



# A Survey of Anuran Breeding Activity in the Lower Coastal Plain of South Carolina Using the North American Amphibian Monitoring Program

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## Introduction

Scientists have documented their concern over amphibian decline, and a number of studies have investigated local amphibian populations and identified factors causing their decline (Pechmann and Wilbur 1994 and Wilcove et al. 1998). However, few studies have been able to investigate long-term trends in amphibian populations across a broad region. The North American Amphibian Monitoring Program (NAAMP) was developed to monitor populations of calling amphibians across the United States (Weir et al. 2005). NAAMP was developed in 1996 by the United States Geological Survey (USGS) and participation is volunteer-based. There are currently 25 states participating in this long-term program nationwide. NAAMP was initiated in South Carolina in 2008, and the fifth sample year is currently underway. NAAMP has been successfully implemented at 39 individual sampling routes throughout South Carolina. From 2008-2011, a total of 386 surveys have been conducted, representing 3,860 five minute stops across 4,600 highway miles producing an average of 1,000 detections per year (North American Amphibian Monitoring Program 2012). Participant efforts have resulted in the detection of 28 of the 30 anuran species known to occur in the state. This 2012 study presents findings from two NAAMP routes within the Lower Coastal Plain of South Carolina, a region with one of the highest diversity of anurans in the United States. Survey routes were near the towns of Bowman and Santee with stops located proximal to a variety of wetland habitats.

### Research Objectives:

- Determine how detections vary by sample period (Window 1, Window 2 and Window 3) and by species.

- Establish baseline data regarding anuran activity on the Bowman and Santee routes.

- Compare detection rates and species diversity across wetland habitat types.

## Methods

- Twenty-one surveys, 9 for the Santee Route and 12 for the Bowman route, were conducted from January 2012 to June 2012 following NAAMP sampling protocol. Routes were surveyed during three sampling windows that cover the peak breeding periods of anurans in South Carolina (Table 1).

- Routes were randomly selected by the USGS Patuxent Wildlife Research Center in Laurel, Maryland and established with GPS in 2012. There were 10 stops per route, each stratified by habitat, at least 0.8 km apart. At each stop, observers listened for five minutes and recorded each anuran species heard. Each species was assigned an index value (1, 2 or 3), which served as an estimate of abundance (Table 2).

- Surveys began 30 minutes after sunset or later, and were completed by 1 a.m. Stops were sampled in numerical order, in one night by one observer. At each stop, air temperature was recorded and any passing cars were counted. Data were recorded on a USGS datasheet template, entered into the NAAMP database, and reviewed by the state coordinator before final submission.

Table 1: NAAMP sample windows and minimum sampling temperatures.

Survey Window	Survey Period	Breeding Period	Minimum Temperature
1	January 15 - February 28	Early	5.6°C
2	March 15 - April 30	Mid	10°C
3	May 15 - June 30	Late	12.8°C

Table 2: Calling index levels and criteria.

Calling Index	Criteria
1	Individuals can be counted; there is space between calls
2	Calls of individuals can be distinguished; some overlapping of calls
3	Full chorus, calls are constant, continuous and overlapping

