Amanda Smith, Executive Director

Utah Department of Environmental Quality

Testimony before the

Sub-Committee on Environment of the

Committee on Science, Space and Technology

"Issues regarding background ozone levels, consequences of a non-attainment designation and the interpretation and background of policy relevant background for ozone"

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Mr. Chairman Stewart, Ranking Member Bonamici and Members of the Committee:
My name is Amanda Smith and I am the Executive Director of the Utah Department of Environmental Quality. Utah is fortunate to boast a high quality of life - a strong economy and a safe and clean environment. Governor Gary Herbert has directed the Department of Environmental Quality to take a pro-active approach to solve Utah's air quality issues. From a strong idle reduction policy for state vehicles, to formation of the independent air quality organization, "UCAIR," that addresses state-wide air issues, to a multi-partner state-of-the science wintertime ozone study - Utah has led.

I am speaking before you today to express Utah's concerns about how the state will meet the ozone standard if it is lowered from 75 ppb. Surprisingly high ozone values have been measured at rural monitors in Utah and even within National Parks. Similar high values have been seen throughout the Intermountain West. In Utah our work to date has focused on reductions in urban areas - successfully reducing peak ozone levels to meet more stringent standards. However, in rural Utah ozone values have not been decreasing, rather values have remained fairly constant despite these significant reductions in emissions of ozone precursors in Utah and upwind states.

National efforts to reduce ozone since the 1970s have focused on the eastern US and California, with accompanying research, modeling, and regulatory strategies designed to solve those problems. The 1990 Clean Air Act Amendments reflect that focus, and included specific strategies and deadlines to solve an urban ozone problem that was primarily caused by mobile sources. Only recently, as ozone standards have become more stringent, has attention been given to background ozone in the Intermountain West. Recent research shows significantly higher impacts in the Intermountain West than in the rest of the country, and these impacts are increasing every year. Wildfires and stratospheric ozone intrusions also contribute significantly to background ozone levels, and have a disproportionate impact on the Intermountain West. It is critical to recognize that the primary causes of high background ozone are beyond the control of the states.

Before moving forward with a more stringent ozone standard, EPA needs to have in place the necessary tools to allow states to succeed in meeting this standard. Those tools would include;

potential legislation, regulations, technical tools, and additional research on ozone formation and mitigation. Additionally, EPA must have a defined path forward on how attainment will be addressed through policies such as exceptional events, policy relevant background and rural transport area designation. Again these tools were designed for the east coast and currently are problematic and an ill fit for solving ozone in the rural Intermountain West. Specifically, the exceptional events policy has proven to be an impossibly high hurdle to meet and one that eats literally thousands of hours of critical staff time to develop each submission. Since 2008 Utah has submitted 12 exceptional event demonstrations for particulate matter, requiring about 4,000 hours of technical work, that have not been approved by Region 8. There were many other events, including ozone levels affected by western wildfires that we did not even attempt to demonstrate as exceptional events because the technical criteria were too difficult to meet. If the exceptional event process doesn't work for particulate matter - it certainly won't work for the complicated science behind rural background ozone. If EPA moves forward with a more stringent standard without workable measures to address background ozone, it will guarantee failure for Utah, leading to severe consequences for the state.

