
SENATE COMMITTEE ON ENVIRONMENTAL QUALITY

Senator Allen, Chair

2021 - 2022 Regular

Bill No: AB 2649
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Version: 6/16/2022
Urgency: No
Consultant: Eric Walters
Hearing Date: 6/29/2022
Fiscal: Yes

SUBJECT: Natural Carbon Sequestration and Resilience Act of 2022

DIGEST: This bill sets goals for natural carbon sequestration, as defined, for California of at least 60 million metric tons of carbon dioxide equivalent by December 31, 2030 and 75 million metric tons by December 31, 2035. It also provides direction on integrating these goals into specified state plans, as well as reporting requirements to the Legislature.

ANALYSIS:

Existing law:

- 1) Under the California Global Warming Solutions Act of 2006 (Health and Safety Code (HSC) §38500 et seq.):
 - a) Establishes the California Air Resources Board (ARB) as the state agency responsible for monitoring and regulating sources emitting greenhouse gases (GHGs).
 - b) Requires ARB to approve a statewide GHG emissions limit equivalent to the statewide GHG emissions level in 1990 to be achieved by 2020 (AB 32, 2006) and to ensure that statewide GHG emissions are reduced to at least 40% below the 1990 level by 2030. (SB 32, 2016)
- 2) Requires ARB to prepare and approve a scoping plan for achieving the maximum technologically feasible and cost-effective reductions in GHG emissions and to update the scoping plan at least once every 5 years.
- 3) States that it is the policy of the state that the protection and management of natural and working lands (NWL) is an important strategy in meeting the state's GHG emissions reduction goals, and that the protection and management of those lands can result in the removal of carbon from the atmosphere and the sequestration of carbon in, above, and below the ground, using the following definitions (Public Resources Code (PRC) §9001 et seq.):

- a) “Natural lands” are lands consisting of forests, grasslands, deserts, freshwater and riparian systems, wetlands, coastal and estuarine areas, watersheds, wildlands, or wildlife habitat, or lands used for recreational purposes such as parks, urban and community forests, trails, greenbelts, and other similar open-space land.
 - b) “Working lands” are lands used for farming, grazing, or the production of forest products.
- 4) Tasks the California Environmental Protection Agency (CalEPA), working with the California Department of Food and Agriculture (CDFA), Department of Forestry and Fire Protection (CalFIRE), and the Forest Management Task Force, with promoting a goal of reducing at least five million metric tons of GHG emissions per year through the development and application of compost on working lands, which include, but are not limited to, agricultural land, land used for forestry, and rangeland. (PRC §42649.87)

This bill, the Natural Carbon Sequestration and Resilience Act of 2022:

- 1) States that it is the goal of the state to sequester through natural carbon sequestration in California at least 60 million metric tons of CO₂ equivalent annually on or before December 31, 2030, and 75 million metric tons by December 21, 2035.
- 2) Stipulates that the above goal does not count towards the goals established by SB 32 or EO S-3-05 for 40% and 80% reductions of GHG emissions below a 1990 baseline by 2030 and 2050, respectively. Further excludes any market-based or alternative compliance mechanism using carbon sequestration on NWLs.
- 3) Requires policies and actions taken to achieve the above goal to maximize ecological health and native biodiversity, and prioritize specified cobenefits.
- 4) Requires CNRA, on or before January 1, 2024, in coordination with CalEPA, ARB, CDFA, and other relevant state agencies, to review and, as necessary, update the *NWL Climate Smart Strategy* and *Pathways to 30x30: Accelerating Conservation of California’s Nature*, as specified, to achieve the above goal.
- 5) Requires the same agencies as above, following the review, to update the two documents every five years, concurrently with ARB’s preparation of the

AB/SB 32 Scoping Plan.

