Webless Migratory Game Bird Research Program

Project Abstracts – 2004

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History and Administration of the Webless Migratory Game Bird Research Program, 1995-2004

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HISTORY

Introduction

The Webless Migratory Game Bird Research (WMGBR) Program was established in December 1994 with the first projects being funded in 1995. It was designed to provide cooperative funding from the U.S. Fish and Wildlife Service (USFWS), state wildlife agencies, and other sources for research on migratory game birds other than waterfowl (e.g., doves, pigeons, cranes, woodcock, snipe, and rails). Information from these studies will be used to more effectively manage these "webless" species.

Formation of the program was not easy and what follows is an attempt to document the events and the individuals associated with it's evolution. This historical overview was derived primarily through use of unpublished minutes from meetings between 1984 and 1995 of the Migratory Shore and Upland Game Bird (MSUGB) Subcommittee (named Committee between 1991-1996) of the International Association of Fish and Wildlife Agencies (IAFWA). The WMGBR Program is similar to the preceding Accelerated Research Program which was discontinued in 1982. After its formation in 1984, the MSUGB Subcommittee worked for 9 years to reinstate a research program for migratory shore and upland game birds. These efforts were realized finally when H. Ronald Pulliam, Director of the National Biological Survey (NBS; now U.S. Geological Survey-Biological Resources Division), contributed $300,000 for the program for FY1995/96. Subsequently, John G. Rogers, Deputy Director of the USFWS, authorized the Division of Federal Aid to allocate $150,000 per year as an annual funding item for the program beginning in FY1996. In FY1998, the USFWS contributed $300,000 for the WMGBR Program, thanks to the efforts of Paul R. Schmidt and Robert Blohm (USFWS) who worked to get an additional $150,000 for the Program in the budget for the Office [now Division] of Migratory Bird Management (DMBM)]. Beginning in FY1999, however, only $150,000 from the DMBM budget was available. Beginning in 2003, funding was suspended due to budget limitations. Funding was reinstated in 2005 at a level of $250,000, $30,000 of which will go towards cooperative funding of an early succession habitat biologist in the Northeast for the next 3 years. Many people supported the effort to obtain this funding, but I would specifically like to acknowledge Scot Williamson (Wildlife Management Institute), and Steve Williams and Matt Hogan (USFWS).

The Accelerated Research Program, 1967-82

The history of the Accelerated Research Program (ARP) was documented by MacDonald and Evans (1970). In July 1967, Congress appropriated $250,000 for the program. Support for this appropriation came from the Southeastern Association of Game and Fish Commissioners and the International Association of Game, Fish, and Conservation Commissioners (predecessor to the IAFWA). Also, Leonard E. Foote (Wildlife Management Institute) was instrumental in development of and gaining support for the program (R.E. Tomlinson, USFWS, personal communication). Internal support within the USFWS (then Bureau of Sport Fisheries and Wildlife) came principally from Walter F. Crissey, Director of the Migratory Bird Population Station (MBPS); significant input for justifying the program was provided by Aelred D. Geis, William H. Goudy, Howard M. Wight, and Roy E. Tomlinson (H.M. Reeves, USFWS, personal communication). Subsequent to the appropriation, the International Association created a National Program Planning Committee for Shore and Upland Game Birds (later known as the National Program Planning Group [NPPG]). The ARP was designed to provide funding for migratory shore and upland game bird research. The NPPG was formed to solicit, screen, and select projects for funding under the program (Sanderson 1977).

Congressional funding of the ARP was $250,000 annually. Of this total, $175,000 was contracted to states; $50,000 was used directly by the USFWS to support 2 field stations─one in Maine to study American woodcock and one in South Carolina to study mourning doves; and, $25,000 was retained by the USFWS to administer the program. William Russell was the first biologist at the Maine woodcock station followed by

William Krohn. Spencer Amend initiated the dove study in South Carolina, followed by George Haas. The dove study site was later moved to Georgia. Henry M. Reeves administered the program until March 1968 when Duncan MacDonald was hired for this purpose. In 1971, Fant Martin took over, followed in 1975 by Richard Coon and in 1980 by Thomas Dwyer.

In the 16 years the program was in operation (1967-82), 122 research projects were completed in 41 states. Over the years, funding for state projects amounted to about $2.5 million. The ARP ended in October 1982 when funding for the program was eliminated, primarily because of fiscal constraints upon the USFWS.

Formation of the Migratory Shore and Upland Game Bird Subcommittee

When the ARP was terminated, the NPPG, which served as an advisory group for the ARP, became inactive in 1982. Consequently, a new group was deemed necessary for focusing attention on MSUGB issues. Accordingly, and largely due to the efforts of Roy Tomlinson (USFWS), and Ronnie George and Ted Clark (Texas Parks and Wildlife Department), the MSUGB Subcommittee was established in 1984 by Mr. Clark, who was Chairman of the IAFWA's Migratory Wildlife Committee. The Subcommittee quickly became a force in migratory bird management.

Development of the Webless Migratory Game Bird Research Program

After its formation, the MSUGB Subcommittee sought to obtain information about the contributions made through the ARP and to determine whether or not the state wildlife agencies wanted to support Subcommittee efforts to have it reinstated. Clait Braun (Colorado Division of Wildlife) outlined 20 specific benefits of ARP to state wildlife agencies (letter attached to MSUGB Subcommittee minutes, March 1985). In summary, he showed that ARP facilitated substantial interchange of ideas among individuals working within regions and different agencies, which greatly expanded our knowledge about this important group of birds.

In 1985, Ronnie George, Chairman of the MSUGB Subcommittee, conducted a survey of all state wildlife agency directors about current MSUGB research needs and the ARP; all 50 states responded to the questionnaire. Results were summarized in a March 1986 report by Mr. George, entitled *Results of the Accelerated Research Program Questionnaire*. All but 3 states indicated MSUGB needs that had not been addressed to date. Thirty-two states felt that [future] MSUGB research needs could best be undertaken through combined USFWS and state wildlife agency funding. Forty-seven states believed ARP served a useful purpose considering the cost, and 49 states favored reestablishment of ARP (or a similar program) as a Congressionally-funded *addition* to the USFWS budget. Only 17 states, however, gave unqualified approval to redirecting current USFWS funds to an ARP-type program.

In a second March 1986 report, entitled *Summary of Accelerated Research Program Publications by Region and State*, Mr. George listed references for 340 publications known to have directly resulted from ARP. One of the most significant contributions was the book, *Management of Migratory Shore and Upland Game Bird Species in North America* (Sanderson 1977). These publications detail the wealth of information that was learned through the research program.

After confirming that state agencies had been pleased with the program and desired a similar program to be organized, the MSUGB Subcommittee passed a resolution in March 1986 asking the IAFWA to support reestablishment of ARP (or a similar program) as a Congressionally-funded $350,000 annual addition to the USFWS budget. The IAFWA also passed the resolution, but did not take further action because they did not feel the timing was right. At the March 1988 MSUGB Subcommittee meeting, a USFWS representative stated that the need exists for such a program, but that the USFWS was faced with rather severe budget limitations and there was a reluctance by the current administration to initiate new funding activities. He also stated that to effect such a resumption, enthusiasm and pressure from the Subcommittee was necessary. Consequently, another motion was made for the current Chairman, Kenneth Babcock, to reiterate the need for immediate study on several declining populations and ask the IAFWA Budget Committee to address those concerns when they testified before Congress on budget considerations. Once again, the IAFWA voiced support of their efforts but decided it was not the appropriate time to make a request before Congress.

In March 1990, a different strategy was undertaken by the Subcommittee, whereby Chairman Babcock was asked to write directly to Director John Turner of the USFWS, pointing out the success of the past program, the current needs, and requesting the addition of a $350,000 line item by the USFWS. Two letters eventually were written. In the telephone reply to the second letter, Deputy Director Richard Smith indicated that the USFWS would consider the request in its 1992 budget deliberations.

At the March 1991 MSUGB Committee (new name) meeting, Mr. Babcock reported that Max Peterson, Executive Vice President of the IAFWA, acted on their past recommendations and provided testimony before the House Appropriations Committee for the FY1992 budget. In this testimony, the IAFWA strongly recommended addition of $350,000 to the USFWS budget for the development of a research program to address existing data deficiencies on webless migratory game birds. Subsequent to the meeting, Chairman Babcock contacted directors of all state wildlife agencies to urge their congressional delegations to support the add-on to the budget. Many state agencies did contact their delegations. Mr. Peterson then testified before the USFWS Appropriations Subcommittee and asked that they add an item to the budget specifically for this work. Unfortunately, these efforts failed.

In 1992, the MSUGB Committee decided to change direction and develop a proposal for an entirely new program that would be submitted to the USFWS. Chairman Babcock (personal communication) then asked John H. Schulz (Missouri Department of Conservation) to take the lead in formulating a proposal for a fresh type of research effort. Although his name did not appear on the document, Mr. Schulz prepared the first draft of a proposal, entitled *Proposal for a Webless Game Bird Research Program,* with input from others. According to Schulz (personal communication), Roy Tomlinson (USFWS) provided the most detailed and lengthy comments, while substantive comments were also provided by Clait Braun, Richard Jachowski (NBS), Thomas Tacha (Texas A&M University-Kingsville), and Ronnie George. The proposal was distributed to MSUGB Committee members for review in August 1992. In the package, the USFWS was asked to establish an annual, line-item-funded research program for migratory shore and upland game bird species. One significant difference from earlier efforts was a request of $750,000 that would fund cooperative state-federal studies. These monies were envisioned to be matched at some level with state or other funding. It was suggested that 12.5% of the funds allocated for such a program be retained by the USFWS for administrative costs. The proposal package included a detailed screening process utilizing committees to review and prioritize submitted proposals. The MSUGB Committee would then review the lists and recommend studies to the USFWS for funding. A suggestion was made to give greater weight to studies supported by population management plans. After input from MSUGB Committee members, a revised proposal was sent to all state wildlife agency directors and USFWS Director Turner on 10 December 1992. The USFWS replied favorably to the plan on 18 March 1993, but several concerns were expressed in an attached review of the proposal by the Office of Migratory Bird Management. Chairman Babcock expressed his appreciation to the USFWS in a letter dated 28 May 1993, and offered suggestions for resolving the concerns raised.

