



Two-Year Report for Amphibian Monitoring at Gulf Islands NS 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 Gulf Islands National Seashore (NS), so these species and their habitats can be understood and protected for the enjoyment of future generations.

The network's monitoring approach involves two types of artificial cover objects, PVC pipes in trees and coverboards 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 two sites within the Naval Live Oaks Area, field crews record the numbers and types of amphibian species under boards or inside pipes, as well as temperature in and around them, relative humidity, barometric pressure, and water level in the nearest water body. Ancillary data on rainfall and temperature in the days prior to sampling are obtained from nearby weather stations. Field crews complete sampling over two mornings, one per site, 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 PVC pipes or coverboards at each site, including native and exotic species; (2) determine the frequency (yes/no detected) and relative abundance (counts per pipe or 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 Effort over Two Years

In March 2018, 64 coverboards and 124 PVC pipes were installed in the two sites in the Naval Live Oaks Area, both near permanent waterbodies: the pond by the Maintenance facility (MT) and Brown's Pond (BP). In each study site, boards and pipes were arranged in clusters of 4 coverboards and 3 pairs of PVC pipes, each separated by 20-30 meters. A final cluster per site had 6 (MT) or 8 (BP) pairs of pipes hung in trees over water (see the Supplementary Materials for maps). After 2 months of settling-in, the first event was in May 2018, after which sampling occurred on 2 days, once every other month through to the present, with new monitoring years (MY) beginning in May. Fieldwork was led by Sarabeth Uriz and her assistants from the University of West Florida. The Gulf Coast Network managed the project, wrote reports, and occasionally visited for site maintenance.

The current report summarizes findings from MY2020 (May 2020 - March 2021) and MY2021 (May 2021 - March 2022). Previous findings from MY2018 and MY2019 were covered in the first 2-year



Green treefrog at Brown's Pond site in March 2021. Photo by Sarabeth Uriz.

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

Fieldwork was completed for all 12 sampling events of MY2020 and MY2021. Within events, the average effort per site was 30 boards and 61 (BP) or 52 (MT) pipes, which was less than the total deployment of 32 boards and 64 or 60 pipes, because individual cover objects were occasionally unsamplable (Table 1). This was particularly true at MT, which was often flooded.

Results from Amphibian Monitoring

There were 579 amphibian captures in Naval Live Oaks between May 2020 and March 2022 (Table 1), belonging to 10 different species.

Table 1. Number of individuals per amphibian species by monitoring year (MY) at Brown's Pond (BP) and Maintenance (MT).

Where found	Latin name	Common name	BP MY2020	BP MY2021	MT MY2020	MT MY2021
pipe	<i>Hyla femoralis</i>	Pinewoods treefrog	2	9	5	58
pipe	<i>Hyla cinerea</i>	Green treefrog	3	18	0	49
pipe	<i>Hyla gratiosa</i>	Barking treefrog	0	1	0	5
pipe	<i>Hyla</i> sp.	UnIDed treefrog species	0	3	0	6
pipe	<i>Hyla squirella</i>	Squirrel treefrog	15	153	31	54
Amphibians captured in pipes by MY and site			20	184	36	172
Total pipes sampled by MY and site			364	373	296	325
board	<i>Acris gryllus</i>	Southern cricket frog	0	0	0	40
board	<i>Eleutherodactylus planirostris</i>	Greenhouse frog	20	71	1	8
board	<i>Eurycea quadridigitata</i>	Dwarf salamander	3	1	0	0
board	<i>Gastrophryne carolinensis</i>	Eastern narrowmouth toad	1	2	0	0
board	<i>Lithobates sphenoccephalus</i>	Southern leopard frog	0	0	0	2
board	<i>Scaphiopus holbrookii</i>	Eastern spadefoot toad	1	0	0	0
board	<i>Hyla femoralis</i>	Pinewoods treefrog	0	0	0	15
board	<i>Hyla cinerea</i>	Green treefrog	0	0	0	1
board	<i>Hyla squirella</i>	Squirrel treefrog	0	1	0	0
Amphibians captured under boards by MY and site			25	75	1	66
Total boards sampled by MY and site			188	190	168	173

Results from Amphibian Monitoring, continued

This total included 412 individuals of 4 species in PVC pipes and 167 individuals of 9 species under coverboards. The most common species in PVC pipes was the squirrel treefrog (*Hyla squirella*) comprising 61% of treefrog captures in pipes. The most common species under coverboards -comprising 60% of those captures- was the only non-native amphibian species detected in monitoring, the greenhouse frog (*Eleutherodactylus planirostris*). This Caribbean species was first seen in the unit in 1997. Because it can reproduce without standing water, it has successfully spread into many habitats throughout the southeast. Greenhouse frogs were recorded in both BP and MT, although they were much more common at BP (91 versus 9 captures).

