King Rail Research Progress Report (2011)

King Rail Nesting and Brood Rearing Ecology in Managed Wetlands

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Introduction

The King Rail (*Rallus elegans*) is a secretive marsh bird of conservation concern. The species has a large range throughout the eastern half of the United States extending from southern Canada to the Gulf Coast. Qualitative accounts indicate that inland migratory populations were once quite common, but have experienced major population declines in the latter half of the 20th century (Peterjohn 2001, Cooper 2008). North American Breeding Bird Survey data suggests a significant annual King Rail population decline of 3.44% (97.5% CI: -6.72, 1.43) across its range in the United States from 1990 to 2009 (Sauer et al. 2011). King Rails are listed as threatened or endangered in 12 states (Cooper 2008).

Wetland loss and alteration are considered the major factors responsible for declines in King Rail and many other wetland-dependent bird populations (Eddleman et al. 1988). Wetland management approaches, specifically water level management and control of woody encroachment, can also affect habitat use during the breeding season (Naugle et al. 1999, McWilliams 2010). King rails are more likely to select nest sites in standing water but little information is known about how water drawdowns affect nest survival, brood habitat use, movement, and chick survival (Reid 1989). Chick survival was hypothesized to be a limiting factor for population growth and the need for more information regarding brood ecology was highlighted during the 2006 King Rail Workshop (Cooper 2008). Multiple observational studies have found a negative association between marsh bird occupancy or nest density and tree cover (Pierluissi 2006, Budd 2007, Darrah and Krementz 2011), however, an experimental approach is needed to strengthen the inference regarding this relationship.

The goal of our study is to investigate the nesting and brood rearing ecology of the King Rail with respect to water level management (early versus late drawdown) and site preparation

(soil disturbance and woody vegetation removal). Objectives of the study are to: 1) determine local scale King Rail habitat use and selection during the nesting and brood rearing period, 2) estimate nest and chick survival rates and document sources of nest and fledgling loss, 3) document movements and estimate home range size during the breeding season, and 4) estimate occupancy rates within units under different management treatments. This information will help wetland managers make better management decisions for King Rails during the breeding season. Parameter estimates produced can be used in viability analyses and simulation models to identify factors limiting population growth.

Methods

Study area

The study area included restored wetlands in southeastern Oklahoma in the Red River floodplain. Two public sites, Red Slough Wildlife Management Area (WMA) and Grassy Slough WMA, and three privately owned wetlands were used in 2011. Red Slough Wildlife Management Area contains multiple impounded wetland units totaling 2,158 ha in size (Figure 1). Dominant emergent vegetation included common rush (*Juncus effusus*), shortbristle horned beaksedge (*Rhynchospora corniculata*), ovate false fiddleleaf (*Hydrolea ovata*), cattail (*Typha* sp.), eastern annual saltmarsh aster (*Symphyotrichum subulatum*), willow (*Salix* sp.), spikerush (*Eleocharis* sp.), smartweed (*Polygonum* sp.), and arrowhead (*Sagittaria* sp.).

Grassy Slough WMA included three impounded wetlands totaling 264 ha. One unit had no standing water and sparse, short vegetation from late April 2011 through early August 2011. The other two units contained shallow water (5-15 cm) with a diverse emergent plant community similar to that at Red Slough WMA. By late June 2011 most units had no standing water aside

from a couple channel segments. Similar borrow ditches and ridge/swale features were present at this management area.

Private Restoration area 1 was dominated by cattail with small patches of spikerush. Water depth within the emergent vegetation was approximately 5 cm but was deeper in the channel along the edge of the wetland. Approximately 60% of Private Restoration area 2 was a deep, open water pond. Along the sides the dominant emergent vegetation was soft rush, but woody encroachment had taken over and there were few patches without woody vegetation. Private Restoration area 3 also contained a deep water pond but also had an extensive stand of dense sedges (*Carex* sp.) in shallow or no standing water. Woody encroachment was also evident but not as dominating as in Private Restoration area 2.

