USC Sea Grant
STRATEGIC PLAN
2024 - 2027

The Urban Ocean Program

Sea Grant
UNIVERSITY OF
SOUTHERN CALIFORNIA

USC Dornsife
Wrigley Institute for Environment and Sustainability

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Coastal properties in Santa Monica Bay (Credit: P. Grifman)

USC Sea Grant: The Urban Ocean Program

Aerial view of Los Angeles from the Hollywood Hills to the sea (Credit: Gabriele Maltinti, Canva)

The University of Southern California (USC) Sea Grant Program is part of a national Sea Grant network consisting of federal-university partnerships between the National Oceanic and Atmospheric Administration (NOAA) and 34 university-based programs in every coastal and Great Lakes state, Puerto Rico, and Guam. Sea Grant programs work with community members to generate, translate, and deliver cutting-edge, unbiased, science-based information to address complex issues in the nation's coastal marine and aquatic ecosystems. The United States Congress created Sea Grant in 1966 as a highly-leveraged federal and state partnership; it harnesses the intellectual capacity of the nation's universities and research institutions to solve coastal and aquatic challenges and generates opportunities with coastal and inland communities and partners to create a more sustainable economy and environment. Sea Grant develops cross-sector partnerships between federal and state agencies, tribal nations, non-governmental organizations, businesses, universities and community organizations to sustain and enhance the vitality, value, and use of the nation's coastal resources.

California's 1,100-mile coastline and offshore islands have diverse and important ecosystems including rocky seashores, sandy beaches, wetlands, and dramatic cliffs that are home to diverse coastal and marine life. Coastal California ecosystems also face challenges such as habitat loss due to intensive urban coastal development, pollution and compromised water quality from watershed runoff and marine debris, rising sea levels from climate change, competing uses for offshore resources, and the introduction of invasive species that disrupt native biodiversity. All of these challenges call for targeted solutions-based research and the need to promote a literate public and workforce capable of managing robust cities, ports, and coastal ecosystems.

Located in the center of Los Angeles, USC Sea Grant adopted the "**Urban Ocean**," as a programmatic theme in the 1980s—a theme that continues to characterize our work at the interface of diverse ecosystems and natural resources within this intensely populated and developed region. USC Sea Grant has an annual base federal budget of approximately $1.5 million and was one of the original participants in the National Sea Grant College Program, receiving some of the earliest funding in 1969 and officially establishing its Sea Grant program in 1972. USC is one of the largest private universities in the United States and has conducted ocean research and managed established marine laboratories in Southern California for over one hundred years.

The greater Los Angeles area is the most populous and diverse metropolitan region in the United States, with more than 18.4 million residents in five counties (Orange, Los Angeles, San Bernardino, Riverside, Santa Barbara, and Ventura) and 27 congressional districts. This is a prime region to study the effects of urbanization on our coastlines and the impact of the ocean on the diverse, urbanized environment. The City of Los Angeles records over 50 million tourists to the region annually, who spend more than $18 billion a year on the regional economy. Beaches are among the most popular destinations among the amenities attracting tourists to the region. In addition, Los Angeles County is home to the busiest port complex in the United States; close to 45% of all oceanic freight entering the country comes ashore through the twin ports at Los Angeles and Long Beach. Together, these ports contribute more than one million jobs regionally and four million nationally. Over the years, USC Sea Grant has established a

A student on one of USC Sea Grant's youth fishing partnership programs (Credit: M. Madrigal)

network of scientists, government agency personnel, private and public sector advisors, and science education leaders. Employing extensive outreach to partners, collaborators, resource managers, and the public, USC Sea Grant can anticipate research needs and develop responses in a timely and responsive manner, leveraging its collaborations for broader impacts. Further, USC Sea Grant has worked closely with its networks to ensure that its research, communication tools, and education services reach broadly into the diverse Southern California community that it serves, with particular attention to underserved and underrepresented communities.

USC Sea Grant has grown throughout the years to provide expert guidance, funding, coordination, facilitation, training, education, neutral brokerage, and mediation—all under the common goal of elevating the best available science to support better decisions. For over 50 years, our research investments, education programs, and extension efforts have supported achievements in many key areas. As we look towards the future, we are excited for the opportunity to practice leadership in an array of emerging issues and research opportunities with new partners who will help us build sustained, long-term, inclusive progress for our urban ocean and its residents.

We are proud to be a national leader in tackling urban-ocean issues, providing information and models serving other urban coastal regions in California, such as the San Francisco Bay and San Diego regions, and other urban coastal environments in the United States and around the world. We consider Los Angeles a city of the future and treat it as an urban ocean laboratory where we can pioneer solutions for the challenging issues that characterize urban coasts.

Aerial view of Pier 400 in the Port of Los Angeles (Credit: Port of Los Angeles)

Vision

USC Sea Grant envisions a resilient Urban Ocean supported by a diverse, environmentally-literate public and informed decision-makers who protect and enhance our regional coastal and inland communities and economies in a changing climate.

Mission

USC Sea Grant's mission is to contribute to solving the problems of the Urban Ocean; foster the public's understanding of coastal, ocean, and social science; recognize opportunities for the blue economy, coastal commerce, and recreation; solicit and fund relevant, innovative science to inform better decision-making; and improve the quality of life in coastal regions across Southern California.

Core Values

Sea Grant's core values are essential tenets that support its mission, guide its management and decision-making, support a culture of integrity and scientific neutrality, and enable Sea Grant to serve as a trusted broker of information.

Leadership: USC Sea Grant is a leader and prominent national and regional resource for scientific, policy, and educational marine and coastal information. USC Sea Grant is a boundary organization that bridges the gaps between science, community, and policy to support better decisions.

Innovation: USC Sea Grant advances creative, innovative solutions that address emerging and chronic challenges through engagement, science, and stewardship. USC Sea Grant is responsive to local, regional, state, and national research needs and develops responses in a timely manner.

Accountability: USC Sea Grant is dedicated to its transparent role as a neutral broker of science that serves the people, wildlife, and ecosystems of such a diverse region. USC Sea Grant upholds the highest standards of scientific integrity.

Inclusivity: USC Sea Grant is dedicated to the full inclusion and participation of individuals from diverse backgrounds who bring a range of perspectives, values, knowledge, tools, history, experience, abilities and systemic challenges to bear on major scientific problems.

Collaboration: USC Sea Grant is committed to its role in building capacity and connections across people, resources, and knowledge to solve our most pressing problems. USC Sea Grant leverages partnerships and collaborations with diverse community members for broader impacts, especially with marginalized, underserved, and underrepresented communities, including Native peoples and Tribal representatives, Black, Latinx, and other peoples of color.

Sustainability: USC Sea Grant prioritizes advancing environmental stewardship practices and communicating the value of the services that the coastal, watershed, ocean, and Southern California ecosystems provide to the region and nation.

Non-Advocacy: USC Sea Grant maintains a commitment to objective research and programming that avoids bias and advocacy in the development and delivery of information, tools, and services.

Communication: USC Sea Grant is committed to disseminating scientific research and information to diverse audiences, promoting informed decision-making and stewardship of coastal and marine resources.

Sea Grant at the University of Southern California

Wrigley Marine Science Center on Catalina Island (Credit: K. Heidelberg)

USC Sea Grant is administered within the **USC Wrigley Institute for Environment and Sustainability (WIES)**, housed in the **Dana and David Dornsife College of Letters, Arts, and Sciences (USC Dornsife)**, the largest administrative unit at USC and the heart of teaching and research in the Natural Sciences, Humanities, and Social Sciences. The present reporting line for Sea Grant runs from the Sea Grant Director; to the Director of WIES; to the Dean of Dornsife; to the Provost and Senior Vice President for Academic Affairs; to the USC President.

