



Assessing Trade-Offs Between Prescribed Fire and Wildfire: Framework Development

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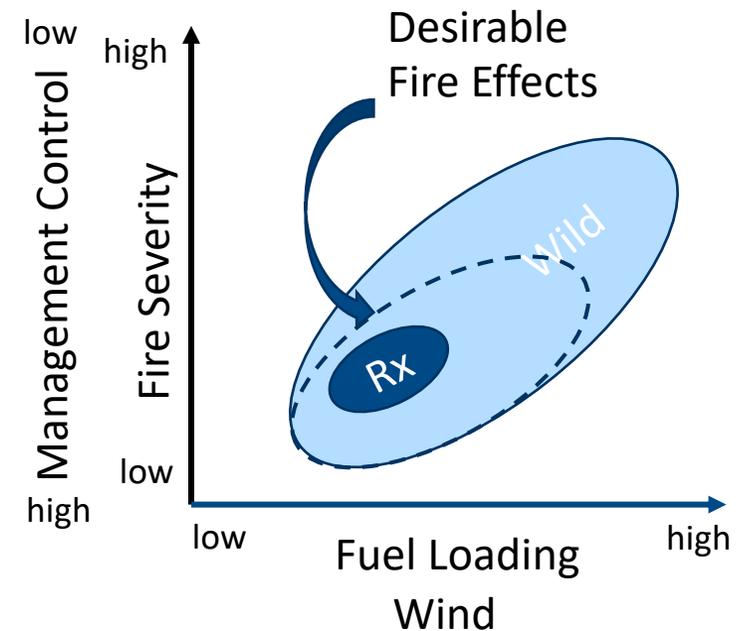
Why is Framework Important

- 2017 Wildland Fire
 - >\$3 B suppression costs
 - 10.0 M acres, 71,500 wildfires
 - 6.4 M acres prescribed fire
 - 12,306 structures burned
 - \$12 B in insurance claims (CA)
 - 44 fatalities
- Factors increasing wildland fire risk
 - Changing weather/climate
 - Development of wildlands
 - Invasive species & insect/disease outbreaks
 - Accumulation of fuels
 - High cost of fighting fires
- 2014 National Cohesive Wildland Fire Management Strategy



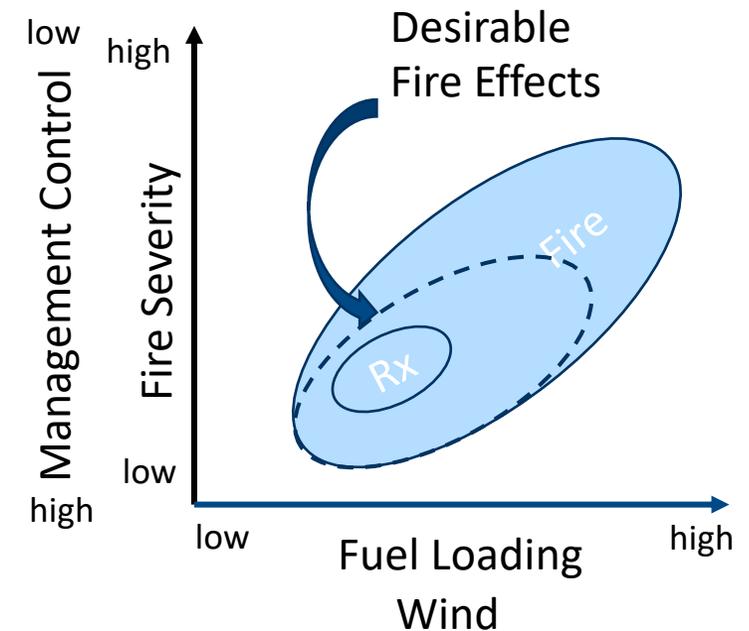
Wildland Fire Continuum vs RxFire & Wildfire

- RxFire over broad range of conditions
- Wildfires over broader range of conditions
- Broad range of management response to wildfire - full suppression to wildfire use
- Beneficial aspects of RxFire and Wildfire
- Negative aspects of both
- Complex interactions of factors affecting fire and resulting effect – sometimes confounding comparison of RxFire & Wildfire



