Friends of Little Hunting Creek
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February 2, 2015

The Honorable Gerald Hyland
Fairfax County Board of Supervisors
2511 Parkers Lane
Alexandria VA 22306

Dear Supervisor Hyland:

We are attaching a resolution opposing Fairfax County's Fall Cankerworm spray program which was unanimously passed by the members of the Friends of Little Hunting Creek in November.

Since then, we have continued our research to learn more about the program and understand the issues involved. We thank Keith Cline and Troy Shaw for talking with us, providing materials, and helpfully responding to our inquiries, and Deana Crumbling for making her boxplots and the County's sticky band survey data available.

We have reached several conclusions which we hope you will consider before deciding whether to continue the Fall Cankerworm spraying program in its present form.

1. There is not enough evidence about actual harm to Fairfax County trees caused by Fall Cankerworm outbreaks to justify the program.

2. The direct and indirect effects of spraying on non-target Lepidoptera (butterflies and moths) and bird populations should not be ignored. We have seen convincing evidence that such effects exist, and that Btk spraying may disrupt or delay the natural population controls for Fall Cankerworms. We have not seen any serious effort to weigh the trade-offs that will be incurred.

3. Does the method used by Fairfax County to identify potential defoliation by Fall Cankerworm support spraying of large areas? The modifications to guidelines for a Gypsy Moth suppression program to adapt them to Fall Cankerworm, appear to vitiate the ability to justify spraying thousands of acres (2000 acres in 2014) on the basis of observing 51 trees with high counts of female Fall Cankerworms.

4. Better information is needed to guide the County in allocating resources to address different threats to its urban forest.

1. Evidence that Fall Cankerworm seriously threatens the County's urban forests is lacking.

Evidence from gypsy moth studies and from a study of a Bull Run Mountain Fall Cankerworm outbreak convinces us that defoliation is stressful to trees and can lead to tree mortality, especially when it happens multiple years in a row and is combined with other stressors, such as drought.

What we have been unable to learn and the County's urban foresters cannot tell us (because data are not available) is whether the outbreaks in Fairfax County might be expected to kill 5 trees, or 50 trees, or 5,000 trees if left untreated. Although Bull Run Mountain may be instructive about what can happen, it is a different environment (in the mountains) and has had a historically different experience than Fairfax County. Between 1944 and 1999, there were 11-15 outbreaks in Prince William County, where Bull Run Mountain has been a Fall Cankerworm "hot spot" for decades or longer. Over the same five decades, Fairfax County had 3-5 annual Fall Cankerworm outbreaks (*Forest Health Review*, May 2007, p. 9).

Bull Run Mountain is not in Fairfax County, and its proximity does not mean that Fall Cankerworms are "coming this way." Fall Cankerworm is a native insect which has been here forever and which goes through boom and bust cycles. The current outbreak appears to be waning, according to the Virginia Department of Forestry:

> "… it looks like the cankerworm population may be on the decline. Typically by the third year of outbreak of a native defoliator, we expect natural enemy populations (insect predators and parasitoids) to catch up and more effectively regulate host numbers. It is thought that a parasitoid wasp that attacks the eggs is most effective at controlling cankerworm numbers." (Dec. 2014, *Forest Health Review*, p. 6)

2. Btk spraying for Fall Cankerworm directly and indirectly impacts non-target Lepidoptera and bird populations, and the local forest ecology.

Fairfax County ignores the effects of spraying on non-target species of wildlife, but many county residents care as much about birds and butterflies as they do about trees. School children are taught about the life cycle of butterflies, monarch migration, etc., and county agencies encourage planting butterfly gardens in residences and schools. Many residents report far fewer butterflies visiting such gardens in the past two years. Some of our neighbors in Stratford Landing are outraged to discover that county spraying kills almost all spring caterpillars in thousands of acres across the county, and in 170 acres–an area roughly the size of Huntley Meadows Park–immediately across Little Hunting Creek.

