



Ch. 9:
**Forests & Forest
Management**

Forests cover 31% of Earth's surface

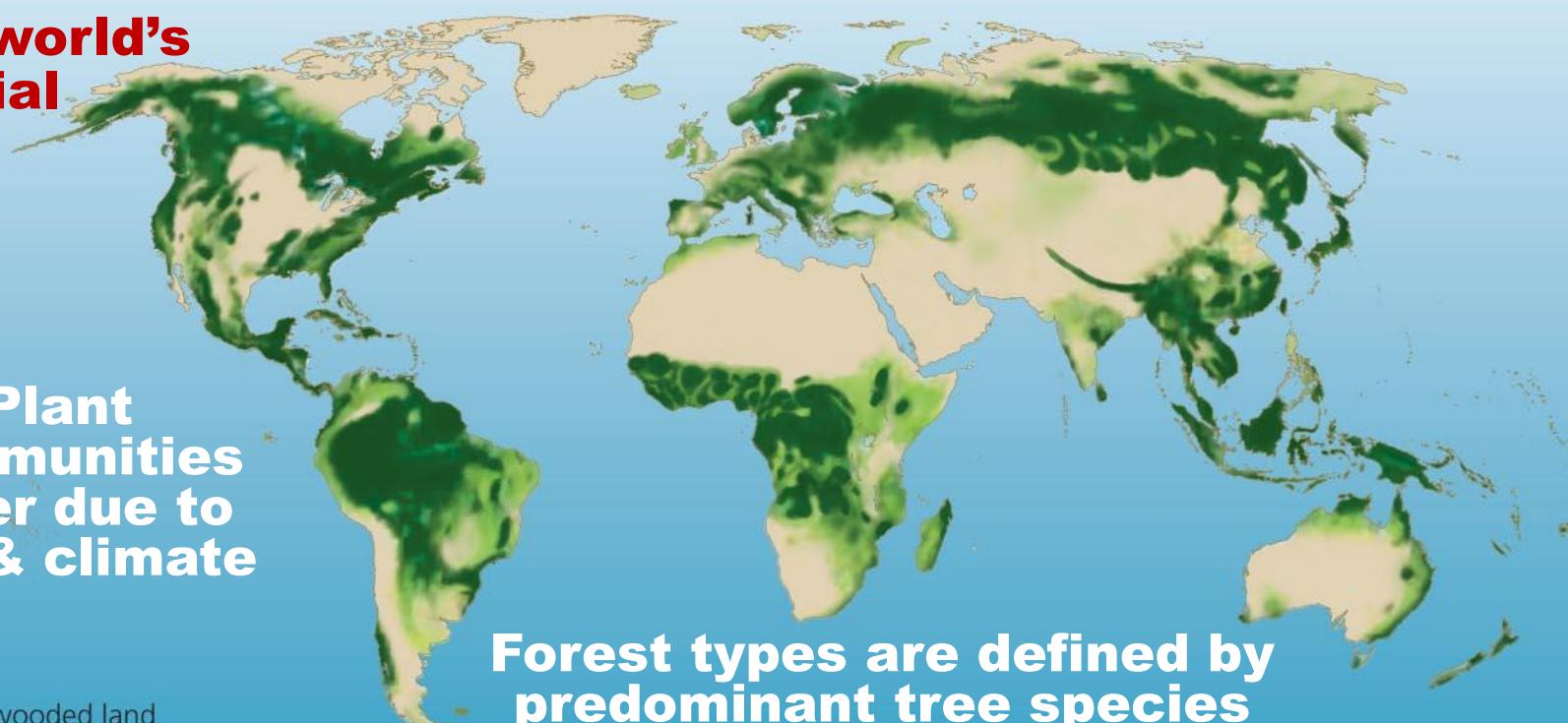
- **Ecosystems with a high density of trees**
 - **Boreal forest (N. latitudes, pines), Temperate deciduous forests (Mid-latitudes, broadleaved trees drop leaves), Tropical rainforests (Equator, broadleaf evergreens)**
 - **Woodlands have a lower density of trees**

