2018

Assessment of Black Rail Status in Georgia, Breeding Season 2017 and 2018 Summaries

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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.

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EXECUTIVE SUMMARY

The Black Rail (*Laterallus jamaicensis*) is the most secretive and least understood marsh bird in North America with the Eastern Black Rail (*L. j. jamaicensis*), one of two subspecies that occur here, listed as endangered in six states along the Atlantic Coast and proposed for federal listing under the Endangered Species Act (USFWS–R4–ES–2018–0057, 2018). Black Rails require dense vegetation for cover during all stages of their life cycle. They require wetlands with minimal water coverage during the breeding season. Historic population size for the Eastern subspecies was likely in the tens of thousands (25,000 to 100,000; Delaney and Scott 2002) but is now believed to be in the hundreds to low thousands. Eastern Black Rails breed within three geographic areas within North America including the Atlantic Coast, the Gulf Coast, and the Midwest. The Atlantic Coast has generally been considered to support the largest breeding population throughout the range with pairs mostly confined to the highest elevations within tidal salt marshes. Breeding range along the Atlantic Coast has contracted south more than 450 kilometers and the population is estimated to be declining by 9% annually (Watts 2016). The primary driver of declines over the past three decades is believed to be sea-level rise and associated tidal inundation during the nesting season.

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 Eastern Black Rail status in the state (Burleigh 1938, Greene et al. 1945, Burleigh 1958) indicate that the species was perhaps more common and widespread in previous decades. 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 is also likely reflected in an extremely low population size, a lack of overlap between Black Rails and bird watchers, or both.

Scattered historic occurrences along the outer coast suggested a presence of a potential breeding population (Sykes 2010). The Eastern Black Rail ranks as a species of high conservation concern (GA DNR Wildlife Action Plan 2015) and breeding season surveys ranked as one of the highest conservation action priorities within the plan. The 2016 population estimate for the state (based on available habitat) was 10 to 40 pairs though the uncertainty in this estimate was very high (Watts 2016). The only definitive breeding record in the state comes from Greene County (Sykes 2010), and this site has been the most consistently documented breeding area throughout the state in the past 25 years (Watts 2016).

During the 2017 field season, 409 coastal points were surveyed, and during the 2018 field season 206 points were surveyed. All points surveyed in 2017 were along the outer coast in tidal or impounded wetlands. During the 2018 survey, 141 inland points and 65 coastal points were surveyed. Three rounds of surveys were conducted between 18 April and 17 July 2017 and between 1 May and 15 July 2018. All points were surveyed three times unless there were access issues during one of the survey rounds. A total of 1,827 individual play-back surveys were conducted, 1,213 in 2017, and 614 in 2018. We detected no Black Rails during either season.

BACKGROUND

Context

The Black Rail (*Laterallus jamaicensis*) is the most secretive and least understood marsh bird in North America with the Eastern Black Rail (*L. j. jamaicensis*), one of two subspecies that occur here, listed as endangered in six states along the Atlantic Coast and proposed for federal listing under the Endangered Species Act (USFWS–R4–ES–2018–0057, 2018). Black Rails require dense vegetation for cover during all stages of their life cycle. They require wetlands with minimal water coverage during the breeding season. Historic population size for the Eastern subspecies was likely in the tens of thousands (25,000 to 100,000; Delaney and Scott 2002) but is now believed to be in the hundreds to low thousands. Eastern Black Rails breed within three geographic areas within North America including the Atlantic Coast, the Gulf Coast, and the Midwest. The Atlantic Coast has generally been considered to support the largest breeding population throughout the range with pairs mostly confined to the highest elevations within tidal salt marshes. Breeding range along the Atlantic Coast has contracted south more than 450 kilometers and the population is estimated to be declining by 9% annually (Watts 2016). The primary driver of declines over the past three decades is believed to be sea-level rise and associated tidal inundation during the nesting season.

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 Eastern Black Rail status in the state (Burleigh 1938, Greene et al. 1945, Burleigh 1958) indicate that the species was perhaps more common and widespread in previous decades. As in all states within the breeding range, the lack of status and distribution information is certainly facilitated by this bird's secretive habits, but in Georgia this is also likely reflected in an extremely low population size, a lack of overlap between Black Rails and bird watchers, or both. Historic occurrences of Black Rails in appropriate high marsh or impounded habitats along the outer coast suggest the presence of an undocumented population. The only definitive breeding record in the state comes from Greene County and this site has been the most consistently documented throughout the state over the past 25 years.

The Eastern Black Rail ranks as a species of high conservation concern (GA DNR Wildlife Action Plan 2015) and breeding season surveys ranked as one of the highest conservation action priorities within the plan. The 2016 population estimate for the state (based on available habitat) was 10 to 40 pairs though the uncertainty in this estimate was very high (Watts 2016).

ACTIVITIES and OBJECTIVES

Study Objectives

The overall objective of the 2017-2018 effort is to conduct a broad-scale breeding season assessment of Black Rails in Georgia to:

1) Systematically survey a large sample of potential breeding areas within coastal and interior Georgia wetlands

2) Document status and distribution of the Black Rail within Georgia

3) Resurvey previously occupied locations along the Georgia coast

Statement of Project Activities: 2017-2018

1) Development of a survey frame for 2017-2018 – Center for Conservation Biology staff consulted with biologists from the Georgia DNR, Wildlife Resources Division, Wildlife Conservation Section and the U.S. Fish and Wildlife Service, and developed a sampling frame for the 2017 and 2018 field seasons. The agreed upon focus of 2017 survey efforts included 1) the best examples of high-marsh habitat that were accessible within the outer Coastal Plain, 2) impounded wetlands that were accessible within the outer Coastal Plain, and 3) areas outside of the national wildlife refuges designated for survey by the USFWS. Areas not to be surveyed during the 2017 effort included private impounded marshes and inland impoundments and wetlands. The focus of the 2018 survey frame included 1) marshes and ponds associated with agricultural areas within the inner coastal plain centered on Valdosta, Georgia, 2) a survey of high quality sites along the coast that were not sampled in 2017, and 3) a resurvey of previously occupied sites along the coast (see Appendix I and II for point names, locations, and survey dates from the 2017 and 2018 seasons).

2) Refinement of survey protocol – We reviewed national and state protocols that are in use or have been used to survey for breeding Black Rails. In consultation with USFWS biologists, we adopted a survey protocol for Georgia that is consistent with what has been used previously in Maryland, Virginia, North Carolina and elsewhere. Based on known breeding and migration data from the region (Watts 2016) we targeted probable breeding dates in Georgia as falling between late April and mid-July. We have attached the 2017-2018 protocol used (much of the structure and text taken from the recent USFWS protocol authored by Smith and Wiest) as Appendix III. We used a modified version of the survey protocol along the Georgia coast during the 2017 and 2018 field seasons, surveying these points between a half hour after sunset to a half hour before sunrise (as in Wilson et al. 2009). All boat-based surveys were centered on high tide events and were completed between mid-rising tide and mid-falling tide to aid navigation

in narrow tidal creeks. We used the unmodified Smith and Wiest diurnal survey protocol for 2018 inland points due to the problem of frog calls at freshwater marshes during the night.

3) Selection of survey point pool for 2017-2018 seasons – In 2017, we blocked out geographic areas that were not included in the 2017 USFWS study survey frame and then used satellite imagery and previous site visits to select accessible marshes that might have suitable habitat including patches of tidal high marsh and shallowly flooded areas of impoundments. Potential survey points were placed on the landscape and a database of point coordinates was created. The point dataset was examined for natural clusters to improve sampling efficiency. Outlier points were excluded from the survey pool.

   For the 2018 inland Rail surveys, we created an inland study grid centered on Valdosta, Georgia, and created points based on non-ephemeral water features observed on satellite imagery. We visited all of these potential points (a pool of just over 270 points) and sampled a subset of the "best" quality points (141 total inland points surveyed). We chose this subset of points based on availability of water features and vegetation that appeared suitable for breeding Black Rails. For the 2018 coastal surveys, we selected high quality coastal habitat that was not surveyed during the 2017 field season as well as points in close proximity to historic detections of Black Rails in Georgia.

   The final pool included over 500 points in 2017, and over 300 points in 2018.

4) Ground truthing and selecting survey pool – Between 440 and 480 of the 2017 points and roughly 300 points of the 2018 points were visited to assess suitability and accessibility. Georgia DNR staff assisted with point layout at Altamaha Waterfowl Management Area. Points that fell on private lands that could not be accessed efficiently or that lacked safe pull-off areas were excluded from the final set of survey points. The final survey set covered during the 2017 field season included 409 points (See Appendix I). The final set of points surveyed during the 2018 field season was 206, including 141 inland points centered on Valdosta, GA and 65 points along the Outer Coastal Plain (See Appendix II).

5) Training field technicians – Field technicians for the 2017 and 2018 Georgia Black Rail survey projects were trained in mid to late April on survey protocols and all aspects of the field study. We utilized housing at Altama WMA for the week-long training of technicians in both years. Field training took place at the Altamaha WMA in both 2017 and 2018.

6) Conducting surveys for Black Rails –Three rounds of surveys were conducted between 18 April and 17 July 2017 and between 1 May and 15 July 2018. Round 1 was conducted between 18 April and 19 May 2017 and between 1 May and 31 May 2018. Round 2 was conducted between 20 May to 18 June 2017, and between 31 May and 21 June 2018. Round 3 was conducted between 19 June and 17 July 2017, and between 22 June and 15 July 2018.

RESULTS

2017 and 2018 Breeding Season Surveys

During the 2017 field season, 409 coastal points were surveyed, and during the 2018 field season 206 points were surveyed (Figure 1). All points surveyed in 2017 were along the outer coast in tidal or impounded wetlands (Figures 2-3). During the 2018 field season, 141 inland points and 65 coastal points were surveyed (Figures 4-6). Three rounds of surveys were conducted between 18 April and 17 July 2017 and between 1 May and 15 July 2018. All points were surveyed three times unless access issues prevented us from surveying during one of the survey rounds. We conducted a total of 1,827 individual play-back surveys, 1,213 in 2017 and 614 in 2018. We detected no Black Rails during either field season.

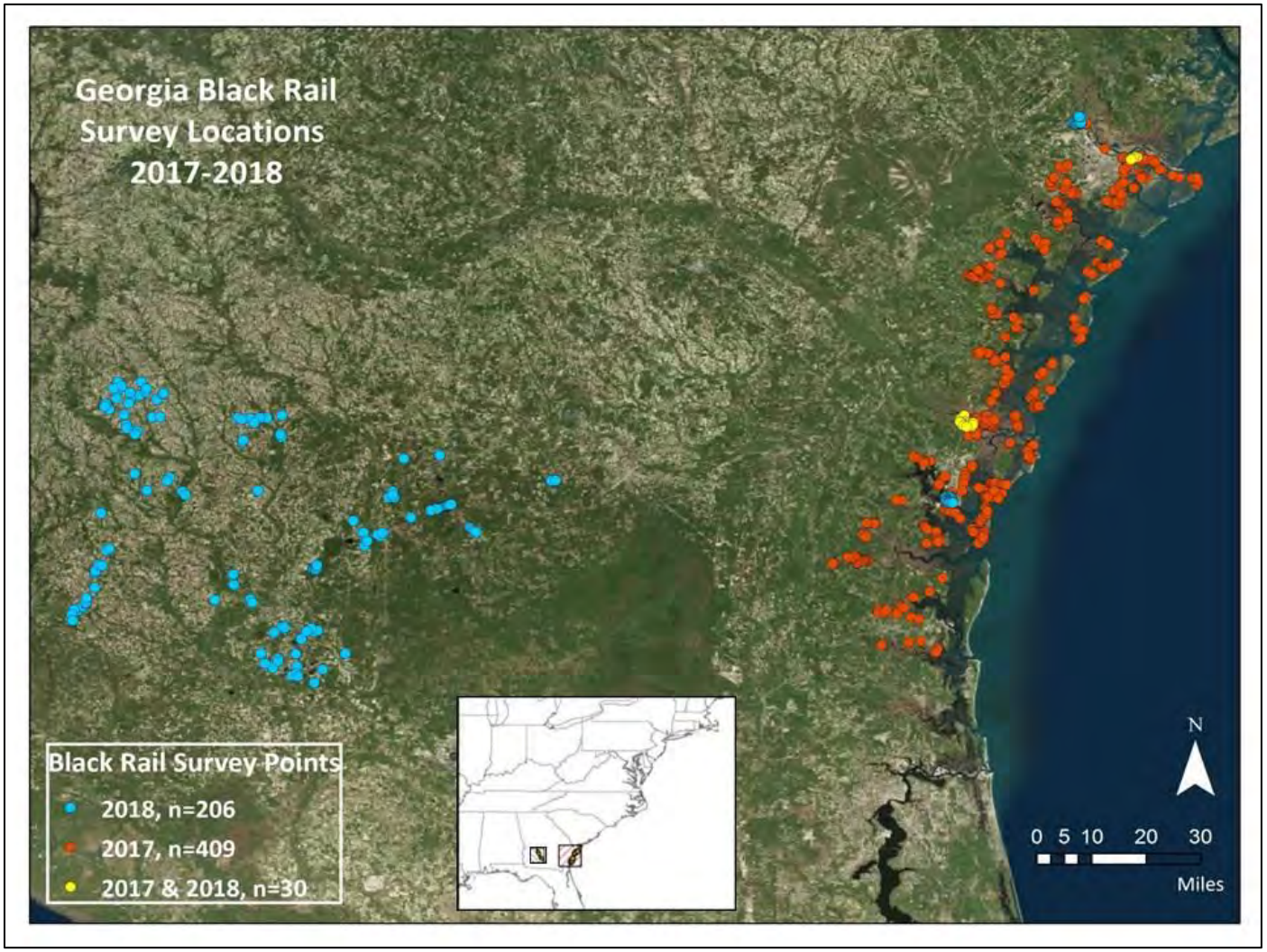

Figure 1. Location of all Black Rail surveys in Georgia during the 2017 and 2018 seasons.

