Aquarena Center Internship
San Marcos, Texas
Summer 2007

Final Report – by Jeremiah Ness

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Introduction

Staring down at the all-too-familiar springs in the headwaters of the San Marcos River, fanning my hands back and forth over each fountain of water and breathing the dry air from the scuba cylinder attached to my back, I suddenly paused. It was at this instant, several weeks after my arrival to this astonishing place in central Texas, that I finally stole a few moments to admire my remarkable surroundings. The water here – a chilly, crystal clear 71 degrees year round, is home to handfuls of creatures, several of which are on the endangered species list. From land animals and amphibians to water bound creatures, these integral species all thrive here to create a dynamic and energetic ecosystem: a dream come true for any scuba diver holding interest in wildlife biology.

Aquarena History

Having played a central role in this area for thousands of years, the history of the upper San Marcos River and its' headwaters is a both rich and fascinating. More than 12,000 years ago Indians made these springs their home. We can literally see proof of this thanks to an archaeological excavation that began in the 1970's by Dr. Joel Shiner and his students. By means of scuba, digging underwater through the layers of sediment, they were able to find many artifacts such as pottery, arrowheads, sharpening stones, and even Mastodon bones that contained engravings from the Clovis Indians (early Paleo-Indian people from around 9000 BC). Even more remarkable than the age of these artifacts, was the fact that from that point in history to present day, there were no periods in the sediment that were without artifacts. This would mean that the headwaters of the

San Marcos River is in fact the oldest continually inhabited area in North America. This would make sense, however, because there has been no record of these springs ever ceasing to flow. In times of drought, people in the area could always count on fresh water and good hunting grounds from these springs. Spanish explorers also came in contact with the springs over three centuries ago, and they are responsible for naming the San Marcos River, after the day it was it was found – St. Marks Day.

In the late 1840's, General Edward Burleson made this area his home. Burleson was one of the founders of the city of San Marcos. Shortly thereafter, a settler named Arthur B. Rogers built a hotel on the newly created Spring Lake (dammed by Burleson). The Rogers family continued to devise means of attracting tourists, and created the first glass-bottom boat. This caught on and more boats were built, followed by a Submarine Theater. The sub allowed people to sit in a theater-like setting, and become submerged in the lake to watch one of several underwater "shows" such as a swimming pig and mermaids. Today the Aquarena Center is owned by Texas State University, and has become more centered on education and wildlife preservation. The old hotel building was renovated and now houses the Texas Rivers Center, while many other amusement park style attractions like the submarine theater have been withdrawn. That is not to say that all the fun is gone – not by a long shot! Visitors to the Aquarena Center can do many things. From glass-bottom boat rides, to the endangered species exhibit in the aquarium, this place holds interest to people of any age.

Aquarena Today

Since it's purchase by Texas State University in 1994, the Aquarena center has steered from thrills and excitement to a more curious, engaging, and educational outlook. Almost everywhere you go there is something to learn about and discover.

The main attraction for most people is the infamous glass-bottom boat tour. The boats – built in the 1950's – hold about 25 tourists, allowing them a personal view of the lake environment (from the surface). They are guided along the lake, stopping over both environmentally and historically important areas. After experiencing the glass-bottom boat, visitors may also explore the aquarium, where there is an exhibit on the endangered species that live in Spring Lake. These species consist of the San Marcos Salamander (Fig. 12), the Texas Blind Salamander (Fig. 20), the Fountain Darter (Fig. 13), Texas Wild Rice, and San Marcos Gambusia. There are several other tanks that hold different species, including the American Eel, Freshwater Prawn, and a turtle tank. Another interesting area to explore is the Floating Wetlands Boardwalk, which is a long floating dock that outstretches over the wetlands area of the lake. This is a great place to see turtles and birds, as well as spawning fish. Lastly, the Texas Rivers Center has an additional exhibit pertaining to the river systems and waterways in Texas. All are great presentations that continue to attract visitors.

My Background

As a child, I held a frightening and irrational fear of water. When friends and family would enjoy the pleasures of water activities, I sat back and watched. I slowly began to understand that my fear was of the unknown, until I discovered that all I needed to confront these fears was a mask and snorkel.

