Wildfires & Forest Carbon in Colorado

September 14, 2021

Wildfire Matters Review Committee

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Colorado Department of Natural Resources

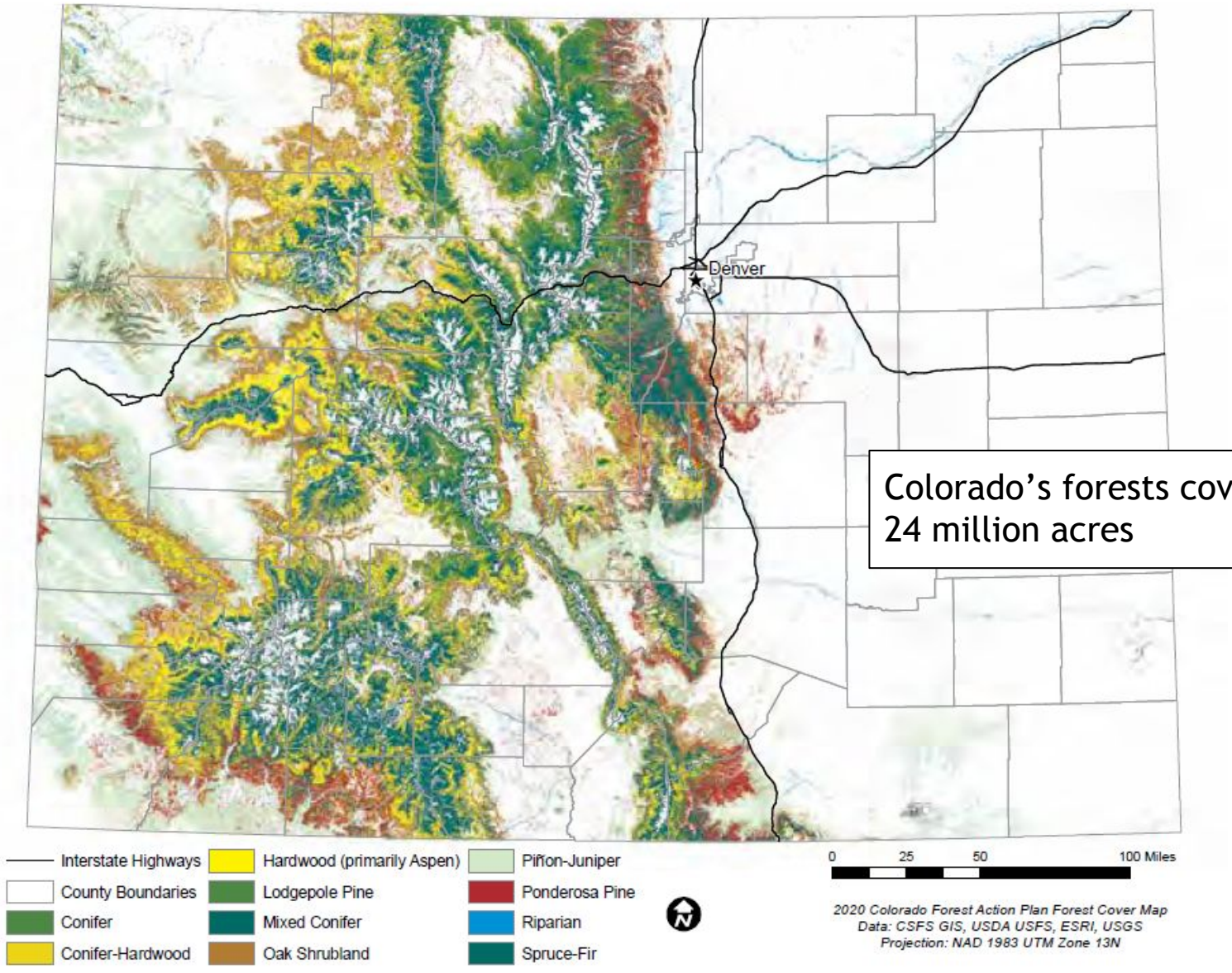
Outline

- Forest carbon cycle & wildfires
- Wildfires & forests in Colorado's Greenhouse Gas Inventory

