

Anticipating Surprise: Better approximately right than exactly wrong

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Geodesign Summit, Lightning Talk. Esri Headquarters, Redlands, CA



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Southern Willamette Study Area



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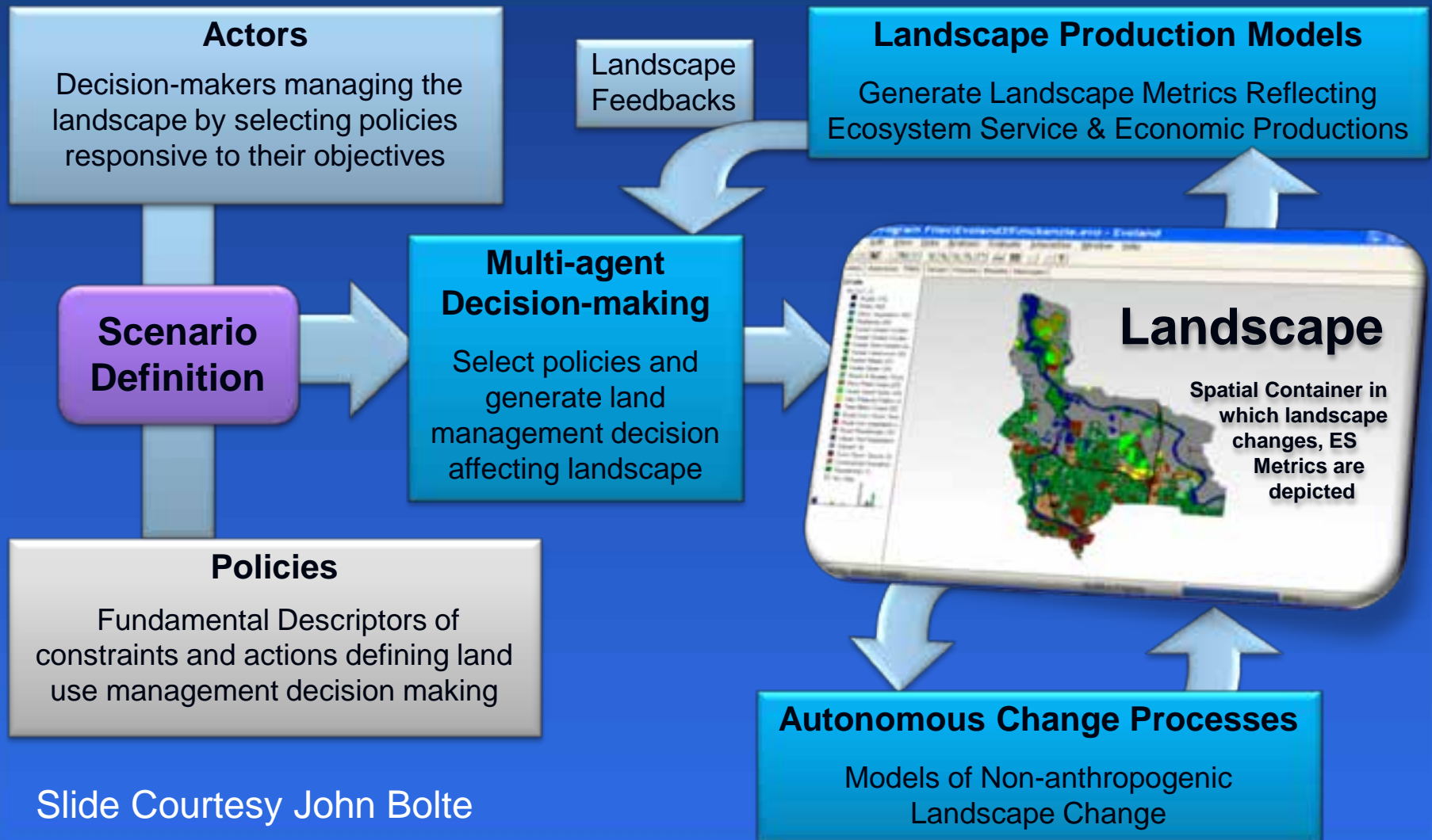


Over the next 50 years, what If:

- Climate impacts on Willamette Valley wildfire and vegetation are high v. relatively attenuated?
- Oregon's land use planning regulations remain intact v. are substantially relaxed?
- Private landowners attempt to manage wildfire hazard through conventional thinning v. restoration of oak and prairie ecosystems?



Conceptual Structure of Envision – An Agent-based Model



Slide Courtesy John Bolte

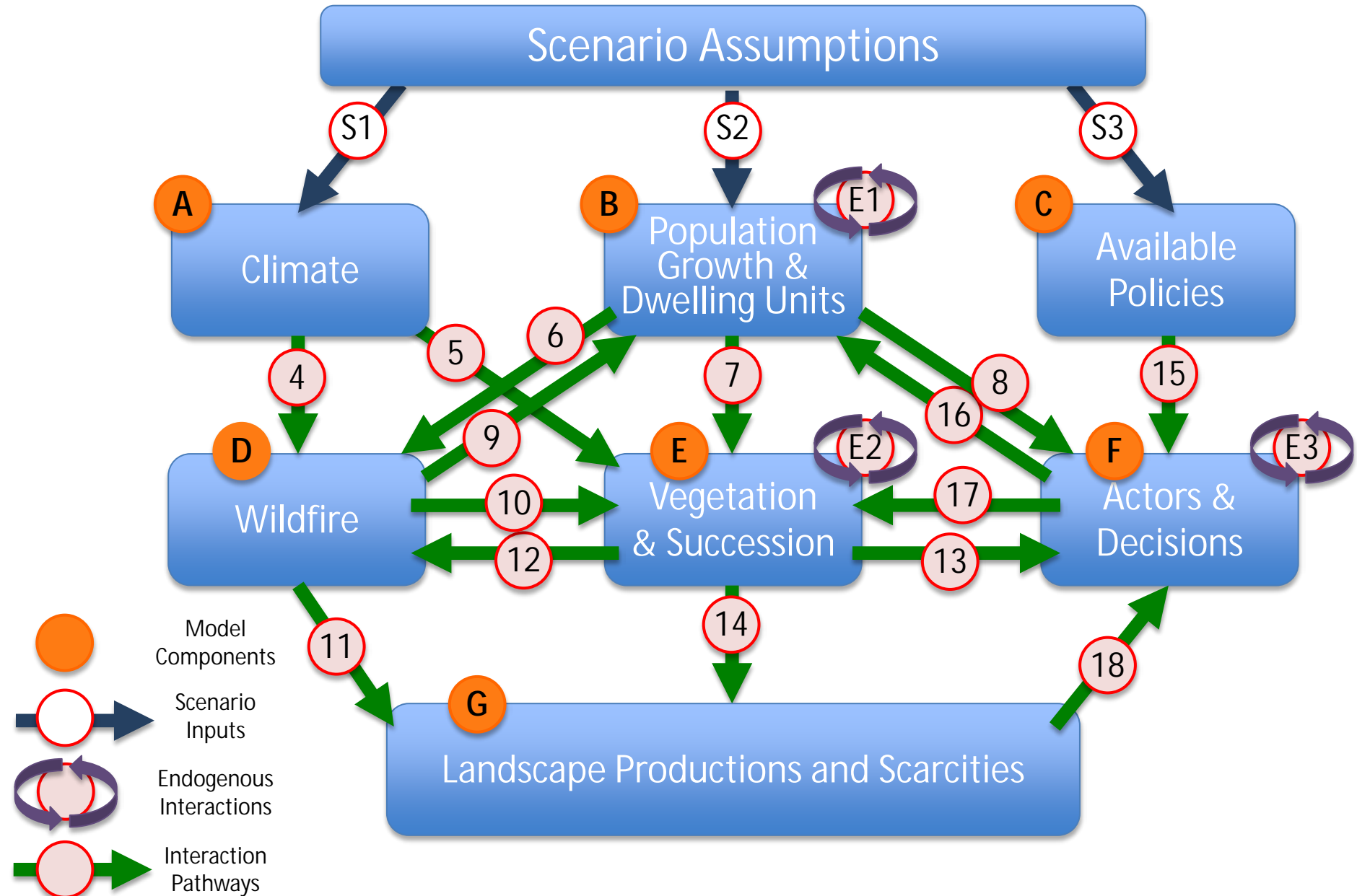
CNH Project Eugene Study Area Agent Classes

- Rural Residents (n=2406)
- Hobby Farmers (n=2718)
- Farmers (n=1836)
- Foresters (n=1386)
- Estates (n=61)
- Small Parcels (<2ac; n=8114)

