FY 2019 Non-native Plant Management Report for Travis County-managed Tracts of the Balcones Canyonlands Preserve



Nandinda domestica. Photo by Julie Murray

Travis County
Department of Transportation and Natural Resources
Natural Resources and Environmental Quality Division

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Non-Native Plants on the Travis County BCP

The Balcones Canyonlands Preserve (BCP) was created in May 1996 to protect the endangered golden-cheeked warbler (*Setophaga chrysoparia*, GCWA) and seven other federally endangered species. The City of Austin, Travis County, The Nature Conservancy, Travis Audubon Society and other partners have protected 32,302 acres of primarily mature oak-juniper (*Quercus-Juniperus*) woodlands from loss to development, but the protected lands still face the threat of biological invasion, second only to habitat destruction in its contribution to biodiversity loss (Keane and Crawley, 2002). The primary invaders of the BCP are feral hogs (*Sus scrofa*), red imported fire ants (*Solenopsus invicta*) and, the focus of this report, non-native plants.

When non-native plant species invade, they tend to grow more vigorously, reproduce more quickly and live longer than native plant species (Willis and Blossey, 1999). Upon introduction to an exotic region, invading plants don't experience the same pressure from herbivory when compared to the local species (Keane and Crawley, 2002). Local herbivores that have developed resistance to the chemical defenses of native plants help to limit the distribution and abundance of native plants. White-tailed deer (*Odocoileus virginianus*) are the largest herbivore in the region and have been shown to prefer native plants to exotic (McShae, 2012). The suppression of native plants by herbivory coupled with the lack of herbivory on non-native species lends the competitive advantage to the invaders. As non-native plant species proliferate, declines in biodiversity among native plants and pollinators have been detected (Hudson *et al*., 2013; Vitousek *et al*., 1997). This phenomenon was also observed in a recent study that showed insectivorous birds prefer areas dominated by native plants and bird abundance declined as non-native plants species abundance increased (Narango *et al*., 2017). A study of pollinator response to Chinese privet (*Ligustrum sinense*) found reduced abundance of bees and butterflies in plots infested with the non-native plant when compared to plots where non-native plants had been removed or did not occur (Hudson et al., 2013). Considering that approximately one third of the diet of GCWA is Lepidopteran larvae and other pollinator insects (Pulich, 1976; Quinn, 2000), areas that become infested with non-native plants could provide diminished foraging opportunities for GCWA.

Vitousek *et al.* (1997) estimated that nearly 10% of the plant species in Texas are established aliens. While such an estimate would be an exaggeration of the non-native plant composition found on the BCP, the threat to the biodiversity of the limited GCWA habitat available is problematic. Studies have shown that a diverse composition of tree species is important to GCWA foraging success (Smith-Hicks, *et al*., 2016).

