

TOWARDS THE INTEGRATION OF FEDERAL DREDGING AND BEACH NOURISHMENT ACTIVITIES WITH NORTH AMERICAN COASTAL BIRD CONSERVATION PROGRAMS

Casey A. Lott¹, Richard A. Fischer², and David N. Pashley³

ABSTRACT

Approximately 53% of the US population currently lives in coastal counties and this number is expected to continue increasing. High population density along with the importance of coastal areas for commercial and recreational navigation systems leads to significant pressure on environmental resources. These pressures have contributed to population declines and continuing threats to breeding, migrating, and roosting waterbirds and shorebirds, several of which migrate between the northern and southern hemisphere. The US Army Corps of Engineers (USACE) is the federal agency charged with coastal shore protection and the maintenance of navigable waterways. As part of its mission, the USACE has significant opportunities to dispose dredged material for coastal island creation and maintenance, wetland restoration, and beach nourishment projects in ways that contribute to coastal bird conservation. There currently is a nationwide effort among federal agencies, non-governmental organizations, and others to improve the planning, construction, and management of coastal dredging, beach nourishment, and shore-protection projects under USACE authority. The goals are to reduce conflicts between coastal engineering projects and bird habitat needs, and to enhance and manage these sites for birds while at the time facilitating completion of authorized projects. This paper and accompanying presentation will provide an overview of dredging and shore-protection issues in North America as they relate to coastal birds, a summary of current coastal bird conservation efforts, and some suggestions for future actions that could help to effectively integrate the two. Although we focus on these issues in North America, similar issues and conflicts exist in coastal areas throughout the world.

Keywords: Beneficial uses, conservation, dredged material disposal, shorebirds, waterbirds

INTRODUCTION

More than 139 million people (53% of the US population) currently live in coastal counties, and this number is expected to increase to 165 million by 2015 (NOAA 1998). High human population density combined with the importance of coastal areas for commercial, recreational, and navigation usage has resulted in population declines and continuing threats to many species of coastal birds, many of which migrate between the northern and southern hemisphere (Kushlan and Steinkamp 2002; Brown et al. 2003). Coastal USACE activities are conducted in different missions that require careful consideration to meet all strategic, economic, and environmental objectives in highly-populated, economically important, and environmentally sensitive coastal regions. The USACE is the Federal agency charged with maintaining Federal navigable waterways of the United States. It is also the agency that executes Federal hurricane and storm damage shore-protection projects. In addition to these, the USACE has an environmental sustainability mission and must comply with applicable local, state, and Federal environmental regulations. Important aspects of the USACE environmental mission relative to coastal birds are goals of “no net wetland loss,” “the restoration of natural, functioning, self-regulating ecosystems,” and “managing lands for long-term natural resource productivity.” (See <http://www.usace.army.mil/public.html>).

¹ Coastal and Waterways Program Coordinator, American Bird Conservancy, P.O. Box 249, The Plains, VA, 20198, USA. T: 631-470-5776, Email: clott@abcbirds.org

² Research Wildlife Biologist, U.S. Army Engineer Research and Development Center, 3909 Halls Ferry Rd., Vicksburg, MS 39180, USA. T: 502-315-6707, F: 502-315-6713, Email: Richard.A.Fischer@erdc.usace.army.mil.

³ Vice President for Conservation Programs, American Bird Conservancy, P.O. Box 249, The Plains, VA, 20198, USA. T: 540-253-5780, F: 540-253-5782, Email: dpashley@abcbirds.org

Maintaining navigable waterways, protecting the shore, and conducting various environmental restoration projects have all significantly shaped many aspects of coastal bird habitat availability, habitat use, and reproductive success. With proper guidelines available in the future, the USACE' navigation and shore-protection missions can be accomplished in ways that also benefit the long-term health and management of coastal bird populations. The USACE has the potential to take a more proactive position to enhance and manage these sites for birds while carrying out federally authorized dredging and shore-protection projects.

