



The Environmental Synopsis

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

JUNE 2016



The Chairman's Corner

**Senator Scott E. Hutchinson,
Chairman**

Attending grade school you likely learned about some of Pennsylvania's state symbols.

Many are easily identified, for example our state bird, the ruffed grouse, or our state animal, the whitetail deer. But did you know that Pennsylvania has a state insect? The inconspicuous Pennsylvania firefly (*Photuris pennsylvanica*) may not gather the same attention as other state symbols, but the tiny insect and its firefly kin have made a big impact on both our environment and society.

The Pennsylvania firefly, also known as the lightening bug, is actually one of about a dozen firefly species that call our state home. Like the Fourth of July and the beach, they are one of the most recognizable signs of summer as green or yellow dots dance across our backyards and fields at dusk. Like most kids, I would spend my summer evenings catching fireflies, putting them in a glass jar and watching as they flashed with light.

Due to their unique traits, fireflies have attracted the attention of scientists and bug lovers for generations. Their name is a misnomer – fireflies are actually beetles and more closely related to lady bugs than a house fly. A complex chemical reaction takes place within their abdomen, known as bioluminescence, creating the firefly's

characteristic glow. Scientists believe the glow fulfills several different functions: it is used to attract mates, ward off predators and mark territory. Even as wingless larvae, fireflies are able to emit soft light, which is why the young insects are commonly referred to as "glowworms."

Fireflies hibernate during the colder months, which lends to their reputation as a symbol of summer. As the temperature drops, the small beetles burrow into the ground or the bark of trees to wait for the warm, humid nights of June, July and August. Like other hibernators, fireflies spend the summer gorging on pollen and nectar, which is used to fuel their long winter slumber.



So how did the firefly become our state insect? Surprisingly, the credit goes to students from Highland Park Elementary in Delaware County. After learning that Maryland had adopted a state insect in 1973, a group of 26 third graders began circulating petitions to make the firefly Pennsylvania's first state insect. The students'

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Notes from the Director

Tony M. Guerrieri, Executive Director

The Black Hills of South Dakota are famous for being the home of Mount Rushmore. The massive faces of George Washington, Thomas Jefferson, Abraham Lincoln and Theodore Roosevelt carved in the eastern side of Mount Rushmore during the 1930s was conceived as a way to lure visitors to this remote corner of the country. The memorial is not just the stone carving; it has 1,200 acres of Ponderosa pine surrounded by the 1.25 million-acre Black Hills National Forest.

Unfortunately, if you go anywhere in the Black Hills it is clear the forest has been subjected to a devastating epidemic. Beginning in the mid-1990s, an extreme infestation by the mountain pine beetle raised concerns that the large number of dead trees would increase the risk of more frequent and intense wildfires. As of 2015, approximately 430,000 acres have been impacted.

Between 1998 and 2009, one of the highlights at Mount Rushmore was the massive pyrotechnic display during their annual Independence Day celebration. The colorful and patriotic fireworks were often shown on national television. Unfortunately, such festivities may have had an unintended consequence on water and soil quality in this isolated region, according to a recent report by the U.S. Geological Survey (USGS).

In 2010, park rangers were so concerned that wayward sparks from the Independence Day fireworks spectacle could trigger a catastrophic wildfire that they canceled all fireworks displays.

While the formulations of fireworks vary, most fireworks contain perchlorate, a strong oxidizer. It's a common component in a variety of industrial uses, including safety flares, air bag deployment systems, as well as military and space exploration applications. While most of

the perchlorate in fireworks combusts, the remainder cascades down on the nearby land and water.

Most documented occurrences of perchlorate contamination have been related to military and munitions operations. The big concern from fireworks fallout was that it was a potential localized source of perchlorate, but few studies had been done on the topic.

The now-defunct Fourth of July fireworks display at Mount Rushmore may have contributed to high levels of perchlorate in the surrounding soil and groundwater, according to the USGS.

Perchlorate is highly soluble in water and thus migrates readily from soil to groundwater and surface waters. It has been detected in many water supplies throughout the country. Numerous states have promulgated enforceable standards for perchlorate in drinking water. For example, Massachusetts and California have established strict standards for perchlorate in drinking water.

At high concentrations in drinking water, perchlorate can interfere with the function of the thyroid gland's ability to process iodine, which in turn can alter the function of many organs in the human body. Low doses of perchlorates do not seem to hurt healthy adults, however.

