

High volume aerial applications on Redberry Juniper

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SUMMARY

A study was initiated to evaluate the potential of high volume aerial applications for redberry juniper control. Currently, no aerial treatments are recommended through Texas AgriLife Extension. Plots were established during 2004, 2005, 2006 and 2007 in Howard and Hood Counties. Final results at two years after treatment are presented.

OBJECTIVES

Redberry Juniper is a common evergreen tree found in abundance in many eco-regions of Texas. Control methods for this plant are limited due mainly to the fact that it vigorously re-sprouts from buds located just beneath the soil surface on the crown of the plant. For this reason, tree cutting techniques tend to be less beneficial to plant control as compared to Ashe Juniper trees. The most common method of redberry juniper control is currently mechanical removal using a dozer. This method is very expensive costing as much as \$100-\$150 per acre and more.



Juniper is an aggressive invader of rangelands. When left unchecked, juniper can form a complete canopy coverage reducing desired forage production. Once juniper gets to this stage control options are limited. However, smaller junipers can be controlled easier and cheaper. It is for this reason that the Brush Busters approach to individual plant treatments has become increasingly viewed as a favorable alternative. The premise of the program is to control the smaller juniper plants before they become a large problem. There are two Brush Buster individual plant treatment methods for chemical control of redberry juniper. The first is a soil spot spray method using Velpar L. The second is a foliar applied leaf spray method using Tordon 22K.

Excellent results with both Brush Buster treatments have been obtained. However, treatments with Tordon 22K applied aerially have failed. This is extremely important for areas where

density and plant size has gone beyond the realm of treating individual plants. We know that Tordon 22K has activity on redberry juniper; the problem appears to be a coverage and concentration issue when applied from the air. Simply stated, we have not been successful in getting enough herbicide into the plant when applied aerially. This research is looking at the use of helicopter, droplet size, high total spray volume and spray adjuvants to increase spray coverage and ultimately herbicide absorption into the leaf of juniper, thereby increasing mortality from aerial applications. The project is intended to be a multiple year project, with only three years of applications completed. Additional trials will be based on results from previous trials, building on the successes and failures of previous results.

MATERIALS AND METHODS

On August 3, 2004 an initial study was instigated. A site was selected on the Morgan Ranch in Howard County that contained dense stands of mature redberry juniper. Eight treatments were established with Tordon 22K and Overdrive herbicides (Table 1) using varying total spray volumes (10-40 gpa) on 10 acre plots. Rivet (MSO/Silicone NIS) was added to each spray volume at a rate of 16oz/ac.

Treatments were applied by North Star Helicopters. The spray was delivered through 45 ft. flow-through booms equipped with CP-03 poly aerial nozzles delivering a medium-fine droplet size (400-700 μ) at 40psi. Plots were documented with GPS guidance technology with ESRI shape files downloaded to a laptop computer for future identification of the plot and calculation of acreage sprayed.



A second set of plots were established on the Morgan Ranch in Howard County on November 13, 2005. Six treatments were established (Table 1) using Tordon 22K, Overdrive, Escort, and Krenite herbicides with MSO/silicone surfactant (Rivet), Crop Oil Concentrate (Superb HC) or NIS/crop oil concentrate (Topfilm). Treatments were again applied by North Star Helicopters using a combination nozzle system with Accuflo .028 nozzles (#6 orifice) and CP-03 nozzles (middle orifice, high deflector). This combination nozzle system provided a wider range of droplet size from 400-1000 μ in size. Plots were again documented with GPS guidance technology with ESRI shape files downloaded to a laptop computer for future identification of the plot and calculation of acreage sprayed.



A third set of plots were established on the Diamond A Ranch in Hood County on November 14, 2006. Eleven treatments were established (Table 1) using Tordon 22K, Overdrive, Escort, and Krenite herbicides with Topfilm surfactant. Additionally, two treatments used Load Out adjuvant to increase spray absorption. Treatments were again applied by North Star

Helicopters using a combination nozzle system with Accuflo .028 nozzles (#5 orifice) and CP-03 nozzles (middle orifice, high deflector). This combination nozzle system provided a wider range

of droplet size from 400-1000 μ in size. Plots were again documented with GPS guidance technology with ESRI shape files downloaded to a laptop computer for future identification of the plot and calculation of acreage sprayed.



A fourth set of plots were established on the McKay Ranch in Hood County on April 18, 2007. Eight treatments were established (Table 1) using Tordon 22K, Escort, and Krenite herbicides with Synurgize surfactant.

Treatments were applied by North Star Helicopters using .028 Accuflo nozzles and CP nozzles (small orifice, high deflection), #6 orifice in both, and 25 psi boom pressure. All 2007 plots were documented the same as previous years with GPS guidance technology.

