

PROTECTION OF THE EAST MAUI WATERSHED & LOCAL GRAZING LANDS: A GIS & AERIAL-BASED APPROACH



Final Report
CIG Cooperative Agreement # 69-9251-7-774



SUMMARY OF PROJECT OBJECTIVES AND RESULTS

Miconia calvescens is an aggressive non-native plant that threatens the East Maui Watershed and adjacent grazing lands. The purpose of this Conservation Innovation Grant from the U.S. Department of Agriculture Natural Resources Conservation Service was to use a systematic GIS-based aerial approach to locate and control miconia on forest and grazing lands. Well-defined aerial management units were needed to guide operations and ensure thorough coverage.



This project had six major objectives:

- **Establish management units** for aerial survey and control of *Miconia calvescens* around grazing lands and adjacent forested areas.
- **Systematically map** the highly invasive *Miconia calvescens* within established management units, using an integrated GPS/GIS¹ system.
- **Systematically remove miconia**, using a GPS-GIS system to record the number, size and location of plants removed.
- **Work collaboratively with landowners** to maintain project area clear from miconia.
- **Prevent inadvertent vectoring of miconia seeds** from the project area using strict decontamination protocols.
- **Summarize and share results** via preparation of a technical report.

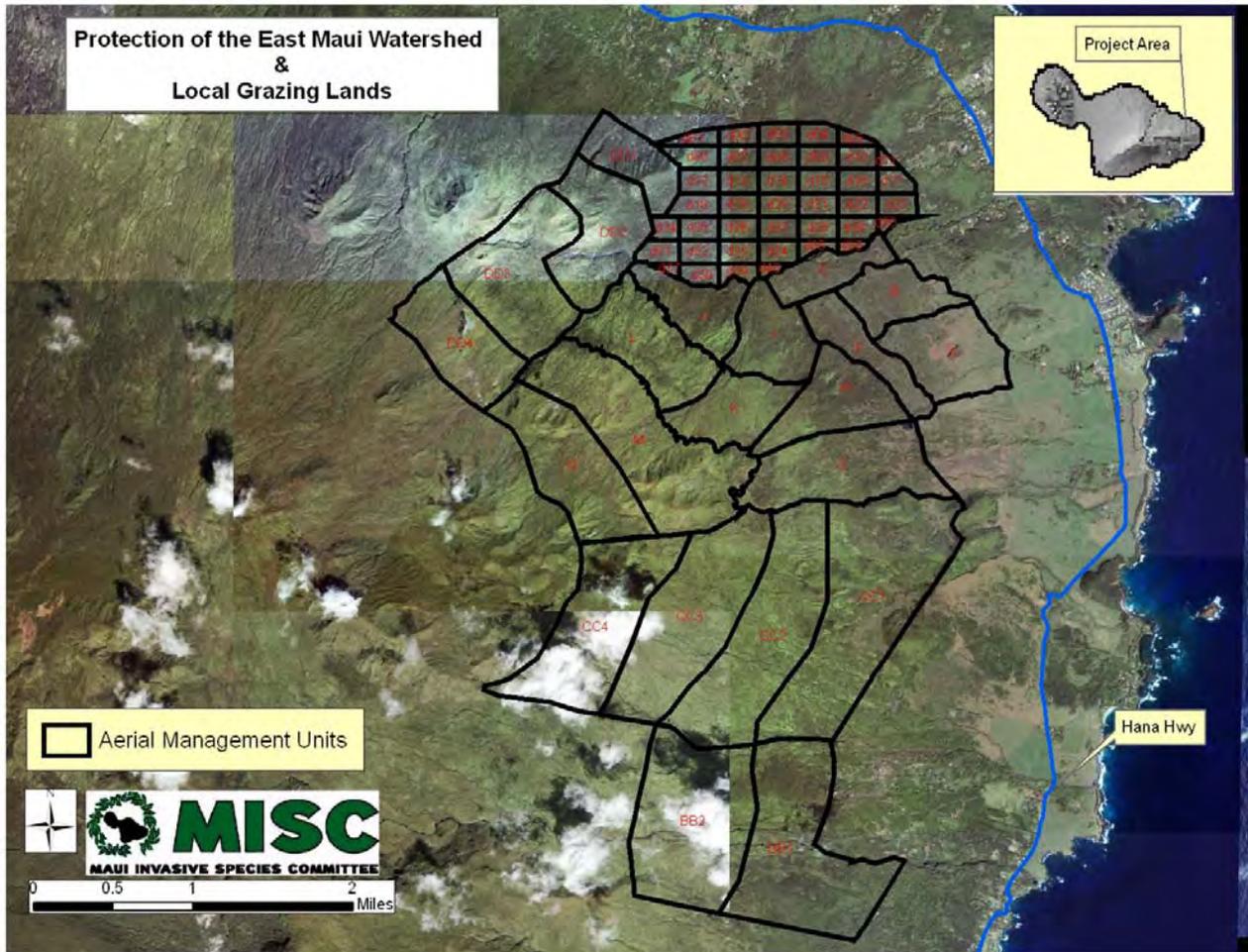
Work under this project included the following major accomplishments:

