About the Draft Vision

Conserving the Future: Wildlife Refuges and the Next Generation is a national effort to craft a renewed vision for the National Wildlife Refuge System. The work of five core teams of U.S. Fish and Wildlife Service employees has been consolidated into this single, draft vision document for your comment and review until Earth Day – April 22, 2011. To learn more about the vision process, visit http://americaswildlife.org/about/.

The transparency and collaborative spirit of this process has been possible through the power of partnership. The National Wildlife Refuge Association (NWRA) developed an interactive website (http://americaswildlife.org) as one means to openly engage diverse audiences to take part in lively conversations about the core teams' focal areas, even as the core teams were writing their draft recommendations. The Association of Fish and Wildlife Agencies (AFWA) is an organization of State fish and wildlife agencies that promotes sound management and conservation. They speak with a collective voice on important fish and wildlife issues and they agreed to have the Chair of their Federal and Tribal Relations Committee serve on the Steering Committee for *Conserving the Future* along with the National Wildlife Refuge Association.

This draft vision document begins with a look back at the Refuge System's history of dealing with urgent conservation challenges through innovation, perseverance and leadership. It goes on to describe how the challenges of a changing planet and America affect the Refuge System's conservation work and mission. Chapter 2 explains the vision for planning, designing, and delivering strategic conservation in the future. Chapter 3 focuses on the importance of conservation science in managing the Refuge System. Chapter 4 – called Human - Nature – recommends how the Refuge System can connect people with America's great outdoors and engage them in the stewardship of their Refuge System. Chapter 5 lays out recommendations for organizational excellence, and Chapter 6 addresses the need to ensure that leadership development keeps pace with the challenges facing the Service. The draft vision does not include a conclusion. A final chapter summarizing the a call to action will be written only after the critical input from reviewers like you when the revised draft vision is published in July of 2011.

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Chapter 1
Introduction

Wild beasts and birds are by right not the property merely of the people who are alive today, but the property of unborn generations, whose belongings we have no right to squander.
President Theodore Roosevelt

The course of American conservation changed dramatically as the 20th century dawned, when Paul Kroegel – appalled by the slaughter of brown pelicans for their fashionable feathers – decided to take action. Kroegel was a German immigrant, boat builder, and citrus grower who lived across the Indian River Lagoon from a 5- acre island where the birds nested. The situation was urgent; the colonies were on the brink of destruction. He patrolled the island's shores with his shotgun trying to safeguard the nesting birds. He talked to anyone who would listen, trying to rally support for the protection of the birds and this special place. He had the ear of some prominent ornithologists and they knew another man with a passionate interest in birds, the young President Theodore Roosevelt.

In a story that would be repeated many times over the next century and beyond, the passionate advocacy of a single citizen responding to an urgent conservation need was successful. On March 14, 1903 President Roosevelt established Pelican Island as the first national wildlife refuge.

He also established our nation's first waterfowl refuge, Lower Klamath, in 1908. Spurred by the organization that he co-founded, the Boone and Crockett Club, Roosevelt also made sure the early Refuge System provided habitat and management for big game animals that had been depleted on public lands.

Over the course of his presidency, Roosevelt established 53 refuges, from Key West's mangrove islands and sand flats to Flattery Rocks along the Washington Coast, where 150,000 pelagic birds nest and migrating birds sometimes swell the population to over one million. A new concept, protecting a system of wild lands for wildlife, was born.

Today, the Refuge System has evolved into the nation's most extensive network of public lands and waters dedicated to the conservation of wildlife species and their habitat. Its 553 national wildlife refuges and 38 wetland management districts support at least 700 species of birds, 220 mammals, 250 reptiles and amphibians, more than 1,000 species of fish and countless invertebrates and plants In an ever changing world, wildlife refuges have proven to be anchors for biodiversity and ecosystem conservation.

In America's increasingly urban world, these islands of natural beauty offer Americans places to soothe or stir the soul, educate the mind and enjoy outdoor, wildlife-dependent recreation, including fishing, hunting, wildlife observation, birding and photography.

Refuges assist communities too in the restoration of millions of acres of depleted lands, relieving regional flooding by protecting wetlands, improving water quality, and helping private landowners utilize conservation protocols on their own lands. According to the last estimate in

2004, national wildlife refuges generated nearly $1.7 billion in economic activity and created 27,000 private sector jobs. The value of the Refuge System's ecosystem services — such as improved soil and water quality in neighboring communities — has been estimated at almost $27 billion per year.

The conservation dream of 1903 is being fulfilled every day across the country. National wildlife refuges stretch from the southern Caribbean to the northernmost tip of Alaska and more than halfway to Japan. They range from small urban oases to remote Pacific Islands; former military ranges to Arctic estuaries; tropical lagoons to deserts, tundras, salt marshes, seashores and forests. At least twenty million acres are designated wilderness — natural areas undisturbed by human activity and allowed to remain truly wild places.

National wildlife refuges sustain nearly 300 of the nation's more than 1,300 endangered or threatened species; 59 refuges were established specifically for endangered species. Refuges have been instrumental in the recovery of several species, including the bald eagle, Kirtland's warbler, the brown pelican, Key deer and the American alligator.

Another 200 wildlife refuges were established to protect migratory birds. Many wildlife refuges along the four major north-south flyways hold festivals to celebrate the seasonal arrival of snow geese, tundra swans, sandhill cranes, shorebirds and songbirds; these refuge festivals provide a major economic boost to their communities. More than 3,000 waterfowl production areas — primarily in the Prairie Pothole regions of Minnesota and the Dakotas — offer habitat for a vast variety of waterfowl, shorebirds, grassland birds, plants and insects.

The Refuge System; however, does not operate in isolation. The Service cooperates closely with State fish and wildlife agencies in planning and administering the Refuge System. Both the Service and the State fish and wildlife agencies have authorities and responsibilities for management of fish and wildlife on national wildlife refuges. Effective conservation of fish, wildlife, plants and their habitats depends on the professional relationship between managers at the State and Federal level. The Service acknowledges the unique expertise and role of State fish and wildlife agencies in the management of fish and wildlife.

The Refuge System also depends on the expertise of many partners in the conservation community including federal land management agencies, other federal conservation agencies, tribes, Friends organizations, and numerous non-governmental organizations with varying interests. Without these partners, the Refuge System would be unable to accomplish a great deal of its conservation work.

The Refuge System works to foster public understanding and appreciation of the natural world through wildlife-oriented recreation. The National Wildlife Refuge System Improvement Act of 1997 gives priority to recreational activities that depend on wildlife: hunting, fishing, wildlife observation, photography, interpretation, and environmental education. Hunting is offered at more than 300 national wildlife refuges, and quality fishing is available on more than 270 wildlife refuges. Sometimes called America's "first conservationists", hunters and anglers have played a role in the conservation of the nation's fish and wildlife resources since the late 19th century. They have been longtime partners of the Refuge System, and will continue to be so as

long as there is a National Wildlife Refuge System. Fishing opportunities in the Refuge System represent virtually every type of sport fishing on the continent. From inconnu and grayling in remote Alaska to snook hovering by mangroves in Florida's Ten Thousand Islands, national wildlife refuges offer anglers adventure and diversity.

The number of people engaged in wildlife observation on wildlife refuges – especially birding and photography – are on the rise. Every year, thousands of schoolchildren and their teachers visit national wildlife refuges to learn about conservation firsthand and discover the joy and mystery of the natural world. Through environmental education and interpretation, wildlife refuges nurture a sense of wonder in Americans of all ages. Wildlife refuges are also repositories of the nation's archeological and cultural heritage, with protected historic sites on wildlife refuges offering visitors glimpses of life in other eras.

A Changing America

In developing the National Wildlife Refuge System's strategic direction for the next decade, the Service and the public it serves must understand where America has been and where it is going — demographically, socially, and economically. Much has changed since 1999 when the Refuge System last examined its future at this scale.

A growing number of the people in American and global societies see less of a direct link between the natural world and their food, water, and quality of life, but this does not make conservation less relevant today than it was in President Roosevelt's era or at other times in history when people rallied to save nature. This disconnection demands innovative and dynamic ways to increase society's conservation literacy, to connect people to nature and to communicate why the collective conservation mission is more relevant today than ever before.

The United States population has increased more than 14 percent since 1998. As U.S. residents become increasingly concentrated in cities and mega-cities, urban sprawl is fragmenting more habitat. By 2050, the U.S. population is projected to grow to 392 million.

The United States is more racially and ethnically diverse. Groups that have historically been considered minorities are projected to be the majority by 2042. Hispanics are the fastest growing group, expected to make up a third of the population by 2050. One of eight Americans is African American.

The nation is also aging. By 2030 nearly one in five residents will be 65 or older. By 2050 Americans 65 and older will exceed 80 million. But the "baby boomer" generation, the first of who turned 65 in 2011, is different than those who turned that same age generations ago. They are determined to stay active, to try new adventures and to make a difference for society.

Demographic shifts are intersecting with other major trends. Among the most profound is accelerating climate change, fueled by rapid world population growth. These changes are evidenced by rising sea levels, loss of coastal wetlands, more incidents of flooding and droughts, and the growth of non-native species that crowd out native organisms in ecosystems once thought outside their range.

Social changes have also been profound. The pervasive spread of portable, wireless communication devices and a culture of nonstop social networking have changed the social fabric. The American people are less connected with America's great outdoors. While environmental threats still resonate on some level — witness public outcry over the 2010 Deepwater Horizon oil spill in the Gulf of Mexico — many citizens feel that conservation threats are a distant concern. The Refuge System's challenge is to make wildlife refuges relevant to citizens' lives.

Being relevant to America demands the delivery of lasting benefits to all of America's citizens while at the same time ensuring representation of all of her citizens appropriately as The Service works within the broader global context. The Service needs to stand ready to meet opportunities with appropriate and immediate action, renewed focus, flexibility, and creative initiatives that are responsive to change. The Service must be prepared to learn new strategies, exchange models and insights, and effectively manage the Refuge System for a rapidly changing America.

Chapter 2
Conserving the Future

Strategically Conserving Fish and Wildlife

Climate change, habitat degradation and fragmentation, declines in water quality and quantity, the spread of invasive species, and ocean acidification are among the many stressors putting unparalleled pressures on the nation's ecosystems. There has never been a more critical time for the conservation community to work together to develop landscape-level conservation strategies. Land managers are more frequently facing the difficult task of identifying lands that can be saved by timely, concerted action; those that will likely recover on their own; and those that no amount of effort will save. In these situations, managers must often answer questions, such as, should we attempt to maintain freshwater wetlands in the face of salt-water intrusion, or would the wildlife refuge's limited resources be better spent enhancing the ecological resilience of upland habitats to climate change? Such trade-offs in conservation are nothing new, of course, but are likely to become ever more urgent in the coming years. The need for collaborative, scientifically based and proactive conservation planning and design has long been seen as essential. During the early implementation phase of *Fulfilling the Promise*, several teams assessed how wildlife refuges should plan for wildlife, habitat and biodiversity goals at multiple spatial scales. Their important "goals report" made clear that such an endeavor would have implications throughout the landscape. Nearly a decade ago, the teams concluded that it made little sense for the Refuge System to undertake such an effort on its own. Several of the report's authors joined with U.S. Fish and Wildlife Service colleagues to form a National Ecological Assessment Team, which examined the subject more broadly. Their work resulted in the June 2006 report, "Strategic Habitat Conservation," which serves as the scientific blueprint and methodology for the Service's current conservation efforts.

Strategic Habitat Conservation is a science-based framework for making management decisions about where and how to deliver conservation effectively to achieve specific biological outcomes. It is a feedback loop that starts with assumption-based research that feeds biological planning and then moves into conservation design; conservation delivery; inventory and monitoring; and back again to inform biological planning. The principles of Strategic Habitat Conservation are being used in implementing the Service's climate change strategy, *Rising to the Urgent Challenge: Strategic Plan for Responding to Accelerating Climate Change*. This plan establishes a basic framework within which the Service will work as part of a larger conservation community to help ensure the sustainability of fish, wildlife, plants and habitats in the face of accelerating climate change. A key component of the plan is development of Landscape Conservation Cooperatives, a national network of 21 self-directed partnerships. They are to provide shared science capacity to inform resource management actions addressing climate change and other stressors within and across landscapes.

The *Strategic Habitat Conservation* report recognized that the Service has considerable capacity for conservation delivery. It focused primarily on the undeveloped capacity for biological planning, conservation design and targeted research and monitoring. But the report also recognized that "delivery of conservation actions" would be the subject of ample future discussion, including the changing role of the Service in collaborative conservation.

The discussion now turns to how the Service can continue to use the National Wildlife Refuge System – and its impressive array of conservation tools – to deliver conservation on the ground, and how, in light of numerous changes on the landscape, that delivery will differ from the past.

Delivering Fish and Wildlife Conservation

Wildlife conservation on national wildlife refuges requires carefully designed protection and planned management of fish and wildlife populations and habitat to assure that biological diversity, integrity and environmental health are sustained. Conservation delivery means taking action on the ground to protect, restore and enhance fish, wildlife and plant populations and their habitats. It may sound simple, but nothing could be more complex.

Conservation delivery is not a new concept, but the job has grown in complexity because of unprecedented habitat fragmentation, invasive species, climate change impacts, and other stressors. Conservation professionals must contend with the endless variability and interdependence of ecological systems, and work to achieve positive conservation outcomes with information that will always be incomplete. Conservation professionals will require skill, adaptability and the capacity for innovation to meet such threats.

For conservation delivery systems to meet the challenges of the present and future, the traditional strengths of the National Wildlife Refuge System – a spectacular diversity of lands and waters fortified by a dedicated workforce – must be enhanced. So, too, must the Refuge System's scientific capacity, operational flexibility and practical innovation be strengthened. Conservation delivery is where biological planning and conservation design come together, and action is taken. The urgency for action has never been greater.

Ever since Pelican Island was established as America's first national wildlife refuge in 1903, the Refuge System has grown, sometimes haphazardly and opportunistically. Growth has benefited species and habitat most when goals are clear, such as protecting and restoring waterfowl populations along the flyways or the protection of an endangered species.

Land protection strategies have evolved to recognize that multiple ecological scales must be considered. Future conservation efforts will still require core protected areas, but strategies must include linking and buffering core areas with working landscapes that consider conservation practices. Maximizing sustainable populations of fish and wildlife at larger geographic scales requires they be managed in conjunction with the adjoining mosaic of land.

> Recommendation: All future land protection strategies should incorporate local, landscape and other necessary ecological scales and emphasize the importance of working lands in the surrounding landscape.

