

More than a Fish Tank GIS at the Aquarium



Jennifer Anne Lentz, Ph.D.

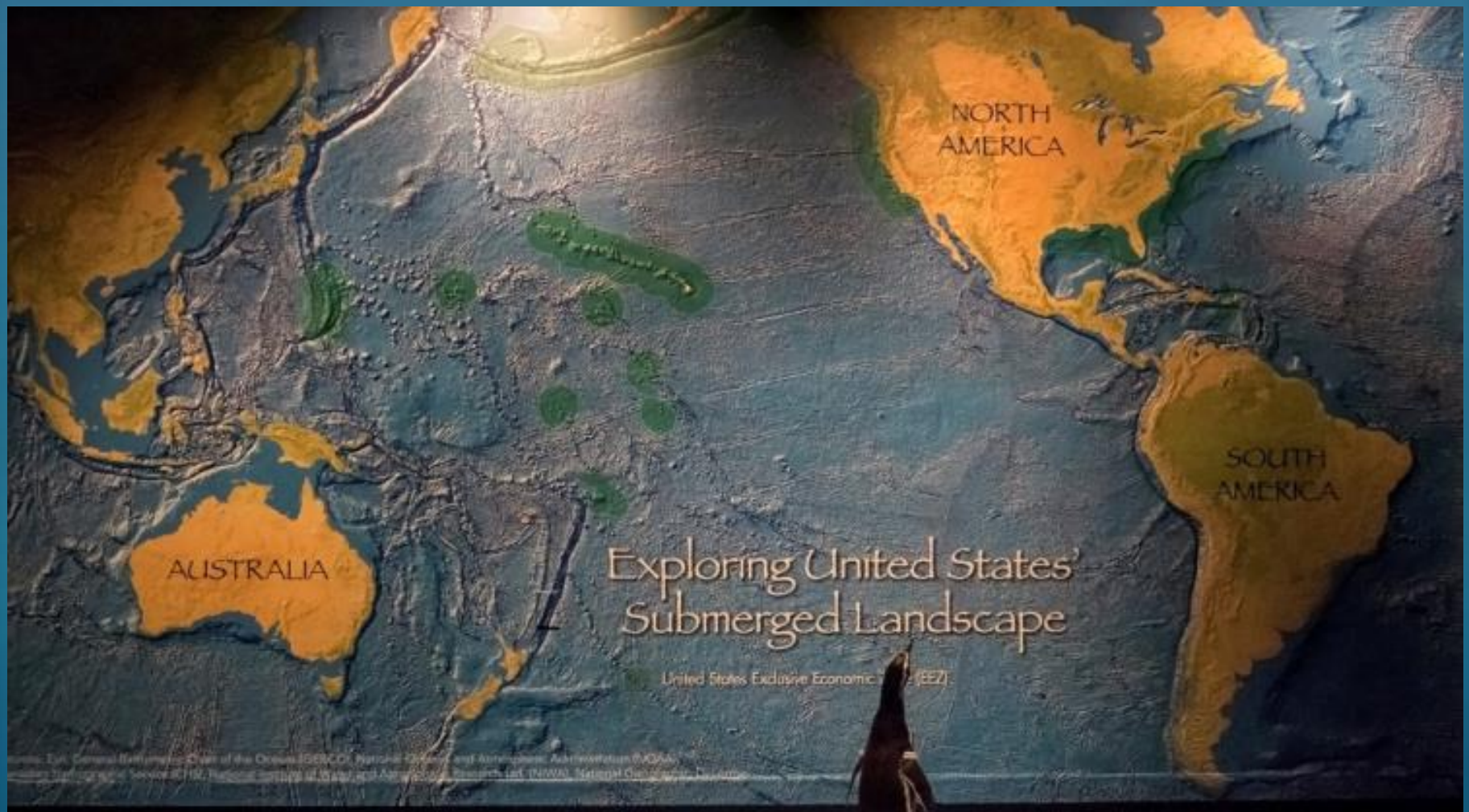
Education Coordinator at the **Aquarium of the Pacific**
Esri Ocean GIS Forum Lightning Talk Presentation
November 5th, 2015



Exhibit Maps

We use large maps to help orient guests to the geographic locations represented by our exhibits





Our Maps are popular with our guests & our residents

3 Main ways the Aquarium is using GIS

- 1. Using map-based interactives to engage guests, encouraging exploration and hands-on learning about exhibit animals, habitats, and the surrounding world**
- 2. Showing K-12 educators how they can use GIS in the classroom**
- 3. To communicate important environmental issues to politicians, local stakeholders, and the public**

1. Using Map-based Interactives with Guests



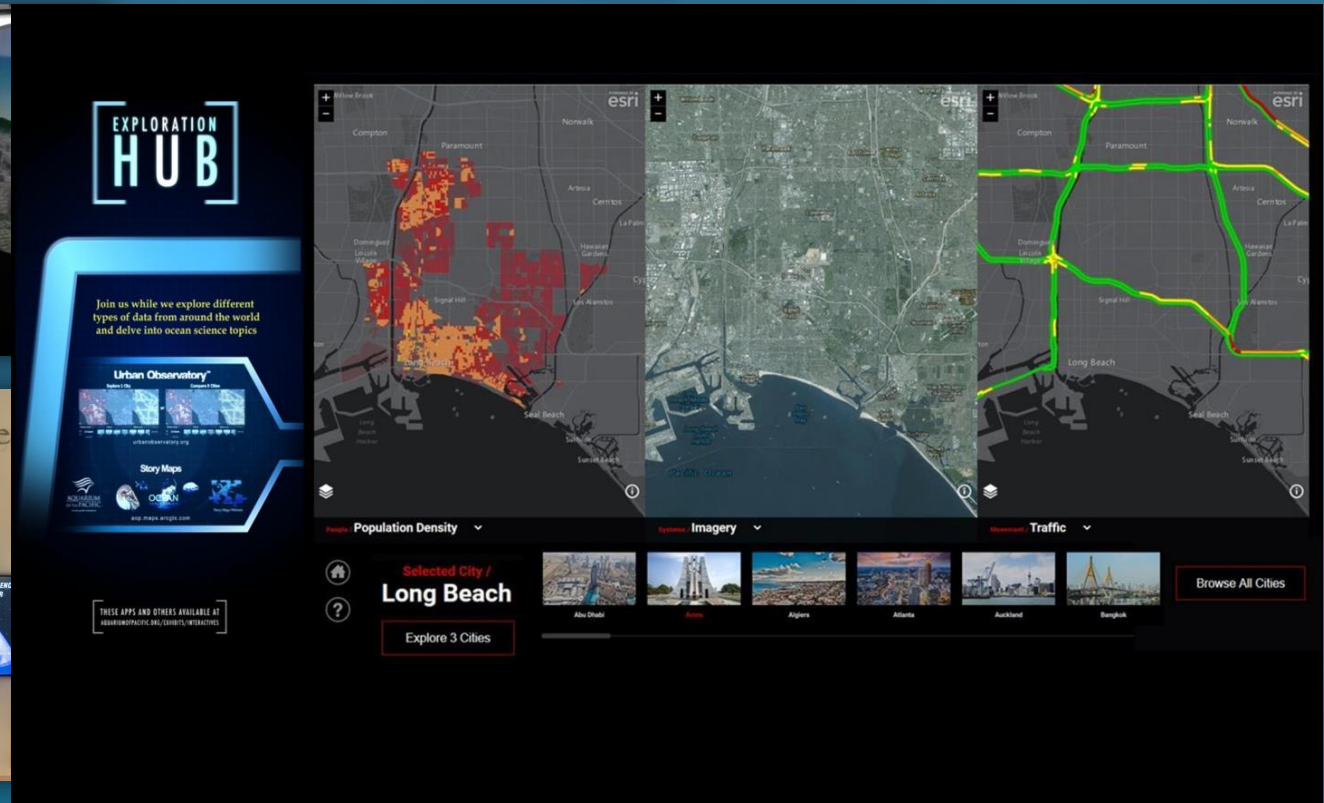
Google Galaxy

1. Using Map-based Interactives with Guests



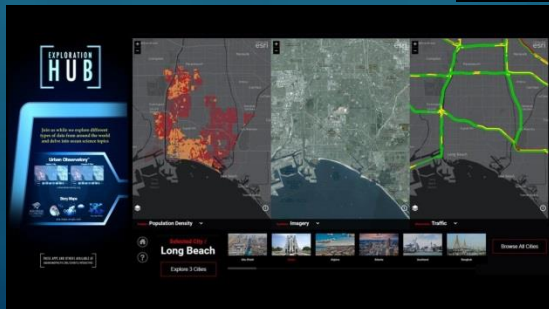
NOAA's Science on a Sphere

1. Using Map-based Interactives with Guests



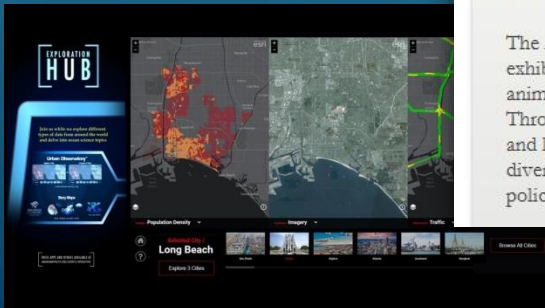
Exploration Hub
featuring
Esri's Urban Observatory

1. Using Map-based Interactives with Guests



Exploration Hub
featuring
Esri's Urban Observatory

1. Using Map-based Interactives with Guests



Story Maps and other GIS-related projects



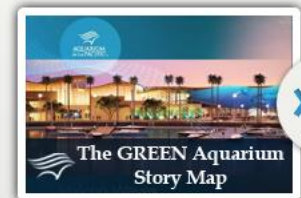
AOP's CELC Story Map



AOP's Magellanic Penguins Story Map



AOP's Visions '13 Cruise Story Map



AOP, The GREEN Aquarium Story Map

The Aquarium of the Pacific's mission is to instill a sense of wonder, respect, and stewardship for the Pacific Ocean, its inhabitants, and ecosystems. Our vision is to create an aquarium dedicated to conserving and building Natural Capital (Nature and Nature's services) by building Social Capital (the interactions between and among peoples).

The Aquarium of the Pacific (AOP) is the fourth most-attended aquarium in the nation. It displays over 12,000 animals in more than 50 exhibits that represent the diversity of the Pacific Ocean. Each year more than 1.5 million people visit the Aquarium. Beyond its world-class animal exhibits, the Aquarium offers educational programs for people of all ages from hands-on activities to lectures by leading scientists. Through these programs and a variety of multimedia experiences, the Aquarium provides opportunities to delve deeper into ocean science and learn more about our planet. The Aquarium of the Pacific has redefined the modern aquarium. It is a community gathering place where diverse cultures and the arts are celebrated and a place where important topics facing our planet and our ocean are explored by scientists, policy-makers and stakeholders in the search for sustainable solutions.

Story Maps

Using Story Maps to help guests learn more about our...

Animals



Exhibits



Experiences



Locations



Issues & Topics



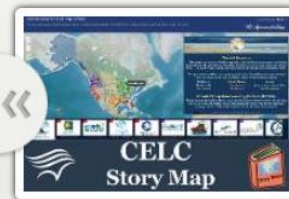
Example of a Story Map about our Animals

[HOME](#) [GALLERY](#) [MAP](#) [SCENE](#) [GROUPS](#)

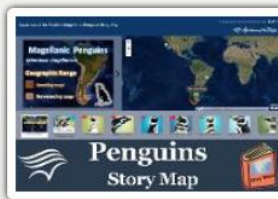
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Story Maps and other GIS-related projects



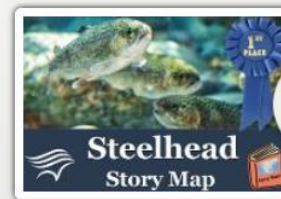
AOP's CELC Story Map



AOP's Magellanic Penguins Story Map



AOP's Seafood Story Map



AOP's Southern California Steelhead Story Map

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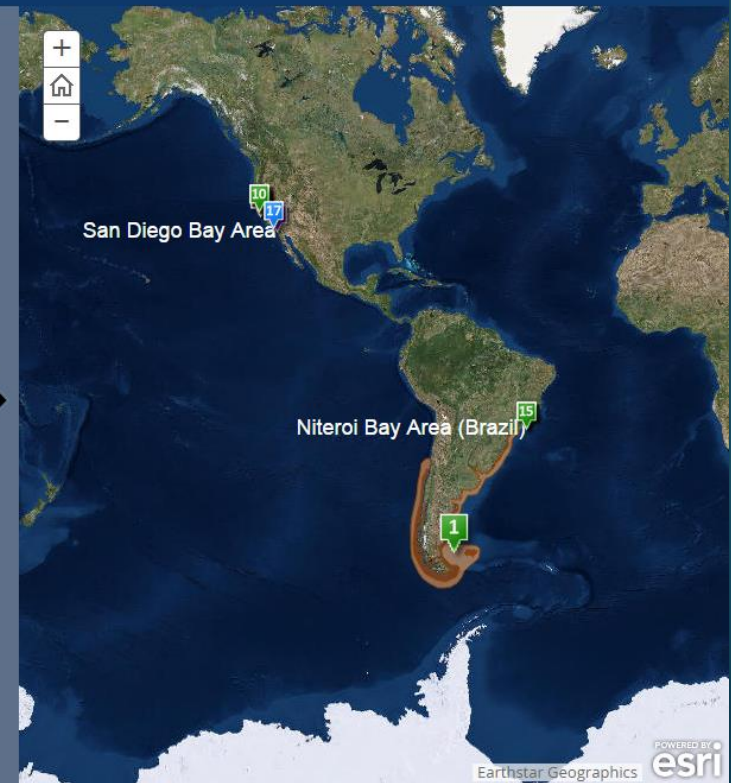
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Example of a Story Map about our Animals

Aquarium of the Pacific's Magellanic Penguins Story Map

An Aquarium of the Pacific (AOP) story map



Example of a Story Map about our Animals

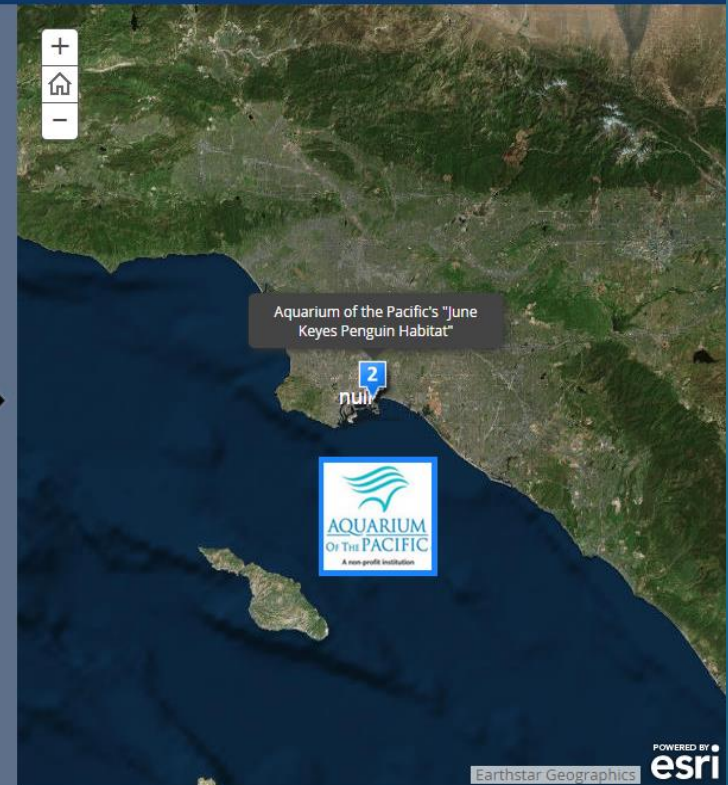
Aquarium of the Pacific's Magellanic Penguins Story Map

An Aquarium of the Pacific (AOP) story map [f](#) [t](#) [e](#)



Aquarium of the Pacific's "June Keyes Penguin Habitat"

Get up-close with more than a dozen Magellanic Penguins both above and below the water in the new June Keyes Penguin Habitat. Some of our penguins were born in facilities that are part of the Association of Zoos and Aquariums (AZA) "Species Survival Program." Others were rescued from the coast of Brazil. They were classified as "non-releasable," meaning their chances of surviving in the wild are very small. Our breeding colony will help the Species Survival Program maximize genetic diversity among captive penguins. Increasing the supply of captive bred penguins and passing knowledge along to our guests will help protect wild penguins.