Initial 60 day leaf brownout evaluations are made by visual estimations. Evaluations of percent apparent mortality are made by counting sub-samples of live and dead plants. A line through the plot is selected and 100 plants counted as either live or dead. Three transects lines are made within each plot and an average mortality calculated for each. Final Percent mortality estimates are made at two year post-treatment.

Table 1. Herbicide treatments and rates applied to redberry juniper during 2004, 2005, 2006 and 2007 in Howard and Hood Counties.

Plot No.	Herbicide	Acres Treated	Rate (product/acre)	Total Spray Volume/Acre
Applications made August 3, 2004				
1	Tordon 22K + Overdrive	10	32 + 4 oz.	10 gal.
2	Tordon 22K + Overdrive	10	32 + 8 oz.	10 gal.
3	Tordon 22K + Overdrive	10	32 + 4 oz.	20 gal.
4	Tordon 22K + Overdrive	10	32 + 8 oz.	20 gal.
5	Tordon 22K + Overdrive	10	32 + 4 oz.	30 gal.
6	Tordon 22K + Overdrive	10	32 + 8 oz.	30 gal.
7	Tordon 22K + Overdrive	10	32 + 4 oz.	40 gal.
8	Tordon 22K + Overdrive	10	32 + 8 oz.	40 gal.
Applications made November 13, 2005				
1	Tordon+Rivet	10	32+19.2 oz.	20 gal.
4	Tordon+Overdrive+Rivet	10	32+8+19.2 oz.	20 gal.
5	Tordon+Superb HC	10	32+12.8 oz.	20 gal.
7	Tordon+Overdrive+Superb HC	10	32+8+12.8 oz.	20 gal.
8	Krenite+Escort+Tordon+Topfilm	10	192+2+32+16 oz.	20 gal.
10	Krenite+Topfilm	10	128+16 oz.	20 gal.

Table 1. Herbicide treatments and rates applied to redberry juniper during 2004, 2005, 2006 and 2007 in Howard and Hood Counties.

Plot No.	Herbicide	Acres Treated	Rate (product/acre)	Total Spray Volume/Acre
Applications made November 14, 2006				
1	Tordon 22K	10	32oz.	15 gal.
2	Tordon 22K + Escort	10	32+2 oz.	15 gal.
3	Tordon 22K + Overdrive	10	32+8 oz.	15 gal.
4	Escort + Overdrive	10	2+8 oz.	15 gal.
5	Escort	10	2 oz.	15 gal.
6	Escort	10	4 oz.	15 gal.
7	Tordon 22K + Escort	10	32+4 oz.	15 gal.
8	Tordon+OD+Escort	10	32+8+2 oz.	15 gal.
9	Krenite+Escort+Tordon	10	192+2+32 oz.	15 gal.
10	Tordon+Escort+LO	10	32+2+4.8 oz.	15 gal.
11	Tordon+LO	10	32+4.8 oz.	15 gal.
Applications made April 18, 2007				
1	Tordon 22K	6.67	0.5 lbs	15 gal.
2	Tordon 22K	6.67	0.75 lbs	15 gal.
3	Tordon 22K	6.67	1.0 lbs	15 gal.
4	Tordon 22K+Escort	6.67	0.5 lbs+1.2 oz.	15 gal.
5	Tordon 22K+Escort	6.67	0.5 lbs+2.4 oz.	15 gal.
6	Escort	6.67	1.2 oz.	15 gal.
7	Escort	6.67	2.4 oz.	15 gal.
8	Krenite+Escort+Tordon 22K	6.67	6.0 lbs+1.2 oz.+0.5 lbs	15 gal.