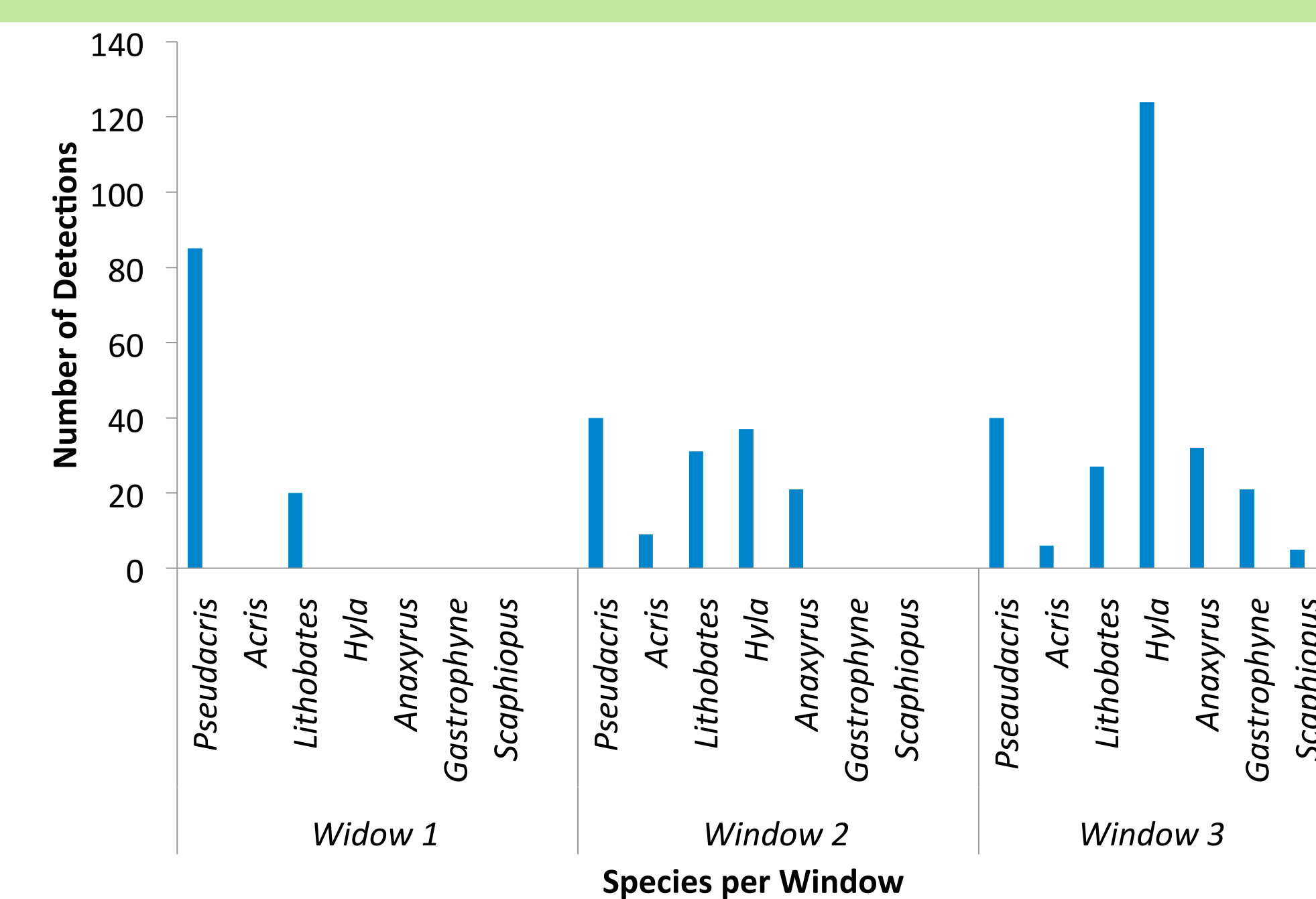


Figure 1. Variation in detections across sample windows.

