Business Plan for the Conservation of the American Oystercatcher

A 10-Year Plan to Secure a Coastal Keystone Species

American Oystercatcher Working Group

National Fish and Wildlife Foundation

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WHAT IS A BUSINESS PLAN?

A business plan serves two broad, primary functions. First, it provides specific information to those (e.g., prospective investors) not familiar with the proposed or existing business, including its goals and the management strategy and financial and other resources necessary to attain those goals. For outside individuals, it is imperative that the business plan offer a clear rationale for why the goals represent a good investment and why the strategy for achieving those goals is the best one possible. Second, a business plan provides internal guidance to those who are active in the operation of the business, allowing all individuals to understand where the business is headed and the means by which it will get there. The plan helps keep the business from drifting away from its goals and key actions through careful articulation of a strategy.

In the context of the National Fish and Wildlife Foundation's conservation efforts, business plans represent the strategies necessary to meet the goals of Keystone and other initiatives. At its core, each business plan emphasizes the type(s) and magnitude of the impacts (benefits) that will be realized through the initiative, the monetary costs involved, and the potential obstacles (risks) to achieving those gains. Readers of the business plan must be able to see the strength of the relationship between the activities identified within the strategy and the anticipated outcomes. Investors also must be able to see their investment as being integral to achievement of those outcomes.

EXECUTIVE SUMMARY

American Oystercatcher is a large, stately shorebird that inhabits coastal marshes, beaches, and islands along Atlantic and Gulf coasts of the U.S. Although American Oystercatchers can be found sporadically along coastlines elsewhere in the Western Hemisphere, the subspecies that inhabits the eastern U.S. is distinct in its taxonomy and geographic range. Biologists have become increasingly concerned about the long-term prospects for American Oystercatchers. Once a fairly common bird along the eastern seaboard, oystercatchers there now number only 11,000, irregularly distributed between Maine and Texas.

Despite existing conservation efforts American Oystercatchers in eastern North America are projected to decrease by at least 12% during the next decade, though that may be overly optimistic. Through this business plan, a partnership has laid out an aggressive 10-year goal to increase the Atlantic and Gulf Coast population of American Oystercatchers by 30% -- a 42% marginal increase over population levels if additional actions identified through this business plan are not implemented. If accomplished, scientists believe that the enhanced oystercatcher population will provide a robust foundation for long-term persistence of the species in the face of anticipated sea-level rise and coastal changes associated with global climate change and other anthropogenic influences. Efforts directed towards American Oystercatchers will also benefit more than a dozen other bird species of high conservation priority. Meeting this goal is projected to require $1.45 million of annual funding beyond that already being directed specifically towards American Oystercatchers.

Efforts and funding will be focused strategically on specific locations within coastal states between Maine and Texas, and on five key issues necessary to reverse population declines:

(a) *Management of predation*. Native and non-native predators have boomed in coastal areas because of their ability to adapt to and thrive in human-altered landscapes. Action: direct predator removal and habitat management that reduces the attractiveness of oystercatcher nesting areas as predator foraging sites.
(b) *Management of disturbance*. Direct human disturbance to nesting and foraging birds has profound negative consequences to oystercatchers. Action: public education and outreach, and limiting human access to critical nesting areas.
(c) *Management and acquisition of habitat*. Dynamic systems, such as coastal zones, require management to abate the changes brought about by human and natural actions. Action: implement targeted projects that reduce flooding of nests, provide habitat buffers, restore coastal marshes and intertidal zones, and reduce threats of invasive plants.
(d) *Assessment of reproductive success, survival, and population size*. Evaluation of, and adjustments to, the strategies presented in this business plan require targeted assessment of demographic characteristics of the oystercatcher population. Action: research directed at the relationship between oystercatcher populations and threats and conservation actions that are implemented.
(e) *Assessment of potential climate change effects*. Future climate change could alter coastal environments to the extent that the existing business plan is rendered ineffective. Action: research to identify potential future threats to existing coastal habitats and, if necessary, recommendations for abating those threats.

A major portion of the actions described in this business plan will facilitated through a competitive grants program administered by the National Fish and Wildlife Foundation and implemented by federal, state, and local government agencies, non-governmental organizations, and academic institutions.

Moderate-to-high levels of risk are associated with meeting the goals of this initiative; specifically, the threats that are posed by climate-change induced sea level rise, anticipated human population growth along coastlines, and challenges in generating adequate funding to carry out long-term programs.

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CONSERVATION NEED

The American Oystercatcher is a large shorebird that inhabits coastal salt marshes and mudflats throughout the year, and occurs in largest concentration along the mid-Atlantic and southeastern United States coast. The American Oystercatcher (*Haematopus palliatus palliatus*) is classified as a species of high conservation concern by the U.S. Fish and Wildlife Service along both the Atlantic and Gulf coasts of the United States because of its small and declining population of about 11,000 individuals. The world's pre-eminent shorebird conservation consortium, the Western Hemisphere Shorebird Reserve Network, has designated American Oystercatcher populations in North America as being of "high concern." The species occurs only in the coastal zone near mudflats and intertidal shellfish beds where oysters, small clams, snails, crabs, worms, and aquatic insects are available. Most birds overwinter in the United States, but some migrate to Central America and the Caribbean. While other genetically and geographically distinct subspecies of *H. palliatus* occur in southern California and Mexico, and Central and South America, this business plan addresses only the population on the Atlantic and Gulf coasts.

Historical oystercatcher population levels are difficult to determine, but declines of at least 50% may have occurred since the early 1800s because of unrestricted hunting and concentrated human development in coastal areas.[1] The major current threats to the persistence of American Oystercatcher populations are:

- Loss of habitat from coastal development
- Disturbance from human recreational activities
- Elevated predation associated with human activities and land use changes

In addition, two other threats – not yet fully documented -- could pose serious risk to oystercatchers:

- Contamination of primary food sources by non-point pollution or oil spills
- Effects of climate change, especially rising sea-level and heightened storm surges

In the past few decades, American Oystercatchers have recolonized the northeastern states and southeastern Canada from where the species was extirpated a century before. Overall, however, the species remains highly vulnerable along the Atlantic and Gulf coasts because of its small overall population size, its widespread declines, and the many different threats facing its primary habitats. In fact, preliminary population modeling[2] suggests that the oystercatcher will decline even further over the next 10 years, from its current level of 11,000 individuals to 9,700 individuals (a 12% loss) or less, in the absence of more aggressive conservation actions.