As a freshman in college, inspired by a friend's experiences, I enrolled in a PADI open water diver course. I loved it. Eager for more, I completed the Advanced Open Water course and several specialties, and am currently working on my Rescue Diver status. After stopping by the Aquarena Center in the spring of 2006, my parents suggested I check out the Scientific Diver course there (Fig. 16). While taking the course, I had the privilege of getting to know Ron Coley, director of the Aquarena Center. Ron was at one time an OWU scholar, and was eager to tell me about the organization. Considering an intern for the summer of '07, he encouraged me to apply.

I was determined to find a summer work opportunity geared toward my intended career path: marine biology. Although Spring Lake is not a marine environment, I was fascinated by the aquatics and geology of the area. In addition, this internship would allow me to spend a great deal of my time underwater.

Discussion

My daily tasks at Aquarena consisted of cleaning the lake and it's springs by means of scuba, invasive aquatic plant removal, dive supervisor, giving glass-bottom boat tours, aquarium duties, and other diver related scientific research. Shortly after arriving in San Marcos, I was able to help in a group clean-up of the Texas Wild Rice just below

Spring Lake in the San Marcos River. The algae and other aquatic plants that drift downstream from the lake become trapped in the wild rice plants, eventually sinking the wild rice. I was also lucky enough, on several occasions, to help graduate students conduct their research at Spring Lake. One day I was asked to assist Kristin Epp, a graduate student working on her Phd, and Dr. Katlyn Gabor carry out research on dietary habits of Red-Breasted Sunfish. However, in order to study these fish, we first had to catch them. Since the lake is off-limits to fishing, except for research like we were doing, the fish are very large and naive. I was able to land a lunker largemouth bass that had an odd, blister-like sore on several of his fins – apparently a parasite. We took the four sunfish that had been "collected" and pumped their stomachs to find out what they had been eating (checking for salamanders). This procedure was done by first mixing clove oil with water to calm and numb the fish, and then using a turkey baster to pump water into the specimen's stomach (Fig. 25). As it became full, the water would be ejected from the stomach and collected, carrying the food contents with it. This brought me back to my days of dissecting fish stomachs while cleaning fish with my father. It was always fascinating to know what the fish had been eating, and how much that could change in different bodies of water.

Another female student named Bridget Lewin was working on collecting water samples from each of the springs for her Masters research. Being the "go-to" guy for anyone needing a dive buddy, I was lucky enough to help in the water collection (see Fig. 3). Since the springs are spread out all along the lake, it takes a reasonable amount of time to collect from them all, swimming to each. Instead, we had Ethan Chappell drag us behind the dive barge. It was fun; kind of like an underwater amusement park ride. We

also switched out the "bugs," or bags that contain coconut charcoal. These bags are placed in the flow of the springs, and are very absorbent to dyes, which are released in the recharge zones of the aquifer. This way, we can study the bags and determine where the water is coming from, and how long it takes to reach the springs; just by looking at the color that is absorbed.

My main job, simply put, was to dive, dive, and dive some more. On Tuesdays and Thursdays I was scheduled to dive both morning and afternoons, cleaning any and all of the sites visited by the glass-bottom boats. One of our most effective techniques, especially during times of high algal bloom, was to use DPV's (diver propulsion vehicle) to clear unwanted vegetation from the sites. By turning the DPV around, we could mimic the effect of a leaf blower, underwater (see Fig. 2). This sped up the cleaning process greatly, and was especially crucial this summer, as algae was in full bloom. Here's a quick excerpt from the journal I kept:

> There was recently a massive diatom bloom, leaving the water looking like egg drop soup with large amounts of suspended algae. Ethan's hypothesis is that the drought for the last few years left large amounts of fertilizer runoff (non-point source pollution) to sit in the shallow earth. Now, with the extraordinary amount of rain, the nitrogen and phosphorus was able to trickle down into the groundwater and come up into Spring Lake providing the aquatic plants with the perfect nutrients to grow. In laymen terms, the pollution caused the "seaweed" to grow as if it were on steroids.
>
> We planned to use the little yellow sea-doo scooters for this dive. I was able to learn the basics of how to fill tanks. After heading to Cream of Wheat, the three of us formed a line and began blowing the unwanted plant growth from the floor using our scooters like underwater leaf blowers. In all honesty, I enjoyed this dive thoroughly. Its fun to watch the fish swarm, waiting for us to kick up a free meal with our scooters.

