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A New Paradigm for Bird Conservation: The Role of Applied Science in Conserving the Full Spectrum of North American Birds through Regional Partnerships

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Introduction

The North American Waterfowl Management Plan (NAWMP) is widely credited with reinventing approaches to conservation. For the first time, conservationists from the private sector joined representatives of state, provincial, federal and corporate entities in an effort to affect populations of birds at a continental scale. Despite past successes of the NAWMP and joint ventures partners assembled under the NAWMP banner, persistent forces continue to diminish the quantity and quality of bird habitats. In most areas of North America, changes in habitat abundance and quality are the cumulative effects of decisions by individual land owners to alter existing land use. Government programs often exert a profound influence on those decisions. To underscore the extent to which these programs may effect bird habitats, U.S. Farm Bill expenditures in 2001 exceeded $16.4 billion for farming subsidies (not including crop insurance subsidies or $2.4 billion in disaster payments) and $1.9 billion for conservation titles (Environmental Working Group 2003). In many parts of the United States., bird conservation lives and dies through the conservation provision of the current Farm Bill; yet, it is the tension between commodity payments and conservation payments—bringing new land into production on one hand, encouraging habitat

restoration on the other—that ultimately determines net changes in the nationwide availability of wildlife habitat. Although many speculate that the 2002 Farm Bill will contain the largest expenditures for conservation of any to date, the ratio of commodity to conservation spending is expected to be essentially unchanged. In contrast to expenditures for agriculture, in 2002, combined direct federal expenditures for bird conservation totaled less than $121 million (James Woehr, personal communication 2003).

In the face of continuing habitat losses, most successes by bird conservationists will be transient. In fact, traditional approaches to habitat conservation that rely on direct appropriations for wildlife management might be characterized as doing little more than delaying inevitable habitat degradation and declines in bird populations. Clearly, the challenge of conserving the full spectrum of North American birds and their habitats dwarfs traditional wildlife management resources. Overcoming these deficits will require that we make more efficient use of our traditional resources and that we broaden our reach to more effectively capture the potential wildlife benefits of a host of federal and state programs that use habitat restoration as a tool to secure diverse environmental quality and socioeconomic benefits. Successfully refining delivery of programs, like the Farm Bill, to increase their benefits to birds and other wildlife will require expanded partnerships that are based on more sophisticated approaches to conservation that embrace science-based, strategic planning and implementation at continental, regional, landscape and local scales. This approach is predicated on the revolution in information management technology. In this paper, we will explore the idea of a new paradigm for bird conservation and how this paradigm shift may lead to a broader sphere of influence for conservationists.

Reinventing the Bird Conservation Paradigm

Traditional approaches to habitat management may be characterized as dependant on direct appropriations to land management agencies and to programs such as the North American Wetlands Conservation Act explicitly for the purposes of protecting and managing wildlife habitats. Funds for habitat protection have typically been expended opportunistically, with little regard to predicted biological consequences and without coordination among conservation agencies working within the same landscape or seeking the same goals (Figure 1). Using these relatively limited traditional resources more strategically and broadening our reach to nontraditional partners will require a new conservation paradigm. The new paradigm will require new approaches to the business of bird conservation and new ways of thinking about our agencies' roles in habitat management. We can no longer regard our roles as solely habitat stewardship. Under the new paradigm, we will be purveyors of information that captures the biological foundation for bird conservation, that is, our understanding of how birds relate to their habitats across space and time during the annual cycle. Understanding the new demands of bird conservation begins with a critical assessment of the goal of, "regionally based, biologically-driven, landscape-oriented partnerships" (North American Bird Conservation Initiative 2002). Recognizing the implied commitment in this goal to a new model for conservation requires that we break the goal into its basic elements (Baxter 2003).

The Traditional Paradigm		The "New" Paradigm
Program-based	→	Program-based
Agency-specific	→	Collaborative
Opportunity-driven	→	Science-driven
Project-oriented	→	Landscape-oriented
Planning averse	→	Planning intense
Monitoring and Evaluation are dispensable	→	Monitoring and Evaluation are indispensable
Habitat objectives are program-based	→	Habitat objectives are biologically-based
Technology insensitive	→	Technology hungry

Figure 1. Contrasting elements of the traditional conservation paradigm with the "new" paradigm.