Unit Management

Habitat manipulation occurred at Red Slough WMA and private restoration area 1. Boards were removed from stop-log structures at Red Slough WMA during different times of the year and with varying frequency (Table 1). More boards were removed than planned at unit 30E, resulting in a rapid drawdown of water. Beaver activity hindered drawdown management at unit 27. In mid-June unit 16 experienced an unplanned, rapid water loss suggesting structural problems with the levee. Disking occurred in five units during August and September 2011. Private restoration area 1 was drained early in the season and mowed in June.

Wetland units contained a borrow ditch between the levee and the marsh interior which contained water well after the interior of the marsh was dry. Many units also included circular or linear excavations containing open water or deep-water emergent vegetation such as American lotus (*Nelumbo lutea*). The soil from these excavations was placed directly adjacent to the ditch

and is typically covered by willows or upland herbaceous vegetation (referred to as ridge/swale in the text).

Experimental Design

A field experimental approach was taken to explore the effect of wetland management on King Rail habitat use and chick survival. The experimental unit was the impounded wetland and the factor was water-level management. Treatment levels consisted of an early drawdown (prior to the start of the breeding season) and a late drawdown (during the breeding season). Starting in 2012, we will include site preparation as an additional treatment factor. Treatment levels will include removal of woody vegetation and disking.

Sampling & Trapping

We broadcasted King Rail calls to elicit a territorial response at all wetland units in order to locate breeding territories. We surveyed sites opportunistically and calls were broadcasted on the levee and inside the wetland. We surveyed all wetland units at least twice and wetlands appearing to have ideal habitat conditions based on review of the scientific literature were surveyed up to 5 times.

We captured King Rails in order to attach VHF transmitters, collect morphological measurements, and collect feather samples for a concurrent study. We attempted to capture King Rails using mist nests, walk-in traps, toe-snares, and airboat and dip-net. We set up two mist nets in a "v" in the emergent vegetation and placed a King Rail decoy in the center and played calls. A walk-in trap containing a decoy and speakers broadcasting King Rail calls was also used to capture birds. We also used toe-snare traps towards the end of the field season. The traps consisted of monofilament tied into a loop with a slipknot and attached to a thin bamboo dowel. We tied a series of ten traps together with monofilament and inserted them into the ground along

a used path or at the water/emergent vegetation interface in the hopes that a King Rail would pass over them. An airboat was used in early July to capture birds at night with a dip-net. We also used a large spotlight and walked transects in the marsh at night to find and capture roosting King Rails on two occasions.

Once a bird was captured and marked, we allowed the bird three days to adjust to the harness and transmitter. We used triangulation with a Yagi antenna to estimate the location of birds daily. We tracked individuals at different times during the day and night.

We collected habitat data at King Rail telemetry point locations and at a random location on the same day that the bird's location was estimated. Random locations were selected from the entire Red Slough WMA complex using the sampling application in ArcGIS. All data were collected within a 50 m radius circular plot centered at the telemetry point or the random point. We visually estimated the percent cover of short emergent (< 1 m), tall emergent (≥ 1 m), open water and counted the number of woody stems in the plot. We counted shrubs composed of multiple stems as one woody stem and counted all trees past the sapling stage ($\geq$ 7cm DBH). We also recorded the dominant tall and short emergent plant species (20% or more of cover type). Water depth was collected at the point and 10 m from the point in the four cardinal directions. We used a cover board to estimate visual obstruction 10 m from the point in the four cardinal directions. Four interspersion cover classes were used to estimate the amount of interspersion within each plot. Interspersion class 1 indicates a plot dominated by emergent vegetation with $\leq$ 5% open water or exposed soil. Class 2 indicates high interspersion (or water/emergent edge density) with dense emergent cover between 50% and 95%. Class 3 represents a lower degree of interspersion typical of channels or large pools of water surrounded by emergent vegetation.

Class 4 represents a site with high interspersion but emergent cover is sparse or less than 50% of the plot area.

