

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 (FPP) managed by Stormwater Services and the Disease-Carrying Insects Program (DCIP) 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 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 2021, 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 for tree removal and/or remediation as a result of those pests. An increase to the service district tax rate has not been required as taxes levied after July 1, 2019, were 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 (if 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 2021 Adopted Budget Plan, \$300,000 of the FPP budget has been allocated to the removal and/or remediation of hazardous trees. 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*

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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 predators such as *Telenomus (T.) alsophilae*, an egg parasitoid wasp. Measuring the viability (successful larval 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 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. 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 2018-2019 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 so 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. alsophilae*, which suggests that the population of fall

cankerworms remains low, causing no detectable defoliation. 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 2019. The purpose of this survey was to determine those areas of Fairfax County where fall

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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 contributed 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. The results of this survey indicated that there was no defoliation from fall cankerworm in 2019.

Fall cankerworm populations have decreased in recent years and no treatment was required in calendar year 2019. Staff anticipates no aerial treatment program in FY 2020; however, small amounts of ground treatment may be required. The FY 2021 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 2020 and January 2021 indicate the need.

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. Recently, 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 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. Since 2015, staff have treated roughly 180 ash trees for EAB. Yearly assessments are made on treated trees to evaluate their health and crown conditions based on parameters set in the EAB Management Plan.

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 planipennis*. 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. In 2017 and 2018, FPP released emerald ash borer parasitoid wasps. The wasps were produced and supplied from the United States Department

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of Agriculture's Animal and Plant Health Inspection Service (APHIS) at the Plant Protection and Quarantine (PPQ) EAB Parasitoid Rearing Facility in Brighton, Michigan.

Over the past three years, EAB parasitoids were released in Fairfax County Park Authority properties. Staff released parasitoids in new areas in the County in calendar year 2019. 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. Staff will continue to identify additional areas that qualify for parasitoid release. For information on the parasitoids, please call 866-322-4512.

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; however, Eastern black walnut trees are very susceptible and infested trees usually die within a few years. Urban foresters established monitoring sites for the WTB during the summer of 2012. WTB 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. Recently, Forest Pest staff learned that statewide and regional efforts yielded no WTB in traps deployed. To more closely monitor the insect's presence in Fairfax County, urban foresters deployed WTB traps in confirmed locations for calendar year 2018. WTB was positively identified from the traps that were deployed. 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 testing methods have been developed. Consequently, staff has implemented these monitoring methods in areas of the County where nursery stock that could have been shipped from areas known to have the pathogen is being sold. Staff continues to educate private and public groups on this disease and its control.

Asian Longhorned Beetle

The Asian longhorned beetle (ALB) (*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 ALB 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.

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Hemlock Woolly Adelgid

Hemlock woolly adelgid (HWA) (*Adelges tsugae*) is a sap-feeding insect that infests and eventually kills hemlock trees. Forest Pest staff employ various control options for this pest, including injected pesticide treatments and releasing predatory insects that feed on HWA. Native eastern hemlock is relatively rare in Fairfax County. The rarity of this tree 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. Staff continued to manage trees in two native stands, the Dranesville and Springfield magisterial districts. Staff monitored the condition of treated hemlocks in calendar year 2019. Staff is continuing to research management options for hemlocks and HWA.

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.

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 FPP 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, 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.

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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. 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.
- **Meaningful Watershed Experience** - Staff explain the importance of an urban forest and how it impacts stormwater 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.

Urban Forest Management Division (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, podcasts, videos, Facebook postings, Slideshare presentations, updating UFMD web content, newspaper articles, and television, radio, and YouTube 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 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 DCIP 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.

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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 number of merit staff in the Division of Environmental Health that are licensed by the Virginia Department of Agricultural and Consumer Services (VDACS) as Certified Pesticide applicators in Public Health Pest Control or as Registered Technicians increased from five in FY 2016 to 48 in FY 2020. This increased capacity improves the Health Department's ability to respond to vector-borne disease threats.

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 the deployment of Environmental Health (EH) staff from other program areas and an increase in DCIP seasonal staff from five to 16 in FY 2019. During FY 2020 and beyond, the DCIP may routinely evaluate additional stormwater structures including outfalls, stream restoration projects, and detention/retention ponds.

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 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) 2019. 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 2019, 62 human cases have been reported in the County. More recently, five cases were reported in CY 2017, nine cases in CY 2018, and three cases in CY 2019. CY 2019 data are preliminary and subject to final approval by the Virginia Department of Health (VDH). In total, seven WNV-associated deaths have occurred—one in CY 2002, one in CY 2004, one in CY 2012, two in CY 2015, one in CY 2018, and one in CY 2019.

