Priority Information Needs for American Woodcock

A FUNDING STRATEGY

Developed by the Association of Fish and Wildlife Agencies' Migratory Shore and Upland Game Bird Support Task Force.

March 15, 2010

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Executive Summary

This Strategy contains recommendations for obtaining priority information needed to improve habitat and harvest management decisions for migratory populations of American woodcock, focusing on evaluating and improving knowledge of monitoring efforts, vital rates (survival, reproduction, and recruitment), and habitat needs during the annual cycle of these birds. The Strategy is intended to increase financial support for management and research activities over the next 5 to 10 years with thoughtful and deliberate planning built on basic scientific principles.

The Migratory Shore and Upland Game Bird Support Task Force determined that convening a workshop of American woodcock experts would be the most efficient and effective process to develop the Strategy. Experts from Flyways, NGOs, universities, and from state and federal agencies in the United States (U.S.) and Canada were invited to the workshop. The workshop was held August 25–27, 2009 in Bloomington, Minnesota.

The American woodcock is found throughout the forested regions of eastern North America and is a popular game bird in the U.S. The principal breeding range is located in north-central and northeastern parts of the U.S. and southeastern Canada, with limited breeding in the southeastern U.S. The winter range is primarily in the southeastern U.S. extending west to eastern Texas and Oklahoma. Woodcock are managed on the basis of two management regions (Eastern and Central Regions).

Results from the Singing-ground Survey indicate a long-term (1968–2009) declining trend of -1.1%/year for both management regions and a stable 10-year trend (1999–2009) for both management regions (Cooper and Parker 2009). Since the start of the Harvest Information Program survey in 1999, U.S. harvest has averaged 89,142 birds/year in the Eastern Region and 232,752 in the Central Region (Cooper and Parker 2009). U.S. hunter effort (days afield) has averaged about 170,000 days afield in the Eastern Management Region and 390,000 in the Central Management Region since the start of the Harvest Information Program survey.

The loss of young forest and shrubland habitats on breeding grounds is thought to be the primary reason for declines in woodcock populations. In response to population declines, an *American Woodcock Conservation Plan* was developed by a broad partnership of federal, state, and private partners under the leadership of the Association of Fish and Wildlife Agencies (Kelley et al. 2008).

The workshop resulted in the identification of four priority information needs for American woodcock (in priority order):

1. Develop a demographic-based model for assessing American woodcock population response to harvest and habitat management decisions.

2. Develop communication strategies to increase support for policies and practices that benefit American woodcock and other wildlife of young forests.

3. Improve understanding of migration, breeding, and wintering habitat quality for American woodcock.

4. Improve the Singing-ground Survey.

Workshop participants also identified overarching guidelines that should be considered in further development of each of the priority information needs; i.e., (1) consider the effects of climate or system change on woodcock habitats and ultimately on the abundance and distribution of woodcock, (2) actively engage Canada, given the role that habitat and harvest management decisions in Canada play in the overall management of this species, and (3) recognize that habitat and habitat management are critical to woodcock conservation.

The priorities described in this Strategy promote efforts to reduce uncertainty in current management practices. Improved information will better enable managers to target site-specific and range-wide management and monitoring programs, increasing the cost-effectiveness of management.

Introduction

In 2006, the Migratory Shore and Upland Game Bird Working Group (Working Group) established a Migratory Shore and Upland Game Bird Support Task Force (Task Force). The Task Force is composed of nine representatives of state, federal, and non-governmental organizations. The Task Force was directed to update the research and management needs of the 16 species of migratory shore and upland game birds (MSUGB) and to develop a strategy for funding priority research and management needs for these species. The American woodcock (*Scolopax minor*) is one of the six "groups" of species selected.

STRATEGY PURPOSE

This Strategy contains recommendations for obtaining priority information needed to improve habitat and harvest management decisions for migratory populations of American woodcock, focusing on evaluating and improving knowledge of monitoring efforts, vital rates (survival, reproduction, and recruitment), and habitat needs during the annual cycle of these birds. The Strategy is intended to increase financial support for management and research activities over the next 5 to 10 years with thoughtful and deliberate planning built on basic scientific principles. Resulting priorities will be used to guide the acquisition and expenditure of funds, as well as provide the means to attract additional funding from partners interested in migratory shore and upland game birds. Separate from the Strategy, an Action Plan will be developed to encourage partners to collaborate and support these information needs, to use or redirect current funding, and to secure new funding. Finally, the Action Plan will ensure the development of a consistent message when pursuing funding.

