May 26, 2016

Via Internet Upload (http://www.arb.ca.gov/lispub/comm/bclist.php)

Clerk of the Board
Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Proposed Short-Lived Climate Pollutant Reduction Strategy and Draft Environmental Analysis

To Whom It May Concern:

The Center for Biological Diversity (the "Center") and Climate Change Law Foundation ("CCLF") submit the following comments on the Proposed Short-Lived Climate Pollutant Strategy (the "Strategy") and accompanying Draft Environmental Analysis ("Draft EA") prepared by the California Air Resources Board ("ARB").

The Center is a non-profit organization with more than one million members and online activists and offices throughout the United States, including in Oakland, Los Angeles, and Joshua Tree, California. The Center's mission is to ensure the preservation, protection and restoration of biodiversity, native species, ecosystems, public lands and waters and public health. In furtherance of these goals, the Center's Climate Law Institute seeks to reduce U.S. greenhouse gas emissions and other air pollution to protect biological diversity, the environment, and human health and welfare. Specific objectives include securing protections for species threatened by global warming, ensuring compliance with applicable law in order to reduce greenhouse gas emissions and other air pollution, and educating and mobilizing the public on global warming and air quality issues.

CCLF is a non-profit organization headquartered in San Francisco, California with a core mission to address climate change and related environmental problems through legal advocacy. CCLF engages in legal and policy matters related to climate change, alternative energy, air quality, and environmental and natural resources law, including the climate impacts from short-lived climate pollutants.

The Center and CCLF greatly appreciate ARB's attention to the critical task of reducing short-lived climate "superpollutants" like methane, black carbon, and flourinated gases ("HFCs"). As discussed below, we support many elements of the proposed Strategy, and these

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comments offer specific recommendations intended to strengthen its goals and enhance its effectiveness. At the same time, we are deeply concerned that ARB's proposals for reducing black carbon emissions from wildfires—a natural occurrence in California forests—are poorly conceived, highly uncertain, inadequately supported, and likely to cause substantial adverse environmental effects that neither the Strategy nor the Draft EA adequately address. The Center and CCLF strongly recommend that this element of the Strategy be removed so that ARB can focus on measurable, achievable reductions from the important anthropogenic sources of SLCPs identified in the Strategy.

Please include this letter and the references cited therein (uploaded concurrently in PDF format and/or hyperlinked in this document) in the administrative record of proceedings for this project. Detailed comments follow. [1]

I. Comments on Proposed Strategy

A. The Center Strongly Supports Pursuing the Maximum Possible Reductions in Anthropogenic SLCPs on the Shortest Possible Timelines

The Center strongly supports the goal of seeking substantial reductions in anthropogenic SLCP emissions, and urges ARB to consider all options within the Strategy to increase the depth of reductions in each source and accelerate the rate of reduction or elimination of SLCP emissions. For example, the Strategy should consider not just how to achieve reductions commensurate with rates of reduction already proposed for other GHG sources, or assumed within federal modeling. Instead, the Strategy should include options for maximal reductions and minimal timelines for achieving those reductions.

1. The Strategy Should Prioritize Methane Reductions from the Waste and Oil and Gas Sectors.

ARB has set forth a methane reduction strategy that seeks to encompass all major sources of methane. The Center strongly supports taking an aggressive approach to reducing emissions from the waste sector. The Strategy places a well-warranted focus on eliminating the disposal of organic waste, proposing to divert 90 percent of organics from landfills by 2025, which will result in significant co-benefits and help the state achieve multiple policy objectives. Because of the many benefits to eliminating the disposal of organics, and the fact that organics continue to emit methane for decades once they enter the landfill, the implementation of this policy should be accelerated to the greatest extent, going into effect statewide by 2020.

Similarly, the Center applauds the Strategy's proposal to reduce methane from the oil and gas sector. This is critical not only to achieving the climate goals of the state but also to ensuring that our current fuel supply does not result in unaccounted and unregulated methane leakage. To

[1] The positions hereinafter taken by "the Center" are supported and joined by CCLF.

begin to move oil and gas toward a standard that allows for meaningful comparison to clean energy sources, fugitive methane should be capped at effectively zero by 2020. Furthermore, it is essential that ARB continue its efforts (Strategy at 79) to ascertain true levels of methane leakage from the oil and gas industry such that all fugitive emissions are effectively addressed.

The Strategy's reduction options for oil and gas should be expanded further to include specific measures that would reduce demand for oil and natural gas, especially in the energy sector. As the Strategy notes, reduced demand is the most effective means to cut methane from the oil and gas sector. Strategy at 77. Climate science and the state's long-term goals dictate that fossil fuels like natural gas ultimately must remain safely "in the ground." For other sources, such as dairy manure methane and forest-related black carbon emissions, the Strategy proposes financial incentives to achieve emissions reductions. *See, e.g.*, Strategy at 51 (proposing "strategic investment" to increase forest thinning), 67 (recommending "financial incentives, collaboration to overcome barriers and other market support" to address methane from dairy manure management). Yet, the Strategy has failed to propose similar incentives or market support to achieve oil and gas methane reductions. We urge ARB to consider financial incentives and market support for proven zero-carbon energy technology to replace fossil energy. For example, this could take the form of subsidizing rooftop solar in disadvantaged communities, enhancing access to heat pumps and solar water heating, and aiding efficiency improvements for homes and small businesses. These technologies and measures have a proven track record of reducing greenhouse gas emissions through avoidance of fossil fuel-based energy. These options stand in sharp contrast to the unproven benefits of dairy digesters and the potentially counterproductive forestry practices currently proposed. ARB should apply the same financial strategies to reducing oil and gas demand and consequent methane emissions that it does for other sectors.

Finally, while we support the mitigation of methane from anaerobic manure management at dairies and concentrated animal facilities, we urge ARB to maintain careful oversight of mitigation measures. As we have discovered with landfill gas to energy projects, there are numerous points in methane systems that can result in extensive and unexpected leakage or other inefficiencies that undermine the utility of the mitigation efforts. Detailed monitoring and system engineering is essential to ensure that any measures taken to reduce methane from manure management result in real-world climate benefits.

2. The Global Warming Potential for Methane Must Reflect the Latest Science.

We strongly support the Strategy's adoption of a 20-year global warming potential ("GWP") for methane. This is an important step because the time horizon used to equate methane and CO_2 emissions has significant implications for policy decisions in which the time horizon of the GWP critically influences the cost-benefit analysis of mitigation options.

As we noted in previous comments, however, the Strategy employs an outdated value for the 20-year GWP of methane and F-gases, which is based on the IPCC's Fourth Assessment Report. Strategy at 35. We strongly urge ARB to use GWP values from the most recent IPCC Fifth Assessment Report ("AR5"), just as it does for black carbon. This is crucial because the science regarding the climate influences of various pollutants is evolving. We also note the Strategy uses GWP values for methane that omit carbon cycle feedbacks. This must be corrected: carbon cycle feedbacks must be included to properly equate methane and CO_2 warming influences. The groundbreaking realization by the contributors to AR5 was that carbon cycle feedbacks are an inherent part of the warming caused by CO_2. Yet, until the most recent Assessment, they were omitted from GWP values for non-CO_2 greenhouse gases. As a result, until AR5, the GWP conversion was actually comparing apples to oranges. The only way to accurately compare among greenhouse gases—the entire purpose of a GWP—is to include carbon cycle feedbacks. According to the AR5, this results in a 100-year methane GWP of 36 and a 20-year GWP of 87.[2]

B. The Forest-Related Black Carbon Element of the Strategy is Not Supported by Science and Should Be Removed.

The Strategy's proposals for reducing black carbon emissions from wildfires are poorly conceived, not scientifically supported, and likely to cause substantial environmental harm to California's forest ecosystems. Due to these irreparable deficiencies, the Center strongly recommends that this element of the Strategy be removed.

At a fundamental level, the forest-related black carbon strategy fails to adequately recognize the distinction between forest fire and its related emissions compared to anthropogenic sources of greenhouse gases. Wildfire is a natural and necessary component of California's forest ecosystems, with many critical functions for diversity and wildlife. It would be a misunderstanding of the science and nature of forest and fire dynamics to approach emissions from these natural processes in the same context as anthropogenic emissions from smokestacks, bioenergy and pile burning, which are discretionary activities under direct human control.

Moreover, the Strategy's forest-related black carbon strategy is predicated on assertions that are either unsupported by the best-available science or highly uncertain. Namely, the Strategy asserts that "we must act to reduce wildfire risk in the State" (Strategy at 49) because "many of California's forests are already in a perilous condition" and climate change will make forests "more vulnerable to wildfire and disease." Strategy at 6. The Strategy further states that "[a]fter a century of fire suppression, chronic underfunding for forest management at the State and Federal level, and exacerbating impacts of climate change, bark beetle infestations and

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[2] G. Myhre et al., *Anthropogenic and Natural Radiative Forcing*, in CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE IPCC Table 8.7 at 714 (Cambridge Univ. Press 2013).

drought, California's forests are highly vulnerable and potentially a source of increasing black carbon emissions." Strategy at 50.

However, the Strategy fails to provide supporting scientific evidence to show that wildfire risk in California's forests is at unnatural or unusual levels and therefore should be reduced. The Strategy similarly presents no evidence demonstrating how or why the current condition of California's forests is "perilous," or showing that fire suppression and bark beetle outbreaks are leading to increased fire activity. The Strategy provides only two citations to support its claims that climate change will increase fire activity in California's forests (Westerling et al. 2006 and Hurteau et al. 2014). As detailed below, however, an extensive body of studies examining current effects of climate change on wildfire activity indicates that fire severity and amount have not increased in California's forests. Furthermore, studies projecting the influence of climate change on future fire activity indicate that fire severity in California forests is likely to stay the same or decrease, and that climate change effects on future fire activity are highly uncertain. The Strategy makes no effort to address this evidence.

In contrast to the Strategy's unsupported assertions, the best-available science detailed below indicates that (1) wildfire is a natural and necessary component of California forests, California's mixed-conifer and ponderosa pine forests have been historically characterized by mixed-severity fire including significant amounts of high-severity fire, and high-severity fire creates biodiverse, ecologically important, and unique habitat; (2) California forests are experiencing a deficit of fire compared with historical conditions; (3) California's forests are not burning at higher severity or amount, nor are the most long-unburned forests burning at higher severity; (4) the projected effects of climate change on fire activity in California forests are highly uncertain; (5) bark beetle outbreaks have not increased annual area burned or fire severity; and (6) trees killed by drought and beetles do not increase fire intensity or extent.

As a result, the Strategy is out of touch with the best-available science on wildfire activity in California forests and fails to provide a defensible justification for the forest-based black carbon strategy. Of added concern, the body of science detailed below demonstrates that efforts to reduce wildfire risk pursuant to the Strategy are likely to cause significant environmental harm to California's forest ecosystems.

1. Wildfire, including high-severity fire, is a natural and necessary component of California's forested landscapes.

a. California mixed-conifer and ponderosa pine forests are characterized by mixed-severity fire.

Numerous studies and multiple lines of evidence demonstrate that California's mixed-conifer and ponderosa pine forests are characterized by mixed-severity fire that includes ecologically significant amounts of high-severity fire. Mixed-severity fire creates complex successional diversity, high biological diversity, and diverse stand structure across California's forested landscapes.

Baker 2014: A reconstruction of historical forest structure and fire across 330,000 ha of Sierra Nevada mixed-conifer forests using data from 1865-1885 demonstrates that these historical forests experienced mixed-severity fire over 43-48% of the land area, with high-severity fire over 31-39% and low-severity fire over just 13-26%. Historical forests were generally dense with abundant large trees, but numerically dominated by smaller pines and oaks. Smaller trees, understory seedlings, saplings and shrubs created abundant ladder fuels. The high-severity fire rotation was 281 years in the northern and 354 years in the southern Sierra, which contributed to high levels of heterogeneity, including abundant areas and large patches (up to 9,400 ha) of early successional forest and montane chaparral, as well as old-growth forest over large land areas. The author concludes that "[p]roposals to reduce fuels and fire severity would actually reduce, not restore, historical forest heterogeneity important to wildlife and resiliency."[3]

Beaty and Taylor 2001: On the western slope of the southern Cascades in California, historical fire intensity in mixed-conifer forests was predominantly moderate- and high-intensity, except in mesic canyon bottoms, where moderate- and high-intensity fire comprised 40.4% of fire effects [Table 7].)[4]

Bekker and Taylor 2001: On the western slope of the southern Cascades in California, in mixed-conifer forests, fire was predominantly high-intensity historically [Fig. 2F].[5]

Bekker and Taylor 2010: In mixed-conifer forests of the southern Cascades, reconstructed fire severity within the study area was dominated by high-severity fire effects, including high-severity fire patches over 2,000 acres in size [Tables I and II].[6]

Collins and Stephens 2010: In a modern "reference" forest condition within mixed-conifer/fir forests in Yosemite National Park, 15% of the area experienced high-intensity fire over a 33-year period—a high-intensity fire rotation interval of approximately 223 years.[7]

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[3] Baker, W.L. 2014. Historical forest structure and fire in Sierran mixed-conifer forests reconstructed from General Land Office survey data. Ecosphere 5(7): Article 79.
[4] Beaty, R.M. and A.H. Taylor. 2001. Spatial and temporal variation of fire regimes in a mixed conifer forest landscape, Southern Cascades, USA. Journal of Biogeography 28: 955–966.
[5] Bekker, M.F. and A.H. Taylor. 2001. Gradient analysis of fire regimes in montane forests of the southern Cascade Range, Thousand Lakes Wilderness, California, USA. Plant Ecology 155: 15-28.
[6] Bekker, M.F. and A.H. Taylor. 2010. Fire disturbance, forest structure, and stand dynamics in montane forest of the southern Cascades, Thousand Lakes Wilderness, California, USA. Ecoscience 17: 59-72.

