Our World – Underwater Scholarship Society
National Park Service Submerged Resources Center 2016 Internship
Final Report
by Garrett Fundakowski

Stuck somewhere in the limbo of my senior year of college, faced with the impending "real world", I found myself struggling in my search for opportunities following graduation. I knew I wanted to pursue a career in marine science after I discovered SCUBA diving during my study abroad experience my junior year of college, but was unsure of exactly where to begin. As I had majored in mathematics and biology, I had limited exposure to the field and was unaware of the different career paths someone with a love for the marine environment could take. That's when I received the call that I had been selected for the internship of a lifetime - the **Our World-Underwater Scholarship Society's National Park Service Research Internship!**

This dream internship gives a budding young diver the opportunity to travel the country for several months in order to live, work, and dive alongside leading underwater archaeologists, photographers, and research scientists in some of our nation's most remarkable natural areas. Boasting the nation's oldest non-military dive program, the National Park Service supports well over 200 Park Service divers across the United States and its territories, from the warm tropical coral reefs of the US Virgin Islands to the frigid kelp forests of the Pacific coastline. Across the country, park dive teams perform a variety of tasks ranging from annual monitoring surveys to the documentation of shipwrecks to routine underwater maintenance.

At the core of the Park Service Diving Program is the Submerged Resources Center (SRC). The SRC is an elite team of highly trained divers that doesn't operate out of a specific park, but rather travels around the park system as a sort of specialized task force. Made up of underwater archeologists and photographers, the SRC team tends to focus on the identification and interpretation of submerged cultural resources. However, the SRC is always eager to support any projects throughout the park system or with external partners that enhance public appreciation and preservation of any and all submerged resources.

Because they work with many different people and parks across the country, the SRC is the perfect team to host this internship. With access to and contacts in countless parks, the SRC can easily connect the intern with various projects going on throughout the greater park system. But perhaps the best feature of this internship is the freedom the intern is given to pick and choose from a plethora of projects. This allows each intern to create a completely different and unique internship tailored to his or her specific interests.

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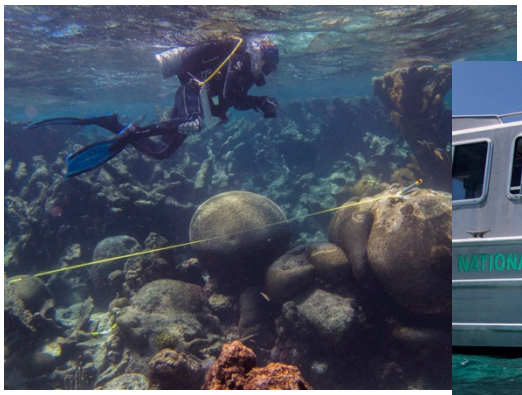
So last June, after weeks of nervous excitement and a very late night of packing, I hopped on a plane to Denver to begin my non-stop summer of adventures. While in Colorado, I reported to the National Park Service Intermountain Regional Office, which is the home base of the SRC. There I met the entire SRC staff, including Dave Conlin, Chief of the SRC, and Brett Seymour, photographer and Deputy Chief of the SRC, both of whom would serve as my mentors throughout my next few months of cross-country travel. Sitting down with Brett, we discussed my interest in marine ecology, as well as my previous experiences in biological research and education. Together, we planned out my schedule for the summer, choosing stops that focused mostly on projects involving natural resources while still taking advantage of the opportunity to be exposed to new and exciting facets of marine biology. Having only ever dove in the Caribbean, I was extremely excited to expand my horizons and explore a variety of unique marine ecosystems from St. Croix to Hawaii, Florida to California, and even as far out as American Samoa!

But before I went anywhere, I had a lot to do. I spent the week in and out of doctors' offices for various components of my comprehensive government dive physical, hopped into a local pool to complete the physical fitness and diving skills tests for my Blue Card certification (required of all NPS divers), and collected all of the gear I would need for a summer of diving in a range of environments. And after all that and a stack of paperwork, everything was clear for me to head out and explore all that the Park Service has to offer!

