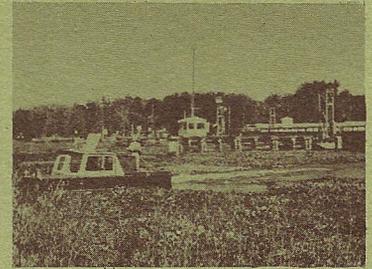
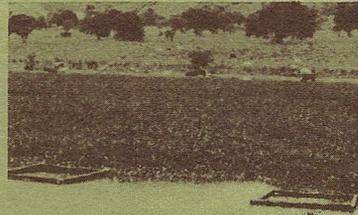
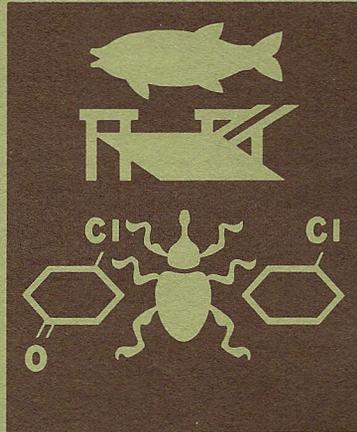


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AQUATIC PLANT CONTROL RESEARCH PROGRAM

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WATER DEPTH LIMITATIONS ON MECHANICAL HARVESTER USE IN THE ST. JOHNS RIVER, FLORIDA

BY V. E. LAGARDE

INTRODUCTION

The St. Johns River is located on the Atlantic Ocean side of the Florida Peninsula (Figure 1). The river originates in a freshwater marsh southwest of Melbourne, Florida, flows northward approximately parallel to the Florida Coast through the north half of Florida, passes through Jacksonville, and discharges into the Atlantic. This major Florida river is approximately 310 miles long, drains over 9000 square miles (almost one sixth of Florida), and is over 1 mile wide for almost half of its length. The river flows through or is connected to 15 major lakes, such as Crescent Lake and Lake George,

and contains large regions of shallow water.

PROBLEM

The waterhyacinth (*Eichhornia crassipes*) (Figure 2) can be found throughout the river system, and has been a major problem for recreation and navigation. The Jacksonville District (SAJ) has been continually searching for the most economical and effective methods of controlling this problem. Although a successful chemical control program has been used on the river for several years, mechanical harvester systems have been undergoing evaluation for use in special problem areas. The types of problem areas

that could require mechanical harvesting are those that require immediate plant removal and those where the use of herbicides is not acceptable.

During the past 2 years, the Waterways Experiment Station has been soliciting new harvester system designs from industry in an attempt to provide an improved field capability for the SAJ. As a result of this effort, a system was field-tested and delivered for control of hydrilla, a submersed aquatic plant. However, no proposed new system for control of waterhyacinths was found acceptable. In general, evaluations showed that the machines have very low production efficiencies. One of the primary