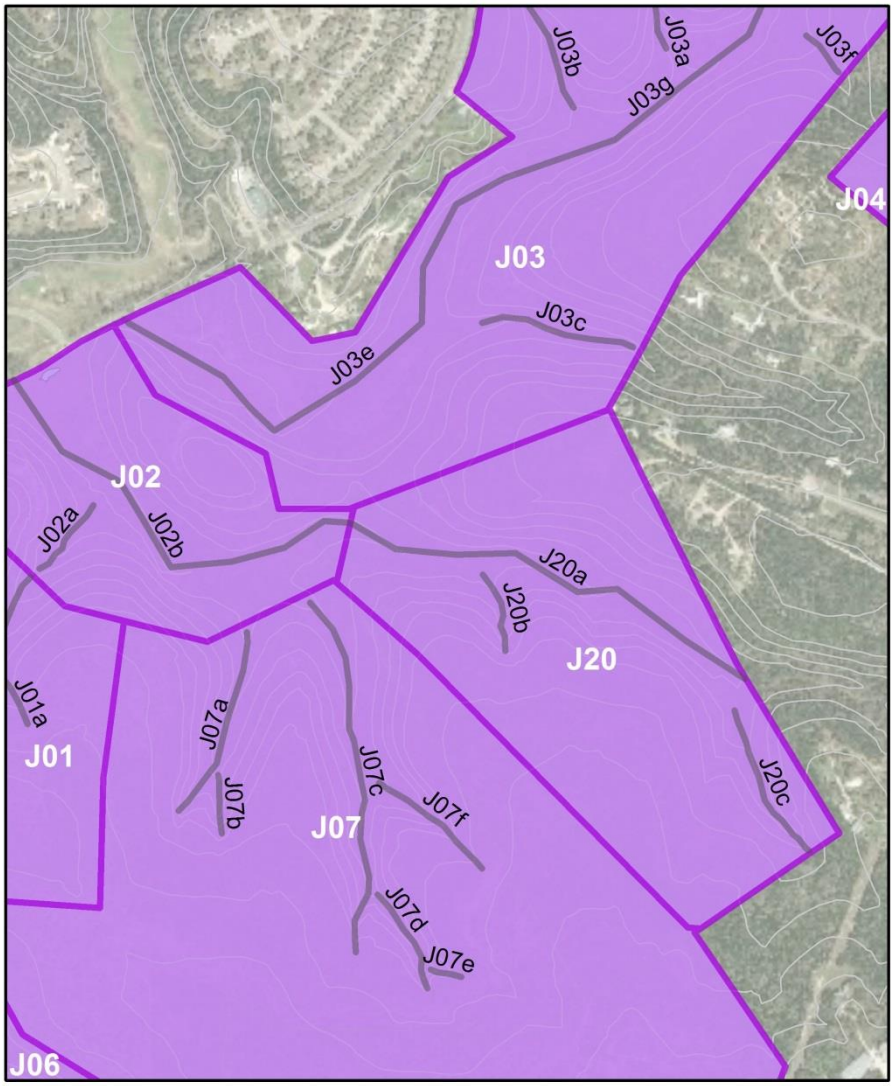
Compounded by lagging hardwood regeneration rates (Russell and Fowler, 1999), prime foraging habitat for the GCWA is at a premium.

Areas most impacted by non-native plants are those near the wildland-urban interface (WUI) and in riparian areas. The Travis County-managed BCP shares more than 140 miles of perimeter boundary with primarily single-family residential units that back up to the preserve. Most of the development occurs in the uplands on the tops of ridges with the majority of the preserve land comprising the canyons below. Invasive, non-native plants used for landscaping in residential and commercial areas spread into the preserve using sexual reproduction (dissemination of seeds) and/or vegetative reproduction (budding from parent). Many non-native plants produce abundant fruit which germinate near the parent tree. The parent trees attract birds which consume the fruit and deposit the seeds further in the preserve, sometimes at a great distance from the source. Some species, such as Japanese honeysuckle (*Lonicera japonica)* invade vegetatively by sending out stolons, or runners that take root as they extend from the parent plant. When non-native plants become established in the preserve, their seeds are often washed down drainages and into riparian areas found on the canyon bottoms. The rich soils and abundant water resources found in the riparian areas enable the exotics to thrive even during unfavorable weather conditions. As conditions become more favorable, the riparian areas serve as invasion corridors for rapid dispersal into the ecosystem (Stohlgren, et al., 1998).

Invasive Plant Management Strategy

With over 12,000 acres of preserve land to manage for invasive plants, there was a need to divide the treatment areas into manageable units in order to prioritize limited resources to the most impacted areas. Each management unit was divided into treatment plots based on topography and access. Within each treatment plot, each drainage and wildland urban interface segment was given a unique identifier (Figure 1). There are currently 463 segments identified. With these identifiers, the segments can be systematically searched and infestations can be located. Once an infested area is located, consistent treatment can begin. Initial efforts would be focused on the treatment of mature plants capable of bearing fruit. Once the seed producers are eliminated, efforts will shift to the removal of resprouts and seedlings until the seed bank is depleted. Following eradication, regular revisits, such as every 5 years, would be required to ensure no new invasive plants have become established.