My first stop was Buck Island Reef National Monument on St. Croix, US Virgin Islands. There I joined visiting scientists and graduate students from Florida Institute of Technology, Liz Whitcher and Robby Fidler. Liz's research focused on assessing coral accretion as part of a larger collaborative investigation with the NPS and the USGS looking at the current state of the park's prized reef. As part of this study, our job for the week was to collect 6-month-old sediment traps and conduct four different transect surveys at each of 54 sites.



With such a lofty goal, our days on the water were long and our surface intervals merely lasted the time it took to drive to the next site. Underwater, things were fast-paced. When we hit the bottom, each of us set up our respective transects and got right to work. Drawing from my previous experience working with sponges in an undergraduate research lab and my familiarity with Caribbean invertebrates, my job was to perform the sponge and urchin surveys, while Liz and Robby performed photographic and parrotfish surveys respectively. At first, the whole process took us just under an hour to complete at each site. But as the week progressed, we became more efficient, worked better as a team, and could accomplish two sites in the same amount of time.

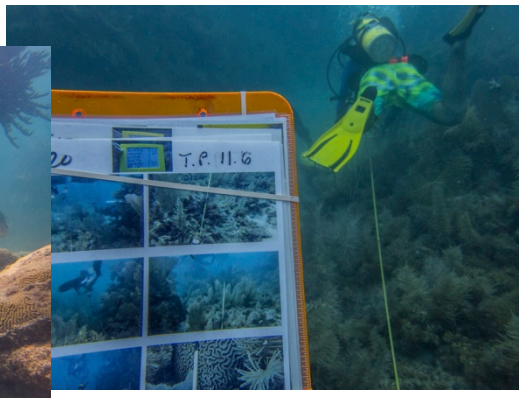
After diving at countless sites all around the island, most of which are closed off to the public, I can say that the reef at Buck is gorgeous and diverse! Buck Island is surrounded by a fringing reef with the reef crest just 500 feet from shore. Beyond the reef slope, the north side of the island is home to dramatic towering reef structures, aptly named haystacks, that rise from the sandy bottom 30 feet below and scrape the surface of the water. Yet perhaps the most striking thing about Buck was its abundance of elkhorn coral (*Acropora palmata*). The two Caribbean species of *Acropora* are critically endangered and a majority of places have seen massive die offs. Here, however, I was blown away by the size and stature of the elkhorn colonies; they seemed to be standing as a silent testament to the work the park and it collaborators have put in to protect their home on the reef.

Leaving the impressive elkhorn stands of Buck Island behind, I headed north to Key West to meet up with Mike Feeley and his team from the South Florida/Caribbean Network (SFCN) for their 10-day research expedition out to Dry Tortugas National Park. The SFCN is one of 32 NPS Inventory and Monitoring Networks across the country. These I&M Networks are in charge of collecting and analyzing long-term natural resource data for parks and providing them with information that can be integrated into park planning and management strategies. Over the course of the next week and a half, we spent every day on the water, monitoring dozens of permanent transects to document coral species, colony counts, and cases of coral disease at various sites within Dry Tortugas.

To increase efficiency, our cohort split and dove in teams. The navigation team would locate the permanent transects (which was harder than it sounds; imagine looking for an old encrusted nail on a reefscape) and set them up for the survey team. When one team came back from their dive, the next team splashed in soon after. On the next dive, we picked up wherever we left off. When we finished a site, we would motor over to the next

one and repeat the process again. Diving with SFCN was like being a part of a well-oiled machine. But when we weren't diving, we were laughing around a home-cooked dinner having a good time. The entire team was incredibly driven and passionate about their work – something I quickly found was the norm of all National Park Service employees!





While I was in Dry Tortugas, I joined the United States Geological Survey (USGS) crew on one of their nightly beach patrols looking for nesting sea turtles. That night a total of three females came up to nest. After they finished nesting, we corralled them on the beach and performed a whole work-up. We noted the species, took various size measurements, collected a blood sample, and tagged new turtles before letting them return to the ocean. I had never seen a turtle nesting before. It was absolutely miraculous to watch these 300-pound beasts lug themselves up on shore and crawl hundreds of feet before finding the perfect spot to dig their nest and lay their eggs.