Key Terms

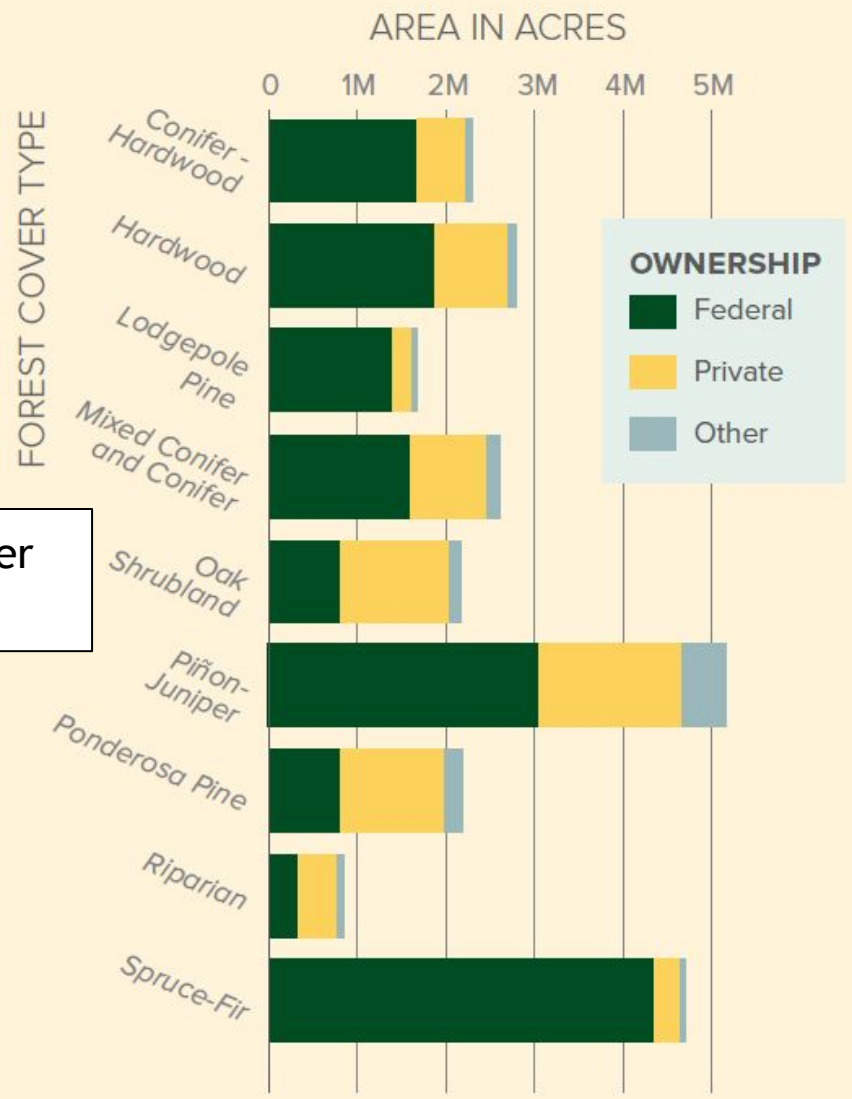
- **Greenhouse gas:** a gas that traps heat in the atmosphere, including carbon dioxide, methane, nitrous oxide, and fluorinated gases (EPA).
- **Carbon sequestration:** the process of capturing and storing atmospheric carbon dioxide (USGS).
- **Climate change mitigation:** reducing emissions of and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere (NASA).
- **Climate adaptation:** action to prepare for and adjust to new climate conditions, thereby reducing harm or taking advantage of new opportunities (NCA).
- **Natural climate solutions:** conservation, restoration and improved land management actions that increase carbon storage or avoid greenhouse gas emissions (TNC).

