Dredging and Diver Dredging

U.S. ARMY CORPS OF ENGINEERS **Building Strong®**

ANS Control: Dredging and Diver Dredging[1]

Targeted Species: Dredging may be used to control submersed and emergent vegetation. Specific ANS of Concern – CAWS[2] that may be controlled with this technology include plants such as Cuban bulrush *(Oxycaryum cubense)*, marsh dewflower *(Murdannia keisak)*, reed sweetgrass *(Glyceria maxima)*, swamp sedge *(Carex acutiformis)*, and water chestnut *(Trapa natans)*.

Scuba diver using suction dredge to remove submersed hydrilla

Diver dredging is mainly applicable to controlling submersed aquatic vegetation (SAV), but may also have applications on emergent vegetation. This technology is designed for submersed aquatic vegetation, so it may or may not have application with the current ANS of Concern – CAWS.

Selectivity: Dredging is a non-selective means of controlling submersed and emergent vegetation and may also remove species that reside in the dredged sediment. Compared with dredging, diver dredging is a more selective method for controlling submersed aquatic plants; however, it will remove species that reside in the sediment.

Developer/Manufacturer/Researcher: Modern dredging is conducted by the U.S. Army Corps of Engineers (USACE) using both in-house and contract labor, and by other private and public agencies and entities such as port authorities.

Diver dredging is conducted specifically for invasive plant management and was developed by the British Columbia Ministry of Environment. Several state environmental agencies, such as the Washington Department of Ecology, currently use this technology to control nuisance SAV (Washington State Department of Ecology 2011).

Workers collecting hydrilla removed by diver dredging

Brief Description: The main use of dredging is to manage and relocate sediment for purposes typically related to navigation and flood control. Associated benefits of this activity related to the control of ANS include the removal of vegetation and mollusks, as well as altering the bathymetry [3] so

[1] Dredging and diver dredging are forms of mechanical control. See fact sheet titled "Mechanical Control Methods" for more details on similar technologies.
[2] For a complete list of the 39 specific ANS of Concern – CAWS, please see Table 1 of the main report.
[3] Bathymetry is topography of a water body; it is the measure of depth and contour of a water body's soil and changes in elevation.

that an area is no longer suitable for inhabitance by a variety of species (Heilfrich et al. 2009). Depending on the scope of the dredging operation, dredging may not eliminate plant ANS; instead, it will reduce the plant mass at the dredging location.

Dredging – Two main types of dredging methods exist: mechanical dredging and hydraulic dredging. Mechanical dredging removes material by scooping it from the channel bottom and placing it into a barge for transport to a disposal area (Sabbatini et al. 1994). Hydraulic dredging works like a vacuum, sucking a mixture of dredged material and water from the channel bottom and pumping it to a destination.

Mechanical dredging in Calumet River, Chicago, IL. Although this dredging was performed to maintain navigation depths, dredging for ANS control would use similar equipment and methods.

Each type of dredge equipment performs the function in a different manner, but all result in sediment being removed from one area and relocated to a temporary or permanent storage or disposal area. Dredge material management areas (DMMAs) are storage or disposal facilities that normally consist of diked areas that hold the dredged material until the material is dewatered. The material is then stored permanently or, depending on its geotechnical and environmental characteristics, may be put to use for projects such as roadbed construction. Confined disposal facilities are a type of DMMA that are used for permanent disposal of contaminated sediments. Unconfined disposal sites can include onshore, near-shore, or open water locations where material is disposed of or beneficially reused. Beneficial uses can include placing sand to encourage marsh or shoreline vegetation development, or reduce shoreline erosion.

Diver Dredging – Diver dredging is essentially a scuba diver with a vacuum hose. Currently, the technology has focused on the removal of invasive SAV. The diver is trained to identify invasive SAV; once the target species is located, the diver removes it using the hose of a small suction dredge.

Prior Applications: Dredging has been used to modify water bodies since the beginning of civilization. Diver dredging was developed more recently to perform specific work, such as aquatic plant management and underwater excavation.

Dredging – Dredging has been applied in waterways to manage water flow, volume, and direction, to alter or improve navigation of federal navigation channels for commercial navigation and recreational traffic, and to improve flood control (USACE, April 2011). Specific uses of dredging to control aquatic plants can be found in urban and agricultural landscapes worldwide (Heilfrich et al 2009). Modern practices in both areas alter water flow and nutrient levels in aquatic environments, creating a need for management. This often involves the removal of sediment to manage aquatic plant growth, restore water storage capacity, reduce downstream pollution, and/or improve navigation (Bhowmik et al. 1988).

Diver Dredging – Diver dredging technology was developed to manage SAV; it has been adapted to manage invasive SAV within stands of native SAV, as well as to prevent invasive spread by fragmentation. Eurasian watermilfoil *(Myriophyllum spicatum)* and curly-leaf pondweed *(Potamogeton crispus)* are two invasive submersed plants managed in practice using this technology (Tobiessen et al. 1992). While the technology has not been applied to mollusks to date, diver dredging may have application to control mollusks in certain environments.

General Effectiveness:

Dredging – Dredging is a highly effective method for controlling submersed and emergent aquatic vegetation. This is done through both direct removal of the vegetation and alteration of the habitat (Gettys et al. 2009).

Diver Dredging – The technology is an effective method for selectively removing submersed aquatic vegetation.

Operating Constraints: In areas where native vegetation is mixed with ANS or native species are living in the sediment, dredging cannot selectively remove the targeted ANS, and disrupts the benthic ecosystem. If sediment containing ANS is to be beneficially reused, caution must be taken to ensure that the reuse of this sediment will not cause establishment of ANS in a new location. The potential for downstream establishment of species is a risk during dredging, managing vegetative fragments generated by dredging prevents the accumulation of decaying plant material or downstream infestation of target species. In addition, special consideration should be given for disturbance of sediment and sediment management, when using this technology to control invasive vegetation.

Dredging – Dredging requires highly specialized equipment and capabilities.

Diver Dredging – Diver dredging is principally limited by underwater visibility and diver safety concerns. In principle, the technology should be applicable to any type of vegetation, as long as the suction dredge has adequate suction ability. The technology was designed for SAV and has not been utilized on emergent and/or wetland plants.

Cost Considerations:

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Implementation: Implementation costs would include sediment characterization to ensure proper handling and disposal, dredging and dewatering, transportation, and either disposal or reuse of the dredged material. 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.

Operation and Maintenance: Operation and maintenance requirements would include continued inspection and removal of ANS of Concern – CAWS.

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:

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