Marsh Bird Monitoring, including Yuma Ridgway's Rail, along Las Vegas Wash, Clark County, Nevada, 2019

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Las Vegas Wash Coordination Committee

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SOUTHERN NEVADA WATER AUTHORITY
Las Vegas Wash Project Coordination Team

Prepared for:

U.S. Fish and Wildlife Service
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ABSTRACT

The Las Vegas Wash Coordination Committee, a 28-member stakeholder group, is working to stabilize and enhance the Las Vegas Wash (Wash), the channel that drains flows from the Las Vegas Valley to Lake Mead at Las Vegas Bay. The Wash also flows through the 2,900-acre Clark County Wetlands Park (Wetlands Park). As part of informal Section 7 consultation for the project with the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service (USFWS) recommended conducting annual surveys to determine the occurrence of the federally endangered Yuma Ridgway's rail (*Rallus obsoletus yumanensis*) within the Wetlands Park. Surveys were conducted by permitted consultants nearly annually from 2000 through 2007. The USFWS established a new standard protocol for conducting Yuma Ridgway's rail surveys in 2006 that includes monitoring for other marsh bird species. The Las Vegas Wash Project Coordination Team (Wash Team) began conducting surveys using this protocol in 2007 and added Yuma Ridgway's rail in 2008 once a federal permit was obtained. This report presents 2019 monitoring season results.

Six species were targeted during the surveys: black rail, Ridgway's rail, Virginia rail, sora, American bittern, and least bittern. Detections of pied-billed grebe, common gallinule, and American coot (referred to as non-target species) were also recorded. Surveys were conducted along three survey routes (Routes 2-4) comprising 27 points. Virginia rail, sora, least bittern, and the three non-target species were detected. Sora was the most abundant of the target species, and American coot was the most abundant of all species. No Yuma Ridgway's rail, black rail, or American bittern were identified. Habitat quality on Routes 2 and 3 was fair to good and in the Mitigation Wetlands (Route 4), it was good to excellent, with the latter providing the highest quality potentially suitable nesting habitat for Yuma Ridgway's rail in the study area.

The informal consultation for Yuma Ridgway's rail has been concluded but continued monitoring is recommended. The species was detected in the study area in 2015-2017, and while no consultation is in effect for it any longer, that does not remove the requirement under the Endangered Species Act to avoid take of federally listed species. Continued monitoring will enhance the Wash Team's ability to detect the rail and respond proactively, if needed.

ACKNOWLEDGEMENTS

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1.0 BACKGROUND

The Las Vegas Wash (Wash) is the primary drainage channel for the Las Vegas Valley, carrying flows, including highly treated wastewater, urban runoff, shallow groundwater, and storm runoff, through the 2,900-acre Clark County Wetlands Park (Wetlands Park) to Lake Mead at Las Vegas Bay (Figure 1). Although originally an ephemeral stream, the Wash began supporting perennial flows in the 1950s when the discharge of treated wastewater into the channel was initiated. At first these perennial flows created a lush wetland along the channel. However, the volume of flows in the Wash continued to increase with the increasing urban population, and erosion began to drain the wetlands and carry thousands of tons of sediment to Lake Mead. By the late 1990s, headcutting had deeply incised the channel and reduced the wetlands by approximately 90% from their peak extent, leaving less than 200 acres.

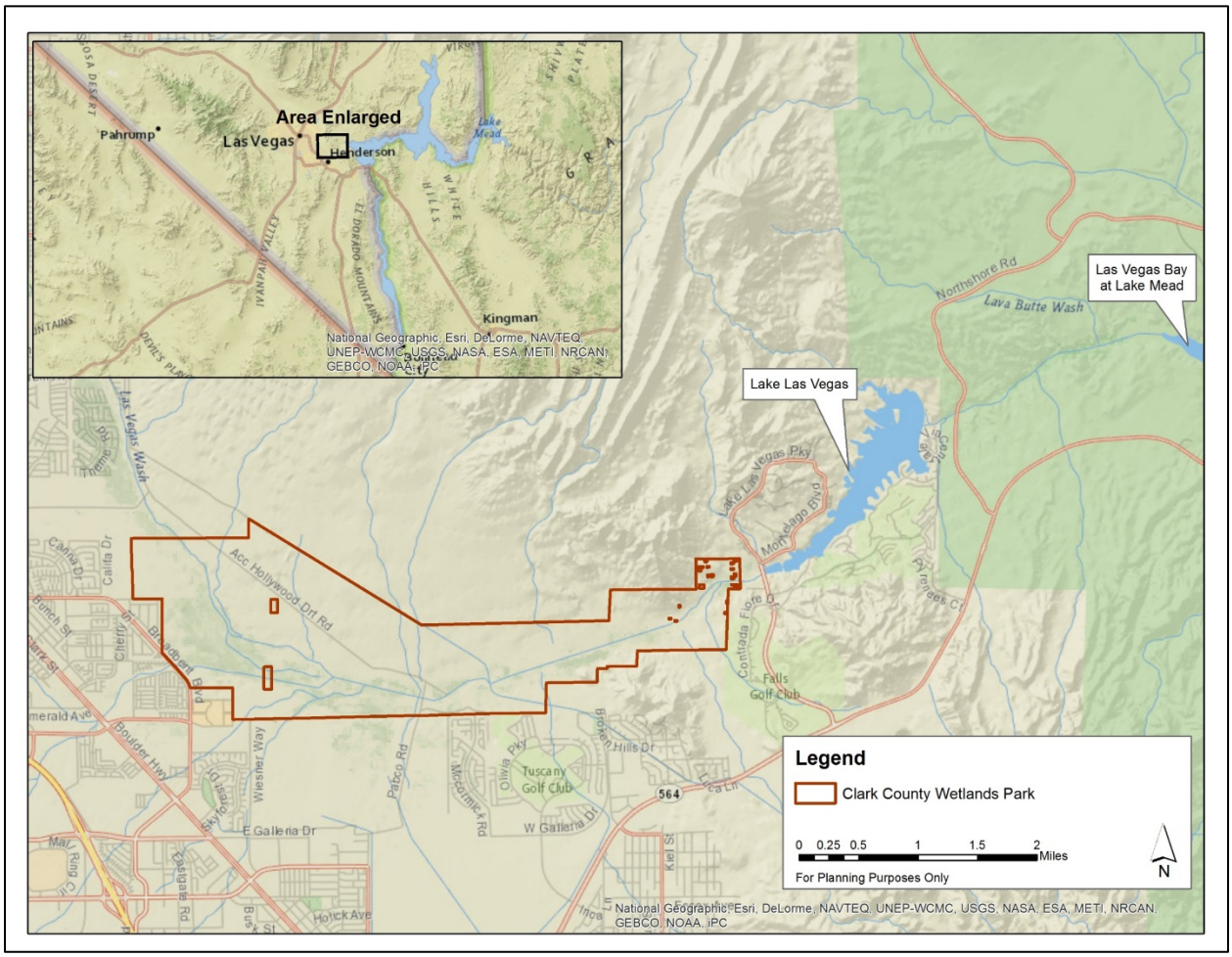

Figure 1. Las Vegas Wash location and general study area map.

In 1998, the Las Vegas Wash Coordination Committee (LVWCC), a 28-member stakeholder group, was created to address the degradation of the Wash. The group developed and is implementing the Las Vegas Wash Comprehensive Adaptive Management Plan (LVWCC 2000) to stabilize the Wash and restore its ecological functions. Stabilization and enhancement activities include the construction of 21 erosion control structures (weirs) and extensive

revegetation to help deter further erosion and reduce the amount of sediment being deposited in Lake Mead. By the spring of 2019, all planned weirs were in place.

The LVWCC has increased wetland habitat along the channel by planting bulrush (*Schoenoplectus* spp.) in the impoundments of the weirs, and cattails (*Typha domingensis*) and common reed (*Phragmites australis*) volunteer from upstream sources, creating islands and often covering the faces of the weirs themselves. Clark County established emergent wetlands in the constructed wetland ponds in the Wetlands Park Nature Preserve (Nature Preserve) and in the in-lieu fee mitigation wetlands (Mitigation Wetlands; Figure 2). Changes in habitat could impact secretive marsh birds (e.g., rails and bitterns), including the federally endangered Yuma Ridgway's rail (*Rallus obsoletus yumanensis*). (Note: This species was known as the Yuma clapper rail [*Rallus longirostris yumanensis*] until it was reclassified as a different species by Chesser et al. [2014]; for simplicity, all references below have been updated with the current species name).

