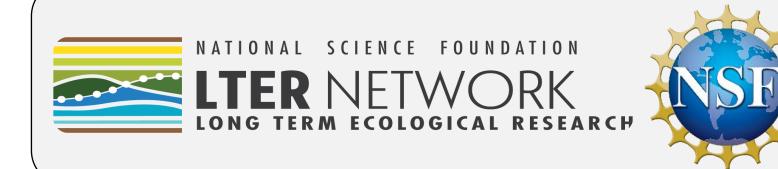


# A Collaboration with Bren Students to Create an Interactive Web-based **Application to Visualize MCR Data**

Visualizing Spatial and Temporal Patterns of Coral Reef Stressors Surrounding Moorea, French Polynesia



Hillary Krumbholz, Thomas Adam, Deron Burkepile, Allie Cole, Felicia Cruz, Jake Eisaguirre, Charles Hendrickson University of California Santa Barbara, Department of Ecology, Evolution and Marine Biology, Bren School of Environmental Science and Management Moorea Coral Reef LTER



# Background – MEDS Capstone Project

Visualizing Spatial Data

• The Master of Environmental Data Science (MEDS) program through the Bren School of Environmental Science and Management gives teams of students an opportunity to design, conduct, and present a data science project proposal.

Through the spatial tab researchers can toggle between different time periods, and look at the corresponding levels of nitrogen, coral bleaching, and bathymetry.

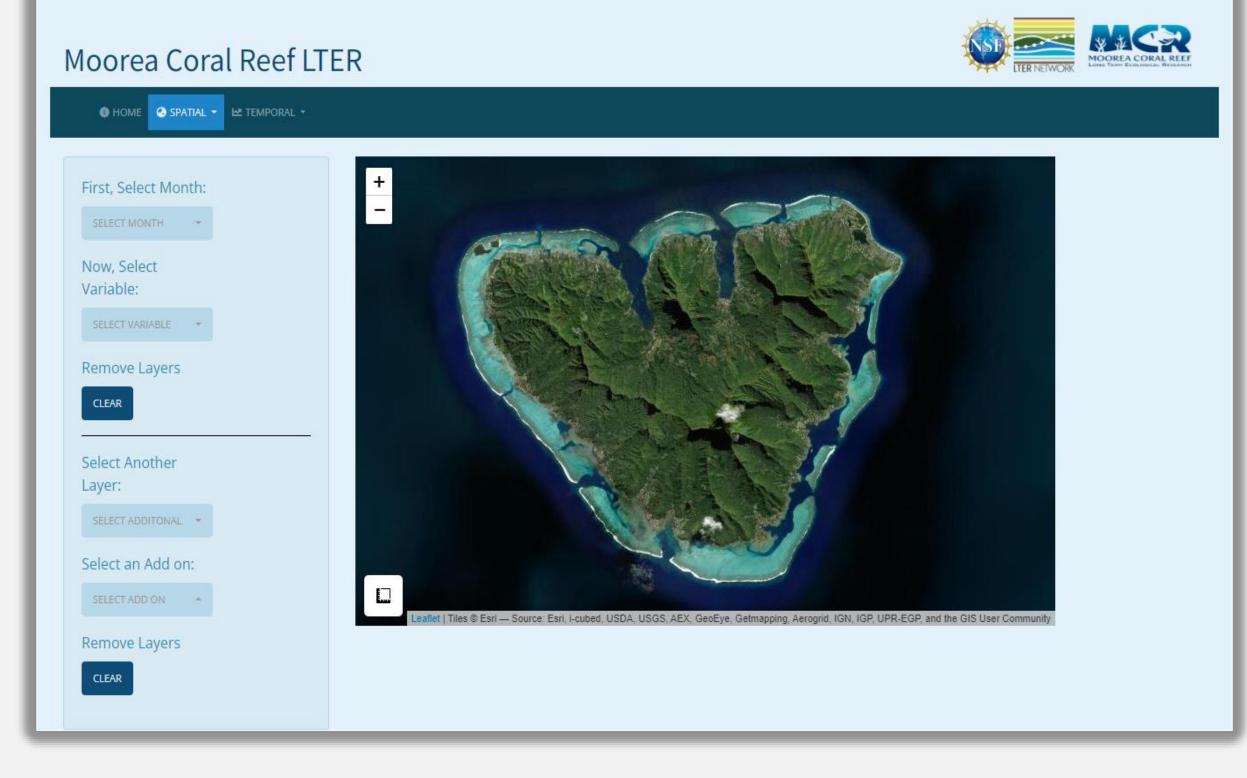
# Visualizing Temporal Data

The temporal tab allows researchers to track trends of fish biomass, crown of thorns density, mean percent coral cover, and mean percent algae cover. There are two options for organizing visualizations: by variable or by site.

