W&M ScholarWorks

CCB Technical Reports

Center for Conservation Biology (CCB)

2016

Status and distribution of the eastern black rail along the Atlantic and Gulf Coasts of North America

B. D. Watts
The Center for Conservation Biology, bdwatt@wm.edu

Follow this and additional works at: https://scholarworks.wm.edu/ccb_reports

Recommended Citation

Watts, B. D., "Status and distribution of the eastern black rail along the Atlantic and Gulf Coasts of North America" (2016). *CCB Technical Reports*. 315.
https://scholarworks.wm.edu/ccb_reports/315

This Report is brought to you for free and open access by the Center for Conservation Biology (CCB) at W&M ScholarWorks. It has been accepted for inclusion in CCB Technical Reports by an authorized administrator of W&M ScholarWorks. For more information, please contact scholarworks@wm.edu.

STATUS AND DISTRIBUTION OF THE EASTERN BLACK RAIL ALONG THE ATLANTIC AND GULF COASTS OF NORTH AMERICA

THE CENTER FOR CONSERVATION BIOLOGY

COLLEGE OF WILLIAM AND MARY

VIRGINIA COMMONWEALTH UNIVERSITY

Status and distribution of the eastern black rail along the Atlantic and Gulf Coasts of North America

Bryan D. Watts
The Center for Conservation Biology
College of William and Mary
Virginia Commonwealth University
Williamsburg, VA 23187-8795

Recommended Citation:

Watts, B. D. 2016. Status and distribution of the eastern black rail along the Atlantic and Gulf Coasts of North America. The Center for Conservation Biology Technical Report Series, CCBTR-16-09. College of William and Mary/Virginia Commonwealth University, Williamsburg, VA. 148 pp.

Project Funded By:
The Northeast Regional Conservation Needs Program
United States Fish and Wildlife Service
The Center for Conservation Biology

Cover Illustration: Virginia Greene

The Center for Conservation Biology is an organization dedicated to discovering innovative solutions to environmental problems that are both scientifically sound and practical within today's social context. Our philosophy has been to use a general systems approach to locate critical information needs and to plot a deliberate course of action to reach what we believe are essential information endpoints.

Table of Contents

Contents

Executive Summary 1

Acknowledgments 2

Introduction 3

Objective 4

Methods 4

- Study Area 4
- Source Materials 6
  - Literature 6
  - Museum Specimens 7
  - e-bird 7
  - Targeted Black Rail Surveys 8
- Data Collection 8
  - Spatial Resolution 8
  - Anecdotal Data 8
- Status 9
  - Legal Status and Ranking 9
  - Population Size 9
  - Uncertainty 9
  - Trends 10
- Likelihood of Breeding 10
- Habitat Use 11
  - Grassy Fields 11
  - Freshwater Wetlands 12
  - Impoundments 12
  - Coastal Prairies 12
  - Tidal Salt Marshes 12

Results 13

- Study-Wide 13
  - Legal Status and Rank 13

TABLE OF CONTENTS

Historic Occurrence 14
Recent Occurrence 16
Northeast 20
Historic Occurrence 20
Recent Occurrence 22
Recent Population estimate 24
Trends 24
Narratives for Northeastern States 26
Maine 26
New Hampshire 28
Massachusetts 30
Rhode Island 34
Vermont 36
Connecticut 38
New York 42
Pennsylvania 46
New Jersey 50
Delaware 55
Maryland 59
Washington D.C. 65
Virginia 67
West Virginia 73
Southeast 75
Historic Occurrence 75
Recent Occurrence 77
Recent Population estimate 79
Trends 79
Narratives for Southeastern States 81
North Carolina 81
Tennessee 86
South Carolina 89

TABLE OF CONTENTS

Georgia 93

Florida 96

Alabama 103

Mississippi 106

Louisiana 108

Texas 111

Discussion 117

Distribution 117

Population Estimate 118

Population Trends 118

Habitat Use 120

Tidal Salt Marshes 121

Impoundments 122

Grassy Fields and Freshwater Wetlands 122

Coastal Prairie 122

Recommendations 123

Complete 2014-2018 coastal surveys 123

Establish inland survey network 123

Compile database of black rail surveys 123

Perform regional occupancy analysis 123

Literature Cited 124

Appendices 138

Appendix I. Summary of survey records by state. 138

Appendix II. Common and Latin names for referenced vegetation. 139

Appendix III. Summary of black rail occurrence records by county. 140

Appendix IV. Summary of black rail occurrence records by property. 138

Executive Summary

The black rail (*Laterallus jamaicensis*) is the most secretive of the secretive marsh birds and one of the least understood species in North America. The eastern black rail (*L. j. jamaicensis*) is listed as endangered in six eastern states and is a candidate for federal listing. Nearly all of what we know about the population exists in bits and pieces scattered throughout more than 100 years of literature, museum specimens and unpublished observations. The objective of this project is to identify, collect and compile all information pertaining to the breeding population along the Atlantic and Gulf coasts with the intention of developing the historical context needed to inform future conservation efforts.

The historic breeding range of the eastern black rail appears to have included coastal areas from south Texas north to the Newbury Marshes in Massachusetts and interior areas west to the eastern slope of the Appalachian Mountains. A total of 1,937 occurrence records were found within this area between 1836 and 2016. Credible evidence of occurrence was found for 21 of the 23 states including 174 counties, parishes and independent cities and 308 named properties. Based on breeding evidence and seasonality of occurrence 34 (19%) counties were classified as confirmed, 97 (56%) as probable breeding and 43 (25%) as possible breeding. Many of the named properties are well-known conservation lands including 46 (15%) national wildlife refuges, 44 (14%) state wildlife management areas, 26 (8%) state and municipal parks and many named lands managed by non-governmental conservation organizations.

A relatively soft estimate of current population size for black rails within the study area is 455 to 1,315 breeding pairs including ranges of 55 to 115 and 400 to 1,200 for the Northeast and Southeast regions respectively. More than 75% of the overall estimate is accounted for by South Carolina, Florida and Texas with the latter two having high uncertainty ratings due to extensive areas of potential habitat that have yet to be assessed. This collective estimate is approximately 40-50% lower than the estimate derived during the Southeast and Northeast black rail workshops held in 2014. The difference reflects ongoing declines, an increase in survey coverage of geographic gaps and a more thorough assessment of available information.

Black rails within northern areas have experienced a catastrophic decline including a contraction of the northern range limit from Massachusetts to New Jersey a distance of approximately 450 km. Study areas in New Jersey, Delaware, Maryland and North Carolina that were surveyed in the late 1980s and early 1990s and again over the past two years have documented a 64% decline in occupancy and an 89% decline in birds detected equating to a 9.2% annual rate of decline. Maryland has experienced a 13.8% annual rate of decline. South Carolina has experienced a 4.7% rate of decline over the same time period. No information is available to assess trends for areas south of South Carolina.

Black rails within the study area have primarily been documented within sites with tidal salt marsh as the primary habitat. Of the 308 properties with documented use, 186 (60%) were salt marshes, 49 (16%) were impoundments, 36 (12%) were freshwater wetlands, 20 (6%) were coastal prairies and 17 (6%) were grassy fields. Of the sites documented within salt marshes, 65 (35%) were along the lee side of barrier islands with the remaining in estuaries or along unprotected coastlines. Impoundments included waterfowl management units, rice fields, wetland restoration or mitigation sites, spoil deposition sites, abandoned mines and farm ponds.

Acknowledgments

This project was partially funded through RCN GRANT 2011-01 (Support for Status Assessment for the Eastern Black Rail across the Northeast Region) by State Wildlife Grant funding awarded through the Northeast Regional Conservation Needs (RCN) Program. The RCN Program joins thirteen northeast states, the District of Columbia, and the U.S. Fish and Wildlife Service in a partnership to address landscape-scale, regional wildlife conservation issues. Progress on these regional issues is achieved through combining resources, leveraging funds, and prioritizing conservation actions identified in the State Wildlife Action Plans. See RCNGrants.org for more information. The grant and associated conservation activities are done to support implementation of a priority action of the State Wildlife Action Plans from members of the Northeast Association of Fish and Wildlife Agencies. Additional funds were provided by the U.S. Fish and Wildlife Service (Southeast Region) and The Center for Conservation Biology. I thank the many editors who provided access to electronic archives and recent issues of regional and local journals including Ned Brinkley, Renee' Carleton, Bob Ford, Matthew Halley, Geoff Malosh, John Marsh, Wayne Petersen, Marsha Salett, Gene Scarpulla, Rebecca Suomala and Eric Swanzey. Many biologists including participants in the Eastern Black Rail Working Group have provided unpublished documents and government reports including Harry Armistead, Dave Brinker, Bill Burt, Jack Chiles, Christina Davis, Imer DeLaGarza, Tom Erdman, Anthony Gonzon, Clay Green, John Fussell, Christi Hand, Diana Iriarte, Katie Koch, Jim McCann, David Mizrahi, Amanda Moore, Brent Ortego, Todd Schneider, Amy Schwarzer, Sara Schweitzer, John Stanton, Kelli Stone, James Tolliver, Nellie Tsipoura, Patrick Walther, Craig Watson, Whitney Wiest and Jean Woods. Chris Wood and Brian Sullivan allowed access to the great reservoir of e-bird data. The author rather than contributors is responsible for any errors in data reproduction or omission. Virginia Greene assisted with production of the working bibliography and the occurrence database. I thank Erica Lawler and Jane Lopez of the Office of Sponsored Programs, College of William and Mary for fiscal and administrative oversight. Scot Williamson and Meghan Gilbart provided administrative oversight from the Wildlife Management Institute. This project would not have been possible without the commitment and expertise of the biologist and staff within The Center for Conservation Biology. I am grateful to Bart Paxton, Gail Penn, Marie Pitts, Fletcher Smith and Marian Watts for assistance in gathering and managing materials and assisting with the production of the digital library and final report. Bart Paxton produced maps and Marie Pitts laid out the report. Finally, I thank Mike Wilson for all of his efforts to advance the conservation of the black rail in eastern North America.

Introduction

The black rail (*Laterallus jamaicensis*) is the most secretive of the secretive marsh birds and one of the least understood species in North America. Referred to by Sprunt (1957) as a "feathered mouse" black rails rarely venture out from the most rank vegetation available. Because of their secretive habits the species was not recognized by the ornithological community as a bird occurring in North America until Dr. Thomas Rowan captured an adult male with four young on 22 July, 1836 on his farm in Philadelphia and brought them live to Titian Peale (Allen 1900). Later that fall, Peale would send specimens to Audubon and they would be the basis of his plate on the species and a declaration of their occurrence on the continent. As additional specimens and observations were collected a rough outline of their distribution would slowly unfold over the next century (e.g. Baird et al. 1884, Brewster 1907, Eaton 1910, Cooke 1929, Forbush 1929, Stone 1937).

The black rail breeds in tidal and freshwater marshes within disjunct ranges throughout the Americas with two subspecies including the California black rail (*L. j. coturniculus*) and eastern black rail (*L. j. jamaicensis*) breeding in North America and three subspecies occurring elsewhere (Eddleman et al. 1994). The California black rail occurs in California, Arizona, Baja California Norte, and the Colorado River delta in Sonora (Evans et al. 1991). The North American population of the eastern black rail has historically occurred along the Atlantic Coast from Massachusetts to Florida, along the Gulf Coast from Florida to south Texas and within inland locations scattered across the mid-continent from Texas to the Great Lakes and west to Colorado and areas east of the Appalachian Mountains (Eddleman et al. 1994).

California and eastern black rail populations have been of recent conservation concern due to declines related to habitat loss and degradation (Eddleman et al. 1988, 1994). A population estimate of 10,000 to 25,000 individuals has been made for the California black rail (Wetlands International 2012) based on work with subpopulations (Repking and Ohmart 1977, Evans et al. 1991, Conway and Sulzman 2007, Richmond et al. 2008) and declines appear to be continuing (Evans et al. 1991, Conway and Sulzman 2007) particularly along the northern range limit. A global (including known areas in North America, Central America and Caribbean Basin) population estimate of 25,000 to 100,000 individuals has been published for the eastern black rail (Wetlands International 2012) based on a workshop assessment. Concern for the eastern black rail population in North America began to build in the late 1980s and early 1990s (e.g. Hands et al. 1989, Kerlinger and Sutton 1989, Hunter 1990, Davidson 1992) eventually leading to the formation in 2009 of the Eastern Black Rail Conservation and Management Working Group that has successfully brought biologists and agencies together around a common goal of collecting and sharing information for the purpose of developing a conservation strategy.

Despite the fact that eastern black rails were discovered breeding in Philadelphia more than 150 years ago, we know very little about the status, distribution and ecology of the eastern population. Nearly all of the information on the population exists in bits and pieces scattered throughout more than 100 years of literature, museum specimens and unpublished observations. Targeted surveys that included black rails were not initiated until the late 1980s (Kerlinger and Sutton 1989, Runde et al. 1990, Brinker and Therres 1992, Cely et al. 1993) and early surveys were geographically limited to either study areas or states. Since the establishment of the eastern working group targeted surveys (2014-2018) have been initiated on an unprecedented scale including new work in New Jersey, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida and Texas. Some early results from

these efforts paired with earlier surveys have documented catastrophic (>90%) declines particularly within the northern portions of the breeding range.

A high priority activity identified by the eastern black rail working group has been to identify, collect and compile all information pertaining to the population with the intention of developing the historical context needed to inform conservation efforts moving forward. The effort envisioned included three interrelated products including a working bibliography, a geo-referenced occurrence database derived from all available information sources and a status assessment that would build on resources from the previous two products. Both the working bibliography (Watts and Greene 2016) and the occurrence database (Watts 2016) have been completed.

Objective

The objective of this effort is to use the information resources compiled within the eastern black rail occurrence database to assess what is known about the status and distribution of black rails across multiple spatial scales including named properties, counties, states, geographic regions (Northeast and Southeast) and the eastern study area. Because the information is largely anecdotal the assessment is primarily descriptive.

Methods

Study Area

The eastern black rail has a broad but poorly known breeding range that includes the Atlantic and Gulf Coasts of North America, parts of Colorado, Oklahoma and the mid-west, the West Indies including Cuba, Jamaica and historically Puerto Rico and parts of Central America from Mexico through Panama (Eddleman et al. 1994). This assessment focuses on potential breeding areas of the eastern black rail in eastern North America including the Atlantic Coast (Maine through Florida), the Gulf Coast (Florida through Texas) and eastern inland states (including the District of Columbia) east of the Appalachian Mountains including Vermont, Pennsylvania, West Virginia and Tennessee (Figure 1).

Figure 1. Map of study area included in eastern black rail status assessment.

Source Materials

Every attempt was made to gather all information about eastern black rails that is pertinent to status and distribution throughout the study area. The status assessment builds on the eastern black rail bibliography and the eastern black rail occurrence database that have recently completed (Watts 2016, Watts and Greene 2016). In addition to literature, information was extracted from other information sources. Although I made a significant effort to locate and include primary materials pertaining to black rails within the geographic area it is certain that some materials were not found or were unavailable for inclusion.

Literature

We used several approaches to locate black rails in the literature. We searched more than 6,000 journal issues for primary material (Table 1). We included all journals within the geographic area that we believed had the potential to publish materials of interest. We searched breeding bird atlas treatments for states and jurisdictions within the focal geographic area and books or reports addressing bird status. We searched reports from state-level bird record committees and checklists. We searched written treatments of museum collections. We searched for graduate theses that were produced within the region that focused on either black rails directly or secretive marsh birds. We conducted an online search for government documents that might include black rails and sent letters to appropriate government biologists who might have access to unpublished reports or manuscripts. Once materials were located we expanded the reach by examining literature cited sections for new materials.

Table 1. Titles and time span of journals searched for black rail literature.

JOURNAL TITLES	COVERAGE
The Oologist	1875 to 1881
Bulletin of the Nuttall Ornithological Club	1876 to 1883
The Ornithologist and Oologist	1881 to 1893
The Auk	1884 to 2015
The Wilson Bulletin/Wilson Journal of Ornithology	1889 to 2015
Cassinia	1890 to 2015
The Nidologist	1893 to 1897
The Osprey	1896 to 1902
Bird Lore	1899 to 1945
The Condor	1899 to 2015
The Warbler	1905 to 1913
Bird-Banding	1930 to 1979
The Raven	1930 to 2015
The Migrant	1930 to 2015
The Redstart	1933 to 2015

JOURNAL TITLES	COVERAGE
The Chat	1935 to 2015
The Oriole	1936 to 2015
Audubon Magazine, Section II	1941 to 1945
Maryland Birdlife	1945 to 2015
The Wood Thrush	1946 to 1950
Audubon Field Notes	1946 to 1970
Atlantic Naturalist	1950 to 1990
Kingbird	1950 to 2015
Alabama Birdlife	1953 to 2015
Delmarva Ornithologist	1964 to 2015
Bulletin of Texas Ornithological Society	1967 to 2015
American Birds	1971 to 2015
Florida Field Naturalist	1973 to 2015
Bird Observer	1973 to 2015
Waterbirds	1976 to 2015
Journal of Field Ornithology	1980 to 2015
The Connecticut Warbler	1981 to 2015
New Hampshire Bird Records	1981 to 2015
Pennsylvania Birds	1987 to 2015
Virginia Birds	2004 to 2015
New Jersey Birds	2006 to 2009

Museum Specimens

We searched online databases (e.g. Vertnet, Indigbio) for black rail specimens including skins, eggs, tissues and audio recordings within the study area. Specimen records not entered into online databases were provided by the Delaware Museum of Natural History and the Richter Collection of Natural History. The study area does include many small museums that do not currently participate in online catalogs and many specimens have been distributed throughout the world. No systematic attempt was made to contact all of these collections independently.

e-bird

Cornell Laboratory of Ornithology allowed access to all black rail records. Records were downloaded for assessment on 21 July, 2016. Records were sorted for geography and date but could not be independently validated. However, due to the conservation interest in black rails many states request details about sighting and e-bird entries often have detailed accounts of characteristics used for identification, photos or audio recordings attached. It should be noted that e-bird is a dynamic database with not only new but historic

records being added daily. Information about the past distribution may continue to unfold as historic records are uploaded.

Targeted Black Rail Surveys

Since the 1970s there have been a considerable number of targeted surveys for black rails throughout the study area (Appendix I) including the establishment and survey of more than 6,000 points. Some of these surveys have been published and some have not. Particularly since 2012 a wave of black rail surveys have been conducted to assess status in states including New Jersey, Maryland, Virginia, North Carolina, South Carolina, Florida and Texas. We contacted biologists leading those surveys to inquire about including recent data in the assessment.

Data Collection

I examined all information sources for records that included date and location. All records found were used to populate an occurrence database that included source, date, observer, observation, state, county, property, any landmarks and coordinates when available. The resulting occurrence database (Watts 2016) along with other materials gained from the literature sources was used to compile the status assessment.

Spatial Resolution

Information used to populate the occurrence database came from a wide range of sources and circumstances spanning more than 150 years. It was necessary to find units of space that would accommodate this range and allow for a consistent representation of the data over time. To accomplish this I used three levels of spatial resolution including counties, properties and observational coordinates. Although data resolution improves across this range the proportion of the total occurrences included declines. Counties (including parishes in Louisiana and some independent cities in Virginia) are a consistently reported jurisdictional unit across the study area and virtually 100% of observations could be attributed to the county level. Properties are defined parcels of land (e.g. national wildlife refuges, state wildlife management areas, state parks, islands, marsh complexes) where names are consistently used and recognizable. More than 90% of all observations could be attributed to a named property. Observational coordinates are typically high resolution locations recorded during the observation or in the case of targeted surveys, the point location where the survey is conducted. The availability of coordinates associated with observations is relatively recent and accounts for less than 30% of the total observations. Although included in the occurrence database, the observational coordinates will not be used within the assessment.

Anecdotal Data

Black rails are extremely secretive and often occur in remote locations. The vast majority of black rail observations across the study area are anecdotal in nature. It is important to note that this type of information

comes with a number of inherent biases that limits its use. Unlike systematic surveys anecdotal observations emphasize positive over negative data. Observers report where birds have been seen but rarely report on where they have been and not seen them. The implication of this in understanding distribution is that we identify areas where a species has been but not where they are absent. There is a similar concern in using anecdotal information to assess trends because we have reports of when birds have been observed but not when they are absent. We are left to assume that where and when birds do not occur in the observational record that they did not occur. Anecdotal information is useful in assessing descriptive patterns such as broad distribution, migration phenology, seasonality of breeding, etc. From a practical standpoint we have to acknowledge and accept the fact that most of the information that exists on the status of the black rail in the study area is anecdotal in nature and while this is not perfect it is all that we will ever have. We have the opportunity to improve the quality of information moving forward.

Status

Legal Status and Ranking

I investigated the legal status and natural heritage ranks for each state by searching state wildlife agency and natural heritage online sites for the most recent listings. Of particular interest were any special legal protections (e.g. state endangered, state threatened, species of special concern) provided by the state for black rails. Of additional interest were the ranks (e.g. critically imperiled, imperiled) assigned to black rails by natural heritage programs.

Population Size

I used the best available information to assess population size on a state by state basis. Due to the quality of available information, population size ranges should be considered soft at best. Assessments were made by examining the most recent information available. Many of the states south of New York have recently completed targeted black rail surveys or are conducting surveys. Assessments used recent observations or survey information in conjunction with coverage of available habitat to produce a "reasonable" range of values. At present there is no method available for independently assessing this range. The estimated range was compared to that derived during the black rail workshops convened in both the southeast and northeast regions in 2014.

Uncertainty

Uncertainty in population estimates may stem from a number of sources including a survey's capacity for estimation (e.g. adequate sampling, seasonal coverage, detection probability) or geographic coverage relative to the range of occurrence. Although geographic variation in the density of sampling units or the number of surveys conducted to overcome low detection probability is certainly a problem within the study area, the uncertainty referenced in this assessment is only related to perceived voids in coverage. In some states, many areas that appear to support suitable habitat or for which there are reports have never been surveyed for black

rails. If geographic voids in coverage are large within a state, I considered uncertainty in the distribution and population estimate to be high. If coverage of habitat was complete or nearly so then I considered uncertainty to be low. These are qualitative assessments.

Trends

Very few states have a chronosequence of survey information that allows for an assessment of temporal trends. Due to the quality of available information, trends in both distribution and abundance were difficult to assess. I presented the best available information state by state that had relevance to potential trends. In some cases this was a change in occurrence or distribution over time. In other cases this was a series of surveys within specific sites or the entire state. In no case was a formal trend analysis performed.

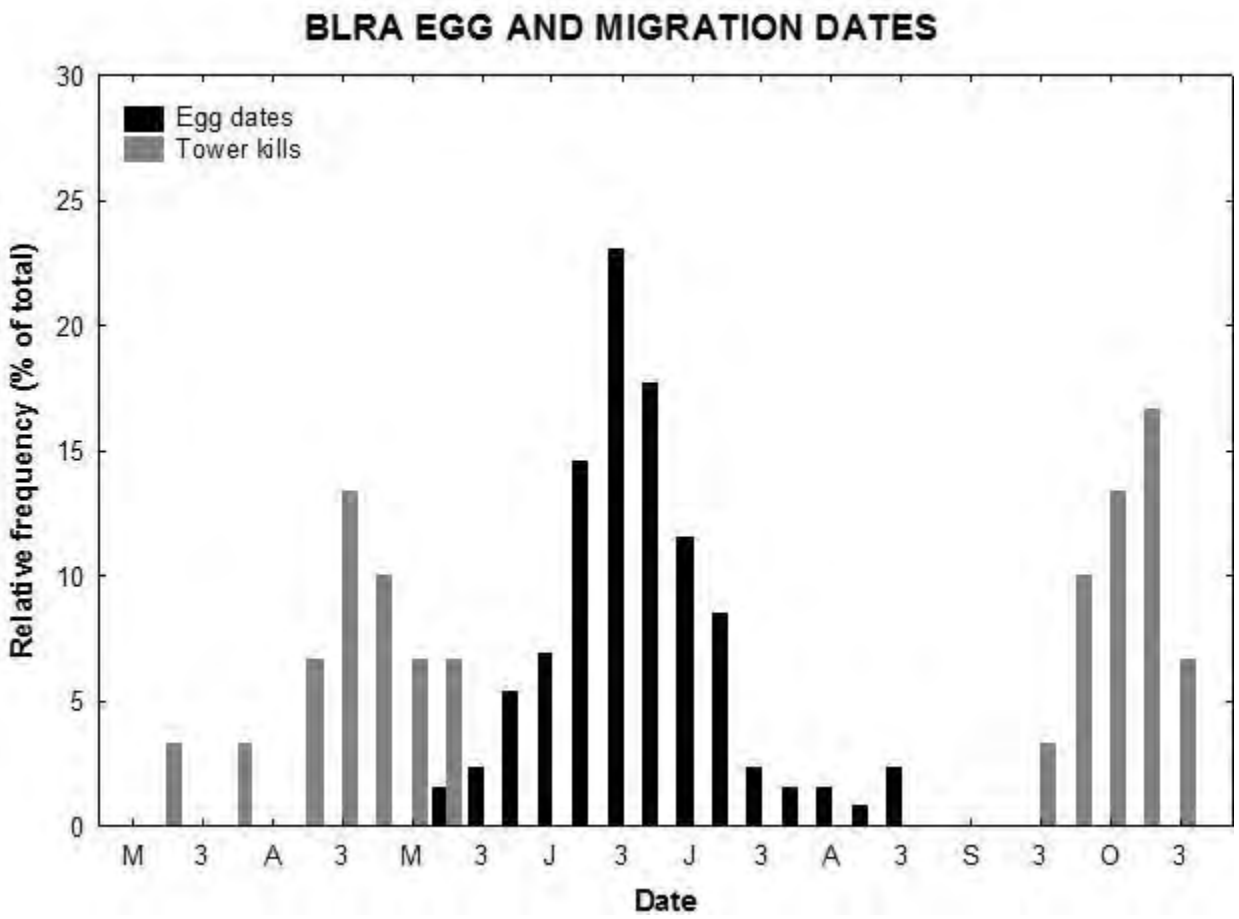
Likelihood of Breeding

Three categories of breeding status were used throughout this assessment including confirmed, probable and possible. Similar to most breeding bird atlases, breeding was considered to be confirmed within a location when a nest with eggs was found or young were observed. In almost all circumstances of confirmed breeding these conditions were met. An uncommon (<5 cases) extension of these conditions that was also classified as confirmed is when fledged juveniles were observed before the end of August. Aside from sites with confirmation of breeding, the seasonality of the observation was used to classify breeding status.

As with many migrant species, the separation of migrants from breeders has always been problematic for black rails. Birds begin to arrive and call within northern breeding grounds in April and early May (e.g. Bull 1964, Hess et al. 2000, McWilliams and Brauning 2000) but are these birds staying or just passing through? Our ability to clarify the transition between migration and breeding is made more difficult by the tendency of black rails to reduce calling when eggs are laid (Legare et al. 1999). Virtually all survey efforts in the northern reach of the breeding range (e.g. Kerlinger and Sutton 1989, Wilson et al. 2009, Mylecraine et al. 2015) show a reduction in calling and detection rate through May and into early June which has fueled the belief that these birds may be passing through. The situation is equally problematic within the southern reach of the breeding range where overwintering birds overlap with the breeding population and migrants are believed to depart in March. Are birds calling in April or early May breeders or stragglers that will ultimately migrate north?

In order to evaluate date of observation relative to likelihood of breeding, I examined the phenology of 1) egg dates (N = 146) across the study area and 2) mortalities (e.g. Stoddard 1962, Browne and Post 1972, Carter and Parnell 1978) of presumed migrants. I assumed that birds that were killed by flying into radio towers or lighthouses were passage birds. I also assumed that birds shot by hunters while hunting sora within fall migration areas were also migrating. Not surprisingly, there is a clear break between egg dates and the presumed fall migration (Figure 2). However, there is some overlap between presumed migrants and egg dates within the early May period. For the purpose of this assessment, probable breeding is considered to be the period between 15 May and 31 August and possible breeding is considered to be the period between 1 April and 15 May. For readers who would prefer to use a different transition date, observation phenology is provided for counties and properties in Appendix III and IV respectively.

Figure 2. Breeding (egg dates) and migration (tower kills) phenology for eastern black rails within the study area.



Habitat Use

I extracted habitat information directly from occurrence locations and descriptions when possible. Many literature accounts described habitat where birds were observed or where nests were found. Many specimen record cards provide a description of vegetation surrounding nests. For accounts that did not provide habitat descriptions but provided adequate location information, I inferred habitat types from locations. I grouped habitats into five categories including grassy fields, freshwater wetlands, impoundments, coastal prairies and tidal salt marshes. Plant species names that are included in this report are provided in Appendix II.

Grassy Fields

This habitat category includes a gradient of open, early successional habitats that range from fallow fields dominated by mixed grasses and forbs to hay fields or pastures to agricultural fields or row crops.

Freshwater Wetlands

This habitat category includes all nontidal, emergent wetlands ranging from sedge and rush meadows to cattail marshes. Also included in this category were a small number of sites where birds were described using tidal fresh marshes. Not included in this category were sites within impoundments. Although the majority of impounded wetlands were freshwater, these sites were considered separately.

Impoundments

A range of impounded to semi-impounded wetlands was lumped into this habitat category including sewage treatment plants, wetland mitigation sites, reservoirs, waterfowl management impoundments, moist soil units and semi-impounded salt marshes.

Coastal Prairies

The habitat included here is inland of most tidal influence as high marsh grades into grasslands including indiangrass, big and little bluestem and switchgrass. The areas may include intermixed spartina species. This habitat is distributed along the coast of Texas and Louisiana. The hydrology is dominated by rainfall. The wet and dry prairies of Florida were lumped into this habitat category. Although not classic coastal prairie they share some of the same characteristics of rain-driven hydrology with often short hydroperiods.

Tidal Salt Marshes

This habitat includes brackish and saltwater emergent marshes along the Atlantic and Gulf coasts. These marshes support low and high components where the low marsh is inundated daily and the high marsh is inundated irregularly on lunar or wind tides. The specific vegetation occupying these zones varies geographically. Salt marshes are found in two distinct landscape settings along the coasts including on the lee side of barrier islands and within estuaries or unprotected coastlines.

Results

Study-Wide

Legal Status and Rank

Black rails are listed as endangered within six states throughout the study area and are considered a species of special concern within North Carolina (Table 2). The geographic pattern of ranking reflects the perception of distribution and population changes. Black rails are not listed north of Connecticut where the species is believed to either have been extirpated or never to have occurred in the states. Populations within the mid-Atlantic states are listed as endangered reflecting concerns about recent declines. Black rails are not listed in southern states indicating the lack of historic occurrence, a general lack of status information or the perception that populations have not declined. In general natural heritage ranks follow the geographic pattern of state listing except within the southeast where assigned ranks generally indicate some level of imperilment

TABLE 2. State listing and natural heritage ranks for black rails within states throughout the study area.

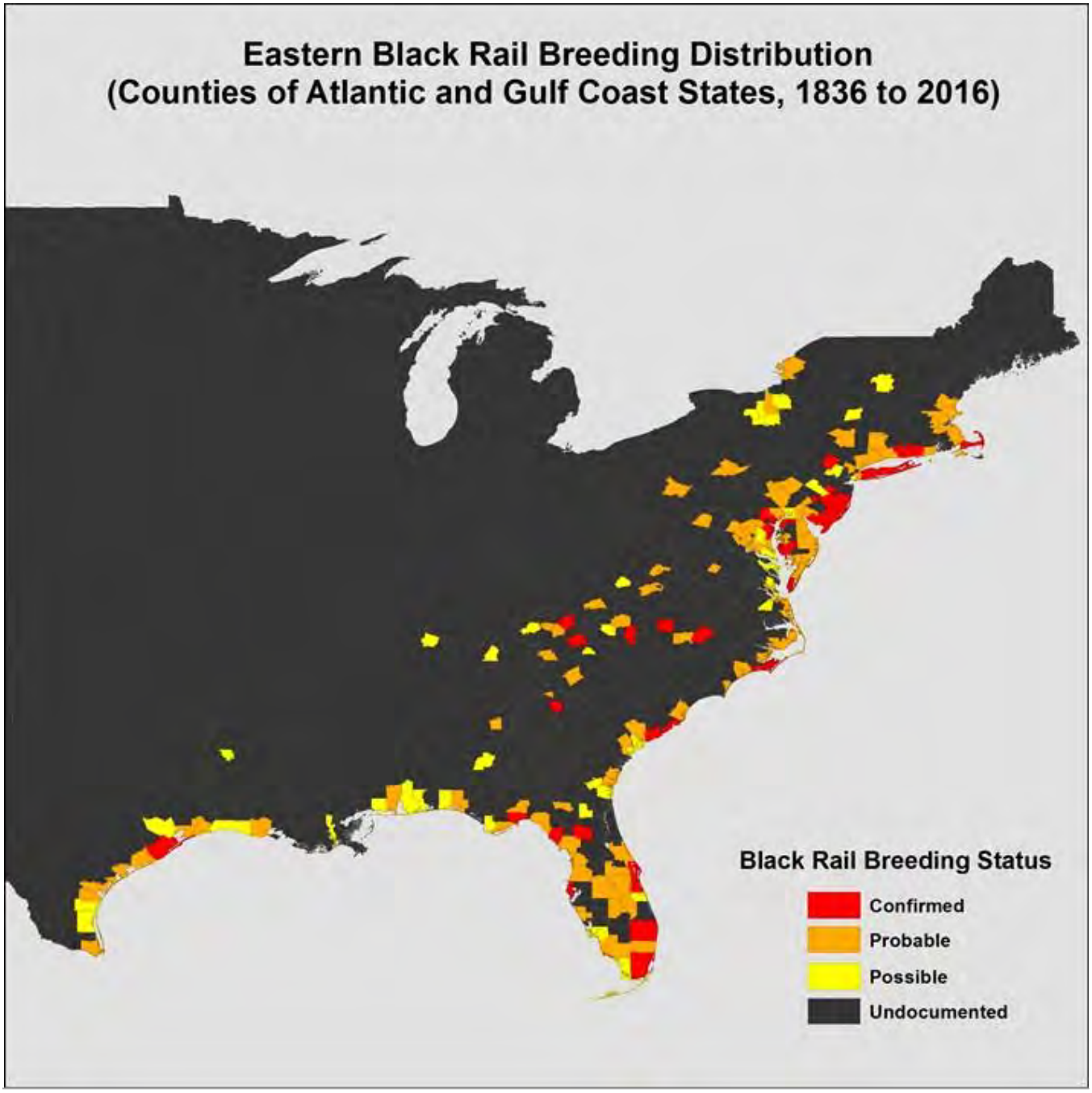
STATE	STATE LISTING	HERITAGE RANK
Maine	Not Listed	No Rank
New Hampshire	Not Listed	No Rank
Massachusetts	Not Listed	No Rank
Vermont	Not Listed	No Rank
Rhode Island	Not Listed	No Rank
Connecticut	Endangered	S1 (Critically Imperiled)
New York	Endangered	S1 (Critically Imperiled)
Pennsylvania	Not Listed	No Rank
New Jersey	Endangered	S2 (Imperiled)
Delaware	Endangered	S1 (Critically Imperiled)
Maryland	Endangered	S1 (Critically Imperiled)
District of Columbia	Not Listed	SH (Possibly Extirpated)
Virginia	Endangered	S1 (Critically Imperiled)
West Virginia	Not Listed	No Rank
North Carolina	Special Concern	S2 (Imperiled)
Tennessee	Not Listed	No Rank
South Carolina	Not Listed	SNR (Unranked)
Georgia	Not Listed	S1 (Critically Imperiled)
Florida	Not Listed	S2 (Imperiled)
Alabama	Not Listed	S2 (Imperiled)
Mississippi	Not Listed	S2 (Imperiled)
Louisiana	Not Listed	S2 (Imperiled)
Texas	Not Listed	S2 (Imperiled)

Historic Occurrence

A total of 1,937 occurrence records were found during the defined breeding period within the study area between 1836 and 2016. This included some redundancy as many records were reported and misreported through time. Credible evidence of occurrence was found for 21 of the 23 states (and the District of Columbia) included in the study area. States with no historic records during the breeding season include Maine and Vermont. Records of black rail occurrence were found for 174 counties, parishes and independent cities across the study area (Figure 3, Appendix III). Based on breeding evidence and seasonality of occurrence 34 (19%) counties were classified as confirmed, 97 (56%) as probable breeding and 43 (25%) as possible breeding.

Black rails have been documented to occur within a significant number (N = 308) of named properties (Appendix IV). Many of these properties are well-known conservation lands including 46 (15%) national wildlife refuges, 44 (14%) state wildlife management areas, 26 (8%) state and municipal parks and many named lands managed by non-governmental conservation organizations. Based on breeding evidence and seasonality of occurrence 49 (16%) properties were classified as confirmed, 196 (64%) as probable breeding and 63 (20%) as possible breeding.

Figure 3. Map of counties with historic (1836-2016) credible records of eastern black rails during the breeding period (1 April through 31 August).



Historic Breeding Range

The historic breeding range of the eastern black rail appears to have extended north along the Atlantic Coast to the Newbury Marshes in coastal Massachusetts and interior along the eastern slope of the Appalachian Mountains (Figure 3). Although a bird was calling in Rockingham County New Hampshire from 19 to 23 May, 2003 this was the first documented state record, has not been observed since and was only a short distance north of the Newbury Marshes of Massachusetts. Despite the controversy surrounding the breeding status in Massachusetts, given the number and seasonality of observations, breeding is probable as defined here. One of the more interesting aspects of the historic distribution is the number of documented inland locations stretching from Connecticut through Georgia. Although most of these occurrences were within the inner Coastal Plain and Piedmont, several extend into the Appalachians of West Virginia, North Carolina and Tennessee.

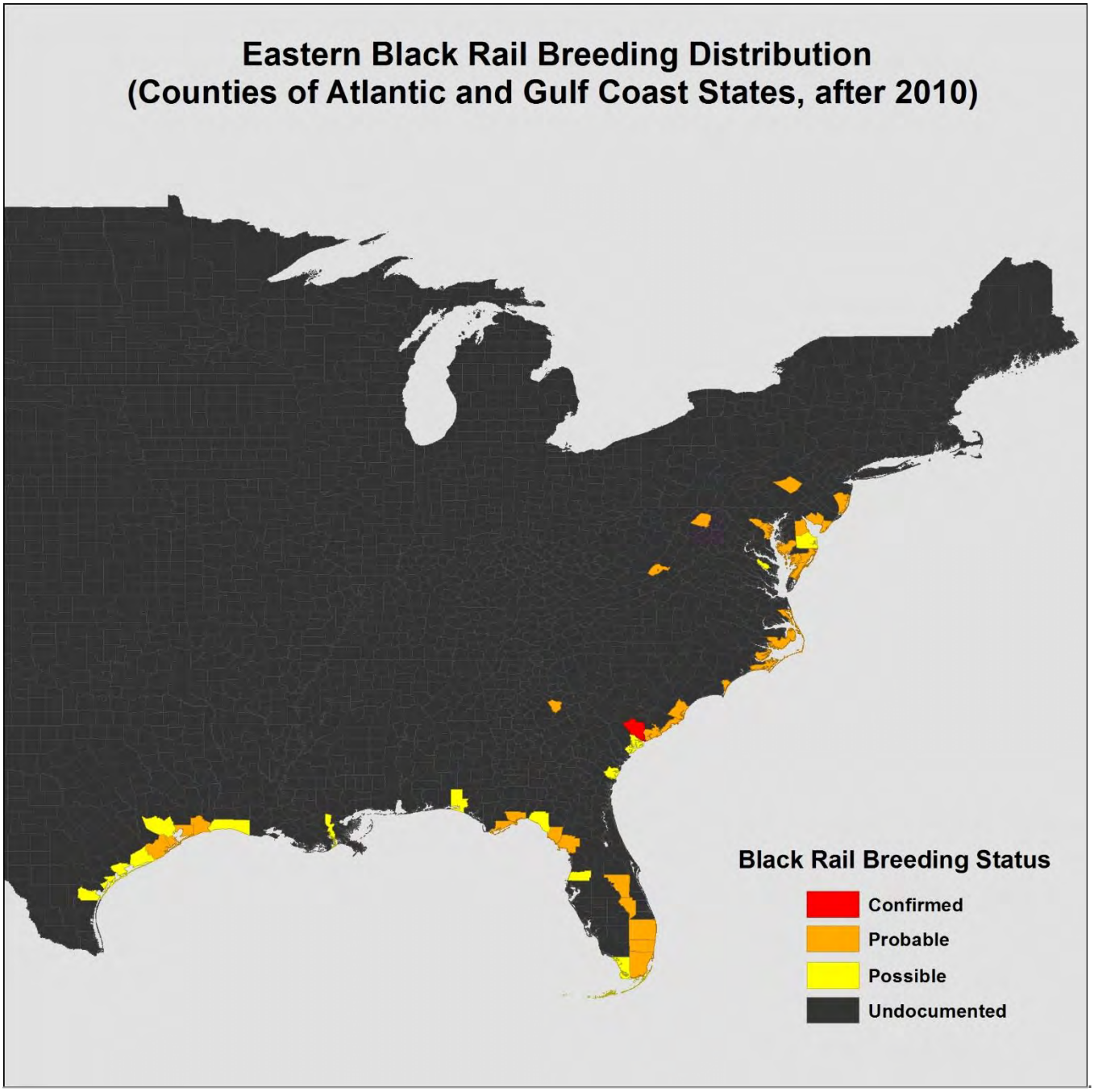
Historic Habitat Use

Black rails within the study area have primarily been documented within sites with tidal salt marsh as the primary habitat. Of the 308 properties with documented use, 186 (60%) were salt marshes, 49 (16%) were impoundments, 36 (12%) were freshwater wetlands, 20 (6%) were coastal prairies and 17 (6%) were grassy fields. Of the 186 sites documented within salt marshes, 65 (35%) were along the lee side of barrier islands with the remaining in estuaries or along unprotected coastlines. Impoundments included waterfowl management units, rice fields, wetland restoration or mitigation sites, spoil deposition sites, abandoned mines and farm ponds. Freshwater wetlands were primarily headwaters or fallouts around reservoirs and depressional wetlands within pastures. Only two sites documented included tidal fresh wetlands. Grassy fields were primarily hay fields but included row crops including grains and fallow fields with mixed grasses and forbs.

Recent Occurrence

Since 2010 247 black rail occurrences have been recorded within 11 of the 23 states in the study area. Records were found for 53 counties, parishes and independent cities (Figure 4). Based on breeding evidence and seasonality of occurrence 2 (4%) counties were classified as confirmed, 35 (66%) as probable breeding and 16 (30%) as possible breeding. Records were found for 92 named properties including 2 (3%) properties classified as confirmed, 73 (79%) as probable breeding and 17 (18%) properties classified as possible breeding.

Figure 4. Map of counties with recent (2011-2016) credible records of eastern black rails during the breeding period (1 April through 31 August).



Recent Breeding Range

The recent breeding range of eastern black rail appears to extend up the Atlantic Coast to Ocean County, New Jersey (Figure 4). This is a contraction south of approximately 450 km from the historic northern range limit. In recent years almost all records have been restricted to the outer coast. Exceptions include recent records in Berks County, Pennsylvania, Alleghany County, Virginia and the long-term site in Greene County, Georgia.

Recent Habitat Use

Recent sites where black rails have been documented continue to be dominated by tidal salt marsh habitat. Of the 92 properties with documented use since 2010, 56 (61%) have been salt marshes, 21 (23%) have been impoundments and 9 (10%) have been coastal prairies. The number of documented sites that are freshwater wetlands (4, 4%) and grassy fields (2, 2%) is collectively lower compared to those documented historically (6% vs 18%). Historically, use of these habitat types has been documented within inland locations. It is important to note that the large wave of black rail surveys that have been conducted since 2012 including a significant number of states and properties has focused on the outer areas of the Atlantic and Gulf coasts.

Recent Population Estimate

A relatively soft estimate of population size for breeding black rails within the study area is 455 to 1,315 pairs (Table 3, see state by state narratives below for details). Most (>85%) of this estimate is accounted for by the southeastern states. In particular, the three states of South Carolina, Florida and Texas account for more than 75% of the overall total. Uncertainty (based on recent survey coverage or the lack of records over the past decade) in the population estimates varies geographically with most states in the Northeast being assigned low to moderate uncertainty and some states in the Southeast being assigned moderate to high uncertainty. The high uncertainty in Florida and Texas is particularly consequential because these two states are currently believed to support a high (>65%) portion of the overall population. Completion of ongoing surveys in these states will hopefully help to narrow the estimated population range.

The collective population estimate presented here is approximately 40-50% lower than the estimate derived during the Southeast and Northeast Black Rails Workshops held in 2014 (Table 3). The difference reflects ongoing declines, an increase in survey coverage of geographic gaps and a more thorough assessment of available information. Since the 2014 meetings there has been a realization that populations in mid-Atlantic states have declined more than previously thought. However, both of these estimates should be considered very soft.

TABLE 3. Population estimates in breeding p airs from this status assessment and the Southeast and Northeast Black Rail workshops held in 2014. Level of uncertainty refers to the recent estimate.

