# INDIGENOUS WATER SCIENCE & ART RESEARCH CAMP

GEOTRIBE AND CAL STATE WATER RESOURCES INSTITUTE, IN PARTNERSHIP WITH WISHTOYO CHUMASH VILLAGE

A project funded by DACIP for the county of Ventura

WISHTOYO
CHUMASH FOUNDATION

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# Introduction


Map from: https://indigenousmexico.org/southwest-us/california/the-native-roots-of-southern-californians/?print=print

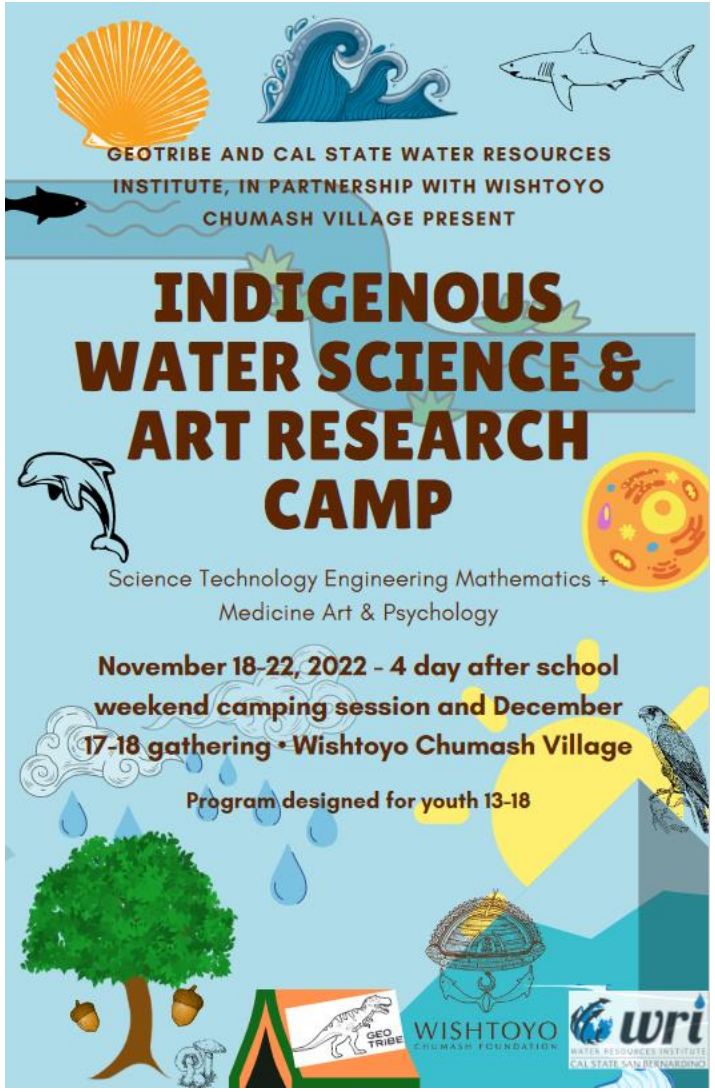
- Native students and cultural-community perspectives have historically been marginalized within academic STEM fields. As of 2019, Native students represent on average 0.2% of those who earn a Bachelors in a STEM field, revealing the urgent need for early STEM exposure.
- This project delivered a Native youth program in the Fall of 2022
  - Onsite program took place on November 18-22 and December 17-18. And
  - Student's engaged in 2-4 virtual research development meetings
  - Fourteen participants between Middle school to Highschool age range.
- Field studies, use of water quality testing kits, soil and water sample microscopy, and hands on activities in virtual and hybrid training sessions all serve to immerse students in Indigenous water science,
- Creation narratives, and water stewardship strategies which were supported by community ethics and discussion about traditional tribal water use practices that remained sustainable and supported large populations in coastal environments.

# Partner’s

- Tribal partnerships Crucial organization’s gave assistance with the recruitment of students and program input for Ventura County region with Coastal Band of Chumash Nation, Colectivo Ce’eni, Acjachemen Nation, and Sacred Places Institute.
- Primary Project Leads and contributors:
  - CSU Channel Islands to integrate a pathway to higher education.
  - Wishtoyo Chumash Village administrators, scientific personnel, and cultural bearers from to develop curriculum, booking, and lodging logistics for this program.
  - GeoTribe education program leads: Nic Rajen and Anisah Kabarra
  - CSU San Bernardino for expert program direction, from PI Daisy Ocampo-Diaz
  - And Water Resources Institute for indispensable admin assistance and program support.

