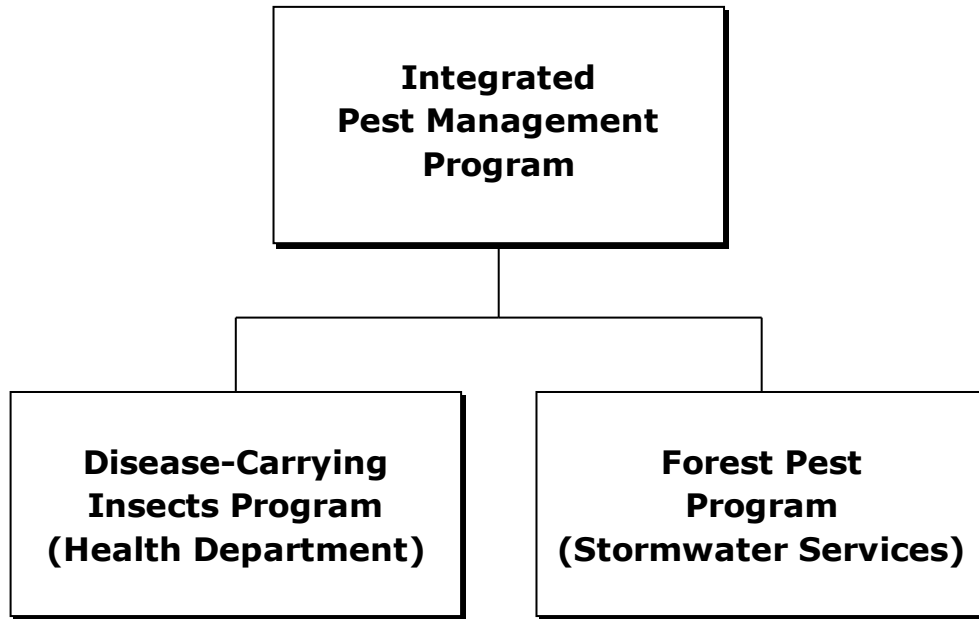


Fund 40080

Integrated Pest Management Program



Mission

To suppress forest pest infestation and pests of public health concern throughout the County through surveillance, pest and insect control, as well as public information and education, so that none of the County tree cover is defoliated and human morbidity and mortality are minimized while protecting the environment.

Focus

Fund 40080, Integrated Pest Management Program, includes two separate programs – the Forest Pest Program managed by Stormwater Services and the Disease-Carrying Insects Program managed by the Health Department. Integrated Pest Management (IPM) is an ecological approach to pest control that combines appropriate pest control strategies into a unified, site-specific plan. The goal of an IPM program is to reduce pest numbers to acceptable levels in ways that are practical, cost-effective, and safe for people and the environment. The Forest Pest Program (FPP) focuses on preventing the spread of state approved forest insects and diseases in the County. The Disease-Carrying Insects Program focuses on protecting citizens from public health pests and maintaining a low incidence of the West Nile virus, Lyme disease, and other tick-borne diseases—as the prevention of epidemics and spread of disease is one of the core functions of the Health Department.

A countywide tax levy financially supports Fund 40080 activities and this levy is subject to change annually due to funding requirements based on the level of infestation. Since FY 2001, the Board of Supervisors approved tax rate has been \$0.001 per \$100 assessed value and has provided support for both the Forest Pest and the Disease-Carrying Insects Programs. In FY 2020, the same tax rate, along with the existing fund balance, will continue to support both programs. An amendment to the service district’s enabling legislation in Appendix I of the County Code was approved by the Board of Supervisors at the May 7, 2019 Board of Supervisors Meeting to allow revenue collected by the fund to be used for removal and/or remediation of hazardous trees. Prior to this change, Appendix I of the County Code only allowed funds to be used for control of infestations of forest pests and disease carrying insects and not

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tree removal and/or remediation as a result of those pests. An increase to the service district tax rate is not required as taxes levied after July 1, 2019 will be sufficient for this new purpose.

Forest Pest Program (FPP)

The Forest Pest Program is a cooperative program with the United States Department of Agriculture (USDA) Forest Service and the Virginia Department of Agriculture and Consumer Services (VDACS). VDACS maintains a list of insects that are eligible for control by this program. Currently, five insects and two diseases are listed: the gypsy moth, cankerworm, emerald ash borer, hemlock woolly adelgid, Asian long-horned beetle, sudden oak death and thousand cankers disease of black walnut. The proposed treatment plan and resource requirements for all listed pests are submitted annually to the Board of Supervisors for approval. The County may also be eligible for partial reimbursement for treatment costs from the federal government (assuming funding is available). Throughout the year, staff conducts an extensive outreach program with the goal of educating Fairfax County communities about pest suppression methods and measures that they may take to alleviate potential forest pest population infestations. As part of the FY 2020 Adopted Budget Plan, \$250,000 of the FPP budget has been allocated to the removal and/or remediation of hazardous trees, based on approval of an amendment to the County Code to allow this activity. This activity will be limited to instances where the hazard is a direct result of pests included in the list of insects and diseases eligible for control by the program.

Gypsy Moth

In FY 2019 gypsy moth (*Lymantria dispar*) caterpillar populations remained very low. There was no measurable defoliation reported in Fairfax County or elsewhere in the Commonwealth of Virginia. Active control programs in conjunction with the naturally occurring fungal pathogen *Entomophaga maimaiga* may explain the extremely low gypsy moth populations in Fairfax County and other areas. The FPP staff continues to monitor gypsy moth, but no control treatments have been applied in recent years. Gypsy moth populations are cyclical and it is not uncommon for outbreaks to occur following dormant phases similar to current conditions in Fairfax County.

