Climate Change, Forest Fire, and Air Quality

A DSS Approach

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Context

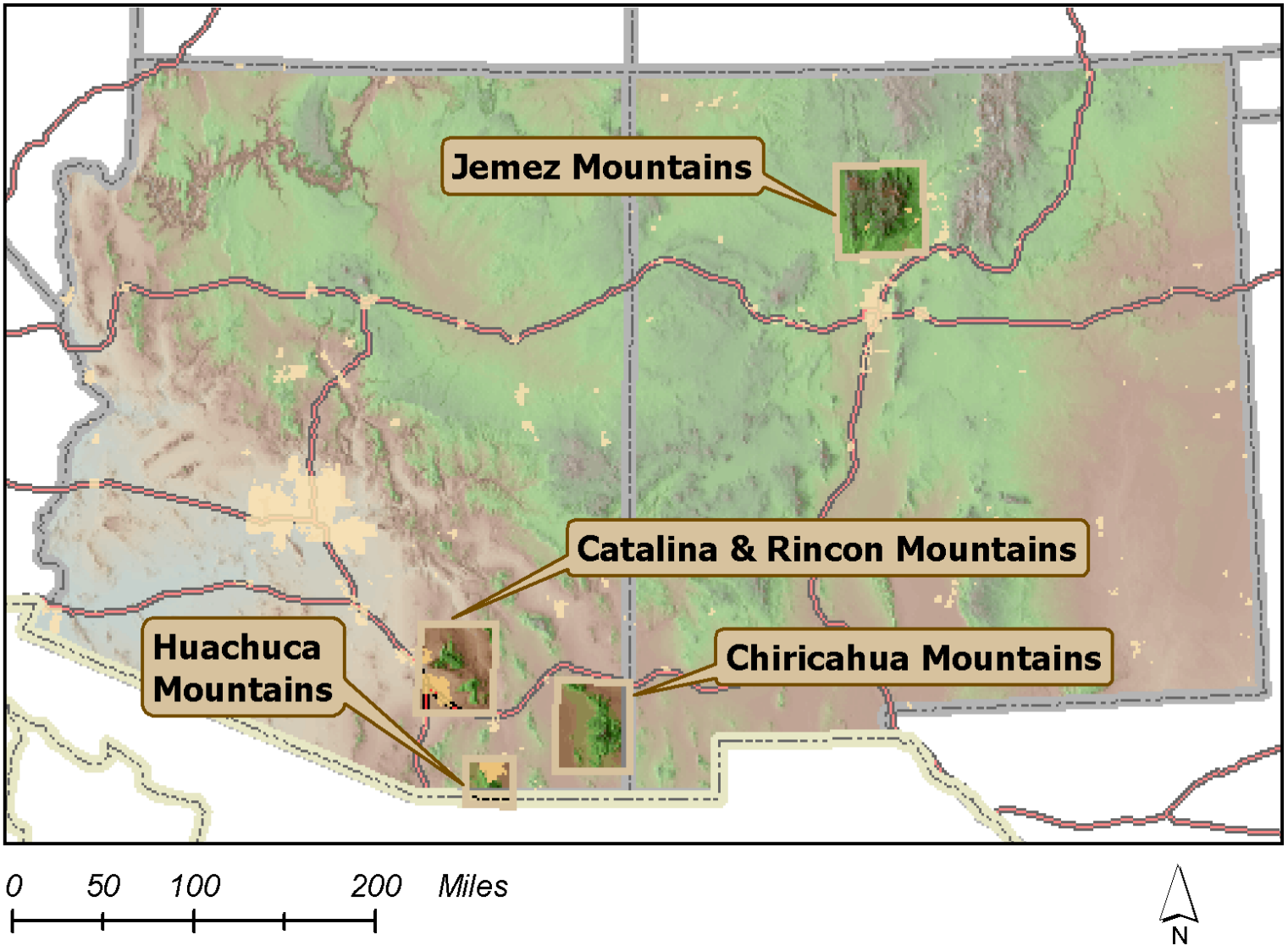
- High levels of fire activity and fire risk
  - >8 million acres have burned this year
- Increased fire suppression costs
  - Billion-dollar fires in 3 of past 4 years
- Increased complexity of decision contexts
  - Concerns about air quality
    - Fire use issues
    - Wildfire impacts

Climate in the US Southwest

- High annual & inter-annual variability (ENSO)
- Climate change: Things are getting hotter...
  - Increase of 1.8-2.5 degrees Fahrenheit since 1976
  - Greater temperature changes projected
  - Precipitation change less certain, *but*
  - Higher evapotranspiration = less available water
- More extreme events: droughts, tropical storms, flooding
- Ecological transformation

Santa Catalina Mountains

- Santa Catalina Mountains
  - North edge of Tucson
  - Large fires in 2002 and 2003
    - ~40% of land within fire perimeters torched
  - Fire-adapted ecosystems
    - Natural fire return interval = 10 years
  - Fire suppression has thrown this out of whack
  - Climate is an important factor
    - When can fire be used and when not?