COLORADO'S FORESTS: FOREST TYPES AND LOCATIONS

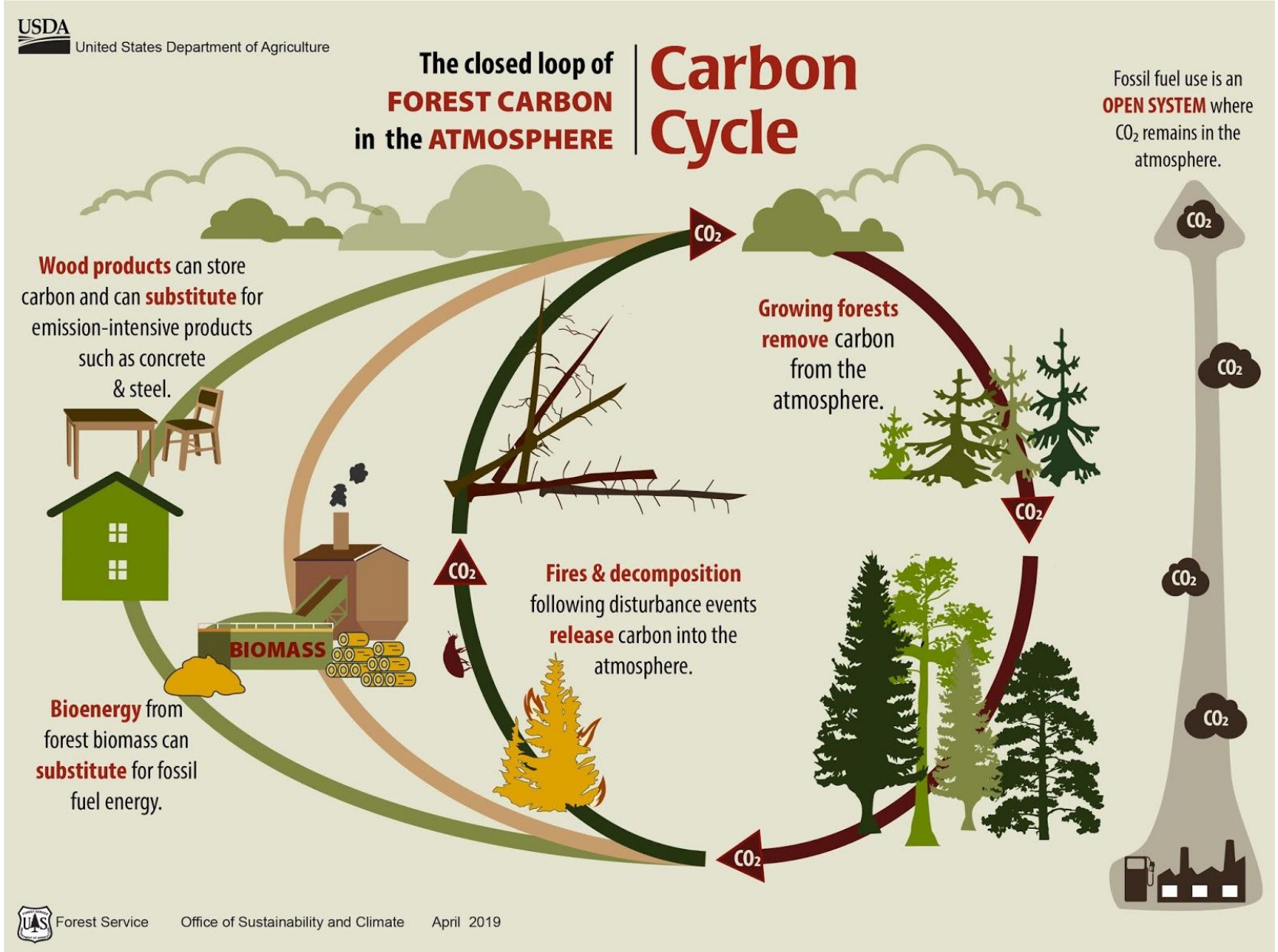


Colorado's forests cover 24 million acres

FORESTED ACRES: OWNERSHIP AND COVER TYPE [1,2]



From: CSFS 2020 Forest Action Plan;
https://csfs.colostate.edu/forest-action-plan/


