

LEGISLATIVE BUDGET AND FINANCE COMMITTEE

A JOINT COMMITTEE OF THE PENNSYLVANIA GENERAL ASSEMBLY

A Study Pursuant to House Resolution 2023 - 87: The Current Status of Conservation Connectivity in Pennsylvania

June 2024



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For the eighth straight year, the National Legislative Performance Evaluation Society (NLPEs) awarded the Legislative Budget and Finance Committee with a Certificate of Impact. The Certificate of Impact is presented to legislative offices that produce evaluations or audit reports that resulted in documented public policy changes, program improvements, dollar savings, or other public impacts.

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TABLE OF CONTENTS



Report Summary S-1

Report Sections

I. Objectives, Scope, and Methodology 1

II. Perspectives on Conservation Corridors.....7

 A. Conservation Corridors, Connectivity, and Continuity 9

 B. Major Players in Conservation Connectivity in Pennsylvania 20

 C. Identified Areas of Conservation Corridor Needs 45

III. Wildlife-Vehicle Collisions 49

 A. PennDOT Wildlife-Vehicle Collision Data 50

 B. Auto Insurance Claims Data57

 C. Economic Impacts of Wildlife-Vehicle Collisions 59

IV. Best Practices in Conservation Connectivity.....61

 A. Current Status of Other States’ Conservation Connectivity Practices 62

 B. Best Practices in Developing and Managing Conservation Corridors77

 C. Funding Sources for Conservation Corridors85

V. Appendices..... 89

 A. House Resolution 2023-87 89

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REPORT SUMMARY



Objectives and Scope

Our objectives for the study were the following:

- 1. To provide perspectives on conservation corridors, including but not limited to, wildlife preservation, human safety, and economic benefits.*
- 2. To analyze data related to vehicle and wildlife collisions on Pennsylvania roadways.*
- 3. To identify best practices in developing, establishing, and funding conservation corridors in Pennsylvania.*

Our study covered the period between January 1, 2019, and December 31, 2022. Further extending the scope was necessary in some research areas to provide better context about the subject matter.

Report Overview

The development of land in Pennsylvania for business and housing has created significant economic benefits but has also had negative consequences for the commonwealth's flora and fauna. Habitat fragmentation, or separating natural habitats into noncontinuous areas, prevents wildlife and plants from life-sustaining movement for food, water, mates, and other biologically necessary processes.

In response to concerns about habitat fragmentation and its effects on Pennsylvania wildlife and plants, the House of Representatives adopted House Resolution 2023-87 (HR 87). HR 87 directs the Legislative Budget and Finance Committee (LBFC) to conduct a study on the current status, management, and benefits of conservation corridors (also known as wildlife or migratory corridors). Conservation connectivity is one scientifically backed way to counter habitat fragmentation.

Our report is organized as follows:

- **Section I – Objectives, Scope, and Methodology**
- **Section II – Perspectives on Conservation Corridors**
- **Section III – Wildlife-Vehicle Collisions**
- **Section IV – Best Practices in Conservation Connectivity**

Our findings, conclusions, and recommendations are summarized on pages S-1 through S-5.

Section II Perspectives on Conservation Corridors

All species (humans, flora, and fauna alike) depend on Pennsylvania's outdoors. Pennsylvania has over 25,000 wildlife and plant species, 11 ecoregions, and 86,000 miles of streams and rivers. For Pennsylvania's citizens, outdoor recreation provides health and wellness benefits but is also critical to the commonwealth's economy. In 2022, outdoor recreation's value added to Pennsylvania's gross domestic product (GDP) was \$16.9 billion, or 1.8 percent of the commonwealth's GDP. Business and housing development have also been economic drivers. However, development has caused negative externalities such as habitat fragmentation.

Habitat fragmentation cuts off species from critical movement between areas.

Conservation connectivity can reduce the negative impacts of habitat fragmentation by reconnecting “islands” of habitats. Conservation corridors can mean different things; sometimes, it involves preserving existing natural corridors (rivers, mountain ranges, etc.); other times, it is designating areas as conservation zones or adding on to existing protected land (federal, state, or local parks); and other times, it prevents land from future development (easements).

Despite the lack of official Pennsylvania public policy regarding the development of conservation corridors, we found many state agencies and independent commissions implementing conservation connectivity practices. The commonwealth agencies and independent commissions include:

- Department of Agriculture (PDA).
- Department of Conservation and Natural Resources (DCNR).
- Department of Environmental Protection (DEP).
- Department of Transportation (PennDOT).
- Fish and Boat Commission (PFBC).
- Game Commission (PGC).
- Turnpike Commission (PTC).

These agencies and commissions are involved in conservation in different ways. For example, PennDOT has constructed 35 wildlife crossings (underpasses) to make roadways safer for drivers and wildlife. PTC has constructed one wildlife crossing (underpass) and is considering building an overpass.

State-owned land presents opportunities to connect adjoining habitats for conservation connectivity. There are currently 3.9 million acres of state-owned land managed by DCNR and PGC, including 2.2 million acres of state forest (DCNR), 1.5 million acres of state game land (PGC), and 295,000 acres of state parks.

The commonwealth agencies and commissions partner with each other and other federal and local stakeholders in conservation connectivity. Partnership examples include:

- Pennsylvania Wildlife Crossings Strategic Plan and Analytical Tools.
- Pennsylvania Natural Heritage Program.
- Pennsylvania Statewide Wildlife Action Plan.
- Conservation Landscape Program.
- Greenways, Trails, and Recreation Program.

Section III Wildlife-Vehicle Collisions

Wildlife vehicle collisions (WVCs) are one result of habitat fragmentation. When roadways separate habitats, wildlife may be forced to cross roadways, putting humans and animals at risk. In 2022, 4,533 deer-related and 217 other animal-related WVCs were reported to PennDOT (4.10 percent of all crashes reported to PennDOT). Of the WVCs reported to PennDOT, seven resulted in human fatalities.

WVC data is a tool to assist in identifying hotspot areas that may benefit from wildlife crossings or other conservation connectivity tools; however, in Pennsylvania, WVC data is limited to crashes reported to PennDOT. The Pennsylvania Vehicle Code requires reporting all crashes involving "death, injury, and/or damage to any one vehicle to such an extent that it cannot be driven from the scene without further damage and therefore requires towing." According to State Farm Mutual Automobile Insurance Company estimates, there were 153,387 WVC auto insurance claims filed in Pennsylvania (July 1, 2022, through June 30, 2022). Therefore, we estimated that crash data reported to PennDOT only accounted for about three percent of insurance claims estimates. Because not all WVCs are required to be reported, many are unreported.

Section IV Best Practices in Conservation Connectivity

Reviewing conservation connectivity practices in neighboring states (with similar landscapes, species, and climates) offered a comparison to gauge Pennsylvania's efforts. We found that most of the conservation connectivity tools the surrounding states utilize are similar to Pennsylvania's. Through our research, we identified some areas for improvement for the commonwealth to consider. For example, a robust working group was established in New Jersey for conservation connectivity collaboration.

We identified best practices in conservation corridor development, including wildlife crossings, preserving natural corridors, collaboration, and data collection. We also researched funding options for conservation corridors used in other states and potential revenue sources.

Recommendations

We recommend:

Recommendations for Executive Action

1. The Governor should create a position to work among and between state agencies and independent commissions to direct conservation connectivity work in Pennsylvania.
2. The Pennsylvania Department of Transportation should add considerations for wildlife crossings in its long-term planning.
3. The Office of the Governor should convene an official inter-agency/commission conservation connectivity working group to build on existing collaborations (including federal and non-governmental partners).
4. An interagency/commission conservation connectivity working group should identify high-priority areas of conservation connectivity in Pennsylvania and establish common goals.

Recommendations for Legislative Consideration

5. The General Assembly should consider requiring a study by the LBFC after PennDOT implements the "Pennsylvania Wildlife Crossings Strategic Plan and Analytical Tools" to provide an update on where Pennsylvania is at in implementing conservation connectivity procedures.
6. If the General Assembly deems expanding commonwealth-owned land a public policy priority in conservation connectivity, it should consider, at a minimum, an inflation adjustment to the Pennsylvania Game Commission's \$400 per acre land acquisition limit.
7. The General Assembly should consider requiring auto insurance carriers to track and provide state transportation agencies with annual data identifying wildlife-vehicle collision locations in Pennsylvania to identify hotspots.
8. The General Assembly should consider requiring commonwealth agencies, independent commissions, contractors, etc., who remove animal carcasses from roadways to centrally track the data, including coordinates of where animal carcasses were removed, to aid in identifying wildlife-vehicle collision hotspots.

9. If deemed a public policy priority, the General Assembly should consider funding to develop new and preserve existing conservation corridors.

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SECTION I OBJECTIVES, SCOPE, AND METHODOLOGY



Why we conducted this study...

The Pennsylvania House of Representatives adopted House Resolution 2023-87 (HR 87) on April 25, 2023, and the officers of the Legislative Budget and Finance Committee adopted the resolution as a staff project on June 21, 2023.

HR 87 directs the LBFC to conduct a study and issue a report on the status, management, and benefits of conservation corridors in the commonwealth.

Objectives

On April 25, 2023, the Pennsylvania House of Representatives adopted House Resolution 2023-87 (HR 87). The resolution pertained to the status, management, and benefits of conservation corridors (wildlife or migratory corridors). HR 87 was adopted by the Legislative Budget and Finance Committee (LBFC) officers as a staff project on June 21, 2023. As a matter of practice, once the officers adopt a project, staff develop objectives to answer the resolution's intent and to guide planning efforts further. The objectives for this study were as follows:

1. To provide perspectives on conservation corridors, including but not limited to wildlife preservation, human safety, and economic benefits.
2. To analyze data related to vehicle and wildlife collisions on Pennsylvania roadways.
3. To identify best practices in developing, establishing, and funding conservation corridors in Pennsylvania.

Scope

Our study covered January 1, 2019, and December 31, 2022. In some research areas, further extending the scope was necessary to provide better context about the subject matter.

Methodology

To develop an understanding of conservation corridors, we conducted preliminary research and information gathering regarding habitat fragmentation and habitat connectivity. We also conducted research specific to conservation connectivity practices in Pennsylvania, including threats to native species, the economic impact of outdoor recreation, wildlife crossings, state agencies and independent commissions involved in conservation, other stakeholders, and existing partnerships. In addition to our research, we interviewed federal and state government officials,

academicians, researchers, land trust staff, and other conservation stakeholders to gain an understanding of current conservation connectivity practices utilized in the commonwealth.

To examine the impact of wildlife-vehicle collisions (WVC), we reviewed the Pennsylvania Department of Transportation (PennDOT) annual crash statistics reports. The crash data was submitted to PennDOT from traffic crash reports submitted to PennDOT by state, county, municipal, and other law enforcement agencies, as specified in the Pennsylvania Vehicle Code (75 Pa.C.S., Chapter 37, Subchapter C). We also utilized the raw crash data for geographic information system (GIS) analysis. We did not audit the crash data and assumed it to be accurate for our report.

Our research made it clear the crash data reported to PennDOT is not a complete count of total WVCs. We attempted to retrieve vehicle insurance claims data; however, only one insurer in Pennsylvania tracks wildlife-specific claims. We reviewed this insurance company's publicly available analysis (as it determines additional data to be proprietary). We also reviewed studies on roadway carcass data because research conducted in other states has shown that carcass data may provide additional information than crash data.

To gauge Pennsylvania's conservation corridor efforts compared to peer states, we examined programs in Pennsylvania's surrounding states: (1) New Jersey, (2) Ohio, (3) Delaware, (4) Maryland, (5) New York, and (6) West Virginia. We selected these states based on geographic location and similar ecological climates. To complete this analysis, we examined conservation corridor studies and other reports published by the states.

To develop best practices in conservation corridors, we reviewed and summarized research conducted by experts with science-backed evidence of success. The research included best practices for developing human-established corridors, preserving natural or existing corridors, collaboration and partnerships, and data collection and analysis.

Finally, we reviewed a comprehensive report on funding options for conservation corridors commissioned by Pew Charitable Trusts. This report was beneficial in determining revenue options for conservation corridors and funding used in other states.

Frequently Used Abbreviations and Definitions

This report uses several abbreviations for government-related agencies, terms, and functions. These abbreviations are defined as follows:

Abbreviation	Name	Definition
BEA	Bureau of Economic Analysis	A bureau of the United States Department of Commerce that provides economic and industry statistics.
CHANJ	Connecting Habitats Across New Jersey	A New Jersey program designed to prioritize land protection, inform habitat restoration and management, and guide mitigation of road barrier effects on wildlife and their habitats.
DCNR	Department of Conservation and Natural Resources	The state agency is responsible for maintaining and preserving the state's state parks and forests, providing information on the state's natural resources, and working with communities to benefit local recreation and natural areas.
DEP	Department of Environmental Protection	The state agency responsible for protecting and preserving the land, air, water, and public health through enforcement of the state's environmental laws.
FHWA	Federal Highway Administration	A division within the United States Department of Transportation that supports state and local governments in designing, constructing, and maintaining the nation's highway system.
NRCS	Natural Resource Conservation Service	An agency of the United States Department of Agriculture that provides technical assistance to farmers and other private landowners and managers.
PDA	Pennsylvania Department of Agriculture	The state agency is responsible for ensuring a safe and sustainable supply of food and agricultural products, protecting the environment, and promoting Pennsylvania's agriculture.
PennDOT	Pennsylvania Department of Transportation	The state agency is responsible for maintaining and constructing Pennsylvania state roads and highways.
PGC	Pennsylvania Game Commission	The independent commission is responsible for wildlife conservation and management.
PFBC	Pennsylvania Fish & Boat Commission	The independent commission is responsible for conserving aquatic species, amphibians, and reptiles and providing fishing and boating opportunities.
PNDI	Pennsylvania Natural Diversity Inventory	An inventory system of Pennsylvania's rare and threatened species.
PNHP	Pennsylvania Natural Heritage Program	A public-private partnership that gathers and maintains ecological data to help with conservation and land-use planning.
PTC	Pennsylvania Turnpike Commission	The independent commission is responsible for the management of the Pennsylvania Turnpike.
SGCN	Species of Greatest Conservation Need	Species that need conservation action to prevent them from becoming too rare or expensive to restore.

Abbreviation	Name	Definition
SWAP	State Wildlife Action Plan	An assessment of wildlife and habitats that need conservation action.
WVC	Wildlife-Vehicle Collision	A vehicular accident between a vehicle and wildlife is sometimes called "animal-vehicle collision" or AVC.
FWS	United States Fish and Wildlife Service	An agency of the United States Department of the Interior that oversees fish, wildlife, and natural habitats.
USDA	United States Department of Agriculture	The Department of Agriculture is the U.S. government agency that administers federal food production and rural life programs. The department's principal duty is to aid farmers, but it also serves consumers through its food assistance and inspection programs.
CWD	Chronic Wasting Disease	A disease found in deer, elk, and moose that damages portions of the brain and can cause progressive loss of body condition, behavioral changes, excessive salivation, and death.

Throughout this report, we also use technical and scientific terms. These terms are defined as follows:

Term	Definition
Adaptation	Any heritable trait that plants or animals survive and reproduce in their environment.
Culvert	A tunnel carrying a stream or open drain under a road or railroad.
Degradation	When the condition of a habitat declines due to factors such as pollution, invasive species, and over-utilization of natural resources.
Easement	A right to cross or otherwise use someone else's land for a specified purpose.
Ecoregions	An area is defined by its environmental conditions, especially climate, landforms, and soil characteristics.
Exclusionary Fencing	A sturdy, meshed barrier that prevents animals from moving between areas.
Functional Connectivity	Determining how well a landscape allows for the movements of organisms and processes (i.e., seed dispersal, breeding migrations, and genetic exchange).
Gene Flow	The transfer of genetic material from one population to another.
Genetic Diversity	The biological variation that occurs in species.
Habitat Connectivity	The state of connected structural landscape features enables access between places via a continuous route.
Habitat Fragmentation	The process in which a large expanse of habitat is separated into smaller, unconnected patches of land.
Invasive Species	An organism that is not indigenous or native to a particular area.
Listed Species	Species listed as either threatened or endangered, nationally or statewide.

Term	Definition
Native Species	An organism within its known range occurs naturally in a given habitat.
Outdoor Recreation	Any leisure activity conducted in a natural setting.
Pollinators	An insect or other agent that conveys pollen to a plant allows ferritization.
Right-of-Way	The legal right, established by usage or grant, to pass along a specific route through grounds or property belonging to another.
Riparian Buffer	An area adjacent to a stream, lake, or wetland that contains trees, shrubs, or other perennial plants is managed differently from the surrounding landscape.
Seed Dispersal	The movement, spread, or transport of seeds away from the parent plant.
Species	A group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding.
Structural Connectivity	Considers the physical characteristics that support or impede a connected natural landscape.
Ungulate	A hoofed mammal.
Urbanization	The process of making an area more urban.
Urban Sprawl	The uncontrolled expansion of urban areas.
Wildlife Crossing	Structures that allow animals to cross over or under human-made barriers such as roads or railroads.
Wildlife Corridor	A feature of the landscape or seascape that provides habitat connectivity and allows for native species movement or dispersal.

Acknowledgments

We thank the staff of the Pennsylvania Department of Transportation, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Game Commission, Pennsylvania Fish and Boat Commission, and the other state agencies mentioned in this report for providing us with timely information. We also thank the many local and federal stakeholders for providing insight and data on the subject areas in this report.

Important Note

This report was developed by the Legislative Budget and Finance Committee staff, including Project Manager Stevi Sprenkle and staff analysts Josh Ballard and Morgan Smith. The release of this report should not be construed as an indication that the Committee, as a whole, or its individual members necessarily concur with the report’s findings, conclusions, or recommendations.

Any questions or comments regarding the contents of this report should be directed to the following:

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SECTION II PERSPECTIVES ON CONSERVATION CORRIDORS



Fast Facts...

- ❖ Pennsylvania agencies and independent commissions oversee a total of 3.9 million acres of land, including 2.2 million acres of state forests, 1.5 million acres of state game lands, and 295,000 acres of state parks, and maintain nearly 40,000 miles of roadway.
- ❖ The 2015-2025 Pennsylvania State Wildlife Action Plan (SWAP) identified 664 species of greatest conservation need.
- ❖ The outdoor recreation sector is associated with 164,344 (2.7 percent) of Pennsylvania's jobs.

Overview

Pennsylvania has always been a place rich in natural resources. Pennsylvania's name translates to "Penn's Woods" in Latin. The importance of Pennsylvania's natural resources is enshrined in the commonwealth's constitution. Article I, Section 27 of the Pennsylvania Constitution states:

"The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people."

In many ways, Penn's woods have been an asset to the commonwealth, from recreation to habitats for tens of thousands of species to economic impacts. All species (humans, flora, and fauna alike) depend on Pennsylvania's outdoors. Not only does outdoor recreation have health and wellness benefits, but it is also critical to the state economy. In 2022, outdoor recreation's value added to Pennsylvania's gross domestic product (GDP) was \$16.9 billion, or 1.8 percent of the commonwealth's GDP.

Centuries of industrialization and development have negatively impacted Pennsylvania's native species, including habitat fragmentation or the separation of natural habitats. Habitat fragmentation cuts off species from critical movement between areas. Not only can fragmentation prevent species from reaching water, food, and mates, but it also prevents necessary biological processes. Fragmentation can disrupt gene flow or when genetic material moves from one population to another.¹ Reduced or nonexistent gene flow disrupts genetic diversity, which "gives wild populations their best chance at long-term survival."²

House Resolution 2023-87 (HR 87) directed LBFC staff to focus on conservation corridors and consider a conservation strategy to mitigate the

¹ *Evolution 101: Mechanism: The Processes of Evolution*. University of California Berkeley, Museum of Paleontology. June 2020.

² *Preserving Genetic Diversity Gives Wild Populations Their Best Chance at Long-Term Survival*. National Oceanic and Atmospheric Administration. November 2021.

impacts of habitat fragmentation. Conservation corridors can mean different things; sometimes, it involves preserving existing natural corridors (rivers, mountain ranges, etc.); other times, it is designating areas as a conservation zone or adding on to existing protected land (federal, state, or local parks); and other times, it is preventing land from future development (easements).

Despite the lack of official public policy requiring the development or implementation of conservation corridors, we found many stakeholders at the federal, state, and local levels, directly and indirectly, employing conservation corridor practices as part of other conservation efforts and mandated requirements. At the commonwealth level, we found multiple state agencies and independent commissions working on aspects of conservation connectivity. While existing partnerships between agencies and commissions and interconnected work exist, we found that fragmented commonwealth entities and jurisdictions made it challenging to capture the totality of the conservation connectivity work being done.

The Pennsylvania Department of Transportation (PennDOT) has constructed 35 wildlife crossings to make roadways safer for drivers and wildlife. We found that PennDOT's current planning process for wildlife crossings is more reactive as it does not consider crossings in its longer-term planning process. PennDOT's upcoming projects are based on age needs in traffic, maintenance, safety, and infrastructure. Wildlife-vehicle collision (WVC) factors are not considered until later in the project planning process.

In December 2023, the Federal Highway Administration (FHWA) announced the award of a Wildlife Crossing Pilot Program grant for the Pennsylvania Wildlife Crossings Strategic Plan and Analytical Tools program. The grant was awarded to PennDOT and other commonwealth partners to develop comprehensive strategic plans for wildlife crossings. The program has three phases and is expected to be completed by December 2027.

State-owned land presents opportunities to connect adjoining habitats for conservation connectivity. For example, the Pennsylvania Game Commission (PGC) sometimes considers acquiring land adjacent to its current State Game Lands. However, PGC is currently limited to a purchase price of \$400 per acre, which has remained unchanged since the 1980s.

This section overviews the commonwealth agencies and commissions most involved in conservation connectivity work, identifies other stakeholders, and highlights existing partnerships. It will conclude with identified areas of conservation corridor needs and limitations with existing mapping.

Recommendations

Recommendations for Executive Action

1. The Governor should create a position to work among and between state agencies and independent commissions to direct conservation connectivity work in Pennsylvania.
2. The Pennsylvania Department of Transportation should add considerations for wildlife crossings in its long-term planning.

Recommendations for Legislative Consideration

1. The General Assembly should consider requiring the LBFC to conduct a study after PennDOT implements the "Pennsylvania Wildlife Crossings Strategic Plan and Analytical Tools" to provide an update on where Pennsylvania is implementing conservation connectivity procedures.
2. If the General Assembly deems expanding commonwealth-owned land a public policy priority in conservation connectivity, it should consider, at a minimum, an inflation adjustment to the Pennsylvania Game Commission's \$400 per acre land acquisition limit.

Issue Areas

A. Conservation Corridors, Connectivity, and Continuity

Pennsylvania has over 25,000 native animal and plant species and diverse habitats.³ As shown in Exhibit 1, Pennsylvania has 11 areas with similar environmental conditions known as ecoregions.

³ See <https://waterlandlife.org/wildlife-pnhp/species-at-risk-in-pennsylvania/#:~:text=Pennsylvania's%20more%20than%2025%2C000%20native%20species%20face%20many%20challenges>, Accessed February 27, 2024.

Exhibit 1

Pennsylvania's Ecoregions



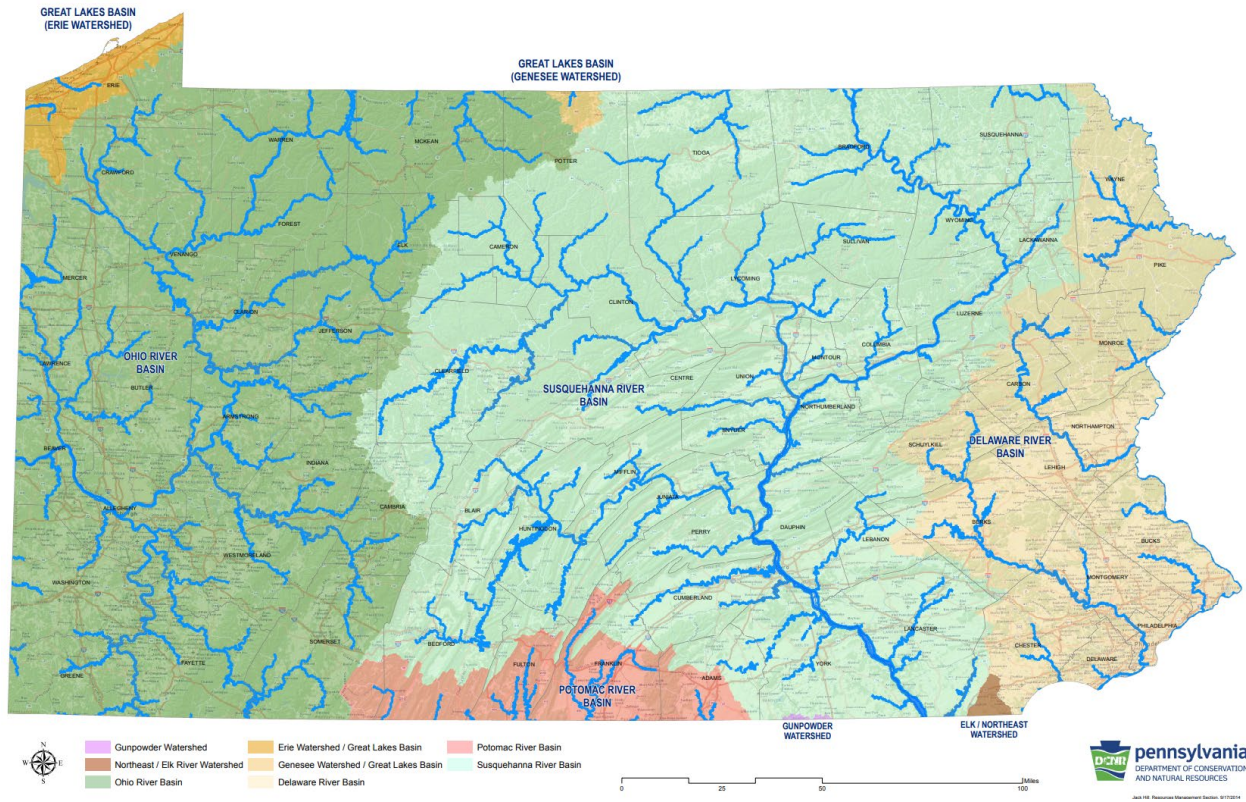
Source: Pennsylvania Department of Conservation and Natural Resources.

Pennsylvania also has many different waterways, as the commonwealth has 86,000 miles of streams and rivers (second only to Alaska).⁴ Pennsylvania has five major basins and additional smaller watersheds (shown in Exhibit 2).

⁴ *Prevention and Management on Stream, Pennsylvania's Geography and Meteorology*. Pennsylvania Department of Environmental Protection.

