King Rail (*Rallus elegans*) Conservation Plan

Tom Cooper, Plan Coordinator
U.S. Fish and Wildlife Service
Midwest Regional Office
Division of Migratory Birds
Fort Snelling, MN 55111

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Plan Dedication

The King Rail Conservation Plan is dedicated in memory of Brooke Meanley (1915 – 2007), an outstanding field ornithologist, who conducted extensive research on the King Rail during his career. He wrote the classic North American Fauna Monograph on the natural history of the King Rail in 1969, for which he earned a special achievement award.

Acknowledgements

Special thanks are extended to the numerous people from state conservation agencies, U.S. Fish and Wildlife Service offices (USFWS), universities, and private conservation organizations that provided information used in developing this plan and reviewed earlier drafts. I especially thank those who attended the King Rail Workshop held in Memphis, TN during November 2006 (see Appendix A for a list of participants). Completion of the plan would not have been possible without their guidance, support, and input. Tom Will, Steve Lewis, and Bob Russell, USFWS, provided day to day guidance and consultation during the completion of this project. Special thanks go to National Wildlife Refuges that responded to a survey regarding King Rail status on refuges; Noppadol Paothong, Missouri Department of Conservation, who supplied many of the photographs in the plan; and Deanne Endrizzi, who assisted with the state status assessments. Data sources for King Rail locations were graciously supplied by: 1) National Audubon Society (Christmas Bird Count); 2) United States Geological Survey (Breeding Bird Survey, Bird Banding, and State Breeding Bird Atlas); 3) Courtney Conway (Continental Marsh Bird Monitoring Program); and 4) states that supplied Natural Heritage Inventory data (IL, IN, MA, MO, NE, TN, and WV). Funding for this project was provided by the Survey, Monitoring, and Assessment (SMA) funds through the Division of Migratory Bird Management, USFWS.

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I. Executive Summary

The King Rail (*Rallus elegans*), a U.S. Fish and Wildlife Service Focal Species, is a large rail found locally in freshwater wetlands throughout the eastern United States, southern Ontario, central Mexico, and Cuba. Available data indicate range-wide population declines and reduced distribution primarily caused by habitat loss, both natural wetlands and rice field habitat. Due to declining populations, the King Rail has received special status throughout its range at both the state and federal level. In order to address concerns, a workshop was held during November 2006 to get stakeholder input for developing a King Rail Conservation Plan (the plan) that will provide direction for future conservation efforts.

The main topics of discussion at the November 2006 King Rail Workshop were developing population objectives, identifying research and monitoring priorities, and developing conservation and management strategies. These subjects form the backbone of the plan. Population objectives were difficult to define due to the lack of historic population data for the King Rail. However, a regional approach, using regions delineated by the North American Waterbird Conservation Plan, is presented as a means for establishing population objectives. Research and monitoring are essential for future King Rail conservation efforts because we lack considerable information on habitat requirements and limiting factors for the species. Habitat conservation and management are essential for maintaining viable King Rail populations throughout its range. Initial conservation efforts should be focused in high priority landscapes and integrated with one another using a Strategic Habitat Conservation (SHC) approach (NEAT 2006). SHC is an adaptive process that ties together the planning, implementation, and evaluation phases of habitat conservation. Goals for Research and Monitoring Actions as well as Conservation and Management Actions are presented below. Specific objectives and tasks for each goal can be found in Sections VII and IX.

Goals for Research and Monitoring Actions identified in the plan are:

- Determine the current status and distribution of the King Rail based on the best, currently available information.
- Gain a better understanding of landscapes important to the King Rail throughout its range and use this information to target future conservation and monitoring efforts.
- Improve understanding of King Rail population dynamics and ecology including brood survival, nonbreeding season survival, migration patterns, metapopulation structure, and genetic relationships to Clapper Rail.

Goals for Conservation and Management Actions identified in the plan are:

- Develop outreach materials promoting and providing guidelines for the management and restoration of King Rail habitat.
- Protect, restore, and manage habitats needed to support self-sustaining populations of King Rail in key areas throughout its range.

The actions identified in the plan will likely benefit other species requiring similar habitat. As such, cooperative partnerships should be fostered with groups having similar conservation goals. Version 1.0 of the plan focuses on the North American population, while future revisions will incorporate populations throughout the entire species range including Mexico and Cuba. The plan also contains a status assessment section that identifies important areas in each state or province within the King Rail range in the United States and Canada.

II. Introduction

The King Rail has been identified as a focal species by the U.S. Fish and Wildlife Service's (USFWS) "Focal Species Strategy for Migratory Birds". The strategy was initiated to provide explicit, strategic, and adaptive sets of conservation actions required to return species of concern to healthy and sustainable levels. As part of the strategy, the USFWS identified 139 species of management concern that are to receive increased attention over the short term. Included on this list is the King Rail (*Rallus elegans*) whose populations, especially northern populations, have shown long-term declines resulting from range-wide habitat loss and degradation. The King Rail is one of nine species initially chosen for developing a comprehensive conservation action plan in cooperation with conservation partners and stakeholders. For more information on the Focal Species Strategy, visit the following website: http://www.fws.gov/migratorybirds/.

The first step in developing a comprehensive King Rail Conservation Plan (the plan) was to organize a workshop to receive input from concerned stakeholders. As such, a King Rail Conservation Action Plan Workshop was held November 14-15, 2006 at the Ducks Unlimited National Headquarters in Memphis, Tennessee. Twenty-five people, representing United States Geological Survey (USGS) Cooperative Fish and Wildlife Research Units, state conservation agencies, academic institutions, and various regions/programs within the USFWS, attended the workshop (Appendix A). The workshop began with presentations on the current status of the King Rail and updates on current research. The remainder of the workshop was devoted to setting population objectives and identifying action items participants felt were necessary to move conservation of the species forward. At the conclusion of the workshop, working groups were formed to help refine action items for inclusion in the plan. A workshop summary is available at http://www.fws.gov/midwest/MidwestBird/focalspecies.

The plan was developed to promote and facilitate cooperative efforts toward the long-term conservation of the King Rail. The partners who provided input for the plan are committed to taking steps to reverse the long-term decline in distribution and abundance of the species throughout its range. Included in the plan are: 1) a description of the target population; 2) a population status assessment focused on the North American population including an overview on known or suspected limiting factors; 3) a natural history overview of the King Rail; 4) population objectives; and 5) actions to move the conservation of the species forward. Actions to advance King Rail Conservation were developed for two categories: Research and Monitoring actions; and Conservation and Management actions. In each category, specific *goals*, *objectives* to reach the goals, and *tasks* to reach the objectives are presented. Justifications for recommended actions are presented in these sections of the plan.

Other species, with habitat needs similar to those of the King Rail, are likely to benefit through the implementation of the actions presented in the plan. A partial list of species identified at the November 2006 King Rail Workshop that may benefit throughout a portion or all of their annual lifecycle include: American Bittern (*Botaurus lentiginosus*), Black Tern (*Chlidonias niger*), Black-bellied Whistling-Duck (*Dendrocygna autumnalis*), Common Moorhen (*Gallinula chloropus*), Fulvous Whistling-Duck (*Dendrocygna bicolor*), Least Bittern (*Ixobrychus exilis*), Marsh Wren (*Cistothorus palustris*), Purple Gallinule (*Porphyrula martinica*), Sedge Wren (*Cistothorus platensis*), Sora (*Porzana carolina*), Virginia Rail (*Rallus limicola*), and various species of egrets and herons. Species that would benefit during migration and/or wintering periods include: Greater Yellowlegs (*Tringa melanoleuca*), Lesser Yellowlegs (*Tringa flavipes*), Black-necked Stilt (*Himantopus mexicanus*), Long-billed Dowitcher (*Limnodromus scolopaceus*), and Stilt Sandpiper (*Calidris himantopus*).

III. Description of Target Population

A. *Range and General Habitat Use*

The range of the King Rail extends west to the 100th meridian in the United States, into southern Ontario, throughout Cuba and in Central Mexico (Figure 1). Two recognized subspecies of the King Rail are *Rallus elegans elegans* found in North America and *Rallus elegans ramsdeni* found in Cuba (Reid et al. 1994, Poole et al. 2005). A third, less recognized subspecies is *Rallus elegans tenuirostris* which occurs in the Valley of Mexico (Meanley 1969; Reid et al. 1994).

A majority of the North American subspecies is found in the United States with portions extending into southern Ontario and along the Gulf Coast of Mexico (Figure 1). Northern breeding populations of this subspecies are migratory, while southern breeding populations are generally non-migratory consisting of resident populations (Poole et al. 2005). Migratory populations breed inland into southern Ontario west to southeastern North Dakota, while resident populations are found primarily in coastal areas along the Gulf of Mexico extending into the Mid-Atlantic States and Mississippi Alluvial Valley (Figure 1). Northern breeding populations are thought to migrate to coastal areas where the wintering range of migrant populations overlaps with resident populations (Reid et al. 1994, Poole et al. 2005). However, there are still uncertainties about migration corridors or exact wintering locations for migratory populations (Meanley 1969; Poole et al. 2005; Cooper 2006; Perkins 2007).

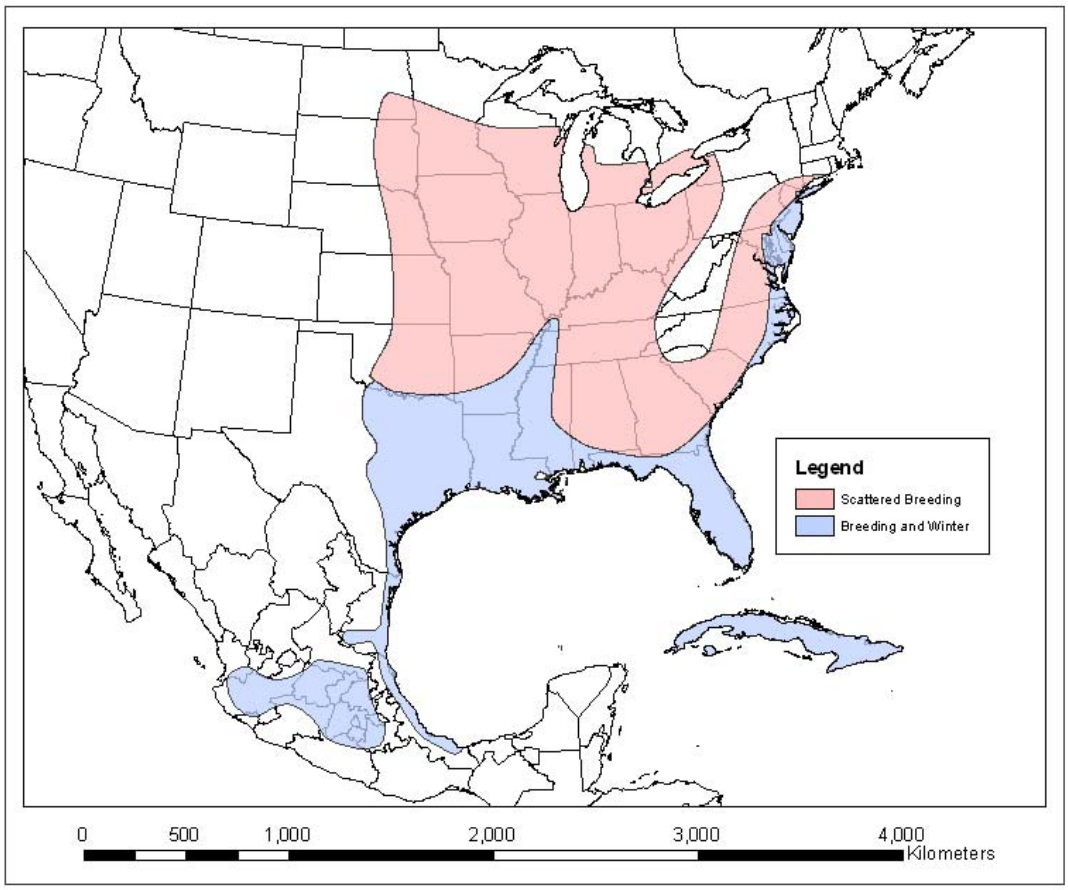


Figure 1. Breeding and wintering range of the King Rail in North America (adapted from NatureServe 2006).

The King Rail uses a variety of wetland habitats throughout its range including freshwater marshes (tidal and non-tidal), brackish marshes, shrub swamps, and rice fields (Meanley 1969; Sikes 1984; Reid et al. 1994; Poole et al. 2005). Meanley (1969) stated, "The King Rail probably occurs in a wider variety of habitats than any other rail." Typical habitat includes dense, emergent vegetation and shallow water (Figure 2). Micro-topography is also important with sites usually containing an interspersion of hummocks, swales, and dry patches. Due to the many habitat types used by the King Rail, Meanley (1969) provided an in-depth description of habitats used by the species in different regions of its range based on his own and other's observations. He described vegetation associations and structural attributes of habitats used by the King Rail for the following regions: 1) Louisiana Gulf Coast Marshes; 2) southern rice fields in Louisiana, Texas, Arkansas, and Mississippi; 3) State of Florida; 4) South Carolina Low Country; 5) Chesapeake Bay Country of Maryland and Virginia; 6) Delaware Bay; 7) Great Lakes Region; 8) north-central prairie marshes; and 9) Northern Great Plains. Meanley (1969) noted that the distribution King Rail habitat also coincides closely with the distribution of the muskrat (*Ondatra zibethicus*). Participants at the November 2006 King Rail Workshop (Cooper 2006) felt that most of the remaining quality wetland habitat is located on public lands managed for wildlife, which agrees with an assessment Reid (1989) made for the Mississippi River corridor. More detailed information on foraging and nesting habitat is presented in the natural history overview in Section V.

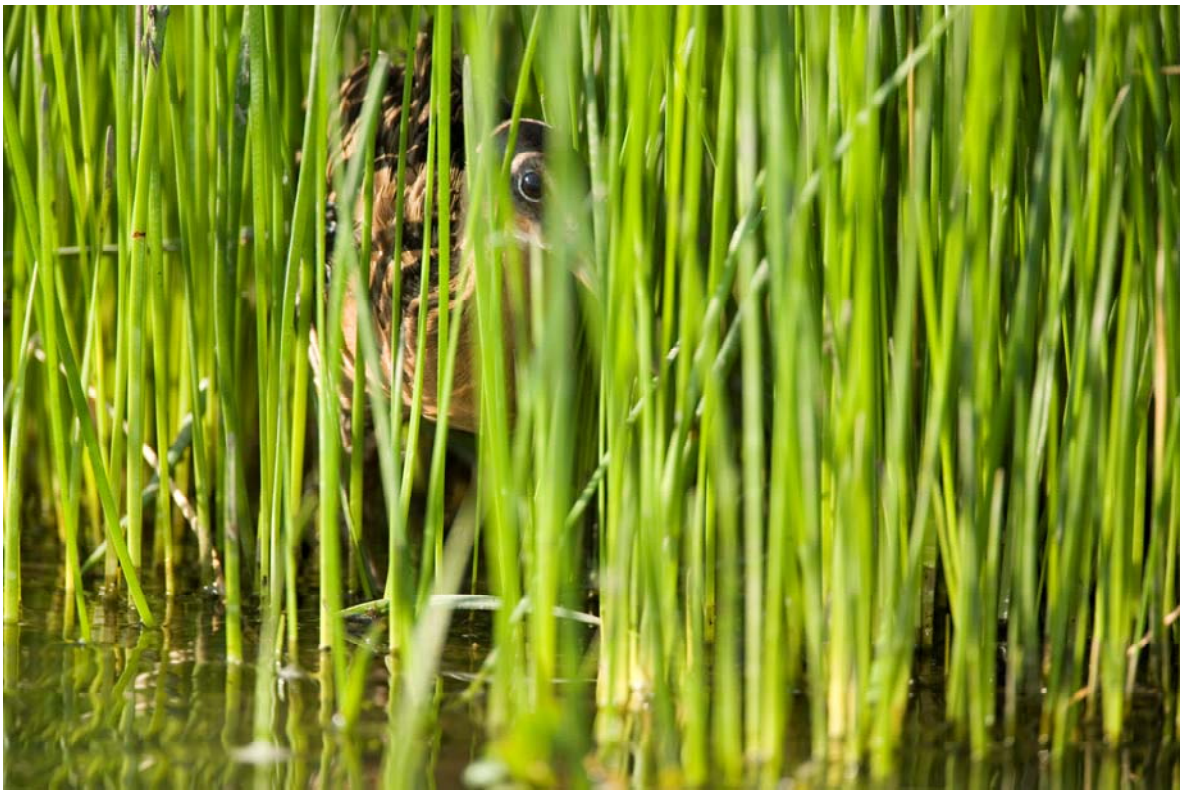


Figure 2. Typical King Rail habitat showing dense, emergent vegetation and shallow water (photo by Noppadol Paothong, Missouri Department of Conservation).

B. *Breeding Distribution*

The primary data sources for assessing the breeding distribution of the King Rail are the North American Breeding Bird Survey (BBS) and State/Provincial Breeding Bird Atlas (BBA) projects. Data from these sources are summarized below. In addition, a county-scale map was developed that shows the distribution of counties where King Rail were have been documented since 1996 based upon data from multiple sources.

BBS Survey Distribution

The BBS is an annual roadside survey conducted throughout the continental United States and southern Canada. The BBS began in 1966 and over 3,500 routes are surveyed each year in June. Routes are 24.5 mile long with stops placed every 0.5 miles for a total of 50 stops per route. At each stop, a three-minute count is conducted and all birds seen or heard within 400-m of the stop are recorded (Sauer et al. 2005). For more information on the BBS, visit http://www.mbr-pwrc.usgs.gov/bbs/.

King Rail have been recorded at least once on 93 Breeding Bird Survey (BBS) routes in 17 states since the start of the survey in 1966 (Figure 3). A majority of the BBS routes recording King Rail are located along the Gulf of Mexico in Texas and Louisiana, throughout Florida, and along the Mid-Atlantic Coast (Figure 3). King Rail have been recorded on few BBS routes away from coastal areas, especially in the Upper Midwest portion of its range (Figure 3). Over the past 10 years, King Rail have been recorded on 43 routes in 10 states with Florida, Louisiana, and Texas having the most routes with recorded King Rail (Table 1). The total number of years that King Rail have been recorded on a BBS route is greater for routes located in coastal areas than for inland routes (Figure 4). Most inland routes have only recorded King Rail one to three years (Figure 4). One exception is the BBS route located in the Cheyenne Bottoms region of Kansas (Figure 4). See state status assessments in Section XI for more specific information on BBS routes recording King Rail.

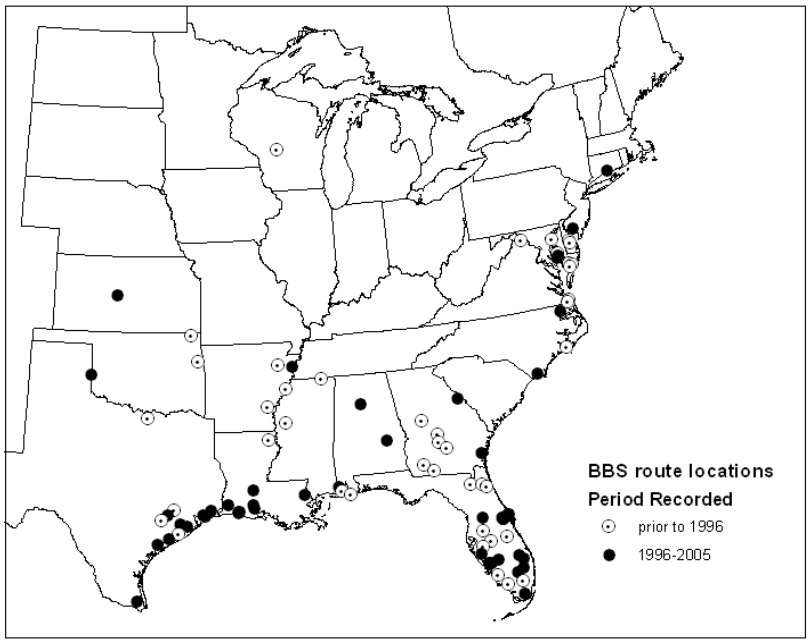


Figure 3. Location of Breeding Bird Survey routes where King Rail have been recorded indicating the time period that King Rail were last recorded on the route.

Table 1. The number of Breeding Bird Survey routes recording King Rail by state during 1996-2005.

State	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
FL	3	2	3	5	5	4	2	3	3	6	36
LA	4	4	2	3	3	1	2	0	2	2	23
TX	6	3	3	2	2	1	1	2	1	1	22
MD	1	0	0	0	0	0	2	1	1	1	6
NC	1	1	0	0	1	0	1	1	0	0	5
AL	0	0	0	0	1	0	2	0	0	0	3
GA	1	0	1	0	0	0	1	0	0	0	3
KS	1	1	0	0	0	0	0	0	1	0	3
CT	0	0	1	1	0	0	0	0	0	0	2
AR	1	0	0	0	0	0	0	0	0	0	1
NJ	0	1	0	0	0	0	0	0	0	0	1
OK	0	1	0	0	0	0	0	0	0	0	1
Total	**18**	**13**	**10**	**11**	**12**	**6**	**11**	**7**	**8**	**10**	**106**

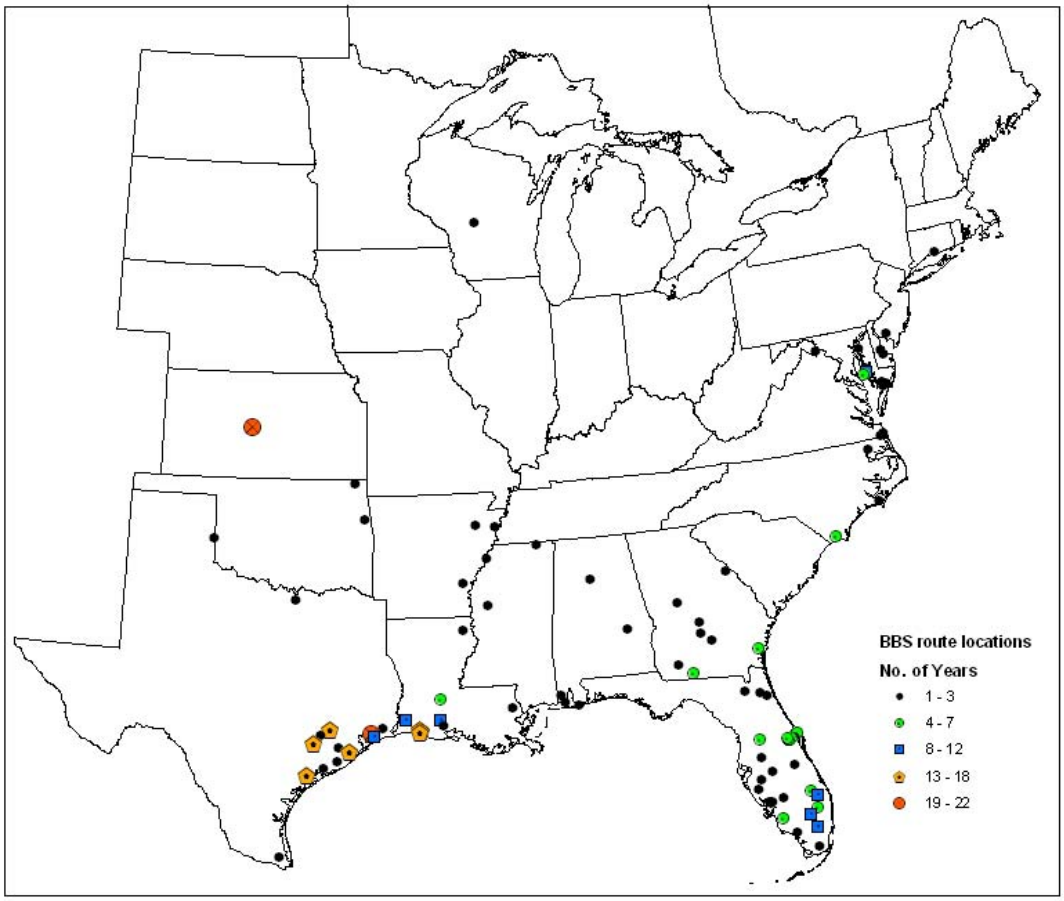


Figure 4. Number of years that King Rail have been recorded on each BBS route with ≥ 1 detection, 1966 – 2005.

Breeding Bird Atlas Distribution

Many states/provinces within the King Rail range have completed BBA projects over the past 30 years. Most BBA projects use a sampling process established by the North American Ornithological Atlas Committee (Smith 1990). The sampling frame is based on U. S. Geological Survey 7.5-minute topographic maps that are divided into six, 25-km blocks with one block randomly chosen to sample. Birds are then classified as possible breeders, probable breeders, or confirmed breeders for blocks where they have been recorded. Visit http://www.bsc-eoc.org/norac/atlascont.htm for more information on breeding classifications and BBA methodology.

King Rail have been recorded in 614 survey blocks for states and provinces that have completed a BBA project and had data available (Figure 5). Out of the 614 blocks, King Rail were confirmed breeders in 118 blocks, probable breeders in 229 blocks, and possible breeders in 267 blocks (Figure 5). The distribution of locations recording the King Rail is similar to the BBS distribution, however, the species has been documented at more locations in the Midwest due to the more intensive searches conducted during BBA projects. See state status assessments (Section XI) for specific information on BBA results for each state that has completed a BBA and had data available. States that completed a BBA, but did not record King Rail include Mississippi, Nebraska, North Dakota, and South Dakota.

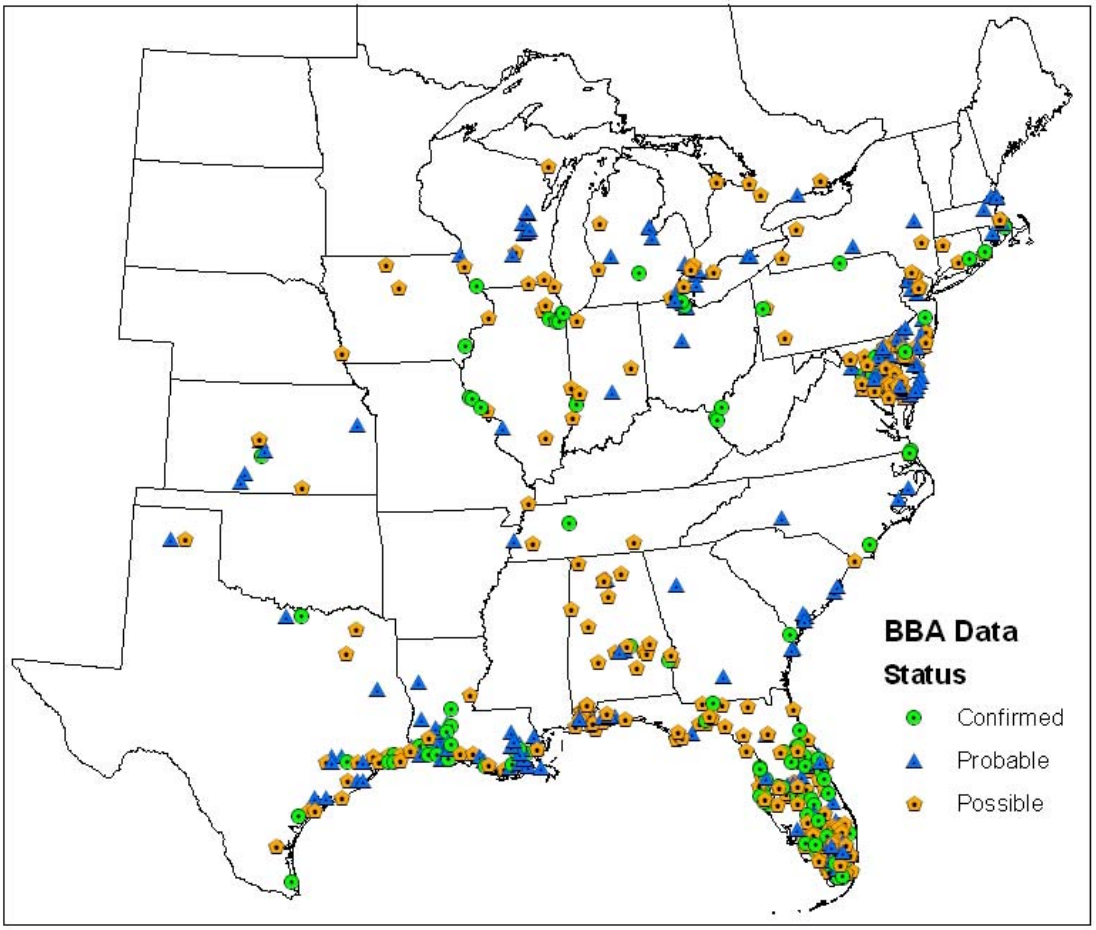


Figure 5. Location of state Breeding Bird Atlas survey blocks where King Rail were recorded (BBA data not available for Arkansas, Minnesota, Virginia).

County Distribution Based on Current Records

Data sources used to develop the county-scale map of recent (1996-2006) locations where King Rail presence have been documented include: 1) BBS data; 2) State BBAs; 3) State Natural Heritage Inventory data; 4) Christmas Bird Count (CBC) data; 5) Bird Banding Lab records; 6) a survey sent to National Wildlife Refuges (NWRs); 7) specific research studies; 8) postings on Birder Listserves; 9) data from the Continental Marshbird Monitoring program; 10) Audubon's ebird website; and 11) other records from reliable sources. King Rail have been observed in 413 counties (or parishes) over the past 10 years based on the above data sources (Figure 6). The highest concentration of counties with King Rail observations are found along the Gulf of Mexico, in Florida, and up the Atlantic Coast. The map only indicates that King Rail have been observed in that county from 1996-2006 and does not indicate confirmed breeding. The map will be updated periodically as new records become available. For a larger scale map of each state please see the state status assessments in Section XI. A database of specific locations where King Rail have been documented can be viewed at http://www.fws.gov/midwest/MidwestBird/focalspecies. The database lists the USFWS Region, state, county, location, and sources documenting King Rail presence. It should be noted that there may be gaps in the distribution map because most records come from public lands where people are actively looking for the species. The proposed modeling projects outlined in Section VII will play an important part in filling in distributional gaps and assessing occurrence on private land.

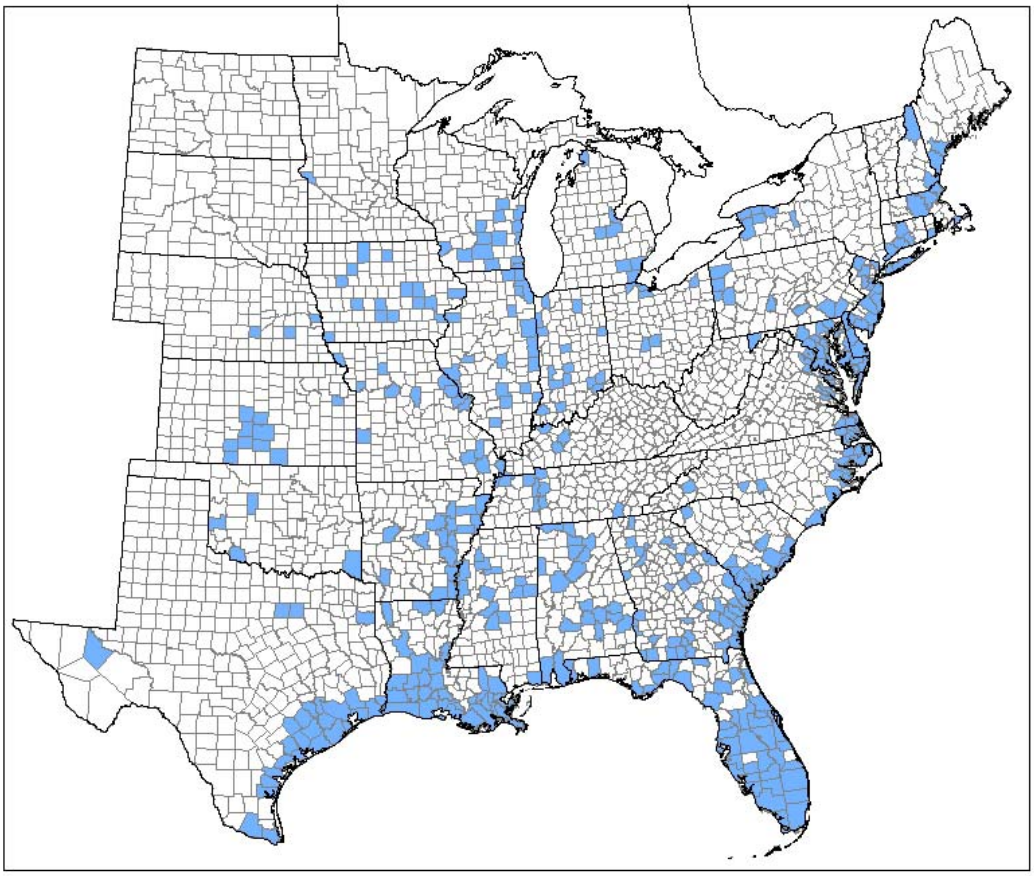


Figure 6. County-scale map showing counties/parishes where King Rail presence has been confirmed, 1996-2006.

C. *Non-breeding Season Distribution*

The primary data source for assessing the winter distribution of the King Rail is the Christmas Bird Count (CBC). The CBC is supported by the National Audubon Society and began in 1900. Each year, over 2,000 single-day counts are conducted within 15-mile diameter circles between 14 December and 5 January (National Audubon Society 2002). For more information on the CBC, visit http://www.audubon.org/bird/cbc/.

The King Rail has been recorded at least once on 284 CBC circles in 27 states during the history of the survey (Figure 7). Over the past 10 years, King Rail have been recorded in 137 circles in 12 states (Figure 7) with Florida, Louisiana, and Texas having the most CBC circles (Table 2). A majority of the circles recording King Rail over the past 10 years are located in coastal areas along the Gulf of Mexico and the Atlantic Coast. There have been a limited number of inland circles recording King Rail. In general, the winter range is thought to overlap with the breeding range of resident populations (Poole et al. 2005). However, more research is needed to better delineate wintering areas for migratory populations (Cooper 2006).

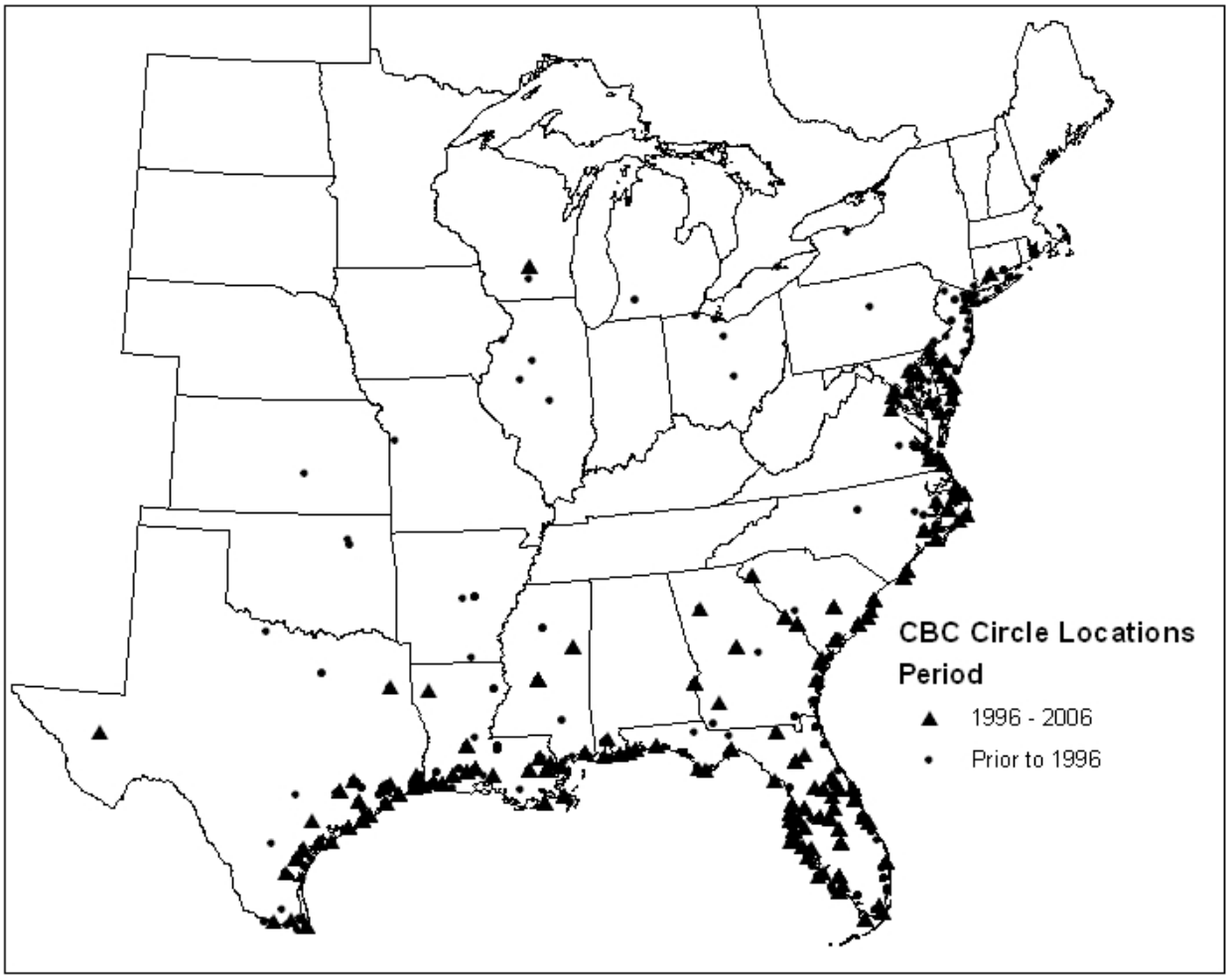


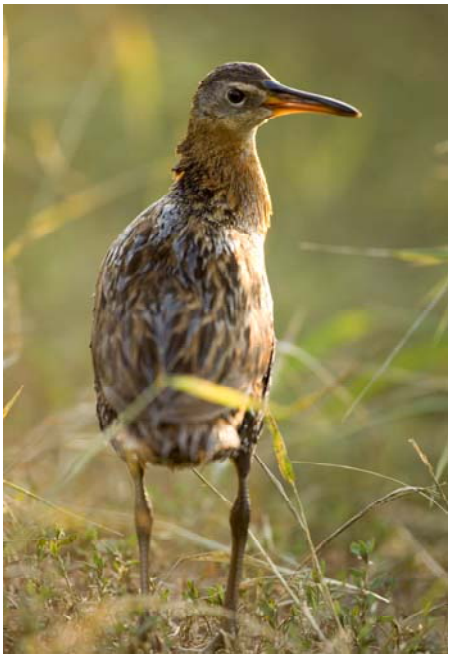
Figure 7. Location of CBC Circles that have recorded King Rail during 1996 – 2006 and prior to 1996.

Table 2. The number of CBC circles recording King Rail by state during 1996-2006 (Count years 97-106) and the percentage of circles completed in each state during 1996-2006 that recorded King Rail.

State	96-97	97-98	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	Total	%
FL	22	21	21	22	16	20	21	24	22	24	213	34.7
LA	9	11	9	14	9	8	12	9	11	6	98	41.9
TX	8	10	12	10	9	5	8	9	12	8	91	9.6
NC	3	7	6	8	5	4	7	9	7	9	65	14.9
SC	4	6	7	5	3	6	5	5	6	5	52	28.3
MS	2	3	1	3	1	3	3	3	2	4	25	14.6
MD	4	2	3	3	1	4	1	0	1	2	21	9.3
VA	3	2	1	2	0	2	1	3	3	4	21	5.1
GA	0	1	0	2	2	2	2	3	1	5	18	8.8
AL	1	2	2	2	3	2	1	2	1	1	17	14.8
DE	1	1	0	1	0	3	1	2	2	0	11	17.2
NJ	1	0	0	1	0	0	0	0	0	0	2	0.7
Total	**58**	**66**	**62**	**73**	**49**	**59**	**62**	**69**	**68**	**68**	**634**	

D. *Spatial Extent of Action Plan*

The King Rail Conservation Action Plan is a range-wide plan. Version 1.0 of the plan focuses on the North American subspecies. An action item identified at the November 2006 King Rail Workshop was to contact authorities from other countries including Mexico and Cuba (Cooper 2006). The goal will be to determine the status of King Rail populations in those countries, evaluate population threats, and identify conservation/research needs. Actions to address identified needs can then be developed and implemented.



IV. Population Status

A. *Population Trend*

Reid et al. (1994) indicated that basic population trends for the King Rail are generally unknown. Regardless, the most complete source of trend information for the King Rail comes from BBS data. BBS trends for the King Rail should be interpreted with caution since regional abundances for King Rail are low especially for inland, migratory populations (Sauer et al. 2005, Cooper 2006). In addition, the BBS is poorly designed for monitoring population trends of secretive marshbirds (Ribic et al. 1999, Conway and Gibbs 2005). The routes are non-randomly placed and do not sample King Rail habitat sufficiently especially in the Midwest (Stephen J. Dinsmore, Iowa State University, pers. com. 2007).

The number of BBS routes recording King Rail and the total number of birds counted has varied since the survey began in 1966 (Figure 8). King Rail were recorded on the most routes (18) in 1996, while the highest count was in 1991 when 64 birds were recorded on BBS routes (Figure 8). Analysis of BBS data indicates a declining long-term (1966-2005) trend of -6.7%/year ($p = 0.00$, $n = 36$; Figure 9) and a short-term (1996-2005) decline of -9.7%/year ($p = 0.19$, $n = 15$) survey-wide (Sauer et al. 2005). Trends were estimated using the estimating equations method (Sauer et al. 2005). State trends are available for Arkansas, Florida, Georgia, Louisiana, Maryland, and Texas (see state status assessments in Appendix B). All states show a negative trend both long-term and short-term with the exception of Florida, which has a positive short-term trend. Only the trends for Louisiana are significant at the $p = 0.05$ level.

