BIOMES

Living World

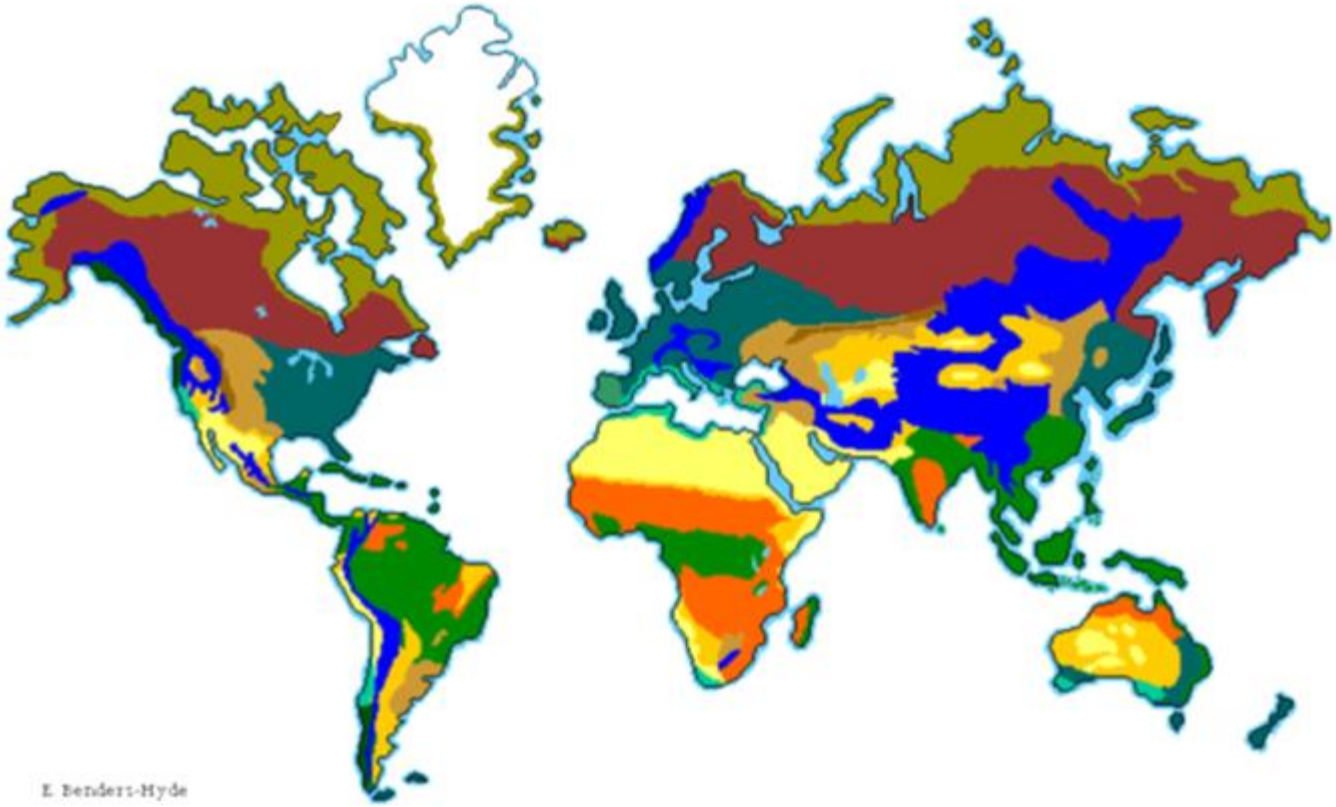
Biomes

- Biomes are large regions of the world with **distinctive climate, wildlife and vegetation**.
- They are divided by terrestrial (land) or aquatic biomes.

