FY 2017 Travis County Balcones Canyonlands Preserve
Non-native Plant Management Program



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

1 October 2016 – 30 September 2017

Non-Native Plants on the Travis County BCP

The Balcones Canyonlands Preserve (BCP) was created in Mary 1996 to protect the endangered golden-cheeked warbler (*Dendroica 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 31,859 acres of primarily mature oak-juniper (*Quercus-Juniperus*) 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, 2009). 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, 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), 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 138 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 with the runoff 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 improve, the riparian areas serve as invasion corridors for rapid dispersal into the ecosystem (Stohlgren, *et al.,* 1998).

Treatment Methods

To combat the invasion of exotic plants, Travis County staff implements a non-native plant management program across County-managed BCP lands. Search and destroy efforts have currently been focused on the WUI and in riparian areas with treatment priority given to plants of reproductive age. 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 about one third 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. About 60% of the non-natives are treated using the “cut & treat” method where the stem or trunk of the plant is cut at least 6” from 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 impractical. The circumference of the targeted plants is girdled at breast height using a hand saw or chainsaw and herbicide is immediately applied to the living tissue. The E-Z-Ject™ lance provides another treatment method for large diameter trees. The gravity-fed, spring-loaded lance delivers a capsule of viscous poison under the bark of the tree for slow release. This method is particularly useful in areas where felling is too labor-intensive and/or dangerous.



Cut & treat



Girdle & Squirt

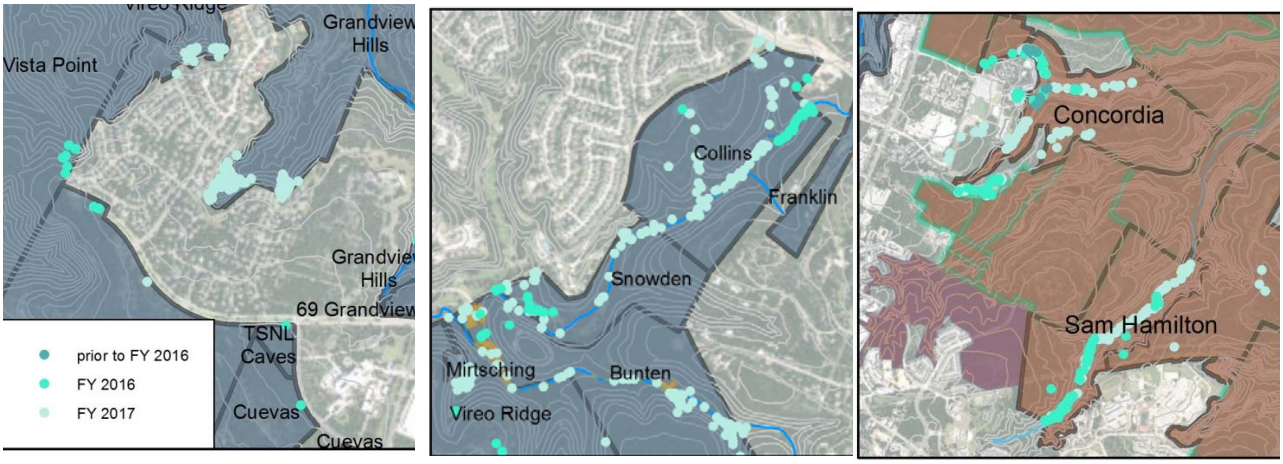


E-Z-Ject™ Lance

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. The E-Z-Ject™ cartridges contain a concentrated gel of imazapyr or glyphosate. The effectiveness of these treatments has not been formally tested, but periodic checks on treated individuals have shown that with a few stubborn exceptions, treatment is typically terminal.

Non-native plant treatment in fiscal year 2017 was focused on riparian areas within the tracts at Sam Hamilton, Concordia, Collins, Bunten, and Wild Basin. Areas adjacent to residential developments were treated on the tracts at Grandview Hills, Canyon Vista and various fuel mitigation treatment areas. Other infestations were treated as they were discovered by staff during land management or biological monitoring activities. The figures below illustrate the location of selected treatment areas in various settings.