Many areas along the Atlantic Coast regularly receive shore protection in the form of beach nourishment. Beach nourishment projects have the potential to provide a variety of environmental benefits (Nordstrom 2005). For example, these projects can potentially improve nesting or foraging habitat for beach-nesting birds. However, this potential is often not met because bird habitat needs are rarely included in project designs (Guilfoyle et al. 2006). Additionally, high-quality, beach-nesting bird habitat that can be created by beach nourishment projects is often compromised or rendered unsuitable by high levels of disturbance by beach-goers and their pets after projects are completed (Hecht et al. 1996). Bird habitat creation or enhancement should be a more frequent goal for beach nourishment projects, as should management of the bird-recreation interaction that often follows the completion of beach nourishment projects. These issues need to be a higher priority and perhaps part of project design.

The USACE can contribute directly to promoting coastal bird conservation, and this objective fits well with its other environmental missions. Increased coordination between existing coastal bird conservation initiatives and the USACE' dredging, wetland restoration, and shore protection programs has the potential to reduce some of the major threats to coastal bird populations and provide solutions in areas where habitat is limited. Collaboration and creative solutions to conflicts will need to simultaneously meet logistical and cost considerations for the USACE' missions and provide quality habitat management for birds (Figure 1).



Figure 1. Coastal birds such as Black Skimmer (*Rynchops nigra*) are the focus of a joint effort between American Bird Conservancy and the USACE to integrate bird conservation with the management of dredging and beach nourishment activities (photography by Robert Van Hoff, USACE).

COASTAL BIRD BIOLOGY IN RELATION TO DREDGING AND BEACH NOURISHMENT PROJECTS

Most bird species that interact with dredging or beach nourishment operations in large numbers are referred to as a group as “waterbirds” or “shorebirds.” These are general terms for birds that rely heavily on aquatic or beach habitats respectively during some portion of their life cycle. Waterbirds can be further subdivided by where they typically forage: pelagic seabirds (e.g., shearwaters, gannets, albatrosses) feed primarily on the open ocean; terns and gulls use the interface between land and salt water; wading birds (such as storks, herons, and ibises) feed by wading in shallow waters; waterfowl (such as ducks, geese, and swans) use a wide range of coastal and inland habitats; and marsh birds (such as coots, some grebes, and rails) are often secretive and feed mostly in fresh or

brackish water, often in coastal marshes. Shorebirds, such as sandpipers or plovers, are found on coastal mudflats and along sandy or rocky shorelines. In addition, some land birds, such as the Seaside Sparrows and Marsh Wrens, use coastal wetlands.

Several aspects of coastal bird biology and life-history strategies present challenges for conservation planning and management. Dredging and beach nourishment activities can affect different groups of coastal birds during different phases of their annual cycle, including periods of breeding, pre-migratory dispersal to staging areas, fall or spring migration, and wintering. Many coastal birds nest colonially, some in large, mixed-species colonies. In some cases, a large percentage of individuals from a species' regional breeding population may breed in only 4-20 colonies (Hunter et al. 2000). In extreme cases, one to three very large colonies may represent the majority of breeding birds for a single species within a region (Spendelov et al. 1995). Others, such as beach-nesting plovers may be solitary or semi-colonial, nesting in small aggregations.

Typically, colonies exist in areas with limited access to mammalian predators of eggs or chicks such as foxes, raccoons, and rats. In some regions, such as the northeastern U.S., many mainland nesting areas have been abandoned due to increases in human-associated nest predators, or increased human disturbance related to greater recreational use of coastal areas (Erwin et al. 2003). Most large or productive colonies within this region exist on islands that are sufficiently isolated from land to preclude access from most mammalian predators. Many of these islands were originally created as dredged material disposal areas (Erwin et al. 2001). In summary, coastal bird colonies occur at discrete locations that often need to be protected or managed for predators during the breeding season.

Some coastal birds have the potential to disperse great distances among breeding seasons. Young birds often breed hundreds of kilometers (km) (or more) from their natal colonies. Adult birds may breed in different colonies, widely separated in space, in different years, apparently depending on water conditions and prey availability (Melvin et al. 1999). Due in part to the high annual variation in water management strategies that affect foraging areas, suitable nesting habitat must be widely available within a region for coastal bird populations to flourish. Because of their ability to shift breeding locations among years, a regional perspective is often necessary for coastal bird management.

