Monitoring Human-Wildlife Interactions to Prevent MPA Violations and Sand Bar Breaching

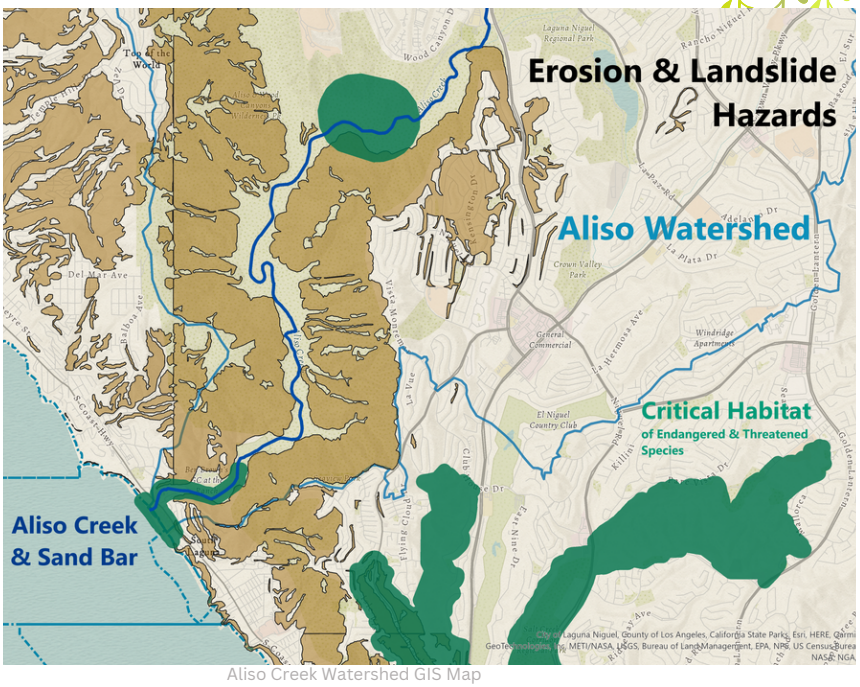
Prepared for: The Laguna Bluebelt Coalition
Prepared by: Christina Giudice
Program Assistant | Orange County Coastkeeper

Background

The Aliso Beach Wildlife-Habitat Monitoring Project has been ongoing at Aliso Beach and Treasure Island in Laguna Beach, CA since 2021. Volunteers and staff members of Orange County Coastkeeper have been collecting data in this area from the Summer to Fall seasons each year.

This project mainly focuses on the bar-built estuary of Aliso Creek, which is fed by a 30-square-mile urban watershed and ends at Aliso Beach. The creek serves as an important resource to both drought-prone and high-fire-risk communities[1].

Not only is this area a vital resource for our community, but it also serves as a critical habitat for endangered and endemic species.



Aliso Creek Watershed GIS Map

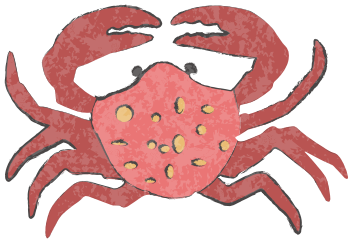
The estuary is a temporary open/close system, so it does not permanently flow into the ocean. This area serves as a critical habitat for several endangered species including the Steelhead Trout, Southern Tidewater Goby, and California Least Tern[1]. Due to human impacts on the Aliso Creek lagoon system, there has been a significant decline in the Southern Tidewater Goby population, which can now only be found in various lagoons in San Diego[2].

In this area, there is a natural sand bar that separates Aliso Creek from the ocean. This sand bar is imperative for lessening the effect of sea level rise, beach erosion, and extreme weather by breaking up incoming wave impact. Additionally, it serves as a barrier between the freshwater wildlife in the creek and marine species in the ocean. However, this area has been exposed to high amounts of human disturbance, and often the sand barrier protecting the ocean is significantly altered.

These are photos of the berm when it's unaltered: flat, straight across connection from Treasure Island to Aliso Beach. Photos by Christina Giudice

