

DOFAW

Oahu Native Ecosystems Protection and Management

2015 Report to the Hawaii Invasive Species Council



Control of *Angiopteris evecta* at Poamoho Section of Ewa Forest Reserve

Angiopteris evecta (giant fern) is a highly invasive fern in Hawaii, with a very large growth form (up to 7 m tall). It displaces native tree ferns and other native plants by forming a dense canopy and spreading rapidly, especially in stream gulches. *A. evecta* is established along the lower portions of the Kaukonahua stream, and has spread to the summit crest where a large core population is concentrated in a central drainage of the upper Poamoho forest. Poamoho is an area of high biodiversity, contains numerous endangered plants and animals and is a high priority management area that has been fenced to exclude feral pigs. An aerial survey in January 2014 showed dense coverage of *A. evecta* extending downstream, with individual plants occurring sporadically in the surrounding forest. The fern spores are wind and water dispersed, and mature plants at the stream headwaters and the summit crest create a source for spores to travel downstream and to be blown to other drainages across the Ko'olau Mountains. Control is essential to prevent *A. evecta* encroachment in the upland native forest of the northern Ko'olau, and to protect the high-value Poamoho forest.

A plan was developed to aerially spray the dense core population on the steep slopes above the stream, and to perform ground-based control in the more accessible areas of the management unit. Baseline high-resolution gigapan photo-mapping of the 20-acre core infestation area is conducted yearly to aid in monitoring efficacy of the aerial spraying along with native regeneration.

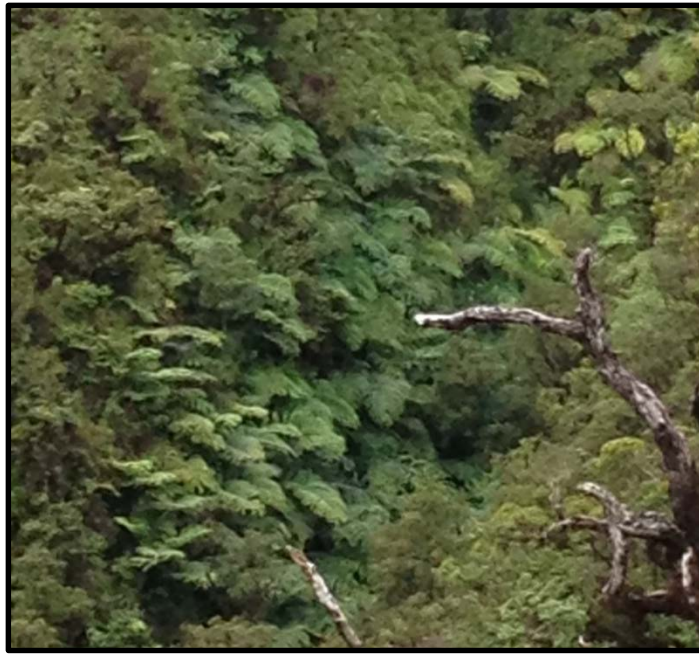


Photo 1: *Angiopteris evecta* aerially sprayed. Note the blue dye to show treatment coverage.

Previous aerial control targeted the upper core and also focused on plants that were inaccessible by foot outside of the core gulch. For FY15 staff returned focus to treatment of the core gulch.

Aerially spraying was delayed repeatedly in 2015 due to contractor availability and inclement weather conditions. In February 2016, 3 days of aerial spraying was conducted. A total of 12.7 flight hours and 165 gallons of 2% Polaris AC Complete covering a survey area of 11.3 acres was aerially treated. Spray focused on continuing treatment of the upper core plants located along the back walls of Pu'u Pauao.

In April 2016 one additional spray day was conducted in partnership with Oahu Army Natural Resource Program (OANRP). A total of 6 flight hours and 70 gallons of 2% Polaris AC complete was aerially sprayed covering approximately 5.7 acres. Spray coverage targeted the western end of the core gulch to avoid duplicating spray conducted in February. Figure 1 details the total area sprayed in February and April.

Photo 2: OANRP staff setting up gigapan



In November 2015, gigapan monitoring was completed. Unfortunately, staff experienced difficulties with replicating the monitoring from previous years. The fence line was now installed creating an obstacle for gigapan setup and erosion had occurred at the upper most photopoint location again creating another obstacle. Staff improvised to duplicate the same photo angle as in previous years. The 2015 imagery was then compared to 2013 and 2014 imagery. Dead *A. evecta* were observed on the 2015 imagery. Non-target impact was also observed on the imagery and is concerning to

staff. Staff will continue to monitor non-target impact and research additional spray nozzle setups to help avoid future non-target impact. Further comparison shows native regeneration filling in within treated zones. *Dicranopteris linearis* and *Machaerina angustifolia* are observed replacing treated *A. evecta* and is detailed in photos 3, 4 and 5 below. Due to software stitching issues a bottom portion of the 2015 lower photopoint imagery was cut off. This missing portion was important as it captured a large area of the spraying from 2014, thus staff was unable to analyze much of the spray zone from the previous year. Staff hope to recollect this missing data in the 2016 monitoring event.