[1] *Nol, E. and R.C. Humphrey. 1994. American Oystercatcher (Haematopus palliatus), The Birds of North America Online (A. Poole, Ed.). Cornell Lab of Ornithology, Ithaca, New York.*

[2] *Simons, T.R. 2008.Unpublished data. USGS Cooperative Fish & Wildlife Research Unit, North Carolina State University.*

CONSERVATION OUTCOMES

Through this initiative, we will stabilize and increase the declining and imperiled eastern North American population of American Oystercatchers to a level that ensures its long-term persistence. We have established several population outcomes (targets) for American Oystercatchers that reflect expectations based upon various levels of funding that might be secured (Figure 1). The desired outcome is a 30% increase in the oystercatcher population (42% marginal increase over that predicted without increased funding) over a 10-year time period.

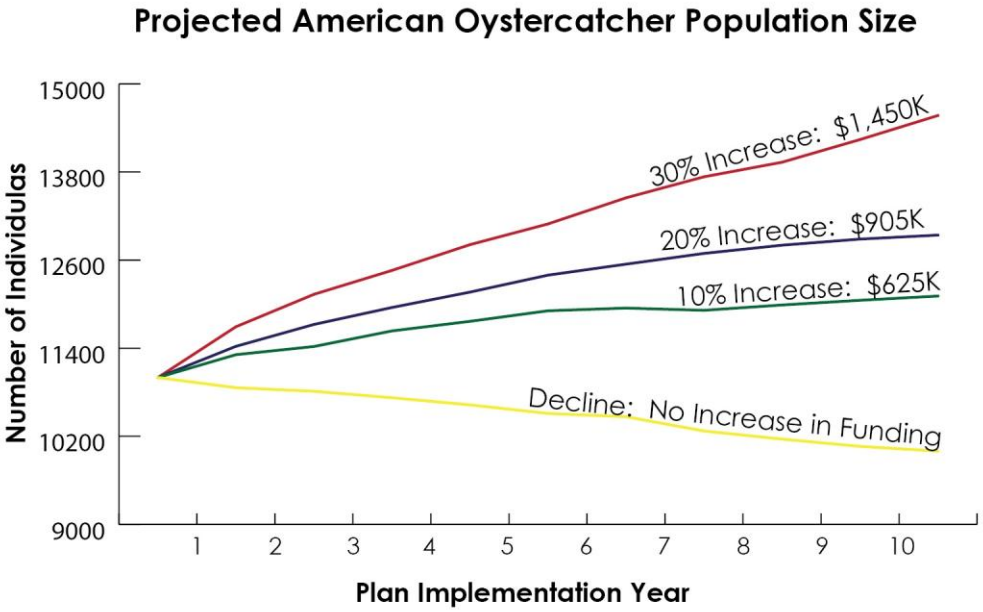


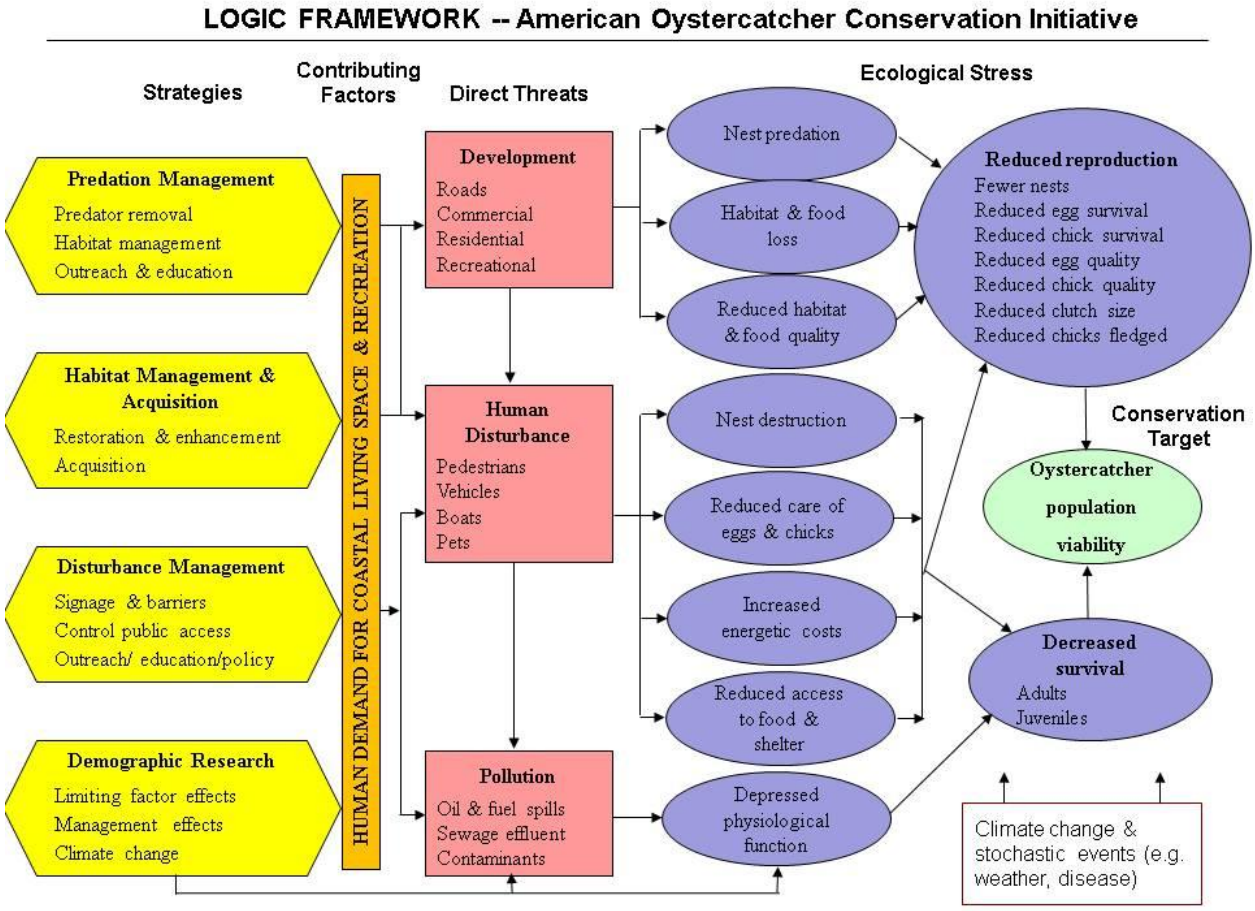
Figure 1. Expected changes in American Oystercatcher population size on Atlantic and Gulf coasts with various levels of targeted financial investment over a 10-year period.