Halofsky et al. 2011: In the Klamath-Siskiyou Mountains of northwestern California and southwestern Oregon, a mixed-severity fire regime produces structurally diverse vegetation types with intimately mixed patches of varied age. The close mingling of early- and late-seral communities results in unique vegetation and wildlife responses, including high resilience of plant and wildlife species to mixed-severity fire.[8]

Hanson and Odion 2016: An assessment of US Forest Service forest survey data from 1910 and 1911 for central and southern Sierra Nevada ponderosa pine and mixed-conifer forests indicates that these historical forests had a mixed-severity fire regime, with an average of 26% high-severity fire effects. This study's findings are contrary to those of several other reports that use a very small subset of the available data from the 1910 and 1911 surveys, demonstrating the importance of analyzing data from sufficiently large spatial scales when drawing inferences about historical conditions.[9]

Nagel and Taylor 2005: The authors found that large high-severity fire patches were a natural part of 19^{th} century fire regimes in mixed-conifer and eastside pine forests of the Lake Tahoe Basin, and montane chaparral created by high-severity fire has declined by 62% since the 19^{th} century due to reduced high-severity fire occurrence. The authors expressed concern about harm to biodiversity due to loss of ecologically rich montane chaparral.[10]

Odion et al. 2014: In the largest and most comprehensive analysis conducted to date regarding the historical occurrence of high-intensity fire, the authors found that ponderosa pine and mixed-conifer forests in every region of western North America had mixed-intensity fire regimes, which included substantial occurrence of high-intensity fire. The authors also found, using multiple lines of evidence, including over a hundred historical sources and fire history reconstructions, and an extensive forest age-class analysis, that we now have unnaturally low

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[7] Collins, B.M. and S.L. Stephens. 2010. Stand-replacing patches within a mixed severity fire regime: quantitative characterization using recent fires in a long-established natural fire area. Landscape Ecology 25: 927939.

[8] Halofsky, J. E., D.C. Donato, D.E. Hibbs, J.L. Campbell, M. Donaghy Cannon, J.B. Fontaine, J.R. Thompson, R.G. Anthony, B.T. Bormann, L.J. Kayes, B.E. Law, D.L. Peterson, and T.A. Spies. 2011. Mixed-severity fire regimes: lessons and hypotheses from the Klamath-Siskiyou Ecoregion. Ecosphere 2(4): art40.

[9] Hanson, C.T. and D.C. Odion. 2016. Historical fire conditions within the range of the Pacific fishers and spotted owl in the central and southern Sierra Nevada, California, USA. Natural Areas Journal 36: 8-19.

[10] Nagel, T.A. and A. H. Taylor. 2005. Fire and persistence of montane chaparral in mixed conifer forest landscapes in the northern Sierra Nevada, Lake Tahoe Basin, California,USA. J. Torrey Bot. Soc.132: 442-457.

levels of high-intensity fire in these forest types in all regions, since the beginning of fire suppression policies in the early 20th century.[11]

b. High-severity fire creates important habitat critical to numerous species.

High-severity fire creates biodiverse, ecologically important, and unique habitat (often called "snag forest habitat"), which often has higher species richness and diversity than unburned old forest. Plant and animal species in the forest evolved with fire, and many of these species (such as the black-backed woodpecker[12]) depend on wildfires, and particularly high-severity fires, to reproduce and grow. Fire helps to return nutrients from plant matter back to soil, the heat from fire is necessary to the germination of certain types of seeds, and the snags (dead trees) and early successional forests created by high-severity fire create habitat conditions that are beneficial to wildlife. Early successional forests created by high-severity fire support some of the highest levels of native biodiversity found in temperate conifer forests.

Bond et al. 2009: In a radio-telemetry study, California spotted owls preferentially selected high-intensity fire areas, which had not been salvage logged, for foraging, while selecting low- and moderate-intensity areas for nesting and roosting.[13]

Buchalski et al. 2013: In mixed-conifer forests of the southern Sierra Nevada, rare myotis bats were found at greater levels in unmanaged high-severity fire areas of the McNally fire than in lower fire severity areas or unburned forest.[14]

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[11] Odion, D.C., C.T. Hanson, A. Arsenault, W.L. Baker, D.A. DellaSala, R.L. Hutto, W. Klenner, M.A. Moritz, R.L. Sherriff, T.T. Veblen, and M.A. Williams. 2014. Examining historical and current mixed-severity fire regimes in Ponderosa pine and mixed-conifer forests of western North America. Plos One 9(2): e87852. *See also* response and rebuttal: Odion D.C., C.T. Hanson, W.L. Baker, D.A. DellaSala, and M.A. Williams. 2016. Areas of agreement and disagreement regarding ponderosa pine and mixed conifer forest fire regimes: a dialogue with Stevens et al. PLoS ONE 11(5): e0154579; Stevens J.T. et al. 2016. Average stand age from forest inventory plots does not describe historical fire regimes in ponderosa pine and mixed-conifer forests of western North America. PLoS ONE 11(5): e0147688.
[12] Seavy, N.E., R.D. Burnett, and P.J. Taille. 2012. Black-backed woodpecker nest tree preference in the burned forests of the Sierra Nevada, California. Wildlife Society Bulletin 36: 722-728; Tingely, M.W., R.L. Wilkerson, M.L. Bond, C.A. Howell, and R.B. Siegel. 2014. Variation in home-range size of black-backed woodpeckers. The Condor 116: 325-340.
[13] Bond, M.L., D.E. Lee, R.B. Siegel, and J.P. Ward, Jr. 2009. Habitat use and selection by California Spotted Owls in a postfire landscape. Journal of Wildlife Management 73: 1116-1124.
[14] Buchalski, M.R., J.B. Fontaine, P.A. Heady III, J.P. Hayes, and W.F. Frick. 2013. Bat response to differing fire severity in mixed-conifer forest, California, USA. PLoS ONE 8: e57884.

Burnett et al. 2010: Bird species richness was approximately the same between high-severity fire areas and unburned mature/old forest at 8 years post-fire in the Storrie fire, and total bird abundance was greatest in the high-severity fire areas of the Storrie fire [Figure 4]. Nest density of cavity-nesting species increased with higher proportions of high-severity fire, and was highest at 100% [Figure 8].[15]

Cocking et al. 2014: High-intensity fire areas are vitally important to maintain and restore black oaks in mixed-conifer forests.[16]

DellaSala et al. 2014: Complex early seral forests in the Sierra Nevada of California, which are produced by mixed-severity fire including large high severity patches, support diverse plant and wildlife communities that are essential to the region's ecological integrity. Fire suppression and biomass removal after fire reduce structural complexity, diversity, and resilience in the face of climate change.[17]

Donato et al. 2009: The high-severity re-burn [high-severity fire occurring 15 years after a previous high-severity fire] had the highest plant species richness and total plant cover, relative to high-severity fire alone [no re-burn] and unburned mature/old forest; and the high-severity fire re-burn area had over 1,000 seedlings/saplings per hectare of natural conifer regeneration.[18]

Franklin et al. 2000: The authors found that stable or increasing populations of spotted owls resulted from a mix of dense old forest and complex early seral habitat, and less than approximately 25% complex early seral habitat in the home range was associated with declining populations [Fig. 10]; the authors emphasized that the complex early seral habitat was consistent with high-intensity fire effects, and inconsistent with clearcut logging.[19]

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[15] Burnett, R.D., P. Taillie, and N. Seavy. 2010. Plumas Lassen Study 2009 Annual Report. U.S. Forest Service, Pacific Southwest Region, Vallejo, CA.
[16] Cocking M.I., J.M. Varner JM, and E.E. Knapp. 2014. Long-term effects of fire severity on oak-conifer dynamics in the southern Cascades. Ecological Applications 24: 94-107.
[17] DellaSala, D., M.L. Bond, C.T. Hanson, R.L. Hutto, and D.C. Odion. 2014. Complex early seral forests of the Sierra Nevada: what are they and how can they be managed for ecological integrity? Natural Areas Journal 34: 310-324.
[18] Donato, D.C., J.B. Fontaine, W.D. Robinson, J.B. Kauffman, and B.E. Law. 2009. Vegetation response to a short interval between high-severity wildfires in a mixed-evergreen forest. Journal of Ecology 97:142-154.
[19] Franklin, A.B., D.R. Anderson, R.J. Gutierrez, and K.P. Burnham. 2000. Climate, habitat quality, and fitness in northern spotted owl populations in northwestern California.Ecological Monographs 70: 539-590.

Hanson and North 2008: Black-backed woodpeckers depend upon dense, mature/old forest that has recently experienced higher-intensity fire, and has not been salvage logged.[20]

Hanson 2013: Pacific fishers use pre-fire mature/old forest that experienced moderate/high-intensity fire more than expected based upon availability, just as fishers are selecting dense, mature/old forest in its unburned state. When fishers are near fire perimeters, they strongly select the burned side of the fire edge. Both males and female fishers are using large mixed-intensity fire areas, such as the McNally fire, including several kilometers into the fire area.[21]

Hanson 2015: Pacific fisher females in the Sierra Nevada use unlogged higher severity fire areas, including very large high-severity patches. In the McNally fire area at 10 to 11 years postfire, female fishers used the large, intense fire area significantly more than unburned forest, and females were detected at multiple locations >250m into the interior of a very large (>5,000 ha), unlogged higher severity fire patch. The author concludes that these results "suggest a need to revisit current management direction, which emphasizes extensive commercial thinning and postfire logging to reduce fuels and control fire."[22]

Hutto 1995: A study in the northern Rocky Mountain region found that 15 bird species are generally more abundant in early post-fire communities than in any other major cover type occurring in the northern Rockies. Standing, fire-killed trees provided nest sites for nearly two-thirds of 31 species that were found nesting in the burned sites.[23]

Hutto 2008: Severely burned forest conditions have occurred naturally across a broad range of forest types for millennia and provide an important ecological backdrop for fire specialists like the black-backed woodpecker.[24]

Hutto et al. 2016: This review highlights that high severity fire was historically common in western conifer forests and is ecologically essential. Many animal and plant species depend on severely burned forests for persistence. The researchers recommend a "more ecologically informed view" of severe forest fire, including changes in management and education to

[20] Hanson, C. T. and M. P. North. 2008. Postfire woodpecker foraging in salvage-logged and unlogged forests of the Sierra Nevada. Condor 110: 777–782.
[21] Hanson, C.T. 2013. Pacific fisher habitat use of a heterogeneous post-fire and unburned landscape in the southern Sierra Nevada, California, USA. The Open Forest Science Journal 6: 24-30.
[22] Hanson, C.T. 2015. Uses of higher severity fire areas by female Pacific fishers on the Kern Plateau, Sierra Nevada, California, USA. Wildlife Society Bulletin 39: 497-502.
[23] Hutto, R. L. 1995. Composition of bird communities following stand-replacement fires in Northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology 9: 1041–1058.
[24] Hutto, R. L. 2008. The ecological importance of severe wildfires: Some like it hot. Ecological Applications 18: 1827–1834.

maintain ecologically necessary levels of severe fire and the complex early-seral forest conditions it creates.[25]

Lee and Bond 2015: California spotted owls exhibited high site occupancy in post-fire landscapes during the breeding season following the 2013 Rim Fire, even where large areas burned at high severity; the complex early seral forests created by high-severity fire appear to provide important habitat for the small mammal prey of the owl.[26]

Malison and Baxter 2010: In ponderosa pine and Douglas-fir forests of Idaho at 5-10 years post-fire, levels of aquatic insects emerging from streams were two and a half times greater in high-intensity fire areas than in unburned mature/old forest, and bats were nearly 5 times more abundant in riparian areas with high-intensity fire than in unburned mature/old forest.[27]

Ponisio et al. 2016: A study of plant–pollinator communities in mixed-conifer forest in Yosemite National Park found that pyrodiversity (the diversity of fires within a region) increases the richness of the pollinators, flowering plants, and plant-pollinator interactions, and buffers pollinator communities against the effects of drought-induced floral resource scarcity. The authors conclude that lower fire diversity is likely to negatively affect the richness of plant–pollinator communities across large spatial scales. [28]

Raphael et al. 1987: At 25 years after high-intensity fire, total bird abundance was slightly higher in snag forest than in unburned old forest in eastside mixed-conifer forest of the northern Sierra Nevada; and bird species richness was 40% higher in snag forest habitat. In earlier post- fire years, woodpeckers were more abundant in snag forest, but were similar to unburned by 25 years post-fire, while flycatchers and species associated with shrubs continued to increase to 25 years post-fire.[29]

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[25] Hutto, R.L., R.E. Keane, R.L. Sherriff, C.T. Rota, L.A. Eby, and V.A. Saab. 2016. Toward a more ecologically informed view of severe forest fires. Ecosphere 7(2):e01255.
[26] Lee, D.E. and M.L. Bond. 2015. Occupancy of California spotted owl sites following a large fire in the Sierra Nevada, California. The Condor 117: 228-236.
[27] Malison, R.L. and C.V. Baxter. 2010. The fire pulse: wildfire stimulates flux of aquatic prey to terrestrial habitats driving increases in riparian consumers. Canadian Journal of Fisheries and Aquatic Sciences 67: 570-579.
[28] Ponisio, L.C., K. Wilken, L.M. Gonigle, K. Kulhanek, L. Cook, R. Thorp, T. Griswold, and C. Kremen. 2016. Pyrodiversity begets plant-pollinator community diversity. Global Change Biology 22: 1794-1808.
[29] Raphael, M.G., M.L. Morrison, and M.P. Yoder-Williams. 1987. Breeding bird populations during twenty-five years of postfire succession in the Sierra Nevada. The Condor 89: 614-626.

