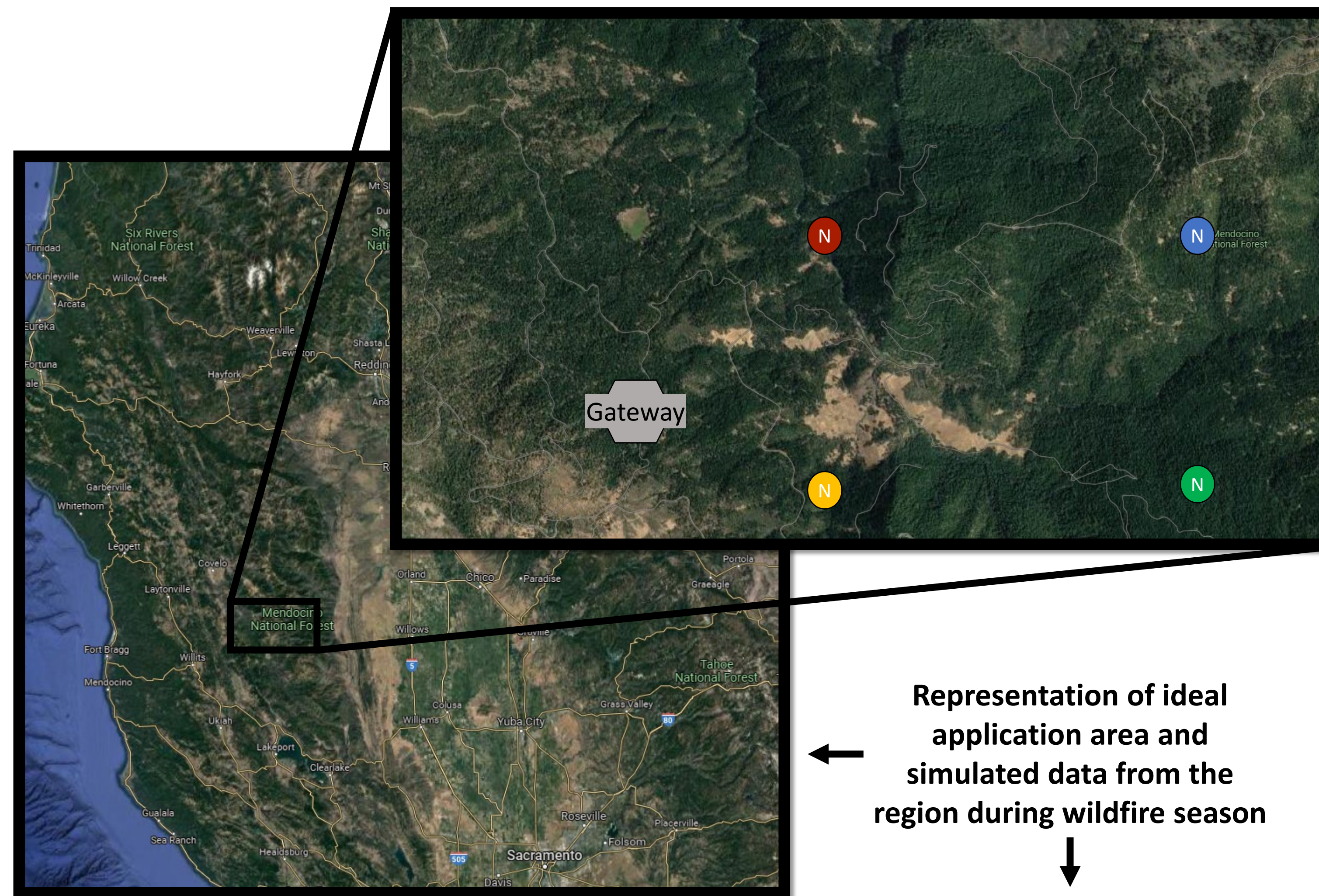


Background

- Massive uncontrolled wildfires, have become more common, especially in the western United States, and have wide-ranging and extremely detrimental effects
- Wildfire occurrences have doubled from 1984-2015
- 84% of wildfires are caused by human activity, from negligence to faulty equipment.
- The wildfires in California in 2018 alone have estimated cost of \$150 billion
 - Additional costs:**
 - To health due to poor air quality
 - Environment (carbon emissions)
 - And psychosocial impacts