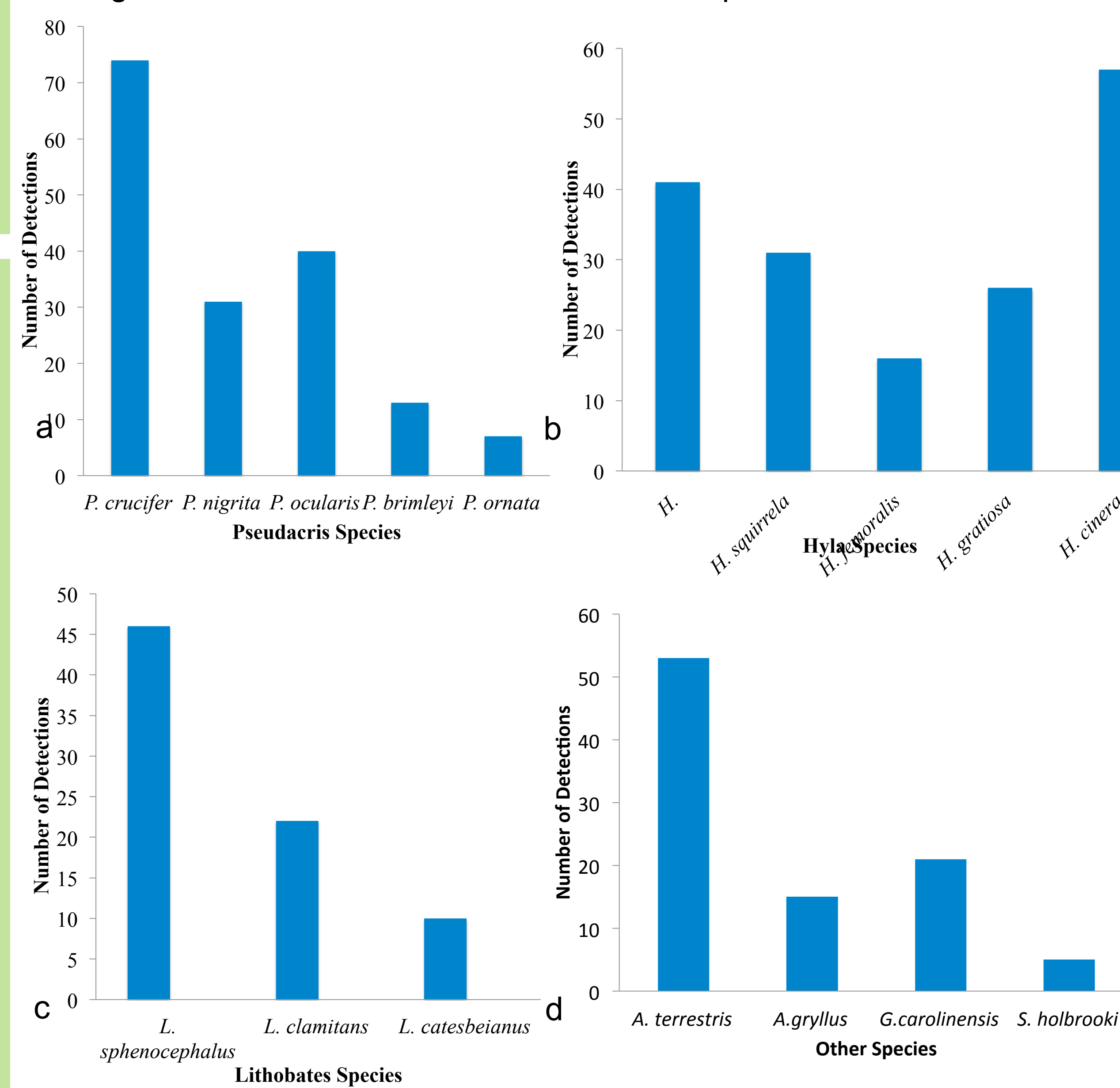


Figure 2 a-d. Anuran species detections for 2012 for the Bowman and Santee NAAMP routes.

## Results

- Nine surveys were conducted on the Santee route and twelve were conducted on the Bowman route, producing 210 five minute samples. Surveys detected 17 anuran species.

- The Bowman route yielded 378 detections as compared to the 167 detections from the Santee route.

- Sixteen species were detected for the Bowman route and 15 for the Santee route. Spring peepers were heard at all stops during Window 1, but other dominant callers were detected most often in Windows 2 and 3 (Figure 1).

- The spring peeper (*Pseudacris crucifer*), green treefrog (*Hyla cinerea*), southern leopard frog (*Lithobates sphenoccephalus*) and southern toad (*Anaxyrus terrestris*) yielded the highest rate of detection (Figure 2). Ornate chorus frog (*Pseudacris ornata*) and Brimley's chorus frog (*Pseudacris brimleyi*) were unique to the Bowman route. The eastern spadefoot toad (*Scaphiopus holbrookii*) was unique to the Santee route.

- The most diverse stops were proximal to lentic wetlands (cypress ponds and beaver ponds) with dense herbaceous cover. Lentic wetlands (creek swamp and backwater cove habitats) with little herbaceous cover had fewer species (Figure 3).

