ENVIRONMENT

Dr. V. Sai Saraswathi.,
VIT University

defined

as the total sum of water, air, and land

Tradition:
Yogiraj Vethathiri
Maharishi

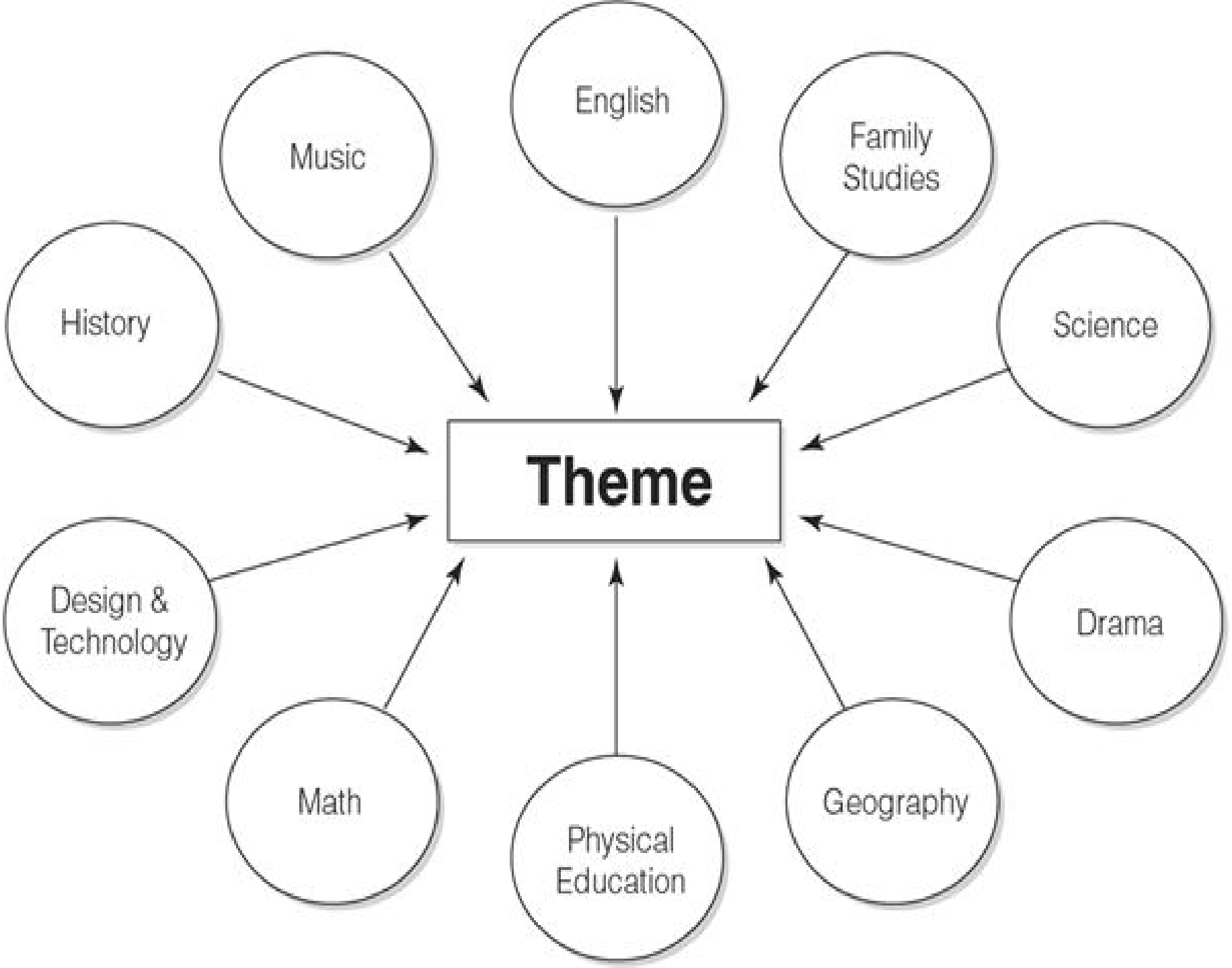
Voice:
Pradheep Kumar
Chalisyil

Relaxation
and
Pancha Bhuta Meditation

Music:
Sivaparvathiyar Somasuthiram
and
Bharat Jayaraman

Environment

- Environment is derived from the french word “ENVIRONNER”.
- Environmental protection act: “1986”.


Theme
English
Music
Family Studies
History
Science
Design & Technology
Drama
Math
Physical Education
Geography

Scope of environmental studies

- Natural resources
- Ecology and biodiversity
- Environmental pollution
- Social issues
- Human population
- Other issuses.

several career option

R & D

Green advocacy

Green Marketing

Green media

Environmental Consultancy

Environmental Calendar

- World E. Day 5th june
- Earth day apr.22
- Anti-tobacco day: may 31`
- Forest day: mar. 21
- Biodiversity day: may 22


Eco mark symbol
consumer awareness

NOBEL PRIZE

- Kenyan environmentalist: wangari maathai
- Green belt movement: planted 30 million trees.
- Slogan: “when we plant new trees, we plant the seeds of peace”

- What’s the use of a beautiful house if you don’t have a decent planet to put it on?


THINK GLOBALLY
ACT
LOCALLY

Key Environmental Issues and Sustainable Living

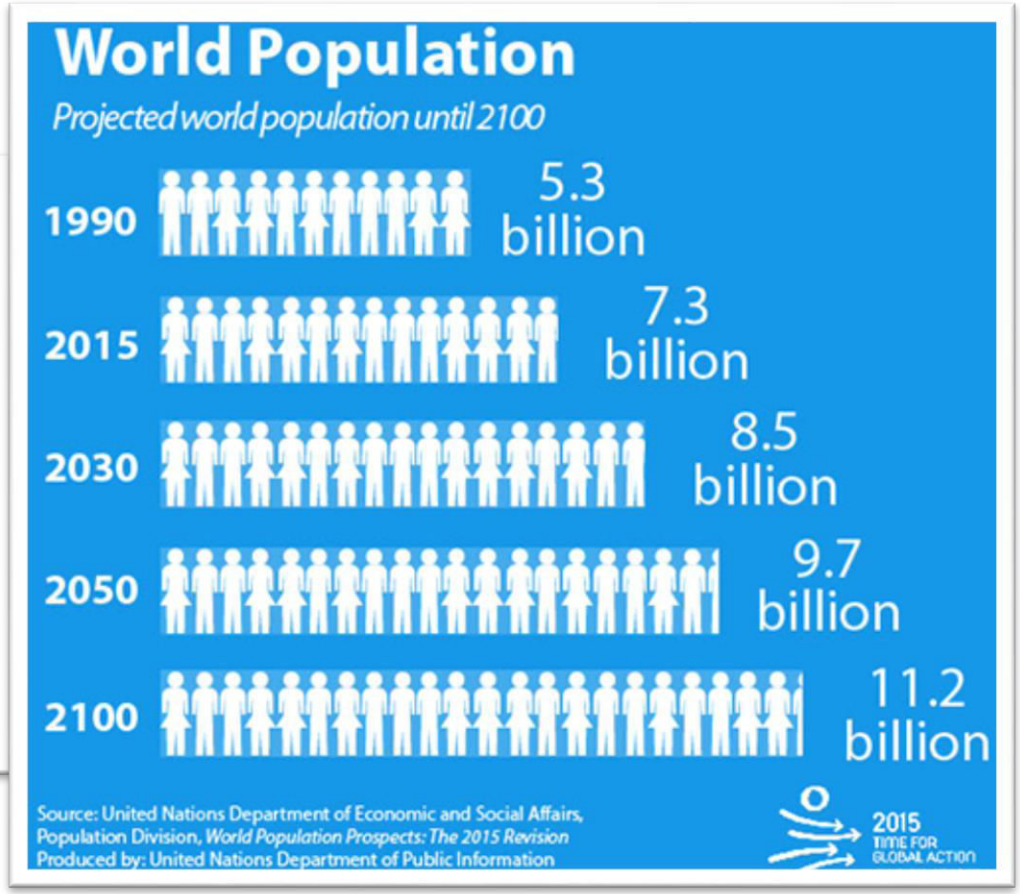
By
Dr. V. Sai Saraswathi., M. Pharma., Ph. D.,
Asst. Prof. (Sr.)
School of Advanced Sciences
VIT University
Vellore- 632014


Healthy - Dec 2014
Dying - Feb 2015
Dead - Aug 2015

What are Environmental Issues?

- Created due to human activities and cause harm to the environment.

Population Explosion



Population Growth and its Variation

Living style change

Major Issues:-

Deforestation

Desertification

The transformation of some landscapes into desert areas when the soil becomes dry and poor is called **desertification**

Habitat loss occurs when natural areas are destroyed to make room for housing or industry.

Excessive development, hunting, fires and other actions cause **extinction of animals.**


Air Pollution

Water Pollution


Loss of biodiversity

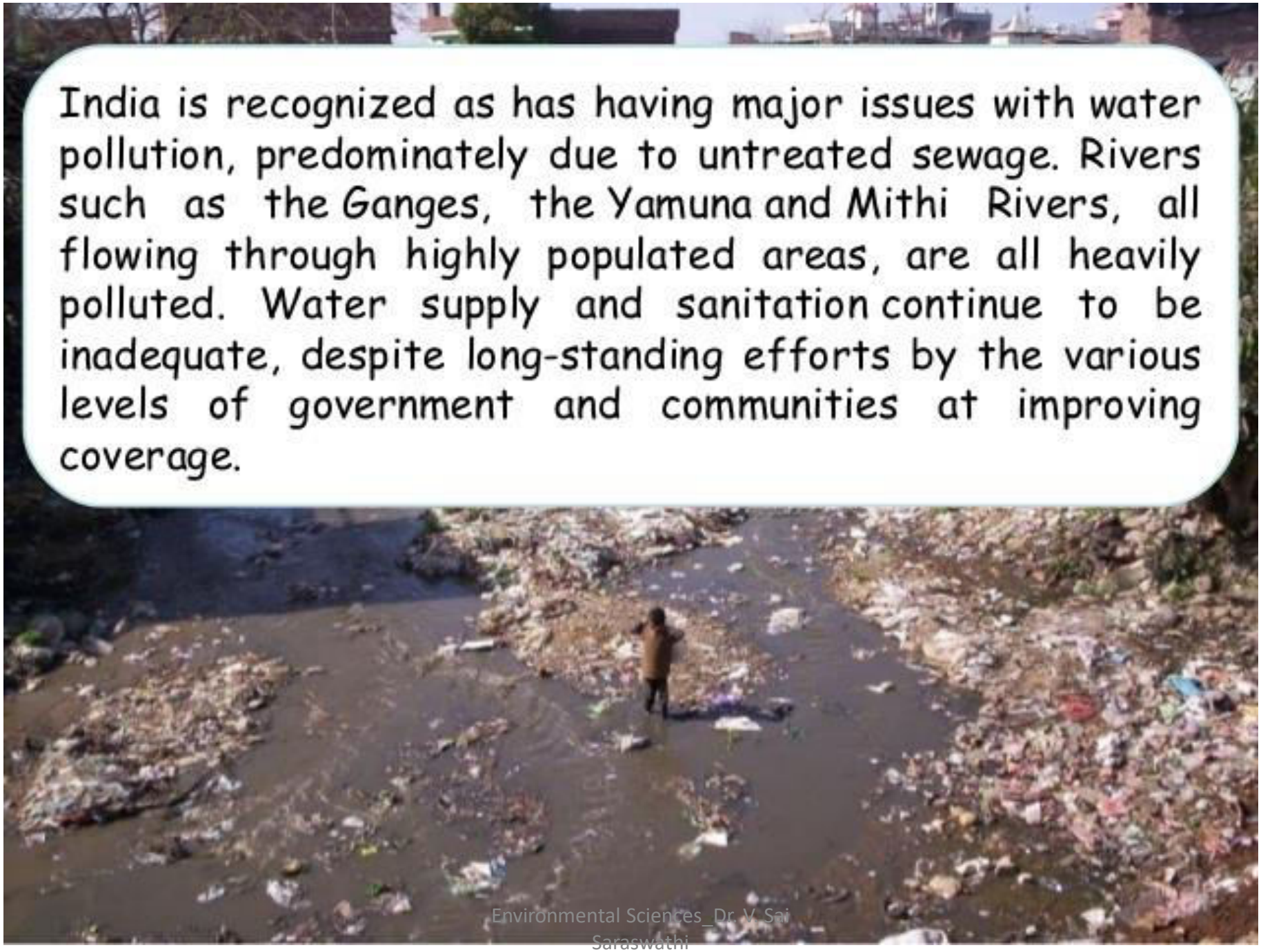
Over Fishing

Issues In India

- India has made one of the fastest progress in the world, in addressing its environmental. Still, India has a long way to go to reach environmental quality similar to those enjoyed in developed economies.
- Pollution remains a major challenge and opportunity for India.
- All forms of pollution – air, land, water – are prominently found in India.

Mumbai Flood- 2018


Floods are a significant environmental issue for India. It causes soil erosion, destruction of wetlands and wide migration of solid wastes.


India is recognized as has having major issues with water pollution, predominately due to untreated sewage. Rivers such as the Ganges, the Yamuna and Mithi Rivers, all flowing through highly populated areas, are all heavily polluted. Water supply and sanitation continue to be inadequate, despite long-standing efforts by the various levels of government and communities at improving coverage.

