September 15, 2023

Amanda Hansen, Deputy Secretary of Climate Change
Jenn Phillips, Assistant Secretary for Climate Change
California Natural Resources Agency
715 P Street
Sacramento, CA 95814

Subject: **Recommendations for AB 1757 Targets and Pathways for Annual and Perennial Agriculture**

Dear Deputy Secretary Hansen, Assistant Secretary Phillips, and Members of the AB 1757 Expert Advisory Committee:

On behalf of the undersigned agricultural, climate, and conservation advocacy organizations, we write to share our recommendations for climate targets and pathways for California's annual and perennial agricultural lands. The recommendations contained in the table below were developed in consultation with a working group of researchers, practitioners, and advocates with expertise in climate solutions in California agriculture. These recommendations are intended to inform and complement the valuable work of the AB 1757 Expert Advisory Committee (EAC).

The table linked and attached below contains recommended practices, scientific literature documenting each practice's climate benefits, implementation targets with justifications for the recommended scale, co-benefits and synergies with other state priorities, and strategies to achieve the recommended targets.

We want to highlight a few themes that cut across these recommendations:

1) **Prioritize the stacking of multiple climate-resilient practices**: The scientific literature makes it clear that stacking multiple practices results in synergistic climate, agronomic, biodiversity, and health benefits. As such, we strongly recommend that programs and regulatory frameworks incentivize the stacking of climate-resilient practices wherever possible.

2) **Recognize co-benefits are key to scaling up adoption and support**: The climate benefits of these practices, while significant, are often less salient to farmers than the agronomic benefits (e.g., soil health, crop yield) and less salient to communities than the public health benefits. Highlighting and quantifying, when possible, these "co-benefits" will be critical to scaling up adoption and support, as will research efforts that use participatory methods to address key farmer questions.

3) **Build on existing tools and frameworks:** We are *not* starting from scratch. Federal, state, and local governments have many existing tools and frameworks in place to advance and measure progress on the practices described below, including incentive programs, research and education initiatives, procurement policies, recurring agricultural surveys and reports, and regulatory frameworks. While new policies and programs may be needed, the main task ahead will be continuously improving, scaling, coordinating, and leveraging these existing tools and frameworks.

4) **Invest in farmers by supporting secure land tenure and farm viability:** Many of the practices detailed below have multiple long-term benefits. However, the long-term nature of those benefits combined with significant upfront costs of adopting those practices (i.e., equipment, materials, labor) make it challenging for farmers with insecure land tenure to justify adopting many climate-beneficial practices. Additionally, farmers need to have viable business operations and access to technical assistance in order to be able to transition to climate resilient farming. Solving this challenge will not be easy, but the state can learn from the recently appointed California Agricultural Land Equity Task Force at the Strategic Growth Council as well as organizations supporting beginning and historically underserved farmers in accessing secure land tenure (e.g. CA FarmLink, Kitchen Table Advisors, etc.).

Our recommended targets and pathways for annual and perennial agriculture, if adopted, would satisfy the AB 1757 (C. Garcia, 2022) requirement for your respective agencies to determine an "ambitious range of targets for nature-based climate solutions that reduce greenhouse gas emissions to support state goals to achieve carbon neutrality and foster climate adaptation and resilience." We appreciate the state's and the EAC's leadership on many of the strategies we

have outlined. Furthermore, we are eager to work with you and your staff to advance these strategies and others that emerge through the AB 1757 process.

Our organizations also urge the state to continue bridging local/regional climate planning and target-setting processes with state-level climate planning processes. As such, we welcome a conversation with you about how to deepen collaboration with producers and technical assistance providers in a bottom-up approach to drive innovation and regionally-tailored action for the 1757 process, the 2025 update of the Natural and Working Lands Climate Smart Strategy, and the 2027 Scoping Plan update.

Thank you again for your leadership and consideration of our recommendations.

Sincerely,

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Cc: Virginia Jameson, CDFA; Adam Moreno, ARB; Keali'i Bright, DOC

ATTACHMENT 1 - Table of Recommended Targets and Pathways for Annual and Perennial Agriculture (Google Sheets Link) (PDF below)

Note: For functioning hyperlinks to references, see the Google Sheets version of this table

