Carbon Farm Plan

for

[INSERT FARM NAME]

City, County, CA

Month, year

[FARM LOGO & PHOTO]

A whole farm approach to optimize carbon capture on working landscapes, based on the Carbon Farm Planning process created by the Carbon Cycle Institute with Marin Resource Conservation District and online tools developed by researchers at Colorado State University and the United States Department of Agriculture Natural Resources Conservation Service.

Prepared by:

Planner names

Organization

Email

Phone number

Landowner Acceptance Statement and Signature:

I accept the completed Carbon Farm Plan as thorough and satisfying my objectives.

Landowner Signature:

Date:

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Introduction

Largely taken for granted, carbon has been absent from discussion of elements essential to agriculture and the management of working lands; yet carbon is the basis for all agricultural production. Carbon enters the farm system from the atmosphere through the process of plant photosynthesis, which uses the energy of sunlight to capture carbon dioxide from the air and combine it with water and nutrients from the soil to produce the products of agriculture. In addition to food, fiber, fuel and flora, photosynthates (sugars) produced by the crop are moved to the soil: directly as exudates from plant roots; indirectly through plant roots to beneficial soil mycorrhizal fungi; via the sloughing of plant parts such as leaves and roots, and through deposition on the soil surface of above ground plant parts and the bodies and manures of animals.

In addition to its transformation from carbon dioxide into the sugars, cellulose and lignin of the harvestable crop, carbon can also be beneficially stored long-term (decades to centuries or more) in soils and woody vegetation in a process known as terrestrial carbon sequestration. While the importance of carbon to soil health and fertility has long been understood, its significance has begun to be increasingly recognized in recent years. Today, managing for increased soil organic matter, which is about 50% carbon, is the core of the USDA-Natural Resources Conservation Service (NRCS) healthy soils program and the California Department of Food and Agriculture's 2015 Healthy Soils Initiative.

While Carbon Farm Planning includes identifying opportunities to decrease the production of greenhouse gases on farm whenever possible, Carbon Farming involves implementing on-farm practices that increase the rate of photosynthetically-driven transfer of carbon dioxide (CO_2) from the atmosphere to plant productivity and/or soil organic matter. Enhancing working land carbon, whether in plants or soils, results in beneficial changes in a wide array of system attributes, including; soil water holding capacity and hydrological function, biodiversity, soil fertility, and resilience to drought and flood, along with increasing agricultural productivity. Increasing carbon capture on working lands also helps to slow rising levels of carbon dioxide and other greenhouse gases in the atmosphere, currently contributing to climate destabilization and unpredictability through global warming.

What is Carbon Farming?

Technically, all farming is "carbon farming," because all agricultural production depends on plant photosynthesis to move CO_2 out of the atmosphere and into the plant, where it is transformed into agricultural products, whether food, flora, fuel or fiber. Carbon entering the farm from the atmosphere can end up in several locations: in the harvested portion of the crop, in the soil as root exudates and soil organic matter, in "waste" materials such as compost or manure, in standing carbon stocks, such as grassland vegetation or woody perennials (trees, vines, orchards, etc.), or in other permanent woody or herbaceous vegetation such as windbreaks, vegetated filter strips, or riparian systems, forests and woodlands.

While all farming is completely dependent upon atmospheric CO_2 in order to produce its products, different farming practices, and different farm systems, can lead to very different amounts of on-farm carbon capture and storage. The Carbon Farm Planning (CFP) process differs from other approaches to land use planning by focusing on increasing the capacity of the working farm or ranch to capture carbon and to store it beneficially; in the crop, as standing carbon stocks in permanent vegetation, and/or as soil organic matter.

While agricultural practices often lead to a gradual loss of carbon from the farm system, particularly from working land soils, CFP is successful when it leads to a net increase in farm-system carbon. By increasing the amount of photosynthetically captured carbon stored, or "sequestered," in long-term carbon pools on the farm or ranch, including soil organic matter, perennial plant roots and standing woody biomass, carbon farming results in a direct reduction in the amount of CO_2 in the atmosphere, while supporting crop production and farm resilience to environmental stress, including flood and drought.

On-farm carbon in all its forms (soil organic matter (SOM), perennial and annual herbaceous vegetation, plant roots, root exudates and standing woody biomass), contains energy, which originated as the solar energy used by the plant to synthesize carbohydrates from atmospheric CO2 and water and nutrients from the soil. The carbon in plants and SOM can thus be understood as the embodied solar energy that drives on-farm processes, including the essential soil ecological processes that determine water and nutrient holding capacity and availability for the growing crop. **Consequently, CFP places carbon at the center of the planning process and views carbon as the single most important element, upon which all other on-farm processes depend.**

Carbon Farm Planning (CFP) is based upon the USDA Natural Resource Conservation Service (NRCS) Conservation Planning process, **but uses carbon and carbon capture as the organizing principle around which the Farm or Ranch Plan is constructed.** This simplifies the planning process and connects on-farm practices directly with ecosystem processes, including climate change mitigation and increases in on-farm climate resilience, water holding capacity, soil health and agricultural productivity.

The Carbon Farm Planning Process

Increasing on-farm carbon capture as biomass and, most importantly, soil carbon, is the resource concern of overriding importance for the CFP process. Like NRCS Conservation Planning, CFP begins with an overall inventory of natural resource conditions on the farm or ranch, but with a focus on identification of opportunities for reduction of greenhouse gas (GHG) emissions and enhanced carbon capture and storage by both plants and soils. Building this list of opportunities is a brain-storming process; it should be as extensive as possible, including everything the farmer and planners can think of that could potentially reduce emissions and capture and sequester carbon on the farm. While actions proposed in the Plan should reflect the inherent limits of the farm ecosystem, financial considerations should not limit this initial brainstorming process, as one goal of the CFP process is to identify potential funding, above and beyond existing resources, to realize implementation of the Plan.

During this process, a map, or maps, of the ranch is/are developed, showing existing ranch infrastructure and natural resource conditions. These maps can be used to locate potential carbon capture practices on the ranch and to envision how the ranch may be expected to look years down the road, following plan implementation. Next, the carbon benefits of each practice, as potentially applied at the farm scale, are quantified using the on-line USDA greenhouse gas model, COMET-Farm (cometfarm.nrel.colostate.edu), COMET-Planner, (comet-planner.com), or similar tools and data sources, to estimate tons of carbon dioxide equivalent (CO2e) that would be 1) avoided or 2) removed from the atmosphere and sequestered on farm by implementing each practice. A list of potential practices and their on-farm and climate mitigation benefits is then developed.

Finally, practices are prioritized based on needs and goals of the farm or ranch, choosing high carbon-benefit practices wherever possible. Economic considerations may be used to filter the comprehensive list of options, and funding mechanisms are identified, including; cap and trade, CEQA, or other greenhouse gas mitigation offset credits, USDA-NRCS and other state and federal programs, and private funding. Projects are implemented as funding, technical assistance and farm scheduling allow. Over time, the CFP is evaluated, updated, and altered as needed to meet changing farm objectives and implementation opportunities, using the fully implemented plan scenario as a goal or point of reference. Where plan implementation is linked to carbon markets or other ecosystem service markets, periodic Plan evaluation may be tied to those verification or monitoring schedules.

Additional information about Carbon Farming can be found on line at: www.marincarbonproject.org and
www.carboncycle.org.