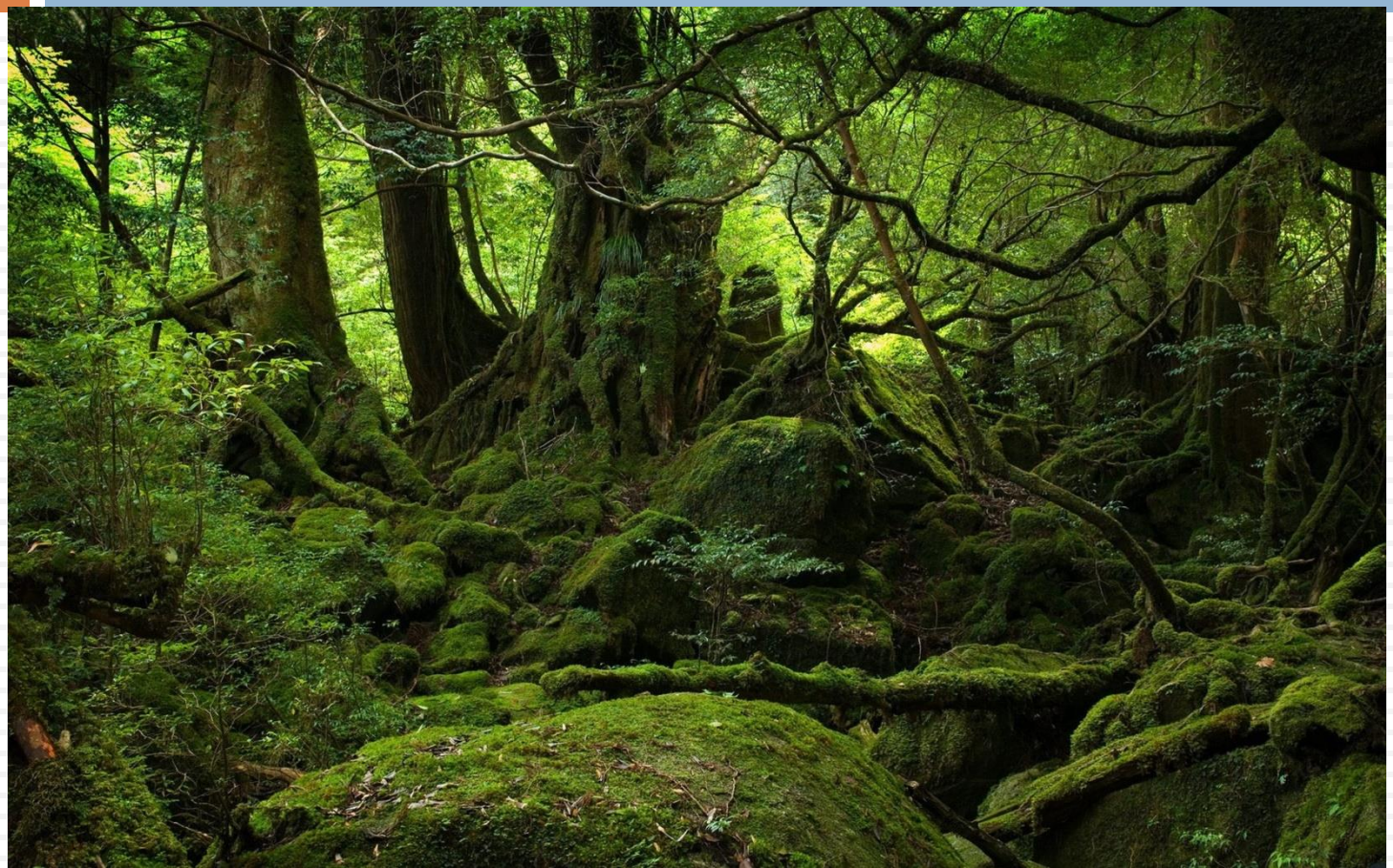
Terrestrial Biomes

Terrestrial Biomes

- Categorized by latitude, altitude, temperature, rain, soil type, sun exposure, winds and how close to water they are found.



Tropical Forests



Tropical Forests

Flora and Fauna

- **50-80% of all plant and animal life** on Earth
- High biodiversity
- Finding new species every year


©FRANS LANTING

Rainforests

Birds of Paradise

Climate & Soils

- Temperature: 20-34°C
- Rains all year
- **Soil rich with nutrients** because optimum weather conditions allows for **quick plant/animal decomposition**.

Other Info

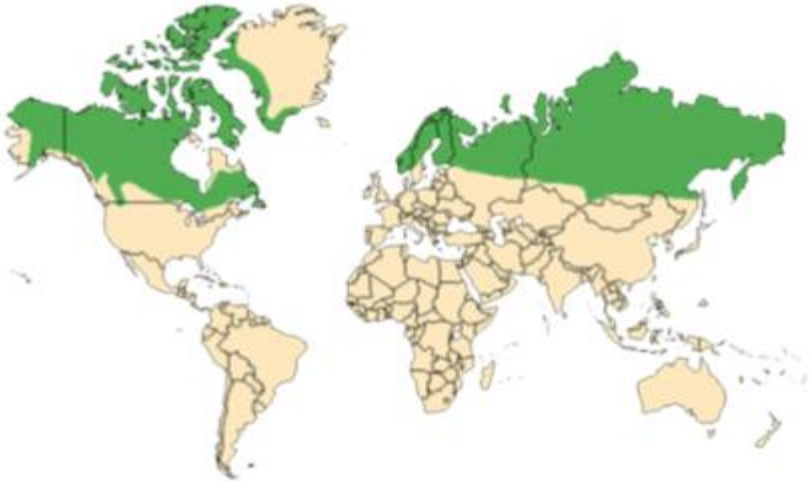
- Important in regulation of climate because exchanges O_2 and CO_2.
- Produces **more than 20% of the world's O_2**
- In danger due to logging

Boreal Forest

Boreal Forest

Flora and Fauna

- Diverse wildlife
- **Conifer trees** and the forest floor is covered with moss and lichen
- Green forest




BOREAL
FOREST


© Tom W. Hall

Climate & Soil

- **Long, cold** winters and **short warm** summers
- **Acidic, nutrient poor** soil because of moss and lichen on forest floor
- Poor decomposition of plants and animals
- Vegetation still thrives because of 18 hours/day sunlight in the summer

Other Info

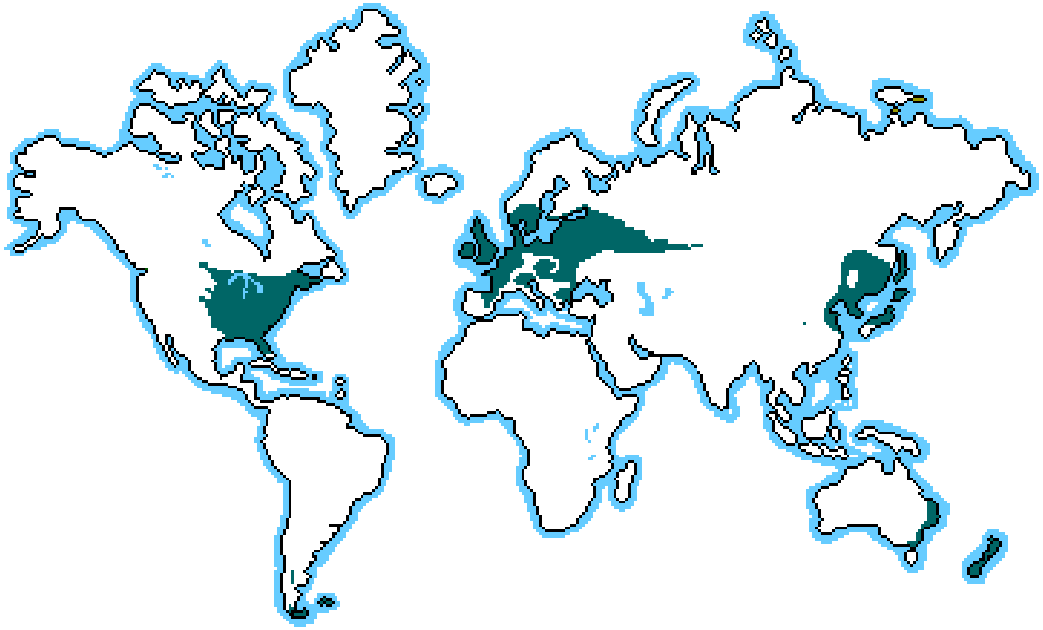
- **More than 1/4** of all the forests in the world
- Over logging
- **Sensitive to fire, insects and disease**
- Has many lakes and marshes