After a successful expedition out to Dry Tortugas, I flew out west to connect with SRC photographers, Brett Seymour and Susanna Pershern, for a special project up in Wisconsin to work with the *In a New Light* program and the kids of Northwest Passage. As a treatment and assessment center for youths struggling with their mental health, Northwest Passage specializes in experiential therapies. For the past few years, the National Park Service and the SRC have helped fund the *In a New Light* program, a therapeutic nature photography program aimed at empowering marginalized youth by encouraging artistic expression in tandem with outdoor exploration. So on an invitation from Ben Thwaits, the director of the program, we spent the week accompanying the kids on field trips to nearby Saint Croix National Scenic Riverway and even to Apostle Islands National Lakeshore on the southern shore of Lake Superior.

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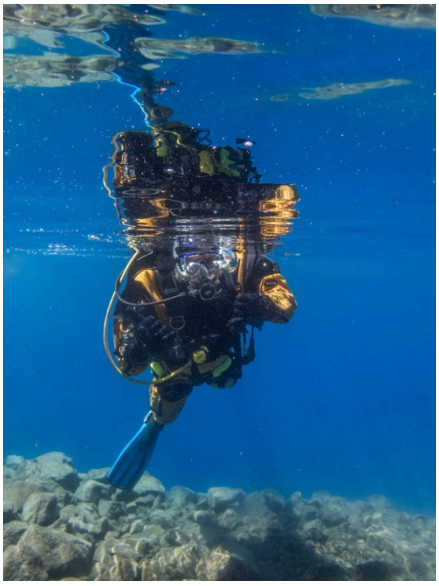
Armed with only an underwater camera and snorkel gear, the boys and girls spent hours in the water photographing everything from mussels to crawfish, freshwater sponges to algae, an old dock to a discarded tackle box. In the afternoons, we gathered as a group and everyone presented their favorite photo from the day's trip. I was shocked by the quality of work they produced. It was evident they saw the world from unique perspectives, and the resulting photos were breathtaking.

Working with the Northwest Passage kids impacted me in an indescribable way. Watching them splash about and have fun with their friends while satisfying their curiosities and exploring the world, reminded me what it's like to be a kid. And that was the beauty of it all. When they were in the water, they forgot about their issues; they were just kids. Kids who just needed the time, the tools, and the encouragement to make sense of their world, develop relationships, and express themselves. And that is what Northwest Passage and the *In a New Light* program is providing for these children. I was absolutely privileged to have witnessed it in action.



Together, Susanna, Brett, and I left Wisconsin on a 15-hour road trip back to Denver. There I met back up with Dave Conlin for a crash course on dry suit diving. My next stop was Crater Lake National Park, whose cold water necessitated the use of a dry suit. I spent the weekend in the pool practicing the new skills and learning the intricacies of diving dry.

Ready to put my new dry suit skills to use, I caught a flight out to Oregon, picked up my first rental car, and made my way to the deepest lake in the USA. I arrived at Crater Lake just in time for the annual newt-crayfish surveys. Led by aquatic ecologists, Scott Girdner and Mark Buktenica, the Lake crew and I spent the week snorkeling the shoreline of the cauldera. The data we collected was part of a long-term study monitoring the distribution and relative populations of the native Mozama newt and invasive signal crayfish.

Unfortunately, our surveys indicated that the newts' range along the caldera wall was greatly reduced, while the population of crayfish had grown exponentially.

Snorkel surveys completed, it came time to perform a set of surveys at depth. I quickly volunteered, eager to dive below the lake's sapphire surface. Diving in Crater Lake was otherworldly. The water was so clear and so blue, almost to the point of being disorienting. Not to mention the visibility was incredible, though it made the steep sloping walls quite eerie. I couldn't have asked for a better first dry suit dive!