This introduction to carbon farming is adopted from previous plans developed by Jeff Creque and Lynette Niebrugge at the Carbon Cycle Institute.

History of [Insert farm name]

I. *History of current farm management*
II. *History of prior land management (if known)*
III. *Property and operations description*
   A. *Provide a landscape setting description explaining how surrounding management affects the property as well as how the participant's actions impact their neighbors. Consider aesthetic quality, privacy, wildlife movement and habitat, noxious weeds, urban encroachment, wildland fire interface, if applicable.*
   B. *Are there any existing carbon beneficial practices? If so, include a table of these practices and a map*
IV. *Site location maps (a farm map inset on a map of the watershed is particularly helpful for this section)*

Environmental conditions

Watershed and hydrology

Find watershed information here: https://mywaterway.epa.gov/

Vegetation

Wildlife

Ecological Sites

Are there different ecosystem types on the property? Consider making an ecological site map like the one to the right that includes slope, soil type, streams, and wetland areas. <u>This section is not required but can be helpful if the area spans multiple landscape types.</u> Web Soil Survey may have ecological site data in addition to soils data and auto-creates a map based on map unit areas- this is a good alternative to making your own map if the data are available.

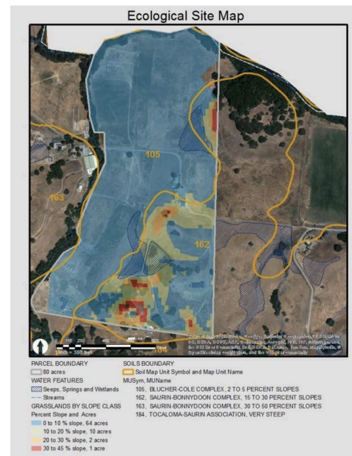

Figure 3. Using Soils and Slope to Indicate of Ecological Sites, Gilardi Family Farm (see appendix B, NRCS Soil Report)

This map shows ecological sites, defined by slops, soil and aspect variables, overlaid on an aerial image of the subject farm.

Experiential knowledge and visual assessments allow land managers and planners to group landscape attributes into "ecological sites." Similar soils, slope, elevation, vegetation, wildlife habitat, and agricultural management can be considered part of one ecological site. Understandably, many operations span multiple landscape types and therefore require multiple ecological site distinctions. Planning decisions take these differences into account to ensure implementation yields the most significant results for specific practices on specific land types. For this plan, ecological site delineations were developed based on [Web Soil Survey data?, vegetation type, soil type, slope, elevation, wetland status, etc.]. These sites include the following which can also be found in Figure 1:

- Ecological site 1
- Ecological site 2
- ... etc.

Climate

[Begin this section by describing local climate and any recent patterns.]

The Sacramento Valley Region faces numerous climate-related challenges, many of which are already present to varying degrees and are anticipated to intensify into the future. Warming temperatures, drier landscapes, decreased precipitation in the Valley and upper watershed, less predictable drought, subsidence, habitat loss, and increased fire risk are among risks named in California's Fourth Climate Change Assessment for the Sacramento Valley. Potential paths forward include planting more heat tolerant crop varieties when possible, reducing carbon and methane emissions through climate smart agriculture, and planting pollinator and wildlife habitat to maintain ecosystem biodiversity and crop success.

No one solution will be able to fully address negative climate impacts on agriculture, but integrating multiple working lands strategies, including carbon farming at [insert farm name], has the potential to offset some of the harm and stress on the agroecosystem of the Sacramento Valley.

Soils

I. Describe soil classification from web soil survey
***II. Soil maps:** Include map unit symbol delineations and ecological site shading (if available).*
III. Results from initial soil health assessment (Can be moved to appendix)

Resource concerns

List grower resource concerns in this section. Find specific language related to possible resource concerns at: https://www.farmers.gov/conservation/concerns-tool. Additional categories such as human and climate can be included in carbon farm plan resource concern lists.

Resource concerns are items identified on the ranch that may be preventing the landowner from reaching their goals and objectives. The resource concerns are based on factors inhibiting the full potential of the soil, water, plants, animals, or economics of the ranch. For the purpose of this plan, the principal resource concern to be addressed is the potential for carbon sequestration. Additional resource concerns are also identified through the planning process that may have a secondary cause and effect relationship with carbon capture potential. Through multiple site visits, discussions with stakeholders, and field assessments the following resource concerns were identified.

1. Concern 1 and where it is identified
2. Concern 2 and where it is identified
3. Concern 3 and where it is identified
4. .... etc.

Goals and objectives

In the [MONTH] of [YEAR], [FARM NAME] sought assistance from [RCD] to develop a Carbon Farm Plan for their farm/ranch. This plan is developed with the intent to meet the following goals and objectives for [farm name].

5. Goal 1
6. Goal 2
7. Goal 3
8. .... etc.

Plans and specifications

Identify potential carbon farm practices. They may fall into the following categories. Each section should include a paragraph describing the spatial extent of current and proposed management practices. Suggested species lists, if relevant, can be included in an appendix. Consider using the Calscape planning tool or EFOTG for plant list development if needed. If you have an additional CPA or DIA included as part of this carbon farm plan, create a *sub-category within this section to provide more detail; refer to the individual plan templates here for further instruction.*

Carbon farming opportunities and outlined plans are categorized into the following subsections: Agroforestry, riparian systems, croplands, and rangeland or pasture systems. A comprehensive map of the proposed practices is included below, followed by plan details. A summary of the calculated carbon benefits offered by these practices is provided in the Carbon Benefits section of this carbon farm plan. COMET-Planner software is used to provide these estimates of GHG benefits.

[INSERT ONE MAP OF ALL PROPOSED MANAGEMENT PRACTICES]

Agroforestry

Agroforestry is the practice of integrating trees and woody shrubs into crop and animal production systems. Agroforestry practices can: increase on-farm biological and structural diversity; help control pests by providing habitat for beneficial insects and birds; protect crops and livestock by creating microclimates to reduce cold and heat stress on animals by providing shade and shelter; slow runoff to reduce flooding, soil erosion, and water pollution while increasing water infiltration; reduce crop evapotranspiration by reducing wind speed; and provide multiple products, including forage, fruit, nuts, timber, fence posts and wildlife habitat (Table 1). *Language adopted from previous Carbon Cycle Institute carbon farm plans.*

Agroforestry practices that will be beneficial to [insert farm name] include:

- Hedgerows, windbreaks & shelterbelts
- Silvopasture/Tree & Shrub Establishment
- Forest farming
- Alley cropping systems
- Riparian forest buffers
- Etc.

Table 1. Reducing On-Farm Climate Risk through Agroforestry
This table lists climate change risks and how implementing certain agroforestry practices can increase the farm's resilience to those changes. Information is from the USDA National Agroforestry Center.