It is now widely recognized that partnerships are essential to configure a conservation landscape large enough to protect fish and wildlife. The Refuge System is a vital and irreplaceable element of the conservation estate, but it cannot protect all ecosystems and all species alone. Partnerships and collaboration are essential to extend conservation delivery work beyond boundaries and

across the landscape. The variety of potential partners is nearly limitless, but must include federal agencies, states, tribes, a diverse spectrum of non-governmental organizations, and Refuge Friends organizations.

One example of a collaborative, landscape-scale conservation success is the Blackfoot Challenge in Montana. The Blackfoot Challenge is a grassroots group organized to coordinate management of the Blackfoot River, its tributaries and 1.5 million acres of adjacent lands. While the group has no formal membership, it consists of numerous private landowners, federal and state agency representatives, including a number of national wildlife refuges, local government officials and several corporate landowners. Together, the participants work to enhance, conserve and protect the natural resources and rural lifestyle of the Blackfoot River Valley for present and future generations. The Blackfoot Challenge supports environmentally responsible resource stewardship through the cooperation of public and private interests.

Land protection strategies for the future must be devised to place protected areas in the context of the greater surrounding landscape and consider the role of working lands, like ranches and farms. Efforts must focus on representation of ecological communities in protected areas, of adequate size and connectivity to other protected areas. The Service, in partnership with others, must work with a dual focus of protecting both the areas under highest threat today and those with relatively intact biodiversity. Conservation in the future must include not only public lands but the important roles of working ranches, farms and forests, as well as privately owned recreational properties with conservation provisions that buffer and link protected areas.
Not all new wildlife refuges or refuge expansions must involve land acquisitions. The vast majority of the Refuge System, as well as the National Park and Forest systems, came from the withdrawal of lands from unreserved public domain. Planners should consider whether withdrawal of unreserved public domain for wildlife conservation purposes as national wildlife refuges can increase the size, connectivity, redundancy and representation of the conservation estate and contribute to climate change adaptation.

Landscape Conservation Cooperatives will help inform future land protection efforts via Strategic Habitat Conservation and the National Fish and Wildlife Climate Adaptation Strategy. Both efforts endorse a unified approach to reducing the negative impacts of climate change, setting conservation targets, identifying gaps in the conservation landscape, designing a network of planned conservation areas, implementing priority conservation measures, monitoring, and adapting future strategies based on cooperative action. But future land protection planning is hampered by the lack of an integrated strategy for accomplishing the varying missions of the land management agencies. Others in the conservation community have developed like-minded, adaptive management models, which present an opportunity to integrate efforts and further establish common ground upon which to act.

The Refuge System must move quickly to participate in a collaborative landscape-level strategy for the National Wildlife Refuge System that can effectively address the most challenging and pervasive 21st century threats to biodiversity, such as climate change, urban development, habitat loss and fragmentation, and invasive species. The landscape strategy must transcend the Refuge System. A National Conservation Strategy for the Refuge System involves working with partners and local communities to develop and implement innovative conservation techniques across

federal, state, public, and privately owned lands that effectively and efficiently protect and manage species, habitats, and ecological services.

> Recommendation: Work collaboratively to develop a National Conservation Strategy for the National Wildlife Refuge System.

Under this strategy and working with partners, the Refuge System must use the best available science to identify local, national, and global conservation priorities and link these with clear conservation goals and objectives across various temporal and spatial scales. The process takes into consideration how priorities fit into a policy and institutional context. The Refuge System should establish a mechanism to revise or reassess priorities at regular intervals.

The national strategy will ensure implementation of management actions that transcend jurisdiction. The Refuge System encourages collaboration and teamwork among the Service, state and federal agencies, and other partners to maximize effectiveness of species and habitat conservation and stewardship across the landscape. Successful implementation of the National Conservation Strategy must involve partner agencies, organizations, local communities, and other stakeholders at all stages of the process, from priority setting to implementation and evaluation.

The national strategy should include 1) identifying conservation targets (species, habitats, connectivity, biological redundancies, and ecological services), 2) collecting information, assessing existing conservation areas based on biodiversity values and conservation targets, and identifying gaps, 3) setting bold conservation goals and priorities, 4) evaluating the viability and integrity of conservation targets, 5) selecting and designing a network of conservation areas that preserves these conservation targets and contributes to meeting conservation goals (both as a part of the Refuge System and external to the Refuge System), 6) assessing threats and setting priorities, and 7) evaluating and monitoring the process to ensure the strategy is meeting program objectives.

Strategic Growth

While the nation has amassed impressive lands that benefit wildlife, including national wildlife refuges, national parks, national forests, state protected areas, and others, current human population and development trends threaten to overwhelm the value many of these habitats currently hold for wildlife and ecosystem integrity. By 2050, the U.S. population is expected to reach nearly 400 million, each of who require water, housing, roads, stores, and huge tracts of land to grow food and to recreate. Many of America's natural areas exist as parcels surrounded by land or water unsuitable for most wildlife; an arrangement that is not sustainable if the goal is to conserve as many species and habitats as possible. In recognition of these serious threats, the Refuge System embraces and is enthusiastically committed to the progressive language of the Refuge System Improvement Act, which calls for "the continued growth of the System in a manner that is best designed to accomplish the mission of the System, to contribute to the conservation of the ecosystems of the United States, to complement efforts of States and other Federal agencies to conserve fish and wildlife and their habitats, and to increase support for the System and participation from conservation partners and the public."

Moving forward, the Service's attention to strategic growth will be on a scale commensurate with the seriousness of the development trends that threaten to undermine more than a century's worth of conservation efforts. In the context of land acquisition and other on-the-ground conservation strategies, the people of the Service will act with a sense of urgency, as critical pieces of the conservation estate are disappearing with each passing day. The Service must move quickly toward a collaborative landscape-level strategy that can effectively address the most challenging and pervasive 21st century threats to biodiversity.

Strategic growth of the Refuge System begins with creating a prioritized blueprint for acquisition based on a combination of completing existing refuge acquisitions and developing new acquisition projects in focal areas. New acquisition projects will be developed in conjunction with partners and with a commitment to focus conservation in the highest priority areas.

The Refuge System will develop an adaptive prioritization model that considers the various and oft-changing factors that affect the most important conservation targets. This need, which is currently filled by the Land Acquisition Prioritization System (LAPS), will be better met by including evaluations of a potential acquisition parcel's role in a regional and ecological context, analyses of the changes an area may experience due to climatic shifts, and a sort of "urgency index," or how imminent the threat is to any particular parcel. These, along with other important considerations, such as the opportunity for partnerships and public education, and any perceived social or economic barriers, will help the Refuge System develop an indispensable decision analysis model that informs a truly national conservation vision.

The results of this prioritization model will be used to implement a new progressive policy and implementation plan that guides the land conservation approaches of the Refuge System. Species, water, fire, and other crucial ecological services do not recognize human land boundaries. National wildlife refuges serve as anchors for biodiversity and often represent the last stronghold for an endangered species or a diminished habitat type, such as tallgrass prairie. Minimizing threats to species of conservation concern and key ecosystem processes requires strategies of preserving large areas and maintaining landscape connectivity, in addition to creating and maintaining biological redundancies throughout the system. Refuges must look beyond their borders, work with partners, and think critically about the pressing issues affecting the species and ecosystems the Service and its partners strive to conserve. The time to act is now.

> Recommendation: Finalize a policy and implementation plan to guide land conservation efforts of the Refuge System.
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> Recommendation: Complete an overhaul to the Land Acquisition Prioritization System to develop an adaptive prioritization model that helps determine the relative importance of potential land acquisition projects, both in completing existing acquisition projects and in beginning new ones.

Protecting Wildlife: The Role of Conservation Law Enforcement

The Refuge Law Enforcement program is crucial. Refuge Law Enforcement officers are often the first – and sometimes the only – staff that a visitor meets on a national wildlife refuge. Moreover, Refuge Law Enforcement officers are on the front lines of conservation delivery, putting their lives at risk to protect wildlife and habitats, on wildlife refuges and on lands beyond the boundaries, and the people who use them. Officer safety, a top priority for the Refuge System, has advanced through ensuring that officers have the training, experience and equipment to do their jobs. Refuge Law Enforcement Officers enforce the law, regulations, and policy first and foremost, but also look for teachable moments and educate the public on the importance and relevance of conservation.

The Refuge System considers the top-to-bottom review of Refuge Law Enforcement by outside experts another significant accomplishment in the last decade. A report from the International Association of Chiefs of Police and a second Department of the Interior-wide review by the Inspector General resulted in mandates from the Secretary of the Interior to reform many aspects of the law enforcement program. The Refuge System is in the midst of implementing systemic changes in its law enforcement program including: developing policy and an organizational structure at headquarters, regions, zones and the field to adequately manage a law enforcement program; shifting to a cadre of all full-time officers; enhancing training for officers and law enforcement managers; developing an electronic case management system and using centralized recruitment and hiring.

In implementing these systemic changes, the Refuge System has also emphasized the importance of the conservation work that Refuge Law Enforcement Officers do. The Refuge Officer Basic School has been expanded to include waterfowl identification, hunting compliance scenarios, tracking and other resource-based enforcement classes. The Field Training and Evaluation Program has also been expanded to add thirty tasks to the field task book that directly relate to resource protection and investigations. These and other changes enable the law enforcement program to continue to develop strong conservation law enforcement officers.

Conservation law enforcement has been the first step in effective wildlife refuge management since Paul Kroegel patrolled the nesting bird colonies at Pelican Island more than a century ago. If wildlife refuges do not provide for basic public safety and resource protection, they will not succeed in accomplishing their purposes and the mission of the Refuge System. Any refuge officer in the Prairie Pothole regions can describe what will happen if wetland easements are not patrolled and laws not enforced. The habitat will be lost and the ducks will suffer.

> Recommendation: Complete law enforcement reforms and staff wildlife refuges with sufficient officers to protect wildlife and habitat and make refuges safe places for staff and visitors.

Setting aside land and water for the protection of wildlife along with enforcing conservation laws are the oldest foundations of conservation delivery. They remain essential, but much else has changed.

Managing Wildlife Refuges for Biological Integrity, Diversity and Environmental Health

The ecological crisis of the Dust Bowl in the 1930s caused a dramatic change in conservation strategies. In response to the impacts of massive soil erosion, new agricultural techniques were developed to conserve soil and water. These strategies and techniques had great implications for other conservation programs that would restore land health. In 1933, Aldo Leopold incorporated these new conservation paradigms into his classic book, *Game Management*, and a new profession was born. Throughout the 1930s, the Civilian Conservation Corps reclaimed degraded lands through reforestation and creation of managed wetland impoundments on 35 refuges in 25 states.

Over the next few decades a wide array of wildlife and habitat management techniques were developed to address numerous ecological challenges. Sometimes a utilitarian approach to wildlife management missed underlying ecological principles that were not yet well understood. So, freshwater impoundments were developed in some coastal wetlands, and some bottomland hardwoods were cleared to grow agricultural crops to feed the ducks and geese.

Modern science has enhanced understanding of ecosystem functions and how they can inform wildlife and habitat management. The Refuge System Improvement Act incorporated a new standard for management in the law: refuges are to be managed to protect and maintain biological integrity, diversity and environmental health.

The Service implemented a policy in 2001 that requires wildlife management to strive to mimic natural processes to protect: biological diversity at multiple scales; natural ecosystem functions; and clean water, air and soils on wildlife refuges. The policy also tells managers of wildlife refuges to address threats and stressors that originate from beyond their boundaries. Explicitly recognized in the policy is the reality that many wildlife refuges are islands in highly fragmented landscapes and they require intensive management to meet their purposes. Techniques ranging from fire to flooding, and from farming to grazing, and maintaining wilderness character are used on different refuges in differing circumstances to accomplish policy goals.

Managing Refuges to Support Ecological Resilience and Climate Adaptation

A rapidly changing climate is magnifying existing environmental stressors such as habitat loss and fragmentation, water quality and quantity, and the spread of invasive species. Climate change is impacting ecosystems everywhere, regardless of protected status. Firmly rooted in sound science, an adaptive, landscape-scale conservation approach and collaboration with others, the Service's 2010 *Strategic Plan for Responding to Accelerating Climate Change* is a call to arms and a clear roadmap for action:

> "We must act boldly with the information we have, confident that we will learn and adapt as we go. And most importantly, we must act now, as if the future of fish and wildlife and people hangs in the balance — for indeed, all indications are that it does."

The protection and management of wildlife refuge lands and waters to maintain biological integrity, diversity and environmental health are critically important to support ecological resilience and facilitate adaptation of fish, wildlife and plants to climate change at landscape scales. Ecological resilience is defined as the ability of ecosystems to withstand disturbances and reorganize while undergoing change, so as to retain essentially the same function, structure, identity and feedbacks. Critical conservation delivery strategies to enhance ecological resilience include maintaining or restoring the ecological integrity of existing conservation units, enhancing linkages and connectivity among units, buffering core areas, identifying and protecting climate refugia, and ensuring adequate representation of our nation's ecological communities in the collective conservation estate.

The Service's strategic plan for responding to climate change recognizes that adaptation strategies can be anticipatory or reactive. Anticipatory adaptation manages towards a new climate change-induced equilibrium; reactive adaptation abates the impact by trying to maintain the current condition despite climate change.

The Service primarily is employing reactive adaptation strategies. This overall approach makes sense as a means of "holding ground and hedging bets" while considerable uncertainty about climate change impacts remain and the Refuge System faces the immediate need to counter environmental stressors. Over time, uncertainty about climate change impacts will be reduced, and the vulnerability of ecosystems and plant and animal populations to environmental change will be better understood. As this occurs, the Service can shift to a predominantly anticipatory approach to protecting and managing refuge lands and waters. Maintaining or restoring habitats, ecological processes, and plant and animal populations on wildlife refuges will require reconsideration of desired outcomes as climate change impacts are more accurately predicted. Accelerated climate change will occur over the next century regardless of the successes of mitigation efforts. Therefore, reducing "non-climate stressors" to increase ecological integrity on wildlife refuges and ecological resilience at landscape scales are more critical than ever.

Targeted restoration will also be necessary in many wildlife refuge landscapes to bring an altered landscape back into balance. The word "restoration" is often associated with a backward-looking mindset, trying to return to a lost condition in the past. Instead, restoration efforts in the Refuge System should focus on strategically replacing highly altered landscapes with native plant communities to create the best possible current and future habitat for trust species. Restoration efforts that try to recreate the past may have limited success in a highly altered landscape under predicted climate change scenarios. Restoration efforts and restored landscapes should create landscape-level habitats or habitat complexes capable of supporting genetically viable populations and metapopulations of trust species, be resilient to short-term climate fluctuations and long-term climate change, recreate as many ecosystem processes as possible on the landscape, integrate partnerships with federal and state agencies, nongovernmental organizations, and private landowners and integrate with future acquisition efforts to strategically grow the conservation estate. Maintaining biological integrity, diversity and environmental health on national wildlife refuges and contributing to ecological resilience and climate change adaptation will require innovation, flexibility and adapting policy to changing conditions.