Exhibit 2

Pennsylvania's Watersheds and Basins



Source: Pennsylvania Department of Conservation and Natural Resources.

Economic Impact of Outdoor Recreation. According to data from the United States Department of Commerce’s Bureau of Economic Analysis (BEA), in 2022, outdoor recreation’s value added to Pennsylvania’s gross domestic product was \$16.9 billion, or 1.8 percent of the commonwealth’s GDP.⁵ Pennsylvania is the eighth-largest outdoor recreation economy in the country.⁶ Exhibit 3 shows the BEA’s breakdown of value-added outdoor recreation activities in Pennsylvania.⁷

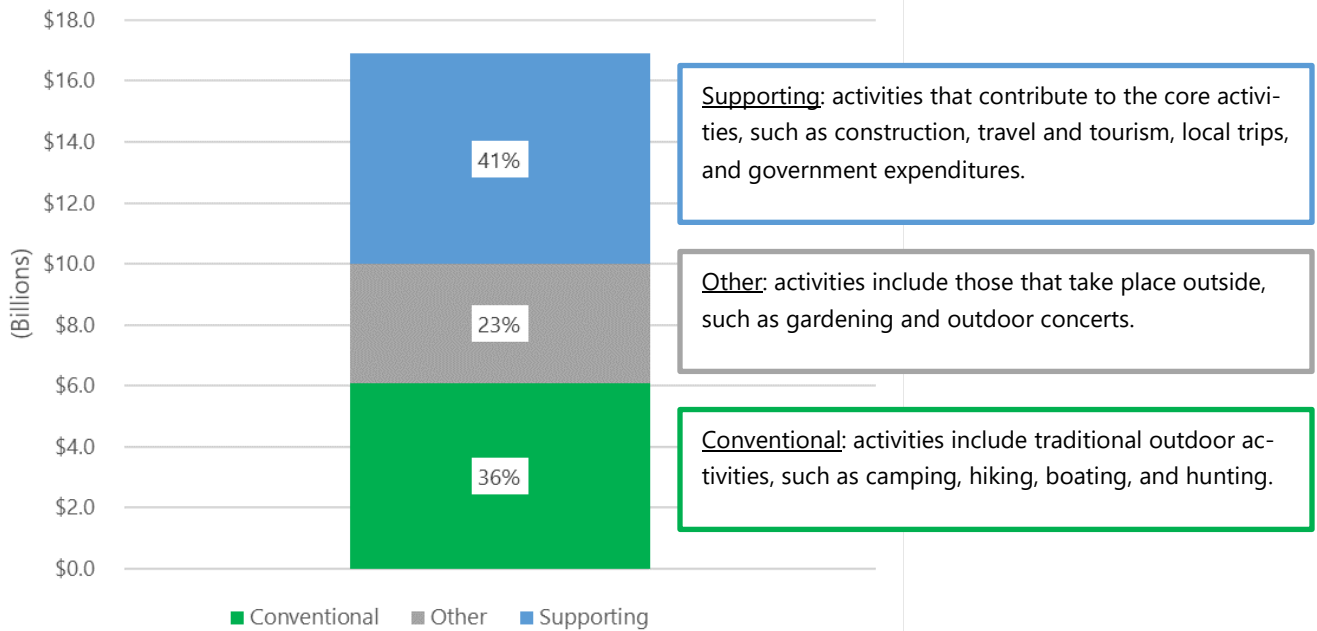
⁵ BEA defines value added as “consists of the gross output of an industry less its intermediate inputs; the contribution of an industry to gross domestic product.” *Outdoor Recreation Satellite Account (ORSA) - 2022 Pennsylvania*. United States Department of Commerce, Bureau of Economic Analysis. November 2023.

⁶ *Growing Outdoor Recreation for Pennsylvania: Conclusions Report and Roadmap for the Future*. Pennsylvania Department of Conservation and Natural Resources, Office of Outdoor Recreation. 2023.

⁷ *Outdoor Recreation Satellite Account (ORSA) - 2022 Pennsylvania*. United States Department of Commerce, Bureau of Economic Analysis. November 2023.

Exhibit 3

**Value-Added Outdoor Recreation Activities in Pennsylvania
2022**



Source: Developed by LBFC staff from information obtained from the United States Department of Commerce.

The outdoor recreation sector also employs 164,344 (or 2.7 percent) individuals.⁸

Threats to Pennsylvania's Wildlife

The 2015-2025 Pennsylvania Statewide Wildlife Action Plan (SWAP) highlights many threats impacting the commonwealth's wildlife. Examples include residential and commercial development, pollution, climate change, severe weather, energy production, and mining. Of these impacts, the SWAP notes the most significant threat to Pennsylvania's species of greatest conservation needs (SGCN) is residential and commercial development:

The loss of natural habitat is due largely to the consumption of open space and wildlife habitats by sprawling human development. Although the population of Pennsylvania has not increased substantially, the amount of suburban and urban land consumed by development

⁸ BEA employment data "consists of all wage-and-salary jobs in which workers are engaged in the production of [outdoor recreation] goods and services."

continues to increase uncontrolled sprawl and the resulting habitat loss and degradation are now the number one threat to wildlife in the [commonwealth].

Residential and commercial development has negatively affected Pennsylvania native species and migrating species who use Pennsylvania as a thruway. Development and roadways have led to habitat fragmentation or the separation of natural habitats. Habitat fragmentation happens when:

Roads, fences, dams, urban areas, or other aspects of human development encroach on natural habitats or cut off migration routes, leaving animals trapped in small or isolated sections of their natural range. When wildlife populations are left with only islands or patches of habitat set aside in protected areas, such as national parks, they are at a greater risk of starvation, inbreeding, and death.⁹

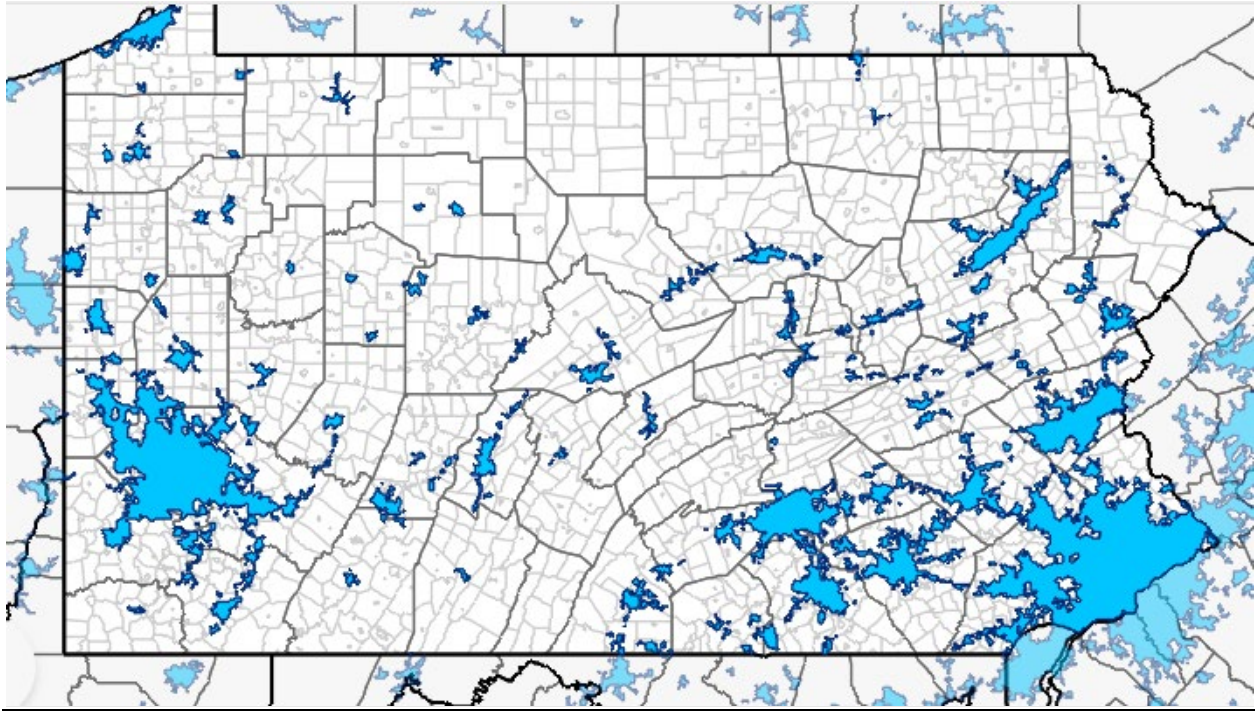
Though Pennsylvania has the third-largest rural population, the commonwealth has also experienced urbanization and the expansion of cities and towns in suburban and rural areas.¹⁰ Exhibit 4 shows urban areas in Pennsylvania as of 2020.

⁹ *The Road to Recovery: How Wildlife Corridors are Smart Economic Investments*. Center for Large Landscape Conservation.

¹⁰ See [https://www.census.gov/newsroom/press-releases/2022/urban-rural-populations.html#:~:text=The%20states%20or%20territory%20with,Pennsylvania%20\(3%2C061%2C630\)](https://www.census.gov/newsroom/press-releases/2022/urban-rural-populations.html#:~:text=The%20states%20or%20territory%20with,Pennsylvania%20(3%2C061%2C630),), Accessed April 24, 2024.

Exhibit 4

**Pennsylvania Urban Areas
2020**



Source: Pennsylvania State Data Center.

Rural areas are not immune to development; as noted in the *SWAP*, "some rural counties have seen an increase in housing units exceeding 20 percent in recent decades."

Quantifying the exact impact of habitat fragmentation on all wildlife species is difficult as there are many other variables and species-specific threats. Researchers have noted that other threats (climate change, invasive species, overhunting, pollution, and altered disturbance regimes) are "exacerbated by fragmentation."¹¹ Through conservation actions completed under the previous *SWAP* (*2005-2015 Pennsylvania Statewide Wildlife Action Plan*), 150 wildlife species were removed from the *SGCN* list. However, Exhibit 5 shows 178 species were added in 2015.

¹¹ Haddad, Nick, et al. *Habitat Fragmentation and Its Lasting Impact on Earth's Ecosystems*. *Sci Adv.* March 2015.

Exhibit 5

**Changes in Pennsylvania Species of Greatest Conservation Need
2005 to 2015**

	Total in 2015	Maintained from 2005	Removed Since 2005	New in 2015
Birds	90	67	12	23
Mammals	19	14	7	5
Fishes	65	54	22	11
Reptiles	22	20	2	2
Amphibians	18	12	1	6
Invertebrates	450	319	106	131
Total	664	486	150	178

Source: Developed by LBFC staff from information obtained from the *2015-2025 Pennsylvania State Wildlife Action Plan*.

As noted in the *SWAP*, “a focus on habitat connectivity, water quality, and invasive species is among the many options to increase resilience for wildlife populations.” This report focuses on one such solution: improved habitat connectivity.

Threats to Pennsylvania’s Plants

Pennsylvania has approximately 3,000 plant species, two-thirds considered native to the commonwealth. Of the Pennsylvania native plants, 582 are classified in various classifications, as defined by the Pennsylvania Code, Title 17, Chapter 45.¹² As shown in Exhibit 6, the number of classified plants has decreased from 1993 to 2022 (by 3.64 percent).

¹² Classified plants differ from unlisted plant species or species native to the Commonwealth, presently capable of sustaining their populations successfully, not in need of protection currently, and currently not included in classifications under this chapter.

Exhibit 6

**Changes in the Number of Pennsylvania’s Classified Plants
 1993 to 2022**

Title 17, Chapter 45 Status	Definition	1993	2022	% Change
Extirpated	A classification of plant species the department believes to be extinct within the commonwealth. The plants may or may not exist outside the commonwealth. If plant species classified as Pennsylvania Extirpated are found to exist, the species automatically will be considered to be classified as Pennsylvania Endangered.	106	102	(-3.77)
Endangered	A classification of plant species that are in danger of extinction throughout most or all of their natural range within the commonwealth if critical habitat is not maintained or if humans significantly exploit the species. This classification also includes populations of plant species classified as Pennsylvania Extirpated but which subsequently are found to exist in the commonwealth.	228	232	1.75
Threatened	A classification of plant species that may become endangered throughout most or all of their natural range within the commonwealth if critical habitat is not maintained to prevent their further decline in the commonwealth or if humans extensively exploit the species.	78	78	0.00
Rare	A classification of plant species that are uncommon within the commonwealth because they may be found in restricted geographic areas or low numbers throughout the commonwealth.	41	39	(4.88)
Vulnerable	A classification of plant species that are in danger of population decline within the commonwealth because of their beauty, economic value, use as a cultivar, or other factors that indicate that persons may seek to remove these species from their native habitats.	3	3	0.00
Tentatively Undetermined	A classification of plant species that are believed to be in danger of population decline but which cannot presently be included within another classification due to taxonomic uncertainties, limited evidence within historical records, or insufficient data.	148	128	(13.51)
Special Concern Populations	A classification that is composed of colonies, groups, or single individuals of a plant species that the department has determined to be a unique occurrence deserving protection. Among the factors that may be used to classify a plant population within this category are unusual geographic locations, unisexual populations, or extraordinarily diverse plant populations.	0	0	0.00
Total		604	582	(3.64)

Source: Developed by LBFC staff from information obtained from the Department of Conservation and Natural Resources.

While Pennsylvania's number of classified plants has decreased over the last three decades, roughly one-third of all native plants are still classified.

Plants in Pennsylvania face challenges like those faced by wildlife. According to the Pennsylvania Department of Conservation and Natural Resources (DCNR), the most common threats to plants in Pennsylvania include:¹³

- Habitat loss and fragmentation due to development or conversion of habitat.
- Invasive plants are displacing native plants.
- Creation of more edge habitat, increasing the threat of invasive plant species.
- Selective browsing by wildlife prevents plants from reproducing.
- Humans are over-collect showy, edible, or medicinal plants.

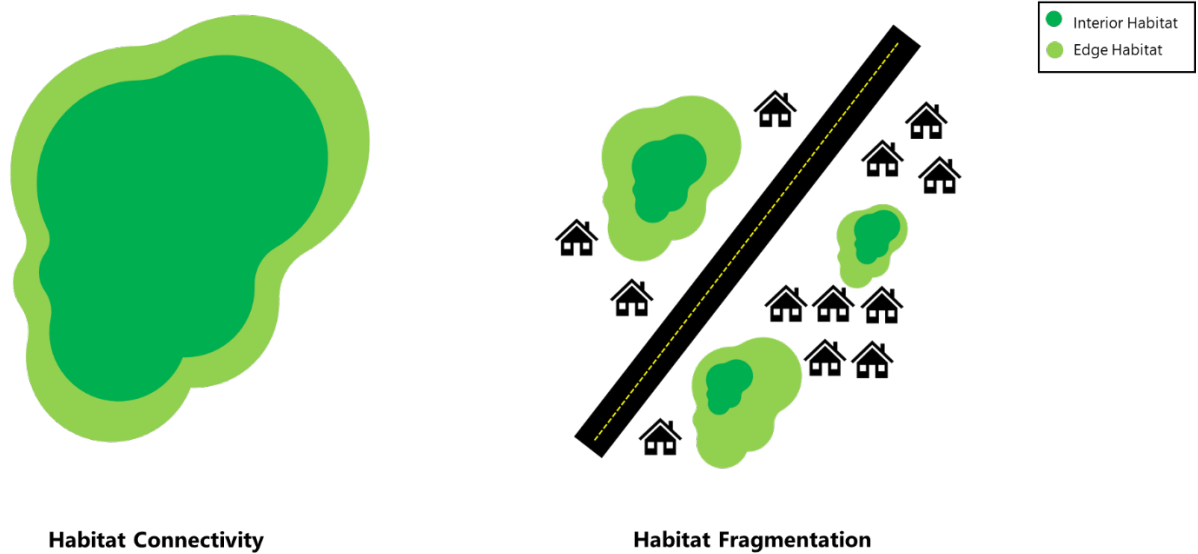
“In plants, habitat fragmentation may impact the genetic and demographic structure of populations resulting in local or species-level extinctions, but more commonly, fragmentation affects plant growth and reproduction through changes in the biotic and abiotic environments.”¹⁴ Fragmentation can alter a region's interior and edge habitats (the outer layer or transitional zone between habitats). As shown in Exhibit 7, when habitat fragmentation occurs, the interior and edge habitat area changes.

¹³ See <https://www.dcnr.pa.gov/Conservation/WildPlants/RareThreatenedAndEndangeredPlants/Pages/default.aspx#:~:text=Some%20of%20the%20most%20common,invasive%20plants%20displacing%20native%20plants>, Accessed April 11, 2024.

¹⁴ Sayago, Roberto, et al. *Consequences of Habitat Fragmentation on the Reproductive Success of Two Tillandsia Species with Contrasting Life History Strategies*. AoB Plants. August 2018.

Exhibit 7

Interior and Edge Habitat Changes as a Result of Habitat Fragmentation



Source: Developed by LBFC staff.

The edge change is negative for some wildlife species but positive for others.¹⁵ As noted by DCNR, creating more edge habitats can negatively impact Pennsylvania's plants.

Habitat Connectivity

As the name implies, habitat connectivity connects or reconnects habitats by facilitating animal movement and other ecological processes, such as seed dispersal.¹⁶ In the Northeast, "on average, 43 percent of forests are in blocks of less than 5,000 acres and are completely encircled by major roads, resulting in an almost 60 percent loss of local connectivity between habitats."¹⁷ Reconnecting habitats allows plants and animals to move for food, water, mating, and adaptation. Connectivity can be viewed in two ways: structural and functional. Exhibit 8 highlights the difference between the two concepts.

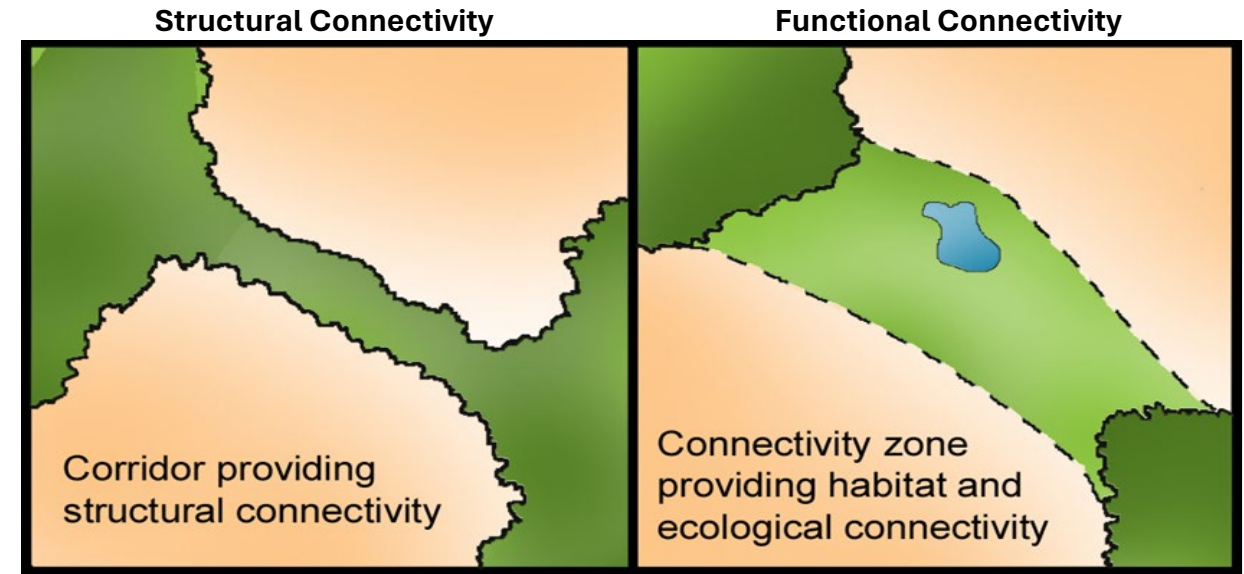
¹⁵ Maters, Ron, et al. *Wildlife Management Notes: No. 10 Edge and Other Wildlife Concepts*. Oklahoma State University Cooperative Extension Service. April 2017.

¹⁶ *Wildlife Corridors Fast Facts*, National Wildlife Federation, May 2019.

¹⁷ 2015-2025 Pennsylvania Wildlife Action Plan.

Exhibit 8

Structural vs. Functional Connectivity



Source: Cornell University, College of Agriculture and Life Sciences, Department of Natural Resources and the Environment.

Structural connectivity “considers the physical characteristics that support or impede a connected natural landscape, such as large forests, human development, and water bodies.”¹⁸ Functional connectivity “described how well a landscape allows for the movements of organisms and processes such as seed dispersal, breeding migrations, and genetic exchange.”¹⁹

In some literature about conservation connectivity, “corridor” and “crossing” are used interchangeably. According to FHWA, the two main objectives of wildlife crossings are to:²⁰

- Facilitate connections between habitats and wildlife populations.
- Improve motorist safety and reduce wildlife-vehicle collisions.

For our report, as shown in Exhibit 9, “corridors” connect two separate habitat areas, and “crossings” are structures that cross roadways (over or under) to connect two separate habitat areas.

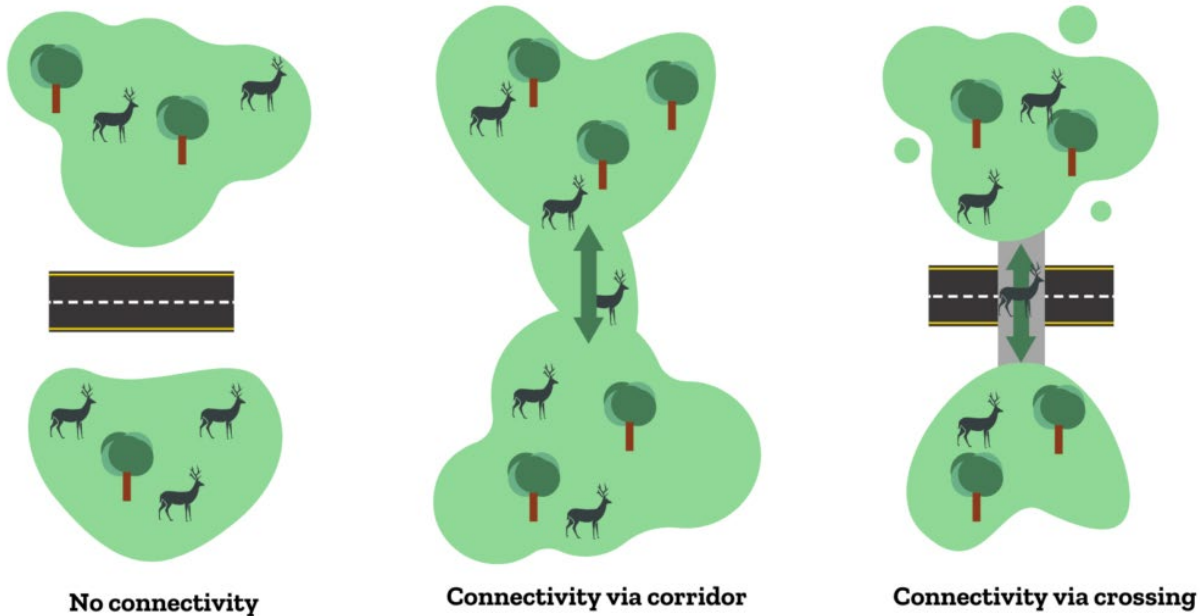
¹⁸ See <https://hudson.dnr.cals.cornell.edu/conservation-planning/inventory-and-planning/connectivity-planning#:~:text=In%20the%20absence%20of%20on,breeding%20migrations%2C%20and%20genetic%20exchange.>, Accessed April 18, 2024.

¹⁹ Ibid.

²⁰ *Wildlife Crossing Structure Handbook Design and Evaluation in North America*. US Department of Transportation, Federal Highway Administration. March 2011.

Exhibit 9

Conservation Corridor vs. Crossing



Source: Center for Large Landscape Conservation.

The concept of conservation connectivity includes roadway crossings. However, not all corridors include crossings. Essentially, there is more to habitat connectivity than just roadways. Some corridors, such as mountain ranges, waterways, and forests, are naturally occurring. Due to development and urbanization, other corridors, such as zones, roadway crossings, and easements, are human made. Each of these corridors will be discussed in more depth throughout the report.

B. Major Players in Conservation Connectivity in Pennsylvania

Various commonwealth agencies and independent commissions currently employ conservation connectivity practices in Pennsylvania. While overlap and interconnected work exists between agencies and commissions, each entity focuses on specific areas or species. The decentralization of conservation work between agencies and commissions made it difficult to precisely determine the statewide efforts in conservation connectivity across the commonwealth. Because of this, we present what conservation connectivity practices individual agencies and commissions have used, note other key stakeholders, and conclude with existing partnerships.






Pennsylvania State-Owned Land and Conservation Agencies

Nearly 14 percent of Pennsylvania's land is owned by the commonwealth, ranking the state sixth in the percentage of state-owned land.²¹ Pennsylvania agencies and commissions oversee 3.9 million acres of land, including 2.2 million acres of state forests, 1.5 million acres of state game lands, and 295,000 acres of state parks.

Multiple state agencies and independent commissions are involved in conservation efforts in Pennsylvania. Exhibit 10 contains the seven state agencies or independent commissions most involved in conservation connectivity efforts.



Exhibit 10

Pennsylvania State-Level Entities Involved with Conservation Connectivity Efforts

Agency/Commission	Agency/Commission Type	Entity Oversight
 Department of Agriculture	Cabinet-Level Agency	Agriculture and related industries.
 Department of Conservation and Natural Resources	Cabinet-Level Agency	State parks and forest land, ecological and geological resources, and plants.
 Department of Environmental Protection	Cabinet-Level Agency	Protect air, land, and water from pollution.
 Department of Transportation	Cabinet-Level Agency	State highways and bridges.
 Fish and Boat Commission	Independent Commission	Fish, reptiles, amphibians, and aquatic invertebrates.

²¹ Nelson, Robert. *State-Owned Lands in the Eastern United States: Lessons from State Land Management in Practice*. PERC Public Lands Report. March 2018.

Exhibit 10 continued

Agency/Commission	Agency/Commission Type	Entity Oversight
Game Commission 	Independent Commission	Wild birds and wild mammals (game and nongame species).
Turnpike Commission 	Component Unit of the commonwealth	I-76/Pennsylvania Turnpike and service plazas.

Source: Developed by LBFC staff.

The following subsections explain each agency and commission's current responsibilities in greater detail. While there is no mandate directing agencies and commissions to conduct conservation connectivity, we found that some work in this area, some in more obvious ways than others.