The phrase *regionally-based* presumes that habitat objectives and conservation strategies will emanate from ecologically-defined units that reflect our best understanding of how birds respond to habitats throughout their annual cycle, much as the founders of NAWMP envisioned for waterfowl. Just as

flyways provide the unifying geographic theme for the regulation of harvest, ecological units, like bird conservation regions (BCR's), provide a comprehensive, geographic framework for planning, implementing and delivering bird conservation programs and the foundation for partnerships that will be increasingly interstate and international in focus.

The demands of *biologically-driven* are perhaps best understood by considering its converse: opportunity-based conservation. In a biologically-driven partnership, conservation does not operate on the basis of an opportunistic pursuit of habitat gains. Instead, it is driven by specified biological objectives and spatially-explicit priorities. A biologically-driven conservation plan demands a departure from the traditional programmatic, opportunistic approach to conservation in at least three key areas.

First, it requires that habitat objectives be linked to population response at multiple scales (e.g., population management). Secondly, we must draw a clear distinction among: (1) the biological planning demanded by a population-driven approach to conservation, (2) the conservation planning required to design sustainable landscapes and (3) the programmatic planning needed to focus our resources on attaining our objectives. In this regard, biological planning and landscape planning require a commitment to monitoring, evaluation, and research. Therein lies the third demand of a biologically-driven partnership—creating a clear link between science and management. This link is nothing more than explicitly stated, testable assumptions about how populations are presumed to respond to habitat manipulations. If we articulate as models the assumptions upon which management operates, we will provide focus for research and a framework for monitoring and evaluation.

A *landscape-oriented* approach to conservation focuses on: (1) translating models of population-habitat relationships into spatially-explicit priorities at multiple scales and (2) developing the decision support tools and conservation blueprints that guide integrated bird conservation. This approach demands that conservation delivery be discriminatory. That is, delivery programs operate in tandem, in awareness of one another, discriminating between and among landscape features and priorities, pursuing a preestablished design of predicted sustainability.

A commitment to biologically-driven conservation planning carries with it an implicit commitment to set aside opportunistic approaches to habitat protection and management that have dominated the traditional conservation

paradigm. By adopting the goal of biologically-driven, partnership-based conservation for all birds, we place ourselves in the vanguard of a new approach to wildlife management. It is appropriate that migratory bird conservation lead the way in developing and implementing the new conservation paradigm. The migratory nature of birds and the diversity of habitats upon which they rely requires that we consider the conservation potential of all parts of all landscapes. This demands thinking at continental scales, yet we must facilitate conservation at the local level where all habitat management occurs. The need to integrate planning and management across spatial scales is fundamental to the new paradigm.

Although our goal is based upon the three key elements outlined above, sound biological planning is the foundation upon which sustainable landscapes are built. Thus, a primary challenge in achieving integrated bird conservation is following a defined biological planning process (Figure 2) with anticipated products (Table 1) for each suite of birds (e.g., waterfowl, landbirds, shorebirds, waterbirds).

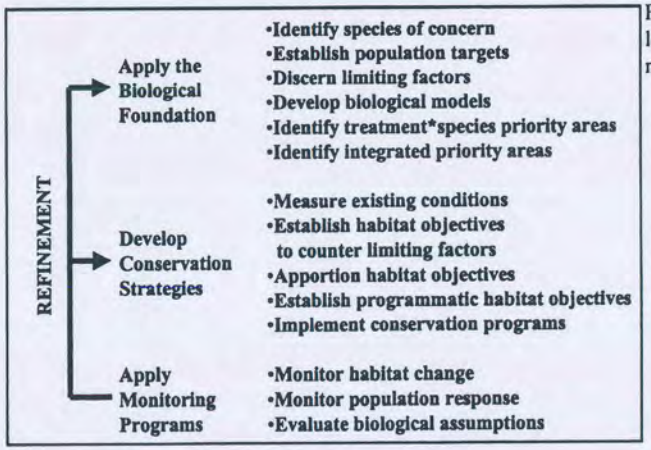

Figure 2. The biologically-driven planning process.

Table 1. The products of regional biological planning.

1.	Regional species priorities developed in a continental context
2.	Population targets that emanate from national and continental population objectives
3.	Population-based habitat objectives expressed at multiple scales
4.	Geographic priority areas for the conservation of priority species
5.	Population and habitat monitoring programs and research directed at testing model assumptions and assessing progress toward population goals

Biological Planning

The fundamental premise of each major bird conservation initiative is that the cumulative effect of many local conservation actions will result in dynamic, but sustainable, landscapes that are capable of providing for the physiological needs of birds at prescribed population levels. The challenge facing bird conservationists is the development of cohesive regional conservation strategies that will lead to the attainment of continental population objectives.

