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EFFICACY OF STEAM WEED MANAGEMENT ON MOTHER OF MILLIONS (*BRYOPHYLLUM SPECIES*), SINGAPORE DAISY (*SPHAGNETICOLA TRILOBATA*) AND BUTTERFLY HEAVEN (*DYSCHORISTE DEPRESSA*).

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SUMMARY

Mother of Millions (*Bryophyllum* species) and Singapore Daisy (*Sphagneticola trilobata*) are both significant weeds in NSW (RBG&DT 2013) and Queensland, with the potential to be a significant weed in Victoria due to their ability to rapidly spread. Dyschoriste or Butterfly Heaven (*Dyschoriste depressa*) is an emerging environmental weed in Queensland (CHAH 2010) that has spread at an alarming rate in the last 20 years across Brisbane. Mother of Millions is also toxic to livestock, and potentially in large enough doses to humans and pets. All these weeds are challenging to control as the smallest cutting can regrow and/or herbicides have been found to have limited effect.

This paper explores the efficacy of saturated steam weed management on Mother of Millions, Singapore Daisy and Dyschoriste across a variety of environments. Saturated steam weed management has been found to have varying degrees of success depending on the soil structure i.e. mulched or sandy sites. In some cases, the weeds are effectively eradicated with one treatment and in other cases require multiple treatments with saturated steam. In the case of Dyschoriste, saturated steam has been demonstrated in the field to be the most effective treatment method. Some of the coastal sites in NSW were severely impacted by the 2019-2020 Black Summer Fires and these impacts on weeds, spread and saturated steam weed management will be covered. This paper also explores factors to improve success rates.

Cited case studies include urban bush regeneration sites in Brisbane, coastal sites at Morton Bay in Queensland; and wetland sites at Byron Bay and coastal sites at Wallabi Point in NSW.

Keywords: SatuSteam™, Chemical Free, Organic, Holistic Weed Control, Integrated Weed Management.

INTRODUCTION

The steam weeder is one tool in the holistic regenerator's toolkit. One of the main benefits is that the only residue is water. The technology is simple and effective. It uses fossil fuels but in a transparent 'honest' way. Burn diesel to heat the water to 120C, utilise a petrol-driven pump to deliver this as pressurised water to the target point, where it physically kills the meristematic (or growth cells) of the plant with a combination of steam and superheated water also known as Satusteam™. Its success is based on the scientific knowledge that at certain temperatures, and temperature differences i.e. from ambient to Boiling Point (BP), the cell walls of biological organisms rupture. Next time you cook broccoli, admire the bright green of the chloroplasts exposed in the tissue - this vibrant look, and the delicious steam-greened smells are what operators observe and experience while effectively treating weeds with Steam Wand (SW) units.

Using the SW unit in natural areas requires a sensitive approach. This machine was developed for landscapers and urban settings, where neatness and clean-line aesthetics is key; in areas where soft meets hard, where unwanted weeds grow through cracks in paving or through decorative gravel. But the science still stands when one applies it in the bush, or where bushland meets urban, so it is an excellent ethical choice in natural ecosystems too.

The *ethical consideration here is, that as it is* a non-selective method, with the potential to harm all flora and fauna of all sizes, we must utilise this ‘tool’ with utmost discernment and skill.

Preparation is key. Plant identification skills are crucial. Acknowledgement of onsite soil type and structure is important. Understanding the diversity, life-cycle and behaviours of onsite fauna is paramount to use this tool ethically.

Once experience and skill in discernment, operation and control are attained the SW unit becomes an indomitable tool for landscapers, especially in treating tough weeds such as Mother of Millions, Singapore Daisy and Dyschoriste.

METHODS

The information presented in this paper was collated from sites that the co-authors manage, survey results from two respondents, representing sites overseen by the following organisations:

- Coochiemudlo Island Coastcare Inc, QLD
- MidCoast Council, NSW (contractor: Aus Eco Solutions)
- Byron Shire Council, NSW (contractor: Steam Weeders/Garden Warrior)
- Brisbane City Council, QLD (contractor: Bushtekniq Pty Ltd)

The following data was collated from site representatives:

1. Name of contributor:
2. Name of relevant organisation:
3. Name of weed steam treated:
Mother of Millions (*Bryophyllum* species), Singapore Daisy (*Sphagneticolatrilibata*) or Butterfly Heaven (*Dyschoristedepressa*)
4. Site location
5. Initial weed infestation size (m²):
6. Date(s) weed treated:
Include dates/details of any follow up treatments
7. Steam treatment method:
50mm Head / 300mm Head / Short Steam Spike / Short Spike / Long Steam spike / Long Spike / Brush Cut / Other:
8. Length of treatment (seconds):
9. Results/observations:
Eradicated / estimated % reduction (or m²) / seed bank germination
10. Any further details - ask for copies of data forms if any available:
- weather conditions
- soil type
- bushfire impacts
11. Any factors observed that have improved success rates
12. Any before / after photos or video footage available

Scientific papers available via the internet have also been referenced where they relate to the discussion in point.

The saturated steam weed control undertaken on all sites cited in this paper was done using Weedtechnics SW800 and SW900 saturated steam units (Satusteam™).

RESULTS

Case Studies

The following section outlines five case studies where saturated steam weed control has been used in Queensland and NSW. The case studies explore the efficacy of saturated steam weed management on three weed species as noted below.

