Manual Harvest

ANS Control: Manual Harvest

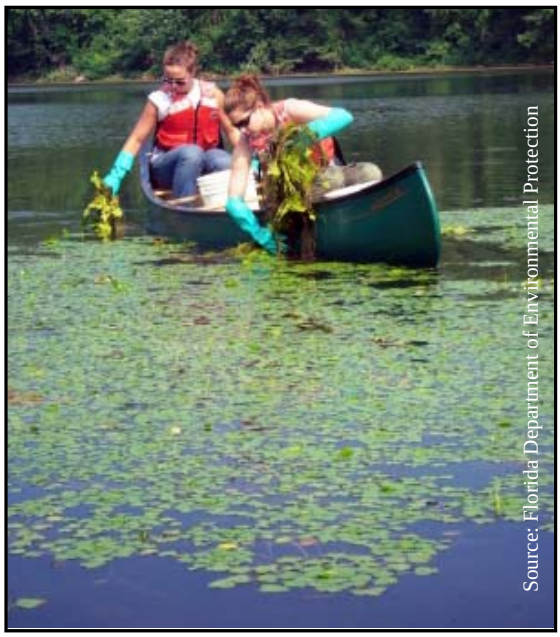
Targeted Species: All species of aquatic and wetland plants could possibly be managed using manual harvest (commonly referred to as hand removal) techniques. Specific examples of ANS of Concern – CAWS[1] that may be controlled with this method include swamp sedge *(Carex acutiformis)*, reed sweetgrass *(Glyceria maxima)*, dotted duckweed *(Landoltia (Spirodela) punctata)*, marsh dewflower *(Murdannia keisak)*, Cuban bulrush *(Oxycaryum cubense)*, and water chestnut *(Trapa natans)*.

Selectivity: Manual harvesting can be a selective control method for plants. The overall level of selectivity depends on whether or not selective removal is required, as well as the skills and abilities of personnel performing control activities.

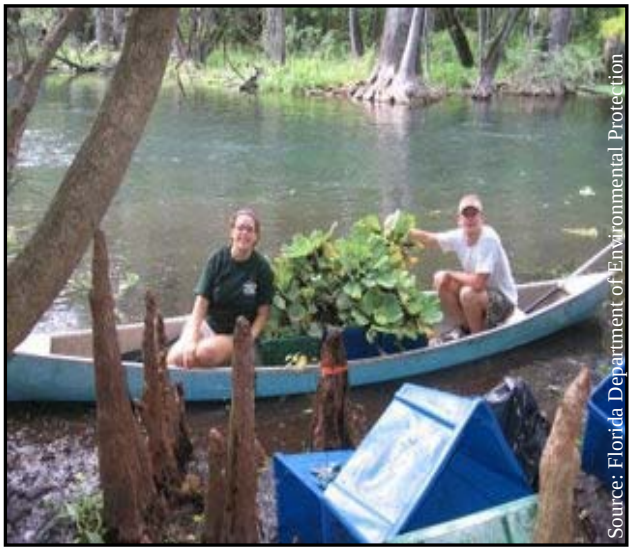
Developer/Manufacturer/Researcher: This Control does not require any special research or development.

Brief Description: Manual harvesting (or hand removal) includes a variety of methods, the simplest being physical removal of a plant by pulling it out of the ground or water, or more refined and site-specific methods, such as cut stump control. Cut stump control is an integrated pest management approach; workers use cutting tools to remove the top of the plant, then treat the remaining portion of the plant with herbicide[2] to prevent regrowth. The 'cut stump' method is most often utilized with woody stemmed vegetation, however, many large grass species, including bamboo, Napier grass, and phragmites, are also controlled using this method.

Cutting tools, such as hand swung machetes and axes, as well as chainsaws, can be used in conjunction with hand removal to improve removal speed and effectiveness. Additionally, rakes and



Youth Conservation Corps hires pull invasive water chestnut from a lake at Silvio O. Conte National Fish and Wildlife Refuge in Massachusetts.



