Sustainability Fee Project Grant Report Guidelines
for grants awarded during FY2019
Due by 5pm August 1, 2019
Email pdf or word doc to cfs@georgiasouthern.edu

Please provide the following information in order to help the Center for Sustainability document the success of the Sustainability Fee Grant Program.

Date: July 25, 2019
Name(s): Emily Kane, Christian Cox
Unit/Department(s): Department of Biology
E-mail address: ekane@georgiasouthern.edu, clcox@georgiasouthern.edu
Phone: (912) 478-0134, (912) 478-2230
Project title: Dating, dining, and ducks: Monitoring the recovery of campus lakes after dredging
Amount granted: $30,000
Amount spent: $30,000

I. Project Outcomes/Value

Detail the planned and actual outcomes of the project here.

Project Timeline - Is your project *completed* or still *in progress*? It is completed.

Project Outcomes -List the *proposed* project goals/objectives and *actual* outcomes of the grant. Describe any successes, challenges and observations.
Proposed goals/Objectives:

1. Monitor the aquatic vertebrate biodiversity in the ponds for 1 year and approximate the amount of time needed for recovery of campus ponds.
2. Provide an outlet for the campus community to assist in assessing the health of these ponds as well as understanding campus biodiversity.

Actual outcomes:

1. We have surveyed the 3 ponds each once a month for the past year and recorded all reptile, amphibian, and fish species encountered. In the past year we have conducted 11 surveys using on average 8 traps per pond with a total 44 hours of survey effort.
2. Data from surveys is publicly accessible through iNaturalist: Pond Recovery Project. 3. We have had both graduate (4) and undergraduate students (10) participate in pond sampling and have presented our results at the Sustainability Showcase and Undergraduate Biology Symposium. We also have a website and blog for members of the community to interact with, including a link to a form for anyone who has expressed interest in joining our efforts. Lastly, two George-Anne articles were written about the dredging and the project.

Sustainability Improvements – clearly state how your project has improved campus or community sustainability and explain how you assessed the improvement. If funds were used to purchase products intended to reduce energy, water use, waste, labor cost, etc., please provide information and calculations that show the expected return on investment for your grant.

The benefits to the campus community have been indirect as this is a monitoring program and we have not altered the campus. Our project has served to increase awareness of campus biodiversity and allow for transfer of that understanding outside of the campus community. For example, many students may also have farm ponds on their family's property and may have been unfamiliar with the effects of dredging activities, which are considered standard maintenance, on the animals that depend on those ponds. By participating in this project, students and volunteers

have become more aware of the effects of human activity on the environment. Subsequently, these students can spread this knowledge not only on campus, but at their homes and in the community. Evidence of this indirect benefit has been provided through student-written blog posts on our project website that have described what they learned from working on the project. Additionally, this project was featured twice in the George-Anne, which has broad readership. However, we have no way to assess how readers responded to these articles. Informal conversations with curious students and community members suggest that this project is of broad interest, and many were unaware of the magnitude of effects on biodiversity, which we have observed.

Outreach – how did you publicize your Sustainability Fee grant/project? Please attach copies of all publicity (news articles, web pages, fliers, newsletter, etc.) associated with your grant. If no publicity measures have been taken yet, what are your plans for publicity of your project?

- Verbal announcements in courses and lab meetings, conversations with passers-by during surveys, updates posted on Twitter (by @KaneLabGSU and @EvoCohen)
- Highlighted as an ongoing research project on Kane Lab website: https://www.thekanelab.com/pond-recovery-project
- A dedicated project website with a blog: https://thekanelab.wixsite.com/gsupondrecovery ● There have been two news articles written about our project:
    - Sustainability project seeks to monitor campus lakes following dredging - Mar. 12, 2019 ○ Georgia Southern ponds beginning to see return of species - Nov. 9, 2018
- Poster presentation at the Biology Undergraduate Research Symposium
- Poster and display, including a video, at the Campus Sustainability Showcase

Budget report- provide an explanation of how all funds were used and explain any deviation from the original budget.

Four graduate students have received funding from this grant: 2 students in the Fall semester, 3 students in the Spring semester. Deviation from the original budget included revision upon being awarded less funding than requested - instead of paying undergraduate assistants to help the graduate students, several signed up to receive course credit instead. Additionally, for Spring and Summer, 2 graduate students were included in the budget, but the position for 1 student was split between 2 students, resulting in 3 students contributing to the effort of the grant.