The MSUGB Committee decided in September 1993 to recommend that an ad hoc Task Force, consisting of 2-3 committee members and an equal number from the USFWS, be formed to work out the details of a final joint proposal. The USFWS concurred. Subsequently, Ronnie George was named Chairman of the Task Force with the following members: Duane Shroufe (Arizona Game and Fish Commission), Cal DuBrock (Pennsylvania Game Commission), Roy Tomlinson [David Dolton replaced Roy after his retirement in June 1994] and Robert Blohm (USFWS), and Russell Hall (NBS). This group met to finalize the proposal for a webless research program, and developed details for a review process and evaluation criteria for research proposals under the program.

In August of 1994, Kenneth Babcock met with USFWS Director Mollie Beattie to urge her support for the webless research program. Also, he met with Ronald Pulliam and F. Eugene Hester (NBS) to enlist their support (K. M. Babcock, personal communication). The effort was successful. Mr. Babcock stated that Noreen Clough (who worked in the Director's Office at the time) helped arrange the meeting and that Paul Schmidt (Chief, MBM) helped set the stage by briefing the Director beforehand.

On 13 September 1994, Ronnie George transmitted the final version of *Recommendations for a Webless Migratory Game Bird Research Program,* prepared by the Webless Migratory Game Bird Research Task Force, to MSUGB Committee Chairman Kenneth Babcock. Key recommendations included the designation of 4 Technical Committees to evaluate proposals, a WMGBR Review Committee appointed by the MSUGB Committee to make the final project selection, the designation of a Project Officer within MBM to coordinate this activity, a USFWS budget line item of $750,000 annually, and that the United States Congress be urged to pass a budget, including a Webless Migratory Game Bird Research Program.

The efforts and persistence of the MSUGB Committee finally came to fruition in the fall of 1994 when funding became available, as stated in the Introduction. One stipulation was that 1/3 of the project cost must come from non-federal dollars. Also, funds were to be given for the life of the project rather than for just one year, as was done under the ARP.

Even though the amount of funding was not at the level recommended in the original proposal, the WMGBR Program has been successful thus far. MBM absorbed the administrative cost of the program without taking any of the research funds and designated David Dolton as Project Officer and program coordinator.

Another key contribution made by the MSUGB Committee was the publication of the book entitled *Migratory Shore and Upland Game Bird Management in North America* (Tacha and Braun 1994). This was a revised and updated version of the book edited by Sanderson (1977). As stated in the Preface to the book, key individuals responsible for planning, authorship selection, and other aspects of the publishing process included the editors and ad hoc committee members T. C. Tacha, C. E. Braun, J. M. Anderson, R. R. George, and R. E. Tomlinson. Authors of individual chapters were recognized authorities in their field. Immediately after publication, the book began to serve as a guide for research on species described therein.

There remains support to increase funding to the level originally recommended. On 26 July 1996, and again on 28 July 2000, the 4 Flyway Councils passed a Joint Recommendation requesting that the USFWS and the National Biological Service [USGS in 2000 version] seek additional revenue to fully fund the WMGBR Program at the recommended level of $750,000 per year. In December 1998, an IAFWA Ad Hoc Committee on Migratory Bird Funding met with USFWS personnel in Washington, D.C. to discuss funding needs for migratory birds. One of the recommendations was to fund the WMGBR Program at the full recommended level.

WMGBR PROGRAM ADMINISTRATION

At least 1/3 of the total project cost must be paid with non-federal dollars. In-kind services, such as salaries of state employees and vehicle expenses, are acceptable as matching funds. Study proposals may be on any webless migratory game bird topic identified as a research need in a national, regional, or state management plan or other document, or in the 1994 book entitled *Migratory Shore and Upland Game Bird Management in North America.* Additionally, a letter of support is required for each proposal from the state in which it originates.

A call for proposals is distributed by the USFWS Project Officer in May each year to USFWS Flyway Representatives and Migratory Bird Coordinators, and USGS-Biological Research Division (BRD) Regional Offices and the Cooperative Research Units office. Flyway Representatives are responsible for distributing the letter to biologists in their respective states. State biologists, in turn, are asked to send the information to other state personnel, universities, and any others who may be interested. Migratory Bird Coordinators forward the letter to National Wildlife Refuges and other federal offices. USGS-BRD Regional Offices are asked to forward the letter to all their respective Science and Technology Centers, while the Cooperative Research Units office distributes the call to all Cooperative Fish and Wildlife Research Units.

The review process is as follows. Proposals are sent by 15 November to the Project Officer for the program (David Dolton, USFWS/MBM). He checks the proposals for budget and support letter compliance and sends these materials to 4 Regional Technical Committees (Appendix 1). These committees review all the proposals submitted within their respective region and provide David with an evaluation of each project. The evaluations are based upon criteria that have been developed for this program and also upon regional needs (Appendix 2). Additionally, the projects are ranked in priority order. A compilation of all evaluations and rankings, along with the proposals, are then sent to members of a WMGBR Review Committee for review. Ronnie George (Texas Parks and Wildlife Department) served as the first Chairman of the Review Committee from 1994-96. Current committee members include Robert Boyd, Chairman, (Pennsylvania Game Commission) and David Dolton (USFWS), along with the 2005 Chairmen of the 4 Technical Committees: Western–Craig Mortimore (Nevada Division of Wildlife); Central–John H. Schulz (Missouri Department of Conservation); Northeastern–Ed Robinson (New Hampshire Fish and Game Department); and Southeastern–Billy Dukes (South Carolina Department of Natural Resources).

In February, the WMGBR Review Committee discusses the evaluations and rankings and makes a recommendation on which projects to fund. These recommendations are presented for final approval to the IAFWA's MSUGB Working Group at their meeting held in conjunction with the North American Wildlife and Natural Resources Conference. Funds become available as soon as contracts can be completed and signed.

To date, $1,505,183 in WMGBR Program funds has been expended to support 41 research projects and 1 workshop with a total value of $5,553,182 (Table 1). *Proceedings of the Marsh Bird Monitoring Workshop* is available from David Dolton. The uneven Grand Total for WMGBR funds is due to NBS contributing an additional $5,578 to the program in 1996 and an unused $395 in 1999. Although not reflected in the Grand Total, USGS-BRD (formerly NBS) provided additional support in 1997, 1998, and 1999 by contributing a total of $30,000 directly to 3 of the projects selected. For 2003, 12 proposals with a total value of $2,448,505 were received, requesting $684,148 in WMGBR funds. Two projects were selected for funding prior to the suspension of funds. Later, however, the U.S. Fish and Wildlife Service committed to fund 1 project for $119,000 (pilot reward banding study of mourning doves) using other funds. In order for 2 USGS studies to be completed, the USGS-BRD funded the second project on sandhill cranes ($30,900) along with another one on band-tailed pigeons ($19,215).

The WMGBR Program is invaluable in providing much-needed funding for webless species who receive considerably less attention than waterfowl. The current level of funding will not begin to meet the needs identified in the 1994 management book mentioned previously, but it is a start. This is a very cost-effective program and it is hoped that funding can be increased in the future.

Table 1. Projects funded through the Webless Migratory Game Bird Research (WMGBR) Program, 1995-02.

Species	Number of projects	WMGBR Program funds	Total project cost
Mourning dove	8	$348,495	$803,102
American woodcock	8	$276,739[a]	$1,421,071
Marsh game birds	9	$188,313	$1,146,017
Band-tailed pigeon	6	$345,995[b]	$788,920
Sandhill crane	8	$284,824[c]	$1,265,168
Marshbird Monitoring Workshop	–	$6,853[d]	—
GRAND TOTAL	40	$1,451,219[e]	$5,424,278

[a] An additional $13,000 was given to 1 project by the U.S. Geological Survey (Biological Resources Division) in 1997.

[b] An additional $11,000 was given to 1 project by the U.S. Geological Survey (Biological Resources Division) in 1998; $6,000 was given to 1 project in 1999; and, $19,215 was given to 1 project in 2003.

[c] An additional $6,046 was provided for the workshop by the the U.S. Geological Survey (Biological Resources Division) in 1998. Other funding support came from a variety of state and federal agencies, the Canadian Wildlife Service, and private organizations.

[d] An additional $30,900 was given to 1 project by the U.S. Geological Survey (Biological Resources Division) in 2003.

[e] The National Biological Service contributed $5,578 to the WMGBR Program in 1996.

ACKNOWLEDGMENTS

I am grateful for the comprehensive minutes prepared by R. E. Tomlinson for each meeting of the MSUGB Subcommittee between 1984 and 1994. Without them, a detailed historical account of events and programs would not have been possible. Additionally, I want to thank R. E. Tomlinson, J. H. Schulz, R. R. George**,** H.M. Reeves, R. J. Blohm, D. MacDonald, and K. M. Babcock for reviewing this paper and providing information and suggestions for improvement.

LITERATURE CITED

Much of the information contained herein is from minutes and reports on file in the author's USFWS office. Additionally, all remaining copies of Tacha and Braun (1994) are being stored there. Copies of either the minutes or the book can be obtained upon request.

MacDonald, D. and T.R. Evans. 1970. Accelerated research on migratory webless game birds. Transactions of the Thirty-fifth North American Wildlife and Natural Resources Conference. Wildlife Management Institute, Washington, D.C., USA. 35:149-156.

Sanderson, G.C., editor. 1977. Management of migratory shore and upland game birds in North America. International Association of Fish and Wildlife Agencies, Washington, D.C., USA.

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Appendix 1. Technical Committees for evaluating and prioritizing Webless Migratory Game Bird Research Program proposals.

