

 **Laurea / B.A.  
in Global Governance**

# 4. BIOMES

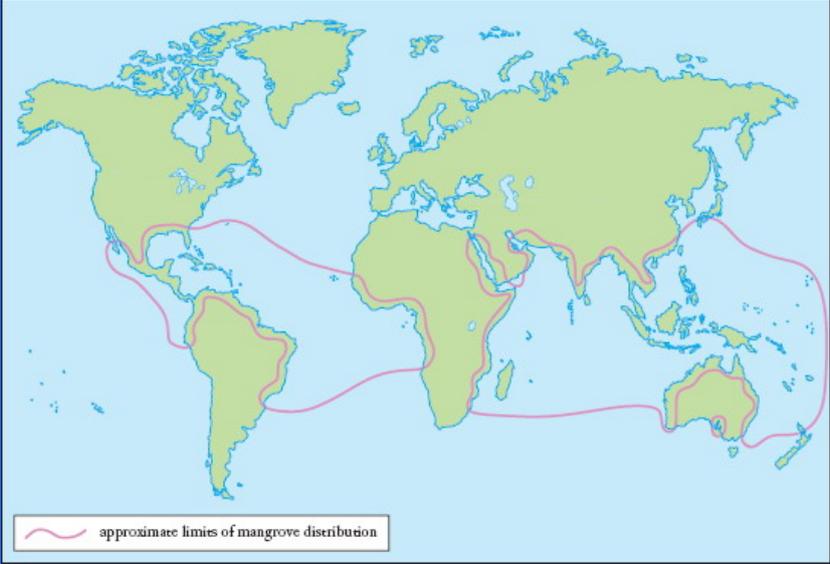
## Mangroves, Mediterranean biome and Temperate Forest

*2020/2021*  
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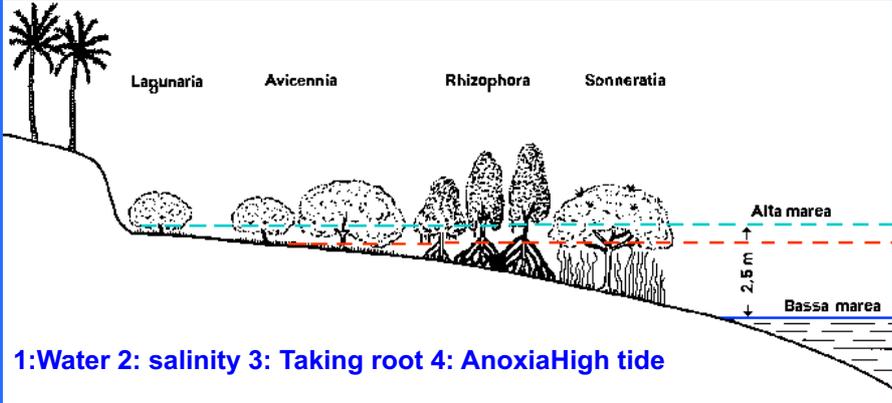
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Mangrove lives near to the sea on the coast:



 approximate limits of mangrove distribution

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1: Water 2: salinity 3: Taking root 4: Anoxia High tide

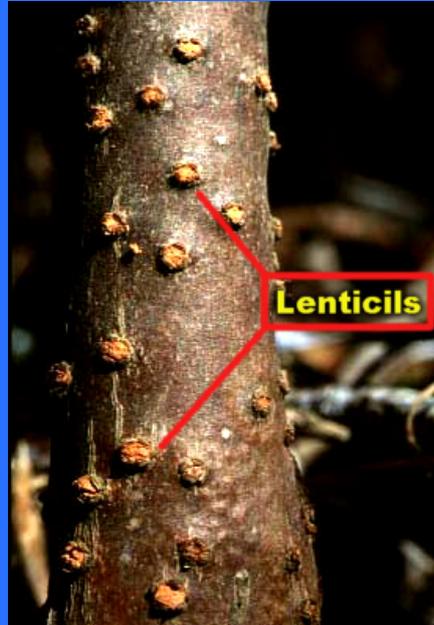
Which are the problems for plant in this place? First of all, water salinity. Semifluid soil get more difficult take root. Moreover soil is anoxic. Finally flood tide changes four time in the day salinity of water.

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All mangrove species developed two expedient: numerous pores on the bark, called little opening associated with cork tha provid for gas exchange The cortex often develops into a type of tissue called aerenchyma, which contains air spaces produced by separation, tearing, or dissolution of the cortex cell walls.



5

Adaptation to salinity



**Salt Excluder**

ultra filtration reducing of 90 percent of adsorbed ions

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### Non Salt Excluder

Another type of adaptation is expulsion of salt in excess by leaf gland. Secreted liquid has salt concentration 40 percent higher than sea water



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*Laguncularia racemosa*

Salt glands

All mangroves however cumulate salt in cork and in old leaf. When these leaves fall high quantity of salt is spread in water

8

### Mediterranean ecosystems :Geographical features

**These climatic conditions are found in at least 5 different parts of the world, around the 35th parallel north and south of the equator:**



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**This peculiarity is often accentuated by the orography of the territory; at short distances from the coast these regions are bounded by mountain ranges such as:**



10

## Climate characteristics

Csa/Csb – Mediterranean

Mediterranean climates (Csa/Csb) receive rain primarily during winter season from the mid-latitude cyclone

**Warm-temperate climate (T annual average between 14-20° C), markedly influenced by the influence of the sea or ocean**

11

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## Mediterranean soils



- A Thin mull humus forming in eroded remains of Bt horizon
- Btf Illuvial horizon enriched with clay and iron, has become red-coloured. High clay content renders them relatively impermeable and prone to erosion
- C Parent material (commonly calcareous) but in this case composed of Palaeozoic shales

12

12

## Adaptations of plants in Mediterranean

The vegetation of Mediterranean ecosystems is generally composed of species that can exploit the strong lighting and adapt to the high summer temperatures and periods of drought; adaptations to the cold are few.