The WEIS's mission is to create a more sustainable and environmentally just future for our planet and all who live on it, and WIES is a leader in USC's solutions-driven commitment to sustainability and environmental research, education and real-world impact. USC Sea Grant and the academic degree-granting Environmental Studies Program (ENST) are major units within WIES. WIES also administers the Wrigley Marine Science Center on Catalina Island, a world-class research station and satellite campus. The close relationship promotes collaborative efforts with WIES, such as position sharing and joint research, education, and workforce

development efforts related to integrated research, marine science, policy, education, and outreach programs. WEIS and USC Sea Grant jointly support new fellowships for undergraduate and graduate students; moreover, Sea Grant partners in running the Wrigley National Science Foundation-supported summer 10-week Research Experiences for Undergraduates (REU) program and multiple undergraduate and graduate student outreach and education programs. WEIS's strong commitment to marine science research and education and formal affiliations with accomplished natural and social science faculty provide important opportunities for strong interdisciplinary partnerships with USC Sea Grant in the pursuit of training and finding solutions to local and regional urban ocean challenges.

Under WIES, achievements in Sea Grant's research and extension programs are well represented in WIES reports to USC leadership, its Advisory Board, and supporters. This crosslinked approach enables programs to simultaneously study, train, exchange, and apply knowledge into practice for maximum impact on research and workforce training.

USC Sea Grant Director speaking to students in the Catalina Summer High School Program
(Credit: USC Sea Grant)

Strategic Plan Development

A sand dune restoration site on Santa Monica beach (Credit: USC Sea Grant)

USC Sea Grant's Strategic Plan reflects the United States' most urgent coastal and ocean needs, NOAA's national priorities, and the National Sea Grant Program's goals, while still addressing the specific needs and priorities of the state and the region. Under the larger umbrella of the Urban Ocean theme, our program's Strategic Plan aligns with the National Sea Grant College Program Strategic Plan for 2024-2027, including four main focus areas of **Healthy Coastal Ecosystems; Sustainable Fisheries and Aquaculture; Resilient Communities and Economies; and Environmental Literacy and Workforce Development**. In practice, we recognize that focus areas are interrelated and that a single activity may advance the goals of multiple focus areas. This Strategic Plan is designed to be adaptive to competing and shifting priorities in an environment that can shift rapidly due to climate change and societal needs. Each focus area of our strategic plan has "goals," "actions," and "desired outcomes." The goals describe the long-term direction for each focus area. The actions are means used to achieve desired outcomes. Furthermore, as we implement these strategies, we develop and apply performance measures (see **Appendix V**) as quantitative ways of tracking success.

While developing this Strategic Plan, USC Sea Grant communicated with a range of interests at the national, regional, state, and local levels. We sought input from members of our Advisory Council, Academic Coordinators, the California Natural Resources Agency Sea Grant Advisory Panel, and California Ocean Protection Council, as well as individuals from local and state governments, marine transportation and ports, K-12 and higher education professionals, coastal businesses, university researchers, Indigenous peoples, fishers and aquaculture professionals, nonprofit environmental organizations, coastal residents, and communications professionals. Enthusiasm among constituents remains strong for issues emphasized in our focus areas and for expanding work on improving equitable coastal access, enhancing our emphasis on climate change, local and traditional ecological knowledge, alternative energy, microplastics, marine debris, and emerging contaminants. Several advisory bodies to Sea Grant are regularly consulted for guidance and input on strategic direction. USC Sea Grant has an

active and engaged **Advisory Council** (**Appendix I)**. The diverse composition of the Advisory Council is analogous to the diversity of the region USC Sea Grant serves, representing the California Water Resources Control Board, the California Ocean Protection Council, the Santa Monica Bay Restoration Commission (part of the Environmental Protection Agency National Estuary Program), the Marine Exchange of Southern California, the Southern California Coastal Water Research Project (SCCWRP), Channel Island National Marine Sanctuary, public universities, private industry, and others.

USC Sea Grant's **Academic Coordinating Committee** members (**Appendix II)** come from several academic departments at USC and include representation from the California State University System leadership (Director of the Southern California Marine Institute), helping to ensure that a range of scientific disciplines is represented. The Academic Coordinating Committee contributes to the development of Sea Grant's Strategic Plan and research solicitations, reviews preliminary proposals, and provides input on external research opportunities and programs.

A third advisory group, **RASGAP,** is a state panel composed of representatives from the departments and agencies in the California Natural Resources Agency, the state agency that provides state matching funds for the two Sea Grant programs in California (**Appendix III**). The RASGAP panel meets with Sea Grant leadership twice a year during those years when proposals are being considered—first, for review and ranking of preliminary proposals, and second, after peer and technical reviews, to help rank projects in the context of agency information needs. The open dialogue and collaboration between key state partners and USC Sea Grant helps to calibrate research focus areas.

The **California Ocean Protection Council (OPC)** was created in 2004 to protect California's coast and ocean by advancing innovative, science-based policy and management, making strategic investments, and catalyzing action through partnerships and collaboration. This Governor-appointed council is charged with providing leadership and coordinating the activities of ocean-related state agencies to better manage ocean resources. OPC leadership oversees the administration of RASGAP, reinforcing active collaboration between USC Sea Grant and high-level State representatives. OPC guides California's ocean policy initiatives and provides input for Sea Grant's solicitation of research proposals as well as occasional funding for Sea Grant projects.

USC Sea Grant also maintains close contact with the **California Ocean Science Trust (OST)**, a nonprofit public benefit corporation established in 2000. OST provides scientific guidance and support for a number of California state agencies, including the OPC. USC Sea Grant has partnered with OST on projects in the past and will continue to collaborate to ensure coordination in meeting state research priorities.

Cross-Cutting Principles

Cross-cutting principles provide a common foundation for all of the four major focus areas and all the work Sea Grant conducts.

Partnerships: USC Sea Grant cultivates and sustains partnerships by integrating the expertise and capabilities of partners from international, federal, tribal, and state governments as well as from academia, nongovernmental organizations, local, tribal and indigenous groups, and industry.

Blue Economy: For more than 50 years, USC Sea Grant has advanced community progress in creating a sustainable economy by encouraging multifaceted activities that encompass research, education, extension, policy support, community resilience, and economic development, fostering what has become known as the blue economy. Our active and growing partnership with AltaSea in the Port of Los Angeles and our local presence at USC in Los Angeles provides support for pressing needs like workforce development and business continuity that improve livelihoods and support coastal economies. Many of our programs promote the sustainable and productive use of ocean and coastal resources, contributing to the overall growth and health of the blue economy.

Climate Change: In all of our focus areas, the changing climate is a lens through which we view the health of coastal ecosystems, the sustainability and resilience of coastal communities and those who work and reside in them, and the production of food resources, both by aquaculture and fishing. In science education, understanding the impacts of a changing climate is already an important dimension affecting all study areas in ocean science.

Community: We aim to actively engage local communities, meeting people where they are, and creating a more inclusive organization and marine sciences field. Our staff receive training to effectively serve diverse communities, especially Indigenous, underserved, and underrepresented groups. We encourage diverse participation in Sea Grant activities, bringing together various perspectives and tools to find innovative solutions for challenges facing our urban ocean environment.

