

## Memorandum

**To:** Dan Gjerde, Chair of Mendocino County Board  
**CC:** Ted Williams, Vice-chair of Mendocino County Board  
John Hascheck, Supervisor of 3rd District  
**From:** Birdseye Consolidated  
**Date:** April 20, 2021  
**Subject:** Using Drones to Restore Vegetation After Wildfires

The objective of this memo is to introduce our project and our supervising team. Our project aims to utilize drones and A.I machine learning technology to restore the vegetation lost from wildfires. The drones will fulfil the essential role of replanting seeds in the most efficient way.

The largest wildfire recorded in California history took place in Mendocino County. This fire, known as, “The Ranch Fire” or “The Mendocino Fire,” burned over 410,000 acres of land (Helsel, 2019). This is not the first account of a wildfire in Mendocino County, despite that, it is a huge representation on how much vegetation is lost after these wildfires spread. In order to restore the lost vegetation, it would take a significant amount of individuals and time to replant seeds manually. However, our team wants to develop drones that are capable of hovering over the acres of land that have fallen victim to the wildfires and release the seeds to start the replantation process.

Birdseye Consolidated is an organization founded by a diligent team of three mechanical engineers and a computer engineer. We intend to utilize the latest technology sourced from highly recognized and reliable third - party companies to provide efficient solutions at a low cost. Drones controlled by A.I machine learning technology is just one way that innovated the future of disaster recovery. Using drones, we are capable of covering up to 50 acres a day for replanting, this is six times faster than a tree planter with a shovel.

In order to move forward with our project, we need the proper funding to further develop and program the drones. The drones require various forms of testing, in regards to software and durability. We’re outsourcing the jobs to maintain low costs. We’ll need qualified cross-functional teams to assist in the production and operation of the drones in itself.

Our company hopes that you take into consideration the information presented, to read over our ideas on using drones to restore vegetation after wildfires, and possibly assist us with the funding aspect. To discuss matters further, please feel free to contact us at [birdseyeconsol@gmail.com](mailto:birdseyeconsol@gmail.com).

Thank you for your time and consideration,

Birdseye Consolidated

### **Introduction of Staff and Company**

Birdseye Consolidated is a technology company that was created for the sole purpose of developing cost effective and efficient solutions to issues that occur during natural disasters. Our team consists of three mechanical engineers and a computer scientist. Emily contributes as a mechanical engineer, assisting in the development of engineering projects. She is an engineering student and shows strong skills with CAD software. Hyemin contributes as a computer scientist, she displays care and consideration in the development and testing of software. She is an engineering student who shows deep understanding in her field and has experience. Zameer contributes as a mechanical engineer who is determined to optimize the benefits of our company's solutions. He is thorough in investigating the many aspects of production and innovation. Michael contributes as a mechanical engineer who shows good judgment in selecting the best course of action for product development.

### **Boilerplate:**

At Birdseye Consolidated we collaborate with highly recognized organizations to elevate your business, literally. Customized solutions at Birdseye utilize drones and other technology from third - party manufacturers to improve the efficiency of your business at a low cost. Whether it be recovering damaged forests from wildfires or assisting farmers with managing crops, Birdseye can ensure that each goal will be achieved safely and with the greatest precision.

### **Mission Statement:**

Our mission is to develop a drone with the capability of distributing seeds across various acres of land in order to restore vegetation after wildfires. Through the development of these drones, it will be a more safe and efficient way of replanting seeds in areas where wildfires have occurred. We will be utilizing cross-functional teams to incorporate ideas in regards to the technology and programming that will lead to the creation of the drones.

## **Code of Conduct:**

### **Work Ethics**

#### *Attendance:*

Company projects follow strict schedules. Absent employees must provide valid reason(s) for absence to the proper superior.

#### *Dress Code:*

Team members must remain attired in business casual clothing for their duration on the project site.

#### *Protection of company assets:*

Company assets and facilities must be used only to conduct business or for any purpose approved by the Company. Assets include all physical and intellectual property, various fixtures, equipment, and facilities, and the use of company assets for the benefit of individuals or third parties, theft or damage is prohibited.

### **Protection of information and intellectual property**

#### *Confidentiality:*

All company data must be managed and protected in accordance with security regulations. This responsibility relies upon cooperation of executives and employees. No filming, audio recording, or photography on the project site.

#### *Intellectual property rights:*

We do not use the intellectual property rights of third parties without permission. All employees must use the software and works of a third party while performing their duties in accordance with the scope permitted by law and the applicable license conditions.

### **Professionalism**

#### *Harrassment/ Discrimination:*

Verbal or physical assault are unacceptable at all times. Usage of derogatory remarks or actions in any form are prohibited. Employees must observe the basic etiquette necessary for their work life, and should not use their superior position to give unreasonable work orders or pressure.

#### *Workplace Behavior:*

Team members must always maintain professionalism on the project site. No alcohol consumption, smoking, or drug use of any kind.

### **Safety**

#### *Product safety:*

We comply with all national laws and company standards related to product safety and quality, fulfill our responsibilities for our products, and supply safe products with the highest quality and reliability without compromising safety and cost to reduce costs.