IMPLEMENTATION PLAN

American Oystercatcher populations are limited mainly by (a) *poor reproductive success* associated with high predator populations and disturbances to nests by humans; and (b) *annual mortality to juveniles and adults* that may be related to quality of habitat during migration and winter. Our implementation strategy for oystercatchers, therefore, is aimed at increasing fecundity (fledging more chicks per nest) and increasing annual survivorship.

We propose *five key strategies* as core conservation efforts necessary to address those limiting factors. Within each strategy, we have established two tiers that reflect the relative importance of implementing specific actions in certain geographic areas. Tier 1 projects have a relatively high chance of significantly contributing to population goals, generally because those projects will occur in regions (states) with high oystercatcher density. Tier 2 projects also have a direct and important link to population goals, but are not expected to have the same level of benefit as Tier 1 projects. Nonetheless, both tiers of activities are necessary to achieve the desired population outcome.

The following logic model outlines the hypothesized relationships among threats to (factors limiting) the Atlantic and Gulf coast American Oystercatcher population and the conservation actions necessary to realize the desired population increase of 30% over a 10 year timeframe.



Key Strategy 1: Management of Predation

Oystercatchers appear to be limited mainly by unusually high predation on nests and chicks, and reversing this by controlling predators is a promising conservation strategy

Raccoons, feral cats, red fox and other mammals often are found in high densities in areas of human development, such as coastal zones. For oystercatchers, this often results in high predation of eggs and chicks. We will expand efforts to control and manage oystercatcher nest and chick predators at select sites across the species' range and to assess and implement other innovative management strategies (such as controlling access to supplemental food that results from human presence) to alleviate predation pressure on nesting oystercatchers (Tables 1 and 2). Preliminary results of predator control projects by The Nature Conservancy on Virginia's Eastern Shore are very encouraging.

Table 1. Tier 1 projects for management of predation on eggs and chicks of American Oystercatchers.

STATE (specific sites)	KEY PARTNERS	ESTIMATED OUTCOME
New Jersey (southern coast, barrier islands, key breeding areas)	NJ Div. Fish & Wildlife, USFWS, NPS, USDA Wildlife Services	Increased nest success for 150 pairs of oystercatchers (including Sandy Hook, Island Beach State Park/Sedge Islands, Holgate, Hereford Inlet)
Virginia (barrier islands)	The Nature Conservancy, USFWS, VA Dept. Game & Inland Fisheries, USDA Wildlife Services	Increased nest success for at least 400 pairs of oystercatchers at 9 sites along the Virginia barrier island chain
Massachusetts (Cape Cod, islands)	MA Audubon, MA Div. of Fisheries & Wildlife, Manomet, USDA Wildlife Services, towns of Chatham and Nantucket, USFWS	Increased nest success for 175 pairs of oystercatchers on islands & coast
North Carolina	USGS NC State University Coop Unit, NC Wildlife Resources Comm., NC Audubon, NPS, USFWS	Increase nest success for 130 pairs of oystercatchers on outer barrier island beaches
South Carolina (Cape & Lighthouse Islands)	SC DNR, USFWS	Increased nest success for 200 pairs in the Cape Romain Region
Georgia & South Carolina (barrier islands)	GA DNR, SC DNR, St. Catherines Island Survival Center, GA Sea Turtle Center, SC Raptor Center	Develop capacity to reduce predation via avian husbandry techniques; expect increase in fledging rate, with application across entire range

Table 2. Tier 2 projects for management of predation on eggs and chicks of American Oystercatchers. Predator control projects in these areas, while important for species recovery, are not expected to have the same impact on oystercatchers as Tier 1 projects.

STATE (specific sites)	KEY PARTNERS	ESTIMATED OUTCOME
Florida (Gulf coast, Tampa Bay region)	FL Fish & Wildlife Comm., Audubon of Florida	Increased nest success for 120 pairs of oystercatchers
New York (Long Island)	USDA Wildlife Services, NY Dept. Environmental Conservation	Initial assessment of feasibility of predator management (initially up to 110 pairs)
Gulf Coast states	State fish & wildlife agencies, USFWS, USDA Wildlife Services	Initial assessment of feasibility of predator management

Key Strategy 2: Management of Disturbance

Human use of coastal habitats affects oystercatchers in many ways, and learning to coexist requires understanding and mitigating these impacts

The Atlantic coast is the most densely populated region of the United States, and simple recreational activities in coastal zones can have distressing consequences for wildlife, including American Oystercatchers. Oystercatchers require mudflats, shellbeds, and beaches for foraging and nesting. Human disturbance affects many different needs of oystercatchers, including nesting, foraging, and even resting. Each time the birds are disturbed, oystercatchers are less able to get the food resources needed to raise young and survive. It is clear that as coastal development continues, education about the effects of disturbance and control of access to critical areas will become increasingly important. As one example, the oystercatcher population at Cape Hatteras National Seashore has declined by 51% in nine years, despite the fact that the amount of habitat has not changed.[3] Experts state that the cause of that downturn in oystercatcher numbers is likely to be the decline in habitat quality as visitor use and vehicle traffic increase. Control of human disturbance through public education (e.g., user group presentations), outreach (sign postings), and enforcement of restricted areas have been shown to have a strong positive effect on reproductive success and survival, and is therefore identified in this business plan as a key strategy in recovering oystercatcher populations. Those efforts are critical during both the breeding and non-breeding seasons (Tables 3 and 4)

[3] *Simons, T.R. 2008. Unpublished data. USGS Cooperative Fish & Wildlife Research Unit, North Carolina State University.*

Table 3. Tier 1 projects for management of human disturbance to American Oystercatchers during the breeding and non-breeding seasons.

