

**Forests:
Opportunities for
Greenhouse Gas
Emission Reduction in
Sonoma County**

Community Climate Action Plan

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Forests: Opportunities for Greenhouse Gas Emission Reduction in Sonoma County

Introduction

Sonoma County's natural endowment of forestland offers the County a significant opportunity to include its forestlands in countywide efforts to meet its greenhouse gas emission reduction goals. This report provides an overview of the connection between forests and global warming, the general types of forest activities that produce climate benefits, and recommendations that the County should implement to engage the forestland base more effectively to fulfill its climate change objectives. Specifically, these recommendations are:

- 1) Performance of additional research to establish a countywide forest carbon baseline and monitoring process to track overall performance in the forest sector
- 2) Establishment of an overall emissions reduction target and emissions "floor" for the forest sector to complement the County's overall greenhouse gas reduction goals
- 3) Adoption of additional regulatory and incentive-based policies, including zoning, conservation easements and fees, related to greenhouse mitigation and land use planning

Background

Forests are both a part of the global warming problem and part of the solution. Unlike other emission sectors, forests have the unique capacity to remove carbon dioxide (CO₂) from the atmosphere and store this gas as carbon for long periods of time in their biomass (e.g., trunks, branches, leaves, roots, etc). In fact, California's coastal redwoods (sequoia sempervirens), like those in Sonoma County¹, are capable of absorbing and storing enormous amounts of carbon for hundreds, if not thousands, of years.

While forests are a natural CO₂ reservoir, or "sink", they are also a source of CO₂ emissions. On a global level, forests are responsible for roughly 20 – 25% of overall CO₂ emissions, largely to due conversion of forestland and the associated depletion of carbon stocks. When forests are disturbed through events such as conversion to development or agriculture, fire or harvest, the carbon that is stored in tree biomass is emitted to the atmosphere. When harvested for timber, a percentage of forest carbon is

¹ According to Save the Redwoods League there are roughly 3,000 to 4,000 acres of old-growth redwoods left in Sonoma County today, which is substantially less than their historic extent. Personal correspondence with Laura Kindsvater, July 31, 2007.

stored in wood products for periods of time. These wood products decay over time, releasing CO₂ at an average decay rate of 2% annually.²

Given forests' unique capacity to be a greenhouse gas (GHG) emissions source and sink, they can and should play a critical role in global warming mitigation policy both nationally and locally. Through forest activities, such as changes in forest management, forest restoration and conservation, direct CO₂ emissions from forests can be prevented and minimized and additional CO₂ can be removed from the atmosphere and stored in our forests. Restoration and management for retention of bigger trees and older forests³ can result in greater amounts of CO₂ removed from the atmosphere than what would occur otherwise. Furthermore, forests can be protected from conversion to other uses and development patterns can be managed to minimize emissions that result directly from forestland conversion to non-forest uses. Such activities would foster not only the climate benefits of forests, but also the many other public benefits that forests provide – such as water quality, biodiversity, recreation, forest economies and wildlife habitat.

Forest and Climate Opportunities and Actions for Sonoma County

With approximately 480,000 acres of forestland⁴ within its boundaries, including oak woodlands and productive timberland, Sonoma County has an opportunity to take specific measures to incorporate its forestlands in its climate change goals. The County has roughly 375,000 acres of land that is capable of growing timber (and hence, sequestering more carbon), with 230,000 acres that are currently functioning as timberland.⁵ These lands can be conserved to minimize the CO₂ emissions associated with conversion of timberland to other uses, such as vineyards. Additionally, these lands can be restored and managed to remove additional CO₂ from the atmosphere, while also providing wood products and many other public benefits. Likewise, the County can protect and restore its oak woodlands to maintain and enhance the climate service that its oak woodlands provide.

² Turner, D.P. et al. 1995. A carbon budget for forests of the coterminous United States. *Ecological Applications* 5(2):421. Turner, D.P. et al. 1995. A Carbon sequestration by forests of the United States: current status and projections to the year 2040. *Tellus* 47B:232. Harmon, M.E., B. Marks, N.R. Hejeebu. 1996. A users guide to STANDCARB version 1.0: a model to simulate the carbon stores in forest stands. Department of Forest Science, Oregon State University, Corvallis, Oregon.

³ The management for older forests (i.e., greater carbon stocks on the landscape) can include the production of wood products and the remaining carbon value that wood products hold.