*Industrial safety:*

We do our best to maintain and manage safe workplaces and ensure the right of employees to work in good health. Hazardous substances and disaster risks are prevented and managed in advance, and appropriate risk prevention measures are designed and applied through risk assessment before all work is performed.

**Disciplinary Actions:**

If any employee doesn't follow the code of conduct, they will face specific disciplinary actions.

Violation of work ethics, to a certain extent, will result in verbal warnings. If this action continues, it will result in a 2 week suspension (without pay). If the employee continues, immediate termination will follow.

Violation of protection of information and intellectual property will result in immediate termination. Legal action will be taken if the employee leaks confidential information, steals company products, or has participated in any form of destruction of property.

*Technical Project Proposal*

**Drone Usage to Restore Vegetation After Wildfires**

*To be presented on April 28, 2021*

***Birdseye Consolidated***

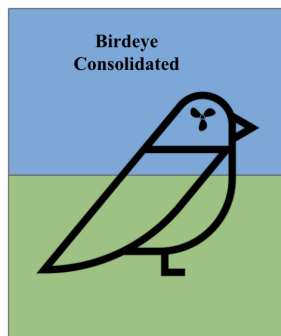
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This proposal is to be submitted to the Chair of Mendocino County, Board of Supervisors, Dan Gjerde, as well as the Vice Chair, Ted Williams, and the 3rd District Supervisor, John Haschak.

## Table of Contents

Introduction.....	7-8
<i>Problem Statement</i> .....	7
<i>Background</i> .....	7
<i>Needs Statement</i> .....	8
<i>Objective</i> .....	8
Technical Approach.....	8-13
<i>Requirements</i> .....	9
<i>Architecture Design</i> .....	9-10
<i>Software Design</i> .....	10-12
<i>Implementation Design</i> .....	12-13
<i>Quality Assurance Plan</i> .....	13
Expected Project Results.....	13-14
<i>Measures of Success</i> .....	13-14
<i>Budget</i> .....	14
Qualifications.....	14-15
Schedule.....	15-16
References.....	17-19

## **Introduction**

The Mendocino Ranch wildfire in Mendocino County, California is one of the many destructive wildfires that occurred across the state. By increasing the efficiency of the vegetation planting process, the environment and its inhabitants can begin to recover sooner. A.I controlled drones are the solution to replanting the forests of California. With the proper funding, seed planting A.I drones would prove to be the most efficient solution to revive forests after a wildfire.

### ***Problem Statement***

Beginning on July 27, 2018, the Mendocino Ranch wildfire in Mendocino County, California burned for 160 days until it could be fully contained. Over this period of time over 410 thousand acres of land were burned. California state spent over \$114 million to suppress the fire, straining their budget. The destruction caused by wildfires heavily impacts those who live in and around the location of the disaster. People and animals experience suffering through different means such as the environment, economy, or their welfare. Wildfires can take away more than just trees. The homes of animals and people are destroyed, along with any food the forest provides. Maintenance employees lose their jobs, as there is no longer a forest to protect. Additionally, some people rely on the natural filtration properties of forests for clean drinking water (Arboday, 2021). More present, are the concerns of climate change. Wildfires pollute the air, which lowers the air quality and contributes to climate change.

### ***Background***

To recover forests burned down by wildfires, many solutions have been suggested. In Chile, to restore 1.4 million acres of forest, dogs were used to sow seeds in the fired mountains. A pouch containing seeds is attached to the back of the dog, and the seeds are spread naturally while walking the dog. Border collies with small pores of seed bags are known to have sown more than 20 pounds of seeds while traveling 18 miles a day for three months in the damaged forest area(Bem,2020). This is much more cost-effective and time-efficient than planting seedlings directly on site by manpower. However, there is a disadvantage in that it is not possible to control the movement of dogs, the subject of replanting, as desired. These drawbacks may result in overlapping or omission of the area where the seed is planted. The use of drones has been proposed as a way to solve this uncertainty. By using drones to replant seeds in a burned area, they are capable of covering 50 acres a day and can each carry approximately 57 pounds of seeds(CBS Sacramento, 2020). It also has a benefit that drones can be fully controlled by humans to reduce uncertainty.

### ***Needs Statement***

When a wildfire occurs, uncontrollable fires spread to various types of land, including forests and grasslands. The aftermath includes loss of large quantities of vegetation, which affects the inhabitants of that area, leaving them without a home, and increasing the release of carbon dioxide. In order to reduce these outcomes, the process of reforestation must occur, however whether individuals decide to help nature replant what was once lost, or whether they want to utilize border collies to assist in spreading seeds all throughout the area, these methods will be more time consuming and require more manpower and dedication. Areas that have fallen victim to wildfires need a more effective and time efficient plan to continue the process of reforestation.

### ***Objective***

A cross-functional team of engineers will assist in developing AI-based drones for the purpose of reforestation. These drones will have the capability of covering an immense amount of land in a shorter amount of time compared to previous methods that have been used.

The objective of this proposal is to request funding from the Board of Mendocino County in order to acquire these AI- based drones, as well as, additional hardware and software, and utilize them to distribute seeds across areas that have been affected by wildfires. In addition, request access to the test site in which these drones will be implemented, Mendocino County has acres of land that have been impacted by wildfires and these drones can assist in restoring the vegetation that was lost.