Pennsylvania Department of Transportation

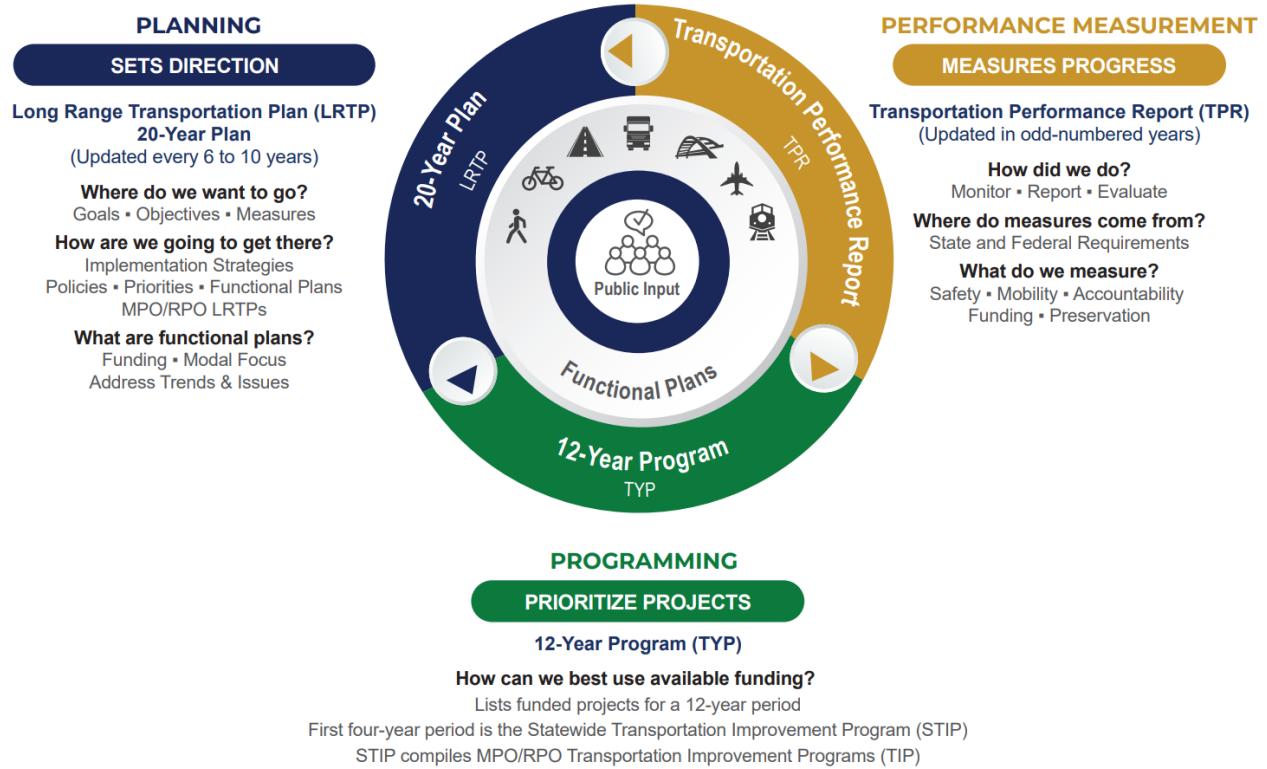
The Pennsylvania Department of Transportation (PennDOT) oversees programs and policies affecting highways, public transportation, airports, ports, and waterways. The department manages a system with nearly 40,000 highway miles and roughly 25,400 bridges. Within PennDOT's Bureau of Design and Delivery Division is the Environmental Policy and Development Section. The division's mission is to "provide environmental and cultural resources expertise to PennDOT during the planning, design, construction, maintenance, and daily operation of transportation projects."²²

PennDOT's highway and bridge planning process is multifaceted and begins with long-term planning (see Exhibit 11).

²² See <https://www.penndot.pa.gov/ProjectAndPrograms/RoadDesignEnvironment/Environment/environmental-policy/Pages/default.aspx#:~:text=The%20mission%20of%20the%20Environmental,daily%20operation%20of%20transportation%20projects>, Accessed April 24, 2024.

Exhibit 11

PennDOT Planning Process



Source: Pennsylvania Department of Transportation.

During project planning, PennDOT conducts an environmental analysis that includes various federal and state-mandated considerations such as cultural and historical resources, wetlands, and threatened and endangered species.²³ After planning, PennDOT designs projects based on information gained during the environmental analysis.

PennDOT’s Design Manual outlines highway design guidelines, including the design and use of wildlife crossings. The purpose of PennDOT’s Design Manual is to:

Provide its users with the current, uniform procedures and guidelines for the application and design of safe, convenient, efficient, and attractive highways that are compatible with their service characteristics and that optimally satisfy the needs of highway users while maintaining the integrity of the environment.²⁴

²³ PennDOT Transit Project Delivery Process Guide. Pennsylvania Department of Transportation. January 2021.

²⁴ Chapter 1 – General Design. Pennsylvania Department of Transportation Design Manual. Publication 13.

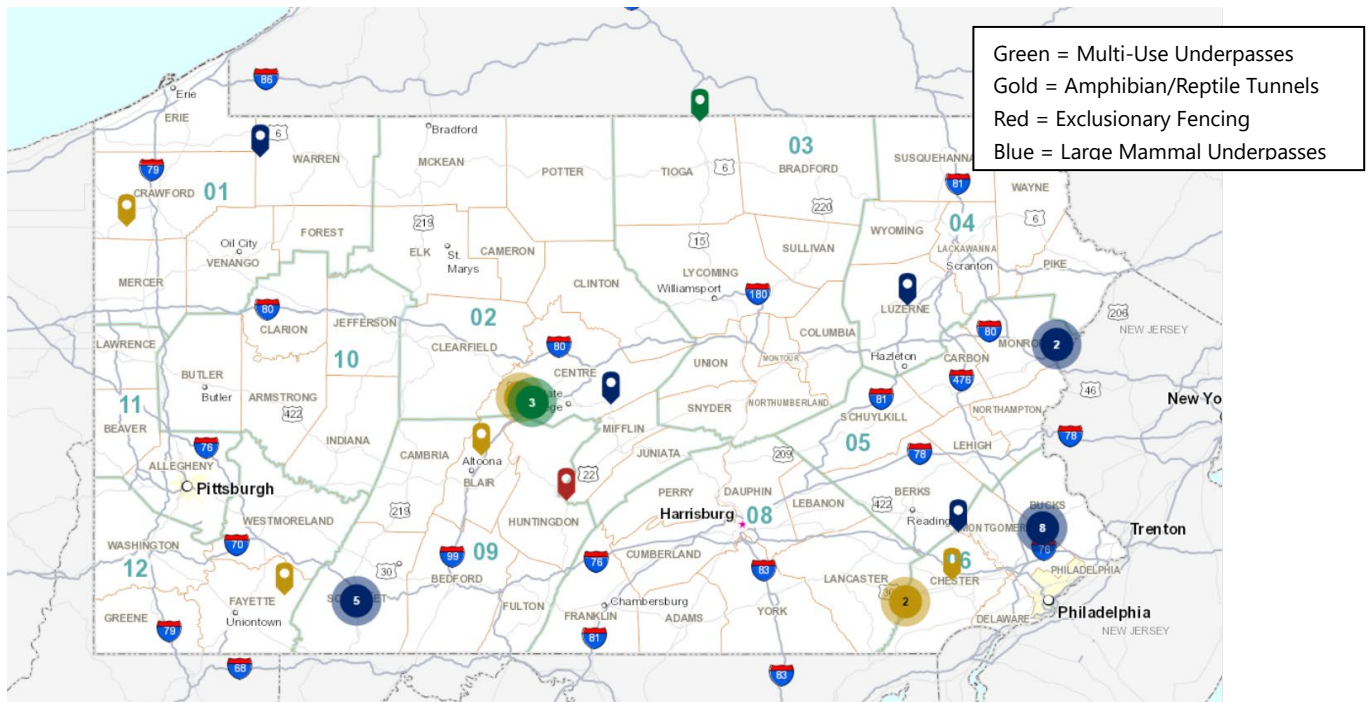
The design manual has a section dedicated to wildlife crossings, which provides guidance should an Engineering District elect to study and construct a crossing or exclusionary device. However, the Engineering Districts are not mandated to use such devices.²⁵

We found PennDOT's current approach to wildlife crossings to be more reactive than proactive because PennDOT does not consider wildlife crossings in the long-term planning. While PennDOT focuses on highway and bridge maintenance and construction, waiting until later in the planning process to consider wildlife needs may miss high-priority opportunities, such as areas with frequent wildlife-vehicle collisions (WVCs). Additionally, if wildlife crossings are needed, they can be a financial investment not currently considered in the Twelve-Year Program.

Pennsylvania Wildlife Crossings and Exclusionary Devices on State Highways. PennDOT has constructed multiple different types of wildlife crossings across Pennsylvania. Exhibit 12 contains the locations of the wildlife crossings previously built.

Exhibit 12

**PennDOT Wildlife Crossings and Exclusionary Fencing Map
As of November 2022**



Source: Pennsylvania Department of Transportation.

²⁵ Chapter 21 – Wildlife Crossings. Pennsylvania Department of Transportation Design Manual Part 2 – Contextual Highway Design. Publication 13 (DM-2).

As of 2023, there were 35 wildlife crossings on Pennsylvania state highways.²⁶ PennDOT utilized five types of wildlife crossings to prevent wildlife from entering the roadway. According to the agency, the crossings were built with specific "site conditions, target species, and safety goals in mind for the project area."²⁷

Each type of PennDOT wildlife crossing is explained in further detail. Additionally, pictures are provided as the crossings may not be evident to passersby as all of the crossings constructed by PennDOT are underneath the roadways.

Multi-Use Underpass. The first type of wildlife crossing is the multi-use underpass. An example of such is shown in Exhibit 13.

Exhibit 13

Multi-Use Underpass I-99 Centre County



Source: Pennsylvania Department of Transportation.

A multi-use crossing can be co-used between wildlife and humans. The structure is created to be used by generalist species that are common in human-dominated environments. The above example was constructed on an Interstate 99 (I-99) section in Centre County. PennDOT coordinated with other state agencies and commissions to identify five areas that presented opportunities for a wildlife passage structure. As shown,

²⁶ Worden, Amy. *Critter Crossings: Pa. Builds Safe Road Passages for Wildlife*. PennLive. June 2023.

²⁷ See <https://storymaps.arcgis.com/stories/d24cf101327946489d2d8b67338e5ce7>, Accessed March 1, 2024.

PennDOT cameras indicated the use of the underpasses by large mammals such as bears and deer.

Underpass with Waterflow. PennDOT's second type of wildlife crossing is the underpass with water flow. PennDOT states, "This allows for the movement of aquatic and terrestrial species below the roadway." This crossing can also be fenced to encourage wildlife to use it. Exhibit 14 shows an underpass with water flow constructed under US Route 219 (US 219) in Somerset County.

Exhibit 14

**Underpass with Waterflow
US 219 Somerset County**



Source: Pennsylvania Department of Transportation.

PennDOT's wildlife cameras showed the use of the US 219 crossing by white-tailed deer and bobcat.

Amphibian/Reptile Tunnels. PennDOT has constructed amphibian/reptile-specific tunnels under roadways in areas of fragmentation near wetlands. Exhibit 15 shows an amphibian/reptile tunnel installed to connect wetlands and state game lands under the highway.

Exhibit 15

**Amphibian/Reptile Tunnels
US 219 Somerset County**



Source: Pennsylvania Department of Transportation.

According to PennDOT, the tunnels have had evidence of wildlife use. For example, wildlife tracks were observed within one of the amphibian/reptile tunnels (left image), and a snapping turtle was spotted using the tunnel (right photo).

Large Mammal Underpass. PennDOT has also constructed large mammal underpasses like the crossings mentioned. However, they are larger to accommodate Pennsylvania's larger mammals like bears and white-tailed deer. The underpasses are specifically built for the landscape. For example, as shown in Exhibit 16, on Route 209, PennDOT utilized an underpass paired with wildlife fencing and plantings (left image) in one area and a large mammal underpass with an "earthen shelf" (right image) in another roadway section to meet the specific needs of the two areas.

Exhibit 16

**Large Mammal Underpass
Route 209 Monroe County**



Source: Pennsylvania Department of Transportation.

Exclusionary Fencing. As the name implies, exclusionary fencing excludes wildlife from entering a roadway. One example of exclusionary fencing constructed by PennDOT is located along Route 522. The fencing was designed to prevent turtles from entering the roadway and reduce turtle-vehicle collisions (shown in Exhibit 17).²⁸

²⁸ See <https://storymaps.arcgis.com/stories/d24cf101327946489d2d8b67338e5ce7>, Accessed March 1, 2024.

Exhibit 17

Exclusionary Fencing for Turtles
SR 522 Huntingdon County



Source: Pennsylvania Department of Transportation.

Exclusionary fencing is used either apart from or in addition to wildlife crossings. Section IV discusses using exclusionary fencing with wildlife crossings as a best practice.

PennDOT stated they continue “to build and evaluate wildlife crossings across the commonwealth with the goal of increasing safety and improving habitat connectivity for wildlife.” Section III will discuss WVCs, driver safety considerations, and PennDOT crash data.

PennDOT also has programs related to plants and insects for habitat connectivity. PennDOT has worked to reduce the use of invasive species such as crown vetch and promotes the use of native plants as roadside vegetation. Additionally, because highways “have been recognized nationally as lands that have [the] potential to provide habitats for pollinators and support corridor connectivity for pollinators,” PennDOT has developed a Pollinator Habitat Plan.²⁹ As will be discussed in more depth, PennDOT partners with many other stakeholders in its conservation connectivity work.

²⁹ See <https://www.penndot.pa.gov/ProjectAndPrograms/RoadDesignEnvironment/Environment/environmental-policy/Pages/Pollinator-Habitat-Plan.aspx>, Accessed May 3, 2024.

Pennsylvania Department of Conservation and Natural Resources

DCNR is charged with (1) maintaining and protecting 124 state parks, (2) managing 2.2 million acres of state forest land, (3) providing information on the state's ecological and geologic resources, and (4) establishing community conservation partnerships with grants and technical assistance to benefit rivers, trails, greenways, local parks and recreation, regional heritage parks, open space, and natural areas.

Within DCNR, the Bureau of Forestry manages state forests with habitat management and biological diversity maintenance.³⁰ DCNR can grant rights-of-way (ROW) in state forest lands for pipelines and transmission corridors through the Conservation and Natural Resources Act. DCNR must consider the purpose of the ROW and the impact on state forests. ROWs for power and pipelines are habitat connectivity because linear strips sometimes connect vast land areas between landowner types (public and private).³¹

DCNR's Bureau of Recreation and Conservation focuses on the long-term sustainability of Pennsylvania's resources by connecting local communities with resources for conservation-focused design, such as protecting wetlands, managing stormwater, and supporting green landscaping projects.³² As part of DCNR's grant partnerships, the bureau considers projects that meet goals such as enhancing landscape connectivity.³³ DCNR supports land conservation and acquisition through several methods, including:³⁴

- The acquisition of lands added to state parks, state forests, and state game lands.
- Grant funding assistance for acquiring trail corridors, recreation areas, greenways, critical habitats, and other open spaces by local government or nonprofit organizations.
- Grant funding assistance for the purchase of conservation easements.
- Grant funding assistance for large, landscape-scale planning efforts.

These methods are funded primarily through the Community Conservation Partnerships Program. DCNR's acquisition and development

³⁰ *Bureau of Forestry Fact Sheet*. Department of Natural Resources and Conservation. October 2017.

³¹ Crable, Ad. *Power, Pipeline Corridors are Becoming Wildlife Habitat*. Bay Journal. April 2024.

³² See <https://elibrary.dcnr.pa.gov/GetDocument?docId=4685446&DocName=BRC%20Fact%20Sheet.pdf>, accessed April 4, 2024

³³ *2024 Community Conservation Partnerships Program, Grant Round 30, Application Materials, Policies, and Forms*. Department of Natural Resources and Conservation, Bureau of Recreation and Conservation.

³⁴ See <https://www.dcnr.pa.gov/Communities/Grants/LandAcquisitionGrants/Pages/default.aspx>, Accessed May 3, 2024.

projects require the land to be used for a specific time (often in perpetuity) for recreation and conservation.³⁵ Community Conservation Partnerships Program grants primarily fund two projects - land acquisition and conservation easements.³⁶

DCNR's Bureau of State Parks manages Pennsylvania's state parks. The bureau notes that "stewardship responsibilities should be carried out in a way that protects the natural outdoor experiences for the enjoyment of current and future generations."³⁷ In 2022, DCNR added new state parks in Chester, Wyoming, and York counties.

The state park in Wyoming County (Vosburg Neck) was added due to "significant pressure from residential and commercial development," and the newly added park in York County (Susquehanna Riverlands) was added because the site "adjoined and built on large tracts of already preserved open space."³⁸ These considerations are conservation connectivity practices: preserving and protecting existing lands and reconnecting habitats.

Pennsylvania Game Commission

PGC was created in response to dwindling wildlife due to "deforestation, pollution, and unregulated hunting and trapping."³⁹ Their mission is to manage and protect wildlife and habitats while promoting hunting and trapping for current and future generations.⁴⁰ Hunting and furtaker license sales, State Game Lands timber, mineral, oil, and gas revenues, and federal appropriations fund the commission.

PGC owns more than 1.5 million acres of State Game Lands to manage wildlife habitats and provide lawful hunting and trapping opportunities. PGC's primary goals are to add lands adjacent to current game lands, conserve habitats, and provide connectivity.⁴¹ PGC land purchased

³⁵ Ibid.

³⁶ An agreement between a landowner and a land trust or government for conservation purposes. The agreement limits certain uses on all or a portion of a property while keeping the property in the landowner's ownership and control.

³⁷ See <https://www.dcnr.pa.gov/about/Pages/State-Parks.aspx>, Accessed May 3, 2024.

³⁸ See <https://www.dcnr.pa.gov/GoodNatured/pages/Article.aspx?post=217#:~:text=The%20new%20state%20parks%20are,decided%20during%20the%20planning%20process>, Accessed May 3, 2024.

³⁹ See <https://www.pgc.pa.gov/InformationResources/AboutUs/Pages/default.aspx>, Accessed May 2, 2024.

⁴⁰ Ibid.

⁴¹ According to PGC, the only time they look at "stand alone" parcels is if there's land with high value of species of greatest conservation need or "some other critical habitat or unique feature." See Whipkey, Brian. *Pa. Game Commission Discusses Strategies for Future Purchase of State Game Lands*. GoErie. March 2024.

through the Game Fund is statutorily limited to a maximum purchase price of \$400 per acre, a figure set in the 1980s.⁴²

Pennsylvania Fish and Boat Commission

The Pennsylvania Fish and Boat Commission (PFBC) is an independent commonwealth commission with jurisdiction over fish, reptiles, amphibians, and aquatic invertebrates.⁴³ Their mission is “to protect, conserve, and enhance the commonwealth’s aquatic resources and provide fishing and boating opportunities.”⁴⁴ Like PGC, PFBC receives no General Fund appropriation and is funded from the sale of fishing licenses, fees, and federal appropriations.

PFBC’s Division of Habitat Management “assists sportsmen and conservation groups on projects to improve fish habitat in local lakes and streams; coordinates the removal of dams and other blockages to natural fish movement; and provides technical guidance on designing riparian buffers.”⁴⁵

Another conservation connectivity practice supported by PFBC is the replacement of culverts.⁴⁶ A culvert is a closed pipe that runs under a roadway for drainage. It can reduce the flow of water and sediment, preventing fish and other wildlife from reaching the other side of the pipe, which results in habitat fragmentation. Researchers illustrated the impact of traditional culverts on fish compared to ecological-designed culverts (Exhibit 18).⁴⁷

⁴² 34 Pa.C.S § 705.

⁴³ Invertebrates are animals without a backbone or bony skeleton. See <https://www.nationalgeographic.com/animals/invertebrates>, Accessed May 7, 2024.

⁴⁴ See <https://www.fishandboat.com/About-Us/AgencyOverview/Pages/default.aspx>, Accessed May 2, 2024.

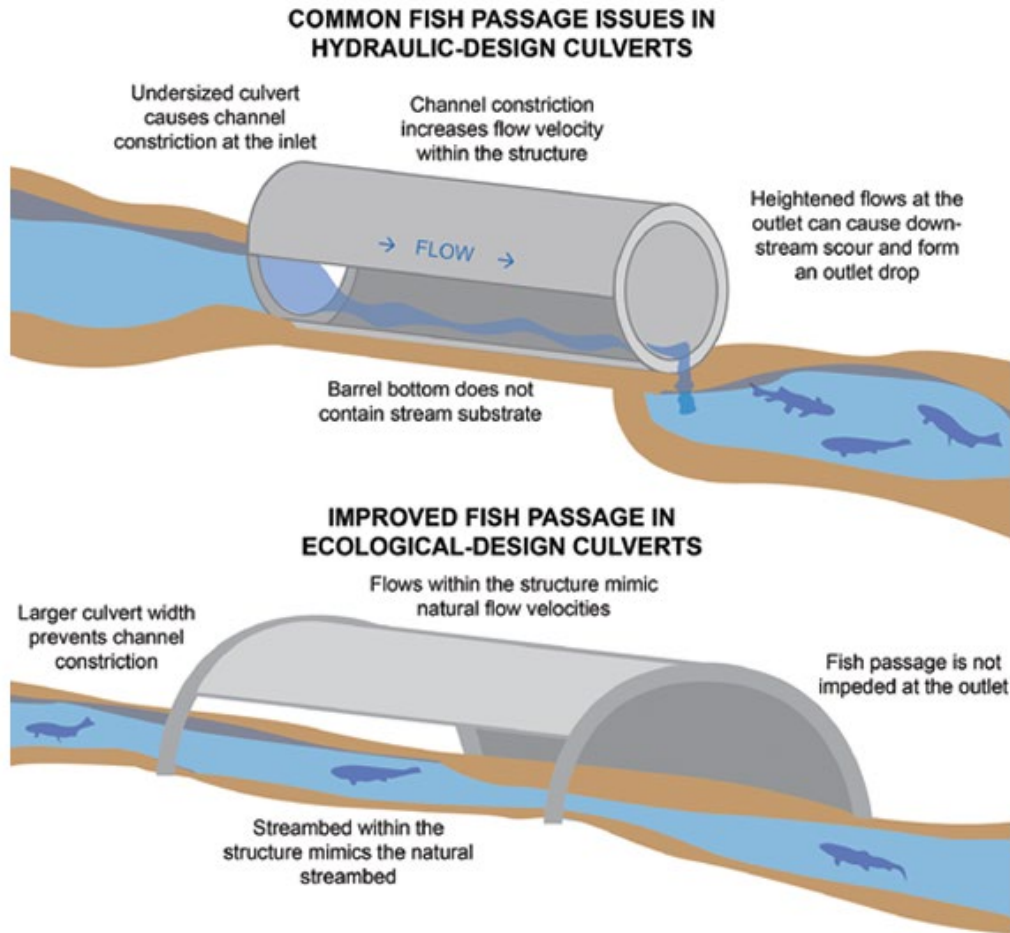
⁴⁵ See <https://www.fishandboat.com/Conservation/Habitat/Pages/default.aspx>, Accessed May 2, 2024.

⁴⁶ *PA Fish and Boat Commission Strategic Plan July 1, 2020 – June 30, 2023, Quarterly Progress Report for Operational Goals*.

⁴⁷ O’Shaughnessy, Eric, et al. *Conservation Leverage: Ecological Design Culverts also Return Fiscal Benefits*. Fisheries. January 2017.

Exhibit 18

Traditional Culverts Compared to Ecological-Design Culverts



Source: *Conservation Leverage: Ecological Design Culverts also Return Fiscal Benefits.*

Researchers have also indicated that replacing culverts benefits more than just fish and wildlife. For example, ecological-design culverts are more expensive up front but have lower maintenance and repair costs than traditional culverts.⁴⁸ PFBC confirmed this and added that culverts designed for fish have a higher hydraulic capacity and allow debris to pass through, leading to lower overall maintenance expenditures. Traditional culverts also flood easily, damaging infrastructure and posing additional risks to people and wildlife.⁴⁹

⁴⁸ Levine, Jessica. *An Economic Analysis of Improved Road-Stream Crossings.* The Nature Conservancy. August 2013.

⁴⁹ Ibid.

Pennsylvania Department of Environmental Protection (DEP)

The Pennsylvania Department of Environmental Protection (DEP) is tasked with protecting Pennsylvania’s clean air, land, and water from health and safety concerns.⁵⁰ DEP’s conservation connectivity practices are primarily related to its administration and oversight of environmental permits.

According to DEP, many of its permits have provisions explicitly relating to habitat for threatened or endangered species. For example, Chapter 105, General Permits, considers the potential impacts on “water quality, stream flow, fish and wildlife, aquatic habitat... and other relevant significant environmental factors.” While DEP’s purpose in environmental permitting is not conservation connectivity, habitat protection and restoration are part of connectivity strategies.

Pennsylvania Turnpike Commission (PTC)

The Pennsylvania Turnpike or Interstate 76 (I-76) runs 550 miles across the state and, like other highways, separates wildlife habitats. To reduce some impacts of habitat fragmentation, PTC has constructed one wildlife crossing, an underpass in Somerset designed for bog turtles.⁵¹ PTC is considering the construction of a wildlife crossing overpass in its plans to bypass the Allegheny Tunnel.⁵² However, these plans are still preliminary.

PTC began implementing an Integrated Roadside Vegetation Management Plan in 2024 to reduce mowing frequency in prescribed areas along the PTC right-of-way. According to the commission, the Plan will promote increased stability as the vegetation matures and allow for the development of more natural vegetation along the Turnpike. In effect, this will help serve as a corridor for plants.

PTC installs exclusionary fencing along its roadway to try to reduce WVCs. The fence deployed on much of the system is 48 inches. According to PTC, between mile markers 324 and 326, the fencing is 96 inches due to a substantial number of deer crossing in this area.

⁵⁰ See <https://www.dep.pa.gov/About/Pages/default.aspx>, Accessed May 2, 2024.

⁵¹ Worden, Amy. *Critter Crossings: Pa. Builds Safe Road Passages for Wildlife*. PennLive. June 2023.

⁵² Griffith, Randy. *Plans Advance for Bypass of Allegheny Tunnel on Turnpike*. The Tribune-Democrat. January 2023.