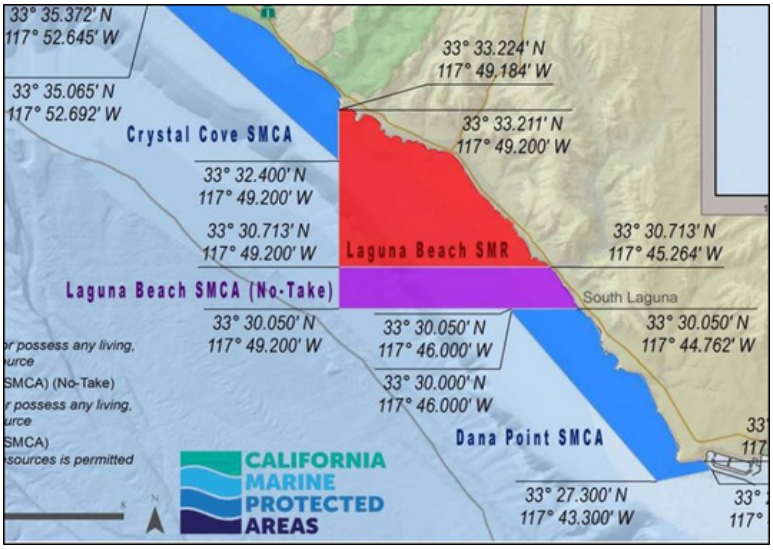
[1]Medina, S. (2022) Monitoring Human- Wildlife Disturbances to Protect Sand Barrier Estuaries from Artificial Breaching. A report of The Laguna Bluebelt Coalition.
[2]Swift, C. C., Spies, B., Ellingson, R. A., & Jacobs, D. K. (2016). A new species of the bay goby genus Eucyclogobius, endemic to southern California: evolution, conservation, and decline. PloS one, 11(7), e0158543.

MPA's and Regulations



A Marine Protected Area is an area of the marine environment that has been reserved by federal, state, tribal, or local laws to provide lasting protection for natural and cultural resources (MPA Executive Order 13158)[3]. The Marine Life Protection Act of 1999 is the law that put MPAs in place.

MPA's are essential for sustaining marine life populations that have been threatened by overharvesting and habitat alteration. The project area includes a State Marine Reserve (SMR) and No Take State Marine Conservation Area (SMCA). Both of these areas prohibit "take" of any kind by the public. "Take" is defined as the extraction or significant alteration of cultural or natural resources.



Aliso Beach Wildlife-Habitat Monitoring Program Training Docs

Aliso Beach and Treasure Island are both in Marine Protected Areas that prohibit "take." Not only are the wildlife and plants in this area protected by MPA status, but several local, state, and federal laws also have jurisdiction.

The **California Coastal Act of 1976** forced developers to use carefully planned sustainable development plans[4]. This was put in place to lessen the impacts of coastal development and prevent beach erosion that could endanger wildlife that requires stable shore habitats.

The **Marine Mammal Protection Act of 1972** prohibited the "take" of all marine mammals due to their declining populations[5]. The animals protected include whales, dolphins, and pinnipeds like seals and sea lions.

The **Clean Water Act** and **BEACH Act** help protect fishable, swimmable, and navigable waters of the United States[6]. The BEACH Act served as an amendment to the Clean Water Act of 1972 to require health-based regulations and enhanced pathogen monitoring in coastal recreation areas.

Sunset at Treasure Island, Photo Credit: Christina Giudice

Bottlenose Dolphins at Aliso Beach, Photo Credit: Christina Giudice

[3]Executive Order 13158—Marine Protected Areas May 26, 2000. (2000, May 26). GovInfo. Retrieved December 20, 2023, from https://www.govinfo.gov/content/pkg/WCPD-2000-05-29/pdf/WCPD-2000-05-29-Pg1230.pdf

[4]Public Resources Code Division 20 California Coastal Act (2023). (n.d.). California Coastal Commission. Retrieved December 20, 2023, from https://www.coastal.ca.gov/coastact.pdf

[5]Marine Mammal Protection | NOAA Fisheries. (n.d.). NOAA Fisheries. Retrieved December 20, 2023, from https://www.fisheries.noaa.gov/topic/marine-mammal-protection

[6]About the BEACH Act | US EPA. (n.d.). Environmental Protection Agency. Retrieved December 20, 2023, from https://www.epa.gov/beaches/about-beach-act

Creek Disturbance

Over the years, beachgoers have been digging out the sand bar at Aliso Creek, disrupting the natural coastal process of the estuary. Sand berms are vital for protecting inland areas from coastal storm surges and help mitigate beach erosion[7]. Without these natural barriers, beaches with high coastal development are susceptible to enhanced sand erosion that can severely alter the natural landscape and even threaten beachfront properties.

These are the steep sand cliffs that result from berm digging that make access between adjacent beaches nearly impossible. Photo by Christina Giudice

Additionally, when people open the sandbar, this drains the estuary, killing all of the freshwater organisms that are washed into the ocean. It also allows pathogens and nutrients from upstream runoff to enter the ocean.

Urban runoff has been shown to increase harmful bacteria and nutrient levels when released into the ocean[8]. When there is a rapid abundance of nutrients in the ocean, this can cause an increase in algae. Algal blooms result in many problems including the blockage of sunlight for marine organisms and even oxygen depletion. The oxygen depletion is a result of bacteria undergoing high rates of respiration when consuming the dead algae.

