Southeastern Coastal Plains-Caribbean Region Report

U.S. Shorebird Conservation Plan

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Executive Summary

This report articulates what is needed in the Southeastern Coastal Plains and Caribbean Region to advance shorebird conservation. A separate Caribbean Shorebird Plan is under development and will be based in part on principles outlined in this plan. We identify priority species, outline potential and present threats to shorebirds and their habitats, report gaps in knowledge relevant to shorebird conservation, and make recommendations for addressing identified problems. This document should serve as a template for a regional strategic management plan, with step-down objectives, local allocations and priority needs outlined.

The Southeastern Coastal Plains and Caribbean region is important for breeding shorebirds as well as for supporting transient species during both northbound and southbound movements. Breeding species of highest regional priority include American Oystercatcher (*Haematopus palliatus*), Snowy Plover (*Charadrius alexandrinus*), Wilson's Plover (*Charadrius wilsonia*), and Piping Plover (*Charadrius melodus*). Shorebirds in the planning region face potential impacts primarily from: (1) chronic human-caused disturbance to roosting, nesting birds and possibly to foraging birds too, (2) oil spills, (3) transfer of water rights that may directly or indirectly affect shorebird food base in some systems by reducing freshwater input and other systems increasing input into important estuarine habitats, (4) recent but sharp increase of harvesting pressure on horseshoe crab populations leading to decreasing food resources for northbound migrating shorebirds, (5) barrier beach stabilization that may affect foraging and nesting habitat, (6) contaminants (*e.g.*, from agricultural runoff, dredged materials, water treatment areas), and (7) inadequate management capability on public lands, where high quality habitats should be more dependably available. The well-documented loss of wetland habitats in this region during the last 200 years undoubtedly affects shorebirds. Our strategies to best address these issues are outlined below and in the following sections.

Three general habitat goals for our region are: (1) to provide optimal breeding habitat to maintain and increase populations of priority species, (2) to provide high quality managed habitat to support requirements of species migrating through or spending winter in the region, and (3) to restrain human disturbance to tolerable levels for shorebirds throughout the year.

In our region, the challenge for directly providing habitat for migrating shorebirds can be partly met by public land managers fostering appropriate management, including disturbance management along with more traditional habitat management –particularly of impounded wetlands. At present 4.8 million shorebirds are estimated to occur within the region during peak migration periods and about 2.4 million shorebirds are estimated to use inland and managed wetland habitats. Presently, about 50,000 acres of publicly managed wetlands are potentially available, with about 30,500 acres on National Wildlife Refuges alone. Because shorebirds generally live on a broad geographic scale, interagency, collaborative management needs to better target shorebirds throughout the region, starting with 4800 acres in the year 2000, which equates to less than 10% of shorebirds estimated to use inland and managed habitats.

The plan calls for increasing habitat availability to 18,500 acres by 2002, which equates to about

25% of all shorebirds using inland and managed habitats. Monitoring peak times of passage and species composition will follow International Shorebird Survey protocols along the Atlantic Coast portion of this region (from Virginia to Florida). Data will be entered unto a website to keep track of managed habitat availability and identify needs for adjustments while migration is underway. If monitoring and research shows that more managed wetland habitat is needed, upwards to 50% of all shorebirds using inland and managed habitats, then the plan calls for providing 37,000 acres by 2005. In addition for shorebirds feeding primarily within coastal habitats, retaining important washover habitat along beaches (i.e., minimize or avoid beach "restoration") after major storms is becoming an increasingly important issue.

Meeting habitat objectives for nesting shorebirds will depend more upon actions taken on lands managed cooperatively through public/private partnerships, especially along beach fronts, dredge spoil and oyster rake sites, and other near-shore habitats. Presently, this plan calls for the region to support a minimum 1000 pairs of American Oystercatchers, 300 pairs of Snowy Plovers, 1500 pairs of Wilson's Plovers, and 55 pairs of Piping Plovers (*i.e.*, status quo) and to attempt to at least double these numbers during the next 50 years. These numbers will be subject to better information such as appropriate population viability analyses, establishing more specific objectives targeting higher reproduction (in terms of numbers of fledged young per successful nest), and a better understanding of present nesting habitat capacity versus potential. Monitoring and assessment of management efforts should become a high priority for evaluating the success of nesting habitat protection measures.

Setting management objectives for roosting habitat should focus on areas where known concentrations of shorebirds occur and should concentrate on controlling sources of chronic human disturbance.

In all aspects of shorebird conservation, research and education/outreach must play important roles in both refining specific objectives and for gaining both public support and participation as well as training of land managers and interested landowners.

1. Description of the Region

The Southeastern Coastal Plains - Caribbean shorebird planning unit consists of four Bird Conservation Regions (BCRs), the Southeastern Coastal Plain, Southern Piedmont, Peninsular (including Subtropical) Florida, and Puerto Rico/U.S. Virgin Islands. It encompasses all or part of the following states: Virginia (VA), North Carolina (NC), South Carolina (SC), Georgia (GA), Florida (FL), Alabama (AL), Mississippi (MS), Puerto Rico (PR) and the Virgin Islands (VI). General descriptions of the three BCRs follow and a list of sites with potential for shorebird habitat organized by state can be found in Table 1. This table also recognizes some sites as extremely important for the protection and conservation of migratory shorebirds and those areas recommended for establishing standardized survey efforts (if they have not been established already).

The Southern Piedmont is a transitional area between the mountainous Appalachians and the flat coastal plain, with forests dominated by pine and mixed hardwoods. Shorebird habitats in the Southern Piedmont mostly consist of flooded farm fields, sod ("turf") farms, and water treatment plants, but some public lands provide locally important shorebird habitat (e.g., Pee Dee National Wildlife Refuge, NC). The Southeastern Coastal Plain proper makes up most of the planning region and supports substantial shorebird habitats. The East Gulf Coastal Plain is otherwise dominated mostly by oak, hickory and pine. These plains extend to the Southern Atlantic Coastal Plain which is characterized by extensive swamps and pine forests, with marshes along the Atlantic Coast from the mouth of the Chesapeake Bay to north Florida. Coastal intertidal habitats in this region provide important breeding and wintering sites as well as critical migratory stop-overs for shorebirds particularly during spring. Peninsular Florida is transitional from coastal plain forest types into more tropical forest types, but also includes substantial prairie and rangeland, natural wetlands, and farm fields that when flooded support large numbers of shorebirds. Coastal areas in Peninsular Florida consist largely of mangroves, lagoons, estuaries, everglades and tropical hammocks and supports large numbers of wintering and migratory shorebirds. Within Puerto Rico and the U.S. Virgin Islands, most shorebird habitats are in mangroves and salt flats. Throughout the planning region inland habitats are variably available but are nevertheless very important for shorebirds.

This region is extremely important for supporting transient shorebirds during both northbound ("spring") and southbound ("fall") movements. Spring migrations for shorebirds in the Southeast typically extend from mid-March to late May and fall migrations from early July to late October for all species combined. Fall migration for many, especially Arctic-breeding, species occurs as two peaks, with the first dominated by adults during July and early August and later by young of the year from late August through September and October. For most species, again especially Arctic-breeding ones, higher numbers are moving through during spring within the Southeastern Coastal Plains - Caribbean Region (many fall migrants for Arctic-breeding species presumably migrate via a Trans-Atlantic route). Fortunately, there is opportunity for wetland managers already keyed into supporting wintering waterfowl populations in the "Southeast" to easily provide good quality shorebird habitat during spring. Nevertheless, proper incentives for private cooperating landowners to delay planting for about a month or other customized management recommendations will be needed. Also specific guidance will be given for both private and public land managers to slow the timing of spring draw-downs to closely

match peak shorebird habitat needs in their respective areas.

Although lower numbers are presumably moving through the Southeastern Coastal Plains - Caribbean Region during fall, shorebirds still depend on managed habitats when made available. Large shorebird numbers during late summer and early fall in flooded croplands (e.g., Zellwood and Belle Glade areas in Florida), sod farms, water treatment facilities, and dredge spoils attest to this fact. Several species, in fact, may be strictly dependent upon "managed" fall wetland habitats, such as Pectoral Sandpipers (*Calidris melanotos*) and Stilt Sandpipers (*Calidris himantopus*). Unfortunately, some of the inland habitats where water is made available for reasons other than birds may not provide dependable high quality foraging habitat and may be laden with contaminants. On more actively managed lands, providing water specifically for shorebirds, in areas that otherwise would be dry, would require specialized knowledge for pumping and discing vegetation in ways that are still considered compatible with habitat conditions needed for waterfowl. These management needs would be more involved, at least initially, and earlier in the year than typically would be done if waterfowl were the only resource of management interest. Therefore, most opportunities for fall management based on past experience would be on publicly managed wetlands as opposed to private. The challenge for providing late summer and early fall habitat for migrating shorebirds will be best met by public land managers overseeing appropriate management particularly of impounded wetland habitats.

Recommendations need to be developed for agencies and landowners (e.g., U.S. Army Corps of Engineers, water management districts) that can more directly provide habitat through disposal of dredge materials in areas that would minimize negative consequences to foraging habitat but increase nesting habitat. By providing such recommendations we would reduce the risk of exposing birds to contaminants. Also we would provide roosting and foraging sites removed from frequent disturbances.

An increasingly important issue is the recent sharp increase in harvesting horseshoe crabs in Atlantic and Gulf waters. This is of particular concern for shorebirds concentrating during northbound migrations in the Delaware Bay area, north of our region. However, likely declines in horseshoe crabs and their eggs upon which many shorebirds depend for a rich food source also may be a very serious problem in the Southeastern Coastal Plain as well.

Regarding important estuarine areas, many freshwater inputs have been severely altered from pre-settlement conditions. In some systems, concerns are mostly for establishing and maintaining minimum flows necessary to maintain high foraging habitat quality (e.g., Altamaha River, GA). In other systems the concern is for decreasing current unnaturally high flows, often with high levels of nutrients or other contaminants (e.g., Caloosahatchee River, FL, and many estuaries downstream from hog farms or other agricultural areas).

Other management issues in the region are related to beach fronts. Beach restoration using sand "renourishment" apparently may disrupt the shorebird food base for months or even years (Donoghue 1999, Peterson et al. in press). Reduction in food resources for nearshore fishes also has been demonstrated when beach widening has resulted in burial of hardbottoms and it is reasonable to assume similar effects occur for shorebirds feeding in these areas at low-tide (Lindeman and Synder 1999). The question remains how long it takes for food resources to return to pre-"beach restoration" levels.