Recommendation: Complete a step-down of the goals in the Service's 2010 *Strategic Plan for Responding to Accelerating Climate Change* for the Refuge System that prioritizes and guides future actions.

Recommendation: Review and update policy for managing biological integrity, diversity, and environmental health on wildlife refuges. The benchmark for desired conditions must anticipate that climate-changed ecological conditions may preclude managing for historic conditions.

Recommendation: Review and update Service policies on Comprehensive Conservation Planning and Wilderness Stewardship to reflect that climate-changed ecological conditions may preclude managing for historic conditions.

Recommendation: Include climate change adaptation criteria in the overhaul of the Land Acquisition Prioritization System.

Issues, Concerns, and Systemic Challenges in Managing for Biological Integrity, Diversity and Environmental Health

Fire Management and Emergency Preparedness

A significant proportion of lands in the Refuge System occur within fire-adapted ecosystems. The management of wildland fires, both prescribed fires and wildfires, is perhaps the System's most widely used tool for ecological restoration and management of habitats and wildlife populations.

Climate change and a rapidly expanding wildland-urban interface are increasing the risks of catastrophic fire, resulting in less funding for work *outside* of the wildland-urban interface. Maintaining wildland fire management capability is critical for the Service to support ecological resilience and facilitate adaptation of fish, wildlife and plants to climate change at landscape scales. With these important ecological values in mind, a top priority of Refuge System fire management is fire personnel safety. The Service must ensure employees have the training, experience and equipment to do their jobs.

The Refuge System has continually led the way in the use of prescribed fire in meeting departmental goals for hazardous fuels reduction. Current interagency fire policy narrowly emphasizes hazardous fuel reduction as a goal and overlooks the protection of broader landscape and ecosystem goals. Fire managers should be equally concerned with protecting watersheds, the spread of invasive species, maintaining fuel conditions where treatment has already occurred, and protecting and recovering endangered and threatened species.

Recommendation: Aggressively pursue changes to interagency fire policy that ensures the use of fire to protect the full range of natural resource values.

The Refuge System excels in providing critical support to national wildland fire preparedness and suppression efforts. In fact, the refuge fire program responds to 41% of fires on federal lands

while only receiving 18% of the Department of the Interior fire dollars. The Service conforms to the highest interagency standards of training, operations, and safety, and benefits from sharing expertise and knowledge with partner agencies.

Preparedness for responding to emergencies; however, needs improvement. Recent emergencies, such as the catastrophic Deepwater Horizon oil spill event, highlight that wildlife refuge lands and resources are disproportionately affected. While the Service's overwhelming support in responding to this and other oil spills is a testament to the character of the agency, the Refuge System is reminded of the inadequacy of its preparedness for such disasters. Refuges lack staff certified and trained in the necessary response protocols (Hazardous Waste Operations and Emergency Response Standard HAZWOPER and Incident Command System ICS) and Natural Resource Damage Assessment (NRDA) programs. The NRDA is the mechanism by which habitat, wildlife populations, and services are restored. The Refuge System's national inventory and monitoring program can assist in providing baseline data to inform damage assessments; however, the Refuge System must increase its overall understanding of the NRDA and ensure adequate numbers of staff are trained to conduct damage assessments. The Refuge System must also build on the success of the fire community's preparedness infrastructure to ensure the ability to participate quickly and effectively when the Service responds to spills.

> Recommendation: Develop a program that maintains trained staff (like the fire program) for certified staff to respond to emergency incidents, such as oil and other hazardous material spills, and leads NRDA activities during events.

Farming

Growing agricultural crops to feed wildlife is one of the oldest wildlife management techniques. This practice is still utilized in some locations with high concentrations of waterfowl. Wildlife refuges also use farming techniques to prepare land for restoration. In many areas, wildlife refuges continue to farm or cultivate many more acres than needed for wildlife because funds are not available to manage the acres differently, such as by developing moist soil and wetland management infrastructure. Some wildlife refuges use cooperative farming agreements to produce crops for wildlife where funds or personnel are not available for the refuge to farm. Cooperative farming is cost effective in terms of dollars spent, but it often requires three to four times as many acres to be in production.

The production of agricultural crops on wildlife refuges also emits carbon, contributing to the problem of climate change. On the other hand, restoration of native vegetation sequesters carbon. Priorities for funding should be directed towards carbon sequestration projects.

> Recommendation: Review the farming program and identify opportunities to reduce carbon emissions and sequester carbon by restoring native vegetation.

Water Supplies and Aquatic Ecosystems

The Refuge System Improvement Act directs the Secretary of the Interior to acquire, under state law, water rights that are needed for the purposes of wildlife refuges. Ensuring adequate water

quantity for conservation purposes is essential, and will become increasingly challenging as the nation's population grows and the impacts of accelerating climate change are felt. The Refuge System has recently initiated an assessment of its water needs, and the results will be used to prioritize and direct action in order to meet the long-term water quantity needs. Given regional differences in U.S. water laws, a range of actions could include purchase of additional water rights in some western states, while working within state water-appropriation processes in other parts of the country.

The Refuge System's efforts to secure sufficient water quantity and quality must also include actions to improve overall health and resiliency of all aquatic resources within national wildlife refuges. This effort should enlist the support and expertise of Service fisheries biologists, hydrologists and other experts and partners to assess the condition of wildlife refuge water bodies and identify existing limitations and future problems. The results will be included in the second round of system-wide comprehensive conservation planning. The comprehensive effort should address critical issues, including: adequate groundwater and instream flows; instream passage barriers to native species; restoration of extirpated or reduced native aquatic species; and exclusion, elimination, or control of harmful invasive species.

> Recommendation: Complete a thorough assessment of water quantity needs and use the information to determine and prioritize appropriate actions to meet those needs.
>
> Recommendation: Assess water quality conditions and use the information to determine and prioritize appropriate actions to increase aquatic ecosystem health and resiliency.

Working Beyond Wildlife Refuge Boundaries

In earlier decades, most wildlife refuge managers focused more on what happened within their refuge boundaries. In more recent times, managers of wildlife refuges have realized that it is increasingly important to view and manage refuge lands as pieces interwoven in a landscape-level tapestry of conservation. They have recognized that because wildlife ecosystem processes require work at broad landscape levels, the Service must, again, look outward to our neighbors, conservation partners and surrounding communities to achieve our collective goals. The Refuge System must look beyond its borders and think critically about the pressing issues affecting the species and ecosystems it strives to manage.

The number of national wildlife refuges involved in landscape-level conservation coalitions grows every day. The San Joaquin River Partnership, Sandhills Task Force, and Greater Noxubee Wildlife Management Cooperative are coalitions with one or more wildlife refuges at their core. Other projects like Montana's Blackfoot Challenge, South Carolina's ACE Basin and New England's Silvio O. Conte Refuge are famous for their collaborative approaches to conservation, and they have impressive tallies of protected acres to show for their work.

The era is over when the Refuge System could focus only on protecting land and water inside refuge boundaries, and leave to a roll of the dice what happened outside the boundaries. The emerging model focuses on conserving entire landscapes and connecting the stewardship of those landscapes to the livability and sustainability of local communities.

The new model has patterns and themes that, while not evident in every coalition, can certainly be found in most. Each project accomplishes conservation through a broad coalition of partners. Working in such diverse coalitions requires utmost diplomacy and collaboration skills.

Each project is based on a network of core protected areas which are usually complemented with conservation easements overlain on working lands. Each organizes resources and provides workshops to help participants be better land stewards. Some may teach a workshop on how to control invasive plants while at the same time implementing a landscape-level contract to control them. Others might train members of the public how to remove fish passage barriers while at the same time securing one drainage-wide permit to remove dozens of barriers.

Leaders of such projects become masters at finding efficiencies of scale and at directing new issues to the members most capable of handling them. They take advantage of all the tools that diverse partners can bring to the table, and gain efficiency by applying the best tool to the task at hand.

New units of the Refuge System are being designed as cooperatives from the start. The Flint Hills Legacy Conservation Area in Kansas will conserve up to 1.1 million acres of tallgrass prairie through voluntary, perpetual conservation easements; 45,000 acres of core areas are already protected there. These easements will further protect habitat for 100 species of grassland birds and 500 species of plants. Importantly, these working landscapes ensure the region's ranching culture is sustained. A partnership of ranchers, state and federal agencies, and non-government organizations are coordinating the project.

Similarly, the Everglades Headwaters National Wildlife Refuge and Conservation Area is being planned with a broad coalition of partners and land owners to protect 150,000 acres of the Kissimmee River Valley near Orlando, Florida. The proposed conservation area includes 50,000 acres that could be purchased with an additional 100,000 acres protected through easements and agreements. Major goals include improving water quality and providing outdoor recreation, but at the same time protecting habitat for 88 federal and state threatened and endangered species, including the Florida panther, Florida black bear, whooping crane, Everglade snail kite and the Eastern indigo snake. The 150,000-acre project would link to another 690,000 acres of existing conservation lands.

Some long-established wildlife refuges undoubtedly are in landscapes ripe for collaborative coalitions. Funding similar to what is available through the Service's Partners Program can be vital to starting coalitions and building new relationships. The Service should manage wildlife refuges, where possible, with a partnership approach with adjacent private landowners. State Wildlife Action Plans should inform these efforts. Their effectiveness will be enhanced through coordination with Landscape Conservation Cooperatives.

Recommendation: Seek conservation funding for cooperative management projects.

Recommendation: Develop and provide collaboration and diplomacy skills training to employees to increase land management cooperatives among national wildlife refuges,

local landowners, and other partners. The training should include educating private landowners on the benefits of conservation.

With the urgent need to both buffer conservation lands and connect them, the Service must place greater emphasis on pursuing the as-yet unrealized potential of Farm Bill programs. The Refuge System can accelerate conservation in priority areas by more strategically partnering with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) and Farm Service Agency (FSA) to better access, leverage and target Farm Bill dollars. The Farm Bill contains billions of dollars in funding for conservation on private lands – much of it under-utilized. More than a dozen conservation programs fund land protection through conservation easements and long-term rental contracts as well as restoration of forests, wetlands, grasslands, riparian buffers and other wildlife habitats.

Recommendation: Work closely with the USDA to align and prioritize Farm Bill conservation program funding in landscapes with the highest wildlife value.

Recommendation: Educate high-priority landowners adjacent to wildlife refuge boundaries about relevant Farm Bill conservation programs.

Recommendation: Become well versed on Farm Bill programs and opportunities through representation on each of the NRCS State Technical Committees.

Recommendation: Seek out opportunities to partner with other agencies, non-government conservation groups and others to pool resources and leverage Farm Bill dollars in priority wildlife areas.

Ocean and Marine Conservation

When people generally think of the Refuge System, they envision the lands protected for wildlife. In fact, like much of the Earth, the Refuge System has far more "waters" than one might assume. Ocean and coastal national wildlife refuge lands and waters comprise 76 percent of the total acres in the Refuge System. A third of all national wildlife refuges are ocean or coastal sites. Through the protection of some of the largest, most intact marine ecosystems on the planet, the Refuge System is a leading contributor to global efforts to conserve marine biodiversity and save the world's oceans.

National wildlife refuges offer a vast geographic spectrum of scientific research opportunities, whether in the Arctic, near large coastal population centers, or in remote, pristine insular and ocean wildlife refuges. The marine wildlife refuges protect diverse fish and wildlife habitats including salt marshes, rocky shorelines, sandy beaches, kelp forests, mangroves, seagrass meadows, barrier islands, estuaries, lagoons, tropical coral atolls and open ocean. With the addition of the Marianas Trench and Arc of Fire National Wildlife Refuges in 2009, the Refuge System can now add deep-sea hydrothermal vent communities to this list of protected marine ecosystems. With the expansion and additions to the Pacific Reefs Refuges, the Refuge System is now a leader in highly migratory oceanic species conservation, such as tuna, by protecting large areas that are closed to commercial harvest.

Recommendation: Develop a comprehensive communications and outreach strategy regarding Refuge System's coastal and ocean areas management paradigm to help land managers understand its place within the suite of options for conservation.

Many marine wildlife refuges, particularly the Remote Pacific Islands Complex, make ideal natural laboratories for studying the effects of climate change in the absence of other human disturbance. The Refuge System should continue to support existing research partners like the Pacific Island Climate Change Cooperative and the Palmyra Atoll Research Consortium.

Recommendation: Working in concert with the Service's Landscape Conservation Cooperatives and the Refuge System Natural Resources Program Center, maintain, enhance and develop research partnerships and materials on marine issues to provide information on how to work with individual wildlife refuges as well as guidelines and guidance on types of appropriate and compatible research.

Recommendation: Establish access to a research vessel and put together a qualified scientific research team to better inventory, monitor and manage Pacific marine wildlife refuges.

Invasive Species

The spread of invasive species remains one of the nation's and the Refuge System's most pervasive threats to ecological integrity and resilience. Climate change is likely to exacerbate the threat. Currently, the Refuge System is focused on controlling large, well-established infestations rather than pursuing early detection and complete eradication of smaller incipient populations. More emphasis on prevention and early detection and rapid response may be a more efficient and effective strategy in the long term.

In implementing *Fulfilling the Promise*, the Refuge System developed a strategic plan for invasive species. From that came development of invasive species strike teams to provide rapid response capability in certain areas. They have proved highly effective. A cooperative effort with the National Wildlife Refuge Association developed a volunteer and invasive species program, in which volunteers undertake early detection and mapping. The Service has worked with programs to eradicate rats and restore bird nesting colonies on a number of islands.

Recommendation: Update the Refuge System's invasive species strategy to include implications of climate change and set clear priorities and performance measures to guide future work.

Recommendation: To leverage limited federal funding resources available to wildlife refuges and the U.S. Fish and Wildlife Service, mobilize 10,000 volunteers over the next 10 years to map, inventory and eradicate invasive species on wildlife refuges.

Wilderness Stewardship

The Refuge System includes at least twenty million acres of wilderness, about 22 percent of lands within the nation's National Wilderness Preservation System. Wilderness, as defined by the Wilderness Act, is relatively untrammeled ("free from man's control"), undeveloped and natural and offers outstanding opportunities for solitude and primitive recreation. Wilderness includes some of the largest and most intact landscapes in the country. Because of their management emphasis on natural conditions, wilderness areas can serve as baseline or reference areas to be compared with similar ecosystems undergoing active management. Since natural processes are allowed to predominate without human intervention, these areas are also key components in a national strategy for monitoring long-term ecological change, such as climate change. To adhere to the principles of wilderness stewardship, adapting to climate change will require resisting manipulation and embracing the Wilderness Act provision regarding scientific purpose.

