

The National Science Analysis

National Cohesive Wildland Fire Management Strategy

Science Analysis Report: Application to the Southeast Region

January, 2014

Agenda

- Today:
  - The National Science Analysis
  - Preparing Data for Analysis
  - Application of Products
  - Basics of Belief Nets
- Tomorrow:
  - Exercise #1: Pivot Tables
  - Exercise #2: Naïve Networks
  - Exercise #3: Bayes Networks
  - Wrap-up

Cohesive Strategy Focus Areas:

- Restore and maintain resilient landscapes
- Fire adapted communities
- Response to wildfire

Background on National Analysis

- Assignment (January 2013): Explore various potential national policy options for achieving the national goals of the Cohesive Strategy

- Purpose: provide a broad strategic overview of the challenges and opportunities that could inform subsequent discussion and decision-making processes.

- Follow-up Assignment (June 2013): Use the information from the national analysis to suggest spatially explicit national priorities to be included in a national strategy.

Move from Goals to Action!

Analytical Challenge

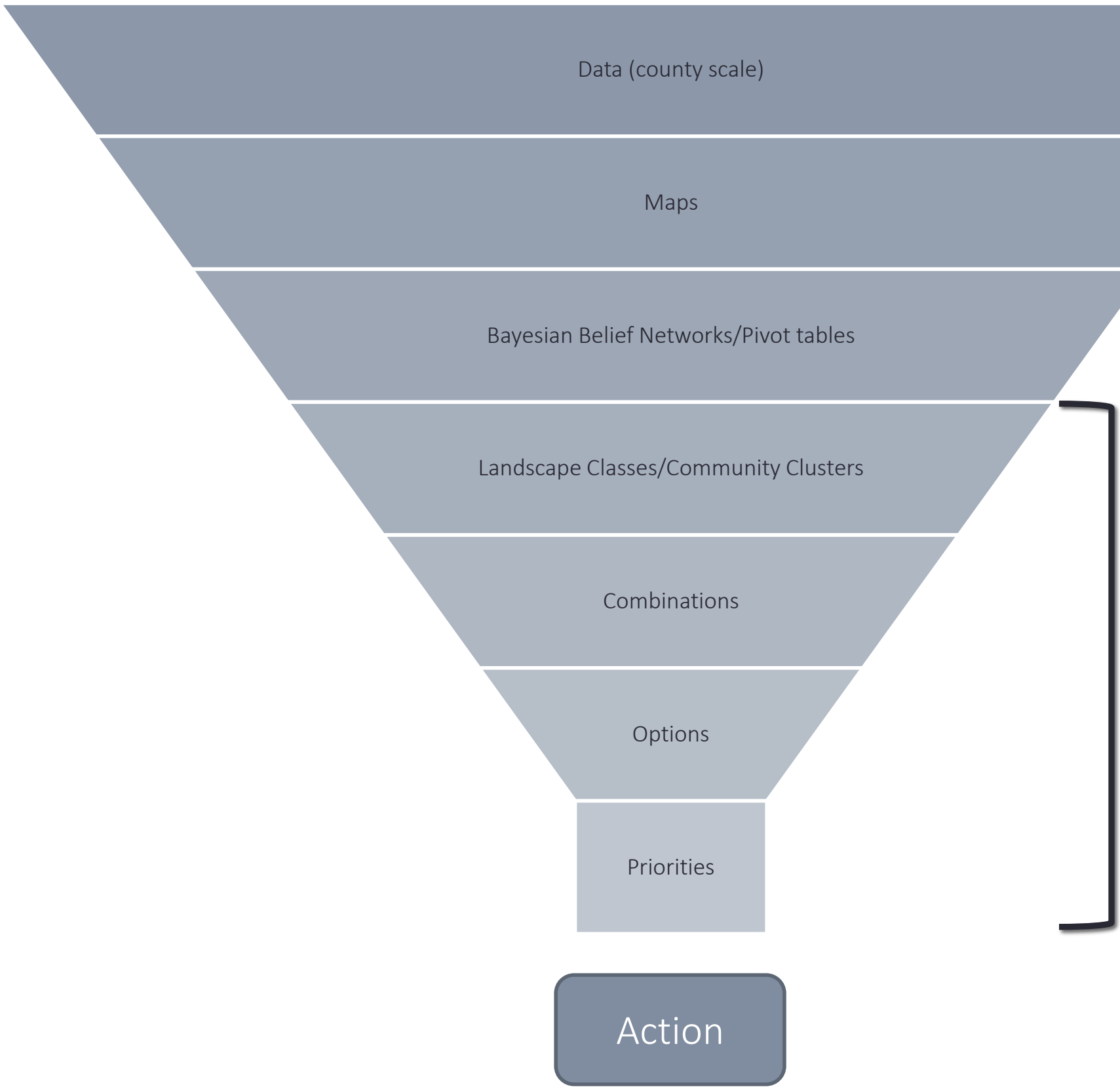
- Wildland Fire is a complex issue that involves many interacting factors and processes.

- The United States is a dynamic and diverse landscape, where no single characterization (or solution) is universally appropriate—too diverse for a ”one size fits all” approach.

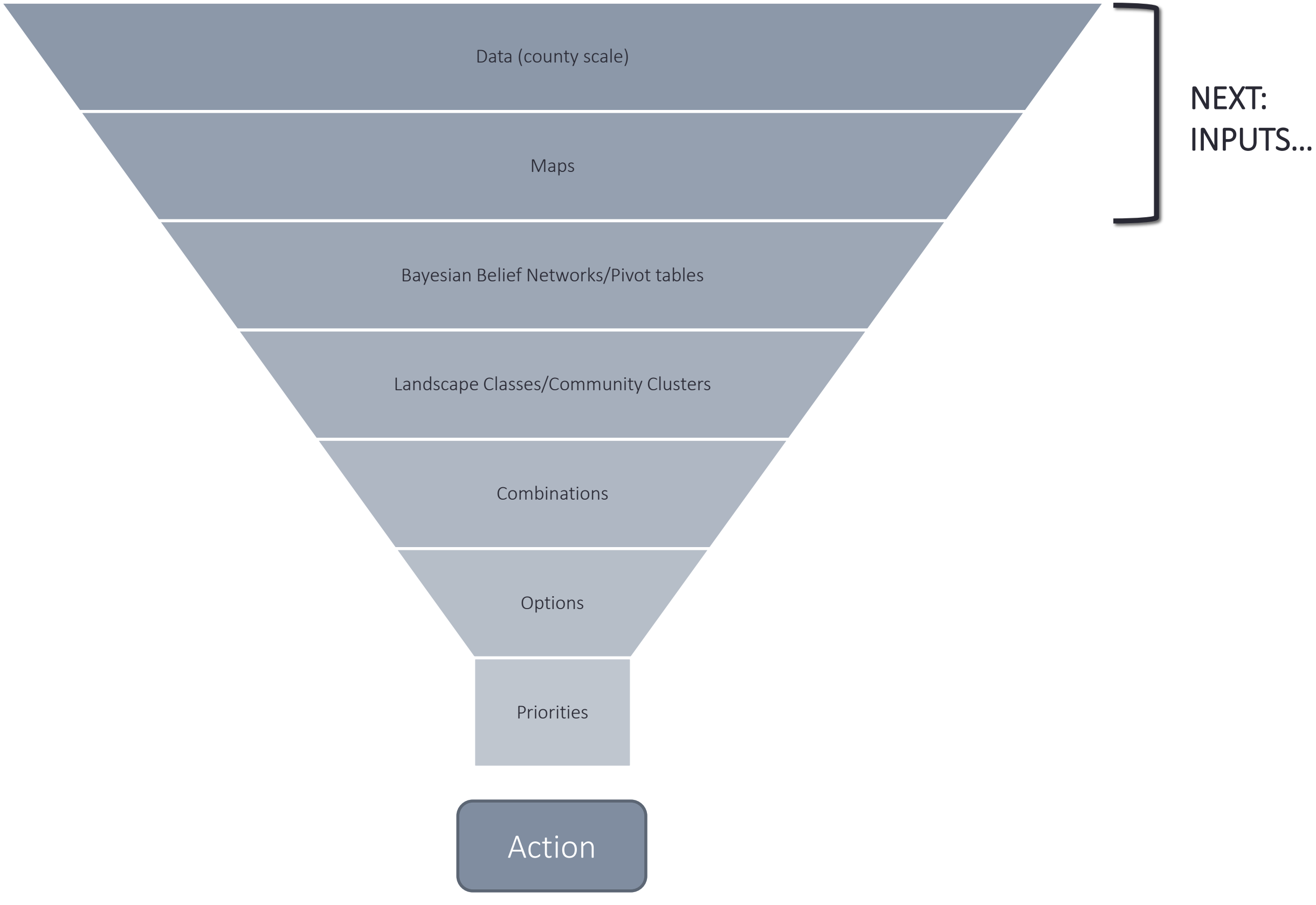
- Yet without some generalization, simplification, or consolidation, it’s not possible to create a cohesive strategy. Cannot have an “everyone for themselves” strategy.”

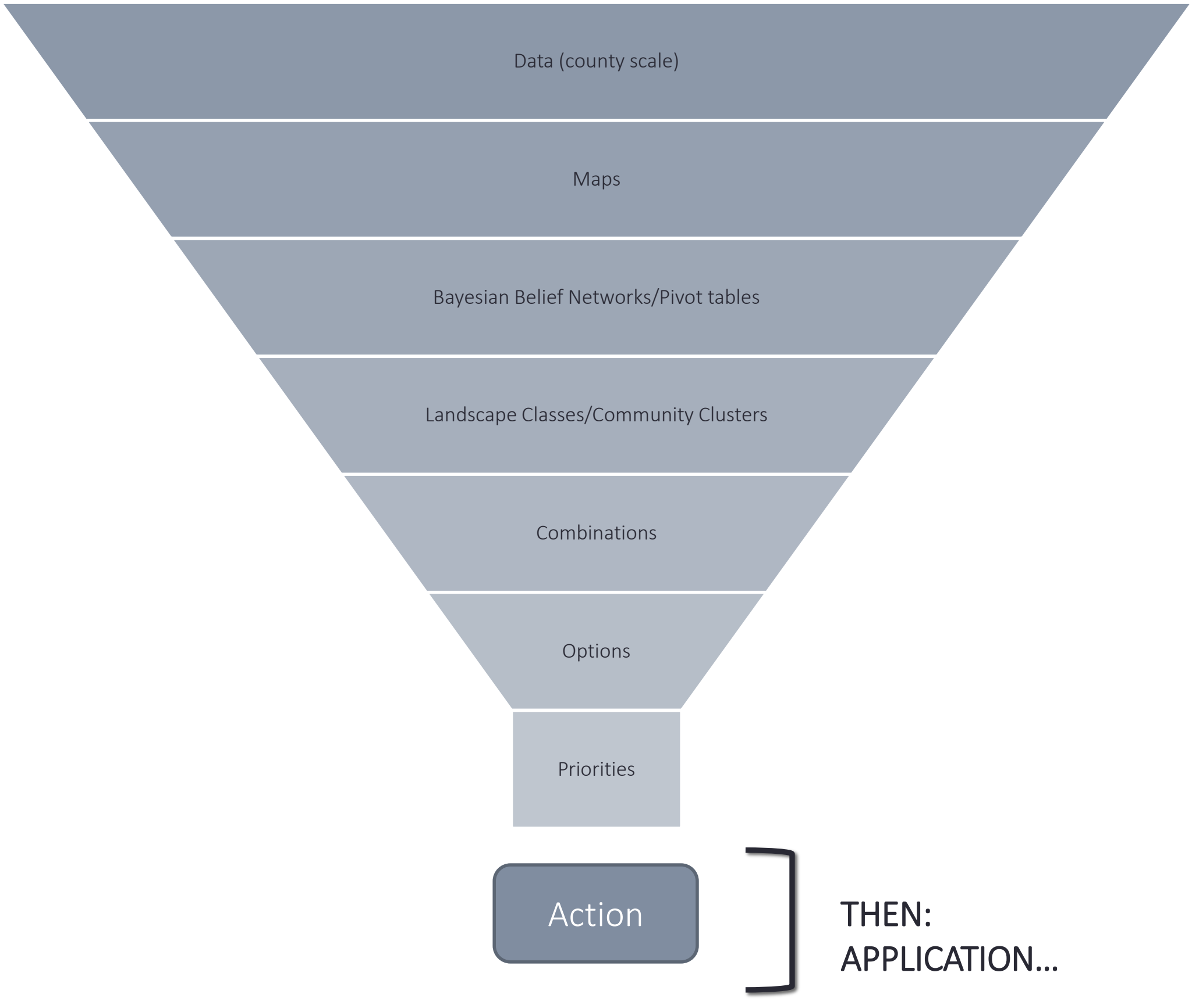
Meeting the Analytical Challenge

- Draw from multiple data sets spanning the range of biophysical, social, and economic factors in addition to a comprehensive summary of wildland fire statistics.
- Explore relationships and patterns using a mix of statistical and geospatial techniques to create a nationally consistent classification system.
- Match patterns with policy or management options to identify opportunities for addressing major challenges.
- Blend options spatially and institutionally to create a national strategy (role of the larger CS governance).