II. Student and Community Impact

Because these grant funds come directly from a $10 Student Sustainability Fee, it is important to document how they benefit students. Please provide information on the following:

- 4 Graduate students employed by the grant
    - Fall 2018 - 2 graduate students
    - Spring 2019 - 3 graduate students (1 graduate student/20 hours/week; 2 graduate students/10hours/week)
    - June 2019 - 3 graduate students (1 graduate student/20 hours/week; 2 graduate students/10hours/week)
- 10 Undergraduate volunteers involved in the project, including total 22 volunteer hours
- 3 Undergraduate students presented a poster at the Biology Undergraduate Research Symposium, which can be added to their CVs.
- Blog posts - students received experience communicating about the project to a non-technical audience. These posts are public and can be included as writing experience on students' CVs.
    - 5 Undergraduate students wrote about their experiences

- 4 Graduate students wrote about a topic related to the project

Grant Leverage

Were you able to leverage your work for additional outcomes? Indicate the following if they apply.

Biological surveys provide important information about the time and space that organisms exist. This grant allowed for consistent surveys that otherwise would not have occurred. By making data publicly accessible this grant has provided valuable information that can be used in future studies. Such studies may ask questions about campus biodiversity, conservation and management.

Project abstract

Provide a one paragraph abstract of the completed project **and several photos** (preferably including some of the people involved with the project at work) to be posted on the CfS web page. Also include links to all web pages on which this work is discussed or displayed

Link for general website of project:
https://thekanelab.wixsite.com/gsupondrecovery
Link for blog posts made by Dr. Emily Kane, graduate and undergraduate students:
https://thekanelab.wixsite.com/gsupondrecovery/news

The lakes and ponds on campus are ingrained in the culture and ecology of the Georgia Southern Statesboro campus and contain a surprising variety of fishes, amphibians, reptiles, and water-oriented birds. However, these lakes were drained and dredged in December 2017 to remove accumulated sediment, causing disturbance to the campus wildlife that is a large part of the cultural value of these ponds. Sustainability fees were awarded to us last year to involve graduate and undergraduate students in monitoring pond recovery by surveying campus lakes on a monthly basis (Figure 1). Although we have seen recovery of some animals (Figure 2), our results thus far suggest that the timeline for full recovery of the campus lakes is significantly longer than a single year. Animals are recovering slowly but remain at low levels of biodiversity (fishes: 4 species total, 29% recovery; amphibians: 2 species total, 25% recovery) with the exception of aquatic reptiles (6 total species, 86% recovery) (Figure 3). Reptiles such as turtles are more mobile and/or less reliant on the water, likely facilitating their rapid recovery. The College of Education pond has shown the greatest evidence of a recovering wetland as most of the animals that have been observed have been in this pond. In contrast, we have found only a single species of fish in Lakes Ruby and Wells. Amphibian diversity remains low in all 3 lakes. The rate of wetland recovery from dredging is based upon the type of wetland, its connections to surrounding water bodies, and the type of animal targeted. Together, the results from our current sustainability project highlights the need for continued and expanded monitoring of important campus lakes for biodiversity recovery.

Figure 1. Student sustainability fees supported graduate and undergraduate students to begin conducting biodiversity surveys on dredged campus lakes in FY2018-2019.

Figure 2. Twelve species of fish, amphibians, and reptiles have been discovered in the dredged lakes over the last several months.