Western	**Central**	**Northeastern**	**Southeastern**
Alaska	Arkansas	Connecticut	Alabama
Arizona	Colorado	Delaware	Florida
California	Iowa	Illinios	Georgia
Hawaii	Kansas	Indiana	Kentucky
Idaho	Minnesota	Maine	Louisiana
Oregon	Missouri	Massachusetts	Maryland
Utah	Montana	Michigan	Mississippi
Washington	Nebraska	New Hampshire	North Carolina
	New Mexico	New Jersey	South Carolina
	North Dakota	New York	Tennessee
	Oklahoma	Ohio	Virginia
	South Dakota	Pennsylvania	West Virginia
	Texas	Rhode Island	
	Wyoming	Vermont	
		Wisconsin	

Appendix 2. Evaluation criteria for Webless Migratory Game Bird Research proposals (Revised July 20, 1998).

Possible points	Criteria

10 **I. Existing information data base related to the problem in question for this species/population**

10 pts. Little known
5 pts. Moderately known
2 pts. Extensive

20 **II. Information needs**

20 pts. Addresses an immediate need identified in a management plan (national, regional, or state), the 1994 book *Migratory Shore and Upland Game Bird Management in North America*, or a regional technical committee priority list.
10 pts. Addresses a future need identified in a management plan (national, regional, or state), the 1994 book *Migratory Shore and Upland Game Bird Management in North America*, or a regional technical committee priority list.
2 pts. Addresses a need identified only in the proposal.

30 **III. Status of the species/population**

A. Population

15 pts. Decreasing
13 pts. Unknown
7 pts. Stable
2 pts. Increasing

B. Habitat

15 pts. Decreasing
13 pts. Unknown
7 pts. Stable
2 pts. Increasing

20 **IV. Management applicability**

A. Range

15 pts. Results applicable throughout
10 pts. Results applicable to > 50% of range
5 pts. Results applicable to < 50% of range

B. Applicability

5 pts. Multi-species (Biodiversity approach)
3 pts. Single species

30 **V. Scientific merit**

30 pts. Objectives are clearly stated, procedures are well designed, results are attainable, quantifiable estimates will be statistically reliable and comparable to other studies, manpower and budget are adequate.
15 pts. Objectives are clearly stated, most procedures are well designed, important results are attainable, quantifiable estimates will be statistically reliable and comparable to other studies, manpower and budget are generally adequate.
0 pts. Objectives fuzzy, poor design or results not attainable, results will not be statistically reliable or will be difficult to compare, budget and manpower are inadequate (zero value automatically kills the proposal).

10 **VI. Funding**

10 pts. > 75% of funding from other sources
7 pts. 50-75% of funding from other sources
5 pts. 33-49% of funding from other sources
0 pts. <33% of funding from other sources (zero value automatically kills the proposal).

120 **TOTAL**

Webless Migratory Game Bird Research Program Projects
Progress to Date

American Woodcock

Survival, Habitat Use and Fall Movements of American Woodcock in the Western Great Lakes Region

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Expected completion date: September 2005

There has been concern for several years about the status of American woodcock (*Scolopax minor*) populations, primarily because of declining trends in the number of woodcock heard on the annual singing-ground survey. The number of woodcock heard on the survey declined an average of 2.1% per year in the Eastern Region and 1.8% per year in the Central Region during 1968–2004. The causes of the declines are not entirely clear but habitat changes, particularly a decline in the extent of early successional forest habitats, are widely regarded to be the primary cause of population declines. However, concern about the status of woodcock populations has highlighted the need for information on the role of hunting mortality in woodcock population dynamics. A recent study is addressing this issue in the Eastern Region (D. G. McAuley, USGS, BRD, personal communication) but results of that study may not be applicable to management in the Central Region. Hunting seasons are more liberal in the Central Region and other factors that influence population dynamics may vary between the 2 regions.

Our objectives were to use radio telemetry to document survival rates, sources of mortality, habitat use, and local movements of woodcock in Michigan, Minnesota and Wisconsin during fall. We completed the fourth year of field work in Minnesota and the third in Michigan and Wisconsin during fall 2004. During 2001–2003, we radio-marked woodcock on paired study areas, 1 of which was open to woodcock hunting ("hunted areas") and 1 of which was closed ("non-hunted areas") or had limited access for woodcock hunting ("lightly-hunted area") in all 3 states. A major change in 2004 was that the formerly non-hunted area in Minnesota was opened to woodcock hunting. A sub-sample of after-hatch-year female woodcock was monitored intensively in each state to provide information on movements and habitat use.

Woodcock Captures, Telemetry and Survival

In 2001, we put transmitters on 75 woodcock in Minnesota. Forty-four of these birds were captured and released in the non-hunted area and the other 31 were captured and released in the hunted area. Four of the birds in the non-hunted were censored, 2 slipped their transmitters, and 1 was killed by a mammalian predator. In the hunted area, 3 birds were censored, 1 slipped its transmitter, and 1 was shot prior to the hunting season.

During 2002–2004, we put transmitters on 1,098 woodcock in Michigan, Minnesota and Wisconsin, combined (Tables 1–3). Preliminary Kaplan-Meier season (Table 4) suggest that woodcock survival rates were generally higher in non-hunted areas than in hunted areas and that there was considerable variation in survival among sites and years.

Hunting was generally the primary source of mortality in the hunted areas in Michigan and Minnesota during 2001–2003. Hunting also was the primary source of mortality in the hunted area Wisconsin in 2003, but predation was the primary source there in 2002. Predation was the primary source of mortality in the non-hunted areas in Michigan and Minnesota, and the lightly-hunted area in Wisconsin in 2002. However, hunting mortality exceeded predation mortality in the lightly-hunted area in Wisconsin in 2003. As of this writing, primary sources of mortality during the 2004 field season were unclear because of a relatively large number of woodcock (20) for which the cause of death is unknown. Necropsies will be conducted on these birds to attempt to determine the cause of death.

Future survival-related analyses will include estimation of survival for the entire fall period, age and sex-specific survival rates, cause-specific mortality rates, hazard functions, and statistical comparison of survival curves. We will examine the influence of covariates (e.g. site, sex) using the Cox proportional hazards model.

estimates of survival of woodcock during the hunting

Movements and Habitat Use

Preliminary analyses of movement and habitat use data from after-hatch-year female woodcock suggest that these birds make primarily small-scale movements (47.7% <50 m between subsequent locations and 5.82 ha average 95% fixed kernel home range size) prior to fall migration. Primary cover types used were aspen (*Populus* spp.) seedling/sapling, aspen pole, alder (*Alnus* spp.), conifer and willow (*Salix* spp.) Preliminary analyses also suggest that woodcock used edges within individual covers, but that use of edge habitats is variable among habitat types and years.

These are preliminary results from 3 field seasons in Michigan and Wisconsin and 4 field seasons in Minnesota. Funding for this project is being provided by the U.S. Fish and Wildlife Service-Region 3, the Biological Resources Division of the U. S. Geological Survey, the Minnesota Department of Natural Resources (DNR), the Michigan DNR, the Wisconsin DNR, the 2001 Webless Migratory Game Bird Research Program, the University of Minnesota, Northern Michigan University, the University of Wisconsin-Madison, the Wildlife Management Institute, the Ruffed Grouse Society, the Wisconsin Pointing Gun Dog Association and the North Central Wisconsin Chapter of the North American Versatile Hunting Dog Association.

Table 1. Fate of woodcock radio-tagged in hunted and non-hunted or lightly-hunted study areas in Michigan, Minnesota, and Wisconsin in 2002. All other woodcock were assumed to have migrated.

	Michigan		Minnesota		Wisconsin	
Fate	Hunted (*n* = 65)	Non-hunted (*n* = 56)	Hunted (*n* = 67)	Non-hunted (*n* = 69)	Hunted (*n* = 71)	Lightly-hunted (*n* = 48)
Shot	4	0	9	0	2	0
Mammal predation	0	2	0	2	3	3
Avian predation	0	2	2	2	2	1
Unknown mortality	0	1	2	4	3	0
Trauma	1	0	0	0	0	0
Pulmonary congestion	1	0	0	1	0	0
Slipped transmitter	3	5	1	5	6	2
Censored mortality	7	3	5	10	5	2
Total	16	13	19	24	21	8

Table 2. Fate of woodcock radio-tagged in hunted and non-hunted or lightly-hunted study areas in Michigan, Minnesota, and Wisconsin in 2003. All other woodcock were assumed to have migrated.

	Michigan		Minnesota		Wisconsin	
Fate	Hunted (*n* = 58)	Non-hunted (*n* = 17)	Hunted (*n* = 68)	Non-hunted (*n* = 77)	Hunted (*n* = 70)	Lightly-hunted (*n* = 52)
Shot	5	0	9	1	12	6
Mammal predation	3	0	1	5	4	2
Avian predation	0	0	4	7	2	1
Unknown mortality	1	1	1	2	1	1
Trauma	1	0	0	0	0	0
Pulmonary congestion	0	0	0	0	1	0
Slipped transmitter	2	0	1	3	0	3
Censored mortality	2	0	3	6	9	2
Total	14	1	19	24	29	15

Table 3. Fate of woodcock radio-tagged in hunted and non-hunted or lightly-hunted study areas in Michigan, Minnesota, and Wisconsin in 2004. All other woodcock were assumed to have migrated.

	Michigan		Minnesota		Wisconsin	
Fate	Hunted (n = 63)	Non-hunted (n = 52)	Hunted (n = 32)	Formerly non-hunted[a] (n = 96)	Hunted (n = 70)	Lightly-hunted (n = 67)
Shot	11	0	1	5	4	3
Mammal predation	0	2	2	1	3	3
Avian predation	0	1	0	2	1	0
Unknown mortality	3	4	1	9	1	2
Tower kill	0	0	0	1	0	0
Slipped transmitter	0	1	0	0	0	0
Censored mortality	3	2	2	4	8	3
Total	17	10	6	21	17	11

[a]Opened to woodcock hunting in 2004.