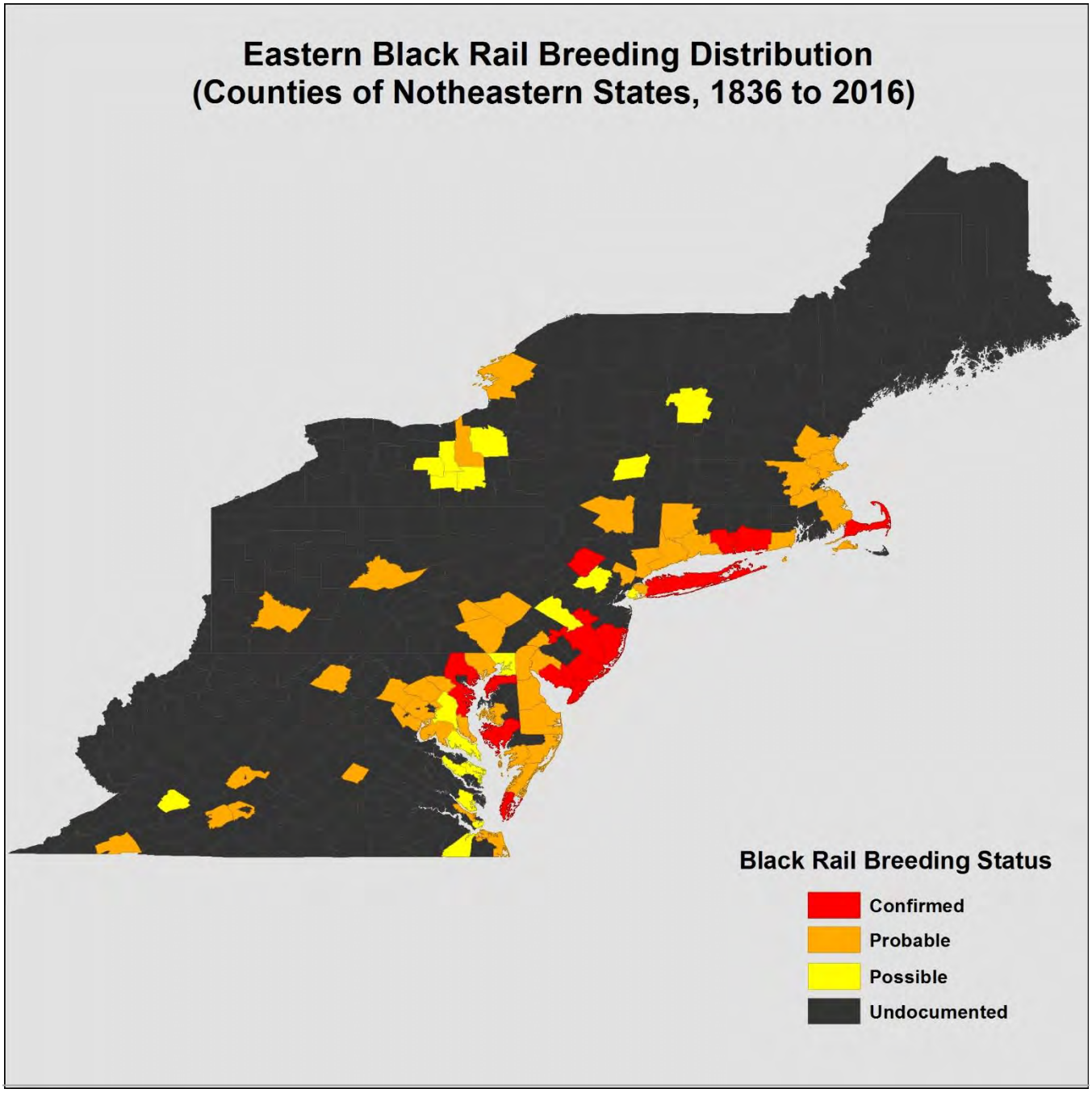
STATE	RECENT	UNCERTAINTY	2014 WORKSHOP
Maine	0	Low	0
New Hampshire	0	Low	0
Vermont	0	Low	0
Massachusetts	0	Moderate	0
Rhode Island	0	Low	0
Connecticut	0	Low	0
New York	0	Moderate	0
Pennsylvania	0-5	Low	0
New Jersey	40-60	Moderate	25-50
Delaware	0-10	Moderate	25-50
Maryland	15-30	Moderate	200-250
District of Columbia	0	Low	0
West Virginia	0	Low	0
Virginia	0-10	Moderate	20-50
Northeast Region	**55-115**		**270-400**
North Carolina	40-60	Moderate	50-100
South Carolina	50-100	Low	100-200
Tennessee	0	Low	0
Georgia	10-40	High	25-50
Florida	200-500	High	200-500
Alabama	0	Low	0
Mississippi	0	Low	0
Louisiana	0-10	High	0
Texas	100-500	High	300-1,000
Southeast Region	**400-1,200**		**675-1,850**
Study Area	**455-1,315**		**945-2,250**

Northeast

Historic Occurrence

The Northeast has the longest record of black rail occurrence in North America (Dr. Thomas Rowan brought an adult male with four young on 22 July, 1836 to Titian Peale that were collected in Philadelphia). A total of 1,108 occurrence records were found during the defined breeding period within the Northeast region between 1836 and 2016. Credible evidence of occurrence was found for 11 of the 13 states (including the District of Columbia) included in the region. States with no historic records during the breeding season include Maine and Vermont. Records of black rail occurrence were found for 85 counties and independent cities across the region (Figure 5). Based on breeding evidence and seasonality of occurrence 18 (21%) counties were classified as confirmed, 49 (58%) as probable breeding and 18 (21%) as possible breeding. Black rails have been documented to occur within 160 named properties in the Northeast. Based on breeding evidence and seasonality of occurrence 37 (23%) properties were classified as confirmed, 102 (64%) as probable breeding and 21 (13%) as possible breeding.

Figure 5. Map of Northeast counties with historic (1836-2016) credible records of eastern black rails during the breeding period (1 April through 31 August).



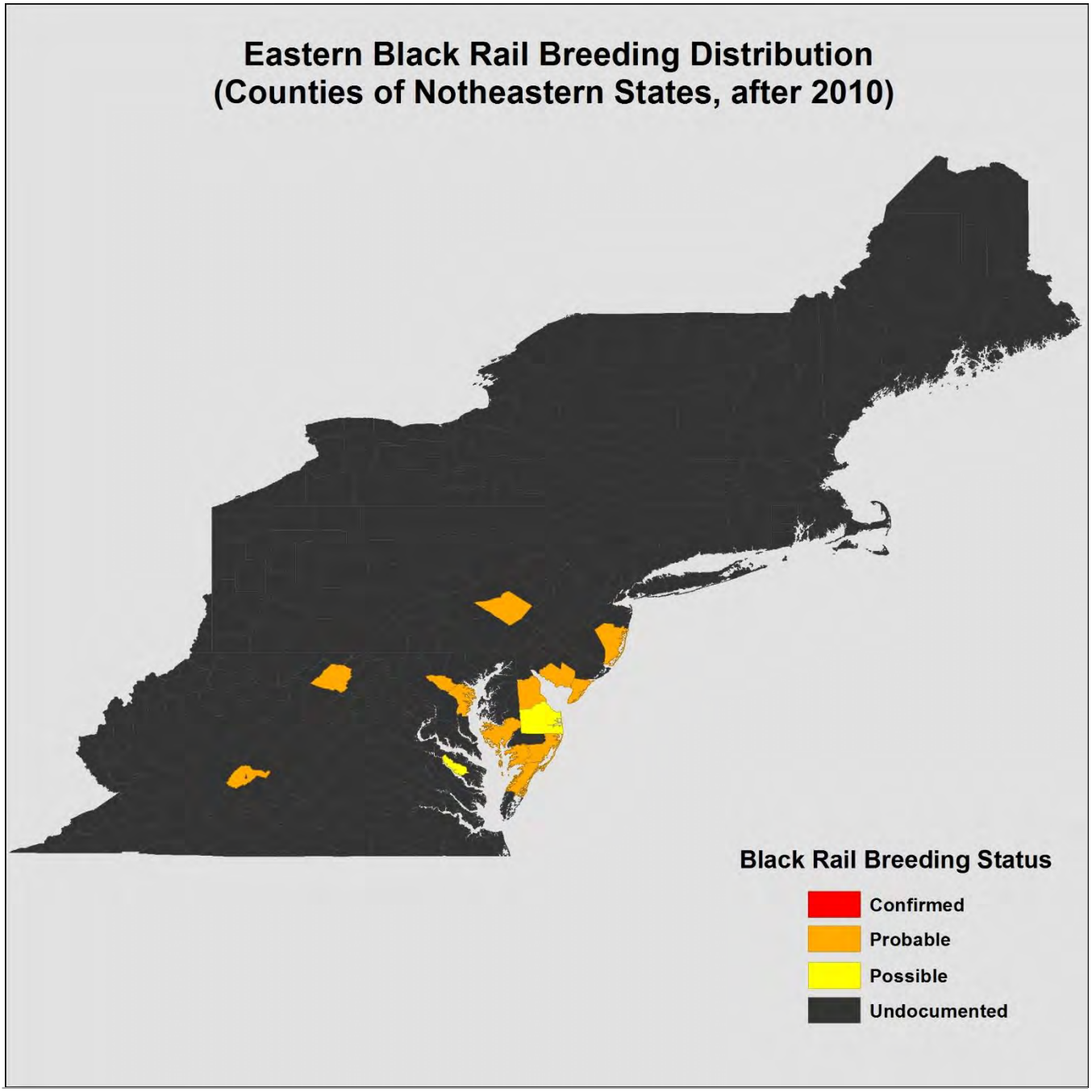
Historic Breeding Range

Within historic times black rails have been documented during the breeding season from Virginia north through Massachusetts (One record in 2003 does exist north of the Newbury Marshes into New Hampshire). The coastal areas of Maryland, Delaware and New Jersey are the historic strongholds of the region and for the entire breeding range of the eastern black rail. These three states alone account for 773 (70%) of the occurrence records in the region. Beyond this core range, Virginia, New York and Connecticut account for 235 (21%) of the occurrence records in the region. Other states have been minor or peripheral areas within the breeding range.

Recent Occurrence

Since 2010 64 black rail occurrences have been recorded within six of the 13 states in the Northeast Region. Records were found for 15 counties and independent cities (Figure 6). Based on breeding evidence and seasonality of occurrence 2 (13%) counties were classified as probable breeding and 13 (87%) as possible breeding. Records were found for 31 named properties including 29 (94%) as probable breeding and 2 (6%) properties classified as possible breeding.

Figure 6. Map of Northeast counties with recent (2011-2016) credible records of eastern black rails during the breeding period (1 April through 31 August).



Recent Breeding Range

The recent breeding range of eastern black rails within the Northeast appears to extend from Virginia through New Jersey. In recent years almost all records have been restricted to the outer coast. Exceptions include recent records in Berks County, Pennsylvania and Alleghany County, Virginia. Distribution of records during the breeding period from within the core coastal range has become patchy in recent years.

Recent Population estimate

Assessment of available state by state information (see state narratives below) resulted in a regional estimate in the range of 55 to 115 breeding pairs. The region includes two states (Maine and Vermont) that have no accepted breeding season records and six states (New Hampshire, Massachusetts, Rhode Island, Connecticut, New York and Pennsylvania) that have had historic records but either have had no records or only a single, isolated record during the past 10 years. Remaining states represent the historic and recent core of the breeding period occurrences. Of these, New Jersey stands out as having the most detections over the past two years scattered across four counties. Maryland continues to support a small number of birds though the decline has been rapid and it is not clear how long the population will persist. The most recent status of black rails in Delaware is uncertain with limited reports from three locations. The last record of a black rail (other than a single bird flushed in the inner Piedmont) during the breeding period in Virginia was in 2014. The species may have been extirpated within the last stronghold in Accomack County.

Trends

Due to the lack of survey information within earlier time periods it is not possible to quantify trends on the scale of the Northeast Region. However, changes in range from historic to recent times and occupancy within documented strongholds over the past 30 years are telling. There has been a complete loss of black rails during the breeding period throughout the northern tier of states within the region that has resulted in an effective contraction of the range limit from the Newbury Marshes in Massachusetts to Ocean County, New Jersey a distance of approximately 450 km. This northern portion of the range previously vacated included documented occurrences within 33 counties. Within the southern states that continue to be within the recent range of occurrences, 37 counties have had historic documentation but none since at least 2010. Collectively, only 15 (18%) of the counties throughout the region where black rails have been documented during the breeding season have had records in recent years.

Available information from study areas within the core of the Northeast black rail breeding range suggests a nearly complete collapse of the population over the past 30 years. Three study areas within the Northeast including parts of New Jersey, Delaware and Maryland have been surveyed for black rails between 1988 and 1992 and again between 2014 and 2016 (see survey effort sections within the New Jersey, Delaware and Maryland narratives below). These surveys allow for some limited comparisons in occupancy and number of birds detected between the two time periods (Table 4). Collectively, occupancy of named properties declined by more than 65% and the number of rails detected declined by more than 90% between the two time periods.

The collective annualized rate of decline in the number of birds detected is 9.2%. The Maryland study area experienced the largest declines equating to a 13.8% annual rate of decline in the number of birds detected.

Elliott Island in Dorchester County, Maryland has experienced catastrophic declines in calling black rails over the past 60 years. This site supported the largest concentration of eastern black rails ever recorded when 100+ birds were reported on 22 May, 1952. As recently as 1991 44 birds were recorded within this site. By 2000 the peak count was 12 calling birds and after 2010 most observers have reported one calling bird. No birds were recorded from this site in 2016. Similar patterns have been documented within other historic strongholds in Maryland and Virginia.

TABLE 4. Comparison (occupancy and number of birds detected) of black rail surveys conducted in New Jersey, Delaware and Maryland during an early time period (1988-1992) and a later time period (2014-2016). Parenthetic values reflect percentage of previous survey.

STUDY AREA	1988-1992 OCCUPIED PROPERTIES	2014-2016 OCCUPIED PROPERTIES	1988-1992 BIRDS DETECTED	2014-2016 BIRDS DETECTED
New Jersey	13	5(38.5%)	24	7(29.2%)
Delaware	3	2(66.7%)	11	2(18.2%)
Maryland	19	5(26.3%)	180	7(3.9%)
All Sites	35	12(34.3%)	215	16(7.4%)

Narratives for Northeastern States

MAINE

SUMMARY: Maine is believed to lie beyond the historical northern range limit for breeding in black rails. No records of birds during the breeding season were discovered and there is no suggestion that the species has bred in the state during modern times.

LEGAL STATUS AND RANK:

State – Black rails have no special legal status in Maine.

Natural Heritage Rank – Black rails have not been assigned a natural heritage rank by Maine.

SURVEY EFFORTS: No dedicated surveys have been conducted for black rails in Maine. However, surveys for secretive marsh birds have been conducted in various regions and to address a number of questions throughout the state. A total of 312 marsh points were surveyed in Maine in 2011 and 2012 as part of the SHARP survey covering the Northeast coast (Olsen et al. 2014). Scarborough Marsh, the largest saltmarsh in the state, is surveyed annually by Maine Audubon. A large number of surveys have been conducted in Maine to support a range of targeted questions (e.g. Gibbs et al. 1991, Hodgman et al. 2002, Longcore et al. 2006). A breeding bird atlas was conducted from 1978 to 1983. No black rails were detected.

RECORDS DURING THE BREEDING SEASON:

Historic Records – Maine is believed to be north of the historic breeding range for black rails. No historic records of black rails were discovered in Maine during the breeding period.

Recent Records (after 2010) – No black rails have been reported from Maine in recent years.

DISTRIBUTION: Black rails have not been detected during the breeding period within any counties or properties in Maine.

Major Landscapes - No breeding locations are currently known for the state.

Habitat - There is currently no evidence that birds have used any habitats in the state during the breeding season.

TRENDS: Not applicable.

POPULATION ESTIMATE: Maine is believed to lie north of the historic range limit. The population estimate for the state is set to 0.

Uncertainty - Given the absence of historic records the uncertainty in the population estimate is considered low.

THREATS: Although there are many forces that have impacted wetlands in Maine, there is no reason to believe these have impacted black rails.

NEW HAMPSHIRE

SUMMARY: New Hampshire supports relatively little habitat that would be considered suitable for black rails and has been considered to be north of the historic range limit. A single bird was documented to be calling from a wet swale from 19 to 23 May, 2003 representing the first state record. It is notable that the site is just north of the Newbury Marshes that support the most concentrated cluster of records in Massachusetts.

LEGAL STATUS AND RANK:

State – Black rails have no special legal status in New Hampshire.

Natural Heritage Rank – Black rails have not been assigned a natural heritage rank by New Hampshire.

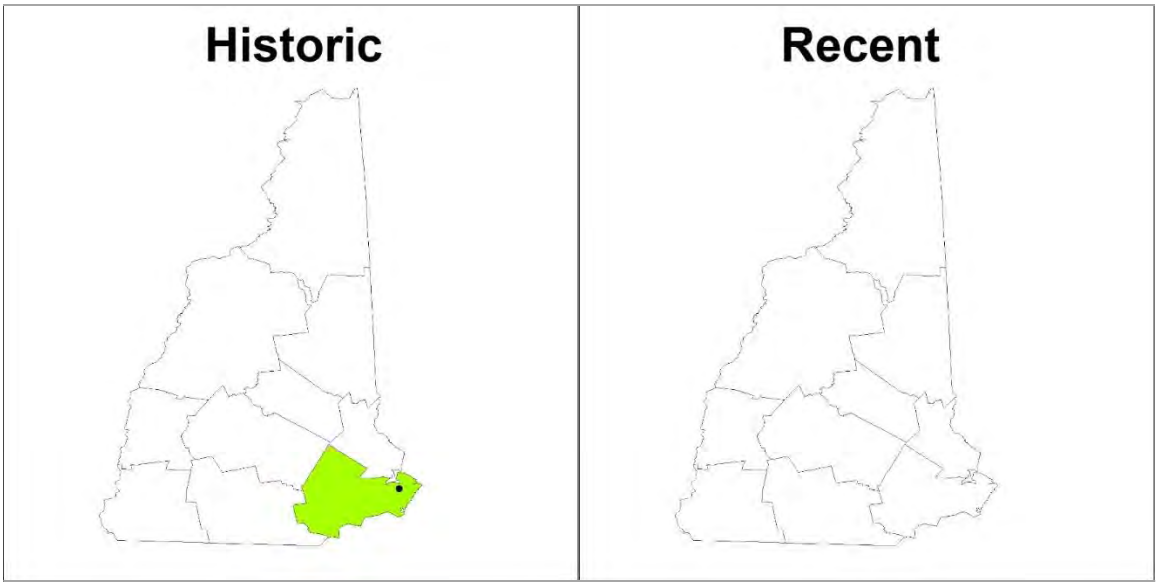
SURVEY EFFORTS: No dedicated surveys have been conducted for black rails in New Hampshire. A total of 62 points were surveyed in Maine in 2011 and 2012 as part of the SHARP survey covering the Northeast coast (Olsen et al. 2014). A New Hampshire breeding bird atlas was conducted from 1981 through 1986. No black rails were detected.

RECORDS DURING THE BREEDING SEASON:

Historic Records – Tarr (2003) recorded the first state record on 19 May, 2003 on private property near Greenland, Rockingham County. The bird was calling from 19 May through 23, May and a recording was collected.

Recent Records (after 2010) – Despite follow-up surveys no additional records have been documented on the Greenland property.

DISTRIBUTION: Black rails have been documented within a single county (Rockingham) and property (Greenland Marsh) in New Hampshire (Appendix III and IV). There have been no occurrences reported since the detection in 2003.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Major Landscapes - The single location reported from Rockingham County was in a wet swale embedded within a fallow field that apparently had been farmed in the past. It is of note that the site is just north of the Newbury Marshes that have supported the most concentrated records in Massachusetts including two birds in 2010.

Habitat - The bird documented in 2003 was in a wet swale with canary grass and cattails embedded within an early successional oldfield.

TRENDS: Not applicable.

POPULATION ESTIMATE: New Hampshire supports very little habitat suitable for black rails and has been assumed to be north of the historic range limit. The population estimate for the state is set to 0.

Uncertainty - Given the limited habitat and lack of historic records the uncertainty in the population estimate is considered low.

THREATS: Draining of small depressional wetlands within row crops and pastures continues to be a threat to secretive marsh birds including black rails within inland landscapes.

MASSACHUSETTS

SUMMARY: Black rails have been detected during the breeding period within seven Massachusetts counties between 1869 and 2010. Breeding has only tentatively been confirmed (controversial accounts by Baker) in Barnstable County during the late 1800s. Most reports have been associated with the salt marsh areas around Chatham, Eastham, Falmouth and Newbury. Early reports also included surprising concentrations of birds along the upper reaches of the Concord, Charles and Neponset rivers that were presumably associated with freshwater wetlands. Over the past century, the most consistent concentration of reports has been in the marsh complex south of Newbury including the Parker River National Wildlife Refuge. This area is the location of the most recent occurrence in May and June of 2010. All of the locations and habitats where black rails were detected in the late nineteenth and early twentieth century have been severely impacted by human activities. Black rails are generally believed to have been extirpated from the state as a breeding species.

LEGAL STATUS AND RANK:

State – Black rails have no special legal status in Massachusetts.

Natural Heritage Rank – Black rails have not been assigned a natural heritage rank by Massachusetts.

SURVEY EFFORTS: No dedicated surveys have been conducted for black rails in Massachusetts and none are currently planned (Andrew Vitz, personal communication). However, a number of surveys for secretive marsh birds have been conducted throughout the state. Gibbs and Melvin (1993) surveyed 177 marsh patches between 1991 and 1993. Erwin et al. (2002) surveyed 78 marsh sites within Cape Cod National Seashore. Several other marsh bird projects have been conducted in the state that have addressed a variety of targeted questions (e.g. Bradbury 1938, Clarke et al. 1984, Buchsbaum et al. 2009). A total of 254 points were included in Massachusetts and surveyed by the SHARP network (Olsen et al. 2014). Two Massachusetts breeding bird atlas projects have been conducted including the first from 1974 through 1979 and the second from 2007 through 2011. Neither of these efforts recorded black rails.

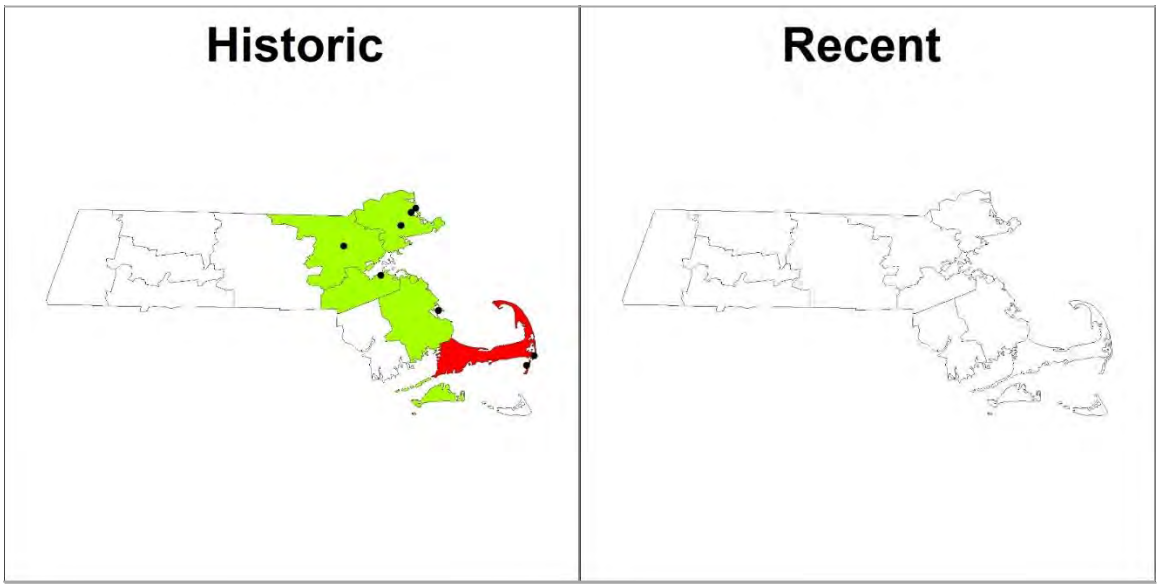
RECORDS DURING THE BREEDING SEASON:

Historic Records – The literature refers to a number of early records of black rails in Massachusetts during the breeding season, most of which are poorly documented. The earliest record was of an individual picked up dead in August of 1869 on Clark's Island that was inspected by Purdie in the Brown collection (Purdie 1877). Howe and Allen (1901) relay reports from Baker of a pair with young in July of 1884 and a nest with four eggs in May, 1885 near Chatham. Authors as early as Forbush (1929) and Griscom and Snyder (1955) have questioned these records because no specimens were collected and Baker was a little-known market hunter. However, Veit and Petersen (1993) suggest that the records should not be rejected out of hand. Regardless of the voracity of these specific reports, black rails were documented in the vicinity during this general time frame with Brewster recording birds in Falmouth in June of 1889 and July of 1890 (Hill 1965). Low later would

record a bird during the spring of 1935 near Eastham and Griscom himself would record two birds near Chatham on 15 August, 1948. Other early records include consistent reports of four to five calling birds from marshes along the Concord River (now Great Meadow National Wildlife Refuge) over an extended period including scattered years between 1892 and 1913 (Griscom and Snyder 1955). A more recent record within this same location was a bird detected on 11 July, 1962 (Bagg and Emery 1962). Griscom and Snyder (1955) also report on birds along the Charles River including five locations known in 1889 near Cambridge and at least six birds detected in Dedham by Allen and Griscom in July of 1935 but provide no details. They also report three occurrences near Readville on the Neponset River. Although many have dismissed the zany account by Cobb (1906) of capturing an adult in Milton Hill on 16 May, 1904, this site is also near the marshes of the Neponset River. Forbush (1929) reports a wing of a bird that was sent to him for identification after being killed by a mowing machine in West Tisbury on 26 August, 1920. The most compelling concentration of black rail detections in the state over the past century has been the marsh complex in Essex County south of Newbury including the Parker River National Wildlife Refuge. Detections have been made by many observers in this area during ten years including 1903, 1929, 1944, 1945, 1946, 1958, 1960, 1970, 1976 and 2010. The latter observation included detections within the national wildlife refuge during the height (31 May through 21 June) of the breeding season (Garvey and Illiff 2011).

Recent Records (after 2010) – No additional black rails have been reported from Massachusetts since the birds on Plum Island.

DISTRIBUTION: Black rails have been recorded from six counties and eight named properties in Massachusetts. Breeding has been confirmed only in Barnstable County (this classification is controversial in the literature). Remaining counties were classified as probable based on seasonality of occurrence (Appendix III). Six of the eight properties were classified as probable with the remaining two being confirmed and possible (Appendix IV).



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Massachusetts counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Barnstable	Confirmed	-----
Dukes	Probable	-----
Essex	Probable	-----
Middlesex	Probable	-----
Norfolk	Probable	-----
Plymouth	Probable	-----

Major Landscape - The majority of black rail records in Massachusetts have been associated with coastal bays behind barrier islands near Chatham, Eastham and Newbury. Other locations that support similar landscape settings but where records are lacking include Barnstable and Hampton harbors in Barnstable and Rockingham Counties. The other important setting was apparently freshwater wetlands along the upper reaches of the Charles, Concord and Neponset rivers.

Habitat - Early authors offer very little information on habitat use by black rails in Massachusetts such that habitats must be inferred by location. Birds detected within the outer coastal areas of Chatham, Eastham and Falmouth were likely using salt marshes similar to those used by birds recently observed on Plum Island. Early observations of birds on the upper reaches of the Concord, Charles and Neponset rivers were presumably using freshwater wetlands.

TRENDS: Most early authors believed that Massachusetts represented the northern range limit during the heyday of occurrence throughout the Northeast. Even during this time, the species was not regularly detected within the state. Forbush (1929) believed that the species was more common in the Cape Cod area than records reflected. The species is generally believed to have been extirpated from the state. However, given the occurrence of birds within the Essex marshes in recent years and the detection of a bird to the north in Rockingham County, New Hampshire vigilance along the coast should be maintained.

POPULATION ESTIMATE: Massachusetts has a history of black rail use and vigilance should be maintained particularly in the Newbury Marshes. However, no reports have been made since 2010. The population estimate for the state is set to 0.

Uncertainty - Given the history of use and the difficulty of monitoring all of the coastal marshes, uncertainty in the population estimate is considered moderate.

THREATS: As with other states along the Atlantic Coast there have been a large number of past impacts to marsh habitats in Massachusetts that may have been important to black rails. Early sites documented from the upper Charles and Neponset rivers that fall within the greater Boston area have likely been filled and developed. Virtually all salt marshes in the state were ditched for mosquito control. This effort has a long history but was accelerated to completion during the depression-era Works Progress Administration. Other projects that have been completed to facilitate overland transportation and flood control have also impacted marsh habitats, particularly the highest areas of the marsh that are preferred by black rails. These high areas are also the most susceptible to colonization by invasive plants. The relationship between these impacts both individually and collectively on breeding black rails remains unclear. The direct benefits of ongoing attempts to reverse some of these impacts in terms of black rail recovery also remain uncertain.

RHODE ISLAND

SUMMARY: Rhode Island supports relatively little habitat that would be considered suitable for black rails and although the state is within the historic range of the species there is only a single record during the potential breeding period. The population estimate is currently set to zero for the state with relatively low uncertainty.

LEGAL STATUS AND RANK:

State – Black rails have no special legal status in Rhode Island.

Natural Heritage Rank – Black rails have not been assigned a natural heritage rank by the state of Rhode Island.

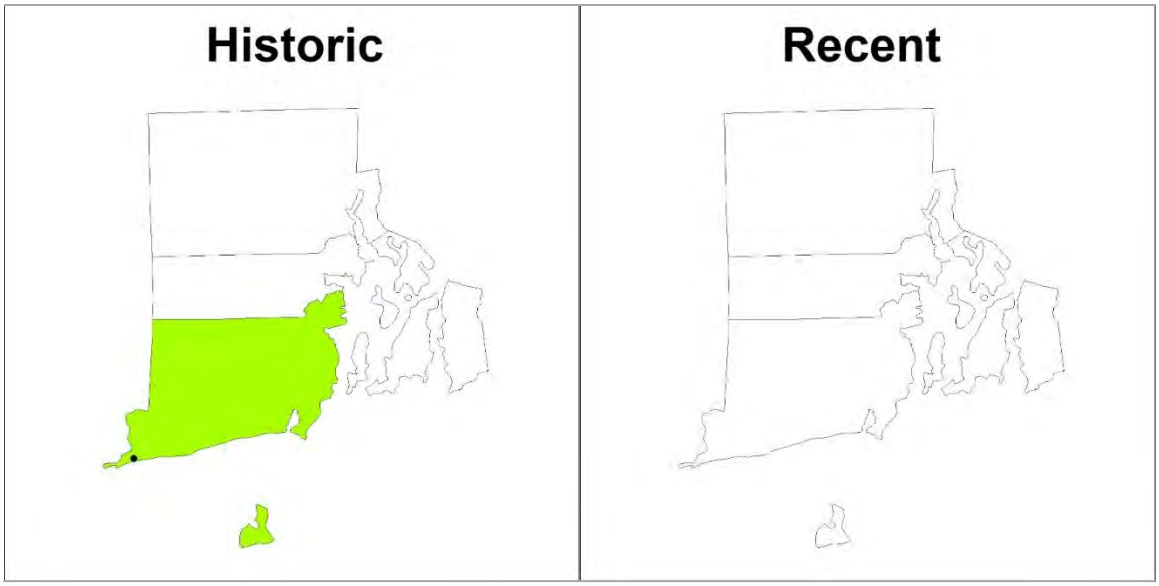
SURVEY EFFORTS: No dedicated surveys have been conducted for black rails in Rhode Island. Multiple survey rounds have been conducted within significant marsh patches within the state (Berry et al. 2015). A total of 108 points were included in Rhode Island and surveyed by the SHARP network (Olsen et al. 2014). One Rhode Island breeding bird atlas project has been conducted from 1982 through 1987 and a second was initiated in 2015 and scheduled to be completed in 2019.

RECORDS DURING THE BREEDING SEASON:

Historic Records – Despite the fact that Rhode Island lies within the historic range of the black rail, the species has rarely been recorded in the state during the breeding period. Krauss observed and recorded a bird that was present 8 to 13 June, 1975 in Green Hill, Washington County (Davidson 1992).

Recent Records (after 2010) – No recent records of black rails during the breeding season were discovered for Rhode Island.

DISTRIBUTION: Black rails have been detected in Washington County and based on seasonality of occurrence the county was classified as probable.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Major Landscapes – Consistent with records in surrounding states, the single historic record was on the outer coast.

Habitat – The black rail detected in Green Hill was within a wet swale around a golf course pond.

TRENDS: Not applicable.

POPULATION ESTIMATE: Rhode Island supports very little habitat suitable for black rails and although it is within the historic range of the species the state is not currently known to support a breeding population. The population estimate for the state is set to 0.

Uncertainty - Consistent with the lack of any historic records uncertainty in the population estimate is set to low.

THREATS: Although there are many forces that have impacted wetlands in Rhode Island, there is no reason to believe these have impacted black rails.

VERMONT

SUMMARY: Vermont supports relatively little habitat that would be considered suitable for black rails. Vigilance should be maintained for potential inland locations within open, farmed landscapes and floodplain wetlands. The population estimate is currently set to zero for the state with relatively low uncertainty.

LEGAL STATUS AND RANK:

State – Black rails have no special legal status in Vermont.

Natural Heritage Rank – Black rails have not been assigned a natural heritage rank by Vermont.

SURVEY EFFORTS: No dedicated surveys have been conducted for black rails in Vermont. However, several years of marsh bird surveys have been conducted in the state (Shambaugh 2001). Two Vermont breeding bird atlas projects have been conducted including the first from 1976 through 1981 and the second from 2003 through 2007.

RECORDS DURING THE BREEDING SEASON:

Historic Records – A single black rail was reported near Rutland on 5 May, 1990 by Shepard (Perkins 1990). However, the report was not accepted by the Vermont Bird Record Committee and does not appear on the state's official checklist (Vermont Bird Records Committee 2015).

Recent Records (after 2010) – No recent records of black rails during the breeding season were discovered for Vermont.

DISTRIBUTION: No black rail records reported during the breeding period have been accepted for Vermont.

Major Landscape - Not applicable.

Habitat - Not applicable.

TRENDS: Not applicable.

POPULATION ESTIMATE: Vermont supports very little habitat suitable for black rails and the state is not currently known to support a breeding population. The population estimate for the state is set to 0.

Uncertainty - Consistent with the lack of any historic records uncertainty in the population estimate is set to low.

THREATS: Draining of small depressional wetlands within row crops and pastures continues to be a threat to secretive marsh birds including black rails within inland landscapes.

CONNECTICUT

SUMMARY: Black rails have been detected during the breeding period within five Connecticut counties between 1876 and 1997. Breeding has been confirmed in two counties including Middlesex and New London and based on season of occurrence breeding has been classified as probable in three counties including Fairfield, Litchfield and New Haven. Observations have been concentrated along the outer coast where birds use marshes within estuaries of the lower Connecticut, Housatonic, Quinnipiac and Wequetequock rivers. In addition to coastal records, black rails have been detected within inland locations including Cromwell Meadows and Dead Man's Swamp along the Connecticut River and two freshwater wetlands in Litchfield County. Once a regular breeder in the state, black rails are now listed as endangered and are considered to have been extirpated. The tidal salt marshes that represent the primary breeding habitat for the species in Connecticut have been severely impacted by a long list of human activities. It remains unclear whether or not ongoing programs intended to reverse some of these impacts will have direct benefits to black rails.

LEGAL STATUS AND RANK:

State - Black rails are listed as endangered within the state of Connecticut and have been ranked as a Tier I species of greatest conservation need. The species is currently considered to be extirpated from the state (Huang, personal communication).

Natural Heritage Rank – Black rails have been assigned a rank of S1B (Critically Imperiled) in Connecticut indicating their extreme rarity in the state and reflecting their perceived decline.

SURVEY EFFORTS: No dedicated surveys have been conducted for black rails in Connecticut. However, surveys of the marsh-bird community have been conducted within 11 marsh patches (1974-1987) along the Connecticut River (Craig 1990) and within 40 patches along the outer coast (Benoit and Askins 1999) that have included the black rail as a target species. The study along the Connecticut River encompassed the entire salinity gradient while the coastal study focused on tidal salt and brackish marshes. A total of 81 points were included in Connecticut and surveyed by the SHARP network (Olsen et al. 2014). The Connecticut breeding bird atlas was conducted from 1982 through 1986. The state has conducted call-back surveys of secretive marsh birds since 1993. The Connecticut Ornithological Association is considering targeted surveys for black rails using volunteers and standard night-time protocols.

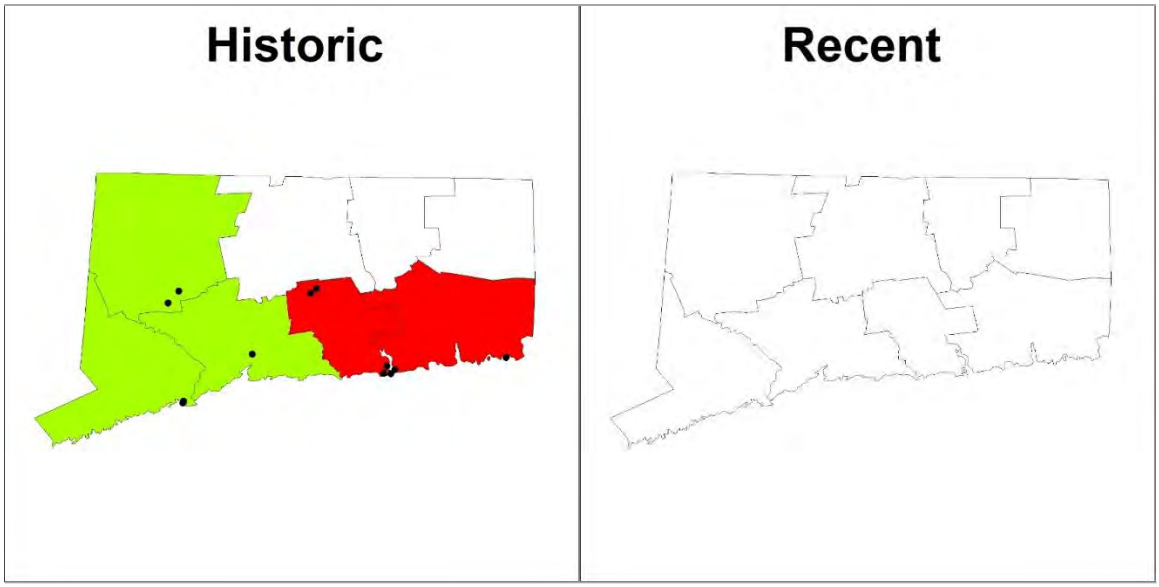
RECORDS DURING THE BREEDING SEASON:

Historic Records – The first reported record of black rails during the breeding period in Connecticut was a report that J. H. Batty had shot two birds with young in June several years previous to 1884 on a freshwater marsh near the Hazardville, Enfield area of Hartford County (Baird et al. 1884). Some including Bull (1964) and Proctor (1994) have dismissed this report due in part to the lack of surviving specimen material and to the inland location. The first accepted breeding record was from Clark who reported a clutch of nine eggs that was

collected on 13 July, 1876 in the Cove Meadow area of Old Saybrook by a neighbor who had killed the adult while cutting salt hay (Clark 1884). Over the next dozen years, Clark would collect several additional clutches of black rails while out in the marshes around the mouth of the Connecticut River collecting other bird eggs (Clark 1897). Other early records include single birds flushed from the Quinnipiac Marshes above New Haven by Bishop on 11 July, 1893 and again on 12 August, 1904 (Sage et al. 1913). On 14 September, 1904, Whitney reported a juvenile bird near Essex (likely on Great Meadow) on the Connecticut River. A number of poorly documented reports were made during the 1940s and 1950s from Barn Island (now Barn Island Wildlife Management Area) near Stonington, Great Meadows (now Stewart B. McKinney National Wildlife Refuge) and Nell's Island (now Charles E. Wheeler Wildlife Management Area) near Stratford and marshes around Guilford Beach and Great Harbor near Guilford (Proctor 1994). On 5 September, 1973, Muller collected a juvenile along the Housatonic River (Proctor 1981). Between 25 June and early July, 1980 a bird was calling in Dead Man's Swamp near Cromwell that was captured and photographed by Proctor (Proctor 1981). Later that year on 15 September Muller would collect an adult on Nell's Island. On 5 June, 1986 during the breeding bird atlas period, Rosgen detected a single bird in the marshes of the Barn Island Wildlife Management Area (Proctor 1994). Between 1974 and 1987, Craig surveyed marsh birds within 11 marsh patches along the Connecticut River from Great Island to Wethersfield Meadows (Craig and Beal 1992) and detected black rails in Ragged Rock Creek Wildlife Area and Cromwell Meadows during the summer of 1987. The most recent coastal records include observations of birds in 1987, 1990, 1991 and 1996 on Great Meadows near Stratford. Two inland records include birds calling from two freshwater wetlands in Litchfield County during June of 1997 (Mantlik et al. 1998).

Recent Records (after 2010) – No recent records of black rails during the breeding season were discovered for Connecticut.

DISTRIBUTION: Black rails have been recorded from five counties and 12 named properties in Connecticut. Breeding has been confirmed in New London County and other counties were classified as probable based on seasonality of occurrence (Appendix III). Three of the 12 properties were classified as confirmed, one was listed as possible and the remaining eight were classified as probable (Appendix IV).



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Connecticut counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Fairfield	Confirmed	-----
Litchefield	Probable	-----
Middlesex	Probable	-----
New Haven	Probable	-----
New London	Probable	-----

Major Landscapes - Most of the black rail activity that has been recorded in Connecticut during the breeding period has been on the outer coast within the salt marsh complexes around the mouths of the Connecticut and Housatonic rivers. These landscapes appear to have a long history of use. Individuals have also been detected within the brackish to tidal-fresh reaches of the Connecticut and Quinnipiac Rivers including sites that are non-tidal freshwater marshes. Very little is known about the occurrence of black rails within inland regions of the state. The early call from Proctor (1981) that freshwater wetlands throughout the state should be investigated seems warranted.

Habitat - Most observations during the breeding season have involved the highest elevations within tidal salt marshes. Clark (1884) describes the conditions of a nest site on Great Island as an extensive section of salt hay that had not been harvested for several years and was set back and only reached by the highest tides. Within mainland marshes birds have been found along the landward edge of the marsh where saltmeadow cordgrass is interspersed with increasingly upland plants, often with freshwater components. Clark (1897) describes a nest

he found in the Cove Meadows area as the bank of a small ditch that was grown up in sedges and nearly dry but surrounded by salt hay that had not been harvested in several years. Observations in more recent years along the outer coast have involved extensive areas of high marsh. Proctor (1981) describes the habitat where the bird was captured in Dead Man's Swamp as dominated by river bulrush and narrow leaf cattail. The more recent occurrence of a calling bird in Litchfield County was in a freshwater wetland embedded within a pasture that is consistent with inland habitats documented throughout the North American range.

TRENDS: It does not appear that black rails have ever been a common species in Connecticut. However, evidence suggests that the species was a regular breeder within the salt marshes of the outer coast at least into the early 1900s becoming less reliable through mid-century and apparently extirpated today.

POPULATION ESTIMATE: Connecticut has a history of breeding by black rails and vigilance should be maintained particularly in the outer coastal marshes. However, no reports have been made since 2010. The population estimate for the state is set to 0.

Uncertainty - Although Connecticut does have a history of use, both the relatively limited and accessible coastal marshes that remain and the level of bird-watching activity in the area suggest that uncertainty in the population estimate should be considered low.

THREATS: There have been a large number of impacts to marsh habitats in Connecticut since colonial times including marsh loss via filling for development, transportation and landfills, harvest of salt hay for livestock feed, changes in hydrology for flood abatement and mosquito control, colonization by invasive plant species and more recently changes related to sea-level rise. The relationship between these impacts both individually and collectively on breeding black rails remains unclear. The direct benefits of ongoing attempts to reverse some of these impacts in terms of black rail recovery also remain uncertain.

NEW YORK

SUMMARY: Black rails have been detected during the breeding period within 15 New York counties between 1870 and 2009. Breeding has been confirmed in two counties including Nassau and Suffolk and based on season of occurrence breeding has been classified as probable in five counties and possible in seven counties. Although observations of birds within inland locations have occurred throughout their recorded history, these detections have been rare and scattered. Most of the black rail activity recorded in New York has been concentrated along the barrier islands of Long Island including nests found from 1937 to 1940. Initial activity was recorded in both Nassau and Suffolk counties but since the mid-1900s has been restricted to areas around Oak Beach, though the most recent record in 2009 was east of this location near Amagansett. With the exception of Oak Beach, coastal locations where black rails were detected in the late 1800s and early 1900s have been severely impacted by human activities. It remains unclear if any remnant population persists in the state today.

LEGAL STATUS AND RANK:

State - Black rails are listed as endangered within the state of New York and have been ranked as a Tier I species of greatest conservation need.

Natural Heritage Rank – Black rails have been assigned a rank of S1B (Critically Imperiled) in New York indicating their extreme rarity in the state and reflecting their perceived decline.

SURVEY EFFORTS: No dedicated surveys have been conducted for black rails in New York. Funding is currently being sought to conduct a targeted survey in the state (Jason Smith, personal communication). Despite the lack of dedicated surveys, the species has been sought after by the bird watching community in the areas with the greatest historical occurrence since the early 1900s (Griscom 1915). The state has conducted two rounds of extensive marsh bird surveys although black rails were not a stated target for either effort. New York State Department of Environmental Conservation initiated secretive marsh bird surveys in the early 2000s surveying 336 points within 58 marshes annually between 2004 and 2006 (Osborne et al. 2011). The department conducted another round of 1,500 call-broadcast surveys of 417 points in freshwater wetlands during 2009 through 2011 (Yard et al. 2012). A total of 110 points were included in New York and surveyed by the SHARP network (Olsen et al. 2014). Two New York breeding bird atlas projects have been conducted including the first from 1980 through 1985 and the second from 2000 through 2005. During both of these projects, black rails were detected within the historic Oak Beach site.

