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# *Environmental Effects of Dredging*
## *Technical Notes*

### BUILDING, DEVELOPING, AND MANAGING DREDGED MATERIAL ISLANDS FOR BIRD HABITAT

PURPOSE: This note describes the environmental considerations and techniques that have been developed and tested for building, developing, and managing dredged material islands for use by birds for nesting and other life requirements. The text of this note was taken from lectures presented from 1979 to 1986 at the Dredging Short Courses held each year by the Texas A&M University Center for Dredging Studies and from information compiled for Engineer Manual EM 1110-2-5026 entitled "Beneficial Uses of Dredged Material."

BACKGROUND: One hundred years of dredging and open-water disposal operations by the Corps of Engineers (CE), state agencies, and private enterprise has resulted in the creation of over 2000 man-made islands throughout US coastal waters, riverine waterways, and the Great Lakes. The CE continues to maintain an interest in developing such islands because of its responsibility in using environmentally acceptable disposal methods and sites, the increasing shortage of upland disposal sites, the need for wildlife habitats in waterway areas, and the islands' recreational potential.

As the population in coastal areas has increased, natural areas have been altered and occupied by man. Dredged material islands have provided vital habitat in many areas. The primary wildlife species needing habitat on dredged material islands as part of their life requirements are 37 species of colonial-nesting birds: pelicans, cormorants, anhingas, herons, egrets, ibises, spoonbills, gulls, terns, and skimmers. Several of these species are rare, threatened, or endangered throughout large parts of their ranges, and an estimated 1,000,000 are nesting on dredged material islands each year, especially along the Atlantic and Gulf coasts from Long Island to Mexico.

ADDITIONAL INFORMATION OR QUESTIONS: Contact the author, Dr. Mary C. Landin (601) 634-2942 (FTS 542-2942), or the manager of the Environmental Effects of Dredging Programs, Dr. Robert M. Engler (601) 634-3624 (FTS 542-3624).



US Army Engineer Waterways Experiment Station, Environmental Laboratory

## Building New Islands

### Success stories

Construction of new islands for birds and other forms of wildlife is technically and environmentally feasible. In 1977, the Wilmington District constructed two islands in Core Sound, North Carolina, for habitat development. The two islands are unique in that they were the CE's first to be constructed and placed in a manner to deliberately create habitat for colonial seabirds and aquatic biota and that they were retained by the use of large sand-filled nylon bags (Figure 1).

Figure 1. Construction of dredged material islands, Core Sound, N. C. (1977)

The sites were designed so that during future maintenance dredging of the nearby navigation channel, material could be added within the original sandbag retainers and more sandbags could be added to provide higher retention dikes. The islands were placed in an area with adequate shallow water and food resources but with a scarcity of bare-ground nesting habitat.

The kidney shape of the islands formed a small cove where smooth cordgrass and saltmeadow cordgrass were planted around the perimeter of the cove to accelerate marsh development. A marsh developed, and benthic organisms are thriving in the cove. Terns and skimmers nested on the islands during the first breeding season after construction.

Prior to the Core Sound construction, personnel of the Environmental Laboratory had been involved in building or modifying several islands for habitat development for research purposes. A number of dredged material islands have also been built in Florida, Maryland, Alabama, Texas, Louisiana, and the Great Lakes with waterbird habitat development as a secondary project goal.

In the Great Lakes and a number of ports along the Atlantic and Gulf coasts, CE districts have constructed large diked islands for permanent containment areas for maintenance dredged material. These islands are sometimes over 1000 acres in size, often well armored with riprap on both sides of the dikes (Figure 2), and, in most cases, designed for containment of contaminated

Figure 2. Dike building at Pointe Mouillee CDF in western Lake Erie. Habitat for waterbirds, waterfowl, other wildlife and fish was incorporated into the long-range management plan for the 4600-acre site

sediment, especially those islands located along the mid Atlantic to New York coast and in the Great Lakes. They are up to three miles from shore and relatively isolated. From the time of their construction, they have been used more and more by nesting and loafing seabirds. Where seabird use was incorporated into design and management of newer confined disposal facilities (CDFs), seabird colonization has been spectacular, such as at the Gaillard Island CDF in Mobile Bay where over 16,000 seabirds nest each year (Figure 3).

