Testimony of

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Chairman Wyden, Senator Barrasso, members of the Committee: My name is Dominik Kulakowski. I have been conducting research on the interactions between outbreaks of bark beetles and fires for over a decade. During that time I have worked as a research scientist at the University of Colorado and I am now a professor at Clark University in Massachusetts where I continue to pursue this line of research. I have authored numerous scientific papers on this topic and have contributed to three major scientific literature reviews related to bark beetle outbreaks, the most recent of which is attached as supporting material with my testimony. I have also peer-reviewed numerous related scientific studies and research proposals of other scientists. My testimony is based on the findings of my own research and on the research of other established scientists. My goal is to summarize the best available science on the relationship between beetle outbreaks and fire risk and on associated mitigation efforts.

1. Outbreaks and the risk of fire

First of all it is important to recognize that the Rocky Mountain region is being affected by the largest outbreak of bark beetles in recorded history. The extensive areas of dead trees have understandably led to real concern about forest health and the risk of wildfires. However, these concerns need to be informed by the best available science to ensure that our responses do not have unintended ecological consequences with potentially undesirable effects. The vast majority of scientific studies have found that fire risk does not increase following outbreaks of spruce beetle or mountain pine beetle and some studies actually have reported a decrease in fire risk following outbreaks. In contrast, only a couple of studies have reported a minor increase in fire risk following outbreaks and the certainty of some of those conclusions was hindered by complications in the research design. Thus, the premise, such as that contained in

S. 2798, that outbreaks increase the risk of fire is not consistent with the general conclusions of the scientific work on this topic. Consider the following examples.

Following a major outbreak of spruce beetle in Colorado in the 1940s, there was substantial concern about the increased risk of fire. But although over 300 fires occurred in that region in the decades that followed, our research found that the forests that had been affected by beetles were no more likely to have burned than other forests. Furthermore, no major fires occurred in those beetle-affected forests in the years and decades that followed the outbreak despite the abundance of dead trees. The most likely explanation for this lack of large severe fires is that climatic conditions in these spruce-fir forests are a greater factor in determining fire risk than is the presence of dead trees. In fact, it was not until a severe drought in 2002 that a large fire affected these forests and during that year there were many wildfires in Colorado, the majority of which burned forests with no recent history of outbreaks. During the drought of 2002, wildfires also burned some forests in northern Colorado that were being attacked by beetles at that time. It has been hypothesized that the risk of fire may increase during and immediately after outbreaks of bark beetles when the dry red needles are still on the trees. However, our research found that those ongoing outbreaks affected neither the extent nor severity of fires, most likely because changes in fuels brought about by outbreaks were overridden by climatic and weather conditions.

Similarly, after a large fire burned in Yellowstone National Park in 1994, another group of researchers found that stands of lodgepole pine that had been affected by beetles prior to the fire did not burn more severely compared to adjacent areas of forests that had not been affected by beetles. Yet another recent study by a different group of researchers examined fuel conditions for 35 years following outbreaks in lodgepole pine forests and concluded that, depending on wind conditions, the probability of active crown fire either does not change or actually decreases following outbreaks. Numerous other independent studies have also concluded that the risk of fire does not increase following outbreaks and may decrease in some situations.

To understand these scientific findings, which may seem counter-intuitive, we need to consider that (1) bark beetles affect fuels in several ways and (2) several factors are necessary for the occurrence of wildfires. Recent research indicates that reductions in canopy density following outbreaks are actually more important to fire risk than are increases in dead fuel. In other words, beetle-killed trees rapidly lose their needles and this reduces the amount of potentially flammable material in the canopy. In contrast, live trees have dense canopies which are instrumental in the spread of wildfire. Second, and most importantly, in any given ecosystem either fuels or climate will be limiting to the occurrence of wildfire. The emerging scientific view is that fuels are not limiting to the occurrence of fires in the vast majority of

forest types that are currently being affected by beetles in the western United States. In other words, in forests dominated by lodgepole pine and Engelmann spruce there is no shortage of flammable material, even in the absence of beetle outbreaks. These forests are characteristically dense and during droughts the risk of severe wildfire will be high, regardless of outbreaks. In fact climate is so important to fire risk that the effects of outbreaks appear to have comparatively little or no influence.

2. Climate and the risk of fire

There is compelling evidence that outbreaks have little or no effect on the risk of wildfires in these forests. There is also compelling evidence that drought conditions have a major effect on the risk of wildfires. Over the past decades we have seen an increase in large fires that have been associated with drought conditions. Furthermore, using various scientific methods numerous research groups have examined the history of lodgepole pine and spruce forests over the past centuries and have concluded that large and severe fires are the norm in these types of forests and that such fires have historically occurred during periods of droughts. This has been the case long before Colorado and Oregon were states and even before the United States was a country.