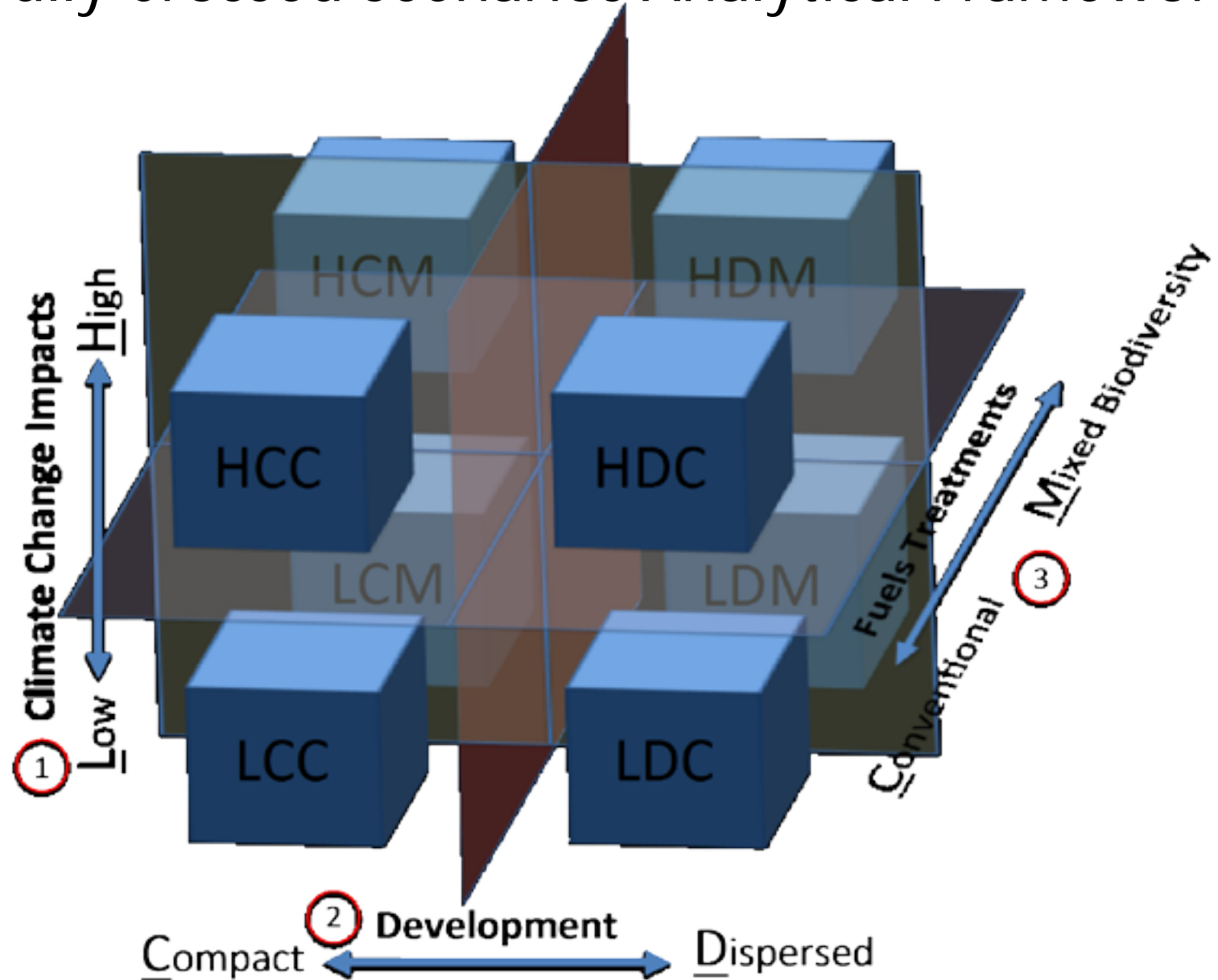
Eugene-Springfield
Metropolitan Area



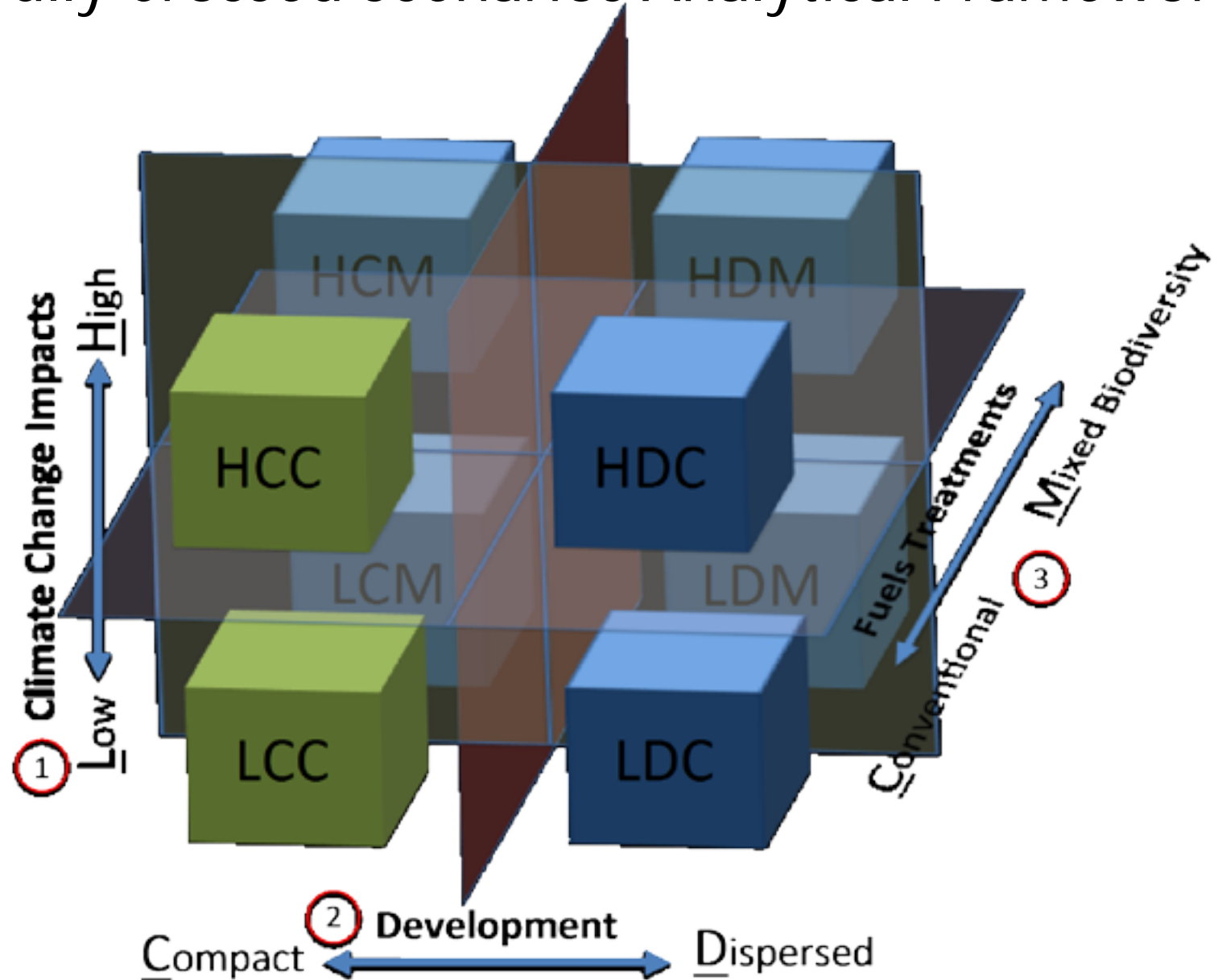
Envision Coupled Human & Natural Systems Model Structure



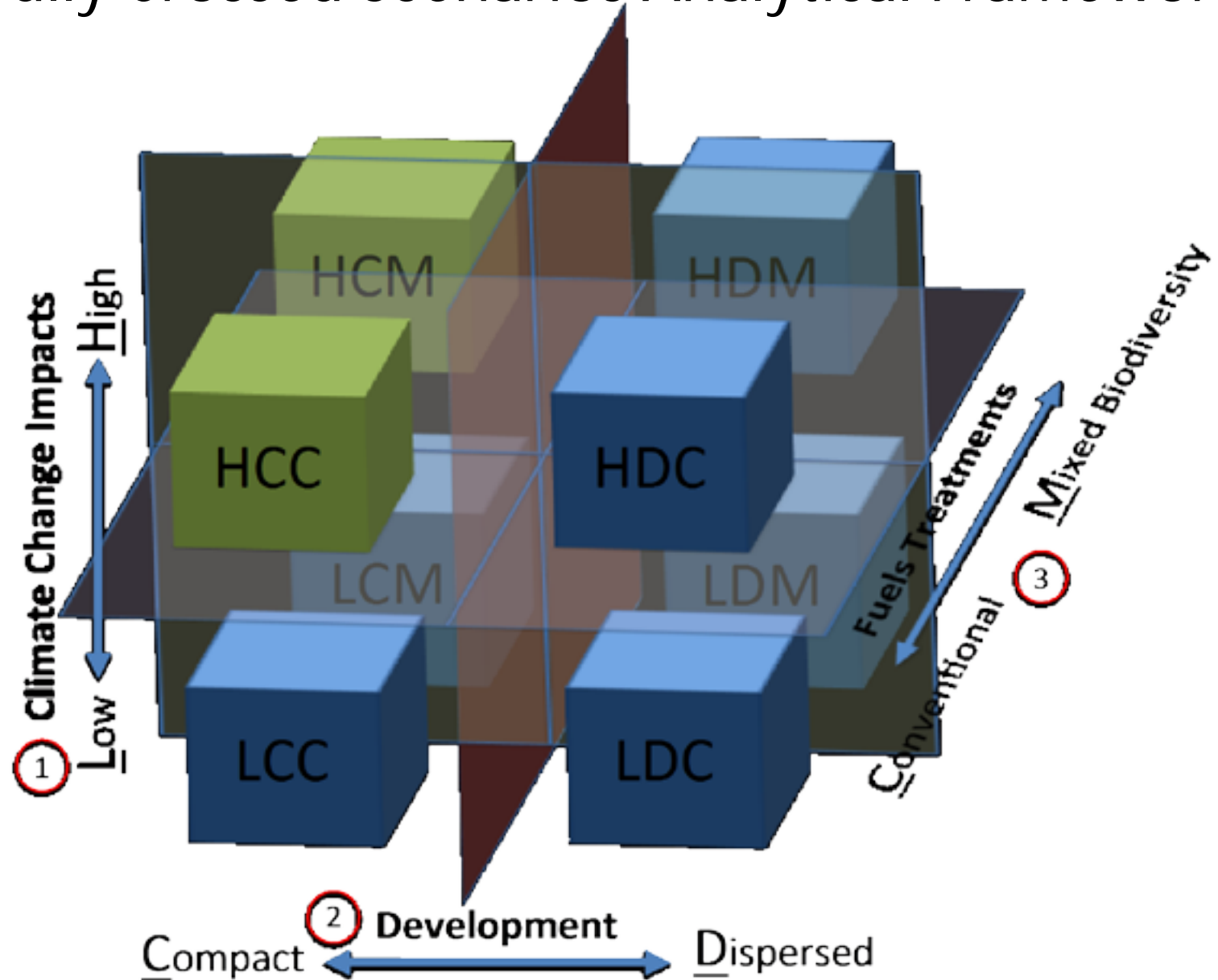
Fully Crossed Scenarios Analytical Framework



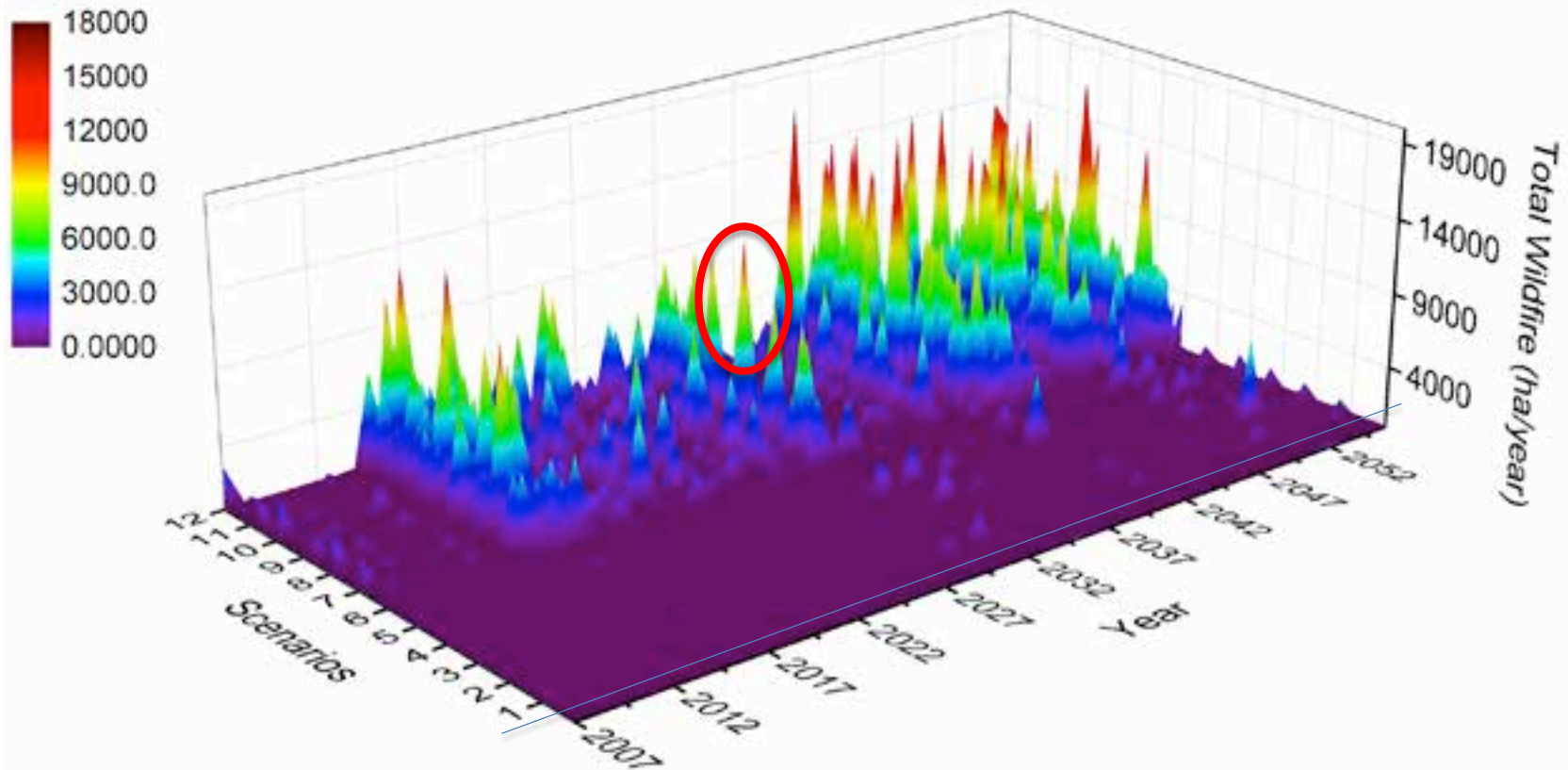
Fully Crossed Scenarios Analytical Framework