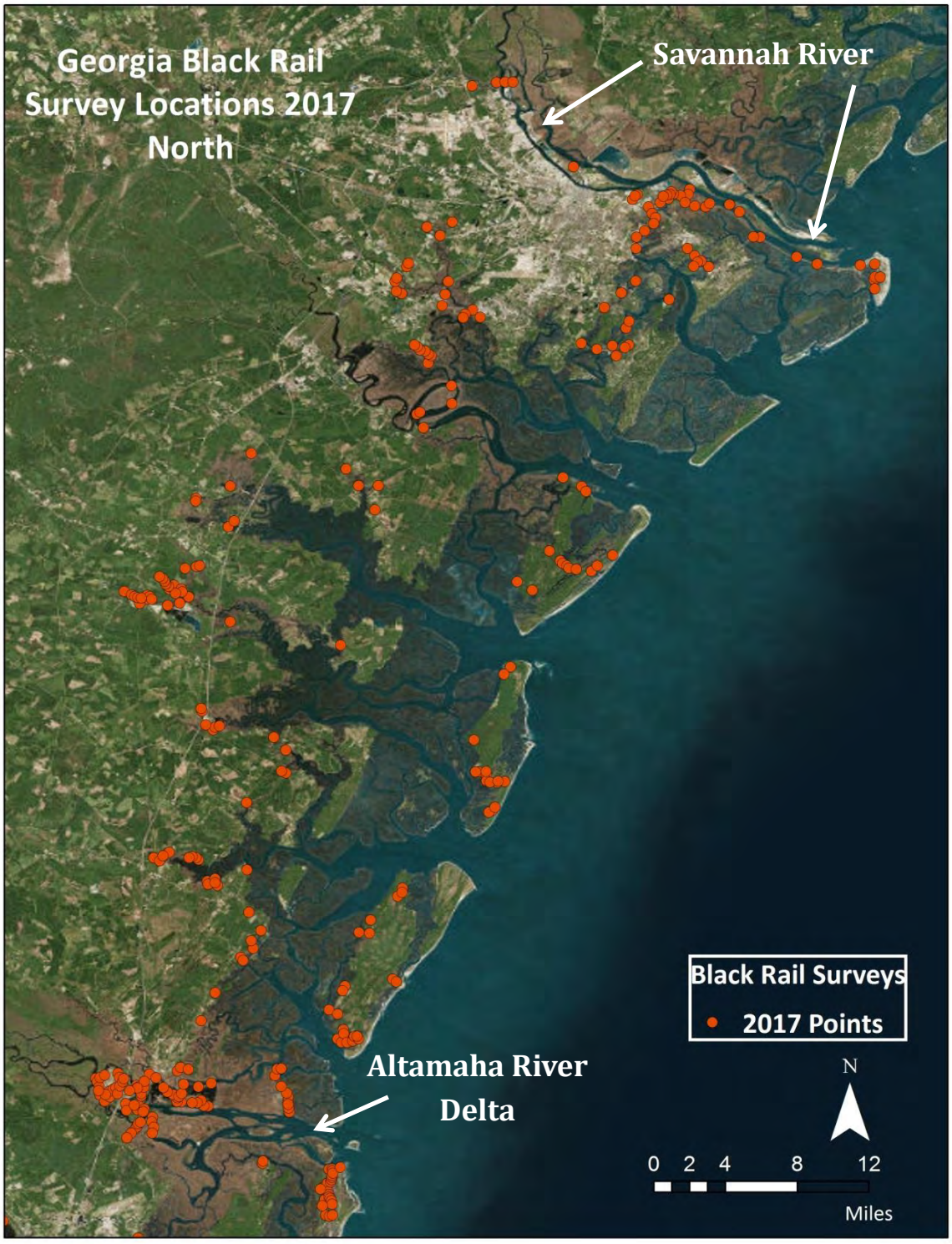

Figure 2. Georgia Black Rail survey points from 2017 season. Northern coastal points from the Savannah River to the Altamaha River Delta.

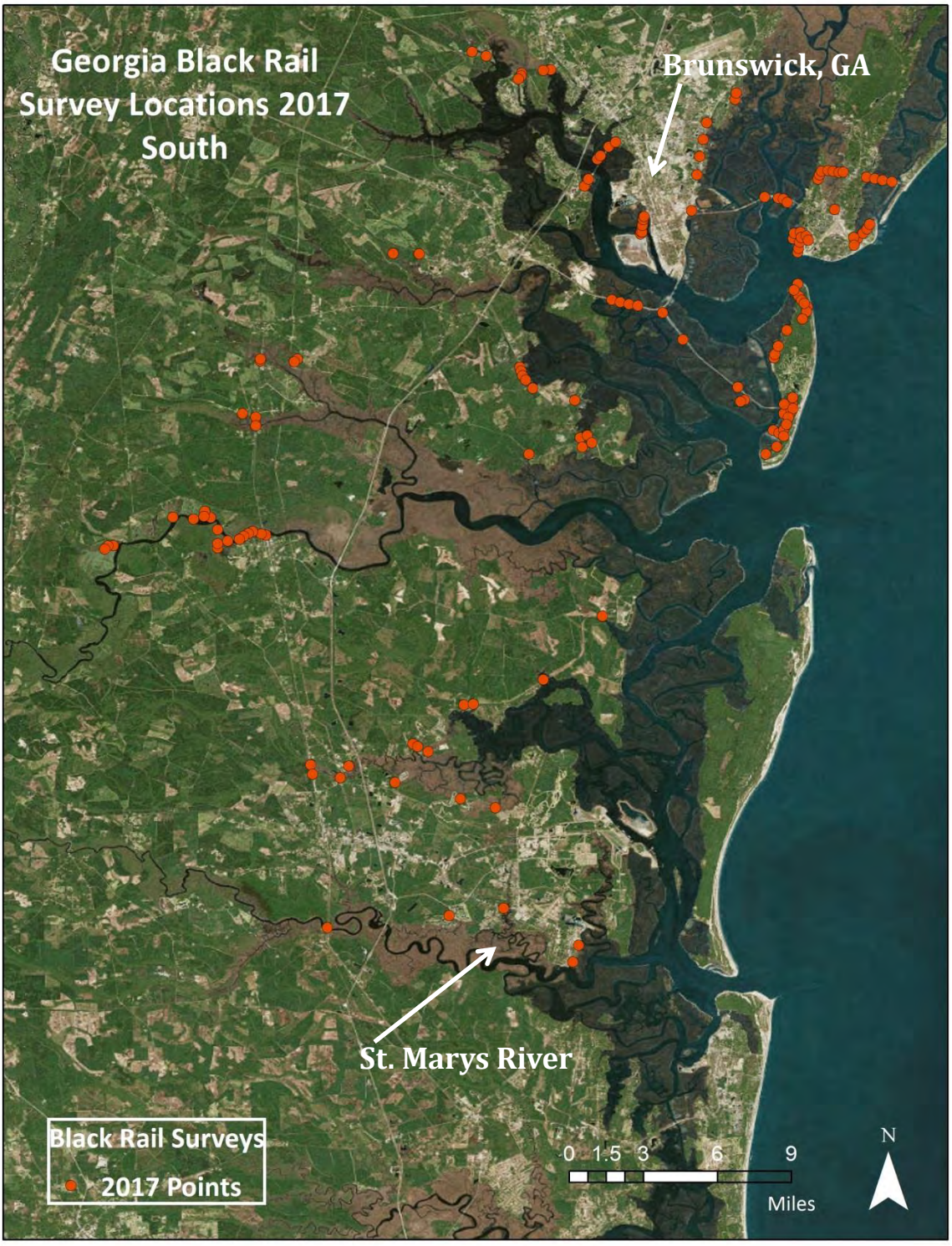

Figure 3. Georgia Black Rail survey points from 2017 season. Southern coastal points from Brunswick, Georgia to the St. Marys River.

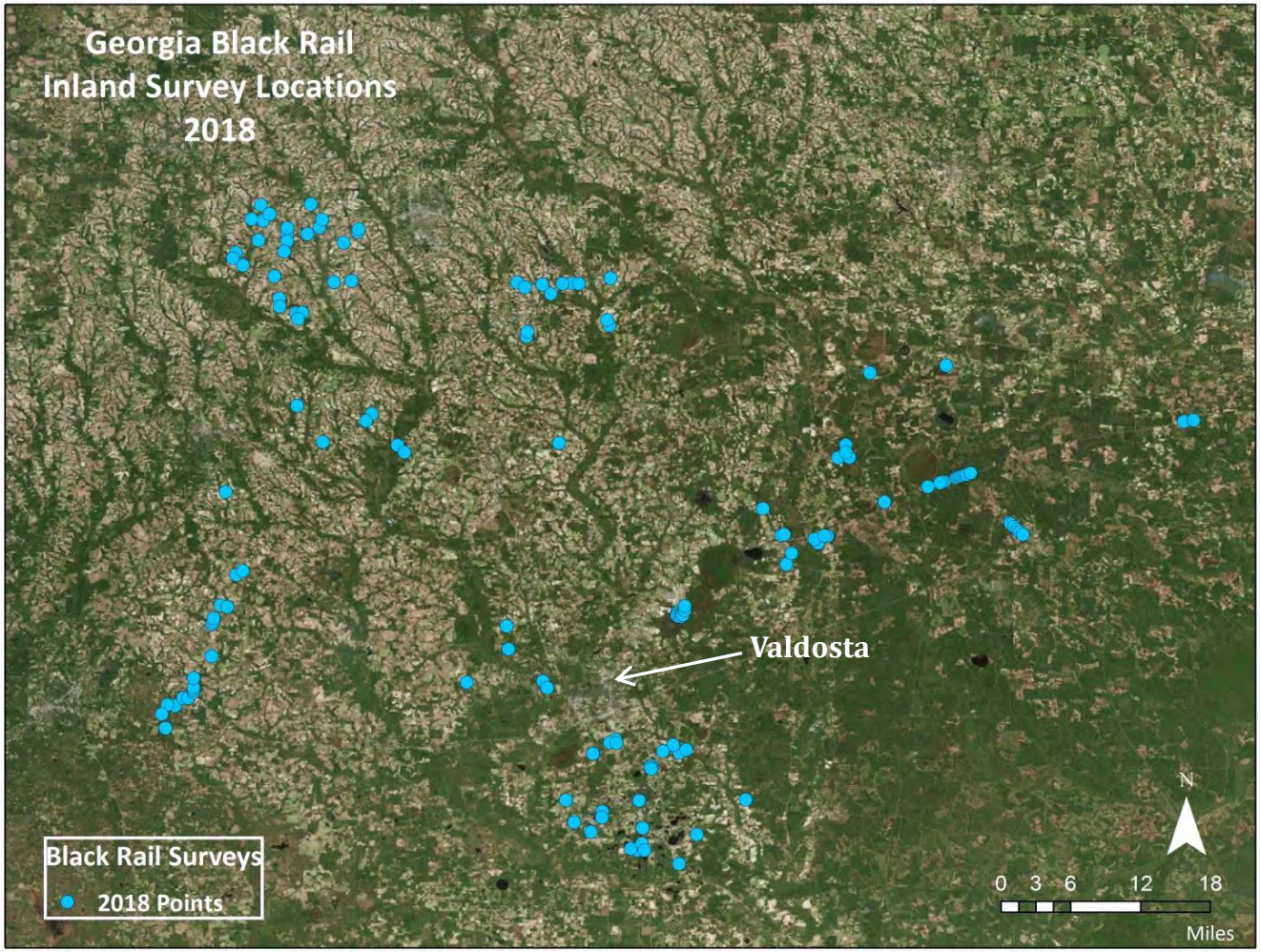

Figure 4. Georgia Black Rail survey points from 2018 season. Inland points located centered on the Valdosta, Georgia area.