Plastic Pollution

Nuclear pollution

Mining

Chuquicamata, the largest open pit copper mine in the world, Chile

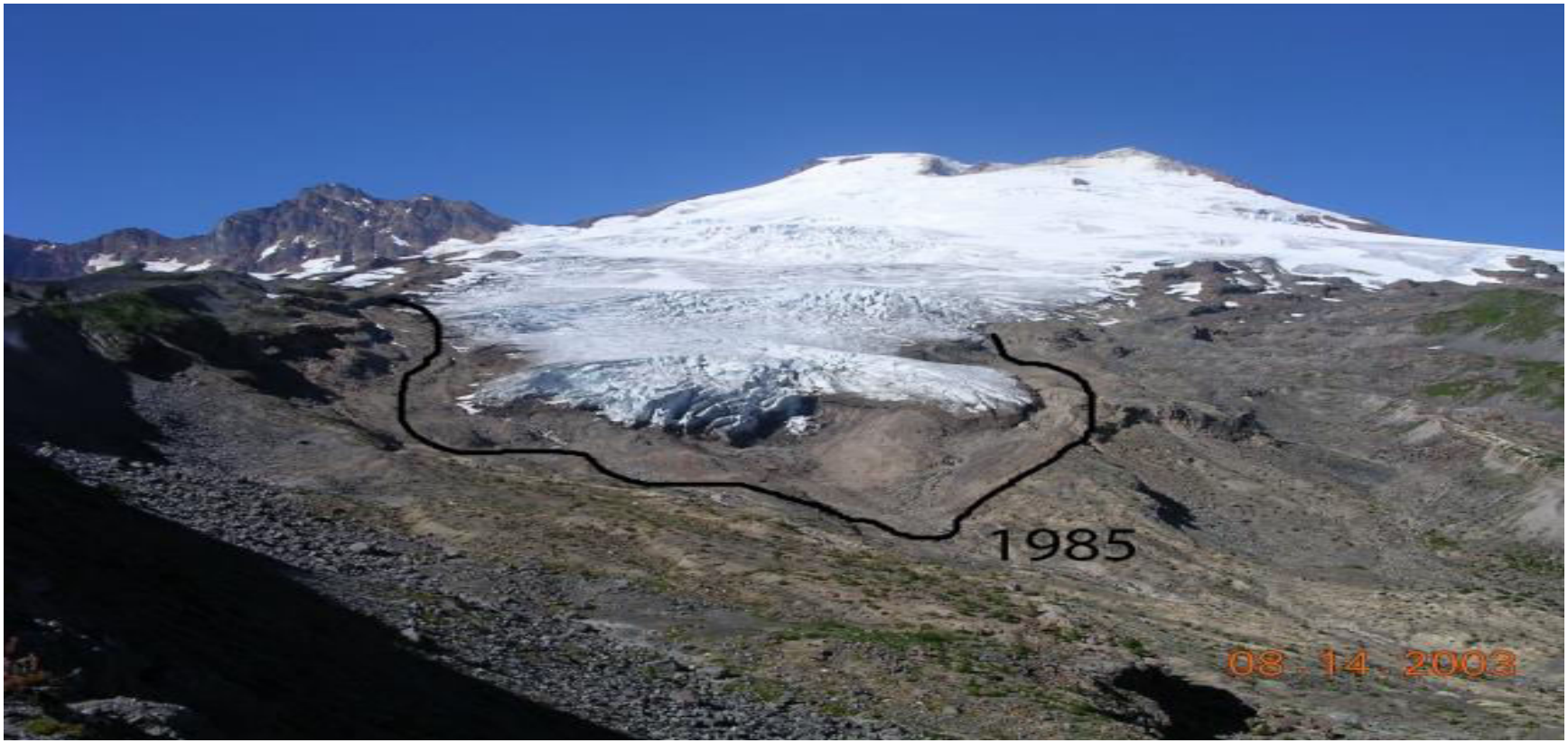
Other issues

- Acid Rain
- Over harvesting of fishes
- Urban Sprawl
- Waste generation
- GM Crops

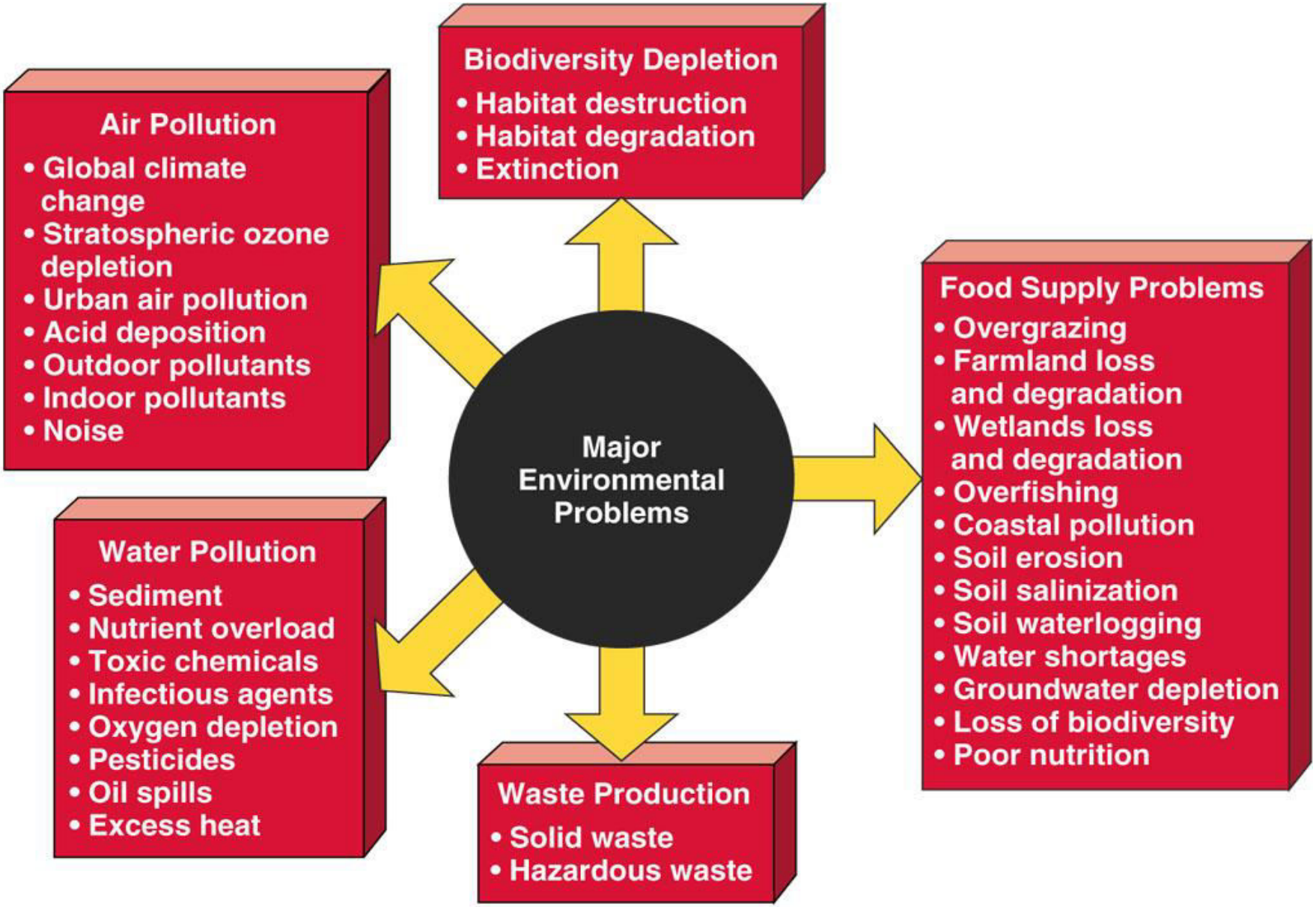
All the above factor leads to Climate Change


Climate Change

Global warming



This image is of the Easton Glacier on Mount Baker in the North Cascades of Washington taken in 2003. It shows the terminus position of the glacier in 1985 as well.


Biodiversity Depletion
• Habitat destruction
• Habitat degradation
• Extinction
Air Pollution
• Global climate change
• Stratospheric ozone depletion
• Urban air pollution
• Acid deposition
• Outdoor pollutants
• Indoor pollutants
• Noise
Major Environmental Problems
Food Supply Problems
• Overgrazing
• Farmland loss and degradation
• Wetlands loss and degradation
• Overfishing
• Coastal pollution
• Soil erosion
• Soil salinization
• Soil waterlogging
• Water shortages
• Groundwater depletion
• Loss of biodiversity
• Poor nutrition
Water Pollution
• Sediment
• Nutrient overload
• Toxic chemicals
• Infectious agents
• Oxygen depletion
• Pesticides
• Oil spills
• Excess heat
Waste Production
• Solid waste
• Hazardous waste

THANK YOU

Environmental Problems

Our environment is constantly changing. There is no denying that. However, as our environment changes, so does the need to become increasingly aware of the problems that surround it. With a massive influx of natural disasters, warming and cooling periods, different types of weather patterns and much more, people need to be aware of what types of environmental problems our planet is facing.

Global warming has become an undisputed fact about our current livelihoods; our planet is warming up and we are definitely part of the problem. However, this isn't the only environmental problem that we should be concerned about. All across the world, people are facing a wealth of new and challenging environmental problems every day. Some of them are small and only affect a few ecosystems, but others are drastically changing the landscape of what we already know.

Our planet is poised at the brink of a severe environmental crisis. Current environmental problems make us vulnerable to disasters and tragedies, now and in the future. We are in a state of planetary emergency, with environmental problems piling up high around us. Unless we address the various issues prudently and seriously we are surely doomed for disaster. Current environmental problems require urgent attention.

15 Major Current Environmental Problems

1. Pollution: Pollution of air, water and soil require millions of years to recoup. Industry and motor vehicle exhaust are the number one pollutants. Heavy metals, nitrates and plastic are toxins responsible for pollution. While water pollution is caused by oil spill, acid rain, urban runoff; air pollution is caused by various gases and toxins released by industries and factories and combustion of fossil fuels; soil pollution is majorly caused by industrial waste that deprives soil from essential nutrients.

2. Global Warming: Climate changes like global warming is the result of human practices like emission of Greenhouse gases. Global warming leads to rising temperatures of the oceans and the earth' surface causing melting of polar ice caps, rise in sea levels and also unnatural patterns of precipitation such as flash floods, excessive snow or desertification.

3. Overpopulation: The population of the planet is reaching unsustainable levels as it faces shortage of resources like water, fuel and food. Population explosion in less developed and developing countries is straining the already scarce resources. Intensive agriculture practiced to produce food damages the environment through use of chemical fertilizer, pesticides and insecticides. Overpopulation is one of the crucial current environmental problem.

4. Natural Resource Depletion: Natural resource depletion is another crucial current environmental problems. Fossil fuel consumption results in emission of Greenhouse gases, which is responsible for global warming and climate change. Globally, people are taking efforts to shift to renewable sources of energy like solar, wind, biogas and geothermal energy. The cost of installing the infrastructure and maintaining these sources has plummeted in the recent years.

5. Waste Disposal: The over consumption of resources and creation of plastics are creating a global crisis of waste disposal. Developed countries are notorious for producing an excessive amount of waste or garbage and dumping their waste in the oceans and, less developed countries. Nuclear waste disposal has tremendous health hazards associated with it. Plastic, fast food, packaging and cheap electronic wastes threaten the well being of humans. Waste disposal is one of urgent current environmental problem.

6. Climate Change: Climate change is yet another environmental problem that has surfaced in last couple of decades. It occurs due to rise in global warming which occurs due to increase in temperature of atmosphere by burning of fossil fuels and release of harmful gases by industries. Climate change has various harmful effects but not limited to melting of polar ice, change in seasons, occurrence of new diseases, frequent occurrence of floods and change in overall weather scenario.

7. Loss of Biodiversity: Human activity is leading to the extinction of species and habitats and and loss of bio-diversity. Eco systems, which took millions of years to perfect, are in danger when any species population is decimating. Balance of natural processes like pollination is crucial to the survival of the eco-system and human activity threatens the same. Another example is the destruction of coral reefs in the various oceans, which support the rich marine life.

8. Deforestation: Our forests are natural sinks of carbon dioxide and produce fresh oxygen as well as helps in regulating temperature and rainfall. At present forests cover 30% of the land but every year tree cover is lost amounting to the country of Panama due to growing population demand for more food, shelter and cloth. Deforestation simply means clearing of green cover and make that land available for residential, industrial or commercial purpose.

9. Ocean Acidification: It is a direct impact of excessive production of CO2. 25% of CO2 produced by humans. The ocean acidity has increased by the last 250 years but by 2100, it may shoot up by 150%. The main impact is on shellfish and plankton in the same way as human osteoporosis.

10. Ozone Layer Depletion: The ozone layer is an invisible layer of protection around the planet that protects us from the sun's harmful rays. Depletion of the crucial Ozone layer of the atmosphere is attributed to pollution caused by Chlorine and Bromide found in Chloro-floro carbons (CFC's). Once these toxic gases reach the upper atmosphere, they cause a hole in the ozone layer, the biggest of which is above the Antarctic. The CFC's are banned in many industries and consumer products. Ozone layer is valuable because it prevents harmful UV radiation from reaching the earth. This is one of the most important current environmental problem.

11. Acid Rain: Acid rain occurs due to the presence of certain pollutants in the atmosphere. Acid rain can be caused due to combustion of fossil fuels or erupting volcanoes or rotting vegetation which release sulfur dioxide and nitrogen oxides into the atmosphere. Acid rain is a known environmental problem that can have serious effect on human health, wildlife and aquatic species.

12. Water Pollution: Clean drinking water is becoming a rare commodity. Water is becoming an economic and political issue as the human population fights for this resource. One of the options suggested is using the process of desalinization. Industrial development is filling our rivers seas and oceans with toxic pollutants which are a major threat to human health.

13. Urban Sprawl: Urban sprawl refers to migration of population from high density urban areas to low density rural areas which results in spreading of city over more and more rural land. Urban sprawl results in land degradation, increased traffic, environmental issues and health issues. The ever growing demand of land displaces natural environment consisting of flora and fauna instead of being replaced.

14: Public Health Issues: The current environmental problems pose a lot of risk to health of humans, and animals. Dirty water is the biggest health risk of the world and poses threat to the quality of life and public health. Run-off to rivers carries along toxins, chemicals and disease carrying organisms. Pollutants cause respiratory disease like Asthma and cardiac-vascular problems. High temperatures encourage the spread of infectious diseases like Dengue.

15. Genetic Engineering: Genetic modification of food using biotechnology is called genetic engineering. Genetic modification of food results in increased toxins and diseases as genes from an allergic plant can transfer to target plant. Genetically modified crops can cause serious environmental problems as an engineered gene may prove toxic to wildlife. Another drawback is that increased use of toxins to make insect resistant plant can cause resultant organisms to become resistant to antibiotics.

The need for change in our daily lives and the movements of our government is growing. Because so many different factors come into play; voting, governmental issues, the desire to stick to routine, many people don't consider that what they do will affect future generations. If humans continue moving forward in such a harmful way towards the future, then there will be no future to consider. Although it's true that we cannot physically stop our ozone layer from thinning (and scientists are still having trouble figuring out what is causing it exactly,) there are still so many things we can do to try and put a dent in what we already know. By raising awareness in your local community and within your families about these issues, you can help contribute to a more environmentally conscious and friendly place for you to live.

Image credit:

About Latest Posts

Rinkesh

A true environmentalist by heart ❤. Founded Conserve Energy Future with the sole motto of providing helpful information related to our rapidly depleting environment. Unless you strongly believe in Elon Musk's idea of making Mars as another habitable planet, do remember that there really is no 'Planet B' in this whole universe.

Recommended For You

What are Top 25 Environmental Concerns? - Conserve Energy Future

40+ Intriguing Facts About Plastic Pollution - Conserve Energy Future

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"The greatest threat to our planet is the belief that someone else will save it."