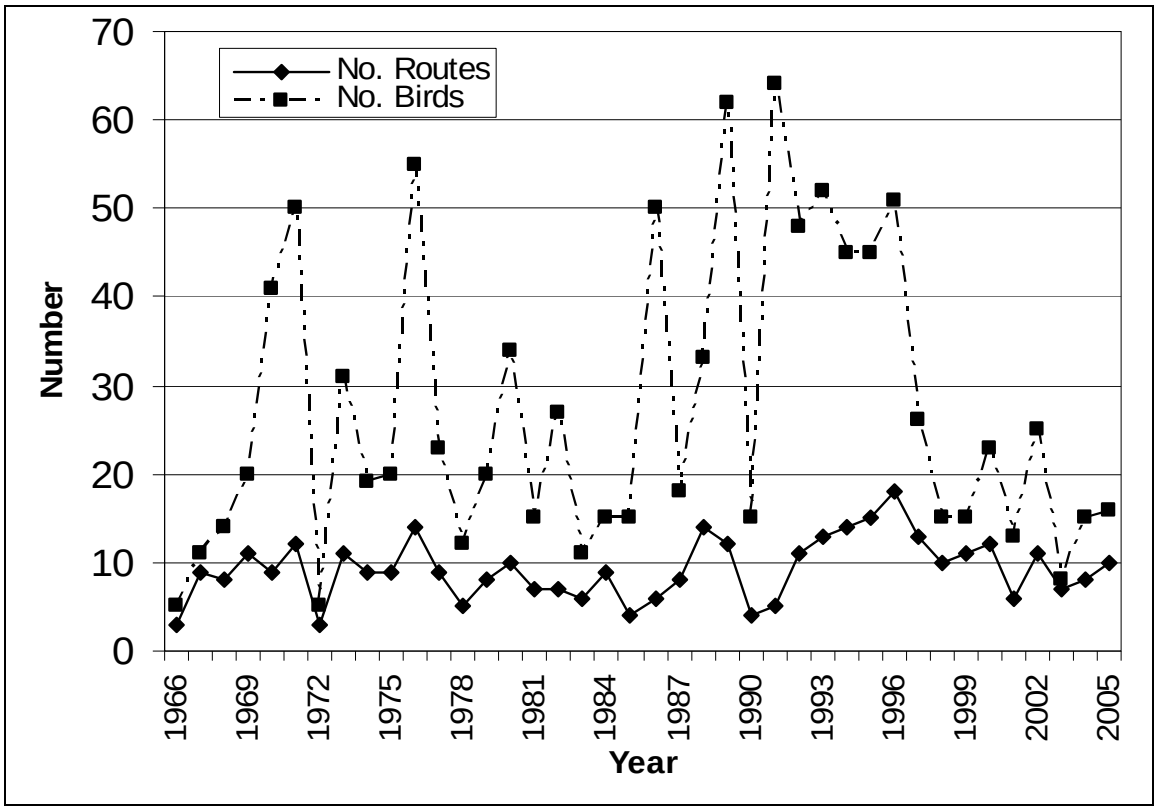


Figure 8. The number of Breeding Bird Survey routes recording King Rail and the total number of King Rail counted each year, 1966-2005.

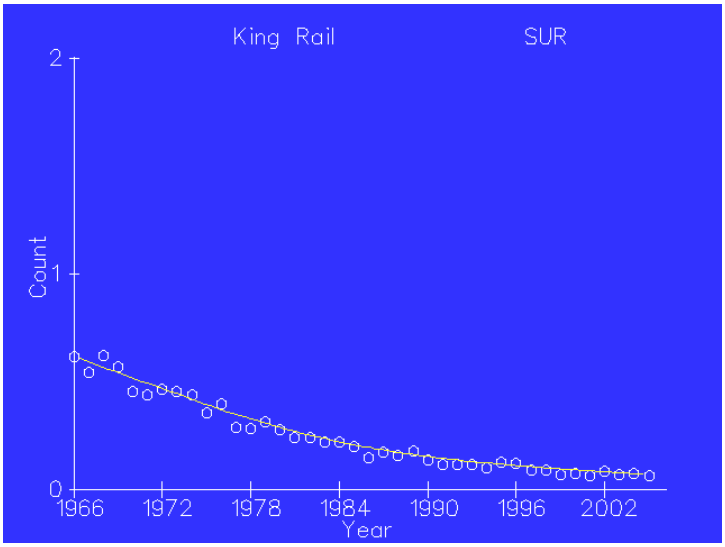


Figure 9. Breeding Bird Survey range-wide population trend (bird/route) for King Rail, 1967-2005 (n = 39 routes; Sauer et al. 2005).

Most information indicating population declines for the King Rail, especially migratory populations, is qualitative in nature. Five examples include: 1) Hicks (Cited in Peterjohn and Rice 1991) documented breeding in 43 counties in Ohio during the mid-1930's, while only 5 counties have recent observations; 2) Meanley (1969) found nest densities reaching 16.5 nests/km^2 in Arkansas rice fields in the 1950's, while recent marsh bird surveys in rice fields in Arkansas did not record a single King Rail during callback surveys (Mike Budd, University of Arkansas, pers. com. 2007); 3) Castrale et al. (1998) reported that the King Rail was once considered a common summer resident in northern Indiana, while surveys conducted in 1993 and 1994 recorded the species at only 2 out of the 108 marshes sampled; 4) historic records indicated the King Rail were common in southern Ontario marshes, while there were an estimated 300 pairs in the early 1980's and an optimistic estimate in the late 1990's projected only 50 pairs (James 2000); 5) Bennett and Hendrickson (1939) found 30-40 nests per year in the Ruthven area of NW Iowa in the 1930s, while Tanner and Hendrickson (1956) found only 6 nests during 3 years of searches in the 1950s.

More appropriate methods for assessing marshbird population trends, including the King Rail, are needed. Protocols have been developed for surveying secretive marshbirds using call-back sequences to elicit responses (Conway and Gibbs 2005). Efforts are currently underway to develop and implement a continental marshbird monitoring (CMBM) survey program using these protocols to better assess population trends for secretive marshbirds (Ribic et al. 1999; U.S. Fish and Wildlife Service 2006d). A pilot study to begin implementing the CMBM program on a landscape-scale began during 2008 in Wisconsin and will expand to New York in 2009 (Mark Seamans, USFWS, pers. com. 2008).

B. *Legal and Priority Status*

The King Rail is classified as a "Bird of Management Concern" and a "Gamebird Below Desired Condition" in the United States by the USFWS (2002) and is a federally endangered species in Canada (James 2000). The American Bird Conservancy's "Green List" classifies it as a species of highest continental concern (ABC 2007). In addition, the King Rail is listed as a threatened or endangered species in 12 states and is listed as a Species of Greatest Conservation

Need (SGCN) in 30 State Wildlife Action Plans (SWAPs) (Table 3, see Appendix B for a bibliography of SWAPs which list King Rail as a SGCN). The North American Waterbird Conservation Plan classifies the King Rail as a species of high concern (USFWS 2006c) and it has received high conservation status in four regional waterbird plans that were developed to implement the North American Waterbird Conservation Plan (Table 4, Figure 10). Other than in Louisiana and Florida, Eddleman et al. (1988) thought that the King Rail warranted threatened status throughout North America.

Table 3. Status of the King Rail based on State Wildlife Action Plans, Natural Heritage Rank, and State Conservation Status.

State	SGCN[1]	Natural Heritage Rank[2]	State Status
Alabama	No	S3	Moderate Concern
Arkansas	Yes	S1B,S3N	Inventory Element
Connecticut	Yes	S1B	Endangered
Delaware	Yes	S2	No Status
Florida	Yes	SNR	No Status
Georgia	Yes	S4	No Status
Illinois	Yes	S2B	Endangered
Indiana	Yes	S1B	Endangered
Iowa	Yes	S1B	Endangered
Kansas	No	S1B	No Status
Kentucky	Yes	S1B	Endangered
Louisiana	Yes	S4	No Status
Maryland	Yes	S3B, S2N	Conservation Need
Massachusetts	Yes	S1B	Threatened
Michigan	Yes	S1B	Endangered
Minnesota	Yes	S1B	Endangered
Mississippi	Yes	S3	No Status
Missouri	Yes	S1B	Endangered
Nebraska	Yes	S1B	No Status
New Hampshire	No	SHB	No Status
New Jersey	Yes	S3	Priority
New York	Yes	S1B	Threatened
North Carolina	Yes	S3	No Status
North Dakota	No	SNR	No Status
Ohio	Yes	S1B	Endangered
Oklahoma	Yes	S1B	No Status
Pennsylvania	Yes	S1B	Threatened
Rhode Island	Yes	S1B	Concern
South Carolina	Yes	SNR	No Status
South Dakota	No	S1B	No Status
Tennessee	Yes	S2B	Need of Management
Texas	Yes	S3	Special Concern
Virginia	Yes	S2B, S3N	No Status
West Virginia	Yes	S1B	Rare
Wisconsin	Yes	S2B	Special Concern

[1] Listed as a Species of Greatest Conservation Need in State Wildlife Action Plan
[2] SH = possibly extirpated, S1 = critically imperiled, S2 = imperiled, S3 = Vulnerable, S4 = apparently secure, S5 = secure, and SNR = not ranked (qualifiers: B = breeding, N = nonbreeding)

Table 4. King Rail conservation assessment factor scores for the national and step-down regional waterbird conservation plans (All factor scores based on criteria from the North American Waterbird Management Plan (Kushlan et al. 2002).

Waterbird Plan	PT[1]	PS[2]	TB[3]	TN[4]	BD[5]	ND[6]	Status
North American Waterbird Plan	5	3?	4	4	3	4	High Concern
Mid-Atlantic/New England Maritimes	5	?	4	4	3	4	Highest Concern
Northern Prairie and Parkland	3	?	2	2	2	4	High Concern
Southeast United States	5	4	4	3	2	3	Immediate Action
Upper Miss. Valley/Great Lakes	5	?	4	3	3	4	High Concern
Central Prairies	No plan to date, but species occurs in south-central Kansas in this region						

[1] Population Trend; [2] Population Size; [3] Threats to Breeding; [4] Threats to Non-breeding; [5] Breeding Distribution; and [6] Non-breeding Distribution. Each category ranked from 1-5 with higher numbers indicating more concern (see Kushlan et al. 2002 for specific definition of each rank).

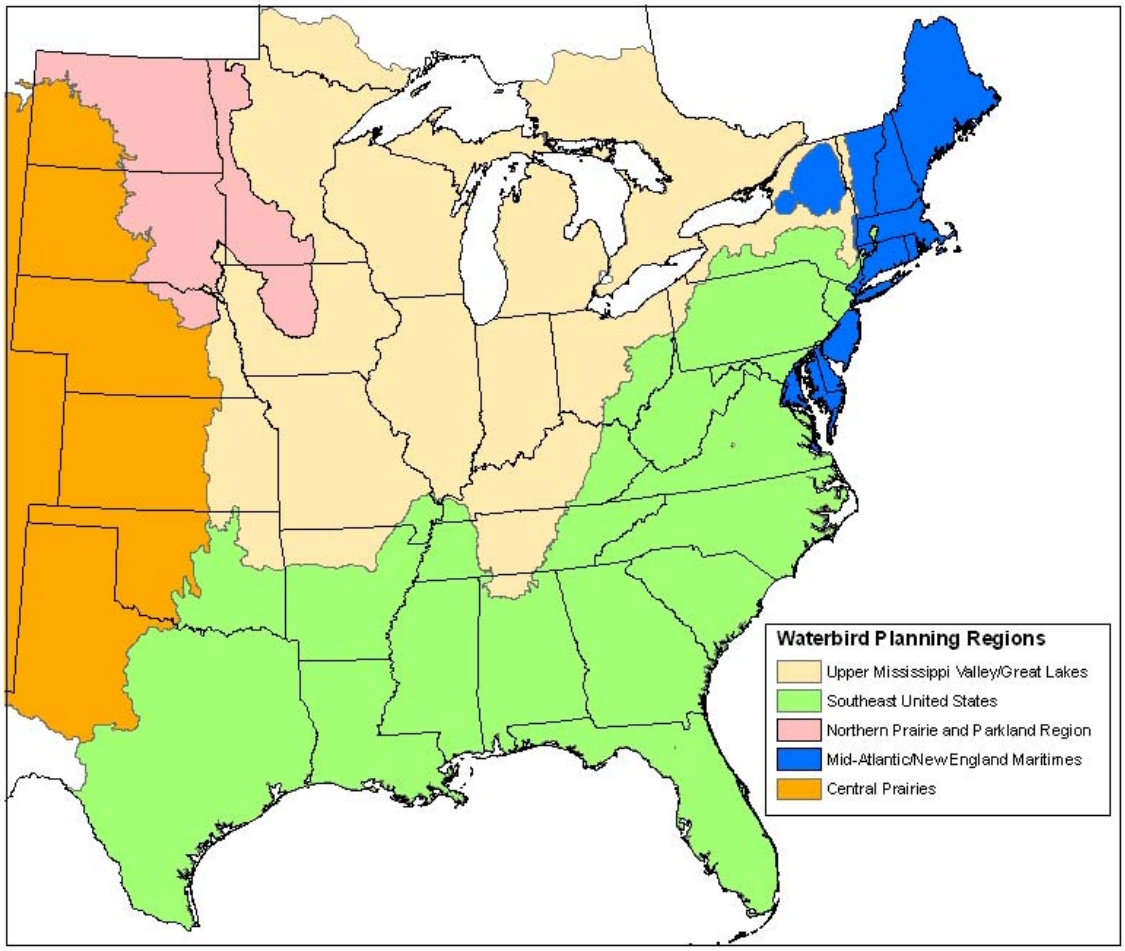


Figure 10. "Step-down" waterbird planning regions in the King Rail range under the auspices of the Waterbird Conservation for the Americas Initiative.

C. *Known or Suspected Limiting Factors and Threats*

Wetland Loss and Degradation

Wetland loss is thought to be the main cause for King Rail population declines and the biggest limiting factor throughout the species range (Reid et al. 1994; Poole et al. 2005). In Canada, more than 80% of the original wetlands have been lost in its historic range in southwestern Ontario (James 2000). In the United States, 18 states within the range of the King Rail have lost 50% or more of their original wetland base since the 1780's, while 15 have lost between 25% and 50% (Figure 11, Dahl 1990). An estimated 10.6 million acres of wetlands have been lost in the United States from the mid-1950's until the present (Frayer et al. 1983; Dahl and Johnson 1991; Dahl 2000; Dahl 2006). Wetland status reports (Frayer et al. 1983; Dahl and Johnson 1991; Dahl 2000; Dahl 2006) indicate that there has been a net loss of wetland acres from the mid-1950's through 1997, with a net gain in wetland acres between 1998 and 2004 (Table 5). Although the current report indicates a net gain of 191,750 acres, freshwater emergent marshes important to the King Rail still declined by 142,560 acres during 1998-2004 (Dahl 2006). Recent trends also indicate that the greatest losses have come from the southeastern United States, primarily in the Atlantic and Gulf Coastal Plains (Dahl 2000; Dahl 2006). This trend is of particular concern because these areas have some of the highest known King Rail densities.

Other threats associated with wetland loss that decrease the value of remaining wetlands, as identified from multiple sources, include: 1) invasive, non-native plant species displacing native wetland vegetation (i.e.; reed canary grass and phragmites); 2) wetland fragmentation through construction of roads, utility right-of-ways, and levees; 3) siltation and excess nutrient loads from the surrounding landscape; 4) saltwater intrusion into tidal, freshwater marshes associated with climate change and sea-level rise; 5) dredging and stream channelization; 6) excessive disturbance from recreational activities; 7) management practices targeted toward other species (i.e., waterfowl); and 8) contaminant runoff causing direct mortality or indirectly disturbing food supplies (i.e., Eddleman et al. 1988; James 2000; Hunter et al. 2006; MANEM 2006; Cooper 2006; Wires et al. 2007) .

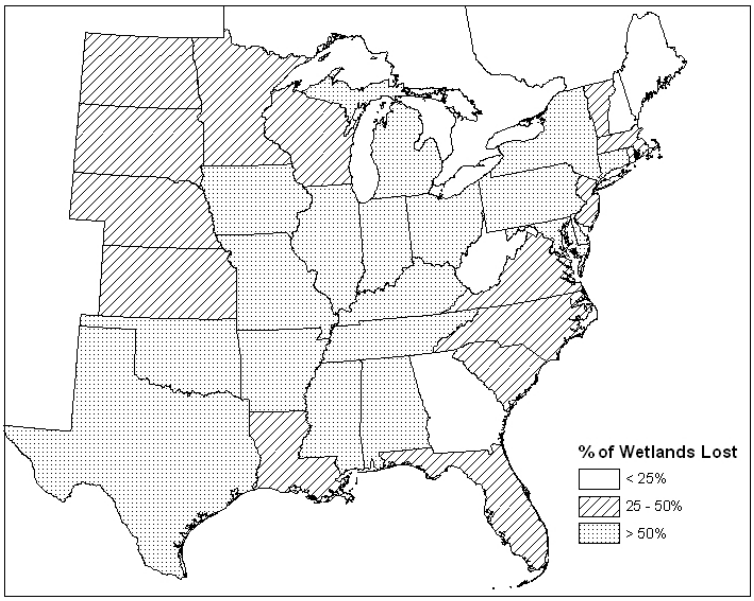


Figure 11. Wetland loss by state in the King Rail range since the 1780's (from Dahl 1990).

Table 5. Wetland status and trends in the United States from the mid-1950's through 2004.

Status Period	Loss or Gain (acres)	Rate (acres/year)	Source
Mid-1950's to mid-1970's	-7,600,000	-380,000	Frayer et al. 1983
Mid-1970's to mid-1980's	-2,600,000	-290,000	Dahl and Johnson 1991
1986 to 1997	-644,000	-58,500	Dahl 2000
1998 to 2004	+192,000	+32,000	Dahl 2006

Rice Habitat Loss

Rice provides important habitat (Figure 12) to the King Rail in rice producing portions of its range particularly in Arkansas, Louisiana, and Texas (Meanley 1953; Meanley 1969; Hohman et al. 1994; Shanley 1996; Huner et al. 2002; Pierluissi 2006; Brent Ortego, Texas Parks and Wildlife, pers. com. 2007). Studies have shown that nest densities in Louisiana rice fields range from 3.4 nests/km^2 to 15.0 nest/km^2 (Hohman et al. 1994; Pierluissi 2006), while Meanley (1969) reported a density of 16.5 nests/km^2 in Arkansas rice fields. Historic records show that the King Rail was common in rice fields in Arkansas (Meanley 1969); however, no rails were recorded during recent marshbird surveys in Arkansas rice fields (Mike Budd, University of Arkansas, unpublished data 2007). Two reasons for its absence in Arkansas rice fields may be that ditches in the 1950's had gradually sloped banks with more emergent vegetation than today (David Krementz, Arkansas Cooperative Fish and Wildlife Research Unit, pers. com. 2006) and that pesticide use has reduced the number of crayfish, which are a primary food source (Eddleman et al. 1988). Other threats include the decline of acreage being planted to rice and changes in rice farming practices (MFCTS Webless Migratory Game Bird Committee 2004). Louisiana and Texas have experienced recent declines in acreage planted in rice (Figure 13). Reasons for the decline include rising production costs, low commodity prices, and recent damages inflicted by Hurricane Rita (Linscombe et al. 1999; Pierluissi 2006). Farming practice changes include using shorter-stemmed varieties of rice, increased pesticide use, laser-leveled fields, and increased harvest frequencies (MFCTS Webless Migratory Game Bird Committee 2004, Hunter et al. 2006).

Figure 12. Rice field used by King Rail in southwestern Louisiana (Photo by Sergio Pierluissi, USFWS).

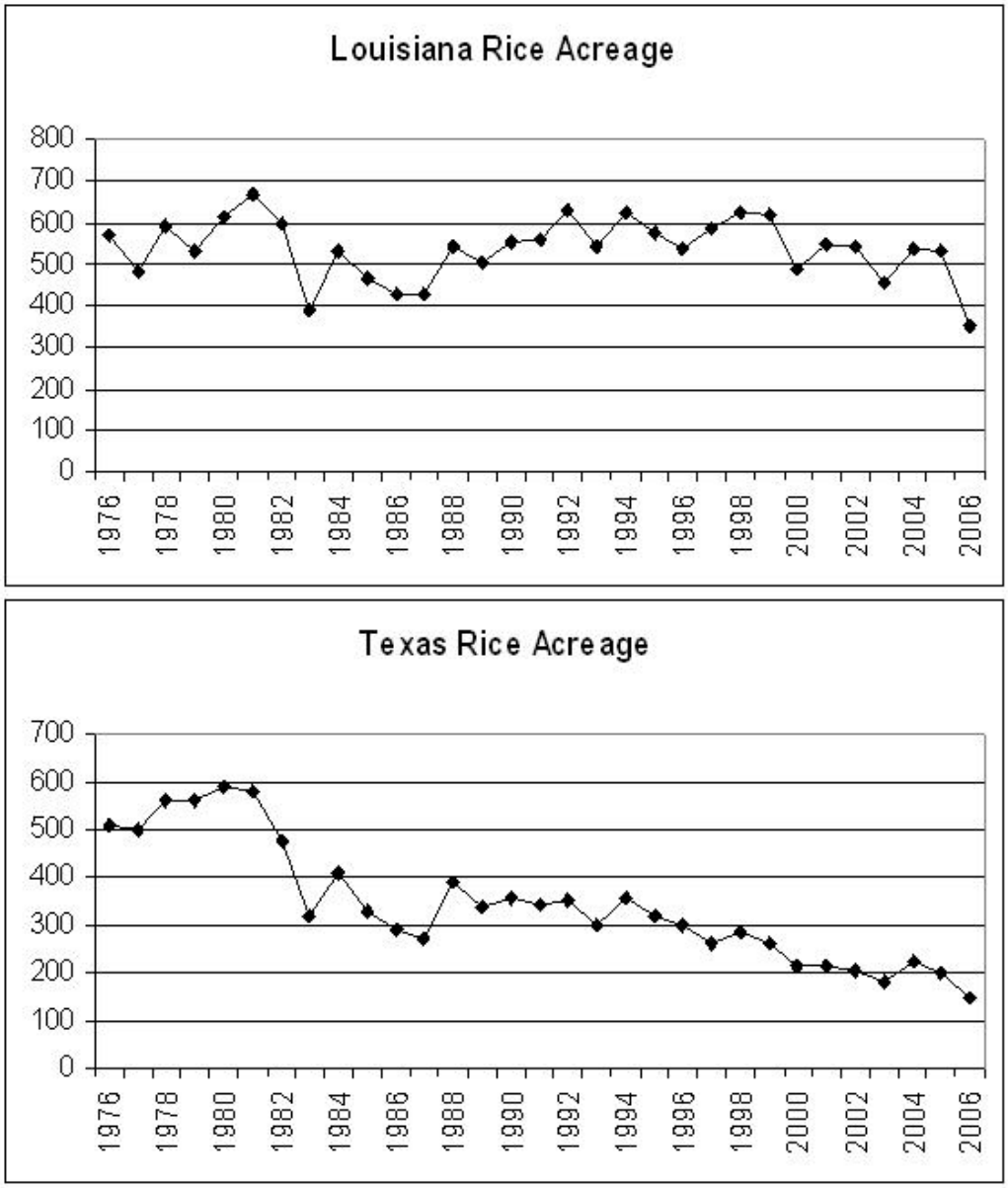


Figure 13. Acreage (in thousands) planted to rice in Louisiana and Texas, 1976-2006 (based on data from U.S. Department of Agriculture).

Harvest

Thirteen states (Figure 14) currently have a hunting season for King Rail (Office of the Federal Register 2006a, 2006b). During the 2006-07 hunting season, states could choose a season of up to 70 days in length between September 1, 2006 and January 28, 2007 (Office of the Federal Register 2006a, 2006b). Nine states had a daily bag limit of 15; three had a limit of 10; while one had a limit of five (Table 6). The daily bag limit and possession limit for most states was composed of an aggregate of King and Clapper Rail for all states allowing King Rail hunting (Table 6). Two exceptions are Connecticut and Maryland where only one King Rail could be included in the aggregate limit. Hunting mortality probably has little influence on King Rail populations based on available harvest data (Hunter et al. 2006; USFWS 2006b). USFWS data show limited harvest of

King Rail with an estimated harvest of 300 in 2004 and 200 in 2005 (USFWS 2006b). Likewise, data from Texas show that about 700 rail hunters annually harvest around 1,000 rail of all species (Jay Roberson, Texas Parks and Wildlife, pers. com. 2007). Although harvest appears limited, some participants at the November 2006 King Rail Workshop expressed concern that any harvest of migratory breeding populations (i.e., King Rail breeding in the Midwest) may be detrimental to those populations (Cooper 2006). Eddleman et al. (1988) also expressed concern that rare species of rail, such as King Rail, often occur in areas where related species, such as Clapper or Virginia Rail (*Rallus limicola*), are classified as game birds so therefore may experience accidental harvest.

Wintering areas and migration corridors for populations of management concern (i.e., King Rail breeding in the Midwest) are not currently known; therefore, the potential of harvest on these populations warrants investigation. Two methods for determining wintering areas and migration corridors are: 1) using stable isotopes from harvested rail (Perkins 2007); and 2) using satellite telemetry to track migration (Cooper 2006). One study has already used stable isotopes to assess the origin of wintering King Rails along the Gulf Coast of southwestern Louisiana and Texas (Perkins 2007). Results from the study indicated that 99% of the wintering King Rail from the region were resident birds (Perkins 2007). Overall, more research is needed to quantify harvest of King Rail and to further assess the impact of harvest on populations of management concern. A combination of telemetry studies and further isotope research from other regions will be important for determining the origin of harvested King Rail and assessing harvest potential on populations of concern (Cooper 2006).

Hunting of large rails in areas where populations of concern migrate or winter should be carefully evaluated if harvest is determined to distress populations of concern. One proposed option would be to restrict King and Clapper Rail hunting only to those counties that contain saltwater marshes used primarily by the Clapper Rail; and all rail hunting in freshwater marshes would be limited to smaller rail species such as Sora (*Porzana carolina*) and Virginia Rail (Hess et al. 2000). Meanley (1969) provided evidence that restricting harvest to saltwater marshes may limit harvest of King Rail. He reported that few King Rail are killed by Clapper Rail hunters in coastal saltmarshes.

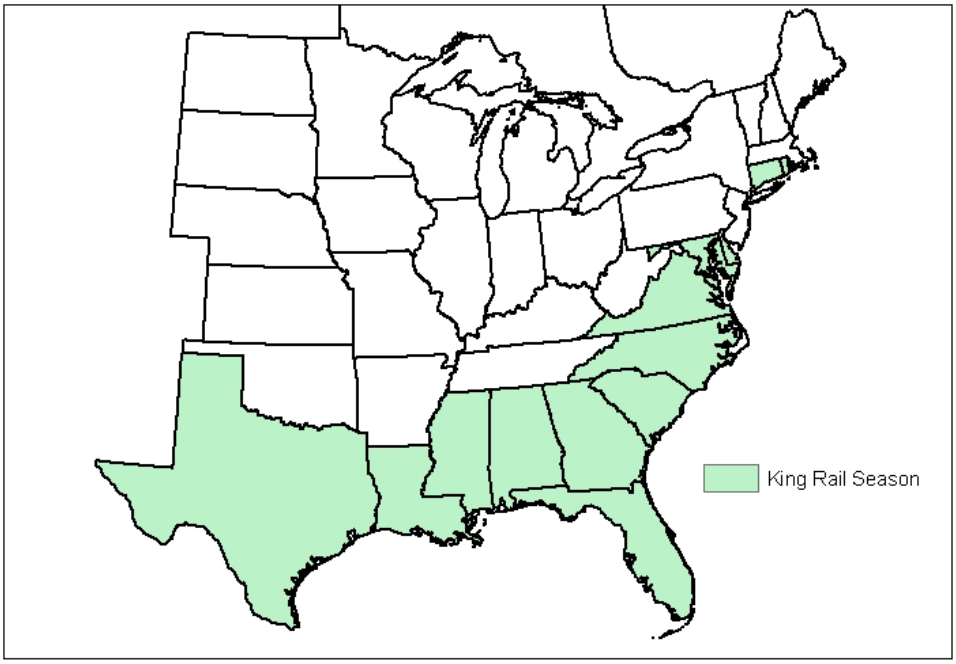


Figure 14. States with a King Rail hunting season during the 2006-07 hunting season.

Table 6. States with King/Clapper Rail hunting, hunting season dates, daily bag limits, and possession limits for King Rail/Clapper Rail during the 2006-07 hunting season (Office of the Federal Register 2006).

State	Season Dates	Daily Bag [a]	Possession Limit [a]
Alabama	Nov. 24-Jan. 28	15	15
Connecticut [b]	Sept. 5-Nov. 11	10	20
Delaware	Sept. 1-Nov. 9	10	20
Florida	Sept. 1-Nov. 9	15	30
Georgia	Sept. 7-Oct. 13, Nov. 4-Dec. 3	15	30
Louisiana	Sept. 15-30, Nov. 11-Jan. 3	15	30
Maryland [b]	Sept. 1-Nov. 9	10	20
Mississippi	Oct. 7-Dec. 15	15	30
North Carolina	Sept. 1-Nov. 9	15	30
Rhode Island	Sept. 2-Nov. 10	5	10
South Carolina	Sept. 6-12, Oct. 6-Dec. 7	15	30
Texas	Sept. 16-24, Nov. 4-Jan. 3	15	30
Virginia	Sept. 8-Nov. 16	15	30

[a] In aggregate with Clapper Rail.
[b] Only one King Rail can be included in bag

Other Threats

Other threats identified from State Wildlife Action Plans, Regional Waterbird Plans, and other sources include: 1) collisions with lighted structures during nocturnal migration; 2) incidental catch by furbearer trapping; 3) lead poisoning from ingested lead shot; 4) mowing and burning during nesting and brood rearing periods; and 5) high predation rates (nests and broods) associated with changes in predator communities and habitat fragmentation (i.e., Sikes 1984; Eddleman et al. 1988; James 2000; Rabe 2001; Hunter et al. 2006; MANEM 2006; Cooper 2006; Wires et al. 2007). While these threats probably do not endanger King Rail populations as a whole, these threats should be assessed at locally important breeding and wintering areas throughout the species range. If the identified threats are found to significantly jeopardize local populations, management actions should be implemented to address any actual threats on a case by case basis.

V. Natural History Overview

A brief natural history overview for the King Rail is presented in this section to include items not covered in previous sections. Primary topics include information on its genetic relationship to the Clapper Rail (*Rallus longirostris*), foraging ecology, and nesting ecology. For more detailed information on the natural history of the King Rail, consult the following sources: 1) Meanley 1969; 2) Reid et al. 1994; and 3) Poole et al. 2005.

A. *Species Description and Relationship to the Clapper Rail*

The King Rail is a large rail with a long, slender, slightly decurved bill, rusty-buff plumage, and a laterally compressed body. Plumage coloration does not vary by sex; however, males are generally larger than females (Meanley 1969; Poole et al. 2005). Males weigh from 300 to 490g, while females weigh between 250 to 360g (Meanley 1969; Perkins 2007). Chicks are precocial and have a solid black plumage after hatching.

King Rail are closely related to the Clapper Rail with some evidence that they may actually be races of the same species. Evidence includes: 1) Meanley (1962, 1969) documented breeding between the two species with fertile eggs being produced; 2) a genetic study examining mitochondrial DNA and allozymes found no conclusive proof that they are separate species (Avise and Zink 1988); 3) Rabatsky (1997) found that both species responded with the same frequency to each others calls; and 4) Sikes (1984) was unable to differentiate between species by sight or song in study sites with intermediate salinity (1-5 ppt salinity) at Anahuac NWR. Although evidence indicates they may be the same species, habitat use generally differs, in that the King Rail is primarily found in freshwater marshes, whereas, the Clapper Rail is found in saltwater marshes (Meanley 1969, Sikes 1984). However, both are found in brackish water marshes with intermediate salinities (Meanley 1969, Sikes 1984).

Plumage coloration and size generally differ between the species (Meanley 1969; Poole et al. 2005). King Rail have rusty-brown coloration with more distinct barring on the rump, while Clapper Rail have more gray coloration with less distinct barring (Figure 15). King Rail are generally larger than Clapper Rail; however, there is overlap in size between female King Rail and male Clapper Rail (Reid et al. 1994; Perkins 2007). Differentiation between the two using physical characteristics alone can be difficult as documented by Sikes (1984).

Figure 15. Comparison of the Clapper Rail and King Rail showing color and marking variations (Clapper Rail Photo by Emily Tyler, Piedmont Bird Club and King Rail Photo by Noppadol Paothong, Missouri Department of Conservation).

B. *Foraging Ecology*

King Rail are omnivores; however, aquatic macroinvertebrates (i.e., crustaceans and aquatic insects) make up the majority of its diet (Meanley 1956; Meanley 1969; Reid et al. 1994). Meanley (1956) found that animal matter made up a larger percentage of its diet from spring through fall (74-95%), while animal matter made up 58% of its winter diet. Crayfish are the most important food item in freshwater marshes, while fiddler crabs are the most important item in brackish marshes (Reid et al. 1994; Poole 2005). Other food items include beetles, grasshoppers, fish, frogs, and plant seeds (Meanley 1956; Meanley 1969; Reid et al. 1994; Poole et al. 2005).

Foraging habitat varies throughout the annual cycle of the King Rail. Reid (1989) found that foraging sites prior to brood rearing and during the fall had tall, dense vegetation with water up to 24.5-cm deep, while open mudflats with shallow water up to 7.5-cm deep were the primary habitat used during brood rearing (Figure 16). Prey densities are more predictable at brood foraging sites than at sites used by adults during nesting and migration periods (Reid 1989). Based on limited information primarily from Missouri, an ideal habitat complex consists of dense, emergent vegetation interspersed with openings that dry out during brood rearing. Nonetheless, habitat use from other locations appears to be consistent with this pattern. Little information, other than from a recent study looking at King Rail use of Louisiana ricefields, is available on habitat requirements at larger spatial scales (i.e., patch and landscape) (Cooper 2006). Results from the Louisiana study indicated that King Rail presence was positively associated with the proportion of canals in the landscape and negatively associated with trees surrounding the perimeter of rice fields (Pierluissi 2006).

Figure 16. Brood foraging habitat showing mudflat conditions with shallow water and sparse vegetation (photo by Noppadol Paothong, Missouri Department of Conservation).

C. *Breeding Ecology*

Nesting phenology varies by latitude with nest initiation starting from late January in Florida to early May in the Midwest (Meanley 1969; Reid 1989; Reid et al. 1994). Nests are generally built in clumps of dense, emergent vegetation (Figure 17) in shallow water ranging in depth from < 1 to 25 cm deep, although nests have been found in deeper water (Meanley 1953; Meanley 1969; Reid 1989; Reid et al. 1994). Sites with recent fire history are unsuitable for breeding (Sikes 1984). Patch and landscape scale variables may be important in nest site selection. A recent Louisiana rice field study indicated that nest density was positively associated with the amount of canals surrounding a rice field and negatively associated with the amount of trees surrounding the field (Pierluissi 2006). Canals and adjacent marshes are also important for early breeding efforts in rice landscapes, with birds moving into fields as rice matures and the fields are flooded (Shanley 1996; Pierluissi 2006).

Clutch size varies little throughout the range of the King Rail ranging from 10.5 to 11.2 eggs per clutch (Meanley 1969; Trautman 1940; Reid 1989). Both sexes incubate for a period of 21-23 days (Meanley 1969; Reid et al. 1994). Limited data suggest that nest success for the King Rail is relatively high. The apparent nest success in a Missouri moist soil study was 81% (Reid 1989) and in Arkansas rice fields it was 75% (Meanley 1969), while the Mayfield estimate (Johnson 1979) of nest success rate in Louisiana rice fields was 52.1% in 2004 and 50.3% in 2005 (Pierluissi 2006). Research has shown that nests placed in the interiors of marsh and moist soil management units have higher success rates than those placed on edges (Reid 1989). Primary nest predators include raccoon (*Procyon lotor*), mink (*Mustela vison*), red fox (*Vulpes vulpes*), and striped skunk (*Mephitis mephitis*) (Reid et al. 1994). Little is known about brood survival from hatching to fledging. There is concern that brood survival may be a limiting factor to population growth in certain portions of its range (Cooper 2006). Limited evidence suggests high predation rates. A brood observed during the summer of 2007 in Indiana had 8 chicks when first observed and within a couple of weeks was down to 2 chicks with mink suspected of being the primary predator (Lee Sterrenburg, pers. com. 2007), while Meanley (1969) estimated a brood survival rate of 50% from hatching until two weeks old in Arkansas.

Figure 17. King Rail nest with newly hatched chicks in a southwestern Louisiana rice field (photo by Sergio Pierluissi, USFWS).

VI. Population Objectives

For many species such as waterfowl or American Woodcock (*Scolopax minor*), long-term surveys have been conducted with population estimates and/or trends reported annually. Conservation plans for these species have developed population objectives based on historic population estimates from some point in time. Population goals are then often linked to a habitat goal. For example, X acres of habitat Y are needed to get a breeding population of Z individuals. Setting explicit population and/or habitat objectives for the King Rail was difficult because historical population data are scarce (Reid et al. 1994, Hunter et al. 2006). The best source of data comes from the BBS, which, as discussed earlier, is poorly designed for sampling secretive marshbirds. In addition, the King Rail is poorly sampled by the BBS throughout much of its range because it occurs at such low densities. Because of this dilemma, participants at the November 2006 King Rail Workshop presented several options that should be evaluated for setting population objectives (Cooper 2006). The options included:

1) Restore populations to their historic range and concentrate on areas where they were historically common.
2) Increase the frequency of King Rail detections on marsh bird surveys by some factor (e.g., a five fold increase was discussed which would be consistent with some Midwestern evidence of declines)
3) Set regional population goals using the best available population estimates and "backing into" historical population estimates using percent decline trends estimated from BBS data.
4) Set metapopulation objectives within key areas (i.e., Joint Ventures, States, and Waterbird Planning Regions). For example, first determine the number of metapopulations within key areas and set an attainable goal such as doubling the number of metapopulations within that area in a given amount of time).

One recommendation from the November 2006 King Rail Workshop was that the species range should be divided into planning regions based on geography and similar habitats (Cooper 2006). Further, population objectives should be established for each region using the most suitable method outlined above. This approach should be viewed as a starting point with population objectives being revised as new information becomes available through the studies, modeling efforts, and surveys recommended in Section VII of the plan.

The most practical approach for dividing the King Rail range is using the existing framework established by the North American Waterbird Conservation Plan. North America was divided into planning regions with each region developing a "step down" plan to be used for guiding conservation actions. Planning regions were delineated using the Bird Conservation Regions (BCRs) framework developed by North American Bird Conservation Initiative (NABCI 2000). The main waterbird regions within the King Rail range are the Southeast United States Region, Upper Mississippi River Valley and Great Lakes Region, Mid-Atlantic/New England/Maritime Region, Northern Prairie and Parkland Region, and Central Prairies Region (Figure 10). Regional plans can be accessed at http://www.waterbirdconservation.org/regional/ and a map of BCRs can be viewed at http://www.nabci-us.org/map.html. Using this approach, population objectives were developed for each region based on information from the regional waterbird plans and other relevant sources of information. One exception is the Central Prairies Region, which does not have a completed plan.

A. *Southeast United States Waterbird Region*

The Southeast United States (SUS) Region is comprised of 10 BCRs; however, only six BCRs are important to the King Rail in the region (Table 7). The SUS Region contains approximately 95% of the entire North American King Rail breeding population. Most populations in the SUS Region are undergoing steep declines (Hunter et al. 2006). As such, the region has a large responsibility toward the overall conservation of the species. Population estimates and explicit population goals for each BCR in the region were developed because more reliable BBS data exist for the region (Hunter et al. 2006). Population estimates were calculated using BBS data following the Partners in Flight approach (Rich et al. 2004, Rosenberg and Blancher 2005). A population of 34,742 pairs was estimated for the region with estimates ranging from 30,000 pairs in the Gulf Coastal Prairie BCR to 12 in the West Gulf Coastal Plain BCR (Table 7). The population objective for the plan is to increase the population to between 40,000 to 60,000 pairs in the entire region (Hunter et al. 2006). Specific goals for each BCR were also developed (Table 7).

Conservation and Management Actions identified in Section IX of this plan should be targeted toward priority landscapes within the listed BCRs (Table 7) in order to meet the population goals. Additionally, Research and Monitoring Actions identified in Section VII should be targeted within priority BCRs to gain a better understanding of habitat requirements and limiting factors. Two projects have recently been funded to model King Rail habitat suitability within the Southeastern United States Waterbird Region. An expert-based model, which will be field evaluated, is being developed for the Roanoke-Tar-Neuse-Cape Fear Ecosystem of North Carolina and Virginia, located in the Southeastern Coastal Plain BCR (Ashton Drew, North Carolina Cooperative Fish and Wildlife Research Unit, pers. com. 2007). The other model is being developed for the Gulf Coastal Prairie BCR in Louisiana and Texas using field collected data (Bill Vermillion, Gulf Coast Joint Venture, pers. com. 2007). The goal of both projects is to develop spatially explicit habitat suitability models for the King Rail in each location. Information from the modeling projects can then be used to guide future habitat conservation and improve population objectives.

Table 7. The estimated population and population goal (in pairs) for each Bird Conservation Region in the Southeast Region Waterbird Plan (Hunter et al. 2006).

