SYNTHESIS OF RESEARCH RESULTS

DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT DS-78-17

UPLAND HABITAT DEVELOPMENT WITH DREDGED MATERIAL: ENGINEERING AND PLANT PROPAGATION

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Upland habitat development using dredged material as a substrate was shown by the Dredged Material Research Program (DMRP) to be a feasible alternative to standard dredged material disposal operations. This report synthesizes pertinent literature and research at three major DMRP upland field sites: Miller Sands in the Columbia River, Oregon; Bolivar Peninsula in Galveston Bay, Texas; and Nott Island in the Connecticut River, Connecticut. Guidelines for developing existing or potential dredged material disposal sites into upland habitat

(Continued)

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are presented: (a) planning and designing the project in relation to the proposed site and project goals; (b) construction of the site including dredging and disposal operations, substrate modification, and vegetation establishment; (c) maintenance and management of the site as a habitat; (d) costs of proposed and sample projects; and (e) potential problems that may be encountered.

Emphasis is placed on two major areas: engineering and plant propagation. Engineering aspects include data collection and analysis for site design, protective and retention structures, substrate characteristics, dredging and disposal operations, and specific requirements. The phases of plant propagation are detailed: selecting plant species; selecting, collecting, and handling plant materials; planting; maintenance and management; and costing the work effort. Tables of 360 selected plant species showing best propagules, occurrence by region and whether known to occur on dredged material, growth requirements and habits, propagule handling methods, soil tolerances, and other pertinent information are given.

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PREFACE

This report synthesizes literature and research pertinent to upland habitat development conducted by the Habitat Development Project (HDP) of the Dredged Material Research Program (DMRP). The DMRP was sponsored by the Office, Chief of Engineers, U. S. Army, and was assigned to the Environmental Laboratory (EL) of the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi. Research synthesized in this report was performed by personnel of WES, other Federal and state agencies, consulting firms, educational institutions, and by private individuals.

The following personnel of EL participated in preparation of this report: Ms. L. Jean Hunt and Ms. Mary C. Landin, Environmental Resources Division (ERD); Mr. Alfred W. Ford, Environmental Engineering Division; and Dr. B. R. Wells, EL and University of Arkansas Rice Experiment Station, Stuttgart. Review was provided by Ms. Mary K. Vincent and Dr. Raymond L. Montgomery, EL; Mr. Charles Newling and Mr. Fran Donovan, New England Division, CE; Dr. Kenneth O. Allen, U. S. Fish and Wildlife Service; Dr. Richard A. Cole, New Mexico State University; Dr. John Crawford, Oregon State University; and Dr. Robert J. Diaz, Virginia Institute of Marine Science.

Work was performed under the general supervision of Dr. Hanley K. Smith, Manager of HDP; Dr. Conrad J. Kirby, Jr., Chief, ERD, EL; Dr. Roger T. Saucier, Special Assistant for DMRP, EL; and Dr. John Harrison, Chief, EL, WES.

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PART I: INTRODUCTION

1. A definition of upland habitat development can be obtained by modifying Yoakum's (1971) definition of habitat management:

> To develop habitat is to bring into existence the proper conditions of food, water, cover, and space to provide better living conditions for wildlife.

As Leopold (1933) stated and more recent investigators have verified, proper conditions change with the species of wildlife and geographic region and may change with the age, sex, and physical condition of the animal and season of the year. Both quantity and quality of habitat must be considered. In most cases, the primary goal of habitat development will be to improve conditions for selected wildlife species or communities. Secondary objectives may be met as well: provision of recreation facilities and opportunities, increased aesthetic value, control of soil erosion, or improvement of soil quality.

2. The Dredged Material Research Program tested the premise that sediments dredged from the bottoms of waterways and harbors could be used as a substrate on which to develop upland habitat, thus supplying an alternative method of dredged material disposal. Field sites were located at Nott Island in the Connecticut River, Connecticut (Figure 1); Bolivar Peninsula in Galveston Bay, Texas (Figure 2); and Miller Sands in the Columbia River, Oregon (Figure 3). Activities and results of investigations at the sites are summarized in Hunt et al. (1978), Allen et al. (1978), and Clairain et al. (1978), respectively. Upland habitat is defined as an area not normally subject to inundation. An island is a specialized upland habitat that is characterized by isolation and completely surrounded by water or wetlands.

