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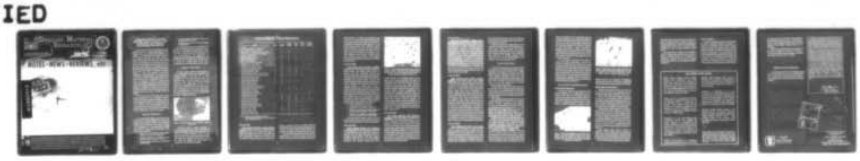

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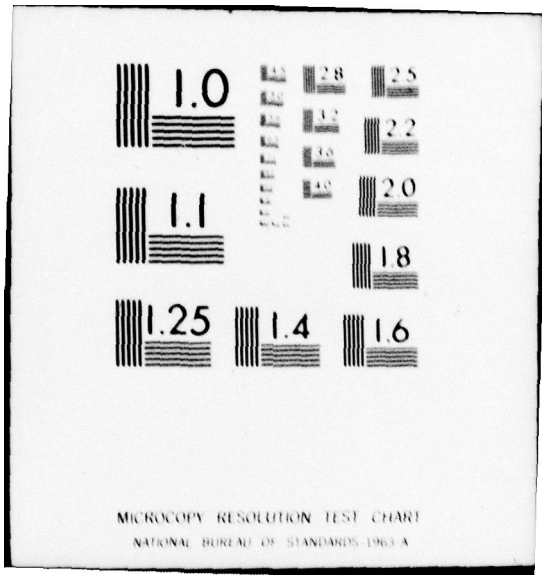
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DREDGED MATERIAL RESEARCH

U. S. ARMY CORPS OF ENGINEERS
INFORMATION EXCHANGE BULLETIN

Vol D-78-4
Apr 1978

NOTES • NEWS • REVIEWS etc.

A goal of the Dredged Material Research Program (DMRP) is the development of guidelines for the management of existing islands and the development of new islands for use by wildlife, primarily colonial nesting sea and wading birds. The above photo shows one of two islands constructed by the Wilmington District during 1975 maintenance dredging in Core Sound, N. C. Both islands were used extensively in 1976 and 1977 for nesting by black skimmers, gull-billed terns, common terns, and least terns (all but the common terns are rare, threatened, or endangered species). The following article describes the nationwide group of studies to provide input for the guidelines.

DREDGED MATERIAL ISLANDS PROVIDE CRITICAL HABITAT USED EXTENSIVELY BY COLONIAL WATERBIRDS FOR NESTING

A hundred years of active dredging and disposal operations by the U. S. Army Corps of Engineers, State agencies, and private industry have resulted in the creation of over 2000 man-made islands throughout U. S. coastal, Great Lakes, and riverine waterways. Usually these islands were formed with little thought given to use or need for new land areas. They are of various sizes and characteristics and presently range in age from newly formed to an estimated 50 years. Although the majority of the islands were created by the Corps, many are owned or managed by Federal agencies, State governments, conservation organizations, or private citizens. The Corps continues to maintain an interest in these man-made islands for several reasons: (1) the responsibility placed on the Corps by Congress to provide environmentally acceptable dredged material disposal methods and sites; (2) the continued need for disposal sites for maintenance dredging of navigable waterways; (3) the recreation potential these islands offer to boaters, sportsmen, and fishermen; and (4) the need to provide habitat for wildlife.

When the majority of the islands were formed during construction of the Intracoastal Waterway system in the 1930-40's, public and wildlife use was not a strong consideration. However, the rapid increase in the U. S. population and the corresponding demand on natural resources by citizens have helped to cause a gradual change in the use of the islands by wildlife and a need for reassessment of their role as habitat.

PROBLEM ASSESSMENT

In 1976 the DMRP's Habitat Development Project (HDP) made an initial assessment of the existing use of dredged material islands by wildlife, primarily colonial nesting sea and wading birds. This assessment resulted in the development of a nationwide group of studies under Task 4F: Island Habitat Development, which pursued several objectives:

- Document use of dredged material islands by colonial nesting sea and wading birds.
- Document succession of vegetation on the islands and relate succession to bird use.
- Compare vegetation and bird use of diked and undiked islands.
- Compare vegetation and bird use of natural and man-made islands and sites.
- Study migratory and year-round use of dredged material islands.

