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The Corps of Engineers Aquatic Plant Management Program

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INTRODUCTION

At the turn of the century waterhyacinth (*Eichhornia crassipes* (Mart) Solms-Lauback) was a major obstruction to navigation in the St. Johns River, among other rivers in the southeast. Today, thanks to persistent efforts of the Jacksonville Engineer District over the past 80 years, the St. Johns is almost completely free of waterhyacinth. The development of the St. Johns River control plan is an excellent example of the advance of technology since the 1896 investigations. The most common method of removing waterhyacinth from navigation channels in early years was to dislodge them so that they would float downstream and ultimately reach salt water. Improved mechanical devices were next used to transport harvested material and deposit it on the river banks. This method was replaced by crusher boats which would grind the vegetation and deposit it in the river. The most effective mechanical device was the sawboat, which shredded the plants into parts too small for regrowth.

During this time research was being conducted on chemical control of aquatic plants. In 1945 Congress recognized the potential of the new herbicide, 2,4-D (2,4-dichlorophenoxyacetic acid), and requested the Corps of Engineers review the waterhyacinth program in the Southwestern, Lower Mississippi Valley and the South Atlantic Divisions of Districts[1] (Figure 1).

In 1946, representatives of the Department of Agriculture, in cooperation with the Jacksonville District Engineer and the Everglades Experiment Station, Belle Glade, conducted tests which proved that 2,4-D was harmless to fish, cattle, and wildlife. Application by means of an air boat provided the most effective and economical method for control of waterhyacinth. A suit was filed in 1972 by environmentalists in Florida against the Corps of Engineers' use of 2,4-D for control of waterhyacinth. Final judgment of the case was given in the District court of Jacksonville in June 1974 in favor of the Corps. The findings were that the Environmental Impact Statement was adequate; that from a social well-being and public interest, waterhyacinth was an obstacle to navigation, fishing, boating, and recreation, and that from an engineering and economic standpoint, all possible alternatives were considered to maximize social and economic benefits.

SPECIFIC EXEMPTIONS

The Corps of Engineers has the responsibility under Public Law 89-298 to develop the most economic and effective measures for control of obnoxious aquatic plants. Use of herbicides as a control measure is subject to other regulations, however. Aquatic plant control problems frequently arise for which the proper herbicide registration does not exist. This was the case in the Mobile District in the spring of 1975, where a build-up of duckweed (*Lemna* spp.) occurred in the Alabama-Black Warrior River System. A specific exemption under Section 18 of the Federal Insecticide, Fungicide, and Rodenticide Act was required for the use of the herbicide, Diquat (6,7-dihydrodipyrido 1,2-:2',1'-c pyrazindiinium dibromide salt). Use of Diquat was approved by the Environmental Protection Agency (EPA), and the problem was alleviated by a relatively simple chemical control operation. Apparently this problem developed as a result of draining an eutrophic lake into the Black Warrior River, causing a subsequent build-up of duckweed in the river itself.

Hydrilla (*Hydrilla verticillata* Royle) was observed in Florida growing in a canal near Miami and in springs near Crystal River in 1960. A large scale field trial for herbicidal control was initiated in 1969, but serious consideration for a general program for control was not taken until 1977. Mechanical and chemical control are now receiving careful attention. Drawdown studies in Lake Oklawaha are not considered satisfactory. Combined drawdown and chemical treatment was successful in Louisiana.