In addition, vehicular use on beaches supporting nesting populations of shorebirds, terns, and skimmers is strongly suspected of reduced nesting success, as is public use in general on beaches especially where pets (i.e., dogs) are allowed to run freely. Recently, evidence suggests that sea turtle monitoring involving ATV's also may be disruptive to nesting plovers (Epstein 1999). Specifically, data exist for Wilson's (*Charadrius wilsonia*), but presumably Snowy (*Charadrius alexandrinus*) and Piping (*Charadrius melodus*) plovers are affected as well. Working closely with conservation minded sea turtle monitoring crews should minimize plover nest disturbance and avoid running over plover chicks. Epstein (1999) suggests turtle monitoring crews become aware of plover nests and eggs in the upper beach and of chicks feeding in the intertidal areas where use of ATV's could be harmful. ATV speed should be < 10 mph (5 mph is recommended in the recovery plan for areas occupied by nesting Atlantic Coast Piping Plovers; U.S. Fish and Wildlife Service 1996).

2. Shorebird Species Occurrence and Regional Species Priorities

The prioritization process used here follows the approach used by Partners in Flight instead of that outlined in the U.S. Shorebird Plan (Carter et al. in press). The actual scores within each prioritization category follow the procedures outlined by the U.S. Shorebird Plan, but the major departure is in how the scores are used to determine relative priorities among species. Few real differences in the two approaches result in which species fall within broad priority levels. However where differences are found, typically the U.S. Shorebird Plan process identifies as higher priority some species that are relatively common and/or widespread, but with reasonably certain declining population trends and/or suspected high levels of threat. The Partners in Flight approach favors species with limited distributions and that are relatively uncommon regardless of population trend or suspected levels of threat, but with obviously much higher priority for declining species with suspected high levels of threat.

The principal author of this report favors the Partners in Flight approach because (1) species are likely to be most vulnerable when they are narrowly distributed and globally less abundant regardless of population trends, (2) population trends and threats for shorebirds have high levels of uncertainty (especially for rarer species), and (3) the Partners in Flight approach is better for integrating priority levels for shorebird species in with priorities for landbird and other waterbird species in the Southeast for ease in communicating overall bird priorities to managers and the public. The principal objection voiced by some for using the Partners in Flight approach is the lack of recognition of the perceived independence among prioritization factors and the process outlined in U.S. Shorebird Plan may be slightly more instructive on the reasons why any one

species should be considered a higher priority than another. For further discussion, the interested reader is referred to Carter et al. (in press) and Bessinger et al. (in press). For those interested in comparing Southeastern Coastal Plain - Caribbean species priorities with other shorebird planning regions, simply take the scores provided here and apply them to the process outlined in the U.S. Shorebird Plan.

Species in highest need of conservation attention ("extremely high") include American Oystercatcher (*Haematopus palliatus*), Snowy Plover, Piping Plover, and Red Knot (*Calidris canutus*). Seasonal importance and regional priority status of all other shorebird species occurring in our region are indicated in Table 2 and Appendix 1.

The relative priority status of Snowy Plover and Red Knot in this planning region are based in part on very high level of concerns for southeastern populations which may or may not represent distinct subspecies. Both of these species are considered generally as high priority for conservation attention anyway, but breeding Snowy Plovers in this region are extremely vulnerable to habitat loss in Gulf coastal beach habitats. For Red Knots, most North American birds migrate to and from southern South America, but a separate (and possibly taxonomically distinct) "population" of birds remains in winter from southern Georgia through Florida and a smaller population winters along the Texas Gulf coast, both in areas where beach renourishment projects and other habitat losses are of concern. Piping Plovers wintering in the Southeast represent three possibly separate breeding populations, but they are treated together here as they overlap in distribution during winter and represent an extremely high priority for conservation attention anyway. A number of other populations or subspecies wintering solely within or migrating through the region (e.g., Marbled Godwit [*Limosa fedoa*], Short-billed Dowitcher [*Limnodromus griseus*]) may represent higher priorities, but for now species will remain the conservation unit for these taxa until compelling evidence becomes available suggesting greater attention is specifically warranted (see Appendix I for species with subspecies that may require future more specific attention; Warnock and Hunter in prep.).

Total shorebird population sizes and proportional use of the Southeastern Coastal Plains - Caribbean Region are at best poorly understood. On the other hand, some best minimum estimates for temperate North American shorebird species have been made and our working group was able to make "guesstimates" on the peak proportion of North American populations using the regions under discussion at some point during the annual cycle. In addition, the group made best "guesstimates" of the Southeastern Coastal Plains - Caribbean Region shorebird populations using each of four broad habitat types, primarily for foraging requirements but also to some degree for breeding and roosting requirements (Table 3). Red-necked Phalarope (*Phalaropus lobatus*) and Red Phalarope (*Phalaropus fulicarius*) populations were not estimated as they are pelagic. Present numerical objectives for foraging shorebirds will be adjusted as new information dictates for each species and shorebirds overall regarding (a) total continental numbers, (b) proportion of population(s) resident in or migrating through region, (c) data on relative use of available habitats within region, and (d) foraging habitat requirements.

For the Southeastern Coastal Plains Region specifically, estimated breeding populations for

priority species are more precise. Between 35-55 Piping Plover pairs are estimated for North and South Carolina breeding sites (no known nesting now occurs in the Virginia portion of this planning region). About 300 Snowy Plover pairs are estimated in the region with most on the Florida Gulf coast, the rest scattered along the beaches of Mississippi and Alabama. An estimated 1000 American Oystercatcher pairs (subject to revision) breed along both Atlantic and Gulf coasts combined, many on oyster rakes and dredge spoil sites that are protected from disturbance and predators. Finally, about 1500 Wilson's Plover pairs are estimated along both coasts combined. Little information is available for estimating breeding shorebird populations within the Caribbean region, but descriptors are given for all these species in Appendix II.

All shorebirds are protected under the Migratory Bird Treaty Act of 1918, from take which prohibits pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, or attempting such conduct without appropriate permits. This protection extends to adults, young, eggs, and nests. The Piping Plover is also protected as a Federally Threatened species under the Endangered Species Act of 1973, as amended. Federal actions are all subject to consultation so that conservation of Piping Plovers can be achieved while avoiding actions that would jeopardize the continued survival and recovery of this species. Further the Endangered Species Act prohibits take, which includes definitions of "harm" and "harass" as violations of the Act. Harm includes significant habitat modification or degradation that results in the killing or injury of wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. Harass means an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.

Also relevant for species using beaches, Executive Order 11644, Use of Off-Road Vehicles on the Public Lands, and Executive Order 11989, Off-Road Vehicles on Public Lands, pertain to Federal public lands subject to use by off-road vehicles. Appropriate agencies are required to determine whether the use of off-road vehicles will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, and wildlife habitat and immediately close such areas where off-road vehicles are causing such problems until remedies are implemented to eliminate these problems.

Most States also have regulations written specifically to protect colonial nesting waterbirds, but also benefit shorebirds nesting in the same areas. In North Carolina, their regulation prohibits entry by people or dogs onto posted state owned islands or beach sites during the nesting period (April 1 through August 31). In Georgia, several State owned islands, important for nesting shorebirds and colonial waterbirds, were recently extended stricter protection from distributions associated with certain recreational activities during the nesting season.

3. Regional Goals

Population goals:
1. Presently, maintain breeding populations and ensure high reproductive success to ensure sustainable populations of each of the highest priority species in the region.

2. During the next 50 years double the breeding population size for each of the highest priority species in the region and/or through population viability analyses determine population levels needed to ensure long-term viability.

Habitat and management goals:
1. Provide optimal breeding habitat to maintain and increase priority species in the planning region.

2. Provide high quality managed habitat to support successful migration through and over-wintering within the planning region.

3. Maintain disturbance frequencies at breeding, foraging and roost sites below that which would be expected to exceed tolerance levels for successful reproduction or for maintaining fat stores needed for long-distance migration.

4. Work closely with beach managers and communities (to include sea turtle monitoring crews) and educate them on ways to minimize plover nest disturbance and to avoid running over plover chicks where use of vehicles are allowed on beaches.

5. Provide specific guidance for both private and public land managers to slow the timing of spring draw-downs and build in habitat recommendations involving teal considerations in autumn to closely match peak shorebird habitat needs in their respective areas.

6. Provide proper incentives for private cooperating landowners to delay planting for about a month.

7. Assess individual managers' current contribution as well as their capacities to help achieve habitat objectives outlined in this report, to include the potential to close beaches where excessive public use is shown to be detrimental to important nesting habitat.

8. When it is necessary to conduct beach renourishment projects, work with communities, State and Federal agencies, on the timing and design of the project to minimize disturbance and impacts on shorebird food base.

9. Maintain washovers, sandflats, and mudflats, especially on barrier islands created by hurricanes; that is, do not immediately attempt "repairs" to hurricane created habitat.

10. Work with appropriate fishery councils and organizations to reduce, or if necessary to

eliminate, fisheries harvesting horseshoe crabs either directly or through bycatch.

11. Work with all interested parties to improve freshwater inputs, in terms of both flows and quality, into estuarine systems.

Management coordination and monitoring goals:
1. Develop a website for the purpose of coordinating management of impoundments.

2. Initiate International Shorebird Survey (ISS) sites within the region and survey on a coordinated schedule, maintain a database and develop mechanisms to exchange information with existing databases as with Manomet Center for Conservation Sciences and with the Western Atlantic Shorebird Association (WASA) website if appropriate.

Research goals:
1. Assess the degree of depredation on nesting populations.

2. Determine factors inhibiting successful reproduction of plovers and oystercatchers.

3. Determine shorebird disturbance tolerance levels, primarily from human use and their pets. Determine whether the disturbances are at such levels that shorebirds are unable to store as fat an average of 1 gm of food per day, which is thought to be necessary for successful migration.

4. Determine effects, if any, from contaminants for migrant versus resident populations in known problem areas.

5. Determine factors influencing or inhibiting effective management of impoundments for shorebirds, including hydrodynamics, mosquito control, vegetation control protocols, minimizing exposure to contaminants, and public use (including possible disturbances associated with early teal seasons).

6. Determine factors influencing invertebrate diversity and abundance, among both natural and managed habitats, among seasons, and among all the conditions listed under item 5.

7. Investigate the actual effects of beach renourishment on shorebird foraging habitat and determine the time necessary for a return to pre-renourishment shorebird food resources.