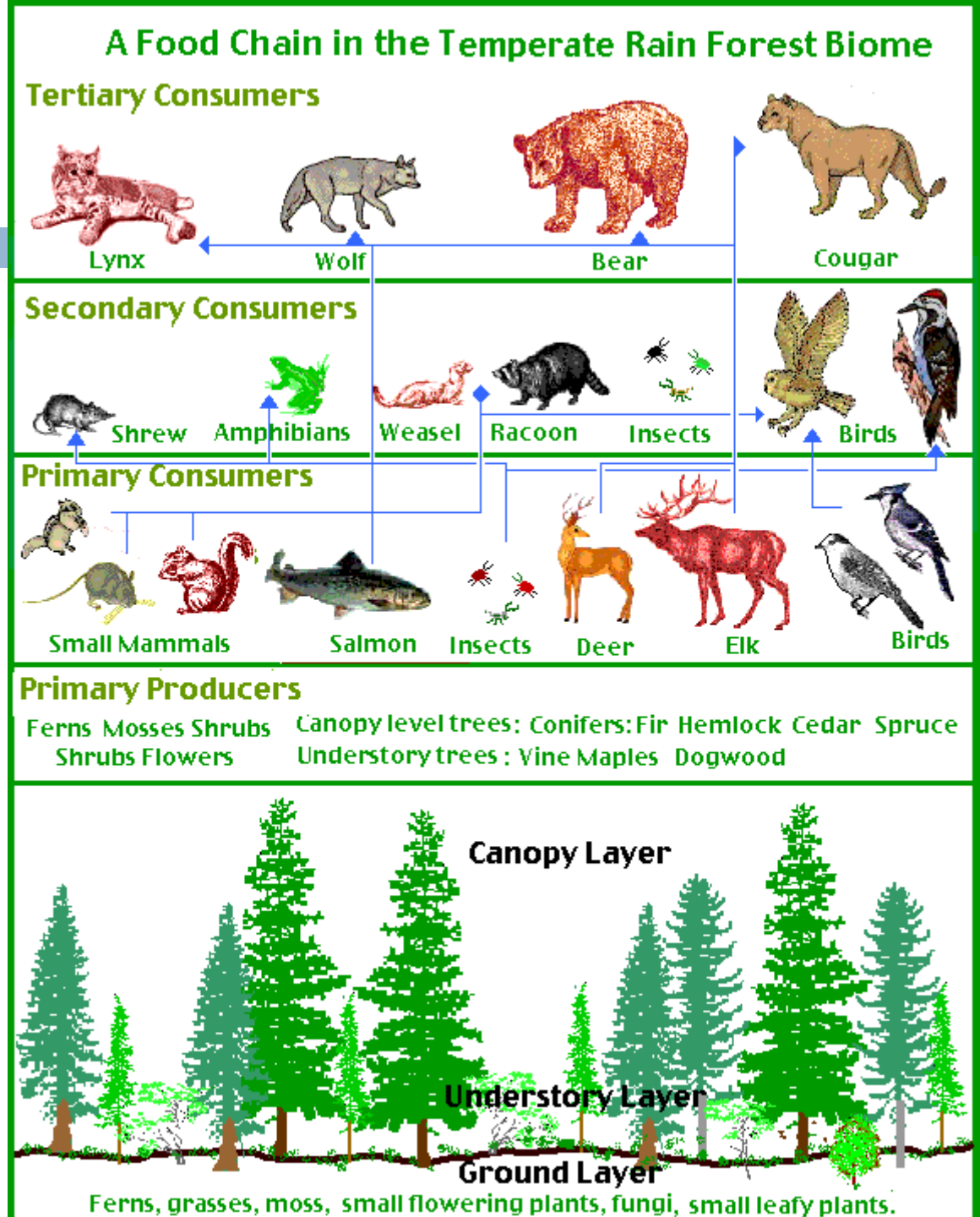
Temperate Forests

Temperate Forests

Flora and Fauna

- Many mammals
- Mix of **deciduous and coniferous** trees
- Multi-coloured forest




A Food Chain in the Temperate Rain Forest Biome
Tertiary Consumers
Lynx
Wolf
Bear
Cougar
Secondary Consumers
Shrew
Amphibians
Weasel
Racoon
Insects
Birds
Primary Consumers
Small Mammals
Salmon
Insects
Deer
Elk
Birds
Primary Producers
Ferns Mosses Shrubs
Shrubs Flowers
Canopy level trees: Conifers: Fir Hemlock Cedar Spruce
Understory trees : Vine Maples Dogwood
Canopy Layer
Understory Layer
Ground Layer
Ferns, grasses, moss, small flowering plants, fungi, small leafy plants.

