



WILDFIRE AND WOODLANDS

ASSESSING AND REDUCING RISKS

by Jeff Stringer

Photo courtesy: Kentucky Division of Forestry

All woodlands, to one degree or another, are at risk of being damaged by a wildfire. Fortunately, it is possible to assess woodlands for the risk of wildfire occurrence and the degree of damage that might occur. This assessment allows plans to be made that are effective in reducing the potential harm to woodlands from wildfires.

FIRE SCIENCE AND BEHAVIOR

It is helpful to understand some of the facts associated with how wildfires start and spread and the science and behavior of wildfires. While this is a complex subject, there are some basics that can be easily explained, and once understood, they are very helpful in assessing risk and implementing practices to reduce damage to trees and woodlands caused by wildfires.

In order for a wildfire to start, there has to be fuel present that can easily ignite. In Kentucky, the easily ignitable fuels are dried leaves from hardwoods or needles from pines. Dry conditions with abundant ignitable fuel on the ground occur directly after leaf fall, in late October through December, and again in late February through April. Once new leaves emerge, shade is on the ground, the humidity in the woodlands increases, and the leaves become hard to ignite. The periods cited above are when leaves are exposed to sunlight and signal Kentucky's wildfire hazard seasons. Laws are associated with outdoor burning at these times (see page 4). It takes only a small amount of warming and wind at these times of the year to dry the surface of the leaves so that they can easily ignite. This drying occurs quickly on south- and west-facing slopes compared to areas that are shaded, such as north-facing slopes, coves and hollows, and areas directly adjacent to streams.

While a patch of dry leaves can easily ignite, a fire can spread if there is an unbroken distribution of fuel throughout the woodland. Unfortunately, after leaf fall most woodlands

are left with a continuous blanket of fuel. This continuity of fuel allows a wildfire to spread quickly across the ground, encompassing the entire woodland. Fires fueled solely by leaves or other fuels on the forest floor are termed ground fires, compared to those in the western United States, where entire conifer trees catch on fire and the fire spreads through the canopy as well as along the ground. How fast a ground fire moves and its heat and intensity relate to how much fuel is present, how dry the fuel is, air movement, and landscape position. While leaves (or needles) are the ignitable fuel, twigs, branches, and logs are also fuel. The more there is of this type of woody debris, and the drier it is, the greater the potential for intense fires. More will be said about this later. Relative humidity and rainfall are what controls the moisture of the fuel, whether it is leaves or branches. Of course, leaves dry quickly when subjected to low humidity, followed by larger fuels such as twigs, branches, and finally logs or large tree stems. The longer the dry spell, the more the larger fuels dry out and the more easily they are ignited, which can contribute significantly to increasing a fire's intensity significantly (see *Kentucky Woodlands Magazine* December 2007, Vol. 2 [3]).

Moving air fans flames and creates more intense fires. We normally consider air movement as wind, and certainly wind can create hotter and faster moving wildfires. However, fires also create their own air movement. As hot air rises from the front of a wildfire it "sucks" air in behind it, creating air movement. This air movement fans the flames. This is very noticeable on steep terrain if a fire gets started at the bottom of the hill. As the fire naturally moves uphill, the air currents flow in the same direction as the fire's movement accelerating the fire as it moves up the hill, increasing its intensity, and resulting in conditions at the top that can be lethal to trees, shrubs, and understory.

WOUNDING TREES

Regardless of size, all trees can be wounded from fires. Once the inner bark heats to approximately 140°F for a very short period of time, the living cells can die, resulting in an open wound that lets rot fungi into the tree. Years later, the result is a hollow tree. Most of our species do not have bark thick enough to ward off internal heat buildup. On slopes, forest fuels such as, leaves, twigs, and branches can accumulate against the bottom of a tree on the uphill side. Such added fuel allows fire to linger at the base of a tree. In addition, the uphill side of the tree is shielded from the wind generated from a fire moving up a hill, thus allowing heat to build up. Both of these conditions combine to produce the basal wounding that is common on the uphill side of trees on steep slopes that have burned (see photo to right).