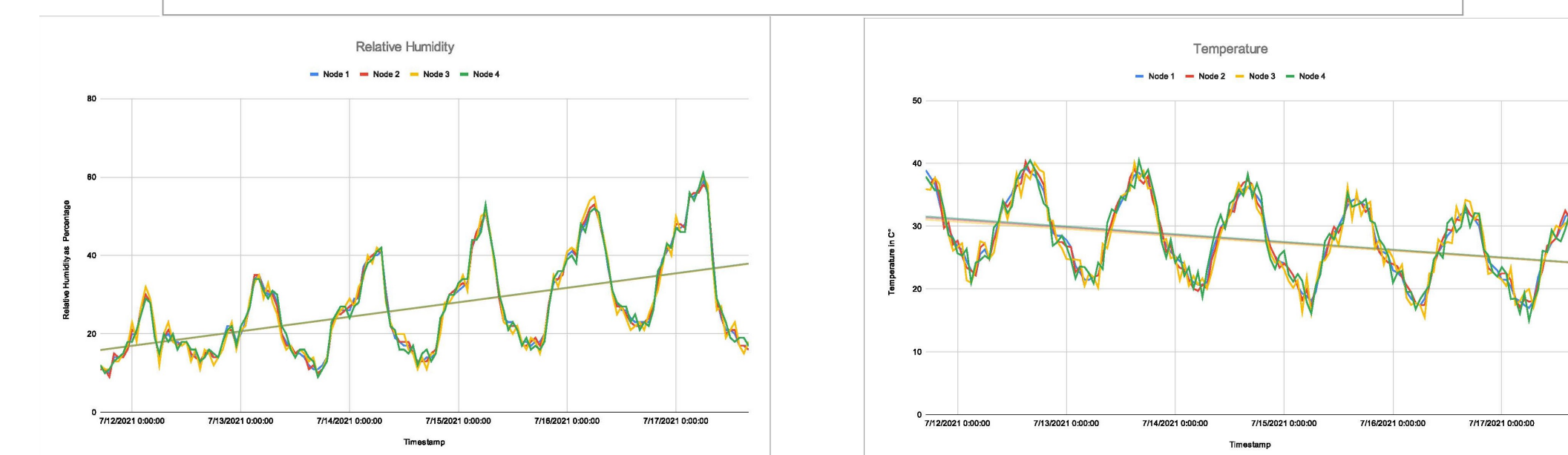
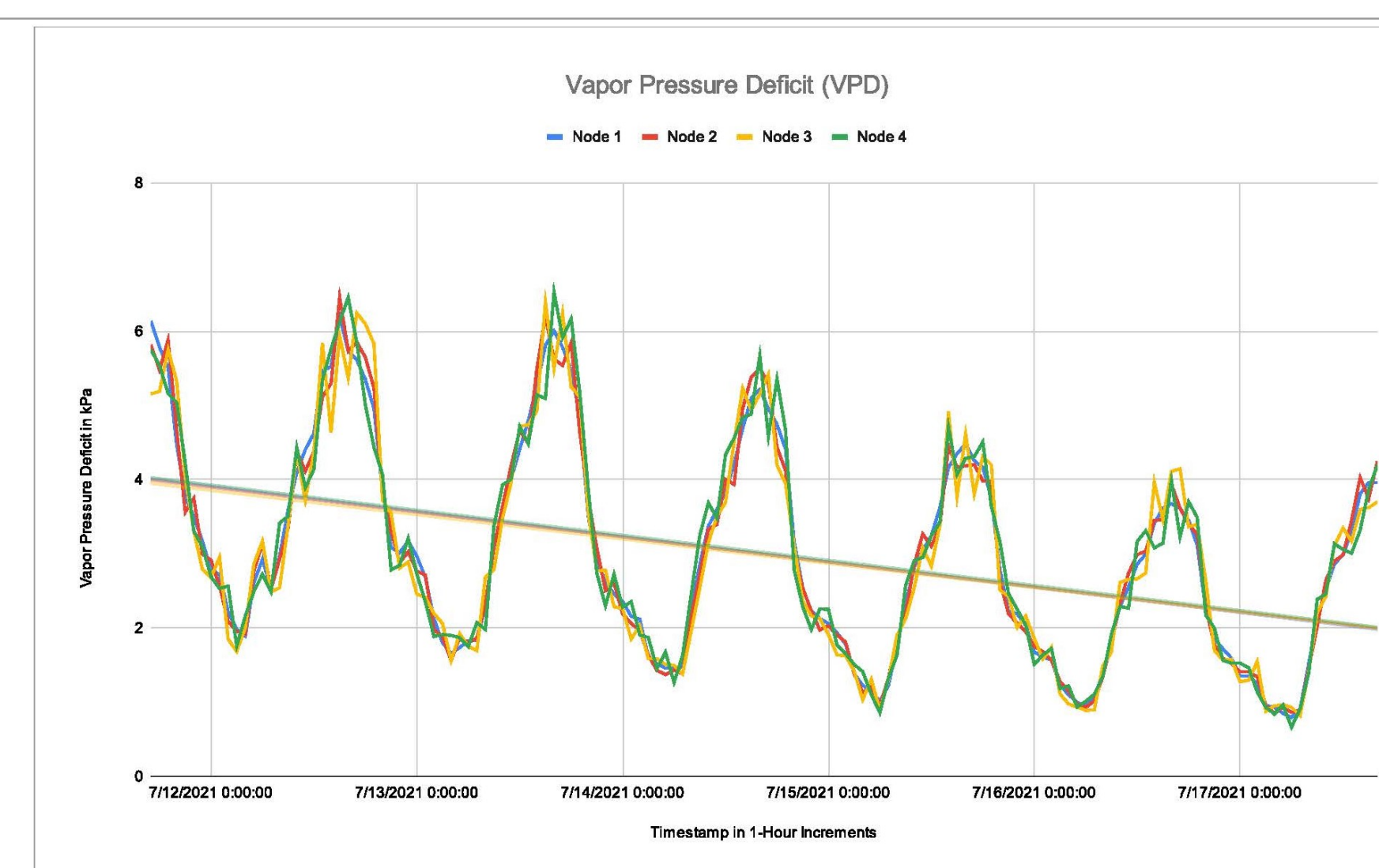
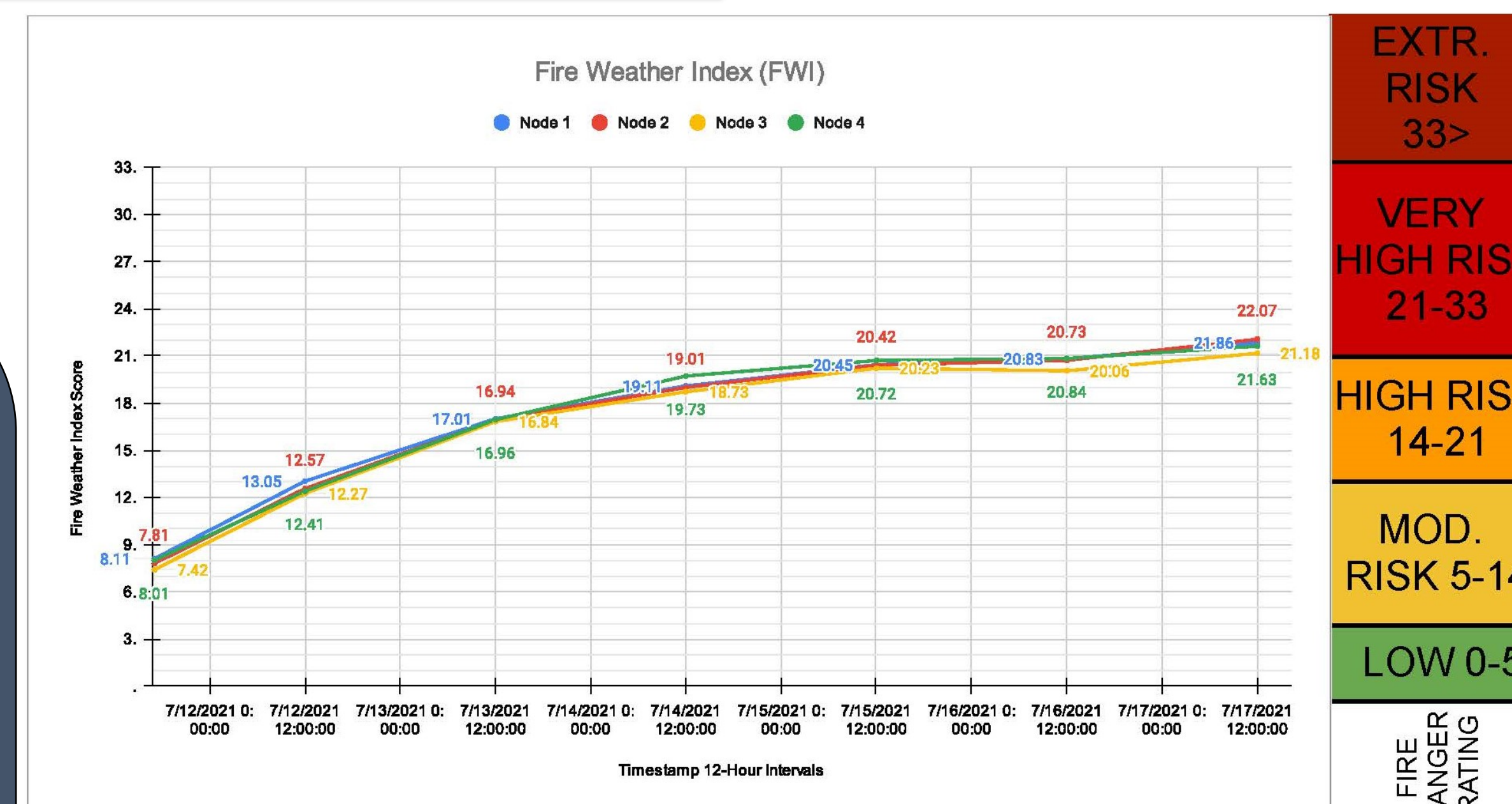
Representation of ideal application area and simulated data from the region during wildfire season