Table 4. Preliminary Kaplan-Meier estimates of woodcock survival in hunted and non-hunted or lightly-hunted areas during the hunting seasons in Michigan, Minnesota and Wisconsin, 2001-2004.

		Hunted			Non-hunted[a]		
Year	State	n^b	Survival	95% CI	n^b	Survival	95% CI
2001	MN	27	1.000	0.000-0.000	37	0.966	0.763-1.169
2002	MI	58	0.820	0.541-1.098	48	0.901	0.674-1.128
	MN	61	0.772	0.633-0.911	51	0.929	0.836-1.022
	WI	63	0.872	0.736-1.009	46	0.847	0.660-1.035
2003	MI	52	0.821	0.676-0.966	17	0.833	0.561-1.105
	MN	59	0.733	0.430-1.036	55	0.851	0.690-1.012
	WI	58	0.639	0.489-0.788	49	0.735	0.583-0.886
2004	MI	59	0.731	0.507-0.955	44	0.896	0.739-1.053
	MN	28	0.883	0.291-1.475	83	0.812[c]	0.621-1.004
	WI	57	0.802	0.591-1.013	55	0.936	0.772-1.100

[a]Lightly-hunted in Wisconsin.
[b]The number of birds that provided any useable data during the 45-day hunting season.
[c]Opened to woodcock hunting in 2004

Mourning Doves

Development and Evaluation of Mourning Dove Population Models for Optimizing Harvest Management Strategies in the Eastern, Central, and Western Management Units

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Graduate student: David A. Miller (Ph.D) **Expected completion:** 2008

Introduction and Objectives

An informed harvest management process for mourning doves will require development of one or more population models that synthesize existing knowledge of basic life history parameters and how these parameters may be affected by intrinsic and extrinsic factors such as harvest rate, weather, and habitat conditions. Such models allow predictions of effects of different harvest prescriptions on long term population and harvest levels, and can ultimately be used to define decision criteria for implementing alternative harvest strategies. This modeling effort represents an initial step in a process to an improved decision making process for mourning doves, and strives to place mourning dove harvest management in an objective and quantitative framework.

Understanding the effects of harvest on mourning dove populations is a multi-faceted challenge, and this effort is only one of many steps in increasing our knowledge. Upon completion of the project, we expect to have advanced the process of developing an improved system of dove harvest management by 1) improving our understanding of dove population dynamics, 2) prioritizing population monitoring data needs within the context of a long term harvest management system, and 3) recommending surveys and studies to fill information gaps that constrain development of more useful and realistic population models.

Contemporary information about dove population demographics and the relationship of mortality and reproductive rates to extrinsic and intrinsic factors is clearly inadequate to support sophisticated modeling fitting or adaptive modeling efforts at this point in time. However, it is necessary to begin development and evaluation of rudimentary models that represent a first step toward a long term objective of improved dove harvest management strategies that are grounded in credible population models and that guide improved population monitoring programs that will be necessary to support management efforts.

Progress to Date

Re-analysis of the 1965–1975 banding studies in the EMU, CMU and WMU was completed, and a set of survival models for each management unit was constructed based primarily on these analyses. The models are distinguished by the functional form of the relationship between annual survival and harvest rate, which ranges from completely additive to totally compensatory. A manuscript based on this work has been published.

Estimates of annual recruitment, in terms of number of juveniles (HY) per adult (AHY) in the pre-harvest population, can be derived from age ratios observed in the harvest, corrected for differential harvest vulnerability of age classes. Harvest age ratios are usually from collection of wings from surveyed hunters, and long term surveys are conducted by the U.S. Fish and Wildlife Service for waterfowl species and woodcock (*Scolopax minor*). In the case of waterfowl, age ratio data from wing surveys is a key component in development of reproductive models used in the adaptive harvest management program. However, no long term program has been instituted for mourning doves. Thus, no long-term, large-scale monitoring programs or datasets are available to serve as the basis for development of quantitative models that predict annual production as a function of weather, habitat, and/or population density. Based on a review of the dove literature and a more general review of relevant ornithological literature, I derived a predicted range of per capita reproductive rates for each of several large geographical subregions. These estimates are based on a simple model that is a function of breeding season length, nest success, and length of the nesting cycle of

successful and unsuccessful nests. A manuscript based on this work has been published.
Survival and productivity models have been integrated into simple predictive models of population growth rate. Model predictions for are positively biased when compared to trends calculated from the Call Count Survey. It is unknown whether bias is due to poorly estimated vital rates or model structure inadequacy, and model improvement will depend on data generated from new research and monitoring programs.

Contemporary and statistically reliable estimates of harvest rates are fundamental to the evaluation and improvement of population models and the harvest regulation process. In cooperation with a consortium of 26 states, the U.S. Fish and Wildlife Service, and the USGS Bird Banding Laboratory, a 3-year banding study has was initiated in 2003. The project is designed to achieve the following objectives: 1) estimate harvest rates in a representative sample of multi-state regions, 2) estimate current band reporting rates, which can be used to convert direct recovery rate estimates to harvest rates from other regions and presumably for all regions in the foreseeable future, 3) serve as a pilot study for a future coordinated nationwide banding program designed to produce comprehensive estimates of harvest and survival rates, 4) provide information on geographical distribution of harvest, and initial estimates of annual survival and breeding site fidelity from a sample of breeding populations. IN 2003 and 2004, nearly 60,000 birds were banded, and preliminary summaries of band recovery data have been provided to cooperators.

In response to a request in 2003 from the U.S. Fish and Wildlife Service for interim harvest management strategies that could be implemented until adequately reliable populations models and monitoring programs are in place, technical assistance was provided to dove technical and steering committees. A proposed management strategy based on harvest data, i.e., estimates of total harvest from the national Harvest Information Program, and harvest rates from an ongoing banding program, was developed and evaluated for potential use.

Future Work

Work in the next year will primarily focus on:

1. Assistance in development of an implementation plan for the National Mourning Dove Strategic Harvest Management Plan. The focus of this plan will be to describe an integrative strategy for establishment of survival, recruitment, and population monitoring protocols that will be necessary for improvement of population models and informed harvest management.

2. Discussion of the need for development of improved predictive models for annual recruitment, perhaps based on a national harvest wing survey program. Initial ideas have been developed regarding research necessary to calibrate results from such a survey, and proposals for pilot field studies in 2005 are in progress.

3. Communication of project status and direction to technical committees and working groups in dove management units, steering committees, and flyways.

These are results from the fifth year of a multi-year study funded by the USFWS Webless Migratory Game Bird Program and more than 25 cooperating state wildlife agencies.

HARVEST DYNAMICS OF MOURNING DOVES IN SOUTH CAROLINA

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Final Report

Call-count surveys indicate that mourning dove (*Zenaida macroura*) populations in South Carolina and in the Eastern Management Unit declined during 1966-2004 (Dolton and Rau 2004). Although reasons for this negative trend are not known, annual survival, particularly that of juveniles, appears to have decreased in South Carolina between the 1970s and 1990s (Haas 1978, McGowan and Otis 1998). Thus, there is a need to investigate patterns of mortality during periods within the annual cycle when the mortality rate may be particularly high.

The role that various sources of direct mortality and their interactions have played in the population dynamics of mourning doves is sometimes unclear (Braun et al. 1993). Because South Carolina is thought to have had a relatively high dove harvest historically (Shipes et al. 1983) and the role of hunting in this decline is unknown, we initiated a telemetry study to estimate population parameters at 3 core sites thought to have had different levels of hunting pressure (heavy, moderate, and light). Each of the 3 core study sites was surrounded by a 5km buffer zone, which defined the boundaries of each study site. The objectives of this study are to (1) assess the influence of subcutaneous radiotransmitter implants on the weight change, dehiscence rate, and survival of doves, (2) estimate period survival rates (PSR) and cause-specific mortality rates during July- November, (3) estimate recruitment into the fall population, and (4) estimate band reporting rates.

We radiomarked birds to estimate PSRs and cause-specific mortality rates from retrieved and unretrieved hunter harvests, and natural factors (i.e., predation) during July–November 1998–2000. We estimated recruitment into the fall population from harvest age ratio data collected at organized dove hunts that occurred at the 3 study sites. We used 1992–97 band and recovery data and 1998-2000 telemetry data to estimate band reporting rates.

We elected to attach radiotransmitters to birds using the subcutaneous transmitter implantation (STI) method of Schulz et al. (1998) because traditional methods of transmitter attachment have been unsuccessful in doves. We assessed possible negative influences of the STI method on doves in both a cage experiment and in *a posteriori* analyses of the field study data. In the cage experiment, we found that the percent weight changes for adult birds of known gender were 1.25 (0.15–2.35, 95% CI) and -1.55 (-3.27–0.17, 95% CI) for AHYM and AHYF birds, respectively, and 0.79 (-1.09–2.67, 95% CI), 1.89 (0.01–3.77, 95% CI), and -3.13 (-4.68–1.58, 95% CI) for control (CTL), sham surgery (SS), and STI birds, respectively. In the analysis in which birds of all ages were included, the percent weight changes of birds in the CTL, SS, and STI groups were 3.36 (1.36–5.36, 95% CI), 2.92 (0.25–5.59, 95% CI), and -2.98 (-4.65–1.31, 95% CI). The dehiscence rate in the cage experiment and field study birds were 0% and 9%, respectively. In the field study, we detected a relatively high number of mortalities during the 3 days post-release. However, the summer PSR after that time was relatively high, 0.9466 (0.8950–0.9982, 95% CI). The proportion of known age birds that were marked during the preseason and recovered by hunters in the hunting season immediately following marking did not vary significantly by marktype. However, because the proportion of STI birds that were directly recovered (14.7%) was somewhat greater than the proportion of leg-banded birds (9.2%), future investigations should address the susceptibility of STI birds to hunting mortality.