Health warning about swimming in the ocean due to unsafe levels of bacteria from stormwater runoff. Photo by Christina Giudice

People struggling to cross the beach to get back to the parking lot due to the artificial breaching of the berm. Photos by Christina Giudice

Furthermore, when the berm is dug out, the strong flow of the creek water paves the way for a massive canyon-like crevice on the beach. This results in steep cliffs that can get up to 10 feet high, creating a treacherous drop that can harm beachgoers if not navigated carefully.

The opening of the creek is very dangerous when breached as it creates strong standing waves that flow across the beach and can easily sweep visitors off their feet. Safe access to any California beach without obstruction is protected by Article X, Section 4 of the California Constitution[9].

Digging out the berm or altering the beach landscape below the mean high tide line in any way violates Marine Protected Area regulations. However, beachgoers continue to dig it out for recreational sports. Though one person was ticketed for digging out the berm this past Fall, we hope for more enforcement in the future.

[7]Pontiki, M., Puleo, J. A., Bond, H., Wengrove, M., Feagin, R. A., Hsu, T. J., & Huff, T. (2023, September 26). Geomorphic Response of a Coastal Berm to Storm Surge and the Importance of Sheet Flow Dynamics. Journal of Geophysical Research:Earth Surface, 128(10). AGU. https://doi.org/10.1029/2022JF006948
[8]Reifel, K. M., Johnson, S. C., DiGiacomo, P. M., Mengel, M. J., Nezlin, N. P., & Warrick, J. A. (2009, August 20). Impacts of stormwater runoff in the Southern California Bight: Relationships among plume constituents. Continental Shelf Research, 29(15), 1821-1835.
[9]California Constitution Article X § 4 - Water :: California Constitution. (1976, June 8). Justia Law. Retrieved December 20, 2023, from https://law.justia.com/constitution/california/article-x/section-4/

Project Overview

The Aliso Beach Wildlife Habitat Monitoring Program utilizes staff members of Orange County Coastkeeper along with volunteers to document the human and wildlife activities in three survey areas. These include Treasure Island, Aliso Creek, and Aliso Beach.

The lack of enforcement in this area has motivated us to pay close attention to activities in the area. Each member had access to the Marine Safety phone number along with CA Fish and Wildlife CalTip to report any violations.

People standing precariously above the steep cliffs formed and people having trouble crossing the strong current after beachgoers dug out the creek. Photo by Christina Giudice

People recording and surfing the standing wave that results from berm digging. The wave lasts for only a few minutes but leaves a deep ditch on the beach. Photo by Christina Giudice

Each surveyor of the program would take 30-minute surveys of wildlife presence and human activity at each site. The data included site conditions, human recreational activities, wildlife presence and behavior, offshore activities, and potential violations and hazards.

MPA violations included:

- Digging out the sandbar at Aliso Creek
- Disturbing wildlife habitat
- Hand collection of biota
- Shore-based fishing
- Off-leash dogs (City of Laguna Beach violation)

The hazards included approaching the breached berm and swimming in the creek. This is because someone could fall from the steep cliffs of the broken sand bar when observing it, and the creek may contain unsafe substances from urban runoff.

Digging out the sand bar and draining it into the ocean can kill freshwater organisms in the creek below the mean high tide line. This is considered “take” under the Marine Life Protection Act of 1999[3].

[3]Executive Order 13158—Marine Protected Areas May 26, 2000. (2000, May 26). GovInfo. Retrieved December 20, 2023, from https://www.govinfo.gov/content/pkg/WCPD-2000-05-29/pdf/WCPD-2000-05-29-Pg1230.pdf

Research Assistant Data

Six trained volunteers and two staff members took 129 surveys between July 30th, 2023 to December 31st, 2023.

Most surveys were taken at the Aliso Berm and Creek site, forming 70% of the surveys. Due to more surveys being taken at Aliso Creek instead of Aliso Point and Treasure Island, we will be using proportion graphs to represent the data.

95% of the Aliso Creek surveys listed that the berm was already broken at the time of the survey.

Program Assistant Christina Giudice in Research Assistant shirt. Photo by Jinger Wallace

