



Photo credit: Alan Waiti

USC Sea Grant's Urban Ocean Report, Spring 2015

URBAN MARINER

The Call of the Running *and Rising* Tide

USC Sea Grant answers the call for climate change science, adaptation, planning and education in Southern California

I must go down to the seas again, for the call of the running tide

Is a wild call and a clear call that may not be denied

—John Masefield 1902, from the poem "Sea Fever"

Poet John Masefield was not alluding to sea level rise in his turn-of-the century poem, but his words ring eerily true today when we consider the clear and undeniable evidence for the running *and rising* tides. Just four years ago when we wrote our Spring 2011 climate change issue of the *Urban Mariner*, it felt like we were on the cusp of change—new climate change assessments were being developed by the State of California, new models were providing down-scaled climate information accessible to local municipalities, and the new concept of ‘adaptation,’ in parallel with ‘mitigation’ (efforts to reduce GHG emissions), was being embraced by progressive communities.

Just four year later, we are deep in the middle of a changed world. In 2013, the Intergovernmental Panel on Climate Change (IPCC) released a fifth assessment report, *Climate Change 2013: The Physical Science Basis*, with a serious tone that comes with reporting undeniable facts rather than predicting an uncertain future.

Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.

(IPCC Report, Summary for Policymakers, p. 2)

In May 2014, the National Climate Assessment was published, and, following suit, documented these and numerous other cases of climate change happening now throughout the United States. In 2013, the State of California released (*con't on page 2*)



The Call of the Running *and Rising* Tide (con't)

Indicators of Climate Change in California, a report focused on compiling and characterizing scientifically-based information that conveys the extensive list of changes and impacts from climate impacts currently observed in the state. Here in California, one effect of climate change—sea level rise—generates great concern for coastal cities. And the sea is already rising. NOAA reports a 1.016 - 2.54 mm¹ (0.04-0.1 inches) rise in sea level over the last one hundred years, and a recent NOAA report² on “nuisance flooding” shows increases of 300-900% on all three U.S. coastlines since 1960.

So now that climate change and adaptation are a given; the real question is, *how* are coastal communities adapting? In order to more precisely identify community needs, USC Sea Grant led an effort, in partnership with 15 organizations, including California state agencies, to: 1) survey coastal professionals with the goals of understanding the needs and barriers of coastal communities in planning for climate change; 2) develop appropriate technical assistance for communities; and 3) determine the best ways to link communities to resources and tools already available.



January 20, 2015 King tide at China Cove, Corona Del Mar.
(Photo credit: Gayle Rindge)

Based on the survey results, close to 90% of communities up and down the California coast in 2011 were beginning to incorporate climate adaptation into their planning. The majority of those communities (~50%) were still trying to understand their vulnerabilities; a smaller percentage (~10%) of communities were actively developing adaptation plans. Notably, this was a reversal of results from the same study conducted five years prior (Moser and Tribbia 2006/2007; Tribbia and Moser 2008), in which only 10% of respondents stated that they were considering climate adaptation in their planning. The most common barriers that communities faced in planning were lack of staff and financial resources to conduct assessments, develop plans, and then implement strategies. These are, without a doubt, significant hurdles.

These survey results caught the attention of the California Ocean Protection Council, which, accordingly, developed a \$2.5 million-grant program in 2013 to help provide financial resources to local communities. Over the last four years, USC Sea Grant has been working with the City of Los Angeles and other Southern California cities and counties, as well as formal and informal educators, to help build scientific understanding of climate change and sea level rise and to help build capacity within local municipalities to develop adaptation strategies. This is an exciting and rare example of science, policy and education all working together simultaneously and quickly adapting to new information. USC Sea Grant is very excited to be waist-deep...well, maybe neck-deep :) ...in all aspects of this groundbreaking work.

For more information on the reports mentioned here:

Indicators of Climate Change in CA: <http://oehha.ca.gov/multimedia/epic/pdf/climatechangeindicatorsreport2013.pdf>

National Climate Assessment: <http://nca2014.globalchange.gov/>

USC Sea Grant's Climate Change Survey: <http://dornsife.usc.edu/uscseagrant/2011survey/>

IPCC (IPCC) Report—Climate Change 2013: The Physical Science Basis: <http://www.ipcc.ch/report/ar5/wg1/>

OPC 2013 Grant LCP Grant Program Announcement: http://www.opc.ca.gov/webmaster/ftp/pdf/docs/LCP2013/LCP_SLR_Program_Announcement_FINAL

¹ <http://oceanservice.noaa.gov/facts/sealevel.html>

² http://www.noanews.noaa.gov/stories2014/20140728_nuisanceflooding.html

At the Helm: From USC Sea Grant

At the helm of this fourteenth issue of the *Urban Mariner*, USC Sea Grant's Urban Ocean Report, is Associate Director, Phyllis Grifman.

