



ALL WAY

*Takoma Park Tree Canopy:  
Invasive Vines Assessment*



## New Study: Invasive Vines Could Kill Nearly 5,000 Trees in Takoma Park, MD Within 5-7 Years

**Groundbreaking study** has possible national implications while calling for immediate, commonsense rescue actions from the local City government and volunteers.

TAKOMA PARK, MD – In what may be the first survey of its kind in the nation, an invasive plant specialist walked all 36 miles of the streets and adjacent areas of Takoma Park, MD while directly identifying nearly 5,000 trees in the process of being overwhelmed by invasive vines like English Ivy.

The startling results in a small city known to highly value its tree canopy could signal that the scale of invasive vine destruction nationwide is far beyond previous assumptions. The study also identifies relatively low-resource, commonsense solutions to the problem. Most of the trees in the survey can be saved in 5-10 minutes by volunteers using common garden clippers and pruning saws.

**The survey**, conducted in February 2021 and commissioned by the Chesapeake Climate Action Network (CCAN), found that a total 4,850 trees were so invested with climbing vines that they could die within 5-7 years. The large majority of affected trees were more than 20 years old and some were beyond a century in age. Trees play a huge role in sequestering carbon dioxide, cooling urban neighborhoods, and beautifying property.

“We knew non-native invasive vines were a big problem for Takoma Park trees, but we were still shocked by the findings in this study,” said Mike Tidwell, director of the Chesapeake Climate Action Network. “Put together, 5,000 trees in an urban setting can cover acres of land and, if lost, represent a huge amount of money, comfort, and climate benefits.”

The report was conducted by native plant specialist Jesse Buff of Takoma Park. It points out that planting 5,000 new trees and protecting them to the age of several decades – and some for over a century – would be a fantastically expensive undertaking for the city. Yet saving the same number of trees currently dying in plain sight from invasive vines would cost little beyond educating citizens and supporting local volunteer efforts already underway to eradicate invasive vines.

Last summer, volunteers organized by CCAN in Takoma Park eradicated deadly vines on over 700 trees in the city. Now the group is launching a weekly Saturday morning program where volunteers sign up to “adopt” between 10 and 100 trees in the city for rescue.

The CCAN survey cataloged the exact location of troubled trees on residential, commercial, and park property. Volunteers will be given addresses and asked to set out to meet with homeowners and business owners to encourage them to eradicate the vines themselves using quick, simple methods. Or property owners can elect to have volunteers do it for them. By autumn, the goal is to have rescued all 4,850 trees in the city.

CCAN hopes the Takoma Park survey and volunteer system will become a model for other city, county and state programs nationwide to save affected trees. Volunteers can learn more by filling out this [questionnaire](#) and visiting this [website](#).

## Executive Summary

Trees are an important tool in combating climate change thanks to their ability to sequester carbon. However, forests and trees are threatened by non-native invasive (NNI) plant species, particularly vines. A survey of all trees in Takoma Park, Maryland that are affected by NNI vines was conducted in February 2021. An experienced specialist in invasive tree vines, Jesse Buff, walked all 36 miles of Takoma Park streets and adjacent areas to create a detailed survey of vine-affected trees within the city's boundaries. The survey is based on firsthand visual inspection of trees – where possible – on public, commercial, and residential property.

Surprisingly, despite the dramatic growth of invasive tree vines nationwide, this appears to be the first comprehensive tree survey of its kind in any US city, county, or state. A total of 4,850 trees in Takoma Park were found to be moderately to severely affected by NNI vines on 969 distinct properties. For the purpose of this survey, “affected trees” were those judged likely to succumb to vines within 5-7 years if no action is taken. The age of affected trees in this survey range from well over a century to less than a decade. But the majority were beyond 20 years old.

Controlling these vines represents a prime opportunity for a small jurisdiction like Takoma Park to both contribute to climate change mitigation and maintain the health of its urban forest. The City can do this by: 1) educating citizens about the threat of vines and how they can address the problem; 2) facilitating a corps of trained volunteers that can undertake vine removal on public and private property; 3) create a model control program for City property; and, 4) publicizing and enforcing city code that requires property owners to control invasive plant species.

While the threats presented by NNIs are severe, saving standing trees can be accomplished relatively easily. A trained volunteer, in most cases, can clip and remove the base of invasive vines from a tree within 5-10 minutes, using nothing more than gloves, a garden clipper, and pruning saw. While not a permanent solution, this usually rescues the tree for several years to come. Meanwhile, by comparison, the sheer cost of planting 5,000 new trees and managing them to an age of several decades is staggering compared to simply rescuing existing trees.

