Coastal Sustainability Initiative
As Marcel Proust once noted, “The real voyage of discovery consists not in seeking new lands but seeing with new eyes.” With issues such as sustainability that are so critical to the future of coastal communities, it is imperative to look at these issues through multiple lenses and bring different perspectives and expertise to tackle these daunting challenges head-on. In this issue we are proud to highlight a new coastal sustainability initiative that started with a kernel of an idea by Dr. Gordon Grau, UH Sea Grant director, and resulted in the hiring of seven new faculty members. Together, these talented and visionary individuals will truly expand the boundaries of what is possible, and make a genuine and lasting impact on the communities they serve.

Cindy Knapman
Communications Leader
In February 2011, University of Hawai‘i at Mānoa (UH Mānoa) Chancellor Virginia Hinshaw (former) announced a university-wide strategic hiring initiative to increase the pool of scholars in the teaching and research community. In a competition with 11 other departmental proposals, the University of Hawai‘i recognized the excellence of the University of Hawai‘i Sea Grant College Program (UH Sea Grant) and its longstanding commitment to coastal sustainability by selecting the UH Sea Grant-led proposal entitled “Integrating Marine Science, Economics, Engineering, Design and Policy for Sustainable Coastal Communities.” Through this initiative, UH Sea Grant was able to hire six new general-funded faculty. Over the next 30 years, this will represent an approximate $50 million investment in Sea Grant’s outreach and research program. We believe that this is likely an unprecedented commitment on the part of a university to Sea Grant and its National Oceanic and Atmospheric Administration partner. This initiative greatly increases our ability to address diverse challenges, needs, and opportunities in a multifaceted fashion.

According to Chancellor Hinshaw, “The proposal was a well-defined, tightly integrated cluster on a topic of great importance for the state with the potential for significant education, research, and community impact.” Five tenure-track faculty positions were proposed, one in each of the following areas: coastal civil engineering, coastal policy and community development, environmental economics, microbial oceanography/biogeochemistry and sustainable building/community design – all with partial appointments in UH Sea Grant for the purpose of conducting outreach. During the faculty recruitment process, the Chancellor added a second position for microbial oceanography/biogeochemistry.

Through a second initiative from the UH Mānoa Chancellor’s Office, UH Sea Grant had the opportunity to collaborate with the Hawai‘inuiākea School of Hawaiian Knowledge and the College of Tropical Agriculture and Human Resources to hire an additional tenure track faculty. This new position was designed to transcend traditional academic boundaries and focus on cross-disciplinary solutions to natural and cultural resource management, sustainability, and food security issues facing Native Hawaiians, Pacific Islanders, and other indigenous communities using traditional Hawaiian knowledge and practices.

In this issue we introduce the reader to the seven talented faculty members hired through these two initiatives. While four of the seven faculty members were hired very recently, all of them bring a wealth of knowledge and expertise to the position and have already begun to embrace the challenges and opportunities provided through this unique strategic hiring initiative. In the future, this cadre of professionals will address some of today’s most pressing problems and the solutions they devise collectively will have the potential to bring about meaningful and enduring positive change.
Rosie Alegado represents one of a cluster of seven faculty hired as a result of the University of Hawai‘i at Mānoa’s (UH Mānoa) former Chancellor Virginia Hinshaw’s initiative to promote multidisciplinary sustainability. This ambitious initiative is aimed at integrating science, engineering, and design into decisions on sustainable development and public policy in coastal communities, with particular focus on developing, engaging, and implementing wise and sustainable use of energy and water resources, and in the management and reuse of waste. Understanding what drives the abundance and structure of coastal microbial communities and what impact human activities may have on that structure is an essential component in the design and construction of cities and towns that function within the capacity of their natural systems. Rosie’s work combines her long-standing interest in comparative genomics, evolutionary biology, and chemical ecology. She studies the microbial signals that elicit morphogenic responses in choanoflagellates, organisms that form important links between bacteria and higher levels of the marine food web and play key roles in the ecology and biogeochemistry of oceans and estuaries.

Born to grassroots community activists who were also professors at the University of Hawai‘i at Mānoa, Rosie’s childhood was filled with community service projects involving the Protect Kaho‘olawe ‘Ohana, Ka Papa Lo‘i o Kānewai, and the Union of Democratic Filipinos. These experiences afforded her unprecedented awareness of the social issues that faced Native Hawaiian and local communities in the 1980s and 1990s, and instilled in her the tenets of social justice, equality, and Aloha ‘Āina (love of the land) at a very young age. Indeed, over the course of her education – graduating from Kamehameha Schools, attaining an undergraduate degree at Massachusetts Institute of Technology, a PhD from Stanford University, and a postdoctoral fellowship at University of California, Berkeley (UC Berkeley) – these themes continued to permeate her life.