> Recommendation: Update the Wilderness Stewardship Policy to address the relationship between maintaining wilderness character and addressing the threats of climate change.

In 2012, all national wildlife refuges will have completed Comprehensive Conservation Plans (CCPs). The second round of comprehensive conservation planning will begin in late 2012.

> Recommendation: Complete wilderness reviews for all national wildlife refuges within two years and make recommendations for wilderness designation of appropriate areas during the second round of CCPs.

Fulfilling the Promise stated that, "central to the experience and awareness of wilderness is humility, with its corollary, restraint; restraint in what is appropriate for visitors to do, as well as managers. Restraint is the reason for the 'minimum tool' rule, limiting use of our mechanisms to that which is necessary, and necessary not only to manage these areas, but to manage them *as* wilderness." This remains a guiding philosophy for wildlife refuge wilderness stewardship.

International Connections

In the face of such global environmental stresses as climate change and a burgeoning worldwide population, effective communication of successful wildlife conservation across international boundaries is imperative. In the future, the Refuge System will be used increasingly as an example for international conservation initiatives. The Refuge System should strengthen the focus and understanding of conservation efforts beyond national borders, especially regarding internationally shared species.

Over the last 20 years, the Service has moved to a broader and more collaborative vision of wildlife conservation, understanding that the United States is part of an interconnected, global web of conservation partners and ecological landscapes. Ultimately, no single group, agency or country can achieve wildlife conservation in isolation.

Service employees working on national wildlife refuges have been frequent hosts of international wildlife managers and have participated with the International Conservation staff on trips to foreign countries to advise them and help them develop capacity. The Service's International Conservation staff also have access to a considerable network of on-the-ground conservationists around the globe. The Refuge System should work with the International Conservation staff to engage the network of conservation specialists around the globe to strengthen collaboration and integrate approaches to wildlife and habitat management.

> Recommendation: Lend expertise and assistance to the Service's International Conservation efforts to increase collaborative work on global issues and wildlife conservation projects.

Comprehensive Conservation Planning 2.0

Sometime near the end of 2012, the Refuge System will feel a great sense of accomplishment when it completes comprehensive conservation plans (CCPs) for every national wildlife refuge. The joy will be short lived because some plans will be more than a decade old in 2012. Some plans were visionary in dealing with complex issues such as sea level rise, while others got caught in whirlpools of controversy and barely maintained the status quo.

> Recommendation: Begin an after-action review of the first round of CCPs, capture lessons learned, and update the planning policy prior to the next round of planning. The updated planning policy should consider how the plans meet not only the needs of the wildlife refuge, but also can collectively inform the Refuge System's management.

The schedule for the second round of CCPs should place priority on refuge climate change adaptation planning that is needed most. This round will play a critical role in recommending refuge expansions, migrations and other changes to deal with the effects of changing climate conditions. These new CCPs will be integral to the plans for strategic growth of the Refuge System.

Many things have changed since the first round of planning began. All states now have State Wildlife Action Plans that inform refuge CCPs. The Refuge System Inventory and Monitoring Blueprint is ready for wildlife refuges to include in their plans. The Service's Climate Change Strategic Plan informs adaptation planning on wildlife refuges. Landscape Conservation Cooperatives can assist in understanding and communicating the conservation benefits of wildlife refuges beyond their boundaries and within the context of the greater, surrounding landscape. Wilderness stewardship policy is in place and gives wildlife refuges the tools to assure a comprehensive review of wilderness resources during the next round of planning. All of these factors will help improve future plans.

The next round of planning will not only update refuge management strategies, but must also describe how the wildlife refuge fits in the greater surrounding. These plans will be flexible enough to adapt to new situations and issues. Those who read them will come away with a clear understanding of what is expected. Refuge staff members who implement them should be inspired to act with a firm grasp of the overall intent.

Recommendation: In new comprehensive conservation plans, describe how the Service can use all its conservation delivery tools to project conservation benefits beyond refuge boundaries across the landscape.

Chapter 3
Conservation Science and the Refuge System

The Refuge System has always relied upon science to inform its actions. As an example, bird-banding studies in the early 20th century contributed to an understanding of migratory patterns. In response to a dramatic continental decline of waterfowl populations, the Refuge System used scientific information to inform a shift to a new conservation strategy based on the creation and management of a series of connected migratory habitats.

Science is dynamic, with certainties and uncertainties continually changing in light of new data, field methods and analytical techniques. The evolution of conservation biology has introduced concepts such as landscape ecology, biodiversity, ecosystem health, ecological function and sustainability. The Refuge System has integrated these ideas into its policies and practices, testing their validity and adaptively applying the resulting information to refine habitat and wildlife population management decisions. Since the Refuge System Improvement Act of 1997 and publication of *Fulfilling the Promise* in 1999, the Service has outlined and implemented strategies to accomplish the wildlife and habitat goals set before the Refuge System. In the intervening time the Refuge System has learned to better appreciate adaptive management, become more aware of global climate change, and recognized the need to address conservation at multiple spatial scales.

While the Refuge System has long been a leader in fish and wildlife conservation, particularly in habitat restoration and management, its ability to consistently implement science has been uneven, typically hampered by various combinations of lack of staff, funding and clear objectives. Complex management questions are common and have magnified these challenges.

The threats to fish and wildlife posed by climate change, invasive species, habitat loss and fragmentation, energy development and extraction, contaminants and alterations in ecological processes are making the future as challenging as any faced in Refuge System history. However, the Refuge System's traditions of innovation and adaptation underscore its potential to meet today's challenges, and science is regaining its place within the Service. Adaptive management has come to the forefront to help deal with complex management conditions, and decision-making tools continue to evolve. Innovative methods of utilizing science to build conservation models, set habitat and population objectives, plan strategic growth of the Refuge System, design conservation delivery actions, and evaluate indicators of success are being continually developed and improved. The application of science within the Refuge System is expanding to include not only natural resource sciences, but also the related fields of physical, social, historical and cultural resource sciences.

The Refuge System envisions a future where the Service maintains and enhances its culture of commitment to scientific excellence. The Refuge System commits to embracing four foundational elements in its vision for conservation science:

- Application of sound science to refuge management,
- Implementation of robust inventory and monitoring,
- Development of deliberate research agendas, and

- Fostering of communication and collaboration within the Service and among partners.

The four foundational elements must be equally emphasized and inform and complement one another across wildlife refuges, ecosystems and issues. To achieve the vision, broad actions must be taken to support, enhance and re-vitalize these four foundational elements.

Science-based Wildlife and Habitat Management

The integration of science, management and learning in a collaborative framework forms the foundation for on-the-ground conservation delivery by wildlife refuges. Wildlife and habitat management efforts must be effective and supported by the best available data in order to learn from successes and failures and continually improve the Refuge System's delivery of conservation benefits. In this way, Refuge System wildlife and habitat management efforts will have impacts well beyond the boundaries of wildlife refuges and integrate with broader landscape scale habitat conservation frameworks.

Wildlife and habitat management decisions must always be made within a scientific context. Science-based management decisions use better information, improve efficiency, reduce the uncertainty of outcomes, and increase the ability to solve complex problems and adapt to changes in habitats, populations and ecosystems. The integration of refuge-based information sources from a robust inventory and monitoring program and directed research will provide the data necessary to implement intensive and proactive adaptive management and science-based decision making at appropriate spatial and temporal scales. A proven track record of wildlife and habitat management decisions that are professionally approached, transparent and sound will promote more effective partnerships.

Scientific approaches and information underpin this iterative decision-making process. Adaptive management requires formulating an explicit objective, generating information to optimize management decision making, reducing uncertainty in management decisions by monitoring (which provides new information describing how well objectives are achieved), and feeding back new data to improve the ability of science to inform future actions. In achieving effective wildlife and habitat management that springs from a commitment to the scientific process, the Refuge System will provide tangible conservation benefits for the nation's lands, water, species and habitats, and continue to be recognized as a valued and authoritative conservation entity.

> Recommendation: Ensure that resources are sufficient to make investing in the application of science-based wildlife and habitat management a priority and promote a science-based approach consistently throughout the Refuge System.

Without staffing and expertise, the Refuge System will be unable to keep pace with advances in technology and science, including scientific expertise in a diversity of fields of study in order to meet the challenges of a changing world.

> Recommendation: Proactively and consistently implement adaptive management.

This requires establishing clear goals and objectives for management in the context of best available science and local and landscape level conservation priorities. Refuge managers must explicitly plan and document management actions and identify and understand threats at multiple spatial and temporal scales. Monitoring responses and assessing outcomes in relation to clearly defined and measurable goals and objectives is necessary. The work of adaptive management is not complete without communicating outcomes to appropriate, often multiple, audiences and using the information to inform decisions.

Faced with the escalating pace of environmental change, the Service and its partners must develop the capability to provide on-the-ground delivery of facilitated adaptation for climate change and other threats. The Refuge System can contribute valuable data for models, as well as offer a unique and significant network of habitats essential to landscape-scale mitigation of environmental threats.

Mechanisms for data management and communication of scientific information must be improved. Standardization, scalability, flexibility, and interoperability are vital to the design of all spatial and non-spatial information systems. Information technology resources and staff capacity at all levels need to be further developed to maximize the long-term integrity and availability of scientific techniques and information.

> Recommendation: Ensure that scientific information collected by the Refuge System is applicable, and organized, stored, processed, accessible and distributed in a timely and reliable manner to support decision-making by resource managers and partners.

To build its scientific capacity, the Refuge System must assure accountability at the wildlife refuge, regional and national levels for the systematic implementation of science protocols and for a culture of scientific excellence.

> Recommendation: Develop Service standards for credibility, efficiency and consistent application of science in planning and management.

Robust Inventory and Monitoring

The Refuge System Improvement Act directs the Service to monitor the status and trends of fish, wildlife and plants on each wildlife refuge. Most wildlife refuges do not currently have a comprehensive baseline inventory of the diversity of fish, wildlife and plants that live there. Without an understanding of the species that depend on a wildlife refuge, the capacity to delivery effective conservation is reduced. This understanding is essential in order to assess the effects of a changing world.

Effective management requires an understanding of species distributions, abundances and demographics, and their relationships to habitat composition and condition across multiple spatial and temporal scales. It also requires the ability to predict and respond to changes in these relationships brought about by rapid climate change, invasive species, habitat loss and degradation and other environmental stressors. Understanding such complexity and anticipating

the affects of management will require novel, robust inventory and monitoring approaches that have appropriate statistical rigor, are scalable, and can accommodate multiple metrics and taxa.

In 2010, the Refuge System launched a national inventory and monitoring program to increase its collective ability to inventory and monitor wildlife and habitats and inform conservation. Success in conserving fish, wildlife, plants and habitats will depend on how well integrated the inventory and monitoring efforts are with those of others throughout the conservation community.

> Recommendation: Institutionalize a nationally coordinated program to inventory and monitor wildlife and habitats across multiple spatial and temporal scales.

The Refuge System must employ inventory and monitoring approaches that are scalable and collect information within hierarchical frameworks to allow analysis to occur at a variety of spatial and temporal scales. Inventory and monitoring designs must be robust enough to detect subtle yet critical changes in populations and landscapes before causes are known; however, statistical rigor should be commensurate with the goals of a given project, risk tolerance and the priority of the resource issue in question. Wildlife refuges should monitor non-target impacts in adaptive management designs.

Developing an effective program will include identifying, supporting and expanding centers of inventory and monitoring excellence within and outside the Refuge System. It will support the development of consistent and reliable national habitat data sets to inform strategic habitat conservation, assist implementation of State Wildlife Action Plans and other conservation plans, and establish a baseline for inventory and monitoring. The Refuge System should explore the applicability of existing inventory and monitoring programs to its needs for attaining biological information, including invertebrates and plants as well as other flora and fauna associated with respective ecosystems. Collaboration on collection of biological data that allows detection of subtle changes in environmental health will inform refuge needs and establish the Refuge System as a valued partner in supporting strategic habitat conservation.

The Refuge System is building its inventory and monitoring program in close cooperation with the National Park Service. Federal land management agencies should collaborate and integrate their inventory and monitoring programs. This would not result in identical programs in each agency, as specific needs vary. Instead, it would allow for collaboration and sharing of information where interests are shared. It can assist in building a nationwide network to help detect changes in the population and distribution in response to climate changed conditions.

> Recommendation: As part of a National Conservation Strategy, collaborate with other federal land management agencies to integrate inventory and monitoring programs.

Deliberate Research

The Refuge System has definitive research needs. Research projects must have credible and defensible designs and modes of data analysis; results must be reported. Research should be backed by appropriate and consistent data acquisition protocols and data management systems. A

deliberate research agenda complements science-based wildlife and habitat management and inventory and monitoring.

The Refuge System must commit to framing research targets with assumption-driven priorities, and ensure direct applicability to refuge management needs. Projects must be underpinned by peer reviewed, transparent designs and modes of data analysis. Rigor will remain appropriate to the priority of the issue and project scale. Refuge System scientists must routinely and transparently identify, challenge and articulate assumptions made with respect to management decisions. Those assumptions greatly influencing modeled outcomes, possessing high uncertainty, and substantially influencing decisions should be captured and elevated as research priorities.

National wildlife refuges serve as outdoor laboratories, providing opportunities for collaborations spanning multiple spatial scales. If the Refuge System identifies priority management-oriented research needs, it can encourage partnerships and the leveraging of funds. Additional collaboration with U.S. Geological Survey research centers and co-op units, climate science centers, universities and other research institutes is needed. Enhancing wildlife refuge facilities and infrastructure, such as bunkhouses and office space used to support research, can help entice partnerships.

> Recommendation: Articulate and direct research applicable to wildlife refuges to meet the Refuge System's research needs.

Land Management Research Demonstration Areas are places where new habitat management techniques and approaches are developed, implemented and showcased. Although they have received limited funding, they have been successful as centers of excellence in restoration and management science. They deserve national level support to encourage cross-regional and even continental and international-level research and to continue to build demonstration capacity that delivers findings to other wildlife refuges, partners and the public.

> Recommendation: Review the operations of Land Management Research and Demonstration wildlife refuges, which have been established to increase research and strengthen the demonstration of science.

> Recommendation: Support Land Management Research and Demonstration wildlife refuges that have been established and establish at least one Land Management Research and Demonstration wildlife refuge in each Landscape Conservation Cooperative to increase research and strengthen the demonstration of science.