Sestrich et al. 2011: Native bull and cutthroat trout tended to increase with higher fire intensity, particularly where debris flows occurred. Nonnative brook trout did not increase.[30]

Siegel et al. 2012: Many more species occur at high burn severity sites starting several years post-fire, and these include the majority of ground and shrub nesters as well as many cavity nesters. Secondary cavity nesters, such as swallows, bluebirds, and wrens, are particularly associated with severe burns, but only after nest cavities have been created, presumably by the pioneering cavity excavating species such as the black-backed woodpecker. As a result, fires that create preferred conditions for black-backed woodpeckers in the early post-fire years will likely result in increased nesting sites for secondary cavity nesters in successive years.[31]

Swanson et al. 2010: A literature review concluding that some of the highest levels of native biodiversity found in temperate conifer forest types occur in complex early successional habitat created by stand-initiating [high severity] fire.[32]

2. California's forests have a deficit of fire, including a deficit of high-severity fire, compared with historical conditions.

Studies indicate that California's forests are experiencing a significant fire deficit compared with pre-settlement conditions, meaning that there is much less fire on the landscape than there was historically (Mouillet and Field 2005, Stephens et al. 2007, Marlon et al. 2012, Odion et al. 2014, Parks et al. 2015).[33] A recent analysis by Parks et al (2015) reported that

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[30] Sestrich, C.M., T.E. McMahon, and M.K. Young. 2011. Influence of fire on native and nonnative salmonid populations and habitat in a western Montana basin. Transactions of the American Fisheries Society 140: 136-146.

[31] Siegel, R.B., M.W. Tingley, and R.L. Wilkerson. 2012. Black-backed Woodpecker MIS surveys on Sierra Nevada national forests: 2011 Annual Report. A report in fulfillment of U.S. Forest Service Agreement No. 08-CS-11052005-201, Modification #4; U.S. Forest Service Pacific Southwest Region, Vallejo, CA.

[32] Swanson, M.E., J.F. Franklin, R.L. Beschta, C.M. Crisafulli, D.A. DellaSala, R.L. Hutto, D. Lindenmayer, and F.J. Swanson. 2010. The forgotten stage of forest succession: early-successional ecosystems on forest sites. Frontiers Ecology & Environment 9: 117-125.

[33] Mouillot, F. and C. Field. 2005. Fire history and the global carbon budget: a 1º x 1º fire history reconstruction for the 20th century. Global Change Biology 11: 398-420; Stephens, S.L., R.E. Martin, and N.E. Clinton. 2007. Prehistoric fire area and emissions from California's forests, woodlands, shrublands and grasslands. Forest Ecology and Management 251: 205-216; Marlon, J.R., Bartlein, P.J., Gavin, D.G., Long, C.J., Anderson, R.S., Briles, C.E., Brown, K.J., Colombaroli, D., Hallett, D.J., Power, M.J., Scharf, E.A., and M.K. Walsh. 2012. Long-term perspective on wildfires in the western USA. PNAS 109: E535–E543; Odion, D.C. et al. 2014; Parks, S.A., C. Miller, M-A Parisien, L.M. Holsinger, S.Z. Dobrowski, and J. Abatzoglou. 2015.

California forests, including Sierra Nevada and southern Cascades forests, experienced a significant fire deficit during the recent 1984-2012 study period, attributed to fire suppression activities.[34] According to Stephens et al. (2007), prior to 1800, an estimated 18 to 47 times more area burned each year in California, including 20 to 53 times more forest area, than has burned annually during recent decades: "skies were likely smoky much of the summer and fall." This study estimated that 1.8 million to 4.8 million hectares burned each year in California prior to 1800, of which 0.5 million to 1.2 million hectares were forest, compared to just 102,000 hectares burned each year between 1950-1999, of which 23,000 hectares were forest. Based on this extreme fire deficit, Stephens et al. (2007) recommend "increasing the spatial extent of fire in California [as] an important management objective." Odion et al. (2014) similarly found evidence that there is currently much less high-severity fire in California's mixed-conifer and ponderosa pine forests than compared with historical levels.

3. Scientific studies are finding no significant trends in wildfire risk.

Scientific evidence does not indicate that wildfire risk is at unnatural levels in California's forests and therefore must be reduced. Notably, the majority of studies that have analyzed recent trends in fire severity and area burned in California forests have found no significant trends in these metrics. Studies have also consistently found that forest areas in California that have missed the largest number of fire return intervals are not burning at higher fire severity.

a. California forests are not experiencing an increase in fire severity or burned area.

Eleven studies have analyzed recent trends in fire severity in California's forests in terms of proportion, area, and/or patch size. Nine of eleven studies found no significant trend in fire severity, including: Baker 2015 (California dry pine and mixed conifer forests), Collins et al. 2009 (central Sierra Nevada), Dillon et al. 2011 (Northwest California), Hanson et al. 2009 (Klamath, southern Cascades), Hanson and Odion 2014 (Sierra Nevada, southern Cascades), Miller et al. 2012 (four Northwest CA forests), Odion et al. 2014 (eastern and western Sierra Nevada, eastern Cascades), Picotte et al. 2016 (California forest and woodland), and Schwind 2008 (California forests).[35] The two studies that report an increasing trend in fire severity—

Wildland fire deficit and surplus in the western United States, 1984-2012. Ecosphere 6: Article 275.

[34] Parks, S.A. et al. 2015.

[35] 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(9): e0136147; Collins, B.M., J.D. Miller, A.E. Thode, M. Kelly, J.W. van Wagtendonk, and S.L. Stephens. 2009. Interactions among wildland fires in a long-established Sierra Nevada natural fire area. Ecosystems 12:114–128; Dillon, G.K., et al. 2011. Both topography and climate affected forest and woodland burn severity in two regions of the western US, 1984 to 2006. Ecosphere 2:

Miller et al. 2009 and Miller and Safford 2012 (Sierra Nevada, southern Cascades)[36]—were refuted by Hanson and Odion (2014) using a larger dataset.

Hanson and Odion (2014) conducted the first comprehensive assessment of fire intensity since 1984 in the Sierra Nevada using 100% of available fire intensity data, and found no increasing trend in terms of high-intensity fire proportion, area, mean patch size, or maximum patch size. Hanson and Odion (2014) reviewed the approach of Miller et al. (2009) and Miller and Safford (2012) for bias, due to the use of vegetation layers that post-date the fires being analyzed in those studies. Hanson and Odion (2014) found that there is a statistically significant bias in both studies ($p = 0.025$ and $p = 0.021$, respectively), the effect of which is to exclude relatively more conifer forest experiencing high-intensity fire in the earlier years of the time series, thus creating the erroneous appearance of an increasing trend in fire severity. Hanson and Odion (2014) also found that the regional fire severity data set used by Miller et al. (2009) and Miller and Safford (2012) disproportionately excluded fires in the earlier years of the time series, relative to the standard national fire severity data set (www.mtbs.gov) used in other fire severity trend studies, resulting in an additional bias which created, once again, the inaccurate appearance of relatively less high-severity fire in the earlier years, and relatively more in more recent years.

Of note, Baker (2015) found that the rate of recent (1984–2012) high-severity fire in dry pine and mixed conifer forests in California is within the range of historical rates, or is too low. There were no significant upward trends from 1984–2012 for area burned and fraction burned at high severity. The author concluded that "[p]rograms to generally reduce fire severity in dry forests are not supported and have significant adverse ecological impacts, including reducing habitat for native species dependent on early-successional burned patches and decreasing landscape heterogeneity that confers resilience to climatic change."

Article 130; Hanson, C.T., D.C. Odion, D.A. DellaSala, and W.L. Baker. 2009. Overestimation of fire risk in the Northern Spotted Owl Recovery Plan. Conservation Biology 23:1314–1319; Hanson, C.T., and D.C. Odion. 2014. Is fire severity increasing in the Sierra Nevada mountains, California, USA? International Journal of Wildland Fire 23: 1-8; Miller, J.D., C.N. Skinner, H.D. Safford, E.E. Knapp, and C.M. Ramirez. 2012. Trends and causes of severity, size, and number of fires in northwestern California, USA. Ecological Applications 22: 184-203; Odion, D.C. et al. 2014; Picotte, J.J., B. Peterson, G. Meier, and S.M. Howard. 2016. 1984-2010 trends in fire burn severity and area for the coterminous US. International Journal of Wildland Fire 25: 413-420; Schwind, B. 2008. Monitoring trends in burn severity: report on the Pacific Northwest and Pacific Southwest fires (1984 to 2005). USGS.

[36] Miller, J.D., H.D. Safford, M.A. Crimmins, and A.E. Thode. 2009. Quantitative evidence for increasing forest fire severity in the Sierra Nevada and southern Cascade Mountains, California and Nevada, USA. Ecosystems 12:16–32; Miller, J.D. and H. Safford. 2012. Trends in wildfire severity: 1984-2010 in the Sierra Nevada, Modoc Plateau, and southern Cascades, California, USA. Fire Ecology 8(2): 41-57.

In studies of area burned, Dennison et al. (2014) found no significant increase in annual fire area in the Sierra Nevada/Klamath/Cascades forest ecoregion in California during the 1984-2011 study period, nor a significant trend toward an earlier fire season in this or any other western ecoregion.[37] Similarly, Dillon et al. (2011) detected no trends in annual area burned in the two ecoregions that occur in part in northern California (i.e., Pacific, Inland Northwest) during the 1984-2006 study period.[38]

b. The most long-unburned forests are not burning at higher fire severity.

Studies empirically investigating the assumption that the most long-unburned forests are burning predominantly at high severity have consistently found that forest areas in California that have missed the largest number of fire return intervals are not burning at higher fire severity. Specifically, six empirical studies that have investigated this question found that the most long-unburned (most fire-suppressed) forests burned mostly at low/moderate-severity, and did not have higher proportions of high-severity fire than less fire-suppressed forests. Forests that were not fire suppressed (those that had not missed fire cycles, i.e., Condition Class 1, or "Fire Return Interval Departure" class 1) generally had levels of high-severity fire similar to, or higher than, those in the most fire-suppressed forests, as found by Odion et al. 2004, Odion and Hanson 2006, Odion and Hanson 2008, Odion et al. 2010, Miller et al. 2012, and van Wagtendonk et al. 2012.[39]

4. The projected impacts of climate change on wildfire activity in California are uncertain.

While climate change will almost certainly alter fire activity in many California ecosystems, scientific research does not indicate that climate change will increase fire severity nor necessarily increase fire amount in California forests. As described above, the majority of

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[37] Dennison, P.E., Brewer, S.C., Arnold, J.D., and M.A. Moritz. 2014. Large wildfire trends in the western United States, 1984-2011. Geophysical Research Letters 41: 2928–2933.
[38] Dillon, G.K., et al. 2011.
[39] Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.A. DellaSala, and M.A. Moritz. 2004. Patterns of fire severity and forest conditions in the Klamath Mountains, northwestern California. Conservation Biology 18: 927-936; Odion, D.C., and C.T. Hanson. 2006. Fire severity in conifer forests of the Sierra Nevada, California. Ecosystems 9: 1177-1189; Odion, D.C., and C.T. Hanson. 2008. Fire severity in the Sierra Nevada revisited: conclusions robust to further analysis. Ecosystems 11: 12-15; Odion, D. C., M. A. Moritz, and D. A. DellaSala. 2010. Alternative community states maintained by fire in the Klamath Mountains, USA. Journal of Ecology; Miller, J.D., C.N. Skinner, H.D. Safford, E.E. Knapp, and C.M. Ramirez. 2012. Trends and causes of severity, size, and number of fires in northwestern California, USA. Ecological Applications 22:184-203; van Wagtendonk, J.W., K.A. van Wagtendonk, and A.E. Thode. 2012. Factors associated with the severity of intersecting fires in Yosemite National Park, California, USA. Fire Ecology 8: 11-32.

studies that have analyzed recent wildfire trends in California forests have found no significant trends in fire activity. Studies that project trends in fire activity under climate change scenarios indicate that fire severity in California forests is likely to stay the same or decrease, and projection studies show no consensus on how climate change is likely to affect future fire probability or area burned in California forests, as detailed below.

