National Park Service
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Bi-Annual Surveys for Southwestern Willow Flycatcher (*Empidonax traillii extimus*) Along the Colorado River in Grand Canyon National Park

2021 Annual Report

Report Prepared for the Upper Colorado Region, Bureau of Reclamation.
Interagency Agreement Number R18PG00066.
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Figure 1. A biologist crawls through the tamarisk along a SWFL transect. NPS Photo/ Miranda Terwilliger.

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Key Findings

1. Three surveys for Southwestern Willow Flycatchers (SWFL) were conducted between Lees Ferry (River Mile 0) and Pearce Ferry (River Mile 280) from May 15-31 (21-SRM046), June1-21 (21-SRM047), and June 22-July17 (21-SRM048) in 2021.

2. Willow Flycatchers (WIFL) were detected along the Colorado River within Grand Canyon National Park at six different sites during the May 17-29, 2021 river mission. This was the first time they have been detected since 2011.

3. WIFL's were detected at 6 sites; 4 individuals at one, and 5 other sites with a single detection. These detections were likely migratory birds, rather than territorial/ nesting birds, since no WIFLs were detected at the occupied survey sites, or any other survey sites, during subsequent river mission.

4. A total of 13 acoustic recording units (ARUs) were placed at six different survey sites. Two recorders were not able to be retrieved on subsequent river missions. No detections were made via ARUs.

5. In addition to the SWFL surveys, a Yellow Billed Cuckoo (*Coccyzus americanus*) was detected at one site, passive acoustic recorders were placed inside canyons to detect Mexican Spotted Owl calls, Monarch Butterfly transects were surveyed, staff counted and aged/sexed desert bighorn sheep, California condors were monitored at Deer Creek, and incidental bird sightings were documented.

Acknowledgments

Funding was provided by the Bureau of Reclamation, Upper Colorado Region, and the Grand Canyon National Park through Interagency Agreement Number R18PG00066. Grand Canyon is permitted by the U.S. Fish and Wildlife Service to conduct Southwestern Willow Flycatcher related activities under permit TE-819473. Grand Canyon also obtained a permit from the Hualapai Nation to conduct surveys on their land that is within the canyon.

Mission participants during 2021 included (alphabetical by last name): Deron Clark, Sarah Haas, Greg Holm, Anne Miller, Erikka Olson, Miranda Terwilliger, Aurora Trejo. Colorado River & Trail Expeditions (CRATE) and Ceiba provided contracted boats and crews for the three SWFL missions.

Figure 2.Surveyors walk on transect in Burnt Springs. NPS Photo/ Deron Clark.

Introduction and Background

There is little information on the number of Southwestern Willow Flycatchers (SWFL) along the Colorado River before the completion of construction of the Glen Canyon Dam in 1963 although the park has incidental records noting nesting pairs over 8 separate years starting in 1909 (Sogge et al. 1997, Brown 1988). Historically, the range of SWFL in Arizona included portions of all major watersheds (Brown, H. 1902 unpubl. data, Willard 1912, Swarth 1914, Phillips 1948, Unitt 1987); however, these watersheds have changed dramatically in many cases. The SWFL was placed on the Endangered Species List in 1995 (USFWS 1995), over 30 years after dam construction. It is undocumented what conditions were like for SWFL habitat within the confines of Grand Canyon National Park (GRCA) pre-dam although near-shore habitat conditions were likely quite different. Post dam construction, the dense riparian habitats that the birds prefer for breeding are rare, but present, in scattered locations. What historical data exists suggests that SWFLs are not common, breeders along the Colorado River in GRCA.

Standardized monitoring for SWFL along the Colorado River corridor in the park began around 1981 and were conducted by a variety of entities covering a variety of different portions of the river (Table 1). All surveys followed USFWS protocols consisting of 3 call-back surveys with a follow up of nest searching where pairs of Willow Flycatchers (WIFL) were identified (Rourke et al. 1999). In the latter 2 surveys it would be clear which subspecies of WIFL pairs were detected but in the first survey migrants from other subspecies may appear to be paired or territorial. In 2003, the lower portion, starting at Diamond Creek (RM 225) was determined by the USFWS to contain critical habitat for the SWFL (USFWS 2003), and designated as SWFL critical habitat in 2005 (USFWS 2005). However, there are historic detections of SWFL upstream of Diamond Creek (Sogge et al. 1997). For numerous reasons, no surveys were conducted between 2013-2018.

