

NETA PowerPoint® Slides

to accompany

prepared by
Ian Dawe

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Chapter 7**Aquatic Biodiversity**

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Key Concepts

Aquatic life zones

- Factors that influence aquatic systems
- Saltwater life zones
- Freshwater life zones
- Human impacts on aquatic life

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Case Study: Why Should We Care About Coral Reefs?

Ecological Services

- Carbon cycle (CO₂ use)
- Barriers to coastal erosion
- Serve as nurseries and habitat for many marine organisms

Concerns

- Development, pollution, overfishing, etc.
- Dissolving due to acidification
- Bleaching due to warming

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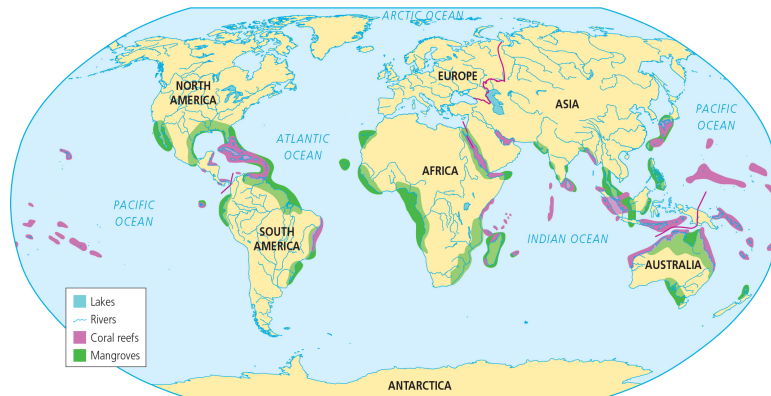
Case Study: Why Should We Care About Coral Reefs?



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Aquatic Environments



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What Organisms Live in Aquatic Life Zones?

Plankton

- Phytoplankton
- Zooplankton
- Ultraplankton

Nekton

Benthos

Decomposers

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Living in Water: Trade-Offs

FIGURE 7-3 **TRADE-OFFS**

Living in Water

Advantages and disadvantages of living in water



Advantages

- Physical support from water buoyancy
- Fairly constant temperature
- Nourishment from dissolved nutrients
- Water availability
- Easy dispersion of organisms, larvae, and eggs
- Less exposure to harmful UV radiation
- Dilution and dispersion of pollutants



Disadvantages

- Cannot tolerate a wide temperature range
- Exposure to dissolved pollutants
- Fluctuating population size for many species
- Many aquatic offspring separated from parents by dispersion

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What Factors Limit Life at Different Depths?

Dissolved oxygen

Temperature

Sunlight (euphotic zone)

Nutrients

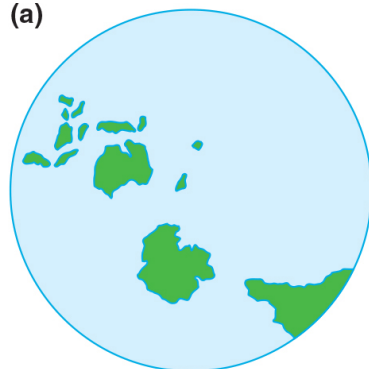
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Why Should We Care About the Oceans?

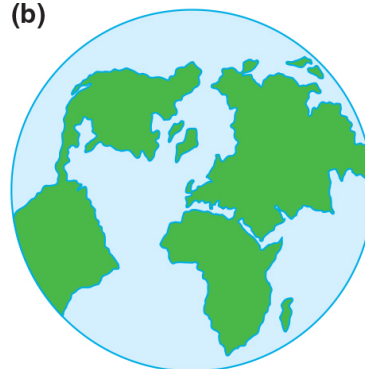
Oceans cover 71% of the Earth's surface.

