Appendix H

Heavy-Duty Omnibus Regulation's Contribution to Regional Haze and Visibility Protection

Date of Release: June 23, 2020
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LIST OF ACRONYMS AND ABBREVIATIONS USED IN APPENDIX H

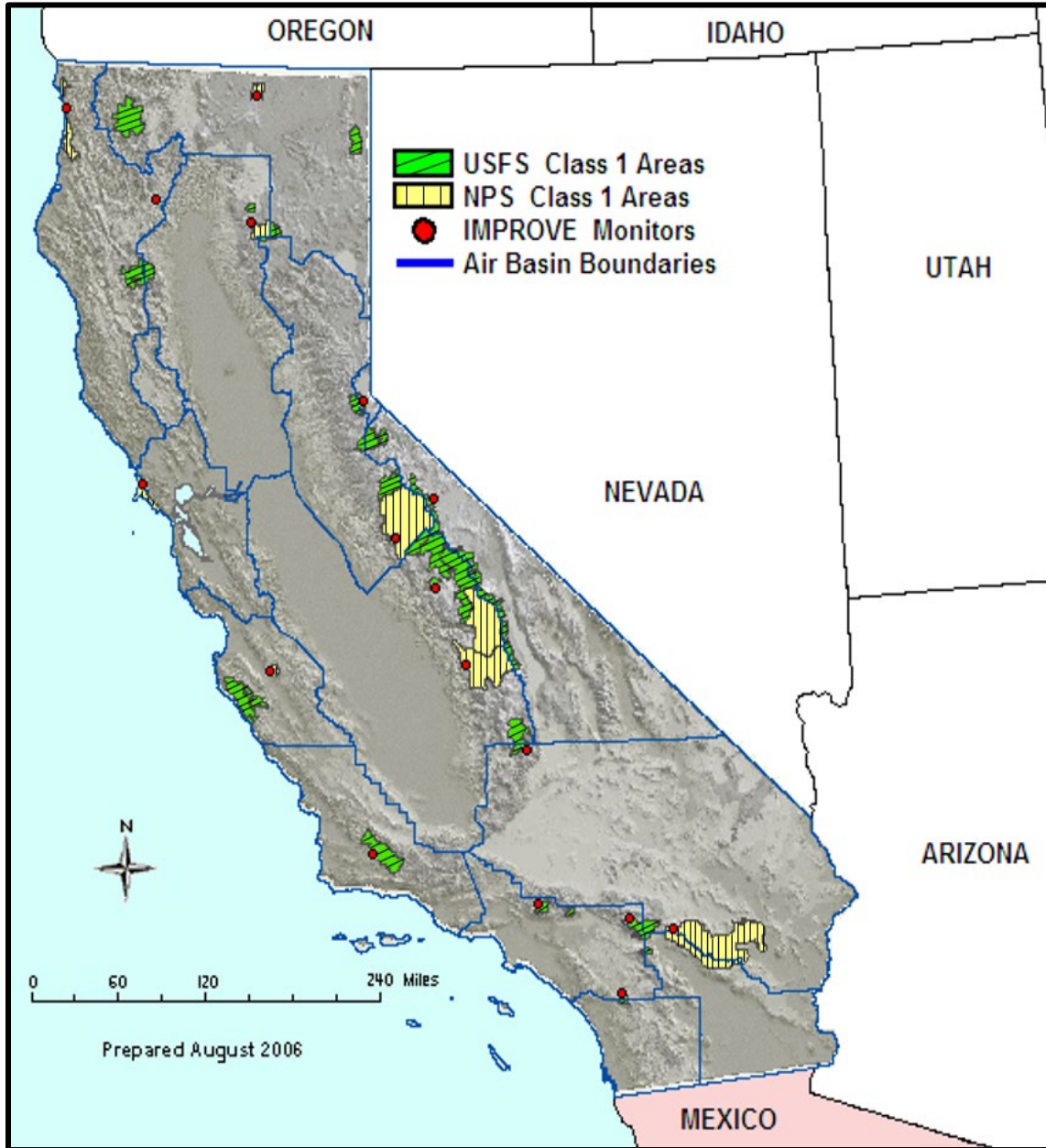| Acronym or Abbreviation	Description
CARB	California Air Resources Board
IMPROVE	Interagency Monitoring of Protected Visual Environments
NOx	Oxides of Nitrogen
RPG	Reasonable Progress Goals
SIP	State Implementation Plan

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to Regional Haze and Visibility Protection