Aside from diving on these scheduled days, I also became what we called the weekend "Dive Cop." This very distinguished position meant that I would regulate and

keep tabs on all divers and open water classes that entered the water. Needless to say, being the Dive Cop is not a good way to make friends with fellow divers, as my job was to let all the divers know the errors in their ways. On other days, I would often pair up with volunteers in need of a dive buddy.

Another important part of my internship was driving the glass-bottom boats (Fig. 22). While I would much rather be underwater when the boats passed by, being a tour guide was a unique and valuable experience. I enjoy interacting with others, especially children; everything seems fascinating to youngsters. While it was often hard to relate my scientific knowledge of the area to the tourists, I liked educating the public about the endangered species and their delicate ecosystem. I was surprised at how many people living in the area had no idea where their water was coming from, and it made teaching them all the more worthwhile.

One of my duties, which I always looked forward to, was working in the aquarium. Whether it was helping out with cleaning and/or feeding in the small tanks, or gearing up and hand feeding in the big 5400 gallon tank, I was sure to gain hands-on experience. Every couple of days or so, we would schedule a "public feeding," which basically put someone inside the big tank on a hookah rig with the fish so that all the tourists could watch their interaction with people (Fig. 21). It was a priceless experience; being in the tank, able to see the children's faces light up as they watched me feed the fish. It made me smile to hear the unfailing, " Mommy, mommy, look! There's a person in there!"

The tank wasn't all fun and games, however. Amongst the other creatures in that particular tank, we had a very curious Soft-shelled Turtle, who really seemed to prefer the

taste of human flesh to the baitfish we provided (Fig. 19). Nevertheless, it made for an interesting task.

Although the majority of my stay in San Marcos was given to my internship, there was time for other activities. San Marcos is a lively college town with an abundance of things to do. I was a minor during my time there, which prevented me from much of the nightlife and socializing. Instead, I set out to spend as much of my free time doing outdoor activities as I could. When it wasn't raining (which it regrettably did nearly everyday), I would hop on my bike and explore the town. The San Marcos River flows right through the TSU campus in a beautiful place called Sewell Park. I found myself visiting this spot on many occasions, floating down a stretch of the river with my mask and snorkel. Other times, I would head to a local field to play soccer or go for a run. Lucky for me, I joined World Gym in San Marcos, where most days after work I would head there to lift weights and relax in the sauna. This was especially beneficial because it rained most days, and instead of becoming a couch potato, I could still head to the gym for some exercise. When the sun *did* decide to come out, I was invited to go tubing down a long stretch of the river, which was relaxing and fun.

One day Ron suggested that I meet up with his son, Stephen, and head north to the Austin Rock Gym. I had always enjoyed the prospect of rock climbing, but had little experience. After spending a few hours with Stephen, I realized that I had uncovered yet another passion of mine: rock climbing. Fortunately, a fellow co-worker at Aquarena (Robert) was an avid climber, and was thrilled when I asked to come along. We climbed on several occasions, and after investing in my own gear, I plan on continuing this exciting hobby (Fig. 15). In addition, Robert enjoys kayaking, so we took a half-day trip

down a long stretch of the San Marcos River by kayak. This was a great place to spend outdoors; my only regret was the poor weather, which no matter how hard I tried, I could not control.

Reflections

As I look back on my internship at the Aquarena Center in San Marcos, I feel fortunate. Very few students are given the opportunity that I was. Working with graduate students in similar fields as I am was extremely beneficial to me, and the Aquarena staff consists of wonderful, competent, and down-to-earth people who are passionate about what they do. Each morning I would report to Ethan Chappell (lake manager) to find out what needed to be done. Instead of listing the daily tasks to me, he would walk me around the facility making sure I knew what needed to be done, and would often partake in whatever that job was. This was a refreshing change from any employer-employee relationship I've ever experienced. In addition, I spent much of my time diving with Ethan who showed me the ropes.