NOW:
PROVIDE OVERVIEW OF MAJOR COMPONENTS …


Data (county scale)
Maps
Bayesian Belief Networks/Pivot tables
Landscape Classes/Community Clusters
Combinations
Options
Priorities
Action
NEXT:
INPUTS…


Data (county scale)
Maps
Bayesian Belief Networks/Pivot tables
Landscape Classes/Community Clusters
Combinations
Options
Priorities
Action
THEN:
APPLICATION…

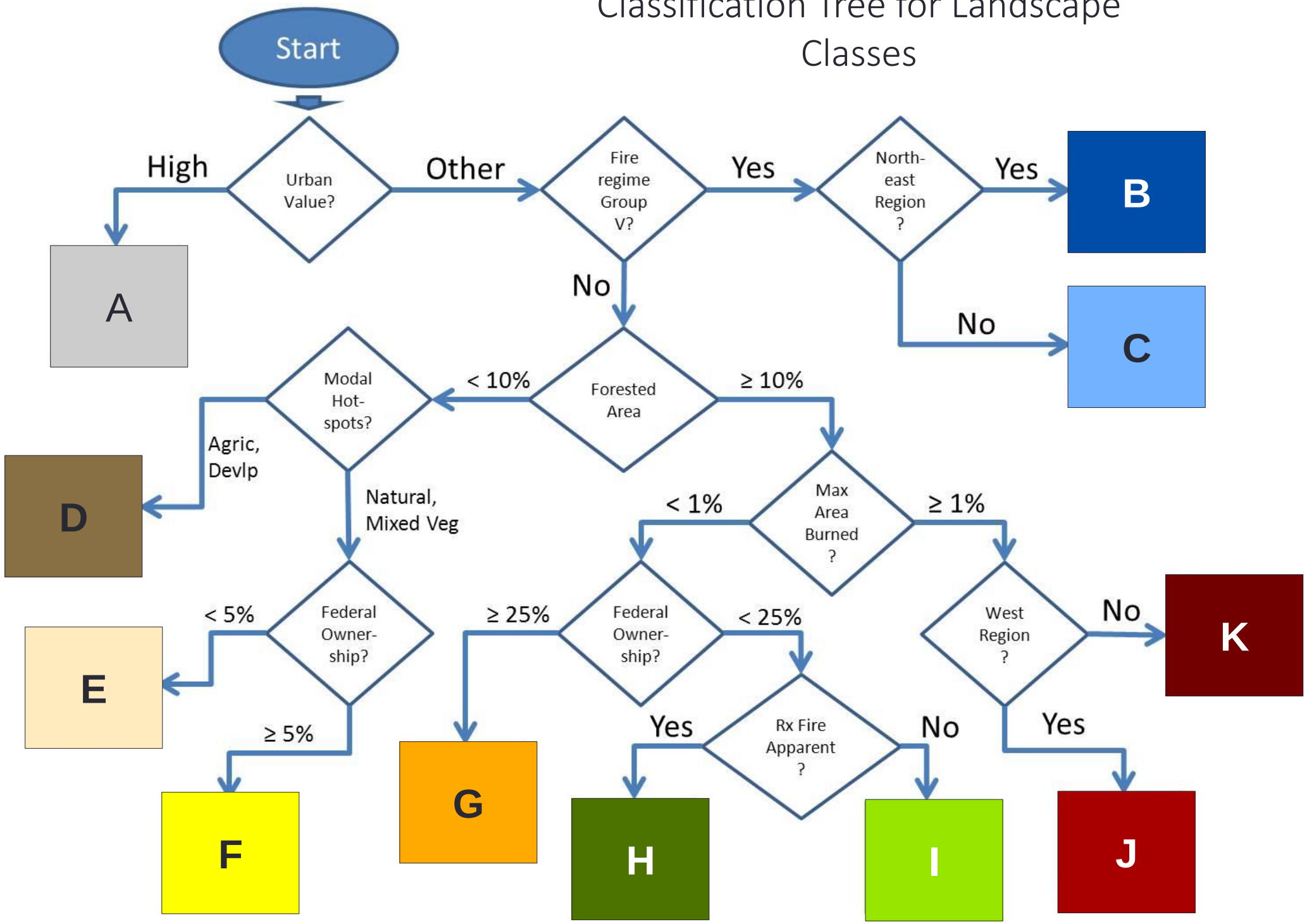
National Characterization

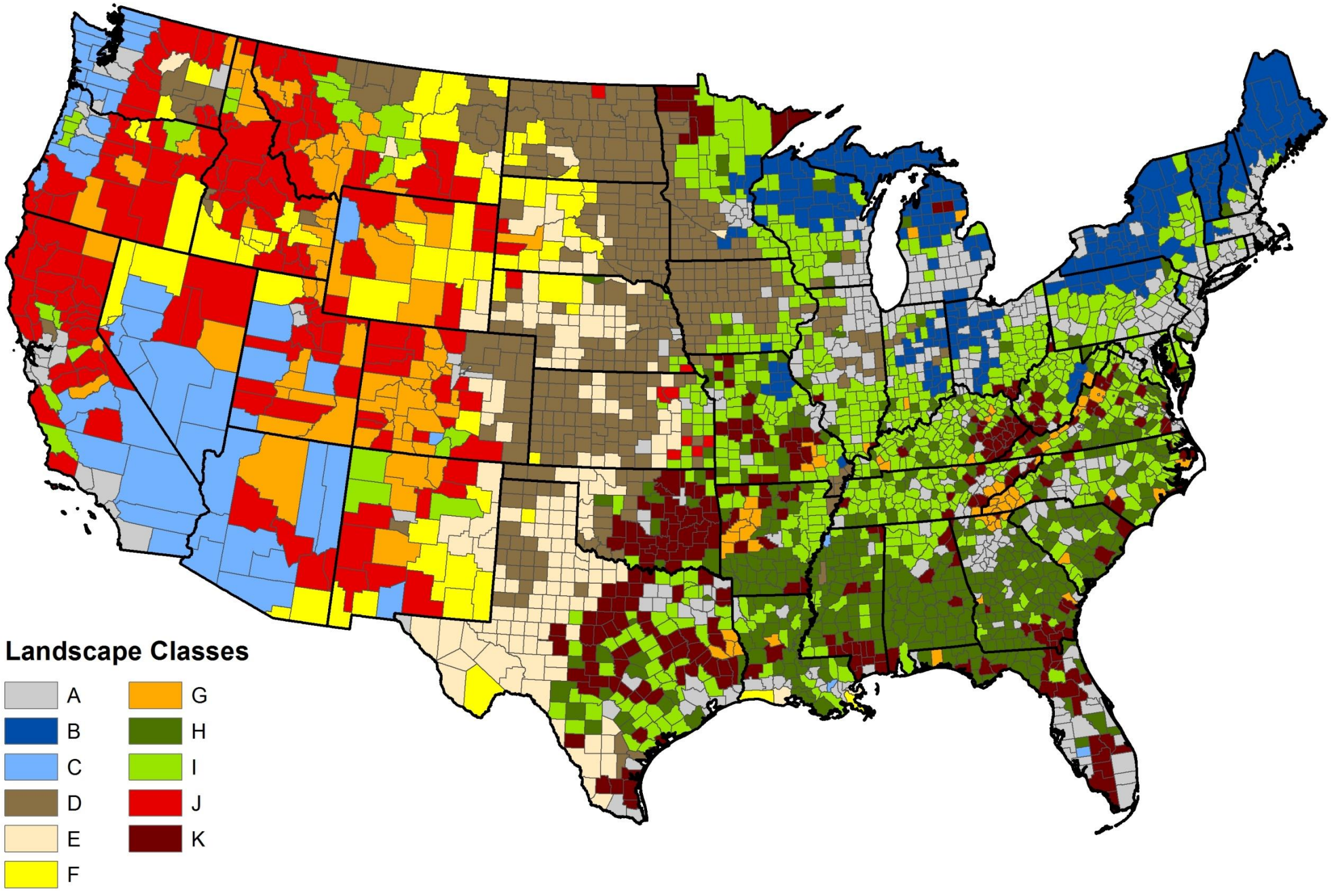
- Use county-level data and various models to identify commonalties and geographical differences among counties.
- Classify counties into subsets that share common characteristics relative to two principal goals:
  - Landscape resiliency
  - Community protection
- Use the characteristics of each group of counties to help tailor management options and priorites.

Landscape Resiliency Classes

- Resiliency is about sustainability and resistance to, or recovery from, disturbance.
- Landscapes themselves are complex intersections of natural, built, and human components—and the interacting processes involving those components.
- County-level summary data are insufficient to accurately measure resiliency, but they are indicative of the key issues and processes in play.
- The classification system is designed to divide counties into landscape classes where similar conversations about resiliency might occur.