• Capstone projects allow students to build real world experience by tackling current environmental problems using data science. Students collaborate with clients from industry, academia, government, or non-government organizations.

• Bren students collaborated with MCR researchers to create an interactive web-based application that uses MCR's time-series data to quickly visualize and analyze data.

• The application will be used as an educational tool for UCSB undergraduate courses and MCR outreach activities. It will also serve as a tool for the local community in Moorea to visualize spatial data that can help inform local management decisions.



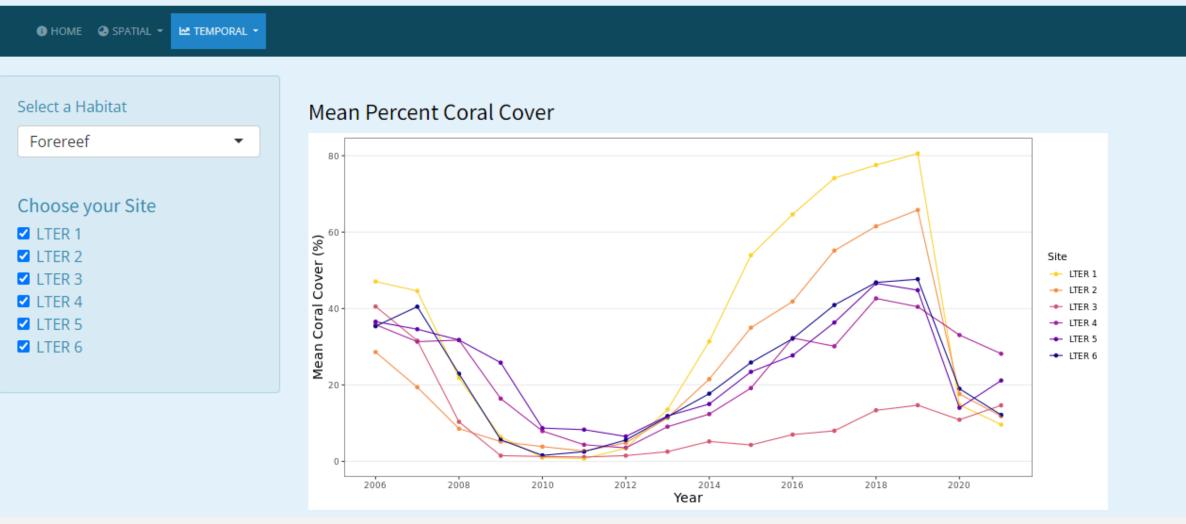
## The landing page after navigating to the Spatial tab