Climate & Soil

- Average temperature 8-10°C
- High precipitation throughout the year
- Soil very **rich in nutrients** because of good decomposition of leaves

Other Info

- At risk due to **human activity** (farming) and new developments
- **Many towns were once temperate forests** (Montreal and Toronto)

Grasslands & Shrublands

Grasslands & Shrublands

Flora & Fauna

- Grazing animals and their predators
- Lots of **grass and shrubs, but very little trees**
- Has enough moisture to avoid being a desert, but not enough to sustain trees

Climate & Soil

- Climate depends on region of the world and type of grassland
- Nutrients and water are deep in soil are absorbed by extensive plant root systems
- Grass is able to survive **drought and fire**

Other Info

- 3 types of grasslands:
  - 1) **Temperate grasslands**: hot summer and cold winters
  - 2) **Savanna**: hot all year long
  - 3) **Derived grasslands**: was grassland and is now farmland

Temperate grasslands

Savanna

Derived grasslands

Arctic Tundra

Arctic Tundra

Flora and Fauna

- Migratory birds go to reproduce in the summer
- Polar bears, arctic fox and caribou live there year round
- Has **limited grass, bushes, moss and lichen**

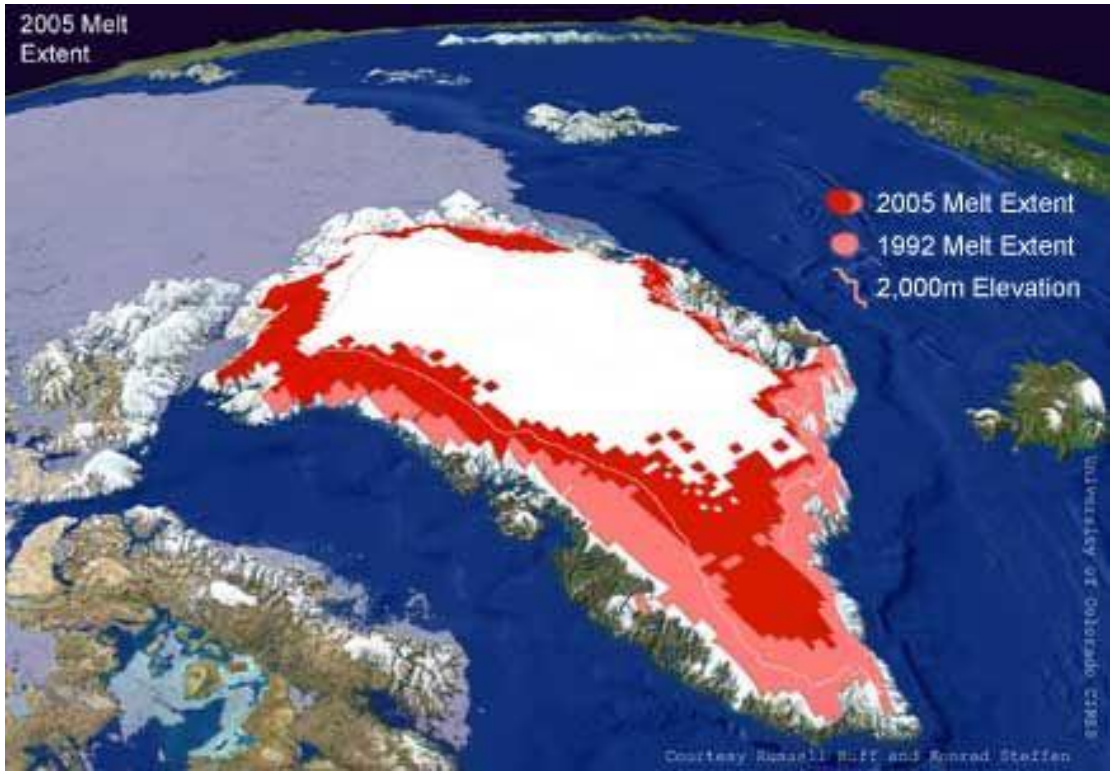

www.duiops.net/seresvivos

Climate & Soil

- Long, cold winters
- Average summer temperature is only **10°C**
- In winter can be as cold as -50°C
- thin top layer of soil (1 m) thaws in summer only … deeper soil is **permanently frozen** (aka **permafrost**)

Other info

- The arctic is warming up twice as fast as the global average which may lead to devastating consequences in the near future




Minneapolis
Chicago
Detroit
Montreal
Halifax
Boston
Philadelphia
New York
Washington
Norfolk
San Francisco
Honolulu
Los Angeles
San Diego
Charleston
Present-day shoreline
New Orleans
Tampa
Miami
Havana
Veracruz
Cancun
Port-au-Prince
North America
The entire Atlantic seaboard would vanish, along with Florida and the Gulf Coast. In California, San Francisco's hills would become a cluster of islands and the Central Valley a giant bay. The Gulf of California would stretch north past the latitude of San Diego—not that there'd be a San Diego.

Deserts

Deserts

Flora & Fauna

- Only a **few plant and animal species** that are highly **adapted to the dry climate**

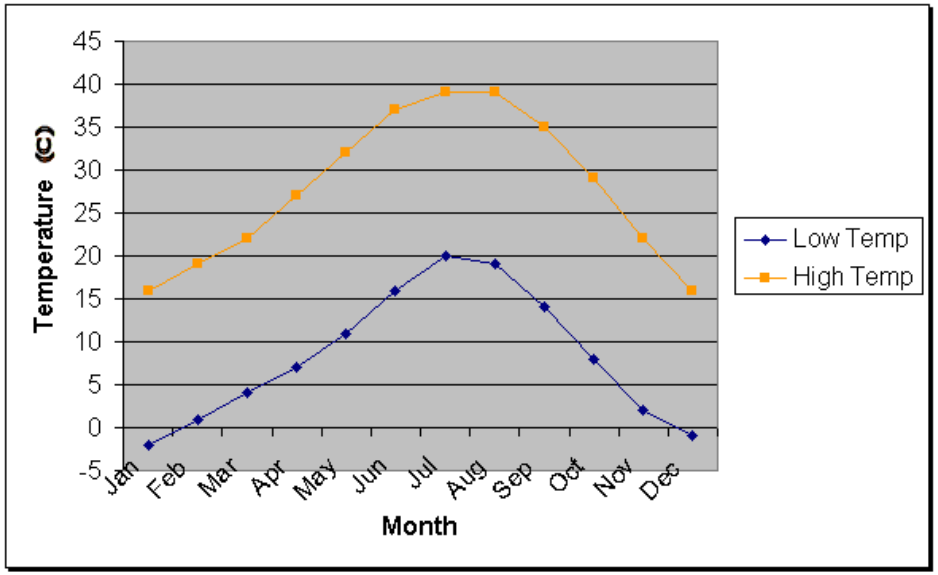
Climate & Soil

- Can be **hot or cold** deserts
- Total **annual precipitation is less than 25 cm**
- Can be as warm as 50°C or as cold as -89°C
- Soil is **nutrient poor**

Arctic and Antarctica are also considered deserts!