Two influences during high school set the trajectory of Rosie’s career – the first was Hui Lama, Kamehameha Schools’ environmental science and hiking club, and the second was the Honors Science Research program. Founded in 1974 by Dr. Charles Burrows, Hui Lama engaged high school students in environmental restoration projects as well as fieldwork with Hawai‘i’s top environmental scientists. From identifying a new species of spider on Keith Robinson’s land in Makaweli on Kaua‘i, to building erosion resistant trails in Haleakalā National Park on Maui, to counting native bird species in the rainforests of Puna and the tundra of Alaska, Rosie’s encounters with these unique people and places galvanized her desire to help preserve and protect Hawai‘i’s fragile ecosystems. In contrast, honors biology teacher Gail Ishimoto provided Rosie with her first taste of molecular biology. Together with Dr. Lawrence Mordan, a former researcher at the Cancer Research Institute of Hawai‘i, Rosie’s high school science fair project aimed to use comparative sequence analysis of mitochondrial genes to resolve the origins of the moanalo or Thambetochen, an ancient flightless Hawaiian bird that was most certainly driven to extinction by early Native Hawaiian settlers. Was it a goose or a duck? Rosie’s preliminary results supported the archeological data and incited her passion for molecular approaches and evolution.

Instead of staying in Hawai‘i for her formal education, Rosie felt she could make the most impact by being immersed in new and innovative modalities and bringing them back to Hawai‘i. Her interests in how organisms interact with their environment were fine-tuned toward...
deciphering the underlying molecular bases for these interactions. Rosie’s doctoral dissertation focused on chronic infection of the round worm *C. elegans* with the bacterial pathogen *Salmonella typhimurium*, a causative agent of food poisoning. Supported by a Ford Foundation Fellowship, Rosie sought to understand the nature of persistence in worms because the outcome of *Salmonella* infections in humans is reliant upon effective control of this pathogen in the intestinal tract.

In 2007, Rosie joined Dr. Nicole King at UC Berkeley in the Department of Molecular and Cell Biology in the hopes of bringing her expertise in microbiology to bear on understanding choanoflagellate-bacterial interactions. Choanoflagellates are marine microeukaryotes and the closest living relatives of animals; their study has yielded insights into the cell biology of the ancestor of animals. While at UC Berkeley, Rosie established an interdisciplinary program to understand the influence of bacteria on animal evolution; a question that forms the foundation of her current lab research. The species of choanoflagellate that Rosie studies, *Salpingoea rosetta*, forms simple rosette-shaped colonies and Rosie’s postdoctoral work centered on identifying the chemical signal that triggered formation of choanoflagellate colonies. The notion that bacterial signals could trigger the closest relatives of animals to transition between a unicellular and multicellular lifestyle has significant implications on how animals might have evolved. Could the trigger for animal multicellularity also involve bacteria? These are fundamental questions that Rosie hopes to answer here at UH Mānoa.

Ultimately, Rosie hopes to translate her findings from modeling microbial community dynamics to understanding the impact of land use in fragile Hawaiian estuarine and marine wetland ecosystems. Wetlands play crucial roles in decreasing the export of nutrients to downstream ecosystems and microbial communities, and control biogeochemical transformations important for improving water quality. By leveraging her training in classical microbial genetics with experience in evolutionary biology to model microbial community dynamics, Rosie will carry out both lab-based experimental modeling and field-based sampling of microbial populations in coastal environments such as He`eia Fishpond. This work promises to yield discoveries not only germane to the goals of the coastal sustainability initiative, but is the first of its kind to model the microbial processes underlying indigenous Native Hawaiian sustainability practices.

Throughout her undergraduate and graduate studies, Rosie never wavered in her desire to return home to Hawai‘i to serve her community. In many ways, she feels that she has come full circle, combining her love for Hawai‘i and scientific passion for the environment and ocean ecosystems. As a faculty member in the Department of Oceanography within the School of Ocean and Earth Science and Technology, Rosie embraces the idea of partnerships between research, outreach, and education, and between the community and the university. Most of all, she looks forward to combining fieldwork and molecular approaches to reveal the biology of organisms in the ocean ecosystem, and then bringing this knowledge back to her teaching, and fostering future young scientists with their passion for learning and love for our natural world.

Rosie would like to thank her `ohana (family) for instilling her with the values that she works to perpetuate every day. Without their unending support and aloha, she would not be able to carry out her research. Mahalo piha.
After spending over 15 years in Alaska pursuing her undergraduate and graduate degrees in engineering at the University of Alaska, both in Fairbanks and Anchorage, Oceana Puananilei Francis was thrilled to return home to Hawai‘i and join the other talented faculty members hired through the University of Hawai‘i Sea Grant College Program’s (UH Sea Grant) coastal sustainability hiring initiative. As a Native Hawaiian, she was always interested in sharing her passion for science and engineering with the next generation, and ever since she started her new position in 2012 she has been busy working to achieve this lofty goal.