– Robert Swan

Know the products before use

Use the products which is reusable

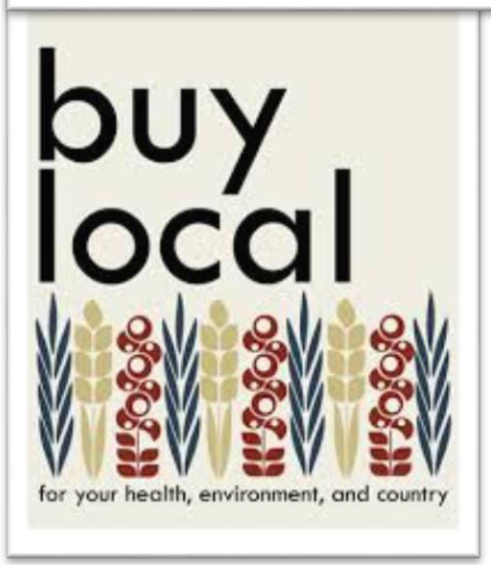
reuseit®
everyday eco-solutions


Organic
Organic
Organic


IF YOU ATE TODAY
THANK
A FARMER


NO
GMO


Think Globally
Act Locally


buy
local
for your health, environment, and country

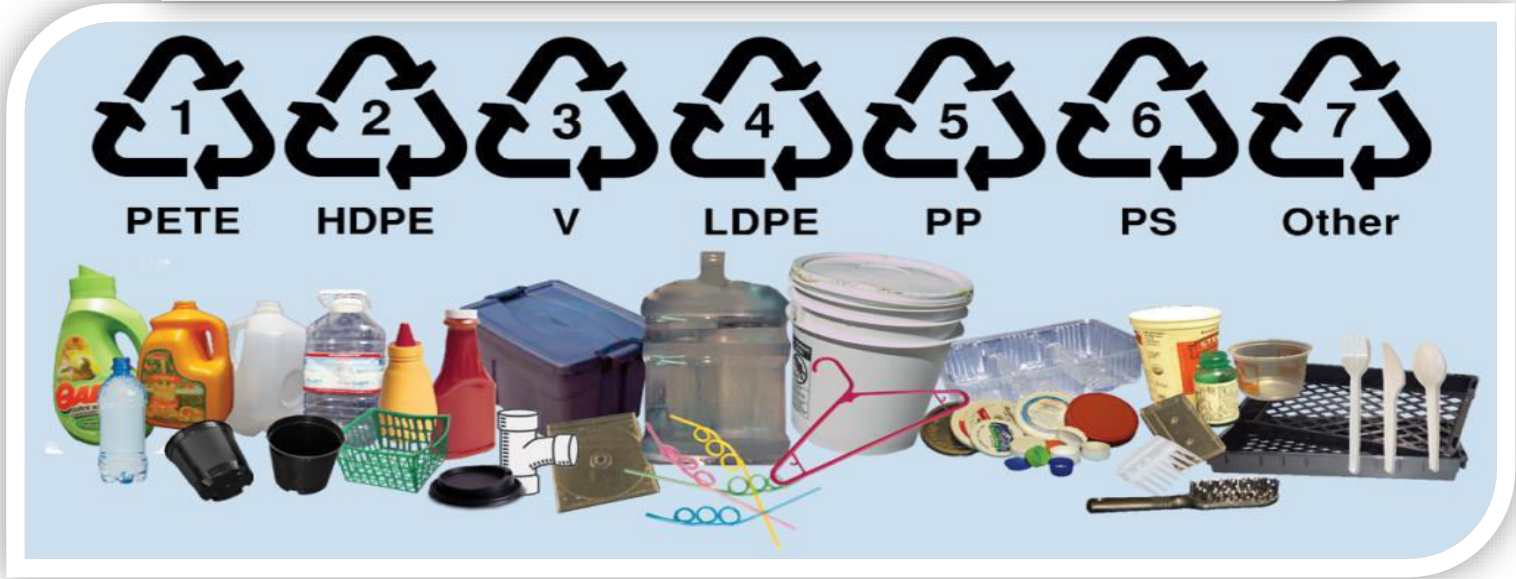

5 Digit Code
Starting With 9
means:
ORGANIC
(Grown Naturally. No chemicals)
4 Digit Code
Starting With 4
means:
CONVENTIONAL
(Grown with chemicals and pesticides.)
5 Digit Code
Starting With 8
means:
GMO
(Grown Unnaturally. Genetically modified.)

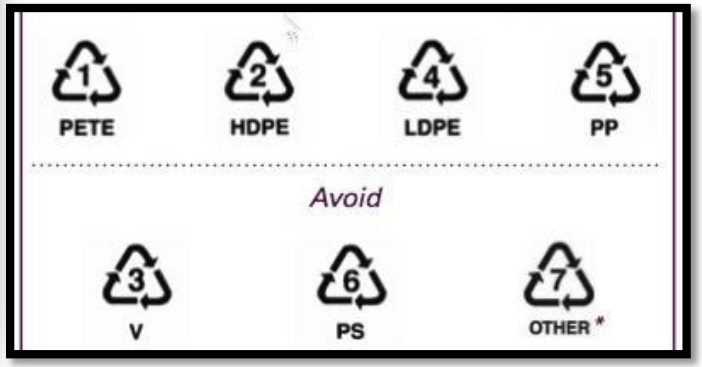

oothpaste pack ?
Do you know the meaning of the colors ?
Green : Natural.
Blue : Natural + Medicine.
Red : Natural + Chemical composition.
Black : Pure Chemical.
BE AWARE OF THE PRODUCTS THAT YOU USE DAILY

Try to Practice

Practice daily to lead a Sustainable living

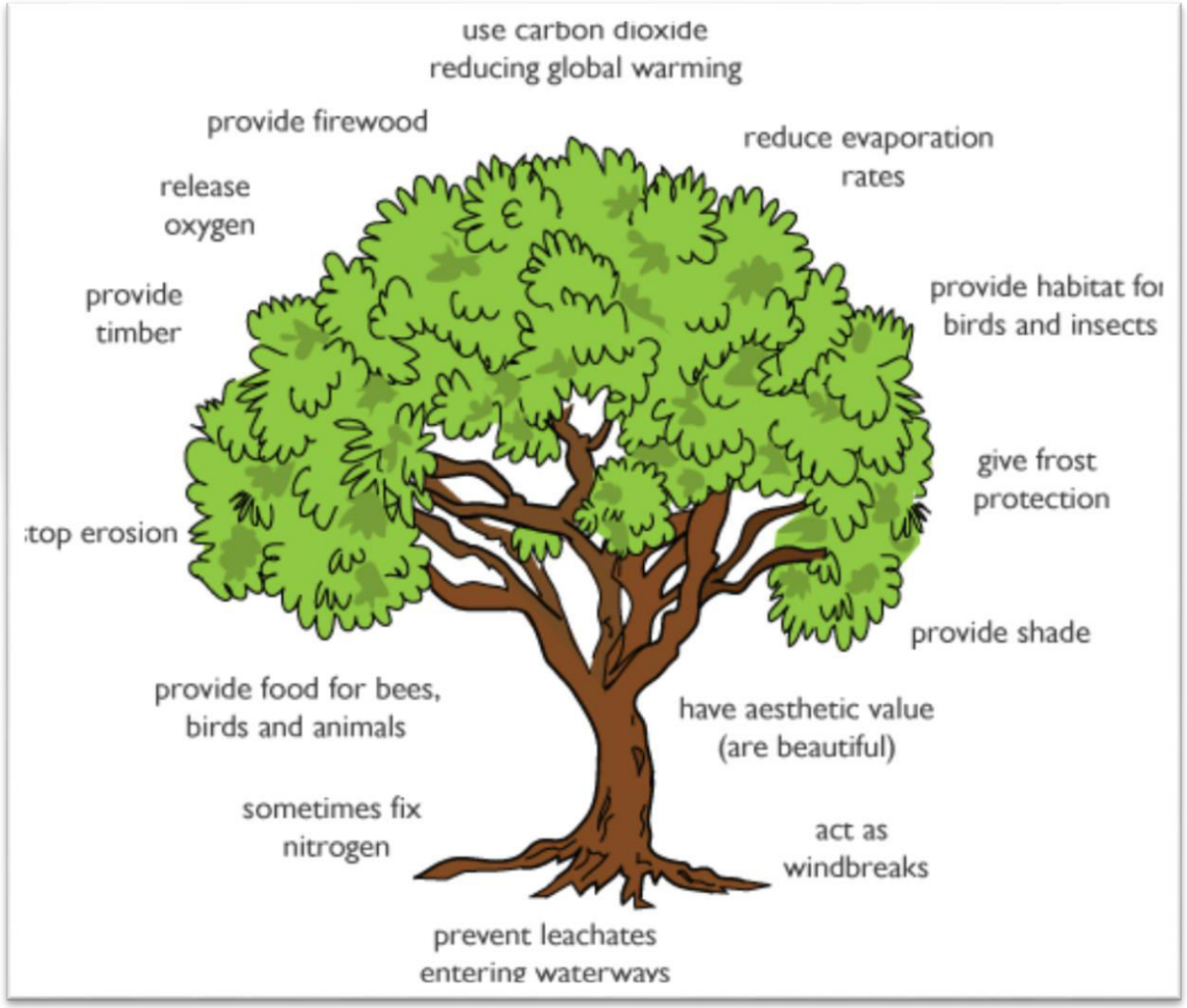
1 PETE	2 HDPE	3 PVC	4 LDPE	5 PP	6 PS	7 OTHER
polyethylene terephthalate soft drink bottles, mineral water, fruite juice container, cooking oil	high-density polyethylene milk jugs, cleaning agents, laundry detergents, bleaching agents, shampoo bottles, washing and shower soaps	polyvinyl chloride trays for sweets, fruit, plastic packing (bubble foil) and food foils to wrap the foodstuff	low-density polyethylene crushed bottles, shopping bags, highly-resistant sacks and most of the wrappings	polypropylene furniture, consumers, luggage, toys as well as bumpers, lining and external borders of the cars	polystyrene toys, hard packing, refrigerator trays, cosmetic bags, costume jewellery, CD cases, vending cups	other plastics, including acrylic, polycarbonate, polyactic fibers, nylon, fiberglass





PLANT TREES


Adopt
a
Tree
PROJECT


use carbon dioxide
reducing global warming
provide firewood
reduce evaporation
rates
release
oxygen
provide
timber
provide habitat for
birds and insects
give frost
protection
top erosion
provide shade
provide food for bees,
birds and animals
have aesthetic value
(are beautiful)
sometimes fix
nitrogen
act as
windbreaks
prevent leachates
entering waterways


POLLUTION
FREE
ZONE


World
Environment
Day
June 5th


Environmental
Awareness


SUSTAINABLE
LIVING


1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
THE GLOBAL GOALS
For Sustainable Development
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE AND JUSTICE STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS

Thank You

Key Environmental Issues and Sustainable Living
IPAT Equation

By

Dr. V. Sai Saraswathi., M. Pharma., Ph. D.,

Environmental Science Professor,

Asst. Prof. (Sr.)

School of Advanced Sciences

VIT University

Vellore- 632014

IPAT Equation
Paul Ehrlich and John Holdren Model

IPAT Is Another Environmental Impact Model

In the early 1970s, scientists Paul Ehrlich and John Holdren developed a simple model showing how *population size* (P), *affluence* (A), or wealth, as measured by rates of resource consumption per person, and the beneficial and harmful environmental effects of *technologies* (T) help to determine the *environmental impact* (I) of human activities. We can summarize this model by the simple equation:

$$\text{Impact (I)} = \text{Population (P)} \times \text{Affluence (A)} \times \text{Technology (T)}$$

IPAT – High/middle/low Income Countries

TABLE 1.1 Environmental Impact of Selected High-, Middle-, and Low-Income Countries

Country	Population Size	Population Growth Rate	Resource Use Per Person	Use of Harmful Technology	Use of Beneficial Technology	Overall Environmental Impact
High-Income Countries						
United States	316 million	Moderate (0.5%)	Very high	Moderate	High	High
Japan	128 million	Negative (−0.2%)	High	Moderate	High	Moderate
Germany	82 million	Negative (−0.2%)	High	Moderate	High	Moderate
Middle-Income Countries						
China	1.35 billion	Moderate (0.5%)	Low	High	Moderate	High
India	1.26 billion	High (1.5%)	Low	High	Low	High
Brazil	194 million	Moderate (1%)	Low	High	Moderate	Moderate
Low-Income Countries						
Nigeria	402 million	High (2.6%)	Very low	High	Low	Moderate
Bangladesh	228 million	High (1.6%)	Very low	High	Low	Moderate
Congo	194 million	High (2.8%)	Very low	High	Low	Moderate

Compiled by the authors using data from Population Reference Bureau, Global Footprint Network, World Wide Fund for Nature, and Earth Policy Institute.

Some forms of technology such as polluting factories, gas-guzzling motor vehicles, and coal-burning power plants increase environmental impact by raising the harmful T factor. But other technologies reduce environmental impact by decreasing the T factor. Examples are pollution control and prevention technologies, fuel-efficient cars, and wind turbines and solar cells that generate electricity with a low environmental impact. These and newer technologies to come can help us reduce our ecological footprints and expand our beneficial environmental impact.