STRATEGY DEVELOPMENT PROCESS

The Task Force determined that convening a workshop of American woodcock experts would be the most efficient and effective process to develop the Strategy. Experts from Flyways, NGOs, universities, and from state and federal agencies in the United States (U.S.) and Canada were invited to the workshop. The workshop was held August 25-27, 2009 in Bloomington, Minnesota. A list of workshop participants is included in Appendix A. The Task Force retained D.J. Case & Associates to facilitate the workshop and to compile and finalize the Strategy.

Status of American Woodcock

The American woodcock is found throughout the forested regions of eastern North America and is a popular game bird in the U.S. The principal breeding range is located in north-central and northeastern parts of the U.S. and southeastern Canada, with limited breeding in the southeastern U.S. (Figure 1). The winter range is primarily in the southeastern U.S. extending west to eastern Texas and Oklahoma. Woodcock are managed on the basis of two management regions (Eastern and Central Regions) as recommended by Owen et al. (1977; Figure 1). This configuration was biologically justified through the analysis of band recovery data (Martin et al. 1969; Krohn et al. 1974).

Each year, the U.S. Fish and Wildlife Service, in cooperation with numerous partners, coordinates three surveys to assess the population status of American woodcock: 1) Singing-ground Survey, which provides an estimate of population trends, 2) Wing-collection Survey, which provides an annual index of woodcock recruitment, and 3) Harvest Information Program, which provides data on the number of hunters, harvest, and days spent afield each year. The Singing-ground Survey covers a major portion of the breeding range in Canada and the U.S. (Figure 1), while the Wing-collection Survey and Harvest Information Program only sample U.S. hunters. The Canadian Wildlife Service estimates woodcock recruitment, annual harvest, and hunter activity through the National Harvest Survey, which is similar to the Wing-collection Survey and Harvest Information Program survey.

Figure 1. American woodcock management regions, breeding range, Singing-ground Survey coverage, and winter range.

Results from the Singing-ground Survey indicate a long-term (1968–2009) declining trend of -1.1%/year for both management regions (Figure 2) and a stable 10-year trend (1999–2009) for both management regions (Cooper and Parker 2009). The long-term (1963–2008) average recruitment indices (young per adult female) are 1.7 and 1.6 for the U.S. portion of the Eastern and Central Management Regions, respectively (Figure 3; Cooper and Parker 2009). In Canada, the long-term (1991–2008) recruitment index is 2.3 young per adult female (Canadian Wildlife Service, unpublished data). Available harvest data indicate a long-term decline in woodcock harvest in both management regions (Figure 4). Since the start of the Harvest Information Program survey in 1999, U.S. harvest has averaged 89,142 birds/year in the Eastern Region and 232,752 in the Central Region (Figure 4; Cooper and Parker 2009). U.S. hunter effort (days afield) has averaged about 170,000 days afield in the Eastern Management Region and 390,000 in the Central Management Region since the start of the Harvest Information Program survey. Regional estimates of hunter numbers cannot be obtained because individual hunters may be registered for the Harvest Information Program in more than one state. National Harvest Survey data indicate a long-term decline in woodcock harvest and hunters in Canada (Canadian Wildlife Service, unpublished data).

