

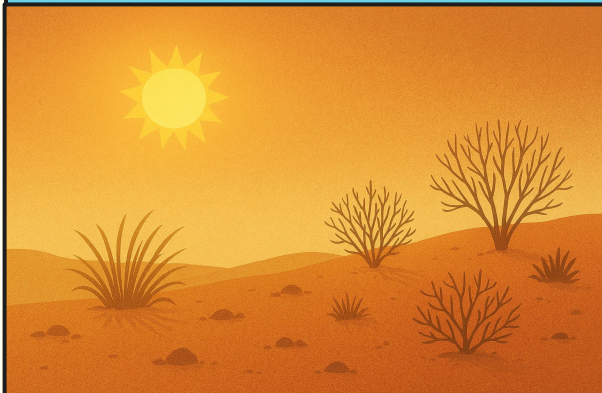
Fire Weather Forecast Elements

*In this short talk, we'll look at the
most important weather ingredients
that influence wildfires:*

*Heat and Dryness, Wind, and
Atmospheric Stability.*

Forecast Elements

2



Hot and Dry

High temperatures and low humidity dry out vegetation, making it easier for fires to start and spread.



Wind

Strong winds push flames forward, increase fire spread, and carry embers that can start new fires ahead of the main front.



Atmospheric Stability

Unstable air allows smoke and heat to rise quickly, creating stronger updrafts/downdraft that can intensify fire behavior and lead to towering smoke plumes.

Hot and Dry

3

Hot

High temperatures lower the ignition threshold of fuels, making it easier for fires to start, while also speeding up the drying of vegetation, which makes fuels more flammable.

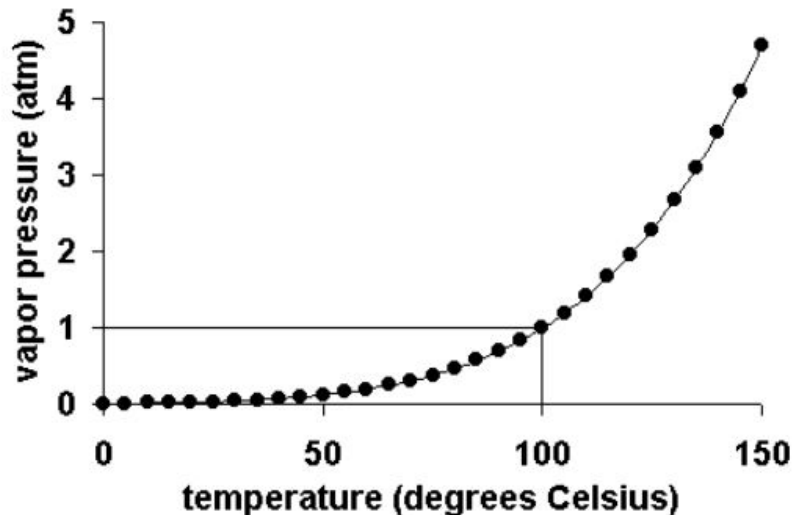
Dry

Dryness is often reflected in low dew point temperatures, which indicate very little moisture in the air. When the dew point is low, fuels lose moisture quickly and become more flammable, increasing the potential for fires to ignite.

Vapor Pressure Deficit (VPD)

Vapor Pressure Deficit (VPD) combines temperature and dew point to show how dry the air really is. When temperatures are high and dew points are low, VPD increases—meaning the air is pulling moisture from fuels more aggressively, which raises fire danger.

Vapor Pressure (and SVP) increase **exponentially** related to dew point temperature and air temperature.