STATE (specific sites)	KEY PARTNERS	ESTIMATED OUTCOME
Breeding Season		
New Jersey	NJ Div. Fish & Wildlife, USFWS, Rutgers University	Reduce rate of nest loss, thus increasing nest and chick survival (400 pairs of oystercatchers)
Virginia	The Nature Conservancy, VA Dept. Game & Inland Fisheries, VA Marine Resources Comm., VA Dept. Conservation & Recreation	Reduce rate of nest loss, thus increasing nest and chick survival (500 pairs of oystercatchers)
North Carolina	USGS NC State University Coop Unit, NC Wildlife Resources Comm., NC Audubon, NPS	Reduce rate of nest loss, thus increasing nest and chick survival (330 pairs of oystercatchers)
South Carolina	SC DNR, Clemson University, USFWS	Reduce rate of nest loss, thus increasing nest and chick survival (400 pairs of oystercatchers)
Florida	FL Fish & Wildlife Conservation Comm., Audubon of Florida	Reduce rate of nest loss, thus increasing nest and chick survival (390 pairs of oystercatchers)
Non-Breeding Seasons		
South Carolina	SC DNR, Clemson University, USFWS	Reduce disturbance to roosting and foraging oystercatchers, thereby increasing survival (3,270 birds)
Florida	FL Fish & Wildlife Conservation Comm.	Reduce disturbance to roosting and foraging oystercatchers, thereby increasing survival (1,550 birds)

Table 4. Tier 2 projects for management of human disturbance to American Oystercatchers during the breeding and non-breeding seasons. Human disturbance projects in these areas, while important for species recovery, are not expected to have the same impact on oystercatchers as Tier 1 projects.

STATE (specific sites)	KEY PARTNERS	ESTIMATED OUTCOME
Breeding Season		
Massachusetts	MA Audubon, Manomet, USFWS, NC State University, College of Staten Island	Reduce rate of nest loss, thus increasing nest and chick survival (200 pairs of oystercatchers)
New York	NY Dept. Environmental Conservation, others to be determined	Reduce rate of nest loss, thus increasing nest and chick survival (110 pairs of oystercatchers)
Maryland	MD DNR, others to be determined	Reduce rate of nest loss, thus increasing nest and chick survival (110 pairs of oystercatchers)
Georgia	GA DNR, others to be determined	Reduce rate of nest loss, thus increasing nest and chick survival (100 pairs of oystercatchers)
Non-Breeding Season		
Georgia	GA DNR, University of GA	Reduce disturbance to roosting and foraging oystercatchers, thereby increasing survival (880 birds)
North Carolina	NC Wildlife Resources Comm., NC Audubon, NPS, NC State University	Reduce disturbance to roosting and foraging oystercatchers, thereby increasing survival (580 birds)

Key Strategy 3: Population Assessment and Monitoring

We need to know how many birds there are, how successfully they are reproducing and surviving so that we can measure the success of our conservation efforts and adapt ongoing efforts to maximize conservation benefits.

Assessment and monitoring form the backbone of any successful conservation program. Through the American Oystercatcher Working Group, monitoring of breeding and wintering populations, as well as reproductive success, has provided the scientific basis for the development of this business plan. However, these efforts are fragmented and not well coordinated because of funding limitations. Continued monitoring of reproductive success will be vital for measuring the effectiveness of the conservation actions implemented through this plan. Winter population surveys offer a measure of total population size, indicating the level of range-wide success. Our plan focuses on efforts to monitor oystercatcher numbers and reproductive success in states with large breeding and overwintering

populations (Tables 5). Secondary (Tier 2) assessment projects will be development in states (Rhode Island, Connecticut, New York, Delaware, Maryland) with smaller numbers breeding and overwintering oystercatchers, or with less current capacity to implement those activities.

Table 5. Tier 1 projects for assessing population size, reproduction, and survival of American Oystercatchers and monitoring those trends through time.

STATE (specific sites)	**KEY PARTNERS**	**ESTIMATED OUTCOME**
Massachusetts	MA Audubon, Manomet, MA Div. Fisheries & Wildlife, Trustees of Reservations, Nantucket Conservation Found., USFWS, Lloyd Center for Environmental Studies	Assess effectiveness of management activities, which improves ability to effectively manage populations; results in increased fecundity and survival of oystercatchers
New Jersey	NJ Div. Fish & Wildlife, Rutgers University, Conserve Wildlife Found. NJ, USFWS, NPS, Wetlands Institute	
Virginia	USFWS, The Nature Conservancy, VA Dept. Game & Inland Fisheries, Center for Conservation Biology	
North Carolina	USGS NC State University Coop Unit, NC Wildlife Resources Comm., NC Audubon, NPS	
South Carolina	SC DNR, Clemson University	
Georgia	University of GA, NPS, Georgia DNR	
Florida	FL Fish & Wildlife Comm., FL Audubon, Doris & Patrick Leary	

Key Strategy 4: Reduce Gaps in Knowledge of Demographics and Limiting Factors

Demographic studies tell us where the population is headed, what limits overall population, and how effective our conservation efforts have been at changing population trend

Demographic models use estimates of survival and reproduction (data collected through strategy 3) to estimate rates of population growth or decline. We can use demographic models to estimate the population growth rate changes expected to be brought about by our various management actions, which are useful in understanding the bottlenecks that limit population size and predicting actions that will reduce those bottlenecks (see box at right). Existing demographic models for American Oystercatchers are based on incomplete information about reproductive success and annual survival. In addition, potential impacts of global climate change have not been evaluated in detail. These research efforts are indispensible for creating future roadmaps for conservation of this species (Table 6).

Demographic Models Guide Our Management Actions

Consider the importance of demographic research being developed by U.S. Geological Survey's Cooperative Research Unit at North Carolina State University. They have developed a preliminary model upon which much of our business plan rests. Using limited data, the model estimates an oystercatcher population growth rate of 0.988, which indicates a population declining by >1% per year. If this model reflects changes across the entire oystercatcher range, the population of 11,000 will drop to 9,700 in 10 years.

