Testimony of

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on the *Depleting Risk from Insect Infestation, Soil Erosion, and Catastrophic Fire Act of 2013*

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Chairman Bishop, Ranking Member Grijalva, members of the Committee: My name is Dominik Kulakowski. I have been researching insect outbreaks and fires in Rocky Mountain forests for fifteen years. During that time I have worked as a research scientist at the University of Colorado and I am now a professor at Clark University where I continue to pursue this research. I have authored numerous scientific papers on these topics, I have peer-reviewed numerous scientific studies and research proposals, and I have testified before subcommittees of the United States House of Representatives and the United States Senate. My testimony is based on the findings of my own research as well as on the research of other scientists. My goal is to summarize the best available science.

1. Climate is driving outbreaks and fires

In recent decades wildfires have burned millions of acres of forests and insect outbreaks have killed trees over an even larger area. My research as well as that of many other scientists indicates that both of these disturbances are being driven by climate. Despite the widespread concern that increased fire risk is due to insect outbreaks, the controlling influence of fire weather is much more important. This is especially so for active crown fires, which are particularly dangerous due to their high intensity and rate of speed.

Mountain pine beetle and spruce beetle are responsible for most insect-caused mortality across the western United States. Both of these insect species are native to the region and have been important in the development of these forests for centuries. However, recent climatic conditions have favored the growth of beetle populations and have at the same

time stressed trees and reduced their capacity to defend themselves against attack. This perfect storm has contributed to the largest outbreaks of bark beetles in recorded history.

As with bark beetle outbreaks, large severe wildfires have been important in the development of many western U.S. forests for centuries. However, recent warm and dry conditions have been particularly conducive to wildfires. It is these climatic conditions that are driving the increase in wildfires over the past decades.

A critical issue in the context of recent increases of outbreaks and wildfires is whether, and to what degree, outbreaks may heighten fire risk. The answer to this question is complex and contingent on the type of forest, the time since the outbreak, as well as the particular fire characteristics in question. Some modeling studies have suggested that the risk of active crown fire may increase slightly following outbreaks in certain forest types and under very specific weather conditions. However, other modeling studies have concluded that the risk of active crown fire may actually decrease following outbreaks. Most importantly, any influence of outbreaks on fire risk is small compared to the overarching influence of weather, which is much more important. Furthermore, modeling results may be highly contingent on the type of model used and the assumptions upon which that model is built. In contrast, empirical research that has examined how beetle outbreaks have affected actual wildfires has overwhelmingly downplayed the importance of outbreaks versus other variables, including weather. For example, my research group recently completed a study in which we examined the influence of mountain pine beetle outbreaks and drought on severe wildfires in lodgepole pine forests in Colorado over the past century. We found that burned stands were no more likely to have been affected by outbreak prior to fires than were nearby unburned stands. However, drought was more extreme during fire years than during non-fire years. This work indicates that climate has been more important than outbreaks to the fire regime of lodgepole pine forests in this region over the past century. Indeed, we found no detectable increase in the occurrence of high-severity fires following mountain pine beetle outbreaks. Dry conditions, rather than changes in fuels associated with outbreaks, appear to be most limiting to the occurrence of severe fires in these forests.

Another example is that of a major outbreak of spruce beetle in spruce and fir forests in Colorado in the 1940s, following which 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 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 forests are a more important 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. 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 attacked by beetles just prior to 2002. The potential increase of fire risk immediately following bark beetle outbreaks is the subject of active research. During this so-called "red phase" dry red needles persist on recently killed trees. It has been hypothesized that the risk of fire may therefore increase during and immediately after outbreaks of bark beetles. Relatively little research has examined fires during the red phase of outbreaks and more research is necessary. However, our examination of the 2002 fires found that outbreaks that immediately preceded those fires affected neither the extent nor severity of fires, most likely because changes in fuels brought about by outbreaks were overridden by weather conditions and other variables.

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 forest canopy. In contrast, live trees have dense canopies which are critical to the spread of wildfire. Furthermore, and most importantly, in forests dominated by lodgepole pine and spruce there is generally 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 is likely to be high, regardless of outbreaks. In sum, catastrophic fire is not an inevitable outcome of bark beetle outbreaks. Instead climate is so important to fire risk in these forests that the effects of outbreaks appear to have comparatively little or no influence.

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 not appear to be flammable, the fact is that during drought conditions the risk of wildfire can be extremely high. While it may be possible that under certain conditions there may be a minor increase in likelihood of fire following outbreaks, the larger and more

important context is that the effects of outbreaks are not as important as the controlling influence of weather.

2. Protecting homes and communities by reducing fire hazard in their immediate vicinity

Generally speaking, fuel-reduction strategies designed to protect homes and communities from wildfire risk can be categorized as those that primarily aim to reduce fuels in remote forest lands or in the immediate vicinity of homes and communities. Forest Service experts point to a 40-meter zone (about 122 feet) around the home that, along with non-flammable building materials, is a most important determinant of the flammability of structures during wildfire. 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.

Our recent research indicates that almost all of the forests affected by outbreaks are in remote areas rather than in the wildland-urban interface. Furthermore, in the context of limited resources and the goal of protecting homes and communities from wildfire, our research found that focusing fuel reduction treatments in the immediate vicinity of homes and communities, rather than in remote beetle-affected forests, would not only be more effective at reducing fire risk to those structures, but would also involve treating less land and thus would incur lower financial and ecological costs. Furthermore, most of the land that primarily determines flammability of homes is not in National Forests, but rather is private land that is adjacent to homes and communities. It is on that private land that fire hazard mitigation is likely to be most effective for protecting structures.

By focusing treatments in remote forests, we will be using up limited funds and resources while leaving homes and communities at risk of wildfire. Overall, it is going to be more effective and less expensive to focus fire-hazard reduction efforts around communities and homes than to make a wholesale modification of forest structure over large landscapes. Pine branches touching wooden decks are much more relevant to fire risk than are beetle outbreaks in remote forests. Replacing wooden shingles with a metal roof will do much more to protect a home than treating remote beetle-affected forests.

A larger context is that as a nation, we are increasingly building our homes in fire-prone ecosystems. This type of development in the wildland-urban interface, especially when coupled with prolonged drought conditions, is putting homes and lives at risk. Therefore, an important way of reducing this risk would be to reduce the number of structures that are being built in harm's way.

3. Promoting existing ecosystem resilience

Over the past centuries, forests of the Rocky Mountains have been resilient to both wildfires and bark beetle outbreaks. Currently, it is unknown whether forest resilience has been compromised by the magnitude and extent these disturbances and by an unfavorable post-disturbance climate. Nevertheless, following even very severe bark beetle outbreaks, some trees and seedlings survive and viable seeds remain in the soil. Therefore, promoting ecosystem resilience should complement natural regeneration and avoid inhibiting it.

4. Conclusion

Although ongoing outbreaks understandably have led to widespread public concern about increased fire risk, the best available science indicates that effects of outbreaks are not as important as the controlling influence of weather and climate. The ongoing outbreaks have not increased the risk of wildfire as much as they have drawn attention to the risk that is there due to recurring and prolonged warm, dry conditions. In addition to recent trends in climate, a major concern is that we have built and continue to build homes, communities, ski resorts, and other infrastructure in inherently flammable ecosystems.

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 most effective 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. Additionally, any comprehensive forest management plan will eventually need to address housing development in the wildland-urban interface as well as trends in climate.