Classification Tree for Landscape Classes

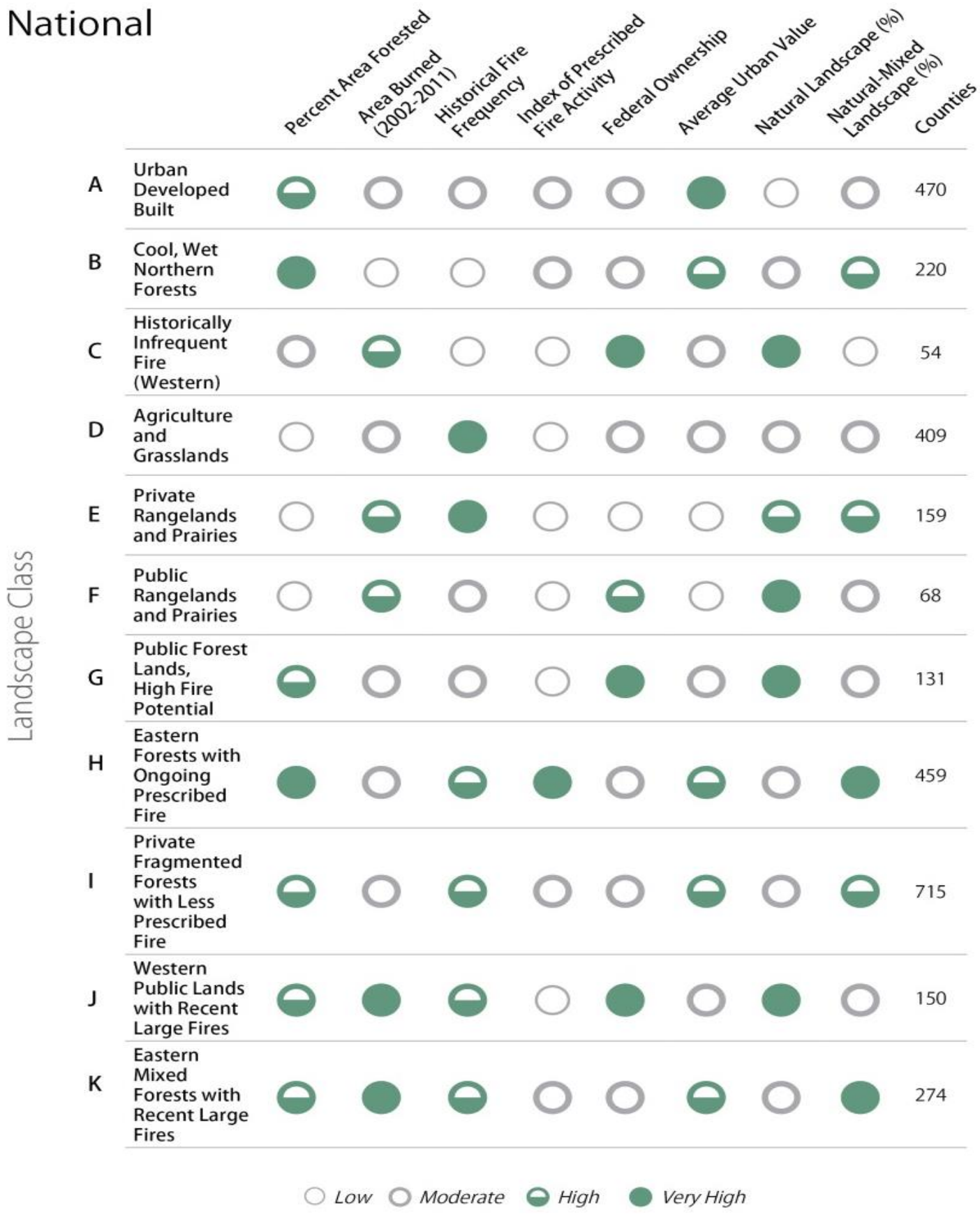



Landscape Classes
A
B
C
D
E
F
G
H
I
J
K

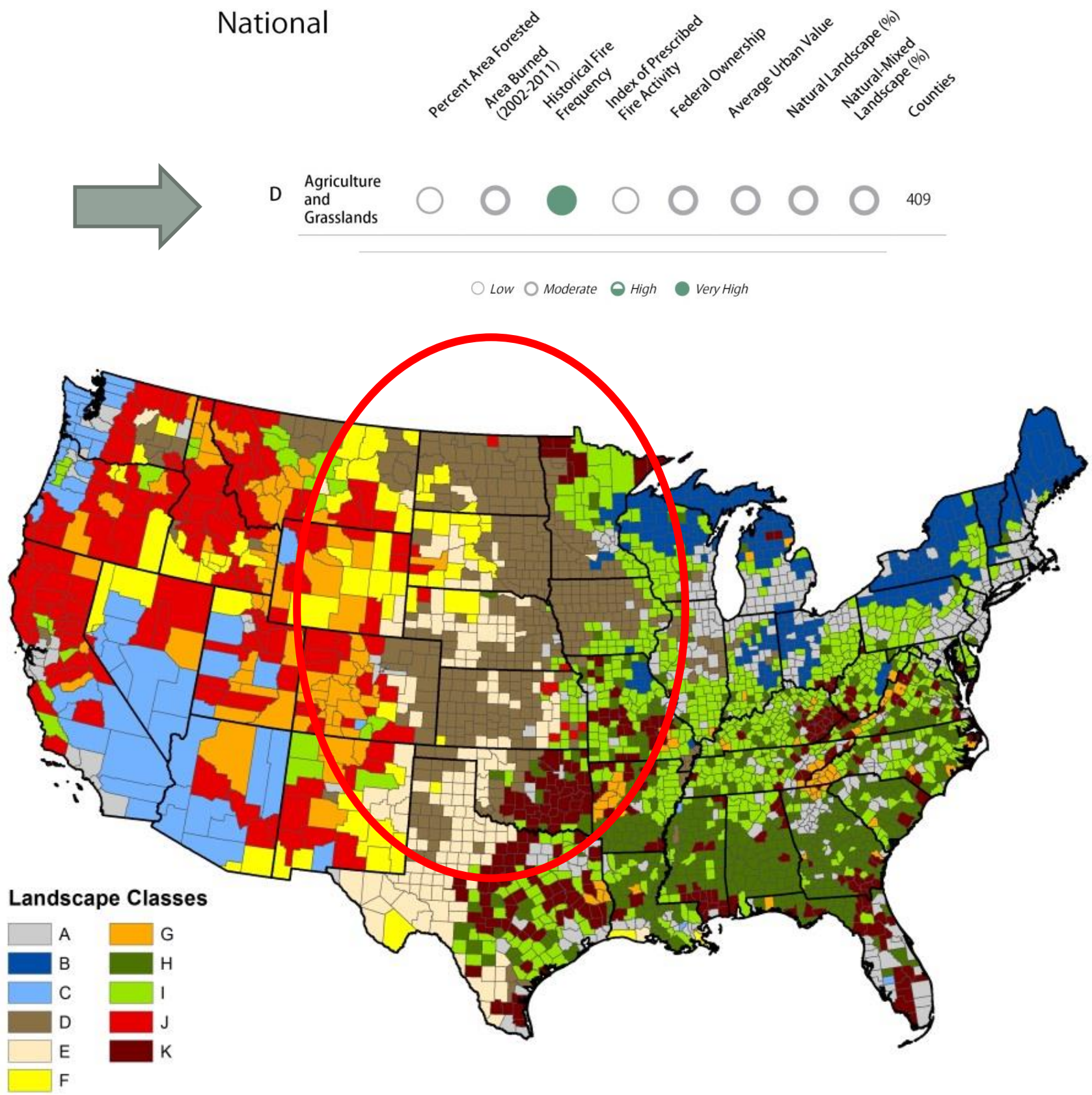
For comparison…

The nature of each class is revealed by looking at the classification tree and the broader range of descriptive variables for each county.

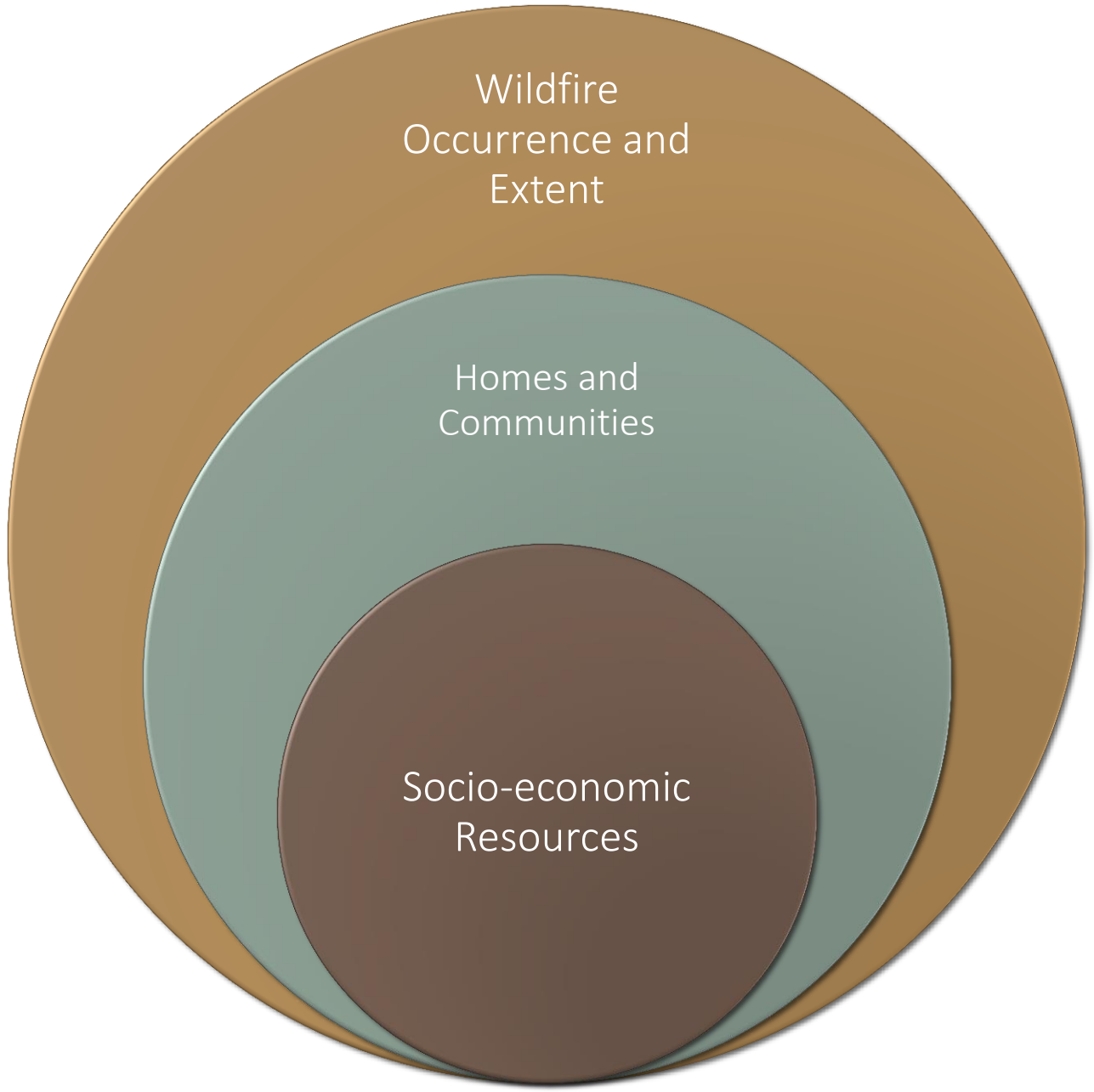
Using this figure, one can develop an informative, general narrative that applies to the counties within each class.



For example, landscape class “D” characterizes agricultural and grasslands areas that have relatively little forested area or federal ownership and have historically experienced very high levels of natural fire.

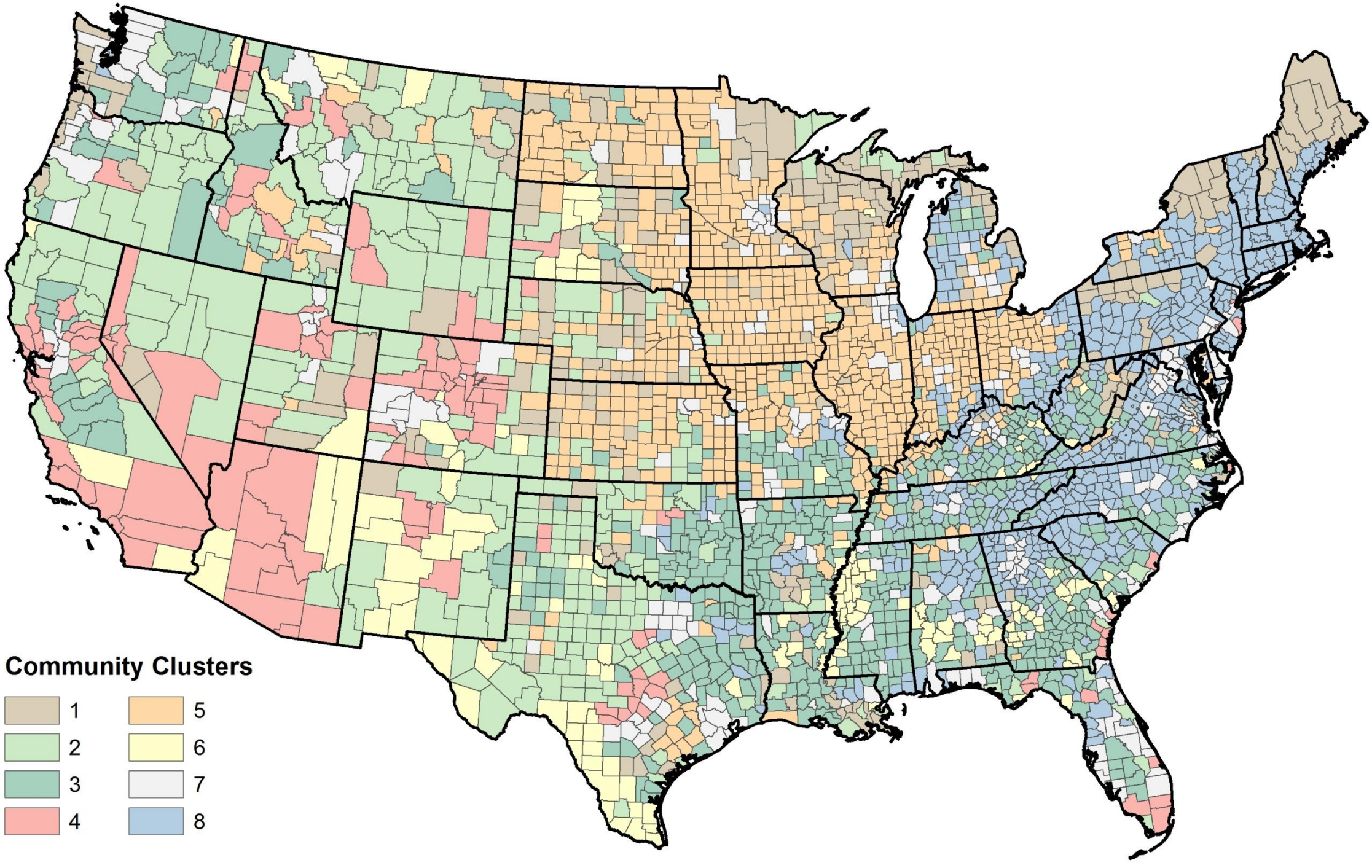


Basic Conceptual Model: Risk results from the intersection of wildfires, homes and communities, and socioeconomic resources.