Table 1. History of surveys following USWFS protocols within Grand Canyon (Stroud-Settles et al. 2011).

Years	Surveyors	River Miles covered (GCMRC river miles)
1981-2004	GCMRC	0 (Lees Ferry) - 88.5 (Phantom Ranch)
2005-2009	GRCA	0 (Lees Ferry) - 88.5 (Phantom Ranch)
2003-2005	SWCA	239.5 (Separation Canyon) - 274.5 (Columbine Falls)
2006-2010	Hualapai	239.5 (Separation Canyon) - 274.5 (Columbine Falls)
2010-2012	GRCA	0 (Lees Ferry) – 280 (Pearce Ferry)
2016	GRCA	71.1L (Cardenas Marsh)
2019	GRCA	0 (Lees Ferry) – 280 (Pearce Ferry)
2021	GRCA	0 (Lees Ferry) – 280 (Pearce Ferry)

GCMRC = U.S. Geological Survey, Grand Canyon Research and Monitoring Center
SWCA = SWCA Environmental Consultants

Hualapai = Hualapai Tribe Department of Natural Resources
GRCA = Grand Canyon National Park

In 2019, to meet the conservation measures listed in the Long-Term Experimental and Management Plan (DOI 2016), GRCA resumed USFWS protocol call-back surveys for SWFL presence/ absence along the whole length of the river (RM 0 - 280). These same surveys were conducted in 2021 and are the subject of this report.

Project Objectives

1. Conduct presence/absence surveys for SWFLs using the USFWS 3-survey call-back protocol at 17 historically known sites and promising new habitat sites along the Colorado River.
2. If territorial Flycatchers are located, where possible, document nesting status and outcome.
3. Place sound recorders at select survey sites to record SWFL vocalizations to expand the timeframe during which SWFLs might be detected.
4. Perform other wildlife management objectives along the river.

Methods

As SWFL are listed as federally endangered species, the USFWS has developed a very specific protocol that must be followed (USWS 2002). This protocol requires that a minimum of one survey be completed during each of the three survey periods (May 15 – 31, June 1 – 21, June 22–July 17). It requires a surveyor to walk through sites playing recorded SWFL vocalizations every 30 meters to induce a response from WIFL (of any subspecies) if they are present. It also requires surveys to be conducted between the morning hours of 0430 – 1030. All surveys were conducted with the use of standard audio playback of SWFL calls as described in the survey protocol (Sogge et al. 2010). During 2021, we planned to monitor 17 sites for SWFLs, which expanded to 19 (Figure 4) due to incidental detections during the first survey window (RM 0-280). The 2021 surveys were conducted within GRCA between May 17-29 (river mission 21-SRM046); June 7-19 (river mission 21-SRM047), and June 29 – July 11 (river mission 21-SRM048). We also took photos of each site with a visible white board stating identifying information so that we could evaluate changing habitat over the year (Figure 3).

Figure 3. Identifying white board for a section of SWFL survey. NPS Photo/ Deron Clark.

Additionally, we deployed 13 passive acoustic recording units (ARUs) at some survey sites. Habitat patches for SWFL in the canyon are located along difficult to access riparian patches where surveyors have limited windows in which to conduct their work. Increasingly, avifauna research and monitoring are changing to include automated recording devices that capture bird vocalizations, reduce observer bias, and increase survey duration (Budney and Grotke 1997, Gaunt et al. 2005, Rempel et al. 2005). A benefit to using these types of passive surveyors is that no additional disturbance to the target species is required such as occurs during a normal survey. We wanted to test whether ARUs might give us a longer window in which to detect SWFL.