For oystercatchers, fecundity is the demographic trait most responsive to conservation actions. If we are able to raise annual fecundity from 0.155 to 0.255 (average number of chicks fledged per female), the population will shift from one that is declining to one that is growing at nearly 2% per year. This increase in fecundity is well within our grasp when management actions reduce nest predation and disturbance levels. This is an example of how demographic models allow us to allocate our resources towards those actions that result in the largest gains.

Key Strategy 5: Habitat Management and Acquisition

Some key habitats are not protected, and because coastal development continues, additional habitat must be protected, created, and more effectively managed

Oystercatchers use many protected coastal areas for breeding and wintering, but some key areas are not protected and are vulnerable to development. Securing these critical areas through acquisition or conservation easements is an important strategy in our long- term effort to support populations of oystercatchers and other coastal species. Funding opportunities for land acquisition and management exist, but there is a critical need for staff support to develop proposals.

There may be great opportunity to use existing government programs to create habitat that is beneficial to American Oystercatchers. For example, biologists are working with the U.S. Army Corps of Engineers to build and enhance nesting habitat. Our business plan proposes to expand efforts and cooperative agreements with the Corps to make use of dredge material for augmenting nesting habitat and restoring eroding breeding sites. Plans need to be developed that outline timing and placement of material so breeding birds are minimally impacted and to ensure that nesting sites are at elevations that minimize flooding. Existing oystercatcher habitat, too, is in need of innovative management. For example, reducing "nest-swamping" by boat wakes, enhancing nest sites through addition of oyster shells, and reducing the exposure of salt marshes and tidal flats to contaminants are necessary for maintaining existing high quality breeding and non-breeding habitat (Table 7).

Table 6. Projects for developing and refining demographic models that predict future population trajectories and help guide investments towards those conservation actions that will result in the greatest gains in oystercatcher populations.

STATE (specific sites)	KEY PARTNERS	ESTIMATED OUTCOME
Massachusetts	MA Audubon, Manomet, Monomoy Island NWR	Improved predictive capabilities for more effectively directing efforts towards actions that have greatest benefits to oystercatchers (expected 20% *increase* in return from investments)
New Jersey	Rutgers University, NJ Div. Fish & Wildlife, Conserve Wildlife Found. of NJ	
Virginia	USFWS, The Nature Conservancy, VA Dept. Game & Inland Fisheries	
North Carolina	USGS NC State University Coop Unit, NC Wildlife Resources Comm., NC Audubon, NPS	
South Carolina	SC DNR, Clemson University	
Georgia	University of GA, NPS, Georgia DNR	
Florida	FL Fish & Wildlife Comm., universities, Doris & Patrick Leary	

Table 7. High priority projects for acquiring, protecting, and managing habitats that provide more and higher quality nesting and overwintering sites for American Oystercatchers.

STATE (specific sites)	KEY PARTNERS	ESTIMATED OUTCOME
North Carolina South Carolina Florida (Tampa Bay region)	U.S. Army Corps of Engineers, State Depts. Transportation, NC Wildlife Resources Comm., SC DNR, Florida Fish & Wildlife Comm., USFWS	Create 200 acres (>30 sites) of new & existing dredged islands under existing government protocols (habitat for 2,000 wintering oystercatchers & 300 nesting pairs) Other activities focus on management of existing habitat.
Georgia South Carolina North Carolina Virginia Florida (Gulf Coast)	NC Wildlife Resources Comm., SC DNR, FL Fish & Wildlife Comm., USFWS	Identify prospective lands for acquisitions & easements, including add-on coastal lands to existing refuges, parks & natural areas Establish management protocols for breeding & wintering sites in emergent alluvial and tidal sand-spits, sand islands & oyster shell bars Secure 100 acres of accretional, emergent lands (60 breeding pairs)
Virginia North Carolina South Carolina Florida (Gulf Coast)	The Nature Conservancy, NC Wildlife Resources Comm., SC DNR, FL Fish & Wildlife Comm., USFWS, VA Dept. Game & Inland Fisheries, land trusts	Encourage partners to purchase coastal properties important to oystercatcher survival (target 300 acres to support 1,000 birds)

Risk: Obstacles to Success

Risk is an uncertain event or condition which, if it occurs, could have a negative effects on an initiative's desired outcome. We have identified seven risk event categories (see box on next page) that could substantially impede progress towards our stated population goal for the American Oystercatcher during the next 10 years. Risks associated with threats that are not likely to be manifested in that time period, but are likely to have a significant influence on our ability to attain the desired population outcomes, are also identified. These seven categories are evaluated below in the context achieving our stated oystercatcher population goals.

Regulatory. Chances are low that regulatory or policy changes will impede the conservation activities in this plan because the plan has already been constructed to account for those existing impediments. Changes that would make existing laws or policies less compatible with oystercatcher conservation do not appear likely in the foreseeable future.

Financial. Bringing about a 30% (42% marginal) increase in oystercatcher populations requires a level of funding above that currently directed towards oystercatchers. Two types of financial risk events have

potential to prevent long-term security of oystercatcher populations. Insufficient generation of funds by both NFWF and its partners during the course of this program is certainly a concern. In fact, the American Oystercatcher Working Group already has raised the probable difficulty of meeting match ratios of 2:1 (what is projected in the business plan). In the first grants cycle open under the American Oystercatcher Keystone Initiative (2008), seven grant proposals totaling nearly $1 million in requests to NFWF (over a 3-year period) were matched by only $1.2 million in non-federal funds, a ratio of 1.2:1 and short of expectations. The second type of financial risk involves the ability of the oystercatcher partnership to maintain necessary funding for conservation activities once NFWF funding is no longer available, regardless of whether our population target has been met. For example, direct predator control is likely to be an important long-term management strategy, even if other management actions become more prominent after the initial reduction of local predator populations. Other, creative means of controlling predator populations (e.g., working with state wildlife agencies and furbearer associations to enhance trapping efforts in certain coastal areas) are likely to be necessary and those discussions have already begun in order to manage this type of risk.

Categories of Risk Events

The extent by which the following risk events impede progress towards desired initiative outcomes.

Regulatory. Existing or potential future laws, regulations, policies, or judicial decisions.

Financial. Level or stability of financial resources necessary to implement strategies outlined in business plan.

Environmental. Biological or environmental.

Scientific. Scientific understanding of the threats or necessary conservation actions.