Other Info

- Hot deserts experience **drastic temperature changes** due to absence of clouds and humidity



Alpine

Alpine

Flora and Fauna

- Animal and plant species vary depending on altitude
- As **altitude increases, life and temperature decreases**


C. A. Gregersen 2010

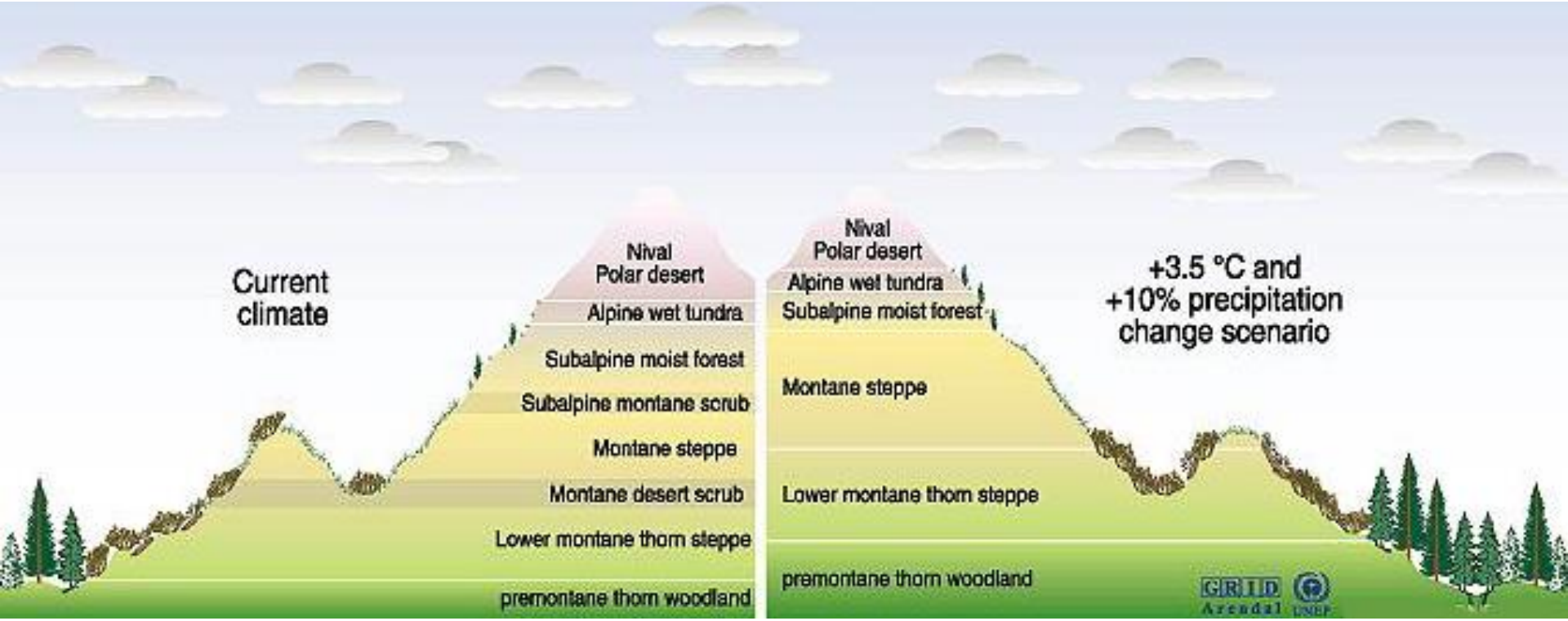
Climate & Soil

- For every 100 meters in altitude gain, the temperature drops by 0.6°C
- Nutrients in soil become scarce with increasing altitude
- Ground remains frozen for more than half the year

Other Info

- **Defined by altitude**

- Divided into 5 zones depending on altitude:
  - Submontane: below 1300m, people, plants, animals
  - Montane: 1300-1800m, mostly conifers, 8-15 °C
  - Subalpine: 1800-2400m, highest zone for trees
  - Alpine: 2400-3000m, no trees, extremely cold
  - Nival: above 3000m, snow caps, almost no vegetation


Current climate
Nival
Polar desert
Alpine wet tundra
Subalpine moist forest
Subalpine montane scrub
Montane steppe
Montane desert scrub
Lower montane thorn steppe
premontane thorn woodland
Nival
Polar desert
Alpine wet tundra
Subalpine moist forest
Montane steppe
Lower montane thorn steppe
premontane thorn woodland
+3.5 °C and
+10% precipitation
change scenario
GRID
Arendal

PRACTICE – Terrestrial Biomes

Name That Terrestrial Biome!

- Produces a large amount of the world's oxygen
  - Tropical forest
- Grazing animals
  - grasslands
- Cold all year long
  - Arctic tundra
- Defined by altitude
  - alpine

Name That Terrestrial Biome!

- Lack of clouds causes high temperature variation
  - desert
- Drought and fire resistant
  - grasslands
- A lot of rain & very warm
  - Tropical forest
- Acidic, nutrient-poor soil
  - Boreal forest
- Permafrost
  - Arctic tundra

Name That Terrestrial Biome!