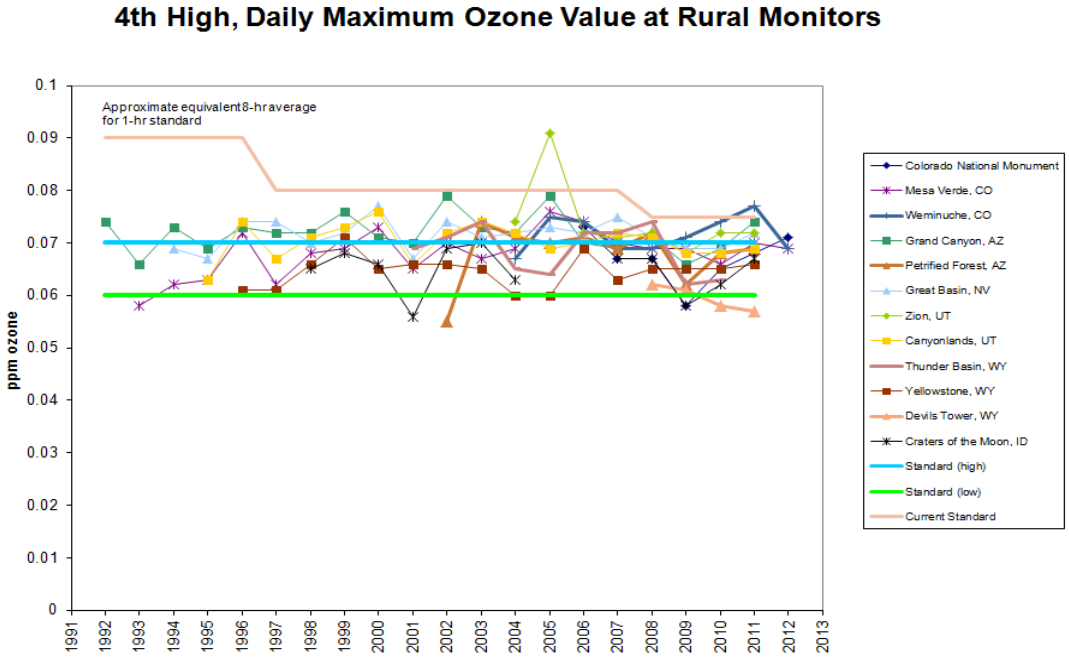
To put this in perspective, the Canyonlands monitor in San Juan County, Utah regularly measures ozone above 70 ppb, the upper end of EPA's standard proposal. San Juan County is close to the size of the state of New Jersey with a population of 14,413. If designated nonattainment, permitting regulations would require existing sources to reduce emissions before new emission sources could be built, affecting economic development in the area because there are few existing sources. If the standard is not met, increasingly more stringent strategies are required including a mandatory 15% reduction in VOC, vehicle emission programs, fuel reformulations, reasonably achievable control technology for stationary sources and traffic control measures. These requirements would be nearly meaningless in reducing ozone and would be exceptionally burdensome on an area of Utah with one of the highest rates of poverty.

The Department of Environmental Quality's mission is to safeguard public health and our quality of life by protecting and enhancing the environment. We take that mission seriously, and the public health impacts of ozone are important to address. We want to ensure that our efforts are focused on emission reduction strategies that are effective and appropriate in reducing ozone levels without requiring difficult, expensive measures that make no sense. Transportation-focused measures in small rural communities will not be effective, nor will overly stringent controls applied to remote industrial sources. Setting an ozone standard that can't be met won't improve public health in Utah.

The Subcommittee asked the Utah Department of Environmental Quality to address three specific questions. The remainder of this written testimony provides more detail regarding the specific elements that relate to those three questions.

1. Describe the Utah Department of Environmental Quality's assessment of background ozone concentrations and their import relative to the National Ambient Air Quality Standards (NAAQS), including the consequences of a "nonattainment designation."