Bird Conservation Region	Population Estimate	Population Goal
Oaks and Prairies (BCR 21)	2,500	4,000
West Gulf Coastal Plain (BCR 25)	12	1,000
Mississippi Alluvial Valley (BCR 26)	800	1,000
Southeastern Coastal Plain (BCR 27)	830	6,000
Peninsular Florida (BCR 31)	600	5,500
Gulf Coastal Prairie (BCR 37)	30,000	32,000
Total	34,742	49,500

B. *Upper Mississippi River Valley and Great Lakes Waterbird Region*

The Upper Mississippi River Valley and Great Lakes Region (UMVGL) is composed of five BCRs: Boreal Hardwood Transition (BCR 12); Lower Great Lakes/St. Lawrence Plain (BCR 13); Eastern Tallgrass Prairie (BCR 22); Prairie-Hardwood Transition (BCR 23); and Central Hardwoods (BCR 24). Historical population size in the Upper Mississippi Valley and Great Lakes (UMVGL) Region is unknown. However, evidence suggests large declines and range retraction throughout this region (i.e., Peterjohn and Rice 1991, Castrale et al. 1998). The only source of information for current populations is a status assessment for the Midwest that was prepared by Bob Russell, USFWS Region 3 Migratory Bird Biologist, for the Mississippi Flyway Council in 2004 (MFCTS Webless Migratory Game Bird Committee 2004). Based on data received from states/provinces, a low confidence population estimate for the entire Midwest Region was between 137 and 443 pairs. Twelve States and one Canadian Province were included in the estimate: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Ontario. Individual state estimates from the report can be found in the State status assessments in Section XI.

The population objectives presented in the UMVGL Region Waterbird Plan are to increase populations to pre-1970's levels and prevent further range retraction (Wires et al. 2007). Using the UMVGL objectives and the Midwest population estimate, the Upper Mississippi River and Great Lake Joint Venture (JV), which overlaps much of the UMVGL Region, developed a population goal as part of its habitat planning strategy (Soulliere et al. 2007). The current population estimate for states in the JV was 349 individuals with a goal to increase the population to 524, which equates to a deficit of 175 individuals. The JV estimated that an additional 2,500 hectares of new wetland habitat is needed within the JV to eliminate the deficit. The habitat goal was calculated by dividing the deficit by recent density estimates for King Rail in the region (175 Rail/0.07 Rail/ha = 2,500 ha). The recommendation of the JV was that the new breeding habitat should be proportionally distributed throughout the historic or current breeding range in the JV (10% Iowa, 10% Illinois, 20% Indiana, 20% Michigan, 10% Missouri, 10% Ohio, and 20% Wisconsin). A spatially explicit habitat suitability model based on expert opinion was also developed by the JV to guide placement of new habitat (Figure 18).

The primary population objective identified at the November 2006 King Rail Workshop was to first stabilize the small, remaining populations within the region. As such, the first step should be to implement the Conservation and Management Actions identified in Section IX and the JV habitat recommendations in locations with existing populations (i.e., Horicon NWR, Ottawa NWR, Clarence Cannon NWR, and Goose Ponds/Beehunter Marsh State Wildlife Management Area). A secondary objective was to restore and protect habitat in the vicinity of existing populations or areas predicted to be suitable based on the JV model. This is recommended because evidence throughout the Midwest suggests that King Rail are good colonizers of new restoration projects that provide suitable habitat (i.e., Wetland Reserve Program restoration projects located in Arkansas, Indiana, Missouri, and Oklahoma).

A research project to evaluate the accuracy of the JV model has recently been funded. Field collected data will be used to assess model accuracy and refine the model. Results from the project will be used to guide future habitat conservation and provide better population estimates for the region. Population estimates from the project can then be used to develop better population objectives along with habitat goals to meet the objectives in the future.

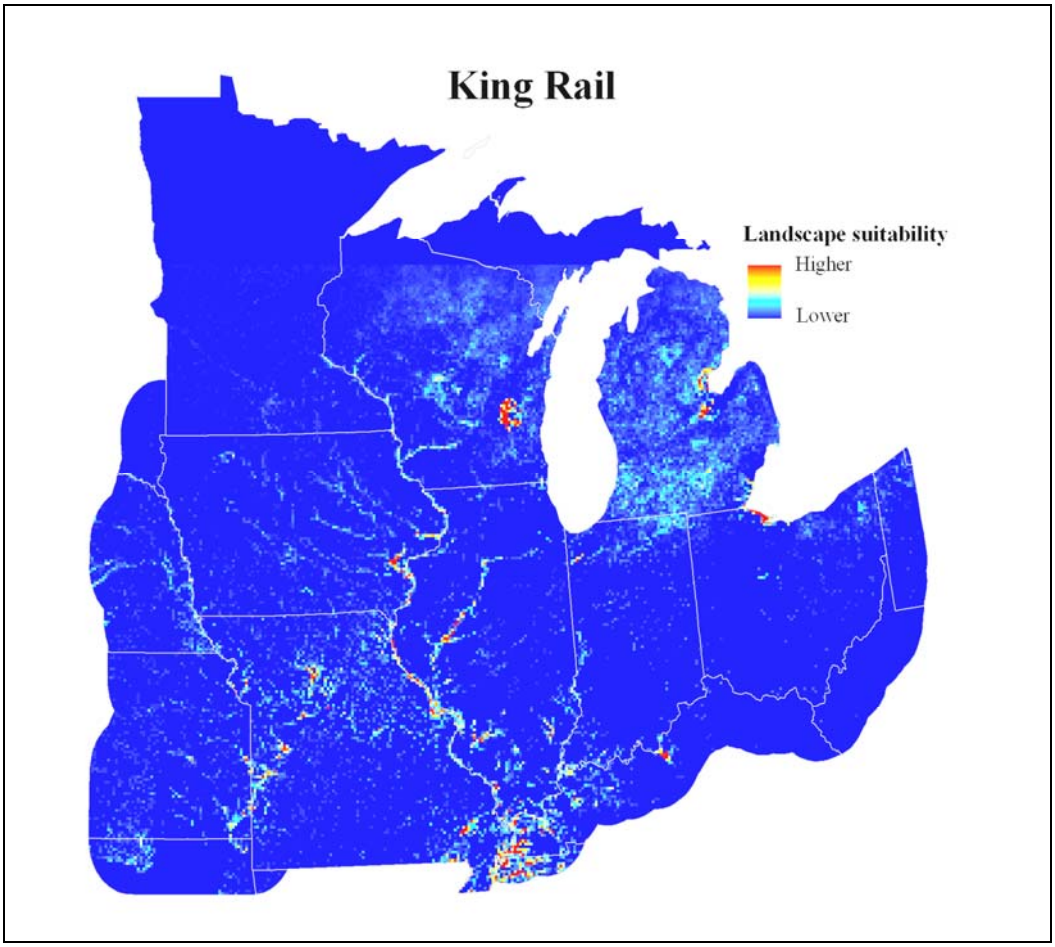


Figure 18. Spatially-explicit, expert-based habitat suitability model for the King Rail in the Upper Mississippi Valley and Great Lakes Joint Venture (Brad Potter, UMVGLJV, unpublished data).

C. *Mid-Atlantic /New England /Maritime Region*

The current and historic population size in the Mid-Atlantic /New England /Maritime (MANEM) Region are unknown (MANEM 2006). The MANEM Region Waterbird Plan contains a general population goal of restoring and increasing populations throughout the region. The plan identifies priority habitat complexes where habitat protection and restoration should be focused: 1) Huntley Meadows/Dogue Creek Wetlands in Virginia; 2) Tanyard Wetlands in Maryland; 3) Bombay Hook NWR in Delaware; 4) Westchester Coast in New York; 5) Lords Cove in Connecticut, and 5) Ninigret and Quonochontaug Ponds in Rhode Island. The actions identified in Section VII of this plan should be implemented to get a better estimate of population size and habitat needs at these locations. An expert-based habitat suitability model should also be developed for the region. This will assist in identification of other areas that may be important to King Rail in the region. In the meantime, Conservation and Management Actions identified in Section VIII should be implemented in the locations listed for the MANEM Region. Population objectives and habitat objectives should be updated as better information becomes available for the region.

D. *Northern Prairie and Parkland Region*

The Northern Prairie and Parkland (NPP) Region is located at the northwestern edge of the species breeding range and has historically only had small populations. As with the other regions, the historic and current population size are unknown (Beyersbergen et al. 2007). The primary population objectives in the NPP Region Waterbird Plan are to get a more accurate estimate of population size, distribution, and trend (Beyersbergen et al. 2007). The actions identified in Section VII of this plan should be implemented to meet this objective. Population objectives should be updated once there is a better estimate of population size and distribution.

VII. Research and Monitoring Actions

Research and monitoring are critical components in efforts to conserve the King Rail especially since there is limited information available on the species' habitat requirements and limiting factors. Information gained from research and monitoring efforts will be important for focusing conservation and management actions as well as directing future research and monitoring needs. At the November 2006 King Rail Workshop, participants felt that research should focus on factors believed to be limiting population growth and distribution throughout the species' historic range (Cooper 2006).

Specific actions identified at the workshop include: 1) assessing the current status and distribution of the King Rail based on currently available information; 2) gaining a better understanding of landscapes important to the King Rail throughout its range by developing expert based models, evaluating the models, and refining them based on field collected data; and 3) improving understanding of King Rail population dynamics and ecology including brood survival, nonbreeding season survival, migration patterns, metapopulation structure, and genetic relationship with the Clapper Rail. Specific objectives along with a brief justification, estimated costs, lead partner(s), and tasks to achieve each objective are listed in the section. Goals are not listed in order

of priority; however, objectives under each goal are listed in order of priority. Progress of work completed to date for each objective is listed under each objective.

1. **Goal: Determine the current status and distribution of the King Rail based on the best, currently available information.**

   1.1. Objective: Determine the status and distribution of the King Rail in the United States based on existing data sources and professional opinion.

   Priority: Ongoing, will be updated as new information is obtained **Estimated Cost:** NA

   Lead Partner(s): USFWS (Division of Migratory Birds)

   Justification: Recent locations where King Rail have been observed, based on currently available data sources, need to be identified. This will allow us to focus conservation and management actions until more detailed information from other modeling and survey projects is available. As part of this effort, locations from multiple data sources will be entered into a Geographic Information System (GIS) to allow managers to assess their proximity to known King Rail locations. For example, a manager may decide to alter management if the area they are managing is located in the vicinity of numerous King Rail observations and has suitable habitat.

   1.1.1. Task: Review and summarize existing data sources for King Rail distribution and status including: 1) BBS data; 2) Banding data; 3) NWR bird lists; 4) Research studies; 5) Birder Listserves on the internet; 6) State Natural Heritage Databases; 7) State BBAs; 8) Regional waterbird plans; 9) Ebird records; 10) CBC records; and 11) state conservation department records.

   1.1.2. Task: Determine the current status of the King Rail on NWRs throughout its range by sending a survey to refuge biologists.

   1.1.3. Task: Create a county-scale map showing the current distribution of the King Rail based on the best, currently available information and a location database for locations where King Rail have been documented.

   1.1.4. Task: Based on the distribution data and map created in task 1.1.3, create conceptual habitat models for each waterbird region to guide King Rail research and conservation efforts until recommended modeling and evaluation projects are completed.

   Progress: A GIS has been developed for records from the data sources listed in Task 1.1.1. The GIS was used to develop the maps in the State Status Assessment Section of this plan. In addition, an database was created for locations where King Rail have been documented during breeding and wintering. Locations are primarily from the past 10-15 years. The database is available at http://www.fws.gov/midwest/MidwestBird/focalspecies. This information can be used by resource agencies to help prioritize conservation actions for the species on a state by state basis until other actions recommended in objectives 2.1 and 2.2 are completed. For more information on GIS data, please contact Tom Cooper, plan coordinator, at tom_cooper@fws.gov.

   1.2. Objective: Gain a better understanding of the status and distribution of King Rail populations outside of the United States.

   Priority: High, Ongoing **Estimated Cost:** NA

Potential Partner(s): USFWS (Migratory Birds)

Justification: Little is known about populations of King Rail outside of the United States and Canada. Efforts should focus on first determining the status of King Rail in Mexico and Cuba and then determining threats and management opportunities.

1.2.1. **Task:** Contact Canadian, Mexican, and Cuban resources for information on King Rail populations occurring in those countries.

Progress: Canadian officials have been contacted and a status report has been reviewed. Mexican officials have not been contacted to date.

2. Goal: Gain a better understanding of landscapes important to the King Rail throughout its range and use this information to target future conservation and monitoring efforts.

2.1. **Objective:** Develop spatially explicit landscape suitability index (LSI) models for the King Rail in each waterbird conservation region based on expert opinion and existing data sources.

Priority: High, Ongoing **Estimated Cost:** ≈ $300,000 to complete modeling and evaluation projects for the Middle Atlantic Coast and Peninsular Florida

Potential Partner(s): USGS Coop Units, USFWS (Migratory Birds, Refuges), State Agencies, Joint Ventures

Justification: Very little is known about what landscapes are being used by the King Rail throughout its range. Based on existing knowledge, LSI models could be developed that would help guide research, monitoring, and conservation programs for King Rail. Participants at the King Rail Workshop held November, 2006 felt that developing LSI models would be a good first step in better understanding landscapes important to King Rail. A single LSI model can be developed for regions where King Rail require similar habitats. One suggestion is developing a model for each waterbird region or other priority focal areas within the King Rail range. The LSI model developed by the Upper Mississippi/Great Lakes Joint Venture could be used as a template.

2.1.1. **Task:** Form a working group within each management region to identify variables thought to be important to King Rail in that region.

2.1.2. **Task:** Coordinate model development between regions by forming a coordination group with a member from each regional group

2.1.3. **Task:** Identify GIS data layers that are available for creating LSI models and identify data layers that need to be created.

2.1.4. **Task:** Develop GIS data layers that are currently not available

2.1.5. **Task:** Identify a lead partner to complete regional LSI models and produce spatially explicit maps predicting landscape suitability for King Rail.

2.1.6. **Task:** Identify a lead to collectively summarize regional modeling results and share the results with interested conservation partners by developing an informational website, presenting results at professional meetings, and/or completing a publication.

Progress: Scientists with the Upper Mississippi River and Great Lake Joint Venture have completed an expert based LSI model for the King Rail within the JV. Researchers with the North Carolina State Cooperative Fish and Wildlife Research Unit are currently developing an expert based LSI model for the Roanoke-Tar-Neuse-Cape Fear Ecosystem of North Carolina and Virginia, which is located in the Southeastern Coastal Plain BCR. Funding from the USGS Science Support Partnership (SSP) program was approved to develop a model from field collected data for the Gulf Coastal Prairie of Texas and Louisiana. Field work and model development for this project will be completed by 2010. Additionally, an informal "King Rail Working Group" has been formed to discuss research opportunities. Members of the group include biologists and managers with the U.S. Fish and Wildlife Service and researchers from the North Carolina, Louisiana, and Arkansas Cooperative Fish and Wildlife Research Units. A meeting was held during the fall of 2007 in Baton Rouge, LA to further coordinate modeling efforts between regions. Other regions for which expert-based models should be developed and evaluated include Peninsular Florida and the Middle Atlantic Coast. See Section VIII for an update of current King Rail associated research projects.

2.2. **Objective:** Evaluate LSI models using the Continental Marshbird Monitoring Program survey protocol.

Priority: High **Estimated Cost:** $150,000

Potential Partner(s): USGS Coop Units, USFWS (Migratory Birds, Refuges), State Agencies

Justification: Evaluating the LSI models is essential for seeing how well they predict important landscapes for King Rail. Data collected while evaluating the models can be used to refine the models. The refined models may be a valuable tool in designing a long-term monitoring program for King Rail and other secretive marsh birds. Location information collected during the surveys would also help improve current distribution maps constructed from multiple data sources.

2.2.1. **Task:** Work with a biometrician to set up a sampling scheme based on the LSI models developed for each region (i.e. stratify surveys by low, medium, and high quality landscapes)

2.2.2. **Task:** Form a range-wide group to determine what variables (especially local scale variables) will be useful in refining expert-based models, and measure those while conducting the surveys.

2.2.3. **Task:** Identify funding sources and partner(s) to conduct surveys for model evaluation in each region for which LSI models are developed.

2.2.4. **Task:** Identify a lead to coordinate data management and analysis of survey data so regional survey results are comparable.

2.2.5. **Task:** Summarize results and make regional management recommendations based on study results.

2.2.6. **Task:** Refine LSI models based on results of model evaluation surveys.

Progress: Webless bird program funds were received from the USFWS Division of Migratory Birds to evaluate the expert based models for the Upper Mississippi River and Great Lakes Joint Venture and the Roanoke-Tar-Neuse-Cape Fear Ecosystem. Field work will be conducted during the 2008 and 2009 breeding seasons with final reports being completed in 2010 (see Section VIII for an update of each project).

2.3. **Objective:** Cooperate with existing comprehensive secretive marshbird monitoring efforts, such as the Continental Marshbird Monitoring (CMBM Program), to ensure that King Rail are a priority species when sampling plans are developed for a continental marshbird monitoring program.

Priority: High **Estimated Cost:** NA

Potential Partner(s): USGS Coop Units, USFWS (Migratory Birds, Refuges), State Conservation Agencies

Justification: As mentioned in previous sections, marshbird populations including King Rail have been poorly monitored in the past. A comprehensive marshbird monitoring program needs to be implemented to better monitor these species, especially those that are harvested. The King Rail should be a primary focus of such a monitoring program throughout its range due to the conservation status of the species.

2.3.1. **Task:** Keep marshbird monitoring working groups informed about developments concerning King Rail modeling and research.

2.3.2. **Task:** Share LSI modeling data with marshbird monitoring groups to ensure that King Rail calls are included in marshbird playback surveys being conducted in landscapes predicted to have King Rail present.

2.3.3. **Task:** Share data from pilot marshbird monitoring projects (i.e., sites using CMBM protocol) with researchers studying King Rail.

Progress: The King Rail plan coordinator has been in contact with the working group developing a sampling framework. The working group will be updated on the status of model evaluation studies using the CMBM survey protocol. Mark Seamans, USFWS, has been working with the states of Wisconsin and New York to implement a pilot study to examine the feasibility of a secretive marshbird survey program using the CMBM survey protocols. The pilot study began during 2008 in Wisconsin, with King Rail being detected at several survey locations.

3. **Goal**: **Improve understanding of King Rail population dynamics and ecology including brood survival, nonbreeding season survival, migration patterns, metapopulation structure, and genetics relationship to the Clapper Rail.**

3.1. **Objective:** Gain a better understanding of migration patterns and wintering areas used by migratory populations of King Rail as well as estimate non-breeding season survival.

Priority: High **Estimated Cost:** $150,000
Potential Partner(s): USGS Coop Units, USFWS (Migratory Birds, Refuges), State Conservation Agencies

Justification: Little information is available about the migratory pathways or wintering areas of inland populations of King Rail. Telemetry studies would allow the identification of these areas and help resource managers prioritize the conservation of these areas. Migratory and winter survival rates could also be estimated through this study.

3.1.1. **Task:** Determine appropriate telemetry technology for following migrating King Rail.

3.1.2. **Task:** Identify funding sources and partners to conduct migration research.

3.1.3. **Task:** Conduct telemetry studies for migratory birds from known breeding areas (i.e. Clarence Cannon NWR (MO), B.K. Leach Conservation Area (MO), Horicon NWR (WI), Delta Region of Arkansas, Goose Ponds WMA (IN), Beehunter Marsh WMA (IN), and Ottawa NWR (OH)) in order to identify important staging areas, migratory stops, and wintering areas.

3.1.4. **Task:** Determine nonbreeding season survival of birds marked during telemetry studies.

3.1.5. **Task:** Assess habitat use on wintering and migratory areas delineated with telemetry data.

3.1.6. **Task:** Once wintering areas are determined through telemetry, further evaluate the use of stable isotopes to look at interactions between resident and migratory populations of King Rail.

Progress: A proposal was submitted to the USFWS Webless Migratory Game Bird Research Program and the Upper Mississippi River and Great Lakes JV for funding to conduct a satellite telemetry study of breeding King Rail from the Upper Midwest. Possible sites include Ottawa NWR in Ohio, Clarence Cannon NWR in Missouri, and Goose Ponds/Beehunter Marsh WMA in Indiana. Partners in the project also include the states of Indiana and Missouri. Funding for the satellite telemetry project was received from the Upper Mississippi River and Great Lakes JV and Region 3 Migratory Bird Office. Eight satellite transmitters were purchased and the plan is to deploy them during August 2008. Plans are being developed to assess origin of harvested rails using stable isotope analysis of wings sent in by hunters as part of the USFWS Wing Collection Survey.

3.2. **Objective:** Further assess the accuracy of the CMBM protocol for sampling the presence of King Rail.

Priority: High **Estimated Cost:** $95,000

Potential Partner(s): USGS Coop Units, Gulf Coast Joint Venture

Justification: Extensive monitoring efforts by dozens of researchers in several states are underway using the standardized CMBM protocol developed by Conway (2005). Callback surveys have been shown to be more effective than passive surveys for Rail, however, there is uncertainty regarding the overall effectiveness of the technique and the sources of variation in response rates. Furthermore, some results from Tennessee in 2007 suggest that playing 3 minutes of King Rail calls may be more effective than using the standardized Conway (2005) protocol, which broadcasts species calls for one-half minute followed by a one-half minute listening period. Thus, information is needed to evaluate the effectiveness of call back surveys and to improve monitoring designs and survey interpretations.

3.2.1. **Task:** Identify a funding source to study the utility of different call-broadcast survey approaches in detecting King Rail.

3.2.2. **Task:** Evaluate effectiveness of roadside surveys vs. in marsh surveys.

Progress: A proposal has been developed by the Gulf Coast Joint Venture and the Louisiana Cooperative Fish and Wildlife Research Unit to compare call-broadcast survey methods. The proposal will be submitted to potential funding sources in the near future. There is an ongoing USGS Science Support Partnership grant currently looking at the effectiveness of roadside vs. in marsh surveys using the standardized North American marsh bird survey; however, the research is not specific for King Rail.

3.3. **Objective:** Implement a range-wide brood survival study for King Rail from hatching until young are recruited into the fall population.

Priority: Medium **Estimated Cost:** $270,000 to assess brood survival at three sites throughout the species range ($90,000 per site).

Potential Partner(s): USGS Coop Units, USFWS (Migratory Birds, Refuges), State Conservation Agencies, Joint Ventures

Justification: Among biologists at the King Rail Workshop, brood survival was hypothesized to be a limiting factor for population growth. Two studies have shown that nesting success is fairly high for King Rail in Missouri and Louisiana (Pierluissi 2006, Reid 1989). However, little is known about survival of chicks after they hatch and how that is related to habitat. Anecdotal information from one site in Indiana indicates that mink predation on chicks is a problem. Results from a brood survival study would allow for habitat specific management recommendations. Any study looking at brood survival would most likely have the ancillary benefit of tracking nests so nesting success could also be determined for other regions within the King Rail range.

3.3.1. **Task:** Develop a study design that would allow for the comparison of brood survival between studies conducted in different regions and habitats within the King Rail range.

3.3.2. **Task:** Work with partners to identify potential funding sources, study areas, and principal investigators for brood survival studies in different regions of the King Rail range.

3.3.3. **Task:** Summarize results and identify region specific management recommendations that land managers can use to enhance nest and/or brood survival rates.

Progress: Indiana DNR has expressed interest in looking at brood survival at the Goose Ponds/Beehunter Marsh State Wildlife Management Area (WMA) in southwestern Indiana. Evidence from the site suggests high brood mortality primarily from mink. This objective may be able to be completed in conjunction with the telemetry studies proposed under Objective 3.1. A proposal to study nest site selection, nest success, and brood rearing habitat in the ACE Basin of South Carolina was funded by the U.S. Fish and Wildlife Service's Webless Migratory Game Bird Research Program. The study is being conducted by the Nemours Wildlife Foundation (see Section VIII of plan for an update).

3.4. **Objective:** Better understand the genetic relationship between King Rail and Clapper Rail.

Priority: Medium, In progress **Estimated Cost:** ?

Potential Partner(s): USGS Coop Units, USFWS (Migratory Birds, Refuges), State Agencies

Justification: Previous work has shown there is not much genetic variation between coastal, non-migratory King Rail and Clapper Rail. There have been few studies looking at how migratory King Rail compare with resident populations and Clapper Rail. Determining genetic relationships would help guide future management actions for King Rail.

3.4.1. **Task:** Identify a funding source and lead investigator to analyze the genetic relationship between migratory King Rail, non-migratory King Rail, and Clapper Rail.

3.4.2. **Task:** Identify studies where these rails are being captured and contact the investigators to gather samples for genetic analysis.

3.4.3. **Task:** Have collected samples analyzed for genetic relationships between migratory King Rail, resident King Rail, and Clapper Rail.

3.4.4. **Task:** Summarize the genetic study results and determine how this will guide future management actions.

Progress: A cooperative study between the Louisiana Cooperative Fish and Wildlife Research Unit and USGS National Wetlands Research Center looking at hybridization between King and Clapper Rail is currently being conducted.

3.5. **Objective:** Implement a range-wide banding program for King Rail to better estimate survival rates, harvest rates, and document spatial and temporal patterns of King Rail movements.

Priority: Low **Estimated Cost: ?**

Potential Partner(s): USGS Bird Banding Lab, USFWS (Migratory Birds, Refuges), State Agencies

Justification: No information is currently available on annual survival of King Rail or the movements of King Rail. Through 2004, only 432 King Rail have been banded with only 11 encounters reported. Banding a larger sample of King Rail would allow better estimates of annual survival, life expectancy, and movements.

3.5.1. **Task:** Form a working group to evaluate the feasibility of developing a large-scale banding program.

3.5.2. **Task:** If feasible, develop a protocol that would sufficiently band populations of King Rail throughout its range.

3.5.3. **Task:** Develop a strategy to get adequate recoveries that will allow inferences to be made about survival, harvest rates, and movements.

Progress: Not a high priority objective at this time. All current studies capturing King Rail are banding them with a USGS bird band. USGS Bird Banding Lab records show that 432 King Rails have been banded with only 11 encounters.

VIII. Current Research Updates

Since the November 2006 King Rail Workshop, several projects have been funded to develop habitat models for King Rail or to evaluate models that have already been developed. In addition, a project investigating nest success and brood ecology was also funded by the USFWS Webless Migratory Game Bird Research (WMGBR) Program. The following reports provide an update on the projects and provide some preliminary results. The reports were submitted by the researchers working on these projects.

1) Evaluation of an expert-based model for King Rail in the Upper Mississippi River and Great Lakes Joint Venture (update provided by Jason Bolenbaugh, University of Arkansas).

Field research began on 4 May 2008 and concluded on 12 July 2008. Throughout the season my crew and I surveyed 269 wetland sites in seven states (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, and Ohio). Each site was surveyed 3 times, approximately 17 days apart. Conducting surveys and detecting marshbirds proved to be very challenging due to above average rainfall and flooding that occurred in the Midwest. Of the 269 sites surveyed, we detected 9 king rails at four state managed properties. Two king rails were detected at Goose Pond Conservation Area in Linton, IN, on 20 May, and another three were detected on 8 June. One king rail was detected at Four Rivers Conservation Area in Horton, MO, on 30 May. A pair of king rails were detected and observed at Whitewater Wildlife Management Area in Winona, MN, on 7 June, and one king rail was detected and observed at BK Leach Conservation Area (Bittern Basin) in Ellsbury, MO, on 17 June. Due to the amount of rainfall that fell in Iowa and Missouri this spring and the flooding that followed, we were forced to find new areas to survey other than those randomly selected before the field season began. Our efforts were aided by numerous federal and state employees and volunteers throughout the region. All of our king rail detections came from areas that were not randomly selected before the field season.

2) Development and evaluation of an expert-based model for the Roanoke-Tar_Neuse-Cape Fear Ecosystem of North Carolina and Virginia (update provided by Ashton Drew, North Carolina State University).

An expert-based model, designed to step-down national habitat and population objectives to the scale of individual refuges, is being developed for the Roanoke-Tar-Neuse-Cape Fear Ecosystem of North Carolina and Virginia, located in the Southeastern Coastal Plain. Data from the first of two years validation surveys indicate that experts accurately identified the environmental gradients that would best predict the probability of King Rail occurrence at a given site and time. In order of importance, King Rail occupied sites with lower salinity, larger patch size, and greater interspersion of open water. They were never observed in interior habitat (> 250 m from mapped open water). Of particular importance to distribution modeling efforts, however, the model using landscape data alone (e.g. fresh, brackish, and saline marsh landcover classes), rather than site and time specific measurements (e.g. salinity in ppt at time of each repeat survey), do not effectively describe the observed occurrence patterns.

3) Nesting, Brood Rearing and Winter Habitat Selection of King Rails and Clapper Rails Within the ACE Basin, SC (update provided by Eddie Mills, Nemours Wildlife Foundation)

Biologists at the Nemours Wildlife Foundation in Beaufort County, SC began studying King and Clapper Rails in 2005. Our initial efforts involved an MS thesis project conducted by a University of Georgia graduate student under the advisement of Dr. Sara H. Schweitzer. This student, working on and around Nemours Plantation, examined the distribution and frequency of occurrence of King and Clapper Rails in managed impoundments and tidal marshes. Call broadcast surveys were used during 2005 and 2006 to estimate frequency of occurrence. In 2006, we captured and radio-marked 5 King and 5 Clapper Rails to assess home range size, habitat selection and movement during the breeding season. Since that time, we have been working on refining and developing more efficient capture techniques and testing different radio attachment methods. In spring of 2008, we radio-marked 24 Clapper Rails that we will be tracking for home range and habitat use data for the remainder of the year. During 2009 and 2010, using funding received through a WMGBR Program grant, we are planning to trap both King and Clapper rails and collect radio-telemetry data on a sample size of 50-60 birds per year. Data will be used to examine habitat use and home range as well as nest site selection, nest success and brood rearing habitat.

4) King Rail Surveys in SW Louisiana Rice Region (update provided by Bradley A. Pickens, Louisiana State University AgCenter)

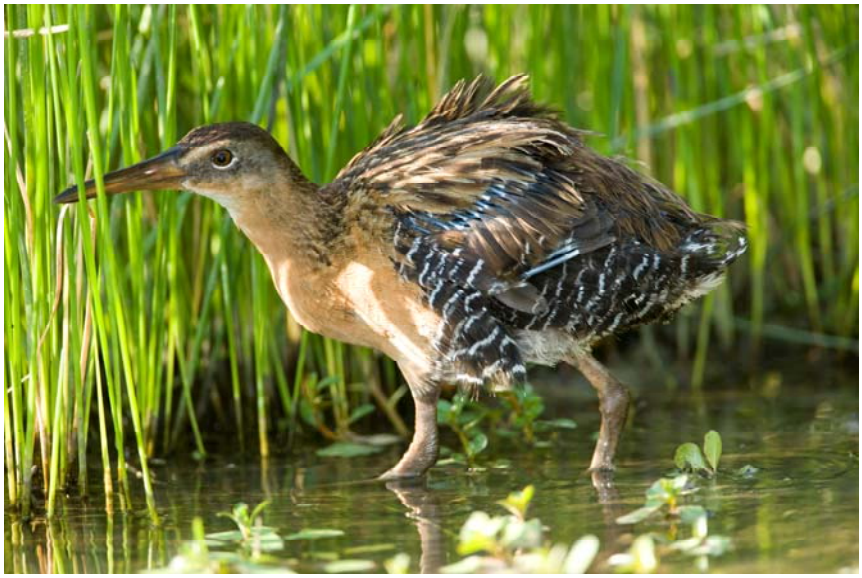
In 2008, we surveyed 67 rice field locations in southwest Louisiana for 3 rounds of call-back surveys. We found King Rails at 23 of these locations. This data will be used to test our habitat suitability model for the region. In addition, we performed one round of surveys in southeast Texas (just west of Winnie, TX). We focused on areas which were shown to be high quality habitat based on our Louisiana model. We found 7 of 15 locations to have King Rails, including 6 of 10 on a single transect (more than any Louisiana transect).

5) Breeding ranges and habitat associations for secretive marsh birds in northeast Louisiana (update prepared by Jonathon Valente, Louisiana State University)

In the summers of 2007 and 2008, we sought to identify breeding ranges and habitat associations for several species of secretive marsh birds, including King Rails, in the Mississippi Alluvial Valley of northeast Louisiana. In the spring of 2007 we randomly selected approximately 112 wetlands from those accessible to us on National Wildlife Refuges, Wildlife Management areas, and Wetlands Reserve Program easements in the region. One survey point was then randomly placed on the edge of each of those wetlands, and we conducted 3-5 bird surveys at each point 15 April and 30 June. The following year, 30% of the sites had to be replaced due to high flood waters in the region, and more sites were added, so that in 2008 we sampled 122 wetlands between 15 April and 30 June. We also selected 39 rice fields in the region in 2007 and 40 in 2008 to sample in the same fashion. Bird surveys lasted 11 minutes and consisted of a 5 minute silent period, followed by 6 minutes of playing recorded calls of 6 target marsh bird species.

While we recorded detailed habitat information at each wetland and rice field site, we were not able to construct habitat models for King Rails due to the extremely low number of occurrences. None

of our 112 wetland sites was utilized by breeding King Rails in 2007, while 3 sites were utilized in 2008. Similarly, none of our rice field sites was used by breeding King Rails in 2007 (though probable breeding individuals were observed incidentally in other nearby rice fields) while 3 sites were in 2008. Interestingly, the first King Rails did not start showing up in the rice fields until the first week of June in both 2007 and 2008, several months after breeding would have commenced for this species. While analysis is still in the early stages, it would seem as though King Rails are not breeding in significant numbers in the Mississippi Alluvial Valley of northeast Louisiana, though whether the reason is related to habitat, historic breeding ranges, or other factors is yet to be determined.



IX. Conservation and Management Actions

The maintenance of viable King Rail populations will require the protection, management, and restoration of habitat on both public and private lands. In order to implement these actions, outreach to public land managers and private landowners will be important for delivering conservation actions. Conservation and outreach efforts should be targeted toward high priority landscapes that currently have King Rail populations or are identified through modeling projects described in the previous section. Much of the remaining quality habitat for the species is located on public land. As such, efforts should first focus on working with public land managers in regions that are currently being used by King Rail. Conservation efforts should then be targeted toward private lands surrounding public lands using existing conservation easement and restoration programs. Additionally, conservation and management actions outlined in the plan should be targeted toward important regions identified in State Wildlife Action Plans and integrated with actions identified in the state plans.

An important component of conservation efforts will be to evaluate the success of implemented habitat projects. As such, all implemented projects should be planned and evaluated using a Strategic Habitat Conservation (SHC) approach (NEAT 2006). SHC is an adaptive process that ties together the planning, implementation, and evaluation phases of habitat conservation.

1. **<u>Goal:</u> Develop outreach materials promoting and providing guidelines for the management and restoration of King Rail habitat.**

   1.1. <u>Objective:</u> Develop a general informational brochure and website providing guidance on King Rail habitat requirements for regions throughout the King Rail range.

   Justification: Outreach is a key component of managing habitat for the King Rail. Management strategies for other species (i.e., waterfowl) can at times be in conflict with management for the King Rail. Developing outreach materials and distributing them in high priority landscapes will provide information for managers and landowners about the importance of the King Rail in the region.

   1.1.1. **<u>Task:</u>** Form a working group with members from each region to provide input on King Rail habitat requirements and appropriate audiences for inclusion in a brochure and website for that region.

   1.1.2. **<u>Task:</u>** Design a general brochure and website, suitable for tailoring to specific audiences (e.g. resource professionals, public land managers, private landowners, rice farmers, and the general public).

   1.1.3. **<u>Task:</u>** Distribute brochure and advertise website to targeted audiences in high priority landscapes.

   Progress: A brochure on best management practices (BMPs) for rice field habitats is being developed for rice growing regions supporting King Rail. The expected completion date is fall 2008.

2. **<u>Goal:</u> Protect, restore, and manage habitats needed to support self-sustaining populations of King Rail in key areas throughout its range.**

   2.1. <u>Objective</u>: Promote the protection, restoration, and management of King Rail habitat on public lands in high priority landscapes (especially breeding areas being used by migratory populations) identified through the status assessment and modeling efforts.

   Justification: Much of the remaining suitable habitat for the King Rail is located on public lands. As such, cooperation is needed with public land managers to protect, restore, and manage habitat in high priority landscapes.

   2.1.1. **<u>Task</u>:** Based on the status assessment, modeling efforts, and state/regional plans, identify opportunities to restore or enhance management of King Rail habitat on public lands in high priority landscapes.

   2.1.2. **<u>Task</u>:** Provide outreach materials to public land managers in high priority landscapes about management and restoration strategies benefiting King Rail. Accomplish this by distributing outreach materials (brochures and websites) and holding regional workshops that present restoration and management guidelines for King Rail and other marshbirds relying on similar habitat conditions.

   2.1.3. **<u>Task:</u>** Develop a strategy for prioritizing public land acquisitions that will benefit King Rail within high priority landscapes. Identify existing habitat and areas with high restoration potential. Target these lands for future acquisition from willing landowners.

   2.1.4. **<u>Task:</u>** Within each priority area, identify financial and technical resources to assist in funding the protection, restoration, and management of habitat on public land.

2.1.5. **Task:** Develop performance standards and appropriate measurements of success for evaluating projects completed on public land. For example, conduct marshbird surveys on recently restored sites to see if King Rail are using the site. If they are using the site, consider further demographic studies to evaluate productivity.

Progress: A Webinar (a web-based seminar) is being planned by David Krementz, Arkansas Cooperative Fish and Wildlife Research Unit, and Sammy King, Louisiana Cooperative Fish and Wildlife Research Unit, for the fall of 2008. Results from King Rail research will be presented during the webinar and management practices will be discussed.

2.2. Objective: Promote the voluntary protection, restoration, and management of King Rail habitat on private land in high priority landscapes through existing private land conservation programs [i.e., Wetlands Reserve Program (WRP), Conservation Reserve Enhancement Program (CREP), Conservation Reserve Program (CRP), Partners for Fish and Wildlife Program].

Justification: Much of the land throughout the King Rail range is in private ownership. As such, conservation efforts also need to focus on private land in high priority landscapes.

2.2.1. **Task:** Based on the status assessment, modeling efforts, and regional/state plans, identify priority areas within each region for targeting private land habitat restoration projects and permanent habitat protection through available conservation easement programs.

2.2.2. **Task:** Develop an outreach program to inform the public about concern for the King Rail and to highlight private land conservation opportunities to benefit the species. Outreach can be accomplished by working through state conservation magazines, issuing press releases, developing an informational website geared toward the public, and holding local conservation forums for private landowners in high priority landscapes.

2.2.3. **Task:** Identify conservation practices in existing conservation programs that are beneficial to King Rail and highlight projects using these programs that have benefited King Rail (i.e., Wetland Reserve Program projects at Goose Ponds/Beehunter Marsh WMA in Indiana, B.K. Leach Conservation Area in Missouri, and Red Slough in Oklahoma).

2.2.4. **Task:** Propose new conservation practices that will benefit King Rail. Work to have them added as eligible practices under existing private land conservation programs.

2.2.5. **Task:** Based on the status assessment and modeling efforts, identify priority areas within each region for targeting private land habitat restoration projects and permanent habitat protection through available conservation easement programs.

2.2.6. **Task:** Hold regional workshops for local technical assistance providers in high priority landscapes (i.e. Natural Resources Conservation Service, Soil and Water Conservation District, USFWS, State Conservation Department staff) on how they can incorporate practices beneficial to King Rail into conservation plans and restoration activities on private land.

2.2.7. **Task:** Develop performance standards and appropriate measurements of success for evaluating projects completed on private land (i.e. conduct marshbird surveys on recently restored sites to see if King Rail are using the site. If they are using the site consider demographic studies to evaluate productivity).

2.3. **Objective:** Increase communication with the agricultural community, state farm agencies, and the United States Department of Agriculture (USDA) to promote farming practices and programs that are beneficial to King Rail and other marshbirds.

Justification: Rice fields and crayfish ponds in the southern portion of the King Rail range in the United States provide important habitat for many wetland bird species. A variety of factors are threatening this important resource base. As such, the conservation community needs to work with the rice industry to support rice farming in an environmentally sustainable manner that provides habitat for wetland birds.

2.3.1. **Task:** Create an informational brochure for rice and crayfish farmers in the south-central United States on how they can incorporate best management practices (BMPs) beneficial for marshbirds into their operation.

2.3.2. **Task:** Write an article about the importance of rice habitat to King Rail and how BMPs can be incorporated into their operations to benefit them and other marshbirds. Submit the article to rice farming publications and/or other media sources located in rice growing regions of the King Rail range.

2.3.3. **Task:** Participate in regional rice growing conferences. At the conferences, inform participants about the importance of rice to King Rail/other marshbirds and how they can incorporate BMPs into their operation benefiting King Rail.

2.3.4. **Task:** Support state and federal agricultural policies that provide incentive payments to rice farmers implementing marshbird-friendly BMPs into their farming operation.

2.3.5. **Task:** Propose focus areas to USDA agencies (Natural Resources Conservation Service and the Farm Service Agency) for targeting Farm Bill conservation programs [i.e., CRP, CREP, WRP, Wildlife Habitat Incentive Program (WHIP), Environmental Quality Incentive Program (EQUIP)] that restore or protect King Rail habitat.

2.4. **Objective:** Identify other partners to assist in efforts to protect, restore, and manage habitat for King Rail.

Justification: Habitat protection, restoration, and management are expensive endeavors. As such, cooperative relationships need to be developed with other partners.

2.4.1. **Task:** Identify "non-traditional" partners (i.e. hypoxia task forces, water treatment facilities, watershed districts interested in flood storage) and cooperate with them to use practices that will benefit King Rail and still meet their objectives.

2.4.2. **Task:** Form partnerships and combine resources with other conservation groups (waterfowl groups, shorebird groups, etc) that have similar habitat goals.

2.4.3. **Task:** Identify opportunities to implement and integrate actions identified in the plan with SWAPs and State Wildlife Grant Programs.

2.4.4. **Task:** Develop cooperative grant proposals to fund habitat projects in high priority landscapes.

X. Next Steps

Version 1.0 of the plan is a living document that will be updated as new information is received and incorporated into the plan. The actions presented in Version 1.0 of the plan represent priorities identified by the participants at the November 2006 King Rail Workshop along with input from other concerned stakeholders and regional waterbird plans. As previously reported, progress has been made on several of the action items presented in the plan since the conclusion of the November 2006 King Rail Workshop. Moving forward, a coordinated approach should be taken to implement action items which have not been funded to date.