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## Adaptations to the thermal regime

The plants of the Mediterranean have two critical periods: the winter's cold temperatures and the summer's heightened environmental aridity

Adaptations to cold: poor

Adaptations to the heat:

### thermophilic

1. Habitus evergreen: for intense vegetative activity during optimal (spring and fall);
2. Reducing the length of internodes resulting in formation of compact foliage can protect the primary branches with shading

14

14

## **Adaptations to the conditions of humidity**

**Many species protect themselves from excessive water loss from the tissues during the periods of drought**

**these plants are called XEROPHYTE**

**Xerophytic adaptations:**

- 1. Sclerophyllia: resistant leaves, tough, leathery, with skin covered by a thick cuticle layer, generally small, persistent and subject to a gradual replacement;**
- 2. Capacity closing of stomata in the leaf water stress conditions;**
- 3. Ability to go dormant in the dry season**

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## **Mediterranean basin**

**Three different vegetation forms:**

**Evergreen forest**

**Scrub**

**Garrigue**

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## Evergreen FOREST



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## scrub

The scrub is spread over rocky terrain, shallow and subject to rapid drainage, on which the vegetation play an important role in the defense of the soil from erosion.

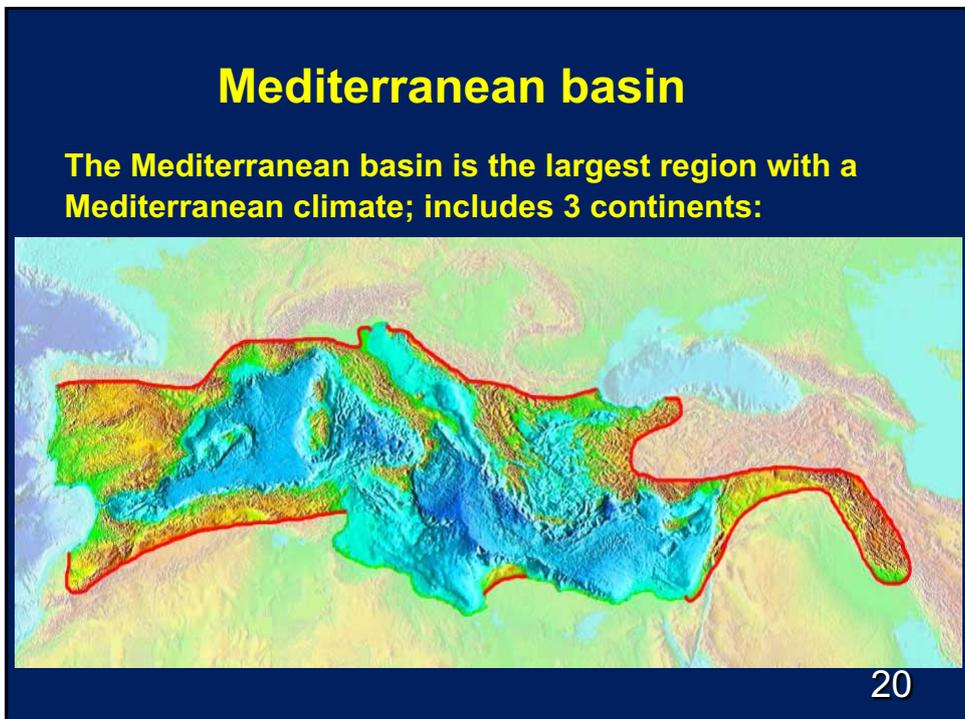
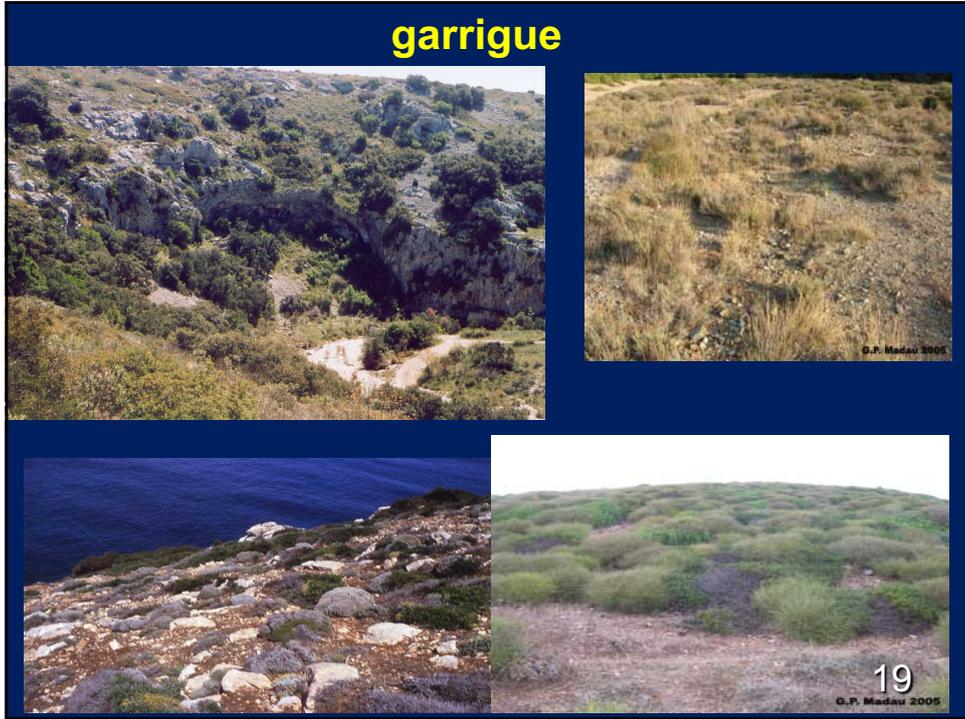
The structure is variable because its composition depends on the geological substrate, climatic factors, and the exploitation of man: in this sense it can be considered a regeneration of the garrigue, or may result from deforestation of evergreen forest.

