FY 2020 Travis County Balcones Canyonlands Preserve

Non-native Plant Management Program Report

Pyracantha. Photo by Julie Murray

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

1 October 2019 – 30 September 2020

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 32,273 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 plants (McShea, 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).

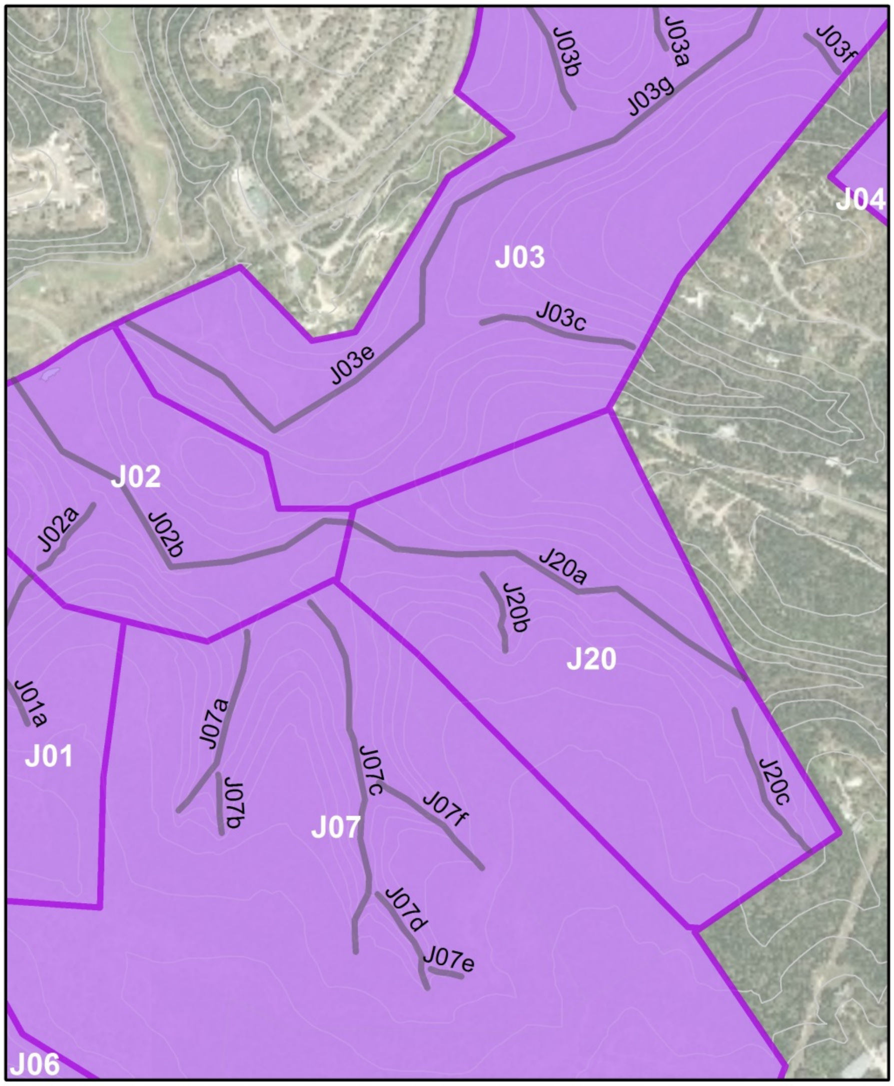
Compounded by lagging hardwood regeneration rates (Russell and Fowler, 1999), prime foraging habitat for the GCWA is at a premium.

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 by Travis County staff 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 the level of infestation can be evaluated. Once an infested area is located, consistent treatment can begin. Initial efforts are 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 that 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 2020 (FY20) was focused on 55 of the treatment segments across 21 tracts. While volunteer hours sharply declined due to the pandemic, the overall effort increased from FY19 due to the work of Texas Conservation Corps, contracted to assist with invasive plant treatment (Table 1).