- Creation of well-defined management units
- Mapping of miconia within management units
- Control of 126,709 miconia plants, of which 1,712 were mature
- Maintenance of a positive, collaborative relationship with the landowners, and
- Adherence to strict decontamination protocols

PROJECT ACCOMPLISHMENTS

Management units were delineated in the project area to guide aerial survey and control work. Management units covered approximately 7,201 acres. Boundaries for each unit were established using readily identifiable topographical features. Additional considerations included presence/absence of dwellings and whether the area could be easily surveyed on the ground. Information about occupation status was obtained using the current Tax Map Key (TMK) GIS layer from the County of Maui. To avoid flying over inhabited properties, TMKs with dwellings valued at \geq \$9,000 were considered to be inhabited. Upper-elevation boundaries of management units were based on current knowledge of the highest known elevation for miconia on Maui (~2,800 feet). Smaller management units were created within the most densely infested area using a grid system to ensure thorough coverage. Units were numbered and mapped using ArcGIS software.

¹ GPS = Global Positioning System; GIS = Geographic Information System



Aerial management units

Systematic mapping was achieved by flying the project area with helicopters and trained spotters. Two approaches were used. If the focus of the mission was reconnaissance, two or three spotters accompanied the pilot to search for miconia plants. Only personnel who had been thoroughly trained to recognize miconia plants were allowed to fly. The missions were flown with the helicopter doors off to allow maximum visibility for each spotter. The spotter riding in the front of the helicopter carried a GPS unit to record the spatial location for each miconia plant detected. The pilot attempted to fly systematic lines back and forth within established management units. All spotters and the pilot searched for miconia plants. Whenever a plant was detected, the spotters informed the pilot, who then hovered over the plant while the spotter with the GPS unit took a location point and entered information about number, size, and status (flowering or seeding) of plants observed. These points were entered as “Treatment Needed” into the unit so the helicopter on a future flight could return directly to that location to aeri- ally spray the plants. When the focus of the mission was to spray known plants or to conduct what are called “spray-recon” operations, only one spotter flew with the helicopter so that