It is composed mainly of thermophilic species, shrub-like, with foliage that reach a maximum height of 2-3 m



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# California

Chaparral is the term (of Spanish origin) used to indicate the evergreen vegetation.

There are various types of chaparral; the arborescent type, is characterized by the presence of an evergreen oak like the holm oak (*Quercus agrifolia* and *dumosa*).



21

# Chile

The Mediterranean vegetation is called Matorral

There are also a low scrubs similar in appearance to the mediterranean formations *Cistus*, but dominated by *Asteraceae* shrubs.



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## Eastern Mediterranean conifer-sclerophyllous-broadleaf forests



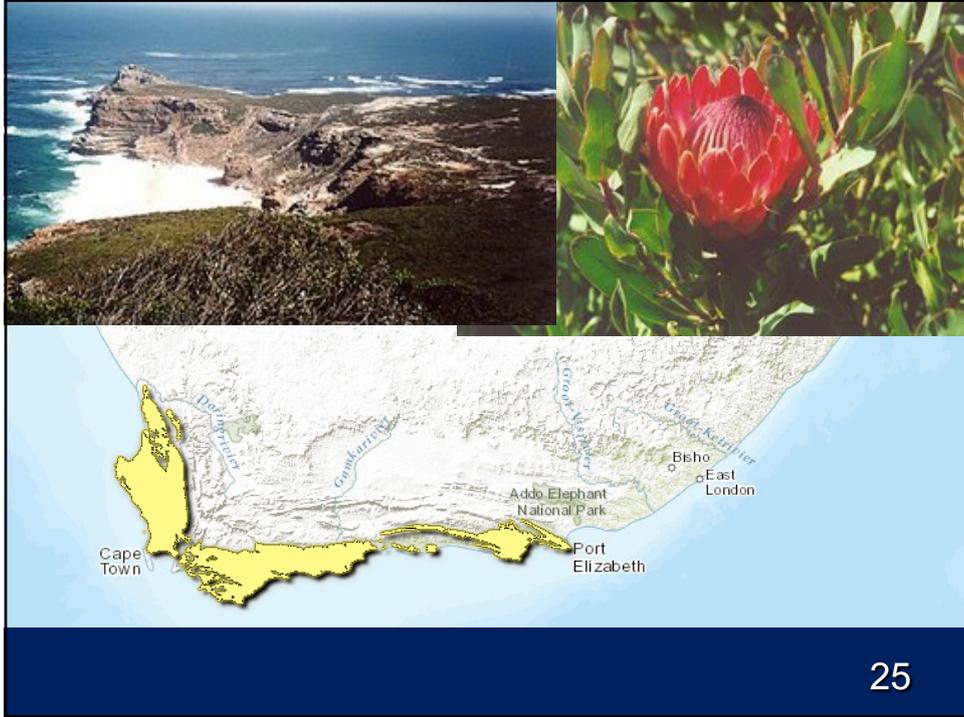
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## South Africa

The Fynbos consists sclerophyllous shrubs of the genera Protea and Leucadendron, heather shrubs (Erica), herbal aspect graminoides.



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**Australia**  
The evergreen vegetation of Mediterranean type is indicated as mallee scrub , or Kwongan (Aboriginal word)



Proteaceae, Myrtaceae, Rhamnaceae, Dilleniaceae, Restionaceae. 26

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## Types and severity of threats

- Human activities
- Agriculture
- Herbicide
- Human-caused fires
- Overgrazing
- Dams

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**Risk Factors**  
**1. Human activity**  
**Intensive agro-forestry-pastoral**



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**Risk Factors**  
**2. Fire**



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## Effects

- 2. Alteration of floristic component: for introduction of exotic species, differential exploitation of essences, direct selection by man and fire.**

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## Man and environment

The human disturbance is the primary cause of vegetation mosaic.

In the Mediterranean area, the major crops are wheat, grapevine and the olive tree, originating in these areas; fruit farming and the cultivation of maize are newly introduced.

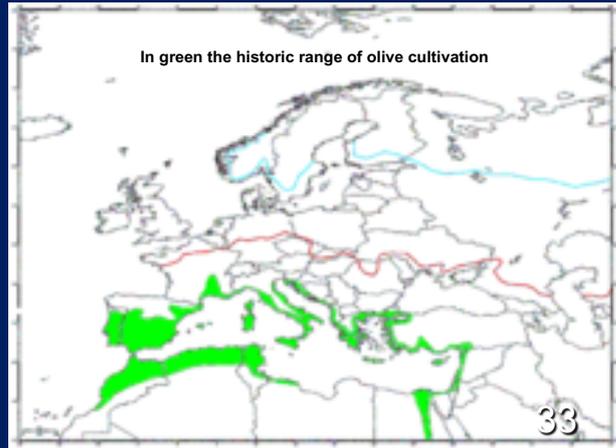


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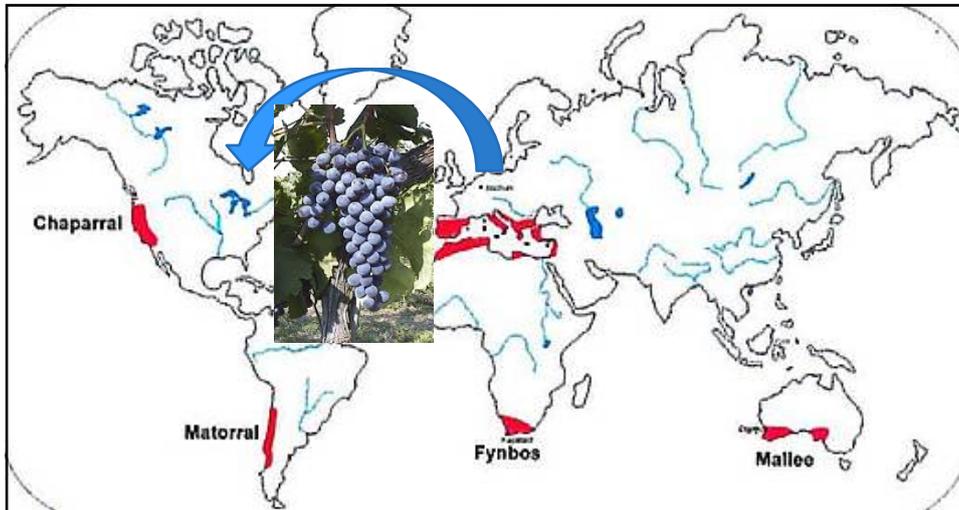
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# Olive tree