Though this study was commissioned and executed in the early weeks of 2021, CCAN and associated volunteers have been working on the issue of invasive vines in Takoma Park for over a year. The protection of trees from invasive species provides us with a huge opportunity to not only make a huge climate impact on our local scale, but to engage our communities along the way. To learn more and get involved, email us at [info@chesapeakeclimate.org](mailto:info@chesapeakeclimate.org)

Sincerely,



Mike Tidwell,  
Executive Director, 240-460-5838  
Chesapeake Climate Action Network

## Background

Takoma Park has a robust urban forest. Tree canopy covers around 60% of the city's land area. Other small to midsize cities in Maryland, such as Annapolis, Bowie, and Hyattsville, have tree canopies of around 40%. Only Greenbelt has a canopy that is on par with Takoma Park's<sup>1</sup>. Urban forests provide critical benefits to people and wildlife, including helping to filter air and water, controlling storm water, conserving energy, and providing wildlife habitat. They reduce noise and provide places to recreate while strengthening social cohesion, spurring community revitalization, and adding economic value to communities<sup>2</sup>. Urban forests are perhaps now more important than ever, as trees' ability to capture carbon will be essential in averting catastrophic climate change. In particular, mature trees sequester exponentially more carbon than young trees<sup>3</sup>, underscoring the need to protect mature trees.

Trees and forests in both urban and rural settings already face myriad threats. Among these is the threat of NNI (Non-Native Invasive) plants. NNIs cause significant changes in the composition, structure, and ecosystem function of our natural areas. Of particular concern are NNI vines which can<sup>4</sup>:

- Smother trees and shrubs, blocking light to their leaves;
- Shade and out-compete low growing plants;
- Inhibit wildlife movement;
- Make trees more vulnerable to blowing over in storms due to their added weight; and,
- Climb, twist, and strangle trees and shrubs and eventually girdle and kill them by cutting off flow of water and nutrients.

Invasive plant species and climate change together present a double-edged threat to trees: invasive plant species appear to take advantage of warming trends<sup>5</sup> and climate change will put further stress on trees that are already disadvantaged<sup>6</sup>. This is of particular concern in Takoma Park which witnessed numerous fatalities of mature oak trees over the past two years<sup>7</sup>.

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<sup>1</sup> Takoma Park Tree Canopy Assessment, University of Vermont and US Forest Service, March 20, 2019, <http://publicworks-takomapark.s3.amazonaws.com/public/arborist/Tree%20Canopy%20Takoma%20Park%202018%20Report.pdf>

<sup>2</sup> Urban Forests, US Forest Service, <https://www.fs.usda.gov/managing-land/urban-forests#:~:text=They%20are%20dynamic%20ecosystems%20that,and%20structure%20to%20urban%20design.>>

<sup>3</sup> Old trees store more carbon, more quickly, than younger trees, E&E Climate Wire, January 17, 2014, <https://www.pacificforest.org/ee-old-trees-store-more-carbon-more-quickly-than-younger-trees/#:~:text=A%20sweeping%20study%20of%20forests,aged%2C%20thus%20absorbing%20more%20carbon>

<sup>4</sup> Montgomery County, Maryland, Montgomery Parks Weed Warrior Online Training, <https://www.montgomeryparks.org/caring-for-our-parks/natural-spaces/weed-warriors/>

<sup>5</sup> How Climate Change is Helping Invasive Species Take Over, Smithsonian Magazine, December 2013, <https://www.smithsonianmag.com/science-nature/how-climate-change-is-helping-invasive-species-take-over-180947630/>

<sup>6</sup> Urban Forests and Climate Change, US Forest Service, <https://www.fs.usda.gov/ccrc/topics/urban-forests>

<sup>7</sup> Statement Regarding Reports of Sudden Tree Decline, Takoma Park City Government, September 10, 2019, <https://takomaparkmd.gov/news/statement-regarding-reports-of-sudden-tree-decline/>

Of particular concern is English ivy, an aggressive invader that threatens all vegetation levels of forested and open areas. It grows along the ground as well as into the forest canopy where vines climb up tree trunks, spread out, and envelop branches and twigs, blocking sunlight from reaching the host tree's foliage, thereby impeding photosynthesis. An infested tree will exhibit decline for several to many years before it dies. The added weight of vines can also make trees susceptible to blowing over during storms.<sup>8</sup>

While the threats presented by NNIs are severe, saving standing trees can be accomplished relatively easily and provides a significant bang for the carbon dollar. If the community is educated about the threat of vines to existing trees, it is highly likely that significant support can be generated, especially in a progressive enclave such as Takoma Park.



Example of a severely affected canopy tree in a public park in Takoma Park

The City of Takoma Park is approximately 2.4 square miles in area and had a population of about 17,725<sup>9</sup> as of 2019. The City is divided into six political wards, each of which has an elected City Councilmember. No information on relative land uses per ward was available at the time of this writing. However, it appears from the map below – and this is supported in the results section (see Figure 2) – that the highest numbers of single family homes are in Wards 1-3.