Notably, a recent study by Parks et al. (2016) projected that most areas of the western US, including California's forested areas, will experience decreases or no change in fire severity by mid-century (2040-2069) under the highest-emission RCP 8.5 scenario used in global climate models.[40] Three studies that have projected changes in the probability of burning or the probability of a large fire occurring show no consensus, with projections for no change, increases, or decreases in fire varying by region: Krawchuk and Moritz 2012, Moritz et al. 2012, and Westerling and Bryant 2008.[41]

Studies that have projected trends in area burned in California forests under climate change show no consensus. Four studies project both increases and decreases in total area burned depending on the region: Lenihan et al. 2003, Lenihan et al. 2008, Krawchuk et al. 2009, and Spracklen et al. 2009.[42] One study projected an overall decrease in area burned (McKenzie et al. 2004), while two studies projected increases (Fried et al. 2004 in a small region in the Amador-El Dorado Sierra foothills; Westerling et al. 2011).[43] The projected increases in Westerling et al.

[40] Parks, S.A., C. Miller, J.T. Abatzoglou, L.M. Holsinger, M-A. Parisien, and S. Dobrowski. 2016. How will climate change affect wildland fire severity in the western US? Environmental Research Letters 11: 035002.
[41] Krawchuk, M. A., and M. A. Moritz. 2012. Fire and Climate Change in California. California Energy Commission. Publication number: CEC-500-2012-026; Moritz, M., Parisien, M., Batllori, E., Krawchuk. M., Van Dorn, J., Ganz, D., & Hayhoe, K. 2012. Climate change and disruptions to global fire activity. Ecosphere 3 (6): 1-22; Westerling, A. and B. Bryant. 2008. Climate change and wildfire in California. Climate Change 87: S231– S249.
[42] Lenihan, J.M., Drapek, R.J., Bachelet, D., and Neilson, R.P. 2003. Climate change effects on vegetation distribution, carbon, and fire in California. Ecological Applications 13: 1667-1681; Lenihan, J.M., D. Bachelet, R.P. Neilson, and R. Drapek. 2008. Response of vegetation distribution, ecosystem productivity, and fire to climate change scenarios for California. Climate Change 87(Suppl. 1): S215-S230; Krawchuk, M.A., M.A. Moritz, M. Parisien, J. Van Dorn, K. Hayhoe. 2009. Global pyrogeography: the current and future distribution of wildfire. PloS ONE 4: e5102; Spracklen, D.V., L.J. Mickley, J.A. Logan, R.C. Hudman, R. Yevich, M.D. Flannigan, A.L. Westerling. 2009. Impacts of climate change from 2000 to 2050 on wildfire activity and carbonaceous aerosol concentrations in the western United States. Journal of Geophysical Research 114: D20301.
[43] McKenzie, D., Z. Gedalof, D.L. Peterson, and P. Mote. 2004. Climatic change, wildfire, and conservation. Conservation Biology 18: 890-902; Fried, J. S., M. S. Torn, and E. Mills. 2004. The impact of climate change on wildfire severity: A regional forecast for northern California.

(2011) are relatively modest, with median increases in area burned of 21% and 23% by 2050, and 20% and 44% by 2085, relative to 1961-1990 under lower (B1) and higher (A2) emissions scenarios respectively. Given that the average annual burned area in California in the past several decades was many times lower than the burned area historically, these projected increases in fire activity in California would likely remain well within the historical range of the past several centuries.

As reviewed in Whitlock et al. (2015), wildfire projection studies involve numerous uncertainties, including high uncertainty around future changes in precipitation timing and amount in the western US, which create significant differences among study results. According to Whitlock et al. (2015), observed and projected changes in wildfire activity must be understood in terms of (1) fire's ecological benefits, (2) the current fire deficit in most forested regions of North America, and (3) a sufficiently long baseline to capture the historical range of fire variability within the particular ecosystem. Detecting and interpreting the significance of climate-driven fire patterns requires information on the magnitude and direction of change in comparison to the long-term fire occurrence within the ecosystem as well as the relative influences of climatic and non-climatic drivers that affect fire activity (i.e., invasion of nonnative plants, introduction of nonnative grazers, land-use change, and changes in forest management practices).[44]

5. Bark beetle outbreaks have not increased annual area burned or fire severity.

Substantial field-based evidence demonstrates that bark beetle outbreaks have not increased annual area burned in the western United States, beetle outbreaks do not contribute to severe fires, and outbreak areas do not burn more severely when fire does occur (Bond et al. 2009, Black et al. 2013, Harvey et al. 2013, Hart et al. 2015a, Hart et al. 2015b, DellaSala 2016).[45] Furthermore, scientific studies indicate that thinning and logging have no effect during

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Climatic Change 64 (1–2):169–191; Westerling, A.L., B. P. Bryant, H.K. Preisler, T.P. Holmes, H.G. Hidalgo, T. Das. And S.R. Shrestha. 2011. Climate change and growth scenarios for California wildfire. Climatic Change 109 (Suppl 1): S445-S463.

[44] Whitlock, C., D.A. DellaSala, S. Wolf, and C.T. Hanson. 2015. Climate Change: Uncertainties, Shifting Baselines, and Fire Management. Pp. 265-289 in The Ecological Importance of Mixed Severity Fires: Nature's Phoenix. D.A. DellaSala and C.T. Hanson, eds. Elsevier, Amsterdam, Netherlands.

[45] Bond, M.L., D.E. Lee, C.M. Bradley, and C.T. Hanson. 2009. Influence of pre-fire tree mortality on fire severity in conifer forests of the San Bernardino Mountains, California. The Open Forest Science Journal 2: 41-47; Black, S.H., D. Kulakowski, B.R. Noon, and D.A. DellaSala. 2013. Do bark beetle outbreaks increase wildfire risks in the Central U.S. Rocky Mountains: Implications from Recent Research. Nat. Areas J. 33: 59-65; Harvey, B.J, D.C. Donato, W.H. Romme, and M.G. Turner. 2013. Influence of recent bark beetle outbreak on fire

beetle outbreaks of landscape scales, and that post-fire logging can reduce forest resilience to natural disturbances such as fire (DellaSala 2016).[46]

6. Trees killed by drought and beetles do not increase fire intensity or extent.

The Strategy refers to the Governor's Proclamation of a State of Emergency on Tree Mortality, which addresses drought and beetle-related tree mortality in the state, as evidence that California's forests are in a "perilous condition" and "require accelerated management." Strategy at 6, 51. While the governor's declaration identifies the potential health and safety issues related to dead and dying trees directly adjacent to (i.e. within falling distance of) houses, roads, and infrastructure, this does not indicate any ecological or public safety need for forest management (i.e., logging) of forests in general. Specifically, dead trees do not pose an increased fire risk to wildland-urban interface ("WUI") communities, as is made clear in the scientific literature and recent summaries of the state of the science on this issue (Hart et al. 2015a, DellaSala 2016, Hanson et al. 2016).[47] Furthermore, ecologically healthy forests and native wildlife populations depend upon abundant snags, and California's forests still have a deficit of snags (Hanson et al. 2016).

C. The Black Carbon Emissions and Consequent Climate Impacts of Wildfire are Inadequately Characterized.

The Strategy contains serious flaws in its treatment of wildfire climate impacts that undermine validity of the suggested approaches to mitigating wildfire black carbon emissions. First, the Strategy presents estimates of wildfire black carbon emissions that rely on such minimal and variable data as to be unreliable and potentially incorrect. Second, the Strategy has failed to provide the full context of emissions from wildfire, resulting in the misleading impression that reducing wildfires will result in substantial climate benefits. This conclusion is not supported by the scientific literature.

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severity and postfire tree regeneration in montane Douglas-fir forests. Ecology 94: 2475–2486; Hart, S.J., T. Schoennagel, T.T. Veblen, and T.B. Chapman. 2015a. Area burned in the western United States is unaffected by recent mountain pine beetle outbreaks. PNAS 112: 4375-4380; Hart, S.J., T.T. Veblen, N. Mietkiewicz, and D. Kulakowski. 2015b. Negative feedbacks on bark beetle outbreaks: widespread and severe spruce beetle infestation restricts subsequent infestation. PLoS ONE 10(5): e0127975; DellaSala, D.A. 2016. Do mountain pine beetle outbreaks increase the risk of high-severity fires in western forests? A summary of recent field studies. Geos Institute.

[46] DellaSala, D.A. 2016.

[47] Hanson, C.T., D.A. DellaSala, M. Bond, G. Wuerthner, D. Odion, and D. Lee. 2016. Scientists Letter to Governor Brown on the Governor's Proclamation of a State of Emergency on Tree Mortality. 4 February 2016.

1. Data are Not Available to Estimate Black Carbon from Wildfires with Any Accuracy.

As noted by the Strategy, the estimation of black carbon from wildfires is notoriously difficult and fraught with uncertainty. Not only does the extent of wildfire vary widely from year to year, but also the factors influencing black carbon emissions are highly condition-dependent and time-variable. Strategy at 40 (noting uncertainties in inventory values); 49 (acknowledging large year to year variability in wildfire). Appendix A's review of California's SLCP inventory puts a finer point on it: "This variation [in fuel type, moisture content, oxygen levels and local weather] leads to high uncertainty in speciation assumptions, and adequate speciation profiles to account for various fire conditions are not available." Strategy App. A at 4. Despite its own admission that black carbon estimates for wildfire are not accurate, the Strategy depends heavily on these values in the formulation of black carbon mitigation approaches. Because there are no dependable parameters and methods for estimating wildfire black carbon emissions, ARB's proposals for reducing these emissions lack a rational basis.

Unlike other sources of black carbon, wildfire emissions are not amenable to reasonable estimation using current data and methods. ARB uses a "speciation" model to create its black carbon inventory. This means that black carbon emissions from each source are assumed to be a percentage of total PM2.5 emissions for that source, with the percentage of black carbon based on observational data. For wildfire, total PM2.5 is derived from a model that includes parameters such as the geographic extent of wildfire, fuel type and estimated moisture content, and fire phase (flaming or smoldering).[48]

Wildfire presents several challenges that undermine the accuracy of ARB's speciation approach. The first challenge is that the black carbon portion of PM2.5 can be difficult to estimate because estimates of emissions from biomass burning are highly uncertain. This is a result of the many factors that contribute to emissions, including but not limited to the mix of fuels, mass of fuel, moisture content, temperature of the fire, incline and wind direction, and duration of the fire. This results in estimates of black carbon in PM2.5 that range over two orders of magnitude, as noted by ARB.[49] Nonetheless, the ARB inventory assumes a single value for the proportion of black carbon in PM2.5 of 0.2 (20 percent).[50] Notably, this is more than double EPA's national speciation value for wildfire, which is 0.095 (9.5 percent).[51]

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[48] Cal. Air Resources Board, California's Black Carbon Inventory: Technical Support Document 8 (2015) (hereinafter "TSD") *available at* http://www.arb.ca.gov/cc/inventory/slcp/doc/bc_inventory_tsd_20160411.pdf (visited May 25, 2016).
[49] TSD at 9.
[50] The TSD cites a number of studies that are presumed to reflect California's typical wildfire fuel mix, but at least one study by McMeeking et al. that included a similar fuel mix – and coincidentally observed much lower black carbon proportions – was omitted. *See* G.R. McMeeking et al., *Emissions of trace gases and aerosols during the open combustion of biomass*

The Technical Support Document (TSD) for ARB's black carbon inventory indicates that the speciation value of 0.2 was selected as a median value from the literature, but the studies that ARB relies on for its speciation value indicate the highly variable nature of biomass black carbon emissions, even in the controlled conditions of a laboratory. Only a handful of burns are completed for each sample, and the variability between samples under the same conditions can be extremely high.[52]

Speciation values are typically derived by burning fuels in a laboratory and measuring resulting emissions, although lab conditions cannot "fully anticipate or reproduce the complex real-world fires."[53] Where downwind samples were taken from prescribed burns, the black carbon concentrations were significantly lower.[54] Moreover, Turn et al. expressly noted that their laboratory burns were in relatively windless conditions that would simulate prescribed burns, but not wildfire conditions.[55]

One of the determinants of the emission profile is combustion efficiency. A number of studies have analyzed combustion efficiency, including conditions in which it is increased or decreased. It appears that greater combustion efficiency (more carbon converted to CO_2) is associated with lower organic carbon and PM2.5 emissions, while black carbon may be slightly elevated at high combustion efficiency. There are a number of factors that contribute to combustion efficiency, many of which are difficult to predict for wildfire. Fuel type is one determinant of combustion efficiency.[56] Another influence is moisture content, which may naturally vary with conditions.[57] Generally, higher moisture burns are associated with increased

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in the laboratory, 114 JOURNAL OF GEOPHYSICAL RESEARCH D19210 (2009)(average for Montane mix was 1.4% BC).

[51] EPA SPECIATE profile for wildfire, *available at* https://cfpub.epa.gov/si/speciate/ehpa_speciate_browse_details.cfm?ptype=PC&pnumber=91102.