Focus Area: Health Coastal Ecosystems (HCE)

USC Sea Grant trainee, Kyla Kelly, samples for harmful algal bloom species (Credit: SB Channel Keeper)

Balancing ecological conservation and protection with intensive human uses of a public resource has always been central to USC Sea Grant's funded research, extension, and education programs. USC Sea Grant has consistently maintained a focus on coastal **water quality**, but over the decades, this research has expanded from a focus on sewage and associated pathogens to a focus on nutrient laden stormwater runoff, other pollutants and the health of associated coastal ecosystems. Legacy pollutants, chemicals of emerging concern, marine debris, and harmful algal blooms increasingly affect coastal waters in our region. Integrated with each of these topics is the role of climate change as a major driver of ecosystem change.

Coastal habitats at the land-sea interface—estuaries, wetlands, sandy beaches, dunes, rocky intertidal—are not only important for the organisms which depend on them. They also provide ecosystem services to humans such as water filtration, physical barriers from storms and flooding, groundwater recharge, and nursery grounds for seabirds and fisheries. With added threats from climate change such as changing temperature regimes and rising sea levels, coastal habitats will likely face additional impingement in the future. Understanding how these habitats might change in the future will enable planners to make informed choices for restoring and managing ecosystems. Globally, wildlife and humans are exposed to increasing quantities and

types of persistent chemical contaminants, especially in urban coastal areas. Mitigation or remediation of pollutant sources and effective risk management of potential impacts are significant challenges. For example, in the Southern California Bight, legacy contamination of coastal and offshore sediments with DDT (and associated chemicals) is gathering renewed attention to the potential impacts of deep ocean disposal of DDT on existing and potential future uses of this highly productive region.

Closely linked with pollution and coastal water quality is the issue of **harmful algal blooms**, and USC Sea Grant has and will continue to invest in projects investigating the biology and ecology of harmful algal species and the cascading effects of hypoxia, fish kills, and health threats to marine mammals and seafood resources. USC Sea Grant has a long history of working on **aquatic invasive species** (AIS), and supports investigations about AIS, including how incidences may increase with a changing climate and additional vectors like floating plastic debris.

The ubiquity of plastic in today's culture has contributed to it being one of the most serious ocean pollution issues of the 21st century. USC Sea Grant, along with the USC Wrigley Institute for Environment and Sustainability, prioritizes **marine debris**—our joint research, education, and outreach programs align with NOAA Marine Debris strategy efforts evaluating pathways, prevention strategies, effects on habitats and wildlife, ecotoxicology, and scalable approaches to mitigating impacts.

Since their implementation in Southern California in 2012, **marine protected areas** (MPAs) are considered to be an essential part of ecosystem-based management and may play a major role in managing responses to climate change effects on habitat and species resilience. In addition to playing a significant role in MPA implementation, USC Sea Grant co-leads the Los Angeles regional MPA Collaborative, a statewide network charged with fostering the implementation of education and enforcement programs and developing new outreach strategies. USC Sea Grant continues to work diligently with local, regional, state, and federal partners to ensure that the goals of Southern California's MPAs are understood and supported by the public through close partnerships with diverse parties from both coastal and inland communities, including Indigenous peoples. USC Sea Grant works closely with the National Marine Sanctuary Program and other federal entities with jurisdiction over marine protected areas.

California's coast has a history of **oil and natural gas production**, dating back to the 19th century, with 27 offshore oil and gas platforms in Central and Southern California. This industry presents challenges, including oil spills, the potential decommissioning of oil and gas platforms, and onshore infrastructure. Simultaneously, new ocean-based energy resources, especially **offshore wind**, are beginning to be developed. We will continue to support scientific research that helps inform management decisions that protect ecosystem health.

USC Sea Grant funded researcher taking water quality samples (Credit: A. Boehm)

HCE Goals and Outcomes

HCE Goal 1: Coastal and watershed habitats, ecosystems, and the services they provide are protected, enhanced, and/or restored.

Action 1: *Co-develop, improve, and share knowledge, decision-support tools, technologies, and approaches to protect, enhance, and restore ecosystems.*

Desired Outcomes:

- Communities have greater awareness and understanding of ecosystem functions and the services they provide.
- Coastal and watershed ecosystem science and conservation needs are identified and prioritized through diverse participation by interested parties.
- Evidence-based science, traditional and local knowledge and innovative solutions inform and improve the management and conservation of coastal habitats.
- Coastal and watershed biodiversity, habitats and ecosystem functions and services are restored and sustained.
- Collaborative and inclusive planning and decision-making leads to enhanced stewardship and community benefits, especially for the most vulnerable.

HCE Goal 2: Land, water, and living resources are managed by applying science, tools, and services to sustain resilient coastal and watershed ecosystems.

Action 1: *Support a science- and management-driven framework that integrates research, observations, monitoring, and modeling and that includes community engagement and traditional and local knowledge to provide a scientific basis for informed decision-making.*

Desired Outcomes:

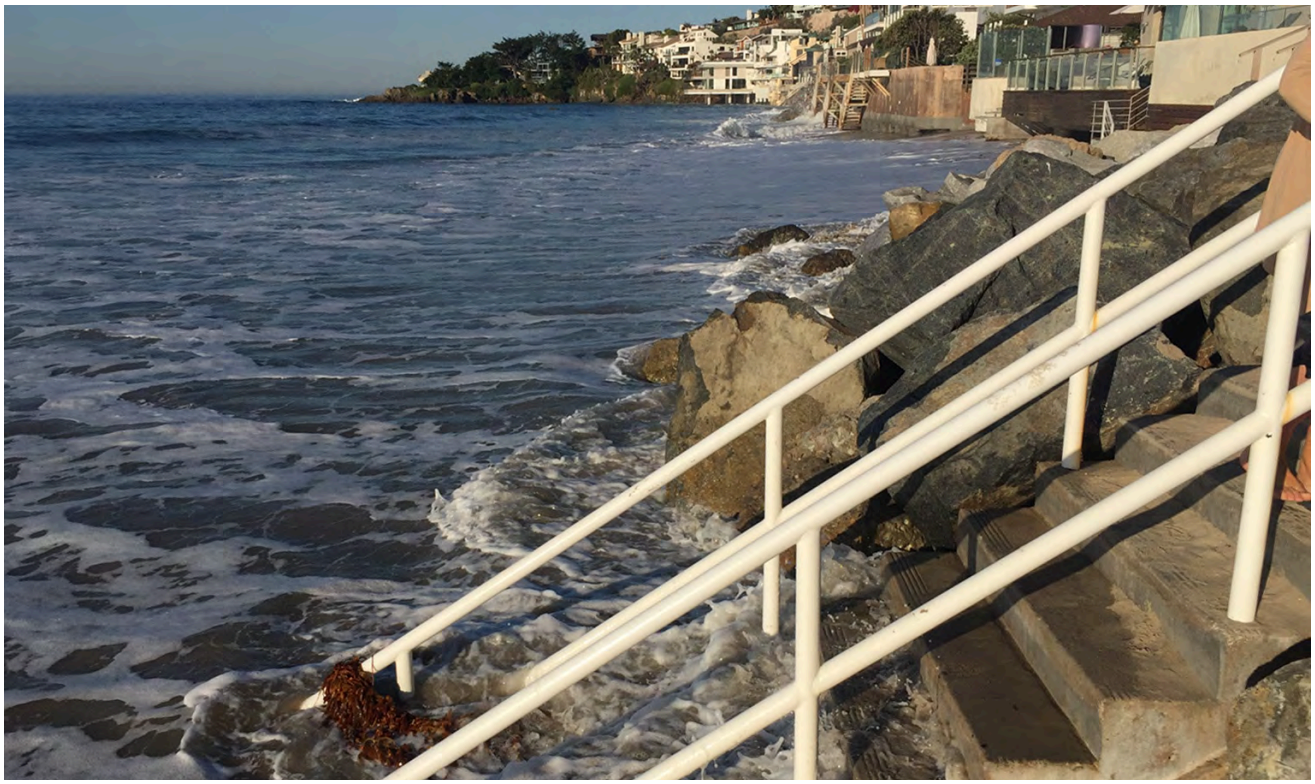
- Inclusive collaborations with diverse partners and other interested parties support planning, research and innovative solutions to address coastal and watershed resource management needs, especially for vulnerable communities.
- Community science initiatives are utilized and contribute to improving our knowledge with respect to stewardship of ecosystems and their contributions to coastal and watershed communities and economies.
- Coastal and watershed communities and resource managers have access to and use science, data, tools and training to be effective in planning and decision-making processes.
- Resource managers understand the risks, options, tradeoffs and impacts of their decisions.

