Upper Mississippi River and
Great Lakes Region Joint Venture

2007 Implementation Plan

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The Upper Mississippi River and Great Lakes Region Joint Venture Management Board supports the goals, objectives, and conservation strategies contained within this 2007 Implementation Plan, and we are committed to its application for bird conservation. This commitment recognizes implementation efforts are subject to annual budgetary and program constraints within each agency or organization, and the Plan does not obligate funding.

Signatures of Management Board here

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Plan Summary

Bird conservation has reached an exciting threshold in the Upper Mississippi River and Great Lakes Region and throughout North America. Scientists are better integrating contemporary biological, ecological, and economic principals in an effort to improve the foundation for bird habitat conservation decisions. Use of biological models and digital spatial data has increased potential effectiveness of landscape-scale planning and the sophistication of decision tools. Regional bird conservation Joint Ventures (JVs) are implementing management actions while promoting 1) research to test planning assumptions, 2) population monitoring to assess conservation effectiveness, and 3) adaptive management based on evaluation results.

A primary goal of the Joint Venture is to integrate continental migratory bird priorities into conservation actions at regional, state, and smaller scales by providing wildlife managers guidance in designing landscapes with greater value to birds. Our hope is to move regional and state-level managers from opportunity-driven bird habitat projects toward more biologically-based projects and programs. The approach uses four primary elements: 1) biological planning and resource assessment, 2) landscape conservation design, 3) program delivery, and 4) evaluation by means of monitoring and research. Use of science based decision tools should more effectively increase landscape carrying capacity for birds through targeted habitat protection, restoration, and enhancement.

Habitat conservation recommendations in this Implementation Plan are based on separate bird-group habitat conservation strategies (JV bird-group strategies) developed for waterfowl, waterbirds, shorebirds, and landbirds. The relatively technical bird-group strategies provide estimates of what, where, when, and how much habitat is required in the region to increase and sustain populations of priority bird species at target levels. Habitat objectives for each bird-group were pooled by primary cover type, overlap in habitat requirements between groups was eliminated, and resulting habitat conservation goals for "all birds" are presented. The document also provides general information concerning the JV partnership, regional landscape characteristics, and program delivery.

JV planning documents (this all-bird plan and associated bird-group strategies) establish explicit regional bird population and habitat conservation objectives, and use several sources of data and advancing technological tools to increase planning efficiency. We establish a scientific process for habitat objective setting, and identify assumptions, research needs, and monitoring efforts necessary to improve subsequent iterations of the plan. JV scientists sought the best information available but found numerous knowledge gaps and uncertainties during plan development. We hope descriptions of evaluation needs, primarily in the JV bird-group strategies, ignite the science community in an effort to enhance our knowledge and refine JV recommendations in the future. Evaluation priorities include 1) appraise population and habitat parameters and test assumptions used in planning, 2) improve key digital spatial datasets, 3) assess response to conservation effort, and 4) refine biological models that result in more efficient and effective bird habitat conservation decisions.

Introduction and Approach

Bird conservation Joint Ventures (JVs) are regional-scale, self directed partnerships involving government agencies, corporations, tribes, individuals, and a wide range of non-government organizations working together on bird habitat conservation. Originally developed as an implementation mechanism for the North American Waterfowl Management Plan (1986), the first eight JVs were strategically located in the continent's primary breeding and winter areas for waterfowl. During recent years, most JVs have evolved from waterfowl-focus groups to "all-bird" habitat conservation partnerships. The number of regional JVs has increased and coverage expanded to nearly all of North America.

JV partnerships and staffs have been challenged with the task of revising strategic conservation plans for a much greater array of species, while at the same time embracing more sophisticated planning approaches. Most contemporary conservation strategies include discrete planning and implementation processes with a feedback system used to "learn while doing." Today's plans also are dynamic; JV partners must expect key information like population and habitat objectives to periodically change with new knowledge gained from monitoring and research.

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The last Implementation Plan update for the Upper Mississippi River and Great Lakes Region JV was completed nearly a decade ago (USFWS 1998), and it focused almost exclusively on waterfowl habitat. Breeding waterfowl habitat objectives were presented for only northern states whereas states in the south half of the region were designated "migration states" and had only waterfowl migration habitat objectives. Breeding habitat objectives were largely opportunistic, based on what managers and administrators from northern states thought could be accomplished over the 15-year plan time horizon. Waterfowl migration habitat objectives were established a bit more scientifically using an estimate of energetic needs for a number of ducks likely to move through the JV region during fall.

In this 2007 version of the JV Implementation Plan we describe habitat needs for all bird groups from a regional perspective. Although the document presents a somewhat general community-based approach for all-bird conservation, it is based on four more specific and technical taxonomic habitat conservation strategies (JV bird-group strategies) developed for waterfowl, waterbirds, shorebirds, and landbirds. JV scientists used regional bird population and habitat trends, in concert with population estimates and an assessment of limiting factors, to establish a biological planning foundation for each bird group. Planning began with characterizing and assessing the landscape for breeding "JV focal species" and "non-breeding guilds," which were emphasized in habitat planning and monitoring recommendations. Other steps included modeling population response,

identifying conservation opportunities, and developing a landscape design with a capacity expected to sustain current bird populations plus eliminate population deficits. The bird-group strategies were developed as "stand alone" documents for managers focused on specific species or groups. They are "living documents" that will be refined periodically as knowledge of regional bird conservation improves and new spatial data becomes available for planning. Latest versions of JV bird-group strategies and associated information are available at www.UpperMissGreatLakesJV.org.

The body of this all-bird plan contains information regarding JV history, continental and state-scale programs critical to plan development and implementation, and approaches recommended to achieve the functional elements required of the JV. Biological planning, regional landscape design, and communication and outreach are covered in detail. Program delivery also is reviewed, but because most habitat actions are conducted locally with various techniques, detailed management suggestions are not provided. Evaluation is a critical but often neglected element of planning. Research and monitoring themes are described in this document, with more specific evaluation recommendations provided in each of the JV bird-group strategies.

Joint Venture Evolution

The term joint venture stems from the private sector and has been commonly used when referring to temporary strategic alliances between business partners (Schermerhorn et al. 1991). When the North American Waterfowl Management Plan (NAWMP) was written in 1986 as the guiding document for continental waterfowl conservation, "joint ventures" were described as regional partnerships of conservation organizations that would be required to deliver NAWMP objectives. Both Habitat JV's and Species JV's were designated to formalize this concept.

The U.S. Fish and Wildlife Service (FWS) definition for joint venture is "a self-directed partnership of agencies, organizations, corporations, tribes, or individuals that has formally accepted the responsibility of implementing national or international bird conservation plans within a specific geographic area or for a specific taxonomic group, and has received general acceptance in the bird conservation community for such responsibility" (USFWS 2002). Working both collectively and independently, JV partners conduct activities in support of bird conservation goals cooperatively developed by the partnership.

To promote development of regional JVs, the FWS began providing funding for administration of these conservation partnerships in the late 1980's. New JV's could request Congressional funding once their strategic plans were developed and formally accepted by the bird conservation community and the FWS. Five functional elements

must be included in the operation of a JV to receive FWS financial support. They include coordination; planning and design; project development and implementation; communication and outreach; and monitoring, evaluation, and applied research.

Five Functional Elements of JVs
Coordination
Planning and Design
Project Development and Implementation
Communications and Outreach
Monitoring, Evaluation & Applied Research

The theme of JVs is partner relationships that build synergy, or a greater collective outcome then parties could achieve individually. JV partners shared their varied resources and expertise, working together to achieve common goals with reduced overlap in effort and thus greater efficiency. The NAWMP was established by government and non-government partners who had a common vision – to restore duck populations. It was the first continental-scale wildlife conservation plan, and it has been implemented using a JV approach. The latest version of the NAWMP (2004) identifies 16 regional habitat JVs and three species JVs to address individual taxonomic groups of concern (Black Duck, sea duck, and arctic geese). Primary NAWMP partners are state and federal agencies directing wildlife conservation and large non-government conservation organizations (e.g., Ducks Unlimited, The Nature Conservancy, and Pheasants Forever). NAWMP partnerships also can be dynamic, depending on interest in a particular site and availability of resources for conservation work. Tribal efforts, local groups, and even individual private citizens have been essential in completing many NAWMP projects.

The original Implementation Plan for the Upper Mississippi River and Great Lakes Region (UMRGLR) JV was finalized in 1993 and updated in 1998. Partners mutually agreed to safeguard waterfowl habitats of the nation's only inland coastal area, the Great Lakes and shorelines, plus interior wetlands including the floodplains of four of the country's major river systems – the lower Missouri, upper Mississippi, the Illinois, and Ohio. JV habitat conservation objectives included protection, restoration, and enhancement of 590,000 acres (240,000 ha) of waterfowl breeding habitat and 165,000 acres (67,000 ha) of migration habitat, particularly wetlands and associated grasslands (USFWS 1998). The 1998 JV plan also included an objective for "protection and/or increase of habitats for wetland and associated upland wildlife species, with emphasis on declining non-waterfowl migratory birds," when this effort is consistent with waterfowl objectives.

Goal accomplishment and growth in support for the NAWMP and its "step-down" regional JV plans has been impressive, largely due to the strength of JV partnerships. Successes became obvious to conservationists working with other bird groups, and the NAWMP was eventually recognized as a model for successful bird conservation. Subsequently, continental conservation plans were developed for landbirds, shorebirds, and waterbirds (colonial nesting waterbirds, wading birds, and secretive marsh birds). In addition, the North American Bird Conservation Initiative (NABCI) evolved to help provide coordination between continental plans.

Establishment of new JVs to implement conservation plans for non-waterfowl bird groups was considered. However, the U.S. NABCI Committee recommended conservation delivery via existing JVs and adding new JVs only where required to achieve nationwide coverage. The goal was to eliminate redundant partnership structures and separate biological planning processes for the various bird groups (Smith 2004). In the spirit of cooperation and partnership, the UMRGLR JV Management Board pledged in a 2001 Resolution to conduct all-bird conservation, accommodating other bird groups while implementing the NAWMP.

Area Overview

The UMRGL JV administrative region has been unchanged since 1998, encompassing all or portions of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin (Figure 1). At 250 million acres (102 million ha) in size and including six Bird Conservation Regions (BCRs), it is one of the largest and most diverse JV regions in the U.S. About 90% of the region is covered by three ecological planning units: Eastern Tallgrass Prairie (BCR 22), Prairie Hardwood Transition (BCR 23), and Boreal Hardwood Transition (BCR 12). The remaining 10% includes portions of the Central Hardwoods (BCR 24), Lower Great Lakes / St. Lawrence Plain (BCR 13), and Appalachian Mountains (BCR 28).

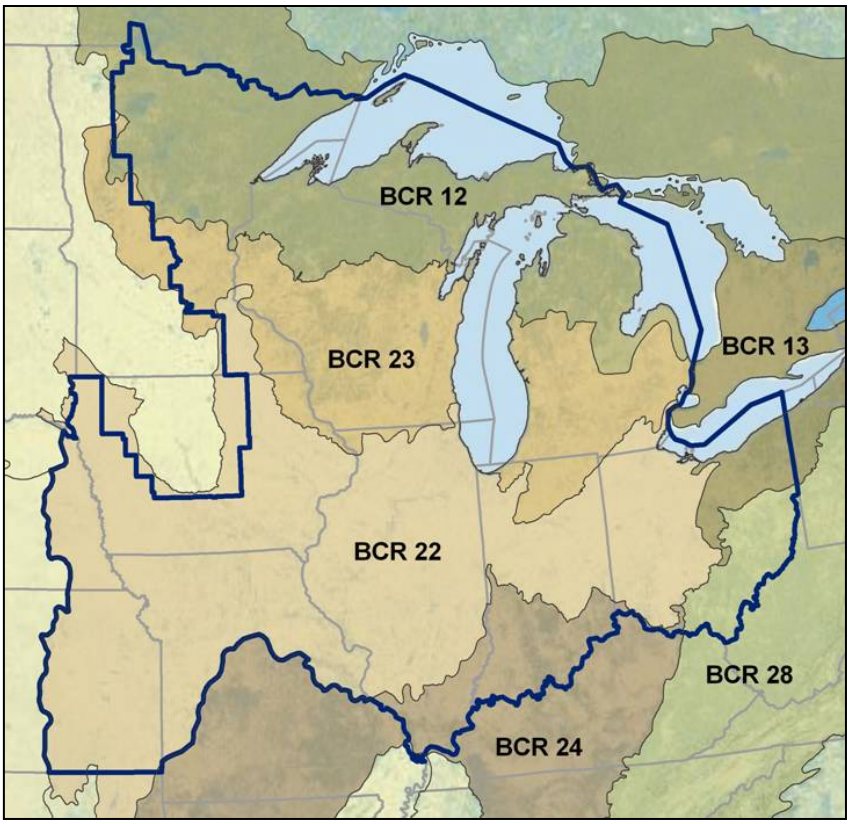

Figure 1. Boundaries of the Upper Mississippi River and Great Lakes Joint Venture (JV) region (blue line) and associated Bird Conservation Regions (BCRs) from the North American Bird Conservation Initiative.

Continental Bird Conservation Initiatives

Continental plans for primary bird groups that followed the example of the NAWMP include the Partners-In-Flight North American Landbird Conservation Plan, the United States Shorebird Conservation Plan, and the North American Waterbird Conservation Plan. In addition, several species-specific strategies with a harvest orientation have been developed for waterfowl by Technical Committees of the four Flyway Councils (Atlantic, Mississippi, Central, and Pacific). Likewise, American Woodcock, Bobwhite, and several other species have been the focus of large-scale conservation initiatives.

NABCI is facilitating linkages among these individual efforts, both within the United States and among the U.S., Canada, and Mexico. Detailed information concerning bird habitat initiatives can be accessed using the internet, with the North American Bird Conservation Initiative providing information links to all continental plans and other associated information (www.nabci-us.org). Brief descriptions of the NABCI and the four primary continental bird conservation plans are provided below.

North American Bird Conservation Initiative (NABCI 2000)

Vision: Populations and habitats of North America's birds protected, restored or enhanced through coordinated efforts at international, national, regional, state and local levels, guided by sound science and effective management.

A primary role of the NABCI is to coordinate, not duplicate, efforts of the four major bird plans. More specifically, NABCI intends to 1) increase the effectiveness of existing and new initiatives, 2) foster greater cooperation among the nations and peoples of the continent, and 3) build on existing structures such as JVs, plus stimulate new JVs and mechanisms as appropriate. NABCI promotes planning by ecologically distinct bird conservation regions (BCRs) with similar bird communities, habitats, and resource management issues. Each of the four primary bird plans has adopted BCR boundaries and is integrating these ecological planning units into regional plan revisions.

North American Waterfowl Management Plan (NAWMP 2004)

Vision: Sustain abundant waterfowl populations by conserving landscapes, through partnerships, guided by sound science.

First of the continental wildlife conservation plans, the NAWMP was developed in 1986 (updated in 1994, 1998, and 2004) by a group of government agencies and private conservation organizations concerned with declining waterfowl populations. The principal goal of the NAWMP has been to restore waterfowl populations to levels recorded during the 1970s, a period of relatively high continental duck abundance. In an effort to reach defined waterfowl population targets, the NAWMP works through regional JV partnerships to manage habitats important to waterfowl. The Upper Mississippi River and Great Lakes region JV was formed to achieve NAWMP implementation in this portion of the continent.

There are three aspects within the NAWMP vision statement: 1) conserving landscapes to sustain waterfowl populations, 2) broadening partnerships, and 3) strengthening the science, or biological foundations, of waterfowl habitat conservation. General consensus by those evaluating the NAWMP is the first two elements have successfully evolved since 1986. During the next several years, more emphasis will be placed on strengthening the plan's biological foundation. In addition, the NAWMP intends to broaden partnerships with other migratory bird conservation initiatives and support and encourage conservation partnerships with communities.

North American Landbird Conservation Plan (Rich et al. 2004)

Vision: Ensure the long-term maintenance of healthy populations of native landbirds through the development of voluntary, non-regulatory bird conservation plans that, proactively, provide frameworks to develop and implement habitat conservation actions on species identified as having the greatest need for conservation.

Concern about significant population declines for several songbird species, notably Neotropical migrants, resulted in a group of bird conservationists encouraging legislative action for nongame birds. They used a publication highlighting 15 years of data from the North American Breeding Bird Survey (Robbins et al. 1986) to succeed in amending the U.S. Fish and Wildlife Conservation Act of 1980 (Keisman 2001). The "Mitchell Amendment" [Public Law 100-653 (102 Stat. 3825)] requires the Department of Interior to "monitor and assess migratory nongame birds, determine the effects of environmental change and human activities, identify those candidates for endangered species listing, identify appropriate actions, and report to Congress … at five-year intervals on actions taken" (USFWS 2001).

Building on this legislative mandate, the National Fish and Wildlife Foundation led a consortium of nongovernmental organizations, research and academic institutions, private conservation groups, and state and federal government agencies in forming Partners In Flight (PIF), an initiative to conserve nongame landbirds in the United States (Keisman 2001). PIF guiding principles included restoring populations of the most imperiled avian species and preventing other birds from becoming endangered – "keeping common birds common."

During the past several years PIF has completed or nearly completed regional bird conservation plans based on physiographic areas which cover the continental United States. Physiographic area plans have similar boundaries to BCRs, but they are not exactly aligned, as BCRs were finalized after many PIF regional plans were completed (e.g., the UMRGL JV encompasses 7 PIF regional plans vs. 6 BCRs). The PIF 2004 continental plan also identifies seven larger scale avifaunal biomes in North America, encompassing 37 BCRs. Bird species warranting attention due to concern (currently "in trouble") are labeled "watch list" species, and those that are common but occur primarily in only one of the seven biomes have been identified as "stewardship species." The plan presents global population estimates for 448 species of North American landbirds as well as continental-scale conservation and stewardship information and population objectives

for priority species. Important research and monitoring needs for landbirds also are identified in the plan.

United States Shorebird Conservation Plan (Brown et al. 2001)
Vision: Ensure that stable and self-sustaining populations of all shorebirds are distributed throughout their range and diversity of habitats in the United States and Western Hemisphere, and that species which have declined in distribution or abundance are restored to their former status to the extent possible at costs acceptable to society.

Developed as a national partnership between federal and state agencies, non-governmental organizations, and university researchers, the U.S. Shorebird Conservation Plan (USSCP) is committed to the conservation of shorebirds that depend on wetland communities. The USSCP calls for development of integrated management practices and regional conservation planning to protect shorebirds. The plan identifies goals at several scales, including a hemispheric goal, which addresses the need for international cooperation. National and regional goals and potential management activities also are provided. They aspire to 1) develop monitoring programs related to shorebirds, 2) conduct research to determine factors limiting shorebird populations, 3) address known limiting factors, and 4) develop coordinated shorebird conservation efforts.

A regional step-down to the USSCP was completed in 2000, the Upper Mississippi Valley / Great Lakes (UMVGL) Shorebird Conservation Plan (de Szalay et al. 2000), with a primary goal of "ensuring the availability of shorebird foraging and nesting sites over a range of climatic conditions by protecting, restoring, and managing a variety of shorebird habitat types." Information in the UMVGL Shorebird Plan was used when developing habitat objectives for the JV Shorebird Habitat Conservation Strategy.

North American Waterbird Conservation Plan (Kushlan et al. 2002)
Vision: Restore and sustain the distribution, diversity, and abundance of breeding, migratory, and non-breeding populations of waterbirds throughout the lands and waters of North America, Central America, and the Caribbean.

Several bird conservation stakeholders recognized the needs of seabirds, colonial-nesting waterbirds, and marsh birds were not being adequately addressed in the decision-making processes of the other bird plans. Initially launched in 1998, the Waterbird Conservation for the Americas initiative is a voluntary partnership dedicated to the conservation of waterbirds (Keisman 2001). The plan document, North American Waterbird Conservation Plan (NAWCP), was finalized in 2002, a product of an independent partnership of individuals and institutions having interest and responsibility for conservation of waterbirds and their habitats. The plan emphasizes importance of scale and habitat diversity for this bird group and encompasses North and Central America, the Caribbean, and the open waters of the Atlantic and Pacific Oceans.

Specific goals of the NAWCP are to 1) ensure sustainable abundance, diversity, and distribution of waterbird species, 2) protect, restore, and manage key sites and high quality habitat for waterbirds, 3) disseminate information on waterbird conservation to

decision makers, the public, and those whose actions impact waterbirds, and 4) coordinate and integrate waterbird conservation efforts, guided by common principles, across geo-political boundaries. The plan also provides a list of scientific information needs, including management-oriented research landscape-scale issues related to waterbirds. A draft step-down waterbird conservation plan for the Upper Mississippi Valley / Great Lakes Region has been completed (Wires et al. 2006). It contains regional population estimates and trends, identification of priority species, and population and habitat threats. This information was useful in developing habitat objectives for the JV Waterbird Habitat Conservation Strategy.

State Programs

State steering committees have been a common tool within the JV when implementing the NAWMP. They worked to achieve goals of previous JV Implementation Plans at the state level. These committees served as an organizational means to help partners identify conservation opportunities, share resources, and collaborate when applying for funding, such as grants available through the North American Wetlands Conservation Act (NAWCA). In some JV states the NAWMP steering committees evolved into or were replaced by other state conservation initiatives with a broader all-bird focus. Three primary efforts include state Bird Conservation Initiatives, the Important Bird Areas program, and State Wildlife Action Plans (which are all-species plans but include bird conservation goals).

Wisconsin Bird Conservation Initiative (WBCI)

Wisconsin partners will deliver the full spectrum of bird conservation, including both game and nongame birds, by working together in voluntary, cooperative initiatives. We will coordinate bird-based projects to ensure effective management for all birds in Wisconsin. We will assess and manage birds and their habitats using the best available science and using ecological landscapes as the management units. Accordingly, we will work both within and outside of Wisconsin to ensure that bird conservation needs are met, and we will share knowledge widely to further bird-based recreational opportunities in Wisconsin.

The focus of the WBCI is on Wisconsin birds, but coordination of conservation efforts will be required at the regional, continental, and even hemispheric levels, since most birds are migratory. In the Upper Midwest, a regional approach will be necessary to provide the appropriate types, amounts, and distribution of habitats for conservation efforts to be successful.

Goals

· Manage communities of birds at a regional and landscape level.
· Keep common birds common.
· Conserve and restore endangered, threatened, and rare bird species and their habitats.
· Identify and prioritize state management opportunities and needs for birds and their habitats.
· Coordinate existing bird conservation initiatives at the state level.
· Develop broad-based partnerships.
· Provide private landowners and land managers the best available ecological information.
· Use voluntary approaches when working with public and private landowners.
· Promote bird-based recreation and the enjoyment of birds.
· Develop management strategies that consider the social and economic impacts on people throughout planning and implementation.

Bird Conservation Initiatives. Several JV states have recently established Bird Conservation Initiatives (BCIs), or partnerships to deliver bird conservation with an emphasis on voluntary stewardship. Although the focus of BCIs is at the state level, partners recognize coordination of conservation efforts will be required at larger scales since most birds are migratory. Goals of the Wisconsin BCI are provided for an example (see box); additional information regarding BCIs and their relationship to the JV can be found at www.nabci-us.org/plans.

Important Bird Areas Program. The Important Bird Areas (IBA) program is a global effort coordinated by the National Audubon Society to identify and conserve areas vital to birds and other biodiversity. By working with Audubon chapters, landowners, public agencies, community groups, and other non-profit organizations, Audubon endeavors to activate a broad network of supporters to ensure all important bird areas are properly managed and protected.

