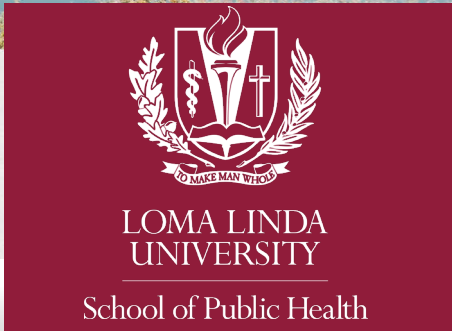


# Balloon mapping used to map shoreline reduction and forecast air quality impacts to nearby communities.

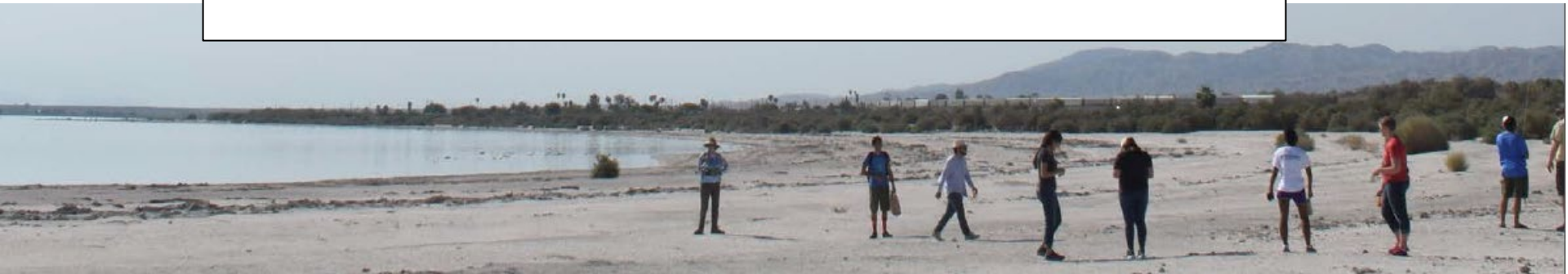
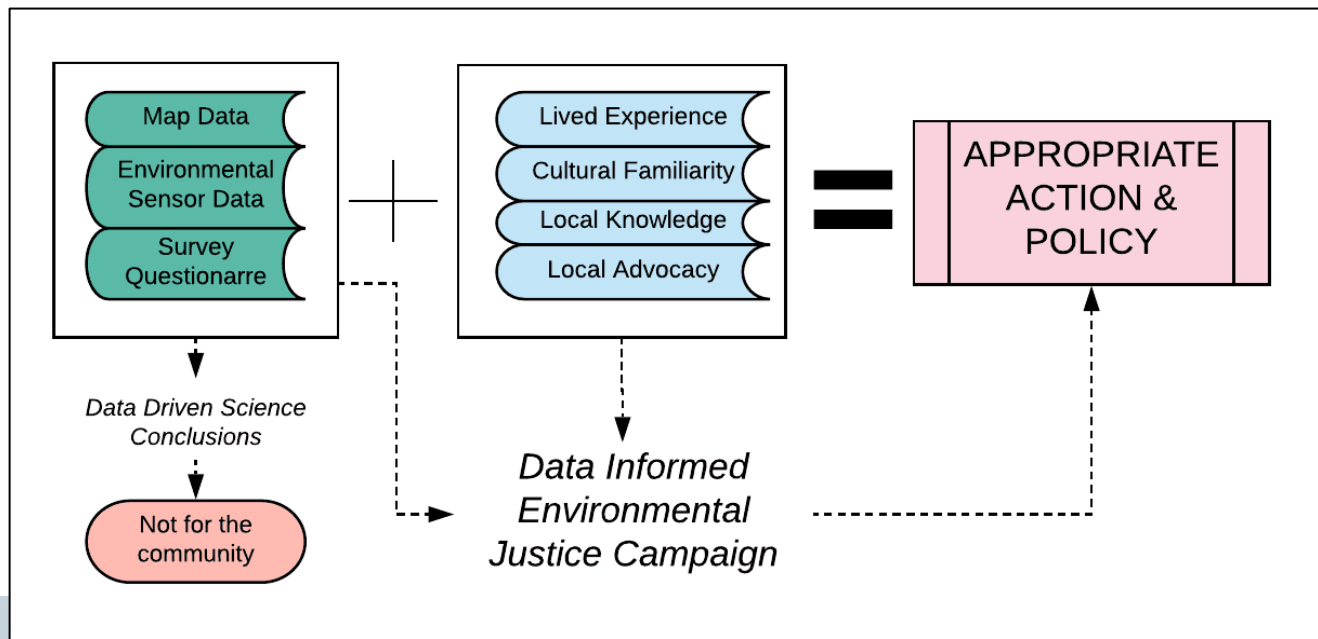
Ryan Sinclair PhD MPH, Josileade Gaio MPH, Patricia Leal-Gutierrez MS, William C. Porter PhD



LOMA LINDA


## What is Community Science?

The process by which scientists and communities **do science together** to advance one or more **community priorities**. It encourages communities, particularly historically marginalized and oppressed communities, **to guide, participate in, learn from, and benefit from science.**



<https://files.resources.ca.gov/salton-sea/>



Search 



Agency

Offices

Initiatives

Water Action Plan

# Salton Sea Management Program

Preserving clean air, ecosystem wealth, and a stable water supply.