The most parsimonious proportional hazards regression model indicated that the mid July- late November PSR (131 days) varied by age, site, and subperiods (hunted and nonhunted). PSR estimates of AHY birds at the sites with heavy, moderate, and light hunting pressure were 0.9008 (0.8085–0.9931, 95% CI), 0.9491 (0.8844–1.0138, 95% CI), and 0.9574 (0.9084–1.0064, 95% CI), respectively, during the nonhunted subperiods, and 0.5853 (0.3962–0.7744, 95% CI), 0.7472 (0.5980–

0.8964, 95 % CI), and 0.8056 (0.6660–0.9452, 95% CI), respectively, during the hunted subperiods. Estimates of HY birds at the sites with heavy, moderate, and light hunting pressure were 0.8043 (0.6255–0.9831, 95% CI), 0.8853 (0.7795–0.9911, 95% CI), and 0.9166 (0.8827–1.0105, 95% CI), respectively, during the nonhunted subperiods, and 0.3095 (0.0984–0.5206, 95% CI), 0.5282 (0.3155–0.7409, 95% CI), and 0.6229 (0.3840–0.8618, 95% CI), respectively, during the hunted subperiods.

The most parsimonious model of hunter kill rate (both retrieved and unretrieved hunter-shot birds) indicated that this source of mortality varied by age, site, and subperiod (hunted and nonhunted). AHY estimates from the sites with heavy, moderate, and light hunting pressure were 0.4352 (0.2314–0.6390, 95% CI), 0.2494 (0.0889–0.4099, 95% CI), and 0.1043 (-0.0131–0.2217, 95% CI), respectively. Estimates for HY birds from these sites were 0.6933 (0.4701–0.9165, 95% CI), 0.4452 (0.2196–0.6708, 95% CI), and 0.2050 (-0.0116–0.4216, 95% CI), respectively. The most parsimonious harvest rate (retrieved hunter-shot birds) model also varied age, site, and subperiod (hunted and nonhunted). AHY harvest rate estimates from birds captured at sites with heavy, moderate, and light hunting pressure were 0.3908 (0.1856–0.5960, 95% CI), 0.2494 (0.0844–0.4144, 95% CI), and 0.0346 (-0.0364–0.1056, 95% CI), respectively. HY estimates from these sites were 0.6408 (0.3972–0.8844, 95% CI), 0.4452 (0.2157–0.6747, 95% CI), and 0.0721 (-0.0690–0.2132, 95% CI), respectively.

Because data were sparse, we included both known age and unknown age birds in the analysis of crippling rate (unretrieved hunter-shot birds). The estimate associated with the simplest model, in which crippling varied by subperiod (hunted and nonhunted), was 0.0721 (0.0160–0.1282, 95% CI). Similarly, we pooled both known age and unknown age birds in the analysis of natural mortality rates because of sparse data. The overall natural mortality rate estimate for the 131-day study period was 0.1445 (0.0577–0.2333, 95% CI).

The preseason age ratios ([number of harvested HYs : number of harvested AHYs] / [HY direct recovery rate : AHY direct recovery rate]) of harvested birds were 1.446:1, 1.321:1, and 1.113:1 during 1998, 1999, and 2000, respectively. Preseason age ratios varied by site during only one year of the study, when this ratio was greatest at the site with the lowest hunting pressure. These ratios are well below most previous estimates from the Carolinas (Haas 1978, McGowan and Otis 1998).

We estimated harvest rates from telemetry data, solicited and unsolicited direct recovery rates from band and recovery data, and used the relationship among these parameters in the equations of Henny and Burnham (1976) and Conroy and Williams (1981) to estimate local band reporting rates. Our age-specific band reporting rate estimates of AHY and HY birds were 0.1729 (0.0069–0.3389, 95% CI) and 0.0709 (0.0150–0.1268, 95% CI), respectively. The overall band reporting rate estimate was 0.1149 (0.0432–0.1866, 95% CI). These estimates are considerably lower than those of other North American reporting rate studies.

Funding for this study was provided by the 1996 and 2000 Migratory Game Bird Research Program (U.S. Fish and Wildlife Service and U.S. Geological Survey Biological Resources Division), South Carolina Department of Natural Resources, South Carolina Public Service Authority (SanteeCooper), Safari Club International, Clemson University, and the South Carolina Cooperative Fish and Wildlife Research Unit.

Reference: Berdeen, J. B. 2004. Harvest dynamics of mourning doves in the Coastal Plain of South Carolina. Dissertation, Clemson University, Clemson, South Carolina, USA.

Band-tailed Pigeons

An Evaluation of Survey Methods for Monitoring Interior Populations of Band-tailed Pigeons

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Abstract of Final Report

Harvest data from the Four-corners region indicate that interior populations of band-tailed pigeons (*Patagioenas fasciata fasciata*) have declined since the late 1960's. Management of these populations requires better knowledge of the distribution, abundance, and population trajectory of the species; however, no standardized protocol currently exists for monitoring band-tailed pigeons in the interior region. The primary objective of this study was to develop an effective survey method for monitoring interior populations of band-tailed pigeons. From 2002 to 2004, we collected data in mountain ranges of southeastern Arizona (our principal study area) and in mixed-conifer forests throughout the state to test five potential survey methods for monitoring interior populations of band-tailed pigeons. The five survey methods that we evaluated were: 1) short-duration auditory surveys at points along transects; 2) call-broadcast surveys at points along transects; 3) longer-duration auditory surveys at random points; 4) capture-recapture at baited feed sites; and 5) counts at baited feed sites. We estimated the detection probability (i.e., the probability that an observer will record a pigeon that is present during a survey) associated with each method and compared these estimates to assess the accuracy and precision of the five survey methods.

We also need more information on the breeding biology, reproductive success, habitat needs, potential causes of mortality, current population trajectory, and effects of habitat disturbance (e.g., wildfire) on populations of band-tailed pigeons to more effectively manage the species. To address these issues, we collected throat swab samples from pigeons caught during trapping efforts to test for the presence of trichomoniasis and attached radio transmitters to captured pigeons to track their movements and locate nests. We visited nests regularly during the breeding season to estimate reproductive success, identify causes of nest failure, and quantify habitat characteristics at nest sites. We estimated population trajectory for band-tailed pigeons in the Santa Catalina Mountains, Arizona by repeating a pigeon survey that was originally conducted from 1968-1970. In an effort to document the effect of wildfire on band-tailed pigeons, we compared pre- and post-burn survey data collected along survey routes that were affected by wildfires in 2002 and 2003.

Of the five survey methods that we evaluated, call-broadcast surveys proved to be the most effective method for monitoring band-tailed pigeons in mountains of southeastern Arizona. Call-broadcasts increased the number of pigeons that were detected by *coo-calls* by an average of 19% compared to auditory surveys (paired one-tailed $t = 2.8$; $df = 344$; $P < 0.01$), a pattern that was consistent across 5 mountain ranges in southeastern Arizona and in mixed-conifer forests throughout the state. Moreover, call-broadcasts increased the number of replicate surveys on which ≥1 pigeon was detected by an average of 14% (36% versus 31%; paired one-tailed $t = 2.4$; $df = 344$; $P = 0.01$). Thus, call-broadcasts increased the efficiency of survey efforts by reducing the number of surveys on which no pigeons were detected. Although not statistically significant, detection probability appeared to be greater for call-broadcast surveys (0.80) compared to short-duration auditory surveys (0.69) and longer-duration auditory surveys (0.37). Variation in detection probability was similar for call-broadcast and auditory survey methods. To the best of our knowledge, this is the first time that call-broadcasts have been shown to increase the probability of detecting band-tailed pigeons (or any other species of *Columbidae*) during surveys.

Although capture-recapture and counts at baited feed sites have been recommended for use in the interior region, we believe that both of these survey methods will be of limited use for monitoring band-tailed pigeons in

southeastern Arizona. Compared to other survey methods, capture-recapture was the least efficient (in terms of pigeons recorded per hour per observer) requiring at least two observers to manage traps and band birds, and considerable extra time to maintain bait sites on a daily basis. More importantly, detection probabilities (i.e., recapture/re-sight probabilities) were very low (<0.01) for both capture-recapture and counts at baited feed sites indicating that we sampled different portions of the population during replicate trapping and count sessions. We attempted to increase the number of pigeons captured/recaptured by placing model pigeon decoys at our baited feed sites; however, we found that the use of decoys actually decreased the number of pigeons trapped at these sites compared to sites without decoys (paired one-tailed $t = 2.4$; $df = 37$; $P = 0.02$).

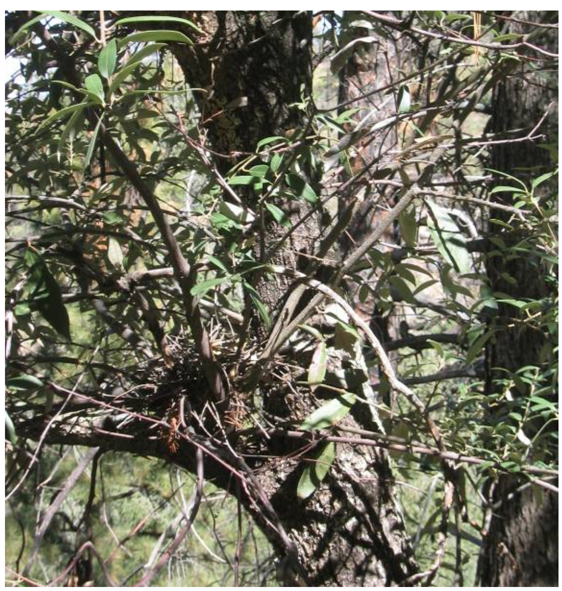
Because band-tailed pigeons flock to bird feeders in mountain towns of southeastern Arizona, daily movements of pigeon flocks between established feed sites likely depressed our rates of recaptures and re-sights (we trapped and counted pigeons at a subset of these established feed sites). Unless trapping and counting sites are moved away from residential areas (a difficult proposition given that band-tailed pigeons utilize these sites), future capture-recapture and count efforts will have to contend with frequent short-distance movements of pigeon flocks between multiple feed sites. Additional movements of band-tailed pigeons between mountain ranges in southeastern Arizona may exacerbate this problem (see below). Southeastern Arizona has neither the agricultural fields (e.g., Colorado) nor the mineral springs (e.g., California) necessary to attract large, consistent numbers of band-tailed pigeons for capture-recapture and count efforts. We suspect that this may be the case for other areas within the interior range of band-tailed pigeons (e.g. New Mexico, Utah, and elsewhere in Arizona).

