

### 4.3.8 Invasive Species

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This section provides a profile and vulnerability assessment for the invasive species hazard. An invasive species is a species that is not indigenous to a given ecosystem and that, when introduced to a non-native environment, is likely to cause economic or environmental harm or pose a hazard to human health. To further assist and identify invasive species in Pennsylvania, the U.S. Department of Agriculture (USDA) has provided a suite of Invasive Species Resources located online at the USDA National Invasive Species Information Center. The following link provides access to the Pennsylvania’s Resource List:

<https://www.invasivespeciesinfo.gov/us/pennsylvania>.

#### 4.3.8.1 Location and Extent

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The Commonwealth of Pennsylvania plays host to a number of invasive pathogens, insects, plants, invertebrates, fish, and higher mammals. These species have largely been introduced by the actions of humans. Common pathways for invasive species include unintentional release, the movement of goods and equipment that may unknowingly harbor species, smuggling, emptying ship ballast water, hull fouling, and escape from cultivation (Pennsylvania Invasive Species Council [PISC] 2010). Invasive species threats are generally divided into two main subsets, as described below.

- Aquatic invasive species are non-native viruses, invertebrates, fish, and aquatic plants that threaten the diversity or abundance of native species; the ecological stability of the infested waters; human health and safety; or commercial, agriculture, aquaculture, or recreational activities dependent on such waters.
- Terrestrial invasive species are non-native arthropods, vascular plants, higher vertebrates, or pathogens that complete their life cycle on land instead of water and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

The PISC, the lead organization for invasive species threats, has identified over 100 species threats that are or could potentially become significant in Pennsylvania. Of these threats, Dauphin County officials and municipal leaders have identified plants, insects, and diseases that have caused, or have potential to cause, significant damage to the County’s natural landscape and agricultural economy through defoliation and mortality, or out-competition for vital resources. Dauphin County recognizes the importance of preserving natural resources, promoting native species, and maintaining agricultural productivity for the county’s cultural heritage and economic stability. The potential financial impact of invasive species on agriculture in Dauphin County was identified as having 1.66 percent of state total sales (PEMA 2018).

In Pennsylvania, the insects and diseases that have caused the most damage in terms of defoliation and mortality during recent years include the emerald ash borer, gypsy moth, hemlock woolly adelgid, beech bark disease, and oak wilt. These species also pose a threat to Dauphin County. Additionally, Dauphin County officials and municipal leaders identified a number of invasive insects, diseases, and plants of particular concern and these are discussed below.

Invasive insects of concern in Dauphin County include the spotted lanternfly, walnut twig beetles, emerald ash borer, and the Asian longhorned beetle (Martin 2017). The spotted lanternfly was first observed in Berks County in 2014. Since then, the pests have been found in 26 southeastern Pennsylvania counties, including Dauphin County (Pennsylvania Department of Environmental Protection [PA DEP] 2020). As a result, the movement of firewood in Dauphin County and the other impacted counties is restricted. Spotted lanternflies primarily feed on the invasive Tree of Heaven and they threaten agricultural crops, including apples, grapes, and hardwoods (Pennsylvania Department of Agriculture 2017a). To feed, the spotted lanternfly (adult and juvenile) will suck the sap from stem and branches from under the bark. When the spotted lanternfly is done feeding, sap will continue to ooze from the tree and attract other insects. If the sap continues to flow, this liquid then promotes mold. All these factors will damage a tree (USDA 2020). A recent economic impact study estimates Pennsylvania could lose more than \$324 million annually and 2,800 jobs (Pennsylvania Department of Agriculture 2020). Because of the detrimental effects this insect has on Pennsylvania’s ecosystem and economy,

the Department of Agriculture has set up a hotline to report spotted lanternfly sightings: 1-888-4BAD-FLY (1-88-422-3359).

Despite thousand cankers disease currently being absent from Dauphin County, the potential for introduction is high. Thousand cankers disease was first identified in Bucks County in August 2011 and spread to Chester County in 2014 by the walnut twig beetle. A quarantine order was imposed on July 22, 2014 restrict the movement of walnut material from Bucks, Chester, Delaware, Montgomery, and Philadelphia counties. This disease is transmitted to black walnut trees when walnut twig beetles carrying the fungus *Geosmithia morbida* tunnel beneath the bark, causing cankers to form. After repeated attacks, the cankers impede water and nutrient movement through the tree, resulting in tree death. Although thousand cankers disease has not been confirmed in Dauphin County, the disease still poses a threat to the walnut tree population and industry. Black walnut lumber is highly valued for woodworking and furniture-making, and the tree nuts are consumed by humans (PADA 2017b). The Asian longhorned beetle species have not been confirmed within Pennsylvania but pose a threat to softer hardwood trees, including maples, birch, elm, willow, ash, and poplar trees. The Asian longhorned beetle will chew out a small area about an inch in size and lay eggs into the bark of a tree. When hatched, these larvae then bore into the tree and will continue to eat the wood for nearly a year creating tunnels up to a half inch in size. After that year, the beetle will create a cocoon and merge as an adult Asian longhorned beetle. During the larval period, the beetle puts great strain on the feeding tree and eventually kills the tree (PennState Extension 2020).