Communication, Collaboration, and Contribution in Science

The challenges of the future require the Refuge System to develop additional scientific expertise to effectively and adaptively manage fish, wildlife, and habitats. It must forge strong partnerships with Landscape Conservation Cooperatives and other scientists to assure coordination and collaboration across the landscape. The conservation challenges of the future are not obstacles that the Service and the Refuge System can overcome alone. The Refuge System and the Service

must lead and be strong partners in conservation science. Communication and collaboration are foundational requirements that must be embraced and implemented if future conservation goals are to be achieved. Placing a strong emphasis on partnerships, building coordinated management, research and monitoring projects that are useful at multiple scales, and communicating the results to the conservation community will improve the Refuge System's ability to leverage assistance, enhance its abilities to share ideas, plans and strategies, and maximize the conservation community's capability to capitalize on shared interests and opportunities.

Collaborative efforts will ensure that the Refuge System prioritize its scientific needs in coordination with state wildlife programs. The ability of the Refuge System to efficiently share and distribute information and data, synthesize and report findings, and provide expertise to the conservation community will result in meeting the goals and objectives of refuges and their mission. The Refuge System will engage with local, regional and national level organizations and communities to solve conservation problems.

> Recommendation: Encourage a culture of science and expand contributions to the scientific community through more sharing information and data, publishing scientific findings in peer-reviewed journals, and becoming participants and leaders in professional societies.

Chapter 4
Human - Nature

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.

The Service's workforce is passionately committed to its conservation mission, yet the purpose behind the mission statement, "for the continuing benefit of the American people," sometimes generates less attention. Just as the Service must adapt its conservation work in the face of changing environmental conditions, there is a similar urgency – and opportunity – to understand and respond to America's changing attitudes and demographics. America is becoming older, increasingly urban, more culturally and ethnically diverse, and more responsive to including people with varying abilities in every area of life. This changing America deserves the utmost service and access to the appropriate nature-based benefits of its public lands. As an agency, the Service must inspire people from all walks of life to create a conservation partnership with America.

Rachel Carson described natural processes as a "panorama of endless change." The phrase is equally apt for the American population: Eighty percent of Americans now live in urban or suburban areas. Americans are spending less and less time outdoors, and some are feeling a disheartening separation from the world. Much writing and research today depicts a younger generation of Americans unaccustomed to digging in the dirt, contemplating the stars, or figuring out what creature lives in the burrow. As society becomes increasingly disconnected from nature, the importance of functioning ecosystems to them fades. National wildlife refuges provide important habitat for our nation's wildlife; equally, they provide meaningful, if not essential, places that nourish the human spirit.

Connecting People with Nature

Spending time in America's great outdoors is good for both the spirit and health of our nation's people. Recreation and relaxation in nature can reduce stress and anxiety, promote learning and personal growth, nourish the imagination, and provide mental and physical restoration. People who are disconnected from nature are less likely to be committed to and involved with stewardship of our shared natural legacy. Americans must learn anew that national wildlife refuges, while providing beneficial habitat for wildlife, are essential and relevant places for a new generation. In response to national demographic trends, national wildlife refuges must provide new opportunities and actively encourage people, whether school age or in their autumnal years, to connect with nature by visiting their national wildlife refuges, personally or virtually.

The National Wildlife Refuge System provides some of the finest outdoor recreational opportunities in the world. Indeed, more than 44 million people visited national wildlife refuges in 2009, up from 34.5 million people a decade earlier. The vision and work of state agencies for game, fish and wildlife conservation – and their authorities for hunting and fishing programs in

the United States – has enhanced these opportunities and the access Americans have to wildlife-dependent recreation.

The Refuge System has a steadfast commitment to the long-standing conservation partnership with America's hunters and anglers to expand and improve hunting and fishing opportunities for children and people with disabilities.

> Recommendation: Conduct an analytical review of and report on wildlife refuge hunting and fishing opportunities and rules and regulations, with special attention to opportunities offered for youth and people with disabilities. Guidance on expanding opportunities will accompany the report.
>
> Recommendation: Work cooperatively with state fish and wildlife agencies to prepare a strategy for increasing quality hunting and fishing opportunities on national wildlife refuges with the goal of doubling youth participation in hunting and fishing on national wildlife refuges by 2020.
>
> Recommendation: Support outdoor recreation access and opportunities on national wildlife refuges by improving coordination, effectiveness and efficiency among federal agencies through close work with the Wildlife and Hunting Heritage Conservation Council, the Sport Fishing and Boating Partnership Council, and other recreational entities.

There are myriad opportunities to provide additional opportunities for people on national wildlife refuges. The Refuge System Birding Initiative has been a successful partnership between the Service and the birding community, and has provided important strategic advice on how to increase birding opportunities and involve avid and casual birders in wildlife refuge conservation and education programs. It is a model that can be expanded upon. The Refuge System must expand opportunities to watch and learn about wildlife, assist people in learning a land ethic to become better stewards of the nation's natural resources, and build relationships with people who have not had traditional links to wild lands and wildlife.

Welcome to Your National Wildlife Refuge

The number of people interested in wildlife watching and learning is actually growing. Increasing visitation and the opportunities for connecting people with nature requires that more people learn about wildlife refuges and feel welcome to visit. The Service must ensure that all visitors feel safe, welcomed, and oriented. Visitors should be able to interact with refuge staff or volunteers at all national wildlife refuges.

Visitors should be welcomed and oriented both when coming to the wildlife refuge and visiting virtually. Wildlife refuges are places of seasonal and specialized uses. Some of the most awe-inspiring spectacles of nature occur on wildlife refuges, but they are not year-round events. From the sandhill cranes and snow geese flying in and out of Bosque del Apache National Wildlife Refuge to the salmon surging up the Kenai River, ancient seasonal cycles and rhythms play out across the Refuge System. A visit to a wildlife refuge is always special, but if the birds have not

arrived yet or the fish are not biting, potential visitors need to know. A variety of tools, especially communications tools such as websites, social media and mobile applications must be used to invite and prepare people for their visits. Visitors need up-to-date information on what is happening on national wildlife refuges, throughout the seasons.

Many visitors will continue to depend on highway signs on the way to the wildlife refuge, directional signs once they get there, and on-site brochures, interpretive kiosks or visitor centers to explain wildlife. Basic signage and visitor facilities remain key elements in welcoming and orienting visitors, but increasingly people are finding their way using GPS units and doing online research before their visit. Interpretive information is sought from wireless devices and high-speed cellular service. America is now a wired nation not accustomed to waiting for information.

> Recommendation: Develop a new, integrated strategy for using technology, social media, web applications, and emerging communications avenues to inform, orient and engage with visitors and the public.

The strategy will describe how the Service will provide: information to welcome and orient potential visitors and encourage their stewardship of natural resources; up-to-the-minute information for wildlife refuge visitors, volunteers, Refuge Friends and others; virtual experiences for those who cannot visit in person; environmental education kits for teachers who may bring students and those who will lead their students on virtual trips and encourage a land ethic; and information in both technical and popular formats about the important conservation work of the Service. The strategy must integrate the development of wildlife refuge websites and social media with other emerging tools and applications. The web page for a national wildlife refuge should be viewed as a primary public face of the wildlife refuge and the Refuge System. Content must be current, accurate, approachable and engaging.

For over a century the Refuge System has provided a variety of wildlife-dependent recreational opportunities. The numbers of people engaged in wildlife observation on wildlife refuges – especially birding and photography – are on the rise. Our interpretive and educational programs are becoming more comprehensive and help people understand the ecological processes that are at work in providing for healthy fish and wildlife communities. Adding multi-language signs and bi-lingual staff is helping the Refuge System be more welcoming to even more Americans.

In the end, promoting relevance to the lives of everyday Americans is about access. People care about what they know and what they can experience. Wildlife refuges must be accessible to all, regardless of their location or the physical abilities of visitors, but never at the expense of the purpose of conserving wildlife.

Transportation systems are the veins that connect America's cities, towns, and places. With the need to reduce the emission of heat trapping gases from fossil fuels, alternative and clean modes of transit are becoming larger components of community and regional planning. The Service can enhance public accessibility to the wonders it manages while reducing impacts to the environment using alternative transportation on high-visitation, capacity-limited national wildlife refuges.

Recommendation: Wildlife refuges must participate in regional transportation planning. A priority should be linking people to wildlife refuges from more urban areas.

Service field stations should also work with local municipalities to facilitate transportation for seniors and people with disabilities. Wildlife refuges must continue to work to standardize inclusive accessibility by retrofitting existing facilities to current Americans with Disabilities Act standards and adopt the Universal Trail Assessment Process as a national standard. Training staff to relate to and assist persons with special needs can make wildlife refuges more welcoming places.

Small scale, low maintenance visitor facilities such as trails, observation towers and blinds, boat launching ramps, interpretive signs and kiosks have proven to be a cost-effective way to provide additional opportunities for all visitors to access and enjoy wildlife refuges. Additionally, many new visitors arrive at wildlife refuges without the specialized equipment they need to enhance the wildlife watching experience such as binoculars, spotting scopes, digital cameras and field guides. The Service has made great strides through its Birding Initiative to make sure wildlife refuges have these items to loan to visitors. Some have developed multimedia such as podcasts and other aids to help visitors explore the wildlife refuge. Others have fishing gear available to loan. A helping hand from staff and volunteers and the loaning of gear make visitors feel welcome and increase the likelihood they will return.

Recommendation: Compile an up-to-date inventory of visitor facility enhancements that must be constructed, maintained and prioritized with an emphasis on improvements that increase the accessibility of Service facilities.

Recommendation: Every staffed wildlife refuge should have specialized equipment available to loan and enhance visitors' experiences.

Becoming more accessible to urban populations is one of the Refuge System's most critical challenges. There are some national wildlife refuges close to large cities. However, most are in the wilder corners of America, beyond easy reach for most people living in the nation's largest metro areas. Though some cities are now expanding further into the countryside – changing once rural wildlife refuges into something more "urban" – it is not likely that many new national wildlife refuges will be established near the most populous cities in America. Most large cities have excellent regional, county or local parks and nature areas. There is huge opportunity for the Service to create a new type of urban presence for wildlife and the Service's mission through partnerships with local land managers and other federal, state, and tribal entities.

Recommendation: The Service should consider establishing national wildlife refuges in urban areas if the land is valuable for wildlife.

Recommendation: Develop public land partnership "portals" or wild land recreation and environmental education partnerships with local parks and nature areas to help an increasingly urban population find ways to enjoy their local resources and raise the profile of the Refuge System.

The job of reaching city dwellers to foster their connection to nature and whet their interest in wildlife stewardship requires many players and partners. The Service can play an appropriate, cost-effective role by bringing information to urban residents, welcoming them to visit and providing virtual experiences for those who cannot visit. Green spaces in cities have limited wildlife value, although they are important to protect for other reasons.

If efforts succeed in drawing new and different visitors to wildlife refuges, then they must first and foremost feel safe. Some people think wild places are dangerous places. Those fears must be dispelled. Front line personnel on national wildlife refuges are poised to address these and other concerns that visitors to wildlife refuges may have.

Refuge Law Enforcement officers share these front lines of interaction with visitor service staff and volunteers. Other field staff, including administrative specialists, biologists and maintenance professionals who interact with the public, also need to project a welcoming message. They should be happy to share their knowledge and experience about the refuge and wildlife. In many regions, information needs to be shared, verbally and in writing, in more than one language.

> Recommendation: Conduct periodic, scientific surveys to monitor and evaluate visitor expectations and experiences with a special focus on children, families, and culturally diverse groups. Use data to assess the effectiveness of the Public Use Requirements Field Station Reviews, identify areas of growing public interest, and facilitate the development of new strategies to enhance national wildlife refuge visitor services and nature-based opportunities.
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> Recommendation: The Service must invest in or recruit for language skills in its employees because languages other than English have become key to successful communications with the public.

Broadening Refuge Visitation and Use

Regulations governing the Refuge System were created to safeguard the System's integrity and are based on preventing excesses that occurred on wildlife refuges in the past. The Refuge System has developed strong policy on compatibility to assure that public uses of wildlife refuges do not interfere with their conservation purposes and assure a priority for wildlife dependent recreation. The Compatibility and Appropriate Refuge Use policies and regulations are powerful tools that have been critical to keeping wildlife refuges a place where wildlife come first. In the past, the Appropriate Refuge Use policy has been interpreted very conservatively. As the constituency of the Refuge System changes, the Service needs to interpret the Appropriate Refuge Use policy more flexibly. Some have questioned whether the current policy needs to be changed in order to provide a wider range of recreational opportunities that may draw new visitors.

Many people enjoy being outside whether it is to have a family picnic, ride a bike, or walk their dog. However, birders should not be frustrated by dogs running loose and barking, and anglers should not have to worry about jet skis disturbing the fish. The Service must be open to innovative ways to connect people to the natural world. The Refuge System has struggled with

uses like jogging, picnicking, sun bathing, dog walking and bike riding. Many people enjoy such uses, which may not harm wildlife if the number of participants is limited. Refuge managers have become rightly cautious because they have seen what happens to wildlife resources when participation is too large and incompatible.

> Recommendation: Review the Appropriate Use Policy to determine if policy barriers prevent appropriate nature-based experiences. Provide support and incentives for managers to be more expansive in their application of the Appropriate Refuge Use policy to welcome a wider variety of nature-based experiences.

> Recommendation: Update Service policies that address the administration of specialized uses such as commercial guiding, recreation fee programs, commercial photography and other audio/visual programs to maintain consistency, integrity, and excellence in the expansion of recreational opportunities for the public.

> Recommendation: Training on Compatibility and Appropriate Uses should be updated to provide managers with consistent guidance on considering a broader array of nature-based experiences on national wildlife refuges, monitoring use of wildlife refuges and reducing conflict between user groups.

Certain types of recreation – biking, hiking, birding, canoe trails – may not appear appropriate for a wildlife refuge if considered solely in the context of refuge planning. However, when they are one piece in a broader regional recreational plan that can significantly protect open spaces and connect people with nature, the Service must keep an open and cooperative attitude. If the Service expects others to be partners in its conservation priorities, it must understand its role as a potential partner in efforts that others lead.

> Recommendation: Wildlife refuges must participate in regional recreation planning in order to both protect wildlife resources and reach a new generation of wildlife enthusiasts.

As demographics and values continue to shift in America, the Service must realize that interpreting the Appropriate Refuge Use policy with flexibility without compromising a commitment to wildlife conservation will engage new users and is a necessary part of securing national support for the agency's mission.

A Sense of Place, a Sense of Community

National wildlife refuges are not usually the destinations for vacations of a week or two. Instead, most people visit just for the day, are from the local area or are just traveling through. National wildlife refuges are community assets, providing economic and environmental benefits, as well as the intangible aesthetic benefits of having an abundance of wildlife and natural scenery as a part of the community landscape. National wildlife refuges evoke a deeply meaningful sense of place for local communities.

