



Two-Year Report for Amphibian Monitoring at San Antonio Missions 2018-2020

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 Installation

In January 2018, 60 coverboards were installed in the three sites in San Antonio Missions NHP, in forests near permanent waterbodies: 20 boards behind San Juan Missions (SJ), 20 on the West Side of the San Antonio River off of Rilling road (WS), and 20 near the old state hospital (HP). In each study site, boards were arranged in clusters of four, each cluster separated by 20-30 meters. For more information on cover object location and materials, see the documents in the Supplementary Materials section below.

The first sampling event included in this report is April 2018, although network staff have checked similarly-placed pilot-study coverboards at all three sites every month since November 2011. Fieldwork is typically completed by Marvin Lutnesky and his students from Texas A&M University San Antonio, although Gulf Coast Network staff, led by Billy Finney, participates on a regular basis.



Rio Grande chirping frog (*Eleutherodactylus cystignathoides*) in San Antonio, TX.

Results from Amphibian Monitoring

There were 916 amphibian detections in San Antonio Missions NHP between April 2018 and Feb. 2020 (Table 1), belonging to two native and one non-native species. The non-native species *Eleutherodactylus cystignathoides*, or the Rio Grande chirping frog, is indigenous to Mexico and a small area in southern-most Texas. Its occurrence elsewhere in the Gulf Coast represent an ongoing range expansion, most likely facilitated by the plant trade and its ability to reproduce in high humidity sites without standing water. This species was the most common amphibian under coverboards, with 797 detections across the three sites. The Gulf Coast toad, *Incilius nebulifer*, was also fairly common, with 117 detections. The only other amphibian species under coverboards was the Western narrow-mouthed toad, *Gastrophryne olivacea*, recorded as only two individuals on the Oct. 2018 sampling event (HP and WS). The low detection rate for this species is unsurprising, given that its presence under coverboards is episodic and dependent on heavy rainfall prior to sampling.

The park's three study sites represent three disjunct forest patches, yet they had fairly similar numbers and species of amphibians. There were 332 detections at WS, 317 at HP, and 267 at SJ. The WS site had a greater wintertime peak in Rio Grande chirping frogs in the 2018-2019 season, relative to the other sites, but none of the sites showed a wintertime peak in the 2019-2020 season (Figure 1).

Table 1. Number of individuals of each amphibian species recorded at the three sites at San Antonio Missions NHP: Hospital (HP), San Juan (SJ), and West Side (WS). Sampling seasons are April 2018 - Feb. 2019 and April 2019- Feb 2020.

Where found	Latin name	Common name	HP 2018-2019	HP 2019-2020	SJ 2018-2019	SJ 2019-2020	WS 2018-2019	WS 2019-2020
board	<i>Eleutherodactylus cystignathoides</i>	Rio Grande chirping frog	190	88	121	94	220	84
board	<i>Incilius nebulifer</i>	Gulf Coast toad	27	11	26	26	20	7
board	<i>Gastrophryne olivacea</i>	Western narrow-mouthed toad	1	0	0	0	1	0
Total amphibians detected by season and site			218	99	147	120	241	91
Total of boards sampled by season and site			120	118	120	120	120	120

Results from Amphibian Monitoring, continued

There were 296 fewer detections overall in the 2019-2020 relative to 2018-2019 season (Figure 1). The Rio Grande chirping frog drove the decline with 136 fewer detections at WS, 102 fewer at HP and 27 fewer at SJ. The cross-year decline was much smaller for the Gulf Coast toad (29 fewer total), but for either species, the network cannot say that these declines are outside normal variation. In pilot data, capture rates were routinely variable among years, and 2018-2019 may in fact represent an unusually high-detection period for the Rio Grande chirping frog, rather than 2019-2020 being unusually low. Further interpretation may be possible by the next report.

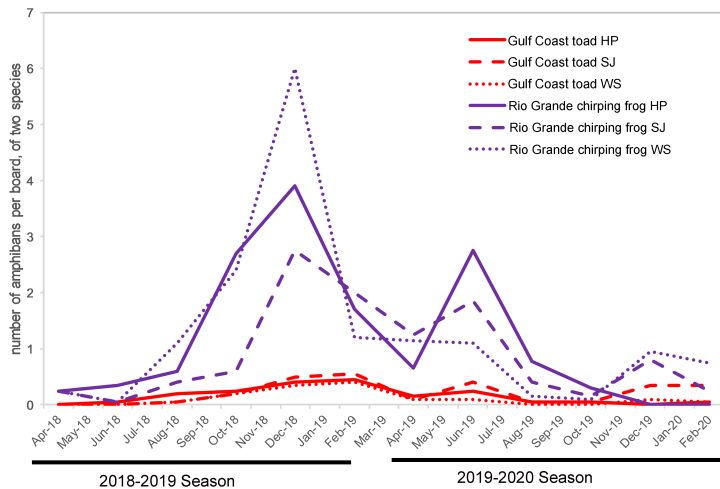


Figure 1. Capture rates for Hospital (HP), San Juan (SJ), and West Side (WS) study sites for two amphibian species.

Notable Events from Fieldwork through Feb. 2020

Two green treefrogs, *Hyla cinerea*, were heard calling during sampling at HP on 6/14/2018. The network once monitored this species using PVC pipes hung from trees at two sites, but because detection rates were so low, pipes were eliminated from the design. These casual observations confirm treefrogs are present in the park, although PVC pipes are ineffective for monitoring them there.

During routine field work, field crews made several other wildlife observations that are notable because they confirm species presence and document behaviors. Under and around the coverboards, crews regularly recorded green anoles (*Anolis carolinensis*) and ground skinks (*Scincella lateralis*), and on 1 or 2 events, they saw a water snake (*Nerodia* sp.) or Mediterranean geckos (*Hemidactylus turcicus*). Field crews also saw dead raccoons at WS and a dead coyote at HP. During a separate trip to the park on 6/4/2019, GULN staff saw a Western diamondback rattlesnake and a coral snake at a site within the same forested unit of WS, but closer to Interstate 410.

Below: Gulf Coast toad (*Incilius nebulifer*), found beneath a coverboard at WS.



During the current reporting period, there were several instances where coverboards had been moved and arranged into shelters by humans, resulting in lost data. On one occasion, the boards were replaced before the sampling date. Tampering has also occurred to metal identification tags that were added to coverboards. Many tags were removed by the next sampling event, most likely by raccoons.

Dead Rio Grande chirping frogs have been found under coverboards during several sampling trips, always after freezing weather. During coverboard deployment on 1/10/2018, several dead frogs were found at HP. The minimum temperature recorded the night before was 4° C (39° F), and on the night of 1/3/2018, there was a hard freeze of -5° C (23° F). The other events with dead frogs under coverboards were on 12/11/2018 (2 dead) and on 2/14/2019 (1 dead), both of which were preceded by a night-time low of 0.5° C (33° F).



Amphibian crew leader Billy Finney walking between sampling clusters at WS.

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) maps of site locations and layouts; (2) weather and environmental data summaries; (3) relevant amphibian life history; (4) useful references; and (5) select images of the field and species for the reporting period.

For more information on this monitoring project, visit:

1. Amphibian project repository, linking all online documents and materials: <https://irma.nps.gov/DataStore/Reference/Profile/2192506>
2. Data repository for report: <https://irma.nps.gov/DataStore/Reference/Profile/2273936>
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. Network webpage for San Antonio Missions NHP: <https://www.nps.gov/im/guln/saan.htm>
6. Park webpage: <https://www.nps.gov/saan/index.htm>

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