(a)



Ocean hemisphere

(b)



Land-ocean hemisphere

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Marine Ecosystems

Ecological Services

Climate moderation

CO₂ absorption

Nutrient cycling

Waste treatment

Reduced storm impact (mangroves, barrier islands, coastal wetlands)

Habitats and nursery areas

Genetic resources and biodiversity

Scientific information

Economic Services

Food

Animal and pet feed

Pharmaceuticals

Harbours and transportation routes

Coastal habitats for humans

Recreation

Employment

Oil and natural gas

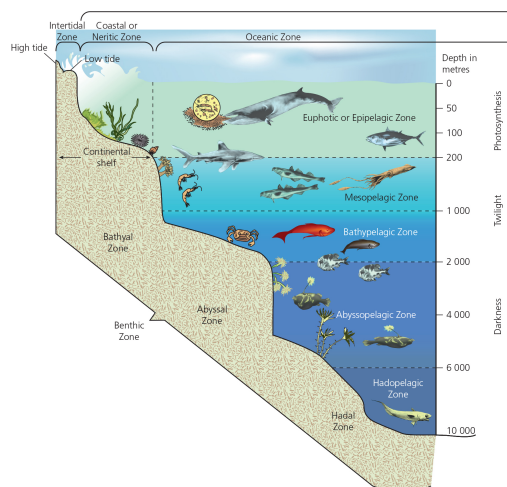
Minerals

Building materials

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Saltwater Life Zones



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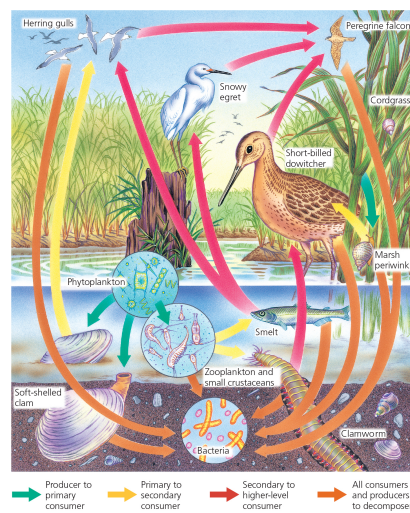
Estuaries and Coastal Wetlands



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Saltwater Marsh Ecosystems



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Mangrove Forest Swamps

Found along coasts

Dominated by trees that can take root in salt water

Collect mud and “build land”

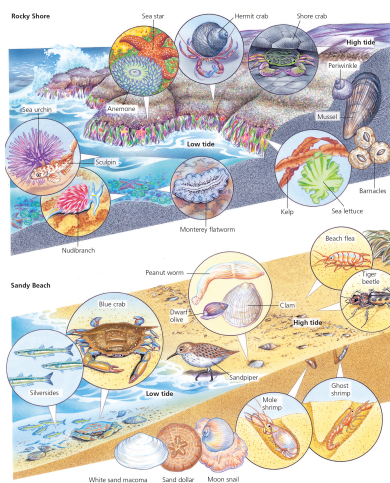
Excellent carbon sinks — stabilize climate change

Threatened by development

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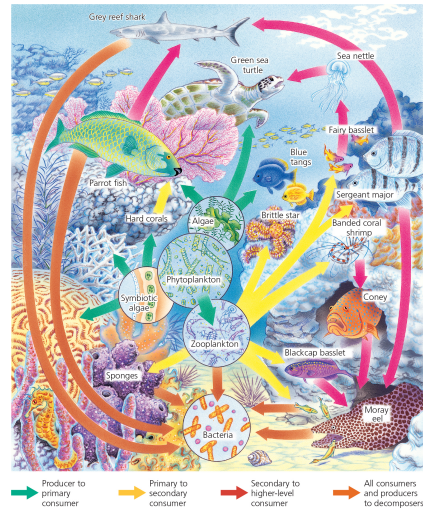
Rocky Shore Ecosystems and Sandy Beach Ecosystems



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Coral Reef Ecosystems



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Major Threats to Coral Reefs