In southeastern Arizona, we detected cooing males more frequently during surveys in mixed-conifer forest (≥1 pigeon detected at 75% of survey points) and oak-juniper-pinyon woodland (≥1 pigeon detected at 51% of survey points) compared to other forest types. Recent wildfires appear to have had little effect on the number of band-tailed pigeons detected during surveys. We were unable to detect a difference in relative abundance of calling band-tailed pigeons when comparing survey data collected before and after the 2002/2003 wildfires at burned and unburned survey points (MANOVA; $F = 0.20$; $P = 0.82$). We found that the rate of *Trichomonaisis* infection was low (4%) for captured pigeons in the Santa Catalina Mountains. By tracking radio-marked birds, we observed movements of pigeons up to 100 km between 4 mountain ranges in southeastern Arizona and located 12 band-tailed pigeon nests that were initiated between May and August (75% of nests were initiated in June or July). Nest success was low (27%) and 50% of the nests that failed were known (or suspected) to have been depredated. We found that the majority of nests were located on north-facing slopes in high-elevation mixed-confer forest. Nest site characteristics were generally similar to those reported for band-tailed pigeon nests in Oregon. By repeating a pigeon survey that had been conducted in southeastern Arizona in the late 1960s, we observed that numbers of band-tailed pigeons appear to have declined substantially (82%) in the Santa Catalina Mountains from 1968-1970 (mean of 5.3 pigeons detected per weekly survey) to 2002-2004 (mean of 1.0 pigeon detected per weekly survey; two-sample $t = 5.4$; $df = 66$; $P < 0.01$).

In summary, our evaluation of potential survey methods for monitoring interior populations of band-tailed pigeons revealed that that there was no one survey method that was clearly superior to the others (i.e., there were drawbacks associated with each method). Nevertheless, compared to the other survey methods, call-broadcast surveys appear to be the best alternative for monitoring band-tailed pigeons in the rugged mountains of southeastern Arizona. We believe that additional research may be required to determine the most appropriate monitoring method for use in other parts of the interior region. For instance, capture-recapture or counts of pigeons may provide a more reliable and cost-effective monitoring method in areas where large flocks of pigeons congregate regularly in agricultural fields or at mineral springs. We suspect that call-broadcast surveys will likely provide the best method with which to monitor band-tailed pigeons in areas that lack these attributes; a potentially sizeable portion of the rugged mountainous region within Arizona, New Mexico and Utah. Ultimately, several different techniques may be required to effectively monitor band-tailed pigeons in different parts of the interior portion of their range.

Given that populations of the interior sub-species of band-tailed pigeon appear to be in decline in southeastern Arizona, we recommend that managers begin regular call-broadcast surveys to monitor band-tailed pigeon populations in the region. Further research is needed to examine the impact of potential limiting factors on the interior sub-species of band-tailed pigeons including mortality risks for adults (e.g., predation and hunting) and factors contributing to the low nest success rates observed during the current study. Management action may be necessary to address potential limiting factors for interior populations of band-tailed pigeons if perceived declines in populations continue. This abstract summarizes results from a 3-year study funded by the U.S. Fish and Wildlife Service Webless Migratory Game Bird Research Program, the Arizona Game and Fish Department Heritage Fund, and the University of Arizona. A final report will be available in March 2005.

Observer conducting a band-tailed pigeon short-duration auditory survey on a survey route in the Santa Catalina Mountains, Arizona (June 2003). The mixed-conifer and Ponderosa-pine forests along this survey route were burned severely during a wildfire in 2002. *Photo by Greg Gryniewicz.*



Band-tailed pigeon nest located 3 m off the ground in a silverleaf oak (*Quercus hypoleucoides*) at 1,841 m elevation in the Santa Catalina Mountains, Arizona (July 2004). *Photo by Chris Kirkpatrick.*

Sandhill Cranes

Developing a Survival Model for the Rocky Mountain Population of Greater Sandhill Cranes

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The Rocky Mountain Population of Greater Sandhill Cranes (RMP, *Grus canadensis tabida*) nests in 5 central and northern Rocky Mountain states (CO, ID, MT, UT, WY) and possibly in southern Alberta. The RMP winters primarily in the middle Rio Grande Valley of New Mexico with smaller numbers found in southwestern New Mexico, southeastern Arizona, and the northern Mexican states of Chihuahua and Durango. Recent September surveys conducted in 5 summer ground states indicates a population of ±18,000–20,000, and surveys conducted from 1984–2004 suggest that the population is stable. Limited permit hunts of RMP cranes started in 1981 in Arizona and they are currently hunted in 6 Rocky Mountain states; they are also hunted in Mexico.

Current harvest levels for the RMP are based on a simple deterministic model of population dynamics. To extend this model to predict population dynamics as a stochastic process driven by harvest, environmental, and habitat factors, we propose to develop a survival model for the RMP. Our objectives include 1) organize and computerize sightings of color-marked cranes collected from 1969 to present, 2) estimate survival and movement rates from sightings, and 3) model survival as a function of hunting regulations and where possible assess influences of climatic and habitat variables.

From 1969–94, >1,900 cranes were color-marked on summer areas in Colorado, Idaho, Montana, Utah and Wyoming including >1,700 by the first author. We are currently extracting observations of these marked cranes from field journals. Each observation is being coded and entered on spreadsheets (Access) by identification of individual, age, date, location and social status of individual (single, pair, family affiliations-breeder, nonbreeder, sibling, etc), marker type, and capture method. Data entry is in progress and analysis will soon follow. Although no cranes have been marked since 1994, we are still recording observations of a limited number of individuals that still retain markers. The oldest crane, marked by the first author at Grays Lake , Idaho in August 1969, was recaptured in 1989 at Grays Lake and remarked; it is currently (Dec 2004) wintering at the Bosque del Apache NWR, New Mexico and is 35 years, 5 months old.

A final report on this project will be provided to the Pacific and Central Flyways Councils by spring 2006. The study is funded by the Webless Migratory Game Bird Research Program (U.S. Fish and Wildlife Service), Pacific Flyway Council, and Central Flyway Council. Wendy M. Brown, U.S. Fish and Wildlife Service, who helped collect observations during the past 20 years, is assisting with some aspects of the project.

Other Webless Research Projects

Mourning Doves and White-winged Doves

Studies of Native Columbiformes in Tucson, Arizona, 2004

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Banding of mourning (*Zenaida macroura*) and white-winged doves (*Z. asiatica*) continued in 2004. A total of 699 mourning doves was banded, as were 179 white-winged doves. Few Inca doves (*Columbina inca*) were seen at the trap location (Catalina Foothills, northeast Tucson) and none was banded. All bandings were between March and 30 October although mourning doves were present at the trap site in substantial numbers everyday. Breeding activities of mourning doves were initiated between 10 and 15 January and calling continued until 15 September. White-winged doves arrived in the area of the trap location in late March and most departed in mid to late August with few remaining into September. Breeding activity of white-winged doves commenced in April, mostly ended by mid August, with some calling continuing into early September 2004 (an unusual event).

Few recoveries (<20) have been received from 4,699 mourning dove bandings since start of banding in 2000 with only 2 shot recoveries. Only 1 shot recovery has been reported (<5 overall recoveries) from the 710 white-winged doves banded. All shot recoveries were in Arizona and no recoveries have been reported outside of Arizona. Based on band recoveries, both mourning and white-winged doves banded in the Catalina Foothills area at the northeast periphery of Tucson would appear to be non-migratory with little exposure to harvest, However, since few white-winged doves occur in the Tucson area after early September, they are presumed to migrate into Mexico. Little is known about movement patterns of mourning doves in the Tucson area although there are clearly increases and decreases in number of birds at the trap location irrespective of food availability. Further, recaptures (repeat captures) at the banding site indicate that some banded birds are not available for capture or have trap avoidance during some months.

Trichomoniasis was confirmed (microscopic identification of *Trichomonas gallinae*) in mourning doves starting in late March, peaking in April and essentially nonexistent after May. A few individuals exhibited signs of trichomoniasis in July and October (1). Trichomoniasis was not observed in white-winged doves.

Assessing Mourning Dove Count Trends along Call-count Transects in Texas

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Significant declines in the Mourning Dove (*Zenaida macroura*) Call-count index were reported for the Central Management Unit (CMU) in previous annual breeding population reports (2002, 2003) by U. S. Fish and Wildlife Service (USFWS). Texas, which comprises the largest proportional land area and the largest number of call-count survey routes (CCS; 133) within the CMU, has reported non-significant declines in the statewide population index (2004). While it is anticipated that the USFWS will consider some form of harvest restrictions if the statewide downward trend continues, changes in harvest regulations will not identify nor alter the underlying factors affecting long term dove population trends. In 2002, we collected data at multiple spatial scales to identify those variables which correlated with the CCS trends within the state, and to determine temporal change by comparison with the data collected in 1976. Variables defining physiognomic class, ground cover, canopy cover, and structural features were collected adjacent to each CCS route by ground surveys in 1976 and 2002. Agricultural and population variables including human density, road density, farm density, cattle density, and land area in small grains were obtained from the U.S. Department of Agriculture and the U. S. Census Bureau for each county in 1976 and 2002. Climatic variables including annual precipitation, mean temperature maximum, mean temperature minimum, mean dew point, and 30 year norms were extracted from 1976 and 2002 continental coverages obtained from the Spatial Climate Analysis Service at Oregon State University. The resulting multivariate data matrix was highly skewed, contained many zeros, and did not conform to traditional parametric statistical assumptions. Recently developed multiple response permutation (MRP) methods can use any distance or dissimilarity measure as the basis for the analysis, allowing researchers the flexibility to choose distance measures that are appropriate for the available data. We demonstrate the utility of MRP methods for generating multivariate models, and for producing constrained and unconstrained ordinations of highly skewed data while taking into account the correlational structure among variables. Unconstrained ordinations (principal coordinate analysis) were generated to visualize multivariate data in reduced dimensional space, followed by constrained ordinations for either testing hypotheses among a priori groups (canonical discriminant analysis), or for relating sets of environmental and CCS variables (canonical correlation analysis). In addition, nonparametric multiple regression using distance measures was used to correlate the multivariate relationship between environmental and CCS variables at multiple spatial scales. Our results indicate that significant changes in habitat occurred along the 84 CCS routes that remained spatially congruent between 1976 and 2002 . Further, our findings support previous studies which suggested that CCS results are poorly suited for use as response variables in habitat analysis. We submit that differences in the probability of detection among the CCS routes adds variability that cannot be accounted for with the available data. As a result we have implemented a pilot study to determine if density estimates, derived from DISTANCE sampling, can be utilized to account for the differences in detectability among CCS routes from different habitat types. Given adequate sample size, this methodology would allow density estimates to be generated for each transect, or for strata which differ from the USFWS sample design, providing for greater flexibility and utility of the data at state and local scales. Because habitat variables were correlated with CCS results at multiple spatial scales, we suggest these variables might be used in future mensurative studies to quantify, and possibly mitigate, the impacts on local and regional mourning dove populations.