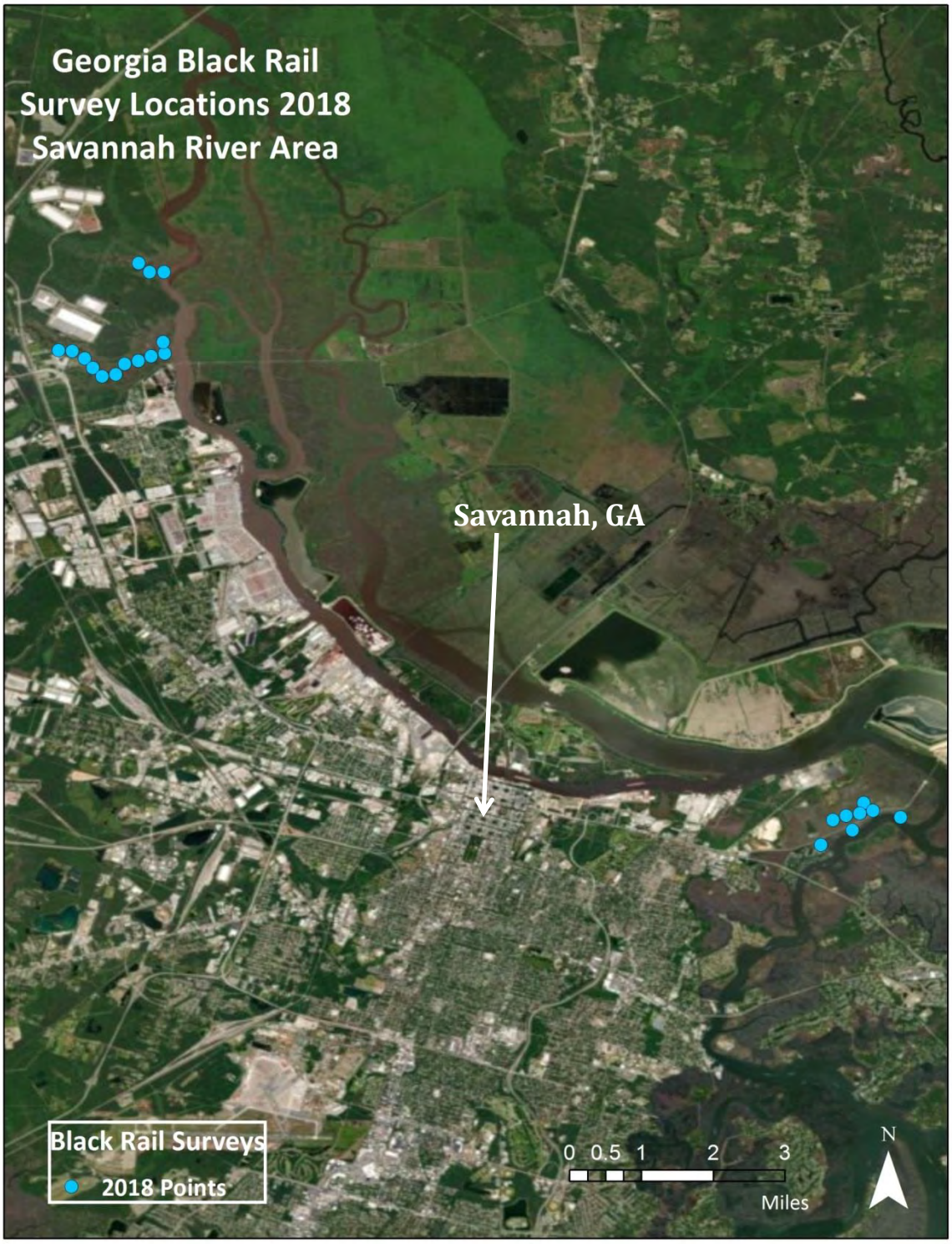

Figure 5. Georgia Black Rail survey points from 2018 season. Points located in the Savannah River area.

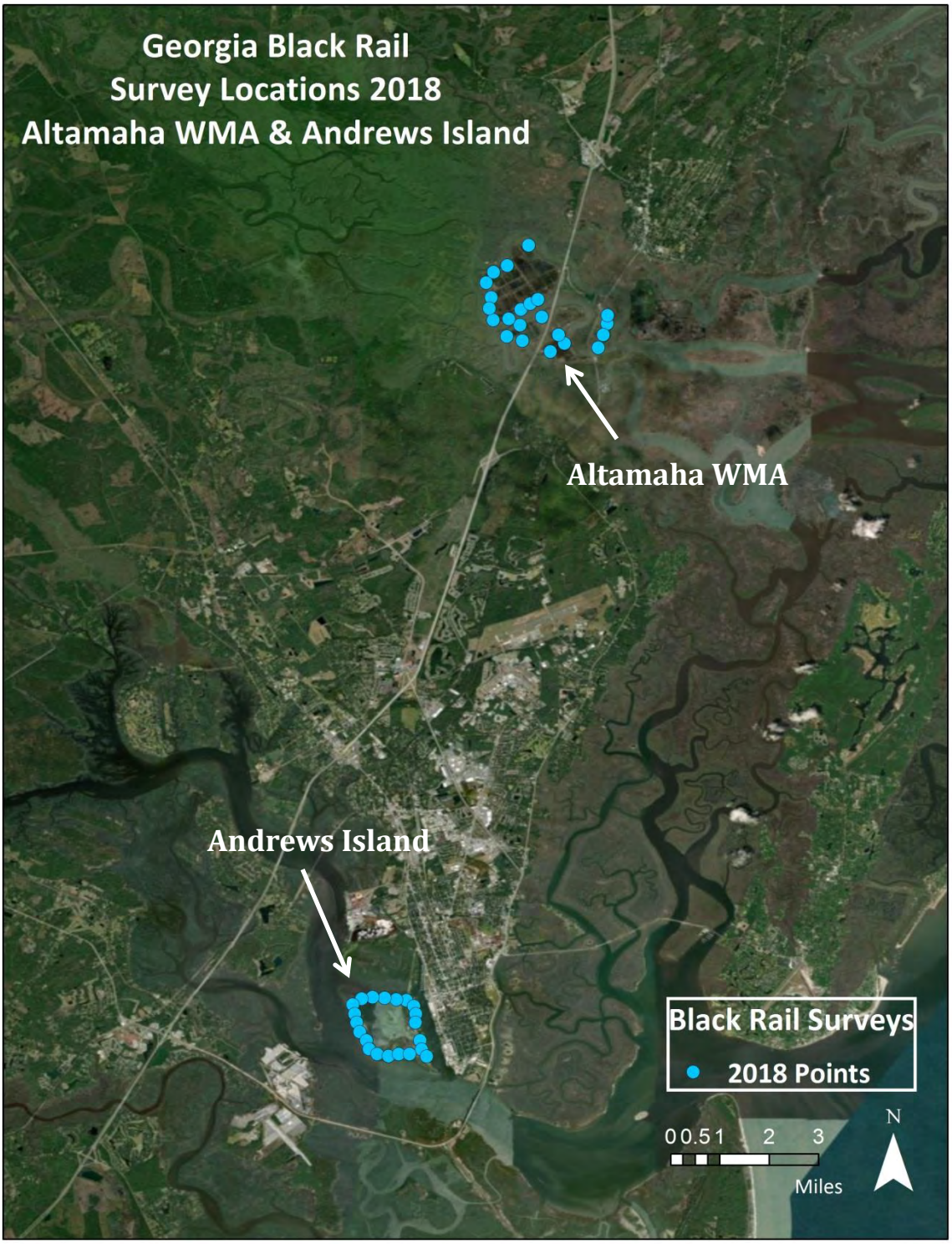

Figure 6. Georgia Black Rail survey points from 2018 season. Coastal points in the Altamaha Waterfowl Management Area and the Andrews Island dredge spoil site.

DISCUSSION and PROJECT OUTCOMES

The Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) may be the most imperiled bird species along the Atlantic Coast. Black Rail populations have been declining in the eastern United States for over a century resulting in a retraction of its breeding range, an overall reduction in the number of breeding locations within its core range, and a loss of individuals within historic strongholds (Eddleman et al. 1994, Watts 2016, Wilson et al. 2015). In the mid-Atlantic region, systematic surveys show that populations have also undergone a more abrupt decline and have disappeared from 85% of their known breeding locations since 1992 (Wilson et al. 2007, Wilson et al. 2015). Black Rails now breed in only a dozen or fewer locations per state within its Eastern breeding range and have reached dangerously low levels. It may be unlikely that Black Rails will persist along large portions of the Atlantic Coast without timely and appropriate conservation actions. The reasons for the recent decline of Black Rails are unknown but are thought to be driven by a combination of sea-level rise and nest inundation. The Black Rail will also breed in freshwater wetlands, though the status and distribution of this population remains poorly understood range-wide east of the Mississippi River (Eddleman et al. 1994, Watts 2016).

Prior to the surveys conducted in Georgia during the 2017 and 2018 seasons, there had never been a large-scale systematic survey for Black Rails in Georgia. Historically, there has been only one confirmed breeding season record in the interior of Georgia and a handful of probable breeding records along the Atlantic Coastal Plain (Sykes 2010, Watts 2016). Populations in Florida and South Carolina likely represent the largest and most stable populations respectively of Black Rails on the south-Atlantic coast (Watts 2016). This bird is a high priority species in the State Wildlife Action Plan (GA DNR 2015), and surveys to examine the status of the bird within the state were identified as being of the “highest priority for action”. We expected Georgia to support a small population of breeding pairs based on its geography in relation to the surrounding populations and the amount of tidal salt marsh and impoundments available, though none were detected during the 2017 and 2018 surveys. In recent years GA DNR staff conducted targeted surveys within high quality coastal habitats but had no detections (Schneider pers. comm.).

There are several historic detections of Black Rails along the coast (St. Marys, Georgia in Camden County and Andrews Island dredge spoil site in Glynn County) during the Georgia breeding bird atlas (Sykes 2010). Those sites were re-surveyed during the 2017-2018 seasons. It is possible that there may have been a historic breeding population of Black Rails on the coast (Sykes 2010) but there is no evidence of any breeding activity within coastal habitats in recent years. The only known breeding location in Greene County (occupied as recently as 2016, Watts 2016 per Sykes) was altered in recent years and no longer has habitat to support breeding birds (Schneider pers. comm.). We surveyed a substantial number of freshwater wetlands centered on Valdosta Georgia during the 2018 season and had no detections. The habitats surveyed had several superficial similarities to occupied sites from the historic and recent records. The underlying factors driving presence/absence of the species in wetlands away from coastal marshes remains unknown.

The impoundments of the Altamaha Waterfowl Management Area appear to have the best habitat available for potential management for breeding Black Rails along the coast. A recent record of Black Rail in Georgia was reported by Willis in April 2013 from the Altamaha WMA (Watts 2016 per Schneider). The marshes within Butler Island, Champney Island, and Rhett's Island are primarily managed for waterfowl. Management strategy in any individual impoundment (i.e. water levels, vegetation composition and density goals) vary year to year. Occupied impoundments in nearby states maintain low water levels and manage for dense vegetation throughout the breeding season. Beaton reported three Black Rails calling on 7 June, 1999 from the Altamaha WMA (Davis 1999). The water levels and vegetation density of the impoundments where these detections occurred is unknown. The efforts of GA DNR staff to manage the impoundment water levels in spring/summer 2018 were severely impacted by Hurricane Irma. The dike breaches caused by the storm created several impoundment cells that had low water levels compared to the 2017 survey season, theoretically improving nesting Black Rail habitat. The moist soil units in Butler Island and Champney Island held the best superficial habitat structure of any of the impoundments during this two-year project but no birds were detected in the site in either year. It is possible that with intense management of one or more large impounded areas that Black Rails could be drawn into the site and become a regular breeding bird within the state.

ACKNOWLEDGMENTS

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APPENDICES

APPENDIX I. TABLE WITH ALL POINTS SURVEYED DURING 2017 BLACK RAIL SEASON, LATITUDE AND LONGITUDE (IN DECIMAL DEGREES), AND SURVEY ROUND DATES.