Geographic Range



Aquarium of the Pacific's "June Keyes Penguin Habitat"



Shim ("The Big One")



Noodles ("The Bruiser")



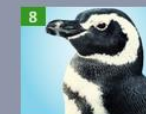
Patsy ("The Shy One")



Whatever ("The Bold One")



Floyd ("The Curious One")



Ludwig ("The Rowdy One")

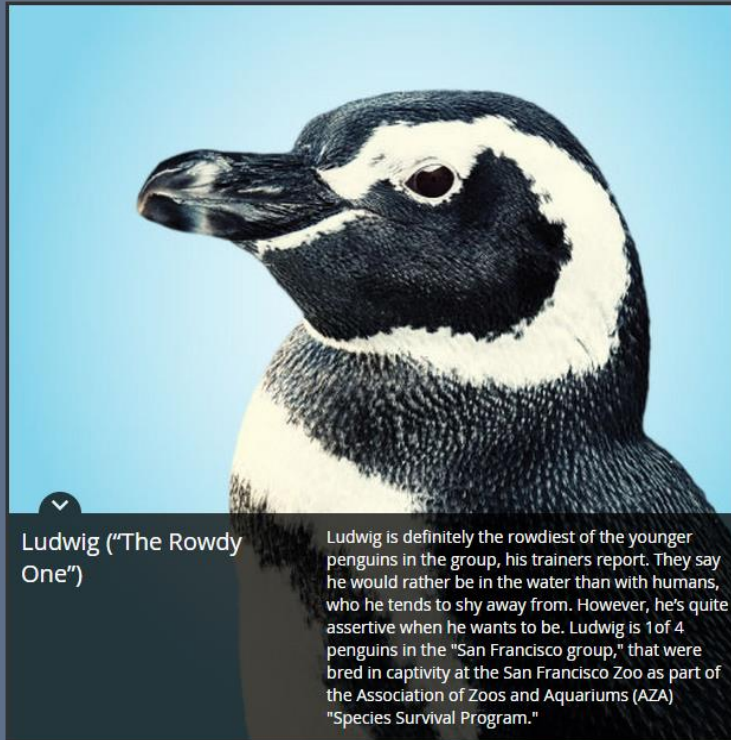


Newsom ("The Baby")

Example of a Story Map about our Animals

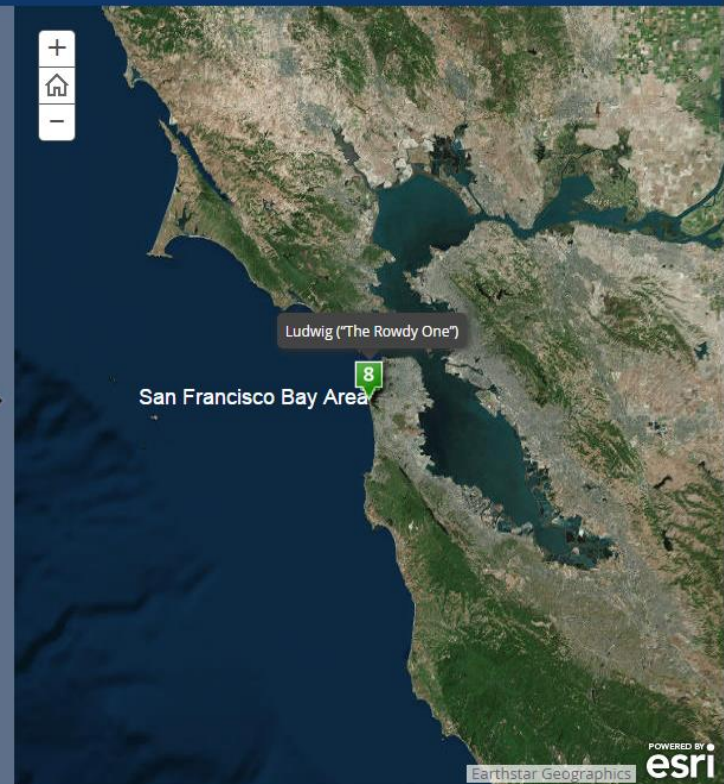
Aquarium of the Pacific's Magellanic Penguins Story Map

An Aquarium of the Pacific (AOP) story map



Ludwig ("The Rowdy One")

Ludwig is definitely the rowdiest of the younger penguins in the group, his trainers report. They say he would rather be in the water than with humans, who he tends to shy away from. However, he's quite assertive when he wants to be. Ludwig is 1 of 4 penguins in the "San Francisco group," that were bred in captivity at the San Francisco Zoo as part of the Association of Zoos and Aquariums (AZA) "Species Survival Program."



POWERED BY
Earthstar Geographics esri



Geographic Range



Aquarium of the Pacific's
"June Keyes Penguin"



Shim ("The Big One")



Noodles ("The Bruiser")



Patsy ("The Shy One")



Whatever ("The Bold One")



Floyd ("The Curious One")



Ludwig ("The Rowdy One")



Newsom ("The Baby")

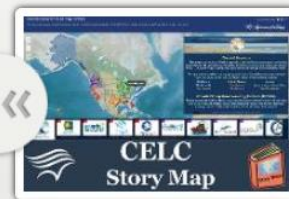
Example of a Story Map about our Exhibits

[HOME](#) [GALLERY](#) [MAP](#) [SCENE](#) [GROUPS](#)

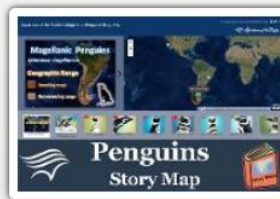
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Story Maps and other GIS-related projects



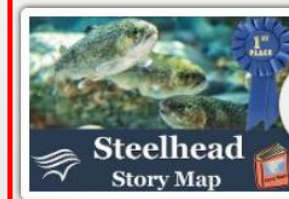
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AOP's Magellanic Penguins Story Map



AOP's Seafood Story Map



AOP's Southern California Steelhead Story Map

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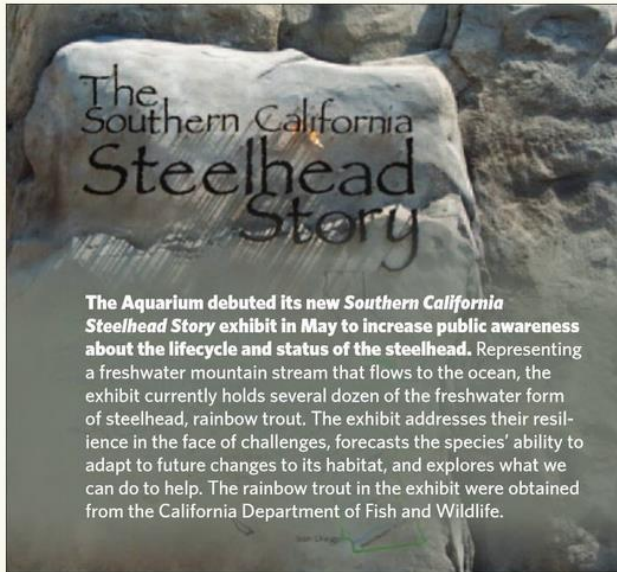
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Example of a Story Map about our Exhibits

an AOP story map



Southern California Steelhead



Species Overview

Steelhead are members of the salmon family that includes all salmon species, trout, and char. Southern California steelhead are the only members of the salmon family native to Southern California. They are anadromous fish, that is, they hatch and live for a part of their life cycle in fresh water, migrate to the ocean where they spend to mature, and return to a freshwater stream, usually the one where they were hatched, to spawn. Unlike their salmon relatives, they usually do not die after spawning.



Example of a Story Map about our Exhibits

an AOP story map

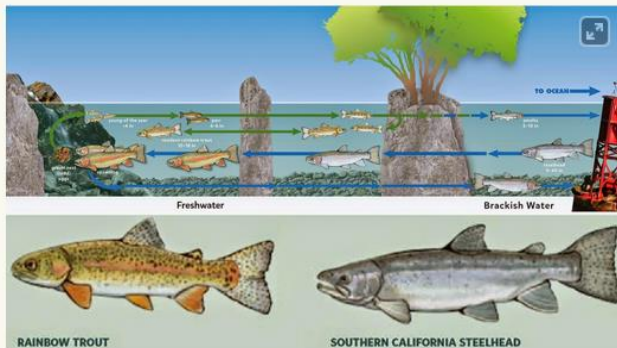


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Steelhead is the name given to ocean-going rainbow trout. Steelhead are born and remain in freshwater for 1-3 years as juveniles, then migrate to the ocean and stay for 1-4 years while growing into adults. When rivers are typically swollen in winter, adults migrate to freshwater to spawn, usually in the stream where they were born. Steelhead belong to a family that includes all salmon, trout, and char. Unlike salmon, which spawn only once, adult Steelhead often return to the ocean after spawning and repeat the spawning migration the next year.



The image on the right is a painting by Ben Lovejoy titled "A Steelhead's Journey" (<http://www.steelheadrecovery.org/images/lovejoy-painting-large.jpg>)



Example of a Story Map about our Exhibits

an AOP story map



Southern California Steelhead

Historical Southern California Steelhead Populations

At one time steelhead spawned in the majority, if not all, of California's coastal rivers.



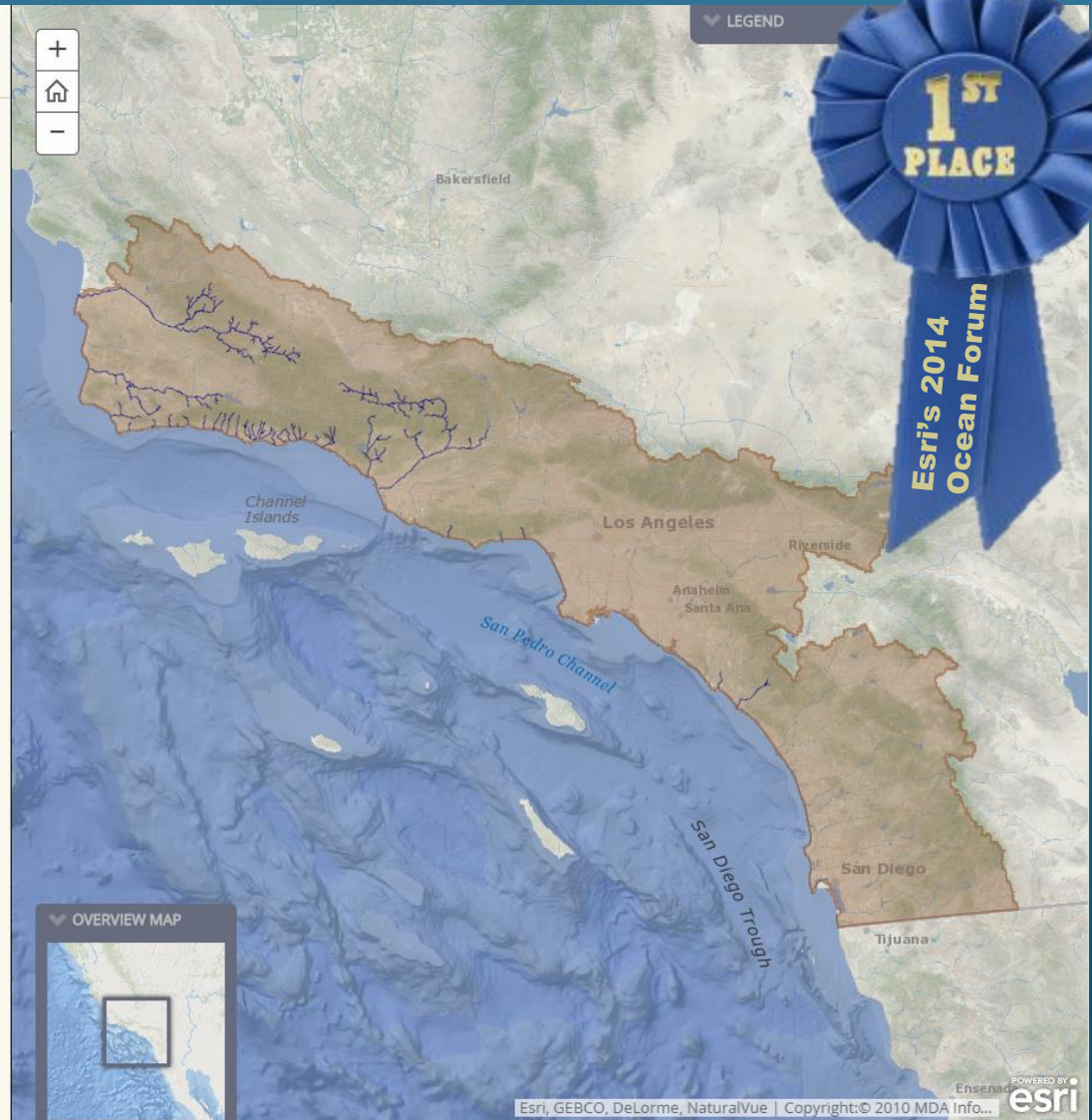
"Ventura River Steelhead Anglers, 1909" (NMFS's 2012 Southern California Steelhead Recovery Plan, page 5)

The map on the right shows the **historical distribution** of Southern California Steelhead populations.

Southern California steelhead can tolerate warm water and have a complex yet flexible life history that increases their resistance to environmental change. Steelhead are at risk of extinction, but restoring water quality and quantity, and removing or modifying man-made barriers to migration in certain Southern California streams would increase their chances of survival.

Present Day Southern California Steelhead Populations

Over the last 100 years the Southern California Steelhead population has declined 99% and some runs are extinct. Southern California Steelhead are



Example of a Story Map about our Exhibits

an AOP story map



Southern California Steelhead

Present Day Southern California Steelhead Populations

Over the last 100 years the Southern California Steelhead population has declined 99% and some runs are extinct. Southern California Steelhead are now listed as endangered under the U.S. Endangered Species Act. The southern California population has declined from about 40,000 steelhead to less than 500. This decline was in large part the result of manmade infrastructure (like dams, concrete lined washes, etc).

The map on the right shows the **current steelhead population range**, the **historical range** which is now anthropogenically blocked, and the locations of **major dams**.



"Bradbury Dam, Santa Ynez River" (NMFS's 2012 Southern California Steelhead Recovery Plan, page 9)



Example of a Story Map about our Exhibits

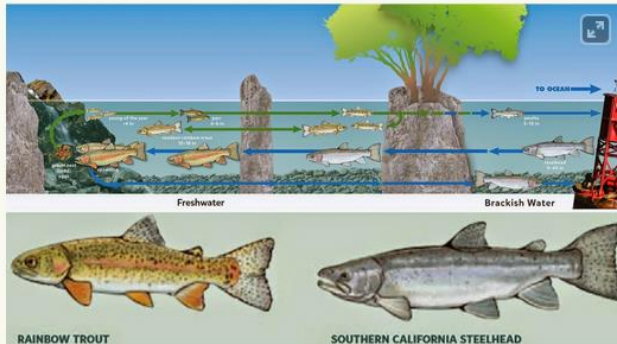
an AOP story map



Southern California Steelhead

At the Aquarium

The Aquarium's steelhead exhibit transports visitors along a mountain path, allowing them to view these fish in three areas, representing the species' journey from freshwater to brackish water, and finally to the ocean. Through this exhibit, the Aquarium hopes to reveal the secrets of a little-known fish that lives amongst us in our urban environment and inspire conservation of this unique animal.



Upper Elevation Habitats

The places where adults spawn, eggs hatch, and young fish develop (0-1 year).



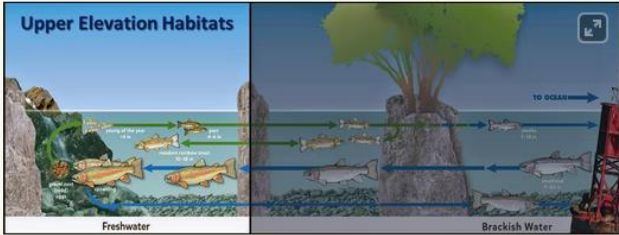
Example of a Story Map about our Exhibits

an AOP story map


Southern California Steelhead

Upper Elevation Habitats

The places where adults spawn, eggs hatch, and young fish develop (0-1 year).



The first segment of the Aquarium's steelhead exhibit represents the **Upper Elevation Habitats** and is filled with **juvenile rainbow trout** (< 4 inch long).



Mid-Elevation Habitats

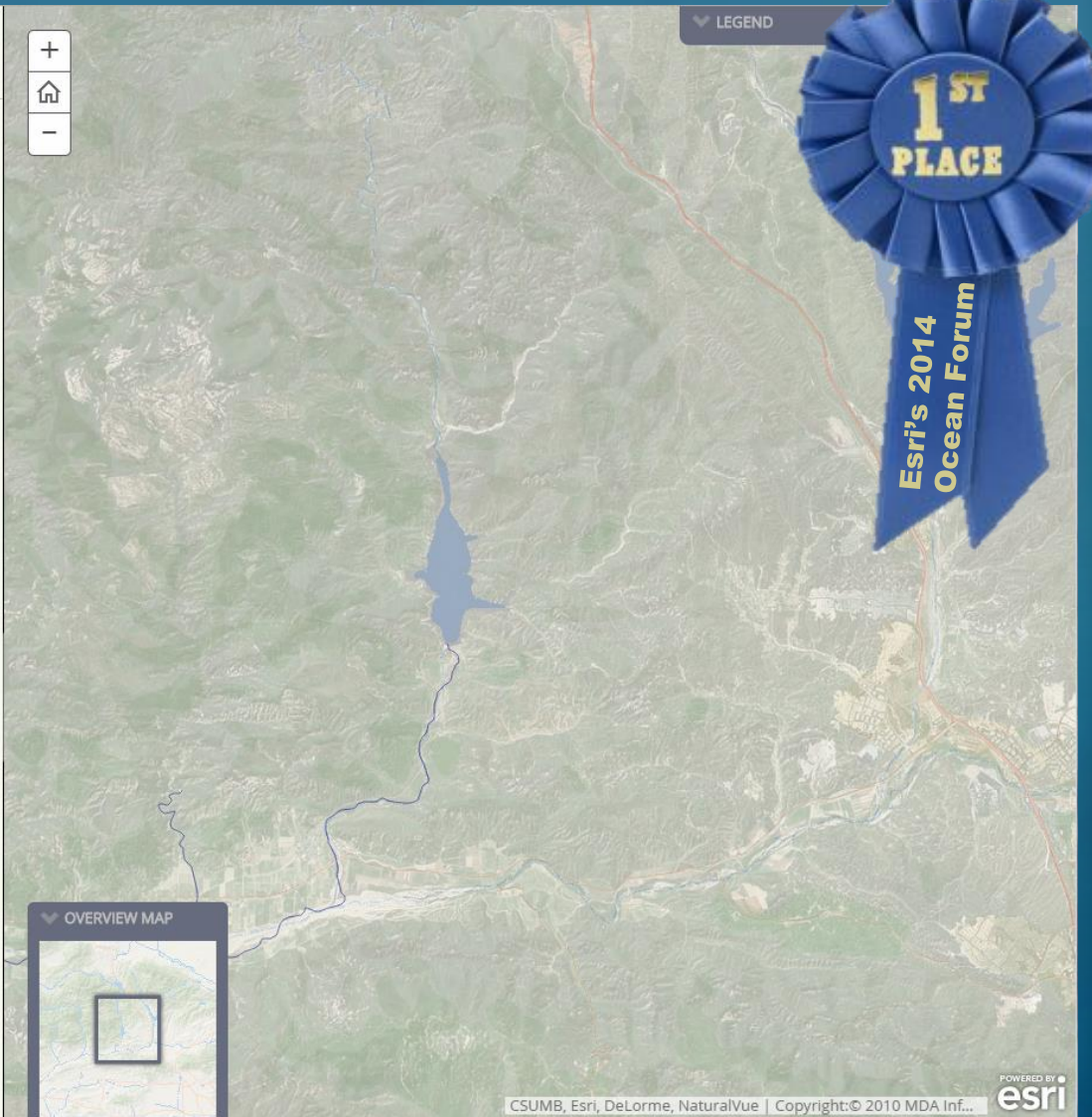
The places where young fish continue to grow. Some will stay in fresh water for life and remain as rainbow trout. Others will migrate to the ocean and become steelhead.

+

Home

-

LEGEND



1ST PLACE

Esri's 2014 Ocean Forum

OVERVIEW MAP

POWERED BY esri

CSUMB, Esri, DeLorme, NaturalVue | Copyright: © 2010 MDA Inf...

