MIGRATIONAL MOVEMENTS AND HABITAT USAGE OF RAILS IN THE LAKE ERIE MARSH REGION, OHIO

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INTRODUCTION

Little is known about migratory timing and habitat use in Ohio by the secretive wetland birds known as rails. Basic life history information and population data are lacking or incomplete for many rail species because reliable survey techniques to detect and monitor rails have not been developed and implemented (Conway 2005). Management of North American rail species is hampered by this lack of basic life history information (Krementz, *personal communication*).

Rich in hunting tradition of a bygone era, where wild birds were staples in the markets of the country, these species have seen considerable population declines, not due to the market hunters, but because of severe habitat loss and degradation. These wetland obligate species are some of the first that have declined with the vast wetland loss of the past century but also may be responding to the recent increase in wetland restorations across their range. Habitat loss especially the palustrine wetlands of the Midwest has been near 90% (Tiner 1984). Population declines are well documented in Ohio (Anderson et al. 2002) and the southwestern Lake Erie marsh region is considered one of the greatest areas of decline in King Rail (Meanley 1992). Substantial migration habitat exists on national wildlife refuges (Eddleman et al. 1988) and these areas remain of greatest importance for secretive marsh birds.

Rails first begin to arrive in northern Ohio in mid April, though early dates for both the Virginia Rail and Sora are in mid March (Peterjohn 1989). King Rails appear in late April and early May. Rails are believed to be nocturnal migrants traveling singly or in small loose flocks of 5-100 (Melvin and Gibbs 1996, Bent 1926). Spring arrival is dependent on weather and emergent plant growth (Conway 1995).

While little is known about migration habitat, rails appear to prefer sites with tall dense cover, short vegetation, and water depth less than 50 cm (Melvin and Gibbs 1996). The King Rail appears to be the most area sensitive (Meanley 1992) but even the Sora is thought to be found less frequently in small wetlands during migration (Gibbs et al. 1991). Rails occur along a cline defined by flooding duration and water depth (Eddleman et al. 1988) and wetlands that are shallow and have heavy vegetative coverage are of greatest importance (Shaw and Fredine 1956). Complex management strategies already developed to provide waterfowl habitat can also provide considerable value to rails, and small alterations including spring flooding of annual grasses and sedges can improve rail stopover use (Andrews 1973, Rundle and Fredrickson 1981).

Increased knowledge of rail vital rates is necessary for wildlife managers to make informed decisions about habitat management and harvest regulations for rails. In addition, little is known about breeding by this group in Ohio, and a special survey has been developed by the Ohio Division of Wildlife (ODW) to ascertain breeding population trends. A lack of knowledge on migrational timing of rails could adversely affect the results of that survey. While this group of birds has proven to be difficult to observe, let alone count, recent studies along the east coast have developed cost-effective methods to gather adequate sample sizes to identify migrational timing and some habitat preferences.

Specific objectives of this study are: (1) to identify peak migration periods for Virginia Rail, Sora, and King Rail, (2) to gather information on habitat preferences of these species, (3) to better delineate the onset of the breeding cycle, and (4) to assess the potential in development of external methodology to sex rails to improve population demographics. Added resource value will be to educate the bird watching public which highly prize these secretive birds. A better understanding of habitat use and migrational timing in Ohio assist managers in developing habitat management strategies and in setting harvest regulations. This information will also enhance the recreational opportunity for those citizens interested in observing this group of species.

STUDY AREA AND METHODS

Study Area - This study was conducted in the Lake Erie Marsh Region located in the western basin of Lake Erie. Trap sites were located on the Ottawa National Wildlife Refuge (NWR) in Ottawa and Lucas Counties, Ohio (Figure 1). Pilot work conducted in 1999 also utilized trap sites on property of the Winous Point Marsh Conservancy in Ottawa County. A series of habitat types was identified to account for various water depths and vegetative components on the refuge complex (Figure 2). Traps were set along a gradient of water depth and are referred hereafter as: Upland (Ottawa NWR - in Bluejoint Grass [*Calamagrostis canadensis*] and sedge [*Carex spp*.]); 7B (Ottawa NWR - *Carex* sedge and *Juncus*); Sedge (Ottawa NWR - *Carex* and *Scirpus* sedges); Pool 9 (Ottawa NWR - Bluejoint Grass); MS3 King (Ottawa NWR - *Carex* sedges); Wetland (Ottawa NWR - cattail and burreed marsh); Pool 1 (Ottawa NWR - bluejoint and sedge); Navarre (Navarre Unit ONWR - cattail marsh); and Darby (Darby Unit ONWR - smartweed).