A number of invasive plants also pose a significant threat to ecosystem biodiversity and agricultural productivity because of their ability to out-compete native species. Pennsylvania has identified 10 Class A noxious weeds as part of the Controlled Plant and Noxious Weed Act. These plants include Palmer amaranth, waterhemp, animated oat, dodder, goatsrue, giant hogweed, hydrilla, wavyleaf basketgrass, broomrape, and kudzu (PA Agricultural Code Title 7). Some species (e.g., Palmer amaranth and waterhemp) are prolific seed producers and have developed a potential resistance to traditional herbicides, making them challenging and expensive to manage. Others, such as kudzu, grow rapidly and prevent slower growing native plants from establishing.

The location and extent of these invasive threats depend on the preferred habitat of the species as well as the species' ease of movement and establishment.

#### **4.3.8.2 Range of Magnitude**

The magnitude of invasive species threats ranges from nuisance to widespread killer. Some invasive species are not considered agricultural pests and do not harm humans. Other invasive species can cause significant changes in the composition of Pennsylvania's ecosystems. Forest or crop-impacting invasive species could have a significant economic impact in Dauphin County because the County hosts both forest-based recreational land and agricultural land. Other invasive species can cause widespread illness or death in humans.

Invasive species contribute to a broad range of environmental impacts. The aggressive nature of many invasive species can cause significant reductions in biodiversity by crowding out native species. This can affect the health of individual host organisms as well as the overall well-being of the affected ecosystem.

Beyond causing human, animal, and plant harm, there are secondary impacts of invasive species in that they also cause harm to host species and ecosystems, particularly in the case of invasive species that attack forests or agricultural crops. Forests prevent soil degradation and erosion, protect watersheds, stabilize slopes, and absorb carbon dioxide emissions. The key role of forests in the hydrologic system means that if forest land is wiped out, the effects of erosion and flooding will be amplified. Invasive species would also negatively impact the county's agricultural economy by increasing the cost of pest control measures and decreasing harvest yields. Overall, invasive species reduce the productivity and profitability of agricultural land. Invasive species that affect the health of hardwood trees can have particularly damaging secondary impacts in urban and suburban areas. As the damage progresses, branches become less stable and are more susceptible to winds. Significant building and auto damage can result from falling trees.

The magnitude of an invasive species threat is generally amplified when the ecosystem or host species is already stressed, such as in times of drought. The already-weakened state of the native ecosystem causes it to more easily succumb to an infestation. An example of a possible worst-case invasive species scenario would be if the spotted lanternfly would continue to spread across Dauphin County and significantly destroy the county’s crops. With the high mortality rate associated with the spotted lanternfly, crops, including grapes and apples, would be devastated. Farms, orchards, wineries, and lumber companies could experience a \$324 billion loss in Pennsylvania (Penn State Extension 2020). Such significant crop loss could cause farms to fail, resulting in the loss of jobs and valuable income to the county. If the land is no longer agriculturally profitable, arable land may have to be developed for residential or business use.

### 4.3.8.3 Past Occurrence

Invasive species have been entering Pennsylvania since the arrival of early European settlers. The presence of the emerald ash borer in Dauphin County was first confirmed in 2013. Pennsylvania has been entirely within the emerald ash borer infestation zone since 2017 (USDA 2020). Additionally, the hemlock woolly adelgid has been present in Pennsylvania since 1973 and was first detected in Dauphin County between 1973 and 2010. The Pennsylvania Department of Conservation and Natural Resources (DCNR) continues to monitor the westerly progression of the invasive species, and since 2010, has detected a general movement west. There are currently 34 counties, including Dauphin County, that have detected the woolly adelgid. Within the past 2 years, cankerworms and spotted lanternflies have been observed in Dauphin County with the potential to cause significant crop and forest damage. Dauphin County is also part of the quarantine zone for the emerald ash borer and spotted lanternfly (USDA 2017c). This means it is legal to move firewood, ash, and the insect between counties, but it is not legal to move non-compliant items out of the state, nor is it legal to move non-compliant firewood into the state.

### 4.3.8.4 Future Occurrence

According to the PISC, the probability of future occurrence for invasive species threats is on the rise because of the growing volume of transported goods; increasing technology, efficiency, and speed of transportation; and expanding international trade agreements. Expanded global trade has created opportunities for many organisms to be transported to and establish themselves in new countries and regions. Furthermore, climate change is contributing to the introduction of new invasive species. As maximum and minimum seasonal temperatures change, pests are able to establish themselves in previously inhospitable climates. This also gives introduced species an earlier start and increases the magnitude of their growth, which may shift the dominance of ecosystems in the favor of non-native species.

