (2024); Shanahan et al. (2016); Economics Center analysis.

[49] (Tebra 2024)

Stormwater Runoff Reduction

Outdoor recreation areas in Warren County provide measurable environmental benefits that enhance local sustainability and public well-being. [50] This section focuses on reduced stormwater runoff, a key ecological service that lowers demands on public infrastructure. Using nationally recognized methods and localized data, the analysis estimates the economic value of avoided stormwater management costs generated by the County's outdoor recreation areas.

Stormwater runoff remains a challenge in the Cincinnati MSA. Intense rainfall events frequently exceed the capacity of aging infrastructure, causing localized flooding, sewer overflows, and environmental degradation. In 2024, the Cincinnati MSA recorded approximately 7.8 billion gallons of combined sewer overflow, discharging untreated water into waterways and increasing public health and ecological risks. [51] Warren County's outdoor recreation areas help mitigate these impacts by capturing rainfall and allowing it to infiltrate into the soil rather than entering storm drains. By slowing and reducing runoff volumes, these areas lessen the burden on public infrastructure and contribute to improved water quality.

Estimated Values

This analysis evaluated approximately 12,474.9 acres (543.4 million ft^2) of outdoor recreation land in Warren County based on available land cover and soil data. Results indicate that these areas absorb more than 1.846 billion cubic feet of stormwater each year. As shown in Table 24, this natural infiltration provides an estimated $159.5 million in avoided stormwater management costs annually. These savings represent the value of stormwater that does not require collection, treatment, or conveyance through infrastructure systems.

Table 24: Annual Stormwater Reduction and Value by Land Type (2024$)

Land Cover Type	Area (ft^2)	Runoff Volume (ft^3)	Monetary Value
Barren Land	905,532	3,268,130	$282,367
Cultivated Crops	1,820,378	6,340,287	$547,801
Deciduous Forest	288,146,884	955,218,562	$82,530,925
Developed, Low Intensity	8,601,466	29,328,461	$2,533,980
Developed, Medium Intensity	1,592,831	5,281,443	$456,317
Developed, Open Space	66,452,032	223,168,015	$19,281,726
Emergent Herbaceous Wetlands	65,166	208,903	$18,049
Mixed Forest	7,844,438	26,565,572	$2,295,267
Open Water	119,071,169	437,586,545	$37,807,496
Pasture/Hay	48,694,247	158,482,983	$13,692,937
Shrub/Scrub	214,100	744,603	$64,334
Total	**543,408,243**	**1,846,193,504**	**$159,511,199**

Sources: SSURGO data; Urban Hydrology for Small Watersheds (TR-55); conomics Center analysis.

These findings align with comparable park systems in peer regions. In Lucas County, Ohio, Metroparks Toledo reduces stormwater runoff by 116.0 million cubic feet annually, valued at $5.5 million in avoided infrastructure costs.[52] Warren County's outdoor recreation areas, with greater total acreage, generate proportionally higher stormwater management value, reflecting the County's extensive natural parkland and trail system.

[50] The Economics Center also analyzed air quality benefits; the results are included in the Appendix.
[51] (WVXU 2025)
[52] (Trust for Public Land 2019)

Property Market Benefits

Outdoor recreation areas enhance neighborhood desirability and contribute measurable value to nearby residential properties. Homes located near parks and natural spaces generally sell for higher prices than comparable homes farther away, reflecting the added benefits of access to recreation, open space, and scenic views. These higher property values not only represent economic gains for homeowners but also expand the local tax base, generating recurring revenue that supports public services and community infrastructure.

Value Premium Estimation

Using the Economics Center's Value Premium Model, a total of 63,321 residential parcels were identified within one mile of public parks and outdoor recreation areas in Warren County. The analysis included single-family homes, multi-family properties (including two-family, three-family, and condominium units), and vacant residential parcels. Table 25 summarizes the property counts, assessed values, and 2024 property taxes for these parcels.