Over the past decades fire fighters have been using an extraordinary amount of resources and have been taking extraordinary risks to try to control wildfires – not because those fires have resulted from bark beetle outbreaks, but because they have occurred during drought conditions. It is climate that we should be focusing on if we want to assess and mitigate fire risk. If conditions are dry enough then the risk of fire is likely to be high and if conditions are not dry enough then the risk of fire is not likely to be high, regardless of the effect of outbreaks. Although lodgepole pine and spruce forests that are made up of live green trees may appear not to be flammable, the fact is that during drought conditions the risk of wildfire can be extremely high.

An important corollary of the fact that large and severe fires are the norm in these ecosystems is that fire hazard mitigation in these forests should not be mistaken for forest restoration. Although it may not be socially desirable, the occurrence of severe fires during drought in these forests is not abnormal, and instead represents the characteristic function of these ecosystems.

3. Strategies for reducing fire risk to homes, communities and public safety

Unfortunately, as a nation, we are increasingly building our homes in fire-prone ecosystems. Doing so is like building our homes in floodplains – we may be lucky for a while, but eventually the flood will come. Recent scientific research on fire hazard mitigation concludes that the greatest priority should be given to the wildland-urban interface, especially in the immediately vicinity of homes— an area known as defensible space. Forest Service experts point to a 40-meter zone (about 122 feet) around the home that determines a home's ignitability. Reducing flammable material in the immediate vicinity of structures and replacing flammable building materials such as wooden decks with non-flammable alternatives has been shown to effectively protect structures against fire damage. Likewise, as beetle-killed trees are likely to fall more often than live trees, strategically removing hazard trees in and around campgrounds, recreation areas, and certain infrastructure where property is at risk is integral to protecting public safety.

By design, traditional timber harvest is focused on producing economically valuable timber and wood fiber and not on reducing fire severity. This type of harvest will do little to reduce fire risk at any scale if it primarily removes large trees, because smaller trees, brush and branches often are the major carriers of a spreading fire. In fact, stands that had been harvested but in which small, non-merchantable material had not been removed prior to the 2002 Hayman fire in Colorado actually burned more severely than stands that had not been harvested. To be effective at reducing fire hazard to communities, tree-cutting must be executed in a way that removes all flammable material (not just economically valuable timber) and must be located in the immediate vicinity of homes and settlements. Treating forest lands far from communities is not likely to reduce the risk of fire to homes and neighborhoods.

Overall, it is going to be much less expensive, more effective and less ecologically damaging to focus fire-hazard reduction efforts around communities and homes than it would be to try to make a wholesale modification of forest structure over large landscapes. Pine branches touching wooden decks are much more relevant to fire risk than is the structure of remote forests. Replacing wooden shingles with a metal roof will do much more to protect a home than treating all beetle-affected forests in the Rocky Mountains. My concern is that by focusing treatments in remote forests, we will be using up limited funds and resources while leaving homes and communities at risk of wildfire. Doing so would be like beginning surgery on a patient before first having the correct diagnosis – we will not address the real problem and we may do more harm than good.

4. Preventing outbreaks

If a bark beetle infestation is relatively small and concentrated in a limited area, it may be feasible to reduce the population growth of beetles by removing infested trees from a forest stand or by thinning a stand to reduce stress on trees competing for limited nutrients, sunlight and moisture. For example, if a small stand of spruce is blown down by a windstorm and populations of bark beetles begin growing in fallen logs, then it may be feasible to remove all fallen, infested trees over a small area. However, given the climatic requirements for beetle population levels to reach epidemic levels, it is not known whether such a situation would lead to an outbreak. In other words, a small population of beetles is not sufficient for an extensive outbreak to occur. Conversely, under climatic conditions favorable for an outbreak, such as those of the past decade, outbreaks of bark beetles can erupt simultaneously in numerous dispersed stands across the landscape. Unfortunately, even if one growing population of beetles is successfully removed from one stand, under outbreak conditions beetles from other stands are likely to spread over the landscape. Given that climate typically favors beetle populations and stresses trees over very large areas, it is unlikely that all populations of beetles over an extensive region could be successfully identified and removed.

5. Conclusion

Although ongoing outbreaks understandably have led to widespread public concern about increased fire risk, the best available science indicates that outbreaks of mountain pine beetle and spruce beetle do not lead to an increased risk of fire in the vast majority of forests that are currently being affected. We should not let the effects of bark beetle outbreaks, as spectacular as they may be, distract us from the real risk. The real concern in that we have built homes, communities, ski resorts, and other infrastructure in inherently flammable ecosystems. The ongoing outbreaks have not increased the risk of wildfire as much as they have drawn attention to the risk that has been there long before the outbreaks began. Forests of lodgepole pine and spruce-fir are prone to high-severity fires during drought conditions, regardless of the influence of bark beetle outbreaks.

There is a need to take effective steps to protect public safety and especially to protect homes and communities from fire risk that is associated with drought conditions. The best way of doing so is by removing flammable material from the immediate vicinity of homes and communities and by using fire resistant building materials, not by modifying forest structure in remote areas that have been affected by outbreaks. The former approach would be less expensive, much more effective at protecting public safety interests, and consistent with the best available science.