One suggestion is that the informal King Rail working group, which formed after the November 2006 King Rail Workshop, should be formalized through the drafting of a Memorandum of Understanding (MOU) between all agencies and organizations involved with the group. The group, which is composed of researchers, managers, and program coordinators, has been holding quarterly conference calls to coordinate research priorities and to develop funding proposals. The working group should continue to coordinate and prioritize the implementation of research and monitoring action items as well as identify new research needs. Potential funding sources to implement unfunded research and monitoring actions include Federal, state, and provincial agencies and non-governmental organizations (NGOs) as well as the USGS Science Support Partnership program, USFWS Webless Migratory Game Bird Research Program, USFWS Webless Migratory Game Bird Management Program, and NGO grants (i.e., National Fish and Wildlife Foundation). Implementation of research action items should occur within the regional framework established by the four main regional waterbird plans within the species range (Southeast United States, Upper Mississippi Valley/Great Lakes, Mid-Atlantic/New England Maritimes, and Northern Prairie and Parkland Region). The Central, Mississippi, and Atlantic Flyway technical committees dealing with webless migratory gamebird issues should also be consulted, especially relative to harvest-related issues.

The implementation of Conservation and Management actions identified in the plan should be coordinated with the main Joint Ventures (Atlantic Coast JV, Gulf Coast JV, Lower Mississippi Valley JV, Upper Mississippi River and Great Lakes JV, and Prairie Pothole JV) and states (Table 3) within the King Rail range. Decisions on where to implement the proposed Conservation and Management actions in high-priority landscapes should be based on the best information (i.e., expert-based models, distribution maps, and local knowledge) currently available for the species and should be adapted using the SHC approach as better information becomes available through the proposed research actions in the plan. Coordination between conservation agencies and organizations will be necessary to fund and implement habitat projects benefiting King Rail and other marshbirds. Potential funding sources for habitat projects include State Wildlife Grants, North American Wetland Conservation Act (NAWCA) Grants, USFWS Partners for Fish and Wildlife Program, and various conservation programs funded through the U.S. Department of Agriculture (e.g., CRP, WRP, CREP, and WHIP).

XI. State Status Assessment

Key to Status Assessment:

Bird Conservation Regions: List of BCRs where the species occurs. **State Status:** Based on state lists

Species of Greatest Conservation Need: If yes, the King Rail is listed as a species of greatest conservation need (SGCN) in the State Wildlife Action Plan (SWAP) for that state. A brief description of primary threats, conservation action items, and/or important areas listed in the plan is presented. For specifics, consult each states SWAP. A bibliography of SWAP is located in Appendix C.

Natural Heritage Rank: Subnational conservation status rank of the King Rail in the state. SX = Presumed Extirpated, SH = Possibly Extirpated (Historical), S1 = Critically Imperiled, S2 = Imperiled, S3 = Vulnerable, S4 = Apparently Secure, S5 = Secure, SNR = State Conservation Status Not Yet Assessed, SNA = Not Applicable. Qualifiers: B= Breeding, N=Non-Breeding.

Regional Waterbird Plan: Indicates what waterbird regions are located in the state. Important areas identified in the plans are included.

Breeding Bird Survey: A summary of King Rail Breeding Bird Survey records for the state through the 2005 survey year (Sauer et al. 2005).

CBC Survey: Provides a summary of King Rail Christmas Bird Count Records for the state through count year 106 (2005-2006). Data was provided by the National Audubon Society (2002).

Breeding Bird Atlas: The citation for the BBA is listed and is followed by a summary of BBA data for states that have completed a BBA project. Much of the data for plotting locations in a GIS were provided by Bruce Peterjohn (USGS), state conservation association, or state ornithological organizations.

Continental Marsh Bird Surveys: Provides a summary of sites in the state that recorded King Rail using the secretive marshbird survey protocol developed by Conway and Gibbs (2005). Data was provided by Courtney Conway, AZ Cooperative Fish and Wildlife Research Unit. Results are reported as the total number of King Rail counted during all survey periods with an average (birds/survey period). A survey period is defined as the number of routes multiplied by the times the route was surveyed. For example, if a site had 5 routes and 3 were surveyed 3 times and 2 were surveyed 5 times, then a total of 19 survey periods were reported).

National Wildlife Refuge Survey: Provides a summary of a survey that was sent to NWR biologists to assess the status of the King Rail on refuges within its range in the United States.

Other Sources: Provides a summary of specific studies, surveys, or other sources specific to the state. Also identifies sites where King Rail have been observed over multiple years over the past ten years based on birder records from the internet.

Map: Is a compilation of available data sources showing the distribution of King Rail records and counties with recent records (highlighted in blue) from 1996-2006. Counties with recent records that contain no points were identified from ebird records, birder listserve records, and/or personal communications. Data Sources: 1) BBA Data = Breeding Bird Atlases; 2) BBS Data = Breeding Bird Survey data; 3) Banding Data = Bird Banding Lab records; 4) CBC Data = Christmas Bird Count; 5) CMBM Data = Continental Marsh Bird Monitoring Database; 6) NWR Bird List; 7) State Data = data from state specific surveys; 8) State NHI Data = State Natural Heritage Inventory; and 9) Study Data = data from a specific research study.

Alabama

Bird Conservation Regions: 24, 27, 28, 29 **State Status:** Moderate Concern

Natural Heritage Rank: S3 **Species of Greatest Conservation Need:** No

Regional Waterbird Plan: Southeast United States Region

Breeding Bird Survey: King Rail have been recorded on 6 BBS routes in the state with 3 routes recording individuals recently (1996-2005). Three routes are from coastal areas, while 3 are from inland routes. Data are inadequate to estimate state population trends.

CBC Survey: King Rail have been recorded on 7 CBC Survey circles in the state with 4 circles recording individuals recently (1997-2006). The circles have primarily been from coastal areas.

Breeding Bird Atlas: King Rail were recorded as possible (34), probable (15), and confirmed (2) in 51 blocks during the Alabama BBA which was conducted from 2002-06 (Rick West, Alabama Ornithological Society, unpublished data 2007). The highest density of observations came from around Mobile Bay with scattered observations from the interior of the state.

CMBM Surveys: At Bon Secour NWR, surveys were conducted over 2 years with a total of 24 King Rail being recorded during 65 survey periods (0.37 birds/survey period).

National Wildlife Refuge Survey: One refuge from Alabama responded to the survey. Results are listed in the table below. Eufaula and Wheeler NWRs did not respond, but have suitable habitat (Chuck Hunter, USFWS Region 4 Refuge Biologist, pers. com. 2007).

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Bon Secour	Yes	X2	X	X	15	Uncommon

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: Alabama conducted coastal marshbird surveys during 2003-04 in tidally-influenced salt and brackish marshes in Mobile and Baldwin Counties. King Rail were recorded in both brackish and saline marshes. A total of 45 individuals were detected at 32 of the 342 points surveyed (0.13 birds/point) (Soehren 2004). No King Rail were recorded during surveys conducted in 2007 at Wheeler NWR (Bob Ford, USFWS R4 Refuge Biologist, pers. com. 2007).

Summary: King Rail live year around in the state. Most records come from the Gulf Coast counties (Baldwin and Mobile) with limited records from the east-central part of the state.

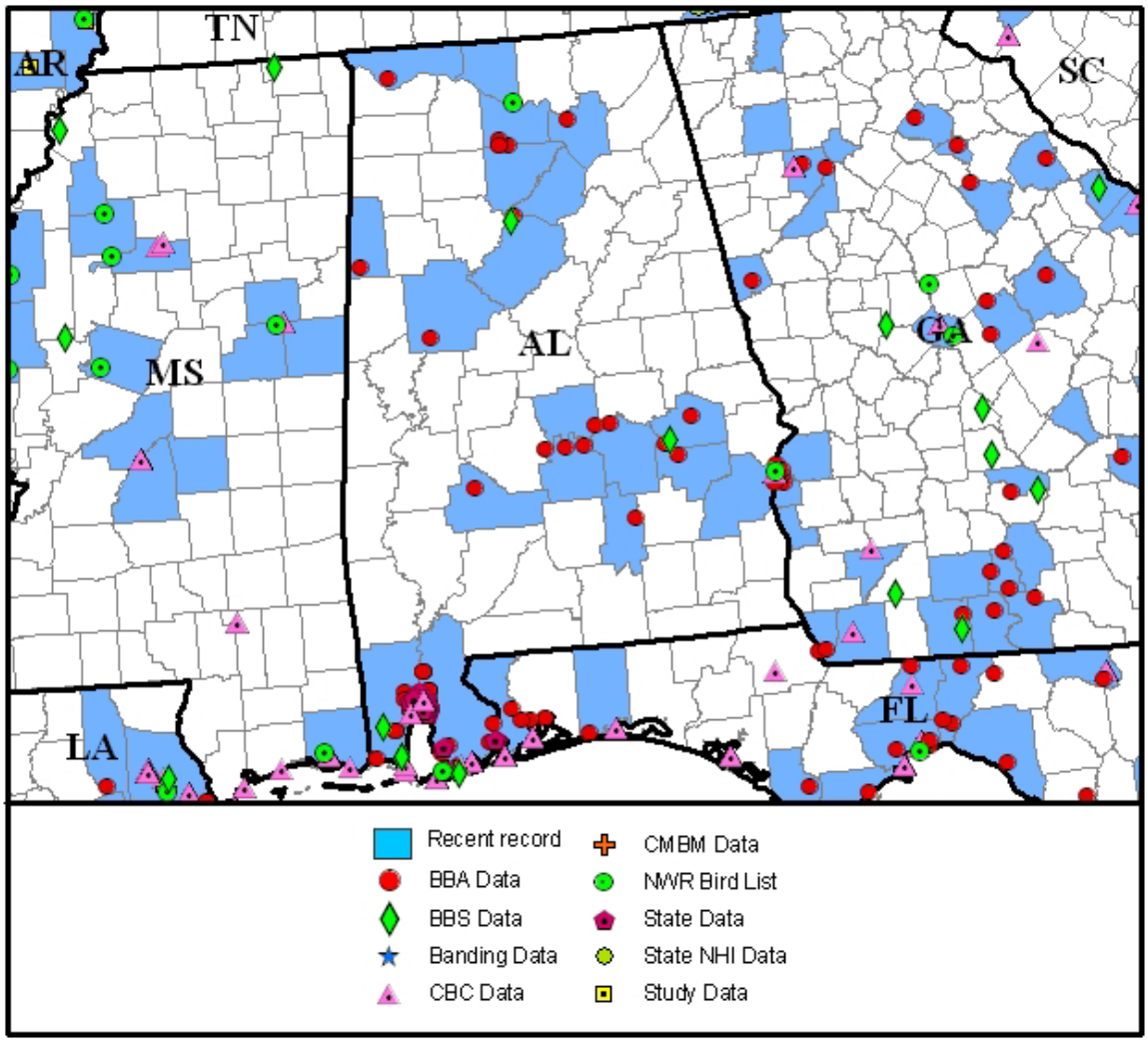


Figure 19. Distribution of the King Rail in Alabama showing documented locations and counties with records from 1996-2006.

Arkansas

Bird Conservation Regions: 24, 25, 26 **State Status:** Inventory Element

Natural Heritage Rank: S1B, S3N

Species of Greatest Conservation Need: Yes, key ecoregions identified in the Arkansas SWAP were the Mississippi Alluvial Plain and the South Central Plains. The largest threat is wetland loss due to crop production practices, urban development, and water diversion. Conservation actions identified were wetland protection and restoration.

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region and Southeast United States Region. The UMVGL plan identifies the Charlie Craig State Fish Hatchery as an important site.

Breeding Bird Survey: King Rail have been recorded on 4 BBS routes in the state with 1 route recording individuals recently (1996-2005). All routes are located in the eastern part of the state. There is a declining, long-term trend of -56.8%/year ($p = 0.09$, $n = 2$) based on limited data from two routes. Data are inadequate to estimate recent trends (1980-2005).

CBC Survey: King Rail have been recorded on 3 CBC Survey circles in the state with no circles recording individuals recently (1997-2006).

Breeding Bird Atlas: Completed, data not available at this time.

CMBM Surveys: The CMBM protocol was used throughout eastern Arkansas, please see summary under other sources below.

National Wildlife Refuge Survey: Four refuges from Arkansas responded to the survey. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Bald Knob	Y	X1			Unknown	Nest Found
Big Lake	Y	X1		X	Unknown	Nest Found
Cache River	Y	X			Unknown	Suspected
Wapanocca	Y	X1		X	Unknown	Nest Found

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: During 2005 and 2006, researchers at the University of Arkansas conducted marshbird surveys in the Delta Region of eastern Arkansas using CMBM protocols (Michael Budd, University of Arkansas, unpublished data 2007). In 2005, King Rail were detected at 10 out of 69 sites with 24 individuals being recorded. In 2006, King Rail were detected at 5 out of 88 sites with 18 individuals counted. In addition, King Rail were opportunistically detected at 5 additional sites. Of the 17 sites occupied by the species, 6 were on federal land, 8 were on WRP easements, 2 were on private land, and 1 was managed as a WRP/WMA. All sites except one were within 50 kilometers of the Mississippi River. One brood was observed during the study at the Hogwallow

WRP site. No King Rail were recorded in rice during the study, while records from the 1950's show they were common in rice (Meanley 1969). Two reasons for its absence from rice may be that ditches in the 1950's had more emergent vegetation than at present (David Krementz, pers. com. 2006) and that pesticide use has reduced crayfish numbers (Eddleman et al. 1988). Counties with multiple records from the Arkansas Audubon Society include Ashley, Chicot, Desha, Mississippi, and Pulaski Counties (Karen Rowe, Arkansas Game and Fish Commission, unpublished data 2007).

Summary: King Rail are found throughout the eastern part of the state during the breeding season. The 2005-06 study indicates that wetlands on public lands and wetlands restored through the WRP program are important habitat for the King Rail in eastern Arkansas. Based on past work in the state (Meanley 1969), the population is probably much lower than historical levels.

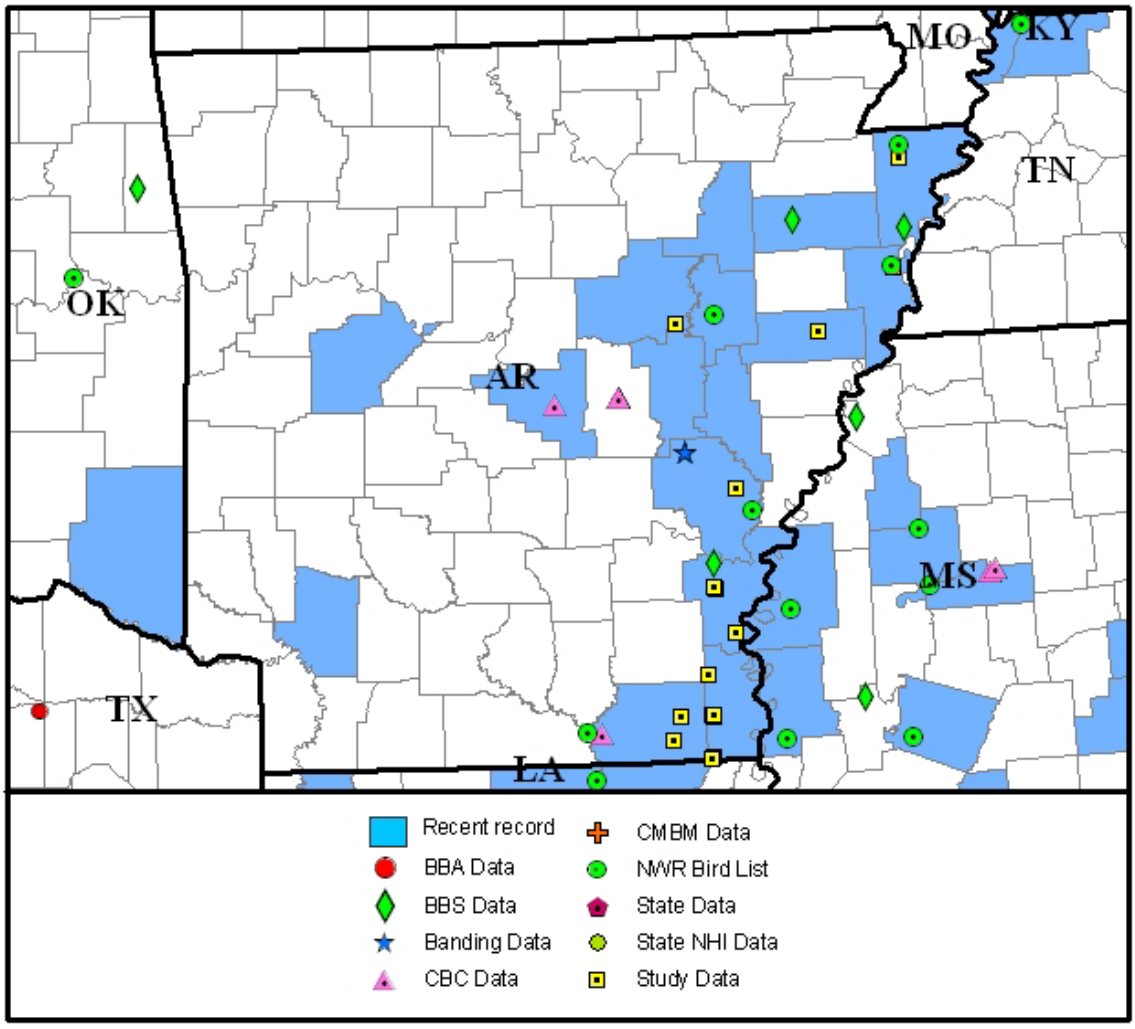


Figure 20. Distribution of the King Rail in Arkansas showing documented locations and counties with records from 1996-2006.

Connecticut

Bird Conservation Regions: 14, 28, 30 **State Status:** Endangered

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the biggest threats to the King Rail and other species using freshwater wetland habitat in the state are loss/alteration of habitat, contamination from pollutants, and invasive species. Actions identified include delineating priority wetlands for protection, maintain and manage wetlands already protected, reduce/eliminate wetland alteration and degradation, and reduce/eliminate invasive species.

Regional Waterbird Plan(s): Mid-Atlantic/New England Maritime Region. The plan identifies Lords Cove as an important area in the state.

Breeding Bird Survey: King Rail have been recorded on 1 BBS route in the state with this route recording individuals recently (1996-2005). The route is located along the coast in New Haven County. Data are inadequate to estimate state population trends.

CBC Survey: King Rail have been recorded on 4 CBC Survey circles in the state with 1 circle recording individuals recently (1997-2006). All circles recording individuals are from coastal areas.

Breeding Bird Atlas: (Bevier 1994) King Rail were recorded as possible (2), probable (1), and confirmed (1) in 4 blocks out of 596 surveyed during the Connecticut BBA conducted from 1982-86. All of these blocks were located on the Atlantic Coast.

CMBM Surveys: At Stewart B. McKinney NWR, surveys were conducted over 4 years with a total of 3 King Rail being recorded during 11 survey periods (0.27 birds/survey period). This was the only site in Connecticut using the CMBM protocol.

National Wildlife Refuge Survey: Two refuges from Connecticut responded to the survey. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Silvio O. Conte	N				Unknown	
Stewart McKinney	Y	X1			1	Nest found

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other: The King Rail was never common in Connecticut and is considered a rare nester in the state (Connecticut Department of Environmental Protection 1997).

Summary: The King Rail is present in small numbers during the breeding season primarily in coastal marshes.

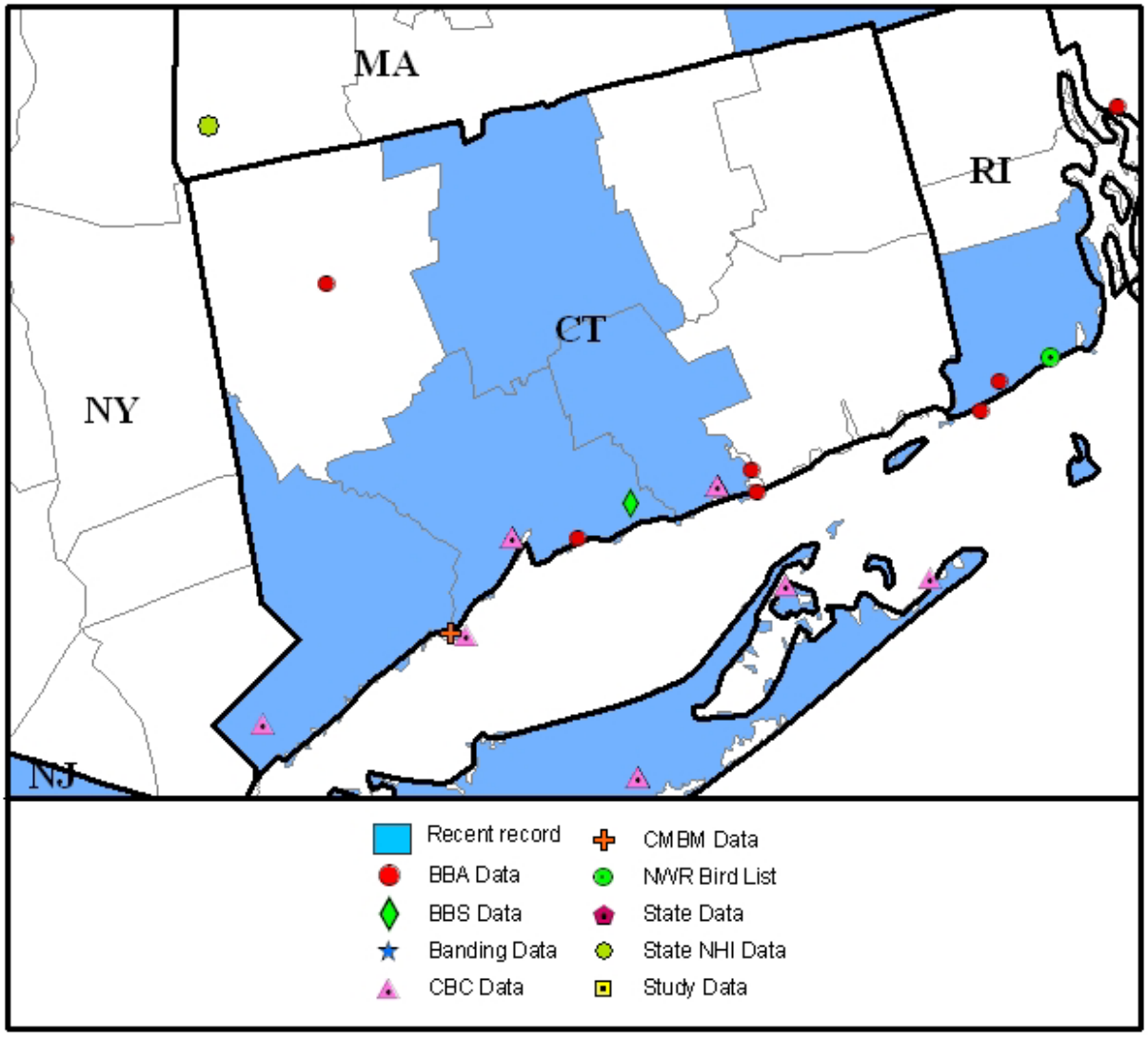


Figure 21. Distribution of the King Rail in Connecticut showing documented locations and counties with records from 1996-2006.

Delaware

Bird Conservation Region: 30 **State Status:** Species of Concern

Natural Heritage Rank: S2

Species of Greatest Conservation Need: Yes, freshwater tidal wetlands were identified as the most important habitat in the state. Primary threats to this habitat include nutrient and sedimentation from a variety of sources, sewage and toxin spills, acid rain, invasive plants, excessive herbivory from Canada Geese and nutria, altered hydrology, sea level rise, and transportation/utilities fragmenting habitat.

Regional Waterbird Plan(s): Mid-Atlantic/New England Maritime Region. The plan lists Bombay Hook NWR as an important site in the state.

Breeding Bird Survey: King Rail have been recorded on 1 BBS route in the state with no routes recording individuals recently (1996-2005). Data are inadequate to estimate state population trends.

CBC Survey: King Rail have been recorded on 6 CBC Survey circles in the state with all 6 circles recording individuals recently (1997-2006). All circles were located in coastal areas.

Breeding Bird Atlas: (Hess et al. 2000) King Rail were recorded as possible (9), probable (7), and confirmed (2) in 18 blocks out of 222 surveyed during the Delaware BBA conducted from 1983-87. Most occurrences were along the Atlantic Coast or from the eastern portion of the state. Populations have decreased in the state based on evidence that the species in uncommon in areas that it used to be common. The state population was estimated at 100-1,000 pairs.

CMBM Surveys: None conducted in the state.

National Wildlife Refuge Survey: One refuge from Delaware responded to the survey. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Bombay Hook	Y	X2	X	X	Unknown	May be found on adjacent state area

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: The King Rail has been documented by birders as being present in the Thousand Acre Marsh/Grier's Pond area in New Castle County and at Bombay Hook NWR in Kent County. Both locations have multiple sightings over the past 10 years.

Summary: The King Rail occurs year around in the state. All locations where they have been documented are in coastal areas along the Delaware Bay. Based on existing information, the state has a relatively low population.

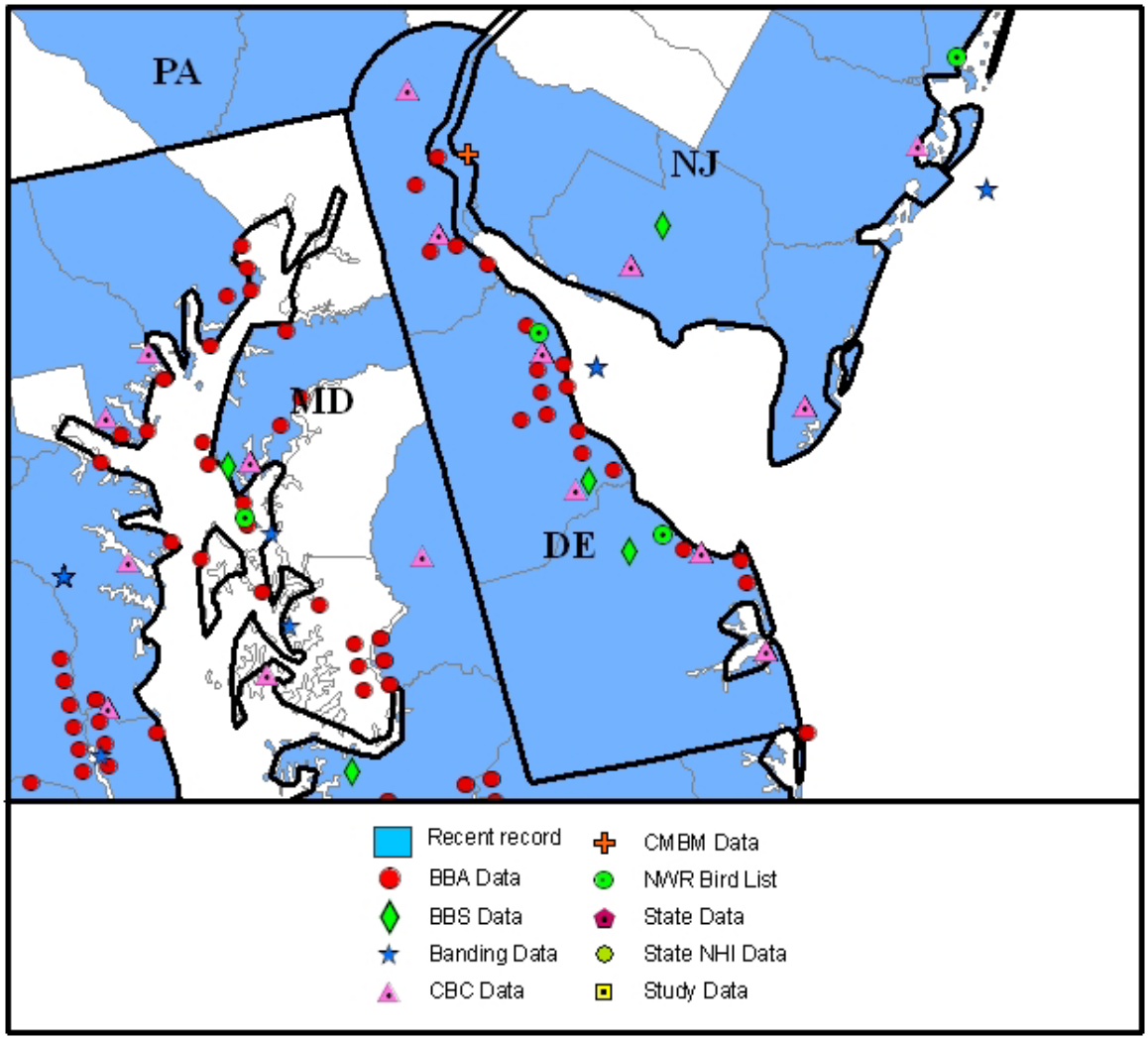


Figure 22. Distribution of the King Rail in Delaware showing documented locations and counties with records from 1996-2006.

Florida

Bird Conservation Regions: 27 and 31 **State Status:** No Status

Species of Greatest Conservation Need: Yes **Natural Heritage Rank:** SNR

Regional Waterbird Plan(s): Southeast United States Region

Breeding Bird Survey: King Rail have been recorded on 25 BBS routes in the state with 12 routes recording individuals recently (1996-2005). The routes are distributed throughout Florida with none coming from the panhandle region of the state. There is a declining, long-term trend of -5.1 %/year ($p = 0.31$, $n = 9$) in the state and an increasing short-term trend of 7.5 %/year ($p = 0.46$, $n = 4$) based on limited data.

CBC Survey: King Rail have been recorded on 74 CBC Survey circles in the state with 45 circles recording individuals recently (1997-2006). Circles recording King Rail are distributed throughout the state. Analysis of CBC data, from 1959-1988, indicated a slightly increasing trend of +0.2%/year (-1.8 to 2.2 95% C.I., $n = 47$) (Sauer et al. 1996).

Breeding Bird Atlas: (Kale et al. 1992) King Rail were recorded as possible (70), probable (32), and confirmed (49) in 151 blocks out of 1,028 surveyed during the Florida BBA conducted from 1986-91. Blocks were distributed throughout Florida with a higher density occurring in the southern half of the state. Although found throughout the state, they are present in low numbers throughout much of the state. The species was most common in the St. John's River marshes and Everglades.

CMBM Surveys: The King Rail was detected at 5 of 9 sites using the CMBM protocol in Florida. At J. Ding Darling NWR, surveys were conducted over 2 years with a total of 5 King Rail being detected during 41 survey periods (0.12 birds/survey period). At Loxahatchee NWR, surveys were conducted during 1 year with a total of 7 King Rail being detected during 2 survey periods (3.50 birds/survey period). At St. Johns NWR, surveys were conducted over 2 years with a total of 7 King Rail being detected during 10 survey periods (0.70 birds/survey period). At St. Vincent NWR, surveys were conducted over 6 years with a total of 1 King Rail being detected during 38 survey periods (0.03 birds/survey period). At Ten Thousand Islands NWR, surveys were conducted over 2 years with a total of 6 King Rail being detected during 16 survey periods (0.38 birds/survey period).

National Wildlife Refuge Survey: Seven refuges from Florida responded to the survey. Results are listed in the table below. Of refuges not responding, Lake Woodruff has suitable habitat for the King Rail (Chuck Hunter, USFWS Region 4 Refuge Biologist, pers. com. 2007).

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Chassahowitzka	N					Possible, but not observed
Loxahatchee	Y	X2	X		Unknown	Recorded during surveys 1998-2004
Merrit Island	Y	X2	X	X	< 50	May not be present during dry years
St. Johns	Y	X1	X	X	75	Chicks Observed
St. Marks	Y	X2	X	X	Unknown	Uncommon

St. Vincent	Y	X2	X	X	Unknown	Uncommon
Ten Thousand Islands	Y	X2			12+	Hope to better assess winter use

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: Meanley (1969) reported that extensive drainage projects have destroyed thousands of acres of habitat.

Summary: The King Rail is found throughout the state year around in areas with suitable habitat. Most records are from the southern half of the state and along the Gulf coast. The most important areas may be the marshes along the St. John's River and the Everglades.

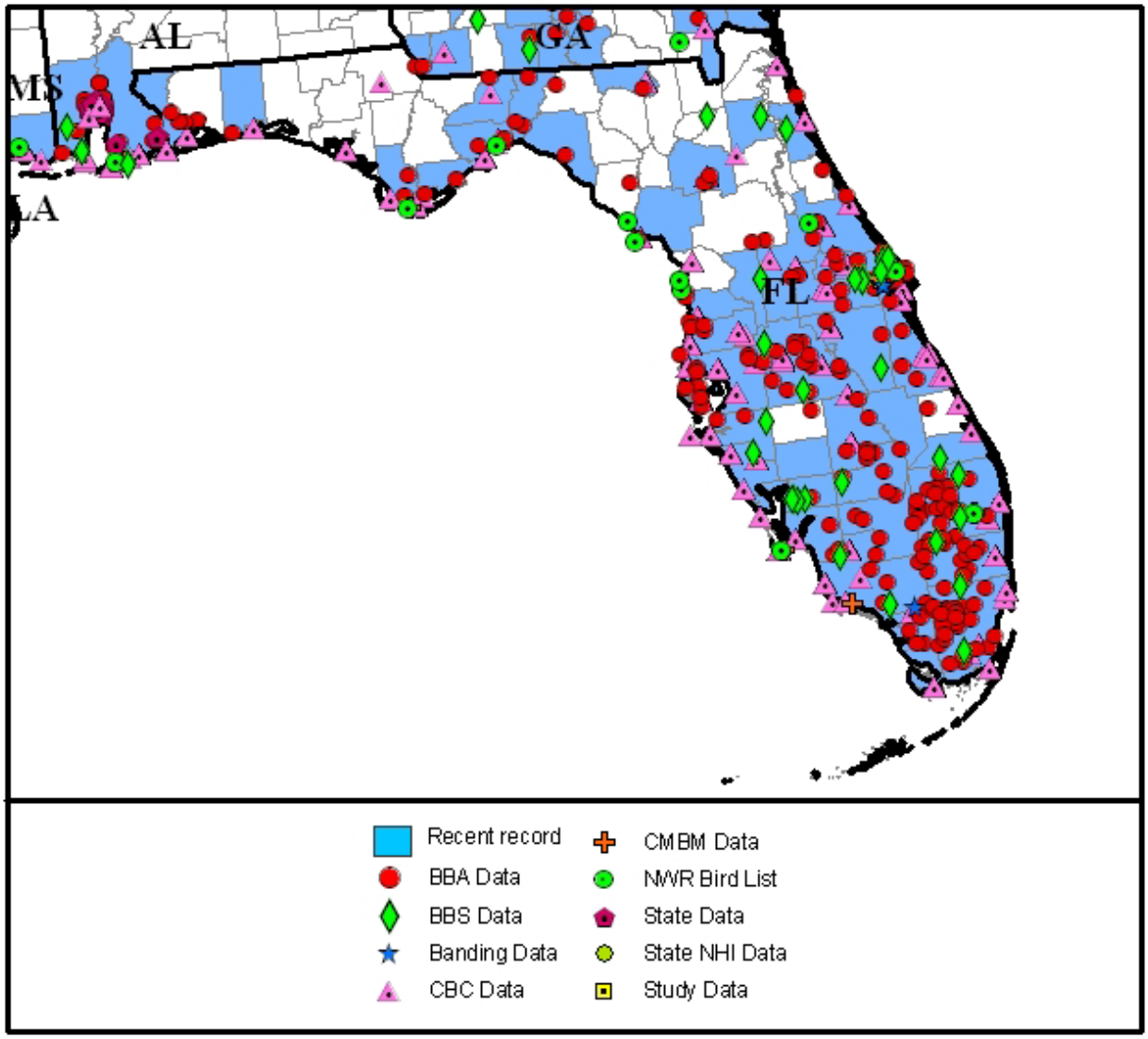


Figure 23. Distribution of the King Rail in Florida showing documented locations and counties with records from 1996-2006.

Georgia

Bird Conservation Regions: 27, 28, 29 **State Status:** No Status **Natural Heritage Rank:** S4

Species of Greatest Conservation Need: Yes, the most important ecoregions identified in the SWAP plan are the Southern Coastal Plain, Southeastern Plains, and the Piedmont.

Regional Waterbird Plan(s): Southeast United States Region

Breeding Bird Survey: King Rail have been recorded on 10 BBS routes in the state with 2 routes recording individuals recently (1996-2005). The routes are primarily from the southern half of the state. There is a declining, long-term trend of -10.3 %/year ($p = 0.26$, $n = 4$) in the state and a decreasing short-term trend of -10.9 %/year ($p = 0.65$, $n = 3$) based on limited data.

CBC Survey: King Rail have been recorded on 13 CBC Survey circles in the state with 6 circles recording individuals recently (1997-2006). Six of the circles are located in coastal areas, while 7 are from inland circles.

Breeding Bird Atlas: (Schneider et al. in press) King Rail were recorded as possible (20), probable (4), and confirmed (4) in 28 blocks during the Georgia BBA conducted from 1994-2001. Blocks were distributed throughout the state.

CMBM Surveys: None conducted in the state.

National Wildlife Refuge Survey: No responses; however, Lower Suwannee, Okefenokee, and Savannah NWRs have suitable habitat for King Rail (Chuck Hunter, USFWS Region 4 Refuge Biologist, pers. com. 2007). Additionally, there are numerous observations from Savannah NWR and Eufaula NWR based on records from birder listserves.

Other Sources: Other locations where the King Rail has been recorded multiple times over the past ten years include: 1) Altamaha WMA in Glynn and McIntosh Counties; 2) Phinizy Swamp near Augusta in Richmond County; 3) Glennwater Wastewater Facility in Tattnall County; and 4) Legacy Sod Farm in Bartow County. All locations are based on birder listserve records.

Summary: The King Rail is a year around resident found throughout the state. Limited data indicates a long-term population decline in the state.

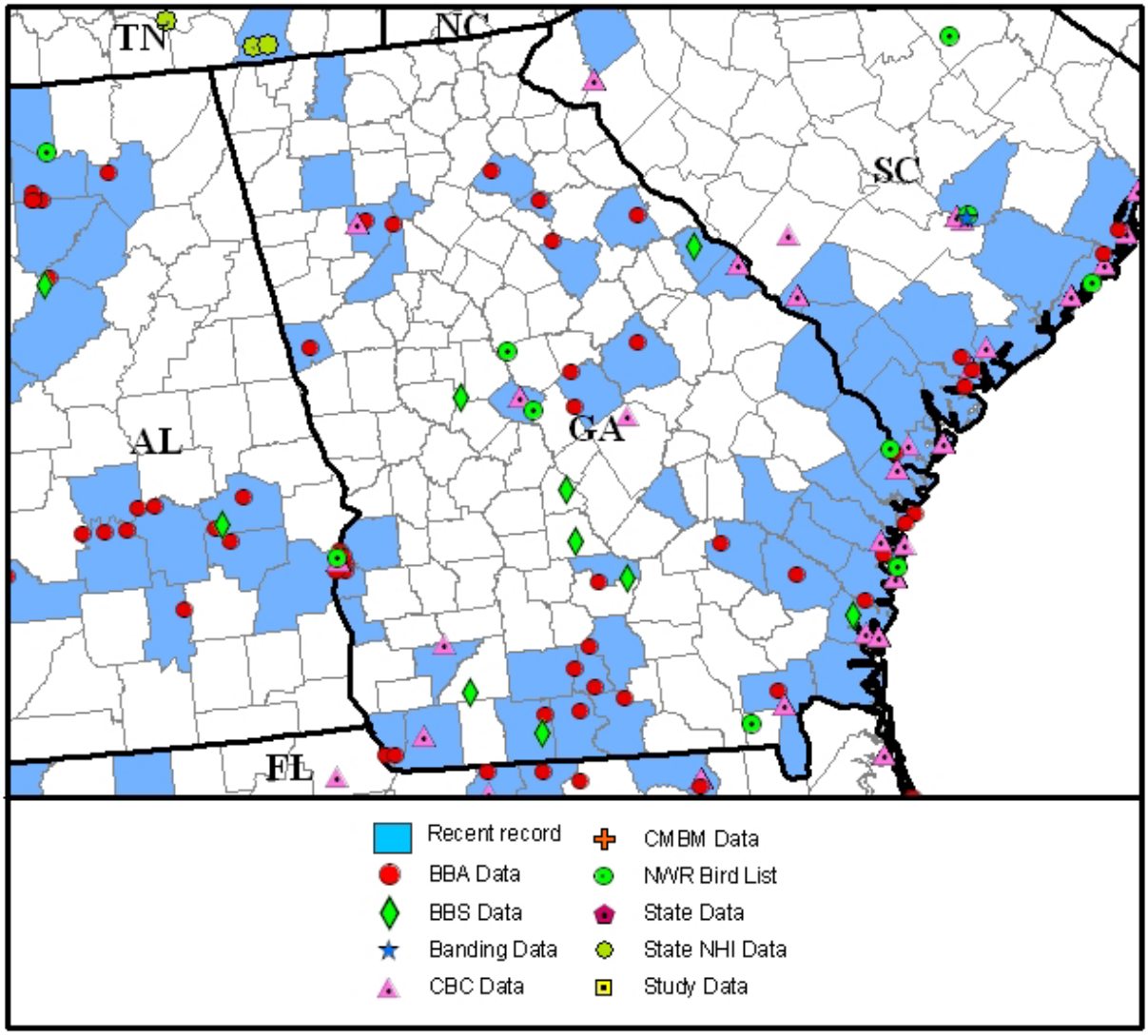


Figure 24. Distribution of the King Rail in Georgia showing documented locations and counties with records from 1996-2006.

Illinois

Bird Conservation Regions: 22, 23, 24 **State Status:** Endangered

Natural Heritage Rank: S2B

Species of Greatest Conservation Need: Yes, the Illinois SWAP estimated a statewide population of <100 individuals with a goal of increasing the population to >100. The state started a "Wetlands Campaign" with the following goals: 1) Improve condition of existing wetlands; 2) Develop and manage additional wetland habitat; 3) Fill information gaps and develop conservation actions; 4) Interagency cooperation on wetland programs; and 5) Emphasize multiple resource benefits of wetland conservation.

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region. The plan identifies the Upper Mississippi NWR, Goose Lake Prairie State Park, and Prairie Ridge State Natural Area (Jasper unit and Marion Unit) as important sites.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have been recorded on 3 CBC Survey circles in the state with no circles recording individuals recently (1997-2006). The circles were located in the central portion of the state.