Thank You

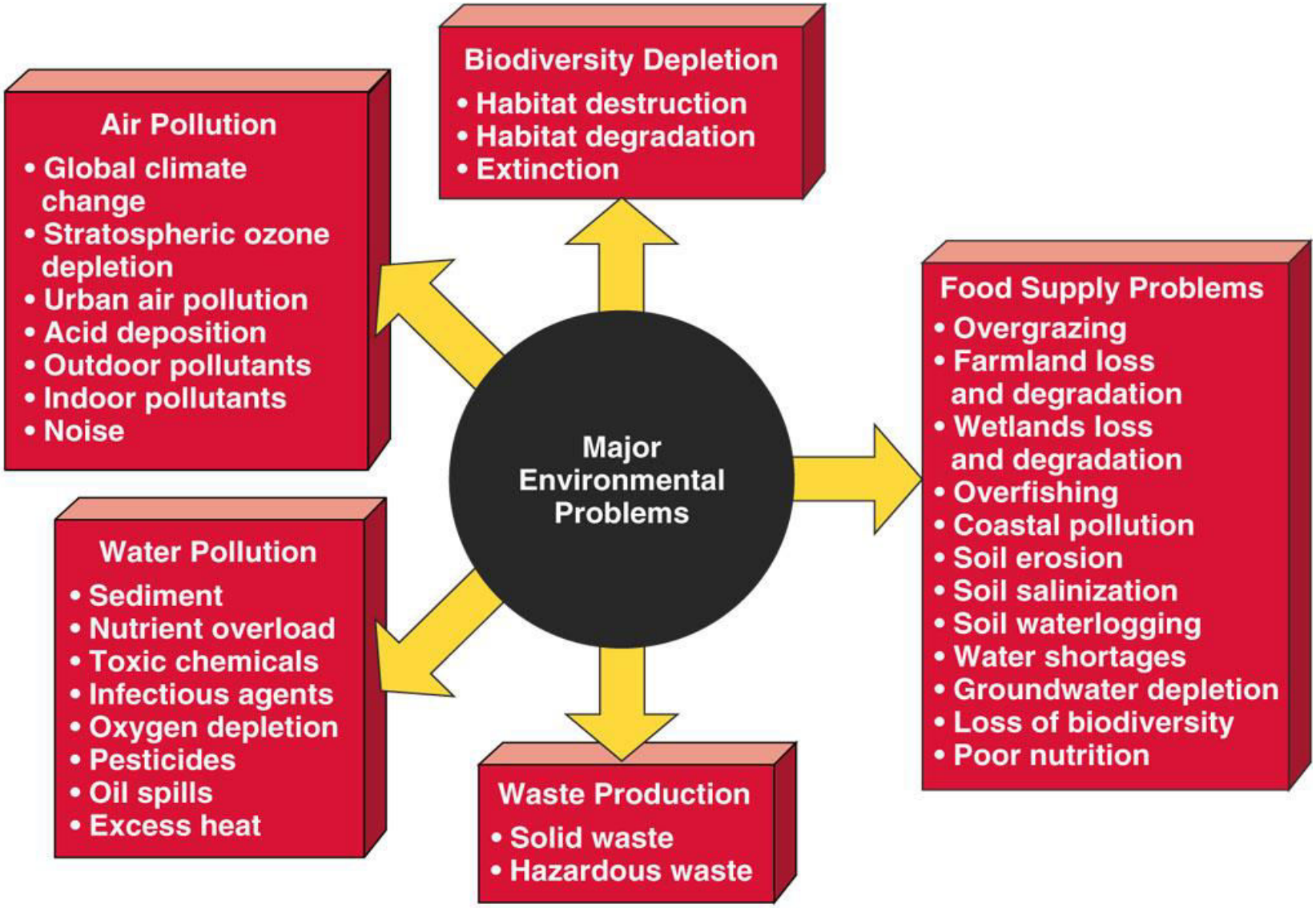
Module – 1
Environment and Ecosystem

By
Prof. V. Sai Saraswathi., M. pharm
Asst. Prof. Sr.
Chemistry Dept.
SAS

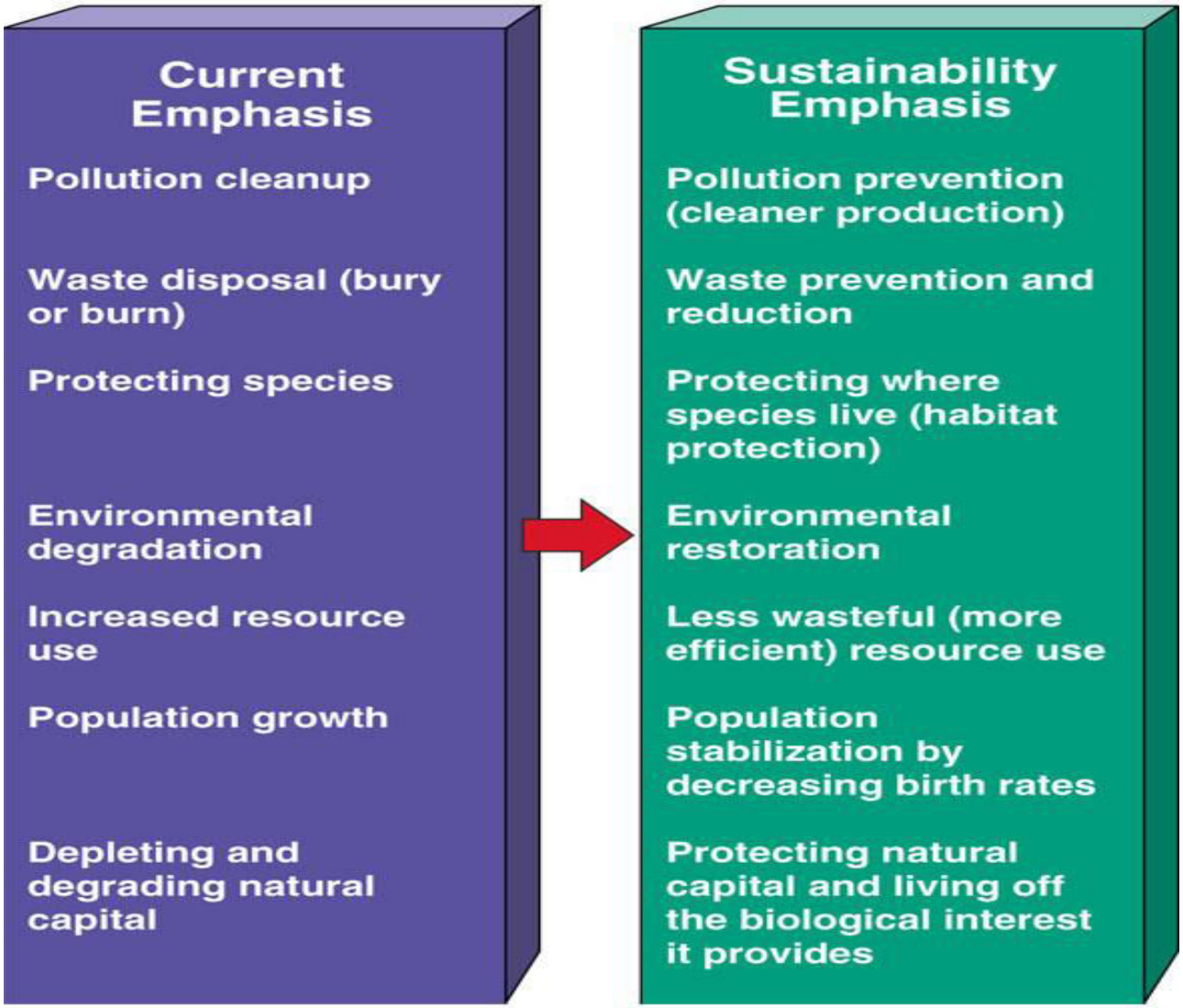
Topics

- Key environmental problems and their basic causes.
- Ecosystem, earth – life support system and ecosystem components.
- Energy flow in ecosystem.
- Ecological succession.
- Nutrient, water, carbon, nitrogen, cycles.
- Effect of human activities on these cycles.

Environmental Problems

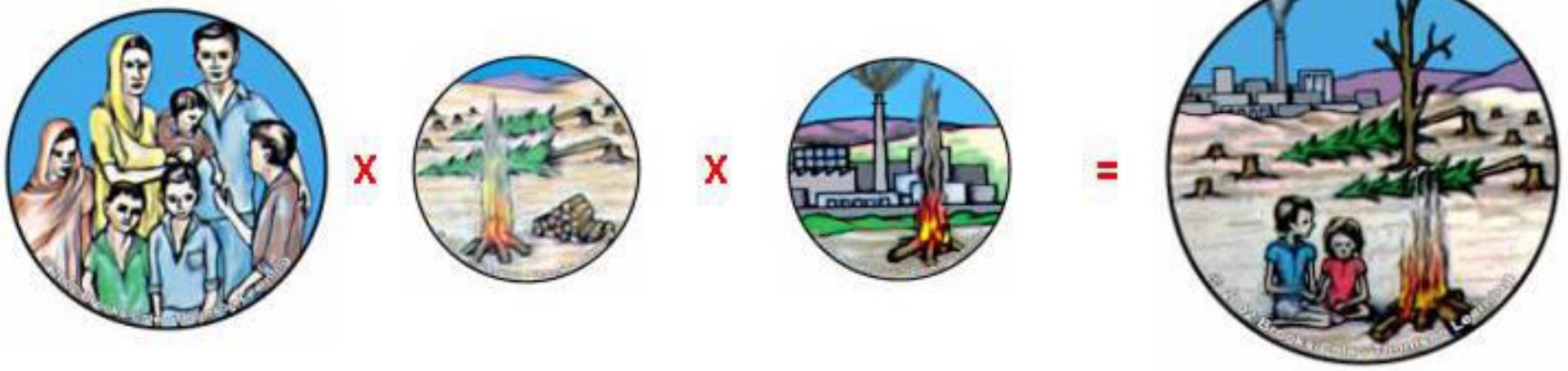


Solutions

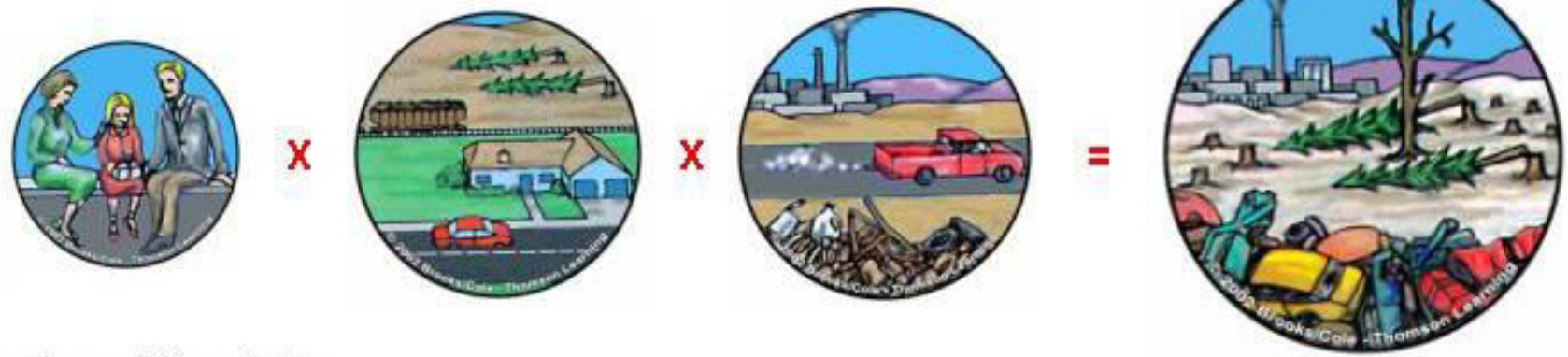

Current Emphasis
Pollution cleanup
Waste disposal (bury or burn)
Protecting species
Environmental degradation
Increased resource use
Population growth
Depleting and degrading natural capital
Sustainability Emphasis
Pollution prevention (cleaner production)
Waste prevention and reduction
Protecting where species live (habitat protection)
Environmental restoration
Less wasteful (more efficient) resource use
Population stabilization by decreasing birth rates
Protecting natural capital and living off the biological interest it provides

Environmental Impact

Developing Countries



Population (**P**) X Consumption per person (affluence, **A**) X Technological impact per unit of consumption (**T**) = Environmental impact of population (**I**)



Developed Countries

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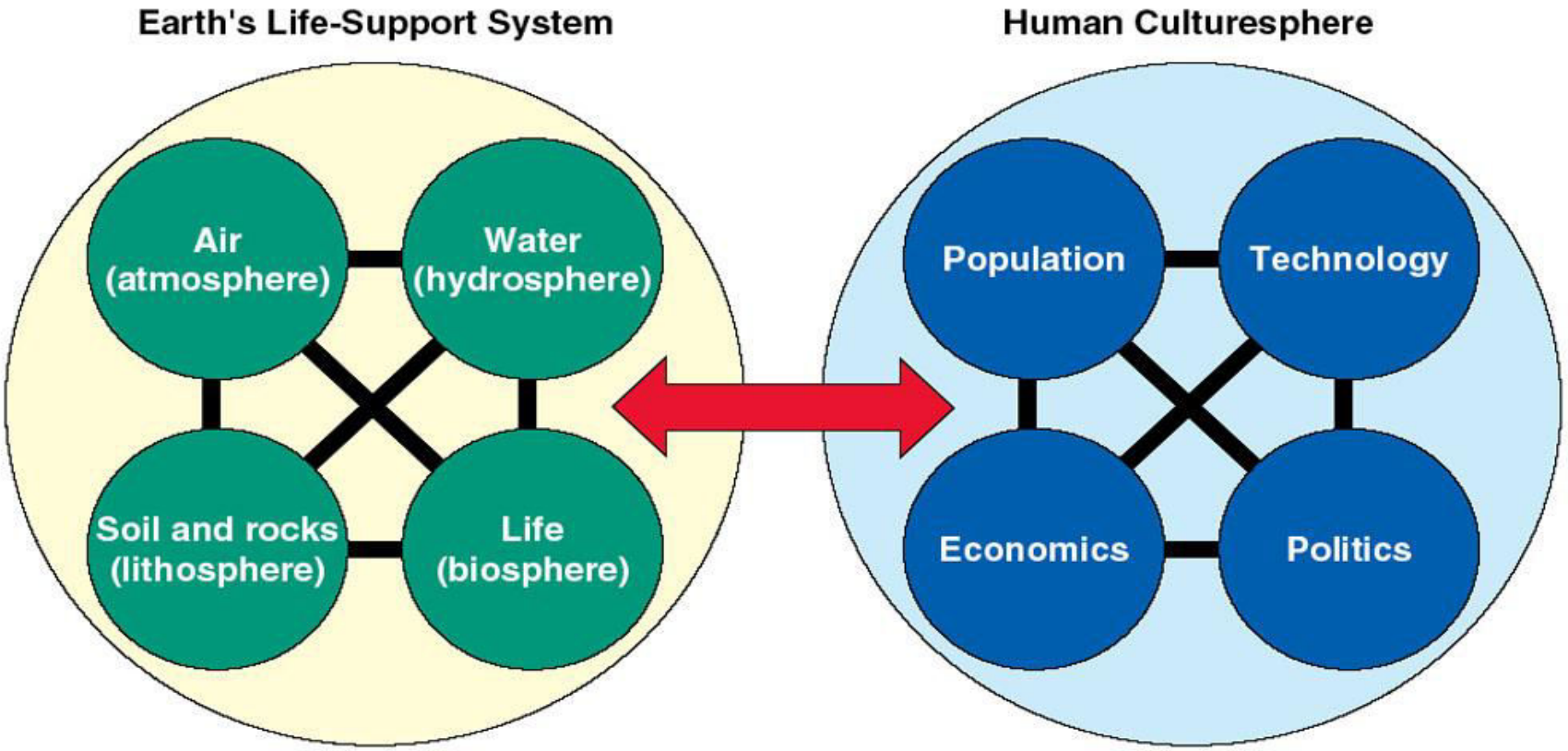
Ecosystems