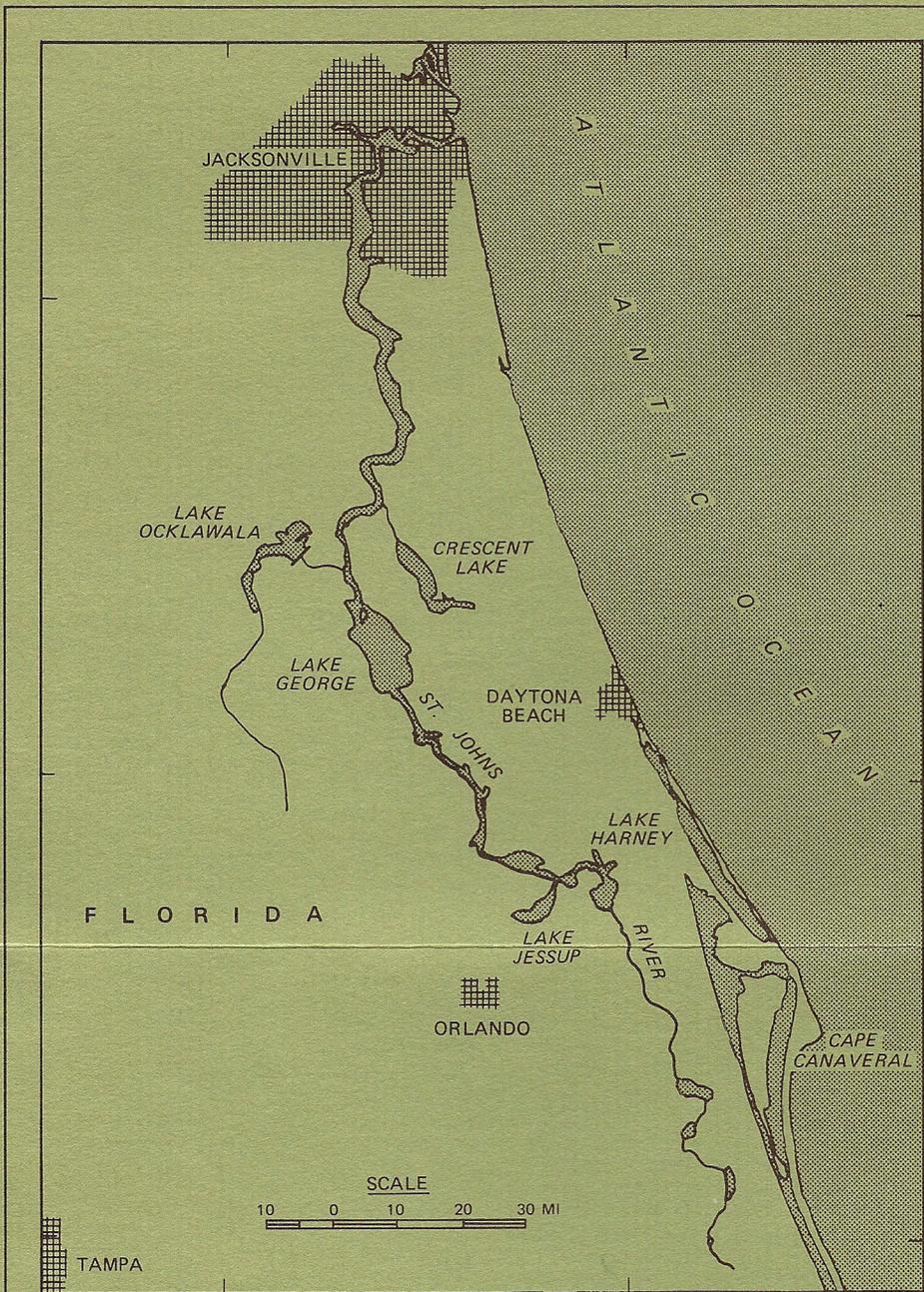


Figure 1. St. Johns River, Florida



Figure 2. Waterhyacinth
(*Eichhornia crassipes* (Mart.) Solms)

river—the St. Johns River. First, this approach would provide an additional basis for making a decision on whether or not to resolicit new harvester designs for waterhyacinth control. Second, it would provide an extensive amount of quantitative data on the physical environment needed for identifying and evaluating future research efforts directed to plant control. Third, it would provide a readily updatable catalog of the regions where infestations and potential problems occur.

A highly automated procedure (Figure 3) including a computerized information system was developed to process, store, and analyze the required data. As developed, the computerized information system contains data on water depths, recurrent plant infestation locations, and locations of interest where analysis results were required. Any number of other data types can be added

reasons for the low efficiencies was related to the fact that the overall harvester designs were not compatible with the environment in which the equipment has to perform. While many environmental factors can influence the performance of mechanical systems, the draft system

seemed to have a predominant influence on overall performance. In the St. Johns River, in particular, a majority of the problem areas occur in shallow water.

APPROACH

It was decided to gather detailed information on the distribution of the waterhyacinth problem areas and the water depths at these locations for a representative SAJ

