



Two-Year Report for Amphibian Monitoring at San Antonio Missions 2020-2022

Project Background and Methods

The Gulf Coast Network tracks amphibian presence and abundance over time in three national park units, as part of their long-term vital signs monitoring program. Amphibians occur in a wide range of terrestrial habitats, but as landscapes change and hydrological processes are altered, most frogs, toads and salamanders are at particular risk because they depend on vegetated habitats for shelter and freshwater to breed. The Gulf Coast Network monitors amphibians as indicators of ecosystem health for San Antonio Missions National Historical Park (NHP), so these species and their habitats can be understood and protected for the enjoyment of future generations.

The network's approach involves monitoring under untreated plywood coverboards, placed flat on the ground. These objects provide favorable microclimates for key amphibian species, allow them to come and go unharmed, and can easily be checked by a team of two. In three sites within San Antonio Missions NHP, field crews record the numbers and types of amphibian species under coverboards, as well as temperature and relative humidity in or around them. Ancillary data on rainfall, barometric pressure, and temperature in the days prior to sampling are obtained from the nearby airport weather stations. Field crews complete sampling over one morning, once every other month.

The network's two monitoring objectives for this project are (1) determine species composition of the amphibian communities that use the monitored coverboards at each site, including native and non-native species; (2) determine the frequency (yes/no detected) and relative abundance (counts per board) of the more commonly encountered amphibian species at each site, particularly in the context of trends over time, while also accounting for the effects of ancillary environmental data.

Monitoring Design and Effort over Two Years

In January 2018, 60 coverboards were installed in three forested sites: 20 boards near San Juan Mission (SJ), 20 near Rillings Rd, west of the San Antonio River (WS), and 20 near the closed state hospital (HP). In each study site, boards were arranged in clusters of four, with each cluster separated by 20-30 meters (see the Supplementary Materials for maps). After 2 months of settling-in for the boards, the first monitoring event was in April 2018, after which sampling occurred on a single day, once every other month through to the present, with new monitoring years (MY) beginning in April. Fieldwork was mainly led by Marvin Lutnesky and his students from Texas A&M University San Antonio. The Gulf Coast Network managed the project, wrote reports and occasionally visited for maintenance or to assist with sampling.

The current report summarizes findings from MY2020 (April 2020 - February 2021) and MY2021 (April 2021 - February 2022). These are the 3d and 4th MY under the current sampling design. Previous findings from MY2018 and MY2019 were covered in the first 2-year



Gulf Coast toads (*Incilius nebulifer*) found under a coverboard in San Antonio, TX.

report for the park, linked [here](#). Prior to the installation of the current design, network staff had checked similarly-placed pilot-study coverboards at all three sites every month since November 2011. For more information on project design and history, see our Supplementary Materials section.

Fieldwork was completed for 11 of the 12 sampling events of MY2020 and MY2021. In MY2020, the April 2020 event was missed due to COVID travel restrictions. In MY2021, 6 of 6 events were completed. During each event, all boards were sampled at SJ and WS, but at HP, the average effort was 16 boards per event. This reduction was because HP was compromised by a homeless encampment for many months. Across the two MY, 59 of 240 potential coverboard checks were lost at HP, due to boards being missing or out of place (Table 1).

Results from Amphibian Monitoring

There were 724 amphibian captures in San Antonio Missions NHP between April 2020 and Feb. 2022 (Table 1), belonging to three native and one non-native species. More than half of these captures (398) were of the non-native Rio Grande chirping frog, *Eleutherodactylus cystignathoides*. This species is indigenous to Mexico and southern-most Texas. Because it can reproduce without standing water and will use potted plants as shelter, it has been introduced into many new habitats. The second most common species under coverboards was the Gulf Coast toad, *Incilius nebulifer*, with 311 captures. These two species comprised 98% of captures for both MYs combined.

Table 1. Number of individuals of each amphibian species recorded under coverboards by monitoring year (MY) at Hospital (HP), San Juan (SJ), and West Side (WS) sites.

Latin name	Common name	HP MY2020	HP MY2021	SJ MY2020	SJ MY2021	WS MY2020	WS MY2021
<i>Eleutherodactylus cystignathoides</i>	Rio Grande chirping frog	6	89	12	93	78	120
<i>Incilius nebulifer</i>	Gulf Coast toad	1	57	3	102	11	137
<i>Gastrophryne olivacea</i>	Western narrow-mouthed toad	0	1	0	8	0	6
Amphibians captured by MY and site		7	147	15	203	89	263
Total boards sampled by MY and site		70	111	100	120	100	120

Results from Amphibian Monitoring, continued

The only other amphibian species with more than one capture was the Western narrow-mouthed toad, *Gastrophryne olivacea*, for which there were no captures in MY2020 and 15 in MY2021. A low detection rate for this species is unsurprising, given that its presence under coverboards is episodic and dependent on heavy rainfall prior to sampling. Finally, a single green treefrog, *Hyla cinerea*, was recorded under a coverboard in February 2022 at HP. This individual was not included in Table 1 or in the total count, because treefrogs are not typically monitored with coverboards.

