



The Environmental Synopsis

A Monthly Update from the Joint Legislative Air and Water Pollution Control and Conservation Committee

AUGUST 2016



The Chairman's Corner

**Senator Scott E. Hutchinson,
Chairman**

Pennsylvania is home to over 600 imperiled or declining wildlife species that serve vital

roles in the Commonwealth's ecosystems. Managing these species and their habitats, however, can be a complex and costly process. The recently completed 2015 Pennsylvania Wildlife Action Plan, led by the Pennsylvania Game Commission (PGC) and the Pennsylvania Fish and Boat Commission (PFBC), is an important framework for wildlife management in our state and provides a nexus to crucial conservation funding. This plan is a cumulative effort of numerous conservation partners including federal and state agencies, non-governmental organizations, technical experts, universities and research institutions, and private citizens.

The 2015 Pennsylvania Wildlife Action Plan is a non-regulatory conservation blueprint to help prevent imperiled, threatened or endangered species from requiring protection under the federal Endangered Species Act. By proactively conserving species before their populations reach levels requiring threatened or endangered status, the plan helps reduce costs associated with wildlife management and safeguard Pennsylvania's natural heritage for future generations.

Beginning in the 1990s, the federal government started to realize the challenges

associated with recovering threatened and endangered wildlife species. Once a species is listed as threatened or endangered, its population and habitat are often diminished to such an extent that recovery is expensive and uncertain. In 2001, the U.S. Congress authorized the State and Tribal Wildlife Grants Program. This legislation approved funding, administered by the U.S. Fish and Wildlife Service (USFWS), to the states and required state-level wildlife management plans to identify problems affecting wildlife and address them before they impact humans. By October 2005, all states, the District of Columbia, and U.S. Territories had submitted formal State Wildlife Action Plans that were subsequently approved by the USFWS.

Under the grant program, states must comprehensively review and revise their Wildlife Action Plans no less than every ten years. For Pennsylvania, the 2015 Pennsylvania Wildlife Action Plan is this 10-year review to evaluate birds, mammals, fishes, amphibians, reptiles and invertebrates most susceptible to changing environmental conditions in our state. These species, referred to as "Species of Greatest Conservation Need," may be rare or declining in population, or may have healthy populations but face significant environmental threats. Pennsylvania may support a significant portion of their total population, or may represent critical habitat for migratory species found here in only part of the year. Collectively, they are a reliable measure of the overall health of Pennsylvania's wildlife resources.

In the recently completed 2015 Pennsylvania Wildlife Action Plan, which is

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Notes from the Director

Tony M. Guerrieri, Executive Director

There are plenty of immediate concerns during a forest fire: protecting homes, saving lives and limiting property damage. However, the danger does not end when the last flame goes out. Smoke and ash can travel any way the wind takes them, exacerbating an array of health problems in cities hundreds of miles from the original fire.

According to the National Interagency Fire Center, more than 55,000 wildfires burned over 9.8 million acres in 2015. During that summer, smoke from fires in the Pacific Northwest blanketed much of the western United States and traveled as far east as Wyoming. Smoke from large wildfires in Canada and Alaska traveled thousands of miles, pouring into Montana and the Dakotas.

Wildfire smoke is a mixture of gases and particulate matter from burning trees and other plant materials. The gases and particles can be dangerous if inhaled. Particulate matter is the principal pollutant of concern from wildfire smoke for the short-term exposure experienced by the public. The characteristics, sources and potential health effects of particulate matter depend on the type of plants burning, wind conditions and, most importantly, the size of the particles.

Particles larger than 10 micrometers do not usually reach the lungs but can irritate the eyes, nose and throat. Small particles less than or equal to 10 micrometers can be inhaled deep into the lungs and exposure to even the smallest particles can adversely affect the lungs and heart.

A 2011 study, conducted in partnership with researchers at the University of California at Berkeley and the University of California at San Francisco, found that more than 760,000 visits to emergency rooms and hospital admissions between 2000 and 2009 were attributed to expo-

sure to wildfire smoke. Scientists fear that the conditions that make wildfires likely – rising temperatures, severe drought and unstable weather conditions – are becoming increasingly common, laying the foundation for a major public health risk.

More than 760,000 hospital visits between 2000 and 2009 were attributed to wildfire smoke inhalation.

The federal Clean Air Act went a long way toward reducing the amount of particulate matter and other pollutants emitted into the air by factories and industrial sites. The act does not cover air pollution caused by wildfires, however, and the combination of rising temperatures and continued development in fire-prone areas could negate much of the improvement.