Fall Cankerworm

The fall cankerworm (*Alsophila pometaria*) is an insect native to the eastern United States that feeds on a broader variety of hardwood trees than the gypsy moth. Periodic outbreaks of this pest are common, especially in older declining forest stands. The Mount Vernon, Mason and Lee magisterial districts have, in recent years, experienced the most severe infestations and associated defoliation. Forest Pest Management staff observed population outbreak levels in the winters of 2012 and 2013 and declining populations since 2014. As a result of monitoring efforts in winter 2018, staff determined that no insect populations warranted control measures in the spring of 2019.

Since 2014 staff has received input from civic groups in regard to the strategies that are used to implement the fall cankerworm control program. Based on community concerns, the Forest Pest Management staff identified several approaches to gauge community sentiment about the treatment program, and refine and improve the methods used to monitor and administer treatments. The following processes were undertaken in support of these efforts:

- **Parasite and Egg Viability Study** – Fall cankerworms have natural predators that can be influential in their population levels. One explanation for outbreak populations in these areas is a lack of predator such as *Telenomus alsophilae*, an egg parasitoid wasp. Measuring the viability (whether larve hatch) of these insects eggs can provide insight into existing population control factors such as parasites, predators and adult nutrition quality. The purpose of this survey was

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to monitor for the presence of *T. alsophilae* as well as measure overall fall cankerworm egg viability in Fairfax County as indicators of population trends.

Collection sites were located within cankerworm banding sites that amounted to 100 or more female moths over the course of one monitoring season. Egg masses were removed from survey bands when present and placed in protective cases to prevent predation in late March before the



natural hatch. The egg masses were retrieved from trap trees and reared indoors. Staff counted the number of eggs which yielded larvae to produce both a site-based and overall percentage estimate of egg viability. Adult *T. alsophilae* wasps emerge from fall cankerworm eggs approximately three weeks after fall cankerworm larva hatch. In addition to noting larval hatch, staff recorded which sample sites had eggs which were parasitized by *T. alsophilae*. During the 2017-2018 season staff found very few egg samples; this is likely due to low

population levels. Staff did not conduct the egg viability study since the sample size was small. Over the past four years of the study there has been an observed reduction in egg viability along with a steady parasitism rate by *T. alsophiae*, which suggests that the population of fall cankerworms is in decline. The data acquired from this survey assists Urban Foresters to better understand overall cankerworm population dynamics in Fairfax County as well as locating areas of concern for monitoring and potential control in the subsequent years.

- **Defoliation Survey** – The Fairfax County Forest Pest Management Program conducted an extensive defoliation survey to measure the damage caused by fall cankerworm in 2018. The purpose of this survey was to determine those areas of Fairfax County where fall cankerworm larvae have impacted the County’s urban forest resources through foliar feeding, and to quantify this feeding damage as a percentage of canopy defoliated. The data acquired from this survey will contribute to knowledge of overall cankerworm population dynamics in Fairfax County as well as locating areas of concern to be targeted in the ensuing year’s fall cankerworm banding survey.

The defoliation surveys for fall cankerworm were done in grids in the known areas of fall cankerworm activity in the southeastern portion of the County. Defoliation was quantified using a visual survey at each grid point. Nearly 350 ground-based surveys were conducted. The results of this survey indicated that there was no defoliation from fall cankerworm in 2018.

Cankerworm populations have decreased in recent years and no treatment was required in CY 2018. Staff anticipates no aerial treatment program in FY 2020; however, small amounts of ground treatment may be required. The FY 2020 budget provides capacity to treat 500 acres of ground treatment and up to 5,000 acres of aerial treatment, should insect surveys conducted between August and January indicate the need.

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Emerald Ash Borer

The emerald ash borer (EAB), *Agrilus planipennis*, is an exotic beetle introduced from Asia and was first discovered in the state of Michigan in the early 2000s. This beetle attacks ash trees (*Fraxinus* sp.) and can cause mortality in native ash species in as little as two years. In 2014, researchers in Ohio also observed EAB attacking white fringetree (*Chionanthus virginicus*), a close relative of ash. In July 2008, two infestations of emerald ash borer (EAB) were discovered in Fairfax County in the town of Herndon and the Newington area. The U.S. Department of Agriculture's Science Advisory Council did not recommend eradication in Fairfax County. The recommendation was based on the consistent lack of success of eradication programs in other eastern states. On July 11, 2008, the County was put under federal quarantine for emerald ash borer. This meant that all interstate movement of ash wood and ash wood products from Fairfax County was regulated, including all ash firewood, nursery stock, green lumber, waste, compost and chips. During the summer of 2012, the Virginia Department of Agriculture and Consumer Services found EAB in many other areas of the state. All of Virginia is now subject to state and federal quarantines. Movement of ash wood and products is now permitted only within the contiguous multi-state, federal quarantine area.

Trapping efforts revealed that beetle populations extend to all areas of Fairfax County. Staff is responsible for educating the public on how to manage the impending mortality and replacement of many thousands of ash trees. Education efforts emphasize hiring a private contractor to remove dead and dying trees and options for effective pesticides that may conserve ash trees in the landscape.

In March 2015, the Board of Supervisors authorized staff to begin a control program for EAB on trees on publicly owned land, including fire stations, parks, schools and libraries. Forest Pest Management staff conducted a survey to locate trees on County property for possible candidates for treatment and found 80 that qualified as candidates for control.

In 2016, surveys for treatable ash trees were extended to include Northern Virginia Regional Park Authority (NVRPA) properties. An additional 100 ash trees were identified within NVRPA parks. In mid-May 2016, forest pest staff injected 89 of those 100, the remainder of which were not healthy enough to be treated. The now-protected trees are in Meadowlark Gardens Regional Park (13 trees); Fountainhead Regional Park (10 trees); Occoquan Regional Park (19 trees); and Pohick Regional Park (47 trees). To increase public awareness of EAB and successful ash treatment methods, signs were printed and displayed near treated ash trees. In 2018 all ash trees that were treated in 2015, 2016 and 2017 were evaluated to determine if reapplication was required. As a result of these evaluations, staff re-treated 57 trees that had been treated in 2015 and 2016 in addition to seven new trees. Staff will continue to monitor these trees and provide treatment as needed.

