# Invasive Species Assessment of Ernie Calcutt Park and Marble Park

Andrew Collett
Conducted for: Riverside Parks Community Association
Under the supervision of: Marianne Ariganello
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## Introduction

An invasive species is considered as a plant or animal species that arrives in a habitat where they were not previously located, typically through human assistance. These species can establish a population and spread quickly, becoming major threats to conservation efforts (Simberloff, 2010). Naturally, competition for area among plants is common. Plants grow close to one another and share the same resources. This can, however, lead to one plant excluding the others from an area by monopolizing its resources (Meekins and McCarthy, 1999). These invasive and aggressive plants can also alter the hydrology of an ecosystem, affecting the inhabitants of the area. Some biological invasions could even create large economic impacts in industries such as agriculture production (Simberloff, 2013). In general, the best method for mitigating the overpowering nature of an invasive species is to prevent the introduction of the species to a new location in the first place (Simberloff, 2010).

In locations impacted by invasive species, various methods can be used for safe, effective, and efficient removal; however, they vary from plant to plant. Some plants can be dug out or hand-pulled, while others may require chemical management (Weber, 2017). Though effective, different management methods can leave their own impacts on ecosystems. These impacts could range from disturbance of soils to the lingering presence of toxic residues (Flory and Clay, 2009).

The purpose of this study is to investigate the different invasive species observed in Ernie Calcutt Park and Marble Park to raise awareness and develop a potential strategy for safe and

effective removal. This will be accomplished by mapping the different invasive species present in the two parks and identifying safe removal and control methods.

## Methods and Materials

### Site selection

Ernie Calcutt Park is located at 759 Mooney's Bay Pl, Ottawa, ON (45.3657 ° N, 75. 6857° W). The park has a length near 100 m and a width near 125 m. The area of the park is 12,368 $m^2$. The length, width, and area of the park were determined and outlined using Google Earth. Marble Park is located at 2693 Marble Crescent, Ottawa, ON (45.3663° N, 75.6816° W). The park has a length near 159 m and a width near 116 m. The area of the park is about 14,457 $m^2$. These two parks are located 260 m from each other. See figures 4 and 15 in the Appendix for maps of the two parks.

### Invasive Species

Buckthorn (*Rhamnus cathartica*) is a species of small tree native to regions in Europe and Asia. It typically has a short life span but is fast growing, making it difficult to control. Buckthorn can be identified through its greyish-brown bark and can reach heights of up to 10 m. It possesses broad green oval leaves with yellowish-green flowers. Each flower contains 4 petals. This species produces a black fruit that contains mildly poisonous seeds. The sap or thorns from this plant may also cause a skin rash or irritation (Knight et al., 2007).

Burdock (*Arctium)* is a species of biennial plant native to regions in Europe and Asia. Its highly invasive nature can cause problems for crops and livestock. Burdock can be identified

through dark green leaves that can reach lengths up to 70 cm. The leaves are generally large, coarse, and take on an oval or heart shape. It typically produces a spiky purple flower in a thistle-like shape. The above-ground portions of this species may cause contact dermatitis in individuals with allergies. It also produces burrs that easily catch on clothing and fur (Wu et al., 2017).

Creeping bellflower (*Campanula rapunculoides*) is a species of perennial herbaceous plant native to regions in central and southern Europe, as well as western Asia. It is considered a highly invasive species and difficult to eradicate. It can reach average heights of 30-80 cm. Creeping bellflower can be identified through a simple erect stem with short and hairy leaves. The leaves are typically triangular, narrow, and possess a rounded base. They usually grow up to 12 cm in length. The plant produces numerous drooping bright blue-violet flowers that reach lengths of 2-4 cm. The fruit is a capsule with 5 pores that are used to spread the seeds. Each plant can potentially produce up to 15,000 seeds. This species is typically not considered harmful to the touch (Vogler et al., 1998).

Garlic mustard (*Alliaria petiolata)* is a species of flowering plant native to regions in Europe, Western and Central Asia, and Northwestern Africa (Welk, 2002). It can self-fertilize, making it highly invasive. As it ages, it grows taller and produces flowers, typically ranging from 30-100 cm. Garlic Mustard can be identified through a long, broad, and toothy leaf that takes on a triangular heat shape. Each flower contains 4 white petals arranged in a cross (Weber, 2017). This species is not harmful to the touch but is known to produce smaller fruit and give off cyanide fumes through the leaves (Cipollini and Gruner, 2007).

Goutweed (*Aegopodium podagraria)* is a species of flowering plant native to regions in Europe and Asia. It is highly competitive and difficult to eradicate. Goutweed can be identified by its broad, toothed leaves. It produces 15-20 flowers grouped together to form an umbrella shape. Each flower contains 5 white petals. This species is not harmful to the touch and does produce a small, oval-shaped fruit. The fruit is not edible and produces seeds when mature (Jakubczyk et al., 2020).

Periwinkle (*Catharanthus roseus* or *Vinca minor)* is a species of highly invasive flowering plant native to regions in Europe, and Northwestern and Southwestern Africa. It can be identified through its small leaves, reaching 1-9 cm in length and 0.5-6 cm in width. It can produce a flower that consists of 5 violet petals joined at their base to form a tube shape. This species is not harmful to the touch, but hands should be washed after handling (Kumar Verma and Narayan Mishra, 2017).

Ragweed (*Ambrosia artemisiifolia)* is a species of flowering plant native to regions in southern North America. Although it is not considered an invasive species in North America, it is expected to continue spreading throughout North American and European regions due to its highly invasive and aggressive nature. Ragweed can be identified through its erect stems and heights that can exceed 4 m. Its leaves can be smooth or toothed, hairy, and glandular in appearance. The leaves can come in many shapes and arrangements. The species is notorious for causing allergic reactions on contact. This can cause reactions that include itching, burning, and swelling (Kazinczi et al., 2008).

White poplar (*Populus alba)* is a species of poplar native to regions in central and southern Europe, as well as central Asia. It is highly competitive in nature and typically grows in moist areas. Its large production of roots form extensive clonal colonies. White poplar can be identified through a trunk that grows up to 2 meters and a height that reaches 15-30 m. The dark green leaves can grow up to 15 cm in length and contain 5 lobes. A thick white layer of scurfy typically grows on the bottom side of the leaf. This species is not considered harmful to the touch and is not noted to produce fruit (Madejon et al., 2004).

Wild grapevine (*Vitis)* is a species of vining plant native to regions in North America and eastern Asia. Although it is not considered an invasive species in North America, it is known to be highly competitive and harmful to trees. This woody vine can be identified through its large brightly coloured berries, as well as its flower buds that form late in the growing season. The small berries typically contain 1-4 seeds and range from green to dark purple in color. The berries are considered safe to ingest. Mature grapevine can grow up to 48 cm in diameter and can reach tree canopies up to 35 m in height. Approximately 25 species of grapevine are known in North America (Smith, 1984).