Photos by Carlos Juarez

# Recruitment flyers




# Methods & Program Learning Outcome Goals

**1. Understand Indigenous and Hegemonic STEM (science, technology, engineering and mathematics) principles for solving complex problems.**

**2. Engage in community building with indigenous partners in a way that fosters self-determination.**

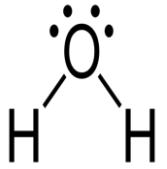
**3. Empower, sense of belonging/building confidence in community and higher education.**

- The program combined traditional knowledge and narratives, shared by Chumash and Ventura County Native community members and elders, with expert scientists and science demonstrations, with meaningful input and perspectives from professors from the CSU system.
- After exploring these concepts over the first camp, student's forumulated their own research ideas to research at home through extracirricular study, leading to the fourth Goal

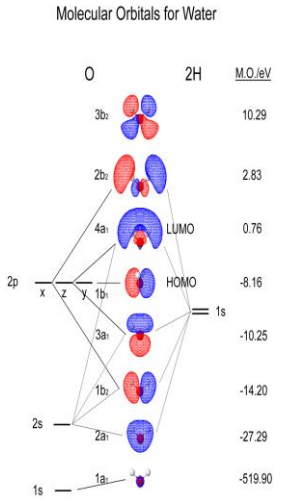
**4. Knowledge of historical and contemporary issues in Water conservation & develop a water-based research project in one or more STEAM (STEM+art) areas**

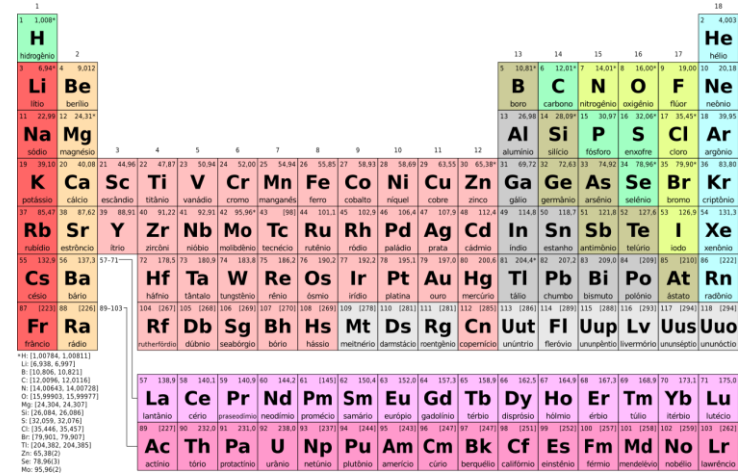
# 1. Understand Indigenous and Hegemonic STEM (science, technology, engineering and mathematics) principles for solving complex problems.

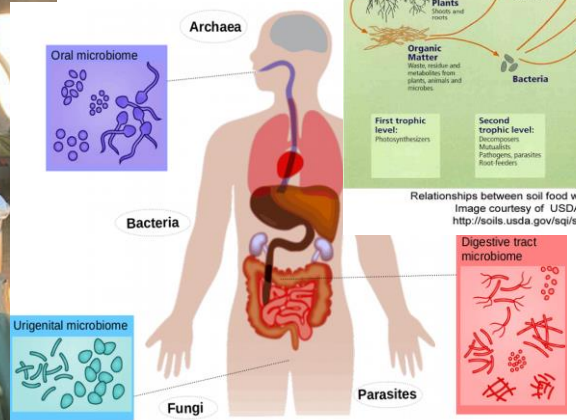
- Traditional indigenous science operates on an intimate understanding of regional geology, and how working in tandem with waterways and accompanying geologic structures can establish non-destructive relationships.
- This required a tactile demonstration of rocks and mineralogy, and climate trends through the fossil record, with a hands-on activity of recreating Mayan aqueduct systems.