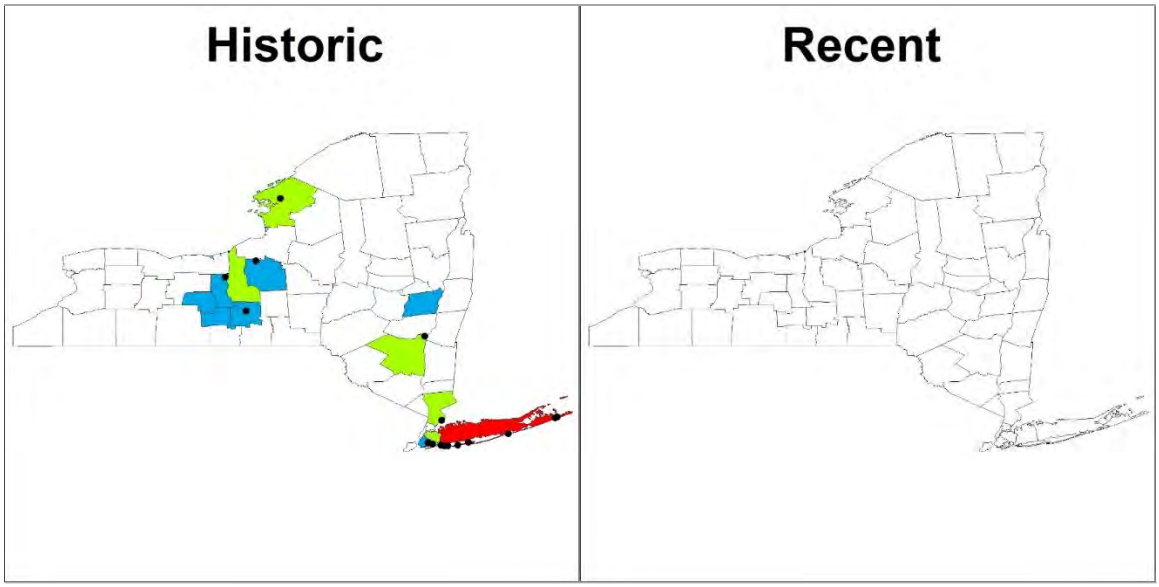
RECORDS DURING THE BREEDING SEASON:

Historic Records – de Kay (1844) considered black rails to be extralimital within New York and provided no records of specimens or detections. The earliest records in the state during the breeding season come from inland locations including the Finger Lakes region and the Hudson Valley. Gilbert collected a bird during the spring of 1870 in Yates County and another in 1873 from a wetland between Watkins and Havana (Rathbun

1879). Webster observed a bird near Watervliet during the spring of 1873 and Wilson observed a bird along the Seneca River below Cayuga on 30 May, 1874 (Eaton 1910). Other early records were associated with the outer coast. Sargood collected a bird in the spring of 1884 from Canarsie, Brooklyn presumably prior to the filling of the extensive wetlands there (Eaton 1910). The Jamaica Bay estuary likely supported birds in earlier times and a bird was detected on the Jamaica Bay National Wildlife Refuge on 11 June, 1975 (Buckley et al. 1975). Other records include birds observed on Three Rivers State Game Management Area on 4 May, 1957 (Schneider 1957), Great Vly Marsh on 18 May, 1963 (Wickham 1963), Marshlands Conservancy in June of 1986 (Paxton et al. 1986) and a bird calling for a week in June, 1996 within Perch River Wildlife Management Area (Long 1996). Long Island stands out as supporting the highest concentration and most consistent records for more than a century. A bird was collected along South Oyster Bay (now Jones Beach State Park) on 1 August, 1884. This initiated a long history of observations in Nassau County including observations extending to 4 June, 1955. Locations have included Jones Beach, Long Beach and Lido Beach areas and Lawrence Marsh across Reynold's Channel from the barrier islands. Carleton found a nest with eggs near Jones Beach on 20 June, 1937 and Beals banded five young at Long Beach on 30 June, 1937 (Cruickshank 1942). Mayer found a nest with nine eggs at Long Beach on 12 July, 1940. The first record in Suffolk County appears to be a bird collected by Helmuth on 3 August, 1910 in the area now designated as Napeague State Park (Bull 1964). This was followed by single birds reported by Nichols on 31 May, 1920 in Mastic, by Church on 8 July 1935 in Montauk and by Carleton in May of 1937 at Oak Beach. The latter observation would be the last for decades in Suffolk County. While conducting other marsh-bird work during the spring of 1968, Post and Enders (1969) rediscovered black rails at Oak Beach and trapped four individuals. Birds persisted within this for the next 15 years reaching an estimated high of five birds in the early 1970s (Andre and Carroll 1988). By the late 1970s and through the first atlas period the site appeared to support only one or two calling birds. Birds were periodically detected through the 1990s with three calling birds reported by Wilson in 1997 and one reported by Mitra in 1999. The most recent record of a black rail on Long Island was a bird that was heard during May and June of 2009 near Amagansett.

Recent Records (after 2010) – No recent records of black rails during the breeding season were discovered for New York.

DISTRIBUTION: Black rails have been recorded from 15 counties and 16 named properties in New York. Breeding has been confirmed in Nassau and Sussex Counties. Five of the remaining counties were classified as probable and the remaining were considered possible (Appendix III). Breeding has been confirmed for four of the named properties, eight were classified as probable and remaining properties were classified as possible (Appendix IV).



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

New York counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Albany	Possible	-----
Cayuga	Probable	-----
Jamaica	Possible	-----
Jefferson	Probable	-----
Kings	Possible	-----
Nassau	Confirmed	-----
Onandaga	Possible	-----
Queens	Probable	-----
Schuyler	Possible	-----
Seneca	Possible	-----
Suffolk	Confirmed	-----
Tompkins	Possible	-----
Ulster	Probable	-----
Westchester	Probable	-----
Yates	Possible	-----

Major Landscapes - Most of the black rail activity that has been recorded in New York during the breeding period has been on the landward side of the barrier islands along the south shoreline of Long Island. Although less documented, black rails have also used estuarine marshes likely including Jamaica Bay and the marsh complex near Lawrence. Birds have been documented in freshwater marshes associated with inland rivers and the Finger Lakes. Much of this activity was during the early period when much of the inland landscape had been cleared.

Habitat - Griscom (1923) describes the habitat used by birds near Jones Beach as dry, short-grass marsh bordered by a swamp of shrubs and edged with common reed. The high zone of the tidal salt marsh dominated by saltmeadow cordgrass on the sound side of the barriers appears to be the primary habitat used on Long Island. Post and Enders (1969) give a complete description of the habitat on Oak Beach as patches of saltgrass and saltmeadow cordgrass embedded within shrubs, patches of common reed and smooth cordgrass. Although activity appeared to be focused on the patches of salt hay, the birds did use both common reed and smooth cordgrass. An important note is that the marsh patch used is one of the few in the state that was not grid ditched during the Great Depression because it was of more recent origin. Early inland observations of black rails were presumably associated with freshwater wetlands although the habitat was poorly described. The more recent bird found in Perch River Wildlife Management Area was detected within cattail marsh habitat.

TRENDS: Despite the lack of definitive evidence, early authors (Eaton 1910, Griscom 1923) believed that the black rail was a regular breeder on Long Island. Even on Long Island the species was more widespread up to the Great Depression than after when most of the marshes were grid ditched. Some have suggested that the rediscovery of birds in the late 1960s may represent a re-expansion of the breeding range back into New York rather than a lapse in detections. Current status is unclear but is certainly much reduced both in distribution and abundance compared to the late 1800s and early 1900s.

POPULATION ESTIMATE: New York has a long history of breeding by black rails and surveys are needed within traditional sites on Long Island. Vigilance should also be maintained within inland locations. However, no reports have been made from New York since 2010. The population estimate for the state is set to 0.

Uncertainty - New York has a history of use in the recent past and comprehensive surveys of suitable areas have not been conducted suggesting that uncertainty in the population estimate should be considered moderate.

THREATS: New York has a long history of impacts to coastal salt marshes that would have impacted black rails. Marsh filling associated with urban expansion in New York City and other locations eliminated large swaths of habitat. Marshes on Long Island have either been filled for development or road building or extensively grid ditched for mosquito control. As with all other states along the Atlantic Coast, many marshes have been tide-restricted to allow for the establishment of roads and other infrastructure. Although much more regulated today, these same forces including urban expansion, development of transportation infrastructure and mosquito control continue to move forward throughout much of the landscape. Impacts are all being exacerbated by ongoing sea-level rise.

PENNSYLVANIA

SUMMARY: Black rails have been detected during the breeding period within Nine Pennsylvania counties between the early 1800s and 2013. Pennsylvania has the distinction of bringing the first black rail to science in North America. Although not well documented, the species was apparently a common breeder within the vast tidal marshes of the upper Delaware River in Philadelphia. These marshes were lost to urban expansion during the 1800s as was the ability of this area to support breeding black rails. What remains today of this system is unlikely to support breeding. Over the past century, observations of black rails during the breeding season have come from inland freshwater wetlands including sites within the Delaware and Susquehanna River valleys and elsewhere. Occurrences have been sporadic and no stable breeding sites have been found.

LEGAL STATUS AND RANK:

State – Black rails have no special legal status in Pennsylvania.

Natural Heritage Rank – Black rails have not been assigned a natural heritage rank by Pennsylvania.

SURVEY EFFORTS: The Pennsylvania Game Commission and partners has conducted a two-year survey of wetlands across the state during the 2014 and 2015 breeding seasons (Fetterman and Barber 2015). Black rails were included among nine other wetland species in a call-broadcast protocol. The 2014 effort surveyed 228 wetland patches in 38 counties with no black rail detections. Two Pennsylvania breeding bird atlas projects have been conducted including the first from 1983 through 1989 and the second from 2004 through 2009.

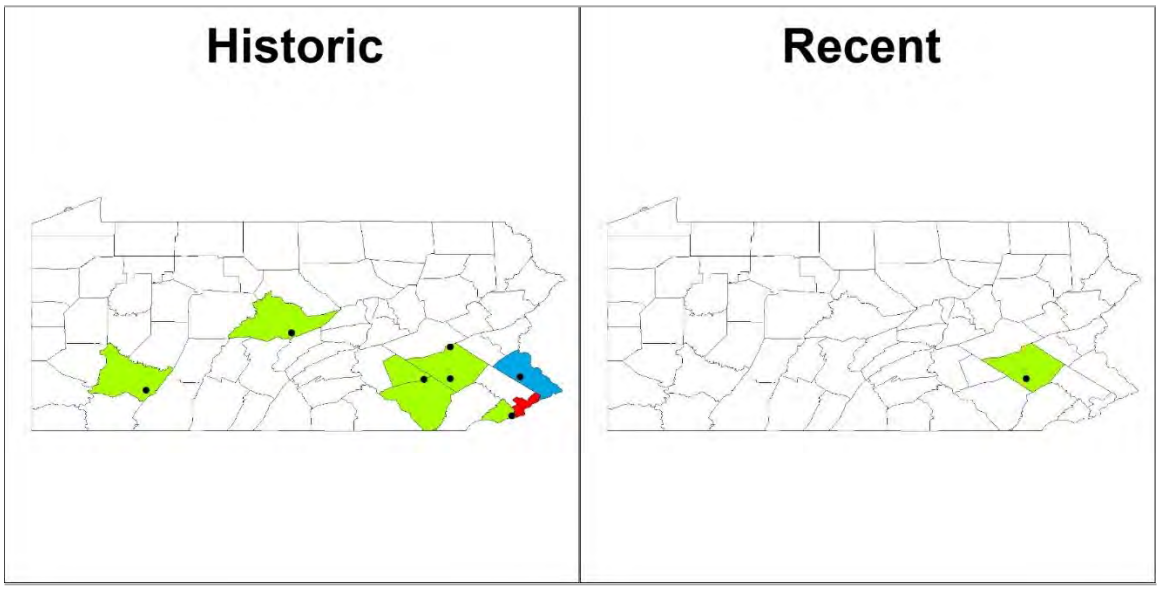
RECORDS DURING THE BREEDING SEASON:

Historic Records – Pennsylvania has the distinction of bringing the first black rail to science in North America. Dr. Thomas Rowan captured an adult male with four young on 22 July, 1836 on his farm in Philadelphia and brought them to Titian Peale (Allen 1900). Later that fall, Peale would send specimens to Audubon and they would be the basis of his plate on the species and a declaration of their occurrence in North America. Peale indicated in his correspondence that another specimen also collected from the Philadelphia area had been in the collection for thirty years (placing its collection in the early years of the 1800s). Rowan indicated that many of these birds could be collected in the meadows on his property. These meadows were likely the extensive tidal salt marshes along the Delaware River prior to being filled as the city expanded. Warren (1890) wrote that Krider also reported black rails breeding in Philadelphia in past years. He also reported seeing two specimens that were shot just downriver in Chester City. Stone (1894) lists a specimen taken by Voelker during the spring of 1877 or 1878 in Delaware County. Other records in what remains of the marshes of upper Delaware Bay are from Tinicum Marsh (now John Heinz National Wildlife Refuge) including a bird detected on 27 August, 1950 by Poole and a bird detected on 14 April, 1970 by DeAoun (Miller 1970, McWilliams and Brauning 2000). All other observations of black rails in Pennsylvania have been in inland locations away from tidal influence. Ross collected a bird in Lebanon County in August of 1890 (Stone 1894). Rannels had a bird

calling in Middle Creek Wildlife Management Area in this county from late May through mid-June of 1994 (McWilliams and Brauning 2000). A bird was calling from Iron Spring Swamp in Westmoreland County from 23 May through 21 June, 1967 (Hall 1967). A bird was detected during the first breeding bird atlas effort from 16 May through 25 June, 1985 near Quarryville in Lancaster County (Schutsky 1992). The other bird detected during the atlas was reported by Peplinski from Tusseyville Pasture in Centre County and was heard from 25 May through 4 August, 1986 (Hall 1986). Relatively recent reports are of a bird that was heard from 29 April through 5 May, 2007 by Etter near Pine Run Reservoir in Bucks County and a bird detected from 17 May through 4 June, 1999 in Eckville Marsh in Berks County.

Recent Records (after 2010) – A single report of a black rail from Pennsylvania since 2010 was found. Wolfe reported a bird calling from 23 May through 23 June, 2013 near Sheerlund Forest Nursery in Berks County.

DISTRIBUTION: Black rails have been recorded from eight counties and six named properties in Pennsylvania. Breeding has been confirmed only in Philadelphia. Five of the remaining counties were classified as probable and the remaining were considered possible (Appendix III). Four of the properties were classified as probable and two were classified as possible (Appendix IV).



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Pennsylvania counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Berks	Probable	Probable
Bucks	Possible	-----
Centre	Probable	-----
Delaware	Possible	-----
Lancaster	Probable	-----
Lebanon	Probable	-----
Philadelphia	Confirmed	-----
Westmoreland	Probable	-----

Major Landscapes - The primary landscape setting that apparently supported black rails prior to the twentieth century was the extensive tidal marshes along the Delaware River. This included the marshes in present day Philadelphia and marshes down river in Delaware County. Other documented locations were in isolated freshwater marshes mostly within inland farmlands. Some of these sites have been within the upper Delaware or Susquehanna River valleys but some have been away from these areas.

Habitat - The meadows referred to by Thomas Rowan and John Krider around Philadelphia were almost certainly tidal marshes along the Delaware River. No specifics of what vegetation the birds were nesting in were provided. Interior birds have been found in freshwater wetlands within cattails, rushes or sedges (Schutsky 1992).

TRENDS: The ability of Pennsylvania to support historic black rail populations was apparently lost with the filling of the great tidal marshes surrounding Philadelphia. Protection of Tinicum Marsh is an important achievement but represents approximately 3% of the marshlands that occupied the site prior to urban expansion including development of the Philadelphia Airport and other transportation structures. Inland areas support a large number of freshwater wetlands a small portion of which could be occupied in any given year. However, recent surveys have not detected calling birds and there is presently no known stable breeding site within the state.

POPULATION ESTIMATE: Pennsylvania has a checkered history of black rail occurrences during the breeding season and mostly from small, inland wetlands. Vigilance should be maintained within inland locations. The single bird from Berks County in 2013 is consistent with previous records from the same county and elsewhere and suggests the occurrence of a low-density, scattered population. The population estimate for the state is set from zero to five breeding pairs.

Uncertainty – The existence of recent and past scattered records along with the difficulty of surveying the large, open farmlands for black rails suggests that uncertainty in the population estimate is moderate.

THREATS: Tidal marshes in Philadelphia along the Delaware River have been irretrievably lost. Draining of freshwater wetlands and other intensive agricultural practices may threaten inland habitats, particularly depressional wetlands.

NEW JERSEY

SUMMARY: New Jersey has the distinction of having the largest number and longest running record of black rail observations of any state throughout the species range. Black rails have been detected during the breeding period within ten New Jersey counties between the early 1800s and 2016. Breeding has been confirmed in seven counties including Ocean, Atlantic, Cape May, Burlington, Cumberland, Sussex and Mercer. Most of the black rail activity in New Jersey has been on the Atlantic Coast where more than 120 nests were collected between 1910 and 1940. The most concentrated breeding occurred in narrow marshes along the sound side of the barrier islands. All of these populations were lost during the post war development boom either by wetland filling or grid ditching for mosquito control. The large populations in tidal marshes along the mainland edge of the coastal bays have also declined dramatically over the past 40 years. Following the collapse of the Atlantic populations, the extensive marshlands that stretch along the Delaware Bay shore from Cape May to Salem became the last stronghold. These populations also appear to have declined by more than 60% since the late 1980s. Birds have been recorded during the breeding season within four inland sites but none since 2006. The greatest current threat to black rails in New Jersey is the loss of breeding sites due to ongoing sea-level rise.

LEGAL STATUS AND RANK:

State – In 1987 black rails were listed as threatened in New Jersey due to population declines associated with habitat loss and degradation. In 2012 black rails were reclassified as endangered within the state due to continuing declines. The state of New Jersey has also ranked the black rail as a Tier I species of greatest conservation need.

Natural Heritage Rank – Black rails have been assigned a rank of S2B (Imperiled) in New Jersey indicating the small number of pairs in the state and reflecting their perceived decline over recent decades.

SURVEY EFFORTS: A number of significant and targeted surveys have been conducted for black rails in New Jersey. The Urner Club surveyed Holgate Marsh from 1946 through 1953 for black rails (Conn 1989). Kerlinger and Sutton (1989) surveyed 63 sites within eight coastal study areas from one to six times using a call-broadcast protocol during the summer of 1988. This benchmark effort detected 24 rails within 15 sites and was the first to highlight the importance of the extensive marshes of Cumberland County. The New Jersey Endangered and Nongame Species Program and New Jersey Audubon initiated a two-year black rail survey effort in the spring of 2015 using a call-broadcast protocol. The 2015 effort sampled 258 points including the Kerlinger and Sutton sites and additional locations with promising habitat. Black rails were detected within ten points. A total of 259 points were included in New Jersey and surveyed by the SHARP network (Olsen et al. 2014). The New Jersey breeding bird atlas was conducted from 1994 through 1997.

RECORDS DURING THE BREEDING SEASON:

Historic Records – New Jersey has had the most consistent and longest running record of observations of any state within the range of the eastern black rail. Harlow (1912) references a breeding record from 1810 though he provides no details. The earliest breeding record listed by Stone (1937) was the three nests (one in early June 1844, one in early June 1845 and a third in mid-August, 1845) collected by Beesley while cutting salt hay on Beesley's Point in Cape May County. Brewster (1907) references a specimen collected in June of 1857 in Salem County likely taken in the New Jersey marshes across the Delaware River from the expansive Philadelphia marshes. Mather collected a nest with eight eggs in May, 1872 on his farm on Rancocas Creek in Burlington County while cutting salt hay (Justice 1903).

Atlantic Coast Locations - From 1910 through 1940 New Jersey became the center of black rail collecting with prominent collectors including McMullen, Davis, Harlow, Wolfe and Jillison. Collecting was focused along the barrier islands of Ocean, Atlantic and Cape May counties. More than 100 nests were collected from back island marshes including Long Beach, Little Island Beach, Brigantine Island, Ludlam's Beach (Sea Isle City), Seven Mile Beach (Stone Harbor) and Atlantic City. In addition to the barrier marshes, Davis collected more than 20 nests and Jillison collected more than 20 individuals in the Tuckerton Marshes (now Edwin B. Forsythe National Wildlife Refuge). The collecting era came to a close around 1940 as the outer marshes were degraded and many of these sites were filled and developed in the post war period between 1950 and 1970. Since this time, black rails have disappeared from the barrier islands. No reports from these areas after 1940 were found except for Holgate Marsh on the south end of Long Beach Island. Birds persisted in this marsh and the site was monitored by the Urner Club from 1946 through 1953 (Conn 1989). The last nest was located on the site in 1955 (Ross 1955) and the last bird was detected there in 1964 (Meritt 1966). However, more recent observations have been made within selected sound and mainland marshes in Ocean, Atlantic and Cape May Counties. Kerlinger and Sutton detected three birds on the Ocean County portion of Forsythe refuge 10 July, 1988, 50 calling birds were detected in May, 1975 on Manahawkin Wildlife Management Area but had declined to a small number by 1986 (Kerlinger and Sutton 1989), Kerlinger and Sutton detected three birds on Tuckahoe Wildilfe Management Area on 23 June, 1988 and McGowan had one on 9 May, 2009.

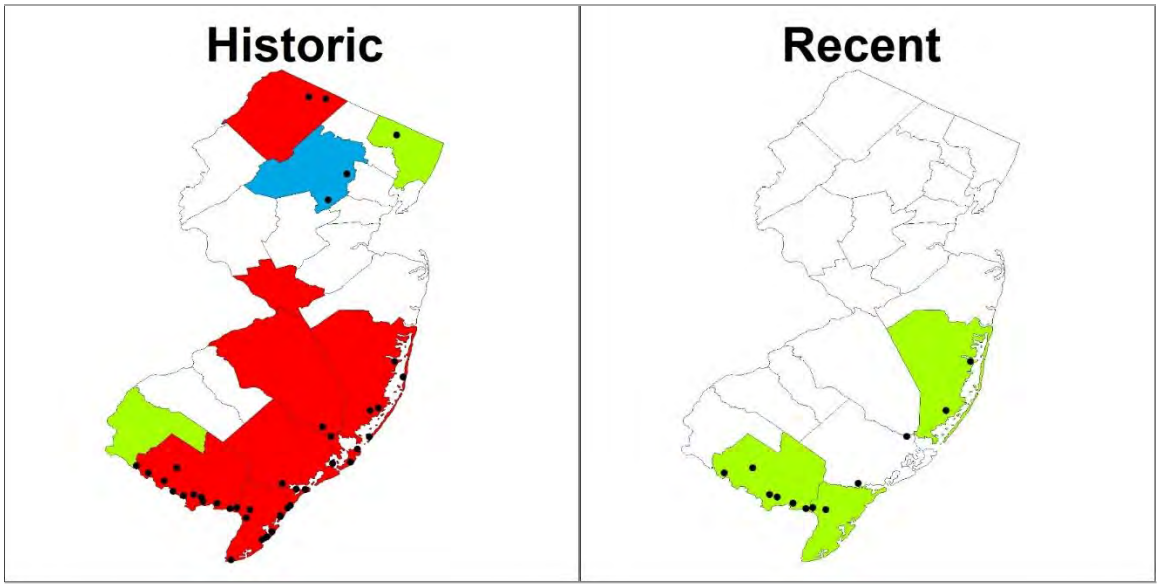
Delaware Bay Locations – This history of black rail occurrence along the Delaware Bay shoreline of New Jersey has been much less known compared to the Atlantic Coast until the historic survey of Kerlinger and Sutton (1989). The site with the most complete history of use is Turkey Point on Dividing Creek (now Glades Wildlife Refuge). Black rails were reported from this site as early as the 1930s (Kerlinger and Sutton 1989) and have been detected from the 1960s with a high of six calling birds on 3 June, 1961 (Scott and Cutler 1961). Multiple birds were detected through the mid-1980s but only one to two birds since that time. Minor collected a bird on 5 May, 1938 on Fortescue Fish and Wildlife Management Area and birds were observed up until 2 July, 1960 when Harty found egg shells (Scott and Cutler 1960). Birds were detected on the Egg Island Fish and Wildlife Management Area throughout the 1960s and 1980s with the last observation on 16 August, 2009. Kerlinger and Sutton (1989) had four birds calling on 15 June, 1988 at Grandy's Beach Marsh and Hoffman had recently fledged young there on 3 July, 2002. On 17 June, 1988 Kerlinger and Sutton had one bird calling on

Heislerville Wildlife Management Area, two birds calling at Moore's Beach and one bird calling at Phillips Creek Marsh. Two days earlier they had one bird calling on New Sweden Wildlife Management Area and on 13 July they detected three birds on Tindall Island Marsh. Kunkle had one bird calling on 18 May, 1965 around Port Norris (Meritt 1967).

Inland Locations – Inland records of black rails in New Jersey are rare compared to those in the coastal salt marshes. David collected a nest with six eggs in Mercer County around Trenton but the specific location is not known. During the atlas period Johnson and O'brien located a bird on the celery farm in Bergen County that called from 14 May to 8 June, 1984 (Boyle et al. 1984). A bird was heard calling on 13 May, 2006 within Great Swamp National Wildlife Refuge in Morris County (Britt 2006). Several people heard a black rail calling from 11 to 16 May, 1991 from Masker Marsh in Sussex County and adults with young were seen in June of 1993 on Walkill National Wildlife Refuge in the same county (Walsh et al. 1999).

Recent Records (after 2010) – The black rail population along the Atlantic Coast of New Jersey is much reduced compared to historic levels. Two detections have been made in Ocean County since 2015 and both were associated with recent survey efforts. One bird was detected on 21 June, 2014 on Oak Island (Edwin B. Forsythe National Wildlife Refuge) as part of the SHARP survey and the second was during the breeding season of 2015 near Manahawkin Wildlife Management Area as part of the New Jersey black rail survey (Mylecraine et al. 2015). The only breeding-season records for Atlantic County since 2010 were 15 birds detected in the tidal marshes of the Mullica River during the 2016 survey conducted by the New Jersey Division of Fish and Wildlife (Davis, personal communication). In Cape May County three birds were detected on Tuckahoe Wildlife Management Area during 2015 (Mylecraine et al. 2015). Along the Delaware Bay shore of Cape May County one bird was detected on 18 May, 2015 by the SHARP survey crew at Reeds Beach (Cape May National Wildlife Refuge). In Cumberland County the New Jersey black rail survey detected one bird in the Tindall Island Marshes (Back Neck Road), one bird at Heislerville Wildlife Management Area (Matts Landing Road), one bird at Turkey Point (Glades Wildlife Refuge) and three birds in the Commercial Township Marshes (Haleyville Road, Berrytown Road) (Mylecraine et al. 2015). No birds have been detected within inland locations since 2006.

DISTRIBUTION: Black rails have been recorded from ten counties and 39 named properties in New Jersey. Breeding has been confirmed only in Atlantic, Burlington, Cape May, Cumberland, Mercer, Ocean and Sussex Counties. Two of the remaining counties were classified as probable and the other was considered possible (Appendix III). Breeding confirmation was documented for 20 of the 39 named properties with an additional 17 classified as probable and two classified as possible (Appendix IV).



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

New Jersey counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Atlantic	Confirmed	-----
Bergen	Probable	-----
Burlington	Confirmed	-----
Cape May	Confirmed	Probable
Cumberland	Confirmed	Probable
Mercer	Confirmed	-----
Morris	Possible	-----
Ocean	Confirmed	Probable
Salem	Probable	-----
Sussex	Confirmed	-----

Major Landscapes - Black rails have been documented in two landscape settings along the Atlantic Coast of New Jersey including marshes along the landward side of barrier islands and salt marshes within estuaries and coastal bays. Rail breeding densities reached their highest levels within the barrier island marsh patches. Estuarine marshes of particular importance include the Tuckerton Marshes along Little Egg Harbor the marshes at the mouth of the Mullica River around Great Bay and the marshes around Manahawkin Bay. Black rails along the Delaware Bay shore use the vast tidal salt marshes that stretch from Cape May west to Salem.

Within the few inland sites that have been recorded, black rails appear to use freshwater wetlands either in a natural setting or within an impoundment.

Habitat - Stone (1937) gives a good description of habitat in New Jersey salt marshes as large patches of saltmeadow cordgrass and saltgrass that attain a height of 18 to 24 inches and then is bent over by wind and rain to form dense recumbent mats that are supported by stems below. Kerlinger and Sutton (1989) describe the habitat of occupied sites as having patches of saltmeadow cordgrass and saltgrass with some rushes and salt bush and further indicate that detections were mostly along the marsh-upland ecotone. Harlow (1912) describes the nest areas as a wet meadow dominated by saltgrass but also included sedges. Stuart (1920) describes the nesting area behind the dunes below Beach Haven as dry fine marsh grass. No description of the freshwater marshes from the few inland locations has been provided.

TRENDS: The black rail population in New Jersey has experienced a dramatic decline over the past century. The large "colonies" of nesting birds behind many of the barrier islands from Long Beach south to Stone Harbor likely numbered in the hundreds during the early 1900s. All of these sites have been lost. Birds using the mainland marshes across the sound from the barrier islands also appear to have declined. Birds breeding in the marshes in Burlington County where Davis collected several nests are now gone. The 2015 survey effort detected one calling bird near Mahahawkin Wildlife Management Area, a site that in 1975 supported 50 calling birds. Tuckerton Marshes where Davis collected 20 nests between 1922 and 1928 does not appear to currently support birds. Birds in the vast marshlands of the Delaware Bay shore that became the remaining stronghold following the loss of birds on the Atlantic have also declined. The 2015 surveys detected seven birds compared to 18 detected by Kerlinger and Sutton (1989) in 1988 despite the fact that more sites were surveyed.

POPULATION ESTIMATE: From recent (2015-2016) survey effort a soft estimate of population size for New Jersey would be in the range of 40-60 breeding pairs. This compares to an estimate of 25 to 50 pairs reported during the 2014 black rail workshop. The difference mostly reflects the detection of an unknown cluster of occurrences in the marshes of the Mullica River during the spring of 2016.

Uncertainty - Uncertainty in the population estimate is moderate. This rating is due to the extensive marshes found in Cumberland County and the difficulty of reaching a high degree of coverage in survey efforts.

THREATS: The great black rail breeding areas behind the New Jersey barrier islands were either filled in the post war development boom or degraded by grid-ditching for mosquito control. McMullen (1952) who located more nests of black rails than anyone in this setting indicated that draining the marshes had had a substantial impact on breeding black rails leading him to cease looking for nests in 1940. Kerlinger and Sutton (1989) suggested problems with invasion by common reed and changes in landuse such as marsh ditching and the cessation of salt hay farming. While some of the sites that have supported black rails in the recent past have also been salt hay farms, the long-term practice of establishing dike systems around marshes to manage salt hay leaves the marsh vulnerable to catastrophic losses of habitat by storm events. The greatest current threat to black rails nesting in the tidal salt marshes of New Jersey is the loss of breeding sites due to ongoing sea-level rise.

DELAWARE

SUMMARY: Black rails have been detected during the breeding period within all three Delaware Counties between 1933 and 2014. Breeding has been confirmed in Kent County. Virtually all of the recorded black rail activity in the state has been within public-access sites in Kent and Sussex Counties including the historic strongholds of Bombay Hook National Wildlife Refuge, Port Mahon Road and Prime Hook National Wildlife Refuge. Other sites include Little Creek Wildlife Area, Big Stone Beach Marsh and Delaware Seashore State Park. All records from the state are from tidal salt marshes. Reported numbers from the three stronghold sites have declined by approximately 90% since the 1990s. The only observations reported since 2010 have been within Bombay Hook National Wildlife Refuge, Prime Hook National Wildlife Refuge and Big Stone Beach Marsh. Although marshes have been impacted by a series of forces over the past two centuries, the greatest current threat to black rails nesting in Delaware is the inundation of habitat used for breeding due to ongoing sea-level rise.

LEGAL STATUS AND RANK:

State - Black rails are listed as endangered within the state of Delaware and have been ranked as a Tier I species of greatest conservation need.

Natural Heritage Rank – Black rails have been assigned a rank of S1B (Critically Imperiled) in Delaware indicating their extreme rarity in the state and reflecting their perceived decline.

SURVEY EFFORTS: Rothstein (1991) conducted an informal but targeted survey for rails in marshes south of Dover. The Delmarva Ornithological Society conducted a survey of 44 sites from the Reedy Point Bridge in New Castle County to Port Mahon Road in Kent County in 1992 (Maier 1993). Sites were surveyed with a call-broadcast protocol at least twice between 13 May and 15 June. A total of 89 points were included in Delaware and surveyed by the SHARP network (Olsen et al. 2014). Delaware has conducted two breeding bird atlas projects including the first from 1983 through 1987 and the second from 2008 through 2012.

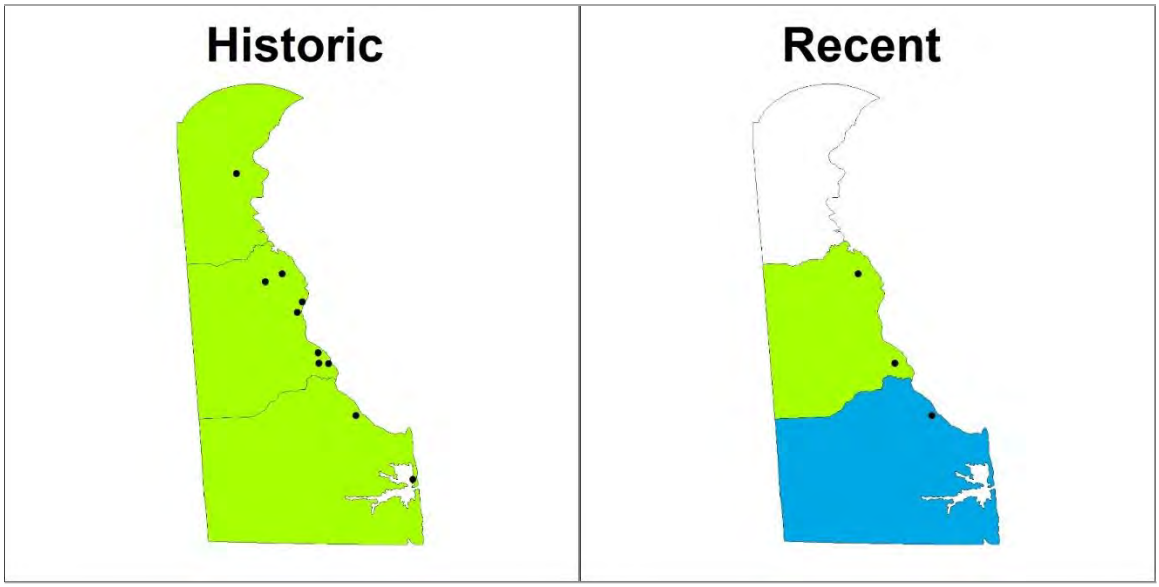
RECORDS DURING THE BREEDING SEASON:

Historic Records – It seems likely that black rails have existed within Delaware marshes throughout modern times but have been poorly documented during the early period. Early authors appear to assume their occurrence but provide no evidence. De Kay (1844) lists the range as extending from New Jersey south to Louisiana and fifty years later Stone (1894) lists the range as southeastern U.S. to Massachusetts. However, Rhoads and Pennock (1905) do not include the black rail in their list of birds from the state. Bent (1926) outlines the broader range but does not list Delaware among the states with specific evidence of occurrence. Hess et al. (2000) list the first state record from Hanson's notes as a bird observed in a marsh south of Dewey Beach (now Delaware Seashore State Park) on 16 June, 1933 and the first breeding record as a nest found in 1938. A second nest was found on 15 July, 1939 on Bombay Hook National Wildlife Refuge. Following these observations, almost all Delaware records are after 1960 and concentrated in Kent and Sussex Counties.

Records for Kent County are primarily from Little Creek Wildlife Area, Bombay Hook National Wildlife Refuge and Port Mahon Road. Little Creek Wildlife Area includes a tidal marsh that was initially grid-ditched and in 1959 the state of Delaware created a series of impoundments totaling 296 ha (733 acres). As part of this mosquito control project, Lesser (1965) conducted bird surveys on the property from 1961 through 1962 and recorded five occurrences of black rails during the breeding season. A bird was detected there in May of 1963 (Scott and Cutler 1963) and not again until Churchill recorded a bird on 18 April, 1987. No detections were found past this date. Records for Bombay Hook include most years from 1980 through 2010 with numbers ranging from one to 12 calling birds (high count of 12 recorded in 1991: Hess 1993) from 1980 through 1995 and typically one bird after 1995. Records for the Port Mahon Road site stretch back to 1970 and include most years from 1985 through 2002 with numbers ranging from one to 16 birds (high counts of 16 in 1991 and 12 in 1997) from 1985 through 1998 and one to two birds from 1999 through 2002. A single bird was heard there by Rowland on 15 May, 2007 (Veit et al. 2007). Other observations in Kent County include a bird heard on 1 June, 1988 by Hill along Bennetts Pier Road and a bird detected on 14 May, 1992 in the marsh at Leipsic during the black rail survey (Maier 1993). Reports from Sussex County have been concentrated on Prime Hook National Wildlife Refuge with observations coming from the marsh along Broadkill Beach Road. Records extend back to 1967 and a high of 13 birds were heard by Carrick on 19 May, 1968 (Scott and Cutler 1968). Most reports since 1970 are of one to two birds but four birds were heard by Bryant on 6 May, 2006. Other observations within Sussex County include the marsh behind Big Stone Beach where two birds were heard by Gordon on 17 May, 2001 (Burgial et al. 2001) and one bird was heard by Hill on 7 May, 2006 (Veit et al. 2006) and Delaware Seashore State Park where Hanson detected the recognized first state record in 1938 and Eventon et al. observed a bird on 30 May, 1964 (Sundel 1968). Wilmington and the surrounding marshlands of New Castle County were contiguous with the marshlands of nearby Chester and Philadelphia Pennsylvania that were known to support black rails. It is likely that the marshes of Wilmington would have supported this species prior to the reclamation of several thousand acres of wetland by the St. George's Marsh Company in the early 1860s. However, no records of the species were found from this location. Armistead recorded a bird on 1 May, 1988 calling from the Dragon Run Marsh near Delaware City but subsequent visits were fruitless indicating that the bird was likely a migrant (Boyle et al. 1988).

Recent Records (after 2010) – Recent records of black rails in Delaware generally follow the pattern of historic records though numbers are much reduced. Records for Bombay Hook National Wildlife Refuge include two birds heard by the SHARP crew on 27 July, 2011, one bird heard by Jennette on 2 May, 2013, one bird heard by Beattie on 27 April, 2014 and one bird heard by Moyer on 29 August, 2014. Records for Primehook National Wildlife Refuge include one bird heard on 7 May, 2014 by the SHARP crew. The only other recent record was a bird heard by Merker on 19 May, 2012 along Big Stone Beach Road.

DISTRIBUTION: Black rails have been recorded from three counties and ten named properties in Delaware. Breeding has not been confirmed in Delaware. However, all three counties have been classified as probable (Appendix III) and all but two properties have been classified as probable (Appendix IV).



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Delaware counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Kent	Probable	Probable
Newcastle	Probable	-----
Sussex	Probable	Probable

Major Landscapes - Black rails have been documented in two landscape settings in Delaware including in marshes along the landward side of the barrier island along Rehoboth Bay and the vast salt marshes along the Delaware Bay shore. The greatest concentration of recorded activity has been in the marshes between Smyrna and Lewes. Black rails have not been recorded within inland freshwater marshes in Delaware.

Habitat - Black rails in Delaware appear to be restricted to tidal salt marshes. Hess et al. (2000) describe the habitat as salt hay marshes the form dense mats of dead vegetation over wet soils and occasionally in the highest areas of the marsh with scattered shrubs. The species has not been recorded within freshwater marshes in Delaware.

TRENDS: If the few public-access locations are any indication, the black rail population in Delaware has declined since reporting was initiated in the 1960s. Numbers reported from the three strongholds in the state including Bombay Hook National Wildlife Refuge, Primehook National Wildlife Refuge and Port Mahon Road have all declined. Bombay Hook detections have declined from an annual norm of several before 1995 to possibly one in

recent years. Primehook numbers have declined from more than ten birds in the late 1960s to two-four birds through the early 2000s to possibly one bird today. The Port Mahon Road site has declined from more than ten birds in some years in the 1990s to one-two birds in the early 2000s to no birds today. No birds have been reported from the Little Creek Wildlife Area in nearly 30 years. A bird has been detected in the marsh along Big Stone Beach Road continuing scattered records dating back to 2001. Collectively in the three strongholds it appears that the population has declined approximately 90% since the 1990s.

POPULATION ESTIMATE: Based on recent reports from traditional sites that are visited annually a soft estimate of population size for Delaware would be in the range of 0-10 breeding pairs. This compares to an estimate of 25 to 50 pairs reported during the 2014 black rail workshop and an estimate of 10-100 breeding pairs suggested by Hess et al. (2000). The difference in estimates over time has reflected the ongoing declines in reports over the past two decades.

> *Uncertainty* - Uncertainty in the population estimate is moderate. This rating is due to the lack of survey coverage of the Big Stone Beach area and surrounding marsh complex (both west and east) that have both supported birds in the past and have not been regularly visited.

THREATS: As with most states along the Atlantic Coast, in the late 1800s and early 1900s a large amount of marshland that may have been important to black rails was "reclaimed" in Delaware for agricultural or urban uses by ditching and constructing dikes. Remaining marshes were grid-ditched for mosquito control, primarily in the 1930s. Later beginning in the late 1950s extensive areas of marsh were impounded to create open water for mosquito control. All of these activities have likely had an impact on the black rail population prior to the species being recorded in the state. Hess et al. (2000) suggest that changes in hydrology and associated salinity may have impacted the population on Prime Hook National Wildlife Refuge. They also point out that invasion of the marshes by common reed along with control measures including the use of herbicides and burning may have impacted the marshes and rails in certain years. The greatest current threat to black rails nesting in the tidal salt marshes of Delaware is the inundation of habitat used for breeding due to ongoing sea-level rise.

MARYLAND

SUMMARY: Maryland has the distinction of documenting the largest concentration of breeding black rails ever recorded throughout the species range. Black rails have been detected in Maryland during the breeding period within 15 counties with breeding confirmed in Anne Arundel, Baltimore, Dorchester and Kent. The distribution of black rails in Maryland approximates the concentration of tidal salt marshes including historic strongholds in the great marshes of Dorchester, Somerset and Worcester Counties with scattered occurrences elsewhere matching isolated marshes. Inland occurrences have been rare and sporadic. Reports beginning in the late 1940s of black rails in Dorchester County would precipitate a following of the bird in the county that included annual forays to Elliott Island that would last for more than 60 years and provide a record of decline emblematic of the broader region. The black rail population in Maryland has experienced a dramatic collapse since the early 1990s. Birds detected during the broad-scale, Maryland DNR surveys conducted by Brinker et al. have declined from an estimated 140 in the 1990-1992 period to 24 in 2007 to only eight in 2014 a decline of more than 90% in less than 25 years. Black rails are listed as endangered in Maryland reflecting these declines. Although several factors including marsh ditching, pesticide spraying, invasion by exotic plants and ground predators may be contributing to declines, mounting evidence suggests that sea-level rise has reached a tipping point that may eliminate black rails from Maryland tidal marshes.

LEGAL STATUS AND RANK:

State - Black rails are listed as endangered within the state of Maryland and have been ranked as a Tier I species of greatest conservation need.

Natural Heritage Rank – Black rails have been assigned a rank of S1 (Critically Imperiled) in Maryland indicating their extreme rarity in the state and reflecting their documented decline.

SURVEY EFFORTS: Maryland has the most comprehensive serial dataset of black rail occurrence of any state within the range of the eastern black rail. Maryland Department of Natural Resources surveyed 331 points throughout the Coastal Plain for secretive marsh birds using call-broadcast surveys from 1990 through 1992 that provides a population benchmark (Brinker et al. 2002). An adaptive version of this survey was repeated in 2007 (McCann 2007) and again in 2014 (Brinker et al. unpublished data). In addition to these systematic surveys, Elliott Island and surrounding marshes in Dorchester County has been visited during the breeding season by the bird-watching community to either encounter black rails or to conduct casual surveys since the late 1940s. The long archive of recorded observations provides an important source of information. Of particular significance have been dedicated surveys of the site by observers including Terbough, Armistead, Rowlette, Warienga, Klockner and O'Brien. Armistead led the "May count" to the area during the first Saturday of May from 1966 through 2004 and the added second Saturday of May from 1970 through 2004 (Armistead 2004). Weske (1969) conducted an intensive breeding study on Elliott Island during the breeding season of 1963 that included habitat use, breeding density, breeding behavior and vocalizations. A total of 130 points were included in Maryland and surveyed by the SHARP network (Olsen et al. 2014). Maryland has conducted two breeding bird atlas projects including the first

from 1983 through 1987 and the second from 2007 through 2011. In addition, Howard County conducted an atlas between 1973 through 1975 and Montgomery County conducted an atlas between 1971 and 1973.

RECORDS DURING THE BREEDING SEASON:

Historic Records – Maryland ornithologists and the public have had an interest in black rails for generations. Kirkwood (1895b) mentions observations and specimens taken but does not provide evidence of birds occurring during the breeding season. The earliest report during the breeding period was a bird collected in Charles County on 6 June, 1879 (Cooke 1929). Jones collected a second bird there on 29 May, 1891. Reports beginning in the late 1940s of black rails in Dorchester County would precipitate a following of the bird in the county that included annual forays to Elliott Island that would last for more than 60 years. Terborgh and Knudson's report of more than 100 calling birds there on 2 June, 1954 is the highest count ever made of the species.

Chesapeake Bay Western Shore and Inland – Despite the fact that the first breeding-season record of the black rail in Maryland was documented in Charles County, there is a limited record of the species along the western shore of the Chesapeake Bay and only a single record of the species from the farming counties (e.g. Frederick, Montgomery) of western Maryland. A bird was heard calling by Osenton and others from a hay field near Potomac from 9 to 12 May, 1994 (Blom et al. 1994). Most of the western shore records are concentrated in Anne Arundel and Baltimore Counties. Terborgh documented birds in Anne Arundel on 22 May, 1952 (Stewart and Robbins 1958). Most records in the county have come from Sandy Point State Park and are the result of surveys done by Warienga from 1974 through 1982 who reported a peak of four calling birds in 1979. Birds have also been documented in the Churchton Marshes, Swan Creek and Jug Bay. Most observations within Baltimore County have been in the Black Marsh portion of North Point State Park where the most frequent observations extend from the late 1970s through the mid-1990s. Miller found a juvenile dead on the road on 17 July, 2004. Ward detected a calling bird in June of 1971 in the Carroll Island Marshes and birds were detected there again by the Brinker et al. survey team in 1990. Other records from the western shore of the Chesapeake include birds from Harford County reported from a freshwater marsh on the Gunpowder River (Day 2004) a bird reported from a wet, grassy field on Aberdeen Proving Ground (Ringler 2003) and a bird from Bush Declaration Natural Resource Management Area (Iliff and Stasz 2000), birds reported from Calvert County during the late 1990s from Parkers Creek to North Beach, a bird from Prince George's County detected on 27 April, 1991 within Patuxent River Park by the Brinker et al. team and birds from St. Mary's County reported on St. George Island on 29 June, 1992 and Point Lookout State Park from 1992 through 1997.