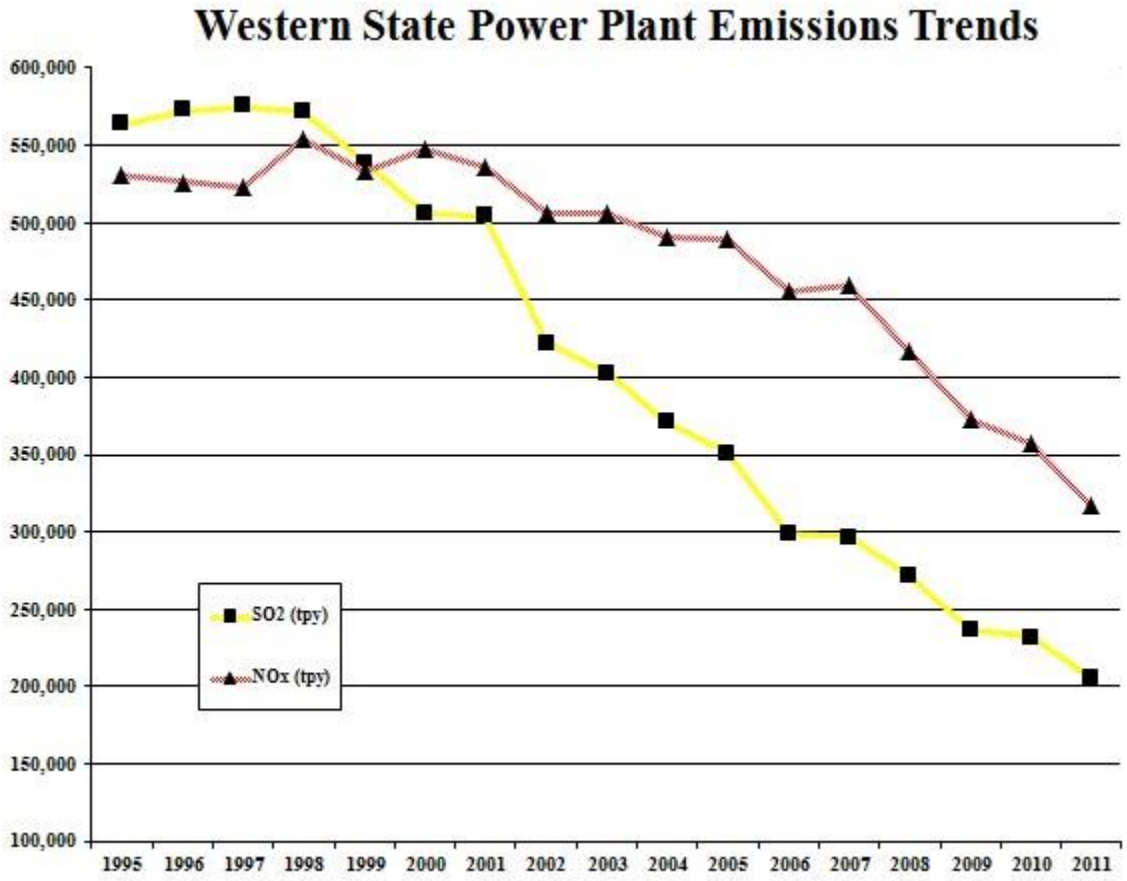
- Ozone levels in the intermountain west are not decreasing as much as would be expected based on the significant emission reductions that have occurred over the last twenty years. Figure 1 shows ozone trends at rural western national parks. Many of these parks, such as Canyonlands in Utah, are located far from any significant emission sources. The current ozone standard is shown, as well as the range of potential ozone standards that had been proposed during EPA's 2010 reconsideration of the 2008 ozone standard. As can be seen from this figure, ozone values have remained fairly constant over the last 20 years and are routinely above the proposed range of 60 to 70 ppb (.060 to .070 ppm). It is also apparent from this figure that the problem is widespread throughout the intermountain west and is not limited to parks that are close to urban areas or to energy-producing areas.



(Source EPA AirData)
FIGURE 1

- The eastern US has seen significant improvements in ozone. One of the major ozone strategies to reduce regional ozone levels in the eastern US has been to reduce nitrogen oxide (NOx) emissions from power plants. Federal motor vehicle standards and non-road engine standards have also reduced NOx emissions substantially throughout the country. As a result of these significant emission reductions ozone levels have been improving throughout the eastern US. Equivalent NOx emission reductions have also

been occurring at western power plants as can be seen in Figure 2, and mobile source emission reductions have also been substantial, but there have not been corresponding decreases in ozone levels in the west.