Bird capture procedures - Traps were made following the design of Kearns et al. (1998) and were placed in a series of habitats ranging from moist soil to < 25 cm in water depth. Traps included holding cages and where warranted a perimeter screen to reduce predation on captured rails. Playback recordings of Sora (SORA) and Virginia Rail (VIRA) calls were used in all traps based on results of a 2002-04 test which found that play back significantly increased capture rate. Calls alternated between Sora and Virginia Rail in all traps except one especially designed for the King Rail (KIRA). A single sound system accompanied each cloverleaf trap fitted with a 5-10-m long drift fence.

Spring trapping operations began in 2002 and continued through 2008. Field operations were initiated in March as weather conditions allowed and terminated in late May prior to the rails' major nesting season. Fall trapping operations were conducted in 2003-04 on the Ottawa NWR as pilot work for future consideration. Traps were checked each morning within two hours of sunrise. Rails were removed from the holding cage and held in mesh bags for banding. Each rail was weighed (Melvin and Gibbs 1996), fat classed (Helms and Drury 1960), and culmen, tarsus, and middle toe measured. Two secondary feathers were collected for DNA sexing analysis. Each bird was banded with a standard U.S. Fish and Wildlife Service band and the individual trap of capture recorded. Arkansas Cooperative Wildlife Research Unit requested assistance with King Rail work in the Mississippi Flyway with the intention of placing transmitters on King Rails captured to monitor habitat use in the marsh region and to track to the southern wintering grounds.

Sexing - DNA sexing techniques were used to determine the sex of individual birds captured during 2005 and 2006. DNA was extracted from primary feathers using the DNEasy Tissue Kit (Qiagen). PCR was performed using primers that amplify conserved CHD genes, located on the avian sex chromosomes (Griffiths et al. 1998), and PCR products were run on 3.5% agarose gels. Males display a single CHD-Z band, while females display two bands, CHD-Z and an additional CHD-W band (Griffiths et al. 1998). The size of the two bands and the degree of separation between them varies across individual species. DNA analysis was completed in cooperation with The Ohio State University Department of Evolution, Ecology and Organismal Biology.

Telemetry - To assess the effects of tape playback on rail capture, preferred habitats, and habitat use, a method had to be implemented that would reduce the bias induced by attracting the birds to the trap. Based on captures alone, it is not clear whether the birds were actually using the habitat in which they were trapped or if they were attracted to trap location by the playback recordings. This has major ramifications for management of habitat. To investigate that question, six VIRA were auxiliary tagged with a back pack radio in 2008. Literature indicates the use of radios do not influence or affect migration in birds (Powell et al. 1998). Birds were chosen to get a cross view of both spatial and temporal concerns by selecting a variety of individual traps and time of year for radio implementation. Transmitters were model BD-2 from Holofil Systems Ltd. (Carp, Ontario). They weighed 1.8g well below the 3% body weight criteria of the Bird Banding Laboratory and were designed to last 10-20 weeks before battery failure. Attachment used a modified 3 loop thigh harness (Haramis and Kearns 2000). Frequency was in the 164-165 MHZ band and an Advanced Telemetry Systems (Isanti, MN) R4000 scanning receiver with a H-style directional portable hand-held antenna was utilized for tracking. Daily scanning to locate all transmitter marked rails was conducted until all radioed birds left the study area or onset of the nesting season. An intense search was made if the radioed bird remained in the same location more than two days.

