

# FORUM

## Special Species and Ecosystem Preserves: Colonial Water Birds in US National Parks

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**ABSTRACT** / An important aspect of developing a philosophical foundation for management of reserves using an ecosystem approach is the exploration of the relationship of ecosystem management strategies to the need for conservation of species of special concern. Colonial water birds are species that may deserve special consideration. They occur in over 25 US national parks, but in no case do the parks have a monopoly on the total protection or management of these birds. As an agency responsible for such popula-

Philosophical, legal, and ecological criteria for the management of decreasing animal populations have been much discussed in recent years (Brokaw 1978). Management approaches emphasizing conservation of single species or ecologically similar groups of species have achieved sophistication through the development of preservation philosophies (Smith 1976), application of species-area relations and biogeographic effects (Terborgh 1974), population modeling (Miller and Botkin 1974), captive management (Martin 1975), and setting priorities among worthy species (Sparrowe and Wight 1975, Adamus and Clough 1978). It has long been a goal of wildlife resource management to manage species of special concern through habitat manipulation (Leopold 1933). More recently, this has expanded to include ecosystem-level management (Stone 1965, Owen 1972, Goodwin 1973, Wright 1974, Dolan and others 1978, Kushlan 1979a, White and Bratton 1980), which is beginning to achieve a legislative foundation similar to that for endangered species protection (Dingell and Potter 1978).

Ecosystem management implies protection, preservation, and manipulation to perpetuate natural processes rather than species. Its ramifications have been considered in management problems associated with entire faunas (Berwick 1976), ungulate populations (Houston 1971), fire (Kilgore 1975), and dynamic physical processes (Dolan and others 1977, Godfrey 1974). As a philosophy, ecosystem management has guided thought and planning, but practical experience in managing reserves on this basis is not extensive. That management to preserve the dynamic processes of natural systems, as described by Dolan and others (1978), may, in practice, become inimical

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to the management of special species is beginning to be recognized (Kushlan 1979a, White and Bratton 1980). The ecosystem approach is the philosophy of many reserves, including the national parks of the United States (Darling and Eichhorn 1967, NPS 1978). Because the consequences of this approach are still unclear, it is worthwhile to explore how ecosystem management relates to conservation of species of particular concern. Colonial water birds are a useful tool in this respect. They are species of concern because of the interest of citizens, naturalists, and politically influential conservation groups. The reduction of wading bird populations, as a result of plume-hunting, gave rise to organized conservation societies in the early 1900s. Presently, two professional organizations in North America hold meetings devoted to the study and conservation of these birds, a journal called *Colonial Waterbirds* is published annually, and special conferences have considered their biology and protection (for example, Parnell and Soots 1975, 1980, Sprunt and others 1978). In recent years, surveys sponsored by government agencies and private groups have documented colony locations nearly continent-wide, (for example, Custer and Osborn 1977, Osborn and Custer 1978, Portnoy 1977, Scharf and others 1978, Schreiber and Schreiber 1978, Landin and Soots 1978, Blacklock and others 1978, Erwin 1979, Korschgen 1979). No legislative imperative protects colonial water birds, as the Endangered Species Act does listed species, but the interest in colonial water birds, in itself, will demand that agencies give consideration to them in plans for managing suitable habitats. A particular utility in considering the conservation of colonial waterbirds is that, unlike many declining species, populations in many areas are relatively large, well dispersed, and mobile.

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In this paper, I present a concrete example of management of special species in ecosystem reserves by first summarizing

Table 1. Selected locations managed by the National Park Service having nesting populations of colonial waterbirds.

Area	Pelicaniforms <sup>1</sup>	Ciconiiforms <sup>2</sup>	Larids <sup>3</sup>	Alcids <sup>4</sup>
Acadia National Park	X	—	X	—
Apostle Islands National Lakeshore	—	—	X	—
Assateague Island National Seashore	—	—	X	—
Big Cypress National Preserve	—	X	—	—
Biscayne National Park	X	X	—	—
Canaveral National Seashore	X	X	X	—
Cape Cod National Seashore	—	—	X	—
Cape Hatteras National Seashore	—	X	X	—
Cape Lookout National Seashore	X	—	X	—
Channel Islands National Park	X	—	X	X
Cumberland Island National Seashore	—	X	X	—
Everglades National Park	X	X	X	—
Fire Island National Seashore	—	X	X	—
Fort Jefferson National Monument	X	—	X	—
Gateway National Recreation Area	—	X	X	—
Glacier Bay National Monument	X	—	X	X
Golden Gate National Recreation Area	X	X	—	X
Gulf Islands National Seashore	—	X	X	—
Indiana Dunes National Lakeshore	—	X	—	—
Katmai National Monument	X	—	X	X
Olympic National Park	X	X	X	X
Padre Island National Seashore	X	X	X	—
Point Reyes National Seashore	X	X	—	X
Sleeping Bear Dunes National Lakeshore	—	—	X	—
Virgin Islands National Park	X	—	X	—
Voyagers National Park	—	X	X	—
Yellowstone National Park	X	X	X	—