Wildland Fire Continuum vs RxFire & Wildfire

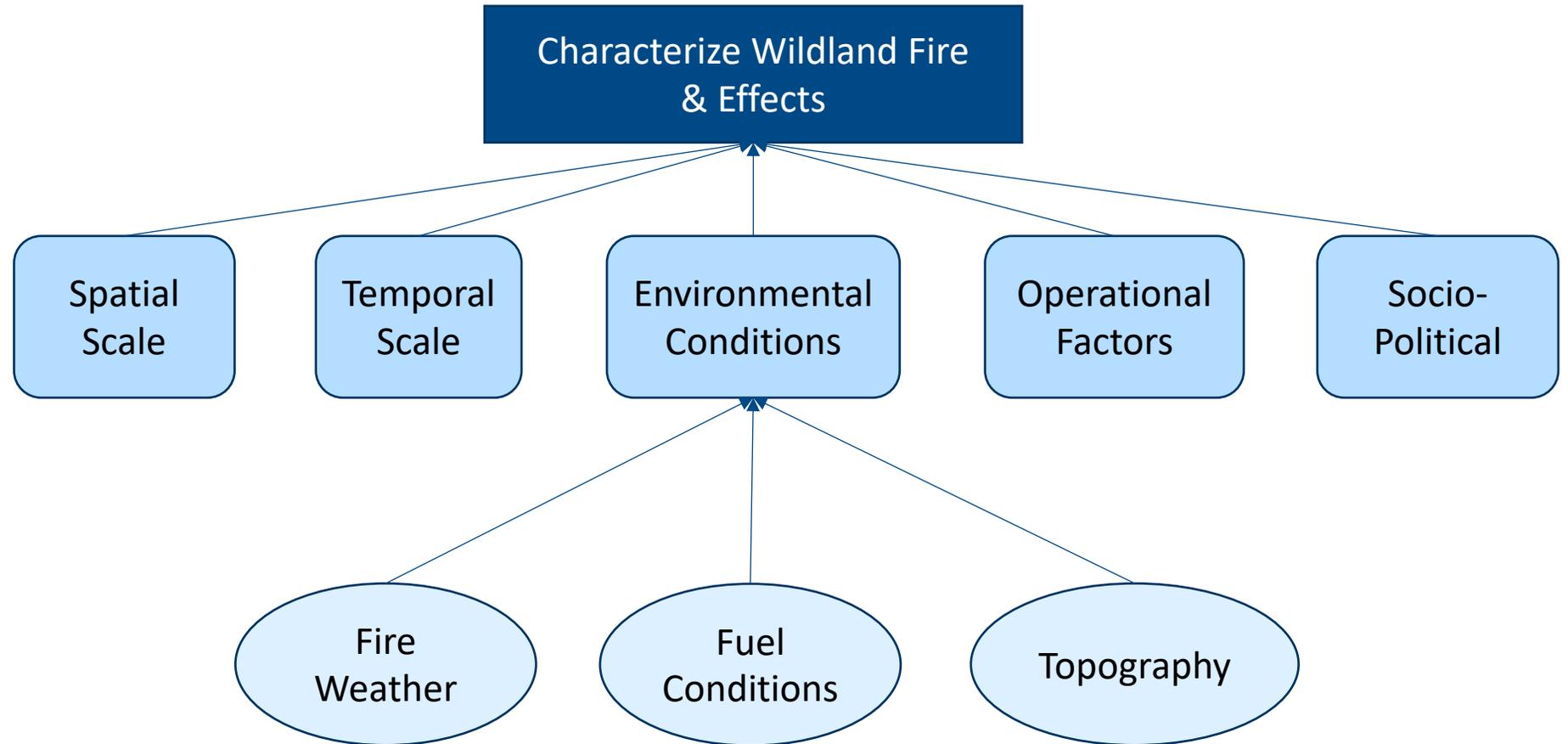
- Treat wildland fire more as a continuum
- Provide more complete context to compare drivers & effects
- For use by researchers, policy makers, & program managers
- A Framework to compare effects and better explain how to put more fire on landscape with beneficial effects