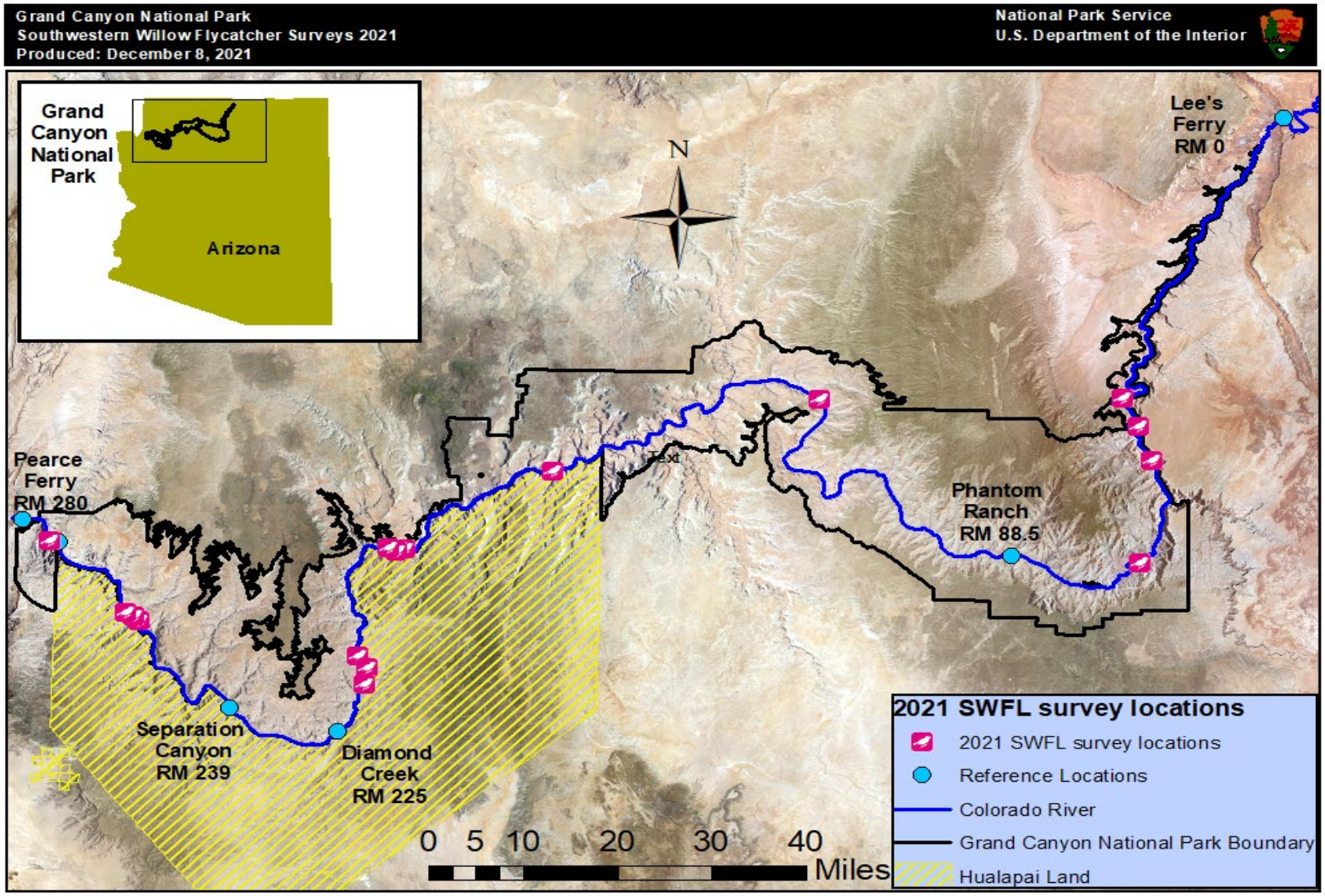

Figure 4. A map of the generalized area of 2021 SWFL survey locations within Grand Canyon National Park.

We used AGPTEK U3 MP3 acoustic recording devices (Szydlo et al. 2019) which GRCA already uses to detect owls (Figure 5). These recorders have 8GB of internal memory and can record for an average of 23 days. Recorders were deployed during the first and second survey windows in SWFL habitat. Areas were chosen based on actual SFWL detections to try and determine if birds stuck around, areas where SWFLs were suspected but not confirmed by the characteristic "*fitz*-bew" call, areas where the habitat still met the criteria, and areas where birds have been detected in the past. Recorders were placed in the field and protected with a plastic bag over the batteries (Figure 5) and the whole device was secured in place in shrubbery. Recorders were retrieved during the second and third survey windows and the data was analyzed using a file compression software (AudioSplit) and an acoustic analysis software (Raven Pro). The large audio files were compressed and split and analyzed between 0430 – 1030 hours (i.e. target hours). An SWFL call detector, "Band Limited Energy Detector", was used to automatically detect SWFL calls. After running the detector, the results were manually inspected to eliminate false positive detections.