Zika virus

Zika is primarily transmitted between humans through the bite of an infected yellow fever mosquito (*Aedes aegypti*) or Asian tiger mosquito (*Aedes albopictus*). It can also be transmitted sexually. Additionally, pregnant women can pass Zika to the fetus during pregnancy, which can cause certain birth defects, including microcephaly. Local transmission of the Zika virus was detected for the first time in the Americas during early CY 2015. Limited local transmission by mosquitoes was observed 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 or 2019. 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 Centers for Disease Control and Prevention (CDC) and

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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 and information as well as controlling mosquitoes as necessary to protect public health.

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. In CYs 2018 and 2019, the program initiated and expanded pesticide resistance testing, respectively. This activity will be ongoing and used to help inform mosquito management activities.

Adult mosquitoes are trapped weekly from May through October using CDC miniature light traps and gravid mosquito traps at 74 sites in Fairfax County and the Cities of Fairfax and Falls Church (Figure 1). 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. Immature mosquito control efforts such as source reduction (elimination of larval mosquito habitats) and larviciding/pupiciding (applying pesticides to control immature mosquitoes 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

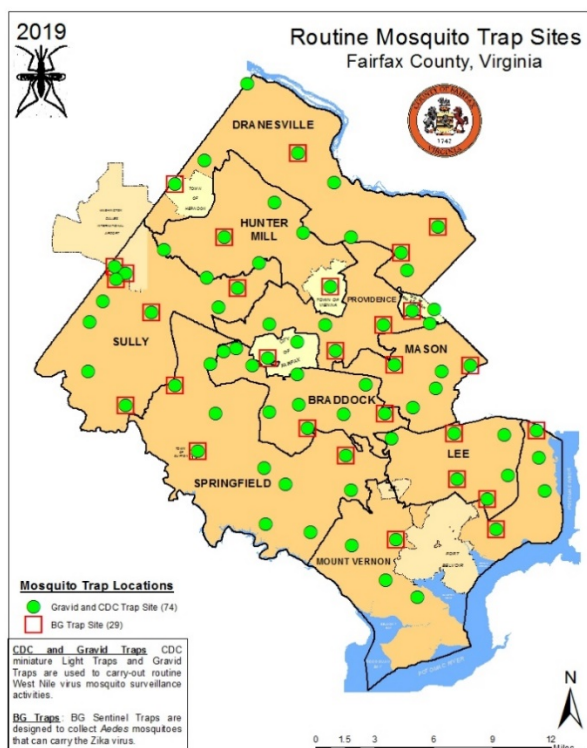


Figure 1. Routine mosquito trap sites.

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- Reported cases of human disease.

In FY 2016, the DCIP expanded its network of BG-Sentinel™ traps, which target the invasive mosquito species 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 this mosquito overwintering in Washington, D.C. since at least 2011. From CY 2003 to 2014, the yellow fever mosquito had only been detected in Fairfax County in 2007. However, from CY 2015 to 2019, the yellow fever mosquito has been detected each season at multiple locations, both at routine and non-routine sites. Although numbers of this mosquito 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 closely 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 to protect public health. Program activities may include public education, elimination of larval habitats, 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 adult 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

A community-level approach is vital to the success of mosquito reduction efforts on both public and private properties. The Health Department responds to complaints and requests for assistance about standing water and mosquitoes, 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. 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 residential and commercial areas. 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 area.

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 2017, 144 in CY 2018, and 96 in CY 2019.

Larval Surveillance and Control Activities

Immature (larval and pupal) mosquito surveillance and control efforts help identify aquatic habitats that support the development of mosquitoes. Timely treatments of those habitats is targeted and can be highly effective. It prevents the mosquitoes from reaching the flying adult stage, when they disperse from source larval habitats and 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 1,400 County-maintained dry ponds six to seven times during the mosquito season (Figure 2). The inspection frequency is monthly, on average, for an estimated 9,000+ routine larval inspections. Since FY 2018, the DCIP has worked with the Department of Information Technology (DIT) to modernize the field collection and pesticide application recording system used by the program. The use of mobile phone applications has capitalized on the expanding suite of ArcGIS resources made available by DIT in recent years. Paper-based methods and records were completely replaced with an end to end mobile data collection management system that provides real-time inspection and treatment data. This systematic approach to larval mosquito surveillance and control is scalable and may be expanded to include additional sites such as storm drains, outfalls, roadside ditches and additional dry ponds during FY 2020 and beyond.