80% of world's terrestrial species live in forests

Plant communities differ due to soil & climate

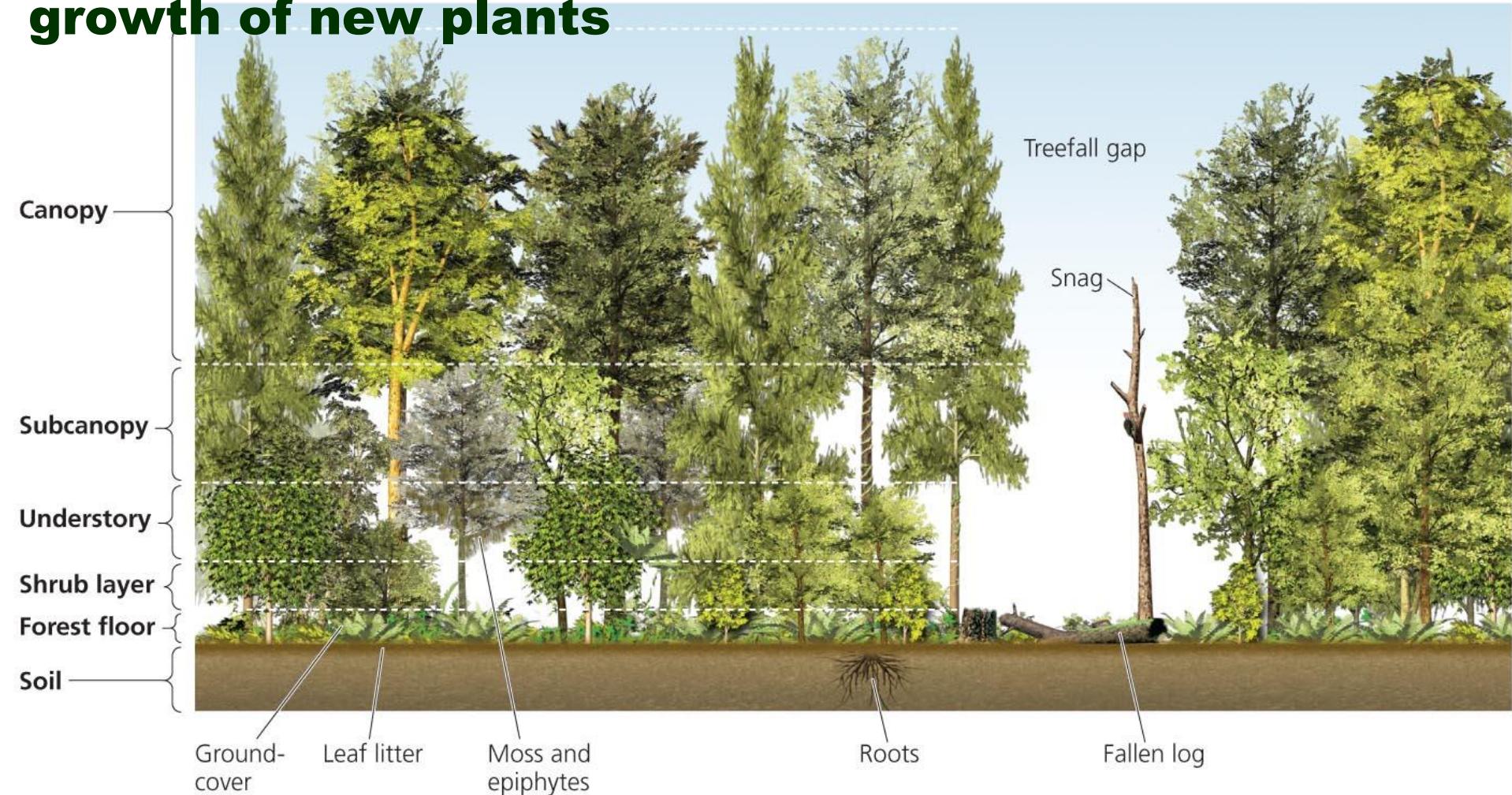
Forest types are defined by predominant tree species