As an assistant professor of civil and environmental engineering at the University of Hawai‘i at Mānoa (UH Mānoa), with a joint appointment to UH Sea Grant, Oceana has been sharing her belief that being an engineer can provide a unique opportunity to contribute to the shaping of our society. She believes that it is essential to foster a deep desire in her students to help their community understand how to tackle the most pressing problems of today. As an engineer, she understands the importance of being able to judge the long-range impact of her solutions and recommendations on society, and feels this is one of the most important traits she can pass on to her students.

Oceana has extensive academic and professional experience in the areas of civil engineering and atmospheric research with an emphasis on coastal engineering and sustainability, as well as green alternatives to water and wastewater management. Her professional engineering experience includes working for the State of Alaska doing water and wastewater engineering, and working for a private consulting firm doing rural sanitation, utilities, civil site design, and marine engineering. She also worked for the Alyeska Pipeline Service Company that services the Trans-Alaska Pipeline System doing piping and instrumentation work. Prior to returning to Hawai‘i, her overall research focused on the impact of sea states that affect shipping operations and coastal communities in western Alaska. The coastal waters of western Alaska are particularly vulnerable to severe sea states, and there is also limited knowledge of sea states and development in this region, which impedes arriving at a balance between cost-effectiveness and safety in engineered structures. Thus, to improve design and operational resilience, the objective of her research was to improve understanding of the specific linkages between atmospheric forcing and the resultant sea state.

Oceana is also a highly decorated engineer who has received many honors and awards for her achievements, including being a recipient of the Young Engineer of the Year Award from the Alaska Society of Professional Engineers, Fairbanks Chapter. She also served as president of the American Society of Civil Engineers, Fairbanks Branch.
and was actively involved with the Alaska Native Science and Engineering Program and American Indian Science and Engineering Society. Being Native Hawaiian by heritage, she enjoyed working with indigenous groups in Alaska, both as a professional engineer and as a mentor of undergraduate students. While she noted it was an honor to be selected for the awards, more importantly it reminded her of her commitment to service and to society as an engineer.

Currently, as an integral part of the coastal sustainability hiring initiative, her coastal sustainability research focuses on the impact to coastlines of wind and waves, and through her analysis she has cultivated expertise in the areas of meteorological and oceanographic field measurements, satellite measurements, and wave and coastal modeling. She plans to apply the oceanographic measurement methods she uses to assess sea-level rise and wave height increase in the Arctic to assess similar impacts of climate change in Hawai‘i.

Oceana holds a doctoral degree in atmospheric science from the University of Alaska, Fairbanks and a master of science in civil engineering from the University of Alaska, Anchorage. She also completed a postdoctoral fellowship at the University of Alaska, Fairbanks’ International Arctic Research Center.

In the future, Oceana is interested in expanding her focus to include:

- Applying green sewage management techniques learned while conducting work in rural sanitation in Alaska to Hawai‘i communities to update and improve current systems / methods in anticipation of future impact of coastal erosion on existing wastewater management systems

- Facilitating increased use of MATLAB based software at the University of Hawai‘i to encourage students to create wave models that they can use to gain hands-on analysis experience using the field data they collect

- Incorporating ‘Olelo Hawai‘i (Native Hawaiian language) into the modern civil engineering vocabulary, and validating Native Hawaiian engineering techniques to show they are mathematically sound and can be applied in the context of today’s environment
For as long as Wendy Meguro can remember, she has been fascinated, inspired, and soothed by the ocean. As a child, exploring tide pools, snorkeling, fishing, whale watching, cleaning up beach trash, swimming with wild dolphins, and learning at marine biology camp initiated a lifetime of love and respect for the ocean. The early life influence of family, friends, and communities motivated Wendy to care for the natural environment while preserving cultural heritage for future generations.

Recognizing that people care for the places that they love, Wendy entered architecture school at the University of Hawai‘i at Mānoa (UH Mānoa) with the desire to create vibrant, inspiring spaces that enhance everyday life. Designing with an awareness of the local climate, like harnessing daylight and breezes, seemed logical and under-utilized in many of today’s buildings that are overly air-conditioned and electrically-lit.

After graduating as the UH Mānoa School of Architecture valedictorian, Wendy headed to Massachusetts Institute of Technology to pursue a master’s degree in Architecture Studies in Building Technology. As she sought knowledge of more rigorous sustainable design methods that moved beyond design “rules of thumb,” she learned how to conduct physical and computational building simulations to quantitatively guide design decisions.

Eager to make a difference in “real-world” projects, Wendy joined Atelier Ten, an environmental design consulting and engineering firm, where she consulted architecture design and construction teams on energy efficiency, water conservation, stormwater management, visual and thermal comfort, material selection, LEED certification, and carbon emissions reductions. Working with a talented team, she guided institutions to create long-term sustainability plans as well as resource-efficient, comfortable buildings informed by technical analyses. For example, to implement building energy and water-saving strategies, the team quantitatively demonstrated annual utility cost and greenhouse gas savings, conducted interdisciplinary discussions regarding financial and space-planning feasibility, and ensured follow-through during the construction process. In eight wonderful years at Atelier Ten, she consulted on over fifty projects including the 17-acre Columbia University Manhattanville, the Department of Energy - Energy Efficient Buildings Hub, National Geographic Headquarters Masterplan, and the Rising Currents exhibit at the New York Museum of Modern Art.