During the breeding season, many colonial birds commute to foraging areas within 1-20 km of the colony (this distance varies across species), and colonies are most productive if located in proximity to productive foraging habitats, often shallow estuaries and/or inlets or freshwater wetlands (Erwin et al. 1993). Colonies are often located in areas where high food availability coincides with the peak chick growth period. Most coastal birds forage in shallow water and intertidal habitats where food availability can be defined as a combination of abundant prey and favorable water depths and visibility conditions for detection of prey (Gawlik 2002). Reproductive success may be related to the productivity and availability of suitable foraging areas near colonies. This means that conservation planning must expand from the level of discrete colonies to the estuaries or wetland complexes surrounding regional colony sites (Haig et al. 1998).

Most species of waterbirds, shorebirds, and waterfowl are migratory. Some shorebirds and terns migrate thousands of km between Arctic breeding areas and wintering areas as far south as southern South America. Some species may spend as much as 5-6 months of each year in migration. Each day during migration, birds must find suitable resting and foraging areas, or "stopover" sites. Some "stopover" sites at highly productive locations may be occupied by hundreds of thousands of birds at one time. For example, Delaware Bay is a critical stopover site for hundreds of thousands of northbound migratory Red Knots, Semi-palmated Sandpipers, Ruddy Turnstones, and Sanderlings (Burger et al. 1997). The Savannah River Site, a USACE dredged-material disposal site in South Carolina, is also used by a tremendous variety of shore- and waterbirds during migration (Mr. Steve Calver, USACE, Savannah District, personal communication, 2006). Birds rely on stopover sites to refuel for continued migration or to acquire necessary reserves for breeding in spring (Placyk and Harrington 2004).

Many waterfowl and seabirds spend the winter at productive coastal sites where they forage on a wide range of prey from small fish to bivalves to submerged aquatic vegetation. For some species, concentrations of wintering birds may represent sizeable proportions of the entire breeding population. Physical disturbance of benthic habitats or increased turbidity can decrease food availability for some species of birds (Einarsson and Magnusdottir 1993). In areas with high concentrations of wintering birds, this may be a particularly important consideration when planning dredging maintenance projects for ports and waterways in inlets where wintering waterfowl are abundant.

USACE DREDGING AND SHORE PROTECTION ACTIVITIES

Dredging operations and beach nourishment projects can create, enhance, degrade, or destroy foraging and nesting habitat at important coastal bird breeding, stopover, or wintering sites. Operations near sites important to birds should be carefully designed so as to not negatively affect productive near-shore shallow-water foraging habitats or beach and upland nesting areas used for nesting or roosting.

Between 1997 and 2002, the USACE was responsible for an annual average of \$793 million dollars in dredging projects. Seventy-five percent of these projects were conducted within the USACE's 13 coastal districts (with the remainder taking place on inland waterways). Coastal projects comprised 92% of the total dredging contracts budget, and also 92% of all material removed during these projects. Eighty-four percent of all dredged material removed was within Atlantic or Gulf Coastal districts, and 9% was removed in Pacific Coastal districts. These projects required the removal and disposal of an annual average of 268 million cubic yards of material.

Considerable concern surrounds future locations of dredged material disposal, because many facilities are full or nearing capacity. Additional coastal or upland disposal sites are often either cost-prohibitive or in short supply. Disposal of uncontaminated materials in projects that would benefit coastal birds would have the dual positive results of addressing some of the USACE's disposal problems while achieving significant environmental benefits. Many of these projects would, therefore, benefit from greater interaction between coastal bird biologists and USACE district offices regarding coastal bird conservation planning and specific project design and implementation. Such consultation and collaboration could occur during pre-project planning (site selection and target bird habitat characteristics) and post-project monitoring (measuring bird responses to habitat creation to gauge project success and to guide future projects).

Three types of dredged material deposition patterns exert a strong influence on the distribution and abundance of coastal birds: 1) island creation or maintenance, 2) wetland restoration (including mudflat creation), and 3) disposal of dredged sediments on beaches. All of these disposal/habitat creation methods have distinct histories and recent trajectories, and methods and frequencies of disposal types have changed considerably over time. Major trends for island creation and maintenance with dredged material, wetland restoration, and beach nourishment projects are described below. It should be noted that much of the literature on these topics consists of technical reports or biological opinions that have not been subjected to peer review.