Breeding Bird Atlas: (Kleen et al. 2004). King Rail were recorded as possible (6), probable (1), and confirmed (4) in 11 blocks out of 1,286 surveyed during the Illinois BBA conducted from 1986-1991. Seven records were in the extreme northeast corner of the state with the other 4 from the southwestern part of the state. The species was considered common throughout the state during the latter part of the 19th century and around the Chicago area through the early part of the 20th century.

CMBM Surveys: Three sites in the state (Delair Division of the Great River NWR, Illinois River NWR, and CREP restoration sites in central Illinois) used the CMBM protocol. The CREP site was the only site that recorded a King Rail. Nine surveys were completed at the CREP site with only one King Rail being recorded.

National Wildlife Refuge Surveys: One refuge responded (Two Rivers NWR) and indicated that the King Rail does not occur on the refuge.

Other Sources: A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 12-30 pairs in the state (MFCTS Migratory Game Bird Committee 2004). The report also indicated that at least three historic populations were found in the state along the Illinois River, in the Chicago area, and along the Mississippi River. Birder records from the past 10 years have reported broods at Goose Lake State Park in Grundy County, Fermilab in DuPage County, Dead Stick Pond in Cook County, and Glacial Park in McHenry County. Bob Russell, USFWS Migratory Birds, (pers. com. 2007) indicated that suitable habitat exists along the Illinois River at the Spunky Bottoms site managed by The Nature Conservancy (TNC) and Banner Marsh State Wildlife Area. In the 1980's, Bohlen (1989) indicated that nesting birds were found at East St. Louis Marshes, Beardstown, Chain O'Lakes State Park, Negro Lake, Volo Bog, and Tinley Park.

Surveys conducted by the University of Arkansas recorded the species at Spunky Bottoms in 2007 (David Krementz, Arkansas Cooperative Fish and Wildlife Research Unit, pers. com. 2007).

Summary: The King Rail was once a common breeding bird found throughout the state. Current records indicate that small populations still exist in the Chicago area and along the Mississippi River.

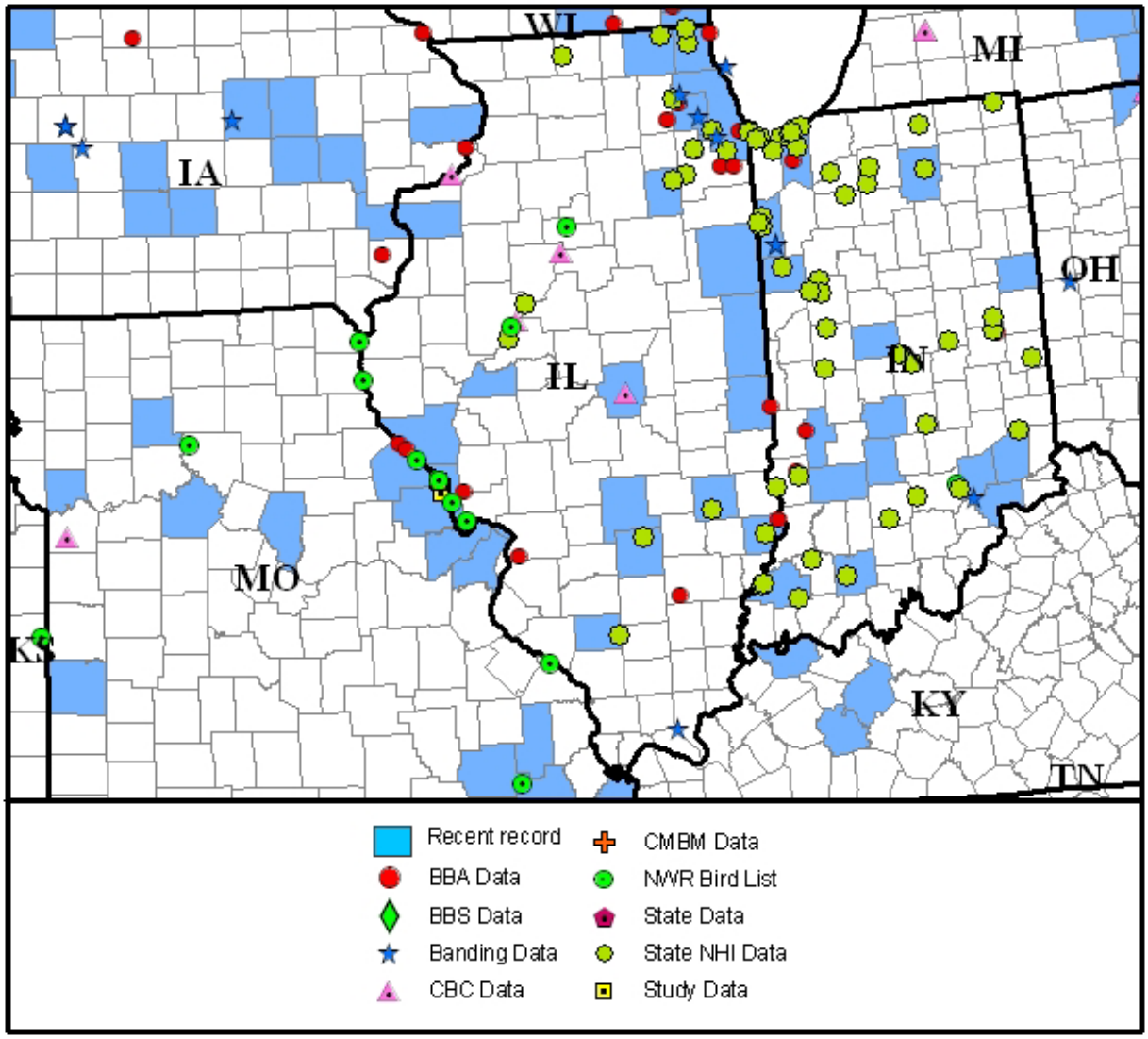


Figure 25. Distribution of the King Rail in Illinois showing documented locations and counties with records from 1996-2006.

Indiana

Bird Conservation Regions: 22, 23, 24 **State Status:** Endangered

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the SWAP identifies the King Rail as a rare species with statewide distribution. Problems affecting wetland dependent wildlife in the state include habitat loss/fragmentation, invasive species, predation, pollution, and dependence on irregular resources. High priority action items for wetlands include protection (easements and fee-title acquisition), restoration, buffers, financial incentives, and regulation.

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region. The plan identifies Beehunter Marsh/Goose Pond WMA, Loblolly Marsh, Pisgah Marsh, TNC Kankakee Sands Preserve, Newport Chemical Depot, and Bluegrass Fish and Wildlife Area/Ayrshire Mine as important sites.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have not been recorded on a CBC route in the state.

Breeding Bird Atlas: (Castrale et al. 1998) King Rail were recorded as possible (2), probable (1), and confirmed (2) in five blocks out of 1,215 surveyed during the Indiana BBA conducted from 1985-90. Two records were in the eastern part of the state, while the other three were in the western part. The sites with confirmed breeding were Wolf Lake in Lake County and Minnehaha Fish and Wildlife Area in Sullivan County. In the current atlas project (2005-10), they have been recorded as possible in two blocks (Bruce Peterjohn, USGS, unpublished data). Historic records indicate that the King Rail was a common summer resident in northern Indiana and rare in the south.

CMBM Surveys: King Rail were not detected at any site using the CMBM protocol in Indiana.

National Wildlife Refuge Surveys: One refuge responded (Big Oaks NWR) and indicated that the King Rail does not occur on the refuge. There has been one unofficial observation on the refuge since 2000.

Other Sources: Chandler and Weis (as cited in Castrale et al. 1998) surveyed 108 northern Indiana wetlands during 1993 and 1994 and only found the species at two sites, Menominee Marsh in Marshall County and Willow Slough Fish and Wildlife Area in Newton County. A minimum of 6 pairs and 4 confirmed broods were present during the summer of 2006 and one King Rail was observed during the 2006-07 CBC at the Beehunter Marsh/Goose Ponds State WMA in Greene County (Lee Sterrenburg, pers. com. 2007). Recent sightings have also been confirmed at the TNC Kankakee Sands Preserve in Newton County (Chip O'Leary, TNC, pers. com. 2007). The Beehunter Marsh/Goose Pond WMA (≈ 7,200 acres) and Kankakee Sands Preserve (≈ 7,600 acres) are both large wetland/grassland restoration projects that were started through WRP administered by the NRCS. A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 5-15 pairs in the state (MFCTS Migratory Game Bird Committee 2004). A dead chick was found at Goose Ponds/Beehunter WMA during the summer of 2005 that apparently choked on a crayfish (Abby Darrah, University of Arkansas, pers. com. 2007).

Summary: The King Rail was once a common breeding bird in the state. Most recent observations are from the western part of the state specifically in Newton and Greene Counties.

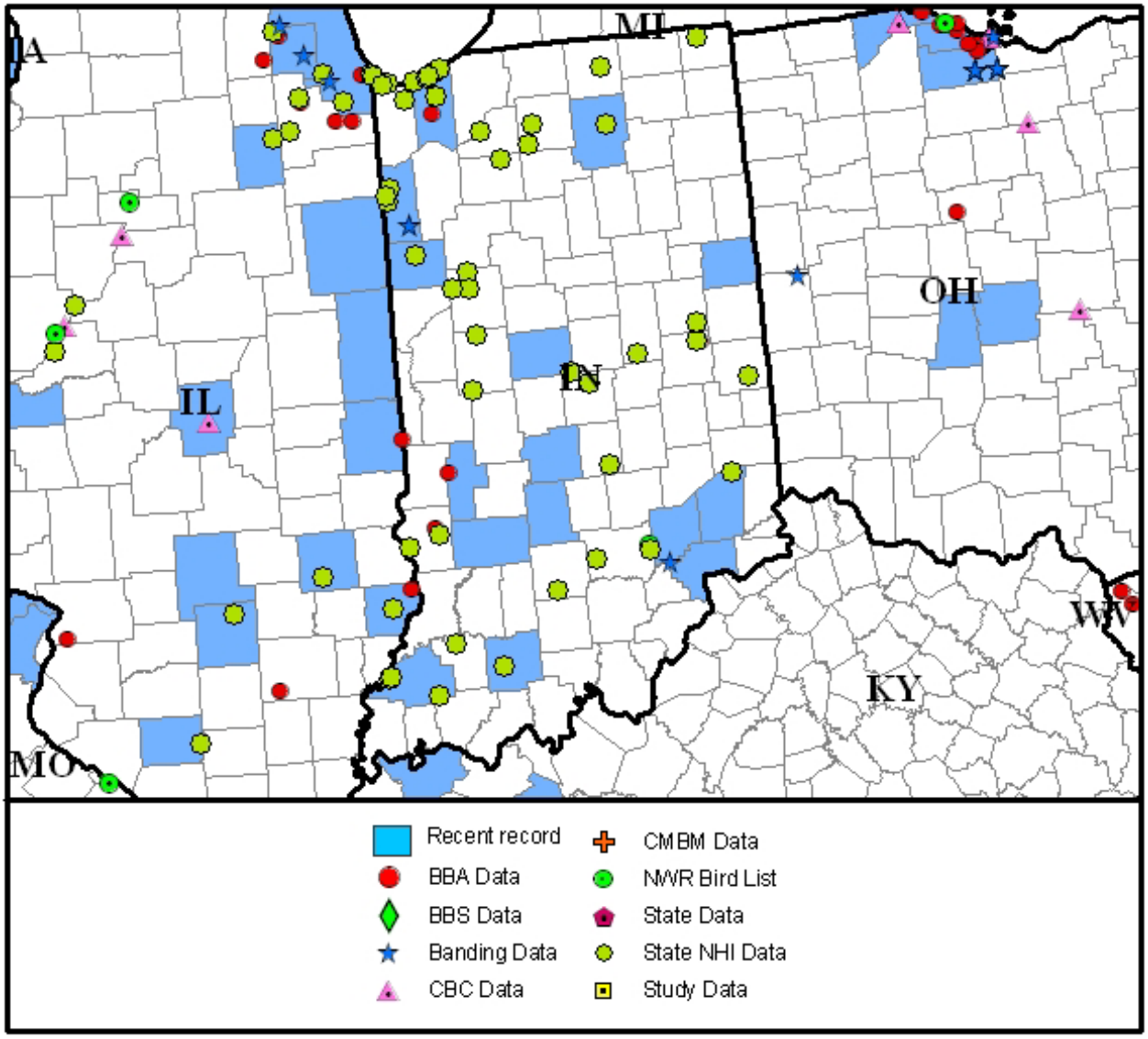


Figure 26. Distribution of the King Rail in Indiana showing documented locations and counties with records from 1996-2006.

Iowa

Bird Conservation Regions: 11, 22, 23 **State Status:** Endangered

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the SWAP indicates that the King Rail is found in the eastern and north-central portions of the state. Ecoregions where herbaceous wetlands are a priority habitat class are the Des Moines Lobe and Iowan Surface.

Regional Waterbird Plan(s): Northern Prairie and Parkland Region and Upper Mississippi Valley/Great Lakes Region. The UMVGL plan identifies the Upper Mississippi NWR and the Coralville Reservoir/Hawkeye Wildlife Area/Lake McBride State Park complex as important sites.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have been recorded on 1 CBC Survey circle in the state with no recent records (1997-2006).

Breeding Bird Atlas: (Jackson et al. 1996). King Rail was recorded as possible (4), probable (1) and confirmed (2) in seven blocks out of 715 surveyed during the Iowa BBA conducted from 1985-1990. Five records were located adjacent to the Mississippi River. The other two blocks were located in the north-central part of the state.

CMBM Surveys: No surveys were conducted in the state

National Wildlife Refuge Survey: Three refuges from Iowa responded to the survey. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Neal Smith	N					
Port Louisa	Y	X2		X	2	Pairs observed during 2006
Union Slough	Y	X2		X	Unknown	No current monitoring efforts

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 10-20 pairs in the state (MFCTS Migratory Game Bird Committee 2004). Bennett and Hendrickson (1939) found 30-40 nests per year in the 1930s in the Ruthven area of northwest Iowa, while Tanner and Hendrickson (1956) found 6 nests there in three years in the 1950s. The last nesting record from this area was in 1981 (Stephen J. Dinsmore, Iowa State University, pers. com. 2007). Kent and Dinsmore (1996) documented the decline of this species from fairly common in 1900 to rare by the 1960's. Most records since the 1980's have come from near the Mississippi River and in the Des Moines Lobe region (Jackson et al. 1996). Birders have recorded multiple observations over the past 10 years from Errington Marsh in Polk County.

Summary: The King Rail breeds in low numbers in the state. The best remaining habitat appears to be located along the Mississippi River (Bob Russell, USFWS, pers. com. 2007) and in the north-central and northwestern part of the state where seemingly "good" habitat exists in areas historically used (Stephen J. Dinsmore, Iowa State University, pers. com. 2007).

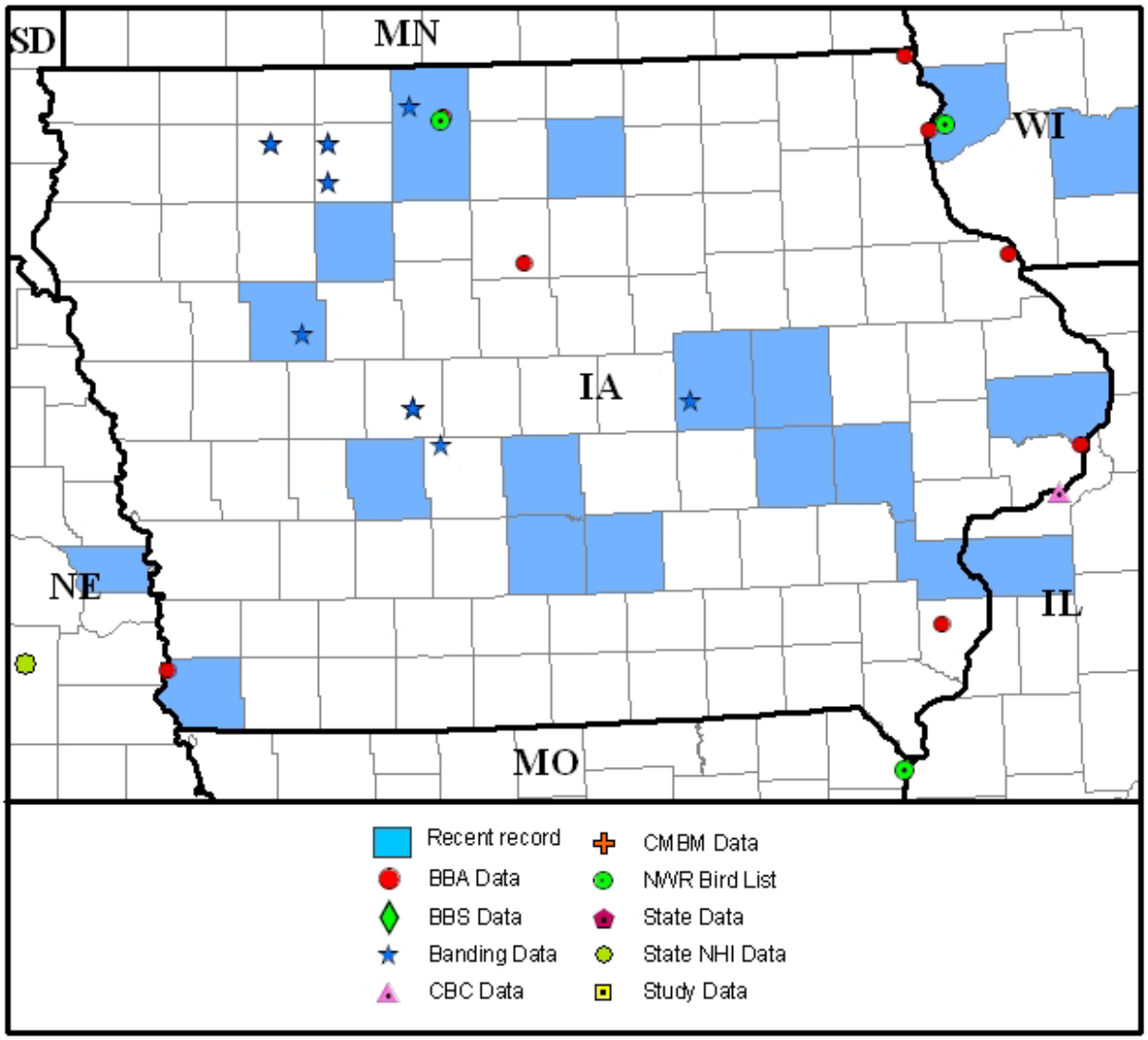


Figure 27. Distribution of the King Rail in Iowa showing documented locations and counties with records from 1996-2006.

Kansas

Bird Conservation Regions: 19, 22 **State Status:** No Status **Natural Heritage Rank:** S1B

Species of Greatest Conservation Need: No

Regional Waterbird Plan(s): Central Prairies Region and Upper Mississippi Valley/Great Lakes Region

Breeding Bird Survey: King Rail have been recorded on 1 BBS route in the state located in Barton County with individuals recently (1996-2005) recorded on this route. Data are inadequate to estimate state population trends.

CBC Survey: King Rail have been recorded on 1 CBC Survey circle in Harvey County with no circles recording individuals recently (1997-2006).

Breeding Bird Atlas: (Busby and Zimmerman 2001) The King Rail was recorded as possible (3), probable (5), and confirmed (1) in nine blocks out of 781 blocks surveyed during the Kansas BBA conducted from 1992-97. All but one record was located in the south-central portion of the state.

CMBM Surveys: Surveys using the protocol were conducted at Cheyenne Bottoms Wildlife Area and Quivira NWR with neither site recording any King Rail.

National Wildlife Refuge Survey: Two refuges responded (Flint Hills and Maris des Cygnes) with both indicating an absence of King Rail. Suzanne Fellow (USFWS, pers. com. 2007) indicated that King Rail are found and breed annually at Quivira NWR.

Other Sources: A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 25-75 pairs in the state (MFCTS Migratory Game Bird Committee 2004). It occurs regularly at Cheyenne Bottoms WMA and Quivira NWR and other areas depending on rainfall (Thomson and Ely 1992). Birders have reported multiple observations over the past 10 years from Quivira NWR in Stafford County, Cheyenne Bottoms Wildlife Area in Barton County, Coldwater Marsh in Comanche County, Baker Wetland in Douglas County, and Slate Creek Wildlife Area in Sumner County.

Summary: The King Rail is an uncommon summer resident found primarily in the south-central portion of the state.

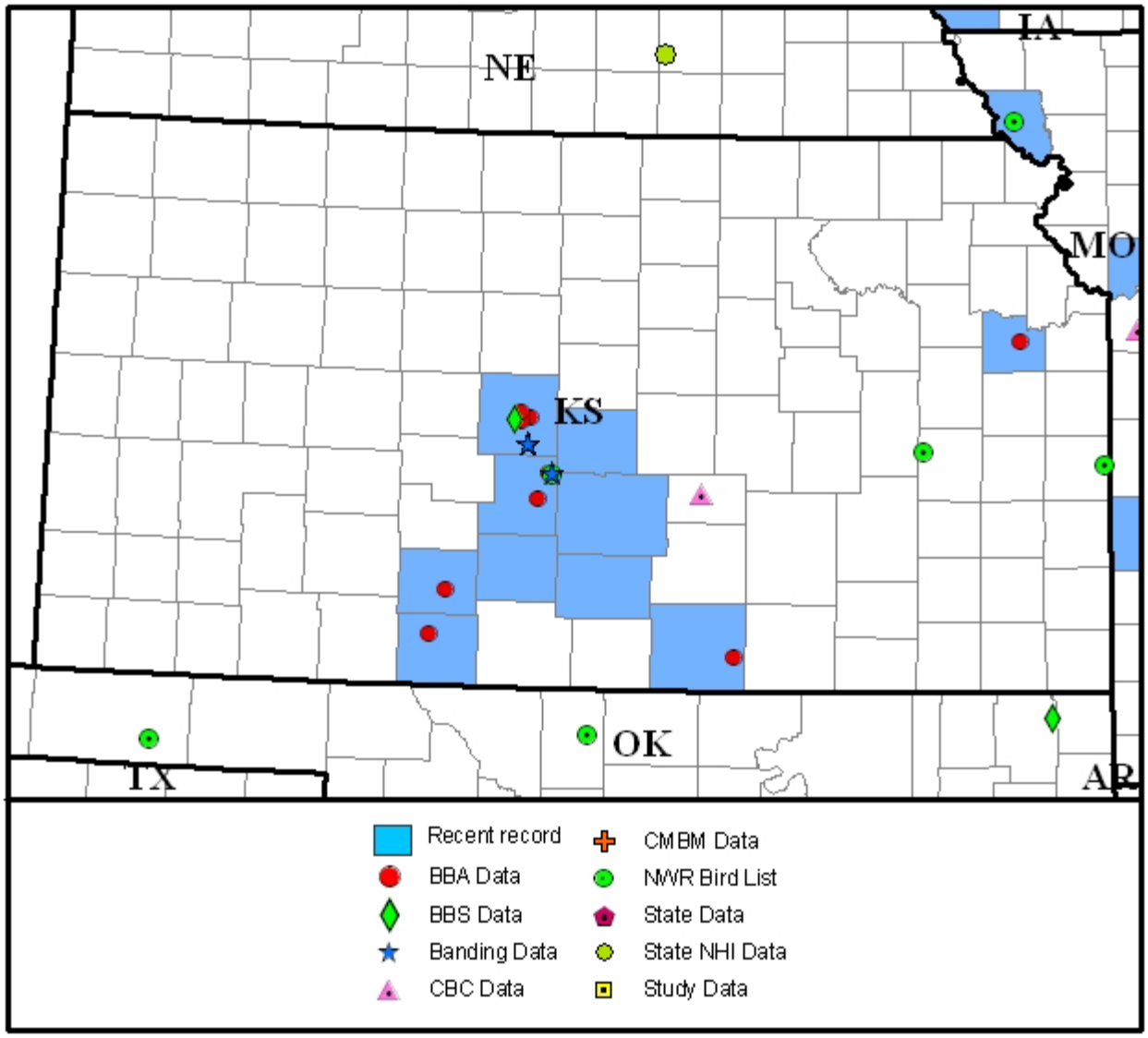


Figure 27. Distribution of the King Rail in Kansas showing documented locations and counties with records from 1996-2006.

Kentucky

Bird Conservation Regions: 24, 28 **State Status:** Endangered **Natural Heritage Rank:** S1B

Species of Greatest Conservation Need: Yes, key habitat locations identified in the SWAP were the Long Point Unit of Reelfoot NWR and the Clear Creek drainage. Conservation issues include habitat degradation, pollution, and siltation.

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region and Southeast United States Region

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have not been recorded on a CBC route in the state.

Breeding Bird Atlas: (Palmer-Ball 1996) King Rail were recorded as possible in one block out of 732 surveyed during the Kentucky BBA conducted from 1985-91. The lone block was located in Fulton County which is the western most county in the state. Historical documentation of the species is scare for the state. The most likely place to find them is in floodplain areas along larger rivers.

CMBM Surveys: None conducted in the state.

National Wildlife Refuge Survey: No responses

Other Sources: In the late 1950's, the King Rail was a locally uncommon summer resident in the lowlands of western Kentucky (Mengel 1965). Birders have recorded the King Rail multiple times over the past 10 years at Slough Wildlife Management Area in Henderson County and Reelfoot NWR in Fulton County.

Summary: The King Rail is an uncommon breeder in the western part of the state.

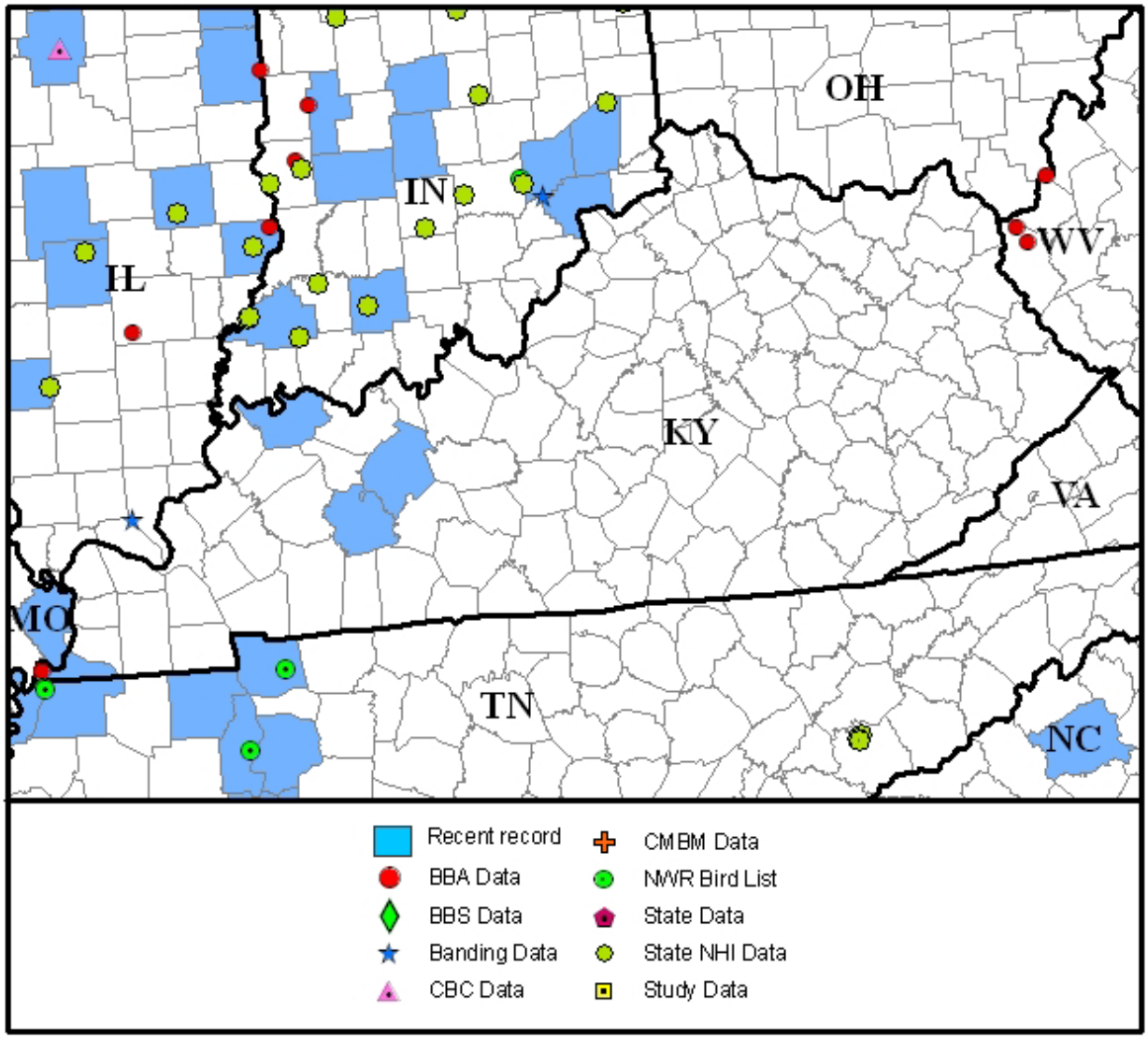


Figure 28. Distribution of the King Rail in Kentucky showing documented locations and counties with records from 1996-2006.

Louisiana

Bird Conservation Regions: 25, 26, 27, 37 **State Status:** No Status

Natural Heritage Rank: S4

Species of Greatest Conservation Need: Yes, important ecoregions identified in the SWAP are the East Gulf Coastal Plain, Mississippi River Alluvial Plain, Gulf Coast Prairies and Marshes, and Lower West Gulf Coastal Plain. Primary threats to its habitat in the state include saltwater intrusion, levee construction, invasive species, channelization, and drainage.

Regional Waterbird Plan(s): Southeast United States Region

Breeding Bird Survey: King Rail have been recorded on 12 BBS routes in the state with 6 routes recording individuals recently (1996-2005). Most of the routes are located in the southwestern, rice producing part of the state. There is a declining, long-term trend of -13.8%/year ($p = 0.01$, $n = 10$) and a declining, recent trend of -10.9%/year ($p = 0.15$, $n = 9$).

CBC Survey: King Rail have been recorded on 25 CBC Survey circles in the state with 15 circles recording individuals recently (1997-2006). Most of the circles are located in the southern half of the state. Analysis of CBC data, from 1959-1988, indicated a decreasing trend of -0.5 %/year (-2.6 to 1.7 95% C.I., $n = 17$) (Sauer et al. 1996).

Breeding Bird Atlas: (Wiedenfeld and Swan 2000) King Rail were recorded as possible (9), probable (28), and confirmed (15) in 52 blocks during the Louisiana BBA conducted from 1994-1996. Most of the records are from the southern part of the state.

CMBM Surveys: Recent and current studies being conducted through the Louisiana Cooperative Fish and Wildlife Research Unit have been using the protocol throughout Louisiana. See other sources below.

National Wildlife Refuge Survey: One refuge responded (Upper Ouachita) to the survey. Results from Upper Ouachita indicated that King Rail were present during migration and winter with birds using moist soil units and rice fields on the refuge. Refuges not responding, but containing suitable habitat for the King Rail include: Bayou Sauvage, Big Branch Marsh, Cameron Prairie, Catahoula, D'Arbonne, Delta, Grand Cote, Lacassine, Lake Ophelia, Mandalay, and Sabine (Chuck Hunter, USFWS Region 4 Refuge Biologist, pers. com. 2007 and Bill Vermillion, USFWS Gulf Coast Joint Venture, pers. com. 2007).

Other Sources: The King Rail breeds throughout the rice producing parishes in Louisiana which include Acadia, Allen, Avoyelles, Beauregard, Cameron, Calcasieu, Evangeline, Jefferson Davis, Lafayette, Rapides, St. Landry, St. Martin, and Vermilion Parishes (Sammy King, Louisiana Cooperative Fish and Wildlife Research Unit, pers. com. 2007). There is uncertainty about how productive rice north of I-10 is for King Rail (Sammy King, USGS, pers. com. 2007). Pierluissi (2006) found 77 King Rail nests in rice fields in Cameron, Jefferson Davis, Vermilion, and Acadia Parishes located in southwestern Louisiana. The nest density of searched rice fields was 3.4 (± 0.87) nests/km^2 in 2004 and 4.8 (± 0.93) nests/km^2 in 2005. Marshbird surveys conducted in northern Louisiana during 2007 recorded King Rail at Catahoula NWR, Buckhorn WMA, and the

Delta Plantation rice farm (Jonathon Valente, Louisiana State University, pers. com. 2007). As part of a stable isotope study, Perkins (2007) trapped King Rail during 2004-2005 at 5 different sites in southwestern Louisiana. The locations and total number of King Rail trapped at each site were: 1) Rockefeller State Wildlife Refuge – 111 captures; 2) Cameron Prairie NWR – 7 captures; 3) Marsh Island State Wildlife Refuge – 9 captures; 4) Sweet Lake Land and Oil Company Property in Calcasieu Parish – 1 capture; and 5) Rice field in Jefferson Davis Parish – 3 captures.

Summary: Louisiana probably has the largest King Rail population of any state. The species is found throughout the state with the highest densities occurring in the southern part of the state. Rice fields in southwestern Louisiana provide important habitat. Recent declines in rice agriculture could have negative impact.

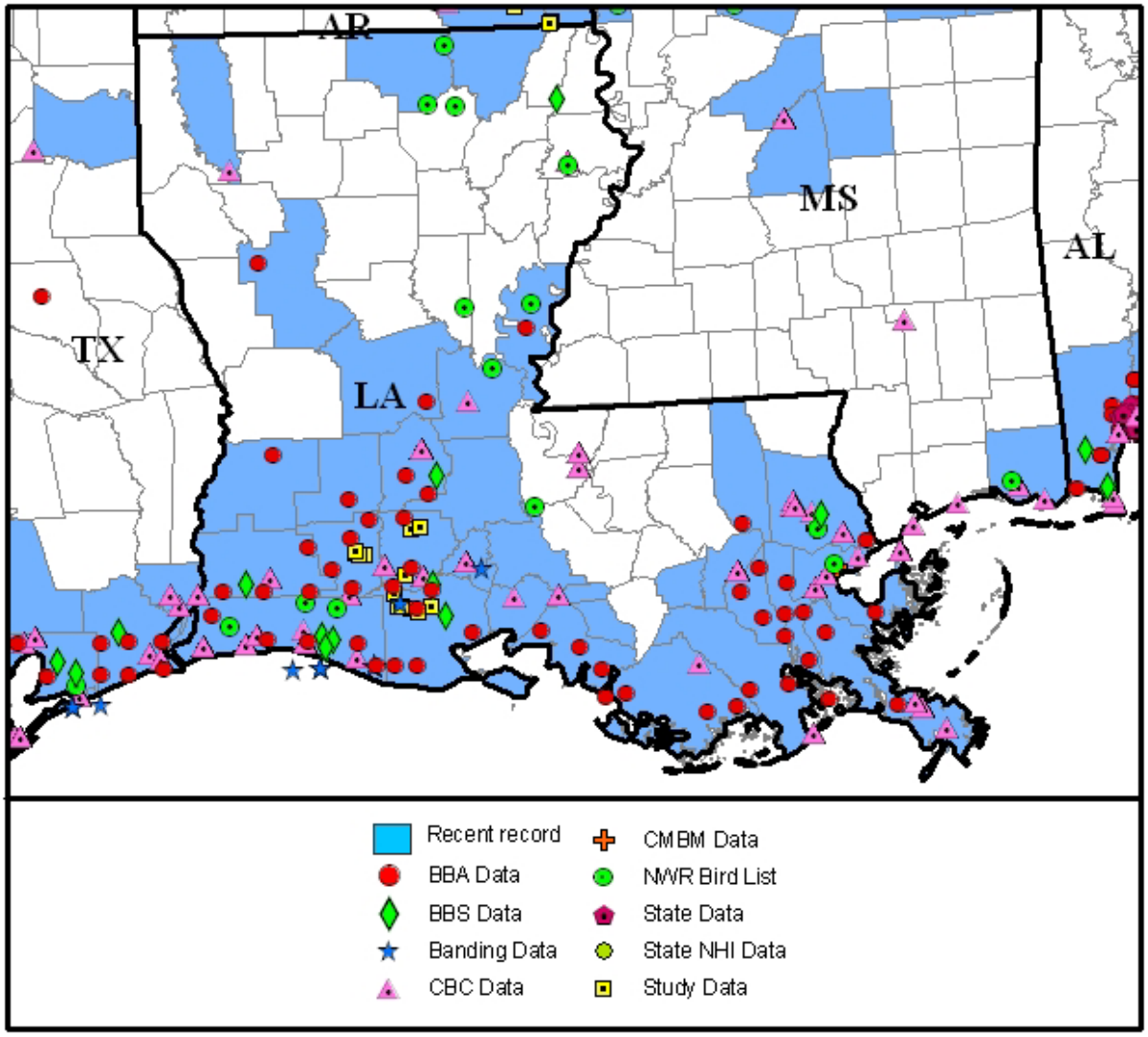


Figure 29. Distribution of the King Rail in Louisiana showing documented locations and counties with records from 1996-2006.

Maryland

Bird Conservation Regions: 28, 29, 30 **State Status:** Species of Conservation Need

Natural Heritage Rank: S3B, S2N

Species of Greatest Conservation Need: Yes, the most important habitats in the state for the King Rail are nontidal emergent wetlands and tidal marshes. Primary threats to these habitats in Maryland include agricultural conversion, development, hydrologic changes, pesticide contamination, sedimentation, dredging/stream channelization, and invasive species. Numerous conservation actions are listed in the SWAP; some high priority actions include acquisition of buffers, acquisition/easements to protect remaining habitat, control invasive species, and restore habitat.

Regional Waterbird Plan(s): Mid-Atlantic/New England Maritime Region and Southeast United States Region. The MANEM plan lists the Tanyard Wetlands as an important site in the state.

Breeding Bird Survey: King Rail have been recorded on 5 BBS routes in the state with 2 routes recording individuals recently (1996-2005). All routes are located along the eastern coastline of the Chesapeake Bay. There is a declining, long-term trend of -5.1%/year ($p = 0.29$, $n = 2$) and a declining, recent trend of –6.7%/year ($p = 0.02$, $n = 2$).

CBC Survey: King Rail have been recorded on 15 CBC Survey circles in the state with 6 circles recording individuals recently (1997-2006). Eleven of the 15 circles are located in the vicinity of the Chesapeake Bay.

Breeding Bird Atlas: (Robbins and Blom 1996) King Rail were recorded as possible (28), probable (39), and confirmed (7) in a total 74 blocks out of 1,296 surveyed in Maryland and the District of Columbia during the 1983-87 BBA project. Atlas results concentrated records in the marshes found on the upper Choptank River, the Upper Nanticoke River, and the Patuxent River. Inland nesting records were rare. King Rail have been recorded as possible (21), probable (16), and confirmed (0) in 38 blocks during the current atlas project conducted during 2002-06 (Walter Ellison, Maryland Ornithological Union, unpublished data 2007).

CMBM Surveys: Blackwater NWR has irregularly recorded King Rail using the protocol.

National Wildlife Refuge Survey: One refuge complex and one refuge responded to the survey. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Chesapeake Marsh Complex	Y	X		X		Inconsistent records from Blackwater NWR only.
Patuxent	N					Was a rare summer resident in 1940's

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: Sites with multiple observations over the past ten years based on birder records include Truitt's Landing in Worchester County and Tanyard Wetlands in Caroline County.

Summary: BBS data indicates a long-term population decline. The two BBA atlas projects in the state support apparent decline. The King Rail was recorded in 74 blocks during the 1983-87 project and only 38 blocks during the 2002-06 atlas project. The highest concentrations occur along the Chesapeake Bay and associated river systems.

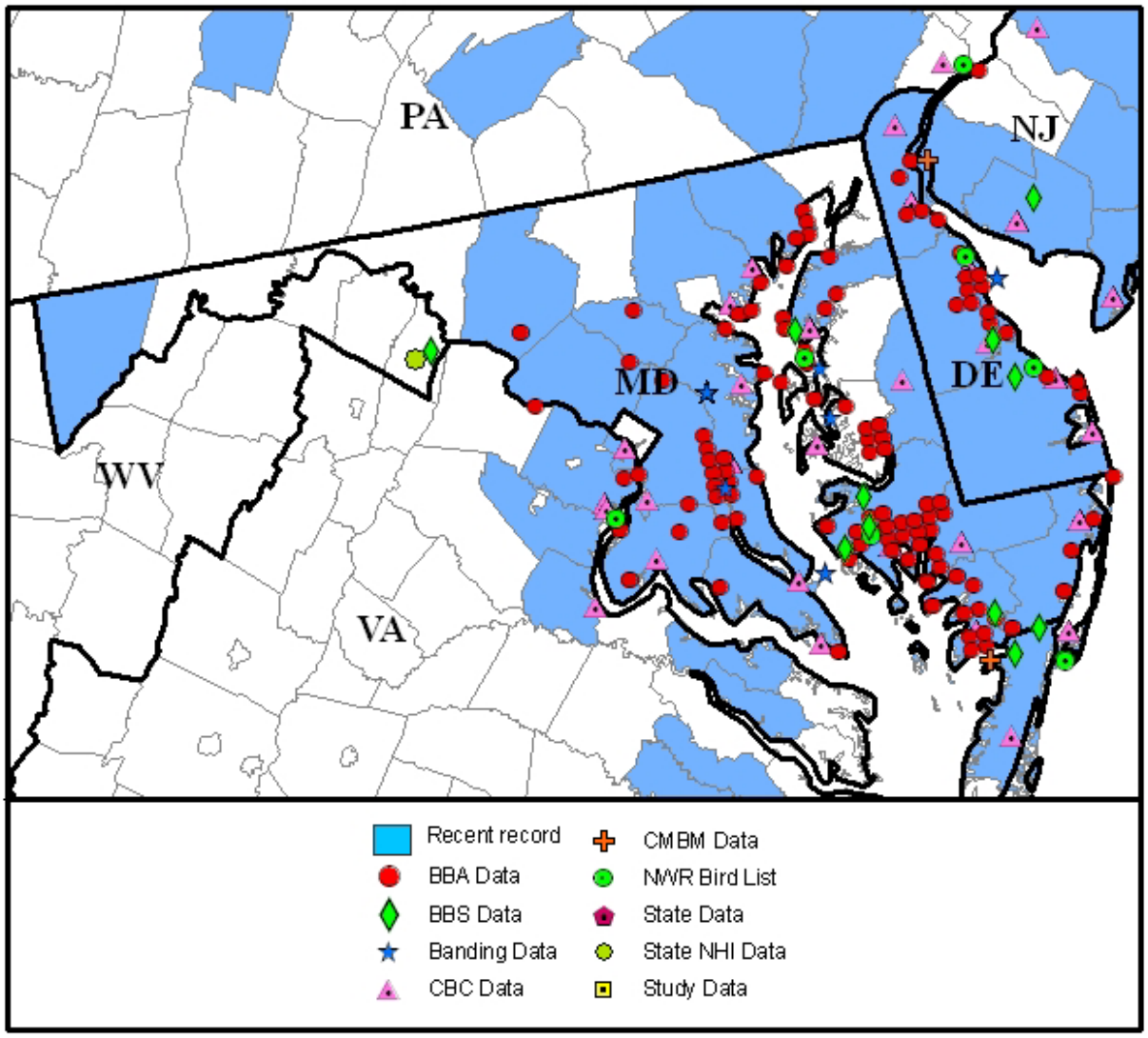


Figure 30. Distribution of the King Rail in Maryland showing documented locations and counties with records from 1996-2006.

