

Southeastern Forests and Climate Change

KENTUCKY SUPPLEMENT

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This Kentucky supplemental document is intended to accompany the Project Learning Tree *Southeastern Forests and Climate Change* Secondary Environmental Education Module (Monroe & Oxarart, 2014). It is intended for educators who are teaching their students about climate change with a focus on the forests of Kentucky and gives a general background on the state's forests, products, projected impacts of climate change, and pests.

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Kentucky Forest Background (for general use and with activities #1, #3, #5, #13):

Kentucky forests provide a multitude of benefits, some that can be easily quantified and others that are more difficult to convert into dollars. These include economic, recreational, and aesthetic benefits, as well as control of erosion, habitat for wildlife, and benefits to our air and water (Kentucky Division of Forestry, 2010). The forests of Kentucky provide vital economic and ecological services to residents, generating a total of \$12.8 billion of impact to the state's economy with more than 59,000 people employed in the forest industry (Commonwealth of Kentucky Energy and Environment Cabinet, 2014). Kentucky forests cover approximately 12.4 million acres, which is equivalent to 49 percent of the state (US Forest Service/Kentucky Division of Forestry, 2012). Ninety-nine percent of forests in the state are considered available for timber production (Oswalt, 2013). Kentucky is a leading producer of hardwood forest products in the Southern United States and, in 2013 the total exported forest products were valued at \$102.9 million (Commonwealth of Kentucky Energy and Environment Cabinet, 2014). In a 2010 report issued by the Kentucky Division of Forestry, Kentuckians identified the following forest issues as top priorities: forest health, water quality and quantity, forest loss and fragmentation, forest management, funding, public awareness, urban and community forestry, unlawful activity (i.e.,

timber theft and trespass), wildland fire, forest economy, mountaintop removal, public access, and prescribed fire (Kentucky Division of Forestry, 2010).

The Trees and Products of Kentucky Forests (for use with activities #3, #5, #12):

In the south, Kentucky is among the leading production states for hardwood forest products that are shipped across the country and around the world (Commonwealth of Kentucky Energy and Environment Cabinet, 2014). The Kentucky forest ecosystem is dominated by two main forest types: oak/hickory and oak/pine, and includes the following species: walnut, oak, maple, cherry, hickory, yellow-poplar, and pines including Virginia, pitch, loblolly and eastern white (Kentucky Department for Natural Resources, 2011). Each of Kentucky's 120 counties contributes to the economic value of its forests; there are more than 1,800 logging firms and 703 processing facilities across the state including sawmills, pulp and paper mills, as well as flooring, barrel, and cabinet manufacturers (Commonwealth of Kentucky Energy and Environment Cabinet, 2014).



Time Required to Produce Various Products from Common Kentucky Trees

Ash (green and white)	Pulpwood 30-50 yrs. / Logs (handle stock, lumber) 40-70 yrs.
Maple, soft (silver and red)	Pulpwood 20-30 yrs. / Logs (lumber & veneer) 40-60 yrs.
Maple, hard (includes sugar)	Logs (lumber & veneer) 40-90 yrs.
Oak, upland	Posts 20-30 yrs. / Logs (lumber & veneer) 40-80 yrs.
Oak, bottomland	Logs (lumber & veneer) 40-70 yrs.
Poplar, yellow (tulip)	Pulpwood 20-30 yrs. / Logs (lumber & veneer) 40-60 yrs.
Pine, eastern white	Christmas trees 7-10 yrs. / Pulpwood 15-25 yrs. / Logs 40-80 yrs.
Pine, loblolly	Pulpwood & posts 15-30 yrs. / Poles & piling 35-50 yrs. / Logs 40-60 yrs.
Pine, Virginia	Christmas trees 8-15 yrs. / Pulpwood & posts 15-25 yrs. / Logs 40-60 yrs.
Walnut	Logs (lumber & veneer) 40-80 yrs. / Nuts 12+ yrs. (30-130 yrs. best)

Source: Kentucky Department for Natural Resources, 2011



Potential Impacts of Climate Change on Kentucky Forests (for use with activities #4, #5, #13, #14):

Climate change will directly affect the productivity and composition of our forests. In Kentucky, temperatures are projected to increase and precipitation events will become more erratic, causing some species (sugar maple, birches, black walnut, and northern red oak) to possibly decline, while others (loblolly pine, blackjack oak, and southern red oak) to possibly increase (Vincelli, et al., 2011). Specific impacts on tree growth and mortality, forest epidemics, and the associated economic losses are difficult to assess, and as such it is expected that most forest management responses will occur too late (U.S. Global Change Research Program, 2014). Plant phenology is also being impacted by climate change, which can affect the reproductive success of various plant species, in turn impacting populations of pollinators and seed dispersers (Vincelli, et al., 2011). In recent years, Kentucky forests have suffered considerable damage from straight-line winds and ice, resulting in economic, recreational, and aesthetic losses (Kentucky Division of Forestry, 2010).

Pests in Kentucky's Forests (for use with activities #3, #4, #14):

There have been recorded increases in forest disturbances including the extent and virulence of insects and pathogens due to increased tree stress, changes in phenology, and a change in insect and pathogen life-cycles (U.S. Global Change Research Program, 2014). In recent years, the threats to Kentucky's forestland have increased, resulting from the introduction of diseases and non-native invasive plants and insects (Kentucky Division of Forestry, 2010). As mentioned in the *Southeastern Forests and Climate Change*, the Southern pine beetle is of major concern to Southeastern forests. In Kentucky, outbreaks of this pest occur in 25-

to 30-year intervals, because the state is the northern extreme of the insect's geographical range (Townsend & Rieske-Kinney, 2010). It is projected that the infestations of Southern pine beetle in Kentucky will intensify as a result of the changing climate (Kentucky Department of Fish and Wildlife Resources, 2007).

Another forest pest of concern in Kentucky is the Hemlock Woolly Adelgid, which was first found in the Southeastern portion of the state in 2006 (Thompson & Mandt, 2010).



The insect can now be found in at least thirty eastern and southeastern counties (Kentucky Department for Natural Resources, 2011). The Hemlock Woolly Adelgid attacks and kills eastern hemlocks of all ages, sizes, and conditions (Kentucky Department for Natural Resources, 2011). The insect is tiny, almost invisible to the naked eye, and is identified by the swab-sized cotton ball "wool" that is found at the base of hemlock needles (Southern Research Station and Forest Health Protection, 2013). Currently, there are monitoring programs to assess infestation levels, as well as biological control agents that can limit the damaging effects of the Hemlock Woolly Adelgid in remote hemlock forests (Evans, 2004). In home and nursery settings, the insect can be managed if detected early through the use of horticultural oil sprays and soaps (Southern Research Station and Forest Health Protection, 2013). Due to a rise in average temperatures attributed to climate change, populations of this insect have begun creeping further north and east, covering larger regions of the United States (Gardner, 2010). The potential loss of hemlocks in Kentucky will have major ecological and environmental effects on forest health including soil erosion, water quality, and biodiversity (Kentucky Division of Forestry, 2010).

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