RESEARCH PLAN

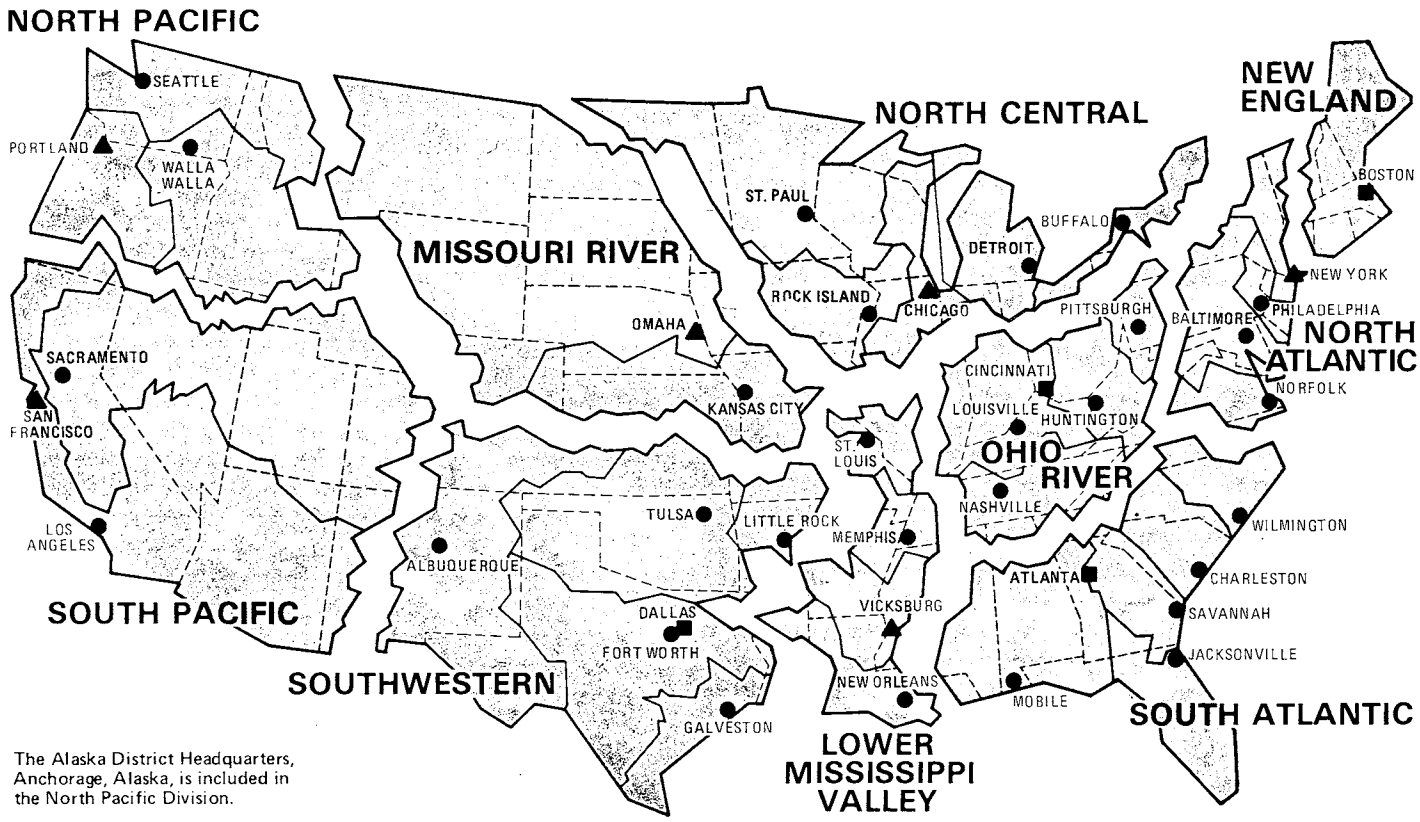
The aquatic plant control program of the Corps of Engineers is designed to find the most effective and economical method for controlling aquatic weed infestations of major economic significance. This program is directed at six aquatic weeds: waterhyacinth, alligatorweed (*Alternanthera philoxeroides* (Mart) Ariseb), waterlettuce (*Pistisa stratiotes* L.), hydrilla, Eurasian watermilfoil (*Myriophyllum spicatum* L.) and egeria (*Egeria densa* Planch).

Although efforts to control aquatic plants date back to the turn of the century, the Corps of Engineers only recently assigned research responsibility for aquatic plants to the Waterways Experiment Station (WES) in Vicksburg, Mississippi.

