

Carbon Cycle Institute

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California Air Resources Board
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Re: Comments on the December Discussion Draft of the 2030 Target Scoping Plan Update

On behalf of the **Carbon Cycle Institute**, we are writing to offer comments, suggestions, and amendments to the Discussion Draft of the 2030 Target Scoping Plan Update, with emphasis on agriculture and working lands. We will provide additional comments and thoughts in response to “Carbon Sequestration Modeling Methods and Initial Results for the Natural and Working Lands Sectors”, as that effort has direct import to the scope and content of this Scoping Plan Update.

The Carbon Cycle Institute’s mission is to stop and reverse climate change by advancing natural, science-verified solutions that remove atmospheric carbon while promoting environmental stewardship, social equity and economic sustainability. To that end, we support projects that promote climate-beneficial management practices on working lands throughout California, work to build the technical capacity of land managers and producers to plan and implement impactful projects that reduce GHGs and sequester carbon in the lands base, and are heavily engaged in gathering scientific data on the important role these practices can play in sequestering carbon from the atmosphere.

California’s working lands and rangelands naturally capture carbon from the atmosphere through photosynthesis and transfer it to the soil, where it provides important ecological services, including the enhancement of soil water holding capacity. Land managers can dramatically increase carbon storage in California’s soils by employing a number of practices recognized by the Natural Resources Conservation Service (NRCS) as climate beneficial, including compost application, riparian restoration, no-till farming, windbreaks, agroforestry and other practices. Along with increasing long-term carbon sequestration in soils and plant material, these practices also offer additional water, habitat, and economic viability benefits for farmers and working land managers.

We would like to see increased emphasis on the potential role of soils in helping the state meet its 2030 GHG reduction goal of 40 percent below 1990, in light of both the tremendous demand from producers to implement carbon-beneficial practices and the robust infrastructure and leadership at the regional and local level ready and able to move projects forward at scale. The State’s GHG and carbon reductions targets for 2030 and 2050 are extremely ambitious, which we applaud, but they are deeper than what has been accomplished to date. Without the natural and working lands sector, in general, and carbon sequestration and soils, specifically, it is difficult to see how the State will meet its 2030 and 2050 climate goals. As detailed below in our comments, the IPCC and leading climate experts agree that we must engage our soils in agricultural and working lands in a significant manner to address climate change, and we need to

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take significant steps now to scale our efforts in this arena if we want to reap the benefits in the 2030 and 2050 timeframe.

Summary of Comments

(ARB/Scoping Plan Update text, followed by CCI comments in *italics*)

Page 7. Preface

The State's 2050 goal to reduce greenhouse gas (GHG) emissions to 80 percent below 1990 levels is consistent with an Intergovernmental Panel on Climate Change analysis of the trajectory that would stabilize atmospheric GHG concentrations at 450 parts per million carbon dioxide equivalent and reduce the likelihood of catastrophic climate change. Continuing progress to this long-term goal requires California to maintain and build upon existing programs, scale up deployment of clean technology, and provide more low-carbon options to accelerate GHG emission reductions, especially after 2020.

- *450 ppm is NOT an acceptable long-term goal. Hansen et al call for significant net GHG **removals** beginning 2015: "We conclude that the world has already overshoot targets for atmospheric temperature and greenhouse gas amount required to maintain a safe long-term environment for humanity and assure the well-being of young people and future generations" (Hansen et al 2016). Given catastrophic climate change is already underway at 400+ppm CO₂, 450 ppm MUST NOT be accepted. Indeed, in terms of CO₂ equivalents, the atmosphere in 2015 contained 485 ppm CO₂e, of which 399 was CO₂, with the balance from other greenhouse gases (NOAA 2015). If climate is to be stabilized, we must achieve 350 ppm, requiring a 6% annual reduction in emissions AND extraction of 386 ppm from the atmosphere by 2100 (see Hansen et al 2016, figure 11)."*

Page 9. Executive Order B-30-15

*There is no timeline attached to any of the 5 pillars. Please add specific timelines for achieving these goals. Managing farm and rangelands, forests and wetlands so they can store carbon is not a "goal", as these systems are already able to store carbon; please specify a goal of **increasing** storage of significant quantities of additional carbon in the state's natural and working lands.*

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Short-lived climate pollutants, such as black carbon, fluorinated gases, and methane, are powerful climate forcers that have a dramatic and detrimental effect on air quality, public health, and climate change. These pollutants create a warming influence on the climate that is many times more potent than that of carbon dioxide.