<sup>1</sup>Pelicans, cormorants, tropicbirds, boobies.

<sup>2</sup>Hérons, ibis, storks, spoonbills.

<sup>3</sup>Gulls, terns, kittiwakes, skimmers.

<sup>4</sup>Guillemots, murre, puffins, auklets.

the status of colonial water birds in national parks in the United States, and then by describing the activities required for management of these species. With this background, I then address the broader question of how ecosystem reserves must, by necessity, fit into a broader, regional perspective for special species conservation.

### Status of Colonial Birds in National Parks

The role of the ecosystem segments within US national parks in the support of colonial water bird populations has not been summarized. The National Park system in the United States is a diverse collection of over 230 natural and historic reserves, the heart of which is the system of large natural national parks and seashores. In these latter areas, the protection of native populations, including colonial water birds, is emphasized, and a philosophy of ecosystem management dominates. Over two dozen National Park Service management

units have breeding populations of colonial water birds (Table 1) (limiting our consideration to colonial pelicaniforms, ciconiiform wading birds, larids, and alcids). These areas include Everglades National Park, previously the nesting habitat for tens of thousands of colonial wading birds and the cradle of the American wading bird conservation movement, and a string of national seashores and lakeshores that provides sites for colonial sand-nesting water birds along the North American seacoasts and the Great Lakes.

National parks support a diversity of colonial water birds (Table 1). Nesting cormorants and pelicans occur in at least fifteen units with other locations providing nesting habitats for colonial ciconiiform wading birds. Coastal areas support terns, gulls, and skimmers, and alcids nest in northern, cold-current coastal parks. Other park units provide wintering, migratory, and feeding grounds.

Although some of these areas are of importance to regional colonial water bird populations, no park, with the possible

exception of the Everglades, was established primarily to protect these birds, and nowhere—even in southern Florida—do national parks have a monopoly on the regionwide protection of colonial water birds. Pockets of marsh, suitable for colonial wading birds, are often protected as National Wildlife Refuges, established primarily for the use of waterfowl. Overall, wildlife refuges may be more critical as reservoirs for some nesting colonial wading birds than are national parks. Similarly, some larid colonies are located just outside National Seashore boundaries. It would appear that, despite an emphasis on entire-ecosystem management, no national park contains an entire support system for the colonial water birds of a region.

### Managing Colonial Water Birds in National Parks

Although national parks are not the principal reservoirs of colonial water birds, as a land management agency the National Park Service engages in several activities for their protection. These include inventorying, monitoring, research, and active manipulative or protective management. Each activity is affected by the ecosystem management philosophy.

The inventory of colonial water birds includes the activities of survey and census; Buckley and Buckley (1976) have described these activities in detail. Impetus was provided by the previously noted collaborative surveys, which were responsible for the first systematic work on colonial water birds in many parks. Area-wide surveys were conducted by the National Park Service in the mid-1970s, especially in the north Atlantic (Buckley and Buckley 1981), and in southern Florida (Kushlan and White 1977 a, b). Each of these surveys contributed to a knowledge of park colonies and helped to place them in a regional ecological perspective.

The second activity in managing colonial water birds is monitoring, an effort requiring a long-term commitment of money and manpower that must compete with other agency priorities. Continuity and consistency are the keys to successful monitoring programs and, thus, can best be provided by the personnel of the agency or group responsible for the reserve (that is, state personnel on state parks and wildlife areas; federal personnel on federal parks, refuges and forests; and conservation organization personnel on private sanctuaries). In the National Park Service, in-house programs operate on various administrative levels (Buckley and Buckley 1980, McEwan and others 1978, Kushlan and McEwan 1978, Minsky 1977). Monitoring data helps to maintain an awareness of the resource condition and to address management questions.

