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The attached document summarizes the threat posed by non-native invasive species and the potential spread of these species via firewood movement. Lessening or eliminating the firewood pest movement vector can have a significant impact on the secondary spread of pests that have entered the United States. Every effort helps as protecting our nation's forests are in everyone's best interest.

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Protecting Forest Resources from the Threat Posed by Firewood Movement

One of the most significant threats to the nation's forest health is the introduction of non-native invasive forest pests. Past introductions and uncontrolled spread of non-native pests such as chestnut blight and Dutch elm disease have nearly eliminated their respective tree hosts. The introduction of emerald ash borer (EAB) is likely to functionally eliminate an entire important tree genus from the American landscape. The loss of major tree species causes significant economic harm and ecological damage as forest ecosystems are irrevocably altered. Pimentel et al (2005) estimated that the destruction to native forest systems in the US by non-native invasive species cost the nation an estimated $120-137 billion per year, and the losses affecting the forest products industry is approaching $4.2 billion dollars per year. The ecological harm that these invasive pests cause is difficult to define in terms of dollar losses, but cascade effects are certain.

For most insect and disease species, including non-natives, natural spread rates are relatively low – perhaps one to two miles per year. Human-aided transport can hasten dispersal significantly, causing drastic "jump" dispersals of several hundred miles or more. Firewood transported by campers has been demonstrated to be an important vector in the spread of forest pests. In the early years of the EAB introduction in the US, 78% of all outlier infestations were associated with a campground, park, or other recreation areas where firewood was commonly used. Personal observations from USDA Animal and Plant Health Inspection Service (APHIS) EAB regulatory staff in IN, MI, MO, OH, & WV also noted that early outlier infestation epicenters were often associated with campsites (Buck 2008). The first EAB reported in the state of Missouri was closely associated with a Corp of Engineers campground, and was more than 100 kilometers from the next nearest infestation. Since 2008, the California Department of Food and Agriculture (CDFA) has worked with USDA Forest Service, Forest Health Protection to monitor the flow of firewood into the state. In 2010, one of the CDFA border protection stations inspected and confiscated infested ash firewood containing viable adult emerald ash borers from a recreational vehicle owned and operated by a couple from Michigan.

The documentation of invasive forest pests being transported in firewood includes multiple peer reviewed scientific articles. A paper published in 2010 by Haack et al investigated APHIS-confiscated firewood recovered at a road stop by the Mackinac Bridge, the main causeway connecting Upper and Lower Michigan. In their study, they split 1,045 pieces of firewood from 21 different tree genera to determine the presence/absence of tree pests. They found that 23% of the sampled firewood contained insects, and another 41% contained evidence of past insect activity. A 2012 Colorado study conducted by Jacobi et al determined that commercially available firewood was transported over a long range. They purchased 419 bundles of firewood from sources in 3 states and found that the bundles came from 18 states in the US. The study revealed that 47% of the firewood bundles resulted in live insect emergence, with an average of 11 insects emerging from each infested bundle. In 2013 study, Koch conducted a pathway analysis study from campground zip code data of over one million federal campground visitors. The data indicated that an estimated 30-40% of campers bring firewood from

elsewhere, and of that introduced firewood, they estimated that 6-10% percent of the firewood was infested. Accounting for many variables, they made a very conservative estimate that 3-5% of all campground visits pose a risk of firewood-facilitated spread of forest pests. A 2010 paper on accumulated introduced invasive species by Aukema et al (2010) showed that between 1860 and 2006 an average of 2.5 introduced species entered the US. Some of these introduced species become pests, and there are no signs of the rate of introduction declining, so the threat of new firewood-vectored pests remains a relevant issue.

The reality is that there is a constant threat of new pest introductions in the forest, just as forests face threats of noxious weed introduction and aquatic nuisance species. Fortunately, in some cases we may be able to develop and implement effective prevention programs to minimize or slow the impacts. The Gypsy Moth Slow-the-Spread Program is one example of diligent outreach, prompt detection, and effective control. This program has slowed the spread of Gypsy Moth by roughly 70% per year, resulting in millions of dollars of savings and countless trees having their lives extended by years, if not decades. A program aimed at discouraging the movement of firewood sourced from at-risk areas into forest lands could reap similar preventive results. Moderating forests visitors' habits in the way they import firewood into forests is possible, and public opinion polls conducted by The Nature Conservancy show that the public is willing to change their firewood use behaviors once they have had the issue clearly explained to them. Much like the public now thinks it is unacceptable to litter - a change that took decades but is now thoroughly ingrained, some day it may seem odd to think that once campers brought items into the forest that ultimately resulted in the destruction of the forest they came enjoy.

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