

Connecting capable enthusiasm with meaningful opportunity through Stanford

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Abstract

Stanford University offers a wide variety of opportunities for its students to engage in substantive, meaningful academic and professional experiences at the interface of ocean science and policy. As a student studying interdisciplinary environmental science, these programs have been transformative for how I see myself academically and professionally. The opportunities are made possible by collaborations with other academic institutions, non-governmental organizations, and governments. For instance, the Stanford at SEA program partners with the Sea Education Association to introduce students to marine biology and oceanography alongside sail handling and celestial navigation aboard a tall ship. While dissecting fish stomachs on the ship, I became more comfortable identifying myself as a scientist and fell in love with being at sea. Outside of courses, Stanford provides students with myriad ways to undertake significant work experiences. The Stanford in Washington program, for example, matches undergraduates with government offices or nonprofit organizations in Washington, D.C., for full-time internships during the school year. Students also take classes in the evening to complement their work experiences. I interned at the Department of Justice in the Environment and Natural Resources Division, which gave me a unique perspective on how federal agencies enforce environmental statutes. The Haas Center for Public Service and Stanford in Government, a student organization, also provide stipends for hundreds of summer fellowships. With SIG funding, I worked at the Center for Ocean Solutions and contributed significantly to a coastal adaptation policy project and planning for a new small-scale fisheries initiative. My experience with Stanford's programs have allowed me to substantively contribute to my learning about the ocean and to the missions of my host organizations while also giving me a sense of direction for my plans post-graduation.



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Scientific Field Work: Stanford@SEA

In collaboration with the Sea Education Association (SEA), Stanford offers an intensive course in marine biology and oceanography that culminates in a month-long cruise on the S.S.V. *Robert C. Seamans*, a research sailing vessel. The 2017 cruise went from Papeete, Tahiti, to Pago Pago, American Samoa, with island stops in French Polynesia, the Cook Islands, and Tonga. Professors Rob Dunbar and Barbara Block teach the course with their respective specializations in Earth system science and biology.

During the course, students design and execute scientific research projects. My project investigated the distribution of fish plastic ingestion and plastic caught in the daily net tows. The cruise track through the South Pacific Subtropical Gyre provided a unique opportunity to study the effects of ocean circulation in an understudied geography. For many students, the experience was also their first introduction into research in the field. Because I intended to study the humanities at the outset of my Stanford career, **taking charge of a scientific project and literally getting my hands dirty by dissecting fish helped make science less intimidating.**



Figure 1. A big-eye tuna caught off the stern of the S.S.V. *Robert C. Seamans*. Photo courtesy of Daniel Cryan.

My project also allowed me to **connect technical skills I learned in traditional classes to a new discipline.** In particular, I used Geographic Information Systems (GIS) to show the spatial distribution of plastics along our cruise. Figure 2, below, maps the number of pieces of plastic collected in net tows along our cruise track and expected values in the surrounding area using inverse distance weighted interpolation.

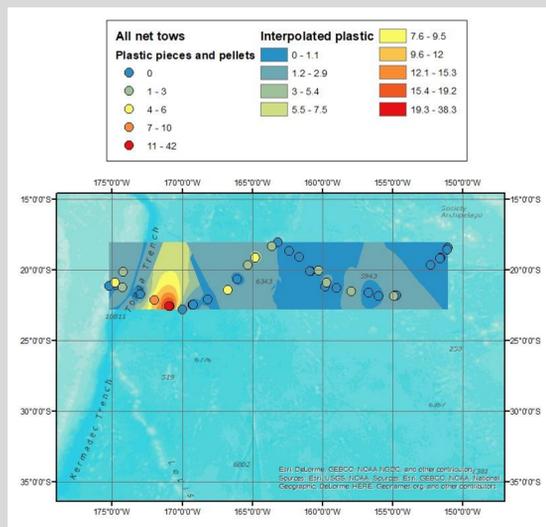


Figure 2. Plastic pieces collected in net tows and interpolated to the cruise track region

Beyond my own research, I learned significantly from the projects of my peers and those of graduate students at Hopkins Marine Station, where the first month of the program takes place. On the ship, I helped other students with their projects on bird species diversity, nutrient sampling, and squid behavior, learning through doing about those topics. The opportunity to be in close proximity and assist with high-level marine biological research at the station was also empowering and eye-opening. I forged close mentorship relationships with several graduate students as well, which I will lean on as I choose my next steps after I finish my undergraduate degree.