Risk	Adaptation	Agroforestry Practice
Intense rainfall events	Slow water runoff to reduce flooding, soil erosion, and water pollution	Riparian forest buffers; alley cropping
Increased temperatures	Reduce heat stress on animals by providing shade	Silvopasture
Increased frequency and intensity of drought	Reduce evapotranspiration by reducing windspeed; trap for soil	Windbreaks

	moisture improvement	
Increased storm intensity (wind & precipitation)	Protect crops, livestock and pasture from wind	Windbreaks; alley cropping
Changes in length of growing season due to temperature and precipitation	Protect crops and livestock by creating microclimates	Windbreaks; alley cropping; forest farming
Winter storms and cold temperature extremes	Reduce cold stress on animals by providing shelter	Silvopasture; windbreaks
Increased insect and disease problems	Controls pests by providing habitat for beneficial insects	Windbreaks; riparian forest buffers; alley cropping
Increased possibility of crop failure due to other risks	Reduce total crop loss by increasing crop diversity	All agroforestry practices

https://www.fs.usda.gov/nac/assets/documents/workingtrees/infosheets/WTInfoSheet-ClimateAdaptation.pdf

HEDGEROW, WINDBREAKS & SHELTERBELTS

Hedgerows, windbreaks, and shelterbelts are an establishment of dense vegetation in a linear design to achieve a natural resource conservation purpose such as providing habitat for terrestrial wildlife, pollinators, and beneficial insects, reducing wind and drifting dust and noise, increasing carbon storage in biomass and soils, or boundary delineation (NRCS, CPS 422).

These listed purposes and additional co-benefits can be achieved at [Insert farm name] by planting woody species like trees and shrubs along [designate field margin]. This planting will help achieve the identified goals of [insert relevant goals]. The hedgerow will be approximately [length] and [width]. Species can include: [possible species list].

EXAMPLE:

Table 2. Proposed location and extent for new hedgerows and shelterbelts (shaded fuel breaks) along SPR crop fields

Proposed hedgerow/shelterbelt	Linear distance (ft)	Width (ft)	Area (ac)
Hedgerow – Mill Creek field	175	8	0.03
Hedgerow – Jacobs field	820	8	0.15
Shelterbelt – Swanton Rd	3,900	6	0.53
TOTAL			**0.71**

Silvopasture/Tree & shrub establishment

Silvopasture has three components, trees, forages, and livestock. Silvopasture is the establishment and management of desired trees and forages to provide shade and shelter for livestock, improve water quality, reduce erosion, enhance wildlife habitat, improve biological diversity, improve soil quality, provide habitat for beneficial insects and pollinators, and increase carbon sequestration and storage (NRCS, CPS 381). Silvopasture can be implemented anywhere that is suitable for the desired plant species and livestock but will require intensive management in the first few years of establishment.

Integrating trees into pastures at [Insert farm name] could provide a number of benefits to grazing livestock, as described above, as well as increasing carbon capture on those pastures.
Planting can take place [suggested areas]. Species can include: [possible species list].

[INSERT MAPS of existing and proposed management (can also be moved to summary or appendix)]

Riparian systems

Stream restoration projects typically focus on streambank stabilization, in-stream grade control structures and vegetation establishment. As structural practices and planted shrubs and trees mature over multiple decades, atmospheric carbon is sequestered in both the soil and vegetation within the riparian area (Lewis et al 2015). Consistent with the relatively high productivity of riparian systems, carbon capture in the soils and woody vegetation of these systems is typically several times greater than in the woodland, grassland or cropland of associated upland areas (Lewis et al 2015, Leonard et al 1997). *Language adopted from previous Carbon Cycle Institute carbon farm plans.*

Riparian system practices that will be beneficial to [insert farm name] include:

- Stream habitat improvement and management
- Riparian forest buffer
- Riparian herbaceous cover
- Critical area planting,
- Prescribed grazing
- Supporting infrastructure (temporary or permanent fencing; off-stream water)
- Etc.

Stream Habitat Improvement and Management

This practice is used to improve, restore, or maintain the ecological functions of a stream and its adjacent floodplain and riparian area by evaluating and addressing factors that impair stream function and structure. Stream habitat improvement can take place in all streams and their associated backwaters, floodplains, wetlands, and riparian areas with impaired habitat. Note that fish and wildlife habitat conservation and streambank stabilization fall under separate NRCS CPS. This practice may be used in conjunction with other practices to address multiple resource concerns at the site. *Guidance language adopted from NRCS CPS 395.*

Implementing stream habitat improvement and management at [Insert farm name] could benefit water quality and stream health as mentioned above, as well as increase carbon capture in waterways. Stream restoration can take place [suggested areas]. Planned activities include: [possible associated activities]. Details of riparian forest/herbaceous buffer planting are specified below.

Riparian Forest Buffer

A riparian forest buffer is an area predominantly covered by trees and/or shrubs located adjacent to and up-gradient from a watercourse or water body. This practice applies to areas adjacent to permanent or intermittent streams, lakes, ponds, wetlands, and areas associated with ground water recharge. The riparian forest buffer is a multipurpose practice designed to accomplish one or more of the following:

- Reduce transport of sediment to surface water, and reduce transport of pathogens, chemicals, pesticides, and nutrients to surface and ground water
- Improve the quantity and quality of terrestrial and aquatic habitat for wildlife, invertebrate species, fish, and other organisms
- Maintain or increase total carbon stored in soils and/or perennial biomass to reduce atmospheric concentrations of greenhouse gasses
- Lower elevated stream water temperatures
- Restore diversity, structure, and composition of riparian plant communities

Guidance language adopted from NRCS CPS 342.

These listed purposes and additional co-benefits can be achieved at [Insert farm name] by planting woody species like trees and shrubs along [designated riparian zone]. This planting will help achieve the identified goals of [insert relevant goals]. The buffer will be approximately [length] and [at least 35 feet in width]. Species can include: [possible species list].

EXAMPLE:

Table 3. Proposed location and extent for riparian forest buffers along farm waterways

Proposed riparian forest buffer	Linear distance (ft)	Width (ft)*	Area (ac)
Backwater	400	35	0.32
Main waterway	100	35	0.08
TOTAL			**0.4**

**NRCS requires the width of riparian forest buffers to be at least 35 feet*

Riparian Herbaceous Cover

Riparian herbaceous cover is establishment and maintenance of grasses, sedges, rushes, ferns, legumes, and forbs tolerant of intermittent flooding or saturated soils and that are established or managed in the transitional zone between terrestrial and aquatic habitats. This practice is used on lands along water courses or at the boundary of water bodies or wetlands where the natural or desired plant community is dominated by herbaceous vegetation, the ecosystem has been disturbed and the natural plant community is missing, changed, or has been converted to agricultural crops, lawns, or other high maintenance vegetation, or invasive species dominate.

The purposes of this practice include:

- Provision of food, shelter, shading substrate, access to adjacent habitats.
- Nursery habitat and pathways for movement by resident and nonresident aquatic, semiaquatic, and terrestrial organisms.
- Improvement and protection of water quality.
- Stabilization of streambanks and shorelines.
- Increased net carbon storage in the biomass and soil.

Guidance language adopted from NRCS CPS 390.

These listed purposes and additional co-benefits can be achieved at [Insert farm name] by planting herbaceous species along [designated riparian zone]. This planting will help achieve the identified goals of [insert relevant goals]. The planting area will be approximately [length] and [2.5x the width of the stream or at least 35 feet in width for water bodies]. Species can include: [possible species list].