Habitat - Vegetation structure was assessed at each trap location for height and density. Water depth and vegetation was measured at the four cardinal directions from the trap at 1, 5 and 10 meters. A more macro scale assessment extending to 100 meters from the trap was made by field personnel.

RESULTS AND DISCUSSION

Bird Capture - Spring migration of rails has been monitored since 2002 on the Ottawa, Navarre, and Darby units of Ottawa NWR. A total of 10 trap sites were utilized during the study. Two were located on the Darby Unit in a vegetated moist soil area and run 2002-03. One trap was operated at Navarre Unit in 2002-04 and 2006-07. This was a deep water marsh site averaging 6 to 20 inches of water in a cattail dominated habitat. Several traps have been run on the main unit of Ottawa since 2003. These traps were located in a variety of water depths from moist soil to 5 inches of surface water. They include a sedge meadow, shallow wetlands, and upland moist soil areas. A total of 979 rails composed of 683 VIRA, 290 SORA, and 6 KIRA has been captured and banded during the seven years (Table 1). Capture numbers for each trap are shown in Table 2 for the study. Virginia Rail has been the primary species captured and relatively consistent over the time of the study in captures per trap night. Sora while much lower in capture has also been consistent on the Ottawa Unit but was much more commonly captured on the Darby Unit than the other sites. King Rails were captured in both 2006 (5 birds) and 2008 (1 bird) in the specialized MS-King trap. While not captured in 2007, at least one bird was observed near the trap. These captures and observations over the last three years suggest that this species consistently occurs on the refuge complex during spring migration.

Minor trapping activity was tried in the fall of 2003-04 on the main unit of Ottawa. Traps were run during September and October with low numbers of rail captures (Table 3). Rails seemed to have less response to the tape playback as compared to spring migration. Birds were captured from 1 September to 24 October.

Sex Determination - In 2005, 21 SORA and 132 VIRA were successfully sexed using DNA sexing techniques. Of the 21 SORA examined, 19 (90%) exhibited two bands and were identified as females and two (10%) exhibited one band and were assumed to be males. Of the 132 VIRA samples, only 8 (6%) appeared to be female and 124 (94%) appeared to be male. A similar pattern was observed in 2006. Nearly all (97%) of the 64 SORA analyzed appeared to be female, while 90% of the 49 VIRA samples appeared to be male. Five KIRA were also analyzed in 2006. All five appear to be males; however, these results should be interpreted with caution because no known-sex reference samples were available and no females were identified. It is, therefore, possible that the King Rail CHD-Z and CHD-W bands are very similar in size and therefore appear as a single band. Overall, these results suggest that the sexes are differentially attracted to the recorded calls, and the response varies among species. It appears that Virginia Rail and King Rail males are attracted at a higher rate than females to the call back tape, while

Sora females are attracted more than males.

Migrational Timing - Spring migrational timing as determined by captures was similar to that reported by Peterjohn (1989). Median VIRA capture dates ranged from as early as 22 April to as late as 6 May. The SORA median dates included 28 April to 10 May. VIRA was more variable in migration timing. Peak capture dates ranged from 3 April to 15 May. SORA peak capture ranged from 20 April to 11 May. These capture data suggest that VIRA has a slightly earlier migration than the SORA. However, the DNA results of this study raises questions on that conclusion as VIRA captures are almost all males while SORA captures are female. If rails are similar to most bird species where the males move 7-10 days before females (Audubon 1842) in migration, the peak for the two species would be identical. This would support (Walkinshaw 1937, Pospichal and Marshall 1954, Kaufmann 1989) conclusions that weather and freeze dates are important to rail migration.

With limited data, little attempt has been made to identify fall migrational timing. Using anecdotal information from hunters and marsh managers as they are active in the marsh at this time, it appears rails begin arriving in late August and continue into October.