The overall goal of the research is the production of a manual synthesizing information obtained in the seven studies and a state-of-the-art review (Work Unit 4F03). The manual, primarily for use by Corps Districts, will offer recommendations and suggestions for management of existing islands and development of new islands. However, other agencies and groups that own or manage the existing islands should benefit considerably from the recommendations being offered.

TASK 4F WORK UNITS

The seven regions selected as representative of various geographical sections of the United States were intensively studied in 1976 and 1977 by WES contractors and WES personnel. These studies were conducted along the entire coastal and estuarine waterways of New Jersey, North Carolina, Florida, Texas, and Oregon/Washington; the entire U. S. shoreline and islands of the Great Lakes; and along the Upper Mississippi River from Alton, Illinois, to St. Paul, Minnesota (Figure 1). Technical reports generated by these studies are in preparation or in press at WES and will be available upon request.

Figure 1. Map showing the seven Task 4F regional study areas

Thirty-six colonial nesting waterbirds, 17 noncolonial waterbirds, and 32 other noncolonial bird species were nesting on dredged material islands in U. S. waterways in numbers estimated to total two million adults on all sites. The colonial waterbird species and the areas where they occurred are listed in Table 1. Some of the results and highlights of these studies are summarized in the following paragraphs.

Table 1

COLONIAL WATERBIRD SPECIES NESTING ON DREDGED MATERIAL ISLANDS OR MAN-MADE SITES IN CORPS-MAINTAINED WATERWAYS

Species	Texas	Florida	North Carolina	New Jersey	Great Lakes	Pacific Northwest
White pelican (*Pelecanus erythrorhynchos*)	X					
Brown pelican (*Pelecanus occidentalis*)	X	X	X			
Double-crested cormorant (*Phalacrocorax auritus*)		X	X			
Olivaceous cormorant (*Phalacrocorax olivaceus*)	X					
Anhinga (*Anhinga anhinga*)		X				
Great egret (*Casmerodius albus*)	X	X	X	X		
Snowy egret (*Egretta thula*)	X	X	X	X		
Cattle egret (*Bulbulcus ibis*)	X	X	X	X	X	
Great white heron (*Ardea occidentalis*)		X				
Great blue heron (*Ardea herodias*)	X	X	X	X		X
Reddish egret (*Dichromanassa rufescens*)	X	X				
Louisiana heron (*Hydranassa violacea*)	X	X	X	X		
Little blue heron (*Florida caerula*)	X	X	X	X		
Green heron (*Butorides striatus*)	X	X	X	X		
Black-crowned night heron (*Nycticorax nycticorax*)	X	X	X	X	X	
Yellow-crowned night heron (*Nyctanassa violacea*)	X	X	X	X		
Wood stork (*Mycteria americana*)[2]		X				
White-faced ibis (*Plegadis chihi*)	X					
Glossy ibis (*Plegadis falcinellus*)	X	X	X	X		
White ibis (*Eudocimus albus*)	X	X	X			
Roseate spoonbill (*Ajaia ajaja*)	X	X				
Glaucous-winged gull (*Larus glaucescens*)[3]						X
Great black-backed gull (*Larus marinus*)			X	X		
Herring gull (*Larus argentatus*)			X	X	X	
Western gull (*Larus occidentalis*)[3]						X
Ring-billed gull (*Larus delawarensis*)					X	X
Laughing gull (*Larus atricilla*)	X	X	X	X		
Least tern (*Sterna albifrons*)	X	X	X	X		
Common tern (*Sterna hirundo*)		X	X	X	X	X
Roseate tern (*Sterna dougallii*)		X	X	X		
Forster's tern (*Sterna forsteri*)	X		X	X	X	
Sandwich tern (*Sterna sandvicensis*)	X	X	X			
Gull-billed tern (*Gelochelidon nilotica*)	X	X	X	X		
Royal tern (*Sterna maxima*)	X	X	X			
Caspian tern (*Sterna caspia*)	X	X	X		X	X
Black tern (*Chlidonias niger*)					X	
Black skimmer (*Rynchops niger*)	X	X	X	X		

Note: [1]White, red, and intermediate color phases.
[2]Near dredged material colonies, but not observed nesting.
[3]Much interbreeding of species.

