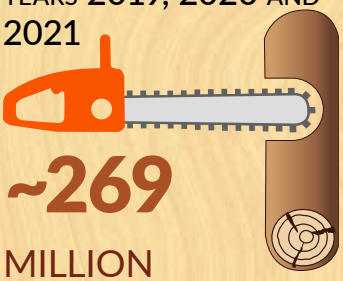
National Forests In CALIFORNIA

Nature's Benefits

TIMBER & WOOD PRODUCTS

TIMBER & WOOD PRODUCTS HARVESTED FROM CALIFORNIA'S NATIONAL FORESTS SUPPORT FOREST HEALTH, JOBS, AND PROVIDE PRODUCTS FOR EVERYDAY USE

On average for fiscal years 2019, 2020 and 2021



~269 MILLION BOARD FEET (MMBF) of timber was cut[1] and 329 MMBF was sold annually[2]

~$105 MILLION in wood products came from California's National Forests[3]

~17% Of timber volume received by California sawmills was from California's National Forests[7]

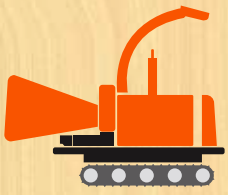
Timber cut from the Forest is used for a variety of purposes and categorized into 3 main areas:

- **LUMBER** dimensional lumber, plywood, veneer, posts and poles
- **BIOMASS** woody debris
- **LANDSCAPING & OTHER PRODUCTS** mulch, soil amendments, animal bedding

~$65 MILLION Value of ~166 MMBF of lumber produced from cut timber, enough to frame 10,365 homes[4]

$1.7 MILLION Value of ~176,280 tons of landscaping, mulch and other wood products[6]

~79,890 Cords of firewood sold, enough to heat 20,342 homes for the winter



Biomass from **~343,598** BONE DRY TONS (BDT) Enough biomass to power ~49,085 homes/year[5]

22,151 Christmas Trees sold

Sources

[1]2019, 2020 and 2021 average Cut and Sold Report
[2]Periodic Timber Sale Accomplishments Reports (PTSAR) Almanac Reports, 2019, 2020 & 2021
[3]Summation of lumber, biomass, landscaping and other products
[4]20,000 Square Foot home at 16MBF per home
[5]Shelly, J. 2010. Biomass Conversion to Electricity: Stand Alone Power Plants, Co-Generation, and Combined Heat and Power. Berkeley, CA. University of California Division of Agriculture and Natural Resources. http://ucanr.edu/sites/WoodyBiomass/files/79012.pdf
[6]$20 per BDT
[7]Marcille, Kate C.; Morgan, Todd A.; McIver, Chelsea P.; Christensen, Glenn A. 2020. California's forest products industry and timber harvest, 2016. Gen. Tech. Rep. PNW-GTR-994. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 58 p.

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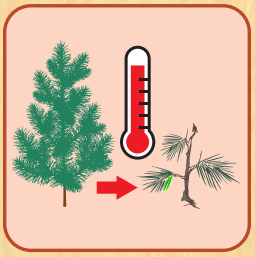
CLIMATE CHANGE EFFECTS ON TIMBER AND BIOMASS

Climate Change Will Impact Forest Health



Higher temperatures and less frequent precipitation will generate drought conditions in forests, **HAMPER TREE GROWTH**, and increase tree mortality. This can affect the rest of the forest ecosystem by removing critical plant species from the food chain.[1]

In turn, this will cause a reduction in opportunities for forest management practices, which keep forests healthy and resilient to wildfire.[3]

Elevated temperatures will also **INCREASE** the rate at which California's **SNOWPACK MELTS**, contributing to **seasonal flooding** at low and middle elevations.

Drought conditions magnify the effects of wildfires and may cause the burned area in California to increase by as much as **12-53%** by 2100.[2]

Additionally, forest nutrients will be limited by drought conditions. This will reduce trees' capacity to produce resin, making them more susceptible to disturbances caused by insect pests.[4]

REPEATED FLOODING can reduce soil oxygen, which makes it more difficult for plants to respirate, or produce energy by breaking down sugar. Oxygen-poor soil can stunt or kill a plant's roots, irrevocably harming a forest's plant population.[5]

1, 2. Climate Change Vulnerability and Adaptation for Infrastructure and Recreation in the Sierra Nevada, 2021
3. Prestemon & Kruger, 2016
4. Hart et al, 2015
5. Management Guide for Flooding Damage, 2010

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Approximately **85% OF THE BUILDINGS DESTROYED BY WILDFIRES** in California from 2000-2013 were located in the wildland-urban interface.