- High biodiversity
  - Tropical forest
- Coniferous and deciduous trees
  - Temperate forest
- St-Lawrence valley
  - Temperate forest
- Lichen, moss & small bushes
  - Arctic tundra
- Savanna
  - grassland

Aquatic Biomes

Aquatic Biomes

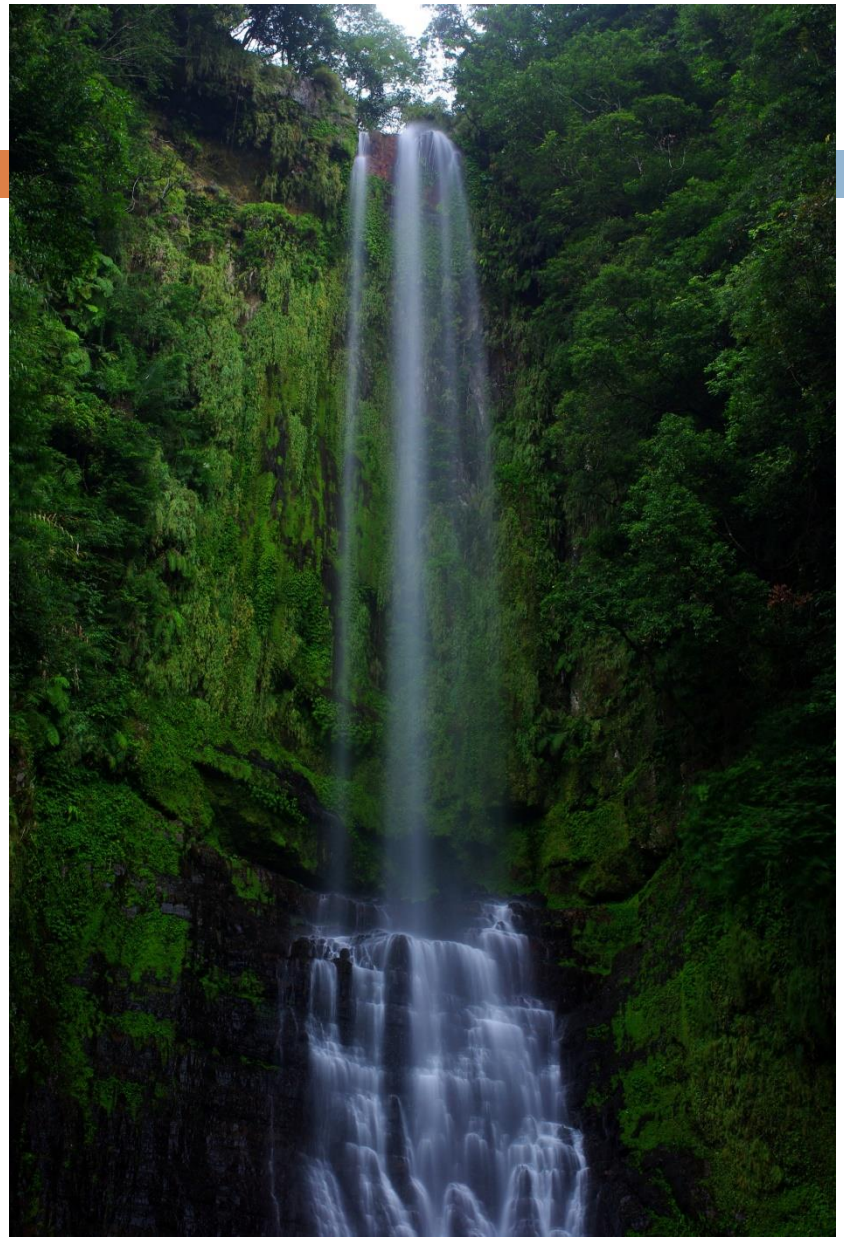
- Covers approximately **75% of the earth's surface**
- 2 types:
  - freshwater (2.5%)
  - marine (97.5%)

Most of the Earth is salt water!

Freshwater

Freshwater

- Salt content less than 0.05%
- Temperature will vary due to location
- Made up of **lakes, rivers and wetlands**

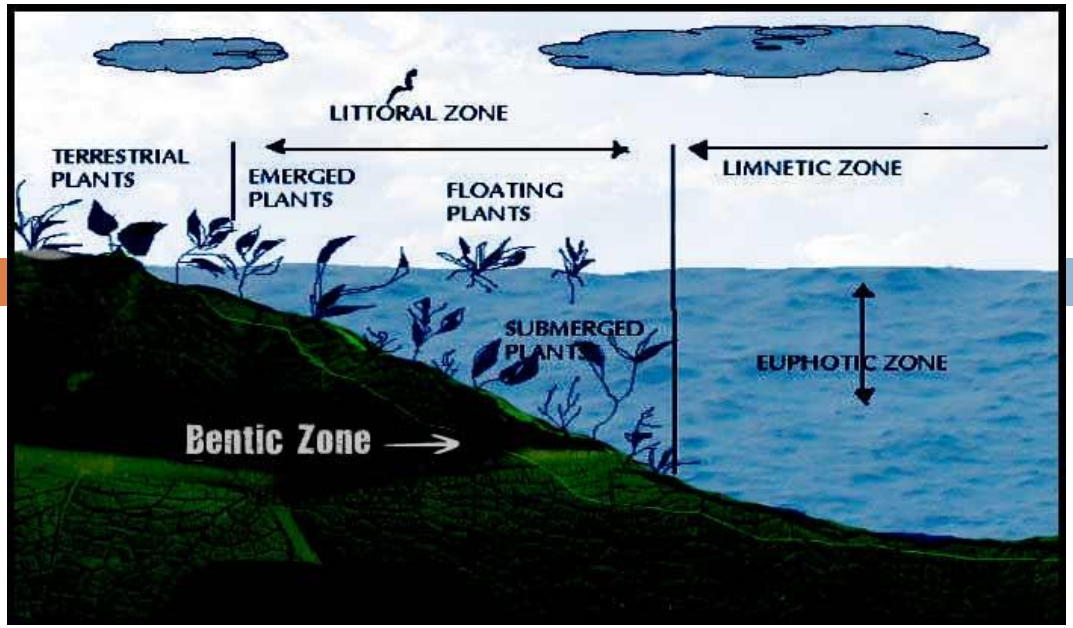


Lakes

Lakes

Flora & Fauna

- Limited species of microorganisms, plankton, fish, amphibians, reptiles, birds and aquatic plants