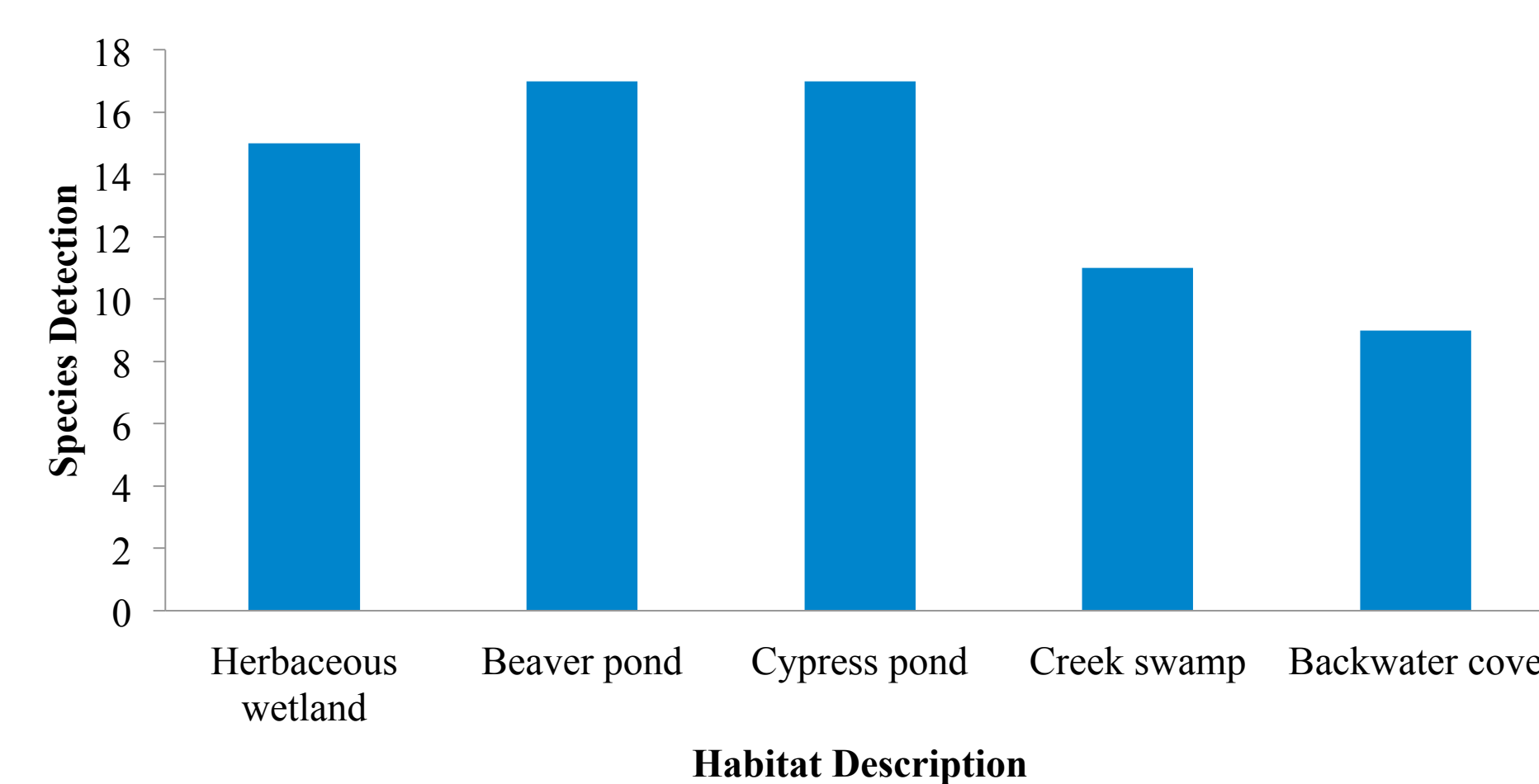


Figure 3. The number of anuran species detected in major habitat types along the Santee and Bowman Routes.