Switching gears completely and ditching the dry suit, I headed to O'ahu to work in the WWII Valor in the Pacific National Monument. There, I joined back up with the SRC on a large-scale collaborative research operation coordinated by Brett the Chief of Cultural and Natural Resources of the park, Scott Pawlowski. Over the course of the week, they brought together an extremely qualified international team of engineers and scientists with hundreds of thousands of dollars of equipment in an effort to learn more about the USS *Arizona* and evaluate the condition of the shipwreck. One team mapped the exterior of the ship with multibeam sonar. Another used a Remotely Operated Vehicle (ROV) to place a water quality sonde inside the wreck. But the main event was a custom-built ROV commissioned from the Woods Hole Oceanographic Institute (WHOI) and Marine Imaging Technology (MITech) team designed to expertly penetrate the USS *Arizona* and explore the interior of the shipwreck. A production team from Story House Media Group also filmed the entire week for a PBS documentary being produced for the 75th Anniversary of the Attack on Pearl Harbor in December 2016.

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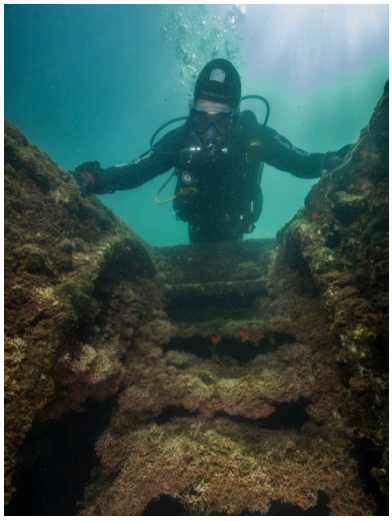
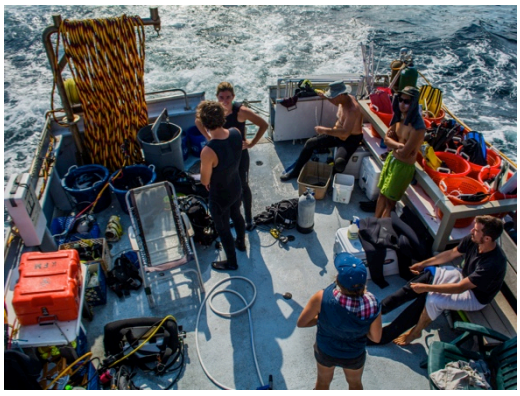


In between all the chaos on land, Brett and I dove on the *Arizona* multiple times to collect underwater footage for the documentary. My dives on the *Arizona* were incredibly humbling and emotional. I was filled with a reverent sense of awe at seeing the famous vessel up close and underwater, a perspective few people get to experience. Simultaneously, the scattered artifacts of those who called this vessel home and the chasm in the body of the ship left by the bomb evoked a sense of solemnity in respect for the 1,177 sailors who lost their lives during the surprise Japanese attack. I am honored to have been given the opportunity to dive on such an important piece of American history.



After leaving Hawai'i, I was excited to get back on a live aboard research vessel and join the Kelp Forest Monitoring (KFM) Program at Channel Islands National Park. Launched in 1981, the KFM Program is the longest established monitoring program in the National Park Service. This multi-decade dataset has not only helped scientists understand the large-scale ecological patterns and processes at work in kelp forest communities and but has also informed various marine resource management strategies adopted by the state of California.

I spent five days onboard the Sea Ranger II with the KFM team under the guidance of Regional Dive Officer and marine biologist, Dave Kushner. With a total of 12 different sampling techniques to perform and a massive amount of data to collect, the crew of eight and I were in the water from sunrise to sunset in order to completely monitor a site. Since this trip marked my first dive in a kelp forest and in the cold waters of California in general, I took the first day's dives to just observe the KFM team and get used to diving amongst the kelp.

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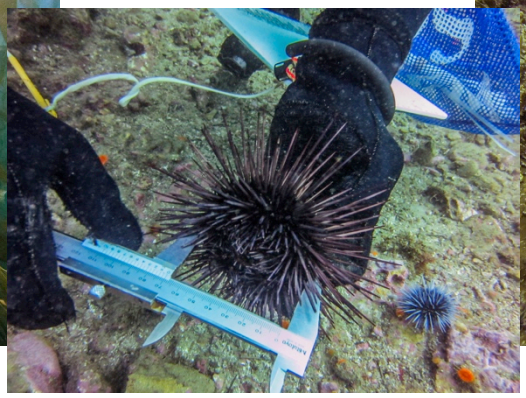
When I first splashed into the water, I was immediately taken aback. I was not quite sure what I was expecting, but it was nothing in comparison to what I saw. I was surrounded by 40-foot tall Giant Kelp swaying back and forth in the surge, dancing in the light, as hundreds of random fish I couldn't identify darted through the forest.. Everything was new to me; it was a bit overwhelming at first, honestly. But over the course of the week with daily lessons and quizzes from the KFM team, I slowly learned to identify dozens of new fish, invertebrate, and algae species.