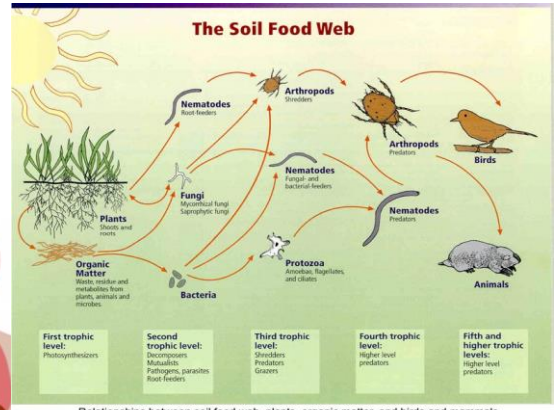


Water's Cosmic Formation

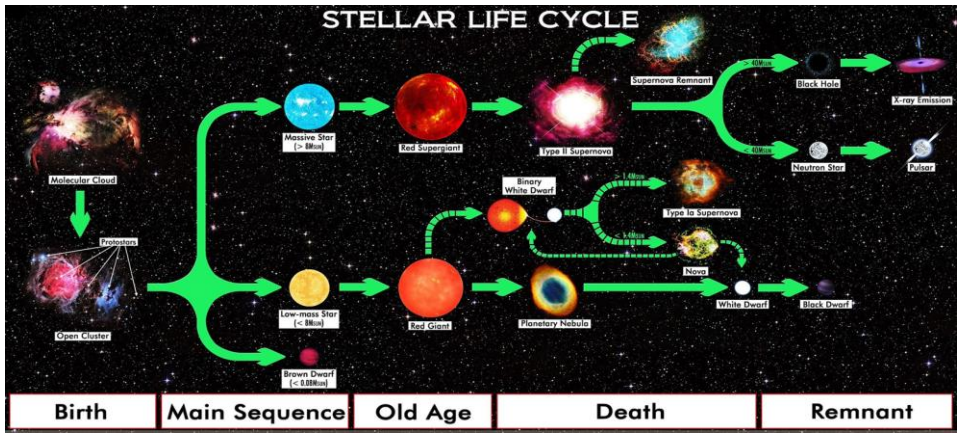





Relationships between soil food web, plants, organic matter, and birds and mammals
Image courtesy of USDA Natural Resources Conservation Service
http://soils.usda.gov/sqi/soil_quality/soil_biology/soil_food_web.html.




https://commons.wikimedia.org/wiki/File:Star_Life_Cycle_Chart.jpg#/media/Fichier:Star_Life_Cycle_Chart.jpg

Activity photos by Nic Rajen

# 2. Engage in community building with indigenous partners in a way that fosters self-determination.

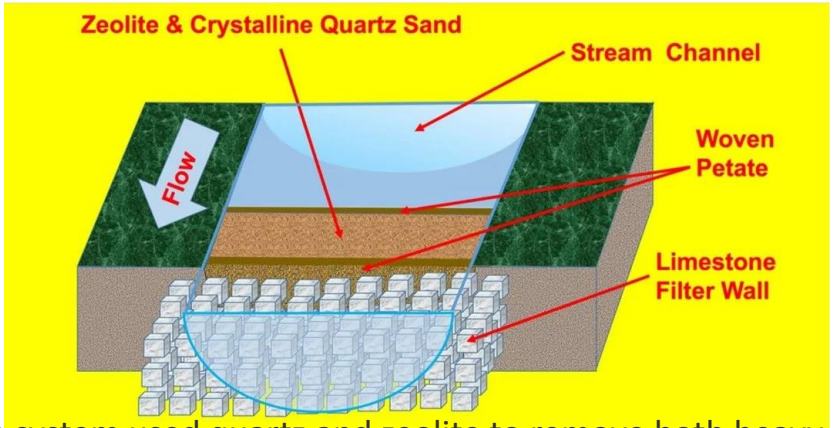
- Student participants worked closely with Chumash elders Mati Waiya, Luhui Isha, Uncle Johnny Moreno, and other's from the Chumash community.
- Students listened attentively to Creation narratives to understand how storytelling guides water management practices. These stories revealed why specific sacred sites were protected, such as the Wishtoyo Chumash Village.
- Chumash leaders exposed students to the legal, financial, and cultural effort to protect the Wishtoyo Chumash Village. The battle to protect this village was a decades long legal battle which resulted in the Chumash being victorious. These narratives allowed students to integrate the spiritual, cultural, scientific elements into understandings of sovereignty.

Activity photos by Nic Rajen

# 3. Empower, sense of belonging/building confidence in community and higher education.

- The program combined traditional knowledge and narratives, shared by Chumash and Ventura County Native community members and elders, with expert scientists and science demonstrations, with meaningful input and perspectives from professors from the CSU system.
  - The students got to experiment with microscopes, water quality testing equipment provided by Wishtoyo environmental scientists, learned crucial definitions and functions of local watersheds, and observe fossils and geologic minerals and materials.
  - Additionally, activities that included abalone and sea urchin shucking, and creating and testing Mayan water filters tangibly showed the importance of water, water food resources, and Indigenous water technology not only for the environment, but for the benefit of people and communities as well.
- By engaging in these activities, self-directed, mentored research and learning from mentors who have achieved degrees in higher ed ranging from Bachelor's and Doctoral-professorship, students can see viable pathways through higher education and STEM careers.