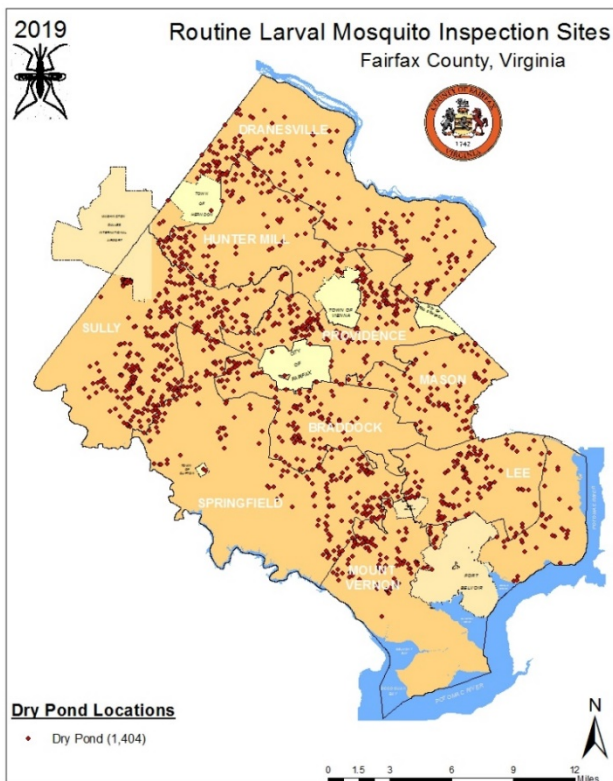


Figure 2. 2019 Routine larval mosquito inspection sites (dry ponds)

The shift to systematic larval surveillance and control activities has increased operational efficiency and led to more sustainable use of mosquito control products and program resources. This is a collaborative effort between DPWES staff, who provide a list of County-maintained dry ponds, and DCIP staff, who conduct routine mosquito inspections at those sites. Inspections by Health Department staff help DPWES staff gather additional information about how the stormwater structures are functioning. When Health Department staff observe potential stormwater-related issues, they are reported to DPWES staff which assists with response and remediation efforts.

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 blacklegged tick (*Ixodes scapularis*), also known as the deer tick. In Fairfax County, 171 cases of Lyme disease were reported in CY 2017, 119 cases in CY 2018, and 22 cases in CY 2019. Other tick-borne diseases reported in Fairfax County include: spotted fever group rickettsioses (22 cases in CY 2017, 12 cases in CY 2018, and eight cases in CY 2019) and Ehrlichiosis/Anaplasmosis (12 cases in CY 2017, 14 cases in CY 2018, and six cases in CY 2019). CY 2019 data are preliminary and subject to final approval by VDH.

Tick Surveillance Activities

The DCIP collects and identifies ticks each month from several vet clinics and the Animal Shelter. In FY 2020, the DCIP added one new animal tick surveillance site. Staff work with local wildlife officials to attend deer management activities that occur in the County to remove and identify ticks from deer. Through a collaboration with the Fairfax County Police Department's Wildlife Management Specialist and Animal Services Division, DCIP will also be able to get ticks through the archery program that is used for deer management in the County. Tick surveillance may also be performed using other

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methods such as dragging, flagging, sweeping, and trapping. Blacklegged ticks collected by routine or response surveillance are 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.

An invasive tick species, *Haemaphysalis longicornis* or the Asian longhorned tick, was first reported in the western hemisphere in New Jersey in late 2017. After reviewing archived specimens, a single tick of this species was identified from collections made in Fairfax County in 2017. To date, no additional specimens of this tick have been identified from Fairfax County but it has been detected in many other areas of Virginia and the mid-Atlantic region. The Asian longhorned tick transmits a variety of pathogens to humans and animals in other parts of the world; however, its medical significance in the western hemisphere is uncertain.

Tick Identification Service

The DCIP offers a free tick identification service. Through the service, County residents learn what type of tick they found, 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. This service does not provide tick testing or medical advice. During the previous three years, the following numbers of tick identifications were performed: 281 in CY 2017, 235 in CY 2018, and 222 in CY 2019.

Outreach and Education

The Health Department is committed to increasing community awareness of personal protection actions that help prevent mosquito and tick-borne diseases as well as steps that can be taken to reduce mosquitoes and ticks. During FY 2019, DCIP staff participated in several outreach events including Celebrate Fairfax, 4-H Fair, 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, schools, and other interested groups. Educational materials are available in multiple languages, both on the County's website and at many County facilities.