Massachusetts

Bird Conservation Regions: 14, 28, 30 **State Status:** Threatened

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, there have been 12 occurrences of documented breeding in the state since 1980. The biggest threats are loss and fragmentation of wetland habitat. Preservation and protection of wetland habitats is crucial for continued presence in the state.

Regional Waterbird Plan(s): Mid-Atlantic/New England Maritime, no priority areas listed.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have been recorded on one CBC Survey circle (Cape Cod) in the state with no recent records coming from this site (1997-2006).

Breeding Bird Atlas: (Petersen and Meservey 2004) King Rail were recorded as possible (2), probable (6), and confirmed (1) in nine blocks out of 969 surveyed during the Massachusetts BBA conducted from 1974-79. All blocks were located in the eastern part of the state with most records coming from Essex and Plymouth Counties.

CMBM Surveys: See refuge summary and other sources below

National Wildlife Refuge Survey: Nine refuges from Massachusetts responded to the survey. Results are listed below.

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Great Meadows	Yes	X			Unknown	Recorded during marshbird surveys
Assabet River	Yes	X			Unknown	Recorded during marshbird surveys
Oxbow	Yes	X			Unknown	Recorded during marshbird surveys
Nomans Land Is.	No					
Mashpee	No					
Nantucket	No					
Massasoit	No					
Parker River	Yes				1-2	Found in 2 impoundments on refuge
Monomoy	No					

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: King Rail were detected at 3 of the 12 marshes surveyed at the Cape Cod National Seashore during 1999 and 2000 (Erwin et al. 2002). There are multiple years of bird records from the Lynnfield Marshes in Essex County.

Summary: The King Rail is uncommon and breeds locally where suitable habitat exists in the state.

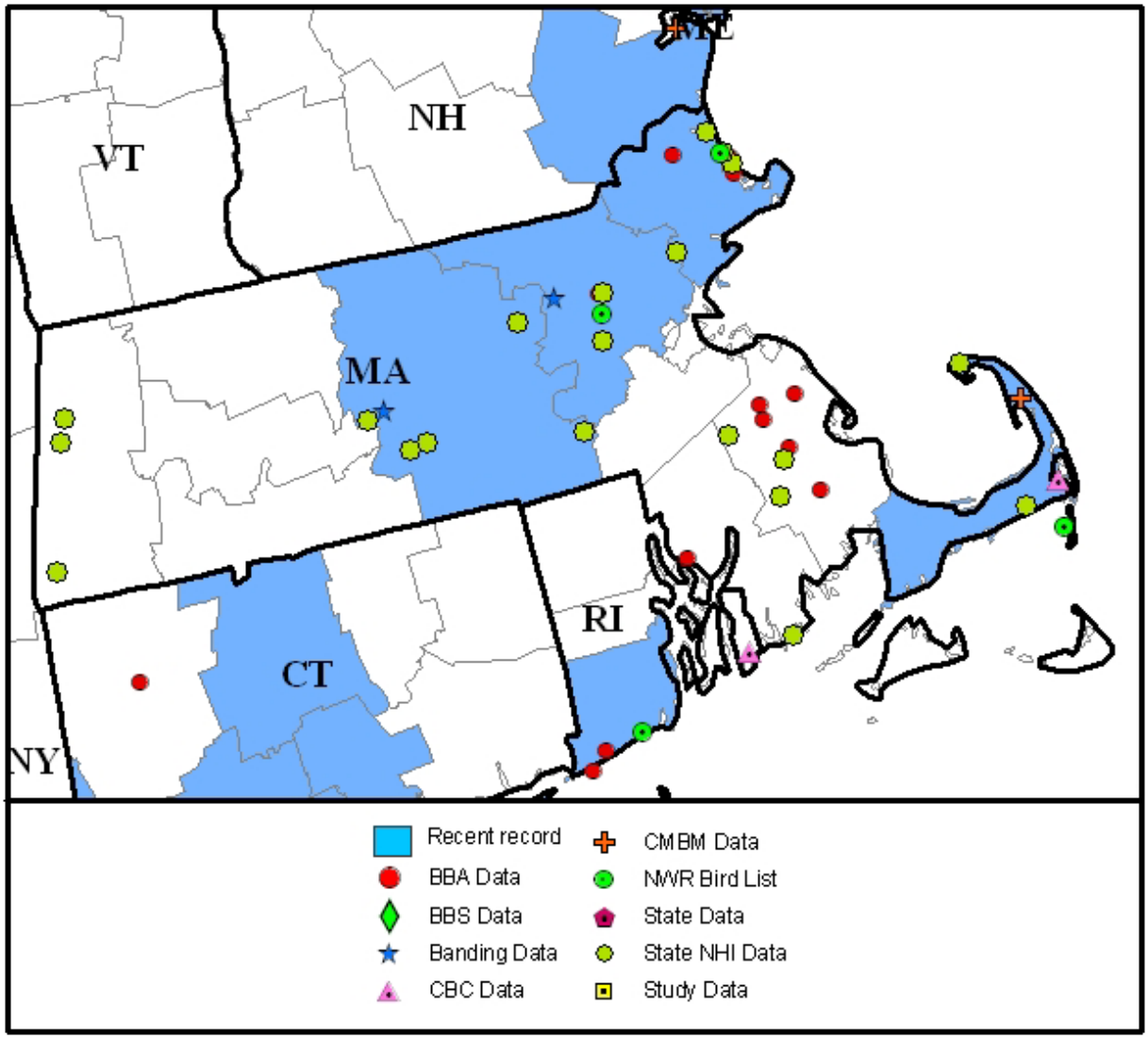


Figure 31. Distribution of the King Rail in Massachusetts showing documented locations and counties with records from 1996-2006.

Michigan

Bird Conservation Regions: 12, 22, 23 **State Status:** Endangered

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the King Rail was once abundant in the marshes along Lake Erie, but has declined considerably due to loss and degradation of marsh habitat. Other threats include disease, altered hydrologic regimes, continued development, pesticides, and wetland modifications.

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region. No specific sites of importance are listed for Michigan.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have been recorded on 1 CBC Survey circle (Kalamazoo) in the state with no recent records from this site (1997-2006).

Breeding Bird Atlas: (Brewer et al. 1991) King Rail were recorded as possible (5), probable (7), and confirmed (1) in 13 blocks out of 6,120 blocks surveyed during the Michigan BBA conducted from 1983-1988. Most of the blocks recording King Rail were scattered across the southern two-thirds of the state, with one record coming from the Upper Peninsula. It has not been recorded to date during the current BBA project started in 2002 based on records received from USGS.

CMBM Surveys: None

National Wildlife Refuge Survey: No responses

Other Sources: A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 10-20 pairs in the state (MFCTS Migratory Game Bird Committee 2004). King Rails were observed at the St. Clair Flats State Wildlife Area (Dickinson and Harsens Islands) and Wildfowl Bay State Wildlife Area (Saginaw Bay, Huron County) during bird surveys conducted in 2006 and 2007 (M. Monfils, Michigan Natural Features Inventory, pers. com. 2007). Sites where King Rail have been reported by birders multiple times over the past 10 years include Nayanquing Point State Wildlife Area in Bay County, Pointe Mouillee State Game Area in Monroe County, and Maple River State Game Area in Gratiot County. Juveniles were seen at Point Mouillee and Maple River. Michigan is at the northern limit of the breeding range with populations currently being confined to large marshes along Lake Erie, Lake St. Clair, and Saginaw Bay (Rabe 2001). King Rail were reported from 9 counties during the 1980's through 1990's, while they were observed in an additional 16 counties prior to 1980 (Rabe 2001). The King Rail was listed as a State Endangered Species in 1987 (McPeek et al. 1994). Since the 1980's most records come from Monroe County (Pointe Mouillee, Erie Gun Club, and Sterling State Park), St. Clair County (St. Clair Flats), Bay County (Crow Island and Nayanquing), Macomb County (Mt. Clemens sewage ponds), Jackson County (Waterloo State Rec. Area), Muskegon County (Muskegon Causeway), and Berrien County (Warren Dunes State Park) (McPeek et al. 1994).

Summary: The King Rail is at the northern limit of its breeding range in Michigan. Most current records come from counties bordering Lake Erie and Lake Huron.

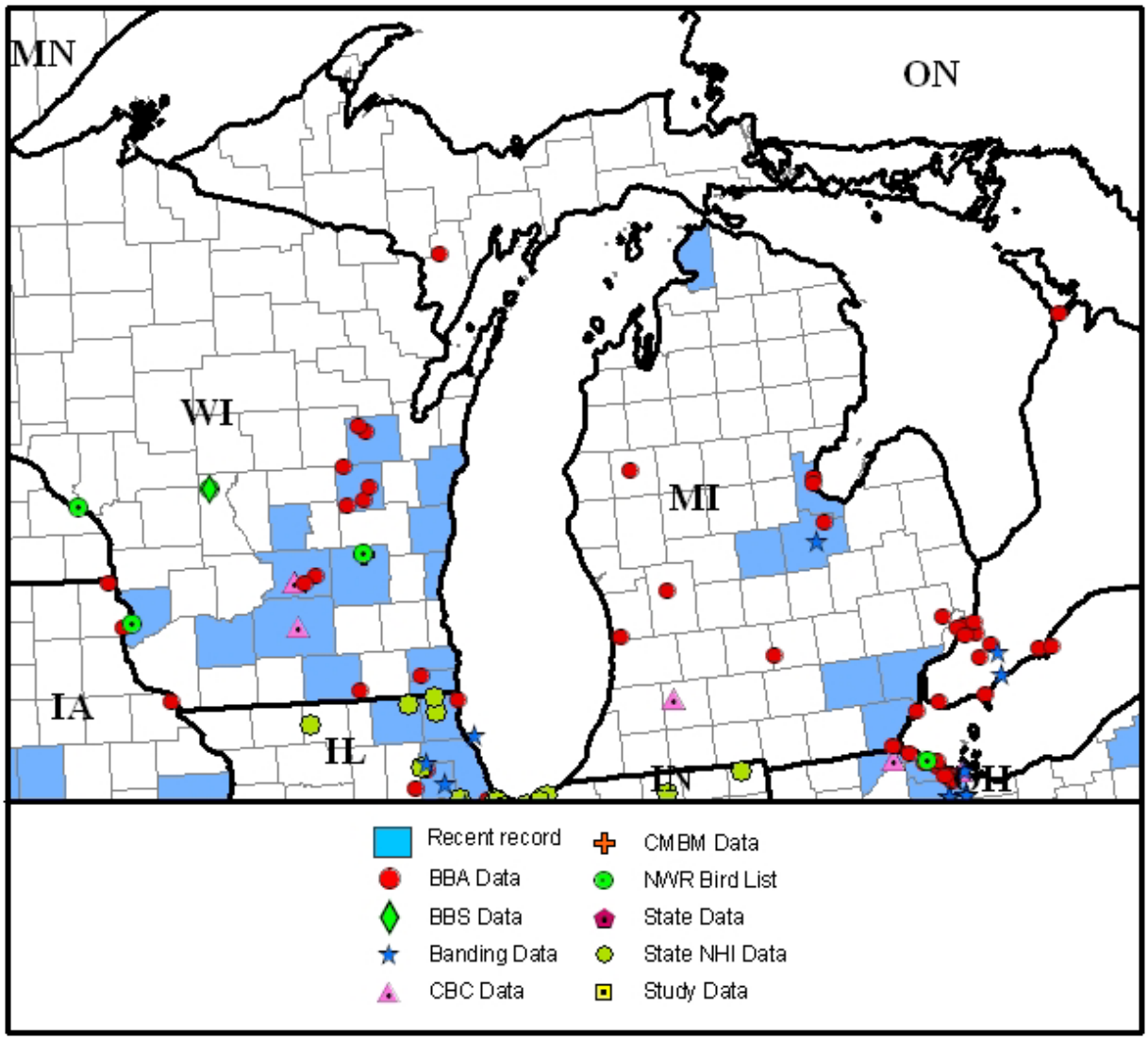


Figure 32. Distribution of the King Rail in Michigan showing documented locations and counties with records from 1996-2006.

Minnesota

Bird Conservation Regions: 11, 12, 22, 23 **State Status:** Endangered

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the primary ecological subsections where the King Rail is found in Minnesota include The Blufflands and Coteau Moraines.

Regional Waterbird Plan(s): Northern Prairie and Parkland Region, Upper Mississippi Valley/Great Lakes Region. The UMVGL plan indicates that possible habitat exists on the Upper Mississippi NWR and McCarthy Lake Wildlife Management Area, both in the southeastern Minnesota.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have not been recorded on a CBC route in the state.

Breeding Bird Atlas: None completed

CMBM Surveys: Four refuges/sites (Hamden Slough, Litchfield Wetland Management District, Minnesota Valley NWR, the Prairie Pothole Region) have used the protocol. One possible King Rail was recorded during surveys at these sites. See refuge summary below.

National Wildlife Refuge Survey: Two isolated records of King Rail were reported. Minnesota Valley NWR reported a lone King Rail observation from 1992 on the Long Meadow Lake Unit in Dakota County. The Morris WMD recorded a possible King Rail during a May 2005 marshbird survey on the Artichoke Waterfowl Production Area in Big Stone County. All other NWRs and WMDs within Minnesota have no records of King Rail presence.

Other Sources: Roberts (1932) reported nesting in the southern-half of the state. Status is listed as a casual summer visitor (Janssen 1987). A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 0-10 pairs in the state (MFCTS Migratory Game Bird Committee 2004). A pair of King Rail were recorded at the Dorer Pools on Whitewater State Wildlife Management Area during marshbird surveys in 2008 (Jason Bolenbaugh, University of Arkansas, pers. com. 2008).

Summary: King Rail are rare in Minnesota with few documented occurrences. The best likely habitat is probably located within the floodplain of the Mississippi River in southeastern Minnesota (Bob Russell, USFWS, pers. com. 2007).

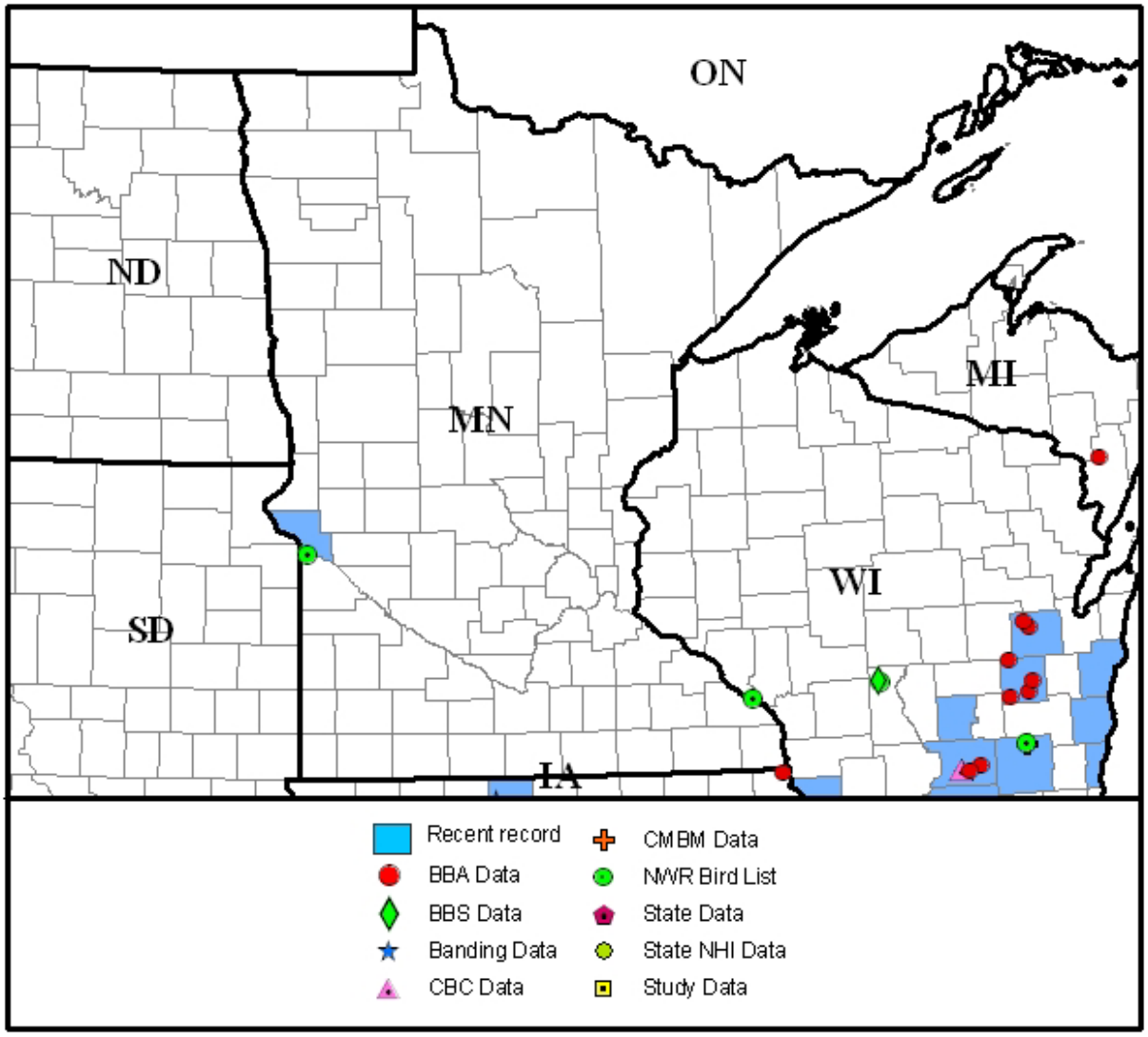


Figure 33. Distribution of the King Rail in Minnesota showing documented locations and counties with records from 1996-2006.

Mississippi

Bird Conservation Regions: 26, 27 **State Status:** No status

Natural Heritage Rank: S3

Species of Greatest Conservation Need: Yes, It is a tier 2 species in the state's comprehensive wildlife action plan and is found in each ecoregion of the state.

Regional Waterbird Plan(s): Southeast United States Region

Breeding Bird Survey: King Rail have been recorded on 4 BBS routes in the state with no routes recording individuals recently (1996-2005). All routes were located in the northern-half of the state. Data are inadequate to estimate state population trends.

CBC Survey: King Rail have been recorded on 9 CBC Survey circles in the state with 4 circles recording individuals recently (1997-2006). Five of the circles were located in coastal areas with the other 4 are at inland locations.

Breeding Bird Atlas: No King Rail were recorded during the 1997-2004 BBA project; however, no callback surveys were conducted during the project (Nick Winstead, Mississippi Dept. of Wildlife, Fisheries & Parks, pers. com. 2007).

CMBM Surveys: CMBM protocols were used for marshbird surveys conducted in the state during 2007. See National Wildlife Refuge Survey below.

National Wildlife Refuge Survey: Five refuges from Mississippi responded to the survey. Results are listed below. Of the refuges not responding, Yazoo NWR has suitable habitat (Chuck Hunter, USFWS Region 4 Refuge Biologist, pers. com. 2007) and 5 rails were recorded during marshbird surveys at Morgan Brake NWR in 2007 (Randy Wilson, USFWS, pers. com. 2007).

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Dahomey	Yes	X			Unknown	Records from the late 1990's on the Wilkins FmHA tract
Coldwater River	Yes	X1	X	X	Unknown	Catfish ponds and associated ditches
MS Sandhill Crane	Yes	X2	X	X	<10	Brackish marshes on the Gautier and G-17 units
Tallahatchie	Yes			X	Unknown	Only records are from migratory periods
Noxubee	Yes	X2		X	Unknown	Found refuge wide in moist soil units

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: Nick Winstead (Mississippi Dept. of Wildlife, Fisheries & Parks, pers. com. 2007) noted that King Rail responded to call-broadcast surveys on the north end of Ross Barnett Reservoir north of Jackson during the summer of 2006 and 2007, with chicks being observed in 2007. He also

noted that the MS Museum of Natural Science has specimens collected in Lamar County (collected 12/12/1939), Pearl River County (collected 1/30/1940), and Hinds County (collected 11/6/1980). The *Birds of Mississippi* lists the species as an uncommon inland marsh permanent resident that breeds very locally and a common permanent resident of coastal marshes (Turcotte and Watts 1999).

Summary: Existing records indicate that King Rail breed and winter throughout the state where suitable habitat is available.

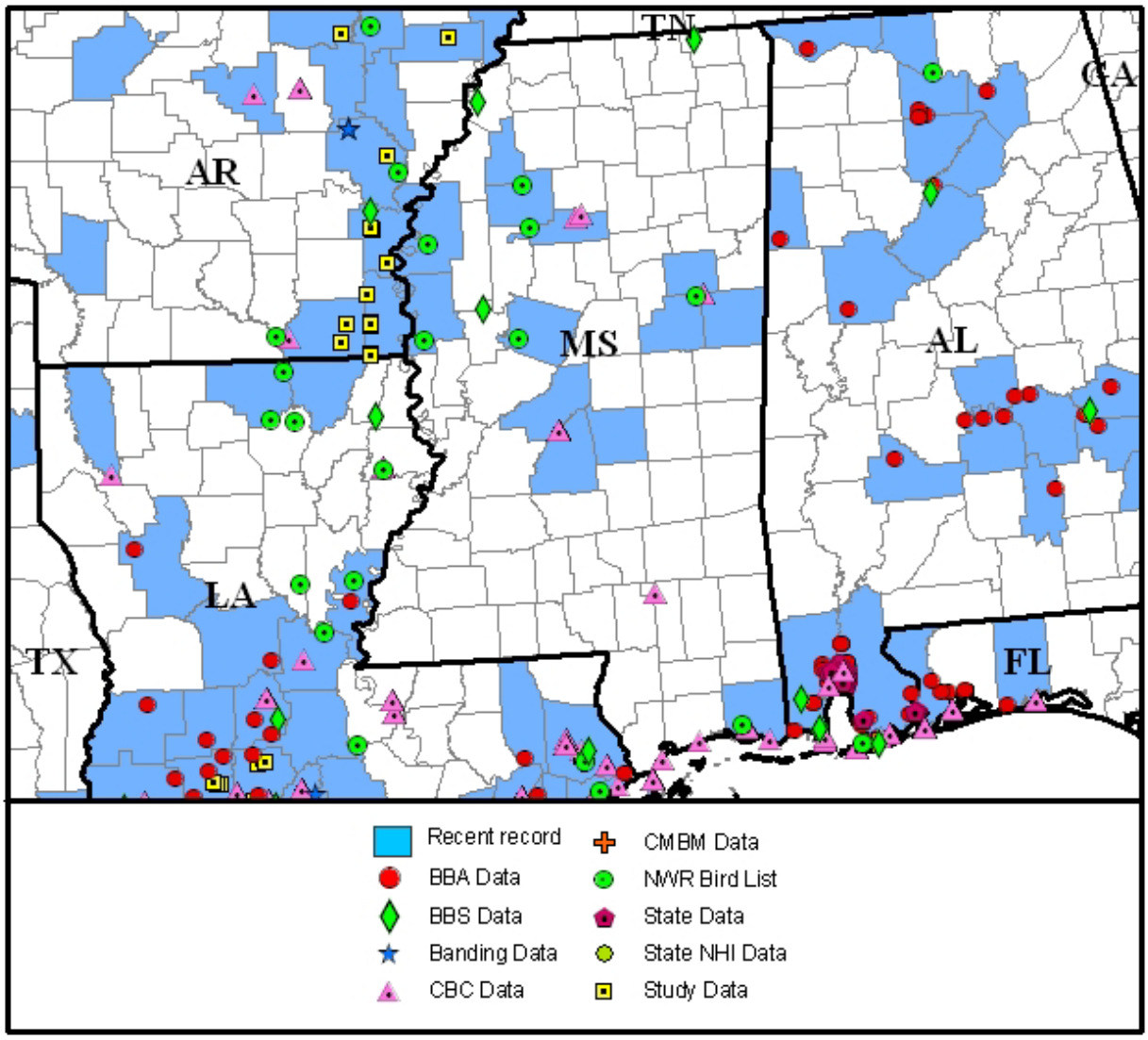


Figure 34. Distribution of the King Rail in Mississippi showing documented locations and counties with records from 1996-2006.

Missouri

Bird Conservation Regions: 22, 24, 26 **State Status:** Endangered

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, key regions for management in the state include the Ozark Highlands, Glades and Cliffs, Central Dissected Till Plains, and Mississippi Alluvial Plain. The species is an assessment target in each of these regions.

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region, Southeast United States Region. Numerous sites are listed as potentially important in the UMVGL plan including Truman Lake Reservoir, Eagle Bluffs Conservation Area (CA), Swan Lake NWR, Marion Bottoms CA, Overton Bottoms CA, Squaw Creek NWR, B.K. Leach CA, Fountain Grove CA, Pershing SP, Plowboy Bend CA, Clarence Cannon NWR, Ted Shanks CA, Columbia Bottom CA, Jones Confluence State Park, Riverlands Environmental Demonstration Area, Schell-Osage CA, Four Rivers CA, and Marmaton River Bottoms Wet Prairie.

BBS: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have been recorded on 1 CBC Survey circle (Kansas City) in the state with no individuals recently recorded at this site (1997-2006).

BBA: (Jacobs and Wilson 1997). King Rail were recorded as confirmed in three blocks out of 1,207 blocks that were surveyed. All blocks were located in the northeastern part of the state (Ted Shanks Conservation Area and Clarence Cannon NWR). Outside the survey, records were from Schell-Osage and Duck Creek conservation areas and Mingo and Squaw Creek NWRs.

CMBM Surveys: At Clarence Cannon NWR, surveys were conducted over 2 years (2003-04) with a total of 25 King Rail being detected during 54 survey periods (0.46 birds/survey period).

National Wildlife Refuge Survey: No responses, but other sources indicate presence at Clarence Cannon NWR and Squaw Creek NWR.

Other Sources: A rare and local summer resident that is most frequently reported in cattail marshes in floodplain wetlands along the Missouri and Mississippi Rivers (Jacobs 2001). A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 10-50 pairs in the state (MFCTS Migratory Game Bird Committee 2004). During 2006, researchers recorded King Rail during surveys at B.K. Leach CA and Clarence Cannon NWR and 6 broods were observed at these sites (Krementz and Darrah 2007). During 2007, rails were observed at Ted Shanks CA, Clarence Cannon NWR, a private WRP north of the Clarence Cannon NWR, and B.K. Leach CA, with a total of 5 broods observed (Abby Darrah, University of Arkansas, pers. com. 2007). Sites where birders have observed King Rail multiple times over the past 10 years include: Little Creve Coeur Marsh in St. Louis County, Prairie Slough Natural Area in Lincoln County, Squaw Creek NWR in Holt County, B.K. Leach CA in Lincoln County, Four Rivers CA in Vernon County, and Clarence Cannon NWR in Pike County. Brian Loges (pers. com. 2007), MO Department of Conservation, reported a brood of 6 from B.K. Leach CA.

Summary: The King Rail is an uncommon breeding bird in the state. The major population center based on recent records is located in NE Missouri along the Mississippi River in Pike and Lincoln Counties. The main locations are the Prairie Slough Natural Area (Lincoln Co.), B. K. Leach Conservation Area (Lincoln Co.), Ted Shanks Conservation Area (Pike Co.), and Clarence Cannon NWR (Pike Co.).

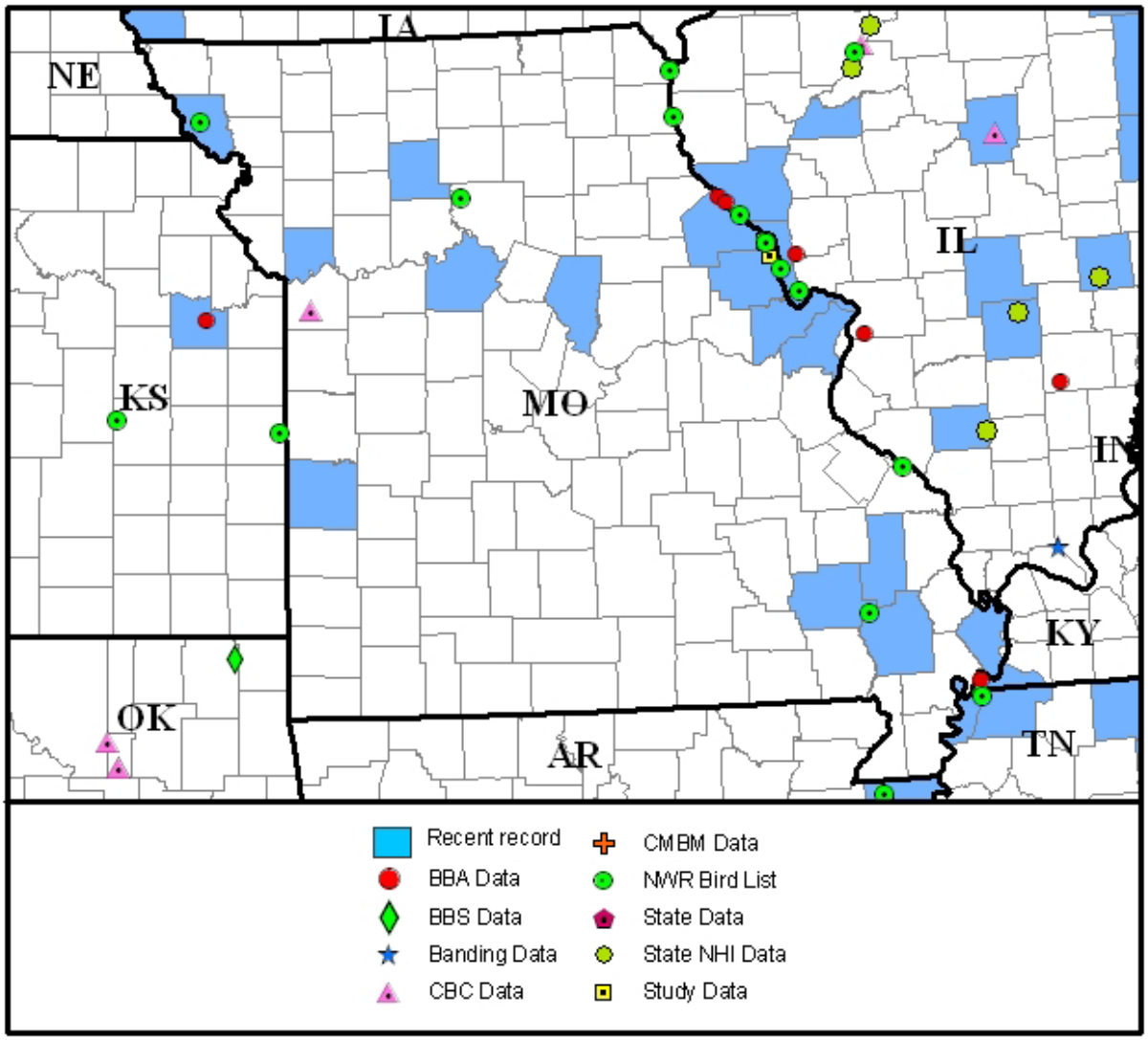


Figure 35. Distribution of the King Rail in Missouri showing documented locations and counties with records from 1996-2006.

Nebraska

Bird Conservation Regions: 11, 19, 22 **State Status:** No Status

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the species is primarily found in the eastern third of the state in wetland complexes that maintain water during droughts (eastern part of the Rainwater Basin). The biggest threat is habitat loss and degradation. Inventory and determining specific habitat requirements are the primary actions identified in the SWAP.

Regional Waterbird Plan(s): Northern Prairie and Parkland Region, Upper Mississippi Valley/Great Lakes Region, and Central Prairies Region. No specific sites listed.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have not been recorded on a CBC route in the state.

Breeding Bird Atlas: (Mollhoff 2001) Species historically bred in this state, but none were recorded during the 1984-89 Nebraska BBA project.

CMBM Surveys: None

National Wildlife Refuge Survey: One response from Crescent Lake indicated that the King Rail was not present.

Other Sources: A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 25-100 pairs in the state (MFCTS Migratory Game Bird Committee 2004). Stephen J. Dinsmore (Iowa State University, pers. com. 2007) indicated that the MFCTS estimate is probably inflated and estimates there are fewer than 10 pairs. He also indicated that the species has not been recorded in the Rainwater Basin region since the mid-1990s. The best locations for encountering the species are Jack Sinn Marsh in Lancaster County, North Lake Basin in Seward County, Clear Creek Marshes WMA in Keith/Garden Counties, and Deep Well Basin in Hamilton County (Sharpe et al. 2001). The Ballard Marsh in north central Nebraska and the Rainwater Basin also contain suitable habitat (Bob Russell, USFWS, pers. com. 2007).

Summary: The King Rail is a rare breeding bird in Nebraska. All recent records and most historic records come from the eastern part of the state.

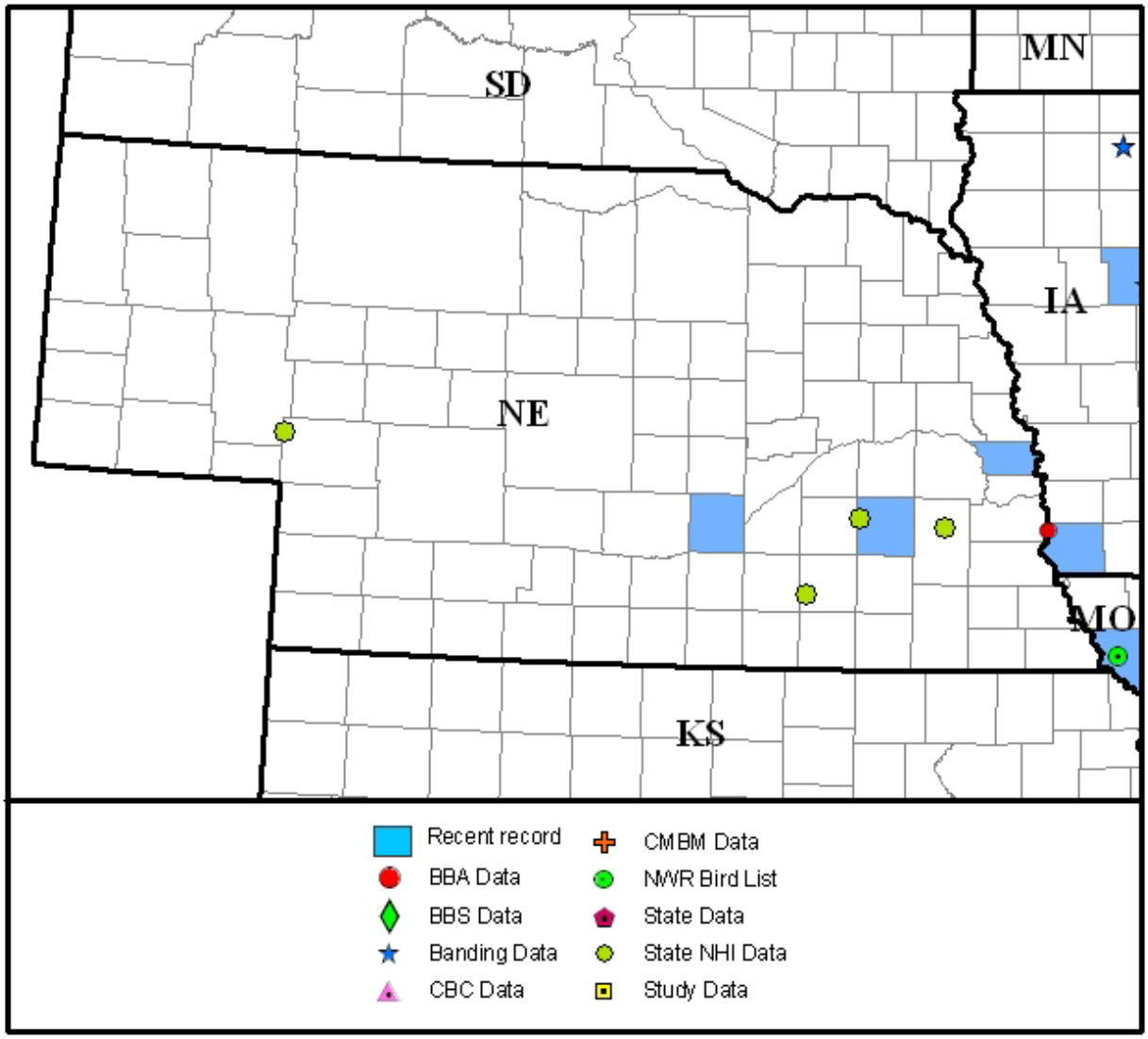


Figure 36. Distribution of the King Rail in Nebraska showing documented locations and counties with records from 1996-2006.

New Jersey

Bird Conservation Regions: 28, 29, 30 **State Status:** Priority Species

Natural Heritage Rank: S3

Species of Greatest Conservation Need: Yes, the goal is to maintain populations throughout the state. It is a species of regional priority in the state.

Regional Waterbird Plan(s): Southeast United States Region, Mid-Atlantic/New England Maritime Region. The MANEM plan documents the presence of King Rail in the Quarryville area, which is in the northern part of the state.

Breeding Bird Survey: King Rail have been recorded on one BBS route (Six Points route) in the state with individuals recently being recorded only one time on this route in 1997. The Six Points route is located in southern New Jersey. Data are inadequate to estimate state population trends.

CBC Survey: King Rail have been recorded on 12 CBC Survey circles in the state with only one circle recording individuals recently (1997-2006). Seven of the circles were located in coastal areas, while 5 were from inland locations.

Breeding Bird Atlas: (Walsh 1999). King Rail were recorded as possible (9), probable (13), and confirmed (1) in 23 blocks out of roughly 800 surveyed during the New Jersey BBA conducted from 1994-1997. The blocks were distributed throughout the state in both coastal and inland locations. They were recorded in the following physiographic regions: Kittatinay Valley, Highlands, Piedmont, Inner Coastal Plain, Outer Coastal Plain, and Pine Barrens.

CMBM Surveys: At Supawna Meadows NWR, surveys were conducted over 2 years (2002-03) with a total of 35 King Rail detected during 19 survey periods (1.84 birds/survey period).

National Wildlife Refuge Survey: Two refuges responded to the survey from New Jersey. See results in the table below.

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Edwin Forsythe	Yes	X2		X	Unknown	5 refuge reports since 1993
Great Swamp	Yes	X1		X	4	Pools 1, 2, 3A, and 3B

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: Sites where birders have observed King Rail multiple times over the past 10 years include: South Cape May Meadows in Cape May County, Forsythe NWR in Atlantic County, Cheesequake State Park in Middlesex County, Hillside Bridge at Black River in Morris County, and Plum Island in Monmouth County.

Summary: The King Rail is primarily a breeding and migrant bird that is found locally throughout New Jersey. Some may winter in the state during mild winters.