Process is to group counties with similar characteristics using statistical cluster analysis

- Begin with six variables:
  - Ignition density (max annual fires per unit area)
  - Area burned (max annual area burned, normalized)
  - WUI Area Factor Score
  - WUI Home Density factor score
  - Demographic Advantage factor score
  - Demographic Stress factor score
- Cluster counties into eight “community clusters” using statistical methods


Community Clusters
1
2
3
4
5
6
7
8

For comparison…

The nature of each cluster is seen in this visual summary of the characteristic features with respect to six variables of interest:

- Demographic advantage and stress
- Ignition density
- Area burned
- WUI area and density

Intersection of Community Clusters with Landscape Resiliency Classes

Landscape Classes	Community Clusters								Grand Total
	1	2	3	4	5	6	7	8	
A	8	3	31	30	71	4	129	194	**470**
B	68	5	6		78	1	6	56	**220**
C	15	5	6	12		9	7		**54**
D	56	38	29	2	265	5	14		**409**
E	22	76	7	3	28	22	1		**159**
F	2	32	6	8	12	7	1		**68**
G	18	24	28	12	4	8	20	17	**131**
H	29	8	189	8	30	54	42	99	**459**
I	62	18	145	7	207	24	60	192	**715**
J		69	24	38	7	4	8		**150**
K		40	135	13	15	16	17	38	**274**
Grand Total	**280**	**318**	**606**	**133**	**717**	**154**	**305**	**596**	**3109**

Summary sheets have been prepared for each combination of community cluster and landscape class

DRAFT

3H

Community Cluster……3

Landscape Class……H

Description

These heavily forested counties mostly fall within the southeastern United States in Coastal Plain and Piedmont. There is small federal and state ownership, and extensive private industry. This area is characterized by significant Wildland Urban Interface (WUI) and is more urbanized than the national average.

There is a history of prescribed fire, but conflicts may arise due to the proximity of the human population.

Challenges and Opportunities

Vegetation and Fuels
These counties have a history of using prescribed fire and could expand or maintain use of this fuel management option. There may be an active forest products industry nearby, which could support fuel treatments. Treatments may be economical as a precursor to prescribed fire.

Homes, Communities and Values at Risk
Individual homeowners can be proactive on home defensive actions. These counties could adjust building and construction codes in non-municipal areas.

Human-Caused Ignitions
Human caused ignitions are a problem in these counties. Reduce human-caused ignitions through enforcement or outreach.

Effective and Efficient Wildfire Response
Protect structures and target prevention of ignitions.

Example of a Typical County

Jones County, North Carolina: This rural county includes longleaf pine in the Croatan National Forest and Hofmann State Forest.

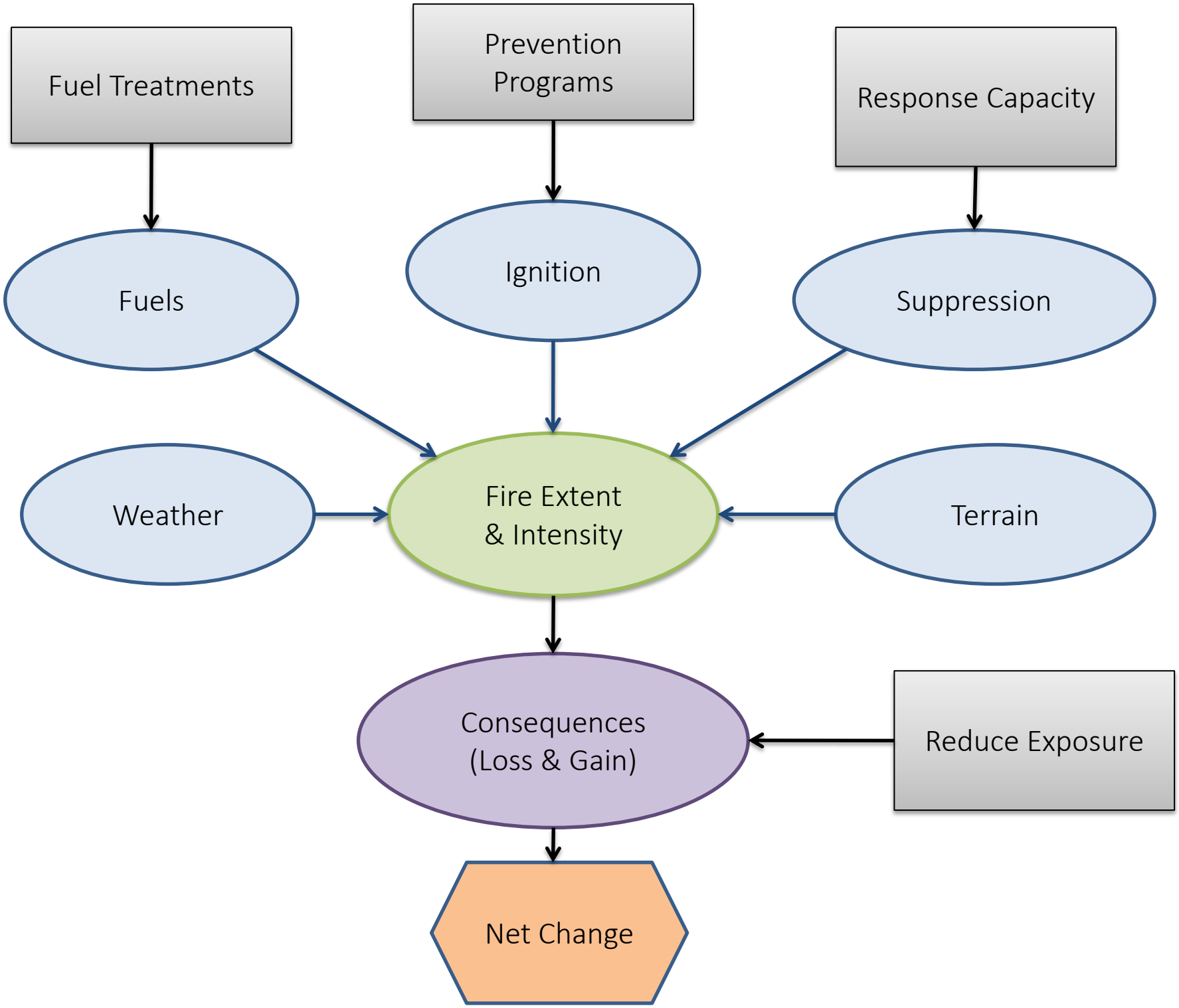
National Priorities

Vegetation and Fuels	High
Homes, Communities and Values at Risk	High
Human-Caused Ignitions	Moderate

Effective and Efficient Response:
There is moderate risk of large wildfires, less potential for resource benefits.

National Challenges and Opportunities

- Begin with a simple conceptual understanding of the wildland fire issue
- Identify key components or themes
- Identify policy or management options under each theme
- Use information and data previously assembled to match management options to landscape and community characteristics


Fuel Treatments
Prevention Programs
Response Capacity
Fuels
Ignition
Suppression
Weather
Fire Extent & Intensity
Terrain
Consequences (Loss & Gain)
Reduce Exposure
Net Change

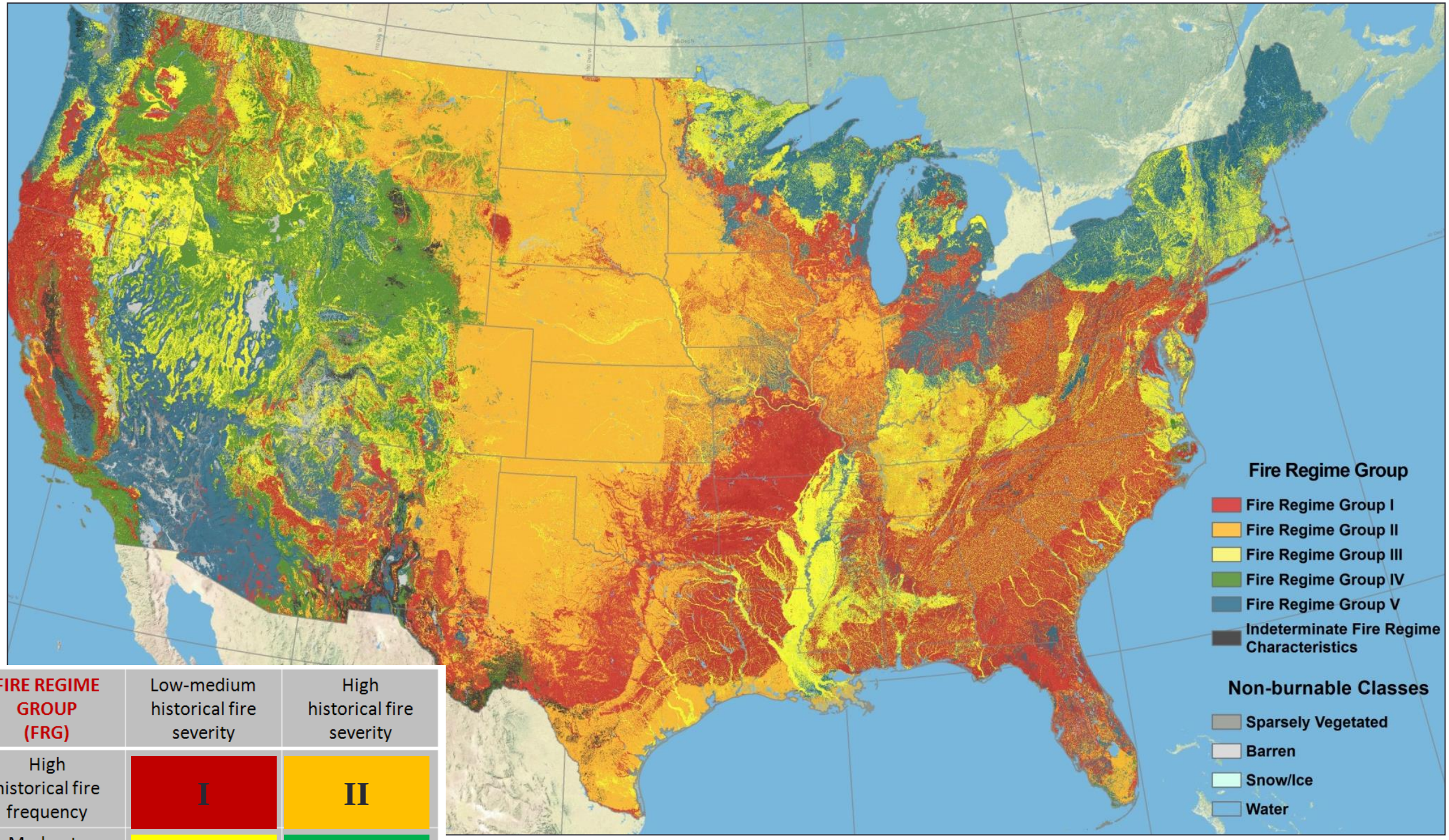
National Challenges

1. Vegetation and Fuels
2. Homes, Communities, and other Values at Risk
3. Human-caused Ignitions
4. Effective and Efficient Wildfire Response
5. Administrative Efficiency