[52] See L.-W.A. Chen et al., *Moisture effects on carbon and nitrogen emission from burning of wildland biomass*, 10 ATMOS. CHEM. PHYS. 1, Table 1 (2010).

[53] L.-W.A. Chen et al., *Emissions from Laboratory Combustion of Wildland Fuels: Emission Factors and Source Profiles*, 41 ENVIRON. SCI. TECHNOL. 4317, 4317 (2007); *see also* T.C. Bond et al., *Bounding the role of black carbon in the climate system: A scientific assessment*, 118 JOURNAL OF GEOPHYSICAL RESEARCH 5380, 5419 (2013).

[54] See L.R. Mazzoleni et al., *Emissions of Levoglucosan, Methoxy Phenols, and Organic Acids from Prescribed Burns, Laboratory Combustion of Wildland Fuels, and Residential Wood Combustion*, 41 ENVIRON. SCI. TECHNOL. 2115, Table 1 (2007).

[55] S.Q. Turn et al., *Elemental characterization of particulate matter emitted from biomass burning: Wind tunnel derived source profiles for herbaceous and wood fuels*, 102 JOURNAL OF GEOPHYSICAL RESEARCH, 3683, 3687 (1997).

[56] McMeeking 2009, *supra*, note 50 at 8.

[57] Chen 2010, *supra* note 52.

PM2.5 and organic carbon emissions, reducing the relative contribution of black carbon.[58] The mass of fuel being combusted can also alter combustion efficiency,[59] which is particularly problematic when translating laboratory emission factors to large scale wildfire.

The second challenge is that PM2.5 and black carbon emissions have different dependencies on phase of burning. Several studies have found that there is an inverse relationship between the mass of PM2.5 and black carbon emissions at different phases of the fire. During the brief duration of the flaming phase, PM2.5 is relatively low while black carbon emissions are elevated. In contrast, smoldering is associated with much higher total PM2.5, but similar or lower black carbon emissions.[60] A similar disjunction between PM2.5 mass and black carbon mass was observed by Mazzoleni et al. (2007) when examining the effect of fuel type and incline (and consequently speed of the fire).[61] Depending on how PM2.5 emissions progress in ARB's model, spurious results may occur if a high percentage of black carbon is assumed for all phases rather than just the flaming phase, when total PM2.5 is actually low.[62]

In sum, the data needed to make accurate estimates of black carbon emissions from wildfire are sorely lacking. The current speciation value selected by ARB is not adequately supportable as the basis for a state-wide mitigation policy. Not only are the speciation values themselves in question, but the time dependence and inverse trends in black carbon as opposed to PM2.5 over fire phases further complicate matters to the point that ARB's estimates of wildfire black carbon are entirely unsupportable.

2. The Strategy Fails to Integrate the Effects of Co-Emitted Aerosols.

The Strategy appears to treat all sources of black carbon as equivalent targets for mitigation, but this fails to account for the full mix of emissions from various sources. In contrast to fossil fuel soot, wildfire black carbon is a much lower proportion of total aerosol emissions. Therefore, mitigation policies must examine the potential climate impacts of the co-emitted particles that include, for instance, various elements, organic carbon, and nitrogen. Some of these co-emitted aerosols exert a cooling effect.[63] At one time it was assumed that all organic carbon exerted a cooling influence. It is now accepted that while black carbon is highly absorbing (hence warming), some portion of organic carbon (brown carbon) is also absorbing to a lesser

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[58] *Id.* at Table 1.
[59] McMeeking 2009, *supra* note 50 at 8.
[60] Bond 2013, *supra* note 53 at 5419; *See also* Chen 2010, *supra* note 52; Chen 2007, *supra* note 53.
[61] Mazzoleni 2007, *supra* note 54 at 2117.
[62] Bond 2013, *supra* note 53 at 5408.
[63] Some portion of organic carbon is light scattering and cooling. In addition, some reactive nitrogen species from combustion can be cooling. R.W. Pinder et al., *Climate change impacts of US reactive nitrogen*, 109 PROC. NATL. ACAD .SCI. 7671 (2012). See Chen 2010, *supra* note 52, for a discussion of nitrogen species in biomass burning smoke.

degree.[64] Various studies have attempted to quantify the effects of absorption by brown carbon, and the current consensus appears to be that the direct cooling effects of non-carbon aerosols may approximately offset brown carbon forcings from biomass burning.[65] But this is an area of active investigation with a large number of remaining uncertainties.

It should be noted that the general conclusion that brown carbon may offset cooling impacts is largely related to agricultural burning and residential cooking and heating stoves. Thus, it is not clear what impact wildfire with its unique combustion qualities would have. A recent study that presented the most comprehensive global black carbon inventory to date noted that because the net forcing from *all* black carbon sources is slightly negative, or cooling, the "uniform elimination of all emissions from black-carbon-rich sources could lead to no change in climate warming."[66] That study indicated that the best potential targets were diesel emissions and potentially residential solid fuel.[67] With regard to wildfire, Bond and colleagues estimate that the total climate forcing for open biomass burning of forests is negative or near zero.[68] Thus, mitigation efforts related to wildfire are not guaranteed to have substantial, if any, net climate benefits.

One of the looming uncertainties related to climate impacts from black carbon relates to indirect cloud impacts. Bond and colleagues reviewed the literature on this topic and estimated that forest burning likely has a net negative climate forcing (cooling), although there is very large uncertainty. Jacobson also recently modeled climate impacts of black carbon using a model that incorporates detailed cloud interactions.[69] His results suggest a warming effect, but the results have not been replicated and he points to large uncertainties as well. Furthermore, Jacobson's recent cloud-interaction model estimates that only 7 percent of the biomass burning in his model was from natural sources such as wildfire.[70] Thus, those results may not be applicable to the specific emissions associated with wildfire. Finally, Kodros et al. recently reviewed the uncertainties in estimates of biofuel aerosol direct forcing and cloud-albedo indirect effects. Notably this study only looked at domestic biofuel combustion, and thus is not directly

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[64] *See, e.g.,* C.E. Chung et al., *Observationally constrained estimates of carbonaceous aerosol radiative forcing*, 109 PROC. NATL. ACAD .SCI. 11624 (2012).
[65] *Id.*
[66] Bond 2013, *supra* note 53 at 5388.
[67] *Id.*
[68] *Id.* at 5504. Although Bond et al. did not expressly include brown carbon, the method used to estimate black carbon emissions likely included brown carbon as a portion of the mass, such that brown carbon effects would be implicitly included. Bond et al. also considered cloud indirect effects in estimating total black carbon forcing.
[69] M.Z. Jacobson, *Effects of biomass burning on climate, accounting for heat and moisture fluxes, black and brown carbon, and cloud absorption effects*, 119 J. GEOPHYS. RES. 8980 (2014).
[70] *Id.* at 8984.

comparable to wildfire emissions. Nonetheless, the authors concluded that the uncertainties in effects and parameters were so large that it was not clear on a global scale whether the effects were positive (warming) or negative (cooling).[71] Furthermore, the authors pointed out that estimates of effects were highly dependent on background pollution levels for a given region.[72]

Taken together, it is clear that co-emitted aerosols can drastically alter the climate impacts of wildfire black carbon. The science is evolving rapidly, but at this point the uncertainties are too large to make any concrete predictions of overall climate impact. Given these uncertainties, ARB's proposed black carbon mitigation strategies lack scientific support and may be counterproductive to climate goals.

II. Comments on Draft EA

The Draft EA fails to comply with the California Environmental Quality Act ("CEQA"), Public Resources Code § 21000 et seq., and the CEQA Guidelines, title 14, California Administrative Code, § 15000 et seq., particularly with respect to its discussion of environmental impacts associated with efforts to reduce wildfire-related black carbon emissions. ARB cannot lawfully approve the strategy based on this EA.

The legal standards governing preparation of the Draft EA are clear. The "portion" of ARB's "regulatory program . . . which involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans to be used in the regulatory program for the protection and enhancement of ambient air quality in California" is a "certified regulatory program" for CEQA purposes. CEQA Guidelines § 15251(d); see title 17, Cal. Code Regs., §§ 60005-60007. Although certified regulatory programs are exempt from certain requirements generally applicable to environmental impact reports under CEQA, the core policy goals and substantive standards of CEQA still apply. *Sierra Club v. Bd. of Forestry*, 7 Cal. 4th 1215, 1229-30 (1994); *POET, LLC v. State Air Res. Bd.*, 218 Cal. App. 4th 681, 714 (2013). The exemption for certified regulatory programs is thus construed narrowly and according to the strict language of the statute. *See Joy Rd. Area Forest & Watershed Assn. v. Cal. Dept. of Forestry & Fire Prot.*, 142 Cal. App. 4th 656, 668 (2006).

Accordingly, ARB must prepare a document that includes among other things a description of the proposed project, "an assessment of anticipated significant long or short term adverse and beneficial environmental impacts associated with the proposed action and a succinct analysis of those impacts," and a discussion of "feasible mitigation measures and feasible alternatives to the proposed action which would substantially reduce any significant adverse impact identified." Title 17, Cal. Code Regs., § 60005(b); *accord Ebbetts Pass Forest Watch v Dept. of Forestry & Fire Prot.* (2008) 43 Cal. 4th 936, 943; Pub. Res. Code § 21080.5(d)(3). In

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[71] J.K. Kodros et al., *Uncertainties in global aerosols and climate effects due to biofuel emissions*, 15 ATMOS. CHEM. PHYS. 8577, 8592 (2015).
[72] *Id.*

keeping with CEQA's substantive requirements, ARB may not approve the Strategy if there are feasible mitigation measures or alternatives available that would lessen or avoid its significant environmental effects. *See* Pub. Res. Code §§ 21002, 21002.1(b), 21081; title 17, Cal. Code Regs., § 60006. If ARB elects to proceed with the Strategy despite significant environmental impacts, it must adopt formal findings that specific considerations render infeasible mitigation measures and alternatives to reduce or avoid those impacts, and must further find that specific benefits of the project outweigh its significant environmental effects. Pub. Res. Code § 21081(a)(3), (b).

"Just as for EIRs, environmental documents prepared by certified programs must use scientific and other empirical evidence to support their conclusions." Kostka & Zischke, Practice Under the California Environmental Quality Act § 21.17 (CEB 2016 supp.). ARB also must provide written responses to substantive comments on the Draft EA. Title 17, Cal. Code Regs., § 60007; *Ebbetts Pass Forest Watch*, 43 Cal. 4th at 943.

A. The Draft EA Fails to Properly Disclose, Analyze, Assess the Significance of, and Propose Mitigation for Potentially Significant Environmental Effects of Measures to Reduce Black Carbon Emissions from Forests.

The Strategy's approach to wildfire-related black carbon emissions is predicated on the assertion that "[r]educing wildfire risk requires active management," which "starts with thinning overstocked forests, removing dead and dying trees, and altering stand characteristics." Strategy at 51. These activities produce "a large amount of woody biomass," which the Strategy proposes should be used as fuel or feedstock "to generate clean energy, fuels, or other products." Strategy at 52.

To achieve its goals, the Strategy recommends actions that will increase the amount of forest thinning. Strategy at 53 (recognizing "clear need to identify sustainable funding streams to support" treatment of 500,000 acres per year of state and private timberland), 54 (identifying several strategies to "Increase Rate of Fuel Reduction"), 55 (acknowledging that "increased volumes" of woody material "will come from improved forest management practices" and recommending further investment in bioenergy and biofuels facilities that could use this material). As shown below, however, the Draft EA fails to adequately disclose, analyze, assess the significance of, and propose mitigation for the potentially significant environmental effects of these actions.

1. The Draft EA Fails to Disclose, Analyze, Assess the Significance of, and Propose Mitigation for Greenhouse Gas Emissions Caused by the Strategy.

The Draft EA's discussion of greenhouse gas impacts from implementation of foreseeable forest-related black carbon reduction measures consists of just a few sentences. First, the Draft EA acknowledges that "[r]easonably foreseeable compliance responses" include "a substantial increase in forest management practices within State and national forests," specifically including "forest and undergrowth thinning, harvesting, or clearance." Draft EA at 4-74. Second, the EA acknowledges that "[t]his may result in . . . the development and operation of new (or expansion of existing) wood product processing and biomass facilities throughout the State." Draft EA at 4-74. Third, after briefly reiterating some of the climatic effects of black carbon—but without any accompanying analysis—the Draft EA concludes that "[i]mplementation of the black carbon reduction measures would reduce emissions associated with . . . wildfires, thereby reducing the climate pollutant emissions from these sources. Thus this impact would be **beneficial**." Draft EA at 4-75 (emphasis in original).

As shown below, this abbreviated, conclusory discussion fails to satisfy CEQA's fundamental requirements in a variety of ways.

a. "Fuels Reduction" Activities Cause Greenhouse Gas Emissions.