There are steps you can take to minimize exposure to wildfire smoke. The Center for Disease Control and Prevention advises monitoring local air quality alerts; keeping indoor air as clean as possible by keeping the windows closed and running an air conditioner if possible; and avoiding activities that stir up



indoor air pollution, such as using wood-burning stoves, burning candles or operating a vacuum cleaner.

The most common call for evacuation during a wildfire is due to the direct threat of the fire rather than exposure to smoke. Leaving an area of thick smoke may be a good protective measure for members of sensitive groups but it is often difficult to predict the duration, intensity and direction of the smoke.

These recommendations are particularly relevant to those with pre-existing heart and lung conditions and older adults who may be susceptible to smoke because of the increased risk of heart and lung disease. The advice also applies to children, whose smaller bodies can absorb more of a contaminant, and to pregnant women, whose developing babies may be harmed by the pollutants.

If you think wildfire smoke is a problem only in the western states, think again. On September 24, 1950, in the middle of the afternoon, it turned dark in Pennsylvania. Pitch black. Smoke from a forest fire in the province of Alberta, in Canada's west, darkened the sky. Almost all the northeastern United States descended into darkness, particularly western Pennsylvania. Weather bureau officials described the phenomena as a 600-mile long, 200-mile wide and 3-mile thick blanket of wildfire smoke.

According to local accounts, the sky was dark over two hours and varied degrees of darkness existed into the early evening. On that date, the Sunday afternoon sky turned so dark that streetlights turned on in Pittsburgh and motorists had to use their headlights for hours before nightfall. Baseball fans in Pittsburgh watched an afternoon game against Cincinnati under the lights. The lights turned on at 2:15 p.m., in the sixth inning of the game.

Research Briefs

Each month, the committee's staff researches and prepares a number of "briefs" on several topics relevant to the committee's mission. Very often these briefs include references to reports and further research on the topics so that readers may pursue issues on their own. Please note that the information and opinions expressed in the Research Brief articles do not necessarily represent the opinions or positions of the Joint Legislative Air and Water Pollution Control and Conservation Committee, nor those of the Pennsylvania General Assembly.

Hurricane Damage Costs Will Increase Faster Than the Economy

Tony M. Guerrieri
Executive Director

Hurricane season in the U.S. generally runs from late spring to late fall. Experts are already forecasting that the 2016 hurricane season will be the most active in three years, with eight hurricanes and four major hurricanes predicted so far. Hurricanes can be catastrophic, destroying homes and businesses and leaving some areas flooded and without power for days to months. Hurricane Katrina, which occurred in 2005, was responsible for a staggering \$151 billion in damages.

According to a report by the Congressional Budget Office (CBO), not only will the costs associated with hurricane damage increase over the next several decades, but more and more Americans will be in the path of these storms. The CBO report, *Potential Increases in Hurricane Damage in the United States: Implications for the Federal Budget*, suggests that the growth in expected hurricane damage is expected to exceed the growth in the nation's ability to pay it.

The report projects the increases in hurricane damages by the years 2025, 2050 and 2075 – and the amount of federal aid money needed for repairs – given current rising temperatures and coastal development projections. Hurricane damages currently total \$28 billion, which is 0.16 percent of the country's

gross domestic product (GDP). By 2075, hurricane damages could reach about 0.22 percent of the country's GDP – equivalent to \$39 billion today.

Climate change is responsible for about 45 percent of that damage, according to the report; a boom in coastal development accounts for the rest of the losses.

If the ratio of spending to damage stays about the same over time, federal hurricane costs will increase from 0.1 percent of GDP, which is about \$18 billion, to 0.13 percent of GDP in 2075, which is about \$24 billion in today's economy.

The Congressional Budget Office estimates that federal hurricane costs will increase nearly a third by 2075.

The effects of a hurricane on the country's GDP vary depending on the costs of rebuilding efforts and spending. Although a single hurricane probably would not have much effect on the country's GDP, as storms intensify due to climate change, "the economy might not fully recover from one catastrophic storm before it was hit by another," according to the report.

The CBO also predicts that over time, more people will live in areas with substantial hurricane damage. Between 2000 and 2010, the number of people living in counties exposed to hurricane damage grew 22 percent faster than the rest of America's population. With current population growth projections, the

report says that about 1.2 million people currently live in counties where hurricane damage could be substantial – meaning losses could total more than 5 percent of the nation's per capita income. By 2050, some 5.8 million Americans will live in areas vulnerable to substantial storm damages. By 2075, that number will nearly double to 10 million people.