Fire Regime Groups

Group	Frequency	Severity	Severity description
I	0 to 35 years	Low / mixed	Generally low-severity fires replacing less than 25 percent of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75 percent of the overstory
II	0 to 35 years	Replacement	High-severity fires replacing greater than 75 percent of the dominant overstory vegetation
III	35 to 200 years	Mixed / low	Generally mixed-severity; can also include low-severity fires
IV	35 to 200 years	Replacement	High-severity fires
V	200+ years	Replacement / any severity	Generally replacement severity; can include any severity type in this frequency range

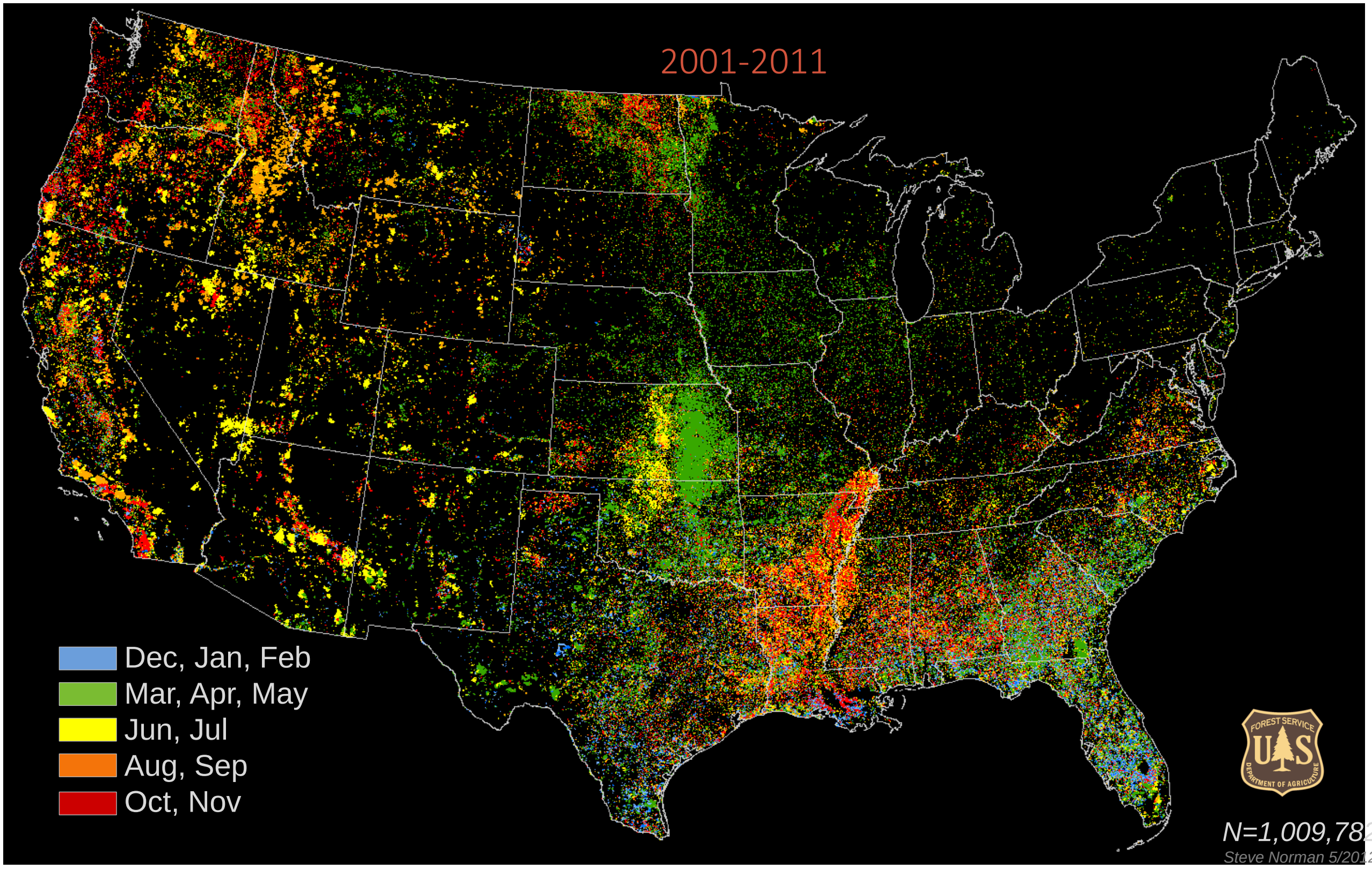
LANDFIRE Fire Regime Groups



FIRE REGIME GROUP (FRG)	Low-medium historical fire severity	High historical fire severity
High historical fire frequency	I	II
Moderate historical fire frequency	III	IV
Rare historical fire occurrence		V

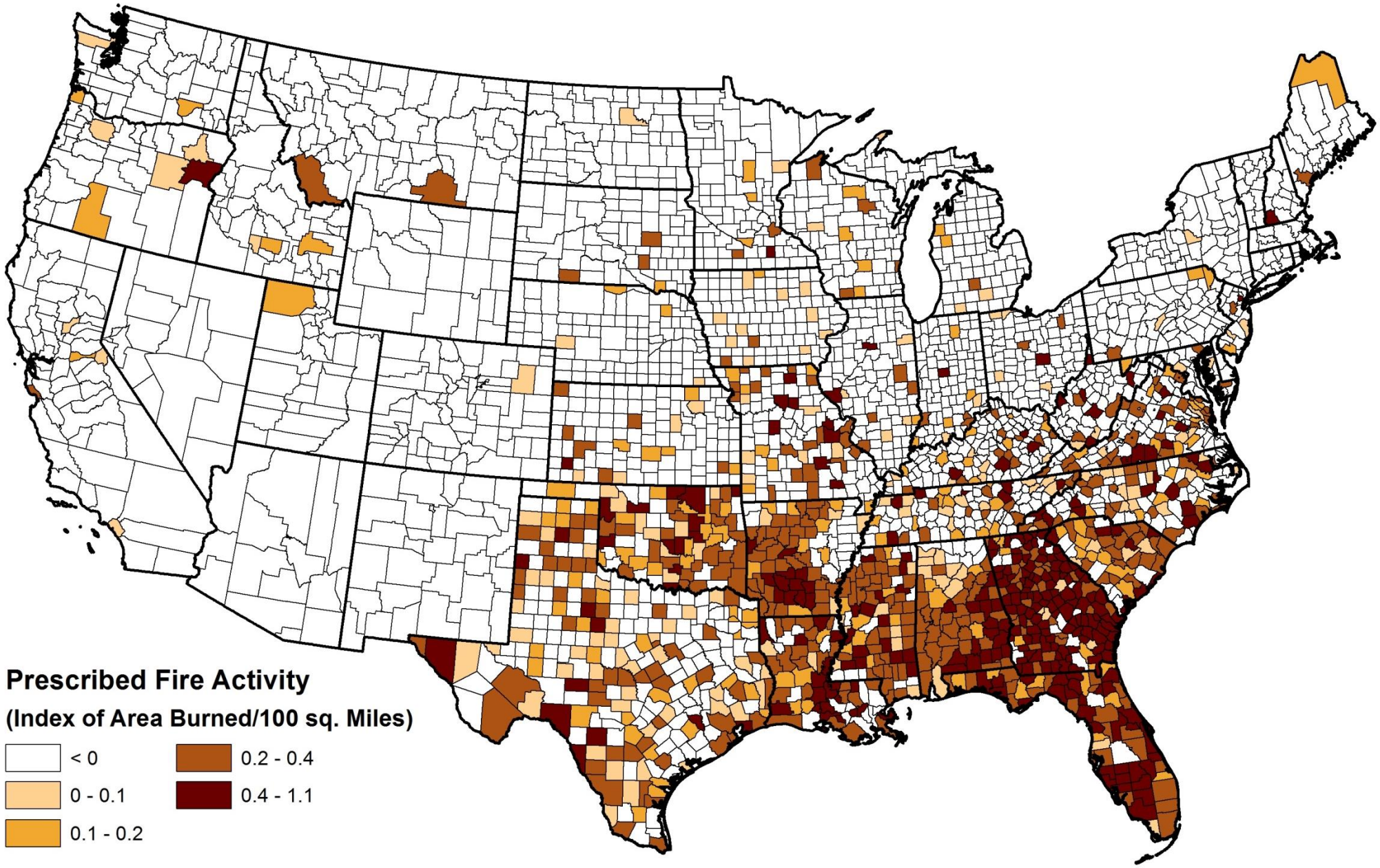
The seasonality of fire from space

as inferred from MODIS hotspots



National Challenges	Management Options
Vegetation and Fuels	Prescribed Fire: Expand or maintain in areas of current use Prescribed Fire: Expand into areas of limited current use Prescribed Fire: Utilize on a limited basis Manage wildfires for resource objectives: In forested systems Manage wildfires for resource objectives: In non-forested systems Manage wildfires for resource objectives: In areas where increased awareness of community risk is necessary. Non-fire Treatments: Supported by forest products industry Non-fire Fuels Treatments: In non-forest areas Non-fire Fuels Treatment: In areas with limited economic markets Fuels Treatments as a precursor to prescribed fire or managed wildfire.