The IBA program recognizes habitat loss and fragmentation, coupled with global climate change, are the most serious threats facing populations of birds across North America and around the world. By working to identify and implement conservation strategies at IBAs, partners hope to minimize the effects of habitat loss and degradation on birds and other biodiversity. IBA locations within each JV state, coordinators, and other program information is available at www.audubon.org/bird/iba.

State Wildlife Action Plans. State wildlife management agencies have been responsible for some of the greatest partner contributions to bird habitat conservation in the JV region, and they have yet another opportunity to enhance bird conservation through planning and partnering. "Wildlife Action Plans" recently have been developed by each state wildlife management agency in cooperation with the FWS. Their intent is to conserve wildlife and associated habitats of concern before these communities become rare and more costly to protect. Taken as a whole, the state action plans present a national agenda for preventing wildlife from becoming endangered. The documents include state and local bird conservation information useful in management decisions, with the following primary components:

- Lists of species in greatest need of conservation.
- Terrestrial and aquatic landscape features critical to these species.
- Threats to landscape features and to wildlife of concern.
- Conservation actions to address these threats.
- Monitoring actions to evaluate success of conservation actions.

Although bird species of concern and environmental threats identified in the JV Implementation Plan and action plans for states in the JV region are similar, state plans do not provide explicit bird population and habitat objectives. The bird component of state action plans can be an extension of the JV Implementation Plan, setting direction for bird conservation at the state level. Ideally, state plans would have incorporated population and habitat objectives "stepped-down" from the JV regional plan, but first iterations of state plans were largely completed by 2005. Updates of state action plans are envisioned,

however, and JV partners from state agencies will have the benefit of a completed all-bird JV regional plan when wildlife action plans are revised. More information regarding state wildlife action plans and individual state plans is available at http://www.wildlifeactionplans.org/index.html.

JV Mission and Coordination

The mission of the JV was developed using the North American Bird Conservation Initiative, the North American Waterfowl Management Plan, and U.S. Fish and Wildlife Service Director's Order No. 146, "Joint Venture Administration." The mission of the Upper Mississippi River and Great Lakes Region Joint Venture is to deliver the full spectrum of bird conservation through regionally based, biologically driven, landscape-oriented partnerships.

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Although most conservation actions are accomplished at a local scale, the JV mission recognizes a need for "regionally based" partnerships. Regional partnerships provide a means to "step-down" priorities of continental bird conservation plans. At the regional level, there are common conservation goals, information needs, monitoring programs, and challenges among partners. Regional planning and cooperation can help ensure that continental objectives are met and that conservation actions are delivered efficiently and effectively at the state or local level.

The term "biologically driven" indicates the need for partners to strive for conservation actions based on sound science. Using the best available information and techniques in planning, delivering, and evaluating conservation actions ensures that maximum benefits are provided to birds. Likewise, this approach has economic value as it helps organizations use their resources wisely.

Both the NABCI and the NAWMP recognize that partnerships should be "landscape-oriented." Partnerships need to expand from delivering bird conservation on a project-by-project basis to envisioning landscapes that provide maximum benefits to bird species of greatest concern. Landscape-scale planning and conservation delivery simply involves consideration of how local projects are "nested" within larger (often ecologically similar) areas. This component is closely tied to the "biologically driven" statement, because conservation focused on the most important landscapes will result in greater influence on bird populations than scattered projects placed opportunistically.

FWS Director's Order No. 146, "Joint Venture Administration," describes the operational elements of a JV receiving FWS financial support, including the role of the JV Management Board. Bird conservation activities of the partnership are coordinated by the

Management Board, a self-directed group of individuals interested in furthering the JV mission (see JV Charter / Bylaws at www.UpperMissGreatLakesJV.org).

In 2001, the UMRGLR JV Management Board signed Resolution No. 1, "Delivering All-Bird Conservation." This act resolved that the Management Board would 1) commit itself to serve as the "all bird" conservation coordinating body of the region, 2) deliver conservation for all bird species within the geographic region of the JV, and 3) support development of state-level implementation plans using established regional plan priorities and/or BCR priorities for all birds in the JV region. This Implementation Plan and associated JV bird-group strategies identify the biological planning, conservation implementation, and evaluation process to delivery all-bird conservation in the JV region.

Partner Priorities, 1993 – 2007

The JV Management Board and FWS Migratory Bird Program staffs have been attentive to both administration and conservation. Administrative accomplishments have been critical in the transition to all-bird conservation and remain a key to improving efficiency and effectiveness of JV bird conservation efforts. Greatest focus has been on the following:

- Establish partnerships of conservation agencies and non-government organizations interested in waterfowl and other wetland-wildlife conservation, and represent those groups on a JV Management Board (since 1993).

- Support bird monitoring programs within the FWS that provide needed population information (since 1995).

- Secure permanent FWS funding for JV administration (since 2001).

- Expand the role of the JV to integrate non-waterfowl bird groups (i.e., all-bird conservation) while not losing waterfowl conservation momentum (since 2001).

- Establish and support a full-time Joint Venture staff: JV Coordinator (since 1993), Assistant Coordinator (since 1994), Science Coordinator (since 2004), and Geographic Information System Biologist (since 2005).

- Establish a JV Technical Committee to solicit, review, and prioritize planning, evaluation, monitoring, and research proposals that relate to population and habitat objectives (since 2003).

JV partners also have an impressive record of habitat conservation activities. Since completion of the 1998 Implementation Plan update, Management Board members and JV staff have developed an annual report of major partner habitat accomplishments. Reporting has been segmented into wetland and upland categories and grouped by protection, restoration, and enhancement. The total area influenced by JV partners between 1998 and 2005 was 660,000 acres (270,000 ha; Table 1).

Table 1. Waterfowl habitat accomplishments (acres) in the Upper Mississippi River and Great Lakes Joint Venture region, 1998 -2005. One acre = 0.4 hectares.

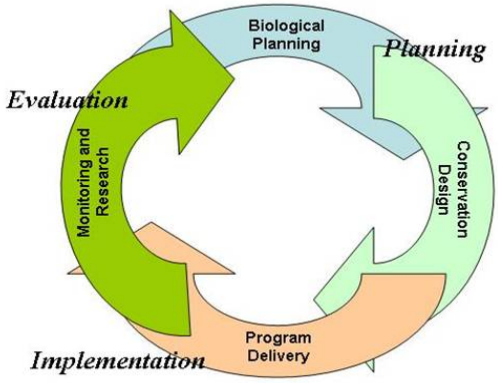
Habitat focus	Wetland			Upland			Combined categories
	Protected	Restored	Enhanced	Protected	Restored	Enhanced	
Production	86,316	57,284	25,432	57,795	62,148	87,601	376,577
Migration	86,503	98,514	60,894	8,067	21,071	11,845	286,894
Total	172,819	155,798	86,326	65,861	83,219	99,446	663,470

Although partners have reported accomplishments that contribute toward their stated focus area objectives (USFWS 1998), the measure remains coarse with general categories ("wetland" and "upland"). In the evaluation portion of this Implementation Plan, we identify a need for more refined reporting as well as the need to determine concurrent habitat loss, allowing an estimate of "net change" in bird habitat for future accomplishment reporting.

Biological Planning

Contemporary planning is on a continuum of refinement, and regional Joint Ventures are providing leadership in the dynamic arena of bird conservation planning. Most JVs are following a process that FWS scientists recently labeled Strategic Habitat Conservation (SHC), which includes a framework for applying and enhancing the "biological foundation" for natural resources management (NEAT 2006). The approach consists of four equally important elements – biological planning, conservation design, implementation or program delivery, and monitoring and research (evaluation). However, the distinctions between these elements are somewhat artificial, because they actually blend together with an iterative process of learning and incorporating new information into regular plan revisions.

Strategic Habitat Conservation (SHC)



Although depicted as a progression of events, activities within each element normally occur simultaneously. Planners, administrators, and implementers must recognize that management cannot wait for a perfect conservation strategy. Conservation partners make the best use of information available today, with the expectation that better information will be available tomorrow. The planning process achieves its full value only when all four elements are functioning and building upon each other.

Principles of Strategic Habitat Conservation

Although the details may vary among specific applications, the following principles are common to SHC and to the approach used in this JV Implementation Plan. Each element is crucial to the process, and failing to account for any one of them compromises planning and implementation effectiveness over time.

- Habitat conservation is simply a means of attaining a true goal – the conservation of populations and the ecological functions that sustain them.

- Defining measurable objectives represents the first step in developing a habitat conservation strategy at any scale.

- Conservation assessment must use the best science possible, both as a body of knowledge and a method of learning. Since our understanding of ecological systems is never perfect, uncertainty must be managed through an iterative cycle of planning, doing, and evaluating.

- Conservation strategies must be defensible and transparent; thus, the process must be systematic, well documented, and explicit about the nature and magnitude of potential errors.

- Conservation strategies are dynamic suites of objectives, tactics and tools that change as new factors or information enter the strategic conservation cycle.

- Partnerships are essential, both for management and for developing conservation strategies.

JV Planning Model

The SHC model provides a conceptual image for strategic planning, but there were many components within each element addressed by JV scientists when developing this Implementation Plan. For example, conducting assessments of past, current, and desired future landscape conditions and bird abundance and distribution were primary goals. This included developing spatially explicit habitat objectives at eco-regional scales based on population requirements "stepped down" from continental bird conservation plans. JV scientists used the best available information and state-of-the-art tools such as biological models and Geographic Information Systems (GIS) to identify what kinds, how much, and where habitat is required to achieve healthy and sustainable populations of birds at goal levels.

Biological information and techniques used to formulate habitat objectives specific to waterfowl, waterbirds, shorebirds, and landbirds are contained in the four JV bird-group strategies. Although these documents were developed independently, habitat objectives and decision support tools were combined to generate "all-bird conservation delivery"

objectives for this Implementation Plan. A detailed bird habitat planning model was developed by JV Scientists to illustrate the process (Figure 2).

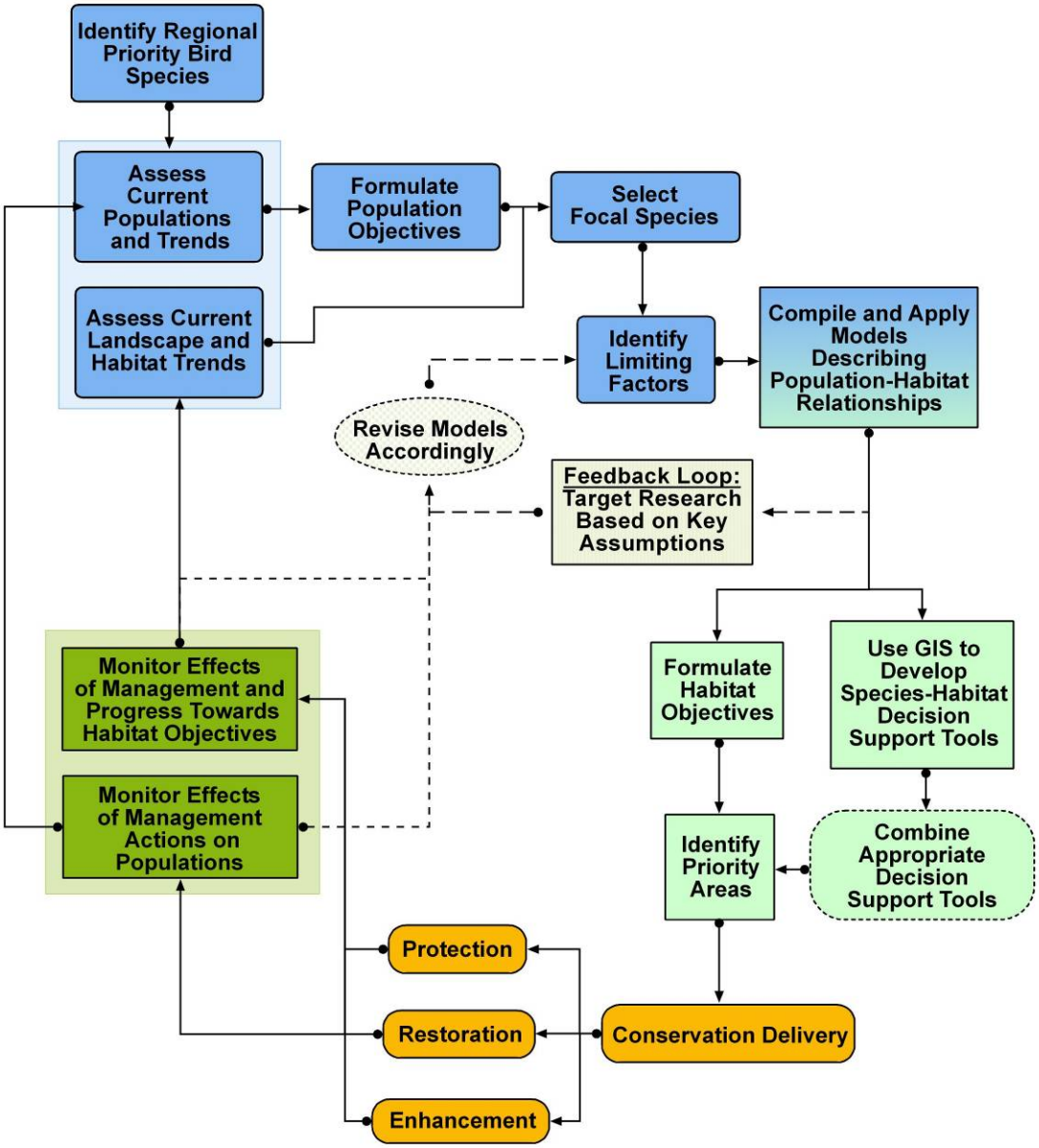


Figure 2. Bird habitat conservation planning model for the Upper Mississippi River and Great Lakes Region Joint Venture. Primary elements in this adaptive management framework include: 1) biological planning and assessment (blue), 2) landscape conservation design (light green), 3) conservation implementation (orange), and 4) evaluation (dark green). Feedback mechanisms are represented by dashed lines. Although the diagram shows a looped process, multiple steps can occur at any point in time.

Science Team and Bird-group Strategies

The JV's transition from a waterfowl habitat focus to a conservation partnership emphasizing all bird groups had substantial implications for planning. This change, coupled with use of a new biological planning paradigm (SHC), required a much more sophisticated planning approach than the one used to complete the 1998 Implementation Plan. The JV Technical Committee recognized a need for additional expertise to assure a revised JV plan would the meet the expectations of the Management Board. Subsequently, a "JV Science Team" was formed, consisting of the 10-member Technical Committee plus 10 additional bird scientists participating ad hoc in the process of Implementation Plan revision. These individuals were solicited for their specific bird expertise and skills in biological modeling.

The JV Science Team initially struggled with the challenge of developing an integrated all-bird conservation plan in an area as large and diverse as the UMRGLR. After much debate, the group decided on a theme of "separate planning and integrated action." In other words, individual habitat conservation strategies would be developed for each of the four primary bird groups, but implementation of habitat actions would attempt to take all bird groups into account simultaneously. Thus, the intent of this all-bird Implementation Plan is to combine recommendations from the four JV bird group strategies, reducing overlap in habitat conservation objectives and evaluation needs. The JV Science Team identified several aspects to address in each bird-group strategy:

- Use BCRs as the universal ecological planning units, and use population goals stepped down from continental and regional conservation plans.

- Prioritize bird species based on continental and regional habitat threats, declining abundance, limited population size or distribution, and socio-economic importance.

- Identify factors limiting bird populations of greatest concern and use advancing technologies and decision tools to target conservation effort.

- Identify management and monitoring "JV focal species" that can represent guilds or assemblages of species that respond similarly to management actions.

- Develop the necessary landscape design and specific habitat objectives to sustain target bird populations within the JV region, and promote management that links habitat programs to population objectives at multiple scales.

- Prioritize bird population and habitat inventory, monitoring, and research needs focused on JV goals and planning assumptions.

- Promote adaptive management, including refinement of JV goals and objectives based on research, monitoring, and assessment results.

- Encourage a shift in how conservation results are measured and evaluated; focus on population influence or habitat characteristics strongly linked to population performance (e.g., change in carrying capacity) vs. simply acres manipulated and dollars spent.

The individual JV bird-group strategies are the basis for all-bird habitat objectives presented in this document. These technical strategies also provide information to better target bird habitat protection, restoration, and enhancement efforts in the region. Within each JV bird-group strategy is a common goal statement: ***"Establish efficient habitat conservation to maintain or increase carrying capacity for populations of priority bird species consistent with continental and JV regional goals."***

The JV partnership recognizes factors outside the region often govern breeding and migratory bird abundance within the region. Therefore, strategy goal statements focus on achieving a "carrying capacity" to meet specific bird abundance targets. We hope to eventually measure JV performance with bird population change or change in vital rates (e.g., nest success, brood survival), so goals and the way success is measured may change over time with our understanding of factors that limit population growth.

Priority and Focal Species

A list of bird species of high conservation concern that occur in manageable numbers in the JV region was generated from the four primary continental bird plans (Table 2). This list is based largely on habitat threats, population size and trends, or the limited distribution of a species. It should be considered a "working list" because priority species change with new knowledge and changes in population status over time. This species prioritization information is not meant to be restrictive but rather to guide JV partners as they consider their most important bird conservation opportunities. The North American Waterfowl Management Plan (2004) also prioritizes BCRs and their value for "breeding" and "non-breeding" habitat needs by species. Regional-scale conservation plans developed for landbirds and shorebirds elaborate on continental priority species and even identify additional species considered to be of regional concern.

Due to the large number of bird species occurring in the region and limited resources available for conservation, several "JV focal species" were selected for breeding habitat planning and population monitoring. In addition, guilds of species (Root 1967) that forage in a common cover type during migration and winter were used to develop non-breeding habitat objectives for some bird groups (waterfowl and shorebirds). The use of focal species is a conservation assessment "shortcut," reducing the number of models required for developing habitat objectives for a full suite of species. In effect, JV focal species were selected to represent cover types used by multiple species within that bird group. Monitoring results (i.e., population change) based on JV focal species are assumed to reflect the suite of species they represent.

Criteria for selecting breeding JV focal species typically included 1) stable or declining population or high economic importance (e.g., Mallard), 2) relatively high

Table 2. Bird species occurring in manageable numbers in the Upper Mississippi River and Great Lakes Joint Venture (JV) region and considered high conservation priority in primary North American bird conservation plans. JV focal species selected for planning and monitoring emphasis also are identified.

Bird group: Continental plan, species (population)	Priority species	JV focal species		Priority species	JV focal species
Waterfowl -- NAWMP 2004			**Shorebirds (continued)**		
Interior Canada Goose	✓		Sanderling[c]	✓	✓
Tundra Swan (Eastern) [a]		✓	Dunlin [a]		✓
Wood Duck [a]		✓	Buff-breasted Sandpiper	✓	
American Wigeon[b]	✓		Short-billed Dowitcher	✓	✓
American Black Duck	✓	✓	Wilson's Snipe [a]		✓
Mallard[b]	✓	✓	American Woodcock	✓	✓
Blue-winged Teal[b]	✓	✓	Wilson's Phalarope	✓	✓
Northern Pintail	✓		**Landbirds -- NALCP 2004**		
Canvasback	✓	✓	Greater Prairie Chicken	✓	✓
Redhead[b]	✓		Short-eared Owl	✓	
Lesser Scaup	✓	✓	Whip-poor-will [a]		✓
Common Goldeneye[b]	✓		Chimney Swift [a]		✓
Waterbirds -- NAWCP 2002			Red-headed Woodpecker	✓	✓
Pied-billed Grebe	✓		Olive-sided Flycatcher	✓	✓
American Bittern	✓		Willow Flycatcher	✓	✓
Least Bittern	✓		Bell's Vireo	✓	
Black-crowned Night-Heron	✓	✓	Veery [a]		✓
Yellow-crowned Night-Heron	✓		Wood Thrush	✓	✓
Yellow Rail	✓	✓	Blue-winged Warbler	✓	✓
Black Rail	✓		Golden-winged Warbler	✓	✓
King Rail	✓	✓	Cape May Warbler[a]		✓
Sora	✓		Black-throated Blue Warbler [a]		✓
Whooping Crane	✓		Kirtland's Warbler	✓	✓
Least Tern	✓		Bay-breasted Warbler	✓	
Black Tern	✓	✓	Cerulean Warbler	✓	✓
Common Tern	✓	✓	Prothonotary Warbler	✓	✓
Shorebirds -- USSCP 2001			Worm-eating Warbler	✓	
American Golden Plover[c]	✓	✓	Louisiana Waterthrush[a]		✓
Piping Plover	✓	✓	Kentucky Warbler	✓	✓
Killdeer[a]		✓	Connecticut Warbler [a]		✓
Solitary Sandpiper[c]	✓		Canada Warbler	✓	✓
Upland Sandpiper	✓	✓	Yellow-breasted Chat [a]		✓
Whimbrel	✓		Henslow's Sparrow	✓	✓
Hudsonian Godwit	✓		Dickcissel	✓	
Marbled Godwit	✓		Eastern Meadowlark[a]		✓
Ruddy Turnstone[c]	✓		Rusty Blackbird	✓	
Red Knot	✓				

[a]Not currently considered high continental priority but selected as a JV focal species for conservation planning and monitoring because primary habitat used represents a unique cover type.
[b]Population reasonably stable (1970-2003) but listed as a priority species in NAWMP because of relative importance to sport harvest.
[c]Species was not labeled "high concern" in the 2001 USSCP, but considered high conservation priority as of August 2004 (U.S. Shorebird Conservation Plan. High Priority Shorebirds – 2004. Unpublished report, U.S. FWS, 4401 N. Dr., MBSP 4107, Arlington, VA 22203 USA. 5pp.). The USSCP high concern status was removed from Greater Yellowlegs following the 2004 report.

importance of the JV region to the continental population, 3) some understanding of factors limiting the population, and 4) a potential to monitor populations. Non-breeding focal species were selected based on 1) regional importance (significance of JV region to species), 2) an ability to identify and manage for habitat-based limiting factor(s), 3) and the potential for monitoring. Using species guilds allowed calculation of food resources needed for all migrating and wintering waterfowl and shorebirds in primary cover types used by these species (see JV bird-group strategies for more detail on focal species and guild selection).

Population Objectives

In order to develop habitat objectives using the SHC biological planning paradigm, we needed to establish population goals, current population estimates, and population deficits (deficits = goal – current estimate). Population goals for JV focal species were largely "stepped down" from the four continental bird plans using various approaches (see JV bird-group strategies for details). Breeding goals were established for all four bird groups whereas non-breeding (migration and wintering) population goals were developed only for shorebirds and waterfowl. Lack of information prevented development of non-breeding population and habitat objectives for waterbirds and landbirds, which is a high priority for the next iteration of habitat conservation strategies for these bird groups.

In some instances, such as breeding waterfowl and waterbirds, JV regional goals could not be developed from the continental plans. State and regional population information and expert opinion were used to develop these goals. An attempt was made to find and use the latest population survey data, and the average annual population estimate for the past decade was typically used as the "current estimate." In the case of waterfowl, harvest data and the Mid-winter Inventory also were used to evaluate distribution and abundance during the non-breeding period.

Habitat Assessment

The JV region contains all the surface area of five states and portions of five more, totaling about 250 million acres (102 million ha). In addition to its vast size, the region has great landscape diversity, encompassing portions of six BCRs (Table 3). Two spatial datasets were used to evaluate landscape cover types available to birds and to establish a regional baseline of bird habitat, the National Land Cover Dataset (NLCD) and the National Wetland Inventory (NWI). These spatial data also were integral in development of bird habitat models used to target conservation opportunities.

Although extremely valuable, each spatial data source has its deficiencies. Substantial land-cover classification error associated with the 1992 NLCD has been identified, especially for the wetland, grassland, and agricultural categories (Thogmartin et al. 2004). Recently an update of the NLCD was completed using imagery from 2001. The updated NLCD requires an accuracy assessment, but early reviews suggest significant classification error again in the wetland, grassland, and agricultural categories. NWI provides far greater cover type resolution than NLCD, but it only includes wetlands.