The Yuma Ridgway's rail is largely restricted to the lower Colorado River watershed and the Salton Sea, inhabiting freshwater and brackish water wetlands (Anderson and Ohmart 1985). Home range size varies seasonally and is greatest during winter and post-breeding (Eddleman 1989, Conway et al. 1993). Eddleman (1989) reported a mean annual home range size of more than 17 acres, while Conway et al. (1993) reported mean annual home range size to be 30 acres. Sites occupied by the Yuma Ridgway's rail have a higher percent cover of shallow water (Eddleman 1989). Density of emergent vegetation has also been reported as an important habitat variable, although findings differ. Anderson and Ohmart (1985) found that Yuma Ridgway's rails typically reached their highest numbers year-round in the densest stands of emergent vegetation, while Conway et al. (1993) found low stem densities to be an important component. Species preferences also vary. Conway et al. (1993) found that cattails and bulrush are preferred, although Yuma Ridgway's rails have also been detected in wetlands dominated by common reed, salt cedar (*Tamarix ramosissima*), and willow (*Salix* spp.; Eddleman 1989, Hinojosa-Huerta et al. 2001). Differences in preferred density and species of emergent vegetation among different geographic locations may relate to densities of crayfish, the most abundantly consumed prey item of the Yuma Ridgway's rail (Anderson and Ohmart 1985). Habitat use also changes throughout the year, thus Conway et al. (1993) suggest that maintaining shallow, open water areas with stands of emergent vegetation at different successional stages would best support Ridgway's rails year-round.

Alcorn (1988) reported that eight Ridgway's rails were observed in the Las Vegas Sewage disposal drainage ditch on September 6, 1959, and that a lone individual was observed in the same location a few weeks later (the site of the detections is believed to be the present-day City of Las Vegas Water Pollution Control Facility discharge channel, located approximately 1.5 miles upstream of the Wetlands Park boundary; Figure 2). A Yuma Ridgway's rail was also detected along the Wash, within the Wetlands Park, on May 28 and June 18, 1998, in a wet, salt cedar-dominated area upstream of Pabco Road Weir (Southwest Wetlands Consortium 1998; Figure 2).

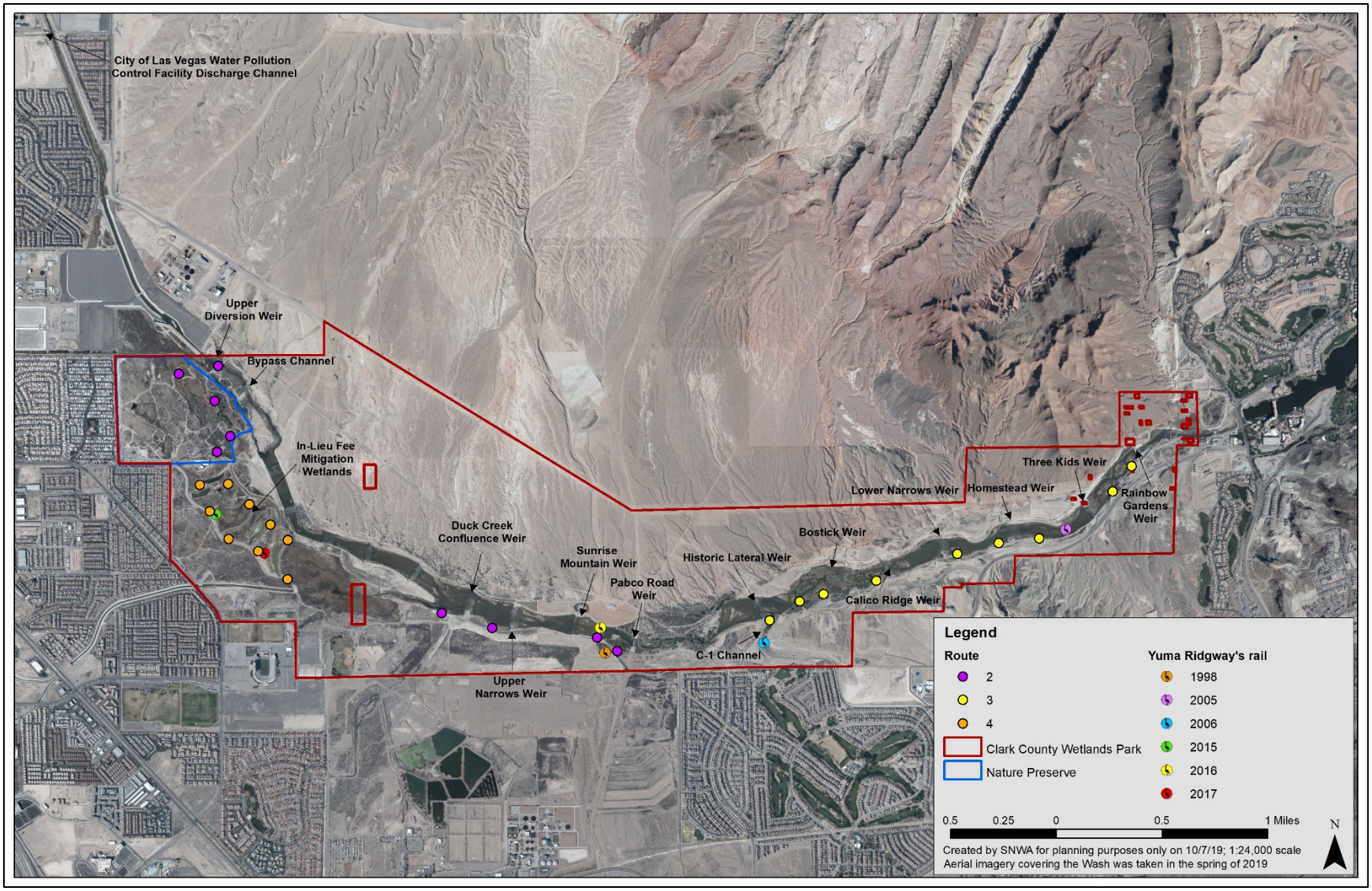

Figure 2. Yuma Ridgway's rail detection locations by year and 2019 monitoring points by survey route. Locations of interest also shown.

As a result of informal Section 7 consultation between the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service (USFWS) on the proposed development of the Wetlands Park and associated erosion control structures, the USFWS recommended annual surveys to determine the occurrence of the Yuma Ridgway's rail in the project area. Southern Nevada Water Authority (SNWA), the lead agency of the LVWCC, contracted with permitted consultants to perform the surveys from 2000 to 2004 and 2006 to 2007 (McKernan and Braden 2001; McKernan and Carter 2002; SWCA 2002, 2003, 2005, 2006, 2007, 2008). Then, Conway (2005, 2009) developed a protocol for conducting marsh bird monitoring that includes calling for Ridgway's rail. It was established as the official Yuma Ridgway's rail survey protocol in 2006 and enables compliance obligations to be met, while also providing information on the status, abundance, and distribution of other sensitive species such as the least bittern (*Ixobrychus exilis*) and black rail (*Laterallus jamaicensis*), which are covered under the Lower Colorado River Multi-Species Conservation Program. Consequently, in 2007, the Las Vegas Wash Project Coordination Team (Wash Team; the implementation team of the LVWCC) initiated a marsh bird monitoring study along the Wash and within the Wetlands Park (Van Dooremolen 2010a, 2010b, 2012, 2013, 2014a, 2014b, 2015, 2017a, 2017b, 2018). Yuma Ridgway's rail could not be surveyed for until 2008 because the necessary federal permit was not in place.

This report presents results from the 2019 monitoring season.

2.0 METHODS

2.1 Description of Survey Routes

Three routes totaling 27 points were surveyed in 2019 (Figure 2). GPS coordinates of the points are included in Appendix A.

Route 1, upstream of the Clark County Water Reclamation District, is no longer surveyed.

Route 2 included nine points in 2019: four within the constructed wetland ponds at the Nature Preserve and five along the Wash, with one in the Upper Diversion Weir impoundment, one above Duck Creek Confluence Weir, one upstream of Upper Narrows Weir, and two upstream of Pabco Road Weir (Figure 2). The Nature Preserve ponds (3-acre lower pond [Vern's Pond], 1.5-acre middle pond complex, and 1.5-acre upper pond) have varying amounts of open water and the vegetation is composed of cattails, California and hardstem bulrush (*Schoenoplectus californicus* and *Schoenoplectus acutus*), common reed, sandbar willow (*Salix exigua*), Goodding willow (*Salix gooddingii*) and cottonwood (*Populus fremontii*). The Upper Diversion Weir point covers the 3.5-acre impoundment; this site is still largely open water, but the cattail marsh is filling in again (it was cleared in the winter of 2017). One point samples 17 acres of habitat in the Duck Creek Confluence Weir and its impoundment. Common reed, cattails and some bulrush blanket the banks, and there are islands of cattails and common reed in the impoundment. In the 14-acre impoundment of the Upper Narrows Weir, California and Olney bulrush (*Schoenoplectus americanus*), cattails, and common reed line the banks, and there is extensive open water. Following the completion of Sunrise Mountain Weir, approximately 20 acres of habitat are now monitored by the two points upstream of Pabco Road Weir. The emergent habitat is dominated by cattails and common reed and includes a small backwater pond and wetlands created by the City of Henderson Water Reclamation Facility outfall channel, as well as marsh volunteering between Sunrise Mountain Weir and Pabco Road Weir.