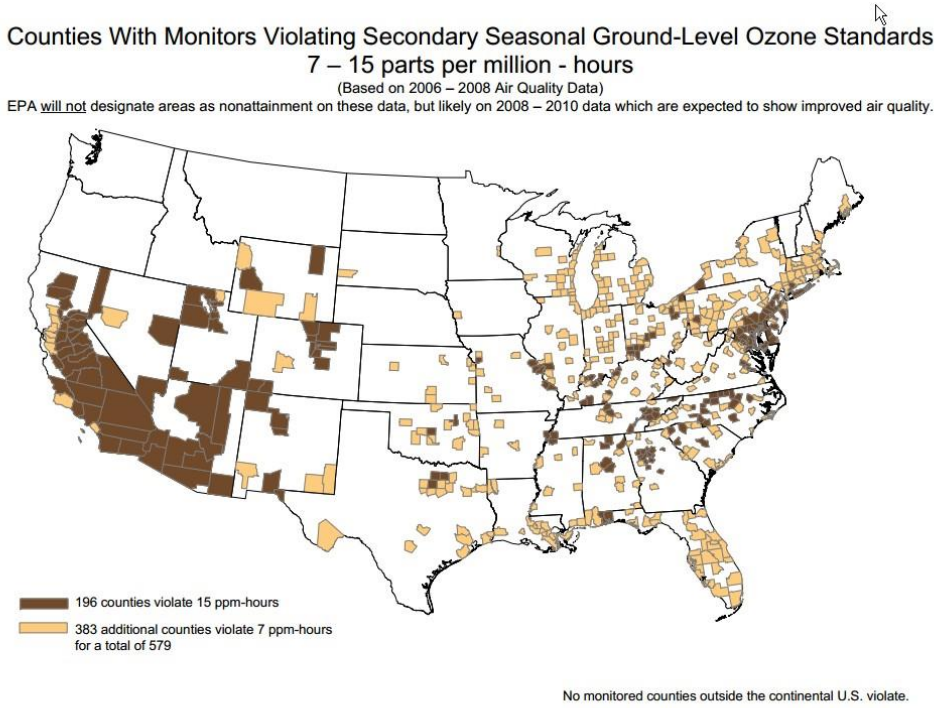
Data from EPA Clean Air Markets Division

FIGURE 2

- One explanation of ozone trends in the intermountain west is that US anthropogenic emissions are only part of the problem. Current research suggests that increased international ozone transport is counteracting domestic emissions reductions in the west (Cooper, et. al. *Long-term ozone trends at rural ozone monitoring sites across the United States, 1990-2010*, J. Geophys. Res., 117).

- High background concentrations may have an even greater impact when evaluating seasonal ozone levels. In the 2010 reconsideration of the ozone standard EPA proposed a new metric called the W126 that is designed to measure ozone over a 3 month period and during daylight hours to protect vegetation during the growing period. Figure 3 shows a map prepared by EPA showing counties with monitors that would have violated the proposed secondary standard. As can be seen from this map, a large portion of the intermountain west would not attain the standard. It is important to realize that the white

areas in this map are primarily areas without monitoring data and these areas are likely to also have high W126