The composition of captures differed notably between BP and MT in other ways as well. For PVC pipes, BP had more squirrel treefrogs than MT (168 versus 85), but for all other treefrog species, there were more captures at MT than BP. For coverboards at BP, greenhouse frogs made up 91% of captures, and the remaining 9% was divided among 4 species. Notable among them were dwarf salamanders (*Eurycea quadridigitata*) and Eastern spadefoot toads (*Scaphiopus holbrookii*).

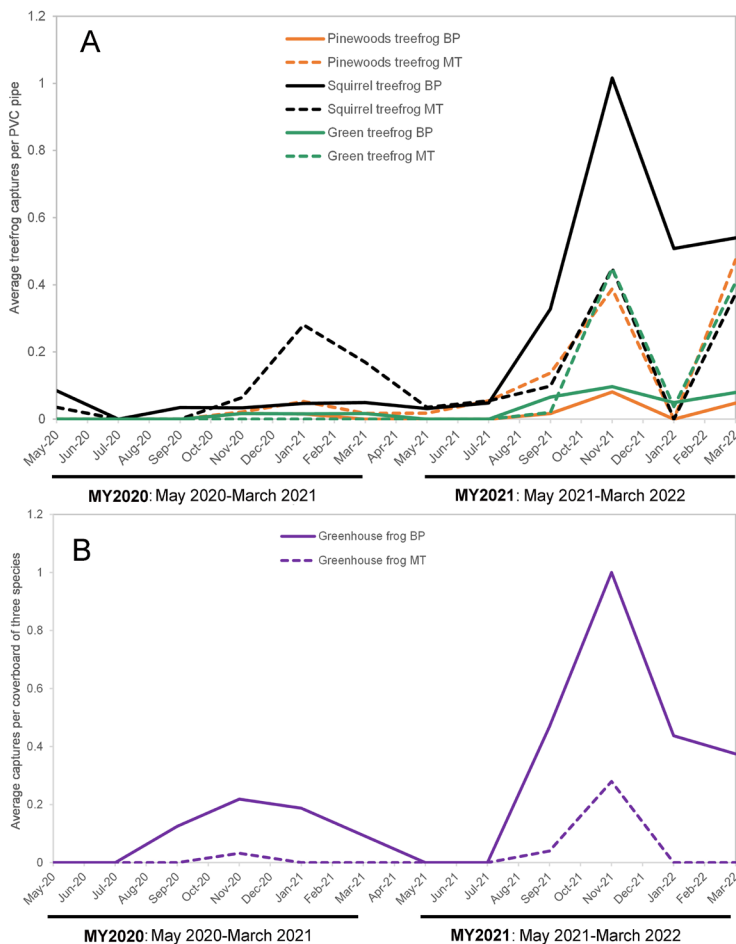


Figure 1. Capture rates of the most commonly-detected species at Brown's Pond (BP) and Maintenance (MT) sites (A) in pipes, and (B) under coverboards.

At MT, in contrast, southern cricket frogs (*Acris gryllus*) were the most commonly captured, at 40 individuals. The remaining coverboard captures at MT were of four other amphibian species, including 16 individuals of 2 treefrog species. It is uncommon to capture treefrogs under coverboards, but it does occur following nights with freezing temperatures, as was the case here.

The number of captures in MY2021 was 83% higher relative to MY2020. When standardized by effort, there were <0.1 captures per trap in MY2020 and 0.5 in MY2021. The temporal increase was strongly driven by higher captures rates in MY2021 of squirrel treefrogs (Figure 1A) and greenhouse frogs (Figure 1B), but nearly all other species increased as well. Although these temporal differences were striking, fluctuations were also common in the pilot data. Further interpretation will be possible with the upcoming trend report in 2024.

Notable Events from Fieldwork through March 2022

Weather conditions in MY2020 and MY2021 resulted in unusually high water in the MT pond. Hurricane Sally brought heavy rains and high winds to the park in September 2020, after which water levels in MT pond remained high for over a year. This flooding often caused the lowest-elevation boards to be unsamplable at MT, and the lower hanging pipes to be dislodged.

Notable wildlife observation during routine field work were as follows. The eastern spadefoot toad detected in January 2021 was one of very few records from the park. Also unusual were barking treefrogs (*Hyla gratiosa*) in pipes in September 2021 and the non-native Brown anole (*Anolis sagrei*) under a BP board in January 2022.

List of Supplementary Materials

A supplementary materials document is prepared for each 2-year report, allowing additional space for background information and ancillary data. 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 of captures over time for the current and pilot study; (4) a list of reptiles detected during monitoring; (5) useful publications and references for amphibian monitoring at the park; and (6) photos of notable amphibians or reptiles.

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. Webpages for Gulf Islands NS: <https://www.nps.gov/im/guln/guis.htm>; <https://www.nps.gov/guis/index.htm>

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