Route 3 included nine points (approximately 65 acres of habitat; Figure 2) in 2019. The route begins in the small backwater wetland at the discharge of the C-1 Channel into the Wash at the toe of Historic Lateral Weir. It continues downstream to end at Rainbow Gardens Weir and includes points sampling the impoundments of Bostick, Calico Ridge, Homestead, Three Kids, and Rainbow Gardens weirs, as well as the toe of Lower Narrows Weir and of Three Kids Weir (Figure 2). All of these locations have banks and islands covered in varying amounts of cattails, common reed, and bulrush. The oldest of them, Bostick and Calico Ridge, also have mature Goodding willow with lesser amounts of sandbar willow, cottonwood and other riparian vegetation. The other points have more limited riparian habitat.

Route 4 included nine points (approximately 60 acres of habitat; Figure 2) in 2019. Two points cover the three small wetland cells, six points cover the three large cells, and one point covers habitat created by Duck Creek and the west channel. The three small cells are dominated by dense stands of cattails and common reed, with the closest open water approximately 150 feet or more from the points. The three large cells had been dominated by open water with cattails, bulrush, and common reed of varying width along the banks and in a few stands in the interior. Revegetation activities to enhance wetland and riparian habitat in two of the cells' interiors (Cells 5 and 6) were conducted in 2016 and 2017, and vegetation has successfully colonized the sites. Open water is deep in the small cells (greater than three feet), but mostly shallow in the large cells, which contain only narrow zones of deeper water. The habitat at the point immediately adjacent to the Mitigation Wetlands consists primarily of cattails, common reed, and flooded tamarisk.

Along each route, survey points were established a minimum of 656 feet apart. Although Conway (2005, 2009) recommends a separation of 1,312 feet, the Wash does not contain enough emergent marsh to allow for such wide spacing while still maintaining a sufficient number of points per route. Conway (2005, 2009) does allow for tighter spacing in such circumstances but warns of the risk of double-counting individuals.

2.2 Survey Protocol

Surveys were performed using the North American marsh bird monitoring protocol developed by Conway (2005, 2009). Trained observers conducted the surveys during the breeding season from April through early May. Three surveys of each route were conducted, as required by the protocol (from 2007 through 2016, a fourth survey was conducted, in mid-May) and each route was surveyed on a separate day. Two observers conducted each survey, including at least one of the following permitted individuals: Deborah Van Dooremolen-TE148556-4, Nicholas Rice-TE64580A-2, and Timothy Ricks-TE67397A-2. Surveys began one half hour before sunrise and concluded by 9 a.m. Although Conway (2005, 2009) specifies that the survey route be run in the same direction every time, each route was run in reverse on the second survey to ensure that most points were surveyed during the earliest morning hours (the time of peak marsh bird vocalization). Surveys were not conducted if wind reached or exceeded 12 miles per hour, as measured by the Beaufort wind scale, for more than two points (see Appendix B for weather conditions on survey days).

At each point, surveys began with a five-minute period of passive listening followed by broadcasting the vocalizations of each target species in succession to elicit a response. Target

species for the Wash survey include black rail, Ridgway's rail, Virginia rail (*Rallus limicola*), sora (*Porzana carolina*), American bittern (*Botaurus lentiginosus*), and least bittern. Each species' vocalizations were broadcast for 30 seconds, followed by 30 seconds of silence to listen for responses, for a total of one minute per species. Species' vocalizations were broadcast in succession from most sensitive (i.e., likely to be deterred from responding by hearing the call of another species) to least sensitive: black rail, least bittern, sora, Virginia rail, Ridgway's rail, and American bittern. Vocalizations were broadcast using MP3 players with portable speakers. The observers recorded all target species heard and/or seen during the survey, making a separate record for each bird and noting each minute of the survey period in which it was heard calling and/or seen. Individuals were also recorded if they were heard or seen at the point immediately before or after the survey. Detections of three other marsh bird species that were not targeted through the broadcast were also recorded, including pied-billed grebe (*Podilymbus podiceps*), common gallinule (*Gallinula galeata*), and American coot (*Fulica americana*). Given the sheer number of coots present at some points, observers often counted them either before or after the survey. Other data collected include the call type heard, the distance and direction to each detected bird, and whether the bird was detected at a previous point. The background noise level was also recorded at each point. Noise designated as loud or intense meant that at least some species could not be heard beyond approximately 165 or 80 feet, respectively.

The observers compared data after the survey was completed at each point in order to rectify any differences in detections.

2.3 Data Analysis

Detections of target and non-target species were summarized by route and date to provide an overall picture of when and where birds were detected. However, since multiple detections could be made of the same bird over the course of a survey season, the number of unique individuals per species along each route was also estimated. This number was calculated as the sum of the maximum number of birds of the species that were detected at each point during the season. Whether or not a bird was counted as a unique individual was determined by the following criteria. If one or more individuals of a species were detected at the same point on more than one survey, they were considered to be the same individual(s). If an individual had been detected at a previous point during a survey, the second survey detection was not counted. If an individual was detected at a point within 656 feet of a location where an individual had been detected on a prior survey, and the individual was calling from approximately the same direction where the other bird had been detected, it was considered to be the previously detected bird and was not counted as a new individual. This yielded an estimate of the number of individuals detected, i.e., the abundance, of each species. (Note: The above assumes that individuals inhabit a relatively small home range throughout the survey season. Thus, a sora detected at Point 1 during the second and third surveys on Route 4 would be considered a unique individual, and a sora detected at Point 6 on the same route in the fourth survey would be considered a unique individual.)

For each route, the total number of individuals detected of each species and the total number of individuals detected regardless of species were divided by the number of points the route contained, yielding a per point abundance for each. Then for the study area as a whole, the total number of individuals detected of each species and the total number of individuals detected

regardless of species were divided by the total number of points surveyed to yield the total abundance per point for each. Per point abundance provides for a more accurate comparison between routes and between years than the raw abundance because the number of points surveyed has varied over time. However, it should also be noted that, with the exception of American coot, the number of individuals detected on each route is typically small enough that the loss or addition of just one or two individuals can have a noticeable impact on this metric.

Per point abundance data were compared with results from the previous year and with an average of all 13 years of surveys (10 for the Mitigation Wetlands) to look for changes, and charts of each species' annual abundance were also created to show trends and variations over time.

As stated in Section 2.1, the recommended spacing of points is 1,312 feet. Broadcasting from points with tighter spacing may impact bird behavior, calling them in from more distant points (Conway 2005, 2009). Since spacing for this study is half of the recommended distance, it is possible that some individuals were double-counted.

3.0 RESULTS AND DISCUSSION

3.1 Species

In 2019, three of the six target species were detected: Virginia rail, sora, and least bittern (Table 1), all of which were identified on all routes. The three non-target species were also detected, with common gallinule and American coot identified during most to all survey replicates on all routes (Table 1). Sora was the most abundant of the target species with 1.33 individuals per point (Table 2). American coot was the most abundant of all species with 18.15 birds per point (Table 2).

Species composition was typical for marsh bird monitoring in the study area. Virginia rail, sora, and least bittern have been identified in all 13 seasons of surveys, as have the three non-target species (Figures 3-5, Appendix C). Sora was the most abundant of the target species, as it has been every year, just as American coot has always been the most abundant, by far, of all species identified. Also similar to prior years, no black rails were detected. The lack of detections of Yuma Ridgway's rail and American bittern is also normal, with the former only detected in one season and the latter only in four (Figure 3, Appendix C). Abundances of Virginia rail and sora increased substantially year over year (Table 2, Figure 3, Appendix C). Virginia rail recovered from a study low of just two individuals in 2018, rebounding with 14, while sora established a new high for the study, and both were well above their long-term averages. Abundances of least bittern and pied-billed grebe were similar to 2018 but were again below average (Table 2, Figures 3 and 5, Appendix C). Common gallinule abundance decreased but was just above average, and American coot abundance increased to a new study high, equaling more than twice the average number of birds per point (Table 2, Figures 4-5, Appendix C).

2019 was the third year the three-survey protocol was implemented. In prior years, four surveys were conducted. A few new individuals were typically detected on the fourth survey, particularly of least bittern, so the change in effort may have contributed to the reduced abundances observed for the species in recent years (Figure 3, Appendix C).

