

# City Nature Challenge & Bringing Community Science Data to Decisions



CALIFORNIA  
ACADEMY OF  
SCIENCES

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# City Nature Challenge

CITY NATURE CHALLENGE IS ORGANIZED BY



CALIFORNIA  
ACADEMY OF  
SCIENCES

NATURAL  
HISTORY  
MUSEUM

LOS ANGELES COUNTY





## City Nature Challenge 2016

2

2 cities took part, San Francisco  
versus Los Angeles

1K

Over 1,000 people participated

19,800

\* Over 19,800 observations were  
made

2,544

2,544 species were found





# City Nature Challenge Through the Years

|                     | 2016  | 2017 | 2018 | 2019 | 2020  | 2021  | 2022  |
|---------------------|-------|------|------|------|-------|-------|-------|
| <b>Cities</b>       | 2     | 16   | 68   | 159  | 244   | 419   | 445   |
| <b>Countries</b>    | 1     | 1    | 17   | 28   | 40    | 44    | 47    |
| <b>Observations</b> | 19.8K | 125K | 441K | 963K | 815K  | 1.2M  | 1.7M  |
| <b>Species</b>      | 2.5K  | 8.6K | 18K  | 31K  | 32.6K | 45.3K | 50.1K |
| <b>Observers</b>    | 1K    | 4K   | 17K  | 32K  | 41K   | 51K   | 67.2K |



A world map with green pins indicating 445 cities. The pins are densely clustered in North America, Europe, and East Asia, with fewer pins in South America, Africa, and Australia. The map shows major landmasses and bodies of water.

# 445 Cities

67K

More than 67,000 people  
participated

1.7M

1,700,000 observations were made

50K

50,000+ species were found

2244+

2244+ rare / endangered /  
threatened species documented!



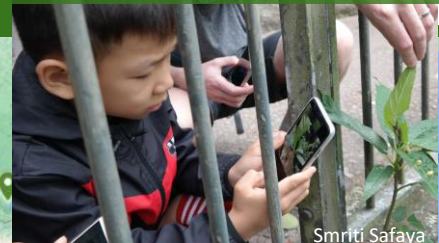
Halifax, NS, Canada



Bristol &amp; Bath, UK



Hong Kong SAR, China

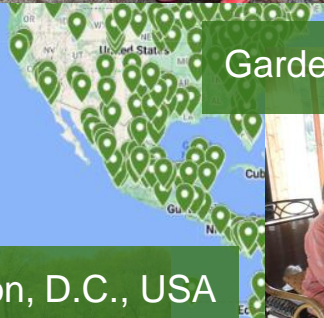


Smriti Safaya

Coyotepec, Mexico



Garden Route, South Africa



La Paz, Bolivia

Maroondah,  
Melbourne, Australia

Washington, D.C., USA



The Nature Conservancy MD/DC

Hsinchu, Taiwan



Kuala Lumpur, Malaysia



Benjamin Ong



Connect people to their  
local nature in  
urban/metro areas

Collect urban  
biodiversity  
data that are  
available to  
managers &  
scientists



Connect  
people to each  
other: build  
community in  
person &  
online around  
local nature

Have fun through  
some friendly  
competition! (Or  
through collaborating  
with people around  
the world!)

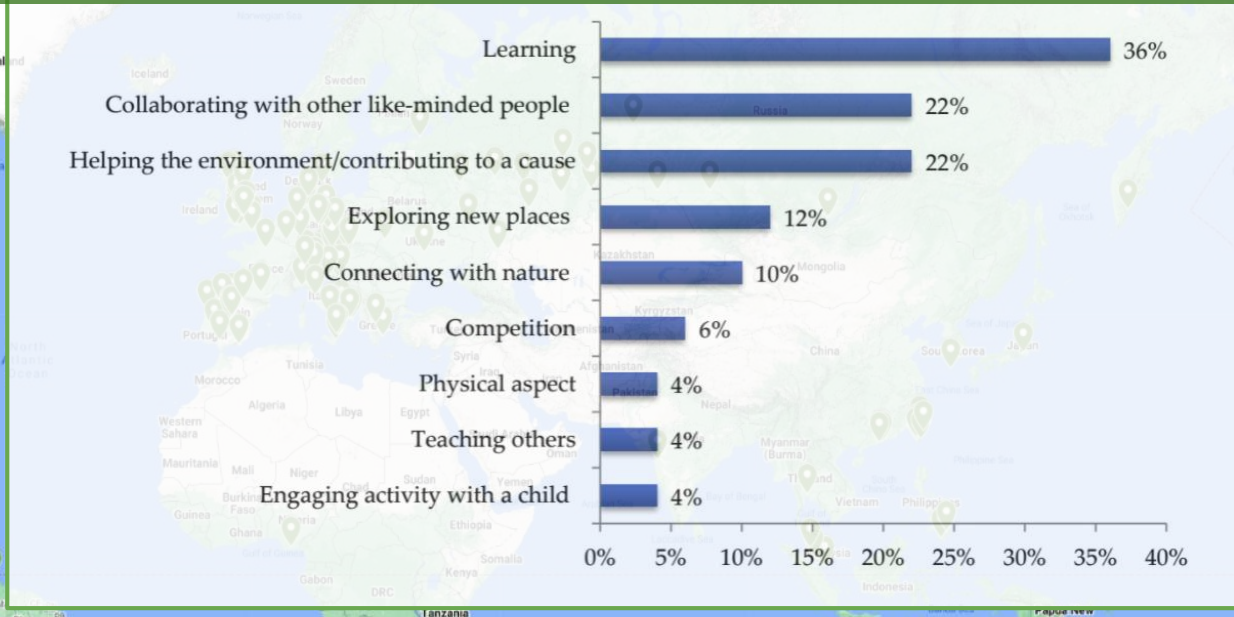


## City Nature Challenge



Grow volunteer  
biodiversity  
documentation  
globally

# Connect people to their local nature



| As a result of participating in the City Nature Challenge.....   | %   |
|--|-----|
| I have learned something new about the animals and plants in my local area                                   | 95% |
| I have learned something new about the threats to animals and plants in my area                              | 50% |
| I have learned about the organizations/projects working to monitor and protect animals and plants in my area | 73% |
| I have learned about different ways I can contribute to protect the local environment                        | 70% |



# Western Bobcat (*Lynx rufus*)

City  
Nature  
Challenge

**Calgary, AB, Canada**

The families in this neighborhood got a close-up lesson on the food chain & bobcat behavior when this individual caught & ate a jackrabbit in a backyard - spending 6+ hours there!



iNaturalist user joolzincalgary



# *Lingulodinium polyedra*

San Diego, CA, USA

Bioluminescent dinoflagellate &  
night surfing



Tim Fallon



# Build community around nature



## Prague, Czech Republic

"It was such a fantastic way to learn more about the plants and animals that I see often, but couldn't name and didn't know anything about. It was also great to connect with other people in my area participating in the City Nature Challenge."

**City  
Nature  
Challenge**

## San Francisco, CA, USA

"[The best part of the City Nature Challenge was] Working with others, in person and virtually, to put together a picture of biodiversity in our environment. It also made me a much more knowledgeable observer of nature around me."



# Collect data for science & management

## Studies That Used iNaturalist Data in 2021

Click the flower charts for more information about what the numbers and colors mean. Impact data and charts courtesy of [Altmetric](#). Information about data usage courtesy of our friends at the [Global Biodiversity Information Facility](#).



Méndez-Camacho, K., Leon-Alvarado, O. and Miranda-Esquivel, D.

