

Wildfire Systems Investigation

Run controlled wildfire simulations, forecast high-risk conditions, and compare mitigation strategies using evidence.

NGSS: MS-ESS3-2 - analyze natural-hazard data to forecast future events and inform technologies that reduce impacts; engineering connection: MS-ETS1-2 - compare competing solutions using criteria and constraints.

Name: _____ **Class / Period:** _____ **Date:** _____

Driving Question

How can wildfire data be used to forecast high-risk conditions and choose strategies that reduce community impacts?

Before You Begin

1. Predict how stronger wind will change the direction and rate of fire spread.

2. Predict how drought or high temperature will change the number of cells affected and the amount of landscape burned.

Plan a Controlled Test

Keep the same landscape and ignition point. Change only one main environmental variable between runs.

Independent variable	Low setting	Medium setting	High setting

Controlled variables: _____

Run Three Trials

Trial	Setting	Time steps	Cells affected	Burned %	Homes destroyed	Air quality	Ecosystem health
Low							
Medium							
High							

Analyze Fire Spread

3. Which trial spread fastest or affected the largest area? What data support your answer?

4. How did the direction of spread compare with the wind direction? Describe one clear pattern.

5. Which landscape features slowed or blocked fire movement? Which features allowed faster spread?

6. How did the variable you tested affect homes destroyed, air quality, or ecosystem health?

Forecast the Hazard

7. Based on your trial data, forecast the combination of conditions that would create the greatest wildfire threat to a community. Cite at least two measurements or patterns that support your forecast.

Compare Mitigation Strategies

Choose two different actions or technologies. Examples: fuel reduction, defensible space, early-warning monitoring, evacuation planning, fire-resistant design, or another strategy. Compare them using evidence from your simulated hazard pattern.

Strategy	How it could reduce impact	Evidence from your trials	Limitation / tradeoff
A.			
B.			

8. Which strategy would you recommend for the community? Explain why it better matches the hazard pattern you observed.

Claim - Evidence - Reasoning

Claim: Which conditions create the greatest wildfire risk, and which mitigation strategy is best supported by your evidence?

Claim: State your answer in one clear sentence.

Evidence: Use at least three specific observations, measurements, or data values from the investigation.

Reasoning: Explain why your evidence supports the claim using the science ideas from the investigation.

Model Limitation

Identify one factor the model simplifies or leaves out (fuel moisture, changing weather, slope, firefighting, ember transport, local geography, etc.). Explain how it could change a real wildfire forecast or mitigation decision.