(A)

— DAVID SEP [?] FIRE ECOLOGY &
PRESENTATION REMOTE SENSING
FEB 13, 2020

WILDFIRES 2000'S > 72000 FIRES OVER
7 million acres
LESS FIRES, GETTING BIGGER IN AREA
1960 – PRESENT — MOST ACRES BURNED
IN THE LAST
5 YEARS
INCREASING AREA
OVER TIME

FIRE CONDITIONS 2014 – 2018
FUEL, TOPOGRAPHY, CLIMATE
IGNITION SOURCES: HUMANS 88%
NATURAL: LIGHTNING, VOLCANIC ERUPTION
12%
NATURAL FIRES — LARGE FIRES IN REMOTE
AREAS

GEOGRAPHY OF U.S. WILD FIRES
MAJORITY EASTERN US
SMALLER FIRES
LARGEST FIRES IN WESTERN U.S.
WESTERN FED LANDS = MOST ACREAGE BURNED

Types of Fires

Ground fires

Surface fires

Canopy fires — most intensity, difficult to suppress

↓ air driven & hot

GIScience & Wild fire Research

- fire modeling & mapping
- Risk & Hazard
- Detection & Mapping
- Burn Assessment
- Veg Recovery

Mapping fire Sources

Satellite imagery → models

Hazard = prob. of ignition event

Risk = Socioeconomic loss

Multicriteria modeling

Simulation Model

fuel data + weather data

Model Simulations

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fire Detection & Monitoring = Satellite RS

Thermal IR band

Avhrr, Modis, Viirs, Goes 16, MSG Sevir — 1/day

250 m pixel resolution

Geostationary vs. orbital satellites (1)

↓ Himawari – 10 min update

Goes – 30 min update

Burned Area Mapping

- Modis Gas emission
- Burn severity

NASA fire mapping system

Risk – cost mapping

Satellite Processing

Near IR band

Emissivity / physics

Image Processing

Image classification → Land cover category

- Vegetation index
- Spectral mixture analysis

NDVI – greeness index

CASE STUDY

Relationship between Fire Weather Conditions vs. Post-Fire Burn Severity

GRAND TETON NP

139,000 ha

Berry Fire 2016
South of Yellowstone

Methodology: Multicriteria evaluation
- Boolean Statement T/F
  - Raster data → commonly used with vector data
- Weighted linear combination use raster datasets

Raster data layers
Likelihood analysis → Map algebra

Factor weighted

Sentinel 2 imagery - sensor system (European Space Agency)
Cloud free [illegible] date
Dems

NDMI CALCULATION (5)

NORMALIZED DIFFERENCE MOISTURE INDEX

USGS DEM 30m DEM, SLOPE, ASPECT

→ SLOPE & ASPECT

NPS - NP PARK INFRASTRUCTURE DATA

FIRE BEHAVIOR MODEL

→ FUEL TYPES + LAND COVER

< MOISTURE > HAZARD

< DIST TO STRUCT > HAZARD

SOUTH SLOPES UPSLOPE

< ELEV > HAZARD

> SLOPE > HAZARD

SOUTH SLOPES < MOISTURE > HAZARD

RECLASSIFICATION = HAZARD MAP CLASSIFICATION

WEIGHTED HAZARD RANKINGS

RASTER MAP ALGEBRA - ARC GIS

NORMALIZE DATA 0 → 1

LOW HIGH

(f)

Comparison of Hazard Map

to Burn Severity Map

Most Severity Burn ≥ Hazard High

Low Severity Burn ≥ Low Hazard

Any Experience or Knowledge with using LiDAR Estimate Biomass, Forest Canopy Composition & ~~Wild~~ Fire Potential?

Any Experience with LiDAR provision in general?

GIS Computers

- Applications
- all Dept Revenue
- Quantum Spatial OR Ag Dept

OPC

NOT ESRI/geology specific

Need a mix of current applications

Techniques Example for Field Calibration & Ground Truthing of RS/GIS based models?

How Done?

- Veg field sampling
- Field Surveys
- Drone Surveys?
- Low Altitude

Who are some of the Key owners of the primary R.S. Satellite Sensing Devices used in Industry?