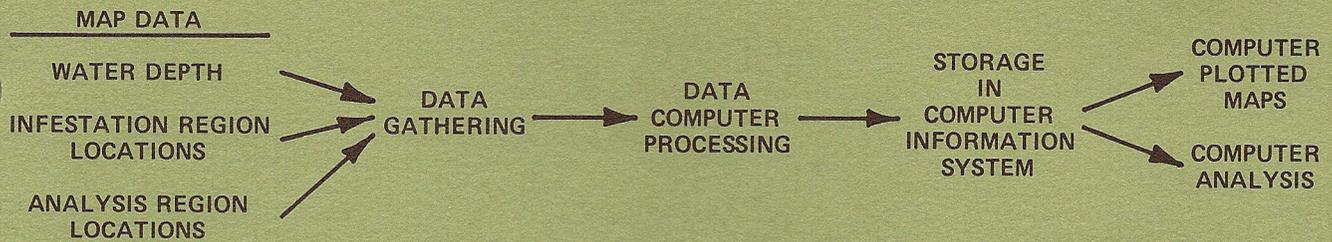


Figure 3. Overview of procedure steps

to the system as required in the future.

DATA BASE

Approximately 900,000 data points pertaining to water depths were gathered from navigation maps by automated digitizing. The result of this process was the creation of a gridded data base containing a three-dimensional description of the river bottom throughout the study area. Figure 4 shows a

computer-drawn three-dimensional scene of a very short section of the river topography drawn from the data base.

SAJ personnel identified the boundaries of the recurrent infestation areas on the navigation maps. These boundaries were digitized and added to the data base.

The total St. Johns River system was cut into 79 analysis regions such as that shown in Figure 5 so that small sections of the river could be studied in detail.

The automated system provides the capability to rapidly plot any type of information in the data base system as a map. Figure 5 shows a computer-plotted map of the infested regions and one of the analysis regions in Lake Jessup. Maps can be produced for any portion of the river system at any map scale.

The automated system also provides the capability to rapidly and inexpensively tabulate data for analysis by planners. For example, Table 1 shows the areas of the plant-