EXAMPLE:
Table 4. Proposed location and extent for riparian herbaceous cover along farm waterways

Proposed riparian herbaceous cover	Linear distance (ft)	Width (ft)*	Area (ac)
Backwater	400	35	0.32
Main waterway	100	35	0.08
TOTAL			**0.4**

**NRCS requires the width of riparian forest buffers to be at least 2.5x the width of the stream or at least 35 feet in width for water bodies*

[INSERT MAPS of existing and proposed management (can also be moved to summary or appendix)]

Cropland systems

Croplands provide critical opportunities to try new management practices without committing to long-term changes to the landscape. Maintaining the ability to adapt to changing markets is a priority at most operations. Proposed practices will have to balance economic feasibility with carbon benefits. Many of the practices listed below are management changes as opposed to infrastructure changes, so they can be scaled up or back as the needs and crops of the farming operation shift. As such, maps represent the plans at the time of this carbon farm plan creation (month, year) and should be altered as needed on a year-to-year basis. Importantly, because these are primarily management practices that will need to be executed by season, equipment availability and/or reliable contractors will be crucial for specific practice implementation directions.

Cropland system practices that will be beneficial to [insert farm name] include:

- Reduced tillage
- Cover crops
- Nutrient management

- Compost application or other soil carbon amendments
- Conservation crop rotation
- Livestock integration
- Etc.

Reduced tillage

Reduced tillage and subsequent residue management is described by NRCS CPS 345 as managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round while limiting soil-disturbing activities used to grow and harvest crops in systems where the field surface is tilled prior to planting. Reduced tillage may require access to specialty equipment to plant and harvest with minimal impacts on topsoil structure.

The purpose of reduced tillage is to:

- Reduce sheet, rill, and wind erosion and excessive sediment in surface waters (soil erosion).
- Reduce tillage-induced particulate emissions (air quality impact).
- Improve soil health and maintain or increase organic matter content (soil quality degradation).
- Reduce energy use (inefficient energy use).

Guidance language adopted from NRCS CPS 345.

Reduced tillage is possible for croplands at [insert farm name]. Some areas and crops may be more suitable for reduced or no-till year-to-year. Reducing tillage will help achieve the identified goals of [insert relevant goals] [Insert plans for equipment access. Will they need to contract this service?]

If 10% (approximately X acres) of the cropland was converted from intensive tilling to reduced tilling, the CO_2e reduction would be about [amount of CO_2e according to COMET] MT/year. If taken a step further, converting X acres of intensive tilling to no-till (CPS 329) would result in X tons of CO_2e/year sequestered. If X acres of reduced-till cropland was converted to no-till, the savings would be X tons of CO_2e annually.

Cover crops

Cover crop and resident vegetation can be cultivated in both croplands and orchard systems to enhance ecosystem benefits and carbon sequestration. Cover crops are grasses, legumes, and other forbs planted for seasonal vegetative cover and can support one or more of the following purposes:

- Reduce sheet, rill, and wind erosion.
- Maintain or increase soil organic matter.
- Improve soil aggregate stability.
- Improve habitat for soil organisms.
- Reduce water quality degradation by utilizing excess soil nutrients.
- Reduce weed and plant pest pressure.
- Improve moisture management.
- Reduce soil compaction.
- Supply nitrogen to the subsequent crop.
- Improve habitat for pollinators, beneficial organisms, or natural enemies of crop pests.

Guidance language adopted from NRCS CPS 340.

Management factors like cover crop termination method and timing are also crucial in meeting identified goals. Producers may want to trial cover cropping on a smaller field or area before committing a whole field to transitioning into cover crop use.

[insert farm name] can plant cover crop in their croplands/orchard vineyard to achieve the identified goals of [insert relevant goals]. Some areas may require different cover crop mixes year-to-year based on their crop rotations so further design and implementation plans are recommended when cover cropping is pursued. [Insert plans for equipment access. Will they need to contract this service?]

To meet carbon farming goals, [insert farm name] should plant a mix of X on their [insert location] during [season]. Termination is planned for [season] and will be completed using [termination method]. COMET-Planner estimates the CO2e reduction resulting from cover cropping this field would be about [amount of CO2e according to COMET] MT/year.

Nutrient management

Nutrient management is grounded in four key principles: ensuring that the right nutrients are applied in the right place, at the right time, and at the right rate. The goal of this practice is to ensure plant health and productivity while at the same time reducing excess nutrient loss, emissions of particulate matter, and release of GHG and ozone precursors. Nutrient management can be incorporated wherever amendments are used. In the most fundamental sense, it helps optimize nitrogen, phosphorus, and potassium by accounting for all significant sources and removal of these nutrients. To properly track nutrient levels, all inputs and removal of nutrients should be considered. Sources include irrigation water, fertilizers/amendments, nutrients within the root zone, and crop residues. Removal includes leaching, erosion, volatilization and crop harvest. *Guidance language adopted from Yolo RCD carbon farm plan (Higgins and Ferguson, 2024).*

[Insert current fertilizer application rates and locations] (Table 5).

Nutrient management at [insert farm name] should focus on [locations and inputs] to meet the identified carbon farming goals of [insert relevant goals]. [insert farm name] can [insert planned changes]. COMET-Planner estimates the CO2e reduction resulting from these changes would be about [amount of CO2e according to COMET] MT/year.

Table 5. Typical fertilizer source and rate by crop (current practices as of date, year).

Crop	Fertilizer source	Rate

Compost and other soil carbon amendments

Compost use on cropland is a widely accepted agronomic practice that enables the partial or complete elimination of synthetic fertilizer use and results in improvement in a wide range of soil and water quality factors, as well as a reduction in GHG emissions from cropland. Soil aggregation and aggregate stability, fertility, water holding capacity, aeration, organic matter and resilience in the face of drought and flood are all improved by compost applications to cropland.

Biochar is another soil carbon amendment gaining popularity in the Sacramento Valley. Biochar is a product of the pyrolysis of waste biomass. This low-oxygen, high-temperature (300-700 ºF) process creates carbon rich char from biomass by locking carbon in solid substances rather than burning it off as carbon dioxide or letting materials decay and release carbon into short-term pools. Applying biochar to soils presents an opportunity to integrate carbon into the terrestrial ecosystem where it can be stored as a long-term carbon sink. Further, recent data find biochar may be a useful soil amendment in agriculture, increasing soil water and nutrient holding capacity, benefitting crop yields, and reducing soil GHG emissions (Lehmann et al., 2006; Mukherjee & Lal, 2013; Zhang et al., 2020). Creating biochar from on-farm biomass waste presents an opportunity to create circular carbon sequestration benefits.

Carbon sequestration effects of compost and biochar applications to cropland are highly variable because cropland management is itself highly variable, including variation among tillage practices, crop species, cover crops, irrigation, and post-harvest grazing practices, among many other factors. Accordingly potential increases in cropland soil carbon (and thus CO2e sequestered) in response to soil carbon amendment application were evaluated solely on the carbon content of the added compost or biochar. Because the value of these applications increases when combined with other carbon-beneficial soil management practices, such as minimizing tillage, using cover crops rather than bare fallows, and practicing crop rotations, this approach to quantification of CO2e sequestered through compost and biochar application to cropland is considered conservative.
Language adopted from a 2016 carbon farm plan developed by Jeffrey Creque (Carbon Cycle Institute) and staff at Fibershed.

Soil carbon amendments at [insert farm name] should focus on [locations and inputs] to meet the identified carbon farming goals of [insert relevant goals]. [insert farm name] can [insert planned changes] to achieve an estimated CO2e reduction of [amount of CO2e according to COMET] MT/year.

Table 6 & 7. SOC calculations from 2024 Carbon Amendment Calculator developed by Carbon Cycle Institute Staff.