**Biogeographic evidence supports the Old Amazon hypothesis for the formation of the Amazon fluvial system**  
*PeerJ*

Data used: [doi:10.15468/dl.pvy4y9](https://doi.org/10.15468/dl.pvy4y9) [doi:10.15468/dl.qdgb4q](https://doi.org/10.15468/dl.qdgb4q)

[doi:10.15468/dl.qwkkmk](https://doi.org/10.15468/dl.qwkkmk)

[doi:10.15468/dl.rq7h5r](https://doi.org/10.15468/dl.rq7h5r)

[doi:10.15468/dl.t6v9hn](https://doi.org/10.15468/dl.t6v9hn)

[doi:10.15468/dl.xmxbkx](https://doi.org/10.15468/dl.xmxbkx)



Satterthwaite, E., Bax, N., Miloslavich, P., Ratnarajah, L., Canonico, G., Dunn, D., Simmons, S., Carini, R., Evans, K., Allain, V., Appeltans, W., Batten, S., Benedetti-Cecchi, L., Bernard, A., Bristol, S., Benson, A., Buttigieg, P., Gerhardinger, L., Chiba, S., Davies, T., Duffy, J., Giron-Nava, A., Hsu, A., Kraberg, A., Kudela, R., Lear, D., Montes, E., Muller-Karger, F., O'Brien, T., Obura, D., Provoost, P., Pruckner, S., Rebelo, L., Selig, E., Kjesbu, O., Starger, C., Stuart-Smith, R., Vierros, M., Waller, J., Weatherdon, L., Wellman, T. and Zivian, A.

**Establishing the Foundation for the Global Observing System for Marine Life**

*Frontiers in Marine Science*

Data used: [doi:10.15468/dd.e7a92g](https://doi.org/10.15468/dd.e7a92g)



Schweiger, A., Ullmann, G., Nürk, N., Triebel, D., Schobert, R., and Rambold, G.  
**Chemical properties of key metabolites determine the global distribution of lichens**

*Ecology Letters*

Data used: [doi:10.15468/dd.4rxy36](https://doi.org/10.15468/dd.4rxy36)



Williams, J., Freeman, R., Spooner, F., and Newbold, T.

**Vertebrate population trends are influenced by interactions between land use, climatic position, habitat loss and climate change**

*Global Change Biology*

Data used: [doi:10.15468/dl.rrizzi](https://doi.org/10.15468/dl.rrizzi)



Macaluso, L., Villa, A., Carnevale, G., and Delfino, M.

**Past, present, and future climate space of the only endemic vertebrate genus of the Italian peninsula**  
*Scientific Reports*

Data used: [doi:10.15468/dl.as6sk2](https://doi.org/10.15468/dl.as6sk2)



Ballen, G., Jaramillo, C., Dagosta, F., and Pinna, M.

**A fossil fish assemblage from the middle Miocene of the Cocinetas Basin, northern Colombia**  
*Papers in Palaeontology*

Data used: [doi:10.15468/dl.67lq6f](https://doi.org/10.15468/dl.67lq6f)

[doi:10.15468/dl.6ghxbx](https://doi.org/10.15468/dl.6ghxbx)

[doi:10.15468/dl.9aryay](https://doi.org/10.15468/dl.9aryay)

[doi:10.15468/dl.d33vwn](https://doi.org/10.15468/dl.d33vwn)

650+ papers published using iNaturalist data in 2021



# A citizen science approach to evaluating US cities for biotic homogenization

Misha Leong and Michelle Trautwein

California Academy of Sciences, Institute of Biodiversity Science and Sustainability, San Francisco, CA, USA

## ABSTRACT

Cities around the world have converged on structural and environmental characteristics that exert similar eco-evolutionary pressures on local communities. However, evaluating how urban biodiversity responds to urban intensification remains poorly understood because of the challenges in capturing the diversity of a range of taxa within and across multiple cities from different types of urbanization. Here we utilize a growing resource—citizen science data. We analyzed 66,209 observations representing 5,209 species generated by the City Nature Challenge project on the iNaturalist platform, in conjunction with remote sensing (NLCD2011) environmental data, to test for urban biotic homogenization at increasing levels of urban intensity across 14 metropolitan cities in the United States. Based on community composition analyses, we found that while similarities occur to an extent, urban biodiversity is often much more a reflection of the taxa living locally in a region. At the same time, the communities found in high-intensity development were less explained by regional context than communities from other land cover types were. We also found that the most commonly observed species are often shared between cities and are non-endemic and/or have a distribution facilitated by humans. This study highlights the value of citizen science data in answering questions in urban ecology.

**Subjects** Biodiversity, Ecology, Data Science

**Keywords** Citizen science, iNaturalist, Urban ecology, Biotic homogenization, NLCD

Submitted 9 January 2019

Accepted 1 April 2019

## A case study from the City Nature Challenge participants' responses to citizen science

Ryo Sakurai<sup>a</sup>, Hiromi Kobori<sup>b</sup>, Dai Togane<sup>c</sup>, Lila Higgins<sup>d</sup>, Simone Cutajar<sup>e</sup> and Young-Sik Ham<sup>b</sup>

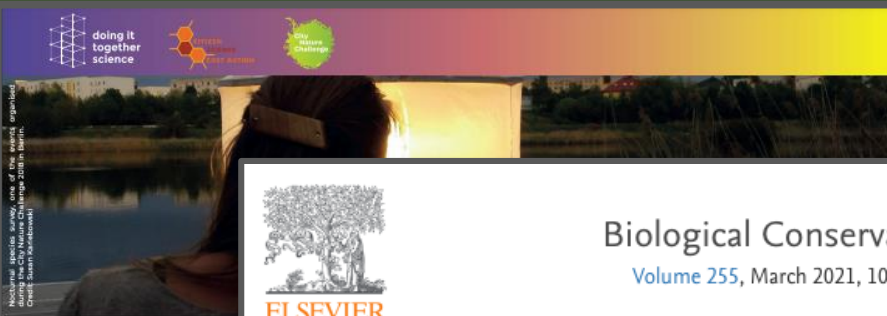
<sup>a</sup>College of Policy Science, Ritsumeikan University, Ibaraki, Osaka, Japan; <sup>b</sup>Faculty of Economics, Keio University, Yokohama, Japan; <sup>c</sup>Comm California, USA; <sup>d</sup>Institute for Biodiversity Science and Sustainability, Ca Media and Governance, Keio University, Fujisawa, Japan; <sup>e</sup>Regional Environment House, Malta

### ABSTRACT

Citizen and community science is an important approach for biodiversity conservation, and currently, various projects are being implemented. We conducted surveys of participants in the City Nature Challenge (CNC) to evaluate participants engaged in monitoring wildlife and plants in their neighbourhoods. Responses from 361 participants representing 12 countries in the United Kingdom, and Malaysia. There were significant differences in demographic attributes and participants' perceptions of citizen/community science. Analysis revealed that the more participants learned about the activities, the more they self-reported their intention to participate in similar activities in the United States and Japan. This suggests that managers of citizen science projects tailor the message and contents of the activities to enhance biodiversity to increase their continued involvement in future.

### Key policy insights

- In both the United States and Japan, the more participants learned about plants in their local area through citizen/community science, the more willing to participate in similar activities in the future.
- Cross-cultural comparison of participants in citizen/community science revealed significant differences in terms of socio-demographic attributes. Participants in Malaysia were younger than those in the United States and Japan.
- Survey results revealed differences in participants' perceptions of citizen science activities (e.g. participants from Malaysia were more interested in animals and plants in their neighbourhood than those in the United Kingdom).



### Evaluating public participation in citizen science: A case study of the City Nature Challenge

#### Executive Summary

Public Engagement with Biodiversity (PEB) events include several forms: mini-BioBlitzes, species identification parties and various derivatives. These events share the common aims: to engage the public with nature (science), to support biodiversity conservation, and to share data (environmental observations). The City Nature Challenge (CNC) is a global citizen science initiative whereby citizens observe and record most plant and wildlife observations in their local area over a set time frame. The CNC has been conducted in cities around the world have events. To support more evaluation of the events of the European BioBlitz network, we conducted a social outcome assessment to report the experience of event organizers and participants in the CNC 2018 in Europe. It clarifies differences among participants and events. We outline key recommendations for common evaluation tool for future events conducted with contributions from members of the European BioBlitz network, the COST Action 151212 and City Nature Challenge partners within the framework of the Horizon 2020 DITOs project.