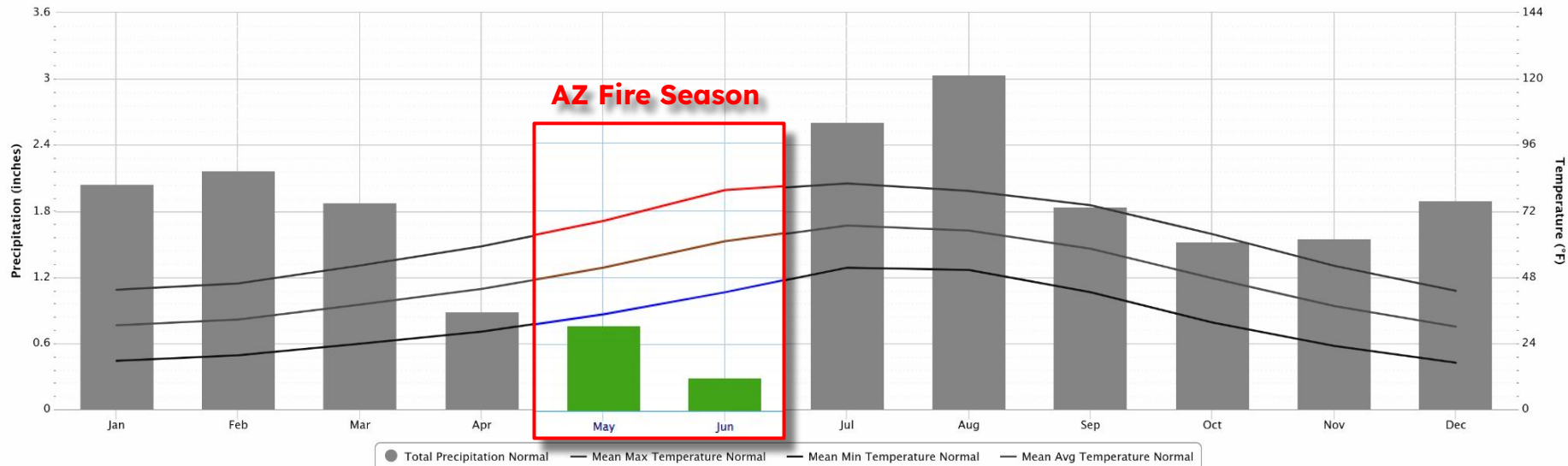


Peak of Vapor Pressure Deficit

4

Monthly Climate Normals (1991–2020) – Flagstaff Area, AZ (ThreadEx)

Click and drag to zoom to a shorter time interval



Wind

5

Wind pushes flames forward, increasing the speed at which a fire spreads across the landscape.

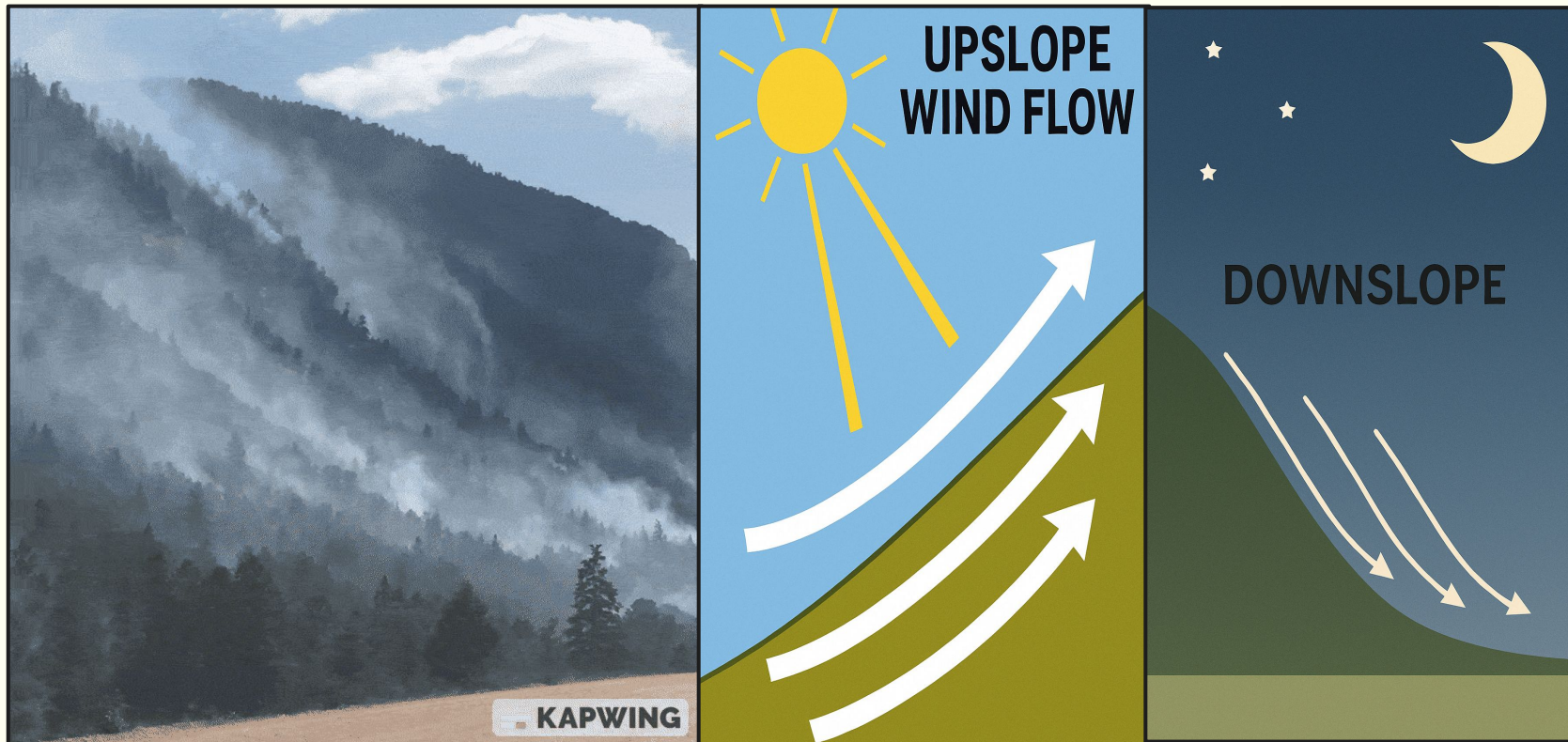
Wind carries embers ahead of the fire, starting new spot fires that can quickly expand the fire's reach.

