

The Colorless Kingdom The Story of Coral Bleaching

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SENIOR YEAR

My senior year of college has been a crazy ride filled with a lot of new experiences and challenges. It has been a culmination of all the hard work, late nights, and moments of self-discovery throughout my college journey. But amidst the chaos, I will cherish the friendships and connections made during the last four years. While there were moments of stress and uncertainty, the year was ultimately defined by growth, resilience, and the excitement of stepping into the next chapter of life.

"I wish there was a way to know you're in the good old days before you've actually left them."

— Andy Bernard



SOCIAL ISSUE

CORAL BLEACHING

Ever since I was a little girl the ocean has had a special place in my heart. To me, the ocean embodies both beauty and mystery. Its vastness and depth inspire a sense of awe and wonder, but also it reminds me of all of the secrets and unknown that exists in our world. The ocean has always been one of my favorite places to visit, especially since I have lived in a desert my whole life, and some of my most special memories growing up is tied to the ocean.

When we were told we had to chose a social issue topic for our senior year projects, I knew I had to choose an issue related to the ocean. After a lot of research, I finally decided to land on the topic of coral reef bleaching.



I chose coral bleaching because it's a pressing environmental issue that directly impacts the entire world. Understanding the delicate balance of our oceans and the intricate relationship between coral reefs and life is crucial for their survival. Many people don't understand the significant threats the reefs are facing and the impacts they have, not only on the ocean and marine wildlife, but also for human beings as well.

> Hopefully, with this book and the other projects I have done in my senior year, more people will realize the seriousness of this issue and will take the time to do their part in helping save the coral.

RESEARCH

CORAL BLEACHING

WHAT IS CORAL BLEACHING?

Corals and algae have a symbiotic relationship that is crucial for the health and survival of coral reef ecosystems. Corals are marine invertebrates that form colonies and the algae, specifically ones called zooxanthellae, are single-celled organisms that live within the tissues of corals.

This relationship is mutually beneficial: corals provide algae with a protected habitat and in turn the algae produces oxygen and provides corals with the majority of their energy through photosynthesis.



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Zooxanthellae harnesses sunlight, carbon dioxide and water to produce oxygen and sugars through photosynthesis. They also produce the pigments that give corals their vibrant colors. The sugars produced by zooxanthellae provide corals with up to 90% of their energy needs, aiding in growth, reproduction, and calcification of their calcium carbonate skeletons.

However, this relationship between coral and algae is extremely delicate. Disruptions can lead to coral stress and the expulsion of algae, resulting in coral bleaching.



The expulsion of zooxanthellae leaves the coral reefs weakened and more susceptible to disease, predation, and mortality. While bleached corals are not necessarily dead, they are significantly compromised and may struggle to recover.



If the stressors persist or if bleaching events occur for long periods of time, coral colonies or even the entire reef ecosystem may face widespread mortality. This will lead to long-term ecological consequences for both marine and human life.



WHY IS IT HAPPENING?

Coral bleaching can be cause by a numerous amount of factors such as pollution, overfishing, and ocean acidification but it primarily occurs due to rising sea temperatures. The Earth's atmosphere is warming due to the release of greenhouse gases like carbon dioxide from activities such as burning fossil fuels, deforestation, and industrial processes. As a result, the oceans absorb much of this heat, leading to an increase in sea surface temperatures.



This expulsion of the algae occurs as a survival mechanism in response to adverse environmental conditions from the coral. By expelling the algae, corals reduce their exposure to stress-inducing factors and potentially harmful byproducts, albeit at the cost of losing their primary source of nutrition and energy.

While this response may temporarily alleviate stress, prolonged expulsion of algae can weaken the coral and make it more vulnerable to additional stressors, ultimately increasing the risk of mortality.











THE IMPORTANCE

WHY ARE THE CORAL REEFS IMPORTANT?

Coral reefs are crucial ecosystems due to their extraordinary biodiversity, vital role in coastal protection, and significant socioeconomic value.

Coral bleaching threatens critical functions, disrupting ecosystems worldwide. Its repercussions extend to food security, economic stability, and climate resilience, which affect millions of people worldwide.

for our world:



Here are some examples of what coral reefs provide



FOOD

Coral reefs provide food through supporting diverse and abundant marine life, including fish, crustaceans, mollusks, and other invertebrates. Marine life utilizes the complex reef structures as habitats for feeding, breeding, and shelter. Species ranging from small herbivores to large predators rely on coral reefs for food and refuge, forming intricate food webs within the reef ecosystem.

Coral reefs support important species that are harvested for food for humans, such as various types of reef fish, shrimp, lobster, and mollusks. Coral reef fisheries are essential for the food security and livelihood of millions of people living in coastal communities worldwide, providing a vital source of protein and income.