During that time Wendy also taught graduate level courses at Parsons The New School for Design in New York City where she enjoyed sharing her design approach with students. For example, to create an energy-efficient or net-zero site energy building Wendy emphasized the following:

- doing more with less by shaping the building form to maximize passive systems
- selecting integrated efficient conditioning and lighting systems
- sizing on-site renewable energy systems

As a UH Mānoa School of Architecture faculty member hired through the University of Hawai‘i Sea Grant College Program (UH Sea Grant) coastal sustainability initiative, Wendy is thrilled by the opportunity...
to have a positive impact on the future of a place that she cares about dearly and calls home: Hawai‘i. Her excitement continues to grow as she interacts with the other six new sustainability faculty - a dream team of brilliant, accomplished, humble, caring individuals. Wendy is looking forward to working with them to have a meaningful, well-rounded influence on the future sustainability of Hawai‘i’s coastal communities.

In Fall 2013, as Wendy begins teaching, research, and outreach, her overarching goal is to make Hawai‘i’s coastal communities exemplars in energy and water-efficiency, resiliency, economic success, and social well-being. To assess where her efforts would be most useful, Wendy is in conversation with leaders in climate change research, high performance buildings, and policy-making. There are several research directions and steps that she is currently considering:

1. Enable Hawai‘i’s coastal communities to adapt to the effects of climate change.

Utilize the National Oceanic and Atmospheric Administration and UH maps on sea-level rise, hurricane inundation, and tsunami run-up, and ascertain their effects on the built environment (buildings, open space, transportation, utilities, etc).

Identify critical areas, survey potential adaptation and resiliency strategies, evaluate them through an environmental, social, and economic criteria, and create a resource of recommended adaptation and resiliency strategies for policymakers or property owners.

Collaborate with the UH Sea Grant Center for Smart Building and Community Design and other national and international efforts on this issue.

2. Elevate high-performance building design and renovation skills and standards in Hawai‘i.

Build upon current state, UH, and grass-roots efforts to reduce building energy and water use.

Offer training to building design professionals to more regularly use whole building energy simulation, daylight simulation, airflow simulation, water conservation and reuse calculations, and life-cycle cost analyses.

Collaborate with the Environmental Research and Design Laboratory at the UH Mānoa School of Architecture.

Renovate existing buildings and train facility managers to monitor and optimize energy and water efficiency. Work with governments and institutions to continually improve building energy and water performance standards.

3. Research and develop technologies to reduce energy and water consumption in buildings.

Collaborate with the UH Sea Grant Center for Smart Building and Community Design and

9 Ka Pili Kai
Bacteria. Not many people give this microscopic organism much thought, and if they do, it is often regarded as something that is best to avoid. Craig Nelson, one of the faculty members hired through the University of Hawai‘i Sea Grant College Program (UH Sea Grant) coastal sustainability initiative as an assistant researcher with the Center for Microbial Oceanography: Research and Education (C-MORE) via a joint appointment with the Department of Oceanography and UH Sea Grant, fortunately sees things differently.

Through his PhD in Ecology, Evolution and Marine Biology from University of California, Santa Barbara (UCSB) and five years as a researcher with the UCSB Marine Science Institute, Craig has become an expert in the ecology of microorganisms in water. He has come to regard bacteria as amazingly diverse, both in terms of number of species and in terms of their physiology. While the vast majority of these organisms are unknown, technological advances of the past few decades have shown that there are hundreds to thousands of bacterial species inhabiting every habitat imaginable, including the deepest oceans, rocks, ice, and every part of our bodies. In addition, bacterial communities are BUSY, recycling critical nutrients, photosynthesizing, and decomposing all types of organic material.

Because bacteria are so diverse, both taxonomically and physiologically, they play a key role in the transformation of energy and material that keep all ecosystems functioning...a role that other organisms cannot fill. This is especially true with most larger organisms: corals, fish, and humans could not live without the complex communities of symbiotic bacteria that protect them, help them digest food, and regulate how they interface chemically with their surroundings.

Accepting the position at UH Mānoa through the coastal sustainability initiative was an ideal fit for Craig’s background and interests because Hawai‘i is an ecosystem where human culture is tied to the health of coastal ecosystems, including watersheds, corals, and the vast ocean that surrounds the islands. Although microorganisms are a poorly understood piece of the puzzle, the way that terrestrial and marine ecosystems intertwine is fundamentally controlled by the activities of bacteria in these habitats.