Biochar						
Crop	Acres	Frequency of application	% carbon	Rate of application	**Annual CO2e sequestered**	**20-yr CO2e sequestered***

Compost						
Crop	Acres	Frequency of application	% carbon	Rate of application	**Annual CO2e sequestered**	**20-yr CO2e sequestered***

**Assumes that 25% of compost carbon is lost per year. Through repeated applications of compost, over time a new steady state is reached. The long-term GHG benefit above represents the average increase in carbon in this new steady state, as long as repeated compost applications are continued. The GHG benefit per compost application event is calculated over 10 years (the long-term GHG benefit divided by 10 years divided by application frequency).*

Conservation crop rotation

Croplands with at least one annual crop are suitable for conservation crop rotation. This practice refers to the incorporation of multiple plant species into the annual crop rotation cycle. A rotation of crops reduces or eliminates bare soil or fallow fields. This improves soil health and builds organic matter, reduces erosion, increases soil moisture, and supports wildlife. Pests, synthetic fertilizer needs, and salt or chemical build up can also be reduced. *Guidance language adopted from NRCS CPS 328.*

At [insert farm name] there were [#] acres in the area of the property that were frequently fallowed in the last 10 years (fallowed for at least three seasons). [#] acres of this land can be addressed with a conservation crop rotation which would equate to [#] MT/year of CO2e storage.

Table 8. Planned conservation crop rotations at [insert farm name].

Location	Acres	Sequence of crops	Purpose of crop rotation	Tillage

Livestock integration

In nature, plants, animals, and soil coexist and have mutually beneficial relationships. Animals graze plants and deposit nutrient rich manure onto soil which then feeds more plant life. Livestock integration is a way of implementing a mixed presence of plants and animals to recreate these natural ecosystem processes. These natural processes can benefit animal welfare and nutrition, soil health, can minimize synthetic inputs, and may even help with reducing wildfire vulnerability.

Livestock integration can be part of cover cropped systems as termination or silvopasture systems as grazers. At [insert farm name], livestock can be integrated into [systems] for the purpose of [purposes]. A total of [#] acres will be grazed periodically by [animal type] sourced from [source; rented or owned?]. Carbon benefits are not as clearly modeled as for other practices, but nutrient rich manure inputs to soil will only increase soil carbon over time. Additional resources can be found at the Community Alliance for Family Farmers website.

If farmers own their livestock, livestock integration is also a method of income diversification. Grazing animals on croplands utilizes the land for multiple income streams (meat, dairy, or eggs and cash crop). This diversification makes the farm less susceptible to any market fluctuations of one crop and increases the output per acre of the farm.

[INSERT MAPS of existing and proposed management (can also be moved to summary or appendix)]

Orchard or vineyard systems

The woody biomass in orchards lends them naturally to longer-term carbon sequestration. With infrequent changes to the primary crop, farmers have ample opportunity to incorporate practices around these perennial systems. In the last decade, cover cropping has grown in popularity in vineyard and orchard systems due to the available alley space between trees and the numerous benefits the cover crop provides. Combining cover crops with additional carbon farming practices can amplify climate benefits on an orchard and build soil health across the whole ecosystem.

Orchard system practices that will be beneficial to [insert farm name] include:

- Hedgerow, windbreaks & shelterbelts
- Cover crops
- Nutrient management
- Compost application or other soil carbon amendments
- Livestock integration
- Etc.

Hedgerow, windbreaks & shelterbelts

Hedgerows, windbreaks, and shelterbelts are an establishment of dense vegetation in a linear design to achieve a natural resource conservation purpose such as providing habitat for terrestrial wildlife, pollinators, and beneficial insects, reducing wind and drifting dust and noise, increasing carbon storage in biomass and soils, or boundary delineation (NRCS, CPS 422).

These listed purposes and additional co-benefits can be achieved at [Insert farm name] by planting woody species like trees and shrubs along [designate field margin]. This planting will help achieve the identified goals of [insert relevant goals]. The hedgerow will be approximately [length] and [width]. Species can include: [possible species list].

EXAMPLE:

Table 9. Proposed location and extent for new hedgerows and shelterbelts (shaded fuel breaks) along SPR crop fields

Proposed hedgerow/shelterbelt	Linear distance (ft)	Width (ft)	Area (ac)
Hedgerow – Mill Creek field	175	8	0.03
Hedgerow – Jacobs field	820	8	0.15
Shelterbelt – Swanton Rd	3,900	6	0.53
TOTAL			**0.71**

Cover crops

Cover crop and resident vegetation can be cultivated in both croplands and orchard systems to enhance ecosystem benefits and carbon sequestration. Cover crops are grasses, legumes, and other forbs planted for seasonal vegetative cover and can support one or more of the following purposes:

- Reduce sheet, rill, and wind erosion.
- Maintain or increase soil organic matter.
- Improve soil aggregate stability.
- Improve habitat for soil organisms.
- Reduce water quality degradation by utilizing excess soil nutrients.
- Reduce weed and plant pest pressure.
- Improve moisture management.
- Reduce soil compaction.
- Supply nitrogen to the subsequent crop.
- Improve habitat for pollinators, beneficial organisms, or natural enemies of crop pests.

Guidance language adopted from NRCS CPS 340.

Management factors like cover crop termination method and timing are also crucial in meeting identified goals. Producers may want to trial cover cropping on a smaller field or area before committing a whole field to transitioning into cover crop use. Additional best practices can be found in the guidance document authored by UC Davis and Almond Board.

[insert farm name] can plant cover crop in their croplands/orchard vineyard to achieve the identified goals of [insert relevant goals]. Some areas may require different cover crop mixes year-to-year based on their soil health and resource concerns, so further design and implementation plans are recommended when cover cropping is pursued. [Insert plans for equipment access. Will they need to contract this service?]

To meet carbon farming goals, [insert farm name] should plant a mix of X on their [insert location] during [season]. Termination is planned for [season] and will be completed using [termination method]. COMET-Planner estimates the CO2e reduction resulting from cover cropping this field would be about [amount of CO2e according to COMET] MT/year.

Nutrient management

Nutrient management is grounded in four key principles: ensuring that the right nutrients are applied in the right place, at the right time, and at the right rate. The goal of this practice is to ensure plant health and productivity while at the same time reducing excess nutrient loss, emissions of particulate matter, and release of GHG and ozone precursors. Nutrient management can be incorporated wherever amendments are used. In the most fundamental sense, it helps optimize nitrogen, phosphorus, and potassium by accounting for all significant sources and removal of these nutrients. To properly track nutrient levels, all inputs and removal of nutrients should be considered. Sources include irrigation water, fertilizers/amendments, nutrients within the root zone, and crop residues. Removal includes leaching, erosion, volatilization and crop harvest. *Guidance language adopted from Yolo RCD carbon farm plan (Higgins and Ferguson, 2024).*

[Insert current fertilizer application rates and locations] (Table 5).

Nutrient management at [insert farm name] should focus on [locations and inputs] to meet the identified carbon farming goals of [insert relevant goals]. [insert farm name] can [insert planned changes]. COMET-Planner estimates the CO2e reduction resulting from these changes would be about [amount of CO2e according to COMET] MT/year.

Table 10. Typical fertilizer source and rate by crop (current practices as of date, year).