- 6) Requires CNRA and ARB to, on December 31, 2025, and annually thereafter, submit a report to the Legislature, as specified, on progress towards meeting the above goal, and to include in that report:
 - a) Descriptions of actions and projects undertaken;
 - b) Quantified progress on emissions reductions, natural carbon sequestration, and cobenefits;
 - c) A description of how ARB calculated emissions reductions, natural carbon sequestration, and benefits;
 - d) A summary of the benefits to low-income, disadvantaged communities, vulnerable communities, disadvantaged farmers, and tribes;
 - e) An evaluation of the efficacy of the priority nature-based solutions, pathways, and priority actions; and
 - f) Identification and description of any barriers to achieving the above goal.
- 7) Requires CNRA and ARB to present the findings of the above report before the relevant policy committees of the Legislature.
- 8) Defines pertinent terms, notably including:
 - a) “Natural carbon sequestration” to mean actions that are undertaken on NWLs to remove and provide long-term storage of atmospheric GHGs in vegetation and soils, including (among other relevant actions):
 - i) Preservation;
 - ii) Conservation;
 - iii) Restoration;
 - iv) Sustainable management of lands;
 - v) Compost application;
 - vi) Cover crops;
 - vii) Hedgerows;
 - viii) Planned grazing;
 - ix) Urban forestry;
 - x) Forest management and restoration;
 - xi) Riparian restoration;
 - xii) Restoration of tidal flows to wetlands; and
 - xiii) Other forms of wetland restoration.
 - b) “Natural lands” to mean “lands consisting of forests, grasslands, deserts, freshwater and riparian systems, wetlands, coastal and estuarine areas, watersheds, wildlands, or wildlife habitat, or lands used for recreational purposes such as parks, urban and community forests, trails, greenbelts,

and other similar open-space land;” and

- c) “Working lands” to mean “lands used for farming, grazing, or the production of forest products.”

Background

- 1) *Natural and Working Lands (NWLs)*. California’s NWLs include rangelands, forests, woodlands, wetlands, grasslands, shrubland, farmland, riparian areas, and urban green space. They cover more than 90 percent of the State and supply life-sustaining resources including clean water, air, food, and fiber. With their potential to sequester carbon, reduce GHG emissions, and increase the capacity for California to withstand inevitable climate impacts, these lands are a critical component of California’s integrated climate change strategy. However, some sources show that California’s NWLs are a net GHG source, losing more carbon than they are sequestering, with wildfire being the largest cause of carbon loss. A number of entities in California’s executive branch are developing policy and implementing programs to mitigate disturbances on natural and working lands and protect these lands from conversion to more intensive land uses.
- 2) *ARB’s NWL Inventory*. The NWL Inventory is a quantitative estimate of the existing state of ecosystem carbon stored in the State’s land base (separate from the California GHG Emissions Inventory). It provides estimates of carbon stocks, stock change, and resulting GHG flux associated with changes in California’s landscape, and attributes those changes to disturbances.

According to ARB’s May 10th draft scoping plan update, ARB’s NWL inventory shows that the state’s lands were a net source of GHG emissions from 2001 to 2011, then a net sink from 2012 to 2014. These trends highlight the interannual and interdecadal variability of lands and their ability to be both a source and a sink of carbon, and the importance of looking at NWL data and trends over multiyear and multidecadal time periods, as opposed to looking only at annual changes. This movement is part of the Earth’s carbon cycle, where carbon transfers between the land, ocean, and atmosphere. As part of the carbon cycle, over decades or centuries, fire and plant respiration and decomposition move carbon from the land to the atmosphere while plant growth and other processes move carbon from the atmosphere to the land.

- 3) *NWL sequestration estimates*. There has been significant interest in the last few years to assess the potential of these solutions to help California meet its future climate goals. The quantity of carbon predicted stored in NWLs in these

reports varies widely.

In 2019, a peer-reviewed journal published in the Proceedings of the National Academy of Sciences, titled *Ecosystem management and land conservation can substantially contribute to California's climate mitigation goals*, assessed the potential GHG emissions reductions from changes in ecosystem management, restoration, and conservation. By 2030, on an annual basis, this ambitious scenario could result in reductions as high as 17.9 MMTCO_{2e}.

In 2020, the Lawrence Livermore National Laboratory released a report, titled *Getting to Neutral: Options for Negative Carbon Emissions in California*. This report also found that better management of NWLs could capture and store 25.5 million tons of CO_{2e} per year.

Similarly, The Nature Conservancy (TNC) of California released a report in 2020 titled, *Nature-Based Climate Solutions: A Roadmap to Accelerate Action in California* outlining 12 nature-based solutions and associated strategies suitable for implementation across 28 million acres of California's NWLs. Under the most ambitious scenarios, the report found that these strategies could provide net emission reductions of up to 514 MMTCO_{2e} cumulatively by 2050 and save over \$24 billion in damages by the year 2050. For comparison, California's total economy-wide GHG emissions in 2019 were 418.1 MMTCO_{2e}.

