

Mechanical removal as response option versus other management techniques

Mechanical removal overview

Mechanical removal of aquatic weeds can be done with harvesters, which work a little bit like an aquatic weed lawnmower or with suction dredges/devices. An overview is given from NIWA following this link: <https://www.niwa.co.nz/our-science/aquatic-biodiversity-and-biosecurity/our-services/aquaticplants/outreach/weedman/control#mechanical> : Usually, some form of sucking or scooping is used to collect and then remove the weed from the wetland. The machinery that is used for such jobs is typically large modified diggers such as excavators or harvesters. Harvesters are often large amphibian vehicles and excavators are used either from the water or the water's edge.

Effectiveness of mechanical removal

Throughout the available literature where access is good for larger machinery, mechanical removal is described as a very effective tool to reduce salvinia infestations. However, the reports and articles which describe mechanical removal as an effective means of reducing infestations are also very clear about the limitations of this management option: It is recommended as a knockdown tool as part of an integrated management approach, with either follow up with a biological control agent (which is not an option for Te Henga) or with herbicides.

Overall there is not a large amount of scientific literature available about mechanical removal of salvinia. Therefore we have also included 'grey literature' (Government reports and from other institutes) in our review:

Abbasi and Nipanay (1986) evaluated different management techniques (note that diquat was not amongst the herbicides under consideration at the time). They concluded that mechanical removal is not a suitable eradication tool, due to the re-growth that occurs when tiny fragments are missed.

More info:

- S.A. Abbasi and P.C. Nipanay (1986). Infestation by Aquatic Weeds of the Fern Genus Salvinia: Its Status and Control. Environmental Conservation, 13, pp 235-241. doi:10.1017/S0376892900036286.

NIWA emphasises the need for a specific site assessment for each site, as the site characteristics will determine which management approach has the greatest likelihood for success. Similarly, the Illawarra District Noxious Weeds Authority also emphasises the need for an integrated approach (<http://www.idnwa.com.au/whatisweed/noxious-weeds-of-the-illawarra/salvinia-salvinia-molesta/salvinia-control-plan/>).

Another review (focuses on submerged weeds, but similar principles apply for floating weeds) can be found following this link: <http://www.chisholm.co.nz/Documents/087Chisholm.pdf>. Chisholm emphasizes the risk of missing parts of the species which is to be eradicated. This is a real problem for salvinia management, especially so at Te Henga where large proportions of the infestation are trapped amongst existing margin vegetation (raupo and/or woody vegetation).

'Harvesting' (another way to describe mechanical removal) has been labelled by the City of Gold Coast as a temporary solution for the removal of floating mats <http://www.goldcoast.qld.gov.au/environment/salvinia-10102.html>. Additionally, the New South Wales Department of Primary Industries state that although mechanical removal can be useful to

reduce the infestation, it is necessary to follow up with herbicides or a biological control agent (again biological control is not an option for Te Henga). They also note the high expense of mechanical harvesting - AU\$2 500 per day in 2011.

(<http://www.aabr.org.au/images/stories/resources/ManagementGuides/WeedGuides/Salvinia-biological-control-field-guide.pdf>).

Further comments on the effectiveness of mechanical removal and the risk from surviving/overlooked fragments can be found on these links:

<http://www.plantwise.org/KnowledgeBank/Datasheet.aspx?dsid=48447> (it was used as a yearly maintenance control and NOT an eradication tool in India)

<http://aquaplant.tamu.edu/management-options/giant-salvinia/>

Conclusion for mechanical removal as an eradication tool:

Where suitable, mechanical removal can be a good tool to reduce the infestation (i.e. control). Best practice has shown that it is not an effective eradication tool except in small-scale infestations (e.g. fish ponds and artificial waterbodies), with good access and the opportunity to get every fragment (e.g. mechanical removal of all salvinia vegetation from a pond and then drying it would be a good example of effective mechanical removal leading to eradication).

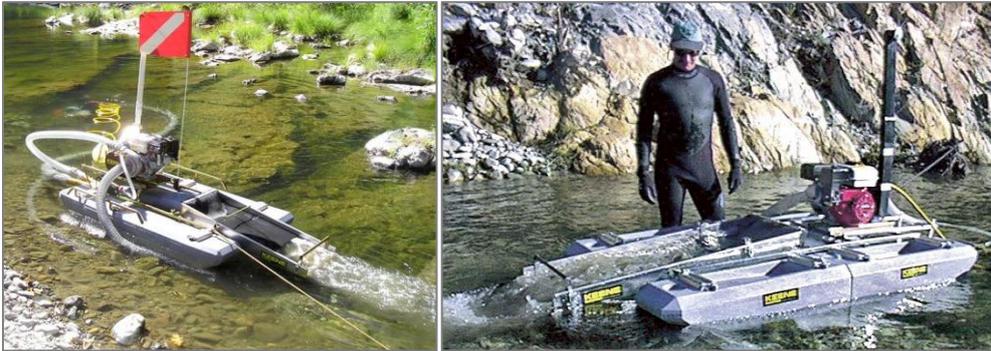
MPI's consideration of mechanical removal for Te Henga

Larger machinery (See photo example below) cannot safely access the infestation at Te Henga without substantial earthworks to provide access. This is highly likely to cause irreversible damage to the wetland, therefore large machinery has been ruled out as management option. The infestation at Te Henga is a large infestation – Best practice in New Zealand with similar sized infestations has been an integrated management approach that has included the use of herbicides for these types of sites.

MPI has put a lot of effort into researching if smaller machines, such as modified gold dredges, vacuum trucks and/or smaller harvesters are suitable and available in a reasonable timeframe for use at Te Henga. Vacuum trucks are unsuitable for Te Henga and gold dredges are highly likely to suffer the same problem as vacuum trucks (the inability to cope with the amounts of water needed to be sucked up in a short time frame). In addition, gold dredges are very costly and not available within the timeframe needed. Furthermore, they are likely to get clogged up and further fragment salvinia, risking to spread this weed. Even if we had found suitable equipment, it would require follow-up with herbicides due to the site and the fragmentation that would occur. The long-term goal of the NIPR (national interest pest responses) programme, which salvinia is part of, remains eradication and not sustained control.



The photos above show two examples of large scale mechanical removal machinery which would be unsuitable for use at Te Henga.



The photos above show the gold dredges that MPI is investigating as an option for mechanical removal.

Photo references:

<http://www.aquamog.com/restoration.html>

http://www.akmining.biz/mine/keene_4_inch_suction_gold_dredge.htm