Once I gained a base knowledge of the organisms and the protocols, I helped out wherever I could. While the rest of the KRM team was busy executing numerous quadrat and band transect surveys, I recorded size-frequency data of urchins, counted kelp stipes, and estimated percent cover of the invasive brown alga, *Sargassum horneri*. I even tried my hand at a fish count to see how just many species I could identify underwater.



My last day on Sea Ranger II coincided with the official date of the NPS Centennial – August 25, 2016! While people around the country were celebrating the Centennial with parties and special events, we spent the day underwater in the beautiful kelp forests of the Channel Islands. In my book, it spoke volumes to the achievements of the Park Service to be surrounded by the passion and dedication of Park Service employees and their immeasurable desire to understand this country's natural areas, even on such a momentous day.

The next leg of my internship was at Kalaupapa National Historical Park on the island of Moloka'i. From the 1860s to the 1960s, thousands of individuals with Hansen's disease, or leprosy, were torn away from their families and forcibly quarantined on this extremely isolated peninsula. Today, about a dozen cured patients have chosen to remain in the settlement with state and Park Service staff rounding out the extremely close-knit and welcoming Kalaupapa community.

In addition to the grim history of Kalaupapa, the peninsula is a backdrop for rich natural beauty. For two weeks, I took in the cinematic views of towering sea cliffs, densely forested river valleys, and thriving coral reef

ecosystems. With the marine team, led by Park Dive Officer and marine ecologist, Eric Brown, I spent the first week helping to finish up their annual benthic marine monitoring surveys. However, our workweek was cut short due to incoming storms Hurricane Lester and Hurricane Madeline, as the community hurriedly prepared for the worst. Luckily, we didn't end up getting more than heavy rain and activity returned to normal after the weekend.

At the start of my second week in Kalaupapa, two visiting researchers from the University of Hawai'i, Kosta Stamoulis and Alex Filous, flew in to continue work on a shark-tagging project. In order to track sharks and other apex predators, acoustic transmitters are implanted into a cavity on the underside of the fish. These transmitters emit a coded series of pings that are then picked up and recorded by hydrophones that are placed strategically around the reef. The array of receivers allows for the researcher to track the movement of the tagged fish over time and can be used to identify feeding grounds and habitat ranges.

Before we got around to tagging any new fish, we collected the receivers and downloaded the data from the last 6 months. Once all the receivers were collected, we spent the mornings underwater redeploying them on the reef and the evenings on the boat fishing. This was by far the biggest fishing endeavor I had ever been on, so I found myself learning a lot from the two experienced fishermen. By the end of the week, Alex and Kosta had reeled in four sizeable fish – unfortunately, none of them were sharks. Once they brought the fish on board, we ran a hose over the gills as they measured its size and inserted the tag. Unfortunately, I didn't catch any taggable fish. Instead my biggest contribution to the fishing trips was catching the baitfish for the game rods.

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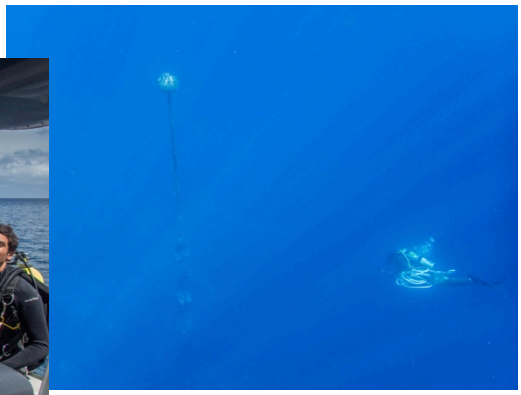
The last stop on my whirlwind adventure of an internship took me to American Samoa. Located 5,000 miles southwest of California, American Samoa is the southernmost territory of the US and contains the only park south of the Equator. I spent an entire month at the National Park of American Samoa, working under marine ecologist, Tim Clark, and alongside 2015 North American Rolex Scholar, Michele Felberg.