Estimates of Area Burned by Prescribed Fire 2008-2011

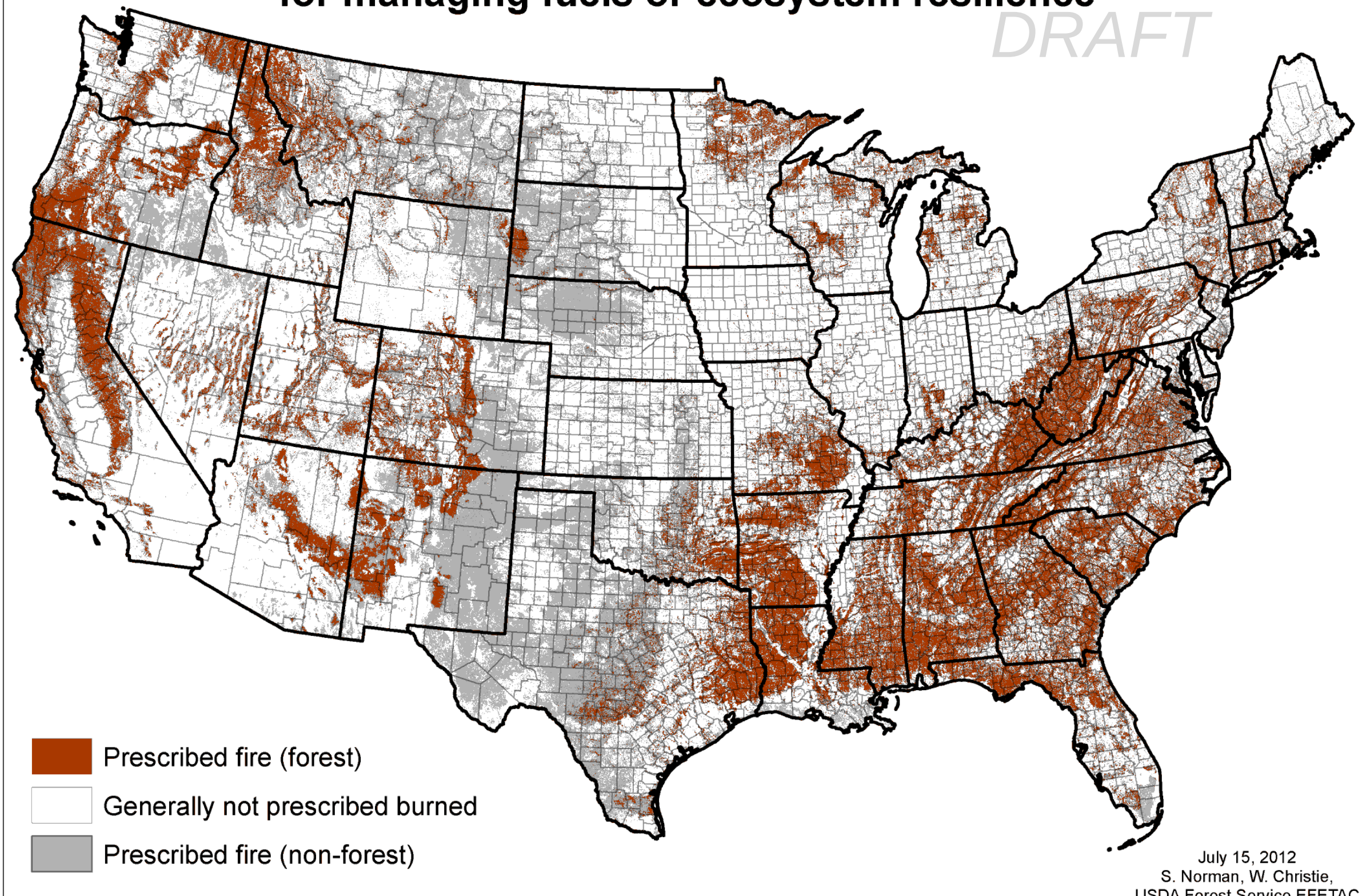


Areas available for Rx fire – summary of filters used

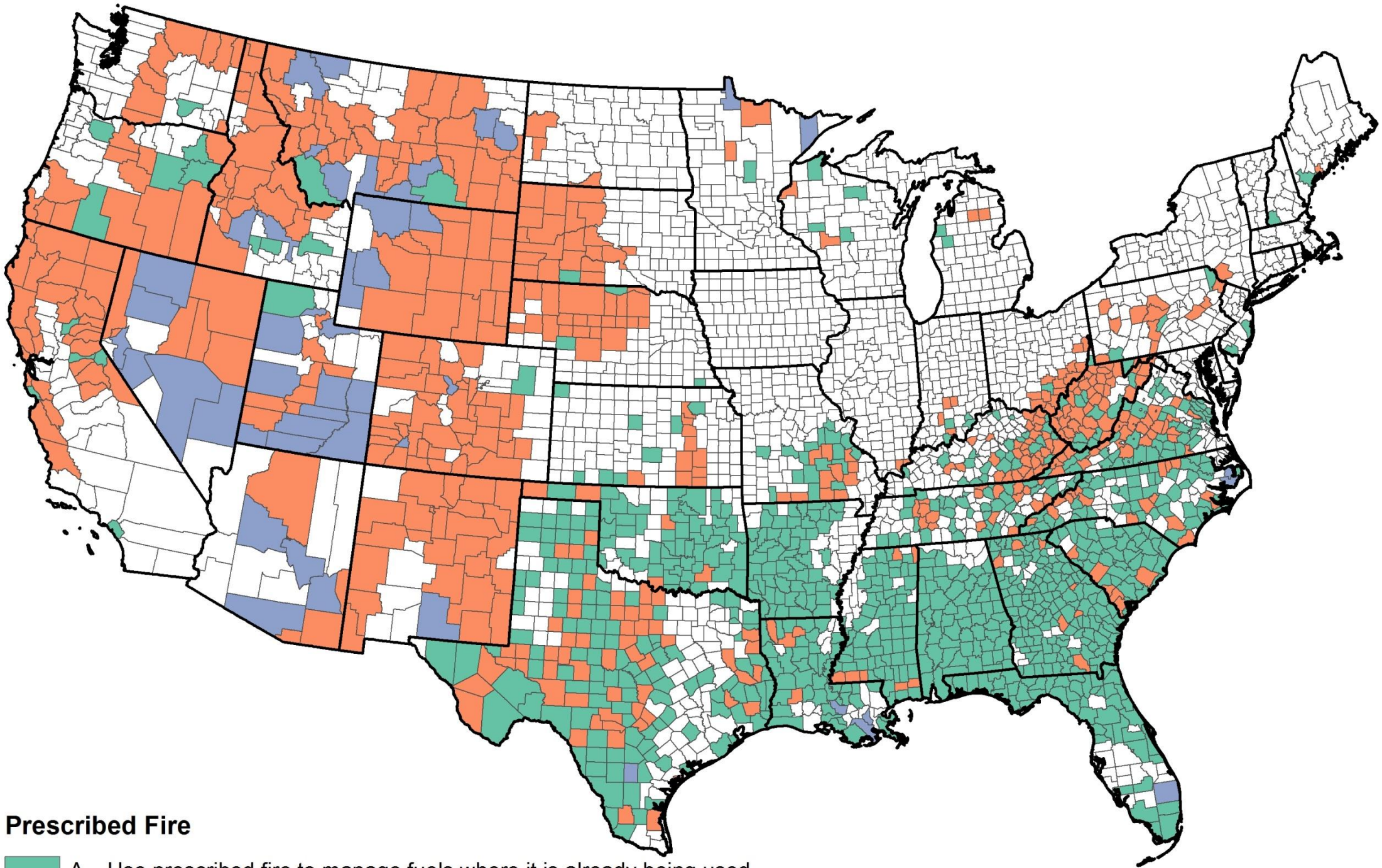
FILTERS

- LANDFIRE Fire Regime Groups I, II and III, some IV
- LANDFIRE burnable fuel models (not: FM91 urban/developed; FM92 snow/ice; FM93 agriculture; FM98 water; FM99 barren)
- Riitters' "Natural" vegetation 810m neighborhoods (NN, N, Nd, Na, Nad; this further excludes agriculture and developed dominated areas)
- Forested and non-forested areas were mapped separately

Areas generally available for prescribed fire use for managing fuels or ecosystem resilience



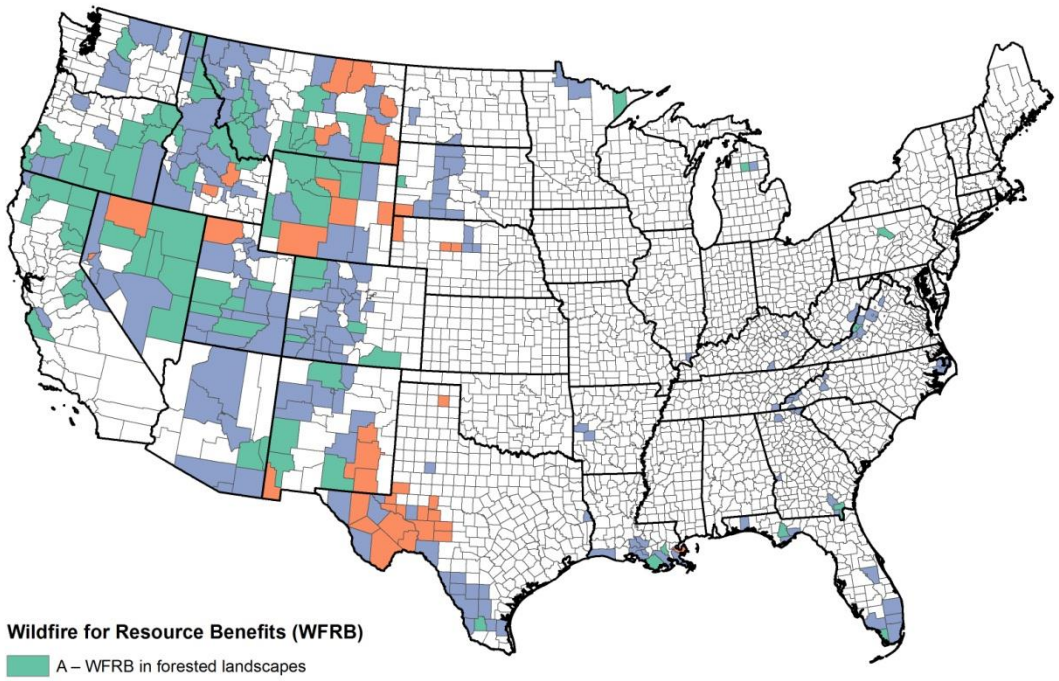
July 15, 2012
S. Norman, W. Christie,
USDA Forest Service EFETAC



Prescribed Fire

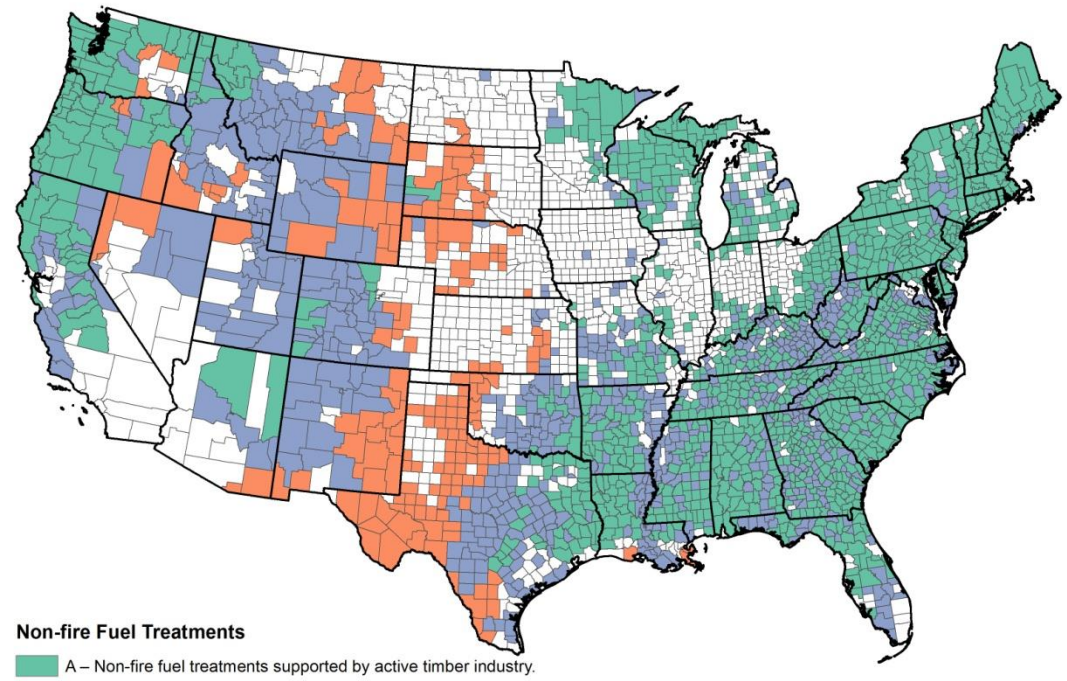
- A – Use prescribed fire to manage fuels where it is already being used
- B – Consider expanding use of prescribed fire
- C – Consider prescribed fire, but on a limited basis

National Challenges	Management Options
Homes, Communities, & Values At Risk	Focus on home defensive actions Focus on combination of home and community actions Adjust building and construction codes, municipal areas Adjust building and construction codes, non-municipal areas
Human-Caused Ignitions	Reduce accidental human-caused ignitions Reduce human-caused incendiary ignitions (e.g., arson)
Effective and Efficient Wildfire Response	Prepare for large, long-duration wildfires Protect structures and target landscape fuels Protect structures and target prevention of ignitions



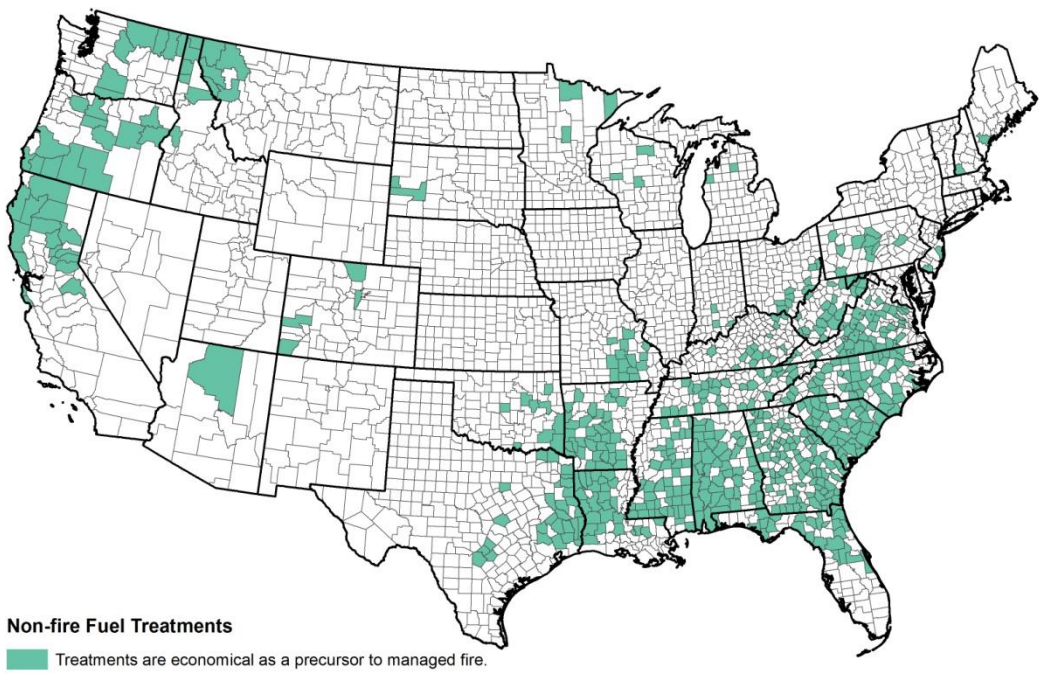
Wildfire for Resource Benefits (WFRB)