The European BioBlitz Network



ELSEVIER

Biological Conservation

Volume 255, March 2021, 109001



# COVID-19 pandemic drives changes in participation in citizen science project “City Nature Challenge” in Tokyo

Keidai Kishimoto<sup>a</sup>✉, Hiromi Kobori<sup>b</sup>✉

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<https://doi.org/10.1016/j.biocon.2021.109001>

Get rights and content

24 hours  
BioBlitz

Mini-BioBlitz

Species  
survey

Guided  
nature walk

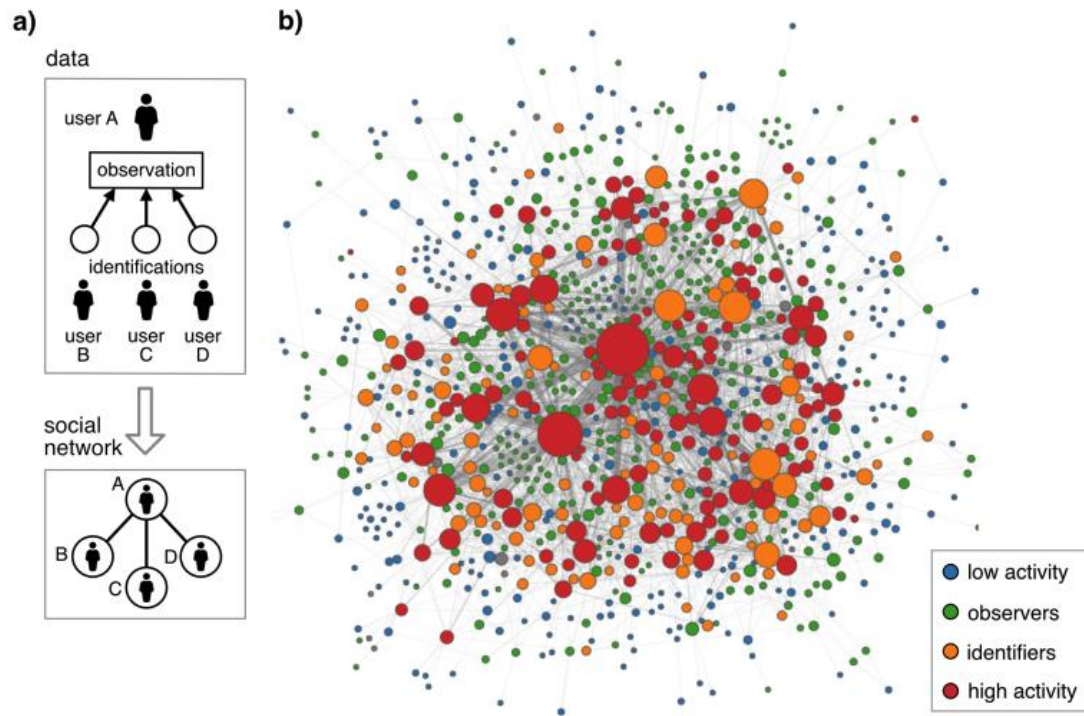


# iNaturalist citizen science approach for analysis

Liubov Tupikina, Frank Muki Haklay, Bastian Gruber, Anna Mogilevskaja,

Analysing patterns of engagement in citizen science projects. We use user interactions to help understand the community and their year-to-year spatio-temporal evolution. We identify user types present in the data and the types of community strategies will be useful.

Comments: 9 figures, 29 pages  
Subjects: **Social and Information Systems**  
Cite as: [arXiv:2112.02693](https://arxiv.org/abs/2112.02693)  
(or [arXiv:2112.02693](https://arxiv.org/abs/2112.02693))  
<https://doi.org/10.26434/chemrxiv-2022-10>



**Figure 8** Illustration of the social interaction network. **a.** A link between two users is created if a user identifies an observation of another user. Multiple interactions increase the link weight. **b** The social interaction network for the London 2020 CNC. Colors

## v computational

z, Anna Mogilevskaja,

practice of individual  
of user behaviour and  
the iNaturalist  
s to explore the  
we investigate the  
level of engagement  
ional analysis

# White-spotted Slimy Salamander (*Plethodon cylindraceus*)



**Washington, D.C., USA**

First record in Arlington County since 1977; found by a high school student

Luca Catanzaro

City  
Nature  
Challenge



# *Epidendrum radioferens* orchid



Danny Javier Cruz López

**Guajiquiro, Honduras**  
First record of this  
species in Honduras on  
both iNaturalist & GBIF

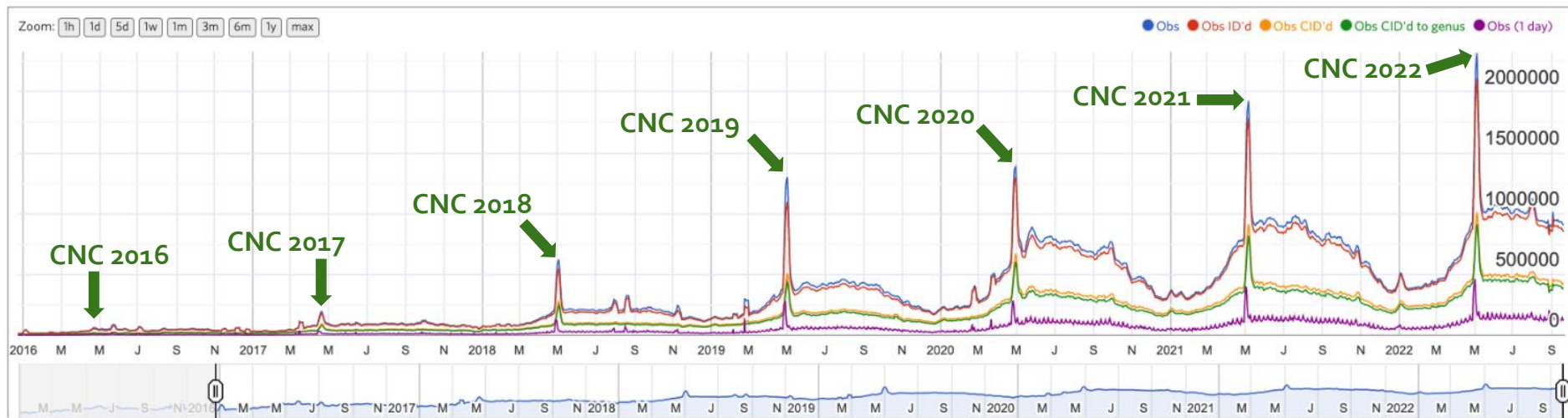
City  
Nature  
Challenge



# Grow biodiversity documentation globally



Observations (1 week moving window)



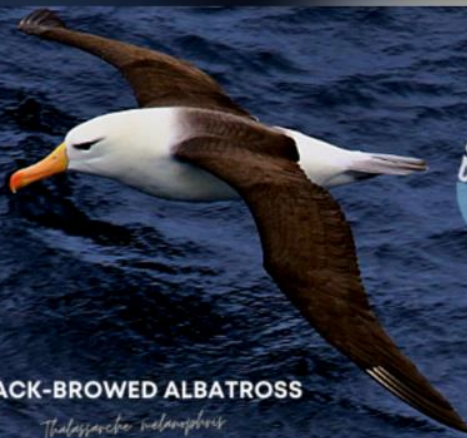
Obs  
Created in prev 7 days  
Obs ID'd  
Created in prev 7 days and have an ID (could be observer's)  
Obs CID'd  
Created in prev 7 days and have a community ID

Obs CID'd to genus  
Created in prev 7 days and have a community ID at or below genus-level  
Obs (1 day)  
Observations created on a single day