8. Develop local and regional monitoring protocols that may improve upon the International Shorebird Survey.

Education goals:
1. Establish regional work group for education and outreach to coordinate implementation of those initiatives outlined in the National Education and Outreach Plan that are appropriate for the region and to develop additional approaches needed to address priority issues identified for the Southeastern Coastal Plains-Caribbean Region. Tasks for the work group include:

a.) identify and engage partners to assist with education and outreach efforts,

b.) work with partners to identify region specific needs for education/outreach products and services, and to assess which components of the National Education and Outreach Plan are appropriate for the region,

c.) coordinate development and/or implementation of audience-specific education/outreach plans, products and programs to address priority issues.

2. Form a regional education and outreach work group as part of the Southeastern Coastal Plains-Caribbean Region / US Shorebird Conservation Plan Work Group.

3. Support the use of the Shorebirds Sister Schools and Sister Cities Programs and adaptation of Shorebirds Sister Schools materials for the east coast and Caribbean.

4. Determine the applicability of the "Great Shorebird Trail" initiative, supported in the National Education and Outreach Plan, to the region's priority goals and, if it is found to contribute to the region's goals, identify and implement appropriate activities.

5. Utilize and contribute to the development of the education section of the Western Atlantic Shorebird Association (WASA) web site which can serve as an information delivery tool for different audiences.

4. Habitat Goals, Objectives and Management Needs

Herein, we expand on the habitat and management goals listed above. It is our intention to develop draft objectives for wetland managers and then to assess individual managers' current contribution as well as their capacities to help achieve those objectives. In developing our habitat objectives, first we define habitat types used by shorebirds within the region. Next, we define three major conservation categories for developing management priorities as breeding (B), foraging (F), and roosting (R). Some habitats are only important for one of these categories for some species, while others are important for many different species for two or all three of these categories as outlined below. Although these all focus on shorebirds, integrated management must be inclusive of all waterbird and fishes as part of the ecosystems involved in making management decisions. Proportions of total estimates of each species using these habitat types are indicated in Table 3 (except for Pelagic).

Pelagic
Open ocean (F; Red-necked and Red Phalaropes)

Beach Front
High energy beach fronts (F)
Sandy flats (e.g., inlet interfaces at low tide, washover) (F)
Oyster (shellfish beds) bars (F)
Rock jetties and groins (F,R)
High beach and dunes and associated washovers (B,F,R)
Oyster (shell) rakes (B,R)
Dredge mounds (B,R)

Intertidal-emergent and submergent vegetated
Brackish and saline marshes (F,R)
High panne (B,F,R)

Intertidal-unvegetated
Muddy flats (F)
Muddy banks (F)

Intertidal-forest
Mangrove flats (F)

Managed wetlands and all inland habitats
Impoundments (B,F,R)
Dredge spoil (B,F,R)
Flooded croplands (F)
Sod farms, pastures, wet prairies, airports (F)
Wastewater treatment facilities (F)
Lakeshores (F)
Riverbars (F,R)

For all but the last major group of habitat types, the main conservation strategy is to protect existing habitats from future loss through land acquisition and conservation easements and effectively addressing loss of habitat quality due to contaminants. Also, the establishment and conservation of washover sandflats after storms, particularly hurricanes, is critically important. Perhaps the most important conservation strategy for these habitats is to determine the level of human disturbance that can be tolerated by nesting, foraging, or roosting shorebirds and manage people in a way so as to not exceed these important thresholds. For the last major group of habitat types, active management to attract shorebirds becomes an additional consideration that is of most interest to managers overseeing wetland habitats.

Habitat Goals should be established for each conservation category mentioned above for (1) breeding, (2) foraging, and (3) roosting habitats. Objectives may vary locally, but in generic

terms these can be derivatives of the following:

(A) The goal for breeding habitat is to provide sufficient habitat to maintain and increase priority species in the planning region. The objectives would be (1) to maintain enough high quality habitat to support a present breeding population of 1000 pairs of American Oystercatchers, 300 pairs of Snowy Plovers, 1500 pairs of Wilson's Plovers and 55 pairs of Piping Plovers, and (2) to determine what is needed to double breeding population size for each of these species during the next 50 years.

(B) The goal for foraging habitat is to provide high quality (in terms of both "contaminant free" and food content) managed habitat to support successful migration through and over-wintering within the planning region. One objective would address the fraction of all the estimated 2.4 million shorebirds using managed and all inland habitats that depend on high quality habitat provided by managed impoundments during both spring and fall migration (see below and Table 4). Also, re-establish foraging habitat on beaches, especially washover which can restore themselves with the reduction of beach stabilization structures and by shifting dredge deposition to other less sensitive areas.

(C) The goals for roosting habitat are (1) to maintain disturbance frequencies below that which would be expected to exceed tolerance levels for maintaining fat stores, etc., needed for long-distance migrations, and (2) to maintain enough protected roosting sites for an estimated minimum of 2.4 million shorebirds foraging along regional coastlines (beachfronts and nearby all intertidal habitats) and another 2.4 million shorebirds foraging in managed and all inland habitats. It is presumed that the most important roost sites already are on public lands or on private lands not otherwise subject to frequent disturbances.

Breeding:
Achieving habitat objectives for nesting shorebirds first and foremost is dependent upon actions taken on public lands and conservation-oriented private ownerships particularly along beach fronts and also at dredge spoil and oyster rake sites near intertidal areas. For example, the National Wildlife Refuge System Improvement Act dictates to the U.S. Fish and Wildlife Service that "Wildlife Comes First" and protecting nesting shorebirds and other beach nesting species would be a priority over, for example, beach-associated recreation on national wildlife refuges. Depredation from overabundant species (e.g., raccoons, feral hogs, foxes, feral cats, mammals, gulls, crows, and crabs) as well as disturbance from humans and their pets may be the most serious problems holding back reproductive success and expansion of breeding population sizes for the highest priority species (plovers and oystercatchers). Efforts to assess the degree of depredation and disturbance on nesting populations and taking corrective action as appropriate should be the highest priorities for public land managers (e.g. increase staff in public use and law enforcement) and cooperating private landowners.

Protection of breeding areas in the Caribbean, especially where development or other disturbances threatening nesting birds are identified, also should be of high priority.

Along many beaches and islands, managers and interested private landowners mark areas where nesting occurs to inform the public of closed areas and the reasons why such areas are closed to public use. In some areas where depredation is a serious problem (including both beach nesting birds and sea turtles), predator control may be called for or predator exclosures around nests may be used. However, predator control may be controversial (and if ATV's are used on beaches to check traps, operators must also be careful to not run over nests and chicks). Without careful monitoring, activities associated with exclosures may result in nest abandonment or the exclosures themselves may be of marginal effectiveness in reducing nest depredation (U.S. Fish and Wildlife Service 1996, Mabee and Estelle 2000). Close coordination between managers and state shorebird conservation coordinators is necessary to outline best strategies which may differ from one location to the next where predators are thought to be a serious problem for shorebirds and/or sea turtles.

An initial objective needs to be established for nesting success among high priority plovers and oystercatchers. Short of conducting appropriate population viability analyses (which should be a high priority for future action), we suggest for all plovers (Piping, Snowy, and Wilson's) that an overall 5-year average fledging success should exceed 1.5 young per nesting pair (Haig 1992, Page et al. 1995, U.S. Fish and Wildlife Service 1996). Coordinated efforts to track Piping Plover nesting success along the Atlantic coast already exist, similar efforts need to be undertaken for Snowy Plovers on the Gulf Coast and Caribbean and for Wilson's Plover throughout the planning region. Nesting success for American Oystercatcher is, as best as we can tell, very low "naturally" (Nol and Humphrey 1994). We suggest for oystercatchers that an overall 5-year average fledging success should exceed 0.5 young per nesting pair. As with plovers, a coordinated effort across the region and with adjacent regions (e.g., North Atlantic, Gulf Coastal Prairies) will be necessary to fully assess the long-term population health of this species in eastern North America.

Foraging:

The proportion of birds using managed habitats for foraging is important for establishing habitat goals for managers, similar to what has been done in the Mississippi Alluvial Plain (Loesch et al 1995). In the Mississippi Alluvial Plain, where managed habitats likely constitute the majority of habitat available for fall migration, the estimate of 500,000 shorebirds was made initially to develop habitat objectives. An initial estimate at numbers of shorebirds using the Southeastern Coastal Plains - Caribbean Region was placed at 4.8 million. About 2.4 million shorebirds are estimated to use managed and all inland habitats in this region, while the other 2.4 million shorebirds thought to use coastal "non-managed" habitats (Table 3). While we should not forget the importance of maintaining high quality estuarine mudflat and beach overwash foraging habitat, the following discussion focuses on what is needed for managed foraging habitats within the planning region.

In order to arrive at goals for acreage of foraging habitat to be provided by managers, several assumptions must be made in addition to the numbers of migrating and wintering shorebirds including: (1) average body size for each species, (2) food base availability, (3) caloric content needed to add 1 gram of fat per day, (4) length of stay-over and (5) number of stops likely in the region for most species. We are assuming for now an average of two stops in the planning region (along with an average 15 days per stop) from the Caribbean to southeastern Virginia. Until we receive invertebrate food availability data from studies ongoing on Pea Island, Merritt Island, and Back Bay National Wildlife Refuges, our conservative estimate is 2.4 gm/m^2. This estimate of food availability, as well as two others, and four different proportions of all shorebirds potentially using managed wetlands and all inland habitats are used to provide estimates of habitat acreage proposed for provision by wetland managers (Table 4a).

For now, we will divide managed shorebird acres equally between four subregions as follows: (1) Southeastern Virginia and North Carolina, (2) South Carolina and Georgia, (3) North Florida and (4) Subtropical (South) Florida/Caribbean. Therefore, 4,625 acres would be the target initially for each subregion by 2002. These acreages may be adjusted later based on census data and availability of impoundments and flooded agriculture.

Just as with the Mississippi Alluvial Plain exercise, many assumptions and blurring of differences between species, and in this case interseasonal differences within species, will require rigorous testing over time. However, as with the previous exercise, much of that testing will be best conducted with managers (1) already aware of some of these objectives, (2) implementing management to achieve these, (3) monitoring results, and 4) making adjustments as necessary.