Figure 1. Example of Invasive Plant Treatment Segments on Jollyville Unit



Treatment Methods

Travis County staff uses mechanical and/or chemical methods to treat invasive plants. Mechanical removal methods, such as hand-pulling or uprooting the plant utilizing WeedWrenchs™, hand weeders or spades, are employed whenever feasible. Mechanical methods account for approximately 40% of plants removed from the County-managed BCP. When mechanical methods are inadequate or impracticable, chemical treatment is used judiciously. County staff is licensed by the Texas Department of Agriculture to administer site-specific herbicides. Approximately 60% of the non-natives are treated using the "cut & treat" method where the stem or trunk of the plant is cut low to the ground using a chainsaw, hand saw, or loppers. The cut stumps are immediately painted with a site-appropriate herbicide. The "girdle & squirt" method is used on larger trees where felling is problematic. Through this method, the

circumference of the targeted plant is girdled as low to the ground as is practical using a hand saw or chainsaw and herbicide is immediately applied to the living tissue. The E-Z-Ject™ lance provides an additional treatment method for large diameter trees and for plants such as the common fig (*Ficus carica*) and paper mulberry (*Broussonetia papyrifera)* that secrete latex which can extrude liquid herbicide from wounds. The gravity-fed, spring-loaded lance delivers a cartridge of viscous herbicide under the bark of the tree for slow release. Cartridges are injected at intervals around the circumference of the trunk. This method is particularly useful in areas where felling is too labor-intensive and/or dangerous.



Cut & treat



Girdle & Squirt



E-Z-Ject™ Lance

The preferred herbicide for “cut & treat” and “girdle & squirt” methods is a 50% concentration of Garlon 3A (triclopyr) with surfactant. The herbicide is applied using a medicine dropper style applicator for precise application to minimize non-target impacts. Efficacy of treatment with Garlon 3A appears to be high, but can vary depending on factors such as the time of year of treatment, site conditions, or the individual characteristics of the plant. For example, chinaberry trees growing near a steady source of water tend to resprout from the roots more readily than trees in a more xeric area. Also, some large, multi-stemmed ligustrum trees seem to be resistant to treatment unless each stem can be completely girdled.

The E-Z-Ject™ cartridges contain a concentrated gel of imazapyr or glyphosate. Treatment with both herbicides is typically terminal when the cartridges are injected within no more than a few inches of each other around the diameter of the tree. Multi-trunked trees seem to be more resistant to treatment by the E-Z-Ject™ as well.

Staff collects data on species, size, quantity and location of the treated plants using GPS and/or ArcGIS Collector.

Treatment Results

Non-native plant treatment in fiscal year 2019 was focused on 51 of the treatment segments across 29 tracts. The hours of effort dedicated to invasive plant treatment and removal more than doubled for the year as a result of an increase in seasonal staffing and the volunteer efforts donated by the American Conservation Experience (ACE) crew (Table 1). ACE crews contributed 343 hours during two, week-long stints in January and February of 2019. ACE crews, with their well-trained sawyers, were instrumental in treating areas infested with large trees in a short amount of time.

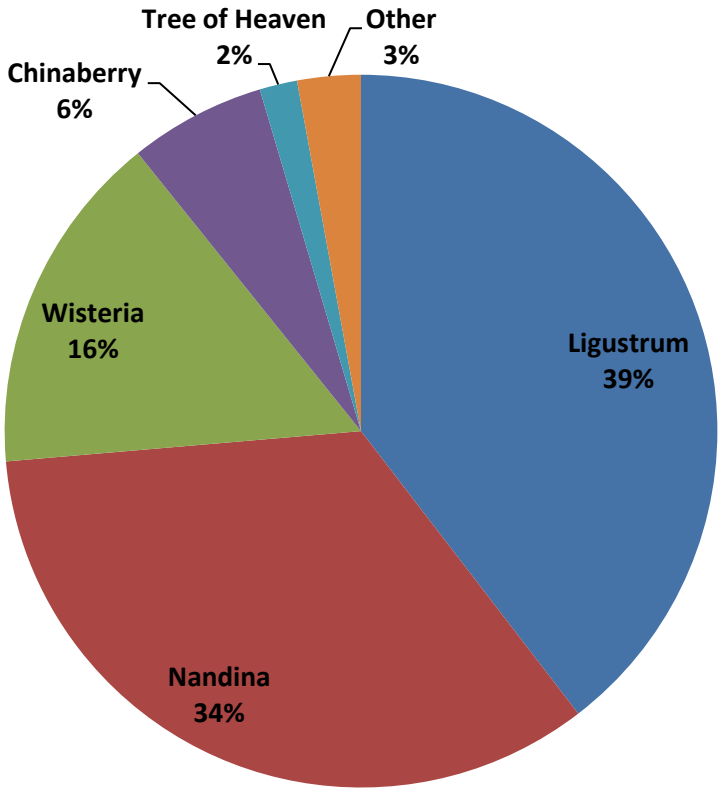
Table 1. Non-native plant treatment effort on Travis County BCP.