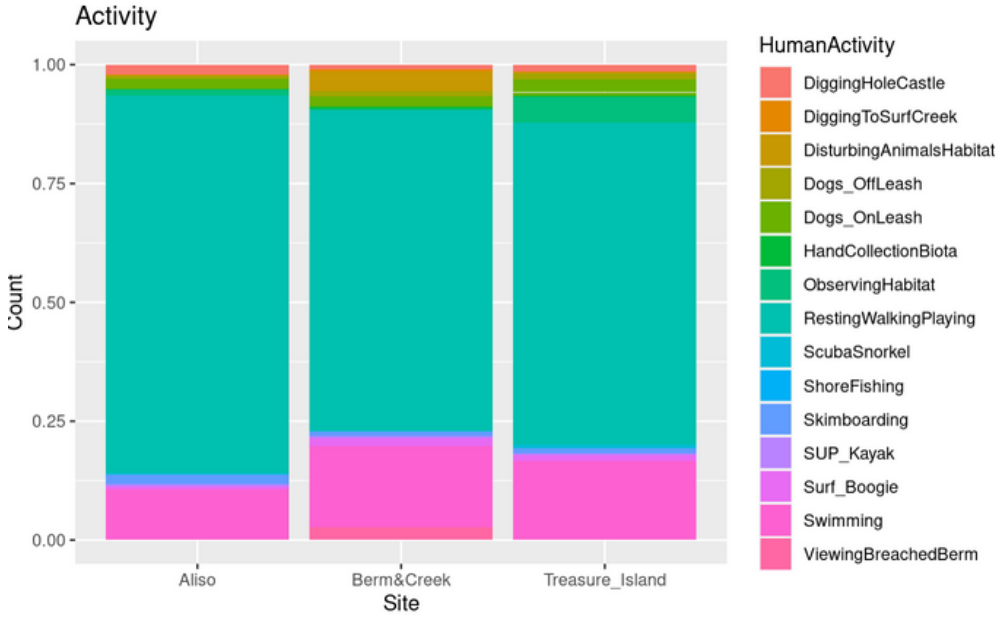


Figure 1: Proportion Graph of Human Activities

Our surveys recorded 10,241 visitors at Treasure Island, Aliso Creek, and Aliso Point in total. In the Aliso Point, Berm and Creek, and Treasure Island surveys, resting or swimming were the most common recreational activities observed.


Project Coordinator Sabrina Medina in Research Assistant shirt with Berm Buddies Tote Bag. Photo by Jinger Wallace


Visitors observing wildlife at the Treasure Island tidepools. Photo by Christina Giudice

Hazards and Disturbances

Throughout our research, there was a total of 1,240 visitors causing environmental hazards and disturbances. The disturbances included breaking the berm to surf it, sliding down the sand cliffs, disturbing animals and their habitat, feeding animals, taking shells or kelp from their natural area, and having off-leash dogs. Meanwhile, the hazards included viewing the breached berm and swimming in the creek.

Beachgoers digging out the creek, forming a stream into the ocean. Photo by Christina Giudice

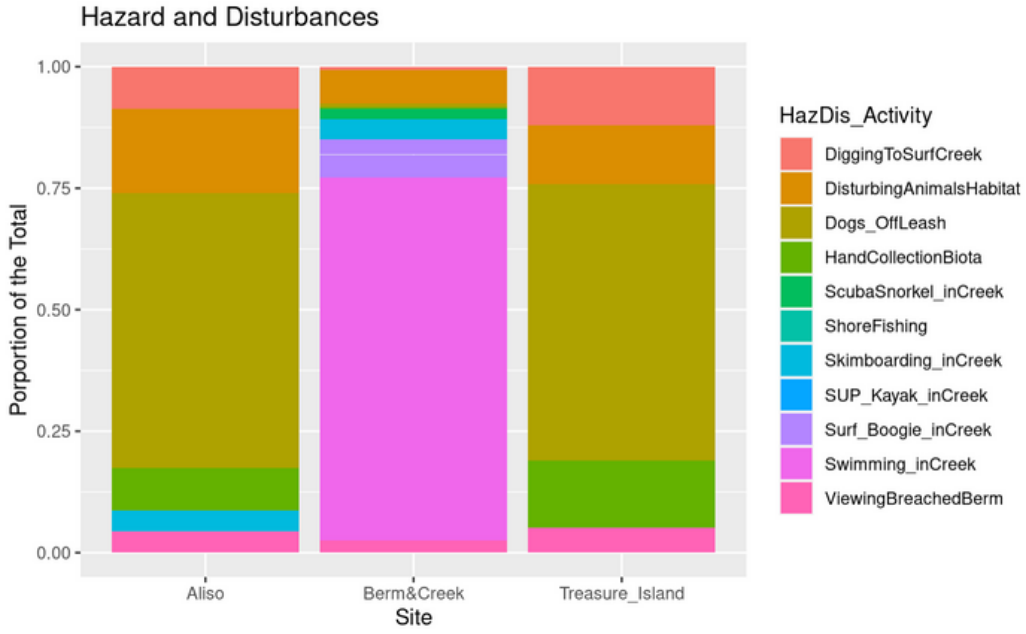


Figure 2: Proportion Graph of Hazards and Disturbances

According to our proportion graph, the majority of the hazards and disturbances recorded were people swimming in the creek, having off-leash dogs, and disturbing animals in their habitat. Though digging to surf the creek was less recorded, the berm was already broken for most of the surveys. 94% of the overall hazards and disturbances recorded took place in the Berm and Creek surveys. It is important to keep wildlife disturbances to a minimum in the Marine Protected Area in order to prevent potential damage to these critical habitats.

