

TAKE REFUGE



Celebrating 100 Years of Threatened and Endangered Species Protection Through the National Wildlife Refuge System

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EXECUTIVE SUMMARY

One hundred years ago, Theodore Roosevelt recognized that America was in the process of thoroughly and rapidly exploiting its natural resources and wildlife. Roosevelt considered conservation to be “a great moral issue,...[involving] the patriotic duty of ensuring the safety and continuance of the nation.” The manifestation of his belief was the National Wildlife Refuge System, which drew the federal government into protecting the habitats of vulnerable plants and animals.

The nation’s wild places are part of our natural heritage—the first settlers stepped onto our eastern shores to find thick forests and rolling hills, and westward pioneers crossed vast plains and deserts before arriving at the teeming rivers and wetlands of the Pacific northwest and California. All of those ecosystems were filled with plant and animal species that provided life-sustaining food and shelter. For many of the native people in America, to share land with such a diverse array of wildlife was humbling and awe-inspiring.

In the course of history, the attitude toward wilderness changed, and urban, residential, and agricultural development began to outpace land preservation and species’ protections. Years of careless resource management has pushed many plant and animal species to the brink of extinction; our country now has 517 threatened and endangered animals and 745 threatened and endangered plants, with more proposed for listing. For many of these imperiled species, the only chance for survival lies in the habitat harbored in wildlife refuges.

This report celebrates 100 years of species protection across the 540 national wildlife refuges that are home to more than 700 bird species, 220 mammals, 250 reptiles and amphibians, and 200 fish species. In particular, we highlight eight of the nation’s refuges for their success in protecting endangered species and their habitat:

Alabama’s **Sauta Cave National Wildlife Refuge** is a primary maternity roost for approximately 300,000 endangered gray bats and a hibernation site for endangered Indiana bats. Since refuge managers gated the cave’s entrances to keep people from disturbing the species, populations have more than doubled. The hardwood forests surrounding the cave provide opportunities for the public to hike while observing wildlife. Thousands of visitors enter the refuge each summer to witness the mass exodus of bats from the cave as they begin their nightly foraging.

The grassland ecosystem of southern Arizona’s **Buenos Aires National Wildlife Refuge** is home to the last remaining population of masked bobwhite quail in the United States and six other endangered species. Captive breeding programs have reintroduced the quail to Arizona, and refuge managers work to restore native habitat by applying prescribed fires to the grasses and controlling invasive species. Visitors wanting to engage in wildlife recreation are also welcome in the refuge; horseback riding, camping, bird watching, and nature trail hiking are all available to the public.

A stone’s throw away from San Francisco, the **Don Edwards San Francisco Bay National Wildlife Refuge** is a sanctuary for endangered California clapper rail, California least tern, salt marsh harvest mouse, and other species which are nearly extinct due to uncontrolled development along California’s coast. The refuge has returned wildlife to the San Francisco Bay by preserving habitat for these and 280 other migratory bird species and controlling non-native predators that have gained access to the vulnerable species through habitat modifications. City-dwellers can travel a few short miles to the refuge to escape concrete skyscrapers, observe rare plants and animals, learn about the impacts of development on the environment, and remember the importance of nature as a contrast to the frenzy of daily life.

Along Florida’s Atlantic coast, the **Archie Carr National Wildlife Refuge** welcomes threatened

loggerhead sea turtles and endangered leatherback and green sea turtles to shore along a 20-mile stretch of protected beach. The refuge allows the turtles to nest in some of their last remaining habitat, protected from coastal development, artificial lighting, and pollution. Nesting turtles are easily disturbed by human activity, so recreational opportunities in the refuge are limited. However, there are educational tours that allow visitors a chance to view turtles at close range.

In the middle of Nevada's expansive desert lies the **Ash Meadows National Wildlife Refuge**, an oasis in the midst of arid land. Twenty-four endemic species and twelve threatened and endangered species are drawn to the ponds and caverns in the refuge, including one of only five remaining populations of Amargosa niterwort, an endangered plant. Refuge managers control non-native species and restore natural vegetation to provide the niterwort with suitable habitat along the refuge's wet, salt encrusted clay flats. The public is welcome to view and learn about the unique wildlife, some of which are as old as the desert itself.

When northern winters become too much for migratory birds to handle, many journey to the **Nestucca Bay National Wildlife Refuge** on Oregon's coast. In the refuge, endangered Aleutian Canada geese flourish in some of their last untouched habitat. The birds' wintering grounds are protected from development and non-native predator species, which decimated the geese at the turn of the century. With threats controlled and habitat intact, the geese were removed from the endangered species list in 1999. The public has access to extensive educational programs that encourage teachers and students to embrace their roles as environmental stewards and allow them to engage in conservation activities.

The designation of the **Attwater Prairie Chicken National Wildlife Refuge** means that the public may once again hear the distinctive calls of the refuge's namesake. Hundreds of species of birds, mammals, reptiles, amphibians, and plants share the prairie chicken's habitat. Grazing prohibitions, habitat restoration, and improvements to the captive-breeding program have provided an opportunity for native grasses and prairie chickens to reestablish

themselves. Diverse wildlife is on display for visitors, who can observe the refuge's plentiful species on hiking and automobile trails.

The history of English settlers in the United States began on the land where the **James River National Wildlife Refuge** now stands. Endangered bald eagles spend their summers roosting in the forests surrounding their river foraging grounds. The discontinued use of DDT and the preservation of habitat have contributed to the eagles' ongoing recovery, prompting a proposal for their delisting. By taking advantage of the hiking and hunting opportunities in the refuge, the public can glimpse a part of American history, wilderness as it was when the settlers arrived.

These and other national wildlife refuges have been successful in stabilizing and improving endangered and threatened species' populations, but challenges abound in maintaining high quality wildlife management. Non-native species flock to the altered environments typical of wildlife refuges, harming vulnerable species through predation and competition. Humans also vie for precious species' habitat, economically valuable for its development potential.

Confronting these and other threats requires financial and human resources. While our refuges have been able to make the most of scarce resources, performing the duties of the refuge system requires a large staff with diverse qualifications. Otherwise, refuge managers must compromise predator management, recovery, and public use programs while neglecting routine maintenance of refuge facilities. The Cooperative Alliance for Refuge Enhancement estimated in 2001 that \$700 million would be needed each year for the refuge system to begin to recover from millions of dollars of backlogged maintenance.¹ In fiscal year 2002, national wildlife refuges received \$318.9 million, less than half of the needed funding.² If allocations remain at current levels, we risk leaving behind a nation devoid of wildlife. The nation needs to make a renewed commitment to the refuge system, which cannot fulfill its wildlife conservation and recreation mission without increased funding and staff.

INTRODUCTION

America is a country of vast lands and extraordinary diversity of wildlife. From the teeming Everglades to the temperate rainforests of the northwest, Americans enjoy wilderness and all of the benefits it affords us: solitude, inspiration, recreation, wonder. Despite these rewards from our wild places, rapid, sprawling development and misuse of resources has initiated a distressing trend in plant and animal species' decline.

Some of our most imperiled species have been protected through the legacy of one of the nation's greatest conservationists and patriots, Theodore Roosevelt, who believed that "the movement for the conservation of wild life and the larger movement for the conservation of all our natural resources are essentially democratic in spirit, purpose, and method." Roosevelt sought to elevate preservation as a democratic ideal in order to guarantee future generations of Americans access to the nation's unique natural heritage. His ongoing contribution to the American people is the National Wildlife Refuge System, which celebrates its 100th birthday this year.

Roosevelt's 1903 designation of the Pelican Island National Wildlife Refuge to protect Florida's brown pelicans from commercial hunting introduced a new way of thinking in American governance. No longer were preservation and development irreconcilable; both were seen as beneficial for the nation. In the following six years, Roosevelt established 54 more refuges to safeguard the nation's plant and animal wildlife. Since then, the National Wildlife Refuge System has expanded to include 540 refuges on approximately 95 million acres of land.

Protecting Threatened and Endangered Species Through the Refuge System

In the 1900s, the refuge system evolved as threats to species increased. The nation's first wildlife refuge was created to counteract unchecked commercial hunting. Subsequently, habitat destruction and sport hunting jeopardized species, prompting the enlargement of the refuge system. More recently, urban development and invasive species have joined

the repertoire of conditions decimating vulnerable wildlife.

Fortunately, a law now exists to bolster the protections provided by the refuge system. Seventy years after the first wildlife refuge was established, the U.S. government made a formal commitment to protect the nation's imperiled species by passing the Endangered Species Act of 1973 (ESA). Recognizing that our diverse plant and animal species provide "esthetic, ecological, educational, recreational, and scientific value" for the country,³ the law is designed to preserve ecosystems and habitat for species at risk of extinction and to revive species through the implementation of recovery programs. The ESA is an indispensable tool in protecting imperiled wildlife, but it does not include provisions to slow the rate of species' decline. Thus, 1,262 U.S. species are now federally listed as threatened and endangered.