Work Unit 4F02

North Carolina (University of North Carolina, contractor). Ninety-two percent of 25 colonial sea and wading bird species (over 85,000 adults) nested on dredged material islands in North Carolina estuaries in 1977. Since diking of islands was a relatively recent Corps disposal method in need of study, comparisons of effects on vegetation and bird use between diked and undiked islands were made. Diking of islands appeared to affect the species nesting, feeding habitat, and vegetation colonization and succession in several ways.

Tree kills within diked islands destroyed potential nesting habitat for herons and egrets. Borrow pits created by dike construction provided prime temporary

feeding habitat for waterfowl and shorebirds. Dikes provided a more stable water supply by trapping fresh water, which resulted in more rapid and lush vegetation colonization and succession. Dikes may prevent some ground nesting species from successfully nesting because succession is very rapid, the heavy vegetation present is not always suitable for the species, the dike might prevent some species from reaching the water before fledging, and an increase in flooding during heavy rains may drown colonies. Dike vegetation sheltered many small migratory and year-round resident passerine species.

Work Unit 4F01B

Texas (Texas A&I University, contractor). Between 60 and 75 percent of 25 colonial species (over 200,000 adults) used dredged material islands for nesting in the Texas Intracoastal Waterway and Houston Ship Channel. The islands in Texas waterways were found to be quite varied in physical characteristics, depending upon climatic factors, currents, and salinities. Hypersaline conditions and a semiarid climate slowed colonization and succession of plants in the Laguna Madre in south Texas, while a freshwater/brackish-water environment and humid climates caused a rapid, lush growth on Galveston Bay islands. The Texas wading bird species seemed to be highly adaptable in that they nested in trees, shrubs, and cacti (*Opuntia* spp.) and on the ground. Nesting occurred from January through September. Dredged material islands were utilized by colonial nesters in varying degrees depending upon these factors:

- Human disturbance and activities.
- Accessibility of the islands to predators.
- Whether or not islands were large enough (over 8.0 ha) to support predators year-round.
- Presence of vegetation, topography, or elevation unsuitable for individual species.

The most important negative factor by far was human disturbance. The paucity of suitable bare ground areas for terns and skimmers was also a serious problem.

Work Unit 4F01C

Florida (Seabird Research, Inc., contractor). Approximately 50 percent of 26 species of waterbirds (over 200,000 adults) used dredged material islands for nesting in 1977. In Florida these species nested from December through October. While black skimmer (*Rhynchops niger*) and least tern (*Sterna albifrons*) populations were suffering, laughing gulls (*Larus*

Figure 2. Typical laughing gull habitat is low, clumped grasses and forbs. This dense colony (30,000 birds) is nesting on a 17-year-old dredged material island in Florida and is increasing in size each year

articilla) seemed to be increasing (Figure 2). Other species such as roseate spoonbills (*Ajaia ajaja*) and reddish egrets (*Dichromanassa rufescens*) seemed to be expanding once more into former territories. Frequently the islands were found to be eroding. Often the island vegetation consisted of exotic species, such as Brazilian pepper (*Schinus terebinthifolous*) and Australian pine (*Casuarina equisetifolia*), which were often used by nesting birds as were native mangroves and grasses growing on dredged material islands. The islands were commonly used by migratory and overwintering shorebirds, waterbirds, and passerines, as well as by resident nesters. Human disturbance was the most important factor affecting nesting in Florida. A critical lack of suitable habitat for ground nesting species was also noted.

