

# **Deliverable F - Prototype I and Customer Feedback**

Teena Zheng: 300350624

Mateo Barbosa: 300430368

Joud Dergham:300420166

Oshomoji Oluwafemi:300448029

Ryanne Khan: 300417383

**Group 01**

**March 2, 2025**

## **Abstract**

*This report outlines the development of an interactions and show the users on the long-term effects of deforestation and its impact on climate change. After modifications based on client feedback, the project now uses research and establishes scientifically accurate timelines and locations to depict the gradual changes in the environment. This report details the prototype development process, analysis of critical components, testing methodology, and future improvements.*

## Table of Contents

|     |                                       |    |
|-----|---------------------------------------|----|
| 1.0 | Analysis Feedback .....               | 4  |
| 1.1 | Client Feedback.....                  | 4  |
| 1.2 | TA Feedback .....                     | 5  |
| 2.0 | Develop Prototype.....                | 5  |
| 2.1 | What is Our Prototype 1.....          | 6  |
| 2.2 | How to Develop .....                  | 7  |
| 2.3 | When of Prototyping Plan.....         | 8  |
| 3.0 | Analysis of System .....              | 8  |
| 3.1 | Why We Are Doing This .....           | 8  |
| 3.2 | Functional Components.....            | 9  |
| 3.3 | Relevant News and Justification ..... | 9  |
| 4.0 | Prototyping Test .....                | 9  |
| 4.1 | Material Feasibility .....            | 9  |
| 4.2 | Scene Construction .....              | 10 |
| 5.0 | Prototype 2 Test Plan .....           | 10 |
| 6.0 | Project Schedule Plan .....           | 11 |
| 7.0 | Research.....                         | 12 |
| 8.0 | Sources .....                         | 13 |
| 9.0 | Task Separation Table .....           | 16 |

## 1.0 Analysis Feedback

This section collects and analyzes customer feedback, makes improvements to the existing storyline and explains the reasons. The initial concept focused mainly on game mechanics but lacked a scientifically accurate description of the progress of climate change.

### 1.1 Client Feedback

Forest Fire

GNG 1103 Group 01

Feb. 8, 2025



Walk in the forest and get back home



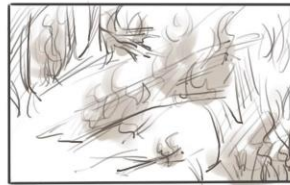
Can interact with animals and objects.



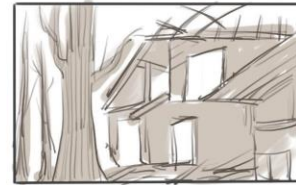
Arriving home to find food.



After a while, the radio broadcast the news that the forest is on fire



Get out of the house and run away from the forest fire



Come back to check the house and the forest after the fire.

The client pointed out that our original story was more focused on gameplay than educating users about climate change, and that the interactions were not tied to environmental change. In response, we revised the storyline and modified the interactions to tie them to environmental change to better illustrate the long-term impacts of deforestation on forests. The updated version emphasizes how cutting down trees releases greenhouse gases, emphasizing the environmental impacts over time.

## 1.2 TA Feedback

Forest Fire

GNG 1103 Group 01

Feb. 16, 2025



User is asked to cut trees because he's a lumberjack.



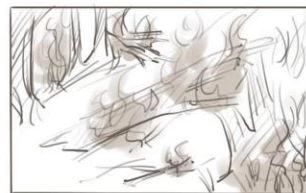
Cut scene display the effects of deforestation, dry out due to global warming.



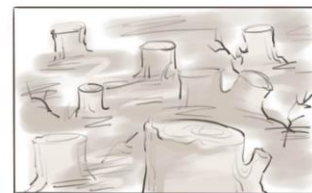
Go to the wooden house to drop off the wood they cut down. Temperature increase.



Radio announcing forest fire.



Escape the forest from the fire.



A lot of trees were cut down, and after the fire, only charred tree stumps remained.