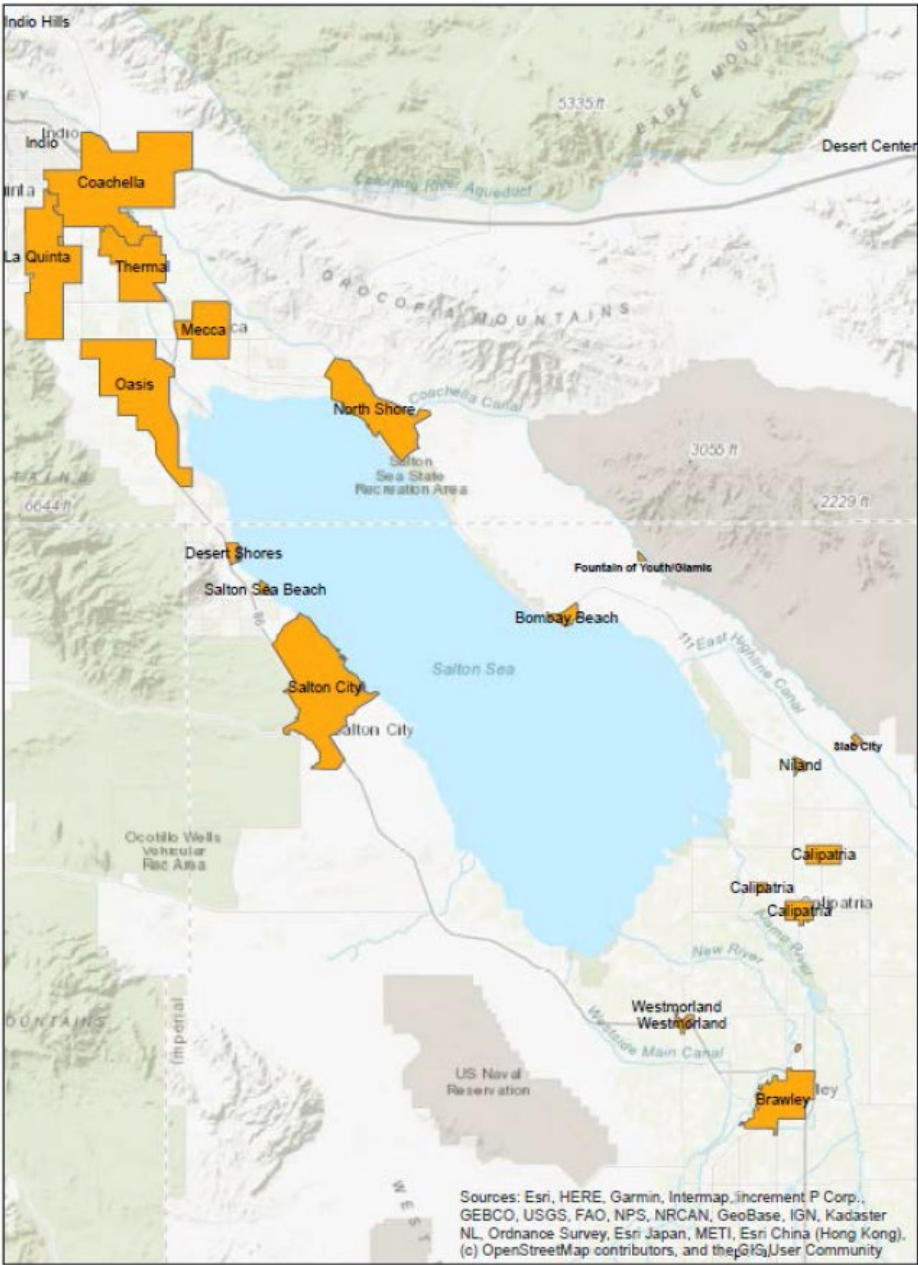


## What are the advocacy needs?

- Build local knowledge and skills “Science of the Salton Sea”.
  - Demonstrate that the shoreline is changing
  - Explain the linkage between the increasing playa and air quality
  - Discuss scientific evidence related to personal health experience
  - Be familiar with the shoreline change in a well-known area
- Conduct policy relevant environmental health research
  - Demonstrate that the shoreline is changing with data
  - Provide data that can be used by advocacy groups and state agencies
  - Test hypotheses for the presence of potential contaminants in the Salton Sea
  - Create a way to visualize the rapid changes that are happening.