■ Forest
■ Other wooded land



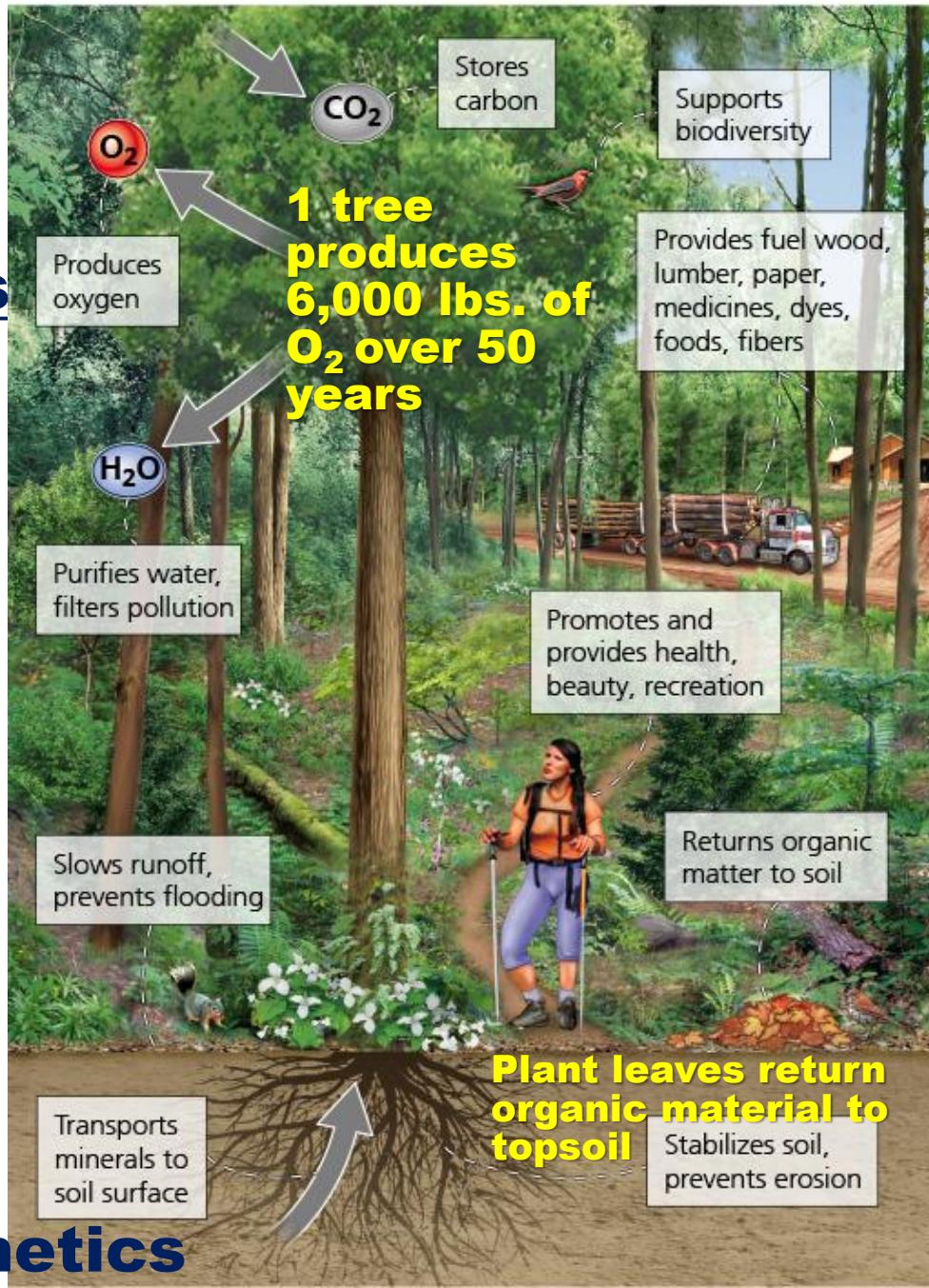
Forests are Ecologically Complex

- Each forest level provides niches for different organisms
- Dead/dying trees (snags) are homes for insects, which provide food for birds & reptiles
- Fallen trees create openings for sunlight to aid growth of new plants



Forests provide resources & services

- Provide medicines, food, fuel, shelter, & wood (paper, homes, furniture)
- Vital ecosystem services
 - Stabilize soil & prevent erosion
 - Slow runoff, prevent flooding by absorbing water, purify water
 - Store carbon, release oxygen, influence weather patterns, & moderate climate
- Roots draw minerals to surface soil layers
- Recreation, health, aesthetics



Carbon storage helps limit climate change

- Carbon storage by forests is of great international interest to help control climate change
- Trees absorb carbon dioxide from atmosphere (13 lbs. per tree/year) & store the carbon
 - The world's forests store 280 billion metric tons of Carbon
- Cutting or burning forests worsens climate change
 - Dead plants decompose & release carbon dioxide
 - Fewer trees soak up less carbon dioxide
- Preserving forests keeps carbon out of the atmosphere
 - Carbon offsets: money paid by polluters to countries or forest land-owners to protect trees



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How is the Rain Forest Helping Limit Climate Change?