Pennsylvania Department of Agriculture

The Pennsylvania Department of Agriculture (PDA) protects and promotes agriculture and related industries in the state. PDA is authorized to purchase conservation easements for quality farmland.⁵³ While the purpose of agricultural-related easements is to preserve farmland, which can differ from other conservation easements, agricultural easements have been shown to prevent development in areas that would have otherwise been developed.⁵⁴

Other Stakeholders

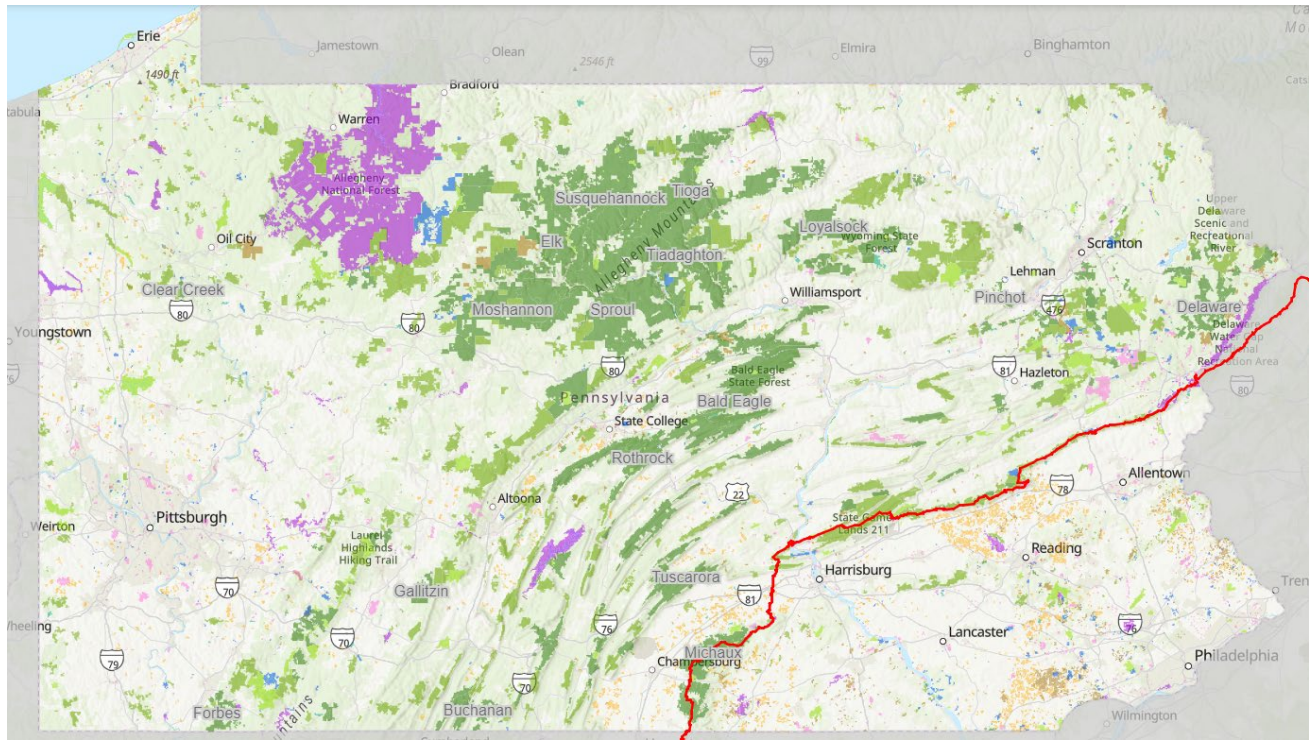
Other stakeholders play a crucial role in conservation connectivity in Pennsylvania. These stakeholders include non-profit organizations, land trusts, private landowners, and local and federal governments. Commonwealth agencies and commissions work with these stakeholders in official and unofficial ways to promote conservation connectivity. Exhibit 19 shows preserved land by stakeholder type.

⁵³ Act 43 of 1998 § 914.1.

⁵⁴ Braza, Mark. *Effectiveness of Conservation Easements in Agricultural Regions*. Conservation Biology. February 2017.

Exhibit 19

Pennsylvania Preserved Land



State Lands

- Bureau of Forestry
- Bureau of State Parks
- Fish and Boat Commission
- Game Commission
- Historical and Museum Commission
- Other

Other Lands

- Federal
- Local Parks and Open Space
- Land Trust Lands
- Conservation Easements
- County Farm Easements

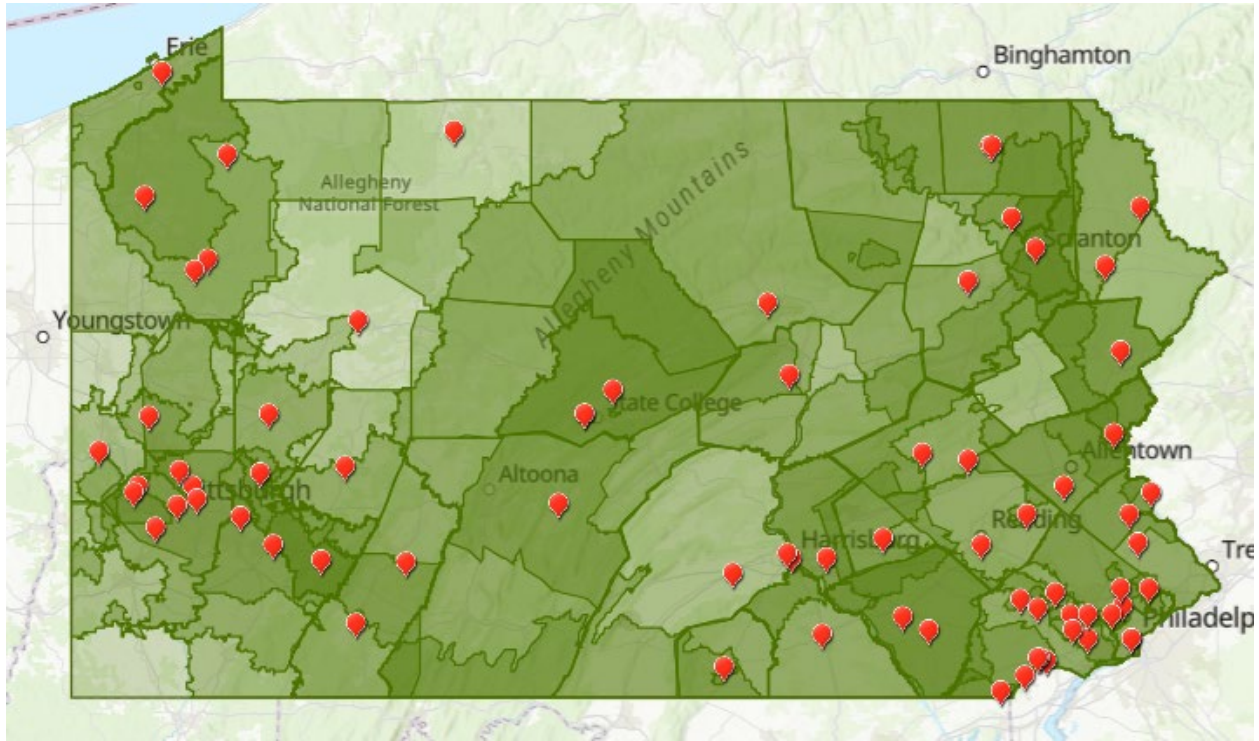
Source: WeConservePA.

Land Trusts. A land trust is a “charitable organization that acquires land or conservation easements, or stewards land or easements, to achieve one or more conservation purposes.”⁵⁵ Exhibit 20 shows the locations of land trusts in Pennsylvania.

⁵⁵ See <https://library.weconservepa.org/guides/150-what-is-a-land-trust#:~:text=Land%20trusts%20work%20cooperatively%20with,under%20easement%20is%20properly%20conserved>, Accessed May 3, 2024.

Exhibit 20

Pennsylvania Land Trusts



Source: WeConservePA.

Land trusts often engage with private landowners to enter easements or for general conservation outreach.

Natural Resources Conservation Service. The United States Department of Agriculture’s (USDA) Natural Resources Conservation Service (NRCS) helps private landowners and managers conserve soil, water, and other natural resources.⁵⁶ According to NRCS staff, the Pennsylvania office entered nearly 1,000 easements through the Agricultural Conservation Easement Program and Wetland Reserve Easements. Some of the NRCS easements protect specific species, while others create corridors by connecting continuous blocks of land. NRCS’s easements are either for a set amount of time (for example, 30 years) or in perpetuity and do not require public access.⁵⁷

⁵⁶ See <https://www.nrcs.usda.gov/conservation-basics/conservation-by-state/pennsylvania>, Accessed May 7, 2024.

⁵⁷ See <https://www.nrcs.usda.gov/conservation-basics/conservation-by-state/pennsylvania/pennsylvania-wetlands#:~:text=Permanent%20Easements%20E2%80%93%20Permanent%20Easements%20are,easements%20expire%20after%2030%20years>, Accessed May 7, 2024.

State Conservation Commission. The State Conservation Commission is a 14-member commission whose primary mission is to ensure the proper use of Pennsylvania’s natural resources and to protect and restore the natural environment by conserving soil, water, and related resources. SCC is under the concurrent authority of DEP and PDA. In turn, SCC supports and oversees 66 county conservation districts. Conservation districts implement county-specific programs such as:⁵⁸

- Abandoned Mines.
- Agricultural Land Preservation.
- Chesapeake Bay Program.
- Environmental Education.
- Erosion & Sedimentation Pollution Control.
- Floodplain Management.
- Forest Management.
- Mosquito-Borne Disease Control Program.
- Nutrient Management Program.
- Stormwater Management.
- The Dirt and Gravel and Low Volume Road Program.
- Waterway Protection.
- Wildlife Management.

Existing Partnerships

While commonwealth agencies have differing yet sometimes overlapping responsibilities, they have created partnerships. Likewise, these agencies have partnered with outside stakeholders. Some commonwealth agencies and commissions have positions that work within and are funded by multiple entities. For example, through an FHWA program, there are shared employees between PennDOT and DEP, DCNR, PBFC, and PGC. Through another federal program (under USDA), NRCS and PGC co-fund biologist positions. In this section, we provide additional examples of existing partnerships involving commonwealth agencies and commissions.

Pennsylvania Wildlife Crossings. During the environmental phase of PennDOT’s planning, PennDOT coordinates with PGC, PFBC, and the United States Fish and Wildlife Service (FWS) to determine the most appropriate crossing(s) for the species of interest. While developing PennDOT’s design manual, PFBC created a standard design for aquatic species-friendly culverts. PGC and PFBC also offer expertise throughout the construction process, review crossings after they are built, and make recommendations for improvements in future projects.

⁵⁸ See https://pacd.org/?page_id=57, Accessed May 3, 2024.

Pennsylvania Wildlife Crossings Strategic Plan and Analytical Tools.

In December 2023, the Federal Highway Administration announced that Pennsylvania was awarded one of its Wildlife Crossing Pilot Program grants. According to FHWA:

The Commonwealth of Pennsylvania will receive \$840,000 to develop a comprehensive statewide strategic plan with [PennDOT, DCNR, PGC] and others to address the wide-ranging challenges and opportunities associated with the safe management and stewardship for wildlife crossings across the state.⁵⁹

On the FHWA grant application, PennDOT stated, "Pennsylvania's challenges and opportunities associated with wildlife crossings can be most effectively addressed by a major initiative to unite stakeholder agencies and other organizations to develop and implement a comprehensive strategic plan."⁶⁰ The program is in three phases and includes timeframes for completion:

- Phase I: Develop a multiagency PA Statewide Wildlife Crossings Strategic Plan (12 months).
- Phase II: Develop wildlife-vehicle Collision Project Development Data Collection and Geographic Information System Mapping Tools (24 months).
- Phase III: Develop and Implement a Multi-year Public Outreach and Education Program (48 months).

PennDOT stated the goal is to "provide PennDOT and stakeholder organizations with the tools necessary to help reduce animal-vehicle collisions and improve habitat connectivity for terrestrial and aquatic species." PennDOT also laid out the following goals:

- Develop a systematic corridor approach to wildlife-vehicle safety.
- Develop a Wildlife Injury/Death app in coordination with other agencies to gain knowledge and data not being collected or reported.
- Develop mapping tools to assist in identifying priority investment areas.
- Develop and implement a public information and education program on wildlife crossings.

⁵⁹ *FY 2022-FY 2023 Grant Selections*. Federal Highway Administration's Wildlife Crossings Pilot Program.

⁶⁰ *FY 2022-2023 Wildlife Crossing Pilot Program (WCPP) Grant Program – PennDOT Application Submittal*.

Pennsylvania Natural Heritage Program. The Pennsylvania Natural Heritage Program (PNHP) is a public-private partnership between DCNR, PGC, PFBC, and the Western Pennsylvania Conservancy in cooperation with the United States Fish and Wildlife Service.⁶¹ PNHP aims to “provide current, reliable, and objective information to help inform environmental decisions.”⁶²

Under the Conservation and Natural Resources Act, DCNR has the authority to “inventory ecological and geologic resources of the commonwealth and make data available.”⁶³ Part of PNHP’s role is managing this data with the Pennsylvania Conservation Explorer. Through the PNHP partnership, species-specific biologists collect data. PNHP tracks species’ current state or federal status, species of special concern (as defined by DEP), and location information. The Pennsylvania Conservation Explorer also has an environmental review tool for project planning and DEP permitting for public and private entities, called the Pennsylvania Natural Diversity Inventory.⁶⁴

Pennsylvania Statewide Wildlife Action Plan. To receive federal funding from the Wildlife Conservation and Restoration Program and the State Wildlife Grants Program, starting in 2005, Congress mandated that all states publish a State Wildlife Action Plan (SWAP) every decade.⁶⁵ The SWAP is jointly compiled and published by PGC and PFBC in Pennsylvania. Other stakeholders are consulted, such as FWS and other federal agencies, DCNR, the Pennsylvania State University, the Pennsylvania Association of Conservation Districts, non-governmental organizations, and organizations with multi-state authorities.⁶⁶

Contained in the *2015 to 2025 SWAP* is:

- List of Species of Greatest Conservation Need (SGCN).
- Extent and condition of habitats where these species are found.
- Environmental threats to these species.
- Conservation actions are needed to recover and protect these species.
- Monitoring needed for species, habitats, and conservation actions.
- Plans to revise the SWAP by 2025.
- Partner and public participation in SWAP development and implementation.

⁶¹ The Western Pennsylvania Conservancy is a non-profit accredited land trust. See <https://waterlandlife.org/>.

⁶² See <https://www.dcnr.pa.gov/Conservation/Biodiversity/PennsylvaniaNaturalHeritageProgram/Pages/default.aspx>, Accessed May 3, 2024.

⁶³ Act 18 of 1995 § 305.

⁶⁴ *PNDI Environmental Review and ER Tool: General Information*. Pennsylvania Natural Diversity Inventory.

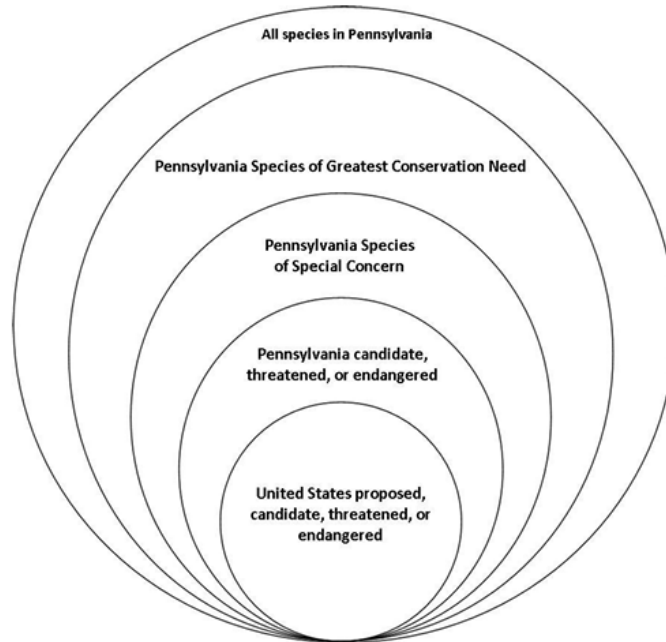
⁶⁵ See <https://www.sciencebase.gov/catalog/item/56d720ece4b015c306f442d5>, Accessed May 3, 2024.

⁶⁶ *2015-2025 State Wildlife Action Plan, Chapter 7, Partner Coordination*.

The SWAP focuses on recognizing SGCN rather than threatened or endangered species. According to the SWAP's authors, this is an effort to protect Pennsylvania's species proactively.⁶⁷ Exhibit 21 shows the protected classifications.

Exhibit 21

Relationship of SGCN to other Protected Statuses



Source: 2015-2025 Pennsylvania State Wildlife Action Plan.

Some classifications refer to legal protections (e.g., threatened and endangered), while others relate to a conservation status within the commonwealth. The SGCN designation does not carry legal protections; however, it does represent native species facing significant threats, declining populations, or Pennsylvania being responsible for a significant portion of the species' range.⁶⁸

Conservation Landscape Program. Conservation landscapes are eight designated regions throughout the commonwealth where DCNR and local partners focus on strategic investment in conservation and recreational projects.

⁶⁷ Pennsylvania Wildlife Action Plan, *Chapter 1: Species of Greatest Conservation Need*, 2015.

⁶⁸ See <https://www.naturalheritage.state.pa.us/SpeciesInfo.aspx#:~:text=Species%20of%20Greatest%20Conservation%20Need,that%20are%20tracked%20by%20PNHP.>, Accessed May 7, 2024.

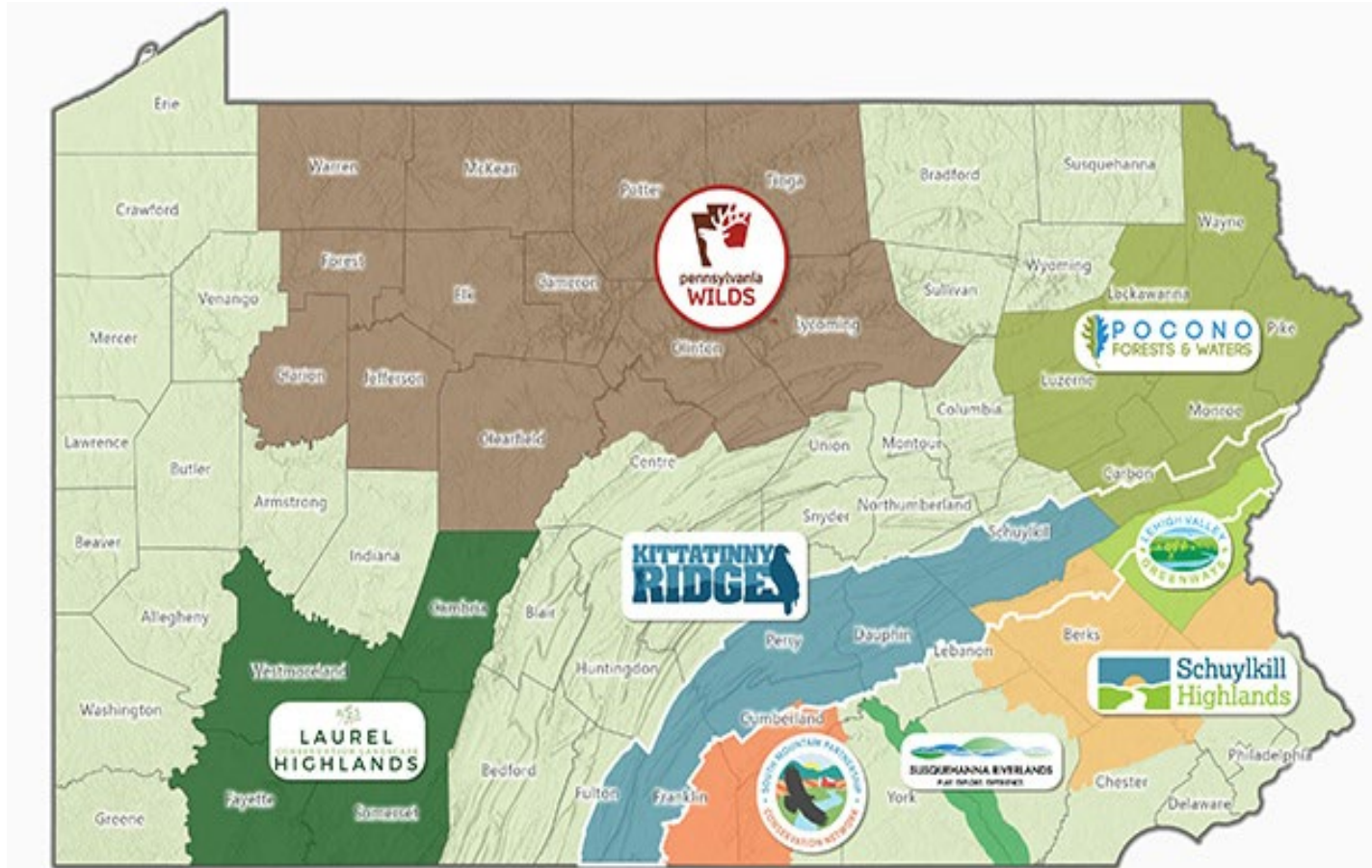
The conservation landscape partnerships are as follows:

- **Kittatinny Ridge.** Conserving a critical natural asset that provides essential habitat for wildlife, clean water, and extensive recreational opportunities.
- **Laurel Highlands.** Conserving and promoting the recreational and cultural aspects of an area in southwestern Pennsylvania is defined by three Allegheny Plateau ridges and portions of several watersheds.
- **Lehigh Valley Greenways.** Using greenways and trails to connect natural and cultural resources in Lehigh and Northampton counties.
- **Pennsylvania Wilds.** Heralding the significant outdoor experiences and rural community character found in a 12-county region in northcentral and northwestern Pennsylvania.
- **Poconos Forests and Waters.** Focusing on land protection and history in two distinct areas in Pike, Monroe, Lackawanna, Luzerne, Wayne, and Carbon counties.
- **Schuylkill Highlands.** Protecting trails and lands in some of the state's most populated communities in Berks, Bucks, Chester, Lebanon, Lancaster, Lehigh, and Montgomery counties.
- **South Mountain.** Highlighting the natural, aesthetic, historic, cultural, community, agricultural, and recreational resources in southcentral Pennsylvania.
- **Susquehanna Riverlands.** Conserving the greenway corridor of river lands along the Susquehanna River in Lancaster and York counties.

Exhibit 22 shows the locations of the conservation landscape regions, which serve as conservation corridors.

Exhibit 22

Pennsylvania Conservation Landscapes



Source: Pennsylvania Department of Conservation and Natural Resources.

According to DCNR, conservation landscape regions were established based on the following factors:

- **Presence of DCNR-owned lands.** Large blocks of state parks and forests provide the foundation for the landscape and a staffing presence.
- **Sense of place.** Regions with a sense of place and identity are often based on shared landscapes, not political boundaries.
- **Readiness.** Often driven by opportunity or threats such as changes in the economic base, depopulation, or sprawl.

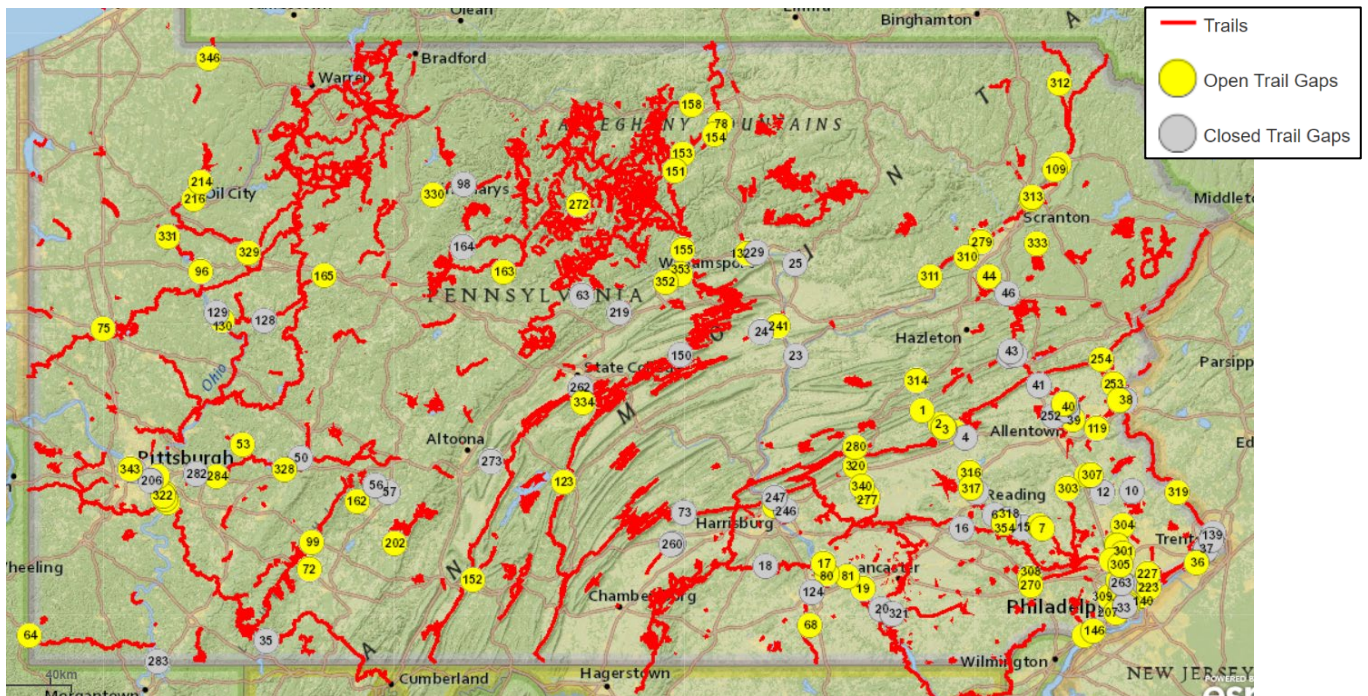
- **Engagement.** Civic engagement process that brings people of the region together to identify shared values and concerns.
- **Strategic investments.** State agencies with regional and statewide partners provide high-level leadership, financial support, and technical assistance to build better communities, conserve identified values, and invest in “sustainable” economic development.

Greenways, Trails, and Recreation Program. Greenways and trails are another conservation connectivity partnership in Pennsylvania. Greenways are typically created for human recreation and activity but also serve as corridors for plants and wildlife. DCNR, PennDOT, and the Pennsylvania Department of Community Economic Development support the trail community by providing financial and technical assistance.⁶⁹

In 2018, a working group of trail organizations and DCNR developed trail gap criteria and mapping to identify gaps in existing trails and determine priority areas for connectivity (results shown in Exhibit 23).

Exhibit 23

Pennsylvania Trail Gaps Priority Locations



Source: Pennsylvania Department of Conservation and Natural Resources.

⁶⁹ See <https://www.dcnr.pa.gov/Communities/TrailDevelopment/pages/default.aspx>, Accessed May 3, 2024.