Figure 2. Annual indices of the number of woodcock heard singing on the Singing-ground Survey, 1968–2009 as estimated using hierarchical modeling for the Eastern and Central Management Regions (Cooper and Parker, 2009). The dashed lines represent the 95th percentile credible interval.
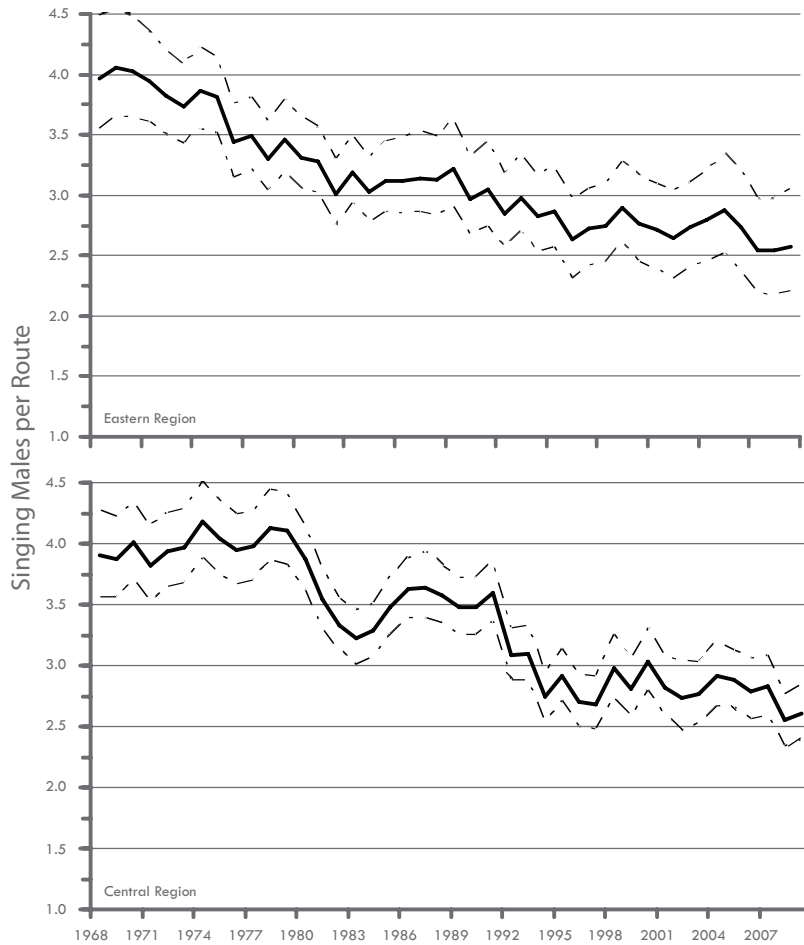
Figure 3. Weighted annual indices of woodcock recruitment for the U.S. portion of the Eastern and Central Management Regions, 1963-2008 (Cooper and Parker, 2009). The dashed line represents the 1963−2007 average.
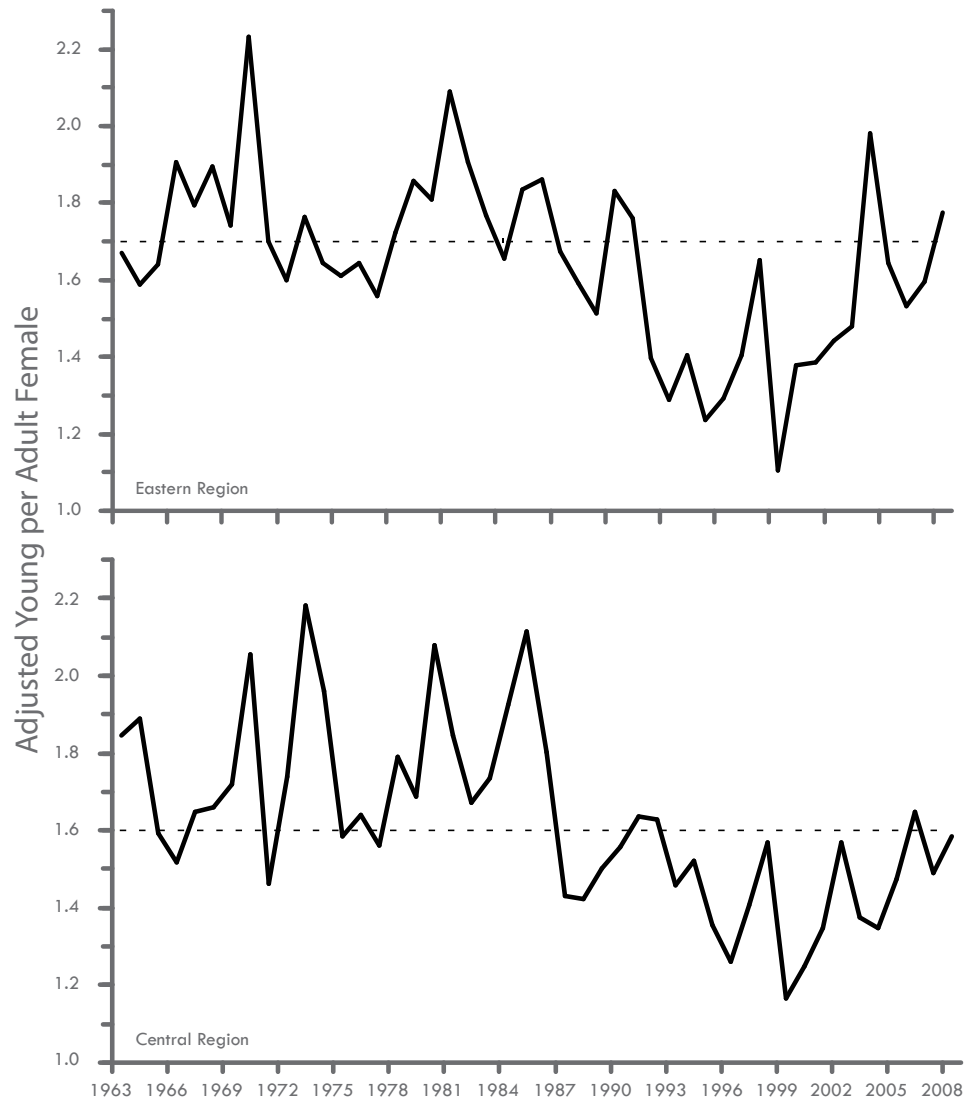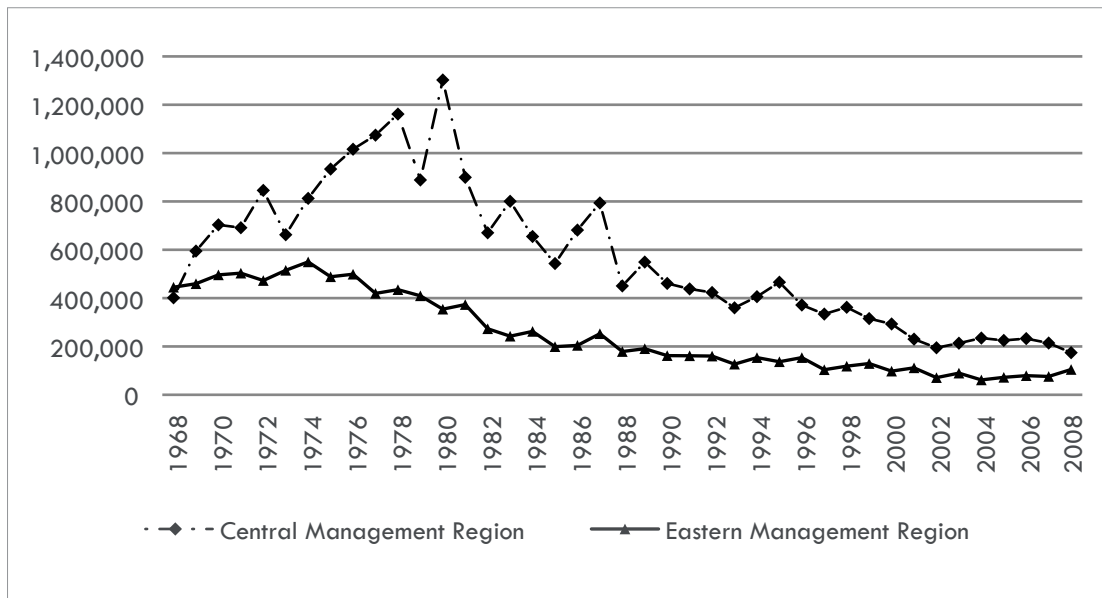
Figure 4. Estimated woodcock harvest in the United States, 1968–2008.[1]