Tape Playback Effects - To examine the effects of tape play back, capture rates during 2002-2004 were compared for traps that used a tape playback vs. passive drift traps. Traps with the tape playback showed a much greater capture rate, similar to Kearns et al. (1998) (Figure 3). Soras indicated a lower effect to the tape playback than VIRA (Figure 3), reiterating the findings of Johnson and Dinsmore (1986) that species have different response rates. The use of tape playback has the advantage of increasing sample size of the capture species but may present problems when analyzing habitat use and abundance. For the duration of this study, it was decided to use tape playback and to evaluate the effects on the two primary targeted species. An unanswered question with the tape playback concerns the sex ratios observed in the captures. The origin, sex, and purpose of the calls used on the tape for the two species, and this may explain the difference in sex ratios observed between VIRA and SORA. Had the sex bias been similar between VIRA and SORA, then it would be easy to explain the ratio. However, with most VIRA being male and most SORA being female, there is no obvious biological explanation.

Telemetry - Six VIRA were outfitted with backpack radio transmitters in 2008 to access habitat use, movements, and stopover duration. One bird was believed to have been depredated or lost its radio within two days after attachment. Considerable effort was taken to locate the radio or bird to no avail. Two birds remained throughout the study period well into June and were believed to nest on the refuge. The other three remained in the vicinity of their capture site and had appeared to move on within six days of attachment. From this small sample size, it was determined that we could successfully attach radios to VIRA without affecting behavior. Stopover appears to be less than one week and breeding attempts do occur on the refuge complex. Tracking indicated how secretive these birds are. One radio which had appeared to go stationary was searched out only to result in a live bird that did not flush from its hiding spot until touched by the search antenna. Even then it chose to run to additional cover rather than fly. Habitats used by all transmitted birds during the tracking time frame were characteristic of sedge meadow or very shallow wetlands with considerable dense vegetation. Moist upland vegetation dominated by grasses and forbs appeared just as useful as traditional aquatic grasses and sedges. These transitional habitats during spring cannot be over stated for good rail habitat.

Habitat Use - A continuum of water depth was a focus of trap placement over the course of the study. Darby, the Upland, and Unit 7B trap sites were the driest and were characterized as less than 5 cm of water cover at the beginning of the migration season to dry to moist soil by May. Vertical vegetation structure was considerable throughout the study period. Different results were documented between these two sites with Darby dominated by SORA (60%; Table 2) and the Upland and 7B sites on Ottawa heavily leaning to VIRA (83-85% VIRA) captures. These last two are directly comparable to the other traps on Ottawa and Navarre. Darby may have been affected by its smaller size and under active drawdown of water resources. Vegetation at the Darby site consisted of pioneer wetland plants versus the sedge, *Juncus*, and grasses of the Ottawa sites.

The Sedge and MS-King trap sites had water depths up to 12 cm with a gradual water reduction during the trapping seasons. These sites were not as productive (10-20 birds/season) as the drier sites (28-60 birds/season) and had a closer species ratio (65-72% VIRA) over the study. The Wetland trap site water depth ranged from 5- 15 cm and averaged 60% VIRA over the study. Excellent rail use was noted with an average of 33 captured per season. The deepest trap sites were the Pool 1 site on Ottawa used one year and the Navarre Unit site. The water depth ranged from 15-50 cm through the migration period and was characterized by consistent water level conditions. With small sample size for Pool 1, little can be said about speciation and habitat associations. However, Navarre showed considerable VIRA use (64% of captures) in deeper water conditions. This does not follow some references in the literature (Sayre and Rundle 1984). However if the water extremes are looked at along a gradient it would indicate the SORA does frequent deeper sites with more regularity than the VIRA. Sora was captured at a greater percentage of total capture in traps with deeper water averages (Navarre and Wetland). This follows the literature (Sayre and Rundle 1984) and indicates there may be minor habitat niching of these two common rails.

During fall migration activity seemed to be greater in the sedge meadow and wetland trap sites in 2003-04. However, birds were captured in the very dry Upland trap site indicating activity extending into the old field habitats near wetlands.