Biological planning is a method of developing strategies that increase the efficiency with which we conserve bird populations through the systematic application of biological knowledge. It culminates in a landscape design that prescribes the most appropriate management treatments to the best areas for affecting populations of priority species. The products of biological planning are transparent in their derivation and defensible because they are based on the best available science with an explicit acknowledgment of critical assumptions as a guide to monitoring and research. Thus, biological planning provides conservation quality assurance that may enhance our credibility as natural resource managers.

Unlike traditional opportunity-based conservation, biologically-driven conservation is founded on the idea that every part of a landscape has a unique and optimal management decision associated with it. These decisions are based on the interplay of the predicted biological consequences of management, the social costs and the management costs. Because conservation plans with these attributes include a geographic component, they are referred to as spatially-explicit plans.

The basis for biological planning is models which are quantifiable statements about our understanding of how birds relate to their habitats and about how habitats affect populations; they enable the systematic identification of priority management areas, the logical development of habitat objectives and the estimation of the impacts of management actions on populations. Models may be mathematical or statistical, derived from research or monitoring data, or heuristic statements (i.e., performance is improved through evaluation feedback) about species-habitat relationships that often, but not necessarily, include empirically-based parameter estimates (Figure 3). In the absence of empirical models, heuristic models are useful because they enable management to proceed in the face of imperfect information, but with the best biological guidance available. Often, systematically applying an informed set of assumptions about bird-habitat relationships results in better management decisions than a more haphazard application of management treatments.

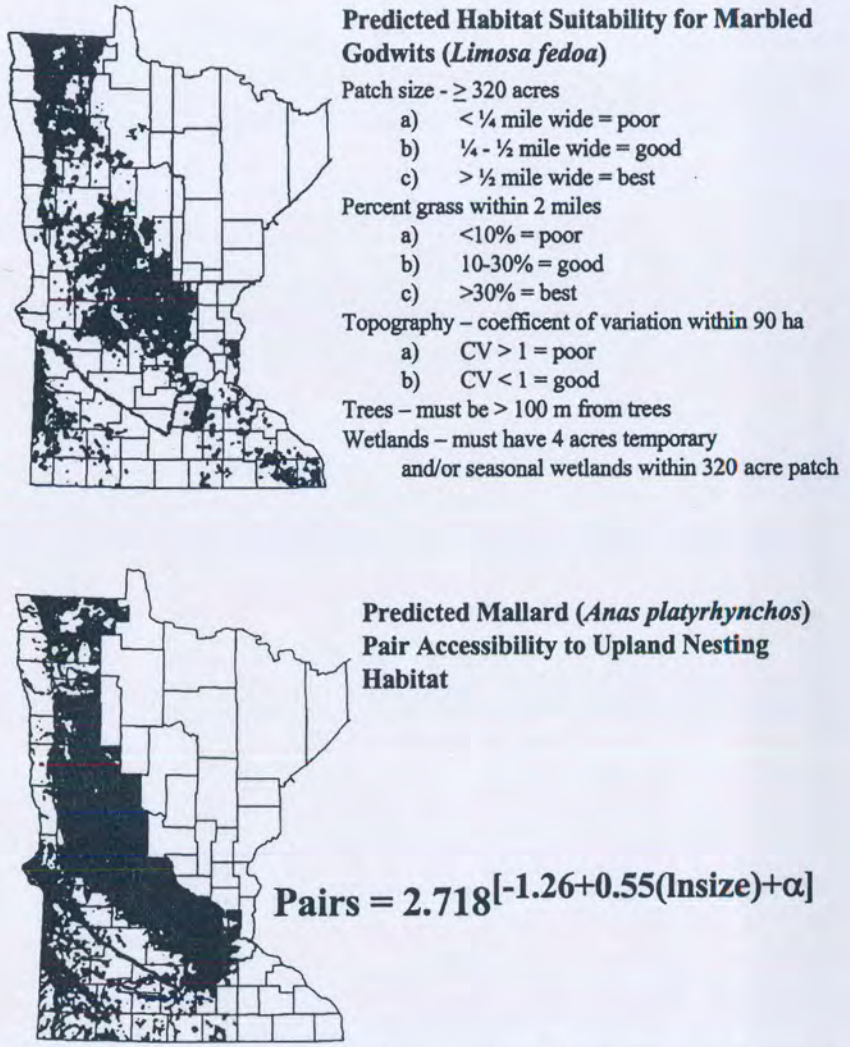

Figure 3. Heuristic (above) and empirical (below) models are both appropriate for biological planning, provided their inherent assumptions are identified and tested.