Feasibility of construction

In many areas there may be no need for more islands, and management of

Figure 3. Brown pelicans nesting on Gaillard Island CDF in Mobile Bay, Ala.

existing islands should be given first priority. There are areas, however, where additional nesting habitat would be beneficial; existing dredged material and natural islands are not available; and construction of new islands would be desirable under some conditions.

Generally, construction on new islands for wildlife will not be feasible unless it can be demonstrated that anticipated positive impacts on the target species will outweigh any negative impacts on the environment. If there is a need for nesting habitat in an area lacking suitable islands and if the benefits for the birds will exceed any negative effects of construction of an island to benthic organisms and current flow, then an island could be built. New island construction will be dependent on the concerns of Federal and state agencies and the private sector, and these concerns vary considerably among regions of the country.

Building constraints

Three prime considerations for building dredged material islands for bird habitat are location, timing, and design. Each of these factors is of importance if birds are to be attracted to the islands.

The site selected for an island should be coordinated with knowledgeable wildlife biologists and concerned agencies to establish the best location. Building an island in an area that does not conform to biological and

engineering specifications would fail to produce the desired wildlife habitat. Islands must be placed where the birds will be isolated from predators and human disturbances, unless the islands are going to be actively protected.

Timing is important: ideally an island should be built during the fall or winter preceding the initiation of the next breeding season. Birds generally do not use a site until after the initial winnowing of fine material by wind and water. If an island is built in the spring, this sorting may not have had time to take place, and any colony of birds trying to nest there may have their eggs covered by drifting fine material. Also, birds cannot use a site until it has had adequate time to dewater.

The physical design of an island is a major factor in its success as bird habitat. In general, islands must be permanently emergent at high water levels; birds have been found nesting on all sizes and shapes of islands as long as the islands met this crucial breeding requirement. Observations of hundreds of birds colonies on dredged material islands and the kinds of islands they select has led to four categories of recommendations: size, configuration, substrate, and elevation. Whether an island is diked or undiked can also make a significant difference in bird use.

Size. Ideally, new islands should be no smaller than 5 acres and no larger than 50 acres. However, birds have been found nesting on both smaller and larger islands, and this is a highly site- and species-specific feature. Larger islands would generally be more difficult to manage and would also be more likely to support predator populations such as coyotes, snakes, foxes, feral cats and dogs, rats, and raccoons. Islands between the two extremes in size can be managed more easily, and considerable habitat diversity can be achieved. Generally, the greater the amount of habitat diversity to be maintained for wildlife populations, the larger the island should be.

Configuration. The configuration on an island will depend on the target wildlife species. Steep slopes such as those found on some dikes should be avoided for all species. A slope no greater than a 3-ft rise per 100 ft has been recommended. Many bare-ground nesters must have gentle slopes to prevent their eggs from rolling from nest scrapes. There is also evidence that the formation of a bay or pond within an island makes it more attractive to nesting birds.

Substrate. Coarse material such as sand or gravel usually makes better nesting substrates due to its greater stability. Fine material such as silt and clay are subject to wind and rain erosion and usually develop desiccation cracks, settling, and ponding. A mixture of sand and shell material makes good nesting substrate for most of the ground-nesting birds, which prefer sandy beach areas.

Fine-grained unstable dredged material may be improved to form suitable nesting substrate by adding coarse material such as shells over its surface or by planting a ground cover on the material to provide vegetation for those species that prefer that kind of habitat, such as the Forster's tern. Tree-nesting species prefer woody vegetation, which often colonizes best on silty, more fertile substrates, and selected species of shrubs and trees preferred by tree-nesting birds could be planted on such sites.