Non-target Captures - A surprising number of non target birds along with non avian life forms were captured in various traps during spring and the limited fall operations. Frogs, turtles and snakes were all encountered. Bird life during spring trapping resulted in a Wilson’s Snipe and a Solitary Sandpiper captured in the MS King trap. During fall this trap captured two Swamp Sparrows and two Marsh Wrens. The Pool 1 trap caught a single Swamp Sparrow in addition to its rails in the fall. By far the biggest capture of non rails came in the wetland trap where 101 additional birds were captured. These included Wilson’s Snipe (1), Savannah Sparrow (2), Nelson’s Sharp-tailed Sparrow (1), Song Sparrow (1), Lincoln’s Sparrow (4), Swamp Sparrow (89), Marsh Wren (2), and American Robin (1).

Management Implications - Results from this study have begun to provide insight into habitat needs and timing of migrant rails on the Ottawa NWR. The National Wildlife Refuge system provides a large component of the habitat available for this secretive group of birds (Eddleman et al. 1988), emphasizing the need to maximize management of existing habitat and to identify potential habitat restorations. Results to date of this study indicate extensive use of the upland/wetland interface as well as sedge meadow and marshlands. Many of these habitats are not what would be considered management priorities under normal circumstances. Outlying areas and small parcels can be effectively managed during spring migration for rails. The Lake Erie marsh region can provide considerable habitat for stopover and has been recognized as an area of concern for the KIRA (Meanley 1969, Eddleman et al. 1988). Fine tuning or slight alterations to spring drawdown regimes that will encourage horizontal zonation (Eddleman et al. 1988) and maximum interspersion of fine leaved and robust emergents (Melvin and Gibbs 1996) can have significant value to rails during migration. Gradual drawdown or evaporation will supply adequate moist soil and water interface for feeding proximal to dense cover.

CONCLUSION

Seven years of data have shed light on migrational timing and habitat use of Virginia Rail and Sora in the Lake Erie marshes. This information can be useful to land managers to improve stopover habitat. The value of sedge meadow and the presence of standing vegetation in wet uplands indicates simple management tools that can meet rails migrational needs. Complex management (Andrews 1973) using partial drawdown to concentrate prey and spring flooding of annual grasses and smartweeds will be beneficial for these species.

Additional years of data will further refine peak migration periods, better delineate the onset of the breeding cycle, continue to gather information on habitat preferences of these species, and identify spatial requirements for the species in habitat use. Identification of peak migration and preferred habitats will allow those interested in observing the species improved recreational opportunity to view these birds. Identification of the termination of migration and onset of breeding will be useful to improve survey criteria for breeding population trends presently being conducted and reviewed. DNA analysis has raised interesting questions on sex ratios of captured birds that suggest further investigating. A second data collection method needs to be identified to determine if the captured birds are representative of birds migrating at the time or is indeed affected by bias. Limited King Rail captures has only touched on habitat needs of this species. It appears there is a remnant population on the refuge and should be a priority of land management. Continued cooperation with Mississippi Flyway studies may provide the resources to get a better picture of habitat needs and migrational pathways. Future study objectives will include development of a reliable monitoring technique for population trends.

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Table 1. Total captures and captures/trap night of rails in spring, 2002-2008.

	Year							
	2002	2003	2004	2005	2006	2007	2008	Total
Trap TN	84	99	261	312	372	297	245	1670
VIRA	63	19	93	139	119	94	156	683
VIRA /TN	0.75	0.19	0.36	0.45	0.32	0.32	0.64	0.41
SORA	44	47	72	29	68	9	31	290
SORA /TN	0.52	0.47	0.28	0.09	0.18	0.03	0.13	0.18
KIRA					5	0	1	6
KIRA /TN					0.42	0	0.02	0.05
Total	107	66	165	168	187	103	187	979
Total /TN	1.27	0.67	0.63	0.54	0.50	0.35	0.76	0.59

TN = Trap Night

Table 2. Total rails captured in spring by trap and percentage Virginia Rails, 2002-2008.