Water lettuce is removed from a Florida waterway. Targeted plants are placed in blue bins and transported to a disposal site.

[1] For a complete list of the 39 specific ANS of Concern – CAWS, please see Table 1 of the main report.
[2] For more information on this technology, please see the fact sheet titled "Herbicides."

hoes can be used to control and/or reduce root mass. The most effective application of hand removal is in conjunction with herbicide application; combining the two techniques is effective at selectively removing vegetation from a site.

Prior Applications: Manual harvesting techniques date back to the beginning of agrarian society, and today are still widely used in agricultural practice and for the removal of unwanted vegetation. Hand removal has been used to eliminate water chestnut and Eurasian watermilfoil in New England, and remove invasive trees and other woody-stemmed vegetation in South Florida ecosystems. In South Florida, harvesting teams wear waders and walk through wooded swamps, using machetes and herbicide spray application to target individual tree species. In the Northeast United States, hand removal of Eurasian watermilfoil is completed with snorkels and wetsuits in the fall, after native vegetation has senesced for the growing season (Bailey & Calhoun 2008).

General Effectiveness: When implemented properly, manual harvesting methods provide extremely effective results. Due to the nature of the work, it can be tool for eradicating small populations, or providing a rapid response to a new infestation. Hand removal is most effective when implemented prior to seed production. Removal prior to seed set reduces the need for follow up control efforts.

Operating Constraints: The nature of hand removal lends itself to environmental and physical operating constraints. Hand removal requires more time and is more labor intensive to complete than other controls targeting the same species. It is most easily implemented in small areas, but can be utilized on larger water bodies or entire systems. A key constraint of harvesting efforts is weather, as the work can only be conducted in safe weather conditions, hospitable to the type of work performed. Site logistics, such as how effectively workers can traverse the landscape, must also be considered, due to difficulties traversing wetland and aquatic soils on foot. Habitat may be damaged when employing large parties of workers to harvest aquatic plants in shallow wetland waters or along a shoreline. The harvested ANS must be properly collected and disposed to prevent introduction of an ANS downstream or at a disposal site.

Cost Considerations:

Implementation: Implementation of this Control would include planning and execution of manual harvesting techniques. The majority of this Control's cost is labor-driven, and initial control efforts may be expensive in the United States when compared to other technologies for controlling the same species (Bailey & Calhoun 2008).

Planning and design activities in this phase may include research and development of this Control, modeling, site selection, site-specific regulatory approval, plans and specifications, and real estate acquisition. Design will also include analysis of this Control's impact to existing waterway uses including, but not limited to, flood risk management, natural resources, navigation, recreation, water users and dischargers, and required mitigation measures.

Operations and Maintenance: If performed on a routine basis, maintenance costs may be lower than the initial treatment (Kelting & Laxon 2010). Additionally, a monitoring plan must be

implemented to assess the effectiveness of this Control, and to determine the timing of maintenance efforts.

Mitigation: Design and cost for mitigation measures required to address impacts as a result of implementation of this Control cannot be determined at this time. Mitigation factors will be based on site-specific and project-specific requirements that will be addressed in subsequent, more detailed, evaluations.

Citations:

Bailey, J.E. & J.K. Calhoun. 2008. Comparison of Three Physical Management Techniques for Controlling Variable-leaf Milfoil in Maine Lakes. *Journal of Aquatic Plant Management,* vol. 46(2), p. 163

Department of Ecology State of Washington. Accessed June 11, 2011. http://www.ecy.wa.gov/programs/wq/plants/management/aqua022.html.

Gettys, L.A., W.T. Haller and M. Bellaud (eds.) 2009. *Biology and Control of Aquatic Plants: A Best Management Handbook.* Aquatic Ecosystem Restoration Foundation, Marietta, GA. 210 pp

Kelting, D.L. & C.L. Laxon. 2010. Cost and Effectiveness of Hand Harvesting to Control the Eurasian Watermilfoil Population in Upper Saranac Lake, New York. *Journal of Aquatic Plant Management,* vol. 48(1). p. 1