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-001	31.19328055	-81.52925875	4/25/2017	5/25/2017	6/30/2017
GA-2017-002	31.19519419	-81.52750926	4/25/2017	5/25/2017	6/24/2017
GA-2017-007	31.20045902	-81.52275152	4/25/2017	5/25/2017	6/30/2017
GA-2017-008	31.11062758	-81.52092477	5/7/2017	6/8/2017	6/24/2017
GA-2017-009	31.20328610	-81.51869343	4/25/2017	5/25/2017	6/30/2017
GA-2017-010	31.10940342	-81.51582638	5/7/2017	6/8/2017	6/24/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-012	31.10808899	-81.51074558	5/7/2017	6/8/2017	6/24/2017
GA-2017-019	31.10731625	-81.50552615	5/7/2017	5/26/2017	6/24/2017
GA-2017-020	31.14935000	-81.50399000	4/25/2017	6/13/2017	7/8/2017
GA-2017-022	31.15219000	-81.50323000	4/25/2017	6/13/2017	7/8/2017
GA-2017-025	31.15443000	-81.50291000	4/25/2017	6/13/2017	7/8/2017
GA-2017-026	31.15775000	-81.50233000	4/25/2017	6/13/2017	7/8/2017
GA-2017-027	31.15964000	-81.50200000	4/25/2017	6/13/2017	7/8/2017
GA-2017-028	31.10316669	-81.49096970	5/17/2017	6/8/2017	6/24/2017
GA-2017-029	31.36102631	-81.48181769	4/27/2017	5/29/2017	7/5/2017
GA-2017-030	31.35838706	-81.48071340	4/27/2017	5/29/2017	7/5/2017
GA-2017-032	31.35406430	-81.47915558	4/27/2017	5/29/2017	7/5/2017
GA-2017-033	31.08745456	-81.47910239	5/17/2017	6/8/2017	6/24/2017
GA-2017-034	31.34746229	-81.47858122	4/27/2017	5/29/2017	7/5/2017
GA-2017-035	31.36153634	-81.47854477	4/27/2017	5/29/2017	7/5/2017
GA-2017-037	31.34267012	-81.47461689	4/30/2017	5/28/2017	7/2/2017
GA-2017-038	31.36344379	-81.47457690	4/27/2017	5/29/2017	7/5/2017
GA-2017-042	31.34603801	-81.47077669	4/30/2017	5/28/2017	7/5/2017
GA-2017-043	31.35060046	-81.47054699	4/27/2017	5/29/2017	7/5/2017
GA-2017-046	31.36941262	-81.46821765	4/27/2017	5/29/2017	7/5/2017
GA-2017-048	31.35221899	-81.46781350	4/27/2017	5/29/2017	7/5/2017
GA-2017-051	31.35350337	-81.46550674	4/27/2017	5/29/2017	7/5/2017
GA-2017-053	31.34840677	-81.46432939	4/30/2017	5/28/2017	7/5/2017
GA-2017-054	31.36516429	-81.46411359	4/27/2017	5/28/2017	7/5/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-055	31.36155725	-81.46266189	4/27/2017	5/28/2017	7/5/2017
GA-2017-056	31.35477218	-81.46253364	4/27/2017	5/29/2017	7/5/2017
GA-2017-057	31.35812028	-81.46017747	4/27/2017	5/29/2017	7/5/2017
GA-2017-059	31.36074810	-81.45946451	4/27/2017	5/29/2017	7/5/2017
GA-2017-061	31.34057008	-81.45776366	4/30/2017	5/28/2017	7/2/2017
GA-2017-062	31.33514390	-81.45698941	4/30/2017	5/28/2017	7/2/2017
GA-2017-067	31.32000787	-81.45030895	4/25/2017	5/25/2017	6/20/2017
GA-2017-070	31.32188863	-81.44862060	4/25/2017	5/25/2017	6/20/2017
GA-2017-071	31.33547479	-81.44827958	4/25/2017	5/25/2017	6/20/2017
GA-2017-072	31.32431967	-81.44786404	4/25/2017	5/25/2017	6/20/2017
GA-2017-073	31.33932657	-81.44776424	4/30/2017	5/28/2017	7/2/2017
GA-2017-075	31.35441596	-81.44660859	4/25/2017	5/25/2017	6/20/2017
GA-2017-079	31.34647696	-81.44520532	4/30/2017	5/28/2017	7/2/2017
GA-2017-080	31.34875771	-81.44512256	4/30/2017	5/28/2017	7/2/2017
GA-2017-086	31.35370676	-81.44315525	4/30/2017	5/28/2017	7/2/2017
GA-2017-105	31.03416594	-81.42604418	5/17/2017	6/8/2017	6/26/2017
GA-2017-106	31.07658088	-81.42571800	5/16/2017	6/10/2017	6/26/2017
GA-2017-108	31.07873668	-81.42523525	5/16/2017	6/10/2017	6/26/2017
GA-2017-111	31.02469633	-81.42395143	5/17/2017	6/8/2017	6/26/2017
GA-2017-115	31.08357640	-81.42304826	5/16/2017	6/10/2017	6/26/2017
GA-2017-118	31.03257864	-81.42260965	5/17/2017	6/8/2017	6/26/2017
GA-2017-122	31.03437687	-81.41981605	5/17/2017	6/8/2017	6/26/2017
GA-2017-127	31.09292368	-81.41817545	5/16/2017	6/10/2017	6/26/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-129	31.04532918	-81.41551782	5/16/2017	6/8/2017	6/26/2017
GA-2017-131	31.36688951	-81.41595484	4/25/2017	5/25/2017	6/20/2017
GA-2017-132	31.04991800	-81.41485476	5/16/2017	6/10/2017	6/26/2017
GA-2017-134	31.05327996	-81.41461221	5/16/2017	6/10/2017	6/26/2017
GA-2017-137	31.36987400	-81.41355767	4/25/2017	5/25/2017	6/20/2017
GA-2017-150	31.36833816	-81.40720357	4/25/2017	5/25/2017	6/20/2017
GA-2017-159	31.18154549	-81.39975414	4/26/2017	6/6/2017	6/24/2017
GA-2017-161	31.18394226	-81.39898194	4/26/2017	6/6/2017	6/24/2017
GA-2017-165	31.18621093	-81.39783576	4/26/2017	6/6/2017	6/24/2017
GA-2017-168	31.40755391	-81.39697839	5/7/2017	5/25/2017	6/27/2017
GA-2017-173	31.18655564	-81.39395616	4/26/2017	6/6/2017	6/24/2017
GA-2017-177	31.52033914	-81.39172332	5/11/2017	5/27/2017	7/1/2017
GA-2017-179	31.18605871	-81.39095970	4/26/2017	6/6/2017	6/24/2017
GA-2017-184	31.51913731	-81.38832922	5/11/2017	5/27/2017	7/1/2017
GA-2017-186	31.18542782	-81.38748266	4/26/2017	6/13/2017	6/24/2017
GA-2017-189	31.43008545	-81.38564537	5/7/2017	5/25/2017	6/27/2017
GA-2017-201	31.14970135	-81.37340742	4/26/2017	6/13/2017	6/24/2017
GA-2017-202	31.18257581	-81.37122961	4/26/2017	6/13/2017	7/16/2017
GA-2017-203	31.15218036	-81.37095582	4/26/2017	6/13/2017	6/24/2017
GA-2017-205	31.18169986	-81.36633642	4/26/2017	6/13/2017	7/16/2017
GA-2017-206	31.45858974	-81.36487659	5/7/2017	5/25/2017	6/27/2017
GA-2017-207	31.45627816	-81.36304120	5/7/2017	5/25/2017	6/27/2017
GA-2017-208	31.18089543	-81.36187477	4/26/2017	6/13/2017	7/16/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-209	31.52925821	-81.35996249	5/7/2017	6/6/2017	6/27/2017
GA-2017-210	31.17993695	-81.35649036	4/26/2017	6/13/2017	7/16/2017
GA-2017-215	31.48029651	-81.34846023	5/7/2017	6/6/2017	6/27/2017
GA-2017-245	31.26104445	-81.29809305	5/8/2017	6/9/2017	7/9/2017
GA-2017-247	31.26321057	-81.29695517	5/8/2017	6/9/2017	7/9/2017
GA-2017-248	31.27247000	-81.29636000	5/8/2017	6/9/2017	7/9/2017
GA-2017-249	31.27075000	-81.29608000	5/8/2017	6/9/2017	7/9/2017
GA-2017-250	31.27433000	-81.29595000	5/8/2017	6/9/2017	7/9/2017
GA-2017-251	31.25043000	-81.29593000	5/8/2017	6/9/2017	7/9/2017
GA-2017-254	31.27643000	-81.29482000	5/8/2017	6/9/2017	7/9/2017
GA-2017-256	31.26937000	-81.29417000	5/8/2017	6/9/2017	7/9/2017
GA-2017-257	31.28755108	-81.29370337	5/8/2017	6/9/2017	7/9/2017
GA-2017-260	31.26707000	-81.29359000	5/8/2017	6/9/2017	7/9/2017
GA-2017-261	31.41636448	-81.29352173	5/5/2017	6/1/2017	7/11/2017
GA-2017-262	31.26544000	-81.29347000	5/8/2017	6/9/2017	7/9/2017
GA-2017-263	31.24961073	-81.29322089	5/8/2017	6/9/2017	7/9/2017
GA-2017-264	31.26393000	-81.29248000	5/8/2017	6/9/2017	7/9/2017
GA-2017-265	31.27738000	-81.29217000	5/8/2017	6/9/2017	7/9/2017
GA-2017-266	31.26227000	-81.29176000	5/8/2017	6/9/2017	7/9/2017
GA-2017-267	31.27910000	-81.29159000	5/8/2017	6/9/2017	7/9/2017
GA-2017-268	31.28094000	-81.29127000	5/8/2017	6/9/2017	7/9/2017
GA-2017-269	31.28272000	-81.29102000	5/8/2017	6/9/2017	7/9/2017
GA-2017-270	31.25946000	-81.29101000	5/8/2017	6/9/2017	7/9/2017

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GA-2017-271	31.28804000	-81.29090000	5/8/2017	6/9/2017	7/9/2017
GA-2017-272	31.25055621	-81.29071400	5/8/2017	6/9/2017	7/9/2017
GA-2017-273	31.28619000	-81.29068000	5/8/2017	6/9/2017	7/9/2017
GA-2017-274	31.28444000	-81.29031000	5/8/2017	6/9/2017	7/9/2017
GA-2017-280	31.41281229	-81.28657240	5/5/2017	6/1/2017	7/11/2017
GA-2017-281	31.39270387	-81.28650011	5/5/2017	6/1/2017	7/11/2017
GA-2017-283	31.28901784	-81.28432894	5/8/2017	6/9/2017	7/9/2017
GA-2017-284	31.39010186	-81.28338308	5/5/2017	6/1/2017	7/11/2017
GA-2017-285	31.40027421	-81.28178640	5/5/2017	6/1/2017	7/11/2017
GA-2017-286	31.39722269	-81.28166423	5/5/2017	6/1/2017	7/11/2017
GA-2017-287	31.43546383	-81.28073372	5/5/2017	6/1/2017	7/11/2017
GA-2017-288	31.38994526	-81.27923945	5/5/2017	6/1/2017	7/11/2017
GA-2017-290	31.39106703	-81.27430134	5/5/2017	6/1/2017	7/11/2017
GA-2017-293	31.39482497	-81.27311529	5/5/2017	6/1/2017	7/11/2017
GA-2017-296	31.39287369	-81.26970926	5/5/2017	6/1/2017	7/11/2017
GA-2017-297	31.44101261	-81.24201266	5/5/2017	6/1/2017	7/11/2017
GA-2017-298	31.43882224	-81.23907779	5/5/2017	6/1/2017	7/11/2017
GA-2017-299	31.50810497	-81.23789239	5/5/2017	6/1/2017	7/11/2017
GA-2017-300	31.51462461	-81.23427265	5/5/2017	6/1/2017	7/11/2017
GA-2017-304	31.60855732	-81.17265168	5/15/2017	No Survey	7/13/2017
GA-2017-307	31.60588719	-81.16638980	5/15/2017	No Survey	7/13/2017
GA-2017-308	31.60141200	-81.16627200	5/15/2017	No Survey	7/13/2017
GA-2017-310	31.59984000	-81.15767300	5/15/2017	No Survey	7/13/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-312	31.60053268	-81.15149866	5/15/2017	No Survey	7/13/2017
GA-2017-313	31.76210592	-81.14147960	5/2/2017	6/3/2017	6/28/2017
GA-2017-314	31.75519538	-81.12934654	5/2/2017	6/3/2017	6/28/2017
GA-2017-315	31.78695607	-81.11564148	5/2/2017	6/3/2017	6/28/2017
GA-2017-317	31.77908733	-81.10662921	5/2/2017	6/3/2017	6/28/2017
GA-2017-318	31.77683938	-81.10475897	5/2/2017	6/3/2017	6/28/2017
GA-2017-319	31.84616186	-81.10440118	5/2/2017	6/3/2017	6/28/2017
GA-2017-320	31.77491716	-81.10142726	5/2/2017	6/3/2017	6/28/2017
GA-2017-321	31.77292527	-81.09968005	5/2/2017	6/3/2017	6/28/2017
GA-2017-322	31.77209545	-81.09371452	5/2/2017	6/3/2017	6/28/2017
GA-2017-341	32.00694600	-80.85303500	5/9/2017	6/4/2017	7/15/2017
GA-2017-342	32.00831600	-80.84962200	5/9/2017	6/2/2017	7/15/2017
GA-2017-344	32.00797169	-80.84818850	5/9/2017	6/2/2017	7/15/2017
GA-2017-345	31.75064200	-81.12255800	5/2/2017	6/3/2017	6/28/2017
GA-2017-346	31.07588600	-81.72713200	5/7/2017	5/26/2017	7/7/2017
GA-2017-347	30.97349100	-81.72660100	5/7/2017	5/26/2017	7/7/2017
GA-2017-348	30.97277400	-81.72391100	5/7/2017	5/26/2017	7/7/2017
GA-2017-349	31.03685000	-81.72989700	5/7/2017	6/4/2017	7/7/2017
GA-2017-350	32.01362700	-80.88491900	5/9/2017	6/4/2017	7/15/2017
GA-2017-351	32.01614800	-80.89103700	5/9/2017	6/4/2017	7/15/2017
GA-2017-352	32.01448600	-80.86944800	5/9/2017	6/4/2017	7/15/2017
GA-2017-353	32.00742500	-80.86793400	5/9/2017	6/4/2017	7/15/2017
GA-2017-354	32.01067000	-80.86944800	5/9/2017	6/4/2017	7/15/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-360	31.74474900	-81.41406700	5/17/2017	5/28/2017	7/7/2017
GA-2017-361	31.74295400	-81.42399200	5/17/2017	5/31/2017	7/7/2017
GA-2017-362	31.74776800	-81.43987200	5/17/2017	5/31/2017	7/7/2017
GA-2017-363	31.75109700	-81.44063600	5/17/2017	5/31/2017	7/7/2017
GA-2017-364	31.75003800	-81.43837200	5/17/2017	5/31/2017	7/7/2017
GA-2017-365	31.75561900	-81.42229300	5/17/2017	5/31/2017	7/7/2017
GA-2017-366	31.75722000	-81.42034500	5/17/2017	5/31/2017	7/7/2017
GA-2017-367	31.77273800	-81.40984900	5/17/2017	5/31/2017	7/1/2017
GA-2017-368	31.77436900	-81.40071300	5/17/2017	5/31/2017	7/1/2017
GA-2017-369	31.77481400	-81.39797900	5/17/2017	5/31/2017	7/7/2017
GA-2017-370	31.75404900	-81.45893600	5/17/2017	5/31/2017	7/17/2017
GA-2017-371	31.74456500	-81.44659700	5/17/2017	5/31/2017	7/7/2017
GA-2017-372	31.75915700	-81.41879000	5/17/2017	5/31/2017	7/7/2017
GA-2017-373	31.88622267	-81.21719349	5/10/2017	5/26/2017	7/1/2017
GA-2017-374	31.51680700	-81.38366700	5/11/2017	5/27/2017	7/1/2017
GA-2017-375	31.51787800	-81.39121200	5/12/2017	5/27/2017	7/1/2017
GA-2017-376	31.53742700	-81.39896200	5/12/2017	5/27/2017	7/1/2017
GA-2017-377	31.53905600	-81.40089500	5/12/2017	5/27/2017	7/1/2017
GA-2017-378	31.54010300	-81.40403800	5/12/2017	5/27/2017	7/1/2017
GA-2017-379	31.53910200	-81.40669500	5/12/2017	5/27/2017	7/1/2017
GA-2017-380	31.51113700	-81.23437300	5/5/2017	6/1/2017	7/11/2017
GA-2017-381	31.43172800	-81.28268900	5/5/2017	6/1/2017	7/11/2017
GA-2017-382	31.47827800	-81.26092600	5/5/2017	6/1/2017	7/11/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-383	31.47884700	-81.26934400	5/5/2017	6/1/2017	7/11/2017
GA-2017-384	31.48871700	-81.26004600	5/5/2017	6/1/2017	7/11/2017
GA-2017-385	32.01772500	-80.86420200	5/9/2017	6/4/2017	7/15/2017
GA-2017-386	32.01853900	-80.85278700	5/9/2017	6/4/2017	7/15/2017
GA-2017-387	32.01864900	-80.89923100	5/9/2017	6/2/2017	7/15/2017
GA-2017-388	32.02414300	-80.91567900	5/9/2017	6/2/2017	7/15/2017
GA-2017-389	32.04009400	-80.94521200	5/9/2017	6/2/2017	7/15/2017
GA-2017-390	32.04069400	-80.95071000	5/9/2017	6/2/2017	7/15/2017
GA-2017-400	31.36437113	-81.43864378	4/25/2017	5/25/2017	6/20/2017
GA-2017-401	31.35863800	-81.44254700	4/25/2017	5/25/2017	6/20/2017
GA-2017-402	31.35307000	-81.44830300	4/25/2017	5/25/2017	7/17/2017
GA-2017-403	31.33930200	-81.45073200	4/25/2017	5/25/2017	6/20/2017
GA-2017-404	31.32551500	-81.44580600	4/25/2017	5/25/2017	6/20/2017
GA-2017-405	31.31671500	-81.45334300	4/25/2017	5/25/2017	6/20/2017
GA-2017-406	31.31295400	-81.45686900	4/30/2017	5/25/2017	6/20/2017
GA-2017-407	31.17750400	-81.53690600	4/25/2017	5/25/2017	6/20/2017
GA-2017-408	31.18157700	-81.53453000	4/25/2017	5/25/2017	6/24/2017
GA-2017-409	31.16344600	81.45030900	4/26/2017	6/6/2017	6/22/2017
GA-2017-410	31.17113500	-81.43100600	4/26/2017	6/6/2017	6/22/2017
GA-2017-411	31.14734300	-81.37875100	4/26/2017	6/13/2017	6/22/2017
GA-2017-412	31.16374800	-81.38988200	4/26/2017	6/13/2017	6/22/2017
GA-2017-412A	31.16536400	81.44469400	4/25/2017	6/6/2017	6/22/2017
GA-2017-500	31.35089395	-81.45455197	4/30/2017	5/28/2017	7/2/2017