The Forest Pest Management Branch made efforts in 2016 to request and release emerald ash borer parasitoid wasps from the United States Department of Agriculture: *Oobius agrili*, *Spathius agrili* and *Tetrastichus planipennisi*. As part of the release process, an inventory was conducted of ash stands within the County including a survey of regional park land by boat along the Occoquan River. Several potential sites were identified including the Confederate Fortifications Historic Site, Cub Run Stream Valley Park, and Bull Run Regional Park.

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In 2017 and 2018 the Forest Pest Management Branch requested and received approval to release emerald ash borer parasitoid wasps. The wasps were produced and supplied from the United States Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) at the Plant Protection and Quarantine (PPQ) EAB Parasitoid Rearing Facility in Brighton MI. For information on these parasitoids, please call 866-322-4512.

In mid-June 2018, Urban Foresters released a total of 1,200 *Oobius agrili*, an egg parasitoid, in addition to 858 *Spathius agrili* and 1,944 *Tetrastichus planipennisi*, both larval parasitoid wasp species. The wasps were released at four Fairfax County sites: Flatlick Stream Valley Park, two separate sites at Cub Run Stream Valley Park and the Confederate Fortifications Historic Site. In accordance with the EAB parasitoid release agreement, the Forest Pest Management Branch will continue to monitor and report on the establishment of these wasps as part of a national network at www.mapbiocontrol.org.

Thousand Cankers Disease

In August 2010, a new disease was detected in black walnut trees (*Juglans nigra*) in Tennessee. During the spring of 2011, the same disease was observed near Richmond, Virginia. The disease complex called thousand cankers disease (TCD) is the result of an association of a fungus (*Geosmithia morbida*) and the walnut twig beetle (WTB), (*Pityophthorus juglandis*) native to the southwestern United States. This disease complex causes only minor damage to western walnut species. Eastern walnut trees, however are very susceptible and infested trees usually die within a few years. Urban foresters established monitoring sites for the walnut twig beetle during the summer of 2012. Walnut twig beetle and disease symptoms were found in the County and VDACS was petitioned to include TCD on the list of organisms that can be controlled by service districts in Virginia. Following disease discovery, VDACS listed Fairfax County under quarantine that prohibited the transportation of walnut wood and its products. The Forest Pest Program will continue to monitor walnut tree health and educate homeowners on this condition. In 2016, Forest Pest staff learned that statewide and regional efforts yielded no presence of walnut twig beetles in traps that were deployed in 2015. To more closely monitor the insect's presence in Fairfax County, urban foresters continue to monitor walnut tree health and follow the disease status elsewhere in Virginia.

Sudden Oak Death

Sudden oak death is caused by a fungus (*Phytophthora ramorum*) that has resulted in wide-scale tree mortality in the western United States since 1995. Fortunately, this disease has been found only in isolated locations in the eastern United States and officials feel that these infestations have been contained. Diligent monitoring is critical in slowing the spread of this disease and recent testing methods that are simple and cost-effective have been developed. Consequently, staff has implemented these monitoring methods in areas of the County where nursery stock is being sold. Staff continues to educate private and public groups on this disease and its control.

The Integrated Pest Management Program supports the following County Vision Elements:



Maintaining Safe and Caring Communities



Connecting People and Places



Practicing Environmental Stewardship



Building Livable Spaces

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Asian Longhorned Beetle

The Asian long-horned beetle (*Anoplophora glabripennis*) is an invasive, wood-boring beetle that, like the emerald ash borer, has the potential to have drastic economic and social impacts should it be introduced in Fairfax County. The larvae will infest and kill trees by boring into the heartwood of a tree and disrupting its nutrient flow. Imported into the United States via wood packing material used in shipping, infestations of this insect in or near Chicago, New York, Boston, and Ohio have been discovered since the mid 1990's. These pests will infest many hardwood tree species but seem to prefer maple species, one of the predominant trees in Fairfax County's urban forest ecosystem. According to the United States Forest Service, most of the infestations found in the United States have been identified by tree care professionals and informed homeowners. Staff has developed a basic management plan to address such monitoring and outreach for this invasive species.

Hemlock Woolly Adelgid

Hemlock woolly adelgid (HWA) (*Adelges tsugae*) is a sap-feeding insect that infests and eventually kills hemlock trees. Forest Pest Management staff employ various control options for this pest including injected pesticide treatments and releasing predatory insects that feed on HWA. In 2014, staff recommended that the Board of Supervisors approve a limited pilot treatment program for HWA. Plans to conduct small scale treatment efforts on naturally occurring hemlock stands found on public property are under way.

Native eastern hemlock is relatively rare in Fairfax County. The rarity of this species and the natural beauty that it imparts make it worthy of protection. Staff will continue to inventory the County in order to identify the natural stands of eastern hemlock. For the FY 2019 program, staff continued to treat trees in two native stands, the Dranesville and Springfield magisterial districts. Trunk injection of the insect growth regulating pesticide, azadirachtin or TreeAzin® is an effective method providing control to the target trees. Once injected, the insecticide is transported throughout the tree and provides control for up to two years.

Quarantine Status

Agricultural quarantines are implemented for invasive pests in order to eradicate or slow their spread. The quarantines currently in effect in Fairfax County are intended to slow the spread of the target insects and not intended to eradicate them. In the United States, eradication is only attempted when an invasive species is discovered early and its populations are small enough to be contained. There are no set end dates to the quarantines in Fairfax County.