Through water and soil sampling, the USGS in cooperation with the U.S. National Park Service, found that perchlorate levels at the Mount Rushmore National Memorial were about 270 times higher than that in samples collected from sites adjacent to the memorial. The USGS stud-

ied perchlorate and metals associated with fireworks in 106 water samples and 11 soil samples taken from the park during 2011–2015. Perchlorate concentrations were greatest in samples collected from the northeast side of the memorial, and the scientists found perchlorate in soil where the fireworks were launched and where the debris had landed.

Key findings of the USGS report include:

- A maximum perchlorate concentration of 54 micrograms per liter was measured in a stream sample and 38 micrograms per liter measured from a groundwater well. In contrast, all samples collected from outside sites had concentrations less than 0.2 micrograms per liter.
 - Concentrations of metals in water samples were similar at sites within and outside the memorial, indicating little evidence of metal contamination due to human-made factors.
 - Dynamite that was used to blast the memorial in the 1930s is not a likely source because perchlorate is not a component of dynamite formulations.
 - Drinking water is provided to about 3 million visitors to the memorial every year and to year-round park personnel. The U.S. Environmental Protection Agency does not regulate the chemical under the federal Clean Water Act, although the agency does provide guidelines that say that any presence over 15 micrograms per liter is a potential health risk.
- The USGS notes that the drinking water at Mount Rushmore meets current regulations and is safe for public consumption. The annual celebration of the Fourth of July continues at Mount Rushmore, but the events currently do not include a fireworks display.

The USGS report is available at: <http://pubs.usgs.gov/sir/2016/5030/sir20165030.pdf>.

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.

Pennsylvania Parks Fare Well in National ParkScore Index

Tony M. Guerrieri
Executive Director

As the summer season begins, many city residents plan to spend some time in a local park. Philadelphia ranks twenty-second out of the largest cities across the country for access, spending per person and size of city parks, according to a study by the national Trust for Public Land (TPL), an organization that advocates for parks in neighborhoods across the country. Pittsburgh was tied with Tampa, Florida, for thirty-ninth place among 100 cities.

Philadelphia and Pittsburgh earned these distinctions by scoring an overall 64.0 and 57.5, respectively, on a ranking system designed by the TPL to determine how well each city is meeting the need for parks.

The index, called ParkScore, is based on three factors: Park access, which measures the percentage of residents living within a 10-minute walk of the park; park size, which is based on a city's median park size and the percentage of total city area dedicated to parks; and facilities and investment, which combines parks spending per resident with the availability of four popular park amenities: basketball courts, off-leash dog parks, playgrounds and recreation centers.

According to the index, Philadelphia has 10,830 acres of parkland, which works out to about 13 percent of the city area that is reserved for parks. The

median park size is 3.6 acres and the city spends \$65.13 per resident on parks. Philadelphia scored extremely high when it comes to accessibility. Over 93 percent of Philadelphia residents have a park, greenspace or natural area within a 10-minute walk, which is well above the national ParkScore average of 71 percent. Many of those parks have plenty of amenities like basketball courts and playgrounds. The TPL also identifies the most popular city park – no surprise that it is Fairmont Park.

ParkScore placed Philadelphia and Pittsburgh in the Top 50 cities that are effectively meeting public park needs.

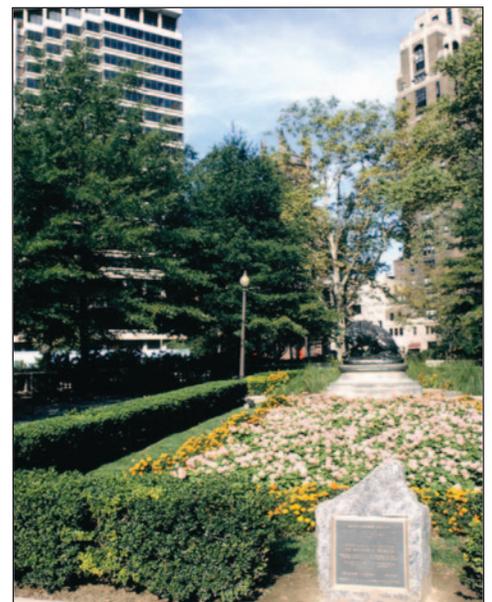
Based on the TPL's analysis, 84 percent of Pittsburgh residents live within a 10-minute walk of a park. Pittsburgh's median park size is 1.7 acres, which fell below the national ParkScore median of 5.1 acres. In addition, parks make up about 8.4 percent of the Pittsburgh city area, which is slightly less than the national ParkScore average of 8.9 percent. The city spends close to \$64 per resident for parks, with the most popular park being Schenley Park & Plaza.