The loss of young forest and shrubland habitats on breeding grounds is thought to be the primary reason for declines in woodcock populations. Aging of the nation's forests over the last 40 years, changes in land use, and societal attitudes about even-aged forest management (i.e., clearcutting) that create prime woodcock habitat are believed to be factors contributing to a decline in suitable habitat. U.S. Forest Service data show that over seven million acres of young forest habitat was lost throughout the core woodcock breeding range during the past 30 years (Kelley et al. 2008). Like woodcock, numerous other bird species requiring young forest habitat have also experienced long-term population declines (Sauer et al. 2008a). In response to population declines, an *American Woodcock Conservation Plan* was developed by a broad partnership of federal, state, and private partners under the leadership of the Association of Fish and Wildlife Agencies (Kelley et al. 2008). The objectives of the plan are to, first, stabilize current populations and subsequently increase populations to densities that occurred in the early 1970s through habitat management. The *American Woodcock Conservation Plan* is available at www.timberdoodle.org.

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[1] *Estimates from 1968–1998 are based on data from the Federal Duck Stamp-based Harvest Survey that were adjusted using three years of overlap with the current Harvest Information Program (HIP) (Paul Padding, FWS, pers. com.) Estimates from 1999–2008 are from the HIP survey, with estimates from 2003–2008 being preliminary (Cooper and Parker 2009).*

Priority Information Needs

The workshop resulted in the identification of four priority information needs for American woodcock (in priority order):

1. Develop a demographic-based model for assessing American woodcock population response to harvest and habitat management.