Chesapeake Bay Eastern Shore – Black rail records during the breeding season exist for all of the counties along the Eastern Shore of the Chesapeake Bay in Maryland. However, Dorchester County (and to a lesser extent Somerset County) is recognized as the center of abundance in the state and is the location of the greatest interface between black rails and the public anywhere throughout the species range. Examination of seasonal reports in Atlantic Naturalist, Maryland Birdlife and American Birds reveals a prominent upswing in visitation

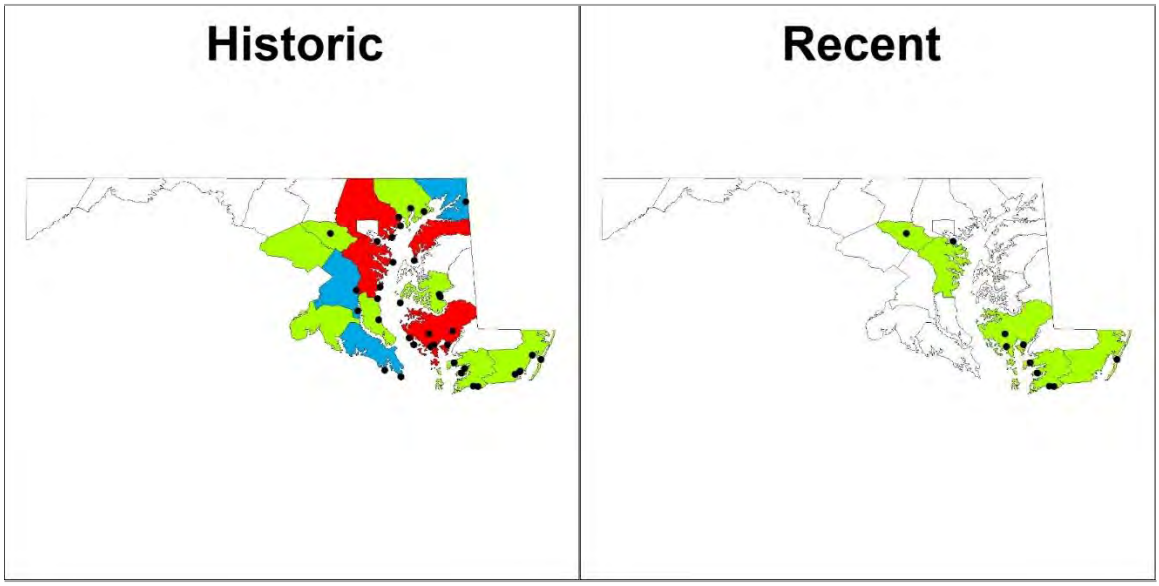
to Elliott Island beginning in the 1960s as the site became an annual destination to hear the bird. Although hundreds of bird watching forays to Elliott Island have been made and offer a record of occupancy, select observers including Armistead, Wierenga, Rowlette, O'Brien, Ringler and Davidson conducted night surveys along Elliott Island Road that represent an index of the population. Weske (1969) conducted an intensive study on Elliott Island during the breeding season of 1963 that resulted in an average home range estimate of 3.2 ha and a breeding density (high estimate) of one pair/10.5 ha. Decadal high counts for Elliott Island include 100+ (1950s), 40 (1960s), 45 (1970s), 47 (1980s), 44 (1990s) and 12 (2000s). Other locations in Dorchester County where black rails have been observed regularly include Fishing Bay Wildlife Management Area where the Brinker survey team recorded 28 calling birds in 1990, Blackwater National Wildlife Refuge where the survey team had 12 birds in 1991, Chicawicomico Marsh where a bird was heard on 4 August, 1991, Cattail Island where two birds were detected on 23 May, 1990 and Farm Creek Marsh where Klockner had three calling birds on 31 May, 1986 (Ringler 1986). Next to Dorchester County, Somerset County has the most extensive black rail record in Maryland with observations dating back to the 1950s and continuing to recent years. Deal Island Wildlife Management Area has the most extensive record with a high of 26 calling birds detected by the Brinker team in 1990. Other sites include Irish Grove Sanctuary where birds have been detected for four decades including a high of three birds in 1990, Fishing and Maddox Island Marshes where the Brinker team had eight birds in 1990 and Fairmont and Pocomoke Sound Wildlife Management Areas where single birds have been detected. Black rails have also been detected in Talbot County where as many as eight birds were detected within the Easton Waste Water Treatment Plant, single birds were detected in Kings Creek Preserve through the 1990s and a bird was heard on 21 May, 1981 on Tilghman Island Marsh. Lamoy (Ringler 1990) observed an adult with two young on Eastern Neck National Wildlife Refuge in Kent County on 4 June 1990 and the Brinker team had four birds in 1992. Whitmyre (Southworth and Southworth 1997) heard a single bird on 19 April, 1996 in Canal Wildlife Management Area in Cecil County.

Delmarva Seaside – Compared to the other regions in Maryland, Worcester County along the Delmarva seaside has a limited history of black rail occurrences. Dyke recorded a bird calling on Assateague National Seashore on 1 August, 1965 (Robbins 1965). Although this observation was an outlier, birds have been detected within the marshes along the landward edge of Assateague since the high of 20 calling birds was set by the Brinker team in 1991. Birds have also been recorded in several locations along the western side of Chincoteague Bay with the most consistent use recorded along Truitt Landing where Dyke recorded a high of three birds during the summer of 1999. Other locations include the Bockatonorton Bay Marshes, the E. A. Vaughn Wildlife Management Area and the Newport Bay Marshes where the Brinker team recorded 12, five and four calling birds respectively in 1991.

Recent Records (after 2010) – Very few black rails have been documented in recent years from the Western Shore of the Chesapeake Bay. Arnold reported a single bird calling from 10 to 19 June, 2011 from swan Creek within the Cox Creek Dredged Material Containment Facility in Anne Arundel County. Surprisingly, the last record of a black rail in western Maryland was a bird detected by Ott and others on 18 May, 2014 in Howard County (first county record) on the University of Maryland Central Farm (Adams et al. 2014). Reports from the historic stronghold on Elliott Island in Dorchester County include two birds detected by McCandless from early

May through mid-July in 2010 and single birds reported from 2012 through 2015. No birds were detected in 2016. A similar pattern was seen from Fishing Bay Wildlife Management Area where two birds were reported in 2011 by the SHARP survey team and single birds were reported from 2012 through 2014. The only other recent report form Dorchester County was a single bird detected by the Brinker team on Blackwater National Wildlife Refuge in 2014. The last reported records from Somerset County include a single bird heard by Stasz on 18 April, 2012 on Irish Grove Sanctuary, a single bird detected by the SHARP crew on 5 May, 2011 on Pocomoke Sound Wildlife Management Area, a single bird detected by the Brinker team on 5 June, 2014 on Fairmont Wildlife Management Area and a single bird detected in the historic stronghold of Deal Island Wildlife Management Area on 14 June, 2014 by the Brinker team. After a gap of several years, three birds were detected on 31 May, 2014 on Assateague Island National Seashore in Worcester County.

DISTRIBUTION: Black rails have been recorded from 15 counties and 40 named properties in Maryland. Breeding has been confirmed in Anne Arundel, Baltimore, Dorcester and Kent Counties (Appendix III). Eight of the remaining counties have been classified as probable. Breeding has been confirmed on only four of the properties but an additional 30 have been classified as probable (Appendix IV).



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Maryland counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Anne Arundel	Confirmed	Probable
Baltimore	Confirmed	-----
Calvert	Probable	-----
Cecil	Possible	-----
Dorcester	Confirmed	Probable
Glymont	Probable	-----
Harford	Probable	-----
Howard	Probable	Probable
Kent	Confirmed	-----
Montgomery	Probable	-----
Prince George	Possible	-----
Somerset	Probable	Probable
St. Marys	Possible	-----
Talbot	Probable	-----
Worcester	Probable	Probable

Major Landscapes - The distribution of black rails in Maryland approximates the concentration of tidal salt marshes. The great stronghold has been the vast marshes of Dorchester and Somerset Counties extending from Fishing Bay south to Rumbly Point. Beyond this core black rails have been found in scattered areas around the Chesapeake Bay where large tidal marsh patches occur (e.g. Sandy Point State Park, North Point State Park, Eastern Neck National Wildlife Refuge). Within the Delmarva coastal bay, the western fringe of Assateague Island and the opposing marshes along the eastern edge of the mainland have been important. Inland occurrences have been rare and sporadic.

Habitat - Several (Weske 1969, Meanley 1975, Brinker and Therres 1992, Burt 1994, Wierenga 1996) exceptional accounts of black rail habitat in Maryland have been written. These have focused on the vast marshes of Dorchester and Somerset Counties where birds use classic high marsh sites. The plant community is dominated by dense stands of saltmeadow cordgrass and saltgrass but also contains patches of big cordgrass, black needlerush and black rush. Rails occupy the highest and driest areas that grade into shrub communities dominated by marsh elder and saltbush. In his extensive treatment of habitat, Weske points out the dominance of smooth cordgrass, big cordgrass and saltmeadow cordgrass in his study area and the lack of association with black needlerush and saltgrass. The description is confined to use of the brackish marshes of Elliott Island. However, the description is comparable to use along remaining areas of the Eastern Shore and tidal salt marshes of the western shore of the Chesapeake Bay. Habitat used on Assateague Island appears similar to that described in both New York (Griscom 1923) and New Jersey (Harlow 1912). Grassy fields described on Carroll Island, Aberdeen Proving Ground and near Potomac were extensive fields with wet areas that contained

broomsedge and sedges. Black rails in Maryland have rarely been detected within tidal-fresh marshes dominated by pickerelweed and arrow arum mixed with wild rice and narrow leaf cattail.

TRENDS: The black rail population in Maryland has experienced a dramatic collapse since the early 1990s. Birds detected during the broad-scale, Maryland DNR surveys conducted by Brinker et al. have declined from an estimated 140 in the 1990-1992 period to 24 in 2007 to only eight in 2014 a decline of more than 90% in less than 25 years. Of particular concern is the documented decline in former strongholds. Armistead (2004) presents a summary of May counts (1966-2004) in Dorchester County (including primarily Elliott Island and Deal Island) conducted annually during the first Saturday of May. Counts averaged 5.8 and 9.8 birds/night for all counts and counts when birds were heard respectively (N = 29, 17) for the 1966 to 1994 period compared to 0.9 and 1.8 (N = 10, 5) for the 1995 to 2004 period. Elliott Island was the site of the highest count of eastern black rails ever recorded and maintained high decadal counts in the 40s through the early 1990s. During the 2000s the peak count was 12 and since 2010 has been one and no birds were detected during 2016. It is conceivable that black rails could be lost from the tidal marshes of Maryland in the next several years.

POPULATION ESTIMATE: From recent (2014) survey effort a soft estimate of population size for Maryland would be in the range of 15-30 breeding pairs. This compares to an estimate of 200 to 250 pairs reported during the 2014 black rail workshop. The difference reflects the ongoing, precipitous declines within historic strongholds.

Uncertainty - Uncertainty in the population estimate is moderate. This rating is due to the extensive marshes found in Dorchester and Somerset Counties and the difficulty of reaching full survey coverage of available habitat.

THREATS: Several authors (Brinker and Therres 1992, Wierenga 1996, Armistead 2004) have discussed potential threats that may be causing black rail declines in Maryland including marsh loss, marsh degradation related to mosquito control programs, ongoing sea-level rise, marsh burning and management, predation and invasion by exotic plants. Like other states along the Atlantic Coast Maryland lost approximately 73% of its tidal marshes from the late 1700s to the 1980s. Although these losses would likely have impacted black rails marshes have stabilized and the relationship between earlier losses and ongoing declines is unclear. Potential conflicts between marsh alterations related to mosquito control programs and the black rail population led to a study comparing altered and unaltered marshes focused on potential impacts of Open Marsh Water Management in 1990 (Brinker and Therres 1992). The study did not document definitive evidence of an impact but did result in a temporary moratorium on the use of the management technique on state lands. Common reed has certainly invaded many of the tidal salt marshes in Maryland. However, this event does not explain dramatic declines within extensive marshes such as Elliott Island and Deal Island where black rails were once common across the marsh and invasion has been confined to the upland edge. Several other factors appear to be plausible contributing factors in observed declines but have yet to be investigated.

WASHINGTON D.C.

SUMMARY: Washing D. C. appears to have supported a small population of black rails in the distant past. Although breeding-season records have been reported within the past 20 years very near the District, it has been nearly 100 years since the last reports in Washington, D. C. proper. The population estimate is currently set to zero for the area with relatively low uncertainty.

LEGAL STATUS AND RANK:

State – Black rails have no special legal status in Washington, D. C. likely reflecting the lack of recent records.

Natural Heritage Rank – Black rails have been assigned a natural heritage rank in Washington, D. C. of SH reflecting the general belief that the species has been extirpated within the area.

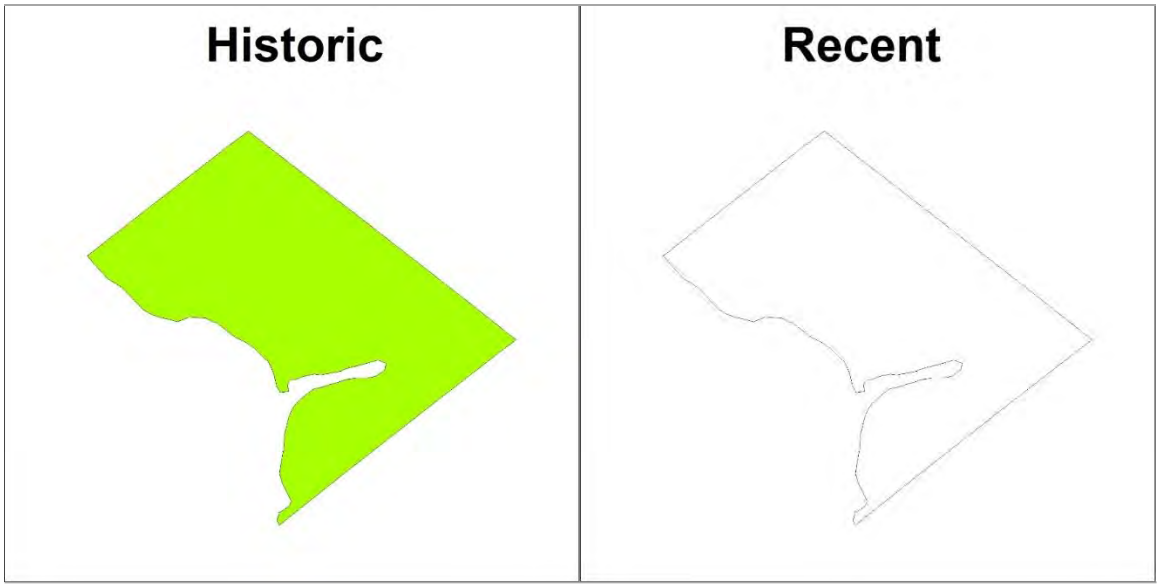
SURVEY EFFORTS: No dedicated surveys have been conducted for black rails in Washington D.C. Two breeding bird atlas projects have been conducted in Washington in association with the Maryland atlases including the first from 1983 through 1987 and the second from 2007 through 2011.

RECORDS DURING THE BREEDING SEASON:

Historic Records – All but one of the records attributed to Washington, D. C. were before 1900. Brewster (1907) gives measurements of a specimen that he inspected in the Bangs collection that was taken by Shekells in the District of Columbia on 6 June, 1879. Palmer (1909) would later identify this bird as an adult male. Brown (1891) describes a black rail that was shot in the District on 29 May, 1891 by Jones and brought to him for identification and indicates that the bird was only the second record known to him. Palmer (1909) reports a bird that was taken along the eastern branch of the Potomac River by Darling on 1 September, 1908. Cooke (1929) describes a bird that was picked up on 14 May, 1923 and preserved.

Recent Records (after 2010) – No recent records of black rails during the breeding season were discovered for Washington, D. C.

DISTRIBUTION: Historic records have been reported for the District but no properties were described within the city and there have been no recent records.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Major Landscapes - Historic records were presumably from the marshes of the upper Potomac River but very little description is given in early accounts.

Habitat - Habitat used was not described by early writers.

TRENDS: Washington, D. C. apparently supported a small number of birds at one time as evidenced by the male collected on 6 June, 1879. However, all observers reported the species to be very rare. Whatever population did exist has been absent for nearly 100 years.

POPULATION ESTIMATE: Washington D.C. currently supports very little habitat suitable for black rails and the areas is not currently known to support a breeding population. The population estimate for the district is set to 0.

Uncertainty - Consistent with the lack of any recent records uncertainty in the population estimate is set to low.

THREATS: Although habitat loss has been a significant issue in Washington D. C. and surrounding areas there is no reason to believe that black rails are being impacted.

VIRGINIA

SUMMARY: Black rails have been detected in Virginia during the breeding period within 15 counties and four independent cities between 1911 and 2014. Breeding has been confirmed only within Northampton County though birds have been resident through the breeding season in thirteen other jurisdictions. Black rails have been documented within a range of landscape settings in Virginia including tidal salt marshes behind barrier islands, open bay or estuarine tidal salt marshes, non-tidal marshes within impoundments and wet meadows associated with pastures or flood plain settings. The early history of black rails in the state is poorly documented with scattered birds reported from the seaside of the Delmarva, lower tidewater and inland counties. The birds on the outer coast were likely lost prior to the 1970s and the ultimate stronghold along the Chesapeake Bay in Accomack County was not recognized until the 1980s. The most recent reports have come from this area and the inner Coastal Plain. The first systematic survey conducted in the state was in 2007 likely well after the most significant declines. A follow-up survey in 2014 suggested a decline of 85% in just seven years. No detections have been reported since 2014. Black rails are listed as endangered in Virginia with a likely population of between zero and 10 pairs.

POPULATION STATUS AND RANK:

State - Black rails are listed as endangered within the state of Virginia and have been ranked as a Tier I species of greatest conservation need (Virginia Department of Game and Inland Fisheries 2005).

Natural Heritage Rank – Black rails have been assigned a rank of S1 (Critically Imperiled) in Virginia indicating their extreme rarity in the state and reflecting their documented decline.

SURVEY EFFORTS: Virginia has a relatively short history of targeted black rail surveys that limits the opportunity to evaluate trends in distribution and abundance. In May and June of 1991 Rottenborn conducted ad-hoc surveys (without broadcast calls) of several locations along the Eastern Shore of the Chesapeake Bay. In April of 1992 Watts and Rottenborn conducted call-broadcast surveys of several locations along the western shore of the Chesapeake Bay. It was not until 2007 that a targeted, systematic survey was conducted covering known historic locations and areas with extensive suitable habitat on the Coastal Plain (Wilson et al. 2009). Wilson et al., working with the Virginia Department of Game and Inland Fisheries, established 328 points along the outer coast, the Chesapeake Bay, and major tributaries. A second round of systematic surveys was conducted in 2014 (Wilson et al. 2015). Aside from targeted efforts, surveys for secretive marsh birds have been conducted in approximately 80 marsh patches in the lower western shore of the Chesapeake Bay (Watts 1992, 1993) and more than 100 marsh patches along the Eastern Shore of the Chesapeake Bay (Watts and Paxton unpublished). A total of 151 points were included in Virginia and surveyed by the SHARP network (Olsen et al. 2014). Virginia has completed one breeding bird atlas project from 1985 through 1989. A second atlas effort is underway and scheduled to be completed in 2019. Loudon County conducted an atlas from 2009 to 2013.

RECORDS DURING THE BREEDING SEASON:

Historic Records – Rives (1890) lists the black rail as a very rare migrant but due to the documentation in nearby Washington D.C. leaves open the possibility of it occurring in the state. The first reported breeding record was on 16 June, 1911 in Northampton County (Bailey 1913). Birds would be found later on the outer coast in Norfolk and Virginia Beach and in the inner Piedmont. Since the 1980s most of the activity has been concentrated within the extensive tidal marshes along the Chesapeake Bay in Accomack County.

Delmarva Peninsula – The Delmarva Peninsula has the distinction of having both the first and last breeding-season records of black rails in Virginia. Interestingly, the first records were on the seaside of the peninsula and it was not until much later that the modern stronghold along the bayside of Accomack County would be discovered. H. B. Bailey collected a nest with a partial clutch on 16 June, 1911 that was built along a freshwater pond on Cobb Island in Northampton County. Several years later on 16 May, 1917 Bailey would collect a nest with six eggs in this same location. He would later discover a small "colony" of six to seven nests around a similar pond on Hog Island. Handley found a nest with eight eggs on Gull Marsh in Northampton County on 15 August, 1938. Twenty years later on 12 June, 1958 he collected an adult male in a marsh along the mainland edge on Wallops Island National Wildlife Refuge (Meanley and Stewart 1960). Knudson recorded two birds calling on Chincoteague National Wildlife Refuge on 10 June, 1955 (Potter and Murray 1955). The last bird reported along the seaside of the peninsula was a bird calling on 15 June, 1989 on the back side of Hog Island (Armistead 1989). It was not until the early 1980s that the bird watching community discovered the black rails in the extensive marshes along the bayside of Accomack County. Like Elliott Island in Maryland, Saxis Wildlife Management Area has been the center of this activity due to the fact that Saxis Road traverses the expansive marsh. The site has produced reports as high as 25 calling birds (Iliff 2002) but recent decadal high counts include eight (1990s) and six (2000s). Beyond Saxis birds have been detected within several marshes in this region. In May of 1991, Rottenborn recorded 13 birds from three locations along this area where roadways allowed access. During the targeted surveys of 2007 birds were detected within Pitts Creek, Doe Creek, Jobes Island, Michael's Marsh, Byrd's Marsh and Hyslop Marsh (Wilson et al. 2009).

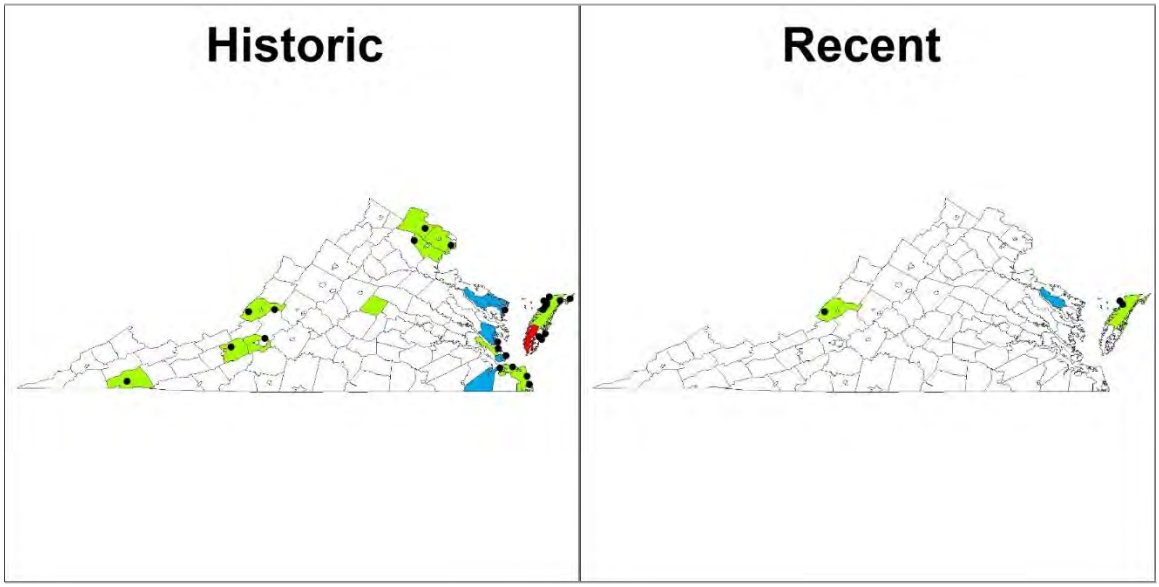
Western Shore of Chesapeake and Lower Tidewater – As in Maryland, the lower western shore of the Chesapeake Bay in Virginia supports fewer extensive marshes compared to the Eastern Shore and fewer black rails have been documented. Beasley and others observed a bird on 21 August, 1949 in the extensive marsh near Seaford (Scott 1950). Terborgh detected a bird on 17 April, 1954 in Dameron Marsh in Northumberland County (Scott 1955). Byrd flushed a bird from the extensive marshes of Grandview Nature Preserve on 11 May, 1968 (Buckley and Buckley 1968). Watts and Rottenborn had two calling birds in Guinea Neck on 10 April, 1992. Harris had a bird calling from 31 July through 7 August, 1994 within Craney Island Disposal Area in Portsmouth. Along the outer coast, historic records are available for the Lower Tidewater cities of Norfolk and Virginia Beach. H. H. Bailey discovered a concentration of ten calling birds in the Little Creek Marshes on 15 June, 1915. Between 1932 and 1968 there are several records of birds within the properties of Dam Neck and

Back Bay. From two to 15 birds were recorded on Back Bay National Wildlife Refuge from 1956 to 1968 with the high number of birds flushed while plowing (Scott and Cutler 1966). All of these records preceded the conversion of some dune swale habitat to flooded impoundments.

Inland – Several scattered observations of black rails have been recorded within the inner Coastal Plain and Piedmont. Handley recorded up to four calling birds within the edge of a wet field on the farm unit of the Virginia Tech campus between 1939 and 1941. An adult male collected on 27 May, 1939 had enlarged testes (Handley 1939). English recorded a bird from 13 to 22 May, 1945 near Cloverdale and Stevenson flushed a bird from a pasture wetland near Abingdon on 27 June, 1946. More recently, single birds were heard during the breeding period from 1997 through 2009 in the Dulles Greenway Wetlands, a restoration site in Loudon County (Cross 1999). A single bird was heard calling from 18 June through 24 July, 2002 in the North Fork Wetlands of Prince William County (Iliff 2002). A single bird was present within Huntley Meadows County Park, Fairfax County between 11 June and 22 July, 2002 and the male's calling territory was estimated to be 0.47 ha (Graves 2013). Four birds were detected along the Cowpasture River in Alleghany County in August of 2005 (Spahr 2005).

Recent Records (after 2010) – Very few black rails have been reported in Virginia since 2010. A single bird was heard by Atwood on 12 May, 2013 near Warsaw in Richmond County. Several reports of one to two birds calling on Saxis Marsh have been made between 2011 and 2014 but none since that time. The SHARP crew detected a single bird on 9 June, 2014 in Byrd's Marsh.

DISTRIBUTION: Black rails have been recorded from 14 counties and three independent cities in Virginia. Within these areas rails have been documented on 26 named properties. Breeding has only been confirmed in Northampton County (Appendix III). However, 14 of the remaining counties were classified as probable. Breeding has been confirmed on only four properties but 14 additional properties were classified as probable (Appendix IV).



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Virginia counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Accomack	Probable	Probable
Allegany	Probable	Possible
Fairfax	Probable	-----
Fluvanna	Probable	-----
Gloucester	Possible	-----
Hampton City	Possible	-----
Loudon	Probable	-----
Montgomery	Probable	-----
Norfolk City	Probable	-----
Northampton	Confirmed	-----
Northumberland	Possible	-----
Portsmouth City	Probable	-----
Prince William	Probable	-----
Richmond	Possible	Possible
Roanoke	Probable	
Suffolk	Possible	
Virginia Beach City	Probable	
Washington	Probable	
York	Probable	-----

Major Landscapes - Black rails have been documented within a range of landscape settings in Virginia including tidal salt marshes behind barrier islands, open bay or estuarine tidal salt marshes, non-tidal marshes within impoundments and wet meadows associated with pastures or flood plain settings. Birds detected on the outer barrier islands, in Back Bay National Wildlife Refuge or within the Chesapeake on Shanks Island or Grandview Beach have been in similar settings to those described further north in New Jersey and New York. Birds within the Chesapeake Bay marshes or along the mainland edge of the Delmarva seaside have been within extensive marsh complexes. Birds detected in Craney Island, Huntley Meadows or the Dulles Greenway have been within freshwater impounded wetlands. Finally, birds that have been detected within inland locations have been associated with wet grassy meadows and typically embedded within pasture areas.

Habitat - Habitat described by birds using the outer barrier islands includes low high marsh vegetation consistent to that described on Long Island (Griscom 1923) and the barrier islands of New Jersey (Harlow 1912). However, the description by Bailey (1913) of the birds on both Cobb and Hogg Islands was that of sedges surrounding a freshwater pond. The setting of birds in Back Bay is similar to that described by Post and Enders (1969) at Oak Island in New York. Birds using the expansive salt marshes of the Chesapeake have been recorded in the same habitat described by Brinker and Therres (1992) as classic high marsh habitat dominated by saltmeadow cordgrass, saltgrass and black needlerush grading into salt bush. Graves (2013) gives a good description of the habitat occupied in Huntley Meadows dominated by lizard's tail and cattail. Documented inland habitats include wet meadows of sedges and rushes often embedded within pastures or open fields.

TRENDS: Although the survey record in Virginia does not extend back long enough to document the full distribution of the species, it is clear that the population within the tidal salt marshes of the outer coast has collapsed. The number of birds detected during systematic surveys of available habitat in the Coastal Plain declined from 15 in 2007 to two in 2014 a decline of more than 85% in just seven years. The extensive salt marshes of Accomack County between the Virginia/Maryland border within the Chesapeake Bay likely supported hundreds of pairs historically. There have been no records within this system for two years. Birds within Saxis Wildlife Management Area (where the public had the most access to the population) has declined from possibly 25 pairs 30 years ago to a peak of two birds after 2010 and none since 2014. The seaside of the Delmarva may have once supported similar numbers but the decline within this system was much earlier. The habitat in Norfolk where Bailey recorded birds has been developed and the site within Back Bay National Wildlife Refuge has been converted to impoundments.

POPULATION ESTIMATE: Based on recent (2014) survey efforts along the outer coast a soft population estimate would be in the range of zero to 10 breeding pairs. Only two detections were made in 2014 and no breeding-season records have been documented since that time. This estimate compares to 20 to 50 breeding pairs reported from the 2014 black rail workshop. The reduction reflects the ongoing rapid decline in the state and the lack of recent records.

Uncertainty - Uncertainty in the population estimate reflects the lack of consistent coverage of the remote marshes in Accomack County between Byrd Marsh and Hyslop Marsh. This area supports extensive habitat, is

accessible by boat only and has not had regular visitation. The uncertainty also reflects the complete lack of information within historic inland locations particularly within the Shenandoah Valley.

THREATS: Wilson et al. (2009) outline some of the ongoing threats confronted by black rails in Virginia including loss of wetlands to development of high marsh, colonization of marshes by the invasive common reed, nest predation by ground predators and problems with ongoing sea-level rise. Some of the sites documented in the early 1900s along the outer coast have either been developed or been lost to storm erosion. However, rates of marsh loss to development have slowed such that they do not explain recent population declines. Common reed may have played a role in the loss of pairs within select locations. As with many other sites in the mid-Atlantic marsh burning may play a role but its association with black rail decline has not been established. Loss of artificial nests placed within salt marshes in the heart of the black rail range in Virginia documented very high predation pressure from ground predators. Virginia is one of the very few states along the Atlantic Coast where mosquito ditching was not widely used and is very restricted to only a small number of sites.

WEST VIRGINIA

SUMMARY: West Virginia supports relatively little habitat that would be considered suitable for black rails. However, a recent (2011-2012) record within a depressional wetland embedded within an active pasture raises the possibility that scattered locations may exist in the state and that vigilance should be maintained for the species. The population estimate is currently set to zero for the state with relatively low uncertainty.

POPULATION STATUS AND RANK:

State – Black rails have no special legal status in West Virginia.

Natural Heritage Rank – Black rails have not been assigned a natural heritage rank by West Virginia.

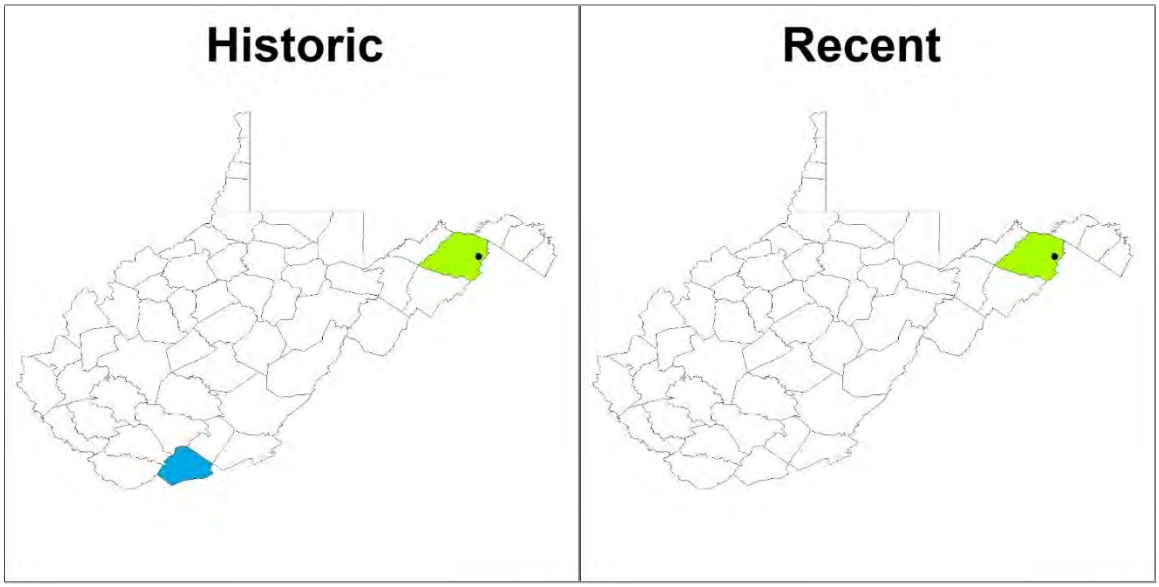
SURVEY EFFORTS: No dedicated surveys have been conducted for black rails in West Virginia and there has been little effort to evaluate secretive marsh birds on a state-wide basis. Two West Virginia breeding bird atlas projects have been conducted including the first from 1984 through 1989 and the second from 2009 through 2014.

RECORDS DURING THE BREEDING SEASON:

Historic Records – A single record of a black rail calling on 28 April, 1955 near Bluefield in Mercer County was reported but no specifics were provided. Black rails were not treated in either West Virginia Birds (Hall 1983) or The West Virginia breeding bird atlas (Buckelew and Hall 1994) reflecting the lack of confidence in this record.

Recent Records (after 2010) – A bird was recorded by Wilbur and Hershberger on 20 May, 2011 near Capon in Hampshire County. The bird was calling from a sedge meadow along the edge of a pasture. Del-Colle reported the bird from 29 May through 13 July the following year (2012) in the same location.

DISTRIBUTION: Black rails have been reported from two West Virginia counties including Hampshire and Mercer (though the latter is somewhat questionable with few details) and one property (Appendix III and IV). Breeding has never been confirmed in the state though Hampshire County was classified as probable based on the seasonality of occurrence and the record was recent (2011-2012).



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Major Landscapes - The single location reported from Hampshire County was in a freshwater meadow embedded within an active pasture. The setting of the older record from 1955 was not reported.

Habitat - The bird reported during the springs of 2011 and 2012 was associated with a drainage ditch between the road and a pasture. A depressional wetland was embedded within the pasture.

TRENDS: Not applicable.

POPULATION ESTIMATE: West Virginia supports very little habitat suitable for black rails and the state is not currently known to support a breeding population. The population estimate for the state is set to 0.

Uncertainty - Uncertainty in the population estimate is set to low. Although there is relatively little capacity for the state to support the species, a survey of available wetlands for secretive marsh birds would be warranted.

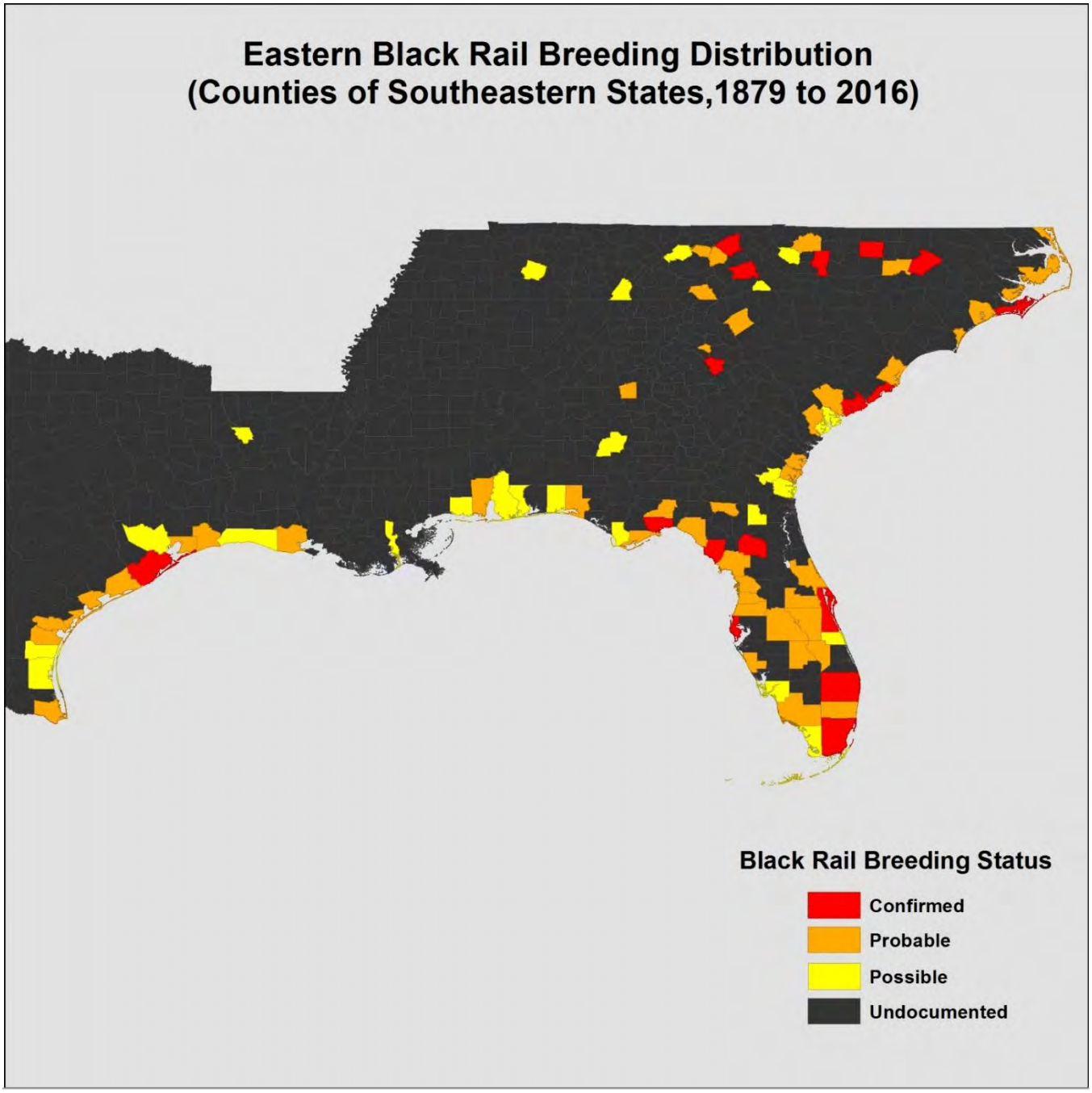
THREATS: Draining of small depressional wetlands within row crops and pastures continues to be a threat to secretive marsh birds including black rails within inland landscapes.

Southeast

Historic Occurrence

The Southeast region appears to be the current stronghold for the eastern black rail population. A total of 829 occurrence records were found during the defined breeding period within the Southeast region between 1879 and 2016. Credible evidence of occurrence during the breeding period was found for all nine states included in the region (only a single record in April for Mississippi). Records of black rail occurrence were found for 88 counties and parishes across the region (Figure 7). Based on breeding evidence and seasonality of occurrence 17 (19%) counties were classified as confirmed, 47 (53%) as probable breeding and 24 (27%) as possible breeding. Black rails have been documented to occur within 148 named properties in the Southeast. Based on breeding evidence and seasonality of occurrence 12 (8%) properties were classified as confirmed, 94 (64%) as probable breeding and 42 (28%) as possible breeding.

Figure 7. Map of Southeast counties with historic (1836-2016) credible records of eastern black rails during the breeding period (1 April through 31 August).



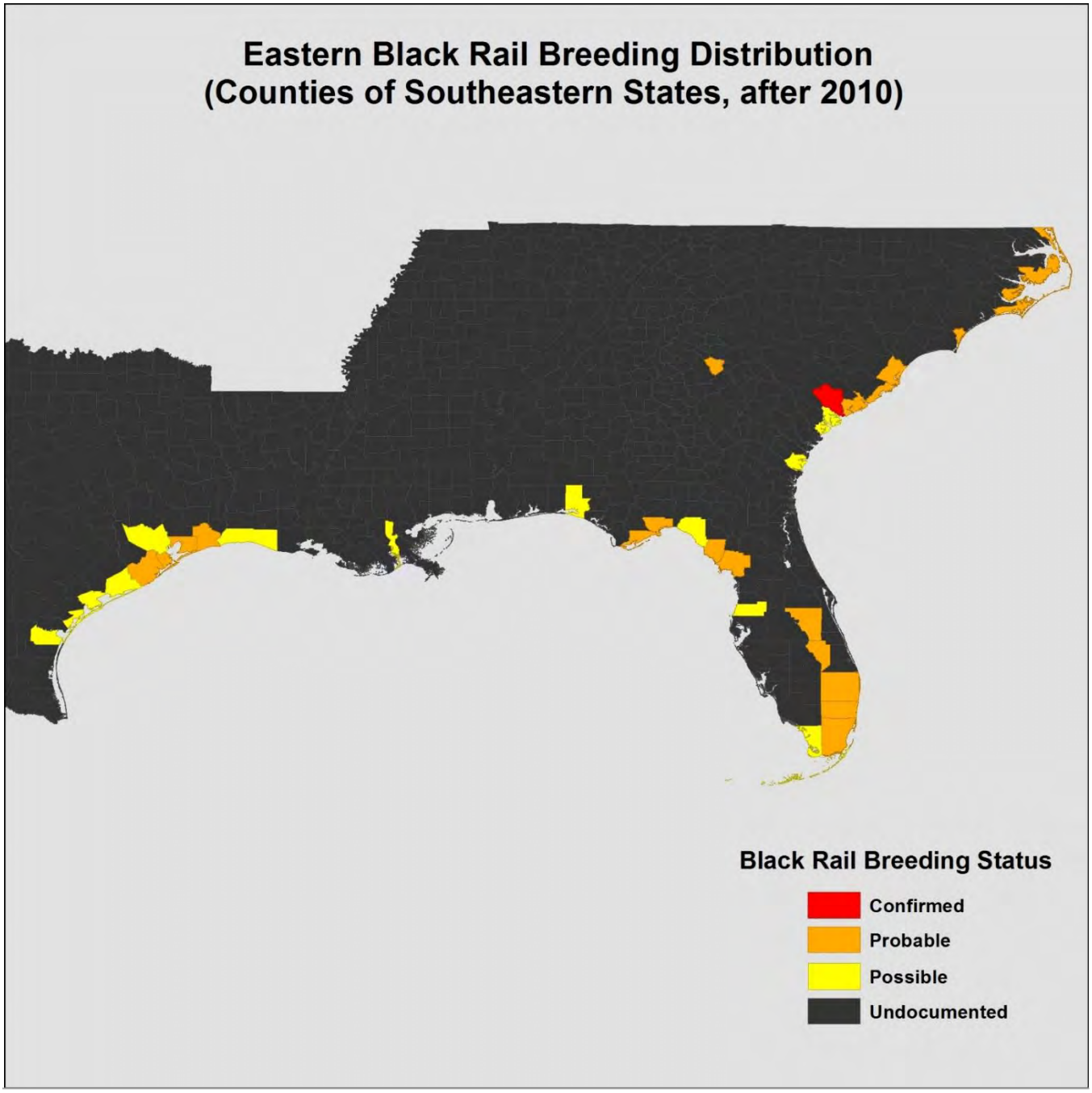
Historic Breeding Range

Although black rails have been recorded during the breeding period within all states in the Southeast, records are not evenly distributed. North Carolina, South Carolina, Florida and Texas have been the strongholds within the region accounting for 734 (89%) of the overall occurrence records. The remaining five states either are peripheral to the breeding range or do not have a history of consistent use. Coastal Georgia stands out as having the potential to support a breeding population and hopefully future surveys will clarify its role in the region.

Recent Occurrence

Since 2010 180 black rail occurrences have been recorded within six of the nine states in the region. Recent records were not found for Tennessee, Alabama and Mississippi. Records were found for 37 counties and parishes (Figure 8). Based on breeding evidence and seasonality of occurrence two (5%) counties were classified as confirmed breeding, 22 (59%) as probable breeding and 13 (35%) as possible breeding. Records were found for 61 named properties including one (2%) confirmed breeding, 46 (75%) as probable breeding and 14 (23%) properties classified as possible breeding.

Figure 8. Map of Southeast counties with recent (2011-2016) credible records of eastern black rails during the breeding period (1 April through 31 August).



Recent Breeding Range

The recent breeding range of black rails within the Southeast extends from North Carolina through Texas. From a broad-brush view the recent range is comparable to the historic range with all of the strongholds continuing to support birds during the breeding period. In recent years all records have been reported from coastal areas except for the site in Greene County, GA. It should be noted that inland areas within the region continue to be a void in survey coverage and should be a priority for future survey efforts.

Recent Population estimate

Assessment of available state by state information (see state narratives below) resulted in a regional estimate in the range of 400 to 1,200 breeding pairs. The region includes three states (Tennessee, Alabama and Mississippi) that have no accepted breeding season records in recent years and two states (Georgia and Louisiana) that have very few records but likely support a breeding population. Remaining states including the Carolinas, Florida and Texas represent the historic and recent core of the breeding period occurrences. North Carolina has been a very important historic stronghold for the species but the population appears to be experiencing a rapid decline. The population in South Carolina appears to be confined to a few locations. Both Florida and Texas appear to be the current strongholds for the entire range based on occurrences within surveyed locations and the large coverage of potential habitat that remains to be fully assessed. Uncertainty for these estimates is high due to the size of the areas where status needs to be clarified.

Trends

Due to the lack of survey information within earlier time periods it is not possible to quantify trends on the scale of the Southeast Region. In terms of distribution there are two obvious changes between the historic and recent records including a lack of recent records from inland areas and a thinning of locations along the outer coast. Although it may be tempting to draw some conclusions from these patterns, most of the historic information is anecdotal. The lack of survey effort within inland locations results in an uncertain status. However, recent survey efforts on the outer coast of North Carolina, South Carolina, Florida, Alabama, Mississippi, Louisiana and Texas are unprecedented suggesting that the change in status for many locations is not simply due to a lack of sampling. The broad footprint of black rail distribution along the coast has remained consistent. Within this footprint black rails appear to have become more patchily distributed.