Have you ever had the experience of seeing someone coming down the street from afar, and although you *think* you know who it is, he or she isn't quite recognizable from that distance? That's the way it seems to be for coastal planners and coastal community managers considering sea level rise and shoreline change. We know something is coming...something is happening...but we can't quite see clearly enough to identify it with any precision.

Sea levels are certainly rising; all of the scientific evidence points to that fact. But knowing exactly how to plan for it—in terms of structures, inhabitants, businesses, and recreation—is difficult. USC Sea Grant has been working with top modelers to ensure that state-of-the-art sea level rise and coastal change models are available to help coastal communities predict shoreline change, impacts on coastal assets, and potential impacts to the social and economic fabric of coastal life.

While scientists are working diligently to develop the latest and greatest sea level rise models for Southern California, USC Sea Grant is laying the groundwork for successful adaptation planning by working directly with coastal managers, planners, and leaders throughout Southern California. As we have heard from our stakeholders again and again, it is not enough to just hand over the science when it is ready. USC Sea Grant plays an important role as a boundary organization, providing the technical assistance, training and outreach to help build capacity in coastal communities as they begin to plan for impacts from sea level rise. Two major capacity building projects underway include the *Regional AdaptLA* project (which includes L.A.'s 11 coastal municipalities and L.A. County) and the *Southern California Coastal Impacts Project (SCCIP)*, which focuses on capacity building and technical assistance on the *Coastal Storm Modeling System (CoSMoS)* for Southern California coastal communities.

Previous issues of the *Urban Mariner* can be found at: <http://dornsife.usc.edu/uscseagrants/urban-mariner/>



Phyllis Grifman, Associate Director, USC Sea Grant

Spring 2015 Climate Change Related Workshops and Webinars

Capacity Building Workshops for Regional Sea Level Rise Planning

- Regional Orange County Sea Level Rise and Coastal Impacts Workshop, February 23, 2015
- Santa Barbara/Ventura Regional Sea Level Rise & Coastal Impacts Workshop, April 14, 2015
- Regional AdaptLA Professional Development Workshop – Social Vulnerability Training, April 21, 2015

Regional AdaptLA Webinar Series - Capacity Building for Southern California

- *Envisioning Future Impacts through King Tides and Storms*, January 12, 2015
- *Why Beaches Matter – Beach Dynamics and Ecology in Southern California*, March 17, 2015

Visit our website to stay up-to-date on upcoming webinars, workshops and topics!

<http://dornsife.usc.edu/uscseagrants/climate-change/>



The Science: Sea Level Rise and Modeling

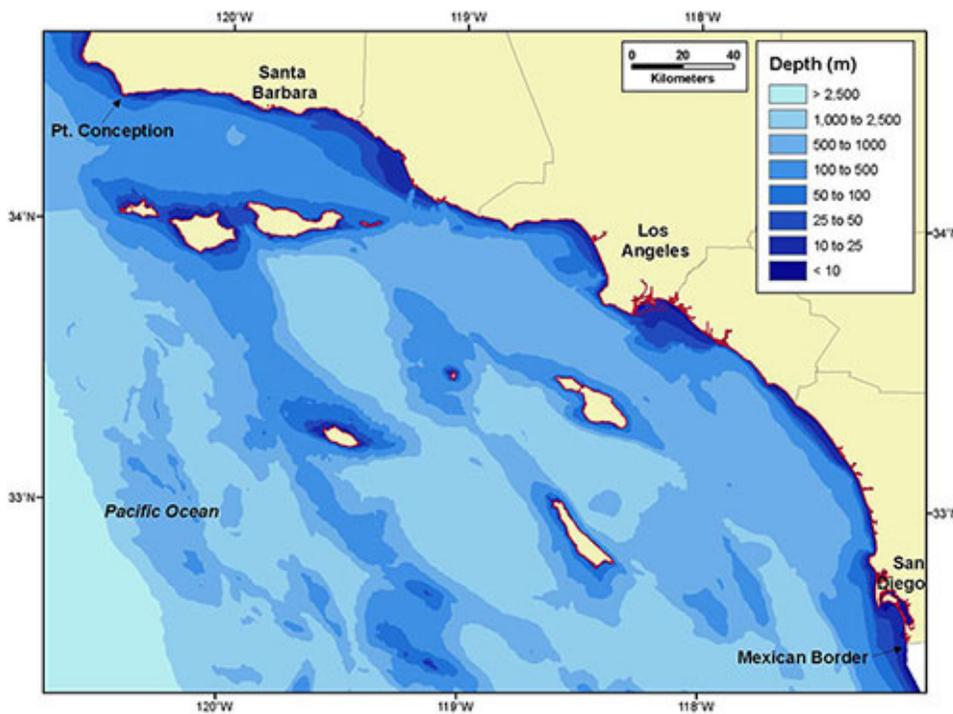
The scientific principles behind climate change and sea level rise are complex. As described in the 2014 National Climate Assessment, the two main sources of sea level rise globally are increased water temperatures and melting of land-based glaciers.