Unfortunately, models are developed with an imperfect understanding of the processes that regulate bird populations. Whether based on empirical or heuristic models, biological planning implies a commitment to monitoring and assessment in order to ascertain if models are providing accurate predictions.

Planning is part of an iterative cycle that includes implementation, evaluation and planning anew. Planning without evaluation and continuous plan updating breaks this cycle and diminishes management effectiveness.

Biological models may be used to track management accomplishments in terms of predicted consequences to populations. This is desirable because it shifts management from a habitat quantity-based to a habitat quality-based accomplishment tracking system, which is the essence of cost-effective, quality-assured management, which is central to the new conservation paradigm.

Developing Habitat Objectives at Multiple Scales

As we make conservation gains through regional partnerships and as human demand for open space increases, being able to say how much habitat is enough and to defend these estimates will be increasingly important. Under the new conservation paradigm, habitat objectives will be biologically-based on the best currently available science (with acknowledged assumptions), not on program goals or perceptions of what seems realistic to attain.

The relationship of a species to its habitat varies, making the development of habitat objectives at a continental scale impractical. For this reason, biological planning should occur within ecological regions across which the species composition, habitats, management approaches and species-habitat relationships are relatively homogeneous. Regional scale habitat objectives can be rolled up into continental- or national-scale programmatic goals. Consequently, regional-scale biological planning is essential to the strategic implementation of continental or national-scale conservation initiatives.

Regional habitat objectives are generally developed from population objectives and biological models (Figure 2). Many joint ventures have adopted the goal of the integrated conservation of all birds, which complicates the process of developing joint venture habitat objectives and conservation strategies, yet it significantly increases the potential for conservation efficiency. Complexity arises in that different groups of birds may have similar, but seldom completely overlapping, habitat requirements. To capture potential efficiencies requires that we understand the extent to which priority areas for different species overlap through a spatially-explicit integrated planning process. Developing habitat objectives for the conservation of all birds is not as simple as summing the habitat objectives for individual species. Nor is it appropriate to take the largest of the species-specific habitat objectives and assume that there is complete coincidence

in the way multiple species relate to their habitats. Through spatially-explicit, model-based biological planning, we can critically assess the potential of management to benefit multiple species and, therefore, formally estimate the amount of habitat to be protected, restored or altered in a comprehensive regional conservation strategy.

The Value of Regional Partnerships

In the not too distant past, waterfowl joint ventures were looked upon as nontraditional partnerships doing the business of conservation in a new way. The drafters of the 1986 NAWMP realized that restoring waterfowl populations would require more than federal intervention on federal lands with federal funds. Joint venture action groups were envisioned to promote coordination at the project scale among interested stakeholders (NAWMP 1986, 1998). Today, the joint venture approach is the standard against which conservation delivery is measured. Joint venture management boards and technical committees are a nexus for information exchange on conservation, management, economic and social policies and programs that affect bird habitats. Coordination among stakeholders interested in pooling and matching resources for habitat projects remains a primary function.

The new conservation paradigm moves joint ventures farther toward their full potential of delivering coordinated conservation across broad regions of North America. As they begin to think of themselves has purveyors of the regional biological foundation for bird conservation, joint ventures must make greater investments in biological planning and evaluation. This is prudent because no joint venture presently has adequate resources to independently affect bird populations. In fact, no single agency or organization has the scope or resources to singlehandedly conserve bird populations. A rational division of responsibilities among agencies, organizations and programs, that is, a comprehensive conservation strategy, is essential. The greatest added value of joint ventures will be realized when each begins to act as a coordination forum for conservation in the context of a regional conservation blueprint—a community strategy for the conservation of birds and other wildlife that transcends political and jurisdictional boundaries. The new conservation paradigm describes this strategy as biologically-driven at landscape scales, accounting for the full suite of tools available to regional partners through their programs that deliver habitat at local scales.