According to another report released in January 2022 by The Climate Center, titled *Setting an Ambitious Sequestration Goal for California's Working Lands: Analysis and Recommendations for Net-Negative Emissions by 2030*, the state could sequester up to 289 MMTCO_{2e} by 2030 and up to 103 MMTCO_{2e} annually thereafter in working lands and some urban lands in California, assuming optimized, best-case conditions.

However, GHG mitigation estimates come with a high degree of uncertainty. The declining health and net GHG emissions of the State's lands are expected to increase through a negative feedback loop as climate change further stresses these systems. With more frequent and intense drought, wildfire, pest outbreaks, and other impacts, it will only become more challenging to achieve climate change mitigation goals.

Comments

- 1) *Purpose of Bill*. According to the author, "As the climate deteriorates and the world rapidly approaches the 1.5 degree celsius threshold of dangerous

warming, California must re-assume its leadership role in the effort to stop global warming. It is critical that we not only sharply reduce emissions but also work to remove existing carbon pollution from the atmosphere using natural solutions. Recent research has shown that California's working lands have the ability to sequester up to 100 MMT of carbon dioxide per year. AB 2649 takes action on these insights by setting into statute a goal of sequestering 60 MMT/year by 2030 through natural carbon removal techniques, ramping up to 75 MMT/year by 2035. Beyond providing key climate benefits, the bill will also increase water retention and soil health, thereby increasing California's drought resilience and food security. In doing so, the state will utilize a time-tested strategy of using ambitious statutory targets to drive climate action across the public and private sectors, as was seen with the Renewable Portfolio Standard and the state's clean vehicle statutes and regulations. These landmark policies have been emulated by numerous jurisdictions, demonstrating how California has led in the past and showing that California can lead again through the enactment of this critical measure."

- 2) *Setting the right target.* The goals set by AB 2649—60 MMT of CO₂ equivalents annually by 2030 and 75 MMT by 2035—are undoubtedly ambitious. As described in the background, numerous reports over the last several years have charted a path for NWL carbon sequestration in California, with estimates on either side of this goal, ranging from roughly 18 MMT CO₂ equivalents per year to over 100.

Perhaps most notably, the May 10th release of the draft scoping plan update from ARB predicts a very different future for NWL carbon sequestration. First, it should be noted that there are currently some discrepancies across the draft scoping plan in modeling NWL carbon stocks, with one section predicting NWLs to serve as an 8 MMT source, and another section reporting them as a 15 MMT sink. Either way, even the more optimistic 15 MMT CO₂e sink by 2045 assumption is still four-fold lower than the 60 MMT CO₂e by 2030 target in this bill.

Does the gap between the draft scoping plan estimate and AB 2649's goals mean the latter is unreasonable? Not necessarily. Setting this target would require the state to undertake major efforts to increase NWL carbon sequestration, but given the multiplicity of cobenefits, doing so may be wise regardless of carbon accounting. While the draft scoping plan is currently open for public comment, initial feedback provided by numerous environmental organizations has criticized the plan for lacking ambition on multiple fronts. Therefore, even though the scoping plan NWL estimates may not align closely with the goals in AB 2649, that is not necessarily a reason to reject the goals

here.

Moreover, AB 2649 does create a process for regularly assessing the progress towards—and barriers preventing—the NWL carbon sequestration targets. Thus, if programs need to be created or revised to achieve these targets, there is a clear process for doing so.

- 3) *We need reductions AND sequestration.* California’s work on reducing GHG emissions today is primarily driven by two targets: SB 32 and Executive Order B-55-18. SB 32 requires a reduction of specified GHG emissions to 40% below a 1990 baseline by 2030, while EO B-55-18 endeavors for carbon neutrality by 2045. There is an important distinction between the two targets that AB 2649 successfully acknowledges; NWL carbon sequestration is important for carbon neutrality, but not for SB 32 compliance.

One major concern often raised with carbon dioxide removal (whether through NWLs or other technological approaches) is that it may be used to justify delaying emission reductions. By explicitly prohibiting the NWL carbon sequestration undertaken pursuant to this bill from counting towards compliance with SB 32 or other similar requirements, AB 2649 successfully addresses this issue and lets the efforts proceed in parallel. Moreover, by not directly counting NWL carbon sequestration against GHG emissions, worries about false equivalence between the two can be somewhat assuaged.

- 4) *Forever is a mighty long time.* Carbon dioxide remains in the Earth’s atmosphere for hundreds of years, helping trap heat all the while. Sequestering carbon in a solid form (such as biomass or soil carbon) is a normal part of the biogeochemical carbon cycle, and removes it from the atmosphere. However, this removal is not necessarily permanent.