# LOMA LINDA UNIVERSITY SCHOOL OF PUBLIC HEALTH



Name	2012 population (ACS)	Distance to 2003 Salton Sea shoreline in miles
North Shore	3,520	0.0
Coachella City	40,966	8.5
V.Santa Rosa + Thermal	2,970 + 2,924	5.3
Oasis	6,948	0.2
Mecca	8,881	1.5
Desert Shores	1,105	0.0
Salton Sea Beach	532	0.0
Salton City	4,145	0.0
Westmorland	2,257	5.0
Brawley	25,688	11.2
Calipatria	7,768	3.3
Niland	1,026	3.7
Slab City	Unknown	7.2
Bombay Beach	301	0.0
Glamis + FoY + Hot mineral spa	Unknown	3.4

Name of communities around the Salton Sea with distance to the Salton Sea shoreline. The distance estimate is taken from the nearest location of that community to the nearest point in the sea.

Figure 1. Map of the Salton Sea and all nearby communities.

## Balloon Mapping

- First used in the US in 1860 from hot air balloon.
- Continued use as collaborative mapping tool with Public Lab
- Image quality as good as drones
- Requires multiple participants to setup, tether and then walk
- Less stigma, but similar FAA restrictions to drones



Photograph of San Francisco in ruins from Lawrence Captive Airship, 2000 feet above San Francisco Bay overlooking water front. Sunset over Golden Gate circa 1906  
George Lawrence—Prints & Photographs Division/Library of Congress. <https://www.loc.gov/resource/ppmsca.07823/>

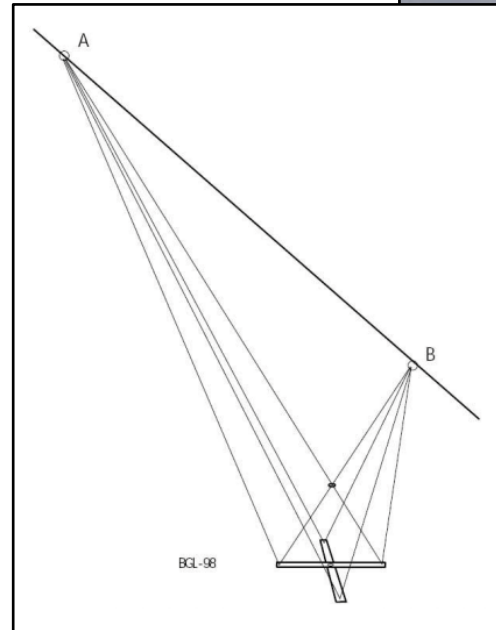


## Balloon Mapping Method

- Purchase a kit or make a balloon
- Use a point & shoot camera or action camera without “fisheye”
- Use a picavet to balance the camera on 400’ line
- Fill with helium
- Walk the transect
- Discuss
- Review images
- Continue process



Summer 2019 Community Science trip to the shoreline near the North Shore Yacht Club



## Balloon Mapping Analysis

- Review images
- Create GIS orthophoto
- Report results to stakeholders
  
- Analyze orthophotos
  - Rate of change DSAS
  - From 2003 – 2017
  - From 2018 – 2021
  - Future Projections
- Use analysis to project playa land
- Use WRF-Chem to project PM10
  