The National Wildlife Refuge System acknowledged this in its vision document, *Fulfilling the Promise* (National Wildlife Refuge System 1999), when it stated its, "intent to manage refuges as a system instead of disparate units." This notion views individual refuges within a broader context of conservation lands, allowing each refuge to fulfill its purpose while also working with partners to contribute appropriately to the conservation and management of fish, wildlife, plants and biodiversity in the ecosystems where they occur. To fulfill this goal, explicit population and habitat objectives and geographic priorities at national, regional and refuge scales must be developed through landscape-scale biological planning and applied in partnership-driven development of conservation strategies at national and regional scales. Under the new conservation paradigm, joint ventures will play a pivotal role in coordinating the development and stewardship of these conservation strategies.

Expanding Our Reach

Biologically-driven conservation strategies are founded on a suite of systematically-derived, continuously-updated, population targets, habitat objectives, evaluation priorities and decision support tools that are used to identify priority management areas (Table 1). A comprehensive conservation strategy must speak to multiple users, some of whom chart the direction of program delivery and others that physically deliver programs at a local scale. Each group requires different information and tools to help attain bird conservation goals. Providing this information will require effective inreach and outreach.

Inreach

To attain its goals, a joint venturs must enter into a partnership with field-level habitat managers that make daily decisions about managing habitats. A comprehensive conservation strategy must provide managers with decision support tools that may be used to identify priority landscapes tailored to the application of specific management treatments. Maps are particularly effective tools for describing spatially-explicit priorities because they enable planners to compress multi-dimensional models, describing complex bird-habitat relationships into two-dimensional space. This is particularly important when the model parameters in the decision process are greater than three because few humans can manipulate four or five dimensional matrices (models based on 4 or 5 variables) in their minds. Managers can readily use the information presented in maps, both for internal management decisions and for public outreach. Perhaps more effectively than any other method, maps may be used to communicate the biological justification for agency priorities, recommendations and decisions.

Outreach to Nontraditional Partners

When asked how much habitat we need for wildlife, the response "as much as we can get" falls short in the face of escalating human demands for resources. New sources of significant funding for wildlife conservation have generally proven to be elusive, examples like the North American Wetlands Conservation Act and state wildlife grants not withstanding. In part, this is because habitat loss and population declines are insidious, and direct threats to human health or the economy are difficult to demonstrate. Yet, acknowledged crises in environmental quality abound, often with strong public and government support for alleviating them. A principal tool of the government agencies responsible for managing these crises is habitat restoration. Adopting the new conservation paradigm requires that we increase our efforts to reach out to these, as yet, nontraditional partners—agencies for whom bird conservation is, at most, a secondary goal—to aid them in refining the delivery of their programs with the explicit goal of increasing the benefits to birds of the habitats they restore.

Experience has proven that nontraditional partners are frequently willing to reshape the delivery of their programs to benefit birds and other wildlife, especially when broader benefits may be attained with little or no loss in efficiency in attaining primary program goals. In the words of a state department of transportation employee, "we want to mitigate wetland losses by restoring wetlands were they can provide greatest overall good." However, the degree to which we will be able to affect the delivery of these programs depends on our willingness to bring unique resources to the partnership, not just an expectation of deriving benefits for birds. Under the new conservation paradigm, our contribution will be a strong biological foundation for bird conservation captured in credible conservation strategies based on the best available science.

When working with nontraditional partners, a conservation strategy must provide guidance at national, regional and local scales that enables nontraditional partners to formulate program objectives and identify priority program delivery

areas. Furthermore, our strategies should be communicated with the understanding that they will change as the science for management improves through research, monitoring and assessment. Generally, nontraditional partners will adopt our conservation strategies more readily if they are engaged during the planning process. A recent example illustrates how this partnership-based conservation planning may lead to gains for bird conservation.