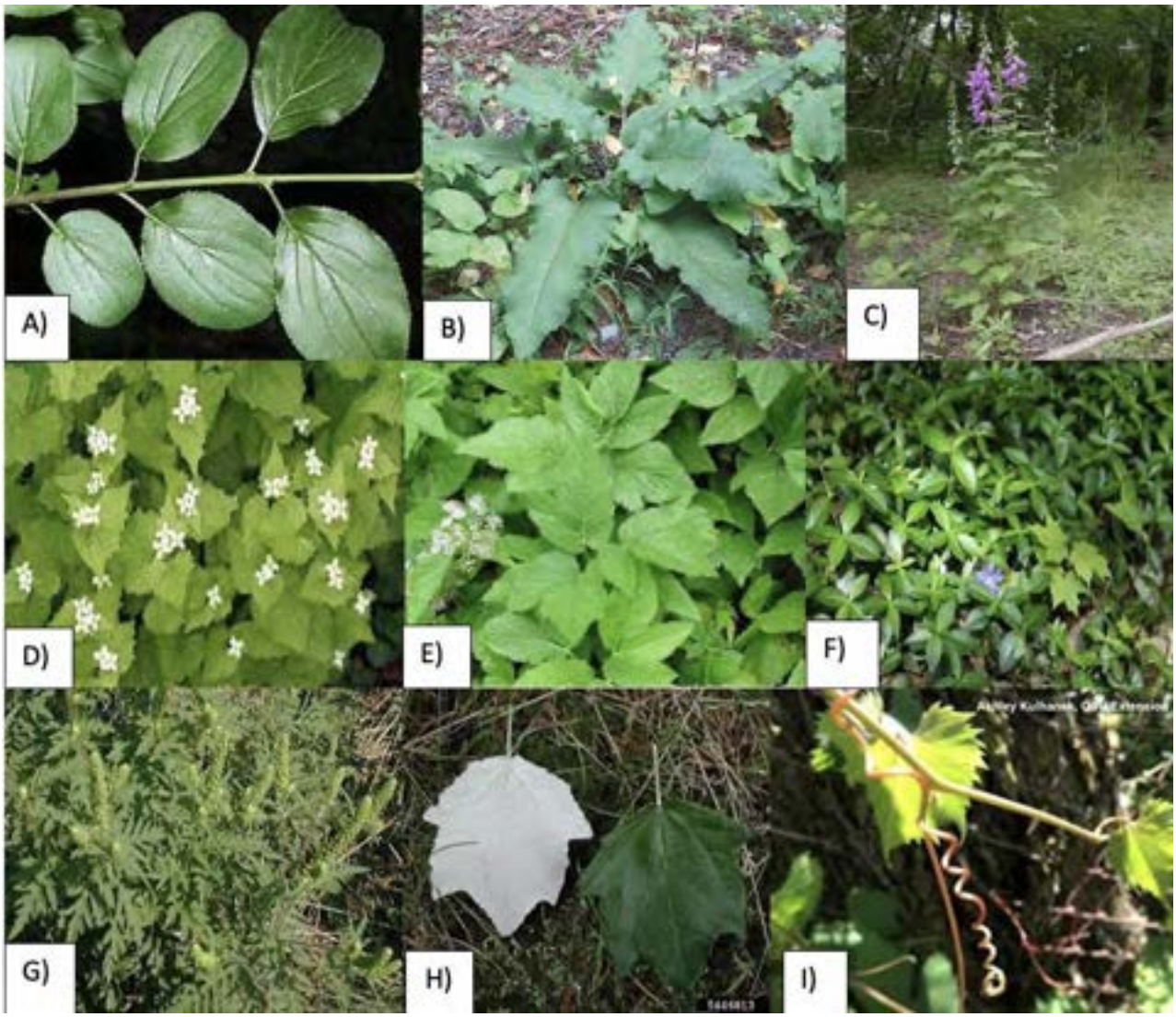


Figure 1. A) Buckthorn (*Rhamnus cathartica)*, retrieved from: https://fmr.org/updates/conservation/buckthorn-how-can-shrub-be-so-harmful, B) Burdock (*Arctium)*, retrieved from: https://northernwoodlands.org/knots_and_bolts/burdock, C) Creeping bellflower (*Campanula rapunculoides)*, retrieved from: https://www.minnesotawildflowers.info/flower/creeping-bellflower, D) Garlic mustard (*Alliaria petiolata)*, retrieved from: https://www.adirondackalmanack.com/2021/05/when-it-comes-to-garlic-mustard-doing-less-is-more.html, E) Goutweed (*Aegopodium podagraria)*, retrieved from: https://gobotany.nativeplanttrust.org/species/aegopodium/podagraria/, F) Periwinkle (*Catharanthus roseus)*, retrieved from: https://www.ontarioparks.com/documents/content/10/203, G) Ragweed (*Ambrosia artemisiifolia)*, retrieved from: https://www.illinoiswildflowers.info/weeds/plants/cm_ragweed.htm, H) White poplar (*Populus alba*), retrieved from: https://www.vtinvasives.org/invasive/white-poplar, I) Wild grapevine (*Vitis)*, retrieved from: https://bygl.osu.edu/node/1612.

**Data collection and analysis**

Using Google Earth, the perimeters of both parks were outlined (see Figure 4 and Figure 15 in Appendix). A grid was developed to divide the parks into even sectors. For Ernie Calcutt Park, each sector represented an area of the park of approximately 20 m x 25 m (see Figure 5 in Appendix), for a total of 25 sectors. For Marble Park, which has 11 sectors in total, each sector represented a 35 m x 40 m area (see Figure 16 in Appendix). Using Google Earth, individual maps for each invasive plant species were created using personal observations taken in the parks (see Figures 6-14 and Figures 17-23 in Appendix). The maps display both the location and size of areas where the different invasive species have been observed at each park. The observations of each species were further corroborated by a local biologist and are represented by different colors on the maps. For both parks, the individual maps were combined to produce a map containing all the invasive species present (see Figures 2 and 3 in Appendix).

# Results

## Invasive species of Ernie Calcutt Park


Figure 2. Map of all invasive plant species in Ernie Calcutt Park. Refer to Appendix for individual maps of each invasive species.

Ernie Calcutt Park was found to contain at least 9 observable invasive plant species. These include buckthorn (*Rhamnus cathartica)*, burdock (*Arctium*), garlic mustard (*Alliaria petiolata*), goutweed (*Aegopodium podagraria)*, periwinkle (*Catharanthus roseus*), ragweed (*Ambrosia artemisiifolia)*, white poplar (*Populus alba)*, and wild grapevine (*Vitis)*. Periwinkle and goutweed were unique to Ernie Calcutt Park.

**Invasive species of Marble Park**


Figure 3. Map of all invasive species in Marble Park. Refer to Appendix for individual maps of each invasive species.

Marble Park was found to contain at least 7 observable invasive plant species. These include buckthorn (*Rhamnus cathartica*), burdock (*Arctium*), creeping bellflower (*Campanula rapunculoides)*, garlic mustard (*Alliaria petiolata)*, ragweed (*Ambrosia artemisiifolia)*, and wild grapevine (*Vitis)*.

## Discussion

### Ernie Calcutt Park

The map of Ernie Calcutt Park (Figure 2) shows that most of the park is infested with invasive plant species. It was observed that wild grapevine (*Vitis*) and buckthorn (*Rhamnus cathartica*) possess the largest infestations (See Figures 6 and 14 in Appendix). In contrast, creeping bellflower (*Campanula rapunculoides)* was observed to have the smallest infestation at the park (See Figure 13 in Appendix). Some species, like burdock and white poplar, had individual growths scattered throughout the park (See Figures 10 and 11 in Appendix). Other species, such as periwinkle and goutweed, had larger and more clustered concentrations (See Figures 8 and 9 in Appendix). The size and locations of these clustered concentrations could indicate that they were either introduced intentionally by an individual with good intentions, or accidentally by an expanding backyard garden. Most of the invasive species were observed along the tree line of the park, in areas that typically receive direct sunlight. Ragweed, however, was typically observed in open grass areas, away from the larger tree and plant species (See Figure 12 in Appendix). The presence of these invasive species was found to decrease towards the center of the forested portion of the park. This could be due to the increasing presence of larger native trees and the development of a thicker overhead canopy.

### Marble Park

The map of Marble Park (Figure 3) shows that a moderate portion of the park is infested with invasive plant species. Due to the density of the forested areas, only species located along the small natural paths of the park were observed. This does not, however, indicate that the unobserved areas do not contain the invasive species. Along the paths, buckthorn (*Rhamnus cathartica*) and

burdock (*Arctium*) were found to possess the largest infestations (See Figures 17 and 19 in Appendix), while white poplar (*Populus alba)* was observed to have the smallest infestation (See Figure 20 in Appendix). Some species, like burdock and ragweed, had individual growths scattered throughout the paths (See Figures 17 and 21 in Appendix). While other species, such as buckthorn and garlic mustard, had larger and more clustered infestations (see Figures 17 and 18 in Appendix). Marble Park has been observed to contain a larger percentage of forested area than Ernie Calcutt Park. This has caused more of the invasive species to be found along the paths of the forested area, rather than along the outer tree lines. The paths have also created breaks in the overhead canopy that permit limited sunlight to hit the path and may have led to the greater growth of the smaller localized infestations. Based on the number of species found along these paths, additional signage that encourages people to check their boots and clothes before entering and after leaving the park may be warranted.

**Methods for Control**

For the control of buckthorn (*Rhamnus cathartica)*, the article "Invasive Common (European) Buckthorn Best Management Practices" mentions that seedlings and saplings up to 1 m in height can be pulled or dug out. Trees above breast height can be cut to the stump and smothered to eliminate the access to sunlight and eventually cause the remaining stump to die out. Care should be taken to remove branches containing berries and protective equipment, such as gloves and safety glasses, should be worn when handling buckthorn. Continual maintenance and monitoring are also crucial for ensuring that infestations are remain under control. Professionals may use herbicides (glyphosate or triclopyr) or prescribed burning techniques; however, these are not recommended for use in local parks (Weber, 2017).

The article “Invasive plants at the FWG – OFNC” identifies that burdock (*Arctium*) can be controlled by cutting back first year growths and digging out the underlying root system. New plants can grow if any roots are left in the ground. The removal of flower heads on second year growths are also considered an effective method for management, however, monitoring is required are these buds can regrow. Additionally, the burrs growing on second year plants are difficult to remove but, when properly bagged and disposed, are effective for controlling the spread of burdock. Although not recommended for use in local communities, burdock is considered susceptible to chemical management using herbicides such as atrazine and silvex; however, it has demonstrated a resistance to herbicides such as monuron-TCA. A stem borer has also been noted as an option to attack burdock. The use of this borer can lead to reductions in branches and delayed flowering; however, it does not affect the seed yield of the species (Gross et al., 1980).

Based on the article “How to get rid of Campanula (Creeping Bellflower)”, creeping bellflower (*Campanula rapunculoides)* can effectively be controlled by digging or pulling out the plant and removing as much of the root system as possible. The roots of this species can be quite deep, making it much easier to remove when the soil is wet. Due to this, new sprouts are easiest to remove as their root systems have not yet fully developed and reached those lower depths. In addition to pulling, the flowers and seed heads should be cut off to prevent self-seeding. All removed plants must be discarded in garbage bins and not composted, as this will sprout new infestations. Like the other invasive species, the repeated spraying (3-4 times during a growing season) of herbicides can also be used to control an infestation, however, other mitigation methods should be attempted first and can be equally as effective (Mitich and Nalewaja, 1978).

The regulation of garlic mustard (*Alliaria petiolata*), as identified in the article "Garlic Mustard", is difficult once it becomes established. Seeds can remain viable in the soil for at least 5 years. The best solution is to prevent seed production and exhaust the seed concentrations in the soil. Individual garlic mustard plants can be pulled out; however, the entire root system must be removed as root fragments are able to resprout. For larger populations, stems can be cut at ground level and smothered. All removed plants should be discarded in garbage bins. They should not be composted or discarded in natural areas. In some cases, herbicides (glyphosate) can be applied. For the herbicide to be effective, it must be applied in late fall or early spring. Professionally prescribed burning can also be an option; however, the burning must be conducted for three to five consecutive years to discourage the germination of stored seeds. The use of fire is typically not recommended in local parks (Weber, 2017).

The article "How to Remove Goutweed" describes that goutweed (*Aegopodium podagraria*) can be effectively controlled by pulling or digging out the smaller infestations. A shovel or hand trowel can be used to uproot the plant. The medium and larger infestations can typically be controlled by smothering. This involves cutting the plant down to ground level and covering the area with a heavy, dark colored plastic or carboard. For these larger infestations, solarizing can is also a technique than can be used; this involves cutting the plant down to the ground and saturating the area with water. This area is then covered by a heavy plastic to trap the heat and 'cook' the goutweed. As a final option, the application of herbicides can effectively kill the entire plant (Gundlach and Robinson, 2009).

The removal of periwinkle (*Catharanthus roseus* or *Vinca minor)* can be considered a challenge. The article "Removing invasive periwinkle" indicates that established plants can be removed with a rake or gardening fork when the soil is moist. When digging, ensure the entire root is removed to prevent resprouting. Properly dispose of the removed plants in garbage bins to prevent potential regrowth. The application of herbicides (glyphosate or triclopyr) can also be effective but should only be considered if all other methods are ineffective. These herbicides must also be used for successive years or resprouting of stored seeds will occur (Gundlach and Robinson, 2009).