In Hawai‘i, Craig is pursuing diverse projects examining the role of microbes in ecosystem health of reefs, ahupua‘a, and the sustainability of our coastal and ocean resources. Some example projects he is hoping to pursue are:
(1) How is the spread of invasive algae impacting the health of Hawaiian coral reefs by altering the number and types of microbes?
(2) What effect do different aquaculture approaches have on the microbes found in sediments, in the water, and in the fish populations?
(3) How do microorganisms living symbiotically with corals regulate their resilience to changes in ocean temperature, chemistry,
and the spread of algae? (4) What determines the types of bacteria delivered to beaches from streams, and how is this linked to land-use patterns? (5) How is bacterial diversity linked with the composition and source of organic matter delivered to the coastal ocean from land, sea, and local algae and coral?

Craig’s expertise lies at the interface of microbial ecology and ecosystem science, specializing in the structure and function of natural microbial communities in aquatic habitats such as coral reefs, lakes, streams, and the open ocean. By studying microorganisms such as bacteria and archaea in the context of the ecosystems which they inhabit, his research broadly aims to simultaneously shed light on their immense undiscovered diversity, and illustrate their collective role in controlling the key elemental transformations that sustain life on Earth. His core research goal is to understand the role that microorganisms play in coral reef ecosystems and their resilience to the intense pressures of a growing coastal human population, warming, and acidification of the oceans.

In addition to his research, Craig is hoping to make a positive impact on the next generation of scientists by teaching local and international courses on microbial oceanography, coral reef microbiology, and watershed science.

Through his research, both past and present, there has been a series of questions dominating his research, including:

**Coral Reefs** - What is the role of bacteria in coral health and reef metabolism? How do bacteria live symbiotically with corals? How do bacteria in coral reefs differ from the surrounding ocean? Are bacteria facilitating the spread of algae on reefs worldwide?

**The Open Ocean** - What do bacteria in the ocean eat? Is the diversity of these bacterial communities determined by the types of organic matter on which they specialize? How does their metabolism affect the global carbon cycle and carbon dioxide in the atmosphere?

**Coastal Landscapes** - How do bacterial communities change as water flows through watersheds? How does land use change the types of bacteria in watersheds? How do these changes impact the amount and types of bacteria released into coastal habitats? Are these bacteria harmful to humans?
Environmental economics may sound like an oxymoron. Most people associate economics with business interests that are largely unconcerned with the environment. Some may feel that economics is the source of environmental problems. However, economics concerns more than business activity. At its core, economics studies how people allocate scarce resources, including environmental resources. The environment connects to economics in that people value environmental resources in their own right, and environmental resources are essential inputs into producing almost all other goods.

As economists see it, the essence of environmental problems is that environmental goods are typically not priced like other goods, and so there can be little incentive to manage environmental resources efficiently. This basic insight, plus economists modeling skills, allows economists to help address environmental problems in at least four ways: (1) by characterizing the essence of environmental problems and determining when policy intervention may be needed; (2) point toward efficient solutions to problems; (3) help quantify tradeoffs between environmental goods and other kinds of goods; and (4) evaluate tradeoffs of specific policies.

In graduate studies at the University of California, Berkeley, Michael studied environmental economics, economic theory, and applied statistics. His dissertation used tools from finance to better understand natural resource prices, like oil, coal, and metal prices. Standard theories predict that prices for these kinds of resources ought to increase steadily over time. But until recently, the long-run trend has been flat or down. Michael attempted to explain this disparity by the way resource prices fluctuate with turns in the broader economy. For example, since oil prices often spike during recessions and fall during booms, investors may hold these resources as a kind of insurance. Such behavior could feed back and affect price trends in ways economists had not considered. The same phenomenon also affects valuation of investments that save energy resources, like solar and wind infrastructure.

Michael then went to work for the U.S. Department of Agriculture (USDA), where he examined how U.S. agricultural policies affect farm structure, land values, production, and conservation. This work made extensive use of data from the USDA Census of Agriculture, as well as some administrative data from programs like crop insurance and the Conservation Reserve Program. Michael showed how statistics, like average farm size, mask growing concentration of agricultural production on larger farms, and how traditional commodity support payments likely accelerate that trend. Other work showed that subsidies increased land values less than previously believed, indicating subsidies mainly benefit farmers, not landowners. Michael also considered different ways conservation goals might be
achieved at a lower cost. While working at USDA, he also taught econometrics at Johns Hopkins School of Advanced International Studies.

At USDA, Michael began collaborating with Wolfram Schlenker, a rising star environmental economist at Columbia University. Michael and Wolfram went on to statistically model crop yields and link them to weather patterns. Around the time that this work started getting attention, Michael was recruited to a faculty position at North Carolina State University (NC State).

Shortly after arriving at NC State, Wolfram and Michael published their statistical crop modeling work in the Proceedings of the National Academy of Sciences. His most influential work to date, it documents a strong, robust, and pervasive link between crop outcomes and exposure to extreme heat. This was considered unusual, because most crop modelers emphasize rainfall over temperatures.

When the authors extrapolated that relationship to projected climate changes it indicated sharp declines. This work and subsequent work by Michael, Schlenker, and David Lobell (a professor at Stanford University) showed this pattern to be even more pervasive, and has begun to unravel some of the underlying mechanisms. Schlenker and Michael have also used links with weather to disentangle the forces of supply and demand in world commodity markets, and to draw out inferences of ethanol policies on food prices.

