

Turtles vs. Pollution

Supercomputing Challenge

Final Report

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## Executive Summary

Our team this year has chosen to do a project that is related to this team's project from last year. It is on Ocean Ecology. This year we will be using the species called the Leatherback Sea Turtles. It will have many components that will be included to do with these turtles. With their life span, what they eat, their migration pattern and how pollution can affect them. We have two models that will show two different parts. Our first model will have multiple layers in the ocean that the Leatherback turtles are in. It is a very small segment that will be shown. The second model will have the migration paths and the trash islands. The migration pattern of these turtles is from Indonesia and Papua New Guinea to the Coast of Western North America and back.

## Problem Statement

Trash islands are the biggest problem that the leatherback turtles have to deal with when they migrate. Their migration pattern is through Indonesia and Papua New Guinea to the Coast of Western North America and back. We are doing this because we care about animals, especially the Leatherback turtles. They are endangered because of human hunting them. Pollution is one of the biggest problems we have in this world today and it is now getting hard to prevent any loss of these creatures. Plastics like plastic bags are what is causing the main problem for these turtles. Plastic bags look like jelly fish, which is the food source for these giants. The pollution is constantly building up now is swirling in circles, they are being called the trash islands. These trash islands are constantly building and getting worse. The Leatherback Turtles swims through these trash islands and get caught in the trash and eat it, mistaking the plastic bags for the jellyfish.

## Method

For our projects we have made two models. The first model will show the migration patterns of the Leatherback Sea Turtles. It shows the turtles leaving from the Indonesia and Papua New Guinea islands and then traveling across the Pacific Ocean to the Coast of Western North America. We have made the map of the Pacific Ocean by importing a picture we have found on google and altering the colors to make it look more like the ocean.. For the map to appear we have a set up a button. While the turtles travel, we have added three trash islands that they have a chance of running into when they migrate. There is a button that will add three trash islands to our world, that we have located to be close to where they are in real life. For the trash islands, we have coded them to where the middle of the islands are darker and then get lighter as it grows out. The darker the color the more risk the turtles have of dying when they swim through the islands.

To keep track of how many turtles are dying, we have made monitors that will tell us how many turtles there were and how many died once they swim through a trash island. If too many sea turtles die we have a repopulation button that will add more turtles to our world. We have made buttons that will make the turtles migrate. One button says travel east, this will allow the turtles to travel to the coast of West America. The second button labeled west will allow the turtles to travel back to the Indonesia and Papua New Guinea islands where they first started.

Our second model will show the different layers of the ocean and how much trash the turtles will eat before they die. We will have a set up button, this will make seven different layers of the ocean, showing light blue at the top and a darker blue at the bottom. The next button will be for the turtle. This button will add our turtles into the ocean we have created. Next we have a button that adds in the leatherback's food source, the lion's mane jellyfish. Next we have a button

that will add the pollution to our ocean. The main trash we are focusing on is the plastic that is thrown into the ocean, for example the plastic bags. We will have monitors for the turtles, jellyfish, and the plastic. This will help us to know how much of everything is in the ocean, and will also help show the numbers decreasing when something eats or dies, or when something reproduces. Next we will have a eat button, it will make the turtles focus to the nearest trash or jellyfish. Then we will have a button that says swim. This will allow the turtles, jellyfish, and plastic to start moving.

In order to show that the turtles are dieing we have set up a system to show what will happen if the sea turtle eats too much trash. If a turtle eats trash instead of a jellyfish, it can die if it eats too much of the trash (plastic). We also have an energy counter which will tell us if the turtles and jellyfish have enough food energy to reproduce. There is a slider that we can use to put the number of each Leatherback sea turtle, Lion's main jellyfish, and plastic we want added to our world. We also have slider that will give our jellyfish a certain repopulation value that will range from one to onehundred. There are also sliders that have the metabolism of the sea turtles, numbers ranging from one to onehundred.

### Verification and Validation

We think that this model represents the real problem. We have a map of the migration and the approximate size of the trash islands. The sea turtles migrate through, under, or around the islands like the actual problem. Some of the things we have are slightly non-realistic but it is just a model. However, once they finish their migration pattern, they go back to the beach where they first started their journey. The Leatherback Turtles as well go through the trash islands and eat their main food source. These models aren't spot on but they are quite close and it is getting to what we are trying to do.

## Conclusions and Results

We were hoping to make it where we can figure out which way was best for the turtles survival without messing with any of the turtles migration or any of their lifestyle. This will specifically be shown in the first program. The turtles, like said before, will be migrating through the Pacific Ocean in the trash islands. We want them to lose some of their health when they go through the trash islands as they migrate. In the second model, it will have the levels of the ocean in which the turtles go through. As they swim around, we want them to eat the jelly fish and that keep their health. With the types of pollution being added, when they run into it or get hit, their health will go down each time. At some point, they will die off or still keep going.

How we programmed it, we still have some ways to go. In the first model that was talked about, when going through the trash islands, they are dying off very quickly. They barely go the one way and about all of them die. The way back, they're all dead. It's not what we are wanting but if we are lucky, we get a few to come back and live. In the second model that was mentioned, there is some more work needed as well. In the levels, all the pollution is either staying at the top or almost to bottom level. Again, all of the turtles are dying off quicker than we are really wanting them to. This program is also based off of last year's program for this team. It really needs some work but its right there to where we are needing it to be.

## Citations and Acknowledgments

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