Under the ESA, the U.S. Fish & Wildlife Service is the primary agency charged with protecting and restoring the nation's wildlife and habitat, although the National Marine Fisheries Service is responsible for safeguarding marine life. The Fish & Wildlife Service oversees the refuge system and is responsible for acquiring new lands to expand the number and size of refuges. As biologically valuable land becomes available, biologists, planners, and realtors evaluate the ecosystem, taking into consideration land uses and values, economics, and several other factors that could affect nearby communities. The assessment team then recommends a refuge boundary to the Service Director, who decides whether to acquire the property from private landowners, who must be willing to sell their land.⁴

The Fish & Wildlife Service sometimes shares refuge management duties with county and state agencies and private landowners. At the Archie Carr National Wildlife Refuge, visitors can access the refuge's beach at county-owned facilities that display and adhere to Fish & Wildlife Service rules and regulations.⁵ Working closely with the Attwater Prairie Chicken National Wildlife Refuge, private landowners work to restore natural vegetation to their property to

provide habitat for the prairie chicken.⁶

The result of this collaborative work is the crowning glory of our wildlife refuges—the protection of 180 threatened and endangered animal species and 78 threatened and endangered plants. The refuge system encompasses a diverse array of endangered species habitats, including coastal land in Hawaii’s Hanalei National Wildlife Refuge, freshwater wetlands in Wyoming’s Mortenson Lake National Wildlife Refuge, and savanna in the Mississippi Sandhill Crane National Wildlife Refuge. Many, if not all, of the endangered species that make their homes on refuges would be extinct by now were it not for their protected habitat, many times the last of its kind.

The fundamental goal of the Fish & Wildlife Service and the refuge system is to provide for the well being of species; but secondarily, the refuge system provides visitors with opportunities to escape from their daily lives and connect with nature, as long as all activities are compatible with species protection. Wildlife observation and photography, hiking, hunting, and fishing attract close to 40 million visitors to refuges each year, and more than half of the refuges have environmental education programs in place for the public to learn about ecosystem threats and recovery programs to keep species from extinction.

By wisely using their limited resources, national wildlife refuges have been able to protect species that otherwise would have gone extinct. This report highlights eight of the 56 wildlife refuges designated for the protection of 105 endangered species. Prefacing the stories of these refuges are the words of notable American patriots and conservationists, who realized that a love of our country means ensuring that its natural richness will continue long into the future. Following in their footsteps, we must applaud the first 100 years of wildlife refuge conservation, but also look ahead to a larger and better-funded refuge system. With sufficient resources, species will be able to thrive and Americans will be able to enjoy wilderness, now and far into the future.

Challenges to the Refuge System

Without the National Wildlife Refuge System, the endangered and threatened species that refuges were designated to protect would probably now be

extinct. The on-going recuperation of these species testifies to the importance of the refuge system for the health of our nation’s biodiversity.

Sadly, each refuge faces a set of challenges in protecting wildlife and habitat; in particular, the refuge system struggles under chronic underfunding and inadequate staffing. Although appropriations for the refuge system have increased slightly in recent years, our wildlife sanctuaries continue to suffer from budget shortfalls.

The U.S. government allocates much less funding to the wildlife refuge system than to other public lands. As compared to the National Park Service, which receives \$15.80 per acre of land, wildlife refuges must work with only \$3.18 per acre.⁷ Such little funding translates into widespread staff shortages. Without staff, refuges cannot implement programs to monitor species’ populations and control invasive species, provide public use activities, or conduct routine maintenance of refuge facilities.

The Mississippi Sandhill Crane National Wildlife Refuge, established to protect the endangered bird, provides the quintessential example of a refuge plagued and burdened by lack of funds. On the grounds of the Mississippi Sandhill Crane refuge, non-native gray and red foxes, coyotes, and bobcats prey on recovering cranes in the absence of staff to control their populations.⁸ Although the crane’s numbers have increased slightly despite these challenges, the refuge does not have enough staff to oversee the species’ recovery or adequate infrastructure to allow staff people to reach the interior of the refuge.

Staff and funding shortages also have limited opportunities for visitors to enjoy the refuge. Without sufficient personnel and funding, refuge managers have been unable to develop—much less advertise—the full range of recreational and educational benefits provided by the refuge’s natural beauty.⁹ Unfortunately, the Mississippi Sandhill Crane National Wildlife Refuge is not alone in its funding and staffing crisis; approximately 200 refuges operate without any on-site staff.¹⁰

ALABAMA

Sauta Cave National Wildlife Refuge

*"In wilderness is the preservation of the world."
-Henry David Thoreau*

Alabama rarely conjures images of diverse species, but, in fact, the state's species diversity is in the top five in the country.¹¹ Unfortunately, Alabama is also high on the nation's list of at-risk and extinct species, with 115 endangered and threatened species,¹² and it is likely that the number of imperiled species will rise if current resource

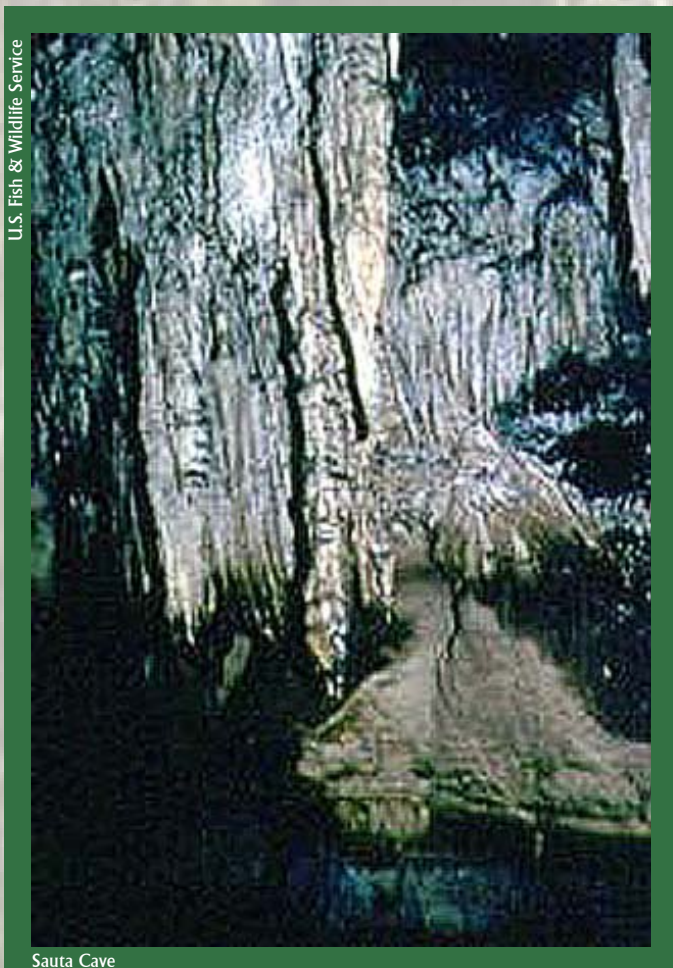
Species in Decline: The Gray Bat

The primary range of the gray bat is limited to Arkansas, Missouri, Tennessee, Kentucky, and Alabama, where limestone caves are located next to rivers and lakes. Gray bats are meticulous in selecting maternity and hibernation caves; with thousands of potential caves, the bats raise their young in only 5% of them, preferring a stream to run through a large, dome-shaped cave that collects heat at the ceiling.¹³ The bat is equally particular about hibernation sites, requiring deep, vertical caves that trap cold air.¹⁴ The bat's limited range is the cause of its endangered status. Simple human activities in or near caves can cause the bats to panic, vacating the cave entirely or dropping their offspring to the cave floor during breeding season. Such disturbance to a single cave could annihilate an enormous percentage of the species.

Bats also suffer from pesticide use on agricultural land. Chemical pesticides flow into the water bodies where bats forage, destroying their primary food source, aquatic insects. The toxic chemicals either exterminate insects and diminish their populations, or they accumulate in the insects' bodies, poisoning the bats as they eat.¹⁵

Refuge for an Imperiled Species

The bats' limited habitat makes the Sauta Cave National Wildlife Refuge essential for their survival. Sauta Cave is one of the most important maternity sites for the bats; historically, half a million bats nursed their young in the cave. However, by 1976, the year the species was listed as endangered, habitat disturbance had reduced the population to just 128,000.¹⁶ To curb the decline and reestablish the population, the refuge was



management practices continue. The Sauta Cave National Wildlife Refuge is a critical 264-acre tract of land for species protection, providing sanctuary for endangered Indiana and gray bats.

established in 1978. Since then, refuge managers have gated the two entrances to the cave to keep curious visitors from disturbing the roosting bats.



The gates produced positive results; 250,000 or more bats now live in the cave during peak season.¹⁷

The Sauta Cave refuge exemplifies the Fish & Wildlife Service's ecosystem approach to conservation. Rather than focus on a single species in their recovery efforts, refuge managers seek to safeguard one of our quickly disappearing cave ecosystems. With this model, bats are not viewed in isolation; proper management of all living organisms near the cave, including plants, animals, and human settlements, are considered in conjunction with environmental factors such as water and air quality in and around the cave. Addressing the widespread problems facing the entire ecosystem improves the likelihood that the bat populations will rebound.

Recreation and Value for Americans

In the Sauta Cave National Wildlife Refuge, visitors can witness an impressive wildlife display. Every evening, thousands of bats exit the cave for a night of foraging. From dusk onward, waves of bats exit the cave at a prime location for visitors to view them. The show attracts 5,000 visitors each year to the entrance of Sauta Cave.¹⁸ Soon, the refuge hopes to construct an observation deck for viewing the bats' flight. The platform will serve the dual purpose of providing a safe place for the public to watch the bats away from slippery rocks, and it will

keep visitors at a distance from the cave entrance to minimize disruption to the bats.¹⁹ The refuge also offers other outdoor activities, including hiking and wildlife photography.