Figure 5. A picture of the ARU used (left, NPS Photo/ Kirsten Fuller), and one deployed in the field for SWFL detections (right, NPS Photo/ Aurora Trejo).

Results and Discussion

Survey Results

The last time SWFL were detected in GRCA was in 2011, and the last time a nest was found was in 2007 (Table 1). 2021 marks the first time since 2011, that any kind of WIFLs were detected in GRCA (Stroud-Settles 2011). In 2021 a total of 9 individual WIFLs were detected at 6 different sites. All the detections occurred during the May trip (river mission 21-SRM046), below RM 130. As the detections occurred when other Flycatchers are known to migrate through the canyon corridor, we were unable to determine if the birds detected were of the Southwestern subspecies. Two of the detections were incidental, at sites not planned for surveys. One of the detections was incidental, but associated with a survey site, when a WIFL was heard from camp the evening prior to surveying. The other three detections were at established survey sites. Four individual WIFLs were detected at one site. All other survey sites (n=5) had single WIFL detections (one bird). As no detections occurred at subsequent surveys, these were likely migratory birds, rather than territorial/ nesting birds.

Figure 6. One SWFL site in 2018 after the Mauv fire (left, NPS Photo/ Rosa Palarino) and in 2021 (right, NPS Photo/ Aurora Trejo).

Numbers of SWFL detections in GRCA have declined since the 1990s (Table 2) and the last nesting pair was documented in 2003 (Yard 2003). Prior to 2003, the breeding population fluctuated between one and four breeding pairs per year (Brown 1988, Sogge et al. 1997). From 1982 to 2002, approximately half of the SWFL nests on the Colorado River between Lees Ferry and Diamond Creek were parasitized by cowbirds (Brown 1998, 1994, Sogge et al. 1997, Kearsley et al. 2003). It is important to note that areas that meet SWFL breeding habitat criteria have changed quite a bit along the Colorado River. These changes are due to Tamarisk beetle (*Diorhabda carniulata*), changes in water flow and sand build up, and even some fires (example Figure 6) in the inner canyon. Several areas that were once considered good nesting habitat for SWFLs (Figure 7) no longer seem to meet the criteria based on changing river flows and vegetation. It is unknown whether detections of WIFL

in GRCA are due to changes in habitat and predation in the canyon or are a result of declines in the species elsewhere.

Figure 7. One historic SWFL breeding site before the tamarisk beetle in 2010 (left) and after the beetle in 2017 (right). NPS Photos.

Use of Acoustic Detectors

In 2012 staff similarly tried to place Song Meter SM2 Platforms (Wildlife Acoustics, Inc. Concord, MA, USA) in 6 locations but no WIFL were detected with any method that year (Settles-Holm 2012). As river-based habitat sites are difficult to reach and optimally survey, in 2021 we placed 13 passive acoustic recorders at six different survey sites to attempt to widen our detection window (Appendix A). Most of the passive detectors were retrieved; however, two could not be relocated due to the difficulty of navigating the habitat and lack of GPS sub-meter accuracy within the canyon. An additional two failed to record any target hours or were corrupted. Target hours was the period of 3 hours between dawn and dusk. A total number of 1,184 hours of audio data was analyzed for SWFL. No SWFL were detected on any of the ARUs which could be a further indication that the SWFLs detected audibly were just migrating through.

It should be noted that the "*fitz-bew*" vocalization of the SWFL is similar to many other species when viewed in terms of its Hertz range and audio pattern. This makes the analysis of the data much more time consuming than for other more distinctive species such as owls. Most of the sounds recorded were either crickets, Bell's Vireos, Common Yellowthroats, House Sparrows, or Ash-Throated Flycatchers. The ARUs deployed in 2021 are much cheaper than those used in 2012 which makes them more reasonable to use. However, it might be more worth testing them first in an area with reliable SWFL calls, since we do not know if they missed calls due to lack of birds or other reasons.

Table 2. Summary of SWFL detections in Grand Canyon National Park (GRCA) from 1982-2021. Boxed areas are the only years in which the whole length of the river within GRCA.