During this feedback collection, we changed some of our materials due to the limit budget. Additionally, we determined that this project would use an QR code survey out of the game. In the first scene, users should be given information to understand the real reason for cutting down trees. In the middle of the project, the radio needs to broadcast real data and notifications to reflect the user's impact on the forest fire. At the final scene, we are going to show the impact of the fire on the forest.

## 2.0 Develop Prototype

Developing a prototype is a crucial step in transforming conceptual ideas into a functional and testable model. The foundation of the prototype begins with constructing the forest environment, which serves as the central setting for the project. By developing the initial environment first, the prototype can effectively support future gameplay mechanics and illustrate the gradual impact of deforestation over time. This section outlines what is our prototype 1, how does this work and when.

## 2.1 What is Our Prototype 1

In our first prototype, we refined the storyline, researched real-life data for the wildfire and built a simple forest scene.

**Section 1:** We will use short voice lines and task prompts to let users know their role: Lumberjack. Users are tasked with completing daily tasks and chopping down trees for humans to provide fuel, crafting, and construction.

- The user starts the experience as a lumberjack in a dense, thriving forest.
- A prompt instructs them to cut down trees using an interactive axe.
- As the user removes trees:
  - A CO<sub>2</sub> meter rises in real time.
  - The environment gradually changes (e.g., sky darkens slightly, fewer birds chirping).
- This phase subtly introduces the idea that deforestation impacts the carbon cycle.

**Section 2:** An animation shows that large-scale deforestation will release carbon dioxide and other greenhouse gases, reduce the release of water from leaves (providing a cooling effect). The tree canopy provides shade, which helps cool the surface. Without the tree canopy, the land will absorb more direct sunlight, causing the temperature to rise.

- A cutscene plays, showing:
  - Greenhouse gases being released into the atmosphere.
  - The forest drying out due to climate change.
  - Visual cues such as rising temperatures, disappearing wildlife, and worsening air quality.
- The scene emphasizes how trees act as carbon sinks, and their removal accelerates global warming.

**Section 3:** The fast-forwarded animation shows the users and NPCs cutting down the forest year after year, with fewer and fewer trees, and a text cut scene of "Ten Years Later" is inserted.

- The user is asked to walk to a wooden house to drop off the lumber they collected.
- As they walk:
  - A temperature gauge increases due to their deforestation actions.
  - The environment continues to degrade (more and more trees being cut down).
- This reinforces the long-term consequences of excessive logging.

**Section 4:** The radio broadcast a voice line saying there will be heavy rain and lightning tonight. Users will see lightning strike the tree, ignite quickly and spread due to the high temperature.

- The user turns on a radio inside the house, which plays a news alert about a forest fire.
- After lightning, smoke fills the air, and fire spreads through the forest.
- The escape sequence highlights the connection between climate change, rising temperatures, and an increase in wildfires.

**Section 5:** The fire spreads and is uncontrollable, the user will flee the forest.

- The user must escape to a safe zone before the fire engulfs them.

**Section 6:** Ends with a display of massive deforestation and the devastation left by a fire.

- Visual impact, show users the severity of natural disasters caused by climate change.

## **2.2 How to Develop**

## 1. Software & Tools

- Unity: Primary game engine for building the VR environment.
- Unity Asset Store: Pre-made 3D models (trees, terrain, buildings, fire effects, etc.).
- Meta Quest 2: Our VR headset for testing and deployment.
- C# Scripting: For interactivity, animations, and environmental changes.

### 2.3 When of Prototyping Plan

- Week 1: Set up the Unity scene (forest, house, assets).
- Week 2: Implement tree-cutting mechanics and CO<sub>2</sub> tracking.
- Week 3: Develop the cutscene and introduce temperature changes and add the fire escape sequence and conduct user testing

By utilizing existing Unity assets, we can focus on scripting interactions and refining environmental feedback mechanisms rather than creating 3D models from scratch. This rapid prototyping approach allows us to efficiently iterate based on client feedback and testing results.