Typical mediterranean  
Slowly grow  
Fully productive ages: 35-100 years



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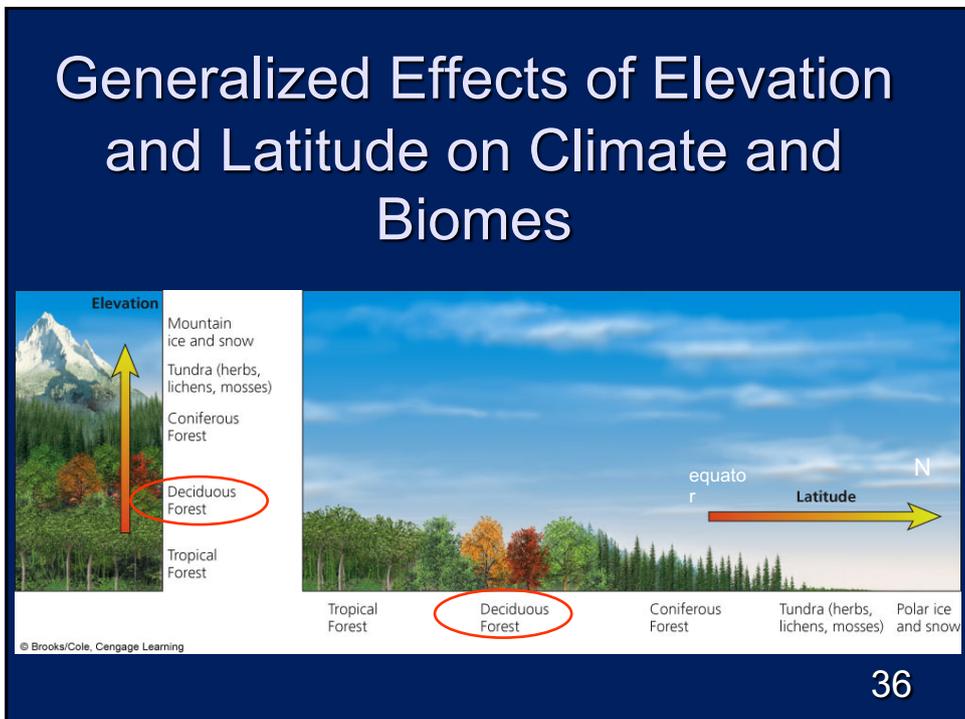