2. Develop communication strategies to increase support for policies and practices that benefit American woodcock and other wildlife of young forests.

3. Improve understanding of migration, breeding, and wintering habitat quality for American woodcock.

4. Improve the Singing-ground Survey.

Rationale, descriptions, timetables and costs for each of the priorities follow.

Priority 1. Develop a demographic-based model for assessing American woodcock population response to harvest and habitat management.

RATIONALE

Woodcock population management has historically relied on trend data from the American woodcock Singing-ground Survey. Alternative monitoring data are also available for woodcock (e.g., harvest estimates from Harvest Information Program, age-ratio data from wing collection surveys, and small-scale banding operations); however, these data have not been used in any formal decision-making process. The validity of the Singing-ground Survey as an index to woodcock abundance is untested and all roadside surveys suffer from similar concerns of how well they truly represent the populations they are intended to monitor. For example, Singing-ground Survey data have indicated long-term population declines presumably from declines in young forest habitat. However, over the past couple of decades the amount of suitable breeding habitat has increased in some portions of the woodcock range, but there has not been a corresponding increase in Singing-ground Survey indices as would be expected if breeding habitat was a limiting factor. Therefore, alternative ways for assessing the relationship between woodcock populations and management decisions need to be explored.

Factors such as habitat availability, weather, and harvest directly influence woodcock vital rates including adult survival, brood survival, and nest success. Vital rates, in turn, drive annual changes in populations. The Singing-ground Survey does not provide specific information on vital rates and how they are related to harvest and habitat management

> **GUIDELINES**
> Workshop participants identified three overarching guidelines that should be considered in further development of each of the priority information needs.
>
> 1. Consider the effects of climate or system change on woodcock habitats and ultimately on the abundance and distribution of woodcock.
>
> 2. Actively engage Canada. It is important to consider the role that habitat and harvest management decisions in Canada play in the overall management of this species. New or expanded information-gathering activities should be range-wide in scope.
>
> 3. Recognize that habitat and habitat management are critical to woodcock conservation. Consider how the priority information needs outlined in this document will help clarify how, when, and where to focus habitat management efforts.

decisions. A better understanding of this relationship requires information beyond trends estimated from the Singing-ground Survey. Specifically, estimates of woodcock vital rates throughout the year and across its range are essential for developing an assessment framework that allows managers to (1) identify specific life history factors that may be limiting populations (e.g., winter survival vs. survival during the migration period) and (2) identify factors affecting woodcock populations in response to habitat and harvest management. Although site-specific survival and recruitment studies have been conducted sporadically over the past 40 years, a comprehensive assessment of annual, seasonal, and spatial variability in vital rates is necessary to accurately predict population responses to habitat and harvest management.

DESCRIPTION

Develop a conceptual model that incorporates the biologically relevant periods of the annual cycle to allow managers to assess the utility of existing monitoring programs, identify gaps in our current information base, and prioritize data collection needs that will feed into a population assessment framework. The first step toward improving woodcock management should explore the feasibility of using a model-based approach to assess population response to harvest and habitat management decisions. Furthermore, identifying the appropriate scales of measurement, examining temporal and spatial variability, and assessing the relative influence of habitat and harvest decisions on these rates are crucial to refining conceptual models and designing future data collection efforts.

The second step is a critical evaluation of existing databases and their ability to be used in the population model(s) developed in step one. Applying existing data (e.g., Forest Inventory Assessment, Singing-ground Survey, Wing-collection Survey, Harvest Information Program, and published research on survival rates) to the conceptual model will be useful for initial assessments of harvest and habitat management activities.

TIMETABLE AND COST

Developing the conceptual model and applying available data to the model would be a multi-year iterative process involving collaboration with the U.S. Fish and Wildlife Service Division of Migratory Bird Management, Flyway technical committees, Canada, and other concerned stakeholders. The estimated cost for this priority is $65,000/year for three years including a stipend for a post-doctoral student to coordinate model development, assess existing data sources, and coordination.

Priority 2. Develop communication strategies to increase support for policies and habitat practices that benefit American woodcock and other wildlife requiring young forest habitat.

RATIONALE

A contributing factor to declines of American woodcock populations is public misunderstanding over the ecological value of young forests and the role of forest management in maintaining young forests. Society's values and perceptions regarding forest management limit the ability to implement landscape-level forest management promoting young forests. Landowners, policy makers, natural resource professionals, and a wide range of other stakeholders directly or indirectly affect forest management decisions. In the eastern U.S., which is the primary range of the American woodcock, approximately 69% of forested

land is owned by private landowners, 17% by public agencies, and 13% by the forest products industry. To successfully implement land management to benefit wildlife dependent upon young forests, resource management professionals must better communicate the important ecological role of these habitats and management necessary to produce and maintain them.