Work Unit 4F01D

New Jersey (Manomet Bird Observatory, contractor). A total of 19 species in 116 colonies (over 126,000 adults) of sea and wading birds were on sites known or suspected to be made of dredged material. Habitat for colonial species seemed to be severely restricted in New Jersey. Tree-nesting wading birds were nesting in giant reed (*Phragmites australis*), and black skimmers established colonies in the salt marshes. Undisturbed bare ground areas for terns and skimmers were especially critical. Human disturbance was once again found to be the single most important factor governing the nesting success of the birds, along with the problem of lack of suitable habitat.

Work Unit 4F01A

Great Lakes (Northwestern Michigan College, contractor). This two-year study located 267 colonies of 13 colonial waterbird species (over 300,000 adults) on the U. S. coastline and islands of the Great Lakes. Due to lower water levels in 1977, newly exposed islands were being used by these birds, but whether or not an increase in population will result was not determined. Habitat seemed to be lacking in the lakes, especially for ground-nesting terns and gulls. Only 15 percent of the colonies were located on dredged material or man-made sites, but close to 100 percent of all available man-made sites were being used for nesting. Indeed, birds nested on new construction or fill sites and islands within months after they were formed. Human disturbance, predation, and limited suitable habitat all played important roles in the success of Great Lake colonies.

Work Unit 4F01E

Pacific Northwest (John Graham Company, contractor). Seven colonial species used dredged material islands for nesting in Oregon and Washington in relatively low percentages compared with actual populations of seabirds in the area. However, the islands seemed to be of importance to Caspian terns (*Sterna caspia*), western gulls (*Larus occidentalis*), and glaucous-winged gulls (*Larus glaucescens*) since almost every available island north of the Columbia River had a nesting colony in 1977. Common terns (*Sterna hirundo*) and ring-billed gulls (*Sterna delawarensis*) were observed nesting in small colonies on the study islands in Washington, a first recorded nesting for these species on the coast. One of two heronies in the Columbia River was located on an island with dredged material deposits. The large-scale use of these islands by all species is not likely for four reasons: natural islands are still available for nesting; human disturbance levels are low on natural sites; populations of ground-nesting species in the area are relatively low compared to the cliff nesting seabirds; and the islands are not suitable habitat for cliff nesters.

Work Unit 4F01F

Upper Mississippi River (WES in-house study). Thirty-five colonies including seven species of herons, egrets, cormorants, and terns were located in the Upper Mississippi River from Lock and Dam 1 at St. Paul, Minnesota, through Lock and Dam 26 at Alton, Illinois. None of these colonies were on dredged material and although some were close by, dredged material deposits seemed to have no effect, good or bad, on the nesting birds. Colonies in the southern half of the study area were further apart and smaller; colonies increased in size and frequency to the north.

In general, colonies were located below or at the confluence of major tributaries of the Mississippi River and/or dams, always on natural sites. Human disturbance was once again found to be an important factor affecting nesting colonies, since immediately upon placement of dredged material, human recreational use of the site increased greatly to the exclusion of any birds attempting to nest.

STUDY CONCLUSIONS

Several broad conclusions may be drawn from the data collected in the various regional studies. Human disturbance and intrusion were found to be highly detrimental to the establishment and success of a bird colony. Campers, sportsmen, boaters, and other recreationalists were harmful to the colonies and created havoc among nestlings who fled from intruders and adults who flew away, leaving eggs and nestlings exposed to weather and predators.

Dredged material islands were used extensively by colonial nesters where natural sites have been destroyed. Where natural sites remained available, use of dredged material islands was lower. However, in some areas, some species actually preferred dredged material islands to natural islands.

Some dredged material deposits did not provide suitable habitat because of factors relating to predation, location, elevation, configuration, and vegetation. Numerous existing dredged material islands were found to be located too close to the mainland and/or in such shallow water that low tide created a land bridge to the islands. This allowed easy access for predators. Large islands (over 8.0 ha) were not often used, probably because predators could live on them year-round.

Elevation and shape of an island often determined which species could successfully nest. Ground nesters could not successfully nest on islands that were occasionally overwashed. Tree and shrub nesters seemed to prefer islands with still-water interior ponds or coves formed by wings of dredged material.