The economic benefits of wildlife refuges are undeniable. As an example, recreational use on wildlife refuges generated almost $1.7 billion in total economic activity in 2006. In addition, property values surrounding Refuges are higher than equivalent properties elsewhere. Cities and communities are more frequently recognizing the value of ecosystem services. Regarding the benefits of nature, they are realizing that it is less expensive to preserve the function of providing clean water, for example, than creating technological solutions to mitigate societal impacts. The value of the ecosystem services the National Refuge System provides has been estimated at almost $27 billion per year.

> Recommendation: The Refuge System should continue studies and publish and share results on the economic benefits of wildlife refuges to communities, the economic benefits of ecosystem services from wildlife refuges, and the beneficial effect they have on property values.

Humans all share requirements for food, water, oxygen, and shelter. Every person – regardless of religion, political affiliation, age, or economic status – must have these things. National wildlife refuges provide these benefits and services from nature that help meet human needs. Wildlands like wildlife refuges are places where the rain and snow fall freely to the soil and are filtered through plant roots into the Earth. Natural processes on wildlife refuges clean the air and water that communities need. Trees and other plants prevent runoff and erosion and recycle heat-trapping gases. Bees, bats, and butterflies live and breed in these natural places and pollinate food crops. Game species such as moose, turkey, bass, and grouper thrive on the lands and in the waters of national wildlife refuges. The Service needs to better communicate such benefits and engage neighbors hand-in-hand in efforts to better understand and expand the impact of those benefits.

> Recommendation: Engage communities to identify what is important to them and articulate the ecosystem services that their wildlife refuge(s) provide(s). As a pilot effort to quantify these benefits, the Refuge System will prepare an ecosystem services benefit report for 10 wildlife refuges in every region within the next 10 years. If successful, these benefit reports will become a standard part of the Refuge System comprehensive conservation planning.

National wildlife refuges are community assets in other ways that no currency could ever measure. Well-trained employees of the Service are often first on the scene following natural disasters like hurricanes, floods and tornadoes. In times of crisis, Service employees help local emergency response officials with specialized skills and equipment. Service employees are integral in their community, whether they are a member of the local nature club or active at a religious, senior, or community center. Being a Service employee means being a good neighbor.

Many national wildlife refuges are successfully collaborating with community groups and are a consistent, engaged, and fully integrated presence in their communities. Local visitors, volunteers and community leaders have banded together to form locally chartered, nonprofit wildlife refuge Friends groups that work in partnership with the Service. Friends organizations help build links between wildlife refuges and local communities. Refuge Friends epitomize the idea that all conservation is local: they do everything and anything imaginable to advance

conservation and serve the visiting public. All of them pour their heart and sweat into the wildlife refuge they love.

Blossoming over the past 25 years, there are now over 230 supporting Friends groups around the nation helping bridge the interests of the local communities with refuge operations and management. The Service will continue to build on this successful model and reach out more broadly in the community and create relationships with people that may not have traditional links to wild lands and wildlife.

> Recommendation: Every staffed national wildlife refuge should have a Friends organization.

Support from Friends organizations is a benchmark of effective public-private partnerships that leverages resources, saves money and better serves the public. Friends organizations are a consistent, engaged and fully integrated presence in their community and are an excellent vehicle for involving a new generation in making a real difference on-the-ground for wildlife conservation. Strong connections to local communities come naturally in some areas and must be nurtured in others.

> Recommendation: The Service will support Friends organizations with education, training, and capacity building resources and provide incentives for Service staff to work closely with Friends and volunteers.

> Recommendation: The Service will provide assistance and networking opportunities to fledgling Friends groups in marketing and diversifying their membership and leadership.

> Recommendation: The Service will partner with the National Wildlife Refuge Association to create a campaign to grow the Refuge Friends membership to 100,000 people within a decade.

Not all individuals who want to help at a wildlife refuge are members of Friends organizations. The Refuge System has succeeded in building a cadre of more than 42,000 dedicated volunteers – more than 10 times larger than the entire Refuge System workforce – who participate in every aspect of stewardship. The Refuge System could recruit yet more volunteers, but lack of staff to organize, recruit, and engage volunteers is one limiting factor. Development of additional recreational vehicle sites with hook-ups could attract more volunteers, as would travel support and reimbursement and construction of bunkhouses and other facilities.

> Recommendation: To fulfill the National Wildlife Refuge System Volunteer Improvement Act, signed January 4, 2011, the Refuge System must develop a national strategy for the coordination and utilization of volunteers.

The Next Generation of Conservationists

Only by connecting with young people can the Service ensure that a new generation of Americans will become connected with the nation's great outdoors and grow into the land

stewards of tomorrow. The Service must develop opportunities for young people to learn a land ethic and the principles and passion of resource stewardship. Programs like the Youth Conservation Corps have provided thousands of people with their first experience working for conservation. The Service and the Department of the Interior are working on a strategy to engage the next generation of conservationists.

> Recommendation: The Refuge System will aggressively implement the plan to engage youth in a diverse array of work and volunteer programs.

Moreover, Refuge System engagement with scouting along with youth involvement in Refuge Friends groups, nature clubs and sporting groups can provide the encouragement and opportunity that will motive young people to join the conservation community. In that pursuit, technology has tremendous value to reach an increasingly plugged-in younger generation. The Service must continue to explore the applications of emerging technologies to engage our youth in wildlife conservation.

School Partnerships and the Future of Environmental Education

The Refuge System's list of Guiding Principles – core values that are ever relevant – start with the most central:

"We are land stewards, guided by the teachings of Aldo Leopold that land is a community of life and that love of land is an extension of ethics. We seek to instill the land ethic in our communities."

Environmental education is fundamental to nurturing a strong land ethic in the next generation and is a critical part of developing people's understanding of and participation in decisions affecting wildlife and habitat conservation. Environmental education can be a key tool to giving people a deeper appreciation of their inherent place in the natural world. Environmental education programs convey the benefits of the Refuge System and other protected areas and provide an avenue to promote a broader ecological conscience in future conservationists. The Refuge System's educational programs are also pathways to articulate nature's benefits and demonstrate tangible contributions to community schools.

The Refuge System has some – but not enough – outstanding examples of environmental education programs. One is the Prairie Wetland Learning Center in Fergus Falls, Minnesota. Each semester, more than 200 fourth and fifth-graders attend the center's prairie science classrooms for two hours a day, five days a week, over nine months. Students use the outdoor world to learn about nature as well as reading, writing, science and mathematics. The curriculum is designed to meet state curricular standards. The Refuge System has several similarly high quality environmental education programs, but the number is limited and undocumented.

The Refuge System can play a vital, but limited, role in environmental education. Professional educators must be the ones to deliver quality environmental education. Visitors and children can learn about nature from their experiences on wildlife refuges, each other, and stories from parents and mentors, but the Service cannot be solely responsible for the environmental

education of the nation and its youth. Additionally, technological tools are increasingly used to provide environmental education in schools and communities, reaching youth in stunningly immediate and relevant ways.

There are two distinct types of environmental education opportunities that wildlife refuges can provide. Top quality programs like the Prairie Wetland Learning Center require highly trained staff and strong commitment from local school districts. Such programs are valuable as demonstration projects to be emulated more broadly, especially in light of the strong community relationships such partnerships build.

The second, more common, environmental education program on wildlife refuges involves making its facilities and information available to local teachers and informal educators. Every staffed wildlife refuge should welcome local schoolchildren for compatible environmental education. Standard toolkits for teachers should be available. A set of environmental education standards could eliminate some duplication of effort and increase efficiency.

> Recommendation: In locations where top quality environmental education programs are working, develop clear research-based documentation of the viability and effectiveness of using the outdoors as a classroom.

The results of this research should be widely disseminated and published to increase the development and effectiveness of community and education partnerships as a model for conservation practices - positioning the U.S. Fish and Wildlife Service increasingly as a leader in environmental education.

> Recommendation: Develop an Environmental Education Strategy that inventories existing efforts, identifies priorities for investment of staff and funds, and outlines basic standards for all national wildlife refuges.

In order to have an effective environmental education program, the Service will need to establish dedicated national environmental education staff to develop programs and foster a land ethic in the next generation of conservationists. Their job would be to develop and disseminate high quality programs, including the integration of "a study of nature" in school curricula and training wildlife refuge and school staff in the use of the "study of nature" tools. Education does not stop with schooling. Many community leaders, organizations and educators are interested in providing opportunities for continuing education on conservation issues and establishing family and inter-generational environmental programs, including nature clubs on and off wildlife refuges.

> Recommendation: Support programs that offer opportunities for wildlife refuges and communities to engage in meaningful conversations about shared stewardship responsibilities (e.g., *Land Ethic Leaders* program of the Aldo Leopold Foundation).

Communicating the core values of a land ethic and sustainability is a worthy endeavor for the Service. It is much more important that the public sees these core values in the Refuge System's

land management and visitor opportunities. Leading by example has more power to change personal behavior than the communication of ideas alone.

Communicating the Benefits of Nature

Interpretation is the priority use of wildlife refuges that has most often been misunderstood. An interpretative program on a wildlife refuge is designed to facilitate meaningful and memorable visitor experiences. People have a natural tendency to care for what they first care about; therefore, interpretative programs encourage stewardship of the wildlife and habitat of the visited refuge. The Service has an incredible tool to reach out to the hearts and mind of America in the National Wildlife Refuge System. Often described as the "front porch of the Service," the Refuge System provides an incredible meeting place for Americans to meet the Service.

Wherever the Service finds an interest in preserving natural or cultural heritage, wilderness stewardship, citizen science, volunteering or healthy outdoor activities, there is an opportunity to engage more Americans as stewards of the land and waters. This includes opportunities to work with non-traditional supporters. The Service should use technology and social networking as part of efforts to expand the idea of appropriateness to include a wider array of users. The Service must actively advertise and market the benefits of conservation to a changing America.

Communication and interpretation are complex disciplines that utilize a variety of techniques. As society diversifies, the Service must use more techniques to reach a wider audience. The heart should be engaged, as well as the mind, understanding that wildlife refuges hold an undeniable place for many.

The Refuge System must develop a strategy for interpretation to ensure that visitors to wildlife refuges find an opportunity to personally connect with the refuge. The interpretive program strategy will assist individual wildlife refuges in developing programs that identify the characteristics of a site that make it a wildlife refuge in a way that is meaningful to the American public. The strategy should also develop standardized materials on the Refuge System and how the network of wildlife refuges across the nation conserves fish, wildlife and habitat for the continuing benefit of the American people. To successfully build and implement a strong interpretation program, the Refuge System must also make sure that front-line staff understand interpretation and the "story" of their wildlife refuge.

> Recommendation: Develop an Interpretation Program Strategy to build meaningful interpretation opportunities at all wildlife refuges that support visitation.
>
> Recommendation: Train all front line staff in the basic concepts of interpretation.

Despite this opportunity, not every visitor to a national wildlife refuge knows that they are at a wildlife refuge, that the U.S. Fish and Wildlife Service manages it, or understands that it is part of a system with breadth and a mission. Despite significant efforts, the Refuge System has been unable to create a widely identifiable brand. Branding issues persist even after some solutions have been mandated. For example, there are standardized designs for offices and visitor facilities, but branding the Refuge System will be advanced only if the standards are employed.

The Service uniform is not always worn consistently in the field, and the uniform may or may not reflect a look that would seem welcoming and professional today. It may be time for a makeover.

> Recommendation: The Refuge System needs an integrated strategy that assures a consistent and professional refuge brand is developed, including publications, websites, signs, facilities and uniforms.

Ultimately, a range of topics discussed under the concept of becoming relevant to a changing America – from the use of communications technologies to stronger branding of the Refuge System – comes under the far broader heading of strategic communications. Communicating the value of the National Wildlife Refuge System to an internal audience of Service employees and an external audience of Refuge Friends and other, targeted audiences is central to expanding a zone of influence on behalf of wildlife conservation. The Service must connect with the minds and hearts of a diverse America to ensure a wildlife legacy that endures for generations.

> Recommendation: The Refuge System must create a multi-faceted, long-term communication strategy, identifying key, targeted audiences and incorporating the newest communication technologies.

> Recommendation: Join and leverage marketing opportunities with a broader array of groups, including private companies/organizations to promote the System conservation message as well as visits to national wildlife refuges.

Strategic communications will help the Service make wildlife conservation of paramount importance to the American people, yet any strategy will only be as effective as its content. The Refuge System was once described as "America's Best Kept Secret." As the Refuge System moves forward into the beginning of its second century of conservation success, America must know of the incredible story that is the National Wildlife Refuge System. The secret must get out.

Stories told about wildlife have engaged mankind for generations. The stories centered around families of wildlife seen on television may seem ridiculous when viewed through a scientific lens, but they have done a lot for instilling conservation ideals in children and families – they have engaged the heart. Engaging the public demands that conservation professionals stretch themselves, be creative, and talk about and teach conservation in a manner that compels the American public to care about wildlife.

Nature provides recognizable benefits in clean air and water, for example, yet there are other benefits, equally important, that are far more difficult to quantify. Despite the difficulty of explaining the mystery of nature's intangible benefits, Americans agree that time in nature is especially restorative to people's health and mental well-being and provides a way to nourish their sense of wonder, imagination and curiosity. The benefits and immeasurable gifts of nature are beneficial for all Americans, and realized by many people who may never visit lands or waters of a national wildlife refuge.

The American public too often discounts wildlife conservation threats as being too far away, not relevant to their everyday lives and even temporal. The finest minds, the strongest partnerships and the greatest innovation must be brought to the task of increasing society's conservation literacy to fulfill the agency's mission "for the continuing benefit of the American people."

Chapter 5
Organizational Excellence

Leadership and organizational excellence are inextricably linked. Leadership is doing the right things. Organizational excellence is doing the right things right. In an excellent organization, the many functional parts work together to achieve a central mission while continuing to grow and evolve in order to meet new challenges. Excellent organizations have a vision, streamlined business practices, integrated information sharing, great resilience, motivated workforces, a distinct and positive culture and high levels of performance. Employees are satisfied and fulfilled. Organizational excellence must be an overarching state of being that cuts across all aspects of the Service. Any vision for the future must result in an agency of strong and talented leaders who achieve the mission of the organization better and more efficiently because of their passion and a commitment to excellence.

The Service will lead by how it manages the organization – encouraging and embracing change and innovative ideas, anticipating opportunities, and taking calculated risks. In today's rapidly changing society, organizations must use the latest technology to communicate, conduct science, and lead in their field and communities. Doing so promotes organizational excellence and allows an organization to focus on the highest priority goals and objectives. Organizational excellence reduces administrative burdens, prevents information overload, and effectively shares institutional knowledge.