Survey Year	RM 0 - 88.5			RM 88.5 - 225			RM 225 - 280			RM 0- RM 280		
	Lees Ferry - Phantom Ranch			**Phantom Ranch - Diamond Creek**			**Diamond Creek - Pearce Ferry**			**Lees - Pearce Ferry Grand Canyon**		
	SWFL[1]	Pair[2]	Nest[3]	SWFL	Pair	Nest	SWFL	Pair	Nest	SWFL	Pair	Nest
1982	2	2	2	4	-	-	-	-	-	6	2	2
1983	4	0	-	-	-	-	-	-	-	4	0	-
1984	4	1	2	-	-	-	-	-	-	4	1	2
1985	10	4	4	-	-	-	-	-	-	10	4	4
1986	13	2	2	-	-	-	-	-	-	13	2	2
1987	10	3	3	-	-	-	-	-	-	10	3	3
1991	4	2	2	-	-	-	-	-	-	4	2	2
1992	5	1	1	1	0	0	0	0	0	6	1	1
1993	8	3	3	0	0	0	3	0	0	11	3	3
1994	24	4	8	1	0	0	0	0	0	25	4	8
1995	5	1	1	-	-	-	-	-	-	5	1	1
1996	7	1	2	-	-	-	1	0	0	8	1	2
1997	4	1	1	-	-	-	9	3	1	13	4	2
1998	2	1	1	0	0	0	18	4	4	20	5	5
1999	4	1	1	0	0	0	29	13	4	33	14	5
2000	3	1	1	1	0	0	25	9	4	29	10	5
2001	4	1	1	1	0	-	38	17	5	43	18	-
2002	2	0	0	1	0	-	0	0	0	3	0	0
2003	4	2	2	0	0	0	1	0	0	5	2	2
2004	1	0	0	0	0	0	2	1	1	3	1	1
2005	0	0	0	-	-	-	1	0	0	1	0	0
2006	0	0	0	-	-	-	4	1	1	4	1	1
2007	1	0	-	-	-	-	7	1	1	8	1	1
2008	0	0	0	-	-	-	0	0	0	0	0	0
2009	3	0	-	-	-	-	-	-	-	3	0	-
2010	2	0	-	3	1	-	2	0	-	7	1	-
2011	1	0	-	2	0	-	0	0	-	3	0	-
2012	0	0	-	0	0	-	0	0	-	0	1	-
2019	0	0	-	0	0	-	0	0	-	0	0	-
2021	0	0	-	0	0	-	0	0	-	0	0	-

[1]Total number of confirmed adult SWFL observed

[2]Total number of breeding pairs observed (1 pair = 2 adult SWFLs)

[3]Total number of nests found, includes nests that were re-nests (nest rebuild after first or second nest failed/destroyed)

Blanks = No survey conducted

Note: One historic site was surveyed in 2016 with no detections.

Other Wildlife Work

During a SWFL survey there was an incidental detection of the threatened Yellow Billed Cuckoo (*Coccyzus americanus*) at one site.

Some other wildlife related work was conducted during the river missions in addition to the SWFL surveys. Ten passive acoustic recorders were placed to detect threatened Mexican Spotted Owl (*Strix occidentalis lucida*, MSO) calls in 3 side canyons that are designated as known breeding territories (Sovie et al. 2015). Staff conducted transects for 5 Integrated Monarch Monitoring Program plots identified by the Joint Monarch Venture for milkweed and monarch butterflies (*Danaus plexippus,* Cariveau et al. 2019, MJV). Staff also counted and aged and sexed bighorn sheep (*Ovis canadensis nelson*) along the river, documenting 69, 71, and 89 desert bighorn sheep during each mission respectively. Between 40-50 different bird species were identified and recorded during each river mission. An attempt was made to locate a suspect nest from an endangered California Condor (*Gymnogyps californianus*) pair in Deer Creek (River Mile 136.5) and regular telemetry surveys were conducted from the river for radio tagged Condors.

Planned Activities – 2022

No SWFL surveys will be conducted during 2022 due to the monitoring schedule of every 2 years. The next SWFL surveys are scheduled for 2023, May-July. GRCA will instead conduct surveys for Yuma Ridgway's rail (*Rallus obsoletus yumanensis*) and Yellow-billed cuckoo (*Coccyzus americanus*) on the lower part of the river in 2022.

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