Photo courtesy: Chris Reeves

HOW FIRES START

The majority of wildfires in Kentucky are started by people due to accident, ignorance, or unfortunately, arson. This is in contrast to the western United States where lightning is the primary culprit responsible for wildfires. Embers from debris and trash burning and cigarettes can easily start fires. Stopping debris and trash fires is a matter of following the burning laws, burning in evenings and attending the burn, and using common sense. Arson fires are purposefully set, often times from an inconspicuous public road or woodland trail or road, some place with easy access and out of sight. Knowing these locations relative to a woodland property is helpful in planning to reduce risks.

ASSESSING RISK

First, all woodlands are at risk, because a fresh ignitable fuel source is generated every year during leaf fall. Having steep slopes that are south and west facing increases the possibility of a fire ignition and spread. Ground fires can be low intensity and slow, as for example when a fire is creeping down a hill. Or, ground fires can become very intense when they move uphill. However, neither type of ground fire can happen unless there is an ignition. Access to woods from a public road on the edge of the property or from trails running through the woods, represent an ignition risk. Knowing the topography and the ignition risks allows you to plan on where wildfires might occur. Identifying wildfire control practices should be included in your management plan or stewardship plan for these areas.

The amount and type of forest fuel must also be assessed to determine risk. As stated earlier, the primary fuel for wildfires in Kentucky is leaf litter. However, wind and ice storms can often create a significant amount of larger fuel on the ground. Occasionally, insect and disease outbreaks can kill a patch of trees that can contribute to ground and standing fuel. A branch here or there is generally not an issue. Extreme risk occurs when twigs and branches cover the entire woods, forming a continuous mat of fuel. Once the leaves ignite, branches can also ignite if they are dry and produce a hot fire that spreads across this fuel source, creating enough intensity to kill or severely wound even large trees. Assessing debris buildup is important where storms or insects and disease have deposited large fuels on the ground. The photos below provide



1: Minimal risk, leaves are only fuel.



2: Moderate risk, leaves and scattered large fuels.

Photos 1,2, and 3 courtesy: "Photo Guide for Predicting Fire Risk to Hardwood Trees during Prescribed Burning Operations in Eastern Oak Forests" in U.S. Forest Service General Technical Report NRS-44 by Dr. Patrick Brose.

examples of stands and trees at varying degrees of risk for fire damage based solely on fuel amount and distribution.

REDUCING RISKS

Reducing fire risk involves determining areas that are at risk and developing and implementing a proactive plan to reduce that risk, which should be included in your management plan. Professionals from the Kentucky Division of Forestry can help to develop an effective wildfire management plan. This plan will typically involve the following practices:

- Determining potential ignition points and close off any roads or access to the property (if possible) during fire season.
- If not already in place, developing a good road infrastructure so those areas rated at moderate to high risk can be reached by a vehicle.
- Planning a fire lane system. This system can include the use of existing woods roads or trails and might include developing some more. Fire lanes are strategically placed to allow:
 - the setting of back fires to reduce fuels directly in front of an oncoming wildfire
 - development of a controlled, proactive burn strategy
 - reduction of fuels before a wildfire occurs
 - a place that can be easily reached to set up a fire line in the event of an ongoing wildfire.
- Prior to and during fire season, make sure that leaves and any other forest fuels are cleared from the fire lanes and woods roads. Leaves can be cleared with a blower, and disking can be used to ensure bare ground after leaf fall. This breaks the continuity of fuel, thus stopping or slowing the spread of fires.

- In moderate or high risk areas, a wildfire buffer zone could be developed near ignition sources or around areas in the woods that need special protection. In the buffer zone, develop and implement a plan to reduce fuels. A well-timed, controlled burn could possibly be used to reduce leaves and larger fuels. Large fuels such as branches, limbs, and tops should be removed from the buffer or managed so that this type of fuel is on the ground. Such management can be accomplished using a slash treatment, cutting branches and other woody material into small pieces so they are resting on the ground, or by running them over with a bulldozer. Getting these types of fuels on the ground helps keep them from drying out quickly and hastens their rotting. Branches, limbs, and tops that are off the ground dry quickly and become ignitable in much less time than fuel that is on the ground.