What is most important to consider when evaluating NWLs (or other forms of carbon sequestration) as part of broader net-zero GHG ambitions is whether the carbon will be removed from the atmosphere for as long as it would have otherwise remained in it. The need for this is most clear in the context of offsetting emissions. Consider one ton of GHG emissions (say from an oil refinery) that is offset through the purchase of one ton of equivalent NWL carbon sequestration. On paper, this balances out and could be considered carbon neutral. However, in practice, if the NWL carbon sequestration used only stores the carbon for a year, then ultimately the atmosphere would contain two additional tons of GHG emissions, despite being counted as zero.

AB 2649 is not explicit in defining the length of time carbon must be stored.

The definition used for “natural carbon sequestration” simply states “actions that are undertaken on natural and working lands to remove and provide **long-term** storage of atmospheric greenhouse gases in vegetation and soils.” [emphasis added]

There is not an obvious best practice or answer for what “long-term” should mean in this context. California’s offset protocols define permanence as 100 years of reliable storage. However, other efforts to remove carbon from the atmosphere—such as the recently announced advanced market commitment for carbon capture from Frontier Climate—seek carbon sequestration with at least 1,000-year storage. Thus, it may in fact be prudent at this time to not define “long-term” in statute for this work.

The Legislature should certainly pay attention to the permanence of NWL carbon sequestration solutions adopted pursuant to this measure, should it pass. If a more specific definition of “long-term” comes to be used in carbon dioxide removal work, then that could be a topic of future discussion between the Legislature and the implementing agencies.

Related/Prior Legislation

SB 27 (Skinner, Chapter 237, Statutes of 2021), among other things, directs CNRA and other state agencies to establish the Natural and Working Lands Climate Smart Strategy.

AB 284 (R. Rivas, 2021) requires the California Air Resources Board (ARB) to identify a 2045 climate goal, with interim milestones, for the states natural and working lands (NWL) to sequester carbon and reduce atmospheric greenhouse gas (GHG) emissions. AB 284 is currently on the Senate inactive file.

AB 1395 (Muratsuchi, 2021) would have adopted a net zero GHG emissions goal with direction to identify a variety of policies and strategies that support nature-based climate solutions in California so its natural and working lands can be a healthy net sink of carbon dioxide and achieve durable GHG emissions reductions or carbon removals. AB 1395 failed passage on the Senate Floor.

AB 2832 (C. Garcia, 2020) would have required the Natural and Working Lands Climate Change Implementation Plan to include sequestration targets consistent with achieving carbon neutrality. AB 2832 never received a hearing due to the COVID-19 pandemic.

AB 2954 (R. Rivas, 2020) would have tasked ARB with setting, as part of the next

Scoping Plan Update, an overall climate goal for the state's natural and working lands to support the state's efforts to achieve carbon neutrality and climate resilience. AB 2954 died in the Senate Appropriations Committee.

SOURCE: Author

SUPPORT:

350 Bay Area Action
350 Humboldt: Grass Roots Climate Action
350 Silicon Valley
American Farmland Trust
Association of Compost Producers
Audobon California
Audubon California
Better World Group; the
California Association of Resource Conservation Districts
California Climate & Agriculture Network
California Climate and Agriculture Network
California Compost Coalition
California Council of Land Trusts
California Environmental Justice Alliance
California Environmental Voters (formerly Clcv)
California Interfaith Power & Light
California Interfaith Power and Light
California Marine Sanctuary Foundation
California Native Plant Society
California Nurses for Environmental Health and Justice
California Urban Forests Council
Californians Against Waste
Carbon Cycle Institute
Center for Food Safety; the
Center for Race, Poverty, and The Environment
Central California Environmental Justice Network
Central Valley Air Quality Coalition
Ceres
Citizens Committee to Complete the Refuge
Civicwell
Civicwell (formally the Local Government Commission)
Communitiy Water Center
Community Environmental Council
Community Water Center