Kids climbing up and sliding down the steep sand cliffs into the creek water. Photo by Christina Giudice

Lifeguard crossing the breached berm attempting to help people cross . Photo by Christina Giudice

Wildlife

Many wildlife species were encountered throughout the Summer and Fall seasons. This included sea lions, harbor seals, terns, gulls, shorebirds, pelicans, dolphins, birds of prey, and sharks.

Royal Tern, a close relative of the endangered California Least Tern, landed at Aliso Creek. Photo taken with a zoom lens by Christina Giudice (animal was not approached)

Harbor seal resting at Treasure Island. Photo taken with a zoom lens by Christina Giudice (animal was not approached)

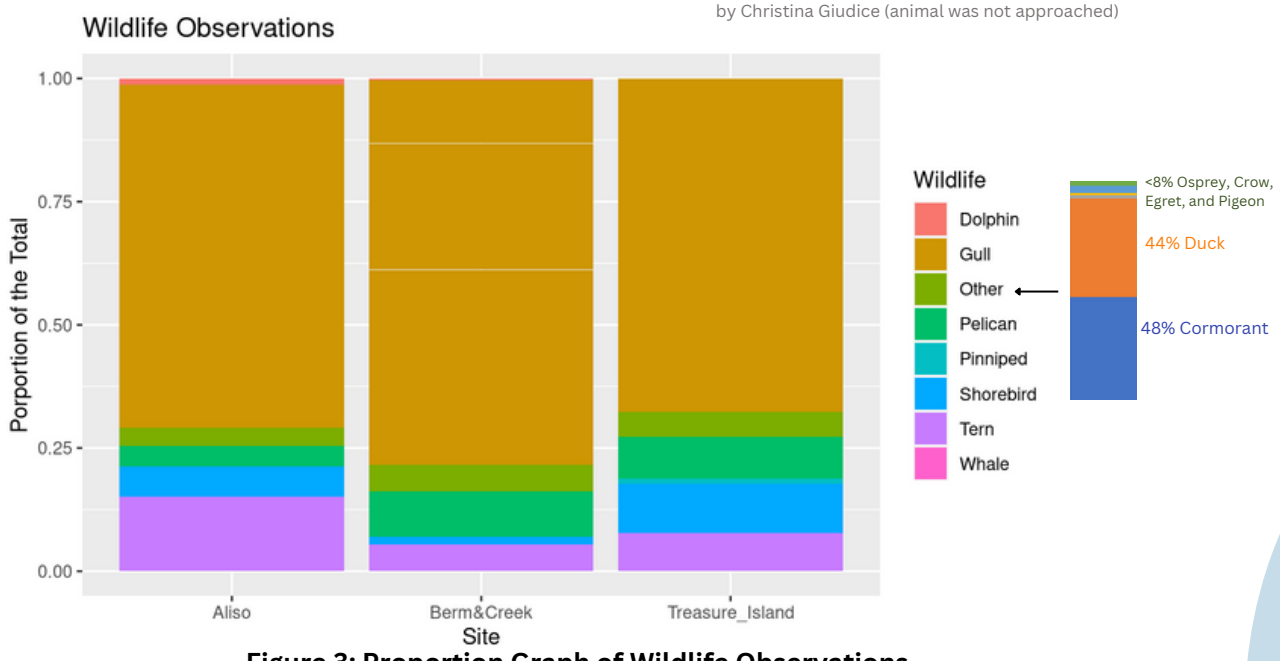


Figure 3: Proportion Graph of Wildlife Observations

According to our breakdown of the wildlife data collected in 2023, gulls were the most prevalent. Additionally, there were high amounts of birds present at all locations including terns, different kinds of shorebirds, pelicans, cormorants, ducks, and many others. However, there were a few harbor seals and sea lions spotted at Treasure Island and often pods of dolphins at all locations.

Shark fin spotted at Aliso Beach. Photo taken with a zoom lens by Christina Giudice

The formerly endangered Osprey passing through Aliso Creek. Photo taken with a zoom lens by Christina Giudice

Biodiversity

Wandering tattler foraging at Treasure Island. Photo taken with a zoom lens by Christina Giudice

Black turnstone foraging in the tidepools at Treasure Island. Photo taken with a zoom lens by Christina Giudice

Willet gliding through the water at Aliso Point. Photo taken with a zoom lens by Christina Giudice

Harbor seal resting at Treasure Island. Photo taken with a zoom lens by Christina Giudice

In our data analysis, we decided to calculate the Shannon's Diversity Index for each survey site. The Shannon's Diversity Index is used for measuring the biodiversity of wildlife in certain samples of data based on species evenness and richness. The higher the diversity index, the higher the biodiversity of the sample.