Fairfax County should address valid concerns about possible harms to non-target Lepidopterans, birds, and other wildlife. It is irresponsible to ignore or dismiss harms to other species.

Btk is toxic to all foliage-eating caterpillars that ingest it. This includes the Tiger Swallowtail, Virginia's state insect and a spring butterfly whose caterpillars hatch around the time the county sprays for Fall Cankerworm. Btk is lethal to early and later (fourth) instars of swallowtail caterpillars, and the toxicity of Btk-sprayed leaves to early instars persists for as long as 30 days.[1]

[1] K. Johnson, M. Scriber, J. Nitao, D. Smitley (1995) "Toxicity of Bacillus thuringiensis var. kurstaki to three nontarget Lepidoptera in field studies." *Environmental Entomology* 24(2):288-297.

Btk may persist in the environment much longer than some spraying proponents claim (for example, the Tree Commission claims that Btk "persists for two weeks or less"[2]). Research does not support this claim but instead shows wide variability in the persistence of Btk on foliage, with Btk detected on leaves up to 12 weeks after aerial spraying in Fairfax County in 2008.[3] Longer persistence implies that sprayed leaves may remain toxic to Lepidoptera longer than supposed. Since persistence is so variable, it should be routinely monitored as part of the evaluation of any "integrated pest management" program that involves spraying.

Songbirds are indirectly affected by Btk spraying because it removes a major food source (caterpillars) at the peak of spring migration and nesting. A noted entomologist states that "loopers are among the most important forest Lepidopterans in Eastern North America. They are an especially important staple in the diets of many forest-nesting birds."[4]

Perhaps the most comprehensive evidence about effects on non-target species comes from a large, USDA-funded scientifically rigorous experimental study that examined Btk spraying effects on arthropods, birds, and salamanders over a 7 year period (1995-2001), including two years pre-treatment, two years of treatment, and three years post-treatment, in Monongahela and George Washington National Forests.[5] Btk was sprayed once in spring of each treatment year in designated plots; matched plots were not sprayed with Btk. Spring caterpillar populations experienced great relative declines during the treatment years on the *Btk* plots compared to plots not sprayed with Btk. The researchers note that migration from untreated areas can quickly re-establish populations and host/prey relationships, but this requires suitable habitat corridors that allow Lepidopterans to migrate from unsprayed to sprayed areas. We worry that Btk spraying of isolated fragments of Fairfax County's urban forest may lead to local extirpations that are not reversed because habitat corridors connecting sprayed to unsprayed forested areas are lacking.

Counts of the 27 most common species of birds showed that two-thirds (18 species) experienced noticeable declines in the Btk-treated plots compared to control plots, most of them during the first year of Btk treatment. Five of the 18 species did not experience significant declines until the second year of Btk treatment. The abundance of several (Eastern Towhee and Dark-eyed Junco) did not recover to the levels of untreated plots during the study. Four bird species were studied more intensively to examine effects of Btk spraying on reproductive success. Two (Wood Thrush and Blue-headed Vireo) appeared to be unaffected. Another (Red-eyed Vireo) delayed the onset of breeding in Btk-treated plots, shortening the breeding season by 3 to 5 days, resulting in a decrease

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[2] *Fall Cankerworm Spraying Resolution of the Fairfax County Tree Commission.*

[3] S. Van Cuyk et al., "Persistence of Bacillus thuringiensis subsp. Kurstaki in urban environments following spraying," *Applied and Environmental Microbiology, 2011: 7954-7961.*

[4] D. L. Wagner, *Caterpillars of Eastern North America: A Guide to Identification and Natural History*, Princeton University Press, 2010.