Practice	Description	Target(s)	Justification for Potential to Scale	Co-Benefits (not exhaustive)	References for Climate & Co-Benefits (not exhaustive)	Justice and Equity Benefits	Synergies with Other State Priorities	How to Measure Progress?	Policies, Tools, Frameworks, Collaborations, Infrastructure, and/or Investment Needed to Achieve Targets	Structural Challenges
Avoided conversion of annual and perennial cropland to development through conservation easements	Conservation easements prevent development on agricultural land. Agricultural conservation easements are placed on the title of land. A landowner voluntarily places a deed restriction on their property to conserve the land's agricultural uses in perpetuity. State programs include Sustainable Agriculture Land Conservation (SALC) and CA Farmland Conservancy Program (CFCP).	(1) 11,120 acres / year for *annual* agriculture (2) 13,480 acres / year for *perennial* agriculture Sum: 24,600 acres / year *total*	For annual agriculture, this target is 100% of the annual acreage converted from annual to non-agricultural uses per the 2022 CARB Scoping Plan. For perennial agriculture, this target is derived from subtracting the annual agriculture acreage target (11,120 acres) and the rangeland agreage target (25,400 acres) from 50,000 acres. 50,000 acres is the estimated total agricultural land lost per year in California.	Prevents conversion to more GHG intensive uses (e.g., residential, commercial) and can prevent sprawl development Supports agricultural and rural economies by continuing ag use Reduces flood and wildfire risk for surrounding communities.	Jackson et al. (2012) American Farmland Trust (2016) CARB 2022 Quantification Methodology for SALC	Agricultural land conservation can reduce heat island effects which disproportionately affect vulnerable populations.	30 x 30 Sustainable Communities Strategies	Track new acres of ag land with conservation easements between state (e.g. SALC & CFCP), federal, and other efforts DOC's Farmland Mapping and Monitoring Program has been measuring agricultural land conversion since 1984	Expand capacity at land trusts and other organizations that work with land owners to find conservation easements. Easements structured to prioritize farmworker housing and equity pathways. Continued funding for SALC and CFCP.	Land trust capacity is highly variable across the state and is especially lacking in the Southern San Joaquin Valley and Southern California. These areas are seeing rapid loss of farmland, especially prime farmland, due to development pressures. The lack of holistic municipal and rural community planning may lead to the use of easments to tacitly block the development of affordable housing adjacent to cities.
Transition to organic farming	The 2022 California Scoping Plan sets a goal to expand organic agricultural acreage to 20% by 2045. We urge the agencies and AB 1757 expert advisory committee to increase this target to 40% by 2045 in its recommendations. Organic certification requires producers to use multiple climate-smart and healthy soil practices including composting, crop rotation, cover cropping, reduced tillage, and natural pest control to conserve and regenerate soil, water, and air resources. Certified organic producers are also required to protect wetlands, woodlands, and wildlife by using methods including riparian buffers, hedgerows, managed grazing, and more. By implementing mutiple climate smart practices, organic systems build healthy soils and ecosystems that can sequester carbon and mitigate climate change. A successful organic transition strategy must include a market development component. Historically, there has been little government investment in supply chains and market opportunities for organic producers, and today, they face many barriers in accessing key public institutional markets. California should set a goal that 20% of food purchased by the state be certified organic by 2045.	(1) Increase organic acreage in CA to 40% by 2045 (2) Develop markets: 20% state organic procurement by 2045	Organic acreage is already growing. Currently, 9% or 2,130,157 acres of CA farmland is managed organically, and organic acreage is growing on average 3.3% per year (CDFA Organic Reports 2014-2021). Consumer demand for organic food is also growing. From 2021 to 2022, California's organic farm sales grew by 16%, according to CDFA's Agricultural Organics Report 2021-2022. Meanwhile, California is already investing in supporting producers with the organic transition process through a pilot program, funded at $10M in 2023-2024. The state is also investing in expanding climate-smart procurement through CDFA's Farm to School Program, funded at $60M in 2023-2024. The foundation to expand organic production and markets in CA already exist. By setting ambitious goals, the state can accelerate the growth of organic and therefore the climate-benefits this production system offers.	Increases health equity by reducing exposure to synthetic pesticides and fertilizers Improves the viability of climate smart farms Increases SOM and soil carbon storage Increases nutrient cycling and reduces leaching Maintains or enhances cropland biodiversity Maintains or improves soil structure, water infiltration, and water holding capacity For more, see Roadmap to an Organic California: Benefits Report	Wolf et al. (2017) Tuck et al (2013) Ghabbour et al. (2017) Tautges et al.,(2019) Rattan Lal, (2020) Robert Crystal-Ornelas, (2021) Smukler et al (2008)	Farmworkers and communities working and living near farms that rely on synthetic pesticides suffer serious acute and chronic health ailments. Pesticides can cause increased risk for diabetes, obesity, cancer, asthma and other respiratory ailments, reproductive and developmental harm, and neurodevelopmental damage. This risk is disproportionately borne by CA's Latino farmworkers and their communities. Latino children in California are 91 percent more likely than White children to attend schools with significant pesticide exposure. Organic agriculture protects health by removing synthetic inputs from farms, thereby reducing exposure to agricultural pollution in air, water, and food.	30 x 30 Sustainable Pest Management Roadmap Farm to School Roadmap Governor's EO on Biodiversity 2022 CA Climate Scoping Plan CDFA Pilot Organic Transition Program	CDFA's organic reports track organic acreage and sales in CA.	Establish a $5M/year permanent CDFA OT Program (adjusted for inflation) that first provides incentives to socially disadvantaged farmer or rancher applicants, then, if there are moneys available, to limited resource farmer or rancher applicants, and lastly, if there are moneys available, to remaining farmer or rancher applicants Establish a $20M/year (adjusted for inflation) permanent CDFA Farm to School Program where at least 20% of procurement funds are targeted toward organic producers Establish and implement state procurement program prioritizing purchase of CA-grown organic food by 2028 Implement a fully funded CA Food to Community Food Hub Program	During the three-year transition period, farmers must make significant investments and carry additional risk without the ability to sell products under the organic label. Most experience yield losses and higher production costs as the soil adjusts to ecological management and the farmer learns and invests in new practices. This often creates an insurmountable barrier to entry for limited resource and socially disadvantaged farmers and ranchers, who manage their businesses on thinner margins, often have insecure land tenure, and face discrimination that limits access to resources and markets.
Reduce synthetic (i.e. fossil fuel based) nitrogen fertilizer use and improve irrigation and nutrient management efficiency	A pound of nitrous oxide has approximately 300 times the global warming impact as a pound of carbon dioxide. Nitrous oxide emissions account for 22% of California agriculture's GHG emissions. These emissions result from a complex biogeochemical process in the soil involving plants and the soil microbiome. In short, when more nitrogen is available than plants or soil microbiota can consume and soils are wet, excess nitrogen tends to "leak" in the form of nitrous oxide (a greenhouse gas), nitrogen oxide (a local air pollutant), and nitrate (a surface and groundwater pollutant). Reducing overall synthetic nitrogen fertilizer use and improving irrigation and nutrient management efficiency can signifcantly reduce nitrous oxide emissions and local air and water pollution. Cover crops, which can scavenge excess nitrogen, and improved soil organic matter (SOM), which can result in more tightly coupled plant-nitrogen cycling, can further reduce nitrous oxide emissions and local air and water pollution (see other recommendations re: cover crops and practices to improve SOM). Finally, reducing synthetic fertilizer (derived from fossil fuels) use reduces upstream climate impacts associated with fossil fuel extraction and processing (via the haber-bosch process). Improving irrigation efficiency also reduces energy use and greenhouse gas emissions.	Reduce fossil fuel based fertilizer use by 20% by 2030, 40% by 2038, and 60% by 2045.	The CA Nitrogen Assessment (2016) found that "California crops recover, on average, less than half of applied synthetic nitrogen, with some crops capturing as little as 30%." This means that in conventional cropping systems in California, on average half or more of the applied synthetic nitrogen "leaks" in the form of greenhouse gases or local water and air pollution. At the same time, certified organic farming, which is already practiced on 2.1 million acres and is growing by 3.3% per year, uses zero synthetic nitrogen. The state already has multiple regulatory, incentive, research, and technical assistance programs to build on to achieve these targets. In terms of regulations, this includes the Irrigated Land Regulatory Program (ILRP) and the Central Valley Salinity Alternatives for Long-Term Sustainability Program (CV-SALTS), which address nutrient management and water quality. In terms of incentives, this includes the State Water Efficiency and Enhancement Program (SWEEP), which funds irrigation efficiency improvement projects, and the Healthy Soils Program, which includes incentives for reducing nitrogen application, planting cover crops, and other practices that can substitute for synthetic nitrogen inputs while increasing SOM. The state also recently launched the organic transition program (see row above). In terms of research and technical assistance, this includes the Fertilizer Research and Education Program (FREP), which is funded by a fertilizer mill fee, and a recently launched a UCANR-CDFA California Nitrogen and Irrigation Initiative, which includes on-farm trials, training events, and grower consultations. For international comparison, the European Commission's Farm to Fork Strategy, published in 2020, sets a target of reducing nutrient losses by at least 50%, while ensuring that there is no deterioration in soil fertility, which the commission says will reduce the use of fertilisers by at least 20% by 2030.	Improved air quality Improved surface and groundwater water quality	Tian et al (2020) Foucheron and Bellassen (2011) CA Nitrogen Assessment (2016) Almaraz et al (2018) Byrnes et al (2017)	Water and air pollution from nitrates and nitrogen oxide disproportionately affect environmental justice communities in the San Joaquin Valley.	CA's Human Right to Water Irrigated Land Regulatory Program Central Valley Sustainable Alternatives to Salinity Program (CV-SALTS) State Water Resilience Portfolio	Fertilizer Mill Fee Data to track volume of fertilizer sales (CDFA) Irrigated Land Regulatory Program Data to track aggregate N use efficiency CV-SALTS Updated CA Nitrogen Assessment	Increase research, technical assistance, and incentive funding to support multiple alternative fertility management strategies commensurate with the costs of addressing the environmental and human health damage caused by N2O, NO3, and NOx in CA. Increase compost infrastructure and cover crop seed supply. Advance policy supporting a mass balance approach to nitrogen accounting and utilization in CA. Existing programs, regulations, and policies to build on: **Research and Technical Assistance:** (1) Fertilizer Research and Education Program (FREP) (2) UCANR-CDFA California Nitrogen and Irrigation Initiative **Incentives:** (1) State Water Efficiency and Enhancement Program (SWEEP) (2) Healthy Soils Program (3) Organic transition program (see row above) **Regulatory:** (1) Irrigated Land Regulatory Program (ILRP) (2) Central Valley Salinity Alternatives for Long-Term Sustainability Program (CV-SALTS) (3) SB 1383 -- will significantly increase compost availability in the state **Revenue:** (1) Fertilizer mill fee (2) Greenhouse gas reduction fund	Insecure land tenure disincentivizes practices and investments (e.g. irrigation upgrades) with long-term benefits