In 2009, the Wildlife Management Institute completed a project to "Investigate communication strategies to integrate private landowner habitat management interests and capacities into programs designed to implement the *American Woodcock Conservation Plan* through identification of critical audiences, testing of key messages, and documentation of optimal delivery mechanisms." The project was funded in part by a grant from the U.S. Fish and Wildlife Service, Webless Migratory Game Bird Research. Reports from this project included:

1. Literature Review — compiled and reviewed pertinent literature regarding private, non-industrial woodland owners and management of their forested lands.

2. Professional Interviews — identified and spoke with 30 natural resource professionals who engage in young forest management and outreach on private lands to learn about their efforts, messages, audiences, and assessment of such efforts.

3. Focus Groups — conducted seven focus groups with private woodland owners in NH, NY, and PA a) to assess why they might choose to either actively manage their land for young forests or not, b) to test the appeal of potential messages that might be used in a communications campaign, and c) to test communication vehicles (images, messages, tag lines, and print ads) that might be used to encourage private landowner participation in young forest management.

4. *National Woodland Owner Survey* (*NWOS*) Analysis — reviewed results of the *NWOS* for small woodland owners in Bird Conservation Regions (BCRs) 14 and 28 to determine their understanding of and attitudes toward forest ownership and management.

5. Communications Strategy — the Wildlife Management Institute project culminated in a comprehensive communications strategy for increasing the amount of woodcock habitat on private lands in BCRs 14 and 28.

DESCRIPTION

Based on the Wildlife Management Institute project, the priority described below would help support initial launch of a communications initiative targeting woodcock habitat creation on private lands. The key elements of the priority would include:

1. Comprehensive Web site — develop a comprehensive Web site to provide information and resources needed by each of the target audiences. Segment the site so the various sections can be customized very specifically to each of the target audiences. Young forest management is a complex topic, and a well-built Web site affords the opportunity to tell the full story in nested fashion, so people can access as much or as little information as they need.

2. Two "Five-County Pilot Areas" — create detailed pilot communications campaigns to increase young forest habitat management on two small scale areas (five counties

within one state, perhaps). There is far too much variability (habitat, programs, social norms, etc.) across the area of interest to effectively implement a single communications campaign. Each of these pilot areas should be large enough to show impacts, but small enough so a reasonable amount of communications can be delivered and impacts can be assessed in a meaningful manner. These campaigns should be customized to local landowners, ecology, assistance programs, and forest products. One campaign should be undertaken in the northeast U.S. (BCRs 14 and 28) and one in the upper Great Lakes. Professional interviews, focus groups, and analysis of *National Woodland Owner Survey* data should be conducted in the upper Great Lakes as a foundation for the communications campaign.

3. Young Forest Outreach Initiative/Partnership — create a communication partnership of stakeholders that already value young forest habitat, for example, the Golden-winged Warbler working group, Ruffed Grouse Society, National Wild Turkey Federation, other conservation groups, forest products industry, and forest resource management agencies. Broad-scale communication efforts to landowners across large geographical regions to support young forest habitat exclusively for woodcock conservation is not strategically justifiable. That is, there are not enough landowners interested in woodcock conservation to make such a strategy succeed. However, there are other organizations and partners that are interested in young forest management, though not necessarily interested in woodcock conservation. Deer, grouse, turkeys, golden-winged warblers, and a wide array of other wildlife and plants are dependent on young forests. A broader scope of species of interest will bring a much larger support base to bear on the issue.

TIMETABLE AND COST

A long-term, systematic communications effort will require ongoing support from a broad base of partners and an initial funding of $90,000/year for three years to support the three elements outlined above.

Priority 3. Improve understanding of migration, breeding, and wintering habitat quality for American woodcock.

RATIONALE

Participants at the workshop discussed many factors that may be limiting woodcock population growth throughout the species' annual life cycle. Factors related to habitat quality during key times of the annual cycle received the most support. Over the near-term, funding should be directed toward the following three elements related to assessing migratory, breeding, and wintering habitat quality. A better understanding of survival and habitat use during these key times of the annual cycle will enable managers to make better habitat management decisions and will be useful for the modeling efforts described in Priority 1.