The top states that will be impacted by increased costs of damage from hurricanes are Florida, Texas and Louisiana. Florida alone may bear more than half the total damages – almost \$16 billion.

In addition, the report examined three approaches to reducing the amount of federal assistance: limiting greenhouse gas emissions; shifting more costs to state and local governments and private entities, thereby reducing coastal development; and investing in structural changes



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to reduce vulnerability to hurricanes.

However, even if the United States were to significantly reduce its own greenhouse gases, hurricane damages would not lessen overall unless lowering carbon emissions becomes a global effort. According to the report, a significant reduction in U.S. greenhouse gas emissions, without corresponding decreases in the emissions of other large economies, would probably not reduce hurricane damage appreciably between now and 2075, in part because U.S. emissions constitute a decreasing share of global emissions.

The Congressional Budget Office is a nonpartisan legislative research agency. The 38-page report, *Potential Increases in Hurricane Damage in the United States: Implications for the Federal Budget*, is available at: <https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/51518-Hurricane-Damage.pdf>.

Managing Forests and Rangeland During Drought

Coleen P. Engvall
Research Analyst

For the most part, the northeast corner of the United States sees plenty of rainfall and mild, infrequent wildfires. Pennsylvania's wet, moderate climate can make the raging wildfires and droughts of the West Coast seem all the more distant. It is surprising when these issues do find their way to the East Coast. However, the United States Forest Service (USFS) warns that these regions must still be prepared to manage forests and other ecosystems when it happens.

In March of this year, a drought watch, the least severe of all drought classifications, was declared in 27 of Pennsylvania's counties. In June it was expanded to 10 more. Fortunately, the



prolonged dry spell never escalated beyond a drought watch and was lifted in July.

Drought can impact an ecosystem in many ways, especially if it is not a common occurrence, which is the case here in Pennsylvania. The obvious impacts are crop and vegetation mortality and the depletion of ground and surface water supplies. However, drought can also clear vegetation, making room for non-native plants and other invasive species. Certain bark beetles take advantage of dehydrated trees and can bring about massive tree mortality in response to a dry spell. Extended droughts can turn natural and beneficial forest fires into infernos like those seen in California recently.

The U.S. Department of Agriculture, U.S. Forest Service and researchers from Duke University compiled research and data on drought and drought management. The final report is entitled *Effects of Drought on Forests and Rangelands in the United States: A Comprehensive Science Synthesis*. The authors emphasize the collaborative nature of the work, pointing to the numerous research organizations, universities and public agencies that provided information.

Much of the literature compiled in the work deals with monitoring and management practices. For forests, management

practices for drought can span from actively fighting the symptoms, such as fire or insects, to preparing for a new ecosystem composition after tree mortality. The report details the costs, benefits and scientific justifications of practices such as thinning tree stands and prescribed fire.

Rangelands include grasslands, tundra, meadow and certain deserts, which are very diverse systems, and therefore require diverse management principles. The most famous rangeland drought was the Dust Bowl of the 1930s, which devastated crops, families and eventually the entire economy. While our nation's agricultural practices have improved a great deal since then, making another disaster of that scale unlikely, droughts in grazing lands and other rangelands can still be damaging.

Researchers from federal, state and non-profit organizations studied the impacts of drought and the management practices used to mitigate them.

For livestock producers and land managers, the report recommends changing grazing practices using fencing, drought-resistant feed crops or reducing stocking rates. They also include economic considerations to mitigate the potential costs to businesses. From a conservation standpoint, they address how to manage wild populations of animals and plants at risk from drought. Especially in instances of vulnerable or endangered populations, assisted migration or artificial selection for plants may be necessary.

The researchers warn that drought can have very complex effects in forests and rangelands, and it is important for research to continue so policymakers and agencies can be prepared to implement

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management practices before emergencies occur. They hope this report will serve as the foundation for further research as well as a baseline for implementing and developing management principles in the future.

To read *Effects of Drought on Forests and Rangelands in the United States: A Comprehensive Science Synthesis*, go to: http://www.fs.fed.us/sites/default/files/DROUGHT_book-web-1-11-16.pdf

Sourcing Water in the Colorado River Basin

Tony M. Guerrieri
Executive Director

Every spring, snow begins to melt throughout the Rocky Mountains, flowing down from high peaks and into the streams and rivers that form the Colorado River. But as spring becomes summer, melting snow slows to a trickle and, as summer turns to fall, all but stops.