Shannon's Diversity Index

0.89	Aliso Berm and Creek
1.19	Treasure Island
1.06	Aliso Point

As seen in the graphic, the Aliso Berm and Creek surveys had a Shannon's Diversity Index of 0.89, Treasure Island had 1.19, and Aliso Point had 1.06. The Berm and Creek surveys were observed to have the lowest biodiversity, even though most of our surveys took place at that site. Due to the Berm and Creek area facing the highest number of disturbances compared to the other two survey sites, this could be the likely cause for low biodiversity.

When we compare this to our 2022 report, we found that these diversity indexes are significantly lower.

Human-Wildlife Interactions

When people disturb animals in their natural habitat, wildlife presence significantly decreases. Many wildlife including shorebirds, fish, marine mammals, sea birds, and intertidal invertebrates depend on the natural processes of their ecosystem in order to survive and reproduce. When these conditions are altered by unpredictable anthropogenic activity, animals will react accordingly and often flee their appropriate niche or habitat.

Gull trying to eat a plastic water bottle left behind by beachgoers. Photo by Christina Giudice

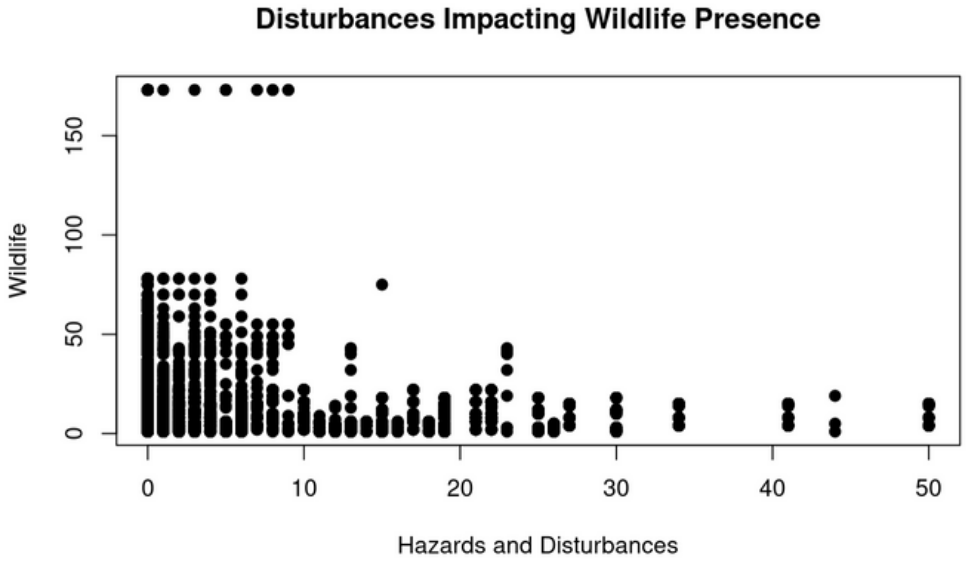


Figure 4: Correlation Analysis of Human Hazards and Disturbances and Wildlife Abundance

According to our correlation analysis, hazards and disturbances significantly impacted wildlife presence in the area (p-value < 2.2e-16). When there are more disruptions to the natural landscape or ecosystem, animals will be more hesitant to return to the unstable environment. As a result, consistent disturbances to areas like the berm at Aliso Creek, disrupt the natural flow of the critical habitat, resulting in animals fleeing the area.

Less birds are foraging in the creek due to the artificial breaching of the berm and strong current. Photo by Christina Giudice

2021 to 2023

We decided to compare our 2023 data to our past reports in order to see how human and wildlife activity has changed over the years. According to our 2021[10] report, we took 109 surveys and recorded 187 hazards and disturbances. In our 2022 report[1], we took 66 surveys and recorded 272 human hazards and disturbances. Finally, in our 2023 report, we took 129 surveys and observed a total of 1,240 hazards and disturbances.

According to this pattern, **hazards and disturbances were almost 5X as prominent in 2023** as compared to our past 2021 and 2022 studies. Though it is not clear what may have caused human disturbances to increase dramatically, we can reason that this was likely caused by the berm being broken for most of the 2023 surveys, paving the way for more risky behavior. However, we should note that we took more surveys in 2023 than in 2021 or 2022 and we also had a higher percentage of Aliso Creek surveys which could likely lead to more disturbances being recorded.

We can conclude that this significant increase in disturbances is the likely cause for the low Shannon's Diversity Index for 2023. Additionally, as seen in our correlation analysis, increased amounts of human disturbances result in lower wildlife presence, thus impacting biodiversity.