Elevation. Elevations of constructed islands should be high enough to prevent flooding of nesting areas but not so high that wind erosion will prevent the substrate from becoming stabilized. Generally, the optimum elevation for an island is between 3 to 10 ft above mean high water. The desirable elevation will depend on the texture of the exposed dredged material, wind exposure, and habitat objectives or target species.

Coarser material may stabilize at higher elevations than finer material. If islands are constructed of coarse material, it may be acceptable to exceed the recommended elevation. In general, the higher the elevation of coarse-grained material, the slower the island will be colonized by plants. Therefore, lower elevations to achieve plant cover for some ground-nesting species and all tree-nesting species should be considered where those are the target wildlife species and where substrates are fine-grained material.

It should be remembered that, given the proper substrates and vegetation for nesting, none of the species using dredged material islands for nesting choose one elevation over another so long as they are above the tide or flood lines.

## Developing and Managing Islands

Management of existing island habitats has been demonstrated to be an effective disposal technique and wildlife management practice that is desirable because the potential environmental impacts of disposing on an existing

site are less than those of building new islands.

Dredging and disposal operations can be acceptably altered to benefit waterbirds and other wildlife on dredged material islands. Developing and managing dredged material islands for birds involves a broad spectrum of techniques: habitat establishment, habitat manipulation, and protection of bird colonies.

Habitat establishment

Habitat establishment may be necessary where nesting habitat is lacking and new islands must be created, often with the resulting need for vegetation establishment; where nesting habitat is expanded by an addition to an existing island; or where undesirable nesting habitats (vegetation) occurring on islands must be cleared out, and desirable habitats established in their place.

A number of suitable plant species could be planted on an island that would increase its attractiveness to avian wildlife. Depending upon the wildlife species specific requirements, plants could be incorporated into an island management plan. No plantings would be necessary for ground-nesting species in most cases, although some of these species use sparse herbs and grasses for nesting. Since tree-nesting species require tree/shrub habitat, planting of this vegetation type would hasten wildlife use by more quickly providing suitable habitat. Woody habitat will require 5 to 30 years to develop, depending upon the region and climatic conditions.

Habitat manipulation

Habitat manipulation, by far the management technique most commonly used by the Corps, includes properly placing the dredged material to maintain or to reestablish habitats; increasing the size of existing islands; and/or changing island configuration, elevation, vegetation, or other features to make more desirable habitats. Manipulation of habitats also included establishing new vegetation and managing existing vegetation on islands through various agronomic and horticultural techniques.

The CE has provided habitat incidental to project purpose since the agency first created dredged material islands. Since that time, islands have been kept in various stages of plant succession through deposition of dredged material from channel maintenance operations. These operations can have a significant positive impact on waterbird breeding populations. Through proper planning, the positive impact of regular deposition could be increased. Since

past dredging and disposal operations have been carried out with little or no regard for nesting birds, many areas do not have adequate diversity of nesting habitat. Some areas lack ground-nesting habitats while others lack woody habitats.

Additions to islands may be useful management tools if valuable nesting sites are being altered by erosion and may eventually have to be abandoned. Such additions will prolong island usefulness as nesting habitat. Adding to existing islands that are covered with vegetation will increase habitat diversity by providing some bare-ground habitat, at least temporarily, for those forms of wildlife requiring bare ground. Colonies have responded favorably to island additions, especially bare-ground nesting species.

Once site-specific needs are known, nesting habitat management can easily become a part of the regular maintenance dredging process. To maintain target habitat diversity for certain bird species, islands in any given area could be selected to receive periodic depositions of dredged material on a rotating basis. Restrictions against dredged material deposition on all or parts of some islands may be necessary in order to allow habitats for tree--nesting birds to develop or to preserve existing tree habitats.