I am interested in pursuing a policy-oriented career, and the **policy ramifications of the science in which I engaged while at sea exposed me to other ways I could bring science and policy together** in the future. The comparative perspective on natural resource management I gleaned from our island stops was particularly impactful. More important than learning about specific policies, however, was gaining confidence in practicing science.



Policy Experience: Stanford in Washington

The Stanford in Washington program provides undergraduate students with hands-on policy experience in the nation's capital. Students in the program work at full-time internships with nonprofit organizations or in federal government and take classes at night with working professionals. While in the program in winter 2017, I worked at the U.S. Department of Justice (DOJ) in the Environment and Natural Resources Division. My internship was humbling in that I had the least legal experience of anyone in the office. After I acclimated to the work environment, however, I found it empowering to conduct substantive factual and legal research to move forward active cases.

I also learned from seeing the interactions between DOJ attorneys and general counsel for client agencies, including NOAA and the Environmental Protection Agency. DOJ attorneys focus on litigation whereas attorneys for client agencies often take enforcement actions outside of court. Because of the different priorities, the DOJ attorneys focused intensely on specific statutory language and pushed the agencies to provide the scientific evidence that exactly met the high standards set forward in the legislation. The dialogue between the two groups showed me that the **differences between the languages that lawyers and scientists speak** can prove challenging, even when both parties are working towards the same outcome.

Moreover, **my scientific background allowed me to incorporate non-legal information into attorneys' arguments.** In one example, I researched the potential effects of contaminants on fish in a specific stream to support a Superfund case. In another, I helped rebut the opposing arguments about a Clean Water Act issue with GIS. The opposing side claimed that a certain waterway was not covered by the legislation, but I used the GIS information in the source dataset from the U.S. Geological Survey to show that other federal agencies agreed that the waterway was subject to the act.