According to the TPL, the 10 highest-ranking city parks systems in the U.S. are:

- Portland, Oregon
- New York, New York
- Irvine, California (debut year)
- Boston, Massachusetts
- Cincinnati, Ohio (tie)
- Madison, Wisconsin (tie, debut year)

The bottom 10 cities on the list include Fresno, California; Charlotte, North Carolina and Mesa, Arizona, with Fort Wayne, Indiana coming in last place. Fort Wayne ranked ninety-eighth, which was last on the list because two communities – Gilbert, Ariz., and Laredo, Texas – did not provide parks data.

ParkScore uses advanced GIS mapping technology to create maps evaluating park accessibility, making it the most realistic assessment system available. Instead of simply measuring distance to a local park, ParkScore's GIS technology takes into account the location of park entrances and physical obstacles to access.



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Also, ParkScore features a website that cities can use as a roadmap to guide park improvement efforts. The website, parkscore.tpl.org, includes entire scorecards for each city, including Philadelphia and Pittsburgh. It provides extensive data and analysis that pinpoints the neighborhoods where parks are needed most. The website includes interactive maps of each ParkScore city that allow users to zoom in and study park access on a block-by-block basis.

Tropical Disease Carrying Mosquitoes Living in the Mid- Atlantic

Coleen P. Engvall
Research Analyst

Mosquitoes have long been known to carry and transmit tropical diseases. Mosquitoes within the aedes classification, such as the yellow fever mosquito, can host dengue fever, west Nile virus and the zika virus. The zika virus in particular has been making headlines over the past year for the large outbreak in tropical regions, as well as its effects on unborn children. Evidence suggests that if a pregnant woman is infected with zika, the fetus can develop serious birth-defects such as microcephaly, a condition where the head and brain are left underdeveloped.

In the early stages of the zika crisis, the United States Centers for Disease Control (CDC) issued a travel warning, particularly to pregnant women visiting the affected countries. While some people have tested positive for the virus here in America, it has generally been from travel or through sexual transmission. According to the CDC website, there have been no locally-contracted cases in the U.S. In other words, the mosquitoes in mainland America are not yet carrying or transmitting the disease.

However, as researchers from the Uni-

versity of Notre Dame point out, a domestic outbreak is not impossible. In fact, with research published in November of last year, they have shown that the yellow fever mosquito's range is expanding. They recently published their findings in the American Journal of Tropical Medicine and Hygiene.

Researchers found a population of yellow fever mosquito in the heart of the U.S. capital. Not only was it found there but they revealed that it had been a resident for four years. This is significant due to the climate of the area, which would not normally be considered habitable by a tropical insect. Until now, they had been confined to the warmer climes of the southern states.

The yellow fever mosquito, which can carry the zika virus, appears to have adapted to winters as far north as Washington D.C., according to researchers at Notre Dame.

The mosquito has been able to survive due to an unexpected adaptation in behavior. The researchers attribute their overwintering success to taking refuge underground during the normally-fatal winters. These surviving mosquitoes are then able to reestablish a strong population quickly once temperatures become favorable, which is a well-known trait of the species.

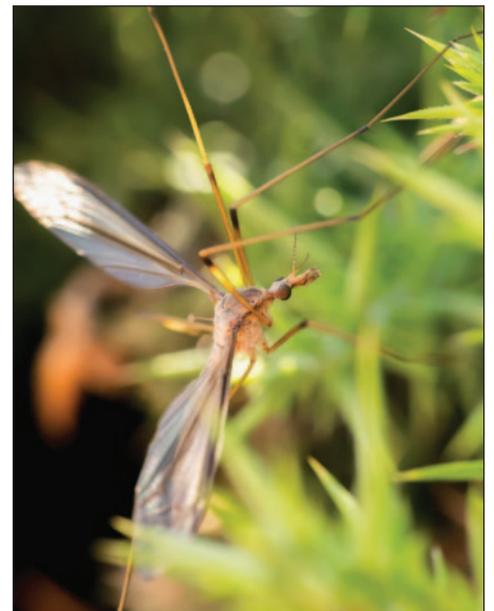
The researchers were able to determine that this same group of mosquitoes was surviving year-after-year by examining their genetics. Samples gathered from 2011 to 2014 showed that there was no new genetic information being introduced into the existing population. This showed that the area was not simply being recolonized by the insect during warmer months, but that a population was solidly established.