Moreover, NWI digital data is based on air photos >25 years old. An effort to update these wetland data by 2010 was initiated by Ducks Unlimited for five JV states (MI, WI, IL, IN, and OH); in addition, the state of Iowa is conducting an NWI update. Early results of this effort in Michigan (Ducks Unlimited 2005) indicate significant loss of shallow herbaceous wetlands when compared with the original (based on 1970s and 1980s aerial photographs).

Table 3. State and Bird Conservation Region (BCR) area estimates within the boundary of the Upper Mississippi River and Great Lakes Joint Venture (JV) region, excluding surface area of the Great Lakes.

State/BCR	Miles^2	Acres	Km^2	Hectares	Proportion of entire state/BCR in JV region	Proportion of entire JV region
Michigan	58,088	37,160,356	150,447	15,044,678	1.00	0.15
Illinois	56,318	36,028,163	145,863	14,586,301	1.00	0.14
Wisconsin	56,048	35,855,713	145,165	14,516,483	1.00	0.14
Minnesota	45,133	28,872,600	116,893	11,689,312	0.53	0.11
Ohio	41,139	26,317,809	106,550	10,654,984	1.00	0.10
Iowa	36,623	23,428,861	94,854	9,485,369	0.65	0.09
Indiana	36,041	23,056,396	93,346	9,334,573	1.00	0.09
Missouri	32,101	20,535,944	83,141	8,314,147	0.46	0.08
Kansas	25,753	16,474,711	66,699	6,669,923	0.31	0.07
Nebraska	8,679	5,552,062	22,478	2,247,798	0.11	0.02
BCR 22	187,793	121,680,996	492,636	49,263,561	0.92	0.48
BCR 12	82,678	53,571,710	216,890	21,688,951	0.35	0.21
BCR 23	78,653	50,963,671	206,331	20,633,065	0.90	0.20
BCR 24	21,472	13,912,680	56,327	5,632,664	0.19	0.05
BCR 28	11,650	7,548,511	30,561	3,056,077	0.07	0.03
BCR 13	8,294	5,373,875	21,757	2,175,658	0.11	0.02
State Total	395,923	253,282,615	1,025,436	102,543,569	0.65	1.00
BCR Total	390,539	253,051,444	1,024,500	102,449,977	0.45	1.00

Other habitat assessment challenges exist due to the specialized cover types used by some birds. Not all JV focal species selected for the planning process neatly fit into cover types classified by currently available digital land-cover data. Future bird habitat planning efforts must consider the limitations of spatial data when selecting JV focal species, as well as the ability of JV partners to track accomplishments for priority cover types.

Pre-settlement Landscape

Managers implementing bird habitat conservation are more effective when they consider a landscape's previous condition and land-use history. Nearly all the JV region has been altered in some way since settlement. Wetland drainage and conversion of prairie to agriculture are the most significant and lasting changes from pre-settlement conditions, whereas removal of virgin forest has been somewhat mitigated by forest

regeneration and succession during the past century. Knowledge of "natural cover conditions" allows land managers to better plan habitat restoration knowing the land capabilities and succession tendencies. Restoration efforts that take into consideration historical conditions, current condition of the surrounding landscape, and future threats tend to be most successful.

Various data sources were used in depicting the composition of major cover types in the JV region before settlement. Information ranged from complete state pre-settlement maps from Public Land Survey notes to soils data and land cover models. Because resolution of spatial data varied and "edge matching" state data sets was not possible, only a crude pre-settlement image could be constructed (Figure 3). The map suggests forest dominated much of the JV region, with evergreen (conifer) and mixed forest in the north, transitioning into deciduous forest in the east and south. With the exception of wooded river corridors, prairie and savanna covered most of the west and central portions of the JV region.

Figure 3. Pre-settlement vegetation map of the Upper Mississippi River and Great Lakes Joint Venture Region based on Public Land Survey notes, soils data, National Wetland Inventory, and historical accounts.

Current Landscape Cover Types and BCRs

The 2001 NLCD was used to assess current land cover in the JV region. Accuracy of this data set is questionable for some cover types, but it is the most recent region-wide land cover dataset available. Excluding the Great Lakes, cultivated crops account for the greatest surface area (39%) of the JV region, followed by forest (deciduous forest, evergreen forest, and shrubland; 26%), grassland and pasture (18%), inland water and wetland (woody and emergent wetland; 10%), and developed land (9%) (Figure 4). Urban centers are more closely associated with (embedded within) the agriculturally dominated central portion of the region (BCR 22), whereas the heavily forested north (BCR 12) and southern fringe (BCRs 24 and 28) are far less developed. Reviewing BCR characteristics provides another means for large-scale bird habitat assessment.

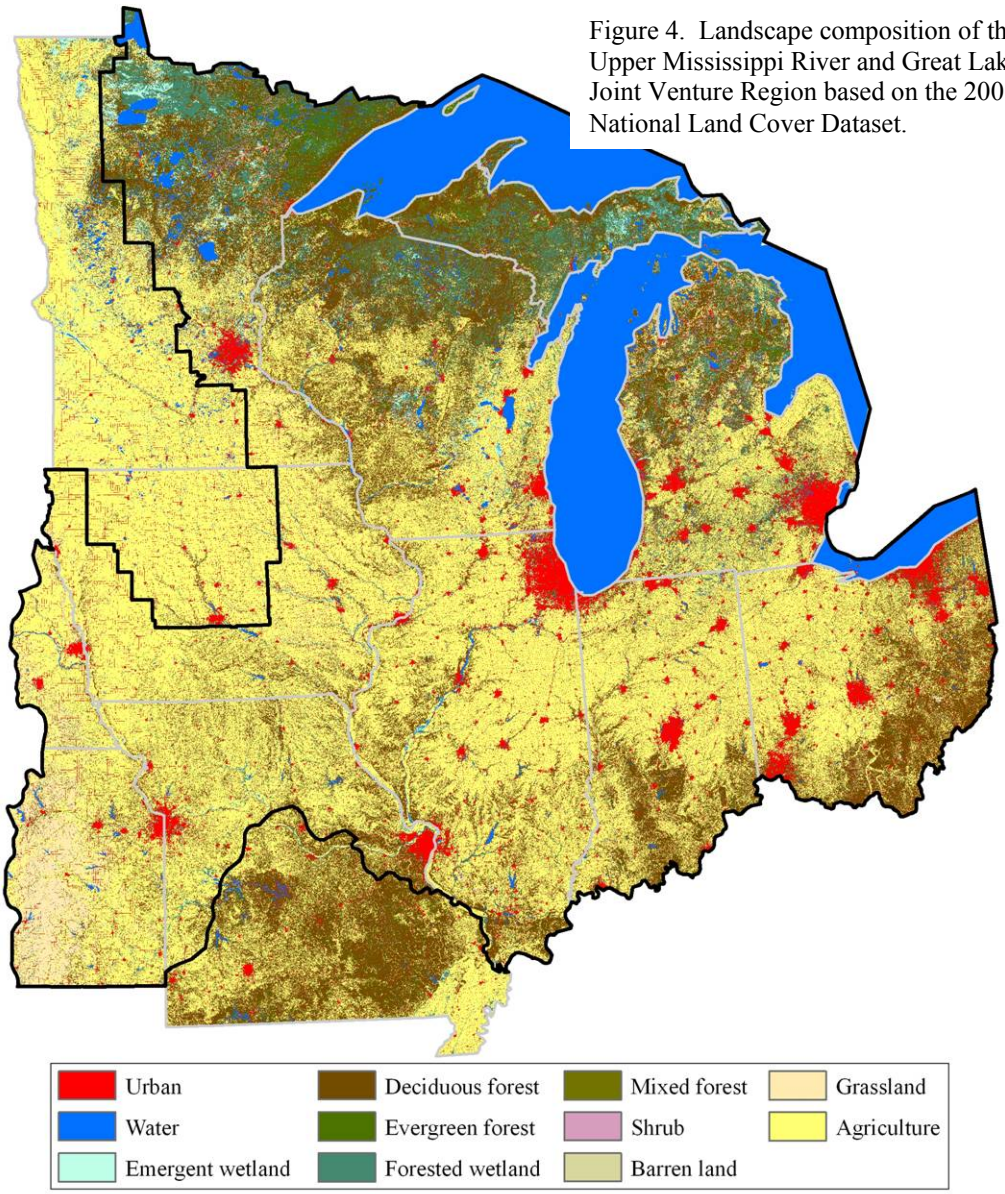


Figure 4. Landscape composition of the Upper Mississippi River and Great Lakes Joint Venture Region based on the 2001 National Land Cover Dataset.

BCRs encompass landscapes having similar bird communities, habitats, and resource issues (NABCI 2000). They are the fundamental biological units through which NABCI promotes delivery of landscape-scale bird conservation, including evaluation, planning, and in some instances implementation. BCRs are ecologically defined units that provide a consistent spatial framework for bird conservation across North American landscapes. By employing broad scale units that are ecologically meaningful to bird populations – rather than political units – conservation efforts can be tailored to support groups of species throughout the heart of their range. For example, conservation for grassland-dependent birds should be targeted within a BCR dominated by grassland communities or altered landscapes with greatest grassland restoration potential. Moreover, with partners using a common spatial framework, and a shared priority-setting tool, the potential for increased efficiency and conservation effectiveness is great.

Eastern Tallgrass Prairie (BCR 22)

BCR 22 accounts for 48% of the land area in the JV region and nearly all of this BCR falls within the JV regional boundary (BCR areas in South Dakota and Oklahoma are outside JV boundary). The landscape includes what were formerly the tallest and most lush grasslands of the Great Plains. Beech-maple forest dominated eastern sections, but this cover type transitioned into a broad and dynamic oak-dominated savanna and then vast prairie farther west. The modern landscape is largely agriculture. Primary threats to native upland and wetland communities include urbanization, recreational development, and agricultural expansion. High priority grassland birds that persist in some areas include the Greater Prairie-Chicken and Henslow's Sparrow. The Cerulean Warbler is found in some wooded areas, and the Red-headed Woodpecker leads the list of priority savanna specialists.

Boreal Hardwood Transition (BCR 12)

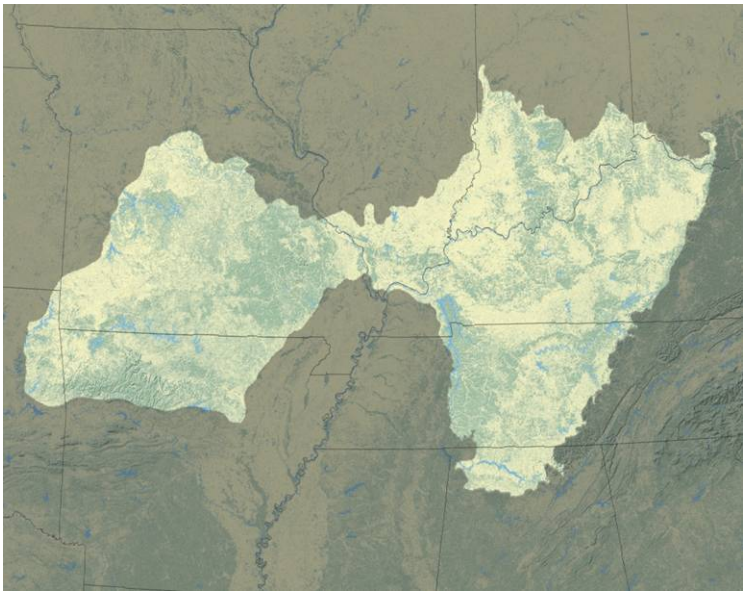
About 35% of BCR 12 is located within the U.S., and it covers the northern 21% of the JV region. The area can be characterized by coniferous (evergreen) and northern hardwood forests, nutrient-poor soils, and numerous clear lakes, bogs, and river systems. Nearly all of the world's Kirtland's Warblers breed here, as do the majority of Golden-winged Warblers and Connecticut Warblers. Other important forest birds include the Black-billed Cuckoo, Veery, Rose-breasted Grosbeak, and American Woodcock. Great Lakes coastal estuaries, river impoundments, large shallow lakes, and natural wild rice lakes are important to many breeding and migrating waterfowl and other waterbirds. The Yellow

Rail is among the rarest wetland species. Islands in the Great Lakes support large colonies of Caspian and Common Terns. Although breeding ducks are sparsely distributed relative to the wetland area available, stable water conditions allow for relatively consistent reproduction. Mallard, Wood Duck, and Canada Goose are common breeding species, but American Black Duck, Ring-necked Duck, and Common Goldeneye also breed in the area. Compared to other BCRs in the JV region, natural communities in this area are relatively intact.

Prairie Hardwood Transition (BCR 23)

BCR 23 covers 20% of the JV region and 90% of the BCR occurs within the JV boundary. Prairies once dominated this region in the west and south and beech-maple forest in the north and east, separated by oak savanna. There are still remnant populations of Greater Prairie-Chicken in grasslands and Cerulean Warbler and other forest-breeding birds to the northeast. Early succession forest and brush is used by Golden-winged Warbler, Henslow's Sparrow, and American Woodcock. Glaciation resulted in numerous pothole-type wetlands and shallow lakes, and many rivers flowing through the BCR terminate in Great Lakes coastal estuaries. With its abundant wetlands, Great Lakes, and numerous shallow inland lakes and rivers, the region is especially valuable to breeding and migrating waterfowl and waterbirds. This area is second only to the Prairie Pothole region in relative density of breeding waterfowl; the Mallard, Wood Duck, Blue-winged Teal, and Canada Goose are particularly abundant. Major threats to native communities include urbanization, exotic species, recreational development, and agricultural conversion.

Central Hardwoods (BCR 24)



About 19% of BCR 24 overlaps the JV boundary, comprising about 5% of the JV region. The Ozark Mountains on the west and Interior Low Plateaus on the east are geologically similar to each other but are bisected by the floodplain of the Mississippi River and its larger tributaries. The entire area is dominated by an oak-hickory deciduous forest inhabited by interior forest species such as Cerulean Warbler, Worm-eating Warbler, and Louisiana Waterthrush. The region includes some of the most extensive forests in the middle of the continent and is probably a source for populations of these birds for many surrounding areas. Floodplains of the river systems exhibit a diversity of community types (e.g., floodplain forests, emergent marsh wetlands, and submerged aquatic beds), all of which are used by migrating waterfowl. Threats to the region include agricultural conversion of floodplain bird habitats and urbanization.

Appalachian Mountains (BCR 28)

A relative small portion (3%) of the JV region is covered by BCR 28 and only 7% of the BCR occurs within the JV boundary. The rugged terrain is generally dominated by oak-hickory and other deciduous forest types at lower elevations and by various combinations of evergreen forest (pine, hemlock, spruce, and fir) in higher areas. Whereas flatter portions of the BCR are in agriculture, the majority of this region is forested. Priority forest birds include Cerulean Warbler at low elevations and Black-throated Blue Warbler at high elevations. Golden-winged Warbler can be

found in early succession forest areas, and Henslow's Sparrow in remnant grasslands. Primary threats include urban sprawl and management of energy and fiber resources.

Lower Great Lakes/St. Lawrence Plain (BCR 13)

Although 11% of BCR 13 occurs in the JV boundary, this area accounts for only 2% of the JV region. The BCR includes low-lying areas to the south of the Canadian Shield and north of various highland systems in the U.S. In addition to important lakeshore communities and associated wetlands, this region was originally covered with a mixture of oak-hickory, northern hardwood, and mixed-coniferous forests. Relatively little forest area remains today primarily due to establishment of agriculture. The highest priority bird in remnant forests is the Cerulean Warbler. Because of agricultural conversion, this is now the largest and most important area of openland/grassland in the Northeast, providing habitat for such species as Henslow's Sparrow and Bobolink. Abandonment of agricultural fields has temporarily favored shrub-nesting species such as Golden-winged Warbler and American Woodcock. However, these lands are increasingly being lost to urbanization. The BCR also is extremely important for providing stopover sites, attracting some of the largest concentrations of migrant passerines, hawks, shorebirds, and waterbirds in eastern North America. These concentrations occur largely along threatened lakeshore communities. Besides urbanization, primary threats to bird habitat are exotic species and recreational development.

Conservation Design

Designing landscapes to meet regional bird conservation objectives is a relatively new science (Will et al. 2005). The process involves developing biologically-based and spatially explicit habitat objectives for supporting and sustaining bird populations at goal levels. Conservation partners work together to develop population goals, assess current habitat conditions and ownership patterns, evaluate current species distributions and bird-habitat relationships, and determine where on the landscape conservation effort can be delivered to best influence populations. Population and habitat objectives must be explicit to allow measurement of performance and develop a foundation for adaptive management.

We assessed ecological requirements and population trends for JV focal species and used this information to develop conservation strategies in a landscape context.

Analysis of digital spatial data and techniques used to generate explicit habitat objectives (i.e., what, where, when, and how much habitat is required) are described in the four JV bird-group strategies. Although identification of landscape trends important to bird populations was essential to this planning process, our ability to accurately quantify many cover types (bird habitats) was limited by the quality of digital spatial data (NLCD and NWI) available for the region. The need to update and improve this information became increasingly obvious during strategy development. However, this version of the JV Implementation Plan establishes a sound science foundation and a process for all-bird conservation design.

Setting Habitat Objectives

Bird habitat conservation objectives were developed using two categories: "maintenance and protection" and "restoration and enhancement." Maintenance and protection objectives equate to the area of habitat required to maintain populations in the region. Conservation actions such as acquisition, conservation easement, and management seek to maintain existing habitat values and sustainable ecosystems at the highest priority sites. These habitat objectives are based on current estimated bird populations and identified by primary cover types used by priority species. Conservation implementation can most effectively be targeted using decision-support maps generated for each of the JV bird-group strategies (www.UpperMissGreatLakesJV.org).

Some of the habitat area required to accommodate current regional bird populations is already protected through ownership by government agencies or non-government conservation organizations. In the future, we plan to develop a digital GIS layer of all protected conservation lands in the JV region. With this information, JV partners can 1) overlay ownership patterns with priority bird conservation lands, 2) determine the proportion and distribution currently protected, and 3) develop a prioritized strategy for acquisition, conservation easement, and other means to safeguard existing bird habitat values.

Restoration and enhancement objectives are based on identified population deficits for JV breeding focal species and non-breeding guilds. Conservation actions include restoring habitat features (i.e., providing the "missing element") that have been lost or degraded, and creating new bird habitat areas that serve as ecological equivalents to lost habitat. We assumed the most effective means to increase a population was to restore adequate habitat to accommodate the number of individuals represented by the deficit, thus increasing landscape carrying capacity to meet population goals. Restoration often implies working in human-influenced areas, frequently converting an annual planted cover type to a perennial native-plant community optimal for the target bird species. Management is generally more economical when restoration efforts establish cover suited for the site considering pre-settlement vegetation, current surrounding cover, and critical/irreversible adjustments to landscape hydrology. Likewise, enhancement work must consider landscape capabilities. Properly located enhancement effort that sets back succession, suppresses invasive plants, improves water quality, or provides a missing

element to an otherwise suitable landscape typically results in the greatest return on investment.

Plant communities surrounding restoration sites also must be considered to help maximize conservation benefits. For example, uplands should be managed to complement and help maintain the values of a restored wetland. Uplands with native plant communities retain or improve water quality in adjacent basins while providing nesting and foraging structure for many species of birds. Because habitat enhancement for one species may result in loss of site value for others, habitat treatments must consider all species potentially using a site. Species of greatest concern from various bird groups and relevant habitat management information can be found in the JV bird-group strategies (www.UpperMissGreatLakesJV.org).

Climate Change Awareness

Most threats to bird habitat are relatively well understood and the ability to predict population change due to environmental trends is growing. One of the most significant threats potentially influencing birds (and other life forms) in the future is climate change. Growing evidence suggests climate change is a reality, and it will fundamentally affect conservation decisions in the future. Unfortunately, the science of predicting how climate change will effect the distribution and abundance of priority bird species is only in its infancy. The U.S. Fish and Wildlife Service is committed to better understanding this issue and developing adaptation and mitigation responses. A climate change working group has been formed and preliminary ideas and recommendations have been developed (Johnson et al. 2008). Future iterations of the JV Implementation Plan will incorporate threats and opportunities associated with climate change when developing bird habitat objectives.

Cover-type Descriptions

Cover type descriptions for primary bird habitat categories (Table 4) were developed to help JV partners use a common language for bird habitat discussions and plan implementation. The definitions used are a combination of common GIS land-cover terms modified to match primary habitats of JV focal species. Using somewhat general definitions for bird habitats was necessary for both technical and administrative reasons. Digital spatial data available for the region (primarily NLCD and NWI) has a resolution similar to most categories used, allowing crude tracking of long-term habitat change via remote sensing. From an administrative perspective, many JV partners are unable or reluctant to track projects using finer-resolution descriptions.

Table 4. Cover types (bird habitat categories) and period of use from bird habitat conservation strategies developed for the Upper Mississippi River and Great Lakes Joint Venture Region.

Cover type	Definition
Wet meadow with open water	Seasonal wetlands with herbaceous vegetation mixed with pockets of semi-permanent shallow open water
Shallow semi-permanent marsh, hemi-marsh	Marsh <1 m (3 feet) deep with herbaceous cover and persistent standing water most years; typically a mosaic of emergent vegetation and open water
Wet mudflat / moist soil plants	Non-forested wetland with dynamic hydrology and areas of exposed mudflat; summer growth of annual seed-producing plants (moist-soil species) is typically flooded in fall and spring
Deep water marsh	Open water 0.5–1.5 m (2-5 feet) deep mixed with areas and borders of emergent vegetation; submergent vegetation common in openings
Marsh with associated shrub/forest	Mixed emergent marsh and open water with nearby shrub or forest; typically marsh and woody cover is <0.1 km (300 feet) apart; often a riparian system
Beach	Sandy shorelines maintained by wave action; may contain pebbles or cobble but little vegetation
Dry mudflat / agriculture	Non-forested wetland in prolonged dry condition (e.g., draw down); harvested agricultural fields, short-grass pastures, and sod farms; some open parks, and golf courses
Shallow water	Non-forested wetland or lakeshore with <5 cm (2 inches) of water depth; includes pools in agricultural fields; vegetation typically sparse
Moderate water	Non-forested wetland with 5–20 cm (2–8 inches) of water depth; vegetation typically sparse
Extensive open water	Open water areas of the Great Lakes, large rivers, and inland lakes with water depth 1–9 m (3–30 feet)
Islands with limited vegetation	Islands with periodic disturbance or a foundation that inhibits vegetation growth (<40% coverage); typically on the Great Lakes; may include lighthouse structures, confined disposal facilities (CDFs), and other man-made structures
Waste-grain field	Areas of agriculture with waste grain or winter wheat (fields <20 km / 12 miles from roost wetlands important to waterfowl)
Deciduous forest	Areas dominated by trees where >75% of the species shed foliage simultaneously in response to seasonal change
Evergreen forest	Areas dominated by trees where >75% of the species maintain their leaves all year; canopy is never without green foliage
Forested wetland	Forest areas with saturated soils or mixed open water
Shrubland	Areas dominated by woody vegetation <6 m (20 feet) tall
Other Forest	Forested areas that could contain any combination of deciduous, evergreen, or mixed tree species, including forested wetland
Grassland	Areas dominated by herbaceous plants (grasses and forbs) and with few trees; includes pasture or hay lands
Mixed wooded openlands	Savanna-like grassland areas in combination with sparse trees or oak openings; some agricultural land, semi-open parks, and golf courses provide similar structure
Residential / commercial	Developed areas with ≥20% impervious surface

Habitat Derivation

Breeding habitat objectives were established using simple biological models with area/distance requirements and perceived "limiting factors" for JV focal species. The limiting factor was typically a missing landscape feature(s) most likely preventing population growth. Non-breeding period habitat objectives (calculated for waterfowl and shorebirds only) were generated with a more complex modeling approach, accounting for energy needs during migration staging and winter. We assumed food energy was the primary factor limiting birds during the non-breeding period, and these habitat objectives were calculated with a bioenergetics model (Loesch et al. 2006). All habitat objectives from JV bird-group strategies are in units of moderate to high quality habitat.