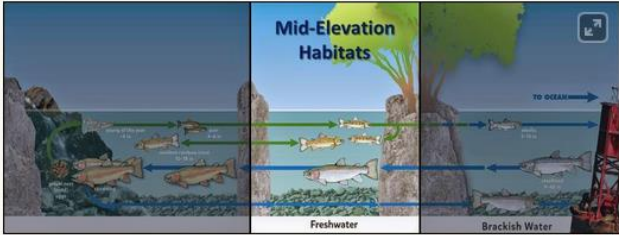
Example of a Story Map about our Exhibits

an AOP story map


Southern California Steelhead

Mid-Elevation Habitats

The places where young fish continue to grow. Some will stay in fresh water for life and remain as rainbow trout. Others will migrate to the ocean and become steelhead.



The middle segment of the Aquarium's steelhead exhibit represents the mid-elevation habitats and is filled with the resident rainbow trout (10-18 inch long)



Estuarine Habitats

LEGEND

1ST PLACE

Esri's 2014 Ocean Forum

OVERVIEW MAP

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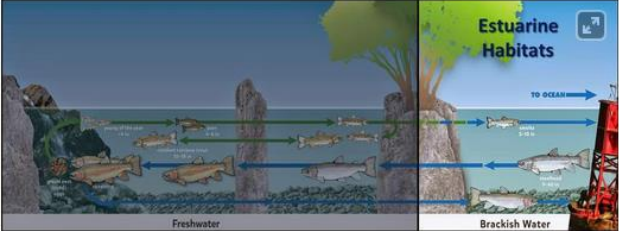
Example of a Story Map about our Exhibits

an AOP story map

Southern California Steelhead


Estuarine Habitats

The places where most young fish grow and develop in preparation for their journey to the ocean where they become steelhead and the places to which they later return from the ocean on their way back upstream to spawn.



The diagram illustrates the life cycle of steelhead. It shows a river flowing from a mountainous area (Freshwater) to a bay (Brackish Water) and then to the ocean. Fish are shown at different stages: young fish (smolts) in the freshwater section, and older fish (steelhead) in the brackish water and ocean sections. Arrows indicate the flow of the river and the migration of the fish. The text 'Estuarine Habitats' is prominently displayed in the center of the diagram.

The last segment of the Aquarium's steelhead exhibit represents the estuarine habitats and is filled with the smolts (5-10 inch), which will hopefully turn into steelhead (9-40 inch) someday.



The photograph shows a large, rectangular exhibit tank filled with water. Several steelhead smolts are visible swimming in the water. The tank is surrounded by a wooden structure, and there are some rocks and driftwood in the water. The background shows a naturalistic setting with trees and a body of water.

[Read More](#)

LEGEND

1ST PLACE

Esri's 2014 Ocean Forum

Pitas Point

Pierpont Bay

Oxnard

Port Hueneme

73 Canyon

OVERVIEW MAP

CSUMB, Esri, DeLorme, NaturalVue | Copyright: © 2010 MDA Inf... esri

Example of a Story Map about our Exhibits

an AOP story map



Southern California Steelhead

Steelhead

Historian John G. "Tom" Tomlinson, Jr., in collaboration with the Aquarium of the Pacific, has written a book documenting the local history of the Southern California Steelhead, including historic photos, postcards, fishery data, newspaper clippings, and rainfall statistics.

This book gathers historical information about this fish species and describes its resilience in the face of the region's changing watersheds, rainfall levels, and manmade infrastructure.

Against the Currents is available for sale in the Pacific Collections gift store or online at shop.aquariumofthepacific.org

Learn More

Watch "Southern California Steelhead: Against All Odds" by California Trout




available online at: <http://vimeo.com/79393289>

More information about southern California Steelhead can be found online at:

- The Aquarium's Online Learning Center "Southern California Steelhead" page
- National Marine Fisheries Service (NMFS) [Steelhead profile](#)
- The [Recovery Plan for Southern California Steelhead](#) (Jan. 2012)

Example of a Story Map about an Exhibit Topic

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AQUARIUM OF THE PACIFIC
A non-profit institution


OCEAN EXPLORATION

Story Maps Website


Story Maps and other GIS-related projects




Ocean Exploration Story Map
Ocean Exploration Story Map (working draft)



Sea Level Rise Web App
Sea Level Rise App



Watersheds Web App
Watersheds Online Exhibit App



Whale Research Web App
Whale Research App

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Example of a Story Map about an Exhibit Topic

An Aquarium of the Pacific (AOP) story map


Ocean Exploration



The **Exploration Now** program, which is run out of the **Inner Space Center** in Rhode Island, promotes awareness of the need to advance the field of deep sea exploration by connecting the public to research vessels as they explore the deep sea.

- <http://explorationnow.org/about>

Unknown Ocean - Why Explore?



It gives us a chance to look back in time.

The map on the right shows the location of the Inner Space Center, and the current location and status of each of the 5 vessels (as of Dec. 2014).

Inner Space Center

Mission

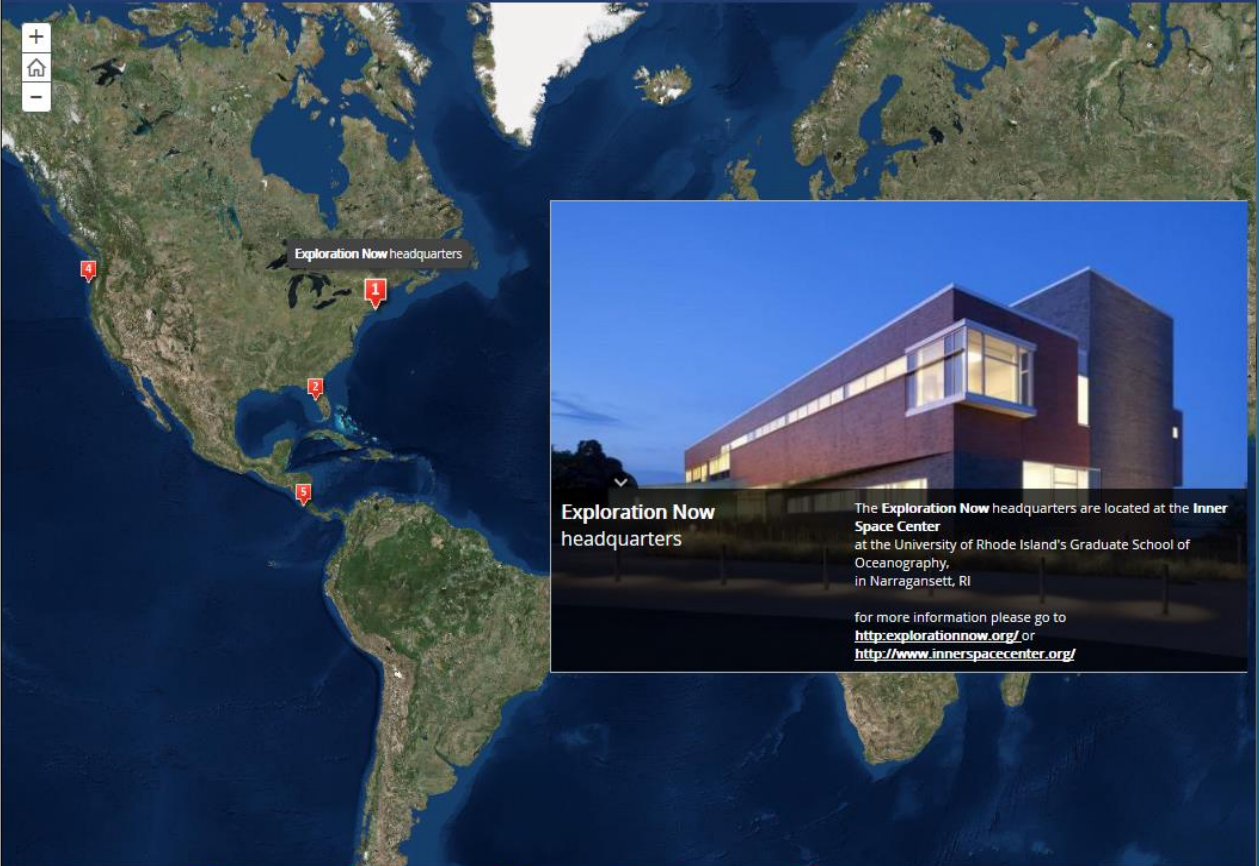
The Inner Space Center is an innovative leader in advancing ocean science exploration, research, and literacy.

Vision

The Inner Space Center uses cutting edge technology, including telepresence, for ocean science research, exploration, and education. The ISC generates accessible

Exploration Now

This map shows the current locations and status of all the ships in the Exploration Now Program









Exploration Now headquarters

Exploration Now headquarters

The **Exploration Now** headquarters are located at the **Inner Space Center** at the University of Rhode Island's Graduate School of Oceanography, in Narragansett, RI

for more information please go to <http://explorationnow.org/> or <http://www.innerspacecenter.org/>

1	2	3	4	5	6
					
Exploration Now headquarters	E/V Nautilus	Okeanos Explorer	R/V Thompson	R/V Atlantis	STS Bodrum

Example of a Story Map about an Exhibit Topic

An Aquarium of the Pacific (AOP) story map

Ocean Exploration

Research Submersibles

An ROV is a remotely operated vehicle used by research teams as a submersible. ROVs are tethered to ships. They are controlled by a remote either on ship or land. They are powered by the ship. For the purpose of ocean exploration, the ROVs we follow have high definition video cameras that record the live streaming video.

Unknown Ocean - Remotely Operated Vehicle

ROV

than one hair on your head.

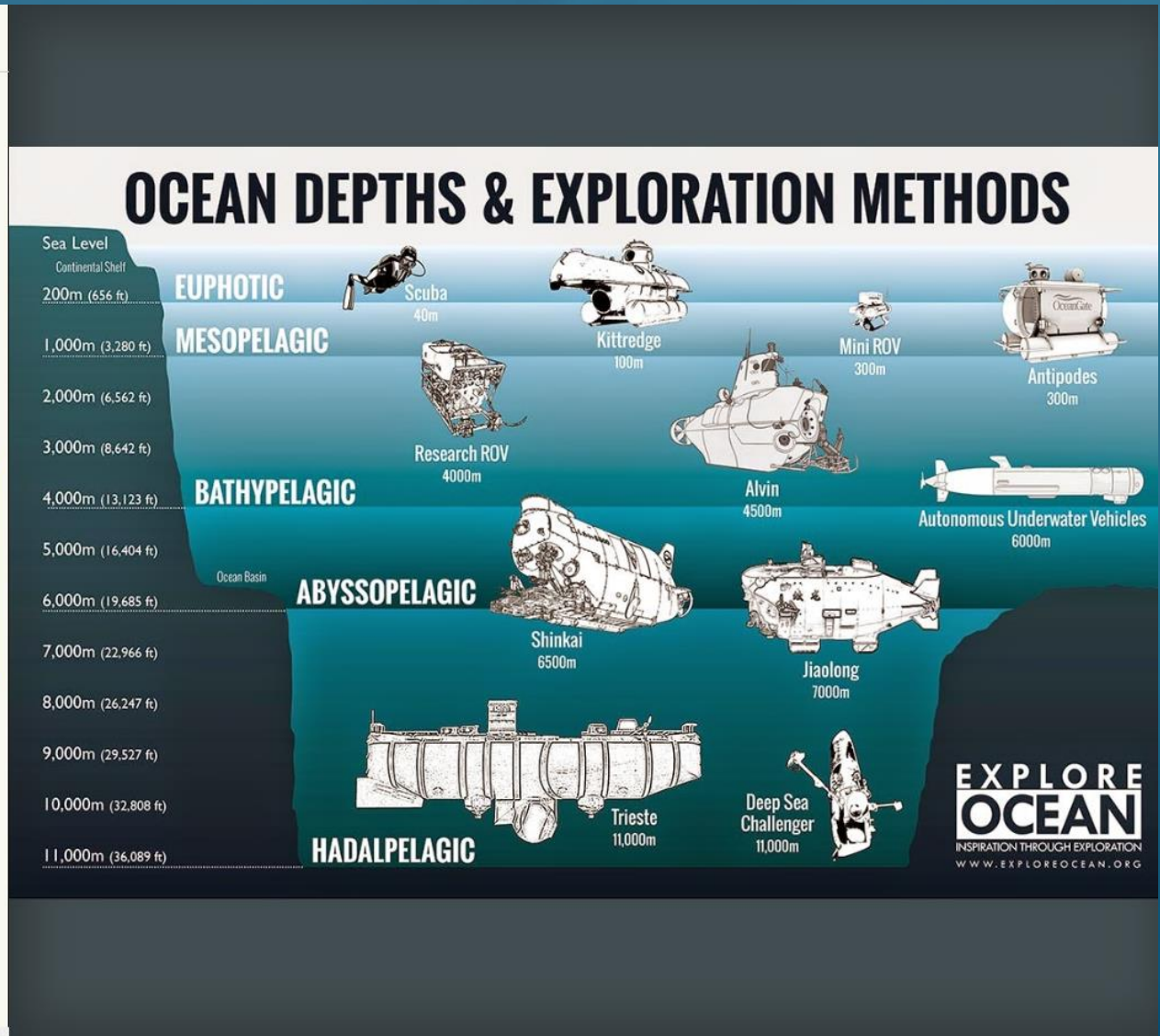
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E/V Nautilus

The Exploration Vessel (E/V) Nautilus, is a 64-meter research vessel operated by the Ocean Exploration Trust

The Ocean Exploration Trust was founded in 2008 by Titanic-discoverer and National Geographic Explorer-in-Residence Dr. Robert Ballard to engage in pure ocean exploration.


Map of the 2014 Nautilus Expedition



Example of a Story Map about an Exhibit Topic

An Aquarium of the Pacific (AOP) story map about Ocean Exploration


E/V Nautilus



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Map of the 2014 Nautilus Expeditions



NAUTILUS 2014 FIELD SCHEDULE

Their international programs center on scientific exploration of the seafloor. In addition to conducting scientific research, their expeditions are made available to explorers on shore via live

NAUTILUS LIVE

Explore the ocean LIVE with Dr. Robert Ballard and the Corps of Exploration

MAIN THE EXPEDITION PHOTOS & VIDEOS THE TECH THE SCIENCE THE TEAM LATEST NEWS EDUCATORS JOIN US

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Meet the Siphonophore



"Wrath of Khan" Worm Found in Mussels



The Future of Science: Exploring with Remote Telespresence



What Happens to Collected Samples?



Nautilus Doodles: Science Communication Through Art



Shrinking Cups in the Deep



Ocean Explorer



Seafloor Topography

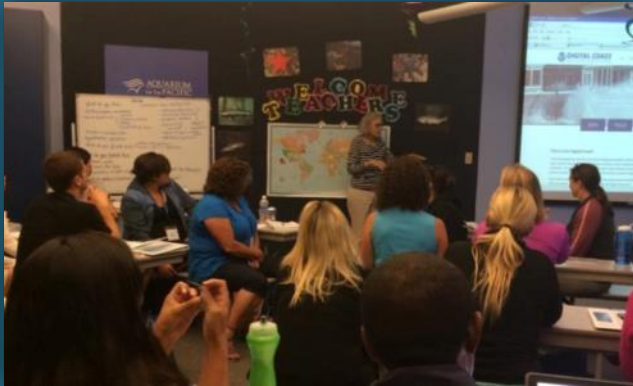


NAUTILUS 2014 FIELD SCHEDULE

3 Main ways the Aquarium is using GIS

- 1. Using map-based interactives to engage guests, encouraging exploration and hands-on learning about exhibit animals, habitats, and the surrounding world**
- 2. Showing K-12 educators how they can use GIS in the classroom**
- 3. To communicate important environmental issues to politicians, local stakeholders, and the public**

2. Introducing GIS to K-12 Educators



Alie LeBeau Clarke

August 21, 2013 - Long Beach, CA

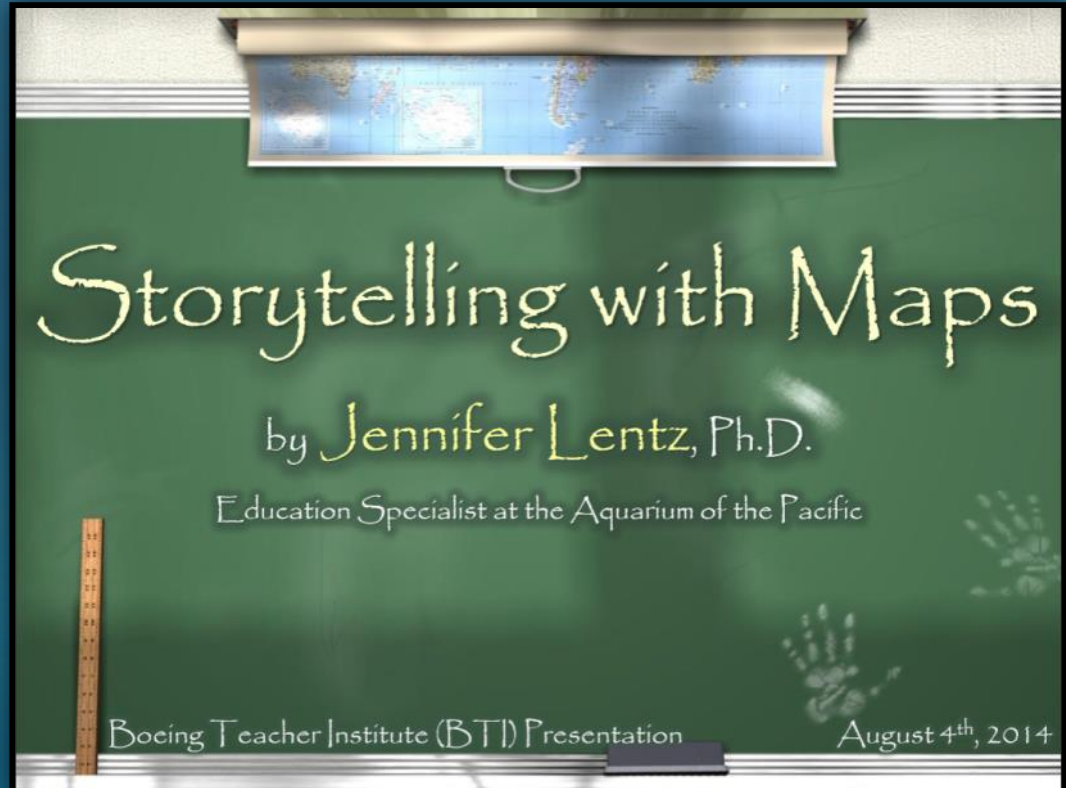
We talked about data and storymapping and GIS with Jennifer Lentz, so I thought you might enjoy this map of favorite field trip destinations. p.s. the AOP is missing. How is that possible? Anybody want to submit their glowing recommendation?