Aside from the established criteria of my internship, some of my time spent in the office was inadvertently geared toward another passion of mine: photography. It was inevitable; working in close proximity with Ron Coley, any question or issue pertaining to photography turned into a learning session of sorts. As many know, the name Ron Coley and photography were made synonymous ever since being awarded the OWU Scholarship in 1976. Ron, in addition to Ethan (who also is an avid photographer), made for a wealth of knowledge on the subject of photography. After picking Ron's brain and seeing some of his previous underwater video equipment (which he built), I was inspired.

I built my own underwater video housing after I got home from Texas, which I recently took on a dive trip to Thailand where it worked flawlessly. My time with Ethan and Ron undoubtedly sparked an interest in underwater photography and video, which I will continue to pursue.

I am certainly coming away from this experience with many skills. As I mentioned, my proficiency in photography has definitely improved. Also, during the many hours I spent underwater diving, I was able to really develop my buoyancy control. Boat tour after boat tour, my speaking and communication skills picked up, until I was confident leading a group of tourists around the lake, answering any question they may have had. And of course, being situated in a new place far from home, I became more independent.

In all the diving I did over the eight weeks of my internship, I'll never forget the one and only night dive:

> June 30, 2007
>
> Finally! Ron and Ethan and I were finally able to get everything together and make a night dive. We did it on the 2nd full moon in June (blue moon), and it was an incredible dive. With scarcely a cloud in the sky, we were able to accomplish much of the dive with nothing but moonlight. It was remarkable to see the springs and holes in the natural moonlight. I was fortunate enough to see a large freshwater prawn, a rare sight, as they are nocturnal and rarely come out - even at night (Fig 18). It was the first time Ethan had seen one in the wild, and he has been working there for more than 10 years! I find it strange that I use much less air during night dives. Something about being in the water in the dark – maybe the fact that I only concentrate on what is in my beam of light – that calms me, and I find myself totally relaxed.

Acknowledgements

I would like to thank Ron Coley and Ethan Chappell for that memorable experience, and for all of the great times during my stay. Kat Chapman, the Volunteer Dive Coordinator at Aquarena, was instrumental in organizing my housing situation in San Marcos, and I'm very grateful. I would also like to give thanks to George Wozencraft for taking the time to come and visit me at my internship site, which helped connect me to the OWUSS in a personal way. Finally, may I express my gratitude toward everyone at Our World Underwater Scholarship Society for having the vision to create such opportunities. I was one of these fortunate students, and I look forward to being involved with your organization in the years to come.

Fig. 1 – The dive entry area.

Fig. 2 – Sean cleaning diatoms from the springs.

Fig. 3 – Bridgett Lewin collecting water samples for Masters research.

Fig. 4. Largemouth Bass.

Fig. 5 – Alligator Gar.

Fig. 6 – Largemouth Bass.

Fig. 7 – Ethan Chappell taking photos.

Fig. 8 – Water “bubbling” up through springs from the Edwards Aquifer.

Fig. 9 – A Cabomba flower breathing underwater.