## 3.0 Analysis of System

This section provides a detailed analysis of the system's core functional components, including real-time tracking of user actions, dynamic environmental transitions, and educational insights. To ensure accuracy and relevance, real-world data, such as CO<sub>2</sub> emissions from California wildfires, has been incorporated to replicate historical climate events, reinforcing the educational impact of the experience.

### 3.1 Why We Are Doing This

The VR initiative strives to produce a fully interactive educational environment which teaches climate change effects of deforestation in the long term. The act of letting users participate in deforestation activities strengthens both their emotional response and their capacity to remember information. The objective focuses on ensuring people become aware while teaching them to choose sustainable alternatives.



### **3.2 Functional Components**

- The system tracks user actions through tree-cutting features while monitoring CO<sub>2</sub> production effects.
- The game features non-player characters which provide relevant information alongside better perspective in the game world.
- The game environment automatically transforms through its environmental transitions when players advance with deforestation practice.
- The Escape Sequence function delivers both increased authenticity and concern by displaying wildfires together with thermal temperature dangers in the game world.

### **3.3 Relevant News and Justification**

Research confirms that California wildfires produce considerable amounts of CO<sub>2</sub> which impact global emissions. Firestorms during 2021 emitted 1.76 billion tons of CO<sub>2</sub> because of persistent droughts that occurred alongside elevated temperatures. Through our simulation we replicate actual historical occurrences to deliver a meaningful learning experience.

## **4.0 Prototyping Test**

Considering computer performance and project smoothness, we choose to use Unity - Universal 3D for this project.

### **4.1 Material Feasibility**

Change the material SMM - Stylized Grass and replace it with Low Poly Wind, the rest of the materials currently used are functioning properly. Because SMM - Stylized Grass can only be run in High-Definition 3D.

Low Poly Wind:

<https://assetstore.unity.com/packages/vfx/shaders/low-poly-wind-182586>

## 4.2 Scene Construction

Importing Unity Assets is different from what we thought before. We can't import the entire environment template and still need to arrange the prefabs. During the development process, some parts were pink, which means Unity did not render the texture or material. We will consult tutorials and ask classmates or TA to solve this problem later.



## 5.0 Prototype 2 Test Plan

- Implement tree-cutting mechanics and CO<sub>2</sub> tracking.
- Test movement of NPCs to ensure natural pathfinding.
- Optimize interactions for tree-cutting to ensure accurate CO<sub>2</sub> emission updates.
- Fine-tune environmental changes based on tree removal (e.g., adjusting lighting and atmospheric effects).
- Verify collision detection for both player and NPC interactions.
- Adjust physics for felled trees to maintain realism.

## 6.0 Project Schedule Plan

The improved Project Schedule Plan ensures a structured yet adaptable approach to task management. While our schedule remains flexible, we are committed to completing tasks in a timely manner and avoiding leave it to last minute.

*Table 1: Plan for Tasks in Prototype 1 that need to be completed*

| <b>Tasks</b>                   | <b>Estimated duration<br/>(due date)</b> | <b>Name of the<br/>responsible</b> | <b>Notes</b>   |
|--------------------------------|--|------------------------------------|--|
| <b>Scene Development</b>       | 2 weeks<br>(Mar.17)                      | T.Z.                               | Visual aspects, for example backgrounds and scenes.                                  |
| <b>Cut Scene Animations</b>    | 2 weeks<br>(Mar.17)                      | O.O.                               | Greenhouse gasses being released into the atmosphere.                                |
| <b>Coding for Interactions</b> | 2 weeks<br>(Mar.17)                      | J.D.                               | Cutting trees and trees falls.   |
| <b>Coding for UI</b>           | 2 weeks<br>(Mar.17)                      | R.K.                               | User interface, include the gauge system for temperature. And the cutting animation. |
| <b>Quality Contral</b>         | Depend on the bugs<br>(Mar.23)           | M.B.                               | Testing. Make sure the prototype works properly and fix any bugs.                    |
| <b>Voice line</b>              | 3 days<br>(Mar.20)                       | M.B.                               | Recorded voice line for news and character.  |

|                          |                    |      |  |
|--------------------------|--------------------|------|--|
| <b>Extra Info. Sheet</b> | 3 days<br>(Mar.20) | R.K. | A QR code include more information of the effect of global warming and wildfire. |
|--------------------------|--------------------|------|--|