FY	Staff Hours	Volunteer Hours	Total Hours	# Plants
2009	25	0	25	422*
2010	158	3495	3653	2,862*
2011	91	96	187	5,883*
2012	103	92	195	3,510*
2013	45	35	80	1,954*
2014	89	87	176	2,491*
2015	36	95	131	3,217*
2016	164	142	306	5,830*
2017	304	399	703	8,484
2018	184	358	542	6,460
2019	477	705	1182	15,400

These figures do not include the number of vinca or bamboo plants removed.
*Prior to FY 2017, the number of stems treated was counted rather than the number individual plants.

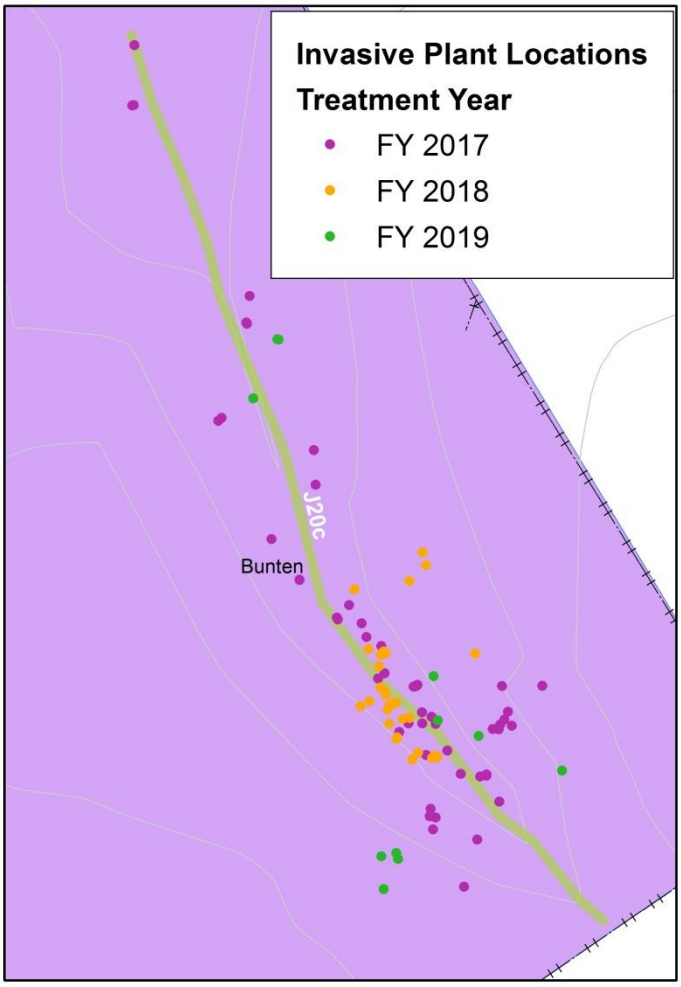
Over 15,400 non-native plants were treated or removed during FY 2019 (Table 1). Approximately 39% of those were ligustrum (*Ligustrum sp.*) (Figure 2). This species is highly prolific and colonizes drainages with ease. Nandina, or Heavenly Bamboo, was the second most commonly treated plant. The treatment method for nandina has been slightly modified after observing prolific resprouting after stems were cut at six to twelve inches from the ground. The new approach is to dig around the base of the plant to expose where the nandina stems split off from the main stem and cut the main stem as low as possible before applying herbicide.