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GA-2017-600	31.11304528	-81.41129196	5/16/2017	6/10/2017	6/30/2017
GA-2017-601	31.12015626	-81.41178268	5/16/2017	6/10/2017	6/30/2017
GA-2017-602	31.39486097	-81.27079621	5/5/2017	6/1/2017	7/11/2017
GA-2017-604	31.02021122	-81.43049001	5/17/2017	6/8/2017	6/26/2017
GA-2017-605	31.03085738	-81.41988624	5/17/2017	6/8/2017	6/26/2017
GA-2017-606	31.11648304	-81.41402426	5/16/2017	6/10/2017	6/30/2017
GA-2017-607	31.11054344	-81.40948771	5/16/2017	6/10/2017	6/26/2017
GA-2017-608	31.10650679	-81.40593857	5/16/2017	6/10/2017	6/26/2017
GA-2017-609	31.10392069	-81.40644289	5/16/2017	6/10/2017	6/26/2017
GA-2017-610	31.09962626	-81.40885342	5/16/2017	6/10/2017	6/30/2017
GA-2017-611	31.05954285	-81.44689669	5/17/2017	6/8/2017	6/24/2017
GA-2017-612	31.05202620	-81.44299545	5/17/2017	6/8/2017	7/17/2017
GA-2017-613	31.05105238	-81.44520729	5/17/2017	6/8/2017	7/17/2017
GA-2017-614	31.04953765	-81.41970470	5/16/2017	6/10/2017	6/26/2017
GA-2017-615	31.04699938	-81.41437102	5/16/2017	6/8/2017	6/26/2017
GA-2017-616	31.54361289	-81.42268839	5/7/2017	6/6/2017	6/27/2017
GA-2017-617	31.10864487	-81.40771310	5/16/2017	6/10/2017	6/26/2017
GA-2017-618	31.04160855	-81.41722169	5/16/2017	6/8/2017	6/26/2017
GA-2017-619	31.03770602	-81.41837524	5/17/2017	6/8/2017	6/26/2017
GA-2017-621	31.46587019	-81.35467074	5/7/2017	5/25/2017	6/27/2017
GA-2017-622	31.47234448	-81.35645785	5/7/2017	5/25/2017	6/27/2017
GA-2017-623	31.49524834	-81.35837946	5/7/2017	6/6/2017	6/27/2017
GA-2017-624	31.58371234	-81.36014959	5/7/2017	6/6/2017	6/27/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-625	31.60754734	-81.32847505	5/7/2017	6/6/2017	6/27/2017
GA-2017-626	31.60924424	-81.33179683	5/7/2017	6/6/2017	6/27/2017
GA-2017-627	31.62602978	-81.32833316	5/7/2017	6/6/2017	6/27/2017
GA-2017-628	31.63655352	-81.33802367	5/7/2017	5/28/2017	7/1/2017
GA-2017-629	31.64225441	-81.38726157	5/7/2017	5/28/2017	7/1/2017
GA-2017-630	31.64466530	-81.38545757	5/7/2017	5/28/2017	7/1/2017
GA-2017-631	31.64559004	-81.38194507	5/7/2017	5/28/2017	7/1/2017
GA-2017-632	31.64656450	-81.39314078	5/7/2017	5/28/2017	7/1/2017
GA-2017-633	31.65749159	-81.39607517	5/7/2017	5/28/2017	7/1/2017
GA-2017-634	31.65964886	-81.39688706	5/7/2017	5/28/2017	7/1/2017
GA-2017-635	31.71074443	-81.28420149	5/9/2017	5/28/2017	7/1/2017
GA-2017-637	31.80617749	-81.37500489	5/9/2017	5/28/2017	7/1/2017
GA-2017-638	31.81105290	-81.37003967	5/9/2017	5/28/2017	7/1/2017
GA-2017-639	31.85296174	-81.27965241	5/9/2017	5/28/2017	7/1/2017
GA-2017-641	31.82931759	-81.40100073	5/9/2017	5/28/2017	7/1/2017
GA-2017-642	31.82697747	-81.40131878	5/9/2017	5/28/2017	7/1/2017
GA-2017-643	31.83943255	-81.26958758	5/9/2017	5/28/2017	7/1/2017
GA-2017-644	31.83952466	-81.25360218	5/9/2017	5/28/2017	7/1/2017
GA-2017-645	31.82014373	-81.25657995	5/9/2017	5/28/2017	7/1/2017
GA-2017-657	31.13757965	-81.63403676	5/7/2017	5/26/2017	6/24/2017
GA-2017-658	31.13797193	-81.64930515	5/7/2017	5/26/2017	6/24/2017
GA-2017-659	31.07115650	-81.57467707	5/7/2017	5/26/2017	6/24/2017
GA-2017-660	31.06892041	-81.57412994	5/7/2017	5/26/2017	6/24/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-661	31.06610527	-81.57307500	5/7/2017	5/26/2017	6/24/2017
GA-2017-662	31.06362861	-81.57139216	5/7/2017	5/26/2017	6/24/2017
GA-2017-663	31.05889201	-81.56722916	5/7/2017	5/26/2017	6/24/2017
GA-2017-664	31.05175856	-81.54265208	5/7/2017	5/26/2017	6/24/2017
GA-2017-665	31.02983120	-81.53933029	5/7/2017	5/26/2017	6/24/2017
GA-2017-666	31.03112196	-81.53529167	5/7/2017	5/26/2017	6/24/2017
GA-2017-669	31.02684713	-81.53245220	5/7/2017	5/26/2017	6/24/2017
GA-2017-670	31.02443076	-81.53819221	5/7/2017	5/26/2017	6/24/2017
GA-2017-671	31.02018740	-81.56942728	5/7/2017	5/26/2017	6/24/2017
GA-2017-674	31.07482244	-81.72726216	5/7/2017	5/26/2017	7/7/2017
GA-2017-675	31.04405481	-81.73755148	5/7/2017	5/26/2017	7/7/2017
GA-2017-676	31.04187135	-81.72980161	5/7/2017	5/26/2017	7/7/2017
GA-2017-677	30.85037638	-81.63766050	5/8/2017	5/31/2017	6/25/2017
GA-2017-678	30.84872442	-81.63494603	5/8/2017	5/31/2017	6/25/2017
GA-2017-679	30.84579702	-81.62867921	5/8/2017	5/31/2017	6/25/2017
GA-2017-680	30.87309098	-81.60757286	5/8/2017	5/31/2017	6/25/2017
GA-2017-681	30.87353448	-81.60222889	5/8/2017	5/31/2017	6/25/2017
GA-2017-682	30.83791788	-81.69774260	5/8/2017	5/31/2017	6/25/2017
GA-2017-683	30.83238380	-81.69662241	5/8/2017	5/31/2017	6/25/2017
GA-2017-684	30.83050060	-81.68022754	5/8/2017	5/31/2017	6/25/2017
GA-2017-685	30.83718817	-81.67529963	5/8/2017	5/31/2017	6/25/2017
GA-2017-686	30.82756974	-81.64804936	5/8/2017	5/31/2017	6/25/2017
GA-2017-687	30.81819086	-81.60978671	5/8/2017	5/31/2017	6/25/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-688	30.81280720	-81.58905994	5/8/2017	5/31/2017	6/25/2017
GA-2017-691	30.73225557	-81.54017591	5/8/2017	5/31/2017	6/25/2017
GA-2017-692	30.72242659	-81.54369436	5/8/2017	5/31/2017	6/25/2017
GA-2017-693	30.74250054	-81.68787255	5/8/2017	5/31/2017	6/25/2017
GA-2017-694	30.88798954	-81.56103634	5/8/2017	5/31/2017	7/17/2017
GA-2017-695	30.92515390	-81.52642871	5/19/2017	5/29/2017	6/30/2017
GA-2017-696	31.22841379	-81.44835609	5/19/2017	5/29/2017	6/22/2017
GA-2017-698	31.20484610	-81.46709507	5/19/2017	5/29/2017	6/22/2017
GA-2017-699	31.19476227	-81.46922509	5/19/2017	5/29/2017	6/22/2017
GA-2017-700	31.18397421	-81.47077834	5/17/2017	5/29/2017	6/22/2017
GA-2017-701	31.16309129	-81.47409447	5/17/2017	5/29/2017	6/22/2017
GA-2017-705	32.16245775	-81.17785979	5/11/2017	6/4/2017	7/16/2017
GA-2017-706	32.16530385	-81.15810541	5/10/2017	6/4/2017	7/16/2017
GA-2017-707	32.09699510	-81.09601910	5/10/2017	6/4/2017	7/16/2017
GA-2017-708	32.03118704	-81.00416002	5/9/2017	6/2/2017	7/15/2017
GA-2017-709	32.02569324	-80.99878702	5/9/2017	6/2/2017	7/15/2017
GA-2017-710	32.07880113	-81.00224640	5/13/2017	6/6/2017	7/14/2017
GA-2017-711	32.07465519	-81.00332396	5/13/2017	6/6/2017	7/14/2017
GA-2017-712	32.07384777	-81.00985852	5/13/2017	6/6/2017	7/14/2017
GA-2017-713	32.07516558	-81.01541205	5/13/2017	6/13/2017	7/14/2017
GA-2017-714	32.07130551	-81.01953241	5/13/2017	6/6/2017	7/14/2017
GA-2017-715	32.06831285	-81.02587797	5/13/2017	6/6/2017	7/14/2017
GA-2017-717	32.05933770	-81.03269853	5/13/2017	6/6/2017	7/14/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-719	31.94978111	-81.07721369	5/10/2017	6/2/2017	7/15/2017
GA-2017-720	31.95448881	-81.08985889	5/10/2017	6/2/2017	7/15/2017
GA-2017-721	31.94436978	-81.06149354	5/10/2017	6/2/2017	7/15/2017
GA-2017-726	31.97539001	-81.17128854	5/10/2017	6/2/2017	7/15/2017
GA-2017-727	31.98139996	-81.17733065	5/10/2017	6/2/2017	7/15/2017
GA-2017-728	31.97794332	-81.18364295	5/10/2017	6/2/2017	7/15/2017
GA-2017-729	31.97533527	-81.18529569	5/10/2017	6/2/2017	7/15/2017
GA-2017-736	31.98335978	-81.07135527	5/9/2017	6/2/2017	7/15/2017
GA-2017-737	31.99537951	-81.05750415	5/9/2017	6/2/2017	7/15/2017
GA-2017-739	31.98994618	-81.01895242	5/10/2017	6/2/2017	7/15/2017
GA-2017-740	32.01648401	-80.98677415	5/9/2017	6/2/2017	7/15/2017
GA-2017-741	32.02119508	-80.99317920	5/9/2017	6/2/2017	7/15/2017
GA-2017-744	31.99477083	-81.23484266	5/9/2017	6/2/2017	7/7/2017
GA-2017-745	31.99671346	-81.23916100	5/10/2017	6/2/2017	7/7/2017
GA-2017-746	32.00451496	-81.24004209	5/9/2017	6/2/2017	7/7/2017
GA-2017-747	32.00726967	-81.23907216	5/10/2017	6/4/2017	7/7/2017
GA-2017-748	32.01628648	-81.23090414	5/9/2017	6/4/2017	7/7/2017
GA-2017-749	32.01924139	-81.22940750	5/10/2017	6/4/2017	7/7/2017
GA-2017-750	32.04144882	-81.20370503	5/10/2017	6/4/2017	7/7/2017
GA-2017-751	32.04836846	-81.21429957	5/10/2017	6/4/2017	7/7/2017
GA-2017-752	32.05246263	-81.19400810	5/10/2017	6/4/2017	7/7/2017
GA-2017-753	32.16549655	-81.15136576	5/10/2017	6/4/2017	7/16/2017
GA-2017-754	32.16558168	-81.14498300	5/10/2017	6/4/2017	7/16/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-755	31.53917918	-81.43513852	5/11/2017	5/27/2017	7/1/2017
GA-2017-756	31.53645838	-81.43034160	5/11/2017	5/27/2017	7/1/2017
GA-2017-768	32.05585753	-81.02971516	5/13/2017	6/6/2017	7/14/2017
GA-2017-769	32.05127443	-81.03144523	5/13/2017	6/6/2017	7/14/2017
GA-2017-770	31.52199693	-81.38543967	5/11/2017	5/27/2017	7/1/2017
GA-2017-770b	32.04531489	-81.03844360	5/13/2017	6/6/2017	7/14/2017
GA-2017-771	32.04008922	-81.04507489	5/13/2017	6/6/2017	7/14/2017
GA-2017-781	32.03111842	-81.04548275	5/13/2017	6/6/2017	7/14/2017
GA-2017-800	31.89749689	-81.22245767	5/10/2017	5/26/2017	7/2/2017
GA-2017-801	31.90590327	-81.19426480	5/10/2017	5/26/2017	7/2/2017
GA-2017-802	31.89901820	-81.22012096	5/10/2017	5/26/2017	7/2/2017
GA-2017-803	31.92023439	-81.19470142	5/10/2017	5/26/2017	7/2/2017
GA-2017-804	31.93844927	-81.21333456	5/10/2017	5/26/2017	7/2/2017
GA-2017-805	31.94437075	-81.21082418	5/10/2017	5/26/2017	7/2/2017
GA-2017-806	31.94560901	-81.21330111	5/10/2017	5/26/2017	7/2/2017
GA-2017-807	31.94808855	-81.21612766	5/10/2017	5/26/2017	7/2/2017
GA-2017-808	31.94923385	-81.22010244	5/10/2017	5/26/2017	7/2/2017
GA-2017-808a	31.95155700	-81.22213200	5/10/2017	5/26/2017	7/2/2017
GA-2017-808b	31.95325900	-81.22462600	5/10/2017	5/26/2017	7/2/2017
GA-2017-1000	32.07680591	-81.01727178	5/13/2017	6/13/2017	7/14/2017
GA-2017-1001	32.07468655	-81.01804770	5/13/2017	6/13/2017	7/14/2017
GA-2017-1002	32.07416436	-81.02080258	5/13/2017	6/13/2017	7/14/2017
GA-2017-1003	32.06806200	-81.00604858	5/13/2017	6/6/2017	7/14/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-1004	32.06542086	-80.99794236	5/13/2017	6/6/2017	7/14/2017
GA-2017-1005	32.07334880	-81.02343022	5/14/2017	6/13/2017	7/14/2017
GA-2017-1007	32.06757735	-80.98604685	5/14/2017	6/6/2017	7/14/2017
GA-2017-1008	32.06666406	-80.96999961	5/14/2017	6/6/2017	7/14/2017
GA-2017-1009	32.06064586	-80.96202247	5/14/2017	6/6/2017	7/14/2017
GA-2017-1012	31.60862599	-81.17529433	5/15/2017	No Survey	7/13/2017
GA-2017-1014	31.60880081	-81.16668727	5/15/2017	No Survey	7/13/2017
GA-2017-1015	31.60014207	-81.16355858	5/15/2017	No Survey	7/13/2017
GA-2017-1025	31.60082040	-81.15690170	5/15/2017	No Survey	7/13/2017
GA-2017-1026	31.57725600	-81.16134000	5/15/2017	No Survey	7/13/2017
GA-2017-1027	31.57595300	-81.16446900	5/15/2017	No Survey	7/13/2017
GA-2017-1028	31.57994700	-81.15958700	5/15/2017	No Survey	7/13/2017
GA-2017-1029	31.69321700	-81.14683800	5/15/2017	No Survey	7/13/2017
GA-2017-1030	31.68731236	-81.15231932	5/15/2017	No Survey	7/13/2017
GA-2017-1500	31.14258790	-81.37854883	4/26/2017	6/13/2017	6/24/2017
GA-2017-1505	31.35904600	81.45611500	4/27/2017	5/29/2017	7/17/2017
GA-2017-1506	31.34780158	-81.47410903	4/27/2017	5/29/2017	7/5/2017
GA-2017-1507	31.35093981	-81.47980085	4/27/2017	5/29/2017	7/5/2017
GA-2017-Darien Boat 001	31.33631571	-81.44269710	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 002	31.34283722	-81.32636736	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 003	31.34602596	-81.32660911	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 004	31.34899188	-81.32779295	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 005	31.35433929	-81.33212011	5/3/2017	5/25/2017	6/26/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-Darien Boat 006	31.36320885	-81.33719823	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 007	31.36855299	-81.33544655	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 008	31.36892522	-81.33214613	5/4/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 009	31.36144275	-81.43316040	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 010	31.33394239	-81.44360583	5/4/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 011	31.32964328	-81.43612375	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 012	31.32593645	-81.43686840	5/4/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 013	31.32165753	-81.43519753	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 014	31.31676673	-81.43632660	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 015	31.33381015	-81.32551399	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 016	31.33687121	-81.32609158	5/3/2017	5/25/2017	6/26/2017
GA-2017-Darien Boat 017	31.33995826	-81.32660587	5/3/2017	5/25/2017	6/26/2017
GA-2017-Rhetts 001	31.33831900	-81.39119500	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 002	31.33880600	-81.39450900	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 003	31.34315500	-81.39686700	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 004	31.34116200	-81.39987300	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 005	31.34125700	-81.40402700	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 006	31.34183300	-81.41300900	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 007	31.34237400	-81.41620100	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 008	31.34528200	-81.41606800	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 009	31.34802500	-81.41960400	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 010	31.35009300	-81.42406600	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 011	31.35364100	-81.42744800	5/16/2017	6/16/2017	7/6/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-Rhetts 012	31.34621500	-81.41476100	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 013	31.34868468	-81.41259112	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 014	31.35641522	-81.41096720	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 015	31.35419287	-81.39902424	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rhetts 016	31.35701009	-81.38869516	5/16/2017	6/16/2017	7/6/2017
GA-2017-Rice 035	31.75147307	-81.45293361	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 036	31.75007648	-81.45050629	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 037	31.74930233	-81.44790740	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 038	31.74875725	-81.44518739	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 039	31.74777715	-81.43658143	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 040	31.74963945	-81.40704545	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 041	31.75622083	-81.41294262	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 042	31.75386518	-81.41216336	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 043	31.75275550	-81.41755309	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 045	31.75832511	-81.42313736	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 046	31.76007106	-81.42540090	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 047	31.76242730	-81.42652944	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 048	31.76464708	-81.42785210	5/18/2017	5/28/2017	6/27/2017
GA-2017-Rice 049	31.76626445	-81.43058318	5/18/2017	5/28/2017	6/27/2017
GA-2017-Satilla River 050	30.97486946	-81.73183230	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 051	30.97373086	-81.73432088	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 052	30.97210536	-81.73706336	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 053	30.97011306	-81.73951054	5/19/2017	6/10/2017	6/25/2017