Route	Date	VIRA	SORA	LEBI	PBGR	COGA	AMCO	Grand Total
2	4/1/2019	1	4	3	0	13	286	307
2	4/17/2019	2	6	2	0	15	172	197
2	5/6/2019	0	0	0	0	12	24	36
2 Total		3	10	5	0	40	482	540
3	4/3/2019	6	7	0	6	10	152	181
3	4/15/2019	2	7	1	0	3	85	98
3	5/7/2019	0	1	0	0	5	17	23
3 Total		8	15	1	6	18	254	302
4	4/4/2019	4	16	0	0	2	22	44
4	4/18/2019	2	19	0	1	0	10	32
4	5/8/2019	0	2	1	0	1	13	17
4 Total		6	37	1	1	3	45	93
Grand Total		17	62	7	7	61	781	935

Table 1. Total 2019 detections for each species by route and date for the 27 points surveyed. VIRA=Virginia Rail, SORA=Sora, LEBI=Least Bittern, PBGR=Pied-billed Grebe, COGA=Common Gallinule, AMCO=American Coot.

The lack of Yuma Ridgway's rail detections continues to be disappointing but, given its history in the study area, not surprising. The species has rarely been detected and observations have typically been during other work rather than the official surveys. These include detections on May 23, 2005 in what is now the Three Kids Weir impoundment; on June 4 and June 7, 2006 along the C-1 Channel near the Wash confluence; at the Mitigation Wetlands (Route 4) off and on from August 19 through September 3, 2015; and upstream of Pabco Road Weir on October 20, 2016 (SWCA 2006, 2007; Van Dooremolen 2015, 2017a; Figure 2). Finally, in 2017, a male was heard kekking from shallowly flooded cattail marsh at the Mitigation Wetlands on April 19 and May 3, 2017, representing the first time the species was detected during the surveys targeting it. It was also heard periodically during other work, including on June 1, 2017, the last confirmed detection, when it was also seen (Van Dooremolen 2017b; Figure 2).

Route	Year	No. of Points	VIRA	SORA	AMBI	LEBI	PBGR	COGA	AMCO	Grand Total
2	2018	8	0.13	0.50	0.00	0.50	0.38	2.38	23.13	27.00
2	2019	9	0.22	0.78	0.00	0.44	0.00	2.11	33.00	36.55
2	**13Y AVG**	**8.77**	**0.12**	**0.68**	**0.01**	**0.39**	**0.45**	**1.59**	**9.09**	**12.32**
3	2018	9	0.11	0.78	0.00	0.22	0.33	1.56	13.67	16.67
3	2019	9	0.78	1.00	0.00	0.11	0.67	1.44	18.89	22.89
3	**13Y AVG**	**7.92**	**0.27**	**0.65**	**0.00**	**0.32**	**0.31**	**1.40**	**14.68**	**17.63**
4	2018	9	0.00	0.89	0.11	0.00	0.11	0.67	1.89	3.67
4	2019	9	0.56	2.22	0.00	0.11	0.11	0.22	2.56	5.78
4	**10Y AVG**	**8.40**	**0.65**	**1.18**	**0.07**	**0.26**	**0.34**	**0.89**	**4.11**	**7.51**
Total	2018	26	0.08	0.73	0.04	0.23	0.27	1.50	12.50	15.35
Total	2019	27	0.52	1.33	0.00	0.22	0.26	1.26	18.15	21.74
Total	**13Y AVG**	**25.46**	**0.33**	**0.80**	**0.02**	**0.30**	**0.34**	**1.20**	**8.86**	**11.86**

Table 2. Species and total per point abundances for each route and overall for 2018 and 2019 with study averages. Overall averages include data from Route 1, which was surveyed from 2007 through 2010. VIRA= Virginia Rail, SORA=Sora, AMBI=American Bittern, LEBI=Least Bittern, PBGR=Pied-billed Grebe, COGA=Common Gallinule, AMCO=American Coot.

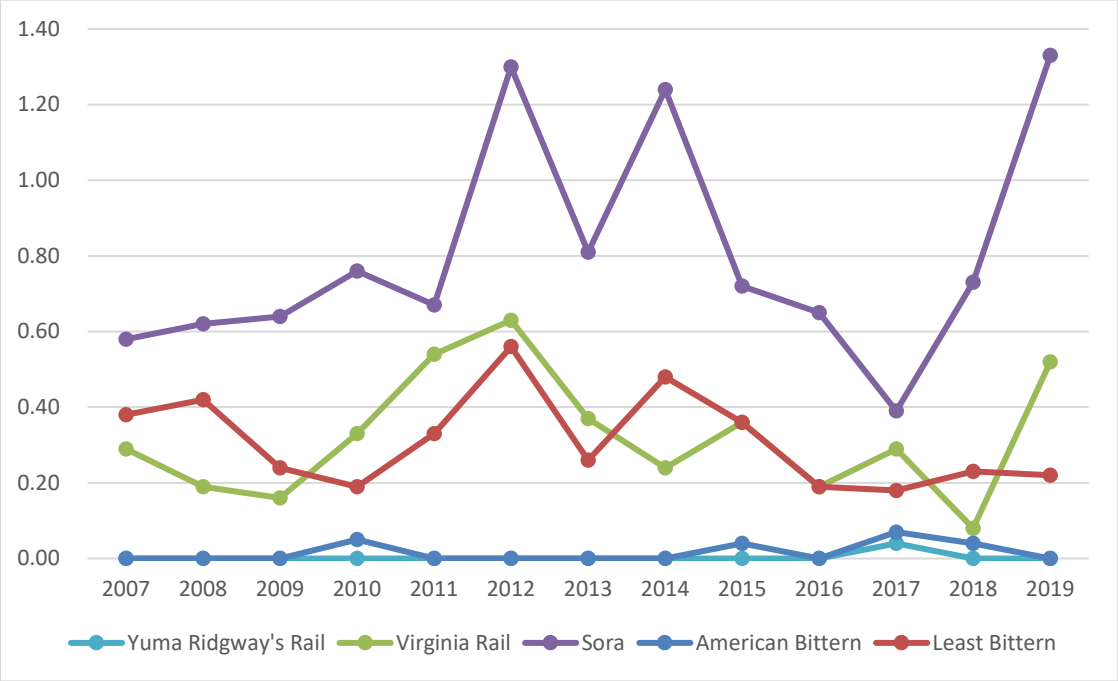

Figure 3. Target species per point abundances by year.

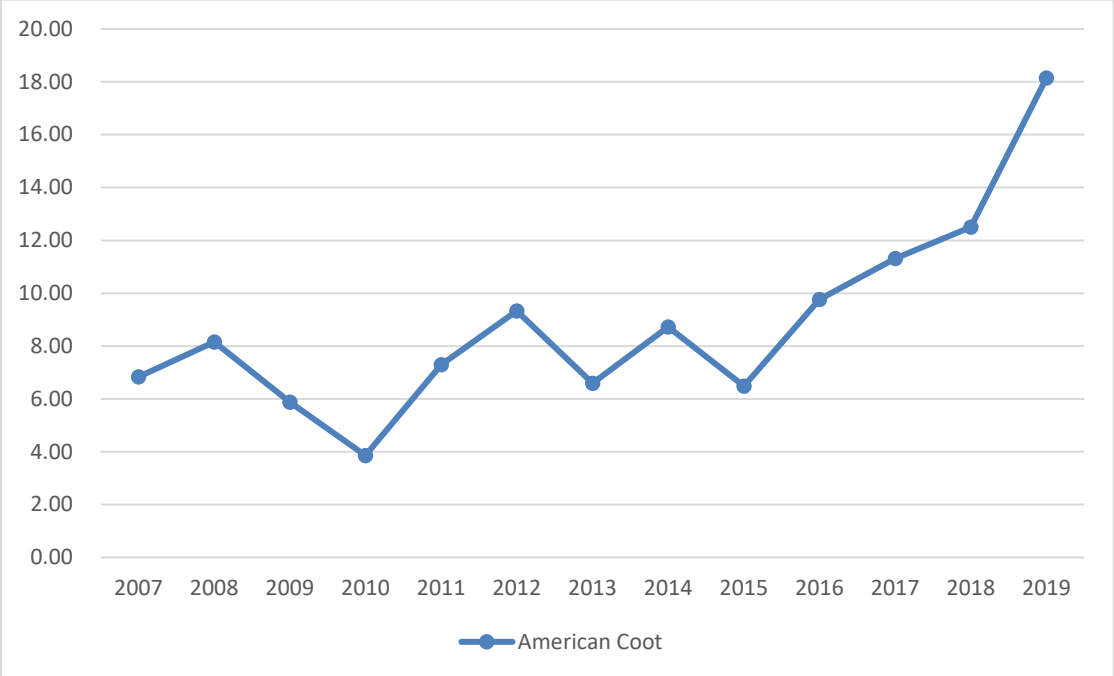

Figure 4. American coot per point abundance by year.