The oceans cover more than two-thirds of the Earth's surface and play a very important role in regulating the Earth's climate and in climate change. Today, the world's oceans absorb more than 90% of the heat trapped by increasing levels of CO₂ and other greenhouse gases in the atmosphere due to human activities. This extra energy warms the ocean, causing it to expand and sea levels to rise. Of the global sea level rise observed over the last 35 years, about 40% is due to this warming of the water. Most of the rest is due to the melting of land-based glaciers and ice sheets. –National Climate Assessment, 2014

Over the next century, sea level rise in the Los Angeles (L.A.) region is expected to match global projections with an increase of 0.1 - 0.6 m (5 - 24 inches) from 2000 to 2050 and 0.4 - 1.7 m (17 - 66 inches) from 2000 to 2100. There are also important local influences on sea level rise, including the limiting or exacerbation of inputs of land-based water (rivers, precipitation and run-off) into the ocean as well as tectonic activity and subsidence. Similarly, currents, tides, wave-driven run up and storm surge sometimes cause coastal flooding in Southern California, especially when storms occur at or near peak high tides (aka king tides). Sea level rise will exacerbate the impacts from these events.

To help bring the best scientific information to the region, we have partnered with the U.S. Geological Survey (USGS) to develop an updated version of their *Coastal Storms Modeling System* (or CoSMoS) for Southern California. In 2010, Dr. Patrick Barnard and his USGS team developed CoSMoS, a region-specific numerical modeling system that projects coastal flooding and erosion driven by climate change, not only from sea level rise (SLR) but from future storms as well.



Example of flooding hazards predicted from the CoSMoS hindcast of a January 2010 storm, with and without sea-level rise scenarios, in the region of Venice and Marina del Rey, CA (Photo Credit: CoSMoS)

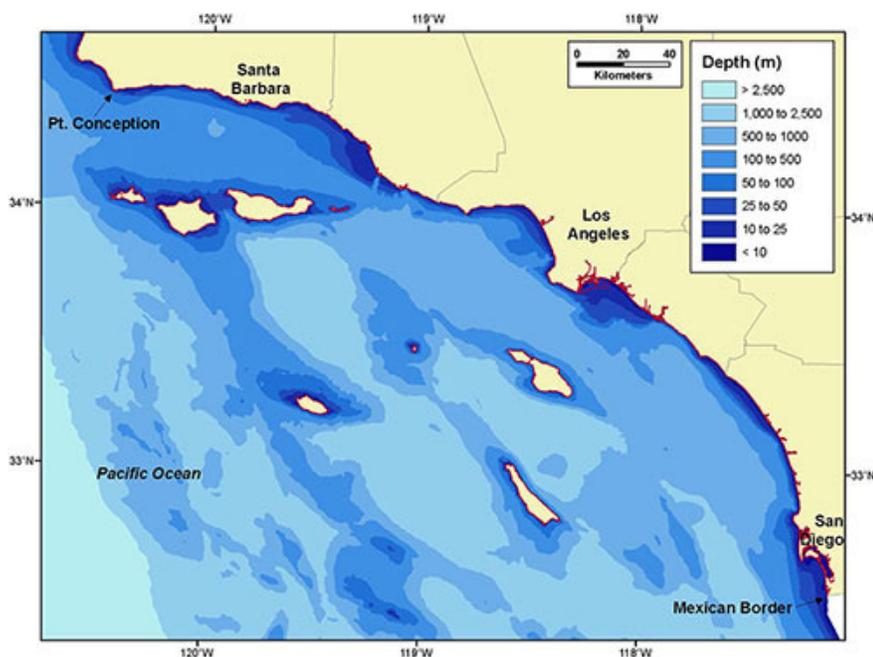
The first iteration of the model (CoSMoS 1.0) was developed as a pilot project for the Southern California region. It hindcast, or recreated, a January 2010 storm, that persisted in the area for several days and led to considerable coastal flooding. Such a storm is anticipated to occur approximately every ten years (or a 10 percent probability of occurrence in any given year). The model then projected coastal flooding from a similar 10-year storm, in conjunction with two sea level rise scenarios—0.5 m of sea level rise (predicted for ~2050) and 1.4 m of sea level rise (predicted for ~2010). (con't on p. 5)