Crop	Fertilizer source	Rate

Compost and other soil carbon amendments

Compost use in orchards is a widely accepted agronomic practice that enables the partial or complete elimination of synthetic fertilizer use and results in improvement in a wide range of soil and water quality factors, as well as a reduction in GHG emissions from orchards. Soil aggregation and aggregate stability, fertility, water holding capacity, aeration, organic matter and resilience in the face of drought and flood are all improved by compost applications to orchards.

Biochar is another soil carbon amendment gaining popularity in the Sacramento Valley. Biochar is a product of the pyrolysis of waste biomass. This low-oxygen, high-temperature (300-700 ºF) process creates carbon rich char from biomass by locking carbon in solid substances rather than burning it off as carbon dioxide or letting materials decay and release carbon into short-term pools. Applying biochar to soils presents an opportunity to integrate carbon into the terrestrial ecosystem where it can be stored as a long-term carbon sink. Further, recent data find biochar may be a useful soil amendment in agriculture, increasing soil water and nutrient holding capacity, benefitting crop yields, and reducing soil GHG emissions (Lehmann et al., 2006; Mukherjee & Lal, 2013; Zhang et al., 2020). Creating biochar from on-farm biomass waste presents an opportunity to create circular carbon sequestration benefits.

Carbon sequestration effects of compost and biochar applications to orchards are highly variable because orchard management is itself highly variable, including variation among tillage practices, cover crops, irrigation, and livestock integration grazing practices, among many other factors. Accordingly potential increases in orchard soil carbon (and thus CO2e sequestered) in response to soil carbon amendment application were evaluated solely on the carbon content of the added compost or biochar. Because the value of these applications increases when combined with other carbon-beneficial soil management practices, such as minimizing tillage and using cover crops rather than bare alleys, this approach to quantification of CO2e sequestered through compost and biochar application to orchards is considered conservative.

Language adopted from a 2016 carbon farm plan developed by Jeffrey Creque (Carbon Cycle Institute) and staff at Fibershed.

Soil carbon amendments at [insert farm name] should focus on [locations and inputs] to meet the identified carbon farming goals of [insert relevant goals]. [insert farm name] can [insert planned changes] to achieve an estimated CO2e reduction of [amount of CO2e according to COMET] MT/year.

Table 11 & 12. SOC calculations from 2024 Carbon Amendment Calculator developed by Carbon Cycle Institute Staff.

Biochar						
Crop	Acres	Frequency of application	% carbon	Rate of application	**Annual CO2e sequestered**	**20-yr CO2e sequestered***

Compost						
Crop	Acres	Frequency of application	% carbon	Rate of application	**Annual CO2e sequestered**	**20-yr CO2e sequestered***

**Assumes that 25% of compost carbon is lost per year. Through repeated applications of compost, over time a new steady state is reached. The long-term GHG benefit above represents the average increase in carbon in this new steady state, as long as repeated compost applications are continued. The GHG benefit per compost application event is calculated over 10 years (the long-term GHG benefit divided by 10 years divided by application frequency).*

Livestock integration

In nature, plants, animals, and soil coexist and have mutually beneficial relationships. Animals graze plants and deposit nutrient rich manure onto soil which then feeds more plant life. Livestock integration is a way of implementing a mixed presence of plants and animals to recreate these natural ecosystem processes. These natural processes can benefit animal welfare and nutrition, soil health, can minimize synthetic inputs, and may even help with reducing wildfire vulnerability.

Livestock integration can be part of cover cropped systems as termination or silvopasture systems as grazers. At [insert farm name], livestock can be integrated into [systems] for the purpose of [purposes]. A total of [#] acres will be grazed periodically by [animal type] sourced from [source; rented or owned?]. Carbon benefits are not as clearly modeled as for other practices, but nutrient rich manure inputs to soil will only increase soil carbon over time. Additional resources can be found at the Community Alliance for Family Farmers website.

If farmers own their livestock, livestock integration is also a method of income diversification. Grazing animals in orchards utilizes the land for multiple income streams (meat, dairy, or eggs and cash crop). This diversification makes the farm less susceptible to any market fluctuations of one crop and increases the output per acre of the farm.

Rangeland or pasture systems

This section combines overall ranch livestock carrying capacity with ecological site potentials and limitations to plan for optimum carbon capture–as forage production and soil carbon–within site-specific management constraints. In general, increasing forage production from permanent pastures on farms will tend to result in an increase in soil carbon, assuming good or excellent pasture management. Practices that reduce or repair soil erosion, reduce area of bare soil, reduce trailing, and provide grazed vegetation sufficient rest for adequate regrowth between grazing periods, will tend to result in both more overall forage production and more carbon sequestered in vegetation and soils over time. *Language adopted from previous Carbon Cycle Institute carbon farm plans.*

Grazing management strategies that might benefit [insert farm name] include:

- Management intensive rotational grazing
- Pasture restoration
- Compost application
- Nutrient management
- Improved irrigation technology
- Etc.

Grazing management goals

(eg): increase C-sequestration, increase forage production, reduce/repair soil erosion, reduce bare soil, reduce trailing, reduce fuel load, etc.

This grazing management plan is developed with the intent to meet the following goals and objectives for [farm name].

1. Goal 1

2. Goal 2
3. Goal 3
4. .... etc.

Pasture management

How pastures are divided (existing and proposed), temp vs. permanent fencing, frequency of use (how many days cattle are on each pasture; period of stay, period of rest, return intervals), irrigation by fresh or wastewater (if any), wastewater distribution if any.; supplemental feeding, hay or silage production, etc.

Annual forage production

The baseline forage inventory at [insert ranch name] can be identified using animal unit months (AUMs). One AUM is the amount of forage needed to support a 1,000 lb cow and her calf for one month; here it is assumed to be [900] pounds of dry forage. 1 AUY (animal unit year) is the amount of forage needed to support one animal unit (cow with calf, or equivalent) for one year.

Table 13. Field location, area, ecological site, average production, and baseline AUM.

Field location	Area (acres)	Ecological site	Average production (lbs/acre)	AUM
Total	#			#

Number and class of livestock

These values are based on the time each herd is actually on the ranch. Animal numbers are based on personal communication with the landowner.

- Sheep
    - Rams – 120/year (120 x .2 x 12 months) = 288 AUM
    - Ewes – 4000/2.5 months (4000 x .2 x 2.5) = 2000 AUMs
- Stockers – 2,000/5 months (2000 x .7 x 5) = 7000 AUM
- Replacement heifers – 400/12 months (400 x .9 x 12) = 4320 AUMs
- Cow herd – 2100 total (spilt evenly at 600 each for the desert and mountain herd)
    - Desert herd are only on the ranch for a total of 5 months (1500 x 1 x 5) = 7500 AUMs
    - Mountain herd are on the ranch for approximately 4 months (600 x 1 x 4) = 2400 AUMs

Given these numbers of animals and grazing duration, the **AUM demand is 23,500 AUM.**

Recommended residual dry matter

Residual dry matter (RDM) (Bartolome et al 2006) is the herbaceous plant material -living or dead- left standing or on the ground at the end of the grazing year (typically measured in October, or just before the start of the water year). RDM measurement is commonly used to assess the year's grazing use on annual rangeland, whether moderate, excessive or light. The recommended standards are based on the observation that the amount of RDM remaining in the fall interacts with site conditions and weather to influence rangeland vegetation species composition and forage production in the coming year. This is particularly true of annual-dominated pastures, but the principle has some relevance for perennial pastures as well. **For purposes of this plan, a "take half, leave half " rule of thumb was applied, suggesting one half of annual above ground pasture production is available for livestock use.**

While leaving appropriate amounts of RDM can appear to represent lost grazing opportunity in any given year, consistently low levels of RDM over time can be expected to result in gradual loss of soil organic matter and soil carbon, soil water holding capacity and rangeland productivity. Insufficient soil cover, whether live or dead material, can result in a downward spiral of declining rangeland condition. In this sense, RDM can be understood as an investment in the long-term productive capacity of the land, albeit at the "cost" of current season's total grazing capacity. Because of the limited amount of site-specific research information, however, RDM standards normally have to be developed using local experience and general guidelines, particularly on perennial pastures. RDM standards have not been developed for irrigated pasture or for grazed agricultural fields.