Organizational excellence will result from clear business practices that allow efficient and consistent operations within the Refuge System and that focus on the highest priority goals and objectives. It will reduce administrative burdens, prevent information overload, and effectively share institutional knowledge. Through organizational excellence, the Service can improve efficiency to facilitate better stewardship of the nation's natural and fiscal resources.

The Service has the potential to be the premier conservation organization in the world, and the Refuge System will emerge even more so as a benchmark by which other land management organizations measure success. Conservation professionals will covet careers in the Refuge System, not only because of its critical mission, but also because of the quality of its leadership and the efficacy of its practices. There will be a clear vision; streamlined business practices; integrated information sharing; great resilience in the face of change; a motivated workforce; a positive, welcoming, and inclusive culture and high levels of performance towards specific goals and objectives.

Organizational Structure

Organizational excellence begins with leaders who embrace change and innovative ideas. Service leadership at all levels must anticipate opportunities, remain transparent, and take calculated risks. The Service must be flexible and adaptive.

Changing times call for a critical review of business management practices and operating procedures, as well as organizational structure. Internal programs including human resources, engineering and water resources divisions must be analyzed in the greater context of effectively

providing support across the Refuge System in light of changing times. The Service should strive for consistency and efficiency in budgeting and work planning in order to ensure that a true system of wildlife refuges is maintained.

The Refuge System has been organized at three distinct levels – field, regional offices, and headquarters – and the overwhelming majority of the Refuge System's workforce has been concentrated in the field. Indeed, the cultural and organizational emphasis has always been at the field level. The Service's Regional Offices contain mostly staff support, and supervisory and line authority positions. Although the structure has served the Refuge System well, the evolution to functional specialties, along with the accompanying economies of scale, require that the Refuge System explore a structure that both meets functional specialty needs and enhances career pathways amongst specialty and supervisory or management tracks.

> Recommendation: Review the Refuge System organizational structure and design a business model that more efficiently meets the needs of employees and accomplishes its wildlife conservation mission.
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> Recommendation: Identify needed staffing levels for wildlife refuges and ensure that the appropriate range of skills and expertise are available on the ground, at the wildlife refuge level.

The Refuge System requires a national organizational structure that provides an adequate balance of decentralization, with employees positioned closest to the resource where the work needs to be done, and centralization to gain efficiencies from consolidating similar work into fewer locations. In periods of declining budgets, every Region has explored creative management strategies that bring efficiencies. Such structural analysis must continue and be reinforced.

Organizations are increasingly part of larger networks that share missions, purposes, and even responsibilities. The field of networked governance looks to the interconnectedness of essentially separate entities and looks at how relationships and connections between them affect the overall network or system. The Refuge System should adopt communication tools that facilitate the exchange of experience, knowledge, and ideas among Service staff, and with practitioners and specialists from other areas and organizations. At present, such "communities of practice" are too often isolated from each other by regional or administrative barriers, or "stovepipes." These barriers must be broken down. Sharing knowledge is a fundamental strategy for adapting during periods of rapid change. It promotes the transfer of hard-won experience and knowledge from an experienced workforce to a new generation of Service employees, and allows staff to learn how practitioners in other areas have dealt with similar issues.

Part of this is working across the organizational boundaries of federal agencies by establishing positive working relationships and partnerships. The Service must take the opportunity to leverage other federal dollars across agencies to meet multiple missions, where possible, and contribute to ongoing management. While state wildlife agencies have always been strong partners for the Refuge System, collaboration can be improved. Likewise, incredible opportunities exist to partner with the Departments of Agriculture, Defense and Education. In a similar way, transportation and trails programs, for example, have a major return on investment

for the Refuge System. The Refuge System's organizational structure must include opportunities to weave other agencies into its conservation mission. The American people expect fiscal responsibility, and the Refuge System will take advantage of agencies' respective expertise to provide efficiencies.

> Recommendation: The Refuge System will find innovative and efficient ways to work with other agencies to establish positive relationships and partnerships.

All natural resource agencies must look to each other for opportunities to collaborate, where appropriate. Federal agencies can work closely together to further the mission of each while celebrating their differences. Fiscal responsibility dictates that all agencies and resources must be shared to efficiently manage the people's business. In some circumstances, one environmental education specialist can speak about four agencies while in a classroom instead of four environmental education specialists providing separate programs to the same class. Agencies must take advantage of their respective expertise and capitalize on each other. The American people expect that entities in their government will work with each other to enhance efficiencies. The Service may not have all the resources to implement the ideal organizational structure, however, there is the commitment, fortitude and passion to build it with others.

Increased Productivity

One of the most powerful tools for modern organizations to enhance productivity is technology; however information technology is only viable if the information, processes and people behind it are also up to par. Antiquated data systems must be replaced with new technology where data can be shared and managed effectively to multiply its value and reduce or eliminate redundancy. Strong information technology support will be needed, with expertise provided by employees skilled in information technology management. While there are challenges associated with new information systems, these can be overcome with strong commitment from leadership.

The Service can also increase productivity by adopting communication tools that facilitate the exchange of experience, knowledge and ideas among Service staff, and with practitioners and specialists from other areas and organizations. At present, such "communities of practice" are too often isolated from each other by regional or administrative barriers, or "stovepipes." These barriers must be broken down. Sharing knowledge is a fundamental strategy for adapting during periods of rapid change. It promotes the transfer of hard-won experience and knowledge from an experienced workforce to a new generation of Service employees, and provides examples of how practitioners in other areas have dealt with similar issues.

New technology can also be used as a means to effectively deliver on-the-ground conservation actions now and in the future. The Service must provide managers with the capacity to try innovative on-the-ground conservation techniques, and allow them to take risks in hopes of developing more effective practices. This is particularly true when it comes to trying to adapt to large-scale threats such as climate change and invasive species.

Recommendation: Become more productive and efficient in internal and external communications and business processes, using new social media tools, web-based communications and online training.

Recommendation: Antiquated data systems will be replaced with technology that shares and manages data effectively.

Recommendation: Identify data management technologies that improve on-the-ground conservation delivery capabilities and empower managers to use them risk-free.

The use of technology will increase the Refuge System's productivity. But it should not supplant essential personal contact. Being able to meet in person to better connect and build trust will enhance employee morale, public satisfaction and greater fish, wildlife and habitat conservation.

Excellent organizations operate at peak efficiency by ensuring that the workforce is appropriately sized and placed to do the job at hand. Excellent organizations are also able to change direction quickly when circumstances dictate that change is necessary and prioritize mission-critical work when challenges exceed the fiscal and human resources necessary to address them.

Recommendation: Mandate an annual review of each Refuge unit's activities to ensure that operations are compliant and mission critical.

The skills required for refuge management are also evolving and mandate that the Service focus on developing outstanding supervisors and executives. The development of executive skills is as important as technical skills in an ever-changing landscape. The complexities of America's workplace and challenges of land management require that an appropriate balance be struck.

Recommendation: Invest in providing executive management training to the Refuge System's workforce, especially to those in supervisory positions, and in developing systems to track effective supervisory performance.

Effective supervisors must provide for the training and development of all employees but should also be supported when they must make the difficult decisions regarding performance standards. All employees, including supervisors and managers, must be held accountable for contributing to this culture of success.

The Right Training for the 21st Century

A continuous learning culture will be viewed as no less than a critical means of conservation relevancy, and indeed survival in a constantly changing world. The Service needs to ensure that its employees possess the right competencies to address the conservation challenges for the next decade within this landscape of change in the Refuge System. Threats from climate change, declining water quantity/quality and invasive species will require a new and stronger suite of skills, including, for example:

- Skills in collaboration and coalition building to coordinate with a range of public, private and nongovernmental agency partners, including an understanding of the legalities and business implications of formal partnerships.
- Ability to manage and communicate with "citizen scientists" to enhance the capacity to monitor climatic and ecological variables.
- Expertise in a range of communications tools, including advances in social media, to educate communities that learn differently than in previous generations.
- Knowledge of predictive modeling, carbon sequestration and the ability to use GIS. Knowledge of hydrology and water resources protection, and facility and asset management.

Employee training, continuing education and professional development are mission-critical. This viewpoint has grown significantly due to excellent work of the Service's National Conservation Training Center in Shepherdstown, West Virginia. The Refuge System has benefited tremendously from sending cohort after cohort of Service employees and managers on wildlife refuges to the various academies and training offered there. Internal training, however, is not the sole source of development opportunities. A number of professional organizations, colleges and universities, and training services offer courses and programs. Regardless of the source, training for employees is, and should be, increasingly offered virtually.

Recommendation: Evaluate the training opportunities at the National Conservation Training Center and other venues in order to ensure that adequate and appropriate training is available for the skills sets that will be needed in the future.

Recommendation: Work with colleges, universities and technical schools to build the knowledge base of future employees while developing programs that develop mission critical skills and abilities.

As our nation changes, fewer people are growing up with experience in the deeply rooted American traditions of hunting and fishing. The Service's workforce is beginning to reflect these changes. While we embrace a diverse and inclusive workforce, it is important that those with responsibility for managing wildlife refuges understand the historic and current roles of hunters and anglers in fish and wildlife conservation.

Recommendation: The Service must ensure basic employee training explains the North American Model of Wildlife Conservation while also offering training courses on hunter safety and managing hunting programs on national wildlife refuges.

Effective and adaptive training is key to organizational learning, but it is not everything an organization needs to learn and grow.

Transfer of Intellectual Capital

Twenty percent of the Service's employees that work within the Refuge System are expected to retire by 2014; nearly 45 percent are expected to leave by 2020. Such an exodus will create a critical need to transfer the intellectual capital of today's leaders to those who follow.

Managing knowledge and information effectively will guarantee a skilled and efficient workforce for the future. In many cases, effective data sharing and management can eliminate redundancy and lead to economies of scale. Improved knowledge management systems must be developed to allow for more timely and effective sharing of scientific information, accomplishments, and needs both internally and with our external partners.

The disciplines required to manage the Refuge System can be viewed as a microcosm of all the various functional and scientific practitioners of the Service or really any conservation organization such as biologists, modelers, communicators, or managers. They represent topical "communities of practice" or groups of specialists. Using updated online technologies, these communities can share information, collectively analyze successes and failures and gather virtually to maintain functional networks. Such communities of practice could help bridge knowledge gaps as many employees retire from the workforce.

> Recommendation: Design a knowledge management strategy for the Refuge System that supports communities of practice open to all Service employees and other groups that are relevant and appropriate, including partners, other agencies, and interested citizens.
>
> Recommendation: Develop and mandate system-wide leadership and position succession processes to ensure learning and knowledge is passed from the departing employee to the successor.

Greening Wildlife Refuge Infrastructure and Operations

Climate change will intensify existing threats on fish, wildlife, and the ecosystems that sustain them. In September 2010, the Service published its plan to address climate change.

In order to support the plan's bold charge, the Service must adopt more sustainable business practices. Valuable efforts are already underway, and the Service must look to employees, partners and the business community for their expertise in refocusing energies and recalibrating activities.

> Recommendation: Support and implement the goals in the Service's 2010 *Strategic Plan for Responding to Accelerating Climate Change* as they apply to mitigation. Specifically, contribute to Goal 5 to achieve carbon neutrality by the year 2020.

Achieving carbon neutrality will require active steps, including the development of a tool to calculate carbon sequestered and the offset of remaining carbon balances on wildlife refuges.

Aligning the work of the Refuge System with its environmental values involves more than just contributing to carbon neutrality. First, the Refuge System should innovate to become itself carbon negative and contribute more than its share to the Service's overarching goal of carbon neutrality. The Refuge System has the advantage of a land base where restoration activities can be prioritized within high priority landscapes that are effective in sequestering carbon. Second, there are a multitude of impacts to the environment and wildlife in addition to the emission of

heat-trapping gases that come from Refuge System work and operations. The Service should consider and evaluate these impacts and take action to reduce them.

Recommendation: Develop a 5-year plan for greening the Refuge System.

The plan should build off of the Refuge System's step down of the Service's climate change strategic plan and its elements that apply to mitigation. The plan should address the breadth of Refuge System operations and propose solutions for meeting targeted goals for the reduction of environmental impacts. Such options should include:

- Reduce the number of facilities and other assets that the Refuge System owns and maintains.
- Reduce fuel consumption by evaluating old equipment against national or local emissions standards and converting to more efficient vehicles, tractors and equipment on all new purchases.
- Opt for replacement equipment that includes new technology, such as GPS, to increase precision and decrease fuel consumption when working or treating large areas.
- Reduce travel by making video and teleconferences the primary delivery method for trainings and meetings.
- Use sustainably renewable or recycled construction materials, with focus on those that have the smallest carbon footprint to manufacture and recycle.
- Recycle 100% of materials such as paper, glass, aluminum and tin. If recycling facilities are not readily available, wildlife refuges can work with local communities to develop a way to recycle.

For new construction and operations, the Refuge System must aim higher in its commitment to environmental sustainability. The Refuge System should:

- Utilize green technologies and water conservation systems in all deferred maintenance projects.
- Meet the Leadership in Energy and Environmental Design (LEED) certification standards for all new structures and when retrofitting existing structures.
- Require Green Seal certification for all Service facilities and contractors.
- Use innovative carbon neutral energy sources consistent with maintaining biological diversity, integrity and environmental health.
- Convert to clean and more efficient energy technologies like solar and wind power on existing and future infrastructure.

Workforce of the Future

Excellent organizations recruit and retain excellent employees. Historically, the Service has drawn employees largely from individuals who had a direct connection with and understanding of the natural world. Future employees may have spent less time outdoors and more time with electronic media than those who have historically been attracted to the Service. Many of these prospective employees may not naturally think of government or the Service as a place to have a career. The Service needs to develop and execute innovative approaches to find and recruit the

best and brightest of future employees. These employees should reflect the full diversity of the American people.

> Recommendation: Establish, communicate and track the current baseline and future goals for employee recruitment and retention, especially within specific functions where recruitment has been problematic.

The Refuge System should recognize and plan for the growth of specialized groups in the workforce. Multidisciplinary work is becoming less common as natural resource management becomes more scientific and expertise more focused. The Refuge System has identified a need for more specialized scientists in areas such as climate change, hydrology and invasive species, among others. It has also identified a need for expertise in non-science areas such as environmental education, public-use planning, asset management and business management.

> Recommendation: The Refuge System must develop effective strategies for recruiting and deploying specialists as a fundamental part of its workforce planning efforts.

In the past, the Refuge System has also encouraged and even required employees to physically move to achieve certain positions. While a breadth of experience is important, especially to employees competing for senior level management positions, it is becoming increasingly more difficult for employees to relocate. The increase in the number of dual career families as well as recent economic trends in the housing market has significantly impacted employee mobility. The Refuge System should continue to encourage employees to gain a diversity of experiences during their careers; however, there must also be career ladders and opportunities that can enable employees to achieve higher graded positions without relocating.