Another aspect of habitat manipulation is that sometimes vegetation must be controlled in order to provide the proper or desired habitat for target wildlife species. Vegetation control would be necessary if habitat for ground-nesting species was scarce and there was an abundance of other habitats or if the incorrect species of trees growing on an island precluded its use. Some successful control methods are mechanical removal, hand removal, controlled burning, and applications of herbicides.

Management of CDFs generally consists of continued protective isolation, wildlife monitoring, and posting. Vegetation management has not yet become a problem on any of these relatively new islands.

The feasibility of these management recommendations has been demonstrated by the Wilmington District where local management on an annual basis has been practiced for several years. A long-range CE habitat management plan for colonial sea and wading birds in the lower Cape Fear River estuary includes timing of maintenance dredging and controlled placement of dredged material deposits on existing islands.

Protection of bird colonies

Lack of isolation and protection is one of the primary problems waterbirds face. They are protected under the US Migratory Bird Treaty Act and its amendments, but this law does not protect habitat unless the migratory bird is present. Some of the provisions of the act can be detrimental for long-term protection of the colonies by restricting management activities that are for the long-range benefit of species in existing colonies. Some states have laws and regulations designed to give the necessary protection. It has been shown repeatedly throughout North America that, in general, protected colonies are successful while unprotected colonies are not.

To ensure compliance with law, maintenance operations involving placement of dredged material on existing islands should be conducted in a manner that will not disturb bird colonies. Management should include proper care during placing, surveying, and constructing dikes.

Public education concerning the vulnerability of colonial-nesting birds has the potential of being a valuable management tool. Through various public relations channels, the general public could be made aware of the value of the dredged material islands and at the same time could be told that the continued periodic disposal of dredged material on an island may be a viable management option to improve the bird habitat.

Protective measures for the colonies including posting of the islands with signs such as those used by the Mobile and Portland districts (Figure 4), fencing, designating certain colonies as wildlife sanctuaries such as the Tampa Bay dredged material islands now being managed by the National Audubon Society, limiting scientific study (and thus disturbance of birds by constant observation and measurements), and controlling wildlife predators such as raccoons, foxes, and feral animals.

. . . and a few words of caution

A key to success in the early planning stages of island development is cooperation, communication, and coordination with Federal, state, and local agencies with regulatory authorities. Many obstacles to project success could be prevented or removed by correct planning and public awareness efforts before a project actually begins. Positive public and agency opinion regarding disposal of dredged material may improve acceptance and understanding of the


Figure 4. One of the posted signs erected by the Mobile District to protect sensitive nesting colonies of seabirds on Gaillard Island CDF

operations and allow more of this resource to be beneficially developed for wildlife.

The development of disposal specifications that will create or maintain island habitats and will simultaneously satisfy the need to dispose of a given amount of dredged material requires considerable care. Specifications should include exact locations; time of disposal; final size, elevation, slope, and configuration of deposit; and instructions for movement of discharge pipes to ensure that habitat requirements are met. Onsite monitoring of the disposal operation is highly desirable and is necessary when disposal is on an island with an existing bird colony or population of vulnerable wildlife.

Strategic placement of new sites is a valuable management tool. However, islands should not be placed in areas where they would be used for recreation purposes during the nesting season, thus eliminating or severely reducing their habitat value.

If a steep-sloped dike is built on an existing island and then filled, the dike should usually be at least partially removed or breached to allow ground access to water by young birds. This will require planning for earthmoving equipment to return to the site at appropriate times. Dikes should be erected just prior to disposal for best use of the existing island by wildlife. Temporary dikes may sometimes suffice. Periodic monitoring to

determine the after effects of continued disposal will provide useful information for future disposal efforts.

Fishing or boating adjacent to an island during the nesting season can inflict severe damage on a colony through disturbance of young and adults. Dredging and disposal operations, surveying of islands, and constructing dikes could also disrupt nesting birds.

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