Left: Pronghorn antelope on Mourning Dove Call-count Survey route 32 in the Trans-Pecos ecoregion. Right: Desert mule deer on Mourning Dove Call-count Survey route 134 in the Trans-Pecos ecoregion. *Photos by Brian L. Pierce.*


Left: Mourning doves in a mesquite tree on a route in the Cross Timbers ecoregion. Right: Call-count Survey work is a lonely business, but one does make an occasional friend along the way such as this Rattlesnake on route 33. *Photos by Brian L. Pierce.*

Dietary Overlap and Foraging Competition between Mourning Doves and Eurasian Collared-doves

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Final Report

Eurasian collared-doves (*Streptopelia decaocto*; hereafter "collared-doves") are recent invaders of North America. Introduced to the Bahamas in the mid-1970s, collared-doves have spread across much of the continent, assisted by additional releases and escapes from captivity. Recent authors have raised concern about the potential effects of the collared-dove invasion of North America on mourning dove (*Zenaida macroura*) populations based on ecological similarity between species, apparent behavioral dominance of collared-doves, and anecdotal reports of a negative relationship between numbers of the 2 species in Florida.

The overall goal of this research was to assess potential for interspecific (exploitation and interference) foraging competition between mourning doves and collared-doves. Within this goal, this study had four objectives. The first was to compare diet selection and measure degree of dietary overlap between the two dove species with respect to seed size and species, within a single food patch and across multiple patches. Our second objective was to determine results of direct competitive interactions between species, and assess influences of body size differences between competitors and temperature on results of these interactions. Our third objective was to determine the effect of food distribution (single patch versus multiple patches) on level of interference competition between species. Our final objective was to document levels of intraspecific aggression within species to provide an index with which to compare interspecific aggression levels. These objectives reflected four hypotheses that were tested: seed size selection in these two species is a function of body/bill size, behavioral dominance in direct competitive interactions between these species is a function of difference in body size, interspecific aggression between these species increases with decreasing temperature, and interference competition between these two species depends on resource distribution.

This research was conducted in a captive situation at the Tennessee Tech University avian research facility during September 2003-May 2004, using 15 collared-doves and 19 mourning doves captured in Coffee County, Tennessee. Dietary preference trials using both single and multiple patch methods compared seed selection patterns between the 2 dove species using seeds of 6 commonly cultivated plants. Three competition experiments documented levels and outcomes of competitive interactions between and within species. Experiment 1 documented aggression and competitive success of individuals of each species in pairwise interspecific trials, and tested the influence of temperature, body size of competitors, and resource distribution (single versus multiple patches) on these parameters. Experiment 2 compared aggression and competitive success between 4 classes of interactions (2 interspecific and 2 intraspecific) in 4-dove (2 of each species) trials. Experiment 3 used both 4-dove and pairwise trials to compare aggression and competitive success between 4 classes of interactions (2 interspecific and 2 intraspecific) and trial type.

Food preferences were similar between species, although Eurasian collared-doves included corn in their diet and mourning doves largely did not. Pianka's index of foraging niche overlap between species was 0.95. Food preferences did not vary between single- and multiple-patch trials. In competition experiment 1, aggression varied between trial types; mean rates (±SE) of interactions were 0.50 ± 0.10 and 0.12 ± 0.02 per minute during single and multiple patch trials, respectively. Neither aggression nor competitive success varied between species. In trials using multiple food patches, competitive success of mourning doves was positively related to ambient temperature. In experiment 2, aggression level varied between classes of interactions. Highest aggression levels occurred in intraspecific interactions among mourning doves, and lowest aggression levels occurred in intraspecific interactions among collared-doves. In experiment 3, mourning dove intraspecific aggression level was higher than levels of either intra- or interspecific aggression initiated by collared-doves in two-bird trials, but aggression level did not vary among interaction classes in four-bird trials. Competitive success varied among interaction classes, and was highest in intraspecific mourning dove interactions and interspecific interactions in which mourning doves were aggressors.

Our results indicated a high degree of dietary overlap between species in the foraging situation we provided, which did not support the hypothesis that bill and body size differences between species are associated with corresponding differences in seed size preference. Actual competition between these species in the wild may be more limited than suggested by our foraging experiments, however. Distribution of food in cafeteria experiments does not affect seed preferences of these species. Collared-doves do not appear behaviorally more aggressive or competitively successful than mourning doves, contradicting earlier reports. In fact, mourning doves seem to be more aggressive and competitively successful than collared doves in some situations. Intraspecific aggression among mourning doves generally is greater than interspecific aggression between mourning doves and collared-doves. Ambient temperature and body size of competitors have little effects on aggression or competitive ability of either species. Distribution of food in the environment does affect aggression between species, however. Our results suggest that the potential for negative effects of collared-doves on mourning dove populations may be less than previously suspected.

Our manuscript describing this project currently is in preparation and will be submitted for publication in the near future. Funding and/or other support for this project were provided by the Tennessee Tech University Department of Biology; the Center for Management, Utilization, and Protection of Water Resources; and the Tennessee Wildlife Resources Agency.

The Use of Artificial Nesting Structures in Mourning Dove Nesting Research and Habitat Management

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Despite a wealth of mourning dove nesting studies, the causes and consequences of nest site selection in the species remain poorly understood. Previous studies have measured parameters associated with nesting sites and drawn inductive conclusions regarding their relative importance based on observed data patterns. This study will take an experimental approach to understanding nest site selection mourning doves by using artificial nesting structures to manipulate availability of potential high-quality nesting sites. Extension publications advocate the use of such artificial nesting structures to improve mourning dove nesting habitat and nest success, but there have been no recent evaluations of the effects of these structures on dove nesting or productivity, and there are no research-based guidelines for their use in mourning dove management. The overall goal of this project is to evaluate the value(s) of artificial nesting structures for mourning doves research and conservation. Specific objectives include evaluation of the relative quality of nesting sites offered by artificial nesting structures, development of an optimal strategy for establishment of these structures in potential dove nesting habitat, and evaluation of the relative importance of various nest site parameters (including species of substrate, height, aspect, etc.) in dove nest site selection.

Preliminary data collection took place during May-August 2004 in Putnam County, Tennessee, to document density, distribution, nest success, productivity, and nest site selection patterns of locally nesting doves. Potentially suitable nesting habitat on woodlot edges and in suburban park-like areas was surveyed once per week for mourning dove nests, and nests found in were monitored weekly. Additionally, nest site characteristics such as height, substrate, and aspect were recorded. Analysis of these data are underway, to establish local baseline nesting patterns and aid in the selection of study areas and sites at which to establish artificial nesting structures in our second year of study. Construction and establishment of 250 of these structures will take place during February and March 2005. Nesting structures will be circular, 17.8 cm in diameter and 5.1 cm deep, made of hardware cloth. Structures will be placed within trees in areas used for nesting in 2004 to offer doves a range of site options with respect to tree species, height, aspect, and other variables deemed potentially important. All potential nesting habitat surveyed in 2004, including trees containing artificial structures, will be surveyed weekly during May-August 2005. Analyses will compare daily nest survival rates among 2004 nests, 2005 nests in artificial structures, and 2005 natural nests. Use of, and success of nests in, artificial structures will be modeled as functions of site characteristics. Data analysis will be conducted during September-December 2005, and manuscript preparation will be completed by April 2006. Funding for this study is being provided by the Tennessee Tech University Department of Biology.

Marshbirds

Development of a National Sampling Frame for Secretive Marshbirds

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No national program exists to survey secretive marshbirds such as rails and coots, yet some of these species are of concern, and many independent surveys of them are made. We are developing recommendations for a national program that will coordinate the existing work and identify gaps in coverage. Dr. Courtney Conway is developing the field sampling methods, and I am developing the sampling frame. Our recommendations will be reviewed and, when they are judged acceptable, may be extended into Canada. The basic approach is to delineate “bird monitoring regions” constructed by intersecting a States map with a Bird Conservation Regions map, smoothing the borders, and deleting small polygons. In each region, we then produce a list of species that will be the focus for designing the sampling frame. Next we identify “designated sites”, areas which should be included (i.e., should be non-randomly selected for inclusion). These sites are placed in one stratum. They will be surveyed, but results will be extrapolated only to this stratum, not to other areas. The rest of the area is termed the “matrix” and may be sub-divided into two or more matrix strata. The matrix strata cover all parts of the region; no areas are completely left out, though a decision may be made that too few birds occur in some matrix strata and that no surveys will be conducted in them. Guidelines for conducting surveys at each designated site and in each matrix stratum are then developed in cooperation with the people and groups who sill carry out the survey. An initial draft of the plan, with tentative species lists, designated sites, and matrix strata will be completed by February 28, 2005. These are results from the final year of a four-year study funded by the Science Support program of the USGS.