### **Technical Approach**

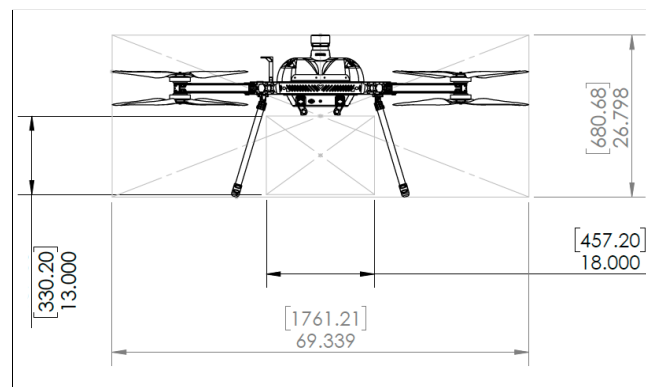
The purpose of the following plan is to describe a drone designed for the specific task of planting seeds in areas affected by wildfires. To ensure that the drone is prepared to endure its environment, three important aspects must be implemented and tested: it's the software, a drone capable of heavy payload, and a large seed dispenser. This plan is going to occur over the course of 42 months. The first three months will be utilized to develop the drone, its software, and the seed dispenser, in addition to that, the land surveyor will assist in creating a detailed map to implement within the drone. The following three months will be used for drone training and testing. Once the drone is complete and has been tested to ensure it's functionality, the restoration process will commence for the next 6 months, and then the monitoring process for the following 6 months, and the cycle continues for the next 24 months. Our team includes three mechanical engineers and one computer scientist. The mechanical engineers will work on both the design of the drone and design of the seed dispenser, while the computer scientist develops the software.



### ***Requirements***

The drone is designed to be a high quality and efficient aerial seeder. The capacity of the drone covers 81 acres per day. We will use 10 drones which will be able to replant the 410,000 acres of burned Mendocino County land in about 500 days, assuming that there will be no additional wildfires within that time. At this planting rate, the drones performance will accomplish twice as much planting compared to competing drones and manual labor. Certain individuals will be hired to provide a proper inspection of the site, in other words, the land surveyor and the environmental engineer will assist in accessing information about the land where the drone will be operating. The land surveyor will provide a detailed map on the area, while the environmental engineer acquires data on the condition of the area. In addition, the environmental engineer will also gather intel on the proper seed combination to include inside the pods, which will be required from the individuals in charge of said region. Once the construction of the drone is complete, a drone operator will be hired to supervise the drones in action.

### ***Architecture design***



*Figure 1. Display of Carrier Hx8 Drone with Dimensions (Harris Aerial, 2020)*

The Carrier Hx8 drone, as presented in Figure 1, was originally developed for industrial, scientific, and military use. The purpose of this drone is to carry heavy loads that can't be offered by any typical drone. The features this drone contains, qualifies it as the perfect template for the seed dispensing drone that we wish to develop. This drone is charged using 30,000 mAh lithium polymer batteries, 4 of these batteries per drone provides the drone with reliable and efficient power. These batteries are placed at the center of the drone, under a canopy, which allows for easy access when the batteries need to be replaced, the canopy also prevents the batteries from coming in contact with dust or water. This design also includes a Lightware SF40/C (100 m.) LiDAR scanner to prevent

the drone from colliding with obstacles. The LiDAR uses lasers to determine the drones distance from objects in all directions. The scanner also targets lasers at an object and measures the time it takes to return to the receiver (Harris Aerial, 2020). In this case, the LiDAR on this drone will be programmed to avoid objects at a distance of 500 meters. The computer chips, model i.MX 6 Dual/Quad which has a feature with 1.2GHz ARM A9, Multicore, GPU, MIPI CSI, IMU, LCD and model QorIQ Layerscape which specialized for Usage of Camera system, Radar, Lidar high speed on board networking, processing or storage are included in drone(NXP, 2021). With these computer chips, Sense and avoid technologies, machine vision, real time mission planning are available.

Unlike this design, the seed dispensing drone will contain a Tiger Motor (T - Motor) 30 in. by 10.5 in. carbon fiber propeller. These specific propellers are designed for drones that will endure heavy lifting. The entire propeller is designed from carbon fiber, which increases strength without adding too much weight. With the use of these propellers, the drone will be able to carry a bigger supply of seeds.

#### *Seed Dispenser*

Attached to the seed dispensing drone, will be a 35 lb. Spintech Spreader seed-spitter that fires 100 lbs of marble-sized pods packed with baby trees and all the nutrients they need to get growing. The weight of the seed-spitter is effective because it doesn't add such a large mass to the drone, and gives us room to add more seed pods. The seed pods, or containers, will have vessels that can hold about 4-6 seeds. In addition to that, the vessels will contain the proper natural pest deterrents, fertilizer, and fibrous material that absorb water, which will allow the seeds to grow more effectively.