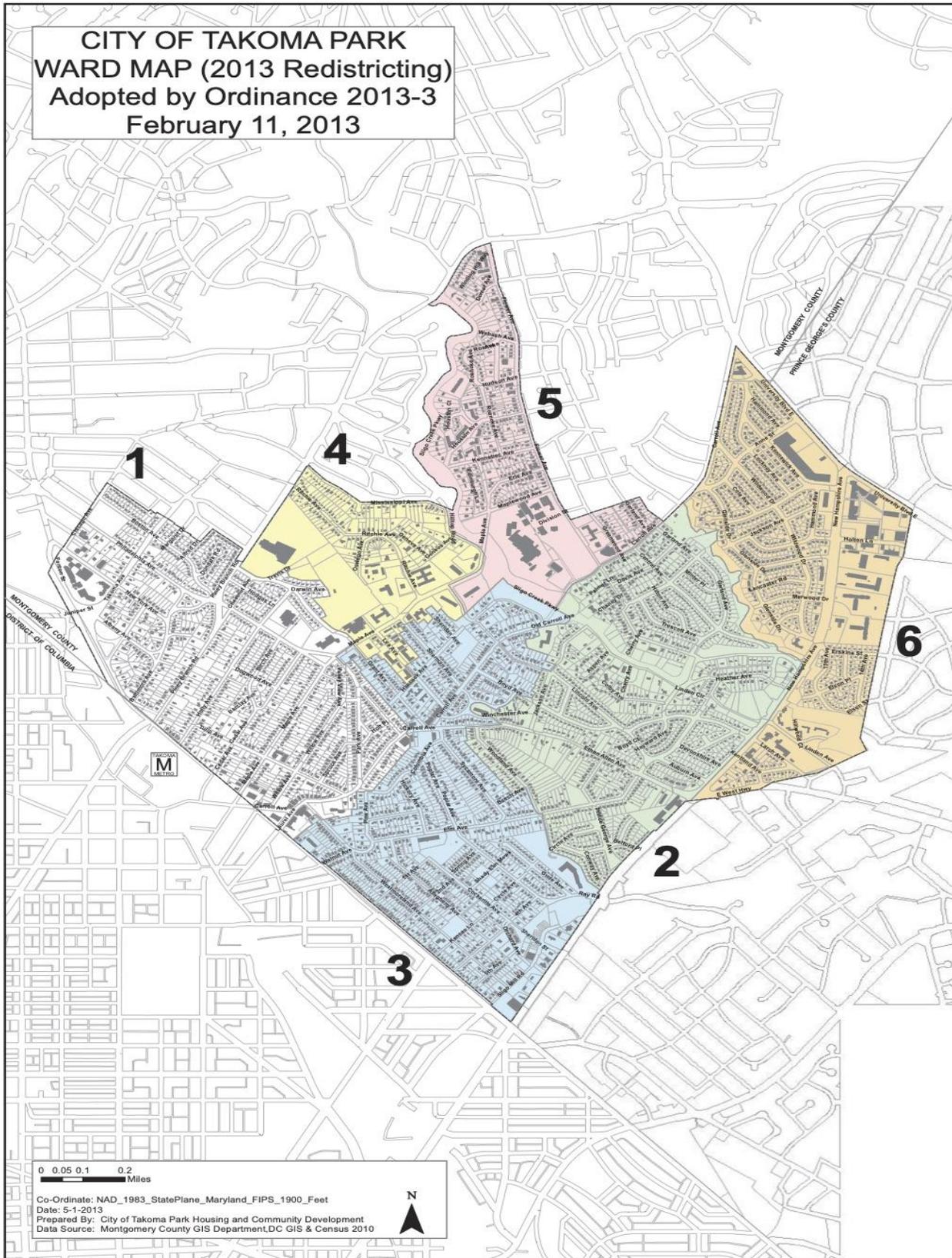
The City has a robust 60% urban tree canopy, 74 percent of which is on residential property, followed by Rights of Way (ROW) (13%), Maryland National Capital Park and Planning Commission (MNCPPC) (10%), and the City (2%)<sup>10</sup>.