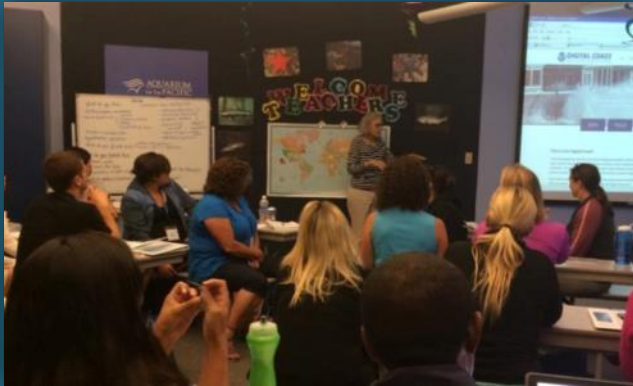
Get Going: Mapping Teachers' Favorite Field Trip Spots

Teachers! Need ideas on where to take your students for beyond-school learning? See our interactive map of the best field trip spots across the U.S. Have a favorite field trip location? Submit your favorite venue and help us build a rich and dynamic...

EDWEEK.ORG



2. Introducing GIS to K-12 Educators




Alie LeBeau Clarke
August 21, 2013 - Long Beach, CA

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p.s. the AOP is missing. How is that possible? Anybody want to submit their glowing recommendation?



Get Going: Mapping Teachers' Favorite Field Trip Spots
Teachers! Need ideas on where to take your students for beyond-school learning? See our interactive map of the best field trip spots across the U.S. Have a favorite field trip location? Submit your favorite venue and help us build a rich and dynamic...

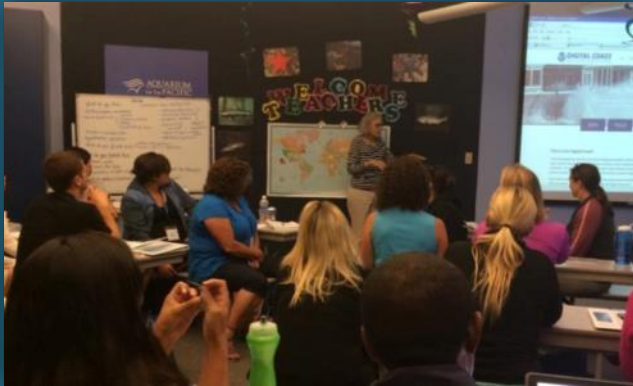
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**An Introduction to
GIS and Spatial Data**

Jennifer Anne Lentz, Ph.D.
Education Specialist at the Aquarium of the Pacific
NASA Teacher Workshop Presentation
October 11th, 2013

2. Introducing GIS to K-12 Educators



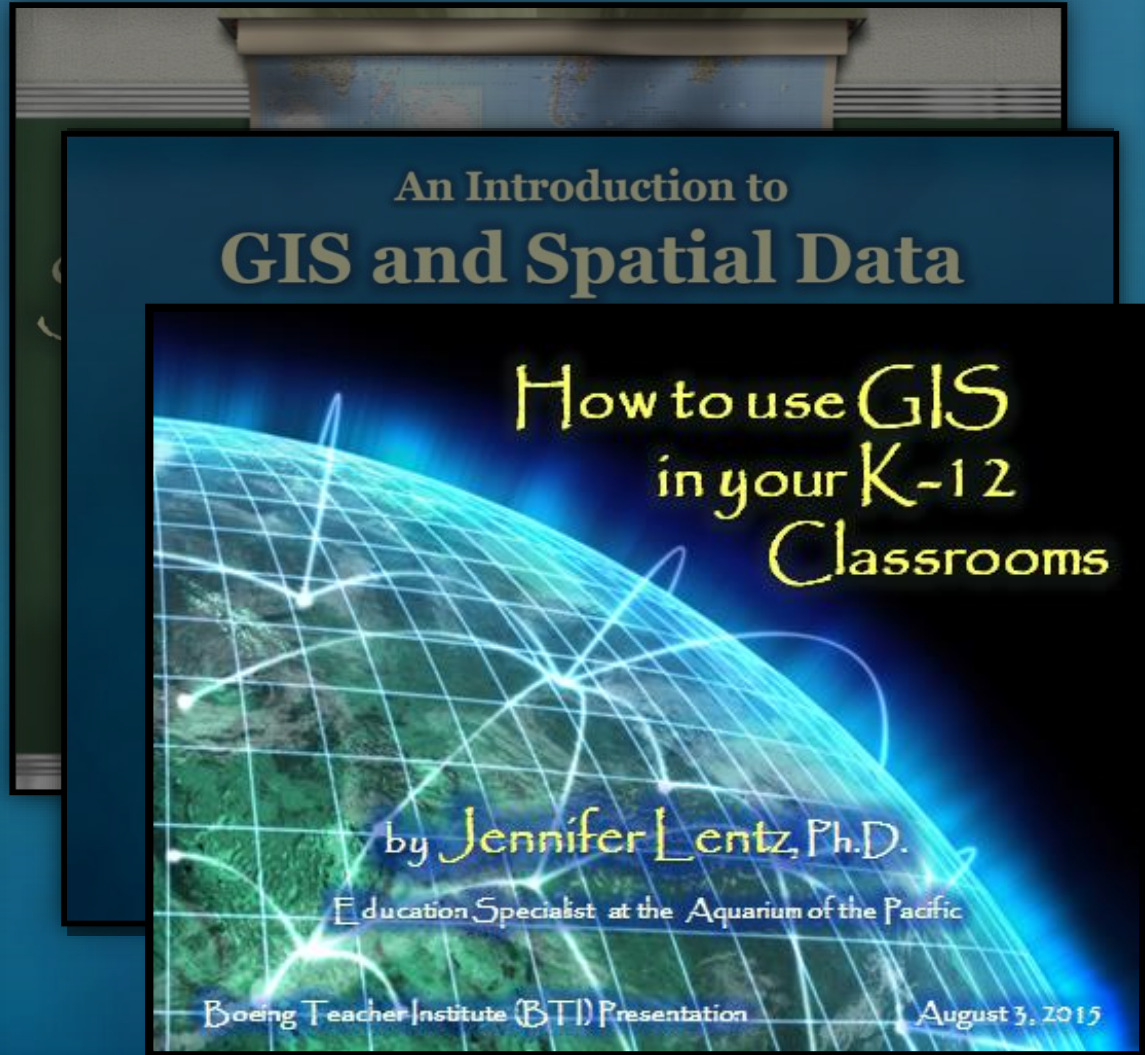
Alie LeBeau Clarke
August 21, 2013 · Long Beach, CA

We talked about data and storymapping and GIS with Jennifer Lentz, so I thought you might enjoy this map of favorite field trip destinations.
p.s. the AOP is missing. How is that possible? Anybody want to submit their glowing recommendation?



Get Going: Mapping Teachers' Favorite Field Trip Spots
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EDWEEK.ORG



**An Introduction to
GIS and Spatial Data**

**How to use GIS
in your K-12
Classrooms**

by **Jennifer Lentz, Ph.D.**
Education Specialist at the Aquarium of the Pacific

Boeing Teacher Institute (BTI) Presentation August 3, 2015

ConnectED Initiative

Free ArcGIS Online Accounts available for
ALL K-12 Schools in the United States!



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School Website <input type="text"/>	School Phone <input type="text"/>
Contact First Name <input type="text"/>	Contact Last Name <input type="text"/>
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(or use the form in your binders)

ConnectED Initiative

ArcGIS Online provides **Project-based Learning**
in line with **NGSS** standards



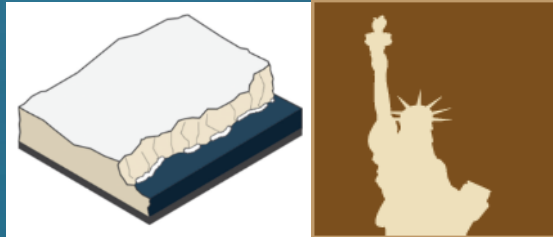
These sites include...

- Teacher Stories
- Student Videos
- Case Studies
- Resources
- Lessons Plans

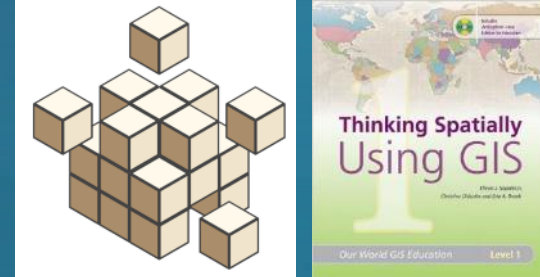
<http://www.esri.com/connected/>
& <http://edcommunity.esri.com/>

Instructional GIS Materials for K-12

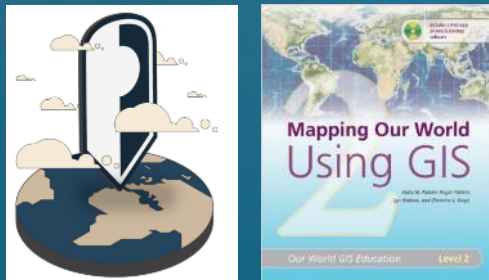
GeoInquiries



Thinking Spatially



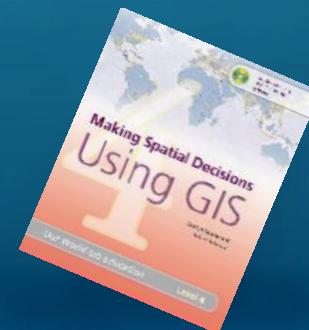
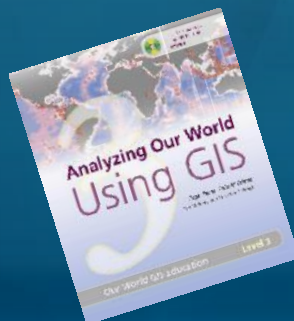
Mapping our World



Story Maps



and more!



Step-by-Step GIS & Story Map Tutorials

GIS Wildlife Data Tutorial

How to find, Map, & Spatially Analyze Wildlife Data in a GIS System

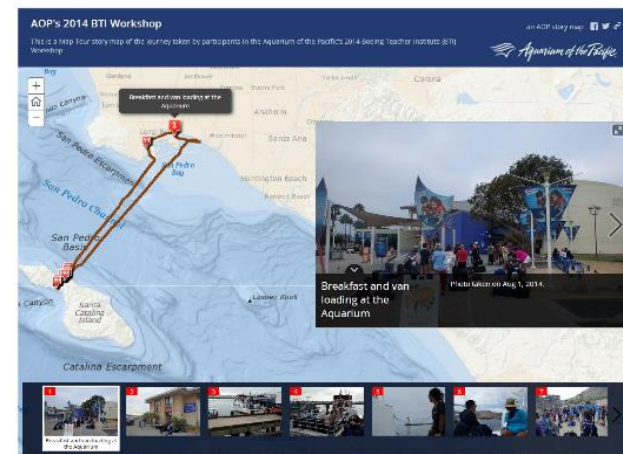


This Tutorial was Created by
Jennifer Anne Lentz, Ph.D.
Education Specialist at the Aquarium of the Pacific

This tutorial, and other teaching-related materials by Dr. Lentz are available online at:
<http://jenniferALentz.info/Teaching.html>

Creating "Map Tour" Story Maps

How to create a Map Tour Story Map quickly and easily using your smartphone or tablet, and your ArcGIS Online Organization Account



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Jennifer Anne Lentz, Ph.D.
Education Specialist at the Aquarium of the Pacific

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Available online at: AOP.maps.arcgis.com & JenniferALentz.info

So Easy 4th Graders Can Do It!

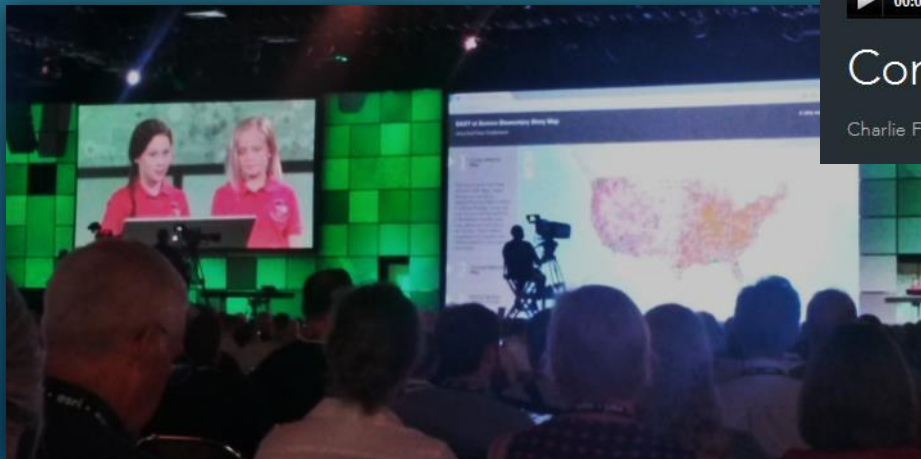


Connecting GIS with Education

Charlie Fitzpatrick introduces the amazing work by students at Sonora Elementary in Springdale, Arkansas.

Watch Kylie & Rikki demo their GIS work
online at:

[http://video.esri.com/watch/3665/
connecting-gis-with-education](http://video.esri.com/watch/3665/connecting-gis-with-education)



“GIS Kids Are Super!” blog post (<http://blogs.esri.com/esri/ucinsider/2014/07/15/gis-kids-are-super/>)

3 Main ways the Aquarium is using GIS

- 1. Using map-based interactives to engage guests, encouraging exploration and hands-on learning about exhibit animals, habitats, and the surrounding world**
- 2. Showing K-12 educators how they can use GIS in the classroom**
- 3. To communicate important environmental issues to politicians, local stakeholders, and the public**

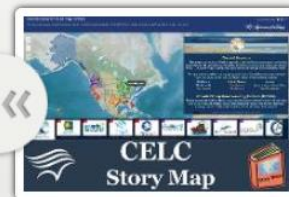
Sustainable Seafood Story Map

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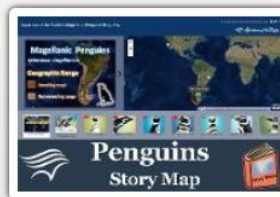
[Sign In](#)



Story Maps and other GIS-related projects



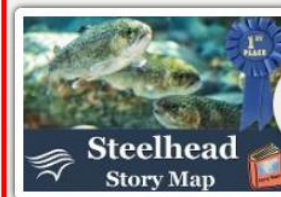
AOP's CELC Story Map



AOP's Magellanic Penguins Story Map



AOP's Seafood Story Map



AOP's Southern California Steelhead Story Map

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Sustainable Seafood Story Map



Seafood Story Map

Feeding A Growing Population

More than 3 billion people around the world depend on seafood as their primary source of protein and for many of them, it is their only source. Seafood is becoming the healthy protein choice for billions of others and as our population increases, the demand for seafood is increasing even faster.



Image (above): "Dependence on Seafood Protein"

Seattle Times (2013) "[Sea Change: Food for Millions at Risk](#)" by Craig Welch. Data: Earthtrend Databased, World Resources Institute, and the Food and Agriculture Organization of the U. N.



Sustainable Seafood Story Map



Seafood Story Map

Overfishing

Today, nearly 30 percent of the world's fisheries are being harvested faster than they can replenish themselves and more than 60 percent are being fished at their maximum capacities, meaning that they cannot withstand additional fishing pressure.



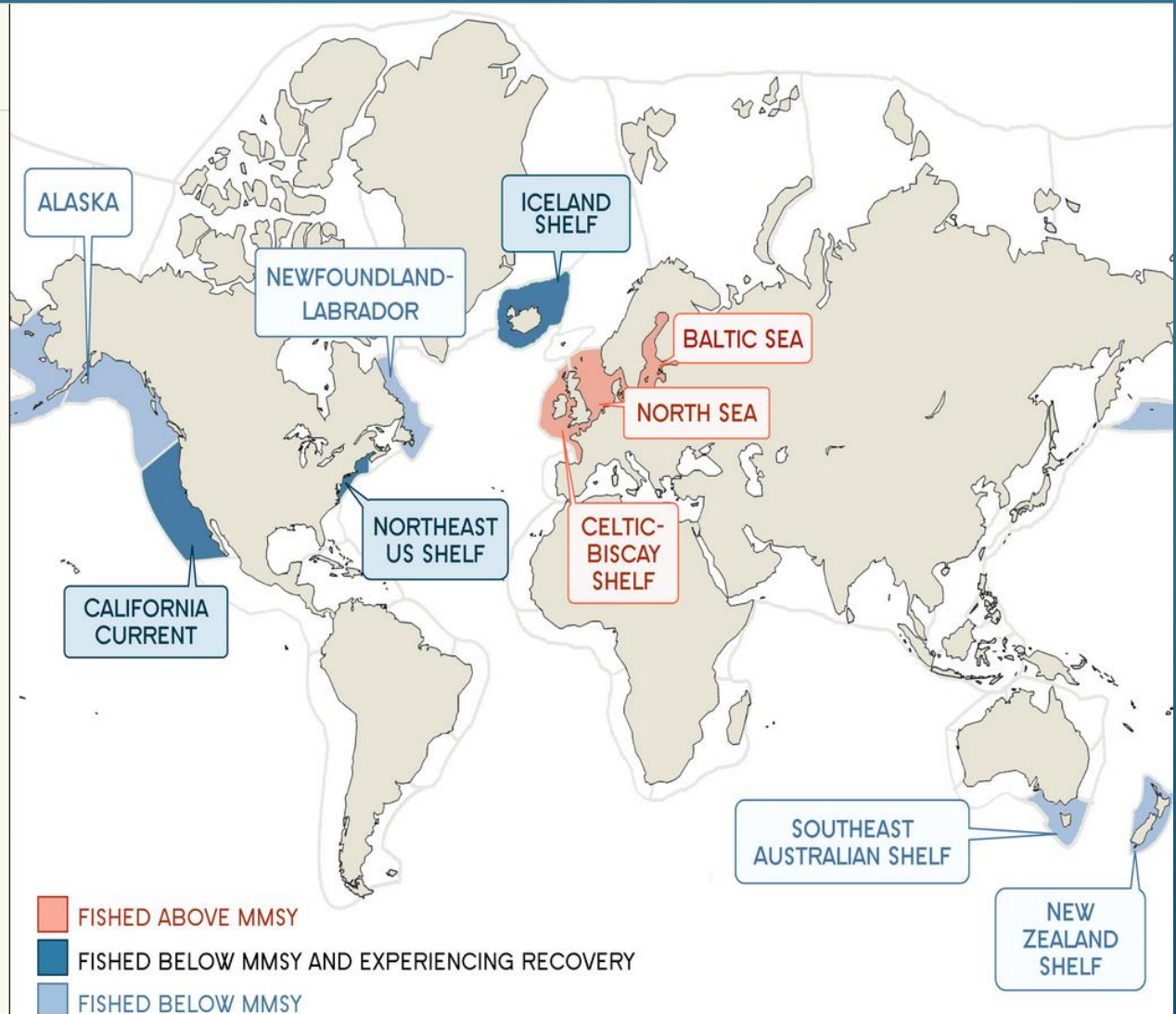
Image (above): U.N. Food and Agriculture Organization (2014) *State of the World Fisheries and Aquaculture*

Map (right): Worm et. al. (2009) *Rebuilding Global Fisheries* published by Science Magazine. Supplemental materials available at [The Future of Marine Animal Population \(FMAP\)](#).