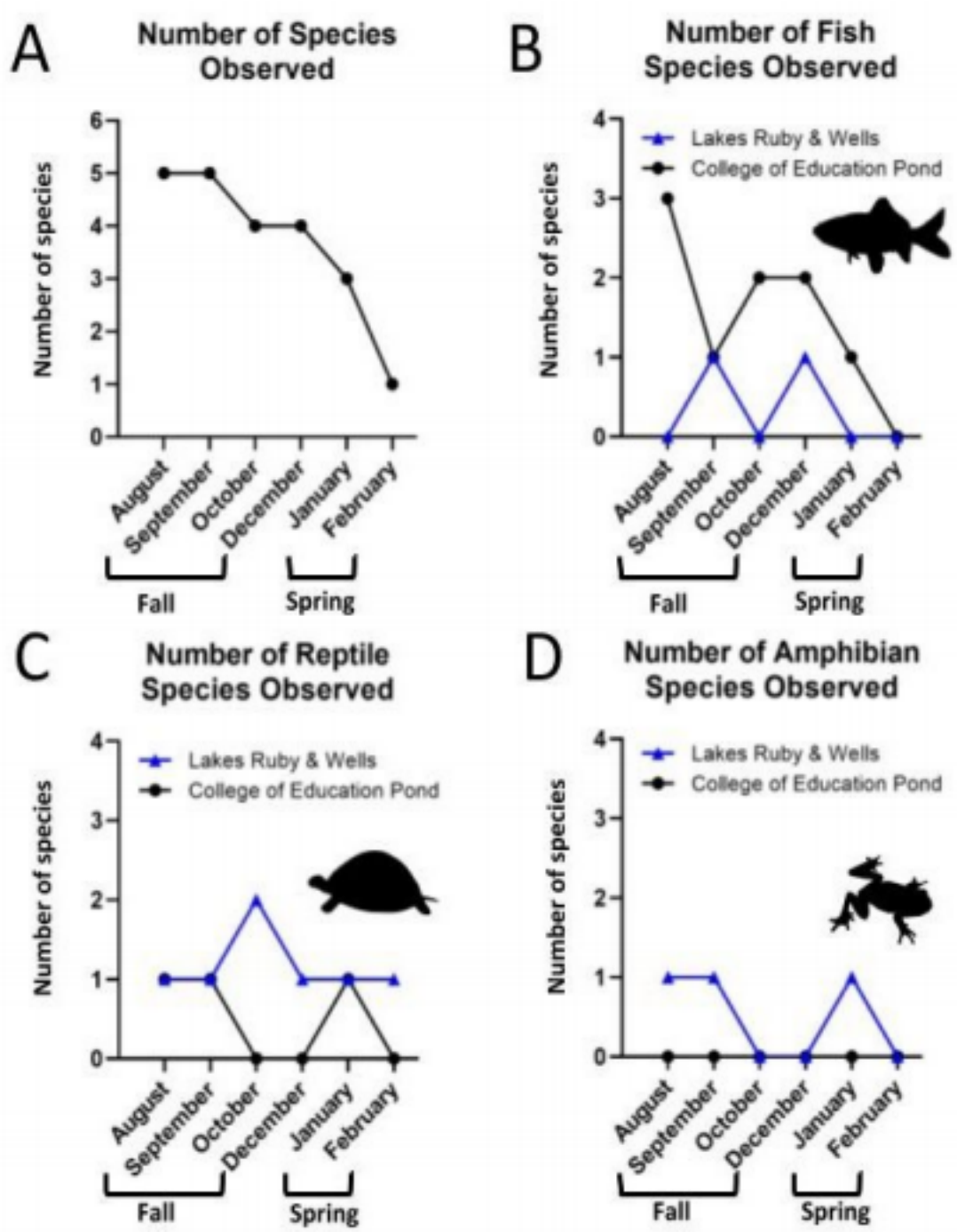


Figure 3. Number of animal species detected during our survey. A) Total number of species observed across all ponds. B) Number of fish species detected in each pond location. C) Number of reptile species detected in each pond location. D) Number of amphibian species detected in each pond location. Note that a decline in observations occurred as temperatures fell and animals hibernated.

Recovery of species

diversity post lake dredging

Tacarie Lewis, William Ray, Kimberly McInnes, Dr. Emily Kane and Dr. Christian Cox

Department of Biology, Georgia Southern University

Introduction Methods

•Starting in December 2017, three ponds on campus were drained and dredged to remove excess sediments

from the bottom. •This process was traumatic to the fauna that lived in these ponds and reduced the biodiversity seen before dredging. •This presented an opportunity to study factors that might affect the recovery of biodiversity.

We knew that lakes Ruby, Wells, and College of Education all have different topographic profiles and input sources. Based on this knowledge, we expected:
1) The ponds that have more input sources and higher chances of migration to have a faster recovery than those that are more isolated.
2) The more mobile animals such as reptiles, birds, and amphibians to return more quickly than fish species. 3) The more hardy fish species to reestablish populations before specialized species.
We used monthly surveys to track species recovery: 1) We used different kinds of aquatic traps (promar, hoop, minnow, etc.) to

collect species of different sizes and life strategies.

2) Traps were set on Friday mornings and checked later the same evening.

3) Cat food and canned fish were used as bait to lure the animals to the traps.

4) We recorded the species caught as well as used visual identifications in our surveys.

5) Animals were released after identifying and logging them.


MORTAL KOMBAT
GOLD

Figure 1. Total number of fish, reptile, and amphibian species that have been recovered in campus ponds post dredging

Results

1) Immediately pond dependent species of birds such as geese and ducks returned.