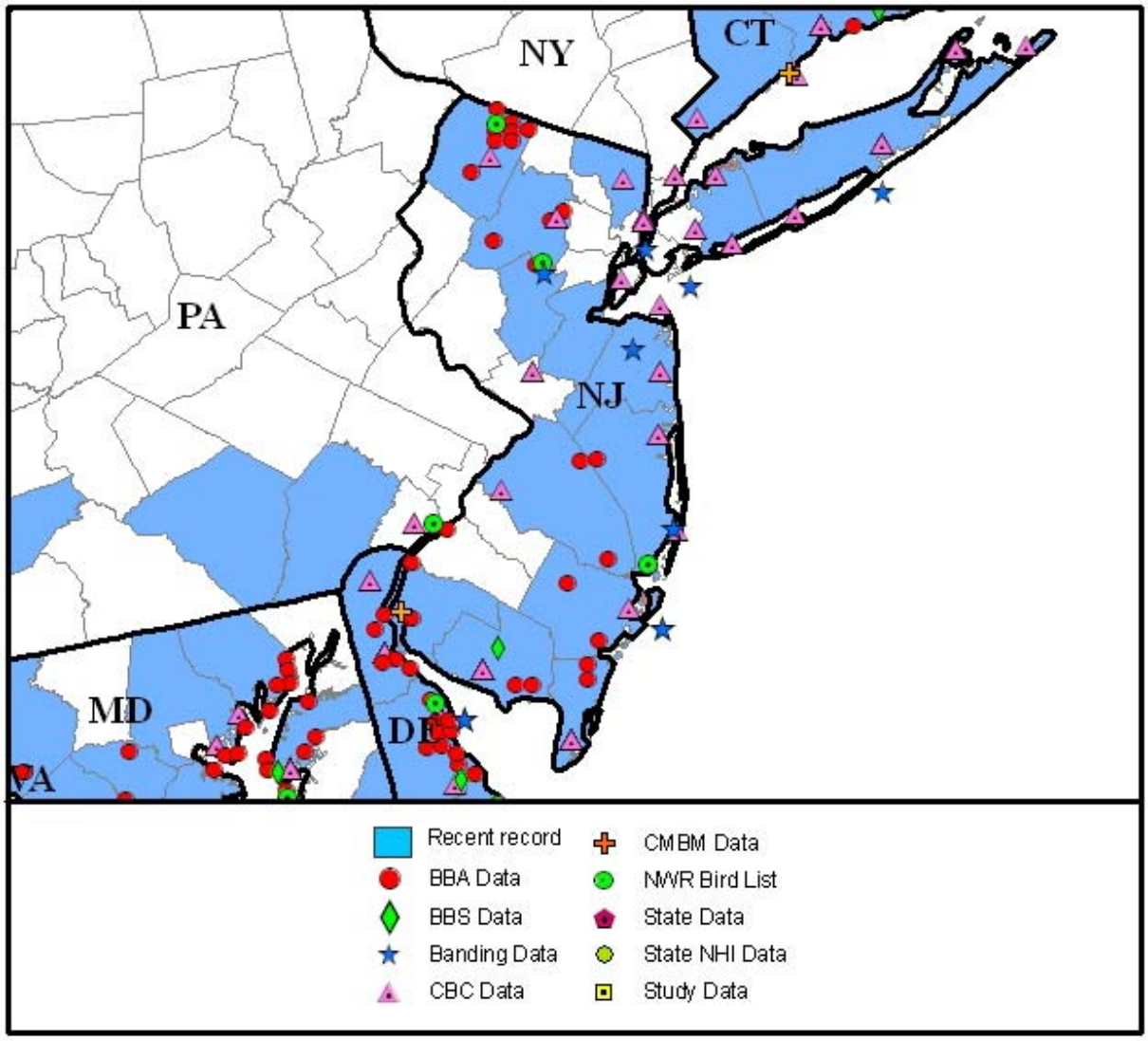


Figure 37. Distribution of the King Rail in New Jersey showing documented locations and counties with records from 1996-2006.

New York

Bird Conservation Regions: 13, 28, 30 **State Status:** Threatened

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the main threats to marshbirds in New York are loss, degradation, isolation and fragmentation of wetland habitat from drainage for agriculture or development. Watersheds where the King Rail is found include Lake Erie, SE Lake Ontario, Upper Hudson, and Lower Hudson-Long Island Bays.

Regional Waterbird Plan(s): Southeast United States Region, Mid-Atlantic/New England Maritime Region, Upper Mississippi Valley/Great Lakes Region. The MANEM plan lists the Westchester coast as an important area in the state. The UMVGL plan lists Tivoli Bays on the Hudson River as an important site.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have been recorded on 11 CBC Survey circles in the state with no circles recording individuals recently (1997-2006). All of the records with the exception of one came from the Long Island area. The other came from the Rochester survey circle by Lake Ontario.

Breeding Bird Atlas: (NYSDEC 2006) King Rail were recorded in 5 survey blocks (2 probable and 3 possible) out of 5,323 blocks surveyed during the 1980-85 atlas project and in 4 survey blocks (3 probable and 1 possible) during the 2000-05 atlas project. The locations from 1980-85 were scattered throughout the southern part of the state, while those from 2000-05 were located in the western part of the state.

CMBM Surveys: No sites.

National Wildlife Refuge Survey: Two refuges from New York responded to the survey. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Iroquois	Yes			X	Unknown	Rare migrant through area
Montezuma	No					

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: The King Rail is a very rare and local breeder that formally bred at locations south of the Adirondacks (Levine 1998).

Summary: The King Rail is a rare breeding bird in the state. The two primary locations where the species is found in the state are along the Great Lakes and Atlantic Coast.

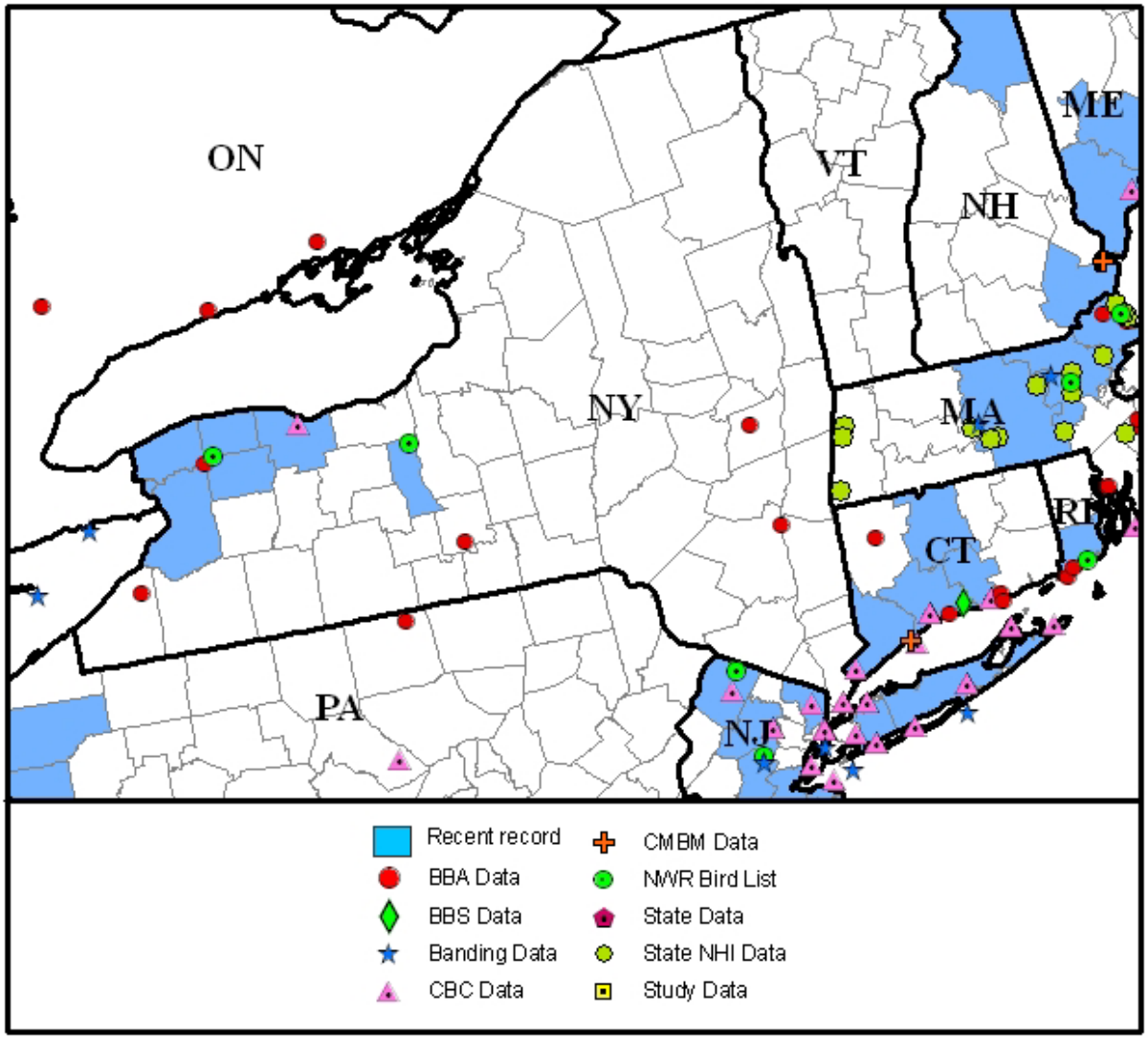


Figure 38. Distribution of the King Rail in New York showing documented locations and counties with records from 1996-2006.

North Carolina

Bird Conservation Regions: 27, 28, 29 **State Status:** No Status

Natural Heritage Rank: S3

Species of Greatest Conservation Need: Yes, important habitats for the King Rail in North Carolina are brackish estuarine marshes and tidal wetlands. The condition of these habitats is threatened by development, invasive species, fragmentation, wetland ditching, dredging, lack of fire, and human recreational activities. Primary conservation actions include land acquisition of key areas, education and outreach efforts, increased use of prescribed fire, and forming partnerships.

Regional Waterbird Plan(s): Southeast United States Region

Breeding Bird Survey: King Rail have been recorded on 3 BBS routes in the state with 2 routes recording individuals recently (1996-2005). All three routes are located along the Atlantic Coast in the state. Data are inadequate to estimate state population trends.

CBC Survey: King Rail have been recorded on 17 CBC Survey circles in the state with 12 circles recording individuals recently (1997-2006). All records came from the Atlantic Coast with the exception of one inland location.

Breeding Bird Atlas: King Rail were recorded as possible (3), probable (3), and confirmed (3) in 9 blocks out of 558 blocks surveyed during the North Carolina BBA conducted from 1988-1993 (John Gerwin, North Carolina Museum of Natural Sciences, Unpublished data 2007). All but one record were from coastal areas. The one inland record was from Cabarrus County.

CMBM Surveys: At Mackay Island NWR, surveys were conducted over 2 years (2003-04) with a total of 191 King Rail being detected during 18 survey periods (10.61 birds/survey period). At Mattamuskeet NWR, surveys were conducted over one year (2003) with a total of 37 King Rail being detected during 5 survey periods (7.40 birds/survey period).

National Wildlife Refuge Survey: One refuge (Pocosin Lakes) responded to the survey. See summary below. Refuges not responding, but containing suitable habitats include Alligator River, Cedar Island, and Swanquarter (Chuck Hunter, USFWS Region 4 Refuge Biologist, pers. com. 2007).

		Season Present				
Refuge	**Present**	**Breed**[a]	**Winter**	**Migrat.**	**Pair Estimate**	**Notes**
Pocosin Lakes	Yes	X1	X	X	Unknown	Pungo Unit and fire breaks

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: Researchers at the North Carolina Cooperative Fish and Wildlife Research Unit are currently working on a modeling project to predict the species occurrence in the Roanoke-Tar-Neuse-Cape Fear (RTNCF) Ecosystem of North Carolina and Virginia (Ashton Drew, North Carolina Cooperative Fish and Wildlife Research Unit, pers. com. 2007). There are frequent birder

records from Waupoppin Canal at Lake Mattamuskeet in Hyde County and Alligator River in Dave/Hyde Counties.

Summary: The King Rail is a year-around resident in North Carolina. Most current records come from coastal regions in the northeast part of the state.

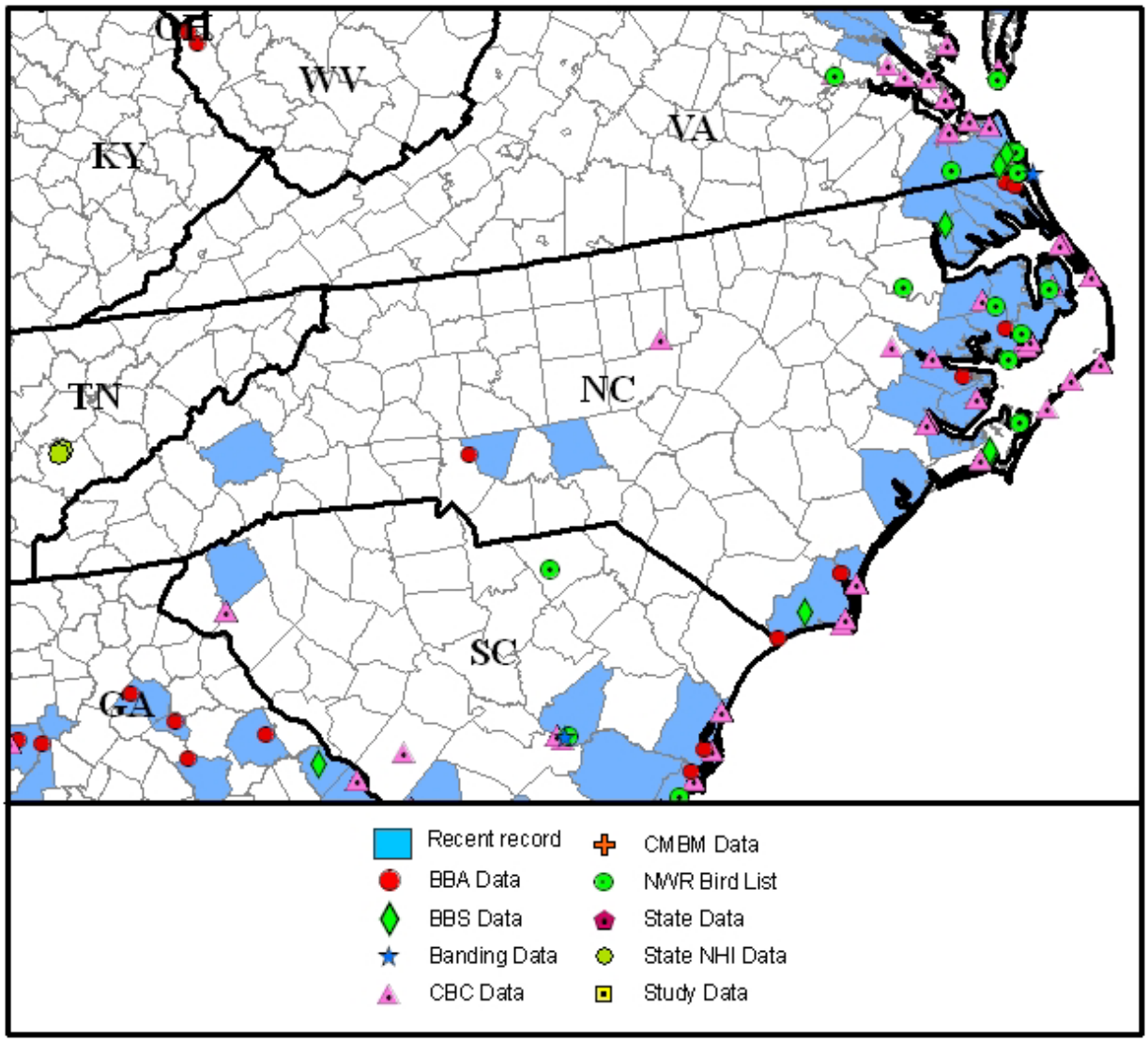


Figure 39. Distribution of the King Rail in North Carolina showing documented locations and counties with records from 1996-2006.

Ohio

Bird Conservation Regions: 13, 22, 28 **State Status:** Endangered

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the King Rail is a primary species of concern in the Lake Erie Marshes Wetland Focus Area. The objective within the focus area is to maintain quality wetland habitat that will support viable populations of 30 wetland species including the King Rail.

Regional Waterbird Plan(s): Southeast United States Region, Upper Mississippi Valley/Great Lakes Region. The UMVGL plan identifies Gilmore Ponds Interpretive Preserve, Hueston Woods State Park/Four Mile Creek Watershed, C.J. Brown Reservoir, and the Chagrin River Corridor as potentially important sites.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have been recorded on 4 CBC Survey circles in the state with no circles recording individuals recently (1997-2006). Two of the records were located near Lake Erie.

Breeding Bird Atlas: (Peterjohn and Rice 1991). King Rail were recorded as probable (5) and confirmed (4) in 9 blocks out of 1,095 blocks surveyed during the Ohio BBA conducted from 1982-87. All records except for one were in the north-central part of the state along Lake Erie. The one exception was from Big Island Wildlife Area in Marion County. The BBA species account indicated that breeding records exist for 42 counties from the 1930's. During the second BBA project (2006-10), there have been 4 probable records with only one confirmed (Ohio Ornithological Society 2007).

CMBM Surveys: No records

National Wildlife Refuge Survey: No responses, but records from other sources indicate presence at Ottawa and Cedar Point National Wildlife Refuges.

Other Sources: King Rail were once the most numerous nesting rail in Ohio (Peterjohn 1989). Historic records (1924-33) from the northeast corner of Blendon Township, Franklin County indicated individuals were present during 5 out of 10 years that surveys were conducted with 8 nests located (Hicks 1935). A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 10-25 pairs in the state primarily along the western shore of Lake Erie (MFCTS Migratory Game Bird Committee 2004). Mark Shieldcastle (Ohio Department of Natural Resources, pers. com. 2003), maintains a slightly higher estimate of 10-50 breeding pairs. Eighteen King Rail were banded during a 1971-72 study conducted at Winous Point Shooting Club on the southwestern shore of Lake Erie in Ottawa County (Andrews 1973). Birders have observed King Rail on multiple occasions in recent years at Crane Creek Causeway State Park in Ottawa County. Two adult King Rail with 3 chicks were reported from Prairie Oaks Metropark west of Columbus in 2004 (Jim McCormac, Ohio Department of Natural Resources, pers. com. 2004).

Summary: Historically, King Rail were widely distributed throughout the state. They are now primarily found along western Lake Erie in Lucas, Ottawa, and Sandusky Counties.

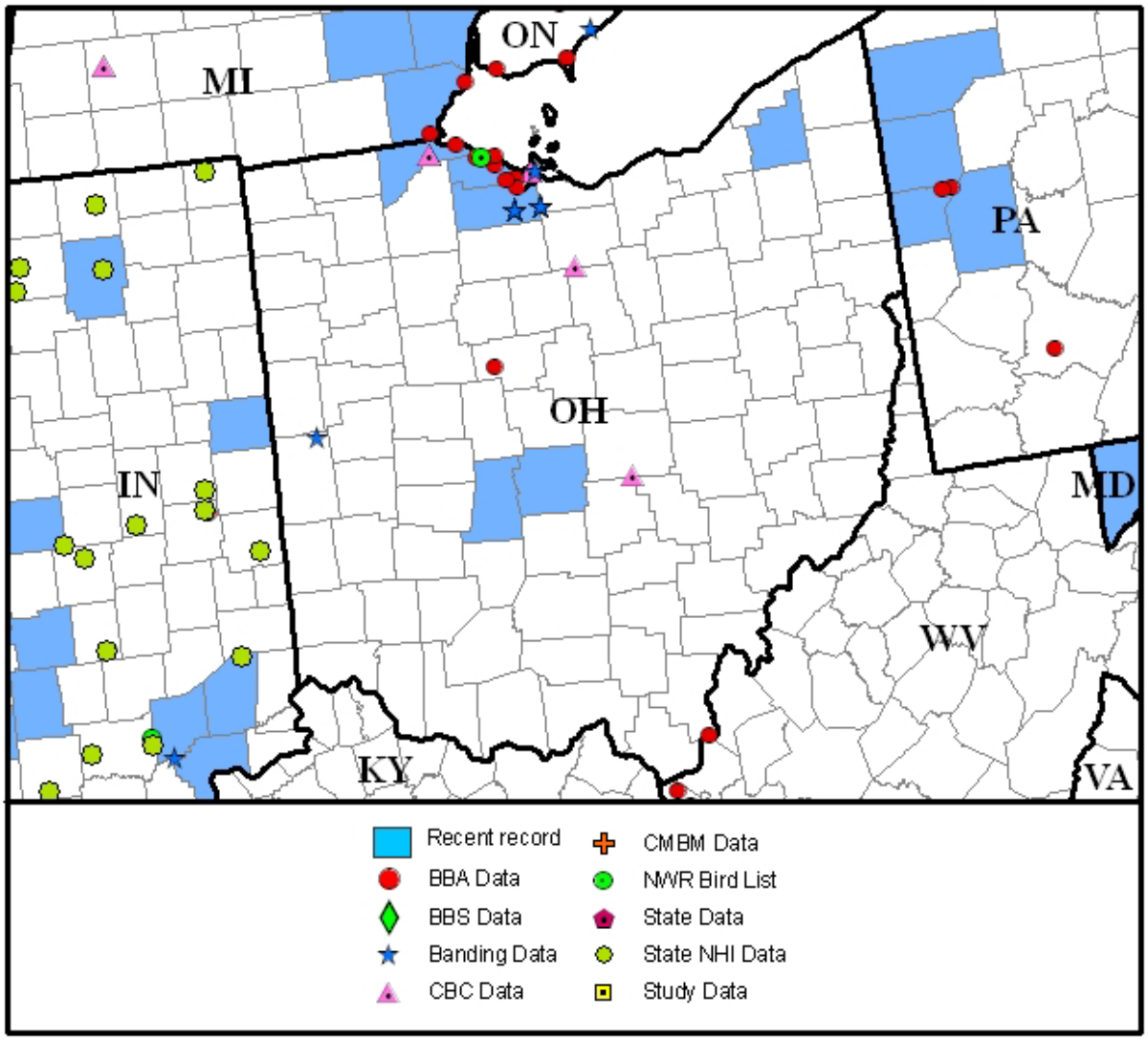


Figure 40. Distribution of the King Rail in Ohio showing documented locations and counties with records from 1996-2006.

Oklahoma

Bird Conservation Regions: 19, 21, 22, 24, 25 **State Status:** No Status

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the species is listed as SGCN in the Tallgrass Prairie, Crosstimbers, and the Ouachita Mountains/Arkansas Valley/Western Gulf Coastal Plain Regions. The species status and population trend are unknown for the entire state. Surveys are needed to better assess populations.

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region, Southeast United States Region.

Breeding Bird Survey: King Rail have been recorded on 3 BBS routes in the state with 1 route recording individuals recently (1996-2005). Two of the routes are located in northeastern Oklahoma with the other route from the southwestern part of the state. Data are inadequate to estimate state population trends.

CBC Survey: King Rail have been recorded on 2 CBC Survey circles in the state with no circles recording individuals recently (1997-2006). Both circles are located in the northeastern part of the state.

Breeding Bird Atlas: (Reinking 2004) King Rail were recorded as possible in one block during the 1997-2001 Oklahoma BBA project. The block was located in Tillman County in southwestern Oklahoma. Nest records have been reported from Red Slough WMA in McCurtain County and Hackberry Flat WMA in Tillman County.

CMBM Surveys: King Rail were not detected during surveys at Sequoyah and Tishomingo NWRs.

National Wildlife Refuge Survey: No responses, but there are historic records from Tishomingo and Salt Plains NWRs (Baumgartner and Baumgartner 1992).

Other Sources: The Red Slough was formerly a rice farm in the Red River floodplain that was restored through the Wetlands Reserve Program. Up to 9 territories were documented at the site in 2004, but management changes (mainly for waterfowl) could alter habitat important for King Rail (David Arbour, pers. com. 2004). Sites with frequent birder records include Red Slough WMA and Hackberry Flat WMA. Other sites with recent records that have been verified and accepted by the Oklahoma Birds Record Committee include Hajek Marsh near Dover and Vann's Marsh north of Muskogee (Eric Beck, pers. com. 2007).

Summary: The King Rail is a rare, localized bird in the state. Most recent records come from the southern part of the state along the Red River.

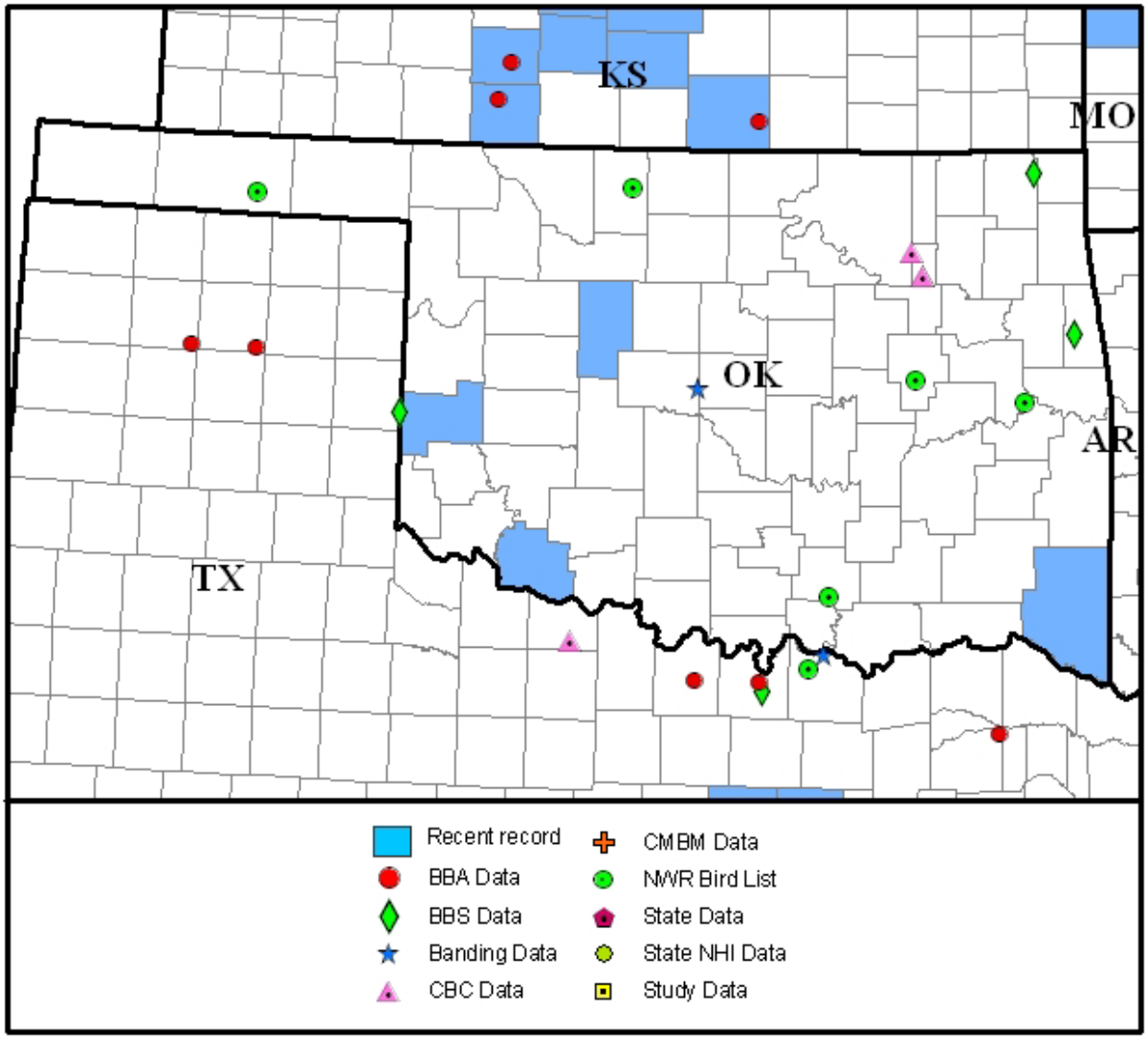


Figure 41. Distribution of the King Rail in Oklahoma showing documented locations and counties with records from 1996-2006.

Pennsylvania

Bird Conservation Regions: 13, 28, 29 **State Status:** Threatened

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the King Rail is a peripheral species in the state. Need to develop better methods for sampling. A priority action item is to implement a marshbird monitoring program on a regular schedule to better monitor populations. Use data to develop models to predict potential habitat that can guide management.

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region, Southeast United States Region. The UMVGL plan lists State Game Lands 151 & 284 and the Pymatuning/Hartstown Complex as potentially important areas.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have been recorded on 2 CBC Survey circles in the state with no circles recording individuals recently (1997-2006). One circle was located in Delaware County while the other is from Clinton County.

Breeding Bird Atlas: (Brauning 1992) King Rail were recorded as possible (2), probable (1), and confirmed (2) in five blocks out of 4,928 blocks surveyed during the Pennsylvania BBA conducted from 1983-89. Three blocks were in the western part of the state, one in the north-central part, and one in the southeastern corner. The BBA account indicates that has always been scarce in the state. Counties with historic nesting records include: bucks, Chester, Crawford, Delaware, Northampton, Philadelphia, and Union Counties. They were also present in the Pymatuning region before creation of the lake. The ongoing second BBA project (2004-2008) has 4 possible records and 1 observed record to date (Douglas Gross, PA Game Commission, pers. com. 2007).

CMBM Surveys: Marsh bird surveys using the CMBM protocol are currently being conducted as part of the 2nd BBA project, see below.

National Wildlife Refuge Survey: Two refuges from Pennsylvania responded to the survey. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
John Heinz	No					Historic records exist, but no current records from the refuge
Erie	No					

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: Recent marshbird surveys in the state recorded 5 singing King Rail at the Pennsy/Celery/Black Swamp area in Mercer and Lawrence County, one at Moraine State Park in Butler County, and one at Great Marsh in Chester County (Douglas Gross, PA Game Commission, pers. com. 2007, Brauning and Fleet 2006). Marsh birds are a priority during the current 2nd

Pennsylvania BBA Project. The goal for the project is to have volunteers conduct the marsh bird surveys using the CMBM protocol to survey three wetlands in each of three size classes (small, 0.5-3.0 hectares; medium, 3.0-10.0 hectares; large, >10 hectares) in every block six in the state by the end of the project (Lazone et al. 2006). Historical records exist for Berks, Bucks, Chester, Crawford, Delaware, Northampton, Philadelphia, and Union Counties and were regularly only found in the tidal marshes of Delaware and Philadelphia Counties (McWilliams and Brauning 1999).

Summary: The King Rail is a rare breeding bird in the state. Recent surveys indicate presence in the northwest and southeast parts of the state.

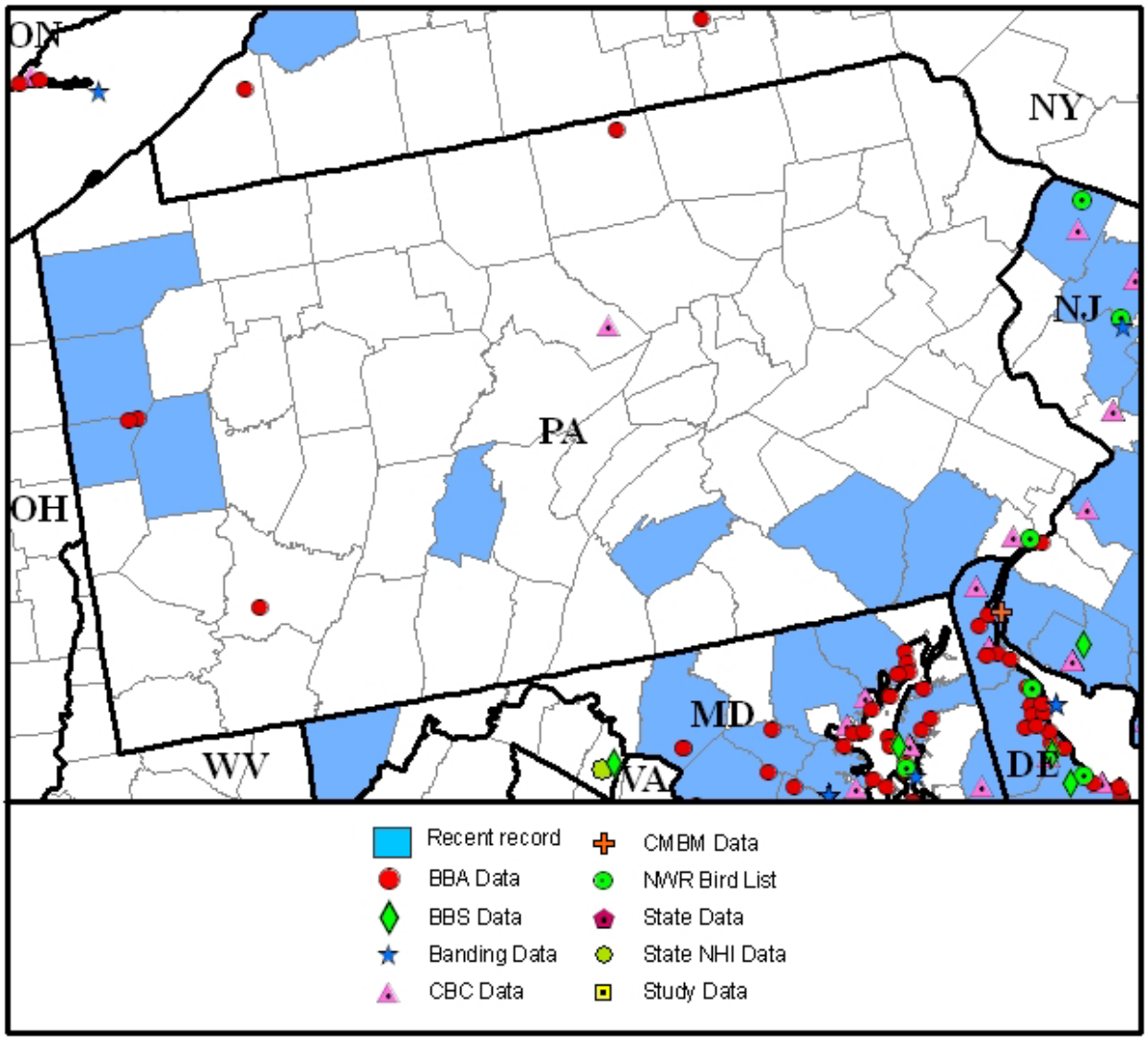


Figure 42. Distribution of the King Rail in Pennsylvania showing documented locations and counties with records from 1996-2006.

Rhode Island

Bird Conservation Region: 30 **State Status:** Species of Concern

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, habitat loss and fragmentation were identified as the biggest threats facing wetland species. No specific actions were listed for the King Rail.

Regional Waterbird Plan(s): Mid-Atlantic/New England Maritime Region. The plan identifies Ninigret & Quonochontaug Ponds and the Barrington Group as important areas in the state.

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have been recorded on one CBC Survey circle (Westport) in the state with no recent records from this circle (1997-2006).

Breeding Bird Atlas: (Enser 1992) King Rail were recorded as possible (1), probable (1), and confirmed (1) in three blocks out of 165 blocks surveyed during the Rhode Island BBA conducted from 1982-87. All blocks were in coastal areas.

National Wildlife Refuge Survey: One refuge from Rhode Island responded to the survey. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
Sachuest Point	Y	X2			1	Plan to continue surveys

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: None

Summary: The King Rail is an uncommon breeder in the state. All records come from coastal locations in Washington County.

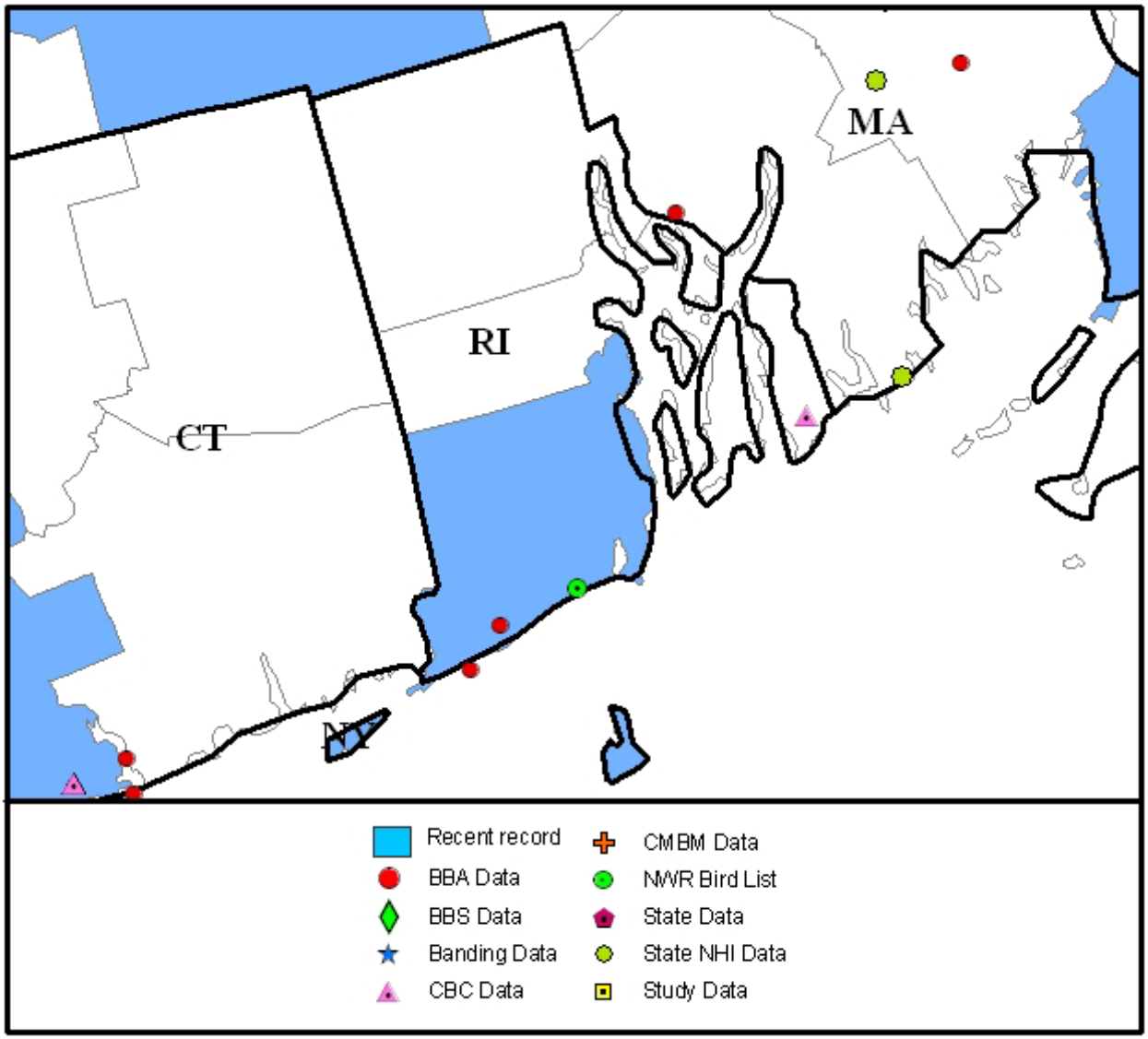


Figure 43. Distribution of the King Rail in Rhode Island showing documented locations and counties with records from 1996-2006.

South Carolina

Bird Conservation Regions: 27, 28, 29 **State Status:** No Status

Natural Heritage Rank: SNR

Species of Greatest Conservation Need: Yes, nothing specific to King Rail actions.

Regional Waterbird Plan(s): Southeast United States Region

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have been recorded on 11 CBC Survey circles in the state with 8 circles recording individuals recently (1997-2006). Seven of the circles are located along the Atlantic Coast with the other 4 located inland.

Breeding Bird Atlas: (Cely 2003) King Rail were recorded as possible (3), probable (2), and confirmed (1) in six blocks out of 303 blocks surveyed during the South Carolina BBA conducted during 1988-95. All blocks are located along the Atlantic Coast. Casual observations and literature documentation was also included on the map. Eight other observations of possible and confirmed breeding were listed outside of the survey. The BBA account indicated that Santee NWR is one of the better inland sites even though the species was not recorded there during the BBA.

CMBM Surveys: See others sources below regarding a study at ACE Basin NWR using the protocol.

National Wildlife Refuge Survey: Two refuges from South Carolina responded to the survey. Results are listed in the table below. Refuges not responding, but containing suitable habitats include Cape Romain and Santee NWRs (Chuck Hunter, USFWS Region 4 Refuge Biologist, pers. com. 2007).

		Season Present				
Refuge	**Present**	**Breed[a]**	**Winter**	**Migr.**	**Pair Estimate**	**Notes**
ACE Basin	Y	X2	X	X	15	Combahee River and Edisto River Units
Waccamaw	Y	X2	X	X	Unknown	Primarily in Unit 3

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: Pilot research on the ACE Basin NWR recorded a total of 39 King Rail in unmanaged marshes and 12 in managed marshes during surveys conducted in 2005 and 2006 (Sean McGregor, University of Georgia, unpublished data 2006). Birder listserve records report multiple locations from Georgetown, Charleston, and Colleton Counties. Sites with multiple birder reports include Donnelley WMA in Colleton County, Bear Island WMA in Colleton County, Fairfax Marsh in Allendale County, Huntington Beach State Park in Georgetown County, and Santee Coastal Reserve in Charleston/Georgetown Counties.

Summary: The King Rail is found year around in the state primarily in coastal areas.

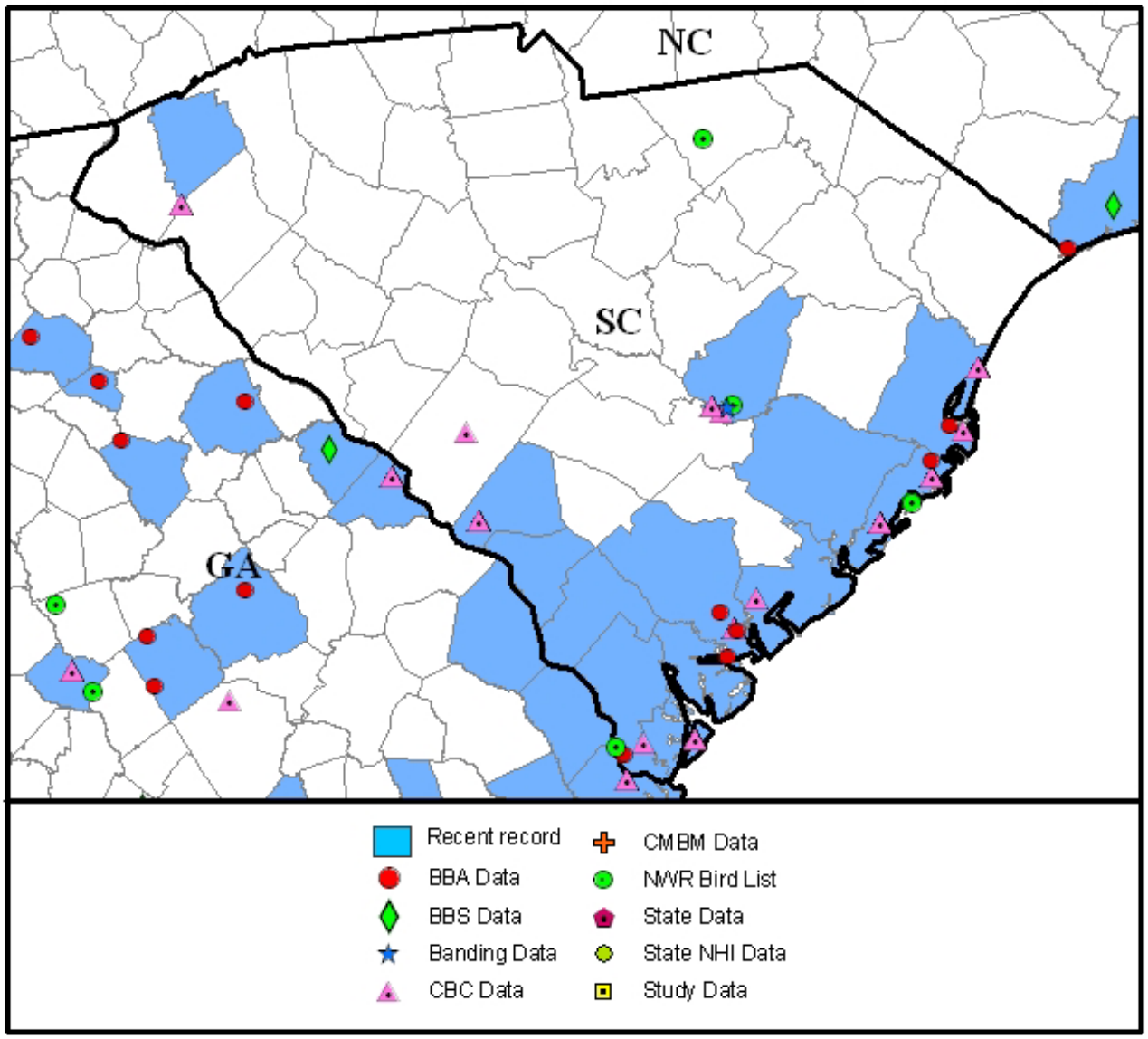


Figure 44. Distribution of the King Rail in South Carolina showing documented locations and counties with records from 1996-2006.