Action 2: *Identify and advance successful strategies that enhance resilient ecosystems and watersheds in the context of changing conditions, including environmental variability, and climate change, and other anthropogenic impacts (e.g., urbanization, pollutant impacts).*

Desired Outcomes:

- Communities share, access, understand and use information regarding projected changes and related impacts within ecosystems.
- Communities can apply knowledge from case studies, training and tools to improve their ability to plan, prepare, and adapt to environmental variability and climate change, and anthropogenic impacts.

Focus Area: Resilient Communities and Economies (RCE)



Broad Beach in Malibu during a King Tide (Credit: K. Alvarez)

USC Sea Grant strives to balance the growing complexities of supporting a vibrant, growing coastal economy and protecting the sustainability and biodiversity of marine ecosystems. **Sea level rise** and shoreline change threaten coastal infrastructure, beaches, wetlands, and wildlife; prolonged drought impacts water quality and availability; and increased storm intensity leads to damaging floods and mudslides. Therefore, climate change is a lens through which USC Sea Grant considers future research and engagement. With changing demands on coastal and ocean space for conservation, renewable energy, and commerce, competition over prioritization of uses is accelerating.

USC Sea Grant plays a significant role helping coastal practitioners in local and regional governments understand, evaluate and integrate adaptation strategies to prepare for impending impacts. Developed in 2010, USC Sea Grant's **AdaptLA Program** continues as a robust outreach, capacity building, and technical assistance program for coastal communities across Southern California. Our goal is to ensure that the best available science-based information, scientific modeling, and planning tools for sea level rise and coastal change are available for local and regional jurisdictions and we have trained scores of coastal professionals on adaptation-related topics. We have conducted statewide longitudinal surveys to asses the state

of climate adaptation in California, enabling us to gauge the needs of coastal managers and practitioners and to calibrate our outreach appropriately. We continue to support the needs of the adaptation community of practice in California, funding research aimed at evaluating the impacts of a changing climate on coastal habitats; evaluating the effectiveness and economic feasibility of potential adaptation strategies with an emphasis on natural and nature-based solutions; providing guidance for monitoring approaches to shoreline resilience; and creating and evaluating strategies for improving water quality and availability along the coast and within urban watersheds.

Often, the communities most at risk to **severe weather and climate extremes** are those who are traditionally underrepresented in the sciences. We engage practitioners, community members, educators, and students in policy and management discussions of social vulnerability and community resilience. We ensure that all have an opportunity to contribute through community-based participatory science opportunities.

For populations affected by potential changes to coastlines, including threats to infrastructure posed by changing shorelines and aging facilities, we assist emergency managers and planners in integrating changing climate considerations into **disaster and land use planning.** We also consider the issues of **human mobility** raised by the necessity of adapting to a changing coast. For coastal and inland communities alike, we support research evaluating the implications of changing shorelines and infrastructure threats on **equitable coastal access**, including MPA and beach access.

Our region is home to the **ports of Los Angeles and Long Beach**, constituting the busiest seaport complex in the country. Close to 45% of all marine freight entering the U.S. comes through these ports, and international trade brings considerable economic benefits to the region as well as the nation. However, there are notable environmental impacts on the coast and residents in the region, such as poor air quality, diminished water quality, the introduction of aquatic invasive species, and significant transportation congestion.

Experts predict increases in maritime commerce by 2030 that will further impact the two Southern California ports. Alterations in shipping patterns due to changes in international trading relationships, evolution in vessel size, the addition of infrastructure to support offshore wind energy facilities, and the potential for climate change to affect polar shipping routes are important issues affecting port infrastructure and potentially the entire U.S. economy. USC Sea Grant has amplified research on the operational efficiency of seaports and the use of **alternative maritime fuels,** and we will continue to work with ports to address future port-related challenges to coastal health and resource use. USC Sea Grant has a strong and growing community

partnership with **AltaSea**, a multi-use facility, marine laboratory, and blue economy outreach center on the waterfront in the Port of Los Angeles. Moving forward, with initiation of a shared extension position, we anticipate working closely with AltaSea on maritime commerce, aquaculture, and the emergence of the **blue economy**.

Developments in energy resources, specifically **wind-generated electricity** both offshore and nearshore, are issues of growing interest to the West Coast. Similarly, discussions of water availability and **drought** in Southern California are escalating. Sea Grant has long helped facilitate discussions on planning the use of ocean space, and we anticipate continuing our role in **marine spatial planning** as interest in offshore wind energy, desalination, and other coastal-dependent uses continues to develop.

In coastal communities, new paradigms for sustaining resilient communities are emerging, using information from economics, planning, landscape architecture, and the building industry. As some coastal communities transform from fishing communities to combined residential, business, and recreation centers with innovative technologies including aquaculture, questions emerge about spatial planning and new models for **working waterfronts**. USC Sea Grant contributes to the development of tools for including multiple and diverse voices, including Indigenous stewards, in the development of coastal and marine spatial planning.

Urban Tides Community Science Project (Credit: K. Alvarez)

RCE Goals and Outcomes

RCE Goal 1: Coastal and watershed communities have the capability and resources to prepare for and adapt to extreme and chronic weather and coastal hazards, climate change, economic disruptions, and other threats to community health and well-being.

Action 1: *Improve and expand exchanges of knowledge to better identify the diverse needs of communities and to increase the public's understanding of changing conditions and related impacts.*

Desired Outcomes:

- Scientific understanding, including traditional and local knowledge, provides foundational information, and all community members understand the impacts of changing conditions and coastal hazards and have the capability to prepare, respond and adapt.
- Community leaders improve their understanding of changing conditions and coastal hazards and their capability to implement mitigation and adaptive strategies.

Action 2: *Work with communities to advance collaborative, comprehensive planning, actionable science, and adaptive management strategies.*

Desired Outcomes:

- Inclusive collaborations with diverse interested parties and partners support mitigation and adaptation efforts built on knowledge from and responsive to the needs of all, especially the most vulnerable.

Action 3: *Work with communities to explore and support diversification, strengthening, sustainability, and social equity within coastal economic sectors and the blue economy.*

Desired Outcomes:

- Coastal and watershed communities have access to and share knowledge, tools, services, and technologies to adapt and grow resilient economies.
- Leaders in coastal and watershed economic sectors understand how they can become more resilient through diversification, including expanded renewable, regenerative, and clean practices.