Structure and density of vegetation determined which bird species would use an island, and plant succession rates and patterns determined how long an island would be of use to some bird species before becoming available to others. Bare-ground nesters such as black skimmers and least terns generally only have

access to an island for 1 to 3 years before growth of vegetation forces them out. Ground-nesting gulls and terns that prefer grass and herbaceous cover will use an island from two years of age and older, depending on rates of plant colonization and succession. Sometimes an island will maintain a climax community of herbaceous plants that can be used by ground nesters. Tree-nesting species generally cannot use a dredged material island until the vegetation has reached a tree-shrub stage and the plants are tall enough (1.5 to 21 m) to support their nests.

The construction of permanent dikes (Figure 3) affected bird species using islands in several ways. Feeding and loafing areas were enhanced and enlarged by those dikes that had shallow protected borrow pits behind them. On the other hand, nesting was disrupted because the dikes created a barrier to water access for ground-nesting species. The trees killed by changes in salinity and water levels were no longer suitable for tree-nesting species. In general, dikes were beneficial in creating feeding and loafing areas and were detrimental in disrupting potential nesting sites.

MANAGEMENT RECOMMENDATIONS

Control Human Disturbance

Of the factors which man can potentially control, human disturbance is the single greatest one that disrupts nesting. Measures successfully employed in some locations include posting of islands known to have colonies and patrolling of islands by full-time wardens (Figure 4). A certain amount of human access to colony islands is acceptable if limited to visitation between

Figure 3. This diked dredged material island in North Carolina has greatly different habitats than before diking. Trees were killed and borrow pits created, resulting in loss of permanent nesting habitat but in gain of temporary feeding areas

Figure 4. Great egrets, snowy egrets, and little blue herons nesting in shrub canopy of Bird Island, a 47-year-old dredged material island in Tampa Bay, Florida, which is part of a warden-protected sanctuary

nesting seasons and competent knowledgeable researchers and work crews. Restrictions on fishing and boating could be enforced around islands with colonies.

Supply Suitable Nesting Habitat

Suitable nesting habitat could be provided. This can be done in several ways, depending upon the demand for certain kinds of habitat in a given area.

New islands could be built if necessary, such as the two by the U. S. Army Engineer District, Wilmington (cover photo). Birds nested successfully on both in 1977. Any new island built should be less than 8.0 to 15.0 ha in size, 1 to 3 m above mean high tide, and isolated as much as possible from the mainland and recreationalists.

Existing islands could be expanded. A cooperative effort between the Florida chapter of the National Audubon Society and the U. S. Army Engineer District, Jacksonville, resulted in an extension to Sunken Island, an Audubon Sanctuary heavily used by nesting birds. The addition stabilized the existing island and created nesting areas for terns and gulls. A study of a proposed extension of Sidney Island (a dredged material island that is an Audubon Sanctuary) in Sabine Lake, Texas, is under way.

Some existing islands could be cleared of vegetation to provide nesting habitat for bare-ground nesters such as terns and skimmers. Dredged material could be placed on existing islands to set back the stage of plant succession and accomplish the same objective.

Some existing islands could be planted in grasses to

encourage certain ground nesters and to stabilize the island, or planted in trees to speed up the rate of succession of vegetation to benefit tree-nesting species. Wetland plants could be used for island perimeter stabilization as well as nesting substrate for marsh nesters.

Since diking does not appear to be beneficial to colonial nesting species, efforts should be made to negate the harmful effects by (1) nondiking, (2) breaching or removing the dike after the dredged material has dewatered, or (3) by building three-sided or partial dikes.

Central Coordinator

A central coordination position could be developed and used to coordinate location and condition of colonies, and cooperative efforts among the various Federal, State, and private agencies and to in general ensure the welfare of colonial waterbirds through careful monitoring of developmental and environmental activities throughout the United States as they pertain to waterbirds and their habitat. The coordinator would be responsible for maintaining contact with knowledgeable local and regional groups and individuals and for dissemination of information to

NEW DMRP PUBLICATIONS

Marine Sciences Research Center, "Aquatic Disposal Field Investigations, Eatons Neck Disposal Site, Long Island Sound; Appendix B: Water-Quality Parameters and Physicochemical Sediment Parameters," WES Technical Report D-77-6, January 1978, prepared by State University of New York for the Environmental Laboratory. (Final Report on Work Unit 1A06B.)