- A – WFRB in forested landscapes
- B – WFRB in non-forested landscapes
- C – WFRB, but with more conflicts with communities



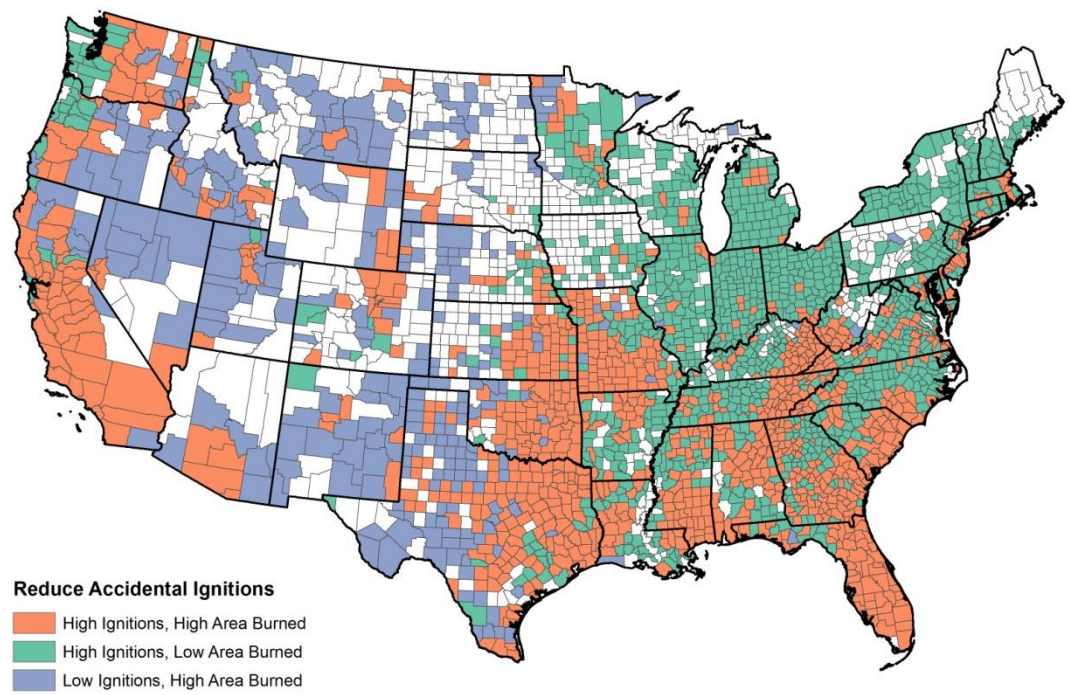
Non-fire Fuel Treatments

- A – Non-fire fuel treatments supported by active timber industry.
- B – Non-fire fuel treatments in non-forested areas supported by grazing or mowing.
- C – Non-fire fuel treatments are preferred option but supporting markets are weak.



Non-fire Fuel Treatments

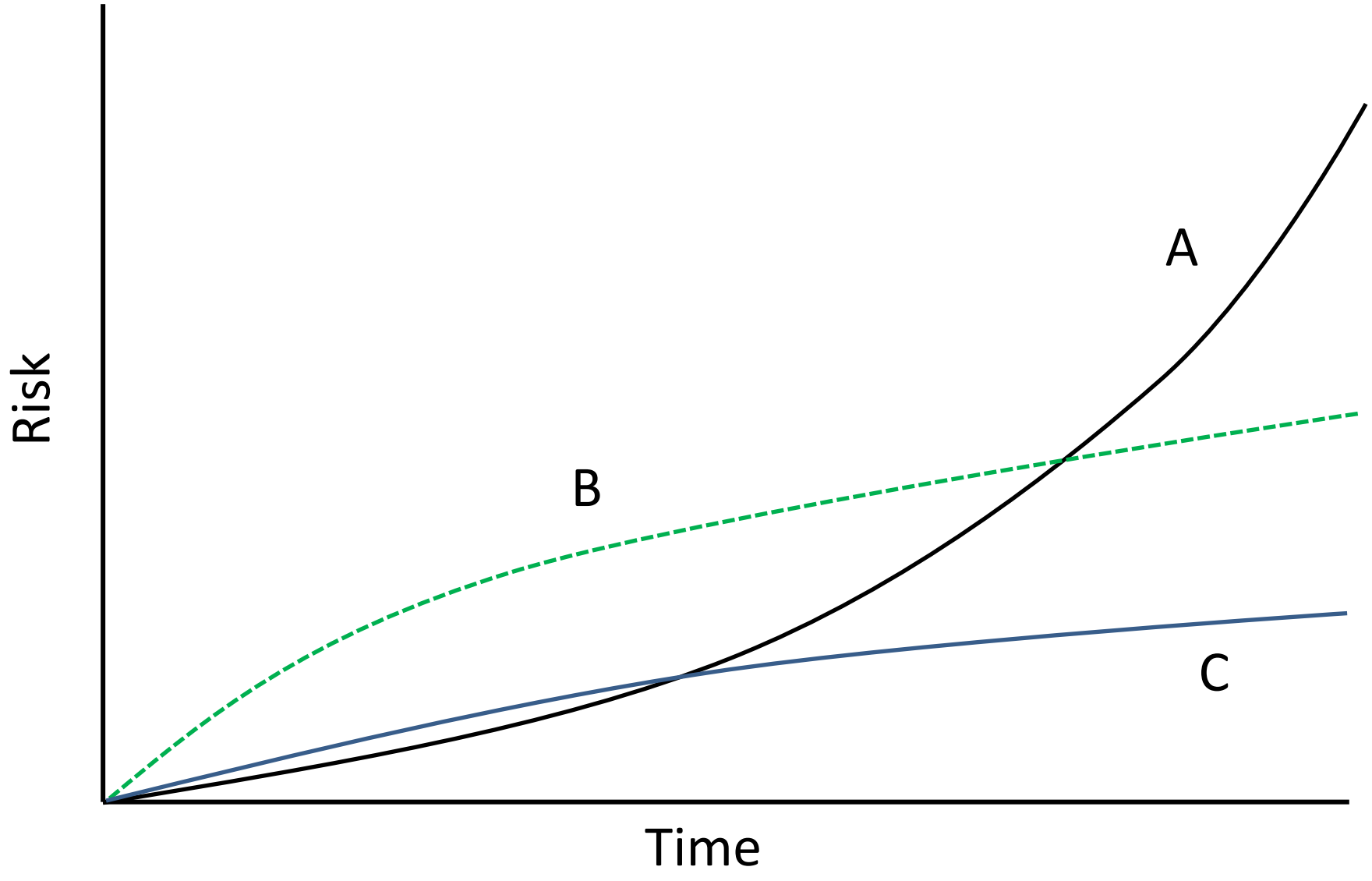
- Treatments are economical as a precursor to managed fire.



Reduce Accidental Ignitions

- High Ignitions, High Area Burned
- High Ignitions, Low Area Burned
- Low Ignitions, High Area Burned
- Low Ignitions, Low Area Burned

National Strategy: Temporal risk trajectories



Three hypothetical scenarios for temporal trends in risk nationwide: continuation of current policies and actions (A), return to historical levels of wildland fire (B), and a mix of prudent policies and actions that effectively reduce long-term risk (C).

National Strategy: Key assumptions

- **Prioritization of investment and use of resources**. Reducing risk significantly will require that existing resources are used more efficiently. From a national perspective, this may require reallocation of resources across agencies, geographical areas, or program areas.
- **Acceptance of increased short-term risk.** Significantly reducing fuels across broad landscapes will require expanded use of wildland fire to achieve management objectives. Using fire as a tool carries inherent risks that must be accepted in the short-term in order to achieve the longer-term benefits.
- **Greater collective investment.** Even with greater efficiency and acceptance of short-term risk, current levels of investment may be inadequate to achieve the levels of risk reduction desired. All who have a stake in the outcome must share the financial burden.

National Priorities

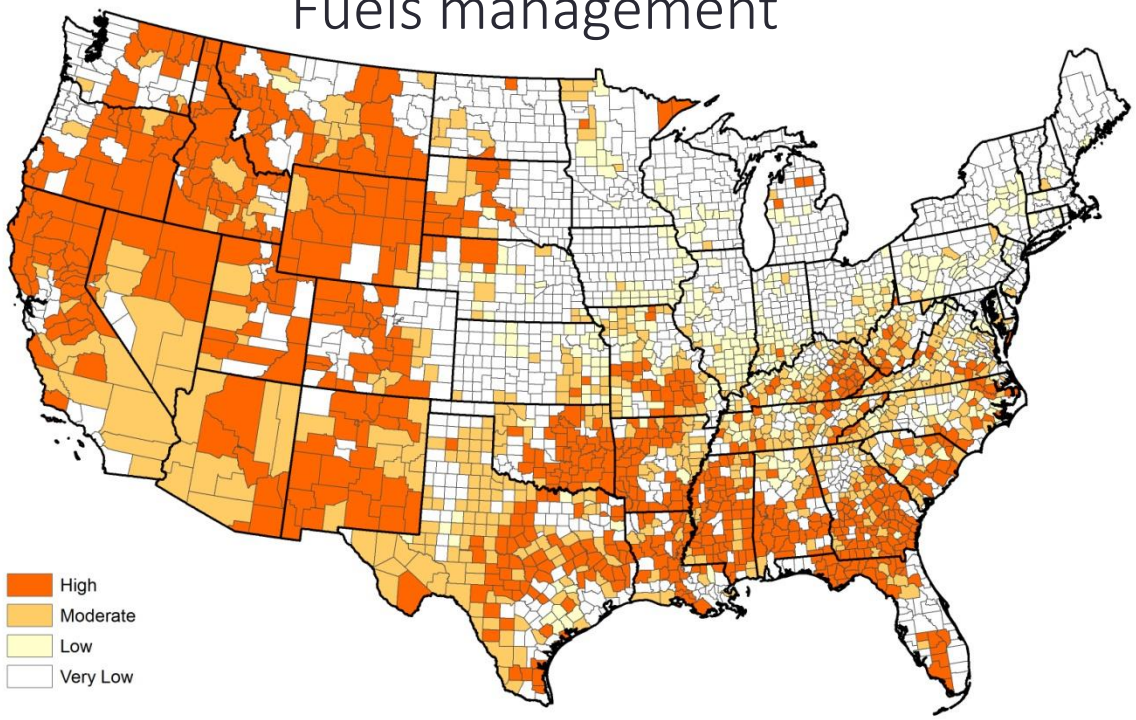
Attributes of counties falling within each **combination** of community clusters and landscape classes were considered to the four national challenges.

The match between county characteristics and thematic actions were used to suggest relative priorities from a national perspective.