Assessment Framework for Wildland Fire

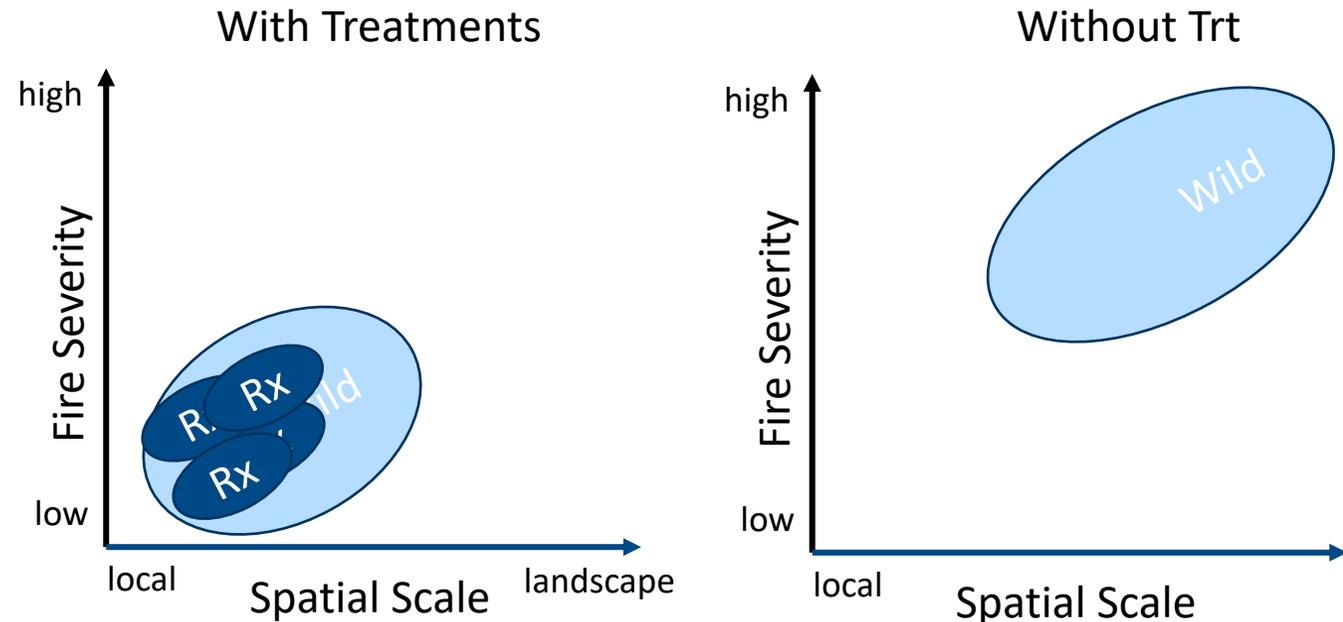
- Framework contexts

- Elements



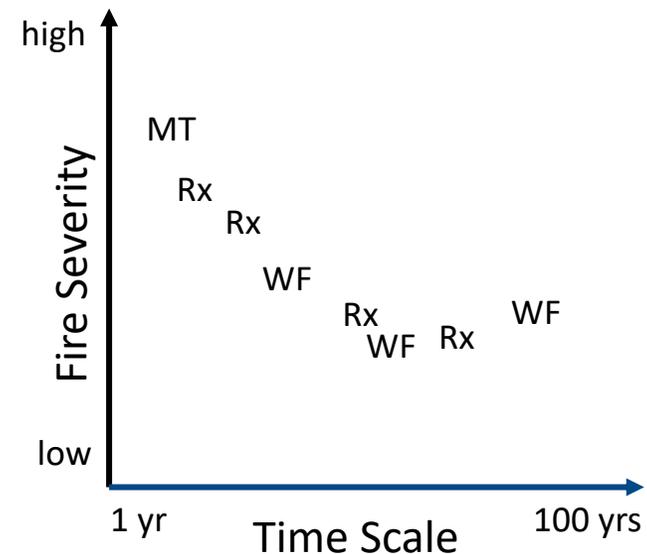
Framework Context – Spatial Scale

- Range of scale
 - Small fire or treatment
 - Stand or mgmt. unit
 - Big fire
 - Landscape
 - Regional/continental
- Context of spatial scale
 - Number & size of fires/treatments
 - Spatial heterogeneity of environmental & operational factors
 - Type of vegetation, terrain, weather