- Report results to stakeholders



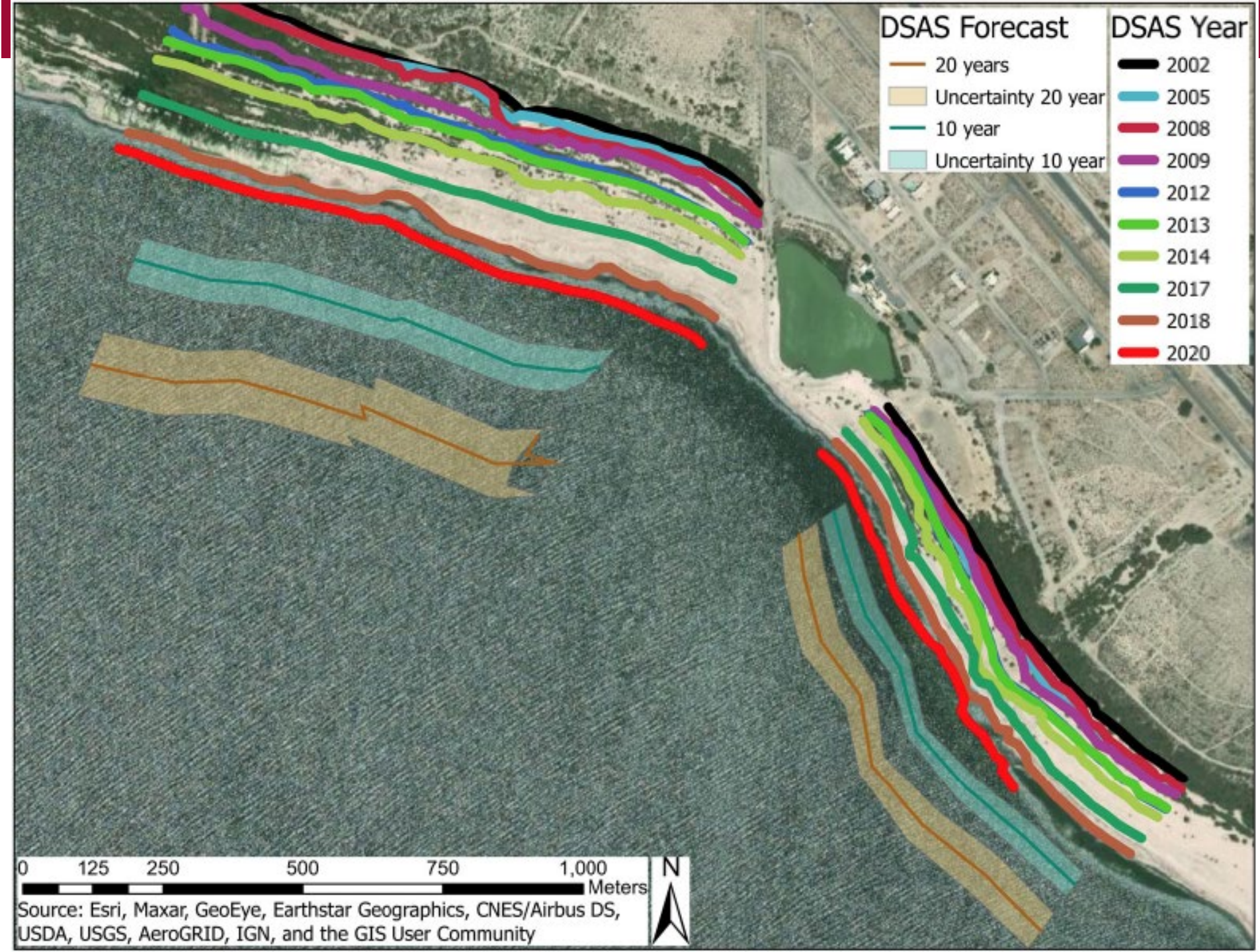


## Balloon Mapping Results

- Collected 16 images
- From 10/2019 to 04/2021
- Variable walks and image results
- Common areas