- *We certainly support reductions in SLCP, but this statement is deceptive. While it is true these pollutants are more potent than CO₂ on a gram for gram basis, CO₂ accounts for 82-90% of effective Global temperature forcing (W/m²) (Hansen et al 2016, Table A1; NOAA 2015).*

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Moving forward, California's climate strategy will require contributions from all sectors of the

economy.

- *Please include the role of significantly enhanced terrestrial carbon sequestration in this paragraph, well beyond “land conservation.” (Hansen et al 2016),*

Page 14. Updated Climate Science Supports the Need for More Action

California is already feeling the effects of climate change, and projections show that these will continue and worsen over the coming centuries.

- *Please change this to read, “...over the coming decades.”*
- *We would encourage this section to include recent science and analysis from the IPCC (2014) and detailed by Hansen et al (2016) that we **must** reduce atmospheric carbon even as we reduce GHG emissions if we are to avoid the worst consequences of climate change.*

Page 20. Black Carbon (BC)

- *We strongly recommended separating prescribed fire BC from forest wildfire BC. Prescribed fire is a necessary and under-utilized tool in forest management, which can and should be used to manage forests to reduce wildfire emissions. These two sources of BC are –or should be- negatively correlated, such that a laudable goal of decreasing wildfire emissions should lead to a managed increase in prescribed fire emissions. It therefore seems important to track these emissions separately, both for monitoring purposes and to build the evidence for increased use of prescribed fire as a GHG reduction strategy where alternative forms of fuel reduction (mulching, composting, co-gen diversion, etc.) are not feasible.*

Page 21. Natural and working lands GHG inventory

The ARB NWL Inventory will include an inventory of carbon stocks, stock-change (and by extension GHG flux associated with stock-change) with some attribution by disturbance process for the analysis period 2001-2010. Disturbance processes would include activities such as conversion from one land category to a different category, fire, and harvest.

- *We strongly urge ARB to explicitly include **management for increased terrestrial carbon sequestration** as a disturbance category under this heading. Extensive literature and ongoing applied research under the auspices of the Marin Carbon Project, the Carbon Cycle Institute and many other organizations and research institutions at the global scale are demonstrating significant terrestrial carbon capture and storage capacity for working lands (Chambers et al 2016, Lal 2016, Hansen et al 2016). As recognized by the IPCC (2014) and detailed by Hansen et al (2016), we **must** reduce atmospheric GHG even as we reduce GHG emissions if we are to avoid the worst consequences of climate change. Preliminary analysis by the Carbon Cycle Institute suggest a state-wide CO₂e sequestration potential on croplands and grazed grasslands (a total of approximately 20 million acres) of at least **18 million metric tons of CO₂e by 2030**, through realization of the French Ministry of Agriculture’s ‘4 per 1000’ initiative in the California context.*

- *Offsetting **all** of the state's **agricultural emissions** (36,744,000 metric tons of CO₂e per year) with equivalent increases in soil organic carbon (SOC) would require 1.84 metric tons of CO₂e, or 0.5 metric tons C, per acre per year across **all** of the state's 20 million cropland and grazed grassland acreage. This goal could be achieved over time through voluntary implementation of a suite of incentive-based USDA-NRCS and other soil carbon-increasing conservation practices, including compost applications, across the agricultural lands of the state on an ongoing basis. How long this rate of annual increase in SOC could be maintained varies across sites and management regimes, but 20 to 30 years is realistic (Chambers et al 2016, Ryals et al 2015). The network of NRCS and UC Extension offices, Resource Conservation Districts (RCDs), land trusts, producer associations, and NGO's across the state provides an existing functional framework for realizing these goals for California, given sufficient state support in policy and resources. We strongly urge ARB and its sister agencies to take stock of this infrastructure and leadership and provide necessary support to scale its work toward GHG reductions and carbon storage.*

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The ARB NWL Inventory will cover varieties of forests and woodlands, grasslands, and wetlands (biomass-stock-change only). The ARB NWL Inventory will include default carbon densities for croplands and urban/developed lands to facilitate stock-change estimation for natural lands that convert to cropland, natural lands that convert to developed lands, and for croplands that convert to developed lands.