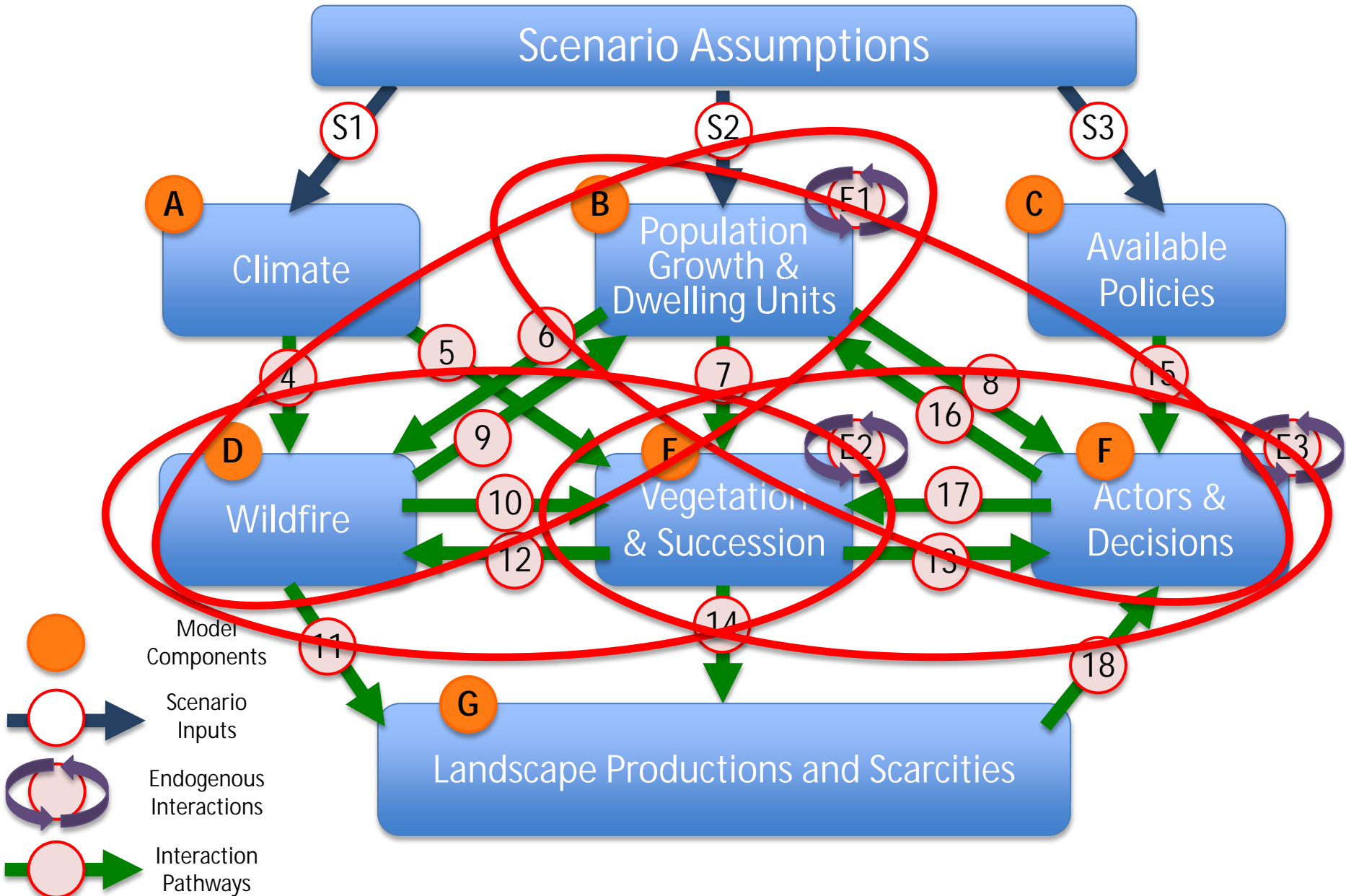
Fully Crossed Scenarios Analytical Framework



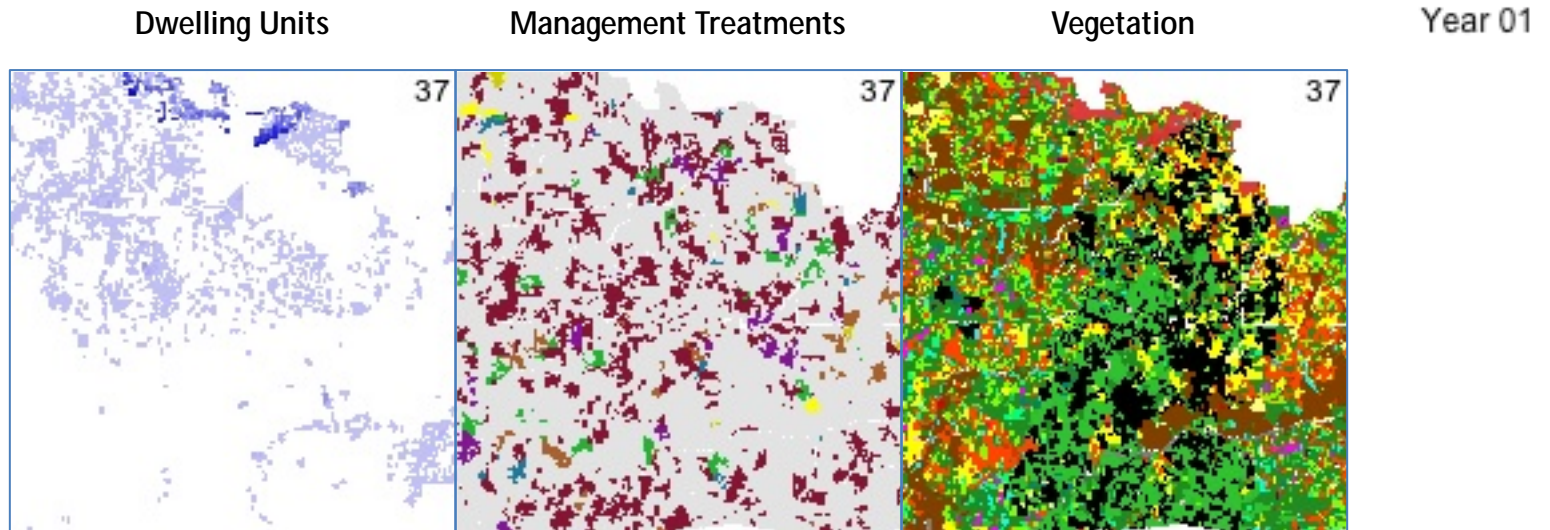
Total Area Wildfire/Year – 600 alternative futures