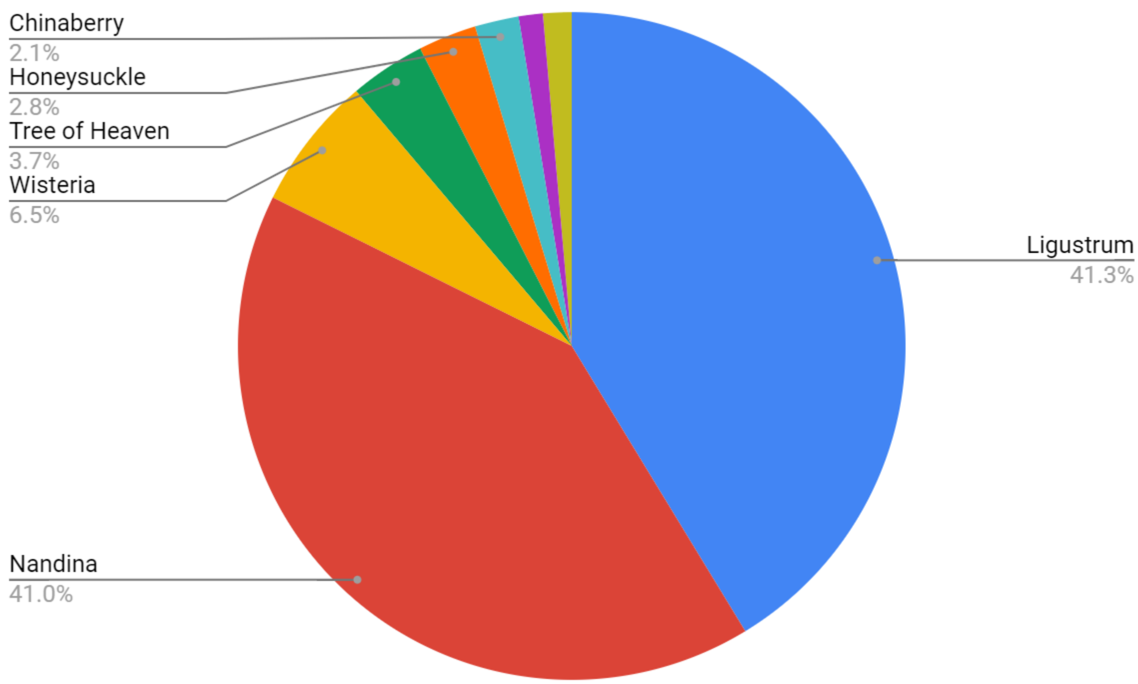
Table 1. Non-native plant treatment effort on Travis County BCP.

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
		Volunteer	**Contractors**		
2020	641	16	892	1548	40,052

These figures do not include the vinca, bamboo, wisteria, or Macartney rose plants treated in areas of severe infestation.
*Prior to FY 2017, the number of stems treated was counted rather than the number individual plants.

Over 40,000 non-native plants were treated or removed during FY20 (Table 1). Approximately 41.3% 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 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 2020



Preliminary data show that consistent effort can reduce the rate of invasion. Initial treatments are usually focused on plants of seed-bearing size. Subsequent visits then focus on the smaller sized plants and reprouts as plants are treated before they begin to contribute to the seed bank. 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.

Infestations

Some non-native invasive species have the capability of overtaking native landscapes to form monocultures. Lesser Periwinkle (*Vinca minor*), Japanese honeysuckle (*Lonicera japonica*), wisteria (*Wisteria floribunda*), bamboo (*Bambusoideae*) and Macartney rose (*Rosa bracteata*) have been found on the BCP. Treatment methods vary for these species and often it is more practical to document treatment by area rather than by individual plants treated.

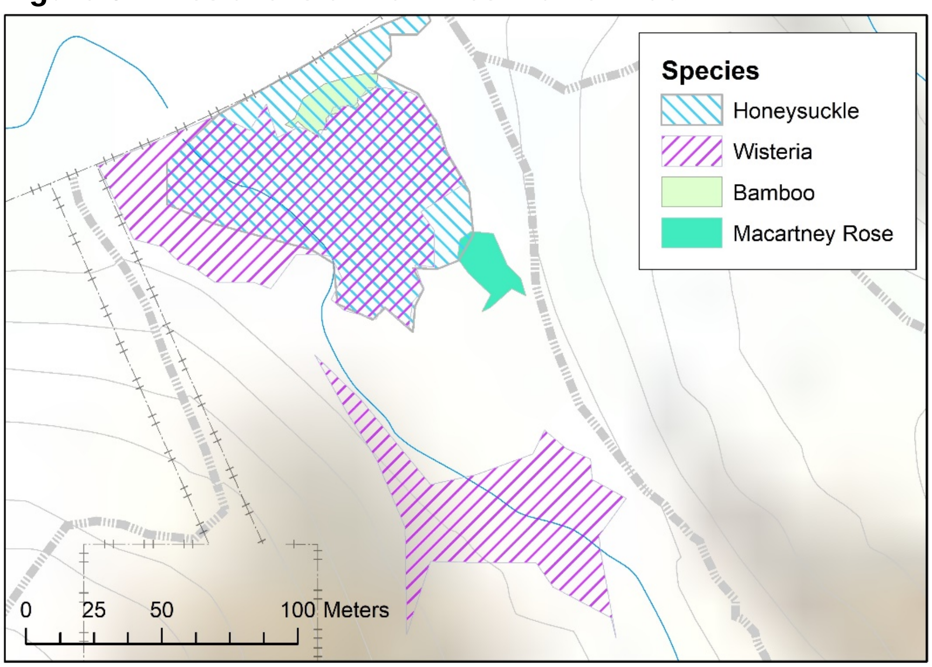
Bamboo

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 2,750 square foot patch of bamboo on the Attwood tract has been treated repeatedly since its discovery in 2017. 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. Quarterly visits to both sites have shown a steady decline in the resprouting of bamboo shoots.