The overall aquatic plant control research program of the Corps of Engineers has six major program elements. Four cover the technological developments necessary for the primary methods of control and management of problem aquatic plants on an operational level. The fifth element identifies the technological development necessary for assessment and continual monitoring of problem areas. The sixth element identifies the means for applying available control methods to a problem that would ensure a level of success commensurate with the technological potential. These six elements provide the most effective and economical method for controlling problem aquatic weeds under field operating conditions for the Corps and others.

[1]House Document 37, 85th Congress.

DIVISIONS AND DISTRICTS for CIVIL WORKS ACTIVITIES



The Alaska District Headquarters, Anchorage, Alaska, is included in the North Pacific Division.

The State of Hawaii and Islands in the Pacific are included in Honolulu District, Pacific Ocean Division, with Headquarters at Honolulu, Hawaii.

The Territory of Puerto Rico and adjacent Islands is included in Jacksonville District, South Atlantic Division.

Biological Control Program. The overall objective of the Corps of Engineers' program is to use biological agents for control of problem aquatic plants in the shortest time possible. In the past, research into the development of biological control technology has centered primarily around the use of insects. This work was conducted in cooperation with the United States Department of Agriculture. Current research and testing of insects, pathogens, and herbivorous fish have been accelerated. A large scale field test, using the grass carp (*Ctenpharyngodon idella* Val.) for hydrilla control, is currently underway at Lake Conway, Florida, conducted by the Corps of Engineers in cooperation with State and local agencies. The objective is to determine the impacts of this fish for aquatic plant control.

Herbicidal Control Program. The overall objective of this program is to identify and develop herbicides and to secure registration for their use as aquatic herbicides. This also includes the development of equipment and application techniques. Past research under this program has been limited to investigations related to the development of controlled release herbicides, and studies on the effects of other aquatic herbicides. Current research is also directed toward expanding the development and testing of controlled release herbicides and the testing and evaluation of various granular and liquid forms of herbicides.

Mechanical Control Program. The objective of this program is the implementation of mechanical control systems for operational use in selected problem areas in the shortest possible time. In the past, research into mechanical methods of controlling aquatic plants has been sporadic. For all practical purposes, mechanical control was abandoned in favor of apparently less costly methods before a significant technology base could be realized. The public's insistence for immediate problem relief without environmental side-effects has generated the requirement for an intensive evaluation and development program in mechanical control. The Corps of Engineers does not have authority to research the use of aquatic plants when they are harvested, but we encourage others to research potential positive uses of aquatic plants.

Integrated Control Program. The objective of this program is to develop and evaluate, for operational use, control methods that provide a greater level of control when used in combination that when used alone. Past research has primarily concentrated on the study of combinations of biological control agents. Insufficient attention has been paid to the potential of using combinations of methods. Research to define the proper concurrent and sequential applications of various combinations of biological, chemical, and me-

chanical methods of controlling problem aquatic plants is included.

Problem Identification and Assessment. The objective of this research is to develop low-cost, rapid, remote sensing techniques for locating, identifying, and mapping the character and distribution of aquatic plant problems that are within the capabilities of the user, and to develop a problem classification technique for selection of optimum control measures. Past efforts devoted to the development of rapid remote sensing and contact techniques for identification and assessment of aquatic plant problems have resulted in highly technical, hardware-oriented methods that are of little operational use due to requirements that extend beyond users' capabilities. Current research is devoted to the application of advanced planning procedures.

Management Program. The most important objective of this program is to provide a method for integrating present control technology transfer. Past research efforts have not addressed the problem of identifying, for operational managers, a framework for applying available control methods. Current research has developed a concept for the development of detailed management plans for specific water bodies. The concepts and selected plans are being field evaluated at the operational level through cooperative programs with various Corps of Engineer Districts, State agencies, and the Panama Canal Company.

As the state-of-the-art develops, we see more engineering applications in this program. The challenge is to bring about that development of the state-of-the-art in a progressive, timely and efficient manner.