Jemez Mountains
Catalina & Rincon Mountains
Huachuca Mountains
Chiricahua Mountains
0 50 100 200 Miles
N

Managing for Fire Risk in the Santa Catalina Mountains

- Very large unburned area still exists
  - High fire hazard
- Where burned, regrowth is occurring
  - Need to keep risk low
- Need landscape-scale fire use
  - Fires of 100,000+ acres in size

Fire Use Issues - Climate

- Climate change – narrows window of opportunity
  - Even greater reason to increase fire use now
    - Sustain existing forests as long as possible
    - Where unavoidable, take proactive measures to achieve smooth transition to new state
- Climate variability – complicates decision
  - In SW, beware of wet winter 1-2 years before, followed by dry and hot pre-summer weather

What about Smoke?

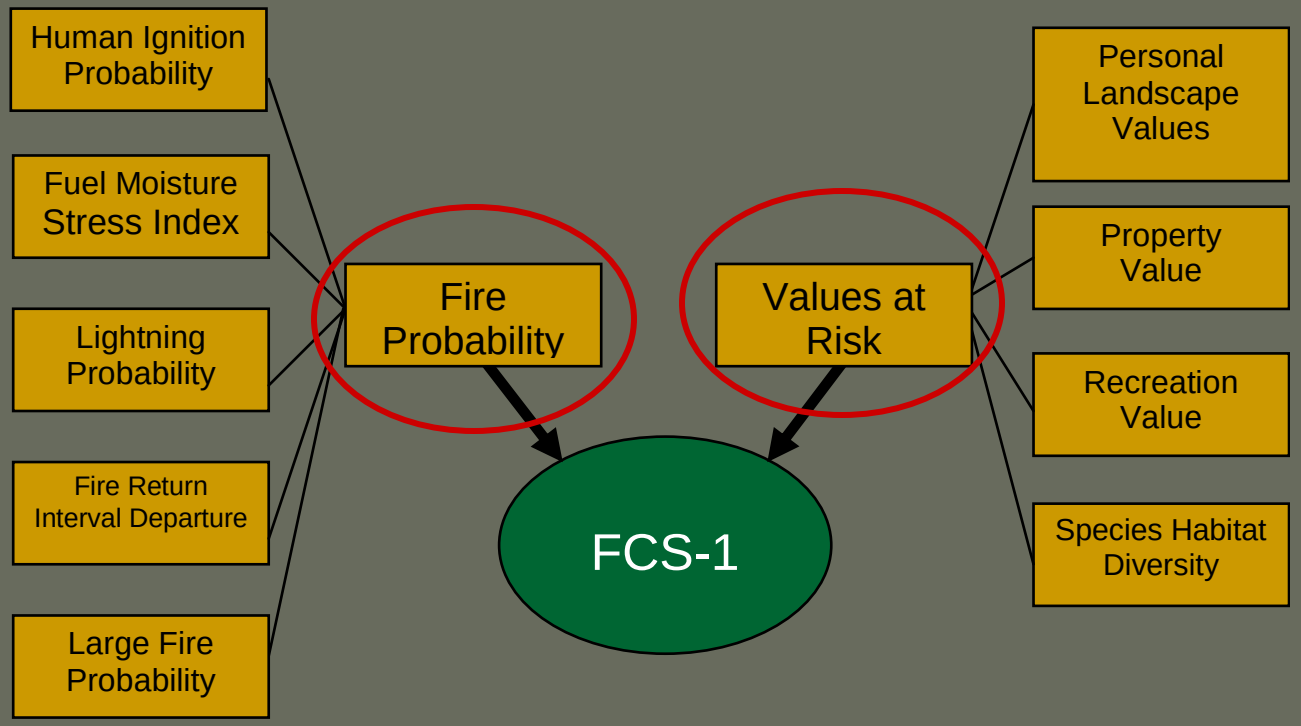
- High level of urban-wildland intermix
- Resistance to fire use policies
  - Health concerns
  - Fear of escaped fire
- Decision support tools may facilitate dialogue between managers and public