Wishtoyo Environmental Scientists Tevin and Delayni demonstrate water quality in riparian creek running to the ocean. Photo by Nic Rajen




The Tikal filtration system used quartz and zeolite to remove both heavy metals and biological contaminants. Kenneth Barnett Tankersley / University of Cincinnati [Researchers Uncover 2,000-Year-Old Maya Water Filtration System | Smart News| Smithsonian Magazine]

# 4. Knowledge of historical and contemporary issues in Water conservation & develop a water-based research project in one or more STEAM (STEM+art) areas


- The Water Web Project involved students working individually or in a small team to develop a water-based research project.
- Students identified a topic of interest, created a research question/ thesis that drove their entire projects, and incorporated community perspectives.
- Students met with research members (Daisy, Nicholas, Anisah) four times through Zoom to assist in development of project ideas and access to research database. Their projects culminated in a presentation with their peers and family members on the last day of the program.
- Some of the topics included:

-Colonialism & water dispossession-Damming and effect on native communities
-Water-related extinction events
-Language revitalization and reclamation of water place-names.
-Mixtec Community Water Management Negotiations in Oaxaca.

# Student Experience

“My five nights here were really interesting and I learned a lot more from here than at school. I learned about Chumash culture and how they live. There were so many things we learned and there is so many new things that there is to learn. Hopefully I will be coming back and seeing everybody again and have lots of fun.” – Aaliyah

“I want to learn more about geology and how it makes humans and the earth a better place. One thing I learned about is the three different rocks. There’s sedimentary, igneous, and metamorphic. These past few days were amazing. They taught me things I never knew about my culture and how they had so many traditions. One thing I loved about this trip was the hands-on activities we did and how opening they were to us. Just everything was beautiful.” – Jazmin

“I would like to learn more about math because it is interesting and everywhere. What these past days were like was we did much projects like for example looking at so many rocks and learning about them, testing water, and looking closely at water. Making cord necklaces. We also got to know more about each other. I made new friends and had so much fun. If I had another opportunity to come here again, I would.” - Anahi

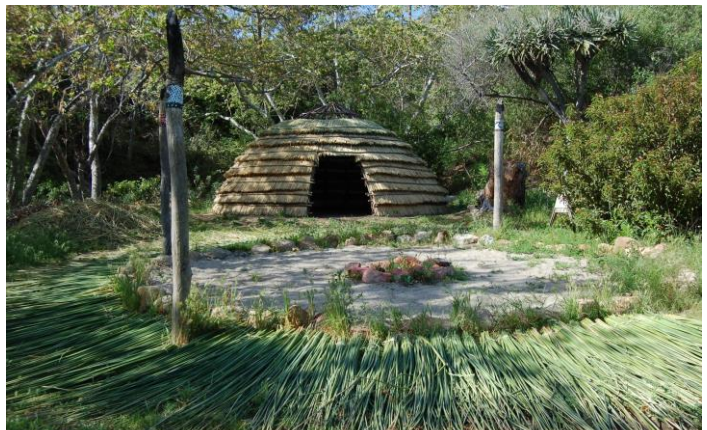
Salick Education grounds, photo by Wishtoyo. Activity photo of sea  urchin harvest by Nic Rajen

“Something that I did was learn about rocks and water and where they come from. All these days were fun and there were different activities every day and every hour. Learning different things is better for our life and also going forward to our future. This place was beautiful for me.” - Jose

“These last few days I had an amazing time here meeting new people and doing different things throughout the days. Sleeping in a tent as well was interesting. While some nights were really windy and some nights were cold. I really enjoyed my time here and I will come back. I also loved hearing about the Chumash culture listening to the stories and hearing the songs as well. I want to keep learning about how water travels. I also want to thank this camp for allowing us to come here as a family. This place felt like home but better.” - Alexis

“What I really love about the camp was learning things that I never knew before and how they were teaching us was amazing. I am just glad that I came here. Even if at first I didn’t want to.” -Maya

“When we came at first it was all dark and we went inside some kind of place and I saw four people. They showed me how to get in to the Selik and we all introduced eachother. We were next to the beach but we couldn’t see it since it was dark. After we all went to set up our tent and went to sleep. We woke up the next day and saw the ocean. It was breathtaking.” -Yeudiel



*'ap 'ap* (traditional Chumash dwellings) photo by Wishtoyo

# Future Considerations

- Continuing to work with Coastal Band of Chumash and Wishtoyo Village to support more Indigenous STEM programs
- Develop a Geotribe Cohort so that students know they are connected with eachother, peer mentors, and professional-academic mentors and community.
- Develop similar water STEM and Indigenous STEM programs for other Tribal Nations and communities
- Community education for greater understandings of science, cultural knowledge, and basis for citizen science research.

# Thank you!