SHELTER

Coral reefs serve as vital habitats and shelters for a diverse array of marine life through their intricate three-dimensional structures. The complex architecture provides numerous hiding places, nurseries, breeding grounds and habitats for many marine animals and organisms. The abundance and diversity of life supported by coral reefs contribute to the overall richness and productivity of marine ecosystems, making coral reefs one of the most vital hubs of biodiversity in the oceans as they provide for over 1 million different species.

PROTECTION

The coral reefs provide coastline protection through their ability to protect costal areas from the damaging effects of waves and storms. The complex structure of the coral reefs acts as a natural barrier. The corals absorb and dissipate wave energy, reducing the impact of storms, helping to protect adjacent shorelines. This helps to prevent erosion, stabilize sediments, and protects coastal communities and infrastructure from damage caused by wave action and storm surges.









JOBS & INCOME

Additionally, coral reef-based tourism, including activities such as diving, boating and snorkeling generates significant revenue and employment in coastal regions, supporting jobs in hospitality, transportation, and related industries. The economic value of coral reefs shows their importance for sustaining livelihoods and fostering economic development in coastal communities globally.

Coral reefs provide jobs and income through various economic activities associated with fisheries, tourism, and coastal protection. Fishing on coral reefs provides employment opportunities for fishers, processors, and traders involved in harvesting, processing, and selling reef-associated seafood.

MEDICINE

Coral reefs provide sources of medicine through the biodiversity they support, as marine organisms found within these ecosystems produce compounds with pharmaceutical properties. Many marine organisms, including sponges, soft corals, and algae, have been found to produce bioactive compounds that show promise in pharmaceutical research for treating various human diseases and conditions, including cancer, bacterial infections, asthma, arthritis, heart disease, inflammation, and neurological disorders. The unique chemical diversity of marine organisms found on the coral reefs offers a vast resource for discovering new drugs and therapeutic compounds, making coral reef ecosystems invaluable for biomedical research and drug development efforts.







OVERALL

The coral reefs are more then just pretty, colorful organisms that live in the ocean. They are invaluable ecosystems that play a crucial role in supporting marine biodiversity, coastal resilience, economic prosperity, and human well-being. Protecting and conserving coral reefs is essential for ensuring their continued existence and the countless benefits they provide to both marine life and human societies.

THE IMPACT

HOW DOES CORAL AFFECT US?

The loss of the coral reefs would trigger a domino effect of environmental, economic, and social repercussions worldwide. Ecologically, it would lead to a dramatic decline in marine biodiversity. Countless species of marine life rely on coral reefs for habitat, food, and protection. The extinction or severe decline of these species would disrupt marine food webs, jeopardizing the stability and productivity of fisheries that millions of people depend on for sustenance and their livelihood.

Economically, the decline of coral reefs would have profound impacts on industries such as fisheries, tourism, and coastal development. The reefs decline would lead to revenue losses and economic hardships for communities dependent on these sectors. Furthermore, their decline would leave coastal communities more vulnerable to erosion, storms and exacerbate the impacts of climate change on coastal regions. This could lead to displacement, loss of property, and heightened vulnerability to climate related disasters for millions of people living in coastal areas globally.

















WHY SHOULD WE ALL CARE?

Even if people don't live in coastal areas, they should care about the decline of coral reefs because these ecosystems provide essential services that benefit the entire planet. Coral reefs support food, shelter, protection, jobs, income and medicine for living beings all over the world. The loss of coral reefs would disrupt marine ecosystems, diminish fisheries resources, and exacerbate climate change impacts, affecting not only coastal communities but also global food security, biodiversity, and climate stability. Therefore, preserving coral reefs is essential for the health and well-being of all life on Earth, regardless of proximity to coastal areas.

HOW TO HELP

HOW CAN WE HELP?

To help address the decline of coral reefs, it is essential to take a multi-faceted approach. The best way to help prevent coral reefs from bleaching is by adopting eco-friendly practices and raising awareness. Reducing your carbon footprint is a big one as it addresses the root cause of rising sea temperatures. However, education and advocacy are equally vital—spreading awareness about the importance of coral reefs can inspire collective action and foster a commitment to preserving these vital underwater sanctuaries for future generations.

to help the coral reefs:



Here are some things that you can do on a daily basis

CONSERVE WATER

By minimizing water usage, individuals and communities can help reduce the discharge of pollutants such as sediment and chemicals into coastal waters, which can harm coral reefs. Furthernmore, water conservation helps preserve freshwater resources, reducing the need for dams and other infrastructure that can disrupt natural water flow and sediment transport, which are essential for coral reef health.