LITTORAL ZONE
TERRESTRIAL PLANTS
EMERGED PLANTS
FLOATING PLANTS
LIMNETIC ZONE
SUBMERGED PLANTS
EUPHOTIC ZONE
Bentic Zone

Other Info

- Lakes **are surrounded by land**, fed by springs or precipitation
- Shore vegetation acts like a filter, provides habitat and attracts species
- Threatened by farming, industrialization and urbanization

Rivers

Rivers

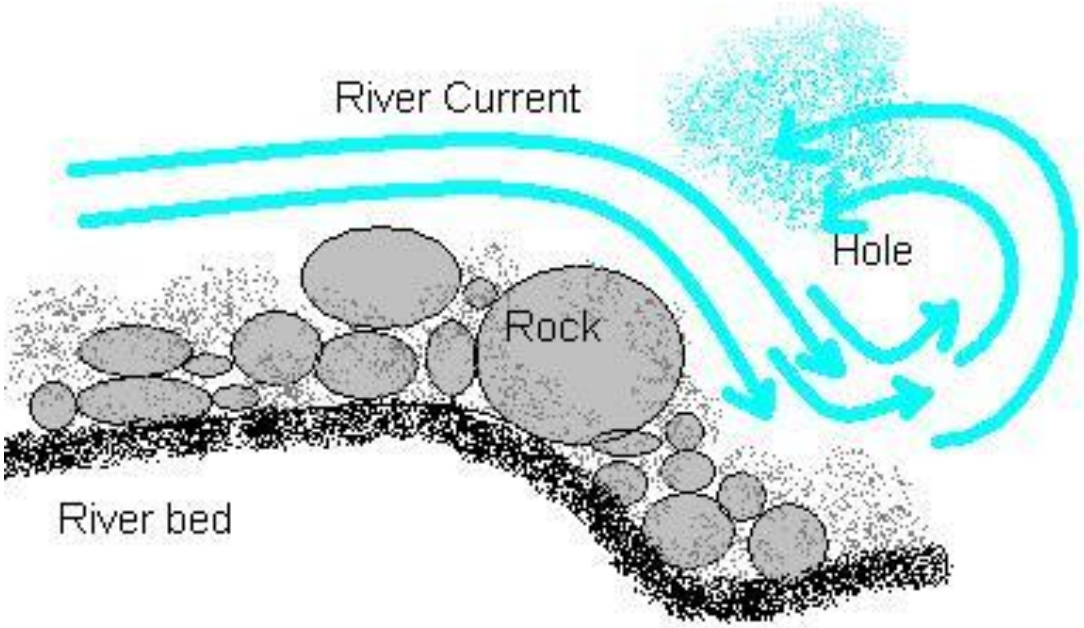
Flora & Fauna

- Animals and plants that are adapted to moving current and high levels of O_2


lonelyplanetimages.com

Other Info

- **Water quality at risk due to farming** (phosphorus from fertilizers)
- Current flows rapidly **in one direction**



Wetlands

Wetlands

Flora & Fauna

- Home to many species depending on type of wetland
- Plants grow in **water saturated soil**
- They act as sponges that absorb rainwater and reduce the risk of flooding

3 types

- 1) Marshes:
  - land covered with **stagnant water and no trees**

3 types

- 2) Swamps:
  - land covered with stagnant or slow moving water in which **trees and shrubs** grow

3 types

- 3) Peat bogs:
  - poorly drained soil carpeted with **moss**

Marine Biomes

Marine Biomes

- More than **3% salt content**
- Estuaries, oceans and coral reefs
- Temperature will vary due to location and depth
- **Deeper the water the colder and darker it becomes**

Estuaries

Estuaries

Flora & Fauna

- Plant and animals adapted to both fresh and sea water
- Water is **very turbid (not clear) due to sediment**
- Very rich in nutrients and home to many species

Other Info

- Where a **river opens into the sea**.
- St-Lawrence Estuary is known for whale watching
- Salt content will vary between 0.05% and 3%