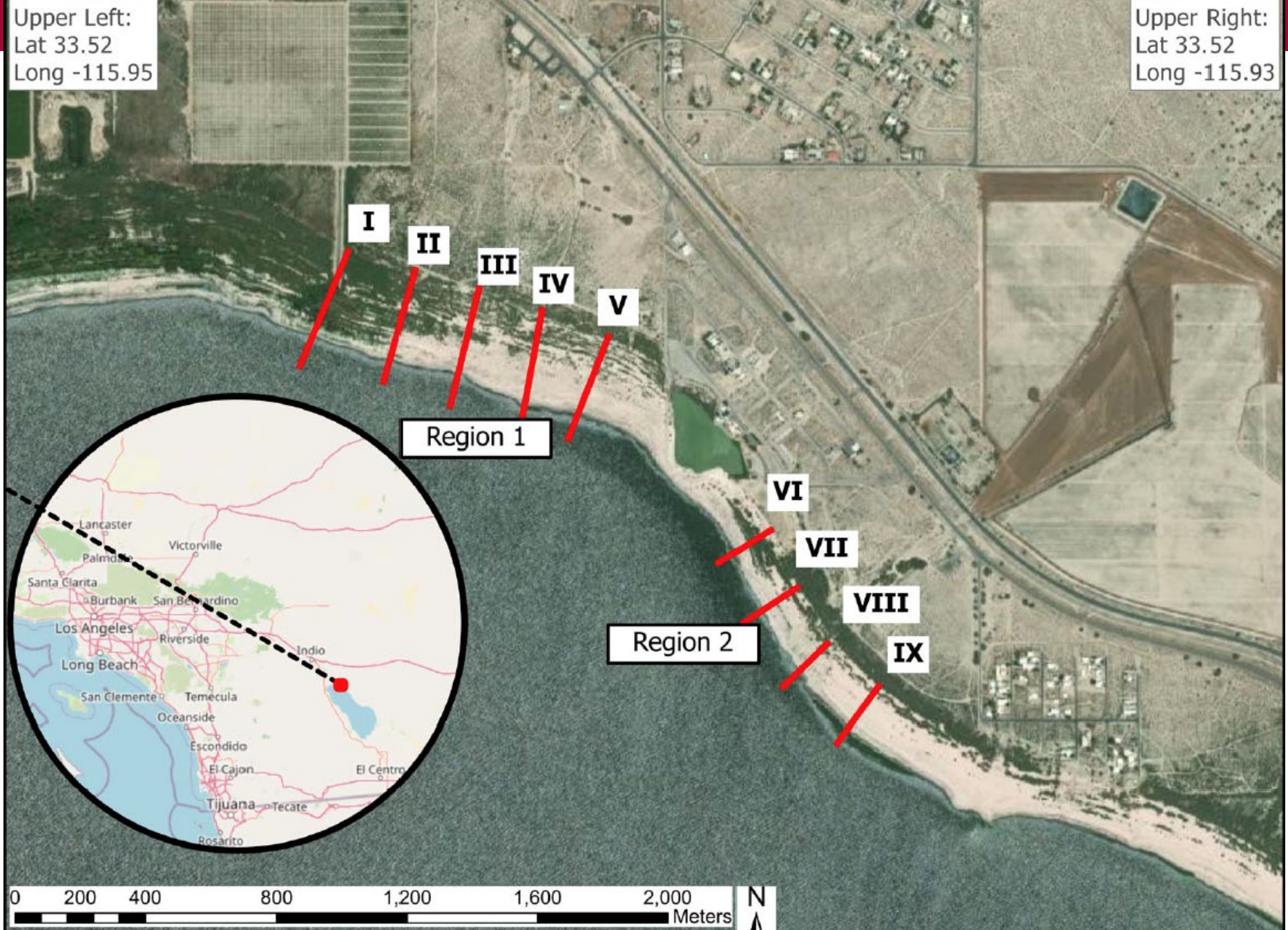






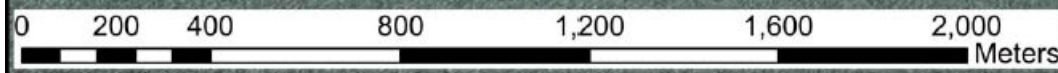
Upper Left:  
Lat 33.52  
Long -115.95

Upper Right:  
Lat 33.52  
Long -115.93



Region 1

Region 2