USE PUBLIC TRANSPORTATION, CARPOOLING OR BIKING

Using public transportation, carpooling, or biking can significantly reduce carbon emissions. By decreasing the use of personal vehicles powered by fossil fuels, individuals can lower their carbon footprint and contribute to reducing greenhouse gas emissions, air pollution and the demand for fossil fuels that contribute to the rising sea temperatures and ocean acidification.

REDUCE, REUSE & RECYCLE

Recycling plays a huge role in saving coral reefs by reducing the demand for raw materials and minimizing the environmental impacts associated with resource extraction, manufacturing, and waste disposal. It can conserve natural resources and reduce energy consumption and greenhouse gas emissions associated with the production and disposal of goods. Recycling also reduces the amount of waste entering landfills and marine environments, which can release harmful pollutants and toxins that degrade water quality and harm the coral reefs.









USE REEF-SAFE SUNSCREEN

Using reef-safe sunscreen helps save coral reefs by reducing the harmful impact of chemical ingredients found in traditional sunscreens which have been shown to contribute to coral bleaching and coral reef degradation. Reef-safe sunscreens use alternative ingredients that are less harmful to marine life, minimizing the risk of coral toxicity and bleaching.

PRACTICE SAFE BOATING AND DIVING

Practicing safe boating and diving is crucial for saving coral reefs by minimizing physical damage and reducing the risk of pollution. Safe boating practices can prevent damage to coral reefs caused by anchor chains and boat propellers. Similarly, safe diving practices help minimize direct physical damage to reef ecosystems. By following guidelines for safe boating and diving, individuals can help protect coral reefs from accidental damage and disturbances.









EDUCATE OTHERS

Educating others about the importance of coral reefs and the threats they face is essential for saving these invaluable ecosystems. By raising awareness about the role of the coral reefs in supporting marine biodiversity, providing coastal protection, and sustaining livelihoods, individuals can inspire action and gain a sense of control towards reef conservation.

Empowering local communities with knowledge about coral reef conservation can build capacity for effective management and protection efforts. Through education and awareness-raising initiatives, individuals can play a vital role in mobilizing collective action to safeguard coral reefs for future generations.

PROJECTS

SOCIAL ISSUE PRESENTATION

PRESENTATION

For the final in our first semester, the class was assigned with creating a presentation to give to our peers, professors and any invited guests. Our presentations were supposed to present the research and data that we collected and to explain why people should care about our topic.

final presentation:

The next few pages are my slides from the









WHY ARE THE REEFS DYING?

HIGH SEA TEMPERATURES

14%

WHY SHOULD I CARE? (I MEAN COME ON WE LIVE IN A DESERT)





COASTLINE PROTECTION

SOURCE OF INCOME





HOW CAN I HELP?

REDUCE YOUR CARBON FOOTPRINT

SPREAD AWARENESS



ESS
RESOURCES

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SUMMARY

My goal was to help people to realize the severity of coral bleaching. I started off the presentation with alarming data about the decline of our reefs and what is in store for their future if this pattern continues. Then I go on to explain what coral bleaching is, how it happens and the affect it has on many aspects of our world. Finally, I finished my presentation with different ways people can help and try to save the reefs.

THE CLOCK

CLOCK

The major project for the first semester of our senior year was the Clock Project. For this assignment, the class was assigned to create a clock that visually communicated elements of our social issue that we felt was important. They were meant to be fully functioning clocks, while also incorporating time within the visual itself.





This exercise was meant to let the class practice and teach us different ways to communicate time without numbers or hands on clocks.

This clock exercise did not have to relate or reflect our social issues.





COMPUTER SKETCHES

My initial concepts for my clock tried to reflect the gradual process of coral losing it's color and the kind of effects that it would have if they disapeared.

However, after trying a few variations, I decided the face of my clock should reflect how coral bleaching will make us lose the coral reefs all together. Then my hour hand would reflect the reasoning behind coral bleaching.















THE SET UP

The clock was made of 4 stacked pieces of 12 inch acrylic circles, many layers of traslucent blue spraypaint, 70+ pieces of individually laser cut paper corals and a functioning 6 inch thermometer.







FINAL CLOCK





















CLOCK DESCRIPTION

Coral bleaching is a devastating phenomenon caused by rising ocean temperatures, which stress corals and expel vital algae. This leads to their vivid colors fading, making them vulnerable to death.







FINAL CLOCK PROGRESS SHEETS







CLOCK EXHIBIT

Our clocks were publicly displayed for one day at ASU's Red Square in the Design North building.

Here are some photos from the clock exhibition:





























SENIOR EXHIBITION

OBJECTIVE

The senior exhibition was our final project for our senior year. The goal of this project was to visually communicate our social issue and its importance.

DIGITAL PROTOTYPES

These prototypes experiment with different layouts, colors, textures and ways of displaying information.