The researchers emphasize that the population of mosquitoes that they studied in Washington D.C. is currently disease-free. Their concern is the mosquito's potential to host diseases in the future.

One major concern is that the degree of the impacts of the zika virus are not well known. The virus was discovered in 1947 but outbreaks were never widespread enough to warrant concern or significant investment in research. It is still unclear what precautions need to be taken by pregnant women, aside from avoiding mosquitoes all together, and even the most basic questions about the virus go unanswered. Observable evidence of zika causing microcephaly was only recently uncovered, despite this being the most prevalent impact of the virus.

The authors express hope that their discovery in the heart of U.S. government will underscore the need for a greater understanding of the zika virus and the insect that transmits it.

A summary of Evidence for an Overwintering Population of *Aedes aegypti* in Capitol Hill Neighborhood, Washington, D.C. is available at: <http://www.newswise.com/articles/mosquitos-capable-of-carrying-zika-virus-found-in-washington-d-c>.



Report Examines Workplace Safety Issues in Recycling Industry

Tony M. Guerrieri
Executive Director

The recycling industry is an important part of the economy in Pennsylvania. Across the state, residents separate paper, glass, plastics and metal for recycling. Disposing of these materials is relatively easy – they can be separated from trash and placed for curbside pickup or dropped off at recycling centers. Electronic devices, such as computer and televisions, are also recyclable but require special handling because of the potentially dangerous materials. As Pennsylvania moves towards increased recycling, employment in municipal and private recycling centers is increasing. Unfortunately, so are work-associated injuries.

A report by the Global Alliance for Incinerator Alternatives and the Partnership for Working Families examines workplace safety challenges facing the recycling industry.

Recycling encompasses a wide range of businesses, from drop-off centers operating in parking lots, to industrial materials recovery facilities (MRFs), where workers handle many types of materials and encounter a variety of safety issues each day. Sorting and processing materials involves loud, heavy equipment, including large conveyor belts, forklifts, shredders, bundle wrappers and trash compactors.

Improving conditions in recycling centers is critical for workers in Pennsylvania, a state in which recycling supports about 6,000 jobs. More than 2,200 operations are involved in the collection and processing of recyclables. Sorting recyclables might be more labor-intensive at some MRFs than at others. Machines are

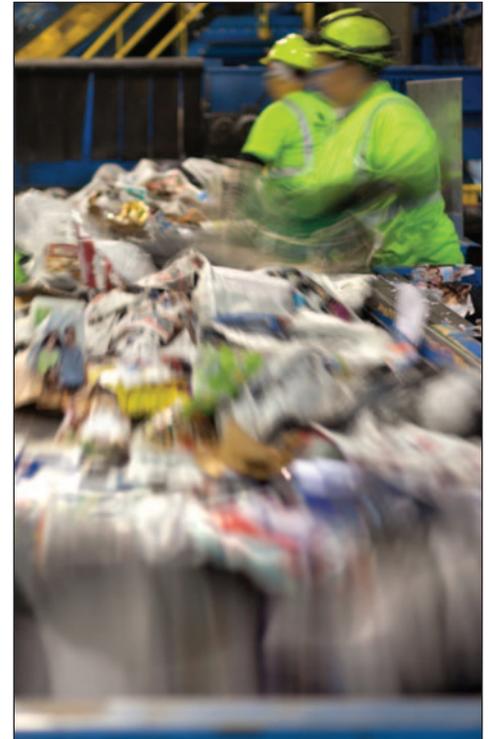
important in the waste management industry but in older MRFs, sorters separate the different types of recyclables by hand. Once the recyclables have been sorted by material, they need to be processed into a usable form. Machines at the MRFs condense the recyclables into a shape more easily shipped. For example, paper is frequently shredded and baled, whereas aluminum cans are crushed together and bundled.