A Community Strategy for Wetland Restoration. Wetlands were a dominant feature of the prairies of Minnesota and Iowa at the time the area was fist occupied by humans of European decent. However, the lure of fertile soils and a strong work ethic converged in an unprecedented effort to drain prairie wetlands. In many watersheds, fewer than 5 percent of the original wetlands still exist (Bishop 1981). Although not all of the consequences of this intensive wetland drainage are understood, they are thought to include water quality degradation and increased flood frequency and intensity along mainstem rivers and major tributaries. Today, wetland restoration is increasingly favored as a means of providing multiple natural resource and socioeconomic benefits. These multiple benefits are most likely to accrue when restorations are conducted in the context of a comprehensive strategic restoration plan. An essential precursor to such a plan is spatial information about the distribution and extent of drained wetlands. In 2001, a team of U.S. Fish and Wildlife Service biological planners of the Prairie Pothole Joint Venture assembled a small group of natural resource managers, self-titled the Restorable Wetland Working Group (RWWG), to assess the feasibility of mapping restorable wetlands at watershed scales. Today, the RWWG is comprised of nearly 30 participating or contributing agencies and organizations. They include many traditional wildlife entities, but the majority of its members come with different environmental agendas. Among others, these groups include county soil and water conservation districts, clean water partnerships, watershed management boards, the U.S. Army Corps of Engineers, the Minnesota Pollution Control Agency, the Minnesota Board of Water and Soil Resources, and the Minnesota Department of Transportation. The RWWG is developing a comprehensive digital data layer of drained and restorable wetlands in the intensively farmed areas of the eastern Prairie Pothole Region, and teams have recently begun to develop and apply models to this data to develop a comprehensive, cross-jurisdictional strategy for wetland restoration that yields wildlife, water quality enhancement and flood damage reduction benefits (Figure 4). Within the context of this strategy, agencies will select

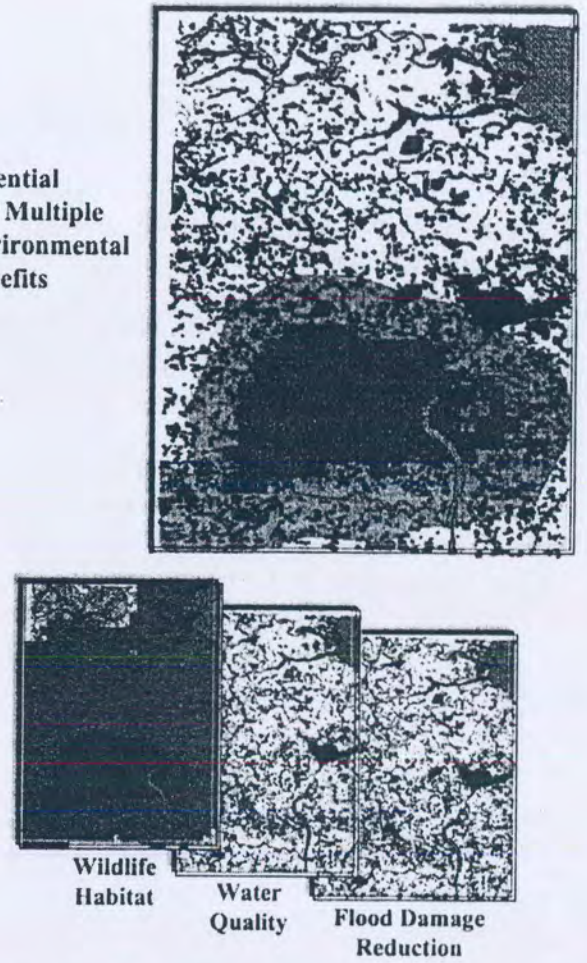

Figure 4. A model-based community conservation planning tool for wetland restoration for a 50 mi² area of Jackson County, Minnesota. Darker shades indicate wetlands predicted to provide significant multiple environmental benefits. The shaded landscape in the center is a model-based priority restoration focus area for migratory birds.

restoration sites that optimize attaining their primary objectives as well as the collateral benefits from restoration, thereby increasing their cost effectiveness. To date, restorable wetlands data has been used refine watershed management plans developed by soil and water conservation districts and watershed management boards, to focus multi-agency restoration expenditures on key wetland complexes, and to direct landowner outreach for the U.S. Department of Agriculture Farmable Wetlands Pilot Program. The RWWG anticipates that this community wetland restoration strategy will enhance interagency

cooperation and coordination, thereby reducing future conflict over wetland alteration and mitigation, and bird conservationists expect to reap greater benefits from wetland restoration programs targeting nonwildlife functions.

Summary

Successfully meeting the challenges of bird conservation demands a shift in habitat management from traditional opportunistic, project-oriented approaches to a new paradigm that is based on the implementation of collaborative, landscape-oriented strategies, which are derived from biological planning. Biological planning links program-based delivery, scalable habitat objectives and regional population targets, and, as such, it improves conservation efficiency and management credibility. Under the new paradigm, wildlife managers will be purveyors of the biological foundation for bird conservation, and regional partnerships, like joint ventures, will expend greater resources on biological planning and on coordinating the development and implementation of community conservation strategies. This facilitates nontraditional partnerships with government agencies that use habitat management to attain various socioeconomic and environmental benefits, but for whom bird conservation is, at most, a secondary goal.

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