Typically, a quarantine is established by a state and by the United States Department of Agriculture on a county by county basis. Once a sufficiently large enough area is infested, the state will determine that all of the state is generally infested and the issue is taken over by USDA. Forest pest quarantines are not an unusual or a historically recent method of controlling the spread of pests. The gypsy moth was first quarantined by state and federal governments in 1912 and continues to be quarantined today. Research has proven that by slowing the spread of an invasive insect, uninfested localities can avoid the extraordinary costs of attempting to control it.

Emerald ash borer was first quarantined in Northern Virginia in 2008. Since that time numerous sites around the state have been confirmed as infested with EAB. In the summer of 2012, the Virginia Department of Agriculture and Consumer Services determined that the entire state is generally infested and is now part of the USDA quarantine. It is anticipated that this quarantine will stay in effect indefinitely.

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Thousand cankers disease is relatively new in regard to forest health issues. This disease is spread by a tiny bark beetle and is very difficult to detect. Staff found the bark beetle in Fairfax County in the summer of 2012, and VDACS implemented a statewide quarantine of all walnut products. There is no existing federal regulation in regard to TCD.

Outreach

The Forest Pest Program conducts and participates in multiple outreach and education efforts in support of Core Recommendation Number 1 of the Tree Action Plan, to Engage and Educate. FPP staff fosters an appreciation for trees and the urban forest to inspire citizens, County agencies and the development industry to protect, plant and manage greenscape resources. Targeted audiences for education and training include Fairfax County Public Schools, Department of Public Works and Environmental Services (DPWES) staff, the Engineers and Surveyors Institute, volunteer groups, homeowner's associations and scouting groups. Through Fairfax ReLeaf and public events such as Fairfax Springfest, Fall for Fairfax, Fairfax 4-H Fair and town hall meetings, staff educate the public about the County's urban forest resources and programs. Urban foresters develop hands-on activities and displays that help convey the importance of the stewardship of the County's natural resources.

The FPP staff reaches out to students in the County through various school programs which encourage students to advocate for protection and support of the County's urban forest. The number of students reached through Forest Pest programs in school years 2016/2017 and 2017/2018 was 2,095 and 1,492, respectively. FPP education participation programs include:

- **Alien Invaders** - Staff introduces native and invasive species. Students learn what qualities make invasive species destructive and how to reduce their impacts on the landscape.
- **Career Day** - Students learn what an urban forester is and the importance of protecting the County's urban forest.
- **Forestry Badge** - Boy Scouts learn about what it is to be an urban forester from UFMD staff and the importance of protecting the County's urban forest.
- **Meaningful Watershed Experience** - Staff explain the importance of an urban forest and how it impacts storm water runoff at Hidden Oaks Nature Center.
- **Science Fair** - Urban foresters judge high school science fairs and discuss students' projects.
- **Tree Planting** - Students learn about the value of trees and how to properly plant them.
- **Trees Please** - Students learn about the value of trees and simple measures they can take to protect them.
- **Tree-ting Your Water** - How Trees Act as Nature's Water Filtration and Storage System: an interactive activity to engage 5th grade students on how water is filtered through various substrates: sand, gravel, clayey topsoil, turf, and a simulated forest. The goal of the activity is to foster appreciation for trees as natural flood and erosion mitigation.

UFMD continues to improve messaging and communication with County residents by utilizing a variety of media to reach multiple audiences and demographics in the County. Such methods include: Fact Sheets/Brochures, Television and YouTube Interviews, Podcasts, Videos, Facebook postings, Slideshare presentations, Updating UFMD web content, and Newspaper articles and radio interviews.

Management Plans

The nature of invasive insects and diseases is such that it is difficult to make long-term predictions on monitoring techniques and response plans. USDA has drafted a management plan for ALB; it outlines a role for localities consistent with what staff had envisioned. For example, County staff can play a critical

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role in public meetings, notification and mapping. VDACS and the FPP have drafted basic management plans for ALB and EAB. The management plans will act in concert with plans in place by USDA and VDACS.

Disease-Carrying Insects Program (DCIP)

Mosquitoes, ticks and other vectors are responsible for transmitting pathogens that can result in life-changing illnesses such as West Nile virus, Zika and Lyme disease. The Health Department's Disease Carrying Insects Program was established in 2003 and works to protect County residents and visitors from vector-borne diseases. The program uses an integrated approach to monitor and manage vectors. The program continuously promotes personal protection and vector prevention methods in the community to raise awareness of these public health pests, the diseases they transmit, and what residents can do to protect themselves and their family.

Operational Changes

From FY 2003 through FY 2017, the Health Department utilized a contractor to perform larval mosquito surveillance (inspection of larval mosquito habitats) and larval mosquito control activities (larvicide treatments to storm drains and other larval mosquito habitats). During FYs 2015, 2016 and 2017, the contractor was unable to fulfill the requirements of the contract and only completed 70 percent, 71 percent and 73 percent respectively, of expected storm drain treatments on-schedule. The contract was not renewed in late FY 2017.

The emergence of Zika stressed the need for more Health Department staff to be prepared to mount a public health response to the threat of mosquito-borne diseases should the need arise. The Division of Environmental Health has increased the number of staff that are licensed by the Virginia Department of Agricultural and Consumer Services (VDACS) as pesticide applicators and/or registered technicians from five in FY 2016 to 47 in FY 2019.