The following is the figure legend provided by FMAP for this map:

"MMSY is 'Multi-species maximum sustainable yield' - it is the level at which an ecosystem can maximally sustain fisheries yield across a number of species, not just one. Fishing below MMSY provides ecosystems with a chance to recover. PLEASE NOTE: Alaska (the East Bering Sea in particular) has never been fished above MMSY."

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Sustainable Seafood Story Map



Seafood Story Map

Marine Aquaculture

There are many advantages of farming seafood in the marine environment, including fewer demands on space and fresh water.

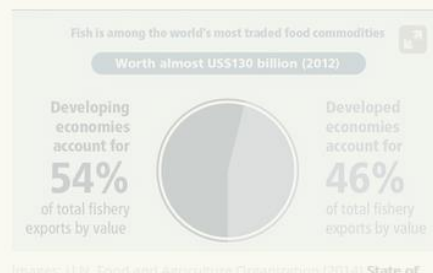
But sustainable ocean aquaculture requires careful oversight. There have been numerous examples of aquaculture operations around the world that are neither environmentally nor socially responsible. (see the "Bad News" image on the right)

But we know how to manage operations to produce quality seafood while maintaining healthy and productive ocean ecosystems. Recent advances in aquaculture science and technology have led to more sustainable systems. Many of those advances have been made in the U.S. (see the "Good News" image on the right)

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Seafood In The United States

Worldwide, seafood is one of the most traded commodities.



Images: UN, Food and Agriculture Organization (2014) State of

Bad News

Sewage with your salmon, sir?

Pressure is mounting to do something about salmon farming in Scotland. From the first edition of the report, the Scottish Government has been criticised for its handling of the issue. A report published this week, Friends of the Earth Scotland's 'Salmon and Sewage', says it is worried about the impact of salmon farming on the environment. The report was published in the wake of a report by the Scottish Government that 340 tonnes of sewage were discharged from Scottish fish farms last year.

Twenty years ago, the output of Scotland's fish farms was 1,000 tonnes. Last year, 340 tonnes—two-thirds of that—were discharged from Scottish fish farms last year.

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The Disgusting Truth About Asian Farms

JENNIFER WELSH
0911 254 2022, 2108 666
@jwelsh1971

Eighty-six percent of our seafood is imported, and about half of those imports are raised on factory farms, called aquaculture.

Asia is the number one producer of these aquaculture products, dominating 89 percent of the industry, and most of our farmed fish imports. National Oceanic Association report

Thai shrimp produced by forced labour reaching EU and US, warn campaigners

Report by Environmental Justice Foundation urges import bans amid claims of human trafficking and labour abuses

Harriet Davis
Project on April, Thursday 20 September 2013 13:14 EDT



Fish Farming's Growing Dangers

By Kim Star
Wednesday, Sept. 18, 2007

To her back that for a small planet, human beings



Disease threatens aquaculture in developing world

Disease may damage fish farming, hitting food security and economies, *Worldwide*
GlobePost

Good News



Chesapeake oysters making an incredible comeback

Harvests increased 3,000 percent since 2005

But the water quality is still a concern and is expected to remain so for the next 10 years, according to the report. The report also says that the water quality is still a concern and is expected to remain so for the next 10 years, according to the report.

Salmon Farming Gets Leaner and Greener

Report says the industry is becoming more sustainable

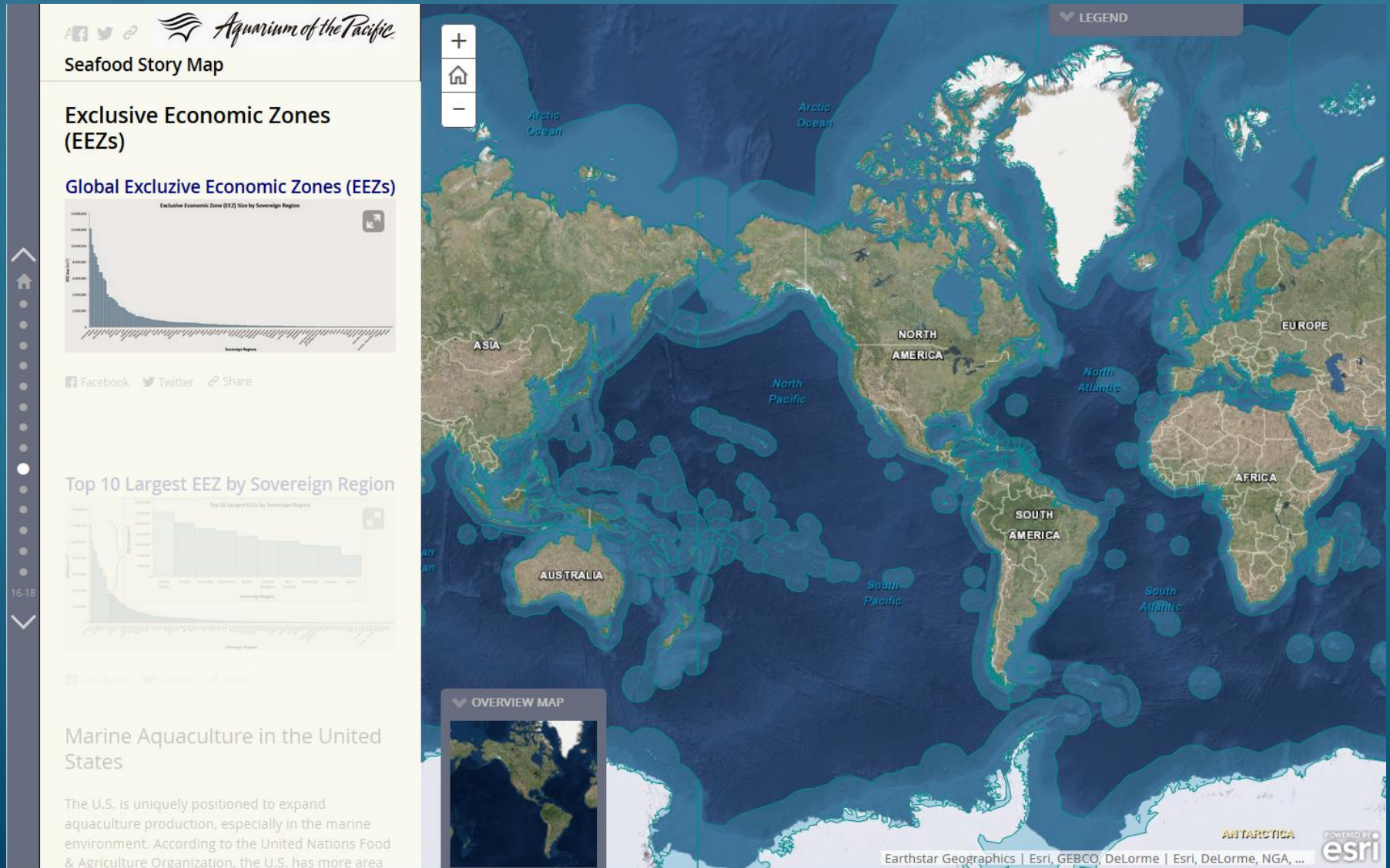


RESEARCH

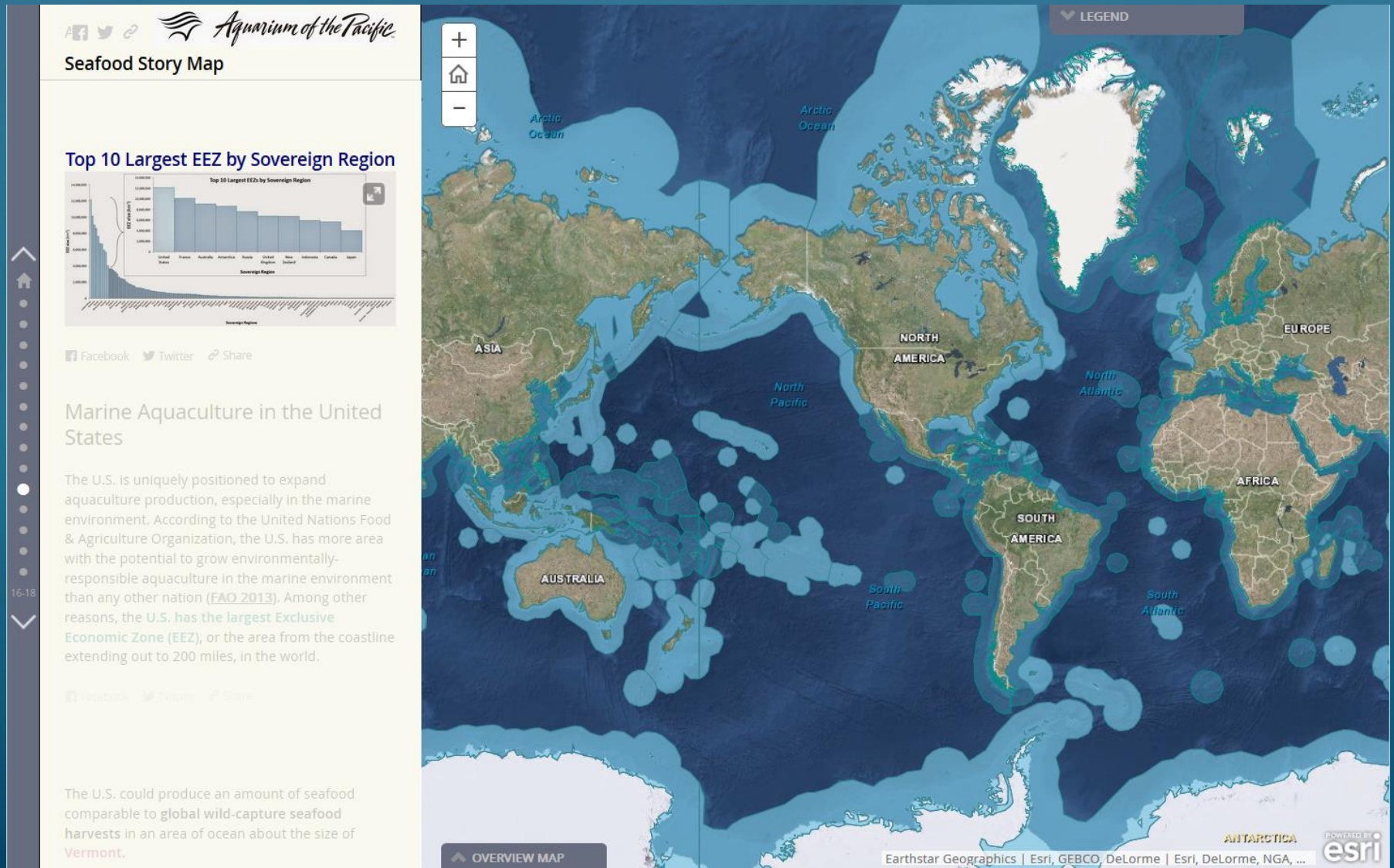


UTILIZATION OF FISH BY SPECIES

Sustainable Seafood Story Map



Sustainable Seafood Story Map



Sustainable Seafood Story Map



Seafood Story Map

Marine Aquaculture in the United States

The U.S. is uniquely positioned to expand aquaculture production, especially in the marine environment. According to the United Nations Food & Agriculture Organization, the U.S. has more area with the potential to grow environmentally-responsible aquaculture in the marine environment than any other nation ([FAO 2013](#)). Among other reasons, the U.S. has the largest **Exclusive Economic Zone (EEZ)**, or the area from the coastline extending out to 200 miles, in the world.

Facebook Twitter Share

The U.S. could produce an amount of seafood comparable to global wild-capture seafood harvests in an area of ocean about the size of Vermont.

Source: U.N. Food and Agriculture Organization (2013) [A Global Assessment of Offshore Mariculture Potential from a Spatial Perspective](#)

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Making a Case for Aquaculture in the Southern California Bight

The Southern California Bight

The Southern California Bight extends from Point



Sustainable Seafood Story Map



Seafood Story Map

The U.S. could produce an amount of seafood comparable to **global wild-capture seafood harvests** in an area of ocean about the size of **Vermont**.

Source: U.N. Food and Agriculture Organization (2013) [A Global Assessment of Offshore Mariculture Potential from a Spatial Perspective](#)



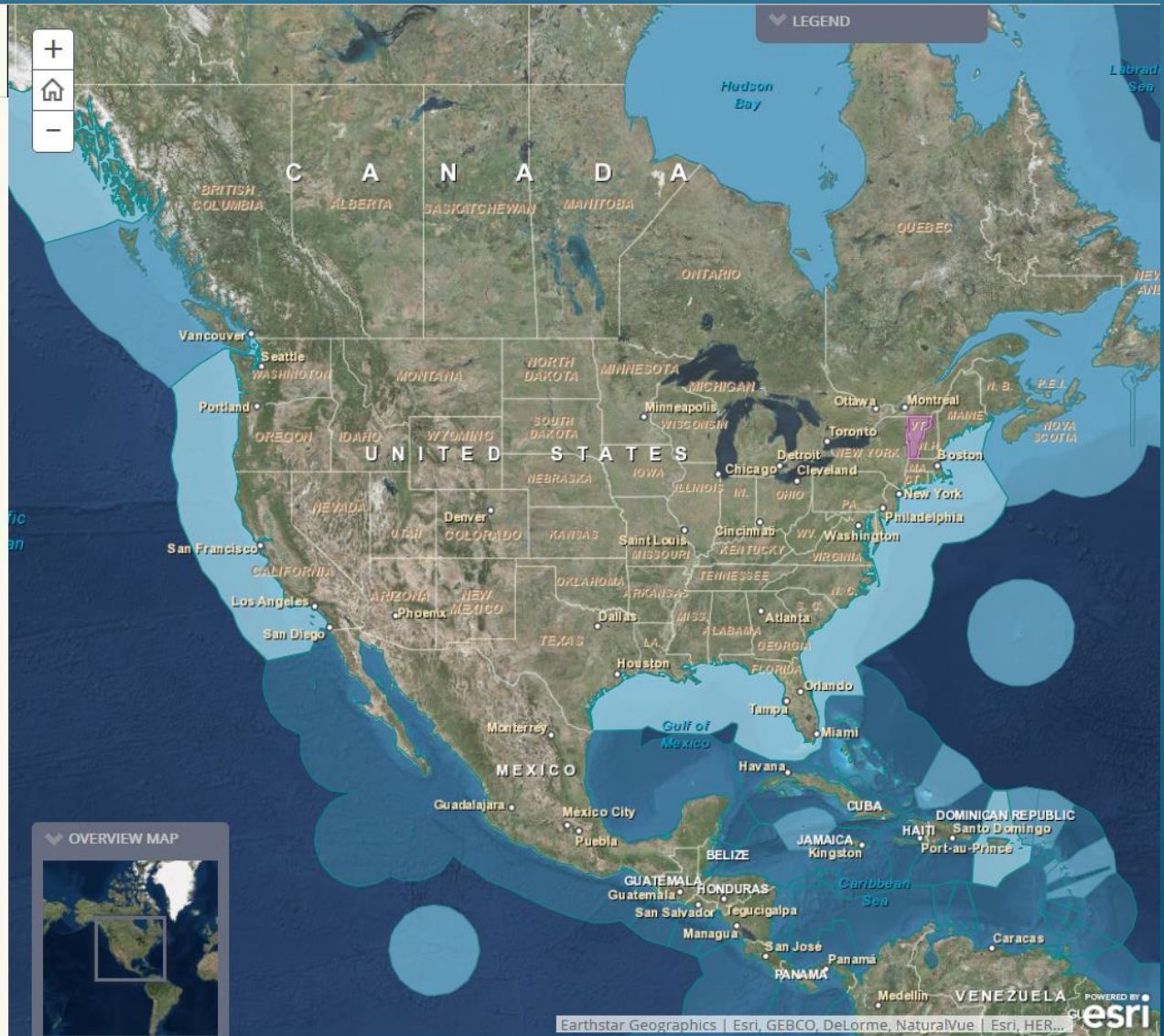
To put the above statement into perspective, the entire State of Vermont fits into the Southern California Bight, with quite a bit of room to spare.

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Making a Case for Aquaculture in the Southern California Bight

The Southern California Bight

The Southern California Bight extends from Point



Sustainable Seafood Story Map



Seafood Story Map

The Future of Seafood

Globally, best management practices for fisheries and aquaculture is improving in many countries for various reasons, including international pressure and the collaborative efforts of multi-stakeholder groups working to improve fisheries and aquaculture in areas where management and enforcement are lacking.

In the United States, fishermen and aquaculture producers operate under one of the most comprehensive regulatory environments in the world. Seafood producers that are operating in U.S. waters must meet a suite of federal, state, and local regulations that ensure environmental protection, water quality, food safety, and protection of public health.

The U.S. has the science, technology, policy, and natural resource assets to produce environmentally-responsible seafood to meet our growing demand for seafood.







Image (above): NOAA Fisheries

Image (right): Aquarium of the Pacific (2014). *Marine Aquaculture: Farming Seafood for People and the Planet*. Created for NOAA Science on a Sphere.