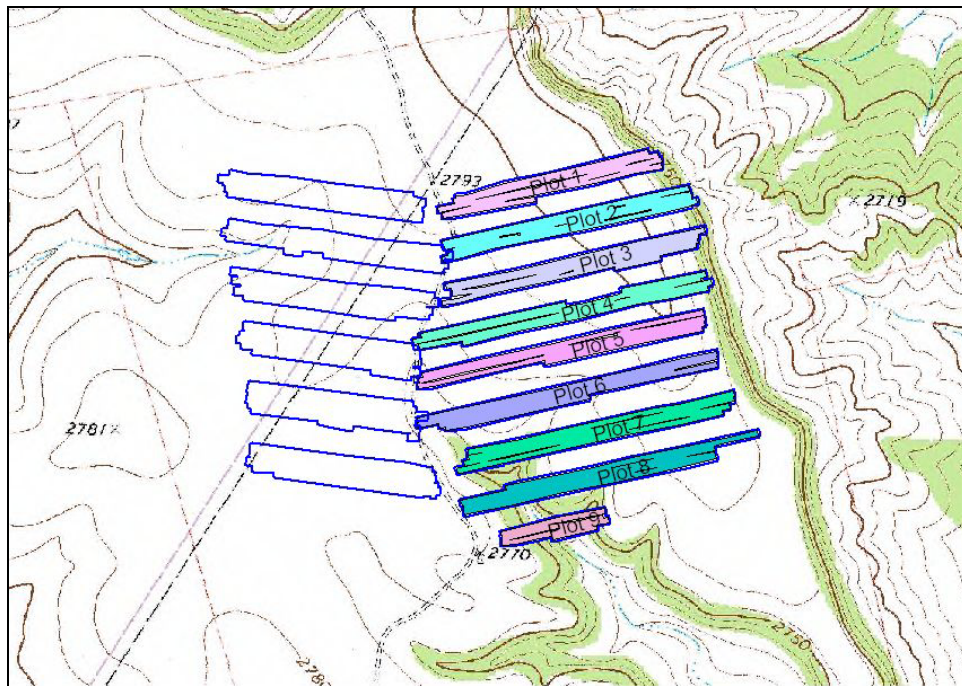


Figure 1. Location and layout of redberry juniper plots on the Morgan ranch in Howard County in 2004.

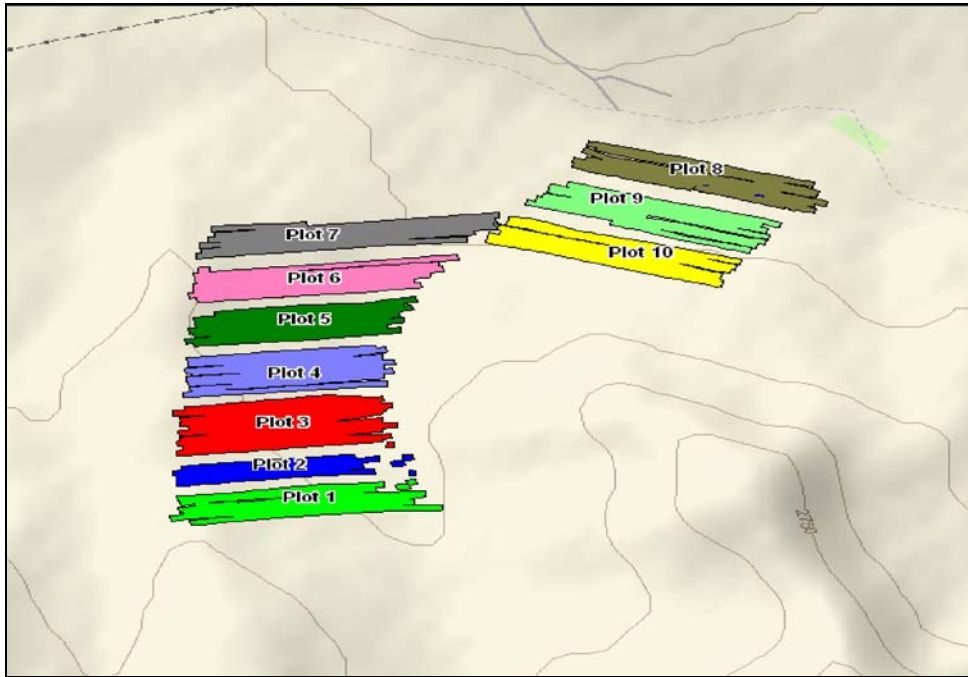


Figure 2. Location and layout of redberry juniper plots on the Morgan ranch in Howard County in 2005.