<sup>8</sup> Swearingen, J., B. Slattery, K. Reshetiloff, and S. Zwicker. 2010. Plant Invaders of Mid-Atlantic Natural Areas, 4th ed. National Park Service and U.S. Fish and Wildlife Service. Washington, DC. 168pp.  
<https://www.invasive.org/alien/pubs/midatlantic/midatlantic.pdf>

<sup>9</sup> US Census Bureau,  
<https://www.census.gov/quickfacts/fact/table/takomaparkcitymaryland/PST045219?fbclid=IwAR3i6LyY3w0uqrS3mMHN8PjIF4aMQKGdwVlnkODz57qZ2H5psukryKHxY>

<sup>10</sup> <sup>10</sup>Takoma Park Tree Canopy Assessment, University of Vermont and US Forest Service, March 20, 2019, <http://publicworks-takomapark.s3.amazonaws.com/public/arborist/Tree%20Canopy%20Takoma%20Park%202018%20Report.pdf>

**CITY OF TAKOMA PARK  
WARD MAP (2013 Redistricting)  
Adopted by Ordinance 2013-3  
February 11, 2013**



## Methodology

CCAN staff developed a simple Google form for surveying properties and trees<sup>11</sup>. The form included fields for entering information such as Takoma Park political boundaries (Wards), property addresses, numbers of affected trees, additional descriptive notes, and whether contact was made with the homeowner. Data was entered while in the field using a smartphone. It should be noted that the total number of units that were assessed (i.e., all properties in Takoma Park) was not tallied; only properties with affected trees were counted.

### *Defining “Affected Trees”*

For the purpose of the survey, “affected trees” were those considered to be moderately to severely affected by vines - trees that, if no action is taken, will succumb to vines within 5 to 7 years. For the most part, trees with small vine tendrils at their base were not counted. However, trees were considered to be affected by vines by virtue of the trees’ relative size (e.g., a small tree will be overwhelmed by vines in a relatively shorter time frame) or the amount of vines covering their trunks or canopy. In order to facilitate prioritization of work at a later date, properties were marked as “priority” if: a) there was a significant number of affected trees; b) there was at least one mature tree that was severely impacted; or, both “a” and “b”.

Because this survey was conducted in February and no leaves were on trees, it was generally easy to identify trees affected by evergreen NNI vines such as English ivy (*Hedera helix L.*) and winter creeper (*Euonymus fortunei*) at a distance. Other NNIs such as Oriental bittersweet (*Celastrus orbiculatus*) and Chinese wisteria (*Wisteria sinensis*) were also present but in most cases, it was difficult to identify these deciduous vines without leaves and from a distance. In these cases, notes were made that the NNI was likely to be one of these two species. Similarly, porcelainberry (*Ampelopsis brevipedunculata*) and Japanese honeysuckle (*Lonicera japonica*) were likely seen in many yards and on forest edges. However, positive identification was also difficult at a distance (porcelainberry can be confused with native grape species). Only in cases where it was almost certain that they were invasive were these cases documented.

In some cases, it was obvious that attempts had been made by property owners to control vines. In these cases, vines may have still been present, but were much reduced from their former growth. These cases were not counted, as it can be assumed that owners will attempt control again at a later date.

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<sup>11</sup> A copy of the survey (Google Form) can be viewed [here](#).

### *Property Considerations and Challenges*

Assigning trees, definitively, to the correct property was often difficult for a number of reasons. In many instances, when viewing the limits of yards from a distance, it was not clear on which side of a fence line trees stood. This was exacerbated by steep slopes, obstructed views, or bright sunlight.

Additionally, property lines abutting public areas were often unclear. Every effort was made to avoid double-counting affected trees seen from multiple viewpoints.

Due to the resources allocated for this study, a more granular analysis of the affected trees and respective vines species was not possible. For future work, assigning a team of researchers to use GPS to “tag” trees would yield a more comprehensive data set.



Mature vines affecting a canopy tree in forest park



An example of a heavily infested public right of way in Takoma Park.

### *Parks and Open Space*

Parks were labeled with their official name. In cases where open space did not have a title, the nearest address or general orientation, along with a description of the property, was provided. In some cases, properties assumed to be public spaces were described as public right of way (ROW), and designated as “public”. Two parks – Sligo Creek and Long Branch – were divided into manageable segments because of their size. In the case where a public area (Sligo Creek) crossed wards, the unit and trees were assigned to the ward with the majority of that unit.

## Results

A total of 4850 affected trees were recorded on all properties within the City of Takoma Park (see figure 1 below). The most numerous property type surveyed was single family homes (820), followed by multi-family/apartments (88), parks<sup>12</sup> (25), other public and government units (10), businesses (9), churches or church institutions (e.g., school, convent) (8), schools (7), hospital (1), and nursing home (1). Not surprisingly, single-family homes counted for the majority of affected trees (2290), followed by parks (1307), given the extent of parks within the City. Taken together, single-family homes and parks represent 74% of all affected trees surveyed.