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-Satilla River 054	30.96940607	-81.74643341	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 055	30.96518199	-81.75233762	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 056	30.96771056	-81.75218574	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 057	30.97601063	-81.75222010	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 058	30.98296705	-81.75649907	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 059	30.98669574	-81.75991519	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 060	30.98372092	-81.76028475	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 061	30.98214059	-81.76649021	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 062	30.98324222	-81.77847616	5/19/2017	6/10/2017	6/25/2017
GA-2017-Satilla River 063	30.96656090	-81.81355024	5/19/2017	6/10/2017	6/26/2017
GA-2017-Satilla River 064	30.96635537	-81.81659480	5/19/2017	6/10/2017	6/26/2017
GA-2017-Satilla River 065	30.96447825	-81.81849011	5/19/2017	6/10/2017	6/26/2017

APPENDIX II. TABLE WITH ALL POINTS SURVEYED DURING 2018 BLACK RAIL SEASON, LATITUDE AND LONGITUDE (IN DECIMAL DEGREES), AND SURVEY ROUND DATES.

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2018-001	30.6796656	-83.3033839	5/22/2018	6/1/2018	6/22/2018
GA-2018-002	30.6916959	-83.3241418	5/22/2018	6/1/2018	6/22/2018
GA-2018-003	30.6568009	-83.2454212	5/22/2018	6/1/2018	6/22/2018
GA-2018-004	30.6586408	-83.2534265	5/22/2018	6/1/2018	6/22/2018
GA-2018-005	30.7620744	-83.2279514	5/22/2018	5/31/2018	7/10/2018

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2018-006	30.7602035	-83.2295086	5/22/2018	5/31/2018	7/10/2018
GA-2018-007	30.7581844	-83.228032	5/22/2018	5/31/2018	7/10/2018
GA-2018-008	30.7047281	-83.2888965	5/22/2018	6/1/2018	7/11/2018
GA-2018-009	31.3099617	-83.2802358	5/31/2018	6/14/2018	7/11/2018
GA-2018-010	31.3169085	-83.2834266	5/31/2018	6/14/2018	7/11/2018
GA-2018-013	31.2604227	-82.860425	5/30/2018	6/14/2018	7/10/2018
GA-2018-014	31.1479312	-81.5041101	05/03/2018	6/4/2018	7/4/2018
GA-2018-015	30.9357865	-83.4085539	5/22/2018	6/1/2018	6/21/2018
GA-2018-016	31.1462489	-81.5019637	05/03/2018	6/4/2018	7/4/2018
GA-2018-017	31.1438821	-81.5014094	05/03/2018	6/4/2018	7/4/2018
GA-2018-018	31.141425	-81.5015249	05/03/2018	6/4/2018	7/4/2018
GA-2018-020	31.1362079	-81.5001003	05/03/2018	6/4/2018	7/4/2018
GA-2018-021	31.13357	-81.4996824	05/03/2018	6/4/2018	7/4/2018
GA-2018-022	31.1482073	-81.5071061	05/03/2018	6/4/2018	7/4/2018
GA-2018-023	31.1486697	-81.5105379	05/03/2018	6/4/2018	7/4/2018
GA-2018-024	31.1488315	-81.5140148	05/03/2018	6/4/2018	7/4/2018
GA-2018-025	31.1483543	-81.5172826	05/03/2018	6/4/2018	7/4/2018
GA-2018-026	31.1466799	-81.5199232	05/03/2018	6/4/2018	7/4/2018
GA-2018-027	31.1439489	-81.5193095	05/03/2018	6/4/2018	7/4/2018
GA-2018-028	31.1413937	-81.5187401	05/03/2018	6/4/2018	7/4/2018
GA-2018-029	31.1386999	-81.5178079	05/03/2018	6/4/2018	7/4/2018
GA-2018-030	31.1361357	-81.5159138	05/03/2018	6/4/2018	7/4/2018
GA-2018-031	31.1337005	-81.5150862	05/03/2018	6/4/2018	7/4/2018