Dredged Material Island Creation and Maintenance

Historically, large quantities of materials were dredged and deposited during new-work dredging performed in creation of the Intra-coastal Waterway (ICW) system (in the 1940s). Many islands were created as part of maintenance and deepening projects associated with this and other navigable waterways, and with port development. The USACE has considerable technological expertise and experience creating such bird nesting habitat as part of its Beneficial Uses of Dredged Material Program; (<http://el.erdc.usace.army.mil/dots/budm>).

Statistics are lacking for the amount of dredged material recently allocated to island creation or maintenance, but this amount is most likely much less than historical levels, during digging of the ICW and in earlier years where the ICW received greater funding for maintenance dredging. Many dredged material islands have been used extensively by colonially nesting birds such as terns, gulls, skimmers, pelicans, cormorants, ibises, spoonbills, and herons. For some coastal bird species, dredged material islands support large proportions of local, regional, or international breeding populations. Some of these species are experiencing population declines that are due, at least in part, to loss of suitable nesting habitat (Erwin et al. 2003). Mainland bird colonies frequently experience low reproductive output due to human disturbance or heavy losses to human-associated predators. Enormous potential exists to integrate maintenance dredging and new project material deposition patterns with colonial bird nesting habitat maintenance and/or creation. Such integration has the potential to simultaneously create environmentally acceptable disposal sites for dredged materials and increase productive predator-free coastal bird nesting options on offshore islands with significant positive benefits to bird conservation (Guilfoyle et al., 2006).

This process will be enhanced if participants become familiar with the literature on dredged material islands. Much of this literature is published as USACE technical reports that contain information on bird habitat use, habitat creation, plant succession, and management. Extensive research on the distribution and abundance of birds nesting

on islands created with dredged material was carried out between 1973 and 1978 as part of the USACE' Dredged Material Research Program (DMRP). This research program also documented regional patterns in plant succession on dredged-material islands that influence nesting habitat availability for birds. Several summary reports discussed the major results of this research program. In particular, Soots and Landin (1978) examined the relationships between dredging operations and nesting birds. The DMRP also produced a number of technical reports with detailed regional data on bird distribution and abundance and regional patterns of vegetation succession. In 1997, Dr. Mary Landin of the USACE provided 21 recommendations that grew out of this program for managing and maintaining dredged material islands as bird nesting habitat (Landin 1997). Many of these recommendations are relevant to the success of future efforts to integrate USACE dredging operations with coastal bird conservation. It will be necessary to balance the creation and maintenance of new bird nesting habitat with potential negative impacts that this process may have on fisheries resources (which provide the primary food resources for most coastal birds) or on the reproductive success of the nesting birds themselves (if project timing is not carefully considered).

Current spatial patterns and trends in the creation of new nesting islands or the maintenance of existing nesting islands for coastal birds are poorly documented. Many of the islands that were initially created by maintenance dredging are in advanced stages of plant succession. As a result, some regions are currently experiencing a shortage of the early successional sandy substrates that are favored for nesting by species such as terns, plovers, and black skimmers. Increased deposition of this material in specific locations on existing islands could promote increased nesting habitat for these birds. The placement of sandy dredged material on islands for bird nesting has been reduced in some areas due to competition for this same sand as a source for beach nourishment projects. Records of birds nesting on dredged-material islands over the past 30 years, although numerous, are scattered and have not been recently summarized. This lack of accessible recent information is an impediment to long-term planning for disposal of dredged material to maximize benefits for colonially-nesting coastal birds.

Spatially explicit databases with bird colony locations and numbers of nesting birds would be useful tools for planning future deposition of dredged materials for bird nesting habitat creation and for monitoring nesting bird populations in relation to these actions (<http://www.fws.gov/birds/waterbirds/MANEM>). Databases should also include information on the creation, maintenance, and loss of nesting habitat through plant succession and erosion of dredged-material islands. It may be possible to integrate numerous independent databases and information sources to create a geo-referenced database of coastal bird nesting locations and numbers for use in planning of future dredged material deposition schedules to maximize benefits for coastal bird conservation. It is recommended that USACE districts work with local waterbird biologists to become more familiar with the habitat needs of island nesting species within their region.