Maintenance and protection objectives reflect estimated habitat needs of current populations, whereas restoration and enhancement objectives were generated based on population deficits. JV regional habitat objectives calculated for breeding JV focal species and non-breeding guilds were stepped-down from the JV region to smaller, more manageable units. For JV breeding focal species, habitat objectives were identified to the BCR scale and linked to BCR population objectives. We further partitioned habitat objectives to the state level and then into State×BCR areas (polygons).

Stepping-down habitat objectives for waterfowl and shorebird non-breeding guilds was more complicated. Waterfowl migration and wintering population distribution was derived for the region, state, and BCRs from FWS harvest survey data and Mid-winter Inventory data, respectively. Habitat objectives were then generated using an estimate of 1) non-breeding period waterfowl use days in each State×BCR polygon, 2) forage nutritional value / unit area for each cover type, and 3) daily energetic needs for each species. Likewise, shorebird migration habitat objectives were derived using estimates of area importance, use days, and energetic requirements.

Program Delivery

In this plan we assume bird populations limited by habitat are benefited by the delivery of appropriate conservation actions. While each conservation action may contribute habitat, sustaining a habitat-limited population is a function of the cumulative positive impacts of all conservation programs countered by impacts resulting from negative land alterations (e.g., human development). We suspect habitat degradation for many bird species occurring in the JV region is continual, perhaps only eclipsed by the rate of development and direct habitat loss. Therefore, JV partners must strive to continually improve the precision of conservation practices in space, time, and technique. A challenge for the JV is how best to transfer information from the scientific foundation to the development and implementation of conservation delivery in the form of habitat restoration, enhancement, and protection. Equally important is establishing mechanisms to assess results of program implementation and transfer new knowledge back to biological planning.

The JV is undergoing an evolution from opportunity based conservation to strategic conservation design and delivery. The Technical Committee is growing its capability to provide decision-support tools for targeting habitat conservation to sites with the highest biological return on investment. Digital spatial data and biological models were integrated to produce explicit habitat objectives at the following scales: JV region, Bird Conservation Region (BCR), State, and State×BCR polygon. The smallest of these units, State×BCR polygons, are simply the area of each BCR occurring in each JV state. There are 24 State×BCR polygons in the JV region (Figure 1), and habitat objectives in the Implementation Plan are presented to this level.

Although the discussion regarding program delivery and integrated bird conservation was developed in the context of combining conservation actions for multiple bird groups, forging partnerships in other (non-bird) environmental initiatives also must be considered by the JV. Potential cross-programmatic ventures can substantially increase financial and human resources available for conservation when multiple values (especially societal needs and concerns) are part of the decision process. In addition to government natural resource agencies, wetland and grassland protection and restoration are often associated with federal and state agricultural programs, highway right-of-way management, or improving water quality for a town-community or river system. Addressing global climate change may be the most significant example of a societal challenge fostering bird conservation opportunities. By using the decision-support tools provided in the JV planning documents, and the substantial resources available outside the bird conservation arena, JV partners may be able to greatly increase benefits to birds.

Integrated Bird Conservation

Setting regional habitat objectives for multiple bird groups with various seasonal needs is extremely challenging. A limited number of cover types (primary bird habitats) had to be identified and the seasons of greatest importance recognized by bird group (Table 5). It is difficult to quantify how a particular bird group (represented by individual JV focal species or non-breeding guild) is affected by habitat protection or restoration targeted at other bird groups. For the purpose of this plan, we assumed that by providing adequate habitat (area of cover type) for the bird group with the greatest area requirement, other bird groups using the same cover type would also be accommodated.

Bird habitat objectives for each cover type were generated using the maximum habitat area calculated for all bird groups at the State×BCR level. Thus, habitat objectives for the group with the greatest need / State×BCR polygon are reflected in the habitat recommendations. Overlap in habitat objectives between breeding and non-breeding periods was not compared as the habitat value of cover types often changes temporally. State and local managers will need to determine if protected and restored areas are providing multi-seasonal habitat values, potentially reducing the habitat requirement for a given cover type where sites are annually available during >1 season.

Table 5. Cover type use by bird group and period from Upper Mississippi River and Great Lakes Region Joint Venture Habitat Conservation Strategies. Non-breeding period habitat planning was completed for only waterfowl and shorebirds and only cover types used by these groups are identified in this category.

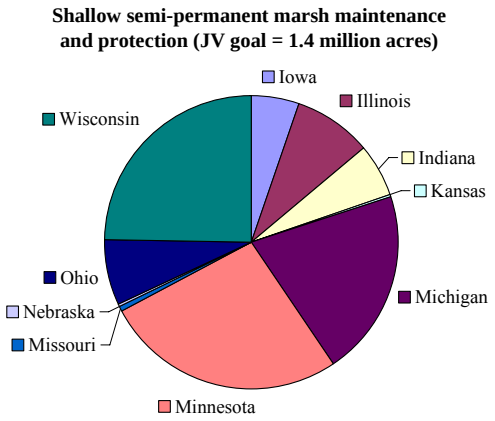
	Bird-group				Period	
Cover type	Waterfowl	Waterbird	Shorebird	Landbird	Breeding	Non-breeding
Wet meadow with open water	X	X	X		X	
Shallow semi-permanent marsh, hemi-marsh	X	X			X	X
Wet mudflat / moist soil plants	X		X			X
Deep water marsh	X	X			X	X
Marsh with associated shrub / forest	X	X			X	
Beach			X		X	X
Dry mudflat / agriculture			X		X	X
Shallow water (<5 cm)			X		X	X
Moderate water (5–20 cm)			X		X	X
Extensive open water	X					X
Islands with limited vegetation		X			X	
Waste-grain field	X					X
Deciduous forest				X	X	
Evergreen forest				X	X	
Forested wetland				X	X	
Shrubland				X	X	
Grassland				X	X	
Mixed wooded openlands				X	X	
Residential / commercial				X	X	

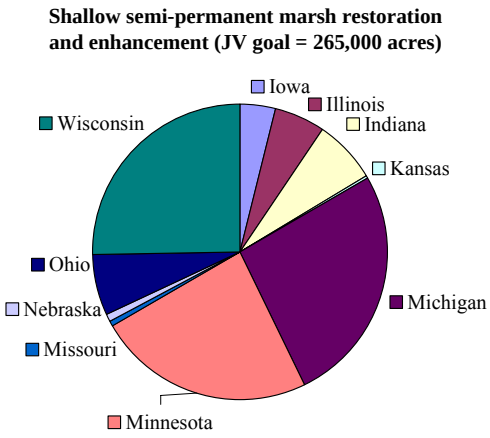
Breeding Habitat

Cover types used by breeding birds in the JV region were grouped into three major categories to help emphasize the importance of various landscapes and locations in the region and to aid in program delivery. The categories included marsh wetlands, woodlands, and openlands. Breeding habitat objectives for all bird groups combined are provided in Appendices A–C. The sections below highlight cover types with the highest objectives, and the states with greatest conservation importance for these key bird habitats. Objectives are presented in units of "quality habitat," providing relatively high value to breeding birds. Restoration and enhancement objectives calculated using population deficits represent the amount of additional (new) habitat required to increase landscape carrying capacity so that bird population goals (current population + deficit) can be achieved. Residential / commercial (developed areas with ≥20% impervious surface) is a cover type category referred to in the plan (Tables 4 and 5) and of some value to birds. This cover type was assumed to be adequate across the region and is not included in the discussion below or Appendices A–C.

Marsh Wetlands

The marsh wetland category includes four cover types used for bird planning and habitat recommendations: 1) wet meadow with open water, 2) shallow semi-permanent marsh / hemi-marsh, 3) deep-water marsh, and 4) marsh with associated shrub / forest (Table 4). The single wetland cover type with greatest maintenance and protection need (area to conserve) at the JV regional level is shallow semi-permanent marsh, with 1.4 million acres (570,000 ha) required to maintain current bird populations (Appendix A). Containing the greatest area of shallow marsh, the northern states of Minnesota (26%), Wisconsin (25%), and Michigan (21%) account for a majority of the habitat maintenance objective.

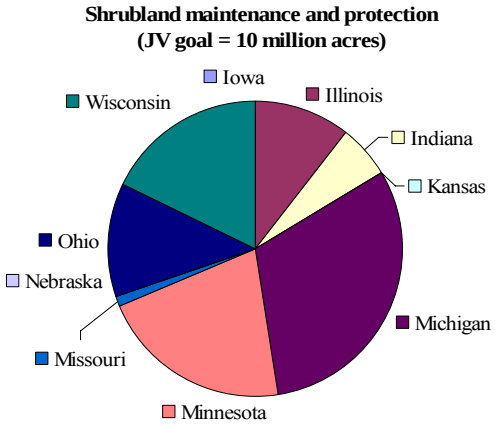




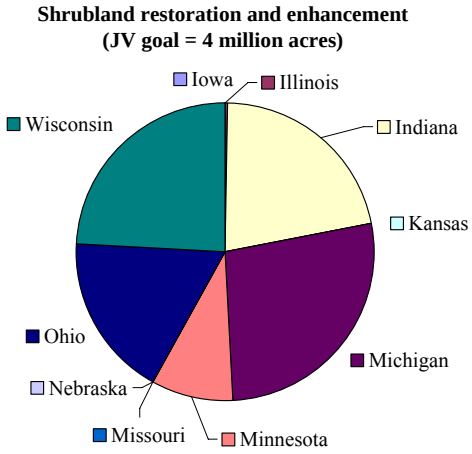
The wetland cover type requiring greatest restoration and enhancement effort is shallow semi-permanent marsh, having an objective of 265,000 acres (107,000 ha). Michigan (25%), Wisconsin (25%), and Minnesota (24%) account for most of the restoration requirement. Although breeding habitat conservation objectives for wetland communities are substantially lower in southern JV states (Appendix A), efforts are critical in these areas because of the limited wetland-bird habitat remaining.

Woodlands

The woodland-bird breeding habitat category includes five cover types: 1) deciduous forest, 2) evergreen forest, 3) forested wetlands, 4) shrubland, and 5) "other forest" (Table 4), which is a non-specific category for generalist species that can use deciduous forest, mixed deciduous and evergreen forest, and or woody wetlands. Of these cover types, protection and maintenance requirements are greatest for shrubland (Appendix B). An estimated 10 million acres (4 million ha) of shrubland are needed within the JV region to maintain bird



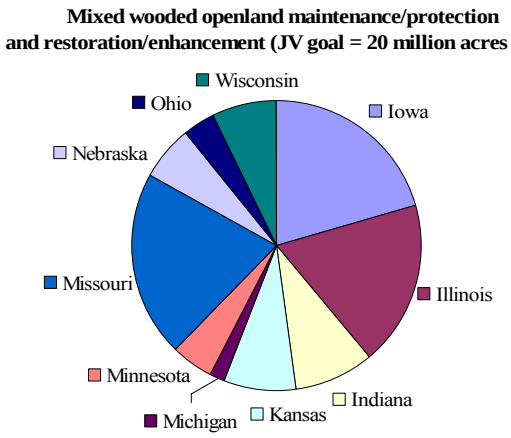
populations that depend on this cover type. Michigan (29%) and Minnesota (21%) account for half of the objective, with the remainder spread across other JV states.



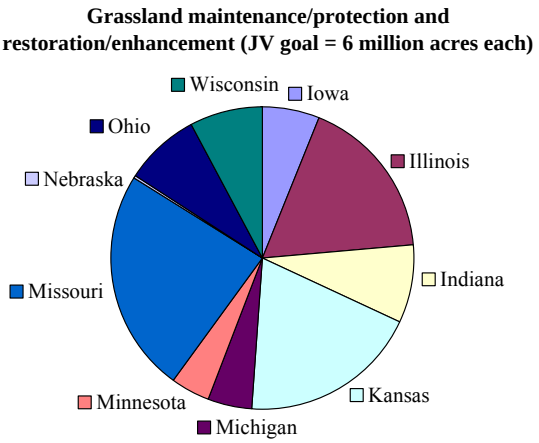
Shrubland also is the cover type with greatest need for restoration and enhancement (Appendix B). An additional 4 million acres (1,600,000 ha) is required to reach the carrying capacity necessary to attain breeding shrubland bird population goals. Much of the objective is recommended for Michigan (27%) and Wisconsin (24%), followed by Indiana (22%) and Ohio (18%). Woody cover is generally increasing in area and maturity in the JV region. Conservation actions must consider community structure and patch size suitable for priority birds (see species accounts in JV Landbird Strategy for more detail).

Openlands

The openland bird habitat category includes four cover types: 1) grassland, 2) mixed wooded openland, 3) dry mudflat / agriculture, and 4) beach (Table 4). Greatest area need for habitat maintenance and protection to retain current populations is in mixed wooded openland, with an objective of 20 million acres (8 million ha) (Appendix C). This cover type also has the greatest need for restoration and enhancement with a doubling of the existing habitat area, and Missouri (21%), Iowa (20%), and Illinois (18%) account for a majority of both the maintenance and enhancement objectives.



Although wooded openland conservation figures are substantial, partners can take comfort knowing this cover type is quite diverse. It is defined as "savanna-like grassland areas in combination with sparse trees or oak openings; some agricultural land, semi-open parks, and golf courses provide similar structure" (Table 4). With 100 million acres (40 million ha) of agricultural land in the JV region, openlands are extremely abundant. Opportunities for savanna species management abound in the form of grassland restoration near existing woodlots and in less productive agricultural fields, plus woodland patch enhancement (e.g., understory clearing) near existing grasslands.



Secondary, yet very substantial in openland area, were conservation objectives for the grassland cover type (Appendix C). Maintenance and protection of an estimated 6 million acres (2.4 million ha) is needed to retain current grassland bird populations, with an additional 6 million acres restored or enhanced to attain grassland bird population goals. While the combined grassland goal (protection and restoration) of 12 million acres (5 million ha) may seem unrealistic, this is only about two percent of the total land area in the JV region. Southern JV states account for the majority of this habitat goal, particularly Missouri (24%), Kansas (19%), and Illinois (18%). Nebraska had a surprisingly small grassland maintenance objective because that portion of the state within the JV region had a relatively low abundance of grassland focal species (Greater Prairie-chicken, Meadowlark, Upland Sandpiper, and Henslow's Sparrow). Grassland restoration / enhancement in northern JV states should not only focus on large blocks of habitat for breeding upland birds, but also near wetland sites to increase value for species that depend on wetland-grassland complexes.

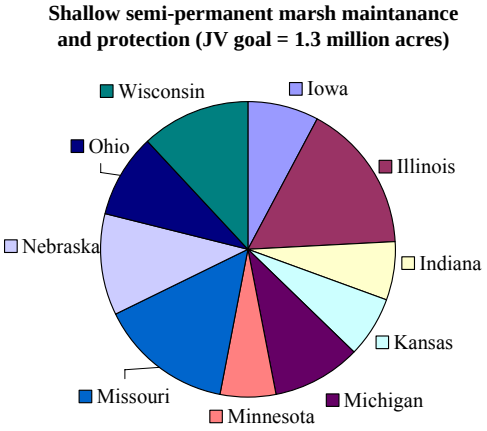
Non-breeding Habitat

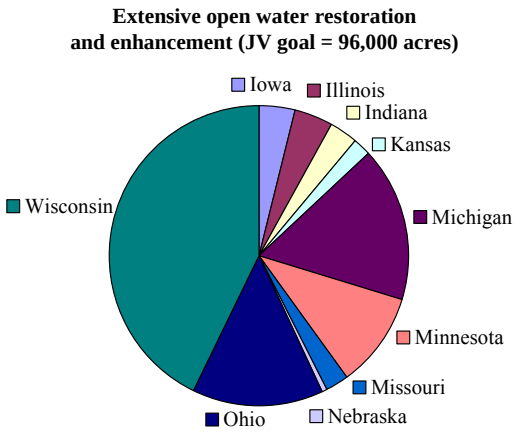
Cover types used during the non-breeding period were grouped into two broad categories: marsh and deep water, and mudflat and shallows. Bird habitat objectives for a variety of cover types used by non-breeding birds can be found in Appendices D and E; the sections below highlight only cover types and states with the greatest conservation area needs. Objectives are presented in area units of "quality habitat," providing relatively high value to staging and wintering birds (non-breeding habitat is based on waterfowl and shorebirds only). Furthermore, habitat must be available when birds need it, thus the timing of migration and wintering for priority species must be considered in management decisions.

Waste grain field (areas of agriculture with waste grain or winter wheat near wetlands potentially valuable as waterfowl roost sites) is a cover type category referred to in the plan (Table 4 and 5) and of some value to birds, especially during the non-breeding period. This cover type was assumed to be adequate across the region and is not included in the discussion below or Appendices D and E.

Marsh and Deep Water

The marsh and deep water non-breeding habitat category includes three cover types: 1) shallow semi-permanent marsh / hemi-marsh, 2) deep water marsh, and 3) extensive open water (Table 4). To sustain the forage resources necessary for current populations of migratory birds, an estimated 1.3 million acres (543,000 ha) of shallow semi-permanent marsh must be maintained (Appendix D). Illinois accounts for 16% of this habitat objective closely followed by Missouri (15%) and Wisconsin (12%).

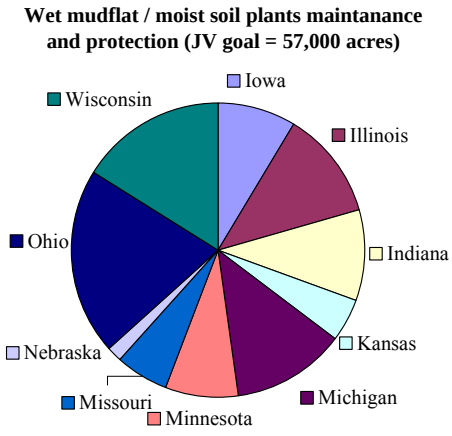


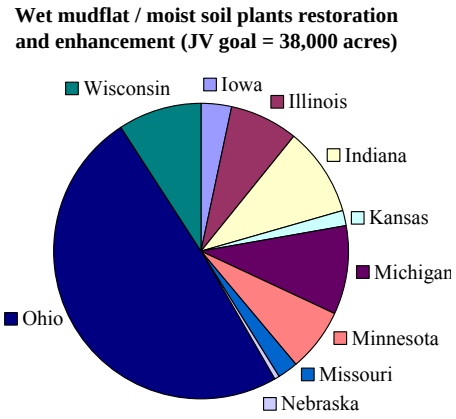


Extensive open water is the cover type in greatest need for restoration and enhancement to achieve carrying capacity goals (Appendix D). Because there is little opportunity for restoration within this cover type, an estimated 96,000 acres (39,000 ha) of extensive open water must be enhanced (rehabilitated) so that a quality and abundant forage base is restored for staging and wintering birds (primarily diving ducks). States with the greatest conservation opportunity and derivation of habitat objectives include Wisconsin (43%), Michigan (17%), and Ohio (14%).

Mudflat and Shallows

The mudflat and shallows habitat category includes five cover types: 1) wet mudflat / moist soil plants, 2) dry mudflat / agriculture, 3) shallow water (<2 inches; 5 cm), 4) moderate water (2–4 inches; 5–20 cm), and 5) beach. Of these, wet mudflat / moist soil plants has the greatest area need for maintenance and protection (Appendix E), with an estimated 57,000 acres (23,000 ha) across the region. Ohio (20%), Wisconsin (15%), and Michigan (13%) account for half of this objective, while Indiana and Iowa account for 10% and 9% of the area needed, respectively.





Restoration and enhancement area requirements are also greatest for the wet mudflat / moist soil plant cover type. An additional 38,000 acres (15,000 ha) are required to establish the carrying capacity necessary to accommodate non-breeding period population deficits (Appendix E), with Ohio accounting for 49% of the objective.

Habitat for some bird species is increasing in area or improving in quality, whereas the habitat base for most is declining; grassland and herbaceous wetland species are subject to the greatest habitat loss. Although the rate of wetland destruction has slowed in recent years, losses still occur in the JV region (Ducks Unlimited 2005), particularly in areas dominated by agriculture and human development. The proposed bird habitat restoration and enhancement objectives are "net area" estimates. In other words, loss of existing habitat during the plan implementation period will have to be added to plan restoration objectives. Likewise, degradation of existing habitat must be considered in the habitat accounting process and a method for evaluating, quantifying, and tracking this parameter will need to be developed.

Targeting Conservation Actions

Scientifically targeting conservation actions for birds is essential to increasing program efficacy, sustaining the maximum number of priority bird species and individuals while minimizing cost. Decision-support maps were created to assist JV partners in identifying areas most valuable to birds at the regional scale and to better evaluate partner roles (based on area of administration/influence) in migratory bird conservation. Some areas of the JV region are simply more suited to one cover type and bird association than another, or more important for providing breeding habitat than sites for migration and wintering.

To complete this analysis and better target priority habitat work across the region, JV focal species from the four primary bird groups were placed into three general breeding habitat categories (marsh wetlands, woodlands, and openland) and two non-breeding habitat categories (marsh/deep water and mudflat/shallows). Abundance and distribution maps and or model-based habitat suitability maps were combined for species occurring in these categories to identify relative importance and location of priority conservation areas. Data for all four bird groups were used to generate breeding habitat maps, whereas only waterfowl and shorebird data were available and used for migration and winter habitat maps. The next iteration of this plan will include a means to target landbird and waterbird non-breeding habitat effort. In addition, future landscape analyses will incorporate land values and other economic parameters, such as location feasibility, into the decision making process.

In the analysis for targeting conservation, JV focal species common to a habitat group (e.g., openland birds) were given equal weight in final map products. Equal weighting was accomplished by reclassifying abundance or suitability values from 0–100; these values were then summarized by 5 km cells (5 km × 5 km land units). Next, multiple "input maps" for each habitat group were overlaid, with a resulting "output map" containing values representing the number of bird species, relative abundances, and or habitat suitability values depending on the input data available for JV focal species used in the analysis. Hard edges and isolated pixels in the output maps were smoothed using a 5 cell circular focal average. The smoothed overlay was then classified by primary and secondary "quartiles" to delineate priority habitat areas for maintenance/protection and restoration/enhancement (Figures 5–9).

The upper quartile, containing higher bird abundances or suitability for multiple focal species within the habitat category, is recommended for protection emphasis because of the relatively high current value at the regional scale. The second quartile encompasses areas with moderate regional importance for each habitat category (Figures 5–9). While not currently as important at the regional level, managers should find abundant restoration and enhancement opportunity in this zone. These secondary areas are used by JV focal species but often may be missing an important landscape component that, if restored or enhanced, would result in much greater value to birds.

Although some priority species input maps could be used to target site level planning, the combined-bird output maps are more appropriate for regional multi-species habitat conservation decisions. Some resolution is lost in output maps when combining multiple inputs at different scales and averaging values. For example, the output map for breeding woodland species clearly reflects the importance of BCRs 12, 24, and 28 in the JV region based on the analysis (Figure 5). However, not all sites within this large area are important for woodland bird conservation. Likewise, smaller areas that are unique and high in conservation value for birds may not appear on regional maps.