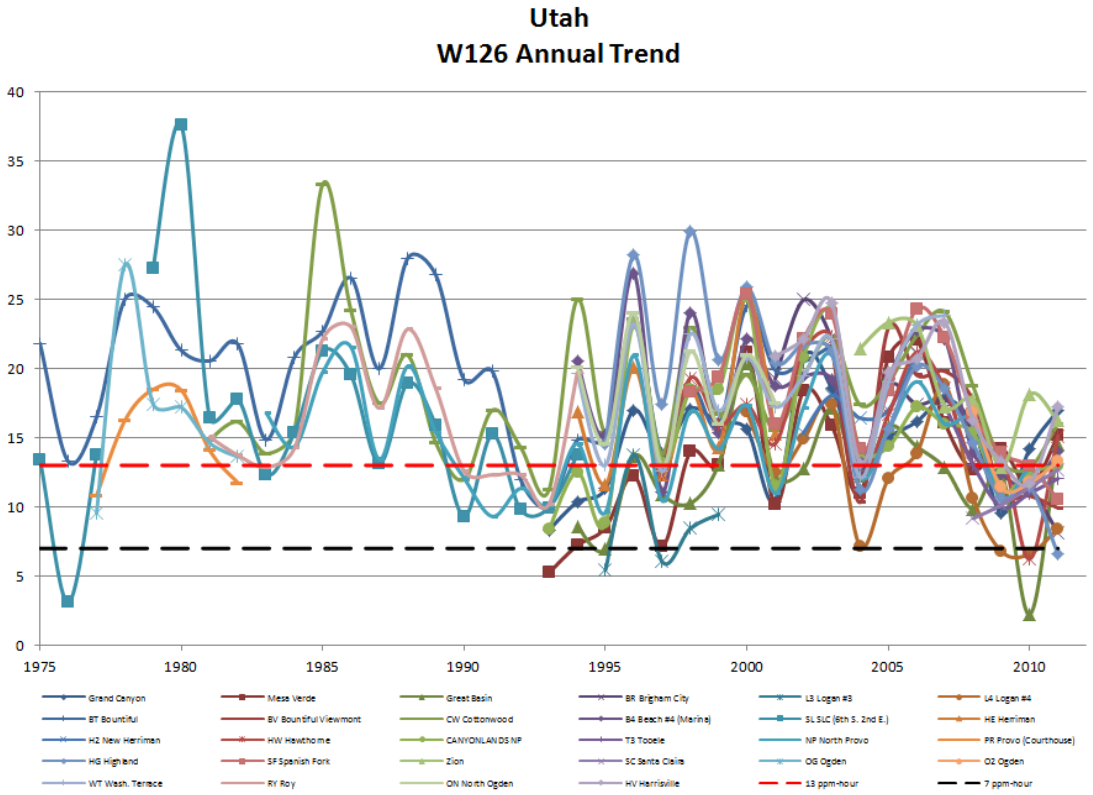


values.

FIGURE 3

Figure 4 shows long term trends for the W126 measurements in Utah. As can be seen from this graph, values are consistently above the range of the secondary standard that EPA proposed in 2010. This is despite the ongoing emission reductions that have occurred in Utah and throughout the west over the last 35 years. Peak levels in urban areas have decreased, and there are fluctuations up and down due primarily to changes in meteorology and impacts from fire (2010 and 2011 were low ozone years due to favorable meteorology), but the sobering conclusion is that significant emission reductions over a

long time period have had little impact on seasonal ozone levels.



(Source: EPA Air Quality Systems (AQS))

FIGURE 4

Utah has little experience with developing a SIP for a secondary standard and the implications of this standard are therefore unclear. Ultimately, the secondary standard may be more difficult to meet in the intermountain west than the primary standard.

- The consequences prescribed in the Clean Air Act of a nonattainment designation can be severe for an area.
    - Nonattainment area permitting rules require offsetting emission reductions for any new major source in a nonattainment area. The reductions must occur within the nonattainment area. EPA had tried to allow some flexibility to allow reductions from other areas that impact the nonattainment area, but this flexibility was overturned by recent court decisions. These rules would effectively prevent development in rural areas that are designated nonattainment because there are no existing sources that could provide this offset. For example, the Canyonlands monitor in San Juan County Utah has measured ozone levels above 70 ppb, the upper end of EPA's recent ozone standard proposals. San Juan County is 7,933 sq miles, the largest county in the state. This is close to the size of the entire state of New Jersey (8,722 sq miles). The population for the entire county was 14,413 in 2005. The point source inventory for this entire county is less than 400 tons/yr NOx and less than 100 tons/yr VOC. Economic opportunity in this part of Utah, including portions of the Navajo Nation, could be stifled because there would be

no possibility to construct a new major source even though ozone levels at Canyonlands are not caused by local emissions.

- The Clean Air Act provides some flexibility for Rural Transport Areas. In these areas, the nonattainment permitting requirements must be met, but other mandatory measures that were designed for urban areas do not apply. Unfortunately, because of the large county sizes in western states, large areas do not qualify as Rural Transport Areas because the definition in the Clean Air Act excludes any areas that are part of a metropolitan statistical area (MSA) or consolidated statistical area (CSA) or that are adjacent to an MSA or CSA. As can be seen in Figure 5 below, the Salt Lake City CSA excludes most of northern Utah, as well as half of the state of Nevada, even though many of these areas are clearly rural. The scattered MSAs throughout the intermountain west effectively exclude most areas from being considered Rural Transport Areas under the Clean

Air Act.