The Science (con't): Sea Level Rise and Modeling

Sea Grant used the CoSMoS 1.0 model in its first sea level rise vulnerability assessment for the City of Los Angeles. Then Dr. Barnard and his colleagues moved up the coast to the San Francisco Bay Area where they developed a modified and more dynamic model (version 2.0), which included a broader suite of sea level rise and storm scenarios and included the development of a user-friendly interface.

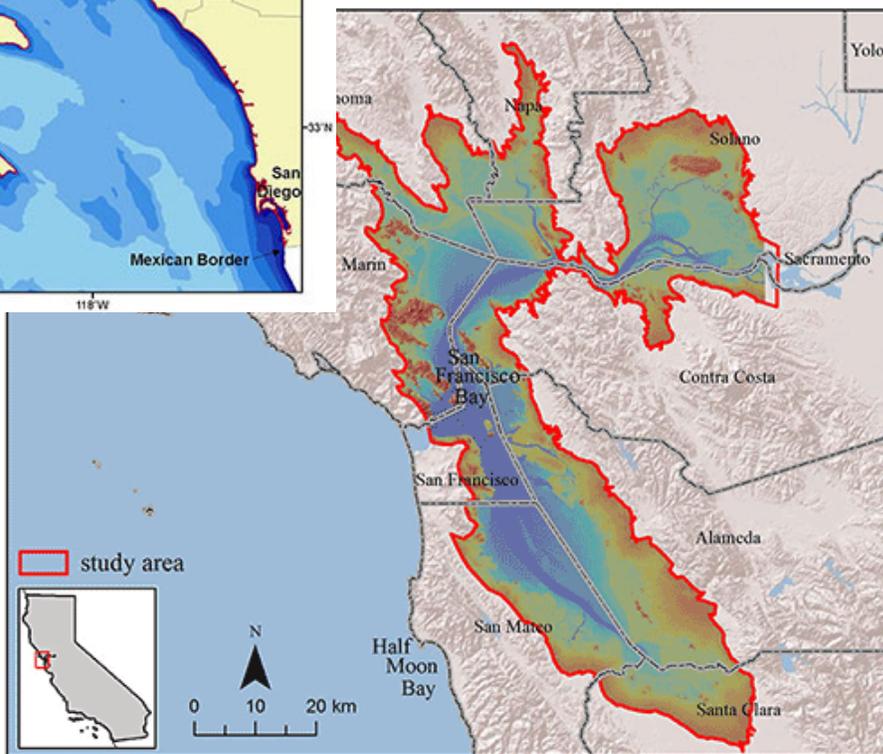
The CA Coastal Conservancy has now funded USGS to return to Southern California to update the model for our region. This updated version of CoSMoS (version 3.0) will build on the improvements of the previous version, which includes a suite of 40 scenarios that incorporate 0 – 2m (and 5m as a catastrophic scenario) of sea level rise and storm scenarios ranging from a common annual storm to the infamous 100-year storm that can inflict significant coastal damage. CoSMoS 3.0 also will consider the compounding impacts to the coastline from erosion, shoreline change, and inputs from riverine sources. For the L.A. County coastal region, the CoSMoS models will be supplemented by additional modeling by other leading consultants (ESA and TerraCosta Consulting), to provide even more detailed information on beach changes and backshore shoreline change. The more factors considered, the more accurate these models can be. As we describe in more detail in the *In Depth* section of this *Urban Mariner*, USC Sea Grant will move beyond the science and take the lead on ensuring this modeling information is available to, and understandable by, coastal communities.