2) Species of amphibians (American Bullfrog, tadpoles, toads) reestablished within a few months.
3) Reptiles, specifically turtles, also returned
(yellow-bellied/red eared/ common sliders, common snapping turtle, common musk turtle, Florida softshell).
4) Species of fish reestablished in the College of Education pond (Warmouths, Brown Bullhead, Dollar Sunfish, and Eastern Mosquito fish).
5) Only Brown Bullheads have returned to lake Wells 6) No fish species have been recovered in lake Ruby

Conclusions

[redacted]

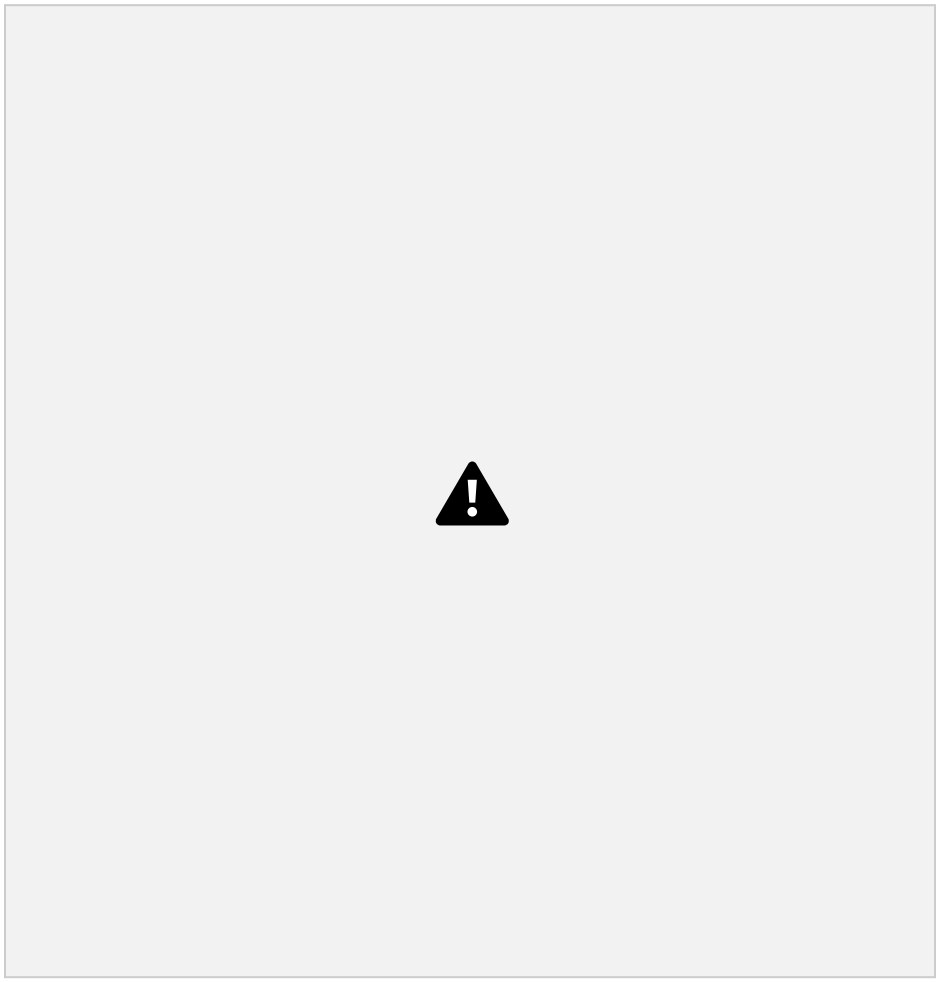
2) Many Bird, amphibian, and reptile species have recovered successfully and springtime reproduction of these species has been observed.

3) We want to encourage all the faculty and students to be mindful of how human actions can influence the ecosystems around them and to take the time to enjoy the biodiversity that our beautiful campus has to offer.