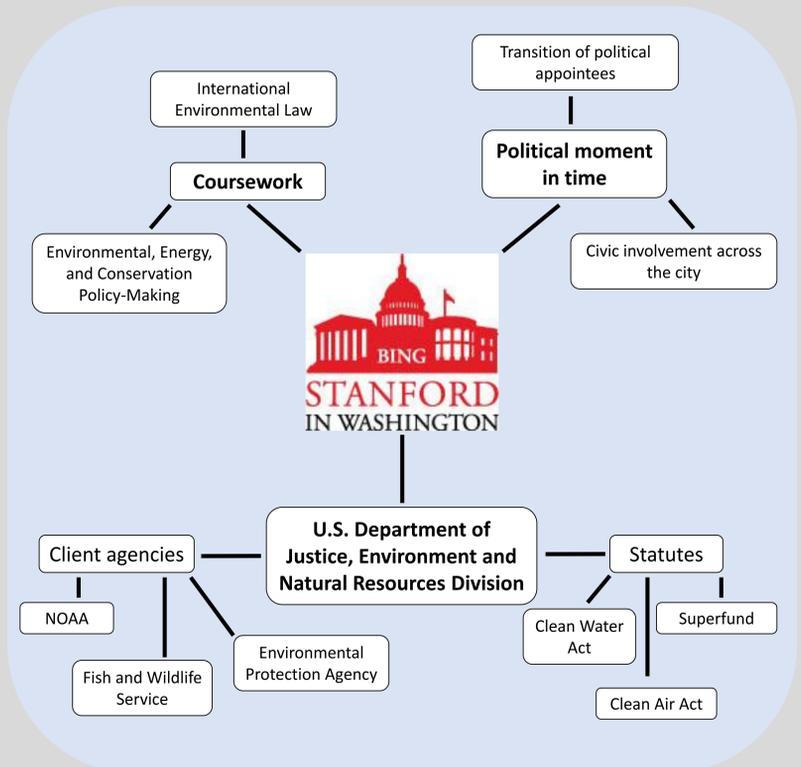


Figure 3. Intersecting components of the Stanford in Washington program

My experience in science-based policy extended beyond the office. In the evenings, I took **courses in international environmental law and in environmental policy-making**, which enriched and informed the research I did during the work day. The international law class was taught by an attorney in a different section of the DOJ's Environment and Natural Resources Division. Among other treaties, the course discussed the U.N. Convention on the Law of the Seas, which dovetails with my interest in marine policy. The policy-making course was taught by a prominent lobbyist who focuses on energy policy in the American West. Through class assignments, I honed my **memo-writing ability**, which served me well at DOJ and in subsequent professional experiences.

Being in Washington, D.C., in early 2017 by itself was a unique experience. I saw firsthand how the presidential administration affected the executive branch more broadly. The new administration's policies provided plentiful topics for conversation. I was struck by the D.C. residents' engagement in political goings-on. Over the course of the quarter, I went from being disillusioned by the political process when I arrived to **actively wanting to engage further with federal policy** after I graduate. The intellectual stimulation I felt and meaningful work I witnessed has been a powerful driver in planning for life after Stanford.

Science-Based Policy: Summer Fellowships

Stanford in Government (SIG), a student organization, coordinates dozens of summer fellowships for undergraduates. In 2017, I was the SIG fellow at the Center for Ocean Solutions (COS), which is part of Stanford's Woods Institute for the Environment. I created statewide geospatial datasets for social and legal metrics that provide context for policy decisions. Using existing data, I calculated the population, lengths of major roads, and number of coastal access points within one kilometer of the coastline and linked those data to the coastal exposure output points. I also compiled a statewide dataset of zoning designations, which is the first of its kind. The final dataset has 93% coverage of California's coastal zone. A portion of the dataset is shown in Figure 4 below.

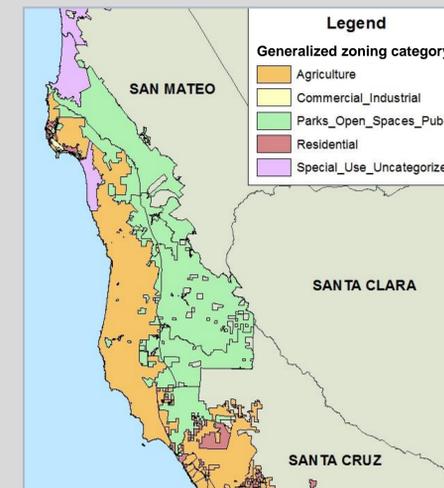


Figure 4. Zoning designations in San Mateo and Santa Cruz counties by generalized category

I was very fortunate to be **trusted with significant independence** in my work. Because of this, I was sometimes the face of the project to outside collaborators. In the process of sorting local zoning designations into generalized categories, for example, I became comfortable in reaching out to local land use planners. It was empowering to be taken seriously by professionals in the field. These kinds of responses also made the work more meaningful for me because I knew it would inform issues with which local governments are currently contending.

In addition to the coastal adaptation work, I conducted a landscape analysis to add to COS's strategic planning and initiative development. It was informative to learn more about how nonprofit organizations evolve over time.

With the encouragement of the COS staff, I have extended the coastal adaptation work past the summer. I presented on my portion of the project at the Esri Ocean GIS Forum in October and at GIS Day at Stanford in November. Additionally, I am co-authoring a Marine Policy paper with my COS colleagues. It has been incredible to be encouraged to **work without limits based on my age or experience** and be able to **contribute substantively to real-world problem-solving.**

My fellowship additionally allowed me to take COS's two-week ocean policy course. With an interdisciplinary group of graduate students in biology, business, and oceanography, I learned about the nuts and bolts of how science can and should play a role in federal marine policy. I am grateful that COS did not hold my undergraduate status against me and gave me the chance to work with other emerging ocean leaders.



Figure 5. Cross-disciplinary collaboration in the ocean policy short course. Photo courtesy of the Center for Ocean Solutions.

My time at COS integrated my past experience on the extreme ends of science and policy and equipped me with people and resources to guide my future career decisions.