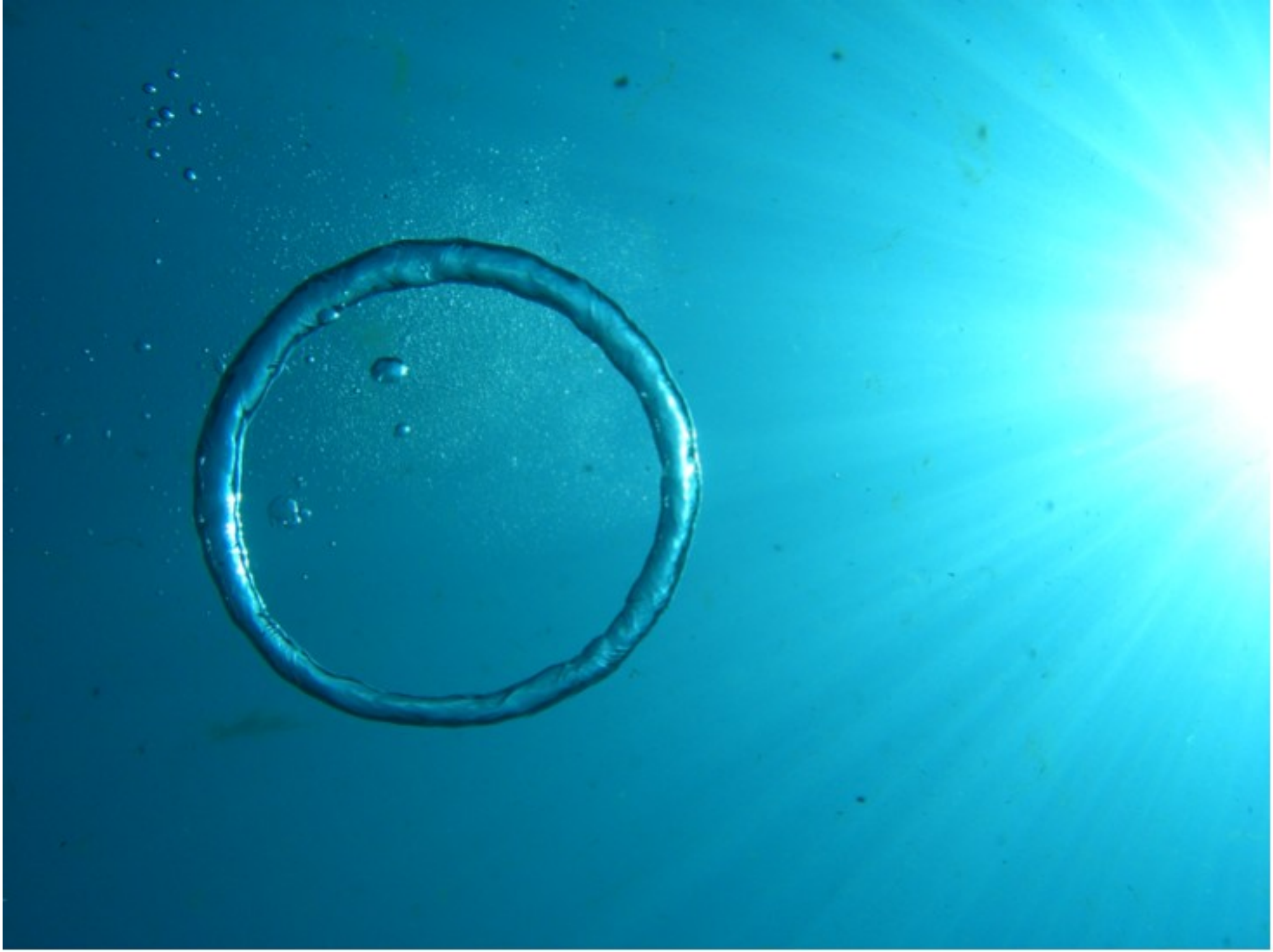

Fig. 10 – I had a lot of time to work on my bubble ring skills.

Fig. 11 - Crayfish

Fig. 12 – San Marcos Salamander.

Fig. 13 – Fountain Darter

Fig. 14 – Playing with an armadillo.

Fig. 15 – Rock climbing.

Fig. 16 – Students of the Diving for Science class learning buoyancy control.

Fig. 17 – Ethan Chappell snorkeling while watching over the Diving for Science class.

Fig. 18 – Freshwater Prawn seen on our night dive.

Fig. 19 – Feeding the fish in the 5400 gallon tank.

Fig. 20 – Texas Blind Salamander.

Fig. 21 – Public feeding in the 5400 gallon tank.

Fig. 22 – Driving a glass-bottom boat.

Fig. 23 – Relaxing with Austin, the boat manager.

Fig. 24 – Out for lunch with Ron Coley.

Fig. 25 - Pumping fish stomachs to examine their contents for PhD research.