Envision Coupled Human & Natural Systems Model Structure



Interactions and Feedbacks: Development, Management, Succession and Wildfire

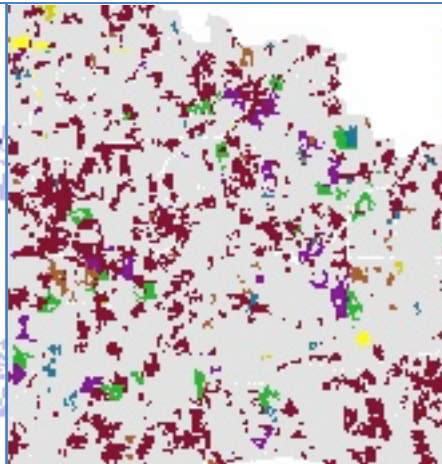


Interactions and Feedbacks: Development, Management, Succession and Wildfire

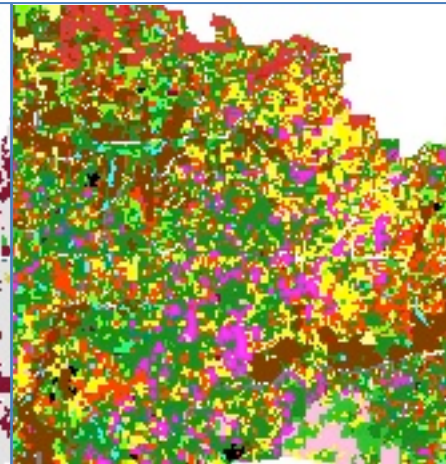
Dwelling Units



Management Treatments

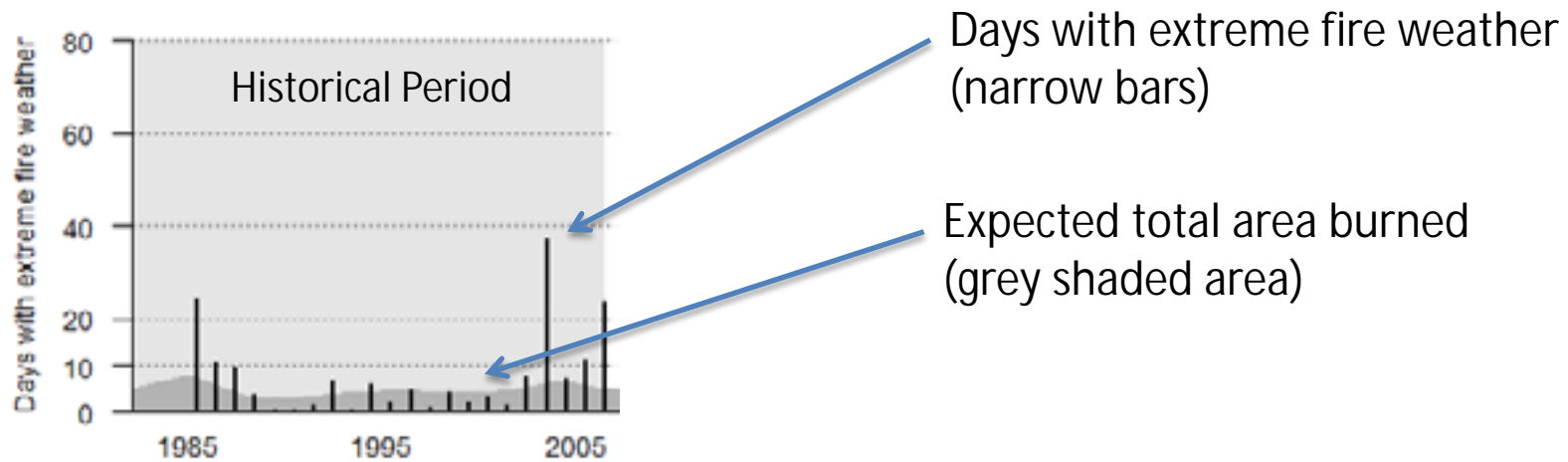


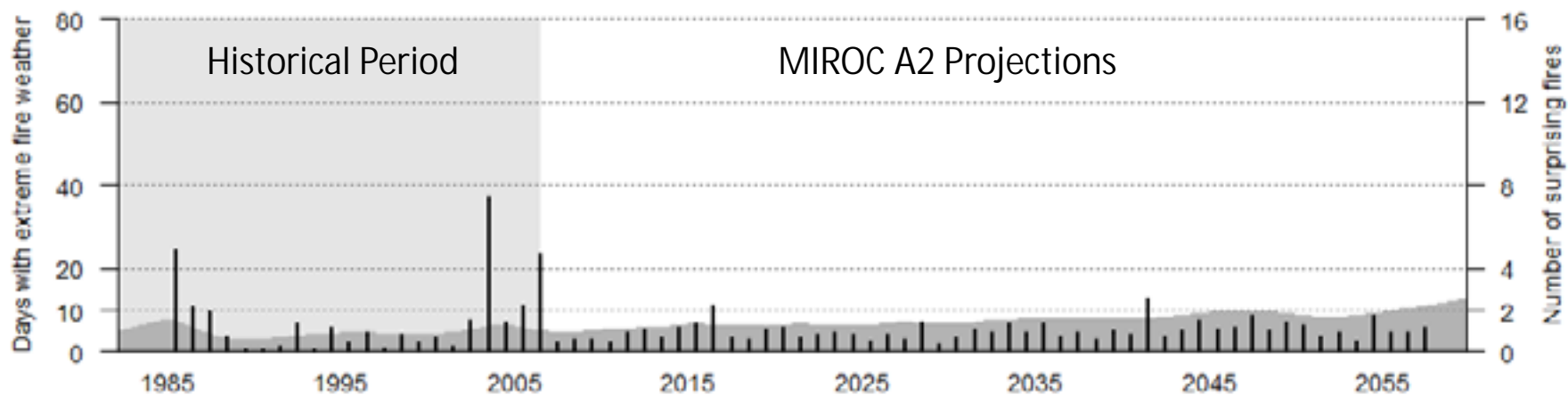
Vegetation

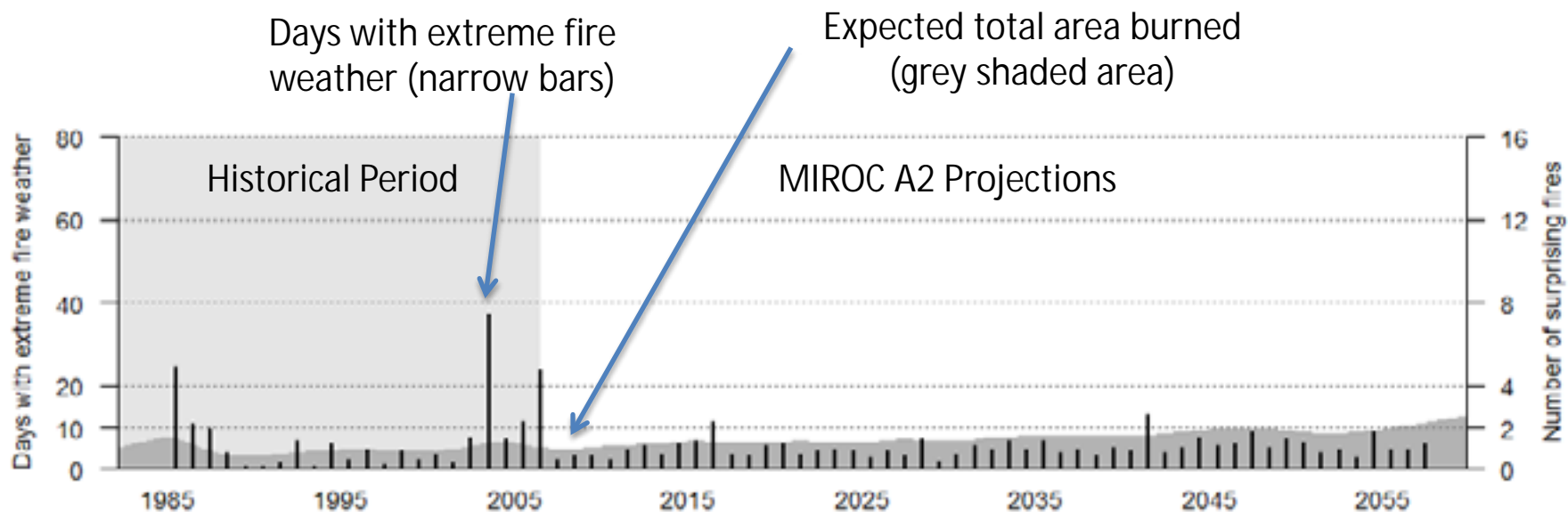


Year 37

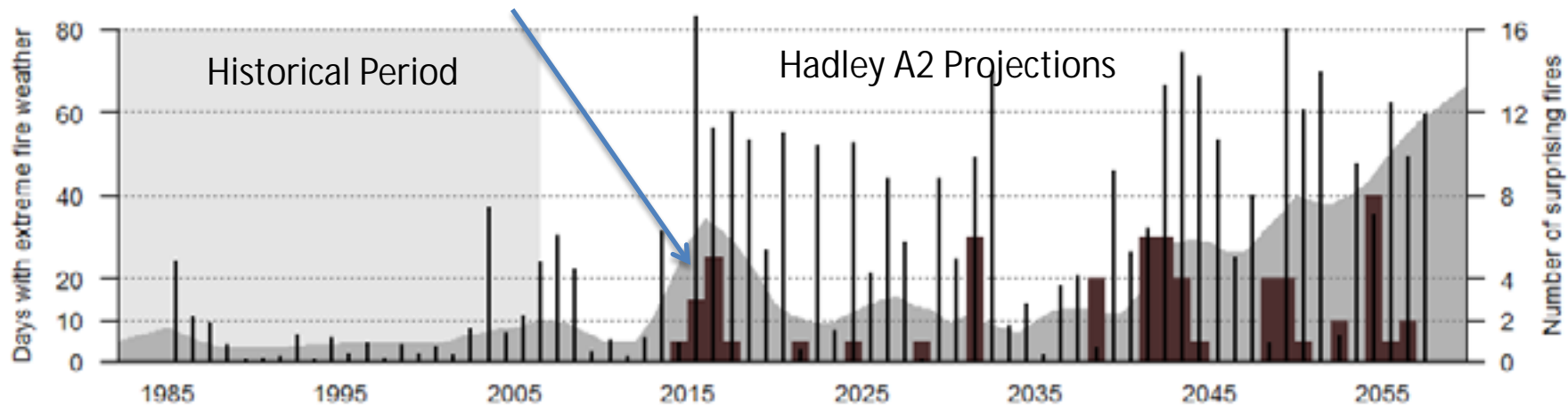






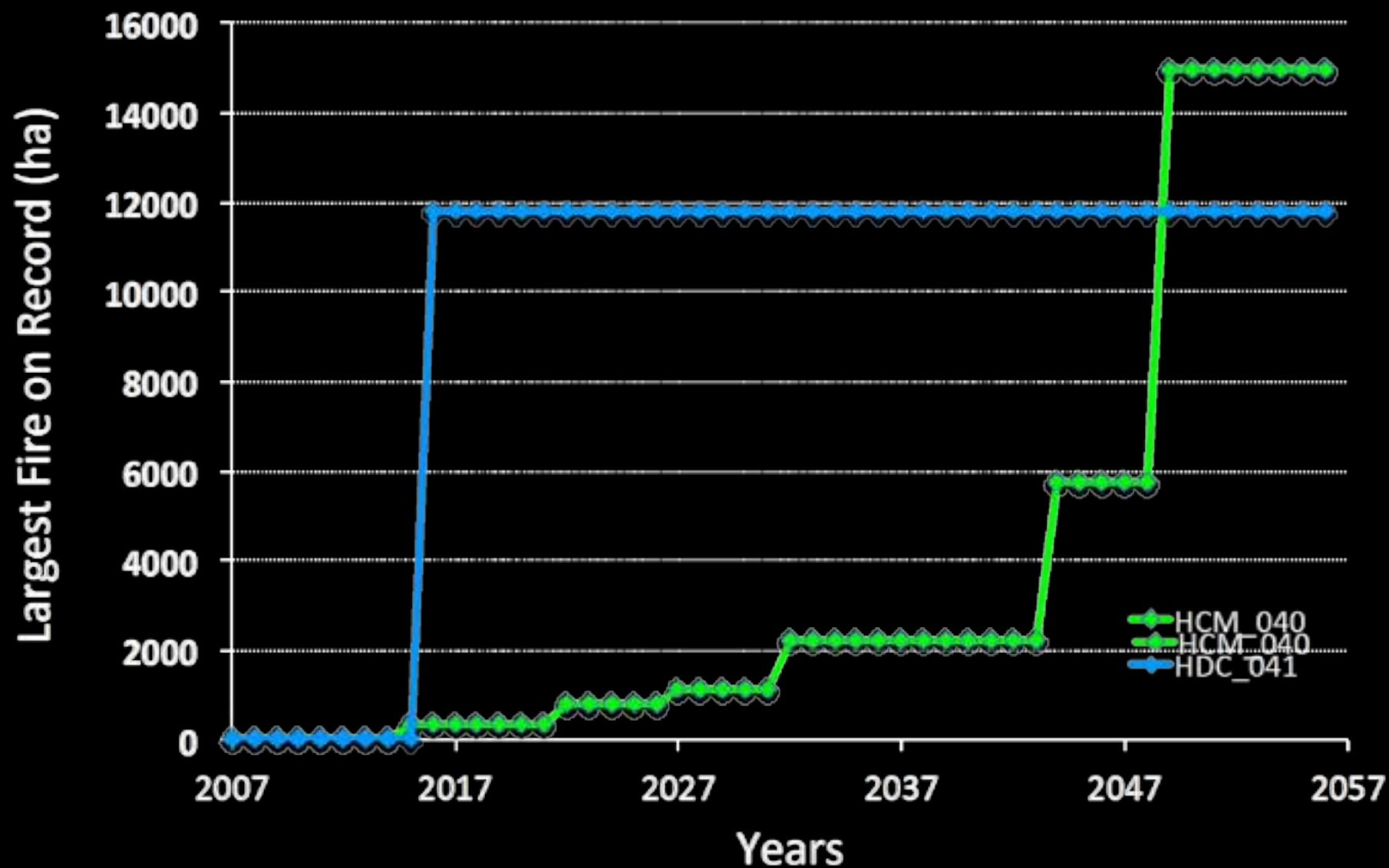


Number of fires >6,000 ha in 200 Hadley simulation runs



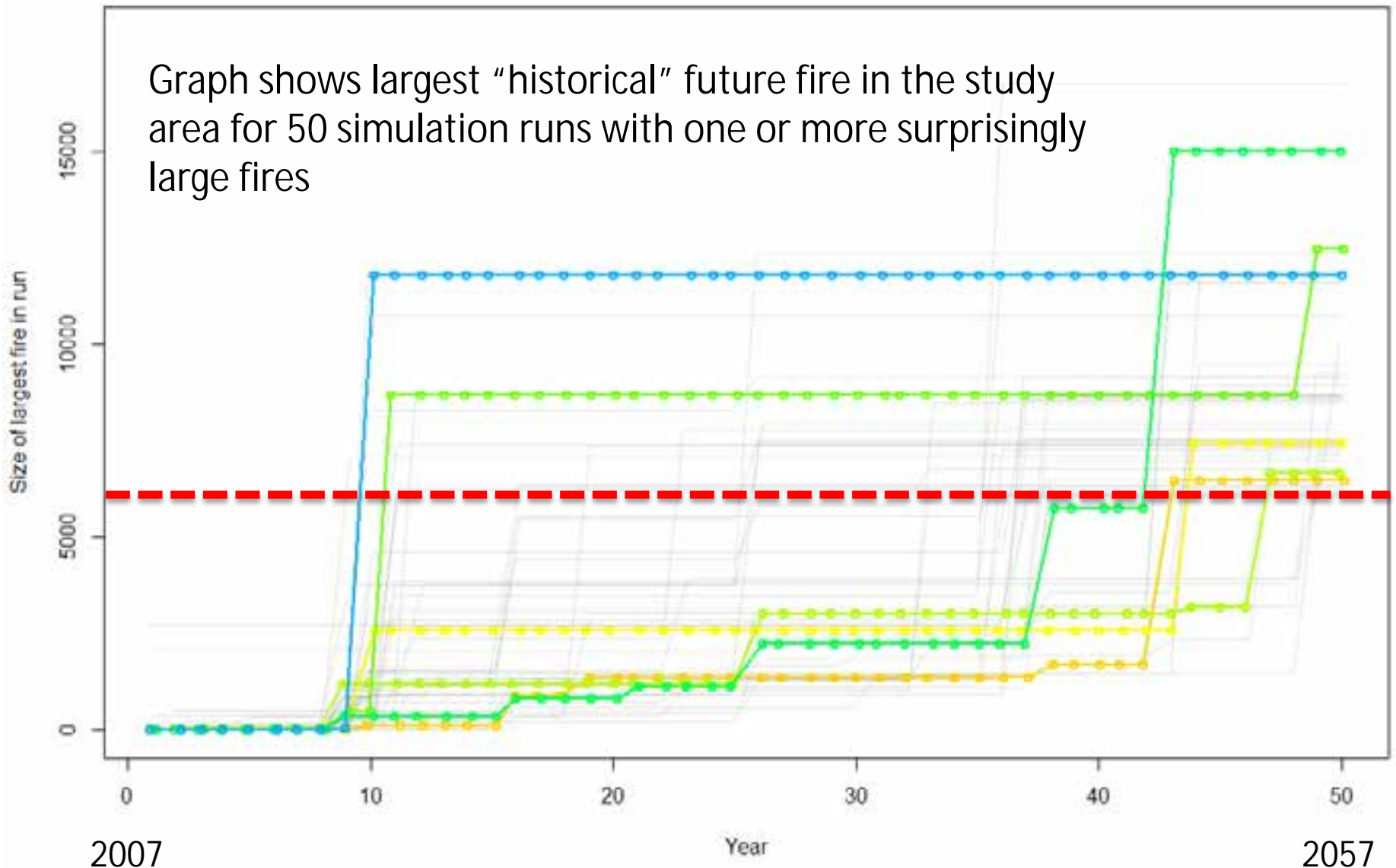
“surprising” fires were defined as those larger than any experienced in 1,000,000 ha of land similar to the 80,000 ha study area in the last 50 years