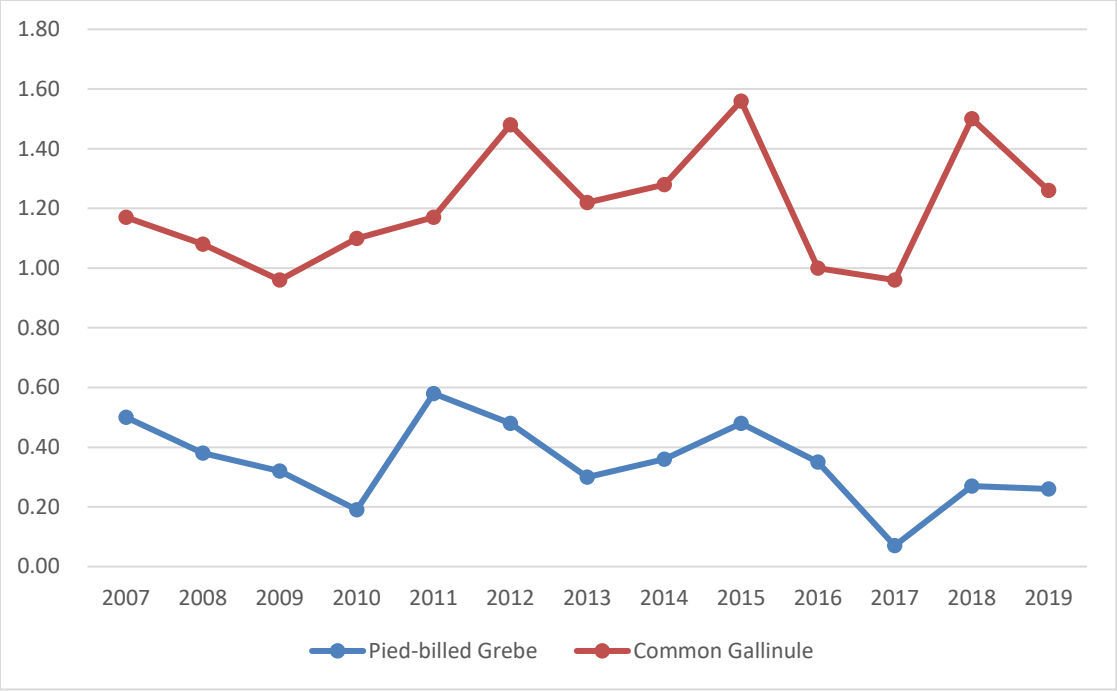

Figure 5. Pied-billed grebe and common gallinule per point abundances by year.

3.2 Routes

3.2.1 Route 2

In 2019, Route 2 had the highest abundances of least bittern, common gallinule and American coot and the lowest abundances of Virginia rail and sora although the latter still represented increases from 2018 (Table 2). Pied-billed grebe was notably absent from the route, a first for the study; other abundances were somewhat to substantially above average (Table 2, Appendix C).

Overall, habitat quality was fair to good, as in the prior few years. The cattail-dominated marsh that had been cleared from the Upper Diversion Weir impoundment in 2017 continued to recover. The habitat around Duck Creek Confluence Weir, coupled with the habitat of the Upper Narrows Weir just downstream, likely represents the most suitable potential nesting habitat currently available for Yuma Ridgway's rail on the Wash channel itself. The addition of this habitat and the removal of the bypass channel from monitoring has changed the nature of the route in recent years, weighting the habitat coverage to the Wash versus the constructed wetland ponds. The completion of Sunrise Mountain Weir has added to this effect, increasing open water and marsh habitat above Pabco Road Weir. The points along the Wash were responsible for the high abundance of coots on the route, particularly the point closest to the toe of Sunrise Mountain Weir.

In the middle and upper pond of the Nature Preserve, cattails continued to age and expand, resulting in little open water at these sites. Clark County did clear cattails in the lower pond (Vern's Pond), which substantially increased open water there.

3.2.2 Route 3

Route 3 had the highest abundance of Virginia rail, which increased substantially year over year and was well above average, reaching a high for the study along the route (Table 2, Appendix C). Sora, pied-billed grebe, and American coot abundance also increased and were well above average. Abundances for least bittern and common gallinule decreased, with the former well below the long-term average (Table 2).

Overall, habitat quality was still fair to good. Construction concluded on the expansion of Historic Lateral Weir, but the marsh was cleared from the C-1 Channel to increase flow capacity, leaving little more than an acre of wetland habitat near its confluence with the Wash. Regrowth was already occurring when surveys were conducted but was limited. The wetlands that had been cleared from the impoundment of Rainbow Gardens Weir in 2015 have largely recovered, contributing to results. Habitat in the two-point stretch between Lower Narrows and Homestead weirs continued to improve and expand and still represents the highest quality potentially suitable nesting habitat for Ridgway's rail on the route. This was the reach with the sole least bittern detection along the route.

3.2.3 Route 4

2019 marked 10 seasons of surveys along the route, although during the first year it only had three points (Table 2, Figure 6, Appendix C). Activity improved year over year (Table 2, Figure 6). The site, which had hosted the highest abundance of Virginia rail from 2010 through 2016 and of total target species from 2011 through 2016, had zero detections of the former and lagged the other routes for the latter in 2018 (Table 2, Appendix C). In 2019, field crews detected five Virginia rails, yielding a per point abundance of 0.56 that, while still below average, was a marked improvement (Table 2). They also identified a record 20 soras, for a per point abundance of 2.22, nearly twice the 10-year average (Table 2, Appendix C). Least bittern abundance was below average, with just one bird found, but that was still an improvement from the lack of detections in 2018. Non-target species abundances were mixed year over year, but all were below average. The site has accounted for four of the five American bittern detected over the course of the study, but none were observed in 2019.

In 2016, it was first suggested that water level changes may have contributed to the year over year declines of some species along the route. There is little doubt that lower water levels and other changes in hydrology negatively impacted habitat quality and contributed to declines in detections in 2017 and 2018. Water levels were lowered in two of the three large wetland cells to aid the growth of new plantings. In 2019, water levels were raised in the large cells and this, coupled with the increased emergent vegetation, helped results for target species. In addition, the marsh at the Duck Creek/west channel point had improved, with increased inundation and clumps of hardstem bulrush compared to 2018, which also aided results.

With the increase in native emergent marsh vegetation and shallowly flooded zones, the habitat quality of the route is good to excellent, and the Mitigation Wetlands once again provide the highest quality potentially suitable nesting habitat for the Yuma Ridgway's rail in the study area.

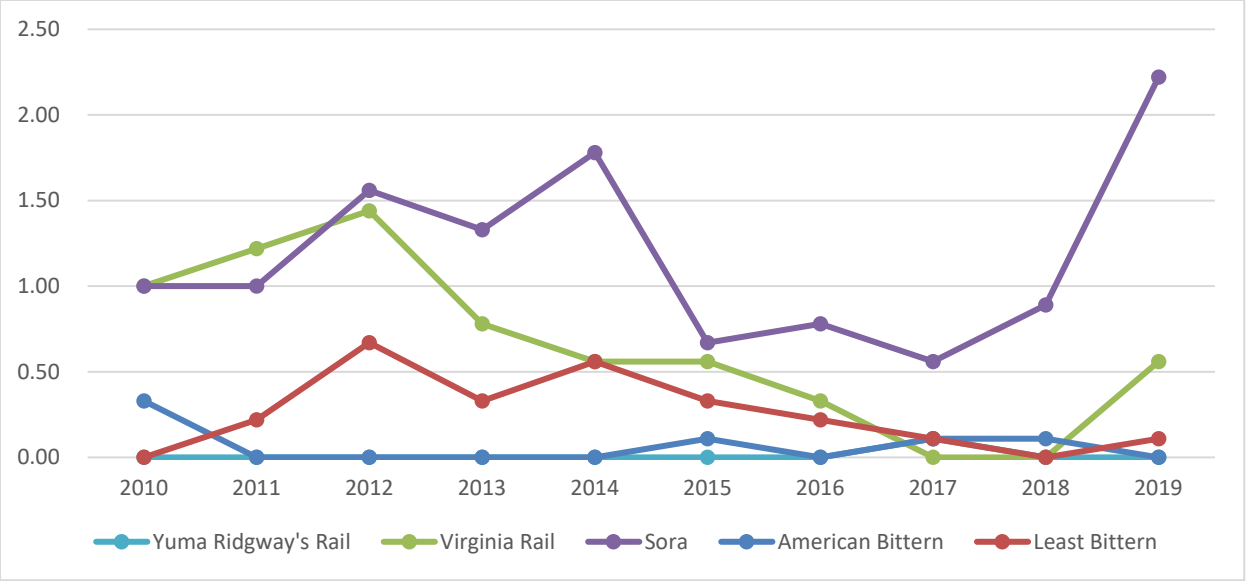

Figure 6. Target species per point abundances by year for Route 4.

