# LECTURE #23: Wild Fire Hazards: Monitoring & Mitigation

#### Date: 14 April 2025

#### I. Course Information/Reminders:

- the class evaluations (the OMET's) are open and available now to all students if you would like to review the class, myself, and/or your TA
- I will talk a little about the final exam and the last recitation at the start of this lecture on Wednesday
- I will have normal office hours this week and next
  - o however, I will not be here for the final exam due to conference travel
  - $\circ$  the TAs will proctor the exam along with another professor filling in for me

## II. Final Exam

- Time and Date
  - o last day of finals: Wednesday, April 30<sup>th</sup> @ <u>8:00am</u> (have until 9:50am)
- same format as the mid-term exams
  - except a little longer (~75 questions)
    - better odds for you each question is only worth 1.33 points rather than 2.0 points
  - o material:
    - book chapters: 11 14 and 17 18
    - hurricanes, flooding (plus the video), wildfires, mega-disasters
    - weeks 12 16
  - o same rules as previous exams
    - don't show up later than 15 min!
    - bring a pencil, eraser, and a photo ID

#### III. Monitoring

- primarily: satellite remote sensing
  - thermally elevated regions (*hot spots*)
    - detection of active fires
  - o smoke plumes
  - previously burned areas
    - monitoring land conditions for increased hazard risk



- o weather and modeling
  → produce fire hazard maps
  - drought/dryness
  - lightning strikes
  - wind direction
  - humidity



- FireBugs
  - older technology
  - o small, wireless sensors used for adaptive data collection
    - GPS
    - detect temperature, pressure, humidity, light
    - on a finger-sized board equipped with a radio
      - dropped throughout a forest
      - or around houses
      - information is broadcast back to monitoring agencies
- FireALERT MK I
  - newer technology
  - self-contained system
  - scans 360 degrees with an infrared camera
  - solar powered

#### **IV. Mitigation: Poor Management Policies?**

- aggressive fire fighting
  - o increased fuel/forest density
  - less fire resistant trees and grasses
    - increased fire impact
- growing population and tourism
  - o increased development of the wildland/urban interface
    - more homes at risk
  - o public education/awareness
    - national campaigns
    - local community-based efforts
  - o however, risks have *increased* for large fires!
    - one of the few hazards where successful mitigation efforts have increased the future risk!

#### **Average Acres Burned** 1919-1930-1940-1950-1960-1970-1980-1990-

# Average Number of Acres Burned By Decade





- effects of wildland fire management on U.S. Forest Service budget
  - suppression costs have skyrocketed
    - exceeding \$1 billion in five of the last seven years
    - USFS non-fire budget has declined over 35% since FY2001
    - wildland fire management activities
      - > 13% of the agency's budget in fiscal year 1991
        - ➢ 48% in fiscal year 2009
      - $\succ$  more than 65% now

# V. Urban-Wildland Interface

- population shifts in the US over the past 40 years to more fire-prone states
- building of homes/towns in dangerous locations for fires
- other notes:

- building practices
  - can reduce the risk of increased fire damage/destruction to a structure in the path of a wildfire
  - e.g., do not build in fire-prone areas
    - not always easy to prevent
      - Iarge numbers of people moving into mountainous, forested areas
      - Iarge wildfires that move into already existing urban regions
      - <u>example:</u> Camp Fire (Paradise, CA)
  - o customize an existing structure to reduce threat:
    - remove vegetation close to home
    - avoid wood shingle roofs
    - avoid large wooden decks
    - use double-pane windows to help insulate
    - do not build on steep slopes
    - provide wide roads for fire vehicles
  - o other questions (FEMA website: <u>https://usfa.fema.gov/</u>)
    - Are combustible materials away from the house? → why?
    - Are sun decks and porches enclosed underneath? → why?
    - Are house vents covered with wire mesh? → why?
    - Are chimneys and stovepipes covered with spark arrestors?  $\rightarrow$  why?
- firefighting practices
  - building protection
    - water, fire retardant, spark inhibitor material



Use in higher fire hazard potential

- $\circ$  fire breaks
  - mechanical
  - using controlled fire burns

water and fire retardant

from land and air



Use in lower hazard potential



fire breaks



fire retardant air drop



selective removal of trees

extinguish the fire

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- remove fuel build-up
  - controlled burns
  - physical removal
  - prevents insect invasion

- $\circ$  reducing the risk
  - fire is an important part of natural ecosystem
    - ➢ reduces fuel
    - ➤ thins trees
    - reduces disease

## VI. Future?

- there have been more fires over time
- those fires have been larger
- only 11% of the Western US has burned
- these fires will have a large impact on the future economy and people's lives



Future (2040 - 2070)