The marine team and I spent the first week and a half surveying the entire north side of the island looking for outbreaks of crown-of-thorns sea stars (COTS). Although these sea stars are native to the Indo-Pacific, because of the fact that they are voracious predators that feed on living corals, population surges of COTS can overwhelm and often decimate an entire reef. In an attempt to rescue the reefs here after a recent explosion of the COTS population, the Park Service has undergone eradication efforts in the last few years to control the population and return it to a natural level. Our mission was to determine the current status of the outbreak and the success of these eradication efforts. Compared to data from previous years, the number of outbreaks had significantly decreased and indicated (at least temporary) success of the park's eradiation efforts!

We then shifted focus to fish-tracking, very similar to the project I had worked on at Kalaupapa. However, the marine team at American Samoa sought to use this data to identify spawning sites of large snappers and groupers in order to inform better policies to protect their populations from overfishing as they are valuable to Samoans. In a week's time, we downloaded the data from the old receivers, replaced some of the mooring lines, and installed multiple new hydrophones to expand the current array.



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American Samoa was infinitely stunning. Everywhere I looked was as if I was looking at the pages of a travel magazine. Beautiful blue water gave way to long stretches of pristine sandy beaches, and mountains flaunting dense verdant rainforests towered over quaint villages. But it was definitely the unique Samoan culture, which I was lucky enough to experience and be a part of, that made this park stand out above the rest.



In a fast-paced 107 days, I traveled 31,000 miles (via plane, car, and boat), visited 9 NPS units, dove with 35 park divers on a total of 70 dives, and spent over 50 hours underwater. From tracking the progress of the crown-of-thorns seastar outbreak in American Samoa to assisting with the annual inventory and monitoring work of the coral reefs of Dry Tortugas, I worked in and explored a wide variety of unique marine ecosystems. Each stop along the way not only posed a new physical diving environment, but also meant I was joining a new team of individuals working on entirely new monitoring projects with completely different protocols. This forced me to learn quickly and be flexible, constantly challenged my communication and teamwork skills, and refined my scientific diving skillset in an effort to maintain professionalism as a Park Service diver.

Throughout this journey, I have met so many hardworking and talented people tasked with protecting and preserving our nation's most remarkable parks. They have shown me what genuine passion is and have greatly inspired me by their dedication to the stewardship of these precious sites and resources. I am both humbled and proud to have worked alongside these underwater leaders. I wish to extend my deepest appreciation and gratitude for those incredible park service employees, the Our World-Underwater Scholarship Society, and the Submerged Resources Center for everything you all have done to make this dream internship a reality.

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I went into this internship thinking I'd Find My Park, but in the end I found a family. Thank you all so much!

If you would like to read about my experiences in more detail or check out more of my photographs from the internship, please head over to the blog I updated throughout the summer.
http://blog.owuscholarship.org/category/past-internships/2016-national-park-service/

Acknowledgments
I would like to extend the sincerest of thank you's to everyone who made this internship possible. To the staff, interns, and collaborators at BUIS, DRTO, APIS, CRLA, VALR, CHIS, KALA, and NPSA, thank you for being so welcoming, for sharing your beautiful parks with me, and for showing me what makes each of them magical. To those of you who invited me into your homes, offered up your couch, taught me something new, had me over for dinner, talked to me about my future career plans, shared stories with me, introduced me to your family, assisted me with arranging travel, gave me life advice, laughed with me, and took me on adventures, I am appreciative of every single thing you have done; without you, the internship would not have been what it was. And to the entire team at OWUSS and the SRC, I express unending gratitude for the confidence and responsibility you placed in me and the encouragement and support you gave me that allowed me to have a truly successful and inspirational experience. Together, you all made this experience something I won't ever forget.