4.0 RECOMMENDATIONS

Annual monitoring for the Yuma Ridgway's rail was originally necessary to comply with informal Section 7 consultation measures. That consultation has been concluded but continued monitoring is recommended. Wash Team staff are trained and permitted, and effort has been reduced from four to three surveys. The species was detected in the study area in 2015-2017, and while no consultation is in effect for it any longer, that does not remove the requirement under the Endangered Species Act to avoid take of federally listed species. Continued monitoring will enhance the Wash Team's ability to detect the rail and respond proactively, if needed.

Weir construction occurred from 1999 through 2018, and several structures were completed after marsh bird monitoring began in 2007. These weirs created additional habitat that needed to be surveyed, resulting in a piecemeal approach, with points added as habitat became available. The last planned weirs are now complete. Revegetation of the final sites is under way. In preparation for moving to long-term operations of facilities, SNWA engineers worked with a consulting firm to review the function of all stabilization structures. It was found that vegetation on the weirs and in key areas around them negatively impacts their ability to carry 100-year flood flows. As a result, engineers are recommending that approximately 65 acres of marsh and riparian vegetation be removed from these sites and that sites be maintained biennially from that point forward to keep them clear. This process will impact habitat at many of the marsh bird monitoring points along the Wash. The original plan was to review and reconfigure the routes before monitoring in 2020, but now the Wash Team will wait until after the vegetation clearing process is complete before reconfiguring Wash sites. Consolidation of off-channel wetland sites into a single route will likely still move forward before monitoring begins in 2020.

5.0 LITERATURE CITED

Alcorn, J. R. 1988. *The Birds of Nevada*. Fallon, Nevada: Fairview West Publishing.

Anderson, B.W., and R.D. Ohmart. 1985. Habitat use by clapper rails in the lower Colorado River valley. Condor 87: 116-126.

Braden, G.T., A. Miller, and L. Crew. 2007. The status of Yuma clapper rail and yellow-billed cuckoo along portions of the Virgin River and Muddy River in Southern Nevada: 2006 Final. Final report to the Southern Nevada Water Authority, Las Vegas, prepared by San Bernardino County Museum, Redlands, California.

Chesser, R.T., R.C. Banks, C. Cicero, J.L. Dunn, A.W. Kratter, I.J. Lovette, A.G. Navarro-Siguenza, P.C. Rasmussen, J.V. Remsen, Jr., J.D. Rising, D.F. Stotz, and K. Winker. 2014. Fifty-fifth supplement to the American Ornithologists' Union *Check-list to North American Birds*. The Auk 131: CSi-CSxv.

Conway, C.J, W.R. Eddleman, S.H. Anderson, and L.R. Hanebury. 1993. Seasonal changes in Yuma clapper rail vocalization rate and habitat use. Journal of Wildlife Management 57:282-290.

Conway, C.J. 2005. Standardized North American marsh bird monitoring protocols. Wildlife Research Report #2005-4, U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit, Tucson, Arizona.

Conway, C.J. 2009. Standardized North American marsh bird monitoring protocols, version 2009-2. Wildlife Research Report #2009-2, U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit, Tucson, Arizona.

Eddleman, W.R. 1989. Biology of Yuma clapper rail in the southwestern U.S. and northwestern Mexico. Final Rep. Intra-Agency Agreement No. 4-AA-30-02060, U.S. Bureau of Reclamation, Yuma Project Office, Yuma, Arizona. 127pp.

Hinojosa-Huerta, O., S. DeStefano, and W.W. Shaw. 2001. Distribution and abundance of the Yuma clapper rail (Rallus longirostris yumanensis) in the Colorado River delta, Mexico. Journal of Arid Environments 49: 171-182.

LVWCC (Las Vegas Wash Coordination Committee). 2000. Las Vegas Wash Comprehensive Adaptive Management Plan. Las Vegas Wash Project Coordination Team, Southern Nevada Water Authority, Las Vegas, Nevada.

McKernan, R. L., and G. T. Braden. 2001. The status of Yuma clapper rail and yellow-billed cuckoo along portions of Virgin River, Muddy River, and Las Vegas Wash, Southern Nevada, 2000. Final report to the U.S. Fish and Wildlife Service and Southern Nevada Water Authority, Las Vegas, NV, prepared by San Bernardino County Museum, Redlands, California.

McKernan, R. L., and K. J. Carter. 2002. The status of Yuma clapper rail and yellow-billed cuckoo along portions of Virgin River, Muddy River, and Las Vegas Wash, Southern Nevada, 2001. Final report to the U.S. Fish and Wildlife Service and Southern Nevada Water Authority, Las Vegas, NV, prepared by San Bernardino County Museum, Redlands, California.

Rush, S.A., K.F. Gaines, W.R. Eddleman, and C.J. Conway. 2012. Ridgway's Rail (Rallus obsoletus), version 2.0. In The Birds of North America (P. G. Rodewald, editor). Cornell Lab of Ornithology, Ithaca, New York, USA. Retrieved from the Birds of North America: https://birdsna.org/Species-Account/bna/species/ridrai1

Southwest Wetlands Consortium. 1998. A survey for southwestern willow flycatchers along Las Vegas Wash, Clark County Wetlands Park, Nevada. Final report to the Clark County Department of Parks and Recreation, Las Vegas, NV, prepared by SWCA Environmental Consultants, Salt Lake City.

SWCA. 2002. Survey for Yuma clapper rails, yellow-billed cuckoos and southwestern willow flycatchers along Las Vegas Wash, Clark County, Nevada. Prepared by SWCA Environmental Consultants, Salt Lake City. Final report prepared for the Southern Nevada Water Authority, Las Vegas, NV.

SWCA. 2003. Survey for Yuma clapper rails, yellow-billed cuckoos and southwestern willow flycatchers along Las Vegas Wash, Clark County, Nevada. Prepared by SWCA Environmental Consultants, Salt Lake City. Final report prepared for the Southern Nevada Water Authority, Las Vegas, NV.

SWCA. 2005. [2004] Survey for Yuma clapper rails, yellow-billed cuckoos and southwestern willow flycatchers along Las Vegas Wash, Clark County, Nevada. Prepared by SWCA Environmental Consultants, Salt Lake City. Final report prepared for the Southern Nevada Water Authority, Las Vegas, NV.

SWCA. 2006. Survey for southwestern willow flycatchers in 2005 along Las Vegas Wash, Clark County, Nevada. Prepared by SWCA Environmental Consultants, Salt Lake City. Final report prepared for the Southern Nevada Water Authority, Las Vegas, NV.

SWCA. 2007. 2006 survey for Yuma clapper rails and southwestern willow flycatchers along Las Vegas Wash, Clark County, Nevada. Prepared by SWCA Environmental Consultants, Salt Lake City. Final report prepared for the Southern Nevada Water Authority, Las Vegas, NV.

SWCA. 2008. 2007 survey for Yuma clapper rails and southwestern willow flycatchers along Las Vegas Wash, Clark County, Nevada. Prepared by SWCA Environmental Consultants, Salt Lake City. Final report prepared for the Southern Nevada Water Authority, Las Vegas, NV.