Available information from study areas within the northern portion of the Southeast suggests a dramatic decline. Survey information from coastal North Carolina and South Carolina is available within the 1992-1993 time period and again in the 2014-2016 period (see survey effort sections within the North Carolina and South Carolina narratives below). These surveys allow for some limited comparisons in occupancy and number of birds detected between the two time periods (Table 5). Collectively, occupancy of named properties declined by more than 55% and the number of rails detected declined by more than 70% between the two time periods. The North Carolina study area experienced the largest declines in both properties occupied and birds detected. The annualized rate of decline in the number of birds detected is 5.5%. The North Carolina study area experienced the largest declines in both properties occupied and birds detected with an annual rate of decline in birds detected

of 6.4% compared to 4.7% in South Carolina. The lack of information south of South Carolina prevents any investigation of whether this pattern is restricted to northern areas or more representative of the region.

TABLE 5. Comparison (occupancy and number of birds detected) of black rail surveys conducted in North Carolina and South Carolina during an early time period (1992-1993) and a later time period (2014-2016). Parenthetic values reflect percentage of previous survey.

STUDY AREA	1992-1993 OCCUPIED PROPERTIES	2014-2016 OCCUPIED PROPERTIES	1992-1993 BIRDS DETECTED	2014-2016 BIRDS DETECTED
North Carolina	9	4(44.4%)	62	16(25.8%)
South Carolina	3	3(100%)	45	15(33.3%)
All Sites	12	7(58.3%)	107	31(28.9%)

Cedar Island in Carteret County, North Carolina has experienced dramatic declines in calling black rails since the 1970s. This site supported one of the largest concentrations of eastern black rails when 80+ birds were reported on 27 May, 1973. Decadal high numbers from Cedar Island include 20 (1980s), five (1990s) and one (2000s). A single calling bird was reported from the site in May of 2016.

NORTH CAROLINA

SUMMARY: The historic record of black rails in North Carolina is long and unusual being concentrated in the Piedmont and mountains in the late 1800s and early 1900s and along the outer coast over the past 40 years. Black rails appear to have thrived in the post civil war agricultural setting but were lost along with this farming culture. Black rails have been recorded from 16 counties and breeding has been confirmed in five including Buncombe, Carteret, Guilford, Iredell and Wake. The marsh complex in lower Pamlico Sound including Cedar Island and Piney Island has the distinction of supporting one of the largest concentrations and highest densities of black rails throughout their range. The black rail population in North Carolina appears to have declined dramatically since the 1970s. The number of calling birds within accessible parts of Cedar Island has declined from 80 to below 10. Birds have been lost from some historic sites and declined in others. Although several threats including marsh ditching, pesticide spraying, and ground predators may be contributing to declines, sea-level rise may represent a greater long term factor.

LEGAL STATUS AND RANK:

State - Black rails have no special legal status in North Carolina but the species is listed as a species of special concern.

Natural Heritage Rank – Black rails have been assigned a rank of S2 (Imperiled) in North Carolina indicating their rarity and vulnerability in the state and reflecting their perceived decline.

SURVEY EFFORTS: A number of significant and targeted surveys have been conducted for black rails in North Carolina with much of the efforts led by John Fussell. Fussell and McCrimmon (1976) surveyed Cedar Island and several other areas in Carteret County during 1974 through 1976. Fussell later established a survey point network on Piney Island and adjacent Atlantic Field and would survey these areas in 1992-1993 and again in 2011 and 2014 (Fussell, unpublished data). Fussell (1994) has reported on the black rail over much of the outer Coastal Plain for an extended period. Paxton and Watts (2002) established and surveyed a network of 28 survey points along the Albemarle-Pamlico Peninsula during the breeding season of 2001. Finally Wilson et al. (2016) working with the North Carolina Wildlife Resources Commission established and surveyed a network of 263 survey points throughout the outer Coastal Plain during the 2014-2015 breeding seasons. North Carolina conducted a breeding bird atlas from 1988 through 1993. Mecklenburg County conducted an independent atlas from 2011 through 2014.

RECORDS DURING THE BREEDING SEASON:

Historic Records – North Carolina has a long history of black rail records dating back to a nest reported by Cairns (1889) in 1887. One of the more interesting historical patterns in the state is that all of the early records are within the Piedmont and Mountain physiographic regions following the period of great deforestation (Lee

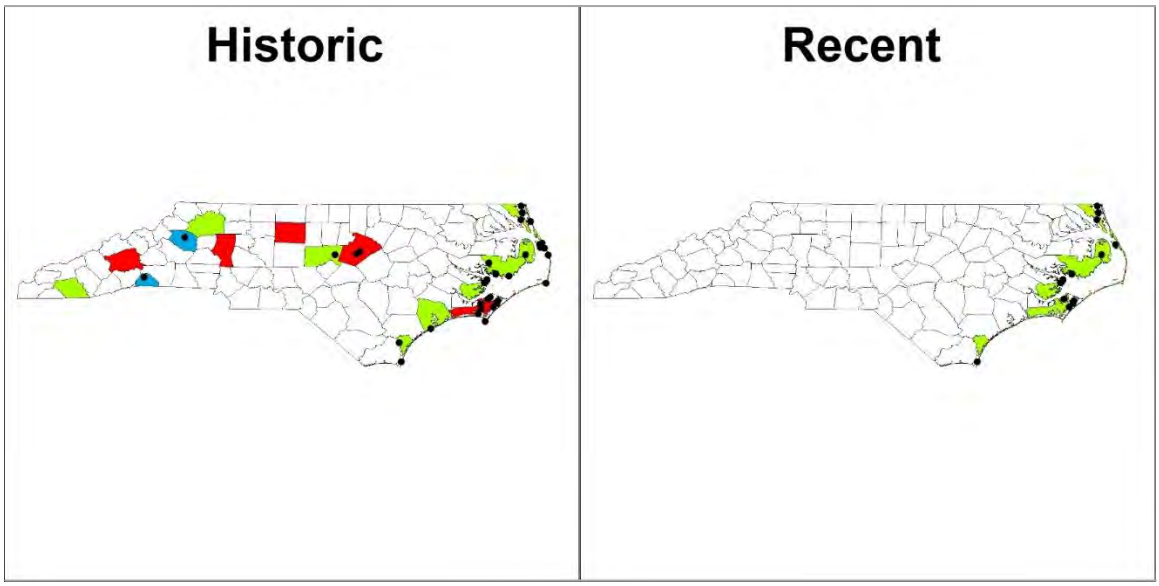
1999) but virtually all of the records since the 1970s have been on the outer Coastal Plain. There was little acknowledgment or exploration of the latter population during the earlier period.

Inland – Lee (1999) suggests early records of black rails in North Carolina were from wet meadows and hayfields created by the large wave of deforestation throughout the region. Cairns (1889) quoted farmers in Buncombe County who indicated that the species was common within their wet hay meadows. A nest with eggs was brought to him in July of 1887. Soon after this in 1893 a farmer captured an adult with two downy young alive in Guilford County and brought them to Pearson (Pearson et al. 1942). McLaughlin reported nesting prior to 1897 near Statesville in Iredell County but provided no details. The most complete account of the birds within this setting was from the Brimley brothers (1900) who collected or received eight nests between 1890 and 1902 from farm hands working the hayfields along Walnut Creek in Wake County. More recent observations from Wake County include a bird observed on 23 April, 1971 and a bird calling from a wet meadow from 30 May to 15 June, 2005 (Davis 2005). Ogburn reported a bird calling on 21 June, 1929 near Franklin in Macon County (Stevenson and Stupka 1948). Smith reported a bird calling near North Wilkesboro in Wilkes County on 18 May, 1961 (Chamberlain 1961). Lewis and others (LeGrand 1980) reported a bird calling in June and July from 1979 through 1981 along Jordan Lake in Chatham County. Piephoff et al. heard a bird calling near Lake Adger in Polk County from 28 to 30 April, 1989 (LeGrand 1990). Martin flushed a bird on 22 April, 2003 near Happy Valley in Caldwell County.

Outer Coastal Plain – The first indication in the literature of black rails occurring on the outer coast of North Carolina during the breeding season was a bird seen by Brimley at Brown's Inlet, Onslow County on 4 August, 1924 (Pearson et al. 1942). Since that time birds have been recorded in nearly all of the outer coastal counties including locations on the outer barrier islands and tidal marshes along the mainland edge of sounds. From 1960 through 2010, black rails have been reported periodically within scattered areas along the landward edge of the barrier islands, including Pine Island Audubon Sancutary, Bodie Island Lighthouse, Cape Hatteras National Seashore, Pea Island National Wildlife Refuge, Whalebone Junction, Cape Lookout National Seashore, and the Cape Fear Marshes. Virtually all of these areas represent locations accessible to and frequented by the bird-watching community, and reports vary between one and two birds at each site. Much larger concentrations of birds have been reported (mostly 1980s to 2000s) from the extensive marshes along the sounds. Significant sites include the North River Marshes where Fussell had five calling birds in April of 1976, the Roanoke Island Game Land where 10 calling birds were reported on 27 April, 1999, the Leechville Marshes where Wright reported four calling birds on 24 June, 1991 and Hobucken Marsh where Fussell reported four calling birds on 29 May, 1988. By far the largest concentration of black rails in North Carolina has been the marsh complex in southern Carteret County that includes Cedar Island, Piney Island and the associated Atlantic Field. The complex is similar to the Elliott Island and surrounding properties in Maryland in supporting one of the largest concentrations and highest densities ever recorded throughout the species range. High counts include the Rowlette and Wierenga census on 27 May, 1973 that recorded 80+ calling birds on Cedar Island (Tuelings 1973), the Fussell survey on 19 June, 1992 that recorded 19 calling birds on Piney Island (LeGrand 1993) and the Fussell visit to Atlantic Field on 18 and 25 June, 1993 that reported 10 calling birds (Fussell, personal communication).

Recent Records (after 2010) – No recent records of black rails were located for inland areas of North Carolina. Occurrences on the Coastal Plain continue to be in the counties and locations that have been historic strongholds. A total of four calling birds were detected in May and June of 2015 on Church Island and the Great swamp Marshes of Currituck County by the Wilson et al. crew. Fussell reported one calling bird from the North River Marshes on 17 June, 2014 (Sattelmeyer et al. 2015). The Wilson et al. crew had two calling birds from 1 to 6 June, 2015 in the Hobucken Marsh, one calling bird near Swan's Quarter National Wildlife Refuge. Lemons reported a single calling bird in the Roanoke Island Marshes Game Land on 20 August, 2012 and Bobay reported a calling bird on 17 May, 2016 from the same marsh where Fussell detected a bird in Alligator River National Wildlife Refuge on 20 July, 1994. Zeke's Island Coastal Reserve represents a new site where birds were detected in May of both 2015 and 2016. Recent records from the complex in southern Carteret County include one calling bird on 31 May, 2011 reported by Gregory, eight birds from 13 May to 4 June, 2014 reported by Wilson et al. crew, and one bird reported by Fussell on 15 May, 2016 from Cedar Island, eight birds in late April of 2011 and five birds in late April of 2014 reported by Fussell from Piney Island and one bird on 14 June, 2014 reported by Fussell from Atlantic Field.

DISTRIBUTION: Black rails have been recorded from 16 counties and 32 properties in North Carolina (Appendix III and IV). Breeding has been confirmed in five counties including Buncombe, Carteret, Guilford, Iredell and Wake. Of the remaining 11 counties, nine were classified as probable and two were classified as possible. Breeding has been confirmed for only two of the properties with 25 classified as probable and five as possible.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

North Carolina counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Buncombe	Confirmed	-----
Caldwell	Possible	-----
Carteret	Confirmed	Probable
Chatham	Probable	-----
Currituck	Probable	Probable
Dare	Probable	Probable
Guilford	Confirmed	-----
Hyde	Probable	Probable
Iredell	Confirmed	-----
Macon	Probable	-----
New Hanover	Probable	Probable
Onslow	Probable	-----
Pamlico	Probable	Probable
Polk	Possible	-----
Wake	Confirmed	-----
Wilkes	Probable	-----

Major Landscapes – Black rails have been documented within both coastal and inland landscapes in North Carolina. Reports on the outer coast have mostly been restricted to salt and brackish marshes. Occurrences during the breeding season have been documented within the narrow fringing marshes on the landward side of barrier islands or within dune swale vegetation in Currituck, Dare, Carteret, Hyde and New Hanover Counties. The greatest concentrations have been documented within the extensive salt marshes of the sounds or more brackish marshes near the outflow of tributaries. Birds detected within inland locations have been in open wet meadows or wet hay fields often in association with floodplain settings or lakes.

Habitat – Exceptional descriptions of black rail habitat in North Carolina have been written including both inland (Brimley and Brimley 1900) and coastal (Fussell and McCrimmon 1976, Wilson et al. 2016) areas. Inland black rails have used wet hay meadows with tall tussocks of grass. Brimley and Brimley (1900) indicate that nests along Walnut Creek were placed in most areas often near standing water but not in the driest hayfields or the sites with standing water. This description is consistent with others of the time. Fussell and McCrimmon present a comprehensive assessment of vegetation within Cedar Island that is strikingly similar to that presented by Weske (1969) of Elliott Island in Maryland. They emphasize the mixture of black needlerush, saltgrass, and saltmeadow cordgrass with interspersed patches of smooth cordgrass, and by arranging their data according to availability of saltmeadow cordgrass, show an affinity for this cover. As in many accounts elsewhere, they also emphasize the low frequency of tidal inundation. Wilson et al. (2016) present a broad overview of the shift in low-marsh vegetation in North Carolina from smooth cordgrass to black needlerush to

sawgrass and the consistency of rails using the same mixture of high marsh vegetation regardless of the surrounding low marsh.

TRENDS: The black rail breeding population in North Carolina has declined dramatically since at least the 1970s. This is evident both in the number of occupied sites and the decline in numbers within historic strongholds. The population described by Cairns in the late 1800s appears to be gone along with the associated farming culture. It is possible that a remnant of this population may persist and this should be explored. Many of the sites (e.g. Wanchese Marshes, Bodie Island Light, Cape Hatteras, Topsail Island Marshes) that were occupied on the outer coast from the 1980s through 2000s appear not to have had birds in recent years. Equally significant is the apparent decline in numbers within the historic core of the population. Decadal high numbers from Cedar Island include 80+ (1970s), 20 (1980s), 5 (1990s) and 1 (2000s) though the Wilson et al. crew detected 8 in 2014. Fussell's surveys of Piney Island indicate 19 in 1992, 8 in 2011 and 5 in 2014. Similar surveys of Atlantic Field show 10 in 1993 and 1 in 2014.

POPULATION ESTIMATE: Based on recent (2014-2016) survey efforts and observations along the outer coast when approximately 25 birds have been detected soft population estimate would be in the range of 40 to 60 breeding pairs. This estimate compares to 50 to 100 breeding pairs reported from the 2014 black rail workshop. The reduction reflects an improvement in survey information and the apparent ongoing decline in the state.

Uncertainty - Uncertainty in the population estimate reflects the lack of complete coverage of some extensive marsh systems in outer coastal counties. The remote and extensive nature of some of these areas makes it difficult to achieve complete coverage and confidence.

THREATS: Several factors have been suggested as threats to black rails in North Carolina including marsh burning, ground predators, ongoing sea-level rise and mosquito control measures such as grid ditching, open water management and pesticide application (Fussell and McCrimmon 1976, Wilson et al. 2016). Fussell and McCrimmon (1976) point out that during their study several patches of marsh were partially or completely burned. Some ignition was due to natural causes but other was likely human-related. They suggest that burning in the long term may be beneficial to black rails and other species by setting back the successional clock but that complete burns may cause temporary declines. Wilson et al. (2016) point out that the rise in ground predators may result in demographic problems with marsh-nesting species. Both studies point to differences in black rail occupancy that appears to be driven by the distribution of marsh ditching. Large tracts of North Carolina marshes have been ditched. Likely the best evidence of ongoing sea-level rise impacts on black rails has been the spatial pattern of rails across the marsh. Since the surveys of the 1970s it appears that rails have become increasingly confined to the highest portions of the marsh.

TENNESSEE

SUMMARY: Tennessee supports relatively little habitat that would be considered suitable for black rails. However, several records documented over the past century including one breeding record suggest vigilance should be maintained within hay meadows along floodplains and within available freshwater wetlands. The population estimate is currently set to zero for the state with relatively low uncertainty.

POPULATION STATUS AND RANK:

State – Black rails have no special legal status in Tennessee.

Natural Heritage Rank – Black rails have not been assigned a natural heritage rank by Tennessee.

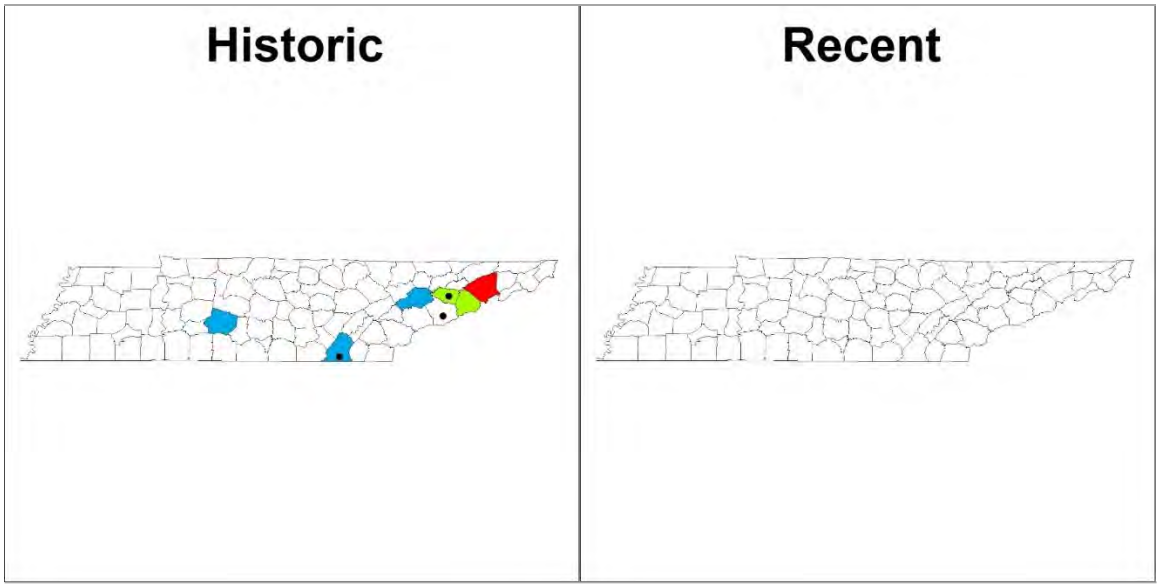
SURVEY EFFORTS: No dedicated surveys have been conducted for black rails in Tennessee and there has been little effort to evaluate secretive marsh birds on a state-wide basis. Tennessee conducted a breeding bird atlas from 1989 to 1991.

RECORDS DURING THE BREEDING SEASON:

Historic Records – Several records of black rails have been reported from eastern counties of Tennessee (Nicholson 1997). The first record for the state was an adult taken by Stokeley between 10 and 20 June, 1915 while cutting wheat in the river valley south of Del Rio in Cocke County (Walker 1935). Nevius (1964) observed a pair of adults and five downy young while cutting a clover and hay field along Roaring Fork Creek in Greene County on 23 June, 1964. He would observe the group again on 25 and 26 June. On 5 May, 1980 Koella flushed a black rail while walking through a dry hayfield near White Pine in Jefferson County (Koella 1981). Single birds have been reported near Knoxville on 1 May, 1983 (Hall 1983) in the wetland at Standifer Gap in Hamilton County on 11 May, 2002 (Hoff 2002) and in Maury County on 28 April, 2007 (Hoff 2007) but details were not provided.

Recent Records (after 2010) – No recent records of black rails during the breeding season were discovered for Tennessee.

DISTRIBUTION: Black rails have been reported from six Tennessee counties and three named properties (Appendix III and IV). Although some of these were early in the season, observations in Cocke, Greene, and Jefferson counties were in June and breeding in Greene was confirmed.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Tennessee counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Cocke	Probable	-----
Columbia	Possible	-----
Greene	Confirmed	-----
Hamilton	Possible	-----
Jefferson	Probable	-----
Knox	Possible	-----

Major Landscapes – Black rails have been recorded within two landscape settings in Tennessee including pasturelands and freshwater wetlands. Although the pastures have been described as dry the setting has been a floodplain and the indication is that the pastures have been flooded in previous years. The pasture in Greene County where the brood was observed was wetter in previous years and supported Virginia rails. The freshwater wetland was also positioned within a floodplain setting.

Habitat – Consistent with inland records in North Carolina and Virginia, all three of the June records documented in Tennessee were from hay meadows. The cover varied from wheat to a mix of clover and grass to overgrown hay. In the two early records there is an indication that the hay fields were wet in some years.

TRENDS: Black rails are considered very rare in Tennessee with only several occurrences over the past century.

POPULATION ESTIMATE: Tennessee supports very little habitat suitable for black rails and the state is not currently known to support a breeding population. The population estimate for the state is set to 0.

Uncertainty - Uncertainty in the population estimate is set to low. Although there is relatively little capacity for the state to support the species, vigilance within hay meadows along floodplains and a survey of available wetlands for secretive marsh birds would be warranted.

THREATS: Draining of small depressional wetlands within row crops and pastures continues to be a threat to secretive marsh birds including black rails within inland landscapes.

SOUTH CAROLINA

SUMMARY: Despite the fact that Arthur Wayne was the first person to ever observe a female black rail incubating eggs in 1903, South Carolina has a very limited record of observations. The Cely et al. (1993) state-wide survey conducted in 1991-1992 and the recent Hand survey both conducted by the South Carolina Department of Natural Resources represent most of what we know about the species in the state. Black rails have a limited distribution focused on the lower ACE Basin, Tom Yawkey Wildlife Center and Santee Coastal Reserve. The population appears to have been relatively stable over the past 25 years. Unlike other states along the Atlantic Coast the majority of pairs are using impounded wetlands. A reasonable population estimate for the state would be 50-100 pairs. This is below the estimate of 100-200 pairs derived during the 2014 black rail workshop. The difference reflects the much more robust survey information.

POPULATION STATUS AND RANK:

State – Black rails have no special legal status in South Carolina.

Natural Heritage Rank – Black rails have been assigned a natural heritage rank of SN (unranked) by South Carolina indicating that their status has not been assessed.

SURVEY EFFORTS: Three rounds of targeted survey efforts for black rails have been completed in South Carolina. Cely et al. (1993) used a call-broadcast protocol to survey a network of 1,276 survey points within 150 properties across the state from May through August (1991-1992) and visited another 100 properties that had no suitable habitat. Roach and Barrett (2015), in a preliminary assessment for South Carolina Department of Natural Resources, used a call-broadcast protocol to survey a network of 344 points in coastal South Carolina from 15 April through 1 August, 2014. Finally, Hand (unpublished data) has used a call-broadcast protocol to survey 283 points in 2015 and 253 points in 2016 in coastal South Carolina. South Carolina conducted a breeding bird atlas from 1988 to 1995.

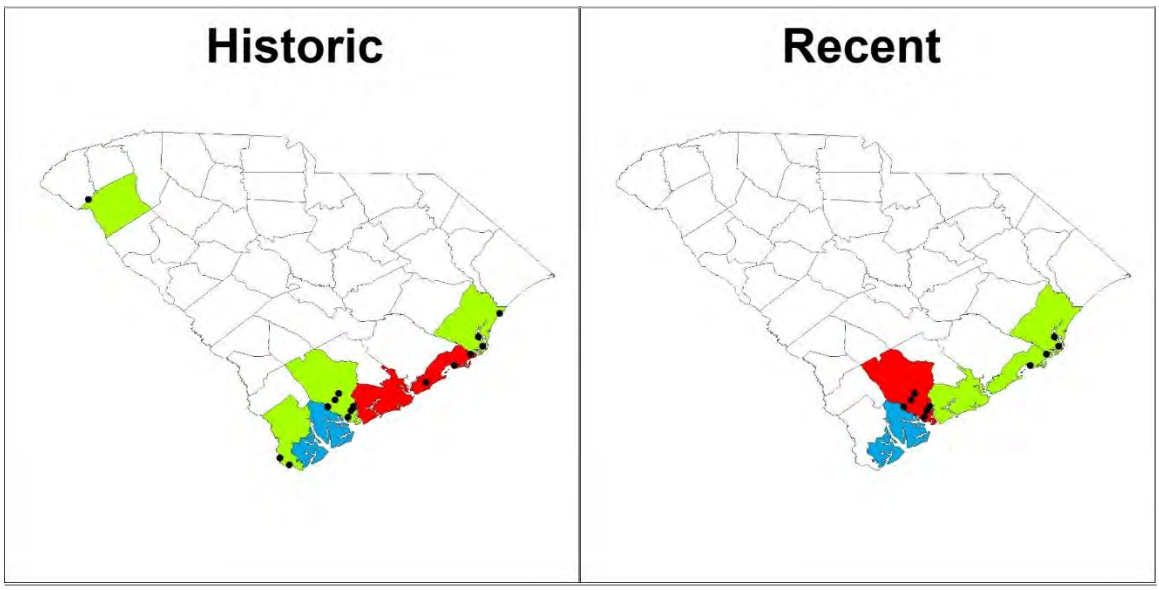
RECORDS DURING THE BREEDING SEASON:

Historic Records – Wayne collected six black rail specimens on Oakland Plantation near Mount Pleasant over approximately 20 years beginning in 1891 (Wayne 1923). Included was a pair of adults with eight eggs on 10 June, 1903 that nested in an oat field and would represent the only definitive breeding record in the state for more than a century. Following Wayne's writings records are very limited until the Cely et al. surveys began in 1991. LeGrand (1976) discovered a bird in a marsh along Beaverdam Creek near Townville in Anderson County on 13 May, 1975 that was heard and seen through 6 July and presumed to be breeding. Nugent reported seeing a bird on 23 July, 1975 on Johns Island in Charleston County. Marsh and Thomas observed a bird on 1 May, 1988 within Huntington Beach State Park and Marsh and Bildstein heard a bird on Pumpkinseed Island on 17 May, 1988 while working with white ibis. Both of these sites are within Georgetown County. Welford reported a bird on 17 May, 1997 from Savannah National Wildlife Refuge in Jasper County and other

reports from this site include 25 August, 2001 and 17 April, 2005 (Davis 2001). Calver reported birds from Savannah Spoil Site in Jasper County in April of 2000 and again in April of 2010 (Davis 2000). The site with the highest concentration of reports in South Carolina is Bear Island Wildlife Management Area in Colleton County. Reports of one to nine birds were produced from this site almost annually throughout the 1990s and into 2010. Cely et al. recorded a composite of 31 birds within the site equating to an occupancy rate of one bird per 8.2 survey points (12%). The Cely et al. survey would also discover five birds within the Yawkey Wildlife Center equating to one bird per 24.6 survey points (4%) and two birds within the Santee Coastal Reserve equating to one bird per 11.5 survey points (9%). Although they reported a rail responding to a black rail broadcast on Cedar Island the bird could not be positively identified.

Recent Records (after 2010) – Almost all of the black rail activity recorded in South Carolina since 2010 has been within or nearby the sites discovered during the Cely et al. surveys and with similar concentrations between sites. Roach and Barrett (2015) recorded black rails from 8, 5 and 1 survey points within Bear Island Wildlife Management Area, Yawkey Wildlife Center and Santee Coast Reserve respectively. Similarly, Hand (2016) had black rail detections from 26, 3 and 0 survey points during 2015 and 12, 1 and 2 survey points during 2016 for the same properties. Both of these surveys efforts recorded black rails from one survey point within ACE Basin National Wildlife Refuge and two from other nearby properties. During the 2016 survey, Hand recorded birds from two locations within Winyah Bay, the same system where Marsh and Bildstein recorded a bird in 1988.

DISTRIBUTION: Black rails have been reported from six South Carolina counties and 15 identified properties (Appendix III and IV). Breeding has been confirmed in two counties and two properties. Nine of the remaining properties were classified as probable and four were classified as possible.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

South Carolina counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Anderson	Probable	-----
Beaufort	Possible	Possible
Charleston	Confirmed	Probable
Colleton	Probable	Confirmed
Georgetown	Probable	Probable
Jasper	Probable	-----

Major Landscapes – Black rails in coastal areas of South Carolina during the breeding season do not appear to be widely distributed but appear to be focused on the ACE Basin, Tom Yawkey Wildlife Center and the Santee Coastal Reserve. The recent rediscovery of birds within Winyah Bay deserves additional exploration. The area around the famous Mount Pleasant site of Wayne does not appear to currently support a population.

Habitat – Unlike other states along the Atlantic Coast, much of the habitat use by breeding black rails in coastal South Carolina is now within impoundments. During the 2014 survey, 18 of 20 occupied survey points were in impoundments (Roach 2014). During the 2015 and 2016 surveys the majority of birds detected were within impoundments though some were in natural marshes either near impoundments or in the case of Winyah Bay distant from impoundments. Within impoundments black rails were detected most frequently along the edges or associated with other elevated areas with dense stands of sand cordgrass and saltmeadow cordgrass. LeGrand (1976) describes the inland habitat as a dense stand of mixed vegetation ranging in height but dominated by common rush.

TRENDS: Within the three primary sites that have been surveyed since 1991 there does not appear to be definitive evidence of any dramatic decline or increase. The numbers reported by Cely et al. (1993) from the most significant site in the state (Bear Island Wildlife Management Area) are very comparable to those reported by Hand in 2015. Although there was a decline in detections between 2015 and 2016 the implications of that result will take additional years to assess. Similar patterns of occupancy between the Cely et al. and Hand surveys hold for the other two primary breeding sites (Tom Yawkey Wildlife Center and Santee Coastal Preserve).

POPULATION ESTIMATE: South Carolina appears to support a fairly stable breeding population of black rails. The maximum, composite number of rails detected during the 2015 survey was nearly 50 birds. A reasonable population estimate for the state would be 50-100 pairs. This is below the estimate of 100-200 pairs derived during the 2014 black rail workshop. The difference reflects the much more robust survey information.

Uncertainty - Uncertainty in the population estimate is set to low. Hand has led an extensive survey from 2015 to 2016 of coastal habitats that included much of the suitable habitat within the state.

THREATS: Threats faced by breeding black rails in South Carolina have not been widely discussed. A large portion of the breeding population currently exists within impounded wetlands and so is possibly more protected from the impacts of sea-level rise compared to other populations along the Atlantic Coast. However, as Hand points out, impoundments have their own hydrology challenges. Single summer rain storms may flood impoundments due to the slow drainage resulting from most impoundment designs.

GEORGIA

SUMMARY: Georgia is noticeably missing from most of the early descriptions of eastern black rail distribution (e.g. Allen 1900, Bent 1926, Forbush 1929). Early authors describing black rail status in the state (Burleigh 1938, Greene et al. 1945) indicate that the species is likely much more common and widespread than known. As in all states within the breeding range, the lack of status and distribution information is certainly facilitated by their secretive habits but in Georgia this may also reflect either an extremely low population size or a lack of overlap between rails and bird watchers or both. As with many other areas early records come from inland locations. Scattered occurrences along the outer coast suggest the presence of an undocumented population. The only definitive breeding record comes from Greene County and this site has been the most consistently documented throughout the state over the past 25 years. The population estimate for the state is 10 to 40 pairs though the uncertainty in this estimate is very high. A targeted survey is scheduled for the breeding seasons of 2017 and 2018.

POPULATION STATUS AND RANK:

State – Black rails have no special legal status in Georgia.

Natural Heritage Rank – Black rails have been assigned a rank of S1 (Critically Imperiled) in Georgia indicating their extreme rarity in the state and reflecting their perceived decline.

SURVEY EFFORTS: No state-wide targeted surveys have been conducted for black rails in Georgia. Schneider conducted exploratory surveys for black rails on the Coastal Plain in the 2000s. Several sites on Little Saint Simons Island have been surveyed in recent years using a call-broadcast protocol. A state-wide black rail survey led by Georgia Department of Natural Resources is scheduled for the breeding seasons of 2017 and 2018. Georgia conducted a breeding bird atlas from 1994 to 2001.

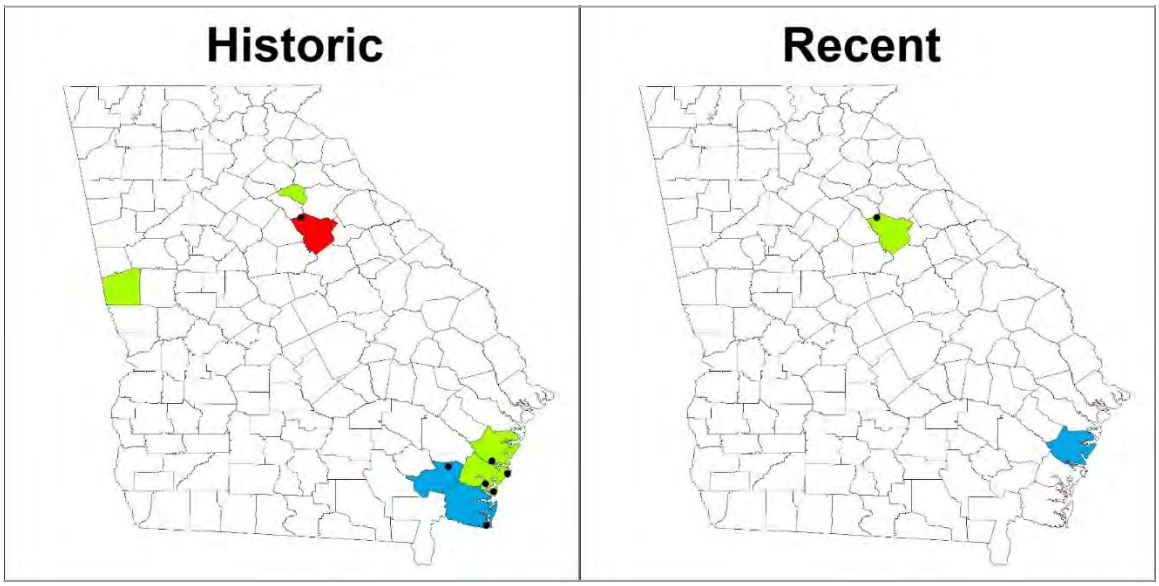
RECORDS DURING THE BREEDING SEASON:

Historic Records – Georgia is noticeably missing from most of the early descriptions of eastern black rail distribution (e.g. Allen 1900, Bent 1926, Forbush 1929). Early authors describing black rail status in the state (Burleigh 1938, Greene et al. 1945) indicate that the species is likely much more common and widespread than known. Given the detections across the Savannah River in South Carolina, the history of use in north central Florida and the occurrences through the southern Piedmont this prediction seems well founded. Burleigh (1938) flushed two black rails on 31 July, 1929 from a field near Athens in Clarke County and suggested that it nested there sparingly but provided no details. Tramer (1968) reports one record of breeding in 1929 within Sandy Creek bottoms but provides no documentation and further indicates that the former site had been converted to swamp forest. Marsh reported two birds calling on 13 June, 1971 from Jekyll Island State Park (Teulings 1971). Birds have been detected during the breeding period on Andrews Island in Glynn County from 1988 through 1998 (Brisse 1989a, Moore 1990) including during the atlas period and a suggestion of possible

breeding (Sykes 2010). Lotz reported a bird on 22 August, 2003 from Little St. Simons Island also in Glynn County. A bird was also detected on Point Peter in Camden County during the atlas period. Keyes heard a black rail on 29 April, 2010 while conducting frog surveys on the upper Santilla Basin in Brantley County (Schneider, personal communication). Beaton reported three birds calling on 7 June, 1999 from the Altamaha Wildlife Management Area in McIntosh County (Davis 1999). Wittington flushed a black rail on 31 August, 1988 from a field adjacent to West Point Lake in Troup County (Brisse 1989b). The most consistent black rail site in Georgia has been an abandoned mine in Greene County monitored by Sykes who has provided reports annually since 1991. The site had a high count of seven birds possibly representing five territories in 1997 (Davis 1997). The first definitive breeding in the state was documented by Sykes when he observed three young in Greene County on 29 August and again on 6 September, 1998 (Sewell 1998, Sykes 2010).

Recent Records (after 2010) – Recent records of black rails in Georgia include a bird reported by Willis in April of 2013 from the Altamaha Wildlife Management Area (Schneider, personal communication) and birds within the historic stronghold in Greene County during the 2016 breeding season (Sykes, personal communication).

DISTRIBUTION: Black rails have been reported from seven Georgia counties and seven named properties (Appendix III and IV). Only Greene County has a confirmed breeding record. One of the named properties has confirmed breeding, four were classified as probable and two were classified as possible.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Georgia counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Brantley	Possible	-----
Camden	Possible	-----
Clarke	Probable	-----
Glynn	Probable	-----
Greene	Confirmed	Probable
McIntosh	Probable	Possible
Troup	Probable	-----

Major Landscapes – Black rails may occur during the breeding season within the salt marshes of the outer coast and possibly within some coastal impoundments in Georgia but this has yet to be fully confirmed. The species has been documented consistently within an abandoned mine in the Piedmont. Early records have been within grassy fields that are consistent with many records to the north.

Habitat – The most consistent record has come from an abandoned mine where the birds are using the grassy edge of a freshwater wetland dominated by sedges and cattails. Along the outer coast black rails may occupy the high marsh zone within tidal salt marshes. Although some birds have been recorded within grassy fields, details on the specific vegetation or landscape context have not been provided.

TRENDS: Black rails are considered very rare in Georgia with a limited number of recorded occurrences of the past century.

POPULATION ESTIMATE: Georgia supports considerable coastal habitat that could be used by black rails. Based on current information the population estimate for the state is set to 10 to 40 breeding pairs. This estimate is comparable to the 25 to 50 estimate derived during the 2014 black rail workshop. Differences reflect a more thorough review of records and spatial gaps.

Uncertainty - Although our current understanding of black rail status in Georgia is poor, plans are in place to remedy the information gap. Based on current information, the uncertainty in the population estimate is set to high.

THREATS: Due to the lack of status and distribution information, threats to black rails in Georgia have not been generally discussed. Sykes (2010) suggests that degradation and loss of shallow salt, brackish, and freshwater marshes may pose one of the greatest threats to the continued occurrence of black rails in the state.

FLORIDA

SUMMARY: Information about black rails in Florida extends back more than 100 years and the state likely supports the largest breeding population throughout the species range. Black rails have been reported from 32 counties and 45 named properties in Florida where they use a diversity of habitats in including tidal salt marshes, interior freshwater wetlands, abandoned mines and impoundments, grassy fields and coastal prairies. Most of the early work on black rails was within the northern portion of the state in tidal salt marshes. In recent decades observations of birds during the breeding season from southern and interior Florida have opened questions about extensive nontraditional habitats that may support large numbers of birds. At this stage an overall population estimate and possible trends are both very difficult to assess because it is likely that a significant portion of the population has not been surveyed. Based on information currently available a soft population estimate would be 200 to 500 pairs. Uncertainty for this estimate is high. Likely the greatest threats to the interior population are factors that alter hydrology such as ground-water withdrawal and changes in hydroperiod.

POPULATION STATUS AND RANK:

State – Black rails have no special legal status in Florida.

Natural Heritage Rank – Black rails have been assigned a rank of S2 (Imperiled) in Florida indicating their rarity and vulnerability in the state.

SURVEY EFFORTS: Several dedicated surveys have been conducted for black rails in Florida. Most of these have focused on geographic areas of interest. Runde et al. (1990) used a call-broadcast protocol to survey locations within nine different properties scattered across six counties in northern and central regions of the state from mid-March through July of 1989. Eddleman and Legare (1995) used a call-broadcast protocol to survey portions of Jena Wildlife Management Area (Dixie County), St. Johns National Wildlife Refuge (Brevard County), Lake Woodruff National Wildlife Refuge (Volusia County), and St. Vincent National Wildlife Refuge (Franklin County) during the breeding seasons of 1992 through 1994 (depending on location) as part of an intense study of habitat preferences, home range, life history parameters and survey techniques. Pranty et al. (2004) used a call-broadcast protocol to survey portions of Weekiwachee Preserve (Hernando County), Crystal River State Buffer Preserve (Citrus County) and Werner-Boyce Salt Springs State Park (Pasco County) during the spring of 1998. Tracey (2005) compiled anecdotal observations of black rails observed in Werner-Boyce Salt Springs State Park made from 2003 through 2005. In 2016, the Florida Fish and Wildlife Conservation Commission initiated a state-wide survey of black rails led by Amy Schwarzer. The northern portions of the state were covered in 2016 and the southern portions of the state are scheduled to be surveyed in 2017. Two Florida breeding bird atlas projects have been conducted including the first from 1986 through 1991 and the second from 2011 through 2016.

RECORDS DURING THE BREEDING SEASON:

Historic Records – Due to the length of coastline and both the diversity and distribution of habitat the history of black rail records in Florida is extremely complex. One of the first records during the breeding period was a female collected near Merrits Inlet on 10 April, 1886 that was inspected by Brewster (1907) in the Bangs collection. The first breeding record for the state appears to be an observation of an adult with three downy young made by Baynard in early June before 1913 (year not given). On 10 September, 1919 Williams (1920) collected three young at St. Marks that still had visible down and primaries just beginning to break. Observations of black rails in Florida appear to have moved north to south with much of the early work focused in northern areas. Observations within central Florida mostly begin during the 1980s and 1990s and even later in southern parts of the state.

North Florida (Alachua, Baker Dixie, Escambia, Franklin, Gulf, Leon, Levy, Okaloosa, Taylor, Wakula, Walton counties) – Most of the black rail activity recorded in north Florida has been within the extensive tidal marshes that stretch from Apalachicola to Cedar Key along the Gulf Coast. Since the 1980s this coastline has been known as one of the most reliable areas in the state to observe black rails. Jena Wildlife Management Area in particular has a consistent record of black rail detections and was one of the primary study areas used by Eddleman and Legare (1995) who located nests and recorded as many as 17 birds there. Other important coastal sites include both the Hickory Mound and Tide Swamp units of Big Bend Wildlife Management Area where reports of one to two birds have been made routinely since the 1980s, St. Marks National Wildlife Refuge where birds have been known since the 1920s and five birds were recorded on 19 April, 1993 by Wamer, St. Vincent National Wildlife Refuge where birds have been reported since the 1970s and five birds were detected by Runde et al. on 25 April, 1989, Lower Suwannee National Wildlife Refuge where Enloe reported one bird calling on 30 June, 2010 and the Steinhatchee Marshes where Wamer reported two birds in July of 1992. Inland areas that have supported black rails include the Fort Walton Beach Spray Fields in Okaloosa County, Occidental Wildlife Management Area in Hamilton County where several birds were reported from 29 July through 15 August, 1995, Lake Jackson in Leon County where a bird was heard calling on 20 May, 1961 and Paynes Prairie Preserve State Park where one to two birds were reported consistently from the late 1980s through the early 2000s.

Central Florida (Brevard, Citrus, Hernando, Highlands, Indian River, Okeechobee, Osceola, Pasco, Pinellas, Polk, Sarasota, Volusia counties) – Black rails have been reported from both coasts and inland areas of central Florida. The longest record of occurrence is in Brevard County where birds have been observed in both Merritt Island National Wildlife Refuge and St. Johns National Wildlife Refuge for more than 100 years. Nicholson and Wray collected nests and eggs from both properties from the 1920s through the 1940s. St. Johns was one of Legare's primary field sites and he recorded more than 30 birds and located 19 nests between 1992 and 1996 (Legare and Eddleman 2001). Eddleman and Legare (1995) believed that this site supported the largest concentration of black rails in the state. Although a number of birds have been detected, much less work has been conducted on the central Gulf Coast. Smith reported one bird on 1 April, 1995 calling on Honey Moon Island State Park, Pranty et al. (2004) recorded two birds each on Crystal River Preserve State Park and

Weekiwachee Preserve on 4 April, 1998 and 24 June, 2000 respectively, and 18 birds between March and May, 1998 on Chassahowitzka National Wildlife Refuge (Pranty 2002). Reports of one to five calling birds have been made consistently for Werner-Boyce Salt Springs State Park since the 1990s. A substantial number of black rails have been reported from inland sites of central Florida since the 1980s and most of these discoveries have been relatively recent. Black rails were collected from the MACASPHALT Shell Pit in Sarasota County during the summer of 1986, birds were detected from the mid-1980s to early 1990s within Lake Woodruff National Wildlife Refuge, two birds were heard through the summer of 2000 within KICCO Wildlife Management Area in Polk County (Pranty 2001), a bird was heard in Fort Drum Marsh Conservation Area by Rowe on 10 April, 2001, one to two birds were present on Buck Island Ranch in Highlands County from 2001 through 2003, a single bird was heard by Robinson on Lake Apopka Restoration Area on 4 June, 2003 and one bird was detected by Timmer and Geanangel on 10 July, 2005 within the Polk County phosphate mines.

South Florida (Broward, Collier, Lee, Miami-Dade, Monroe, Palm Beach counties) - Compared to other regions in the state, discovery of black rails in southern Florida is relatively recent. Rebel and others reported four birds calling on 9 to 15 June, 1968 from Big Cypress National Preserve (Stevenson 1968). Various locations within Everglades National Park including Mahogany Hammock, Coastal Prairie Trail, Taylor Slough and Old Ingram Highway have had records dating back to the late 1980s. Holey Land Wildlife Management Area has had reports of two calling birds since the late 1980s. Neville detected a bird on 21 May, 1988 as part of the breeding bird survey near Long Pine Key. Cooper reported two birds calling on 30 April, 1998 within Fakahatchee Strand Preserve State Park (Pranty 1998). Boyd reported hearing three birds calling on 28 August, 2010 along Browns Farm Road in Arthur R. Marshall Laxahatchee National Wildlife Refuge (Pranty 2011) and Mitchell and Ketterlin detected one bird on 6 May 2010 on Rotenberger Wildlife Management Area in Palm Beach County.

Recent Records (after 2010) – There have been a considerable number of recent records in Florida scattered across numerous counties.