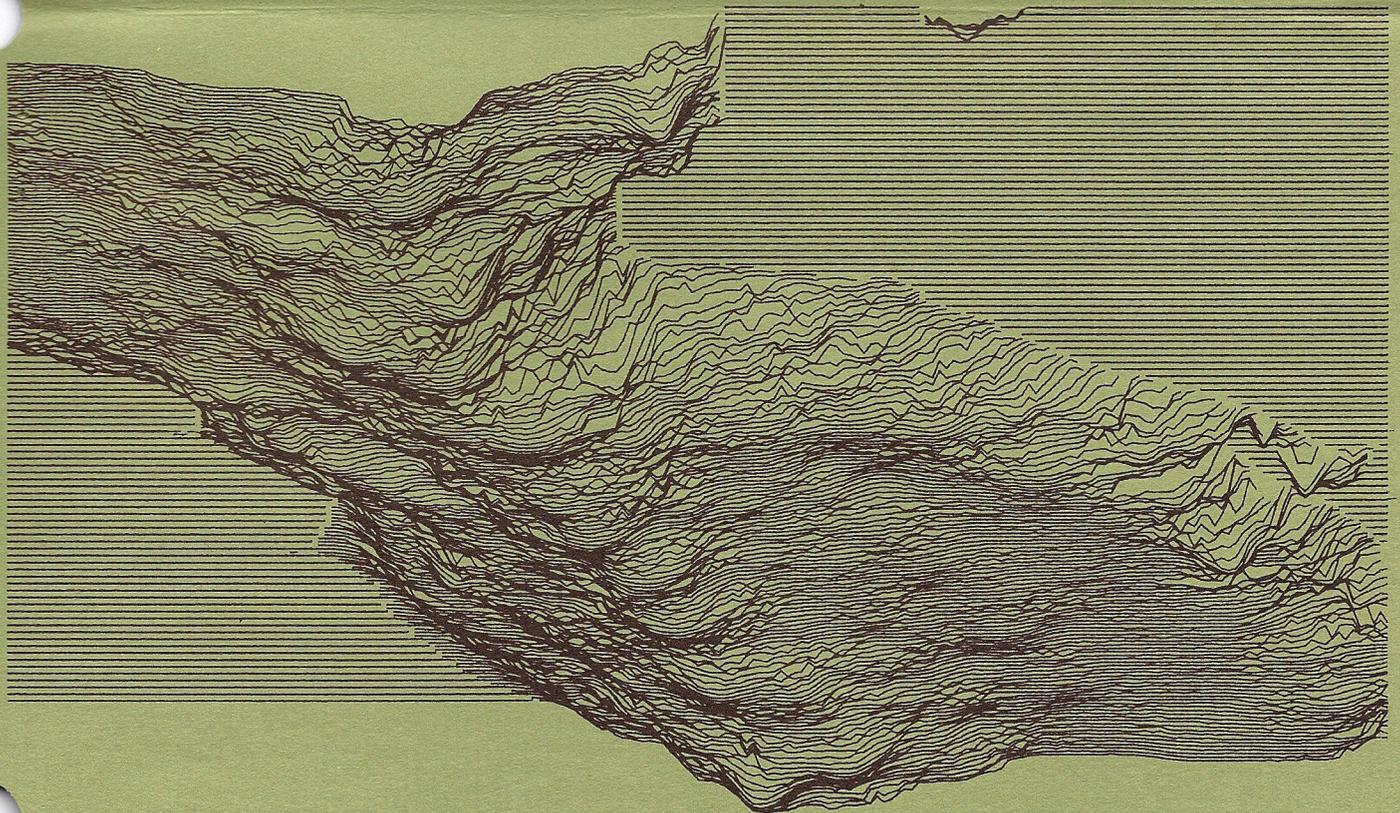


Figure 4. Computer-plotted view of 1200-ft length of St. Johns River bottom

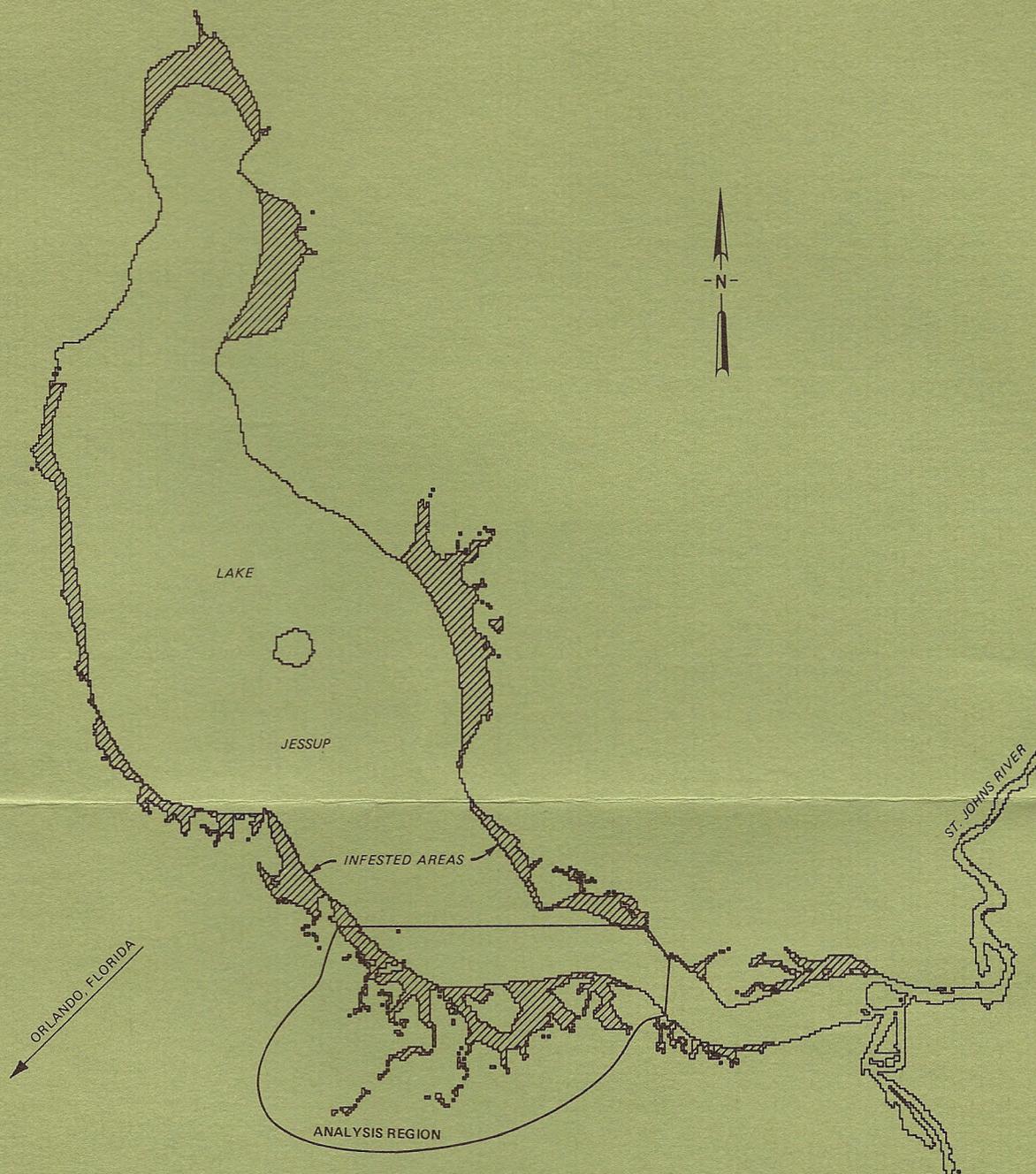


Figure 5. Sample computer-plotted map—infestation regions and analysis regions in Lake Jessup

TABLE 1.
PLANT-INFESTED AREAS IN
ANALYSIS REGION

Bathymetric Contours, ft	Area acres	Percent Analysis Region Area
0-1	258	88
1-2	35	12
2-3	0	0

infested regions at different water depths for the analysis region in Figure 5. Note that 88 percent of the infested area within the analysis region has a water depth of less than 1 ft, and that all of the infested area has a water depth less than 2 ft.

RESULTS

From the data considered, it