Currently, Michael is continuing to work with Schlenker and Lobell on climate impacts. Most of this work involves detailed statistical analysis of massive databases on crop outcomes and weather. They are engaging with crop scientists and combining and comparing their statistical models with process-based plant models. These efforts should help to further unravel the mechanisms underlying the effects of extreme heat, inform strategies for adaptation, and improve predictions. Michael is also investigating how world commodity markets can adapt to a changing climate, with potentially lower and more volatile crop yields. A lot of this modeling involves grain storage, which will become more important as crop yields become more volatile.

Michael hopes to use some of his statistical and storage dynamics modeling skills to investigate Hawai‘i’s water resource challenges. Michael hopes to bring his statistical modeling skills to bear on aquifer modeling. The storage management tools he has used to model global food commodity prices should also be useful for evaluating alternative groundwater management strategies given uncertainties about climate change and sea-level rise. Michael is also delving into Hawai‘i’s energy challenges, especially those surrounding rapid growth of solar and wind, and how to best regulate a system with distributed generation.
Daniele Spirandelli joined the Department of Urban and Regional Planning (DURP) and the University of Hawai‘i Sea Grant College Program (UH Sea Grant) in the fall of 2012 as an assistant professor in coastal policy and community development. She came from the University of Washington in Seattle, WA where she completed a master’s degree in landscape architecture and pursued an interdisciplinary PhD in urban design and planning. While a student and graduate research assistant in the Urban Ecology Research Laboratory, Daniele was involved in research with scientists, planners, and policymakers from diverse backgrounds who collaborated to study coupled human-natural systems.

At the University of Washington, Daniele’s research focused on understanding the complex interactions between human and environmental systems. Her dissertation addresses human dimensions of coastal management policy by examining the mediation of urban development patterns and alternative wastewater infrastructures on shellfish habitat. This research bridges urban ecology theory with planning practice, and demonstrates an approach for studying a coupled human-natural system in an urban estuary.

As a faculty member hired through UH Sea Grant’s coastal sustainability initiative, she is thrilled to be an integral part of what she considers to be a truly ground-breaking effort to integrate the demands of society with a rapidly growing scientific understanding of the complex interdependence between humans and natural systems. She noted “In my opinion, there are no better ecosystems to study this than in island marine coastal environments. Here, the isolation of people and natural systems establishes an uncompromising need to focus on the short- and long-term implications of the planning and land use choices of island communities for nearshore ecosystems; a necessary passion that promises to drive the University of Hawai‘i at Mānoa (UH Mānoa) toward resolutions for environmental problems faced by coastal cities across the globe.”

Through her position at UH Mānoa, she has continued her research assessing the relationship between urbanization and the choice for central or decentralized wastewater disposal types and the implications for coastal ecosystem services. This empirical work focuses on spatial measures of urban development across the Puget Sound in Western Washington, and examines patterns of development and wastewater choices in urban, suburban, and rural coastal basins. This research also studies the association with indicators of water quality in shellfish growing areas and recreational beaches. In the near future she plans to extend the approach and analysis to coastal basins in Hawai‘i.
As with all of the faculty hired through UH Sea Grant’s coastal sustainability initiative, Daniele’s education and experience is truly interdisciplinary. She has experience with sustainable energy and water systems at the building and neighborhood scales, urban hydrology as it relates to in-stream flows and stormwater pollution, retention and detention strategies, wastewater treatment alternatives, terrestrial biogeochemistry, and economic valuation techniques for ecosystem services. Her research in the Puget Sound informed her about the science behind climate change, particularly as it relates to sea-level rise, ocean acidification, and coastal adaptation strategies.

For Daniele, being a part of the interdisciplinary coastal sustainability initiative represents an opportunity to do policy-relevant interdisciplinary research with a talented group of scholars across the university, and with the unequivocal support of UH Mānoa, which is a rare and unusual prospect in academia. In addition, the fit within UH Sea Grant’s program to explicitly focus on coastal sustainability combined with community outreach is key to making her research relevant, understandable, and usable by decision-makers, community groups, and other user groups of coastal ecosystems.

The challenges communities are facing across the globe are complex in nature, particularly in the face of climate change, and solutions require collective thinking and problem solving across disciplines and institutions. Sometimes even trying to articulate the nature of the problem involves experts and scientists across many disciplines. This is because with complex problems a) the science is still evolving, so there is some uncertainty in the details of how the system works; b) it involves the future; and it is hard to predict the future, and c) people have different views on the best decisions or strategies for how to solve these problems. Back in 1973, Rittel and Weber described these types of problems as “wicked problems.”

