Deliverable 2

Proposed Solution:

Prediction: To predict wildfires, one has to consider 3 main factors - humidity, temperature, and CO2 emissions.

Our research showed us that although highly detailed weather models are being used to analyze how the fire will develop when it is already ablaze, there is no system to predict it.

We are creating a device which would be able to detect the concentration of CO2 in the area around it, if it surpasses a certain threshold level, the humidity is low, and temperatures are also above a certain level, it will alert the user that the area has become a potential wildfire hotspot. These devices will also be low-cost and hence, many can be scattered over a large area to keep the reading accurate.

Containment: Building upon the idea of a fire extinguisher based on dry ice, i.e., solid Carbon Dioxide, we came up with the idea of using pressurized Carbon Dioxide to suffocate and hence, extinguish the fire.

Hypothesis:

90% of all wildfires are caused by human intervention: a flat tire, a lit cigarette, etc., in areas which are just waiting for a spark. These optimal conditions, that are just waiting for a spark, need to be identified so that local fire departments are aware of possible circumstances.

Firefighters use aircrafts to fight wildfire. These aircrafts drop water above the burning trees. The fighters also tackle it from below by using suppressants.

The problem they face is that they have to store large amounts of extinguishing material to put out the fire and need to refill it repeatedly in the case of a big wildfire. Our proposal is to replace that material with liquid CO2. Due to its properties of driving away oxygen from the site it is applied at and its general cooling effect, pressurized CO2 would get the job done spotlessly.

Aircrafts would bring in the pressurized CO2 and use a technique termed as 'carpet bombing,' to extinguish the fire. After the fire is extinguished using this suffocation technique, a single plane holding water would be sent in to extinguish any remaining smoldering sites to prevent re-ignition. This method can also be used by ground units, as long as any humans in the immediate vicinity have gas masks to prevent asphyxiation.

This would help us tackle a large area in smaller duration and with less materials, since a minute quantity of CO2 is required to effectively extinguish a fire. The counter argument may be that it is not environmental friendly, but on calculating the net effect of this method, the sum total CO2 emission is brought down. We see that it saves both time and material, which are equal to a smaller duration of the fire and minimal damage.

The conventional method would result in a larger amount of fuel being burnt which means greater CO2 emissions, whereas if we use CO2 in the first place, it would kill the fire in the very beginning, preventing further emissions so the net CO2 emission is substantially lower.

The process basically targets removing oxygen from the fire triangle. CO2 covers the fuel and pushes oxygen molecules away from the fuel. As there is no oxygen for the fuel to chew on, the fire suffocates and dies.

Research plan:

We plan on building a detector that is arduino-based to check the feasibility of the model prior to and during a fire.

We will also be testing out how efficient a streamlined liquid CO2 extinguisher can be during a wildfire, by creating using current models of for extinguishers and then ideate a final design.