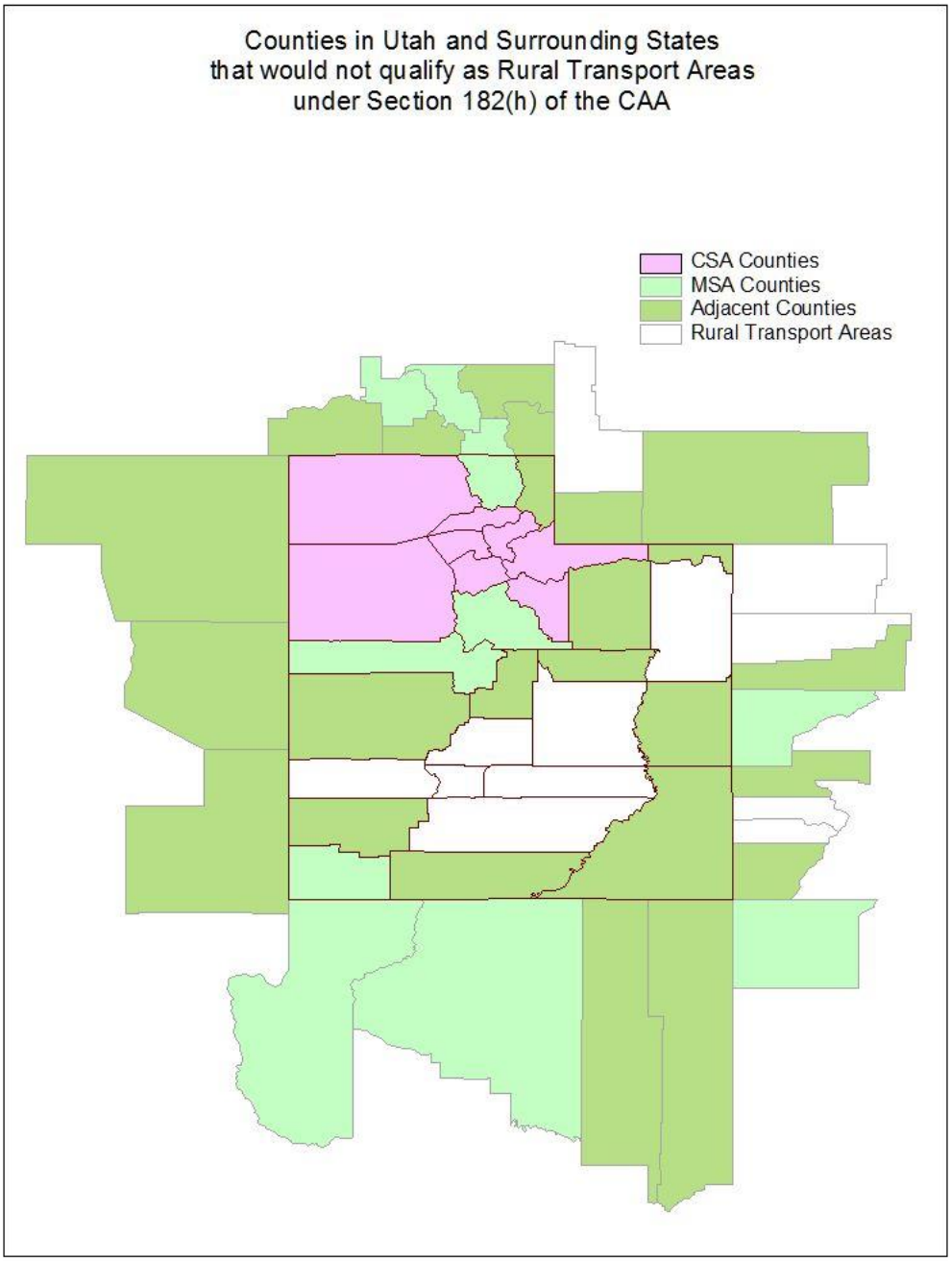


FIGURE 5

- Mandatory measures are established for moderate, serious, severe, and extreme ozone nonattainment areas. If an area starts as a marginal area but is not able to attain the standard it is progressively bumped up to a higher classification over time, requiring progressively more stringent control measures even if those measures do not help the ozone problem in the area. These measures include a 15% mandatory VOC reduction for moderate areas followed by a 3% reduction

per year for serious and above areas, vehicle emission and inspection programs, fuel reformulations, reasonably available control technology requirements for stationary sources, and traffic control measures. These measures make little sense in rural western counties, may be impossible to implement, and may do little to reduce ozone levels even in the urban areas where background levels are high. In rural areas where biogenic (natural source) emissions are the majority of the inventory, the mandatory VOC reductions are especially problematic because reductions in anthropogenic VOC are unlikely to have any effect on ambient ozone concentrations.