The third activity is research, without which wise management action is impossible. Such work has been pursued in

many parks, for example at Channel Islands (Hunt and Hunt 1974, 1977, Lynch and Johnson 1974, Jones and Diamond 1976, Anderson and others 1975, 1977, Hunt 1980), Glacier Bay (Patten 1974a, b), Fort Jefferson (Robertson 1964, 1969), and Yellowstone (Diem 1979). When possible, such research is carried out from an ecosystem perspective.

The interrelationship of inventory, monitoring, and research is exemplified in Everglades National Park. Surveys and inventories have been completed and a preliminary monitoring system developed. There is an important history of research on colonial wading bird populations. The research has revealed the hydrological determinants of nesting success in one of the most stressed birds, the wood stork *Mycteria americana* (Kushlan and others 1975, Ogden and others 1976, 1978), and in a species apparently showing less stress, the white ibis *Eudocimus albus* (Kushlan 1977, 1979c). These populations continue to decline and move out of traditional nesting and feeding areas (Robertson and Kushlan 1974). Significant questions remain to be answered in an effort to understand the ecosystem processes that are necessary to initiate more biologically sound water management in the park.

The fourth activity is active manipulative or protective management. Protective management is usually in concert with an ecosystem perspective in that an unnatural disturbance can dramatically affect both population levels and colony site selection (Buckley and Buckley 1976, 1977; Erwin 1980). Buckley and Buckley (1976) explained closure methodologies. Protection from off-road vehicles is crucial (Minsky 1977). Signs and barriers have proved successful in controlling pedestrian and boat traffic when combined with publicity and law-enforcement at the colonies. The use of aircraft may not be too disturbing. Colonial water birds often adjust to aircraft (Kushlan 1979b), and their use by management can be cost-effective (Buckley and others 1978).

Other management actions, although of benefit to colonial waterbirds, may not be appropriate from the perspective of ecosystem management, which requires that natural processes be allowed to continue. Storms along seashores, which disturb colony sites by moving dunes, changing vegetation, and breaching barrier beaches, are part of the natural processes operating in the system (Dolan and others 1978). Though management actions such as stabilizing dunes, groining beaches, plugging inlets, and planting vegetation are not generally in concert with a policy for ecosystem management; artificial dredge fill islands, resulting from channel dredging, can benefit colonial water birds by providing nesting sites (Buckley and Buckley 1975, Soots and Parnell 1975a, b, Buckley 1978, Chaney and others 1978). When channels through parks require redredging, it is technically possible to deposit spoil in ways conducive to colonial water bird nesting (Parnell and Soots 1975, Parnell

and others 1978, Landin and Soots 1978). Such management activities can enhance populations, thereby causing deviations from natural ecosystem conditions.

Management of predation is also affected by the philosophy of allowing natural processes to occur. From an ecosystem management perspective, non-native predators, such as hogs on Cumberland Island or cats on Channel Islands, require elimination if possible. Predation by natural predators is an integral part of the ecosystem process and requires study to answer such questions as: Is the predation biologically excessive? Does it result from unnaturally high predator populations? Are current predation levels part of a natural cycle? What is the result of this predation on the regional bird population? Even though natural levels of predation are part of a natural system, allowing them to occur may bring management into conflict with those public interests concerned with the species serving as prey. As a result, protection has sometimes been provided for colonial water birds in National Park Service areas (for example, Minsky 1980). Predation can result in reduced numbers of ground nesting water birds (Scharf 1970, Patton and Southern 1978, Southern, and others 1979, Holden pers. comm.).

Management action from an ecosystem perspective needs to consider what the reduction or elimination of a colony means to the regional population. If multiple colony sites exist and the birds are increasing regionally (Ludwig 1974), there may be little jeopardy in the loss of one colony, even from a national park. This would be particularly so if other colony sites could be protected under special management. A major point is that from an ecosystem perspective, management that occurs outside a reserve is critical to understanding the impact of management actions within the reserve.

### The Regional Perspective in Management of Colonial Water Birds

An important generalization to come from consideration of an ecosystem-oriented management strategy for colonial water bird protection is the need for a regional perspective. As shown above, individual reserves usually hold only a fraction of the total, or even the regional, population of wide-ranging species. Even a large wetland park such as the Everglades that historically supported a large proportion of the regional population is not occupied year-round by all colonial wading birds of the region.