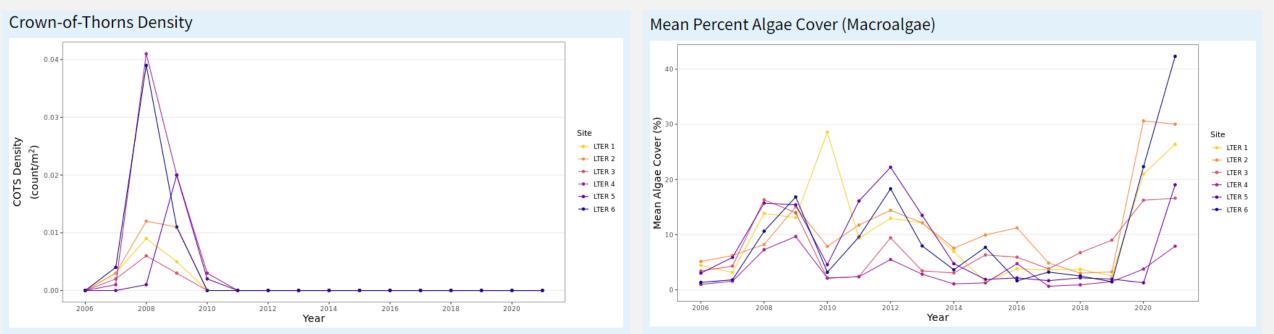
# A Heatmap Looking at Coral Bleaching



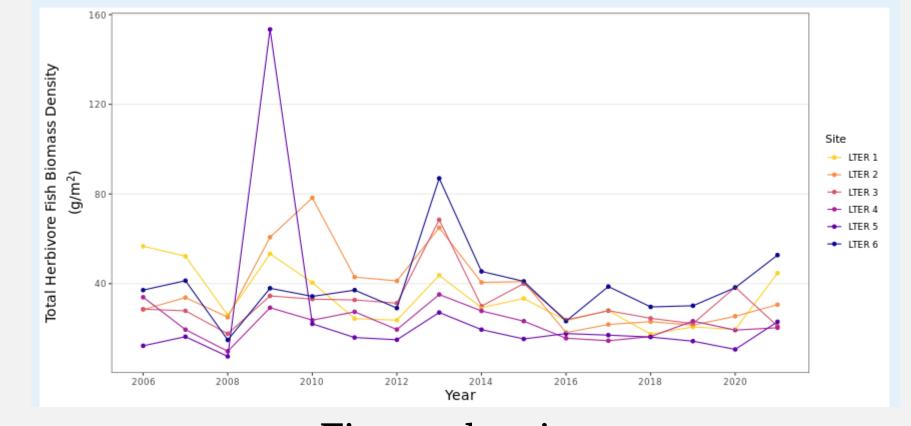
### Moorea Coral Reef LTER







### **Total Herbivore Fish Biomass Density**



# Software and Tools Used

Data was accessed from the MCR data catalog, and from the EDI data repository.

- MCR data catalog
- <u>EDI data portal</u>



R/RStudio was used to access, wrangle, and clean data downloaded from the MCR data portal.

Interpolated spatial data was

The Shiny R package was used to create interactive data visualizations of temporal data.



#### Background

Coral Bleaching is the whitening of corals due to expulsion of symbiotic algae and/or their pigments, which can lead to coral mortality (Brown 1997). Bleaching events are increasing in frequency and magnitude due to climate maximum water temperatures that exceed co stically with heat stress to increase coral bleachin ata set was collected from coral bleaching surveys o test the hypothesis that bleaching prevalence and severity were correlated with differences in heat stress and nutrient availabilit

#### **Data Collection**

167 sites were surveyed around Moorea and bleaching on colonies of Pocillopora and Acropora were recorded, which were present at 149 of the conducted 10-minute swims in opposite directions recording all observed by the dominant cardinal direction of the coastline (North, East, West).

Visualizing the spatial extent of coral bleaching is critical for researchers as they can guickly see a snapshot of the entire reef's health following a thermal stress event. Understanding where corals are more prone to bleaching can help scientists understand the factors driving coral bleaching and can help guide spatial management

Here is the link to download this dataset

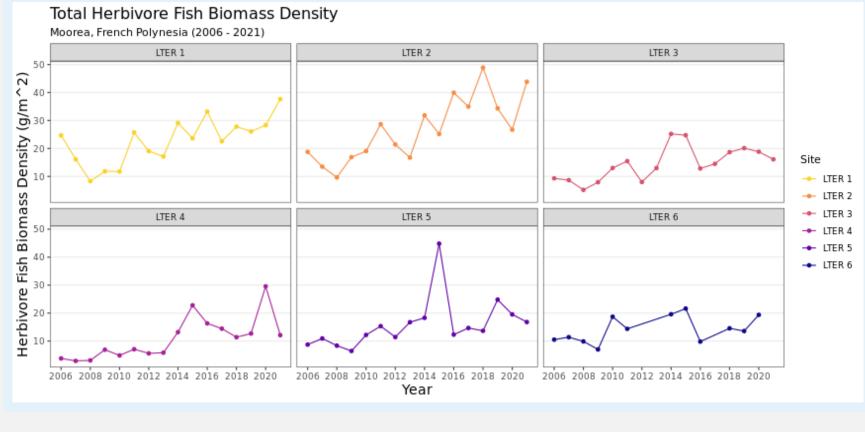


Each variable has a corresponding metadata tab (shown above) that gives background information and a description of how data is collected.

## A View of Nitrogen Levels

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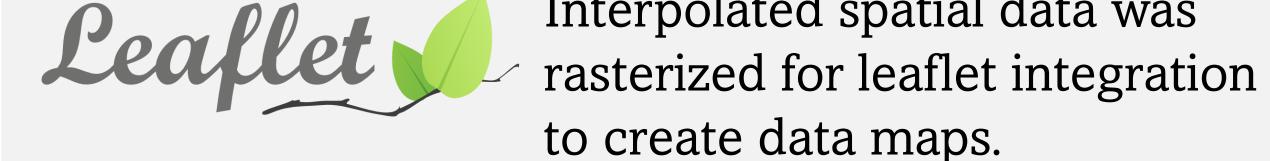
Figures by site



## Figures by variable

## Next Steps and Future Deliverables

• As new temporal data is collected, code will be updated to incorporate the most recent years' data.



All code, files, and an accompanying user guide can be found on the MCR LTER

GitHub organization repository.



A map view when

toggling to the month of January, choosing the variable percent nitrogen, and selecting the additional layer

"observations".

• Future iterations would include the ability to display additional ecological and environmental time series data streams, such as oceanographic data.

• Translating the content of the application to French and Tahitian, so the information can be easily communicated with local groups.

# Please visit the interactive web application <u>here</u>! https://shinyapps.bren.ucsb.edu/ShinyAppMooreaViz/