Achieving habitat objectives for foraging shorebirds is dependent primarily on the actions of public land managers and conservation-oriented private landowners. Presently, about 50,000 acres of public agency managed wetlands are estimated to be potentially available with about 30,500 acres on National Wildlife Refuges alone. Increasing our collective management capabilities targeting shorebirds at this time suggests a substantial but still cautious commitment starting with about **4000-4800** acres in the year 2000 (Table 4b). We are setting our first goal for spring of 2000 because managers generally are more tuned to shorebird management then and because we will not have to rush something onto their shoulders for fall. This schedule allowed for bringing managers and biologists together at a meeting held in March 2000 to kick off the effort and discuss how we arrived at goals, make adjustments as necessary, talk over management techniques once more, demonstrate web site etc., and build enthusiasm for fall shorebird management. We will work up to **18,500** acres by 2002. Then, depending on the amount of use that we see and as we get Refuges, States and Private Landowners gradually involved, we may want to increase the goal to 50% by 2005 (**37,000** acres). Allocations among States and individual land management units will follow similar procedures completed in the Mississippi Alluvial Plain and actual use of managed wetlands will be monitored to ensure that expected use rates are matching timing and duration of habitat availability among management units.

Roosting:
Roosting habitat objectives need to be based on areas where known concentrations of shorebirds occur during high tide for coastal areas and in managed habitats for inland and impounded habitats. To ensure protection of these roost sites, public and cooperating private managers will need to minimize disturbance as much as possible. Research may be needed to determine how much disturbance is too much, i.e., whether disturbance, primarily from humans and their pets, is at such levels that shorebirds are unable to store as fat an average of 1 gm of food per day which is thought to be necessary for successful migration. If disturbances exceed this or other measures of tolerance thresholds, then corrective actions are suggested to reduce these disturbances as much as possible (e.g. on public lands, increase staff in public use and law enforcement).

With few exceptions where shorebird needs are already integrated into management (e.g., Merritt Island National Wildlife Refuge, FL and Yawkey Wildlife Center, SC), all areas in Table 1 have potential for increased management attention targeting shorebirds.

5. Management Coordination and Monitoring Needs

USFWS Ecosystem Teams covering the entire South Atlantic coast have been working towards coordinating management of impoundments through the development of a web site. Development of this web site, using both GIS and shorebird population objectives, is awaiting preliminary habitat objectives allocated among all cooperators along the South Atlantic coastline based on discussions held at a managers workshop held March 27-28, 2000, at Cape Romain National Wildlife Refuge.

We recognize that monitoring coordination is necessary to make adjustments on where and when habitat should be provided in managed wetlands across the region. Bob Noffsinger, USFWS Manteo, NC, along with Doug Newcomb, USFWS Ecological Services Field Office in Raleigh, NC, have established shorebird monitoring database for stations using International Shorebird Survey (ISS) protocol. Each cooperating station conducting ISS will do so on approximately 10 day intervals on or about the following dates to allow for more direct intra- (and possibly inter-) regional comparisons of shorebird movements:

Northbound (Spring)	Southbound (Autumn)	Winter (optional)
March 15	July 15	November 5
March 25	July 25	November 15
April 5	August 5	November 25
April 15	August 15	December 5
April 25	August 25	December 15
May 5	September 5	December 25
May 15	September 15	January 5
May 25	September 25	January 15
	October 5	January 25
	October 15	February 5
	October 25	February 15
		February 25
		March 5

This standardized monitoring effort would allow for very specific recommendations for providing habitat locally based on peak movements through any one area compared with all other areas in the region. This information would be maintained on the web site for all shorebirds combined and hopefully for each species as well (the latter, to make sure management targeting all species does not miss the movements of rarer higher priority species) . Other dates during winter (November, December, January, and February) should follow similar 10-day intervals but are considered optional based on available time and intended management that could effect wintering shorebird populations (also see Research below). On the other hand, this same protocol may provide for standard monitoring of all other waterbirds (waterfowl, wading species, rails, etc.) using managed wetlands throughout the year, depending again on the priorities set for each land management unit.

During the next 5 years, we will evaluate use of impoundments managed for shorebirds across the ecosystems and determine if we need to increase the number of managed acres (say to perhaps the 50% figure of 37,000 acres; Table 4a) proposed for the 2003-2005 period. Jaime Collazo, USGS Biological Resources Division, North Carolina State University, has committed to analyze all data collected from monitoring feedback to help drive future management efforts.

Using ISS protocol, collecting data on shorebird use of beaches is also encouraged and can be tied in with efforts monitoring possible problems with off-shore and near-shore problems with contaminant spills and gill-netting associated mortality for loons, petrels and shearwaters, gannets, pelicans, and seaducks (Forsell 1999).

For both beachfront and inland ISS routes, we expect coverage to be accomplished by both agency management staff and volunteers (i.e., “citizen scientists”), depending on availability of individuals trained as necessary on shorebird identification and estimation techniques.

Finally for non-breeding shorebirds, aerial surveys likely are necessary to fully understand use of estuarine foraging and protected roosting habitats along coastal areas within the planning region.

We recommend searching coastal areas for shorebird concentrations at least twice monthly during migration and once monthly during winter and to the extent possible tie these efforts in with waterfowl surveys often covering the same areas. Counts of shorebirds, should be split among large, medium, and small bodied groups of species. If adequate training is not available to easily group shorebirds into these three groups, lump medium in with large species, but otherwise use the following three groups for counting shorebirds:

(1) Small-bodied shorebirds are the small plovers and "peeps".

(2) The medium-bodied group consists of the larger plovers, yellowlegs and other larger tattlers, and moderately sized sandpipers including the larger *Calidris* (e.g., Red Knot, Stilt Sandpiper, Pectoral Sandpiper) and dowitchers.

(3) Large-bodied shorebirds include oystercatchers, stilts, avocets, curlews, and godwits.

Total numbers censused from aerial surveys can then be used in concert with ISS to determine not only relative, but also absolute, abundances among species.

Standardized surveys for nesting Piping Plovers have been established and efforts require special care to not disturb nesting efforts for this threatened species (U.S. Fish and Wildlife Service 1996). Surveys for Snowy and Wilson's plovers, and American Oystercatchers still need to be developed, but most states attempt to cover all potential nesting habitat for these species on at least a periodic basis, if not annually. A likely standardized survey protocol may be tied in with surveys for beach-nesting terns (especially Common. Least and Gull-billed) and Black Skimmers, but would require coverage beyond tern and skimmer colonies. Such a protocol may be best conducted once to establish number of breeding pairs and no more than twice a season to minimize disturbances. Measuring reproductive success would require more careful monitoring, both to gather accurate data and to avoid detrimental disturbances to nesting efforts. A protocol following that developed by the Florida Fish and Wildlife Conservation Commission entitled Statewide Breeding Shorebird Survey is now under review for developing a regional standard by other states ("shorebirds" in this survey refer primarily to Least Terns and Black Skimmers, but can be modified to include all nesting shorebirds).

6. Research Needs

Jaime Collazo and his students are working to develop local and regional monitoring protocols that may improve upon International Shorebird Survey (ISS), which was not designed originally to be a monitoring tool. Data from both Pea Island NWR, NC, and Merritt Island NWR, FL, plus additional sites are serving to test assumptions on duration of migratory stop-over at any one site, food availability and other factors used to establish habitat objectives. Louise Weber has also collected much data from Yawkey Wildlife Center, SC, and Mark Sherfy from Back Bay NWR, VA.

Other research topics requiring attention include:

(A) establishing shorebird disturbance tolerance levels,

(B) effects, if any, from contaminants for migrant versus resident populations in known problem areas,

(C) better determining factors, where not already understood, inhibiting successful reproduction of plovers and oystercatchers and

(D) better determining factors influencing or inhibiting effective management of impoundments for shorebirds, including hydrodynamics, mosquito control, vegetation control protocols, minimizing exposure to contaminants and public use.

(E) determine factors influencing invertebrate diversity and abundance under all conditions shorebirds are foraging.

(F) determine which methods of dredge spoil disposal (beach disposal, dredge island, or side cast) and timing (breeding and non-breeding) have what impacts (both positive and negative) on shorebirds.

(G) determine the effect that that ghost crabs may have on Piping Plover and other beach-nesting shorebird breeding success.

These and other research needs were discussed at the Coastal Issue Workshop held at Georgetown, SC, March 24-25, 2000, entitled "**Status and Future of Shorebird Research, Management, and Education in the Southeast"** sponsored by the Ace Basin, North Carolina, North Inlet-Winyah Bay, and Sapelo Island National Estuarine Research Reserves (NERR). The need to include "citizen scientists" where possible was also emphasized to help with studies mostly for monitoring purposes, but also for the more detailed issues identified above. NERR may serve as a future forum for coordinating research activities across the planning region.

7. Education Objectives and Strategies
(Based mostly on discussions at the NERR-sponsored workshop).

The National Education and Outreach Plan recommends the establishment of regional groups to address region and site specific needs and priority issues. It will be important to identify key partners who can assist in the identification of education and outreach needs, program planning and implementation, and evaluation. These might include education/outreach representatives from state and federal natural resources agencies, Sea Grant programs, National Estuarine Research Reserves, and private groups involved with environmental education. One of the first tasks for the regional work group will be to assess what education and outreach products and services are currently available in the region and how well these address the priority issues in the region's conservation plan. The National Education and Outreach Working Group conducted a survey for the entire country and the results are outlined in their plan. Additional service providers exist for the Southeastern and Caribbean region and should be included in a more

comprehensive regional survey. Once region specific education and outreach needs have been identified, the work group can guide the development and implementation of appropriate tools and programs to address the priority issues. Efforts should be made to integrate current research and best management practices into any educational products and programs that are developed.

It will be important to integrate education, management and research interests as the National Shorebird Conservation Plan and the regional plans are implemented and modified over time. The NERR regional work group in essence can serve as the lead for education and outreach activities for the integrated efforts of the Southeastern Coastal Plains-Caribbean Region Work Group.

Two existing shorebird education efforts, the Shorebirds Sister Schools Program and the Sister Cities Program, are recommended outreach tools in the National Education and Outreach Plan. It will be important to assess the applicability of both of these programs to the region and to support the programs, if they are determined to be a good use of resources to address regional priorities. The Shorebirds Sister Schools Program, designed to reach K-12 audiences, has a West Coast orientation. Adaptation of this educational program to the Atlantic flyway should be considered.

The National Education and Outreach Plan also highlights the "Great Shorebird Trail." This project promotes Western Hemisphere Shorebird Reserve Network sites as unique travel destinations that can contribute to ecotourism. Again, there is a need to assess the relevance of this initiative to regional goals and priorities before dedicating resources in support of this effort. For example one of the primary goals of the regional plan is to investigate and reduce human disturbance on shorebird populations. Education is a key to achieving this goal. Care must be taken to ensure that education and outreach activities reduce and do not contribute to human disturbance problems.