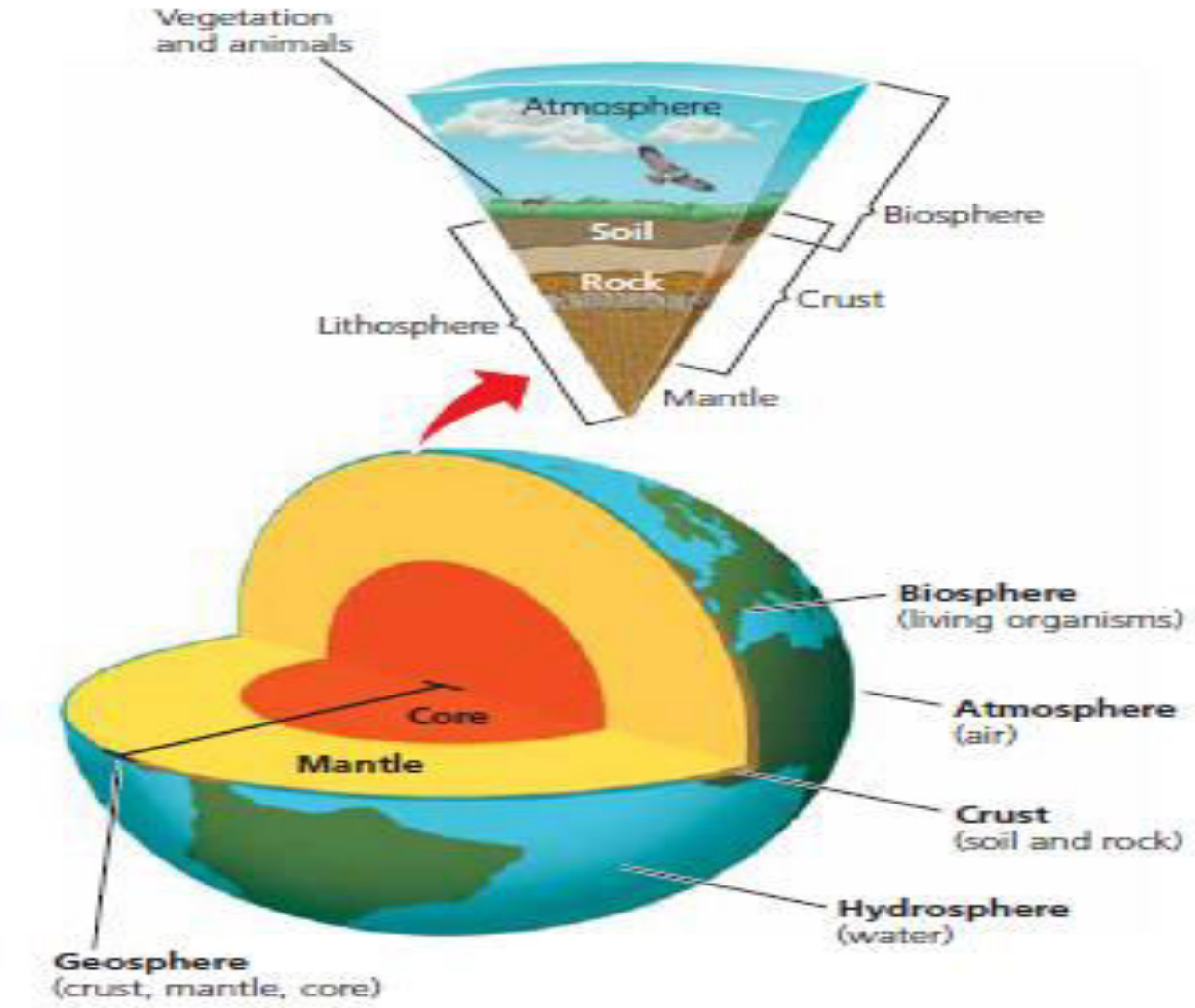
Goal for environmental science is to learn about these complex interactions



Earth's Life – support system

- Scientific studies reveal that the earth's life-support system
  - consists of four main spherical systems that interact with one another
  - the atmosphere (air),
  - the hydrosphere (water),
  - the geosphere (rock, soil, sediment) and
  - the biosphere (living things)

The atmosphere



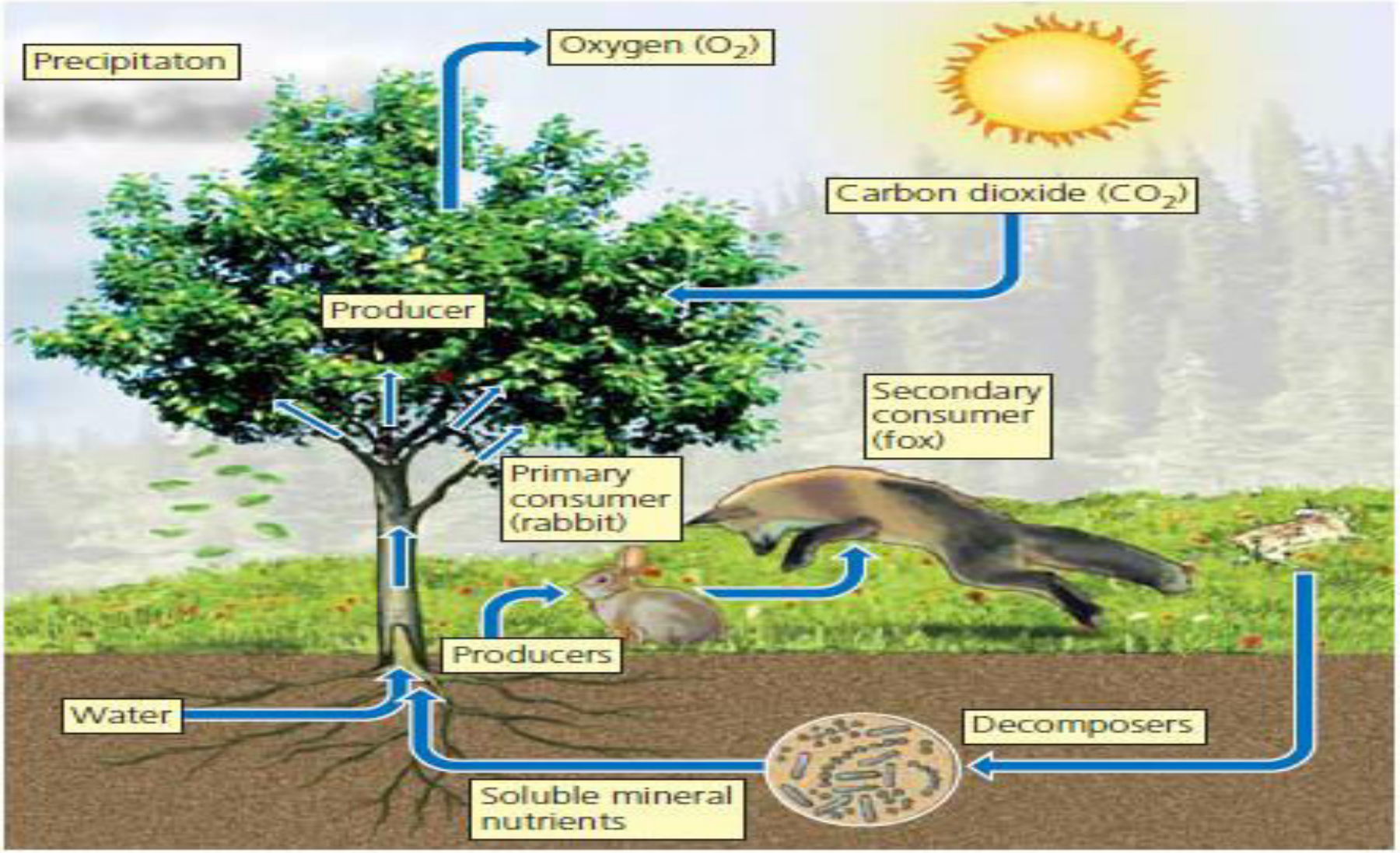
- The atmosphere is spherical in shape.
  - Inner troposphere: 17 Kms above sea level.
  - 78% of nitrogen and 21 % of oxygen, 1% of air includes water vapor, CO_2, methane. – green house gases.
  - Stratosphere (11-31 miles) above earth's surface.
  - Its lower portion is ozone. (UV radiation)
  - Hydrosphere: earth's water. Found as ice bergs, liquid water, water is in form of ocean.

  - Geosphere: consist of hot core, mantle, outer crust.
  - Lithosphere is the earth's solid crust and upper mantle.
- Biosphere occupies the atmosphere, hyrosphere and geosphere – life is found.
- Ecology is the interaction in thin layer of water, air, soil and organism.

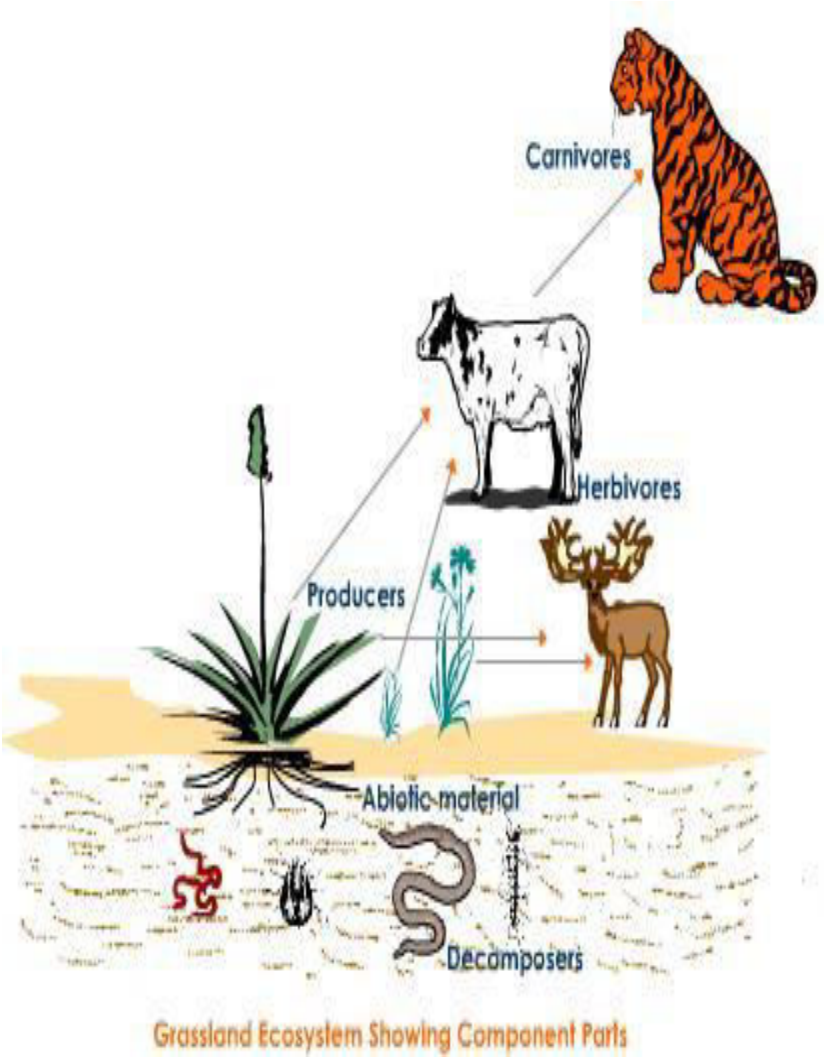
Life exist on land and water

- Classification: two types
  - **Biomes**: eg: forest, deserts, grasslands, with different where species live in.
  - Aquatic life zone:
    - Fresh water life zones: lakes, streams
    - Marine life zones- coral reefs, estuaries, deep ocean.

Major component of ecosystem



Major component of ecosystem
Biotic Structure



Grassland Ecosystem Showing Component Parts

- Producers
- Consumers
- Decomposers

Producers

carbon dioxide + water + **solar energy** → glucose + oxygen

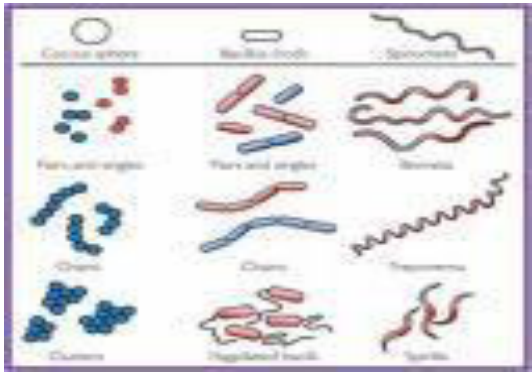
$6\,CO_2 + 6\,H_2O$ + **solar energy** → $C_6H_{12}O_6 + 6\,O_2$

- Photo Autotrophs: Auto- Self, Trophs- Food, Photo- Light.

  Eg. Green Plants

Chemo-autotrophs: which produces the organic matters- oxidation, in absence of sun light.

Eg. Micro – Organisms.



Consumers

- Herbivores: they directly feed on producers.

- Carnivores: they feed on other consumers.

- Called as secondary consumers.

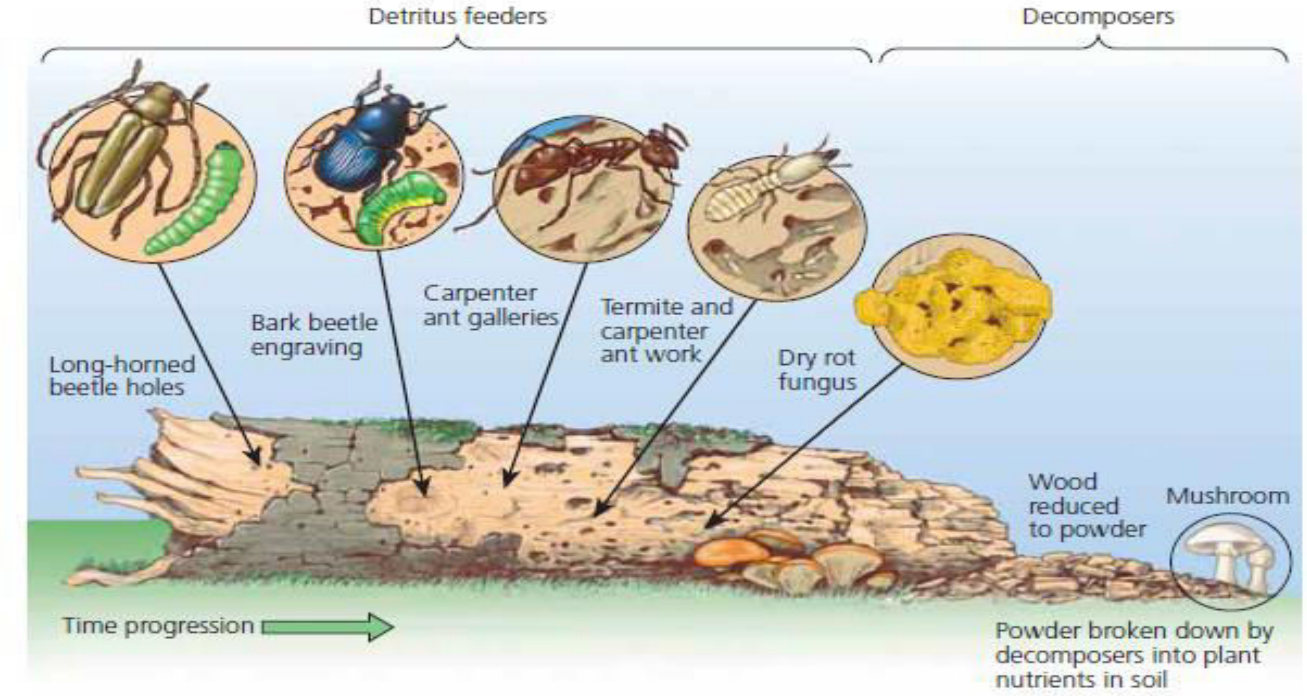
Consumers contd..

- Omnivores: they feed on both plants and animals.

- Detritivores: feed on dead organism, wastes of living organism.

Detritus feeders

- These feed on dead organism/ dead bodies of other organism called detritus.
  - Eg: earthworm, insects, larger scavenger- vultures.
  - These organism extract some of the chemical energy stored in dead organic matter, bodies, wastes in turn serve as food for detritus.



Aerobic respiration

- Some producer , consumer and decomposer use the chemical energy stored in glucose and other organic compounds to their life process.
- The most of cells energy is released by aerobic respiration,

glucose + oxygen → carbon dioxide + water + **energy**

$C_6H_{12}O_6 + 6\,O_2 \rightarrow 6\,CO_2 + 6\,H_2O$ + **energy**

Anaerobic respiration

- Some decomposers get energy by breaking done glucose in absence of oxygen.
- This form of cellular respiration is called **anaerobic respiration/ fermentation.**
- The end products are methane gas, ethyl alcohol, acetic acid- vinegar, hydrogen sulfide.
- Note: all organism get their energy from aerobic or anaerobic respiration, but plants – photosynthesis.