The main purpose of "fuels reduction" to reduce wildfire risk and severity is to remove wood from the forest. Wood contains a great deal of carbon. Harvesting and processing of wood products result in substantial CO_2 emissions.[73] Several studies have demonstrated that thinning forests and burning the resulting materials for bioenergy can result in a loss of forest carbon stocks and a transfer of carbon to the atmosphere lasting many years. Because it is impossible to know in advance that wildfire will occur in a thinned stand, thinning operations may remove carbon that never would have been released in a wildfire; one recent study concluded, for this and other reasons, that thinning operations tend to remove about three times as much carbon from the forest as would be avoided in wildfire emissions.[74] Another report from Oregon found that thinning operations resulted in a net loss of forest carbon stocks for up to 50 years.[75] Another published study found that even light-touch thinning operations in several Oregon and California forest ecosystems incurred carbon debts lasting longer than 20 years.[76] Other recent studies have shown that intensive harvest of logging residues that otherwise would be left to decompose on

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[73] Mark E. Harmon, et al., *Modeling Carbon Stores in Oregon and Washington Forest Products: 1900-1992*, 33 CLIMATIC CHANGE 521, 546 (1996) (concluding that 40-60% of carbon in harvested wood is "lost to the atmosphere . . . within a few years of harvest" during wood products manufacturing process).

[74] John L. Campbell, et al., *Can fuel-reduction treatments really increase forest carbon storage in the western US by reducing future fire emissions?* FRONT. ECOL. ENV'T (2011), doi:10.1890/110057.

[75] Joshua Clark, et al., *Impacts of Thinning on Carbon Stores in the PNW: A Plot Level Analysis*, Final Report (Ore. State Univ. College of Forestry May 25, 2011).

[76] Tara Hudiburg, et al., *Regional carbon dioxide implications of forest bioenergy production*, 1 NATURE CLIMATE CHANGE 419 (2011), doi:10.1038/NCLIMATE1264.

site can deplete soil nutrients and retard forest regrowth as well as reduce soil carbon sequestration.[77]

Combustion of wood for energy instantaneously releases virtually all of the carbon in the wood to the atmosphere as CO_2. Burning wood for energy is typically less efficient, and thus far more carbon-intensive per unit of energy produced, than burning fossil fuels. Measured at the stack, biomass combustion produces significantly more CO_2 per megawatt-hour than fossil fuel combustion; a large biomass-fueled boiler may have an emissions rate far in excess of 3,000 lbs CO_2 per MWh.[78] Smaller-scale facilities using gasification technology are similarly carbon-intensive; the Cabin Creek bioenergy project recently approved by Placer County would have an emissions rate of more than 3,300 lbs CO_2/MWh.[79] By way of comparison, California's 2012 baseline emissions rate from the electric power sector was 954 lbs CO_2 per MWh.[80] As one recent scientific article noted, "[t]he fact that combustion of biomass generally generates more CO_2 emissions to produce a unit of energy than the combustion of fossil fuels increases the difficulty of achieving the goal of reducing GHG emissions by using woody biomass in the short

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[77] David L. Achat, et al., *Forest soil carbon is threatened by intensive biomass harvesting*, SCIENTIFIC REPORTS 5:15991 (2015), doi:10.1038/srep15991; D.L. Achat, et al., *Quantifying consequences of removing harvesting residues on forest soils and tree growth – A meta-analysis*, 348 FOREST ECOLOGY & MGMT. 124 (2015).

[78] The Central Power and Lime facility in Florida, for example, is a former coal-fired facility recently permitted to convert to a 70-80 MW biomass-fueled power plant. According to permit application materials, the converted facility would consume the equivalent of 11,381,200 MMBtu of wood fuel per year. *See* Golder Assoc., Air Construction Permit Application: Florida Crushed Stone Company Brooksville South Cement Plant's Steam Electric Generating Plant, Hernando County Table 4-1 (Sept. 2011). Using the default emissions factor of 93.8 kg/MMBtu CO_2 found in 40 C.F.R. Part 98, and conservatively assuming both 8,760 hours per year of operation and electrical output at the maximum 80 MW nameplate capacity, the facility would produce about 3,350 lbs/MWh CO_2. If the plant were to produce only 70 MW of electricity, the CO_2 emissions rate would exceed 3,800 lbs/MWh. If such a facility were dispatched to replace one MWh of fossil-fuel fired generation with one MWh of biomass generation, the facility's elevated emissions rate would also result in proportionately higher emissions on a mass basis.

[79] Ascent Environmental, Cabin Creek Biomass Facility Project Draft Environmental Impact Report, App. D (July 27, 2012) (describing 2 MW gasification plant with estimated combustion emissions of 26,526 tonnes CO_2e/yr and generating 17,520 MWh/yr of electricity, resulting in an emissions rate of 3,338 lbs CO2e/MWh).

[80] See Energy and Environment Daily, Clean Power Plan Hub, at http://www.eenews.net/interactive/clean_power_plan/states/california (visited May 18, 2016).

term."[81] Put more directly, replacing California grid electricity with biomass electricity likely more than *triples* smokestack CO_2 emissions.

Biomass and fossil CO_2 are indistinguishable in terms of their atmospheric forcing effects.[82] Claims about the purported climate benefits of biomass energy thus turn entirely on "net" carbon cycle effects, particularly the possibility that new growth will resequester carbon emitted from combustion, and/or the possibility that biomass combustion might "avoid" emissions that would otherwise occur. But even if these net carbon cycle effects are taken into account, emissions from biomass power plants can increase atmospheric CO_2 concentrations for decades to centuries depending on feedstocks, biomass harvest practices, and other factors. Multiple studies have shown that it can take a very long time to discharge the "carbon debt" associated with bioenergy production, even where fossil fuel displacement is assumed, and even where "waste" materials like timber harvest residuals are used for fuel.[83] One study, using realistic assumptions about initially increased and subsequently repeated bioenergy harvests of woody biomass, concluded that the resulting atmospheric emissions increase may even be permanent.[84]

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[81] David Neil Bird, et al., *Zero, one, or in between: evaluation of alternative national and entity-level accounting for bioenergy*, 4 GLOBAL CHANGE BIOLOGY BIOENERGY 576, 584 (2012), doi:10.1111/j.1757-1707.2011.01137.x.
[82] U.S. EPA Science Advisory Board, *Science Advisory Board Review of EPA's Accounting Framework for Biogenic CO_2 Emissions from Stationary Sources* 7 (Sept. 28, 2012) (hereafter "SAB Panel Report"); *see also Center for Biological Diversity, et al. v. EPA*, 722 F.3d 401, 406 (D.C. Cir. 2013) ("In layman's terms, the atmosphere makes no distinction between carbon dioxide emitted by biogenic and fossil-fuel sources").
[83] *See, e.g.*, Stephen R. Mitchell, et al., *Carbon Debt and Carbon Sequestration Parity in Forest Bioenergy Production*, GLOBAL CHANGE BIOLOGY BIOENERGY (2012) ("Mitchell 2012"), doi: 10.1111/j.1757-1707.2012.01173.x (attached); Ernst-Detlef Schulze, et al., *Large-scale Bioenergy from Additional Harvest of Forest Biomass is Neither Sustainable nor Greenhouse Gas Neutral*, GLOBAL CHANGE BIOLOGY BIOENERGY (2012), doi: 10.1111/j.1757-1707.2012.01169.x at 1-2 (attached); Jon McKechnie, et al., *Forest Bioenergy or Forest Carbon? Assessing Trade-Offs in Greenhouse Gas Mitigation with Wood-Based Fuels*, 45 ENVIRON. SCI. TECHNOL. 789 (2011) (attached); Anna Repo, et al., *Indirect Carbon Dioxide Emissions from Producing Bioenergy from Forest Harvest Residues*, GLOBAL CHANGE BIOLOGY BIOENERGY (2010) ("Repo 2010"), doi: 10.1111/j.1757-1707.2010.01065.x (attached); John Gunn, et al., Manomet Center for Conservation Sciences, Massachusetts Biomass Sustainability and Carbon Policy Study (2010), *available at* https://www.manomet.org/sites/manomet.org/files/Manomet_Biomass_Report_Full_LoRez.pdf (visited May 24, 2016).
[84] Bjart Holtsmark, *The Outcome Is in the Assumptions: Analyzing the Effects on Atmospheric CO_2 Levels of Increased Use of Bioenergy From Forest Biomass*, GLOBAL CHANGE BIOLOGY BIOENERGY (2012), doi: 10.1111/gcbb.12015.

It has been argued that if logging residues otherwise would be burned in the open, using those same materials for bioenergy might result in a very short carbon payback period. However, unlike combustion in a bioenergy facility, broadcast and pile burning of logging slash does not tend to consume all of the material; a significant portion may remain uncombusted on site. According to Forest Service research, fuel consumption in slash piles can range as low as 75%.[85] Combustion factors for broadcast understory burning of coarse woody debris can be as low as 60%.[86] Moreover, open burning of slash is not a universal practice, nor is it universally permissible; rather, it depends on local conditions, including weather and relevant air quality regulations.[87]

ARB thus cannot assume that biomass CO_2 emissions have no effect on the climate. As EPA's Science Advisory Board panel on biogenic CO_2 emissions concluded, biomass cannot be considered a priori "carbon neutral."[88] Rather, a full and scrupulously accurate life-cycle analysis is essential to understanding the atmospheric implications of burning biomass for energy.[89] In particular, biomass emissions must be compared with emissions that would otherwise occur if the materials were not used for bioenergy.[90] Such a comparison requires careful attention not only to the quantity of emissions, but also to the timeframe on which the emissions occur; bioenergy emissions occur almost instantaneously, while future resequestration or avoided decomposition may take years, decades, or even centuries to achieve atmospheric parity.

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[85] Colin C. Hardy, *Guidelines for Estimating Volume, Biomass, and Smoke Production for Piled Slash*, U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Research Station, Gen. Tech. Rep. PNW-GTR-364 (1996).

[86] *See* Eric E. Knapp et al., *Fuel Reduction and Coarse Woody Debris Dynamics with Early Season and Late Season Prescribed Fire in a Sierra Nevada Mixed Conifer Forest*, 208 FOREST ECOLOGY & MGMT. 383 (2005).

[87] *See, e.g.*, North Coast Unified Air Quality Management District (California), Regulation II , *available at* http://www.ncuaqmd.org/index.php?page=rules.regulations; Placer County (California) Air Pollution Control District, Regulation 3, *available at* http://www.placer.ca.gov/departments/air/rules.

[88] SAB Panel Report, *supra* note 82 at 18.

[89] *See id.*; *see also generally* Timothy D. Searchinger, et al., *Fixing a Critical Climate Accounting Error*, 326 SCIENCE 527 (2009) (attached); see also Mitchell 2012, *supra* note 83 at 9 (concluding that management of forests for maximum carbon sequestration provides straightforward and predictable benefits, while managing forests for bioenergy production requires careful consideration to avoid a net release of carbon to the atmosphere).

[90] *See* SAB Panel Report, *supra* note 82 at 18; *see also* Michael T. Ter-Mikaelian, et al., *The Burning Question: Does Forest Bioenergy Reduce Carbon Emissions? A Review of Common Misconceptions about Forest Carbon Accounting*, 113 J. FORESTRY 57 (2015).

b. The Draft EA's Failure to Disclose CO_2 Emissions from Compliance Activities Violates CEQA as a Matter of Law.

The Draft EA's conclusion, in the absence of any analysis, that the Strategy will have a beneficial effect on the climate falls short of CEQA's requirements in no fewer than five different ways.

First, the Draft EA completely fails to disclose, analyze, or assess the significance of CO_2 emissions associated with a "substantial increase" in forest "thinning, harvesting, or clearance" and a concomitant expansion of biomass energy generation and/or biofuels production. As discussed above, these activities have been shown to result in an immediate and long-lasting transfer of carbon from forest stocks to the atmosphere (as CO_2). The Draft EA's complete failure to address these effects renders the document inadequate under CEQA as a matter of law. *See, e.g.*, *Sierra Club v. Bd. of Forestry*, 7 Cal. 4th at 1236 (complete absence of information made meaningful assessment of potentially significant impacts and development of mitigation measures impossible; "[i]n these circumstances prejudice is presumed"); *Bakersfield Citizens for Local Control v. City of Bakersfield*, 124 Cal. App. 4th 1184, 1198 (2004). Nor may ARB lawfully focus solely on the claimed short-term benefits of the project to the exclusion of its detrimental long-term consequences. *See* Pub. Res. Code § 21083(b)(1) (requiring mandatory finding of significance if project "has the potential . . . to achieve short-term, to the disadvantage of long-term, environmental goals"). Indeed, even CO_2 exerts its greatest warming effect over the short term, although the warming effect also persists over the long term.[91] To the extent that ARB's Strategy seeks to reduce the short-term risk of climate change (see Strategy at 15-16), it must address the short-term impact of measures that increase CO_2 emissions.

Second, the Strategy improperly "segments" or "piecemeals" the project under consideration by focusing solely on black carbon reductions to the exclusion of overall forest carbon effects. CEQA defines a "project" as the "whole of an action" that could result in either a direct or reasonably foreseeable indirect change in the physical environment. CEQA Guidelines § 15378(a). Courts give the term "project" a "broad interpretation and application to maximize protection of the environment." *Tuolumne Cty. Citizens for Responsible Growth, Inc. v. City of Sonora*, 155 Cal. App. 4th 1214, 1223 (2007). "[T]he requirements of CEQA cannot be avoided by chopping up proposed projects into bite-size pieces which, when taken individually, may have no significant adverse effect on the environment." *Id.* (internal quotations and citations omitted); *Bozung v. LAFCO*, 13 Cal. 3d 263, 283 (1975).