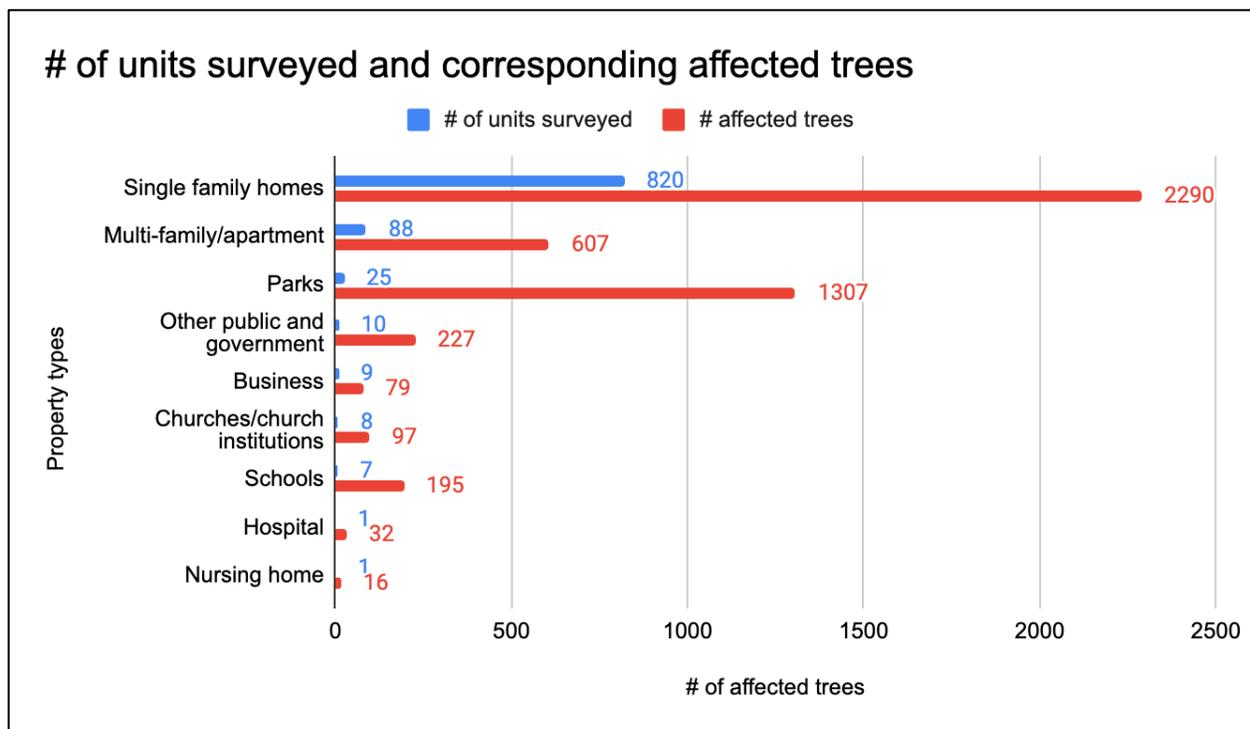


Figure 1: Number of units surveyed and corresponding numbers of affected trees

Wards with the most affected trees, in descending order, were Wards 2, 3, and 1, followed by 6, 5, and 4 (see Figure 2 below). This is likely due to these Wards having the highest amount of existing tree canopy as the number of affected trees generally tracks with the amount of tree cover in those Wards (2, 1, 3, 6, 5, and 4, also in descending order)<sup>13</sup> (see Figure 3 below).

<sup>12</sup> Twenty-five distinct parks were surveyed but for ease of future work, two of these parks - Sligo Creek and Long Branch - were broken down into 13 and 2 separate units/segments, respectively.

<sup>13</sup> Takoma Park Tree Canopy Assessment, University of Vermont and US Forest Service, March 20, 2019, <http://publicworks-takomapark.s3.amazonaws.com/public/arborist/Tree%20Canopy%20Takoma%20Park%202018%20Report.pdf>