Refuge Challenges

The Sauta Cave refuge operates without refuge facilities or staff on site. Personnel shortages create missed opportunities for educating the public about the bat's vulnerability, which could be explained at the daily gathering of tourists watching the bats' departure from the cave.²⁰ Lack of staff also hinders law enforcement. Even though bars block the entrance to the cave, people still attempt to intrude because the chances of being detained are so narrow.²¹

Increased funding to staff the refuge is unlikely to come through in the near future. The refuge is a satellite of the larger Wheeler National Wildlife Refuge and receives no base funding of its own except for special projects.²²

Sauta Cave National Wildlife Refuge

Sauta Cave National Wildlife Refuge

Established: September 15, 1978

Location: Jackson County, Alabama

Acres: 264

Endangered & Threatened Species: gray bat and Indiana bat

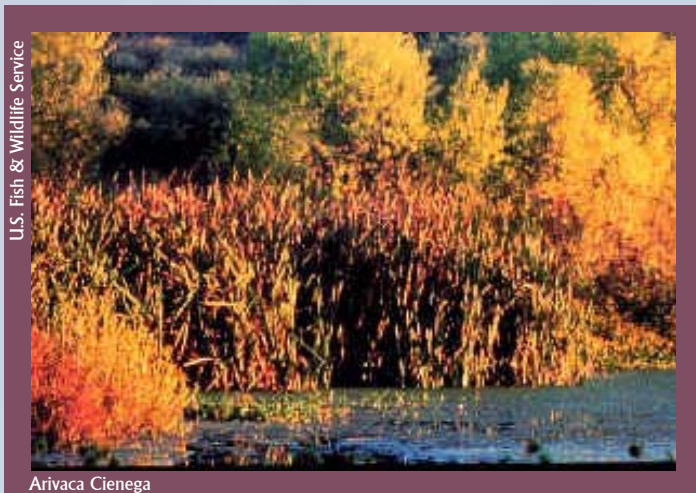
ARIZONA

Buenos Aires National Wildlife Refuge

*"Take away wilderness and you take away the opportunity to be American."
-Roderick Nash*

Living among Arizona's extreme landscapes of high mountains, deep canyons, desert, and grassland is equally extreme and diverse wildlife. Arizona is home to a remarkable 4,759 distinct species, the third most in the country.²³ However, 59 of those species are currently listed as threatened or endangered,²⁴ and almost 600 more are considered at-risk for extinction.²⁵ The Buenos Aires National Wildlife Refuge was established to help one of those species, the masked bobwhite quail, recover its dwindling population by restoring its original habitat. The refuge also serves as a safe

abundant feed for their cattle. A million or more grazing livestock overwhelmed the ecosystem. Soon the land was barren, threatening the survival of the bobwhite quail. Ranchers, determined to utilize the land, planted non-native grasses from Africa to feed their livestock and control soil erosion, but the foreign vegetation could not meet the quail's defense, breeding, and foraging needs.²⁶ By 1950, the quail was considered extinct in Arizona. The last remaining population was discovered in Sonora, Mexico in 1964, prompting the U.S. government to list it as endangered in 1967.²⁷



Arivaca Cienega

haven for six other endangered species living in the grasslands of southern Arizona—cactus ferruginous pygmy-owl, Pima pineapple cactus, Kearney bluestar, peregrine falcon, southwest willow flycatcher, and razorback sucker.

Species in Decline: The Masked Bobwhite Quail

The masked bobwhite quail once thrived in the native grasses of the Altar Valley of Arizona. Settlers traveling west in the late 1800s also were attracted to the grassland, which provided

Refuge for an Imperiled Species

Recognizing that an entire tract of land would be necessary to manage quail populations, the U.S. Fish & Wildlife Service purchased the grasslands of the Buenos Aires ranch in 1985. Since then, the Buenos Aires National Wildlife Refuge has expanded to encompass wetland and riparian habitat surrounding Arivaca Cienega and Arivaca Creek and wooded canyon habitat at Brown Canyon. Upon the acquisition of these lands, refuge managers designed an intensive habitat restoration plan involving replanting native grasses and using controlled fires to replenish eroded soils and slow the growth of non-native vegetation. With the quail extinct in Arizona, the refuge managers also developed an ambitious captive breeding and reintroduction program to increase the quail's numbers in the wild. Since its inception in 1985, 13,000 bobwhites have been released in the refuge.²⁸ Given that bobwhite quails are ground-dwelling birds with 80% mortality from predation, the estimated 150 to 500 birds now surviving in the wild is a sign of the program's success.²⁹

Recreation and Value for Americans

The grassland and wetland ecosystems within the Buenos Aires National Wildlife Refuge provide



visitors with an opportunity to witness Arizona's impressive wildlife diversity through hiking, horseback riding, and camping. The Tucson Audubon Society leads guided bird tours along the refuge's riparian habitat, and overnight nature workshops and guided hikes are available at Brown Canyon's education center. The refuge also converted an 1880s-era ranch dwelling into a visitor center with exhibits designed to educate the public about species and the pronghorn reintroduction program.

Moreover, the refuge's environmental education activities provide insight into the complexity of ecosystems. Visitors discover how a flourishing non-native species of grass can almost spell the end of an entire bird species, and they learn about the costly and risky programs that are needed to recover a nearly extinct species forced to survive in a severely modified environment.

Refuge Challenges

The refuge faces several ecological challenges, including invasion of non-native species. In parts of the refuge, grasslands have been transformed almost entirely into mesquite woodland, which must be converted back into its original habitat if quail are to thrive there.³⁰ Unfortunately, completion of the mesquite clearing project is currently beyond the capability of the underfunded

and understaffed refuge.³¹ Staff shortage also complicates habitat and endangered species management. According to Bonnie Swarbrick, who directs public use programs at the refuge, "[g]ood management is based on good science, which is based on good data. Currently, there are not enough staff to gather information about the quail and their habitat, and the refuge is relatively young, without historical data to build on."³² Difficulties also arise in determining the number of birds in the refuge. Current estimates are extrapolated from the number of calling males during breeding season,³³ but better approximations could be made if staff were available to more accurately monitor the number of birds.

Finally, the surest way to protect species is to preserve more natural habitat. Recent cuts in funding for land acquisition will hamper the ability of the refuge to procure new suitable habitat for at-risk species, thus allowing more of the land to be purchased by developers and ranchers.

Buenos Aires National Wildlife Refuge

Established: February 27, 1988

Location: Pima County, Arizona

Acres: 116,585

Endangered & Threatened Species:
masked bobwhite quail, cactus
ferruginous pygmy-owl, Pima
pineapple cactus, Kearney bluestar,
peregrine falcon, southwest willow
flycatcher, and razorback sucker

★ Buenos Aires
National Wildlife Refuge

CALIFORNIA

Don Edwards San Francisco Bay National Wildlife Refuge

"The general desire of men to live by their heads rather than their hands, and the strong allurements of great cities to those who have any turn for dissipation, threaten to make them...the sinks of voluntary misery."

-Thomas Jefferson

The California state flag is adorned with a grizzly bear, a species that has been extinct in the state since 1922. The flag illustrates the imperiled status of much of California's wildlife—the state ranks first in the country for species endemism and



diversity, but second in risk with 296 endangered and threatened species, and third in extinctions.³⁴ The Don Edwards San Francisco Bay National Wildlife Refuge is one part of the solution, preserving some of the last remaining coastal habitat suitable for the endangered salt marsh harvest mouse, as well as California clapper rail, California least tern, and brown pelican, three of the state's endangered birds.

Species in Decline: The California Clapper Rail

The refuge is particularly important for the California clapper rail, which lives almost exclusively in the bay area. Settlers arriving in San Francisco for the gold rush in the mid-1800s considered the rail a delicacy and hunted the birds until many populations were extinct and the entire species was nearing the same end. Fortunately, rail hunting was made illegal in 1915, and the species

began to recover. Not long after, however, an upsurge in urban development and commercial salt production transformed the rail's marsh habitat; developers filled in the wetlands to create foundations for buildings and residential communities, and salt producers created pools to harvest salt. Unexpectedly, the modified habitat allowed non-native red foxes, feral cats and dogs, and other land animals access to the few remaining rails, which were once protected by the vast expanse of wetlands surrounding them. With destroyed habitat and teeming predators, the rail was added to the endangered species list in 1970.

