AT&T and Argonne National Laboratory
Climate Change Findings
Fire Weather Index—The Canadian Fire Weather Index (FWI) is a tool used to identify locations with enhanced wildfire risk. It is a system based on weather conditions (e.g. temperature, relative humidity, wind and rain) and the availability of fuel sources (e.g. dry vegetation). The higher the FWI, the greater the risk of conditions that will allow a fire to grow into a wildfire. The FWI has proven to be an effective tool at projecting wildfire risk, however it does have some limitations that should be considered when interpreting its results – notably its incorporation of land use information. For example, an FWI analysis may project high wildfire risk at a location where future weather conditions may indicate an elevated risk of wildfire, however there may be very little vegetation to burn. This is true in parts of the U.S that are primarily desert, such as locations across the southwestern U.S. (e.g., near Las Vegas, southern Arizona).

![95th Percentile Midcentury FWI During Wildfire Season](image)

Fig. 1: The 95th percentile of summer and fall averaged FWI for the midcentury (2045-2054) time frame.
Figure 1 shows the projected extreme values for FWI (95th percentile) in at mid-century (i.e., data from 2045 - 2054). Figure 2 shows the percentage change in FWI extremes between historical (1995 - 2004) and mid-century time frames. A percent change in the positive direction (red) means an increase in the FWI between the historical to mid-century data. A negative change (grey) means a decrease in the FWI between the historical to midcentury data. A percent change of zero (white) means there was no change between the two timeframes.

Fig. 3: The 95th percentile FWI historical data for Florida

Fig. 4: The 95th percentile FWI midcentury data for Florida
Florida

Figure 3 and Figure 4 shows the 95th percentile historical and mid-century FWI in Florida, respectively. As shown in the percent change map above, Florida has some of the largest changes in FWI values between the historical and mid-century time frames, with a maximum change of 6.8. Previously, Florida had relatively low or minimal wildfire risk. However, these findings show Florida at higher risk of wildfires in the future.

Figure 5: The percent change of the FWI 95th percentile between historical and mid-Century time frames in Florida, separated by county.

When looking at a population density map of Florida (Fig. 6), the highest population density is in the Palm Beach, Fort Lauderdale, and Miami areas, as well as the Orlando area in Central Florida. Comparing the FWI percent change map (Fig. 5) to the population density map (Fig. 6), the increase in wildfire risk may affect areas of Florida with large populations.
**DROUGHT**

**Vapor Pressure Deficit (VPD)** – VPD is used to measure and locate regions at higher drought risk. VPD is calculated using relative humidity and temperature. As relative humidity decreases and temperatures increase, these conditions cause more moisture to be drawn out of the soil and vegetation into the atmosphere, thereby increasing VPD. Similar to the FWI, VPD is a tool that can be used to help understand drought risk.

**Percent Change in 95th Percentile VPD**

![Map showing percent change in 95th percentile VPD](image)

**Fig. 7:** The VPD data that falls in the 95th percentile of its dataset (more extreme values) was averaged together for the historical (1995-2004) and midcentury (2045-2054) datasets. The percent change was taken between these two datasets and plotted in this map.

Like the wildfire percent change map above, **Figure 7** shows the percent change between the historical and mid-century VPD (drought) data. A percent change in the positive direction (orange) shows an increase in VPD between the historical and mid-century data. A negative percent change (grey) shows a decrease in VPD from the historical to mid-century data. A percent change of zero (white) indicates there was no change between the two timeframes.
The linkage between drought and wildfire potential is well established, and many of the same factors critical to determining future VPD (e.g., relative humidity, temperature, etc.), are also important in determining future FWI projections. In comparing the wildfire and drought maps, similar patterns of increased risks related to climate change are evident. Looking at the drought percent change map (Fig. 7), again Florida stands out as a place with large changes in VPD. As shown in the wildfire section above, the FWI data (Fig. 5) is also showing large changes wildfire risk in Florida by the mid-century time frame. Some of these changes may be driven by the increases in air temperatures across the entire United States as well as decreases in relative humidity.