Of the park's three study sites, the majority of amphibians were captured at WS (Table 1). This site had 352 captures, whereas SJ had 218 and HP had 154. Relative to the other sites, WS had several high-yielding events for Rio Grande Chirping frogs in both MY 2021 and MY2020, whereas the remaining sites were limited to high yields in MY2021 only (Figure 1).

There were 502 more amphibian captures in MY2021 than in MY2020 (Figure 1). When standardized by effort, the difference was 1.7 amphibians per board in MY2021 as compared to 0.4 in MY2020. The gains in MY2021 were primarily driven by captures of Gulf Coast toads increasing by 95%. This species had 56 more captures at HP, 99 more at SJ and 126 more at WS. Similarly, total captures of Rio Grande chirping frogs increased by 75% , with 83 more captures at HP, 81 more at SJ and 42 more at WS. Although the causes of cross-year differences were unclear, the high number of Gulf Coast toads in MY2021 was unusual (highest yet, including the pilot study) and the low yields in MY2020 were also unusual. Captures in MY2020 were lower than both MY2018 (588 individuals or 1.6 per board) and MY2019 (310 individuals or 0.9 per board). Even so, current yields were not necessarily outside normal variation, given that capture rates from pilot data were routinely variable among years. Further interpretation will be possible with the upcoming trend report in 2024.

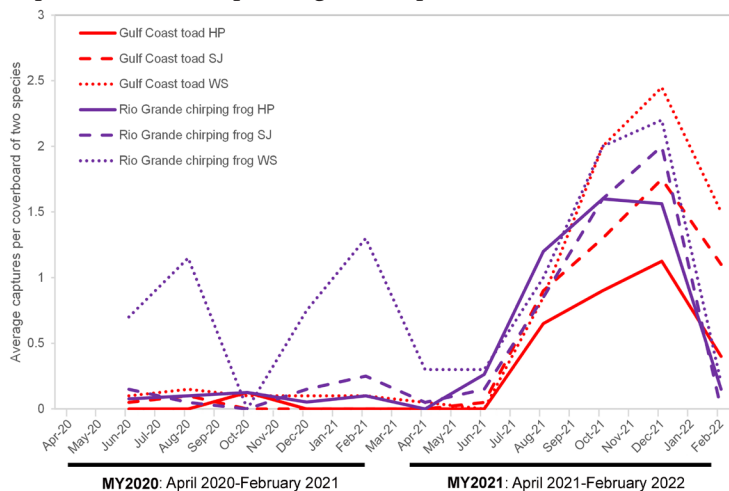


Figure 1. Capture rates for the most commonly-detected amphibian species at Hospital (HP), San Juan (SJ), and West Side (WS) study sites.

Below: Gulf Coast toads (*Incilius nebulifer*) found beneath a coverboard.



Notable Events from Fieldwork through Feb. 2022

As for the previous reporting interval, coverboards at HP continued to be moved and arranged into shelters by humans, resulting in lost data. In MY2020, three sampling events were significantly impacted at HP. Of the 20 boards available per event, 7 were unsampleable in June; 10 in August and 12 in October. In November, park volunteers cleared the site of accumulated camping supplies and trash, and 'Do Not Disturb' signs were installed on coverboards. In MY2021, disturbances were fewer but not absent at HP. In each of April and December 2021, 4 boards were unsampleable, and the continuous logger for temperature and relative humidity was stolen in December 2021. A replacement was made on 12/19/2021, but 2 months of continuous weather data were lost for that site.

The other notable event for the reporting period was weather-related. Between February 12 and 19, 2021, San Antonio experienced near record-breaking freezing temperatures and snow. This event likely impacted amphibians in the park, in particular Rio Grande Chirping frogs, which have previously been found dead under coverboards after freezing nights. Even so, no amphibian mortality was detected during the sampling event following the extreme cold; however, this was two months later. The February sampling event occurred just before the week of extreme cold.

List of Supplementary Materials

A supplementary materials document is prepared for each 2-year report, allowing additional space for data exports, preliminary summaries and informal exploratory analyses. The current Supplementary Materials document includes (1) descriptions of study layout, design and project timeline; (2) overview of weather and environmental data collected during the reporting period; (3) figures showing captures over time for the current study and including pilot data; (4) a list of reptiles detected during monitoring; (5) useful publications and references for amphibians and amphibian monitoring at the park; and (6) photos of notable amphibians or reptiles that were observed during the reporting period.

For more information on this monitoring project, visit:

1. Amphibian project repository, containing all online materials: <https://irma.nps.gov/DataStore/Reference/Profile/2192506>
2. Data repository for 2020-2022 reports: <https://irma.nps.gov/DataStore/Reference/Profile/2294354>
3. Protocol for amphibian monitoring: <https://irma.nps.gov/DataStore/Reference/Profile/2256511>
4. Gulf Coast Network webpage on the amphibian project: <https://www.nps.gov/im/guln/amphibians.htm>
5. Park webpage for San Antonio Missions NHP: <https://www.nps.gov/im/guln/saan.htm>
6. Gulf Coast network webpage for the park: <https://www.nps.gov/saan/index.htm>

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