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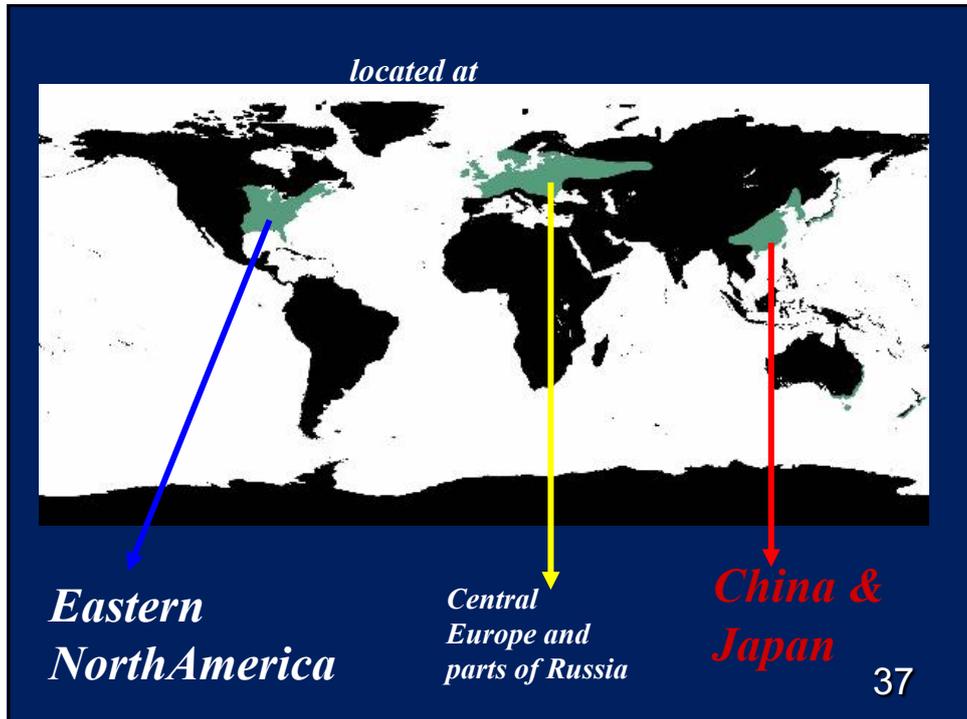
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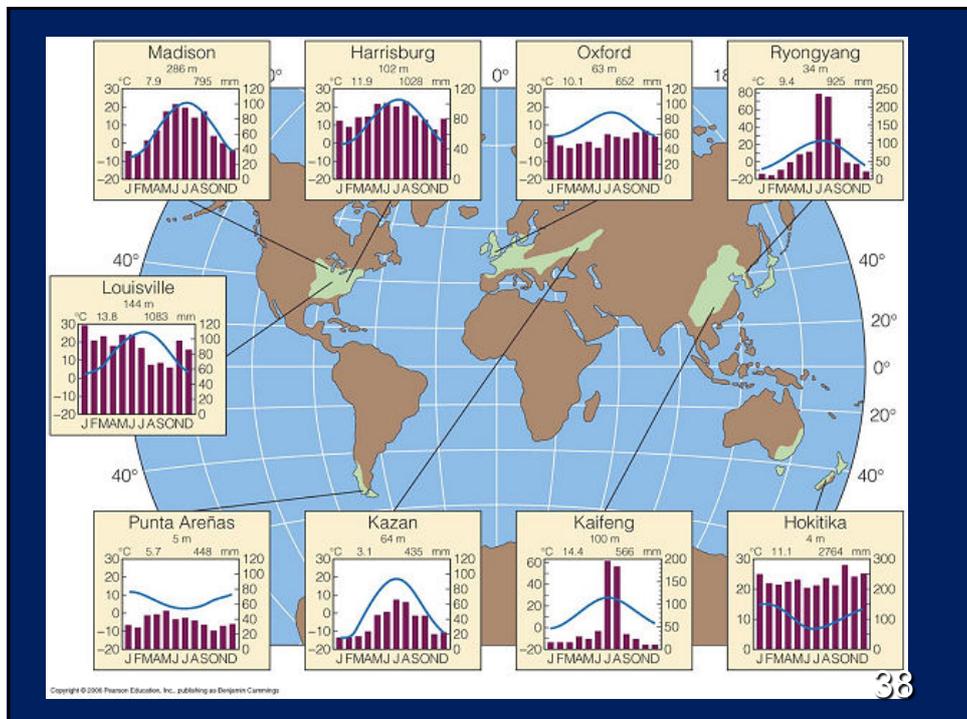
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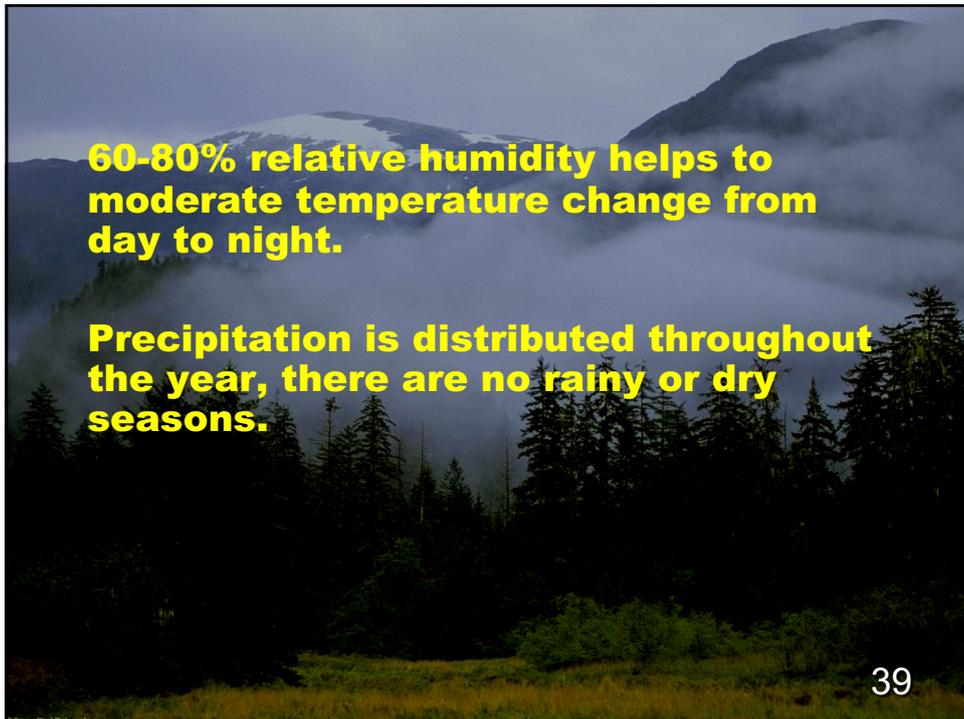
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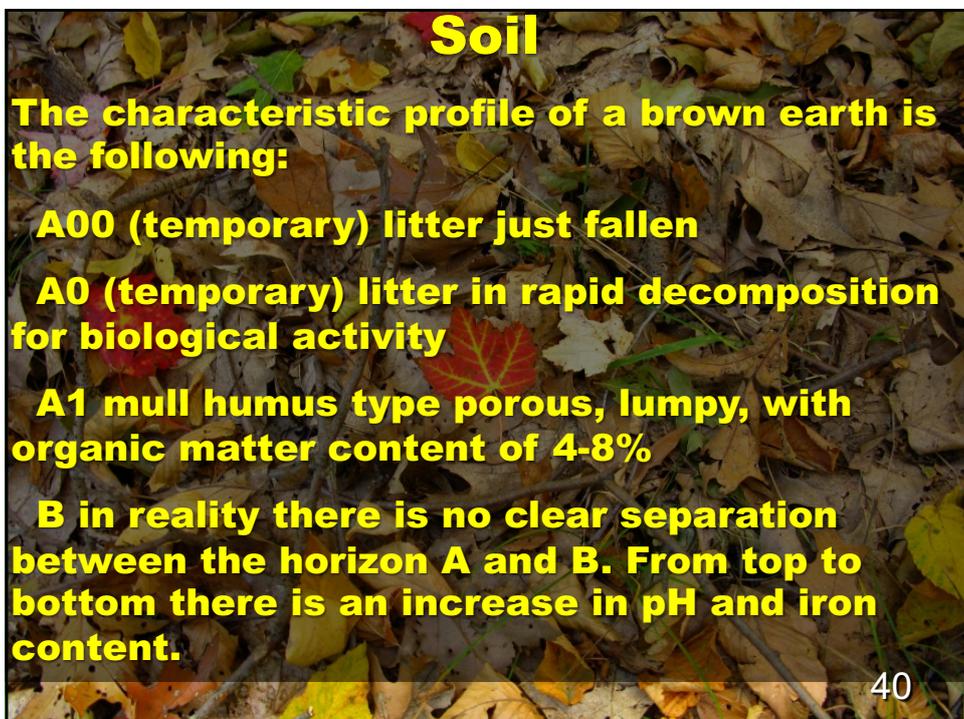
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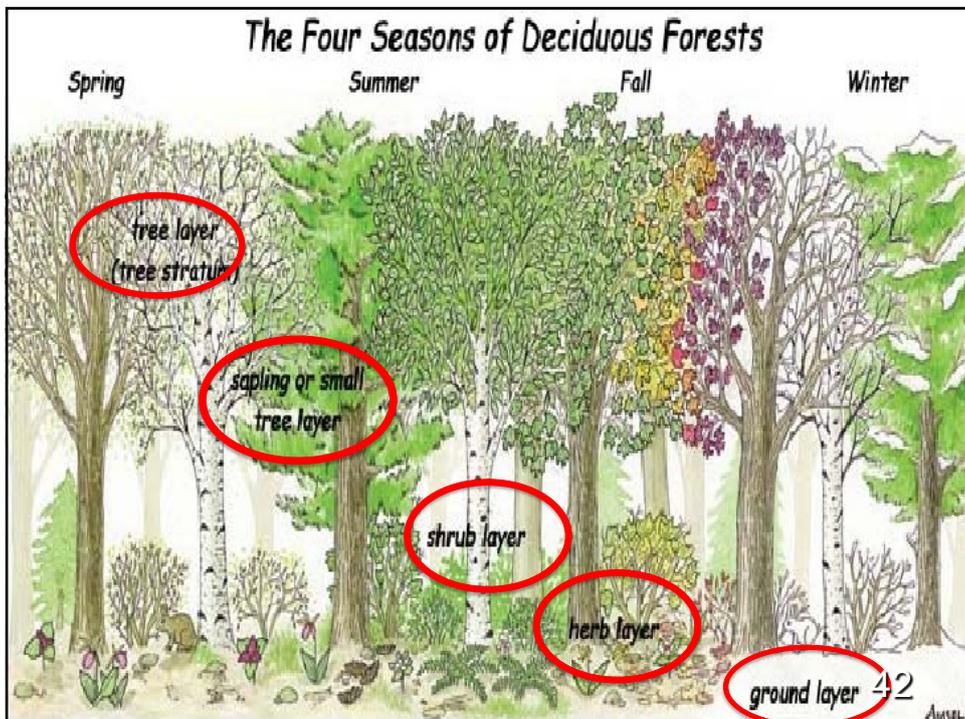
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**Different distribution to the two hemispheres:**