Practice	Description	Target(s)	Justification for Potential to Scale	Co-Benefits (not exhaustive)	References for Climate & Co-Benefits (not exhaustive)	Justice and Equity Benefits	Synergies with Other State Priorities	How to Measure Progress?	Policies, Tools, Frameworks, Collaborations, Infrastructure, and/or Investment Needed to Achieve Targets	Structural Challenges
Integrating grazing into perennial and annual cropland (aka integrated crop/livestock systems)	Seasonal grazing in perennial and annual cropland systems converts plant material (e.g. grasses, weeds, cover crops, or crop stubble) into food and fiber and recycles nutrients back into soil via urine and manure. Seasonal grazing in vineyards, orchards, and some diversified systems has been gaining popularity in recent years as a practice for fertility management, cover crop termination, weed management, and wildfire fuels management. Recent CA-based research found that: (1) Perennial cropland grazing increased the quantity of active, labile, and soluble carbon in soils. (2) Grazed cropland soils had higher microbial carbon use-efficiency. (3) Soil microbial communities showed altered metabolic investment strategies related to nutrient cycling. (4)Grazed cropland showed improvements in soil organic carbon storage.	Need more data on existing practice adoption to set acreage targets. Increase research and demonstration (e.g. via HSP)	The CA Woolgrowers survey (2021) found: 75,714 paid acres were grazed by survey respondents; and the top two targeted grazing services provided by total paid acres were fuel load reduction (73.7%) and Vineyard/Crop (21%). Ryschawy et al (2021) found: "a positive perception of integrated sheep-vineyard systems (ISVS) among both current adopters and non-adopters regarding the potential agronomic, environmental and economic benefits of these practices. All adopters were satisfied with this system as they experienced labor and fuel savings, soil quality improvement and marketing advantages. Local push factors (bottom-up levers emerging from the niche systems) were highlighted by interviewees as contributing to adoption. Push factors identified include knowledge exchange and networking between vineyard managers and developing marketing pathways for “carbon-positive” wool, meat and wine products."	Provides important off season (winter) grazing for flocks dedicated to fire fuel mitigation in the spring and summer Increased local meat production Increased local fiber production Reduces herbicide use Reduces synthetic nitrogen needs	Brewer et al (2023) Ryschawy et al (2021) CA Woolgrowers Survey (2021)	Reduces herbicide and synthetic nitrogen applications Increases forage/grazing opportunities for young and beginning grazing operations, which allows them to expand without purchasing land Increases culturally valued meat products (lamb and goat)	Sustainable Pest Management Roadmap Central Valley Sustainable Alternatives to Salinity Program (CV-SALTS)	Survey of producer associations, e.g. CA Woolgrowers Association, CA Winegrape Growers, CA Almond Board	Increase research and demonstrations through the Healthy Soils Program Collaboration with relevant producer associations to gather data on adoption and identify producer research priorities	Limited local meat processing infrastructure Labor costs and limited domestic herding workforce Food Safety Modernization Act restrictions Insecure land tenure disincentivizes practices with long-term benefits
Compost amendment	Applying compost to croplands with the goals of improving soil health, increasing soil carbon concentrations, and improving productivity	Starting in 2024, implement compost application on 381,000 acres of annual and perennial croplands annually through 2045, resulting in 2.3M acres by 2030, 4.2M acres by 2035; 8M acres by 2045 (roughly 100% of croplands by 2045). This assumes a one time application on each acre, but could be deployed via multiple annual applications on a smaller number of acres.	Compost application is the highest in demand strategy in CDFA's Healthy Soils Program, accounting for approximately 65% of HSP acreage from 2017-2021, and also offers the highest carbon benefits in terms of carbon sequestered and avoided nitrous oxide and methane emissions. Concurrently, SB 1383 sets a goal of diverting 75% of the state’s organic waste from landfills by 2025, providing a tremendous increase in available feedstock for compost production. Harrison et al 2020 report approximately 15.5 million tonnes of organic waste could be diverted from the landfills. Assuming that all of that would be used for compost,15.5 million tonnes of feedstock would be available for compost production. According to CARB, the average conversion rate for organic waste feedstock to compost production is 0.58, which results in approximately 9 million tonnes of compost per year. Taking CDFA's average application rate (roughly 5 tonnes/acre), and assuming 75% of available compost goes to cropland, California would produce enough compost for around 1.35M acres of cropland annually.	Water holding capacity Reduces need for synthetic fertilizers Increased soil fertility and crop/forage productivity Resilience to flood and drought Increased soil aggregate stability Increased belowground (soil ecosystem) biodiversity Increased plant disease suppression	Tautges et al (2019) Levasseur et al (2020) USCC (2017) Brown & Cotton (2013) Shrestha et al (2018) Mugnai et al (2013) Baldi et al (2018) Hu et al (2022) Montanaro et al (2017) USGS (2018)	Protects farmworker health and water quality by reducing or displacing the need for synthetic fertilizers	SB1383/methane reductions NOX reductions N2O reductions Ground and surface water pollution reducitons Water conservation Drought resilience Agricultural production and sustainability	SB 1383 Healthy Soils Program	Support on-farm composting Facilitate permitting for new commercial facilities Leverage local government procurement requirements (i.e. local rebate programs)	Requires 100+ new compost facilities to address need; streamlined permitting for expanding existing facilities; support on-farm composting
Cover cropping and legume-based crop rotation	Grasses, legumes, and forbs planted for seasonal vegetation cover and symbiotic N fixation.	Starting in 2024, increase adoption by 140,000 acres annually through 2045, resulting in an additional 1 M acres by 2030, 2.1 M acres by 2038, and 3 M acres by 2045	Respondents to the 2017 Ag Census reported cover cropping approximately 350,000 acres in California. Cover cropping was the most popular practice in the NRCS EQIP program in 2022 and has consistently been the second most popular practice in the Healthy Soils Program. HSP has incentivized 14,687 acres for cover cropping since 2017. NRCS EQIP has incentivized 158,354 acres for cover cropping since 2005. (Source: USDA dashboard) DeVincentis et al (2022) found that "winter cover crops in the Central Valley may break even in terms of actual consumptive water use" and that "California growers of high-value specialty crops can likely adopt winter cover cropping without altering their irrigation plans and management practices." Tree nuts, stone fruits, and grapes alone are grown on approximately 3 million acres. These perennial orchard and vineyard systems, which produce high value crops, face fewer operational challenges than many annual systems in terms of cover crop adoption. The low upfront cost of cover crop adoption is likely offset by increased soil moisture, increased organic matter content, reduced erosion and nutrient losses, and improved soil health after cover cropping for multiple years.	Cover crops scavenge excess nitrates in the soils, which can reduce nitrous oxide emissions and nitrate pollution into surface and groundwater Cover crops increase belowground and aboveground biodiversity Increased water infiltration Reduced erosion Potential for weed suppression If grazed, cover crops can provide valuable forage for livestock (see integrated crop/livestock systems row above)	Mulvaney et al (2009) Novara et al (2013) DeVincentis et al (2022) Jackson (2000)	Reduced nitrate groundwater pollution	Human right to water Irrigated Lands Regulatory Program CV-SALTS Sustainable Groundwater Management Act	National Ag Statistics Service Ag Census (includes a question about cover cropping use) Conservation Practice Adoption Motivations Survey (includes an estimate of cover cropped area) Healthy Soils Program and NRCS EQIP data Remote sensing (Thompson et al 2023)	Increased funding for the Healthy Soils Program Increased collaboration with NRCS EQIP Increased collaboration with cover crop seed producers to expand production capacity Increase collaboration and incentives with almond producers to transition to off-ground harvesting Updated regulatory frameworks that provide producers incentives (e.g. regulatory relief or water credits) for cover-cropping in water quality regulations and local groundwater sustainability plans	Equipment access (e.g. to seed drills, roller crimpers) Limited cover crop seed production Foregone income in tight/short-succession annual vegetable rotations (e.g. lettuce, broccoli) Insecure land tenure disincentivizes practices with long-term benefits
Reduced/conservation tillage (including no-till)	Reducing tillage passes and intensity, which can include eliminating tillage altogether (no-till)	Starting in 2024, increase adoption by 70,000 acres annually through 2045, resulting in an additional 500,000 acres by 2030, 1 M acres by 2038, and 1.5 M acres by 2045	Respondents to the 2017 Ag Census reported reduced tillage practices (including no-till) on approximately 722,000 acres.	Reduced dust and PM 2.5 emissions Reduced soil water evaporative loss Reduced fuel use from fewer tractor passes	Horwath et al (2007) Mitchell et al (2012) Bowles et al (2017) Mitchell et al (2017)	Improved air quality, particularly in the San Joaquin Valley Mitchell et al (2005) found that conservation tillage reduced PM10 emissions by 53 to 97.	State's Water Resilience Portfolio Achieving Clean Air Act air quality standards in the San Joaquin Valley	National Ag Statistics Service Ag Census (includes a question about cover cropping use) Healthy Soils Program and NRCS EQIP data	Increase funding for the Healthy Soils Program Increased collaboration with NRCS EQIP Updated air quality regulatory frameworks for PM 10 dust emissions that reward producers for reducing tillage	Equipment access (e.g. no-till seed drills, roller crimpers) Weed management in organic systems (where herbicides are not available as a tool) Insecure land tenure disincentivizes practices with long-term benefits