## Observations uploaded per week to iNaturalist



22-25 / 10 / 2021



#GSB21

BLACK-BROWED ALBATROSS

*Thalassarcha melanophrys*



Photo: Andrew Thompson  
iNat: @andythompson1701

## About

Join 1108

English

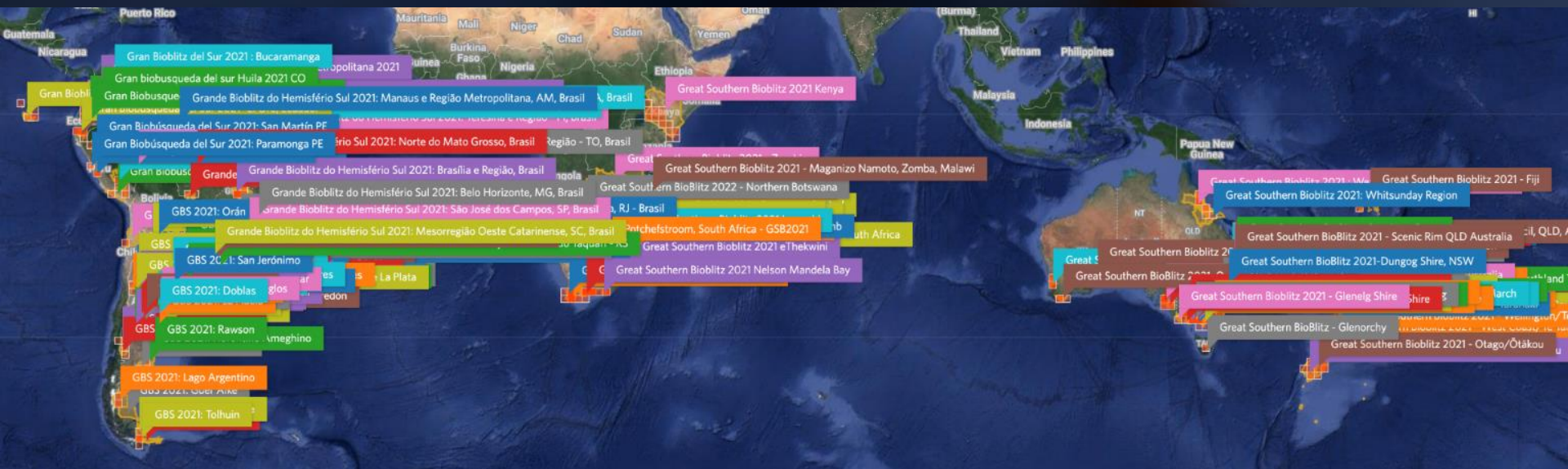
# October 22-25th 2021

# (Leia o texto em português abaixo / Lea el texto en español abajo)

Discover what wild things inhabit the Southern Hemisphere in 2021 for the second-ever Great

[Read More >](#)

[Project Journal](#)





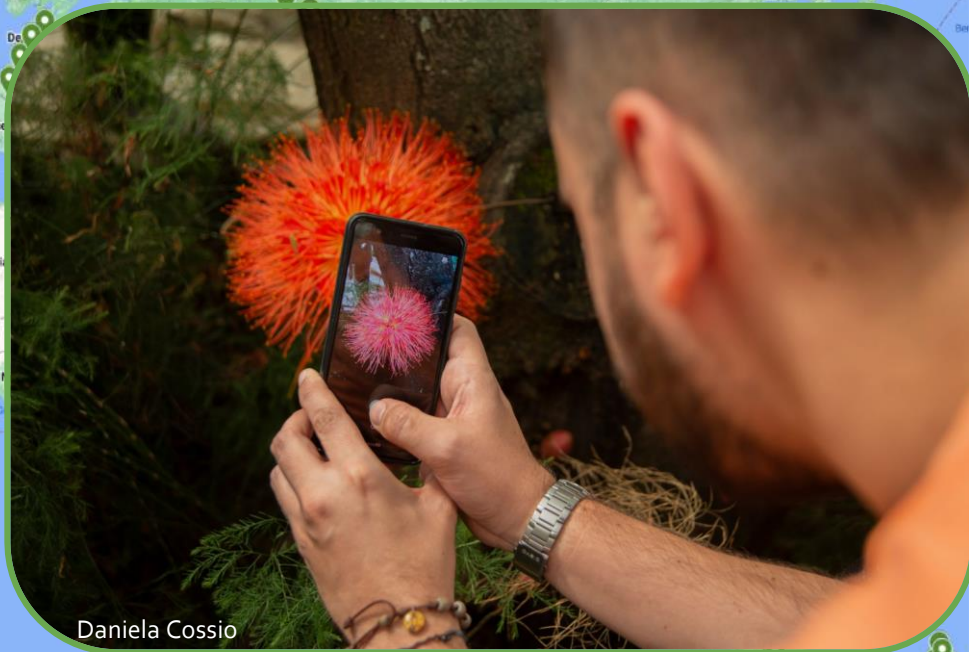
# Have fun!

*Rio Branco, Brazil*

"I like CNC because the event is an opportunity to work and have fun with tens of thousands of people around the world, with something common to everyone, biodiversity, life."

**City  
Nature  
Challenge**

## 2023 City Nature Challenge: April 28 - May 1



Daniela Cossio

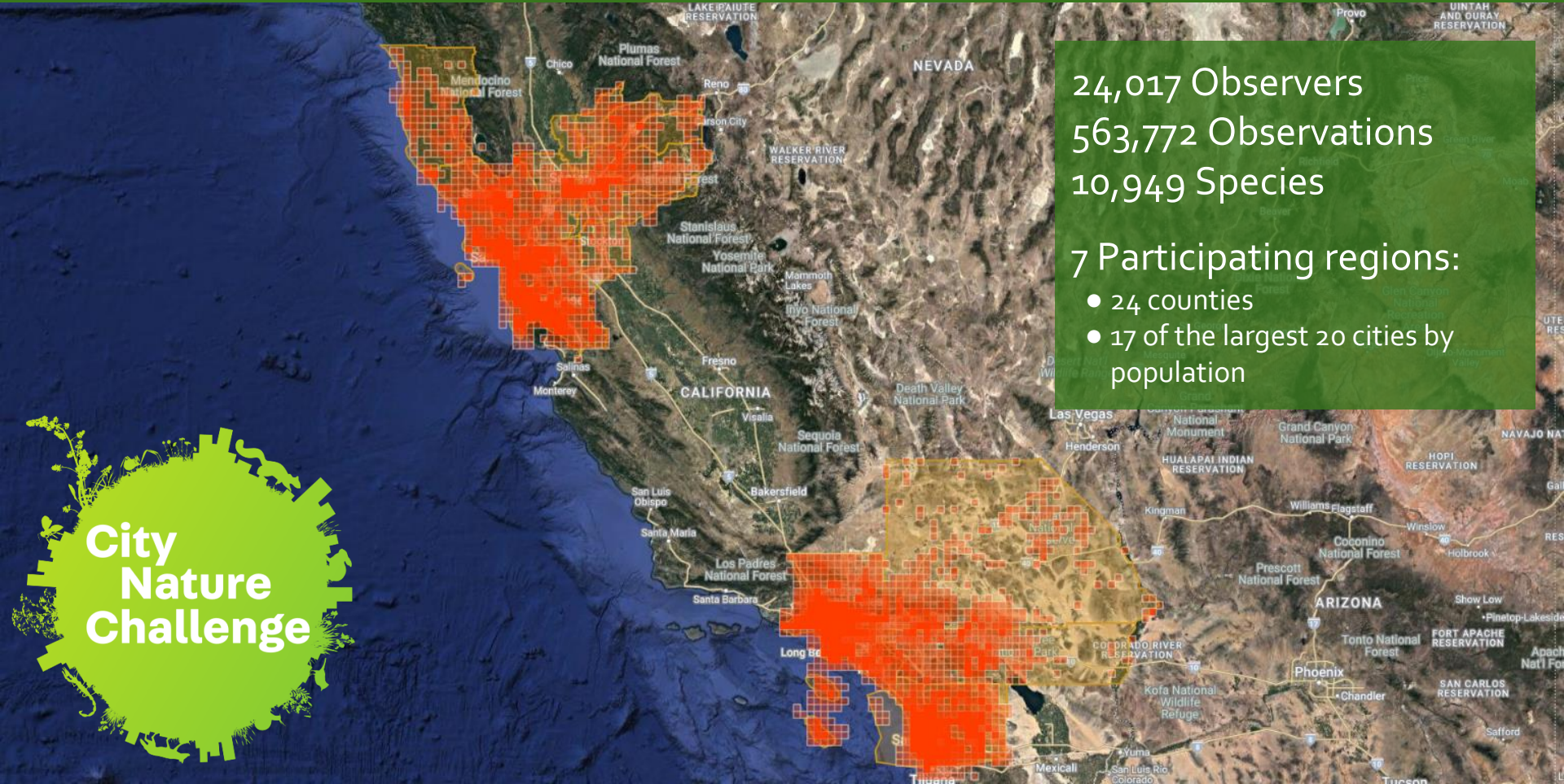
# 2016-2022 City Nature Challenge: California