For more information: <http://dornsife.usc.edu/usceseagrantsccip/>



The first iteration of the model, CoSMoS 1.0, was developed as a pilot project for the Southern California region. (Photo credit: CoSMoS)

The second iteration of the model, (CoSMoS 2.0), was developed while working on the San Francisco Bay Area. (Photo credit: CoSMoS)

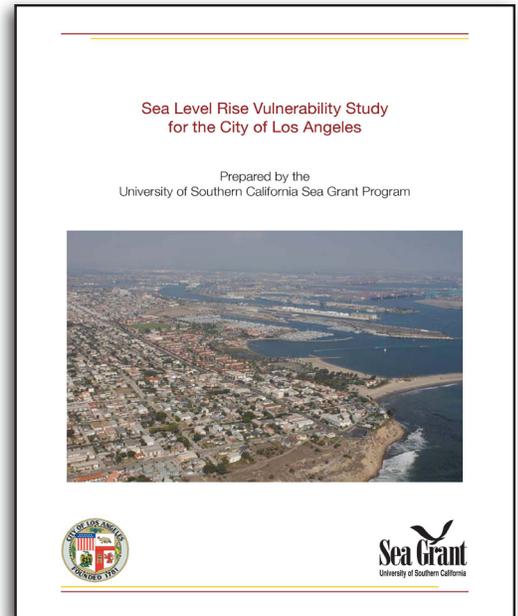


In Depth: USC Sea Grant's Climate Change Projects

In this section we explore Sea Grant's primary climate change adaptation science, adaptation, and planning projects. These projects range from work with individual jurisdictions to ones that encompass the broader L.A. region and Southern California.

Sea Level Rise Vulnerability Study for the City of Los Angeles

The City of Los Angeles, and its many critical coastal assets are at risk from coastal storms and sea level rise. The City owns and operates coastal infrastructure that includes two power plants, two wastewater treatment plants, and the Port of L.A., one of the busiest ports in the world. All this critical infrastructure is situated about ten feet above sea level. In 2011, the City of L.A. commissioned a sea level rise vulnerability assessment for City assets, resources and communities. USC Sea Grant recruited a team of experts in climate science, adaptation planning, and social science to develop a science-based and stakeholder-supported adaptation planning process to help the City begin assessing the potential impacts of climate change. USC Sea Grant developed the final summary report for the City. *The Sea Level Rise Vulnerability Study for the City of Los Angeles* was released in January 2014 with support from the Office of Mayor Eric Garcetti.



The social vulnerability assessment, conducted by Drs. Susanne Moser and Julia Ekstrom, examined the sensitivity and adaptive capacity of L.A.'s coastal populations; the results were particularly powerful. U.S. Census data was utilized to screen for socioeconomic characteristics associated with social vulnerability—large proportions of renters, low per capita income, language barriers, persons with physical disabilities—that typically characterize a low capacity for adapting to change. The study found that the communities of Venice, Wilmington and low-lying portions of San Pedro have the highest vulnerability to sea level rise impacts, and the study provided some recommendations to work with these communities to identify potential adaptation strategies.

Two other critical outcomes emerged from this project. The first was the recognition that the beaches along the L.A. coastline are the region's best defense against flooding from sea level rise. Maintaining these beaches will provide an important buffer to coastal storms and sea level rise for many years to come. There is currently, however, a paucity of information on how exactly the beaches will respond to these impacts over the longer term. Understanding this response in shoreline change is therefore a critical need in this region.



Belmont Shore, Long Beach. King Tide on January 19, 2015.
(Photo credit: Holly Rindge)

The second outcome was the acknowledgement that it is vital to consider the impacts of sea level rise and coastal storms from a regional perspective. What happens to the beaches within the confines of the City of L.A. has broad impacts beyond City boundaries, and in parallel, decisions made by other coastal communities will impact their neighbors and the entire region.

For more information: <http://dornsifecms.usc.edu/uscseagrant/la-sl/>

In Depth (Con't): USC Sea Grant's Climate Change Projects

Regional Adapt LA

Ultimately, outcomes from the 2011-2014 L.A.-focused sea level rise study became the driving force behind developing *Regional AdaptLA*. With the City of Santa Monica as the grant applicant, USC Sea Grant, the Los Angeles Regional Collaborative on Climate Action & Sustainability (LARC), Heal the Bay, the Santa Monica Bay Restoration Commission, 11 coastal jurisdictions and the County of L.A. were awarded a grant in 2013 from the California Ocean Protection Council (OPC) under the Local Coastal Program Sea Level Rise Adaptation Grant program. This grant funds the development of a shoreline change and coastal erosion model for the Los Angeles region (and is discussed in detail in *The Science* section of the this *Urban Mariner*).