Here, the Strategy attempts to "piecemeal" the overall project by stating that "forest carbon storage" is "beyond the scope of this Proposed Strategy" and will be dealt with separately

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[91] Katharine L. Ricke and Ken Caldeira, *Maximum Warming Occurs About One Decade after a Carbon Dioxide Emission*, 9 ENVIRON. RES. LETT. 124002 (2014), doi:10.1088/1748-9326/9/12/124002.

in ARB's forthcoming Scoping Plan and Forest Carbon Plan. Strategy at 51; *see also id.* at 57. As previously discussed, however, foreseeable compliance actions undertaken pursuant to *this* Strategy will have a considerable impact on both "forest carbon storage" and atmospheric CO_2 concentrations. *Id.* at 52 ("thinning produces a large amount of woody biomass"); 53 (describing Forest Service goal of treating 500,000 acres of federal lands and "matching goal" of "treat[ing] 500,000 acres per year of non-federal forestlands"); 54 (recommending "[i]ncreased rate of fuel reduction" and stating that "[w]herever possible, material should be thinned and put to beneficial use, which in turn, can help to finance fuel reduction activities"). Reflecting this impermissible "piecemealing" of the overall project, the Draft EA focuses solely on purported reductions in black carbon emissions from wildfire without assessing the greenhouse gas emissions caused by the activities necessary to achieve those purported reductions. CEQA does not permit ARB to chop up the overall project into "forest carbon" and "black carbon" segments so as to ignore the adverse "forest carbon" impacts of the Strategy while discussing only its purported (and unsubstantiated) benefits. The result is a misleading and uninformative document that fails to comply with CEQA's requirements.

<u>Third</u>, the Draft EA improperly attempts to balance the Strategy's adverse climate impacts against its claimed climate benefits. "CEQA does not authorize an agency to proceed with a project that will have significant, unmitigated effects on the environment, based simply on a weighing of those effects against the project's benefits, unless the measures necessary to mitigate those effects are truly infeasible." *City of Marina v. Bd. of Trs. of Cal. State Univ.*, 39 Cal. 4th 341, 368-69 (2006). The Draft EA acknowledges that construction-related greenhouse gas emissions will likely occur pursuant to the Strategy due to increased forest management activities and development of new wood product manufacturing and biomass facilities. Draft EA at 4-73- to 4-74. However, "[w]hen these short-term construction-related GHG emissions associated with construction activities are considered in relation to the overall long-term operational GHG benefits discussed below, they are not considered substantial. Therefore, short-term construction-related impacts to GHG associated with black carbon reduction measures . . . are less-than-significant." *Id.* at 4-74. The Draft EA's attempt to dismiss the Strategy's adverse effects by weighing them against its purported benefits is legally improper absent full and formal compliance with Public Resources Code section 21081.

<u>Fourth</u>, the Draft EA fails to identify any clear and consistent baseline against which the Strategy's greenhouse gas impacts can be evaluated. "Before the impacts of a project can be assessed and mitigation measures considered, an EIR must describe the existing environment. It is only against this baseline that any significant environmental effects can be determined." *Cty. of Amador v. El Dorado Cty. Water Agency*, 76 Cal. App. 4th 931, 952 (1999); *see also* CEQA Guidelines § 15125(a). "[W]ithout such a description, analysis of impacts, mitigation measures and project alternatives becomes impossible." *Cty. of Amador*, 76 Cal. App. 4th at 953; *see also Save Our Peninsula Comm. v. Monterey Cty. Bd. of Supervisors*, 87 Cal. App. 4th 99, 119 (2001) ("Without a determination and description of the existing physical conditions on the property at the start of the environmental review process, the EIR cannot provide a meaningful assessment

of the environmental impacts of the proposed project.") An agency's use of a legally inadequate baseline renders an environmental document inadequate as a matter of law. *See Communities for a Better Env't v. S. Coast Air Quality Mgmt. Dist.*, 48 Cal. 4th 310, 319, 322 (2010).

Attachment A to the Draft EA contains a general discussion of the environmental and regulatory setting for the Strategy, but it does not contain any of the information necessary to evaluate the Strategy's greenhouse gas impacts. For example, nothing in Attachment A estimates current levels of forest management, forest carbon removals, or associated emissions. Accordingly, the Draft EA cannot meaningfully evaluate the foreseeable increase in forest management and bioenergy or biofuels production envisioned by the Strategy. "CEQA requires that the preparers of the EIR conduct the investigation and obtain documentation to support a determination of preexisting conditions. [Citation.] This is a crucial function of the EIR." *Save Our Peninsula Comm.*, 87 Cal. App. 4th at 122. The Draft EA fails to fulfill this function.

Fifth, the Draft EA fails to address how efforts to reduce forest-related black carbon emissions square (or conflict) with California's overall climate goals. Increased removals of carbon from forests and increased CO_2 emissions over the next 10-15 years (see Strategy at 1) will likely conflict with science-driven greenhouse gas reduction goals established in the 2008 Scoping Plan, the 2014 Scoping Plan update, Executive Order B-30-15, and Executive Order S-3-05.[92] As discussed in detail above, use of forest materials for bioenergy generation can increase atmospheric CO_2 concentrations for a period of decades to centuries depending on the feedstocks involved. The Draft EA fails to address whether foreseeable increases in CO_2 emissions as a result of the Strategy over the next several decades conflict with science and state policy requiring CO_2 emissions to decrease sharply over that same period. *See Center for Biological Diversity v. California Dept. of Fish & Wildlife*, 62 Cal. 4th 204, 223 & n.6.

As a result of these failures and omissions, the Draft EA fails as an informational document. ARB cannot approve the Strategy on the basis of this Draft EA.

c. The Draft EA's Conclusion that the Strategy's Climate Effect Will Be "Beneficial" is Unsupported by Substantial Evidence.

In addition to failing to comply with CEQA's procedural mandates as described above, the Draft EA lacks substantial evidence to support its conclusion that the Strategy's long-term operational climate impacts with respect to forest-related black carbon reduction will be

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[92] *See* CAL. AIR RES. BD., FIRST UPDATE TO THE CLIMATE CHANGE SCOPING PLAN: BUILDING ON THE FRAMEWORK 33-34 (2014), *available at* http://www.arb.ca.gov/cc/scopingplan/document/updatedscopingplan2013.htm (visited May 20, 2016); CAL. AIR RES. BD., CLIMATE CHANGE SCOPING PLAN: A FRAMEWORK FOR CHANGE 117-21 (December 2008), *available at* http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm (visited May 20, 2016).

beneficial. CEQA requires that the Draft EA support its conclusions with substantial evidence. Kostka & Zischke, Practice Under the California Environmental Quality Act § 21.17 (CEB 2016 supp.). It is a bedrock principle of administrative law in California that agencies must articulate findings that "bridge the analytic gap between the raw evidence and ultimate decision or order" so reviewing courts can trace "the analytic route the agency traveled from evidence to action." *Topanga Assn. for a Scenic Community v. County of Los Angeles*, 11 Cal. 3d 506, 515 (1974). A CEQA document "must contain facts and analysis, not just the bare conclusions of a public agency. An agency's opinion concerning matters within its expertise is of obvious benefit, but the public and decision-makers, for whom the EIR is prepared, should also have before them the basis for that opinion so as to enable them to make an independent, reasoned judgment." *Santiago Cnty. Water Dist. v. Cnty. of Orange*, 118 Cal. App. 3d 818, 831 (1981).

Here, the Draft EA concludes that the climate impact of black carbon reduction measures will be "beneficial" (Draft EA at 4-75), but it fails to articulate any of the steps in the "analytic route" taken to reach this conclusion, and fails to identify any evidence to support these analytic steps. Just by way of example, the Draft EA makes no effort to evaluate how much forest carbon would be removed during thinning operations, no effort to identify the portion of that carbon that would be emitted to the atmosphere as CO_2, no effort to quantify CO_2 and other GHG emissions associated with harvest, processing, and conversion and/or direct combustion of wood for energy, gas, or liquid fuels, no effort to quantify CO_2, methane, and black carbon emissions from prescribed fire, and no effort to evaluate or quantify the black carbon emission reductions anticipated to result from these operations. In short, because the Draft EA fails to offer any estimate of either the black carbon emissions purportedly avoided by the Strategy or the CO_2 and other emissions that will be caused by the Strategy, the Draft EA lacks any evidence to support its conclusion that the overall climate impact will be "beneficial." The Draft EA pretends that only one side of the carbon ledger exists, but ultimately fails to count either side.

These failures are especially glaring in light of considerable evidence in the record that—as discussed in detail in Part I.C, *supra*—black carbon emissions from wildfire are highly uncertain. Appendix A to the Strategy concedes that there is tremendous uncertainty in how much black carbon is emitted by wildfires given natural variability in fire conditions. Indeed, the Appendix openly admits that "adequate speciation profiles to account for various fire conditions are not available" and cautions that inventory figures "should be understood as an order-of-magnitude estimate of emissions for a typical year." Strategy App. A at 4. This calls into question the Strategy's unqualified assertion that "[a]n average wildfire season contributes two-thirds of current black carbon emissions in California" (Strategy at 6); that estimate could be literally ten times too high.

The Strategy and the Draft EA similarly concede that anticipated reductions in wildfire emissions are impossible to quantify. The Strategy acknowledges that quantitative emissions reductions targets for wildfire cannot be established because wildfire cannot be "fully controlled." Strategy at 49. Moreover, the air quality section of the Draft EA admits that possible emissions reductions from reducing "the potential for major wildfires" are "highly uncertain" and may not even be "measurable." Draft EA at 4-23. ARB cannot rationally conclude that the Strategy's climate impacts are both "beneficial" and not "measurable."

A comprehensive assessment of black carbon climatic effects cited in the Strategy further reveals that wildfire emissions cannot be determined by estimating fuel loads alone; "[c]ombustion completeness strongly depends on the weather conditions because bulk fuel, which constitutes a large fraction of fuel mass in wooded ecosystems, burns only when the fuel is sufficiently dry and when it is windy."[93] Moreover, as discussed above, that same assessment concluded that although reducing anthropogenic sources of black carbon (like diesel and residential solid fuel burning) would have a cooling effect on the climate, it is not at all clear that reducing open burning emissions would have the same effect because "the impact of *all* emissions from black-carbon-rich sources [i.e., including open burning emissions] is slightly negative (-0.06 W m^{-2}) with a large uncertainty range (-1.45 to $+1.29$ W m^{-2})."[94] "Therefore, uniform elimination of all emissions from black-carbon-rich sources could lead to no change in climate warming, and sources and mitigation measures chosen to reduce positive climate forcing should be carefully identified. The uncertainty in the response to mitigation is larger when more aerosol species are co-emitted."[95]

Furthermore, the Draft EA fails to provide substantial evidence to support its implicit assertion that forest management activities will be effective in reducing wildfire emissions. The body of studies on fuel reduction treatments indicates that the potential for fuel treatments to reduce wildfire occurrence is highly uncertain. [96] Research indicates that larger fires are driven by hot, dry, windy weather conditions, with forest fuel conditions playing a relatively unimportant role in determining fire behavior and intensity.[97]

In short, the Draft EA identifies no substantial evidence in support of its conclusion that the climate impact of purported black carbon reductions from wildfire is even measurable with any degree of certainty, much less "beneficial." Approval of the Strategy on the basis of this Draft EA would therefore represent an abuse of discretion.

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[93] Bond 2013, *supra* note 53 at 5418-19 (cited in Strategy at 34-35 & n.70).
[94] Bond 2013, *supra* note 53 at 5388; *id.* at 5377 (giving same estimate and 90% uncertainty range for total forcing "when open burning emissions are included").
[95] Bond 2013, *supra* note 53 at 5388.
[96] E.D. Reinhardt, et al., *Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States*, 256 FOREST ECOLOGY & MGMT. 1997 (2008).
[97] Id.; see also J.M. Lydersen, M.P. North, and B.M. Collins, *Severity of an uncharacteristically large wildfire, the Rim Fire, in forests with relatively restored fire regimes*, 328 FOREST ECOLOGY & MGMT. 326 (2014); T. Schoennagel, et al., *The interaction of fire, fuels, and climate across Rocky Mountain Forests*, 54 BIOSCIENCE 661 (2004); E.A. Johnson, *Towards a sounder fire ecology*, 1 FRONTIERS IN ECOLOGY & THE ENVT. 271 (2003).

2. The Draft EA Fails to Disclose, Analyze, Assess the Significance of, and Propose Mitigation for Impacts to Biological Resources Caused by the Strategy.

The Draft EA's discussion of impacts to biological resources from the implementation of the forest-related black carbon strategy acknowledges that short-term construction-related effects and long-term operational effects resulting from the Strategy will have a range of "potentially significant and unavoidable" impacts on biological resources. While the EA discloses some impacts that will stem from prescribed fire and mechanical thinning, the EA's analysis and proposed mitigation measures are cursory, incomplete, and inadequate. Specifically, the EA completely fails to disclose, analyze, and assess the significance of several key impacts that would result from the Strategy; acknowledges but fails to analyze wide-ranging impacts to special-status species, sensitive habitat areas, and migratory corridors; is inconsistent with the best-available science; fails to identify any clear and consistent baseline against which the Strategy's impacts to biological resources can be evaluated; and improperly disavows responsibility for mitigating the Strategy's significant impacts to biological resources. Due to all of these failures and omissions, the Draft EA's discussion of impacts to biological resources fails to satisfy CEQA's fundamental requirements.