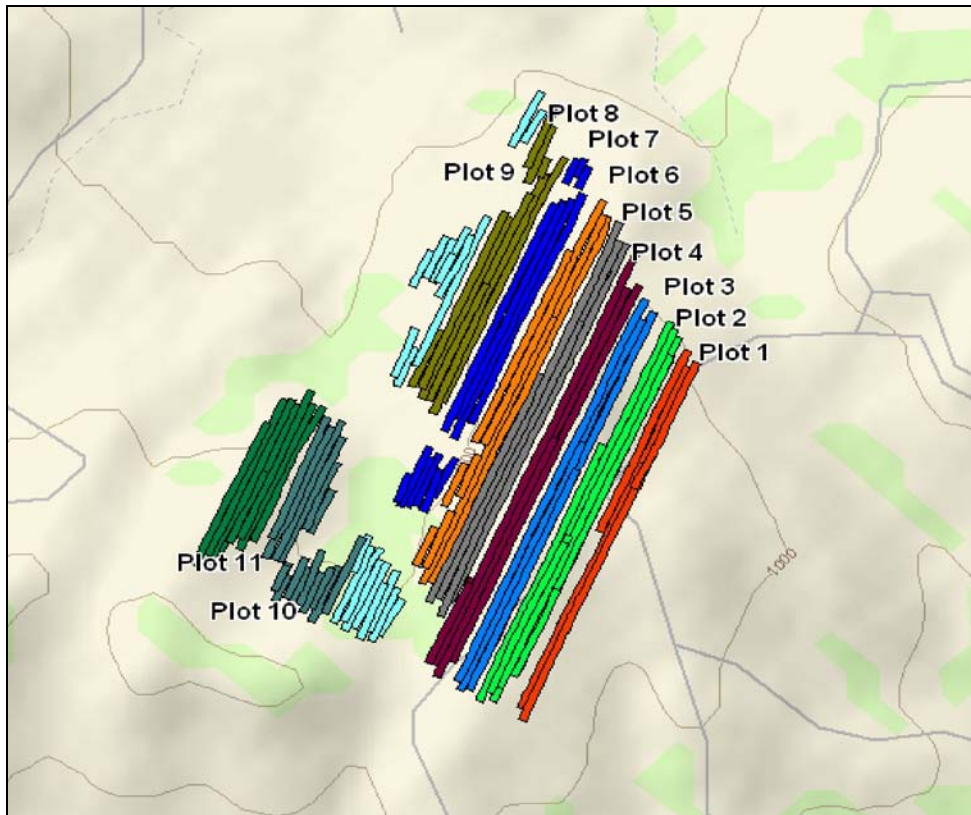


Figure 3. Location and layout of redberry juniper plots on the Diamond A Ranch in Hood County in 2006.



Figure 4. Location and layout of redberry juniper plots on the McKay ranch in Hood County in 2007.

RESULTS AND DISCUSSION

Final evaluations have been completed on all treatments and are presented in Table 2 and Figures 5-11. At 60 days after treatment, no treatment has provided greater than 50% leaf brownout, while most were below 40%. One year post-treatment canopy reduction estimates are low with the exception of 82% estimated on the 2005 Krenite + Escort + Tordon 22K plot (Figure 5). After one year evaluations on 2005 plots, no difference is detected between different adjuvant types (Figure 6), but after two year evaluations Superb HC and Topfilm outperform Rivet (Figure 8). Two year evaluations on plots established in 2004 showed no mortality effect, regardless of treatment or total spray volume. For the 2005 plots, two year evaluations show little mortality effect (Figure 7). In 2006 plots, only three treatments showed any canopy reduction and only one of those treatments showed measurable mortality at two year evaluations (Figure 9). The 2007 plots showed little canopy reduction at six month evaluations and negligible mortality at both one and two years after treatment (Figures 10-11).

Table 2. Percent apparent mortality of redberry juniper after herbicide treatments in 2004-2007 in Howard and Hood Counties.