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Canter, L. W., et al., "An Assessment of Problems Associated with Evaluating the Physical, Chemical, and Biological Impacts of Discharging Fill Material," WES Technical Report D-77-29, December 1977, prepared by the School of Civil Engineering and Environmental Science, University of Oklahoma, for the Environmental Laboratory. (DMRP-related.)

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Sternberg, R. W., et al., "Aquatic Disposal Field Investigations, Columbia River Disposal Site, Oregon; Appendix A: Investigation of the Hydraulic Regime and Physical Nature of Bottom Sedimentation," WES Technical Report D-77-30, December 1977, prepared by the Department of Oceanography, University of Washington, for the Environmental Laboratory. (Final Report on Work Unit 1A07A.)

. . . . . .

Zieman, J. C., and Odum, W. E., "Modeling of Ecological Succession and Production in Estuarine Marshes," WES Technical Report D-77-35, November 1977, prepared by the Department of Environmental Sciences, University of Virginia, for the Environmental Laboratory. (Final Report on Work Unit 4A05.)

. . . . . .

Gosselink, J. G., Hopkinson, C. S., Jr., and Parrondo, R. T., "Common Marsh Plant Species of the Gulf Coast Area; Volume I: Productivity and Volume II: Growth Dynamics," WES Technical Report D-77-44, December 1977, prepared by Louisiana State University for the Environmental Laboratory. (Final Report on Work Unit 4A04B.)

. . . . . .

Gunnison, Douglas, "Mineral Cycling in Salt Marsh-Estuarine Ecosystems; Ecosystem Structure, Function, and General Compartmental Model Describing Mineral Cycles," WES Technical Report D-78-3, January 1978, Environmental Laboratory. (Final Report on Work Unit 2A05.)

NOTE: Copies of the above reports will be furnished to individual requestors as long as supplies last. Since it is only feasible to print a limited number of copies, requests for single rather than multiple copies by a single office will be appreciated. Please address all requests to the Waterways Experiment Station, ATTN: Ms. D. P. Booth. When supplies are exhausted, copies will be obtainable from the National Technical Information Service, 5205 Port Royal Road, Springfield, VA 22151.

requesting agencies and individuals. The coordinator's responsibilities would also be that of a liaison between the U. S. Army Engineer Districts and the owners and managers of the dredged material islands in U. S. waterways.

Task 4F was conducted under the managership of Ms. Mary C. Landin, who with Dr. R. F. Soots, Jr., wrote the task synthesis report. Manager of the Habitat Development Project is Dr. H. K. Smith.

DMRP STATUS SUMMARY

In keeping with the practice of publishing a status report on the DMRP every 6 months, a report updated as of 31 December 1977 is being mailed separately to each recipient of the DMRP Information Exchange Bulletin.

This bulletin is published in accordance with AR 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 Dredged Material Research Program (DMRP) could 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. Although the DMRP was completed in March 1978, all research results have not yet been disseminated to this wide audience. Hence it is being continued until such time as all significant DMRP results and data are summarized. It will be issued on an irregular basis as dictated by the quantity and importance of information available and compiled for publication. Contributions of notes, news, reviews, or any other type of information are solicited from all sources and will be considered for publication as long as they are relevant to the theme of providing definitive information on the environmental impact of dredging and dredged material disposal operations and the development of technically satisfactory, environmentally compatible, and economically feasible dredging and disposal alternatives, including consideration of dredged material as a manageable resource. Special emphasis is placed on materials relating to the application of research results or technology to specific project needs. Communications are welcomed and should be addressed to the Environmental Laboratory, ATTN: R. T. Saucier, U. S. Army Engineer Waterways Experiment Station, P. O. Box 631, Vicksburg, Miss. 39180, or call AC 601, 636-3111, Ext. 3233 (FTS 542-3233).

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