was found that the identified recurrent infestation areas comprise 13,400 acres of the 181,700-acre total river study area. While this represents only 7 percent of the total river area, 69 percent (9,280 acres) of the infested area occurs in the depth range of 0-2 ft and is inaccessible to the majority of available harvesting systems. Approximately 55 percent of the 13,400 acres is in a water depth

range of 0-1 ft. Few mechanical systems can operate in these depths, and those that can have an on-board volume or load capacity far below that required to be effective as an operational control method.

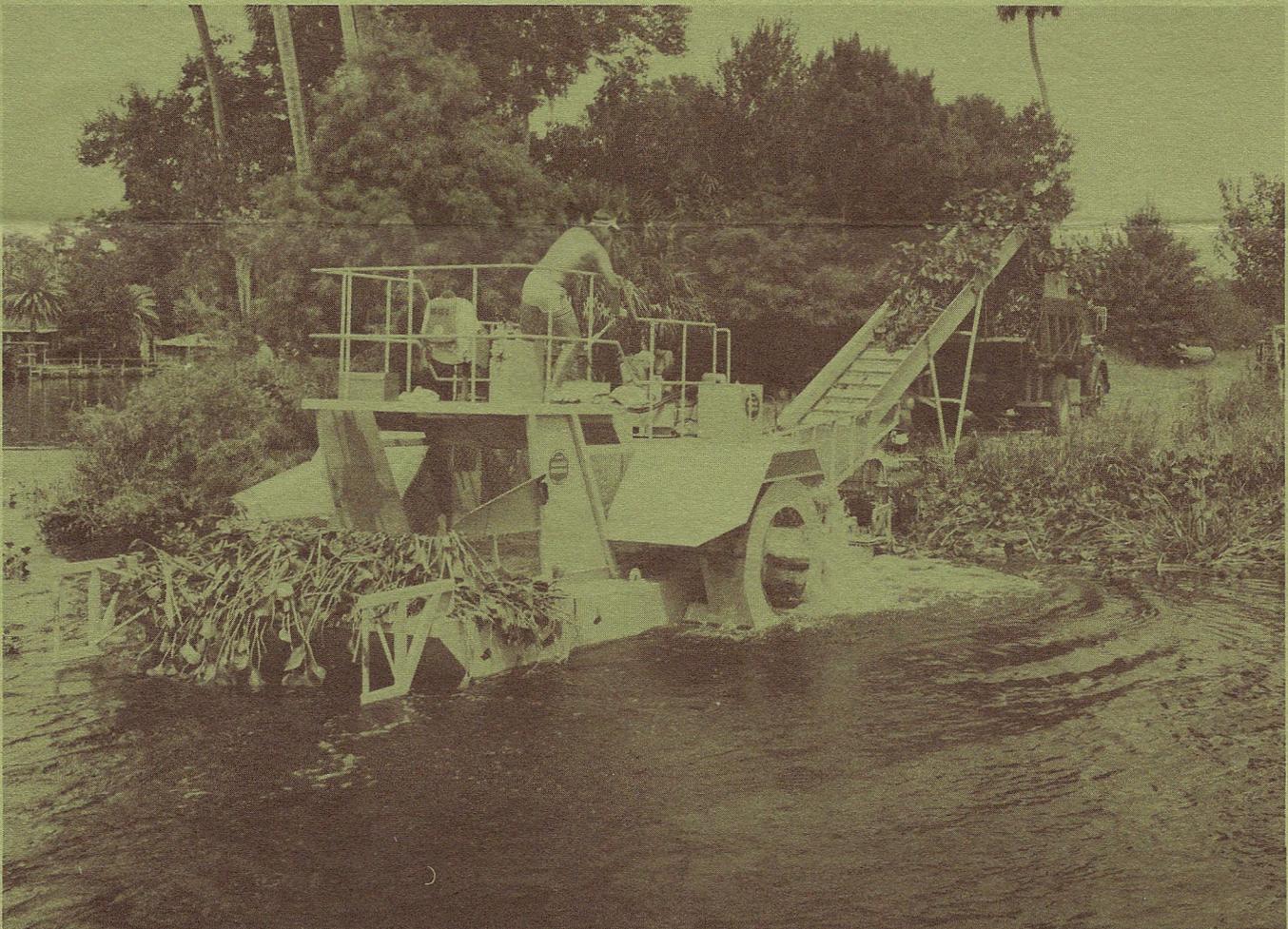
As a result of the information generated by this study and previous studies conducted for the SAJ, it was decided not to resolicit prototype systems for hyacinth control.

