Scope of Work
Establishing Native Hawaiian Plants for ground cover protection on Hawaii's Roadways
(Hydromulching, weed control and subsurface irrigation)

1. Introduction

Hydroseeding is the now the primary means of re-vegetating cleared roadsides, drainage features and commercial landscapes. Currently, quick growing non-native grasses are being used primarily due to availability of seed and proven effectiveness on the U.S. mainland where the hydroseeding process was first developed and then later adopted in Hawaii. The problem with non-native grasses and ground covers is continued maintenance, irrigation, lack of sustainability as well as the indirect cost and environmental impact of controlling non-native, invasive species that escape the roadside and encroach onto adjacent areas.

The primary limiting factor in establishing Native Hawaiian plants with hyromulching equipment is the availability of seeds and vegetative materials. Once suitable plant materials is identified and produced in sufficient quantity, the problem becomes developing effective on site establishment protocols. Sustaining native plants in any disturbed ecosystem requires the developing a soil conducive to growth and the management of weedy species.

It is naïve to think that native species can establish quickly and thrive in soil lacking nutrients, highly compacted and supplied with water through a surface irrigation systems that by their design have a high maintenance requirement and limited effective lifespan (1-2 years). To put it another way, before you can expect native Hawaiian species to thrive you need to develop a native Hawaiian soil profile. It is important to recognize that a stable community of native Hawaiian plants cannot be achieved with a single planting of a single species. A more reliable and ecologically sound approach should include a mixture of plants that encourages a natural succession of plants that begins with pioneering species (rapid growing annuals), progresses through soil building species (perennial grasses and legumes) that provide the soil based foundation for a community of long lasting climax species (woody shrubs and trees).

The goal of any sustainable revegetation effort is to protect the roadside grade from eroding, enhance the scenic beauty of the site and maximize the efficiency of inputs such as water, weed management and labor for height management. In addition to functioning as a soil stabilizing agent, a weed free stand of native species can provide a valuable reservoir of propagation materials that can naturally disperse or be collected for subsequent plantings.

The scope of this project will be to develop site preparation protocols that will provide for rapid soil cover, maximize the efficiency of weed control efforts and increase the success of hydromulching establishment efforts. These protocols will be developed into written manuals as well as narrated slide shows suitable as streaming media for web based distribution.

2. Location.

The site selected for this project is located adjacent to the UH Manoa campus and encircled by the H1 west bound entrance ramp on University Avenue. The site has a security fence and pressurized city water supply. This site represents an ideal location due to its close proximity to the UH campus and high visibility for signage describing research and demonstration projects. This area falls under the control of the Hawaii State Department of Transportation and currently represents an under utilized asset for both research and demonstration activities relating to roadside stabilization and beautification.

3. Work required.

A. Site preparation.

The initial effort in this project will be to design and install an underground drip irrigation system controlled with either a battery or solar time clock. This phase of the project will include identification of valves, installation of pressure reduction devices and trenching for the underground drip lines. The design of the drip system will correspond to planned research and demonstration projects. The irrigation system will be installed to simulate the filtration systems and flushing options required for irrigation with reclaimed water (although city water will be used for irrigation purposes).

After the installation of the irrigation system, the site will be conditioned for native plant establishment. This will include soil amendment (based on soil tests), and applying irrigation to stimulate weed growth for subsequent treatment with systemic herbicides. After the initial weed reduction effort, plots will be established to test both seeds and vegetative plant parts for adaptability to hydromulch establishment.

B. Screening grassy species for adaptability to hydromulch establishment.

The foundation for successful hydroseeding is the availability of viable seed with a high level of germination. The Plant Materials Center (PMC) on Molokai has developed large-scale seed production techniques for several native Hawaiian grasses. The list of grasses includes Aki Aki grass (Sporobolus virginicus), Pili grass (Heteropogon contortus), Emoloa (Eragrostis variabilis), Panicum torridium and Eragrostis leptophylla. Research will address the proper combination of these species to maximize cover, exclude weeds and persistence when irrigation is removed after the establishment phase. Research results will be used to prepare a hydroseeding protocol for roadside stabilization primarily in dry zones such as the Eva plains.

C. Weed control in native Hawaiian grass stands.

Postemergence herbicides will be evaluated to determine weed and ground cover response with emphasis on products labeled for rights of way. Data will be collected on % cover provided by each species at selected intervals after hydroseeding. Species persistence and % cover will be determined for 1 year after establishment.

D. Species response to loss of irrigation.

Underground drip irrigation represents the most efficient means of supplying a perennial ground cover with water. Underground drip also provides an opportunity to make use of reclaimed water that cannot be applied with overhead sprinkler systems. After an initial establishment period (approximately 9-12 months) water will be withheld to identify those species that can persist with only natural rainfall. A weather station will be setup to measure rainfall at this site.

E. Proposed Schedule:

Year 1: Site preparation, secure seed sources, equipment purchase/rentals, installation of test plots and hiring graduate research assistance.

Year 2: Collect herbicide screening data, record percent ground cover and plant vigor of planted material, on-site field day and workshop and maintenance of plots.

Year 3: Collect data on persistence, maintenance of plots, draft final report.

Interim reports will be provided at six month intervals, upon start of project.

F. *Preliminary Budget:*

	Year 1	Year 2	Year 3
Personnel (salary-grad asst,)	20,000	20,800	21,632
Fringe (9%)	1,800	1,872	1,947
Material and Supplies:	11,000	4,000	3,000
Travel and Transportation:	1,500	500	2,300
Subtotal	34,300	27,172	28,879
UH overhead (3.5%) :	1,200	951	1,010
Totals:	35,500	28,123	29,889

Project Total: $93,512

4. Deliverables.

A. On site field days with associated workshops.

B. Final report on species adaptability to hydromulch establishment, response to chemical weed control agents and persistence after the cessation of supplemental irrigation.

C. Website with streaming media (Power Point slide show) to widely disseminate the results of the proposed research, demonstration projects and establishment protocols.

5. Submitted by:

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