Redondo Beach during the December 22, 2014 King Tide.
(Photo credit: Juliette Hart)

In parallel with the modeling work, USC Sea Grant has been awarded a grant through the California State Coastal Conservancy to develop strong stakeholder engagement and to help build scientific and planning capacity throughout the L.A. region to ensure that model results are accessible and understandable to coastal communities. Through a series of in-person workshops, Sea Grant is providing training on important components of adaptation planning, such as conducting vulnerability assessments (including social vulnerability). Workshops will also provide guidance on developing adaptive management policies to ensure the incorporation of the best available science.

In addition, we have launched a professional development webinar series that dives deeply into different topics of importance for coastal communities in their adaptation planning. Recent webinars include: the role of coastal storms, king tides, and a beach dynamics and ecology primer. Future webinars will include: discussions on the legal and economic implications of sea level rise and adaptation planning; ecological considerations; an overview of adaptation strategies and how these mesh with current state and federal guidance and mandates; and case studies from other communities in California and other parts of the country.

For more information: <http://dornsife.usc.edu/uscseagrant/adaptla-webinars/>

Southern California Coastal Impacts Project

As with *Regional AdaptLA*, USC Sea Grant will provide technical assistance and outreach on the U.S. Geological Survey development of a coastal storm modeling system (CoSMoS) for the Southern California region, and will help build capacity in coastal communities as they begin to plan for impacts from sea level rise. We have held a series of introductory workshop in Santa Barbara, Ventura, Orange County and San Diego to provide an overview of available scientific information. Workshops include information on what to expect from the emerging models, and training on how to develop appropriate vulnerability assessments and integrate adaptive management into planning processes. When model results become available in June 2016, Sea Grant will provide technical assistance on interpreting and working with model results. Participants in the Southern California project are also invited to our professional development webinar series to have the opportunity to learn about more detailed aspects of coastal change.

For more information: see *The Science* section of this *Urban Mariner* and <http://dornsife.usc.edu/uscseagrant/sccip/>

In Depth (Con't): USC Sea Grant's Climate Change Projects

Statewide and National Leadership

USC Sea Grant plays leadership roles on several regional, statewide and national efforts. This allows us to share the successes of our local work as well as share lessons learned with other communities engaged in climate adaptation planning. Below, we highlight a few of these efforts.

The Los Angeles Regional Collaborative for Climate Action & Sustainability (LARC)



LARC is a network designed to encourage greater coordination and cooperation at the local and regional levels by bringing together leadership from government, the business community, academia, labor, environmental and community groups. The purpose of this collaboration is to share information, foster partnerships, and develop system-wide strategies to address climate change and promote principles of a green economy through fostering sustainable communities. USC Sea Grant leads LARC's Coastal Impacts Group and has served on its steering committee since shortly after LARC's inception in 2009. LARC is working to develop a *Regional Framework on Climate Action and Sustainability* in order to:

- 1) establish baselines of current greenhouse gas emission levels,
- 2) identify greenhouse gas emission reduction targets and mandates,
- 3) develop a mechanism for tracking progress in reducing those emissions,
- 4) identify a full range of measures for reducing greenhouse gas emissions and adapting to climate change, and
- 5) provide strategies to help meet those goals.

The Alliance of Regional Collaboratives for Climate Adaptation (ARCCA)



ARCCA is a statewide network comprised of existing regional collaborative organizations from across California, including LARC. USC Sea Grant serves as a voting member of ARCCA, representing the L.A. region. ARCCA's members represent leading regional collaboratives that are already coordinating and supporting climate adaptation efforts in their own regions. Through ARCCA, member regional collaboratives have come together to amplify and solidify their individual efforts, as well as to give a stronger voice to local and regional perspectives at state and federal levels. ARCCA members share information among regions on best practices and lessons learned; identify each region's most innovative and successful strategies; and then determine how these strategies could be adapted to another region's particular needs. As a result, ARCCA bolsters the efforts of member regional collaboratives and empowers those interested in forging new regional partnerships.