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2018-032	31.1321505	-81.5126321	05/03/2018	6/4/2018	7/4/2018
GA-2018-033	31.1316191	-81.5093888	05/03/2018	6/4/2018	7/4/2018
GA-2018-034	31.1321675	-81.5063852	05/03/2018	6/4/2018	7/4/2018
GA-2018-035	31.132182	-81.5032511	05/03/2018	6/4/2018	7/4/2018
GA-2018-036	31.1315148	-81.4981269	05/03/2018	6/4/2018	7/4/2018
GA-2018-037	30.8673959	-83.3631056	5/22/2018	6/1/2018	7/11/2018
GA-2018-039	31.0608091	-82.7775583	5/23/2018	6/16/2018	7/10/2018
GA-2018-040	31.0576157	-82.773738	5/23/2018	6/16/2018	7/10/2018
GA-2018-041	31.1636732	-83.3430445	5/31/2018	6/13/2018	7/10/2018
GA-2018-043	31.4231577	-83.682131	5/10/2018	6/1/2018	6/29/2018
GA-2018-045	31.4609256	-83.6523842	5/10/2018	6/1/2018	6/29/2018
GA-2018-049	31.4239823	-83.6567029	5/31/2018	6/20/2018	7/11/2018
GA-2018-051	31.4150921	-83.6822012	5/10/2018	6/1/2018	6/29/2018
GA-2018-052	31.4019904	-83.6856799	5/10/2018	6/1/2018	6/29/2018
GA-2018-053	31.3712942	-83.697872	5/10/2018	6/1/2018	6/29/2018
GA-2018-054	31.3435002	-83.6919115	5/10/2018	6/1/2018	6/29/2018
GA-2018-055	31.3337079	-83.6913327	5/10/2018	6/1/2018	6/29/2018
GA-2018-056	31.3255413	-83.6708921	05/09/2018	6/21/2018	7/11/2018
GA-2018-057	31.3262238	-83.6630767	05/09/2018	6/21/2018	7/11/2018
GA-2018-060	30.6395807	-83.1934569	5/22/2018	6/1/2018	6/22/2018
GA-2018-061	30.9069432	-83.4060856	5/22/2018	6/1/2018	6/22/2018
GA-2018-066	31.161156	-83.5441719	05/09/2018	6/21/2018	7/10/2018
GA-2018-068	30.9998062	-83.7454395	5/22/2018	6/1/2018	7/11/2018

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2018-069	31.0047394	-83.7372151	5/22/2018	6/1/2018	7/11/2018
GA-2018-072	31.1205466	-82.8478262	5/23/2018	6/11/2018	7/1/2018
GA-2018-073	31.1213556	-82.8452814	5/23/2018	6/11/2018	7/1/2018
GA-2018-074	31.1223912	-82.8428517	5/23/2018	6/11/2018	7/1/2018
GA-2018-075	31.1229573	-82.8402141	5/23/2018	6/11/2018	7/1/2018
GA-2018-076	31.1238248	-82.8375205	5/23/2018	6/11/2018	7/1/2018
GA-2018-077	31.1246611	-82.8349018	5/23/2018	6/11/2018	7/1/2018
GA-2018-078	31.1261789	-82.8300532	5/23/2018	6/11/2018	7/1/2018
GA-2018-079	31.1158117	-82.8626888	5/23/2018	6/11/2018	7/1/2018
GA-2018-080	31.11498	-82.8652355	5/23/2018	6/11/2018	7/1/2018
GA-2018-081	31.1139958	-82.8682802	5/23/2018	6/11/2018	7/1/2018
GA-2018-082	31.1095099	-82.8830455	5/23/2018	6/11/2018	7/1/2018
GA-2018-083	31.0904237	-82.9370926	5/23/2018	6/11/2018	7/1/2018
GA-2018-084	31.0479772	-83.0086069	5/23/2018	6/13/2018	7/10/2018
GA-2018-085	31.0390685	-83.0202399	5/23/2018	6/13/2018	7/10/2018
GA-2018-086	31.0440637	-83.0246827	5/23/2018	6/13/2018	7/10/2018
GA-2018-087	31.0129619	-83.059796	5/10/2018	5/31/2018	7/11/2018
GA-2018-088	31.190564	-82.564123	5/30/2018	6/11/2018	7/1/2018
GA-2018-092	31.1030623	-83.7589189	5/22/2018	6/1/2018	6/30/2018
GA-2018-094	31.1579677	-82.9854042	5/30/2018	6/14/2018	7/10/2018
GA-2018-095	31.1456037	-82.9951618	5/10/2018	5/31/2018	7/10/2018
GA-2018-097	31.14567	-82.981275	5/30/2018	6/14/2018	7/10/2018
GA-2018-100	31.1613514	-82.9854003	5/30/2018	6/14/2018	7/10/2018

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2018-101	31.1520618	-82.985436	5/30/2018	6/14/2018	7/10/2018
GA-2018-108	30.8365074	-83.8214733	5/22/2018	6/1/2018	6/27/2018
GA-2018-109	30.8463885	-83.8119938	5/22/2018	6/1/2018	6/27/2018
GA-2018-110	30.8463592	-83.8056821	5/22/2018	6/1/2018	6/27/2018
GA-2018-112	30.8534241	-83.7987886	5/22/2018	6/1/2018	6/27/2018
GA-2018-113	30.8380317	-83.8314041	5/22/2018	6/1/2018	6/27/2018
GA-2018-114	30.8260954	-83.8379107	5/22/2018	6/1/2018	6/27/2018
GA-2018-118	30.938524	-83.7756776	5/22/2018	6/1/2018	6/30/2018
GA-2018-119	30.941299	-83.7742868	5/22/2018	6/1/2018	6/30/2018
GA-2018-120	30.9454901	-83.773612	5/22/2018	6/1/2018	6/30/2018
GA-2018-126	30.8659451	-83.4579553	5/22/2018	6/1/2018	6/22/2018
GA-2018-127	32.1679219	-81.1795933	5/3/2018	6/7/2018	7/5/2018
GA-2018-128	32.1678064	-81.176844	5/3/2018	6/7/2018	7/5/2018
GA-2018-129	32.1663192	-81.1743234	5/3/2018	6/7/2018	7/5/2018
GA-2018-130	32.1644169	-81.1727505	5/3/2018	6/7/2018	7/5/2018
GA-2018-131	32.1626917	-81.1708303	5/3/2018	6/7/2018	7/5/2018
GA-2018-132	32.1630382	-81.1680907	5/3/2018	6/7/2018	7/5/2018
GA-2018-133	32.1651594	-81.1662862	5/3/2018	6/7/2018	7/5/2018
GA-2018-134	32.1658413	-81.1635181	5/3/2018	6/7/2018	7/5/2018
GA-2018-135	32.1667623	-81.1609797	5/3/2018	6/7/2018	7/5/2018
GA-2018-136	32.1673056	-81.1582357	5/3/2018	6/7/2018	7/5/2018
GA-2018-137	32.1695994	-81.1584869	5/3/2018	6/7/2018	7/5/2018
GA-2018-138	32.183675	-81.1584045	5/3/2018	6/7/2018	7/5/2018

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2018-139	32.1837166	-81.161273	5/3/2018	6/7/2018	7/5/2018
GA-2018-140	32.1854727	-81.1634703	5/3/2018	6/7/2018	7/5/2018
GA-2018-141	31.1921936	-82.5519569	5/30/2018	6/11/2018	7/1/2018
GA-2018-147	31.049014	-83.0659896	5/10/2018	5/31/2018	7/11/2018
GA-2018-148	31.0498373	-83.0625946	5/10/2018	5/31/2018	7/11/2018
GA-2018-149	31.0264994	-83.0533723	5/10/2018	5/31/2018	7/11/2018
GA-2018-151	31.0821214	-83.0889181	5/10/2018	5/31/2018	7/11/2018
GA-2018-156	30.8589883	-83.3577926	5/22/2018	6/1/2018	6/22/2018
GA-2018-157	30.7946769	-83.2727058	5/22/2018	6/13/2018	6/22/2018
GA-2018-158	30.7184498	-83.2432804	5/22/2018	6/1/2018	6/22/2018
GA-2018-159	30.7905586	-83.279758	5/22/2018	5/31/2018	6/22/2018
GA-2018-160	30.7900291	-83.2716479	5/22/2018	5/31/2018	6/22/2018
GA-2018-161	30.7768834	-83.3005805	5/22/2018	5/31/2018	6/22/2018
GA-2018-164	30.7193841	-83.1102007	5/22/2018	5/31/2018	6/22/2018
GA-2018-165	30.7782041	-83.1932901	5/22/2018	5/31/2018	6/22/2018
GA-2018-166	30.7818814	-83.1844934	5/22/2018	5/31/2018	6/22/2018
GA-2018-167	30.7877773	-83.20106	5/22/2018	5/31/2018	6/22/2018
GA-2018-168	30.7799816	-83.2136096	5/22/2018	5/31/2018	6/22/2018
GA-2018-169	30.684372	-83.238752	5/22/2018	6/1/2018	6/22/2018
GA-2018-170	30.6652101	-83.2399474	5/22/2018	6/1/2018	6/22/2018
GA-2018-171	30.6566378	-83.236395	5/22/2018	6/1/2018	6/22/2018
GA-2018-172	31.3690046	-83.2788661	5/31/2018	6/14/2018	7/11/2018
GA-2018-179	31.362538	-83.32658	5/31/2018	6/20/2018	7/11/2018

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2018-180	31.362382	-83.318306	5/31/2018	6/20/2018	7/11/2018
GA-2018-181	31.3623503	-83.3384911	5/31/2018	6/20/2018	7/11/2018
GA-2018-182	31.3610841	-83.3642788	5/11/2018	6/20/2018	7/11/2018
GA-2018-183	31.363618	-83.3951809	5/31/2018	6/20/2018	7/11/2018
GA-2018-185	31.1647214	-83.6373046	05/09/2018	6/21/2018	6/30/2018
GA-2018-187	31.210162	-83.6696703	05/09/2018	6/21/2018	6/30/2018
GA-2018-188	31.1524197	-83.5355184	05/09/2018	6/13/2018	7/10/2018
GA-2018-189	31.1997186	-83.5766732	05/09/2018	6/21/2018	6/30/2018
GA-2018-191	31.1909436	-83.5837229	05/09/2018	6/21/2018	6/30/2018
GA-2018-192	31.3642171	-83.6238364	5/31/2018	6/21/2018	6/29/2018
GA-2018-196	31.4132585	-83.6114304	5/11/2018	6/20/2018	7/11/2018
GA-2018-197	31.4267167	-83.5940465	5/11/2018	6/20/2018	7/11/2018
GA-2018-199	31.4325346	-83.6416171	5/10/2018	6/1/2018	6/29/2018
GA-2018-200	31.4420777	-83.6382953	5/11/2018	6/20/2018	7/11/2018
GA-2018-203	31.4406161	-83.7118315	5/31/2018	6/20/2018	7/11/2018
GA-2018-204	31.4160311	-83.717819	5/31/2018	6/20/2018	7/11/2018
GA-2018-205	31.3851397	-83.7372124	5/10/2018	6/1/2018	6/29/2018
GA-2018-206	31.4007697	-83.7462086	5/10/2018	6/1/2018	6/29/2018
GA-2018-207	31.3938613	-83.749624	5/10/2018	6/1/2018	6/29/2018
GA-2018-208	31.3181198	-83.6684644	05/09/2018	6/21/2018	7/10/2018
GA-2018-209	30.7191614	-83.3344456	5/22/2018	6/1/2018	6/22/2018
GA-2018-210	30.697821	-83.289674	5/22/2018	6/1/2018	7/11/2018
GA-2018-211	30.676341	-83.171314	5/22/2018	6/13/2018	6/22/2018

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2018-212	30.8086024	-83.833966	5/22/2018	6/1/2018	6/27/2018
GA-2018-213	30.856475	-83.79873	5/22/2018	6/1/2018	6/27/2018
GA-2018-214	30.859596	-83.798723	5/22/2018	6/1/2018	6/27/2018
GA-2018-215	30.870836	-83.798435	5/22/2018	6/1/2018	6/27/2018
GA-2018-216	30.89846	-83.776159	5/22/2018	6/1/2018	6/27/2018
GA-2018-217	30.9616937	-83.7652618	5/22/2018	6/1/2018	6/30/2018
GA-2018-218	30.959776	-83.7566519	5/22/2018	6/1/2018	6/30/2018
GA-2018-219	31.365489	-83.60186	5/11/2018	6/21/2018	6/29/2018
GA-2018-220	31.430076	-83.593076	5/11/2018	6/20/2018	No Survey
GA-2018-221	31.349693	-83.353271	5/11/2018	6/20/2018	7/11/2018
GA-2018-222	30.95305	-83.1959	5/24/2018	6/15/2018	7/11/2018
GA-2018-223	30.95069	-83.19628	5/24/2018	6/15/2018	7/11/2018
GA-2018-224	30.94839	-83.19595	5/24/2018	6/15/2018	7/11/2018
GA-2018-225	30.94743	-83.19346	5/24/2018	6/15/2018	7/11/2018
GA-2018-226	30.94745	-83.19057	5/24/2018	6/15/2018	7/11/2018
GA-2018-227	30.94934	-83.18857	5/24/2018	6/15/2018	7/11/2018
GA-2018-228	30.955428	-83.186245	5/24/2018	6/15/2018	7/11/2018
GA-2018-229	30.96057	-83.18613	5/24/2018	6/15/2018	7/11/2018
GA-2018-230	31.0646068	-82.7815181	5/23/2018	6/16/2018	7/10/2018
GA-2018-231	31.0628348	-82.7796982	5/23/2018	6/16/2018	7/10/2018
GA-2018-232	31.0592353	-82.775581	5/23/2018	6/16/2018	7/10/2018
GA-2018-233	31.0556382	-82.7714434	5/23/2018	6/16/2018	7/10/2018
GA-2018-234	31.052911	-82.7685848	5/23/2018	6/16/2018	7/10/2018