Beginning in FY 2016, the Health Department began conducting a systematic evaluation of County-maintained stormwater dry ponds for mosquito production. This evaluation includes sampling for immature mosquitoes (larvae and pupae) and treating to control immature mosquitoes when action thresholds are reached. To conduct these systematic evaluations, the Health Department increased its capacity to perform larval mosquito inspections and mosquito control activities by leveraging internal resources and decreasing its dependence on contracted services. The increase and expansion of routine fieldwork performed since FY 2017 has been supported by deployment of Environmental Health (EH) staff from other program areas and an increase in seasonal staff from five each season to at least 11. To improve efficiency and limit the strain on staff/resources from other EH program areas, additional full-time staff have been included as part of the FY 2020 Adopted Budget Plan to help manage the new or expanded work done by the program. New staff will assist in assessing environmental exposures that contribute to or protect against illness, support new or expanded program activities, assist technical program staff, increase continuity and support quality improvement activities. The new positions will also improve the department's ability to respond to citizen concerns about mosquito issues (service requests) and help to prepare the County for an emergency response to mosquito-related issues if the need arises.

West Nile virus

Preparation and planning to address West Nile virus (WNV) risk is essential to effective integrated mosquito management, which combines a variety of tools to reduce the abundance of mosquitoes to

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levels that minimize the risk of WNV infection to the public. WNV is transmitted from birds to humans through the bite of infected mosquitoes and has continued to be a public health concern in the U.S. since it was first detected in humans in New York City in 1999. More than 50,000 human WNV cases and 2,300 deaths have been reported nationally through calendar year (CY) 2018. The first sign of WNV in Fairfax County was in CY 2000 when a dead bird was found infected. The first human cases were identified in CY 2002 and through CY 2018, 61 human cases have been reported in the County. More recently, zero cases were reported in CY 2016, five cases in CY 2017 and nine cases in CY 2018. CY 2018 data are preliminary and subject to final approval by the Virginia Department of Health. In total, six WNV-associated deaths have occurred—one in CY 2002, one in CY 2004, one in CY 2012, two in CY 2015 and one in CY 2018.

Zika virus

Local transmission of the Zika virus was detected for the first time in the Americas during early CY 2015. Zika is found in many tropical and subtropical areas around the world and limited local transmission by mosquitoes was seen in the continental U.S. (southern Florida and Texas) in CYs 2016 and 2017. No local transmission by mosquitoes was reported in the continental U.S. in 2018. Local transmission by mosquitoes has not been reported in Virginia. Zika is primarily transmitted between humans through the bite of an infected yellow fever mosquito (*Aedes aegypti*) or Asian tiger mosquito (*Aedes albopictus*). A woman can pass Zika virus to her fetus during pregnancy, which can lead to severe birth defects including microcephaly. The Centers for Disease Control and Prevention (CDC) is studying the full range of other potential health problems that Zika virus infection during pregnancy may cause. Zika virus can also be transmitted sexually. To limit the potential for local mosquito-borne transmission of Zika virus in Fairfax County, the Health Department utilizes a Zika Action Plan that includes outreach activities, human case investigations, collecting and testing mosquitoes, and targeted mosquito surveillance and control activities as necessary to protect public health. This plan utilizes guidance from the CDC and VDH Zika response documents. The DCIP will continue to respond to Zika cases as they are reported.

Other mosquito-transmitted pathogens of public health concern

In addition to WNV and Zika, VDH's reportable disease list includes other mosquito-borne illnesses: dengue, chikungunya, yellow fever, eastern equine encephalitis, LaCrosse encephalitis, St. Louis encephalitis and malaria. The Health Department's Division of Epidemiology and Population Health investigates reported cases of these illnesses and notifies the DCIP. The DCIP conducts entomological investigations for these cases as appropriate, providing education, information and controlling mosquitoes as necessary to protect public health.



A female Asian tiger mosquito (*Aedes albopictus*), the main nuisance mosquito found in Fairfax County, and a potential vector of viruses like Zika and West Nile. Photo courtesy of CDC.

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Adult Mosquito Surveillance and Control Activities

Adult mosquito surveillance is a vital component of integrated mosquito management that helps staff to monitor mosquito abundance and viral activity. On its own, or in conjunction with investigations of human disease, mosquito surveillance provides information that can trigger control efforts of immature and/or adult mosquitoes. These actions, along with sharing information about the risk of WNV with the public, can help to prevent or limit outbreaks of mosquito-borne disease to people in the community. Vector control equipment and supplies have been purchased each year since FY 2016 to increase capacity as program operations evolve. Vector surveillance and control equipment and supply needs will be ongoing.

Adult mosquito trapping and testing are performed weekly at 74 sites from May through October in Fairfax County, City of Fairfax and Falls Church City. Inter-jurisdictional cooperation is a key component of the program, allowing for coordination of surveillance and management activities on public lands and with surrounding jurisdictions. The Health Department lab routinely tests mosquitoes collected by DCIP for WNV. Mosquitoes can also be tested for other pathogens, such as Zika virus, as necessary.

Action thresholds for targeted adult mosquito control efforts (“spraying”) are flexible, as recommended by organizations such as the American Mosquito Control Association and the National Association of County and City Health Officials. Larval control efforts such as source reduction (elimination of larval mosquito habitats) and larviciding (applying pesticides to control mosquito larvae in water) can reduce vector abundance, but spraying may also be necessary to reduce the risk of WNV or other mosquito-borne diseases. Timely treatments to reduce the number of WNV-infected adult mosquitoes can help minimize human WNV case incidence. It may be necessary to utilize adult control methods even with no or a few human cases if environmental surveillance thresholds are met. The following indicators may trigger adult mosquito spraying by the Health Department:

- Results of mosquito surveillance and testing,
- Environmental factors that impact mosquito or disease cycles,
- Detection of medically-important invasive species, and
- Reported cases of human disease.