#### *Software Design*

##### *Artificial Intelligence and Machine Learning*

We have a program utilizing Machine Learning and Artificial Intelligence to optimize the operation of drones for replanting. The program coded with a rewards function algorithm which motivates drones to fly along the track based on the land analysis. Once the map is created, with the map, the drones will be trained in a virtual system. The drone will be programmed with the rewards algorithm such as 'Center line following: More rewards if car stay close to centerline of track', 'All wings on track + Speed Threshold penalty : Penalize if the drone goes too slow and high reward if the speed is good and all wings on the track'. Each race in the training session will be evaluated by the rewards points the drone earned in a flight. While training, the drone will learn to optimize its driving in terms of speed and stability. Via this training, the drone is capable of autonomous driving with minimal intervention of human control.

```
def reward_function (params):  
  
    import math  
  
    track_width = params['track_width']  
    distance_from_center = params['distance_from_center']  
    all_wheels_on_track = params['all_wings_on_track']  
    progress = params['progress']  
    speed = params['speed']  
  
    #Following CenterLine  
    marker_1 = 0.1 * track_width  
    marker_2 = 0.25 * track_width  
    marker_3 = 0.5 * track_width  
    reward = 1e-3  
  
    if distance_from_center >= 0.0 and distance_from_center <= marker_1:  
        reward = 1.0  
    elif distance_from_center <= marker_2:  
        reward = 0.5  
    elif distance_from_center <= marker_3:  
        reward = 0.1  
    else:  
  
    #All wings on Track  
    if not all_wheels_on_track:  
        reward = reward -1  
    else:  
        reward = reward + progress  
  
    #Speed Penalty  
    if speed < 0.33:  
        reward *=0.80  
    elif speed >=0.33 and speed <=0.67:  
        reward += speed  
    else:  
        reward=speed*speed+reward  
  
    return float(reward)
```

*Figure 2. Programing Code in Python for Virtual Training of Drone Utilizing Reward Function and Machine Learning Algorithm*

### *Realtime Data Scraping*

Our drone is programmed to scrap real-time data of weather based on GPS information. Since the drone is vulnerable to water and wind, it is necessary to forecast weather and decide a flight time(ANAC, 2020). To avoid the uncertainty of weather, the drone will regularly gather weather forecast information from the National Weather Service Webpage(<https://www.weather.gov/>). If there is an expected weather condition such as heavy rain, fog and ice formation or a wind speed exceeding 32km/h, then the drone will send a warning alert to the central control system to confirm the end of flight so that the drone can return to home. If there is no confirmation from the control center after three times of alerts, the drone will automatically return to the designated spot to land.

### *Return to Home utilizing GPS*

The Drone is capable of returning to home utilizing GPS where a landing point is set up by the drone operator. It will automatically return to home with certain conditions. If the battery reaches the minimum level of battery, it will return to its designated landing location. If the weather condition consists of snow, rain or wind speed over 32km/h, then that is a trigger for the drone to trace its way back home. This return to home function can be activated by the control center.

### *Smart Vision*

The drone can capture the image of a land surface utilizing a smart vision sensor and it is capable of analysing the color variation of the picture it captures. The drone is programmed to evaluate the percentage of greens in the image of the surface and gives data based on it. This functionality will help to determine the success of restoration in the monitoring process.

### *Implementation Design*

In order for the drones to distribute the seeds properly across the land, the drone needs to be able to visualize every aspect of the land, including the condition of the land. The land surveyors will provide information on the boundary lines, while the environmental engineers will provide us with insights into the ecosystem of that specific land, this will help us consider any risks that might occur during our project, such as erosion. When all that information has been gathered, we can build a proper map for the drone to follow and it can be implemented into its software. Aside from gathering information for the visual data, the environmental engineers will also assist in providing information on the types of seeds we will need for that area and the nutrients they require.

Once the mapping has been created and the data on the seeds has been determined, the team can gather all the materials, set up camp on the site and begin testing the restoration process through the usage of AI-based drones. The drone operator(s) will keep an eye on the drones, monitoring their progress.

### ***Quality Assurance Plan***

To ensure the drone will plant seeds at its highest efficiency, many investigations must take place. First, the software will be tested to navigate the drone along the best planting path. During this test, the agility, efficiency, and strength of the drone will be evaluated and optimized. Agility will be determined by observing the drones behavior upon approaching obstacles with a given set of parameters. The efficiency will be determined as the drone endures different paths across 81 acres of land. The strength will be evaluated by examining the condition of the drone after every test run. If parts of the drone seem to be degrading with every run, then different parts, of grade or design, may be considered for drone assembly. Next, the seed dispenser will be tested to ensure there will be no delay in seed spreading during the planting process. The percent error of the seed dispenser will be recorded. Finally, the quality of the planting process will be evaluated through a monitoring process. The monitoring process will identify and record the actual amount of land the drone managed to plant.

### **Expected Project Result**

#### ***Measure of Success***

We have Key Performance Indicators(KPIs) in terms of the size of the area covered, amount of seed spreaded and average rate of seed germinated. The result of the process will be evaluated and reported monthly to measure performance and figure out the point that needs improvement accordingly.

#### *Size of area*

The size of the that has already been covered is one of the KPIs that needs to be measured for the success of the project. We will check the average size of the area covered by drones where the seeds have been spread and if the daily average size is equal to 81 acres or more, then we can evaluate that the project is successful.