Figure 1. Selected non-native plant treatment sites



a: Wildlands Urban Interface b: Riparian areas c: Riparian areas

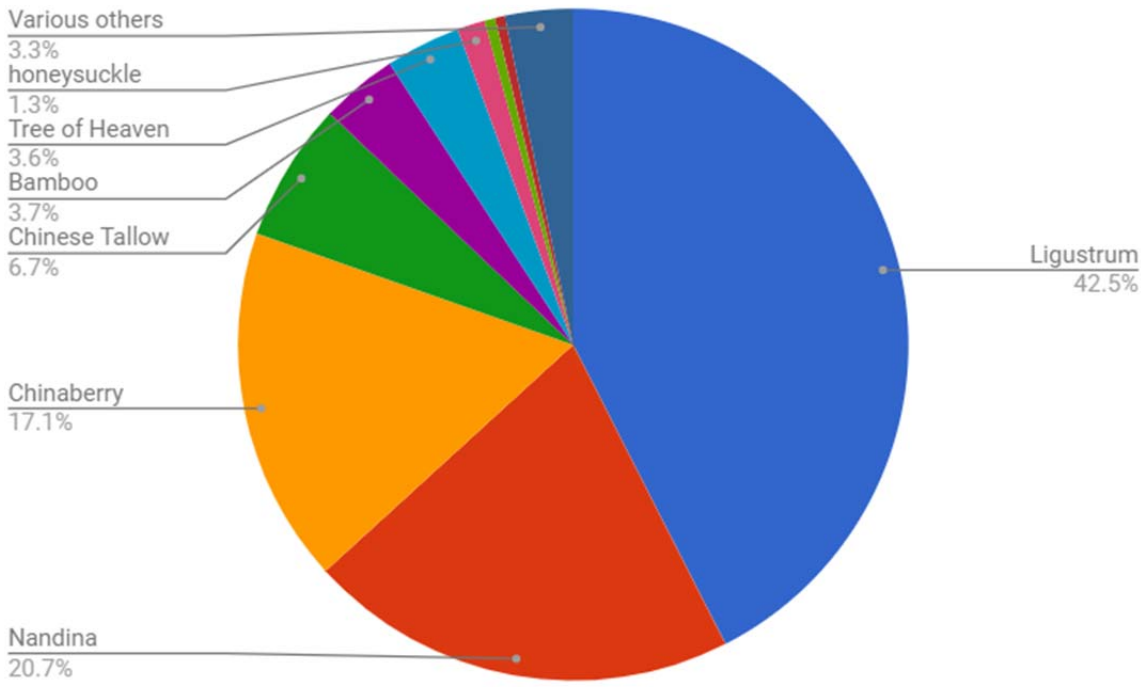
Over 8,000 non-native plants were treated or removed during FY 2017 (Table 1). Approximately 59% of those were either ligustrum (*Ligustrum sp.*) or chinaberry (*Melia azedarach*) (Figure 2). Both of these species are highly prolific and colonize drainages with ease. In many instances, the infestation was so far advanced that treatment efforts were focused solely on seed-bearing size classes. These infested areas will need to be revisited repeatedly with a focus on mechanical removal of the extant smaller plants as well as individuals which may germinate from the substantial seed bed or by re-sprouting from the roots of a mature plant. This will also provide the opportunity to check the efficacy of the treatment on the canopy-class plants. Revisits to treated areas revealed that some ligustrum and chinaberry have survived treatment when the entire circumference of the trunk was not girdled. Common fig (*Ficus carica*) and paper mulberry (*Broussonetia papyrifera)* are particularly resistant to treatment since they both secrete latex which can extrude liquid herbicide from the wounds. The E-Z-Ject lance method is the ideal herbicide vector for these species with its slow release of herbicide and minimal disturbance to the bark.

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

FY	Staff Hours	Volunteer Hours	Number of Species	Tracts	# Stems
2009	25	0	11	5	422
2010	158	3495	12	12	2862
2011	91	96	10	13	5883
2012	103	92	7	15	3510
2013	45	35	9	11	1954
2014	89	87	5	13	2491
2015	36	95	8	13	3217
2016	164	142	49	25	5830
2017	304	399	17	32	8484*

*In FY 2017, the method for counting treated plants was altered to count individual plants rather than the number of stems. This figure does not include vinca plants removed.

Figure 2. Predominance of non-native plant species treated in FY 2017.



A different approach was used on a stand of bamboo (*Bambusoideae*) discovered on the Attwood tract. Near the site of an old homestead, bamboo had spread to cover approximately 2,750 square feet. In June the bamboo stems were cut 10 to 12 inches above the ground and just below a node, and then a funnel was used to pour a small amount of herbicide into the hollow culm where it could slowly soak into the plant tissues. The site was checked in August,