Anticipating Large Fires

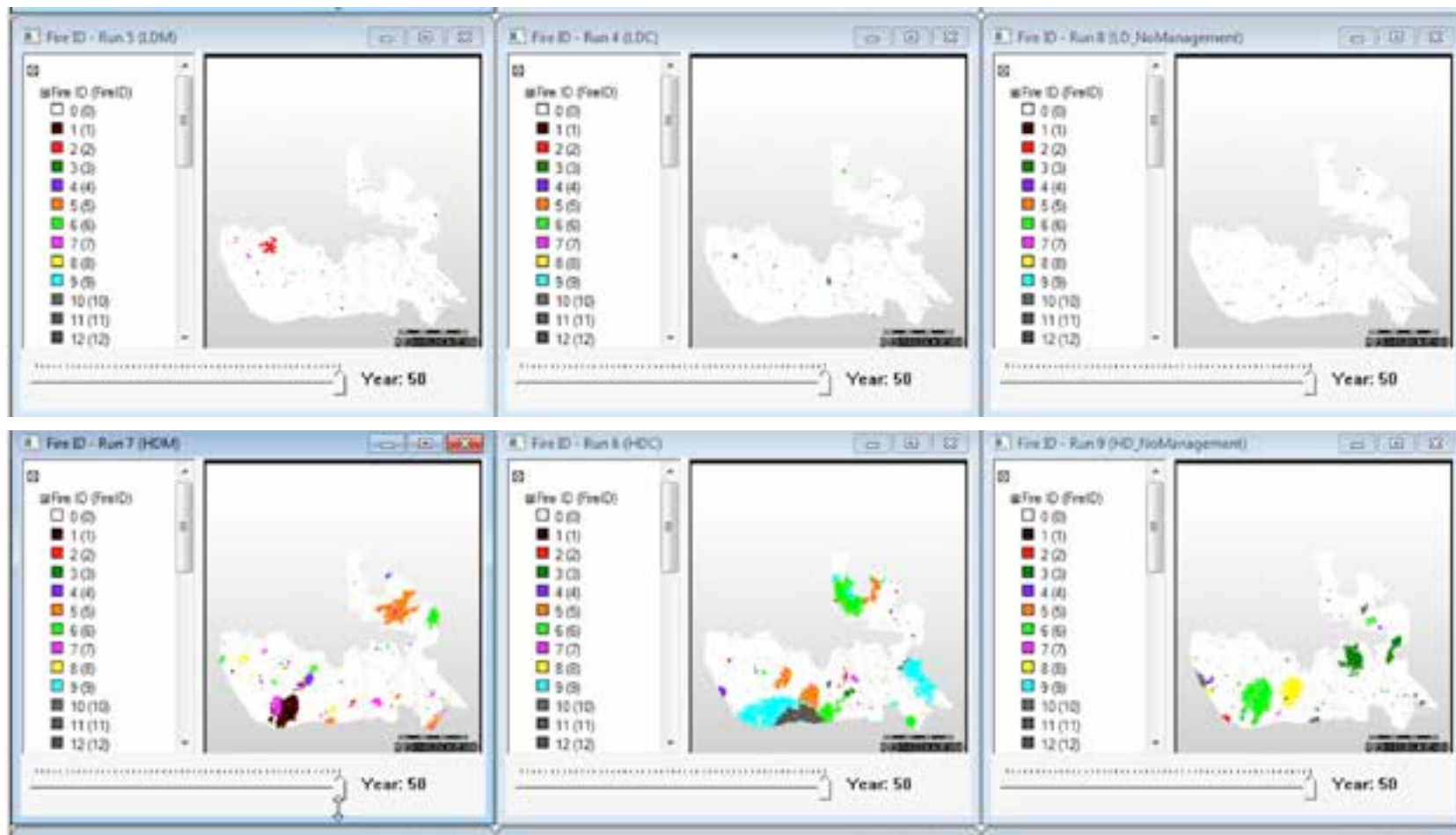


Associating different courses of actions with different types and likelihoods of surprise

Graph shows largest “historical” future fire in the study area for 50 simulation runs with one or more surprisingly large fires



Large uncertainty in future climate creates challenges for managing wildfire risk



MIROC
A2
scenario
runs

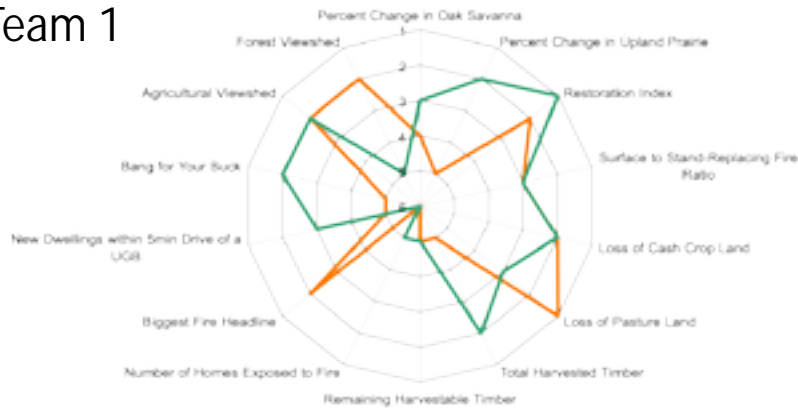
Hadley A2
scenario
runs

Images show simulated fire footprints from 2007-2057
in 81,000 ha rural study area outside Eugene-Springfield, OR metropolitan area

Education

Ranked results of achieving different livability metrics

Team 1



Team 5



- Assessing tradeoffs, risk and uncertainty
- Thinking probabilistically
- A design and planning software that “talks back”

Key lessons for anticipating surprise

- Exploring the dimensions of surprise - what, when, where, how and why
- Wait and see v. act now
- Brings focus to links between actions, uncertainty, risks and tradeoffs
- Modeling as a problem solver v. problem generator
- Thinking probabilistically
- Catalyzing action?



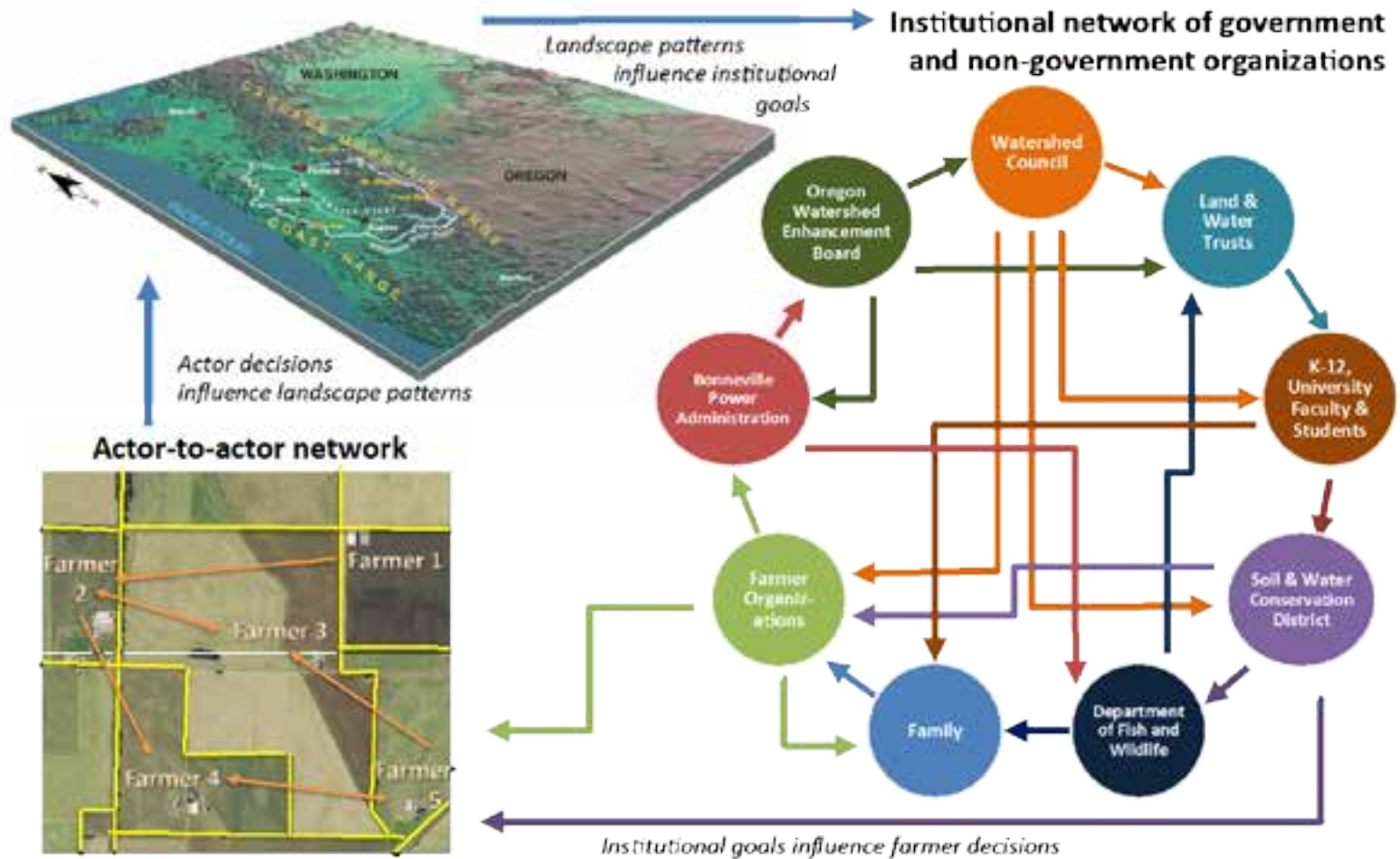


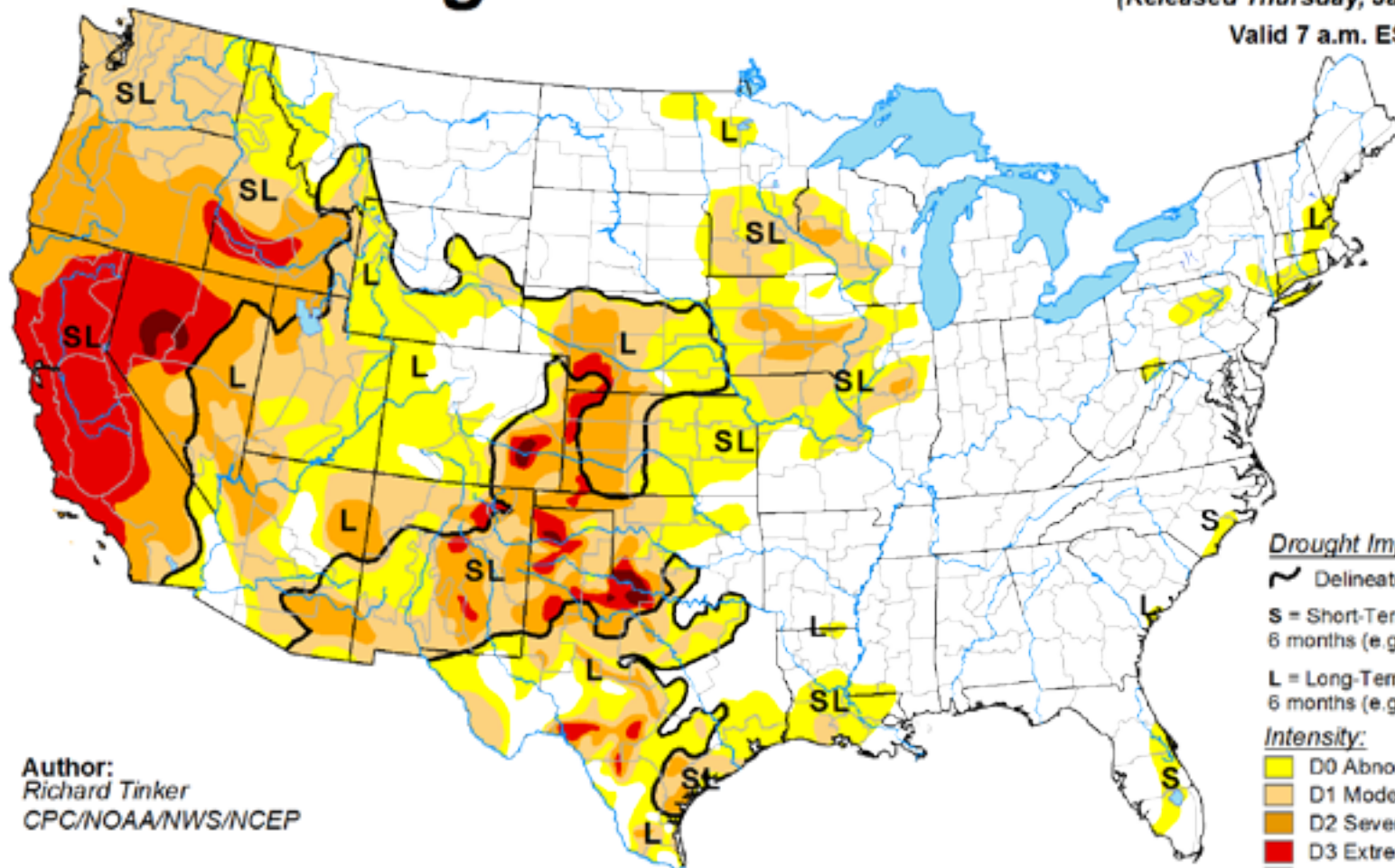
Figure 3. Conceptual diagram of network topology and signal propagation for both actor-to-actor and institutional social networks

U.S. Drought Monitor

January 21, 2014

(Released Thursday, Jan. 23, 2014)