Figure 2. Predominance of non-native plant species treated in FY 2019



Preliminary data show that consistent effort can reduce the rate of invasion. For example in treatment segment J20c (Figure 3), the proportion of seed-bearing sized plants has been reduced. In FY2017, nearly 50% of the 183 plants treated were of seed-bearing size. The following year almost 900 plants were removed, of which 6% were of mature size classes. In FY2019, 208 plants were removed and less than 10% were mature. It is expected that subsequent visits will continue to show reduced abundance and fecundity among the invasive plants. As the reproductive capabilities of the invasive plants diminish, the frequency of revisits may be reduced so that efforts can be directed to higher priority locations.

Figure 3. Invasive Plant Treatment in Segment J20c FY17 – FY19



Bamboo

Bamboo (*Bambusoideae*) infestations require a different approach than the traditional cut & treat methods. Since bamboo grows from underground rhizomes that spread below the surface, a two-step process is recommended for controlling this hardy grass. The first step is to cut the bamboo close to the ground. After several months when the plant begins to resprout, the exposed vegetation must be sprayed with an herbicide suitable to treat grasses. The herbicide will begin to damage the rhizome but new shoots will sprout from untreated areas. The treated stalks and the new growth can be cut again, and allowed to resprout for another dose of herbicide treatment. The process must be repeated until the rhizomes' energy stores are exhausted and the bamboo fails to resprout. There are two known sites that are infested with bamboo. The site on the Attwood tract measured approximately 2,750 square feet when it was discovered in the summer of 2017. The patch of bamboo has

been cut and sprayed three times with increasing frequency since 2017 with encouraging results. Another infestation on the Bunten tract approximately 3,560 square feet in area was initially identified in February 2018. Due to the proximity to sensitive aquatic resources, this patch will not be treated with herbicide and control will rely solely on persistent mechanical treatment. So far, the patch has been back cut twice, with plans to repeat every few months. Both areas will continue to be monitored and re-treated periodically to ensure adequate control.

Vinca

The lesser periwinkle (*Vinca minor,* Figure 3) poses unique control challenges on the BCP. Vinca has been found on Lucas, Lime Creek Unit, and Bunten, with the latter hosting an extensive population. The planting of a single specimen of vinca near the road on the Bunten tract in the 1950s (Bunten interview, 2002) has led to an invasion that spanned approximately 5.5 acres of riparian forest (Figure 4). The comely plant, with its dark glossy sheen and delicate purple blooms was once a source of income for the Bunten family. They sold vinca to neighbors and local nurseries to revegetate residential landscapes following a period of drought. Their supply of vinca never dwindled due to the pernicious nature of the plant. It spreads primarily through vegetative means by sending out stolons, or long runners, that form new root masses when they make contact with the soil. The smallest bits of roots left behind can re-sprout and continue the invasion. The leaves are unpalatable to grazers due to their latex content and a waxy coating protects the plants from foliar herbicide applications. Once established, the vinca creates a thick mat of vegetation that smothers all other plant species. Studies have shown that once vinca invades, native plant species richness and diversity decline (Cushman & Gaffney, 2009). Arthropod communities are drastically altered as well, as shown in a study of forest floor spider assemblage in vinca infested areas (Bultman & DeWitt, 2008).

Figure 3. Vinca minor



Schultz and Thelen (2000) had moderate success treating a vinca infestation using a combination of cutting and herbicide treatments. At the Bunten tract, vinca has invaded areas in and along the creek that serve as habitat for the threatened Jollyville Plateau salamander (*Eurycea tonkawae*). Therefore, the risk of herbicide overspray

and runoff precludes the use of chemicals in the area, leaving mechanical removal as the most viable treatment option.

Figure 4. Vinca extent at the Bunten Tract.