Van Dooremolen, D. 2010a. Marsh bird monitoring, including Yuma clapper rail, along Las Vegas Wash, Clark County, Nevada, 2007-2009. Final report prepared for the U.S. Fish and Wildlife Service, Southern Nevada Field Office, Las Vegas, NV, and Las Vegas Wash Coordination Committee, Las Vegas, NV.
http://www.lvwash.org/assets/pdf/resources_ecoresearch_marshmonitoring.pdf

Van Dooremolen, D. 2010b. Marsh bird monitoring, including Yuma clapper rail, along Las Vegas Wash, Clark County, Nevada, 2010. Final report prepared for the U.S. Fish and Wildlife Service, Southern Nevada Field Office, Las Vegas, NV, and Las Vegas Wash Coordination Committee, Las Vegas, NV. http://www.lvwash.org/assets/pdf/resources_ecoresearch_yuma10.pdf

Van Dooremolen, D. 2012. Marsh bird monitoring, including Yuma clapper rail, along Las Vegas Wash, Clark County, Nevada, 2011. Final report prepared for the U.S. Fish and Wildlife Service, Southern Nevada Field Office, Las Vegas, NV, and Las Vegas Wash Coordination Committee, Las Vegas, NV. http://www.lvwash.org/assets/pdf/resources_ecoresearch_yuma11.pdf

Van Dooremolen, D. 2013. Marsh bird monitoring, including Yuma clapper rail, along Las Vegas Wash, Clark County, Nevada, 2012. Final report prepared for the U.S. Fish and Wildlife Service, Southern Nevada Field Office, Las Vegas, NV, and Las Vegas Wash Coordination Committee, Las Vegas, NV. http://www.lvwash.org/assets/pdf/resources_ecoresearch_yuma12.pdf

Van Dooremolen, D. 2014a. Marsh bird monitoring, including Yuma clapper rail, along Las Vegas Wash, Clark County, Nevada, 2013. Final report prepared for the U.S. Fish and Wildlife Service, Southern Nevada Field Office, Las Vegas, NV, and Las Vegas Wash Coordination Committee, Las Vegas, NV. http://www.lvwash.org/assets/pdf/resources_ecoresearch_march_bird_monitor.pdf

Van Dooremolen, D. 2014b. Marsh bird monitoring, including Yuma clapper rail, along Las Vegas Wash, Clark County, Nevada, 2014. Final report prepared for the U.S. Fish and Wildlife Service, Southern Nevada Field Office, Las Vegas, NV, and Las Vegas Wash Coordination Committee, Las Vegas, NV. http://www.lvwash.org/assets/pdf/resources_ecoresearch_yuma14.pdf

Van Dooremolen, D. 2015. Marsh bird monitoring, including Yuma clapper rail, along Las Vegas Wash, Clark County, Nevada, 2015. Final report prepared for the U.S. Fish and Wildlife Service, Southern Nevada Field Office, Las Vegas, NV, and Las Vegas Wash Coordination Committee, Las Vegas, NV. http://www.lvwash.org/assets/pdf/resources_ecoresearch_yuma15.pdf

Van Dooremolen, D. 2017a. Marsh bird monitoring, including Yuma clapper rail, along Las Vegas Wash, Clark County, Nevada, 2007-2016. Final report prepared for the U.S. Fish and Wildlife Service, Southern Nevada Field Office, Las Vegas, NV, and Las Vegas Wash Coordination Committee, Las Vegas, NV. http://www.lvwash.org/assets/pdf/resources_ecoresearch_yuma16.pdf

Van Dooremolen, D. 2017b. Marsh bird monitoring, including Yuma clapper rail, along Las Vegas Wash, Clark County, Nevada, 2017. Final report prepared for the U.S. Fish and Wildlife Service, Southern Nevada Field Office, Las Vegas, NV, and Las Vegas Wash Coordination Committee, Las Vegas, NV. http://www.lvwash.org/assets/pdf/resources_ecoresearch_yuma17.pdf

Van Dooremolen, D. 2018. Marsh bird monitoring, including Yuma clapper rail, along Las Vegas Wash, Clark County, Nevada, 2018. Final report prepared for the U.S. Fish and Wildlife Service, Southern Nevada Field Office, Las Vegas, NV, and Las Vegas Wash Coordination Committee, Las Vegas, NV. http://www.lvwash.org/assets/pdf/resources_ecoresearch_yuma_2018.pdf

Appendix A

GPS Coordinates for 2019
Marsh Bird Monitoring Points

Route	Point	Easting	Northing	Location (Primary)
2	1	678178	3996968	Nature Preserve, Vern's Pond
2	1.5	678276	3997090	Nature Preserve, Vern's Pond
2	2	678155	3997357	Nature Preserve, Middle Ponds
2	3	677879	3997558	Nature Preserve, Upper Pond
2	4.5	678178	3997623	Wash, Upper Diversion Weir Impoundment
2	4.75	679905	3995767	Wash, Duck Creek Confluence Weir Impoundment
2	4.8	680290	3995659	Wash, Upper Narrows Weir Impoundment
2	5	681090	3995598	Wash, Pabco Road Weir Impoundment and City of Henderson Outfall
2	6	681245	3995496	Wash, Pabco Road Weir Impoundment
3	1.5	682400	3995747	Wash, C-1 Channel
3	2	682626	3995895	Wash, Bostick Weir Impoundment
3	3	682808	3995954	Wash, Bostick Weir Impoundment
3	4.5	683207	3996062	Wash, Calico Ridge Weir Impoundment
3	4.55	683820	3996274	Wash, Toe of Lower Narrows Weir
3	4.56	684134	3996360	Wash, Homestead Weir Impoundment
3	4.6	684442	3996402	Wash, Three Kids Weir Impoundment
3	6.5	684996	3996766	Wash, Toe of Three Kids Weir
3	7	685136	3996960	Wash, Rainbow Gardens Weir Impoundment
4	0.5	678726	3996304	Mitigation Wetlands, Cell 7
4	1	678730	3996008	Duck Creek and West Channel
4	2.5	678502	3996216	Mitigation Wetlands, Cell 7
4	3.5	678591	3996420	Mitigation Wetlands, Cell 6
4	4	678276	3996306	Mitigation Wetlands, Cell 6
4	5	678130	3996515	Mitigation Wetlands, Cell 5
4	6	678051	3996715	Mitigation Wetlands, Cell 1
4	7	678266	3996725	Mitigation Wetlands, Cell 3
4	8	678431	3996573	Mitigation Wetlands, Cell 5

Appendix B

2019 Survey Weather Conditions

Date	Route #	Temperature (Start/ Finish) - Fahrenheit	Sky (Start/Finish)	Beaufort (Start/Finish)
4/1/2019	2	47/61	partly cloudy/partly cloudy	0 (<1 mph)/0 (<1 mph)
4/3/2019	3	60/72	clear skies/clear skies	0 (<1 mph)/0 (<1 mph)
4/4/2019	4	59/72	overcast/overcast	0 (<1 mph)/0 (<1 mph)
4/15/2019	3	67/70	overcast/overcast	0 (<1 mph)/2 (4-7 mph)
4/17/2019	2	53/66	clear skies/clear skies	0 (<1 mph)/2 (4-7 mph)
4/18/2019	4	59/65	partly cloudy/clear skies	1 (1-3 mph)/0 (<1 mph)
5/6/2019	2	60/73	clear skies/clear skies	0 (<1 mph)/0 (<1 mph)
5/7/2019	3	61/70	partly cloudy/partly cloudy	0 (<1 mph)/2 (4-7 mph)
5/8/2019	4	61/73	clear skies/clear skies	0 (<1 mph)/0 (<1 mph)

Appendix C

Total and Per Point Abundances by Year and Route. YRRA=Yuma Ridgway's Rail, VIRA=Virginia Rail, SORA=Sora, AMBI=American Bittern, LEBI=Least Bittern, PBGR=Pied-billed Grebe, COGA=Common Gallinule, AMCO=American Coot