Practice	Description	Target(s)	Justification for Potential to Scale	Co-Benefits (not exhaustive)	References for Climate & Co-Benefits (not exhaustive)	Justice and Equity Benefits	Synergies with Other State Priorities	How to Measure Progress?	Policies, Tools, Frameworks, Collaborations, Infrastructure, and/or Investment Needed to Achieve Targets	Structural Challenges
Riparian forest buffers	Establishing woody and perennial herbaceous species on grasslands in degraded riparian zones, adjacent to streams, lakes, or wetlands.	1,800 miles of riparian corridors, or 22,100 acres by 2030, 5,800 miles of riparian corridors, or 69,500 acres by 2045	Conservatively assumed 20% of the roughly 29,130 miles of intermittent and perennial streams (NHD) on grazing lands (FMMP) have potential for restoration. Conservatively assumed an average riparian area width of 30 m (Collins et al. 2006). For context, Katibah (1984) estimates that only 11% of riparian forest in the Central Valley remains, with at least half of those remaining forests in degraded condition. We recommend a more detailed approach for estimating potential riparian restoration (e.g. Matzek et al. 2020).	Increases the amount of carbon stored in woody biomass, soils and sediments Supports biodiversity by improving aquatic ecosystem health and providing habitat for riparian species Improves nutrient cycling Increases soil water holding capacity Improves ground and surface water quality by filtering runoff Mitigates flooding events Reduces stream bank erosion Bolsters ecosystem resiliency	Matzek et al. 2020 Derose et al. 2020 George et al. 2011 Jackson et al. 2015	Improved flood mitigation and reduced erosion near cropland and residential areas Improved water quality due to filtration and nutrient uptake	30x30 Scoping Plan State Water Resilience Portfolio Climate Adaptation Strategy Can also be applied to grazing lands	HSP and NRCS EQIP data Remote sensing (Thompson et al 2023)	Infrastructure: Scaled regional plant nursery infrastructure statewide, emphasizing regionally appropriate native agroforestry species Workforce Development/Training: enhanced native nursery production and agroforestry system design training opportunities for UCCE, NRCS, CCC and RCD personnel Technical Assistance : TA targeted for riparian forest restoration State Funding: Enhanced funding for native waterways conservation easement program	Insecure land tenure disincentivizes practices with long-term benefits
Hedgerow/Windbreak Establishment	Establishment of managed, dense, linear vegetation composed of perennial shrubs or shrubs and trees adjacent to agricultural fields.	380,000 acres of hedgerow/windbreaks across California by 2040	A conservative estimate of 381,367 acres of farm edges are present across California (Chiartas et. al 2022), which does not consider the multiple opportunities for hedgerow planting within farms alongside roadsides, agricultural drains, fences, canals and gullies.	Increases aboveground biodiversity by providing habitat, food, cover, and corridors for wildlife Enhances pollinator populations by providing pollen, nectar, and nesting habitat Bolsters integrative pest management potential by providing habitat for beneficial invertebrates Improve air quality by intercepting airborne particulate matter, chemical drift, and odor Reduces soil erosion Increases biomass and carbon storage above and belowground Improve surface water quality, flood and drought mitigation Decrease nutrient runoff and improve nutrient cycling Increase crop productivity and protect crop yields by preventing wind damage and evapotranspirative demand Improve soil structure and water holding capacity	Possu et al (2017) Englund et al (2021) Chendev et al (2015) Wiesmeier et al (2018) Biffi et al (2022) Drexler et al (2021) Chiartas et al (2022) Garcia de Leon et. al (2021)	Improved air quality Improved water infiltration preventing flooding of roads and walkways Reduced nitrogen pollution of groundwater due to N uptake Reduced need for insecticide application and associated health hazards due to presence of beneficial insect species Forage and shelter from the wind for beginning grazing operations Improved air quality due to trapping of windborne dust and particulates Preventing wind damage to small farming operations	30x30 Scoping Plan Sustainable Pest Management Roadmap Improved on-farm living and working conditions Can also be applied to grazing lands	National Ag Statistics Service Ag Census (includes a question about agroforestry use) HSP and NRCS EQIP data Remote sensing (Thompson et al 2023) - Used remote sensing to identify hedgerows and windbreaks in diverse agricultural lanscapes in San Benito, Santa Cruz and Monterey counties with a high degree of accuracy.	Investment Practice implementation best-practices research and standardization Infrastructure Scaled plant and nursery infrastructure Workforce development Enhanced native nursery production and agroforestry system design training opportunities for UCCE, NRCS, CCC and RCD personnel TA Technical assistance and outreach for seedling establishment Collaboration Increased funding through the California Healthy Soils Program and EQIP	Insecure land tenure disincentivizes practices with long-term benefits
Diversified Farming Practices	Includes a range of practices meant to increase on-farm above and belowground biodiversity include cover cropping, intercropping, polycutures/multi-cropping, diverse crop rotations (increasing the number of species farmed before returning to the initial species), hedgerows, agroforestry, variety mixtures and floral strips	40% of total ag acreage utilizing two or more diversification practices by 2045 (mirroring committee's draft organic target).	Demand for local and farm to fork produce continues to grow. Many fruit and vegetable farmers are already growing a mix of crops, and CDFA programs promoting diversification practices like the HSP are oversubscribed. At the same time, practices meant to increase biodiversity on working lands, with all the associated benefits, are receiving increasing focus, especially through programs at CDFA's Office of Environmental Farming and Innovation and through CDFA reports on soil biodiversity. Promoting diversification of on-farm practices can result in improved ecosystem services, increased resilience to climate shifts, and reduced environmental impacts.	Decreased pest and disease pressure Increased biodiversity and pollinator services Enhanced nutrient cycling Increased ecosystem services, water quality, climate resilience and soil health while still preserving yields	McDaniel et al (2014) Beillouin et al (2019) Alletto et al (2022) Bowles et al (2015)	Reduced pesticide use Increased local food availability Increased aboveground and belowground biodiversity, with associated benefits for carbon storage, water retention, pest and disease resistance and reduced GHG emissions	30x30 Scoping Plan SPM Roadmap Climate Adaptation Strategy	Utilizing USDA census data on cover cropping and adjusting county level CDFA reporting to include questions regarding diversification practices and acreage Remote Sensing HSP and NRCS EQIP data	TA; Develop markets for non commodity crops, sustained incentives to farmers, access to labor. https://www.mdpi.com/2071-1050/11/12/3380	
Pesticide use reduction	Pesticide use reduction and transition to diverse, local, organically managed food systems (agroecology)	50% reduction by 2030 in overall use/toxicity of chemical pesticides and with highly hazardous pesticides prioritized for phase out	Mirrors EU Farm to Fork targets	Community health, farmworker health, biodiversity benefits, pollinator health, improved water and air quality, improved equity, climate resilience	Pesticide Action Network (2023)	Pesticides are applied predominantly in majority resident of color communities in CA; therefore, reducing their use would primarily benefit the health of these communities	SPM Roadmap (has goal to phase out HHPs and increase adoption of SPM). Some synergies with Scoping Plan & organic adoption goal	Department of Pesticide Regulation (DPR) data	Expand PCAs and TAs with expertise in agroecology/EPM. Expand incentives to farmers, especially small-scale and BIPOC farmers, to adopt EPM/agroecology/organic. Expand local food systems programs. Add NRCS IPM practices to HSP. Support access to appropriate seed and equipment.	Regionally specific data and TA