FIGURE 7-11 **NATURAL CAPITAL DEGRADATION**

Coral Reefs

Major threats to coral reefs



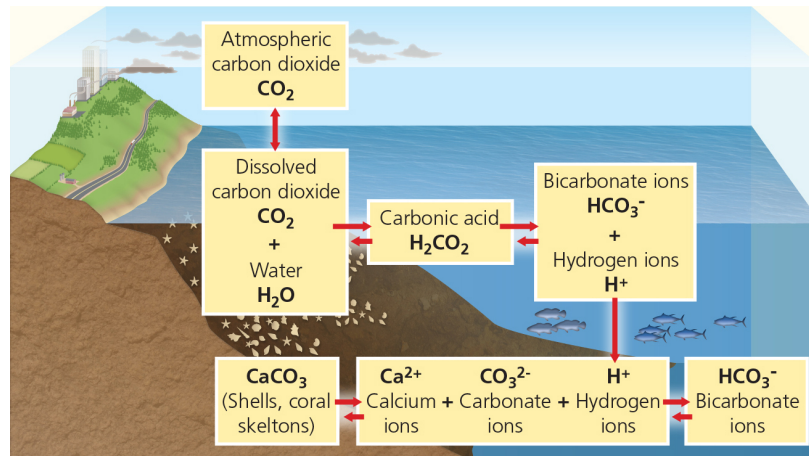
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- Ocean warming
- Soil erosion
- Algae growth from fertilizer runoff
- Mangrove destruction
- Coral reef bleaching
- Rising sea levels
- Increased UV exposure from ozone depletion
- Use of cyanide and dynamite to harvest coral reef fish
- Coral removal for building material, aquariums, and jewellery
- Increasing ocean acidification

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Acidification: A Major Coral Stress



Source: From the booklet "Ocean Acidification—Starting with the Science," from the National Research Council's Ocean Studies Board: <http://dels.nas.edu/resources/static-assets/materials-based-on-reports/booklets/OA1.pdf>

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Natural Capital Degradation: Marine Ecosystems

FIGURE 7-14 **NATURAL CAPITAL DEGRADATION**

Marine Ecosystems

Major human impacts on the world's marine systems



- Half of coastal wetlands lost to agriculture and urban development
- Over one-third of mangrove forests lost since 1980 to agriculture, development, and aquaculture shrimp farms
- About 10% of world's beaches eroding because of coastal development and rising sea level
- Ocean bottom habitats degraded by dredging and trawler fishing boats
- About 75% of the world's coral reefs threatened

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Freshwater Systems

Ecological Services

Climate moderation
Nutrient cycling
Waste treatment
Flood control
Groundwater recharge
Habitats for many species
Genetic resources and biodiversity
Scientific information

Economic Services

Food
Drinking water
Irrigation water
Hydroelectricity
Transportation corridors
Recreation
Employment

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Freshwater Life Zones

FIGURE 7-15 **NATURAL CAPITAL**

Freshwater Systems

Major ecological and economic services provided by freshwater systems



Ecological Systems

- Climate moderation
- Nutrient cycling
- Waste treatment and dilution
- Flood control
- Groundwater recharge
- Habitats for aquatic and terrestrial species
- Genetic resources and biodiversity
- Scientific information



Economic Systems

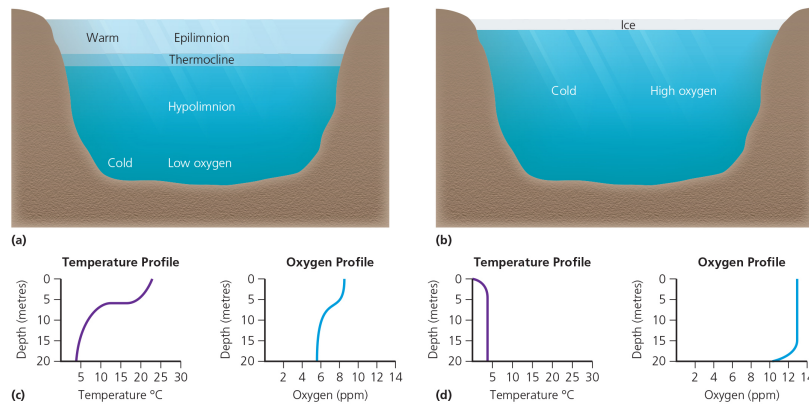
- Food
- Drinking water
- Irrigation water
- Hydroelectricity
- Transportation corridors
- Recreation
- Employment

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What Temperature Zones Are Found in Lakes?



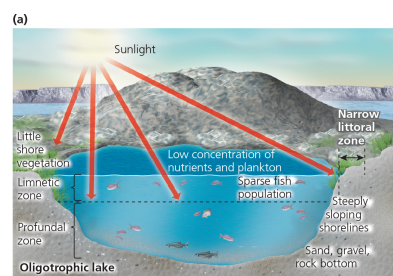
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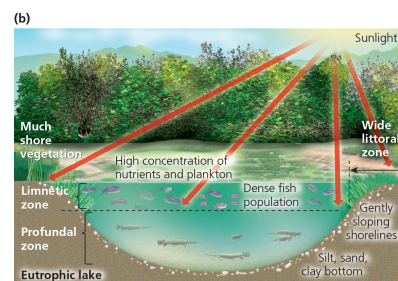
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How Do Plant Nutrients Affect Lakes?