Standing wave following artificial breaching. Lifeguard redirect people to go around the creek. Photo by Christina Giudice

"Artificial breaching causes significant morphological changes due to strong outflow." Photos by Sabrina Medina in 2022 report

2022:

Shannon's Diversity Index	
Berm and Creek	1.67
Aliso Point	3.06
Treasure Island	2.59

Shannon's Diversity Index from 2022 report by Sabrina Medina.

2023:

Shannon's Diversity Index	
Berm and Creek	0.89
Aliso Point	1.06
Treasure Island	1.19

The Aliso Berm and Creek area has a deep history of wildlife habitat disruptions and impacts on biodiversity. This is why our organization along with other community members must continue gathering data and educating the public on the importance of preserving this critical habitat.

[1]Medina, S. (2022) Monitoring Human- Wildlife Disturbances to Protect Sand Barrier Estuaries from Artificial Breaching. A report of The Laguna Bluebelt Coalition.
[10]Santos, A.J. (2021). Protecting sand barriers in estuaries: Outreach program monitors human-habitat disturbance in California MPAs. A report of The Laguna Bluebelt Coalition.

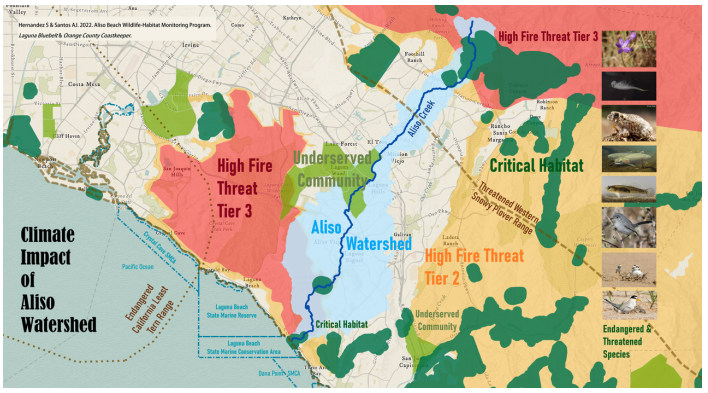
Education and Outreach

Starting in August, Project Coordinator, Sabrina Medina, held outreach events at Aliso Beach at least three times a week. In October, Program Assistant, Christina Giudice was given the project and set out at the berm every weekend until the middle of December. There was a total of 27 outreach events between August and December. In these events, we obtained about 160 educational contacts.

Educational signage displayed on the berm. Photo by Christina Giudice

The outreach setup included a Laguna Bluebelt tent along with a Laguna Bluebelt tablecloth, paper mache animals, educational signage, stickers designed by Sabrina Medina, and informational pamphlets.

Our materials also included a GIS map that illustrates the Aliso Creek watershed along with high-fire threat areas that depend on the creek as a water source.

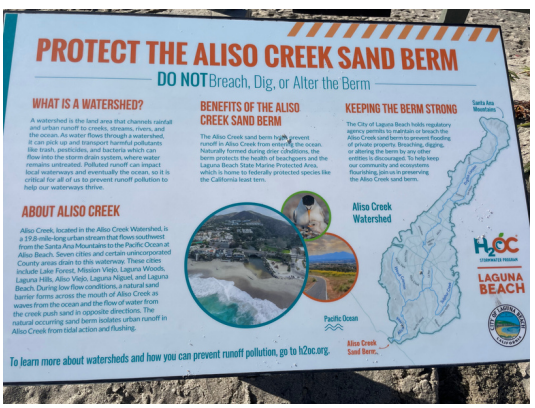


GIS Map by Sophia Hernandez

Christina Giudice, Program Assistant, alongside our wonderful volunteers from the Pacific Marine Mammal Center (PMMC) at one of our outreach events

Additionally, a new permanent informational sign was set up next to Aliso Creek. In August, H2OC and the City of Laguna Beach installed a permanent sign demonstrating the importance of protecting the sand berm and creek. This sign also informs beachgoers about the critical habitat and how damaging the berm is against MPA regulations.

This sign has been a great educational asset as almost all beachgoers who are walking toward the creek read the sign. We are hoping that this sign can be a substantial tool in educating people on the importance of leaving the berm alone at Aliso Creek.