Migration habitat

A number of studies have been conducted documenting various aspects of woodcock habitat and survival on their northern breeding grounds and their wintering grounds. However, similar data are largely lacking for migration periods, although it is widely believed that mortality rates during migration may be relatively high.

Breeding habitat
Very little current information is available on nest success or brood survival throughout the woodcock breeding range. Furthermore, the relationship between these vital rates and habitat quality has not been well documented. The data available are dated and come from a limited geographic area. Additionally, because some land managers believe there seems to be suitable habitat in a portion of the breeding range that supports relatively few nesting females or broods, we believe that a better understanding of factors influencing nest success and brood survival at multiple spatial scales is needed.

Wintering habitat
Wintering habitat is not thought to be a limiting factor for woodcock. However, most studies on the wintering grounds indicate survival rates are lower than during the summer.

DESCRIPTION
Migration habitat
Lack of knowledge of habitat availability and quality during migration, in addition to greater exposure to hazards while migrating, contribute to the belief that mortality may be higher during this period than any other period during the annual cycle. As a consequence, identification of important habitats used during migration is considered a key area for additional research. However, because it is not known whether the same areas are used during fall and spring migration, information during both migration periods is needed at multiple spatial scales.

Breeding habitat
Initially, techniques for better assessing woodcock brood survival and habitat use from hatching until fall migration should be developed and evaluated. Finding broods is relatively easy, but tracking broods from hatching through fall migration presents some challenges that must be examined. After appropriate methods are developed for assessing brood survival, studies assessing nest success and brood survival should be conducted at multiple sites across the northern breeding range. Conducting this research at multiple sites is important because factors affecting nest success, brood survival, and related habitat use may vary by region.

Wintering habitat
A thorough inventory of existing habitat and determining the extent of habitat required to support viable woodcock populations on wintering grounds is needed. If sufficient wintering habitat is available, critical habitats that provide shelter during periods of extreme weather should be identified. Additionally, survival estimates and habitat use data during winter may be obtained by monitoring woodcock that are radio tagged for a migration study until transmitters fail in the fall or birds migrate north in the spring. (Also see *Migration habitat*.)

TIMETABLE AND COST
Migration habitat
Radio telemetry is likely one of the best ways to determine habitat use during migration. A three-year study would cost approximately $3 million ($1.5 million per management region or $750,000 per migration study).

Fall and spring migration stopover locations are probably different because of the highly variable conditions woodcock encounter while migrating north and their tendency to migrate as early as possible in the spring. An alternative to immediately initiating a telemetry study would be to first fund the development of transmitters small enough for remote tracking of woodcock. This technology would allow monitoring woodcock for an entire year, thus providing valuable knowledge on habitat use throughout the year as well as vital rates desired in other priority information needs.

Breeding habitat
A two-year study for determining the appropriate techniques for assessing woodcock brood survival and habitat use will cost an estimated $75,000. Once techniques are developed, woodcock nest success, brood survival, and habitat use should be assessed over a period of two years at three locations within each management region at an estimated cost of $1.2 million ($600,000 per management region or $200,000 per breeding habitat study).

Wintering habitat
The timetable for an inventory of existing habitat is one year and would cost approximately $25,000.

Priority 4. Improve the Singing-ground Survey.

RATIONALE
The Singing-ground Survey, in its present form, was initiated in 1968. This roadside survey is now coordinated by the U.S. Fish and Wildlife Service and the Canadian Wildlife Service. During this early spring survey, singing male woodcock are counted at 10 stops along randomly established routes on rural roads. No attempts are made to estimate the proportion of woodcock missed during counts. Several studies have been conducted on the assumptions behind these counts as well as on the methods for analyzing resulting data (Dwyer et al. 1988, Straw et al. 1994, Sauer et al. 2008b).

The Singing-ground Survey is the only tool currently available to assess population size and trend. It has been used to guide harvest management decisions and assess population declines (e.g., management unit or range-wide). However, many concerns have been identified about the survey and how the results are interpreted and used in making management decisions. It is therefore imperative that the Singing-ground Survey be critically evaluated and improved, if feasible.

DESCRIPTION
It is important to assess the validity of the critical assumptions underlying the Singing-ground Survey in three general areas of concern:

Detection probabilities/availability for detection
The Singing-ground Survey is a count of the number of male woodcock heard courting ("peenting") along a survey route and it is assumed that this count is related to the density of woodcock in the area. However, the relationship between the count index and true woodcock abundance in the area surveyed is not well known. This is especially true for female woodcock, which are of primary importance for understanding the population dynamics of this species.