FINAL DIGITAL PROTOTYPE

The Colorless Kingdoms The Story of Coral Bleaching

What is Coral Bleaching?





What Do Coral Reefs Provide? X \bigcirc



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EXPERIENCE THE EFFECT (TOUCH CORAL FOR 20-30 SECONDS)

After holding the coral, the warmth of your hand turned the coral white, similar to what happenes with real coral and rising sea temperatures.











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Use public transportation, carpooling or biking



Practice safe boating and diving



Reduce, reuse, & recycle



Educate others

The Colorless Kingdoms The Story of Coral Bleaching

What is Coral Bleaching?



Coral bleaching is a process where corals expel the algae living in their tissues, often due to stress from rising sea temperatures. This expulsion leaves the coral's appearance to turn white, hence "bleaching," and weakens their ability to survive. This leads to widespread mortality and ecosystem degradation.

What Do Coral Reefs Provide?





EXPERIENCE THE EFFECT (TOUCH CORAL FOR 20-30 SECONDS)















Coral bleaching threatens critical functions, disrupting ecosystems worldwide. It extends to food security, economic stability, and climate resilience globally.

Why Does This Matter?

Everyone, regardless of proximity to the ocean, should care about coral bleaching, recognizing its cascading effects on the environment and human well-being.

After holding the coral, the warmth of your hand turned the coral white, similar to what happenes with real coral and rising sea temperatures.







de la <u>A</u> 8/50 Educate others





FINAL BOARD MOCKUP

For my final board, I worked hard to focus my information on the visuals and interactivity as that would be the driving factor to get people to view and remember my board.

My board features vinyl text, opening panels, giant laser cut cardboard corals for a bottom texture and 3D printed coral painted with thermochromic paint.

Here is my final mockup for my exhibit board:







SENIOR SOCIAL ISSUE EXHIBIT

Our social issue projects were publicly displayed in our classroom for a four days at the Novus Innovation Corridor building.

Here are some photos from the senior exhibition:













Why Does This Matter?

Coral bleaching extends way beyond just coastal areas. Coral reefs are sources of food, shelter, protection, jobs, income, and medicine for living beings all over the world.

Coral bleaching threatens critical functions, disrupting ecosystems worldwide. It extends to food security, economic stability, and climate resilience globally.

Everyone, regardless of proximity to the ocean, should care about coral bleaching, recognizing its cascading effects on the environment and human well-being.















































APPENDIX

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SENIOR SHOW POSTER DESIGN

OBJECTIVE

For the senior exhibition, each student was tasked with creating a poster that would establish the visual identity and brand of our show. Once all of the posters were created, the class voted on their favorite ones.

Here are the variations of my poster:



TURN THE PAGE REWRITE OUR STORY

May X, 2024 6:00-9:00 p.m. 777 S Noyus Pl Tempe, AZ 85281







FINAL POSTER

My exhibit poster was "Beneath the Surface." The idea behind this poster was that it resembled 3D popups. All of the important information would be hidden beneath the surface much like how social issues are often hidden.



Explore the deeper layers of today's most pressing social topics and d stories that lie beneath the surface. Join us in uncovering the complex world and don't miss this chance to connect, learn and make a differer



SENIOR SHOW POSTER ANIMATION

POSTER ANIMATION

This year, I was apart of the media and marketing team for our senior events. My role within the group was being the video animator to promote the senior exhibition event.

Here are some screenshots from the animation:

FIRST POSTER ANIMATION

The initial poster animation was made to announce our senior show exhibit. It follows the branding of the chosen poster to represent our show while displaying some helpful information.

QR CODE:




















coming soon

asudesignshow.com

BTS PHOTOS















































Just bros keeping their socks on MID Knut.mega + 2 others









































COLOPHON

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COLOPHON

Written and designed by Josie Donda Assigned by Al Sanft, Eric Montgomery and Garren Lofgreen from Arizona State University

Printed at Mixam Stock White paper, 80lb Satin Paperstock, 8.5"x11", Hardcover, Gloss Lamination Cover, Adhesive Casebound

MacBook Pro Apple M2 Pro 16-inch, 2023 iPhone 13 Pro Max, Version 10S 17.4.1 Adobe Indesign 2024, Version 19.3 Adobe Illustrator 2024, version 28.4 Adobe Photoshop 2024, Version 25.6

Montserrat Regular- 9/30/10, 10/30/10 Montserrat Medium- 10/30/20, 14/16/20 Montserrat Semibold-18/22/10 Montserrat Bold- 18/22/20, 24/28/20

Chathams Blue- #126382, RGB (18,99,130), 100% Wedgewood Blue- #4a87a1, RGB (74,135,161), 100% Black- #000000, RGB (0,0,0), 85% White- #FFFFF, RGB (255,255,255), 100%