To combat the increase in future occurrences, the PISC, which is a collaboration of state agencies, public organizations, and federal agencies, released the Invasive Species Management Plan in May 2009 and revised in 2016. This plan outlines the Commonwealth’s goals for the management of the spread of non-native invasive species and creates a framework for responding to threats through research, action, and public outreach and communication. More information on the Species Management Plan can be found online at [https://www.agriculture.pa.gov/Plants\\_Land\\_Water/PlantIndustry/GISC/Pages/default.aspx#:~:text=The%20Governor%27s%20Invasive%20Species%20Council,the%20Commonwealth%27s%20natural%20and%20agricultural](https://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/GISC/Pages/default.aspx#:~:text=The%20Governor%27s%20Invasive%20Species%20Council,the%20Commonwealth%27s%20natural%20and%20agricultural). It is reasonable to assume that current threats, including the emerald ash borer, hemlock woolly adelgid, Asian longhorned beetle, spotted lanternfly, cankerworms, and walnut twig beetles causing thousand cankers disease, will continue to directly impact or threaten Dauphin County. Plants currently identified as part of the Noxious Weed Act, including Palmer amaranth, waterhemp, animated oat, dodder, goatsrue, giant hogweed, hydrilla, wavyleaf basketgrass, broomrape, and kudzu are also likely to threaten Dauphin County.

The future occurrence of invasive species is considered *highly likely*, as defined by the Risk Factor Methodology probability criteria (further discussed in Section 4.4).

#### 4.3.8.5 Vulnerability Assessment

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To understand risk, a community must evaluate what assets are exposed or vulnerable in the area identified. The following sections discuss the potential impact of the invasive species hazard on Dauphin County, including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on (1) life, (2) health and safety, (3) general building stock and critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Additional data and next steps

##### Overview of Vulnerability

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Dauphin County's exact vulnerability will depend on the invasive species in question. In general, though, the University of Arizona and the National Invasive Species Information Center have identified the following characteristics of areas that are more likely to be invaded by invasive species:

- Lack of natural predators or diseases that kept the species under control in its native environment
- Present vacant ecological niches that can be exploited by non-native species
- Lack of species diversity
- Lack of a multi-tiered canopy (in the case of invasive plants)
- Disturbed by fire, construction, or agriculture prior to invasion (University of Arizona 2006)

Estimated losses are difficult to quantify; however, infestation can impact Dauphin County's population and economy. Direct effects of infestation lead to cascading indirect impacts. As vegetation dies or becomes stressed and weakened by pests, such as the emerald ash borer, available fuel and high-intensity wildfires increase. As species compositions change from infestation outbreaks, whole fire regimes can shift. Physical stresses on trees may also affect how trees respond to other natural hazards, such as hurricanes, drought, and ice storms (Kurtz 2007).

Because invasive species is currently present in Dauphin County, it is clear that the county is vulnerable to invasive species. Despite quarantine and control efforts, invasive species movement occurs across county lines through anthropogenic and natural modes, including freight shipping, transplantation, and animal movement. Considering the extent of the current infestations and neighboring county infestations, it is reasonable to project that the county's vulnerability will increase.

##### Data and Methodology

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Because of lack of quantifiable loss information, a qualitative assessment has been used to evaluate assets exposed to this hazard and potential impacts associated with this hazard.

##### Impact on Life, Health, and Safety

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The entire population of Dauphin County is vulnerable to invasive species to some extent, but direct impacts to life, health, and safety are minor.

##### Impact on General Building Stock and Critical Facilities

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No structures are anticipated to be affected directly by infestation or invasive species; however, the emerald ash borer may cause a catastrophic loss of the ash tree throughout state forests, which could result in stream bank instability, erosion, and increased sedimentation. In addition, a preponderance of dead tree limbs could increase the occurrence of downed trees on roadways and utility lines during storms with heavy winds.

### Impact on Economy

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Impacts of infestation and invasive species on the economy and estimated dollar losses are difficult to measure and quantify. Costs associated with activities and programs implemented to conduct surveillance and address a variety of infestations within Dauphin County have not been quantified in available documentation.

Although the economic impact has not been quantified for Dauphin County, state-wide agricultural losses because of invasive species were estimated at \$7,405,754,000 (PEMA 2018). The potential financial impact of invasive species on agriculture in Dauphin County was identified as having 1.66 percent of state total sales (PEMA 2018). As stated in Section 4.3.4 (Drought and Water Supply Deficiencies), Dauphin County’s agricultural products total over \$93 million; any portion of that value is vulnerable to the effects of invasive species.

### Impact of Future Growth and Development

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As discussed in Section 2, areas targeted for future growth and development have been identified across Dauphin County. Any areas of growth could be impacted by the infestation hazard because the entire planning area is exposed and vulnerable.

### Change of Vulnerability

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Invasive species were not profiled in the 2015 HMP, so the change in vulnerability to this hazard cannot be determined.

### Additional Data and Next Steps

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Any additional information regarding localized concerns and past impacts will be collected and analyzed. These data will be developed to support future revisions to the plan. Future mitigation efforts could include partnering and collaborating with existing Commonwealth of Pennsylvania organizations and through local efforts.