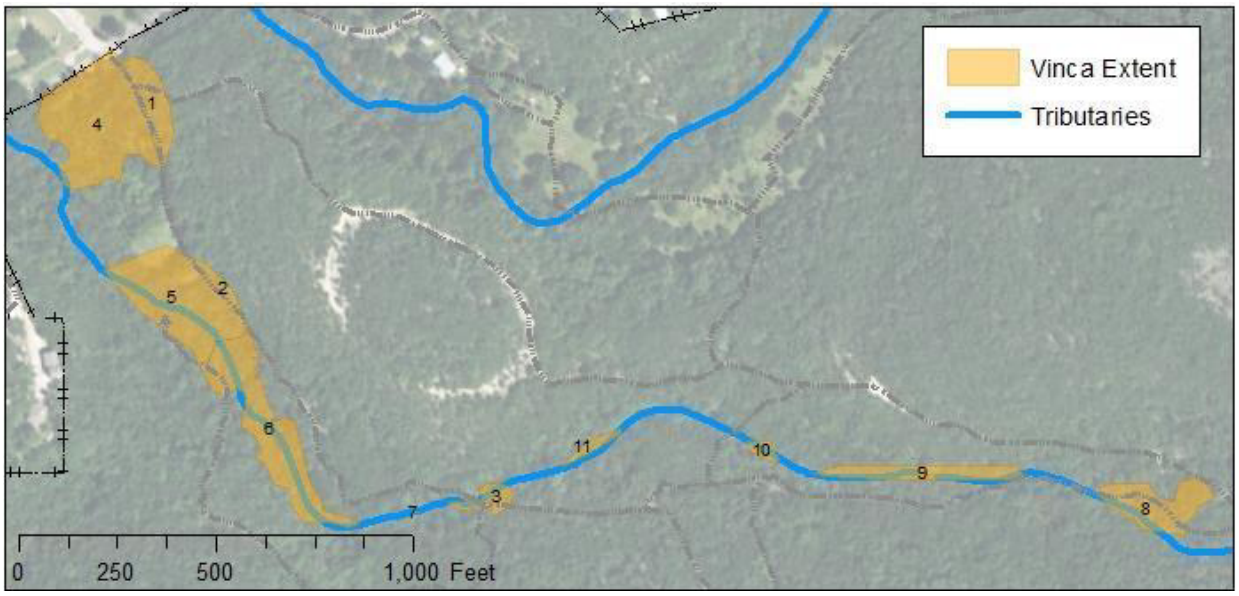
10 weeks after the initial treatment, and very minimal regrowth was observed. The area will continue to be monitored over the next several seasons to determine the efficacy of the treatment.

The Bunten tract is host to a non-native invasion like no other on the Travis County BCP. The planting of a single lesser periwinkle (*Vinca minor*) near the road in the 1950s (Bunten interview, 2002) has led to an invasion that spans approximately 5.5 acres of riparian forest. 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).



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 serves 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 3. 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 resprout 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 2017, approximately 128 hours of staff and volunteer time were spent pulling vinca from Area 1, and 112 hours were spent working in Area 5.

The second approach is focused on one of the most densely infested areas where vinca runners form a thick mat of vegetation that can often be 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 solarization followed by shading as a control method. The goal of solarization is to intensify

the sunlight in the shady areas that vinca prefers by installing a translucent plastic sheet over the plants during the summer months. The second phase replaces the plastic sheeting with landscape cloth to black-out vinca during the winter months. A series of seven plots measuring 3.2 by 5 meters were staked out in Area 5 and canopy cover measurements were collected using a densiometer. The vegetation was cut as close to the soil as possible using a brush cutter. The cut materials were removed to the landfill. Six of the plots (A through F) were covered with the translucent plastic sheeting and left to "cook" for nine weeks through the heat of the summer where the average high temperatures ranged from 95.5 - 101.4□.

Figure 3. Vinca Solarization Plots

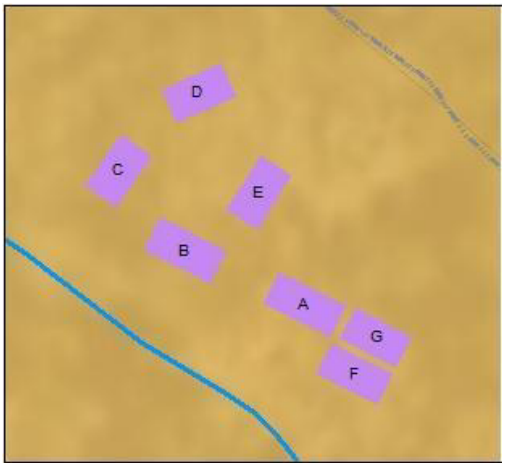


Table 2. Canopy Cover Measurements

Plot	% Open Canopy
A	24%
B	44%
C	13%
D	17%
E	37%
F	9%
G	15%

Preliminary observations suggest that vinca in all treated plots experienced suppressed growth with more extreme effects observed in the sunnier plots (Plots B and E). Control plot G, which was brush cut only, seems to have resumed its pre-treatment appearance. As of the end of FY 2017, the solarization phase has been completed and the shading component of the experiment is now underway. Should the experiment prove successful, the methodology will be applied on a larger scale to begin reducing vinca density in the core area of the invasion while hand-pulling efforts will focus on containing its spread at the perimeter of the invasion. Both approaches will require consistent effort and continued experimentation.

Over 700 hours of labor were dedicated to non-native plant treatment on Travis County BCP tracts in FY 2017. 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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