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LHWRP Final Report to Hawai'i Invasive Species Council for HISC #C71279/RCUH Account #450847
Developing Herbicide Ballistic Technology as a Technique to Control Incipient Populations of Bocconia (*Bocconia frutescens*) on Leeward Haleakalā
11/1/16-4/15/18

Executive Summary:
Bocconia frutescens is one of the most significant invasive plant species threatening leeward Haleakalā watersheds. Its ability to germinate in sun or shade, to spread quickly via bird dispersal, to seed prolifically, to colonize and out-compete native species in remaining diverse pockets of native forest, and difficulty to access/control make it a top priority for Leeward Haleakalā Watershed Restoration Partnership's (LHWRP) invasive species control program. Experiments were conducted in 2017 to test the efficacy of HBT-G4U200 with the active ingredient triclopyr on incipient targets naturalized in the Kahikinui forest from a helicopter platform. A total of 95 bocconia were treated, with an average dose administered per plant at 7.3 g a.i. Treatment efficacy was conservatively estimated at 84% lethality with small seedlings sensitive to < 1 g a.i. HBT-G4U200 with triclopyr active ingredient is effective at eliminating incipient bocconia.

Methods:
The experiment was conducted in the Manawainui gulch region in Kahikinui, Department of Hawaiian Home Lands, Maui. This area is described as a dry, mesic montane area, highly degraded by land conversion and ungulate pressures and suitable to bocconia naturalization. The elevation range of the test area was 1338-1752 m with no targets observed in this tract above this range and heavier infestations below. The mean annual peak temperature followed the lapse rate with a range from 17.8-14.8^{o}C. Mean annual rainfall is 860-920 mm with a majority of precipitation in the winter season. Treatments were administered to individual plants within a 20 m range from a Hughes 500 MD helicopter with a pneumatic applicator, calibrated with 100 m s^{-1} muzzle velocity, discharging 17.3 mm projectiles, each containing 200 mg of the active ingredient triclopyr (a.i.). Projectiles were placed at the stem base, canopy midpoint and all growing points of sympodial specimens. Four treatment and rating operations were conducted on 02/24/2017, 5/04/2017, 10/16/2017 and 01/11/2018, with 69-, 165- and 87-day intervals between operations, respectively. Each operation followed the same path to observe previous treatments and new untreated plants. Plants were scored as lethal (i.e., no surviving portions), survivor (i.e., treated with living portions retreated) and untreated. Not all targets were detectable post-treatment, likely due to rapid decomposition of an effective treatment or imperfect surveillance. In these cases, we assessed optimistic and conservative

estimates of effective treatments based on the probability of a random search effort that assumes if an area of a recorded target is searched there is a 0.63 probability of no target in the area.

Results:

A total of 95 bocconia targets were treated in the first three treatment operations with a total treated area footprint of 386 m^2 spread out across >36 ha. An average dose of 7.3 g a.i. was administered per plant with the small seedlings receiving to < 1 g a.i. Twelve targets were directly observed to be effectively eliminated. Fifty-two of the targets went undetected but were within 10 m of new plants (e.g. recruitment) confirming efficacy of the treatment, while forty of the targets were undetected and with no other targets in the vicinity. Nine plants were recorded as survivors and retreated at lesser doses administered to the living portions. Optimistically, the treatments were 100% effective, including the retreated survivors. A more conservative estimate of efficacy was calculated at 84% when accounting for the ineffective treatments and the targets not confirmed. A pessimistic estimate of efficacy was still 57%.

Conclusion:

Target sizes were widely varied from large, sympodial matures to small, monopodial immatures, with survivors typically being the larger size class. Historically, triclopyr is known to be effective as a basal bark application with a 20% v/v solution. Efficacy was further translated with HBT-G4U200 deployed in an operational setting. Despite being a systemic herbicide, triclopyr doesn't consistently translocate to all parts of the plant, unless each apical growing point is treated. Hence, larger targets requiring higher doses. This project would be further supported with a more controlled dose-response experiment to determine dose as a function of plant size. Regardless, this project will suffice as data towards inclusion of a new species on the FIFRA 24c SLN HI-120001. LHWRP plans to continue to work with Dr. James Leary to utilize this treatment method, especially for small incipient plants, pending label change that would make this method legally available.

An effective treatment of bocconia with HBT-G4U200 approximately 120 days after treatment.

Financial Report:
HISC Final Financials for the period of 11/1/16 – 4/15/18

Description	Amount	Actual	Remainder
Salaries	**$3,046.00**	$3,057.85	($11.85)
Fringe	**$738.00**	$696.28	$41.72
Helicopter/Contract	**$13,680.00**	$12,017.50	$1,662.50
Materials & Supplies	**$912.00**	$923.58	($11.58)
UH Indirect Cost=10%	**$1,838.00**	$1,669.53	$168.47
Total	**$20,214.00**	**$18,364.74**	**$1,849.26**

Budget Summary:
Salaries and Fringe: PCSU released their 5% for support staff to LHWRP for staff salaries and fringe. Approximately $1,849.26 remains unspent in helicopter time and the corresponding UH indirect cost due to weather and scheduling issues.