[https://www.youtube.com/watch?v=TigV80hwebg
&ab_channel=BBCNews](https://www.youtube.com/watch?v=TigV80hwebg&ab_channel=BBCNews)



Demand for land & wood leads to deforestation

- Degrades ecosystems, reduces biodiversity, worsens climate change, disrupts ecosystem services
- Heavy deforestation in North America through the mid-1800s left very little primary forest:

— Natural forest left uncut by people



(a) 1620: Areas of primary (uncut) forest



(b) Today: Areas of primary (uncut) forest

• Secondary forests: new growth of young trees



(a) 1620

Primary forest
Secondary forest

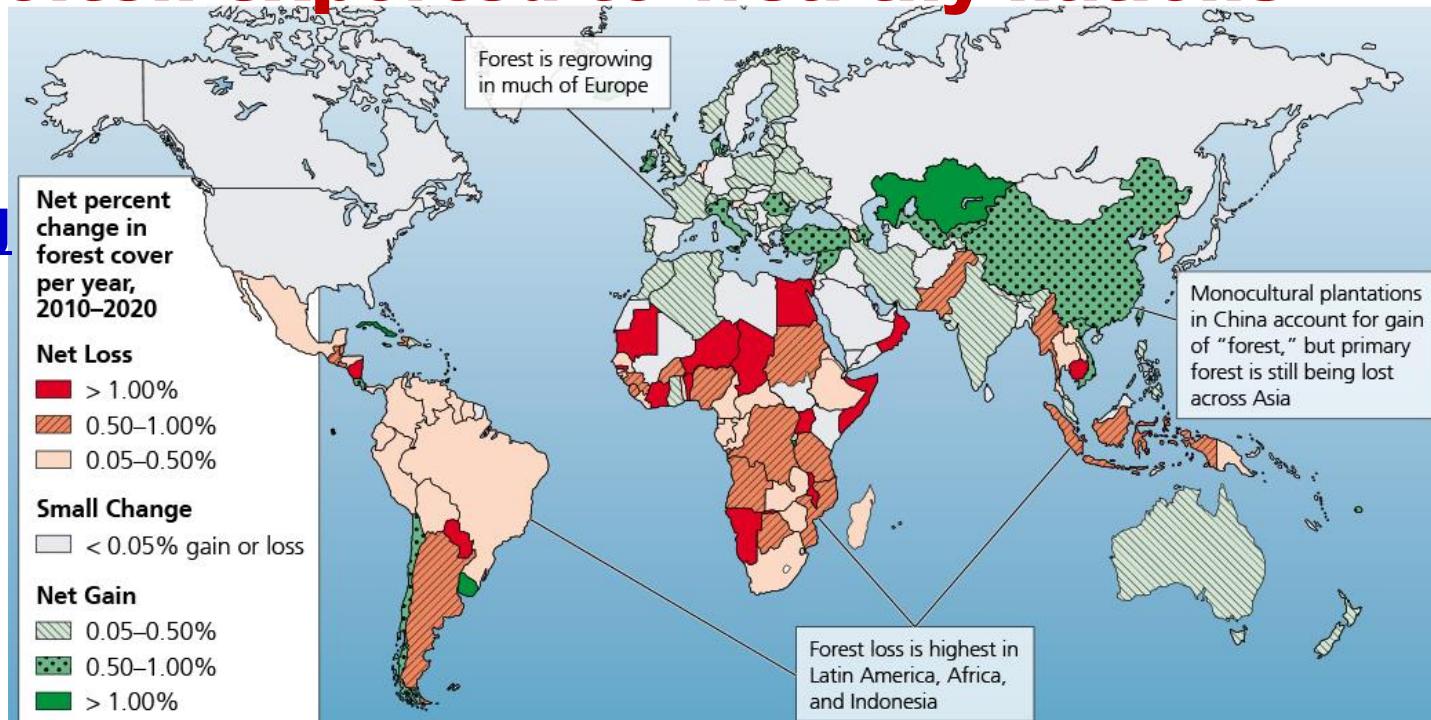
(b) Today

Secondary
Forests
often have
very different
species
composition
& structure

Forests Are Being Cleared Most Rapidly in Developing Nations

- Spurred by expansion of human settlements, to boost economic growth, & provide fuelwood for heating & cooking
- Being harvested much more rapidly due to powerful industrial technologies
 - Wood is often exported to wealthy nations

Land clearance for ranching & farming (slash & burn) also plays a significant role



Plantation forestry

- The timber industry focuses on timber plantations
 - Fast-growing, single-species monocultures
- Even-aged stands: all trees are the same age
- Trees are cut after a certain time & the land is replanted
- Some plant uneven-aged stands that have mixed ages of trees and species

Tree plantations are crops, not ecologically functional forests



Palm oil plantations

- Palm oil is used in snack & processed foods, soaps, cosmetics, biofuel**

- Palm oil replaced unhealthy trans-fats (hydrogenated vegetable oil) & short-shelf life butter & lard**