USDA
United States Department of Agriculture
The closed loop of
FOREST CARBON
in the ATMOSPHERE
Carbon Cycle
Fossil fuel use is an
OPEN SYSTEM where
CO_2 remains in the
atmosphere.
Wood products can store carbon and can substitute for emission-intensive products such as concrete & steel.
Growing forests remove carbon from the atmosphere.
Fires & decomposition following disturbance events release carbon into the atmosphere.
BIOMASS
Bioenergy from forest biomass can substitute for fossil fuel energy.
CO_2
Forest Service
Office of Sustainability and Climate
April 2019

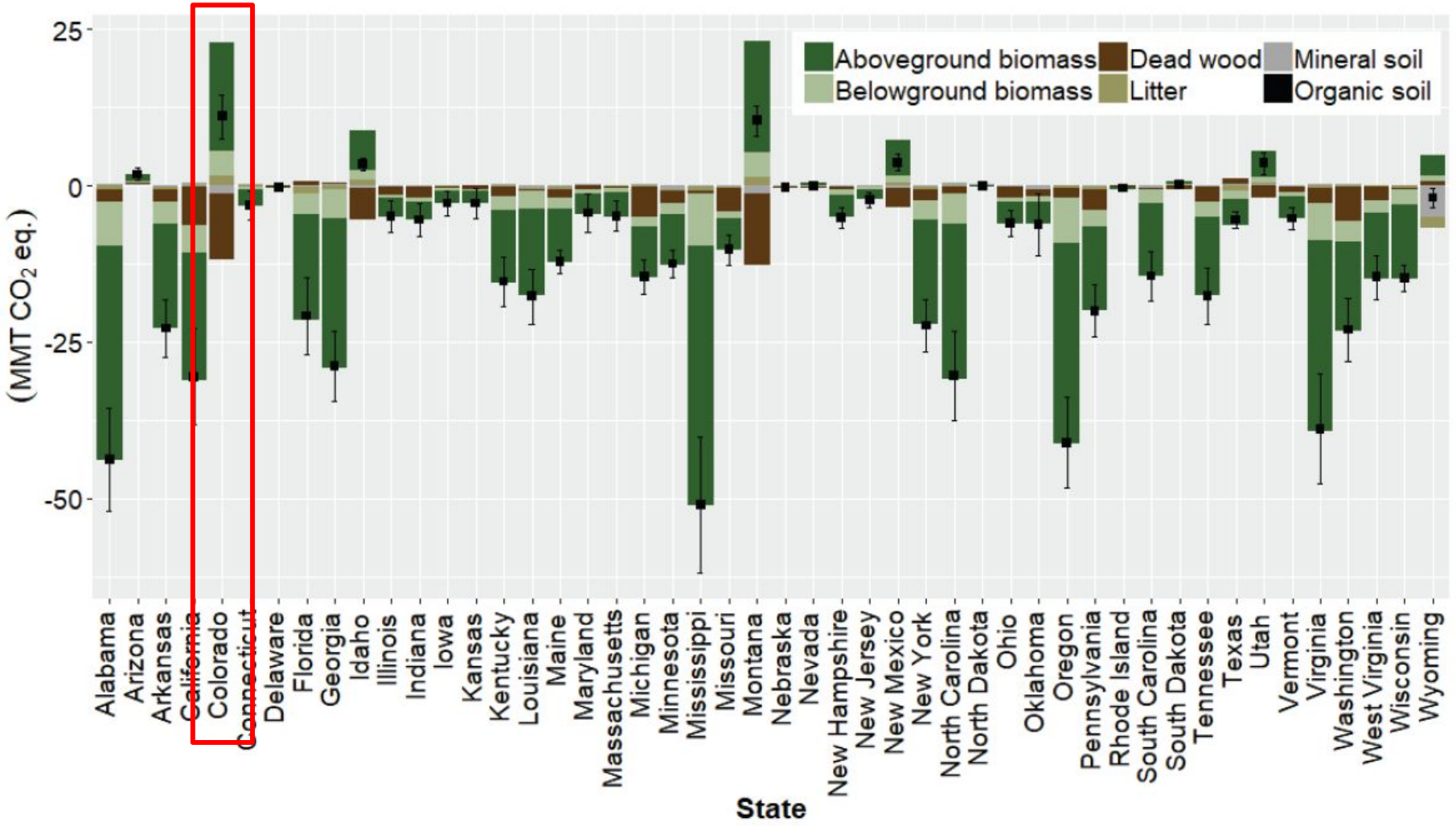


Figure 1.—Estimated annual emissions and removals from forest land remaining forest land by carbon pool for each of the conterminous 48 states in 2018 (MMT CO_2 Eq.). Note that points and confidence intervals (95 percent) reflect net flux for all carbon pools in each state. Negative estimates indicate net C uptake (i.e., a net removal of C from the atmosphere).