According to DCNR, one of the agency's top objectives is to close priority trail gaps in Pennsylvania's statewide trail network and have a trail within 10 minutes of every Pennsylvanian.⁷⁰

Act 2022-13 established the Marcellus Legacy Fund, which allocated funds to the Commonwealth Financing Authority for "planning, acquisition, development, rehabilitation, and repair of greenways, recreational trails, open space, parks, and beautification projects" using the Greenways, Trails, and Recreation Program.⁷¹ Projects involve developing, rehabilitating, and improving public parks, recreation areas, greenways, trails, and river conservation.⁷²

C. Identified Areas of Conservation Corridor Needs

Our research indicated that the Pennsylvania National Heritage Program conducted the most extensive mapping of the area of conservation corridor needs at the statewide level. According to the Program, it conducted Geographic Information System connectivity analyses to highlight a statewide network of connected and resilient high biodiversity-value terrestrial areas.⁷³ Exhibit 24 shows the results of PNHP's connectivity analysis.

⁷⁰ Ibid.

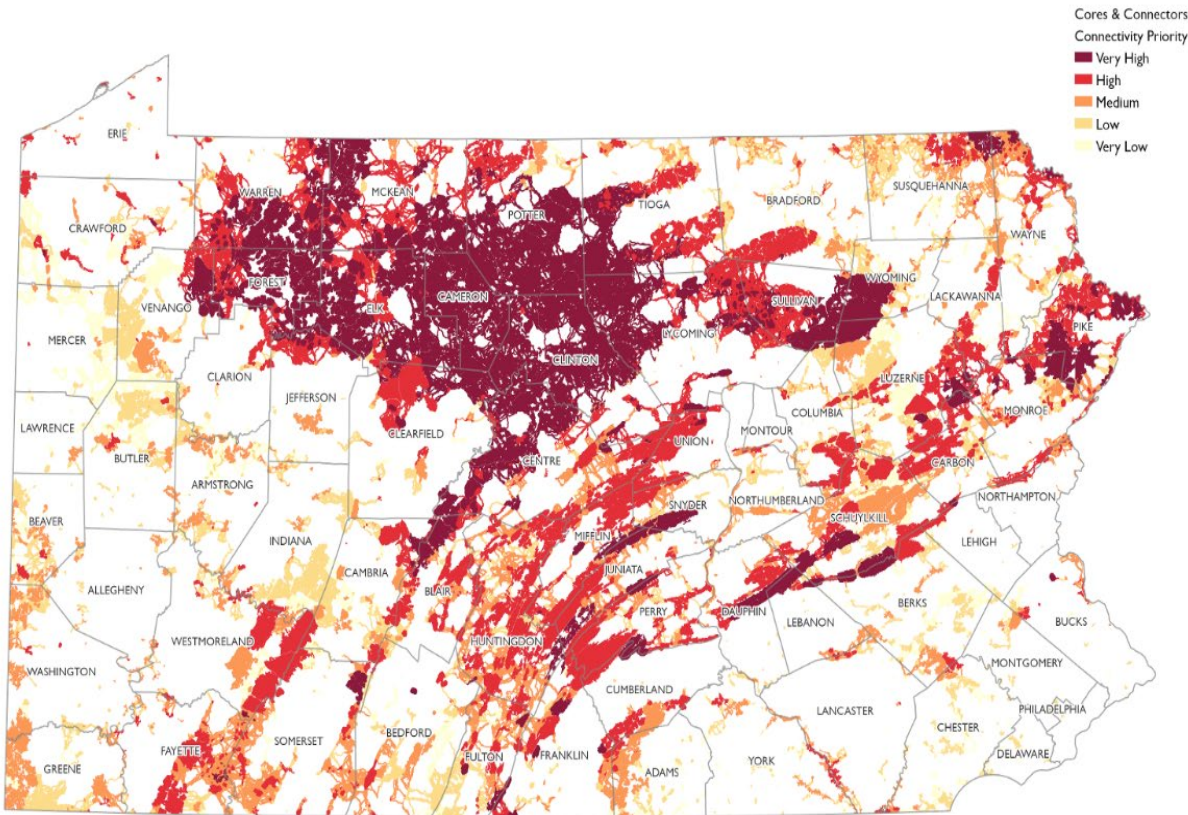
⁷¹ Act 13 of 2022 § 2315.1 (iv).

⁷² See <https://dced.pa.gov/programs/greenways-trails-and-recreation-program-gtrp/>, Accessed May 3, 2024.

⁷³ Yeany, D., A. Johnson, C. Tracey, and J. Wagner. *Priorities for Climate Change Connectivity in Pennsylvania*. Pennsylvania Natural Heritage Program and Western Pennsylvania Conservancy. November 2022.

Exhibit 24

PNHP Connectivity Priority Analysis



Source: Pennsylvania Natural Heritage Program

The five conservation factors PNHP used to calculate its priority areas include (1) regional flow, (2) biodiversity value, (3) resiliency, (4) geophysical setting, and (5) landscape condition.⁷⁴ The high-priority areas are the darkest red areas, representing all conservation factors compiled into a "priority score."⁷⁵ While each area listed is important for connectivity, the dark red areas represent the most crucial areas for maintaining connectivity based on the conservation factors.

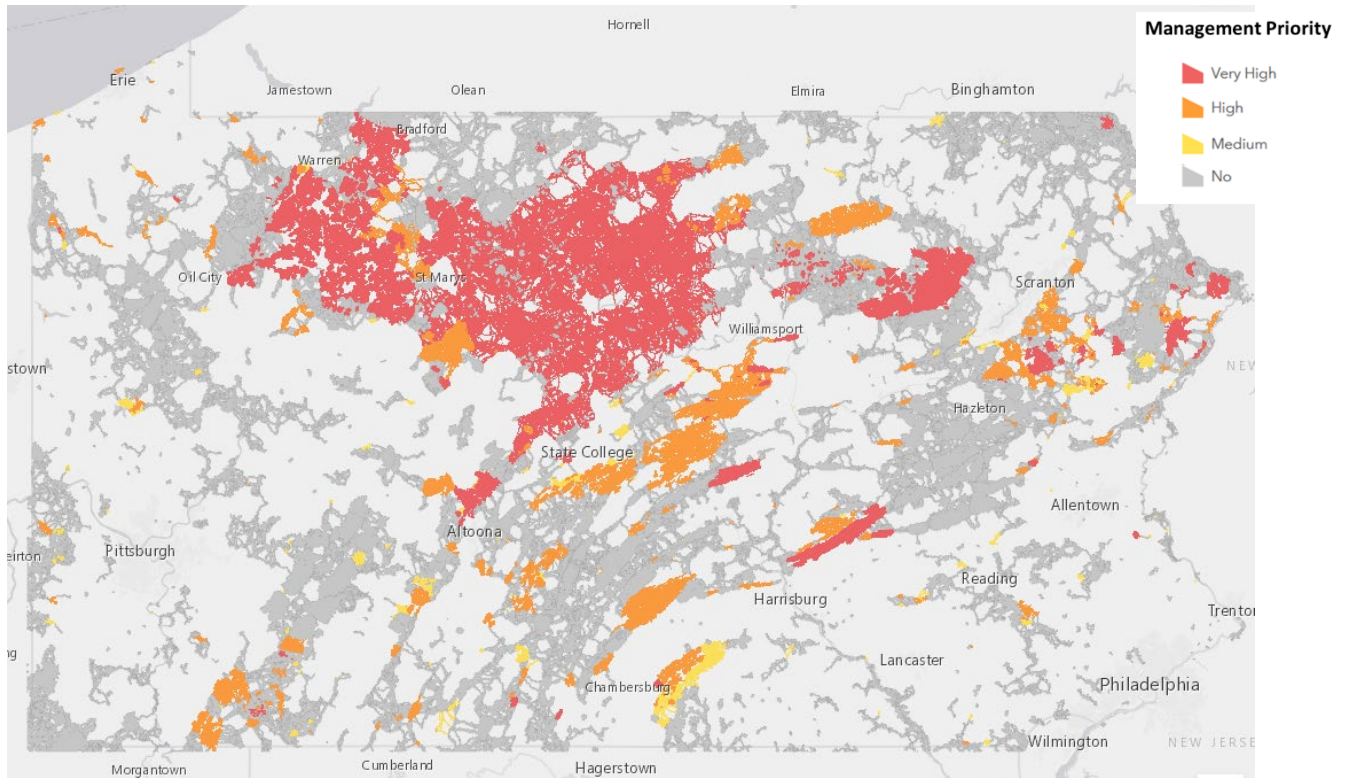
PNHP also identified management priority areas representing high-priority and currently protected areas (shown in Exhibit 25).

⁷⁴ Regional flow represents a species' capacity to adapt to changing environments, such as new infrastructure developments that may cut off habitats. Each core connectivity area is like an island; regional flow represents the ability to go between these islands so wildlife can get food and water and reproduce effectively. Overall, regional flow is essential for gene flow between wildlife and resiliency against climate change.

⁷⁵ Pennsylvania Natural Heritage Program, *Priorities for Climate Change Connectivity in Pennsylvania*, November 9, 2022

Exhibit 25

PNHP Management Priority Areas



Source: Pennsylvania Natural Heritage Program

According to PNHP, the management priority areas represent sites where the "recommended primary conservation focus is to improve management strategies, to maintain high-quality habitat, given that the majority of the habitat is already under some form of protection."⁷⁶

In our discussions with land trusts in preparation for this report, land trusts conveyed the need for additional statewide mapping, particularly forest health surveys, to inform land acquisition and easement decision-making. Additionally, they noted that many areas of Pennsylvania are not contained in the PNHP data, which puts the need for local data collection on land trusts and others. As shown throughout this report, our research found many maps from different sources for various purposes, but none that convey a sense of existing corridors (including wildlife crossings), additional needs, and commonwealth priorities. In Section IV, we discuss mapping as a best practice.

⁷⁶ Yeany, D., A. Johnson, C. Tracey, and J. Wagner. *Priorities for Climate Change Connectivity in Pennsylvania*. Pennsylvania Natural Heritage Program and Western Pennsylvania Conservancy. November 2022.

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SECTION III WILDLIFE-VEHICLE COLLISIONS



Fast Facts...

- ❖ *From 2019 through 2022, approximately one percent of Pennsylvania crashes resulting in fatalities were related to wildlife.*
- ❖ *In Pennsylvania, deer-vehicle collisions were most likely in October and November and between 8:00 PM and 10:00 PM.*
- ❖ *Studies have estimated the average cost of deer-vehicle collisions to be between \$7,625 to \$11,984 per incident, including driver costs (vehicle repairs, injuries, etc.) and societal costs (emergency services, carcass removal, etc.).*

Overview

Wildlife vehicle collisions (WVCs) are a side effect of habitat fragmentation. When development separates habitats, wildlife is forced to cross roadways to seek food, water, mates, and, in some instances, migrate, posing a risk to animals and drivers. WVCs cause human and animal fatalities, injuries, and vehicle damage every year. According to State Farm Mutual Automobile Insurance Company (State Farm), Pennsylvania drivers ranked first nationwide for the number of WVC auto insurance claims filed (estimated 153,397 from July 1, 2022, through June 30, 2022).⁷⁷ In 2022, 4.10 percent of all vehicle crashes reported to the Pennsylvania Department of Transportation (PennDOT) were animal related.

We found that deer-vehicle collisions (DVC) risk increases during October and November. Additionally, the time of day, including dawn, dusk, and nighttime hours, also increases the risk of DVC. We also found certain Pennsylvania highways are more at risk of deer-related WVCs. For example, from 2019 through 2022, 4.57 deer-related collisions occurred for every mile of State Route 33.

WVC data is a tool to assist in identifying hotspot areas that may benefit from wildlife crossings or other conservation connectivity tools (discussed further in Section IV). In Pennsylvania, wildlife-vehicle collision data is limited to crashes reported to PennDOT, which significantly undercounts WVCs occurring in the commonwealth. We found that crash data reported to PennDOT only accounted for about three percent of insurance claim estimates. Because not all WVCs are required to be reported (per the Pennsylvania Vehicle Code), many are unreported.

Recommendations for Legislative Consideration

1. The General Assembly should consider requiring auto insurance carriers to track and provide state transportation agencies with annual data identifying wildlife-vehicle collision locations in Pennsylvania to identify hotspots.

⁷⁷ See <https://newsroom.statefarm.com/likelihood-of-hitting-an-animal-while-driving/>, Accessed April 25, 2024.

Issue Areas

A. PennDOT Wildlife-Vehicle Collision Data

PennDOT publishes an annual motor vehicle *Crash Facts and Statistics* report using figures “compiled from the traffic crash reports submitted to [PennDOT] by state, county, municipal, and other law enforcement agencies, as specified in the Pennsylvania Vehicle Code.”⁷⁸ The Vehicle Code requires law enforcement agencies to “investigate, upon notification, all crashes involving **death, injury, and/or damage to any one vehicle to such an extent that it cannot be driven from the scene** without further damage and therefore requires towing” within 15 days [emphasis added].^{79, 80}

PennDOT defines a crash as “one in which an injury or fatality occurs or at least one of the vehicles involved requires towing from the scene.”⁸¹ WVCs are categorized as a “harmful event,” which is defined as “An action which occurs within a crash (e.g., hitting a tree, hitting a deer, hitting a pedestrian, hitting another vehicle, etc.) and often results in personal injury or property damage.”⁸² While the legal definition of WVCs is “crashes,” we use the terms crash and collision interchangeably.

As we discussed in depth later, WVCs reported to PennDOT do not represent the total WVCs that occurred in Pennsylvania. Only crashes meeting the criteria in the Pennsylvania Vehicle Code must be reported. Drivers involved in WVCs with damaged yet drivable vehicles may report the incident to their auto insurance carrier for repairs. Conversely, drivers who strike a smaller animal with little to no vehicle damage may not report the collision to law enforcement or insurance.

Exhibit 26 shows the number of WVCs reported to PennDOT from 2019 through 2022. PennDOT separates the crash data by deer and “other animals.”

⁷⁸ *Pennsylvania Crash Facts and Statistics*. Pennsylvania Department of Transportation. 2022.

⁷⁹ *Police Officers Crash Report Manual, Pennsylvania Publication 153*. Pennsylvania Department of Transportation. September 2021.

⁸⁰ 75 Pa. C.S., Chapter 37, Subchapter C.

⁸¹ *Pennsylvania Crash Facts and Statistics*. Pennsylvania Department of Transportation. 2022.

⁸² *Ibid.*

Exhibit 26

**Pennsylvania Crashes Involving Deer and Other Animals*
 2019 through 2022**

Year	<u>Deer</u>		<u>Other Animals</u>	
	Number of Crashes as a % of Total Crashes	Number of Fatalities as a % of Total Fatalities	Number of Crashes as a % of Total Crashes	Number of Fatalities as a % of Total Fatalities
2019	4,346 (3.50%)	7 (0.70%)	230 (0.20%)	2 (0.20%)
2020	4,332 (4.20%)	16 (1.40%)	231 (0.20%)	0 (0.00%)
2021	4,343 (3.70%)	11 (0.90%)	197 (0.20%)	1 (0.10%)
2022	4,533 (3.90%)	6 (0.50%)	217 (0.20%)	1 (0.10%)

Note:

*"% Total" lists the percentage compared to *all* crashes or fatalities, not only the ones listed in this table. Also, note that a single crash can involve a collision with multiple objects.

Source: Developed by LBFC staff from information obtained from the Pennsylvania Department of Transportation.

From 2019 through 2022, WVCs comprised 3.70 to 4.40 percent of all crashes reported to PennDOT. During the same period, WVC-related fatalities made up 0.60 to 1.40 percent of crash fatalities in Pennsylvania. Deer-vehicle collisions (DVC) were more common than other animals.

Utilizing PennDOT's raw crash data and geographic information system (GIS) mapping, we analyzed PennDOT's reported deer-related WVCs. Deer-related crashes included deer struck or deer in roadways that caused a crash (but deer were not struck). A map of deer-related WVCs in Pennsylvania from 2019 through 2022 is shown in Exhibit 27.

Exhibit 27

**Deer-Related Wildlife-Vehicle Collisions
2019 through 2022**



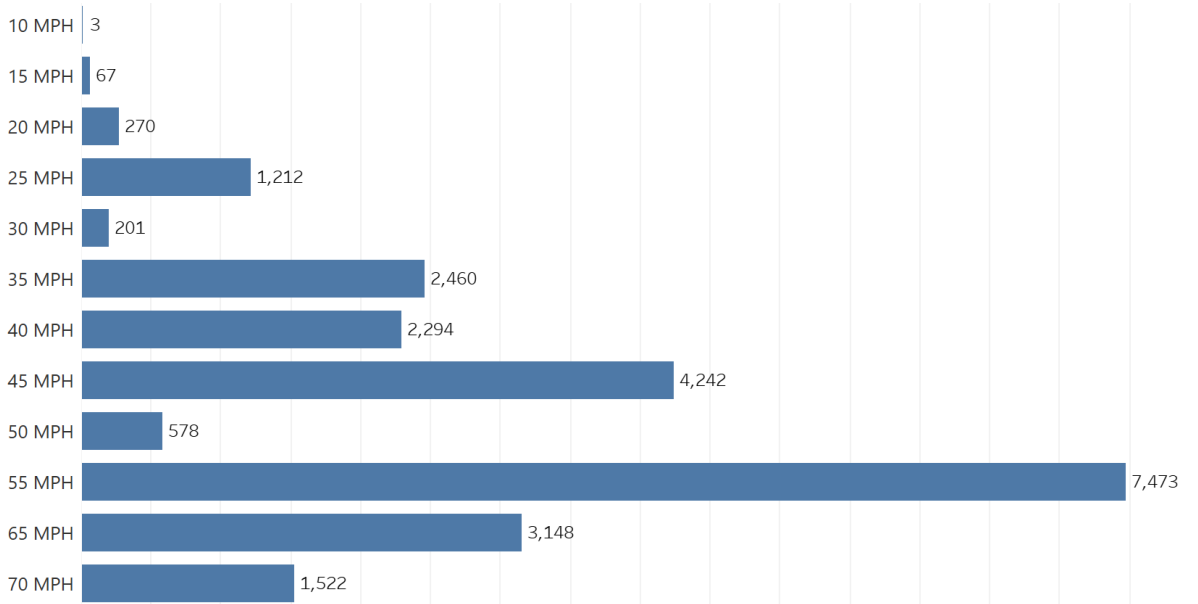
Source: Developed by LBFC staff from information obtained from the Pennsylvania Department of Transportation.

We found that most deer-related WVCs reported to PennDOT occurred on major highways and concentrated around Pittsburgh, Harrisburg, and Philadelphia. Essentially, where there are more people, there are more vehicles, which leads to a higher likelihood of WVCs.

As shown in Exhibit 28, the most common occurrences of WVCs reported to PennDOT were on roadways with speed limits of 55 miles per hour (7,473 WVCs or 31.84 percent).

Exhibit 28

**Number of Wildlife Vehicle Collisions Reported to PennDOT by Speed Limit
2019 through 2022**



Source: Developed by LBFC staff from information obtained from the Pennsylvania Department of Transportation.

Over half (52 percent) of the WVCs reported to PennDOT were on roadways with speed limits over 55 miles per hour. The overall crash rate and injury severity are higher at higher speeds.⁸³ It is possible that WVCs occurring on roads with higher speed limits were reported to PennDOT more frequently because of the severity of the collisions meeting the reporting requirements in the Pennsylvania Vehicle Code.

Some highways had a higher likelihood of a WVC occurring than others. Exhibit 29 shows the highways with over two WVCs per mile of roadway.

⁸³ *The Relation Between Speed and Crashes*. SWOV Institute for Road Safety Research. April 2012.

Exhibit 29

**Ratio of Deer-Related Wildlife-Vehicle Collisions Per Mile
2019 through 2022**

Highway	Number of WVC	Highway Length in Miles	WVC per Mile Ratio
PA-33	128	28	4.57
I-79	738	183	4.03
I-380	105	28	3.75
PA-43	195	60	3.25
I-76	1077	351	3.07
I-83	130	51	2.55
I-99	216	86	2.51
US-202	148	59	2.51
PA-28	242	98	2.47
I-476	306	132	2.32
I-376	194	84	2.31
I-80	714	311	2.30
I-81	519	232	2.24
I-84	121	55	2.20

Source: Developed by LBFC staff from information obtained from the Pennsylvania Department of Transportation.

The highway with the most deer-related WVCs per mile was State Route 33 (connecting the Lehigh Valley to the Poconos). According to PennDOT, on some parts of Route 33, there was an Annual Average Daily Traffic (AADT) of 84,000 vehicles.⁸⁴ Compared to Pennsylvania's most heavily traveled highway, Interstate 76 (154,000 AADT in some sections in Philadelphia County) had 3.07 deer-related collisions per mile of roadway.⁸⁵

Time of Day and Year

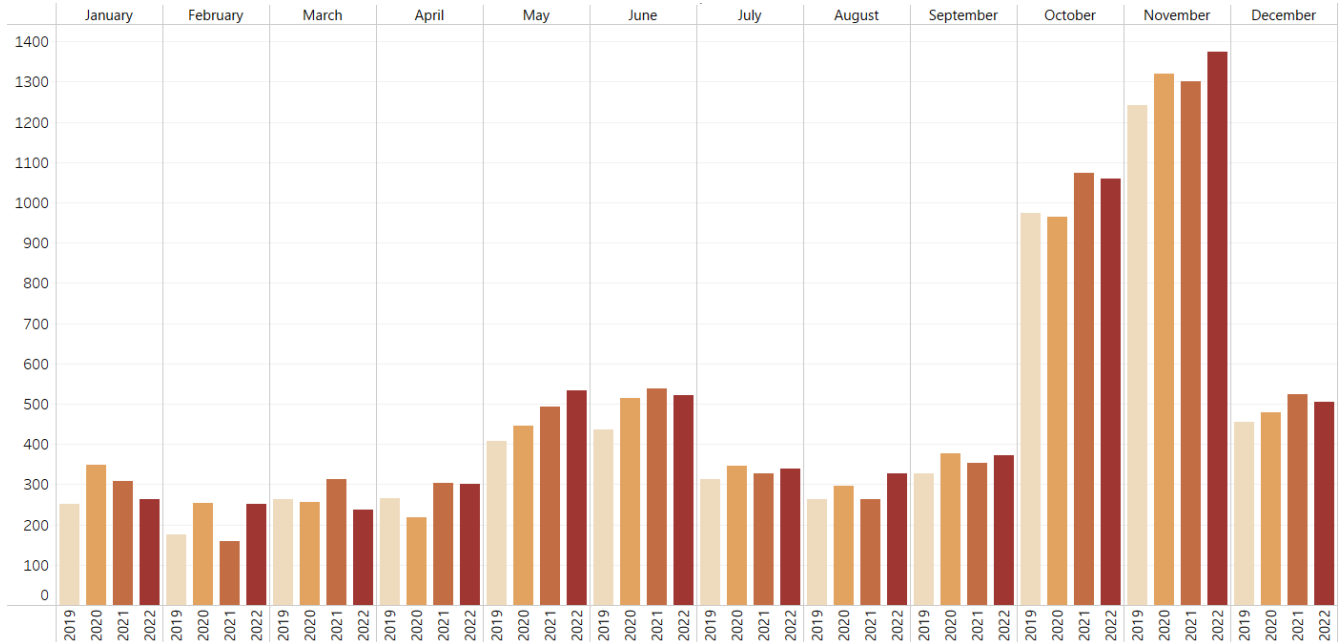
The time of year and time of day increases the risk of DVC. Exhibit 30 shows the number of deer-related crashes reported to PennDOT per month.

⁸⁴ AADT is the typical daily traffic on a road segment for all the days in a week, over one year. See <https://www.penn-dot.pa.gov/ProjectAndPrograms/Planning/Maps/Pages/Traffic-Volume.aspx>, Accessed April 25, 2024.

⁸⁵ Ibid.

Exhibit 30

**Number of Deer-Related Collisions by Month
 2019 through 2022**



Source: Developed by LBFC staff from information obtained from the Pennsylvania Department of Transportation.

We found the most DVC occurrences in October and November. According to the Federal Highway Administration (FHWA), WVCs occur most frequently in the fall because “animals move around more due to migration, mating, or hunting seasons.”⁸⁶ According to the Pennsylvania Game Commission (PGC), the breeding season for white-tailed deer peaks in mid-November.⁸⁷ In Pennsylvania, statewide regular firearms antlered and antlerless running season runs from the end of November to early December. We also found May and June to have increases in DVC (although not as high as the fall numbers), which FHWA explained is due to “distribution of young [animals] and migration.”⁸⁸

Certain times of day also increase the risk of DVC. As shown in Exhibit 31, dawn, dusk, and dark hours were the most common times for deer to be involved in crashes.

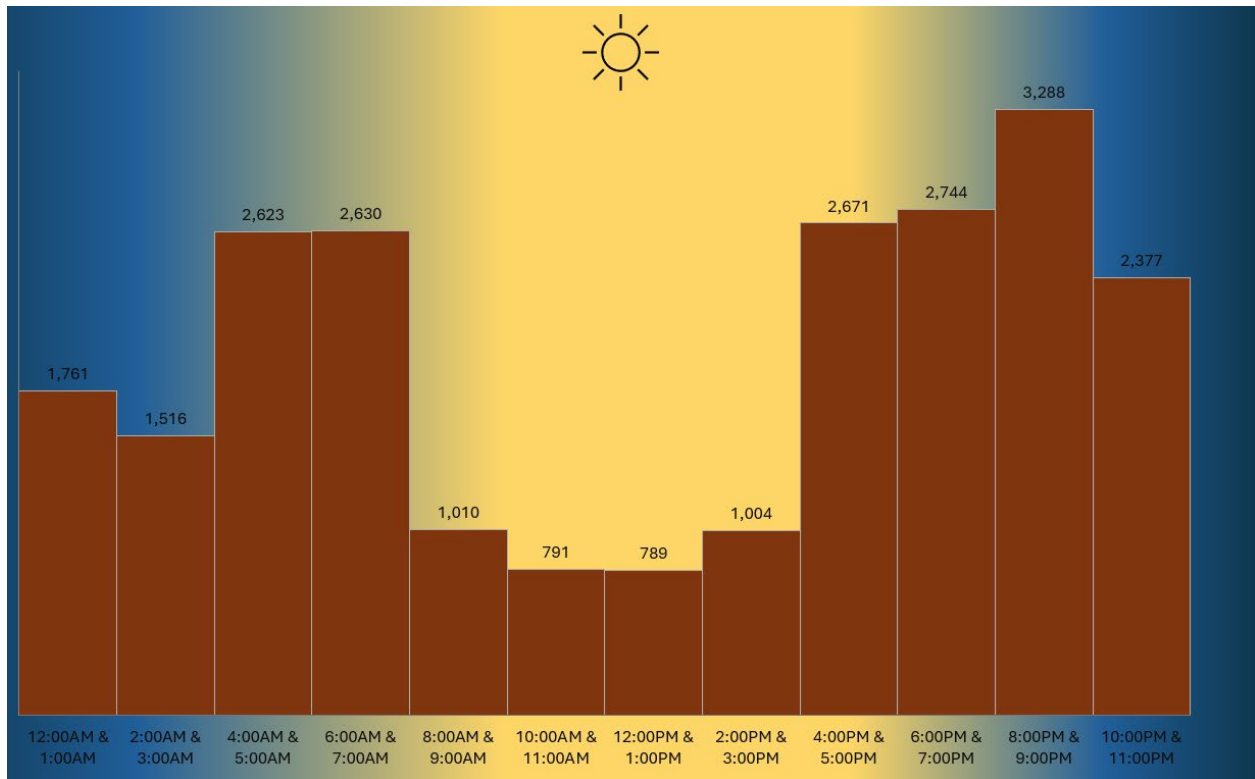
⁸⁶ *Wildlife-Vehicle Collision Reduction Study: Report to Congress*. Federal Highway Administration. August 2008.