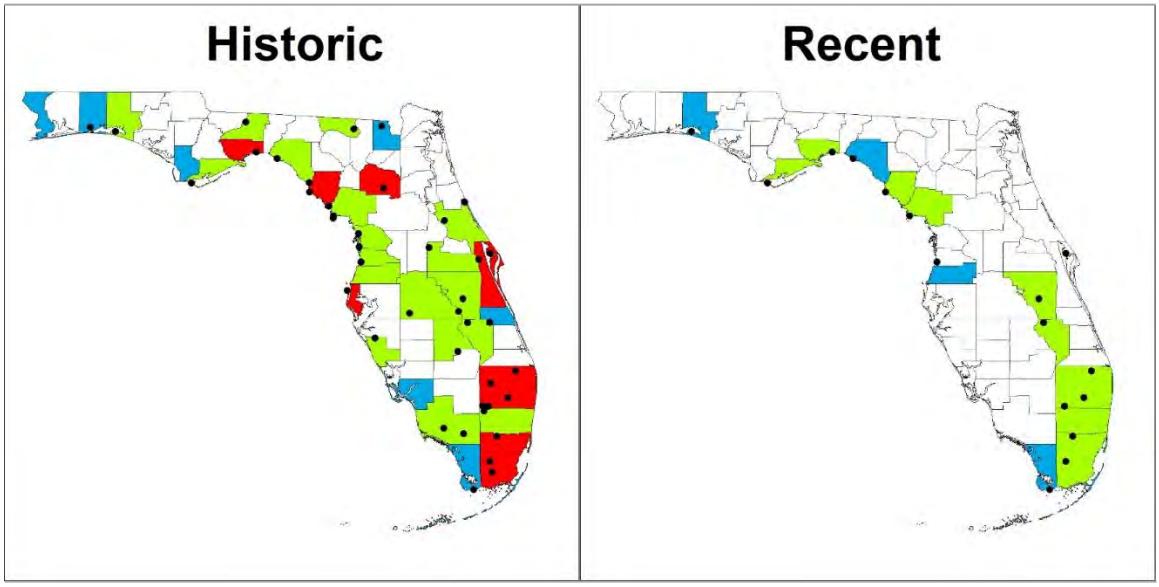
North Florida - Recent observations of black rails in north Florida have been along the Gulf Coast including one bird detected by Powell on 19 April, 2016 on Big Bend Wildlife Management Area, three birds detected by Kent and Powell on 18 April, 2016 on St. Marks National Wildlife Refuge, as many as five detections by Kent and Powell in June of 2016 on St. Vincent National Wildlife Refuge, and observations on Jena Wildlife Management Area during 2012, 2013, 2014 and 2015. In addition to these historic strongholds, Enloe had a single bird on 28 April, 2011 and again on 9 June, 2015 at Hogtown Bayou in Walton County and Parks flushed a bird on 23 June, 2013 at Cedar Key.

Central Florida – Detections of birds within some of the historic sites in central Florida have continued in recent years including two birds reported by Enloe from Werner-Boyce Salt Springs State Park on 26 April, 2016 and Chelemer reported finding a single bird on 30 May, 2014 on Merritt Island National Wildlife Refuge.

However there have been no recent reports from Lake Woodruff National Wildlife Refuge or St. Johns National Wildlife Refuge. There have been new locations discovered in recent years including three birds heard calling by Harris from 6 to 26 August, 2015 from Three Lakes Wildlife Management Area in Osceola County and three birds reported from 16 to 29 June, 2016 from Kissimmi Prairie Preserve State Park.

South Florida – Some of the traditional locations in southern Florida have continued to produce reports of black rails in recent years. Monk reported three birds on 23 May, 2013 and Callahan reported one bird on 24 August, 2014 from Holey Land Wildlife Management Area. A single bird was reported on 28 August, 2013 from Arthur R. Marshall Laxahatchee National Wildlife Refuge and there have been reports of one to three birds from Everglades National Park from 2013 to 2016. Black rails have also recently been discovered on new properties. Juntunen detected a single bird on 19 May, 2015 on Everglades Wildlife Management Area and Miles had a single bird calling on 27 May, 2013 on JW Corbett Wildlife Management Area.

DISTRIBUTION: Black rails have been reported from 32 counties and 45 named properties in Florida (Appendix III and IV). Breeding has been confirmed in seven counties and 18 of the remaining have been classified as probable. Five of the properties have confirmed breeding and 31 of the remaining 40 were classified as probable.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Florida counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Alachua	Confirmed	-----
Baker	Possible	-----
Brevard	Confirmed	-----
Broward	Probable	Probable
Citrus	Probable	-----
Collier	Probable	-----
Dixie	Confirmed	Probable
Escambia	Possible	-----
Franklin	Probable	Probable
Gulf	Possible	-----
Hamilton	Probable	-----
Hernando	Probable	-----
Highlands	Probable	-----
Indian River	Possible	-----
Lee	Possible	-----
Leon	Probable	-----
Levy	Probable	Probable
Miami-Dade	Confirmed	Probable
Monroe	Possible	Possible
Okaloosa	Possible	-----
Okeechobee	Probable	Probable
Orange	Probable	-----
Osceola	Probable	Probable
Palm Beach	Confirmed	Probable
Pasco	Probable	Possible
Pinellas	Confirmed	-----
Polk	Probable	-----
Sarasota	Probable	-----
Taylor	Probable	Possible
Volusia	Probable	-----
Wakulla	Confirmed	Probable
Walton	Probable	Probable

Major Landscapes – Black rails occur in several landscape settings in Florida including both Atlantic and Gulf coasts and the interior spine of the state. The vast tidal marshes that extend along the Gulf Coast from Apalachicola south to New Port Richey in Pasco County appear to have been historically important. Tidal marshes along the Atlantic Coast are primarily behind barrier islands and are more restricted to the areas around Merritt Island. The southern coast of Florida including Florida Bay and the Keys is dominated by mangroves and does not appear to have been significant. Due to the low topographic relief and hydrology of interior Florida there are several settings that appear to have been attractive to black rails, including freshwater wetlands and the vast expanses of coastal prairies. These areas have been the least explored.

Habitat – During the breeding period, black rails use a diversity of habitats in Florida including tidal salt marshes, interior freshwater wetlands, abandoned mines and impoundments, grassy fields and coastal prairies. Their use of tidal wetlands has been well described by Eddleman and Legare (1995) and Pranty et al. (2004). The former emphasizes the favorable hydrologic condition that includes areas that are only inundated during infrequent wind-driven tides. Within the tidal systems in Florida black rails occupy the band of vegetation that lies between the low marsh vegetation (regularly inundated) and the upland. The specific low or high marsh vegetation itself may vary from site to site. All authors indicate that black rails are typically associated with a mosaic of habitat that often includes open, bare ground but are found within patches that have dense, overhead vegetation that provides concealment. Nicholson highlights his observations on Merritt Island that nests are often found in areas with some fresh or brackish water. Pranty et al. (2004) describe black rail distribution in non-tidal sawgrass habitat as being in patches of relatively low and open sawgrass that lies between the lower and higher sawgrass and abutted coastal hydric hammocks composed of cabbage palms and pines. The patches of open habitat varied in size. Habitat within the interior freshwater wetlands and the coastal prairies has been less described.

TRENDS: At this stage overall trends in Florida are very difficult to assess because it is likely that a significant portion of the population has not been surveyed. The population in northern Florida appears to have declined in recent decades. Nicholson describes his collecting trips to Merritt Island in the 1920s and 1930s as "this swale is alive with black rails, judging from the number of birds flushed from the grass the past several years." Reports from this site in recent years have been of single birds though no series of surveys is available to allow for direct comparison. The situation along the Gulf Coast is similar. Numbers appear to be lower in recent years compared to earlier descriptions but surveys using a common network of points are not available. By comparison, information on black rails in south Florida has been emerging in recent years with many more reports compared to the pre-1990 period. The implication is that there may be a population in interior and southern parts of the state that has not been characterized. The lack of early data prevents any trend assessment.

POPULATION ESTIMATE: Due to its low topographic relief and extensive wetland habitat, Florida likely supports the largest population of breeding eastern black rails of any state throughout their range. Although populations in the tidal marshes along both the Atlantic and Gulf coasts have been explored, the population within the much more extensive and diffuse inland habitat is virtually unknown. Pranty et al. (2004) sum up this situation by stating "Suitable habitat appears to be locally common… so it seems likely that dozens or perhaps even hundreds of

additional black rails remain to be discovered. Without more survey work in southern and interior Florida it is not possible to produce a narrow estimate. Based on information currently available a soft population estimate would be 200 to 500 pairs. This is the same estimate that was produced during the 2014 black rail workshop.

Uncertainty – Reports of black rails in southern and interior Florida imply the existence of populations of unknown size. Uncertainty in the population estimate is set to high. Much more extensive survey work is needed to improve confidence.

THREATS: Threats to Florida black rails have not been widely discussed. All of the tidal marshes along the coastal areas are subject to sea-level rise and the potential impact of rising seas on high marsh areas has not been assessed. Many of the traditional tidal marshes that have been documented are burned regularly but this has not been considered a negative management practice for breeding rails in Florida. Predators have been mentioned but primarily in the context of black rails selecting dense cover as an anti-predator strategy. Likely the greatest threats to the interior population are changes in hydrology caused by factors such as ground-water withdrawal and changes in hydroperiod.

ALABAMA

SUMMARY: Records of black rails during the breeding season in Alabama are limited and most have occurred within the early period including April and early May. Howell (1928) suggested that the species may breed in the state but Imhof (1976a) indicated that the species was not known to breed in the state. The records from Gulf State Park during 1973 and 1974 extended into mid-June suggesting that breeding was likely during those years. A survey of 317 points including sites throughout the Gulf Coast in salt and brackish marshes using a call-broadcast protocol resulted in no black rail detections. There have been no reports of breeding season records since 2006. The population estimate is currently set to zero for the state with relatively low uncertainty.

POPULATION STATUS AND RANK:

State – Black rails have no special legal status in Alabama.

Natural Heritage Rank – Black rails have been assigned a rank of S2 (Imperiled) in Alabama indicating their rarity and vulnerability in the state.

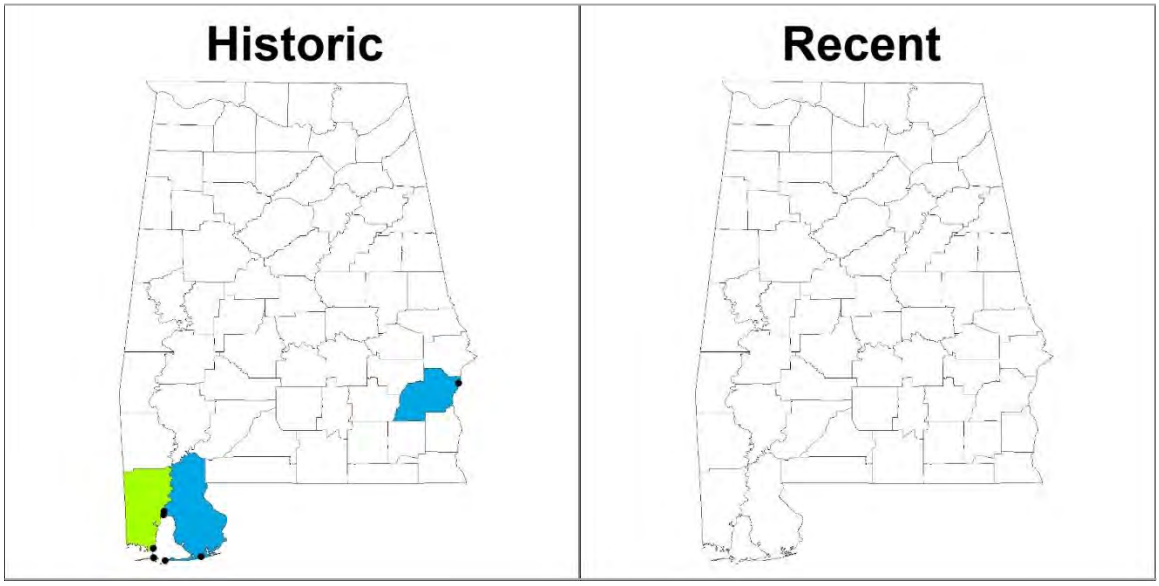
SURVEY EFFORTS: Soehren et al. (2009) used a call-broadcast protocol to survey black rails and other secretive marsh birds within a network of 317 points (195 salt marshes, 122 brackish marshes) between 23 April and 27 July, 2004. The sites covered the coast of Alabama but were selected from a larger pool of potential sites. Alabama completed a breeding bird atlas project from 2000 to 2006.

RECORDS DURING THE BREEDING SEASON:

Historic Records – Historic records of black rails in Alabama during the breeding season are fairly limited. Howell (1928) suggests that the species may breed in the state but has no evidence of occurrences during the breeding period. Imhof (1976a) indicates that the species is not known to breed. Most birds have been documented in the early (April) portion of the breeding period and as such have been classified as "possible". Peavy detected a bird on 7 April and 3 May, 1976 on Fort Morgan (Imhof 1976b) and Forster would flush another from this location on 28 April, 1990 (Jackson 1990). Moore detected a bird on 24 April, 1975 and again on 1 May, 1976 in a freshwater marsh on Eufaula National Wildlife Refuge in Barbour County (Crawford 1975, 1976). Jackson and Cooley recorded one bird calling on Blakely Island on 1 May, 1986 (Imhof 1986). Peavler reported a bird from Pinto Pass in Mobile Bay on 22 April, 1983 (Imhof 1983). A much later report was a bird calling on Heron Bay reported by Jackson on 22 June, 1981 (Jackson 1981). The two areas with the highest concentration of observations over the past 40 years have been Dauphin Island and Gulf State Park. Black rails were reported from Dauphin Island during 10 years between 1976 and 2006 (all during April and May). Gulf State Park had reports of birds from 1973 through 1978 including records into mid-June during 1973 and 1974. The coast-wide survey conducted in 2004 detected no black rails.

Recent Records (after 2010) – No recent records of black rails during the breeding season were discovered for Alabama.

DISTRIBUTION: Black rails have been reported during the breeding period from three Alabama counties and seven identified properties (Appendix III and IV). There have been no confirmed breeding records in Alabama and only Mobile County has been classified as probable based on seasonality of occurrence. Three of the named properties were classified as probable and the remaining were considered possible.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Alabama counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Baldwin	Possible	-----
Barbour	Possible	-----
Mobile	Probable	-----

Major Landscapes – Black rails in Alabama have primarily been recorded on the outer Gulf Coast and mostly focused on Mobile Bay. Known inland occurrences are few and scattered.

Habitat – Observations of birds along the Gulf Coast have been associated with tidal salt marshes. Most of the activity detected on Dauphin Island was around the airport marsh. One of the locations further up Mobile Bay was within an area of industrial impoundment. The inland site within Eufaula National Wildlife Refuge was within a freshwater wetland.

TRENDS: Black rails are very rare in Alabama during the breeding season.

POPULATION ESTIMATE: Habitat for black rails in Alabama is limited but does occur along the Gulf Coast and within inland areas. No breeding has been documented in the state and the last breeding season record is from 2006. The population estimate for the state is set to 0.

Uncertainty - Uncertainty in the population estimate is set to low. Vigilance should be maintained along the Gulf Coast and within appropriate inland locations.

THREATS: Gulf Coast tidal marshes are experiencing a number of threats including degradation and sea-level rise. However, because there is no known black rail breeding population in Alabama it is not clear what impact these factors are having on the broader population.

MISSISSIPPI

SUMMARY: Mississippi has generally been considered to lie outside the breeding range for black rails. There is little evidence in the historic record to refute this suggestion. Mississippi has relatively little exposure to the outer Gulf Coast and those estuaries that do exist do not appear to support a breeding population. It is more likely that inland areas of the state may support black rails though no records have emerged to support this. The population estimate is currently set to zero for the state with relatively low uncertainty.

POPULATION STATUS AND RANK:

State – Black rails have no special legal status in Mississippi.

Natural Heritage Rank – Breeding black rails have not been assigned a natural heritage rank for Mississippi.

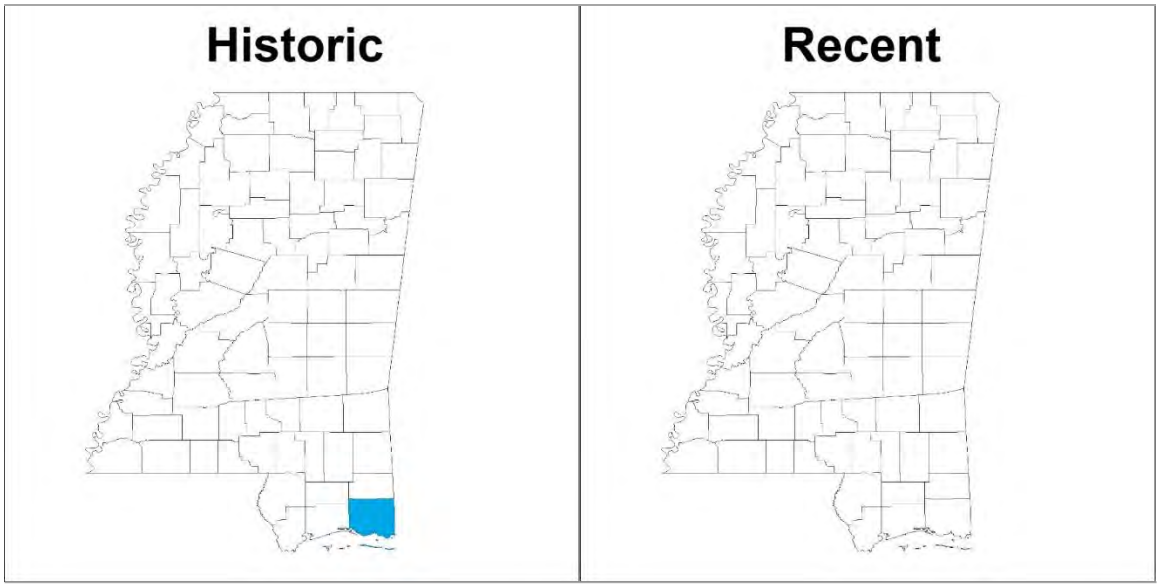
SURVEY EFFORTS: Surveys for secretive marsh birds have been initiated in Mississippi in recent years. Leggett (2014) used a call-broadcast protocol to survey 212 points distributed across available tidal marshes in Hancock, Harrison and Jackson counties from 26 March through 2 July, 2012 and 21 March through 2 July, 2013. Mississippi conducted a breeding bird atlas from 1997 to 2004.

RECORDS DURING THE BREEDING SEASON:

Historic Records – Although there are a number of winter records, Mississippi has virtually no breeding season records of black rails. On 12 April, 1980 during an extreme high tide event within Gulf Park Estates in Jackson County Harris observed four black rails with several soras along an exposed marsh edge (Imhof 1980). Wallace and Foster reported a bird on 14 June, 1936 but Toups and Jackson (1987) have suggested that the observation is likely in error.

Recent Records (after 2010) – No recent records of black rails during the breeding season were discovered for Mississippi. No information clarifying the detection or lack thereof of black rails during the Leggett (2014) surveys is provided.

DISTRIBUTION: Black rails have been reported during the breeding season only from Jackson County and due to the seasonality the county was classified as possible.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Major Landscapes – Black rails have been detected during the early portion of the potential breeding period in outer coastal marshes.

Habitat – The only breeding season records have occurred in tidal marshes.

TRENDS: Historical occurrence of black rails in Mississippi is unclear. Currently, black rails are extremely rare even during the early period of breeding with no late season records.

POPULATION ESTIMATE: There is currently no evidence that black rails breed in Mississippi. The population estimate for the state is set to 0.

Uncertainty - Uncertainty in the population estimate is set to low. Although there appears to be no history of breeding in the state vigilance within tidal salt marshes and wet, grassy fields is warranted.

THREATS: Although there many factors threatening tidal marshes and other potential habitat in Mississippi it is unclear that these factors pose any threat to black rails.

LOUISIANA

SUMMARY: Louisiana is not currently known to support a breeding black rail population. There are no confirmed breeding records and historic observations during the breeding season are rare. Western Louisiana supports the eastern extent of the coastal wetlands and prairie that black rails are known from in Texas. Most historic and recent records are from Broussard Beach area of Cameron Parish that lies within this system. Despite the lack of evidence, the breeding population estimate is set to range from zero to 10 breeding pairs due to the likelihood of occurrence. Uncertainty associated with this estimate is high. Surveys are needed within likely landscapes to clarify status in the state.

POPULATION STATUS AND RANK:

State – Black rails have no special legal status in Louisiana.

Natural Heritage Rank – Black rails have been assigned a rank of S1 (Critically Imperiled) in Louisiana indicating their extreme rarity in the state.

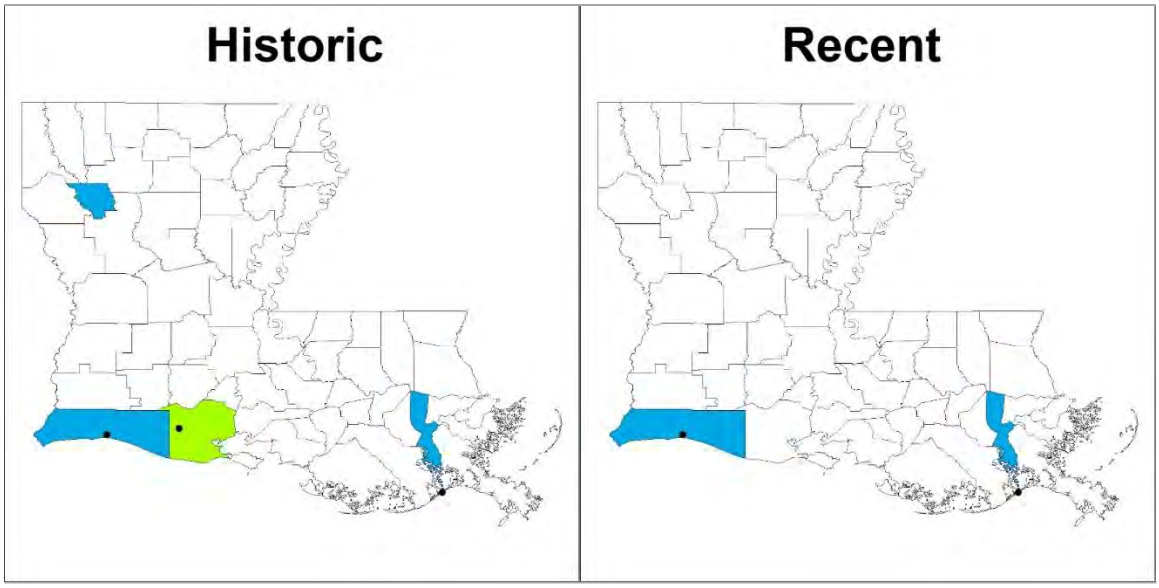
SURVEY EFFORTS: Targeted surveys in Louisiana for black rails and other secretive marsh species have been initiated in recent years. Pickens (2012) used a call-broadcast protocol to survey 304 points annually between 9 March and 19 June (2009-2011) within the Chenier Plain coastal area of Louisiana including Cameron Prairie National Wildlife Refuge, Lacassine National Wildlife Refuge, Rockefeller State Wildlife Refuge, and White Lakes Wetland Conservation Area. In 2010, the Louisiana Department of Wildlife and Fisheries established a network of approximately 240 survey points that included the entire coast and surveyed the network in April, May, and June using a call-broadcast protocol (Louisiana Wildlife Action Plan 2015). A subset of this network (130 points) was surveyed annually from 2011 through 2015. Louisiana conducted a breeding bird atlas from 1994 to 1996.

RECORDS DURING THE BREEDING SEASON:

Historic Records – Louisiana has no definitive breeding record for black rail. Lowery (1955) states that "Field investigators have spent considerable time in Cameron Parish playing tapes of this vocalization without yet eliciting a response or even finding a marshman who could remember ever having heard it." However, given that west coastal Louisiana is a continuation of the habitat along the upper Texas coast that is known to support black rails it seems likely that the state does support a small, yet to be discovered population, possibly in Cameron and Vermillion Parishes. Most records have come from the Broussard Beach area of Cameron Parish. Cardiff reported two calling birds from this area on 24 April, 1982, Sterling reported two calling birds on 14 April, 1990 (Jackson 1990) and Wallace reported two calling birds from 27 April through 10 May, 2008 (Cardiff 2008). Beyond the Broussard Beach area Dickson reported a brief glimpse of a bird on 5 May, 2005 in Red River Parish in the northern part of the state. A very significant record was the discovery of freshly killed bird on the road in White Lakes Wetland Conservation Area in Vermillion Parish on 4 July, 2010 by Conover. This late date suggests breeding.

Recent Records (after 2010) – Like past observations, recent reports have come primarily from the Broussard Beach area with one or more birds being reported from March through early May of 2013 (Cardiff and Nichols 2014) and a bird heard by Del-Rio on 22 April, 2016. Outside of this site, Feura flushed a single bird on 6 April, 2013 from a field on Grand Isle in Jefferson Parish. Pickens (2012) detected four black rails during the three years of surveys but did not provide details on seasonality or location.

DISTRIBUTION: Black rails have been reported from four Louisiana parishes and three identified properties (Appendix III and IV). Although most of these were early in the season, the bird killed in the road in Vermillion Parish was in July.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Louisiana counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Cameron Parish	Possible	Possible
Jefferson Parish	Possible	Possible
Red River Parish	Possible	-----
Vermillion Parish	Probable	-----

Major Landscapes – Virtually all black rail records from Louisiana during the breeding period have come from extensive marshes and associated lowlands of Cameron Parish. This is part of the tidal salt marsh and coastal prairie system that extends west through coastal Texas. There are no breeding-season reports from the extensive delta marshes in Terrebonne and Jefferson Parishes though many of these areas are extremely remote.

Habitat – Most observations of black rails in Louisiana have come from tidal salt marshes in accessible areas along the coast or from nearby grassy fields.

TRENDS: Black rails are considered very rare in Louisiana and no breeding records have been documented in the state. There is no information available to assess trends.

POPULATION ESTIMATE: Although there are few breeding season records of black rails in Louisiana and no confirmed breeding, western Louisiana occupies the eastern extent of the coastal prairie system that is used in Texas. The single bird recorded in late July is suggestive of breeding. Based on current suggestive information the population estimate is set in the range of zero to 10 breeding pairs.

Uncertainty - Uncertainty in the population estimate is set to high. Additional surveys are needed within the most likely landscapes to clarify breeding status in the state.

THREATS: Urban expansion and continued loss or degradation of remaining coastal prairie may pose a threat to black rails assuming Louisiana supports a population. Ongoing sea-level that threatens tidal marshes and other habitats along the coast may also pose a threat.

TEXAS

SUMMARY: Texas is a black rail crossroad making it difficult to differentiate breeders from winter residents from migrants. The upper Texas coast has a long history of black rail records that are concentrated within national wildlife refuges and state wildlife management areas. This area is close to major urban centers and receives considerable attention from bird watchers. Exploration of black rail distribution along the central Texas coast is more recent dating back mostly to the early 1990s. Recent research within both of these geographic areas is beginning to clarify the important role that Texas plays in the life cycle of multiple populations. Status of the black rail along the south Texas coast is poorly understood. Black rails in Texas use tidal salt marshes along the barrier islands and the mainland fringe, as well as, drier coastal prairie. Tidal marshlands are threatened by ongoing sea-level rise. The coastal prairie is a small remnant of an earlier widespread ecosystem and continues to be threatened by grazing and agricultural conversion. A loose population estimate for the state is set to 100 to 500 pairs with high uncertainty. Additional survey effort focused on population estimation would help to improve the population estimate.

POPULATION STATUS AND RANK:

State – Black rails have no special legal status in Texas.

Natural Heritage Rank – Black rails have been assigned a rank of S2 (Imperiled) in Texas indicating their rarity and vulnerability in the state.

SURVEY EFFORTS: A considerable amount of work has been initiated in Texas to assess the role that Texas plays in the conservation of both wintering and breeding black rails. Ortega (unpublished data) has surveyed many locations for black rails in coastal Texas since the early 1990s. Butler et al. (2015) used a call-broadcast protocol to survey 90 points (31 tidal salt marsh, 59 coastal prairie) within San Bernard and Brazoria National Wildlife Refuges from March through May, 2014. In addition, Butler et al. placed nine automatic recording units that recorded continuously from 17 April through 7 July, 2014. Moore et al. (personal communication) used a call-broadcast protocol from March through May, 2015-2016 to survey a network of 375 points distributed among Anahuac National Wildlife Refuge (105 points), Brazoria National Wildlife Refuge (80 points), San Bernard National Wildlife Refuge (65 points), Mad Island Wildlife Management Area (84 points) and Powderhorn Ranch (41 points). Wilson (2013) has worked extensively with black rails within the Texas Mid-Coast National Wildlife Refuge Complex banding 55 individuals between 2007 and 2011 including a female captured on 25 April, 2007 with early brood patch development. Texas conducted a breeding bird atlas from 1987 to 1992.

RECORDS DURING THE BREEDING SEASON:

Historic Records – The upper Texas coast has the longest history of black rail reports in eastern Texas stretching back to the late 1800s. Prominent within this record are the national wildlife refuges and the state wildlife management areas. Black rail exploration on the central Texas coast appears to have been initiated much later in the early 1990s. The south Texas coast has a very limited record of black rails.

Upper Texas Coast (Jefferson, Chambers, Galveston, Harris, Brazoria) – Much of the black rail activity along the upper Texas coast has been concentrated on the Bolivar Peninsula and Brazoria, Anahuac and San Bernard National Wildlife Refuges. Pope made observations of rails along the Bolivar Peninsula from July 1911 through March 1913 and found a black rail nest with six eggs on 9 May, 1912 (Casto 2008). In recent years, consistent reports of one to four birds have been made from this area from the early 1990s through the 2000s. Simmons (1914) walking through a marsh south of Houston (presumably Brazoria County) flushed a black rail on 21 April, 1924. Following a wildfire on 29 May, 1969 Fleetwood found 11 black rail nests in a 50-hectare section of salt marsh dominated by big cordgrass and salt meadow cordgrass (Wilson 2013) on Brazoria National Wildlife Refuge. Following this discovery there has been a consistent stream of reports of one to three calling birds from this location. Although many of these reports have been in the April period, just as many reports have come during July and August. Likely due to its proximity to urban centers, black rails have been reported from Anahuac National Wildlife Refuge more than any other property in coastal Texas. Reports of one to seven birds have been made by the public consistently since the early 1970s. The highest number of calling birds has typically been reported in late April through mid-May each year. Similar to the other refuges, reports of one to five black rails have been made consistently from San Bernard National Wildlife Refuge since the early 1970s. In addition to these dominant properties, black rails have been reported from other locations along the upper coast. One bird was heard by Graber on 25 April, 1964 from Texas Point National Wildlife Refuge and one bird was heard by Stekoll on 28 April, 2002 from Sea Rim State Park both in Jefferson County. Eubanks describes a "colony" of black rails discovered along San Luis Pass in the spring of 1983 (Eubanks et al. 2006). Farrell reported a bird on 28 April, 1968 on Galveston Island and O'Brien reported a bird on 25 May, 1991 from Galveston Island State Park (Webster 1968). Ortego reported a single bird calling from Justin Hurst Wildlife Management Area on 30 April, 1994, James reported a bird calling from Quintana Neotropical Sanctuary on one May, 2005 and Tankersley reported a single bird on 26 April, 2008 from Surfside Marshes all in Brazoria County.

Central Texas Coast (Matagorda, Calhoun, Aransas, San Patricio, Nueces, Kleberg) – The central Texas coast does not appear to receive the same level of visitation from the bird-watching community as the upper coast. Exploration of black rails in this region seems to begin in the early 1990s with surveys by Ortego. Properties with significant black rail histories include Matagorda Island Wildlife Management Area, Mad Island Wildlife Management Area, Aransas National Wildlife Refuge and the Magnolia Beach Wetlands where birds have been detected during breeding bird surveys for many years. Calling birds were reported from Matagorda Island through the breeding season from 1992 through 1996 with a high of five birds reported by Ortego on 30 May, 1996. Mad Island Wildlife Management Area has had a similar recorded history with from one to four birds

reported from the 1990s and 2000s. Reports of black rails on Aransas National Wildlife Refuge date back to 1985 with a high count of four calling birds recorded by Stinson between 10 and 18 May, 2007. There have been reports of black rails calling for 10 of the 18 years between 1993 and 2010 in the marshes around Magnolia Beach and the majority of these reports were during June and July. Other important areas include Padre Island National Seashore where Cooksey reported three calling birds annually during many years between 1994 and 2005. Ortego reported five calling birds on 30 May, 1996 from the Mission Lake Marshes in Calhoun County. Freeman would report a single bird there on 8 April, 2001. Mountjoy reported a bird in April and May of 2010 in Hazel Bazemore Park in Nueces County (Lockwood et al. 2010). Cooksey reported a bird from June through August, 1997 around the Leonabelle Turnbull Birding Center in Nueces County and Bratz reported a bird in the same area on 15 May, 2010. Cooksey would also report birds from Tule Lake (13 May, 2007 and 27 June, 2010) and Vickers Ranch in April from 1994 through 2003 both in Nueces County. On 22 April, 1994 Cooksey reported five calling birds and on 13 April, 1995 four calling birds from Whites Point in San Patricio County.

South Texas Coast (Kenedy, Cameron) – the south Texas coast has had few reports of black rails. Whether this is due to a lack of effort to find them or their absence is not clear. Black rails have been detected by McKinney on 19 May, 1995 and again on 3 July, 2005 around South Padre Island Nature and Birding Center in Cameron County (Lockwood et al. 2005). Freeman had a single black rail calling on 28 April, 2001 on Kenedy Ranch in Kenedy County.

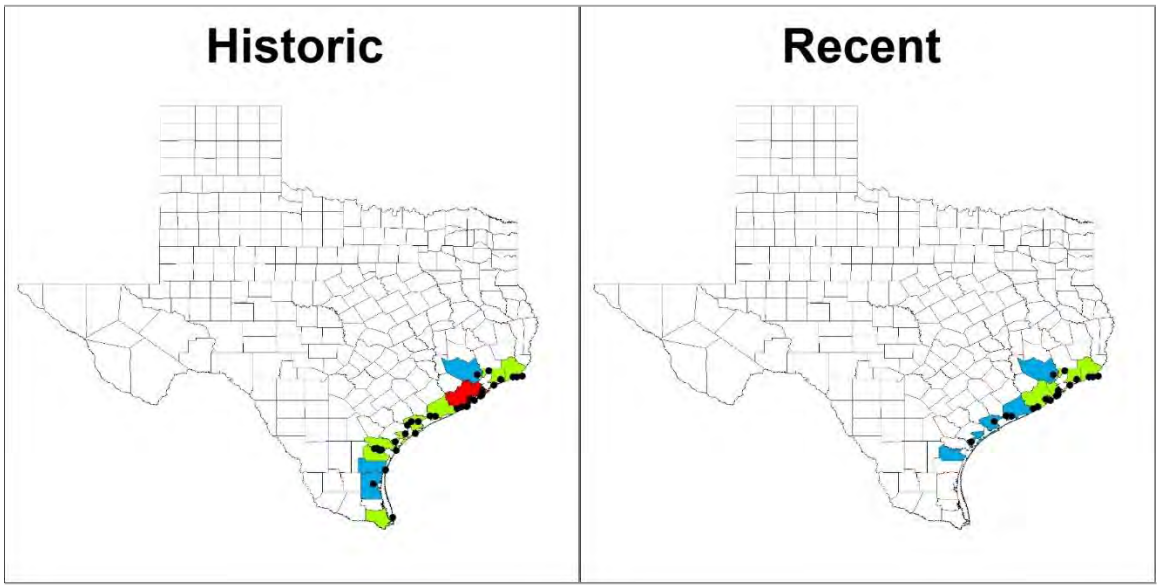
Recent Records (after 2010) – The Texas coast has produced a large number of recent black rail records including the first large-scale targeted surveys. Some of the historic strongholds continue to support significant black rail concentrations.

Upper Texas Coast – Black rail reports from all of the historic strongholds along the upper coast including the Bolivar Peninsula and all three refuges have increased in recent years with some producing several reports of multiple birds annually. Butler et al. (2015) detected black rails from 16 survey points within San Bernard National Wildlife Refuge and three points within Brazoria National Wildlife Refuge in 2014. Moore et al. detected black rails from 40, 27 and 24 points within Anahuac, Brazoria and San Bernard National Wildlife Refuges respectively in 2015-2016 seasons collectively. Outside of these areas, observations have been made annually on Galveston Island and periodically on Texas Point National Wildlife Refuge, Sea Rim State Park, McFaddin National Wildlife Refuge in Jefferson County, Wallisville Lake in Chambers County, San Luis Pass and Virginia Point in Galveston County, San Jacinto Bay Spoil Island in Harris County and Justin Hurst Wildlife Management Area in Brazoria County.

Central Texas Coast – Two of the historic strongholds have continued to produce black rail reports in recent years. Taylor reported a bird calling on 18 April, 2014 around Magnolia Beach. McElaney recorded a single bird on 14 April, 2014 and Guida reported a bird on 2 April, 2015 from Mad Island Wildlife Management Area. Moore et al. detected black rails from 21 points (70% of those surveyed) on this property (2015-2016 breeding seasons). No black rails have been reported from Matagorda Wildlife Management Area since 1996 or from Aransas National Wildlife Refuge since 2008. Similarly no reports have come from Whites Point since 1995, Mission Lake Marshes since 2001, Vickers Ranch since 2003, Padre Island National Seashore since 2005, Hazel Bazemore Park since 2010 or Tule Lake since 2010. Ortego (personal communication) has surveyed Matagorda Island in recent years with no detections. Whether the lack of reports in other areas is due to an absence of birds or a lack of effort to find them is not known.

South Texas Coast – No recent black rail observations were located for the south Texas coast.

DISTRIBUTION: Black rails have been reported from 13 Texas counties and 35 identified properties (Appendix III and IV). Breeding has been confirmed in Brazoria and Galveston Counties and eight of the remaining 11 were classified as probable. Breeding has been confirmed for two of the named properties with another 19 classified as probable.



Maps of counties with historic and recent black rail occurrences. Color codes include red – confirmed breeding, green – probable breeding, and blue – possible breeding. Black dots represent named properties with occurrences.

Texas counties with reported black rail occurrences. Historic refers to occurrences prior to 2011. Recent refers to occurrences after 2010.

COUNTY	HISTORIC	RECENT
Aransas	Probable	-----
Brazoria	Confirmed	Probable
Calhoun	Probable	Probable
Cameron	Probable	-----
Chambers	Probable	Probable
Galveston	Confirmed	Probable
Harris	Possible	Possible
Jefferson	Probable	Probable
Kenedy	Possible	-----
Kleberg	Possible	-----
Matagorda	Probable	Probable
Nueces	Probable	Possible
San Patricio	Probable	-----

Major Landscapes – The majority of black rails that have been recorded in Texas have been associated with the barrier island-lagoon system along the outer coast. Birds use tidal salt marshes either along the landward side of barrier islands or the extensive marshes along the mainland fringe. The other major landscape used in Texas is coastal prairie. As the distribution unfolds, this situation may end up supporting a large portion of the overall population.

Habitat – Wilson (2013) gives a description of the vegetation used by black rails on the Texas Mid-Coast National Wildlife Refuge Complex where the habitat is dominated by coastal prairie dominated by gulf cordgrass and tidal marshes dominated by big cordgrass and saltmeadow cordgrass. Black rails have also been recorded in drier sites dominated by broomsedge. The author gives a compelling description of where the birds fit within the successional sequence following prescribed fire. Butler et al. (2015) measured vegetation within survey plots and showed that occupancy was influenced by the density of stems in the 10 to 20 cm height class indicating a preference for dense overhead vegetation.

TRENDS: More than 95% of the coastal prairie in Texas and Louisiana has been converted to agriculture or grazing lands. It is likely that this earlier conversion resulted in considerable declines in the black rail population. However, trends in more recent times are difficult to assess with existing information. The survey record in the state does not extend back long enough to assess trends in the breeding population. Exploratory surveys were conducted within a number of sites during the early 1990s. For many occupied sites there are no recent records of occurrence. However there is no record of follow-up surveys for many of these that would allow for interpretation of the voids. Recent survey networks should be monitored in the future to allow for trend analysis.

POPULATION ESTIMATE: Recent surveys suggest that occupancy rates in Texas are much higher than elsewhere in the range of the eastern black rail. Moore et al. recorded occupancy rates of 15 to 35% annually across four properties. This coupled with recent survey information and the amount of habitat that appears to be available suggests that Texas supports a substantial breeding population. The status of current information presents a challenge for estimating the population. A very soft estimate may be in the range of 100 to 500 breeding pairs.

Uncertainty - Uncertainty in the population estimate is set to high. Additional systematic surveys are needed over a larger percentage of the coast and near-coast areas to tighten this estimate.

THREATS: Urban expansion and continued loss or degradation of remaining coastal prairie poses a threat to black rails in Texas. Factors that influence tidal marshes such as ditching or sea-level rise are ongoing threats to breeding habitat. Related to these hydrologic factors are recent and future droughts that may cause abandonment of selected sites (Ortego, personal communication).

Discussion

Distribution

Our understanding of black rail distribution in eastern North America unfolded over a period of decades within the early literature (e.g. Baird et al. 1884, Allen 1900, Eaton 1910, Cooke 1929, Forbush 1929, Stone 1937). Early writers recognized the significance of the very few scattered observations that were made during the late 1800s and early 1900s (e.g. Clark 1884, Cairns 1889, Brimley and Brimley 1900, Wayne 1905, Harlow 1912) and incorporated them into the evolving understanding of distribution. More recent treatments (Davidson 1992, Eddleman and Legare 1994) have used information since the 1950s to greatly improve our understanding of distribution and ecology within the region. With the compilation presented here I have attempted to integrate the past 150 years of literature, museum specimens and unpublished records with the more recent dedicated black rail surveys to contrast historic occurrences with the more recent records from the past several years. One of the great benefits of examinations over long periods of time is that they afford the luxury of history in seeing distribution alongside large, eco-social factors that have come and gone through time.

Over the past 150 years black rails have been documented during the breeding period throughout much of eastern North America including 174 counties within 21 of the 23 states examined. This finding is consistent with Davidson (1992) who found historic evidence of widespread distribution in states of the Northeast. Although no similar treatment has been completed for the Southeast, black rails are also known to be widely distributed within the region (e.g. Runde et al. 1990, Fussell 1994, Wamer 2003, Eubanks et al. 2006). Our understanding about distribution has evolved as black rails have been discovered in new areas. Reports beginning in the late 1940s of the black rail concentration on Elliott Island, Maryland would result in multiple visits annually for the next 60 years and one of the best documented populations throughout the range. The rediscovery of black rails on Oak Beach by Post and Enders (1969) would result in an intense interest in the species on Long Island for the next 20 years. This process of discovery and investigation is continuing to expand our understanding of black rail distribution and habitat use. Surveys conducted by Runde et al. (1990) and later by Pranty et al. (2004) would suggest the presence of black rails in central and south Florida, a suggestion that is continuing to be investigated today.

A conundrum to some early writers, historic records have included both coastal and inland locations. Coastal sites have dominated the occurrence records representing nearly 90% of all documented observations during the breeding season. Historically, black rails have been both more concentrated along the coast and individual sites have been more consistently used. Both of these patterns facilitate observations by the bird-watching community and make the species more workable for the research community. Inland records have been both relatively uncommon and early in the historic record. They account for less than 10% of the total occurrences and more than 60% were documented before 1950. Although the frequency of reports within these inland areas is much lower than a century ago, observations continue to the present time (e.g. Schutsky 1992, Sykes 2010, Adams et al. 2014) and these areas remain under sampled. Of the 2,900 black rail survey points that have been established since 2012, all have been on the outer coast. Surveying suitable inland habitats should be considered a priority for future work.

Population Estimate

As within all other regions throughout their range (Hands et al. 1989, Evans et al. 1991) the lack of status information for black rails within their eastern breeding range has precluded the establishment of definitive population estimates. Even though the estimate (25,000 to 100,000 individuals) provided by Wetlands International (2012) included the entire global range of the eastern black rail the estimate seems optimistically high given that the population within the study area is the largest known for the form. The collective estimates provided here of 455 to 1,315 including 55 to 115 pairs for the Northeast and 400 to 1,200 pairs for the Southeast. The population in the Northeast, in particular, appears precariously low and is comparable to some of the smaller subpopulations described for the California black rail (Evans et al. 1991). Two black rail workshops were held in 2014 that independently brought together biologists from the Northeast and Southeast regions to discuss ongoing work with the species and to derive some basic population estimates based on local expertise. The workshops resulted in a collective estimate of 945 to 2,250 breeding pairs that included 270 to 400 pairs for the Northeast and 675 to 1,850 pairs for the Southeast (Wilson et al., unpublished). The estimates provided here are 40 to 50% lower than the 2014 estimates. The difference reflects a more thorough assessment of existing information and new data from recent survey efforts. Both of these estimates suffer from the same lack of information on breeding density and habitat availability, two of the basic components of traditional population estimation. They also point to the need for a more regionally coordinated approach to population assessment. Much progress toward these goals has been made through the Eastern Black Rail Working Group and the effort continues to evolve.

Despite the lack of definitive population information, this black rail assessment does provide some important guidance. Within the Northeast the black rail population appears to have reached dangerously low levels. The current concentration of eastern black rails appears to be supported within the lower latitudes with Florida and Texas serving the largest role. However, these areas have the greatest uncertainty due to the large expanses of potential habitat that have yet to be assessed. The second most important void in recent coverage includes open habitats within the inner Coastal Plain and Piedmont east of the Appalachians.

Population Trends

Given the availability of both tidal salt marshes and open hay fields around the close of the Civil War it seems plausible that the eastern black rail may have numbered in the tens of thousands of pairs or more on par with the estimate provided by Wetlands International (2012). The annual harvest of salt hay from New Jersey north through New England led to the discovery of numerous black rails in the upper reaches of salt marshes (Clark 1897, Allen 1900, Justice 1903). However, the affinity of black rails for the highest and driest portions of tidal salt marshes made them highly vulnerable to human impacts. During the late 1800s and early 1900s this habitat was the focus of federal and state-promoted reclamation programs that converted these habitats to urban and agricultural lands (e.g. Tiner 1984, Dahl 1990, Tiner et al. 2002, Bromberg and Bertness 2005). International airports and residential neighborhoods in Boston, New York City and Philadelphia now sit on lands where black rails were documented in the 1800s. Urban expansion along the entire Atlantic and Gulf coasts occurred at the expense of marsh habitat. Homebound soldiers from the Civil War brought malaria to coastal areas resulting in an epidemic and a movement to drain marshlands to reduce mosquito populations (Rozsa 1995). Marsh ditching would continue long after the malaria epidemic subsided reaching its height when Roosevelt included the activity

under his make work program during the Great Depression. At its height 11,000 men were employed to ditch marshes in Massachusetts alone (Massachusetts Open Marsh Water Management Workgroup 2010). By 1940 more than 90% of marshes from Virginia to Maine had been ditched, many of which were never associated with mosquito problems. Changes in the availability of salt marsh habitat parallel those of inland habitats. Black rails were apparently widespread in the Piedmont and along the east slope of the Appalachians in the post Civil War period when haying was a necessity to support livestock on rural farms and was done using traditional manpower (Brimley and Brimley 1900, Pearson et al. 1942). A considerable number of nests were found in hay meadows by field hands as they harvested the hay by hand. Within the Piedmont and mountains, the general loss of the earlier farming culture, introduction of tractors, consolidation of family farms and reforestation through secondary succession likely reduced the availability of inland sites for black rails significantly by 1950 (Lee 1999). Changes in habitat availability and quality related to human activities had likely resulted in dramatic population changes for black rails fully 30 years prior to the first surveys in the 1980s. The population changes during those early eras are mostly lost to history.