Since FY 2016, the DCIP has utilized an expanded network of BG-sentinel traps, which target the types of invasive species of mosquitoes that can spread diseases like Zika, chikungunya, dengue and yellow fever. The main vector of the viruses that cause those diseases is the yellow fever mosquito (*Aedes aegypti*), a tropical species that was extremely rare to see in Virginia prior to 2015. However, a 2016 publication revealed the existence of population of this mosquito overwintering in Washington, D.C. since at least 2011. Each year since 2015, the yellow fever mosquito has been detected with increasing frequency at routine trap sites. Although numbers of mosquito individuals at these locations remain relatively low (usually a single adult in a trap), continued surveillance and multiple types of control are necessary to continue limiting the species’ ability to establish here.

The Asian tiger mosquito (*Aedes albopictus*), which is related to the yellow fever mosquito, is common and abundant throughout Fairfax County. They are a secondary vector of Zika, chikungunya, dengue and yellow fever. Asian tiger mosquitoes could potentially spread these diseases locally if the mosquito were to pick up the virus from an infected traveler and then pass it to another human. To help limit the spread of these diseases, suspected and confirmed cases of disease are investigated by the Health Department and mosquito surveillance and control activities are conducted by the DCIP as necessary to protect public health. Control activities by the DCIP may include public education, elimination of larval habitats,

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larvicide applications, and/or spraying to kill adult mosquitoes. Adult mosquito control may be conducted via backpack barrier treatments or ultra-low volume (ULV) spraying via backpack or truck. Barrier treatments apply pesticide to areas where Asian tiger mosquitoes rest, providing extended control after the treatment. ULV treatments target flying mosquitoes, and break down quickly in the environment, typically within 24 hours. Area-wide adult mosquito control (e.g. ULV treatment by truck or aircraft) has not been conducted to date, but is an option as a part of the County's response if the need arises.

Mosquito Inspections

The Health Department responds to County service requests about standing water, and when appropriate, conducts site visits. DCIP staff may also visit properties and conduct inspections due to results of mosquito surveillance and testing, environmental factors that impact mosquito or disease cycles, detection of medically-important invasive species, and/or reported cases of human disease. Staff only access private property with permission. A community-level approach is vital to the success of mosquito reduction efforts on both public and private properties. The majority of the mosquito complaints received are due to Asian tiger mosquitoes. These mosquitoes lay their eggs in containers that are often found in yards. Sharing knowledge of how to eliminate these mosquitoes through source reduction and creating good habits reduces the burden of mosquitoes as a nuisance and public health threat. In that way, an individual's actions support the community and can significantly improve the quality of life for everyone in the neighborhood.

If standing water is found during inspections, the preferred way to resolve the issue is usually source reduction—the elimination of aquatic habitats that have potential to support larval mosquito development. Emphasis is also placed on mosquito bite prevention by dressing properly and using repellents, and information is provided about additional prevention and mosquito control options. When appropriate, bacterial larvicides that can be applied without a license are given to residents who can treat standing water on their property that cannot be eliminated. The following numbers of service requests (complaints, requests for assistance, and neighborhood surveys) were performed by the DCIP staff during the past three years: 57 in CY 2016, 109 in CY 2017 and 144 in CY 2018.

Larval Surveillance and Control Activities

Larval mosquito surveillance and control efforts help identify aquatic habitats that support the development of mosquitoes. Timely application of larvicides or pupicides to those habitats is targeted and highly effective. It prevents the mosquitoes from reaching the flying adult stage, when they are much more difficult to control. Larval surveillance and control activities are conducted from April through October. Health Department staff inspect each of the more than 1,300 County-maintained dry ponds six times during the mosquito season (monthly, on average), for an estimated 8,000+ routine larval inspections. This systematic approach to larval mosquito surveillance and control is scalable and could be expanded to include additional sites.

As stated above, larviciding of storm drains is no longer conducted. The shift to systematic larval surveillance and control activities from the storm drain-focused applications allows for the more efficient and sustainable use of mosquito control products and program resources. DPWES staff provided the list of County-maintained "dry ponds" and described their function. Routine mosquito inspections at dry ponds by the Health Department help DPWES gather additional information about how the stormwater structures are functioning. When Health Department staff observe potential issues, they report them to DPWES in a timely fashion, assisting response and remediation efforts.

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Lyme disease and other tick-borne diseases

Lyme disease is the most commonly reported vector-borne illness in the United States, with an average of more than 30,000 cases reported annually. The bacterium that causes Lyme disease (*Borrelia burgdorferi*) is transmitted from small mammals, such as mice, to humans through the bite of an infected deer tick, also known as the blacklegged tick (*Ixodes scapularis*). In Fairfax County, 214 cases of Lyme disease were reported in CY 2016, 171 cases in CY 2017, and 119 cases in CY 2018. Other tick-borne diseases reported in Fairfax County include: spotted fever group rickettsioses (10 cases in CY 2016, 22 cases in CY 2017 and 12 cases in CY 2018) and Ehrlichiosis/Anaplasmosis (five cases in CY 2016, 12 cases in CY 2017, and 14 cases in CY 2018). One travel-associated case of Babesiosis was also reported in CY 2018. CY 2018 data are preliminary and subject to final approval by the Virginia Department of Health.

Tick Surveillance Activities

The DCIP collects and identifies ticks each month from several vet clinics and the animal shelter. Staff also remove and identify ticks from deer at managed deer hunts that occur in the County. Tick surveillance may also be performed using other methods such as dragging, flagging, sweeping, and trapping. Deer ticks collected by routine or response surveillance can be tested for the Lyme disease bacteria at the Health Department laboratory. The data generated by tick surveillance and testing are used to inform the public about the seasonality of local tick species, the diseases they spread and to reinforce messaging about the importance of preventing tick bites.

Tick Identification Service

The DCIP offers a free tick identification service. Through the service, County residents learn what type of tick they found, its biology, the diseases it can spread, symptoms of tick-borne illnesses, and ways to reduce exposure to ticks when outdoors. The tick identification service allows DCIP staff to track which ticks are found on humans and/or pets within the County and provide information about tick “seasonality” for the different species. During the previous three years, the following numbers of tick identifications were performed: 180 in CY 2016, 281 in CY 2017, and 235 in CY 2018.