The Western Atlantic Shorebird Association (WASA), sponsored by the United States Fish and Wildlife Service and the National Estuarine Research Reserve System of the National Oceanic and Atmospheric Administration, represents a collaborative international effort between private, state, and federal organizations in the United States, Canada and South America, to monitor and track the movements of shorebirds along the Western Atlantic flyway. A web site is under development to assist in this monitoring effort (http://www.hopscotch.ca/shorebirds/index.html.en) and includes an education section. The Shorebirds Sister School Program is currently linked to the site (or access directly (http://www.fws.gov/~r7nved/sssp.html). An opportunity exists to expand the education section of the WASA web site to address priorities of the Shorebird Conservation Plan, especially those most relevant to the east coast. The WASA project also encourages the submission of shorebird data (numbers and color marked birds) from observers along the flyway. A need exits to provide regional coordination and training of observers to assist in this effort. Education and outreach partners will have delivery systems, facilities and staff in place and are well-positioned to provide or facilitate the training and coordination needed to accomplish the shorebird monitoring objectives of WASA and those of the Southeastern and Caribbean region.

Educational applications of the South Atlantic Migratory Bird Initiative (SAMBI) web site under development by the US Fish and Wildlife Service should also be explored.

"Inreach" through the sponsorship of frequent training opportunities for both management agency staff and prospective citizen scientists on shorebird identification and estimation techniques must also be a priority for supporting both monitoring and research activities.

8. Funding needs to meet regional goals

See Appendix III for model budget table. Formulas used are as follows:

(1) Impoundment improvements:

VA and NC:

Develop 2000 new acres (on presently owned public lands) @ $500/acre = $1,000,000
Enhance 4000 acres (dike,wcs repair) = @ $100/acre= $400,000
Vegetation (Phragmites) control on 1000 acres, 1000acs * $100/ac * 5 years= $500,000
Fall water pumping costs (extra costs to refuges and WMA /cooperating private landowners- $50,000/year * 5 years= $250,000
New pumps- 4 large stations @ 125K= $500,000
4 small pumps @ $40,000= $160,000

SC and GA:

Enhance 6000 acres (dike, wcs repair) = @ $100/acre= $600,000
New pumps- 1 large stations @ 125K= $125,000
3 small pumps @ $40,000= $120,000
4 wells @ $15k each = $60,000
Vegetation (Sesbania, Phragmites etc) control on 1000 acres, 1000acs * $100/ac * 5 years= $500,000

FL:

Guana River Wildlife Management Area
Vegetation Control 500 ac. * $100/ac * 2 years = $100,000

Merritt Island National Wildlife Refuge
2 portable pumps @ = $40,000 = $80,000
1 large pump station @ $125,000 = $125,000
Enhance existing dikes, wcs= $30,000

Pelican Island National Wildlife Refuge
1 portable pumps @ = $40,000 = $40,000
150 ac veg control @ $100/ac * 2 treatments = $30,000
WCS (water control structures) 3-4 @ $3000/ = $15,000

Tom Goodwin Wildlife Management Area
Vegetation Control 1000 ac. * $100/ac * 2 years = $200,000

Loxahatchee National Wildlife Refuge
2 portable pumps @ = $40,000 = $80,000
1 large pump station @ $125,000 = $125,000
Vegetation Control 2000 ac. * $100/ac * 2 years = $400,000

Crocodile Lake National Wildlife Refuge
????= $18,000

Ding Darling National Wildlife Refuge
WCS (water control structures) = $90,000

Lake Woodruff National Wildlife Refuge
New Impoundment = $100,000
New stationary pump = $125,000
Portable pump = $45,000
Dike repairs = $30,000

Hickory Mound Wildlife Management Area
Minor dike repairs on 1000 ac = $30,000
1 large pump station = $125,000
1 portable pump = $40,000
Vegetation Control 300 ac. * $100/ac * 2 years = $60,000

St. Marks National Wildlife Refuge
Vegetation Control 250 ac. * $100/ac * 2 years = $50,000
1 portable pump = $40,000
1 large pump station = $125,000

St. Vincent National Wildlife Refuge
3 wcs @ $3000 = $9000
Vegetation Control 250 ac. * $100/ac * 2 years = $50,000
1 portable pump = $40,000

AL:

Veg control
Dike, wcs maintenance
pumping costs $30,000

(2) Nest Marking:

Supplies needed to mark nests include signs, rope, posts, post hole diggers, and post drivers. Each state provided an estimate for NC, SC, GA, the rest were estimated based on the expected efforts:

NC: $4,000/year times 5 years, they need $20,000

SC: $1,600/year times 5 years, they need $8,000

GA: $1,200/year times 5 years. they need $6,000

(3) Law enforcement and public use staffing:

Assume each half-time officer at $50,000 each, over and above present capabilities, to include equipment, outreach materials, etc.

VA: 0.3 officer; NC: 7 officers; SC: 4 officers; GA: 1 officer; FL: 4 officers; AL: 2 officers; MS: 2 officers; PR: 2 officers; VI: 1 officer

Multiply this by a 5-year period.

(4) Monitoring nest sites (ground surveys):

Assume $20,000/technician for 3 months in the nesting season per year, which includes equipment, vehicle, gas, and travel costs.

Multiply this by the number of technicians needed to cover the State's coastlines: VA=0.5, NC=5.5, SC=3, GA=2, FL=11, AL=1, MS=1, PR=0.5, VI=0.3

Multiply this by a 5-year period.

(5) Monitoring migration sites (ground surveys):

Determine the number of likely sites to be surveyed using International Shorebird Survey Protocol:

VA=1, NC=19, SC=13, GA=7, FL=40, AL=16, MS=2, PR=1, VI=1

Multiply the number of days survey is to be conducted, with standard being 32 days per year (8 northbound, 11 southbound, and 13 winter)

Multiply by $240/day to cover salaries and transportation, etc.

Multiply this by a 5-year period.

(6) Monitoring roost sites (ground surveys):

Determine how many days needed to cover coastline at least once per year:

VA: 10; NC: 20; SC: 20; GA: 25; FL: 55; AL: 5; MS: 5; PR: 3; VI: 1

Multiply by $200/day to cover salaries and equipment, etc.

Multiply this by a 5-year period.

(7) Monitoring migration and roost sites (aerial surveys):

Assume $800/day ($200/hr. for a 4 hr. flight/day) + $100/day for salaries, etc. for $900/day total.

Assume a State's entire coastline is covered twice a month during migration periods (July, August, September, October, March, April, May) and once a month during winter (November, December, January, February) for a total of 18 days.

Multiplied by the number of days needed to cover the State's coastline once:

VA-NC: 4; SC: 2.5; GA: 2; FL: 11; AL: 0.5; MS: 0.5; PR: 0.3; VI: 0.3

Multiply this by a 5-year period.

(8) Research:

For now we are assuming that existing research priorities should support on average 5 projects at $40,000 per project, which when multiplied by a 5-year period comes to $1 million. This figure was then spread among the States assuming that these will often be multi-state investigations.

(9) Education and outreach:

For now we are assuming that about $100,000 per year will be needed to support travel for education/outreach work group meetings, materials development, and program implementation and evaluation, based on identified priority issues. When multiplied by a 5-year period, this figure comes to $500,000. This figure was then spread among the states, assuming that many of the developed materials will cover multiple-state issues and education initiatives.

(10) Implementation coordinator:

Salary, benefits, travel, supplies, etc. approximately $100,000 per year, multiplied by 5 years equates to $500,000.

9. Recognition of individuals (not otherwise listed on cover page) and organizations that contributed to this report.

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Table 1. PRELIMINARY LIST OF AREAS USED BY SHOREBIRDS WITHIN THE SOUTHEASTERN COASTAL PLAIN AND CARIBBEAN REGIONS. NOTE THAT SITES OF KNOWN IMPORTANCE ARE UNDERLINED AND IN BOLD TYPE AND INCLUDE TWO WESTERN HEMISPHERIC SHOREBIRD RESERVE SITES (CAPE ROMAIN NATIONAL WILDLIFE REFUGE, SC, AND ALTAMAHA DELTA, GA) .

State/ Area	Recommended Surveys	
	Beachfront	Inland/Estuarine
Virginia		
Back Bay National Wildlife Refuge		1
False Cape State Park	1	
North Carolina		
Currituck National Wildlife Refuge	1	
Mackay Island National Wildlife Refuge		
Pea Island National Wildlife Refuge	1	1
Alligator River National Wildlife Refuge		1
Cape Hatteras National Seashore	3	
Pocosin Lakes National Wildlife Refuge		1
Mattamuskeet National Wildlife Refuge		2
Pamlico Point Wildlife Management Area		1
Cape Lookout National Seashore	3	
Bird Shoals area, Rachel Carson site, National Estuarine Research Reserve (Beaufort)	1	
Lea and Hutaff Islands (private)	1	
Lower Cape Fear (South Port)	1	
Pee Dee National Wildlife Refuge		1
Total	**11**	**8**
South Carolina		
Waccamaw National Wildlife Refuge		
Yawkey Wildlife Center (South Island)	1	3
Cape Romain National Wildlife Refuge (WHSRN site)	1	1
Charleston Harbor		
Santee National Wildlife Refuge		1
Santee Coastal Reserve		1
Huntington Beach State Park	1	
Bear Island Wildlife Management Area		1
ACE Basin National Wildlife Refuge		2

Table 1 (cont.).

State/ Area	Recommended Surveys Beachfront	Inland/Estuarine
South Carolina (cont.)		
Savannah River Dredge Spoil Site, Army Corps of Engineers		1
Savannah River National Wildlife Refuge		
Total	**3**	**10**
Georgia		
Little Tybee Island Natural Heritage Preserve		
Wassaw Island National Wildlife Refuge	1	
Ossabaw Island Natural Heritage Preserve		
St. Catherine's Island Bar Natural Area		
St. Catherine's Island (private)	1	
Blackbeard Island National Wildlife Refuge	1	
Altamaha Delta (includes Wolf Island National Wildlife Refuge, Little Egg Island Natural Area, Little St. Simon's Island [private]) (WSHRN Site)		
Altamaha River Wildlife Management Area		1
Kings Bay Submarine Base (Department of the Navy)		1
Cumberland Island National Seashore (Long Point [north end] and south end)	1	
Eufaula National Wildlife Refuge (GA-AL)		1
Total	**4**	**3**
Florida		
SACP=South Atlantic Coastal Plain		
State Wildlife Management Areas		
Guana River		
Hickory Mound		

Table 1 (cont.).