A Diverse and Inclusive Workforce

The Refuge System will become known as a workplace that welcomes employees from all backgrounds. The Service must recruit and retain a workforce that reflects the ethnic, age and language diversity of America in the 21st century. There has to be recognition of different cultural values and the importance of a workforce that resembles the community in which it exists. This will not only enhance public support for the Refuge System, but will also ensure a workforce of the best and brightest minds. An inclusive workforce is a powerful tool in being relevant to a changing America.

> Recommendation: Place special emphasis on reaching youth at the high school and college levels in diverse communities to expose them to conservation careers and promote the Service as the conservation employer of choice.

Employment programs such as the Youth Conservation Corps (YCC), AmeriCorps and work/study programs should be expanded not only to provide temporary employment, but also to ready students for conservation careers. The Service has effective recruiting tools for students. Others are available and successful but often underutilized in recruiting. The focus should be on students with extraordinary potential that traditional recruitment or selection processes might have overlooked.

Ultimately, leaders inspire others. The Service has long recognized that mentoring programs are a step along a development continuum to prepare Service leaders for senior and executive positions. However, there is presently no formal Service or Refuge System-wide mentoring program that could help coach and guide employees towards greater leadership roles. Such mentoring can be especially critical for recruiting and retaining a diverse workforce. In late 2010, the Department of the Interior implemented a mentoring program that should be expanded within the Service and the Refuge System as one step in cultivating a new cadre of Refuge System leaders.

> Recommendation: More than double the number of minorities and people with disabilities working for the Refuge System within the next 10 years, resulting in a workforce representation matching the civilian labor workforce in the System's main occupation series.
>
> Recommendation: Develop and implement a Service-wide strategy for targeting diverse groups of conservation professionals in government and beyond to assist in raising awareness about conservation careers with the Service and develop sustainable relationships with minority-focused conservation organizations.
>
> Recommendation: Implement a mentoring program that supplements the Department of the Interior mentoring program and other efforts underway in the Service.

The Service recognizes that it is imperative to move forward with innovation and a stronger commitment to creating a diverse workforce as part of building a culture of inclusiveness. With a diverse and committed workforce, the Refuge System will capture the diversity of thought and perspectives that are unique to different cultures, experiences and backgrounds. As a result, the Refuge System will excel in engaging all cultures in its wildlife conservation mission.

Chapter 6
Leadership in a Landscape of Change

The spectacular terrain, sparkling waters and diverse habitats that make up the National Wildlife Refuge System and support the nation's treasured wildlife are borne of a rich and proud history. Bold and daring visionaries struck out to challenge the establishment of the time to create something better and greater than them. Teddy Roosevelt used the Antiquities Act to protect lands for conservation; Rachel Carson raised the collective awareness of a nation; and Aldo Leopold and his constantly evolving ideas gave birth to a land ethic that has become the cornerstone of our conservation ideals.

These leaders and others often took action that was not always accepted or supported, but they were people of great vision and conviction. Their actions and words have become central to the conservation legacy of North America. As the Service embraces a renewed vision for National Wildlife Refuge System, this legacy must be remembered and built upon to empower the actors of change in the conservation community to think beyond their current bounds.

At the heart of this vision is ensuring that national wildlife refuges remain a cornerstone of America's conservation estate. Partners strategically addressing priority resource objectives can maintain functional landscapes that support robust fish and wildlife populations. As a leader in this endeavor, the Service must cultivate an organizational culture in which conservation professionals covet careers in the Refuge System because of its vision, excellence, and leadership.

The national treasure of the Refuge System faces an uncertain future. Society and landscapes are changing; threats to natural resources are escalating faster than the reaction time of restoration; federal budgets are declining; and pressures on employees are mounting. The challenges are so vast that it will take more than one iconic leader to overcome them; more than one Teddy Roosevelt, more than one Rachel Carson, more than one Aldo Leopold. Everyone must be a leader.

Every employee must embrace the courage and character of those iconic leaders of the past. Together as part of the Service and with partners, a new conservation legacy will be charted for the next generation. Individuals and organizations must remain visionary, dynamic, and accountable in order to meet the challenges ahead. In doing so, remember that change is the only constant.

Leadership Excellence

The Refuge System's Guiding Principles recognize the very essence of leadership: "We are public servants. We owe our employers, the American people, hard work, integrity, fairness and a voice in the protection of their trust resources." The Guiding Principles go on to state: "Employees are our most valuable resource. They are respected and deserve an empowering, mentoring, and caring work environment." Those sentiments must be carried out in ways that will both nurture leadership and foster a positive work environment at every level.

The leaders of tomorrow must serve from a foundation based on integrity and sound land stewardship in service to others and their communities. They must be adaptive and visionary, inspiring employees and partners to exceed what is necessary and seek what is possible. They must possess agility, passion and exceptional communication skills. They must be skilled in the use of technology to enhance communications and overall management. They will model and expect accountability of themselves and staff. Finally, those leaders must be committed to the development of the next generation of conservation stewards.

Just as leadership is welcomed at every level, this organization remains indebted by the essential contributions of the dedicated people who facilitate its day-to-day achievements. Consider the critical role administrative workers play in bringing on temporary and seasonal staff; the interpretive and environmental education programs given by the student working on an internship who reaches hundreds of visitors over the summer, or the habitat management that is achieved by the wage grade workers who repair, maintain and operate our equipment. These dedicated, innovative, and resilient employees are the face of the agency and the reason for its success. They each play a critical role and deserve positive, proactive leadership and opportunities to develop themselves and their skills.

Leadership development will not be seen as a "collateral duty," but will be central to the culture of the Refuge System. Employees will serve in an environment that values openness and transparency and the contributions each employee makes to the fulfillment of the mission. Leaders will value diversity of personal and professional experience. As such, they will seek out leadership excellence from beyond the Refuge System and will encourage rising leaders to broaden their experience within and outside of the Refuge System. Innovation and well-reasoned risk taking will be embraced and rewarded. Change will continue, and leaders must anticipate it to make positive changes that benefit fish and wildlife and their habitats.

Conservation Leadership

Conservation leadership in 21st century America is far different than it was 50 years ago. Federal agencies have long been compelled to do the most with the people and funding they receive. However, now accounting for agency performance has become more formal and directed.

At the same time, some futurists have predicted that early in the 21st century the entire body of human knowledge would double every week. Moreover, the Refuge System of the 21st century must find ways to manage environmental challenges such as climate change, invasive species, biotechnology and water quality and quantity, to name a few.

Because national wildlife refuges are part of a larger conservation estate, the Service must lead and manage them in the context of the landscapes in which they exist. To meet the conservation community's shared goal for functional landscapes with viable fish and wildlife populations, the Refuge System must participate in collaborative partnerships to support specific landscape-scale goals and objectives. Seeing the Refuge System as part of a bigger "whole" will most effectively contribute to the management of habitats and species across the landscapes in which wildlife refuges are a part of. Human and fiscal resources will be focused strategically on priorities, and the Service will manage existing wildlife refuges and acquire new conservation lands to meet

specific goals for habitats and species. The Service will also be better positioned to use the Refuge System to ensure fish and wildlife populations have the opportunity to respond and adapt with changing climates.

Employees must be well-versed in the principles of strategic habitat conservation and will help lead the larger conservation community to set objectives, design conservation models, deliver conservation on the ground, monitor to determine results and test assumptions through targeted research. The Service must remain committed to operating in a collaborative and adaptive framework. Refuge System leaders at all levels will be effective members and beneficiaries of collaborative landscape conservation cooperatives, where shared goals within a landscape are attained by filling critical information gaps that then allow the Refuge System to more effectively target on-the-ground delivery efforts.

Together, all of these factors mean that today's conservation leaders not only must exhibit professionalism and vision, but they also must become integral parts of their communities and learn to communicate clearly and frequently. This will increasingly mean using cutting-edge technology that did not exist decades ago. Professional development becomes imperative in such a climate.

Developing Others

Organizational excellence and leadership are inextricably linked. The latter begins with leaders who embrace change and new ideas, anticipate opportunities, remain transparent and take calculated risks in a way that efficiently achieves the mission while evolving towards new challenges and opportunities. The development of leaders is integral at all levels of the organization and is not limited by job series or grade level. All employees are entitled, and encouraged, to pursue such opportunities.

As the world's premier scientifically based wildlife conservation agency, the Service has focused on technical credibility, and the agency will continue to be known in this way. The Service is a recognized leader in the use of habitat management techniques and tools, including the use of prescribed fire. Many talented employees emerge as leaders in biological planning, conservation design and modeling and monitoring. The Service must continue to support these scientific endeavors – they are the foundation to the agency's adaptive conservation delivery activities.

Service leaders have always led from a foundation of integrity coupled with adherence to sound principles of land stewardship. The Service supports and encourages developmental opportunities such as details, shadow assignments and job swaps as methods to expand employees' leadership horizons. Moreover, the Service recognizes that leadership development programs are integral to the organization, including for entry-level positions. Supervisors and managers should support individual development and create an environment that fosters self-motivation, high morale, continuous improvement and each employee's contribution to the team.

Programs such as Stepping Up to Leadership (SUTL) and the Advanced Leadership Development Program (ALDP) have been excellent internal sources for leadership training, and they should continue to evolve as the demands and needs for leadership changes. Much the same

can be said for the three-day Leadership Challenge Workshop offered at the National Conservation Training Center and at other Service locations around the country. Further, internal leadership training is not the sole source of development opportunities. A number of professional organizations, including, for example, The Wildlife Society's Leadership Institute, offer courses and programs.

> Recommendation: Encourage qualified employees to apply in greater numbers for leadership training and development programs. Also encourage employees to apply for the Department of the Interior's Senior Executive Service Candidate Development Program.

Supervisors are encouraged to give all the support needed to ensure that the most qualified people do, indeed, apply for advancement and leadership training. The low number of applicants for such leadership training may well account for the small number of individuals with Refuge System field experience who hold the top leadership positions with the U.S. Fish and Wildlife Service and the Department of the Interior. While the Refuge System represents about 50 percent of the Service's workforce and is the land base of the Service, it has far less representation on the leadership of the Service or the Department.

> Recommendation: Develop executive leaders who can guide the work of a variety of specialists toward broad, landscape-level conservation goals.

The Service must also continue to embrace the need for leadership development as critical component of the organization's philosophy. There are a number of identified pathways for employees to follow in their careers. However leaders must model the way and provide the necessary resources for leadership development, including encouraging employees to attend developmental programs, even when it is difficult for the organization or leader. Leaders must also become personally involved in employee development programs, serving as instructors, mentors and coaches.

In addition, the agency must foster an earnest culture through increased focus on leadership competencies. The Service has developed a model for identifying and developing a host of competencies in its employees and emerging leadership. Truly though, the conservation leader of the future is not the same as it was twenty years ago.

While some of the intangible values of leadership – honesty, integrity and trustworthiness – persist, there are other values leaders must unequivocally exhibit. Leaders must foster a positive work environment where calculated risks are encouraged, mistakes are used as developmental experiences, brainstorming and innovation are rewarded, learning is supported and employees are regularly recognized for their achievements. Leaders must put their employee's concerns, work/life balance and developmental needs first. Thus, they recognize that mentoring and coaching is one of the best uses of their time. As being an effective leader can at times be difficult, leaders will need strength in conflict resolution, courage to risk potential failure and strong support from others as a result of their demonstrated performance. Tomorrow's leaders will be more aware of their personal strengths and weaknesses, and they will model behaviors of continued self-discovery and improvement. In light of all this change, the Service should assure

that the competencies developed in its employees and leaders reflect the needs of future conservation leaders.

> Recommendation: Mandate the use of the Service's Leadership Competency Development Model and the Leadership Pathways reports as part of all employee development planning and implementation.
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> Recommendation: Review the Service's Leadership Competency Development Model and, if needed, supplement it to reflect additional priority competencies identified for future leaders of the Refuge System.

Managing People

Leaders truly embrace the practice of treating employees as the most valuable resource – above all else. Leaders will assess the emerging challenges of conservation and strive to recruit and develop employees that possess the tools and resources needed.

Supervisors and managers must encourage leadership at every level and value a diversity of thought. They must ensure that the Service is known as a workplace that welcomes employees from all backgrounds. The Service will be the premier employer of choice because its workplaces will be professional, collaborative, constructive, welcoming, creative, and fun places where people from all portions of the citizenry can find a home. By creating this culture, the Service will attract and retain employees that represent the diversity that exists in the American public.

> Recommendation: Mandate enrollment in the Project Leader Academy for all new national wildlife refuge or complex managers within their first 12 months.
>
> Recommendation: Invest in and mandate coaching and conflict management training for all supervisors.

With a diverse and committed workforce, the organization will be able to capture the diversity of thought and perspectives that may be uniquely presented by different cultures, experiences, and backgrounds – better positioning the organization to embrace all cultures in its mission and ensure that it remains relevant to the public. The Service must work together with the state and federal agencies and organizations that share a conservation mission to create this professional culture and to implement successful recruiting efforts that will ensure the collective conservation workforce represents Americans from all walks of life.

Expanding the Leadership Horizon

To achieve a renewed paradigm of leadership, a culture of continuous and comprehensive leadership development must be evident internally and externally to the organization. Conservation professionals covet careers in the Refuge System because of its mission and the quality of its leadership, and organizational excellence allows efficient and effective achievement of conservation through streamlined business practices, integrated information sharing and high

performance. As supervisors and managers maintain a focus on employees and cultivating leadership, the Service will be the premier conservation organization in the world and the benchmark by which other land management organizations measure success.

Despite best efforts to anticipate and embrace change, today's Refuge System workforce – and certainly the workforce of America – is constantly evolving ahead of the curve of progress. These and other dynamic conditions make leadership development a constant and critical factor in the success of the National Wildlife Refuge System.

Strong leadership is necessary to achieve organizational excellence and excellent organizations continually strive to develop strong leadership skills in all its members. Strong leaders foster a culture of transparency and thrive in the face of uncertainty. Leaders in the future will look at change as an opportunity rather than a threat. They will accept and embrace evolving conditions and will use communication to effectively lead others through difficult times. They will be best characterized as doing the right things in an environment of constant change.

The focus must remain not just on the organization but also on the partnerships and alliances around it. Current and future networks of partnerships will rely heavily on new communication technologies and innovative approaches to share information and promote participation. Over the course of the last 20 years, the Service has continually moved into a broader and more collaborative vision of wildlife conservation, understanding that the agency is an integral part of an interconnected, and even global, web of conservation partners. Ultimately, no single group, agency, country or the Service can achieve wildlife conservation in isolation.