- *The underlying assumption evident in this language is that NWL carbon stocks can only decline from baseline levels in response to land use change. The soil carbon pool globally is at least 3 times that of the biomass pool and uniquely capable of absorbing additional carbon, with significant associated co-benefits, including increased water holding capacity and productivity. NWL Inventory **must** include soil carbon in addition to biomass carbon stocks to provide an even remotely accurate assessment of the stocks and sequestration (and emission) potentials of NWL (Crowther et al 2016, Hansen et al 2016, Machmuller et al 2015). Soil carbon is uniquely susceptible to positive, as well as negative, increases in baseline stocks. USDA SSURGO data, while broadly generalized, offers a means to provide initial quantification of soil carbon stocks in California. Current work under CA BECI grants by UCB and USGS promise to further refine these values over the next few months.*

Page 26. Environmental Justice

- *We suggest that the Scoping Plan include some of the specific environmental justice recommendations contained in Appendix D for Natural and Working Lands. There are considerable benefits soil health and soil carbon sequestration goals and actions in the NWL sector can have for environmental justice and disadvantaged communities, as a recent report summarized (Shattuck et al 2016).*

Table II-1. Cross-Sector Relationships

- *Under, 'Water,' please add, "management of NWL for increased soil carbon also increases soil water holding capacity, reduces irrigation energy demand and increases drought resilience," or similar language.*
- *Under 'Natural and Working Lands,' please add, "management of NWL for increased terrestrial carbon can contribute to significant reductions in atmospheric GHG," or similar language.*

Page 48. Transportation Sustainability

- *California's vast transportation system includes roads and highways totaling more than 175,000 miles. This transportation network represents a significant opportunity for carbon sequestration in woody vegetation and soils along roadways of the state. It also offers significant soil carbon sequestration opportunity through the expanded use of compost and mulches in association with such roadside plantings. An assessment of the opportunity for enhanced environmental quality, including carbon capture by vegetation along the state's highways is strongly recommended, perhaps under the framework of Senate Bill 743 (Steinberg, 2013).*

Page 57 and 59. Natural and Working Lands Including Agricultural Lands

California's climate objective for natural and working lands is to maintain them as a carbon sink (i.e., net zero or even negative GHG emissions).

- *This objective needs to be reevaluated in light of the significant potential and absolute necessity of **increasing** carbon storage on working lands in order to draw down atmospheric GHG. Example suggested language: "California's climate objective for natural and working lands is to increase their capacity as a carbon sink, maximizing negative GHG emission opportunities." (CCI can provide research and information to help support refinement of this section and its language).*
- *SB 1386 calls for far more than "policies and actions to reduce GHG emissions from natural and working lands." It sets as the policy of the state the advancement of protection and management of natural and working lands for "removal of carbon from the atmosphere and the sequestration of carbon in, above, and below the ground".*

Page 59. The statewide goal of net zero loss by 2030 and net sequestration by 2050

- *This goal should be abandoned in favor of a net zero loss goal by 2020 and net sequestration by 2030. See Hansen et al 2016 for a discussion of the dire implications of delaying GHG drawdown efforts beyond 2020. Terrestrial sequestration efforts will have an initially slow impact, accelerating as practices mature and carbon begins to accumulate in working land systems managed for increased carbon capture. Delay in implementation will only aggravate the delay in*

positive effects. We would welcome a discussion of the feasibility and requirements to advance a net zero loss goal for 2020 and net sequestration by 2030, especially for working lands.

Page 59. Looking to the Future

California's climate objective for natural and working lands is to maintain them as a resilient carbon sink (i.e., net zero or even negative GHG emissions) to 2030 and beyond, and minimize the net GHG and black carbon emissions associated with management, biomass disposal, and wildfire events to 2030 and beyond. This will include establishment of agriculture sector GHG emission reduction planning targets for the mid-term time frame and 2050.