Wetland Restoration

Many coastal bird species forage extensively in coastal wetlands. During the past century, many coastal wetlands have been lost or degraded due to development and, in some cases, this loss has contributed to coastal bird population declines (U.S. Fish and Wildlife Service [USFWS] 2000). These habitats can also be created through well-planned and executed wetland restoration projects. Such projects have the potential to increase the quantity and quality of much needed coastal wetlands while also providing an environmentally acceptable means of disposal of dredged material. Potential exists to modify standard wetland creation techniques to better provide for the needs of high-priority birds, such as marsh birds. Design templates for wetland restoration projects that would better benefit marsh birds should be developed and tested.

Shore Protection and Beach Nourishment

With a large proportion of the U.S. population living on the constantly eroding coast, many in areas of hurricane risk, there is a nearly continuous need for shore protection. In some particularly densely populated areas of the Atlantic Coast, beaches and coastal communities would not persist without regularly scheduled beach nourishment. With more people moving to coastal areas and the projected rise in sea level with global climate change, the demand for shore protection will increase. Historically, "hard" shore protection strategies involving fixed structures such as seawalls and groins were common. The recent trend has been towards the "soft" shore protection method of beach nourishment, where sediments are either pumped directly on to the beach or deposited within the littoral zone for delivery to the coastline by the prevailing waves and currents. Beach nourishment accounts for ~6-7% of all dredged material disposal by volume. Seventeen percent of all dredging contracts include beach nourishment as a disposal

method. These statistics do not include beach nourishment projects where material is mined specifically for the project and is not excavated as part of routine dredging maintenance. This is the most frequent source of materials for beach nourishment projects, and there are few areas of the Atlantic Coast that do not regularly receive beach nourishment (Trembanis et al. 1999).

Beach nourishment holds potential for both negative and positive impacts on bird populations. In some cases, without beach nourishment, beach habitat would be non-existent. In these situations, beach nourishment projects create habitat that could potentially be used for nesting by birds such as plovers, skimmers, or terns or for foraging by shorebirds and other coastal birds (Burlas et al. 2001). Some bird species may be more likely to use nourished beaches for nesting if sparsely vegetated dune habitat is also created as part of nourishment projects. Flat, featureless beaches with no dunes or vegetation expose nesting birds to disturbance by beachgoers with pets and vehicles or by beach cleaning equipment which can crush nests or young. Featureless beaches may also provide greater ease for human-commensal predators such as raccoons, foxes, or crows to locate nests (Hecht et al. 1996).

Some studies have shown that piping plovers, a federally endangered species, may prefer nesting or raising their broods in back dune areas of tidal overwash (Elias et al. 2000). These are not a common feature of most beach nourishment projects, which tend to prevent overwash by design. Beach nourishment and maintenance projects can also bury or eliminate important moist soil and standing-wrack foraging habitats used by plovers and other shorebirds. Although beach nourishment has great potential for habitat creation for birds, specific bird nesting or foraging habitat considerations need to be more regularly incorporated into project designs with input from ornithologists. Dunes planted with dense stands of beach grass, or with too steep a slope, can limit the access of piping plover chicks to brood foraging habitats (Hecht et al. 1996). Thus, dune habitats need to be carefully constructed with design features that work for piping plovers or snowy plovers. In some cases, some small sections of coastline with plovers breeding near blow-out or overwash areas may need to remain unaltered during nourishment projects to maintain habitat quality.

It is important to recognize that not all dredged materials are appropriate for disposal on beaches. Dredged sediments that do not match grain size characteristics of local beach sediments can degrade beach, inter-tidal, or near-shore invertebrate communities which are relied on heavily as food by both fish and bird populations (Peterson et al. 2006). Mismatched nourishment sediments can either hamper recovery of invertebrate communities or decrease their availability to birds. Some shorebirds are unable to locate, handle, or ingest prey when grain sizes are too coarse, which can be the case when some offshore sediments are mined to add to beaches. When dredged sediments have different size, color, and sorting characteristics than nearby beach sediments, these materials can create problems for nesting turtles or birds.