## 7.0 Research

**Location:** Northern California

**Forest fire event to be used for VR:** August Complex Fire in 2020

**Note:** The VR will initially start 10 years prior to the forest fire event

**Facts about the August complex fire:**

### 1. Deforestation & Habitat Loss

- Over 1 million acres of forests were burned, destroying ecosystems.
- Wildlife lost their homes and food sources.
- Large amounts of old forests were destroyed, which take centuries to recover

### 2. Air Pollution & Climate Effects

- The fire released millions of tons of carbon dioxide (CO<sub>2</sub>), contributing to climate change.
- Thick smoke caused hazardous air quality across California, Oregon, and even other states
- Air quality was very bad; this can cause for long term effects on the lung and heart

### 3. Water Contamination & Soil Damage

- Burned vegetation left soil unstable which led to leading to mudslides
- Ash and debris contaminated rivers affecting water quality for humans and wildlife

-The loss of tree roots reduced the land's ability to absorb water, increasing flood risks

#### 4. Biodiversity Impact

- Some plant and animal species may never recover in the hardest-hit areas.
- Invasive species often take over after wildfires, further disrupting ecosystems

#### 8.0 Sources

-<https://www.ruralhealthinfo.org/toolkits/emergency-preparedness/case-studies/natural-disasters/round-valley-indian-reservation?>

-

[https://www.fs.usda.gov/detail/mendocino/home/?cid=FSEPRD860382&utm\\_source=chatgpt.com](https://www.fs.usda.gov/detail/mendocino/home/?cid=FSEPRD860382&utm_source=chatgpt.com)

- <https://storymaps.arcgis.com/stories/1a0a88e7872e48919831793fd496b814>)  
(important link)

**Reason:** California experiences the largest amount of forest fires in the world  
(<https://www.iii.org/fact-statistic/facts-statistics-wildfires>)

#### Facts:

1. Carbon dioxide emissions from wildfires, which have been gradually increasing since 2000, spiked drastically to a record high in 2021, according to an international team of researchers led by Earth system scientists at the University of California, Irvine.

Nearly half a gigaton of carbon (or 1.76 billion tons of CO<sub>2</sub>) was released from burning boreal forests in North America and Eurasia in 2021, 150 percent higher than annual mean CO<sub>2</sub> emissions between 2000 and 2020, the scientists reported in a paper in *Science*.

“According to our measurements, boreal fires in 2021 shattered previous records,” says senior co-author Steven Davis, UCI professor of Earth system science. “These fires are two decades of rapid warming and extreme drought in

Northern Canada and Siberia coming to roost, and unfortunately even this new record may not stand for long.

Source: <https://specialreports.news.uci.edu/climate-change/the-problem/wildfires-emitted-a-record-breaking-amount-of-carbon-dioxide.php>

2. as CO<sub>2</sub> emission accumulate in the atmosphere and California experiences more warming, extreme heat events, droughts, and invasive species, the risk and intensity of fires also increases, which in turn push the terrestrial carbon cycle further out of balance.