To eradicate ragweed (*Ambrosia artemisiifolia)* infestations, mowing twice a year is considered a strong method to reduce plant vitality and seed production. However, the mowing must be conducted consistently, as a single mow is found to be inefficient. The cut plants that are collected through mowing should be disposed in garbage bins to avoid regrowth. In some cases, control strategies can incorporate the use of herbicides (glyphosate or glufosinate) between mows. Additionally, a promising alternative was accidentally discovered in Japan and China in the 1980s that utilizes the ragweed leaf beetle (*Ophraella communa*) as a form of biocontrol (Weber, 2017). This could, however, potentially create future issues with growing ragweed leaf beetle populations and decreasing ragweed infestations.

The article "White Poplar" describes that white poplar (*Populus alba)* populations can be best controlled by pulling or digging the seedlings and saplings following a rain event, when the soil is loose. This can ensure that as much of the root system is removed as possible to prevent resprouting. Larger white poplar trees can be cut at ground level and smothered. Girdling stems

followed by the application of chemical management (glyphosate or triclopyr) practices can also be considered a potential option. (Weber, 2017).

To control the aggressive nature of wild grapevine (*Vitis*), the article "Cut Your Grapevines!!!!" identifies that lopping shears, brush axes, or handsaws can be used to sever the vine in different places. When severing the vine, pull to remove the portion of the vine not attached to the ground. For the portions that are still attached to the ground, cut again just above the ground-line and remove the excess vines. Natural and artificial shading of the vines can also be used to kill off strands but may be difficult to execute on larger concentrations. Once cut, the vines should be disposed in garbage bins to avoid regrowth. Continual monitoring and management should be implemented as just one uncut vine can quickly spread into surrounding trees and restart the infestation. In addition, colder seasons are typically considered the best for grapevine removal as growth is stalled and the vine strands are easier to see (Smith and Lamson, 1986). Lastly, in some scenarios, chemical management can be used, but fully formed vines would still dominate the infested area.

Overall, although each species identified herbicides as an effective method for control, they should only be used if all other management strategies fail. The listed herbicides should only be handled and applied by trained professionals in predetermined situations. On this account, the use of chemical management within local communities is not recommended. When attempting to control or remove invasive species, additional considerations, such as underlying infrastructure and human interference, should be also considered. The underlying infrastructure includes city sewer systems and a variety of inlet and outlet pipes. These systems are found to interact to some

extent with both Ernie Calcutt and Marble Park (See Figures 24 and 25 in Appendix). Potential issues could occur when lingering toxins are left behind if herbicides are used; the runoff of these toxins could lead to water contamination issues within the local community. Prolonged exposure to the toxins could potentially also lead to negative health effects. Regarding human interference, most removal projects require time to complete. During these required timings, outside interference with the removal processes could impact the results and lead to additional complications. Based on these factors, it is strongly encouraged for residents to be informed and aware of removal efforts occurring in their community.

## Conclusion

The goal of this study was to investigate the different invasive species found in Ernie Calcutt Park and Marble Park to raise awareness and develop potential strategies for safe and effective removal. This was accomplished by mapping the different invasive species inhabiting the two parks and researching potential safe removal and control methods. Based on the maps, both parks were found to possess of a variety of invasive plant species. The infestations of these species range in both size and location within each park. Safe management and disposal methods that can be used effectively by members of the community were presented for each species identified at the parks These methods range from pulling and digging, to smothering and solarizing. Herbicides are also presented as potential option but are not recommended when other effective and less intrusive methods exist. Overall, through the identification and implementation of these effective control methods, people can be better prepared to manage and mitigate the spread of invasive plant species within their local communities.

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## Appendix

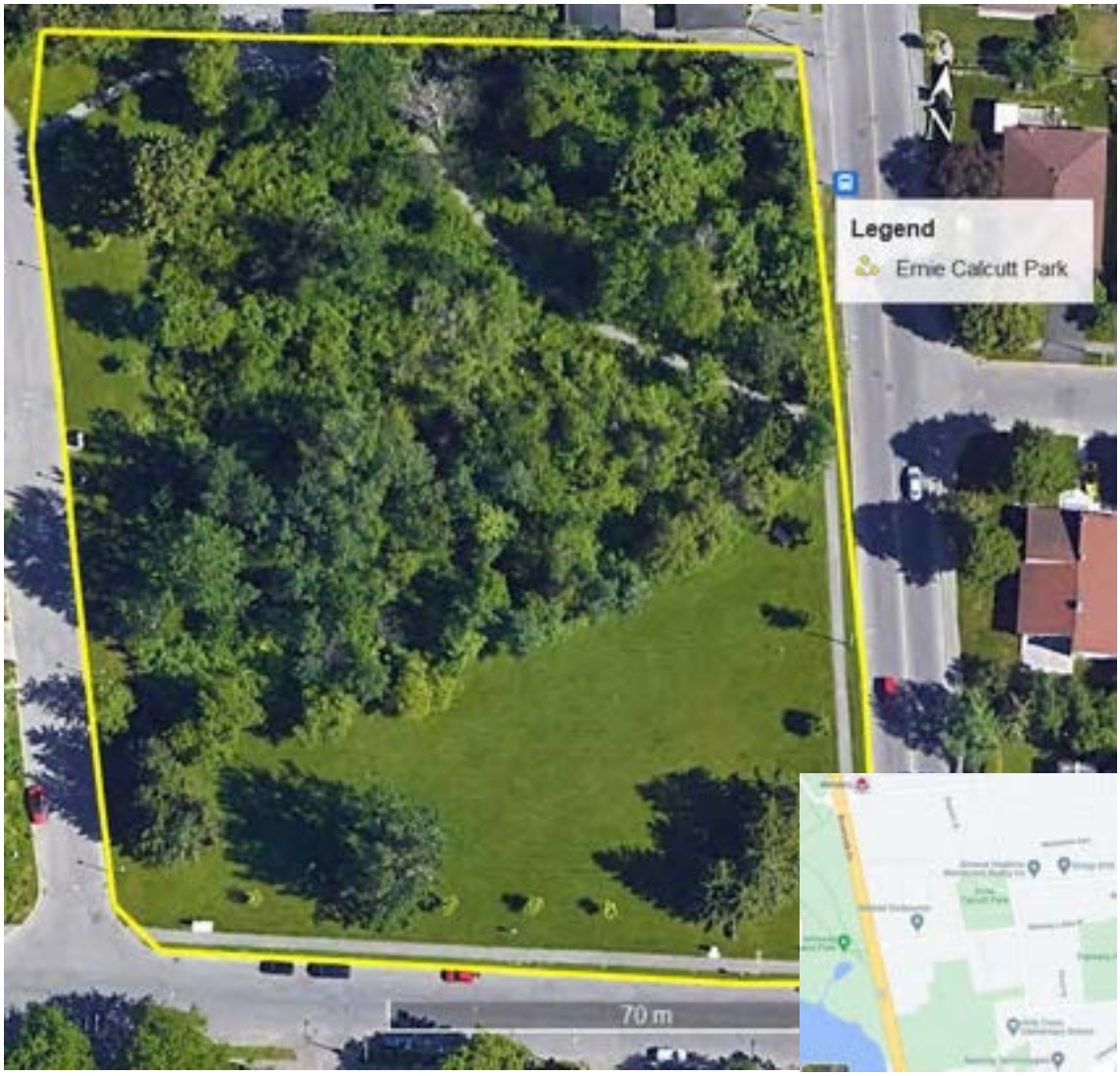


Figure 4. Map of Ernie Calcutt Park.

Figure 5. Grid Map of Ernie Calcutt Park.

Figure 6. Map of buckthorn in Ernie Calcutt Park.

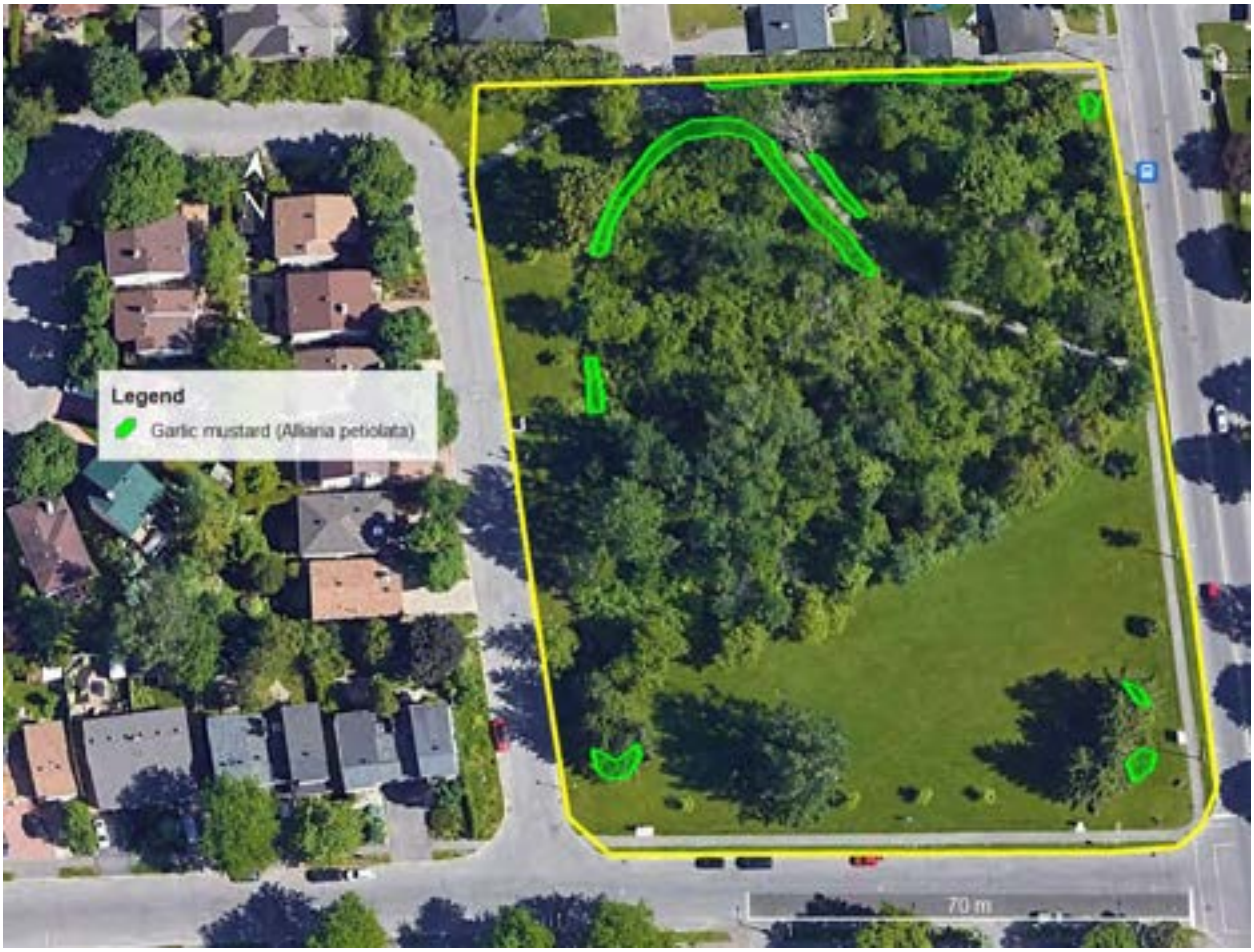

Figure 7. Map of garlic mustard in Ernie Calcutt Park.