Refuge for an Imperiled Species

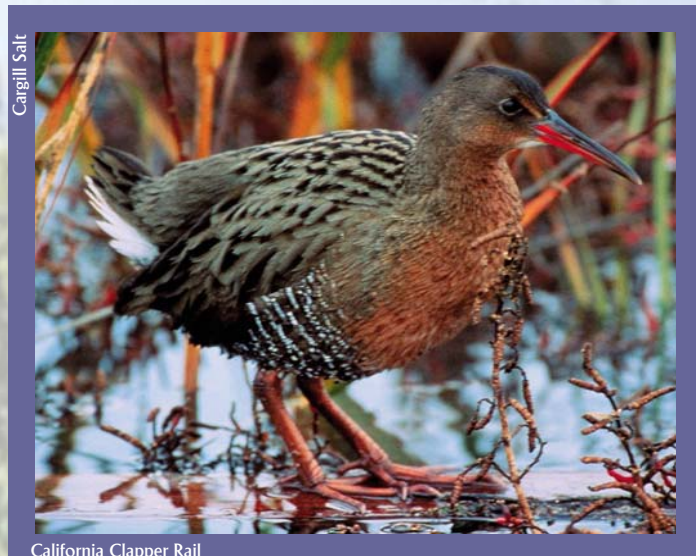
The Don Edwards San Francisco Bay National Wildlife Refuge, established in 1974, is an ideal sanctuary for species jeopardized by urban development. The refuge was the first established in a metropolitan area; it is located in 12 cities and three counties surrounding San Francisco's South Bay. In the midst of sprawling city growth, the refuge is a pocket of species recovery. When the California clapper rail was first listed as an endangered species, between 4,000 and 6,000 birds existed;³⁵ populations continued to fall dramatically until there were fewer than 400 individuals in the San Francisco Bay area in 1992.³⁶ An integrated predator management program to protect the rail from non-native predators, combined with habitat restoration activities, helped the rail population rebound to approximately 600 birds by 1995.³⁷

Recreation and Value for Americans

The primary goal of the refuge is to protect

endangered wildlife, but it also fulfills a secondary purpose of offering city dwellers an escape from the hustle and bustle of San Francisco. Usually, green spaces within cities are just a few acres where people can reconnect with nature; the San Francisco Bay refuge designates 25,902 acres for people to learn about the ecosystem in their backyard where land meets bay. Observing some of the most diverse and rare wildlife in the country with San Francisco's skyscrapers as a backdrop exemplifies the value of our nation's contrasts—the developed versus the untouched, the busy versus the serene, the city versus the wilderness. Without one, it is difficult to appreciate the other.

Valuing a release from city life, 350,000 visitors enter the refuge annually to take advantage of approximately 50 miles of nature trails with guided hikes by wildlife experts. Additionally, each year 10,000 students benefit from the refuge's educational programs designed to train parents and teachers in the fundamentals of environmental education, which they can pass on to their children.³⁸ These educational programs foster an



understanding of the effects of the city on the nearby marshes and the ways to minimize the impact of development on vulnerable species.

Refuge Challenges

Despite the success of the refuge in safeguarding habitat and endangered species while offering opportunities for urban residents to experience the outdoors, the San Francisco Bay National Wildlife Refuge still faces challenges as a result of its proximity to the city. Man-made levees mar the ecosystem, and natural habitat cannot be restored without the risk of flooding San Jose.³⁹ Sewage treatment discharges contaminate the refuge, as well as remnants from an abandoned mercury mine, which continues to pollute refuge waters years after shutting down.⁴⁰

Normally, acquiring urban land is prohibitively expensive because of its commercial uses,⁴¹ but the refuge has recently reached an agreement with the Cargill salt company to purchase 16,000 acres formerly used for salt evaporation.⁴² Refuge expansion, a great achievement given budget constraints, also poses one of the biggest challenges for the refuge. Diverse interests are currently negotiating how to manage the newly-acquired land; some want it to remain as salt ponds, others would like to see it transformed into a salt marsh, and still others would like to restore it as habitat for ducks or fish.⁴³ Hiring staff to manage the new addition is a further burden for the money-strapped refuge.

**Don Edwards
San Francisco Bay
National Wildlife Refuge**

Endangered & Threatened
Species: California clapper
rail, California least tern,
western snowy plover,
salt marsh harvest mouse,
brown pelican, and vernal
pool tadpole shrimp

Don Edwards
San Francisco Bay
National Wildlife Refuge

Established:
October 18, 1974

Acres: 25,902

Location: Alameda,
San Mateo, and Santa
Clara counties, California

FLORIDA

Archie Carr National Wildlife Refuge

"Is civilization progress? The challenge, I think, is clear; and, as clearly, the final answer will be given not by our amassing of knowledge, or by the discoveries of our science, or by the speed of our aircraft, but by the effect our civilized activities as a whole have upon the quality of our planet's life—the life of plants and animals as well as that of men."

-Charles Lindbergh, Jr.

Our nation's southernmost state is a tropical paradise for sun-starved northerners, as well as for rare species that gather in Florida's warm waters, extensive coastline, wetlands, and inland forests.

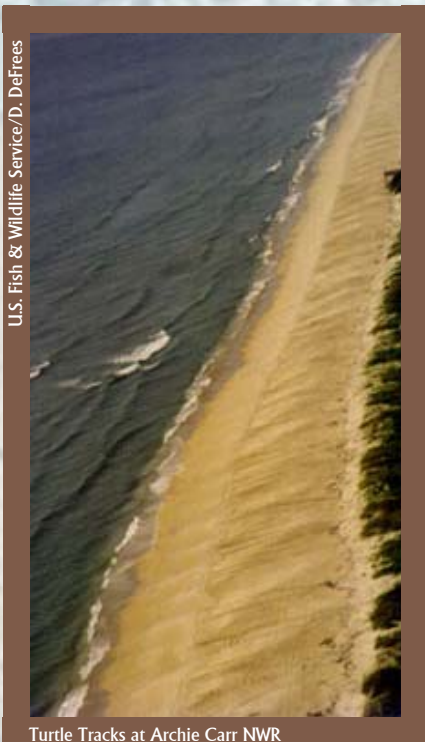
The Archie Carr National Wildlife Refuge, a 20-mile stretch of beach along Florida's central Atlantic coast, is home to several threatened species, including the eastern indigo snake, southeastern beach mouse, and Florida scrub jay. The priority of the refuge, however, is to protect endangered and threatened sea turtles—the beach is one of the most

resorts along the coast bewilder breeding females, discouraging them from coming ashore to lay their eggs. If adults do overcome the artificial lights and build nests, the hatchlings are further challenged by the unnatural environment. Instead of proceeding to the ocean after hatching, the young turtles are attracted to the light.⁴⁵ The turtles are defenseless from predators during the additional time they spend out of the water.

Threats to the turtles' survival do not end once nests have been built and the young make their way to the ocean. Human abuse of the marine environment also increases turtle mortality. Turtles consume toxic pollution and debris in the water, which either kills them or disrupts their internal body processes.⁴⁶ In recent history, the most devastating impact on the turtles has come from commercial fisherman, who captured approximately 925 green turtles each year before turtle excluder devices (TEDs) were required on fishing fleets in 1988.⁴⁷

Refuge for an Imperiled Species

Of the remaining green turtle nesting habitat in the U.S., 90% is located in Florida.⁴⁸ Humans have defiled the majority of those breeding grounds, so the Archie Carr National Wildlife Refuge protects equally endangered habitat. Since the refuge's designation in 1991, green turtle nesting on the beach has increased dramatically. In 1982, the number of nests recorded was almost zero, but between May and October of 2002, beach surveyors found an astounding 2,970 nests.⁴⁹ The refuge also brings together local and state



U.S. Fish & Wildlife Service/D. DeFrees

Turtle Tracks at Archie Carr NWR

productive nesting grounds in the world for green, leatherback, and loggerhead sea turtles.

Species in Decline: The Green Sea Turtle

The Archie Carr National Wildlife Refuge is particularly important for green sea turtles—35% of the world's remaining population builds nests in the refuge.⁴⁴ Erosion and development of the green turtles' nesting beaches led to their 1978 endangered species listing. Lights from vacation

governments and several conservation groups, all of which are dedicated to managing human activity on the beaches and controlling predator and pollution threats to the turtles.

Recreation and Value for Americans

The Archie Carr beach is one of the densest nesting grounds in the Western Hemisphere, so extensive recreational programs are incompatible with the overarching goal of protecting imperiled turtles. Therefore, the refuge itself provides no public facilities, but the county government offers opportunities for surf fishing, hiking, and bird watching on the beach.⁵⁰ Although the refuge does not have plans to develop an elaborate visitor center, it does conduct small environmental education programs. Visitors can learn about the fragility of the turtles' breeding grounds and how to react when encountering a sea turtle in the wild. In conjunction with Florida's Sebastian State Park, the refuge offers guided tours on summer evenings, providing the public with a rare opportunity to see some of the nation's most elusive wildlife.⁵¹



Refuge Challenges

Brazilian pepper trees pose the greatest challenge for refuge managers attempting to restore native habitat to the beach.⁵² Birds feed on the tree's berries, dispersing the seeds widely. As a result, the ornamental tree, which was introduced to Florida near the turn of the century, spreads very rapidly and competes with native species.⁵³ Refuge managers constantly struggle to keep the species from overtaking the rest of the refuge's vegetation.

Keeping up with the growth of pepper tree and other exotic species' populations is often too much for the refuge, which does not have funding to hire adequate staff to maintain the land. Land acquisition for the refuge is also incomplete as a result of funding shortages. Refuge staff anticipate a final phase of refuge expansion, but Congress did not appropriate money for the project this year. The U.S. Fish & Wildlife Service estimates that it would cost approximately \$80 million to acquire the desired habitat because of its development potential,⁵⁴ and only a limited time remains to obtain the coveted property before it is purchased to build resorts.

**Archie Carr
National Wildlife Refuge**

Established: June 25, 1991

Acres: 248

Location: Brevard and Indian River counties, Florida

Endangered & Threatened Species:
loggerhead sea turtle, green sea turtle, hawksbill sea turtle, and leatherback sea turtle

NEVADA

Ash Meadows National Wildlife Refuge

"Something will have gone out of us as a people if we ever let the remaining wilderness be destroyed. We need wilderness preserved - as much of it as still left, and as many kinds - because it was the challenge against which our character as a people was formed."