⁴ Please note that the term forestland is a broad definition that includes all forest types in the county. Statistics for timberlands and oak woodlands in this paper are subsets of this larger definition and due to differences in definitions, the numbers will not total 480,000 acres

⁵ Sonoma County Permit and Resource Management Department, Memorandum from David Schiltgen: Regulating the conversion of timberlands to nontimber uses, June 20, 2002

Minimize and prevent direct greenhouse gas emissions associated with forestland conversion to other uses

Over the past several years, Sonoma County has witnessed an increasing threat of forestland conversion to non-forest uses, vineyards in particular. Between 1990 and 1997, at least 1,630 acres of dense oak woodlands were converted to vineyards⁶ and from 1989 to 2004, 851 acres of timberland were approved for conversion, primarily to vineyards. More recently, an application to convert approximately 1,700 acres of forestland to vineyards has been submitted to the County, which is still pending. According to Sonoma County's Permit and Resource Management Department, once the time and money has been invested to convert timberland to croplands, these lands are almost never restored to forests.

The climate impacts of this forestland conversion are twofold. First, the conversion of these forestlands results in direct emissions of CO₂ to the atmosphere. Second, the future capacity of the forest to remove additional CO₂ from the atmosphere is significantly diminished because there is very little chance that these lands will be restored to forests based on the history of conversions in Sonoma County. The potential net difference between the overall carbon stored in a vineyard and forestland could be anywhere from 15 tons of carbon per acre to over a thousand tons per acre, depending on several factors, including forest type, age, site class and maturity and management of the vineyard. Such a reduction in overall carbon stocks means net emissions of CO₂ to the atmosphere upon conversion of the forestland to vineyards. Likewise, net emissions can occur upon conversion of forestlands to other kinds of developed uses, like commercial or residential development.

A more refined analysis based on the specific forest carbon inventories of the converted forestland and subsequent carbon sequestered by the vineyard would provide a better estimate of net CO₂ emissions and foregone future sequestration caused by these conversions and depletion of forest carbon stocks. California, at the state level, is conducting a similar analysis pursuant to its recently adopted Global Warming Solutions Act of 2006, and could act as a conceptual model for how Sonoma County could perform these inventories at the County and landowner levels. Such an analysis would also give Sonoma County a better sense of the greenhouse gas emissions it could prevent through existing or new policies that minimize forestland conversion (see research and policy recommendation section).

Remove additional carbon dioxide from the atmosphere by restoring and increasing forest carbon stocks across the landscape

The County could also help meet its greenhouse gas emission reduction targets through activities that restore and increase forest carbon stocks on the landscape in existing forested areas and where forests once existed that are no longer in forest cover. Efforts

⁶ Merenlender, Adina and Brooks, Colin. GIS in Rangeland Management, Vineyard Expansion in Sonoma County: Mapping, Monitoring, and Changing Policies

like this have been taking place in the County and additional ones could be facilitated. For instance, Creighton Ridge near Cazadero is undergoing active reforestation after losing its forest cover to a fire in 1978. The loss of this forest during the fire resulted in direct CO₂ emissions to the atmosphere (i.e., the stored forest carbon was emitted to the atmosphere). Restoration efforts are helping to restore the forest carbon stocks that this area once held, resulting in the absorption of CO₂ from the atmosphere as the restored forest area grows and matures. The County, using established greenhouse gas accounting protocols like those developed by the California Climate Action Registry, could quantify the climate benefits of this reforestation. With the help of other local partners, including the Sonoma County Open Space District, Sonoma Land Trust, and landowners, the County could also identify additional areas in the County that would benefit from reforestation, whether they are previously burned areas that have not recovered or areas that are out of forest cover due to other types of disturbances or activities.

In addition, with roughly 230,000 acres of functioning timberland, the County could implement incentives and policies to encourage forest management practices to increase overall forest carbon stocks in these areas. Management activities to increase overall forest carbon stocks could include restocking under-stocked areas and managing for older forests, while still producing wood products. A recent example from Humboldt County is the van Eck forest management project. This project is registered with the California Climate Action Registry,⁷ and through changes in forest management, the project is anticipated to absorb and store over 500,000 tons of additional CO₂ during the project's lifetime. The project continues to be managed for wood products, but is also providing significant climate benefits, as well as enhanced protection for fish and wildlife. Projects like van Eck are also possible in Sonoma County and could be quantified using the California Climate Action Registry's Forest Protocols.

Research and Policy Recommendations

To incorporate the forest sector most effectively in global warming mitigation strategies, the County should undertake a series of actions to attain a better sense of greenhouse gas reduction potential and monitor progress over time.

Establish a countywide forest carbon baseline and monitoring plan

A countywide baseline and monitoring plan would provide the basis for tracking overall emissions and reductions within the forest sector in Sonoma County. As mentioned earlier, this countywide survey could also identify the most appropriate areas for restoring forests, avoiding or minimizing emissions due to conversion, and changes in forest management to increase overall forest carbon stocks. In this effort, the County could partner with local organizations, such as land trusts, landowners and other individuals to gather information.