Wind direction plays a major role in steering a fire—fires tend to move in the direction the wind is blowing, which helps forecasters and firefighters predict where the fire will go next.



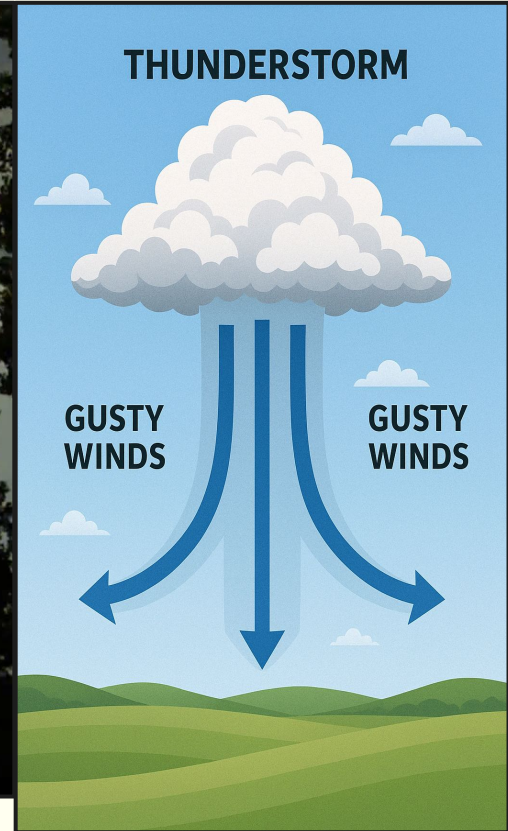
Upslope Flow

6



Thunderstorm Downdraft Winds

7



Atmospheric Stability

8

Unstable Conditions

In unstable conditions, rising air helps carry heat and smoke upward, allowing fires to become more intense.

Stable Conditions

Stable air traps smoke and heat near the surface, which can limit fire growth but also reduce visibility and air quality.

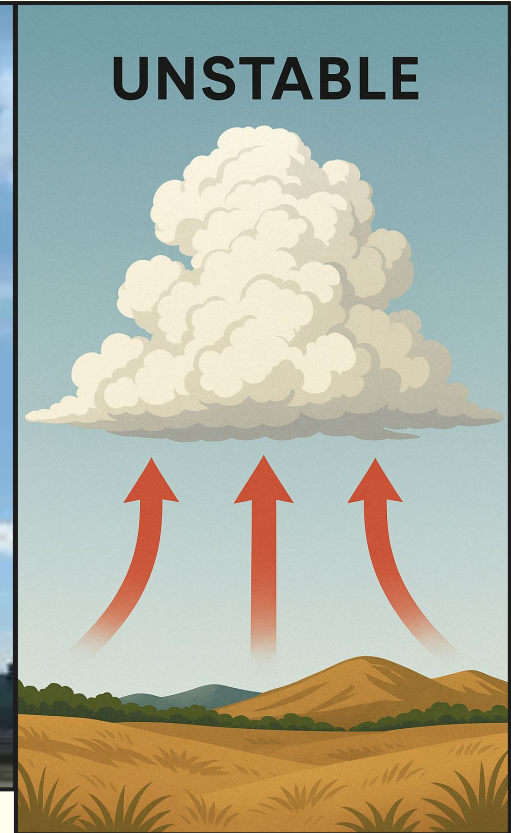
Inversions

An inversion is a layer of warm air in the atmosphere, which traps smoke and limits fire activity. When the inversion breaks, usually as the day heats up, it allows smoke to rise and fresh air to mix in—often triggering a sudden increase in fire intensity and spread.



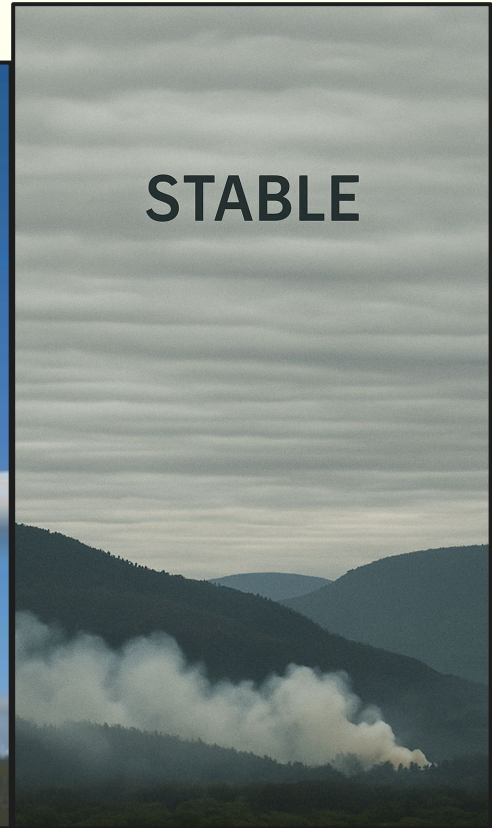
Unstable Atmospheric Conditions

9



Stable Atmospheric Conditions

10



Inversion Break

11



INVERSION



Fire Weather Forecast Elements

Fin