State/ Area	Recommended Surveys	
	Beachfront	Inland/Estuarine
Florida (cont.)		
SACP=South Atlantic Coastal Plain (cont.)		
State Parks		
St. George Islands*	1	
Fort Clinch	1	
Amelia Island		
Little Talbot	1	
Guana River		
Department of Defense		
Mayport NS		1
National Parks		
Timucuan		
National Wildlife Refuges		
St. Vincent *	1	
St. Marks *		1
Lower Suwannee *		
County		
Huguenot (Ward's Bank) Duval Co.		1
EGCP=East Gulf Coastal Plain		
State Parks		
Perdido Key	1	
Fort Pickens	1	
Henderson Beach		
Grayton Beach		
St. Andrews		
T.H. Stone-St. Joseph	1	
Department of Defense		
Pensacola NAS		
Eglin AFB	1	
Tyndall AFB		

Table 1 (cont.).

State/ Area	Recommended Surveys	
	Beachfront	Inland/Estuarine
Florida (cont.)		
EGCP=East Gulf Coastal Plain (cont.)		
National Parks		
Gulf Islands	1	
PEFL=Peninsular Florida		
State Wildlife Management Areas		
Gulf Hammock		
State Parks		
Anastasia	1	
Faver-Dykes		
Washington Oaks State Gardens		
Flagler Beach	1	
Tomoka		
Hontoon Island		
Hillsborough*		
Anclote Key*		
Honeymoon Island*	1	
Caladesi Island*		
Sebastian Inlet		
Oscar Scherer*		
Don Pedro Island*		
Gasparilla Island*		
Cayo Costa-North Captiva*	1	
Ft. Pierce Inlet		
State Lands		
Bunche Beach (Estero Island), Fort Myers Beach	1	
Department of Deense		
Cape Canaveral AFS		
Patrick AFB		
MacDill AFB		

Table 1 (cont.).

State/ Area	Recommended Surveys	
	Beachfront	Inland/Estuarine
Florida (cont.)		
PEFL=Peninsular Florida (cont.)		
National Parks		
Fort Mantanzas		
Cape Carnaveral Natl. Seashore	1	
National Wildlife Refuges		
Archie Carr	1	
Caloosahatchee		
Cedar Keys		
Chassahowitzka		
Ding Darling		1
Egmont Key		
Hobe Sound	1	
Island Bay		
Matlacha Pass		
Merritt Island	1	6
Passage Key		
Pelican Island		1
Pine Island		
Pinellas		
St. Johns		
St. Johns Water Management District		
Zellwood (north edge of Lake Apopka)		2
County/City Lands		
Pinellas County Parks and Preserves		
Sanibel Island beaches	1	
STFL=Subtropical Florida		
State Parks		
St. Lucie Inlet		
J.D. MacArthur Beach		
John U. Lloyd Beach		
Bill Baggs Cape Florida		
Lover's Key*		

Table 1 (cont.).

State/ Area	Recommended Surveys	
	Beachfront	Inland/Estuarine
Florida (cont.)		
STFL=Subtropical Florida (cont.)		
State Parks (cont.)		
Delnor-Wiggins Pass*		
John Pennekamp Coral Reef		
Long Key		
Bahia Honda	1	
Department of Defense		
Homestead AFB		
Key West NAS		
National Parks		
Everglades		1
Biscayne	1	1
Ft. Jefferson (Dry Tortugas)		
National Wildlife Refuges		
Loxahatchee		1
Crocodile Lake		1
Great White Heron		
Key West		
Ten Thousand Islands		1
Private		
Belle Glade (se Lake Ockechobee, South Florida Water Management District)		1
Total	22	18

*Snowy Plover populations from Apalachicola Bay to Cedar Keys in the "South Atlantic" Coastal Plain are actually part of a continuum of breeding populations extending from Texas through to the Gulf side of Peninsular Florida south to the Florida Keys. The reason for this was tied to inland bird populations (*e.g.,* Limpkin, Painted Bunting) between the Apalachicola the Suwannee River Basins being most closely allied with other South Atlantic Coastal Plain populations.

Table 1 (cont.).

State/ Area	Recommended Surveys Beachfront	Inland/Estuarine
Alabama		
Alabama Point	1	1
Fort Morgan Peninsula	1	1
Sand Island	1	
Dauphin Island-east end	1	
Little Dauphin Island		1
Dauphin Island-west end	1	1
Bayou La Batre Ponds		1
Gaillard Island		1
Blakeley Island (Alcoa cooling ponds near Mobile) and Polecat Bay		1
Battleship Flats (near Battleship Alabama), Mobile County		1
Mobile-Tensaw Delta		1
Baldwin County Sod Farms		1
Eufaula National Wildlife Refuge (AL side)		1
Total	**5**	**11**
Mississippi		
All coastline (quickly becoming lost cause due to casino and related development)		
Gulf Islands National Seashore	1	
Pascagoula River Marsh		
West Jackson Wastewater Treatment Facility		1
Total	**1**	**1**
Puerto Rico		
Cabo Rojo (Salt Flats) National Wildlife Refuge		1
Jobos Bay Estuarine Reserve		
Total		**1**
Virgin Islands		
Salt Pond, St. Croix		1
Total		**1**

Table 2. PRELIMINARY LIST OF PRIORITY SPECIES* BY GUILD/GROUP SOUTHEASTERN COASTAL PLAIN AND CARIBBEAN REGIONS (VA, NC, SC, GA, FL, AL, MS, PR, VI).

PRELIMINARY PRIORITY LEVEL	SPECIES (AND SEASONS OF OCCURRENCE)* *						
	TERR/AQUA GLEANERS	TERR/AQUA GLEANERS/PROBERS	AQUA/TERR PROBERS/GLEANERS	AQUA PROBERS	AQUA GLEANERS	AQUA GLEANERS/ SWEEPERS	PROBERS/PRIERS
EXTREMELY HIGH	SNPL (**B**, W) PIPL (**B**, **M,** **W**)		REKN (M, W)				AMOY (**W**, **B**)
HIGH	WIPL (**B**, w)	WHIM (**M**, w) LBCU (w)	UPSA (M,b) SESA (M, w) STSA (M, w) SBDO (M, W) BBSA (M)	MAGO (M, W)	SOSA (M)		
MODERATE	BBPL (M,W) AMGP (m)	RUTU (M, W) PUSA (W)	SAND (M, W) WESA (M,W) LESA (M, W) PESA (M) DUNL (W) WISN (W, M)		GRYE (M,W) LEYE (M, W) WILL (M, W, B)	AMAV (W)	
OTHER SPECIES WITH HIGH CONCENTRATIONS	SEPL (M,W) KILL (B,W)	SPSA (M,W)				BNST (W, B)	
OTHER SPECIES		HUGO (m)	WRSA (m) BASA (m) LBDO (w)			WIPH (m) RNPH (M) REPH (M)	

*See Table 3 for scientific names and Appendix I for actual scores for priority criteria.
**B=breeding, W=winter, M=migration; when bold considered very important to species, bold and underline extremely important, lower case present but not in high numbers.

Species codes are as follows:

BBPL=Black-bellied Plover	LBCU=Long-billed Curlew	PESA=Pectoral Sandpiper	HUGO=Hudsonian Godwit	PUSA=Purple Sandpiper	
AMGP=American Golden Plover	SAND=Sanderling	STSA=Stilt Sandpiper	MAGO=Marbled Godwit	BNST=Black-necked Stilt	
SNPL=Snowy Plover	SESP=Semipalmated Sandpiper	DUNL=Dunlin	GRYE=Greater Yellowlegs	AMAV=American Avocet	
WIPL=Wilson's Plover	WESA=Western Sandpiper	SBDO=Short-billed Dowitcher	LEYE=Lesser Yellowlegs	WIPH=Wilson's Phalarope	
SEPL=Semipalmated Plover	LESA=Least Sandpiper	LBDO=Long-billed Dowitcher	SOSA=Solitary Sandpiper	NOPH=Northern Phalarope	
PIPL=Piping Plover	WRSA=White-rumped Sandpiper	WISN=Wilson's Snipe	WILL=Willet	REPH=Red Phalarope	
KILL=Killdeer	BASA=Baird's Sandpiper	BBSA=Buff-breasted Sandpiper	RUTU=Ruddy Turnstone	AMOY=American Oystercatcher	
WHIM=Whimbrel	REKN=Red Knot	UPSA=Upland Sandpiper	SPSA=Spotted Sandpiper		

Table 3. Minimum population estimates for shorebirds resident within or migrating through the Southeastern Coastal Plain (SECP) and Caribbean (Carib.) Regions. Minimum temperate North American population estimates from National Shorebird Planning Group. Estimated SECP-Carib. proportions for determining regional population sizes based on the collective experience of regional working group members and season of peak occurrence (B=breeding, W=wintering, S=spring or northbound migration, F=fall or southbound migration). Estimated proportions of foraging populations among habitats were also based on the collective experience of working group members. Estimated numbers of individuals are listed for managed and inland habitats in parentheses since these are used to developed managed habitat objectives.

Priority Level/ Species	Minimum North Am. Population Estimate	Estimated SECP-Carib. Proportion	Estimated SECP-Carib. Population	Proportion of Foraging Population Among Habitats within Planning Regions				
					Intertidal			Managed and All Inland
				Beachfront	Vegetated	Unvegetated	Mangrove	
Extremely High								
Snowy Plover *Charadrius alexandrinus* Southeast U.S.-Carib. subsp.	16,000	5% (B)	800	90%		10%		
Piping Plover *Charadrius melodus*	6,000	50% (F)	3,000	100%				
Red Knot *Calidris canutus* Southeast U.S. pop.	400,000	5% (W)	20,000	75%		20%		5% (750)
American Oystercatcher *Haematopus palliatus*	7,500	52% (W)	3,900	10%		90%		
High								
Wilson's Plover *Charadrius wilsonia*	30,000	17% (B)	5,000	80%		20%		
Solitary Sandpiper *Tringa solitaria*	100,000	33% (F)	33,000					100% (33,000)
Upland Sandpiper *Bartramia longicauda*	350,000	3% (F)	10,500					100% (10,500)
Whimbrel *Numenius phaeopus*	57,000	33% (S)	18,810	10%	60%	20%	10%	
Long-billed Curlew *Numenius americanus*	20,000	0.3% (W)	60	100%				
Marbled Godwit *Limosa fedoa*	171,000	1% (W)	1,710	70%		20%		10% (170)
Semipalmated Sandpiper *Calidris pusilla*	3,500,000	60% (S)	2,100,000	10%		50%	5%	35% (735,000)
Stilt Sandpiper *Calidris himantopus*	200,000	10% (F)	20,000			20%		80% (16,000)
Buff-breasted Sandpiper *Tryngites subruficollis*	15,000	5% (F)	1,500					100% (1,500)
Short-billed Dowitcher *Limnodromus griseus*	320,000	50% (S)	160,000	10%		50%	20%	20% (32,000)

Table 3 (cont.).