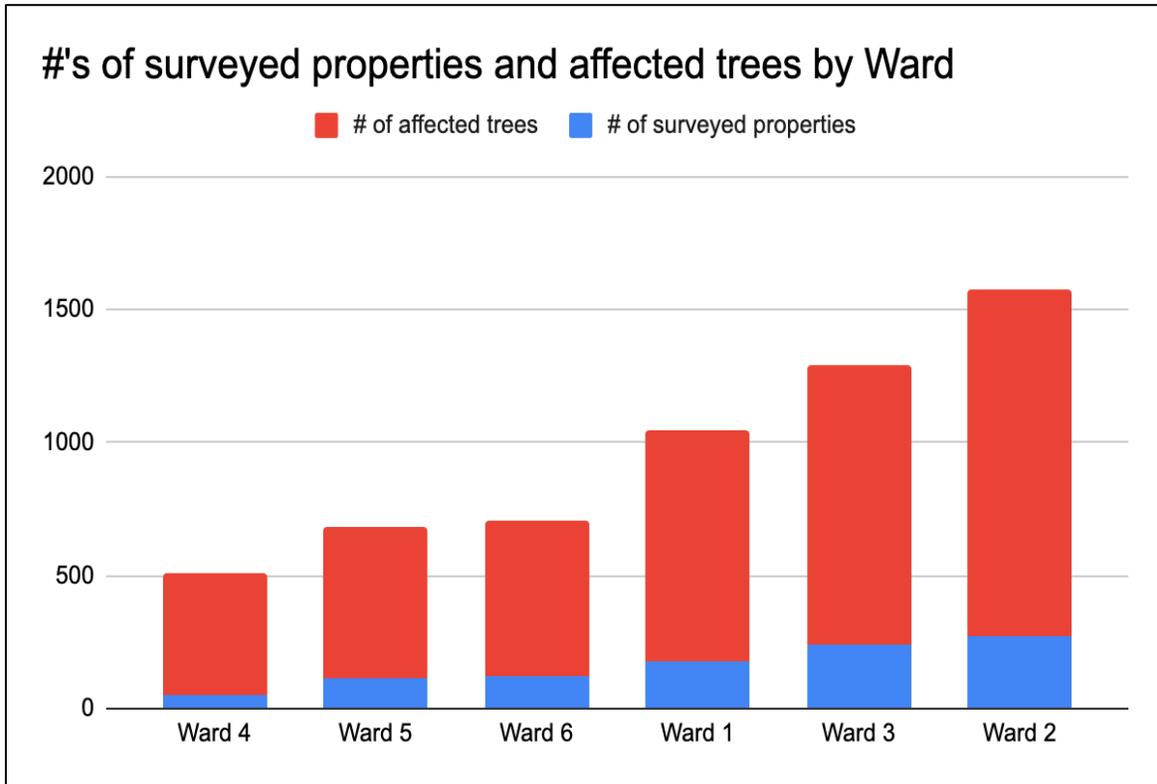


Figure 2: Number of surveyed properties and affected trees by Ward

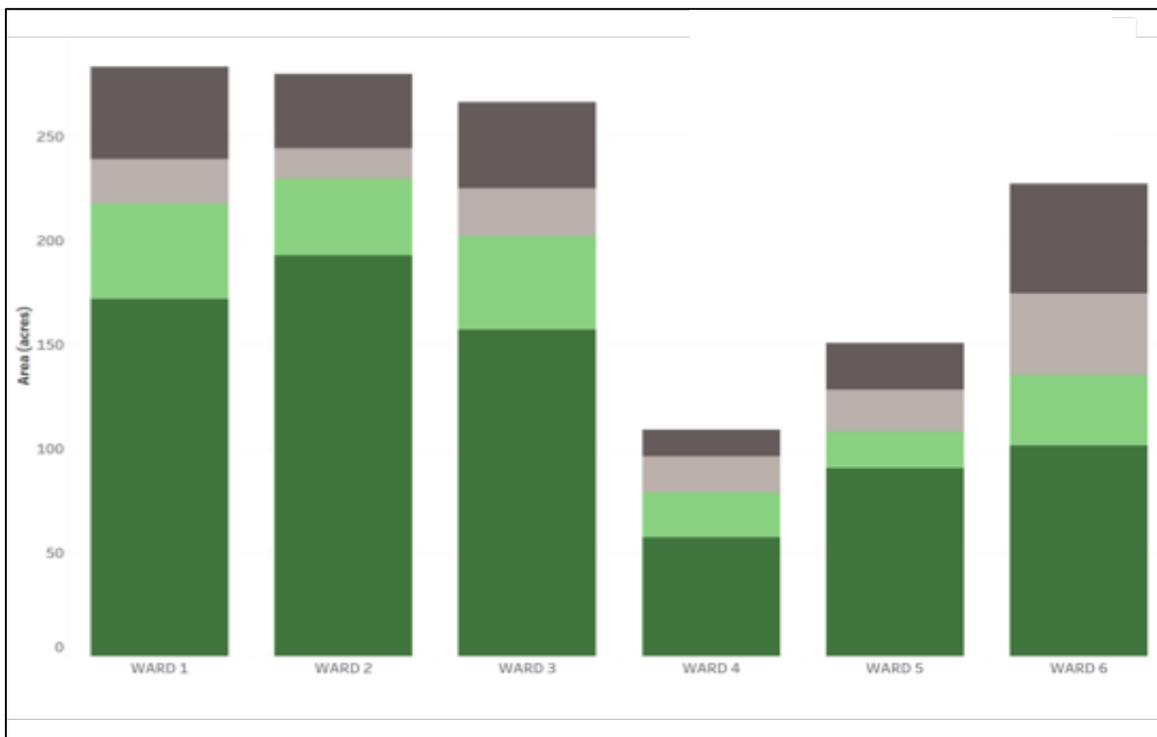


Figure 3: Tree canopy by Ward (from Takoma Park Tree Canopy Assessment, 2019)

There are around 3770 single-family homes in Takoma Park<sup>14</sup>, and 820 of these were found to have affected trees (21%). The average number of affected trees at single-family homes was roughly similar across Wards, ranging from 2.4 in Ward 6 to 3.2 in Ward 2.