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Domke, Grant M.; Walters, Brian F.; Nowak, David J.; Smith, James, E.; Ogle, Stephen M.; Coulston, J.W.; Wirth, T.C. 2020. Greenhouse gas emissions and removals from forest land, woodlands, and urban trees in the United States, 1990-2018. Resource Update FS-227. Madison, WI: U.S. Department of Agriculture, Forest Service, Northern Research Station. 5 p. https://doi.org/10.2737/FS-RU-227.

Wildfire & forests in Colorado's GHG Inventory

- "Land Use, Land Use Change and Forestry" (LULUCF) module estimates based on EPA State Inventory Tool (SIT) and U.S. Forest Service research
- US forests sequestered the equivalent of ~12% of US GHG emissions in 2018

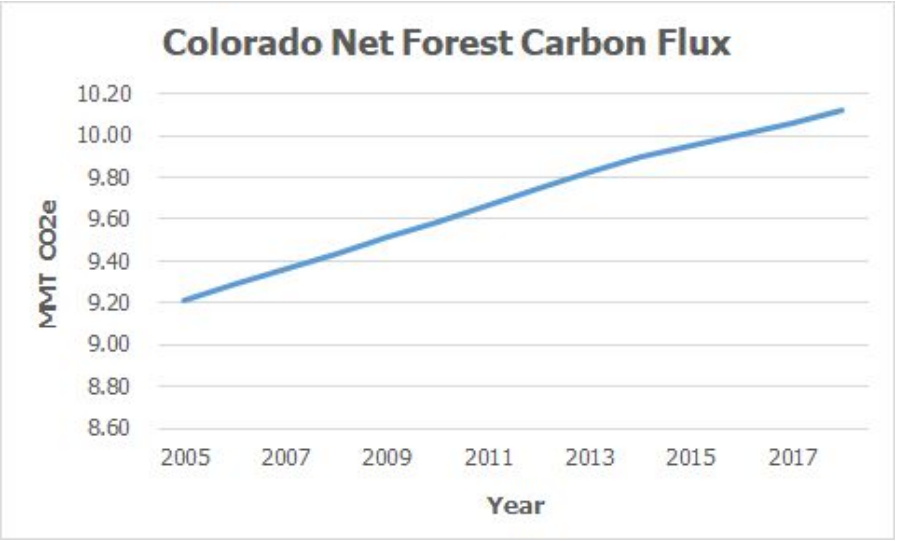
Table 1.—Emissions and removals (net flux) from land use, land-use change, and forestry (MMT CO_2 Eq.)