3. Experience and data obtained from habitat development field test sites on dredged material and from pertinent literature are

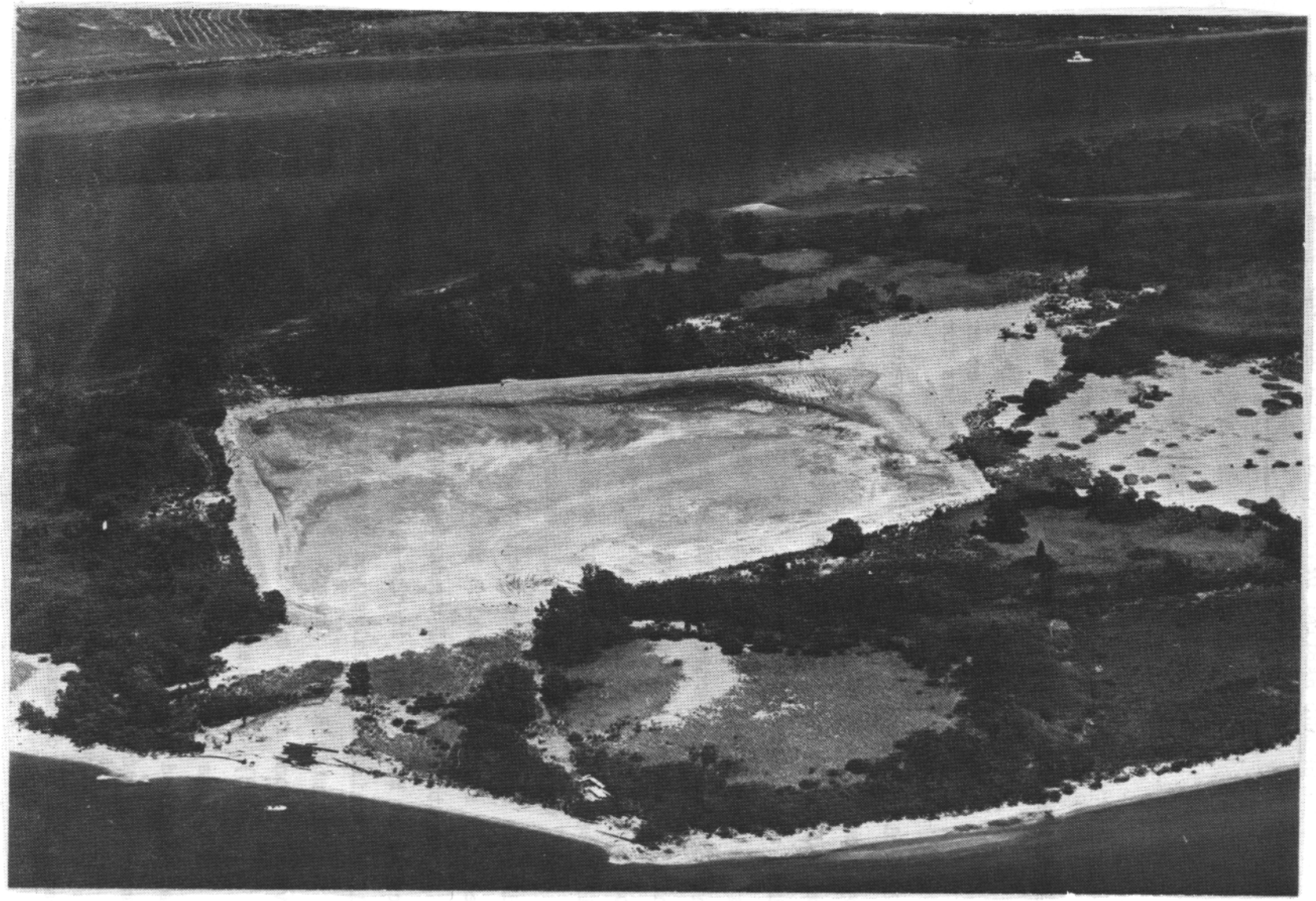

Figure 1. Aerial view of the Nott Island field site in the Connecticut River, Connecticut, showing newly deposited dredged material in summer 1975

Figure 2. Aerial view of the Bolivar Peninsula field site in Galveston Bay, Texas, showing experimental marsh and upland test plots in fall 1977

Figure 3. Aerial view of the Miller Sands field site in the Columbia River, Oregon, showing new deposition adjacent to the existing dredged material island in summer 1975

synthesized in this report. Instructions and advice are provided on the steps in planning, building, and managing an upland habitat development site. A successful project requires interdisciplinary cooperation, since the talents of several physical, biological, and social scientists may be applicable.

4. Additional pertinent literature resulting from the Dredged Material Research Program is tabulated in Smith (1978). Other synthesis reports prepared on habitat development may be useful to the reader. Advantages of and general procedures for developing habitat are given in Smith (1978), and ecological considerations are discussed in Lunz et al. (1978a). Soots and Landin (1978) give guidelines for dredged material island development and management. Environmental Laboratory (1978) provides instructions and advice on developing marsh habitat.