Long Beach Climate Resiliency Story Map

[Home](#) [Gallery](#) [Map](#) [Scene](#) [Groups](#) [My Content](#) [My Organization](#) 1 Jenny ▾




Story Maps Website


Story Maps and other GIS-related projects




Long Beach Climate Change Resiliency



Ocean Exploration Story Map



Sea Level Rise Web App







Seafood Story Map

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Long Beach Climate Resiliency Story Map



Long Beach Climate Change Preparedness and Resiliency

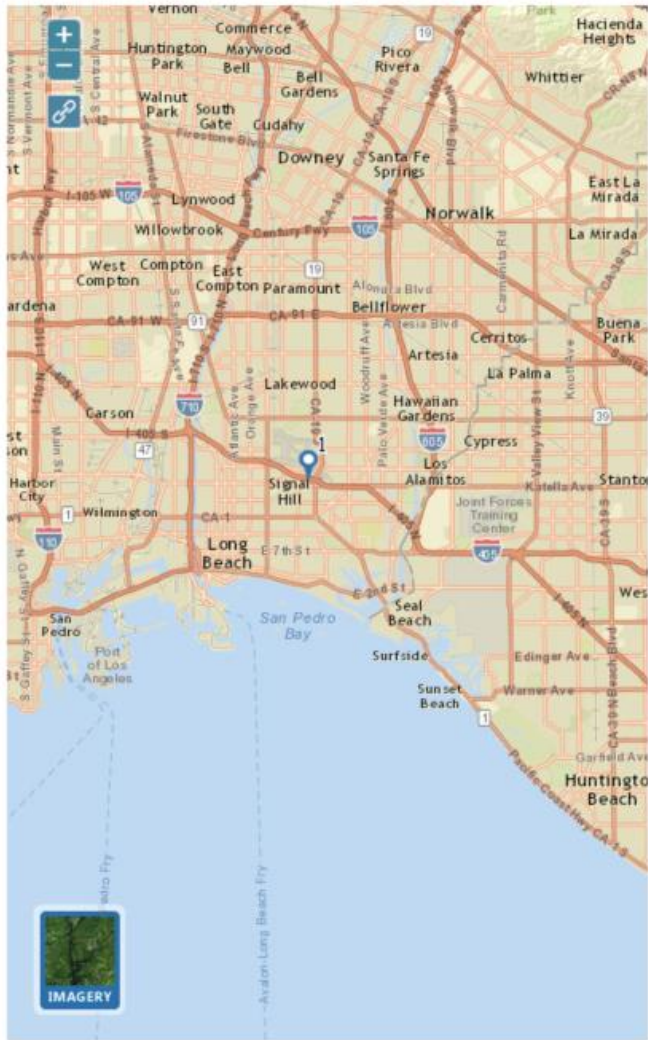
In his January 2015, State of the City Address, Long Beach City Mayor, **Dr. Robert Garcia**, announced the city was partnering with the [Aquarium of the Pacific](#) and scientific experts to create a "Climate Resiliency Action Plan."



The above photo is from the Long Beach Post's January 14, 2015 article
"Mayor Robert Garcia's state of the City Address: Long Beach Strong. Getting Stronger"

The "**Climate Explorer**" interactive map on the right was created by the U.S. **Climate**

CLIMATE EXPLORER




IMAGERY


LAYERS**HISTORICAL DATA**


TOPICS:

Coastal Flood Risk


Climate Stressors


☐ Inundation from Sea Level Rise (1ft) 

☐ Inundation from Sea Level Rise (2ft) 

☐ Inundation from Sea Level Rise (3ft) 

People and Assets Impacted

☐ Population Density (2000) 

☐ Coastal Vulnerability to Sea Level Rise 

☐ Social Vulnerability Index 

LAYER INFORMATION

Long Beach Climate Resiliency Story Map



Long Beach Climate Change
Preparedness and Resiliency

Heat Waves

Cal Adapt information and images of heatwaves.
- <http://cal-adapt.org/temperature/heat/>

What is the Urban Heat Island Effect?



To learn more about urban heat islands
see <http://education.nationalgeographic.com/encyclopedia/urban-heat-island/>

To find out how to protect yourself during a heat wave see <http://www2.epa.gov/natural-disasters/extreme-heat>

Image at right: Chicago Tribune
<http://www.chicagotribune.com/news/ct-chicago-heat-wave-20-years-later-met-20150715-story.html>



Long Beach Climate Resiliency Story Map



Long Beach Climate Change
Preparedness and Resiliency

From Droughts to Floods

Climate change is and will continue to affect rainfall patterns, from longer dry seasons to shorter and more intense storms. Drought may become a permanent feature of California's climate and when the rains do arrive intense storms can cause flooding.

In recent years, California has been experiencing an unusually severe drought. 2014 was the hottest year in California history since 1934, and recent projections from the National Academies of Sciences (NAS) do not show any signs of cooling down. This increased warming combined with an atmospheric anomaly known as "The Ridiculously Resilient Ridge" have caused the severe drought still experienced today. The absence of rain has caused major problems for the agricultural businesses in California, a \$42 billion industry. Also, the drought has resulted in dry vegetation across state parks, which has caused widespread wildfires. *NOAA's map on the right compares drought conditions from 2014 (left) to those of 2012 (right), simply drag the white bar from side to side. For more information on the data used to create this map go to [link](#). Additional Drought data is also available online at [link](#).*

US Drought Monitor Comparison Between June 10, 2014 & June 12, ...

[Link to US Drought Monitor](#)

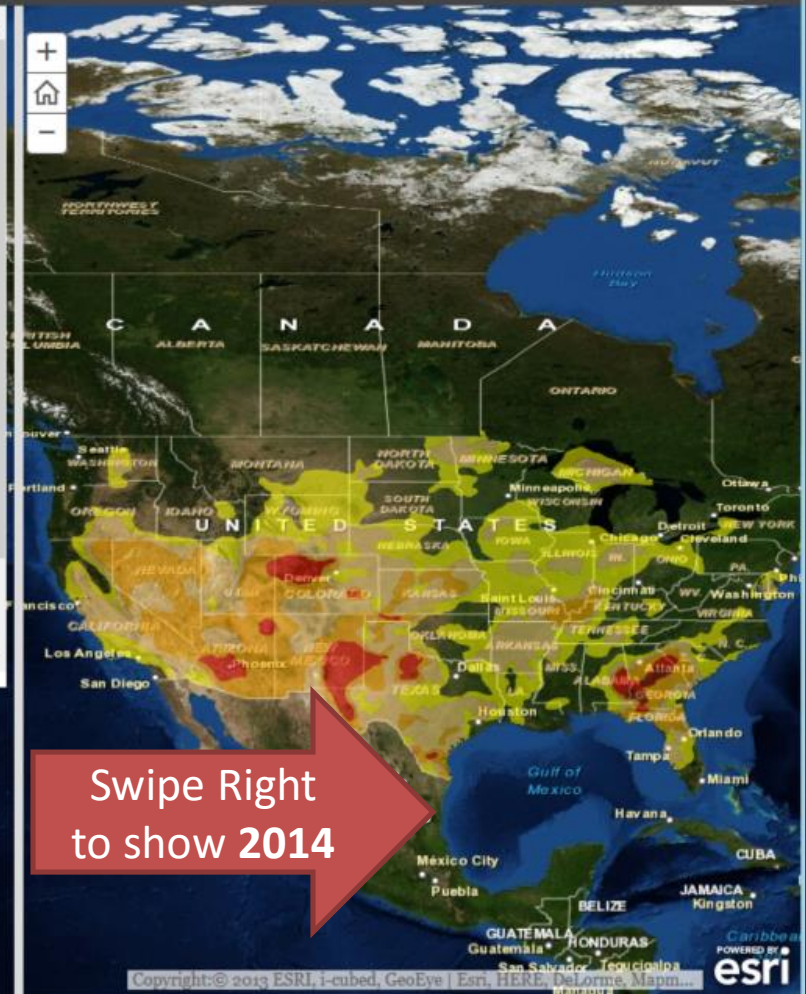
A comparison of the US Drought Monitor maps for the continental United States for June 10, 2014 & June 12, 2012.



The two US Drought Monitor maps presented here compare the drought depiction between June 12, 2012 and June 10, 2014. The drought depiction in the western portions of the United States, especially in CA and NV, has become increasingly more severe due to three below normal rainfall water years of 2011-12, 2012-13 and 2013-2014. Drought in portions of Texas, Oklahoma, Kansas, New Mexico and south east Colorado has also increased in severity.

US Drought Monitor Classification:

D0	Abnormally Dry
D1	Moderate Drought
D2	Severe Drought
D3	Extreme Drought



Long Beach Climate Resiliency Story Map



Long Beach Climate Change
Preparedness and Resiliency

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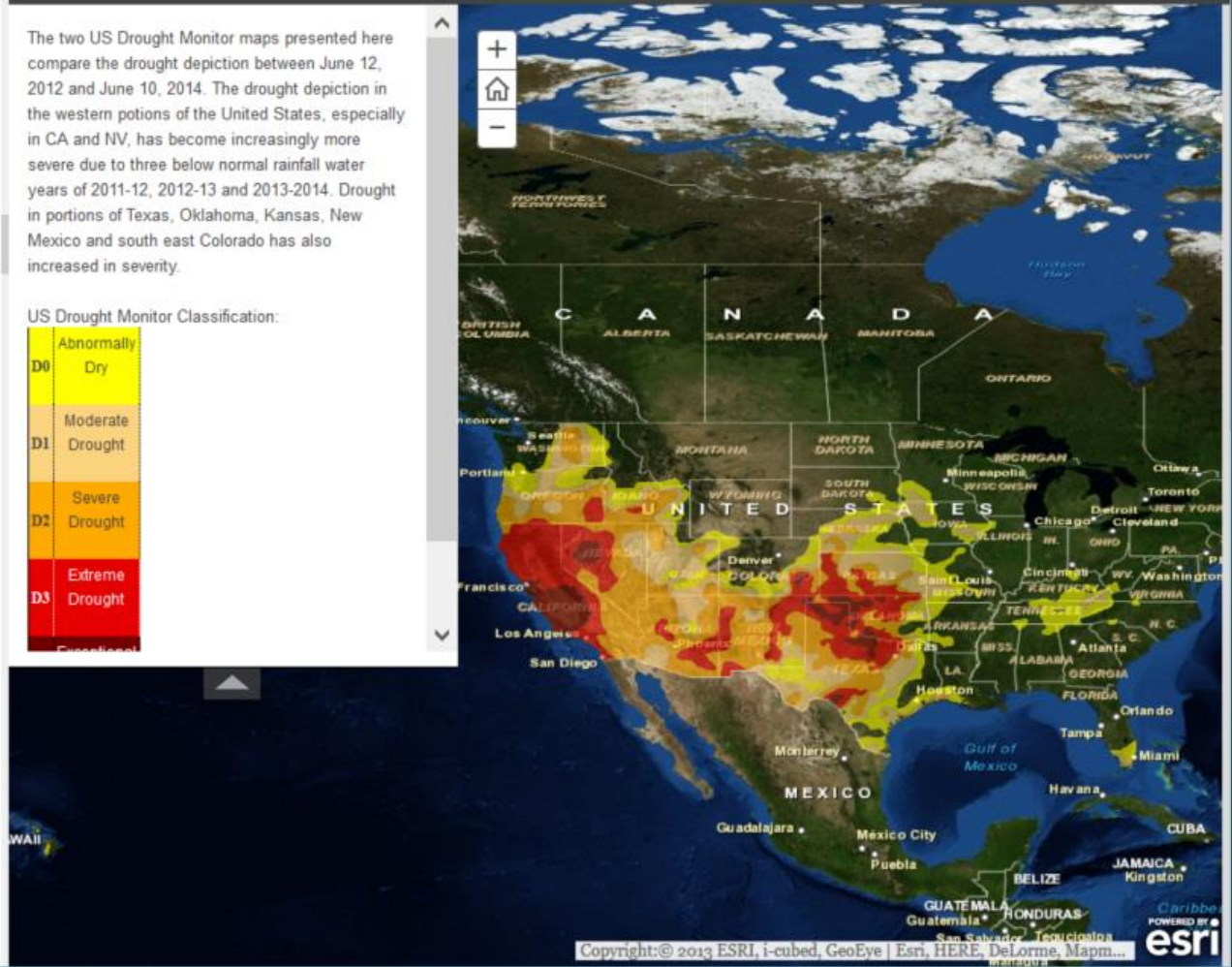
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	Abnormally Dry
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D3	Extreme Drought



Long Beach Climate Resiliency Story Map



Long Beach Climate Change Preparedness and Resiliency

Rising Sea Levels



The above photo (by Mike Flippoff) is from the following Examiner article, "[Public encouraged to post photos of king tides hitting SF coast](#)" by Jessica Kwong (12/30/2013)

The interactive map on the right shows which areas of **Long Beach** would be flooded with **6 feet of Sea Level Rise (SLR)**. The amount of SLR can be adjusted using the slider at the top of the screen. Other categories of related data can be viewed by selecting their respective topic headings (i.e. Confidence, Marsh, Vulnerability, Flood Frequency). This map was created using [NOAA's Sea Level Rise and Coastal Flooding Impacts v2.0](#) data viewing tool.



Sea Level Rise and Coastal Flooding Impacts

Sea Level Rise Confidence Marsh
Vulnerability Flood Frequency

Sea Level Rise ?

6 ft SLR

Legend

- Water Depth
- Low-lying Areas
- Area Not Mapped
- Visualization Location

[View Levees](#)

Overview

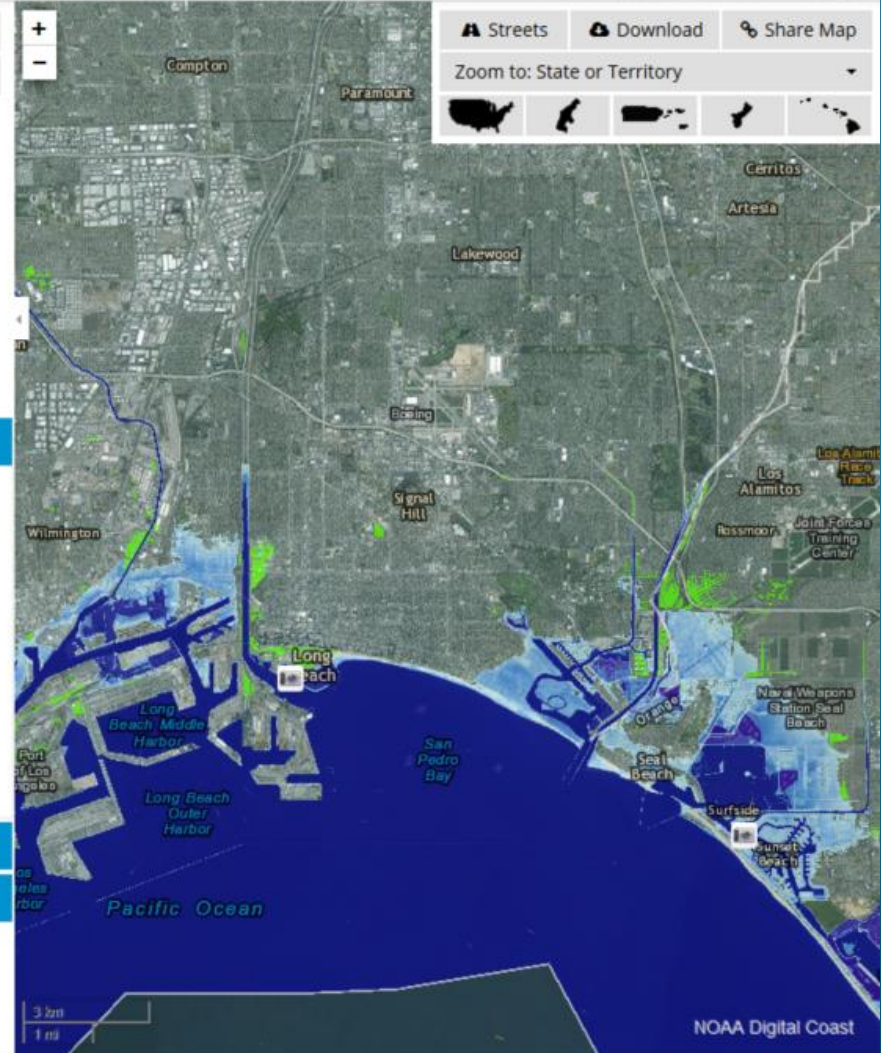
Use the slider bar above to see how various levels of sea level rise will impact this area.

Levels represent inundation at high tide. Areas that are hydrologically connected are shown in shades of blue (darker blue = greater depth).

Low-lying areas, displayed in green, are hydrologically "unconnected" areas that may flood. They are determined solely by how well the elevation data captures the area's hydraulics. A more detailed analysis of these areas is required to determine the susceptibility to flooding.