Social. Social conditions or considerations.

Economic. Existing or anticipated economic factors or conditions.

Institutional. Existing or anticipated institutional capabilities.

Overall, both short-term and long-term financial shortfalls appear to be likely risks of this initiative, though those shortfalls are not likely to be so severe that the impacts will be large. In addition to that identified above, several strategies have been put in place that will help ensure adequate funding. First, the American Oystercatcher was chosen (in part) because it is a high priority to both the federal and multiple state governments, and to numerous non-governmental organizations along coastlines in eastern United States. Through this initiative, regular updates on progress towards population outcomes are expected to keep the American Oystercatcher "visible" to our partners and other prospective funding sources. Second, development of this business plan will provide prospective funders with an unequivocal understanding of the direction of this initiative and explicit insight into how their investment will benefit the oystercatchers in North America. The business plan also lays out a diverse set of actions that is intended to better engage a broader suite of partners and donors.

Environmental. Coastal shorebirds have evolved in an environment that is regularly affected by severe weather events and habitat change, so natural hazards are not likely to affect this species to any great extent. While human-caused, single events that affect the environment are always possible (e.g., oil spills, local or regional contamination), the chances are low that a large portion of the oystercatcher population would be affected. Disease and problems from invasive species are of minor concern. The greatest environmental problem is likely to stem from global climate change and, specifically, from the rising of sea level which could eliminate. In areas of high oystercatcher nesting density (e.g., Virginia, North and South Carolina), approximately two-thirds of existing beaches, oyster bars and rakes, and other low elevation land currently used by nesting oystercatchers will be underwater if sea level rises only modestly (1 m). Scientists believe that sea level rise of that magnitude is likely to take place along the Atlantic Coast in the next 50-100 years. Because many natural coastal habitats already are built up with human development, there may be few places to which coastal wetlands, mudflats,

oyster shelves, and beaches can "migrate" (inland). Additionally, hardened storm walls may be one popular alternative for keeping the rising ocean from inundating developed areas, and this would not be conducive for creation or maintenance of natural habitats that are used by oystercatchers. In virtually all scenarios, coastal species such as American Oystercatcher are likely to suffer unless innovative solutions are found (though oystercatchers have been found to be fairly flexible in nesting requirements, so negative impact should be moderated).

Scientific. American Oystercatcher conservation has benefited greatly from an active, sophisticated group of biologists and scientists. The causes behind oystercatcher declines and limitations for recovery are well known, as are the short-term and long-term actions necessary to meet population targets. Nevertheless, our success depends on the accuracy of our hypotheses about factors limiting populations of oystercatchers. Identification of potential limiting factors (e.g., predation, disturbance) that are not critical to oystercatcher populations will lead to misguided conservation actions that will not produce the intended changes in oystercatcher populations. We will minimize the risk associated with incorrect identification of limiting factors (and actions required to address those factors) by placing all actions in the context of adaptive management. This strategy not only uses research and monitoring to assess current hypotheses, but also to make adjustments to those hypotheses and actions in light of new scientific information. In certain situations, the correct limiting factor may have been identified along with management actions that can abate those limitations, but for social or other reasons those actions cannot be implemented. In these instances, the adaptive management approach will still allow for identification and testing of alternative actions that can reduce the stress on the population.

Social. Atlantic and Gulf coastal habitats have experienced rapid human growth in the past 50 years, and coastal counties there are expected to grow by another 30-50% in the next 30 years. Hence, additional loss of habitat, increased human disturbance and environmental contamination, and growth in predator populations are likely to follow that human growth. All of those effects will result in additional environmental stress on oystercatchers and other shorebirds. The best means of abating those threats to oystercatchers are land acquisition and protection in areas that are of greatest importance, as well as creating a stronger conservation ethic in the human population occupying these areas. If those actions are not taken, and in combination with sea level rise, human populations are very likely to displace bird populations.

Economic. The economic and standard-of-living incentives that drive coastal development today are not anticipated to change in the foreseeable future, and those factors have already been considered in this business plan. However, as identified above, the continued development of coastal regions will only exacerbate land values, which will increase the difficulty of securing additional lands for conserving oystercatchers and other species. So, economic pressures will continue to place a modest risk on efforts to secure oystercatcher populations.

Institutional. Federal and state wildlife agencies, and non-governmental groups have shown keen interest in American Oystercatcher conservation and have devoted significant resources towards its recovery. We do not anticipate that those efforts will diminish

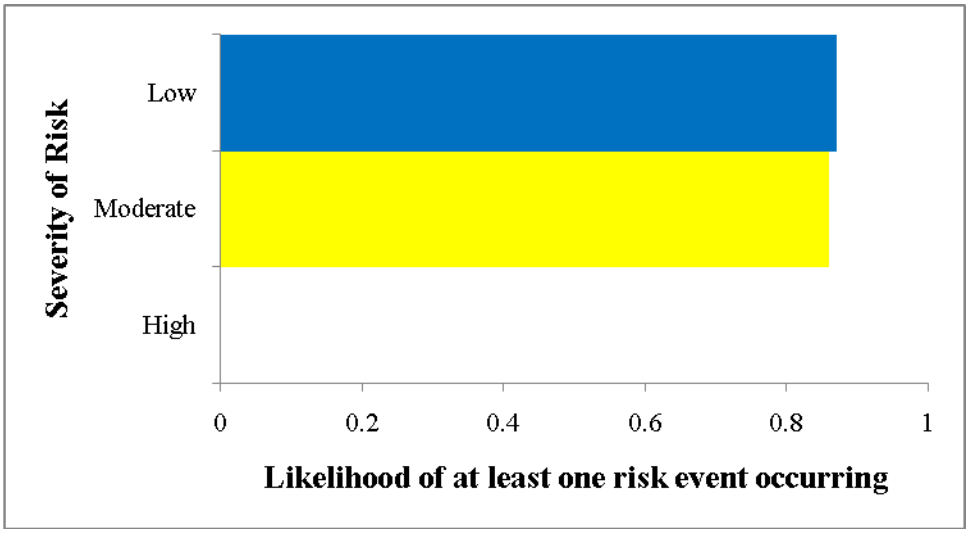


Figure 2. The likelihood that at least one negative event of low (20% or less of goal affected), moderate (21-40% of goal affected) ,or high (41-100% of goal affected) magnitude will occur during this initiative. Probabilities for each magnitude were derived by estimating the probability (to nearest 10%) and impact (using five categories, but reduced to three in this graphic) of different risk events (with at least a 10% chance of occurring), then calculating the probability that at least one event of each different severity would occur.