[5] *Long Term Evaluation of the Effects of Bacillus thuringiensis kurstaki, Gypsy Moth Nucleopolyhedrosis Virus Product Gypchek, Entomophaga maimaiga on Nontarget Organisms in Mixed Broadleaf-Pine Forests in the Central Appalachians.* 2005. J. Strazanac and L. Butler (eds.) Forest Health Technology Enterprise Team Report, available at www.fs.fed.us/foresthealth/technology/pdfs/BtkNontargetStudy_v7.pdf

in the average number of young per female in the two treatment years and one year afterward[6]. A fourth species (Worm-eating Warbler) was adversely affected by reduced food availability due to Btk spraying, with decreased clutch size, lower nestling weight (hence lower survival), and fewer nestlings produced per nest in Btk plots, leading to reproduction below replacement.[7]

The effects on birds lead the authors to "urge caution when considering the application of Btk over larger spatial scales, repeatedly in the same area, or in locations of bird species of concern where even a modest reduction in seasonal productivity could be detrimental" (p.110).

Fall cankerworm is a native insect, which means that other species co-evolved with it and it is embedded in the local web of life and food chain in ways that may not be fully understood. Fall cankerworm (unlike Gypsy Moth) has native predators that regulate its population, including at least 11 families of parasitoid wasp. The Monongahela-George Washington National Forest study found that in the second year of treatment and continuing into the first year afterward Btk spraying resulted in declines in parasitoid flies and wasps after their caterpillar hosts were killed by spraying.

Attempting to suppress populations of this native "pest" may have unintended effects on other species and on the local forest ecology. In particular, we ask:

- Does spraying disrupt the natural forces that regulate Fall Cankerworm populations by wasps that parasitize Fall Cankerworm eggs?
- Is the risk of disrupting natural controls greater in the fragmented urban forest of Fairfax County than in large forest tracts, since urban forests may lack the habitat corridors that allow native parasites and predators of Fall Cankerworm to reestablish in previously sprayed areas?
- Does Fairfax County risk becoming dependent on spraying to control Fall Cankerworm if spraying weakens or eliminates natural population controls?

3. Does Fairfax County appropriately identify areas likely to be defoliated?

According to the "Fall Cankerworm Suppression Program Fact Sheet" (Dec. 4, 2014),

> "The primary goal of the treatment program is to bring the pest population down to a level where defoliation of the trees will not occur. The main factor in determining if a spray program will occur is the number of female moths captured during the monitoring phase of the program. In addition to a potential aerial treatment area having large cankerworm populations, the Forest Pest Program follows guidelines set forth in the Virginia Department of Agriculture and Consumer Services' (VDACS), Virginia Cooperative Gypsy Moth Suppression Program Guidelines for Participation."

[6] M. Marshall, R. Cooper, J. DeCecco, J. Strazanac, and L. Butler. (2002) "Effects of experimentally Reduced Prey Abundance on the Breeding Ecology of the Red-Eyed Vireo." *Ecological Applications* 12(1): 261-280.
[7] J. A. Awkerman, M. Marshall, A. Williams, G. Gale, R. Cooper, and S. Raimondo (2011). "Assessment of indirect pesticide effects on worm-eating warbler populations in a managed forest ecosystem," *Environmental Toxicology and Chemistry* 30: 1843-1851.

A tree is considered "defoliated" when it is required to put on new leaves, roughly when more than 60% of its leaves have been eaten.

The purpose of the guidelines[8] is to predict the level of defoliation of an area from measurements that are practical to make on the ground. Areas with predicted large Gypsy Moth populations are then targeted for spraying.

The Gypsy Moth guidelines specify that an area qualifies for treatment if the average density of Gypsy Moth egg masses equals or exceeds a criterion level per acre. The estimate of egg mass numbers must be based on new, current-year, viable egg masses, free from parasites. The estimate for an area is based on sample plots of 1/40th of an acre taken within the area. The number of sample plots required depends on the size of the area, but there must be at least three and they must be evenly distributed throughout the area. Plots are selected to represent the tree species composition of an area, and are not to be chosen to deliberately include individual trees with unusually high egg mass counts. This protocol implies that areas are defined before sample plots are chosen. These areas can then be combined into spray blocks that are efficient for aerial spraying.