⁷ The California Climate Action Registry (www.climateregistry.org) is a voluntary greenhouse gas registry, which was established by California statute as a non-profit organization. The Registry provides standardized greenhouse gas accounting protocols to quantify greenhouse gas emissions from a variety of sectors, including forests, and emission reductions from forest projects.

The countywide forest carbon assessment and baseline could be established through aerial surveys or satellite imagery and substantiated with sample plot data. The County could also join the California Climate Action Registry and use its Forest Protocols to estimate and track changes in overall forest carbon stocks for at least the County's forestlands. Private landowner level emissions and emission reductions can also be effectively monitored through the California Climate Action Registry to the extent landowners join the Registry.

Establish an overall emissions reduction target and “floor” for the forest sector

The County should seek to establish an overall greenhouse gas reduction target for the forest sector to serve as an incentive to develop policies and programs that include the forest sector in climate change mitigation objectives. The forest sector emissions reduction goal could be developed once the county establishes a baseline for its forestlands as described earlier. Such a goal should be reflected as an overall cumulative forest carbon stock number to account for the permanence or sustainability of reductions within the forest sector. Once the County attains a better sense of where reduction opportunities exist across the landscape, sub-goals or targets, based on particular forest activities, could also be established (e.g., tons of reductions pursuant to reforestation, changes in management or conservation (avoided conversion)).

The County should also consider establishing a forest “floor” or cap for the forest sector to protect against forestland conversion and substantial depletion of forest carbon stocks. Such a floor would effectively limit the amount of human-caused emissions from the forest sector by 1) limiting the amount of forestland that can be converted to other uses and 2) requiring emissions mitigation for any lands that are converted to a non-forest use.

The County could establish a floor by enhancing, or using as a model, its recent ordinance (No. 5651) to mitigate timberland conversion. Such limitations on conversion could be extended to include CO₂ emissions with a 1:1 ratio. The County could also amend the general plan and revise the timber production zoning district to disallow conversion of timberland and do comparable zoning for oak woodlands and other critical natural resource areas.

Facilitate the increased use of conservation easements through zoning, dedication of public funds and mitigation fees

The increased use of conservation easements in the County to minimize forestland conversion and encourage greater overall forest carbon stocks could provide significant, permanent climate benefits. To encourage greater use of easements, the County could enhance zoning laws to promote cluster development to minimize conversion pressure on forested lands and identify and establish “climate reserve” zones on forestlands that are secured with conservation easements. The Sonoma County Open Space District and other local land trusts could be key partners to help identify and establish these climate reserve zones. To quantify the climate benefits of these reserve zones, the county could

rely on its countywide monitoring as described earlier or it could register these lands with the California Climate Action Registry (or some combination of the two).

To support an overall cap on forest-based emissions, the County can require the quantification and mitigation of CO₂ emissions that result from forestland conversion to non-forest uses. As mentioned earlier, recent proposals to convert forestlands to vineyards could include requirements of CO₂ mitigation either directly or through payment of a fee that would be invested in mitigation projects. Such mitigation projects should, among other things, be registered and certified with the California Climate Action Registry to ensure that any permitted mitigation produces real, permanent and verifiable reductions. Furthermore, mitigation requirements should not only consider direct emissions associated with conversion but also any foregone future climate benefits (additional sequestration) that the forest could have provided.

The County could look to its jobs-housing linkage fee as a model for conversion mitigation fees. Similar to this program, a fee could be assessed for new residential development (excepting low-income and high density) or development to other uses. This fee, in turn, can be dedicated to a fund to invest in forest-based GHG mitigation projects, which may include a “climate reserve” as mentioned earlier.

Adopt the Coast Forest District’s Southern Subdistrict harvest rules

The County could also seek to incorporate the Coast Forest District’s Southern Subdistrict harvest rules of the California Forest Practice Rules. Adopting the special harvesting methods for this subdistrict would encourage the retention of greater overall forest carbon stocks on timberlands compared to the current applicable rules for Sonoma County.

Conclusion

As Sonoma County seeks to reduce its carbon footprint and meet its greenhouse gas reduction targets, it should take advantage of greenhouse gas reduction opportunities that are available in the forest sector. The County can include its forestlands in climate change mitigation policies and programs. To do this most effectively, the County will need to take steps to gather forest carbon data to establish a countywide forest carbon baseline and target. It should also adopt an accounting and monitoring process to track carbon dioxide emissions and reductions from forests. Some of the most effective and accessible policy tools to achieve reductions in the County include zoning ordinances, conservation easements and mitigation fees. These actions would foster significant climate benefits, as well as a host of other much-needed public benefits.