Woody brush encroachment is a problem in much of the western United States, and the Trans-Pecos region of Texas is no exception. Woody brush encroachment by creosote, juniper, cacti and mesquite species has been attributed to fire suppression, overgrazing, competition and climate change.

The project discussed in this article focused on the removal of western honey mesquite (*Prosopis glandulosa* var. *torreyana*) from the southwestern regions of Elephant Mountain Wildlife Management Area (EMWMA), a Texas Parks and Wildlife Department (TPWD) property. Western honey mesquite was targeted due to its encroachment in the area and TPWD’s desire to provide further understanding of how to combat this particularly resilient species of mesquite.

Many different methods are available to combat woody brush encroachment such as prescribed fire, mechanical brush control and herbicides. The decision on which method or combination of methods to use depends on individual management goals. If habitat restoration is the primary goal, then there should be limited removal of desirable plants in the target area, which should result in an increase of general health of the range lands. Additionally, treatments can be selected that will improve wildlife food supplies and habitat.

The sites selected for treatment on EMWMA were situated in very erodible soils of silty loams with limited clay components. An understanding of the target area soil types and their response to different treatment methods is very important when constructing a management plan.

After taking into account the erodible soils and wildlife needs, the use of herbicides was chosen to treat the problem areas at EMWMA because herbicides allowed for the treatment of a large area with limited disturbance of erodible soils. The
treatments were applied through the aerial and individual plant treatment (IPT) methods using two different herbicide mixtures. Sendero® from Dow AgroScience was selected for targeting mesquite. We also added Remedy® Ultra to some of the treatment plots to provide a broad-spectrum mixed brush treatment and also to measure the mesquite response to the two different treatments.

For the IPT treatments, a total of 92 acres were treated using backpack and ATV sprayers from Aug. 3, 2015, to Aug. 17, 2015. A total of 418 acres were targeted through fixed wing aircraft on July 29, 2015, at a rate of four gallons of total spray volume per acre. This gave us a total of 510 treated acres with an additional 94 acres of similar habitat and woody encroachment monitored as a control site for direct comparison to the treatment plots.

Treatment took place a couple weeks later than typical due to a high amount of rainfall earlier in the season. This early rain led to low soil temperatures and multiple early bean elongation periods yielding less than optimal conditions for treatment until the end of July and early August. The following year, 2016, EMWMA also saw greater than normal rainfall from May until August which allowed the grasses in the treatment plots to take advantage of this newfound moisture while the mesquite and other shrubs continued to struggle.

Herbicide treatments did affect many species such as catclaw, lobe bush, tasjillo and tarbush but not to the same degree that treatments affected the targeted mesquite. However, this was still useful for the recovery of desired grasses throughout the treatment plots under these species and mesquite canopies.

Grass cover increased across treatment sites post treatment. Grasses went from accounting for an estimated 7.38 percent cover to 31.39 percent one year following treatment with the Sendero® and Sendero®-Remedy® Ultra mix. It is important to note that grass species encountered previous to treatment included plains bristle grass, false roads grass, whiplash pappus grass and alkaline sakaton. Grass species present before treatment increased in abundance following treatment. Post treatment surveys also included the addition of multiple annual grasses like red gramma, shoyy chorlis, stink grass and six weeks gramma as well as the addition of bunch grasses like Arizona cotton top, side oats gramma and green sprangletop.

When separated by treatment type, we see the control areas did show an increase in mean percent grass cover, but all herbicide treatment plots showed a much higher response by grasses than the controls. The mean grass cover doubled from pre to one year post-treatment in the control areas while the mean grass cover in the aerial Sendero® treatment areas went from 7 percent to 35 percent and increased to almost 40 percent in the Sendero® Remedy® mix aerial treatments. For IPT treatments, Sendero® Remedy® mix had a pre-treatment level of grasses in the 15 percent range and a 35 percent post-treatment level.

Forb response to treatments indicated some orb-shock from the herbicide use. Mean forbs percent cover increased from about 23 percent pre-treatment to about 28 percent post-treatment on the control plots. However, all treatment types showed a reduction in mean percent forb cover throughout. Overall the forbs went from a mean 18.95 percent cover pre-treatment to a mean 11.14 percent cover one year post-treatment throughout the documented landscape.