Table 25: Residential Properties within Outdoor Recreation Service Areas, Assessed Value and 2024 Property Tax (2024$)

Category	Parcels	Share of Parcels	Property Value	Tax Revenue
Vacant Land	5,746	9.1%	$194,702,950	$6,591,927
Single-Family	50,029	79.0%	$13,303,854,540	$263,444,779
Multi-Family	7,546	11.9%	$951,451,110	$18,957,300
Total	**63,321**	**100.0%**	**$14,450,008,600**	**$288,994,006**

Source: Warren County Auditor; Economics Center Analysis.

Applying the value premium model, proximity to outdoor recreation areas is estimated to increase single-family property values by $782.3 million (5.9%), multi-family property values by $62.2 million (6.5%), and vacant land values by $10.2 million (5.3%). In total, the model estimates approximately $854.8 million in enhanced residential property value, representing an overall 5.9 percent increase, as shown in Table 26.

Table 26: Estimated Property Value Increase (2024$)

Category	Property Value	Enhanced Value	Percent Increase
Vacant Land	$194,702,950	$10,229,522	5.3%
Single-Family	$13,303,854,540	$782,347,257	5.9%
Multi-Family	$951,451,110	$62,205,036	6.5%
Total	**$14,450,008,600**	**$854,781,815**	**5.9%**

Sources: Warren County Auditor, 2025; Economics Center Analysis.

The property value premium translates into higher property tax revenues for local jurisdictions. Warren County's outdoor recreation areas are estimated to generate an additional $17.0 million in annual property tax revenue, with approximately $15.5 million derived from single-family properties, $1.2 million from multi-family properties, and $333,435 from vacant residential parcels, as detailed in Table 27.

Table 27: Enhanced Property Tax Revenues (2024$)

Category	Property Tax	Enhanced Tax Revenue	Percent Increase
Vacant Land	$6,591,927	$333,435	5.1%
Single-Family	$263,444,779	$15,460,770	5.9%
Multi-Family	$18,957,300	$1,238,720	6.5%
Total	**$288,994,006**	**$17,032,925**	**5.9%**

Sources: Warren County Auditor, 2025; Economics Center Analysis.

The estimated 5.9 percent property value premium in Warren County is consistent with national research. In Lucas County, Ohio, Metroparks Toledo contributed to a $40.8 million increase in residential property values, resulting in $1.1 million in additional annual property tax revenue. In Plano, Texas, park-related property value increases generated $6.1 million in additional annual tax revenue.[53] Warren County's findings reflect a similar pattern at a larger scale, with the County's more extensive park system and regional trail network supporting proportionally greater property value gains.

Total Property Value Premium Effects

Overall, residential properties located near outdoor recreation areas in Warren County are estimated to gain $854.8 million in added market value, resulting in approximately $17.0 million in additional annual property tax revenue, as shown in Table 28. These findings highlight the economic value of maintaining and investing in high-quality parks and natural areas that enhance community livability and fiscal health.

Table 28: Combined Enhanced Property Values and Tax Revenues from Proximity to County Outdoor recreation areas (2024$)

Category	Enhanced Property Values	Enhanced Tax Revenue
Vacant Land	$10,229,522	$333,435
Single-Family	$782,347,257	$15,460,770
Multi-Family	$62,205,036	$1,238,720
Total	**$854,781,815**	**$17,032,925**

Source: Warren County Auditor, Economics Center Analysis.

[53] (Trust for Public Land 2017, 2019)

Conclusion

This report provides a comprehensive assessment of how outdoor recreation areas in Warren County contribute to the local economy, community well-being, and environmental health. The findings draw from reliable data sources, national and regional research, and established analytical methods.

Outdoor recreation areas attract substantial visitor activity that produces measurable economic and fiscal benefits. In 2024, out-of-county visitors made approximately 2.8 million trips to Warren County's outdoor recreation areas. Their spending generated $33.1 million in economic output, supported 295 full-time equivalent (FTE) jobs, and produced $10.9 million in wages. Visitor activity also generated $1.5 million in earnings, lodging, and sales tax revenue for state and local governments.