A number of factors potentially influence counts on Singing-ground Survey routes and reliably transforming counts to estimates of density of either male or female woodcock is not currently possible. These factors need to be assessed to evaluate the effectiveness of the Singing-ground Survey and make improvements that provide more useful data for making management decisions and evaluating the effects of management activities.

Spatial sampling design
The Singing-ground Survey is intended to sample woodcock throughout much of their primary breeding range. However, randomized survey routes were established in 1968 and since then have largely remained the same. Whether habitat conditions along secondary roads currently reflect habitat conditions away from survey roads is not known. Whereas, the southern boundary of the survey is less of a concern because fewer woodcock breed there, the northern boundary is a concern because woodcock are apparently expanding their range northward, possibly in response to climate change.

Implementation logistics
The Singing-ground Survey depends on observers to count peenting male woodcock. Coordinating the large number of observers is demanding and has implications for the analysis of resulting data because variation in observer ability to detect singing woodcock is known to affect counts (i.e., an observer effect).

TIMETABLE AND COST
Although some research on the assumptions behind the Singing-ground Survey has and continues to be conducted, many important issues remain to be addressed. The following projects should occur during the next five years to ensure that the Singing-ground Survey is robust and sensitive to changes in management decisions and habitat availability.

Detection probabilities/availability for detection
Study the relationship between Singing-ground Survey route data and true woodcock abundance. This study should include multiple study sites in each of the two Management Regions over several years. Each site should be intensively managed so that woodcock abundance changes as dramatically as possible over time. Woodcock will be marked with radio transmitters and monitored with the goals of assessing the relationship between counts and population trend, detection probability and factors that influence detection, and effective area surveyed. Approximate cost: $1.2 million.

Spatial sampling design
Assess the spatial extent, resolution, and representativeness of the existing Singing-ground Survey using currently available data and simulation studies. This project can be done in the laboratory and should be coordinated by personnel familiar with the Singing-ground Survey. A technician will assist with data acquisition and compilation. This project should run for one to two years. Approximate cost: $40,000.

Several aspects of the current methods of analyzing the Singing-ground Survey data require additional research. A one- to two-year research project coordinated by personnel who analyze the Singing-ground Survey data will investigate problems including the handling of constant zero routes, the extension of results from areas surveyed to areas not surveyed within a BCR, and other relevant questions. Approximate cost: $40,000.

Implementation logistics

A one- to two-year project improving Singing-ground Survey coordination and increasing participation by cooperating organizations and personnel is required and should be assessed jointly by the U.S. Fish and Wildlife Service and Canadian Wildlife Service. Approximate cost: $40,000.

Measuring Success

The priorities described in this Strategy promote efforts to reduce uncertainty in current management practices. Improved information will better enable managers to target site-specific and range-wide management and monitoring programs, increasing the cost-effectiveness of management.

Specific outcomes expected for each priority include:

Priority 1:

- A report detailing the woodcock conceptual model that includes initial sensitivity/ elasticity of model parameters, an evaluation of the adequacy of existing data sources for parameter estimation, and recommendations for additional data needed for improving models.

- Model code written in a widely accessible program so that managers can manipulate parameter estimates to accommodate new information gathered over time. The degree to which future management decisions are informed by this model will be one measure of success.

Priority 2:

- Communication campaigns in two, 5-county areas will be initiated and the change in the amount of young forest before and after initiation of the communication campaigns will be compared in other counties within the same region.

- Partnerships with other groups interested in promoting young forests will be developed. Although the success of this Priority will be difficult to measure, the size of the network of collaborative partners will be an indicator of success.

- An educational Web site on young forest management will be developed and periodically updated. The availability of the site will be advertised and the amount of site use can be monitored and used as a measure of success.

Priority 3:

- A habitat suitability model will be created based on information gathered via literature review and field studies directed at estimating survival and describing habitat use during nesting, brood rearing, migration, and wintering seasons.

- Seasonal survival rate estimates and habitat inventories resulting from work under this priority will contribute information to the woodcock population model described in Priority 1; success is linked to improvement in management decisions resulting from better estimates of model parameters.

Priority 4:

- Three projects and associated reports/publications will be completed that address assumptions or limitations of the Singing-ground Survey. These projects are expected to greatly improve managers' confidence in woodcock abundance and trend estimates. Improved abundance and trend estimates will provide a means to validate population modeling (Priority 1) and should ultimately be the primary metrics used to assess harvest and habitat management decisions.

Woodcock

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Appendix A

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2009 Workshop Participants

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