PACIFIC FOREST TRUST
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12 January 2017

Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Revised Proposed Short-Lived Climate Pollutant Strategy

Dear Air Resources Board Members and staff,

Thank you for this opportunity to comment on the Revised Proposed Short-Lived Climate Pollutant (SLCP) Strategy. We appreciate that in deferring regulation of forest-based sources of black carbon to other plans, the SLCP Strategy recognizes that fire is an essential natural process and that our policy goal cannot be as simple as reducing the amount of fire in California. Indeed, one of our greatest challenges in the coming years will be *increasing* the amount of ecological appropriate low and moderate severity fire to help decrease fuel loads and reduce the likelihood of uncharacteristically large and severe fires. More frequent, less intense fires also typically produce less black carbon and other pollutants than the large high severity fires that are more likely absent frequent fire.[i]

While we appreciate ARB deferring the wildfire discussion to other planning efforts, we do believe it is important for the SLCP to be careful and deliberate when characterizing fire and its role on the landscape. In particular, this language should place the discussion in the context of historic black carbon emissions that were at least three times as much as present day emissions[ii], encourage more fire, and take a holistic approach to improving forest resilience that goes beyond fuels reduction. These three core issues are addressed in more detail below, along with specific wording suggestions that would improve the accuracy and ecological framing of the wildfire emission discussion.

1. **Recent increases in fire should be placed in the historic context:** The overwhelming scientific evidence is that historically, California experienced fires across many more acres than we do today. [iii,iv,v,vi,vii,viii,ix] Current policies affecting the state's forests should be informed by these historic fire regimes, as well as an understanding of the past decisions that have increased forest vulnerability – including fragmentation, development, fire suppression, and homogenous plantations. Only by understanding how past decisions have created current forest conditions can we avoid recreating historic mistakes and move forward to develop more resilient forest landscapes. For instance, by using the historical levels of fire as a "baseline" for the natural range of emissions from fire, we can avoid reinforcing the rush to fire suppression that has created many of our existing problems. The SLCP Strategy should also clarify that not all fires are forest fires as the majority of area burned by wildland fires in recent decades has been on non-forest lands such as grasslands and shrublands[x], albeit with significantly fewer black carbon emissions than from forests.

2. **We need more fire, not less.** The state is currently in a "fire deficit"[xi] and needs to restore natural fire regimes with mixed severity. Restoring more fire on the landscape is critical to improving the resilience of forests as fire helps reduce fuel loads, creates patchiness on the landscape, and is a necessary ecological process for many species. While restoring fire is not appropriate in all places, the blanket goals to "reduce fire spread" are misplaced. Instead, the SLCP Strategy should take into account the need to restore more natural fire regimes where possible.

3. **Forest resilience will not be achieved by fuels reduction alone.** Improving resilience needs to encompass a broader range of methods that just fuels reduction. A number of activities can help improve forest health and resilience in this era of climate change, including:
    - Letting forests grow older with larger, more fire-resistant trees
    - Increasing the diversity of species, ages, and structures within a stand
    - Reducing forest fragmentation and development of forest land through conservation
    - Restoring mixed severity fires which increase patchiness at the landscape scale
    - Fuel treatments that facilitate the reintroduction of fire

    These many complementary activities will help forests increase resilience to not only fire but other disturbances such as drought, insects, and pathogens – securing their carbon stores and many other ecosystem services for generations to come.

Applying these key principles to the text on pages 45 and 46 of the November 2016 Revised Proposed SLCP Strategy, here are some suggested **additions** *and* ~~deletions~~:

Wildfire is the largest source of black carbon in California. Prescribed fires **and managed natural fires** also emit black carbon, but **these** are ~~an~~ important tool**s** for ~~forest managers~~ **the restoration of ecologically important natural fire regimes**. However, since the legislative direction and intent of SB 1383 is to include only non-forest sources of black carbon in the target, a target for forest-derived black carbon emission reductions is not included in this SLCP Strategy. **Fire regimes have been altered by human activities over the past centuries[xii] and there is broad scientific consensus that historic fires were much more frequent than they are today.[xiii,xiv,xv,xvi,xvii,xviii,xix,xx]** For reference, **modern and historical** estimates for ~~10-year~~ annual average black carbon emissions from fires that occurred in forests and other lands are provided in Table 6. Emissions from fires in forests

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and other lands vary dramatically from year-to-year, and these inventories contain higher uncertainty[86] than the anthropogenic sources in Figure 1.

Table 6: ~~10-Year Average California~~ Average Annual Modern and Historic Black Carbon Emissions in California: Wildfire and Prescribed Fire

Source	**2001-2011 Average Emissions (MMTCO2e)***	**Historic Average Emissions (MMTCO2e)*[1]**
Prescribed Burning	3.6	**N/A**
Wildfire	86.7	**306 - 830**

*Using 20-year GWP

[1] **Calculations on historic emissions from black carbon:**
Stephens et al. (2007) report that PM 2.5 emissions during the prehistoric period from California's forests, woodlands, shrublands, and grasslands were 1.281 Tg under the median fire return interval (MFRI) and 0.474 Tg under the more conservative high fire return interval (HFRI). Rangelands (including steppe, meadows, sagebrush, chaparral, and marshlands) accounted for a total of 9 Gg under the MFRI and 24 Gg under the HFRI, with the remaining 1,272 Gg (MFRI) and 445 Gg (HFRI) caused by fires in forests and shrublands.