Rivers are sustained by contributions from melting snow, rain and the water moving through underground aquifers. Groundwater is particularly important for sustaining a river's flow after the spring snowmelt has subsided. Less clear, however, was exactly how much of the flow in rivers came from groundwater sources.

Groundwater is inherently difficult to study due to its hidden, underground nature and often treated as an unknown variable in water analyses. However, a recent study released by the U.S. Geological Survey (USGS) provides quantitative information that adds new understanding of the joint groundwater and surface water resource in the Upper Colorado River Basin (UCRB).

To determine how much of the flow in rivers came from groundwater, researchers examined water chemistry and streamflow data at 146 sites in Colorado, Utah, New Mexico and Arizona, measuring the electrical conductivity of the water. Low conductivity meant the water

had not had time to pick up ions from the ground, indicating it came from recent snowmelt. Meanwhile, higher conductivity signified the water had picked up ions as it trickled through soil and rocks below the surface.

The data was then analyzed to create a model to predict and map where streamflow originates in the basin. Water data was analyzed using the USGS Spatially Referenced Regressions on Watershed attributes (SPARROW) water-quality modeling framework. On average, it revealed that 56 percent of the streamflow in the UCRB originates from groundwater.

The model was also used to estimate the amount of water lost during stream transport to the Lower Colorado River Basin, which is due largely to withdrawals for irrigation and evaporation to the atmosphere.

The Colorado River Basin refers to all the watersheds, tributary streams and rivers that eventually feed into the Colorado River. In the high-elevation headwaters of the Colorado River Basin, researchers found there is a greater percentage of snowmelt and precipitation contributing to the surface-water streamflow. As water flows further into the basin at lower elevations, a greater percentage of streamflow is from groundwater.

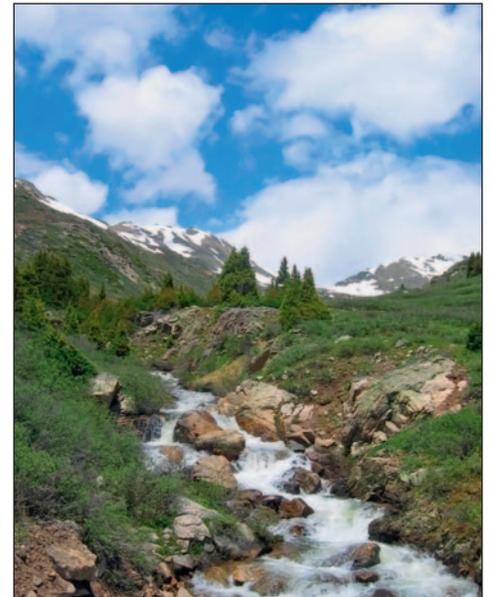
The USGS used water quality modeling to determine how much of the Upper Colorado River Basin's streamflow originates from groundwater.

The results provide a simulated snapshot of present-day groundwater and surface water conditions at a regional scale and help to serve as a foundation for future studies that predict groundwa-

ter response to future climate conditions.

Decision makers have tended to focus on surface water when setting policies for rivers and streams. The study's findings could help decision makers effectively manage current and future water resources in the Colorado River Basin. In light of recent droughts, predicted environmental changes and human consumption, researchers note there is an urgent need for everyone to start thinking of both groundwater and surface water as a single resource.

The Colorado River Basin currently supports 50 million people in seven states, an amount expected to increase by 23 million people between 2000 and 2030. On average, 90 percent of streamflow in the Colorado River Basin originates in the UCRB.



The USGS study calls the Colorado “the most over-allocated river in the world.” The river's water has a multitude of uses that include irrigation, municipal and industrial purposes, electric power generation and mining activities. Water from the river also provides for recreation and an array of environmental benefits, supporting a wide diversity of fish and wildlife and their habitats.

