

Wildfire Risk and Dynamic Hazard Mapping — Applied GIS Case

Status: APPLIED RESEARCH CASE — DESCRIPTIVE / SUBSTANTIAL REVISION REQUIRED

Research question

How well did chaparral distribution and official fire-hazard zones describe the urban areas affected by the 2025 Eaton and Palisades fires, and what additional evidence would be needed for a more dynamic Los Angeles County hazard-mapping method? The case asks whether spatial overlays can reveal planning gaps that static classifications may miss as land cover, development, and short-term hydroclimate conditions change.

Contribution and current result

The Spring 2025 case study produced a descriptive ArcGIS comparison of Los Angeles County land cover, extracted chaparral, Eaton and Palisades fire perimeters, Cal Fire hazard-zone layers, urban context, and downtown Los Angeles precipitation totals from 2018–2025. Its maps visually identify areas—especially in and around Altadena—where the documented fire perimeter extended beyond the chaparral or hazard-zone pattern emphasized by the project.

That is a bounded descriptive observation, not a validated dynamic risk model. The current artifact motivates a future multivariable workflow but does not implement one. A publication-quality continuation would need enumerated source layers, repeatable transformations, uncertainty treatment, quantitative mismatch metrics, and out-of-sample or predictive validation.

Methods

The study used ArcGIS Pro with publicly sourced secondary data. National Land Cover Database vegetation was clipped to Los Angeles County and reclassified to isolate chaparral; Cal Fire perimeter and hazard-zone layers were overlaid for comparison. Precipitation data were summarized in Excel to illustrate recent wet/dry variability. The analysis is visual and descriptive rather than causal or predictive.

A stronger next design would add slope and topography, wind exposure, fuel moisture, temperature anomalies, humidity, urban form, and uncertainty; freeze every layer and coordinate transformation; reproduce all seven figures from a clean environment; and quantify the zone/perimeter mismatch before testing any dynamic model.

Zackary's role

Zackary authored the Geography 490 case study, framed the research questions, assembled the secondary data, conducted the ArcGIS analysis, produced the maps, and interpreted the spatial patterns. Final reuse of course, institutional, source, and map attribution requires a rights and citation audit.

AI and tool role

The source document records ArcGIS Pro and Excel as the principal analysis tools. It does not document a load-bearing AI role in the original study, so none is claimed. Later AI-assisted portfolio auditing identified reproducibility, factual-validation, and rights gaps; that audit does not validate the case study's substantive claims.

Verification

The source file and provenance record are preserved, but the director audit rates present reproducibility as low. Citations, factual claims, layer transformations, quantitative statements, and map rights remain unaudited. The slope, wind, fuel-moisture, temperature, humidity, uncertainty, predictive-validation, and reproducible-package components described as desirable are absent from the current artifact.

Exact nonclaims

The case does not provide a predictive wildfire model, a validated dynamic hazard map, causal attribution of the fires, or a quantified proof that official zones systematically fail. Visual overlap does not estimate risk, sensitivity, specificity, or policy impact. The work should not be represented as peer reviewed, operationally deployed, or ready for planning decisions.

Public artifacts

None yet. No approved public case study, data package, map set, or repository was found.

Employer relevance

The case demonstrates applied GIS, raster reclassification, spatial overlay, environmental-data synthesis, and the ability to turn a real planning problem into a testable next-stage research agenda. It is relevant to GIS, climate-risk, resilience, environmental analysis, and data-visualization roles—provided the portfolio foregrounds its current descriptive scope and revision plan.