- **Northern hemisphere:** natural succession tends to deciduous forest, are especially Fagaceae and Betulaceae and also *Acer*, *Tilia*, *Ulmus* and *Fraxinus*. These kinds of vegetation forming associations with a variety of aspects.
- **Southern hemisphere:** there is a forest belt fully developed. Australia is completely lacking, in South Africa and Argentina have forests of *Celtis*; while in New Zealand, Tasmania and Patagonia is a significant presence of *Nothofagus*.

43

43



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44

The greatest threat is the ongoing land conversion to agriculture



45

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### **Productivity and resilience**

- **Primary productivity high during the spring and autumn with a peak in May-June (late spring); the vegetative awakening is performed by herbaceous plants in particular those bulbous (*Corydalis*, *Scilla*, *Gagea* and *Orchis*).**
- **Rich supply of organic matter allows intensive consumers and manufacturers, with high diversity of fungal species; also animal life is very rich, especially as regards the soil fauna (important function for the recycling of organic matter).**

46

46

- Phytomass 200 tons/ha per year
- Primary production 15 ton/ha per year

47

47

## Risk Factors 1. FIRE

### Forms of protection of vegetation

- 1. Active defense: some species of trees (oak, chestnut and alder) survive the passage of the flame front due to the effect of the insulating outer part of the cortex (cork), which protects the generative parts of the trunk and vital from lethal temperatures developed by the fire.**
- 2. Passive defense: the ability of some plants to regenerate after suffering a partial or total destruction of the aerial parts.**

**Vegetative reproduction from the stump or roots**  
(eg. chestnut, oak)

**Germination of seeds capable of colonizing the burned area after the passage of fire.**  
(eg. birch)

48

48

## 2. ACID RAIN

**By definition we consider acid precipitation with a pH less than 5.6. The substances responsible for the acidity of rain are some air pollutants, mainly sulfur oxides and nitrogen oxides, which in contact with moisture in the air are transformed into corresponding sulfuric acid and nitric acid.**

**Effect on forests Progressive loss of vitality of the plants reported: - depigmentation (yellowing and / or browning of the leaves) - Loss of leaves**

**In the long run this can lead to the death of the trees or to a lower growth and to a state of general suffering that predisposes them to pest attacks and makes them more susceptible to adverse climatic conditions.**

49

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**Pollution caused by humans, in the atmosphere from industries and motor vehicles or in the water from chemicals is a major threat to this biome.**



50

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## DEFORESTATION

- 1) timber for energy (firewood)
- 2) timber for industrial uses (wood work)  
Industry (paper and cardboard)
- 3) new space for farming and pastoral
- 4) new space for the man following her ever-expanding population.

51

51

## CERTIFICATION FSC (Forest Stewardship Council)

This is a certification that guarantees that the product is made with timber from controlled forests in environmental, social and economic terms

Buying certified wood helps indirectly sustainable use of forests, because trees are left in place until they reach a certain age. This assures that the wood does not come from countries where illegal logging is widespread, such as Eastern Europe and the Balkans.