Practice	Description	Target(s)	Justification for Potential to Scale	Co-Benefits (not exhaustive)	References for Climate & Co-Benefits (not exhaustive)	Justice and Equity Benefits	Synergies with Other State Priorities	How to Measure Progress?	Policies, Tools, Frameworks, Collaborations, Infrastructure, and/or Investment Needed to Achieve Targets	Structural Challenges
Ag land tenure	Increase access to capital, ownership and fair leases for new, beginning, small and historically underrepresented farmers	Support community-led land access projects Policy to ensure all farmers have good faith options to renew their lease agreements under just cause termination Historically underrepresented farmers are represented in farming equal to/exceeding their demographics in CA Support access to credit for young, BIPOC, small, and diversified farmers Support business technical assistance for young, BIPOC, small, and diversified farmers	Land access is the biggest challenge for new entrants to farming, and secure and affordable land tenure is a primary challenge for many farmers (Source: National Young Farmers Coalition survey). Farm access and viability is critical to ensure farmers are in a position to adopt climate resilient practices and then maintain adoption.	Farm viability, benefits associated with climate resilience practices, farmer health and well-being	Chapman et al (2022)	Increases access for underserved farmers and those seeking to enter farming, especially BIPOC, new/young, small, and/or diversified farmers. Helps farmers keep their land and stay farming.	SGC Land Equity Task Force	Demographics of farm operators, land in their farms, and land tenure (Ag Census) Policies in place to support fair lease renewals # of FSA loans to new/young, BIPOC, small, and/or diversified farms	Collaborate with FSA, SGC, and the Land Equity Task Force	Financialization of farmland