Trap	VIRA	SORA	KIRA	Total Rails	Ave./year	%VIRA
Darby	45	68		113	28.3	39.8
Navarre	67	38		105	21.0	63.8
1- Upland	249	51		300	60.0	83.0
2- 7B	91	16		107	35.7	85.0
3- Sedge	77	40		117	19.5	65.8
4- Pool 9	38	0		38	38	100.0
5- MS3-King	38	15	6	59	11.8	71.7
6- Wetland	77	53		130	32.5	59.2
7- Pool 1	1	9		10	10	10.0
Total	683	290	6	979	138.9	70.2

Table 3. Total captures and captures/trap night of rails in fall, 2003-2004

	Year		
	2003	2004	Total
Trap Nights (TN)	54	216	270
VIRA	13	10	23
VIRA/TN	0.24	0.05	0.09
SORA	3	4	7
SORA/TN	0.06	0.02	0.03
Total	16	14	30
Total/TN	0.30	0.06	0.11

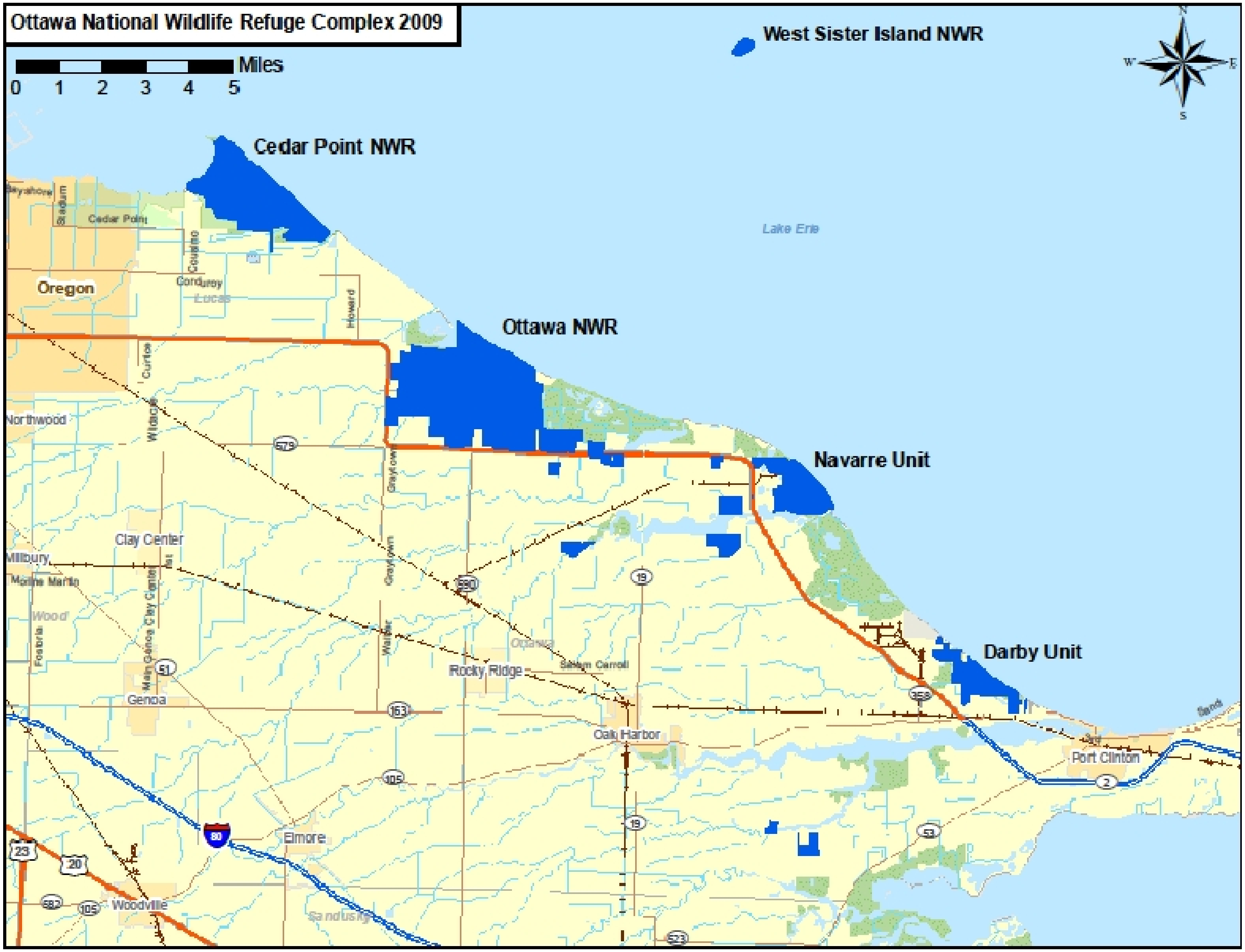

Figure 1. Ottawa National Wildlife Refuge Complex, Ohio.

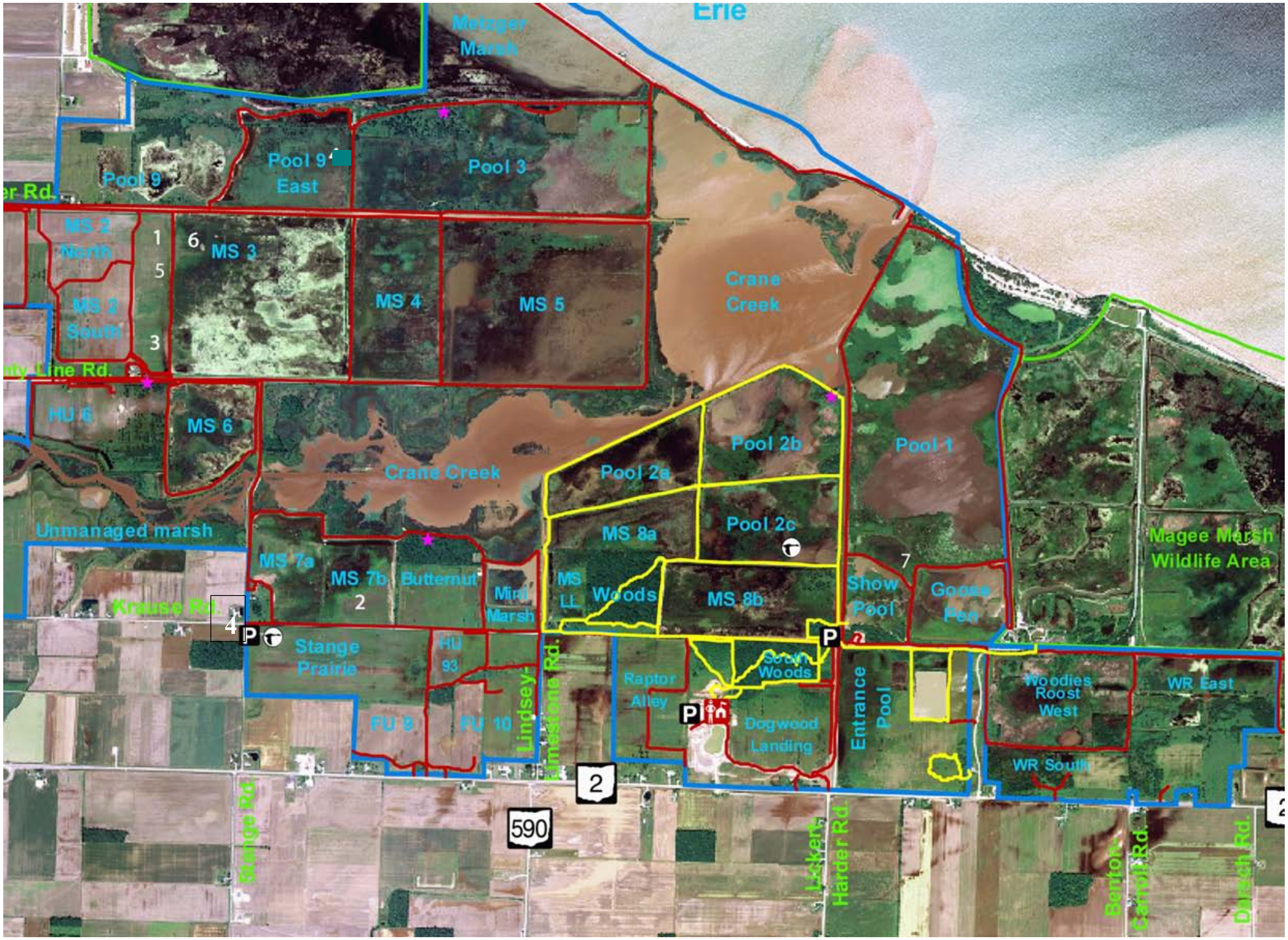

Figure2.Main Unit, Ottawa NWR trap locations, 2002-08.