Tailoring conservation to smaller scales is part of conservation design, with local managers being duly considerate of historical ecological conditions and processes, current and potential growth in less desirable land use (i.e., agriculture and urban land covers), and local species population objectives. Partners are responsible for identifying and implementing site level conservation actions using this JV planning information as a guide. More spatially-refined knowledge should always take precedence over a coarse regional assessment. Species specific information potentially useful to managers can be found in the four JV bird group strategies (www.UpperMissGreatLakesJV.org). In addition, smaller scale bird conservation planning tools have been created by Ducks Unlimited (http://glaro.ducks.org/HEN/glhen.htm) and the U.S. Geological Survey (http://www.umesc.er.usgs.gov/terrestrial/migratory_birds/bird_conservation.html) at the Upper Midwest Environmental Science Center.

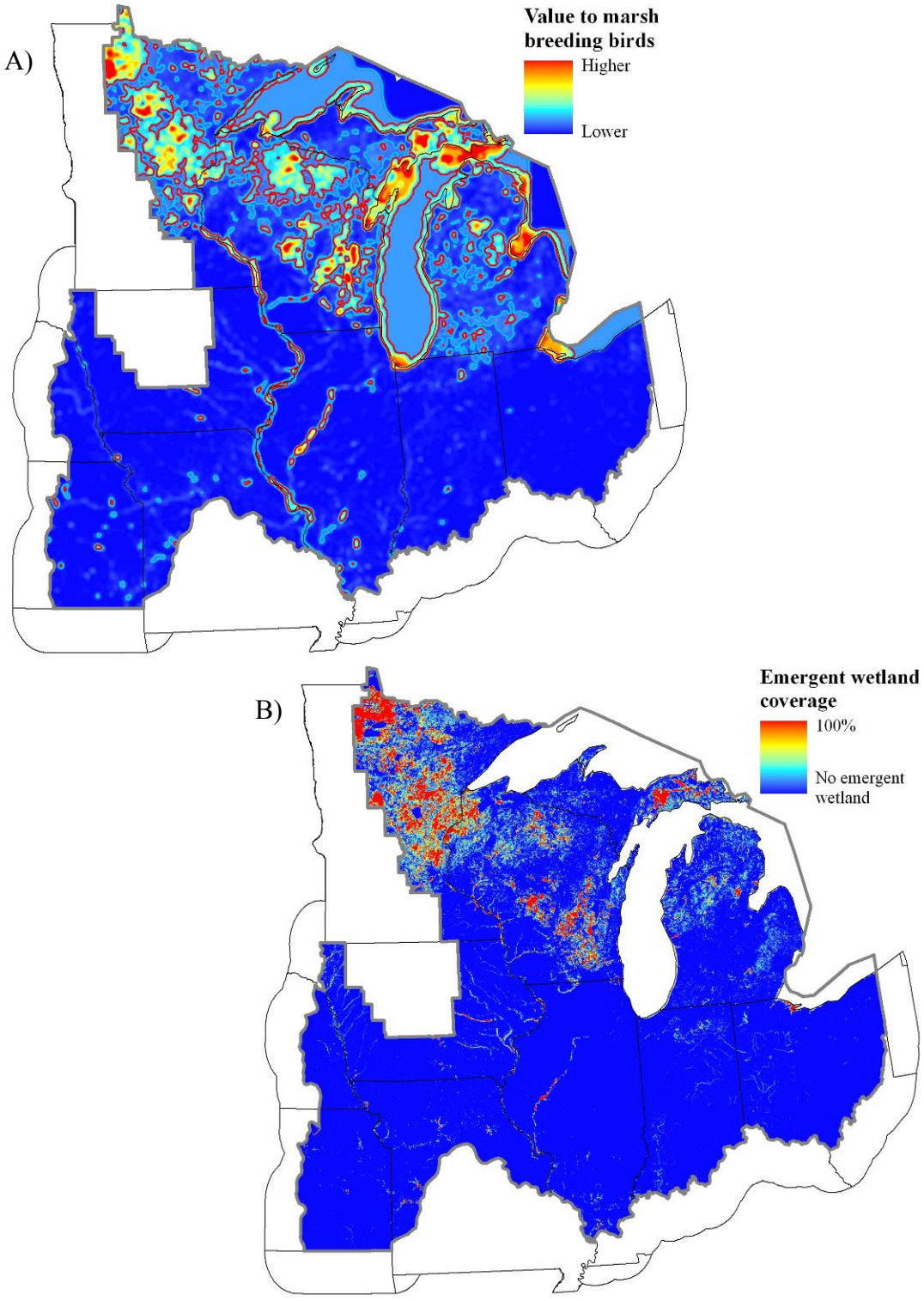


Figure 5. Decision-support maps to target regional marsh-wetland breeding bird conservation effort. A) Value is based on herbaceous wetland breeding bird abundances and habitat models (see JV Waterfowl and Waterbird Habitat Conservation Strategies). *General rule for use:* Locations encompassed by red lines reflect existing important areas for greater habitat maintenance / protection emphasis, while areas within the blue line suggest a restoration / enhancement focus. Conservation priority for the Great Lakes includes coastal areas and islands used by waterbirds, while inland areas represent locations for rails and waterfowl. B) Herbaceous wetland coverage is based on land cover classes in the 2001 National Land Cover Dataset, analyzed by circular plots with 0.6 mi (1 km) radius.

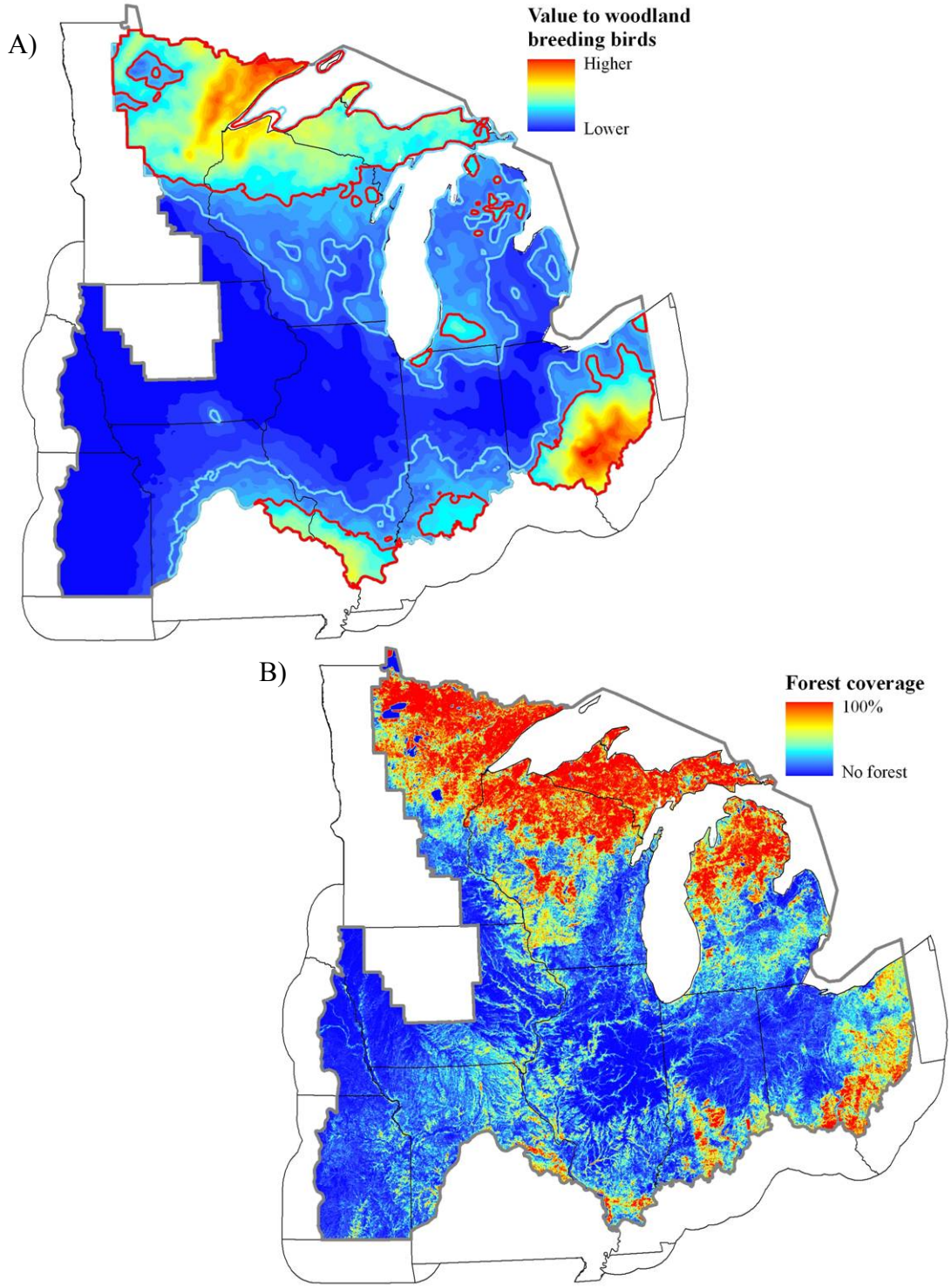


Figure 6. Decision-support maps to target regional woodland breeding bird conservation effort. A) Value is based on woodland breeding bird abundances and habitat models (see JV Landbird Habitat Conservation Strategy). *General rule for use:* Locations encompassed by red lines reflect existing important areas for greater habitat maintenance / protection emphasis, while areas within blue lines suggest a restoration / enhancement focus. B) Forest coverage is based on forest land cover classes in the 1992 National Land Cover Dataset, analyzed by circular plots with 0.6 mi (1 km) radius.

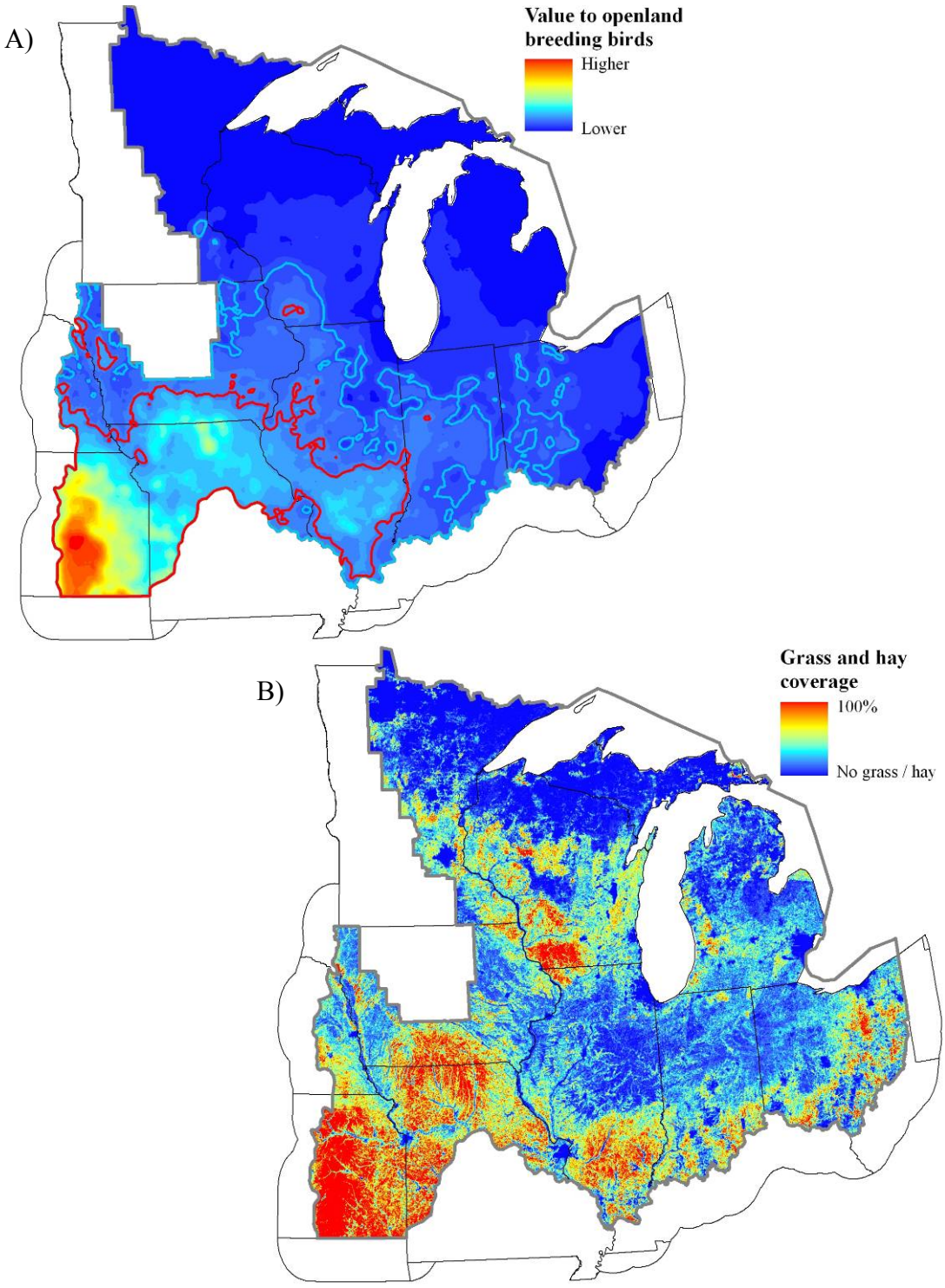


Figure 7. Decision-support maps to target regional openland breeding bird conservation effort. A) Value is based on openland breeding bird abundances and habitat models (see JV Landbird Habitat Conservation Strategy). *General rule for use:* Locations encompassed by red lines reflect existing important areas for greater habitat maintenance / protection emphasis, while areas within blue lines suggest a restoration / enhancement focus. B) Grass and hay coverage is based on grass and hay land cover classes in the 1992 National Land Cover Dataset, analyzed by circular plots with 0.6 mi (1 km) radius.

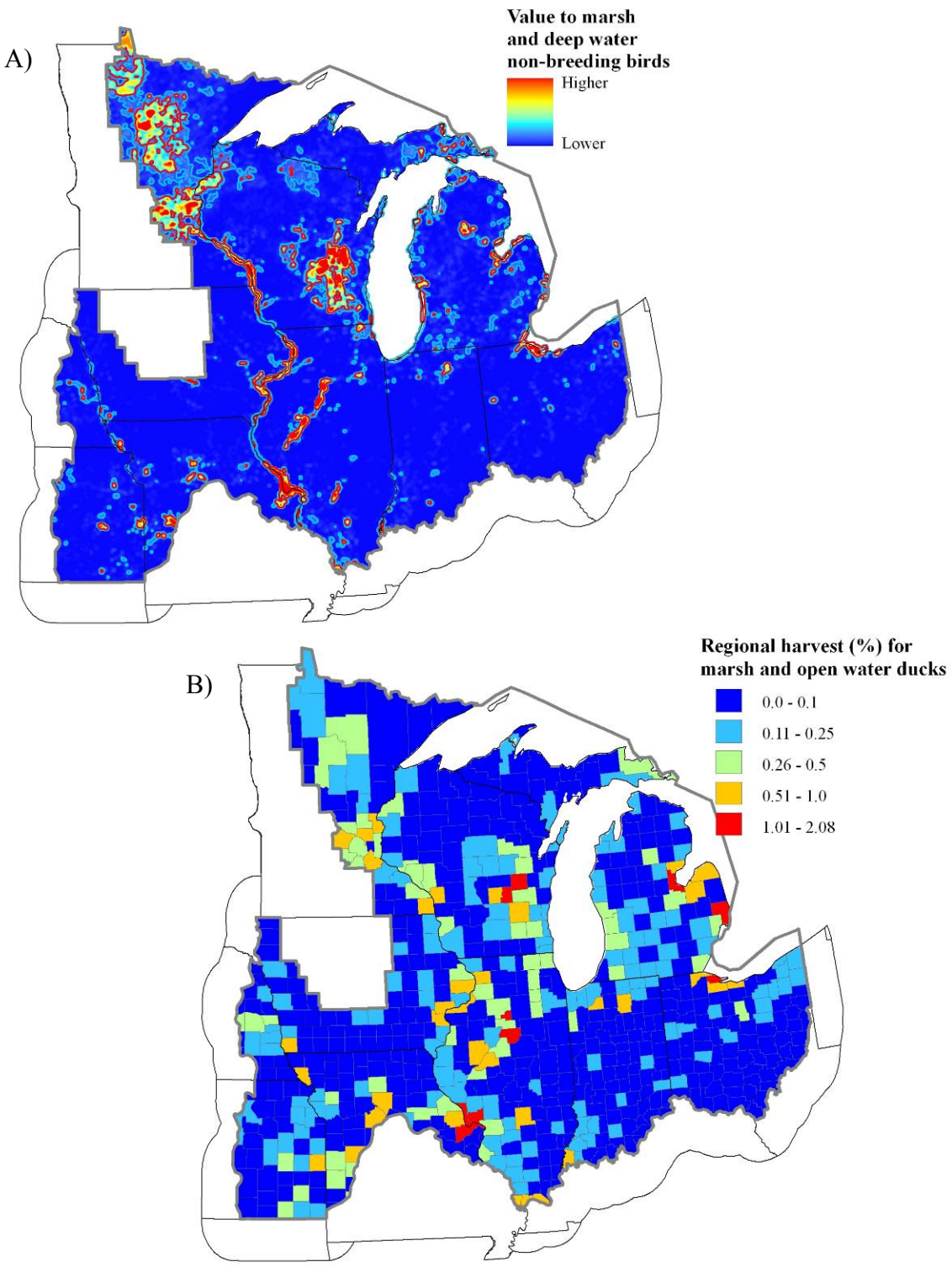


Figure 8. Decision-support maps to target regional marsh and deep-water conservation effort for birds during the non-breeding period. A) Value is based on harvest distribution for marsh and open-water duck species, plus distribution and abundance of existing emergent marsh and open water (National Land Cover Dataset 2001). *General rule for use:* Locations encompassed by red lines reflect existing important areas with greater habitat maintenance / protection emphasis, while areas within blue lines suggest a restoration / enhancement focus. B) County level harvest data (1995–2004) can be used to crudely estimate non-breeding period marsh and open water duck distribution and stakeholder interest in this resource.

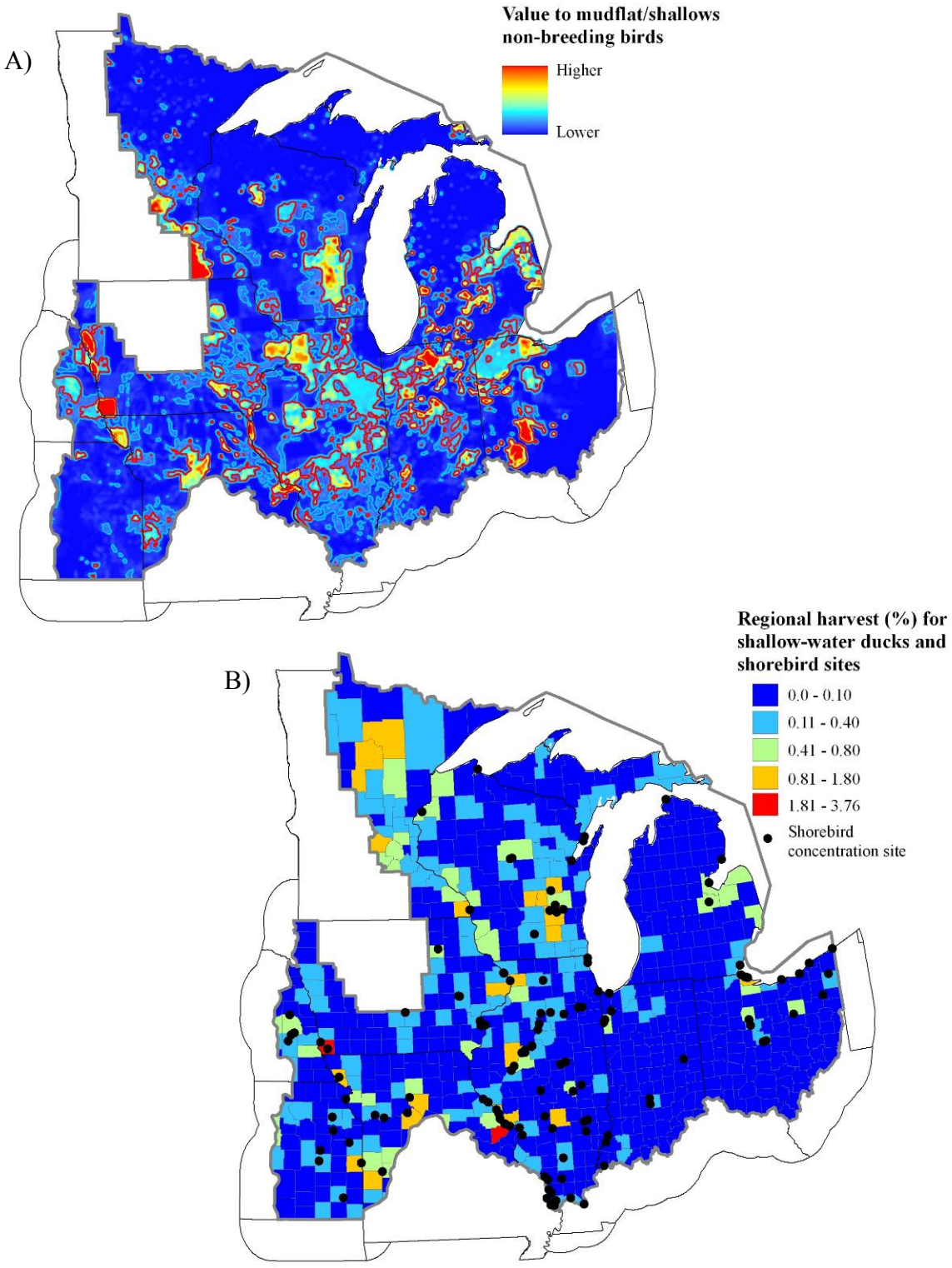


Figure 9. Decision-support maps to target regional mudflat / shallows conservation effort for birds during the non-breeding period. A) Value is based on potential shorebird restoration areas (percent hydric soils, STATSGO 1991) and harvest of waterfowl that frequent mudflat / shallow water communities. Areas were only scored in existing agricultural cover (National Land Cover Data 2001). *General rule for use:* Locations encompassed by red lines reflect existing important areas with greater habitat maintenance / protection emphasis, while areas within blue lines suggest a restoration / enhancement focus. B) County level harvest data (1995–2004) can be used to crudely estimate mudflat / shallow water duck species distribution. Shorebird concentration areas are based on documented migration staging sites.

Funding Needs and Sources

Developing a meaningful cost estimate for the tremendous amount of work recommended in the Implementation Plan is impossible. Costs for conservation work vary greatly across the JV region. For example, the cost of acquiring (protecting) a marsh in central Minnesota will typically be significantly different compared to a similar sized area in northeast Illinois. Likewise, the cost for contracting heavy equipment operation related to many restoration and enhancement projects will be different in remote rural areas than sites near urban centers. Some of the recommended work may actually generate income. For example, restoring or creating a quality shrubland can result from a strategically placed timber sale, such as an aspen "clear-cut" (complete removal of mature trees).

Regarding evaluation, costs for monitoring and research will vary depending on which and how many programs from the plan are selected by JV partners for completion and who does the data collection, analysis, and reporting. Funding sources for bird habitat implementation projects and evaluation will require future discussion by the JV Management Board and Technical Committee. JV partners have access to several traditional funding sources, especially state agencies with active land acquisition and management programs. There are other resources available for private landowners and JV partners working with landowners. Some of the more substantial sources for conservation dollars on private land are listed below. Many other smaller grant and project funding sources exist but are not included in this document.