Outreach and Education

The Health Department is committed to increasing community awareness of personal protection actions that help prevent mosquito and tick-borne diseases, and steps that can be taken to reduce mosquitoes and ticks. During FY 2018, DCIP staff participated in several outreach events both large and small, including Celebrate Fairfax, 4-H Fair, Herndon Fest, and Fall for Fairfax. Staff distribute educational materials, offer yard inspections and advise citizens about how to reduce their exposure to mosquitoes and ticks. DCIP staff also provide educational presentations for County workers, neighborhood and homeowners associations, and other interested groups. Educational materials are available in multiple languages, both on the County’s website and at many County facilities.

During FY 2018, the DCIP staff produced and printed the 14th edition “Fight the Bite” calendar. These informative calendars are distributed annually to every fourth-grade student in Fairfax County Public Schools and are one of the most popular giveaways at outreach events. The DCIP continues to create public health messaging in song form. Following the success of YouTube videos “Zika 101” in CY 2016 and “Centennial Rap” in CY 2017 (produced for the Health Department’s 100th anniversary), the Health Department and Channel 16 developed the County’s third public-health rap video—this time to get the word out about Lyme disease prevention. “Tick Check 1-2” was released in May 2018 and has received more than 13,000 views on YouTube. In addition, Channel 16 created a 30-second PSA using clips from the video, shown at several movie theaters in the County. Outreach and education efforts are expected to

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continue in FY 2020, as the best way to avoid vector-borne illness is through the prevention of mosquito and tick bites.

In recent years, many jurisdictions have found effective ways to share information with the public about vector-borne disease activity or wide-area mosquito control. Some of those tools, like interactive public-facing maps, may be useful here to help Fairfax County residents and visitors better-understand their own relative risk and make more informed decisions about personal protection.

Management Plans

The [DCIP Annual Report](#) provides a summary of program activities for each year. The report highlights the program's integrated mosquito management practices, including information about mosquito surveillance and control, tick surveillance, and a review of outreach and education activities. The DCIP also maintains relationships with professional organizations such as the Virginia Mosquito Control Association, the Mid-Atlantic Mosquito Control Association and the American Mosquito Control Association (AMCA). Publications from CDC, such as "West Nile Virus in the United States: Guidelines for Surveillance, Prevention, and Control," and "Zika Interim Response Plan (CONUS and Hawaii)", the VDH Zika Response Plan and the AMCA's "Best Management Practices for Integrated Mosquito Management" provide guidance on these important mosquito-borne diseases. Staff share information and network with regional counterparts throughout the year for situational awareness and to gather ideas for program improvements.

Budget and Staff Resources

Category	FY 2018 Actual	FY 2019 Adopted	FY 2019 Revised	FY 2020 Advertised	FY 2020 Adopted
FUNDING					
Expenditures:					
Personnel Services	\$1,452,649	\$1,434,731	\$1,574,731	\$1,983,997	\$2,000,655
Operating Expenses	410,579	1,827,847	1,719,023	1,318,227	1,318,227
Capital Equipment	17,631	0	10,000	0	0
Total Expenditures	\$1,880,859	\$3,262,578	\$3,303,754	\$3,302,224	\$3,318,882
AUTHORIZED POSITIONS/FULL-TIME EQUIVALENT (FTE)					
Regular	11 / 11	11 / 11	11 / 11	13 / 13	13 / 13

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Integrated Pest Management Program

Summary by Program

Category	FY 2018 Actual	FY 2019 Adopted	FY 2019 Revised	FY 2020 Advertised	FY 2020 Adopted
Forest Pest Program					
EXPENDITURES					
Total Expenditures	\$890,670	\$1,170,423	\$1,180,016	\$1,439,493	\$1,447,152
AUTHORIZED POSITIONS/FULL-TIME EQUIVALENT (FTE)					
Regular	6 / 6	6 / 6	6 / 6	6 / 6	6 / 6
Disease-Carrying Insects Program					
EXPENDITURES					
Total Expenditures	\$990,189	\$2,092,155	\$2,123,738	\$1,862,731	\$1,871,730
AUTHORIZED POSITIONS/FULL-TIME EQUIVALENT (FTE)					
Regular	5 / 5	5 / 5	5 / 5	7 / 7	7 / 7
FOREST PEST PROGRAM			DISEASE-CARRYING INSECTS PROGRAM		
1	Urban Forester IV		1	Epidemiologist III (1)	
1	Urban Forester III		1	Environmental Health Supervisor	
3	Urban Foresters II		2	Environmental Health Specialists III (1)	
1	Administrative Assistant III		2	Environmental Health Specialists II	
			1	Administrative Assistant III	
TOTAL POSITIONS			() Denotes New Positions		
13 Positions (2) / 13.0 FTE (2.0)					

FY 2020 Funding Adjustments

The following funding adjustments from the FY 2019 Adopted Budget Plan are necessary to support the FY 2020 program. Included are all adjustments recommended by the County Executive that were approved by the Board of Supervisors, as well as any additional Board of Supervisors' actions, as approved in the adoption of the Budget on May 7, 2019.

- ◆ **Employee Compensation** **\$53,262**
 An increase of \$53,262 in Personnel Services includes \$31,801 for a 2.10 percent market rate adjustment (MRA) for all employees and \$21,461 for performance-based and longevity increases for non-uniformed merit employees, both effective July 2019.
- ◆ **Other Post-Employment Benefits** **\$3,042**
 An increase of \$3,042 in Personnel Services reflects required adjustments associated with providing Other Post-Employment Benefits (OPEBs) to retirees, including the Retiree Health Benefits Subsidy. For more information on Other Post-Employment Benefits, please refer to Fund 70030, OPEB Trust, in Volume 2 of the FY 2020 Adopted Budget Plan.