Major component of ecosystem

Abiotic Structure

the physical and chemical components

- Physical factors: sunlight, shade, average temperature, max-min. temperature, rainfall, etc..
- Chemical Factors: carbon, nitrogen, phosphorus, hydrogen, oxygen, sulphur….
- Organic substances present in the soil influences the functioning of the ecosystem.

Functional Attributes

- Food Chain, food webs and trophic structure.
- Energy flow.
- Cycling of nutrients.
- Primary and secondary production.
- Ecosystem development and regulation

Definitions to know

- Food Chain: the flow of energy is mediated through a series of feeding relationships in a definite sequence.
- Tropic structure: the producers and consumers are arranged in the ecosystem in a definite manner and their interaction along with the population size.
- **Tropic level:** each food level.
- **Standing crop/ standing biomass:** the amount of living matter at each tropic level at a given time.

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FOOD CHAIN & FOOD WEB

By
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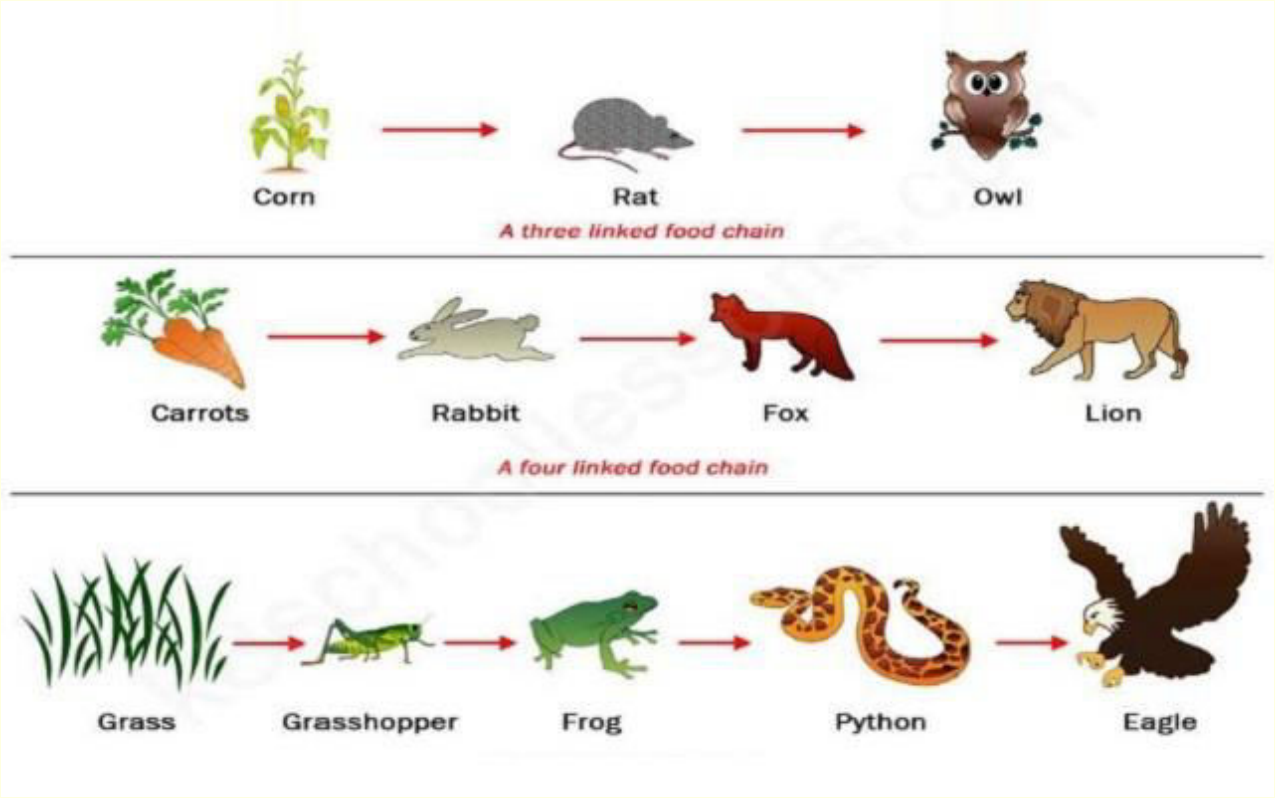
School of Advanced Sciences
VIT University
Vellore- 632014

FOOD CHAIN

- The sequence of eating and being eaten in an ecosystem is known as **food chain**.

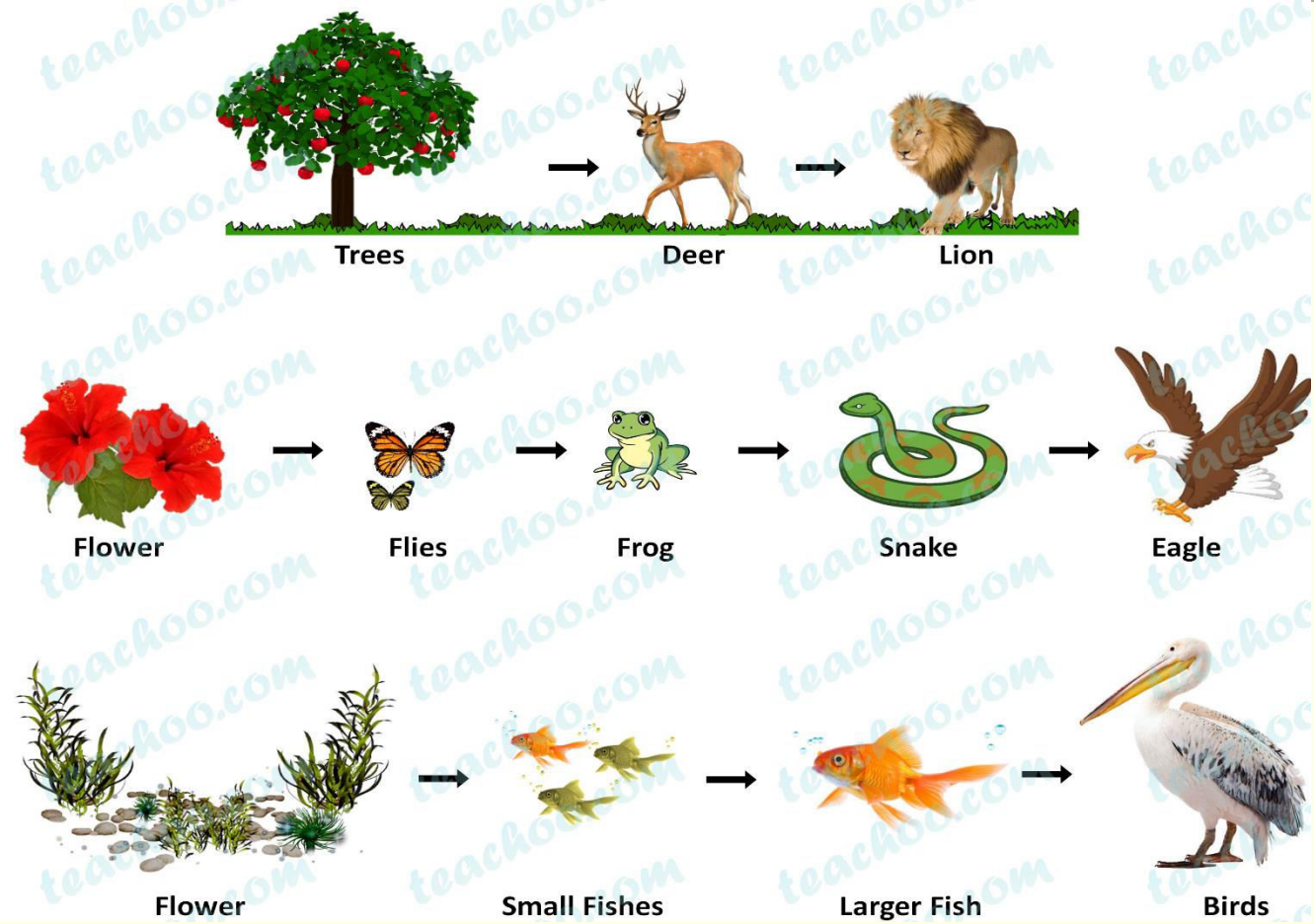


TYPES OF FOOD CHAIN

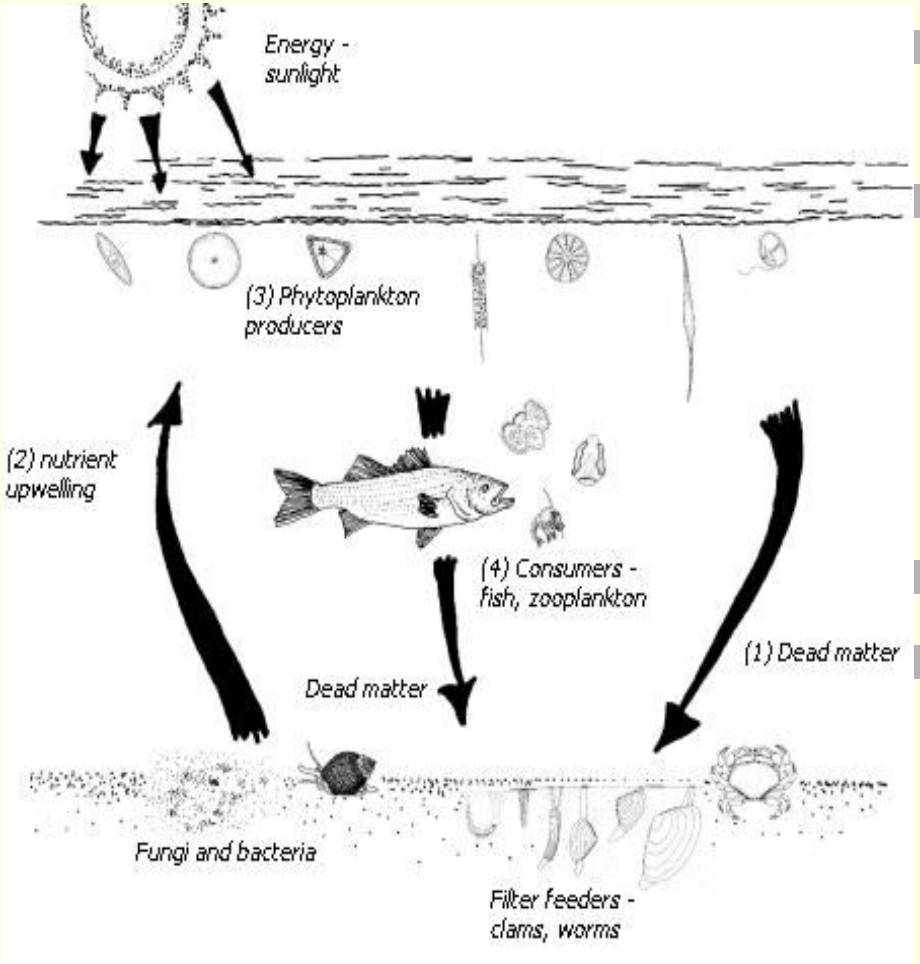
Grazing Food chain

Detritus Food Chain

Grazing Food Chain



Detritus Food Chain



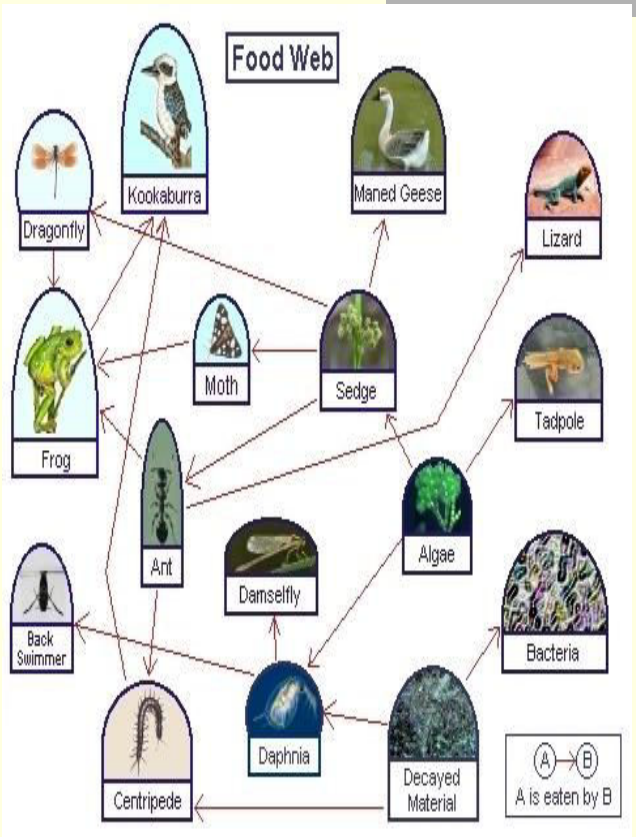
- It starts from dead organic matters.
- Even the decomposers consumed by detritivores and their predators.
- Eg. Estuary
- Grazing food chain derives energy from plant, while detritus gets from plant biomass

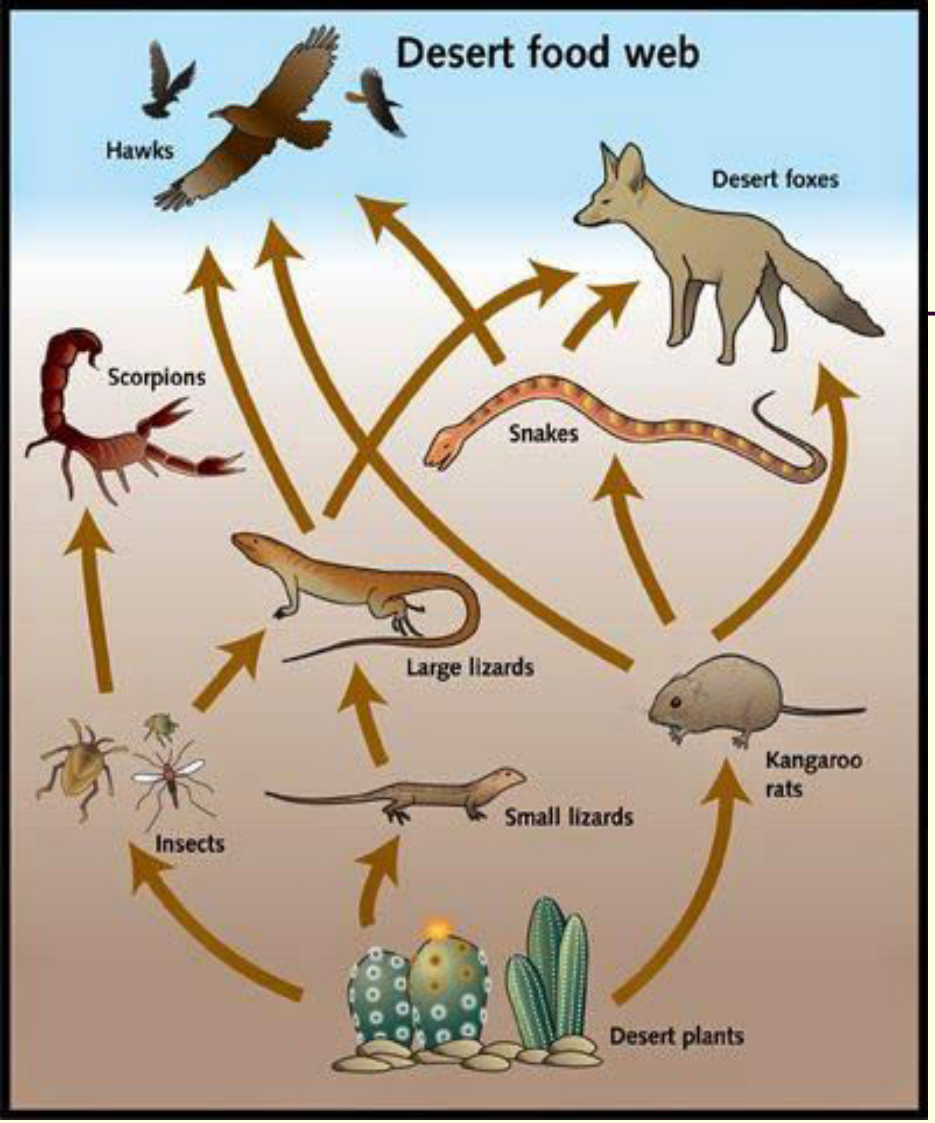
Saprotrophs: they feed on dead organic matter.