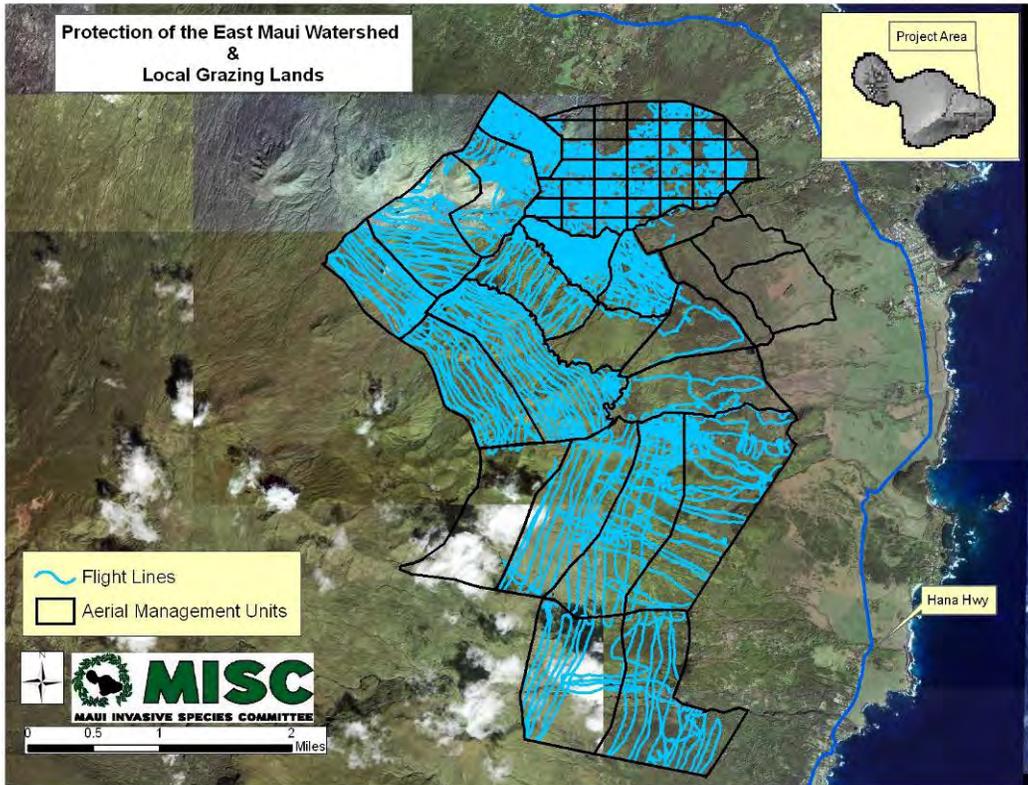
herbicide could be loaded beneath the belly of the helicopter and target plants could be sprayed. The spotter entered information into the GPS unit about the location, number of plants controlled, herbicide used, and status (flowering or seeding) of the plants.

All areas flown were tracked using a Trimble GPS unit. Data were downloaded to ArcGIS. Acreage was calculated by buffering all flight lines by 50 meters. Use of GIS technology provided a more accurate representation of the work completed, both spatially and numerically

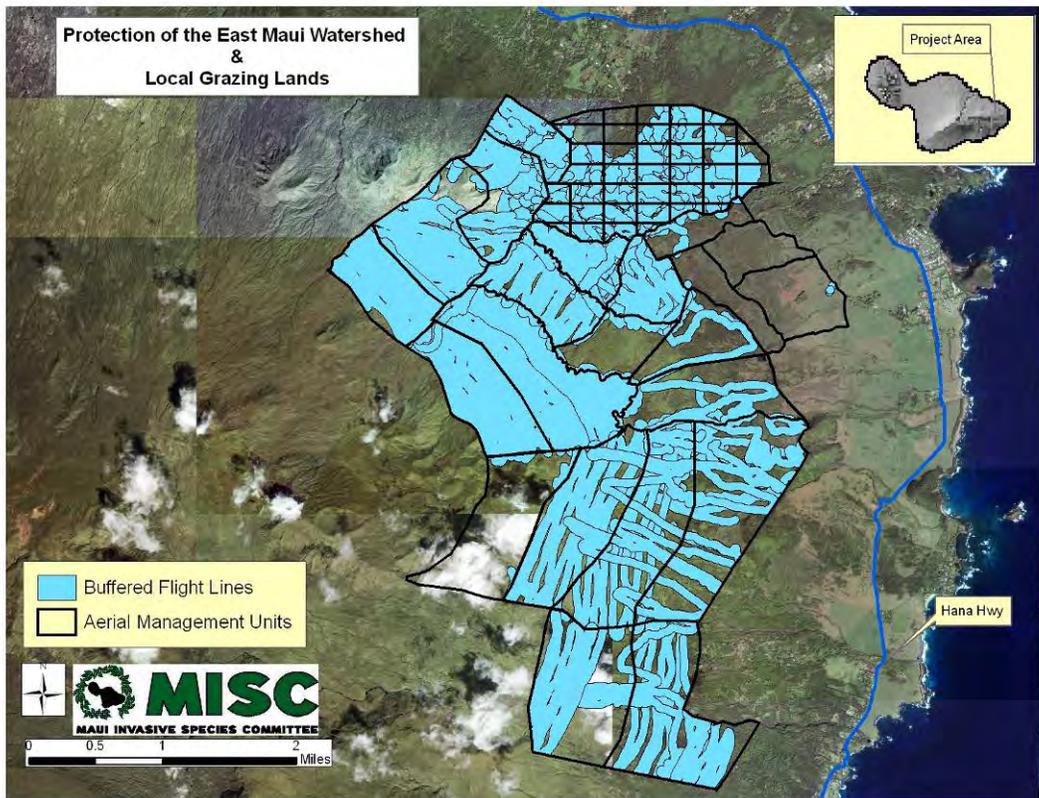
Although the lands within the management units totaled 7,201 acres, the area covered by air was 17,721 acres. This difference reflects overlap of buffered flight lines during multiple flights and indicates very good coverage of the project area. Ground sweeps covered a total of 1,493 acres. Open pastures or areas in close proximity to houses were not suitable for aerial reconnaissance.