24,017 Observers  
563,772 Observations  
10,949 Species

7 Participating regions:

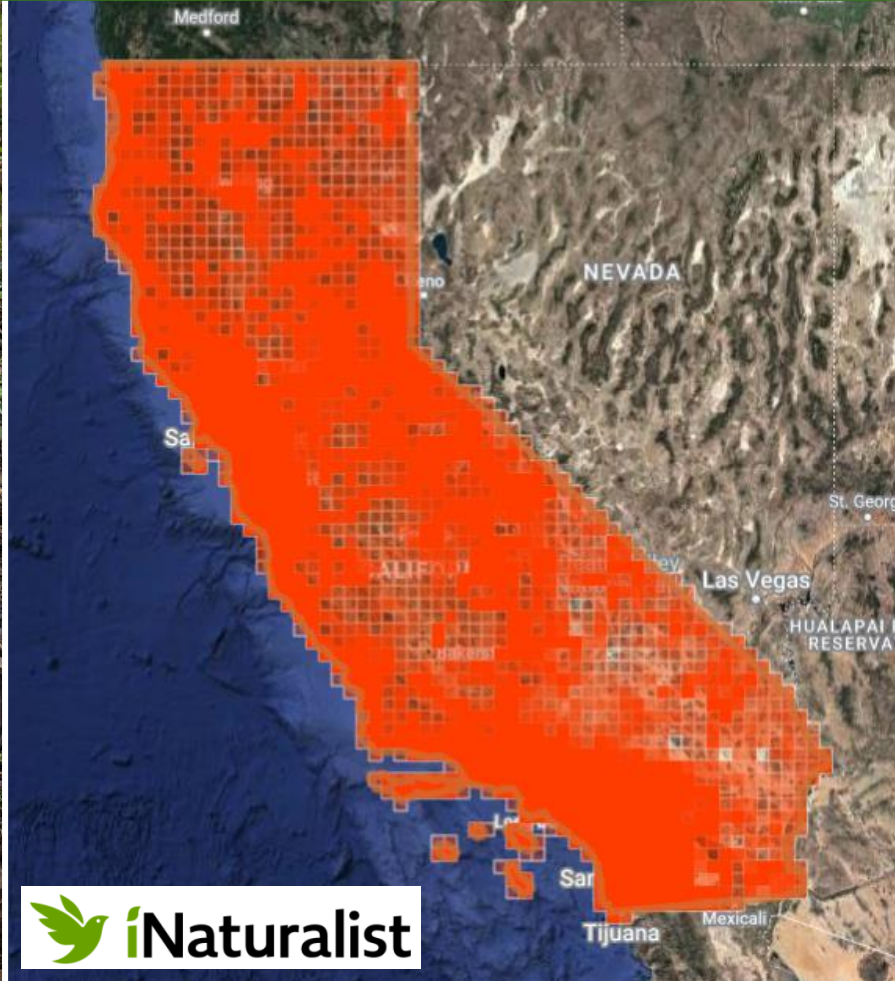
- 24 counties
- 17 of the largest 20 cities by population

City  
Nature  
Challenge





# Bringing Community-collected Data to Decision-making



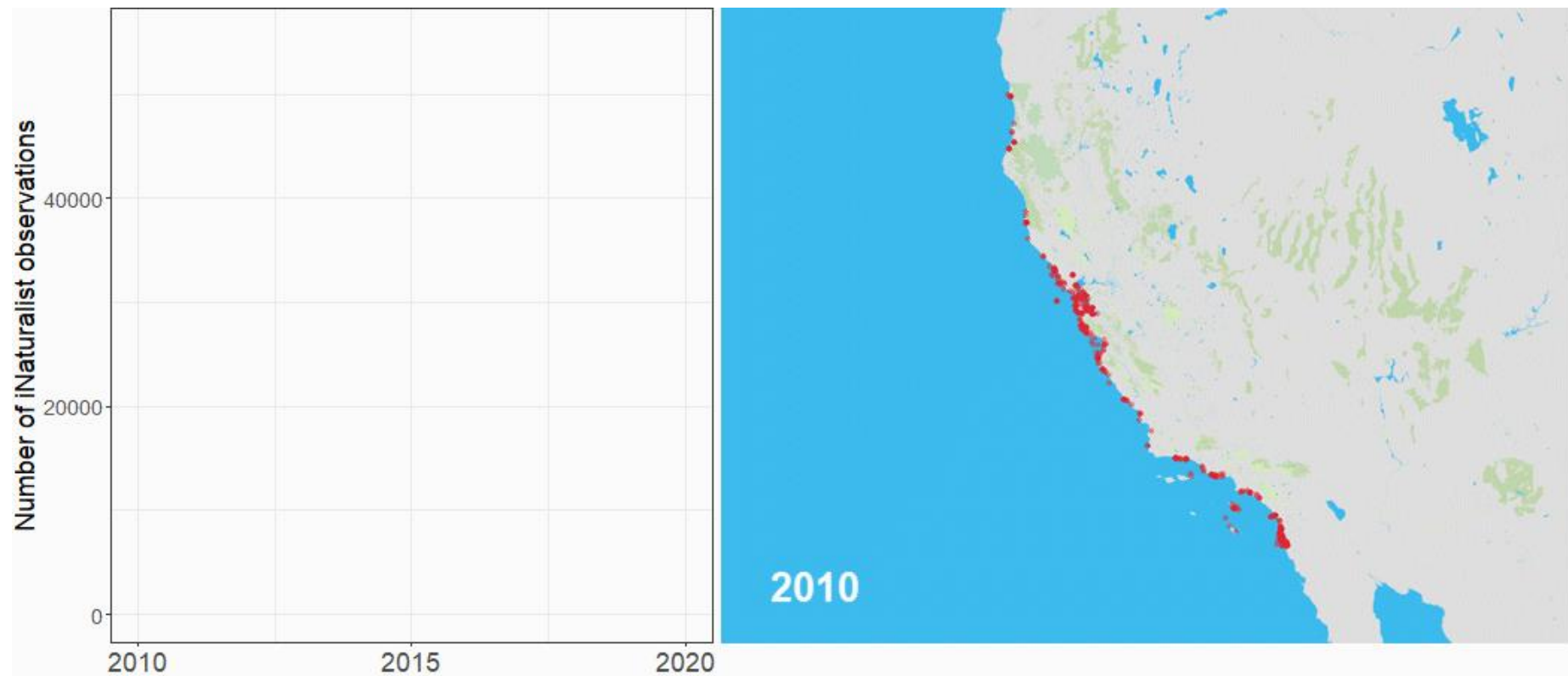


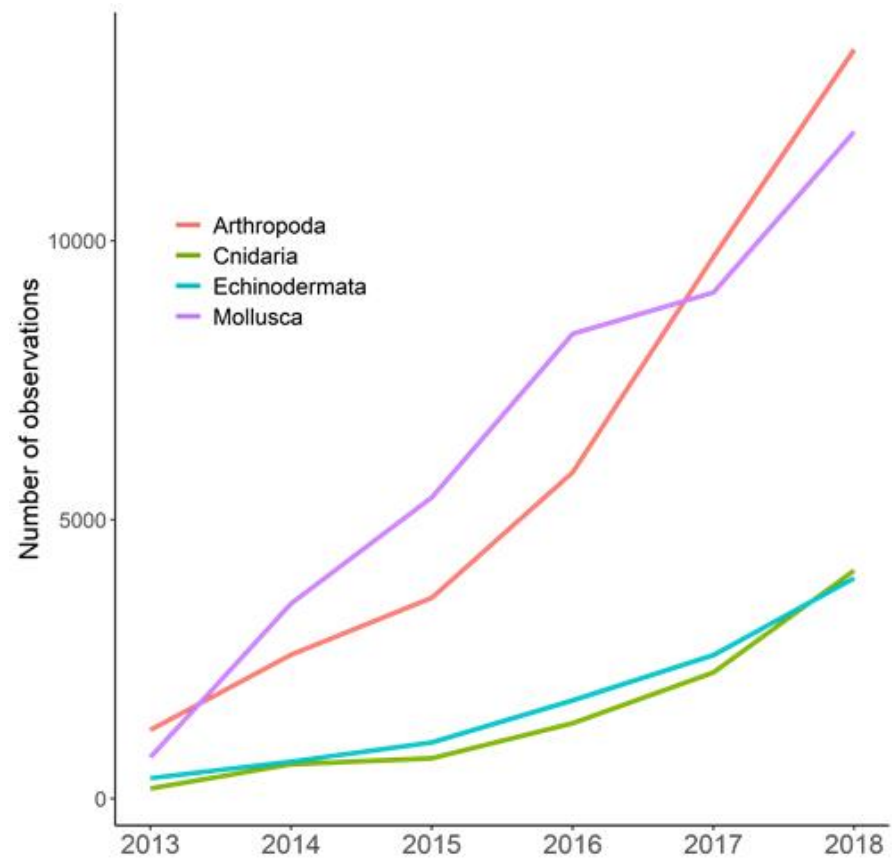


Community working together to document the biodiversity of the California Coast from Del Norte to San Diego using iNaturalist