Plot No.	Herbicide + Rate	TSV/Acre	% Brown 60 DAT ¹	% Canopy Reduction 1 YAT	% App. Mortality 2 YAT
2004 Plots, Morgan Ranch					
1	Tordon 22K (2pts) + Overdrive (4oz)	10 gal.	30	16.3	0
2	Tordon 22K (2pts) + Overdrive (8oz)	10 gal.	30	15.0	0
3	Tordon 22K (2pts) + Overdrive (4oz)	20 gal.	30	11.7	0
4	Tordon 22K (2pts) + Overdrive (8oz)	20 gal.	35	6.0	0
5	Tordon 22K (2pts) + Overdrive (4oz)	30 gal.	20	17.3	0
6	Tordon 22K (2pts) + Overdrive (8oz)	30 gal.	45	10.0	0
7	Tordon 22K (2pts) + Overdrive (4oz)	40 gal.	35	15.7	0
8	Tordon 22K (2pts) + Overdrive (8oz)	40 gal.	50	5.0	0
2005 Plots, Morgan Ranch					
1	Tordon 22K (2pts) +Rivet	20 gal.	NA	28	2
2	Tordon 22K (2pts)+Overdrive (8oz) +Rivet	20 gal.	NA	20	0
3	Tordon 22K (2pts) +Superb HC	20 gal.	NA	10	3
4	Tordon 22K (2pts)+Overdrive (8oz) +SuperbHC	20 gal.	NA	43	7
5	Krenite (6qts)+Escort(2oz)+Tordon 22K(2pts) +Topfilm	20 gal.	NA	82	10
6	Krenite (6qts) +Topfilm	20 gal.	NA	1	0
2006 Plots, Diamond A Ranch					
1	Tordon 22K(2pts)	10 gal.	10	0	0
2	Tordon 22K(2pts) + Escort(2oz)	10 gal.	10	0	0
3	Tordon 22K(2pts) + Overdrive(8oz)	10 gal.	10	0	0
4	Escort(2oz) + Overdrive (8oz)	10 gal.	10	0	0
5	Escort(2oz)	10 gal.	10	0	0
6	Escort(4oz)	10 gal.	20	0	0
7	Tordon 22K(2pts) + Escort(4oz)	10 gal.	10	10	0
8	Tordon 22K(2pts) +Overdrive(8oz) +Escort(2oz)	10 gal.	10	0	0
9	Krenite(6qts) +Escort(2oz)+Tordon 22K(2pts)	10 gal.	50	50	10
10	Tordon 22K(2pts) +Escort(2oz)+LoadOut	10 gal.	20	30	0
11	Tordon 22K(2pts)+LoadOut	10 gal.	10	0	0
2007 Plots, McKay Ranch					
1	Tordon 22K (0.5 lbs) + Synurgize (9.6 oz)	15 gal.	0	1	0
2	Tordon 22K (0.75 lbs) + Synurgize (9.6 oz)	15 gal.	2	1	0
3	Tordon 22K (1.0 lbs)	15 gal.	14	10	9
4	Tordon 22K (0.5 lbs) + Escort (1.2 oz) + Synurgize (9.6 oz)	15 gal.	3	4	1
5	Tordon 22K (0.5 lbs) + Escort (2.4 oz) + Synurgize (9.6 oz)	15 gal.	1	1	0
6	Escort (1.2 oz) + Synurgize (9.6 oz)	15 gal.	0	0	0
7	Escort (2.4 oz) + Synurgize (9.6 oz)	15 gal.	0	0	0
8	Krenite (6.0 lbs) + Escort (1.2 oz) + Tordon 22K (0.5 lbs) + Synurgize (9.6 oz)	15 gal.	5	0	1

DAT= Days after treatment, YAT= Years after treatment, 60 DAT rating is % of leaves brown.

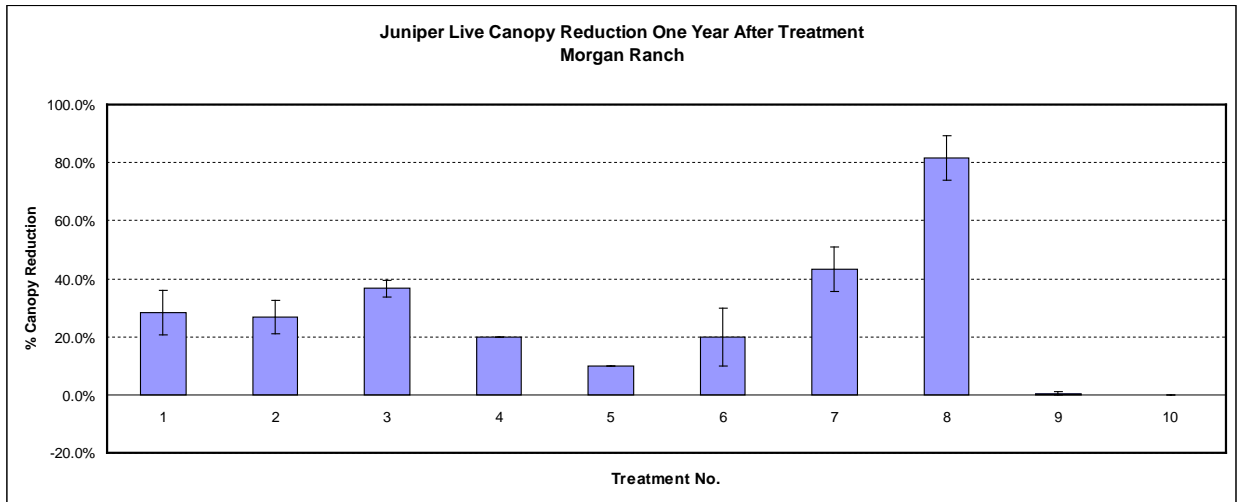


Figure 5. Canopy reduction one year after treatment on aerial juniper plots at the Morgan Ranch applied in 2005.