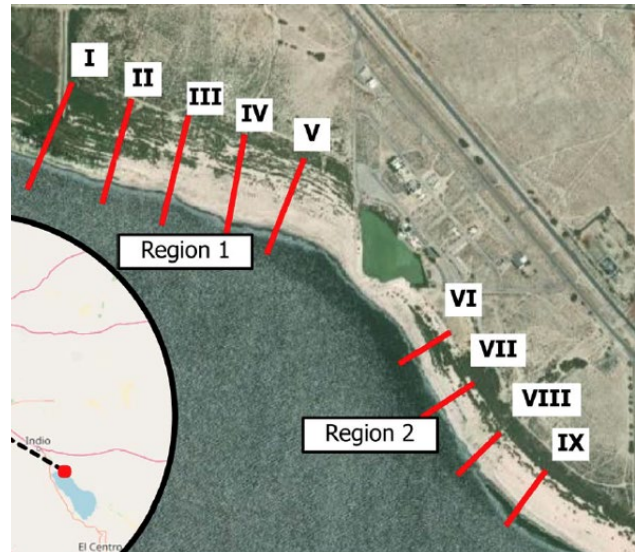
© OpenStreetMap (and) contributors, CC-BY-SA, Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



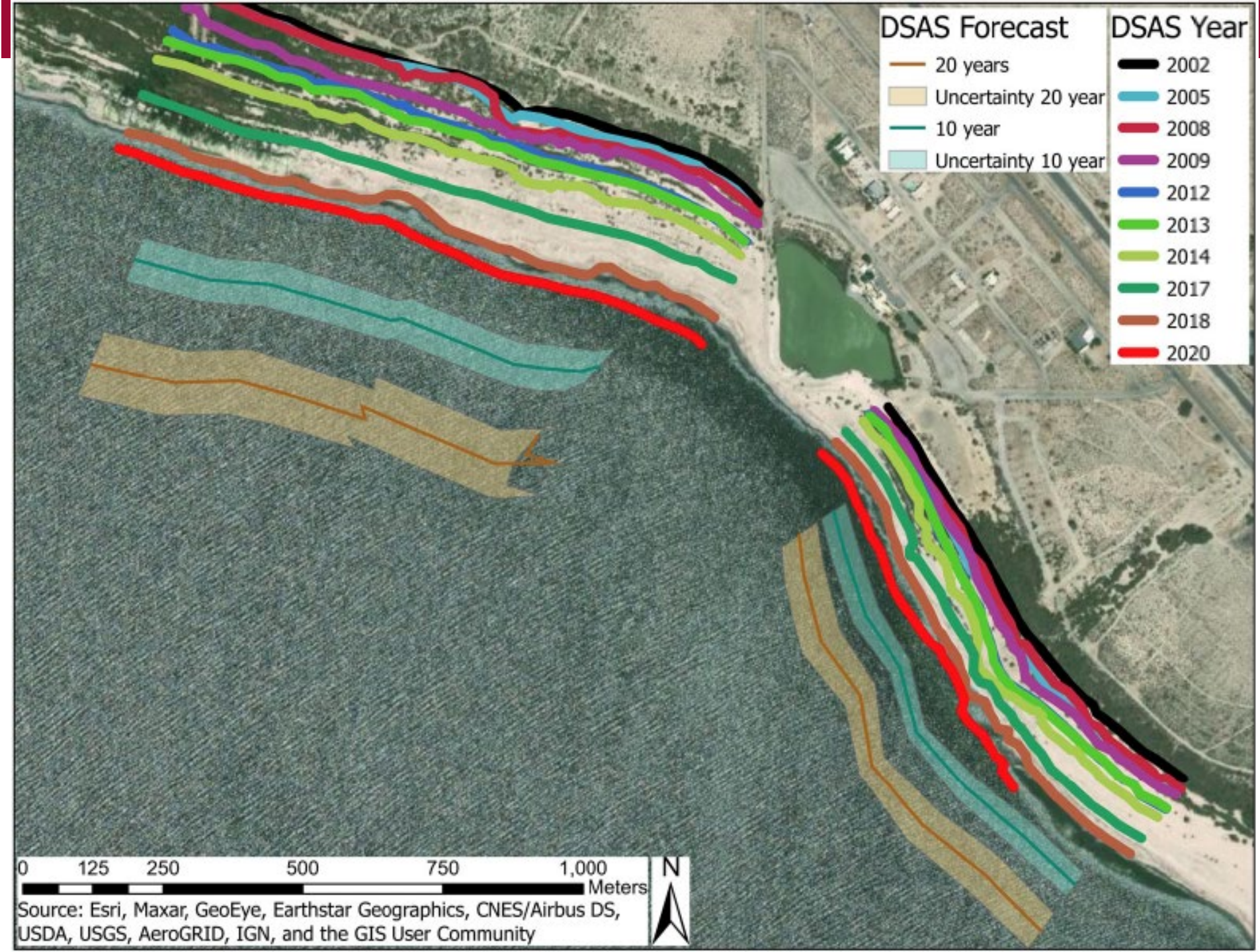
# LOMA LINDA UNIVERSITY SCHOOL OF PUBLIC HEALTH