Tennessee

Bird Conservation Regions: 24, 26, 27, 28 **State Status:** In Need of Management

Natural Heritage Rank: S2B

Species of Greatest Conservation Need: Yes, important regions in the state include the Mississippi Alluvial Plain, the Upper Gulf Coastal Plain, and the Interior Low Plateau. Stresses to the species include agricultural conversion, wetland drainage, industrial discharge, and wastewater/stormwater runoff.

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region, Southeast United States Region

Breeding Bird Survey: King Rail have not been recorded on a BBS route in the state.

CBC Survey: King Rail have not been recorded on a CBC route in the state.

Breeding Bird Atlas: (Nicholson 1997) King Rail were recorded as possible (2), probable (1), and confirmed (1) in three blocks out of 655 blocks surveyed during the Tennessee BBA conducted from 1986-91. They were not found at 2 sites in the eastern part of the state where they have been consistently seen in the past: Alcoa Marsh in Blount County and Amnicola Marsh in Hamilton County.

National Wildlife Refuge Survey: Two refuges within the King Rail range in Tennessee responded to a survey about the status of King Rail. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed**[a]	**Winter**	**Migrat.**	**Pair Estimate**	**Notes**
Reelfoot*	Y	X1			Unknown	Brood observed in 1998
Tennessee	Y	X1			7	On Duck River unit, broods in 2007

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon
* based on records from birder listserve and Bob Ford, USFWS

Other Sources: There are 7 records from the Tennessee Natural Heritage Inventory with all coming from the southeast part of the state (Roger McCoy, unpublished data 2007). Only one record is recent (1996) with all other records from prior to 1990. Bob Ford, USFWS, (unpublished data 2007), reported that 11 King Rail were recorded at Tennessee NWR during 2007 marshbird survey. No King Rail were recorded at Cross Creek NWR during 2007. All rails recorded at Tennessee NWR were in the Duck River Unit where two broods were observed during 2007.

Summary: The King Rail is a rare breeding bird in the state with few existing records. Most current records come from NWRs found in the state with documented breeding on both refuges.

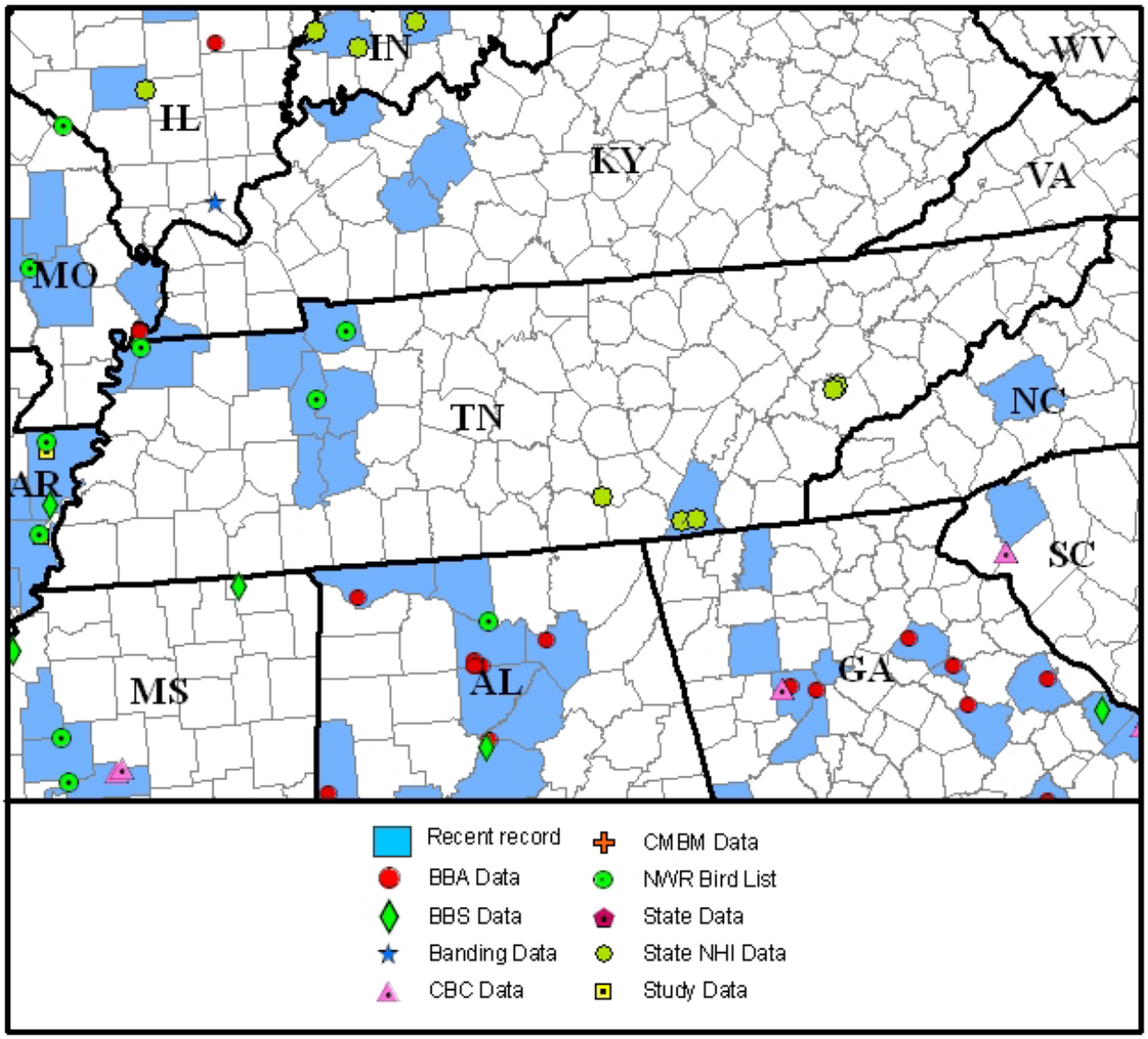


Figure 45. Distribution of the King Rail in Tennessee showing documented locations and counties with records from 1996-2006. (Natural Heritage Data provided by the Tennessee Department of Environment and Conservation, Division of Natural Areas).

Texas

Bird Conservation Regions: 19, 20, 22, 24, 25, 36, 37 **State Status:** Special Concern

Natural Heritage Rank: S3

Species of Greatest Conservation Need: Yes, the species is primarily found in the Gulf Coastal Prairies and Marshes Ecoregions, which is a "highest priority" landscape in the State Wildlife Action Plan. Primary threats in this ecoregions include agriculture, development, habitat fragmentation from a variety of factors, and invasive species. The plan addresses actions needed to protect and manage important habitat.

Regional Waterbird Plan(s): Southeast United States Region

Breeding Bird Survey: King Rail have been recorded on 13 BBS routes in the state with 9 routes recording individuals recently (1996-2005). All routes are located within 125 km of the Gulf Coast. There is a declining, long-term trend of -5.5 %/year ($p = 0.47$, $n = 9$) and a declining, recent trend of –12.3 %/year ($p = 0.09$, $n = 9$).

CBC Survey: King Rail have been recorded on 41 CBC Survey circles in the state with 23 circles recording individuals recently (1997-2006). All but 5 of the circles are located within 100 km of the Gulf Coast. Analysis of CBC data, from 1959-1988, indicated an increasing trend of +0.9 %/year (-0.5 to 2.4 95% C.I., $n = 36$) (Sauer et al. 1996).

CMBM Surveys: Surveys using the CMBM protocol were conducted at Aransas NWR for one year (2005) with 19 King Rail being recorded during 13 surveys periods (1.46 birds/survey period).

Breeding Bird Atlas: (Benson and Arnold 2001) King Rail were recorded as possible (16), probable (11), and confirmed (7) in 34 blocks during the Texas BBA conducted from 1987-92. A majority of the blocks (27) recording King Rail were located along the Gulf Coast of Texas while 5 were located in northeast Texas, and 2 were from the Panhandle.

National Wildlife Refuge Survey: Three refuges within the King Rail range in Texas responded to a survey about the status of King Rail. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed**[a]	**Winter**	**Migrat.**	**Pair Estimate**	**Notes**
Anahuac	Y	X1	X	X	Many	King and Clapper Rail both present
Aransas	Y	X1	X	X	Unknown	Occasionally observed
Attwater Prairie Chicken	Y	X1	X		0 - 10+	Seen in ditches around refuge

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: The King Rail breeds in most coastal wildlife management areas managed by the state, coastal NWRs managed by the USFWS, and rice fields in the rice producing counties of the state (Brent Ortego, Texas Parks and Wildlife Department, pers. com. 2007). A Texas Parks and Wildlife Department survey data indicates that around 700 rail hunters harvest about 1,000 birds annually (Jay Roberson, Texas Parks and Wildlife Department, pers. com. 2007). Sikes (1984)

detected 41 King Rail in freshwater sites, 1 in saltwater sites, and 4 at intermediate sites during surveys conducted at Anahuac NWR. She found that identification of species (King or Clapper) was difficult in sites with intermediate salinity. Shanley (1996) assessed King Rail habitat in Colorado County, including Attwater Prairie Chicken NWR, using call-back surveys and telemetry during 1983-85.

Summary: Texas supports both breeding and wintering populations of King Rail. Major populations are primarily found in marshes on public lands and rice fields in the Gulf Coast region of the state. A major decline in rice farming has likely reduced populations.

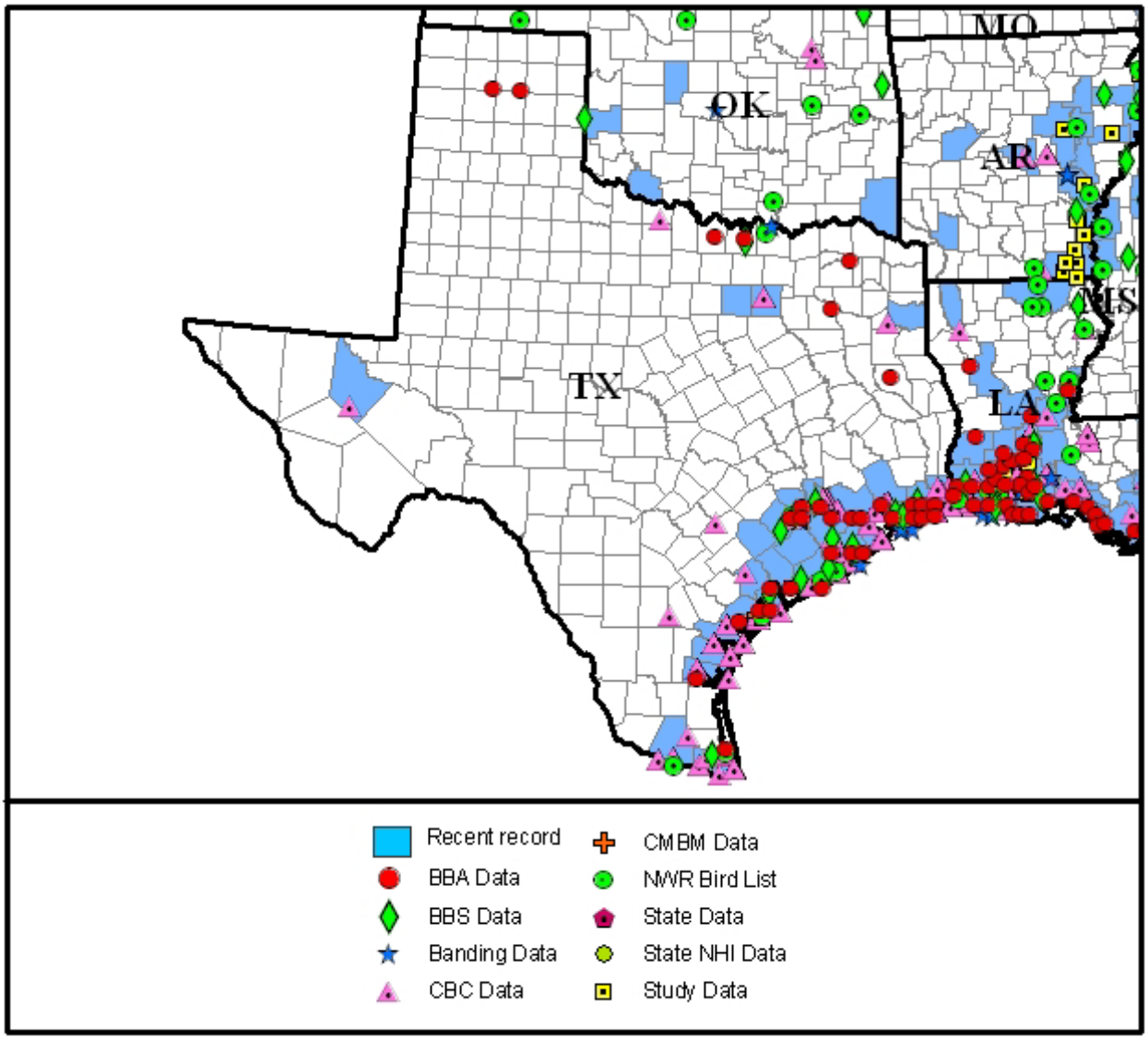


Figure 46. Distribution of the King Rail in Texas showing documented locations and counties with records from 1996-2006.

Virginia

Bird Conservation Regions: 27, 28, 29 **State Status:** No Status

Natural Heritage Rank: S2B, S3N

Species of Greatest Conservation Need: Yes (Tier II), the Mid-Atlantic Coastal Plain is the primary ecoregions of concern. Stresses to coastal marsh habitat in this ecoregions include: sea level rise, invasive species, nutrient regime alteration from agriculture and development, and hydrologic regime alteration from roadways, agriculture, and development.

Regional Waterbird Plan(s): Mid-Atlantic/New England Maritime Region and Southeast United States Region. The MANEM plan identifies Huntley Meadows/Dogue Creek Wetlands as an important area in the state.

Breeding Bird Survey: King Rail have been recorded on one BBS routes in the state with no recent records (1996-2005). The lone route is located in the southeastern part of the state. Data are inadequate to estimate state population trends.

CBC Survey: King Rail have been recorded on 15 CBC Survey circles in the state with 5 circles recording individuals recently (1997-2006). All records are from coastal areas along the Chesapeake Bay.

Breeding Bird Atlas: No BBA has been completed for Virginia.

CMBM Surveys: Surveys were conducted at Mackay Island (2003-04) and Mattamuskeet (2003) NWRs. Eighteen routes were surveyed over two years at Mackay Island with 191 King Rail being recorded (10

National Wildlife Refuge Survey: Eight refuges or refuge complexes from Virginia responded to a survey about the status of King Rail. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed**[a]	**Winter**	**Migrat.**	**Pair Estimate**	**Notes**
Back Bay	Yes	X2	X	X	50	Found on nearby State Areas
Chincoteague	Yes	X	X	X	Unknown	
Eastern Shore	No					
Fisherman Island	No					
Great Dismal Swamp	Yes	X1		X	Unknown	No confirmed breeding since 1970's
Nansemond	No					
Potomac R. Complex	Yes	X2	X	X	Unknown	Breeding confirmed at Occoquam Bay
Rappahannock R.Valley	Yes	X2			2	Probably more in nearby refuges

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: A marshbird study conducted by College of William and Mary researchers at the Lee and Hill marshes in New Kent and King William Counties during 2001 recorded 13 King Rail (Paxton and Watts 2002). These marshes, located at the mouth of the Pamunkey River, are two of

the largest remaining brackish water marshes in Virginia. Surveys conducted by the Virginia Department of Game and Inland Fisheries in 2007 along the Mattaponi River in King William/King and Queen Counties recorded a maximum of 29 individuals (Sergio Harding, Virginia Department of Game and Inland Fisheries, pers. com. 2007). Other locations with numerous records of King Rail observations from birder listserve postings include the Occoquan Bay NWR and Metz wetlands in Prince William County and Back Bay NWR in Virginia Beach. Researchers at the North Carolina Cooperative Fish and Wildlife Research Unit are currently working on a modeling project to predict the species occurrence in the Roanoke-Tar-Neuse-Cape Fear (RTNCF) Ecosystem of North Carolina and Virginia (Ashton Drew, North Carolina Cooperative Fish and Wildlife Research Unit. pers. com. 2007).

Summary: The King Rail is a year around resident found primarily in tidal freshwater and brackish marshes in the vicinity of the Chesapeake Bay and its tributaries.

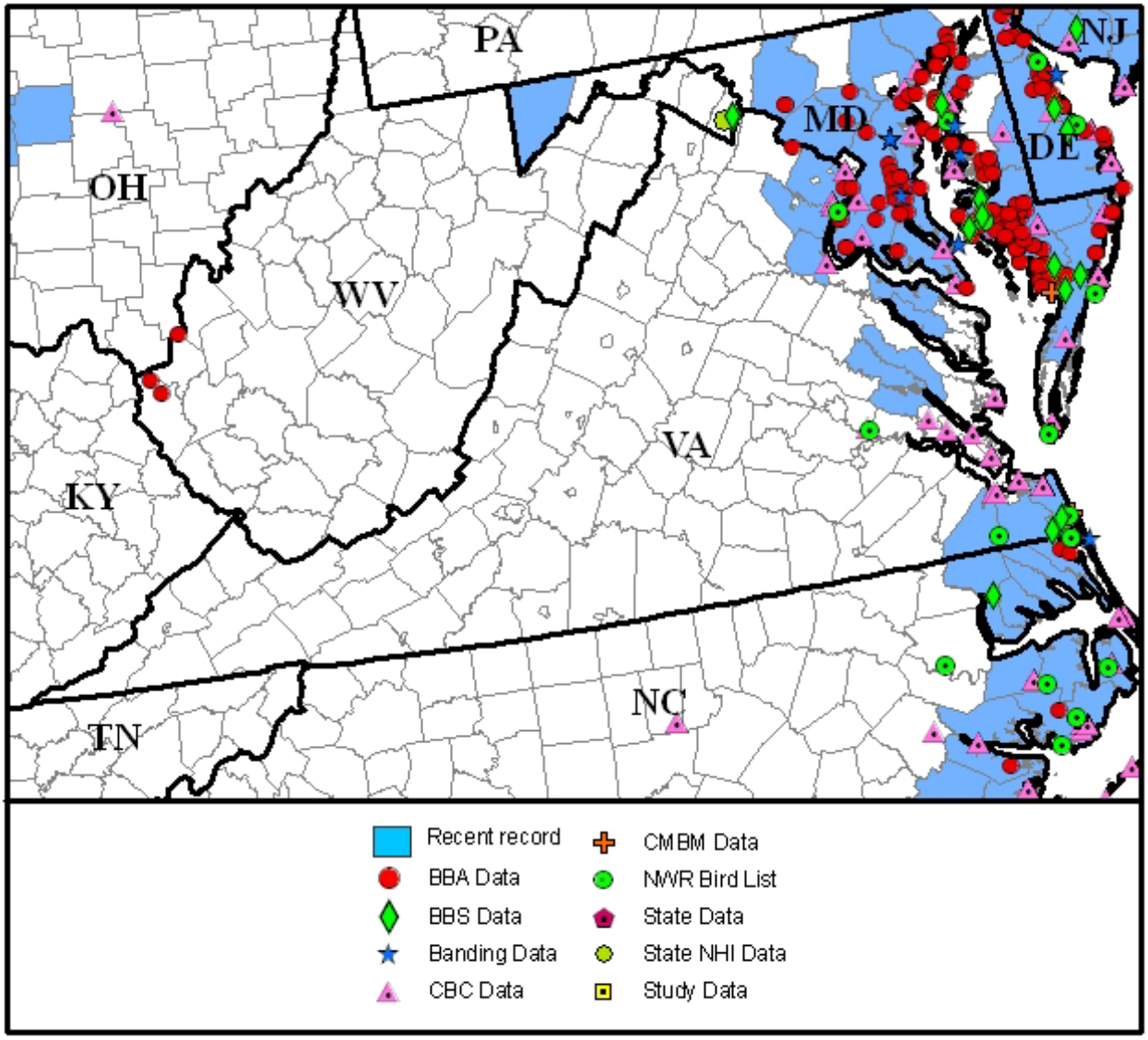


Figure 47. Distribution of the King Rail in Virginia showing documented locations and counties with records from 1996-2006.

West Virgina

Bird Conservation Regions: 28 **State Status:** Rare

Natural Heritage Rank: S1B

Species of Greatest Conservation Need: Yes, the biggest issues facing wetland habitat in West Virginia are habitat loss, acid deposition, management conflicts, damaging recreation, and invasive species. Coordination between agencies, public education, increased management, and wetland protection through management agreements and easements are the primary actions identified in the SWAP.

Regional Waterbird Plan(s): Southeast United States Region, no specific information for West Virginia.

Breeding Bird Survey: King Rail have been recorded on 1 BBS route in the state with no routes recording individuals recently (1996-2005). The lone route is located in Jefferson County in the Eastern Panhandle of the State.

CBC Survey: King Rail have not been recorded on a CBC Survey circle in the state.

Breeding Bird Atlas: (Bucklew and Hall 1994) King Rail were recorded as confirmed breeders within 3 blocks out of 676 blocks surveyed in the state during the 1984 through 1989 project. All records came from the western part of the state in the lower Ohio River Valley. Known breeding locations include Green Bottom WMA in Cabell County and marshes near Beech Fork Lake in Wayne County. Past records show nesting in the Altona Marsh and Albemarle Marsh in the Eastern Panhandle of the state.

National Wildlife Refuge Survey: The Ohio River Islands NWR from West Virginia reported that the King Rail was not present.

Other Sources: None

Summary: The King Rail is a rare breeding bird in the state. The primary location is in marshes along the Ohio River and in the Eastern Panhandle of the state.

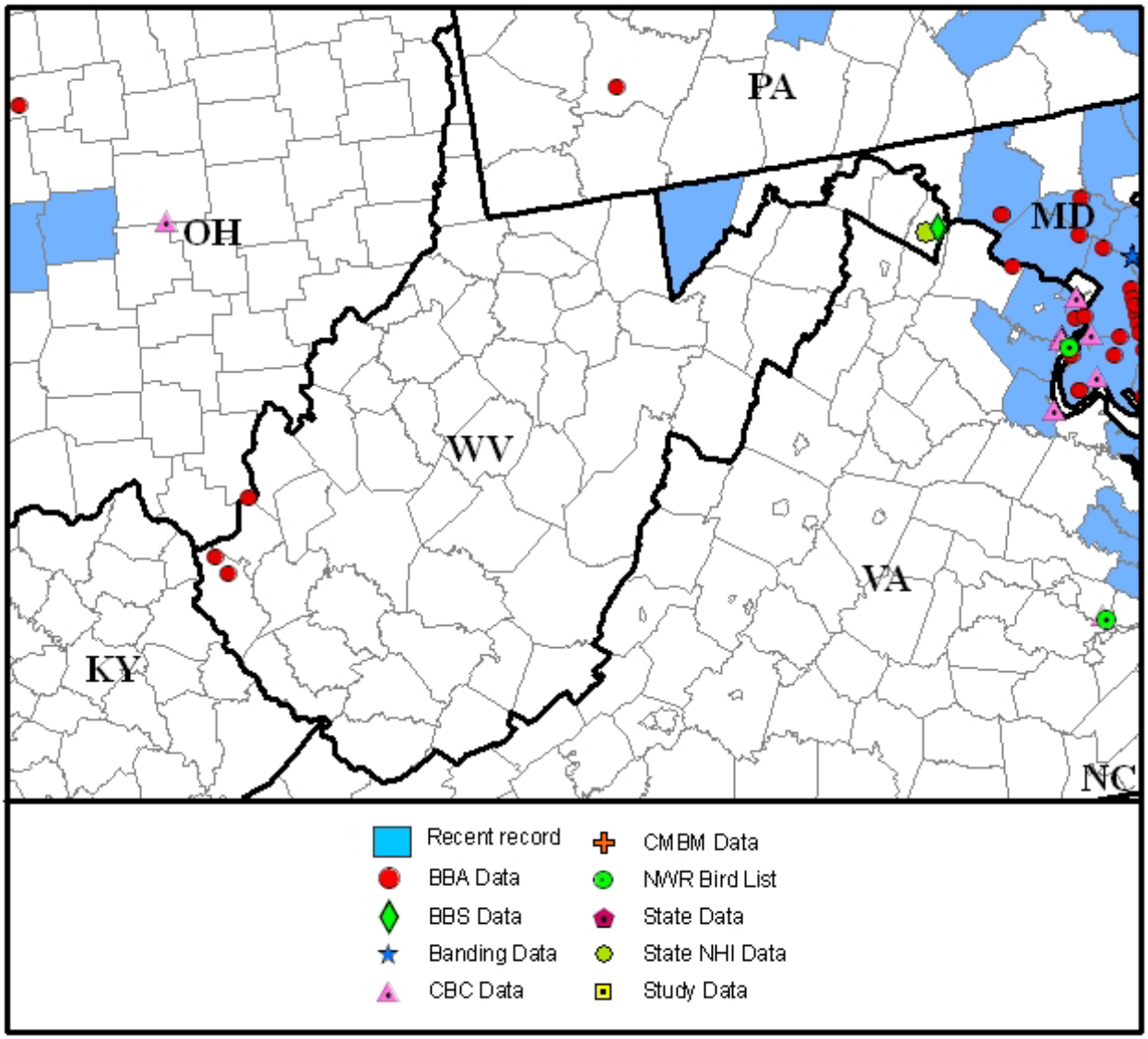


Figure 48. Distribution of the King Rail in West Virginia showing documented locations and counties with records from 1996-2006.

Wisconsin

Bird Conservation Regions: 22, 23 **State Status:** Special Concern

Natural Heritage Rank: S2B

Species of Greatest Conservation Need: Yes, major threats identified in the plan are disruption of hydrology, exotic invasive plants, and wetland loss due to agriculture, dams, filling, and development. Actions include habitat protection and restoration through existing conservation programs and research on how waterfowl management actions affect the King Rail.

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region. Locations listed in the UMVGLR plan important for the King Rail included Units of the Upper Mississippi River NWR, the Mud Lake to Grassy Lake area in Columbia County, Waunakee Marsh WMA in Dane County, Horicon NWR, the Spring Green to Avoca Floodplain in Iowa and Sauk Counties, Greater Lake Koshkonong in Jefferson and Rock Counties, and Comstock/Germania Bog SNA in Marquette County.

Breeding Bird Survey: King Rail have been recorded on 1 BBS route in the state with no routes recording individuals recently (1996-2005). The lone route is located in Juneau County.

CBC Survey: King Rail have been recorded on 2 CBC Survey circles in the state with no circles recording individuals recently (1997-2006). Both circles are located in south central Wisconsin with one in Columbia County and one in Dane County.

Breeding Bird Atlas: (Cutright 2006) King Rail were recorded as possible (4), probable (7), and confirmed (0) in a total 11 blocks out of 3,840 blocks surveyed in the state during the 1995 through 2000 project. Ten of the records come from the southeastern part of the state, while one record is from along the Mississippi River in the southwestern part of the state. After completion of the atlas, an adult with brood was observed at Horicon NWR.

CMBM Surveys: Over four years (2001-2004) of surveys, 4 King Rail were detected at Horicon NWR. Three were detected in 2004 and one in 2002.

National Wildlife Refuge Survey: Two refuges from Wisconsin responded to a survey about the status of King Rail. Results are listed in the table below.

		Season Present				
Refuge	**Present**	**Breed**[a]	**Winter**	**Migrat.**	**Pair Estimate**	**Notes**
Horicon	Yes	X2		X	2	Found refuge wide in small numbers
Whittlesey Creek	No					

[a] X1 = nest or brood observed, X2 = present the entire breeding season, X = present, but uncommon

Other Sources: Manci and Rusch (1988) estimated a density of 0.2 individuals/ha in deepwater (~ 29 cm) and shallow water (~ 5 cm) cattail habitats on Horicon NWR. Based on the density, there was an estimated population of 157 in 1981 and 278 in 1982 on the refuge. A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 10-40 pairs in the

state (MFCTS Migratory Game Bird Committee 2004). Robbins (1991) noted that since 1960, the King Rail regularly occurs in LaCrosse, Waukesha, Milwaukee, Dodge, Brown and Oconto Counties. Sites identified on birder listserves where the King Rail was recorded more that one year (1996-2006) are Waunakee Marsh WMA (Dane Co.), Horicon NWR (Dodge Co.), and Bong Recreation Area (Kenosha Co.).

Summary: The King Rail is an uncommon breeder in the southern portion of the state wherever extensive marsh habitat exists (Robbins 1991). The state may be one of the few strongholds left in the Upper Midwest (MFCTS Migratory Game Bird Committee 2004).

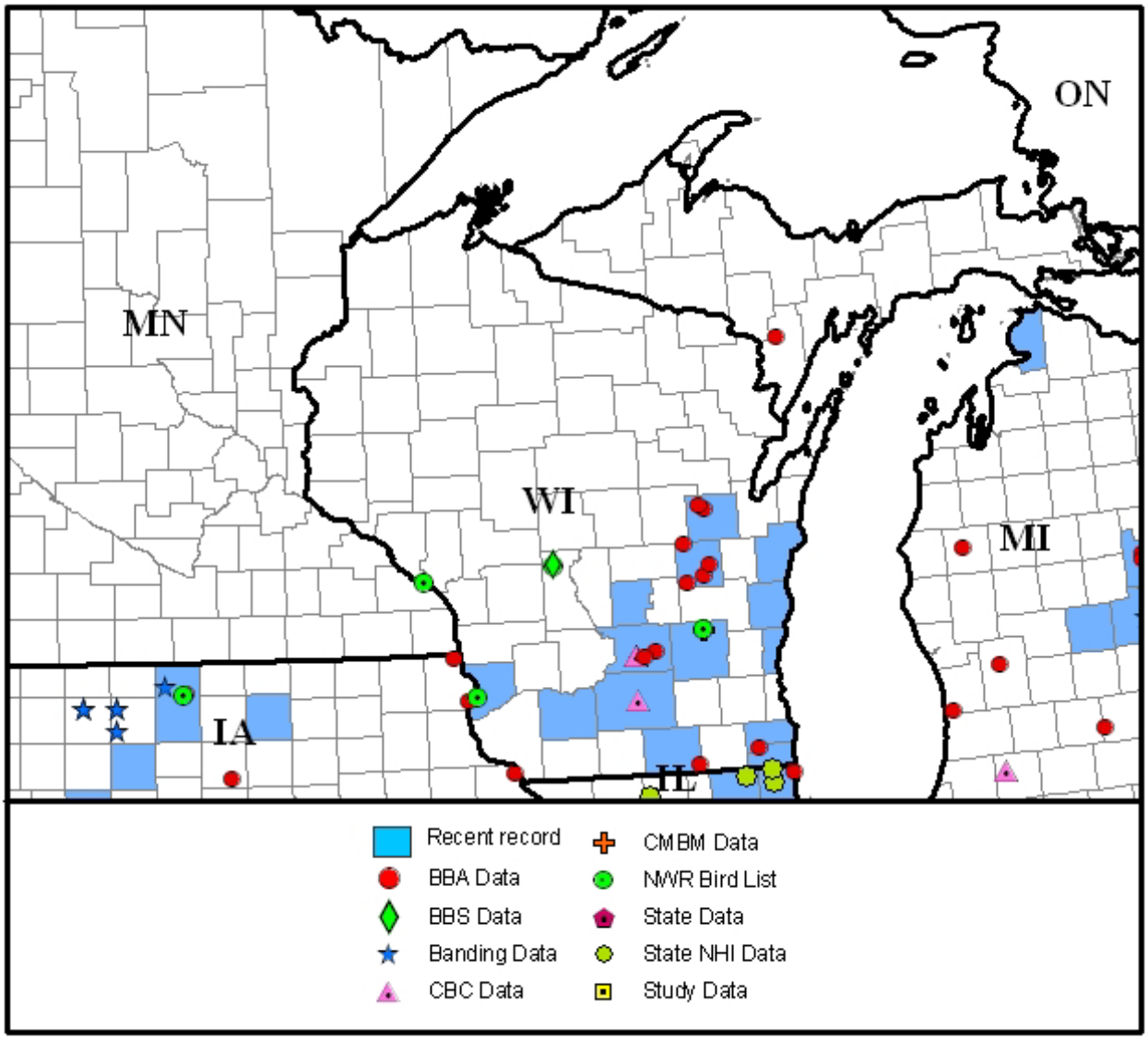


Figure 49. Distribution of the King Rail in Wisconsin showing documented locations and counties with records from 1996-2006.

Other States

Maine and New Hampshire are on the northeast edge of the King Rail range. The King Rail is not a species of greatest conservation concern in either state. Great Bay NWR in New Hampshire recorded a single bird while conducting surveys using CMBM protocols and there are recent records from Coos (Chewonki Marsh on Lake Umbagog NWR) and Rockingham (near Hampton) Counties. In Maine, a single observation was reported from Scarborough WMA in Cumberland County. Four NWRs from Maine (Sunkhaze Meadows, Aroostook, Moosehorn, and Rachel Carson) responding to the King Rail survey indicated the species was not present.

North and South Dakota are on the northwest edge of the King Rail range. There have been a few, scattered records from these states over the past 40 years. Stewart (1975) listed the King Rail as a hypothetical breeder in North Dakota with no confirmed nesting records. There were 7 records in North Dakota during 1950-72, all coming from southeastern North Dakota with 4 of the records from Stutsman County (Stewart 1975). Eight NWR or Refuge Complexes from North Dakota indicated the King Rail is not present. King Rail are listed as accidental in South Dakota with only three breeding records from 1952, 1974 and 1977 (South Dakota Ornithologists' Union 1991, Tallman et al. 2002). All refuges except one responding from South Dakota indicated the absence of King Rail with the exception of the Madison Wetland Management District which reported a few historic records from prior to the 1950's. A 2004 status assessment for the King Rail in the Midwest estimated a breeding population of 0-5 pairs in South Dakota and 0-1 pairs in North Dakota (MFCTS Migratory Game Bird Committee 2004).

Ontario

Bird Conservation Regions: 28 **Status:** Federally and provincially (Ontario) endangered

Natural Heritage Rank: S1B

Regional Waterbird Plan(s): Upper Mississippi Valley/Great Lakes Region. Sites of importance identified in the plan were Eastern Lake St. Clair, Greater Rondeau Area, Long Point Peninsula and Marshes, Matchedash Bay, Pelee Island Natural Areas, Presqu'ile Provincial Park, Tiny Marsh, Wye Marsh

Breeding Bird Atlas: (McCracken and Sutherland 1987) King Rail were recorded as possible (9), probable (7), and confirmed (0) in a total 16 squares out of 1824 squares surveyed in the state during the 1981 through 1985 project. All locations were from southwestern Ontario. The distribution indicated by the atlas project matches historic records for distribution.

Other Sources: James (2000) completed a thorough status assessment for the King Rail in Canada. The following are excerpts from the assessment. The report indicated that the King Rail has experienced large declines over the past 30 years. The species was formerly common in the Lake St. Clair area of Ontario and was probably common in large marshes around Lake Erie. Data suggests the population has declined from approximately 300 pairs in the 1980's to less than 50 pairs by the late 1990's. Surveys conducted in 1999 recorded only 27 birds. Twenty five were from the Lake St. Clair-Walpole Island marshes and one each at Loin Point Marshes and Presqu'ile marshes. Because of its rare status, the King Rail was assigned vulnerable status in 1985 and endangered status in the early 1990's.

Summary: The King Rail is a rare breeding bird in southwestern Ontario. Severe declines over the past 30 years have warranted the species to be classified as endangered in Canada. The Walpole Island – Lake St. Clair Marshes have the highest remaining populations.

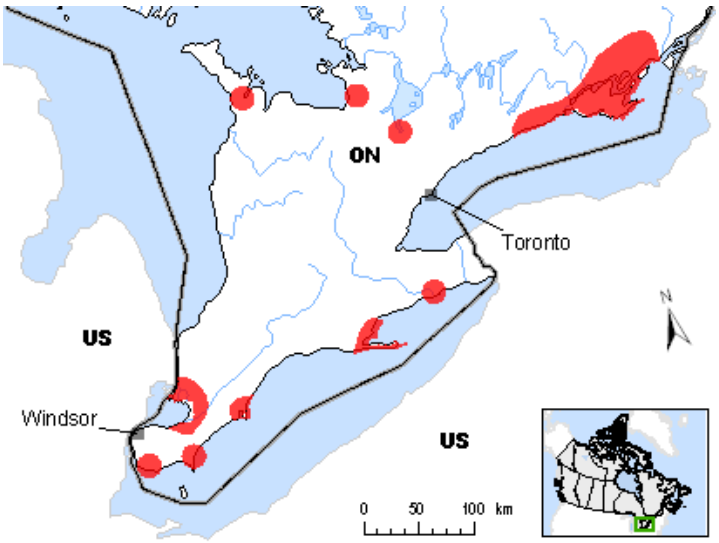


Figure 49. Distribution of the King Rail in Ontario, Canada (Canadian Wildlife Service 2004).

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Appendix A - Participants at the King Rail Conservation Workshop*

First Name	Last Name	Affiliation	E-Mail
Michael	Budd	Arkansas Coop Research Unit	mbudd@ducks.org
Warren	Conway	Stephen F. Austin State University	wconway@sfasu.edu
Tom	Cooper	USFWS – Region 3 Migratory Birds	tom_cooper@fws.gov
Abigail	Darrah	Arkansas Coop Research Unit	adarrah@uark.edu
Bill	Eddleman	SE Missouri State University	weddleman@semo.edu
Dave	Ellis	USFWS – Clarence Cannon NWR	dave_ellis@fws.gov
Suzanne	Fellows	USFWS – Region 6 Migratory Birds	suzanne_fellows@fws.gov
Bob	Ford	USFWS – Region 4 Migratory Birds	robert_p_ford@fws.gov
Rex	Johnson	USFWS – Region 3 HAPET Office	rex_johnson@fws.gov
Sammy	King	Louisiana Coop Research Unit	sking16@lsu.edu
Dave	Krementz	Arkansas Coop Research Unit	krementz@uark.edu
Brian	Loges	Missouri Department of Conservation	Brian.Loges@mdc.mo.gov
Stefani	Melvin	USFWS – Region 4 Migratory Birds	stefani_melvin@fws.gov
Jim	Neal	USFWS – Nacogdoches Field Office	jim_neal@fws.gov
Marie	Perkins	Louisiana Coop Research Unit	mperki6@lsu.edu
Sergio	Pierluissi	USFWS/LA Coop. Research Unit	sergio_pierluissi@fws.gov
Karen	Rowe	Arkansas Game and Fish Commission	krowe@agfc.state.ar.us
Bob	Russell	USFWS – Region 3 Migratory Birds	robert_russell@fws.gov
Mark	Seamans	USFWS – Region 9 Migratory Birds	mark_seamans@fws.gov
Bob	Strader	USFWS – Jackson Migratory Bird Office	bob_strader@fws.gov
Jonathon	Valente	LA Coop Research Unit	jvalen5@lsu.edu
Bill	Vermillion	USFWS – Gulf Coast Joint Venture	william_vermillion@fws.ogv
Jennifer	Wheeler	USFWS – Waterbird Cons.Coordinator	jennifer_wheeler@fws.gov
Tom	Will	USFWS – Region 3 Migratory Birds	tom_will@fws.gov
Randy	Wilson	USFWS – Lower Miss. Joint Venture	randy_wilson@fws.gov

* Workshop was held November 14-15 at the Ducks Unlimited National Headquarters in Memphis, Tennessee.

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Note: State Wildlife Action Plans can be accessed by at http://www.wildlifeactionplans.org/.

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Appendix C. Examples of King Rail Habitat

(All photos are from sites where King Rail presence has been documented)

Photo is from a Wetland Reserve Program restoration site in the Delta Region of eastern Arkansas and shows dense emergent throughout restoration site. (Photo by Jennifer Wheeler, USFWS).

Photo is from a rice farm in southwestern Louisiana which is used by King Rail. Note residual vegetation on ditch in foreground and on the levees. The residual vegetation provides refugia until the rice is tall enough to provide nesting habitat (Photo by Sergio Pierluissi, USFWS).

Photo is from the Hogwallow WRP restoration site in the Delta Region of eastern Arkansas and shows dense emergent vegetation, shallow water, and brood foraging habitat (Photo by Michael Budd, University of Arkansas).

Photo is from the B.K. Leach State Conservation Area located in northeast Missouri and shows dense emergent vegetation, shallow water, and brood foraging habitat (Photo by Abby Darrah, University of Arkansas).

Photo is from the St. Johns NWR located in east-central Florida. Site recently had a prescribed burn conducted as part of normal refuge management, which provides some open water areas (Photo by Tom Cooper, USFWS).

Photo is from the Merritt Island NWR located in east-central Florida and shows linear, swale habitat that is used by King Rail on the refuge. The swales develop between dunes (Photo by Tom Cooper, USFWS).