- If an area is unable to attain a NAAQS, mandatory sanctions apply to highway funding for the state. These sanctions would have severe consequence on an area that had no ability to solve the underlying ozone problem.

- There is a significant correlation between high wildfire years and high ozone years in the western US.
  - EPA has indicated that this impact could potentially be addressed through the exceptional event process used to exclude infrequent exceedances of the standard that do not have an anthropogenic origin, but this is problematic for several reasons.
    - The technical demonstrations that are required to demonstrate that high pollution levels are due to an exceptional event are extensive and it has been very difficult to get EPA concurrence, even for relatively straightforward cases of particulate matter exceedances caused by high wind events. Utah does not have the resources to develop an exceptional event demonstration for every potential event during a high fire year. EPA would need corresponding resources to review the demonstrations and would also need to implement internal policies to ensure that demonstrations could be approved.
    - During a high fire year, it is likely that many days or weeks could be affected by fire smoke and it would strain the exceptional event process to address longer-term events.
    - During high fire years, there are likely regional impacts that affect multiple states, and the current exceptional event process is best suited to address local impacts within a single state's jurisdiction.
    - High ozone values may also occur at monitors that are not operated by the State, such as CASTNET monitors run by the National Park Service or tribal monitors. States do not have the ability to flag exceptional events at those monitors and the entities that are responsible for the data may not have the resources or the desire to prepare an exceptional event demonstration.

2. Discuss recent developments in scientific issues regarding background ozone levels in the United States, including summarizing the relevant portions of EPA's Integrated Science Assessment of Ozone and Related Photochemical Oxidants.

- EPA has been studying ozone in the eastern US for decades, and the mechanisms of ozone formation and transport pathways are well understood there. This process is just beginning in the western US where mountainous topography, unique meteorology, forest fires, stratospheric intrusion, distinct emissions sources, highly variable emissions density, and international transport play important roles in ozone formation. Unfortunately, just at the time when improved models, emission inventories, and research on western ozone issues are needed, EPA is facing funding constraints that will limit its ability to support new technical work, and will likely decrease their current efforts. Funding is also decreasing for important research activities at the National Oceanic and Atmospheric Administration (NOAA) and for grants to support research at universities. States such as Utah do not have the resources to make up for the decreases in federal funding for these important technical tools.
- Emissions from Asia are affecting ozone levels in the western US, especially in the spring, and this impact is increasing. Cooper, 2010 estimated an increase of 0.63 ppbv per year, which would be around 6 ppb over ten years, a significant amount when compared to the current ozone standard of 75 ppb. This Asian impact is often cited as the reason the west is not seeing the reductions in ozone trends over the last 20 years that have been observed in the eastern states.
    - I*ncreasing springtime ozone mixing ratios in the free troposphere over western North America*, O. R. Cooper, et al., published in Nature (Vol 463, January 21, 2010). This paper examines the influence of Asian transported ozone to the western North America. The rate of increase in ozone concentrations over the last 20 years is greatest when measurements are more heavily influenced by direct transport from Asia with an average increase of 0.63 ppbv/yr. The paper suggests that western North America is particularly sensitive to rising Asian emissions and that the observed increase in springtime background concentrations may hinder compliance with its ozone air quality standard.
    - *Long-term ozone trends at rural ozone monitoring sites across the United States, 1990–2010*, Cooper, O. R., R.-S. Gao, D. Tarasick, T. Leblanc, and C. Sweeney (2012), J. Geophys. Res. (Vol 117, Issue D22, 27, November 2012). The paper reports on long term ozone trends (1990-2010) across the US and finds that while eastern sites are generally seeing decreases in ozone concentrations as a results national emissions controls, the western sites are not. The paper discusses the concept that increasing background ozone flowing into the western U.S. is counteracting ozone reductions due to domestic emission reductions.
- Western wildfires significantly affect ozone levels throughout the intermountain west. This impact is highly variable and can positively or in some cases negatively affect ozone formation as the fire emissions plume ages. Though complex, understanding this impact is increasingly important as the ozone standard is lowered. *Ozone production from wildfires: A critical review*, Daniel A. Jaffe and Nicole Wigder, Atmospheric Environment, Vol 51 (2012) 1-10.
- Ozone levels can be significantly elevated due to "stratospheric intrusions" under specific meteorological conditions. This phenomenon typically occurs in spring and summer seasons in mountainous terrain where energetic storm systems can fold a pocket of