#### *Amount of seeds spread*

The amount of seeds spread is also a KPI needed in order to measure the success of the project. Our team will calculate the average amount of seeds spread

by a drone per day. If the daily amount of seeds spread by the drone is the same or greater than 95 to 100 lbs, it will be considered that the project is proceeding successfully. Otherwise, we need to review the performance of the seed dispenser and fix it accordingly to fulfill the planned amount.

The success on germination of seeds

After every replanting seed phase is completed, we will evaluate the monitoring session from October to February to determine the success of performance. Using the smart vision feature on the drones, we can view the status of the land by looking at the surface, and determine the success of the germination and planting of the seeds by the color of the surface covered for replanting. If more than 60% of the surface is covered with greens, it can be considered the replanting is successful. If not, the proper seed combination and the amount of seeds that have been spread need to be reviewed.

### **Budget**

Equipment			Labor			
Name	Quantity	Cost per Item	Position	Quantity	Employment Period (months)	Hourly Wage per Employee
Carrier Hx8 Drone	10	\$41,000.00	Mechanical Engineer	3	42	\$41.00
Spintech Spreader	10	\$300.00	Computer Engineer	1	42	\$54.00
Tattu Lipo Battery	40	\$518.00	Environmental Engineer	1	24	\$41.00
Lightware Lidar Scanner	10	\$800.00	Drone Operator	2	42	\$26.00
Baumer Vision Sensor	10	\$2,078.00	Land Surveyor	1	21	\$28.00
T-Motor Propeller (Pair)	40	\$370.00				
Computer Chips	10	\$7,868.00				
Total Equipment Costs = \$555,980.00						
Total Labor Costs = \$1,922,000.00						
Total Project Cost = \$2,477,980.00						

Table 1: This shows the costs of equipment and labor for the duration of the project.

### **Qualifications**

Our team at Birdseye Consolidated consists of three mechanical engineers and one computer engineer. Altogether, we have deep understanding and experience with the design and functions of mechanical devices. As mechanical engineers we will be able to identify the best drone design required to plant seeds efficiently. This includes selecting the proper power supply, materials, and required hardware. From our computer engineering sector, our computer engineer

strives for the highest quality ensuring that our drone will perform the best. By utilizing vigorous testing, the computer engineer will determine the best course for the drone to fly.

Contributing as a production engineer, Zameer Yusuff is a mechanical engineering student utilizing troubleshooting skills to improve the performance of our drone. Improving performance leads to obtaining higher planting efficiency relative to other drone planters. By conducting investigations of the drones performance with our computer engineer, he will then analyze the results of the investigations to determine if we have achieved our performance goals

Emily Sanchez is pursuing a bachelor's degree in Mechanical Engineering, through this process she gained knowledge on how to utilize CAD softwares to develop 2D and/or 3D designs to help visualize how the product will be constructed. She will work with the team to create a conceptual drawing, followed by a model in order to allow us to modify the original design quality.

Michael Sanchez is a hardware engineer student and with his skills of developing, designing and testing computer systems he will work with the team in deciding on the most efficient drone that is best to seed and fertilize.

Hyemin Shin is a computer scientist who is pursuing her bachelor's degree in Computer Science at the City College of New York. She intends to specialize in Machine Learning and Artificial Intelligence. She has experience in Machine Learning and Artificial Intelligence via a project and has understanding in real-time data scraping skills based on her project in the computer programming club. She is fluent in C++, Python and ROS. She will be in charge of developing a program to train and operate drones to be optimised on its operation utilizing Machine Learning and Rewards function algorithm.

**Schedule**

#	Task Title	Start Date	Due Date	Duration (week)	Year 1 - Year 3																																										
					Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16	Month 17	Month 18	Month 19	Month 20	Month 21	Month 22	Month 23	Month 24	Month 25	Month 26	Month 27	Month 28	Month 29	Month 30	Month 31	Month 32	Month 33	Month 34	Month 35	Month 36	Month 37	Month 38	Month 39	Month 40	Month 41	Month 42	
1	Drone development	1 Sep	30-Nov	12																																											
2	Software development	1 Sep	30-Nov	12																																											
3	Seed dispenser development	1 Sep	30-Nov	12																																											
4	Land survey & Analysis	1 Sep	30-Oct	8																																											
5	Create a map for replanting	1 Nov	30-Nov	4																																											
6	Drone Training with Program	1 Dec	15-Jan	6																																											
7	Quality Assurance Test	15-Jan	28-Feb	4																																											
8	Restoration Process	1-Mar	30-Feb	72																																											
9	Monitoring Process	1 Oct	28-Feb	72																																											

Table 2. Gantt Chart that describes a timeline for the duration of the project. The restoration process is a season-sensitive process and will occur within 6 months, from March to September

only, and the monitoring process will occur for 6 months, from October to February, and both processes repeat every year for 3 years.