Invasive vines

Wisteria and honeysuckle are climbing vines that can girdle standing trees and dominate the treetops. Similarly, Macartney rose sends runners that reach up to the treetops to shade out the host, but it also forms impenetrable thorny thickets in the understory. The northern portion of the Bunten tract has been infested with these species. In FY20, staff expended approximately 176 hours treating the large infestations on the Bunten tract (Figure 3).

Figure 3. Infestations on northwest Bunten tract



Vinca

The lesser periwinkle (*Vinca minor,* Figure 4) 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 5). 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, 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 and Gaffney, 2009). Arthropod communities are drastically altered as well, as shown in a study of forest floor spider assemblage in vinca infested areas (Bultman and DeWitt, 2008).

Figure 4. 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 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 5. Vinca extent at the Bunten Tract.

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 and 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 FY20, approximately 174 hours of effort 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 Areas 3 and 8 have each been reduced by approximately one third by the repeated visits. These efforts have reduced the extent of the vinca more than 20% since 2017 from approximately 5.5 acres to approximately 4.3 acres.

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 FY20, the vinca has been removed from the entire area. Periodic maintenance will be required to prevent reinvasion.

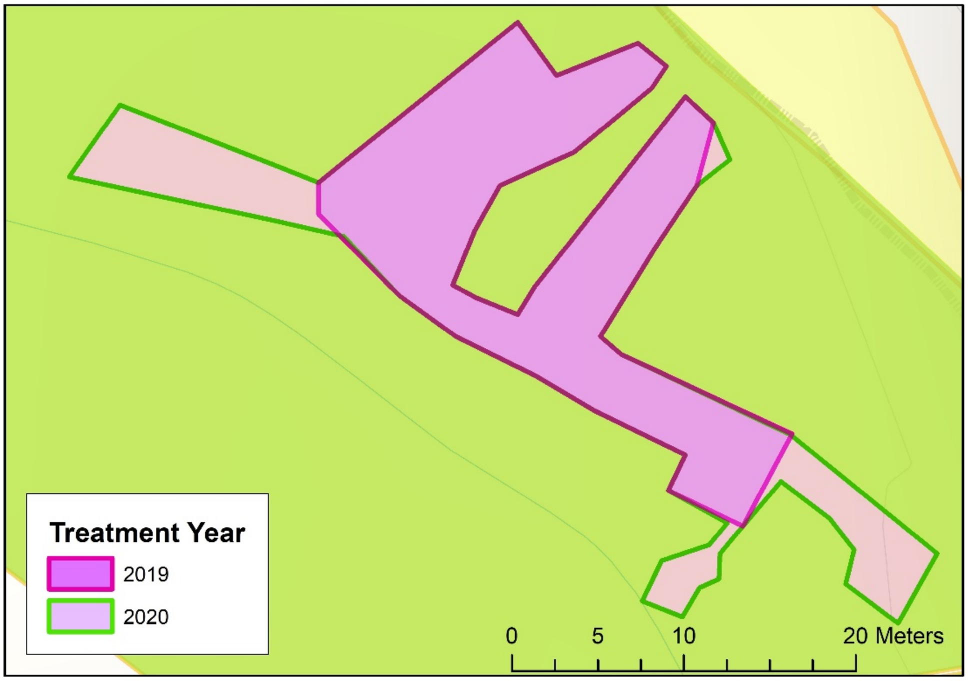
Another vinca invasion was discovered in 2019 on the Lucas tract. Nearly 40 hours has been spent hand pulling vinca in the area, but considering the density of the vegetation, another approach may be more productive.

In the most densely infested areas, 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 control 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. A series of seven, 16-square meter plots were established. 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° F. Despite the extreme heat, all but two of the plots showed little to no impact from the treatment. The two plots with the most observable impact where the ones with the least amount of canopy cover.

Vinca is tolerant of Texas winter temperatures and retains its leaves year-round. With the limited success of solarization, the next method employed was to smother the vinca using blackout landscaping cloth (Figure 6). The plots were brush cut again and the cut material was hauled off site. The landscaping cloth was installed on the plots 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. The promising results led to expansion of the treatment area. As the shade cloth was removed, native seeds were sown on the treated areas and subsequent maintenance was conducted to remove the occasional regrowth of vinca. As of September 2020, the treated plots are showing a significant recruitment of native plants from the seed bank and from seeding.

Figure 6. Vinca Shade Treatment Areas



Grassland Restoration Project

King Ranch bluestem (*Bothriochloa ischaemum*; KR) is an invasive bunchgrass introduced from Europe and Asia in the late 1800s as forage for grazing animals. Its ability to form a monotypic grassland leads to reduced biodiversity. Research has shown that late-summer burns with their higher intensity help to reduce the presence of KR and encourage the growth of other forbs (Reemts. *et al*., 2019). Three fields on the Nootsie tract comprise approximately 15 acres of grassland that are dominated by KR. In September of 2020, staff conducted a prescribed burn on a 2-acre field to reduce the abundance of the non-native grass. A regimen of seeding and repeated burning should help return biodiversity to the impacted grasslands.

More than 1,500 hours of labor were dedicated to non-native plant treatment on Travis County BCP tracts in FY20. 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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