-Wallace Stegner

Nevada is the driest state in the United States,⁵⁵ but in the middle of the vast desert lies an oasis, the Ash Meadows National Wildlife Refuge. Twenty-four endemic species live in the refuge, more than anywhere else in the country.⁵⁶ Unfortunately, of those species, five are endangered,⁵⁷ and much of Nevada's other wildlife is in peril—the state ranks third in the country for at-risk species.⁵⁸ Within the refuge, four endangered fish—Devil's Hole pupfish, Ash Meadows Amargosa pupfish, Warm Springs pupfish, and Ash Meadows speckled dace—are nearing extinction, and the Amargosa niterwort plant also is endangered. Seven refuge species are threatened, including Ash Meadows milk-vetch, spring-loving centaury plant, Ash Meadows sunray, Ash Meadows ivesia, Ash Meadows gumplant, and Ash Meadows blazing star, all threatened plants, and Ash Meadows naucorid, a threatened aquatic beetle.

Species in Decline: The Amargosa Niterwort

Ash Meadows, a lowland plain located in Nevada's Amargosa Valley, is one of only five remaining habitats for the Amargosa niterwort.⁵⁹ The plant lives in open, salt encrusted alkali flats, a rare ecosystem created centuries ago when the landscape of the west changed; the Sierra Nevada mountains formed a barrier between the Pacific Ocean and Nevada, transforming formerly lush land into an arid desert. The niterwort's rare habitat is susceptible to many threats, including overuse of spring water, road construction, off-road driving, grazing, and agricultural land uses.⁶⁰

In the mid to late 1960s, ranchers began diverting groundwater for their cattle. Without the water

from the desert's springs, niterwort populations began to decline dramatically. A 1976 Supreme Court decision ruled that sufficient water had to be available for the Devil's Hole pupfish,⁶¹ which meant that more water also would be available for the niterwort. Unfortunately, the niterwort faces other challenges. Individual niterwort plants are often connected to others through underground



roots, and they have such limited habitat that they face increased odds for extinction. The U.S. Fish & Wildlife Service recognized that a single devastating event could decimate large percentages of the plant's population, so the species was listed as endangered in 1985.⁶²

Refuge for an Imperiled Species

Developers purchased the Ash Meadows land and proposed building a city in the desert in 1980. They abandoned their plans, however, allowing The Nature Conservancy to purchase the land for preservation.⁶³ Subsequently, The Nature Conservancy transferred the land to the U.S. Fish &

Wildlife Service, which designated the 22,117 acres of land as the Ash Meadows National Wildlife Refuge in 1984. The Fish & Wildlife Service implemented a recovery plan for the refuge's

through the refuge in late summer and fall, at the same time game bird hunting is at its peak. Late in the year, nighttime temperatures plummet to below freezing, which is the ideal time to observe tarantulas and the refuge's mammal species.



James L. Reveal

Amargosa Niterwort

numerous imperiled species, focusing on restoring natural habitat and removing threats to the species. Refuge managers are returning irrigation-altered streams to their natural flows and controlling invasive plants and animals, freeing the niterwort from foreign competition. Responding to habitat repairs, as of 2001, 13,000 individual niterworts have reestablished themselves in the wild.

Recreation and Value for Americans

At the Ash Meadows National Wildlife Refuge visitor station, guests have access to displays and literature about the refuge and the rare species that reside there. The public can enjoy unparalleled opportunities to observe endemic wildlife while hiking, birdwatching, picnicking, or hunting. Visitors also can take advantage of the unusual chance to swim in the desert in the refuge's Crystal Reservoir.

The refuge is open year round, and with good reason; the landscape and wildlife viewing prospects vary dramatically from season to season. In late winter and early spring, visitors can glimpse nesting bald eagles, early blooming wildflowers, and song birds, harbingers of the warm weather to come. Late spring is the height of breeding season, and young plants and animals abound in the refuge before summer temperatures skyrocket to 100 degrees Fahrenheit or more. Migratory birds move

Refuge Challenges

Although the refuge already has control programs in place for invasive species, a desert oasis is appealing to most non-native, water-starved wildlife. Until native species are reintroduced and establish a stronghold in their former habitat, refuge managers will have to closely monitor the prevalence and damaging effects of invasive species. Unfortunately, according to Linda Miller, the Deputy Project Manager at Nevada's Desert National Wildlife Refuge Complex, there are not enough staff to oversee the myriad rare and at-risk species at the Ash Meadows refuge.⁶⁴

Ash Meadows National Wildlife Refuge

Endangered & Threatened Species:
Ash Meadows speckled dace, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, Devil's Hole pupfish, Warm Springs pupfish, Ash Meadows milk-vetch, spring-loving centauray, Ash Meadows sunray, Ash Meadows ivesia, Ash Meadows blazingstar, Amargosa niterwort, and Ash Meadows gumplant

Established:
June 13, 1984

Location:
Nye County, Nevada

Acres: 22,117

★ Ash Meadows National Wildlife Refuge

OREGON

Nestucca Bay National Wildlife Refuge

*"When we try to pick out anything by itself, we find it hitched to everything else in the Universe."
-John Muir*

When American pioneers Lewis and Clark explored the Pacific northwest, they encountered the diverse species that live in Oregon's untamed mountains, deserts, wetlands, and coastline. Today, many of those same species find the Oregon environment ideal—some live in the state year-round, and others flock to the state to escape harsh northern



climates. Several species of water birds, raptors, mammals, fish, and amphibians dwell in the Nestucca Bay National Wildlife Refuge along Oregon's central coast. Each year, one of the largest populations of wintering Aleutian Canada goose migrates from the north Pacific islands of Alaska and Canada to the refuge, making it one of the birds' most important wintering habitats.

Species in Decline: The Aleutian Canada Goose

The Aleutian Canada goose was the victim of burgeoning fur demand in the early-mid 1900s. On the goose's island habitat, fur farmers responded by raising Arctic fox for their snow-white coats. The islands were formerly devoid of predators, so hungry fox easily preyed on young chicks and molting geese, neither of which can fly. Fur farmers abandoned their practice in the 1940s, but the fox remained on the islands, further decimating the species until it was listed as endangered in 1967.⁶⁵ Additional threats come from urban development and the expansion of agricultural land, both of which destroy the goose's migratory habitat.⁶⁶

Refuge for an Imperiled Species

Prior to the designation of the Nestucca Bay National Wildlife Refuge in 1991, the U.S. Fish & Wildlife Service trapped and killed rampant fox on the goose's summer islands in order to protect the species. With the threat removed from the breeding habitat, the Fish & Wildlife Service turned its focus toward the wintering habitat, which was quickly being destroyed by development. The Nestucca Bay refuge, in combination with four other refuges in the Oregon Coast National Wildlife Refuge complex, played an important role in keeping some of the goose's last remaining habitat intact. The resilient goose responded quickly to habitat preservation and non-native predator management, and the species was removed from the threatened species list in 2001.⁶⁷

Since the geese have recovered, the refuge is pursuing additional wildlife preservation projects.



Dusky Canada Geese

Soon to acquire more property for the refuge, managers will take on another complicated restoration project—repairing a tidal estuary important for the survival of threatened coho salmon.⁶⁸

Recreation and Value for Americans

The Nestucca Bay National Wildlife Refuge is in the process of developing a public use management plan, so wildlife recreation is currently limited. However, of the six major recreational activities available in most refuges—hunting, fishing, photography, environmental education, nature interpretation, and birdwatching—most are thought to be compatible with the refuge’s conservation plans. The refuge managers likely will introduce all of these activities in the near future, except for hunting, which could jeopardize the geese populations.⁶⁹

While developing the recreation plan, refuge staff have engaged students through in-depth educational research programs. With the help of school environmental groups, the refuge has reforested a hillside and simultaneously taught the students about habitat restoration and nesting geese.⁷⁰ High school students also have surveyed the land to determine if the refuge encompasses suitable habitat to introduce the Oregon silverspot butterfly and analyzed water quality to ascertain whether the refuge is home to a parasite that causes deformities in frogs.⁷¹

Refuge Challenges

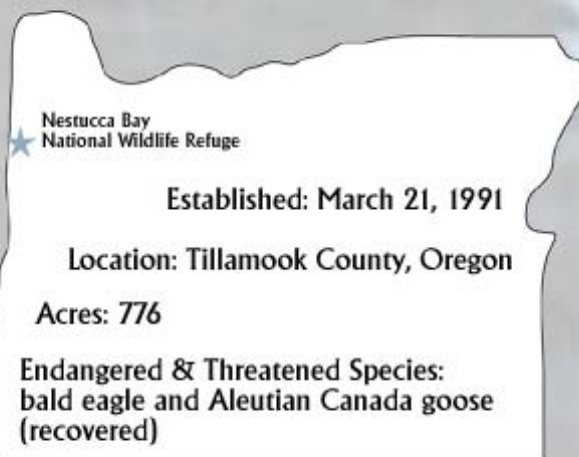
In restoring habitat, refuge managers face their

greatest challenge in controlling rampant non-native blackberry bushes, which overpower saplings trying to establish themselves on the refuge’s hillside.

Funding shortages are a perennial problem for the Nestucca Bay refuge, one of six refuges managed by the Oregon Coast National Wildlife Refuge Complex. Only six staff people are available to oversee the refuges, which span 320 miles of coast. Every rock, reef, and island along the coast is managed as a refuge for migratory water birds, a staggering responsibility for an overextended staff.