It is worth noting that the Russian thistle numbers were quite high prior to treatment and were significantly reduced post-treatment throughout the treated landscape. This may have been due to yearly changes in precipitation but appeared higher especially in the Sendero® and Remedy® Ultra treatment plots. There were cowpen daisy, pigweed, pepperweeds, mealy goosefoot and mustards previous to herbicide treatment, but forbs mostly consisted of pigweed and euphorbs one year post-treatment with some scattered croton.

Canopy reduction of the western honey mesquite one year post-treatment was highest on the IPT treatment plots where the plants mostly consisted of low running motts of knee-high mesquites. In these areas, it was particularly easy to treat the entire plant with a high dose of herbicide. The next highest canopy reduction estimate came from the aerial Sendero® Remedy® mix plot with a 99.14 percent estimated canopy reduction followed by the straight Sendero® mix southern plot with an estimated reduction of 97.15 percent. The northern IPT plots and aerial Sendero® plot all saw a high rate of basil resprout and flagged foliar regrowth yielding lower percent canopy reduction results ranging from 63 percent to 83 percent.

The overall mortality results for the western honey mesquite reflect the canopy reduction results with the highest mortalities in the southern aerial Sendero® Remedy® Ultra plots and IPT treatment plots ranging from 60 percent to 70 percent mortality. With the lowest mortality being the straight Sendero® northern plot at 26 percent and southern plot at 42.5 percent estimated mortality followed by the northern IPT treatment plots.

All these results are quite promising as estimated mortalities with other herbicides were much lower for western honey mesquite prior to the introduction of Sendero®. Herbicides previously available were only able to produce 10 percent to 15 percent mortality on the western honey mesquite.
High mortalities are also not always desired for wildlife rehabilitation as western honey mesquite is a native plant needed in low densities for game management habitat. The response by wildlife was also monitored in response to these herbicide treatments. Monitoring was accomplished through the use of trail cameras randomly distributed in a stratified manner based on acreage per treatment plot. Over 2.3 million photos were collected throughout this two-year study using a total of 60 camera traps. For primary data analysis, only photos taken from April to August of 2015 and 2016 were compared to detect changes in presence or absence of different species due to treatment.

A total of 11,837 photos were used in this analysis as these were the photos that documented identifiable species during the chosen comparison window. Many species were documented including scaled quail, deer, bobcats, turkeys, black bear, pronghorn, elk, raccoons, coyotes, gray fox, cottontails, jack rabbits and many various kinds of birds. Species with less than 30 total observations were not considered in the analysis which limited accidental species not likely utilizing the treatment sites like black bear, elk and pronghorn.

This left a total of 11 species for analysis of which seven species groups showed some significant change from the pre-treatment to post-treatment documentation period. Most of these significant differences were the result of a species being present one season in a treatment type and not documented the next season. For example, scaled quail were documented in the IPT Sendero® Remedy® plot pre-treatment but not post-treatment with the opposite being true for javelina and feral hogs. Bobcats were documented pre-treatment in IPT Sendero® but not post-treatment.

Coyotes were documented both seasons but were significantly lower in IPT Sendero® plots post-treatment. Ground squirrels were also documented both seasons but were significantly reduced post-treatment in the IPT Sendero® Remedy® treatment plots. When all non-game birds were grouped together it was shown that all treatment plots showed much higher numbers pre-treatment than were found post-treatment. We expect that use will resume in the treatment plots for species absent in the first year post-treatment in subsequent years since this year still had some forb shock.

This study is of use to ranchers, land managers, state or federal agencies and wildlife management institutions as a decision making tool for mixed shrub and grassland habitat lost to woody encroachment by western honey mesquite. This study is also useful in that it assesses various delivery methods for the herbicide, which can greatly affect the cost per acre for treatment (IPT treatments: excluding labor $22.96 for Sendero® per acre, $26.31 per acre for the Sendero® and Remedy® Ultra mix; Aerial treatments: $38.56 per acre for Sendero®, $43.34 per acre for Sendero® and Remedy® Ultra).