Climate Action Plan Forestry and Agriculture Emissions Focus Paper

Agricultural and Forestry Emissions

Agriculture and forestry activities were included in the greenhouse gas (GHG) emissions inventory completed for the Climate Action Plan (CAP), along with residential building energy, nonresidential building energy, on-road transportation, off-road vehicles and equipment, solid waste, water supply, and wastewater treatment. Agriculture and forestry emissions are associated with enteric fermentation and manure management from livestock, fertilizer and pesticide application, open burning, and agricultural equipment. Agriculture and forestry contributed to approximately 14 percent of countywide GHG emissions, or approximately 91,591 metric tons of carbon dioxide equivalent (MTCO$_2$e).

Emissions from Wildfires

Consistent with the U.S. Community Protocol and California Air Resources Board (CARB) guidance, GHG emissions from wildfires are not accounted for in the 2019 Tuolumne County GHG emissions inventory. The U.S. Community Protocol currently does not include methodologies for wildfire related GHG emissions and the State of California does not include wildfire emissions in the statewide inventory currently.

Quantifying emissions from fires and forest management is an evolving area of science and it is possible that future State inventories will include these sources of emissions. Estimating how much wildfire emissions alter GHG concentrations and contribute to climate change is difficult, because wildfire emissions are a part of the terrestrial carbon cycle.

The terrestrial carbon cycle transfers carbon between the land, ocean, and atmosphere. The cycle is balanced over decades or centuries by fire, plant respiration and decomposition versus plant growth and other. If the cycle is balanced, biogenic carbon dioxide (CO_2) emissions from fire and other sources are offset by biogenic CO_2 sequestration, resulting in relatively minimal change in the total concentration of atmospheric CO_2 that drives climate change. However, with the combustion of fossil fuels at the rates we have recently experienced, this cycle is put out of balance. Fossil fuels also contribute to a negative feedback loop for California's forests and lands: as CO_2 emissions accumulate in the atmosphere and we experience increased warming, extreme heat events, droughts, and invasive species, the risk and intensity of fires also increases, which in turn push the terrestrial carbon cycle further out of balance. (CARB, FAQ, Wildfire Emissions: https://ww2.arb.ca.gov/wildfire-emissions)

Because of this effect, CARB works to understand and track both the total GHG emissions from anthropogenic sources, like the combustion of fossil-fuels, and the total carbon flux (or *net* change in carbon on the landscape) from terrestrial carbon.

Emission Data and Reports

For the first time, CARB and the California Department of Forestry and Fire Protection developed a draft report (released in December 2020: https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf) that presents statewide estimates of GHG emissions associated with wildfires and prescribed burning activities for 2000–2019 but these estimates are not yet available for the local level. Looking year-over-year at the data in the inventory, we can see clear trends of carbon-loss in California's natural and working lands, with most of those losses coming from wildfires.

Using preliminary fire footprint information, CARB has released a draft estimate of 2020 wildfire GHG emissions, which was the worst fire year on record (by acres burned) for the California. The emissions estimate, 112 million metric tons of CO_2 (MMTCO$_2$), is equivalent to the amount of carbon contained in the structural lumber of 6.3 million average California homes, or over 75 percent of all homes in California. (CARB, FAQ, Wildfire Emissions: https://ww2.arb.ca.gov/wildfire-emissions)

The use of fossil fuels has significantly contributed to the climate and air quality problems we face, so concurrently with developing methodologies to evaluate wildfire and forest management emissions, the County can make efforts to minimize combustion of fossil fuels and reduce emissions as much as possible, which also results in significant co-benefits.

Agriculture and Forestry Proposed Action Items

Livestock management, open burning, fertilizer application, pesticide use, and operation of agricultural equipment contribute to the agriculture and forestry sector of the county's GHG emissions. Most of this sector's emissions (88 percent) are generated by enteric fermentation and manure management. Livestock produce methane and nitrous oxide emissions through their digestion and the decomposition of manure. Open burning refers to agricultural and non-agricultural burning of vegetative matter, hazard reduction and ditch/road maintenance burning, and other burn activities that are permitted by the Tuolumne County Air Pollution Control District.

In 2019, the agriculture and forestry sector accounted for 14 percent of countywide GHG emissions. Emissions associated with this sector are projected to gradually decrease over the next several decades, as it is anticipated that more land will be converted to other uses in accordance with the County's General Plan. While land use changes will contribute to modest GHG emissions reductions, further local actions can help the County achieve additional emissions reductions. In addition, local efforts can be implemented to enhance the resilience of the county's agriculture and forestry operations to climate change. The following are identified as action items in Chapter 4 that have been proposed to be adopted by the Board of Supervisors:

AGRICULTURE AND FORESTRY

STRATEGY 1. LIVESTOCK MANAGEMENT

Measure 1.1: Implement best practices for livestock management.

Action 1.1.1. Work with the County Agricultural Commissioner's office to facilitate forums, training sessions, and capacity-building activities for local farms to continue to implement manure management best practices.

Action 1.1.2. Uphold traditional livestock grazing rights to manage vegetation, protect soil and water, and protect the stability of the communities that depend on range resources.

Measure 2.2: Implement agricultural best practices that improve energy efficiency.

Action 2.2.1. Promote energy conservation; increased energy and water use efficiency; and on-farm solar, wind, and other renewable energy production.

Measure 3.1: Implement agricultural best practices that improve resilience to climate impacts.

Action 3.1.1. Encourage mapping of existing crop varieties against future climate projections such as extreme heat, drought, and flood risk. Adjust varieties to address those future conditions, selecting species that are native, drought-tolerant, and adapted to extreme heat.

Action 3.1.2. Encourage networking among agriculture producers to share resources, tools, and knowledge about sustainable, efficient, and resilient agricultural practices.

	Action 3.2.1. Develop programs to encourage compost application to enhance soil for carbon sequestration and healthy farms. Utilize existing programs and resources from the California Department of Food and Agriculture's Healthy Soils Program.
Measure 3.2: Increase soil organic matter and carbon content.	Action 3.2.2. Support regenerative farming systems that use perennial groundcover, rotational grazing systems, and other natural approaches to increase crop diversity and improve soil health and soil organic matter, while ensuring fair incomes for farmers.
	Action 3.2.3. Encourage farmers and other key stakeholders to pursue innovative agricultural practices that increase the amount of carbon that is removed from the air and stored in soils and working lands.
Measure 6.1: Improve long-term forest resilience.	Action 6.1.1. Continue to support existing projects and organizations including Yosemite Stanislaus Solutions to ensure the long-term health of forests in areas under the County's jurisdiction, as well as areas managed by State and federal agencies. Balance and integrate fuel modification efforts with habitat and open space management, vegetative soil cover/erosion management, and urban greening to reduce the potential for conflicts between safety and environmental goals.
Measure 6.3: Manage vegetation and reduce wildfire risk to promote sequestration.	Action 6.3.1. Implement a vegetation management program to reduce wildfire risk and improve forest health.
	Action 6.3.2. Develop vegetation management programs that support enhanced carbon storage in forests, use of durable wood products, and use of wood biomass for energy, while maintaining healthy forest ecosystems.