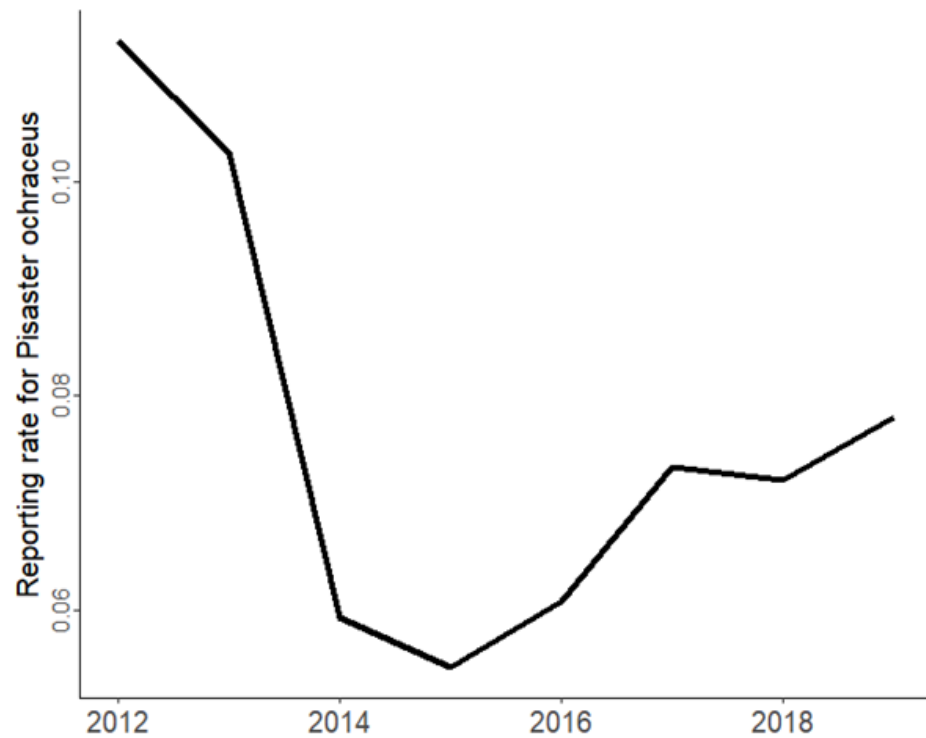












Proportion of times  
*Pisaster ochraceus*  
was recorded when  
associated species were  
also recorded





## Biodiversity Indicators

### Population Trend

Select species

Ochre Sea Star  
(*Pisaster ochraceus*)

Add physical variable

Minimum

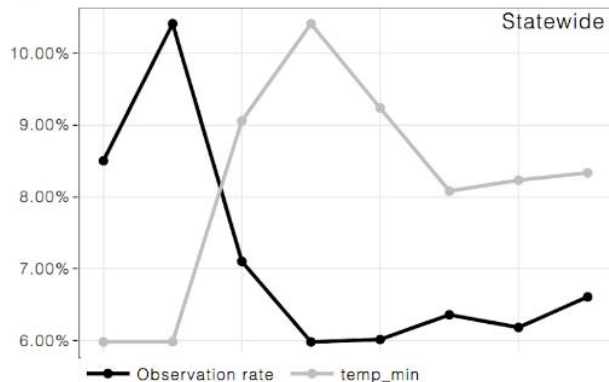
Show trend

+ Geographic Range

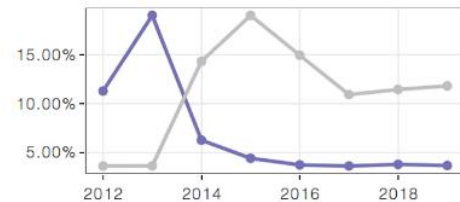
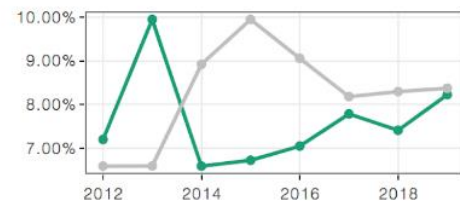
+ Range Change

## Ochre Sea Star *Pisaster ochraceus*

### Proportional rate of observation on iNaturalist [\[what's this?\]](#)



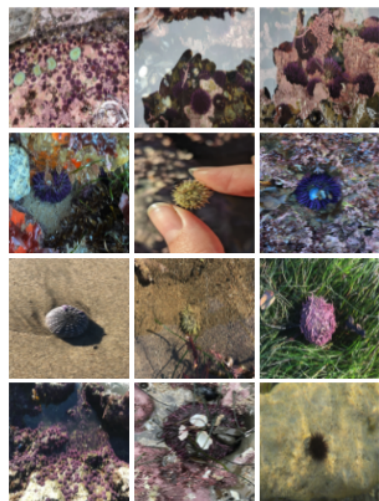
View all *Pisaster ochraceus* observations on [iNaturalist](#)



Choose sentinel species:

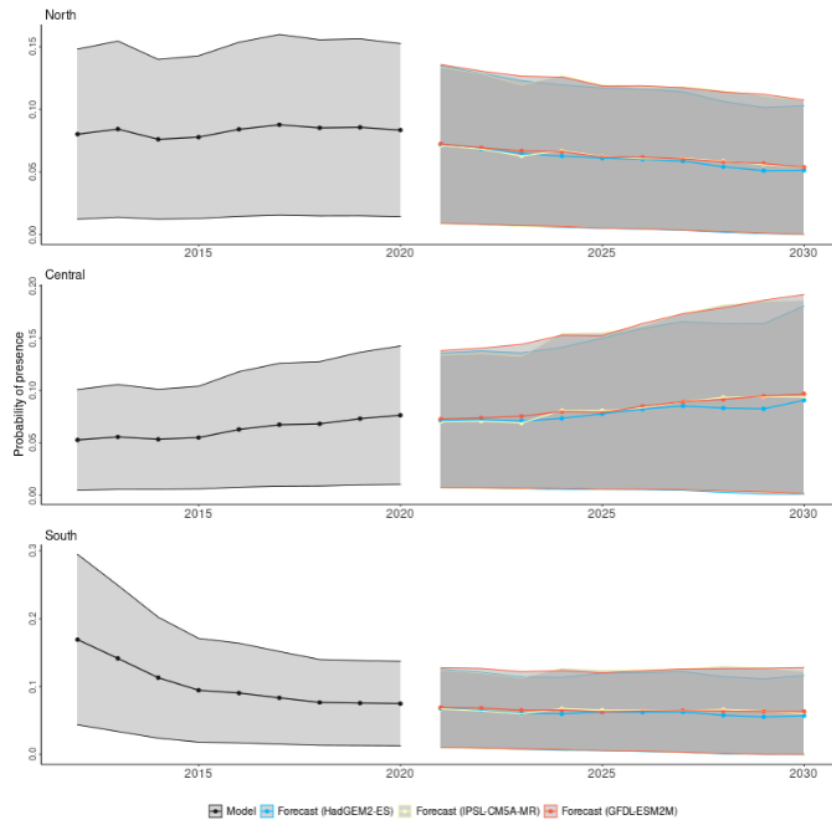
Purple urchins (*Strongylocentrotus purpuratus*)

View *Strongylocentrotus purpuratus* observations on [Naturalist](#)



Explore regional trends:

Modeled between 2012-2020 and forecasted between 2021-2030



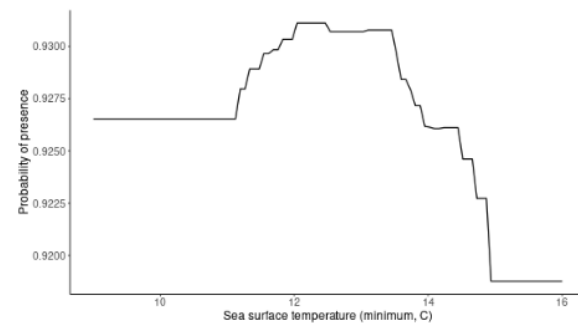
Map spatial predictions:

Forecasted change in probability of presence for 2021-2025



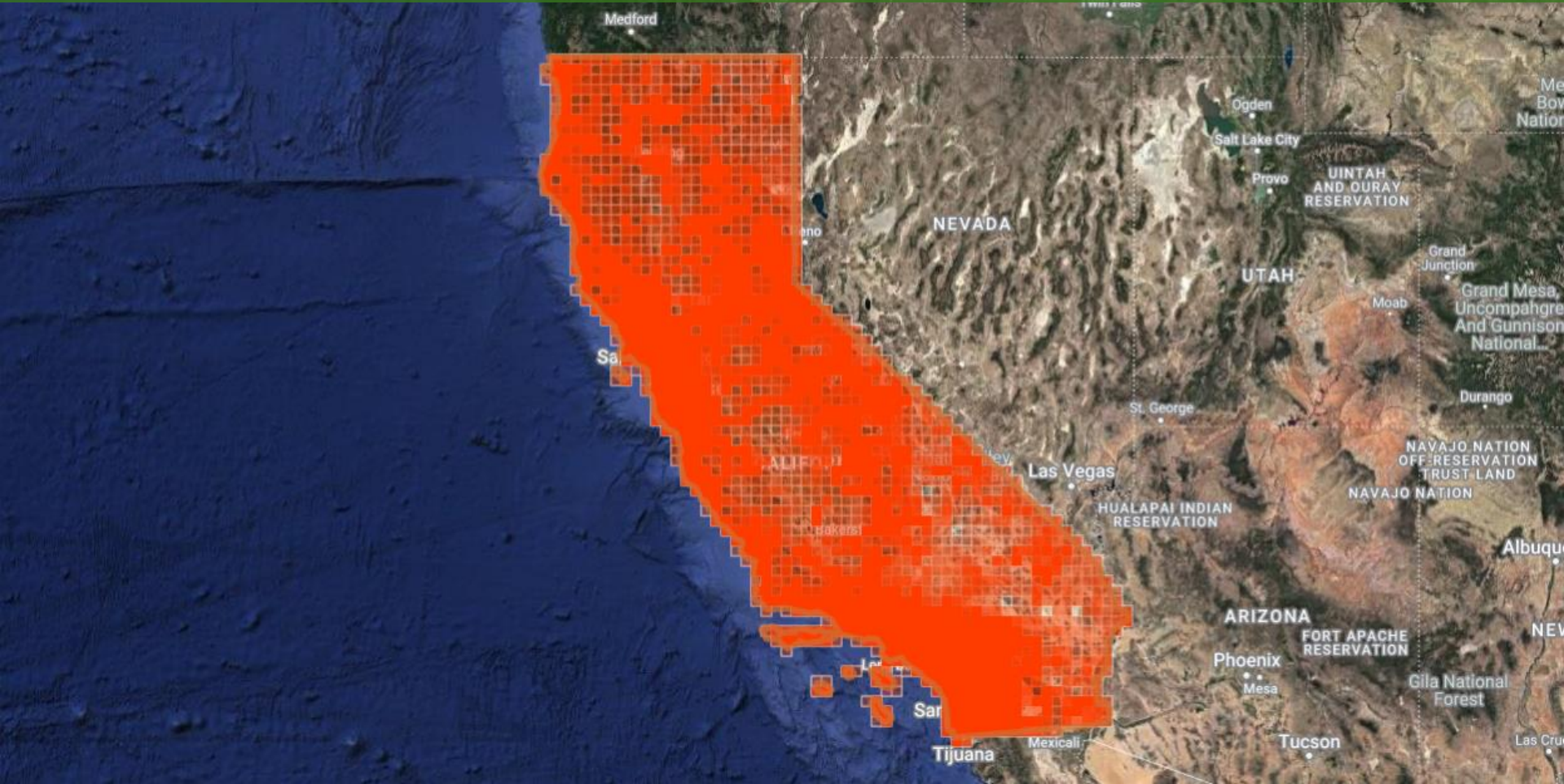
Visualize environmental responses:

Sea surface temperature (minimum, C)