Adapting the guidelines for Gypsy Moth to Fall Cankerworm involved more than a mere change of bug. The place of Gypsy Moth egg mass counts is assumed by counts of female Fall Cankerworms trapped in sticky bands, and the role of a sample plot is taken by one tree. In past years, no egg-mass survey was done to determine whether the eggs were viable. (We are relieved to learn that this year the urban foresters plan to examine the viability of cankerworm egg masses on a trial basis.)

It appears to us that the County identifies trees on which more than 90 females were counted, and then creates spray blocks to include multiple such trees. Troy Shaw said that areas are not predetermined. Unless areas are determined before trees are selected and unless measurements are averaged over all the trees selected to represent an area, the power of area sampling is vitiated, and one has nothing more than a collection of trees with high measurements – no basis for deciding that an entire area should qualify for treatment.

Calling for pre-defined areas within which estimates of potential defoliation are based on measurements of a sample of trees is not "demanding a scientific study." Rather it is asking for some justification for spraying over 2000 acres of urban forest (in 2014) to treat 51 individual trees on which 90 or more female cankerworms were counted in the winter 2013-14 survey. It must be more economical to spray just the 51 trees.

Not conducting an egg mass survey in the cankerworm program is inconsistent with the guidelines adapted from the Gypsy Moth program, and ignores the prescription from the U.S. Forest Service Fall Cankerworm Prediction protocol[9] that "if the land manager is considering a control project, banding can be utilized to delineate an area of infestation. An egg mass survey should follow in areas where heavy defoliation is predicted. The combination of these techniques would identify

[8] Accessed at www.VDACS.virginia.gov/Plant&Pest/pdf/Guide05a.pdf .

[9] J.H. Ghent and C. L. Morris. *Sticky Trap Survey to Predict Fall Cankerworm Defoliation*, 1978.

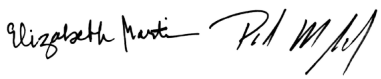
those areas where control would be most advantageous and effective." [Emphasis added.] The protocol also says that a sticky band survey "is effective for predicting increasing populations but is less reliable when populations begin to decline, probably because it fails to consider egg parasitism, which appears to be an important factor in population decline." Without an egg mass survey to determine viability, how does the County know that adequate natural controls are not present? As we have argued above, if adequate natural controls are present and subjected to spraying, is the County undermining them and creating an addiction to artificial controls?

4. **Better data is needed to allocate scarce budget resources among various potential threats to trees—e.g. Fall Cankerworm, exotic invasive plants, deer.**

We endorse Fairfax County's efforts to preserve and expand its urban forest, but we question its priorities and believe that data are lacking that would help establish priorities and evaluate program effectiveness. We question how and why Fall Cankerworm emerged as the only threat to receive significant funding. Invasive exotic plants infest and are destroying vastly larger portions of Fairfax County's forests than are affected by Fall Cankerworm. Plant pests such as ivy have no natural controls and cause significant tree mortality and create "hazard trees" that pose threats to human safety. Yet, this far more widespread threat receives no serious attention or resources from the County. Similarly, browsing by uncontrolled deer populations destroys the forest understory and interrupts succession, selectively removes native trees and favors introduced over native species.

We hope you will consider asking Fairfax County's urban foresters to propose a program of integrated forest management that collects data to monitor the health of the County's urban forest, including its biodiversity and mortality. Perhaps they might be asked to investigate control methods that are appropriate for the fragmented forests of urban areas, instead of adapting methods that have primarily been used in rural areas. Expert advisors in the fields of forestry, entomology, and ornithology might be enlisted to help develop such a program, and to ensure that any program considers broad impacts on the species that make up the local ecosystem, rather than focusing narrowly on trees. We regret that this issue has been framed as trees versus critters. Concern for the forest must extend to all members of the forest community.

Sincerely,



Elizabeth Martin and Paul Siegel
President and Vice President
Friends of Little Hunting Creek