stratospheric ozone into the lower troposphere (ozone levels are much higher in the stratosphere). This entrained ozone can radically increase ozone levels locally and significantly increase surface level ozone over multi-state regions downwind of the event. Researchers have found that stratospheric intrusion can play a major role (at times reaching 50 - 60 percent) in elevating springtime high ozone events over high altitude western US, posing a challenge for staying below the ozone standards, particularly if a standard in the range of 60 - 70 ppb were adopted. *Springtime high surface ozone events over the western United States: Quantifying the role of stratospheric intrusions*, Lin M., A. M. Fiore , O. R. Cooper , L. W. Horowitz , A. O. Langford , Hiram Levy II , B. J. Johnson , V. Naik , S. J. Oltmans , C. Senff, *Journal of Geophysical Research*, Vol 117, November 2012.

- Ozone increases with elevation. This effect is due to the fact the ozone increases vertically through the lower atmosphere (troposphere). Near-surface ozone tends to be titrated by oxides of nitrogen released from sources at the surface and subject to other scavenging processes while ozone aloft can be enhanced by stratospheric ozone intrusion and ozone that has been transported long distances without loss. Mountainous terrain pushing into this ozone aloft can experience higher ozone concentrations.

3. Discuss the interpretation of background and "policy relevant background" for ozone in the NAAQS process.

- Background ozone is important to consider in addressing ozone. In general, it refers to the level of ozone that is not controllable by a regulatory agency and would include ozone precursor emissions from biogenic and other non-anthropogenic sources. It could also include precursor emissions from anthropogenic sources that are not domestic to the US. This latter definition is termed policy relevant background (PRB). PRB is determined using a photochemical transport model.
- PBR from non-anthropogenic sources is not constant. It varies from season to season and from episode to episode. It also varies from place to place. In the Integrated Science Assessment for the current ozone NAAQS review, EPA uses the mean PRB for broad regions and this may not be reflective of the PRB that is occurring during high ozone episodes in the intermountain west.
- PRB increases with elevation. Higher ozone levels in the upper troposphere are more readily mixed to ground level at higher elevations and this could be an important factor in ozone levels in mountain communities and also higher elevation forests that may be evaluated as part of the secondary standard.
- While the concept of PRB considers the impact from international sources, there is no mechanism to address impact that is increasing. Asian emissions are increasing background ozone concentrations in the intermountain west in the spring. Cooper (Nature, 2010) estimated an average increase of 0.63 ppbv/yr from 1995-2008. EPA is considering the current impact from Asia through the concept of PRB, but once the NAAQS is finalized next year, the standard will be set even though the PRB continues to increase.

- Modeling to determine PRB has shown the highest values to occur in the intermountain west where the 4th high values are estimated to be 50 - 60 ppb. "The high PRB values in that region compared to the proposed revisions of the ozone NAAQS (60 - 70 ppbv) suggest that special consideration may be needed in the NAAQS-setting process." *Improved estimate of the policy-relevant background ozone in the United States using the GEOS-Chem global model with ½ x ⅔ horizontal resolution over North America*, Atmospheric Environment, Vol 45, (2011) 6769-6776.

Recommendation

The Utah Department of Environmental Quality does not have a specific recommendation about how EPA should address the issue of background ozone levels in the intermountain west. EPA could address this issue through the standard setting process, as has been done in the past using the concept of policy relevant background, or EPA could address it by changing how the ozone standard is implemented. The key point is that mechanisms to account for background ozone that can't be controlled must be in place, including technical and regulatory tools, before a more stringent ozone standard is finalized. Funding is also needed to improve the technical tools that are available to western states when developing their SIPS, and funding is also needed to support the important research that is currently underway to better understand the causes of background ozone in the intermountain west. Otherwise, states such as Utah will not be able to develop successful state implementation plans and will be essentially set up for failure.