Refuge managers have used unique solutions to overcome habitat restoration and funding problems. The refuge has entered into conservation land management agreements with farmers, who graze their cattle on the geese pastures and pay the refuge with money that is invested back in the refuge.⁷² Some farmers also assist with habitat management.⁷³

Nestucca Bay National Wildlife Refuge



TEXAS

Attwater Prairie Chicken National Wildlife Refuge

*"The more we exploit nature, the more our options are reduced, until we have only one: to fight for survival."
-Morris K. Udall*

Before our country's original settlers began their westward journey, the Texas landscape teemed with

more recently, urban and residential development and oil and gas exploration have decimated the prairie even further. Landowners also have controlled the fires that naturally sweep through the prairie, thus interrupting the cycle of native vegetation growth and death. Now, a mere one percent of the prairie chicken's land is left, and the number of birds that have survived the habitat loss is similarly small.

The small, disconnected tracts of land remaining for the prairie chicken do not provide necessary protection from predators, which find ideal hunting grounds in the fragmented habitat. These threats led to the listing of the prairie chicken as an endangered species in 1967.

Refuge for an Imperiled Species

Endowed with 3,500 acres of land, the U.S. Fish & Wildlife Service established the Attwater Prairie Chicken National Wildlife Refuge in 1972. Since that time, the refuge has grown to encompass more than 10,528 acres of habitat. Despite this habitat protection, there were only 22 prairie chickens remaining on the refuge in 2002.⁷⁶ To keep the species from extinction, the U.S. Fish & Wildlife Service has devised a recovery program focused on captive breeding.

Recreating an environment conducive to breeding is a challenge for managers of captive prairie chickens. Currently, prescribed fire is applied to the prairie in order to control the spread of non-native plants. To complement invasive species management, refuge staff also are replanting native grasses using seeds harvested from the last of the refuge's natural prairie.⁷⁷

With seven breeding facilities, the program has

U.S. Fish & Wildlife Service/Gary P. Montoya



Attwater's Prairie Chicken

diverse wildlife. Still today, Texas ranks second in the country for species diversity, but it is also fourth in number of extinctions.⁷⁴ The Attwater Prairie Chicken National Wildlife Refuge protects the habitat of more than 250 species of birds, 50 species of mammals and several species of reptiles, amphibians, and wildflowers.⁷⁵ As its name suggests, however, the refuge was established to protect one of the 90 endangered and threatened species in Texas, the Attwater's prairie chicken.

Species in Decline: The Attwater's Prairie Chicken

Six million acres of habitat were once available for the million prairie chickens that roamed through the prairie grasslands of Texas and Louisiana. Settlers and farmers erected towns and plowed fields over much of the prairie chicken's range, and

achieved moderate success. Prairie chickens have high annual mortality, so the breeding program has been successful only in replacing the birds that die

Native Prairies Association of Texas



Texas Prairie

each year.⁷⁸ However, the program showed improvement in 2002; 164 birds were released in the late summer before hawks and owls, which prey on young prairie chickens, arrived in the refuge. To date 50% of them have survived, up from the 5% typical of most years.⁷⁹

Recreation and Value for Americans

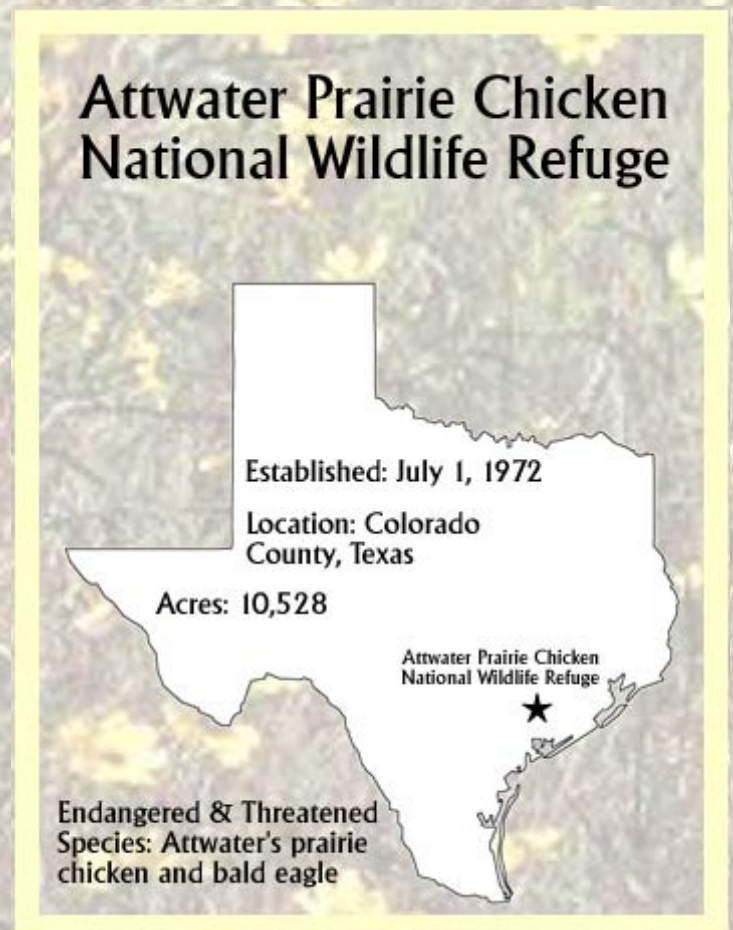
Visitors to the Attwater Prairie Chicken National Wildlife Refuge are not likely to see one of the rare birds, but they may enjoy many opportunities to explore and observe the hundreds of other species that live in the refuge's grasslands. Visitors can traverse the refuge on an automobile tour of prairie and marsh habitat, or hike on trails ideal for observing and photographing wildlife. At the refuge's visitor center, guests can look at more than 100 bird mounts in a small museum and watch a video about the prairie chicken, a consolation for not being able to see one in the wild.

Refuge Challenges

Were it not for the Attwater Prairie Chicken National Wildlife Refuge, the species would be extinct. However, even though the refuge provides necessary habitat for the bird's survival, the land remains separated in unattached tracts that are unfavorable for the species. Connecting habitat for the prairie chicken will require purchasing approximately 15,000 more acres of land.⁸⁰

Unfortunately, funding for land acquisition has declined recently,⁸¹ so the Fish & Wildlife Service has begun using "Safe Harbor Agreements" to expand habitat protections onto private lands. Under these agreements, landowners are free from Endangered Species Act liability for the incidental killing of species on their land, as long as they implement agreed upon habitat improvements and maintain baseline habitat quality.⁸² With so many species residing on privately-owned land, the future of species' protections may depend on cooperative relationships between the refuges and landowners.

The refuge's captive-breeding program has effectively stabilized the number of prairie chickens residing there, but increasing their population is an ongoing challenge for wildlife managers. Allowing the birds to have ample time to adjust to the environment improved survival rates in 2002,⁸³ but the number of birds in the wild is still far short of the desired 5,000 individuals.⁸⁴



VIRGINIA

James River National Wildlife Refuge

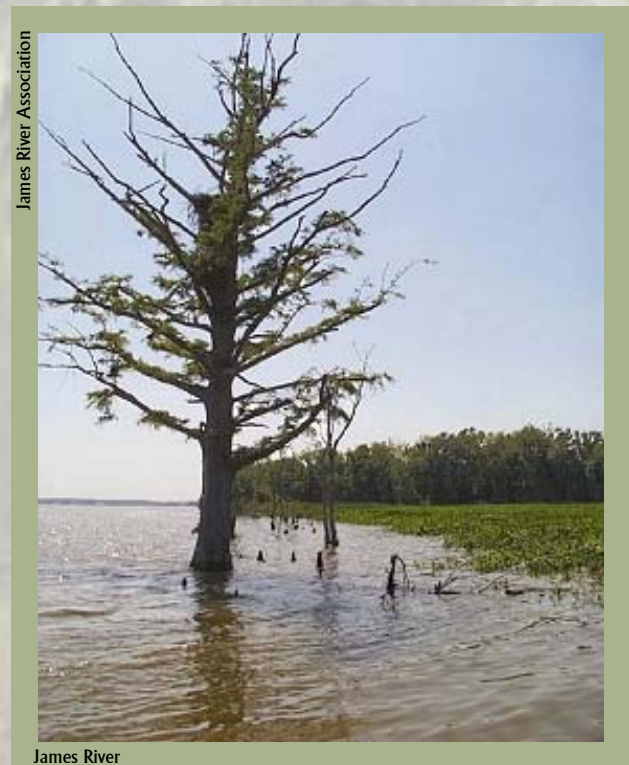
“As we peer into society’s future, we—you and I, and our government—must avoid the impulse to live only for today, plundering for our own ease and convenience, the precious resources of tomorrow. We cannot mortgage the material assets of our grandchildren without asking the loss of their political and spiritual heritage.”
-Dwight D. Eisenhower

When the first wave of English settlers entered Virginia, they encountered wilderness unlike any found in Europe. One of the species that welcomed the travelers, the bald eagle, is now protected in the same area by the James River National Wildlife Refuge. While the refuge was established to protect our celebrated national bird, it is also prime aquatic habitat for several species of fish, including alewives, American shad, blueback herrings, gizzard shad, hickory shad, and striped bass.