Understanding The Map

Additional Information



United States Department of Commerce | National Oceanic and Atmospheric Administration | National Ocean Service

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Long Beach Climate Resiliency Story Map



Long Beach Climate Change
Preparedness and Resiliency

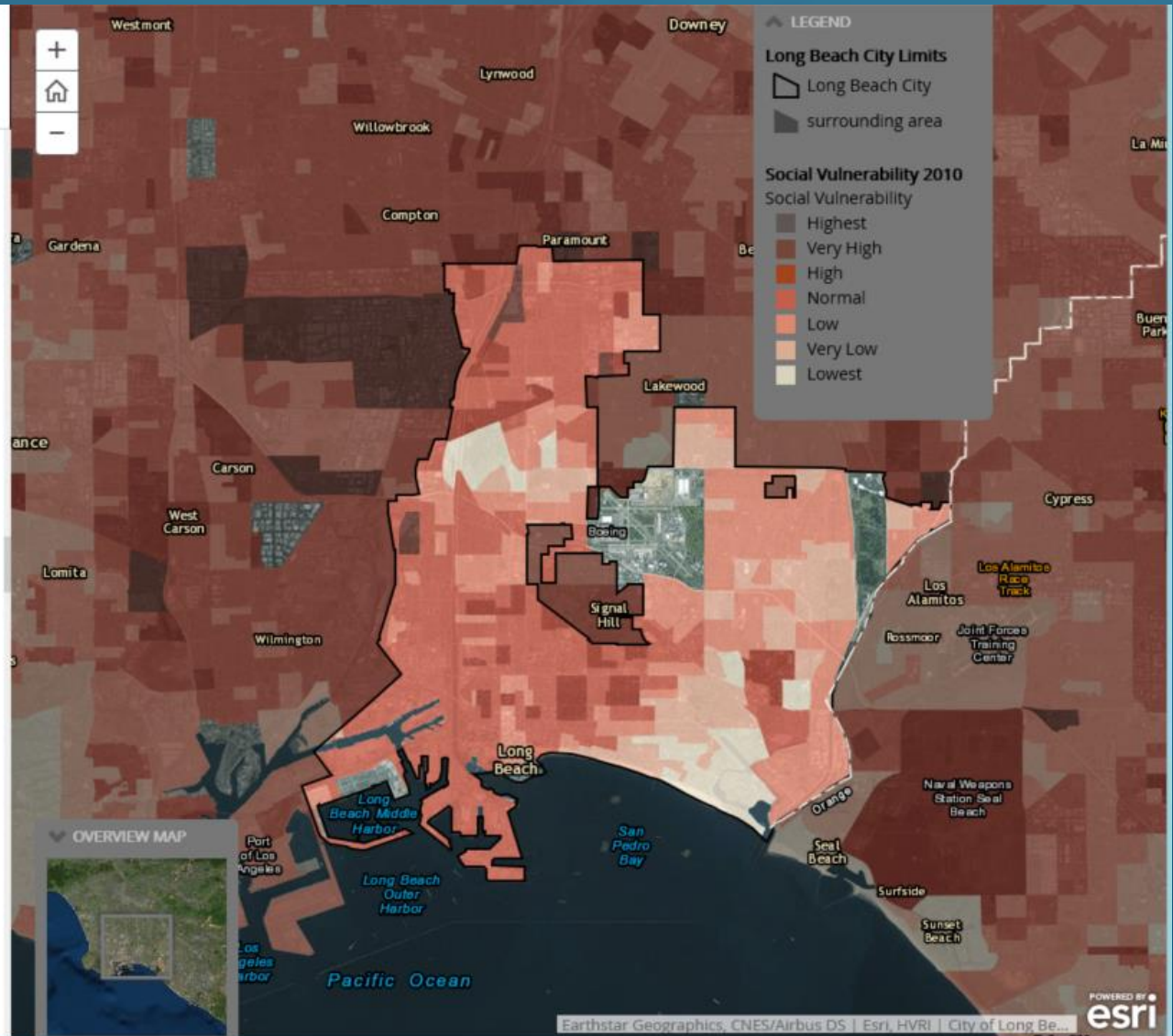
Impacting Our Most Vulnerable



the above image is from TreePeople Blog's website
(<http://blog.treepeople.org/>)

The impacts of climate change do not affect all equally. The poor, elderly, kids, and sick are impacted worst and first when heat waves, droughts, flooding, and other disasters strike. In addition, those who are already socially marginalized and face pre-existing inequalities have fewer resources to respond to these calamities. In other words, climate change worsens socio-economic inequalities. This makes addressing climate change a particular challenge. However with this challenge also comes the opportunity to make our city more equitable while growing the local economy as we prepare for climate change. The following maps use data from the State of California to identify where and who in the city must be prioritized for building a safer and more resilient Long Beach.

Exposure to
climate hazard



Long Beach Climate Resiliency Story Map



Long Beach Climate Change Preparedness and Resiliency

Poverty

Poverty comes with significant societal disadvantages while conversely wealth brings great benefits. The same is true in regards to climate change risk and preparedness. The poorest populations have the least amount of resources to draw on for adapting and responding to extreme weather events like heat waves. For example, when a heat wave strikes not everyone has the financial resources to run fans and air conditioning units, let alone have these amenities in their homes or apartments. Those experiencing homelessness may not even have access to shelter and therefore face even greater threats from being outdoors during climate extremes like severe storms and high temperatures.

For the CalEnviroScreen tool the California Environmental Protection Agency defined those in poverty as individuals living below twice the federal poverty line. This threshold was used to account for California's high cost of living. Within Long Beach distinct pockets of poverty are apparent.



Orange County Register, 2013

Poverty Demographics

Poverty Ratio

Below Poverty Level

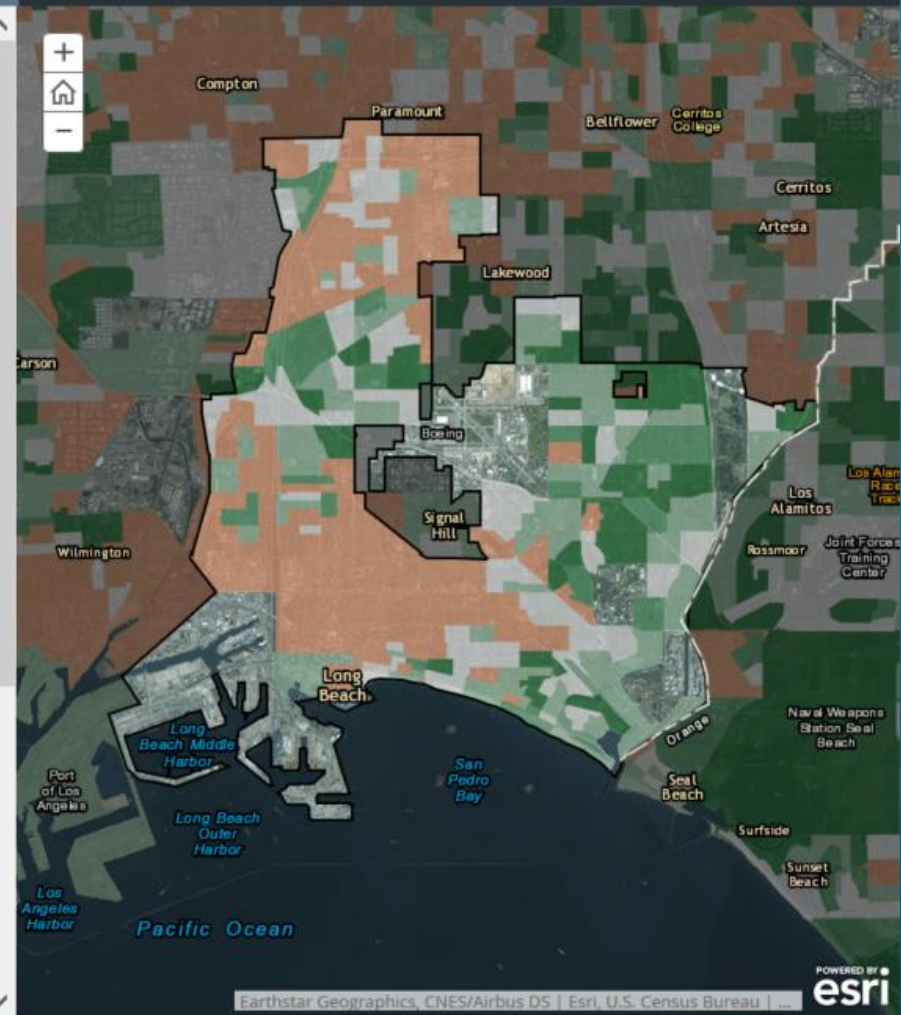
Ratio of Households Living Above and Below the Poverty Line

This map was created by AtlasPublisher and shows "the ratio of households living above the poverty line to households living below the poverty line. For the U.S. overall, there are 6.2 households living above the poverty line for every household living below. This map is shaded to clearly show which areas have about the same ratio as the U.S. overall, and which areas have **far more families living above poverty** or **far more families living below poverty** than 'normal.'"

The poverty threshold used in this map is based on the US Census Bureau's definition of poverty (for more information on how they measure poverty, please see link).

For more information on this web map please see link

an AOP story map



Long Beach Climate Resiliency Story Map



Long Beach Climate Change Preparedness and Resiliency

Children and Elderly

Children and the elderly are particularly vulnerable to environmental and health impacts, from heat waves to droughts to changes in air quality. The elderly are more likely to have other health conditions which make their immune systems particularly susceptible when smog is worsened during extreme heat. Youth and the elderly are important populations for targeting outreach and preventative care around the effects of climate change. The map at right shows the percent of the population under the age of 10 and over the age of 65 for all census tracts within the city.



The above image is from the [Healthy Schools Campaign's National Green Schoolyards Summit](#) website.

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Respiratory Ailments

Changes in temperature and rainfall patterns impact public health. Droughts and heat waves worsen both cardiovascular problems and respiratory ailments. As our cities become hotter smog may worsen with increasing levels of ozone. The health concerns of

Age Demographics

an AOP story map



Median Age Under 18 18 - 64 65 and over

Median Age of the US Population

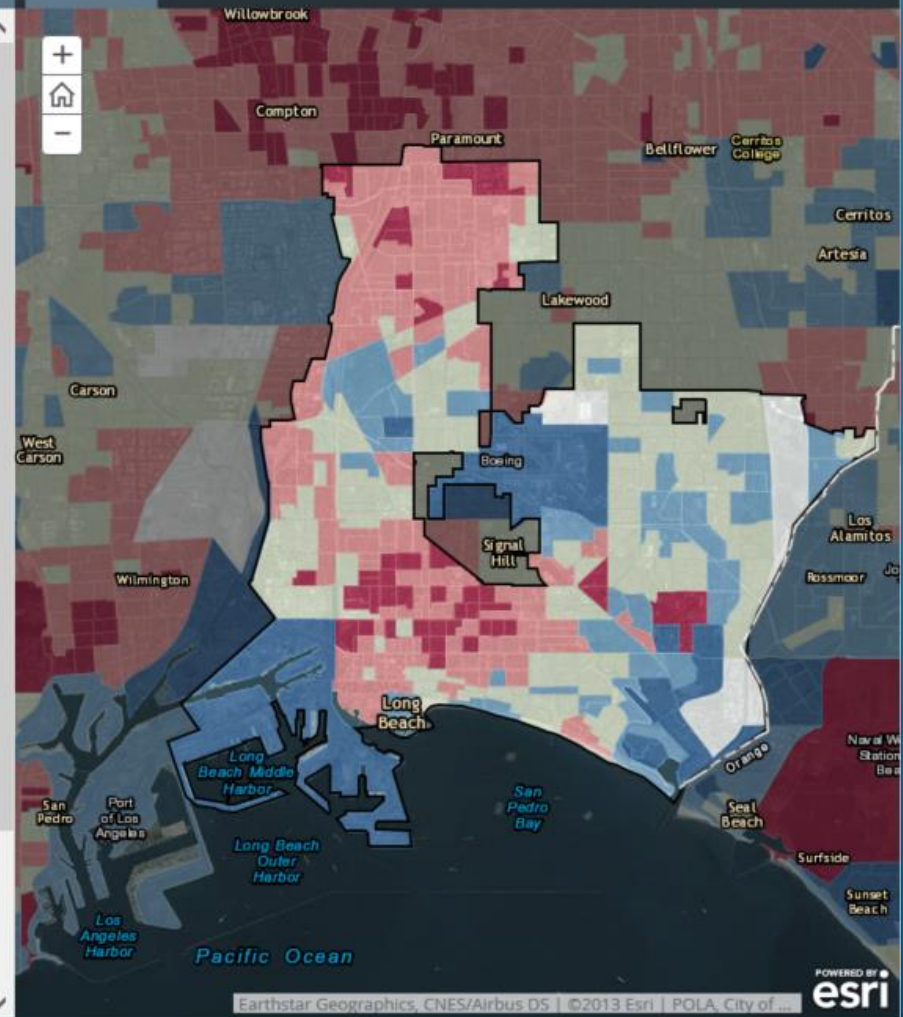
This map was created by Esri and "shows the median age of people in the United States in 2012. The median age for the U.S. is 37 years of age. The data shown is from Esri's 2012 Updated Demographics. The map adds increasing level of detail as you zoom in, from state, to county, to ZIP Code, to tract, to block group data. This map shows Esri's 2012 estimates using Census 2010 geographies. Information about the USA Median Age map service used in this map is here." for more information see link

Long Beach City Limits

- Long Beach City
- surrounding area

2012 USA Median Age (Mature Support) Median Age

- Block Groups
- 52.1 years or older
- 43.1 to 52 years old



Earthstar Geographics, CNES/Airbus DS | ©2013 Esri | POLA, City of ...



Long Beach Climate Resiliency Story Map



Long Beach Climate Change Preparedness and Resiliency

Respiratory Ailments

Changes in temperature and rainfall patterns impact public health. Droughts and heat waves worsen both cardiovascular problems and respiratory ailments. As our cities become hotter smog may worsen with increasing levels of ozone. The health concerns of climate change should give us even greater motivation to do as much as possible to improve Long Beach's air quality and expand health services for those already experiencing respiratory and cardiovascular ailments.



"Smog could get worse by mid-century as climate change boosts summer temperatures and accelerates the formation of ozone, a new study says. Above, a hazy day in Los Angeles. (Francine Orr / LA Times)."

This image is from the Los Angeles Times's May 06, 2014 article entitled "[Climate change could worsen ozone levels across the U.S., study says](#)".

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Opportunities and Strategies

Cities are the main producers of climate warming greenhouse gases and also where the majority of the U.S. population lives. Our city populations

Air Quality Estimates

an AOP story map Aquarium of the Pacific

Environmental Health Index

Particulate Matter Pollution

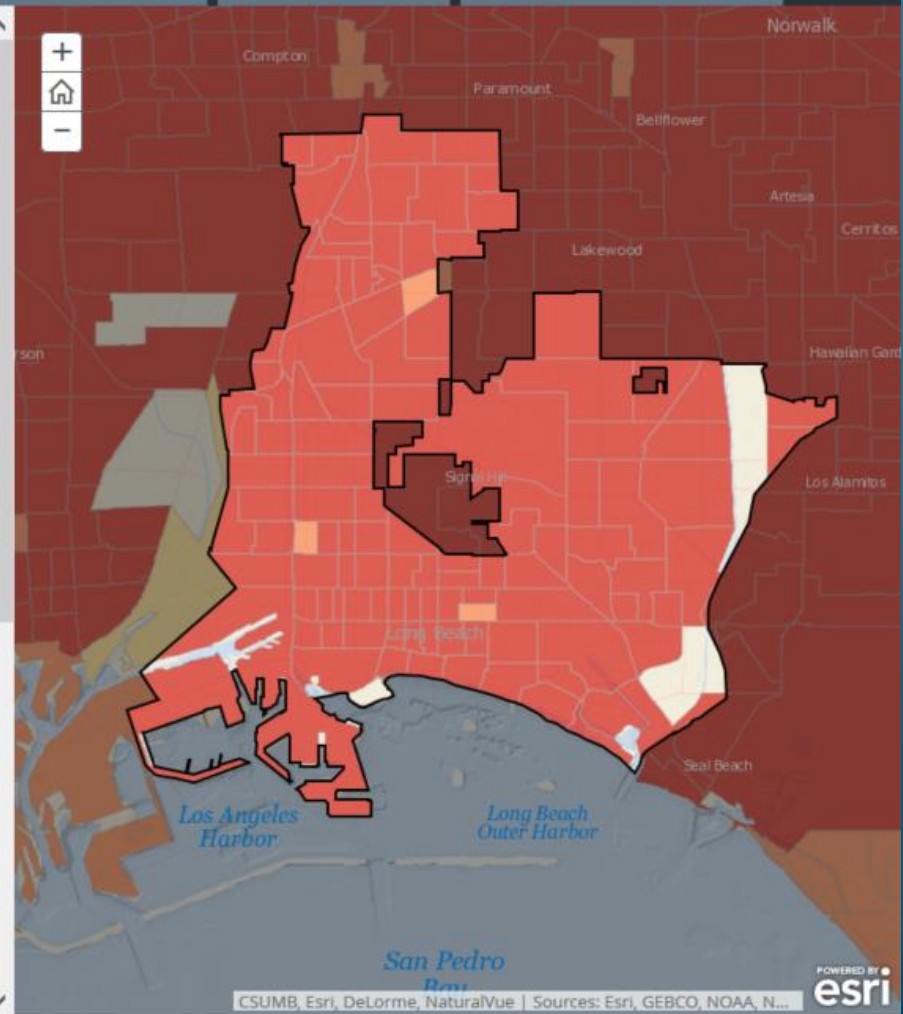
Traffic-related Pollution

Diesel Particulate Matter Pollution

Environmental Health Hazard Exposure Index Values by Census Tract

This map was created by the US Department of Housing and Urban Development (HUD) using data from the National Air Toxics Assessment (NATA) for 2005.

"The Environmental Health Hazard Exposure Index is a good measure of an environment's relative health. Values range from 0 to 100. The **HIGHER** the index value, the **LESS** exposure to toxins harmful to human health. Therefore, the higher the value, the better the environmental quality of a neighborhood, where a neighborhood is a census block-group." Conversely, **LOWER** index values indicate areas with **MORE** exposure to harmful toxins.



Long Beach Climate Resiliency Story Map



Long Beach Climate Change Preparedness and Resiliency

How to be Part of the Solution



The above photo by JLFlickr was part of the following article entitled *"What's the Best Path to a Sustainable Future?"* (published online March 17, 2015)

Everyone in Long Beach has a role to play in addressing the concerns of climate change on our city. Our first step can be to take the medical approach of do no harm. This would entail an accounting of our greenhouse gas emissions and doing all we can to reduce our contribution to climate change both individually and collectively. However even if we were to completely decrease our greenhouse gas emissions to zero today, due to the emissions that have already been released we will continue to see the impacts of our previous actions. Therefore adaptation and mitigation must go hand in hand. Many cities across the globe are coming up with inventive and imaginative strategies to take action. Across our city many organizations are working to improve our air quality, green our neighborhoods and increase walkability, expand community health services, and connect with other cities and organizations to share best practices.

To learn more about how various places across the U.S. are addressing climate change see the [U.S. Climate Resilience Toolkit](#).