Along with developing and implementing a wildfire plan, there are steps that can be taken to help protect woodlands. It is prudent to know the contact information for alerting the proper agencies in case of a wildfire (see page 4). Cease debris burning and other practices that could cause ignition, discuss debris burning and other sources of ignition with your neighbors, and report unlawful burning during fire seasons. During fire seasons, alert the Kentucky Division of Forestry to make its staff aware of the location of your woodlands and that you are concerned about protecting them. The inset provides specific information on Kentucky's wildfire seasons and how to obtain information to help protect your woodland, homes, and property in the woods.

Remember that it's too late to start to worry about a wildfire damaging your woodlands as it rolls up the hill. Start protecting your woods now by assessing risk and developing and implementing a protection plan.



3: High risk, leaves, scattered heavy fuels.



4. Extreme risk, heavy fuel 4 to 5 feet off the ground and continuous across the stand.

Photo 4 courtesy: Diana Olszowy, Kentucky Division of Forestry

The overall risk of fire occurrence and damage for an individual tree, stand, or entire woodland is based on a combination of factors including topography (land form); type, abundance and distribution of fuels; and the presence or absence of an area where ignitions are likely to occur. While all of these factors can occur in a large number of combinations, the table on the right provides a rating for the risk and occurrence of wildfires for some common situations in Kentucky.

Rating for Risk of Wildfire Occurrence and Damage								
How To Use								
To determine the fire danger rating for a stand or an entire woodland find what conditions apply most to your situation as indicated by the Xs. For example, if a stand in your woodland is on a moist facing slope, has scattered branches, and roads and trails are present, then the danger rating is Low.								
Fire Danger Rating		Conditions						
		Land Form		Fuel			Ignition Areas	
		Moist	Dry	Leaves	Leaves with Scattered Branches	Leaves with Continuous Branches	No Roads, Trails	Roads, Trails Present
Flat	Low	X	X	X	X		X	
	Low	X	X	X				X
	Medium	X	X		X			X
	Medium		X			X	X	
	High		X			X		X
Gentle Slopes or Rolling	Low	X		X			X	
	Medium	X			X	X	X	
	Medium		X	X	X			X
	High		X		X	X		X
Steep Slopes	Low	X		X	X		X	
	Medium		X			X	X	
	High		X	X	X			X
	Extreme		X			X		X

Moist = Bottoms, north or east facing slopes, coves and hollows, moist lowlands
 Dry = Ridges, south and west facing slopes, dry, well-drained lowlands

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WILDFIRE RESOURCES AND INFORMATION

FOREST FIRE HAZARD SEASONS:

- Spring Forest Fire Hazard Season: Feb. 15 - April 30
- Fall Forest Fire Hazard Season: Oct. 1 - Dec. 15

DEBRIS BURNING:

- During fire seasons, it is illegal to burn anything within 150 feet of any woodland between the hours of 6 a.m. and 6 p.m.

KENTUCKY DIVISION OF FORESTRY WEB RESOURCES:

A one-stop shop for all information related to wildfires in Kentucky...www.forestry.ky.gov

- **Woodland Homes and Property:** Excellent information on protection of homes in the woods has been developed by Kentucky's FIREWISE PROGRAM. Click on Kentucky Firewise
- **Reporting Arson and Unauthorized Burning:** You can contact local law enforcement or contact one of the nine district offices of the KDF. Click on District Office Locations
- **Getting Assistance Developing a Wildfire Plan:** Contact one of the nine district offices of the KDF. Click on District Office Locations
- **Up-To-Date Information on Fire Conditions and Laws:** Click on Daily Wildland Fire Report

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