#	Task Title	Start Date	Due Date	Duration (week)	Year 1																							
					Preparation						Phase 1 Replanting						Phase 1 Monitoring											
					Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16	Month 17	Month 18						
1	Drone development	1-Sep	30-Nov	12	[Yellow]																							
2	Software development	1-Sep	30-Nov	12	[Orange]																							
3	Seed dispenser development	1-Sep	30-Nov	12	[Green]																							
4	Land survey & Analysis	1-Sep	30-Oct	8	[Blue]																							
5	Create a map for replanting	1-Nov	30-Nov	4					[Light Blue]																			
6	Drone Training with Program	1-Dec	15-Jan	6							[Purple]																	
7	Quality Assurance Test	16-Jan	28-Feb	6							[Pink]																	
8	Restoration Process	1-Mar	30-Sep	72	[Yellow]																							
9	Monitoring Process	1-Oct	28-Feb	72													[Green]											

Table 3. The following table is the same as Table 2 except it provides a closer look at the schedule.



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### Audience Analysis #1

<b>Reader's Name:</b>	Dan Gjerde
<b>Reader's Job Title:</b>	Chair of Mendocino County Board of Supervisors, Fourth District Supervisor
<b>Kind of Reader:</b>	Primary <input checked="" type="checkbox"/> _____ Secondary _____
<b>Reader's Level of Education:</b>	College (Humboldt State University)
<b>Reader's Professional Experience:</b>	Chair of Mendocino County Board (2013 - present), Member of Fort Bragg City Council (14 years)
<b>Reader's Job Responsibilities:</b>	Developing practical long term solutions, Exercise legislative and quasi - judicial authority
<b>Reader's Personal Characteristics:</b>	N/A
<b>Reader's Cultural Background:</b>	N/A
<b>Reader's Attitude Toward the Writer (you):</b>	N/A
<b>Reader's Attitude Toward the Subject:</b>	Loves and cares for his home
<b>Reader's Expectations on the Subject:</b>	Improve the Mendocino County Communities
<b>Reader's Expectations on the Document:</b>	N/A
<b>Reader's Way of Reading the Document:</b>	Skim it <input checked="" type="checkbox"/> Study it _____ Read a portion of it ___ Which portion? Modify it and submit it to another reader _____
<b>Reader's Reading Skill:</b>	College level
<b>Reader's Physical Environment:</b>	Office, located at 501 Low Gap Road, Room 1010, Ukiah, CA, 95482

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### Audience Analysis #2

<b>Reader's Name:</b>	<b>Ted Williams</b>
<b>Reader's Job Title:</b>	<b>Vice-chair of Mendocino County Board of Supervisors</b>
<b>Kind of Reader:</b>	Primary _____ Secondary <input checked="" type="checkbox"/> _____
<b>Reader's Level of Education:</b>	<b>Equivalent to College Education</b>
<b>Reader's Professional Experience:</b>	<b>Ted Williams has worked for Embedded consulting part at IoT from 1993. He Volunteered at Albion- Little River Fire Department as a firefighter from 2007 to 2011 and he became a fire chief from 2011 and responded to more than 1,000 incidents as a chief. He is the person who cares for his community and participates in the activity for social goods. With his experience in community service in the field, he became a 5th district supervisor of the county of Mendocino and served as a vice-chair of Mendocino county board as well.</b>
<b>Reader's Job Responsibilities:</b>	<b>Establish policies and long-term plans according to the needs of community</b>
<b>Reader's Personal Characteristics:</b>	<b>Careful, faithful and open-minded, with leadership</b>
<b>Reader's Cultural Background:</b>	<b>He was born and grew up in Comptche in California.</b>
<b>Reader's Attitude Toward the Writer (you):</b>	<b>Patient and Open-Minded</b>
<b>Reader's Attitude Toward the Subject:</b>	<b>The audience will be very interested in the subject of the proposal since the wildfire is the main natural disaster that Mendocino county community is suffering from. Ted Williams especially has experience working for the Community Fire Department as a volunteer and a chief , so he is the one who knows the significance of the replanting for burned areas after the occurrence of wildfires. He will be very interested in the usage of drones for reforestation.</b>
<b>Reader's Expectations on the Subject:</b>	<b>The audience will expect to get helpful information to solve the problem of restoration of burned acres.</b>

Reader's Expectations on the document:	He will expect a more efficient and effective way to solve a problem.
Reader's Way of Reading the Document:	Skim it <input checked="" type="checkbox"/> Study it _____ Read a portion of it _____ Which portion? Modify it and submit it to another reader _____
Reader's Reading Skill:	Excellent
Reader's Physical Environment:	Office, located at 501 Low Gap Road, Room 1010, Ukiah, CA, 95482

### Audience Analysis #3

Reader's Name:	John Haschak
Reader's Job Title:	3rd District Supervisor of Mendocino County
Kind of Reader:	Primary _____ Secondary <input checked="" type="checkbox"/> _____
Reader's Level of Education:	Majored in History and Political Science at UCLA and Graduated from UCLA's Graduate School of Education
Reader's Professional Experience:	He volunteered at the Peace Corps in Guatemala, was a parent involvement coordinator with Migrant Head Start, followed by teaching Spanish at Willits High School for 28 years. He was also President of the Willits Teacher Association where he advocated for public education. He chaired the statewide Budget Committee of the California Teachers Association. He was also part of various assignments, such as, the Mendocino Fire Safe Council, the North Coast Resource Conservation and Development Area Council, the Mendocino Solid Waste Management Authority, and the Solid Waste Hearing Body.
Reader's Job Responsibilities:	Works with the Mendocino Board of Supervisors to utilize its legislative and quasi-judicial authority, while managing their budget usage, to maintain the health, safety, and welfare of their residents.
Reader's Personal Characteristics:	Active, Altruistic, Authoritative, and Responsible. He is also interested in environmental protection and economic development.