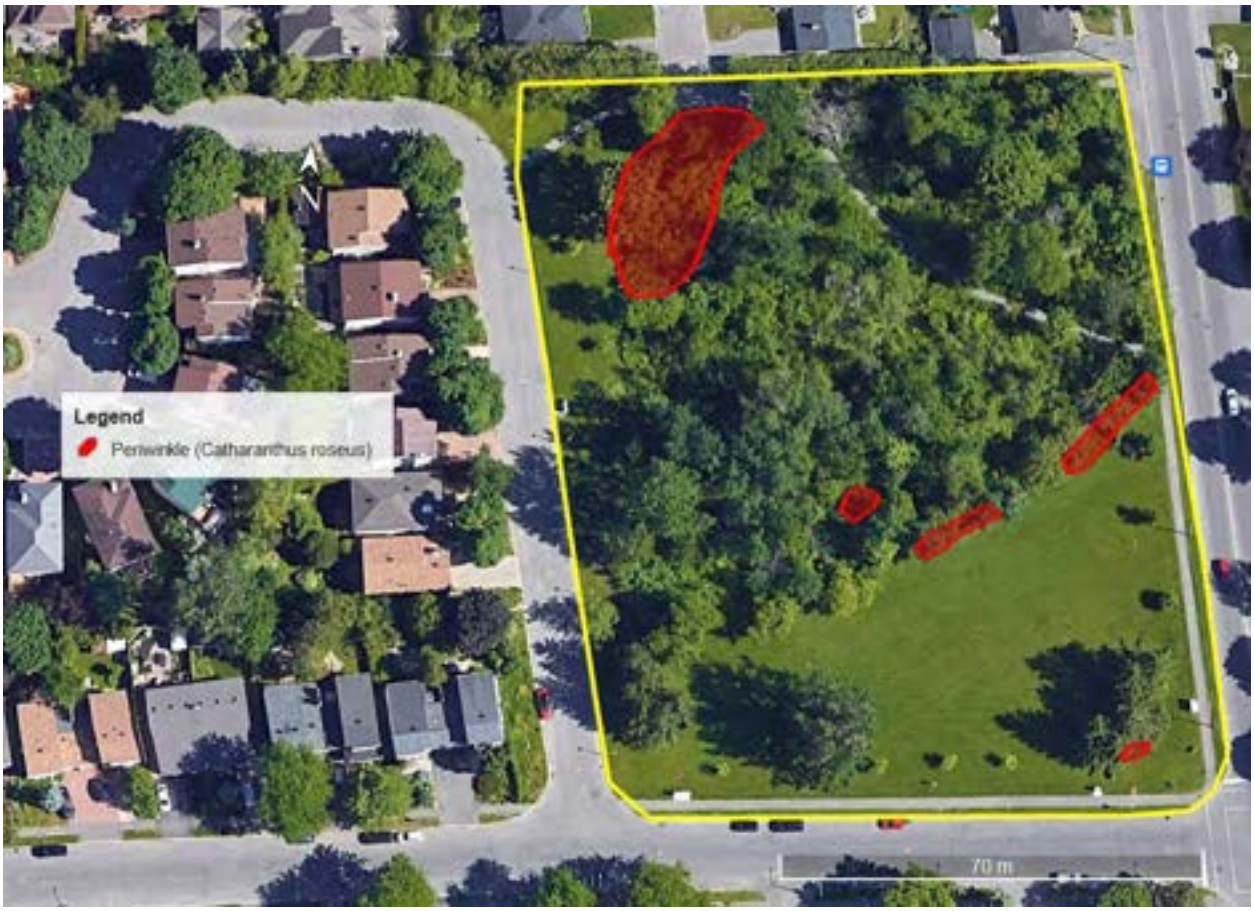

Figure 8. Map of periwinkle in Ernie Calcutt Park.

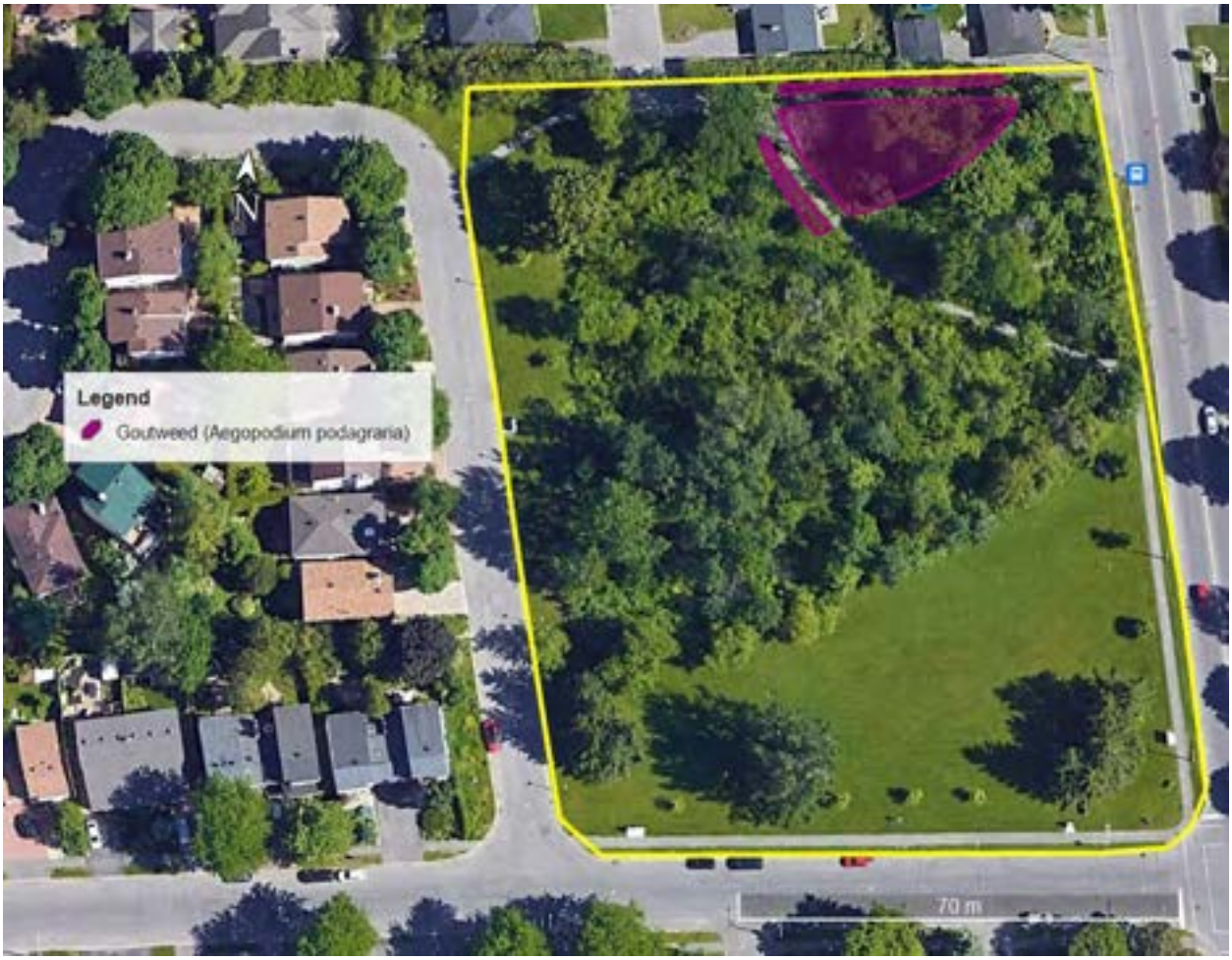

Figure 9. Map of goutweed in Ernie Calcutt Park.