Evaluating the Usefulness of Prescribed Fire to Restore Habitat for the Yuma Clapper Rail and California Black Rail along the Lower Colorado River

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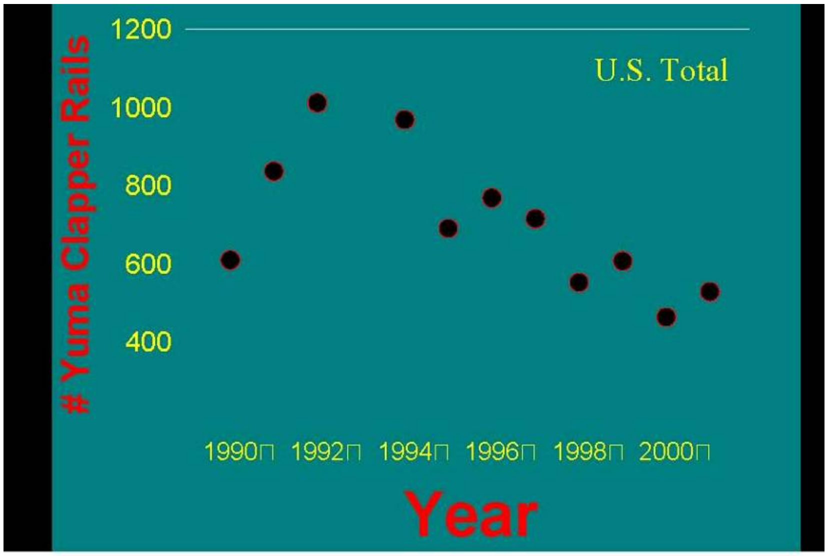
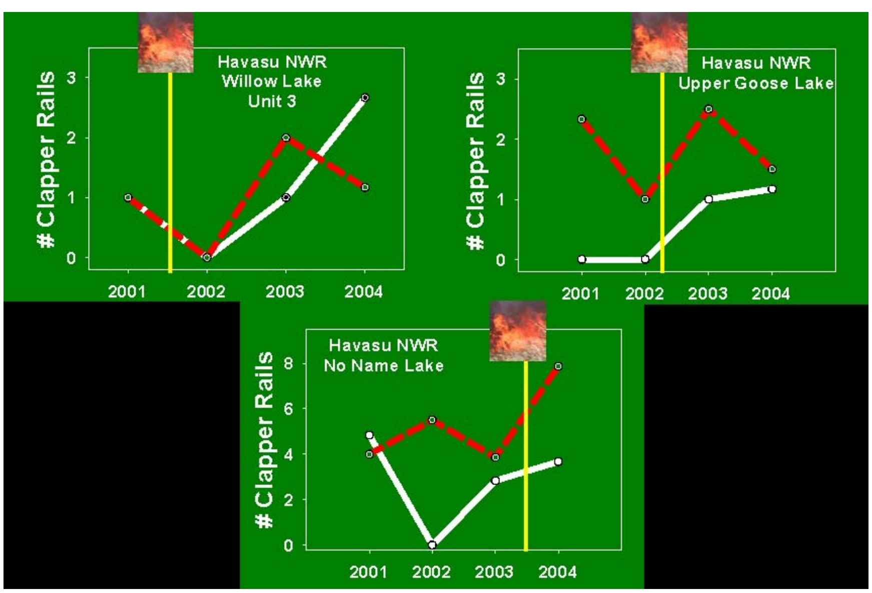
The Yuma clapper rail is listed as federally endangered by the U.S. Fish and Wildlife Service, and the California black rail is listed as state threatened/endangered in California and Arizona. Degradation and loss of optimal habitat are thought to be factors contributing to population declines in these species. Prescribed fire has been suggested as a potential management tool that might help restore habitat conditions for both these species. Fire is thought to improve the health the wetland habitat by encouraging new vegetative growth, reducing encroachment of woody vegetation, and reducing decadent vegetation from past year's growth. The objective of this study is to evaluate the efficacy of using fire as a management tool to restore habitat for, and ultimately delist, Yuma clapper rails and California black rails. Hence, we are examining the effects of fire on the abundance of this and other marsh bird species. The project has many contributing partners and is cooperatively funded by the Bureau of Reclamation, the Joint Fire Science Program, the U.S. Fish and Wildlife Service, and the U.S. Geological Survey.

The first objective of the project is to examine the effects of fire on the population trends of both species. Using a BACI experimental design we are examining marsh bird abundance before and after prescribed burns using standardized call-broadcast surveys. We will compare these data with that in control marshes. Currently, we have 15 replicate study sites (15 burns paired with 15 control sites). We are also conducting surveys in many other marshes in the region so that pre-burn information is available in the event of stochastic wild fire. The second objective of the study is to determine how frequently a marsh should be burned to sustain optimal conditions for these rare birds. Hence, we plan to continue surveys in burned marshes for many years to determine when rail numbers decline.

We are in the 3rd year of an 8-year study. Below are some preliminary results examining the effects of prescribed fire on Yuma clapper rails at a few of our study marshes. White lines indicate the number of rails each year in the burn marshes and the red lines indicate the number of rails each year in the paired control marshes. The yellow vertical lines indicate the date of the burn at each site. The number of Yuma clapper rails increased after the prescribed fire at all 3 of these study marshes. And at 2 of the 3 locations, rails increased in the first year after the burn. These are just a few of our preliminary results. We intend to include at least 5 more prescribed fires and will be analyzing the effect of fire on other marsh bird species as well.

Top: Yuma clapper rail. Bottom: California black rail.


U.S. Total
Yuma Clapper Rails
1200
1000
800
600
400
1990 1992 1994 1996 1998 2000
Year


Havasu NWR
Willow Lake
Unit 3
Clapper Rails
0 1 2 3
2001 2002 2003 2004
Havasu NWR
Upper Goose Lake
Clapper Rails
0 1 2 3
2001 2002 2003 2004
Havasu NWR
No Name Lake
Clapper Rails
0 2 4 6 8
2001 2002 2003 2004

Development and Field-testing of Survey Methods for a Continental Marsh Bird Monitoring Program in North America

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Populations of many species of rails and bitterns are thought to be declining across North America. Many species are listed as threatened or endangered in at least one state or province and several are considered threatened or endangered on a federal level. We know little about continental trends in population size for secretive marsh birds and current broad-scale survey efforts do not effectively estimate these trends due to insufficient coverage of wetland habitat. Despite the current lack of trend information, many of theses species are considered game species and have liberal bag limits. We need better estimates of population trends for many marsh birds so that management agencies can set appropriate harvest limits and effectively manage local populations. Furthermore, we need information on the effects of common wetland management actions on these secretive marsh birds. To help accomplish this goal, we initiated a pilot research and monitoring program to evaluate survey techniques and to field test standardized survey protocols across all of North America. The effort has been funded by the U.S. Fish and Wildlife Service and the U.S. Geological Survey.

The first objective of our study is to evaluate the effectiveness of standardized call-broadcast surveys on rails and bitterns across North America. To do this we will create a pooled database of surveys conducted by participants across the continent. Using this dataset we will then estimate and compare components of detection probability across different survey protocols incorporating estimates of vocalization probability and observer bias. We will also examine the effect of broadcasting numerous species' calls during a single survey.

The second objective of the study is to evaluate participation in the program, with a focus on the National Wildlife Refuge System (NWRS). The NWRS manages approximately 20% of existing wetlands in the United States and serves as an excellent testing grounds for implementing a continent-wide research and monitoring program. We will develop criteria for determining which refuges should participate in the program by examining wetland maps and modeling the potential for rail or bittern occurrence within each refuge's boundaries.

Currently over 105 participants are contributing or have contributed data to the program from 44 states, 1 Canadian Province, and 3 Mexican States. Most (62%) of the participants are associated with the National Wildlife Refuge System. The pooled database currently includes 23,111 individual point-count surveys (Table 1). This includes approximately 95% of the data received from 1999-2003 and approximately 60% of the data received for 2004. Data from 2004 surveys is still arriving and being entered and merged to the pooled database. From the data currently entered in the pooled database, participants have detected 43,876 individuals of the 12 focal species (Table 2).
Preliminary analysis to address the first objective and a detailed website describing the program and providing a variety of interactive tools will be completed in early 2005. Work to evaluate participation will also begin in 2005.

Table 1. Number of surveys conducted each of the past 5 years that are currently in the pooled database (additional surveys for 2004 are still arriving and are yet to be entered and merged).

Year	No. of surveys
1999	562
2000	831
2001	1,940
2002	4,885
2003	8,390
2004	6,503
Total	23,111

Table 2. Number of marsh birds detected during standarsized surveys that are currently in the pooled database.

Species	No. detected
American bittern	1,015
American coot	8,094
Black rail	1,894
Clapper rail	6,376
Common moorhen	4,587
King rail	461
Least bittern	6,922
Pied-billed grebe	6,699
Purple gallinule	19
Sora	2,993
Virginia rail	4,793
Yellow rail	23
Total	43,876

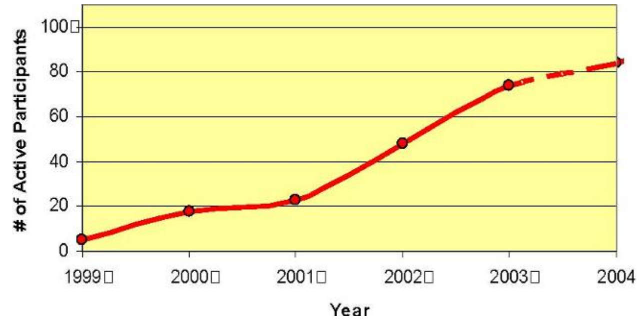

Fig. 1. Increase in program participation.