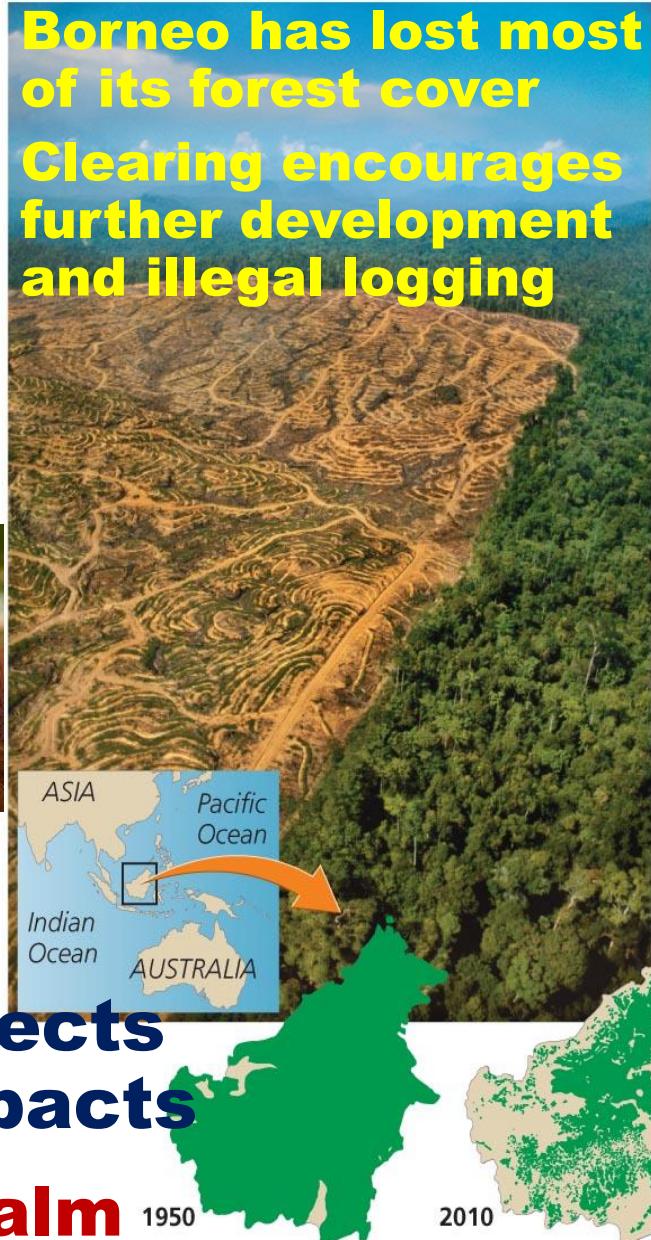
- Lead to massive increase in palm plantations**



- Palm oil is also a saturated fat with significant health effects + environmental, & social impacts**

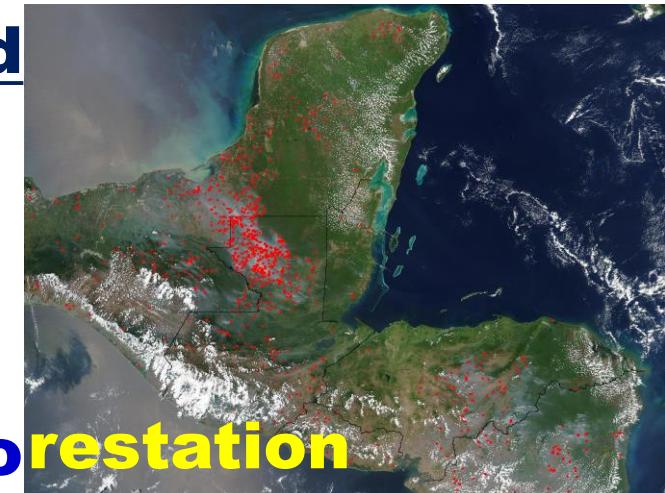
- Pesticides & fertilizers from palm plantations pollute air, water, soil, & kill fish**