RCE Goal 2: Water resources are enhanced, sustained, and protected to meet existing and emerging needs of the communities and economies, and biodiverse ecosystems that depend on them.

Action 1: *Use engagement and information exchange to advance the understanding of how actions impact water quality, quantity, and availability.*

Desired Outcomes:

- Community members understand watershed function and coastal functions and the ecosystem services they provide, understand how their actions will impact water resources, and are able to make informed decisions.

Action 2: *Collaborate with diverse partners and interested parties, especially the most vulnerable, to advance plans and management practices for protecting and managing water resources.*

Desired Outcomes:

- Communities work with knowledge networks to share and access science, data, tools, and services to anticipate changes in water resources, to protect and sustain water resources, and to make informed decisions.
- Communities have diverse, sustainable economies and industries that support existing and emerging water resource needs.

USC Sea Grant staff at Wrigley Marine Science Center on Catalina Island (Credit: USC Sea Grant)

Focus Area: Sustainable Fisheries and Aquaculture (SFA)

South Central Los Angeles Sustainable Seafood Festival (Credit: Nick Neumann/Wrigley Institute)

It is USC Sea Grant's vision to have a safe, sustainable, and accessible domestic seafood supply as well as a public that understands how to make healthy and sustainable seafood choices. Like much of the world's oceans, California has witnessed a decline in fisheries over the last half-century due to threats from poor water quality, coastal development, and habitat alteration. Changes in temperature and ocean acidification will significantly impact fish stocks, particularly those with carbonate shells, such as shellfish.

Coastal development has always threatened the viability of marine resources. Research reveals that many fisheries species, including important game fish, use coastal wetlands and lagoons for breeding and nursery grounds. Man-made habitats—including oil and gas platforms and other artificial reef structures—may appear to improve fish recruitment and production in Southern California, but more work is needed to understand how restoration of existing habitats and deployment of man-made structures may benefit fisheries. Recreational and subsistence fishing is of great importance in Southern California, especially in the context of equitable access to seafood. USC Sea Grant will continue to fund projects focused on recreational and subsistence fisheries in Southern California and to foster understanding of California regulations meant to enhance sustainable and robust recreational and subsistence opportunities.

Sustainable aquaculture is an emerging societal need that will continue to grow in the future. It is clear that natural fish stocks, even with the help of marine protected areas, will not be able to sustain the increasing national demand for seafood. According to NOAA's Office of Aquaculture, 70-85% of seafood consumed in the U.S. is imported (and half of that is from aquaculture), leading to a seafood deficit of over $17 billion per year. Increasing domestic aquaculture could help the U.S. avoid larger foreign imports of seafood, which is not produced with the environmental and health standards attributable to U.S. practices. Importantly, aquaculture also supports commercial and recreational fisheries through wild hatchery and restorative aquaculture programs. Recent policy developments at the federal and state level demonstrate a growing regulatory commitment to actualizing sustainable aquaculture at scale. NOAA recently selected Southern California as a national "Aquaculture Opportunity Area," a geographic region with high potential for commercial development, and the state is currently developing an Aquaculture Action Plan for California.

USC Sea Grant will continue to leverage funded research and outreach programs to ensure that coastal and open ocean shellfish and seaweed aquaculture successfully achieves the triple bottom line for sustainability (i.e., environmental, social, economic). Developing safe, environmentally sustainable, and socially responsible aquaculture products requires development of appropriate technologies and practices, an educated diverse workforce that can support this burgeoning industry, and informed public support for industry expansion.

USC Sea Grant continues to explore new directions in sustainable seaweed and shellfish farming and forms of **restorative aquaculture**. Seaweed aquaculture holds promise as a sustainable source of a large variety of food and natural products while providing multiple ecosystem services. Growing seaweed together with shellfish in integrated multi-trophic aquaculture systems offers promise as a sustainable way to grow protein while improving water quality and expanding the blue economy and workforce. We will support the efforts of local aquaculture and seafood industry groups who are exploring feasible economic models for a regional seafood supply chain that increases **equitable access** to seafood for low-income, food-insecure communities in Southern California.

To support growing aquaculture and aquaponics industries, a trained, diverse workforce must be exposed to the subject in the classroom and the field. For example, Middle and high school students and continuing education students can learn first-hand about fish biology and husbandry. Surveys show that overall public understanding of aquaculture is limited or negative. Greater education and outreach are needed to inform the public about different types of aquaculture, best practices, and the value of eating safe, sustainable seafood. USC Sea Grant continues to work at the intersection of science, communication, and education, partnering with formal and nonformal education centers to better inform and educate the public.

Education about **seafood safety** will continue to be a priority. Enlightened consumers make wiser choices about buying sustainable domestic products and make healthy choices not only about the food they eat, and the manner in which it is produced, harvested, and processed, but also about its potential risk of contamination, for example, from legacy DDT contamination off the Southern California coast. In the Los Angeles region, there are over 140 spoken languages and many different cultural practices when it comes to catching, preparing, and eating seafood. Partnerships are critical in making sure that our educational resources can be understood within the context of these rich and diverse cultures populating the Los Angeles region, including those traditionally underserved and underrepresented in the sciences and science communication.

South Central Los Angeles Sustainable Seafood Festival (Credit: Nick Neumann/Wrigley Institute)

SFA Goals and Outcomes

SFA Goal 1: Domestic fisheries, aquaculture, and other coastal and freshwater living resources supply food, jobs, and economic and cultural benefits.

Action 1: *Promote and support harvesting, culturing, processing, and post-processing (e.g., marketing, accessibility) techniques that lead to safe, sustainable, high-quality food as well as economic, social, and ecosystem benefits.*

Desired Outcomes:

- Coastal and watershed residents and U.S. seafood consumers understand the benefits of domestically-produced seafood, both wild and farmed, for individual and environmental health.
- Coastal and watershed resource industries employ technologies and reinforce strategies to ensure equitable access to safe and sustainable seafood and products.
- Coastal and watershed resource industries employ strategies that balance economic, community, cultural, and conservation goals.

Action 2: *Support development of a trained and diverse workforce and enhance technology transfer in a manner that recognizes a variety of methodologies and approaches, including those based on traditional and local knowledge.*

Desired Outcomes:

- Increased understanding and technological solutions aid management and production.
- Engagement with interested parties and partnerships enable the industry to acquire innovative technologies and adapt to changing conditions.

SFA Goal 2: Natural resources are sustainably managed to support coastal communities and working waterfronts, including commercial, recreational, subsistence fisheries, and aquaculture.

Action 1: *Ensure the best available science, services, and tools are available to and trusted by resource managers, the fishing and aquaculture communities, and consumers.*

Desired Outcomes:

- Commercial and recreational fishers and aquaculturists are knowledgeable about efficient, sustainable, and responsible tools, techniques, and uses of coastal and freshwater resources.
- Resource managers and fishing and aquaculture communities have access to and share diverse knowledge and tools to increase their capability to adapt to changing resource management needs, including those driven by climate change.
- Consumers understand the health and sustainability benefits of domestically produced seafood and use that knowledge to inform their seafood purchasing decisions.