North American Wetlands Conservation Act (NAWCA). The NAWCA (act of 1989) provides matching grants to organizations and individuals who have developed partnerships to carry out wetland conservation projects in the United States, Canada, and Mexico. The FWS Division of Bird Habitat Conservation manages two grant programs under the Act: the Standards Grants Program and the Small Grants Program. More information may be obtained at http://www.fws.gov/birdhabitat/Grants/index.shtm.

Neotropical Migratory Bird Conservation Act (NMBCA). The NMBCA (act of 2000) establishes a matching grants program to fund projects in the United States, Canada, Latin America, and the Caribbean. It promotes conservation of Neotropical migrating birds, with emphasis on non-breeding habitat. More information may be obtained at http://www.fws.gov/birdhabitat/Grants/index.shtm.

Conservation Reserve Program (CRP). The CRP is a voluntary program which provides technical and financial assistance to farmers and ranchers interested in addressing soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. It encourages eligible landowners to convert highly erodible cropland or other environmentally sensitive acreage to permanent cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers. CRP is administered by the Farm Service Agency. The USDA Natural Resources Conservation Service (NRCS) provides eligibility determinations, conservation planning, and

implementation assistance. More information may be obtained at http://www.nrcs.usda.gov/programs/crp/ .

Wetlands Reserve Program (WRP). The WRP is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The NRCS provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection. More information may be obtained at http://www.nrcs.usda.gov/programs/wrp/.

Conservation Security Program (CSP). The CSP is a voluntary program that provides financial and technical assistance to promote conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation values on Tribal and private working lands. Working lands include cropland, grassland, prairie land, improved pasture, and range land, as well as forested land that is an incidental part of an agriculture operation. The program is available to all producers, regardless of size of operation, crops produced, or geographic location. CSP is administered by the NRCS. More information may be obtained at http://www.nrcs.usda.gov/programs/csp/.

Environmental Quality Incentives Program (EQIP). The EQIP is a voluntary program that promotes agricultural production and environmental quality as compatible national goals. It offers financial and technical help to assist participants install or implement structural and management practices on eligible agricultural land. EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practice and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. Activities are carried out according to an environmental quality incentives program plan of operations, developed with the producer, which identifies appropriate conservation practices to address resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. More information may be obtained at http://www.nrcs.usda.gov/programs/eqip/

Program Evaluation

Evaluation via monitoring and research are critical to measure population trends and management results, fill information gaps, and to improve management decisions. Monitoring and research objectives were established and prioritized in each of the JV bird-group strategies. Because monitoring and research are often activities along a continuum, the intent of both was clarified by the JV Science Team: *Monitoring is designed and implemented to measure progress toward meeting JV population goals and habitat objectives. Research, on the other hand, is designed to answer specific questions that arise from uncertainties or assumptions inherent in conservation planning and implementation.* Strategic Habitat Conservation (SHC) also frames the critical nature of evaluation in bird conservation.

Strategic Habitat Conservation – Evaluation Elements

1. Assumption-driven Research. Under the SHC framework, science is both a body of knowledge and a method of learning. Recognizing that the body of knowledge will always be incomplete, we make assumptions to bridge the knowledge gaps about limiting factors and their effects on populations. At this point, science as a method of learning takes over because, to be credible managers, we evaluate the accuracy of our assumptions and begin to fill knowledge gaps. This is how we improve future decisions regarding where and how to deliver habitat conservation programs.

Not all assumptions are equally important. We may consider each in terms of 1) how uncertain it is, and 2) how much would better information affect future management decisions. Assumptions that are both highly uncertain and have a high potential impact on management decisions are priorities for research. When targeted this way, we address "mission critical" assumptions first.

2. Monitoring Project Outcomes. To evaluate whether or not management actions are having the predicted consequences it is necessary to monitor actual outcomes. Monitoring outcomes is not simply counting birds after a project is completed. The methods depend on the inferences we want to make. Monitoring project outcomes consists of answering two basic questions. First, did the management action yield the expected habitat response? And second, did the change in habitat evoke the expected response in targeted species? Answers to the first question enable managers to adjust their tactics to more consistently achieve desired habitat conditions. The second question is how we assess performance or refine our predictions about species responses to management.

If we want to assess outcomes and compare them to the predictions in a proposal for a specific site, we need to conduct multiple counts over time. The longer the time span, the more accurate our understanding of actual outcomes becomes. Conversely, if we need to assess average outcomes over many sites, counts at each site may be fewer. In short, project outcomes can only be reliably assessed using many counts averaged over space and/or time.

3. Estimating Program Accomplishments. We are ultimately concerned with estimating both gross and net accomplishments toward bird population objectives. Since almost all projects occur in partnership with other agencies and programs, estimating accomplishments in terms of total population impacts for any individual funding source would be very difficult. Tracking land area influenced, funding, and partnerships also are useful ways to report accomplishments but are less directly relevant to the desired outcomes for bird populations.

Net progress toward population objectives is a function of habitat gains versus losses, and consequent changes in range-wide populations, which are driven by a wide array of conservation programs as well as other socio-economic and environmental factors. As reported in the recent NAWMP Assessment Report (NAWMP Assessment Steering Committee 2007), we are currently unable to measure net results for most populations of North American waterfowl. Addressing this weakness is a high priority recommendation adopted by the NAWMP Committee, but effectively ascertaining net accomplishments for any particular group of birds will be a significant challenge.

Monitoring Priorities

During the process of developing the four JV bird-group strategies, sources of monitoring data and monitoring needs were identified for improving our understanding of population trends and to measure management results. The following themes, with an emphasis on JV focal species, were prominent among the bird groups: 1) determine status and trends of populations, 2) determine causes of population change, 3) evaluate conservation efforts, and 4) inform conservation design.

Determine status and trends of populations. Conduct statistically valid monitoring to estimate population size (breeding, migration, and wintering) and track changes in abundance, relative abundance, and distribution at scales relevant to the JV. New or enhanced monitoring approaches will be required, particularly for secretive marshbirds and shorebirds.

Determine causes of population change. Track bird habitat change within the region, specifically quantity and quality of key cover types critical to increasing carrying capacity. Incorporate climate change monitoring data into population and habitat assessments.

Evaluate conservation efforts. Conduct a complete land cover inventory every 5–10 years, supplemented with periodic model-based estimates of change in land cover types most important to birds. Determine relative importance of JV conservation effort by ecological regions and evaluate bird response (e.g., change in population size and distribution, use days, vital rates, or physical condition).

Inform conservation design. Improve monitoring of patch or subpopulation persistence, extinction, and colonization by priority breeding species (JV focal species). Assess migratory stopover use (i.e., duration, number of stops, chronology) at staging and wintering areas.

Habitat Monitoring Limitations

In the process of developing this Implementation Plan an initial bird "habitat baseline" was established using National Wetland Inventory Data (NWI) and National Land Cover Data (NLCD). Unfortunately, the NWI is dated (>25 years old) and coverage is incomplete in portions of the region. It currently is being updated for many JV states using recent aerial photography. When the update is complete, wetland cover type estimates will be improved and a crude assessment of wetland trends across the JV region can be conducted. Although new NWI data will improve some bird habitat quantity estimates, it will not provide an index of yearly change, nor will it be useful in assessing habitat quality. NLCD includes upland cover types not depicted by the NWI. However, it too has considerable limitations for tracking bird habitat change. The number of identified wetland types is far more restricted than the NWI, there are significant errors in accuracy, and the timeframe between new data releases is substantial (10 years between the latest datasets). In addition, similar to the NWI, no measure of bird habitat quality can be determined from the NLCD.

Alternatives to track bird habitat trends must be explored, but the task is enormous considering the size and diversity of cover types in the JV region. Two potential options have been identified, including establishing a habitat index based on annual data sets already collected (e.g., Great Lakes water levels, precipitation, or soil moisture), and purchasing yearly imagery of sample areas then extrapolating change over the whole JV region. The index technique can track environmental change very well but may still be limited in its ability to track human influenced change (positive and negative). Purchasing

and analyzing imagery for sample areas across the JV region may provide a more accurate assessment of habitat quantity change and other useful products, though this may require resources beyond those currently available.

The JV staff will continue efforts to improve tracking of bird habitat and collaborate in this universal challenge with other JVs and the National Science Support Team (NSST). Some smaller and less diverse JVs have developed effective systems to inventory cover types important to bird groups and predict changes in bird abundance and distribution with varied management prescriptions. One group developed a Hierarchical All Bird Strategy (HABS) database for conservation planning and implementation, which was used to set goals and measure progress toward goals (Playa Lakes Joint Venture 2005). Much can be learned from collaborating with other JV bird scientists and GIS specialists in the use of spatial tools, population data, and biological planning.

Research Priorities

Development of the four JV bird-group strategies resulted in identification of many information gaps and research needs. Lists of specific research priorities are documented in the strategies, but the following themes were prominent among the bird groups: 1) refine breeding habitat models, 2) conduct behavioral research, and 3) evaluate habitat used during the non-breeding period.

Refine breeding habitat models. Test model assumptions and build / refine models that predict how populations of priority breeding species (JV focal species) respond to habitat change. Specifically, research should address:

1. Breeding bird density estimates and specific aspects of habitat quality most related to changes in density.
2. Factors limiting breeding season vital rates (e.g., nest success, adult female survival, and young survival).
3. Influence of vital rates on population growth.
4. Predicted distribution and abundance in response to habitat quantity, habitat quality, and conservation alternatives.
5. Vulnerability to climate change, especially those species and associated ecosystems of greatest concern.

Conduct behavioral research. Improve understanding of migration corridor selection, movement chronology, and human influences on migrating and wintering populations to better predict habitat needs and target conservation areas. Specifically, research should address:

1. Migration corridor identification, duration of stay at stopover locations, and total non-breeding use days in the region.
2. Optimum spatial arrangement of cover types within and between migrating and wintering habitat, including inter-wetland distances, and juxtaposition with upland cover types such as cropland, human developments, and permanent natural cover.
3. Effective and efficient mitigation of potential human-induced limiting factors (e.g., disturbance, water quality, pollutants, contaminants, and sedimentation).

Evaluate non-breeding habitat. Examine habitat objectives and use at multiple scales and build models to evaluate habitat carrying capacity for priority migrating and wintering populations (JV focal species). Specifically, research should address:

1. Refined estimates of migrating and wintering populations, particularly for waterbirds, landbirds, and shorebirds.
2. Retrospective analyses (using historic data) of carrying capacity based on energy requirements and availability (bioenergetics).
3. Analyses and models to predict expected carrying capacity in the face of changing habitat conditions (e.g., climate change, wet vs. dry years, with/without habitat programs, continued habitat loss, etc.).

Adaptive Management

Implementing a truly active adaptive management process is currently unfeasible for the JV because it would require landscape-scale experiments with adequate replication of alternative treatments and models. However, each of the JV bird-group strategies includes a section on adaptive management to help move the partnership in this direction. Moreover, the term "adaptive management" implies different things to different people, often depending on their background and the conservation arena within which they work (i.e., research, management, administration). The NAWMP (2004) uses the term adaptive management *"in a broad and inclusive sense to mean the use of cyclic planning, implementation, and evaluation to improve management performance."* Adaptive Resource Management (ARM) provides an explicit framework that ensures monitoring data are relevant and useful in making management decisions and provides a means to improve future decision-making through an iterative cycle of biological prediction and testing.

Adaptive Resource Management (ARM) provides an explicit framework that ensures monitoring data are relevant and useful in making management decisions and provides a means to improve future decision-making through an iterative cycle of biological prediction and testing.

Although adaptive management does not need to be complex, it does require commitment to the process. Critical preconditions for successful ARM include consensus regarding objectives and a commitment to manage adaptively. ARM can increase JV effectiveness and efficiency by improving capacity in all three iterative steps: planning, implementation, and evaluation. Planning, at all levels, is based on a set of assumptions, often embodied in implicit or explicit models like those used in the JV bird-group strategies. These models predict how JV focal species will respond to habitat changes and management actions. Strategic planning incorporates this biological foundation, with a set of assumptions, in selecting priority areas and specific habitat objectives required to achieve population goals. A commitment by JV partners to complete identified monitoring and research priorities and use the information to refine plans and improve management decisions will assure effective ARM.

Communications and Outreach

The Joint Venture is a diverse partnership with an even more diverse "customer base" for habitat conservation delivery. Developing and implementing internal and external communications is essential to keep JV partners informed, engaged, and coordinated, as well as to cultivate support from key constituents. The process requires identification of relevant target audiences, key messages, and appropriate methods of information dissemination. Evaluating the effectiveness of communications also is challenging, as public (and partner) attitudes, opinions, and behaviors are not easily influenced or tracked.

A primary product of JV outreach is information that influences the actions of others. We must be effective and compelling at communicating JV goals and strategies to conservation stakeholders including the public and elected officials. Coordinating through various communication approaches is critical to reach public and private entities outside the JV who may have significantly greater resources to affect bird habitats than current partners.

The JV communications program consists of two parts, internal communications and external communications. The goal of internal communication is to share information among existing partners, particularly members of the Management Board and Technical Committee, and to facilitate completion of JV habitat conservation, monitoring, and research initiatives. The goal of external communications is to provide recommendations to management bodies, recruit new JV partners, and raise awareness and support for bird conservation among stakeholders and policy-makers. To fulfill these goals the JV has established the following priorities:

Internal communications

1. Maintain a current list (with contact information) of JV partners, including Management Board and Technical Committee members and other primary partners not represented in these two bodies.
2. Maintain a current list of habitat, monitoring, and research priorities associated with achieving JV Implementation Plan goals.
3. Develop and maintain a current list of completed and on-going research projects, including abstracts containing vital reference information from each.
4. Develop annual JV progress reports with habitat accomplishments by cover type.
5. Maintain and share in a timely manner meeting minutes from Management Board and Technical Committee gatherings.
6. Develop and maintain up-to-date species accounts for birds of greatest conservation concern in the JV region, including ecological information, population and habitat objectives, and management decision support tools.
7. Provide above listed materials and other potentially valuable communications (i.e., publications, interviews, agency accomplishment reports) to JV partners via the Upper Mississippi River and Great Lakes Region Joint Venture webpage (www.UpperMissGreatLakesJV.org).

External communications

1. Exchange information and collaborate on priority bird planning, monitoring, and research with associated JVs.
2. Collaborate on priority bird monitoring and research with University and non-government organization scientists.
3. Collaborate on priority bird planning, monitoring, and research with management entities.
4. Participate and provide information (e.g., presentations) regarding JV bird conservation priorities and planning tools to stakeholders and interest groups.
5. Provide above listed materials and other potentially valuable communications to external groups via the Upper Mississippi River and Great Lakes Region Joint Venture webpage (www.UpperMissGreatLakesJV.org).
6. Collaborate on workshops, symposia, and similar gatherings to provide current information and data to managers, policy-makers, and other stakeholders regarding bird conservation in the JV region.

Target audiences and communication responsibilities

Internal target audiences for JV communications include:

1. Management Board
2. Technical Committee
3. Ad hoc JV Science Team members
4. Migratory Bird Program staff of the U.S. Fish and Wildlife Service

External target audiences include:

1. State wildlife agencies in the JV region (key contacts not on Management Board).
2. Associated species and habitat JVs.
    a. Species JVs: Black Duck, Arctic Goose, and Sea Duck.
    b. Habitat JVs: Prairie Potholes, Atlantic Coast, Rainwater Basin, Playa Lakes, Central Hardwoods, Appalachian Mountains, Lower Mississippi Valley, Gulf Coast, East Gulf Coastal Plain, and Eastern Habitat (Canada).
3. Species management groups including the FWS Endangered Species Program, the Mississippi Flyway Council and associated technical committees, and State agency species managers.
4. Primary land management groups including the FWS National Wildlife Refuge System, U.S. Forest Service, U.S. Park Service, U.S. Army Corps of Engineers, and State agency and other conservation land managers.
5. North American Waterfowl Management Plan National Science Support Team (NSST).
6. North American Waterfowl Management Plan Committee.
7. U.S. Coordinators for the NAWMP, Partners In Flight, Waterbirds, Shorebirds, and North American Bird Conservation Initiative (NABCI).
8. Non-government conservation organizations (NGOs).
9. State and Federal policy-makers.
10. General public.

Much of the JV communications network is maintained and coordinated by the Joint Venture Coordinator and Management Board through ongoing professional channels. The JV webpage (www.UpperMissGreatLakesJV.org) will be a collaborative partner effort facilitated by the JV Coordination Staff (Minneapolis, Minnesota). Management Board members and JV Staff also will collaborate in hosting periodic symposia and workshops to provide management entities and the public with current conservation information on bird ecology, limiting factors for priority species, and management alternatives. Reporting on monitoring and research supported by the JV will be coordinated by the JV Science Staff (East Lansing, Michigan). Science partners will be encouraged to publish results of studies in professional peer-reviewed scientific journals and present information at professional meetings.

Timetable for Plan Implementation

This Joint Venture Implementation Plan is scheduled to be completed between 2007 and 2022. However, during this 15-year time horizon we expect periodic changes in the technical JV bird-group strategies and subsequent adjustments in the all-bird habitat objectives as part of the plan-implement-evaluate cycle of adaptive management. Bird habitat objectives are stated explicitly by State and BCR units (Appendix A–E) to provide JV partners guidance in bird management decisions linked to continental bird conservation priorities. Planning assumptions, monitoring, and research needs also are identified and objectives stated in JV bird-group strategies, including target dates for completion. Knowledge gained through management actions and completion of research, monitoring, and testing of habitat models and assumptions will dictate the intervals for refinement of this Implementation Plan.

Conservation planning and strategy refinement will continue to be the responsibility of the JV Technical Committee, which is led by the JV Science Coordinator. Plan approval, implementation of conservation actions to achieve population goals, and establishment of JV priorities remains the responsibility of the JV Management Board. Partner coordination, funding collaboration, communications, and program accountability will be the responsibility of the JV Coordination Office (Minneapolis, Minnesota), whereas acquisition of GIS spatial data, habitat model development, and collaboration with research and science partners will be the responsibility of the JV Science Office (East Lansing, Michigan). JV partners have an impressive record of achievement, and using the habitat objectives, decision-support tools, and research and monitoring recommendations provided in this Implementation Plan, partners should continue to increase conservation efficiency and effectiveness for all bird groups.

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Appendix A. All-bird habitat conservation objectives for marsh-wetland cover types used by breeding birds at the State, BCR, and State×BCR land-area scales in the Upper Mississippi River and Great Lakes Joint Venture region. Objectives are displayed in tabular (A-1) and graphic (A-2) format, plus bird-groups responsible for objectives (greatest area requirement) are identified (A-3).

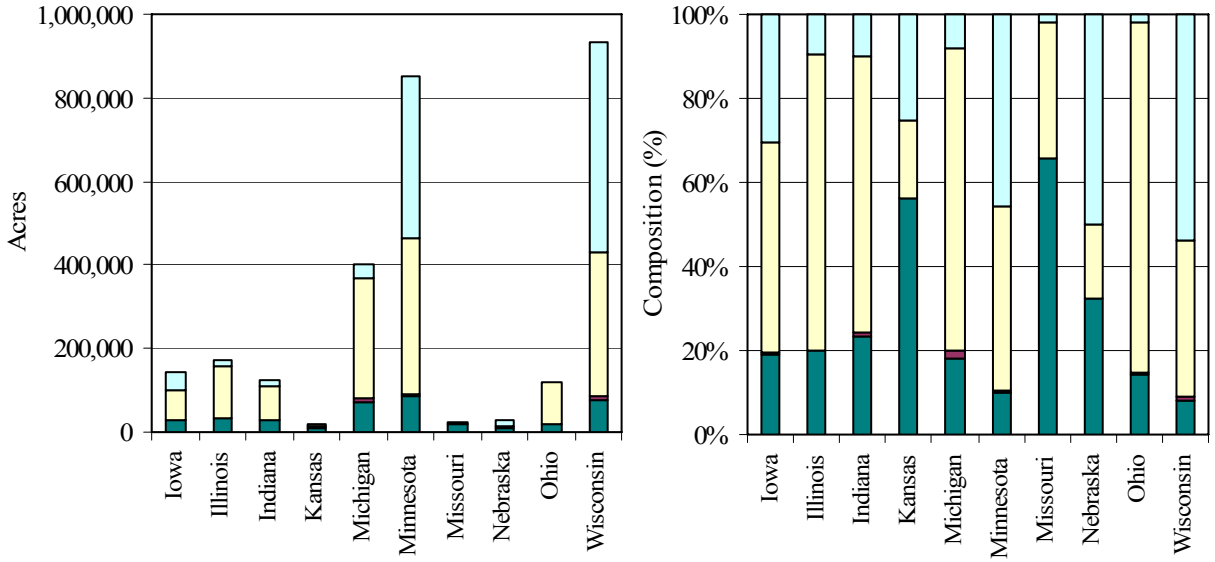
Appendix A-1. Marsh-wetland conservation objectives (acres) by state and Bird Conservation Region (BCR) to meet breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region[a]. Maintenance / protection (M/P) is distinguished from restoration / enhancement (R/E); also see Appendix A-2 for graphic display of habitat objectives and Appendix A-3 for bird-group responsible for objective (group with greatest habitat need).