As a cohesive group, the faculty members will bring their varied and extensive expertise to tackle these “wicked problems” in Hawai‘i, which can then also be applied to many other areas of the region and the world. There are several examples of complex problems in Hawai‘i, for example, ensuring that there is enough available water in our coastal aquifers for future generations, and adapting our coastal areas to climate change. To Daniele, one of the most exciting aspects of this position is to work with a group of enthusiastic researchers to think collectively and across disciplinary boundaries about complex problems in Hawai‘i and other tropical coastal areas.
Mehana Blaich Vaughan grew up on the island of Kaua‘i in a district called Halele‘a. The area is known for its beauty and wealth of fresh water, and also for being a close-knit population with long-standing community roots. As a child she was raised on a small farm that grew citrus fruits and bananas for local fruit stands and for the schools in the community, and she spent many days hiking and exploring remote coastal regions with her father. Her grandmother was a wili lei maker which instilled in her an understanding of what you can use and create from available resources since each location makes a different kind of lei. Because of this upbringing and also her parent’s influences, she holds a deep appreciation for Hawai‘i’s natural resources, the power of place, and the beauty of the natural world.

As one of the newest members of the coastal sustainability hiring initiative, Mehana is able to meld her commitment to community based natural resource management with her new position at the University of Hawai‘i at Mānoa (UH Mānoa). Starting in the fall of 2013, Mehana began serving as an assistant professor in UH Mānoa’s Department of Natural Resources and Environmental Management with a joint appointment to the University of Hawai‘i Sea Grant College Program and Hui ʻĀina Momona. Through these positions, she works with a consortium of scholars who collaborate with Hawai‘i communities to develop solutions to natural and cultural resource management, food security, and sustainability issues.

Her commitment to her community and a desire to return home and give back was always a driving factor in her decision to pursue higher education. She was fortunate enough to come from a family that provided her with abundant educational opportunities, which was not necessarily true for everyone in her community. After completing college and her master’s degree and working as a middle school teacher in the Department of Education, Mehana returned to teach outdoor education programs for students of all ages on her home island. She focused on developing place-based outdoor education programs with Kaua‘i community groups. Student interviews and reflections showed they clearly retained more when they learned in this multi-sensory way, and that learning on field trips offered rich learning experiences which could then be reinforced in the classroom. Assisting with mālama ʻāina made students feel that their learning mattered, and increased their engagement and interest in future careers. Many of the youth she worked with wanted to be involved in resource management locally, however, the college programs and jobs open to them did not provide the opportunities they were seeking. To tackle this issue and create programs at the college level, Mehana went
back to school to pursue a PhD in natural resource policy and environmental studies from the Emmett Interdisciplinary Program for Environment and Research at Stanford University. There she had the unique opportunity to work with talented teachers and scientists who were dedicated to sharing their findings in a way that could shape policy and inform the public in a meaningful way. Students were encouraged to focus their scholarship on issues they cared about, and that were meaningful and applied.

Mehana’s dissertation research focused on community stewardship of natural resources in Hawai‘i through a case of collaborative management of a coastal fishery in Hā‘ena, Kaua‘i by government agencies and community members. She investigated the creation of state law based on customary local management practices, and suggested means of improving the initial phases of collaborative resource management partnerships. She also worked with Native Hawaiian fishermen to understand community level benefits created through sharing of subsistence harvests. She was particularly interested in how values of traditional management get translated into formal state law. In addition, she delved into questions of “How to define community?” “What do natural resources mean to diverse user groups within a community?”

The interdisciplinary nature of the coastal sustainability initiative is a perfect fit for Mehana, and is part of what interested her in the position. She knows environmental challenges require many different individuals working together, bringing multiple skill sets to look at all sides of an issue. She is excited to help future generations of community leaders develop these skills and the ability bring them together to create yet unimagined solutions.

Mehana’s future research includes:

Investigating and enhancing community capacity to monitor the health and use of natural resources, as well as to enforce sustainable harvest practices

Documenting stories of community leaders and policy makers in Hawai‘i with decades of collaborative, local level, resource management experience whose knowledge of past agreements, land uses, and planning efforts are invaluable

Understanding how Hawaiian values and practices related to resource care and management are being transmitted and changing across generations

Investigating effects of land use on coastal fisheries at the ahupua‘a level.
Selected UH Sea Grant Publications

Homeowner’s Handbook to Prepare for Natural Hazards
This 116-page free handbook was specifically developed for the homeowner, and outlines effective ways to significantly lower risks to lives and property. Approximately 75,000 handbooks have been distributed to stakeholders throughout the state, and UH Sea Grant has also assisted eight Sea Grant programs in developing their own state-specific versions.

The 3 ‘Io Brothers and THE BIG BAD HURRICANE
Partnering with NOAA’s National Weather Service in Honolulu, UH Sea Grant published a children’s hurricane preparedness book titled “The 3 ‘Io Brothers and THE BIG HURRICANE.” Books were provided to over 300 public elementary school libraries and throughout the State of Hawai‘i public library system. The book was also featured at the 2011 Hurricane season press conference hosted at the Central Pacific Hurricane Center.