# Bringing Community-collected Data to Decision-making



# Bringing Community-collected Data to Decision-making



## Biodiversity Explorer

ACE Biodiversity

Habitat and Land Cover

Help

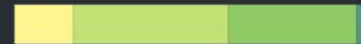
### Biodiversity

#### Species Biodiversity



### Significant Habitat

#### Terrestrial Significant Habitat



#### Aquatic Significant Habitat



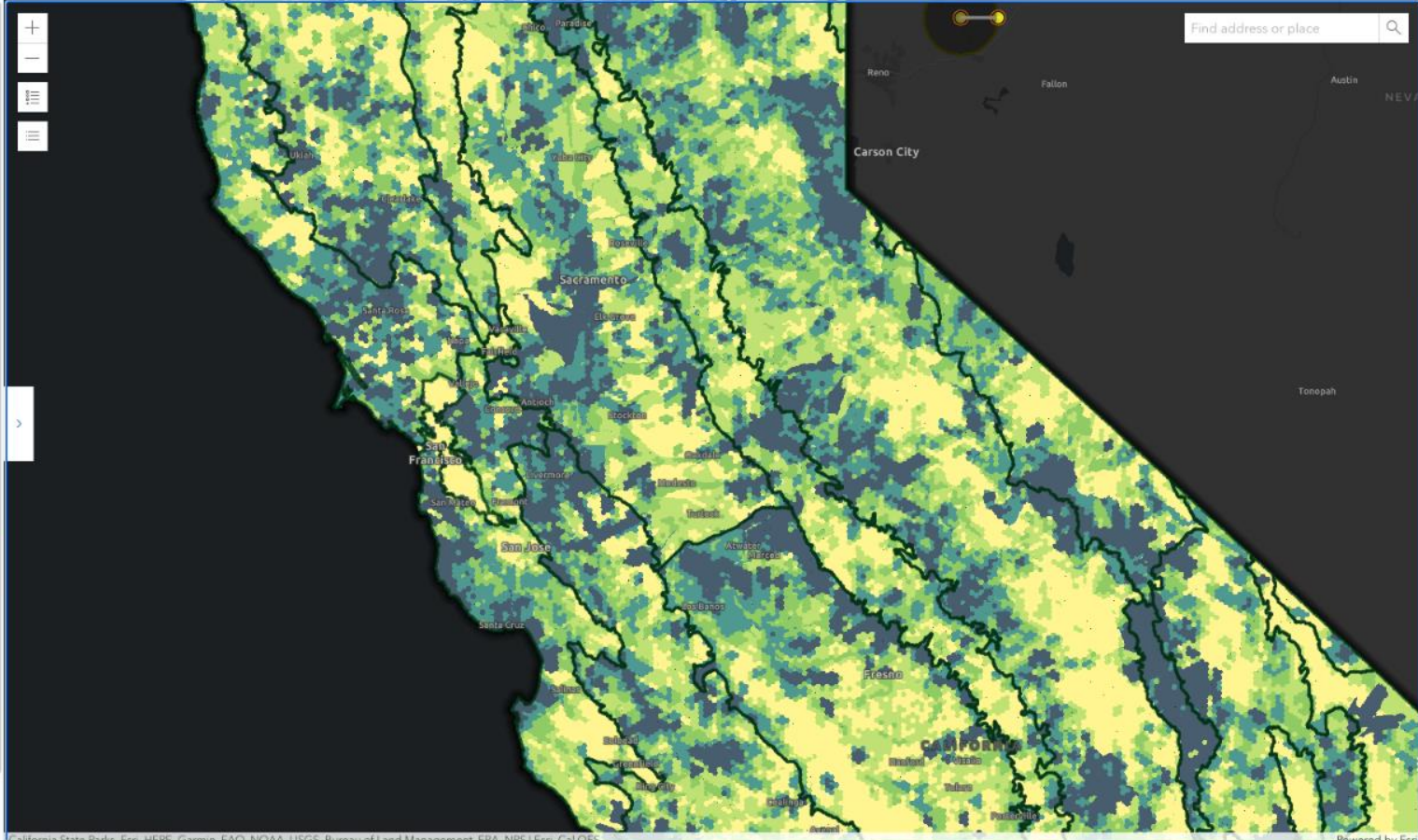
### Connectivity

#### Terrestrial Connectivity



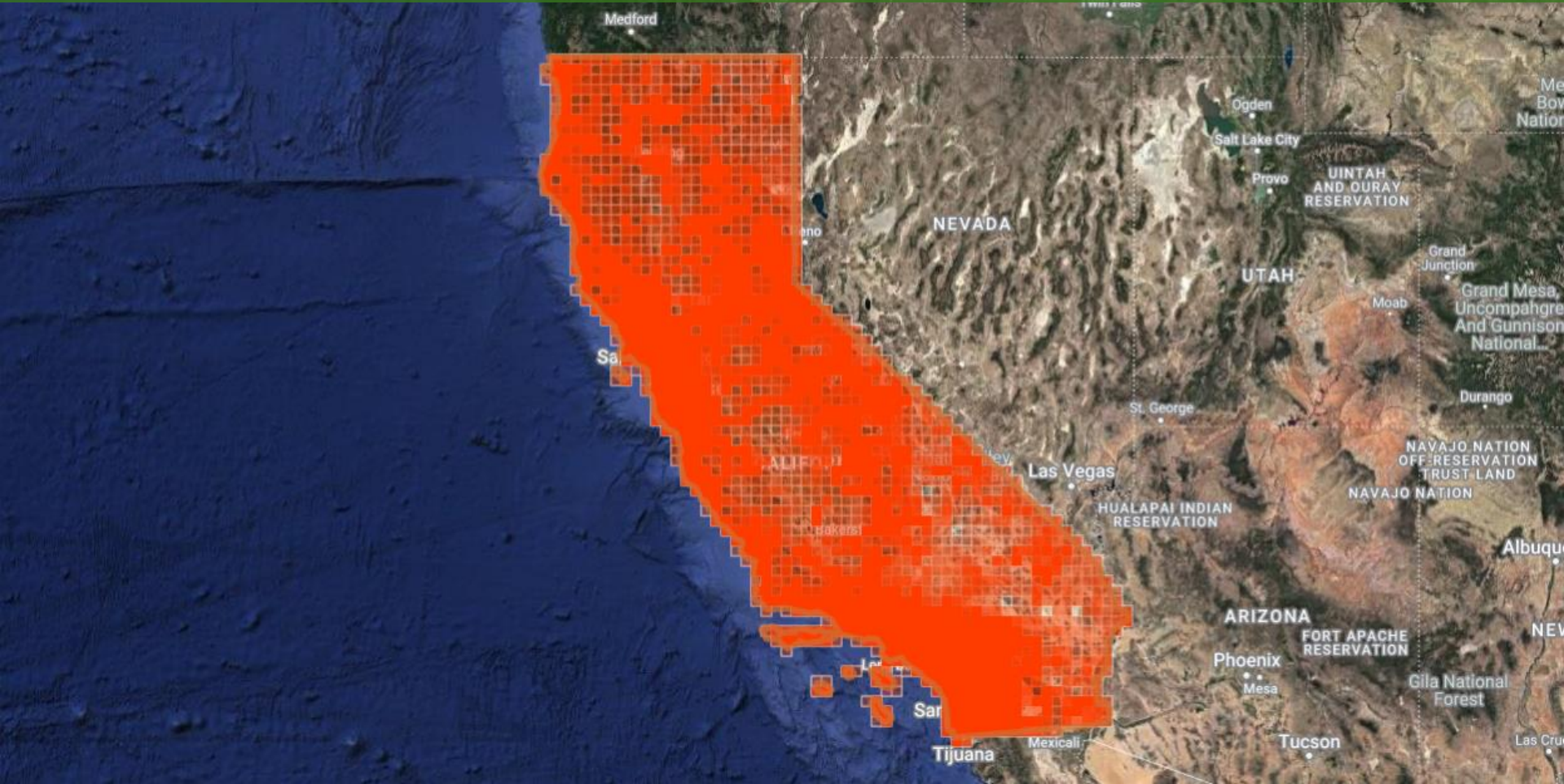
### Climate Resilience

#### Terrestrial Climate Resilience





# Bringing Community-collected Data to Decision-making







## California Biodiversity Week Challenge: FIND 30 SPECIES FOR CA 30x30

SEP 3, 2022 - SEP 11, 2022

### About

Take the 2022 California Biodiversity Week Challenge: Find 30 Species for CA 30x30!

September 3-11, can you document 30 wild species in California? Participating is easy! 1. Join this project. 2. Download the iNaturalist app on your phone. 3. During CA Biodiversity Week, find

[Read More >](#) [Your Membership](#)

[Edit Project](#) [Project Journal](#)

Members 212

Overview

9,021  
OBSERVATIONS

2,218  
SPECIES

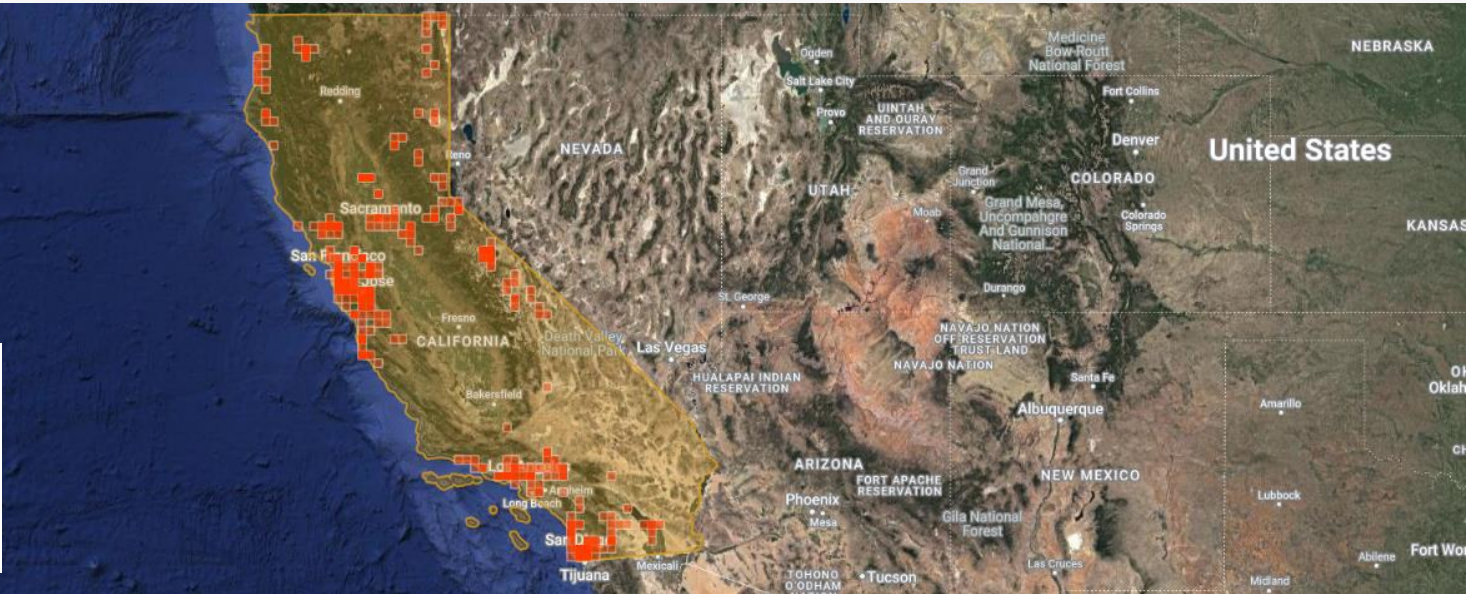
829  
IDENTIFIERS

155  
OBSERVERS

 Stats



30x30  
CALIFORNIA





# THANK YOU!



@alisonkestrel



@kestrel

[calacademy.org/community-science](http://calacademy.org/community-science)

[citynaturechallenge.org](http://citynaturechallenge.org)