Acknowledgements

Dr. Emily Kane, Dr. Christian Cox

Albert Chung, Hannah Cohen, Adam Russo, Lauren Wilson



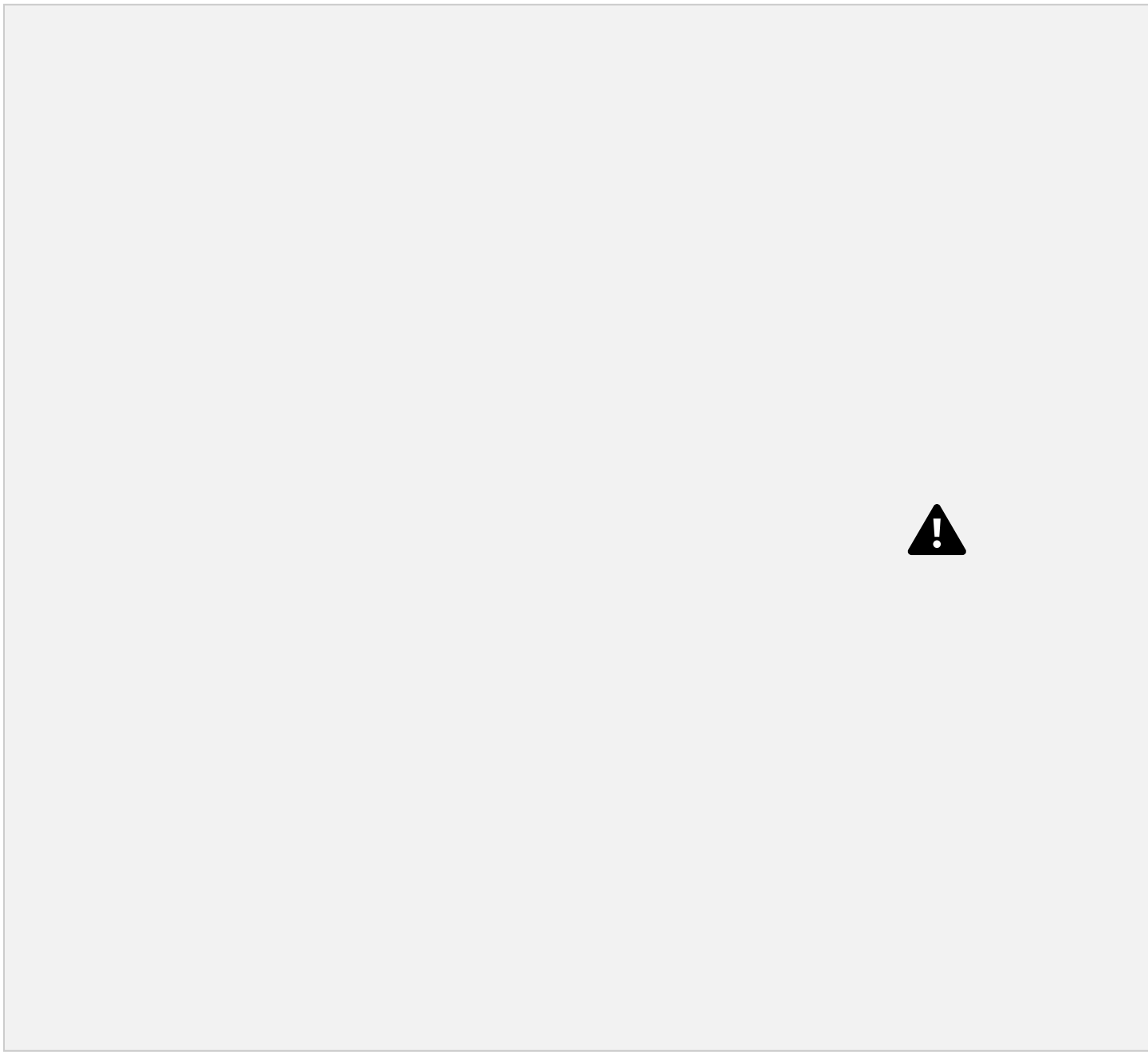


Figure 1. **BioBlitz of 2017 (funded by Sustainability fees)** before the dredging showed the wide diversity in the ponds. These species have not yet come back.

In December 2017, Lake Ruby, Lake

Wells and the College of Education pond were drained and dredged to remove accumulated sediment. These ponds contribute 10% of our campus footprint and provide habitat to over 120 species of animals. These **animals were heavily impacted**, but their recovery provide an opportunity to learn more about biodiversity in these ponds.

Prior to draining these ponds were home to:

- **14 species of fish**
- **8 species of amphibians**
- **7 species of reptiles**

To monitor their recovery, students survey the ponds monthly.

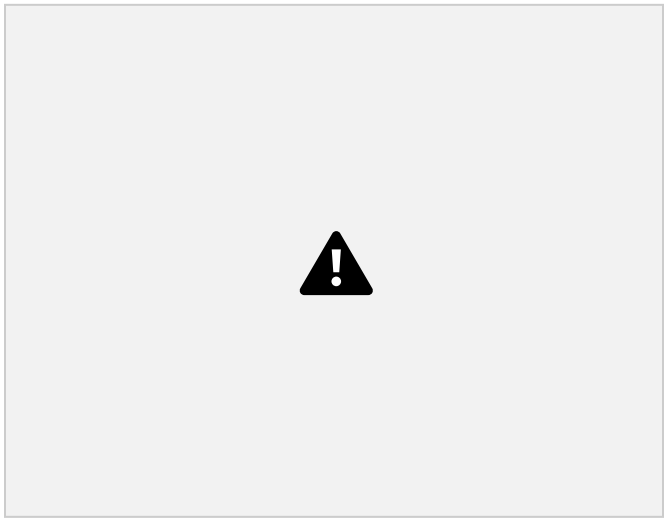
Although our ponds are on the road to recovery, full restoration of