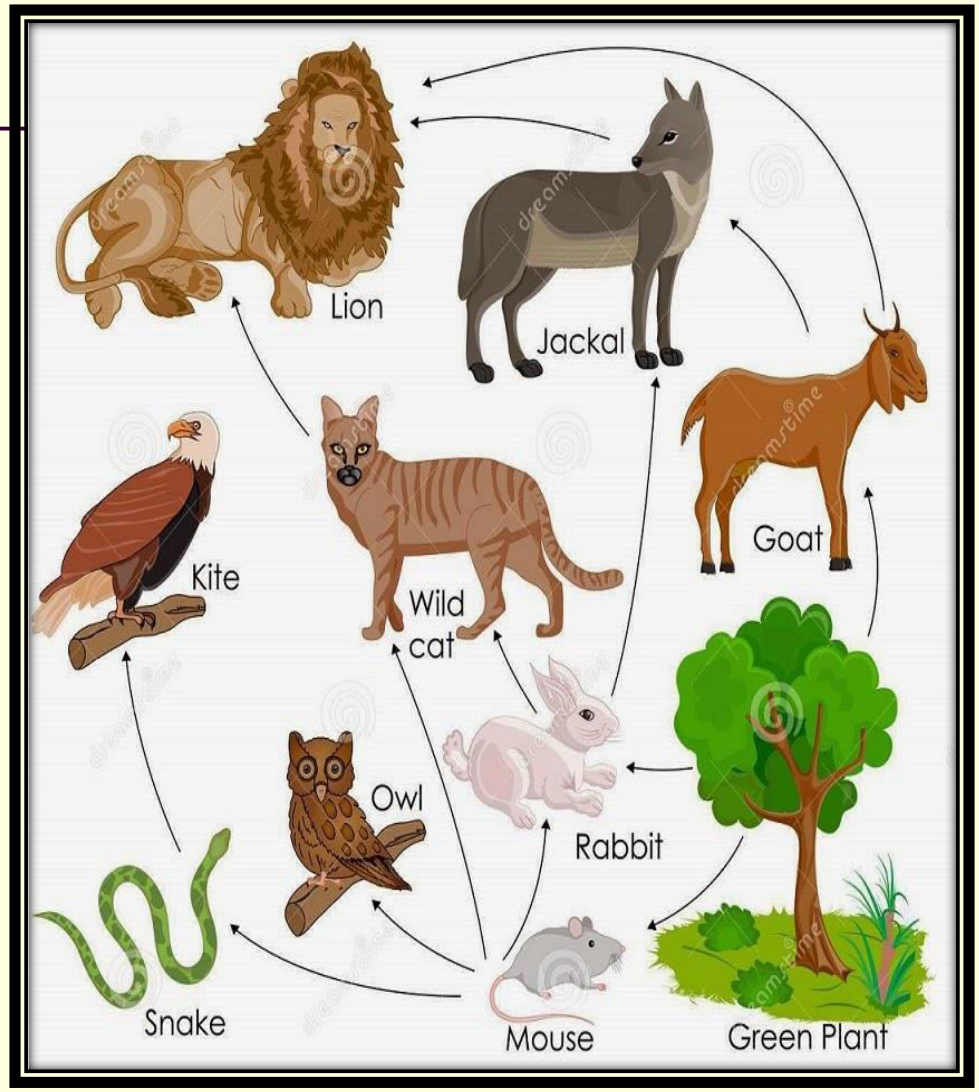
- Large quantity of leaf materials falls in the form of litter into the water.
- The leaf fragments are eaten by saprotrophs.
- Both the grazing and detritus food chain occur in natural ecosystem, but **grazing predominates.**

FOOD WEB

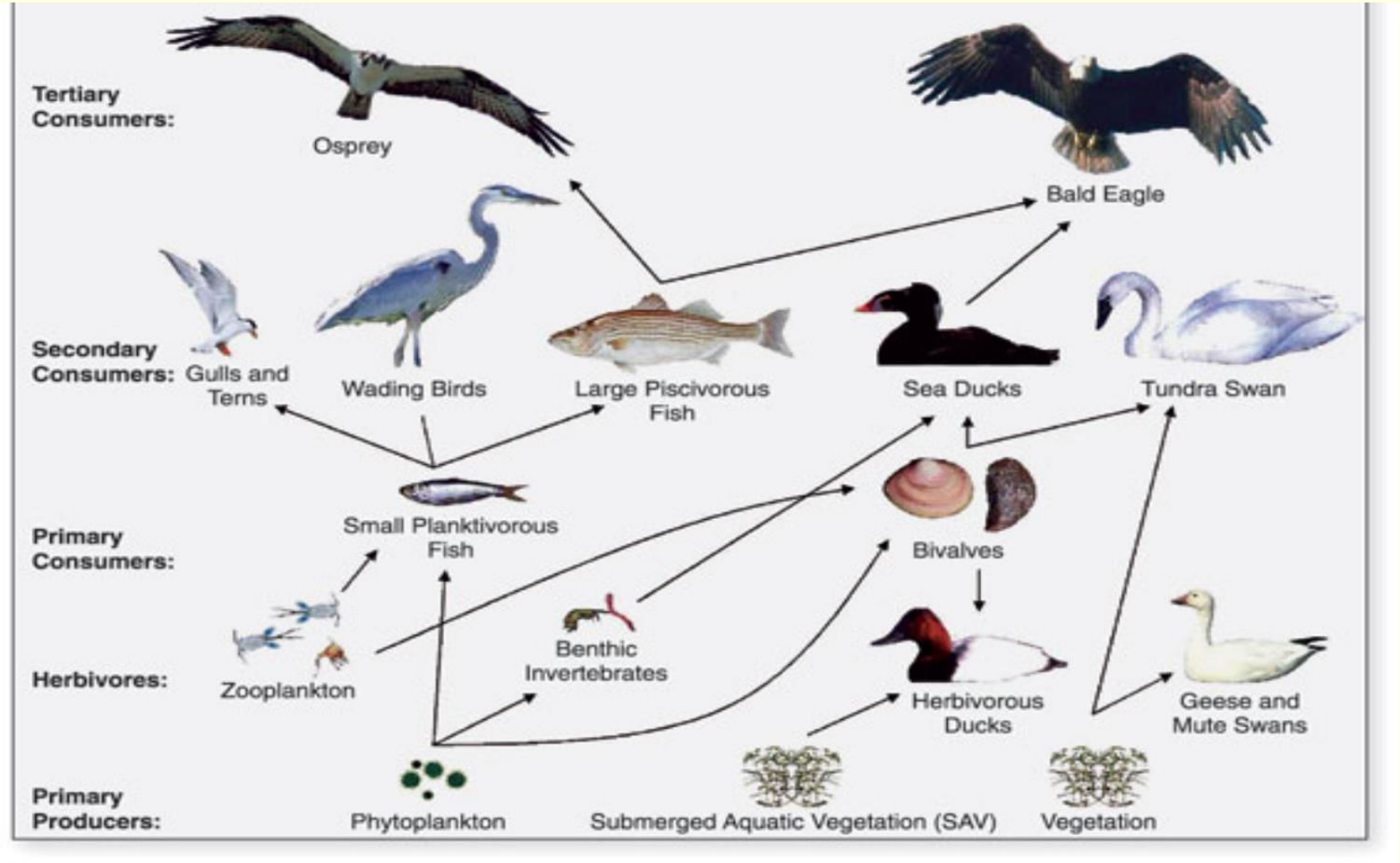
- It is the network of food chains where different types of organisms are connected at different trophic levels, so that the no. of options of eating and being eaten at each trophic level.




Desert food web
Hawks
Desert foxes
Scorpions
Snakes
Large lizards
Kangaroo rats
Insects
Small lizards
Desert plants


Lion
Jackal
Goat
Kite
Wild cat
Owl
Rabbit
Snake
Mouse
Green Plant

Water Bird Food Web



Significance of food chain and food webs

- Significant role in energy flow and nutrient cycle.
- Food chain are helping in maintaining and regulating the population size.: Ecological balance.
- Biological magnification:
- Eg. Pesticides transferred from one trophic level to the other.

Case study

- Biomagnification of DDT was observed in some birds like **Osprey- Sudden decline in population.**
- **The young ones were hatched out in premature condition leading to death.**
- **The reason is due to biomagnification of DDT.**
- **DDT used in low conc. – passed thro' phytoplanktons → Fish → Birds.**

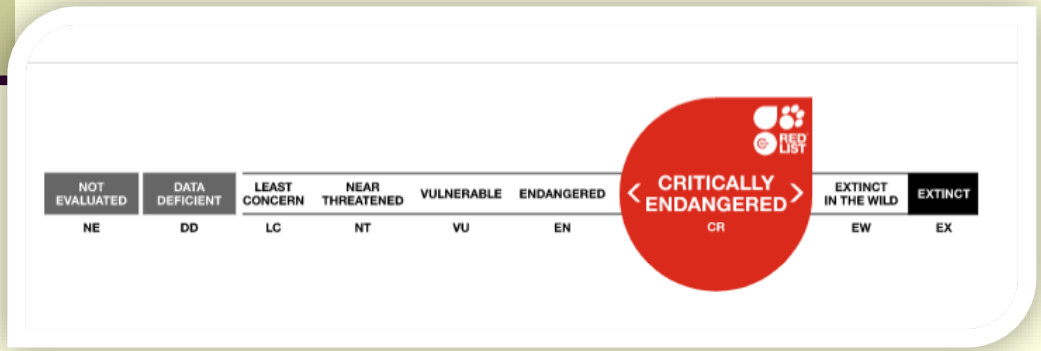
Contd…

- The conc. of DDT was magnified several times in birds which caused the **thinning of shells in bird's eggs**- cause death to the young ones.
- The toxic chemicals are passed from one trophic level to the other.

- Osprey Bird

Vulture Distribution in India

- White Rumped Vulture
- Indian Vulture
- Slender Billed Vulture
- Himalayan Griffon
- Eurasian Griffon
- Egyptian Vulture
- Red Headed Vulture
- Cinereous Vulture
- Bearded Vulture



Slender Billed Vulture

Eurasian Griffon

Vulture & Diclofenac Sodium

The Indian vulture (*Gyps indicus*) is an Old World vulture native to India, Pakistan and Nepal.

NCBI Resources How To

PMC US National Library of Medicine National Institutes of Health

PMC Advanced Journal list

COVID-19 is an emerging, rapidly evolving situation.
Get the latest public health information from CDC: https://www.coronav
Get the latest research from NIH: https://www.nih.gov/coronaviru
Find NCBI SARS-CoV-2 literature, sequence, and clinical content: https://www.ncbi.n

Journal List > Biol Lett > v.2(2); 2006 Jun 22 > PMC1618889

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Biol Lett. 2006 Jun 22; 2(2): 279–282.
Published online 2006 Jan 10. doi: 10.1098/rsbl.2005.0425

PMCID: PMC1618889
PMID: 17148382

Toxicity of diclofenac to *Gyps* vultures

Gerry E Swan,[1] Richard Cuthbert,[2] Miguel Quevedo,[3] Rhys E Green,[2,4] Deborah J Pain,[2,*] Paul Bartels,[5] Andrew A Cunningham,[6] Neil Duncan,[1] Andrew A Meharg,[7] J Lindsay Oaks,[8] Jemima Parry-Jones,[9] Susanne Shultz,[2,†] Mark A Taggart,[7] Gerhard Verdoorn,[10] and Kerri Wolter[11]

Biol

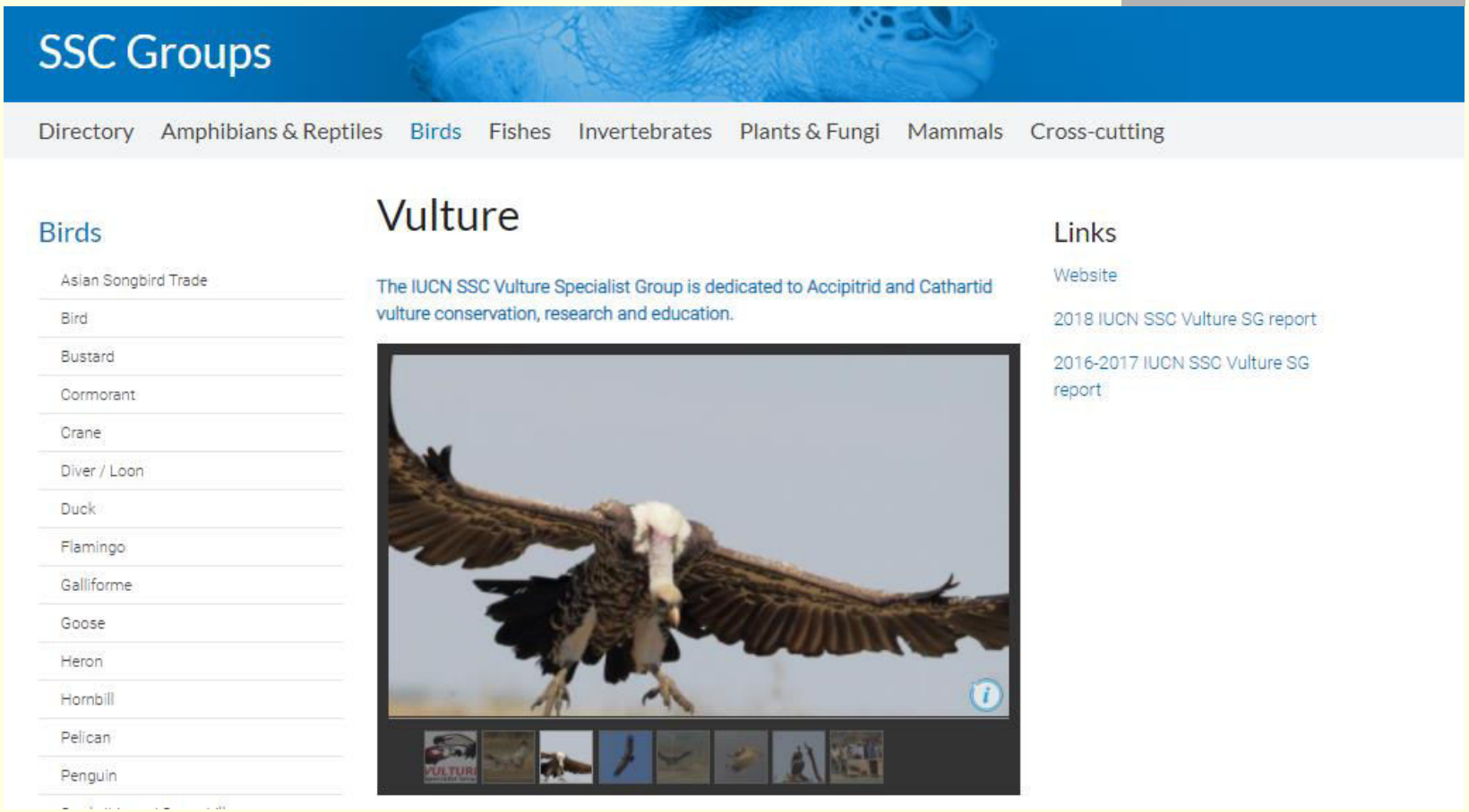
Ban on diclofenac, a lifeline for vultures

TNN | Sep 2, 2015, 08:18 IST

A- A+

KOZHIKODE: The Union government decision to ban multi-dose vials of painkiller drug diclofenac has sparked fresh hopes for the survival of three critically-endangered vulture species in the state, the combined population of which is currently below 50 inside the Wayanad Wildlife Sanctuary (WWS). Their breeding population at last count was estimated at 35 Oriental white-rumped vultures, four Indian long-billed vultures and five red-headed vultures.

