

DREDGED MATERIAL RESEARCH PROGRAM



TECHNICAL REPORT D-78-42

AVAILABILITY OF SEDIMENT-ADSORBED HEAVY METALS TO BENTHOS WITH PARTICULAR EMPHASIS ON DEPOSIT-FEEDING INFAUNA

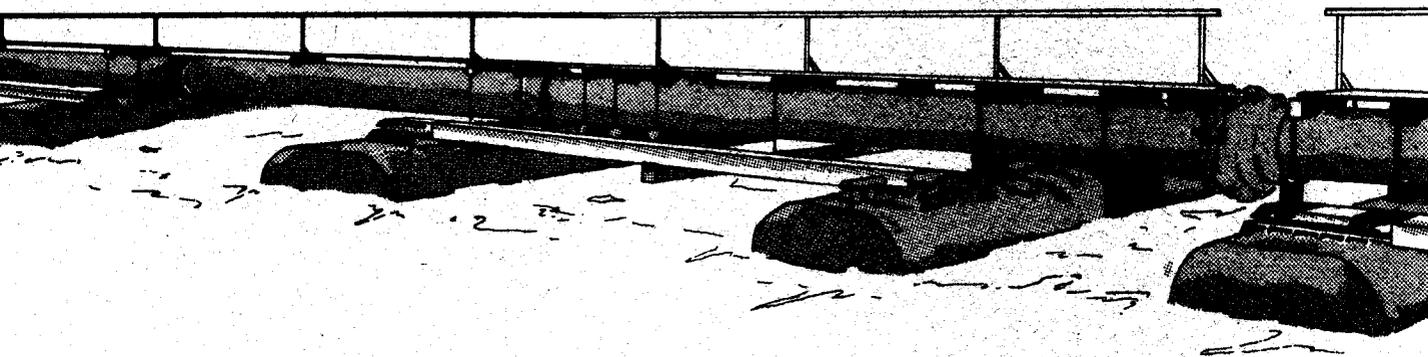
by

Jerry W. Neff, Robert S. Foster, J. Frank Slowey
Texas A&M Research Foundation
College Station, Tex. 77843

August 1978

Final Report

Approved For Public Release; Distribution Unlimited



Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

Under Contract No. DACW39-57-C-0096
(DMRP Work Unit No. ID06)

Monitored by Environmental Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

✓

**Destroy this report when no longer needed. Do not return
it to the originator.**



DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO: WESEV

30 September 1978

SUBJECT: Transmittal of Technical Report D-78-42

TO: All Report Recipients

1. This technical report presents the results of research undertaken as Work Unit 1D06 of Task 1D, Effects of Dredging and Disposal on Aquatic Organisms, of the Corps of Engineers' Dredged Material Research Program. Task 1D was a part of the Environmental Impacts and Criteria Development Project (EICDP), which had a general objective of determining on a regional basis the direct and indirect effects on aquatic organisms due to dredging and disposal operations. The study reported on herein was a part of a series of research contracts developed to achieve the EICDP general objective.
2. The purposes of this study were to determine the bioavailability of sediment-associated heavy metals to benthic invertebrates and to determine the degree of correlation between tissue concentration and metals concentration in various chemical extractants from the sediments. Animals were exposed to contaminated sediments for up to six weeks.
3. A total of 136 species-sediment-metal combinations were studied. Of these, only 36 (26.5 percent) showed a statistically significant accumulation of metals in the tissue due to sediment exposure. In many of these cases, the demonstrated uptake was quantitatively marginal. Substantive uptake of some toxic metals occurred in some species; however, it was the exception rather than the rule.
4. There were important interspecific differences in the bioavailability of sediment-associated heavy metals. In most cases, a species accumulating a particular metal from one sediment did not accumulate the same metal from the other test sediments. This indicates that chemical and physical form, as well as the concentration of the metal in the sediment, determines the bioaccumulation of metals to the species in question. Results also indicate that the physical and chemical forms of a metal that are available for bioaccumulation are different for different species.

WESEV

30 September 1978

SUBJECT: Transmittal of Technical Report D-78-42

5. The information and data published in this report are contributions to the further understanding of the complex nature of sediment, water, and chemical/biological interactions and establish a baseline from which to develop meaningful evaluations for the selection of an environmentally compatible disposal alternative. It is expected that the methodology employed in this study and the resulting interpretation of the chemical/ biological interactions will be of significant value to those persons concerned with CE dredged material permit programs.



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

20. ABSTRACT (Continued).

and Ashtabula, Ohio, harbor. The accumulation of eight heavy metals (cadmium, chromium, copper, iron, manganese, nickel, lead, and zinc) by all species and of two metals (mercury and vanadium) by selected species was measured.

Statistically significant accumulation of metals from sediment was demonstrated only 36 times (26.5%) out of 136 metal-species-sediment test combinations.

Variations in bioaccumulation were observed between species, metals, sediments, and salinity. In these studies, correlation was not observed between accumulation and specific metal forms as determined by selective chemical extraction of test sediments.

Bulk metal analyses of the test sediments also did not correlate with metal bioavailability.

THE CONTENTS OF THIS REPORT ARE NOT TO BE
USED FOR ADVERTISING, PUBLICATION, OR
PROMOTIONAL PURPOSES. CITATION OF TRADE
NAMES DOES NOT CONSTITUTE AN OFFICIAL EN-
DORSEMENT OR APPROVAL OF THE USE OF SUCH
COMMERCIAL PRODUCTS.