Priority Level/ Species	Minimum North Am. Population Estimate	Estimated SECP-Carib. Proportion	Estimated SECP-Carib. Population	Proportion of Foraging Population Among Habitats within Planning Regions				
					Intertidal			Managed and All Inland
				Beachfront	Vegetated	Unvegetated	Mangrove	
Moderate								
Black-bellied Plover *Pluvialis squatarola*	200,000	25% (F)	50,000	50%	20%	20%		10% (5,000)
American Golden-Plover *Pluvialis domimica*	150,000	1% (F)	1,500					100% (1,500)
American Avocet *Recurvirostra americana*	450,000	1% (W)	4,500	15%				85% (3,825)
Greater Yellowlegs *Tringa malanoleuca*	100,000	33% (S)	33,000		25%	10%	5%	60% (19,800)
Lesser Yellowlegs *Tringa flavipes*	500,000	33% (S)	165,000		25%	10%	5%	60% (99,000)
Willet *Catoptrophorus semipalmatus*	250,000	50% (B)	125,000	60%	5%	30%		5% (6,250)
Ruddy Turnstone *Arenaria interpres*	235,000	10% (S)	23,500	70%		30%		
Sanderling *Calidris alba*	300,000	33% (S)	100,000	80%		20%		
Western Sandpiper *Calidris mauri*	3,500,000	10% (F)	350,000	10%		50%	5%	35% (122,500)
Least Sandpiper *Calidris minutilla*	600,000	25% (S)	150,000	5%		30%	5%	60% (90,000)
Pectoral Sandpiper *Calidris melanotos*	400,000	33% (F)	132,000					100% (132,000)
Purple Sandpiper *Calidris maritima*	15,000	10% (W)	1,500	100%				
Dunlin *Calidris alpina*	850,000	25% (W)	212,000	30%		30%	10%	30% (63,750)
Wilson's Snipe *Gallinago delicata*	2,000,000	33% (W)	660,000					100% (660,000)

Table 3 (cont.).

Priority Level/ Species	Minimum North Am. Population Estimate	Estimated SECP-Carib. Proportion	Estimated SECP-Carib. Population	Proportion of Foraging Population Among Habitats within Planning Regions					
					Intertidal			Managed and All Inland	
				Beachfront	Vegetated	Unvegetated	Mangrove		
Other Species with High Concentrations									
Killdeer *Charadrius vociferus*	1,000,000	30% (W)	300,000					100%	(300,000)
Semipalmated Plover *Charadrius semipalmatus*	150,000	33% (S)	49,500	60%		30%		10%	(4,950)
Black-necked Stilt *Himantopus mexicanus*	150,000	10% (B)	15,000				10%	90%	(13,500)
Spotted Sandpiper *Actitis macularia*	150,000	33% (F)	49,500			30%	10%	60%	(29,700)
Long-billed Dowitcher *Limnodromus scolopaceus*	500,000	1% (W)	5,000					100%	(5,000)
Red-necked Phalarope *Phalaropus lobatus*	2,500,000	???	???						
Red Phalarope *Phalaropus fulicaria*	1,000,000	???	???						
Other Species									
Hudsonian Godwit *Limosa haemastica*	50,000	0.3% (F)	150					100%	(150)
White-rumped Sandpiper *Calidris fuscicollis*	400,000	1% (S)	5,000					100%	(4,000)
Baird's Sandpiper *Calidris bairdii*	300,000	0.1% (F)	300					100%	(300)
Wilson's Phalarope *Phalaropus tricolor*	1,500,000	0.1% (F)	1,500					100%	(1,500)
Totals	22,457,500	---------	4,811,730						(2,391,645)

Table 4a. Estimated acreage of managed habitat necessary to support shorebirds resident in or migrating through the Southeastern Coastal Plain -Caribbean Regions for 2,391,645 shorebirds (inland and impoundments users), using turnover of 15 days and two stops from Caribbean to southeastern Virginia.*

Levels of food availability	Acres of managed wetlands needed to support different proportions of total shorebirds			
gm. Inverts/m^2	All using impds	50% using impds	25% using impds	10% using impds.
2.4	74,000 ac.	37,000 ac.	**18,500 ac.**	7400 ac.
3.3	54,000 ac.	27,000 ac.	13,500 ac.	5400 ac.
4.3	41,200 ac.	20,600 ac.	10,300 ac.	4120 ac.

*For other considerations, assumptions, and stipulations, see text under Habitat Objectives.

Table 4b. Suggested schedule for interim shorebird habitat objectives 2000-2002.

Subregion*	Spring 2000	Fall 2000	Spring 2001	Fall 2001	Spring 2002	Fall 2002
(1) VA-NC	1200	1000	2400	2000	4625	4625
(2) SC-GA	1200	1000	2400	2000	4625	4625
(3) N. FL	1200	1000	2400	2000	4625	4625
(4) Subtrop. FL and Caribbean	1200	1000	2400	2000	4625	4625
	4800	4000	9600	8000	18,500	18,500

*Roughly equivalent to Fish and Wildlife Ecosystem Team Boundaries, respectively: (1) Roanoke-Tar-Neuse-Cape Fear, (2) Savannah-Santee-Pee Dee and Altamaha, (3) Northeast Gulf and North Florida, and (4) South Florida and Caribbean.

Appendix I. Conservation Priority Scores for shorebird species occurring within the Southeastern Coastal Plain-Caribbean Regions. RA=(Global) Relative Abundance; BD=Breeding Distribution; ND=Non-breeding Distribution; TN=Threats Non-breeding; TB=Threats Breeding; PT=Population Trend; AI=Area Importance. Total scores identified as appropriate as EH=Extremely High Priority; H=High Priority; M=Moderate Priority. Primary season(s) for which an AI score was based were B=Breeding season; W= "winter," Mi=migration.

Species	RA	BD	ND	TN	TB	PT	Sub Total	AI	Total[4]
Black-bellied Plover[1]	3	2	1	3[2]	2	5	16	4Mi	20 M
American Golden-Plover	3	2	3	4	2	5	19	2Mi	21 M
Snowy Plover	5	3	4	4	5[2]	5		3B	
Southeast U.S. pops.	5	5	5	4	5[2]	5	29	5B	34 EH
Wilson's Plover	5	4	3	4	4	3	23	4B	27 H
Semipalmated Plover	3	1	1	2	2	3	12	5Mi	17
Piping Plover	5	5	4	4	5	5	28	2B/4N	32 EH
Killdeer	1	1	2	3	3	3[2]	13	4B	17
American Oystercatcher[1]	5	3	4	4	4	3	23	5B	28 EH
Black-necked Stilt[1]	3	1	2	2	3	3	14	4B	18
American Avocet	2	2	3	4	3	3	17	3W	20 M
Greater Yellowlegs	4	2	1	2	2	3	14	5Mi	19 M
Lesser Yellowlegs	2	2	1	3	2	5	15	5Mi	20 M
Solitary Sandpiper[1]	4	3	2	2	4	3	18	5Mi	23 H
Willet[1]	3	3	3	2[2]	2[2]	3	16	5B	21 M
Spotted Sandpiper	3	1	1	2	2	3	12	5Mi	17
Upland Sandpiper	2	2	3	4	5[2]	5[2]	21	3Mi/1B	24 H
Whimbrel[1]	4	3	2	4[2]	2	5	20	5Mi	25 H
Long-billed Curlew	5	3	3	4[2]	4	5	24	2W	26 H
Hudsonian Godwit[1]	4	4	4	1[2]	3	3	19	1Mi	20
Marbled Godwit[1]	3	3	3	4	4	4	21	3W	24 H
Ruddy Turnstone[1]	3	2	2	4	2	4	17	4Mi	21 M
Red Knot[1]	2	3	3	4	2	5	19	3Mi	
Southeast U.S. pop.	5	5	5	4	3	5	27	5W	32 EH
Sanderling	2	2	1	4	2	5	16	5Mi	21 M
Semipalmated Sandpiper	1	3	3	3	2	5	17	5Mi	22 H
Western Sandpiper	1	4	2	4	2	5	18	3Mi	21 M
Least Sandpiper	2	2	2	2	2	5	15	4Mi	19 M
White-rumped Sandpiper	2	3	3	2	2	3	15	2Mi	17
Baird's Sandpiper	2	3	3	1[2]	2	3	14	1Mi	15
Pectoral Sandpiper	2	2	3	3	2	3	15	5Mi	20 M
Purple Sandpiper[1]	5	3	3	3	2	2	18	4W	22 M[5]
Dunlin[1]	2	2	3	3	2	5	17	4W	21 M
Stilt Sandpiper	3	3	3	4	3	3	19	4Mi	23 H
Buff-breasted Sandpiper	5	3	4	4	3	4	23	3Mi	26 H
Short-billed Dowitcher[1]	2	3	2	4	2	5	18	5Mi	23 H
Long-billed Dowitcher	2	4	3	2[2]	2	2	15	3W	18

Appendix I (cont.).

Species	RA	BD	ND	TN	TB	PT	Sub Total	AI	Total[4]
Wilson's Snipe	1	1	2	2	3	5	14	5W	19 M
American Woodcock[3]	1	2	3	4	4	5	19	5W	24 H
Wilson's Phalarope	1	2	5	3[2]	3	5	19	2Mi	21
Red-necked Phalarope	1	1	3	1[2]	2	4	12	1Mi	13
Red Phalarope	1	2	1	1[2]	2	5	12	1Mi	13

[1] Further attention may be needed for conservation of subspecies specifically occurring within planning region.

[2] Threat scores and population trend scores within regions differ from national scores due to local conditions or population trend information.

[3] American Woodcock is not included in this plan as it is covered best under Partners in Flight Bird Conservation Plans.

[4] Entry Criteria used to establish priority categories:

(1) Species with total score 28-35. Ordered by total score. Consider deleting species with AI $\leq$ 2 confirmed to be of peripheral occurrence and not of local conservation interest, but retain species potentially known to have greatly declined during this century. These are Extremely High (EH) priority species.

(2) Overall High Priority Species. Species with total score 22-27. Ordered by total score. Consider deleting species with AI $\leq$ 2 confirmed to be of peripheral occurrence and not of local conservation interest, but retain species potentially known to have greatly declined during this century. These are High (H) priority species.