Fig. 26 – Diving down to “Crater Bottom.”

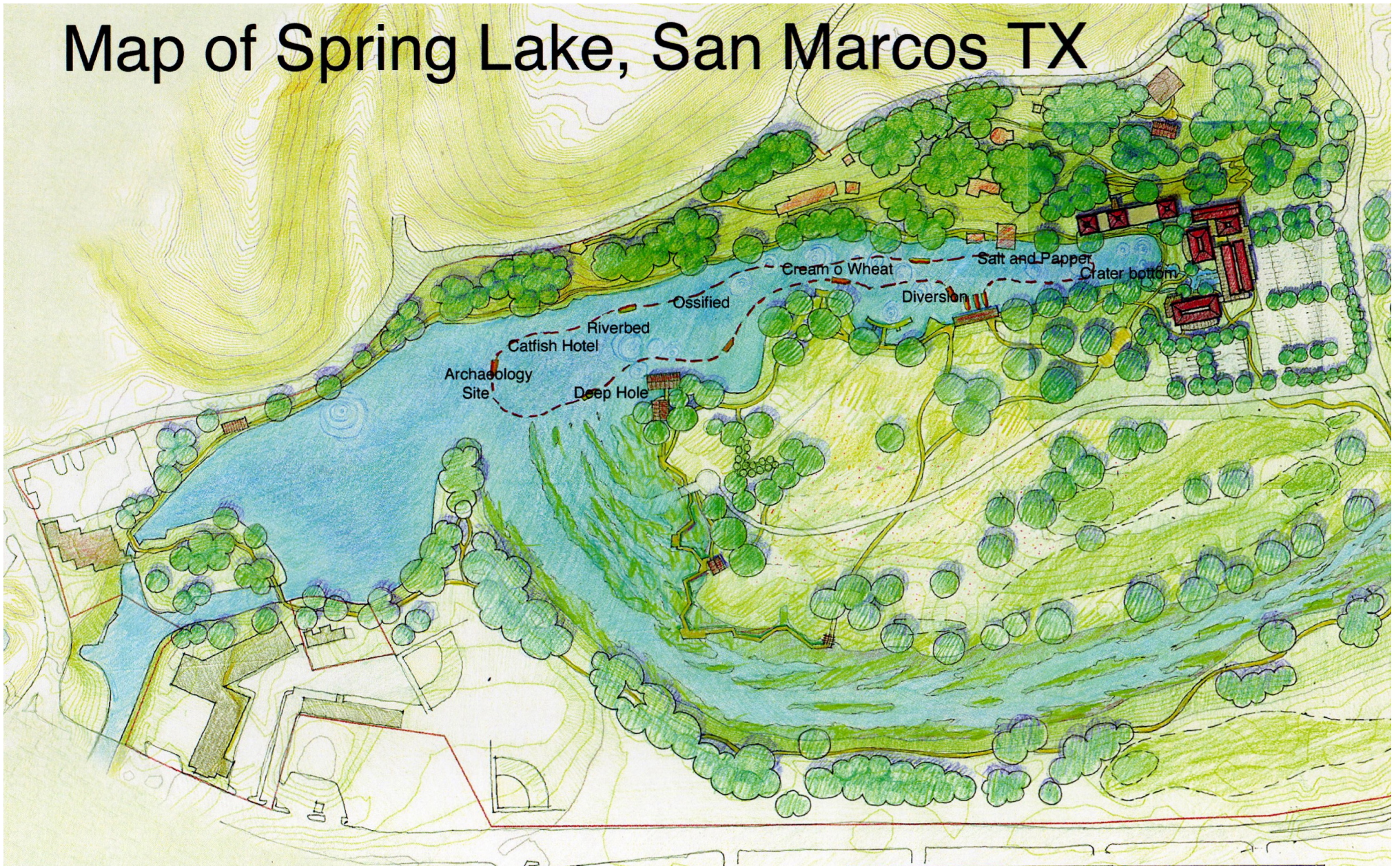

Fig. 27 – Map of Spring Lake showing our dive sites.