52

52

## Anthropogenic disturbance and forest remnants (Europe)



Forest patches on steeper slopes and distant from villages<sup>53</sup>

53

## Temperate Rainforest Sequoia forest

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# rainforest

Rainforests are warm, wet, dense forests. They contain millions of animal and plant life. These forests are important to the earth. They provide many resources for medicines and are a great supply of oxygen.

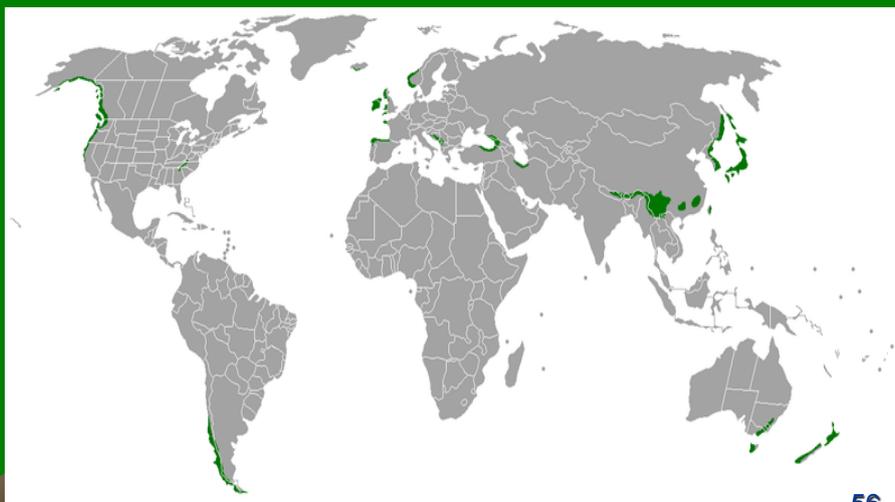
There are two different types of rainforests: temperate and tropical.

rainforest	distribution	seasons	average temperature	rain	soil
<b>Tropical</b>	in tropical regions between the Tropics of cancer and Capricorn	do not really have seasons	21-30 ° C	200-1000 mm	thick and ancient
<b>Temperate</b>	In temperate regions along the coast to 25° and 50° latitude	wet and dry seasons	10° C	200-1000 mm	richer in nutrients

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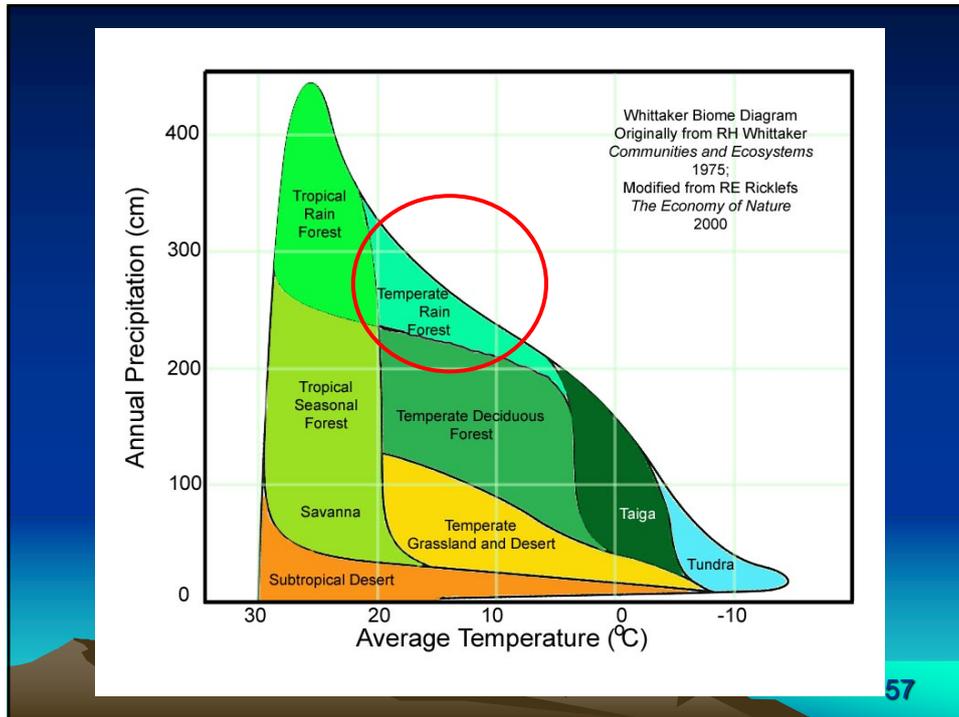
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## Temperate rainforest location



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## Climate



**TEMPERATURE:**

- moderated by coastal currents, 10°C mean.
- Winter temperatures rarely drop below freezing.
- Summer rarely exceed 26°C degrees.