Year	Route	No. of Points	YRRA	VIRA	SORA	AMBI	LEBI	PBGR	COGA	AMCO	Grand Total
2007	1	9	0 (0.00)	4 (0.44)	7 (0.78)	0 (0.00)	1 (0.11)	1 (0.11)	1 (0.11)	15 (1.67)	29 (3.22)
2007	2	8	0 (0.00)	2 (0.25)	5 (0.63)	0 (0.00)	4 (0.50)	7 (0.88)	14 (1.75)	81 (10.13)	113 (14.13)
2007	3	7	0 (0.00)	1 (0.14)	2 (0.29)	0 (0.00)	4 (0.57)	4 (0.57)	13 (1.86)	68 (9.71)	92 (13.14)
2007	Total	24	0 (0.00)	7 (0.29)	14 (0.58)	0 (0.00)	9 (0.38)	12 (0.50)	28 (1.17)	164 (6.83)	234 (9.75)
2008	1	9	0 (0.00)	4 (0.44)	6 (0.67)	0 (0.00)	0 (0.00)	1 (0.11)	1 (0.11)	20 (2.22)	32 (3.56)
2008	2	8	0 (0.00)	0 (0.00)	5 (0.63)	0 (0.00)	2 (0.25)	4 (0.50)	15 (1.88)	41 (5.13)	67 (8.38)
2008	3	9	0 (0.00)	1 (0.11)	5 (0.56)	0 (0.00)	9 (1.00)	5 (0.56)	12 (1.33)	151 (16.78)	183 (20.33)
2008	Total	26	0 (0.00)	5 (0.19)	16 (0.62)	0 (0.00)	11 (0.42)	10 (0.38)	28 (1.08)	212 (8.15)	282 (10.85)
2009	1	9	0 (0.00)	2 (0.22)	5 (0.56)	0 (0.00)	2 (0.22)	0 (0.00)	0 (0.00)	4 (0.44)	13 (1.44)
2009	2	8	0 (0.00)	0 (0.00)	6 (0.75)	0 (0.00)	2 (0.25)	4 (0.50)	11 (1.38)	46 (5.75)	69 (8.63)
2009	3	8	0 (0.00)	2 (0.25)	5 (0.63)	0 (0.00)	2 (0.25)	4 (0.50)	13 (1.63)	97 (12.13)	123 (15.38)
2009	Total	25	0 (0.00)	4 (0.16)	16 (0.64)	0 (0.00)	6 (0.24)	8 (0.32)	24 (0.96)	147 (5.88)	205 (8.20)
2010	1	3	0 (0.00)	2 (0.67)	3 (1.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	5 (1.67)
2010	2	9	0 (0.00)	2 (0.22)	7 (0.78)	0 (0.00)	2 (0.22)	3 (0.33)	11 (1.22)	28 (3.11)	53 (5.89)
2010	3	6	0 (0.00)	0 (0.00)	3 (0.50)	0 (0.00)	2 (0.33)	1 (0.17)	10 (1.67)	50 (8.33)	66 (11.00)
2010	4	3	0 (0.00)	3 (1.00)	3 (1.00)	1 (0.33)	0 (0.00)	0 (0.00)	2 (0.67)	3 (1.00)	12 (4.00)
2010	Total	21	0 (0.00)	7 (0.33)	16 (0.76)	1 (0.05)	4 (0.19)	4 (0.19)	23 (1.10)	81 (3.86)	136 (6.48)
2011	2	9	0 (0.00)	0 (0.00)	5 (0.56)	0 (0.00)	4 (0.44)	5 (0.56)	11 (1.22)	54 (6.00)	79 (8.78)
2011	3	6	0 (0.00)	2 (0.33)	2 (0.33)	0 (0.00)	2 (0.33)	2 (0.33)	8 (1.33)	65 (10.83)	81 (13.50)
2011	4	9	0 (0.00)	11 (1.22)	9 (1.00)	0 (0.00)	2 (0.22)	7 (0.78)	9 (1.00)	56 (6.22)	94 (10.44)
2011	Total	24	0 (0.00)	13 (0.54)	16 (0.67)	0 (0.00)	8 (0.33)	14 (0.58)	28 (1.17)	175 (7.29)	254 (10.58)
2012	2	9	0 (0.00)	1 (0.11)	8 (0.89)	0 (0.00)	5 (0.56)	5 (0.56)	14 (1.56)	32 (3.56)	65 (7.22)
2012	3	9	0 (0.00)	3 (0.33)	13 (1.44)	0 (0.00)	4 (0.44)	2 (0.22)	16 (1.78)	184 (20.44)	222 (24.67)
2012	4	9	0 (0.00)	13 (1.44)	14 (1.56)	0 (0.00)	6 (0.67)	6 (0.67)	10 (1.11)	36 (4.00)	85 (9.44)
2012	Total	27	0 (0.00)	17 (0.63)	35 (1.30)	0 (0.00)	15 (0.56)	13 (0.48)	40 (1.48)	252 (9.33)	372 (13.78)
2013	2	9	0 (0.00)	1 (0.11)	5 (0.56)	0 (0.00)	3 (0.33)	3 (0.33)	15 (1.67)	71 (7.89)	98 (10.89)
2013	3	9	0 (0.00)	2 (0.22)	5 (0.56)	0 (0.00)	1 (0.11)	0 (0.00)	8 (0.89)	48 (5.33)	64 (7.11)
2013	4	9	0 (0.00)	7 (0.78)	12 (1.33)	0 (0.00)	3 (0.33)	5 (0.56)	10 (1.11)	59 (6.56)	96 (10.67)
2013	Total	27	0 (0.00)	10 (0.37)	22 (0.81)	0 (0.00)	7 (0.26)	8 (0.30)	33 (1.22)	178 (6.59)	258 (9.56)
2014	2	9	0 (0.00)	0 (0.00)	11 (1.22)	0 (0.00)	5 (0.56)	5 (0.56)	16 (1.78)	45 (5.00)	82 (9.11)
2014	3	7	0 (0.00)	1 (0.14)	4 (0.57)	0 (0.00)	2 (0.29)	1 (0.14)	3 (0.43)	140 (20.00)	151 (21.57)
2014	4	9	0 (0.00)	5 (0.56)	16 (1.78)	0 (0.00)	5 (0.56)	3 (0.33)	13 (1.44)	33 (3.67)	75 (8.33)
2014	Total	25	0 (0.00)	6 (0.24)	31 (1.24)	0 (0.00)	12 (0.48)	9 (0.36)	32 (1.28)	218 (8.72)	308 (12.32)
2015	2	9	0 (0.00)	1 (0.11)	7 (0.78)	0 (0.00)	4 (0.44)	6 (0.67)	17 (1.89)	24 (2.67)	59 (6.56)
2015	3	7	0 (0.00)	3 (0.43)	5 (0.71)	0 (0.00)	2 (0.29)	2 (0.29)	12 (1.71)	98 (14.00)	122 (17.43)
2015	4	9	0 (0.00)	5 (0.56)	6 (0.67)	1 (0.11)	3 (0.33)	4 (0.44)	10 (1.11)	40 (4.44)	69 (7.67)
2015	Total	25	0 (0.00)	9 (0.36)	18 (0.72)	1 (0.04)	9 (0.36)	12 (0.48)	39 (1.56)	162 (6.48)	250 (10.00)
2016	2	9	0 (0.00)	0 (0.00)	7 (0.78)	0 (0.00)	2 (0.22)	4 (0.44)	7 (0.78)	23 (2.56)	43 (4.78)
2016	3	8	0 (0.00)	2 (0.25)	3 (0.38)	0 (0.00)	1 (0.13)	1 (0.13)	12 (1.5)	155 (19.38)	174 (21.75)
2016	4	9	0 (0.00)	3 (0.33)	7 (0.78)	0 (0.00)	2 (0.22)	4 (0.44)	7 (0.78)	76 (8.33)	99 (11.00)
2016	Total	26	0 (0.00)	5 (0.19)	17 (0.65)	0 (0.00)	5 (0.19)	9 (0.35)	26 (1.00)	254 (9.77)	316 (12.15)
2017	2	10	0 (0.00)	4 (0.40)	0 (0.00)	1 (0.10)	3 (0.30)	1 (0.10)	10 (1.00)	103 (10.30)	122 (12.20)
2017	3	9	0 (0.00)	4 (0.44)	6 (0.67)	0 (0.00)	1 (0.11)	1 (0.11)	10 (1.11)	192 (21.33)	214 (23.78)
2017	4	9	1 (0.11)	0 (0.00)	5 (0.56)	1 (0.11)	1 (0.11)	0 (0.00)	7 (0.78)	22 (2.44)	37 (4.11)
2017	Total	28	1 (0.04)	8 (0.29)	11 (0.39)	2 (0.07)	5 (0.18)	2 (0.07)	27 (0.96)	317 (11.32)	373 (13.32)
2018	2	8	0 (0.00)	1 (0.13)	4 (0.50)	0 (0.00)	4 (0.50)	3 (0.38)	19 (2.38)	185 (23.13)	216 (27.00)
2018	3	9	0 (0.00)	1 (0.11)	7 (0.78)	0 (0.00)	2 (0.22)	3 (0.33)	14 (1.56)	123 (13.67)	150 (16.67)
2018	4	9	0 (0.00)	0 (0.00)	8 (0.89)	1 (0.11)	0 (0.00)	1 (0.11)	6 (0.67)	17 (1.89)	33 (3.67)
2018	Total	26	0 (0.00)	2 (0.08)	19 (0.73)	1 (0.04)	6 (0.23)	7 (0.27)	39 (1.50)	325 (12.50)	399 (15.35)
2019	2	9	0 (0.00)	2 (0.22)	7 (0.78)	0 (0.00)	4 (0.44)	0 (0.00)	19 (2.11)	297 (33.00)	329 (36.55)
2019	3	9	0 (0.00)	7 (0.78)	9 (1.00)	0 (0.00)	1 (0.11)	6 (0.67)	13 (1.44)	170 (18.89)	206 (22.89)
2019	4	9	0 (0.00)	5 (0.56)	20 (2.22)	0 (0.00)	1 (0.11)	1 (0.11)	2 (0.22)	23 (2.56)	52 (5.78)
2019	Total	27	0 (0.00)	14 (0.52)	36 (1.33)	0 (0.00)	6 (0.22)	7 (0.26)	34 (1.26)	490 (18.15)	587 (21.74)