Valid 7 a.m. EST



Author:
Richard Tinker
CPC/NOAA/NWS/NCEP

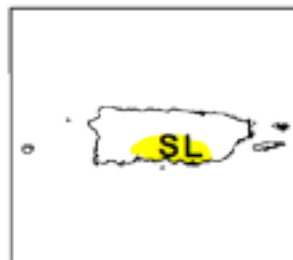
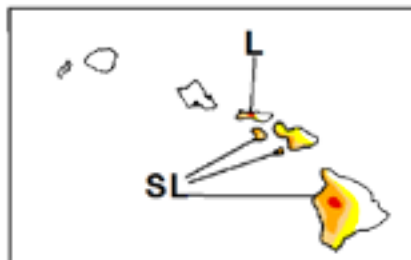
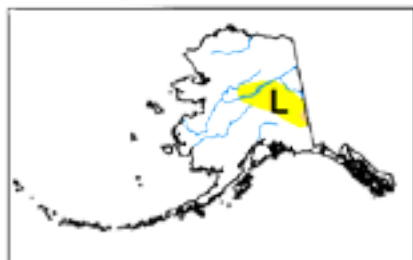
Drought Impact Types:

- ~ Delineates dominant impacts
- S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

Initial forest type

- Non-oak forest
- Forest with oak
- Non-forest

Treatment type and intensity

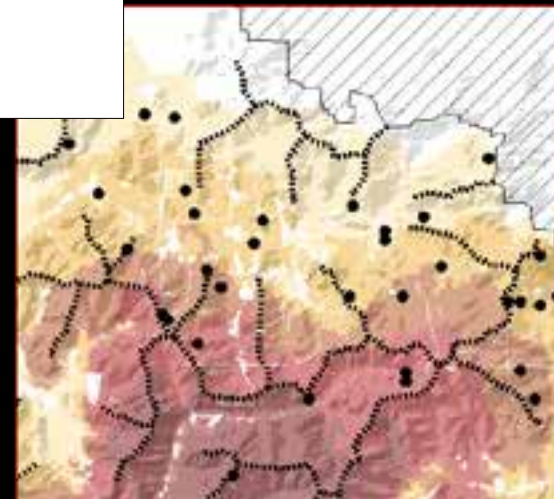
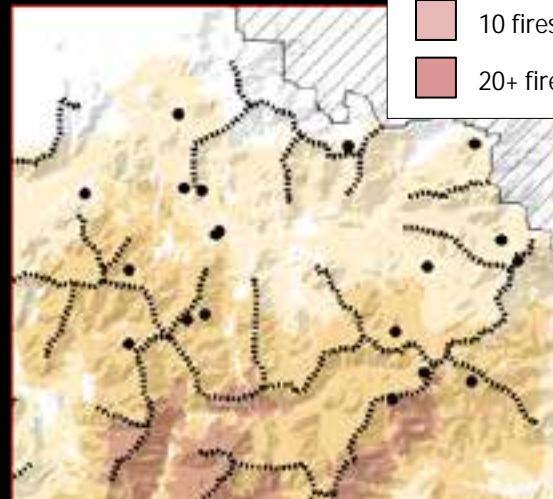
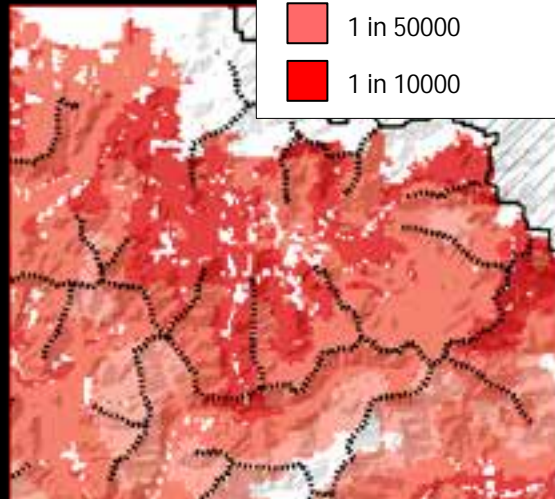
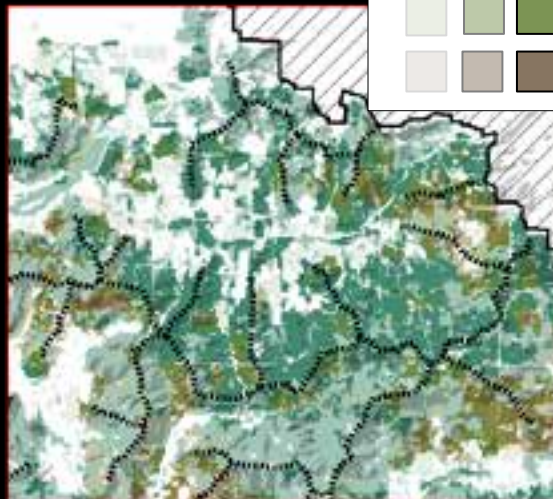
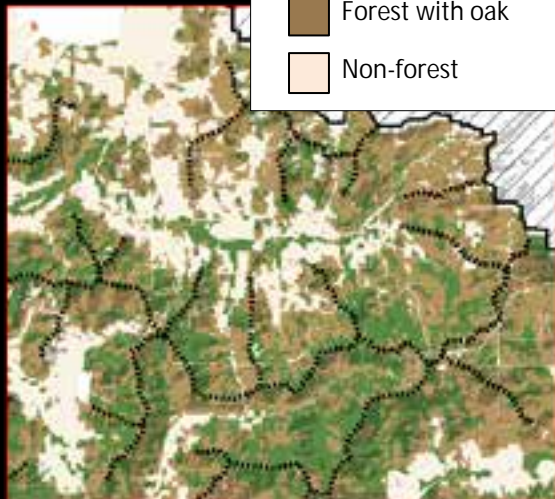
- 80%+ conventional treatment
- 50/50 mix
- 80%+ oak restoration