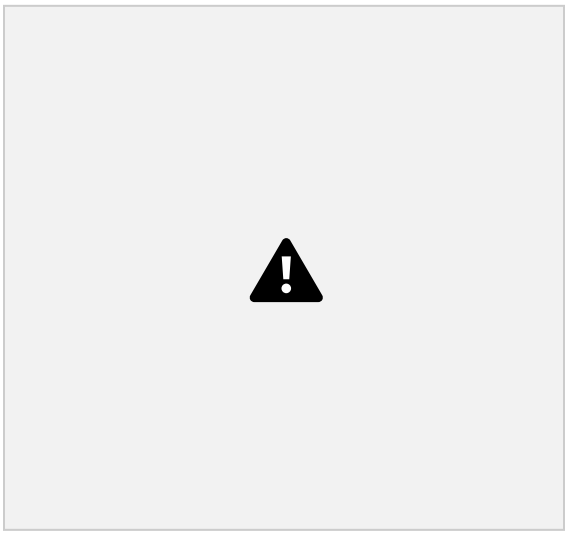
wildlife will take some time. Water quality tests have shown evidence of elevated nitrogen and dissolved solutes, suggesting that **food webs have not yet been established**.

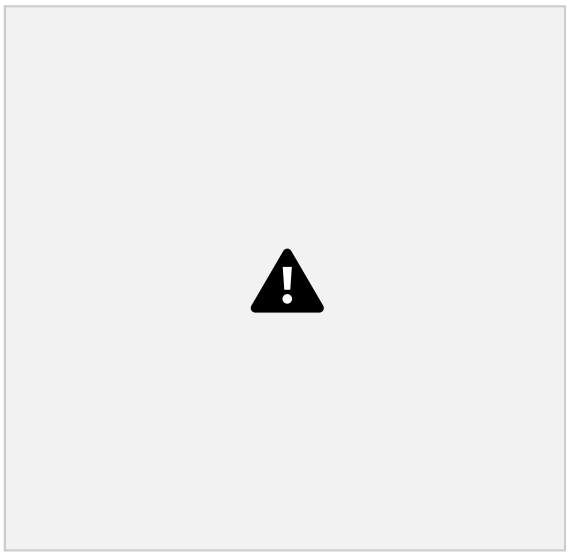
Since the ponds have been dredged, we have seen:

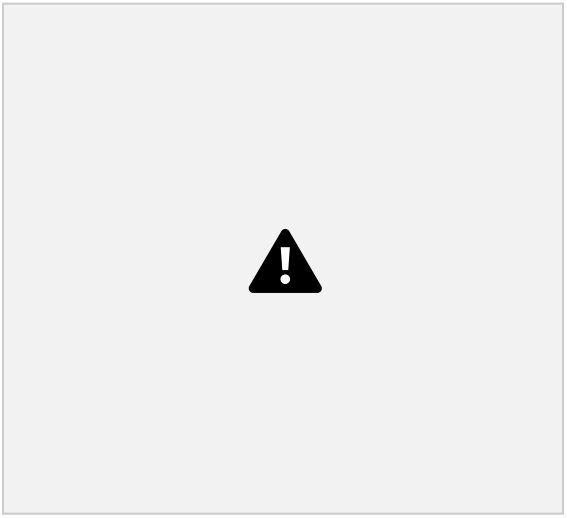
- **4 species of fish (29% recovery)**
- **6 species of reptiles (86% recovery)**
- **2 species of amphibians (25% recovery)**