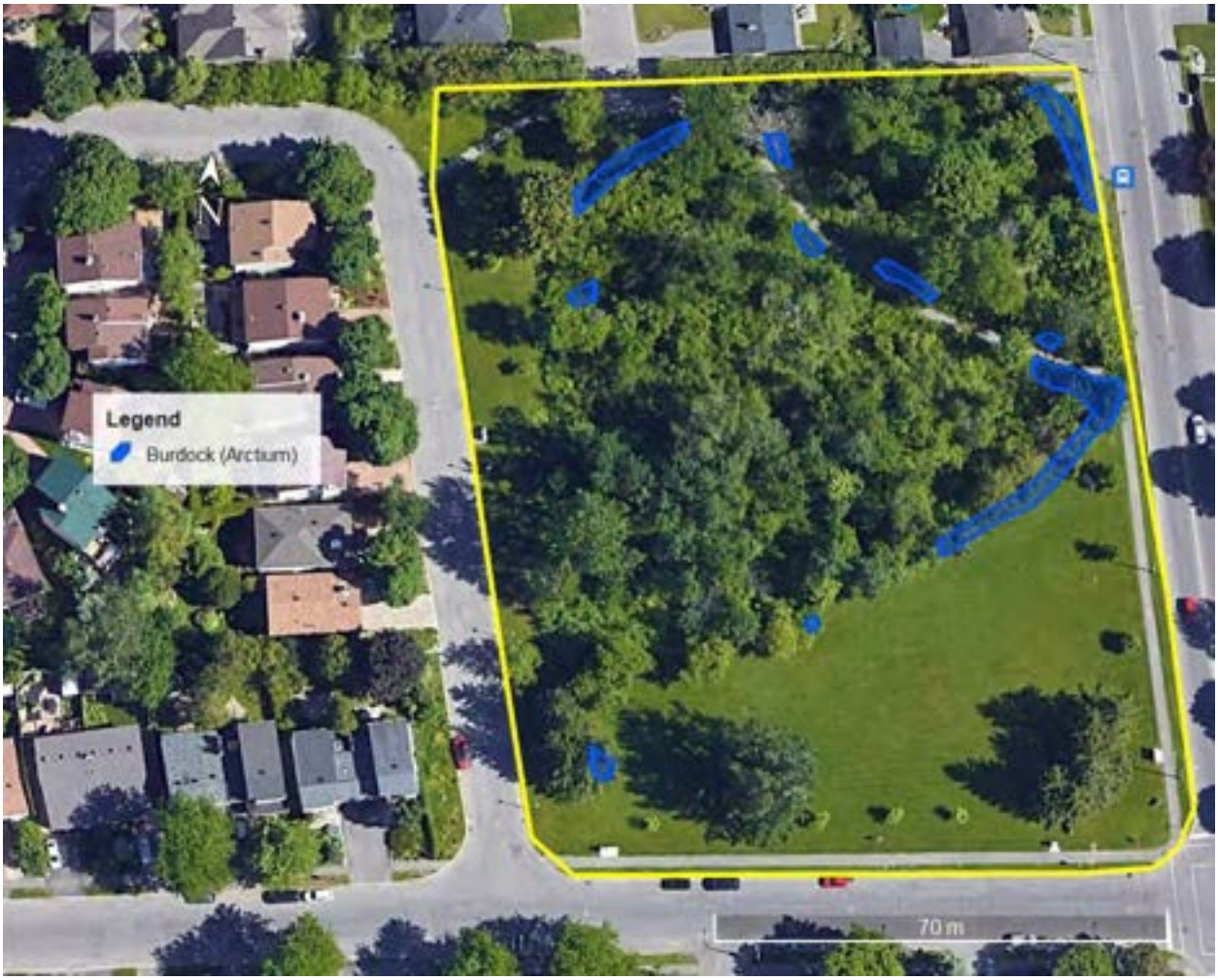

Figure 10. Map of burdock in Ernie Calcutt Park.

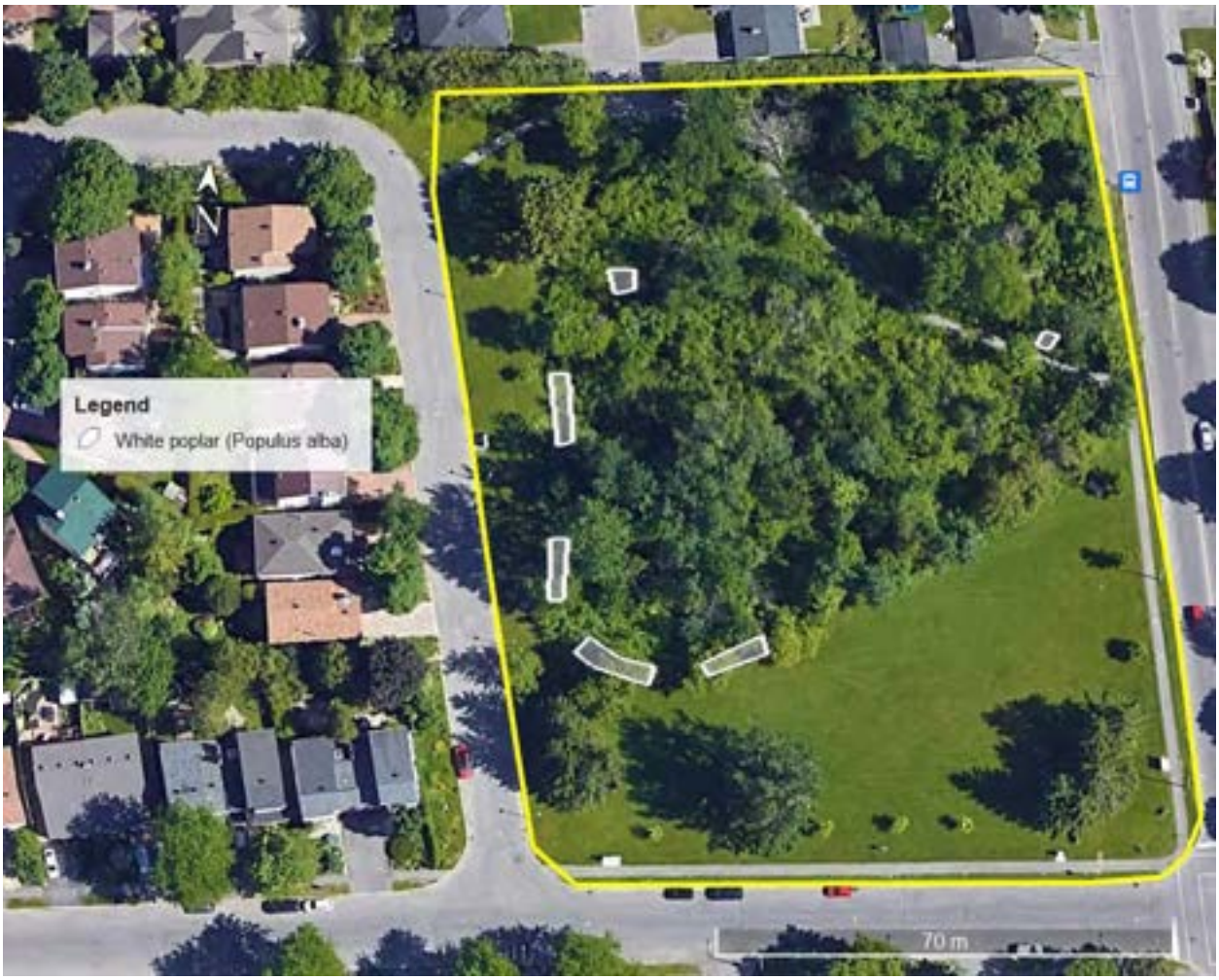

Figure 11. Map of white poplar in Ernie Calcutt Park.

Figure 12. Map of ragweed in Ernie Calcutt Park.

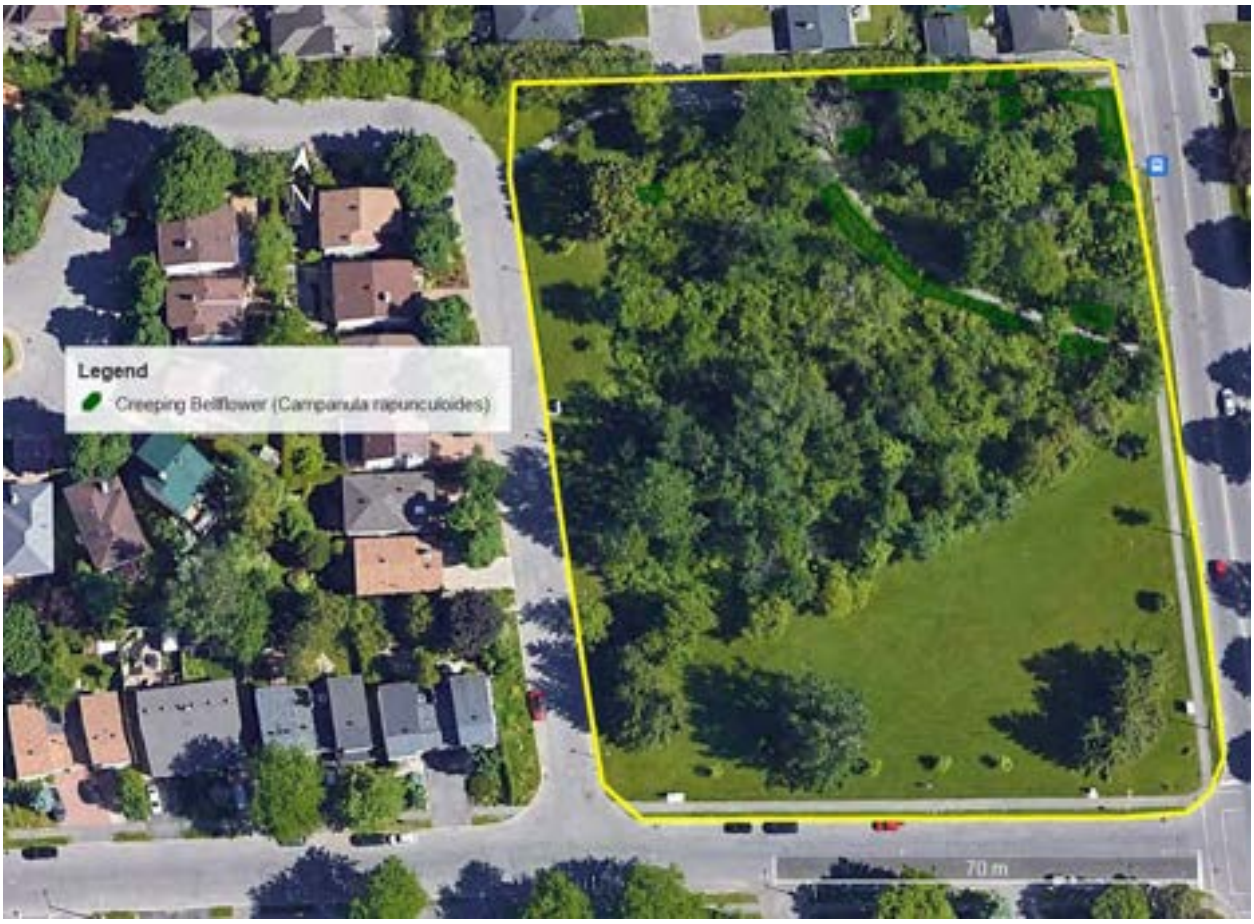

Figure 13. Map of creeping bellflower in Ernie Calcutt Park.

Figure 14. Map of wild grapevine in Ernie Calcutt Park.