Initial ignition probability

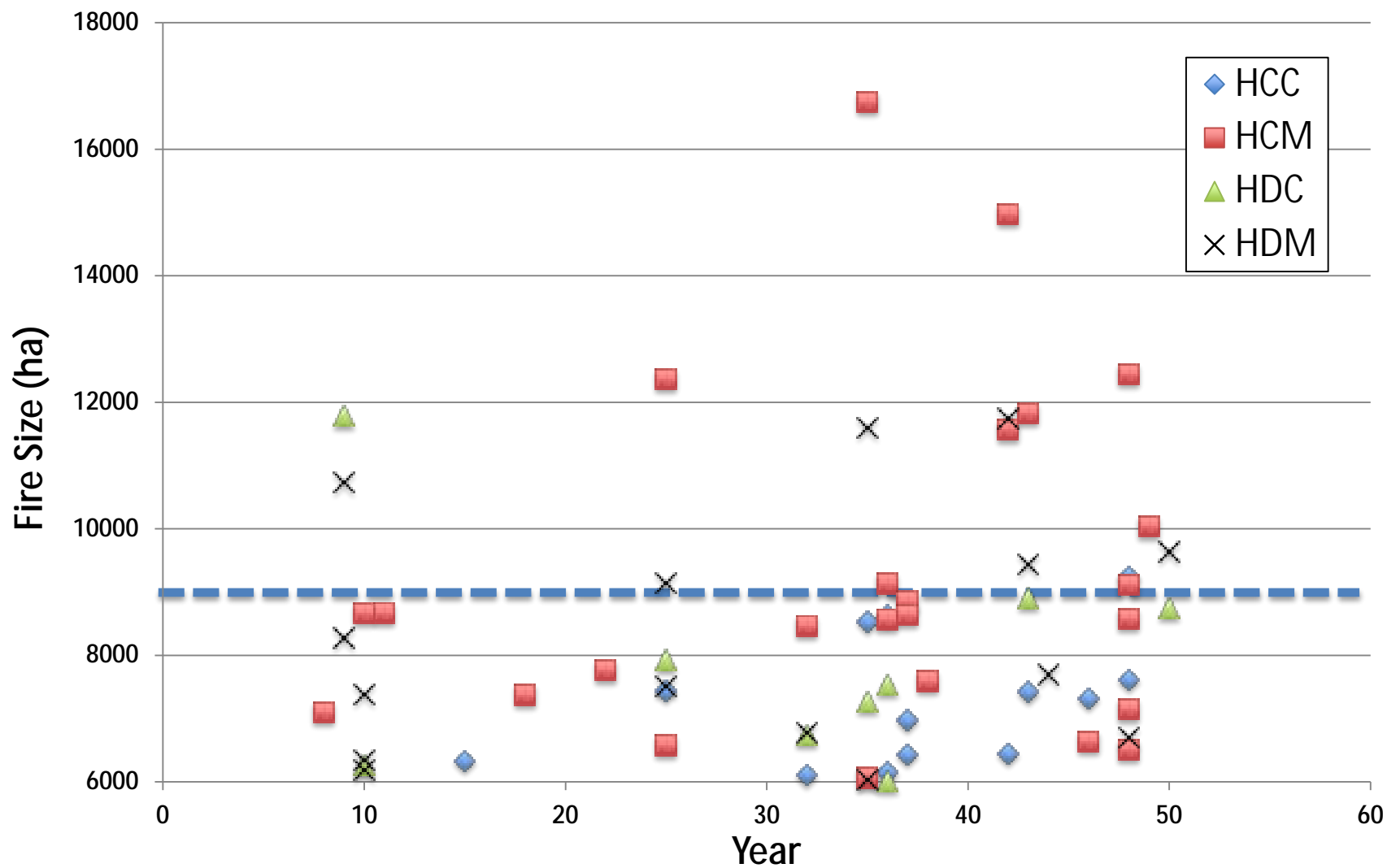
- 1 in 100000
- 1 in 50000
- 1 in 10000

Large fire count

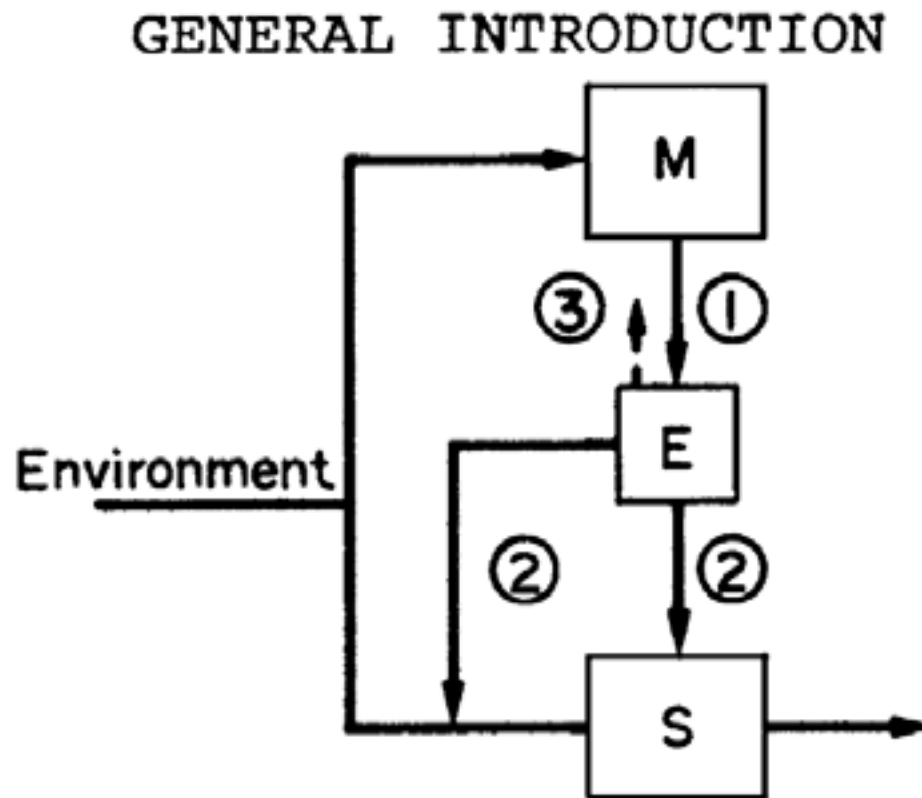
- 1+ fires
- 10 fires
- 20+ fires



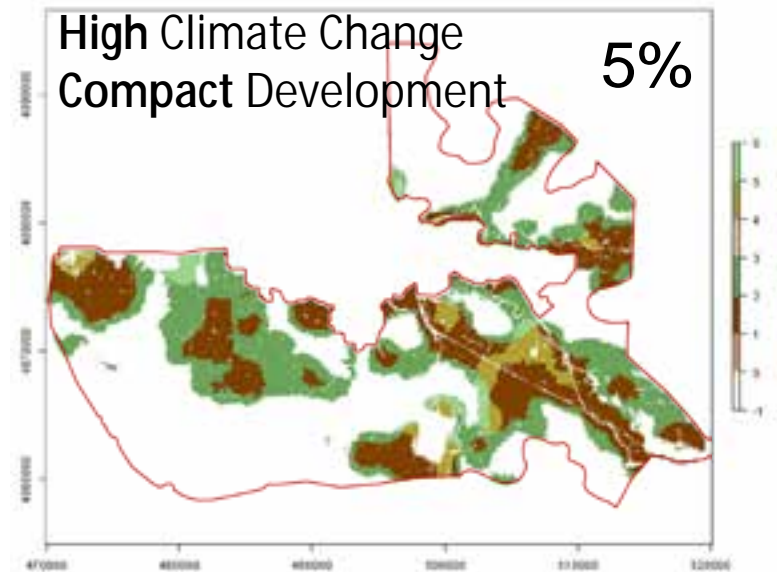
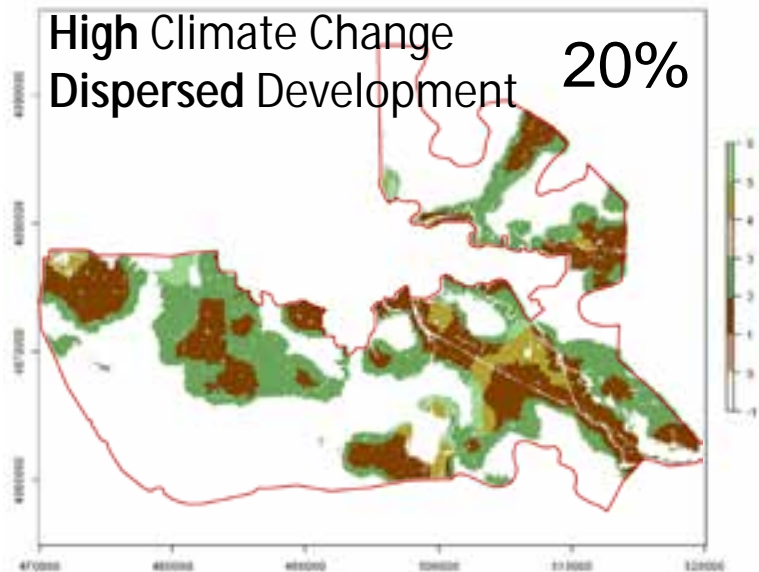
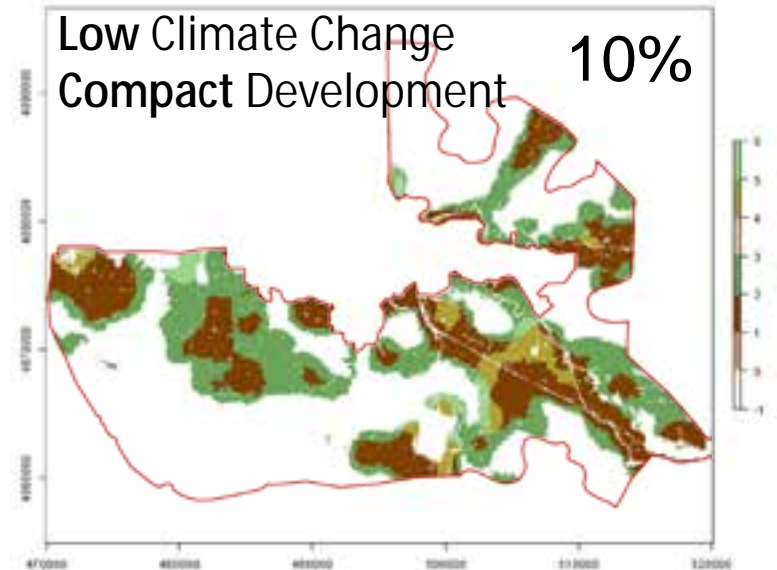
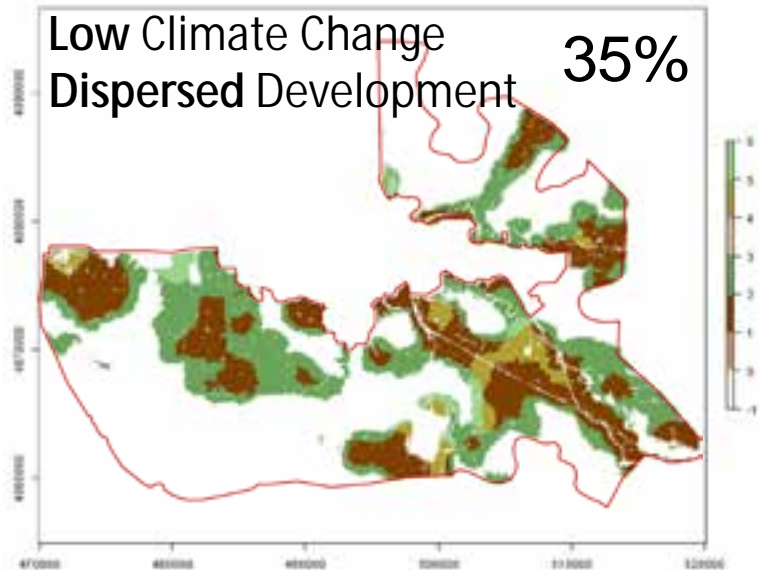
Surprising fires high climate



Rosen – next steps



Different potential policy approaches to future urban and rural development creates large uncertainties of where, when and how many rural houses may be at risk of wildfire

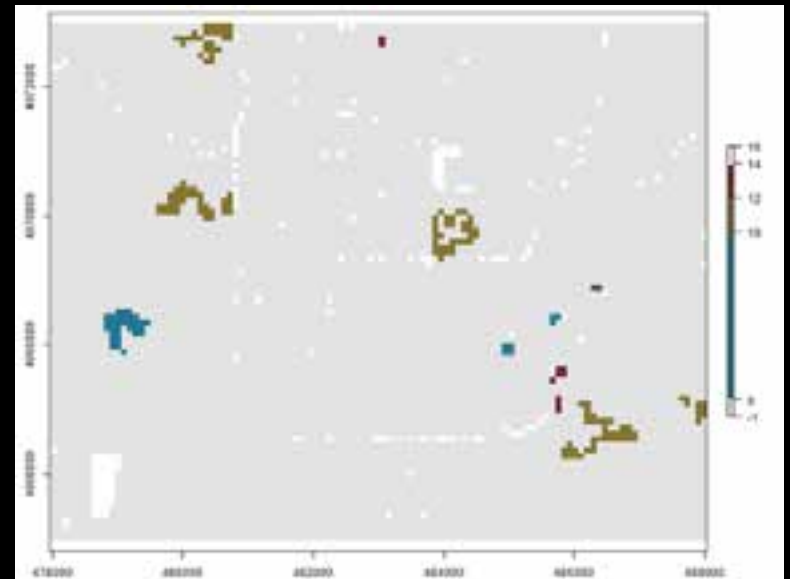
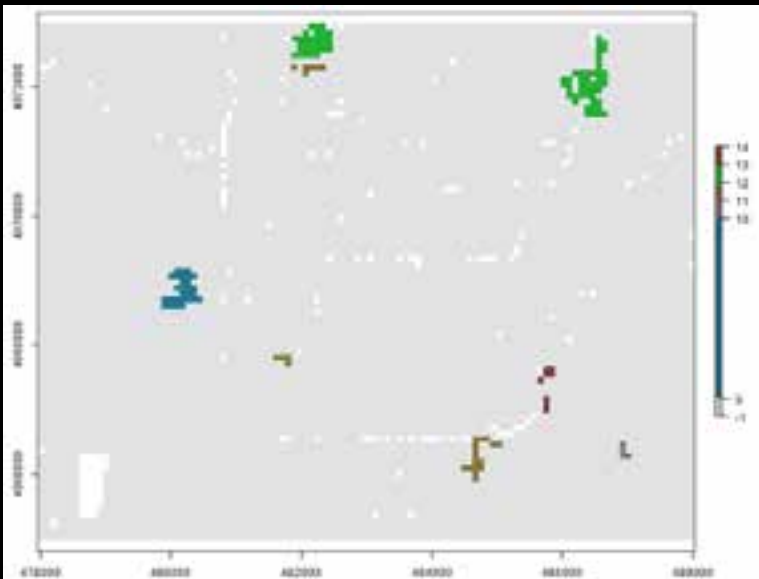


Implementation of fire hazard and restoration treatments over time – years 1-30

Conventional Fuels
Treatment Scenario

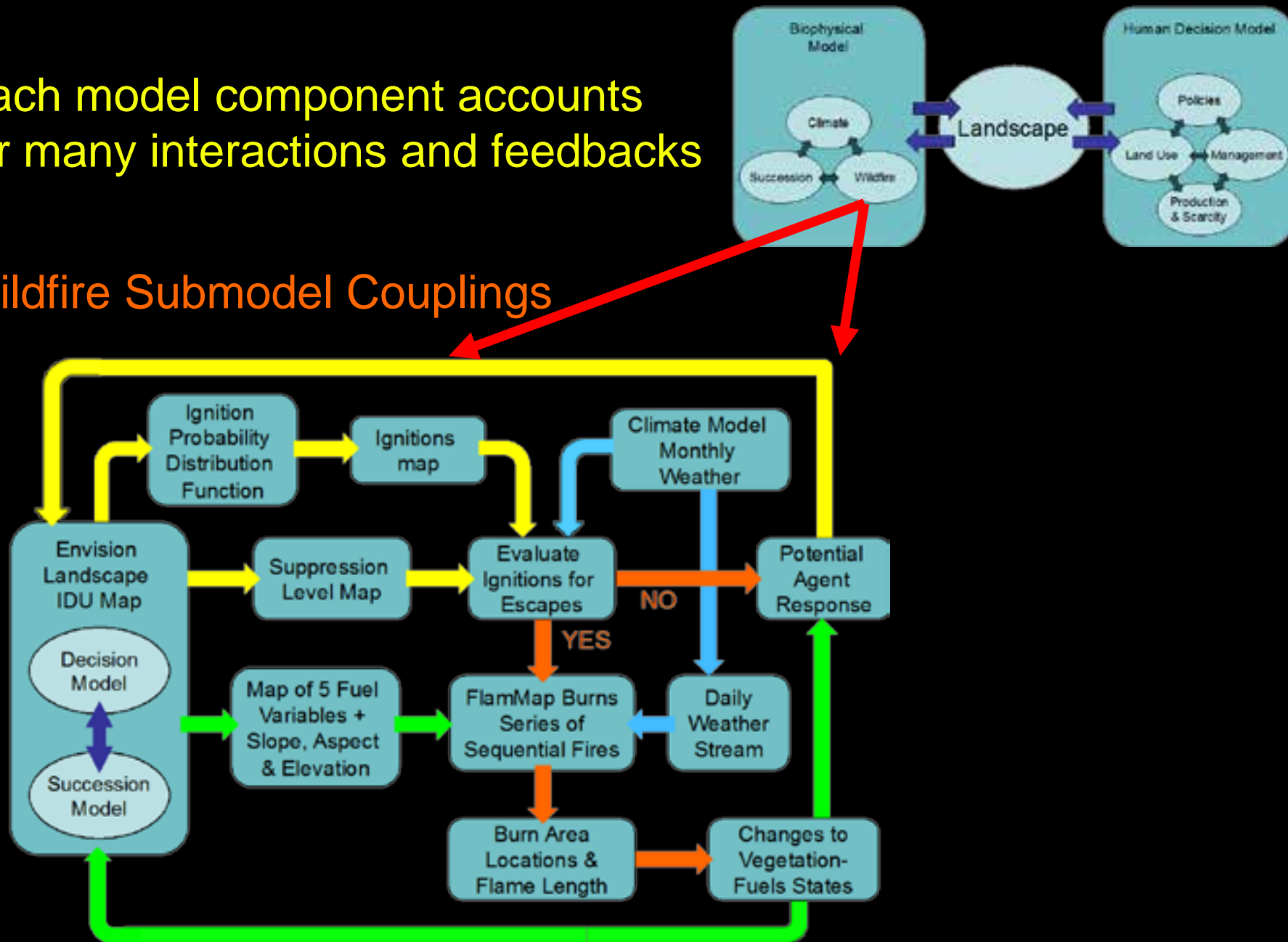


Mixed Fuels
Treatment Scenario



Each model component accounts for many interactions and feedbacks





Wildfire Submodel Couplings






Fire 42

Identical Fire Burns in 3 Replicates of 3 Scenarios

Vegetation state

-  Non-successional vegetation
-  Untreated succ. vegetation
-  Thin-from-below treated
-  Restoration treated