Hawai‘i Coastal Hazard Mitigation Guidebook
UH Sea Grant authored and published the “Hawai‘i Coastal Hazard Mitigation Guidebook” for audiences ranging from developers and architects to homeowners and government officials. The book describes how to reduce risks to coastal development by proactively planning for hazards such as erosion, flooding, tsunamis, and hurricanes. The Federal Emergency Management Agency used the guidebook extensively in its rebuilding efforts after the devastating 2005 Atlantic hurricane season, and the author also worked with the Louisiana and Mississippi Sea Grant programs to write a derivative Gulf Coast guidebook.

Reef and Shore Fishes of the Hawaiian Islands
Authored by esteemed ichthyologist, Dr. John E. Randall, UH Sea Grant produced a comprehensive, scholarly guidebook titled “Reef and Shore Fishes of the Hawaiian Islands.” The 560-page volume covers the 612 species of fish found in the Hawaiian Archipelago to 200 meters depth. In 2008, the book won the Award of Excellence in Natural Science at the Ka Palapala Po‘okela awards which honor the finest books published Hawai‘i.

Hawaiian Reef Plants
UH Sea Grant produced a comprehensive guidebook to marine plants titled “Hawaiian Reef Plants.” The book was written by John M. Huisman, Isabella A. Abbott, and Celia M. Smith, three of the world’s leading botanists. UH Sea Grant produced this guidebook in recognition of the lack of a scholarly book on Hawaiian marine plants. In 2008, “Hawaiian Reef Plants” was awarded the Honorable Mention in Natural Science at the Ka Palapala Po‘okela awards.

Snorkeler’s Guide to the Fishes of Hanauma Bay
UH Sea Grant produced a popular book titled “Snorkeler’s Guide to the Fishes of Hanauma Bay” authored by Dr. John E. Randall. This 65-page waterproof guide provides color photographs, names, and descriptions of the fishes commonly viewed by snorkelers and swimmers at Hanauma Bay. As a result, visitors to the Hanauma Bay Nature Preserve have a resource that enriches their visitor experience and encourages protection and conservation of Hawai‘i’s unique natural resources.

Sustainability Case Studies
UH Sea Grant coordinated the development of four case studies on the sustainability of water resources, energy sustainability, nearshore coastal ecosystems, and fishery resources. The case studies facilitate the teaching and understanding of scientific concepts fundamental to developing a well-rounded understanding of sustainability issues.
Lauren Esaki, who grew up in the small town of Kapa‘a between the Makaleha Mountains and Kapa‘a beach on the island of Kaua‘i, was selected for the 2013 summer internship. A large part of her interest in the internship and her focus on community, environmental, and land use issues came from her parents - her father is a farmer-turned-small business owner and her mother is a public attorney.

After graduating from Kapa‘a High School, Lauren left the islands to attend the University of Southern California in the heart of Los Angeles. With a desire to pursue a field that could make a positive impact on the islands’ natural resources, she pursued a degree in the social sciences and majored in public policy, management, and planning. Lauren felt, and still feels, that through policy and planning efforts there are many opportunities to engage with the drivers of so many issues that plague our environment - people. Lauren decided to further pursue studies in the social sciences and has since moved back to Hawai‘i where she is now enrolled in a master’s degree in planning with a focus on environmental planning and natural resource management.

What Lauren appreciated most about the Peter J. Rappa Sustainable Coastal Development Internship was the opportunity to see planning and outreach in action and in a real-life setting. This internship has not only grounded what she is learning in her classes, but has also given her the opportunity to be exposed to the various agencies and organizations UH Sea Grant collaborates with to address coastal and sustainability issues across the state. One of the projects Lauren focused on over the summer was the Kaua‘i Climate Change and Coastal Hazards Assessment. She mentioned “In conducting the literature review on what other states, cities, and even countries have been doing to tackle climate change adaptation, I have learned how difficult yet extremely important decision-making can be in the face of uncertainty and at the highest levels of planning.”

Lauren noted “I feel very fortunate to have had this opportunity as a Peter Rappa intern to build on my environmental planning experiences in Hawai‘i. In particular, I would like to expresses my thanks to Myrtle Ching-Rappa and all of the UH Sea Grant faculty who graciously welcomed me into the UH Sea Grant program this summer.”
Explore Hanauma Bay with University of Hawai‘i Sea Grant College Program’s digital fish guide! The Hanauma Fish app provides users access to full color images, names (English, Hawaiian, and scientific), and descriptions of the fishes most commonly viewed by snorkelers and swimmers at Hanauma Bay. Authored by Dr. John E. Randall, world renowned ichthyologist, this app is based on UH Sea Grant’s top selling waterproof fish book “Snorkeler’s Guide to the Fishes of Hanauma Bay.” Hanauma Fish identifies 114 species of reef and shore fishes that are likely to be encountered in the waters of Hanauma Bay. They are organized by fish family in a user-friendly format with accompanying facts. All available right at your fingertips! Visit the iTunes store today!

For more information, please visit: http://seagrant.soest.hawaii.edu/hanauma-fish or call (808) 956-7410.