Oligotrophic



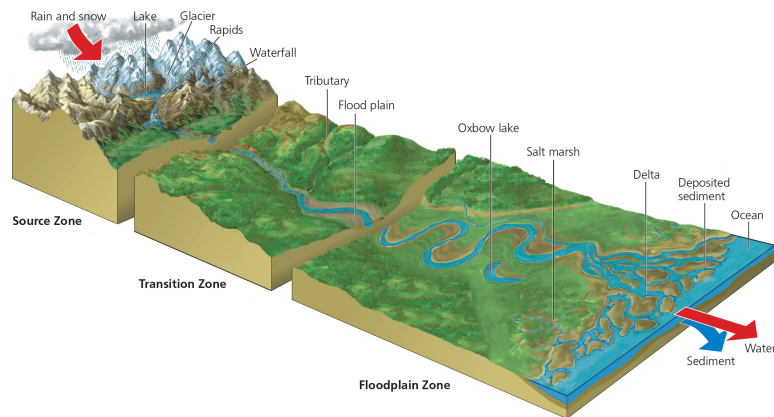
Eutrophic



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Three Zones in the Downhill Flow of Water



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What Are Freshwater Inland Wetlands?

Absorb and store excess water from storms and provide a variety of wildlife habitats

Year-round or seasonal

Marshes

Swamp

Fen

Bog

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Marshes and Swamps

Marshes:

Open water
Nutrient Rich
Neutral pH

(a) Marsh



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Swamps:

Dominated by tall
trees
Nutrient rich
Provide habitat for

(b) Swamp



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Fens and Bogs

Fens

Peatland
Rich in sedges
and grasses
Rich in nutrients and
plant diversity
Slightly acidic pH

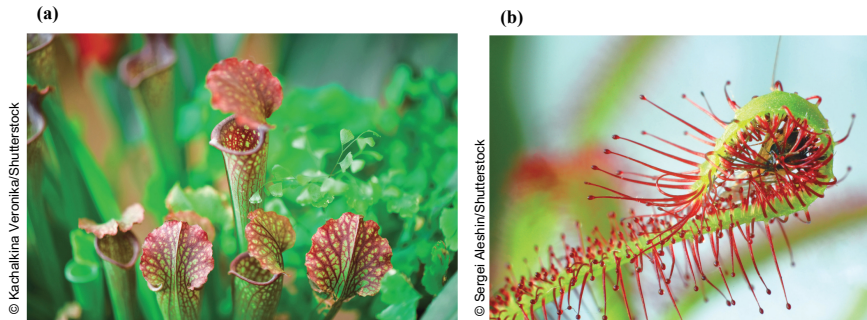
Bogs

Peatland
Dominated by
mosses
Ombotrophic
(nutrients from rain)
Capture insects in
increase nutrients
Quite acidic (pH 3-5)

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Carnivorous Plants Found in Bogs



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Human Impacts on Freshwater Systems

Dams, diversions, canals

- Fragmentation of 60% of world's large rivers

Flood control levees and dikes

- Alter and destroy habitat

Pollutants and excess nutrients

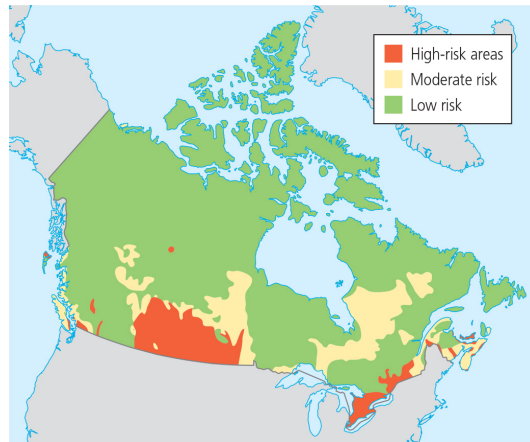
Drainage of wetlands for agriculture

- 70–100% of wetlands destroyed

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Human Impacts on Wetlands



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Conclusion

Aquatic habitats are freshwater and marine.

Marine coral and mangrove are threatened.

Freshwater habitats include lakes, bogs, fens, swamps, and marshes.

All important in addressing climate change — all threatened

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