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- ◆ **Positions for Disease Carrying Insects Program** \$0
 An increase of 2/2.0 FTE new positions is included due to increased departmental and programmatic requirements in the Disease Carrying Insects Program. These positions will assist in assessing exposures that contribute to or protect against illness, increase continuity and support quality improvement activities, and improve the department's ability to respond to citizen concerns regarding disease carrying insects.

Changes to FY 2019 Adopted Budget Plan

The following funding adjustments reflect all approved changes in the FY 2019 Revised Budget Plan since passage of the FY 2019 Adopted Budget Plan. Included are all adjustments made as part of the FY 2018 Carryover Review, FY 2019 Third Quarter Review, and all other approved changes through April 30, 2019.

- ◆ **Carryover Adjustments** \$41,176
 As part of the FY 2018 Carryover Review, the Board of Supervisors approved funding of \$41,176 in encumbered funding for Operating Expenses for contractual obligations in both the Forest Pest Program and the Disease Carrying Insects Program.

Key Performance Measures

Indicator	Prior Year Actuals			Current Estimate	Future Estimate
	FY 2016 Actual	FY 2017 Actual	FY 2018 Estimate/Actual	FY 2019	FY 2020
Integrated Pest Management Program					
Percent of County tree defoliation resulting from gypsy moth and cankerworm infestation	0%	0%	0%/0%	0%	NA
Percent of stormwater structure inspections that resulted in treatments to control immature mosquitoes	N/A	8%	10%/9%	10%	10%

A complete list of performance measures can be viewed at
<https://www.fairfaxcounty.gov/budget/fy-2020-adopted-performance-measures-pm>

Performance Measurement Results

Forest Pest Program

There was no aerial treatment for the gypsy moth in the spring of 2018. Based on field surveys of the gypsy moth population in the fall of 2018, no acres required treatment in the spring of 2019. Based on surveys for the cankerworm, no treatment was necessary in the spring of 2018. Defoliation surveys for both insects conducted in the summer of 2018 indicated that there will be no defoliation in Fairfax County during FY 2019.

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Disease-Carrying Insects Program (DCIP)

New performance measures introduced by the DCIP in FY 2018 replaced past measures. The termination of contracted services at the end of FY 2017 and systematic review of the larval surveillance and control program by DCIP has resulted in significant operational changes. Stormwater “dry ponds” are now inspected and treated by Health Department staff in lieu of storm drain treatments performed by a contractor. The replacement measures reflect the DCIP’s shift to using more routine mosquito surveillance to drive targeted control activities that seek to prevent or reduce the risk of disease transmission by mosquitoes in Fairfax County.

DCIP operational costs are based on the number of inspections, pesticide treatments and other mosquito control measures completed during the fiscal year, as well as education, outreach and surveillance activities. The total DCIP cost per capita was \$0.89 in FY 2018, which was \$0.27 lower than in FY 2017. This was less than the estimate of \$1.85 per capita for FY 2018, which is based on spending the entire balance of the budget amount. FY 2018 was the first complete fiscal year without reliance on any contracted mosquito surveillance/control services. The percentage of stormwater structure inspections that resulted in treatments to control immature mosquitoes was 9 percent in FY 2018, just below the 10 percent estimate.

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Integrated Pest Management Program

FUND STATEMENT

Fund 40080, Integrated Pest Management Program

	FY 2018 Actual	FY 2019 Adopted Budget Plan	FY 2019 Revised Budget Plan	FY 2020 Advertised Budget Plan	FY 2020 Adopted Budget Plan
Beginning Balance	\$2,805,322	\$1,740,973	\$3,167,166	\$2,186,056	\$2,186,056
Revenue:					
General Property Taxes	\$2,352,781	\$2,455,953	\$2,455,953	\$2,544,264	\$2,544,264
Interest on Investments	30,922	7,691	7,691	7,691	7,691
Total Revenue	\$2,383,703	\$2,463,644	\$2,463,644	\$2,551,955	\$2,551,955
Total Available	\$5,189,025	\$4,204,617	\$5,630,810	\$4,738,011	\$4,738,011
Expenditures:					
Forest Pest Program	\$890,670	\$1,170,423	\$1,180,016	\$1,439,493	\$1,447,152
Disease-Carrying Insects Program	990,189	2,092,155	2,123,738	1,862,731	1,871,730
Total Expenditures	\$1,880,859	\$3,262,578	\$3,303,754	\$3,302,224	\$3,318,882
Transfers Out: ¹					
General Fund (10001) - Forest Pest Program	\$66,453	\$66,453	\$66,453	\$66,453	\$66,453
General Fund (10001) - Disease-Carrying Insects Program	74,547	74,547	74,547	74,547	74,547
Total Transfers Out	\$141,000	\$141,000	\$141,000	\$141,000	\$141,000
Total Disbursements	\$2,021,859	\$3,403,578	\$3,444,754	\$3,443,224	\$3,459,882
Ending Balance²	\$3,167,166	\$801,039	\$2,186,056	\$1,294,787	\$1,278,129
Tax Rate Per \$100 of Assessed Value	\$0.001	\$0.001	\$0.001	\$0.001	\$0.001

¹ Funding in the amount of \$141,000 is transferred to the General Fund to partially offset central support services supported by the General Fund which benefit Fund 40080, Integrated Pest Management. These indirect costs include support services such as Human Resources, Purchasing, Budget and other administrative services.

² Due to the cyclical nature of pest populations, the treatment requirements supported by this fund may fluctuate from year to year. Therefore, Ending Balances may also fluctuate depending on the level of treatment necessary to suppress gypsy moth, cankerworm, emerald ash borer or West Nile Virus - carrying mosquito populations in a given year.