We searched known King Rail territories in order to locate broods from 1 June-August 16 2011. Observers sat with spotting scopes on the levee or next to areas within the marsh that contained shallow open water (5-15cm) and adjacent emergent cover. Once a brood rearing site was identified, we observed the brood to collect information on chick survival, habitat use, and foraging behavior.

Results

Weather Conditions

Average monthly precipitation in April 2011 was 20 cm above normal in the region, resulting in relatively deep wetland units in the early breeding season (Figure 2). This was followed by an average monthly precipitation seven and eight cm below normal in June and July and monthly temperatures above normal (Figures 2 & 3). Mid-summer conditions resulted in little to no standing water in the majority of impoundments by the end of July.

Territories

We detected a Sora and Least Bittern but no King Rails at Grassy Slough WMA on 13 May 2011. We detected a Virginia Rail but no King Railss on 13 May 2011 at one privately owned wetland. We identified 17 King Rail territories at Red Slough WMA in early to mid-May (Figure 4). Vocal Detections of King Rails were greatly reduced at these sites after June. We were unsure whether these individuals moved from their territories because of a lack of water or if vocalizations ceased because of changes in the breeding status of the bird. A resurgence of territorial behavior (vocalizations and response to call-broadcasts) occurred in

units 27A and 27B on 17 June 2011 in locations where a territory had not been identified previously. We also observed a King Rail pair copulating in unit 27B on 28 June 2011, but a nest was never found. Our observations suggest that territories locations may change throughout the season. Following radio marked birds in future field seasons will help to determine if King Rail movements are related to nest failures or changes in water levels.

Capture Data

The use of an airboat and dip nets at night was the most successful means of trapping King Rails (Table 2). The airboat trapping method was used in unit 5, unit 15, and unit 38. Two individuals, one adult and one juvenile, were captured in unit 5 with the airboat and dip net on 6 July 2011. We fitted both birds with a VHF transmitter harness. We found the transmitter and remains of the juvenile King Rail at 9:30 am two days later near the release site. The adult King Rail captured in unit 5 was tracked for 17 days. The individual remained in an area dominated by ovate false fiddleleaf for eleven days (Table 3). The site had high interspersion (class 2 and 4) with patches of both saturated soil and standing water. Mean water depth ranged from 0 to 15 cm at telemetry point locations. Standing water was found only in the borrow ditches surrounding the unit and not in the marsh interior when the adult left unit 5. The King Rail then traveled approximately three kilometers to unit 27B. The bird was then tracked in unit 27A for five days. Dominant vegetation included soft rush and willows and a small patch of standing water with arrowhead. The adult remained near the western end of the levee adjacent to a deep water reservoir. On 29 July 2011, the transmitter was found with the harness intact. Habitat at the telemetry locations tended to have a higher proportion of open water or saturated soil than randomly selected points (Table 4).

At least five individuals or territorial pairs responded aggressively when a decoy and mist nets were used. In most cases, the rails would either lift the net up with their bill and walk under the net or fly away from the net when flushed. A downy chick was captured in a mist net in unit 27a on 2 August 2011. The bird was mostly black but had white auricular tufts and lighter colored feathers on the underside. The chick was most likely between four and five weeks old, based on plumage descriptions from captive chicks (Meanley 1969). The capture site was dominated by cattail in 0-15 cm of water. We observed two chicks and an adult foraging on the edge of open water and cattail a couple minutes after the bird was captured. The chick was fitted with an aluminum USFWS band and a VHF transmitter attached around the neck with a stretchy nylon cord to allow room for growth. On 3 August 2011, the transmitter was found in a patch of soft rush and it was surmised that the neck harness was removed by the bird during grooming. The banded chick was also observed foraging that same day, but the brood was never observed at the site again.

We used walk-in traps frequently throughout the season and on two occasions we set the trap up overnight. Adult rails responded with territorial calls to the play-back call system and would walk around the trap. Unfortunately, no King Rails ever entered the traps.

We did not capture any rails with the toe-snare traps, although King Rails were observed walking in the area where the traps were placed.

We used a spotlight and dip-net at night to search for and capture roosting King Rails in unit 27A where the airboat could not be launched. Although an adult pair had been observed at the site on several occasions prior, we never observed rails in this location at night.