September 15, 2023

Amanda Hansen, Deputy Secretary of Climate Change
Jenn Phillips, Assistant Secretary for Climate Change
California Natural Resources Agency
715 P Street
Sacramento, CA 95814

Subject: Recommendations for AB 1757 Targets and Pathways for California Rangelands

Dear Deputy Secretary Hansen, and Assistant Secretary Phillips:

On behalf of the undersigned agricultural, climate, and conservation advocacy organizations, we write to share our recommendations for climate targets and pathways for California's abundant rangelands. The recommendations contained in the table attached below were developed in consultation with a working group of researchers, practitioners, and advocates with expertise in the implementation of climate solutions on California's rangelands, and are intended to inform and complement the valuable work and recommendations of the AB 1757 Expert Advisory Committee (EAC).

The table below contains recommended practices, relevant scientific literature documenting each practice's climate benefits, implementation targets and justification for each practice, co-benefits and synergies with other state priorities, and strategies to achieve the recommended targets. As we know the EAC is working in earnest to develop their recommendations, we wanted to provide our recommendations to inform the EAC's current and ongoing deliberations.

We want to highlight a few themes that cut across these recommendations:

1) **Prioritize the stacking of multiple climate-resilient practices**: The scientific literature makes it clear that stacking multiple practices results in synergistic climate, agronomic, biodiversity, and health benefits. As such, we strongly recommend that programs and regulatory frameworks incentivize the stacking of climate-resilient practices wherever possible.

2) **Center co-benefits as key to scaling up adoption and support**: The climate co-benefits of these practices are significant and sometimes are important to land managers and communities. Highlighting and quantifying, when possible, these "co-benefits" will be critical to scaling up adoption and support.

3) **Build on existing tools and frameworks:** We are *not* starting from scratch. Federal, state, and local governments have many existing tools and frameworks in place to advance and measure progress on the approaches described below, including incentive programs, research and education initiatives, procurement policies, recurring agricultural surveys and reports, and planning frameworks. While new policies and programs may be needed, the main task ahead will be continuously improving, scaling, coordinating, and leveraging these existing tools and frameworks.