438 properties or units were considered to be “priority” (see figure 4 below). Of these, the highest number of priority properties was in Ward 3 (111). However, the greatest proportion of priority properties - 72% - was in Ward 4 (39 of 54 properties), followed by Wards 5 and 6. See Figure 4 for percentages of priority properties.

	# of priority properties	% of total properties in Ward
<b>Ward 1</b>	<b>90</b>	<b>50%</b>
<b>Ward 2</b>	<b>63</b>	<b>23%</b>
<b>Ward 3</b>	<b>111</b>	<b>47%</b>
<b>Ward 4</b>	<b>39</b>	<b>72%</b>
<b>Ward 5</b>	<b>65</b>	<b>57%</b>
<b>Ward 6</b>	<b>70</b>	<b>56%</b>

Figure 4: Percentages of priority properties per Ward

In conducting the survey, contact was made with 3 homeowners.



Invasive vines in Takoma Park, MD

As mentioned previously, because of resource constraints, data was not collected on specific species of NNIs except for cases where it will be helpful for removal efforts. However, it can be said that English ivy was by far the most prevalent NNI, followed by wintercreeper and porcelainberry.

<sup>14</sup> Personal conversation, Dan Metcalf, Long and Foster realtor, 3/12/2021

## Discussion

While no spatial data was collected on distribution of affected trees, it was observed that affected trees tended to be concentrated in certain areas. Following are some of these observations on locations of affected trees and possible explanations:

Observation	Explanation
<ul style="list-style-type: none"> <li>Street side ROWs and other public spaces</li> </ul>	<ul style="list-style-type: none"> <li>Difficult to access by Weed Warriors or other tree stewards</li> <li>Unclear ownership</li> </ul>
<ul style="list-style-type: none"> <li>Along property borders</li> </ul>	<ul style="list-style-type: none"> <li>Unclear ownership, e.g., “not my trees,” or considered no-man’s land</li> <li>Difficult to access</li> </ul>
<ul style="list-style-type: none"> <li>Multi-family dwellings, particularly smaller apartment buildings</li> </ul>	<ul style="list-style-type: none"> <li>Lack of agency by renters</li> <li>Smaller buildings may not invest in landscaping contracts</li> </ul>
<ul style="list-style-type: none"> <li>Along major roads</li> </ul>	<ul style="list-style-type: none"> <li>More rental properties</li> <li>Lower property values</li> </ul>

Public areas such as street side ROWs (Right-of-Ways) were often heavily infested. This is likely due to their difficulty to be accessed by tree stewards, or that their ownership is unclear. However, well-maintained public parks, particularly in places that were heavily trafficked, did not often have massive infestations.

Infestation appeared to be more common along property lines in the following scenarios: between yards; between yards and public areas; and between businesses and apartment buildings and public areas. This is likely due to there being unclear property lines and ownership, unclear responsibility for upkeep, and/or dereliction of responsibility due to the perception of unclear ownership. In some cases, these areas were difficult to access. There were a number of cases where bamboo thickets between yards made access to trees difficult. Another example was Sligo Creek Parkway, where concentrations of severely-affected trees were seen where multi-family units were adjacent to parkland. On private property, it also stands to reason that people are socialized to do what their neighbors do, to either cut or NOT cut vines. In numerous cases, where there were severely-affected trees, there were often more in adjoining yards.

Multi-family apartment buildings, especially smaller buildings, seemed to have disproportionately severely affected trees. There seemed to be a tendency for the trees on grounds of multi-family buildings to be vine-heavy. Obviously, the grounds of large buildings support more trees than the smaller yards of single-family homes. However, many buildings had a majority of affected trees. There are a few likely reasons for this. It can be assumed that renters do not feel empowered to act on property that they don't own. It is also likely that smaller buildings don't invest in landscaping contracts, and hire out the bare minimum amount of yard work (e.g., mowing grass). However, because building owners may not be local, there is likely less social pressure from neighbors to attend to vines on trees. The concentration of priority properties in Ward 4, relative to total properties surveyed, is likely due to concentration of severely affected trees at multi-family buildings.



Infested trees in Takoma Park yard

Properties along major roads also seemed to harbor more heavily affected trees. This could be because of the tendency for multi-family buildings and rental properties to be situated along major roads.

Because the total number of housing units was not counted, it is unclear if a particular Ward has a higher or lower percentage of affected trees per population.

Lastly, one observation that cuts across all residential categories is that even well-kept yards are not immune to vines. This points to a lack of awareness of invasive vines and the potential harm they can cause.