Wildfire ALTERnatives (WALTER)

- 4 decision tools
  - Animated vegetation greenness maps (NDVI-AVHRR)
  - Climate scenario tool
  - Interactive fire policy pages
  - FCS-1 GIS model

http://walter.arizona.edu

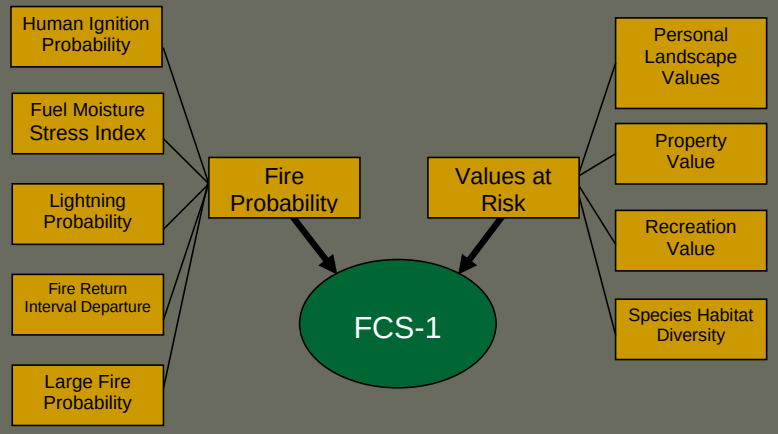
FCS-1 Decision Tool (GIS-based; Web-based)



User-Centered Approach

- Select climate scenario
- Decide the relative importance of the components
- Run the model

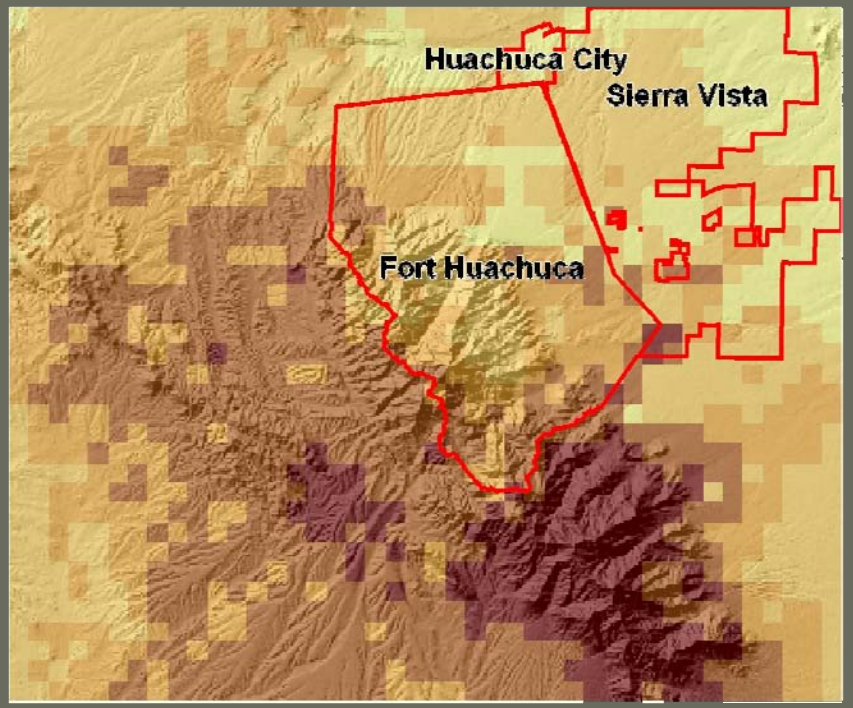
- Analytic Hierarchy Process (AHP)
  - Pair-wise comparison of submodel components
  - Pair-wise comparison of submodels



Example of Map Output

- Fire Probability: .333
  - Human Factors of Fire Ignition: .139
  - Fuel Moisture Scores: .399
  - Lightning: .205
  - FRID: .054
  - Vegetation Type Hazard: .203

- Values at Risk: .667
  - Personal Landscape Values: .307
  - Recreation: .175
  - Species Diversity: .135
  - Property Value: .383



WALTER Advantages

- WALTER web site
  - Designed to accommodate multiple forms of content and expertise
  - Designed to run on most computers
- Web-based FCS model
  - Allows exploring alternatives
  - Provides resolution at landscape scale
  - Integrates a range of human values
  - Provides expert and public access
    - Offers opportunities to compare outputs
  - System architecture allows expansion, addition of new functions: **air quality/climate var. & change**

Thank you!