- Habitat loss driving Orangutans to extinction**



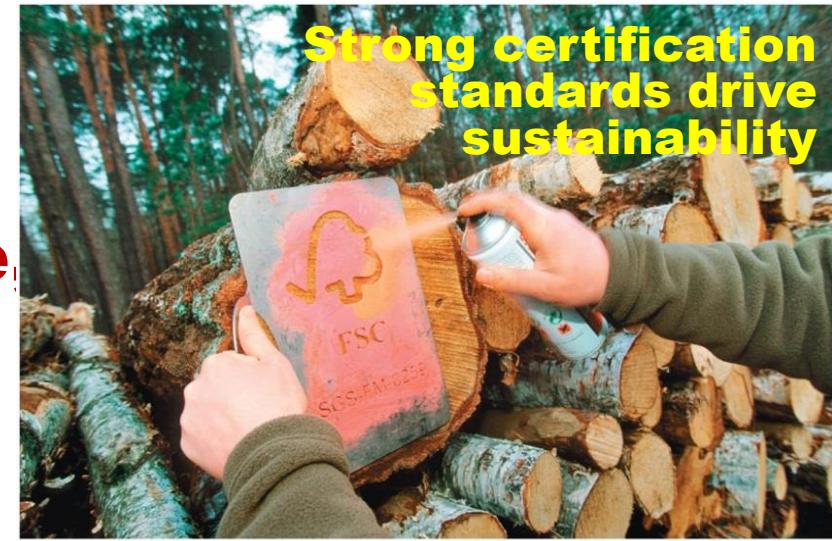
Forest management

- Timber is renewable if not exploited too rapidly
 - Maximum sustainable yield
- Ecosystem-based management: minimizes impacts on ecosystems & ecological processes
 - Protect certain areas of the forest
 - Restore ecologically important habitats
 - Replant native trees of mixed species
- Costa Rica's forest area increased from 20% in 1980 to 50% today
- Ecotourism makes forests more valuable alive than dead
- Satellite imagery allows officials to view forest cover & illegal deforestation
- Forest owners in Mexico, Costa Rica are paid by locals for ecosystem services (clean water)



Sustainable Forestry

- Sustainable forest certification: products produced sustainably can be certified by organizations
 - The Forest Stewardship Council (FSC) has the strictest standards
 - Companies such as Home Depot sell sustainable wood, encouraging better logging practices
 - Consumers look for logos to buy sustainably produced timber, furniture, & paper products
- 65-69% of paper products are recycled in USA (2023)
 - Consumers should recycle their paper & buy recycled paper products to reduce pressure on forests



Fire & Forest Ecosystems

- Many forest & Chaparral plants are adapted to survive fire & many require it
 - Thick seed coats must be burned for seeds to sprout, thick leaf litter inhibits growth of seedlings (no access to sun), ash provides nutrients to poor soil
 - Thick bark insulates trees, many plants can burn to the ground & re-sprout, some bloom after fires
- But, for over 100 years, the U.S. Forest Service suppressed all fires
 - Forests need to burn to regenerate



Fire is a natural part of many ecosystems



Catastrophic Fires Have Become More Numerous

SCIENCE CONNECTIONS →

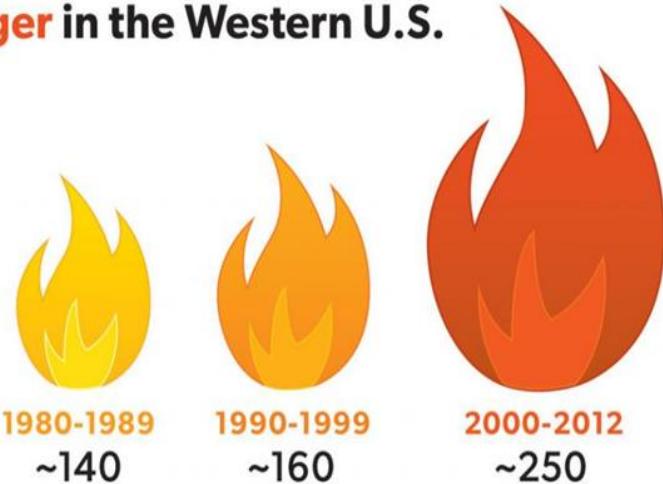
WESTERN WILDFIRES & CLIMATE CHANGE

Wildfires are **increasing** and wildfire season is getting **longer** in the Western U.S.



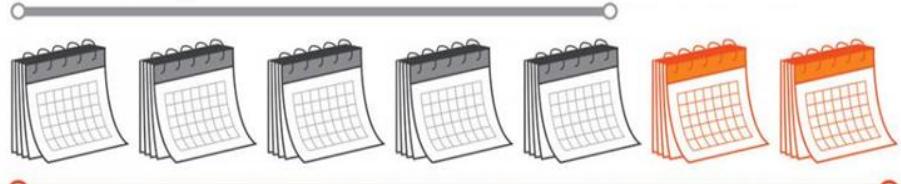
Average number of large wildfires per year

