

ECOLOGY AND CONTROL OF FOUNTAIN GRASS (*Pennisetum setaceum*)

TAXONOMY. Fountain grass (*Pennisetum setaceum*), native to north Africa, was introduced to Hawai'i probably near the turn of the century as an ornamental.

DISTRIBUTION. Fountain grass is found on Kaua'i, O'ahu, Lana'i, and Hawai'i, with an incipient infestation on Maui. The largest infestation is on the Big Island, in North Kona and South Kohala. Its spread has probably been facilitated by its use as an ornamental.

ECOLOGY. Fountain grass is one of the few alien plants to invade young lava flows and disrupt primary succession at an early stage. Fountain grass is also a fire-tolerant and fire-promoting species. It accumulates large volumes of dead biomass and burns with high fire intensity. It also establishes itself rapidly after fire by vigorous resprouting and apparently by seedling recruitment (the latter has not been documented). As a result, fire favors the establishment of dense to monospecific stands of fountain grass. It can invade native dry forest to form a dense understory that preclude regeneration of native trees and promotes frequent, hot fires. Fountain grass has broad environmental tolerances. It grows from sea level to 9,500 feet elevation and from dry coastal areas in north Kona (probably 10 in of rain/year) to disturbed slopes above Waipio Valley (probably around 100 in rain/year). However, it does best in drier areas with rainfall <50 in/year.

CONTROL STRATEGIES AND TACTICS. The most intensive fountain grass control program is at Hawai'i Volcanoes National Park. Control work started in the early 1970s in dense populations at the core of the 20,000 ac infestation. By 1985, control of the core areas was abandoned in favor of control of satellite populations and roadsides. Manual control was used, with searching done from helicopter, horseback, and on foot. Using the approach of starting with satellite populations, the expansion of fountain grass in the Park has been stopped. Almost all outlying populations were eradicated after 1-3 control efforts, and these areas are largely searched now from the air. The program now emphasizes control of the dense populations at the center of the infestation, using Velpar.

Hawai'i Island NARs managers control fountain grass at Manuka NAR using a combination of ground crews for accessible plants and helicopter spraying for remote populations on rough lava flows.

There has also been success at Ka'upulehu-Kona in controlling a monospecific stand of fountain grass in the understory of six acres of dry forest leased by National Tropical Botanical Garden from Bishop Estate and in separate plots in nearby private lands. In these floristically rich forest remnants, fountain grass is precluding native forest regeneration and providing a hazardous fuel bed for a potentially stand destroying fire. Control was effected with herbicides and seedling recruitment declined considerably. There are also some signs of native tree recruitment. These experiments suggest that control of dense fountain grass stands is feasible for small, highly significant biological sites.

CONTROL METHODS: Linda Pratt and Greg Santos at Hawai'i Volcanoes National Park investigated three preemergent/postemergent herbicides on control of fountain grass at approximately 700 ft elevation in moderately dense stands. They tested Velpar (HEXAZINONE), wettable powder of Hyvar X (BROMACIL), and Arsenal (IMAZAPYR). They concluded that fountain grass is not sensitive to Hyvar X or Arsenal, with little preemergent or postemergent response at rates tested. However, Velpar at 9 lbs AI/AC produced 100% kill and complete preemergent activity for 12 months, with some seedling recruitment by 18 months.

Mick Castillo and Carlo Popolizio are conducting a complex factorial experiment on fountain grass control. They are working in an actively growing monospecific strand of fountain grass resprouting after fire at Pohakuloa. They used two concentrations of Roundup (GLYPHOSATE) (1.5% and 3%), Garlon 3A (TRICLOPYR) at 0.5%, Velpar at 2kg/ha, and manual control. They tried them separately and in combination. They provisionally concluded that manual removal, immediately followed by Roundup at both concentrations, applied to soil surface and plant remains, was the most effective postemergent treatment. They have not evaluated effects of their treatments on preemergent control.

Phil Motooka tested BROMACIL, DIURON, AND HEXAZINONE. He found that HEXAZINONE was very effective at a lower rate (5 lbs/ac) than Pratt and Santos found effective (9 lbs/ac). Phil also discovered, while testing herbicides for roadside weed control, that Garlon 3A apparently had a post-emergence activity with fountain grass, but has not followed up on this hypothesis.

The effects on native plants were investigated rigorously only at Hawai'i Volcanoes. Of particular concern is the impact of Velpar. Pratt and Santos found that Velpar did not have a long term effect on pili grass (*Heteropogon contortus*).

Managers have modified research results in the field and tried new chemicals. Chris Zimmer at Hawai'i Volcanoes largely uses manual control on isolated plants and 10% Velpar in dense fountain grass stands with over 9 months of preemergent activity. The soil is also sprayed around the base of the plants. Five percent Velpar is effective as a postemergent. Velpar can be used effectively on dormant plants, but is never used around native woody plants because they have observed unfavorable effects. Chris found that 2% Roundup is very effective only if the plants are actively growing. Julie Leialoha uses 10% Garlon 3A for postemergence control using a helicopter and the pakalolo spray rig for dense stands of fountain grass in remote and rugged terrain. She has not monitored for preemergent activity. She also found that Roundup is not fully effective on dormant plants. At Ka'upulehu, a 1.5% solution of Fusilade (FUAZIPOP), a highly selective postemergence grass killer, was relatively effective in controlling fountain grass that was resprouting from weedwacking or on seedlings. Fusilade was used to avoid damage to non-target native trees. Percent kill was not determined, but stands were

largely reduced to scattered seedling recruitment after three applications.

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