FUNDING NEEDS

The population changes that we have estimated to occur through implementation of the described actions are dependent, in large part, on the level of financial investment. This business plan is built upon the assumption that adequate funds can be raised on an annual basis to affect a 30% increase in the Atlantic and Gulf coast population of American Oystercatchers over a 10-year period. That sum, *representing additional funding above that currently directed towards oystercatchers*, is equivalent to an investment of $14.5 million over the 10-year period, and can be roughly broken down into the budget categories identified in Table 9. The annual budgets for each of the first 5 years of this initiative are projected to approximate 1/10 of the total cost for each budget category. Years 6-10 are likely to be similar, but will certainly require some adjustment based upon the results obtained during the initial years.

Fully one-third ($500,000) of the additional $1.45 million of annual funding necessary to realize a 30% growth in oystercatcher populations needs to be raised by NFWF. Federal appropriations directed towards this initiative are expected to be approximately $200,000/year (American Oystercatcher is a high priority species for the USFWS). The remaining $300,000/year needs to be realized through other existing or new funding sources. Existing NFWF Charter programs, including Chesapeake Bay Small Watershed Grants, Shell Marine Habitat, ConocoPhillips SPIRIT of Conservation Migratory Bird Program, and Southern Company Power of Flight are well matched sources for the oystercatcher initiative. NFWF's Impact-Directed Environmental Account (IDEA) Program, which manages funds that originate from court orders, settlement of legal cases, regulatory permits, and mitigation plans, also could serve as a funding source for oystercatcher projects. In particular New Jersey Coastal Conservation Fund, Long Island Sound Futures Fund, Delaware Estuary Watershed Grants, Dissolved Oxygen Environmental Benefits Fund, and Vessel Source Pollution Prevention and Compliance Fund are aligned with the objectives of coastal habitat protection and restoration.

Table 9. Budget estimates, representing additional funding above that currently directed towards oystercatchers, for the first 10 years of the American Oystercatcher initiative. Years 1-5 figures depict the annual cost for each budget category. Years 6-10 provide an expectation of the direction and magnitude of change in expenditures from Years 1-5. Actual budgets will based on previous years results and any strategic changes in approaches to oystercatcher conservation.

BUDGET CATEGORY	YEARS 1-5 (Annual costs)	YEARS 6-10
Management of predation	$340,000	Decrease due to reduced predator populations
Management of disturbance	$300,000	Similar
Population assessment & monitoring	$380,000	Slight decrease due to more secure oystercatcher populations
Research	$350,000	Decrease due to heightened knowledge from previous research
Habitat management & acquisition	$80,000	Increase due to heightened knowledge of critical sites and habitat needs

EVALUATION

Timely success of this initiative requires dedication to an evaluation process that focuses on individual projects, each of the five strategies, and the collective outcomes across all projects. At each level, we will determine whether the planned actions are achieving the desired results.

Individual projects funded by NFWF will be evaluated based upon the anticipated outcomes identified in the full proposal. Typically, individual grantees will provide a summary of results and outcomes directly to NFWF as part of each grant agreement. However, periodically, individual projects will be evaluated by NFWF or independent 3rd party evaluators. Achieving the stated outcomes is obviously the desired result of these projects but, in those cases where outcomes were not realized, it is equally important to identify the reasons behind the discrepancy between expected and observed outcomes.

Because of the numerous extraneous factors operating on biological populations and the time lags between conservation actions and actual changes in population size, the contribution of an individual project to the desired outcome of a larger oystercatcher population can rarely be directly measured. Rather, in most situations, *indicators associated with potential population change* will be used to evaluate the level of success of a project (Table 10).

Projects under each of the five key strategies identified earlier are intended to collectively produce results that are meaningful and measureable whether those were directly or indirectly meant to result in an increase in oystercatcher numbers. Certainly, not all individual projects will produce the intended results. Some will fail for reasons that could have been controlled and others will fail for reasons that were largely uncontrollable. But, projects that use a similar strategy to address a limiting factor should collectively make progress towards the intended short- and long-term targets. The collaborative nature of this initiative will readily allow for periodic evaluations of the effectiveness of each strategy and its contribution to the overall desired outcome.

Finally, the combined results of setting in motion the various strategies are intended to produce a positive trajectory in the Atlantic and Gulf coast population of the American Oystercatcher. This will be evaluated systematically through range-wide population surveys every 5 years. Between those surveys, however, population assessments and demographic modeling should provide a comprehensive understanding of the types and magnitudes of factors limiting this population, and the relative population benefits offered by each of the key strategies.

LONG-TERM NFWF SUPPORT

This business plan lays out a strategy to achieve clear outcomes that benefit American Oystercatchers over a 10-year period. At that time, it is expected that the conservation actions taken under this initiative will have brought about new institutional and societal standards (e.g., more effective management and polices for conservation of oystercatchers, greater recognition by recreationists of the detrimental impacts of human disturbance) and environmental changes (e.g., more extensive and higher quality habitat, lower density of predators) that will have set the population in a positive direction such that maintaining those successes will be possible without further (or greatly reduced) NFWF funding. To help ensure that the population and other gains made in 10 years won't be lost after the exit of NFWF funding, the partnership must seek development of solutions that are long-lasting, cost-effective, and can be maintained at lower levels of funding in the future. Therefore, part of the evaluations of this initiative will address that staying power and the likelihood that successful strategies will remain successful at lower management intensity and financial investment.

The adaptive nature of this initiative will also allow NFWF and partners to regularly evaluate the strategies behind our objectives, make necessary course corrections or addition within the 10 year frame of this business plan. In some cases these corrections and additions may warrant increased investment by NFWF and other partners. However, it is also possible that NFWF would reduce or eliminate support for this initiative if periodic evaluation indicates that further investments are unlikely to be productive in the context of the intended outcomes.