Brood/Juvenile Observations

King Rail broods or solitary juveniles were observed at four different locations at Red Slough WMA in 2011. We observed the first brood on 2 June 2011 on the eastern side of unit 30E. The brood included one adult and one young in full juvenile plumage. In general, the juvenile would forage in the open at the edge of standing water and frequently run back to the emergent vegetation at the adjacent ridge/swale. The juvenile appeared substantially more wary of this feeding site than the adult which would slowly walk around or preen in the open. Mammalian tracks including raccoon and coyote were observed on the edge of the receding pool of water close to the site where the rails were observed. We made observations at this location for a total of seven hours and the brood was visible for approximately 2.5 hours over the course of these observations. We observed the brood at this location again on 3 June 2011 and on 12 June 2011. The brood was not sighted again during two subsequent visits.

We observed two downy chicks with an adult bird next to the borrow ditch in unit 16E on 23 June 2011. The adult was on the levee side of the borrow ditch and flew to the chicks on the opposite side of the ditch when we approached. The brood proceeded to hide in the emergent vegetation dominated by sedges. By this time, there was no standing water within the wetland except for at the ridge/swale pools. We observed the site for a total of eight hours at various times of the day after the first sighting, but the brood was never observed again.

On 2 August 2011, we observed a brood with four chicks in unit 27A. The brood was observed foraging with one adult in a small open area adjacent to the levee. The site was predominately exposed, saturated soil and may have been flooded previously because the adult was observed picking up and feeding a small fish to one of the chicks. On occasion the chicks would venture back into the surrounding cattail. We also observed the brood moving down a

ditch through the middle of the marsh surrounded on both sides by willows. We attached a VHF transmitter to one of the chicks, but it fell off the next day. The brood rearing site was observed for a total of five and a half hours over the next week, but we never saw the brood again after 3 August 2011.

We observed solitary King Rail chicks of varying ages foraging at the northwest corner of 27B starting on 2 July 2011. The site contained a channel ending in a pool of water with a shallow grade surrounded by emergent vegetation. The forage site was along the water's edge between 0 and 5 cm deep. The rails would slowly walk along the edge probing their bill into the water. Food items were small and not identified. We made observations at the site for a total of ten hours in July-August 2011. We observed Juvenile rails foraging at different times mostly in the morning from 6:00am to 10:00am although on one occasion a juvenile was observed foraging at 12:40pm.

Future Efforts

We will conduct point count surveys based on the North American Marsh Bird Monitoring Protocols starting in the 2012 field season (Conway 2010). We will use a random sampling design stratified by habitat types to select survey points. Habitat type strata include tall emergent ($\geq$ 1 m), short emergent ($<$ 1 m), and woody vegetation. Surveys will begin in April and run through June. We will survey each point up to five times. We will use program Presence to estimate detection probability, occupancy rate and abundance for the study area. Habitat data will also be collected after each survey to determine habitat associations at different stages in the breeding period.

We have arranged with the Oklahoma Department of Wildlife Conservation to use their airboat again in spring 2012 to help capture King Rails. We hope to use the airboat at least twice between late February and early April before King Rails nesting begins. We still believe that toe-snares can be an effective capture method and will continue to use then in 2012. We will visit with biologists at the Mississippi Sandhill Crane National Wildlife Refuge in November to fine tune our methods.