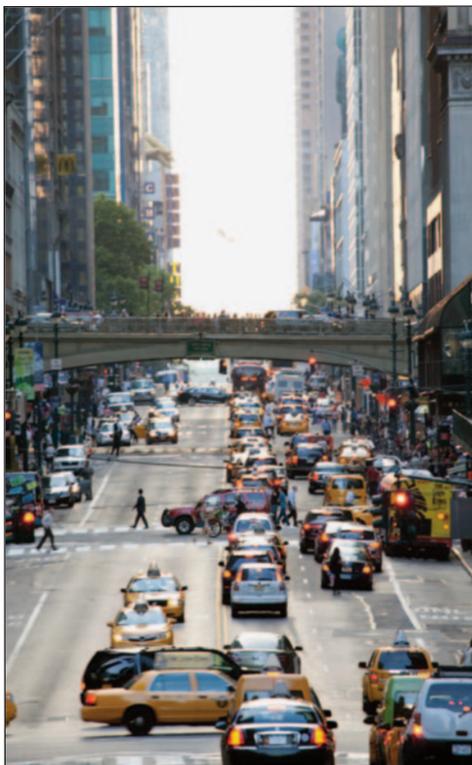
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The study, *The Importance of Base Flow in Sustaining Surface Water Flow in the Upper Colorado River Basin*, was conducted by the USGS WaterSMART initiative and the USGS National Water Quality Assessment Project. Full results are published online in the journal *Water Resources Research* at: <http://onlinelibrary.wiley.com/doi/10.1002/2015WR017963/full>

Impacts of Car Sharing Services in Urban Areas

Coleen P. Engvall
Research Analyst

Transportation needs vary widely across the United States, depending on the community. If a person lives in the suburbs, having a personal form of transportation, such as a privately owned car, is almost a necessity. Without a car in the suburbs or the rural areas of the country, daily commutes to work, the grocery store or even to the nearest train station become a daunting task. However, some Americans living in cities have very little use for a personal vehi-



cle. This doesn't stop cities from being congested with parked cars that are used only on rare occasions.

Many infrequent urban commuters have turned to car sharing services as a way to access inexpensive personal transportation when necessary. Companies such as car2go allow renters to access their fleet of vehicles and pay by the minute using their smartphone.

Researchers from the University of California at Berkeley found that car sharing reduced air pollution and car ownership in five major North American cities.

City officials and scientists alike have wondered what impact these companies have on the cities they inhabit. It seems logical that people sharing cars and using them only when needed would free up parking and roadways, as well as clearing the air of vehicle emissions. Researchers at the Transportation Sustainability Research Center at University of California at Berkeley decided to put that assumption to the test. The three-year research project focused primarily on car2go because of its prominence as the largest car-sharing company in the world.

The researchers released their working paper this July, entitled *Impacts of car2go on Vehicle Ownership, Modal Shift, Vehicle Miles Traveled and Greenhouse Gas Emissions: An Analysis of Five North American Cities*.

First, while the report focuses primarily on a particular company, they address car sharing as a larger concept. The researchers define it as "the shared use of a vehicle fleet by members for trip-making on a per trip basis." It is further broken down into roundtrip sharing, one-way, peer-to-peer and fractional.

The report found that car sharing allowed for some users to sell a vehicle or forgo a vehicle purchase, using the shared automobiles for the few trips a year where they required one. The researchers estimate that between Calgary, San Diego, Seattle, Vancouver and Washington D.C., car2go had helped rid the road of 28,000 vehicles. Overall, this has amounted to an average emissions reduction of 10 percent per member. For cities, this means less traffic congestion, more open parking and cleaner air.

The report does note a slight uptick in miles driven annually by some members. However, they estimate that this is offset by discouraging the purchase of cars in the first place as well as the decrease in miles driven by other members. Overall, less vehicle miles are reported as driven in the five cities. Additionally, fleet vehicles tend to be newer, with more stringent pollution and emissions standards.

The researchers point out that car2go is not the only car substitute in cities. Bike sharing opportunities as well as other forms of car sharing are becoming increasingly popular and profitable. Additionally, other factors of the city's composition appear to effect the success of car sharing. Traits such as density and the presence of ride sourcing seem to be an influence, but the researchers state that more studies need to be conducted before conclusions are drawn.

This type of report, the researchers argue, is valuable to cities deciding whether or not to allow car share fleet vehicles to park in public parking, and if they want to encourage such programs. Understanding options beyond public transportation and private car ownership can make life easier for city dwellers, decongest our urban spaces and reduce emissions.

To read the full working paper, go to: http://innovativemobility.org/wp-content/uploads/2016/07/Impactsof-car2go_FiveCities_2016.pdf

On the Horizon *A Look at Upcoming Events*

Monday, October 24, 12 p.m. *Environmental Issues Forum*

Room 8E-A, Capitol East Wing, Capitol Complex, Harrisburg, PA

The topic of the September Environmental Issues Forum will be Pennsylvania's updated State Wildlife Action Plan. A joint project of the Fish and Boat Commission and Game Commission, the action plan guides how Pennsylvania will conserve some of the state's most threatened wildlife species. Representatives from the respective commissions will provide an overview of the new plan and trends they have identified for the future.