State	BCR	Wet meadow with open water		Shallow semi-permanent marsh, hemi-marsh		Deep-water marsh		Marsh with associated shrub/forest	
Practice >		*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*
Iowa	22	43,220	8,645	68,436	9,359	27	12	26,696	5,340
	23	1,040	1,218	4,720	692	699	351	1,047	210
	Total	44,260	9,863	73,156	10,050	726	363	27,743	5,550
Illinois	22	15,551	3,110	112,096	13,825	30	15	27,958	5,592
	23	487	568	4,720	743	351	175	820	163
	24	847	170	5,901	615	0	0	5,765	1,153
	Total	16,885	3,848	122,715	15,183	380	190	34,543	6,909
Indiana	22	8,040	1,608	48,377	10,537	12	5	13,150	2,631
	23	3,890	2,216	18,878	5,029	1,050	524	6,583	1,317
	24	435	86	14,161	2,418	0	0	9,159	1,833
	Total	12,365	3,910	81,416	17,984	1,062	529	28,892	5,780
Kansas	22 / Total	4,792	958	3,540	1,257	17	7	10,609	2,122
Michigan	12	24,043	28,123	140,415	29,850	2,075	1,037	38,927	7,785
	22	0	0	10,619	1,149	0	0	1,452	291
	23	9,067	9,890	136,875	38,065	5,068	2,534	31,959	6,392
	Total	33,110	38,013	287,908	69,064	7,143	3,572	72,339	14,469
Minnesota	12	96,861	26,553	160,473	38,799	1,971	986	44,919	8,983
	22	9,117	1,823	33,039	2,705	2	2	4,411	882
	23	283,941	56,788	180,532	21,588	2,097	1,050	36,082	7,217
	Total	389,919	85,163	374,044	63,091	4,071	2,038	85,413	17,083
Missouri	22 / Total	506	101	8,260	1,689	20	10	16,836	3,367
Nebraska	22 / Total	13,242	2,648	4,720	1,623	5	2	8,559	1,712
Ohio	13	2,055	2,408	31,858	5,355	576	287	2,959	734
	22	0	0	56,637	10,243	12	7	11,337	2,267
	24	0	0	0	104	0	0	215	42
	28	0	2,408	12,980	2,137	0	0	3,023	605
	Total	2,055	4,817	101,475	17,838	588	294	17,535	3,648
Wisconsin	12	51,430	14,887	90,856	12,590	1,141	571	18,024	3,604
	22	2,122	425	4,720	800	0	0	1,013	203
	23	450,945	90,190	250,149	53,710	8,213	4,108	56,590	11,318
	Total	504,498	105,501	345,726	67,100	9,354	4,678	75,626	15,124
All States	12	172,334	69,563	391,744	81,238	5,187	2,594	101,870	20,373
	13	2,055	2,408	31,858	5,355	576	287	2,959	734
	22	96,589	19,318	350,446	53,187	126	62	122,020	24,406
	23	749,371	160,869	595,875	119,827	17,478	8,741	133,081	26,617
	24	1,282	257	20,059	3,137	0	0	15,139	3,028
	28	0	2,408	12,980	2,137	0	0	3,023	605
	Total	1,021,632	254,822	1,402,960	264,880	23,366	11,683	378,093	75,762

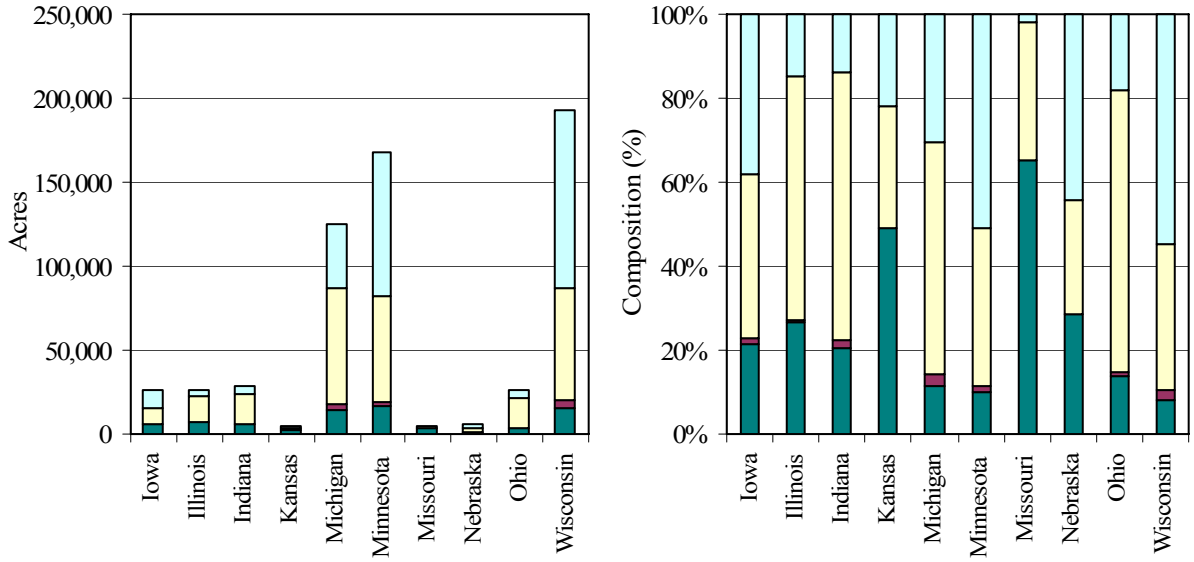
[a]See JV bird-group conservation strategies for information on how specific habitat objectives were generated and Table 4 in this document for more detailed cover type descriptions. The metric conversion is 1 acre = 0.40 ha.

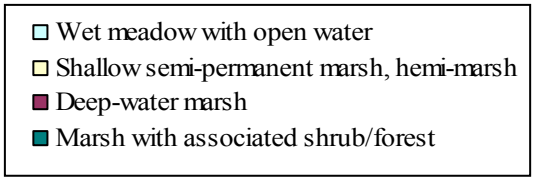
Appendix A-2. Marsh-wetland conservation objectives (acres) and composition of cover type objectives (%) by state to meet breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region.

Protection / maintenance objectives - breeding



Restoration / enhancement objectives - breeding





Appendix A-3. Bird-group responsible (greatest need) for marsh-wetland conservation objectives by state and Bird Conservation Region (BCR) to meet breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region. Maintenance / protection (M/P) is distinguished from restoration / enhancement (R/E).

State	BCR	Wet meadow with open water		Shallow semi-permanent marsh, hemi-marsh		Deep-water marsh		Marsh with associated shrub/forest	
Practice >		*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*
Iowa	22	Waterfowl	Waterfowl	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	23	Shorebird	Shorebird	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
Illinois	22	Waterfowl	Waterfowl	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	23	Shorebird	Shorebird	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	24	Waterfowl	Waterfowl	Waterfowl	Waterfowl	NA	NA	Waterfowl	Waterfowl
Indiana	22	Waterfowl	Waterfowl	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	23	Waterfowl	Shorebird	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	24	Waterfowl	Waterfowl	Waterfowl	Waterfowl	NA	NA	Waterfowl	Waterfowl
Kansas	22	Waterfowl	Waterfowl	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
Michigan	12	Shorebird	Shorebird	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	22	NA[a]	NA	Waterfowl	Waterfowl	NA	NA	Waterfowl	Waterfowl
	23	Waterfowl	Shorebird	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
Minnesota	12	Waterfowl	Shorebird	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	22	Waterfowl	Waterfowl	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	23	Waterfowl	Waterfowl	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
Missouri	22	Waterfowl	Waterfowl	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
Nebraska	22	Waterfowl	Waterfowl	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
Ohio	13	Shorebird	Shorebird	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	22	NA	NA	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	24	NA	NA	Waterfowl	Waterfowl	NA	NA	Waterfowl	Waterfowl
	28	NA	NA	Waterfowl	Waterfowl	NA	NA	Waterfowl	Waterfowl
Wisconsin	12	Waterfowl	Shorebird	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl
	22	Waterfowl	Waterfowl	Waterfowl	Waterfowl	NA	NA	Waterfowl	Waterfowl
	23	Waterfowl	Waterfowl	Waterfowl	Waterfowl	Waterbird	Waterbird	Waterfowl	Waterfowl

[a]NA identifies State×BCR areas without a priority bird species or guild representing the specific cover type.

Appendix B. All-bird habitat conservation objectives for woodland cover types used by breeding birds at the State, BCR, and State×BCR land-area scales in the Upper Mississippi River and Great Lakes Joint Venture region. Objectives are displayed in tabular (B-1) and graphic (B-2) format, plus bird-groups responsible for objectives (greatest area requirement) are identified (B-3).

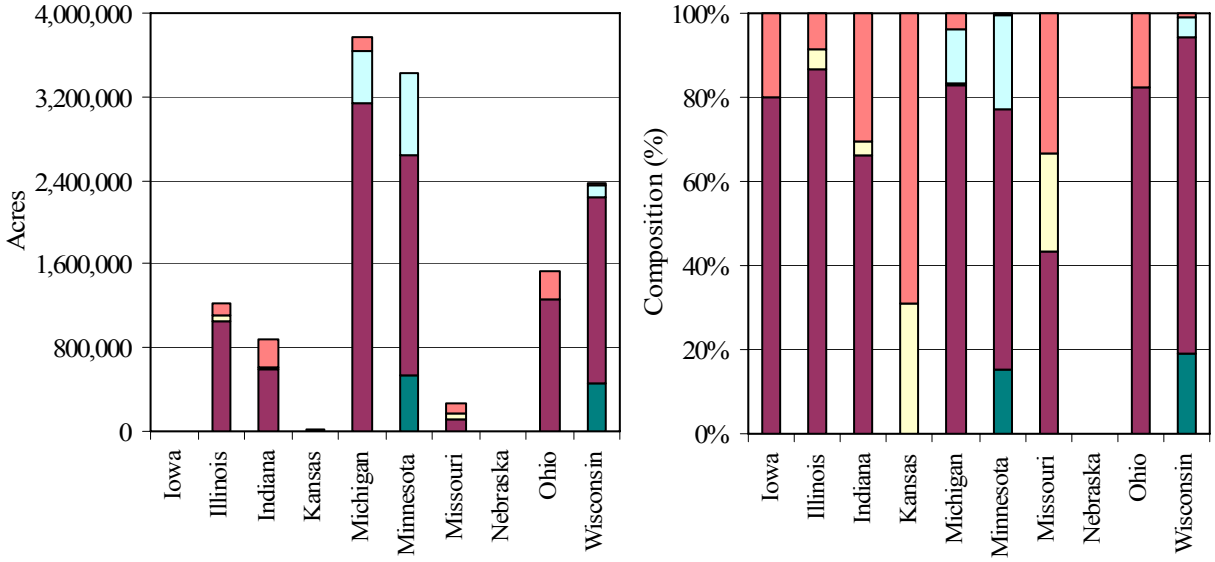
Appendix B-1. Woodland conservation objectives (acres) by state and Bird Conservation Region (BCR) to meet breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region[a]. Maintenance / protection (M/P) is distinguished from restoration / enhancement (R/E); also see Appendix B-2 for graphic display of habitat objectives and Appendix B-3 for bird-group responsible for objective (group with greatest habitat need).

State	BCR	Deciduous forest		Evergreen forest		Forested wetland		Shrubland		Other forest	
Practice >		*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*
Iowa	22	1,235	741	0	0	0	0	4,940	1,976	0	0
	23	0	0	0	0	0	0	0	0	0	0
	Total	1,235	741	0	0	0	0	4,940	1,976	0	0
Illinois	22	15,314	7,657	0	0	36,556	18,278	607,620	741	0	0
	23	0	0	0	0	0	0	5,434	4,940	0	0
	24	88,179	44,213	0	0	23,959	11,856	439,660	3,458	0	0
	Total	103,493	51,870	0	0	60,515	30,134	1,052,714	9,139	0	0
Indiana	22	3,211	3,211	0	0	741	247	187,720	266,760	0	0
	23	1,235	1,235	0	0	988	494	51,870	74,100	0	0
	24	264,537	132,392	0	0	29,640	14,820	345,800	508,820	0	0
	Total	268,983	136,838	0	0	31,369	15,561	585,390	849,680	0	0
Kansas	22 / Total	8,892	4,446	0	0	3,952	1,976	0	0	0	0
Michigan	12	116,090	988	494,000	43,472	0	0	3,050,450	350,740	0	0
	22	0	0	0	0	0	0	0	34,580	0	0
	23	20,995	20,995	0	0	11,609	5,681	83,980	674,310	6,916	0
	Total	137,085	21,983	494,000	43,472	11,609	5,681	3,134,430	1,059,630	0	0
Minnesota	12	11,609	0	741,000	139,555	0	0	1,561,040	207,480	465,842	453,245
	22	0	0	0	0	0	0	56,810	0	0	0
	23	1,976	1,976	37,050	1,729	0	0	494,000	140,790	62,985	47,424
	Total	13,585	1,976	778,050	141,284	0	0	2,111,850	348,270	528,827	500,669
Missouri	22 / Total	88,179	44,213	0	0	61,750	30,875	113,620	3,952	0	0
Nebraska	22 / Total	0	0	0	0	0	0	0	0	0	0
Ohio	13	51,623	51,623	0	0	0	0	582,920	192,660	0	0
	22	8,151	8,151	0	0	494	247	271,700	397,670	0	0
	24	9,880	4,940	0	0	0	0	34,580	3,952	0	0
	28	200,070	155,116	0	0	494	247	370,500	103,740	0	0
	Total	269,724	219,830	0	0	988	494	1,259,700	698,022	0	0
Wisconsin	12	21,983	3,705	98,800	21,736	0	0	797,810	321,100	274,417	172,159
	22	0	0	0	0	0	0	2,223	988	0	0
	23	4,199	4,199	14,820	3,458	741	247	978,120	617,500	177,840	90,896
	Total	26,182	7,904	113,620	25,194	741	247	1,778,153	939,588	452,257	263,055
All States	12	149,682	4,693	1,333,800	204,763	0	0	5,409,300	879,320	740,259	625,404
	13	51,623	51,623	0	0	0	0	582,920	192,660	0	0
	22	124,982	68,419	0	0	103,493	51,623	1,244,633	706,667	0	0
	23	28,405	28,405	51,870	5,187	13,338	6,422	1,613,404	1,511,640	247,741	138,320
	24	362,596	181,545	0	0	53,599	26,676	820,040	516,230	0	0
	28	200,070	155,116	0	0	494	247	370,500	103,740	0	0
	Total	917,358	489,801	1,385,670	209,950	170,924	84,968	10,040,797	3,910,257	988,000	763,724

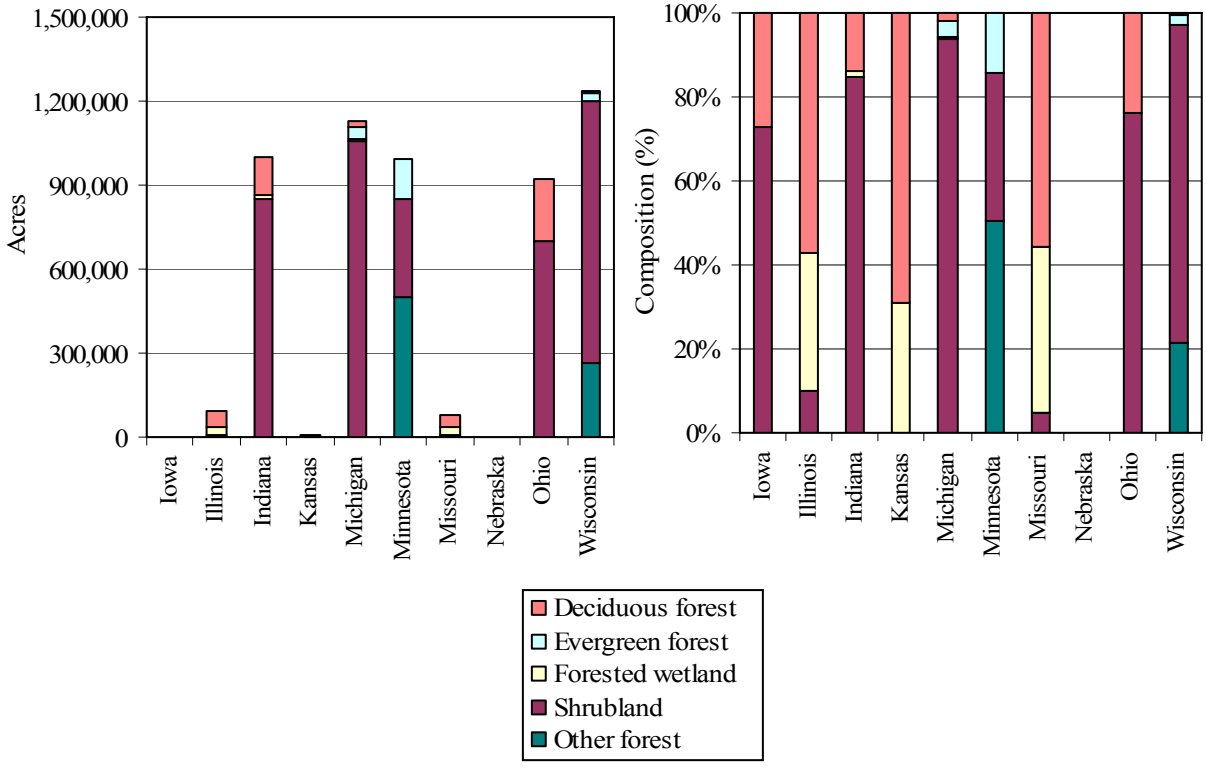
[a]See JV bird-group conservation strategies for information on how specific habitat objectives were generated and Table 4 in this document for more detailed cover type descriptions. The metric conversion is 1 acre = 0.40 ha.

Appendix B-2. Woodland conservation objectives (acres) and composition of cover type objectives (%) by state to meet breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region.

Protection / maintenance objectives - breeding



Restoration / enhancement objectives - breeding



Appendix B-3. Bird-group responsible (greatest need) for woodland conservation objectives by state and Bird Conservation Region (BCR) to meet breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region. Maintenance / protection (M/P) is distinguished from restoration / enhancement (R/E).

State	BCR	Deciduous forest		Evergreen forest		Forested wetland		Shrubland		Other forest	
Practice >		*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*
Iowa	22	Landbird	Landbird	NA	NA	NA	NA	Landbird	Landbird	NA	NA
	23	NA[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA
Illinois	22	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird	NA	NA
	23	NA	NA	NA	NA	NA	NA	Landbird	Landbird	NA	NA
	24	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird	NA	NA
Indiana	22	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird	NA	NA
	23	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird	NA	NA
	24	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird	NA	NA
Kansas	22	Landbird	Landbird	NA	NA	Landbird	Landbird	NA	NA	NA	NA
Michigan	12	Landbird	Landbird	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	NA
	22	NA	NA	NA	NA	NA	NA	NA	Landbird	NA	NA
	23	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird	Landbird	NA
Minnesota	12	Landbird	NA	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird
	22	NA	NA	NA	NA	NA	NA	Landbird	NA	NA	NA
	23	Landbird	Landbird	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird
Missouri	22	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird	NA	NA
Nebraska	22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ohio	13	Landbird	Landbird	NA	NA	NA	NA	Landbird	Landbird	NA	NA
	22	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird	NA	NA
	24	Landbird	Landbird	NA	NA	NA	NA	Landbird	Landbird	NA	NA
	28	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird	NA	NA
Wisconsin	12	Landbird	Landbird	Landbird	Landbird	NA	NA	Landbird	Landbird	Landbird	Landbird
	22	NA	NA	NA	NA	NA	NA	Landbird	Landbird	NA	NA
	23	Landbird	Landbird	Landbird	Landbird	Landbird	Landbird	Landbird	Landbird	Landbird	Landbird

[a]NA identifies State×BCR areas without a priority bird species or guild representing the specific cover type.

Appendix C. All-bird habitat conservation objectives for openland cover types used by breeding birds at the State, BCR, and State×BCR land-area scales in the Upper Mississippi River and Great Lakes Joint Venture region. Objectives are displayed in tabular (C-1) and graphic (C-2) format, plus bird-groups responsible for objectives (greatest area requirement) are identified (C-3).

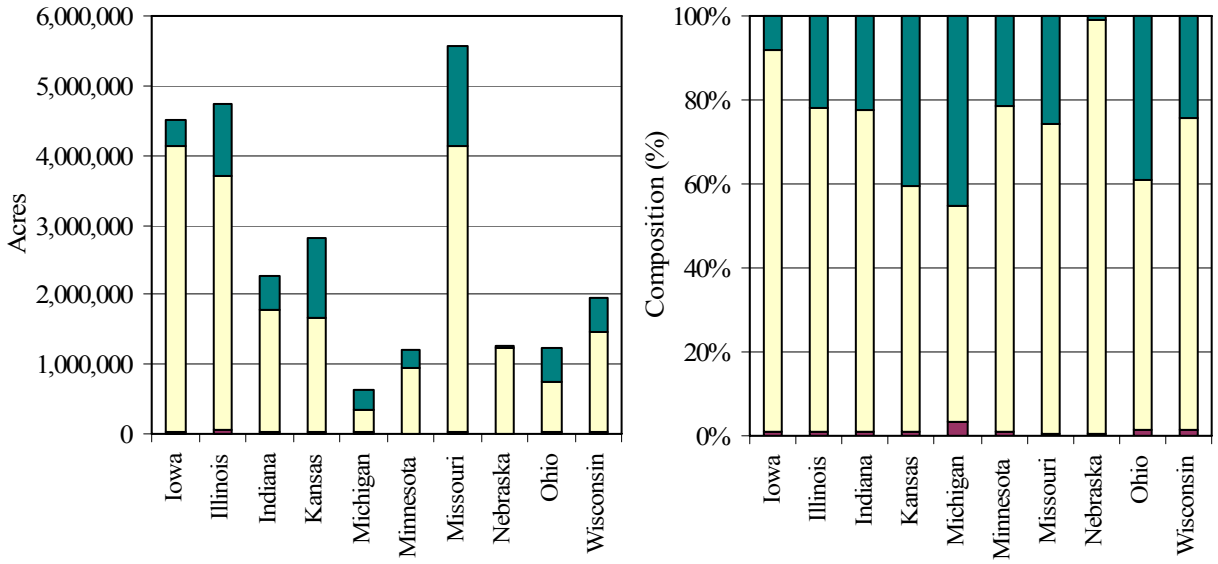
Appendix C-1. Openland conservation objectives (acres) by state and Bird Conservation Region (BCR) to meet breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region[a]. Maintenance / protection (M/P) is distinguished from restoration / enhancement (R/E); also see Appendix C-2 for graphic display of habitat objectives and Appendix C-3 for bird-groups responsible for objective (group with greatest habitat need).

State	BCR	Grassland		Mixed wooded openland		Dry mudflat / agriculture		Beach	
Practice >		*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*
Iowa	22	339,625	339,625	3,910,751	3,910,751	37,371	53,725	0	0
	23	23,218	23,218	193,401	193,401	2,058	2,959	0	0
	Total	362,843	362,843	4,104,152	4,104,152	39,429	56,684	0	0
Illinois	22	895,375	895,375	2,881,749	2,881,749	42,825	61,570	17	0
	23	23,218	23,218	63,726	63,726	961	1,383	0	0
	24	129,675	129,675	699,751	699,751	492	706	0	0
	Total	1,048,268	1,048,268	3,645,226	3,645,226	44,277	63,659	17	0
Indiana	22	231,686	231,686	720,499	720,499	15,494	22,277	0	0
	23	58,786	58,786	164,749	164,749	3,745	5,385	15	0
	24	216,125	216,125	864,500	864,500	911	1,312	0	0
	Total	506,597	506,597	1,749,748	1,749,748	20,150	28,973	15	0
Kansas	22 / Total	1,136,200	1,136,200	1,646,749	1,646,749	22,852	32,853	0	0
Michigan	12	114,361	114,361	92,625	92,625	1,717	2,470	210	0
	22	0	0	69,901	69,901	1,440	2,070	0	0
	23	169,936	169,936	164,749	164,749	16,717	24,033	27	0
	Total	284,297	284,297	327,275	327,275	19,874	28,573	237	0
Minnesota	12	143,260	143,260	98,800	98,800	1,620	2,332	1	0
	22	37,050	37,050	185,250	185,250	2,682	3,858	0	0
	23	77,311	77,311	658,749	658,749	7,415	10,661	0	0
	Total	257,621	257,621	942,799	942,799	11,718	16,850	1	0
Missouri	22 / Total	1,420,250	1,420,250	4,116,749	4,116,749	28,682	41,234	0	0
Nebraska	22 / Total	12,597	12,597	1,235,000	1,235,000	7,677	11,036	0	0
Ohio	13	92,625	92,625	185,250	185,250	568	818	2	0
	22	268,736	268,736	494,000	494,000	18,142	26,083	5	0
	24	6,422	6,422	0	0	0	203	0	0
	28	111,150	111,150	45,201	45,201	141	27,103	0	0
	Total	478,933	478,933	724,451	724,451	18,851	54,207	7	0
Wisconsin	12	37,050	37,050	32,851	32,851	909	1,307	64	0
	22	3,705	3,705	10,374	10,374	516	741	0	0
	23	432,250	432,250	1,399,749	1,399,749	27,713	39,844	15	0
	Total	473,005	473,005	1,442,974	1,442,974	29,139	41,891	79	0
All States	12	294,671	294,671	224,276	224,276	4,246	6,108	275	0
	13	92,625	92,625	185,250	185,250	568	818	2	0
	22	4,345,224	4,345,224	15,271,022	15,271,022	177,682	255,447	22	0
	23	784,719	784,719	2,645,123	2,645,123	58,608	84,264	57	0
	24	352,222	352,222	1,564,251	1,564,251	1,403	2,221	0	0
	28	111,150	111,150	45,201	45,201	141	27,103	0	0
	Total	5,980,611	5,980,611	19,935,123	19,935,123	242,648	375,961	357	0

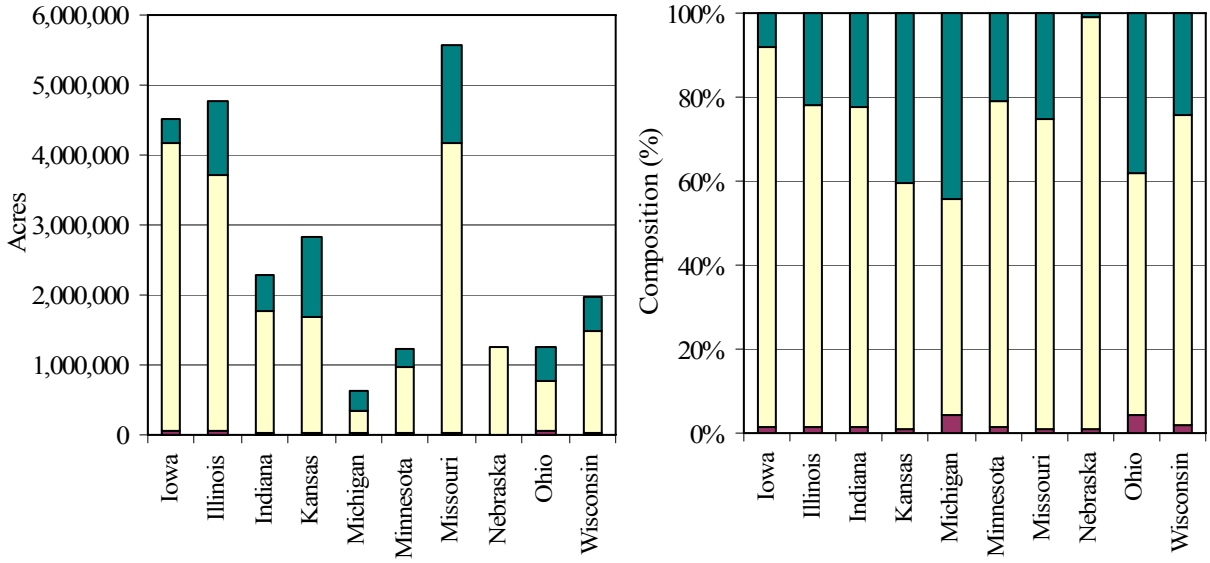
[a]See JV bird-group conservation strategies for information on how specific habitat objectives were generated and Table 4 in this document for more detailed cover type descriptions. The metric conversion is 1 acre = 0.40 ha.