With warmer and drier average conditions experienced over the past few years, and anticipated in the future, it may be necessary to consider both historic norms and dry year precipitation when setting RDM targets on [insert ranch name]. RDM is based upon a percentage of total annual above ground production. Thus, while total recommended RDM may decline from wetter to drier rangeland types, RDM, as a percentage of total production, should actually increase on drier annual rangelands.

Language adopted from Bare Ranch Grazing Management Plan (Dale-Cesmat, 2016).

Livestock carrying capacity

Animal numbers and season of use described above is based on personal communication with the landowner and may be approximate only. As with all forage production calculations, these are based on an average production year. The numbers may vary from year to year.

Based on the values obtained above, the forage production on the ranch in AUMs is 17,222. The animal demand based on these values is 23,500. This shows that there is a deficit of forage in the amount of 6,300 AUMs. This is equivalent to 2,800 tons of hay. The ranch purchases this amount of hay each year to make up this deficit. If hay was not purchased there would be resource concerns that could arise from over grazing.

Animal Demand = 23,500 AUMs
Ranch Carrying Capacity = 17,222 AUMs
Purchased hay = 2,800 tons, or 630 AUMs + 17,222 AUMs = 23,500 AUMs

Potential practices and recommended strategy

Describe existing grazing system and potential for enhancement, if any (avoid grazing prescriptions unless by a certified rangeland professional). This may include: Intensification of grazing management- longer rest periods, increased pasture divisions; increased water development; replacing annual silage/hay production w/ permanent pasture, and increasing perennial vs. annual grass cover. Another potential practice is compost application on grazed *sites and/or croplands (hay, silage, haylage). It is likely that these recommendations will be accompanied by necessary changes to grazing infrastructure. Use this section to identify these needs [eg. fencing, water development (tanks, troughs)]. See existing carbon farm plans with grazing management plans for examples.*

Table 14. Grazing management enhancement, details, acreage, and potential CO2e sequestration per year.

Practice	Details	Acres	Annual CO2e sequestered
Prescribed Grazing (CPS 528)	Implement prescribed grazing program on pasture and rangeland	4,411	790
Range Planting (CPS 550)	No-till interseeding of salt tolerant forage species in irrigated pasture fields within the Saline Bottom ecological site.	2,107	720

Total carbon benefits: [#] metric tons CO2e = [#] metric tons of C = [#] metric tons of above and below ground biomass. Assuming 60% of this production is above-ground, yields [#] metric tons of above ground biomass. Assuming 80% harvest efficiency, this yields a total of [#] metric tons, or [#] short tons of increased forage. This estimate supports the increased forage production of [#] short tons anticipated above.

Other

A. Based on the operation you are planning for, you may also need to include one or more additional sections/chapters. Below are a few examples of additional sections that may be appropriate for a given plan.
   1. *Compost Operation/Compost Facility*
   2. *Dairy Operations, manure management plan, nutrient management plan, Anaerobic Digester, etc.*
   3. *Forestry, Wildfire, Timber Harvest Plan*
   4. *Infrastructure*

Design

Include if completing a DIA in addition to the carbon farm plan

I. *Consult the EFOTG database for practice specifications and implementation requirements– these documents will provide design guidance.*
   A. *List the practices from the above section that are included in the DIA*

II. *Consider using the [Calscape planning tool] or [EFOTG] for plant list development if needed.*

III. *Annotated map showing the area for implementation*

IV. Timeline for finding vendors/contractors, planting, and monitoring.

Carbon benefits

I. Using COMET-Planner, find estimates of the GHG impact that each of your suggested practices will have
II. Compile a table of 1 and 20 year GHG benefits per each practice recommended in the plan.

Table 15. Summary of annual and 20-year carbon benefits at [insert farm name].

NRCS Conservation Practice and Code	**Acreage / Linear Feet**	**1 year GHG benefits (total CO_2e)**	**20 year GHG benefits (total CO_2e)**	**Implemented?**
Name of conservation practice and code (e.g. Hedgerow Planting (CPS 422)		Carbon information from Comet-planner or other source	Carbon information from Comet-planner or other source	Yes / No

* Numbers are estimates based on the closest related practice standard currently on Comet-planner.com. Some listed practices have not been quantified for carbon impact at this time, however, it is assumed these practices will have beneficial impacts on carbon sequestration within the property.

In keeping with requirements set by the California Department of Food and Agriculture for Carbon Farm Plans, a COMET-Farm report is included in the Appendix.

Project implementation

Implementation for the practices outlined in the plan will be staggered to optimize meeting farmers goals and acquiring financial assistance through various funding sources. Cost is estimated at the time this plan was written (month, year) and should not be used in any official capacity. When possible, update estimated cost based on most recent material and labor costs.

Timeline

Ideal timeline – What will be prioritized and why?

I. *Creating a Gantt chart can be a great visual aid to plan for future project management of practices that are imminent.*
II. *Consider listing three possible vendors/contractors and their quotes.*

Table 16. General timeline for implementing various carbon-beneficial practices. Some practices (or expansion of a practice) are dependent upon funding acquisition. Short-term implementation is either ongoing or planned to initiate in the next 1–2 years. Mid-term implementation will be initiated in 2–5 years. Long-term implementation will be initiated in 5–10 years from initial plan creation.

Practice	Short-term	Mid-term	Long-term	Additional notes & possible vendors for short-term implementation	Estimated cost	Implemented?
Cover crop	X			CDFA Healthy Soils Program funding is available Winter 20XX Possible vendors: Seed drill vendor A, seed drill vendor B.	$6,000 (source: e.g. UC Davis cost study)	Y/N

Funding considerations

I. *Indicate if implementation funds are included with this plan– if so, from where and when?*
II. *If implementation is not included use the following and include any additional programs that are relevant AND INCLUDE THEIR DEADLINES:*

Implementation can be paid for in full by growers, or cost matched through various programs. The following list includes some but not all of the options for funding carbon farm practices in the State of California. Funding deadlines are variable, this plan attempts to capture the most up to date information at the time the plan is written.

Federal

Natural Resource Conservation Services Environmental Quality Incentives Program (EQIP)
This program provides financial and technical assistance to producers to address natural resource concerns and provide environmental benefits. This program typically assists agricultural producers with cost share related to many of the practices listed in this carbon farm plan (e.g. hedgerow planting, soil carbon amendment, cover crop). Contact your local NRCS office for more information.