- As noted above, a much more ambitious view of working land carbon sequestration potential is needed here, beyond "minimizing net GHG." The state should set a realistically ambitious goal, as per the French '4 per 1000' (see above discussion) and work to exceed that target. Agricultural sector GHG "reductions" targets will fail to engage the full potential and capacity of agricultural producers and the agricultural management infrastructure in California in this effort. Incentivizing an ambitious GHG sequestration program across the NWL sector is needed, perhaps through significant expansion of the Healthy Soils Initiative (and other state programs that support soil carbon sequestration, including SALC, Climate Ready Program, and IRWMP), and expanded partnership with and support of existing NRCS-RCD networks and programs.*

Page 64. Table II-2. Land Management and Restoration Activities

- It is not clear how targets listed in this table were derived, but it is important to note that USDA-NRCS already is achieving implementation of GHG-negative practices on approximately 80,000 new acres of crop, range and pastureland in CA each year (NRCS, pers. com.). If this effort can be combined/supported with the state Healthy Soils Initiative (and other state programs aimed at working land conservation, water/drought management, and organic waste management), that impact could certainly be doubled, if not increased ten-fold. This suggests setting the 'Low Management' (rate of implementation) to at least 80,000 acres/year plus appropriate additional acreage from State and local programs (such as Healthy Soils and local efforts to support working lands such as those being developed by the Bay Area Air Quality Management District as part of its regional climate plan) and increasing the 'High Management' targets accordingly. **We strongly urge further research on strategies for increasing rates of implementation for working lands, specifically, especially with experts and practitioners with working knowledge of current adoption rates and future projected demand for soil and land management practices that sequester carbon across California's agriculture. Table II-2 significantly under-estimates rate of implementation for working lands.***
- In addition, the LBNL modeling estimate of carbon sequestration potential for working lands is a gross under-estimated due to the fact that the model only includes 3-4 soil and land management practices; there are at least 34 practices employed on*

working land in California, currently supported by NRCS and several state programs in California (including recent research by UC Cooperative Extension on riparian restoration).

Page 64. Innovate Biomass Utilization Pathways

Excess biomass generated by commercial agricultural and forestry operations, as well as biomass produced through forest health and restoration treatments, must be disposed of in a manner that minimizes GHG and black carbon emissions.

- *We strongly urge ARB to emphasize “utilization, and maximization” of GHG benefits of biomass resources, rather than “disposal, and minimization” of emissions. This is not offered as semantic hair-splitting, but as an opportunity for a paradigmatic shift in understanding of the role of terrestrial carbon in the climate change equation.*

Figure II-2.

The initial carbon loss visualized here represents the potential for innovative biomass utilization pathways to literally fill the gap – to use this land-based carbon to increase carbon stored in durable wood products and agricultural soils and offset use of fossil fuels consumed for electricity and fuels.

- *Assuming a “high management” scenario, there should be no carbon loss here; rather, carbon should be moving into longer-term storage pools, and/or displacing fossil carbon for energy generation, and/or avoiding GHG and BC emissions associate with avoided wildfire. As drawn, this figure fails to accurately address the boundaries of the system of interest, in this case, the state of CA, not the specific working landscape from which biomass might (or might not) be removed for transfer to alternative carbon pools, including soil carbon and durable wood products.*

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Please add these additional measures:

- *Move “Promote on-farm and ranch management practices that sequester carbon or reduce GHG emissions” from “Protect” to “Enhance”. Carbon sequestered on-farm enhances the soil carbon pool.*
- *Add to “Enhance”: Provide support and technical assistance for counties, cities and regions to integrate working lands goals, actions, measures, and practices that sequester carbon and reduce GHG emissions into regional and local climate action plans. Note that several regional and local climate plans have integrated working lands and carbon management, including BAAQMD Regional Climate Protection Strategy (<http://www.baaqmd.gov/~media/files/planning-and-research/plans/clean-air-plan-update/rcsp-flyer-2-pdf.pdf?la=en>) and the counties of Sonoma, Marin, Yolo, and several others.*

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Compost from organic matter provides soil amendments to revitalize farmland, reduce irrigation and landscaping water demands; contribute to erosion control in fire-ravaged landscapes; and potentially increase long-term carbon storage in rangelands.