Emissions and Removals Category[a]	1990	1995	2000	2005	2010	2016	2017	2018
Forest land remaining forest land[b]	(610.1)	(598.7)	(572.1)	(572.6)	(556.2)	(565.5)	(552.0)	(564.5)
Non-CO_2 emissions from fire	1.5	0.6	2.9	8.2	4.6	5.6	18.8	18.8
N_2O emissions from forest soils	0.1	0.3	0.5	0.5	0.5	0.5	0.5	0.5
Non-CO_2 emissions from drained organic soils	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Forest land converted to non-forest land[b]	119.1	120.8	122.5	124.4	126.0	127.4	127.4	127.4
Non-forest land converted to forest land[b]	(109.4)	(109.7)	(109.9)	(110.2)	(110.4)	(110.6)	(110.6)	(110.6)
Harvested wood products	(123.8)	(112.2)	(93.4)	(106.0)	(69.1)	(92.4)	(95.7)	(98.8)
Woodlands remaining woodlands[c]	5.0	4.9	4.8	4.6	4.4	4.1	4.0	4.0
Urban trees in settlements[d]	(96.4)	(103.3)	(110.4)	(117.4)	(124.6)	(129.8)	(129.8)	(129.8)
Total Emissions and Removals	**(813.9)**	**(797.2)**	**(755.0)**	**(768.4)**	**(724.7)**	**(760.6)**	**(737.3)**	**(752.9)**

Domke et al. 2020

Wildfire & forests in Colorado's GHG Inventory

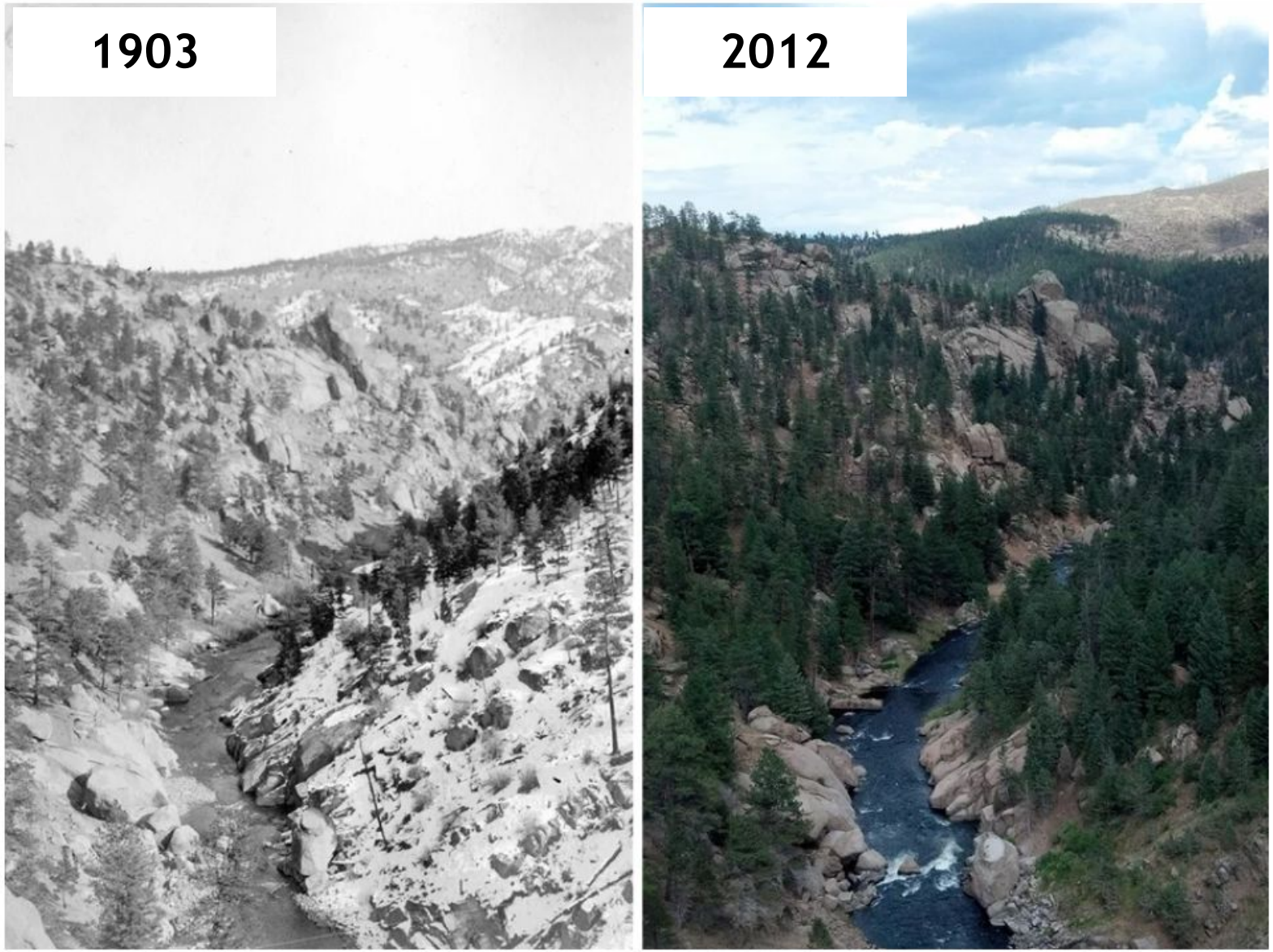
- "Land Use, Land Use Change and Forestry" (LULUCF) module estimates based on EPA State Inventory Tool (SIT)
- Total GHG Emissions in Colorado (2019): 128 MMT CO2e
- Forests (2018):
  - Total forest carbon flux: 10 MMT CO2e
  - Urban trees: -0.44 MMT CO2e
  - CH_4 and N_2O wildfire emissions (475,000 acres burned): 3 MMT CO2e