Species in Decline: The Bald Eagle

Eagles were once abundant in the U.S. In 1782, when the federal government chose the bird for our national emblem, approximately 25,000-75,000 nesting pairs inhabited the country.⁸⁵ The decline of the bald eagle began in 1947 when the pesticide DDT entered into widespread use. DDT was a persistent toxin in the environment, accumulating in animals’ fatty tissues. At the top of the food chain, eagles collected a great deal of the chemical in their bodies, impeding the birds’ ability to lay eggs. When the birds were able to breed, the egg shells were too weak to withstand the incubation process.⁸⁶ As few as 450 pairs remained by the early 1960s.⁸⁷

Eagles also live on choice real estate land, near coasts, rivers, and lakes surrounded by mature forests. Consequently, before the refuge was established, logging and sprawling urban and residential development continuously destroyed the eagles’ habitat. Because of this toxic pollution and habitat loss, populations dramatically



declined, warranting the bald eagle’s listing as endangered in 1967.

Refuge for an Imperiled Species

The James River National Wildlife Refuge is one of four refuges that was established for the sole purpose of protecting endangered bald eagles, and one of 127 refuges that provide habitat for significant populations of the species.

DDT was banned in United States in 1972, initiating the slow recovery of the eagle, but the species’ rebound would have been far more difficult without protected habitat. The James River

National Wildlife Refuge, created in 1991, encompasses particularly important habitat for eastern bald eagles during the roosting season; nearly 1,000 eagles visit the refuge each summer.⁸⁸ Nationwide, eagle protection efforts have been highly successful; between 1982 and 1999, the number of nesting eagle pairs increased from 1,480 to 6,104.⁸⁹ Given this dramatic rebound, the species' listing was downgraded from endangered to threatened in 1995, and the species was proposed for complete delisting in 1999.⁹⁰

Recreation and Value for Americans

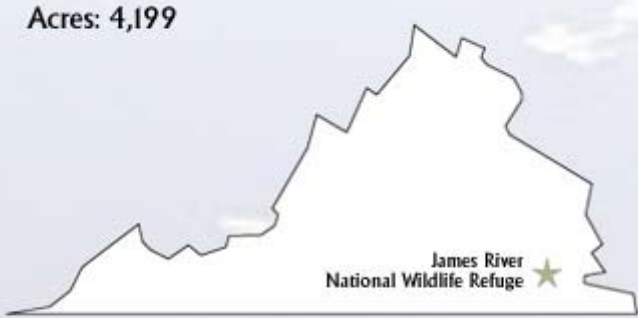
Hiking and hunting are allowed in the refuge on a limited basis, particularly during the refuge-sponsored deer hunt each year. Visitors also can enjoy a history lesson in the James River area. A significant portion of America's history began on the land of the James River National Wildlife Refuge. Through the years, the eagles' habitat provided life-sustaining resources for the Native American Algonquian tribe and English colonialists. Without the abundant natural riches of the land, the region's waves of settlers would have perished.

James River National Wildlife Refuge

Established: March 27, 1991

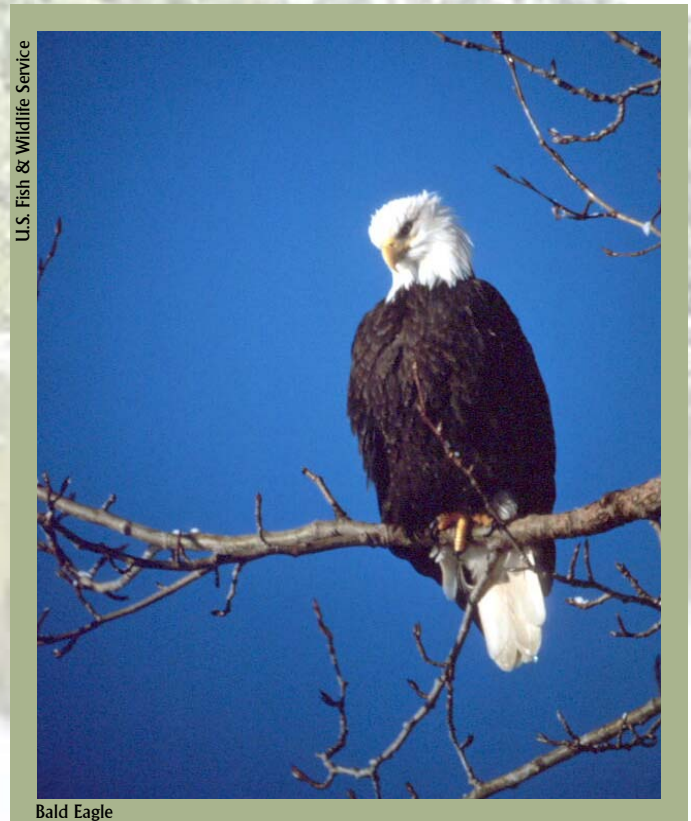
Location: Prince George's County, Virginia

Acres: 4,199



James River National Wildlife Refuge

Endangered & Threatened Species:
bald eagle



Refuge Challenges

The intricate history of the James River area appeals to visitors and enhances the value of the refuge, but it also poses a unique challenge for refuge management. Long ago, the refuge forest was replanted with pine trees, which now grow thickly along the river. Abundant trees compete for resources, resulting in a forest of small, weak trees that are not ideal for eagle roosting. Sturdier trees like those found in the eagles' original habitat can grow only if the natural forest composition and structure is restored, a process that damages nearby soils and archaeological resources. Striving to protect artifacts while providing the best possible habitat for the eagles has delayed the approval of a forest management plan.⁹¹

Limited recreational activities are available in the refuge, but increased funding for the refuge would allow managers to develop more public use opportunities. Currently, however, the refuge is without an on-site staff person to carry out important wildlife management programs, so the likelihood that someone will be hired to increase public engagement in the refuge is remote.

RECOMMENDATIONS

“Public lands and parks, our forests and our mineral reserves, are subject to many destructive influences. We have to remain constantly vigilant to prevent raids by those who would selfishly exploit our common heritage for their private gain. Such raids on our natural resources are not examples of enterprise and initiative. They are attempts to take from all the people for the benefit of a few.”

-Harry S. Truman

The U.S. government must provide more resources for the refuge system to fulfill its conservation and recreation mission. The centennial of the refuge system has produced modest progress in increasing appropriations for the refuge system. For the 2002 fiscal year, the Bush administration increased funding by \$19.3 million to a budget of \$318.9 million.⁹²

While these budget improvements have been graciously accepted, allocations must continue to grow in order to deal with the ever-increasing line of programs and maintenance that need funding. The Cooperative Alliance for Refuge Enhancement (CARE), a coalition of conservation and recreation groups dedicated to improving the operation and maintenance of refuges, estimated in 2001 that eliminating the backlog of refuge maintenance would cost \$831 million.⁹³ CARE's analysis shows that the refuge system needs significantly more funding to hire more than 1,000 additional staff, maintain refuge facilities, and provide recreational opportunities for the millions of refuge visitors each

year. CARE estimates that the refuge system, at minimum, needs \$560 million allocated annually for operations and \$140 million per year for maintenance in order to protect species and provide the public with satisfying wildlife recreation.

In addition, the refuge system needs to grow in order to effectively guard wildlife and its habitat. In the proposed FY2004 budget, the Bush administration reduced the budget for land acquisition by \$29.6 million.⁹⁴ While this may allow more resources to be devoted to land management on current refuges, if our nation's threatened and endangered species are to be protected, more of their disappearing habitat will need to be preserved. Of the threatened and endangered species in the United States today, only 32% have critical habitat designated for their survival. Wildlife refuges are ideal sites for recovery, where dedicated staff can devote their energies to maintaining species' populations while involving the public in wildlife conservation and recovery programs.

CONCLUSION

We have altered the landscape of our country. High rise buildings stand where forests once grew; pollution contaminates formerly pristine waters; and non-native species invade ecosystems that have functioned in harmony for centuries. For much of our nation's wildlife, those challenges have been too much to overcome, and 1,262 species are close to the brink of extinction.

The U.S. Fish & Wildlife Service is responsible for ensuring that these species will continue to enhance the country for generations to come. Fortunately, the Fish & Wildlife Service has two primary mechanisms to guarantee that species endure: the Endangered Species Act and the National Wildlife Refuge System.

Species have a legal defense once they are listed as endangered, for they receive mandatory protection under the Endangered Species Act. The law is a beacon of hope for wildlife, announcing that extinction is intolerable and that species are well

worth the land set aside for their continued survival. That land has often been found in the refuge system.

National wildlife refuges may be the savior for imperiled species; they already provide essential habitat for 258 threatened and endangered plants and animals. In 56 instances, refuges were created to preserve the last fragments of suitable habitat for dying species. Without refuge lands, displaced wildlife would have nowhere to hide from escalating development and habitat modification. Many of those species would already be extinct.

The fate of hundreds of species may be decided by the refuge system, which has been able to protect wildlife even under extreme funding constraints. However, there is no assurance that it will be able to continue with so few resources. Only with adequate funds will our wildlife refuges be able to protect species for another century.

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REFUGE LIST

Refuges Established for Endangered Species

ALABAMA

Sauta Cave National Wildlife Refuge

Location: Alabama

Species Protected: Gray bat and Indiana bat.

Fern Cave National Wildlife Refuge

Location: Alabama

Species protected: Gray bat, Indiana bat, and American Hart's-tongue fern.