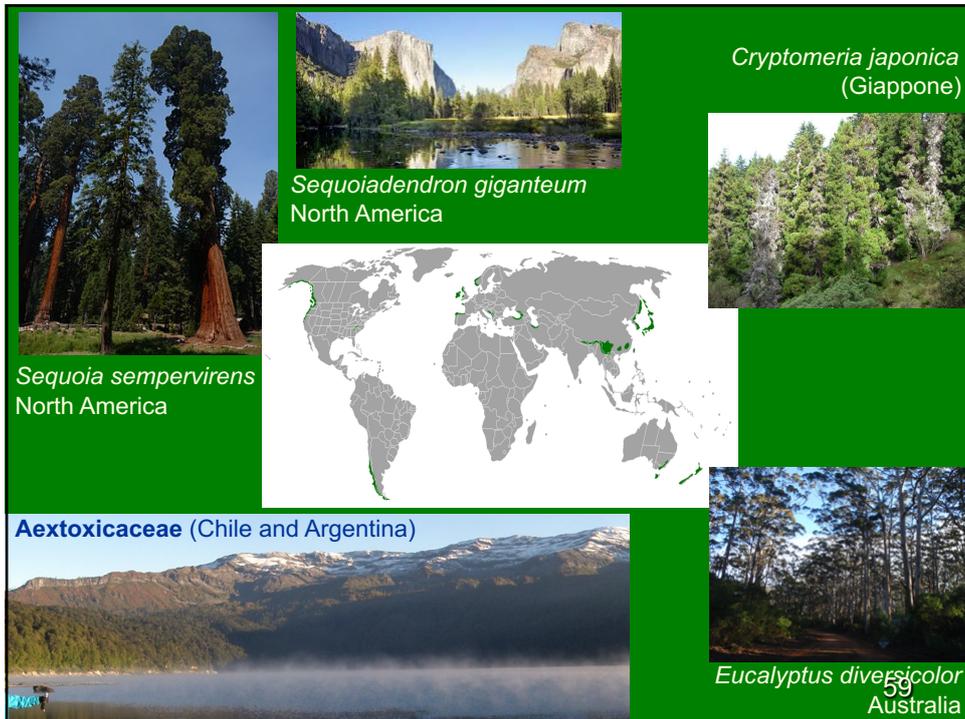
**RAINFALL:**

- high but seasonal, 1000 - 1200 mm of rain per year average some receive more.
- dry summer moderated by fogs

**SOILS:** deep, rich humus layer, rich horizon A. Slow decomposition and shallower bedrock keep nutrients at surface

58

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59

## Limiting Factor

- Natural disasters,
- hunting,
- human activity

→ loss of habitat and  
loss of biodiversity

60



61

## geographical distribution

- along the coast from North Pacific California San Francisco until the Oregon
- Hills at low altitude and high humidity
- Its distribution is strongly correlated with the presence of fog
- Because of its proximity to the Pacific Ocean, the climate is mild and without temperature extremes.
- Precipitation varies from 130 mm per year in the southern portion of the biome, where relatively dry summers prevail, to 500 mm on the mountain slopes of Washington and southern British Columbia.



62

62

## ecological factors

The redwoods do not tolerate either temperature neither extreme rainfall patterns:

- temperature range between 8 °C in winter to 17 °C in summer, and rarely reach below 0 °C and above 37 °C
- rainfall reached 1.600 mm per year, concentrated in the winter with higher values northward
- the fog is an important factor for the survival of these plants
- grow on well-drained soils moderately acidic and not very deep rich in humus

63

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## the fog

The fog appears during the summer and is an important component in the ecology of the forest and plays a key role in the survival of these plants:

- **Source of water available for the entire ecosystem**
- **allows less water loss through transpiration**
- **makes up for the high demand for moisture during the dry season**
- **the plants of the biome have developed very efficient leaves to remove moisture from the air: derive 40% of the water from the fog**

64

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## The forest..

- The virgin forest is called "old-growth forest" in it trees of different size and age coexist
- There are trees from 200 to 2000 years of age (the average is 500-800 years)
- Ecosystem ancient and very stable, which is the largest accumulation of biomass on earth: the biomass estimated for the trunks of redwood per Km<sup>2</sup> is 800 tons, 950 considering the branches and roots, 7 times the biomass of the rainforest
- The flora is mostly coniferous trees.
- Other plant life includes Mosses and Lichens

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*Pseudotsuga densiflorus*



*Arbutus menziesii*



*Tsuga heterophylla*



*Litocarpus densiflorus*

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*Abies balsamea*  
the Balsam Fir is  
used as  
Christmas trees,  
cold remedy,  
glue and paper.

67

## *Sequoia sempervirens*

- the more representative species is *Sequoia sempervirens* Family: **Taxodiaceae**
- Evergreen durable and giant; can live up to 2,000 years to reach 115.5 m in height and a diameter of 5 m.
- The trunk is wider and reinforced at the base, often surrounded by protuberances or nodes slightly tapered
- The bark is very thick (35 cm) quite soft and fibrous reddish → redwood



68

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69

## reproduction

- Sequoia are the only conifer that can also reproduce asexually
- Asexual reproduction occurs through the sprouts
- The sprouts are derived by a collar at the base of the tree (up to 3 m) made from dormant buds
- The growth is inhibited by a hormone
- In condition of stress hormone production is interrupted and the sprouts begin to grow transformed into real trees
- If the number of sprouts is high and many of these will survive form a ring of trees around the mother tree called "family ring" or "fairy ring"



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## The fire

Fire is a natural part of the ecosystem of the redwood

Develops naturally every 22-27 years

Contributes to the development of the forest:

- recycling of nutrients
- cleaning the undergrowth
- insect control and other pathogens
- preparing the ground for the settlement of the seeds: the seeds sprout on fertile soils results from a previous fire, flood or fallen trees



### Adaptations to fire:

- presence of tannins and a particularly thick bark
- complete absence of resin which limits the damage caused by fire

71

71

## forest and man

- The first Europeans arrived in these areas in 1850
- At that time, the forest stretched for 810,000 hectares
- In 1914 was built the Northwestern Pacific railroad and in 1922 was built the Redwood Highway
- This allowed an exploitation on a large scale of the whole area both from the point of view of tourism that in the timber
- In the space of 150 years, much of the ancient forest has been destroyed

72

72

## current state

- Today remains only 4% of the ancient original forest, only part of this portion is protected
- The remaining 96% has been cut in the last 200 years
- The forest and the complex ecosystem that supports it is in danger of extinction

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- Many areas of second-growth forest were converted into protected areas, such as the "Big Basin State Park" with the hope that they will one day reach the characteristics of virgin forest
- Many trees replanted in the past have now reached the size suitable for the development of a soil and a community "canopy" but these trees are usually cut back to extract valuable timber before the community can develop fully
- Populations largest redwood are now in protected parks of California's "Redwood National Park "and ", Humboldt Redwood State Park"

74

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