<b>Reader's Cultural Background:</b>	<b>Fluent in Spanish, was raised in Willits, California.</b>
<b>Reader's Attitude Toward the Writer (you):</b>	<b>Patient and Open-Minded</b>
<b>Reader's Attitude Toward the Subject:</b>	<b>Very interested on the benefits of the drone</b>
<b>Reader's Expectations on the Subject:</b>	<b>Expects to receive helpful information that will benefit the welfare of his residents</b>
<b>Reader's Expectations on the Document:</b>	<b>To introduce a better method for restoring vegetation after a wildfire</b>
<b>Reader's Way of Reading the Document:</b>	Skim it ___ ✓ ___ Study it _____ Read a portion of it ___ Which portion? Modify it and submit it to another reader _____
<b>Reader's Reading Skill:</b>	<b>Exceptional</b>
<b>Reader's Physical Environment:</b>	<b>Office, located at 501 Low Gap Road, Room 1010, Ukiah, CA, 95482</b>

### **Reflection Paper - Emily Sanchez**

The genre of this assignment is a technical proposal because it follows the necessary requirements of a technical proposal. This includes a table of contents, the problem statement, background information, a needs statement, the objective, the technical approach, measures of success, budget, and the schedule that will be followed if this project is approved.

The media I utilized was digital because it was written on both a digital platform and submitted through a digital website. By completing this project remotely, it was proven a bit difficult because it was hard to get in contact with certain teammates and ensure that they're contributing. Aside from that, it wasn't as much of a difference as doing it in person because we all communicated through blackboard and bounced ideas on the project off of each other. The completion was as successful as it would have been if we were to meet in person.

The exigence that influenced the creation of this technical proposal is the consistent wildfires that occur in California. When all this vegetation is lost from these wildfires, the inhabitants of that area lose their homes and the carbon dioxide in the air increases. Although border collies have been utilized to replant seeds, it won't be as effective as utilizing drones because the drones will replant the seeds at a faster rate and they don't require constant supervision. The acres of land that have been burned through need a fast, more efficient way of distributing seeds all throughout the land.

My stance is neutral because I aim to introduce a plan to my audience on how to restore the vegetation that was lost during wildfires. In reading our proposal, I hope that the audience will understand the plan we propose and provide us with the funding and permission that we need to follow through with said plan.



The purpose of my technical description is to inform my audience of a better way for restoring the vegetation that has been lost, in hopes that they will provide us with the funding and permission needed to continue with this project. By reading the plan proposed, my audience will have gained knowledge on how the drones will be developed and programmed, how seeds will be implemented through the use of drones, and what the cost for this project would be. In addition to that, the audience will understand why it's important and more effective to utilize drones as a source of replanting, they will have a clear idea of what the schedule would consist of, and why our team is qualified to handle this project.

My target audience were the board of representatives at Mendocino County. These individuals are in charge of the legislative and quasi-judicial decisions, they decide what their budget will invest in. If we can convince the board of representatives that this project is ideal, then we can ensure that we will have access to their land to run the project, and that we will have their full cooperation with our funding needs. The board of representatives at Mendocino County care about the health and welfare of their residents, if the wildfires are increasing the amount of carbon dioxide, then this could be the best solution to reduce that intake and protect their residents.

I met a specific amount of course learning outcomes that will help develop my writing. This assignment meets course learning outcomes 3 and 4. It demonstrates my use of number 3, negotiate your own writing goals and audience expectations regarding conventions of genre, medium, and rhetorical situation, because in order to reach the same page wit my group members, we had to discuss our views on the project and how we wanted to approach it, and we would combine all of our ideas to compose one final project. It also demonstrates my use of

number 4, develop and engage in the collaborative and social aspects of writing processes, because this is the first major project we worked on as a group. This project demonstrated how open-minded one has to be in regards to others' ideas and how you have to compromise to reach the same goal.

In order to complete this assignment in its entirety, we all separated the work so that each teammate was doing a certain section but still met up on a call to discuss any questions or clarifications. Zameer worked on the problem statement, the requirements, the quality assurance plan, the budget, and the references. Hyemin completed the background, the entire software design section, the measures of success, and the schedule. I wrote the needs statement, the objective, the technical approach, the architecture design, and the implementation design. Regardless, as a group we all discussed the information that was going to be included before it was written. The qualifications and the powerpoint were all done as a group. This collaboration in engineering made me realize the importance of communicating your ideas and keeping an open-mind for what your teammates have to say. In order to complete a group project effectively, you must all work like a well-oiled machine.