The Net Shoreline Movement values (in meters) and the End Point Rates (in meters per year) in shoreline changes within the nine-study shoreline segments during the 2002 to 2017 and 2017 to 2019 period.

Shoreline Segment	Net Shoreline Movement (m) 2002 - 2017	End Point Rates (m/year) 2002-2017	Net Shoreline Movement (m) 2017 - 2020	End Point Rates (m/year) 2017-2020
I	-209.55	-13.89	-97.63	-35.28
II	-188.70	-12.51	-96.67	-34.94
III	-190.83	-12.65	-107.36	-38.80
IV	-182.62	-12.10	-109.98	-39.74
V	-173.85	-11.52	-120.21	-43.44
VI	-79.83	-5.29	-63.91	-25.55
VII	-98.83	-6.55	-69.88	-27.94
VIII	-120.66	-8.00	-68.28	-27.30
IX	-131.15	-8.69	-59.53	-23.80





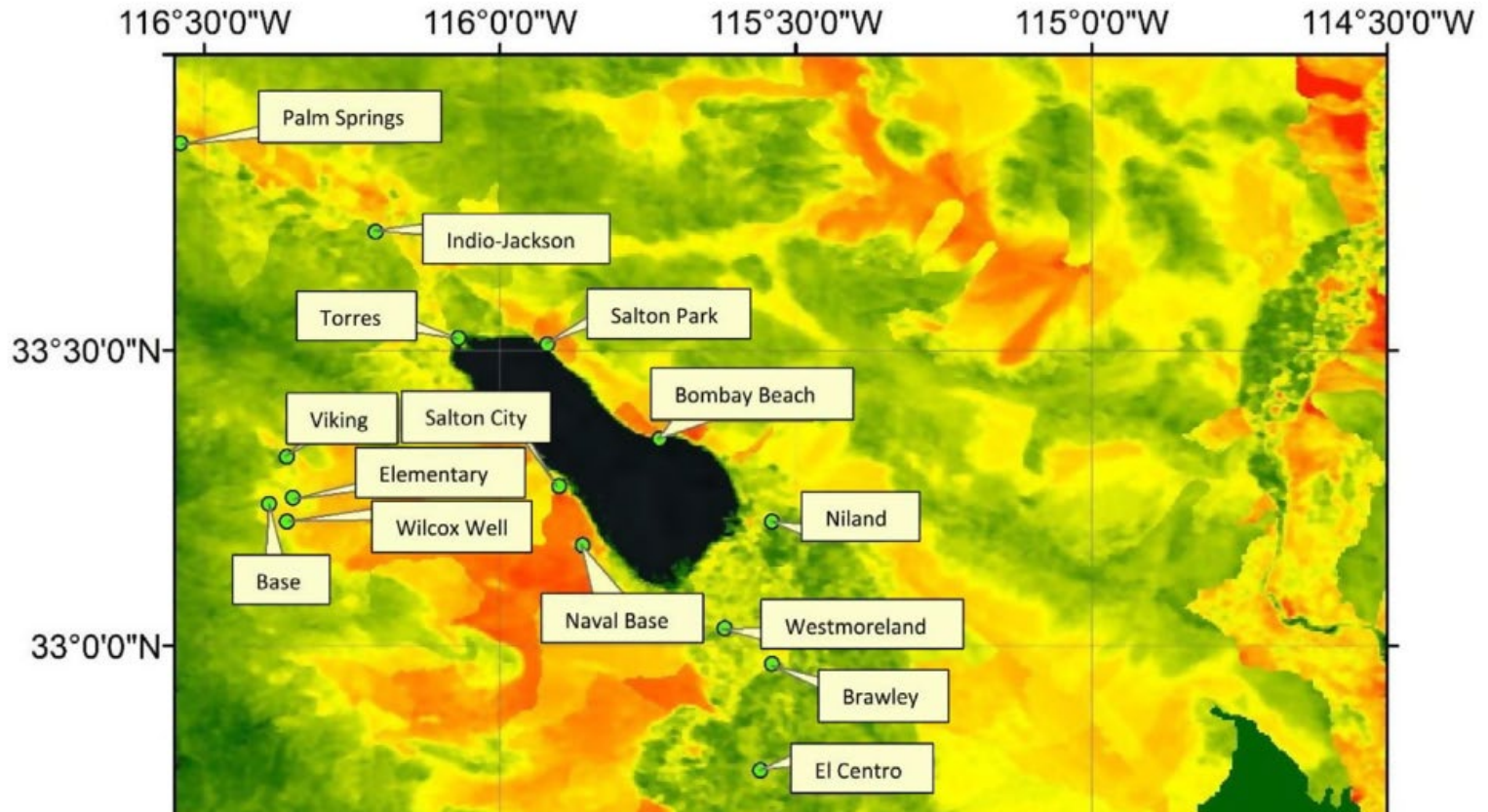


## Balloon Mapping

<https://youtu.be/lbJJtjW-UKY>







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Projected changes in dust emissions and regional air quality due to the shrinking Salton Sea

Sagar P. Parajuli<sup>a,\*</sup>, Charles S. Zender<sup>b</sup>

<sup>a</sup> King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia  
<sup>b</sup> Department of Earth System Science, University of California, Irvine, CA, USA