bigger than 1,000 acres



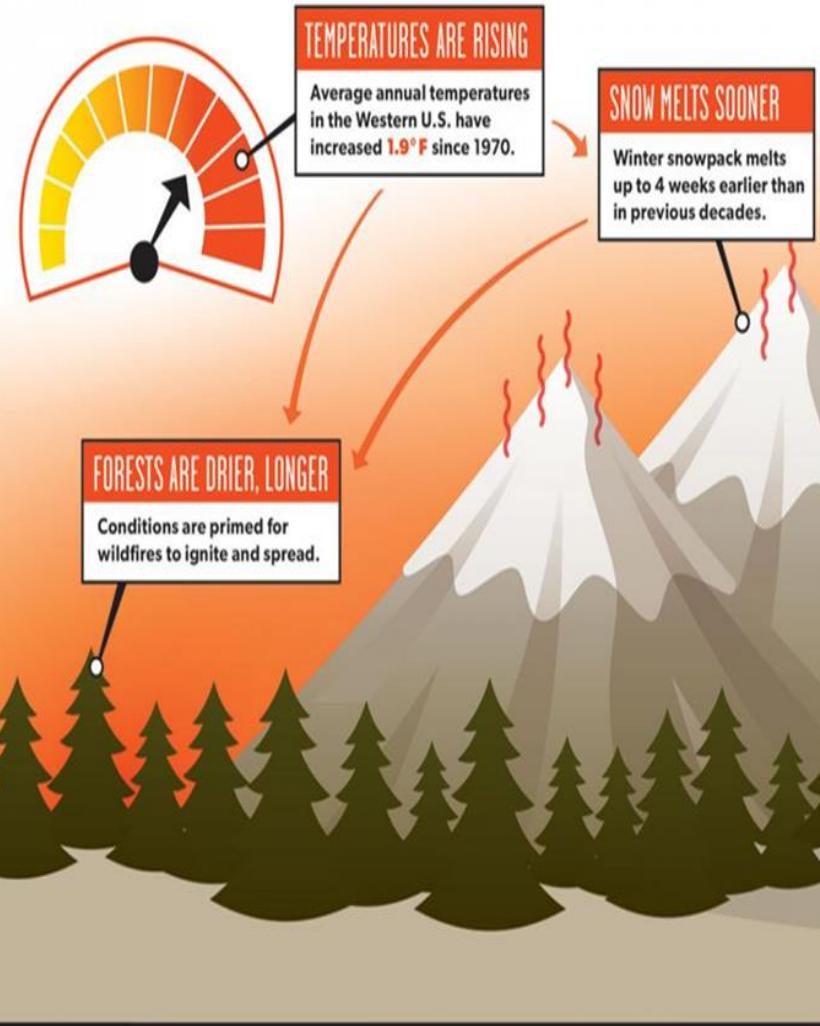
Average length of wildfire season

Early 1970s: 5 months



Today: 7+ months

Climate change is driving up temperatures and **increasing wildfire risk**.



Fires in the Amazon more than doubled since 2013. Many are deliberately started to illegally deforest land for cattle ranching



Fires rarely start naturally in the rain-forest, because it is so wet. Once the tropical rainforest is lost, it converts to a savannah biome



Fires are Increasing Around the World

In Australia, record-breaking temps. & months of severe drought fueled massive bushfires (Jun 2019-May 2020)



47 million acres & 21% of Australia's forests burned

Nearly 3 billion animals were killed or displaced by 2019-2020 bushfires



Western USA Fires

- Over 10 million acres burned in 2020

Fighting them cost of over \$3 billion

**Silverado Fire,
Irvine, CA**



**Bobcat Fire,
LA county, CA**



**Creek Fire,
Fresno, CA**



**September
2020**

Los Angeles Fires 2025

- Burned 57,000 acres
- 30 dead, 16,251 structures burned



Palisades Fire

Humans Cause Catastrophic Fires

- We have built many communities in the Wildland-urban interface
 - Whole towns built in wildland areas, Millions of homes in West USA at risk, not built to be fire resistant
- Fires have been suppressed for over 100 years & a huge amount of fuel (weeds, dense stands of trees) have built up
- Climate change causes longer & more severe droughts, fire season is longer if not year round, there is less snow that melts earlier
 - Situation will only get worse as climate change advances without action for change
- There are many more people now (8 billion) & most fires are started by human activities



Managing Wildfires with Controlled Burns

- For 1000's of years, indigenous people in North America & Australia practiced cultural burns
- Before 1800, several million acres burned every year in California due to Indigenous burning & lightning-caused fires
- Western settlers didn't understand that fire could regenerate & rejuvenate the land, so they banned indigenous burns & suppressed all fires

Low, cool-burning blazes burn up fuel like grasses & leaf detritus, so natural wildfires have less to devour



Low-grade fires shape the landscape, encouraging beneficial plants

Controlled, Prescribed, Cultural Burns

https://www.youtube.com/watch?v=eg876VdW7Qk&ab_channel=UniversityofCaliforniaTelevision%28UCTV%29