- *Please expand this sentence to read: “increase long-term storage in rangelands, pastures and croplands.”*

Page 78. Cross-Sector Interactions

- *Please include this “interaction” between working lands and water: If California’s working lands, i.e., 46 million acres of grasslands, pastures and arable lands, achieved a 1% increase in soil organic carbon (from 1% to 2%) in the plow layer (top 6 inches of soil) alone, the associated water holding capacity increase would be roughly 7.6 million acre feet and the CO₂e sequestered would be 1.5 billion tonnes. Across 8 million **arable** acres of CA alone, this represents 80 million metric tons of soil organic carbon, or 293 million metric tons of CO₂e and 1.3 million acre feet of water (Carbon Cycle Institute)*

Page 85. Table III-1

- *please provide explanatory text for this table.*

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An important feature of the Cap-and-Trade Program is that it can scale to play a larger or smaller role in the overall strategy to induce GHG reductions in the covered sectors depending on how the other measures perform. In the Ideal Scenario, the Cap-and-Trade Program would need to deliver approximately 98 MMTCO₂e net savings of the 671 MMTCO₂e, which would account for about 15 percent of the total reductions between 2021 and 2030.

- *It is imperative that the state begins planning **now** for the uncertainty scenario, which requires a 279 MMTCO₂e Cap and Trade offset. **The state’s natural and working lands can provide this level of offset through enhanced terrestrial sequestration of CO₂e and avoidance of CO₂e emissions, but can only do so if measures to achieve this level of reduction are initiated at the earliest possible moment.** If the state waits until it needs 279 MMTCO₂e in NWL offsets, or even 40 MMT, it will be too late to achieve those offsets in time to meet target deadlines. We strongly urge scenario modeling to include a more robust portfolio of NWL actions and targets set forth in the Scoping Plan Update.*

Page 102. Recommended Local Plan Level Greenhouse Gas Emissions Reduction Goals

- *We would submit that attainment of the Scoping Plan’s proposed 2030 and 2050 goals will require significant local level action, which many regional and local climate plans contemplate. However, there is limited technical and financial support for regional and local governments to plan and implement projects that reduce GHG emissions and sequester carbon, especially the up-front costs for outreach, project*

development, and implementation (in many cases, there are insufficient financial resources to initiate projects due to front-loaded costs in years 1-3). With respect to working lands, there is fairly robust local infrastructure through RCDs (every county has at least one RCD), local NRCS and UC Cooperative Extension offices, and technical assistance NGOs. However, most regional, county and city climate agencies (largely local planning offices) have limited knowledge of and capacity to develop climate-smart agricultural approaches to local climate mitigation and adaption, thus they do not include working land elements in their climate plans and common best practices well-known to reduce GHG emissions and sequester carbon. Targeted technical assistance and planning grants to regional and local governments for supporting climate-smart agriculture and working lands carbon sequestration would allow for substantial scaling of “rate of implementation”.

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This limit is also consistent with the Paris Agreement, which sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to below 2°C.

- *As was made clear at the COP 22 meetings in November 2016 in Morocco, 2°C is an unacceptable increase in global mean temperature. Global warming is already having significant adverse climate impacts (IPCC 2014), including extreme events (NAS 2016), and there is widespread agreement that 2°C warming would commit the world to multi-meter sea level rise (Clark et al 2016). Given that the planet is already experiencing rapidly accelerating climate change, CA must adopt the 1.5°C maximum accepted by the scientific community (Hansen et al 2016) if the state is to retain its leadership in global climate action.*

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In 2009, ARB adopted a “local government toolkit” which can be found on CoolCalifornia.org.

- *Please add terrestrial carbon sequestration information to the CoolCalifornia web site.*

Page 111. Table V-1; V-2.

- *please include natural and working lands in future versions of these tables.*

Page 116. Employment

- *There is considerable need for job training and employment in the working lands sector, specifically for outreach, planning, and on-farm implementation of conservation, soil and land management practices.*

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