South Central Los Angeles Seafood Festival (Credit: Nick Neumann/Wrigley Institute)

Focus Area: Environmental Literacy and Workforce Development (ELWD)

Port of Los Angeles High School Aquaculture in the Classroom Program (Credit: M. Madrigal)

Environmental literacy provides an essential foundation for developing resilient communities, sustainable fisheries and aquaculture, and healthy coastal ecosystems. Southern California faces tremendous challenges—cemented rivers, urban sprawl, and diminishing access to watersheds and the coast—which disconnect communities from each other and from nature. We strive to reach diverse, underserved, and under-represented groups, youth, educators, and families, providing access to current science, experiential learning at all ages, and cultural, local, and traditional knowledge.

USC Sea Grant has been a leader in the national effort to develop principles for **ocean literacy** and expand accessible pathways to ocean literacy for Southern California's diverse constituencies. Our efforts begin at early ages and continue through lifelong learning, in partnership with organizations and agencies representing Southern California. Strategies include providing access to current scientific research; developing and implementing instructional resources and programs; leading hands-on experiences for people of all ages; hosting professional development opportunities for educators; and integrating and sharing local and traditional knowledge in educational and curriculum resources. Through community-

supported science, education, and public outreach in all the areas we work, individuals and communities develop knowledge and skills that enable a better understanding of their environment. They are able to make informed decisions about how to select healthy, sustainable seafood and how they can play a role in protecting watersheds, coasts, and oceans.

USC Sea Grant's **Pre-K to 16** audience for education programming consists primarily of Black, Indigenous, Latinx, and other students and families of color, along with marginalized students who have limited access and opportunities to environmental education. Through both **nonformal and formal education**, USC Sea Grant provides opportunities for families, especially young adults who are not well represented in these fields, to consider a wide range of careers. We provide **career training opportunities** through partnerships with scientists, managers, and policymakers who are similar to students both culturally and experientially, a critical element in helping students see themselves in these roles. Further, USC Sea Grant provides an avenue for increasing knowledge, skills, and employment through the California Naturalist Training Program, conducted in partnership with University of California Extension.

USC Sea Grant helps develop core **curriculum** instruction with many partners including the Los Angeles Unified School District, San Pedro schools' Pre-K to continuing education program, EmpowHer Institute's E-STEAM (Science, Technology, Engineering, Arts, & Math) program, and others. USC Sea Grant serves an equally important role in nonformal education, providing **professional development** opportunities for educators and community members of all ages, including programs like the Los Angeles STEM Collective, geographical expansion of LiMPETS (Long-term Monitoring Program and Experiential Training for Students), and training on hybrid learning platforms through the Coastal Education Collaborative. Strong partnerships with nonformal science, technology, engineering, and math centers such as aquaria, museums, libraries, and afterschool programs help achieve this goal.

USC Sea Grant values **diverse voices** including Native peoples, (especially the Chumash, Tongva (Gabrielino), Kizh and Acjachemen tribes), and Black, Latinx, Asian, and other priority communities throughout the greater Los Angeles region. These voices are essential in broadening our understanding of community connections to the ocean. USC Sea Grant engages Indigenous partners and actively seeks guidance and collaboration with Tribal Nations in various efforts including California Naturalist trainings, the MPA Collaborative, and the Intertribal Education Collaborative. USC Sea Grant also serves on the Wishtoyo Chumash Education Advisory Board.

Environmental science education and workforce development are investments in the future of society. Undergraduate teaching, graduate research investment, and fellowship opportunities help students prepare for careers in science, technology, engineering, mathematics, and other

disciplines critical to local, regional, and national needs. We are partnering with WIES to develop a new interdisciplinary USC graduate program in Environmental Studies, and our engagement in the highly successful **John A. Knauss Marine Policy Fellowship** program will continue to prepare students to lead the nation in sustainable and forward-thinking environmental management. USC Sea Grant, in coordination with its partners, helps to identify and alleviate barriers to participation in Sea Grant fellowship and grant programs to ensure that students from diverse backgrounds, especially those in underserved and underrepresented communities, get access to Sea Grant's research, extension and education programs.

High school students during a summer program on Catalina Island (Credit: USC Sea Grant)

ELWD Goals and Outcomes

ELWD Goal 1: A diverse, environmentally literate public participates in lifelong formal and nonformal learning opportunities.

Action 1: *Create and implement educational resources and opportunities that are diverse, equitable, inclusive, just, and accessible for formal and nonformal learners to explore multiple ways of learning and knowing and to develop their curiosity and learning abilities throughout their lives.*

Desired Outcomes:

- Individuals consider themselves environmentally literate lifelong learners who utilize knowledge to support, build, and restore healthy natural and human communities..

Action 2: *Develop, provide and assess research, curricula, tools, and other resources for educators, students, and lifelong learners to support personal choice, participatory decision-making, and community planning processes.*

Desired Outcomes:

- Educators, students and lifelong learners have current information and innovative tools that meet or exceed relevant standards and practices.
- People know and can act on issues that impact their lives, communities, and environments.
- Community members use their knowledge to remove barriers and act for personal and social resilience and adaptation to changing economic, environmental, and social conditions.

Action 3: *Strengthen the ability of individuals, organizations, and communities so that they have the knowledge, dispositions, skills and abilities to make informed and responsible decisions regarding coastal and watershed issues.*

Desired Outcomes:

- Individuals, organizations and communities create innovative opportunities, businesses, and communities that respect diverse ways of knowing and learning, address systemic problems in equitable and just ways, and integrate traditional and novel cultures.
- Coastal and watershed communities are sustainable, healthy, diverse centers of tradition, innovation, and prosperity.

ELWD Goal 2: A diverse, skilled, and environmentally literate workforce that is engaged and able to build prosperous lives and livelihoods in a changing world through traditional and innovative careers.

Action 1: *Identify and remove barriers to accessing training and learning opportunities so that the nation's diverse population is connected to and prepared for the range of career paths that support the needs of coastal and watershed communities.*

Desired Outcomes:

- All members of a community are enabled to explore and pursue the variety of occupations that are essential to sustain coastal and watershed communities, economies, and ecosystems.

Action 2: *Increase opportunities for students at all levels (P-12, community college, undergraduate, graduate, post-graduate, and technical and vocational) to gain knowledge and experience addressing issues that are important to our ocean, coasts and their respective watersheds.*

Desired Outcomes:

- Sea Grant student opportunities provide increased literacy, experience, and preparedness in critical disciplines, skills, and issues.
- Students from all backgrounds and with diverse needs are thoughtfully and intentionally supported in and have access to formal, nonformal, and experiential learning, training, and research experiences.

Action 3: *Develop and carry out programs that help people discover, create and grow within careers that support the current and future needs of coastal and watershed communities and ecosystems and to adapt and thrive in changing conditions.*

Desired Outcomes:

- Employment in coastal and watershed communities expands and diversifies.
- The existing and future workforce is able to adapt and thrive in changing environmental, social, and economic conditions.

Knauss Fellows Class of 2024 (Credit: NOAA)

Appendix I: USC Sea Grant Advisory Council

Dr. Mariela de la Paz Carpio-Obeso, Ocean Unit Chief, Division of Water Quality, State Water Resources Control Board

Candice Dickens-Russell, President and CEO, Friends of the Los Angeles River

Dr. Mas Dojiri, Assistant General Manager, City of Los Angeles Department of Sanitation & Environment

Dr. John Dorsey, Professor Emeritus of Civil Engineering & Environmental Science, Loyola Marymount University

Jenn Eckerle, Executive Director, Ocean Protection Council and Deputy Secretary for Oceans and Coastal Policy, California Natural Resources Agency

Dr. Lesley Ewing, Senior Coastal Engineer, California Coastal Commission (retired; consultant)

Russell Galipeau, Superintendent (retired), Channel Islands National Park; Lecturer, California State University Channel Islands

Lisa Gilbane, Environmental Analysis Section Chief, Bureau of Ocean Energy Management, Department of Interior

Dr. Mark Gold, Natural Resources Defense Council; Director, Water Scarcity Solutions, Environmental Health; (Former Executive Director, CA Ocean Protection Council)

Jenny Krusoe, Founding Executive Director, AltaSea at the Port of Los Angeles

CAPT J. Kipling Louttit, Executive Director, Marine Exchange of Southern California

Chris Mobley, Superintendent, Channel Islands National Marine Sanctuary, National Oceanic and Atmospheric Administration

Craig A. Moyer, Partner, Manatt energy and Environment Group, LLP Los Angeles, CA.

