

DREDGED MATERIAL RESEARCH PROGRAM



TECHNICAL REPORT D-78-36

THE AGRICULTURAL VALUE OF DREDGED MATERIAL

by

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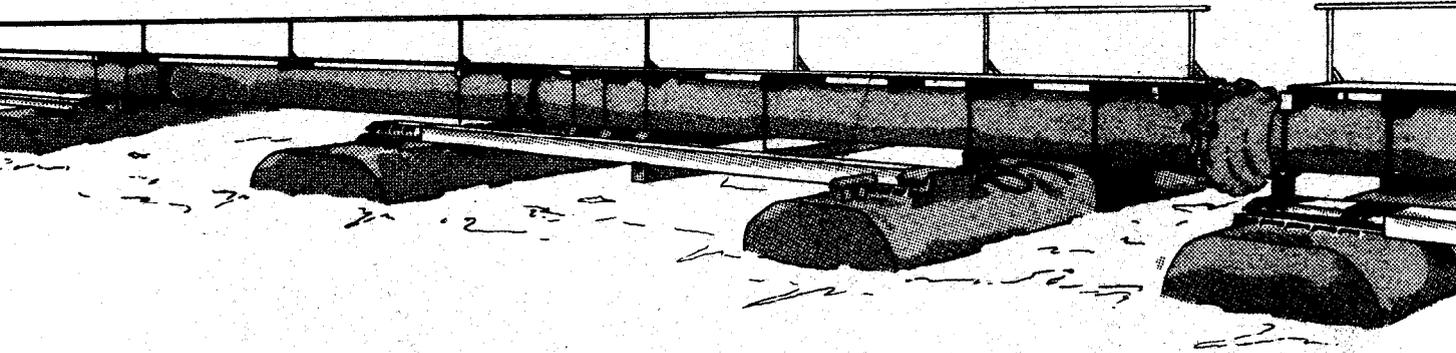
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30 September 1978

SUBJECT: Transmittal of Technical Report D-78-36

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1. The technical report transmitted herewith represents the results of one of several research efforts (work units) undertaken as part of Task 4C, Land Improvement Concepts, of the Corps of Engineers' Dredged Material Research Program. Task 4C was part of the Productive Uses Project (PUP) and had as a general objective determination of the technical feasibility of enhancing nonproductive land with dredged material.
2. There has been a dramatic increase in the last several years in the amount of land disposal of dredged material, necessitated largely as a result of the need for confining dredged material classified as polluted or with potential for causing adverse environmental impacts. Land for disposal activities is becoming scarce and the problem becomes more acute with the selection of each new disposal area. Attention, therefore, was directed towards identifying concepts that can increase the service life of disposal areas and thereby reduce the need for additional facilities.
3. One such concept is the application of dredged material to nonproductive agricultural land with the possibility of increasing production. The purpose of this particular study was to gather basic information about the physical and chemical properties of dredged material as they relate to its agricultural potential and to develop guidelines for determining the suitability of using dredged material as an agricultural soil or as an amendment for a marginal soil.
4. Based on the vast number of parameters involved and the newness of the concept, greenhouse experiments, as opposed to field experiments, were used to determine the suitability. Ten dredged material samples and ten marginal soil samples were collected from locations in the United States. The soils were marginal for crop production and were of such character that additions of dredged material might improve their physical and chemical properties. In addition, three productive Minnesota soils were chosen as controls. Samples of the dredged material, marginal soil, and mixtures of the two were physically and chemically analyzed prior to and after plant growth (production) experiments with three crops of ryegrass and barley.

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5. The basic conclusion is that, in many cases, dredged material can be used for agriculture production or for an amendment to a somewhat nonproductive soil. The report also presents guidelines for the disposal of dredged material on marginal soils. These guidelines cover the majority of the physical and chemical parameters involved.

6. The report also reinforces the idea that dredged material can be considered a soil resource and, when properly disposed of, could increase both agricultural production and disposal opportunities by allowing for reuse of old disposal sites.



JOHN L. CANNON
Colonel, Corps of Engineers
Commander and Director

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) An alternative for disposal of dredged sediments is to use them beneficially to amend marginal agricultural soils. To study the suitability of dredged material for crop production, 10 dredged material samples and 10 marginal soil samples were collected from locations in the United States. The soils were marginal for crop production and were of such character that additions of dredged material might improve their physical and chemical properties. The soils and dredged material samples were dried, ground, and mixed for plant (Continued)		

20. ABSTRACT (Continued).

growth studies and laboratory analysis. The following treatments were prepared: (a) soil alone; (b) 1/3 soil and 2/3 dredged material; (c) 2/3 soil and 1/3 dredged material; and (d) dredged material alone. In addition, three productive soils were chosen from the St. Paul, Minn., area to serve as controls in the plant growth studies.

In general, chemical properties of the dredged material samples did not differ greatly from the chemical properties of the three productive soils from Minnesota. Some of the dredged material samples were relatively high in organic matter, nitrogen, total sulfur, extractable zinc, copper, nickel, and cadmium contents. Samples high in total sulfur were also low in pH and thus had a high lime requirement. High oil and grease content of a few dredged material samples made them slower wetting than most of the soil samples. The clay fractions of many of the fine-textured dredged material samples were amorphous in nature. High organic matter content and the amorphous nature of the clay-size fraction partially explain the low bulk densities and high soil water retention capacities. Multiple regression relationships were developed which can be used for predicting water retention characteristics of dredged material, marginal soil, and their mixtures by considering the sand, silt, clay, and organic matter content and bulk density.

Three cuttings of ryegrass and two crops of barley were harvested from each of the treatments. Yields by plants in the greenhouse were greater for all fine-textured dredged material samples as compared to the coarse-grained marginal soils. Elemental analysis of the plant samples showed that, with the possible exception of boron in Alabama dredged material, none of the elemental concentrations were high enough to be toxic to plants. Zinc and copper contents of plants fell within the normal ranges expected. Nickel and cadmium contents were above the normal ranges expected in plants.

It is concluded that the dredged material used in this study would be beneficial for increasing agricultural production when mixed with marginal soils. Relationships between uptake and the availability of various soil elements were developed that can be used in setting the ratio of dredged material to marginal soil to be used in the field. Physical and chemical data, along with the plant growth data, were used to develop guidelines for the disposal of dredged material on marginal soils.

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