DISCUSSION

Although the critical factor, depth, was the only physical site characteristic considered in this study, other characteristics can be added to the data base for future analysis. The conduct of this study has (1) resulted in an automated system for analysis of potential sites and (2) demonstrated a few of the many analytical techniques that the system has the potential to provide.

The SAJ has both supported and provided the impetus for the needed research and testing required to define the role of mechanical systems

in the overall management of aquatic plants. The adaptation and application of an existing analytical capability was but one element of the research and evaluation process. This capability will be applied to additional aquatic plant problem areas and as a currently available validated method can be used to evaluate problem areas in other Corps District operations.

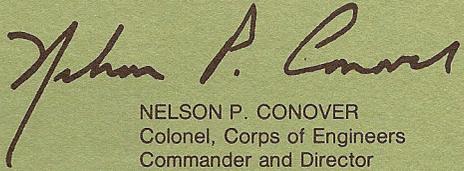


MECHANICAL HARVESTER IN THE ST. JOHNS RIVER

NOTE:

In the Information Exchange Bulletin Vol A-79-2, credit lines for photographs (Figures 3-5) were inadvertently omitted. Cooperation of the British Columbia, Canada, Ministry of the Environment, is recognized in providing those photographs and in continued coordination of research efforts in aquatic plant control.

This bulletin is published in accordance with Army Regulation 310-2. It has been prepared and distributed as one of the information dissemination functions of the Environmental Laboratory of the Waterways Experiment Station. It is principally intended to be a forum whereby information pertaining to and resulting from the Corps of Engineers' nationwide Aquatic Plant Control Research Program (APCRP) can be rapidly and widely disseminated to Corps District and Division offices as well as other Federal agencies, State agencies, universities, research institutes, corporations, and individuals. Contributions are solicited and will be considered for publication so long as they are relevant to the management of aquatic plants as set forth in the objectives of the APCRP, which are, in general, to provide tools and techniques for the control of problem aquatic plant infestations in the Nation's waterways. These management methods must be effective, economical, and environmentally compatible. This bulletin will be issued on an irregular basis as dictated by the quantity and importance of information to be disseminated. Communications are welcomed and should be addressed to the Environmental Laboratory, ATTN: J. L. Decell, U. S. Army Engineer Waterways Experiment Station, P. O. Box 631, Vicksburg, Miss. 39180, or call 601-636-3111, Ext. 3494.


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