According to the report, the work involved in sorting and recovering recycled materials may put some workers at risk. Nationally, for example, between 2011 and 2013, eight recycling workers died on the job from being struck by vehicles or crushed by falling bales or other objects. The rate for nonfatal injuries across all industries was 3.5 per 100 equivalent full-time workers, however, in recycling the rate of incidents was 8.5 per 100 workers – higher than the injury rate for waste-management and remediation jobs in general, which is 5.1 per 100 workers.

The rate of work-related injuries in recycling was 8.5 per 100 workers. This is nearly double the rate for waste-management and remediation jobs in general.

Safety challenges may exist in recycling centers where materials are handled. These can involve:

- Risk of being struck by vehicles, or falling bales or materials
- Working with heavy, moving machinery, such as conveyors and compactors
- Exposure to dangerous materials in recycling facilities
- Working in awkward postures
- Dealing with extreme temperatures and fatigue



- Respiratory hazards, such as dust
- Exposure to noise and vibration
- Slips, trips and falls

According to the report, general hazards include:

- The industry's high injury and fatality rates are a result of unsafe working conditions around heavy machinery and exposure to hazardous items on the sort line, such as contaminated hypodermic needles, toxic chemicals and animal carcasses.
- Many waste and recycling companies rely heavily on temporary workers, who have fewer workplace protections and are less likely to be informed of their legal right to a safe and healthy workplace.

The report provides a number of suggestions on how recycling facilities can improve worker conditions. These include:

- Municipalities evaluating the health and safety records of recycling companies and require them to have compre-

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hensive worker safety programs.

- The recycling industry ending the use of temporary workers, especially for recycling work covered by municipal contracts.
- Municipalities enacting strong community education programs for greater household separation of waste to minimize the risk of dangerous contaminants entering the recycling stream.

The report notes important economic benefits from expanding recycling nationally, such as the potential to sustain over 2 million jobs. That is more than 10 times the number of jobs created by sending the same material to garbage incinerators and landfills.

It should be noted that the majority of MRFs recognize their responsibility for the health and safety of their workplace and have implemented policies to prevent, control and guard against risks of occupational injury and adverse health effects that may arise during the course of business activities.

The report, *Safe & Sustainable Recycling: Protecting Workers who Protect the Planet*, is available at:

<http://www.no-burn.org/downloads/Safe-Recycling-Report.pdf>

Rare Earth Element Extraction from Coal

Coleen P. Engvall
Research Analyst

Rare earth elements (REEs) are becoming surprisingly common in everyday life, even though the name would suggest otherwise. Most Americans have some of these elements in their pockets, in their cars and in their homes. In fact, there are eight different elements in certain smartphones alone. That is because REEs are common components in things like magnets, batteries, displays and other technologies that have become integral in modern American society. These

technologies also support industries such as petroleum refining and wind turbine construction.

Currently, the U.S. has seen a dramatic increase in the amount of REEs that are mined domestically. A significant amount, however, are still imported from places such as China and India. Many economies are seeing an increase in domestic use of REEs due to their growing middle class. With their own citizens buying electronics and their industries advancing technologically, countries like China will begin to export less of these elements abroad. The technologies that use REEs are vital for America's economy, our military and for the average citizen. With exporting markets selling less, these elements will have to be obtained from a different source.

A new technique for extracting rare earth elements from coal byproducts could reduce dependence on foreign imports for vital technologies.

Researchers at the U.S. Department of Energy and Penn State have collaborated on new ways to extract REEs from coal byproducts. Earlier this year they published a report entitled *A Study on Removal of Rare Earth Elements from U.S. Coal Byproducts by Ion Exchange*.

Extracting these elements from coal and coal byproduct was possible before but the concentrations of REEs are very low, making it a labor and time-intensive. It was often mechanically-separated, depending on the ore being sought, and was generally not considered to be economically viable.

The researchers' new method depends heavily on the material composition of the host coal. Two samples were col-

lected from the Upper Kittanning Bed in central Pennsylvania, chosen for the historic REE content, as well as for their current surface-mining operations. Neither of the samples had economic value in the past as a coal product but now could potentially be used for REE extraction.

One benefit to the process described in the study is value it could add to coal mining operations. The type of material that they are processing is the layer of earth that must be removed to expose the coal bed. Until now, this topmost material had no value and needed to be replaced during the reclamation of the mine. So, while the extraction of REEs from coal is still costly, when co-produced with the coal itself, it can provide additional returns from an otherwise costly activity.