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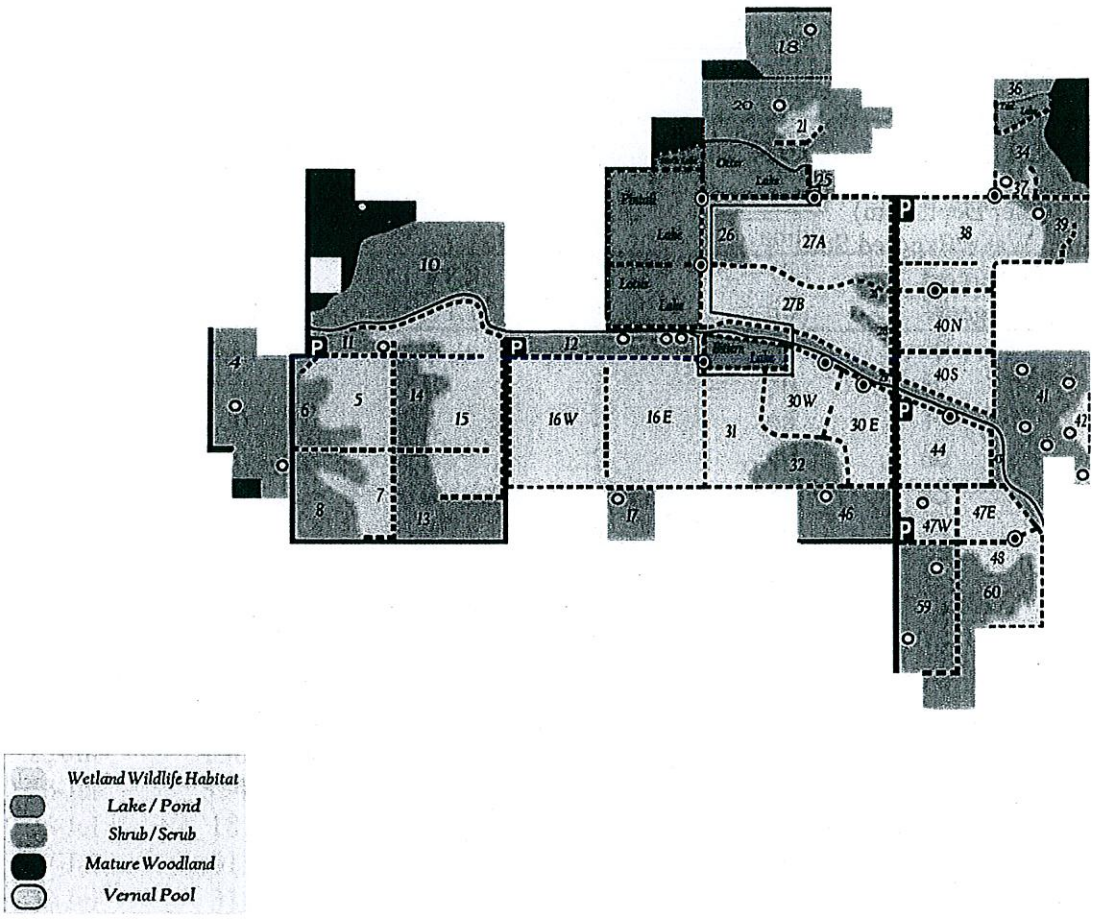

Figure 1. Red Slough Wildlife Management Area wetland units surveyed May-August 2011 to locate breeding King Rail (*Rallus elegans*) territories and document brood rearing habitat use.