Table 10. A preliminary list of indicators used to measure the results of individual projects associated with the five strategies identified as part of the American Oystercatcher initiative. Indirect indicators are those measures that do not directly reflect demographic properties of oystercatcher populations. Direct indicators are those metrics that more closely reflect changes in oystercatcher demographics.

KEY STRATEGY	INDIRECT INDICATORS	DIRECT INDICATORS
Management of predation	• No. predators removed	• Egg predation rate • Chick predation rate • No. nests initiated
Management of disturbance	• Frequency of human intrusion • Frequency of pet intrusion • No. signs/barriers erected • No. education/outreach programs • Contaminant levels	• Frequency of nest destruction • Egg predation rate • Nest abandonment rate • Timing of incubation/brooding • Activity budgets • Quality of eggs and chicks • No. nests initiated • No. birds using area for foraging
Population assessment & monitoring	• No. surveys completed • Accuracy and precision of population estimates	• Changes in the value of other direct indicators that resulted from more accurate and precise estimates of populations
Research	• No. research projects completed • No. adjustments made to strategies based upon research	• Changes in the value of other direct indicators that resulted from adjustments to strategies
Habitat management & acquisition	• Acres restored/enhanced/protected • Abundance of food/shelter • Frequency of human intrusion • Frequency of pet intrusion • Contaminant levels	• No. nests initiated • No. birds using area for foraging • Frequency of nest destruction • Egg predation rate • Nest abandonment rate • Timing of incubation/brooding • Activity budgets • Quality of eggs and chicks

APPENDIX 1 – AMERICAN OYSTERCATCHER NATURAL HISTORY

APPENDIX 2 -- ANCILLARY BENEFITS

Measureable benefits are likely to accrue to other high priority[4] bird species through strategies and actions directed at American Oystercatchers, as described above. The benefits are likely to be greatest for those species whose breeding populations are concentrated along the Atlantic coast and (a) use beaches, shell bars, and intertidal wetlands for nesting and foraging, or (b) whose nests are especially vulnerable to mammalian predation. Ideally, benefits accrued to these species (Table A1) should be measured (along with benefits directed towards oystercatchers), but that will require individual assessment and monitoring plans and logic models.

[4] *Species that have been recognized as high conservation priority by leading bird conservation consortia (i.e., Partners in Flight*, North American Waterfowl Management Plan, United States Shorebird Conservation Plan, and Waterbird Conservation for the Americas) and which, in general, score at least a "13" (out of 20) using the Partners in Flight species conservation assessment process(Panjabi et al. 2005;The Partners in Flight handbook on species assessment. Partners in Flight Technical Series No. 3. Rocky Mountain Bird Observatory, Fort Collins, Colorado).

Table A1. Other high priority bird species likely to benefit from actions directed towards American Oystercatchers. The magnitude of benefits are described in general terms as having small (Low; <10% marginal increase in population) or modest (Mod; >10% marginal increase) positive impact on continental populations of these species over a 10-year period. Check marks indicates actions that are likely to offer the greatest benefits to each species.

Species	Overall Benefits	Predation Management	Disturbance Management	Population Assessment & Monitoring	Research	Habitat Management & Acquisition
Mottled Duck	Low					✓
Clapper Rail	Low					✓
King Rail	Low					✓
Least Tern	Low	✓	✓		✓	✓
Roseate Tern	Low	✓	✓		✓	✓
Gull-billed Tern	Low	✓	✓		✓	✓
Black Skimmer	Mod	✓	✓		✓	✓
Piping Plover	Low	✓	✓		✓	✓
Wilson's Plover	Low	✓	✓		✓	✓
Red Knot	Low		✓		✓	✓
Sanderling	Low		✓		✓	✓
Willet	Low	✓	✓		✓	✓
Semipalmated Sandpiper	Low		✓		✓	✓
Saltmarsh Sharp-tailed Sparrow	Mod					✓
Nelson's Sharp-tailed Sparrow	Mod					✓

APPENDIX 3 -- ABOUT THIS DOCUMENT

This business plan was drafted during winter 2007 and spring 2008, combining the extensive technical expertise and land management experience of the American Oystercatcher Working Group (Working Group) and the conservation vision of the National Fish and Wildlife Foundation (NFWF). The document represents a first generation attempt to comprehensively map out an implementation plan for the restoration of the Atlantic and Gulf Coast population of American Oystercatchers (*Haematopus palliatus palliatus*) to a level that is both self-sustaining and secure from imminent threat of extinction. The business plan represents an initial accomplishment in a timely partnership between the Working Group, which had the foresight to coordinate and synergize the diverse talents and interests of its individual member organizations, and the NFWF, which was seeking ambitious and rigorously developed conservation programs in which to invest.

THE AMERICAN OYSTERCATCHER WORKING GROUP. In 2001, the American Oystercatcher was identified in the U.S. Shorebird Conservation Plan (Brown *et al.* 2001) as a species warranting special attention because of its small and declining population. As a result, the American Oystercatcher Working Group was formed to devise and implement a regional research, monitoring, and conservation strategy for the oystercatcher along the Atlantic and (to a lesser extent) Gulf Coasts of the United States. Its membership, a voluntary group of participants from more than 30 state and federal agencies, non-governmental organizations, and research institutions, meet annually to discuss and strategize on conservation and research topics and coordinate monitoring efforts. These annual meetings have stimulated many working group accomplishments, including completion of a Conservation Plan in 2005 (revised in 2007). For more information about research and conservation activities of this consortium visit www.ncsu.edu/project/grsmgis/AMOY/AMOYworkinggroup_2007.htm.

NATIONAL FISH AND WILDLIFE FOUNDATION. The National Fish and Wildlife Foundation is a 501(c)(3) organization dedicated to funding sustainable conservation initiatives. Chartered by the United States Congress in 1984, NFWF leverages federal grants and private support to achieve maximum conservation impact. Recently, the NFWF – through its Keystone Initiatives -- strategically repositioned itself to more effectively capture conservation gains by directing a substantial portion of its investments towards programs that had the greatest chance of successfully securing the long-term future of imperiled species. By leveraging innovative program design from scientific experts, such as the American Oystercatcher Working Group, NFWF is able to structure smart conservation programs that consistently achieve measurable and meaningful outcomes. [www.nfwf.org]