It will become increasingly important in future years to understand the environmental effects of beach nourishment on the fauna of coastal ecosystems. The literature on this topic is relatively poorly developed, with most studies focused on recovery of beach, inter-tidal, or nearshore invertebrate macro-fauna, and with some studies on the effects of beach nourishment on fish. The direct or indirect effects of beach nourishment on coastal birds have received little attention in the peer-reviewed literature, although summaries of central issues for future research exist in government documents (Hecht et al. 1996, USFWS 2002). Future studies should look beyond site-specific issues of invertebrate response in assessing how the practice of beach nourishment alters coastal processes that create early successional habitats that are favored by many coastal bird species at a regional scale.

Some coastal locations, mostly around inlets, support enormous concentrations of shorebirds during migration (Harrington 2007). More than 500,000 birds were counted at one time during spring in Delaware Bay (Burger et al. 1997). Many of these birds stop over for several days or longer and store large amounts of mass or fat by eating abundant coastal food resources such as horseshoe crab eggs and polychaete worms. Poorly timed or designed beach nourishment projects in locations such as these could reduce the availability of common prey items to shorebirds during migration. Large-scale beach nourishment projects near important shorebird stopover sites should take care to not eliminate productive mudflats used for shorebird foraging, or include mudflat habitat creation components. Projects in these areas should be exceptionally careful to select compatible beach sediments (in color, size, and sorting characteristics) for nourishment so that these important prey concentrations for birds are not negatively affected.

Degradation of a major migration stopover site along the US coast, such as Delaware Bay, could negatively affect a large proportion of the breeding populations of several arctic-breeding species of shorebirds. Many of the major stopover sites for shorebirds have been identified as part of the Western Hemisphere Shorebird Reserve Network (www.whsrn.org), and several others have been identified as part of the U.S. (<http://shorebirdplan.fws.gov>) and Canadian Shorebird Conservation Plans (<http://www.cws-scf.ec.gc.ca/mbc-com>). USACE staff involved with dredged material disposal and shore-protection projects should become familiar with the locations of these sites and take additional project considerations for maintaining productive foraging sites for migrant shorebirds in these areas.

CURRENT COASTAL BIRD CONSERVATION EFFORTS AND USACE

During the past 5-10 years, a number of integrated bird conservation programs have created networks of partnerships and infrastructures for coordinating coastal bird conservation at regional, national, and international levels. These programs are the North American Bird Conservation Initiative, the North American Waterbird Conservation Plan, the US and Canadian Shorebird Conservation Plans, the North American Waterfowl Management Plan, and Partners in Flight (<http://www.partnersinflight.org>). After an initial period of setting general goals and objectives, these programs have recently produced regional planning documents with species or guild-specific recommendations for coastal bird conservation, management, and monitoring (<http://www.fws.gov/shorebirdplan>; <http://www.waterbirdconservation.org>). These documents have been extensively reviewed by the ornithological and conservation community and should be looked to for guidance by the USACE in setting priorities for habitat creation efforts.

Currently, these documents do not specifically address issues of dredged material island creation and maintenance or beach nourishment in detail. This may be a missed opportunity to integrate the activities of the USACE into these larger conservation efforts in a way that could benefit bird conservation. Future versions of regional plans may do well to incorporate specific discussions of beneficial use projects to increase bird-nesting options or to reduce potential conflicts between USACE projects and bird habitat issues.

Coastal Bird Conservation Workshops

American Bird Conservancy and ERDC's Environmental Laboratory recently worked with partners in the USFWS to facilitate a series of three regional workshops involving USACE coastal district personnel, dredging or beach nourishment project consultants, and coastal bird biologists and conservation planners to bridge gap between engineers and biologists (<http://el.erdc.usace.army.mil/dots/coastalbirds.html>). The goal of these workshops was to look for mutually beneficial solutions to some of the problems outlined in this general document and to connect USACE personnel with bird biologists with the goal of increasing partnerships and coordination on implementing future projects. Workshops focused on the topics of: 1) use of dredged material for the creation of bird nesting and foraging habitat, and 2) beach nourishment projects and bird habitat issues. The primary aim of the workshops was to foster improved communication and understanding among participants, to incorporate bird conservation objectives into USACE operations, and to incorporate USACE options into bird conservation plans. Workshops focused on summarizing the existing knowledge regarding project-bird interactions and pointing out gaps in current knowledge.