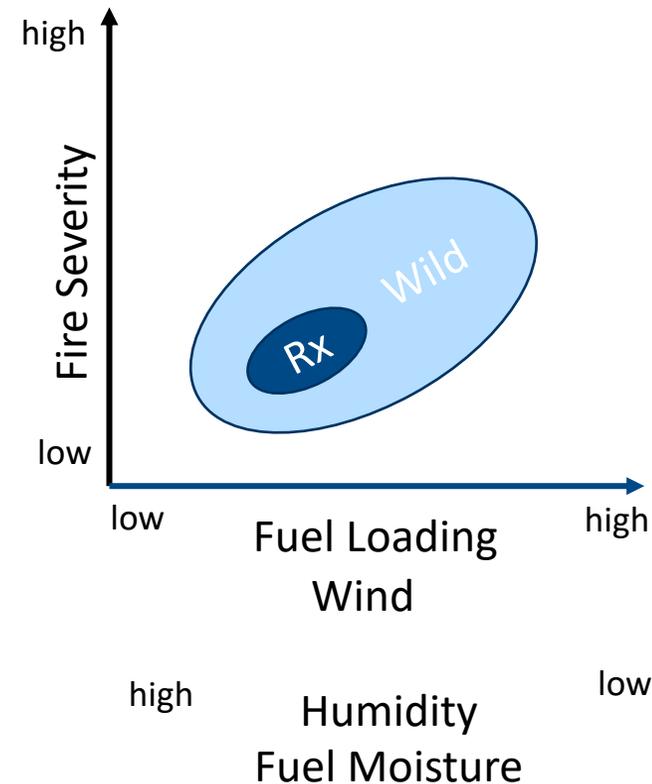
Framework Context – Temporal Scale

- Range of scale
 - < 1 year - event or treatment
 - 10-20 years - duration of plan
 - 100-1000 years – comm. cycle time
- Context of time
 - Fire regimes
 - Management treatments
 - Adaptation of plant communities
 - Attitude of human communities
 - Change in wildland fire risk
 - Short term risks versus long-term benefit



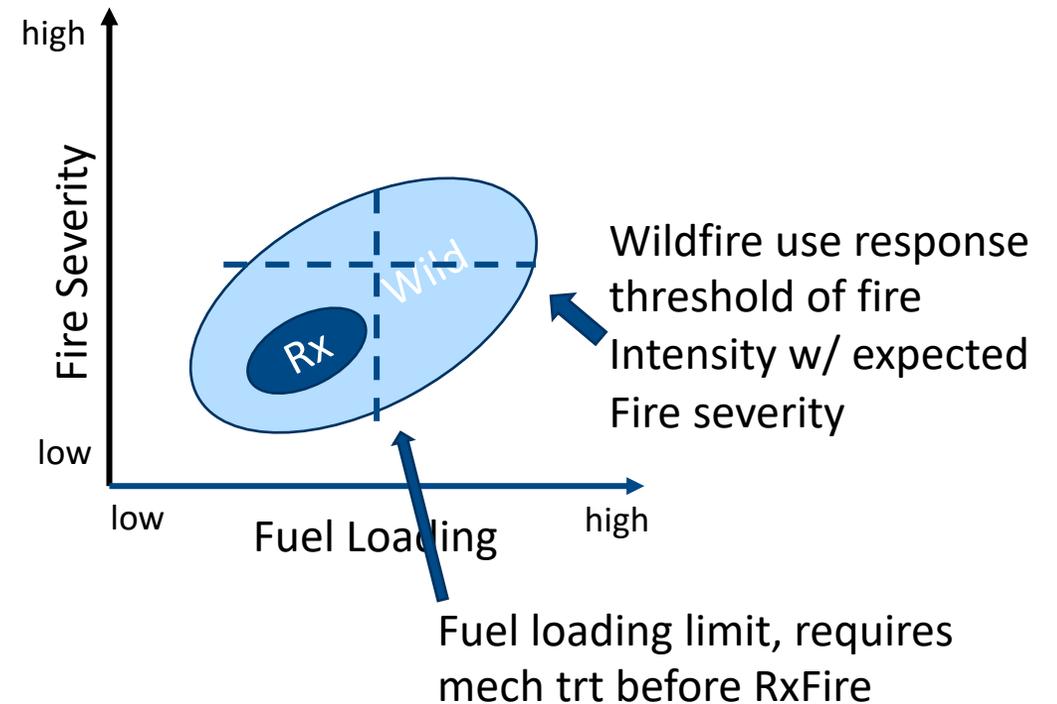
Framework Context – Environmental Condition