Staff presented the control efforts of *A. evecta* at Poamoho during the Oahu 2016 Annual Weed Workshop and received helpful feedback for efforts moving forward.

Figure 1: Map of aerial control work for Fiscal Year 2015

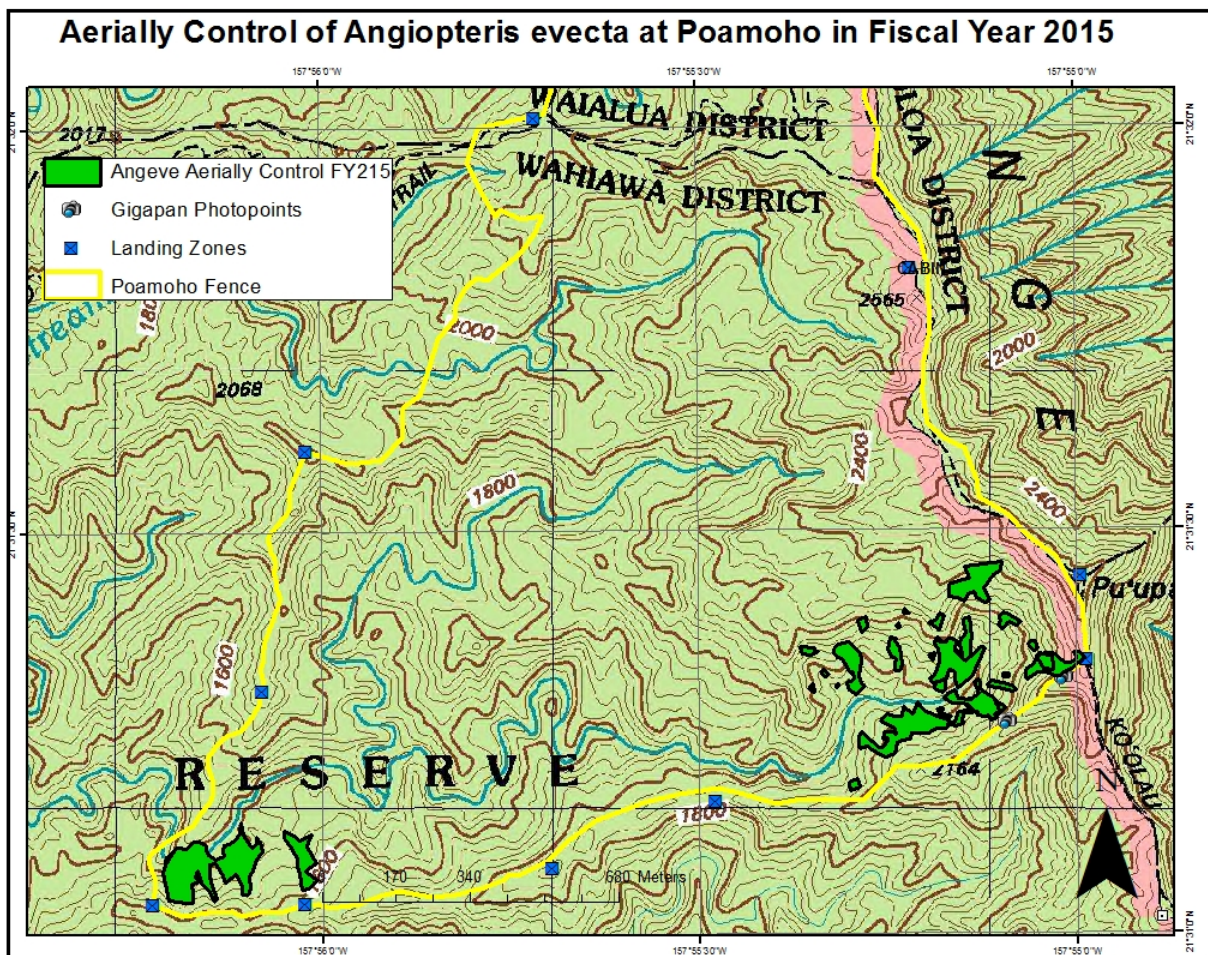




Photo 3: Zoomed gigapan photo pre-treatment (April 2013)



Photo 4: Zoomed gigapan photo 6 months after treatment (November 2014)



Photo 5: Zoomed gigapan photo 1.5 years post treatment (November 2015) **Note the slight angle change*



Photo 6 (left): November 2015 completed stitched (zoomed out) gigapan, upper photopoint

Photo 7 (right): November 2014 completed stitched (zoomed out) gigapan, upper photopoint

**Note the slight difference in angle*



Photo 8 (left): November 2015 completed stitched (zoomed out) gigapan, lower photopoint

Photo 9 (right): November 2013 completed stitched (zoomed out) gigapan, lower photopoint

**Note the slight difference in angle*