If a reserve provides nesting sites, management efforts that successfully protect those sites ensure that one of the bird's ecological requisites will be met. For birds that feed outside the reserve during nesting, conditions in those feeding grounds often determine the reproductive success of a colony located within a reserve. Similarly, birds that feed outside of the

reserve while not nesting may be exposed to environmental factors that affect their later reproductive performance (Anderson and others 1977). In this way, birds that winter outside the United States may accumulate sublethal levels of chemical contamination (Diem 1979), while those that winter in US reserves (Kushlan 1978) will not.

The regional perspective is critical in considering the changing numbers of birds that breed at specific colony sites and the shifts of large groups from one nesting site to another. It is the nature of some colonial water birds to move from one site to another. Changes in colony size may be in response to natural phenomena, such as colonization of post-glacial environments (Patten 1974a). These colony site shifts may be over short distances but can be up to 100 km (Kushlan 1976). This can cause the loss of a colony from a reserve even though the birds still live nearby (Pratt 1970, 1972). In southern Florida, the largest nesting concentrations of colonial wading birds often no longer occur in Everglades National Park (Kushlan and White 1977a). In specific cases, shifts may suggest that feeding conditions in the reserve are no longer suitable to support the historic numbers of birds and that ecosystem processes may not have been preserved. This would be an indication that alternative management actions are required to restore system processes within the reserve. From the perspective of regional population status, the birds have been able, at least in part, to adjust to environmental changes. That such a shift has been accompanied in southern Florida by regional population decreases, however, demonstrates the existence of larger-scale habitat-related problems in supporting these populations. In the southern Florida example, such shifts and population declines occur despite an awareness of the long-term downward trend, despite the existence of extensive wetlands, and despite the good intentions of various state and federal management authorities. These agencies are faced with a limited understanding of the functioning of the natural ecosystem, of which colonial water birds are a part.

A regional perspective involves the realization that the entire remaining natural wetland may be critical to colonial water birds and not just the area set aside within a specific reserve. Often a cluster of management units supports colonial wading birds. In southern Florida, for example, three national parks, three state parks, three state water reservoirs including a National Wildlife Refuge, a county park, two Audubon Society sanctuaries, and considerable undeveloped private land support the regional colonial wading bird population. Seashores that are intimately associated with wildlife refuges similarly share responsibility for colonial wading birds. The practices in each managed area, together with the conditions in nearby unmanaged areas, determine the fate of regional colonial water bird populations.

In each area, management policies differ because various

land-management agencies and conservation groups have their specific missions. Many wildlife refuges are established for the management of migratory waterfowl. In these, specific management for colonial water birds would be possible if funds were available and other refuge objectives were not compromised. On the other hand, in a natural-area national park under a predominating policy of ecosystem management, species-specific management would seldom be appropriate on a large scale. National forests provide multiple uses; water reservoirs supply water; conservation societies protect and enhance sanctuaries; recreation areas provide for visitors, and so forth. Thus, colonial water bird management must be carried out within, rather than in conflict with, this matrix of differing policies. The need to recognize multiple management objectives within a regional perspective is an important practical consideration in colonial water bird conservation. A succession of temporary residences for birds on reserves of various kinds may provide the core that is necessary for the persistence of regional populations of these widely ranging, consistently shifting populations.

### Conclusions and Recommendations

It is clear that the preservation of total ecosystems, accompanied by management to perpetuate natural ecological processes, would provide the best strategy for long-term conservation of colonial water birds. However, this option does not seem possible in many situations. Because reserves seldom encompass complete ecosystems, the varying management strategies found within the array of existing and potential reserves must be the foundation for the conservation of some special species. Colonial water birds can, for example, be given inviolate protection in sanctuaries owned by conservation organizations; species-specific management or habitat enhancement can be supplied on refuges; remnant parts of their ecosystems can be preserved in a condition that is as close as possible to a natural one in national parks. These strategies may provide the best insurance against regional extirpation. Birds, indeed, are adjusting to habitat loss and current management practices in remaining natural wetlands. Because happenstance should not dictate the future of colonial water bird populations, region-by-region management plans that specify the role of each management area and assign goals may be useful.

Thus, while ecosystem management in reserves can provide habitats for colonial water birds, this, alone may not protect populations. Such reserves maintain only a residuum of the support system and population, usually for only part of the year. A regional strategy is imperative. Within this strategy, ecosystem preserves can play one part. The potential for multiple management strategies in different reserves could allow enhancement of the impact of each. Thus, for species of

special concern, ecosystem management is a worthwhile goal, but it may not be sufficient to ensure preservation.

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