In an effort to control vinca, County staff is experimenting with two techniques. The first follows the lead of a 2002 study of the South African vine Cape ivy (*Delairea odorata*) in Northern California. Similar to vinca, Cape ivy reproduces via stolons, it can re-sprout from fragments, and it can dominate the forest floor (Alvarez & Cushman, 2002). The study found that native species diversity was significantly reduced in areas that had been invaded, but that after non-native reduction (hand-weeding three times over two years) the native species richness rebounded to levels similar to areas that had not been invaded. With the hope for a similar outcome, County staff and volunteers have begun hand-pulling vinca along the leading edge of the invasion. Current efforts are focused on working from the outer edges downslope toward the epicenter with a quick check during subsequent visits of the formerly treated areas to pull any re-sprouts or overlooked plants. The hand-pulling approach is targeted at preventing the continued invasion of vinca. Consistent effort will be essential to success. In FY 2019, approximately 301 hours of staff and volunteer time were spent pulling vinca at Bunten. The vinca in areas 1 and 2 has been all but eliminated and requires minimal maintenance to prevent reinvasion. The vinca in Area 8 has been reduced by approximately one third by the repeated visits from hardy volunteer groups. These efforts have reduced the extent of the vinca from approximately 5.5 acres to approximately 4.5 acres since 2017.

The hand-pulling method has shown great promise on the vinca discovered at the Lu II tract of the Lime Creek Unit in 2018. Probably planted as a ground cover (perhaps

from the Bunten family's garden) around an old house, the vinca had expanded to cover approximately 2,220 square feet. As of the end of FY 2019, the vinca has been removed from the entire area. Periodic maintenance will be required to prevent reinvasion.

Another vinca invasion was discovered in 2019 on the Lucas tract. Nearly 40 hours has been spent hand pulling vinca in the area, but considering the density of the vegetation, another approach may be more productive.

Vinca experimental plots

In the most densely infested areas the vinca forms a thick mat of vegetation up to two feet deep. Hand pulling in these areas is extremely labor intensive and deleterious to the volunteer labor pool. In pursuit of a viable control option, a series of experimental plots have been established to test the efficacy of alternative control methods.

The first method tested was solarization with the idea that covering the vinca with translucent plastic sheets during the summer months would cause increased heat and intensified sunlight which would deter growth. To test the idea, a series of seven, 16-square meter plots were established (Figure 5). The vegetation in each plot was cut low to the ground using a brush cutter. The cut material was hauled off the site and the plastic sheets were installed on all but one of the plots. The plastic was left in place through nine weeks of the summer of 2017 when the average high temperatures ranged from 95.5 - 101.4°. After removing the plastic, it appeared that all plots except for the control plot had somewhat reduced regrowth of vinca. The two plots that had the least amount of canopy coverage (B and E) had the least amount of regrowth.

Vinca is tolerant of Texas winter temperatures and retains its leaves year round. With the limited success of solarization, the next step to test was to smother the vinca using blackout landscaping cloth. The plots were brush cut again and the cut material was hauled off site. The landscaping cloth was installed on the plots A, B, E, F and G (due to limited supplies) for several months. When the cloth was removed, very little regrowth was detected. Minimal hand-pulling around the edges and within the seams of the cloth strips was all that was required to rid the plot areas of vinca. In the fall of 2018, native seeds were sown on the treated plots. As more supplies became available, the remainder of the plots and many areas between the plots were brush cut and covered in landscape cloth. As of September 2019, the treated plots are showing a significant recruitment of native plants, most likely volunteers from the seed bank. Efforts continue to hand pull around the native plants and expand the treatment area.

Figure 5. Vinca Experimental Plots



Nearly 1,200 hours of labor were dedicated to non-native plant treatment on Travis County BCP tracts in FY 2019. Despite this effort, there is much work yet to be done to find and treat the non-native plants that have become established on the preserve. Staff will continue to seek out infestations and recruit volunteers to assist in treatment and maintenance. While these efforts shall be required for decades to come, their efficacy can be undermined by the continued re-introduction of non-native plants from neighboring properties. In order to address the cause, in addition to treating the symptoms, public education will be essential to prevent the continued planting and preference for non-native plants in landscaping. Non-native plant management goals for the next fiscal year include developing a native plant exchange program with neighbors, partnering with community organizations to promote more native plant awareness and distribution, and conducting outreach to local retailers and nurseries who sell invasive, non-native plants with information about native alternatives. With consistent efforts to control and prevent the establishment of non-native plants, the high quality habitat which the endangered and threatened species of the BCP rely upon can be preserved.

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