The authors also emphasize the importance of having a reserve base of REEs that is independent of foreign markets. Currently, the U.S. depends on the international market for these commodities, both their availability and their price. Considering that these materials support \$329 billion in economic output and 618,000 jobs, the researchers believe it is vital to have a reliable, domestic source.

They also acknowledge that their process is only the first step. To become a viable practice, supporting technologies and additional research must be conducted. For example, other locations within the Allegheny group should be sampled for richer concentrations and more favorable qualities for processing. They also note that the environmental regulations of the host state must be considered, due to the chemicals used in the process.

To read *A Study on Removal of Rare Earth Elements from U.S. Coal Byproducts by Ion Exchange*, go to:
<http://link.springer.com/article/10.1007/s40553-015-0064-7>.

This Month in Conservation History

Exploring the evolution of environmental stewardship

48 Years Ago

A June 3, 1968, article in the Lebanon Daily News cited the president of Edison Electric Company, Charles Avila, as predicting that electric automobiles would appear in large numbers on American highways by the mid-1970s. Avila went on to boldly claim that electric vehicles would very soon “relegate gasoline engine autos to extinction.” He cited new materials, lower electricity costs and innovative technology as the reasons for the dramatic shift.



54 Years Ago

In June of 1962, marine biologist and Pennsylvania native Rachel Carson published her acclaimed book, *Silent Spring*, warning of the detrimental effects of pesticides. The book is credited as a catalyst to the environmental movement and eventually led to a nationwide ban on DDT in 1972. Today, Carson’s childhood home in Allegheny County is a registered historic landmark and the central state office building of the Department of Environmental Protection and the Department of Conservation and Natural Resources is named in her honor.



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!



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The Chairman's Corner

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campaign eventually caught the attention of state legislators who introduced a bill on their behalf. Their hard work was rewarded when Governor Milton Shapp signed the firefly bill into law on April 10, 1974. To this day, a bronze plaque in the shape of a keystone hangs at the school to commemorate the students' impressive legislative achievement.

As it turns out, Pennsylvania is not the only state with a fondness for the firefly – Tennessee adopted the common eastern firefly (*Photinus pyralis*) as its own state insect the very next year. Together they represent two of the more than 150 different firefly species that inhabit the United States.



Fireflies are more than just a slice of summer Americana. They have important applications in medicine, science and the environment. Last year, a team of Swiss scientists found that by removing a specific protein from a firefly's glowing abdomen and attaching a chemical tag, the protein can be used to detect the presence of cancer cells in humans. The chemicals present in fireflies have been used to treat muscular dystrophy, detect food spoilage and conduct forensic testing. Scientists have even turned to the firefly as a model for improving LED technology in electronics.

Fireflies are also an important indicator of environmental health. The insect is sensitive to lawn and agricultural chemicals, as well as the rapid development of fields and other open areas. But the biggest problem for fireflies comes in the form of light pollution. Researchers believe that artificial lighting decreases the effectiveness of the firefly's glow, which is used to court potential mates. This could be one of the major factors behind the gradual decline in firefly populations over the last several decades.

Perhaps my affection for the humble firefly stems from its popularity in my community. The Allegheny National Forest, which encompasses a large portion of my district, is home to one of only two known colonies of synchronous fireflies (*Photinus carolinus*). For a two-to-three week period each summer, these elusive insects engage in a mesmerizing display by flashing in perfect unison with one another. Many have said it resembles Christmas lights strewn throughout the forest canopy. The dazzling display draws visitors from across the country each June, when the fireflies are in the height of the mating season.

If you are interested in checking out the synchronous firefly ritual, I would suggest stopping by the Pennsylvania Firefly Festival which takes place every June at the Black Caddis Ranch B&B in Kellettsville, Forest County. The annual gathering of firefly enthusiasts is a family affair, featuring food, music and displays. The day-long festival culminates with a guided tour of some of the best firefly viewing spots in the Allegheny National Forest. You can learn more about the festival by visiting their website at pafireflyfestival.org.

This summer, as you enjoy the warm evenings with your family, keep an eye out for fireflies in your own backyard. It may just be my opinion, but the glow from these living points of light beat the glow of an iPhone or laptop any day.