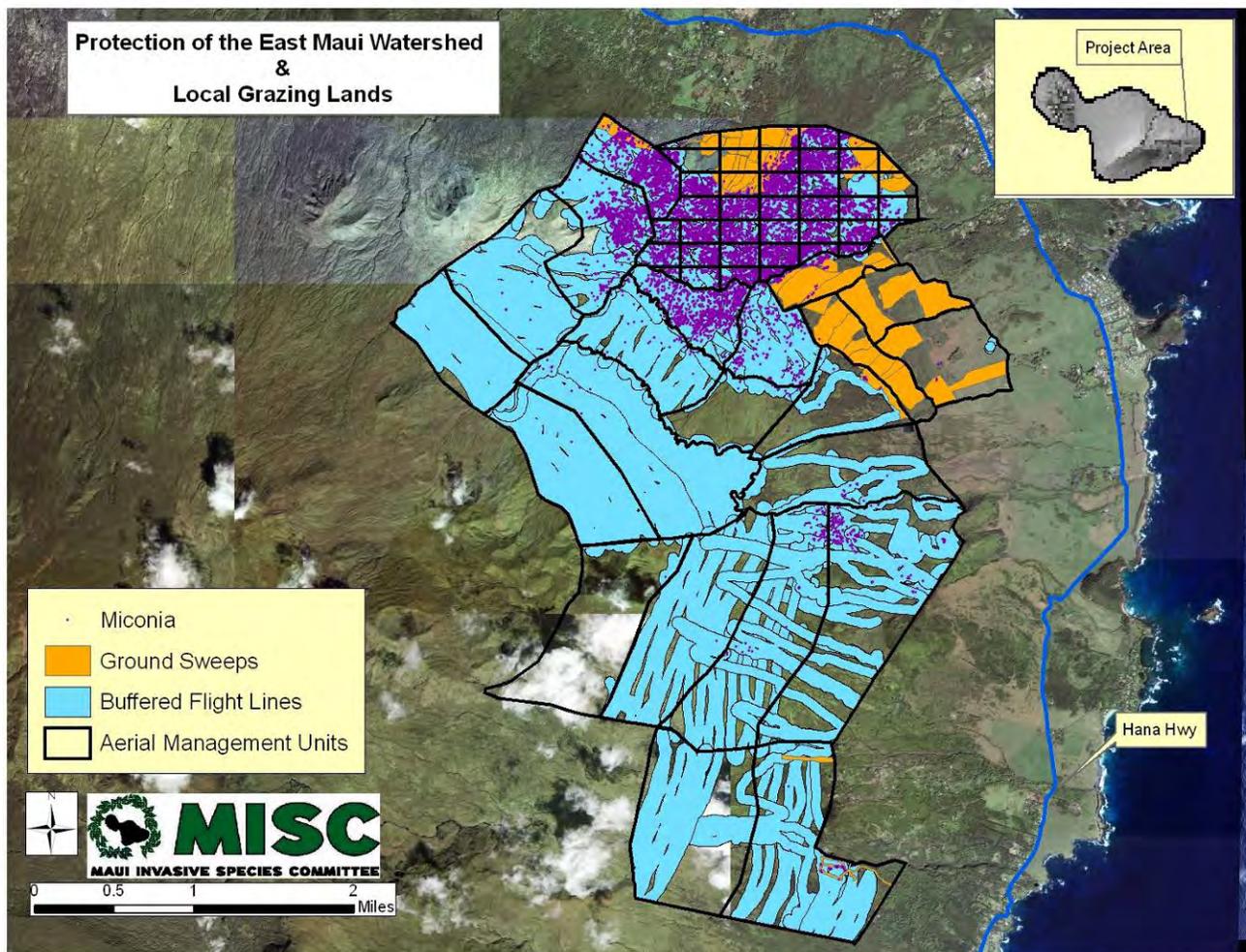
Pilot and spotter – with GPS & “doors off.”