Appendix C-2. Openland conservation objectives (acres) and composition of cover type objectives (%) by state to meet breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region.

Protection / maintenance objectives - breeding



Restoration / enhancement objectives - breeding



Appendix C-3. Bird-group responsible (greatest need) for openland conservation objectives by state and Bird Conservation Region (BCR) to meet breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region. Maintenance / protection (M/P) is distinguished from restoration / enhancement (R/E).

State	BCR	Grassland		Mixed wooded openland		Dry mudflat / agriculture		Beach	
Practice >		*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*
Iowa	22	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
	23	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
Illinois	22	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	Shorebird	NA
	23	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
	24	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
Indiana	22	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
	23	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	Shorebird	NA
	24	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
Kansas	22	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
Michigan	12	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	Shorebird	NA
	22	NA[a]	NA	Landbird	Landbird	Shorebird	Shorebird	NA	NA
	23	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	Shorebird	NA
Minnesota	12	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	Shorebird	NA
	22	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
	23	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
Missouri	22	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
Nebraska	22	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
Ohio	13	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	Shorebird	NA
	22	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	Shorebird	NA
	24	Landbird	Landbird	NA	NA	NA	NA	NA	NA
	28	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
Wisconsin	12	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	Shorebird	NA
	22	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	NA	NA
	23	Landbird	Landbird	Landbird	Landbird	Shorebird	Shorebird	Shorebird	NA

[a]NA identifies State×BCR areas without priority bird species population or guild representing the specific cover type.

Appendix D. All-bird habitat conservation objectives for marsh and deep water cover types used by non-breeding birds at the State, BCR, and State×BCR land-area scales in the Upper Mississippi River and Great Lakes Joint Venture region. Objectives are displayed in tabular (D-1) and graphic (D-2) format, plus bird-groups responsible for objectives (greatest area requirement) are identified (D-3).

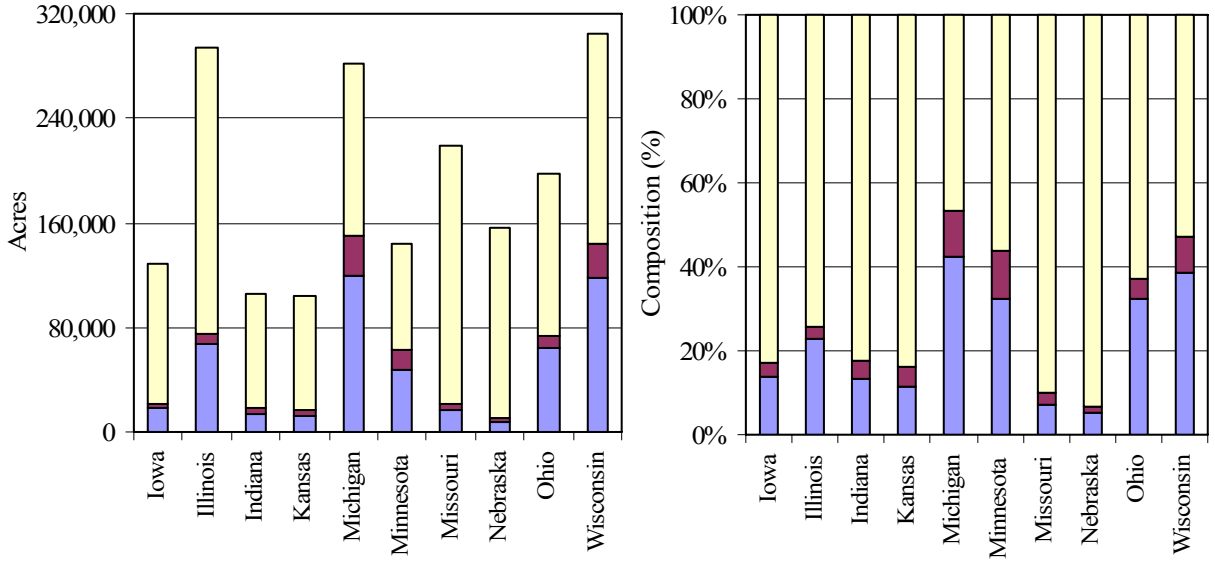
Appendix D-1. Marsh and deep water conservation objectives (acres) by state and Bird Conservation Region (BCR) to meet non-breeding season bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region[a]. Maintenance / protection (M/P) is distinguished from restoration / enhancement (R/E); also see Appendix D-2 for graphic display of habitat objectives and Appendix D-3 for bird-group responsible for objective (group with greatest habitat need).

State	BCR	Shallow semi-permanent marsh, hemi-marsh		Deep water marsh		Extensive open water	
Practice >		*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*
Iowa	22	94,670	988	2,996	0	14,027	2,860
	23	11,271	210	1,433	0	3,717	776
	Total	105,941	1,198	4,429	0	17,744	3,636
Illinois	22	185,754	2,124	6,629	0	56,862	3,456
	23	7,141	126	753	0	2,836	366
	24	26,471	672	785	0	7,361	230
	Total	219,366	2,922	8,168	0	67,058	4,051
Indiana	22	39,048	924	1,339	0	5,461	1,195
	23	19,491	536	2,626	0	6,585	1,410
	24	27,960	1,378	652	0	2,114	388
	Total	86,499	2,838	4,616	0	14,161	2,994
Kansas	22 / Total	87,544	627	4,725	0	12,145	1,949
Michigan	12	49,195	2,601	14,830	0	67,144	8,665
	22	3,129	94	338	0	2,018	170
	23	79,996	2,495	14,751	0	50,798	7,136
	Total	132,320	5,189	29,919	0	119,960	15,971
Minnesota	12	41,703	1,351	10,520	0	33,142	6,923
	22	5,385	72	301	0	916	200
	23	33,963	756	5,436	0	12,940	2,766
	Total	81,051	2,179	16,258	0	46,999	9,890
Missouri	22 / Total	197,551	840	5,651	0	16,114	2,354
Nebraska	22 / Total	146,520	282	2,149	0	7,941	627
Ohio	13	32,910	3,251	5,135	0	25,246	7,037
	22	62,229	4,199	3,018	0	25,648	4,461
	24	1,129	128	59	0	697	109
	28	27,531	2,532	1,178	0	12,874	2,020
	Total	123,799	10,110	9,391	0	64,465	13,627
Wisconsin	12	26,511	921	5,639	0	34,847	12,387
	22	1,131	20	49	0	694	309
	23	133,583	3,176	19,780	0	82,693	28,289
	Total	161,224	4,117	25,468	0	118,234	40,985
All States	12	117,409	4,873	30,989	0	135,134	27,975
	13	32,910	3,251	5,135	0	25,246	7,037
	22	822,962	10,169	27,197	0	141,827	17,581
	23	285,443	7,299	44,779	0	159,569	40,743
	24	55,560	2,179	1,497	0	10,171	726
	28	27,531	2,532	1,178	0	12,874	2,020
	Total	1,341,815	30,302	110,775	0	484,821	96,083

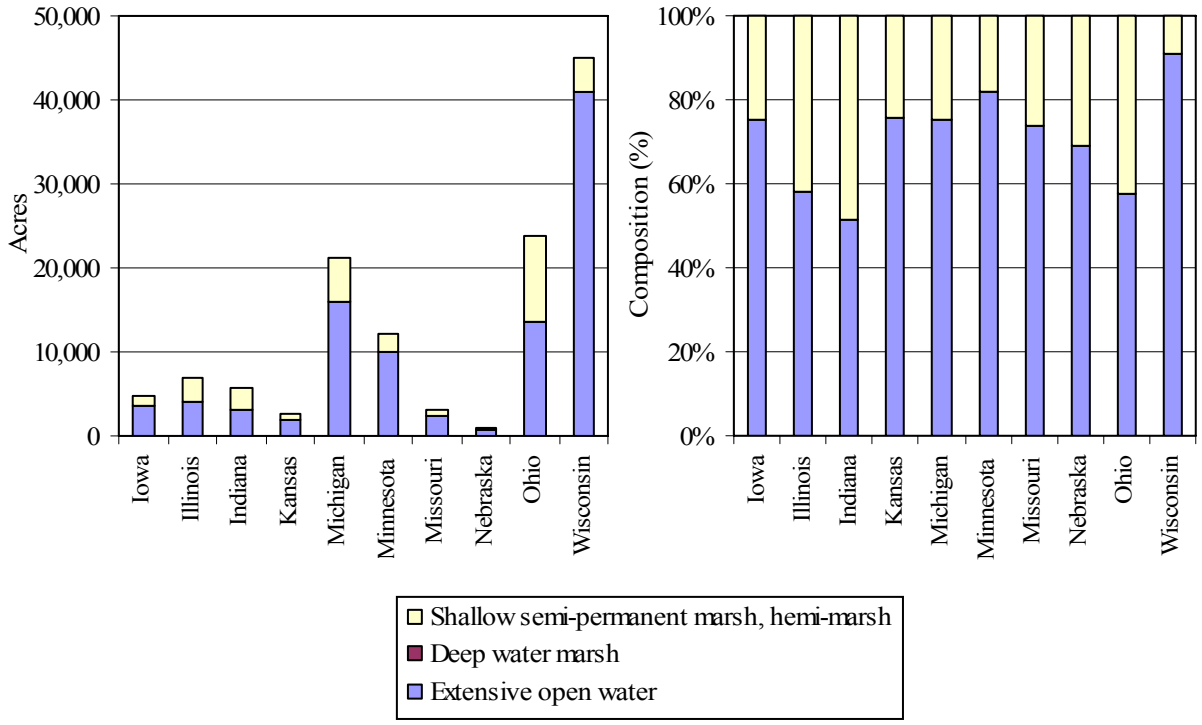
[a]See JV bird-group conservation strategies for information on how specific habitat objectives were generated and Table 4 in this document for more detailed cover type descriptions. The metric conversion is 1 acre = 0.40 ha.

Appendix D-2. Marsh and deep water conservation objectives (acres) and composition of cover type objectives (%) by state to meet non-breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region.

Protection / maintenance objectives - non-breeding



Restoration / enhancement objectives - non-breeding



Appendix D-3. Bird-group responsible (greatest need) for marsh and deep water conservation objectives by state and Bird Conservation Region (BCR) to meet non-breeding season bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region. Maintenance / protection (M/P) is distinguished from restoration / enhancement (R/E).

State	BCR	Shallow semi-permanent marsh, hemi-marsh		Deep water marsh		Extensive open water	
Practice >		*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*
Iowa	22	Waterfowl	Waterfowl	Waterfowl	NA[a]	Waterfowl	Waterfowl
	23	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
Illinois	22	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	23	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	24	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
Indiana	22	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	23	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	24	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
Kansas	22	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
Michigan	12	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	22	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	23	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
Minnesota	12	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	22	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	23	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
Missouri	22	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
Nebraska	22	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
Ohio	13	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	22	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	24	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	28	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
Wisconsin	12	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	22	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl
	23	Waterfowl	Waterfowl	Waterfowl	NA	Waterfowl	Waterfowl

[a]NA identifies State×BCR areas without a priority bird species population or guild representing specific cover type.

Appendix E. All-bird habitat conservation objectives for mudflat and shallows cover types used by non-breeding birds at the State, BCR, and State×BCR land-area scales in the Upper Mississippi River and Great Lakes Joint Venture region. Objectives are displayed in tabular (E-1) and graphic (E-2) format, plus bird-groups responsible for objectives (greatest area requirement) are identified (E-3).

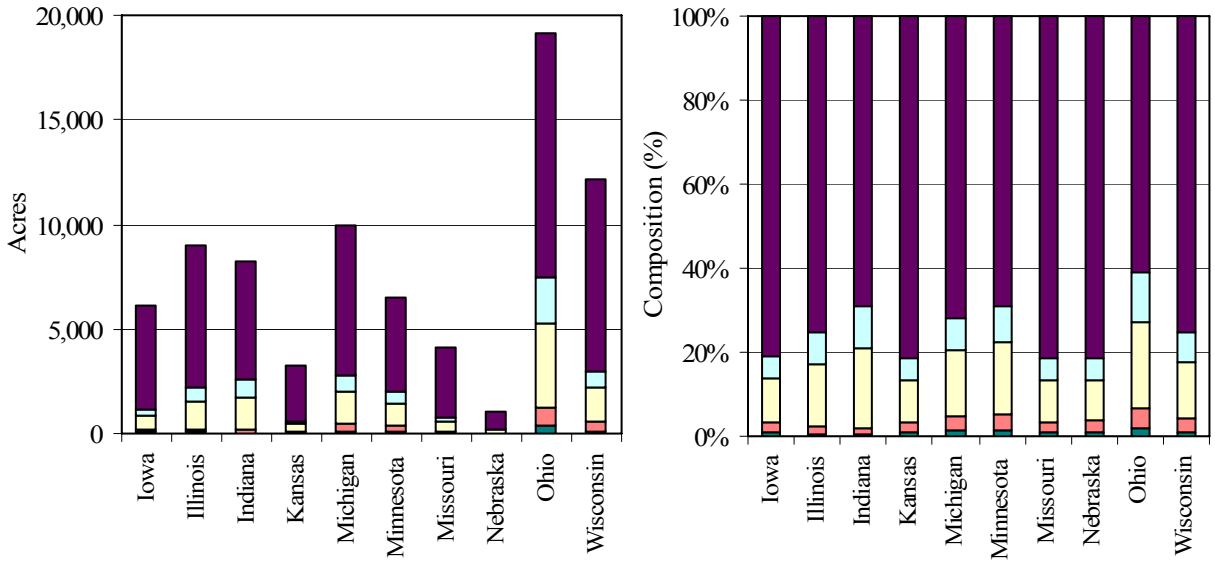
Appendix E-1. Mudflat and shallows conservation objectives (acres) by state and Bird Conservation Region (BCR) to meet non-breeding season bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region[a]. Maintenance / protection (M/P) is distinguished from restoration / enhancement (R/E); also see Appendix E-2 for graphic display of habitat objectives and Appendix E-3 for bird-group responsible for objective (group with greatest habitat need).

State	BCR	Wet mudflat / moist soil plants		Dry mudflat / agriculture		Shallow water (<2 inches)		Moderate water (2-8 inches)		Beach	
Practice >		*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*
Iowa	22	4,327	1,094	282	165	534	170	143	128	42	114
	23	588	178	44	27	89	27	22	20	7	20
	Total	4,915	1,272	326	193	622	198	165	148	49	133
Illinois	22	4,957	1,252	321	190	610	195	163	146	49	128
	23	274	82	20	12	42	12	10	10	2	10
	24	1,529	1,544	321	200	655	222	10	12	0	0
	Total	6,760	2,878	662	403	1,307	430	183	168	52	138
Indiana	22	1,793	452	116	69	222	69	59	54	17	47
	23	1,072	321	82	47	161	52	42	37	12	35
	24	2,838	2,868	598	373	1,213	410	20	22	0	0
	Total	5,703	3,641	795	489	1,596	531	121	114	30	82
Kansas	22 / Total	2,645	669	173	101	326	104	86	79	27	69
Michigan	12	2,174	2,102	412	240	800	257	146	116	82	217
	22	165	42	10	7	20	7	5	5	2	5
	23	4,784	1,438	363	212	719	230	190	168	59	153
	Total	7,123	3,582	785	459	1,539	494	341	289	143	375
Minnesota	12	2,053	1,983	390	227	753	242	138	111	79	205
	22	311	79	20	12	40	12	10	10	2	7
	23	2,122	637	161	94	319	101	84	74	25	69
	Total	4,486	2,700	571	333	1,112	356	232	195	106	282
Missouri	22 / Total	3,320	840	215	126	410	131	111	99	32	86
Nebraska	22 / Total	889	225	57	35	109	35	30	27	10	22
Ohio	13	5,474	5,019	1,228	748	2,216	682	590	538	170	420
	22	2,100	531	136	79	259	82	69	62	20	54
	24	0	3,715	0	454	0	489	0	237	0	415
	28	4,132	9,265	882	1,282	1,509	1,252	240	837	156	889
	Total	11,705	18,530	2,245	2,564	3,984	2,505	899	1,675	346	1,778
Wisconsin	12	1,151	1,112	220	128	422	136	77	62	44	116
	22	59	15	5	2	7	2	2	2	0	2
	23	7,934	2,381	603	353	1,191	380	314	277	96	254
	Total	9,144	3,507	827	484	1,620	519	393	341	141	373
All States	12	5,377	5,197	1,023	595	1,976	635	361	289	205	538
	13	5,474	5,019	1,228	748	2,216	682	590	538	170	420
	22	20,568	5,199	1,334	788	2,537	808	679	613	203	536
	23	16,774	5,036	1,272	746	2,519	803	662	585	203	541
	24	4,367	8,126	919	1,028	1,867	1,121	30	272	0	415
	28	4,132	9,265	882	1,282	1,509	1,252	240	837	156	889
	Total	56,691	37,843	6,657	5,187	12,624	5,301	2,561	3,134	936	3,339

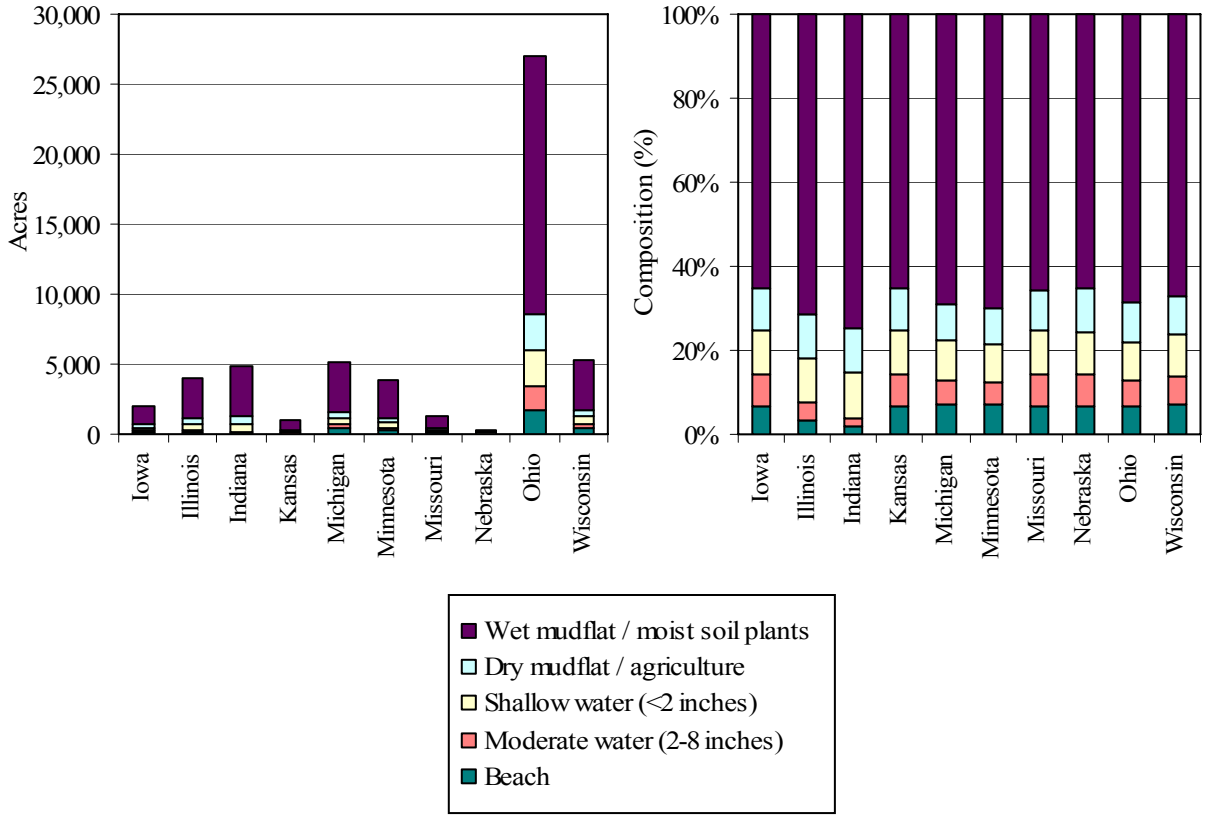
[a]See JV bird-group conservation strategies for information on how specific habitat objectives were generated and Table 4 in this document for more detailed cover type descriptions. The metric conversion is 1 acre = 0.40 ha and 1 inch = 2.5 cm.

Appendix E-2. Mudflat and shallows conservation objectives (acres) and composition of cover type objectives (%) by state to meet non-breeding bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region.

Protection / maintenance objectives - non-breeding



Restoration / enhancement objectives - non-breeding



Appendix E-3. Bird-group responsible (greatest need) for mudflat and shallows conservation objectives (acres) by state and Bird Conservation Region (BCR) to meet non-breeding season bird carrying capacity goals in the Upper Mississippi River and Great Lakes Joint Venture region. Maintenance / protection (M/P) is distinguished from restoration / enhancement (R/E).

State	BCR	Wet mudflat / moist soil plants		Dry mudflat / agriculture		Shallow water (<2 inches)		Moderate water (2-8 inches)		Beach	
Practice >		*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*	*M/P*	*R/E*
Iowa	22	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	23	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
Illinois	22	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	23	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	24	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	NA	NA
Indiana	22	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	23	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	24	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	NA	NA
Kansas	22	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
Michigan	12	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	22	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	23	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
Minnesota	12	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	22	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	23	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
Missouri	22	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
Nebraska	22	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
Ohio	13	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	22	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	24	NA[a]	NA	NA	NA	NA	NA	NA	NA	NA	NA
	28	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
Wisconsin	12	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird
	22	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	NA	Shorebird
	23	Waterfowl	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird	Shorebird

[a]NA identifies State×BCR areas without a priority bird species or guild representing the specific cover type.