Rebecca Smyth, West Coast Director, Office for Coastal Management, National Oceanic and Atmospheric Administration

Dr. Guangyu Wang, Chief Administrative Director (retired), Santa Monica Bay Restoration Commission

Dr. Stephen Weisberg, Executive Director, Southern California Coastal Water Research Project Authority (SCCWRP)

Appendix II: USC Sea Grant Academic Coordinators Council

Dr. Jill Sohn, Director, USC Dornsife Environmental Studies Program, Associate Professor (Teaching) of Environmental Studies

Dr. Carly Kenkel, Wilford and Daris Zinsmeyer Early Career Chair in Marine Studies and Associate Professor of Biological Sciences, USC Dornsife College

Dr. Patrick Lynett, Professor of Civil and Environmental Engineering, USC Viterbi School of Engineering

Dr. Victoria Petryshyn, Associate Professor, USC Dornsife Environmental Studies Program

Dr. Dan Pondella, Director, Southern California Marine Institute and Professor Biology Occidental College and Director, Vantuna Research Group

Appendix III: Resources Agency Sea Grant Advisory Panel

Michael Anderson, State of California Office of Spill Prevention and Response

Dr. Doug Capone, Professor of Biological Sciences, University of Southern California

Michael Esgro, Senior Biodiversity Programs Manager & Tribal Liaison, California Ocean Protection Council

Maren Farnum, Senior Environmental Scientist, State Lands Commission

Dr. Lauren Garske Garcia, Senior Biodiversity Program Manager & Tribal Liaison, California Coastal Commission

Jennifer Mattox, Science Policy Advisor & Tribal Liaison, California State Lands Commission

Dr. Steven Murray, Professor of Biology and Provost (emeritus), California State University, Fullerton

Brian Owens, Senior Marine Environmental Scientist, California Department of Fish and Wildlife

Dr. Emily Duncan, Senior Environmental Scientist (Specialist), State of California Water Resources Control Board

Dr. Wesley Smith, Staff Toxicologist, Office of Environmental Health Hazard Assessment / CalEPA

Peter Struffenegger, North America at Urchinomics (Aquaculture Private Industry)

Katherine Walsh, Senior Environmental Scientist Supervisor, California State Water Resources Control Board

Appendix IV: USC Sea Grant Staff

Director, Karla Heidelberg, Ph.D.

Dr. Heidelberg brings over 25 years of experience as a scientist, educator, and leader in ocean research, education, and policy. She has been on the Biology and Environmental Studies faculty of USC since 2006 and has held multiple leadership and administrative positions including serving as the Director of the USC Program in Environmental Studies and as a leader in a long-running NSF-funded Research Experience for Undergraduates. She has received several USC University teaching awards. From 2019-2023 she served as an NSF Program Officer in the Office of Polar Programs, where she oversaw the Antarctic Organisms and Ecosystems Research Portfolio, receiving an NSF Director's Award for Superior Accomplishment in 2021. She also had past positions as the Global Program Science Coordinator at the J. Craig Venter Institute coordinating an around-the-world expedition to evaluate marine biodiversity and an American Association for the Advancement of Science Diplomacy Fellow in the Office of Oceans Affairs at the U.S. Department of State. Dr. Heidelberg earned her Ph.D. from the University of Maryland in 1999 in Marine-Estuarine and Environmental Science.

Executive Director, Phyllis Grifman, M.A.

As Executive Director, Ms. Grifman oversees and coordinates Sea Grant's research, extension and education programs. She is an active partner in numerous state and national activities, linking Sea Grant with research and information networks in such areas as national marine sanctuaries, state marine protected areas, ecosystem science, land use planning and sediment management in both the public and non-profit sectors, and other local, regional and national endeavors. Ms. Grifman maintains close contact with current and former Sea Grant scientists, and develops Sea Grant's new research capabilities. She served as Chair of the Advisory Council of the Channel Islands National Marine Sanctuary for several years, chairs that body's Research Activities Panel, and has served on the Council for over a decade. She is Vice President for Southern California of the California Shore and Beach Preservation Association, a member of the Santa Monica Bay Restoration Commission Technical Advisory Committee and a member of the National Sea Grant Law Center Advisory Council.

Extension Leader; Science, Research, and Policy Specialist, Amalia Almada, Ph.D.

Dr. Almada serves as a senior extension specialist focused on interpreting and disseminating information and research results, including those from Sea Grant researchers, on topics such as water quality, sustainable aquaculture, and ecosystem health with managers, planners and community members in Southern California. She is also an Adjunct Assistant Professor of Research in the USC Environmental Studies Program. Dr. Almada applies her social science training to several USC Sea Grant projects, including a community-driven California DDT research needs assessment and a Seafood Equity Hub in South Central Los Angeles. Dr. Almada also participates in USC Sea Grant's research coordination and management of research proposals. She received a BSc in Biology from Georgetown University, a PhD in Biological Oceanography from the Joint Program at the Woods Hole Oceanographic Institution and Massachusetts Institute of Technology, and completed a Provost Postdoctoral Fellowship at the University of Southern California.

Science, Research, and Policy Specialist—Resilience, Dane Lazarus, M.S.

Dane Lazarus is a Science, Research, and Policy Specialist with USC Sea Grant serving to bridge current coastal research and community members. He applies his training in coastal science and engineering to

support coastal community members, planners, and managers in Southern California through the facilitation, dissemination, and interpretation of Sea Grant research findings. Prior to joining Sea Grant, Dane worked on coastal dune and wetland restoration and monitoring projects at The Bay Foundation, and developed and implemented unmanned vehicle survey techniques for environmental consultants. Dane received a B.S. in Ecology and Evolution from the University of California Santa Barbara, and a M.S.E. in Civil-Environmental Engineering from Loyola Marymount University.

Science, Research, and Policy Specialist—Resilience, Rachel Darling, M.S.

Rachel Darling is a Science, Research, and Policy Specialist with USC Sea Grant. Her work focuses on connecting applicable science to decision-making for coastal resilience. Rachel received a B.S. in Marine Biology with a minor in Climate Change Studies from UC San Diego, as well as a M.S. in Marine Biology from UC San Diego. Throughout her education and professional career, Rachel has contributed to interdisciplinary projects spanning the topics of climate change, marine and freshwater biology, and public health. These projects have emphasized the importance of interdisciplinary thinking and skills in addressing contemporary environmental and community challenges. Rachel brings her passion for interdisciplinary solutions and rigorous science to her role at USC Sea Grant.

Science, Research, and Policy Specialist—Marine Debris, Sydney Rilum, M.S.