Source: <https://ww2.arb.ca.gov/resources/documents/frequently-asked-questions-wildfire-emissions#:~:text=They%20are%20also%20contributing%20to,cycle%20further%20out%20of%20balance.>

3. The dryness of Los Angeles' vegetation before the fires was due to both hotter temperatures and a lack of rain. An analysis by UCLA found that about a quarter of that moisture deficit was due to the extreme heat, which was influenced by climate change

Source: <https://www.npr.org/2025/01/29/nx-s1-5273676/la-fires-climate-change-rainfall-extreme-weather#:~:text=A%20hotter%20atmosphere%20is%20a,can%20take%20days%20or%20months.>

4. How the weather has increased the amount of forest fires in California from 2003-2020

<https://journals.ametsoc.org/view/journals/wefo/40/2/WAF-D-24-0025.1.xml>

“There’s a vicious cycle connecting forest fires and climate change: warmer temperatures make fires more likely and burning forests release greenhouse gas pollution that makes global warming worse. [15]

This means that overall efforts to reduce greenhouse gas emissions and slow global warming will also help prevent forest fires. And on the other hand, working to reduce the number and severity of forest fires will also help slow climate change.”

<https://climateatlas.ca/forest-fires-and-climate-change>

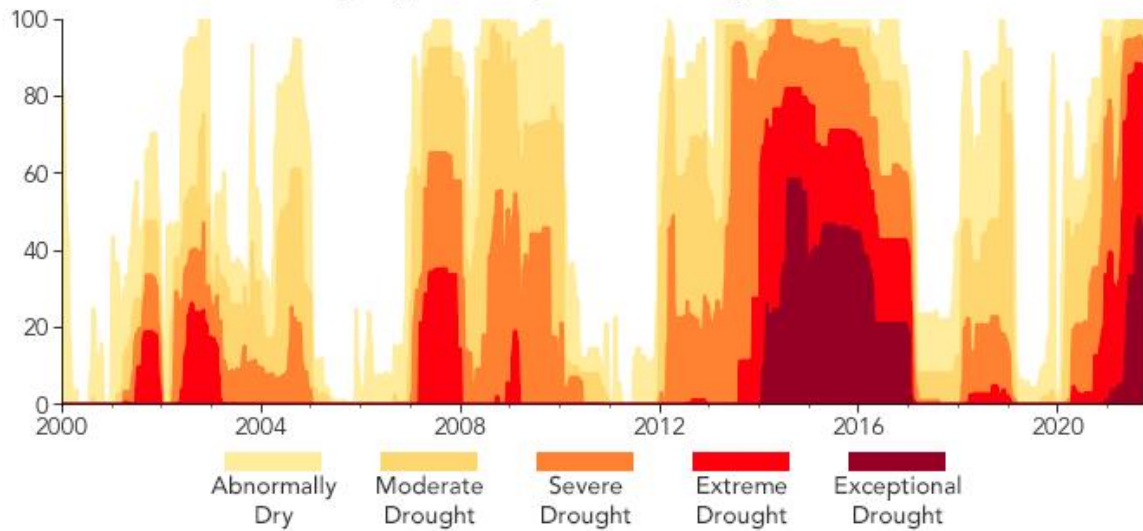
5. Data on worst forest fire in California: in the year...

<https://www.cbsnews.com/news/los-angeles-worst-california-wildfires/#:~:text=Camp%20Fire,town%20burned%20in%20the%20fire.>

<https://ww2.arb.ca.gov/resources/documents/frequently-asked-questions-wildfire-emissions#:~:text=They%20are%20also%20contributing%20to,turn%20push%20the%20terrestrial%20carbon>

*Figure 1: Impact of weather on forest fires*

**More and More of California in Drought**  
Percent of California in Drought by U.S. Drought Monitor Category



## 9.0 Taske Separation Table

| Sections              | Author(s)  | Editing    |
|-----------------------|------------|------------|
| Abstract              | T.Z.       | -          |
| Analysis Feedback     | T.Z., M.B. | -          |
| Develop Prototype     | T.Z., J.D. | -          |
| Analysis of System    | J.D.       | T.Z., O.O. |
| Prototyping Test      | T.Z.       | -          |
| Prototype 2 Test Plan | O.O.       | -          |
| Project Schedule Plan | T.Z.       | -          |
| Research              | R.K.       | -          |



- T.Z. (Teena Zheng)
- J.D. (Joud Dergham)
- M.B. (Mateo Barbosa)
- R.K. (Ryanne Khan)
- O.O. (Oluwafemi Oshomoji)