Additional major goals of this workshop series were to work towards improving interagency coordination for specific projects and long-term planning, bird habitat components of project designs, and post-project monitoring for birds. In addition, the workshops have resulted in the production of several technical notes on specific topics related to coastal engineering and bird conservation to be published by the USACE' Environmental Laboratory. All proceedings documents and technical notes will be available at the above website after they have undergone peer review.

Monitoring and Evaluation

The USACE is the agency with primary responsibility to ensure that projects meet environmental regulations. Environmental standards are established, in part, through pre-project planning consultations with local, state, and Federal agencies such as state wildlife agencies, the U.S. Environmental Protection Agency (USEPA), and the USFWS. Success or compliance of projects relative to environmental goals is typically gauged through post-project monitoring programs that are established during the initial consultation process. The quality, appropriateness, and

statistical rigor of these monitoring efforts can vary. Often, monitoring programs are too short lived to measure the success of a project and improve on future project designs. Improved post-project monitoring should be a priority goal as beneficial-use projects become a larger component of dredged material disposal. The National Oceanic and Atmospheric Agency and the National Marine Fisheries Service have recently produced detailed conceptual and methodological guidelines for monitoring in coastal areas (Thayer et al. 2004), although these protocols do not specifically address monitoring bird responses to coastal projects. In particular, the ornithological community could be more involved with the USACE in monitoring the effects of dredging projects on colonially-nesting birds and beach nourishment projects on nesting and migrant shorebirds.

Different Scales of Planning and Agency Coordination Issues

Considerable challenges in implementation of coastal bird conservation efforts are related to the different spatial and logistical scales at which planning takes place across agencies, programs, and initiatives. The USACE is managed at the level of its eight divisions, which oversee the activities of 41 districts, 13 of which have responsibility on the coast. Coastal districts are responsible for planning, implementing, or permitting most dredging or beach nourishment projects. The USFWS is often responsible for permitting dredging or beach nourishment projects at the level of its coastal ecological services offices. State wildlife agencies all have different kinds of organizational structures, and are often also involved in permitting USACE projects. At the project level, local or regional representatives of the above-mentioned agencies, the National Marine Fisheries Service, municipalities, port authorities, non-profit groups, and others are often involved in planning and public hearings through the efforts of project-specific Interagency Coordination Teams (ICTs).

The USACE's complex planning structure for coastal engineering projects is largely independent of the major planning structures for bird conservation. The North American Waterbird Conservation Plan and the U.S. Shorebird Conservation Plan have taken regional planning approaches organized by habitat type. These programs involve participants from Federal, state, non-profit, and local agencies and represent the best state of the science planning and expertise from the bird conservation community. Both plans have strategies for stepping-down coordination from regional plans to more local scales, such as states, wetland complexes, estuaries, or specific projects (<http://www.fws.gov/shorebirdplan>; <http://www.waterbirdconservation.org>). These strategies are often coordinated through the administrative structure of habitat-based Joint Ventures, three of which are active on US coastlines (<http://www.nabci-us.org/jvmap.html>). Increased interactions between USACE planning staff and the major administrative structures of coastal bird conservation (Joint Ventures and Regional Waterbird and Shorebird Planning teams) are recommended.

SUMMARY

The USACE' navigation and shore-protection missions can potentially be carried out in ways that benefit the long-term health and management of coastal bird populations. The USACE is in a position to proactively contribute directly to coastal bird conservation by enhancing and managing these sites for birds, while carrying out its federally authorized dredging and shore-protection projects. To accomplish this, the coastal bird research and conservation communities are encouraged to become more involved with the USACE in long-term planning for coastal bird habitat creation and management. Similarly, the USACE can become more involved in regional planning efforts for bird conservation. Increased coordination between existing coastal bird conservation initiatives and the USACE's dredging, wetlands restoration, and shore-protection programs has the potential to reduce some of the major threats to coastal bird populations. Collaboration and creative solutions to conflicts will simultaneously meet logistical and cost considerations for USACE coastal missions and provide quality habitat management for birds.

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Note: Additional literature on the topics of coastal birds, dredging, and beach nourishment (and all of the references cited in this document) will soon be accessible via the coastal engineering and bird conservation literature gateway at: <http://el.erdc.usace.army.mil/dots/coastalbirds.html>

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