For more information: LARC: <http://www.laregionalcollaborative.com/> ARCCA: <http://www.arccacalifornia.org/>

USC Sea Grant hosts meetings such as this one, where municipal officials as well as state, federal and local organizations convene to learn about climate science, begin to plan for sea level rise vulnerability assessment and adaptation, and network with colleagues from near and far (Photo credit: Victoria Balentine)



In Depth (Con't): USC Sea Grant's Climate Change Projects

West Coast Governors' Alliance on Ocean Health - Climate Change Action Coordination Team

Representing USC Sea Grant, Phyllis Grifman serves on the Climate Change Action Coordination Team (ACT) of the West Coast Governors' Alliance for Ocean Health, a collaboration of state leaders in California, Oregon and Washington. Grifman participates as member of the Scientific Advisory Panel of the Climate "ACT," which currently has two initiatives aimed at improving climate and sea level rise science and policy in the three states. The first initiative is a comprehensive mapping project to develop a suite of dynamic maps that identify U.S. West Coast exposure to coastal hazards due to sea level rise and storms for the 21st century. The second initiative is the development of a searchable online catalogue of funding sources available to local, regional and state governments, tribal representatives, and any other groups working on the management of natural resources, public access and public health. Together these projects will create economies of scale among the three states for risk assessment, comprehensive planning, and development of green infrastructure to address climate hazards.

National Sea Grant Climate Network

USC Sea Grant currently serves as Co-Chair of the National Sea Grant Climate Network. The network focuses on increasing the effectiveness of Sea Grant climate programming and outreach nationwide by coordinating Sea Grant climate-related activities, sharing talent and resources, and working with climate agencies and organizations within NOAA. In 2013, USC Sea Grant hosted the *National Sea Grant Climate Network Workshop: Sharing our Successes and Challenges on the Path Toward Climate Resilient Communities*. This workshop provided an opportunity for Sea Grant colleagues from all programs to share progress on their climate adaptation planning projects and to participate in training and information sharing opportunities. USC Sea Grant has been instrumental in launching the network's webinar series, in which individual Sea Grant programs highlight their climate related work for a national audience. To date, the network has hosted four webinars, reaching nearly 200 participants nationally.

BEYOND Sea Level Rise: California Current Acidification Network

When thinking about the impacts of climate change on our ocean, there is more to consider than just the impacts of sea level rise. Ocean acidification—the reduction in the pH of the ocean over an extended period of time, caused primarily by uptake of carbon dioxide (CO₂) from the atmosphere—is one of the primary threats from climate change to life in the ocean and fisheries upon which we depend. The California Current Acidification Network (C-CAN) is a collaboration of interdisciplinary scientists, resource managers, industry and others from local, state, federal and tribal levels dedicated to advancing the understanding of ocean acidification and its effects on the biological resources of the US West Coast. C-CAN emerged from a Sea Grant-sponsored 2010 *Workshop on Ocean Acidification Impacts on Shellfish*, held in Costa Mesa, CA. The West Coast Sea Grant programs collaborated to convene the workshop following collapses in spawning at oyster hatcheries in the Pacific Northwest. The C-CAN Mission is to:

- Coordinate and encourage development of an ocean acidification monitoring network for the west coast that serves publicly available data;
- Improve understanding of linkages between oceanographic conditions and biological responses;
- Facilitate and encourage the development of causal, predictive and economic models that characterize these linkages and forecast effects; and
- Facilitate communication and resource / data sharing among the many groups, organizations and entities that participate in C-CAN or utilize C-CAN as an informational resource.

For more information: <http://c-can.msi.ucsb.edu/>

³ National Ocean Service, "What is Ocean Acidification?" <<http://oceanservice.noaa.gov/facts/acidification.html>>



Shell-building species like the California mussel (*Mytilus californianus*) are at risk of thinner shells with rising pH in the ocean. (Photo credit: Lisa Gilbane)

Getting Underway: Students *now* will inherit the *future* climate

One of USC Sea Grant's main strengths is integrating education with current research and outreach initiatives. It is imperative that students of this generation understand their own profound connections to and responsibility for the health of the ocean and earth's changing climate.

California King Tides Curriculum and Photo Contest:

USC Sea Grant helped to develop a pilot curriculum for teachers throughout California focused on climate change-induced sea level rise, its potential impacts on the coastline, and how students can become leaders in citizen-science-based projects like the California King Tides Project. This winter, USC Sea Grant hosted the Urban Tides Photo Contest to engage the public (especially students) to send us their best photos of extreme high tides and winter storms impacting Los Angeles and Orange County beaches and coastal infrastructure.

