Questions from Ranking Member Bruce Westerman to Dr. Courtney Schultz

1. In her testimony, your fellow panelist Dr. Law stated the following: "Vulnerability to wildfire varies across the western US region in the next decades. Broad-scale thinning to reduce severity results in more carbon emissions than would be released by fire, creating a multi-decade carbon deficit that conflicts with climate goals."
a. Do you believe that current forest management practices like thinning will release more carbon emissions than catastrophic wildfires?

Response to Question 1a: I rely on the work of forest and fire ecologists to understand this issue. The best available science indicates that optimized thinning in frequent-fire forests can serve to stabilize carbon stocks (see Krofcheck DJ et al. 2019. "Optimizing Forest Management Stabilizes Carbon Under Projected Climate and Wildfires," *Journal of Geophysical Research: Biogeosciences* 124:3075–3087). Another informative paper on this topic is: "Managing for disturbance stabilizes forest carbon," *Proceedings of the National Academy of Sciences, USA* May 21, 2019 116 (21) 10193-10195.

b. Are you aware of any previous year in which the emissions from thinning on Forest Service land have exceeded the emissions from catastrophic wildfire?

Response to Question 1b: I have not studied these data and associated statistics.

2. In her testimony, your fellow panelist Dr. Law stated the following: "*Fire emissions are small relative to harvest emissions. Harvest-related emissions in the Oregon, Washington and California average about 5 times fire emissions (Hudiburg et al. 2019). In California, fire emissions are just a few percent of California's fossil fuel emissions.*"

a. Do you agree with this statement?
b. Are you aware of any previous year in which emissions from forest management activities on Forest Service land in these three states have exceeded the emissions from catastrophic wildfires?

Response to Question 2a and b.: I have not studied these data and associated statistics.

3. According to the Forest Service, they currently have a backlog of reforestation needs on 1.3 million acres of land and are only addressing less than 5 percent of this backlog annually.
a. Do you believe the Forest Service is sufficiently addressing its reforestation backlog?

Response to Question 3a: This matter is outside my area of expertise. I have not conducted research on reforestation policy and instead have focused on policy and governance approaches for forest restoration and fire response.

b. What are some of the consequences of the Forest Service not adequately reforesting areas that have been impacted by disturbances like catastrophic wildfire?

Response to Question 3b: Depending on forest type and historical disturbance patterns, some areas that burn will regenerate while others areas may see a change in species structure and composition. More research would be needed to quantify the ecological, economic, and social needs for and benefits of post-fire reforestation efforts in different forest types and after different fire events. These consequences would vary by local context, fire type, and reforestation guidelines.

4. Many discussions of wildfire prevention have focused exclusively on catastrophic wildfire in the wildland-urban interface.
a. What are the consequences of catastrophic wildfire outside the wildland-urban interface on water quality, air quality, outdoor recreation, wildlife habitat, and local economies?

Response to question 4a: Fire effects on ecosystems and ecosystem services depend on forest type, conditions, and the range of social and economic activities in any given area. Some fires have beneficial or mixed effects, while others have negative effects, particularly in the short-term, on ecosystems, ecosystem services, and communities. There are several papers that quantify effects across some of these variables in different places and across different timeframes, including:

- **Schoennagel, T., *et al.* 2017. Adapt to more wildfire in western North American forests as climate changes. *Proceedings of the National Academy of Sciences* 114 (18): 4582–4590.**
- **McWethy, D., *et al.* 2019. Wildfire in the West: Learning to live in increasingly fire-prone landscapes. *Nature Sustainability* 2: 797-804.**
- **Ford, B., *et al.* 2018. Future fire impacts on smoke concentrations, visibility, and health in the contiguous United States. *GeoHealth* 2(8): 229-247.**

b. What are the benefits of forest management activities for reducing fire risk and severity within the wildland-urban interface?

c. What are the benefits of forest management activities for reducing fire risk and severity outside of the wildland-urban interface?

Response to Question 4b and c: The effects of forest management activities depend on the specific parameters and silvicultural prescriptions associated with management actions. Whether or not treatments are in the wildland-urban interface, they can have a variety of fuels reduction and forest restoration objectives, although often fuels reduction is weighted relatively more heavily near human infrastructure. Treatments to reduce fire hazard can have differential benefits depending on: local conditions, treatment parameters, time since treatment, the spatial arrangement or connectivity of treatments, values at risk, and fire behavior. Appropriately placed and prioritized ecological restoration and fuel reduction treatments can reduce the severity of fire and slow its progress, which potentially can have benefits for multiple values. While forest fuel reduction alone will not protect communities, it can create more opportunities for safe engagement by firefighters and reduce community exposure. In my research, forest managers often emphasize the need for contiguous and well-maintained forest restoration and fuel reduction treatments near communities and other critical infrastructure.