Issue of Concern: Wildfire

Climate change has the potential to affect the patterns that create and shape wildfires in New England. Projected increases in temperature, drought occurrence and severity, and the occurrence of severe wind events would all increase the potential for wildfire by creating more frequent periods of conducive conditions. Increased stress on vegetation from interactions between drought, pest and disease, windthrow, and other disturbances could all increase tree mortality and lead to greater build up of fuels. These factors will vary geographically, by forest community, and over time, and are likely to depend heavily on human influence both in terms of suppression and ignition. A variety of forest adaptation practices may be able to reduce the riskof wildfire and mitigate the damage when fires do start.

Climate Change Impacts

Wildfire occurrence depends on the coincidence of favorable weather conditions, combustible fuels, and the ignition event itself – all factors that the Northeast's changing climate may affect. Recent modeling efforts that attempt to take these many drivers into consideration have reached mixed conclusions, with some studies suggesting that wildfire risk may increase in Northeastern forests (Guyette et al. 2014, Wotton et al. 2009), while others suggest that it is not likely to change substantially over the next century (Heilman et al. 2015, Tang et al. 2015).

If high temperatures and moisture loss exceed increases in precipitation (even if only during part of the year), conditions supporting wildfire may become more frequent (Drever et al. 2009, Guyette et al. 2014). This may be particularly important during the spring and fall when wildfire conditions are more common. Drier conditions could also increase the frequency of wildfires in certain forest types of the Northeast, such as northern hardwoods, where fires are historically rare. A change in vegetation, particularly an increase in oak systems over time, could increase the abundance of fire-associated forest types in the region (Mohan et al. 2009).

In addition to the direct effects of temperature and precipitation, tree mortality resulting from other stressors, such as pests and extreme weather, can increase fuel loads and potentially the risk of fire (Hicke et al. 2012, Sommers et al. 2011). Even if conditions exist and fuels are present, ignition is required for a wildfire to occur. Recent global modeling efforts suggest that climate change may lead to a marked increase in lightning-caused wildfire and potentially greater extents of burned area in northern forests (Krause et al. 2014, Price & Rind 1994).

The complex interactions between changing climate conditions and human activity on the landscape will ultimately determine the frequency and severity of wildfire in this region. From 2000-2008, the vast majority (>75%) of fires in Eastern forests were caused by human activity (Prestemon et al. 2013). Population density has been linked, at times, to greater fire ignition, but the relationship is complicated and depends on multiple variables over time (Keeley & Syphard, 2018). Whether or not greater population pressure increases wildfire occurrence, over 50% of southern New England consists of development within the wildland-urban interface (WUI) and a growing proportion for each of the last three decades (Radeloff et al. 2018). These interface areas increase the chance for fire, its potential risk, and make suppression operations and prescribed fire much more difficult and expensive to execute safely (Stanturf et al. 2003, Mercer & Zipperer 2012).

“Fighting fire with fire” is also an established cultural and silvicultural principle. The risks of prescribed fire (Yoder, 2008) can be evaluated in relation to the risks posed by wildfires, which may be mitigated by proactive burning (Donovan & Brown, 2007). Many silvicultural practices already prescribe fire as a means of retaining oak or even transitioning to oak-dominated forest types, (Brose, 2014, Vose and Elliot, 2016), and the conditions of a site and its management history will strongly influence whether prescribed fire may be an appropriate tool for achieving restoration goals (Hart & Buchanan, 2012; Patterson, 2006; McEwan et al. 2011).

Adaptation Actions for Forests

Additional actions are described in the Adaptation Strategies and Approaches for Forests.

Site Condition	Adaptation Approaches	Example Adaptation Actions
Risk of severe wildfire	• Restore or maintain fire in fire-adapted ecosystems • Alter forest structure or composition to reduce risk or severity of wildfire • Establish fuelbreaks to slow the spread of catastrophic fire	• Use prescribed fire to reduce fuels, invasive species, and understory competition • Create fire lines and fuelbreaks in order to reduce the spread of wildfire • Remove edge vegetation and lower branches of perimeter trees of flammable stands (e.g., pine islands) to interrupt the path of fire from the ground surface to the tree crown • Shift prescribed burn seasons to align with projected seasonal precipitation changes, thereby reducing the risk of unintended wildfire conditions
Tree species present are more vulnerable to fire	• Restore or maintain fire in fire-adapted ecosystems • Alter forest structure or composition to reduce risk or severity of wildfire	• Promote species that are tolerant of drought and fire conditions • Use prescribed burning to promote fire and drought adapted species
Composition of forest systems changing fundamentally	• Maintain and restore diversity of native species • Restore or maintain fire in fire-adapted ecosystems	• Use prescribed fire to restore the open character of oak woodlands and glades • Favor oak, pine, and other more drought- and heat-tolerant species on sites that are expected to become warmer and drier

On-the-Ground Examples

- Massachusetts Department of Conservation and Recreation: Tannery Road Timber Sale
    - Managers of this timber sale within Savoy Mountain State Forest were concerned that warmer, drier summers and increased windthrow could lead to wildfire conditions in an already degraded Norway spruce plantation. They thinned the Norway spruce plantations with rows oriented east-west in order to reduce the risk and/or severity of future wildfires.
- Massachusetts Department of Conservation and Recreation: Bristol Lot Timber Sale
    - In this oak-dominated stand within F. Gilbert Hills State Forest, managers intend to use prescribed fire to maintain oak regeneration and control invasive species.

Potential Monitoring Items

- Level of moisture stress on forest; drought length and water levels
- Areas where previous mortality or harvest may have led to increased fuel loads
- Consider signage or educational material for other users of the land to prevent ignition events

Additional Resources

- For information about past and current fire incidents, preparedness, and government firefighting resources visit the National Interagency Fire Center.
- For information about ongoing incidents and response, view the InciWeb - Incident Information System.
- For the latest in scientific information and opportunities for collaboration, visit the North Atlantic Fire Science Exchange.
- For more information about the Wildland-Urban Interface and its change over time, you can read more and explore interactive maps at the University of Wisconsin's Silvis Lab.