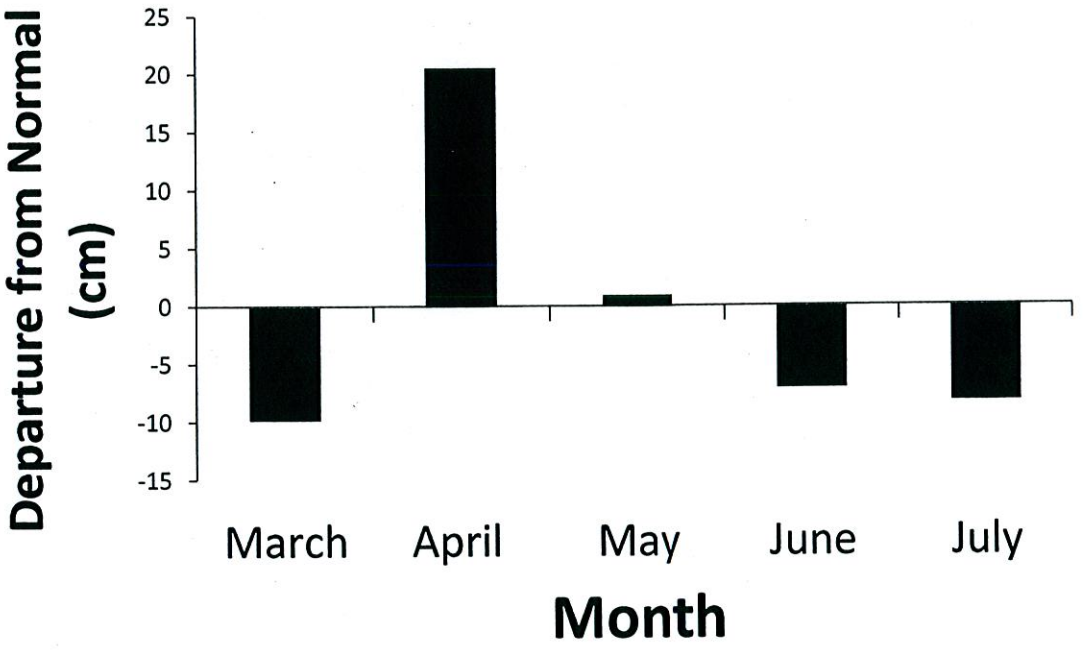

Figure 2. Departure from normal of monthly average precipitation in McCurtain County, Oklahoma from March through July 2011. Standard Normals are defined as the mean of a climatological element computed over three consecutive decades, in this case from 1971-2000 from Idabel, OK weather station data (NCDC 2002).

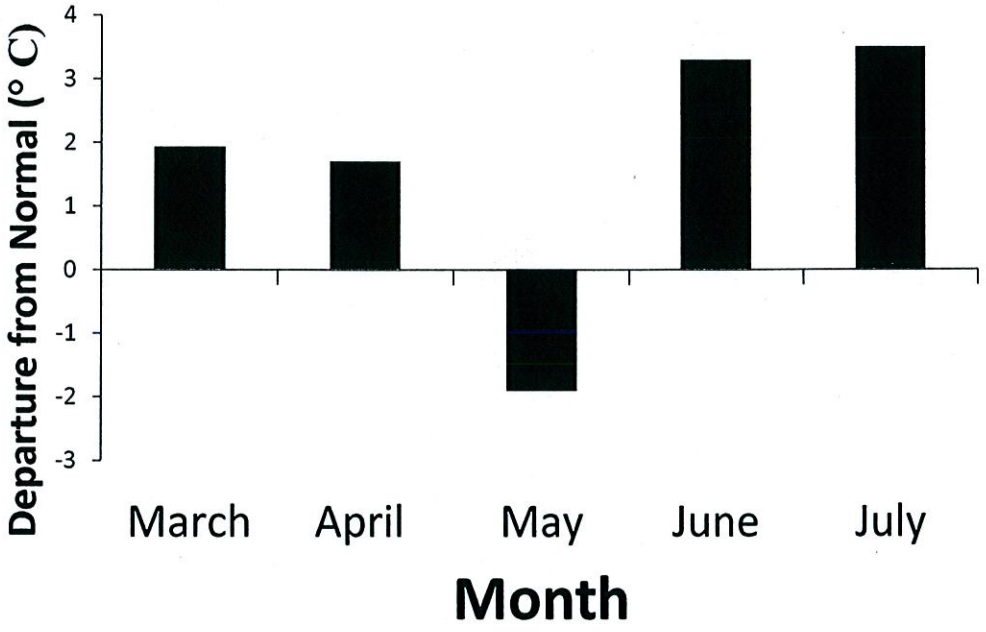

Figure 3. Departure from normal of monthly average temperatures in McCurtain County, Oklahoma from March through July 2011. Standard normals are defined as the mean of a climatological element computed over three consecutive decades, in this case from 1971-2000 from Idabel, OK weather station data (NCDC 2002).

Figure 4. Locations of King Rail breeding territories (yellow stars) identified at Red Slough Wildlife Management Area in May 2011. Classification of breeding territory based on detection of adult King Rail at the site on more than one occasion or detection of an adult pair on at least one occasion.