### **Reflection Paper - Zameer Yusuff**

This assignment follows the engineering proposal genre because it meets the requirements of a project proposal. In this assignment a solution to real world problems was proposed to its appropriate audience. In this particular case, the problem was a natural disaster. The solution was using drones to recover the location from the destruction of the natural disaster. The audience, board of Mendocino County, should look over this proposal and be persuaded that the proposing party is in fact providing the best solution. It was important to be able to persuade the audience because the proposer would lose interest and funding for their cause. This relates to a stance, because I wanted to place some sense of urgency in the proposal. By explaining the drones ability and comparing it to previous planting methods, it can open the eyes of the audience to realize that the drones are the best way to proceed with planting after wildfires. Engineering proposals must have a problem, solution, technical description, schedule, budget, objectives, and qualifications. This proposal satisfies all these aspects. This proposal was aimed at the board of Mendocino County. Through use of a proposal document and powerpoint, the board will be able to clearly see the solution for their problem regarding wildfires. Due to the pandemic, a powerpoint will increase the effectiveness of this proposal because it will be able to provide another angle from which the solution can be expressed. The powerpoint is also much more accessible than a physical document due to its digital media.

This assignment was unique because the exigence was provided. Selecting the Mendocino County wildfires was because of drones and my group members. The drones were exciting because we all had to do a lot of research to present a proper proposal. Additionally, our

group consisted of more than one concentration, mechanical and computer engineers. This disaster was able to incorporate everyone. Projects such as these that are helpful because they are challenging. When one is forced to do something they are not used to, they begin to think critically about what they are doing to come to an understanding. This may relate to engineers in the real world because there will be all kinds of problems that will have to be solved. Some problems may be completely new or out of one's comfort zone. Either way engineers are required to have strong problem solving skills. Emily, Michael, and myself were mechanical engineers, while Hyemin was a computer engineer. This was a slight challenge of its own as we needed a project to involve everyone. Next, Emily decided her contributions would come from using CAD to provide better visuals of the drone before we develop it. Michael decided the best hardware for the drones intended purposes. I managed aspects of testing to ensure the product quality and performance was ready for its environment. Hyemin was a computer engineer that truly brought the solution to life. The software is what navigates the drones and plants the seeds. It was interesting to see that while her occupation was of the minority her contributions were a crucial part of the solution.

In doing this proposal I have accomplished the learning outcomes of, “practice using various library resources, online databases, and the internet to locate sources appropriate to your writing projects.” Researching an unfamiliar event and object such as a wildfire and drone respectively, has proved to be difficult, and requires one to be careful on which sources they choose. Another learning outcome I have achieved was, “develop and engage in the collaborative and social aspects of writing processes.” It was very helpful to have a group for this project. My group was able to come to agreement in the direction we wanted to go. Additionally, most of the

group was able to contribute their own constructive criticisms to the writing process. Usually when writing alone, it is difficult to spot mistakes, with a group, there are multiple views on something, which creates a more refined assignment.

### **Reflection Paper - Hyemin Shin**

For this assignment, I have used a technical proposal with digital media to deliver the messages to the audiences. With the project proposal, I expect to give persuasive information to the audiences - The Board of Mendocino County to consider the solution we delivered in order to solve the problem caused by wildfires in Mendocino Area . My genre is a technical proposal which raises a problem in reality with its background and suggests a solution with technical approaches with credibilities. The media I used to convey my message is a digital document since the best option to reach my audiences regarding the COVID-19 situation in which most works are done online. In addition, this media can be accessed with multi devices and also the media can be changed up to the audiences' preference. The exigence of my assignment is the significance of an efficient solution for restoration of burned areas which were victimized by wildfires. More than 1.4 million acres were burned because of Mendocino Fire in 2018, and the government spent lots of budgets to restore burned areas with various methods but the revegetation is still undergoing. For this situation, our team decided to find a better solution for

replanting by using drones which are more cost-efficient and effective and suggest our solution to the board of Mendocino to accept our proposal and proceed the project accordingly for community goods. My stance is that if the government was looking for a better solution for restoration of burned areas in a more efficient way while saving budgets, the proposal of our team should be considered as one of their possible plans for community. My audience is the board of Mendocino county, especially the chair and vice-chair of the board who are responsible for the entire Mendocino community and the supervisor of the 3rd district where the Mendocino Fire took place. These audiences are the one who are looking for a helpful and efficient solution to replant seeds to restore burned areas since it is the one of the most important mission for Mendocino county suffered from wildfires.

With this assignment, I have met Course Learning Outcomes in most aspects required for group work. Since I have no experience in writing professional technical proposals in depth, I had searched many samples of technical proposals and read extra resources to clearly understand the required elements for the technical proposal genre. It took a while to understand what each element stands for. For this assignment, I set my audience for the technical proposal first, because the audience for this proposal is really clear regarding the location the proposal can be applied and the positions need the solutions. Since my audiences are educated equivalent to college and they have professional understanding on the problem caused by fire, I had to use many resources to make credibilities of my proposal which required me research more technical information and papers in depth.

While working on the proposal, Zameer, Emily and Micheal were in charge of mechanical part to develop on drones performance since they have mechanical engineering background, and I was in charge of the technical part for software engineering part related to

developing a program to train drones and a program to evaluate the success of replanting utilizing a smart vision of drones since I have experiences on several projects with the skills needed for the functionality.

In this project, I can say that the entire project has been done in 'New Normal'. We had a regular meeting online and we had to consider the time difference for meeting since I am in Korea while others in the USA. This experience let us learn how to work and how to communicate to each other while being considerate to each other.