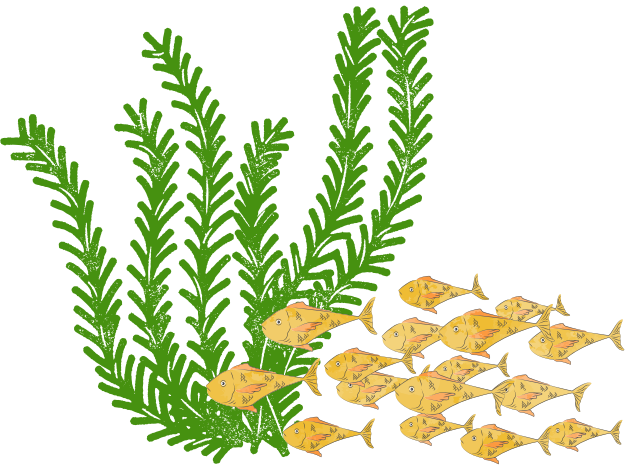
Berm Protection

In December, the Co-Founder of Laguna Bluebelt and the Associate Director of Programs from Orange County Coastkeeper were set up at the berm for outreach. A few people were digging out the berm and recording it, so they decided to tell the lifeguards. The lifeguards went over to check on the situation to talk to the people who were digging out the berm.

Shortly after, the City of Laguna Beach Park Ranger came to control the situation and eventually got the people to leave the area and stop digging out the berm. This whole process took less than 15 minutes and shows us that the city lifeguards and Park Rangers are motivated to combat MPA disturbances and protect the berm.

We hope that the Aliso Creek area will soon experience more legal protections. These protections will be necessary to help maintain the natural open/close estuary. With more enforcement, the lagoon will be allowed to naturally open and close on its own terms thus maintaining a stable environment for wildlife to thrive in.

The berm must maintain its natural shape in order to facilitate beach access as well as protect marine life from inland pollution. We must leave the berm alone in order to preserve the creek's natural processes so other organizations can work on restoring the lagoon. If most of the water from the lagoon flows out into the ocean, this critical habitat will be missing its main water source thus hindering restoration progress.



Park Ranger truck arriving to survey the area. Photo by Christina Giudice

Photos of the berm naturally being built back up by waves following an episode of artificial breaching. Photos by Christina Giudice

Conclusions

Aliso Creek remains to be an incredibly important ecosystem for several endangered, threatened, and endemic species. It continues to be a popular tourist destination and a focal point of skimboard culture for people from far and wide. The Aliso sand berm is a crucial part of the coastal ecosystem and facilitates access between Aliso Beach and Treasure Island by connecting people to the resources of both beaches so every visitor can appreciate it equally.

Sunset at Goff Island. Photo by Christina Giudice

The Aliso estuary combined with the sand berm is critical for carbon sequestration, nutrient turnover, storm and sea level rise buffering, and filtration. Artificial breaching of the sand berm paves the way for stormwater and urban runoff to enter the ocean and thus impacts the biodiversity of marine species.

Additionally, with more support from enforcement along with our continuing educational efforts, we plan for more enforcement and awareness of the harms of breaking open the natural sand barrier. Furthermore, the natural closure of the berm is vital for future restoration projects in the lagoon.

A group of landed terns and gulls on the Aliso Berm. Photo by Christina Giudice

With increased educational awareness, we are hoping that more people will learn to appreciate beach access and marine health, partake in community reporting, and help mitigate potential MPA violations. MPA regulations are put in place in order to protect our beautiful but sensitive open-access resources.

Foraging sanderlings at Aliso Beach. Photo by Christina Giudice

As Southern California residents, we are extremely lucky to have access to the resources that contribute to the beauty and appeal of our Marine Protected Areas. Instead of harming these resources, we should respect and cherish them by letting nature run its course and letting the berm be.

A group of resting harbor seals at Goff Island. Photo by Christina Giudice

Future research and monitoring of the unique Aliso berm and creek habitat will pave the way for new analyses and conclusions to help us better understand the significant role of sand berms in open/close estuary habitats.

Acknowledgements

Dedicated to the ocean and to those who vow to protect it.

Thank you to Mike Beanan, Jinger Wallace, and Ray Hiemstra for pouring your support into the Berm Buddies project and encouraging us to become stronger advocates for marine life. Thank you Sabrina Medina for being a great mentor and a positive force for the project through your encouraging words and passion for marine life. Thank you to all of our wonderful volunteers and to those from PMMC who helped us collect more data and provide outside points of view on the project. Thank you to the City of Laguna Beach and LUSH for the financial support of the project, giving us the ability to share more educational resources with the public. Lastly, thank you Orange County Coastkeeper and the Laguna Bluebelt Coalition for your endless support and advocacy of marine health and safety.

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Laguna Bluebelt

The Laguna Bluebelt Coalition brings together organizations and individuals with a common goal of protecting and restoring marine life, conserving biological diversity and maintaining healthy, sustainable marine habitats for all plant, fish and animal species. We promote education of local marine resources and enforcement of environmental protection laws and regulations. The Coalition seeks to provide a forum for communication, relationship building, and public outreach toward the common goals of caring for the marine life environments of Laguna Beach.