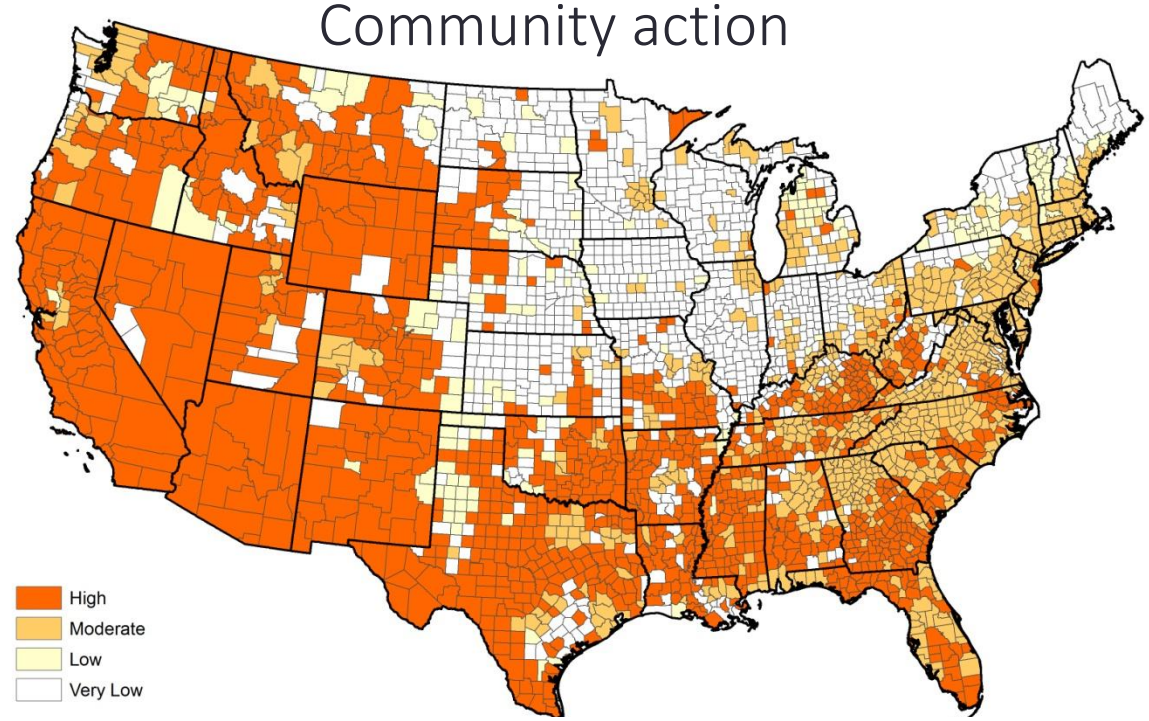
Landscape Classes	Community Clusters								Grand Total
	1	2	3	4	5	6	7	8	
A	8	3	31	30	71	4	129	194	**470**
B	68	5	6		78	1	6	56	**220**
C	15	5	6	12		9	7		**54**
D	56	38	29	2	265	5	14		**409**
E	22	76	7	3	28	22	1		**159**
F	2	32	6	8	12	7	1		**68**
G	18	24	28	12	4	8	20	17	**131**
H	29	8	189	8	30	54	42	99	**459**
I	62	18	145	7	207	24	60	192	**715**
J		69	24	38	7	4	8		**150**
K		40	135	13	15	16	17	38	**274**
Grand Total	**280**	**318**	**606**	**133**	**717**	**154**	**305**	**596**	**3109**

Spatial Prioritization

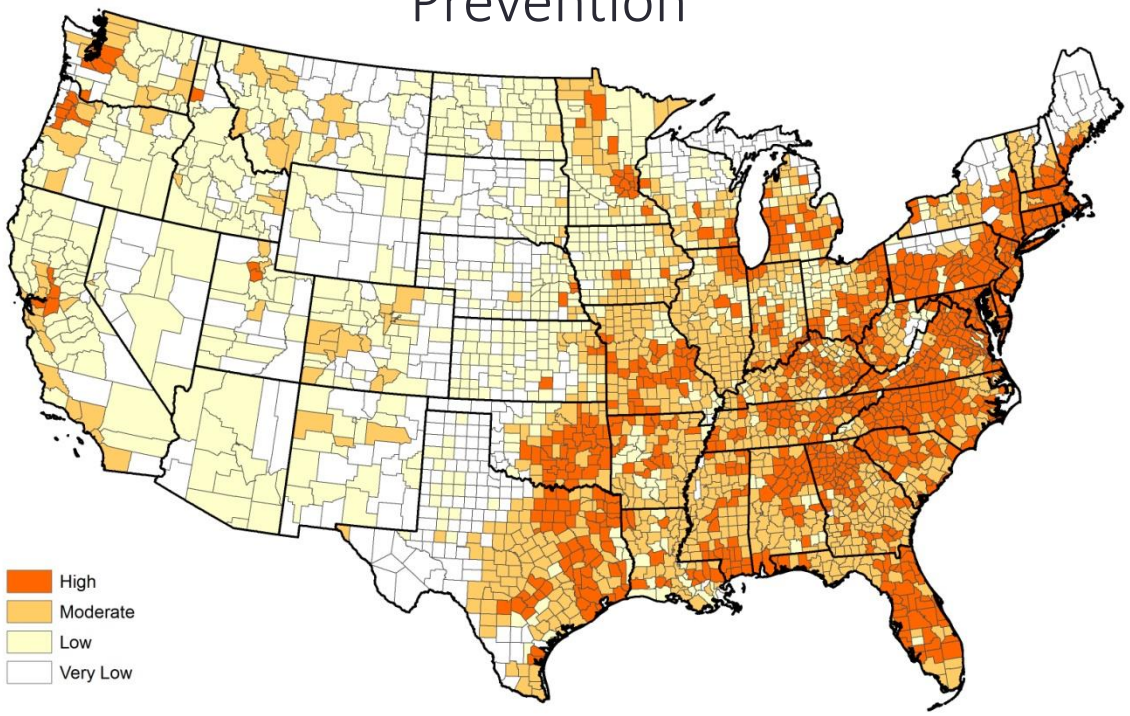
Fuels management



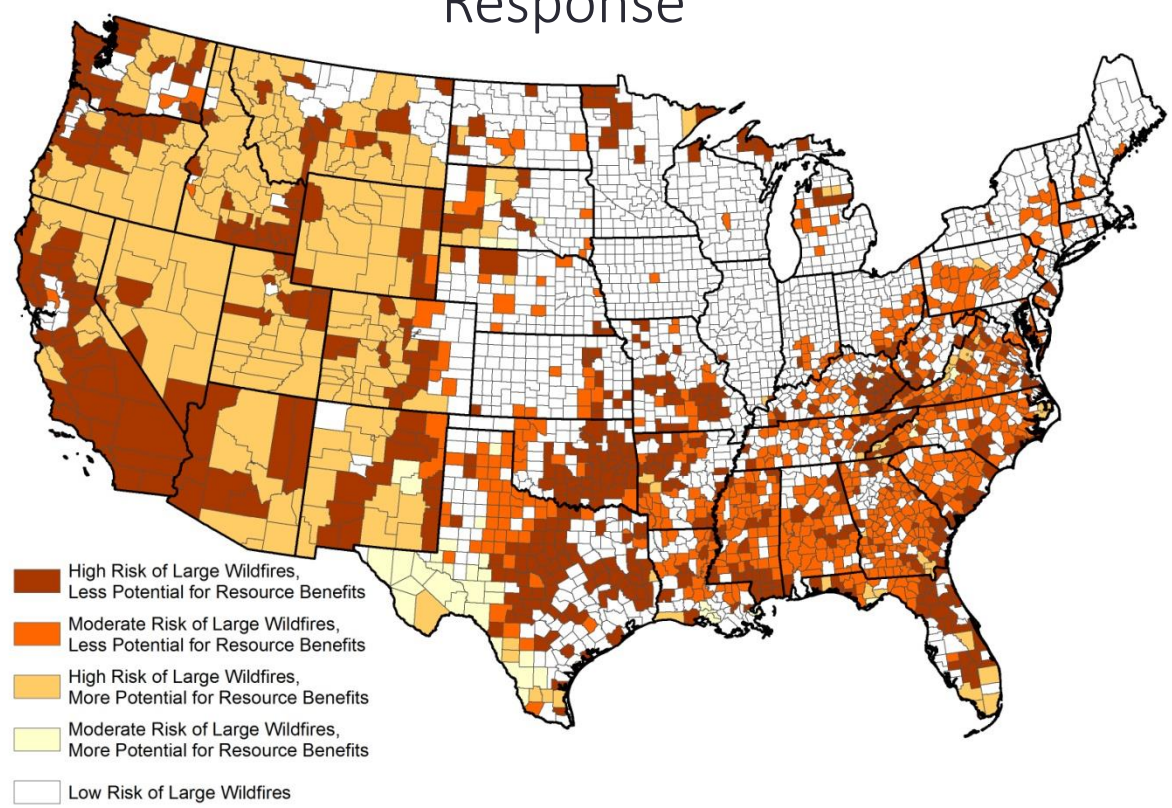
Community action

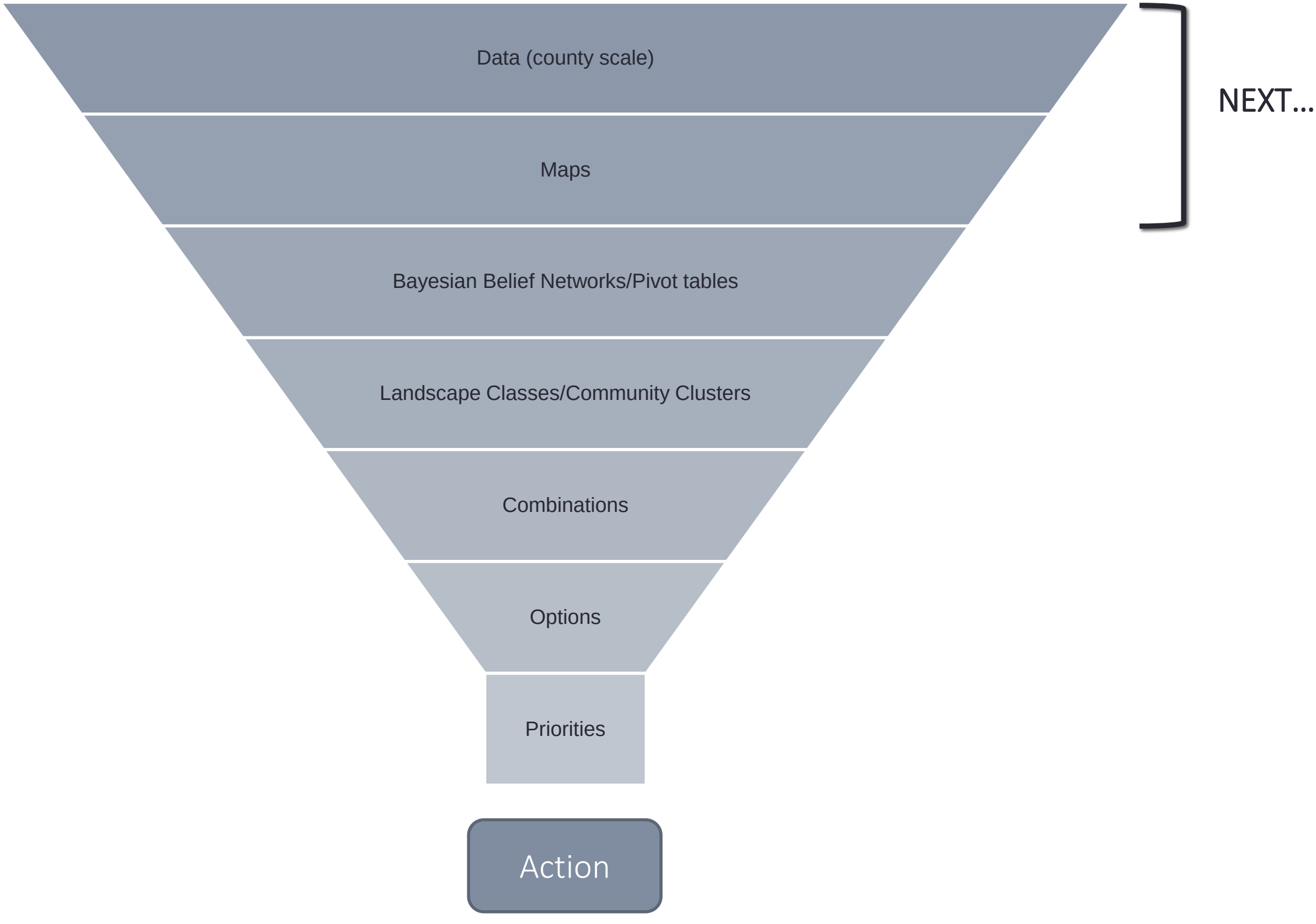


Prevention



Response




Data (county scale)
Maps
Bayesian Belief Networks/Pivot tables
Landscape Classes/Community Clusters
Combinations
Options
Priorities
Action
NEXT…