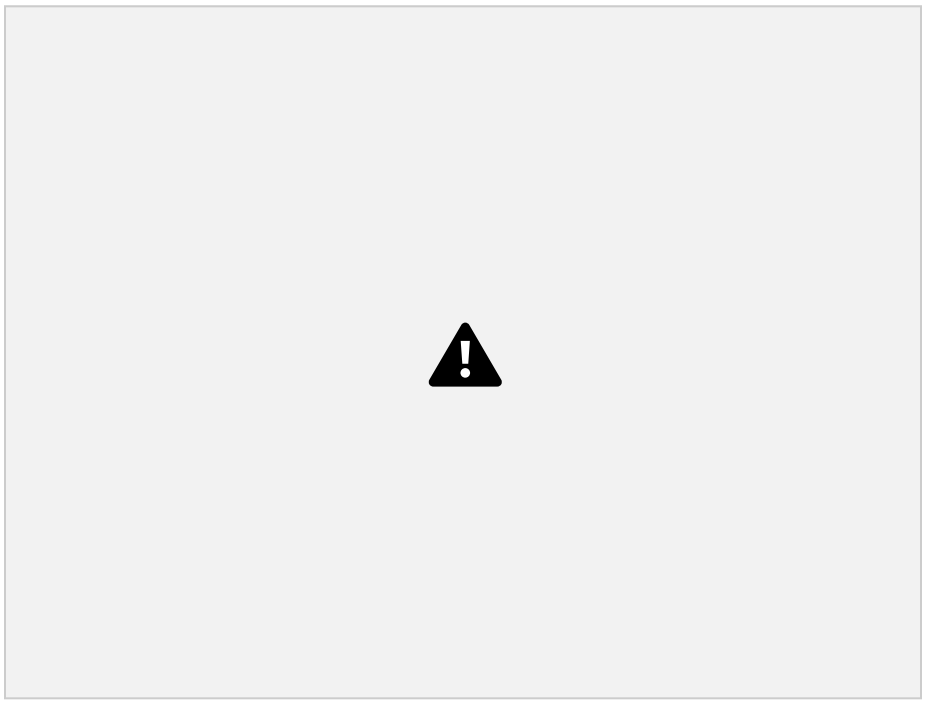
While aquatic reptiles have almost completely recovered, levels of biodiversity are still low for amphibians and fish.