Warren County is also home to 19 outdoor recreation-related businesses that provide goods and services supporting local recreation activity. In 2024, these businesses reported $24.5 million in direct sales and generated $37.0 million in total economic output. These outdoor recreation-related businesses supported 230 jobs, paid $9.9 million in wages, and contributed $2.8 million in income and sales tax revenues across state and local jurisdictions.

In addition to these market-based activities, local park and recreation entities make ongoing investments in the operation and improvement of outdoor recreation infrastructure. In fiscal year 2024, combined operations and capital expenditures generated $26.3 million in economic output, supported 628 FTE jobs, and produced $17.6 million in wages. These activities contributed $0.8 million in income and sales tax revenue within the state and local economy.

Outdoor recreation areas also support community health and well-being. Approximately 98,352 residents living within convenient access to these areas are estimated to regularly participate in outdoor recreation. Based on national cost benchmarks and research on physical and mental health, this level of participation produces approximately $6.6 million in annual health care cost savings.

Outdoor recreation areas provide significant environmental benefits as well. Parklands and natural areas absorb more than 1.8 billion cubic feet of stormwater annually, reducing flood risk, improving water quality, and providing approximately $159.5 million in avoided stormwater management costs.

Proximity to outdoor recreation areas also enhances residential property values. The Value Premium Model estimates an increase of $854.8 million in residential property value and approximately $17.0 million in additional annual property tax revenue for local jurisdictions.

Collectively, these results confirm that Warren County's outdoor recreation areas are vital public assets. They serve not only as recreational amenities but also as long-term investments in public health, environmental quality, and fiscal sustainability. These benefits strengthen the County's overall livability and support its future resilience.

Appendix: Improved Air Quality by Park Trees

Air pollution remains a concern in the Cincinnati Metropolitan Area. The State of the Air 2024 report by the American Lung Association ranked the region as the 42nd worst in the nation for ozone pollution, with Warren County receiving a "D" grade. [54] Trees within the County's outdoor recreation areas help mitigate these risks by filtering pollutants such as ozone (O_3), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), carbon monoxide (CO), and carbon dioxide (CO_2). These functions improve air quality, reduce health risks, and enhance overall environmental sustainability.

Estimated Values

As shown in Table 29, trees in Warren County outdoor recreation areas remove an estimated 138.6 million pounds of air pollutants and carbon dioxide each year. This includes 11,265 pounds of carbon monoxide (CO), 56,362 pounds of nitrogen dioxide (NO_2), 599,246 pounds of ozone (O_3), 212,947 pounds of particulate matter less than 10 microns (PM_{10}), 29,615 pounds of particulate matter less than 2.5 microns ($PM_{2.5}$), 56,287 pounds of sulfur dioxide (SO_2), and 137,650,151 pounds of carbon dioxide (CO_2). The total annual value of air pollution removal, excluding CO_2, is more than $114.6 million. The estimated value of CO_2 sequestration is more than $9.1 million, bringing the combined annual benefit to nearly $123.7 million.[55]

Table 29: Estimated Annual Air Pollution Removal by Trees (2024$)

Category	Pounds Removed	Removal Value
CO	11,265	$6,048,658
NO_2	56,362	$379,607
O_3	599,246	$1,793,931
PM10	212,947	$30,305,474
PM2.5	29,615	$75,974,989
SO_2	56,287	$65,898
CO_2	137,650,151	$9,137,339
Total	**138,615,873**	**$123,705,896**

Sources: i-Tree Canopy; Economics Center analysis.

Together, these findings show that trees within Warren County's outdoor recreation areas provide substantial environmental value by removing harmful pollutants and sequestering carbon. The combined annual benefit of nearly $123.7 million highlights the important role of tree canopy in improving regional air quality, reducing health risks, and supporting long-term environmental resilience.

[54] (American Lung Association 2024)
[55] Monetary values have been adjusted for inflation to reflect 2024 dollars. The original i-Tree benefit rates were benchmarked to 2015-2017 dollars.

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