4) **Invest in enhanced technical assistance, workforce development and capacity building:** Simply put, to achieve any level of ambitious target for climate solutions within the working lands sectors, we will need sufficient *boots on the ground* with the training, expertise and institutional support to plan, implement, and adaptively monitor and manage nature-based projects at scale. As eloquently stated in AB 408 (Wilson) "*additional state, local, and federal financial support should be provided to ensure adequate funding is available for project planning, community engagement, outreach, technical assistance, and organizational capacity. That financial support is particularly necessary when the proceeds of bonds will fund projects benefiting disadvantaged communities, tribal populations, and socially disadvantaged farmers, ranchers, and other food producers."*

We wanted to make clear a few working assumptions inherent in these recommendations. First, there are roughly 57 million acres of rangelands in CA, of which 11.5 million acres of this total are considered grasslands and pastures (please note our recommendations on grazing management focuses on permanent pasture and grasslands). Second, we focused our recommendations on implementation targets and pathways, but did not quantify the GHG impacts of these targets and pathways at this time (as that is a related, but separate conversation).

Lastly, we did NOT address environmental justice and equity-related impacts and issues, nor did we employ an equity/justice framework in our recommendations to date. We strongly feel that the 1757 process to date has not offered a shared framework, methodology, or metrics to adequately support development of recommendations and analyses around environmental justice and equity in the Natural and Working Lands sector. Nor has there been ample discussion with frontline communities or environmental justice bodies, such as the Environmental Justice Advisory Committee, to develop such a shared equity framework.

Our recommended rangeland targets and pathways, if adopted, would satisfy the AB 1757 (C. Garcia) requirement for your respective agencies to determine an "ambitious range of targets for nature-based climate solutions that reduce greenhouse gas emissions to support state goals to achieve carbon neutrality and foster climate adaptation and resilience." We appreciate the EAC's and state agencies' leadership on many of the strategies we have outlined and we are eager to work with you and your staff to advance these strategies and others that emerge through the AB 1757 process.

We are also eager to continue bridging local/regional climate planning and target-setting processes and innovation with state-level climate planning processes, and would welcome a conversation with you about how to deepen collaboration with producers and technical assistance providers in a bottom-up approach for the 1757 process and next scoping plan.

Thank you again for your leadership and consideration of our recommendations.

Sincerely,

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Carbon Cycle Institute

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California Certified Organic Farmers

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Cc: Virginia Jameson, CDFA; Matthew Botill, ARB; Keali'i Bright, DoC; Heather Williams, CalRecycle

ATTACHMENT 1 - TABLE OF RECOMMENDED TARGETS AND PATHWAYS FOR CALIFORNIA RANGELANDS

Recommendations for Implementation Actions, Targets (with research references) and Pathways