Work during project period: flight lines



Work during project period: buffered flight lines



Buffered flight lines, ground sweeps, and miconia detected & controlled

Systematic removal of all accessible miconia plants detected during aerial operations occurred using a spot-spray technique. The helicopter was fitted with a spray tank connected to an 80-foot cable. At the end of the cable a spray ball delivered a 2.5% solution of Garlon 3A (triclopyr) directly to the targeted plant. The helicopter pilots and spotters were very adept at identifying miconia, ensuring a high degree of accuracy in targeting the intended species. Information about each plant was recorded in the GPS unit, including whether the plant was mature (flowers present) or immature. A total of 28,677



Tank attached beneath helicopter holds herbicide.

miconia plants were controlled during aerial missions, of which 1,436 were mature plants. During ground sweeps in the project area, field crews controlled a total of 98,032 plants, of which 276 were mature plants. A large number of plants were controlled immediately adjacent to the northeast boundary of ranch lands and miconia plants were also detected and controlled on the cooperators' property.



Spray ball at end of cable targets miconia plants from the air.

Ground sweeps within the project area were conducted by having field staff walk through potentially infested areas, staggered approximately 10 feet apart. The distance varied depending on terrain and vegetation. At least one staff person carried a GPS unit to record sweep lines within the targeted area. Spatial data was not collected for every plant controlled; it was often difficult to obtain good satellite coverage in some parts of East Maui and the high density of plants in some areas would have required an inordinate amount of time recording data into the GPS unit. Instead, field staff recorded the total number of plants controlled within a sweep area, including information about the size of the plants, method of control (hand pull or chemical treatment) and flowering status. At the end of each day's work, a polygon was created using ArcGIS and information about plant treatment activity was then associated with the spatial file.



GPS units and spatial data guide sweeps on the ground.

Collaboration with landowners continued to ensure the long-term success of the project. The cooperater provided a landing zone and water for helicopter operations. Ongoing communications with ranch managers helped foster a positive collaborative relationship.

Inadvertent vectoring of miconia seeds was prevented by following strict decontamination protocols for all workers in the project area. This step is necessary because miconia seeds are very small – the size of sand grains – and easily become lodged in gear, clothing, boots, or vehicles. To prevent moving miconia seeds by field staff to new sites, field gear was dedicated to use for miconia only. Dedicated gear included field clothing, boots, tools, radios, flight suits, spray balls, and spray tanks. Vehicles and equipment used in miconia areas were thoroughly washed after each mission.



Field crews use dedicated gear and thoroughly decontaminate all equipment.

Summarizing and sharing results from this project were accomplished using a variety of venues. Results from this project were featured in presentations at two workshops: a Data Workshop of the Hawai‘i Association of Watershed Partnerships; and the Landowner Assistance Workshop held by the Hawai‘i Department of Land & Natural Resources. Information from this project was also used in a presentation at the 2009 International Conference on Miconia, held in East Maui. This report and its results will be made available to MISC’s partners and others within the statewide invasive species network, including via the Coordinating Group on Alien Pest Species, and with Hawai‘i’s other island-based Invasive Species Committees, which also work on detecting and controlling miconia. This work has been shared with staff from other ISCs via site visits and aerial training opportunities.

No significant problems or constraints delayed project implementation. Proposed activities were carried out as envisioned by the project proposal.



Landing zone

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