Sydney Rilum is a Marine Debris Extension Specialist with USC Sea Grant and USC Wrigley Institute for Environment and Sustainability. She helps lead research and policy development on marine microplastics and works collaboratively with communities in Southern California to develop improved technologies, and impactful outreach and educational programming to reduce the amount of marine debris and microplastics that enter coastal systems. With a diverse career portfolio, Sydney has worked in education, habitat and species monitoring, research and data science fields within a variety of environmental and sustainability sectors, including non-profit (Laguna Ocean Foundation, Aquarium of the Pacific, OC Habitats), state agency (CA Department of Fish and Wildlife, State Water Resources Control Board), and corporate (Ocean Rainforest). Sydney holds a Master of Environmental Science and Management (MESM) from the University of California, Santa Barbara Bren School with specializations in Coastal Marine Resources Management and Environmental Data Science, as well as a B.S. in Environmental and Ocean Sciences with a Marine Ecology focus from the University of San Diego.

AltaSea Urban Ocean and Port Specialist– To be filled

Education Manager, Maria Madrigal, M.S.

Ms. Madrigal serves as the Education Programs Manager to help identify needs and resources to support coastal based education programs. Her role includes connecting with students, teachers, and families in formal education systems and after-school programming, and facilitating the collaboration of diverse network partners in order to identify common programmatic needs and adaptation strategies, all while ensuring equity and access for all students and educators. Previously, she served as the Program Manager for the USC Viterbi School of Engineering K-12 STEM Center. Prior to joining USC, she spent almost 20 years at the SEA Lab in Redondo Beach, leading and managing education programs. As the SEA Lab was a program of the Los Angeles Conservation Corps, her priority was preparing young adults to enter the workforce by providing education and job-training skills in the marine and environmental fields. In 2012, she was fortunate to participate in NOAA's Teacher at Sea program in American Samoa. Recently, she authored the marine biology book for a series highlighting different fields within the STEM field.

Communications Manager, Leah Shore, M.S.

Leading the team's communications, Ms. Shore's work is centered around conveying the program's marine science research, education, and outreach efforts across a broad range of audiences. Her work enhances the usability of the program's initiatives and science findings through building resiliency, raising awareness, and increasing capacity of the research and issues surrounding our coastal communities. She manages the communication strategies and materials across projects and digital platforms, as well as serves as the primary science writer. Ms. Shore specializes in science communication, especially aimed at bridging the gap between science and application. She holds a B.S. in Meteorology from the University of Oklahoma and an M.S. in Climate and Society from North Carolina State University. Previously, she worked as the Climate Assessment Specialist for the Southern Climate Impacts Planning Program, a NOAA-funded program, leading communication efforts of assessing community member vulnerability to extreme weather and climate events and aiding in adaptation efforts across the South Central United States.

Senior Science Writer and Program Specialist, Charlotte Stevenson, M.S.

Ms. Stevenson is a senior science writer with a graduate-level foundation in research science and a strong background in environmental policy and politics. She has been a science writer for USC Sea Grant for 13 years. She has a broad portfolio in writing, ranging from highly technical research papers to programmatic writing such as strategic planning and grant reporting. She also works in creative forms such as articles, blogs, op-eds, essays, and documentary scripts. Ms. Stevenson has an M.S. and B.S. in Biology from Stanford University, where she spent many years at Hopkins Marine Station in Monterey, CA. She was a 2006 John A. Knauss Legislative Marine Policy Fellow and subsequently a staffer in the House of Representatives, Natural Resources Committee. Over the last decade, she has also written for Scripps Institution of Oceanography and the California Ocean Science Trust and published freelance pieces in publications such as UNDARK, The Chestnut Review, American Literary Review, The New York Times Online, ECO Magazine, and was shortlisted in the 2023 Prism International creative nonfiction contest.

Contracts and Grant Coordinator, Ruth Dudas

Ms. Dudas has over 25 years of administrative experience. Since 2002 she has served as USC Sea Grant's fiscal officer and budget coordinator, managing all contracts and grants logistics, in addition to providing administrative support for Sea Grant staff. She ensures the efficient execution of daily office procedures and serves as liaison with the USC contracts and grants operations and sponsored project administration. Prior to her Sea Grant role, she served as an Executive Assistant and Office Manager working in the fields of printing and logistics. Ms. Dudas has completed several fiscal training programs with NOAA and USC.

Busy container traffic in Pier 300 in the Port of Los Angeles (Credit: Port of Los Angeles)

Appendix V: Performance Measures and Metrics

The Performance Measures and Metrics below are primarily developed by the National Sea Grant College Program, along with discrete elements added by USC Sea Grant (marked with *).

Focus Area: Healthy Coastal Ecosystems (HCE)

- Number of acres of coastal habitat protected, enhanced, or restored as a result of Sea Grant activities.
- Number of resource managers who use ecosystem-based approaches in the management of land, water, and living resources as a result of Sea Grant activities.

Focus Area: Sustainable Fisheries and Aquaculture (SFA)

- Number of fishers, seafood processing, or aquaculture industry personnel or seafood consumers who modify their practices using knowledge gained in fisheries sustainability and seafood safety as a result of Sea Grant activities

Focus Area: Resilient Communities and Economies (RCE)

- Number of communities that adopt/implement sustainable economic and environmental development practices and policies as a result of Sea Grant activities
- Annual number of communities that adopt/implement hazard resiliency practices to prepare for and respond to/minimize coastal hazardous events
- Number of congressional districts who are informed about or have adopted/implemented practices or policies as a result of Sea Grant activities.*

Focus Area 4: Environmental Literacy and Workforce Development (ELWD)

- Number of Sea Grant-supported graduates who become employed in a job related to their degree within two years of graduation
- Number of Sea Grant products that are used to advance environmental literacy and workforce development.
- Number of people (youth and adults) engaged in Sea Grant-supported nonformal education programs
- Visitor Attendance: Number of people that visit museums, aquariums, and other informal education institutions hosting NOAA-supported exhibits or programs (NEW; Pilot)
- Environmental Actions: Number of people participating in environmental actions through NOAA education programs (NEW; Pilot)

Cross-Cutting Performance Measures:

- Number of Sea Grant tools, technologies, and information services that are used by our partners/customers to improve ecosystem-based management
- Economic and societal impacts derived from Sea Grant activities (market and non-market; jobs and businesses created or sustained)
- The number of zip codes that participated in Sea Grant activities*
- Number of Sea Grant tools, technologies, programs, and information services that specifically reach underrepresented and underserved communities*

Cross-Cutting Performance Metrics:

- Sea Grant staffing: number of individuals and full-time equivalent (FTEs) devoted to Sea Grant
- Core funding proposals: number and origination of core funding pre- and full-proposals
- Number of Volunteer hours
- Number of Postsecondary students and degrees financially supported by Sea Grant in Higher Education Programs (Undergraduate, Graduate)
- Number of P-12 students who participated in Sea Grant-supported formal education programs
- Number of Educators who participated in Sea Grant-supported professional development programs
- Number of Sea Grant-sponsored/organized events
- Number of Attendees at Sea Grant-sponsored/organized events
- Number of Public or Professional presentations
- Number of Attendees at Public or Professional Presentations
- Number of Marinas Certified as "Clean Marina" by the Clean Marina Program as a result of Sea Grant Activities
- Number of individuals certified or recertified in Hazard Analysis Critical Control Point (HACCP) as a result of Sea Grant Activities
- Number of peer-reviewed publications produced by Sea Grant

USC Sea Grant's Maria Madrigal presenting her STEAM series marine biology book to promote diversity in science careers (Credit: L. Chilton)

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