(3) Area Priority Species. Species with slightly lower score total 19-21 with PT+AI=8+. Ordered by total score. These are Moderate (M) priority species.

(4) High Threats Species. Like (3), but with high total threat scores. TB+TN=7+, or TB or TN=5. These are Moderate (M) priority species.

(5) Species with High Concentrations. Species with large populations within the planning region not otherwise listed above.

[5] Purple Sandpiper meets numerical criteria for High Priority, but barely (Total Score 22). This score is a result of an inflated "Global" Relative Abundance score that is based only on the relatively small North American population and does not include the larger Eurasian wintering population (not clear that there is a separation of the two on breeding grounds). Since population trends indicate stable or increasing populations associated with rock jetties, this species is dropped from High Priority and included as Moderate Priority for tracking population trends.

Appendix II. Status of breeding shorebirds in the Caribbean based mostly upon Raffaele et al. (1998).

Double-striped Thick-Knee (*Burhinus bistriatus*)--Formerly common, now uncommon in Hispaniola.

Collared Plover (*Charadrius collaris*)--Uncommon to rare in Grenada (but existing evidence suggest that actually all breeding reports are better attributed to the South American subspecies of Wilson's Plover [*Charadrius wilsonia cinnamominus]* which is superficially similar to Collared; Smith and Smith1999).

Snowy Plover--Common southern Bahamas, increasingly rare Hispaniola and Anguilla, of sporadic occurrence in Puerto Rico (most consistent at Cabo Rojo, about 12 pairs).

Wilson's Plover--Common Bahamas, Greater Antilles (in Puerto Rico, Cabo Rojo supports about 30 pairs), and Virgin Islands.

Killdeer--Common Bahamas, Greater Antilles, less so Virgin Islands.

American Oystercatcher--Fairly common, but very local, south and central Bahamas, Puerto Rico, Virgin Islands, and Guadeloupe; spotty breeder north Bahamas, Cuba, Hispaniola, and Lesser Antilles.

Black-necked Stilt--Common south and central Bahamas, Greater Antilles, Virgin and Cayman Islands; uncommon to rare north Bahamas, Lesser Antilles to Guadeloupe.

Northern Jacana (*Jacana spinosa*)--Common Cuba, Jamaica, and Hispaniola

Willet--Rare to uncommon Bahamas, Greater Antilles including Cayman Islands.

Appendix III. Budget needs to meet Southeastern Coastal Plain-Caribbean regional goals (in 1000's/5years). See Section 8 for formulas used.

	Dollars needed per State, Commonwealth, or Territory									
Topic	VA	NC	SC	GA	FL	AL	MS	PR	VI	Totals
Management										
Impoundment Improvements	235	2,475	700	700	2,202	30				**6,342**
Nest Marking (equipment)	5	20	8	6	80	10	10	3	1	**143**
Law Enforcement and Public Use Staffing	90	1,750	1,000	250	1,000	500	500	500	250	**5,840**
Monitoring										
Nest Sites (ground)	50	550	300	200	1,100	100	100	50	30	**2,480**
Migration Sites (ground)	77	730	499	269	1,536	614	77	39	39	**3,880**
Roosting Sites (ground)	10	20	20	25	55	5	5	3	1	**144**
Migration and Roosting Sites (aerial)		324	200	162	890	41	41	24	24	**1,706**
Research										
Based on priorities, but on average	50	150	150	150	200	100	100	50	50	**1,000**
Education/outreach										
Based on priorities, but on average	10	100	100	100	125	25	25	10	5	**500**
Coordinator	10	100	100	100	125	25	25	10	5	**500**
Totals	**537**	**6,219**	**3,077**	**1,962**	**7,313**	**1,450**	**883**	**689**	**405**	**22,535**

		acres=	18469		Avgm/bird	EMR	Energy (kj/gm)				Inverts/m2		Turnover	Number of
			SE Population	% using	87.0	5.84	Chironomids			Pop Needs	2.4		days	Stops
			Inland & Impd	Man. Impd.			23.8			gm. inverts		Per day	15	2
Species	name	Guild	Estimate	0.25	gm/bird	kj/day	Digest Ene	gm/day	EMR+2gm	per day	m2 needs	ac. needs	ac needed	ac needed
BBPL	Black-bellied Plover	mud	5000	1250	150	239.8629	17.374	13.80585	15.80585	19757.32	8232.215	2.03	31	61
LGPL	American Golden Plover	grass	1500	375	130	216.8757	17.374	12.48277	14.48277	5431.041	2262.934	0.56	8	17
SNPL	Snowny Plover	mud		0	30	77.24817	17.374	4.446194	6.446194	0	0	0.00	0	0
WIPL	Wilson's Plover			0	44	101.1546	17.374	5.822181	7.822181	0	0	0.00	0	0
SEPL	Semi-palmated Plover	mud	4950	1237.5	35	86.10309	17.374	4.955859	6.955859	8607.875	3586.615	0.89	13	27
PIPL	Piping Plover	mud		0	40	94.58997	17.374	5.44434	7.44434	0	0	0.00	0	0
KILL	Killdeer	grass	300000	75000	50	110.6801	17.374	6.370447	8.370447	627783.5	261576.5	64.64	970	1939
AMOY	American oyster catcher			0	44	101.1546	17.374	5.822181	7.822181	0	0	0.00	0	0
BNST	Black-necked Stilt	wader	13500	3375	125	210.9694	17.374	12.14282	14.14282	47732.03	19888.35	4.91	74	147
AMAV	American avocet	wader	3825	956.25	150	239.8629	17.374	13.80585	15.80585	15114.35	6297.645	1.56	23	47
GRYE	Greater yellowlegs	wader	19800	4950	125	210.9694	17.374	12.14282	14.14282	70006.97	29169.57	7.21	108	216
LEYE	Lesser yellowlegs	wader	99000	24750	75	147.2441	17.374	8.47497	10.47497	259255.5	108023.1	26.69	400	801
YESP	Yellowlegs sp.	wader		0	100	180.2996	17.374	10.37755	12.37755	0	0	0.00	0	0
SOSA	Solitary sandpiper	wader	33000	8250	60	125.8384	17.374	7.242917	9.242917	76254.06	31772.53	7.85	118	236
WILL	Willet	wader	6250	1562.5	175	267.3583	17.374	15.38841	17.38841	27169.39	11320.58	2.80	42	84
SPSA	Spotted sandpiper	mud	29700	7425	40	94.58997	17.374	5.44434	7.44434	55274.23	23030.93	5.69	85	171
UPSA	Upland sandpiper	grass	10500	2625	125	210.9694	17.374	12.14282	14.14282	37124.91	15468.71	3.82	57	115
WHIM	Whimbrel	mud		0	200	293.7108	17.374	16.90519	18.90519	0	0	0.00	0	0
LBCU	Long-billed Curlew	grass		0	225	319.1033	17.374	18.36672	20.36672	0	0	0.00	0	0
HUGO	Hudsonian Godwit	wader	150	37.5	175	267.3583	17.374	15.38841	17.38841	652.0655	271.6939	0.07	1	2
MAGO	Marbled Godwit	wader	170	42.5	200	293.7108	17.374	16.90519	18.90519	803.4707	334.7795	0.08	1	2
RUTU	Rudy turnstone	mud		0	140	228.4909	17.374	13.15131	15.15131	0	0	0.00	0	0
REKN	Red knot	mud	750	187.5	140	228.4909	17.374	13.15131	15.15131	2840.871	1183.696	0.29	4	9
SAND	Sanderling	mud		0	60	125.8384	17.374	7.242917	9.242917	0	0	0.00	0	0
SESA	Semi-palmated sandpiper	mud	735000	183750	30	77.24817	17.374	4.446194	6.446194	1184488	493536.7	121.96	1829	3659
WESA	Western sandpiper	mud	122500	30625	30	77.24817	17.374	4.446194	6.446194	197414.7	82256.12	20.33	305	610
LESA	Least sandpiper	mud	90000	22500	25	67.94298	17.374	3.910613	5.910613	132988.8	55411.99	13.69	205	411
WRSA	White-rumped sandpiper	mud	4000	1000	40	94.58997	17.374	5.44434	7.44434	7444.34	3101.808	0.77	11	23
BASA	Baird's sandpiper	grass	300	75	40	94.58997	17.374	5.44434	7.44434	558.3255	232.6356	0.06	1	2
PEEP	Small sandpiper	mud		0	30	77.24817	17.374	4.446194	6.446194	0	0	0.00	0	0
PESA	Pectoral sandpiper	wader	132000	33000	60	125.8384	17.374	7.242917	9.242917	305016.3	127090.1	31.40	471	942
PUSA	Purple sandpiper			0	44	101.1546	17.374	5.822181	7.822181	0	0	0.00	0	0
DUNL	Dunlin	mud	63750	15937.5	35	86.10309	17.374	4.955859	6.955859	110859	46191.25	11.41	171	342
STSA	Stilt sandpiper	wader	16000	4000	75	147.2441	17.374	8.47497	10.47497	41899.88	17458.28	4.31	65	129
BBSA	Buff-breasted sandpiper	grass	1500	375	50	110.6801	17.374	6.370447	8.370447	3138.918	1307.882	0.32	5	10
SBDO	Short-billed dowitcher	wader	32000	8000	125	210.9694	17.374	12.14282	14.14282	113142.6	47142.74	11.65	175	349
LBDO	Long-billed dowitcher	wader	5000	1250	125	210.9694	17.374	12.14282	14.14282	17678.53	7366.054	1.82	27	55
DOSP	Dowitcher spp.	wader		0	125	210.9694	17.374	12.14282	14.14282	0	0	0.00	0	0
COSN	Common snipe	wader	660000	165000	150	239.8629	17.374	13.80585	15.80585	2607966	1086652	268.52	4028	8055
AMWO	American woodcock			0	44	101.1546	17.374	5.822181	7.822181	0	0	0.00	0	0
WIPH	Wilson's phalarope	wader	1500	375	40	94.58997	17.374	5.44434	7.44434	2791.628	1163.178	0.29	4	9
NOPH	Northern phalarope	wader		0	44	101.1546	17.374	5.822181	7.822181	0	0	0.00	0	0
REPH	Red phalarope	wader		0	40	94.58997	17.374	5.44434	7.44434	0	0	0.00	0	0
MISC	Miscellaneous	mud		0	40	94.58997	17.374	5.44434	7.44434	0	0	0.00	0	0
Total=			2391645	597911.3	87.04545	163.522							9234	18469

Appendix IV. Converting shorebird population objectives into foraging habitat objectives in managed wetlands.