⁸⁷ *White-tailed Deer Wildlife Note*. Pennsylvania Game Commission. February 2021.

⁸⁸ *Wildlife-Vehicle Collision Reduction Study: Report to Congress*. Federal Highway Administration. August 2008.

Exhibit 31

**Time of Day Deer-Vehicle Collisions Occurred
2019 through 2022^{a/}**



Note:

^{a/}The time of the crash from November through February was adjusted by one hour to adjust for daylight savings time and standard time changes.

Source: Developed by LBFC staff from information obtained from the Pennsylvania Department of Transportation.

The most common timeframe for deer-related WVCs was between 8:00 PM and 10:00 PM. Daytime deer-related WVCs were less common as drivers likely had greater visibility with daylight. According to FHWA, "The daily peaks are typically explained by the fact that deer and other large animals are moving around dusk and dawn, which, combined with relatively high traffic volume in the early morning and late afternoon, results in a peak in collisions in the early morning and late afternoon and evening."⁸⁹

⁸⁹ Ibid.

B. Auto Insurance Claims Data

Auto insurance claims are one source of data that capture more WVCs than state transportation crash data, as drivers may file claims for any damage to a vehicle, including minor damage, which does not require notifying law enforcement (assuming there are no injuries and fatalities). Insurance data also has limitations; auto insurers in Pennsylvania either do not publicly share claims statistics from WVCs or track animal-related claims separately from other not-at-fault claims.

One exception is the insurer State Farm Mutual Automobile Insurance Company (State Farm), which annually publishes (1) estimates of animal-related claims per state for the top 10 states where animal collisions are most likely and (2) animal collision likelihood for every state and the District of Columbia. In the most recent report (2022-2023), Pennsylvania ranked first in the nation for the number of animal collision claims and third in the country for the risk of animal collisions. In Pennsylvania, 1 in 59 auto insurance claims involved an animal (the national average was 1 in 127).⁹⁰

According to a representative from State Farm, the data analysis included the following sources:

- State Farms claims involving an animal in comprehensive and collision coverage (policyholders with only liability insurance coverage were excluded).⁹¹
- State Farm's market penetration in each state.
- Federal Highway Administration (FHWA)'s total licensed driver data.

State Farm estimated the total claims across the auto insurance industry using the three data sources. Exhibit 32 compares State Farms' animal-related claim estimates and PennDOT's crash data.

⁹⁰ *How likely are you to have an animal collision?* State Farm. 2023.

⁹¹ In Pennsylvania, DVCs are covered under comprehensive coverage.

Exhibit 32

State Farm Estimated Animal-Related Claims Compared to PennDOT Wildlife-Vehicle Collisions Data

Year	Estimated Statewide Animal-Related Claim Count	PennDOT's Reported WVCs	PennDOT Crash Data as a % of State Farm's Estimates
2019-2020	176,229	4,346	2.47
2020-2021	166,404	4,563	2.74
2021-2022	156,176	4,540	2.91
2022-2023	153,397	4,750	3.01

Source: Developed by LBFC staff from information obtained from State Farm and the Pennsylvania Department of Transportation.

PennDOT's reported WVC data comprised 2.74 to 3.01 percent of State Farm's estimated Pennsylvania animal-related claims. When we requested additional data, State Farm noted that its market penetration and claims count are proprietary and not shared externally. Additionally, it does not provide information on the time of day, road conditions, or location.

The Highway Loss Data Institute (HLDI) publishes reports on auto insurance losses due to animal strikes. HLDI collects proprietary insurance data but publishes it in aggregate form. According to the institute, "Of the 37 companies that currently report information on losses under comprehensive coverage to HLDI, only 25 provide information on animal strikes. Vehicle exposure from these 25 companies represents 40 percent of the HLDI database."⁹²

HLDI provides some location-based insurance claims information. However, it is limited to counties with the highest animal strike claim frequencies. From 2013 through 2022, eight of the top ten counties with the highest November animal strike claims frequencies were Pennsylvania counties (Crawford, Indiana, Somerset, Mercer, Butler, Fayette, Westmoreland, and Washington).⁹³ According to HLDI, Crawford County's November claim frequency was 86.9 (per 1,000 insured vehicle years), more than 6.4 times the national average and about 3.2 times the county's August claim frequency.⁹⁴

Combining insurance data with carcass data (see Section IV) could provide PennDOT with additional information for determining and implementing WVC solutions such as wildlife crossings and fencing.

⁹² *Losses Due to Animal Strikes Bulletin*. Highway Loss Data Institute. Vol. 40, No. 5. April 2023.

⁹³ *Ibid.*

⁹⁴ Claim frequency is calculated per 1,000 insured vehicle years.

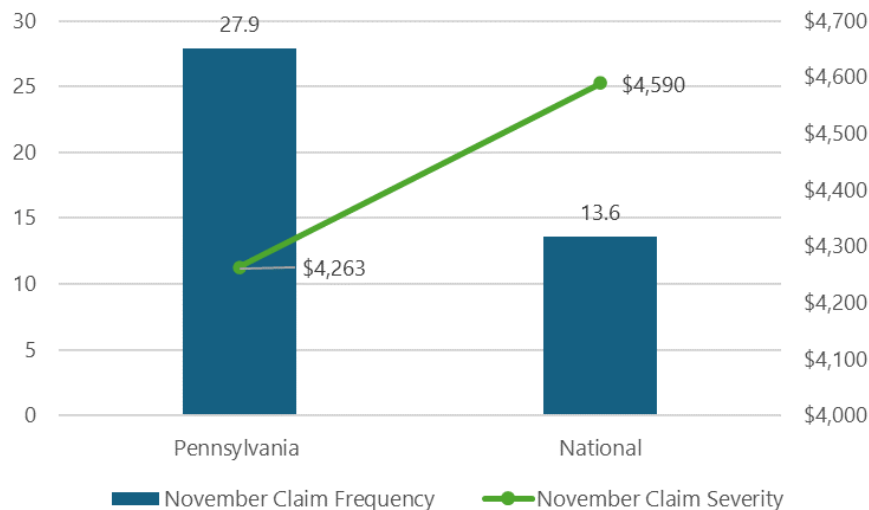
C. Economic Impact of Wildlife-Vehicle Collisions

Like any vehicular collision, WVCs can be costly. Costs associated with WVCs include vehicle repairs, healthcare, human and animal lives, public services (fire, police, and emergency medical services), and carcass removal. According to FHWA, more than 90 percent of DVCs damage vehicles.⁹⁵

From 2013 through 2022, insurance claim severity for November WVC claims in Pennsylvania averaged \$4,263 (shown in Exhibit 33).

Exhibit 33

Average Wildlife-Vehicle Collisions November Claim Frequency^a and Claim Severity^b Pennsylvania vs. National^c (2013 through 2022)



Notes:

a/ Claim frequency is defined as the number of claims for a group of vehicles divided by the exposure for that group and is expressed as claims per 1,000 insured vehicle years. Exposure is when a vehicle is insured under a given coverage type and measured in insured vehicle years. An insured vehicle year is one vehicle insured for one year, two for six months, etc.

b/ Claim severity is the total of all loss payments made for claims divided by the number of claims paid. Claim severity is measured in dollars per claim. It is not a measure of vehicle speed in a crash or injury severity.

c/Only includes states with ≥ 100 claims each November.

Source: Developed by LBFC staff from information obtained from the Highway Loss Data Institute.

⁹⁵ *Wildlife-Vehicle Collision Reduction Study: Report to Congress*. Federal Highway Administration. August 2008.

While Pennsylvania had a higher November claim frequency (27.9) than the national average (13.6), Pennsylvania had a lower severity (\$4,263) than the national average (\$4,590).

Vehicle damage is not the only cost associated with WVCs. Others include injuries and fatalities. In recent years, Pennsylvania has recorded as many as 16 deaths (2020) related to WVCs. "Approximately five percent of [DVCs] result in human injuries... costs from injuries include lost earnings, healthcare-related costs, and reduced quality of life."⁹⁶ The estimated driver and societal costs associated with DVCs are summarized in Exhibit 34.

Exhibit 34

Deer-Vehicle Collisions Cost Estimates 2021

Cost Description	Cost Estimates
Vehicle Repair Costs Per Collision	\$2,405 - \$3,427
Human Injuries per Collision	\$3,531
Human Fatalities per Collision	\$1,309 - \$2,184
Towing, Accident Attendance, and Investigation	\$163
Monetary Value Animal Per Collision	\$152 - \$2,614
Carcass Removal and Disposal Per Collision	\$65
Total	\$7,625 - \$11,984

Source: Developed by LBFC staff from information obtained from the Pew Charitable Trusts.

Total WVC cost estimates for deer accidents ranged between \$7,625 to \$11,984.⁹⁷ Section IV discusses best practices for conservation connectivity, such as wildlife crossings, which can help reduce the number of WVCs.

⁹⁶ *Funding for Wildlife Crossing Infrastructure an Evaluation of Revenue and Funding Mechanisms*. Pew Charitable Trusts and ECONorthwest. April 2023.

⁹⁷ *Ibid.*

SECTION IV BEST PRACTICES IN CONSERVATION CONNECTIVITY



Fast Facts...

- ❖ *Some mule deer in western US states travel more than 150 miles on seasonal migratory routes, whereas white-tailed deer in PA average 5 to 10 miles of travel (some bucks travel up to 25 miles).*
- ❖ *Wildlife crossings with fencing have been shown to reduce wildlife-vehicle collisions by up to 97 percent.*
- ❖ *13 states have enacted legislation and/or issued executive orders regarding conservation connectivity (as of 2023).*

Overview

Reviewing conservation connectivity practices in neighboring states offers a comparison to gauge Pennsylvania's efforts. Pennsylvania and surrounding states face similar challenges related to urbanization, habitat fragmentation, forest loss, threatened/endangered species, and climate. We found that states surrounding Pennsylvania have implemented connectivity efforts that revolve around collaboration, data collection, and analysis. Additionally, we found most of the conservation connectivity tools utilized by surrounding states are similar to Pennsylvania's; however, we did identify improvement areas for the commonwealth. New Jersey, in particular, had a robust working group to foster collaboration and may serve as a model for Pennsylvania to implement.

This section highlights best practices recommended in conservation corridor development, including wildlife crossings, preserving natural corridors, collaboration, and data collection. We found centrally tracking roadway carcass data statewide is effective in capturing accurate wildlife-vehicle collision (WVC) counts along with crash and insurance data.

We conclude the section with funding options used in other states and potential revenue sources. Funding conservation corridors is a public policy option for the General Assembly to aid in the development of corridors and preservation of existing corridors.⁹⁸ Florida is an example of a state that made significant investments into conservation corridors (\$400 million initially, with \$100 million reoccurring).⁹⁹

Recommendations

Recommendations for Executive Action

1. The Office of the Governor should convene an official inter-agency/commission conservation connectivity working group to build on existing collaborations (including federal and non-governmental partners).

⁹⁸ NCEL Fact Sheet, *Wildlife Corridors and Crossings*. National Caucus of Environmental Legislators. July 2021.

⁹⁹ *Florida Wildlife Corridor*. Florida Department of Environmental Protection. July 2022.

2. An interagency/commission conservation connectivity working group should identify high-priority areas of conservation connectivity in Pennsylvania and establish common goals.

Recommendations for Legislative Consideration

1. The General Assembly should consider requiring commonwealth agencies, independent commissions, contractors, etc., who remove animal carcasses from roadways to centrally track the data, including coordinates of where animal carcasses were removed, to aid in identifying wildlife-vehicle collision hotspots.
2. The General Assembly should consider funding to develop new and preserve existing conservation corridors if deemed a public policy priority.

Issue Areas

A. Current Status of Other States' Conservation Connectivity Practices

When reviewing best practices in conservation connectivity, western states are known for their conservation corridor efforts - primarily large overpasses lined with native plants that provide safe passage for wildlife to cross highways that intersect habitats.¹⁰⁰ However, to properly gauge Pennsylvania's status in implementing conservation corridors, it is best to review states with similar environmental and ecological characteristics as Pennsylvania.

Species with Differing Needs

Ungulates provide one example of the differing conservation requirements between states.¹⁰¹ For example, some mule deer found in Colorado and Wyoming spend two to four months migrating south for the winter and north for the summer, traveling more than 150 miles.¹⁰² Because of migration patterns, states with mule deer have created contiguous corridors that cross public and private lands.

¹⁰⁰ See <https://www.pewtrusts.org/en/research-and-analysis/articles/2023/07/20/wildlife-and-people-benefit-from-new-habitat-connectivity-laws>, Accessed April 25, 2024.

¹⁰¹ An ungulate is a hoofed mammal.

¹⁰² *Understanding Mule Deer Migration, Fact Sheet #12*. Western Association of Fish and Wildlife Agencies. July 2014.

Conversely, the white-tailed deer, the most common ungulate in Pennsylvania and surrounding states, do not have large or predictable migratory routes. White-tailed deer average five to ten-mile ranges, with some buck traveling as far as twenty to twenty-five miles.¹⁰³ The Pennsylvania Game Commission (PGC) also noted that connectivity is not always the best option, particularly for the elk. PGC's goal is to keep elk north of Interstate 80 for animal and public safety.

Disease management is another example of when connectivity can be problematic. Chronic wasting disease (CWD) is "a progressive, fatal disease that affects the brain, spinal cord, and many other tissues of farmed and free-ranging deer, elk, and moose."¹⁰⁴ CWD is thought to spread through direct contact, such as body fluids, or indirectly through "environmental contamination of soil, food, or water."¹⁰⁵ Therefore, animals with CWD and connectivity to other areas can further spread the disease.

Landownership

Landownership in Pennsylvania and surrounding states also differs from that in western states. As of 2018, federal land comprised 615.3 million acres out of 2.3 billion, or 27.1 percent of total US land.¹⁰⁶ As shown in Exhibit 35, western states had a higher percentage of federal acreage than eastern states.

¹⁰³ See <https://www.deer.psu.edu/ungulates-who-wander/>, and see <https://www.pgc.pa.gov/Wildlife/WildlifeSpecies/White-tailedDeer/Pages/DeerMovements.aspx>, Accessed March 22, 2024.

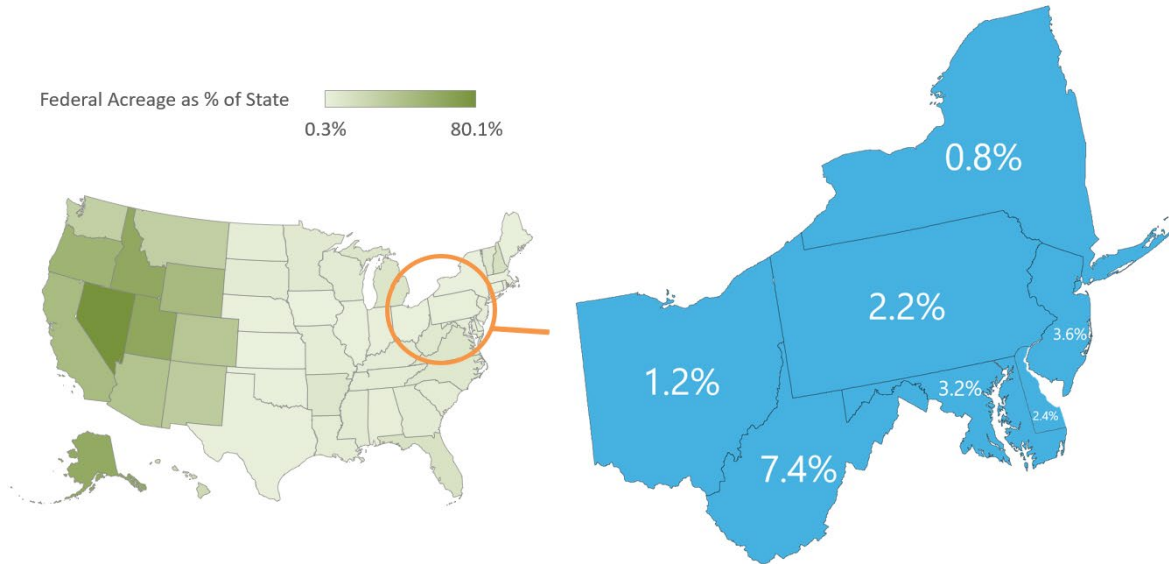
¹⁰⁴ See <https://www.cdc.gov/prions/cwd/index.html>, Accessed April 16, 2024.

¹⁰⁵ *Ibid.*

¹⁰⁶ *Federal Land Ownership: Overview and Data*. Congressional Research Service. February 2020.

Exhibit 35

Federal Acreage Percentage Per State*
2018



Note:

*Federal land falls under one of five different agencies' jurisdictions: US Bureau of Land Management (US Department of the Interior), US Forest Service (US Department of Agriculture), US Fish and Wildlife Service, National Park Service, and US Department of Defense.

Source: Developed by LBFC staff from information obtained from the Congressional Research Service.

In Pennsylvania's surrounding states, the federal acreage as a percentage of the state ranged from 0.8 percent (New York) to 7.4 percent (West Virginia), with Pennsylvania at 2.2 percent – significantly less than western states such as Colorado (36.2 percent), Wyoming (46.7 percent), and Nevada (80.1 percent).

State-owned land is more varied across the US. According to the Property and Environment Research Center (PERC):

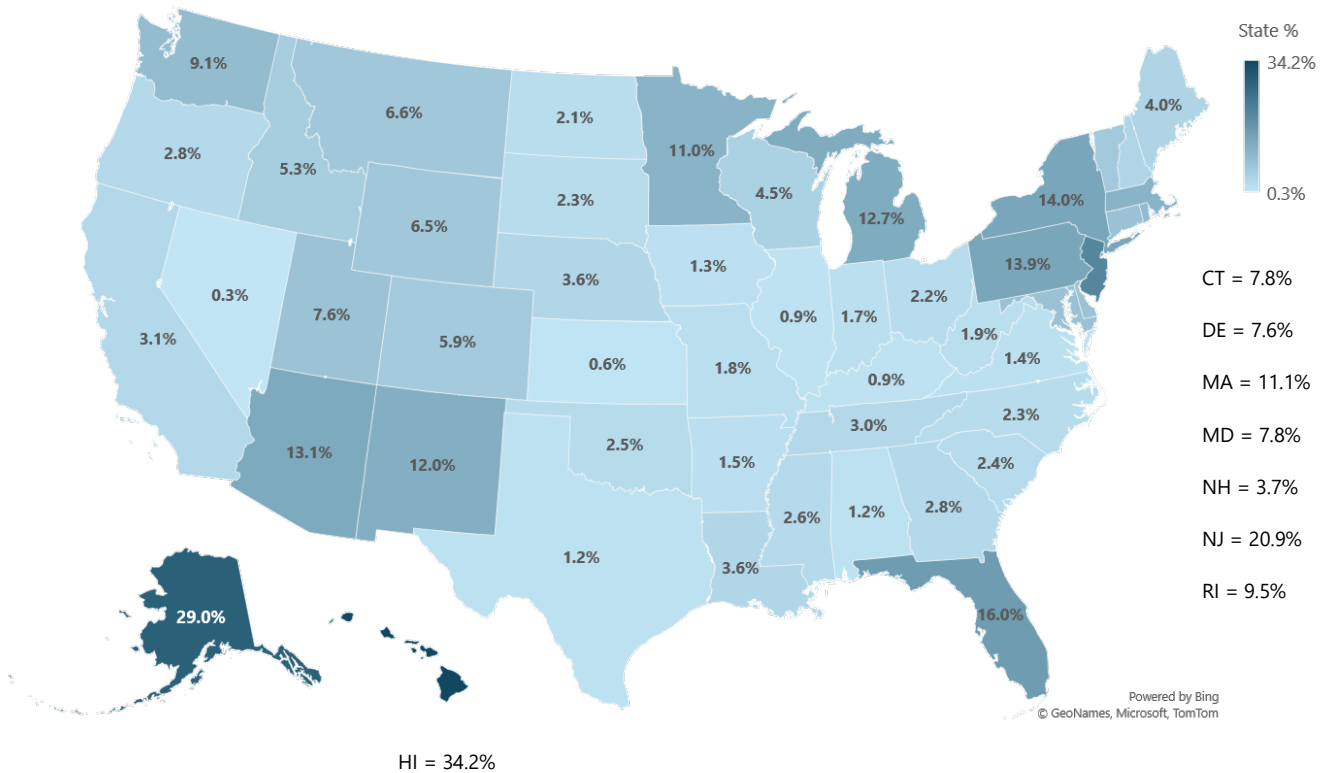
Total state land in [the US] equals 201 million acres, 9 percent of that nation's land area. More than half of this land is in Alaska. Excluding Alaska, there are 96 million acres of state land, which comprises 5 percent of the

country's land outside of Alaska. About half of this state land is located in the West.¹⁰⁷

Exhibit 36 shows the state-owned acreage as a percent of total state land across the US.

Exhibit 36

State-Owned Acreage Percentage Per State 2018



Source: Developed by LBFC staff from information obtained from the Property and Environment Research Center.

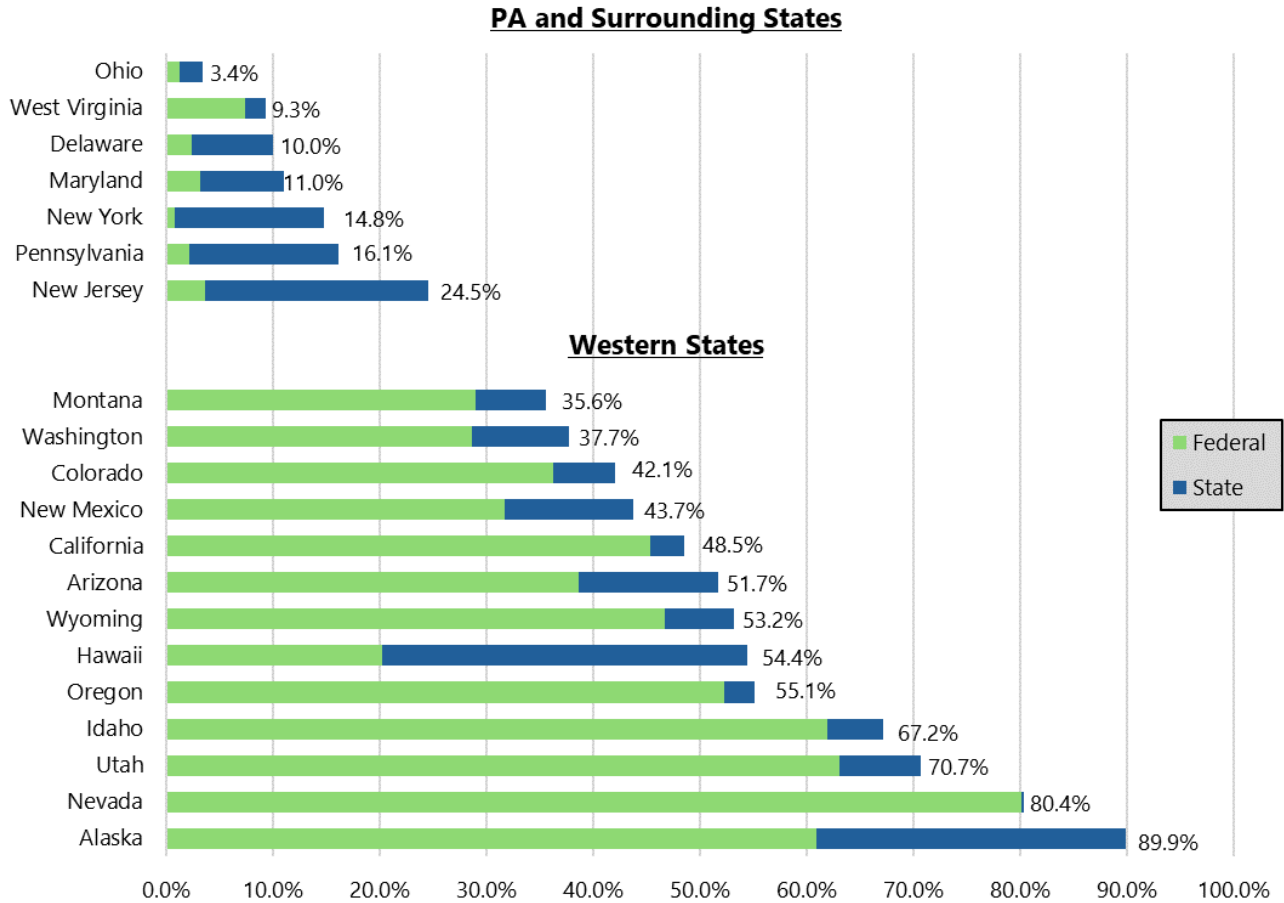
In Pennsylvania's surrounding states, state-owned acreage as a percentage of the state ranged between 1.9 percent (West Virginia) and 20.9 percent (New Jersey). In Pennsylvania, 13.9 percent of the land was state-owned. While eastern states had some higher rates of state-owned land as a percentage of total land, when combined with federal land,

¹⁰⁷ Nelson, Robert. *State-Owned Lands in the Eastern United States: Lessons from State Land Management in Practice*. PERC. March 2018.

western states still had larger percentages of land that was not privately owned (as shown in Exhibit 37).

Exhibit 37

**Combined Federal and State-Owned Land as a Percent of Total State Land
 PA and Surrounding States Compared to Western US States*
 (2018)**



Note:

*Western states identified using the US Census definition.