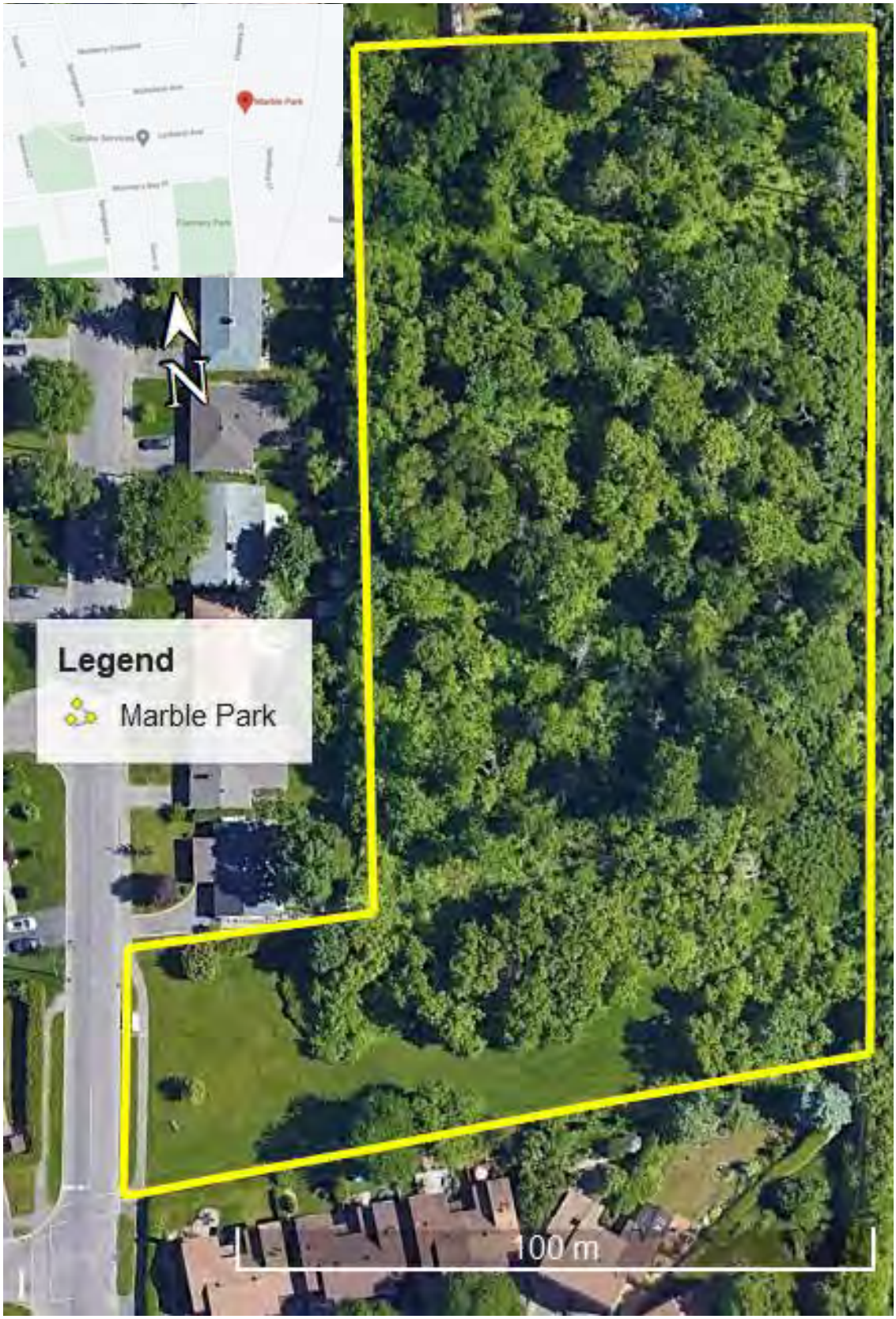

Figure 15. Map of Marble Park.

Figure 16. Grid map of Marble Park.

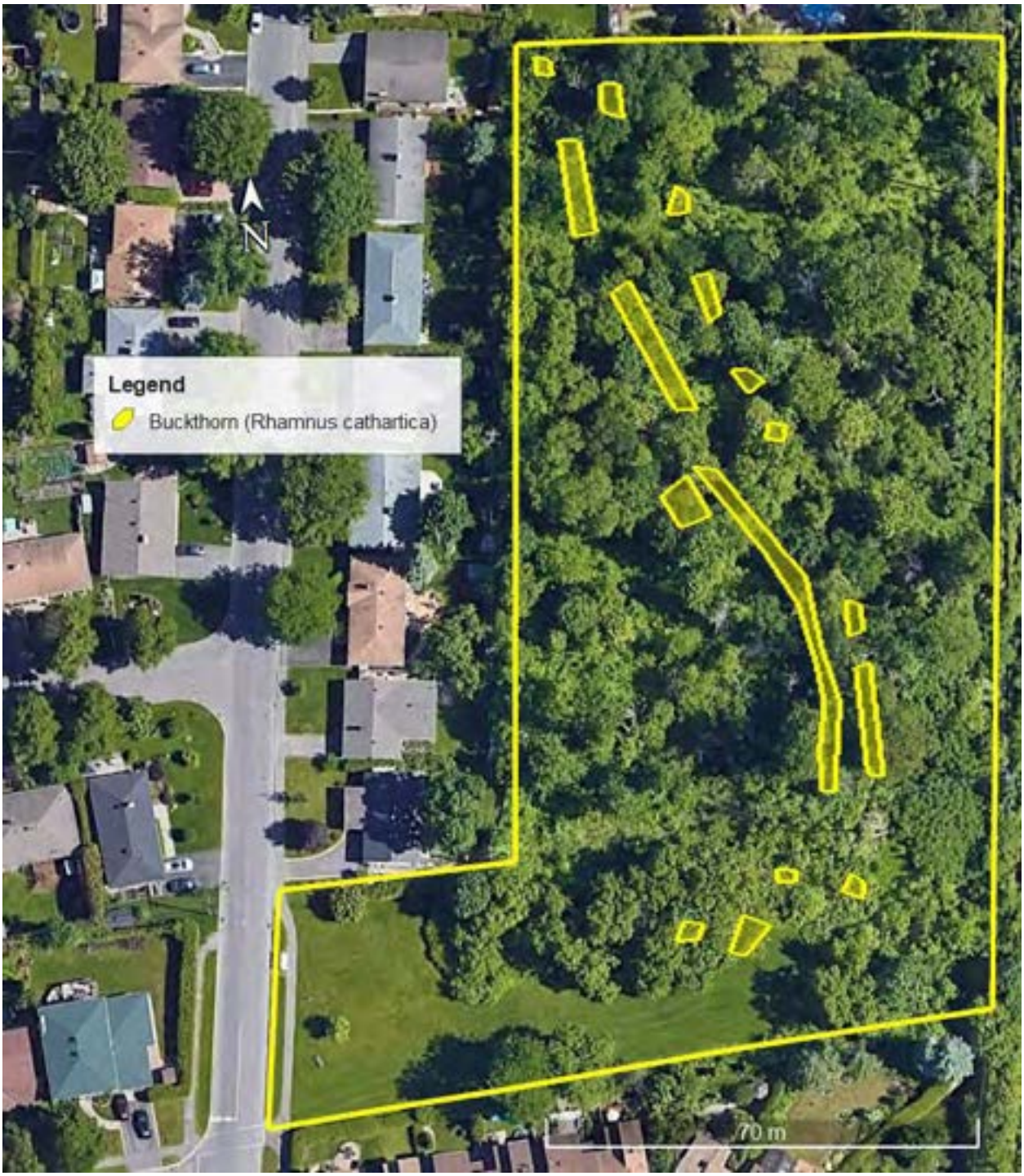

Figure 17. Map of buckthorn in Marble Park.

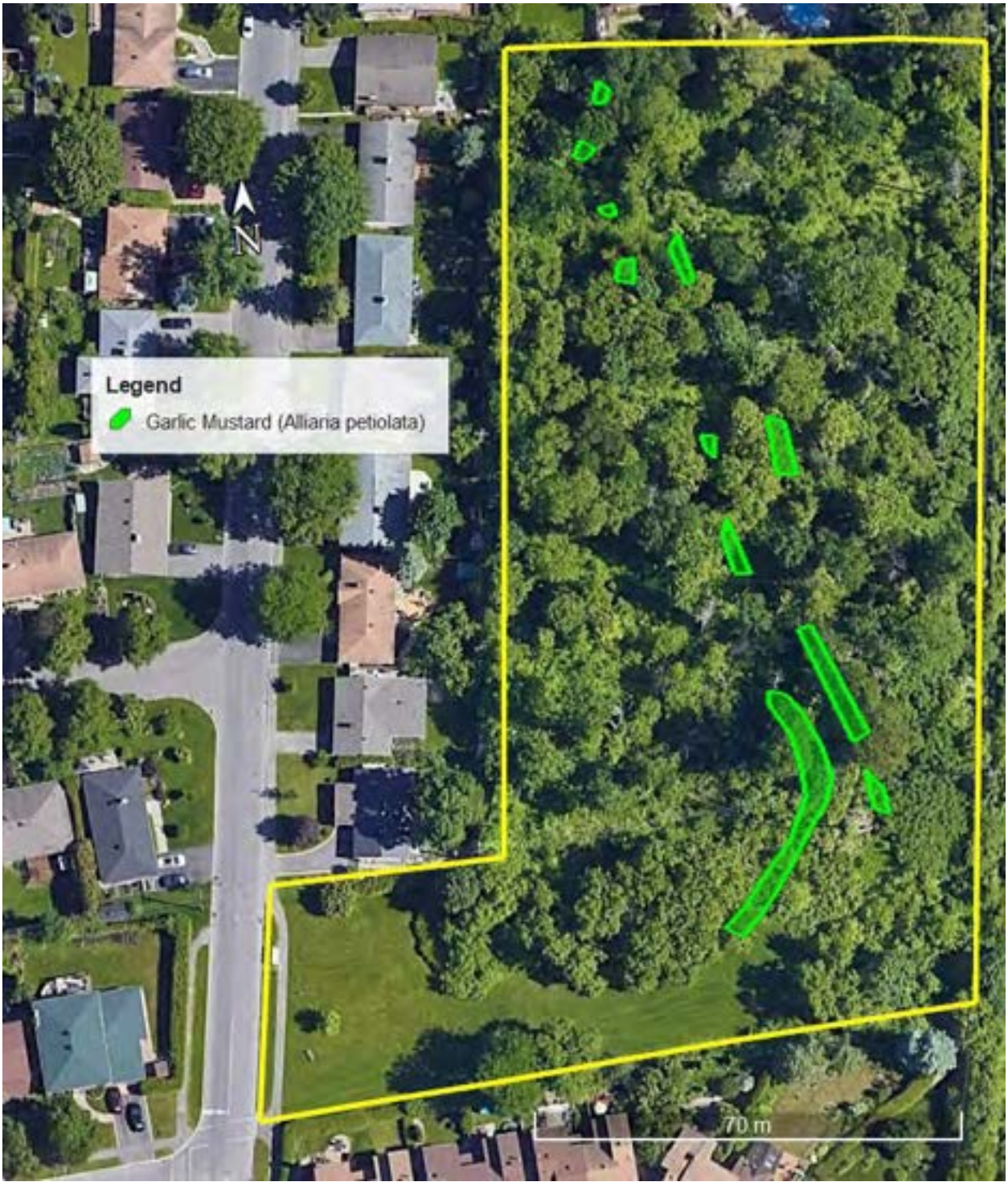

Figure 18. Map of garlic mustard in Marble Park.