Key Cave National Wildlife Refuge

Location: Alabama

Species protected: Gray bat and Alabama cavefish.

Watercress Darter National Wildlife Refuge

Location: Alabama

Species protected: Watercress darter.

ARKANSAS

Logan Cave National Wildlife Refuge

Location: Arkansas

Species protected: Gray bat, Indiana bat, cave crayfish, and Ozark cavefish.

ARIZONA

Buenos Aires National Wildlife Refuge

Location: Arizona

Species protected: Masked bobwhite quail, cactus ferruginous pygmy-owl, Pima pineapple cactus, Kearney bluestar, peregrine falcon, southwest willow flycatcher, and razorback sucker.

Leslie Canyon National Wildlife Refuge

Location: Arizona

Species protected: Gila topminnow, Yaqui chub, and Huachuca water umbel.

San Bernardino National Wildlife Refuge

Location: Arizona

Species protected: Gila topminnow, Yaqui chub, Yaqui catfish, beautiful shiner, cactus ferruginous pygmy-owl, and Huachuca water umbel.

CALIFORNIA

Antioch Dunes National Wildlife Refuge

Location: California

Species protected: Lange's metalmark butterfly, Antioch Dunes evening-primrose, and Contra Costa wallflower.

Bitter Creek National Wildlife Refuge

Location: California

Species protected: California condor, San Joaquin kit fox, and blunt nosed leopard lizard.

Blue Ridge National Wildlife Refuge

Location: California

Species protected: California condor.

Castle Rock National Wildlife Refuge

Location: California

Species protected: Aleutian Canada goose (recovered).

Coachella Valley National Wildlife Refuge

Location: California

Species protected: Coachella Valley fringe-toed lizard.

Don Edwards San Francisco Bay National Wildlife Refuge

Location: California

Species protected: California clapper rail, California least tern, western snowy plover, salt marsh harvest mouse, brown pelican, and vernal pool tadpole shrimp.

Ellicott Slough National Wildlife Refuge

Location: California

Species protected: Santa Cruz long-toed salamander.

Hopper Mountain National Wildlife Refuge

Location: California

Species protected: California condor.

Sacramento River National Wildlife Refuge

Location: California

Species protected: Bald eagle and valley elderberry longhorn beetle.

San Diego National Wildlife Refuge

Location: California

Species protected: Arroyo toad, California red-legged frog, coastal California gnatcatcher, least Bell's vireo, southwestern willow flycatcher, Riverside fairy shrimp, San Diego fairy shrimp, Quino checkerspot butterfly, San Diego button-celery, California orcutt grass, San Diego mesa mint, and Otay mesa mint.

San Joaquin River National Wildlife Refuge

Location: California

Species protected: Aleutian Canada goose (recovered), bald eagle, and riparian brush rabbit.

Seal Beach National Wildlife Refuge

Location: California

Species protected: California least tern, light-footed clapper rail, brown pelican, peregrine falcon, western snowy plover, and Belding's savannah sparrow.

Sweetwater Marsh National Wildlife Refuge

Location: California

Species protected: Light-footed clapper rail, California least tern, least Bell's vireo, western snowy plover, Belding's savannah sparrow, salt marsh bird's beak, and Palmer's frankenia.

Tijuana Slough National Wildlife Refuge

Location: California

Species protected: Light-footed clapper rail, California least tern, least Bell's vireo, western snowy plover, brown pelican, Belding's savannah sparrow, and salt marsh bird's beak.

FLORIDA

Archie Carr National Wildlife Refuge

Location: Florida

Species protected: Loggerhead sea turtle, green sea turtle, hawksbill sea turtle, and leatherback sea turtle.

Crocodile Lake National Wildlife Refuge

Location: Florida

Species protected: American alligator, bald eagle, wood stork, Schaus swallowtail butterfly, Key Largo cotton mouse, Key Largo woodrat, American crocodile, and eastern indigo snake.

Crystal River National Wildlife Refuge

Location: Florida

Species protected: West Indian manatee.

Florida Panther National Wildlife Refuge

Location: Florida

Species protected: Florida panther, bald eagle, Everglade snail kite, red-cockaded woodpecker, wood stork, and eastern indigo snake.

Hobe Sound National Wildlife Refuge

Location: Florida

Species protected: Bald eagle, Florida scrub jay, piping plover, wood stork, four-petal pawpaw, eastern indigo snake, green sea turtle, leatherback sea turtle, and loggerhead sea turtle.

Lake Wales Ridge National Wildlife Refuge

Location: Florida

Species protected: Florida scrub jay, Florida bonamia, pygmy fringe-tree, pigeon wings, Garrett's mint, scrub buckwheat, scrub blazingstar, papery whitlow-wort, wireweed, scrub plum, eastern indigo snake, and sand skink.

National Key Deer Refuge

Location: Florida

Species protected: Bald eagle, wood stork, Key deer, lower Keys rabbit, silver rice rat, Key tree-cactus, Garber's spurge, eastern indigo snake, and Stock Island tree snail.

St. John's National Wildlife Refuge

Location: Florida

Species protected: Bald eagle, wood stork, eastern indigo snake, and dusky seaside sparrow (extinct).

HAWAII

Hakalau Forest National Wildlife Refuge

Location: Hawaii

Species protected: Akiapolaau, Hawaii akepa, Hawaii creeper, Hawaiian duck, Hawaiian goose, Hawaiian hawk, honeycreeper, Hawaiian hoary bat, 'oha wai, haha.

Hanalei National Wildlife Refuge

Location: Hawaii

Species protected: Hawaiian stilt, Hawaiian coot, Hawaiian moorhen, and Hawaiian duck.

Huleia National Wildlife Refuge

Location: Hawaii

Species protected: Hawaiian stilt, Hawaiian coot, Hawaiian moorhen, and Hawaiian duck.

James C. Campbell National Wildlife Refuge

Location: Hawaii

Species protected: Hawaiian stilt, Hawaiian coot, Hawaiian moorhen, and Hawaiian duck.

Kakahaia National Wildlife Refuge

Location: Hawaii

Species protected: Hawaiian stilt, Hawaiian coot, Hawaiian moorhen, and Hawaiian duck.

Kealia Pond National Wildlife Refuge

Location: Hawaii

Species protected: Hawaiian stilt and Hawaiian coot.

Pearl Harbor National Wildlife Refuge

Location: Hawaii

Species protected: Hawaiian stilt, Hawaiian coot, and Hawaiian duck.

IOWA

Driftless Area National Wildlife Refuge

Location: Iowa

Species protected: Iowa Pleistocene snail, northern wild monkshood, and Leedy's roseroot.

MASSACHUSETTS

Massasoit National Wildlife Refuge

Location: Massachusetts

Species protected: Plymouth red-bellied turtle.

MISSISSIPPI

Mississippi Sandhill Crane National Wildlife Refuge

Location: Mississippi

Species protected: Mississippi sandhill crane, bald eagle, red-cockaded woodpecker, and gopher tortoise.

MISSOURI

Ozark Cavefish National Wildlife Refuge

Location: Missouri

Species protected: Ozark cavefish.

Pilot Knob National Wildlife Refuge

Location: Missouri

Species protected: Indiana bat and gray bat.

NEBRASKA

Karl E. Mundt National Wildlife Refuge

Location: Nebraska and South Dakota

Species protected: Bald eagle.

NEVADA

Ash Meadows National Wildlife Refuge

Location: Nevada

Natural history: Ash Meadows speckled dace, Ash Meadows naucorid, Ash Meadows Amargosa pupfish, Devil's Hole pupfish, Warm Springs pupfish, Ash Meadows milk-vetch, spring-loving centaury, Ash Meadows sunray, Ash Meadows ivesia, Ash Meadows blazingstar, Amargosa niterwort, and Ash Meadows gumplant.

Moapa Valley National Wildlife Refuge

Location: Nevada

Species protected: Moapa dace.

OKLAHOMA

Ozark Plateau National Wildlife Refuge

Location: Oklahoma

Species protected: Ozark big-eared bat and gray bat.

OREGON

Bear Valley National Wildlife Refuge

Location: Oregon

Species protected: Bald eagle.

Julia Butler Hansen Refuge for Columbian White-Tailed Deer

Location: Oregon and Washington

Species protected: Columbian white-tailed deer and bald eagle.

Nestucca Bay National Wildlife Refuge

Location: Oregon

Species protected: Aleutian Canada goose (recovered) and bald eagle.

SOUTH DAKOTA

Karl E. Mundt National Wildlife Refuge

Location: Nebraska and South Dakota

Species protected: Bald eagle.

TEXAS

Attwater Prairie Chicken National Wildlife Refuge

Location: Texas

Species protected: Attwater's prairie chicken and bald eagle.

Balcones Canyonlands National Wildlife Refuge

Location: Texas

Species protected: Black-capped vireo and golden-cheeked warbler.

VIRGINIA

James River National Wildlife Refuge

Location: Virginia

Species protected: Bald eagle.

Mason Neck National Wildlife Refuge

Location: Virginia

Species protected: Bald eagle.

WASHINGTON

Julia Butler Hansen Refuge for Columbian White-Tailed Deer

Location: Oregon and Washington

Species protected: Columbian white-tailed deer and bald eagle.

WYOMING

Mortenson Lake National Wildlife Refuge

Location: Wyoming

Species protected: Wyoming toad and bald eagle.



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