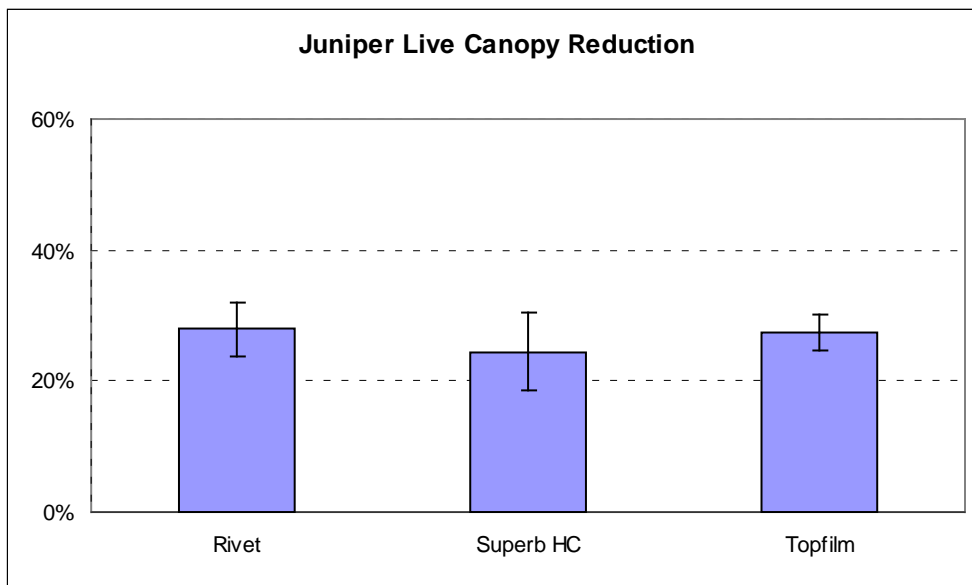


Figure 6. One year after treatment comparison of adjuvants used on aerial juniper plots at the Morgan Ranch in 2005.

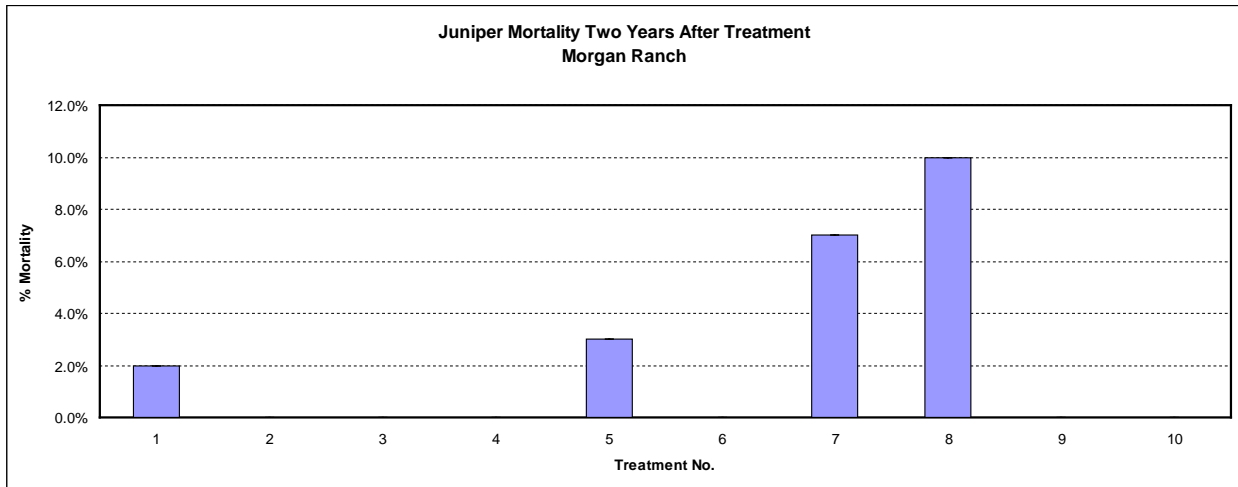


Figure 7. Percent mortality two years after treatment on aerial juniper plots at the Morgan Ranch applied in 2005.