Please call the Committee office at 717-787-7570 if you plan to attend the Environmental Issues Forums or other Committee events. Be sure to visit our website at <http://jcc.legis.state.pa.us> for information on other upcoming events.

Check Us Out on Social Media!

You can now receive updates on committee events, new research and more by following the Joint Legislative Conservation Committee on social media. You can find us on Facebook at www.facebook.com/jointconservationcommittee, or on Twitter at www.twitter.com/PA_JLCC. Take a moment and follow us today for the latest on issues related to Pennsylvania's diverse natural resources!

Committee Chronicles *A review of memorable committee events*

On July 29, Committee members and staff toured Hawk Mountain, a world-renowned raptor sanctuary located in Berks and Schuylkill counties. Hawk Mountain staff provided an inside look at their conservation and research facilities, including a trip to one of the sanctuary's most popular raptor overlooks. Although fall is the prime season for raptor migration, guests were able to catch a glimpse of several hawks and turkey vultures as they circled the mountain top.

The group (pictured at right) takes in the view from one of Hawk Mountain's scenic overlooks. These overlooks are a prime location to view the migration of raptor species that takes place every fall. In its entirety, the sanctuary's grounds span more than 2,600 acres.



Members and committee staff (pictured above) tour the Hawk Mountain visitors' center. The sanctuary sees approximately 60,000 visitors each year from all over the world. It was ranked as the second-best bird watching destination in the nation by USA Today in 2014.



JOINT LEGISLATIVE CONSERVATION COMMITTEE

CONTACT INFORMATION

LOCATION

Room 408
Finance Building
Harrisburg, PA 17120

PHONE

717-787-7570

WEBSITE

jcc.legis.state.pa.us

MAILING ADDRESS

Joint Legislative
Conservation Committee
PA House of Representatives
P.O. Box 202254
Harrisburg, PA 17120-2254



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The Chairman's Corner

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pending USFWS approval, there are 664 fish and wildlife species in Pennsylvania identified as Species of Greatest Conservation Need. That number includes 90 birds, 19 mammals, 18 amphibians, 22 reptiles, 65 fish and 450 invertebrates, both aquatic and terrestrial. A few of the more well-known examples from the list include the barn owl, little brown bat, timber rattlesnake and brook trout.

The 2015 Pennsylvania Wildlife Action Plan goes beyond simply identifying species that require conservation. It also examines the condition of their habitat, existing threats and actions that will be required to address those threats. In the latest plan, over 50 percent of the threats identified for

birds, mammals, reptiles, amphibians and fish came from four sources: residential and commercial development, energy production and mining, pollution, and invasive species and disease. Examples of conservation actions used to mitigate the threats include development of best management practices, invasive species control and technical assistance to local landowners.

Going a step further, the plan provides guidance for evaluating the effectiveness of each action and what entities may be able to assist with its implementation. The plan also outlines how stakeholders can get involved in the process. Public engagement is critical to the plan's overall success, including when the plan is significantly updated or comprehensively revised, during which a public comment period provides interested parties an opportunity to offer suggestions for improvement. The commissions also encourage private landowners and conservation

groups to assist in implementing the plan's conservation actions.

In the intervening years since publication of the original 2005 Pennsylvania Wildlife Action Plan, the commissions have seen a growing interest in managing wildlife species needs beyond state borders. In the newly revised plan, the commissions placed a greater emphasis on regional species and habitats, spanning from Maine to Virginia. States have adopted more standardized classification systems for habitats and threats to bring greater consistency across the individual State Wildlife Action Plans and facilitate region-wide, landscape-scale conservation.

The State and Tribal Wildlife Grants program is the nation's core program for preventing species from becoming

endangered. Of these federal funds, Pennsylvania currently receives approximately \$1.5 million annually,

shared equally between the PFBC and PGC. These funds are crucial for implementing conservation efforts identified in the Wildlife Action Plan.

Through the years, these grants have supported over 110 projects encompassing a broad range of species and habitats, including research, species data collection, habitat improvement, land acquisition and other efforts. Many projects are conducted by partnering with colleges and universities, conservation organizations and natural history museums, thereby maximizing use of these federal funds.

Pennsylvania's Wildlife Action Plan is helping to safeguard our wildlife resources for future generations. I urge readers to visit the commissions' websites to learn more about how you can get involved in the latest version of the plan. You can find the 2015 Pennsylvania Wildlife Action Plan online at www.fishandboat.com and www.pgc.pa.gov.



P E N N S Y L V A N I A
W I L D L I F E A C T I O N P L A N