Rancho Gonzales



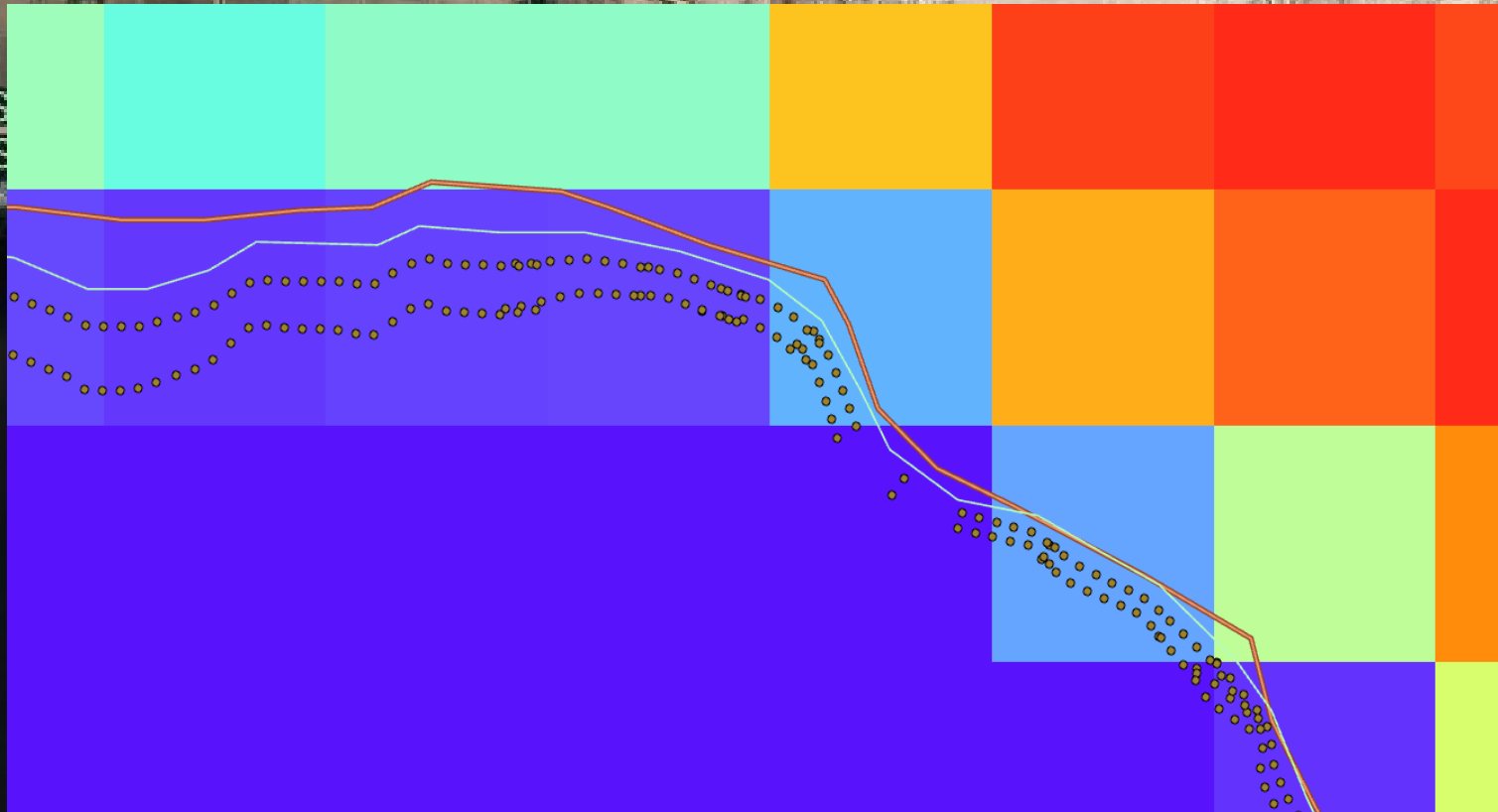
Reyes Market



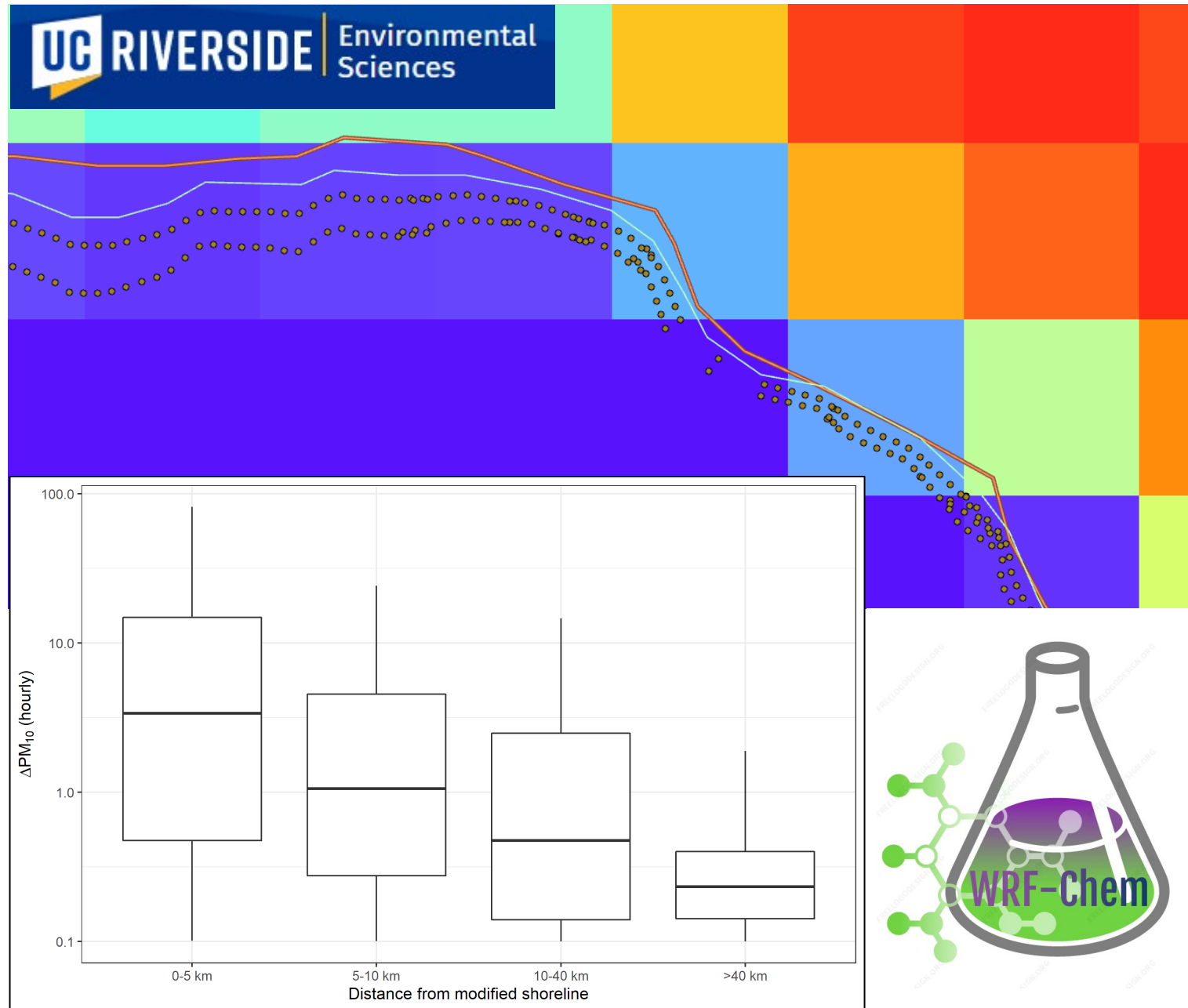
North Shore  
Community Park



Rancho del Sol  
Mobilehome & RV Park



Mecca Beach  
Campground





Thank You!

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Olivia Rodriguez**



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