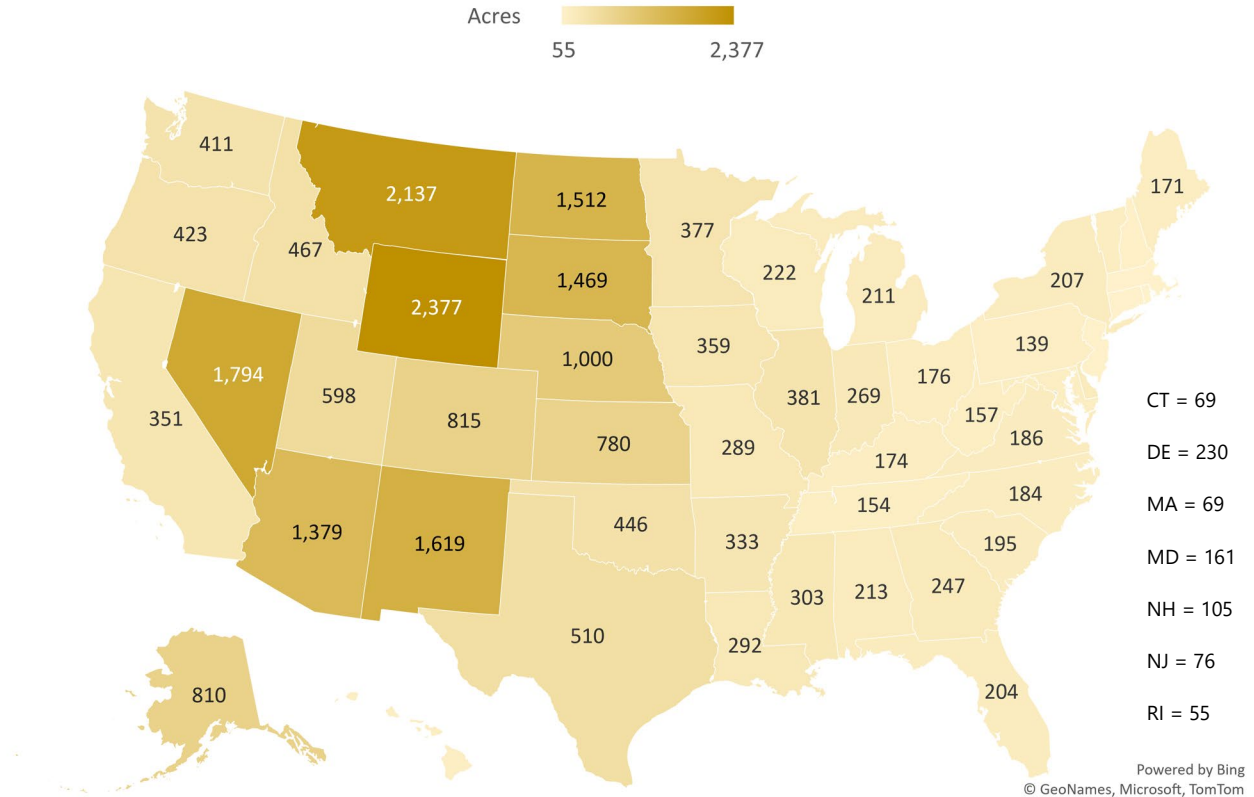
Source: Developed by LBFC staff from information obtained from the Congressional Research Service and Property and Environment Research Center.

One final consideration regarding landownership is the contiguous number of acres owned by private landowners in each state. Western states have parcels with more acreage than Pennsylvania and surrounding states, particularly farms and ranches. As shown in Exhibit 38, western

states had average farm acreage higher than Pennsylvania and the surrounding states.

Exhibit 38

**Average Farm* Size by State In 2021
(Acres)**



Note:

*A farm is defined by the United States Department of Agriculture as "any place which \$1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the year." Government payments are included in sales. Ranches, institutional farms, experimental and research farms, and Indian Reservations are included as farms. Places with the entire acreage enrolled in the Conservation Reserve Program, Wetlands Reserve Program, and other government conservation programs are counted as farms.

Source: Developed by LBFC staff from information obtained from the United States Department of Agriculture.

Pennsylvania state government agencies and independent commissions noted parcel size as a logistical challenge in conservation efforts, particularly for easements. For example, if an area were deemed a conservation corridor in the western states, those states may only have to work with one ranch owner because their land covers a large area. In Pennsylvania,

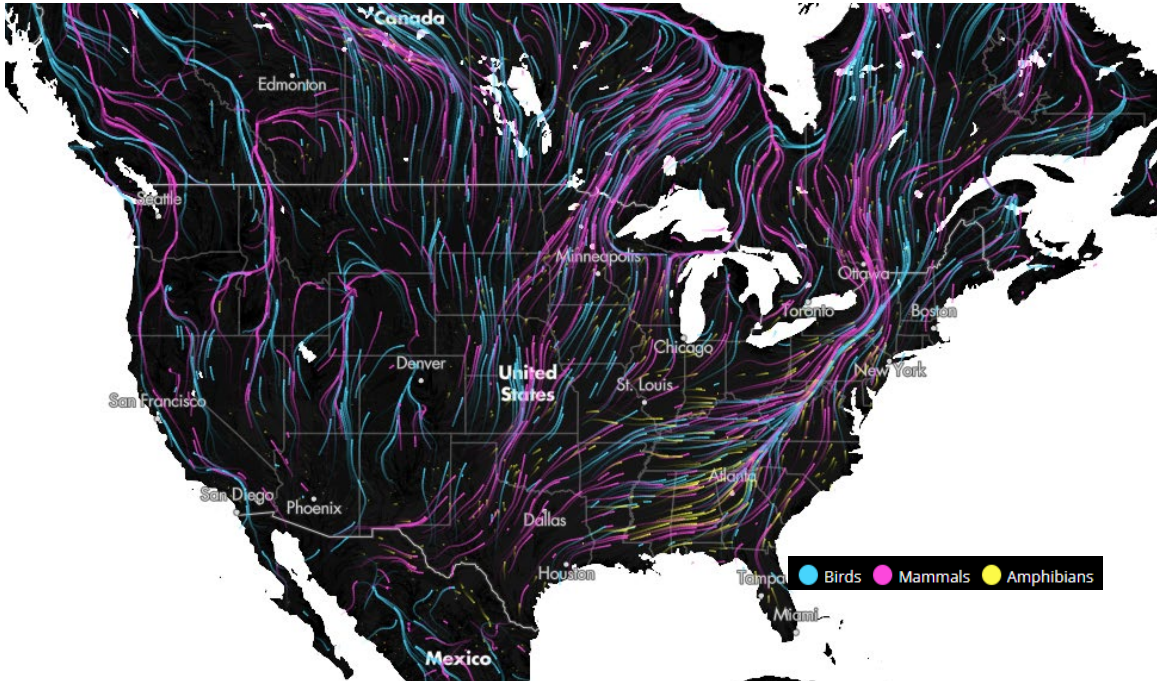
however, more landowners may have to be engaged because they own smaller parcels. This does not make conservation impossible, but it is an added challenge for Pennsylvania and surrounding states.

Mid-Atlantic/Northeastern Conservation

The commonwealth serves as a critical passage environmentally and geographically. As shown in Exhibit 39, Pennsylvania is a wildlife corridor for the East Coast.

Exhibit 39

North America Migration Patterns



Source: The Nature Conservancy.

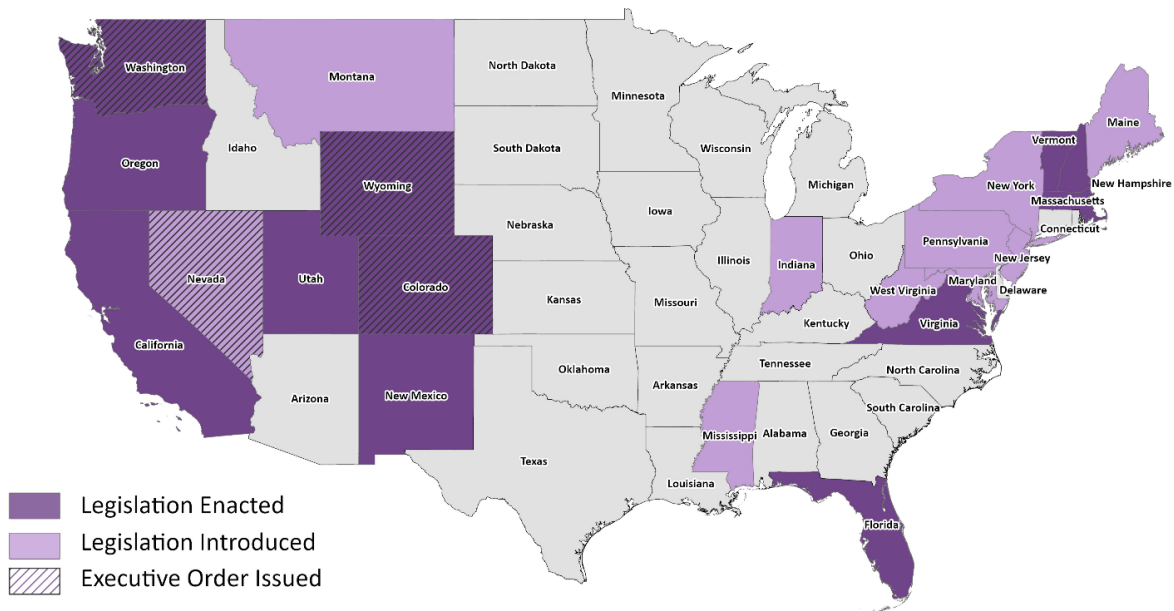
When reviewing connectivity practices in peer states, it is also important to note the structure of Pennsylvania's state government related to conservation differs from the surrounding states. In Pennsylvania, as indicated in Section II, conservation jurisdiction falls between various separate state agencies and independent commissions (i.e., Pennsylvania Department of Conservation and Natural Resources (DCNR), Pennsylvania Department of Transportation (PennDOT), Pennsylvania Game

Commission (PGC), Pennsylvania Fish and Boat Commission (PFBC), etc.). The New Jersey Department of Environmental Protection is home to the Division of Fish and Wildlife, New Jersey Forest Service, Office of Natural Lands Management, and other conservation-related programs in New Jersey.¹⁰⁸ With most of the conservation jurisdiction in one state agency, New Jersey's efforts may be less fragmented than Pennsylvania's. As part of this study, we did not research whether agency structures are inherently positive or negative to conservation efforts. Nonetheless, we highlight collaboration efforts in the surrounding states that may be helpful to adopt in the commonwealth.

States such as California, Colorado, Florida, Nevada, New Hampshire, New Mexico, Oregon, Utah, Vermont, Virginia, Washington, and Wyoming either enacted legislation or issued executive orders on wildlife corridors. Pennsylvania and surrounding states have primarily introduced but not enacted legislation regarding conservation connectivity (as shown in Exhibit 40).

Exhibit 40

**Habitat Connectivity Policies by State
As of 2023**



Source: The Center for Large Landscape Conservation.

¹⁰⁸ *New Jersey Department of Environmental Protection, Official Organization Chart, Departmental Overview.* March 2024.

Without legislative requirements, Pennsylvania and the surrounding states have implemented conservation connectivity practices in varying degrees through new and existing programs. The sections that follow will highlight conservation connectivity efforts in the states surrounding Pennsylvania.

New Jersey

New Jersey's history with conservation corridors dates to the 1980s, when wildlife overpasses were planned with the construction of Interstate 78 (I-78) because the highway was intended to run directly through the center of Watchung Reservation (preserved land in Union County). Ultimately, the I-78 project was built to circumvent most of the Watchung Reservation; however, the wildlife overpasses were still built. They were deemed a success, but a biologist for the state noted New Jersey now relies mainly on wildlife corridors that go under roadways.¹⁰⁹

Today, New Jersey faces steady urbanization, a dense network of roads, and a changing climate.¹¹⁰ New Jersey utilizes collaboration, data collection, and analysis in conservation connectivity. In 2012, New Jersey created Connecting Habitats Across New Jersey (CHANJ), an effort managed by the New Jersey Department of Environmental Protection, Division of Fish and Wildlife. CHANJ was formed to help:

- Prioritize land protection,
- Inform habitat resolution and management, and
- Guide mitigation of road barrier effects on wildlife and habitats.¹¹¹

Collaboration. Since CHANJ's inception in 2012, more than 40 different organizations in New Jersey participated in the conservation efforts. New Jersey's collaboration included working groups between local, state, and federal stakeholders to promote habitat connectivity and reduce wildlife-vehicle collisions (WVCs).¹¹² This collaboration included identifying and developing public-private partnerships (PPPs) and inter-agency communications.

¹⁰⁹ Higgs, Larry. *No, It's Not an Abandoned Overpass. The Story Behind N.J.'s Wildlife Bridges*. NJ.com, January 2024.

¹¹⁰ *Guidance Document, Version 1.0-2019*. Connecting Habitat Across New Jersey. April 2019.

¹¹¹ *Ibid.*

¹¹² *Connecting Habitat Across New Jersey (CHANJ): Guidance Document, Version 1.0, New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program*. New Jersey Division of Fish and Wildlife, p. 73, 2019.

Data Collection and Analysis. In 2022, CHANJ released a final assessment report to detail the effectiveness of its practices in developing habitat connectivity and mitigating WVCs.¹¹³ CHANJ found that human landscape modification (e.g., construction, clearing land for agriculture, and other infrastructure development) impacted wildlife gene flow and identified areas where habitat connectivity could be improved. Gene flow is the successful transfer of genetic information to prevent inbreeding; therefore, habitat fragmentation caused by artificial barriers may inhibit this process.¹¹⁴

CHANJ conducted road transect surveys and culvert assessments as part of the assessment and identified areas of high concern for proposing road mitigation projects.¹¹⁵ Exhibit 41 contains the mapping of constructed and in-progress wildlife mitigation projects in New Jersey.

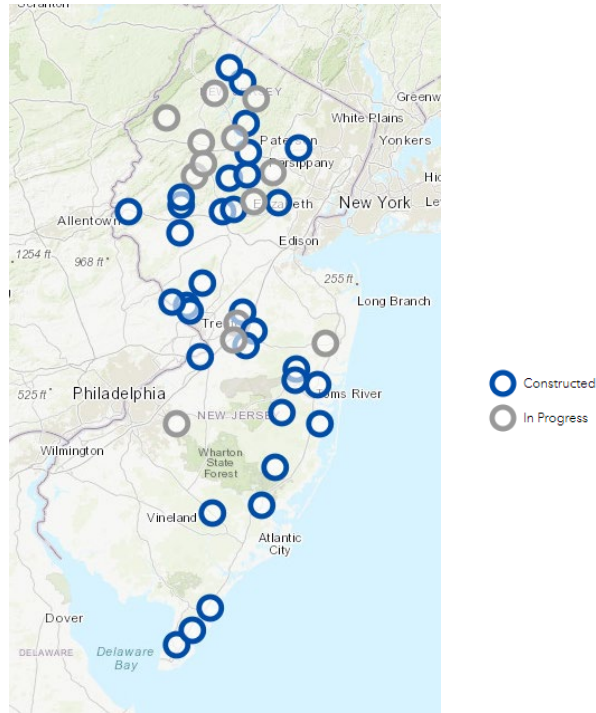
¹¹³ CHANJ Assessments Final Report. New Jersey Division of Fish and Wildlife. August 2022.

¹¹⁴ Ellstrand, Norman and Rieseberg Loren. *When Gene Flow Really Matters: Gene Flow in Applied Evolutionary Biology*. Evolutionary Applications. July 2016.

¹¹⁵ Transect surveys entailed driving or walking each Road Segment at least once weekly for a minimum 6-month timeframe and recording information during each survey, including the date and time of the survey, the number and species of animals found alive-on-road or dead-on-road (or that no animals were observed), the location of animals observed within the transect, and a voucher photograph of each.

Exhibit 41

**New Jersey Road Wildlife Mitigation Projects
March 2024**



Source: CHANJ Web Viewer.

CHANJ also developed the New Jersey Wildlife Tracker App, an application to report sightings of New Jersey rare or endangered species, wildlife on roads, and roadkill. The application allows anyone, including the public, to report sightings.

Ohio

Ecologically, Ohio faces challenges with wildlife habitat loss and fragmentation.¹¹⁶ Focusing on data collection and collaboration as part of its conservation connectivity efforts, the Ohio Department of Transportation (ODOT) developed the WVC data collection protocol to identify statistically significant WVC hotspots, particularly for deer-vehicle collisions.¹¹⁷ Ohio determined that 90 percent of WVCs in the state were deer-related.

¹¹⁶ *Ohio State Wildlife Action Plan 2015*. Ohio Department of Natural Resources, Division of Wildlife.

¹¹⁷ *TRC, AVC Survey Data Collection Protocol*. Ohio Department of Transportation. May 2022.

Collaboration. ODOT collaborated with other state government agencies, private businesses, and universities to identify WVC hot spots.¹¹⁸ ODOT also contracted with an environmental consulting firm to conduct a comprehensive WVC reduction study.

Data Collection and Analysis. Ohio used data from a variety of sources to identify WVC hotspots. For example, Ohio utilized a free public sector program from the navigation application, Waze, called the “Waze for Cities Data” program. Through this collaboration, Waze provided Ohio real-time traffic data, including user-identified roadkill sightings. As discussed in more detail, animal carcass road data may be more accurate in quantifying WVCs than crash data alone. In response to WVC hotspots, ODOT created a mitigation matrix to determine the types of potential wildlife crossings, associated costs, effectiveness, implementation time frame, costs/benefits, limitations, and maintenance needs.

Delaware

Delaware faces a changing climate, particularly severe weather (resulting in saltwater changes, intrusion, and negative impacts on dams and impoundments) and invasive species.¹¹⁹ Delaware has focused on fostering collaboration, enhancing data collection, and supporting landowners in conservation efforts.¹²⁰

Collaboration. The Delaware Department of Natural Resources and Environmental Control (DNREC) works with public and private conservation partners to assist with data collection and analysis. DNREC released best management practices for private landowners to mitigate diverse environmental impacts. Partnerships with other agencies facilitated the implementation of DNREC priority items. One example involved collaboration with the Delaware Department of Transportation (DelDOT), which involved planning for species of greatest conservation need (SGCN) and critical habitats during the planning phases of development for DelDOT-managed roads.

¹¹⁸*Animal Vehicle Collision Hotspot Analysis Presentation.* Ohio Department of Transportation. 2022.

¹¹⁹ “As sea levels rise along the coasts, saltwater can move onto the land. Known as saltwater intrusion, this occurs when storm surges or high tides overtop areas low in elevation. It also occurs when saltwater infiltrates freshwater aquifers and raises the groundwater table below the soil surface.” See <https://www.climatehubs.usda.gov/hubs/northeast/topic/saltwater-intrusion-growing-threat-coastal-agriculture#:~:text=Known%20as%20saltwater%20intrusion%2C%20this,table%20below%20the%20soil%20surface.>, Accessed May 10, 2024.

¹²⁰ *The Delaware Wildlife Action Plan 2015-2025.* Delaware Department of Natural Resources and Environmental Control, Division of Fish and Wildlife.

Data Collection and Analysis. Delaware identified specific priority areas for connectivity, including mapping.¹²¹ Exhibit 42 shows Delaware Environment Navigator core areas as well as existing and potential corridors.

Exhibit 42

**Delaware Existing and Potential Conservation Corridors
2015**



Source: Delaware Wildlife Action Plan.

¹²¹Delaware Wildlife Action Plan. Delaware Department of Natural Resources. 2015.

Delaware noted the need for additional conservation and habitat-mapping tools, including additional data (from public and private stakeholders), to further develop its GIS mapping.

Maryland

Facing significant forest loss due to urbanization, Maryland's conservation connectivity efforts have been headed by the Maryland Department of Natural Resources and the Maryland Department of Transportation (MDOT).

Collaboration. The Maryland Department of Natural Resources utilized data to develop the Green Infrastructure Assessment.¹²² According to Maryland, this assessment tool identified:

A variety of natural resource values (as opposed to a single species of wildlife, for example), how a given place fits into a larger system, the ecological importance of natural open space in rural and developed areas, the importance of coordinating local, state and even interstate planning, and the need for a regional or landscape-level view for wildlife conservation.¹²³

MDOT worked with universities and non-governmental organizations to study specific areas of habitat fragmentation, such as culverts and deer-vehicle collisions.^{124, 125} As a result of this collaboration, MDOT utilized fencing, wildlife escape ramps, updated wildlife-friendly culverts, and wildlife underpasses on state highways.¹²⁶

Data Collection and Analysis. The Green Infrastructure Assessment and three other databases (Rare Species Habitat, Aquatic Life Hotspots, and Water Quality Protection) were utilized to target priority areas. The priority areas determine where MDDNR utilizes land protection funds.

¹²² See <https://dnr.maryland.gov/land/Pages/Green-Infrastructure.aspx>, Accessed March 22, 2024.

¹²³ See <https://data.imap.maryland.gov/datasets/maryland::maryland-green-infrastructure-green-infrastructure-hubs-and-corridors/about>, Accessed March 22, 2024.

¹²⁴ Gates, J. Edward, and James L. Sparks Jr. *An Investigation into the Use of Road Drainage Structures by Wildlife in Maryland*. University of Maryland Center for Environmental Science. August 2011.

¹²⁵ *Deer-Vehicle Collision Data Using GIS*. Maryland Department of Transportation State Highway Administration. November 2002.

¹²⁶ See <https://www.roads.maryland.gov/mdotsha/pages/index.aspx?PagelD=334>, Accessed March 28, 2024.

New York

New York has faced habitat loss and fragmentation challenges due to developing and maintaining connectivity for SGCN.¹²⁷ New York's latest State Wildlife Action Plan (SWAP) discussed the need for habitat connectivity, particularly as suburban development occurs throughout the state. In its SWAP, the New York State Department of Environmental Conservation (NYDEC) noted the objective to "promote" habitat connectivity for SGCN through collaboration and data collection.¹²⁸

Collaboration. In New York, NYDEC and the New York Department of Transportation (NYDOT) set a collaborative goal to reduce SGCN road mortality.¹²⁹ Additionally, NYDOT and the Nature Conservancy (a non-profit organization) partnered to install "Critter Crossings" under New York highways as part of a pilot project.¹³⁰ Critter Crossings are structures designed to help smaller mammals (bobcats and fishers) cross under roadways.

Data Collection and Analysis. According to the Nature Conservancy, to determine New York's Critter Crossing sites, computer models were used "to identify likely wildlife pathways and potential barriers [additionally] field technicians began tracking animals in the snow to confirm their travel patterns."¹³¹ Wildlife cameras were installed to assess the effectiveness of the pilot program, and they showed animals using the crossings.

NYDEC actively uses mapping tools to identify priority areas for habitat sustainability. New York's mapping tool identifies critical environmental areas (CEAs) to alert stakeholders that projects within the CEA should be assessed for environmental impacts before project commencement.¹³²

West Virginia

West Virginia's current conservation challenges revolve around state conservation on private lands and collaboration between conservation stakeholders. Private landowners own around 88 percent of the state's total land area of 15.5 million acres, posing a connectivity challenge.

¹²⁷ *State Wildlife Action Plan*. New York Department of Environmental Conservation. September 2015.

¹²⁸ *State Wildlife Action Plan*. New York Department of Environmental Conservation. September 2015.

¹²⁹ *Ibid*.

¹³⁰ See <https://www.nature.org/en-us/about-us/where-we-work/united-states/new-york/stories-in-new-york/critter-crossings/>, Accessed April 3, 2024.

¹³¹ See <https://www.nature.org/en-us/about-us/where-we-work/united-states/new-york/stories-in-new-york/critter-crossings/>, Accessed April 3, 2024.

¹³² See https://extapps.dec.ny.gov/docs/remediation_hudson_pdf/ceafactsheet.pdf, Accessed March 25, 2024.

Collaboration. West Virginia’s conservation priorities are developed through a core working group consisting of the West Virginia Division of Natural Resources (WVDNR) and West Virginia University Natural Resource Analysis Center under a cooperative agreement.¹³³ West Virginia’s State Wildlife Action Plan (SWAP) proposed collaborating with the West Virginia Division of Highways and other state and federal roadway authorities to consider threats to SGCN and collaboration among forest management communities for SGCN populations.¹³⁴ In 2020, the West Virginia WVDNR partnered with the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the West Virginia Division of Forestry, and other organizations to seek out private landowners interested in improving habitats.¹³⁵

Data Collection and Analysis. WVDNR utilized regional mapping and spatial analysis to identify habitat-species relationships and created a new database to disseminate the results.¹³⁶ This analysis identified 21 significant stresses on terrestrial and 20 major stresses on aquatic SGCNs. Consequently, hundreds of conservation actions were formed to respond to those stresses. According to West Virginia, the actions were not regulatory and required voluntary efforts from stakeholders.

B. Best Practices in Developing and Managing Conservation Corridors

Extensive research on conservation connectivity exists in addition to reviewing conservation practices in Pennsylvania’s neighboring states. Our research indicated that the best practices outlined in the following sections effectively achieve conservation connectivity goals. The evidence-based framework shown in Exhibit 43 shows that conservation connectivity involves interconnected factors, various tools, thoughtful planning, and science-backed analysis.¹³⁷

¹³³ *West Virginia State Wildlife Action Plan*. West Virginia Division of Natural Resources. September 2015.

¹³⁴ *West Virginia State Wildlife Action Plan*. West Virginia Division of Natural Resources. September 2015.

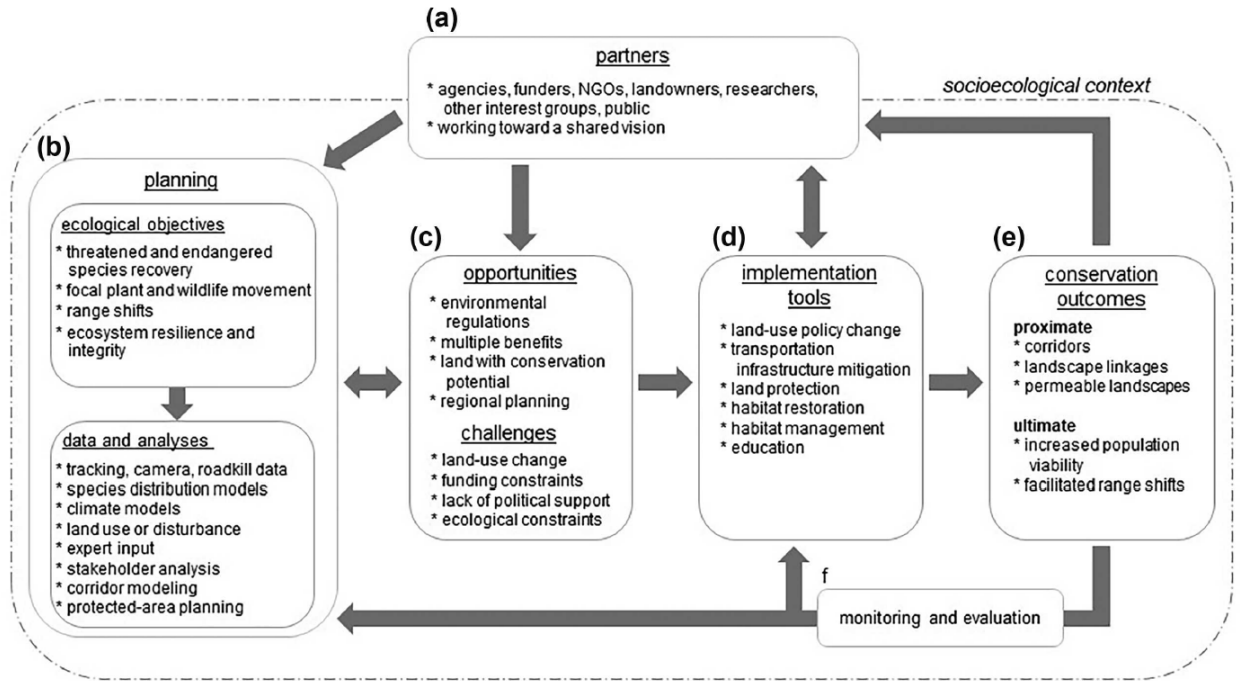
¹³⁵ See <https://wvdnr.gov/wvdnr-seeks-landowner-assistance-with-wildlife-habitat-improvement/>, Accessed March 26, 2024.