Cited case studies include the following sites:

Mother of Millions (*Bryophyllum* species)

- Melaleuca wetlands, Coochiemudlo Island, QLD
- Saltwater Reserve, Wallabi Point, MidCoast Council, NSW

Singapore Daisy (*Sphagneticola trilobata*)

- Water Lily Park, Yamble Drive, Ocean Shores, Byron Shire Council, NSW
- Elizabeth Street, 27 34 4 S 153 20 0 E, 107 degrees, Coochiemudlo Island, QLD

Butterfly Heaven (*Dyschoriste depressa*)

- Downfall Creek Bushland Centre, Chermside Hills, Brisbane City Council, QLD

Weed details: *Bryophyllum sp.* is an escaped ornamental plant that reproduces rapidly, producing hundreds of tiny plantlets which quickly form new colonies (DAF Qld 2021). Each plant produces small plantlets along the edges of its leaves which detach and form new plants. It is adapted to dry conditions and can survive long periods of drought. This increases the plant's potential to persist and spread. It also produces numerous seeds which can survive in the soil for a number of years before germinating. *Bryophyllum sp.* is hard to eradicate and follow up controls are necessary. *Bryophyllum sp.* is toxic when ingested by livestock; it is also poisonous to humans and household pets in large enough doses. (DPI NSW 2021) *Bryophyllum sp.* is spread by floodwater and establishes if pastures are in poor condition; it is also spread by animals, slashers, machinery and vehicles. (DAF Qld 2021)

Bryophyllum sp. was introduced into Australia in the 1950s and has been found in WA, SA, QLD, NSW Victoria and Norfolk Island (Figure 1) but has the potential to spread to other regions (Figure 2). Under predicted future climate conditions (Duursma DE et al, 2013) it's range suitable habitat range may reduce (Figure 3). Habitat types include coastal vegetation/sand dunes, disturbed areas (including trails), garden escape, grasslands, pastures, roadsides, urban areas, gardens and parks, wastelands, woodlands.

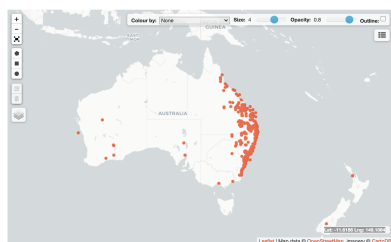


Figure 1. Distribution of *Bryophyllum sp.* in Australia (<http://avh.ala.org.au>).

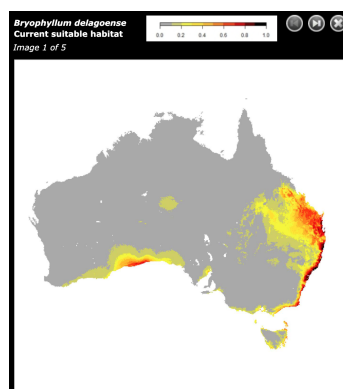


Figure 2. Current suitable habitat of *Bryophyllum sp.* in Australia (<http://weedfutures.net>)

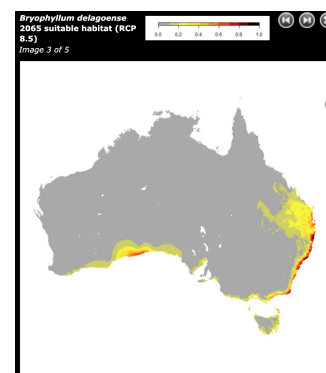


Figure 3. 2065 predicted suitable habitat of *Bryophyllum sp.* in Australia (<http://weedfutures.net>).

Site: Melaleuca Wetlands, Coochiemudlo Island, QLD

Organisation: Coochiemudlo Island Coastcare Inc

Date: March & October 2018 and August 2020

Weed: Mother of Millions (*Bryophyllum* species)

Site details: Melaleuca Wetlands at Coochiemudlo Island includes an 1000m² infestation of *Bryophyllum* *sp.* within the sandy coastal site. This area within the Melaleuca Wetlands was previously infested with asparagus and had been constantly sprayed. When spraying ceased the *Bryophyllum* *sp.* invaded the area and was the only vegetation that appeared to survive (Figures 4.1 and 4.2). In some of the areas that Coastcare manages the group had stopped trying to hand weed as the weeds were as thick as lawn grass. The purchase of the SW900 unit through a Community Sustainability Action Grant from the Queensland Government enabled the group to regain control of such areas.

Site treatment details: The *Bryophyllum* *sp.* was treated with the SW900 unit using the 300mm application head at 1000psi 118 Celsius for 3 seconds approx with slow sweeping motion on 02/03/2018, 02/10/2018 and 07/08/2020.

Site treatment results: The saturated steam treatment of the *Bryophyllum* *sp.* has activated regeneration of *plectranthus* and *acacia*. Two treatments of the *Bryophyllum* *sp.* six months apart had a high success rate with greatly reduced numbers. With such dramatic results, the volunteers were able to move onto other sites within the island.

The low regrowth of the *Bryophyllum* *sp.* indicates that the seed bank has been depleted during the saturated steam treatment.

The latest photo in 2020 (Figure 4.3) captures the regrowth of natives in the rugged foreshore environment. Spot treatments are now undertaken annually, with another spot treatment due.

Site success factors: Saturated steam treatment has proven to be a successful management strategy for the *Bryophyllum* *sp.* at Coochiemudlo Island with only annual spot treatments now required to ensure the *Bryophyllum* *sp.* does not reinfest a large area again. Good access for the SW900 unit is available at this site.



Figures 4.1 and 4.2 04/02/2018 Monoculture of *Bryophyllum* *sp.* prior to steam treatment; **Figure 4.3** 01/07/2021 No *Bryophyllum* *sp.* present following steam treatment.