[Insert contact info for local NRCS office]
https://www.nrcs.usda.gov/sites/default/files/2022-10/EQIP-fact-sheet.pdf

USDA Rural Energy for America Program Renewable Energy Systems & Energy Efficiency Improvement Guaranteed Loans & Grants (REAP)
The program provides loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements. Agricultural producers may also apply for new energy efficient equipment and new system loans for agricultural production and processing.
https://www.rd.usda.gov/programs-services/energy-programs/rural-energy-america-program-renewable-energy-systems-energy-efficiency-improvement-guaranteed-loans

U.S. Fish and Wildlife Service–Partners for Fish and Wildlife Program
This program provides technical and financial assistance (up to $750,000 per award) to landowners for enhancing wildlife habitat on their land.
https://www.fws.gov/program/partners-fish-and-wildlife

Central Valley Project Improvement Act and Habitat Restoration Program
The U.S. Bureau of Reclamation and the U.S. Fish and Wildlife Service's Central Valley Project Improvement Act grant provides funding for the protection, restoration and enhancement of fish and wildlife. This program typically receives $1.5 million annually and funds five or more projects.
https://www.usbr.gov/mp/cvpia/

State

California Dept. of Food and Agriculture Healthy Soils Program
Apply directly to incentives program with CDFA or through awarded block grant recipients: Resource Conservation Districts, non-profit organizations, University of California, California State Universities, California community colleges, and California and federally recognized Tribes. Supported practices would include compost application, cover cropping, no-till, reduced-till, mulching, and hedgerow practices. A list of 2023 awardees can be found here. Contact your local RCD for more information.
[Insert contact info for local RCD office]
https://www.cdfa.ca.gov/oefi/healthysoils/IncentivesProgram.html

California Dept. of Food and Agriculture State Water Efficiency & Enhancement Program
Apply directly to incentives program with CDFA or through awarded block grant recipients: Resource Conservation Districts, non-profit organizations, University of California, California State Universities, California community colleges, and California and federally recognized Tribes. Eligible system components include soil moisture monitoring, drip systems, switching to low pressure irrigation systems, pump retrofits, variable frequency drives, and installation of renewable energy to reduce on-farm water use and energy." If solar panels are incorporated on site, this grant would be relevant. Contact your local RCD for more information.
[Insert contact info for local RCD office]
https://www.cdfa.ca.gov/oefi/sweep/

California Dept. of Food and Agriculture Pollinator Habitat Program

This program funds pollinator habitat implementation such as cover crops, hedgerow planting, integrated pest management, and more. Apply through awarded Resource Conservation Districts, non-profit organizations, University of California, California State Universities, California community colleges, and California and federally recognized Tribes. Contact your local RCD for more information.
[Insert contact info for local RCD office]
https://www.cdfa.ca.gov/oefi/php/

California Dept. of Fish and Wildlife (CDFW) California Waterfowl Habitat Program (CWHP)
The CWHP provides funds to landowners who manage their properties in accordance with a wetland management plan developed by CDFW biologists and the participating landowner. Landowners can receive an incentive of $30-$60/acre annually depending on the lands being managed.
https://wildlife.ca.gov/Lands/WCP/Private-Lands-Programs

California Wildlife Conservation Board
The WCB has a number of wildlife habitat enhancement funding programs including the California Riparian Habitat Conservation Program (CRHCP), the Ecosystem Restoration on Agricultural Lands (ERAL), Monarch Butterfly and Pollinator Rescue Program. Depending on the purpose of a proposed practice, various programs may be utilized.
https://wcb.ca.gov/Programs

Private or non-profit

National Fish and Wildlife Foundation (NFWF) Monarch Butterfly and Pollinators Conservation Fund
Grants are awarded to projects that will create and sustain pollinator habitats. In 2023, grants ranged from $200,00-$250,000 for projects up to two years.
https://www.nfwf.org/programs/monarch-butterfly-and-pollinators-conservation-fund

Project Apis M. Seeds for Bees
Apply through Project Apis M.'s Seeds for Bees program for up to $2,500 in cover crop seed mix your first year, $1,500 your second year, and smaller discounts for all following years of cover cropping. Applications open April 1st each year.
https://www.projectapism.org/sign-up-for-seeds-for-bees-program

Western SARE Farmer/Rancher Grant
Producers may apply for up to $35,000 to work together with a technical advisor to develop a project (1-3 years in scope) that conducts both research and outreach on a sustainable agriculture topic. Requires outreach and possible on-farm demonstrations.
https://western.sare.org/grants/farmer-rancher/

The Xerces Society Monarch and Pollinator Habitat Kits
Provides habitat plant kits that contain climate-smart native plants with the goal to support monarchs and other local pollinators in California whose populations are in decline. This cost share opportunity could support the planned hedgerow components of this carbon farm plan but also riparian areas through a different kit specifically for riparian wildflower plantings.

https://xerces.org/pollinator-conservation/habitat-kits/california

Zero Foodprint Restore Grant
Provides funding for adopting practices aimed at sequestering atmospheric carbon in the soil. Maximum funding is $25,000 per round, with a lifetime maximum of $75,000 across multiple rounds.
https://www.zerofoodprint.org/

Zero Foodprint Compost Connector Grant
Provides funding for compost purchase.
https://www.zerofoodprint.org/

Monitoring

Practice monitoring ([insert examples of practices] etc.) should be carried out in coordination with project managers from the NRCS or others involved in project implementation or monitoring, such as [RCD name]. Tools such as Point Blue's Crop-C or Range-C carbon monitoring systems may be of particular interest. Xerces Society also has guidance for monitoring the success of pollinator habitat which can be followed by farmers or technical assistance providers.

Soil carbon and other ecosystem services should be monitored in accordance with market or voluntary protocol requirements (if applicable). Baseline data and records of implementation activities, including locations, spatial extent of project(s), dates of implementation, etc. should all be included in plan implementation documentation. If possible, take baseline soil measurements ahead of the implementation of individual practices to better understand the impacts of the changes. The Farm production records can also serve as an indication of the direction of overall agroecosystem productivity, predicted to increase over time in conjunction with adoption of the carbon farm framework. Farmer well-being and economic success may also be a variable of interest to monitor over the CFP implementation period.
`

This monitoring guidance has been adopted from previous carbon farm plans developed by staff at Carbon Cycle Institute.

Summary

Insert farm name has the potential to sequester an annual CO2e of [#]. *If possible, contextualize this in county emissions data like so: "A 2018 GHG inventory for Yolo County indicates that the total GHG emissions for unincorporated Yolo County equated to 1,082,801 MT CO2e in 2016, and agriculture accounted for 232,569 MT CO2e of that total (Ascent Environmental, 2018). If all practices outlined in this plan were incorporated, this farm could optimistically sequester 3,800 MT CO2e annually, equivalent to 0.35% of the total 2016 emissions and 1.63% of agricultural emissions."*

This plan should be viewed as a living document. It should evolve as practices are implemented and new information and new tools become available. Additional carbon-beneficial practices may be considered for inclusion in the plan in the future. GHG values presented here, as associated with specific practices, are considered to be both realistic and conservative, based upon the best available information at the time of this plan's completion ([insert month, year]).

Include a final site map of all planned practices in this section and a bar graph of carbon sequestration by planned practice.

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Appendix

INSERT COMET-FARM REPORT & CORRESPONDENCE/PRODUCER NOTES