Methodology

- Distributed sensor nodes transmit temperature and humidity data at 1-hour intervals
- Gateway receives data from nodes, uploads it to Adafruit.io (AF.io), then calculates and uploads:
 - The Vapor Pressure Deficit - hourly
 - The Fire Weather Index (FWI), and it's components - once daily:
 - The Fine Fuel Moisture Code (FFMC)
 - The Duff Moisture Code (DMC)
 - The Drought Code (DC)
 - Previous 24-hour precipitation total and the wind speed is gathered from the hourly weatherbit.io API
 - Retrieves the FFMC, DMC and DC from the previous day from Adafruit.io for calculation
- The data is then displayed on the AF.io Dashboard

Objective

- Build a proof-of-concept IoT system of low-power, low-cost sensor nodes which measure temperature and relative humidity data from hard-to-reach areas.
- Use this data to refine remote sensing data in order to improve the accuracy of existing wildfire prediction models.
- More accurate data will allow decision makers and stakeholders, prepare and allocate resources more efficiently, to prevent catastrophic wildfire losses.



Simulated Data from Potential Target Implementation Area: Mendocino, California 07/11/21-07/14/21

Results

Hardware - Developed:

- Three battery powered Sensor Nodes
 - Raspberry Pi Zero, LoRa transceiver module and AM2302 sensor module
- LoRa Gateway
 - Raspberry Pi 3B+ and LoRa transceiver module

Software – Developed Python Code:

- For LoRa-based data transmission protocol
- To retrieve weather station data from weatherbit.io API
- Calculate wildfire prediction indices and metrics
- Automated uploads of data and metrics to cloud database (AF.io)

Future Directions

- Deploy nodes to rural, wildfire prone areas
- Create real-time visualizations of data based on GPS coordinates on map for stakeholders
- Compare against remote sensing data to refine the accuracy of prediction models