FIGHTING FIRE WITH FIRE CULTURAL BURNING PRACTICES



Support for Prescribed Burns is Rising

- **Federal & California officials agreed to treat 1 million acres a year with combined thinning & controlled burns**
- **We must realize that we're going to get fire one way or another**
 - **Much better outcomes using controlled fires on landscapes rather than reacting & suppressing catastrophic fires**
- **Must develop training programs for qualified, experienced prescribed burners to enable more prescribed fire projects**
 - **Prescribed Fire Training Exchanges (TREX): Nature Conservancy, US Forest Service, Indigenous Peoples Burning Network**

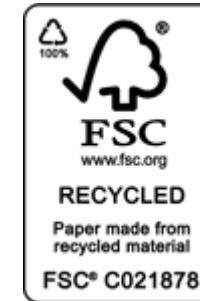


Learn More

- Be an informed & conscientious consumer

–Forest Stewardship Council

- <https://us.fsc.org/>



–Global Forest Watch:

- <http://www.globalforestwatch.org/>

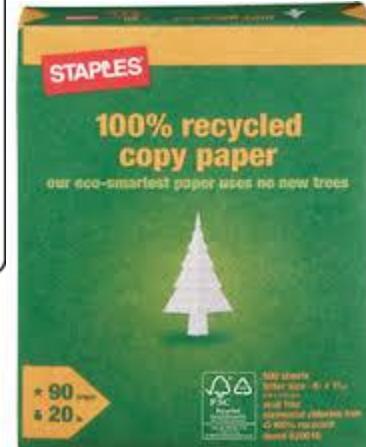
–Roundtable on Sustainable Palm Oil

- <http://www.rspo.org/>

- Recycle paper & buy recycled paper products, certified wood & furniture

- Reduce intake of palm oil & processed foods

- Avoid palm kernel oil & fractionated palm kernel oil (highly processed & very unhealthy)



Sumatran
Orangutan #'s
expected to drop
97% by 2050
Could lead to extinction



6 million of the 11 million hectares of palm oil plantations are in Indonesia, the only home of Orangutans

Exposure to Wildfire Smoke

- As wildfires have increased dramatically in recent years, the number of days that people are exposed to & breathing in smoke has also jumped, alarmingly
- In Southern CA, we are now exposed to 30 days of smoke per year (Central CA - 60 days, North CA 90 days)

The Statue of Liberty shrouded by a haze of Western wildfire smoke



Even as far away as Boston, people are breathing in wildfire smoke 30 days/year

Health Impacts of Wildfire Smoke

Wildfire smoke is toxic.
Protect your health.

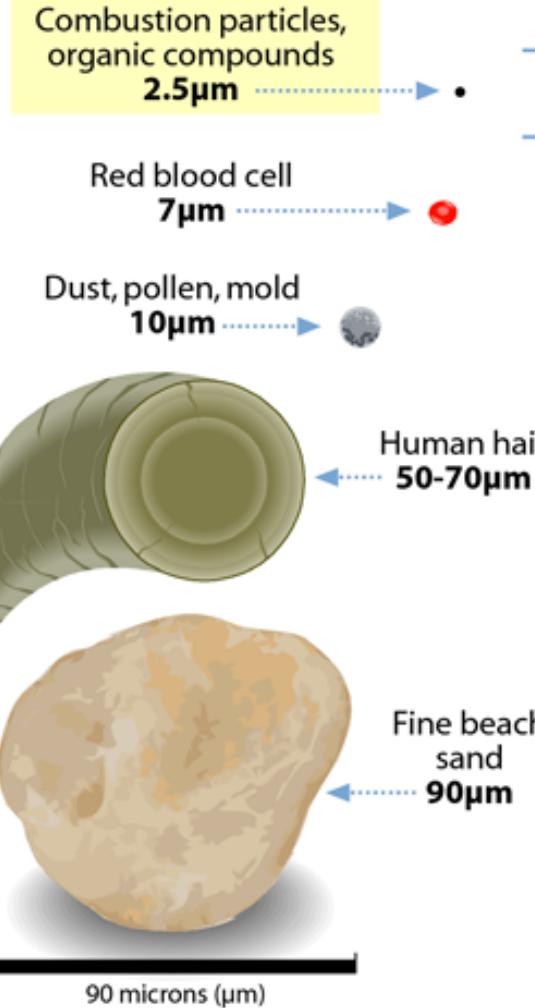


PM2.5: Tiny Particles, Deep Impact

Microscopic particle pollution known as PM_{2.5}, which is a prevalent component in wildfire smoke, is a growing cause for concern due its lingering health impacts at time when climate change is driving an increase in smoke from wildfires. New research is looking at possible links between wildfire smoke and Covid-19.

SIZE COMPARISON

Diameter in microns (μm)



NEGATIVE HEALTH EFFECTS