During FY 2019, the DCIP staff produced and printed the 15th 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 the YouTube video "Tick Check 1-2" in CY 2018 (the County's most-watched YouTube video of the year), the Health Department and Channel 16 produced the County's fourth public health rap video, released in 2019, titled "West Nile Story." The Health Department worked with the American Mosquito Control Association (AMCA) and the San Gabriel Valley Mosquito Vector Control District (SGVMVCD) in southern California on a social media campaign for Mosquito Control Awareness Week in June 2019 to cross-promote "West Nile Story" and SGVMVCD's summertime mosquito rap, "Don't Bring Back the Aedes." In addition, Channel 16 created a 30-second public service announcement using clips from "West Nile Story," shown at several movie theaters in the County. Outreach and education efforts are expected to continue in FY 2021, as the best way to avoid vector-borne illness is through the prevention of mosquito and tick bites.

Fund 40080: Integrated Pest Management Program

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, which can be viewed on the DCIP website, 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 maintains relationships with state and regional partners and with professional organizations such as the Virginia Mosquito Control Association, the Mid-Atlantic Mosquito Control Association, the American Mosquito Control Association, the National Capital Area Environmental Health Association, and the National Association of County & City Health Officials. 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.

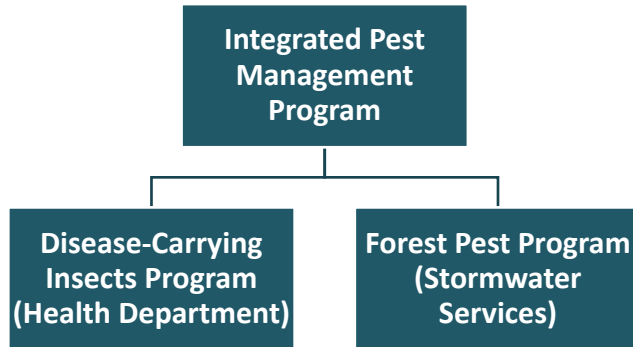
Pandemic Response and Impact

The Integrated Pest Management Fund does not foresee significant fiscal adjustments to the program due to COVID-19; however, staff will continue working with the Department of Management and Budget and the Department of Tax Administration on revenue projections due to changes in real estate values impacting revenues in this fund.

Operationally, the Forest Pest Management Program is continuously working to adjust work processes to COVID-19. The program adapted work functions to allow for telework and is minimizing face-to-face interactions as much as possible. While staff's physical presence in the office has been reduced, staff continue to conduct pest monitoring activities as well as answer phone and email inquiries from County residents. The initial phase of COVID-19 resulted in an overwhelming demand for personal protective equipment. The Forest Pest Program redistributed N95 masks, face shields, and nitrile gloves already on hand to essential Department of Public Works and Environmental Services (DPWES) staff. Following the County's "Assistance from a Distance" efforts, Forest Pest Management has also expanded the outreach provided through County social media, newsletters, and Newswire. A monthly informational webinar series targeted at homeowners will be scheduled.

Fund 40080: Integrated Pest Management Program

Organizational Chart



Budget and Staff Resources

Category	FY 2019 Actual	FY 2020 Adopted	FY 2020 Revised	FY 2021 Advertised	FY 2021 Adopted
FUNDING					
Expenditures:					
Personnel Services	\$1,630,098	\$2,000,655	\$2,000,655	\$2,059,238	\$1,996,028
Operating Expenses	246,395	1,318,227	1,477,090	1,318,227	1,318,227
Capital Equipment	9,581	0	0	0	0
Total Expenditures	\$1,886,074	\$3,318,882	\$3,477,745	\$3,377,465	\$3,314,255
AUTHORIZED POSITIONS/FULL-TIME EQUIVALENT (FTE)					
Regular	11 / 11	13 / 13	14 / 14	15 / 15	14 / 14

Summary by Program

Category	FY 2019 Actual	FY 2020 Adopted	FY 2020 Revised	FY 2021 Advertised	FY 2021 Adopted
Forest Pest Program					
EXPENDITURES					
Total Expenditures	\$833,070	\$1,447,152	\$1,599,188	\$1,472,122	\$1,443,795
AUTHORIZED POSITIONS/FULL-TIME EQUIVALENT (FTE)					
Regular	6 / 6	6 / 6	7 / 7	8 / 8	7 / 7
Disease-Carrying Insects Program					
EXPENDITURES					
Total Expenditures	\$1,053,004	\$1,871,730	\$1,878,557	\$1,905,343	\$1,870,460
AUTHORIZED POSITIONS/FULL-TIME EQUIVALENT (FTE)					
Regular	5 / 5	7 / 7	7 / 7	7 / 7	7 / 7

FY 2021 Funding Adjustments

The following funding adjustments from the *FY 2020 Adopted Budget Plan* are necessary to support the FY 2021 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 12, 2020.