¹³⁶ *West Virginia State Wildlife Action Plan*. West Virginia Division of Natural Resources. September 2015.

¹³⁷ Keely, Annika, et al. *Making Habitat Connectivity a Reality*. Conservation Biology. 2018.

Exhibit 43

Framework for Connectivity Implementation



Notes:

- ^{a/} Early partner engagement.
- ^{b/} Clear ecological objectives that drive data type and analysis.
- ^{c/} Opportunities and challenges that may advance or hinder implementation should be addressed in the planning phase.
- ^{d/} Strategies to overcome challenges and ensure success.
- ^{e/} Resulting outcomes that increase connectivity and foster continued conservation by the partners.
- ^{f/} Monitoring and project evaluation for adaptive management.

Source: Annika Keeley et al.

Our research found that if Pennsylvania implemented a comprehensive approach to conservation connectivity, the commonwealth could expand on existing work to preserve habitats for native wildlife and plants and provide safe passage for migrating species.

Developing Human Established Corridors and Preserving Natural or Existing Corridors

Conservation corridors are not a one-size-fits-all solution to threats facing plant and wildlife species. Some corridors are naturally occurring, and others require human intervention to maintain or develop connectivity. While they have been proven successful, conservation corridors are more than just wildlife crossings intersecting highways. Many tools exist for developing and preserving human-established corridors.

Wildlife Crossings. Wildlife crossings are one tool to reconnect habitats fragmented by roadways and urbanization.

As noted by the USDA, "Wildlife crossing structures designed or retrofitted to provide safe passage for wildlife above (overpasses) and below (underpasses) a roadway, coupled with fencing, have been shown to reduce [WVCs] by up to 97 percent."¹³⁸ The USDA further stated, "It actually costs society less to solve the problem of [WVCs] than it costs to do nothing." Even though there can be a significant benefit to their construction, because wildlife crossings require considerable planning and financial investment, it is wise to implement best practices. USDA noted the following:

- Wildlife crossing structure design, size, and placement influence how different species respond to structures.
- Some species prefer large, open structures, while others prefer smaller structures with less light.
- Wildlife crossing structures designed for multiple species maximize biodiversity conservation.
- Because animals often exhibit a learning curve of several years to find and adjust to wildlife crossings, performance evaluations must be longer to assess effectiveness reliably.
- Land management surrounding wildlife crossings is key in determining their effectiveness; therefore, short- and long-term coordination between transportation and land management agencies is essential.
- Fencing keeps animals off the highway and directs them to, and enhances the effectiveness of, wildlife crossing structures; in contrast, fencing alone (without crossing structures) creates a barrier

¹³⁸ *Highway Crossing Structures for Wildlife: Opportunities for Improving Driver and Animal Safety.* United States Department of Agriculture, Forest Service. May 2021.

that can keep animals away from crucially important habitat areas.

USDA also noted that while wildlife crossings are generally effective, planning them is a localized process, requiring states to consider their unique needs when designing and constructing them.

Throughout our research, exclusionary fencing and wildlife crossings were often noted as leading to crossing effectiveness.¹³⁹ Another similar tool to implement with fencing and crossings is “jumpouts,” or escape areas for animals trapped on roadways with fencing. Jumpouts have been proven effective for deer and other medium-to-large mammals.¹⁴⁰

Easements. Our meetings with various stakeholder groups often mentioned conservation easements as another conservation connectivity tool. There are four main strategies for protecting at-risk species on private land: (a) the government acquiring the land through eminent domain, (b) private land conservation trusts purchasing the land, (c) government regulation, and (d) voluntary easement agreements designed to protect a habitat.¹⁴¹

Voluntary easements provide a more cost-effective solution that also keeps the land in private ownership. For these reasons, land conservation trusts have increasingly used this type of collaboration to establish corridors.¹⁴²

Researchers at the University of Missouri noted, “There is an important role for private land conservation, particularly in the eastern states, where a significant portion of land is privately owned.”¹⁴³ The researchers identified three main best practice recommendations regarding conservation easements:

- **Affirmative Clauses in Conservation Easements.** The research stated, “Such language may require removal of invasive species, restoration of native habitat, and other measures to expand and enhance wildlife habitat.”

¹³⁹ Brennan, Liam, Emily Chow, and Clayton Lamb. *Wildlife Overpass Structure Size, Distribution, Effectiveness, and Adherence to Expert Design Recommendations*. PeerJ. December 2022.

¹⁴⁰ Jensen, Alex, et al. *Quantifying Wildlife Use of Escape Ramps Along a Fenced Highway*. Human-Wildlife Interactions. 2022.

¹⁴¹ Kareiva, Peter, et al. *Documenting the Conservation Value of Easements*. Conservation Science and Practice. May 2021

¹⁴² Ibid.

¹⁴³ Brown, Sarah, et al. *Conservation Easements: A Tool for Preserving Wildlife Habitat on Private Lands*. The Wildlife Society. July 2021.

- **Expanding the Role of Wildlife Professionals.** The researchers noted the need to include wildlife professionals in drafting easements to ensure better ecological outcomes.
- **Research Priorities.** This location-specific best practice included getting to know the private landowners' perceptions of easements in the area, including landowners who enter easements and those who turn down entering into an easement.

Easements can successfully connect private lands to public or land trust-owned lands.

Managing Preservation of Corridors. Preserving land within corridors is another aspect of connectivity. In 2021, researchers from the University of North Texas, Center for Large Landscape Conservation, and Northern Arizona University published a comprehensive literature review of management practices for existing corridors with scientific evidence of success.¹⁴⁴ The researchers noted they did not cover "corridor design or political buy-in, but focus[ed] on how a corridor should be managed once it was established."¹⁴⁵ Exhibit 44 contains the results of the researchers' study. (Note: The researchers use the term "linkage" interchangeably with "corridor.")

Exhibit 44

Best Practices for Corridor Management

Recommendations for Human-Created Linear Barriers Crossing Corridors

- Avoid building roads, canals, or railroad tracks in linkages and having these infrastructures bisect linkages whenever possible.
- When roads are unavoidable, use speed abatements to reduce traffic speed within and adjacent to corridors.
- Use seasonal road closures during critical wildlife travel periods.
- Reduce or eliminate artificial lighting.
- Provide a variety of safe crossing structures over or under roads, railways, or canals, and whenever possible, maintain natural vegetation in the structure.
- Ensure the protective fencing prevents wildlife from accessing the road/railway or canal interior while funneling wildlife to a safe crossing structure.
- Maintain high-quality natural areas on either end of crossing structures.
- Aside from protective fencing along roads, rails, and canals, ensure that all other fencing within the ecological corridor is wildlife-friendly and marked with safe deterring markers.
- Provide safe drinking water sites near canals and aqueducts to prevent wildlife from seeking to access water in unsafe canals and aqueducts.

¹⁴⁴ Gregory, Andrew, et al. *Toward Best Management Practices for Ecological Corridors*. Land. 2021.

¹⁴⁵ *Ibid.*

Exhibit 44 Continued

Recommendations for Streams and Riparian Zones

- Maintain dams and impoundments to ensure they are functioning properly.
- Manage the release of water from the impoundment to mimic the stream's natural water cycle and prevent scouring floods.
- Ensure that water levels below the impoundment are maintained at a level that supports natural vegetation growth.
- Provide riparian zone buffers.
- Actively remove invasive species using chemical or mechanical means as necessary.

Recommendations for Urban and Suburban Development in Corridors

- Whenever possible, avoid urban development within the linkage design.
- Minimize the road infrastructure associated with urban development within or adjacent to the linkage.
- Strive to maintain residential parcel sizes >20 hectares (or 49.4 acres).
- Use signage and education to explain the value of the linkage and encourage good stewardship by visitors.
- Minimize artificial lighting.
- Discourage wildlife feeding on trash or other practices that attract animals to unsafe areas or disrupt natural communities.
- Encourage a leave-no-trace ethic associated with the recreational use of the linkage.
- Reduce the use of fertilizers and pesticides on urban lawns.
- Encourage good pet ownership to reduce domestic animal damage to wildlife within the linkage.

Recommendations for Agricultural Development Within Corridors

- Encourage limited use of herbicides, pesticides, and rodenticides.
- Use controlled burns or mechanical methods to remove debris from the corridor.
- Use conservation easements or other incentives to promote appropriate practices on land adjacent to the linkage.
- Use available government programs to help restore and manage natural vegetation within the linkage.
- Encourage good ranching husbandry practices to reduce livestock depredations and consider payment programs to compensate producers for livestock losses from wildlife.
- Reduce or eliminate grazing within or adjacent to the linkage.

Source: *Toward Best Management Practices for Ecological Corridors* (2021).

Collaboration and Partnerships

As noted in the section on Pennsylvania's surrounding states, collaboration is a common aspect of conservation connectivity. According to the USDA, partnerships generally include a core group of state agency facilitators that work with other agency liaisons to streamline projects and

synthesize data between agencies.¹⁴⁶ Often, this collaboration includes creating a standardized methodology for data collection and reporting.

As noted in Section II, Pennsylvania state agencies and independent commissions have already collaborated on conservation connectivity. Because Pennsylvania's conservation-related agencies and commissions are focused on different species or aspects of conservation, Pennsylvania's efforts are more fragmented than other states. More official collaboration, such as a conservation connectivity working group, may be helpful. A working group would also allow public access to the process and enable conservation stakeholders to track the commonwealth's conservation connectivity efforts.

Due to jurisdictional oversight and fiscal constraints, commonwealth agencies are sometimes limited in achieving wide-ranging conservation and connectivity goals. Additionally, "sometimes, private landowners refuse to deal with public agencies due to previous negative experiences, but the door may be open to non-governmental organizations."¹⁴⁷ PPPs can assist in furthering the work of the state-level conservation agencies/commissions. The federal government and local governments are also vital partners to the commonwealth.

Data Collection and Analysis

Data collection and analysis are imperative in identifying conservation needs. The two areas in Pennsylvania where we needed additional data collection and analysis were mapping and WVC data.

Mapping. Mapping is an essential tool for planning and implementing conservation corridors. Researchers from the Northern Arizona University, Conservation Biology Institute, Clemson University, and Nature Conservancy developed best practices in connectivity mapping. The researchers noted that maps should "serve as decision-support tools and concise expressions of desired future connectivity."¹⁴⁸ Additionally, the researchers developed the following steps in conservation mapping:

Step 1: State the Goal of the Map.

Step 2: Establish Collaborations.

¹⁴⁶ *Highway Crossing Structures for Wildlife: Opportunities for Improving Driver and Animal Safety*. United States Department of Agriculture, Forest Service. May 2021.

¹⁴⁷ Keely, Annika, et al. *Making Habitat Connectivity a Reality*. Conservation Biology. 2018.

¹⁴⁸ Beier, Paul, et al. *Toward Best Practices for Developing Regional Connectivity Maps*. Conservation Biology. July 2011.

- Step 3:** Define the Region.
- Step 4:** Delineate Natural Landscape Blocks.
- Step 5:** Determine which Pairs of Blocks Would Benefit from Connectivity.
- Step 6:** Depict Connectivity Areas.
- Step 7:** Provide Guidance to End Users.¹⁴⁹

The research concluded the best practices by stating, “Regional connectivity [mapping] is a highly cost-effective conservation tool because it provides an inspiring vision and alerts regulators and decision-makers to proposed land development projects that may adversely affect connectivity.”¹⁵⁰

Throughout our study, stakeholders told us about the need for mapping that collectively shows the conservation connectivity priorities of commonwealth agencies and commissions (with input from other stakeholders).

Wildlife-Vehicle Collision Data. WVC data has proven helpful in other states for identifying habitat areas separated by roadways with WVC hotspots. The three primary data sources used in other states include crash data, carcass data, and insurance claim records. As noted by the Center for Large Landscape Conservation (CFLLC):

Many states collect data on (large animal) WVC incidences. Some collect only the number of crashes reported by their state’s law enforcement agencies (typically only crashes resulting in significant property damage or human injuries/fatalities); others also record carcass data collected by their transportation agency’s maintenance personnel when they remove carcasses from the roadside. Another data source used by some states is motor vehicle insurance claim records.¹⁵¹

Each of the three data sources has advantages and limitations. As noted by CFLLC, crash data is limited to WVC reportable to law enforcement.

Roadway carcass data has been shown to capture more WVCs than crash data reported to transportation agencies. In a study conducted by the Virginia Transportation Research Council, deer carcass removal records

¹⁴⁹ Ibid.

¹⁵⁰ Ibid.

¹⁵¹ *Reducing Wildlife Vehicle Collisions by Building Crossings: General Information, Cost Effectiveness, and Case Studies from the U.S.* Center for Large Landscape Conservation and the Pew Charitable Trusts. February 2022.

indicated “the number of [deer-vehicle collisions (DVC)] in the evaluated areas was up to 8.5 times greater than what was documented in police crash reports.”¹⁵² As noted by CFLCC:

Most likely the total number of WVCs is actually much higher than carcass records indicate, since not all carcasses are retrieved, and by some estimates as many as 50 percent of animals struck by vehicles leave the road or right-of-way before dying and so are never recorded.¹⁵³

While limited, insurance claims data is another data source indicating the crash data reported to transportation departments undercounts the number of WVCs. The Virginia Transportation Research Council noted, “Although the insurance data provide some information on the magnitude of the DVC problem, insurance data do not provide location information for these crashes.”¹⁵⁴ We also found this true in Pennsylvania (see Section III).

Combining data from multiple sources will likely provide the most accurate estimate of total WVCs. It is important to note that WVC data is just one metric to consider in conservation connectivity. Most WVC data is limited to medium and large mammals or larger amphibians and birds. It does not measure the impact of roadway fragmentation on smaller animals and plants.

C. Funding Sources for Conservation Corridors

States utilize a variety of funding sources for conservation corridors, including taxes, fees, and grants. Florida is an example of a state that, through unanimous legislative action in 2021, invested over \$400 million (\$100 million recurring) in protecting its wildlife corridors. The Florida Wildlife Corridor Act directed the Florida Department of Environmental Protection (FDEP) to encourage and promote investments in areas that protect and enhance the Florida Wildlife Corridor.¹⁵⁵

¹⁵² Donaldson, Bridget. *Improving Animal-Vehicle Collision Data for the Strategic Application of Mitigation*. Virginia Transportation Research Council. December 2017.

¹⁵³ *Reducing Wildlife Vehicle Collisions by Building Crossings: General Information, Cost Effectiveness, and Case Studies from the U.S.* Center for Large Landscape Conservation and the Pew Charitable Trusts. February 2022.

¹⁵⁴ Donaldson, Bridget. *Improving Animal-Vehicle Collision Data for the Strategic Application of Mitigation*. Virginia Transportation Research Council. December 2017.

¹⁵⁵ *Florida Wildlife Corridor*. Florida Department of Environmental Protection. July 2022.

The Pew Charitable Trusts commissioned a study on state-level funding options for wildlife crossing infrastructure.¹⁵⁶ The study included funding options already used by states and funding options that may be possible for states to implement. Exhibit 45 contains the Pew study’s findings, a description of the funding option, and our analysis of feasibility considerations in implementing the funding solutions in Pennsylvania.

Exhibit 45

Conservation Corridor Funding Options

Conservation Corridor Funding Option	Description	Feasibility Considerations of Implementing Funding Solution in Pennsylvania
Motor Fuel Tax	Excise tax on gasoline.	Pennsylvania already has one of the highest Motor Fuel Taxes in the country.
Wildlife Crossing User Fees	A toll is charged to wildlife crossing users.	Pennsylvania state law (Act 2022-84) prevented PennDOT from tolling construction projects as part of PPPs.
Auto Insurance Surcharge	A surcharge on monthly auto insurance.	In Pennsylvania, WVCs are covered by comprehensive coverage, and insurance providers cannot increase premiums for deer-related crashes, so a legislative change would likely be required to implement and collect a surcharge.
Vehicle Title Registration Fee	An increase in vehicle registration fees.	A fee increase could be a source of conservation funding; however, it may also challenge vehicle registration compliance.
Optional License Plate	An optional license plate for motorists.	Pennsylvania has existing specialized license plates that directly contribute to conservation efforts; however, a portion of those proceeds already go to specific funds (Pollinator Habitat Program Fund and the Wild Resource Conservation Fund).

¹⁵⁶ *Funding for Wildlife Crossing Infrastructure: An Evaluation of Revenue and Funding Mechanisms*. Pew Charitable Trusts and ECONorthwest, April 2023.

Exhibit 45 Continued

Conservation Corridor Funding Option	Description	Feasibility Considerations of Implementing Funding Solution in Pennsylvania
Speeding Ticket Fee	A portion of speeding ticket revenue a) from portions of roadway designated as wildlife crossing zones or b) from established wildlife crossing zones in high collision areas.	In Pennsylvania, speeding ticket revenue is currently divided between courts, enforcement agencies, the Public Transportation Trust Fund, and the General Fund. Dedicating part of this funding to conservation corridors could be possible if additional work was conducted to establish conservation corridor zones, similar to construction zones.
Heavy-Vehicle Use Tax	An increase in state taxes imposed by weight and miles driven.	Pennsylvania’s Motor Fuel Tax already impacts heavy vehicles at a higher rate than passenger vehicles.
State Park User Fee	A fee charged for entering a state park.	Aside from specific events, currently, there are no state park user fees in Pennsylvania.
Hunting License Fee	An increase in state hunting license fees.	Pennsylvania’s hunting license fee is set by legislation, and the revenue goes to a special fund, the Game Fund, which is earmarked for the administration and enforcement of game laws and the protection and propagation of game species.
Mitigation Fee	Fees are imposed on large-scale projects to mitigate the environmental impact and improve conservation.	In other states, mitigation fees are imposed on a project-by-project basis and are heavily influenced by geographic restrictions. This makes them unreliable as a consistent funding source.
Environmental Damage Assessment	The Natural Resource Damage Assessment (NRDA) determines the extent to which environmental restoration is needed after hazardous materials have been released.	These assessments are conducted on a project-by-project basis; however, funding is available every year, provided the project is strongly linked to environmental restoration.

Exhibit 45 Continued

Conservation Corridor Funding Option	Description	Feasibility Considerations of Implementing Funding Solution in Pennsylvania
Outdoor Sporting Goods Sales Tax	Dedicating a portion of sales tax on sporting goods to conservation.	Pennsylvania's substantial outdoor recreation economy makes this a potential funding option. However, this is not a new revenue source and would divert specific revenue already collected.
General Fund	Appropriating a portion of the General Fund to conservation corridors.	This option creates a stable funding source for conservation and can be adjusted based on Pennsylvania projects conducted each fiscal year. However, it likely requires diverting existing funds.

Source: Developed by LBFC staff from information obtained from Pew Charitable Trusts.

One additional revenue source not discussed in detail in the Pew study was federal grants. Grants such as the Wildlife Crossing Pilot Program, State Wildlife Grants, and Forest Legacy Program are grants available to states for conservation efforts (all of which Pennsylvania has received in the past). However, grants are not a guaranteed revenue source. At the same time, if Pennsylvania has a more robust conservation connectivity program, more grant funding may be available.

APPENDICES



Appendix A – House Resolution 2023-87

CORRECTIVE REPRINT

PRIOR PRINTER'S NO. 1037

PRINTER'S NO. 1038

THE GENERAL ASSEMBLY OF PENNSYLVANIA

HOUSE RESOLUTION

No. 87 Session of
2023

INTRODUCED BY DALEY, ORTITAY, HILL-EVANS, MADDEN, HANBIDGE,
ISAACSON, McNEILL, SAPPEY, RABB, PROBST, SAMUELSON,
SALISBURY, SANCHEZ, BENHAM, N. NELSON, BRIGGS, PICKETT,
CIRESI, MENTZER, OTTEN, MERSKI, VENKAT, VITALI, BOROWSKI,
STEELE, FRANKEL, CONKLIN, STURLA, PISCIOTTANO, GAYDOS,
SHUSTERMAN, HOWARD, O'MARA, DEASY, HOGAN, WARREN, WEBSTER,
SCOTT, TAKAC, GUENST, KINKEAD, SCHWEYER, SOLOMON, PASHINSKI,
BRENNAN, SCHEMEL, MATZIE, MAJOR, HADDOCK, CERRATO, GALLOWAY,
MULLINS, FIEDLER AND KRAJEWSKI, APRIL 25, 2023

REFERRED TO COMMITTEE ON TOURISM AND ECONOMIC AND RECREATIONAL
DEVELOPMENT, APRIL 25, 2023

A RESOLUTION

- 1 Directing the Legislative Budget and Finance Committee to
- 2 conduct a study and issue a report on the current status,
- 3 management and benefits of conservation corridors in this
- 4 Commonwealth.

- 5 WHEREAS, Pennsylvania is home to an array of ecosystems and
- 6 has a magnificent diversity of plants, trees and wildlife that
- 7 benefit from connectivity and the conservation of high-quality
- 8 habitats, enabling species to thrive when facing habitat
- 9 stressors and changing environmental conditions; and

- 10 WHEREAS, Conservation ensures that this Commonwealth's
- 11 tourism industry continues to expand and thrive, and prevents
- 12 exploitation, destruction and neglect of this Commonwealth's
- 13 natural resources; and

- 14 WHEREAS, Outdoor recreation is among our nation's largest

1 economic sectors; and

2 WHEREAS, Pennsylvania is a leader in outdoor recreation
3 consumer spending, a critical component of our tourism industry;
4 and

5 WHEREAS, Habitat connectivity for wildlife must be maintained
6 and expanded because connectivity between wildlife habitats is
7 important to the long-term viability of this Commonwealth's
8 biodiversity; and

9 WHEREAS, The ecological benefits of habitat connectivity
10 include greater species richness, increased species populations
11 and wider dispersal of animals and plants; and

12 WHEREAS, A habitat stronghold is a high-quality habitat where
13 wildlife populations are strong, diverse and highly functioning;
14 and

15 WHEREAS, The creation of high-quality habitat strongholds for
16 wildlife can lead to more genetically diverse and robust
17 populations; and

18 WHEREAS, It is the policy of the Commonwealth to encourage,
19 wherever feasible and practical, voluntary steps to protect the
20 functioning of conservation corridors through various means; and

21 WHEREAS, Increasingly, fragmented habitats threaten this
22 Commonwealth's plant and wildlife species; and

23 WHEREAS, Understanding this Commonwealth's habitat
24 connectivity status and potential requires consideration of all
25 relevant data, including from Federal and State agencies and
26 surrounding states, nonprofit organizations, universities and
27 private landowners; and

28 WHEREAS, Different commissions and departments in the
29 Commonwealth manage conservation corridors in Pennsylvania; and

30 WHEREAS, Many State agencies, nonprofit organizations,

1 coalitions and public-private partnerships interested in
2 advancing habitat connectivity across this Commonwealth could
3 benefit from improved understanding of current and potential
4 conservation corridors and support each other in coordinating
5 information and joint land management; and

6 WHEREAS, Pennsylvania ranks third in the nation for wildlife
7 vehicle collisions which cost millions of dollars in damage and
8 insurance claims each year; and

9 WHEREAS, Wildlife vehicle collisions have claimed countless
10 lives in recent decades and ensuring motorists' safety as they
11 traverse this Commonwealth's highways is critical; and

12 WHEREAS, It is essential that areas that provide safe
13 wildlife crossings be identified and utilized to prevent
14 wildlife vehicle collisions; and

15 WHEREAS, A study that identifies and evaluates conservation
16 corridors would be beneficial to both humans and wildlife;
17 therefore be it

18 RESOLVED, That the House of Representatives direct the
19 Legislative Budget and Finance Committee to conduct a study and
20 issue a report on the current status, management and benefits of
21 conservation corridors in this Commonwealth; and be it further

22 RESOLVED, That the study:

23 (1) identifies and examines the approaches, statutes,
24 measures and management responsibilities of State agencies,
25 nongovernmental organizations and academic institutions to
26 assist in the identification and establishment of
27 conservation corridors in this Commonwealth;

28 (2) identifies existing and needed terrestrial and
29 aquatic conservation corridors in this Commonwealth by
30 synthesizing existing relevant plans and data sets, including

1 Geographic Information Systems spatial data, from
2 governmental agencies, nongovernmental organizations and
3 academic institutions;

4 (3) aggregates the existing economic impact analyses of
5 the establishment of conservation corridors in areas of high
6 incidence of wildlife-vehicle collisions;

7 (4) identifies best practices of corridor
8 identification, corridor implementation and support,
9 including public-private partnerships, interagency
10 coordination and conservation easements; and

11 (5) identifies financial mechanisms and options,
12 including those relevant to each agency and for the
13 Commonwealth as a whole, to fund conservation corridors,
14 including Federal, State and nongovernmental sources;

15 and be it further

16 RESOLVED, That the Legislative Budget and Finance Committee
17 consult with organizations that:

18 (1) have organizational missions and expertise in
19 wildlife habitat and ecological conservation;

20 (2) provide representation of this Commonwealth's 121
21 State parks and 2.2 million acres of forest land, or the
22 interests of private landowners;

23 (3) integrate conservation and economic development in a
24 way that strengthens and inspires communities;

25 (4) collect data on wildlife-vehicle collisions; and

26 (5) have knowledge of relevant issues;

27 and be it further

28 RESOLVED, That the Legislative Budget and Finance Committee
29 be authorized to consult with surrounding states and private
30 landowners that have knowledge of relevant issues; and be it

1 further

2 RESOLVED, That the Legislative Budget and Finance Committee
3 make recommendations to organizations, landowners and agencies
4 relevant to identified conservation corridors regarding
5 collaborative engagement for the management of these areas; and
6 be it further

7 RESOLVED, That the Legislative Budget and Finance Committee
8 prepare a report of its findings and the recommendations of the
9 study and submit the report to the Senate and House of
10 Representatives no later than 18 months after the adoption of
11 this resolution.