- Ambient wind (speed and direction)
- Ambient temperature
- Ambient humidity
- Atmospheric mixing conditions/injection height
- Fuel loading
- Fuel moisture
- Vegetation structure/composition
- Topography



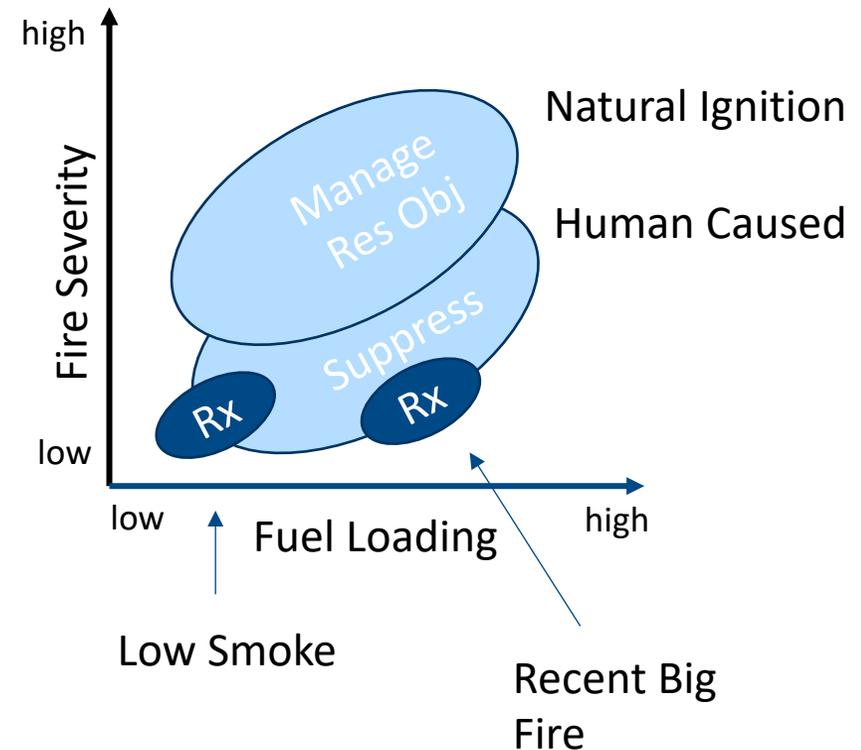
Framework Context – Operational Factors

- Pre-fire planning and preparedness
- Season of burn
- Within day timing of burn
- Ignition (source, single versus multiple, location, and pattern)
- Area burned
- Duration of burn
- Fire intensity
- Total biomass burned/composition of fuel consumed/ratio of flaming versus smoldering combustion
- Weather next 24 hours
- Fire behavior prediction
- Values at risk or that benefit from fire
- Available firefighting resources
- Management approach (based on policy and objectives)