Other Post-Employment Benefits (\$4,627)

A decrease of \$4,627 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 73030, OPEB Trust, in Volume 2 of the FY 2021 Adopted Budget Plan.

Fund 40080: Integrated Pest Management Program

Changes to FY 2020 Adopted Budget Plan

The following funding adjustments reflect all approved changes in the FY 2020 Revised Budget Plan since passage of the FY 2020 Adopted Budget Plan. Included are all adjustments made as part of the FY 2019 Carryover Review, FY 2020 Third Quarter Review, and all other approved changes through April 30, 2020.

Carryover Adjustments **\$158,863**

As part of the FY 2019 Carryover Review, the Board of Supervisors approved funding of \$158,863 in encumbered funding for Operating Expenses for contractual obligations in both the Forest Pest Program and the Disease Carrying Insects Program.

Reclassification of Non-Merit Benefits Eligible Positions to Merit **\$0**

As part of an ongoing Board-directed review of the County's use of limited-term staffing, 1/1.0 FTE new merit position is included due to the reclassification of a non-merit benefits-eligible position to merit status. This is part of a total of 235 positions that were identified in the FY 2019 Carryover Review across all County agencies as candidates for possible conversion based on the tasks performed by each position and the hours worked by incumbents. No additional funding has been included as the work hours of this position are expected to remain largely unchanged.

Position Detail

The FY 2021 Adopted Budget Plan includes the following positions:

INTEGRATED PEST MANAGEMENT PROGRAM - 14 Positions			
Forest Pest Program			
1	Urban Forester IV	1	Urban Forester I
1	Urban Forester III	1	Administrative Assistant III
3	Urban Foresters II		
Disease-Carrying Insects Program			
1	Epidemiologist III	2	Environmental Health Specialists II
1	Environmental Health Supervisor	1	Administrative Assistant III
2	Environmental Health Specialists III		

Performance Measurement Results

Forest Pest Program

There was no aerial treatment for the gypsy moth in the spring of 2019. 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 2019. Defoliation surveys for both insects conducted in the summer of 2019 indicated that there will be no defoliation in Fairfax County during FY 2020.

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.

Fund 40080: Integrated Pest Management Program

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 cost per capita of the DCIP was \$0.92 in FY 2019, just \$0.03 higher than in FY 2018. This was one dollar less than the estimate of \$1.92 per capita for FY 2019, which is based on spending the entire budgeted amount. Due to one of the wettest mosquito seasons on record during CY 2018, significantly more dry ponds required treatments during the first half of FY 2019 than in recent years. The percentage of stormwater structure inspections that resulted in treatments to control immature mosquitoes was 13 percent in FY 2019, up four percentage points from FY 2018 and higher than the 10 percent estimate.

Indicator	FY 2017 Actual	FY 2018 Actual	FY 2019 Estimate/Actual	FY 2020 Estimate	FY 2021 Estimate
Percent of County tree defoliation resulting from gypsy moth and cankerworm infestation	0%	0%	0%/0%	NA	NA
Percent of stormwater structure inspections that resulted in treatments to control immature mosquitoes	8%	9%	10%/13%	10%	10%

A complete list of performance measures can be viewed at
<https://www.fairfaxcounty.gov/budget/fy-2021-adopted-performance-measures-pm>

Fund 40080: Integrated Pest Management Program

FUND STATEMENT

Category	FY 2019 Actual	FY 2020 Adopted Budget Plan	FY 2020 Revised Budget Plan	FY 2021 Advertised Budget Plan	FY 2021 Adopted Budget Plan
Beginning Balance	\$3,167,166	\$2,186,056	\$3,635,765	\$2,568,975	\$2,568,975
Revenue:					
General Property Taxes	\$2,438,730	\$2,544,264	\$2,544,264	\$2,639,992	\$2,639,992
Interest on Investments	56,943	7,691	7,691	7,691	7,691
Total Revenue	\$2,495,673	\$2,551,955	\$2,551,955	\$2,647,683	\$2,647,683
Total Available	\$5,662,839	\$4,738,011	\$6,187,720	\$5,216,658	\$5,216,658
Expenditures:					
Forest Pest Program	\$833,070	\$1,447,152	\$1,599,188	\$1,472,122	\$1,443,795
Disease-Carrying Insects Program	1,053,004	1,871,730	1,878,557	1,905,343	1,870,460
Total Expenditures	\$1,886,074	\$3,318,882	\$3,477,745	\$3,377,465	\$3,314,255
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	\$2,027,074	\$3,459,882	\$3,618,745	\$3,518,465	\$3,455,255
Ending Balance²	\$3,635,765	\$1,278,129	\$2,568,975	\$1,698,193	\$1,761,403
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.