## Conclusions

In Takoma Park, MD there are close to 5000 trees that are so affected by invasive vines, they could perish in 5-7 years if not rescued. This number is striking even when allowing for the fact that Takoma Park has a relatively high number of trees to begin with for a city its size. Having more trees means that more trees are susceptible to invasive vines. Still, Takoma Park is a community that values its tree canopy, as evidenced by its strict tree ordinance, a full-time arborist, and its promotion of tree planting. It is difficult to know how Takoma Park compares to other jurisdictions, as it seems that this type of assessment has not yet been done elsewhere, but it stands to reason that other jurisdictions are likely faring worse.

Takoma Park has made numerous steps to both mitigate and adapt to climate change. It declared a [Climate Emergency](#) in March 2019, commissioned a [Sustainability and Climate Action Plan](#) the following November, and issued a [Climate Emergency Response Framework Resolution](#) in March 2020. These documents stress the importance of maintaining and expanding Takoma Park's tree canopy to both mitigate (i.e., carbon sequestration) and adapt to climate change (e.g., reducing extreme heat events and stormwater runoff, mitigating drought, etc.). However, other than targeted tree planting, there is little mention of ways that the integrity of the urban tree canopy can be preserved. Removing invasive vines from trees – particularly from mature, canopy trees – represents a prime opportunity for the City to at once conserve its urban forest and support its own commitments to climate change mitigation and adaptation. Doing so is also likely to be more cost-effective than tree planting from multiple standpoints – carbon, ecosystem services, and taxpayer dollar – because:

- Mature trees store exponentially more carbon than younger trees<sup>15</sup>;
- Mature trees are better at providing multiple ecosystem services, such as temperature and stormwater regulation and wildlife habitat; and,
- Vine removal from mature trees is arguably cheaper than planting young trees whose benefits in the aforementioned categories would pale in comparison.

Lastly, Takoma Park's newly amended code on noxious growth explicitly addresses “overgrowth of invasive plant species” in order to maintain the health of the urban forest<sup>16</sup>. However, it is not clear how or if the City plans to enforce this code. Takoma Park clearly has the policies and political will necessary to begin to tackle the problem of invasive vines. However, it is difficult to legislate tree care on private land, and other approaches are needed. Because a clear majority of the City's tree canopy is on residential land<sup>17</sup>, engaging the community and raising awareness of the problem will be critical in addressing this issue.

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<sup>15</sup> Old trees store more carbon, more quickly, than younger trees, E&E Climate Wire, January 17, 2014,

<https://www.pacificforest.org/ee-old-trees-store-more-carbon-more-quickly-than-younger-trees/#:~:text=A%20sweeping%20study%20of%20forests,aged%2C%20thus%20absorbing%20more%20carbon>

<sup>16</sup> City of Takoma Park, Administrative Regulation Noxious Growths and Undesirable Trees, <https://documents.takomaparkmd.gov/initiatives/Tree%20Ordinance%20and%20Canopy/AdminNoxiousGrowthRegulations-011121.pdf>

<sup>17</sup> Takoma Park Tree Canopy Assessment, University of Vermont and US Forest Service, March 20, 2019, <http://publicworks-takomapark.s3.amazonaws.com/public/arborist/Tree%20Canopy%20Takoma%20Park%202018%20Report.pdf>

## Recommendations and Next Steps

Takoma Park has an opportunity to be a national model in addressing the issue of NNI vines which will benefit both the climate and urban forest health simultaneously by averting tree loss due to vines. The City can do this by: 1) educating citizens about the threat of vines and how they can address the problem; 2) facilitating a corps of trained volunteers that can undertake vine removal on public and private property; 3) create a model control program for invasives on City property; and, 4) publicizing and enforcing city code that requires property owners to control invasive plant species. Top-line categories and actions should include:

### *Public Education and Community Engagement*

- Both the threat of invasive vines and opportunities to take action (solutions) should be publicized through:
  - City of Takoma Park website (example: post video of how to cut English ivy from a tree)
  - City of Takoma Park social media, including Facebook page
  - City of Takoma Park newsletter
  - Councilmembers' weekly emails
- Particular emphasis should be on tree health, “an easy win for climate”, increased property values, and avoided arborist costs.
- Pair educational content messaging with what people can do; they can volunteer OR sign-up to have their trees saved (see Volunteer Corps below).

### *Operations and Code Enforcement*

- The City should re-focus on vine management on City property in order to model “good neighbor” behavior for residents.
- Send mailers once a year that remind residents that they are obligated to manage vines on their properties.
- Enforce code only as a last resort, i.e., after repeated attempts have been made to educate and warn property owners.

### *Consider a Volunteer Corps*

- A citizen-led corps of trained volunteers who can self-organize and mobilize to fight NNI vines should be facilitated by the City and interested groups. Volunteers would be trained on: interacting with homeowners, removal techniques, and species of vines, both native and NNI, to avoid collateral loss of natives.