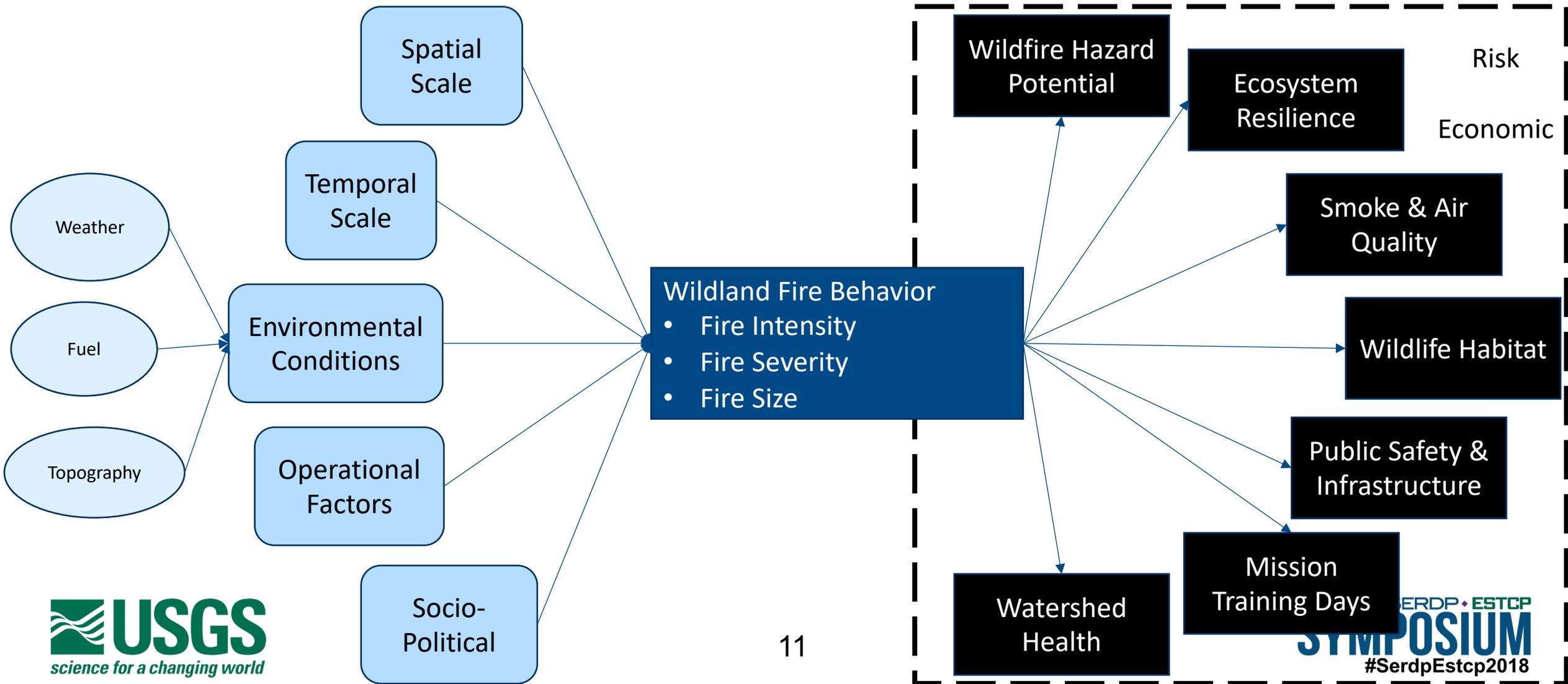


Framework Context – Socio-Political

- Configuration & extent of WUI
- Prior experience/attitude towards fire
 - Tolerance for fire and smoke, recent experience with large fire welcomes RxFire
- Liability constraints
- Stakeholder values/objectives
- Short- versus long-term risk
- Regulatory constraints
 - Air quality limits, Fire response policy on human caused ignition



Framework Application for Wildland Fire



Reviews of Wildland Fire

- Flora & Fauna
 - Brown & Smith 2000, Smith 2000
- Soils & Water
 - Certini 2005, Neary et al 1999, Neary et al 2005, Shakesby et al 2016
- Carbon/Nitrogen
 - Chen et al 2017, Wan et al 2001
- Air Quality
 - Williamson et al 2016, Sandberg et al 2002
- Cultural Resources
 - Ryan et al 2012
- Fire risk/treatments/economics
 - Parks et al 2018, Penman et al 2011, Thomas et al 2017
- General observations with initial look at reviews
 - Often did not compare prescribed fire & full range of wildfires (thousands of small fires, wildfire use vs full suppression fires), or other key factors identified in “Framework”
 - Fire intensity and fire severity are often the biggest determinant of effects
 - Often single event focus versus over landscapes
 - Emphasis on forests versus other habitats (e.g., sagebrush, chaparral, deserts)
 - Wholistic effects analysis rare

Framework Application

- Policy
 - Understand and explain potential implication of policy alternatives
- Research
 - Better characterize interacting factors affecting fire behavior & effects
 - Explain potential variation in findings between regions and studies
- Program Management (local & national)
 - Framework context is roughly equivalent to Fire Management Plan, Burn Plan and NEPA analysis
 - Identify opportunities in advance of fires
 - Evaluate objectives and define improvements in an adaptive management approach



Questions?