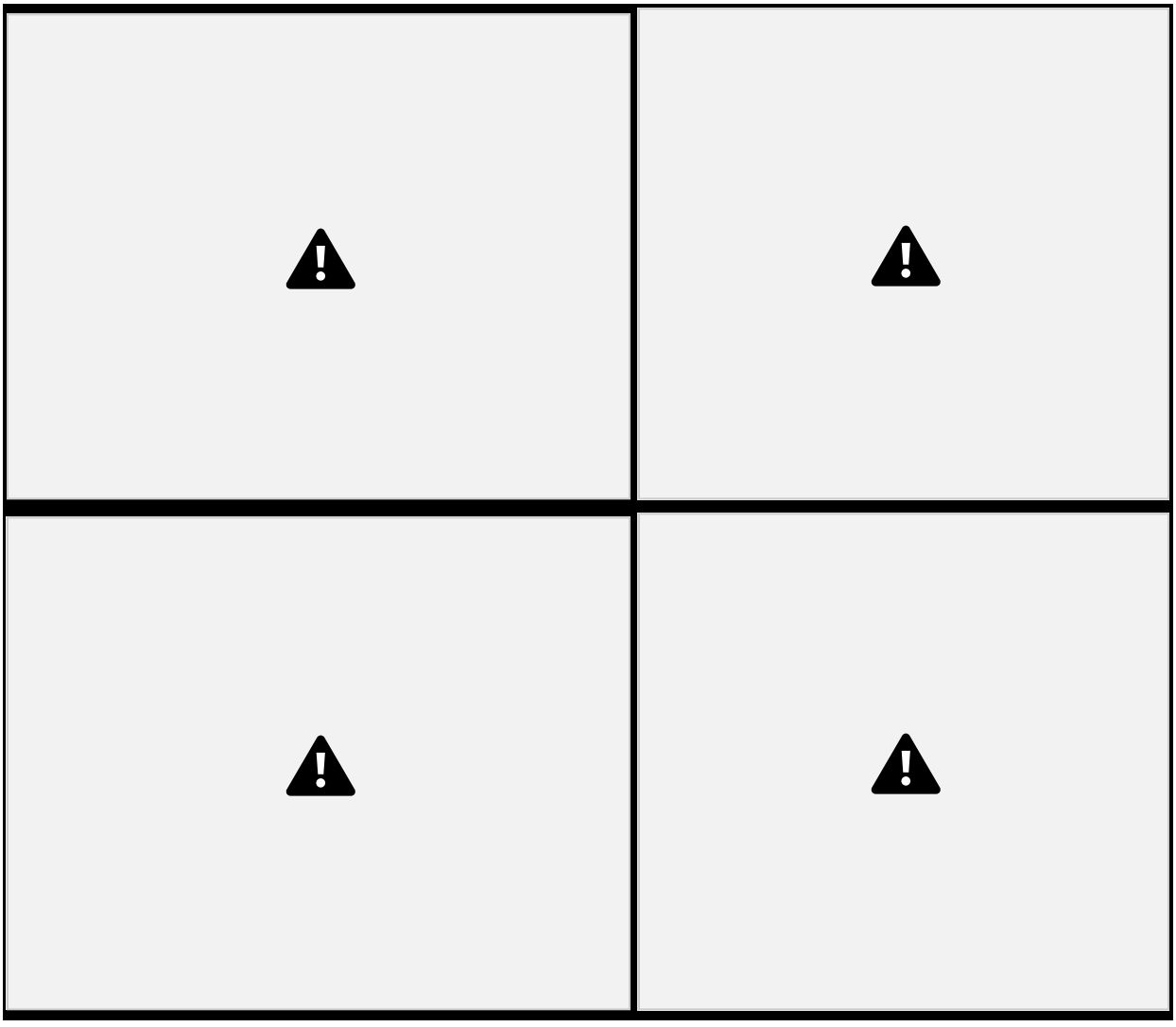








Southern toad



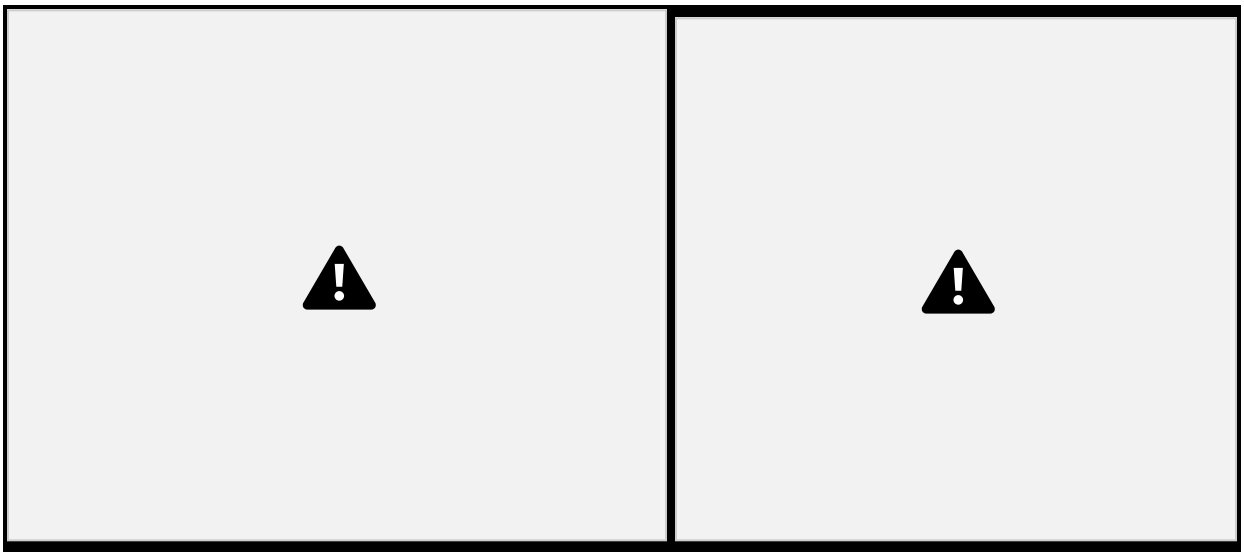


Figure 4. Number of animal species detected during our survey. A) Total number of species observed across all ponds. B) Number of fish species detected in each pond location. C) Number of reptile species detected in each pond location. D) Number of amphibian species detected in each pond

This project has **provided opportunities for students** and community members to gain hands

on experience with research techniques, science communication, as well as increasing our understanding of human influence on the world in which we live.

Watch our video!

Check out our blog for updates, photos, and cool animal facts!

Figure 6. **Student sustainability fees supported graduate and undergraduate students** to begin conducting biodiversity surveys on dredged campus lakes in 2018.

There are many ways you can get involved:

1) Do your own survey! Download iNaturalist & post photos of animals you see on campus. This can contribute to our data.

location.

2) Volunteer with us! Visit our website & sign up to survey with us!

Figure 5. Missing fish! Using an

Check our website for information on how to get involved

Figure 2. Pond draining and dredging over Winter Break 2017.

underwater camera, we discovered that smaller fish are able to swim through the bars of this trap. This is likely affecting what we find on surveys.

We would like to thank all the undergrads who have helped on the project: **Saabirah Carr, Tori Defoe, Walker Dixon, Tacarie Lewis, Kimberly McInnes, Nick McKinley, William Ray, & Sierra Zelaya**