EPA SIT 2020

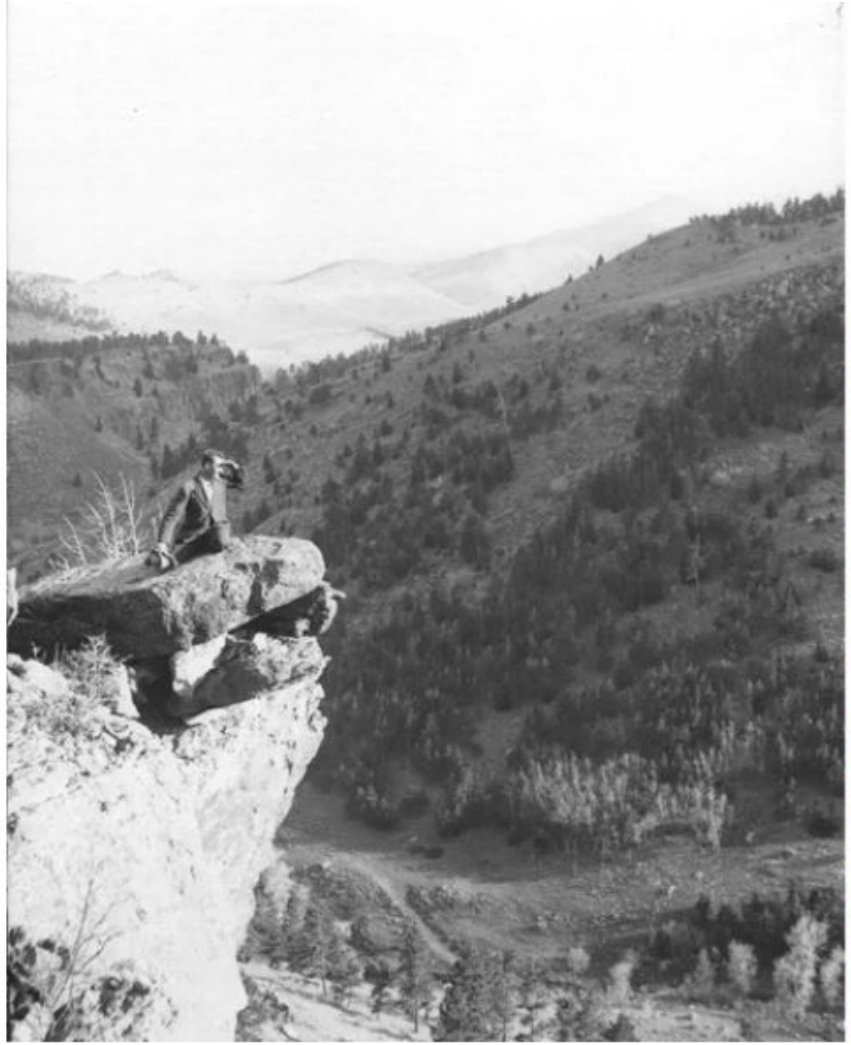
South Platte River

Denver Water Department archives and Paula Fornwalt/U.S. Forest Service

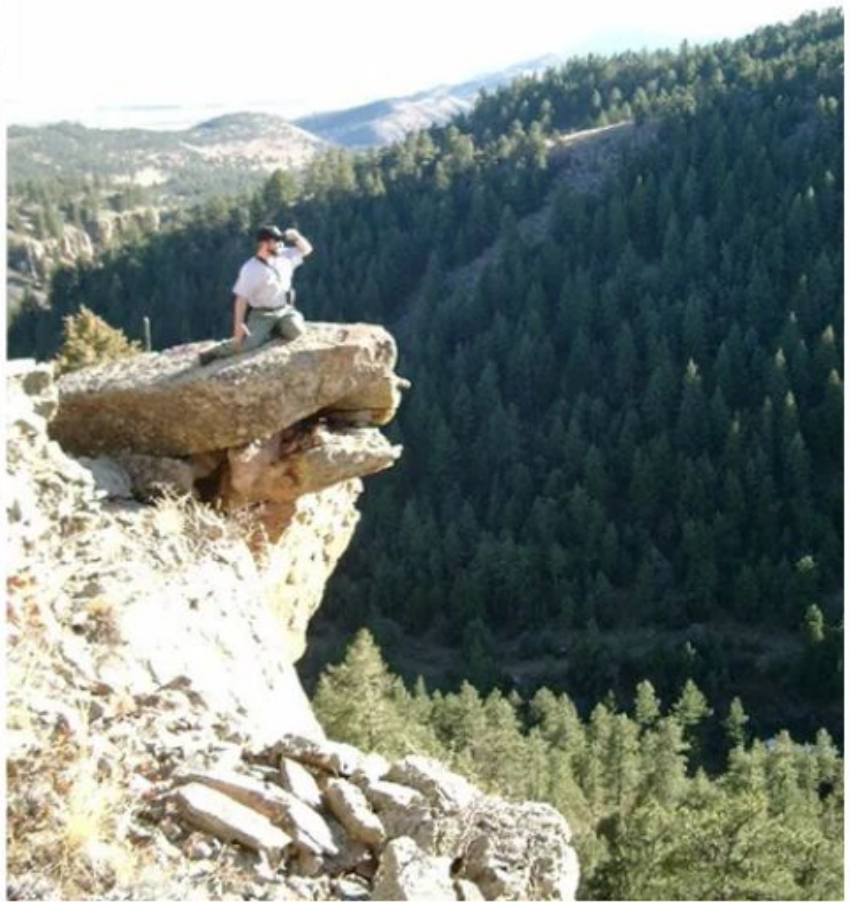


Carnegie Library for Local History/Museum of Boulder Collection and Boulder County Parks & Open Space

1911



2006



2020 Colorado Forest Action Plan Strategies

- Improving forest health can stabilize carbon sequestration
- Trade-offs: Climate-adaptive forest management may require removing biomass and forest carbon in the short-term, but may stabilize forest carbon long-term
- Managed and prescribed fires may increase short-term emissions, however may decrease high severity fires in the future
- Harvested wood stores carbon when used in long-lived products

Colorado Natural & Working Lands Strategic Plan

- Natural and Working Lands (NWL) include potential emission sources (e.g. wildfires emitting CO_2) and sinks (e.g. forests and grasslands absorbing CO_2)
- **The Colorado Natural and Working Lands (NWL) Task Force aims to reduce greenhouse gas emissions, and restore, protect and enhance carbon sequestration across all natural and working lands in Colorado**
- **The NWL Task Force is developing a Strategic Plan**
    - The NWL Task Force is hosting a public listening session on forests tonight:

      September 14, 2021: 5:30-7:00 pm
- CSFS is launching a forest carbon accounting framework project working with CSU Natural Resource Ecology Laboratory and Rocky Mountain Research Station

Questions?

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