There has been a change in the breeding-season distribution of the eastern black rail within the period of recorded history. The northern range limit has contracted south from the Newbury Marshes of Massachusetts to Ocean County, New Jersey a distance of 450 km. As recently as the 1980s the range limit was considered to extend north to Connecticut (Proctor 1981, Craig 1990) and as recently as the 1990s birds were detected periodically on Long Island, New York. In recent years, only 18% of the counties within the Northeast region that had historic records have had recent reports. Black rails continue to occupy the south Atlantic and Gulf coasts though distribution has become patchy in recent years. Given the unprecedented survey effort over the past two years the change is not likely due to a sampling problem. The other distribution shift has been a lack of occurrences within inland areas. Although black rails have not been a reliable species within inland areas since before the 1950s there have been no recent surveys conducted within these areas to assess status.

As with other regions throughout the black rail range (Eddleman et al. 1994) quantitative data is lacking in eastern North America to estimate population trends on a regional scale even during modern times. However, study areas in New Jersey, Maryland, Delaware, North Carolina and South Carolina have been surveyed during the period from the late 1980s through the early 1990s and again between 2014 and 2016. Comparisons between these two time periods suggest a catastrophic decline north of South Carolina where occupancy has declined by 64% and the number of birds detected has declined by 89% equating to a 9.2% annual rate of decline. Within this cohort of studies Maryland has experienced the steepest declines with a 13.8% annual rate. To the south, South Carolina has experienced the slowest decline with a 4.7% annual rate over a similar time period. The South Carolina rate is comparable to study areas in California where a 4.2% annual rate of decline was documented between 1973 and 1989 (Evans et al. 1991). A follow-up survey conducted by Conway and Sulzman (2007) within southwestern portions of the breeding range resulted in a much higher (22.5%) annual rate of decline.

One of the most revealing aspects of the black rail population decline along the mid-Atlantic Coast has been the unprecedented collapse of the populations on Elliott Island, Maryland and Cedar Island, North Carolina. These two sites supported the largest concentrations of black rails ever recorded throughout the global range. Ellioitt Island was the site of one of the first ecological studies of black rails in 1962 when Weske (1969) recorded a density of one calling bird per 26 ha within the Pokata Creek study area.

Decadal high counts for Elliott Island include 100+ (1950s), 40 (1960s), 45 (1970s), 47 (1980s), 44 (1990s), 12 (2000s) and 1 (2010s). The population declined rapidly following the survey in 1992 when 44 calling birds were recorded. No black rails were detected in this site during the 2016 breeding season. Cedar Island has experienced a similar collapse with decadal high numbers including 80+ (1970s), 20 (1980s), 5 (1990s) and 1 (2000s). A single calling bird was reported from this site in 2016.

Habitat Use

A comment that is echoed repeatedly through the literature is that there appears to be a great deal of suitable habitat that remains unoccupied by black rails. This statement suggests the existence of some unknown limiting factor preventing the population from filling the habitat. While it is certainly possible that breeding rails are being held below some saturation limit by demographic constraints unrelated to habitat availability, it is also possible that we are deceived by the simple visual appearance of the habitat as being uniform when it may vary in some significant dimension.

During the breeding season black rails appear to use a wide range of habitats and landscape settings ranging from tidal salt marshes to wet meadows and grassy fields. However, the differences between these habitats may be more superficial than they appear. Two characteristics that seem to be common threads across the full range of habitats are hydrology and the presence of dense, overhead vegetation. Authors from throughout the species range point to hydrology as the keystone habitat characteristic (Repking 1975, Flores and Eddleman 1995, Eddleman and Legare 1995, Tecklin 1999). Black rails appear to tolerate not only a very narrow range of water levels but also a limited variation in water regime. The species seems to walk a hydrology tight rope where they find required places for nest placement and foraging. Decreasing or increasing water beyond this range may impact one or the other of these requirements. Drying as occurs when wet hay meadows or salt marshes are drained for agriculture or when areas experience extended droughts may render sites temporarily or permanently unsuitable (McMullen 1944, Lee 1999). Similarly, when wet hay meadows receive too much rain or when sea-level rise inundates the high zone within tidal salt marshes sites may be made unsuitable. Nevius (1964) in describing the first black rail breeding record for Tennessee when he found a brood of downy young in the corner of his hay field indicated that in years with normal rainfall the corner is wet and he observed Virginia rails but that 1964 was “an unusually dry year” with no water on the surface.

The fact that black rails occupy areas with extremely dense vegetation has been discussed since the earliest descriptions of breeding (e.g. Clark 1884, Chapman 1894, McIlwraith 1894) and is one of the most common habitat characteristics attributed to the species (e.g. Howell 1932, Stone 1937, Burt 1994). Along the length of the Atlantic and Gulf coasts the plant species associated with black rail habitat shift but the structure is surprisingly consistent. Clark (1884) describes the dense mats of salt meadow hay near the historic northern range limit on Great Island in Connecticut and Butler et al. (2015) worked in dense stands of gulf cordrass in the coastal prairies of Texas. Formal treatments of vegetation and space use have demonstrated that black rails select areas with some of the highest stem densities available (Eddleman and Legare 1994, Richmond et al. 2012, Butler et al. 2015, Tsao et al. 2015). This tendency to stay within areas that support dense overhead vegetation is likely one of their key anti-predator strategies and is why the species is so challenging to observe. In most cases the plant density, height and structure appear to be more important than species. Potential interactions between hydrology and availability of dense

overhead vegetation that may help to explain the often patchy distribution of rails has not been fully explored (though see Richmond et al. 2012).

Possibly because the eastern black rail is considered primarily as a species of the tidal salt marsh, the availability of fresh water has not been discussed as an important habitat characteristic. However, historic accounts clearly demonstrate that black rail breeding areas include fresh water components. Clark (1897) describes the setting of one of his famous nests from Old Saybrook as a bank of a small ditch grown up in sedges but surrounded by salt hay. Stone (1900) quotes a letter from Ashmead to Baird describing the collection of a nest from a freshwater meadow along the salt marsh of Beesley's Point in New Jersey. Nicholson (1932) in his description of a nest from Merritt Island, Florida indicated that it was near a stagnant pond. The large numbers of nests that have been found along the Atlantic barrier islands have also been associated with fresh water. Harlow (1912) describes the setting of a nest near Brigantine as low in an area overgrown with salt grass and sedge. Bailey (1927) described a small "colony" of black rails with six nests in the vegetation around a fresh water pond on Cobb Island in Virginia. An association with fresh water is consistent with the little that we know about diet on the breeding ground which from a small sample is primarily aquatic insects (Weske 1969). Richmond et al. (2012) point to the availability of freshwater and associated invertebrate community in California as an unstudied component of habitat and possible contributing factor influencing distribution and density.

Tidal Salt Marshes

Tidal marshes have been the dominant habitat used by eastern black rails. Salt marshes have supported the largest breeding concentrations of rails and represent sites with the longest record of residency. Authors along the entire coast have repeatedly indicated that black rails are primarily confined to marsh areas with the highest elevation often associated with the marsh-upland ecotone (e.g. Kerlinger and Sutton 1989, Brinker and Therres 1992, Pranty et al. 2004, Wilson et al. 2009). These high marsh areas are typically only inundated during extreme lunar or wind tides. High marsh vegetation typically forms in a narrow band between the landward edge of low marsh plants and the uplands. The width of this high marsh band is governed by topography. Plant species that dominate the lower areas of the marsh that receive daily inundation vary geographically throughout the range of the black rail but include smooth cordgrass, big cordgrass, black rush, black needlerush and sawgrass. In a typical marsh configuration the high marsh band provides a structural break between the low marsh and the upland. The high marsh may also support some freshwater components including sedges or rushes (e.g. Harlow 1912, Weske 1969, Brinker and Therres 1992). Throughout most of the range the dominant vegetation within this band includes salt meadow hay and spikegrass but may be dominated by sawgrass within southern areas (Pranty et al. 2004). Some authors have suggested that horizontal patchiness within the high marsh including interspersion of salt panes, ponds and other elements appear to be associated with black rail use (Brinker and Therres 1992).

Impoundments

Black rails used a wide range of habitats that were associated with some form of impounded water including sewage treatment plants (Southworth and Southworth 1991), wetland mitigation sites (Iliff 2001), reservoirs (LeGrand 1976, 1980), abandoned mines (Pranty 1996), waterfowl management impoundments (Cely et al. 1993), moist soil units and semi-impounded salt marshes. Both the single sewage treatment plant in Maryland and sites where birds have been detected in freshwater wetlands formed within the outfall below dams are similar to some sites described in the Southwest (Richmond et al. 2010) in having small emergent wetlands with flowing water. Both the wetland mitigation sites and the waterfowl management impoundments are intriguing because they offer potential management options (Roach and Barrett 2015).

Grassy Fields and Freshwater Wetlands

The use of grassy fields and freshwater wetlands throughout the study area is similar to that described in the southwest (Flores and Eddleman 1995, Conway and Sulzman 2007, Richmond et al. 2010) and mid-continent areas (Thompson and Ely 1989, Beck and Patten 2007). Vegetation within fields ranged from agricultural crops such as oats, wheat and clover (Wayne 1905, Walker 1935, Nevius 1964) to mixed grasses and forbs (Brimley and Brimley 1900, Burleigh 1958, Koella 1981). Vegetation within freshwater wetland sites often included a range of wetland plants such as sedges and rushes (LeGrand 1976) but a few sites also included plants such as cattails (Proctor 1981) that tend to occupy wetter sites. One of the more interesting aspects of inland sites that are used by black rails is that open grassy areas and freshwater wetlands of some type typically occur together. Virtually all of the fields where black rails have been observed occur either within wet floodplain areas (Brimley and Brimley 1900, Nevius 1964, Davis 2003) or they are adjacent to freshwater wetlands (Schneider 1957, Tarr 2003). Similarly, birds described within freshwater wetlands are frequently embedded within pastures or grassy fields (Handley 1941, Stevenson and Stupka 1948, Proctor 1981).

Coastal Prairie

The coastal prairie habitat found within Texas, Louisiana and Florida represents the least explored habitat used by black rails and because of this and its extent the habitat with the greatest potential to support a significant unknown population. Although greatly reduced by grazing and conversion, expansive tracts still remain. Work is needed to determine the extent to which this habitat type supports black rails during the breeding season.

Recommendations

Complete 2014-2018 coastal surveys

The recent round of targeted black rail surveys within coastal areas will provide the information needed to improve population estimates on state and regional scales and will establish a benchmark for the analysis of future trends and conservation success metrics. It is vital that initiated and planned surveys be completed within the allotted survey window. It is also vital voids in coverage be identified and included in the survey effort.

Establish inland survey network

The recent round of targeted black rail surveys including a collective network of nearly 3,000 points is focused entirely on the outer coast. Inland occurrences of black rails were common during an earlier era and despite the fact that much of the earlier habitat is gone or has been altered occasional reports still exist suggesting a residual population of unknown size and distribution. Inland habitat should be assessed and a network of survey sites should be established within areas of concentration. Every effort should be made to accomplish this activity within the current survey window (2014-2018).

Compile database of black rail surveys

A considerable number of targeted black rail surveys have been completed within the region including an estimate of more than 20,000 surveys of 6,000 points. These surveys have value beyond their initial objectives and they should be stitched into a single database that includes a description of methodology for each survey and critical survey parameters including point coordinates and survey dates.

Perform regional occupancy analysis

The current survey effort includes a large number of points and is regional in scope. Following the conclusion of this survey window in 2018, an effort should be made to incorporate recent surveys into the larger black rail database for the specific purpose of performing a regional occupancy analysis.

Literature Cited

Adams, M. T., R. Ostrowski, and A. Bose. 2014. Spring migration, Middle Atlantic. North American Birds 67:425-428.

Allen, J. A. 1886. Revised list Birds of Massachusetts.

Allen, J. A. 1900. The little black rail. The Auk 27(1):1-8.

Andrle, R. F. and J. R. Carroll, eds. 1988. The atlas of breeding birds in New York State. Cornell University Press, Ithaca, New York.

Armistead, H. T. 1989. Nesting season, Middle Atlantic Coast region. American Birds 43:1299-1303.

Armistead, H. T. 2004. Black rail populations in Atlantic and Gulf Coast states. Unpublished manuscript.

Bagg, A. M. and R. P. Emery. 1962. Nesting season, Northeastern Maritime region. American Birds 16:456-461

Bailey, H. H. 1913. The birds of Virginia. J. P. Bell Company, Inc., Lynchburg, Virginia.

Bailey, H. H. 1927. Data concerning the breeding range of certain marsh birds. Wilson Bulletin 29:175-177.

Baird, S. F., T. M. Brewer and R. Ridgway. 1884. The water birds of North America. Memoirs of the Museum of Comparative Zoology at Harvard College Vol. XII. Little Brown and Company. Boston, MA.

Beaton, G., P. W. Sykes, Jr. and J. W. Parrish, Jr. 2003. Annotated Checklist of Georgia Birds. Georgia Ornithological Society, Occasional Paper 14.

Beck, E. and M. A. Patten. 2007. Status of the black rail in Oklahoma, with recommendations for future research. Bulletin of the Oklahoma Ornithological Society 40:5-10.

Benoit, L. K. and R. A. Askins. 1999. Impact of the spread of Phragmites on the distribution of birds in Connecticut tidal marshes. Wetlands 19:194-208.

Bent, A. C. 1926. Life histories of North American marsh birds. Smithsonian Institution. U.S. Natl. Mus. Bull. 135.

Berry, W. J., S. E. Reinert, M. E. Gallagher, S. M. Lussier and E. Walsh. 2015. Population status of the seaside sparrow in Rhode Island: A 25-year assessment. Northeastern Naturalist 22:658-671.

Blom, E., M. O'Brien and E. J. Scarpulla. 1994. Summer season, Middle Atlantic Coast region. American Birds 48:931-933.

Boyle, W. J. Jr., R. O. Paxton, and D. A. Cutler. 1988. Spring season, Hudson-Delaware region. American Birds 42:413-416.

Boyle, W. J., Jr., R. O. Paxton and D. A. Cutler. 1984. Spring migration, Hudson-Delaware region. American Birds 38:889-893.

Bradbury, H. M. 1938. Mosquito control operations on tide marshes in Massachusetts and their effect on shore birds and waterfowl. Journal of Wildlife Management 2: 49-52.

Brewster, W. 1907. Notes on the black rail of California. Auk 24:205-210.

Brimley, H. H. and C. S. Brimley. 1900. Breeding of the little black rail (Porzana jamaicensis) at Raleigh, North Carolina. Auk 17:171-172.

Brinker, D. F. and G. D. Therres. 1992. Preliminary evaluation of the effects of open marsh water management activities on Maryland black rail populations and recommendations for future Department of Natural Resources conservation measures. Nongame and Urban Wildlife Program Wildlife Division, Maryland Department of Natural Resources, Wye Mills, Maryland.

Brinker, D. F., G. D. Therres, P. J. Tango, M. O'Brien, E. A. T. Blom and H. L. Wierenga. 2002. Distribution and relative abundance of breeding rails and other marshbirds in Maryland's tidal marshes. Manuscript for Maryland Birdlife.

Brisse, P. 1989a. From the Field December 1988-May 1989. The Oriole 54:31-36.

Brisse, P. 1989b. From the Field March - May 1988. The Oriole 54:8-12.

Britt, M. 2006. Spring Field Notes, region 2. New Jersey Birds 32:84-88.

Bromberg, K. D. and M. D. Bertness. 2005. Reconstructing New England salt marsh losses using historical maps. Estuaries 28:823-832.

Brown, E. J. 1891. Brief Notes. Ornithologist and Oologist 16:108.

Browne, M. M., and W. Post. 1972. Black rails hit a television tower in Raleigh, North Carolina. Wilson Bulletin 84:491-492.

Buchsbaum, R. N, L. A. Deegan, J. Horowitz, R. H. Garritt, A. E. Giblin, J. P. Ludlam and D. H. Schull. 2009. Effects of regular salt marsh haying on marsh plants, algae, invertebrates and birds at Plum Island Sound, Massachusetts. Wetlands Ecology and Management 17:469-487.

Buckelew, A. R. Jr. and G. A. Hall. 1994. The West Virginia breeding bird atlas. University of Pittsburgh Press, Pittsburgh, Pennsylvania.

Buckley, P. A. and F. G. Buckley. 1968. The current status of certain birds in the Virginia Capes area. II. April 1967-July 1968 observations. Raven 39:27-40.

Buckley, P. A., R. O. Paxton and D. A. Cutler. 1975. The nesting season, 1975 - Hudson-Delaware region. American Birds 29:947-954.

Bull, J. 1964. Birds of the New York area. Dover Publications, Inc., New York.

Burgiel, J. C., R. O. Paxton and D. A. Cutler. 2002. Spring migration, Hudson-Delaware region. American Birds 56:287-291.

Burleigh, T. D. 1938. The birds of Athens, Clarke County, Georgia. Occasional Paper No. 1, Georgia Ornithological Society.

Burleigh, T. D. 1958. Georgia birds. University of Oklahoma Press, Norman, Oklahoma.

Burt, W. 1994. Shadowbirds: a quest for rails. Lyons and Burford, Publishers, New York, New York.

Butler, C. J., J. B. Tibbits and J. Wilson. 2015. Assessing black rail occupancy and vocalizations along the Texas Gulf Coast, Final Report, 16 February 2015. Unpublished report.

Cairns, J. S. 1889. The summer birds of Buncombe County, N.C. Ornithologist and Oologist 17-23.

Cardiff, S. W. 2008. Spring season, Louisiana region. North American Birds 62:425-430.

Cardiff, S. W. and K. Nichols. 2014. Spring migration, Arkansas and Louisiana. North American Birds 67:464-467.

Carter, III, J. H. and J. F. Parnell. 1978. TV tower kills in eastern North Carolina: 1973 through 1977. The Chat (Fall 1978)

Casto, S. D. 2008. E. F. Pope: Collector and craftsman. Bulletin of the Texas Ornithological Society 41:19-25.

Cely, J. E., D. P. Ferrel and B. A. Glover. 1993. Marsh bird survey - final report. Unpublished report to South Carolina Wildlife and Marine Resources Department and U.S. Fish and Wildlife Service.

Chamberlain, B. R. 1961. Regional reports: spring migration, April 1 - May 31, 1961; Southern Atlantic Coast region. Audubon Field Notes 15:399-402.

Chapman, F. M. 1894. Visitors guide to the local collection of birds in the American Museum of Natural History with an annotated list of the birds known to occur within fifty miles of New York City. American Museum of Natural History, New York, New York.

Clark, J. N. 1884. Nesting of the little black rail in Connecticut. Auk 1:393-394.

Clark, J. N. 1897. The little black rail. Nidologist 4:86-88.

Clarke, J., B. A. Harrington, T. Hruby, and F. E. Wasserman. 1984. The effect of ditching for mosquito control on salt marsh use by birds in Rowley, Massachusetts. Journal of Field Ornithology 55: 160-180.

Cobb, S. 1906. A little black rail in Massachusetts. Bird-Lore 8:136-137.

Conn, R. C. 1989. Black rail at Holgate, 1946-1953. New Jersey Birds 15:27-28.

Conway, C. J. and C. Sulzman. 2007. Status and habitat of the California black rail in the southwestern USA. Wetlands 27:987-988.

Cooke, W. W. 1929. Birds of the Washington, D. C. region (20 mile radius). Proceedings of the Biological Society of Washington 42:1-80.

Craig, R. J. 1990. Historic trends in the distribution and populations of estuarine marsh birds of the Connecticut River. University of Connecticut, Storrs Agricultural Experiment Station Research Report No. 83.

Craig, R. J. and K. G. Beal. 1992. The influence of habitat variables on marsh bird communities of the Conneticut river estuary. The Wilson Bulletin 104:295-311.

Crawford, R. L. 1975. From the Field. The Oriole 40:36.

Crawford, R. L. 1976. From the Field. The Oriole 41:64.

Cross, B. 1999. 1998 report of the Virginia Avian Records Committee. Raven 70:26-31.

Cruickshank, A. D. 1942. Birds around New York City. American Museum of Natural History, New York.

Dahl, T. E. 1990. Wetland losses in the United States, 1780's to 1980's. Report to the Congress. No. PB-91-169284/XAB. National Wetlands Inventory, St. Petersburg, Florida.

Davidson, L. M. 1992. Black rail, Laterallus jamaicensis. Pages 119-134 in K. J. Schneider and D. M. Pence, Eds. Migratory nongame birds of management concern in the Northeast. U.S. Department of the Interior, Fish and Wildlife Service, Newton Corner, Massachusetts.

Davis, R. 1997. Summer season, Southern Atlantic Coast region. American Birds 51:985-987.

Davis, R. 1999. Summer season, Southern Atlantic Coast region. North American Birds 53:375-376.

Davis, R. 2000. Briefs for the files. The Chat 64:150-160.

Davis, R. 2001. Briefs for the files. The Chat 65:113-122.

Davis, R. 2003. Briefs for the files. The Chat 67:110-122.

Davis, R. 2005. Briefs for the files. The Chat 69:108-122.

Day, T. M. 2004. Summer, Middle Atlantic. American Birds 58:505-510.

De Kay, J. E. 1844. Zoology of New York, or the New-York Fauna: Birds. Carroll and Cook, printers to the Assembly. New York, NY.

Eaton, E. H. 1910. Birds of New York. Volume 12. University of the State of New York. New York, NY.

Eddleman, W. R. and M. L. Legare. 1994. Black rail (Laterallus jamaicensis). In The birds of North America, A. Poole and F. Gill, Eds). Philedelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists Union.

Eddleman, W. R. and M. L. Legare. 1995. Habitat use, spatial relationships, and censusing techniques of breeding eastern black rails, Laterallus jamaicensis Jamaicensis, in northern Florida. Unpublished final report to Florida Fish and Wildlife Conservation Commission, Tallahassee Florida.

Eddleman, W. R., F.L. Knopf, B, Meanley, F. A. Reid and R. Zembal. 1988. Conservation of North American Rallids. The Wilson Bulletin 100:458-475.

Erwin, R. M., C. J. Conway and S. W. Hadden. 2002. Species occurrence of marsh birds at Cape Cod National Seashore, Massachusetts. Northeastern Naturalist 9:1-12.

Eubanks, T. L., Jr., R. A. Behrstock and R. J. Weeks. 2006. Birdlife of Houston, Galveston, and the upper Texas coast. Texas A&M University Press. College Station, TX.

Evens, J. and G. W. Page, S. A. Laymon, and R. W. Stallcup. 1991. Distribution, relative abundance, and status of the California Black Rail in Western North America. Condor 93:952-956.

Fetterman, A. and P. M. Barber. 2015. Wetland nesting bird surveys. Unpublished research report to Pennsylvania Game Commission Bureau of Wildlife Management, Harrisburg, Pennsylvania.

Flores, R. E. and W. R. Eddleman. 1995. California black rail use of habitat in southwestern Arizona. Journal of Wildlife Management 59:357-363.

Forbush, E. H. 1929. Birds of Massachusetts and other New England states. Massachusetts Department of Agriculture, Norwood Press, Norwood, Massachusetts.

Fussell, J. O., III and D. A. McCrimmon, Jr. 1976. The nesting season status of the black rail and the Virginia rail in Carteret County, N.C. Unpublished report.

Fussell, J. O., III. 1994. A birder's guide to coastal North Carolina. The University of North Carolina Press, Chapel Hill, North Carolina.

Garvey, M. P. and M. J. Illiff. 2011. Fifteenth report of the Massachusetts Avian Record Committee. Bird Observer 39:133-153.

Gibbs, J. P. and S. M. Melvin. 1993. Call-responses surveys for monitoring breeding waterbirds. Journal of Wildlife Management 57:27-34.

Gibbs, J. P., J. R. Longcore, D. G. McAuley and J. K. Ringelman. 1991. Use of wetland habitats by selected nongame water birds in Maine. Fish and Wildlife Research No. 9. Unpublished research report to United States Fish and Wildlife Service.

Graves, G. R. 2013. Characteristics of a black rail (Laterallus jamaicensis) territory in Huntley Meadows, Fairfax County, Virginia. Banisteria 41:94-95.

Greene, E.R., W.W. Griffin, E.P. Odum, H.L. Stoddard and I.R. Tomkins. 1945. Birds of Georgia. The University of Georgia Press, Athens, Georgia.

Griscom, L. 1915. The little black rail on Long Island, N.Y. The Auk 32:227-228.

Griscom, L. 1923. Birds of the New York City region. American Museum of Natural History No. 7, Pittsburg, Pennsylvania.

Griscom, L. and D. E. Snyder. 1955. Birds of Massachusetts. Peabody Museum, Salem, Massachusetts.

Hall, G. A. 1967. Regional reports: nesting season, June 1 to August 15, 1967: Appalachian region. Audubon Field Notes 21:565-568.

Hall, G. A. 1983. Spring migration, Appalachian region. American Birds 37:868-871.

Hall, G. A. 1986. Spring migration, Appalachian region. American Birds 40:469-472.

Hand, C. 2016. Summary of black rail survey locations in South Carolina 2014-2016. Unpublished report, South Carolina Department of Natural Resources. Charleston, South Carolina.

Handley, C. O. 1939. Blacksburg Notes. Raven 10:11-12.

Handley, C., Jr. 1941. Montgomery County Nesting Notes, Febuary 1 - July 1, 1941. Raven 12:61-63.

Hands, H. M., R. D. Drobney and M. R. Ryan. 1989. Status of the black rail in the northcentral United States. United States Department of the Interior, Fish and Wildlife Service, Twin Cities, Minnesota.

Harlow, R. C. 1912. Nesting of the black rail in New Jersey. The Auk 30:269.

Hess, G. K., R. L. West, M. V. Barnhill III and L. M. Fleming. 2000. Birds of Delaware. University of Pittsburgh Press, Pittsburgh, Pennsylvania.

Hill, N. P. 1965. The birds of Cape Cod, Massachusetts. William Morrow and Company, New York.

Hodgman, T. P., W. G. Shriver and P. D. Vickery. 2002. Redefining range overlap between the sharp-tailed sparrows of coastal New England. The Wilson Bulletin 114:38-43.

Hoff, R. 2002. 2002 Tennessee North American migration count. The Migrant 73:89-101.

Hoff, R. 2007. 2007 tradition spring counts. The Migrant 78:117-124.

Howe, R. H., Jr. and G. M. Allen. 1901. The birds of Massachusetts. Privately published, Cambridge, Massachusetts.

Howell, A. H. 1928. Birds of Alabama. Department of Game and Fisheries of Alabama, Birmingham, Alabama.

Hunter, W. C. 1990. Handbook for nongame bird management and monitoring in the Southeast Region. United States Fish and Wildlife Service, Atlantic, Georgia.

Iliff, M. 2001. Summer season, Middle Atlantic Coast region. American Birds 55:420-423.

Iliff, M. 2002. Summer season, Middle Atlantic Coast region. American Birds 56:423-426.

Iliff, M. and J. Stasz. 2000. Spring season, Middle Atlantic Coast region. American Birds 54:268-271.

Imhof, T. A. 1976a. Alabama Birds. 2nd ed. University: Published with the Cooperation of the State of Alabama, Dept. of Conservation and Natural Resources, Game and Fish Division. University of Alabama Press, Tuscaloosa, Alabama.

Imhof, T. A. 1976b. The season, winter-spring Dec 1975 through May 1976. Alabama Birdlife 24:10-14.

Imhof, T. A. 1980. Spring migration, Central Southern region. American Birds 42:445-450.

Imhof, T. A. 1983. Spring migration, Central Southern region. American Birds 37:878-882.

Imhof, T. A. 1986. Spring migration, Central Southern region. American Birds 40:481-487.

Jackson, G. D. 1990. 1990 Spring Sightings. Alabama Birdlife 37:18-24.

Jackson, J. A. 1981. Nesting season, Central Southern region. American Birds 35:947-950.

Jackson, J. A. 1990. Spring season, Central Southern region. American Birds 44:439-444.

Justice, A. R. 1903. Nesting of the little black rail in New Jersey. The Atlantic Slope Naturalist 1:9-13.

Kerlinger, P. and C. Sutton. 1989. Black rail in New Jersey. Records of New Jersey Birds 15:22-26.

Kirkwood, F. C. 1895a. A list of the birds of Maryland giving dates of the arrival, departure and nesting periods of our regular birds; also including stragglers and such others as no doubt occur but are not recorded. Deutsch Lithographing & Printing Company, Baltimore, Maryland.

Kirkwood, F. C. 1895b. A list of the birds of Maryland. Transactions of the Maryland Academy of Sciences 241-383.

Koella, J. A. 1981. Black rail in Jefferson County, Tennessee. The Migrant 52:68.

Lee, D. S. 1999. Extinction, extirpation, and range reduction of breeding birds in North Carolina: what can be learned? The Chat 63:103-122.

Legare, M. L. and W. R. Eddleman. 2001. Home range size, nest-site selection and nesting success of black rails in Florida. Journal of Field Ornithology 72:170-177.

Leggett, A. H. 2014. Distribution, abundance, and habitat associations of breeding marsh birds in Mississippi tidal marsh. Unpublished thesis, University of Georgia, Athens, Georgia.

LeGrand, H. E. Jr. 1990. Briefs for the files. The Chat 54:42-49.

LeGrand, H. E. Jr. 1993. Briefs for the files. The Chat 57:79-85.

LeGrand, H. E., Jr. 1976. Black rail and Virginia rail in summer in northwestern South Carolina. Chat 40:63-65.

LeGrand, Jr. H. E. 1980. The nesting season, Southern Atlantic Coast region. American Birds 34:885-887.

Lesser, F. H. 1965. Waterbirds of Little Creek. Cassinia 47:22-32.

Lockwood, M., E. Carpenter, and W. Sekula. 2010. The spring migration, South Texas region. American Birds 64:457-462.

Lockwood, M., R. Pinkston, R. Weeks. 2005. Summer season, Texas region. North American Birds 59:620-625.

Long, R. E. 1996. Region 6 - St. Lawrence. The Kingbird:353-358.

Longcore, J. R., D. G. McAuley, G. W. Pendelton, C. R. Bennatti, T. M. Mingo and K. L. Stromborg. 2006. Macroinvertebrate abundance, water chemistry and wetland characteristics affect use of wetlands by avian species in Maine. Hydrobiologia 67:143-167.

Louisiana Department of Wildlife and Fisheries. 2015. Louisiana Wildlife Action Plan. Louisiana Department of Wildlife and Fisheries, Baton Rouge, Louisiana.

Lowery, Jr. G.H. 1955. Louisiana Birds, Third Edition. Louisiana State University Press, Baton Rouge, Louisiana.

Maier, C. 1993. On the trail of the rail: A north Delaware survey of black rails (Laterallus jamaicensis) and other marsh birds. Delmarva Ornithologist 25:2-10.

Mantlik, F., M. Szantyr, G. Hanisek, J. Hough and C. Wood. 1998. Eighth report of the Connecticut rare records committee. Connecticut Warbler 18:162-179.

Massachusetts Open Marsh Water Management Workgroup. 2010. Open marsh water management standards. Massachusetts Department of Agricultural Resources, Boston, Massachusetts.

McCann, J. 2007. Job performance report: Breeding status of black rail. Unpublished report. Maryland Department of Natural Resources.

McIlwraith, T. 1894. The birds of Ontario with a description of their nests and eggs. C. W. Coats, Montreal, Canada.

McMullen, T. E. 1944. The black rail. Cassinia 34:20-21.

McMullen, T. E. 1952. The black rail. Cassinia 34:20-21.

McWilliams, G. M. and D. W. Brauning. 2000. The birds of Pennsylvania. Cornell University Press, Ithaca, New York.

Meanley, B. 1975. Birds and marshes of the Chesapeake Bay country. Tidewater Publishers, Cambridge, Maryland.

Meanley, B. and R. E. Stewart. 1960. Color of the tarsi and toes of the black rail. The Auk 77:83-84.

Meritt, J. K. 1966. Field Notes - 1964. Cassinia 48:42-49.

Meritt, J. K. 1967. Field Notes - 1965. Cassinia 49:36-39.

Merriam, C. H. 1877. A review of the birds of Connecticut with remarks on their habits. Transactions of the Connecticut Academy. Volume 4. New Haven, CT.

Miller, J. C. 1970. Birds of the Tinicum Marsh and nearby areas. Cassinia 52:21-25.

Moore, T. 1990. From the Field December 1989- May 1990. The Oriole 55:54-64.

Mylecraine, K., N. Tsipoura and D. A. La Puma. 2015. Assessing the status of eastern black rail (Laterallus jamaicensis jamaicensis) in New Jersey – 2015 report. Unpublished research report, New Jersey Audubon.

Nevius, R. 1964. A Tennessee nesting of the black rail. The Migrant 35:59-60.

Nicholson D. J. 1932. Black rail specimen 216. Oological collection of Donald J. Nicholson, Orlando, Florida.

Nicholson, C. P. 1997. Black rail (Latterallus jamaicensis) Pages 377-378 in C. P. Nicholson ed. Atlas of the breeding birds of Tennessee. The University of Tennessee Press, Knoxville, Tennessee.

Olsen, B., T. Hodgman, C. Elphick, G. Shriver, A. Kovach and J. Cohen. 2014. The saltmarsh habitat and Avian Research Program: Final project report for agreement number 50154-0-G004A.

Osborne, C. E., I. M. Mazzochi, H. Kennedy, S. Muller and D. J. Adams. 2011. Occupancy, detection, and habitat associations of secretive marsh bird species in New York State, 2004-2006. Technical Report. New York State Department of Environmental Conservation. Albany, New York.

Palmer, T. S. 1909. The black rail in Maryland. The Auk 26:427.

Paxton, B. J. and B. D. Watts. 2002. Marsh bird callback surveys of high marsh patches along the southeastern shore of the Albemarle-Pamlico Peninsula, North Carolina. Center for Conservation Biology Technical Report Series, CCBTR-02-09. College of William and Mary, Williamsburg, Virginia.

Paxton, R. O., W. J. Boyle, Jr. and D. A. Cutler. 1986. Nesting season, Hudson-Delaware region. American Birds 40:1182-1186.

Pearson, T. G., C. S. Brimley and H. H. Brimley. 1942. Birds of North Carolina. North Carolina Department of Agriculture, State Museum Division. Bynum Printing Company, Raleigh, North Carolina.

Perkins, S. 1990. Spring migration, New England region. American Birds 44:395-400.

Pickens, B. A. 2012. Modeling the spatial and temporal dynamics of coastal marsh birds. Unpublished dissertation, Louisiana State University, Baton Rouge, Louisiana.

Post, W. and F. Enders. 1969. Reappearance of the Black Rail on Long Island. The Kingbird 19:189-191.

Potter, J. K. and J. J. Murray. 1955. Regional reports: nesting season, June 1 to August 15, 1955; Middle Atlantic Coast region. Audubon Field Notes 9:370-371.

Pranty, B. 1996. Field observations summer report: June - July 1995. Florida Field Naturalist 24:18-24.

Pranty, B. 1998. The spring season, Florida region. American Birds 52:320-323.

Pranty, B. 2001. Field observations summer report: June - July 2000. Florida Field Naturalist 29:33-40.

Pranty, B. 2002. The important bird areas of Florida: 2000-2002. Audubon of Florida, Tampa, Florida.

Pranty, B. 2011. Field observations summer report: June - July 2010. Florida Field Naturalist 39:26-32.

Pranty, B., D. J. Robinson, M. Barnwell, C. Black and K. Tracey. 2004. Discovery and habitat use of black rails along the central Florida Gulf Coast. Florida Field Naturalist 32:51-55.

Proctor, N. S. 1981. The black rail: mystery bird of the marsh. Connecticut Warbler 1:15-16.

Proctor, N. S. 1994. Black rail (Latteraluus jamaicensis) Pp 411-412 in L. R. Bevier ed. The atlas of breeding birds of Connecticut. State Geological and Natural History Survey of Connecticut, Department of Environmental Protection. Hartford, CT.

Purdie, H. A. 1877. Bulletin of the Nuttall Ornithological Club 2:22.

Rathbun, F. R. 1879. Revised list of birds of central New York. Daily Advertiser and Weekly Journal Book and Job Printing House, Auburn, New York.

Repking, C. F. 1975. Distribution and habitat requirements of the black rail (Laterallus jamaicensis), along the lower Colorado River. Unpublished M.S. Thesis. Arizona State University, Tempe, Arizona.

Repking, C. F. and R. D. Ohmart. 1977. Distribution and density of black rail populations along the lower Colorado River. The Condor 79:486-489.

Rhoads, S. N. and C. J. Pennock. 1905. Birds of Delaware: A preliminary list. Auk 22:194-205.

Richmond, O. M. W., J. Tecklin and S. R. Beissinger. 2012. Impact of cattle grazing on the occupancy of a cryptic, threatened rail. Ecological Applications 22:1655-1664.

Richmond, O. M. W., S. K. Chen, B. B. Risk, J. Tecklin and S. R. Beissinger. 2010. California black rails depend on irrigation-fed wetlands in the Sierra Nevada foothills. California Agriculture 64:85-93.

Richmond, O. M., J. Tecklin and S. R. Beissinger. 2008. Distribution of California black rails in the Sierra Nevada Foothills. Journal of Field Ornithology 79:381-390.

Ringler, R. F. 1986. The season: spring migration, March 1 - May 31, 1986. Maryland Birdlife 42:60-79.

Ringler, R. F. 1990. The season: breeding season, June 1 - July 31, 1990. Maryland Birdlife 46:124-131.

Ringler, R. F. 2003. Spring migration: March 1 – May 31, 2002. Maryland Birdlife 59:26-31.

Rives, W. C. 1890. A catalogue of the birds of the Virginias. Proceedings of the Newport Natural History Society. Newport, Rhode Island.

Roach, N. 2014. Unpublished overview of survey results for 2014 black rail surveys in South Carolina presented to the black rail working group.

Roach, N. S. and K. Barrett. 2015. Managed habitats increase occupancy of black rails (Laterallus jamaicencis) and may buffer impacts from sea level rise. Wetlands 35:1065-1076.

Robbins, C. S. 1965. The season: July, August, September, 1965. Maryland Birdlife 21:111-117.

Ross, C. C. 1955. Field notes for 1947. Cassinia 37:26-28.

Rothstein, D. S. 1991. Habitat use of rails in coastal southern Delaware. Delaware Natural Heritage Inventory, draft of unpublished report, Delaware Department of Natural Resources and Environmental Control, Dover, Delaware.

Rozsa, R. 1995. Human impacts on tidal wetlands: History and regulations. Office of Long Island Sound Programs, Connecticut Department of Environmental Protection, Hartford, Connecticut.

Runde, D. E., P. D. Southall, J. A. Hovis, R. Sullivan, and R. B. Renken. 1990. Recent records and survey methods for the black rail in Florida. Florida Field Naturalist 18:33-35.

Sage, J. H., L. B. Bishop and W. P. Bliss. 1913. The birds of Connecticut. State Geological and Natural History Survey Bulletin 20, Hartford, Connecticut.

Sattelmeyer, R., R. Hall, and J. Southern. 2015. Nesting season, Southern Atlantic. North American Birds 68:491-493.

Schneider, F. 1957. Region 5 - Oneida Lake Basin. The Kingbird 7:63-66.

Schutsky, R. M. 1992. Black rail Laterallus jamaicensis in D. W. Brauning (ed.) Breeding birds in Pennsylvania. University of Pittsburgh Press, Pittsburgh, Pennsylvania.

Scott, F. R. 1950. Fall season - 1949 - Virginia. Raven 21(5&6):33-36.

Scott, F. R. 1955. Virginia season reports, winter, 1953-1954 - fall, 1954. Raven 26(1&2):123-130.

Scott, F. R. and D. A. Cutler. 1960. Regional reports: nesting season, June 1 - August 15, 1960; Middle Atlantic Coast region. Audubon Field Notes 14:439-441.

Scott, F. R. and D. A. Cutler. 1961. Regional reports: nesting season, June 1 - August 15, 1961; Middle Atlantic Coast region. Audubon Field Notes 16:455-458.

Scott, F. R. and D. A. Cutler. 1963. Regional reports: spring migration, 1963; Middle Atlantic Coast region. Audubon Field Notes 17:394-397.

Scott, F. R. and D. A. Cutler. 1968. Regional reports: spring migration, April 1 to May 31, 1968; Middle Atlantic Coast region. Audubon Field Notes 22:510-514.

Sewell, J. 1998. From the Field August - November 1998. The Oriole 64:11-29.

Shambaugh, N. 2000. 1999 marsh bird monitoring activities in Vermont. Unpublished report to the Nongame and Natural Heritage Program, Vermont Department of Fish and Wildlife, Waterbury, Vermont.

Shambaugh, N. 2000. 1999 marsh bird monitoring activities in Vermont. Unpublished report to the Nongame and Natural Heritage Program, Vermont Department of Fish and Wildlife, Waterbury, Vermont.

Simmons, G. F. 1914. Spring migration (1914) at Houston, Texas. The Wilson Bulletin 26:128-140.

Soehren, E. C., J. W. Tucker, Jr. and D. G. Crow. 2009. Effectiveness of call-broadcast surveys for breeding marsh birds along coastal Alabama. Southeastern Naturalist 8:277-292.

Southworth, D. R. and L. Southworth. 1991. The season: breeding season, June 1 - July 31, 1991. Maryland Birdlife 47:137-145.

Southworth, D. R. and L. Southworth. 1997. The season: spring migration, March 1 - May 31, 1996. Maryland Birdlife 53:57-64.

Spahr. J. 2005. West region, fall reporting period. Virginia Birds 2:7-8.

Sprunt, A., Jr. 1957. Florida bird life. National Audubon Society, Coward-McCann, Inc. New York.

Stevenson, H. M. 1968. Regional reports: nesting season, June 1 to August 15, 1968: Florida region. Audubon Field Notes 22:599-602.

Stevenson, H. M. and A. Stupka. 1948. The altitudinal limits of certain birds in the mountains of the southeastern states. The Migrant 19:33-60.

Stewart, R. E. and C. S. Robbins. 1958. Birds of Maryland and the District of Columbia. U. S. Department of the Interior, Fish and Wildlife Service, North American Fauna No. 62.

Stoddard, H. L. 1962. Bird Casualties at Leon County tower: an eleven year study. Tall Timbers Research Station No. 1 Tallahassee, Florida.

Stone, W. 1894. The birds of eastern Pennsylvania and New Jersey. Delaware Valley Ornithological Club, Philadelphia, Pennsylvania.

Stone, W. 1900. Breeding of the little black rail (Porzana jamaicensis) at Raleigh, North Carolina. The Auk 17:171-172.

Stone, W. 1937. Bird studies at old Cape May: An ornithology of coastal New Jersey Volume I. Intelligencer Printing Company, Lancaster, Pennsylvania.

Stuart, G.H. 1920. Nesting of the Little Black Rail in Atlantic County, N.J. The Auk 37:292-293.

Sundell, R. 1968. Letters. Delmarva Ornithologist 5:32.

Sykes, Jr., P.W. 2010. Black rail. Pages 144-145 in Schneider, T. M., G. Beaton, T. S. Keyes, and N. A. Klaus, eds. The breeding bird atlas of Georgia. University of Georgia Press, Athens, Georgia.

Tarr, M. 2003. Black rail in Greenland, New Hampshire. Bird Observer 31:227-229.

Tecklin J. 1999. Distribution and abundance of the California black rail (Laterallus jamaicensis coturniculus) in the Sacramento Valley region with accounts of ecology and call behavior of the subspecies. Technical Report, Contract Nos. FG6154WM and FG6154-1WM. California Department of Fish and Game, Sacramento, California.

Teulings, R. P. 1971. Regional reports: nesting season, June 1, 1971 - August 15, 1971: Southern Atlantic Coast region. American Birds 25:843-846.

Teulings, R. P. 1973. The nesting season, June 1 - July 31, 1973: Southern Atlantic Coast region. American Birds 27:856-859.

Thompson, M. C. and C. Ely. 1989. Birds in Kansas, Volume 1, University of Kansas Press, Lawrence, Kansas.

Tiner, R. W. 1984. Wetlands of the United States: Current status and recent trends. United States Fish and Wildlife Service.

Tiner, R. W., J. Q. Swords and B. J. McClain. 2002. Wetland Status and Trends for the Hackensack Meadowlands, An Assessment Report from the U.S. Fish and Wildlife Service's National Wetlands Inventory Program. Hadley, Massachusetts.

Toups, J. A. and J. A. Jackson. 1987. Birds and birding along the Mississippi coast. University Press of Mississippi, Jackson, Mississippi.

Tracey, K. 2005. Black rail sightings, data sightings, compiled data, black rail, Laterallus jamacicensis, Werner-Boyce Salt Springs State Park, Pasco County Florida.

Tramer, E. J. 1968. A revised list of the birds of Athens, Georgia, and vicinity. The Oriole 33:2-17.

Tsao, D. C. J. E. Melcer, Jr. and M. Bradbury. 2015. Distribution and habitat associations of California black rail (Laterallus jamaicensis cortunicutus) in Sacramento-San Joaquin Delta. San Francisco Estuary and Watershed Science 13:122-129.

Veit, R. R. and R. O. Paxton. 2006. Spring season, Hudson-Delaware region. American Birds 61:353-357.

Veit, R. R. and W. R. Petersen. 1993. Bird of Massachusetts. Massachusetts Audubon Society, Boston, Massachusetts.

Veit, R. R., R. O. Paxton and F. Rohrbacher. 2007. Spring season, Hudson-Delaware region. American Birds 61:418-421.

Vermont Bird Records Committee. 2015. Vermont state checklist. Vermont Center for Ecostudies, Norwich, Vermont.