Actions			*Implementation Target*	*Implementation Target*		*Objectives*	*Objectives*	*Pathways*
Practice	**Practice Description**	**References for climate mitigation benefits (not exhaustive)**	**2030 Target**	**2045 Target**	**Target Justification and Recommendations**	**Co-Benefits**	**Synergies with other State Priorities**	**Strategies or Infrastructure Needed to Scale**
Grazing management	Managed grazing with the goals of improving grazed grassland condition and productivity	Conant et al. 2017 Byrnes et al. 2018 Jackson and Bartolome 2007 Wang et al. 2014 Teague et al. 2016 Henneman et al. 2014 Huntsinger et al. 2007 Ratcliff et al. 2022 Siegel et al. 2022	1,910,000 acres * does not count grazed rangeland acres	6,000,000 acres * does not count grazed rangeland acres	NRCS programs have funded 5.5 millions acres of prescribed grazing since 2013 (NRCS Data). With 11.6 million acres of pasture (2017 Ag Census), assumed the remainder of grazing land has potential for improved grazing management. Assumed full implementation by 2045 and ~1/3 implementation by 2030. **Recommended:** Refine estimates of grazed pasture statewide. Assess potential for scaled grazing management on grazed rangelands (as distinct from pasture) statewide.	Increases soil carbon storage Maintains or enhances rangeland biodiversity Maintains or enhances rangeland habitat Increases forage productivity Promotes soil structure, water inilftration and water holding capacity Reduces wildfire risk	30x30 Fire and fuel management Wildfire & Forest Resilience Action Plan	**Technical Assistance (TA):** Enhanced TA available to grazing managers and ranchers **State funding:** Cost share for grazing infrastructure (fencing, watering systems) on public and private lands (via NRCS EQIP, CDFA HSP, CalFire Wildfire Prevention Grants, etc.); Funding for grazing and habitat management plans (through CDFA Conservation Planning Grant Program and other state programs) **Increased access** to public rangelands to support fuel reduction and other ecosystem objectives (eg, currently limited access to State Park lands). **Leases:** Longer-term state and federal grazing leases (eg 5-20 years) to allow ranchers to invest in infrastructure to support enhanced grazing management
Compost amendment	Infrequent application of compost to grazed grasslands with the goals of improving soil health, increasing soil carbon concentrations, and improving forage productivity	Kutos et al. 2023 Silver et al. 2018 Ryals et al. 2015 Delonge et al. 2013 Lynch et al. 2005	400,000—1,090,000 acres	1,260,000—3,420,000 acres	Lower estimate assumed 25% of compost produced at full SB1383 implementation (Harrison et al. 2020) is applied to rangelands at a rate of 1/4 inch once every 10 years. Higher estimate is from Silver et al. 2018. Assumed full implementation by 2045 and ~1/3 implementation by 2030. **Recommendation:** develop more robust estimates of compost availability and allocation under different scenarios; carry out an assessment of rangelands statewide suitable for compost application.	Increases soil carbon storage Increases forage productivity Promotes soil structure, water inilftration and water holding capacity Increases nutrient cycling	SB 1383 State Water Resilience Climate Adaptation Strategy	**Infrastructure:** Scaled organics processing and production infrastructure statewide to serve on-ranch demand **Technical Assistance:** Enhanced TA for on-ranch composting, and compost production and utilization training opportunities for TA providers (UCCE, NRCS, CCC and RCD personnel) **Workforce:** **Regulatory/Administrative:** Streamline permitting for on-farm composting; **SB 1383:** Partnerships between farms and cities to meet cities' SB 1383 compost procurement requirements by distributing reduced cost compost to local farms/ranches (eg, San Mateo RCD pilot)
Silvopasture	Re-establishing native oaks in grasslands that were converted from oak savannahs or woodlands to grasslands for livestock and/or cropland	Carey et al. 2020 Gaman 2008 Kroeger et al. 2010 Dube et al 2011 Brewer et al 2022 Silver et al 2010 Baldocchi et al 2010 Dollinger and Jose 2018	290,000 acres	900,000 acres	Assumed replacement of oak savannah intentionally cleared in the name of range improvement from 1940's to 1970's (Davis et al. 2006). Bolsinger (1988) estimates this area to be 1.9 million acres. While some of these areas have been converted to other uses, significantly more oak savannah and woodland clearing occurring prior to the 1940s. Assumed full implementation by 2045 and ~1/3 implementation by 2030. **Recommendation:** carry out a detailed assessment of potential for oak re-establishment on grasslands based on historic vegetation and climate change forecasts (e.g. Baumgarten et al. 2020).	Increases the amount of carbon stored in woody biomass above and Provides habitat for pollinators and other organisms Increases plant species biodiversity Increases forage productivity on rangelands Improves nutrient cycling Improves soil structure and water holding capacity Reduces grassland soil erosion Bolsters ecosystem resiliency and soil biodiversity on grasslands	30x30 Climate Adaptation Strategy	**Infrastructure:** Scaled regional plant nursery infrastructure statewide, empahsizing regionally appropriate native agroforestry species **Workforce Development/Training:** enhanced native nursery production and agroforestry system design training opportunities for UCCE, NRCS, CCC and RCD personnel Grazing management plan to ensure seedlings are established **Technical Assistance :** TA targeted for grazing management, oak woodland restoration and silvopasture establishment **State Funding:** Enhanced funding for WCB's Oak Woodlands conservation easement program
Riparian restoration	Establishing woody and perennial herbaceous species on grasslands in degraded riparian zones, adjacent to streams, lakes, or wetlands.	Matzek et al. 2020 Derose et al. 2020 George et al. 2011 Jackson et al. 2015	1,800 miles of riparian corridors, or 22,100 acres	5,800 miles of riparian corridors, or 69,500 acres	Conservatively assumed 20% of the roughly 29,130 miles of intermittent and perennial streams (NHD) on grazing lands (FMMP) have potential for restoration. Conservatively assumed an average riparian area width of 30 m (Collins et al. 2006). For context, Katibah (1984) estimates that only 11% of riparian forest in the Central Valley remains, with at least half of those remaining forests in degraded condition. Assumed full implementation by 2045 and ~1/3 implementation by 2030. **Recommendation:** carry out a detailed assessment of potential for riaparian restoration (e.g. Matzek et al. 2020).	Increases the amount of carbon stored in woody biomass, soils and sediments Supports biodiversity by improving aquatic ecosystem health and providing habitat for riparian species Mitigates flooding events Increases soil water holding capacity Improves ground and surface water quality by filtering runoff Reduces stream bank erosion Bolsters above- and belowground biodiversity, increasing ecosystem resiliency	30x30 State Water Resilience Portfolio Climate Adaptation	**Infrastructure:** Scaled plant nursery infrastructure statewide, emphasizing regionally appropriate native species **Workforce Development/Training:** Enhanced native nursery production and riparian system design training opportunities for TA providers (UCCE, NRCS, CCC, and RCD personnel) **Technical Assistance:** TA (including financial assistance) targeted for rangeland riparian restoration statewide

Conservation through easements	Avoided conversion of rangeland to development through conservation easements. Agricultural conservation easements are placed on the title of land. A landowner voluntarily places a deed restriction on their property to their property to conserve the land's agricultural uses in perpetuity.	Jackson et al. 2012 American Farmland Trust 2016 Dass et al 2018	35,000 acres / year	35,000 acres / year	California Rangeland Trust alone has a backlog of 225,000 acres of rangeland seeking easements. The Sustainable Ag Lands Conservation Program (SALC) funding alone can conserve approximately 25,000 acres per year at risk of development, assuming funding going forward closely resembles the most recent 4 year period. 25,000 acres is the annual average of SALC's rangeland conservation easements plus half the acreage of SALC's conservation easements on "mixed land" (rangeland + irrigated cropland) for the most recent 4 year period. The Wildlife Conservation Board's Oak Woodlands Program and Rangeland, Grazing, Land, and Grasslands Protection Program, in addition to USDA-NRCS's Agricultural Conservation Easement Program (ACEP), can conserve additional acreage assuming continued funding. **Recommendation:** protect grasslands and rangelands through conservation easements as a means to prevent development and associated GHGs, complement other strategies described above, and maintain grasslands' carbon stores and sequestration potential, which is more reliable than forests	Prevents conversion to more GHG intensive uses (e.g., residential, commercial) and can prevent sprawl Increases flood resilience for surrounding communities by keeping ag land in use Maintains vegetation management for wildfire risk reduction and safe firefighting on grazed lands	30x30	**State Funding**: Targeted, consistent annual state funding for land trust and local government capacity building and local and regional planning (dedicated funding source not subject to annual Legislative appropriation or greenhouse gas reduction fund fluctuations). Increase annual appropriation to WCB conservation easement programs, including the Oak Woodlands Program and Rangeland, Grazing, Land, and Grasslands Protection Program. **Stewardship:** Encourage active stewardship requirement on conserved lands.
Other potential practices not included above: Range planting Prescribed fire Biochar application								