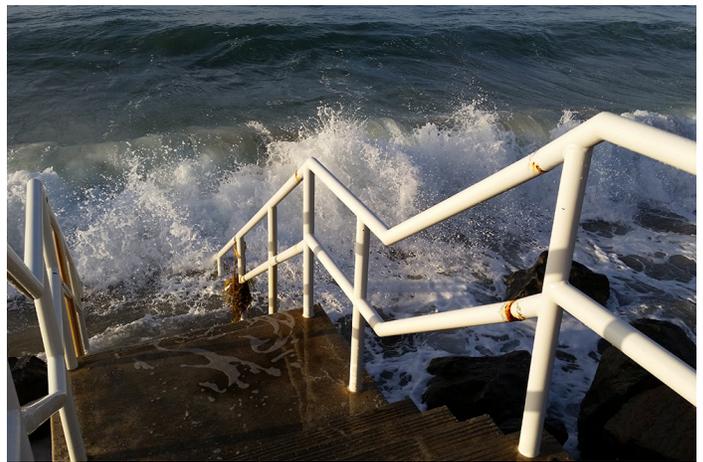
And here are the winning shots from the photo contest. Thank you to all who submitted images! Please see all entries on our website.

Contest: <http://dornsife.usc.edu/uscseagrant/urban-tides-contest/>

Curriculum: http://dornsife.usc.edu/assets/sites/291/docs/King_Tides_info/SLR_KT_Lesson_K.pdf



Category: Photo Essay, Image #3
1st Place: Alan Walti
January 19, 2015. 8:30 AM. Redondo Beach.



Category: Individual Photo
1st Place: Kurt Holland
January 19, 2015. 7:48 AM. Broad Beach, Malibu



Category: High / Low Comparison Images
1st Place: Jeremy Bellman (student at Port of Los Angeles High School)
January 4, 2015. 7:49am and 3:30pm Cabrillo Beach.

Getting Underway (con't): Students *now* will inherit the *future* climate

Southern California Aquarium Collaborative:

Ten informal education centers (i.e. aquaria and science centers) in Southern California are collaborating to develop coordinated training on climate change and sea level rise and to provide workshops for staff and docents. USC Sea Grant brings scientists investigating local impacts of climate change to meetings of the collaborative to both build capacity for teaching the science and to help develop messages that resonate with the public.

Climate Youth Summit with Heal the Bay:

On March 29th, 2014, USC Sea Grant, in partnership with Heal the Bay—a local environmental nonprofit organization—hosted a Climate Youth Summit at USC. Sixty students from across the Los Angeles region learned about the impacts of climate change through games, activities, and interactive workshops led by regional community leaders.

For more info: <http://dornsife.usc.edu/uscseagrant/2014-youth-summit/>



Students at the USC Sea Grant workshop of the Climate Youth Summit held in partnership with Heal the Bay. (Photo credits: Linda Chilton)



Getting Underway (con't): Students *now* will inherit the *future* climate

Partnership with NASA Jet Propulsion Laboratory:

Over the last several years, USC Sea Grant has collaborated with NASA's Jet Propulsion Laboratory (JPL) by providing education support and outreach activities for school groups and members of the public at the annual *Climate Day* for schools and *JPL Open House* for the general public. During *Climate Day 2014*, USC Sea Grant co-led science-based activities and recruited and trained volunteers to lead more than 2,000 middle and high school students through various stations. The *JPL Open House* attracts more than 45,000 visitors over a single weekend and provides hands-on experiences that allow them to explore the concepts behind satellite monitoring of the ocean and to learn about the impacts of climate change.

For more info: http://climatechangeeducation.org/events/nasa/jpl_climate_day/



USC Sea Grant provides hands-on climate change related learning activities at the 2014 JPL Open House and school Climate Day (Photo credits: Linda Chilton)

What is Sea Grant?

Sea Grant is a nationwide network—administered through the National Oceanic and Atmospheric Administration (NOAA)—of 33 university-based programs that work with coastal communities. The Sea Grant Program at the University of Southern California has served the Southern California coastal region since 1972, funding research, transferring results to government agencies and user groups, and providing information about marine resources, recreation and education to the public.

This Urban Mariner is written by Charlotte Stevenson with editorial assistance from Juliette Hart, Alyssa Newton, Holly Rindge and Phyllis Grifman.

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