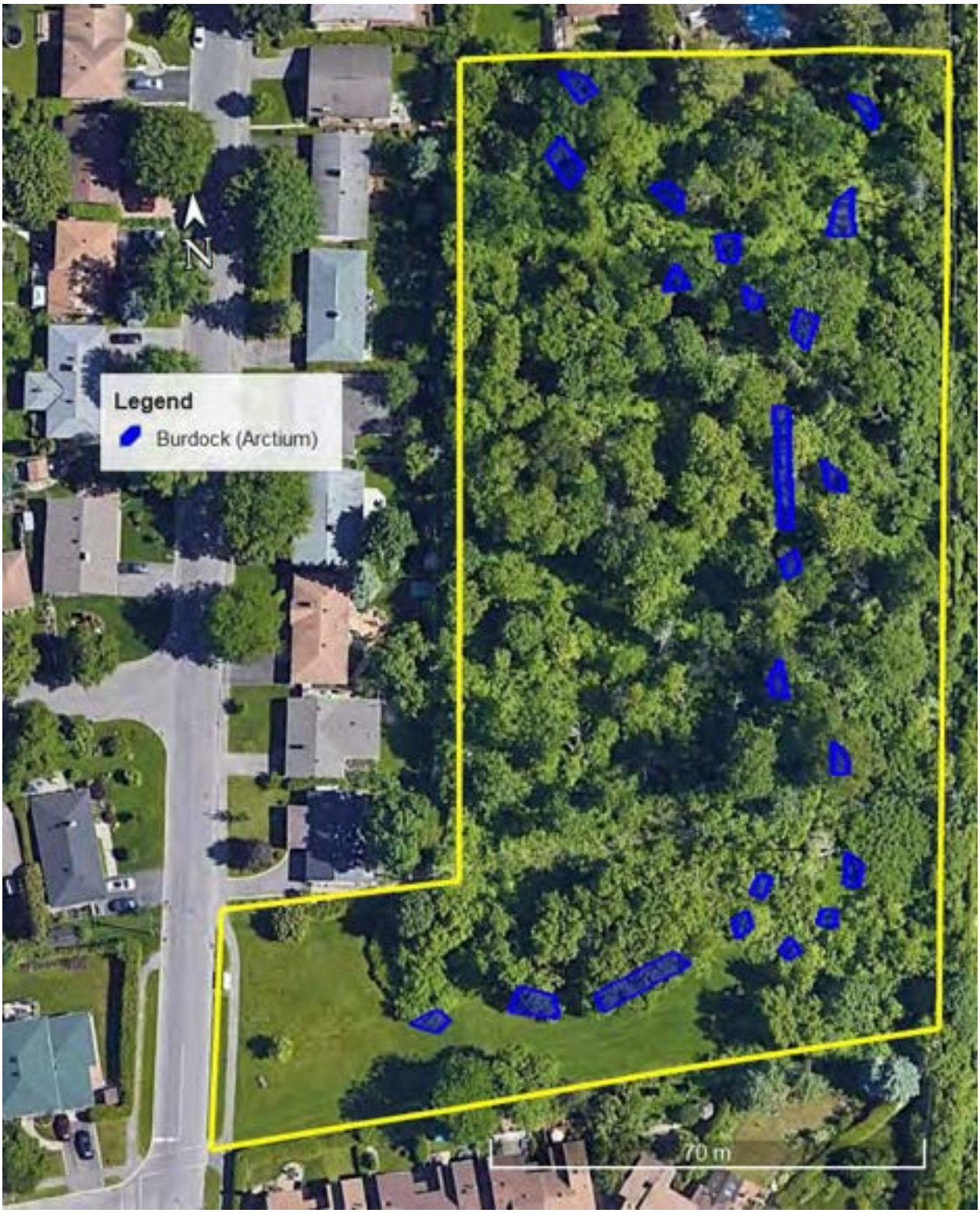

Figure 19. Map of burdock in Marble Park.

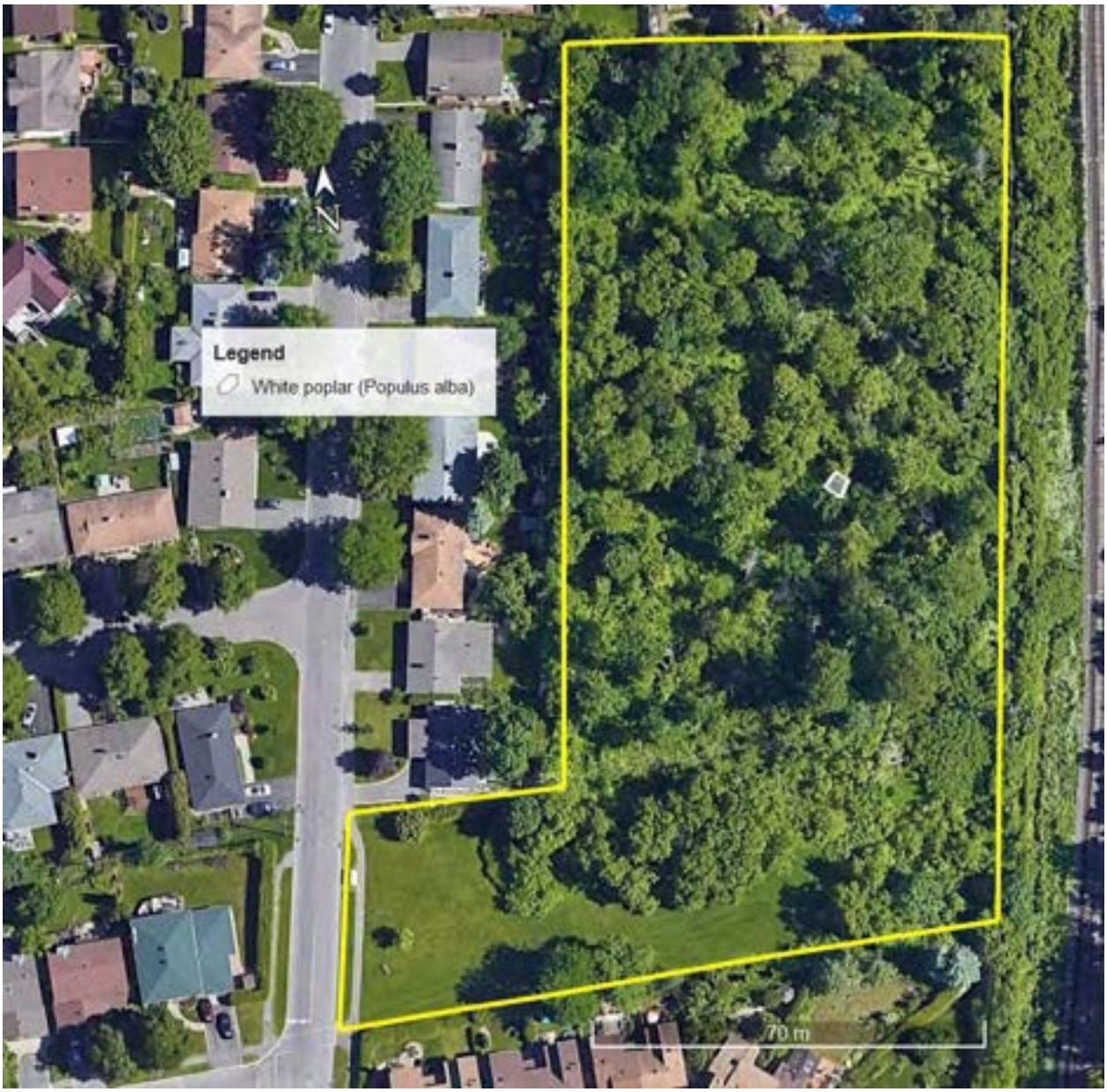

Figure 20. Map of white poplar in Marble Park.