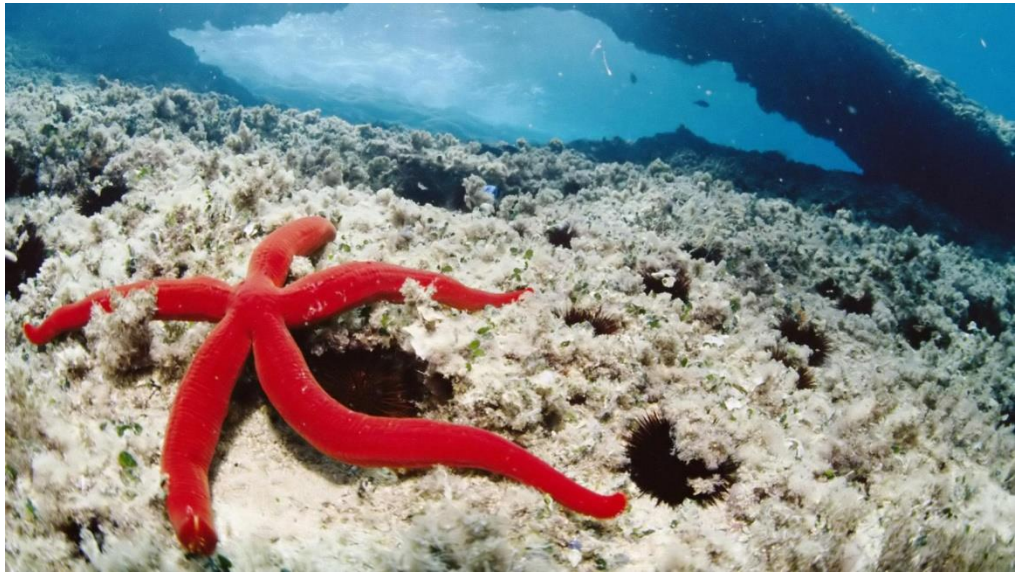
Oceans

Oceans

Flora & Fauna

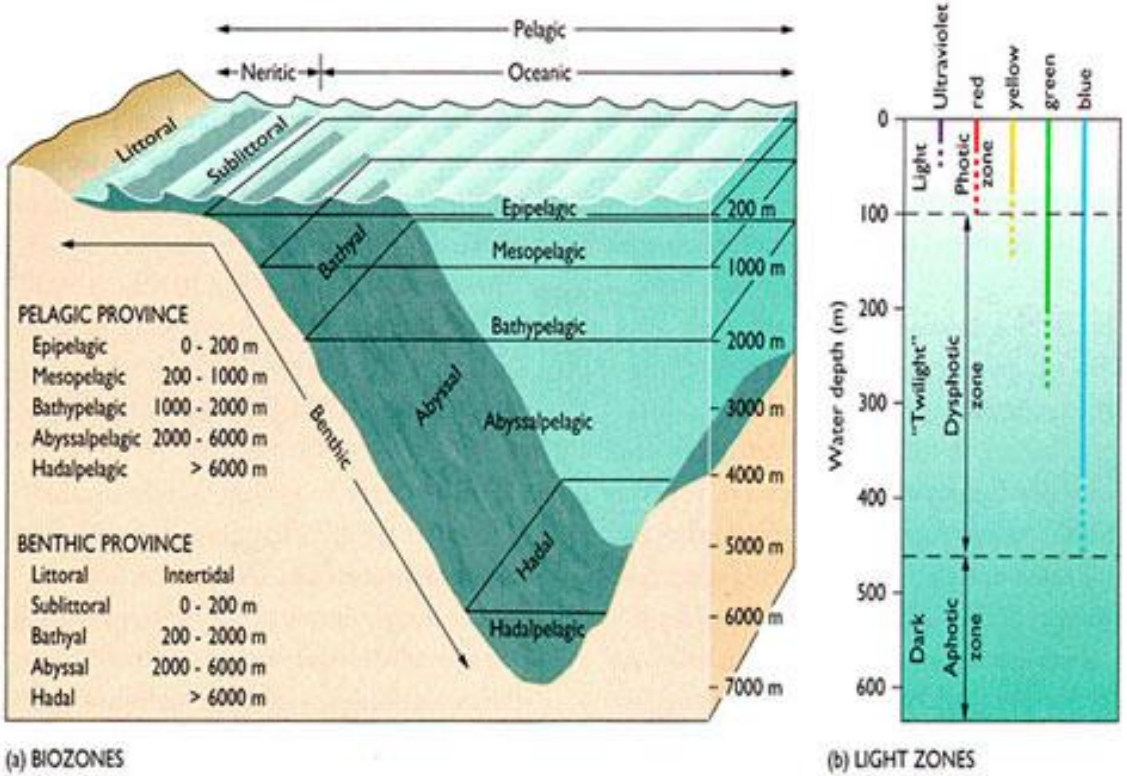
- **Largest ecosystem**
- Plants and animals will vary due to depth


©E. Widder



Other Info

- Deeper the water is the darker and colder it is
- Oceans at risk due to **human activity**
- Benthos: organisms living on the sea bed



Coral Reefs

Coral Reefs

Flora & Fauna

- **High biodiversity**: up to 2 million different species
- Usually in warm waters

Coral reefs are the rainforests of the ocean!


© Alamy

Other Info

- Corals skeleton made up of $CaCO_3$ and feed on plankton and algae
- Some may up to 200 million years old
- **Pollution, overfishing and global warming puts them at risk**
- When diving, you are asked not to touch the corals because too much touching will eventually kill them

CORAL BLEACHING

Have you ever wondered how a coral becomes bleached?

HEALTHY CORAL

1 Coral and algae depend on each other to survive.

Corals have a symbiotic relationship with microscopic algae called zooxanthellae that live in their tissues. These algae are the coral's primary food source and give them their color.

STRESSED CORAL

2 If stressed, algae leaves the coral.

When the symbiotic relationship becomes stressed due to increased ocean temperature or pollution, the algae leave the coral's tissue.

BLEACHED CORAL

3 Coral is left bleached and vulnerable.

Without the algae, the coral loses its major source of food, turns white or very pale, and is more susceptible to disease.

WHAT CAUSES CORAL BLEACHING?

Change in ocean temperature
Increased ocean temperature caused by climate change is the leading cause of coral bleaching.

Runoff and pollution
Storm generated precipitation can rapidly dilute ocean water and runoff can carry pollutants — these can bleach near-shore corals.

Overexposure to sunlight
When temperatures are high, high solar irradiance contributes to bleaching in shallow-water corals.

Extreme low tides
Exposure to the air during extreme low tides can cause bleaching in shallow corals.

NOAA's Coral Reef Conservation Program
http://coralreef.noaa.gov/

PRACTICE – Aquatic Biomes

Name That Aquatic Biome!

- Where fresh and saltwater mix
  - estuary
- Temperature and light varies with depth
  - ocean
- Current flows in one direction
  - river
- Made of calcium carbonate
  - Coral reefs
- Stagnant water, no trees
  - Marsh

Name That Aquatic Biome!

- Water surrounded by land
  - lake
- High biodiversity
  - Coral reef
- Largest ecosystem
  - ocean
- Salinity between 0.05% and 3%
  - estuary
- Soil saturated with water
  - Wetland – peat bog

Name That Aquatic Biome!

- Wetland where trees grow
  - swamp
- Freshwater organisms are adapted to strong currents
  - river
- Rich in oxygen
  - river
- Highly at risk due to global warming
  - Coral reef
- Nutrient rich saltwater, high turbidity
  - estuary