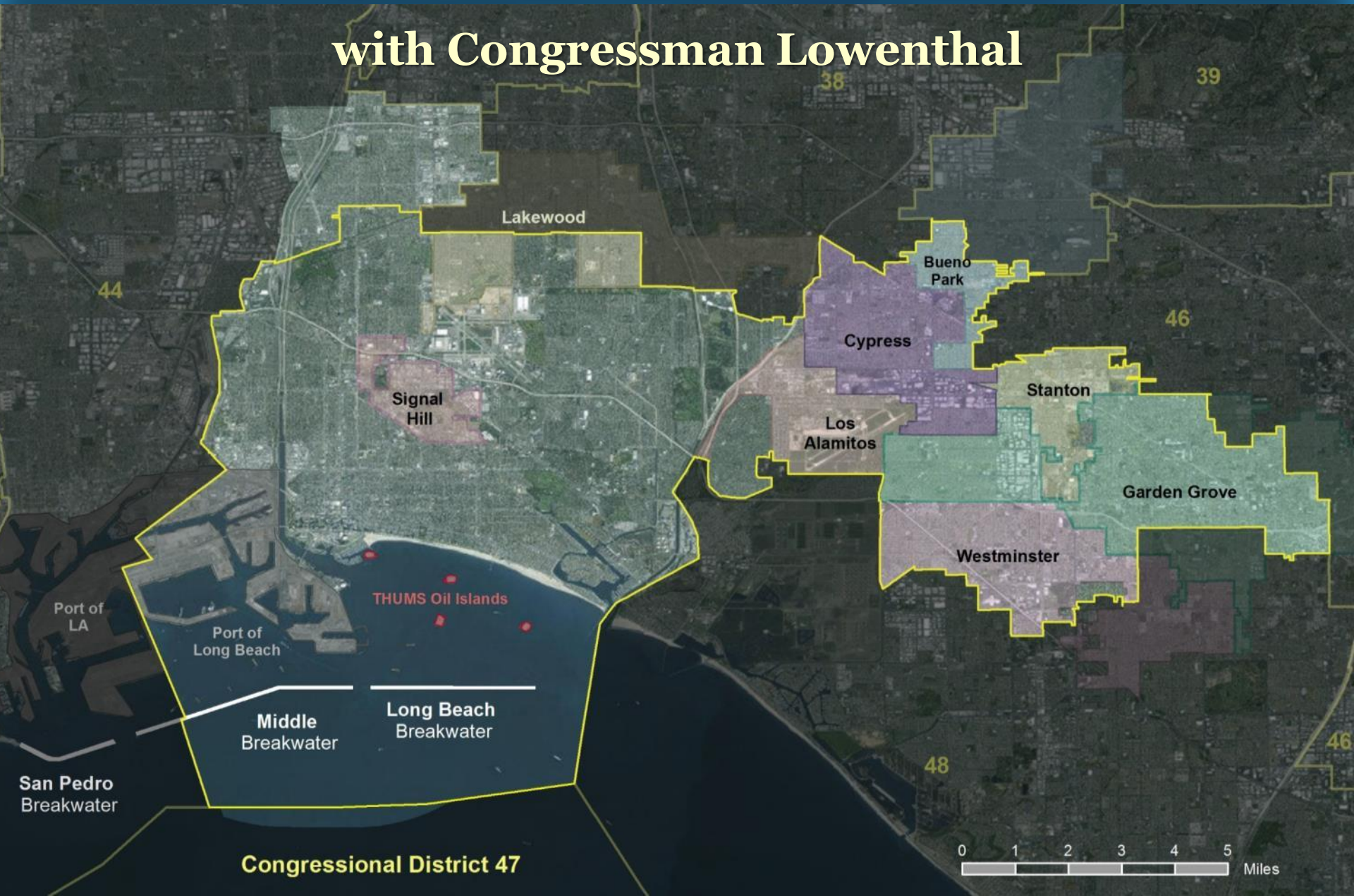
A story map    

Water & Climate Resilience

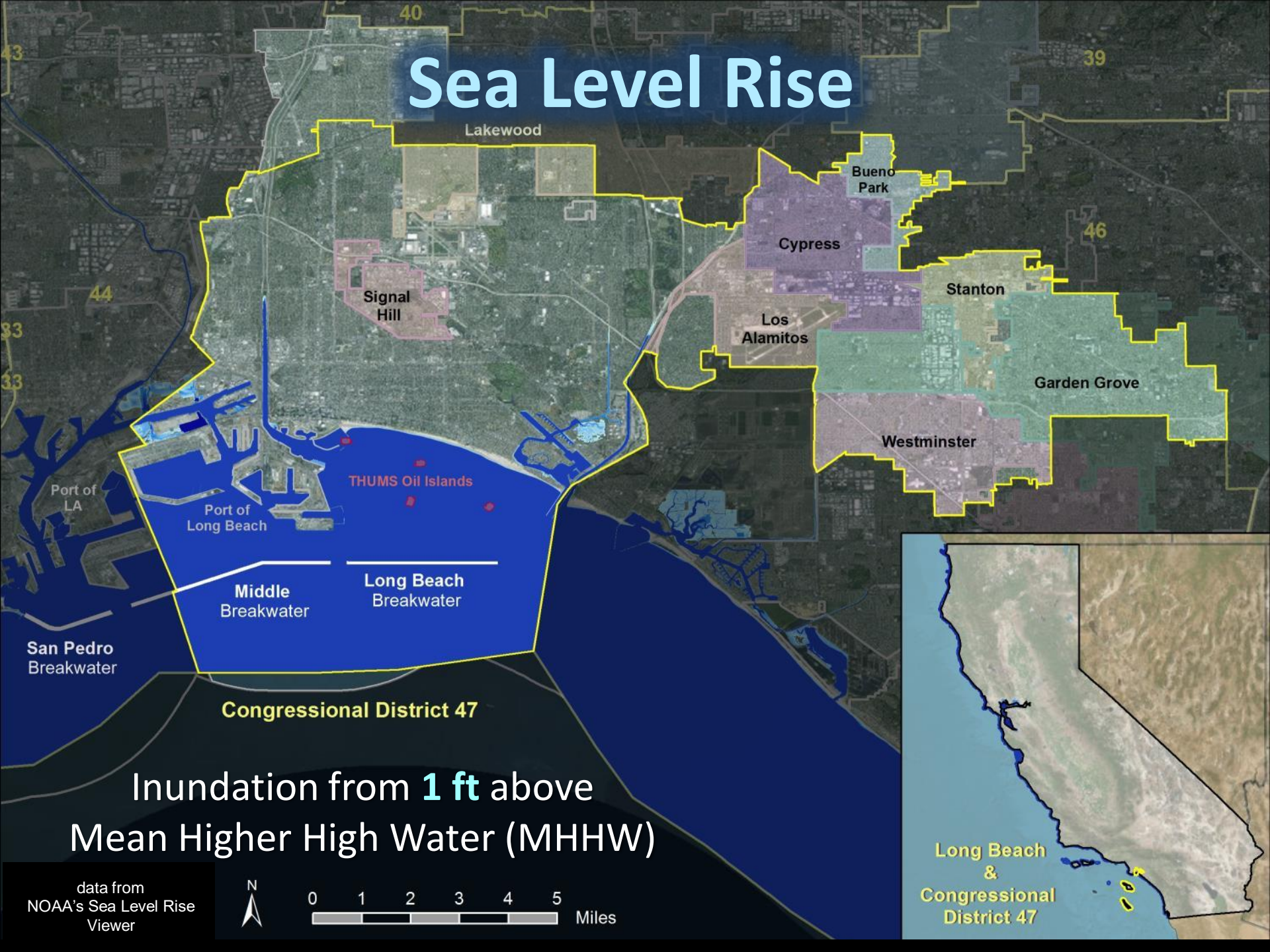
"Water is life," many would say, yet access to clean water is decreasing as temperatures and drought increase. Local, state, and federal governments have taken actions to protect water as a precious resources and mitigate coastal flooding. National flood insurance programs, sustainable agricultural policies, and clean water infrastructure are just some of the resilient actions being implemented.

Climate Change Forum

with Congressman Lowenthal



Sea Level Rise



Inundation from **1 ft** above
Mean Higher High Water (MHHW)

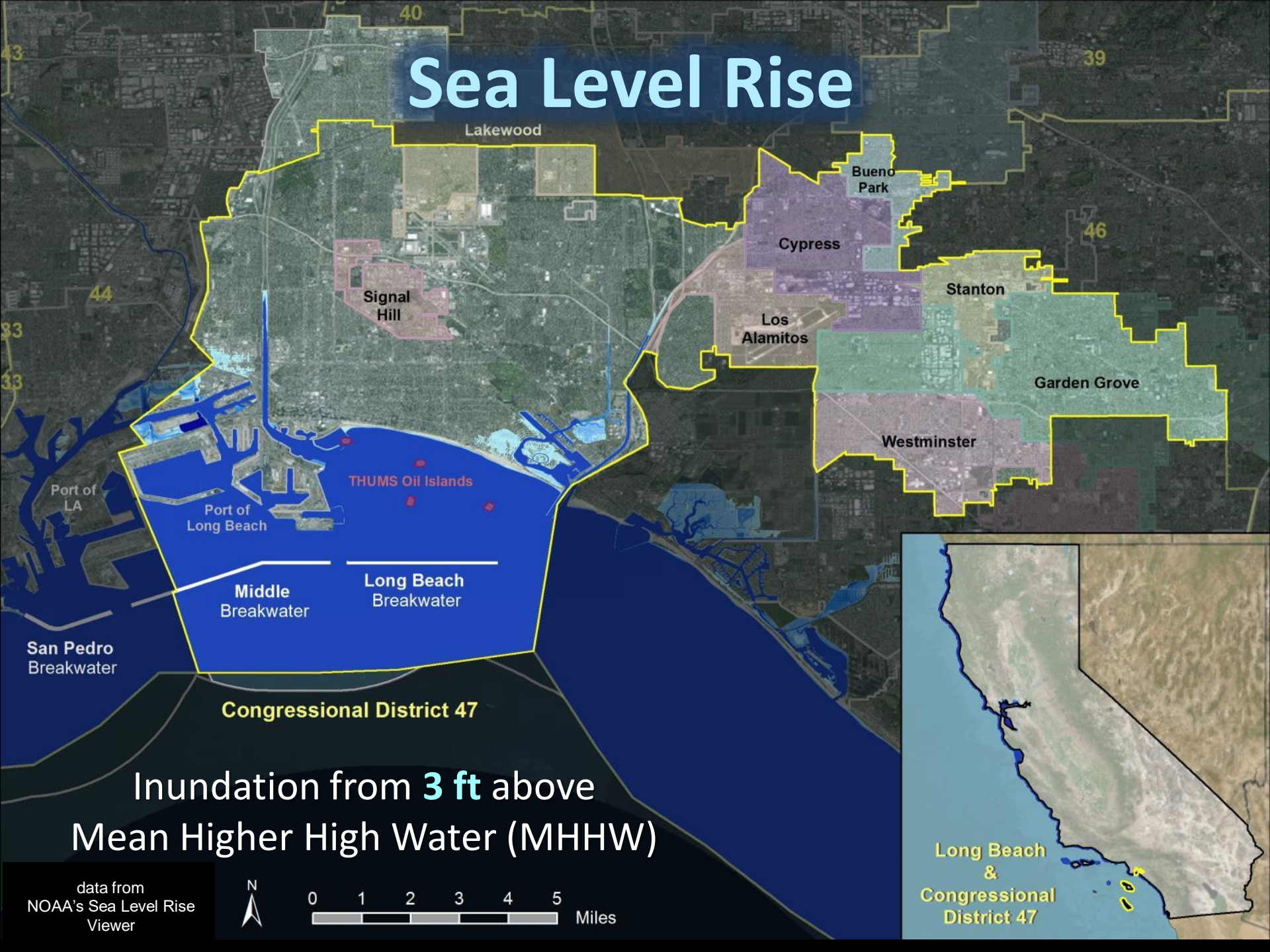
data from
NOAA's Sea Level Rise
Viewer



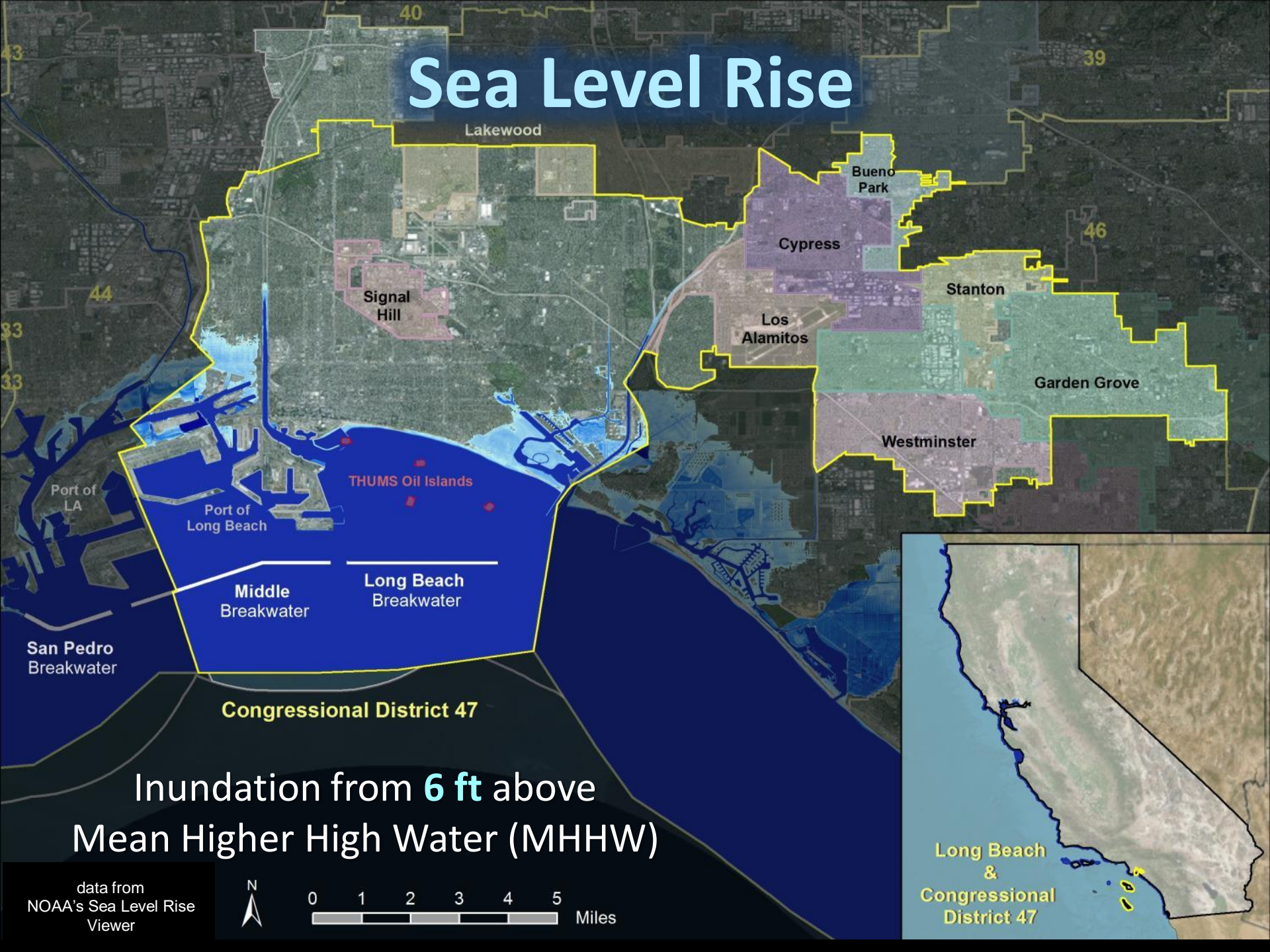
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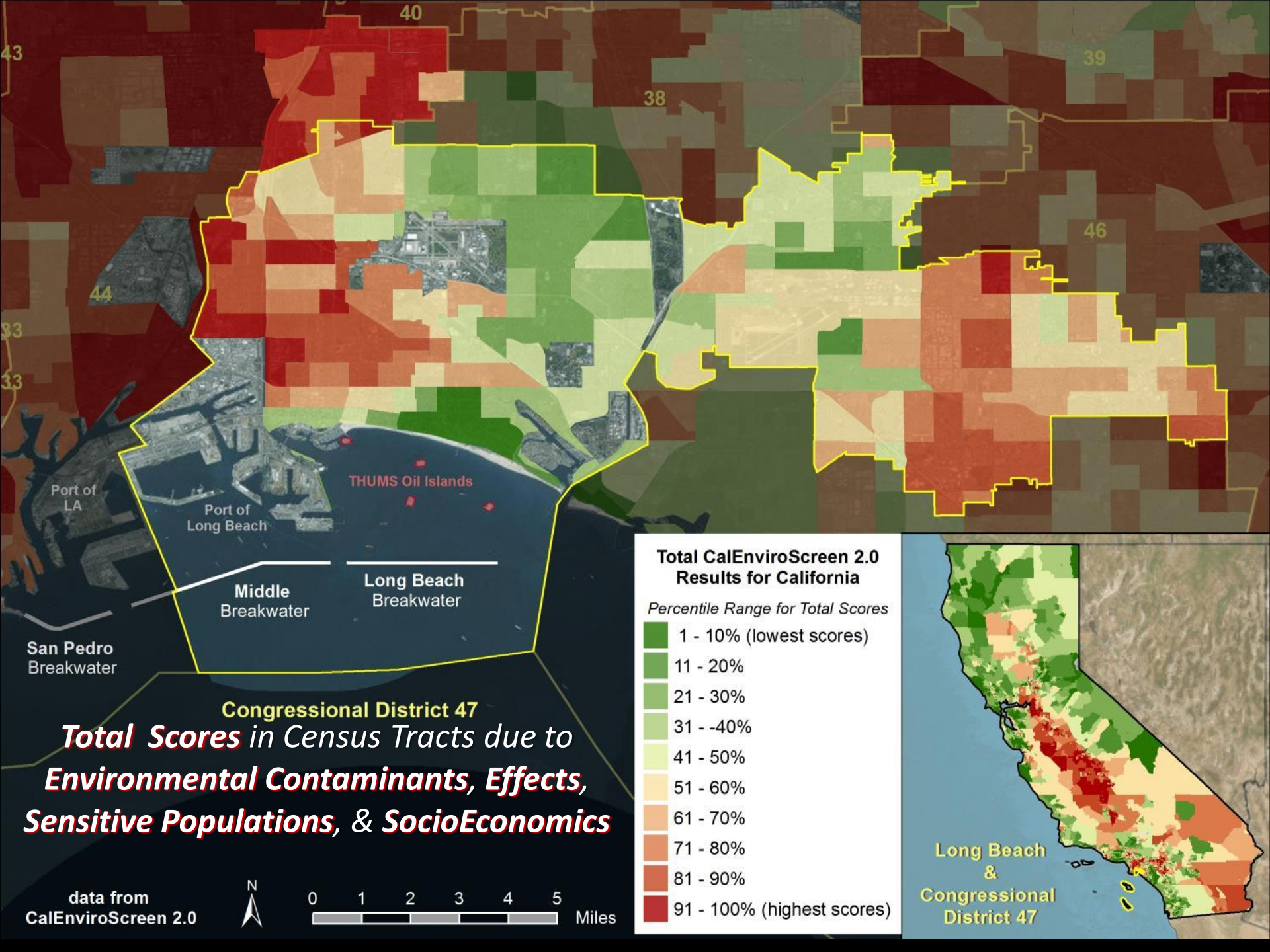
Long Beach
&
Congressional
District 47

Sea Level Rise



Sea Level Rise





Our Challenge: Finding the Right Balance between our Live Animal Exhibits and Digital Interactives





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