Conejo Climate Coalition
Dietrick Institute for Applied Insect Ecology
Earthjustice
Elders Climate Action, Norcal and SoCal Chapters
Environment California
Environmental Center of San Diego
Environmental Working Group
Fibershed
Foodwise
Friends Committee on Legislation of California
Friends of The River
Gold Ridge Resource Conservation District
Greenbelt Alliance
Heritage Growers
Indivisible Ventura
Leadership Council for Justice and Accountability
Let's Green Ca!
Little Manila Rising
Los Angeles Neighborhood Land Trust
Los Angeles Waterkeeper
Midpeninsula Regional Open Space District
Mojave Desert Land Trust
Mothers Out Front California
Natural Resources Defense Council
Nature for All
Outward Bound Adventures
Pacific Environment
Pacific Forest Trust
Point Blue Conservation Science
Puentes
Restore the Delta
River Partners
Sacramento Area Congregations Together
Sage
San Diego Green New Deal Alliance
San Francisco Bay Physicians for Social Responsibility
San Joaquin River Parkway & Conservation Trust, INC.
Santa Clara Valley Audubon Society
Santa Clara Valley Open Space Authority
Save Mount Diablo
Sequoia Riverlands Trust
Sierra Cascade Farm
SoCal 350 Climate Action
South Yuba River Citizens League

The Climate Center
The Pew Charitable Trusts
The Wildlands Conservancy
Third City Coalition
Tomkat Ranch
Tree People
Trust for Public Land
Ventura Climate Coalition
Wildcoast
Wildlands Conservancy; the
Zero Foodprint

OPPOSITION:

Agricultural Energy Consumers Association
California Association of Wheat Growers
California Association of Winegrape Growers
California Bean Shippers Association
California Cattlemen's Association
California Cotton Ginners & Growers Association
California Farm Bureau Federation
California Fresh Fruit Association
California Grain and Feed Association
California Pear Growers Association
California Poultry Federation
California Seed Association
California Walnuts
Center for Biological Diversity
Western Agricultural Processors Association
Western Growers Association
Western Plant Health Association

ARGUMENTS IN SUPPORT: According to a coalition of 77 environmental, community, and other groups in support, “As affirmed by the latest report from the IPCC, limiting global warming to the 1.5 degrees Celsius dangerous threshold will require both dramatically cutting emissions *and* removing up to a trillion tons of past climate pollution from the atmosphere. Natural carbon sequestration (NCS) is not a replacement for direct source emission reductions. Recent climate science indicates that California could pass the dangerous 1.5C warming threshold as soon as 2027. Confronting the climate crisis at the speed and scale demanded by the science will require bold action from California and the removal of carbon from the atmosphere will be a pivotal strategy in this effort.

“These goals are very achievable. Recent research found that NCS on California’s working lands could absorb up to 103 MMT CO₂e additional per year. Adding sequestration on natural lands and waters further increases what is possible annually with already proven, scalable, cost-effective, environmentally sound, and just methodologies, including practices informed by traditional ecological knowledge.

“Practices that enable greater sequestration on NWL help restore the health of soils, vegetation and ecosystems. In doing so, they enhance water and food security, increase resilience to increasing extremes such as drought, heat, wildfires and flooding, and stabilize and improve crop yields. These practices can displace the use of synthetic nitrogen fertilizer, which, when overapplied, pollutes air and water in frontline agricultural communities and is a significant source of the potent greenhouse gas, nitrous oxide. Application at scale of compost on agricultural lands can also divert food and other organic waste from landfills, reducing emissions of the short lived climate pollutant methane while providing benefits to soil health.”

ARGUMENTS IN OPPOSITION: According to a coalition of 17 agricultural groups in opposition, “We agree with the author that California’s natural and working lands are the most promising and cost effective solution to the impacts and realities of climate change. Through the implementation of conservation management strategies, including but not limited to manure management, forest and vegetation management, compost application, no or reduced-tillage, whole orchard recycling and cover cropping, California’s farm, ranch, and forest landscapes can serve as a significant carbon sink. However, that management must be guided by thoughtful and realistic goals and processes, not goal setting for the sake of itself. Under the provisions of AB 2649, natural and working lands would be beholden to significant carbon removal goals with overly narrow state provided means to achieve them.

“This coalition questions the capacity of natural and working lands to achieve the 60 to 75 million metric tons (MMT) carbon dioxide (CO₂e) removal goals by 2030 and 2035, respectively, established in this bill. While we respect the author and sponsor’s intention to highlight the capacity of our landscapes, we disagree with many of the estimates relied upon to establish these goals...

“Likewise, this coalition, which also represents forestland managers and rural residents, questions how the goals of AB 2649 would manifest themselves on the State’s natural lands. If the goals of AB 2649 require the State to maximize the capacity for the State’s forests to sequester carbon, would this require a reversal of

the state's current policy on forest management?

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