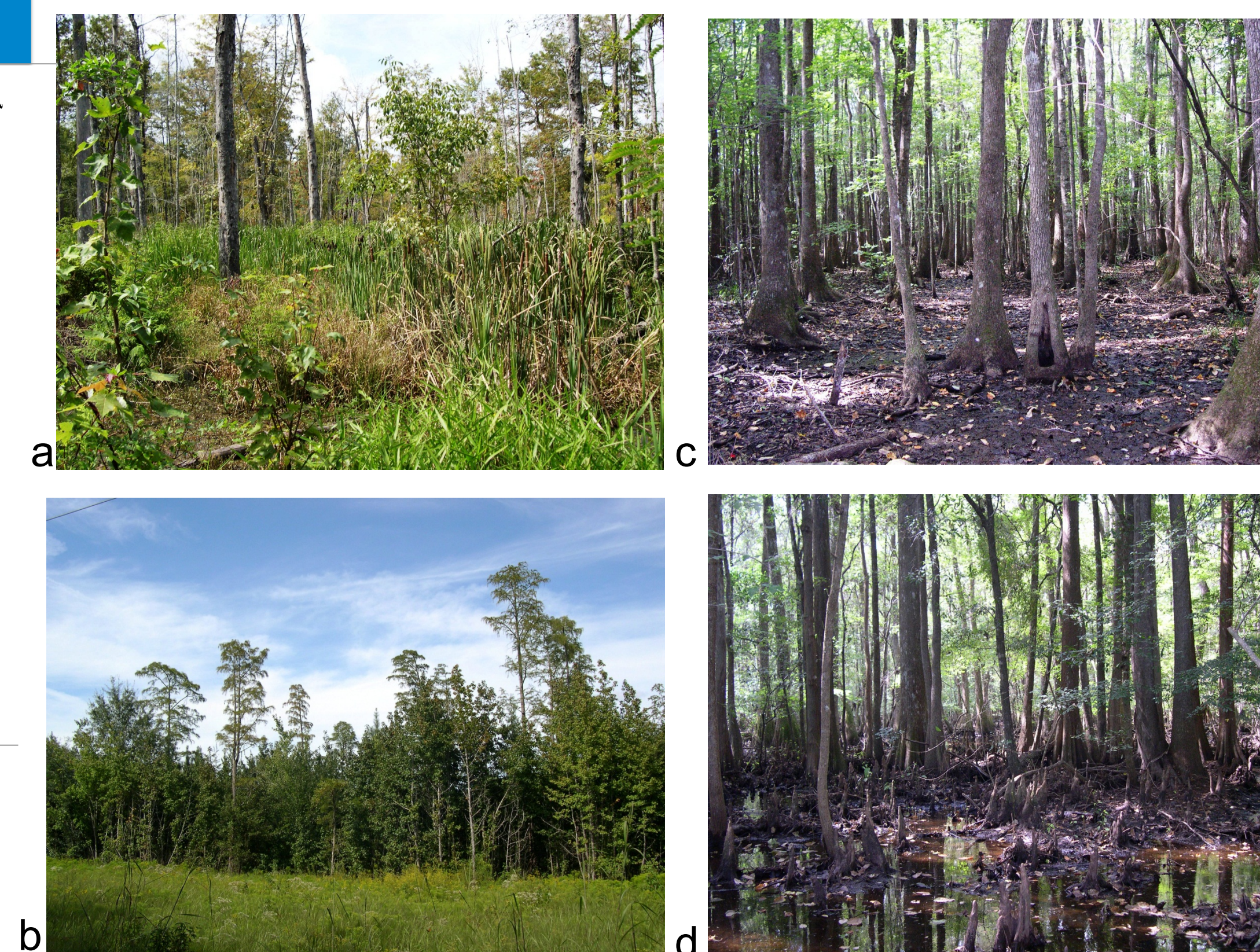


Figure 4. Beaver pond (a), cypress pond (b), gum pond (c) and creek swamp (d) habitat types.

## Conclusions

- The large number of species detected results from the diversity of wetland habitats that exists across the southeastern Coastal Plain. In addition, there is a significant degree of variability in amphibian activity in seasonal wetlands (Pechmann et al. 1994) so conducting repeated surveys at different times of the year is needed to adequately sample the anuran community.

- The relationship between anuran diversity and wetlands with herbaceous cover has also been reported by Smith et al. (2006) and Liner et al. (2008). The lower dissolved oxygen, water temperatures, and reduced food availability found in closed canopy wetlands may not be suitable for anuran larvae (Liner et al. 2008).

- This study provides further support for the conservation of anuran breeding habitats, especially isolated wetlands, to maintain anuran diversity across the landscape.

- Additional analyses are planned for this dataset to produce occupancy estimates and model trends in breeding chronology across years.

- NAAMP continues as a comprehensive statewide monitoring effort, providing an extensive database available to the public.

## Literature Cited

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## Acknowledgements

This project was made possible through the USGS Patuxent Wildlife Research Center and the North American Amphibian Monitoring Program.