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2018-235	31.050008	-82.7648146	5/23/2018	6/16/2018	7/10/2018
GA-2018-236	31.0482251	-83.0122082	5/23/2018	6/13/2018	7/10/2018
GA-2018-237	31.296245	-83.383749	5/31/2018	6/20/2018	7/11/2018
GA-2018-238	31.431277	-83.681961	5/31/2018	6/20/2018	7/11/2018
GA-2018-239	31.4601246	-83.7147793	5/31/2018	6/20/2018	7/11/2018
GA-2018-240	31.4490767	-83.7037655	5/31/2018	6/20/2018	7/11/2018
GA-2018-241	31.4426526	-83.7265294	5/31/2018	6/20/2018	7/11/2018
GA-2018-242	31.251089	-82.955528	5/30/2018	6/14/2018	7/10/2018
GA-2018-243	31.358018	-83.385592	5/31/2018	6/20/2018	7/11/2018
GA-2018-244	31.302049	-83.382602	5/31/2018	6/20/2018	7/11/2018
GA-2017-030 (repeat from 2017)	31.35838706	-81.4807134	5/26/2018	6/17/2018	7/5/2018
GA-2017-032 (repeat from 2017)	31.3540643	-81.47915558	5/26/2018	6/17/2018	7/5/2018
GA-2017-034 (repeat from 2017)	31.34746229	-81.47858122	5/26/2018	6/17/2018	7/5/2018
GA-2017-035 (repeat from 2017)	31.36153634	-81.47854477	5/26/2018	6/17/2018	7/5/2018
GA-2017-037 (repeat from 2017)	31.34267012	-81.47461689	No Survey	6/17/2018	7/9/2018
GA-2017-038 (repeat from 2017)	31.36344379	-81.4745769	5/26/2018	6/17/2018	7/5/2018
GA-2017-042 (repeat from 2017)	31.34603801	-81.47077669	No Survey	6/17/2018	7/9/2018
GA-2017-043 (repeat from 2017)	31.35060046	-81.47054699	5/26/2018	6/17/2018	7/5/2018
GA-2017-046 (repeat from 2017)	31.36941262	-81.46821765	5/26/2018	6/17/2018	7/5/2018
GA-2017-048 (repeat from 2017)	31.35221899	-81.4678135	5/26/2018	6/17/2018	7/5/2018
GA-2017-051 (repeat from 2017)	31.35350337	-81.46550674	5/26/2018	6/17/2018	7/5/2018
GA-2017-053 (repeat from 2017)	31.34840677	-81.46432939	No Survey	6/17/2018	7/9/2018
GA-2017-061 (repeat from 2017)	31.34057008	-81.45776366	5/26/2018	6/17/2018	7/9/2018

Point ID	Latitude	Longitude	Round 1 Date	Round 2 Date	Round 3 Date
GA-2017-073 (repeat from 2017)	31.33932657	-81.44776424	5/26/2018	6/17/2018	7/9/2018
GA-2017-079 (repeat from 2017)	31.34647696	-81.44520532	5/26/2018	6/17/2018	7/9/2018
GA-2017-1000 (repeat from 2017)	32.07680591	-81.01727178	5/2/2018	6/8/2018	7/6/2018
GA-2017-1001 (repeat from 2017)	32.07468655	-81.0180477	5/2/2018	6/8/2018	7/6/2018
GA-2017-1002 (repeat from 2017)	32.07416436	-81.02080258	5/2/2018	6/8/2018	7/6/2018
GA-2017-1005 (repeat from 2017)	32.0733488	-81.02343022	5/2/2018	6/8/2018	7/6/2018
GA-2017-1506 (repeat from 2017)	31.34780158	-81.47410903	5/26/2018	6/17/2018	7/5/2018
GA-2017-1507 (repeat from 2017)	31.35093981	-81.47980085	5/26/2018	6/17/2018	7/5/2018
GA-2017-712 (repeat from 2017)	32.07384777	-81.00985852	5/2/2018	6/8/2018	7/6/2018
GA-2017-713 (repeat from 2017)	32.07516558	-81.01541205	5/2/2018	6/8/2018	7/6/2018
GA-2017-714 (repeat from 2017)	32.07130551	-81.01953241	5/2/2018	6/8/2018	7/6/2018
GA-2017-715 (repeat from 2017)	32.06831285	-81.02587797	5/2/2018	6/8/2018	7/6/2018
GA-2018-994 (repeat from 2017)	31.34311373	-81.45940541	5/26/2018	6/17/2018	7/9/2018
GA-2018-995 (repeat from 2017)	31.3488118	-81.44510944	5/26/2018	6/17/2018	7/9/2018
GA-2018-996 (repeat from 2017)	31.34310604	-81.44629891	5/26/2018	6/17/2018	7/9/2018
GA-2018-997 (repeat from 2017)	31.341396	-81.470041	5/26/2018	6/17/2018	7/9/2018
GA-2018-999 (repeat from 2017)	31.338168	-81.461814	5/26/2018	6/17/2018	7/9/2018

APPENDIX III. COASTAL BLACK RAIL SURVEY PROTOCOLS (USED IN MARYLAND, VIRGINIA, NORTH CAROLINA, GEORGIA). PROTOCOLS MODIFIED FROM A. SMITH AND W. WIEST 2017.

Survey Playback Sources:

Ki-ki-kerr: Sourced from Cornell Lab of Ornithology, Macaulay Library in 2007.

Churt: Sourced from Christy Hand, South Carolina DNR

Growl: Sourced from Cornell Lab of Ornithology, Macaulay Library in 2007.

Eek-eek call: Sourced from Cornell Lab of Ornithology, Macaulay Library, Florida call.

Survey Windows: All 2017 surveys will take place between 18 April and 21 July, with survey window one between 18 April and 17 May, window 2 between 18 May and 17 June, and window 3 between 18 June and 21 July. All 2018 surveys will take place between 1 May and 15 July, with survey window one between 1 May and 31 May, survey window two between 31 May and 21 June, and survey window three between 22 June and 15 July.

All 2017 surveys will take place between a half hour after sunset and will conclude by a half hour prior to sunrise. All inland 2018 surveys will follow standard SC and USFWS protocols and start a half hour before sunrise to 3.5 hours after sunrise or 3.5 hours before sunset to .5 hours after sunset.

Survey Routes: A survey route is a set of points that can be surveyed together during the same night. The number of points per route will depend primarily on logistics. The factor most limiting the number of points per route is the time needed to travel between points. The playback/listening period lasts for 10 minutes. Plan to spend around 12-15 minutes per survey point. It might be possible to survey up to 3-4 points per hour on routes where points are close together and where you can drive from point to point. Routes with more complicated logistics (long distance between points/boat based points) will include fewer points. Surveyors should carefully consider safety and convenience when planning routes, and find safe places to park when doing road based points. Routes can be reorganized during the field season, and care should be taken not to sample the same point repeatedly at the same time of day (e.g., alternate the order of locations along a given route on subsequent visits).

Survey Points and Broadcast Equipment Placement: Surveyor(s) will stand at pre-selected survey point coordinates. Survey points should be marked with pin flagging (and labeled with survey point ID with a permanent marker in a nook of the flagging) during scouting, if visited, or the first survey of the season for ease of location through the rest of the season. Each point should be surveyed at least 3 times, with a 10-day minimum between surveys of the same point.

‘ The game caller should be placed on the ground near the center of the point (on road based surveys) or the bow of the boat during playback surveys. Surveyor should stand 5m away from caller if possible to better hear responses. When surveyors are surrounded completely by marsh, orient the caller toward magnetic north. At survey points located on the edge of open water or upland habitat, orient the broadcast caller towards the center of appropriate marsh habitat. Do not rotate the speaker during the broadcast survey. Speakers should not face the surveyors. Both speakers of the broadcast callers should be operational in open marsh and only the forward speaker operational when the surveying from the edge of open water or upland habitat. Sound pressure should be 70-80 dB at 3 feet in front of the speaker; the appropriate volume level on the FoxPro NX3 or NX4, in combination with this project’s audio file, is illustrated in the figure below. When viewed straight on, the centerline of the volume knob should align with the tRailing edge of the last marked volume setting. Replace batteries in game caller with freshly charged batteries at least every other day of surveys and daily, if necessary.

Figure1. NX4 or NX3 volume level during surveys.

Surveyors: If two observers survey the same point, each surveyor should fill out a separate data sheet and record their data separately without pointing out or discussing bird observations with the other surveyor. Each surveyor should stand 1-2 meters away from each other and avoid cueing the other surveyor with sudden writing activity. Once that evening survey window is completed, surveyors may discuss their observations and any discrepancies, but the original data sheets must not be altered; obvious mistakes should be noted in the comments section of the data sheet, but the original data must not be changed. If a change is necessary while conducting the survey, strike a line through the data and proceed to correct the data on the next available line, but do not erase data from the data sheet. Similarly, if a surveyor must be accompanied by an untrained individual for safety reasons, the surveyor should instruct the accompanying individual neither to collect data nor influence the surveyor in any way (e.g., call out bird sightings during the survey).

Weather Restrictions: Surveys should only be conducted when wind speed is <20 kmph (moderate breeze; dust and loose paper raised; small branches begin to move), and not during periods of sustained rain or heavy fog. Even winds <20 kmph affect the detection probability of marsh birds, especially Black Rail, and perhaps even suppresses their calling behavior. Surveyors should postpone surveys if they believe winds (or other ambient noise) are dramatically affecting the detection probability of marsh birds. If wind speed increases to >20 kmph, or sustained rains/fog begin during a morning or evening survey window, surveyors should cease surveys for that window and visit unsurveyed sites at another time.

Recording Bird Detections: We distinguish between primary and secondary species, which differ in the way data are recorded as described below. Primary Species & 4-letter AOU codes: Each individual is recorded on a separate line and record minute by minute data.

BLRA - Black Rail

CLRA – Clapper Rail

KIRA – King Rail

CLING – Clapper/King

LEBI – Least Bittern

VIRA - Virginia Rail

SORA – Sora Rail

CWWI – Chuck Will's Widow

WPWI – Whip Poor Will

Secondary Species & 4-letter AOU codes: All individuals in a given distance band are recorded on a single line

SESP – Seaside Sparrow

MAWR – Marsh Wren

SEWR – Sedge Wren

Incidental Species: record all species heard or seen, including owls, herons, etc… in this portion of the data sheet.

Distance and direction: For Black Rail, the only primary species, record an estimate of the exact distance and the general direction (N, NE, E, SE, S, SW, W, or NW, or to the degree marker on a compass) to the initial detection of each individual. Recalling the orientation of the broadcast caller can make this determination more efficient. For secondary species, record the estimated distance band at the time of first detection.

Time of detection: Detections of each individual marsh bird should be recorded minute-by-minute during the 10-minute survey period. The beginning of each passive minute during the survey period is indicated by "start". Surveyors should distinguish and indicate the call type(s) of all Black Rail detections during a given survey minute using the call type codes on the provided "cheat sheet"; multiple call types may be recorded in a given minute (e.g., a Black Rail *ki-ki-kerr* followed by a *growl* would be recorded K, GR). For secondary species, indicate the number of individuals detected in each minute using dot and line notation. Remember that for secondary species, each line of the data corresponds to a single distance band. Examples are provided below.

Species Identification: *King Rail vs. Clapper Rail*: These species make similar vocalizations. King Rails typically breed in freshwater marshes and Clapper Rails breed in saltwater marshes. In brackish marshes or inland salt marshes (e.g., N. Pamlico Sound), however, surveyors may not be able to confidently identify vocalizations to species and should, in these situations, record these individuals as KCRA (King-Clapper Rails).

Birds detected at a prior survey point: If a surveyor suspects that a marsh bird detected during a survey is an individual detected at a previous survey point, the surveyor should proceed to record the requisite detection data and record "detected at a previous point" in the comments column. When in doubt, be conservative as to whether an individual bird detected at the current point was the same individual recorded at a previous point (i.e., make a note in the *comments* column).

Birds detected outside the survey period (approaching or leaving): Record any Black Rail detected outside of the survey period by recording the distance and direction of the detection, indication the call type(s) in the "outside survey period" column, and recording your coordinates at the time of detection in the notes column. For example, if a Black Rail is

detected while moving between survey points, record the detection data on the data sheet for the prior (or forthcoming) survey point as described, and record coordinates of the location where you detected the Rail.

Protocol Sources:

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Florida Fish & Wildlife Conservation Commission. 2016. DRAFT - 2016 Black Rail Survey Protocol. **Florida Protocol**

SHARP. 2012. SMI Avian Point-Count/Callback Survey Protocol (revised November 2012), Summary of the Standardized North American Marsh Bird Monitoring Protocols, Modified From Courtney Conway Wildlife Research Report #2007-04. **SHARP Protocol**

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Wilson, M.D., B.D. Watts, and F.M. Smith. 2009. Status and Distribution of Black Rail in Virginia. Center for Conservation Biology Technical Report Series, CCBTR-09-10. College of William and Mary and Virginia Commonwealth University. Williamsburg, VA. **Virginia, Maryland, North Carolina, Georgia Protocol.**