First, the Draft EA completely fails to disclose, analyze, or assess the significance of impacts resulting from the Strategy's efforts to reduce wildfire activity in California's forest ecosystems, including high-severity fire activity. As discussed in detail above (Part I.B, *supra*), overwhelming scientific evidence demonstrates that California forests are adapted to mixed-severity fire regimes, including significant amounts of high-severity fire that create critical habitat diversity and are necessary for the persistence of numerous animal and plant species. The Strategy's fundamental goal to reduce wildfire risk threatens California forest ecosystems which are already experiencing a significant fire deficit in comparison to historical conditions. The Strategy must acknowledge and analyze the findings of numerous studies, detailed above, that demonstrate that reduction in wildfire activity and fuel reduction activities threaten the health, resilience, and diversity of California's forest ecosystems. The Draft EA's complete failure to address these impacts renders the document inadequate under CEQA.

Second, although the Draft EA acknowledges many of the significant impacts that would result from mechanical thinning and prescribed fire, the Draft EA fails to disclose, analyze, and mitigate other key impacts that would result from "the substantial increase in forest management practices within State and national forests," including increases in access roads, which are well-documented to have detrimental effects on species and ecosystems, and the effects of debris storage site development. Moreover, the Draft EA does not adequately address the impacts from "the use of heavy forest harvesting, processing, and transport equipment" resulting from the development of wood product processing and biomass facilities. Nor does the Draft EA adequately acknowledge the detrimental effects on wildlife species and habitat of removing dead trees (whether killed by fire, drought, or beetles) from the forest.

Third, the Draft EA briefly acknowledges that the forest-related black carbon strategy will result in wide-ranging impacts to special-status species, sensitive habitat areas, and migratory corridors, and conflict with conservation plans: "harmful impacts could include modifications to existing habitat; including removal, degradation, and fragmentation of riparian systems, wetlands, or other sensitive natural wildlife habitat and plan communities; interference with wildlife movement or wildlife nursery sites; loss of special-status species; and/or conflicts with the provisions of adopted habitat conservation plans, natural community conservation plans, or other conservation plans or policies to protect natural resources." Draft EA at 5-7. However, the Draft EA completely fails to analyze these impacts. To serve as an adequate informational document, the EA must analyze how the Strategy will impact the conservation and management of California's forest-dependent special-status species, including the state and/or federally listed northern spotted owl, Sierra Nevada red fox, marbled murrelet, American wolverine, Pacific fisher (state candidate for listing), and the fire-dependent black-backed woodpecker[98] (state candidate for listing and under consideration for federal listing). Riparian and aquatic special status species likely to be impacted by the Strategy include the Sierra Nevada yellow-legged frog, mountain yellow-legged frog, Siskiyou Mountains salamander, and numerous listed salmon and steelhead species. The EA must also analyze impacts to sensitive habitat areas, wildlife movement corridors, and consistency with conservation plans.

Fourth, the Draft EA's cursory analysis of the impacts that would result from mechanical thinning and prescribed fire under the Strategy makes numerous unsupported statements that are inconsistent with the best-available science. For example, the Draft EA asserts that historical forests were characterized by low to moderate intensity ground fire. Draft EA at 4-43. As detailed above, numerous scientific studies establish that California's mixed conifer and ponderosa pine forests are characterized by and adapted to mixed-severity fire, including a large proportion of high-severity fire that creates early seral forest characteristics and promotes forest biodiversity. The Draft EA also asserts that that lack of periodic fire in wild areas increases the risk of catastrophic fire (Draft EA at 4-44) without providing support for this claim. As detailed above, studies have consistently found that the most fire-suppressed forest areas in California that have missed the largest number of fire return intervals are not burning at higher fire severity. Additionally, numerous studies have confirmed that California forests are not burning at higher severity. It is a glaring deficiency that fundamental premises used to justify the forest-related black carbon strategy are scientifically unsupported and demonstrably incorrect.[99]

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[98] For example, thinning and post-fire clear-cutting are shown to have detrimental effects on the fire-dependent black-backed woodpecker by reducing post-fire habitat. *See* Odion, D.C. and C.T. Hanson, *Projecting Impacts of Fire Management on a Biodiversity Indicator in the Sierra Nevada and Cascades, USA: The Black-Backed Woodpecker*, 6 THE OPEN FOREST SCIENCE JOURNAL 14 (2013).

[99] The Draft EA's discussion of biological resources impacts from prescribed fire and mechanical thinning cites only another *draft* analysis—CAL FIRE's Vegetation Treatment

Fifth, the Draft EA fails to identify any clear and consistent baseline against which the Strategy's impacts to biological resources can be evaluated. Attachment A to the Draft EA contains a brief, general discussion of the environmental and regulatory setting for the Strategy, but it does not contain any of the information necessary to evaluate the Strategy's biological impacts.

B. The Draft EA Improperly Disavows Responsibility for Mitigation of the Strategy's Significant Environmental Impacts.

Throughout the Draft EA, ARB attempts to disclaim responsibility for mitigating the environmental impacts of foreseeable compliance measures, stating that other agencies will be responsible for permitting (and assessing and mitigating the impacts of) future activities related to the Strategy. These attempts to disclaim responsibility span the entire range of environmental impacts discussed in the Draft EA.

CEQA does not allow ARB to avoid its mitigation responsibilities in this manner. The Supreme Court has held that "[a]n EIR that incorrectly disclaims the power and duty to mitigate identified environmental effects based on erroneous legal assumptions is not sufficient as an informative document." *City of Marina*, 39 Cal. 4th at 356. "In mitigating the effects of its projects, a public agency has access to all of its discretionary powers . . . includ[ing] such actions as adopting changes to proposed projects, imposing conditions on their approval, adopting plans or ordinances to control a broad class of projects, and choosing alternative projects." *City of San Diego v. Bd. of Trs. of Cal. State Univ.*, 61 Cal. 4th 945, 959 (2015). Accordingly, ARB has discretion to modify the project itself in order to avoid or lessen its significant environmental effects, and must adopt such modifications if feasible.

Nor may ARB avoid its mitigation responsibilities by claiming that the Draft EA is merely "programmatic." CEQA expressly requires public agencies to adopt all feasible measures that would substantially lessen a project's significant effects. Pub. Res. Code §§ 21002, 21002.1, 21081. "Programmatic" CEQA documents are not exempt from this requirement. Indeed, identification of "program-wide mitigation" is particularly important "at an early time, when the agency has greater flexibility to deal with basic problems or cumulative impacts." CEQA Guidelines § 15168(b)(4). Now is the time—when the parameters of the Strategy are still under development—for identification of program-wide measures that can reduce or avoid the Strategy's significant environmental impacts. Mitigation at the individual project level may not be nearly as effective, and effective mitigation options may well be foreclosed at that point.

Finally, ARB may not avoid analysis of impacts or disavow mitigation responsibilities by simply declaring impacts "potentially significant and unavoidable." Again, these attempts to avoid analysis and mitigation pervade analysis of every environmental impact discussed in the

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Program Draft Environmental Impact Report—that is itself plagued by unsupported statements and inconsistent with the best-available science.

EA. Agencies are not permitted to "travel the legally impermissible easy road to CEQA compliance" in this manner. *Berkeley Keep Jets Over the Bay Com. v. Bd. of Port Cmrs.*, 91 Cal. App. 4th 1344, 1371 (2001). "Before one brings about a potentially significant and irreversible change to the environment, an EIR must be prepared that sufficiently explores the significant environmental effects created by the project. [An] EIR's approach of simply labeling [an] effect 'significant' without accompanying analysis of the project's impact . . . is inadequate to meet the environmental assessment requirements of CEQA." *Id.* Rather, to the extent ARB determines that impacts are significant, it must either adopt mitigation measures or alternatives to avoid those impacts or make specific findings as to why those mitigation measures or alternatives are infeasible. Pub. Res. Code § 21081(a)(3). Only then may ARB declare an impact "significant and unavoidable." Pub. Res. Code § 21081(b); *City of Marina*, 39 Cal. 4th at 368 ("A statement of overriding considerations is required, and offers a proper basis for approving a project despite the existence of unmitigated environmental effects, only when the measures necessary to mitigate or avoid those effects have properly been found to be infeasible"). The Draft EA fails to comply with these CEQA requirements.[100]

C. The Draft EA Fails to Analyze a Range of Reasonable Alternatives.

Under CEQA, a document of this type must consider a range of reasonable alternatives that would feasibly attain most of the objectives of the Strategy while avoiding or substantially lessening its significant impacts, and must compare the relative merits of these alternatives. CEQA Guidelines § 15126.6(a); *see Ebbetts Pass Forest Watch*, 43 Cal. 4th at 943 (functional equivalent document must "identify any alternatives that are less environmentally destructive"). The Draft EA, however, fails to consider any alternative formulations of the Strategy that could meet CEQA's standards.

Rather, it appears that ARB has formulated alternatives that can be easily dismissed rather than seriously assessed. Alternative 1, the "no project" alternative, appears to be inconsistent with legislative direction. Alternative 3, extending the cap-and-trade program to additional sectors and pollutants, would be inconsistent with AB 32, at least to the extent it attempted to cover black carbon (which is not among the "greenhouse gases" defined by the statute). *See* Health & Saf. Code § 38505(g).

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[100] A statement of overriding considerations would be difficult if not impossible to support on the present record in any event. As discussed in detail above, ample scientific evidence shows that the problem ARB is purportedly trying to address—black carbon emissions from wildfire—is both highly uncertain and a natural effect of wildfires that have occurred with varying frequency and intensity for centuries. ARB has not shown that it is even possible—much less desirable—to try and "geoengineer" SLCP reductions by attempting to alter a complex natural system. ARB has several options for reducing anthropogenic black carbon emissions that actually can be quantified and controlled. There is no indication that the Legislature intended for ARB to include geoengineering proposals among its efforts to reduce SLCPs.

Alternative 2, the "Reduced-Intensity Project Alternative," gestures in the right direction but ultimately fails to fulfill CEQA's requirements for serious consideration of feasible alternatives. The Draft EA does not explain why ARB chose to group together the particular measures that would not be pursued under Alternative 2 (replacement of residential wood-burning devices, increased forest thinning, incentives for dairy manure digestion, and regulation to divert organic materials from landfills). By lumping all of these measures together in a "reduced-intensity" alternative, the Draft EA precludes meaningful analysis of the feasibility of reducing or avoiding significant environmental impacts by forgoing any individual measure or combination of measures. Including forest herbicide treatments in Alternative 2 further skews the analysis; killing trees or shrubs with herbicides has no apparent rational connection to the wildfire reduction activities proposed in the Strategy, and might contribute to the accumulation of dead woody material in forests, which would be contrary to ARB's own stated goals. Alternative 2 is a straw man, not a meaningful alternative.

At the very least, ARB must consider an alternative that does not include increased forest thinning activities and additional incentives for construction of bioenergy and biofuels facilities as black carbon reduction measures. As discussed in detail throughout these comments, any black carbon reductions from these activities are highly uncertain at best, and meaningless or counterproductive at worst. Moreover, the concomitant adverse environmental impacts of pursuing these activities are likely substantial, although they have not been adequately disclosed or fully addressed in the Draft EA. Reductions from the other measures identified in Alternative 2, in contrast, are considerably more certain and are subject to quantified targets by which their effectiveness can be assessed.

ARB cannot reject such an alternative as infeasible on the bases identified in the Draft EA. The Draft EA claims that project Objective 3 "would generally not be fully satisfied" by forgoing increased forest thinning. Draft EA at 7-8. Objective 3, however, says nothing about "the forestry sector." Rather, Objective 3 states only that ARB should "[i]dentify existing and potential new control measures to reduce emissions of methane, black carbon, and F-gases, specifically HFCs." Draft EA at 7-3. Eliminating the uncertain, unquantifiable, expensive, and unsupported efforts to reduce black carbon from wildfires, a *natural* process, while focusing instead on additional methods of controlling *anthropogenic* sources of SLCPs that can be quantified and feasibly achieved, would fully satisfy this objective.

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III. Conclusion

The Center and CCLF recognize that steep and immediate reductions in short-lived climate pollutants are likely necessary to avoid adverse near-term impacts of climate change. As discussed above, the Center and CCLF largely support ARB's proposals to reduce emissions of these "superpollutants" from anthropogenic sources. The Strategy's proposals for reducing black carbon emissions from natural wildfire, however, are scientifically unsupported and should be abandoned. Finally, for the foregoing reasons, the Draft EA fails to comply with CEQA; ARB cannot approve the Strategy unless and until it prepares a legally adequate environmental document. Alternatively, the Center and CCLF strongly recommend that the forest-related black carbon element of the Strategy be removed so that ARB can focus on measurable, achievable reductions from the important anthropogenic sources of SLCPs identified in the Strategy.

Sincerely,

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Attachments: References Cited