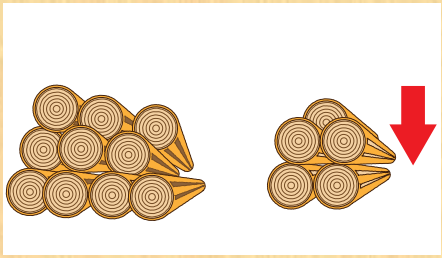
As wildfires become more intense and more frequent, they will imperil the safety of many more communities located in these areas.[6]

Climate Change Will Alter the Nature of Lumber Products

In 2020, the forest and forest product sectors contributed **$39 BILLION** to California's economy. This generated approximately 177,000 jobs.[7]

In 2021, **8,786 WILDFIRES damaged roughly 2,568,941 ACRES of land** in California. Elevated temperatures, reduced precipitation, and reduced atmospheric moisture will likely continue to increase the frequency with which wildfires occur.[8]

As wildfires become more frequent:



The timber **PRODUCTIVITY** of forests will be **REDUCED.**[9]

It will become **MORE DIFFICULT** for tree species that are not fire-tolerant or drought-tolerant **TO GROW** at low and mid-elevations.[10]

Dry **FOREST GROWTH** at lower elevations will be **STUNTED** by higher temperatures, lower amounts of precipitation, and higher evaporation rates. These drought conditions will increase competition for water between plants and degrade forests' timber quality.[11]

6. Kramer et al, 2016
7. Standiford et al, 2010
8. California Department of Forestry and Fire Protection, 2021
9. Latta et al, 2010
10. Climate Change Vulnerability and Adaption for Infrastructure and Recreation in the Sierra Nevada, 2021
11. Aubry-Kientz, 2017

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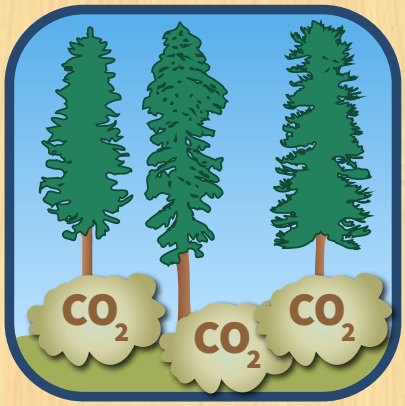
Climate Change will Decrease Forests' Greenhouse Gas Sequestration Ability

Elevated temperatures can modify seedling photosynthesis and respiration, increase evapo-transpiration, and harm seedling tissues. Seedling growth can also be stunted for up to 2 years after a wildfire, reducing timber yields.[12]

1,554 MILLION METRIC TONS (MMT) OF CARBON are stored by California's National Forests; these forests sequester an additional 2 million metric tons (MMT) of carbon annually.[13]



However, more frequent wildfires can **limit forests' ability to sequester carbon dioxide** by reducing the density of forests and by destroying older trees capable of absorbing large amounts of atmospheric and soil carbon.[14]

Elevated temperatures have also **EXPANDED THE RANGE OF PEST SPECIES** like the bark beetle, which burrows into trees, killing them and releasing sequestered carbon dioxide.

From 2003 to 2012, biomass destroyed by wildfires and bark beetles in the Inyo National Forest, Tahoe National Forest, and the Lake Tahoe Basin Management Unit **released roughly**

10 MILLION TONS **of sequestered carbon dioxide.**[15]

12. Moran et al, 2017
13 California Board of Forestry and Fire Protection, 2021
14. Pellegrini et al, 2021
15. Sánchez et al, 2021

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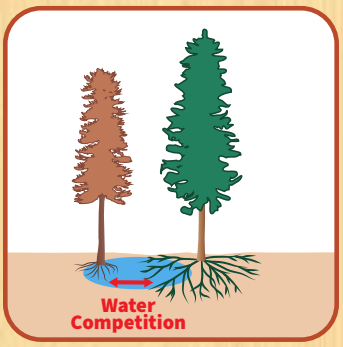
Climate Change may Facilitate Biomass Industry Growth

As a result of California's past employment of aggressive fire suppression policies on the state's public lands, **the concentration of biomass** in California's forests has drastically **INCREASED**.[16]



These policies have harmed forest health by **INCREASING COMPETITION FOR WATER AND NUTRIENTS** among forest plants.

These unique forest conditions have provided forest-derived **BIOMASS POWER PLANTS** with a **PLENTIFUL FUEL SOURCE**; however, logging and harvesting operations in the Sierra Nevada have been hampered by:

I. The region's **CHALLENGING TERRAIN**.[17]

II. The **LIMITED TIME FRAME** in which dead trees can be salvaged.[18]

III. The state's **limited mill and biomass energy infrastructure**.[19]

In 2021, California's estimated biomass resource potential was approximately 47 million bone-dry tons. Essentially, **14% OF THE NON-RENEWABLE ENERGY** currently generated in California could be replaced by energy derived from the state's **FOREST BIOMASS RESERVES**.[20]

HOW YOU CAN HELP

The impacts of climate change on forests are multifaceted, and the problems created are many. Adapting to climate change's impacts on green spaces and the Nature's Benefits that we rely on will require flexibility and responsible stewardship over forest lands. Sustaining our water resources, engaging in proactive forest management to reduce the severity of wildfires, and reusing and repurposing wood products not only are appropriate for addressing contemporary environmental challenges, but also help create an economic climate that stabilizes jobs and potentially draws insurers back to California by reducing risk.

16. Knapp, 2014
17, 18. Tubbesing et al, 2020
19. California Department of Forestry and Forest protection, 2021
20. California Energy Commission, 2021; Tubbesing et al., 2020

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