California's long-term emissions reduction strategy includes phased reductions of anthropogenic haze precursor emissions from all non-natural sources in California Air Resources Board's (CARB's) inventory, whether mobile or non-mobile. The haze precursors are oxides of nitrogen (NOx), sulfur oxides, carbon compounds, and particulate matter. Emissions of these precursors lead to the formation of particles in the atmosphere with differing capabilities to extinguish or absorb light, and to create the haze that impairs visibility. These haze-causing particles (nitrates, sulfates, organic aerosols, elemental carbon, coarse mass, fine soil, and sea salt) are measured at 17 named Interagency Monitoring of Protected Visual Environments (IMPROVE) monitors throughout California. Their measured mass concentrations are converted to a visibility metric (deciviews) which can be converted to visual range in miles or kilometers. Changes in these levels indicate whether improvements in visibility occur over time at the Class I Areas near the monitors. Deciview levels should be decreasing and the visual range increasing at Class I Areas as time passes, as a result of reducing haze precursor emissions.

A strategy to reduce visibility impairment relies on analysis of the inventory and source types, modeling results, and monitoring data. California is pursuing NOx reductions to reduce haze because the inventory of sources shows NOx emissions to be the highest precursor from non-natural sources. NOx gases react with ammonia in the atmosphere to form nitrate particles. Both regional modeling and monitoring data confirm that nitrates are significant contributors to haze on days when non-natural visibility impairment is the greatest at Class I Areas in California. Therefore, reducing NOx emissions decreases nitrate formation, lessens haze, and improves visibility throughout the state. Currently mobile sources contribute the most NOx in the statewide emissions inventory. Additional actions are also necessary to reduce NOx and other precursors from other non-natural sources, in the short-term and the long-term.

As shown in Figure 1, Class I Areas are dispersed throughout California, some close to major roadways and freight transportation corridors, including their associated ports, railyards, and airports. The 17 IMPROVE monitors show where the measurements of haze particles are made, and visibility levels are calculated. The benefit of reductions in haze precursor emissions from the heavy-duty mobile source controls are valued throughout the state and may have some additional benefits to visibility in other states from cleaner traffic on interstates near Class I Areas.

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Figure 1. Map of Class I Areas and IMPROVE Monitors

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Every ten years, every state must prepare a State Implementation Plan (SIP) to set interim Reasonable Progress Goals (RPGs) for each of its Class I Areas for the end of the ten-year planning period. The elements of the SIP and the requirements to evaluate emission sources are spelled out in the federal Regional Haze Rule for Protection of Visibility, most recently amended in 2017. The SIP must include federally enforceable measures to reduce emissions to achieve the RPGs. In each SIP, the RPG for each Class I Area must be compared with the respective glide path to natural visibility conditions in 2064. In addition, every state must demonstrate that it has undertaken all

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reasonable measures to assure that anthropogenic visibility impairment is also avoided or reduced at Class I Areas in neighboring states.

Due to recent Regional Haze Rule amendments, states have until July 2021 to submit a SIP with their RPGs for 2028, the end of the second ten-year planning cycle. CARB is working with 14 other western states, Federal Land Managers, local air districts, and Tribes to develop the RPGs for 2028 by quantifying expected and potential reductions in anthropogenic emissions to be achieved in each state before 2028. These reductions are input to ongoing regional modeling to demonstrate what the 2028 RPGs could be. All states must then explain why these goals are reasonable, given all the feasible reductions in the planning period. Additional reductions will be required in future planning periods until "natural conditions" are achieved.

Every five years, each state must prepare a Progress Report demonstrating how its emissions reduction strategy continues to improve visibility at Class I Areas. In the most recent Progress Report, California was able to demonstrate measurable improvements in visibility at every Class I Area due to the reduction of haze precursor emissions from non-natural sources. The locations making the most progress were those near urbanized areas and traffic corridors, where the most reductions in haze precursors are feasible. Most notable was the overall 40 percent reduction in NOx emissions from non-natural sources. Of those reductions, 80 percent were due to mobile source controls. Our long-term NOx reduction strategy is working to reduce regional haze, but we still must get to much lower nitrate and other haze particle levels to make continuous improvements in visibility by 2064.

In 2014, the NOx emissions from heavy-duty mobile sources were about 30 percent of the non-natural sources in the California emissions inventory. That contribution from heavy-duty mobile NOx emissions should reduce to about 24 percent of the non-natural NOx emissions by 2028 using existing rules already adopted and implemented. The anticipated reductions from the proposed amendments would begin in 2024 and reduce NOx emissions further in 2027. If adopted, these additional reductions would further improve visibility at Class 1 Areas by 2028 and continue to help improve visibility in subsequent years.