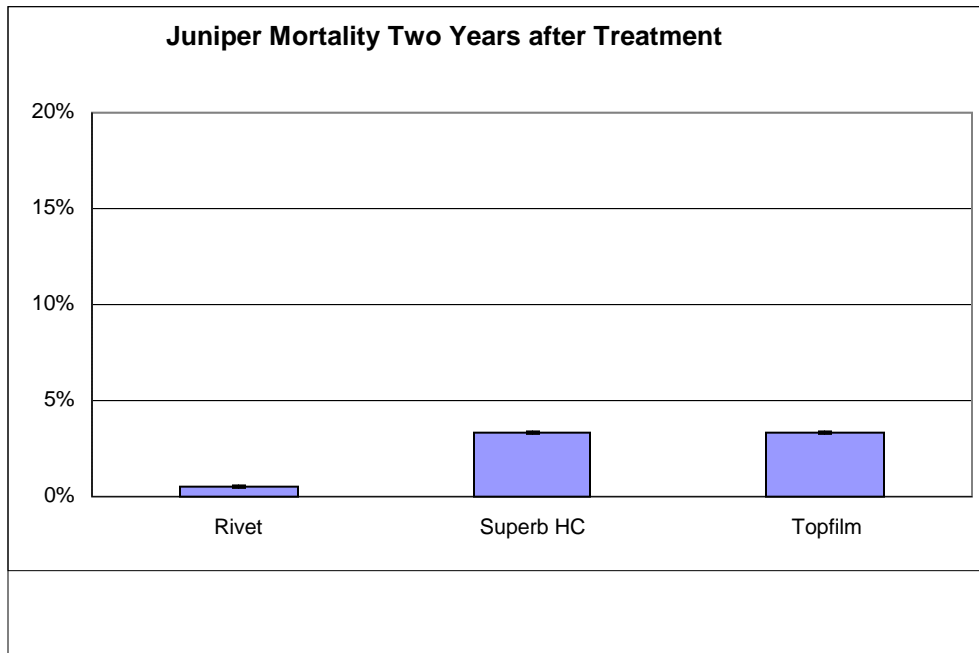


Figure 8. One year after treatment comparison of adjuvants used on aerial juniper plots at the Morgan Ranch in 2005

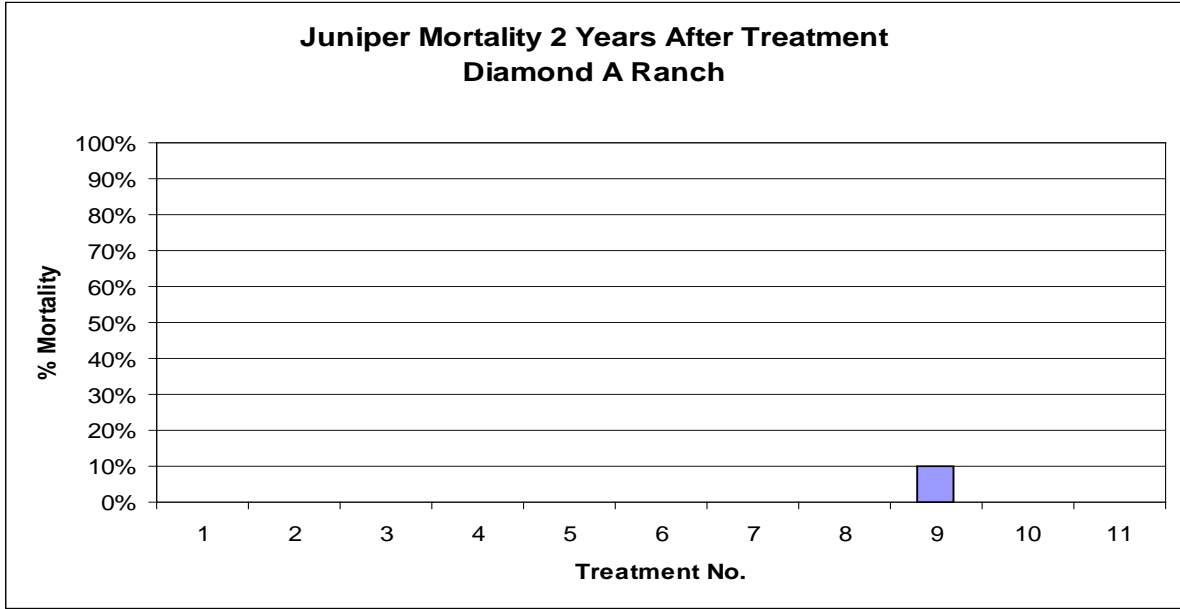


Figure 9. Mortality two years after treatment on aerial juniper plots at the Diamond A Ranch applied in 2006.