Fire intensity

-  Low intensity (coolest)
-  Moderate intensity
-  High intensity (hottest)



~97th %tile fire
weather 1970-2010

Wind NNW
17 mph



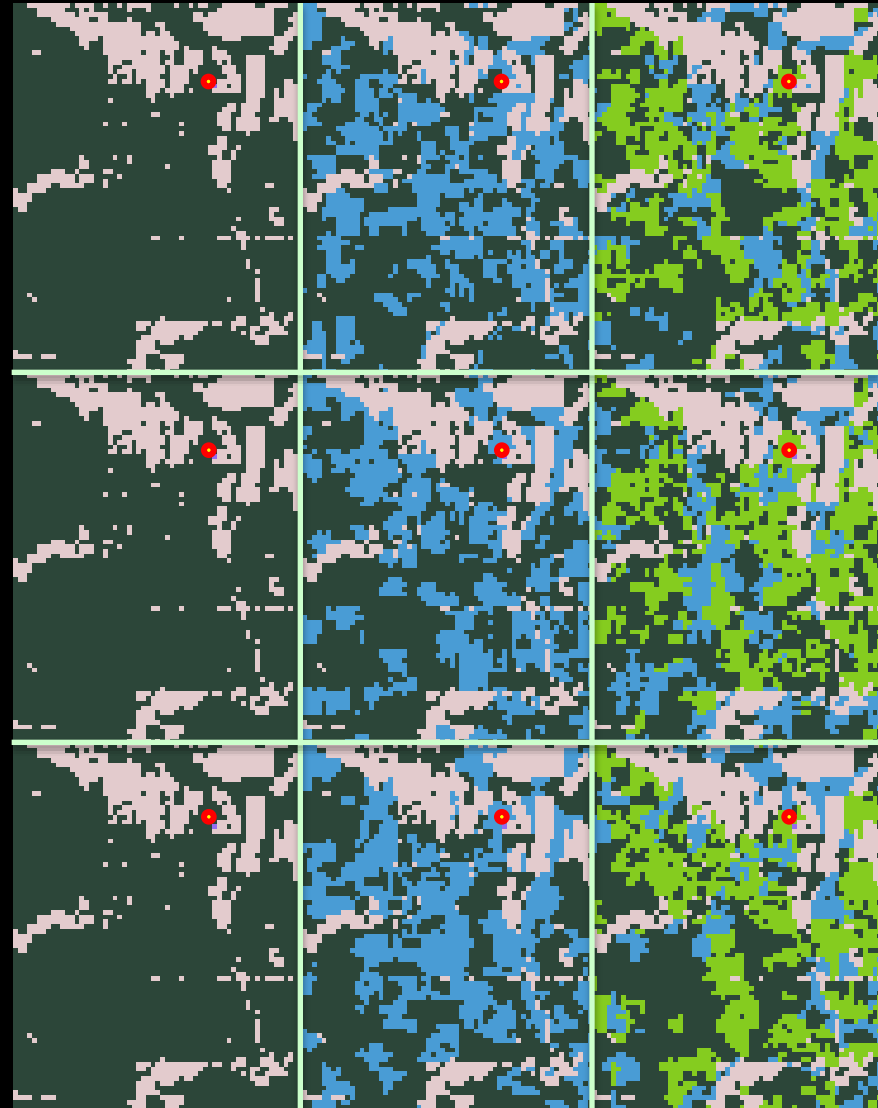
 Ignition point

ERC = 56; Burn Period = 500 min

No Mgmt

Con 40%

Mix 40%



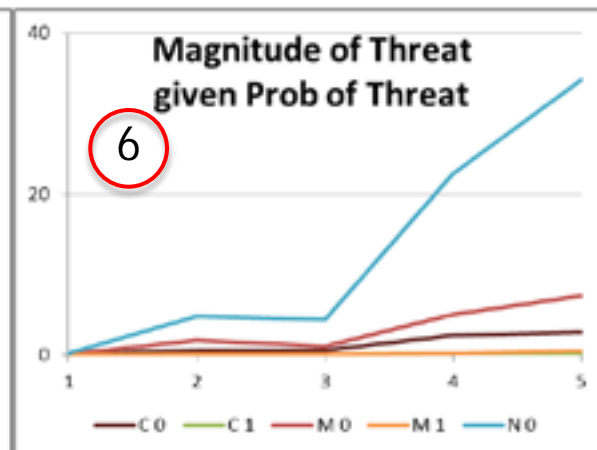
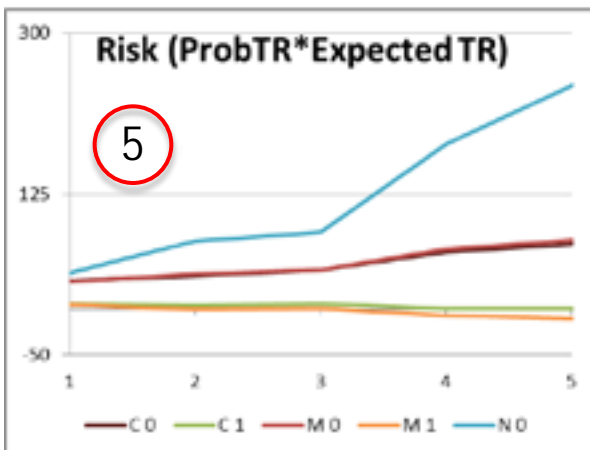
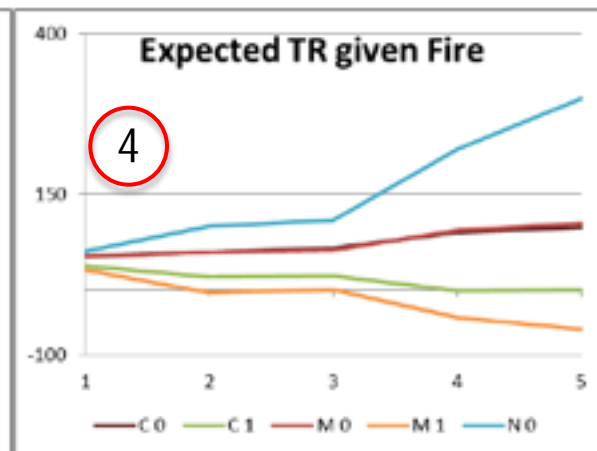
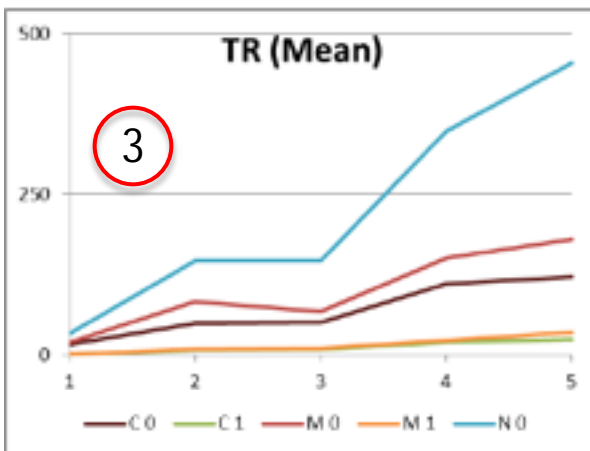
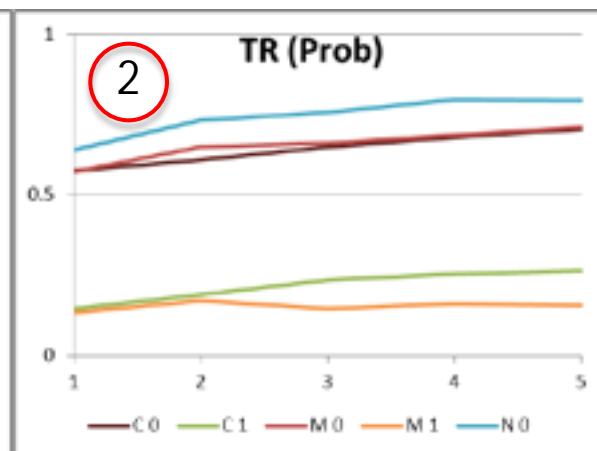
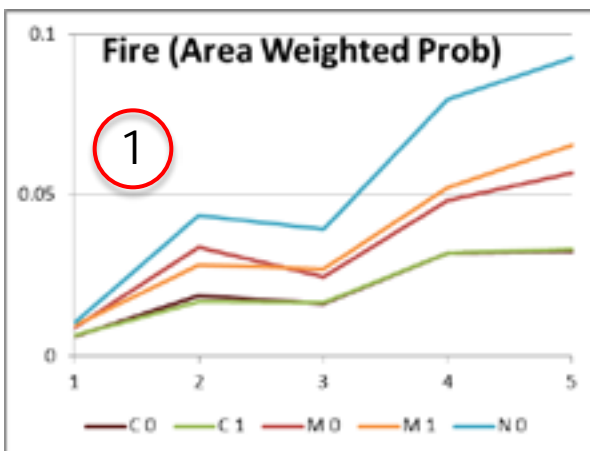
Rep 1

Rep 2

Rep 3

Partition the Risk?

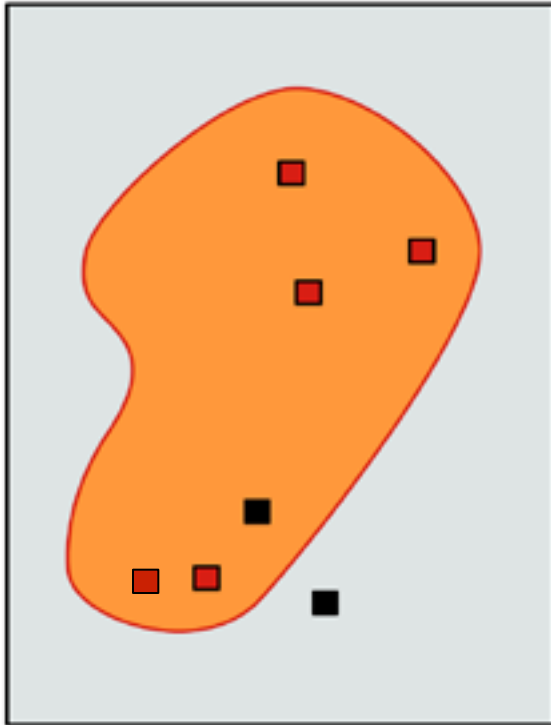
- Conventional
 - Managed
 - Unmanaged
- Mixed
 - Managed
 - Unmanaged
- No Management
 - Unmanaged



Fuels Treatments Redistribute Risk

Fire behavior under 3 treatment scenarios

None



Largest area burned
High intensity fire
High risk to DUs

- 6 DUs affected
- 5/7 DUs threatened

**Greatest overall risk,
Greatest risk/exposed Res.**

Conventional

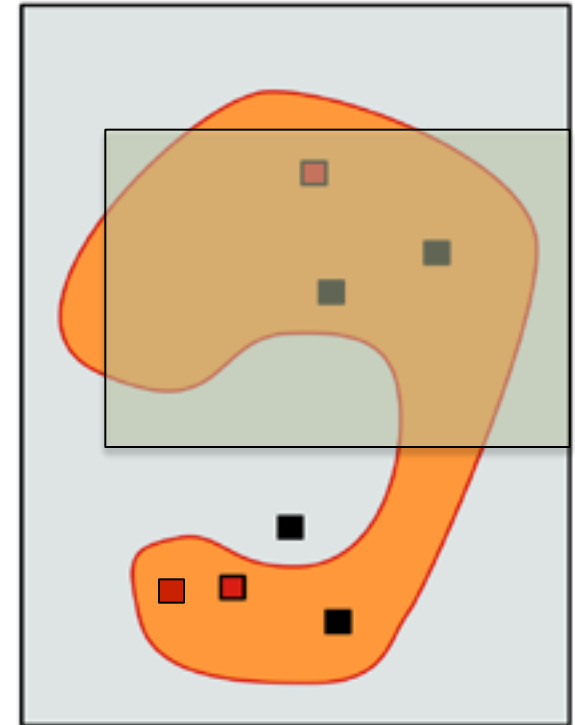


Smallest area burned
Lower intensity fire
Lower risk to DUs

- 3 DUs affected
- 2/3 DUs threatened

**Lowest risk
Medium risk/exposed Res.**

Mixed



Large area burned
Lowest intensity fire
Lower risk to DUs

- 6 DUs affected
- 3/6 DUs threatened

**Medium Risk
Lowest risk/exposed Res.**