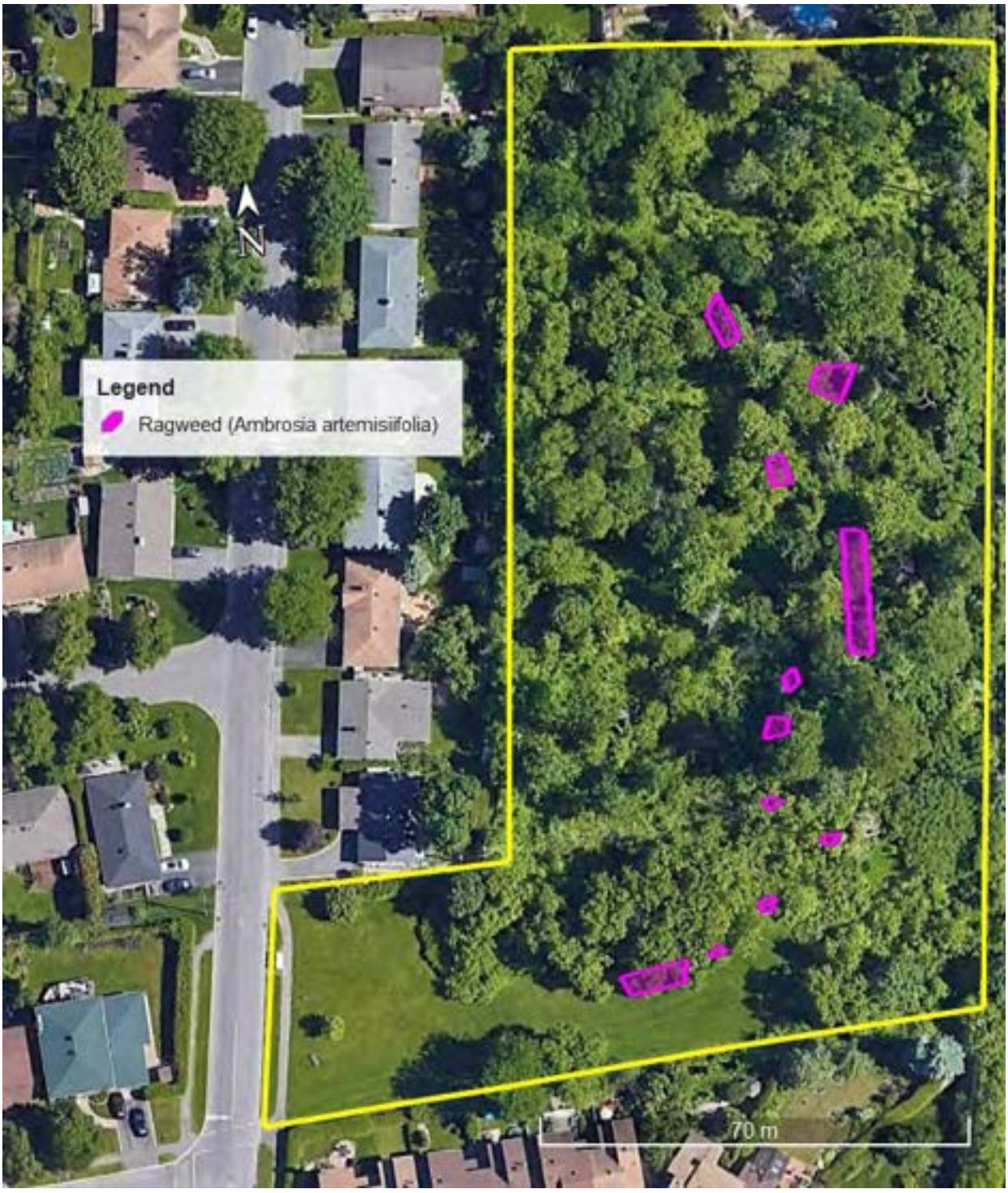

Figure 21. Map of ragweed in Marble Park.

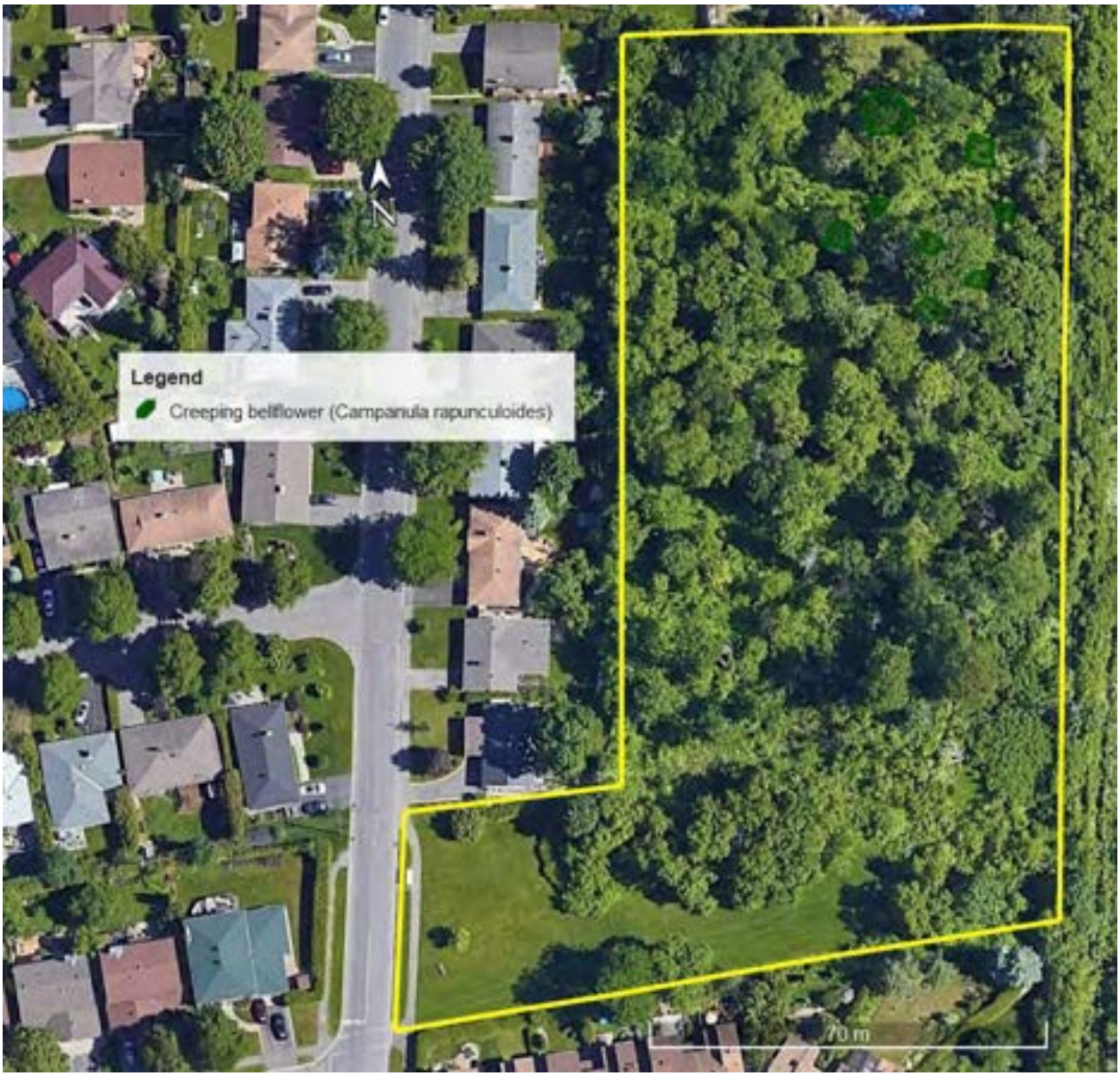

Figure 22. Map of creeping bellflower in Marble Park.

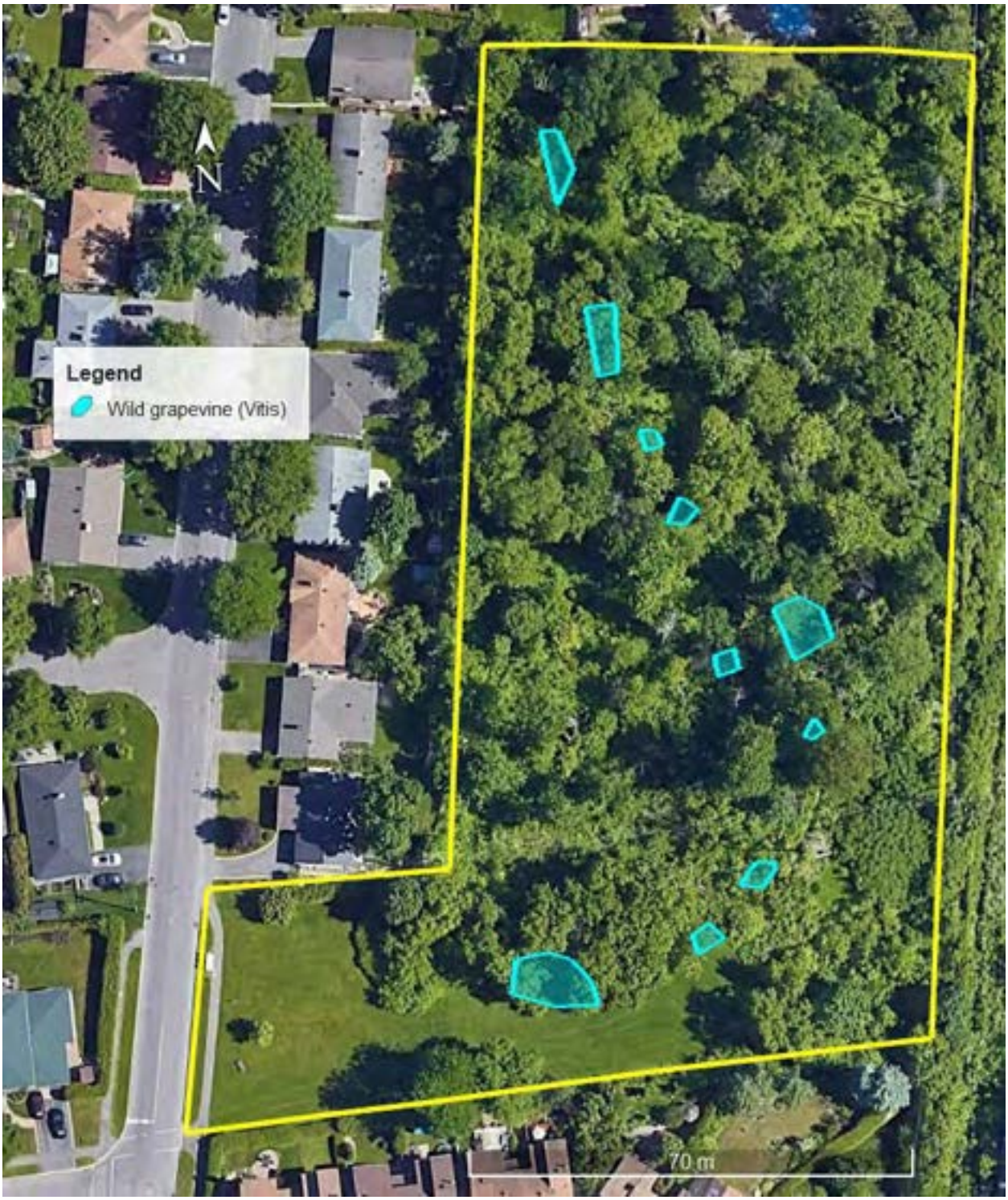

Figure 23. Map of wild grapevine in Marble Park.

Figure 24. Map of water and wastewater infrastructure surrounding Ernie Calcutt Park.

Figure 25. Map of water and wastewater infrastructure surrounding Marble Park.