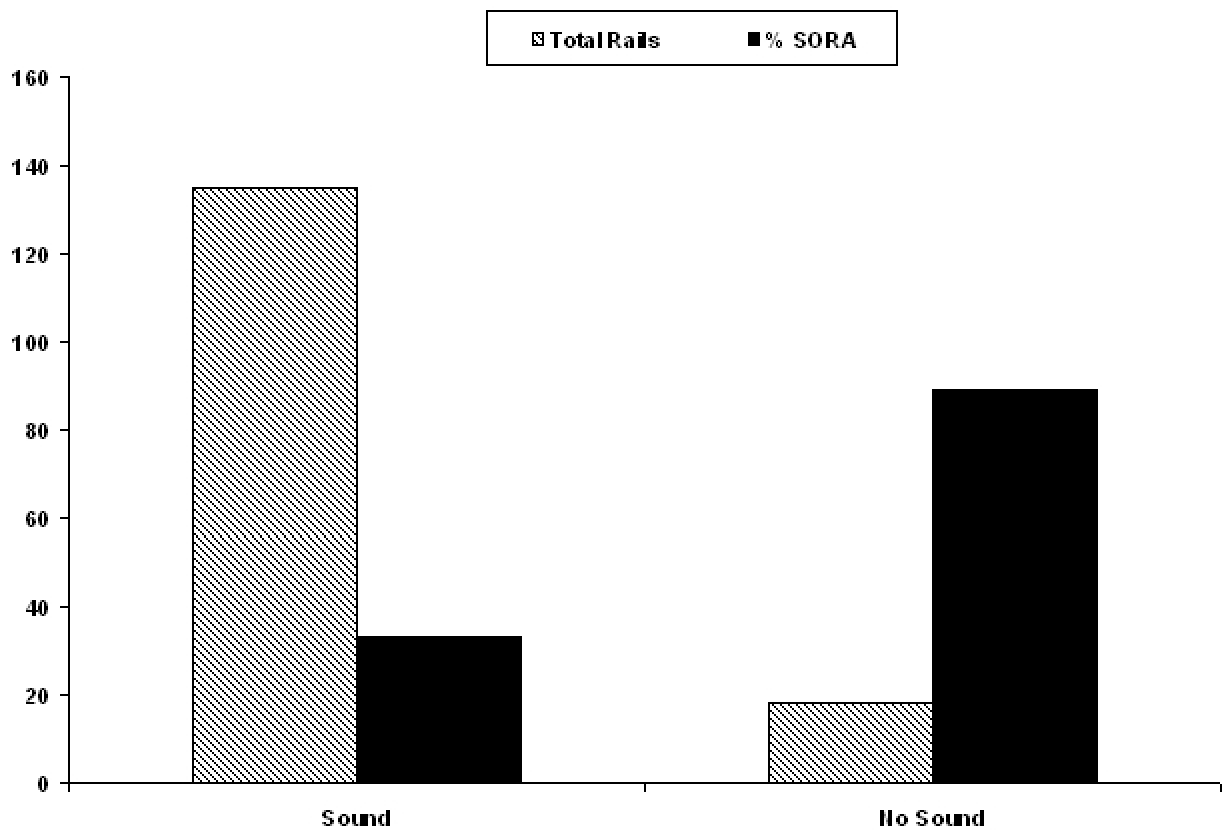

Figure 3. Rail response to tape playback, total rails with and without payback and % of captures Sora , 2003-2004.