The ARB wildland fire protocol assumes that 20.2594% of PM 2.5 emissions from timber and brush fires and 19.3183% of rangeland burning emissions are black carbon.

Using these two values for the fraction of PM 2.5 emissions that are black carbon (BC), Equation 1 from the ARB protocol, and the conversion of 1Tg = 1 MMT, we get the following calculations and results:

MFRI Forests and Brush = 1.272 Tg PM 2.5 * (1 MMT/ 1Tg) * 20.2594% = 0.258 MMT BC
HFRI Forests and Brush = 0.450 Tg PM 2.5 * (1 MMT/ 1Tg) * 20.2594% = 0.091 MMT BC
MFRI Rangelands = 0.009 Tg PM 2.5 * (1 MMT/ 1Tg) * 19.3183% = 0.002 MMT BC
HFRI Rangelands = 0.024 Tg PM 2.5 * (1 MMT/ 1Tg) * 19.3183% = 0.005 MMT BC

Using the GWP 20 of 3,200 for black carbon, this works out to a total of 306 $MMTCO_{2e}$ under a HFRI (291 $MMTCO_{2e}$ from forests and 15 $MMTCO_{2e}$ from rangelands) and 830 under a MFRI (824 $MMTCO_{2e}$ from forests and 6 $MMTCO_{2e}$ from rangelands) based on the figures from Stephens et al. 2007 and the equations from the ARB protocol for black carbon. In Table 1, the more conservative HFRI is used to represent the lower end of the range and the MFRI is used to represent the higher end of the range of emissions. These estimates provide an order of magnitude approximation for the historic black carbon emissions from wildfire.

References for Calculations:

Stephens, S.L., Martin, R.E., Clinton, N.E., 2007. Prehistoric fire area and emissions from California's forests, woodlands, shrublands, and grasslands. Forest Ecology and Management 251, 205–216. doi:10.1016/j.foreco.2007.06.005

Air Resources Board, 2016. California's Black Carbon Emission Inventory Technical Support Document, 2015 Edition. Available at: https://www.arb.ca.gov/cc/inventory/slcp/doc/bc_inventory_tsd_20160411.pdf

~~In general,~~ **While there are still far fewer fires than in historic times,** forests ~~are~~ **have been** burning at increasing rates and at increasing levels of severity **in recent decades**[87] **due in part to the legacy of fire suppression.**[xxi] ~~Many studies have demonstrated net benefits for fuel treatments and forest management activities designed to reduce both fire spread and fire severity at the experimental unit or stand level, both in modeled and real world scenarios.[89,90,91,92,93,94,95,96,97,98,99] Fuel treatments are key elements of forest restoration strategies,[100] and are~~ **A number of activities can help improve forest health and resilience in this era of climate change, including: letting forests grow older with larger, more fire resistant trees; increasing the diversity of species, ages, and structures within a stand; reducing forest fragmentation and development of forest land through conservation; restoring mixed severity fires which increase patchiness at the landscape scale; and fuel treatments that facilitate the reintroduction of fire.** ~~This trend raises concern over~~ **These activities can support** the long-term health of ~~these~~ forests **as well as their** ability to sequester carbon and provide ~~resource amenities~~ **ecosystem services. Such activities can be** embedded in management strategies at local, state and national levels.[101,102] The Forest Carbon Plan, as well as the 2030 Target Scoping Plan Update, will continue to explore the interrelation of climate change and natural lands.

Similarly, the text on page 11 could be revised as follows:

Wildfire is the largest source of black carbon in California. Prescribed fires **and managed natural fires** also emit black carbon, but **these** are ~~an~~ important tool**s** for ~~forest managers~~ **the restoration of ecologically important natural fire regimes**. However, since the legislative direction and intent of SB 1383 is to include only non-forest sources of black

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carbon in the target, a target for forest-derived black carbon emission reductions is not included in this SLCP Strategy. **While there are still far fewer fires than in historic times,** forests ~~are~~ **have been** burning at increasing rates and at increasing levels of severity **in recent decades**[87] **due in part to the legacy of fire suppression.**[xxii] ~~This trend raises concern over~~ **A range of activities can support** the long-term health of ~~these~~ forests **as well as their** ability to sequester carbon and provide ~~resource amenities~~ **ecosystem services,** ~~. Fuel treatments are key elements of forest restoration strategies,~~ and **be** embedded in management strategies at local, state and national levels. The Forest Carbon Plan, as well as the 2030 Target Scoping Plan Update, will continue to explore the interrelation of climate change and natural lands.

Thank you for considering these comments and in-text suggestions on the SLCP Strategy. Please do not hesitate to reach out if you have any questions by email at ahalperin@pacificforest.org or pmason@pacificforest.org.

Sincerely,

Abby Halperin
Policy Associate

Paul Mason
V.P. Policy

References:

[i] Long, J.W., Tarney, L.W., and North, M.P. *Under Review.* Aligning smoke management with ecological and public health goals.
[ii] See calculations for Table 6 below.
[iii] Baker, W.L., 2015. Are high-severity fires burning at much higher rates recently than historically in dry-forest landscapes of the western USA? PLoS ONE 10. doi:10.1371/journal.pone.0136147
[iv] Hurteau, M.D., Bradford, J.B., Fulé, P.Z., Taylor, A.H., Martin, K.L., 2014. Climate change, fire management, and ecological services in the southwestern US. Forest Ecology and Management 327, 280–289.
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