Virginia Department of Game and Inland Fisheries. 2015. Virginia's 2015 wildlife action plan draft. Virginia Department of Game and Inland Fisheries, Henrico, Virginia.

Walker, W. M., Jr. 1935. A collection of birds from Cocke County, Tennessee. The Migrant 6:48-50.

Walsh, J., V. Elia, R. Kane and T. Halliwell. 1999. Birds of New Jersey. New Jersey Audubon Society, Bernardsville, New Jersey.

Wamer, N. 2003. Black rail Laterallus jamaicensis in, Florida's breeding bird atlas: A collaborative study of Florida's birdlife. Florida Fish and Wildlife Conservation Commission.

Warren, B. H. 1890. Birds of Pennsylvania with special reference to the food-habitats, based on over four thousand stomach examinations. E. K. Meyers, state printer. Harrisburg,

Watts, B. D. 1992. The influence of marsh size on marsh value for bird communities of the lower Chesapeake Bay. Center for Conservation Biology Technical Report, CCBTR-92-01. College of William and Mary, Williamsburg, VA.115pp.

Watts, B. D. 1993. Effects of marsh size on incidence rates and community organization within the lower Chesapeake Bay. Center for Conservation Biology Technical Report, CCBTR-93-03. College of William and Mary, Williamsburg, VA. 53pp.

Watts, B. D. 2016. Occurrence data for the eastern black rail along the Atlantic and Gulf Coasts of North America. Center for Conservation Biology Database Series, CCBDB-16-17. College of William and Mary/Virginia Commonwealth University, Williamsburg, VA.

Watts, B. D. and V. Greene. 2016. Working bibliography of the eastern black rail along the Atlantic and Gulf Coasts of North America, Version 1.0. The Center for Conservation Biology Technical Report Series, CCBTR-16-07. College of William and Mary/Virginia Commonwealth University, Williamsburg, VA. 46 pp.

Wayne, A. T. 1905. Breeding of the Little Black Rail (Porzana jamaicensis) in South Carolina. The Warbler 1:33-35.

Wayne, A. T. 1923. Subdivisions of the little black rail (Creciscus jamaicensic jamaicensis). The Auk 40:319.

Webster, F. S. 1964. Regional reports: spring migration, April 1 to May 31, 1964: South Texas region. Audubon Field Notes 18:466-472.

Webster, F. S. 1968. Regional reports: spring migration, April 1 to May 31, 1968: South Texas region. Audubon Field Notes 22:550-557.

Weske, J. S. 1969. An ecological study of the black rail in Dorchester County, Maryland. M.S. Thesis, Cornell University, Ithaca, New York.

Wetlands International. 2012. Waterbird population estimates: Fifth Edition. Summary report. Wetlands International, Wageningen, The Netherlands.

White, J. B. 1956. Birds of Greene County, Tennessee. The Migrant 27:3-8.

Wickham, P. P. 1963. Region 8 - Mohawk - Hudson. The Kingbird 13:175-178.

Wierenga, H. L. 1996. Black rail, Laterallus Jamaicensis. Pages 122-123 in C. S. Robbins and E. A. T. Blom, eds. Atlas of the breeding birds of Maryland and the District of Columbia. University of Pittsburg Press, Pittsburgh, Pennsylvania.

Williams, J. 1920. The black rail at St. Marks, Florida. The Auk 37:128-130.

Wilson, J. 2013. Black rail banding and observations at Texas Mid-Coast National Wildlife Refuge Complex. Unpublished notes on black rail work in Texas.

Wilson, M. D., B. D. Watts, and F. M. Smith. 2009. Status and distribution of black rails in Virginia. Center for Conservation Biology Technical Report Series, CCBTR-09-010. College of William and Mary and Virginia Commonwealth University, Williamsburg, Virginia.

Wilson, M. D., F. M. Smith, and B. D. Watts. 2015. Re-Survey and Population Status Update of the Black Rail in Virginia. The Center for Conservation Biology Technical Report Series: CCBTR-15-04. College of William and Mary & Virginia Commonwealth University, Williamsburg, VA. 14 pp.

Wilson, M.D., B. D. Watts, and D. Poulton. 2016. Black rail status survey in North Carolina. Center for Biology Technical Report Series, CCBTR-16-01. College of William and Mary and Virginia Commonwealth University, Williamsburg, Virginia.

Yard, K. A., C. E. Osborne, J. W. Ozard and P. G. Novak. 2012. New York State Marsh Bird Monitoring Program Pilot Study, 2009-2011. Technical Report. New York State Department of Environmental Conservation, Albany, New York.

Appendices

Appendix I. Summary of survey records by state.

STATE	YEARS	POINTS SURVEYED	SURVEY TYPE	RESEARCHERS
Connecticut	1974-1987	11	Passive Listening	Craig and Beal
Pennsylvania	2014-2015	228	Call-broadcast	Fetterman and Barber
New Jersey	1988	63	Call-broadcast	Kerlinger and Sutton
New Jersey	2015	258	Call-broadcast	Mylecraine, Tsipoura, Davis, La Puma
Delaware	1992	44	Call-broadcast	Maier et al.
Maryland	1990-1992	331	Call-broadcast	Brinker et al.
Maryland	2007	156	Call-broadcast	Brinker et al.
Maryland	2014	156	Call-broadcast	Brinker et al.
Virginia	1991	8	Passive Listening	Rottenborn
Virginia	1992	12	Call-broadcast	Watts and Rottenborn
Virginia	2007	328	Call-broadcast	Wilson et al.
Virginia	2014	134	Call-broadcast	Wilson et al.
North Carolina	2002	28	Call-broadcast	Paxton and Watts
North Carolina	1974-1976	20	Passive Listening	Fussell and McCrimmon
North Carolina	1992-1993	37	Call-broadcast	Fussell
North Carolina	2011 & 2014	42	Call-broadcast	Fussell
North Carolina	2014-2015	263	Call-broadcast	Wilson et al.
South Carolina	1991-1992	1276	Call-broadcast	Cely et al.
South Carolina	2014	314	Call-broadcast	Roach and Barrett
South Carolina	2015-2016	283	Call-broadcast	Hand et al.
Florida	1989	225	Call-broadcast	Runde et al.
Florida	1992-1994	164	Call-broadcast	Eddleman and Lagare
Florida	2016	227	Call-broadcast	Schwarzer et al.
Alabama	2014	317	Call-broadcast	soehren et al.
Mississippi	2012-2013	212	Call-broadcast	Leggett
Louisiana	2009-2011	304	Call-broadcast	Pickens
Louisiana	2011-2015	130	Call-broadcast	LDWF
Texas	2014	90	Call-broadcast	Butler et al.
Texas	2015-2016	375	Call-broadcast	Moore et al.

Appendix II. Common and Latin names for referenced vegetation.

COMMON NAME	LATIN NAME
Arrow Arum	*Peltandra virginica*
Big Cordgrass	*Spartina cynosuroides*
Black Needlerush	*Juncus roemerianus*
Black Rush	*Juncus gerardi*
Broomsedge	*Andropogon spp.*
Cattail	*Typha spp.*
Common Reed	*Phragmites australis*
Common Rush	*Juncus effusus*
Gulf Cordgrass	*Spartina spartinae*
Lizard's Tail	*Saururus cernuus*
Marsh Elder	*Iva frutescens*
Narrow Leaf Cattail	*Typha angustifolia*
Pickerelweed	*Pontederia cordata*
Reed Canarygrass	*Phalaris arundinacea*
River Bulrush	*Scirpus fluviatilis*
Saltbush	*Baccharis halimifolia*
Saltgrass	*Distichlis spicata*
Saltmeadow Cordgrass	*Spartina patens*
Sand Cordgrass	*Spartina bakeri*
Sawgrass	*Cladium spp.*
Sedge	*Carex spp.*
Smooth Cordgrass	*Spartina alterniflora*
Wild Rice	*Zizania aquatica*

Appendix III. Summary of black rail occurrence records by county.

STATE	COUNTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
AL	Baldwin	1976	1990	X	X	X								Possible
AL	Barbour	1975	1976		X	X								Possible
AL	Mobile	1973	2006	X	X	X	X	X	X					Probable
CT	Fairfield	1986	1996				X	X	X	X				Probable
CT	Litchfield	1997	1997					X	X					Probable
CT	Middlesex	1976	1996				X	X	X	X				Probable
CT	New Haven	1893	1904							X	X	X		Probable
CT	New London	1884	1986					X						Confirmed
DC	District of Columbia	1879	1923		X	X	X	X						Probable
DE	Kent	1960	2012	X	X	X	X	X	X	X	X	X		Probable
DE	New Castle	1988	1988			X	X							Probable
DE	Sussex	1933	2014	X	X	X	X	X	X			X		Probable
FL	Alachua	1913	2002	X		X	X	X		X		X	X	Confirmed
FL	Baker	2010	2010		X									Possible
FL	Brevard	1886	2007	X	X	X	X	X	X	X	X	X		Confirmed
FL	Broward	1986	2013			X	X	X	X				X	Probable
FL	Citrus	1987	1998	X	X	X	X							Probable
FL	Collier	1968	1998		X			X	X					Probable
FL	Dixie	1989	2015	X	X	X	X	X	X	X	X	X		Confirmed
FL	Escambia	1987	1987	X										Possible
FL	Franklin	1970	2016	X	X	X	X	X	X	X	X			Probable
FL	Gulf	Und	Und											Possible
FL	Hamilton	1995	1995								X	X	X	Probable
FL	Hernando	2000	2000						X					Probable
FL	Highlands	2001	2003		X		X				X		X	Probable
FL	Indian River	2001	2001	X										Possible
FL	Lee	1954	1954	X										Possible
FL	Leon	1961	1963		X		X							Probable
FL	Levy	1985	2013		X		X		X					Probable
FL	Miami-Dade	1926	2016	X	X	X	X	X	X	X	X			Confirmed
FL	Monroe	2013	2013	X	X									Possible
FL	Okaloosa	2004	2004			X								Possible
FL	Okeechobee	2016	2016					X	X					Probable
FL	Orange	2003	2003					X						Probable
FL	Osceola	2013	2016			X	X				X	X	X	Probable
FL	Palm Beach	1998	2014			X	X	X	X	X	X	X	X	Confirmed
FL	Pasco	1999	2016	X	X	X	X	X	X	X	X	X	X	Probable
FL	Pinellas	1927	1995	X	X	X								Confirmed

STATE	COUNTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
FL	Polk	2000	2005		X	X	X	X	X	X	X			Probable
FL	Sarasota	1986	1986		X		X	X						Probable
FL	Taylor	1987	2016		X			X			X			Probable
FL	Volusia	1984	1997	X	X		X	X	X	X	X	X		Probable
FL	Wakulla	1919	2016	X	X	X	X		X				X	Confirmed
FL	Walton	1993	2015	X	X				X					Probable
GA	Brantley	2010	2010		X									Possible
GA	Camden	1998	1998											Possible
GA	Clark	1929	1929								X			Probable
GA	Glynn	1971	2003		X	X		X					X	Probable
GA	Greene	1991	2016		X	X	X	X	X	X	X	X	X	Confirmed
GA	McIntosh	1999	2013		X			X						Probable
GA	Troup	1988	1988										X	Probable
LA	Cameron Parish	1982	2016	X	X	X								Possible
LA	Jefferson Parish	2013	2013	X										Possible
LA	Red River Parish	2005	2005			X								Possible
LA	Vermilion Parish	2010	2010							X				Probable
MA	Barnstable	1884	1948			X	X	X	X	X	X			Confirmed
MA	Dukes	1920	1920										X	Probable
MA	Essex	1903	2010	X	X	X	X	X	X				X	Probable
MA	Middlesex	1889	1962							X				Probable
MA	Norfolk	1889	1935				X			X				Probable
MA	Plymouth	1869	1869									X		Probable
MD	Anne Arundel	1952	2011	X	X	X	X	X	X	X				Confirmed
MD	Baltimore	1971	2004		X	X	X	X	X	X	X			Confirmed
MD	Calvert	1966	1999					X	X	X	X			Probable
MD	Cecil	1996	1996		X									Possible
MD	Charles	1879	1879						X					Probable
MD	Dorchester	1905	2015	X	X	X	X	X	X	X	X	X	X	Confirmed
MD	Harford	2000	2004			X	X	X						Probable
MD	Howard	2013	2013				X							Probable
MD	Kent	1990	1990					X						Confirmed
MD	Montgomery	1994	1994			X	X							Probable
MD	Prince George's	1990	1991		X									Possible
MD	Saint Mary's	1985	1997			X								Possible
MD	Somerset	1958	2014	X	X	X	X	X	X	X	X			Probable
MD	Talbot	1962	1997		X	X	X	X		X	X	X		Probable
MD	Worcester	1981	2014	X	X	X	X	X	X	X	X	X	X	Probable
MS	Jackson	1980	1980			X								Possible
NC	Buncombe	1887	1887								X			Confirmed

STATE	COUNTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
NC	Caldwell	2003	2003		X									Possible
NC	Carteret	1973	2016	X	X	X	X	X	X	X	X	X		Confirmed
NC	Chatham	1979	1981					X	X	X				Probable
NC	Currituck	1986	2015			X	X	X						Probable
NC	Dare	1960	2016	X	X	X	X	X	X	X	X	X	X	Probable
NC	Guilford	1893	1893											Confirmed
NC	Hyde	1987	2015		X	X	X	X	X	X				Probable
NC	Iredell	1897	1897											Confirmed
NC	Macon	1929	1929						X					Probable
NC	New Hanover	2007	2016		X	X	X	X						Probable
NC	Onslow	1924	1995			X	X	X				X		Probable
NC	Pamlico	1986	2015				X	X						Probable
NC	Polk	1989	1989		X									Possible
NC	Wake	1890	2005		X	X	X	X	X	X		X		Confirmed
NC	Wilkes	1961	1961				X							Probable
NH	Rockingham	2003	2003				X	X						Probable
NJ	Atlantic	1912	2008					X	X	X	X	X		Confirmed
NJ	Bergen	1984	1984			X	X	X						Probable
NJ	Burlington	1872	1925			X	X	X	X					Confirmed
NJ	Cape May	1844	2015		X	X	X	X	X	X	X	X		Confirmed
NJ	Cumberland	1857	2015		X	X	X	X	X	X	X	X	X	Confirmed
NJ	Mercer	1926	1926						X					Confirmed
NJ	Morris	1930	2006		X	X								Possible
NJ	Ocean	1914	2015				X	X	X	X	X	X	X	Confirmed
NJ	Salem	1857	1857					X						Probable
NJ	Sussex	1991	1997			X	X	X	X					Confirmed
NY	Albany	1873	1873											Possible
NY	Cayuga	1874	1874				X							Probable
NY	Jefferson	1996	1996						X					Probable
NY	Kings	1884	1884		X	X								Possible
NY	Nassau	1884	1955		X	X	X	X	X	X	X	X		Confirmed
NY	Onondaga	1957	1957			X								Possible
NY	Queens	1879	1976					X						Probable
NY	Schuyler	1872	1872											Possible
NY	Seneca	1971	1971		X									Possible
NY	Suffolk	1884	2009		X	X	X	X	X	X	X	X		Confirmed
NY	Tompkins	1971	1971		X									Possible
NY	Ulster	1963	1963						X					Probable
NY	Westchester	1986	1986					X	X					Probable
NY	Yates	1870	1870											Possible

STATE	COUNTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
PA	Berks	1999	2013				X	X	X					Probable
PA	Bucks	2007	2007		X	X								Possible
PA	Centre	1986	1986				X	X	X	X	X	X		Probable
PA	Delaware	1877	1970	X									X	Probable
PA	Lancaster	1985	1985				X	X	X					Probable
PA	Lebanon	1879	1994				X	X	X			X	X	Probable
PA	Philadelphia	1836	1890								X			Confirmed
PA	Westmoreland	1967	1976				X	X	X					Probable
RI	Washington	1975	2015				X	X						Probable
SC	Anderson	1975	1976			X	X	X	X	X				Probable
SC	Beaufort	2014	2014		X									Possible
SC	Charleston	1903	2015		X	X	X	X	X	X	X	X		Confirmed
SC	Colleton	1989	2016	X	X	X	X	X	X	X	X	X		Probable
SC	Georgetown	1988	2015		X	X	X	X	X	X	X	X		Probable
SC	Jasper	1997	2010	X	X		X						X	Probable
TN	Cocke	1915	1915					X						Probable
TN	Greene	1948	1964						X					Confirmed
TN	Hamilton	2002	2002			X								Possible
TN	Jefferson	1980	1980			X	X	X						Probable
TN	Knox	1983	1983			X								Possible
TN	Maury	2007	2007		X									Possible
TX	Aransas	1985	2011	X	X	X	X							Probable
TX	Brazoria	1969	2016	X	X	X	X	X	X	X	X	X	X	Confirmed
TX	Calhoun	1992	2015	X	X	X	X	X	X	X	X	X	X	Probable
TX	Cameron	1995	2005				X			X				Probable
TX	Chambers	1970	2016	X	X	X	X	X	X	X	X			Probable
TX	Galveston	1912	2016	X	X	X	X	X	X	X	X	X		Confirmed
TX	Harris	2013	2013			X								Possible
TX	Hutchinson	1979	2014			X				X				Probable
TX	Jefferson	1964	2016	X	X	X					X			Probable
TX	Kenedy	2001	2001		X									Possible
TX	Kleberg	1994	2005	X	X	X								Possible
TX	Matagorda	1992	2015	X	X	X	X	X	X	X	X	X	X	Probable
TX	Nueces	1994	2011	X	X	X	X	X	X	X	X	X		Probable
TX	San Patricio	1994	1995	X	X	X	X							Probable
TX	Van Zandt	1995	1995		X									Possible
VA	Accomack	1955	2014		X	X	X	X	X					Probable
VA	Alleghany	2005	2016			X							X	Probable
VA	Fairfax	2001	2004		X			X	X	X	X			Probable
VA	Fluvanna	2008	2008				X							Probable

STATE	COUNTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
VA	Gloucester	1992	1992	X										Possible
VA	Hampton City	1968	1968			X								Possible
VA	Loudoun	1997	2001			X				X	X	X		Probable
VA	Montgomery	1939	1941				X	X						Probable
VA	Norfolk City	1915	1915						X					Probable
VA	Northampton	1911	1989				X	X	X				X	Confirmed
VA	Northumberland	1954	1954		X									Possible
VA	Portsmouth City	1994	1994								X	X		Probable
VA	Prince William	2002	2002						X	X	X			Probable
VA	Richmond	2013	2013			X								Possible
VA	Roanoke	1945	1945			X	X							Probable
VA	Suffolk City	Und	Und											Possible
VA	Virginia Beach City	1932	1968		X	X	X			X				Probable
VA	Washington	1946	1946						X					Probable
VA	York	1949	1949										X	Probable
VT	Rutland	1990	1990			X								Possible
WV	Hampshire	2011	2012				X	X	X	X				Probable
WV	Mercer	1955	1955		X									Possible

Appendix IV. Summary of black rail occurrence records by property.

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
AL	Baldwin	Fort Morgan	1976	1990	X	X	X								Possible
AL	Baldwin	Gulf State Park, Gulf Shores	1973	1978	X	X	X	X	X	X					Probable
AL	Barbour	Eufaula National Wildlife Refuge	1975	1976		X	X								Possible
AL	Mobile	Blakely Island	1986	1986			X								Possible
AL	Mobile	Dauphin Island	1976	2006	X	X	X	X							Probable
AL	Mobile	Heron Bay	1981	1981						X					Probable
AL	Mobile	Pinto Pass	1983	1983		X									Possible
CT	Fairfield	Great Meadows Marsh	1987	1996				X	X	X	X			X	Probable
CT	Fairfield	Stewart B. McKinney National Wildlife Refuge	1996	1996				X							Probable
CT	Litchfield	Lynn's Corner marsh	1997	1997					X	X					Probable
CT	Litchfield	Woodbury marsh	1997	1997					X						Probable
CT	Middlesex	Cove Meadows	1876	1876							X				Confirmed
CT	Middlesex	Cromwell Meadows	1980	1987						X	X	X			Probable
CT	Middlesex	Dead Man's Swamp near Cromwell	1980	1980						X					Probable
CT	Middlesex	Lynde Point	1897	1897											Confirmed
CT	Middlesex	Ragged Rock Creek Wildlife Area	1987	1987	X	X	X								Possible
CT	New Haven	Quinnipiac Marshes	1893	1904							X		X		Probable
CT	New London	Great Island Wildlife Management Area	1884	1884					X						Confirmed
CT	New London	Stonington Marsh	1986	1986					X						Probable
DE	Kent	Bennetts Beach Marsh	1988	1988					X						Probable
DE	Kent	Big Stone Beach Marsh	2001	2006			X	X							Probable
DE	Kent	Bombay Hook National Wildlife Refuge	1983	2014	X	X	X	X	X	X	X	X	X	X	Probable
DE	Kent	Leipsic Marsh	1992	1992			X								Possible
DE	Kent	Little Creek Wildlife Area	1960	1987		X	X	X		X					Probable
DE	Kent	Milford Neck Wildlife Area	2012	2012				X							Probable
DE	Kent	Port Mahan Road	1970	2007	X	X	X	X	X	X			X		Probable
DE	New Castle	Delaware City	1988	1988			X								Possible

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
DE	Sussex	Delaware Seashore State Park	1933	1964				X		X					Probable
DE	Sussex	Prime Hook National Wildlife Refuge	1967	2016	X	X	X	X	X	X			X		Probable
FL	Alachua	Paynes Prairie Preserve State Park	1989	2002	X			X	X		X		X	X	Probable
FL	Baker	John M. Bethea State Forest	2010	2010		X									Possible
FL	Brevard	Merritt Island National Wildlife Refuge	1926	2014		X		X	X	X	X				Confirmed
FL	Brevard	St. Johns National Wildlife Refuge	1932	2000	X	X	X	X	X	X	X	X	X	X	Confirmed
FL	Broward	Levee site	1986	1986					X	X					Probable
FL	Citrus	Chassahowitzka National Wildlife Refuge	1998	1998	X	X	X	X							Probable
FL	Citrus	Crystal River Preserve State Park	1998	1998	X										Possible
FL	Collier	Big Cypress National Preserve	1968	1968					X	X					Probable
FL	Collier	Fakahatchee Strand Preserve State Park	1998	1998		X									Possible
FL	Dixie	Jena Wildlife Management Area	1989	2015	X	X	X	X	X	X	X	X	X		Confirmed
FL	Dixie	Steinhatchee marshes	1992	1992					X	X	X				Probable
FL	Dixie	Shired Island Marsh	2010	2010						X					Probable
FL	Franklin	St. Vincent National Wildlife Refuge	1979	2016	X	X	X	X	X	X	X				Probable
FL	Hamilton	Occidental Wildlife Management Area	1995	1995								X	X	X	Probable
FL	Hernando	Weekiwachee Preserve	2000	2000						X					Probable
FL	Highlands	Buck Island Ranch	2001	2003		X	X	X				X		X	Probable
FL	Indian River	Fort Drum Marsh Conservation Area	2001	2001	X										Possible
FL	Leon	Lake Jackson	1961	1961				X							Probable
FL	Levy	Cedar Key	1985	1998		X		X							Probable
FL	Levy	Cedar Key National Wildlife Refuge	2013	2013						X					Probable
FL	Levy	Lower Suwannee National Wildlife Refuge	1989	2010	X	X	X	X		X					Probable
FL	Miami-Dade	Everglades National Park	1988	2016	X	X	X	X	X	X	X	X			Probable
FL	Miami-Dade	Everglades Wildlife Management Area	2011	2015				X							Probable
FL	Miami-Dade	Long Pine Key #3	1988	1988				X							Probable
FL	Monroe	Costal Prairie Trail	2013	2013	X										Possible
FL	Okaloosa	Fort Walton Beach Spray Fields	2004	2004			X								Possible
FL	Okeechobee	Kissimmii Prairie Preserve State Park	2016	2016					X	X					Probable
FL	Orange	Lake Apopka Restoration Area	2003	2003					X						Probable

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
FL	Osceola	Three Lakes Wildlife Management Area	2013	2016			X	X				X	X	X	Probable
FL	Palm Beach	Rotenberger Wildlife Management Area	2010	2010			X								Possible
FL	Palm Beach	Arthur R. Marshall Laxahatchee National Wildlife Refuge	2010	2013										X	Probable
FL	Palm Beach	Belle Glade Marina	2001	2001							X				Probable
FL	Palm Beach	Holey Land Wildlife Management Area	1986	2014			X	X	X	X	X	X	X	X	Confirmed
FL	Palm Beach	JW Corbett Wildlife Management Area	2013	2013				X							Probable
FL	Pasco	Werner-Boyce Salt Springs State Park	1999	2016	X	X	X	X	X	X	X	X	X	X	Probable
FL	Pinellas	Honeymoon Island State Park	1995	1995	X										Possible
FL	Polk	KICCO Wildlife Manaagement Area	2000	2000		X	X	X	X	X	X	X	X	X	Probable
FL	Polk	Polk County phosphate mines	2005	2005							X				Probable
FL	Sarasota	MACASPHALT SHELL PIT	1986	1986		X		X	X						Probable
FL	Taylor	Big Bend Wildlife Management Area	1987	2016		X			X			X			Probable
FL	Volusia	Lake Woodruff National Wildlife Refuge	1984	1992	X	X		X	X	X			X		Probable
FL	Volusia	Tomoka aquatic preserve	1997	1997				X							Probable
FL	Wakulla	St. Marks National Wildlife Refuge	1919	2016	X	X	X	X		X			X	X	Confirmed
FL	Walton	Santa Rosa	1993	1993	X										Possible
FL	Walton	Hogtown Bayou	2011	2015		X				X					Probable
GA	Brantley	Upper Santilla Basin	2010	2010		X									Possible
GA	Camden	Point Peter	1998	1998				X	X						Probable
GA	Glynn	Andrews Island	1988	1998		X	X								Possible
GA	Glynn	Jekyll Island State Park	1971	1971					X						Probable
GA	Glynn	Little St. Simons Island	2003	2003										X	Probable
GA	Greene	Curtis Mine	1991	2016		X	X	X	X	X	X	X	X	X	Confirmed
GA	McIntosh	Altamaha Wildlife Management Area	1999	1999					X						Probable
LA	Cameron Parish	Broussard Beach	1982	2016	X	X	X								Possible
LA	Jefferson Parish	Grand Isle	2013	2013	X										Possible
LA	Vermilion Parish	White Lakes Wetland Conservation Area	2010	2010							X				Probable
MA	Barnstable	Cape Cod National Seashore	1884	1948				X	X	X	X	X	X		Confirmed
MA	Barnstable	Monomoy National Wildlife Refuge	1971	1971					X						Probable

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
MA	Essex	Great Marsh Area of Critical Concern	1976	1976				X							Probable
MA	Essex	Ipswich Wildlife Sanctuary	1944	1944		X									Possible
MA	Essex	Parker River National Wildlife Refuge	1960	2010		X	X	X	X	X					Probable
MA	Middlesex	Great Meadows National Wildlife Refuge	1889	1962							X				Probable
MA	Norfolk	Milton Hill	1904	1904				X							Probable
MA	Plymouth	Clark's Island	1869	1869									X		Probable
MD	Anne Arundel	Churchton Marshes	1992	1992						X					Probable
MD	Anne Arundel	Cox Creek Dredged Material Containment Facility	2011	2011					X	X					Probable
MD	Anne Arundel	Jug Bay Wetlands Sanctuary	2000	2000			X	X							Probable
MD	Anne Arundel	Sandy Point State Park	1974	1983		X	X	X	X	X	X				Confirmed
MD	Baltimore	Carroll Island	1971	1990			X	X	X	X					Probable
MD	Baltimore	North Point State Park	1977	2004		X	X	X				X			Confirmed
MD	Calvert	North Beach--marsh	1998	1998								X			Probable
MD	Calvert	Parkers Creek	1999	1999						X					Probable
MD	Caroline	Kings Creek Preserve	1990	1997					X			X			Probable
MD	Cecil	Canal Wildlife Management Area	1996	1996		X									Possible
MD	Dorchester	Blackwater National Wildlife Refuge	1991	2014		X	X	X	X	X	X	X			Probable
MD	Dorchester	Cattail Island	1990	1990				X							Probable
MD	Dorchester	Chicawicomico Marsh	1991	1991									X		Probable
MD	Dorchester	Eliott Island	1954	2015	X	X	X	X	X	X	X	X	X	X	Confirmed
MD	Dorchester	Farm Creek Marsh	1986	1986				X							Probable
MD	Dorchester	Fishing Bay Wildlife Management Area/Toddville/Crapo/Lakesville	1986	2014			X	X	X	X	X	X	X	X	Probable
MD	Dorchester	Fishing Creek Marsh	2003	2003					X						Probable
MD	Harford	Aberdeen provng Ground	2002	2002			X								Possible
MD	Harford	Bush Declaration Natural Resource Management Area	2000	2000				X							Probable
MD	Harford	Gunpowder River Marshes	2004	2004			X								Possible
MD	Howard	University of Maryland Central Farm	2013	2013				X							Probable

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
MD	Kent	Eastern Neck National Wildlife Refuge	1990	1992				X	X						Confirmed
MD	Prince George's	Patuxent River Park	1991	1991		X									Possible
MD	Saint Mary's	Point Lookout State Park	1992	1997		X	X								Possible
MD	Saint Mary's	St. George Island	1992	1992						X					Probable
MD	Somerset	Deal Island Wildlife Management Area	1958	2014		X	X	X	X	X	X	X			Probable
MD	Somerset	Fairmont Wildlife Management Area	1990	2014					X	X					Probable
MD	Somerset	Fishing and Maddox Island Marshes	1987	2007				X	X	X	X				Probable
MD	Somerset	Irish Grove Sanctuary	1969	2012	X	X	X	X	X	X					Probable
MD	Somerset	Pocomoke Sound Wildlife Management Area	2000	2011			X			X					Probable
MD	Talbot	Easton Waste Water Treatment Plant	1990	2007		X	X	X	X	X	X	X	X		Probable
MD	Talbot	Tilghman Island Marsh	1981	1981				X							Probable
MD	Worcester	Assateague Island National Seashore	1991	2014		X	X	X	X	X	X	X	X	X	Probable
MD	Worcester	Bockatonorton Bay Marshes	1991	1991		X	X	X	X	X	X	X	X	X	Probable
MD	Worcester	E.A. Vaughn Wildlife Management Area	1991	1996		X	X				X				Probable
MD	Worcester	Newport Bay Marshes	1991	1991			X	X	X						Probable
MD	Worcester	Truitt Landing	1981	2002		X	X	X	X	X	X				Probable
NC	Brunswick	Zeke's Island Coastal Reserve	2015	2016		X	X	X							Probable
NC	Caldwell	Wagner Property	2003	2003		X									Possible
NC	Carteret	Back Creek Marsh	1985	1985						X					Probable
NC	Carteret	Beaufort airport	1969	1969			X								Possible
NC	Carteret	Cape Lookout National Seashore	1988	1988							X				Probable
NC	Carteret	Cedar Island National Wildlife Refuge	1973	2016	X	X	X	X	X	X	X	X	X	X	Probable
NC	Carteret	Cherry Point Military Reservation	1990	1992						X					Probable
NC	Carteret	Atlantic Field	1992	2014			X	X	X	X					
NC	Carteret	North River Marshes	1975	2006	X	X	X	X	X	X	X	X	X		Confirmed
NC	Carteret	Stacy Marsh	2014	2014				X							Probable
NC	Carteret	Turnagain Bay Marsh	2014	2014					X						Probable
NC	Chatham	Jordan Lake State Recreation Area	1979	1981					X	X	X				Probable
NC	Currituck	Church Island	2015	2015				X							Probable

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
NC	Currituck	Great Swamp Marshes	2015	2015			X	X	X						Probable
NC	Currituck	Mackay Island National Wildlife Refuge	2013	2013			X								Possible
NC	Currituck	Pine Island Audubon Sanctuary	1986	2010			X	X							Probable
NC	Dare	Aligator River National Wildlife Refuge	1994	2016				X				X			Probable
NC	Dare	Bodie Island Lighthouse	1960	2004	X	X	X	X			X				Probable
NC	Dare	Cape Hatteras National Seashore	1987	2003				X	X	X	X	X			Probable
NC	Dare	Pea Island National Wildlife Refuge	1982	2000				X				X			Probable
NC	Dare	Roanoke Island Marshes Game Land	1983	2012				X	X	X	X		X		Probable
NC	Dare	Wanchese Marshes	1987	1999			X	X						X	Probable
NC	Dare	Whalebone Junction	2009	2009			X								Possible
NC	Hyde	Gull Rock Game Land	1988	1988				X							Probable
NC	Hyde	Leechville Marshes	1991	1994		X			X						Probable
NC	Hyde	Swan Quarter National Wildlife Refuge	2001	2015				X	X						Probable
NC	New Hanover	Cape Fear Marshes	2007	2007					X						Probable
NC	Onslow	Topsail Island Marshes	1986	1995			X	X	X						Probable
NC	Pamlico	Goose Creek Game Land	2014	2014					X						Probable
NC	Pamlico	Hobucken Marsh	1986	2015			X	X	X						Probable
NC	Polk	Lake Adger	1989	1989		X									Possible
NC	Wake	NCSU Experimental Farm	2005	2005				X							Probable
NC	Wake	Walnut Creek Farm	1890	1971				X	X	X	X		X		Confirmed
NH	Rockingham	Greenland Marsh	2003	2003				X	X						Probable
NJ	Atlantic	Atlantic City Marshes	1913	1915					X	X					Confirmed
NJ	Atlantic	Brigantine	1912	1912						X					Confirmed
NJ	Atlantic	Edwin B. Forsythe National Wildlife Refuge and Mullica River Marshes	1920	2016			X	X	X	X	X				Confirmed
NJ	Atlantic	Little Beach Island	1919	1934						X	X				Confirmed
NJ	Atlantic	Tuckahoe Wildlife Management Area	1981	2016				X	X	X	X				Probable
NJ	Bergen	Celery farm	1984	1984			X	X	X						Probable
NJ	Burlington	Wading River Marshes	1924	1925					X	X					Confirmed
NJ	Cape May	Beesley's Point	1844	1845					X	X	X	X	X		Confirmed

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
NJ	Cape May	Cape May Migratory Bird Refuge	1965	2009		X		X	X	X	X				Probable
NJ	Cape May	Corson's Inlet State Park	1926	1939				X	X						Confirmed
NJ	Cape May	Dennis Creek Wildlife Management Area	1945	2006			X	X	X	X	X	X			Confirmed
NJ	Cape May	Jakes Landing	1988	2011			X	X	X	X	X				Probable
NJ	Cape May	Ludlam's Beach	1926	1934					X	X	X				Confirmed
NJ	Cape May	Ocean City	1938	1938					X						Confirmed
NJ	Cape May	Nummy Island	1990	1990					X	X	X	X			Confirmed
NJ	Cape May	Sea Isle City	1934	1934					X						Confirmed
NJ	Cape May	Seven Mile Beach	1921	1929					X	X	X				Confirmed
NJ	Cape May	Stipson Island Marshes	2008	2015			X	X							Probable
NJ	Cape May	Stone Harbor Marshes	1915	1929				X	X	X	X				Confirmed
NJ	Cape May	Strathmere Marshes	1927	1932						X	X				Confirmed
NJ	Cumberland	Clarks Pond Fish and Wildlife Management Area	2015	2015				X							Probable
NJ	Cumberland	Commercial Township Marshes	2015	2015				X	X	X	X				Probable
NJ	Cumberland	Egg Island Fish and Wildlife Management Area	1960	2009			X	X	X	X		X		X	Probable
NJ	Cumberland	Fortescue Fish and Wildllife Management Area	1938	1960			X	X		X	X				Confirmed
NJ	Cumberland	Glades Wildlife Refuge	1961	2015		X	X	X	X	X	X	X	X		Confirmed
NJ	Cumberland	Grandy's Beach Marsh	1988	2002						X	X				Confirmed
NJ	Cumberland	Heislerville Wildlife Management Area	1988	2015			X	X	X	X	X				Probable
NJ	Cumberland	Moore's Beach Marsh	1988	2015				X	X	X					Probable
NJ	Cumberland	New Sweden Wildlife Management Area	1988	1988						X					Probable
NJ	Cumberland	Tindall Island Marshes	1988	2015				X	X	X	X				Probable
NJ	Morris	Great Swamp NWR	2006	2006			X								Possible
NJ	Morris	Troy Meadows	1930	1930		X									Possible
NJ	Ocean	Edwin B. forsythe National Wildlife Refuge norther units	1914	2014			X	X	X	X	X	X	X	X	Confirmed
NJ	Ocean	Holgate Marsh	1919	1964			X	X	X	X	X	X	X		Confirmed
NJ	Ocean	Island Beach State Park	1919	1919							X				Confirmed

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
NJ	Ocean	Manahawkin Wildlife Management Area	1962	1975			X	X	X	X	X				Probable
NJ	Ocean	Ocean Gate Wetlands	2015	2015				X	X	X	X	X			Probable
NJ	Salem	Phillips Creek Marshes	1988	1988						X					Probable
NJ	Sussex	Masker Marsh	1991	1997			X	X							Probable
NJ	Sussex	Walkill National Wildlife Refuge	1993	1993					X	X					Confirmed
NY	Jefferson	Perch River Wildlife Management Area	1996	1996						X					Probable
NY	Kings	Carnisie	1884	1884											Possible
NY	Nassau	Jones Beach State Park	1884	1937		X	X	X		X	X		X		Confirmed
NY	Nassau	Lawrence Marshes	1952	1955		X			X						Probable
NY	Nassau	Lido Beach Marshes	1940	1940							X				Confirmed
NY	Nassau	Long Beach	1937	1937						X					Confirmed
NY	Onondaga	Three Rivers State Game Managemnt Area	1957	1957			X								Possible
NY	Queens	Jamaica Bay National Wildlife Refuge	1975	1976					X						Probable
NY	Seneca	Montezuma National Wildlife Refuge	1971	1971		X									Possible
NY	Suffolk	Bendigo Road Wetland	2009	2009					X						Probable
NY	Suffolk	Gilgo State Park	1937	1999		X	X	X	X	X					Confirmed
NY	Suffolk	Napeague State Park	1910	2009			X	X	X	X			X		Probable
NY	Suffolk	Smith Point County Park	1991	1991								X			Probable
NY	Tompkins	Tompkins Co. Airport	1971	1971		X									Possible
NY	Ulster	Great Vly Marsh	1963	1963				X							Probable
NY	Westchester	Marshlands Conservancy	1986	1986					X	X					Probable
PA	Berks	Eckville Marsh	1999	1999				X	X						Probable
PA	Berks	Sheerlund Forest Nursery	2013	2013				X	X	X					Probable
PA	Bucks	Pine Run Reservoir	2007	2007		X	X								Possible
PA	Centre	Tusseyville Pasture	1986	1986				X	X	X	X	X	X		Probable
PA	Delaware	John Heinz National Wildlife Refuge	1877	1978	X	X								X	Probable
PA	Lebanon	Middle Creek Wildlife Management Area	1994	1994				X	X	X					Probable
PA	Westmoreland	Powdermill Nature Reserve nr Rector	1967	1976			X	X	X						Probable
RI	Washington	Misquamicut Pond	1975	2015				X	X						Probable
SC	Beaufort	Nemours Plantation	2014	2014		X									Possible

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
SC	Charleston	Cape Romain National Wildlife Refuge	2015	2015			X								Possible
SC	Charleston	Oakland Plantation	1903	1912					X						Confirmed
SC	Charleston	Santee Coastal Reserve	1991	2016		X	X	X	X	X	X	X	X		Probable
SC	Colleton	Ace Basin National Wildlife Refuge (and surrounding)	2014	2015		X	X	X	X	X	X	X	X		Probable
SC	Colleton	Bear Island Wildlife Management Area	1989	2016	X	X	X	X	X	X	X	X	X		Probable
SC	Colleton	Donnelley Wildlife Management Area	2012	2016		X							X		Probable
SC	Colleton	Hutchinson Island	2014	2014		X	X	X	X	X	X	X	X		Probable
SC	Colleton	Upper Ashepoo River	2014	2014		X	X	X	X	X	X	X	X		Probable
SC	Georgetown	Huntington Beach State Park	1988	1988			X								Possible
SC	Georgetown	Winyah Bay	1988	2016		X	X	X	X	X	X				Probable
SC	Georgetown	Yawkey Wildlife Center	1991	2016		X	X	X	X	X	X	X	X		Probable
SC	Jasper	Savannah National Wildlife Refuge	1997	2005		X		X						X	Probable
SC	Jasper	Savannah Spoil Site	2000	2010	X	X									Possible
SC	Oconee	Little Beaverdam Creek	1975	1976			X	X	X	X	X				Probable
TN	Hamilton	Standifer Gap Marsh	2002	2002			X								Possible
TN	Jefferson	Koella's farm	1980	1980			X		X						Probable
TN	Sevier	Roaring Fork Creek Hayfield	1964	1964						X					Confirmed
TX	Aransas	Aransas National Wildlife Refuge	1985	2008	X	X	X	X		X				X	Probable
TX	Aransas	Rockport Wetlands	2011	2011		X									Possible
TX	Brazoria	Brazoria National Wildlife Refuge	1969	2016	X	X	X	X	X	X	X	X	X	X	Confirmed
TX	Brazoria	Justin Hurst Wildlife Management Area	1994	2015		X					X				Probable
TX	Brazoria	Quintana Neotropical Sanctuary	2005	2005			X								Possible
TX	Brazoria	San Bernard National Wildlife Refuge	1971	2015	X	X	X	X	X	X	X				Probable
TX	Brazoria	Surfside Marshes	2008	2008		X									Possible
TX	Calhoun	Calhoun rice fields	2008	2008		X									Possible
TX	Calhoun	Magnolia Beach Wetlands	1993	2015	X	X		X	X	X	X	X			Probable
TX	Calhoun	Matagorda Island Wildlife Management Area	1992	1996	X	X		X		X	X	X			Probable
TX	Calhoun	Mission Lake Marshes	1996	2001	X			X							Probable

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
TX	Cameron	South Padre Island Nature and Birding Center	1995	2005				X			X				Probable
TX	Chambers	Anahuac National Wildlife Refuge	1970	2016	X	X	X	X	X	X	X	X	X	X	Probable
TX	Chambers	Wallisville Lake	2014	2014		X									Possible
TX	Galveston	Bolivar Peninsula	1912	2016	X	X	X	X					X	X	Confirmed
TX	Galveston	Galveston Island	1968	2014	X	X									Possible
TX	Galveston	Galveston Island State Park	1991	2015	X	X	X	X	X	X	X	X	X		Probable
TX	Galveston	San Luis Pass	1983	2013							X	X			Probable
TX	Galveston	Virginia Point	1959	2014			X					X			Probable
TX	Harris	San Jacinto Bay Spoil Islands	2013	2013			X								Possible
TX	Hutchinson	Jim's Lake Wetland	1979	1979							X				Probable
TX	Hutchinson	Lake Meredith National Recreation Area	2014	2014				X							Probable
TX	Jefferson	McFaddin National Wildlife Refuge	2014	2016	X	X									Possible
TX	Jefferson	Sea Rim State Park	2002	2015		X									Possible
TX	Jefferson	Texas Point National Wildlife Refuge	1964	2015	X		X					X			Probable
TX	Kenedy	Kenedy Ranch	2001	2001		X									Possible
TX	Kleberg	Padre Island National Seashore	1994	2005	X	X	X								Possible
TX	Matagorda	Lookout Point	2015	2015				X							Probable
TX	Matagorda	Mad Island Wildlife Management Area	1992	2015	X	X	X	X	X	X	X	X	X		Probable
TX	Nueces	Hazel Bazemore Park	2010	2010		X	X								Possible
TX	Nueces	Leonabelle Turnbull Birding Center	1997	2010		X		X	X	X	X	X	X		Probable
TX	Nueces	Tule Lake	2007	2010			X			X					Probable
TX	Nueces	Vickers Ranch	1994	2003	X	X									Possible
TX	San Patricio	Nueces Bay Marshes	1994	1995	X	X									Possible
TX	Van Zandt	Grand Saline Marsh	1995	1995		X									Possible
VA	Accomack	Byrd's Marsh	1991	2014			X		X						Probable
VA	Accomack	Chincoteague National Wildlife Refuge	1955	1955					X						Possible
VA	Accomack	Doe Creek Marsh	2007	2007				X	X	X					Probable
VA	Accomack	Jobes Island	2007	2007				X	X	X					Probable
VA	Accomack	Michael's Marsh	1991	2007			X	X	X						Probable

ST	COUNTY	PROPERTY	FIRST	LAST	A 1	A 2	M 1	M 2	J 1	J 2	J 1	J 2	A 1	A 2	STATUS
VA	Accomack	Pitts Creek Marsh	2007	2007				X	X						Probable
VA	Accomack	Saxis Wildlife Management Area	1980	2014				X	X	X					Probable
VA	Accomack	Wallops National Wildlife Refuge	1958	1958					X						Probable
VA	Alleghany	Hematite	2016	2016			X								Possible
VA	Botetourt	Iron Gate	2005	2005										X	Probable
VA	Fairfax	Huntley Meadows Park	2002	2004		X			X	X	X				Probable
VA	Gloucester	Guinnea Neck	1992	1992	X										Possible
VA	Hampton City	Grandview Nature Preserve	1968	1968			X								Possible
VA	Loudoun	Dulles Greenway Wetlands	1997	2009			X				X	X	X		Probable
VA	Montgomery	Virginia Tech College Farm	1939	1941				X	X						Probable
VA	Northampton	Cobb Island	1911	1917				X							Confirmed
VA	Northampton	Gull Marsh	1938	1938									X		Confirmed
VA	Northampton	Hog Island	1915	1989				X	X	X					Confirmed
VA	Northumberland	Dameron Marsh Natural Area Preserve	1954	1954		X									Possible
VA	Portsmouth City	Craney Island Disposal Area	1994	1994								X	X		Probable
VA	Prince William	North Fork Wetlands	2002	2002					X	X	X				Probable
VA	Roanoke	Cloverdale	1945	1945			X	X							Probable
VA	Virginia Beach City	Back Bay National Wildlife Refuge	1956	1968			X	X							Probable
VA	Virginia Beach City	Dam Neck Facility	1938	1938							X				Probable
VA	Virginia Beach City	Little Creek Marshes	1915	1915						X					Probable
VA	Washington	Abingdon Pasture	1946	1948						X					Probable
VA	York	Seaford	1949	1949									X		Probable
WV	Hampshire	Capon Pature	2011	2012				X	X	X	X				Probable