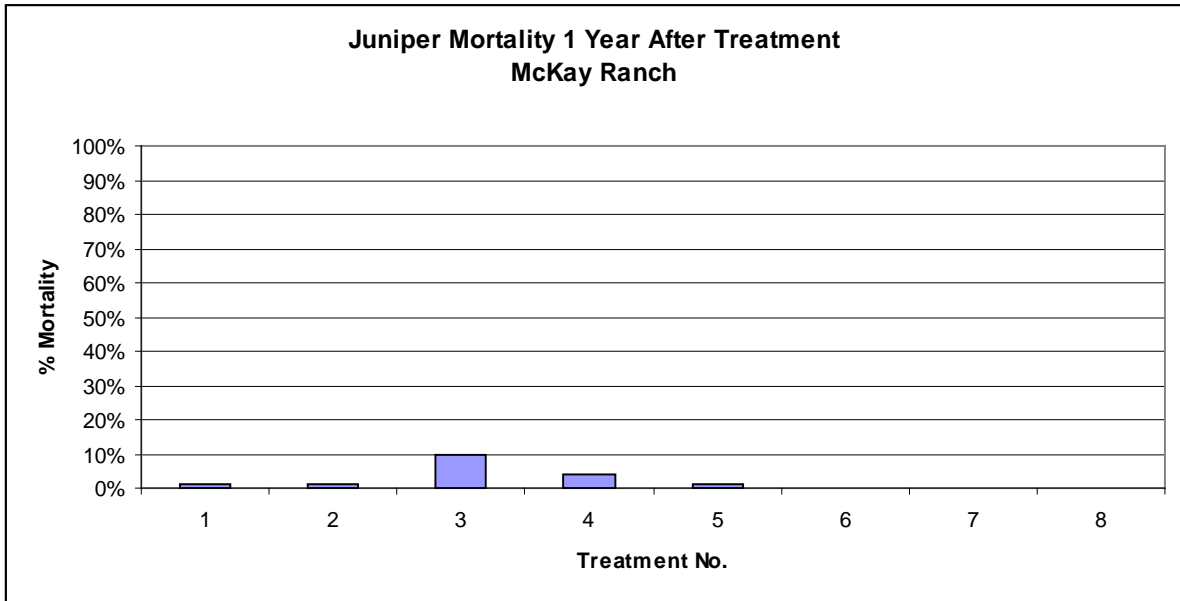


Figure 10. Mortality one year after treatment on aerial juniper plots at the McKay Ranch applied in 2007.

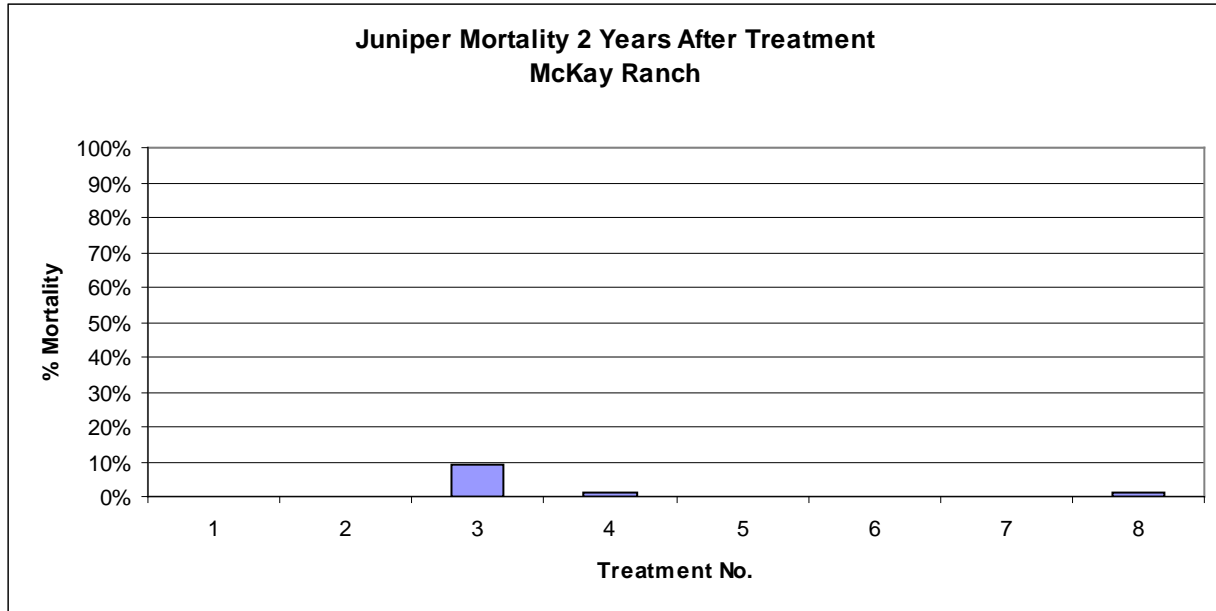


Figure 11. Mortality two years after treatment on aerial juniper plots at the McKay Ranch applied in 2007.

CONCLUSIONS

- No treatments applied in this study provided consistent, acceptable control levels for redberry juniper.
- Mechanical or individual plant herbicide treatment methods remain the only viable option for juniper management in Texas.

ACKNOWLEDGMENTS

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