SSC- Vulture


SSC Groups
Directory
Amphibians & Reptiles
Birds
Fishes
Invertebrates
Plants & Fungi
Mammals
Cross-cutting
Birds
Asian Songbird Trade
Bird
Bustard
Cormorant
Crane
Diver / Loon
Duck
Flamingo
Galliforme
Goose
Heron
Hornbill
Pelican
Penguin
Vulture
The IUCN SSC Vulture Specialist Group is dedicated to Accipitrid and Cathartid vulture conservation, research and education.
Links
Website
2018 IUCN SSC Vulture SG report
2016-2017 IUCN SSC Vulture SG report

Thank You

Energy flow – Ecosystem

By
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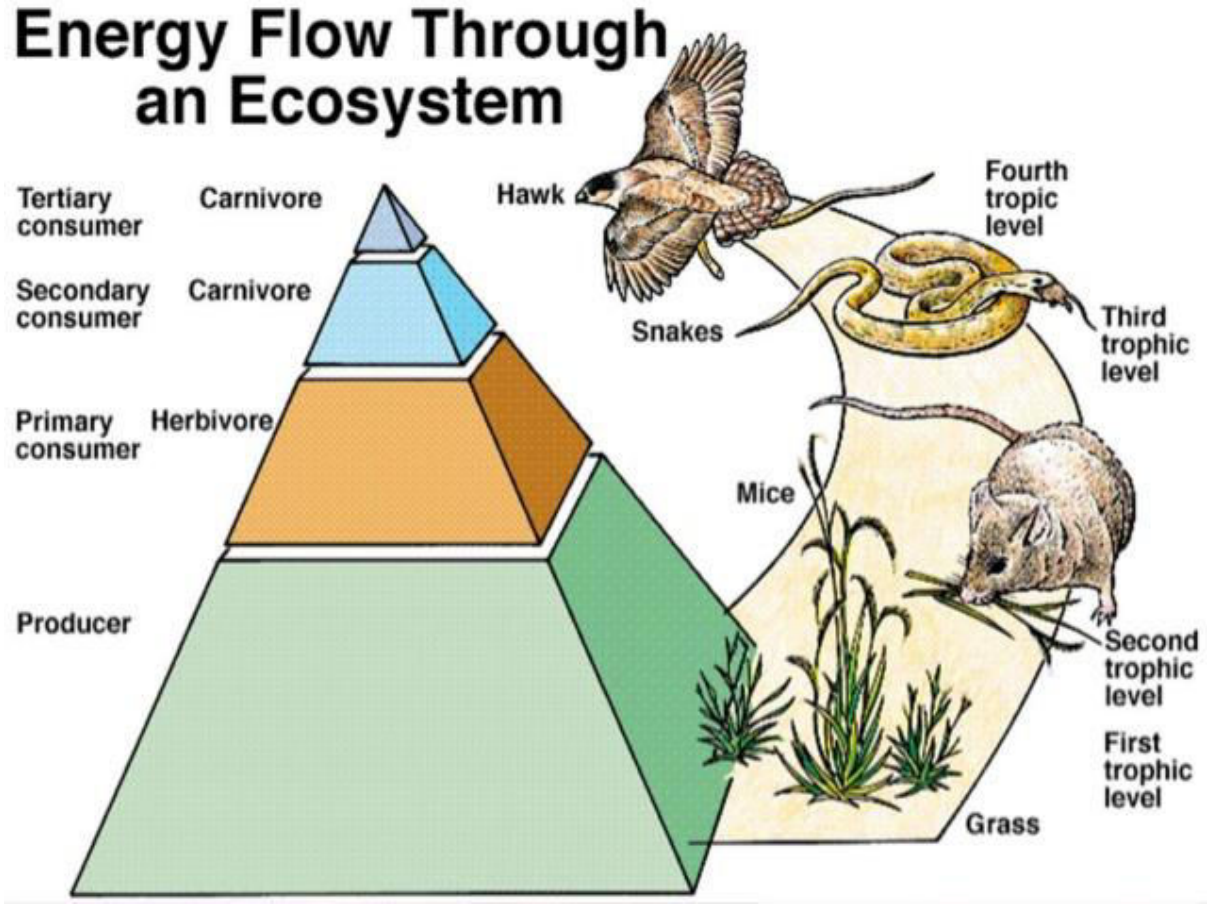
contents

- Gross primary production
- Net primary production
- First law of thermodynamics
- Second law of thermodynamics

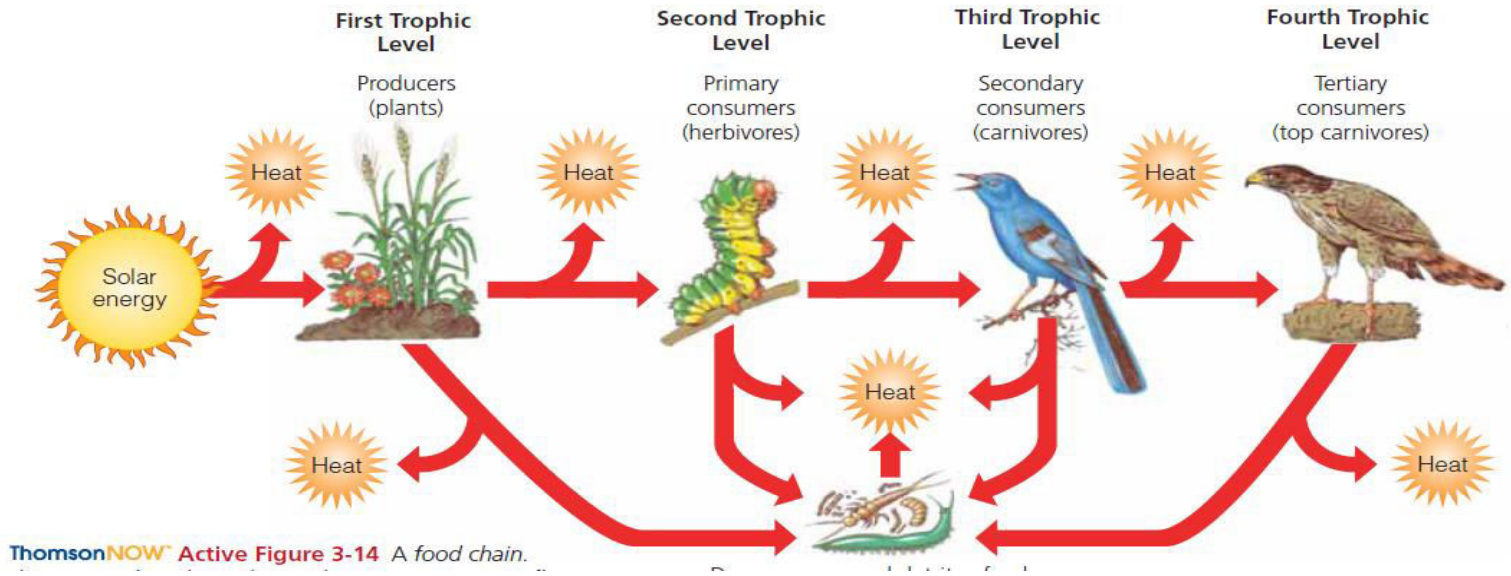
Energy & types

- In scientific term
  - Work = force x distance (eg: put a object on a table or touch a hot object)
  - Capacity to do work or transfer of heat.
- Two types
  - Kinetic energy : moving energy (wind energy, hydro energy)
  - **Potential energy:** stored energy (water in a dam, hot sand in your palm)
  - Potential energy can be converted into kinetic energy (eg: an object falling down from your hand , an automobile burns on gasoline)

Energy flow- Food Chain and Food webs



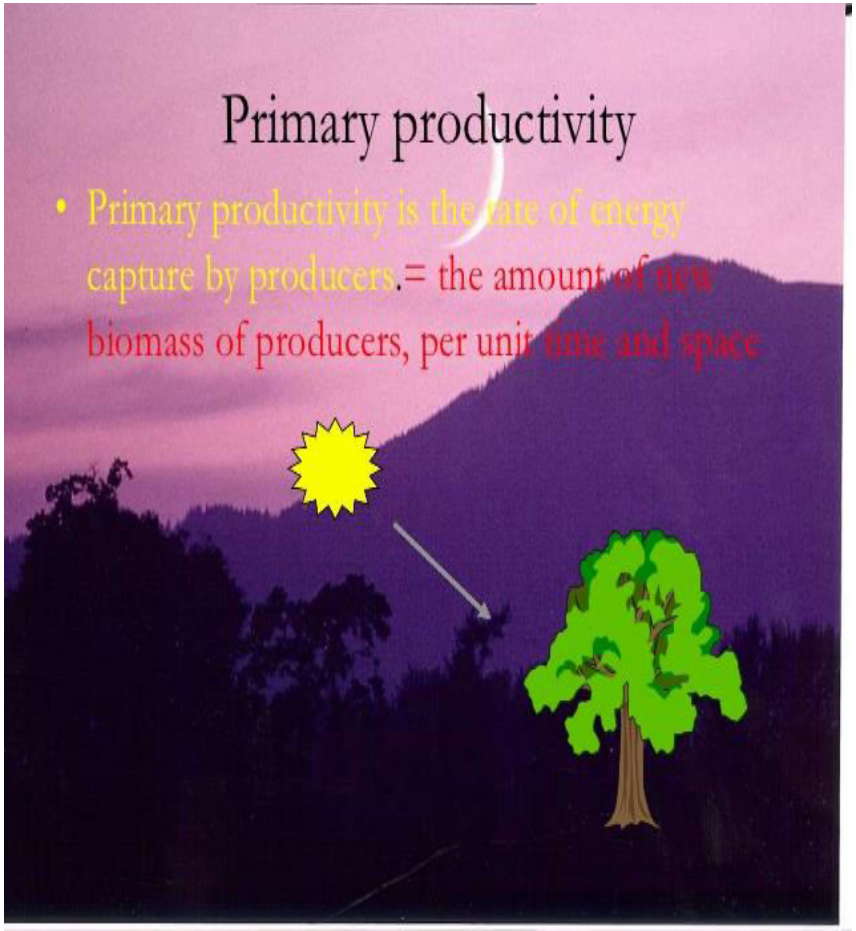
- A sequence of organisms, each of which serves as a source of food for the next, is called a **food chain**
- It helps to determines – chemical energy, nutrients (one to the another)
- Nutrients to soil – reuse by producers.

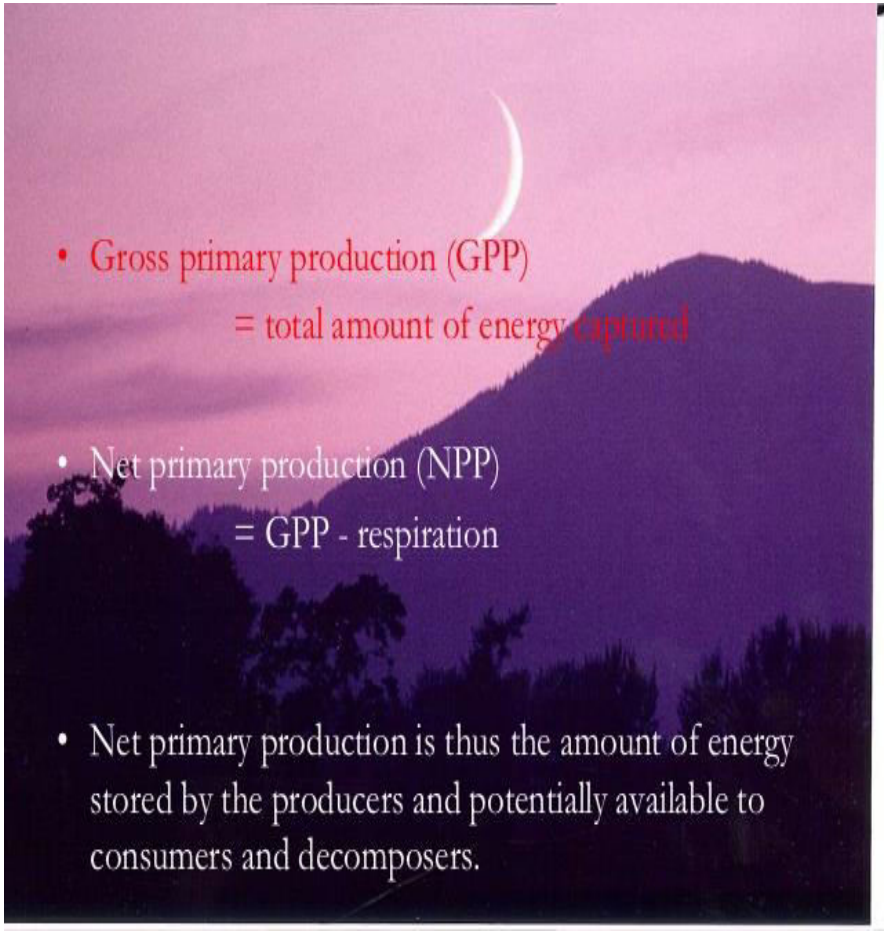


Gross primary production & NPP

- The amount of biomass that a ecosystem is determined by the amount of energy captured and stored as chemical energy by producers.
- GPP is the rate at which an ecosystem producers **convert solar energy into chemical energy** as biomass.
- Measured in terms of energy production per unit area over time given. (Kcal/m^2/yr)
- ***Net primary production (NPP) = GPP- R***
  - R is energy used in respiration

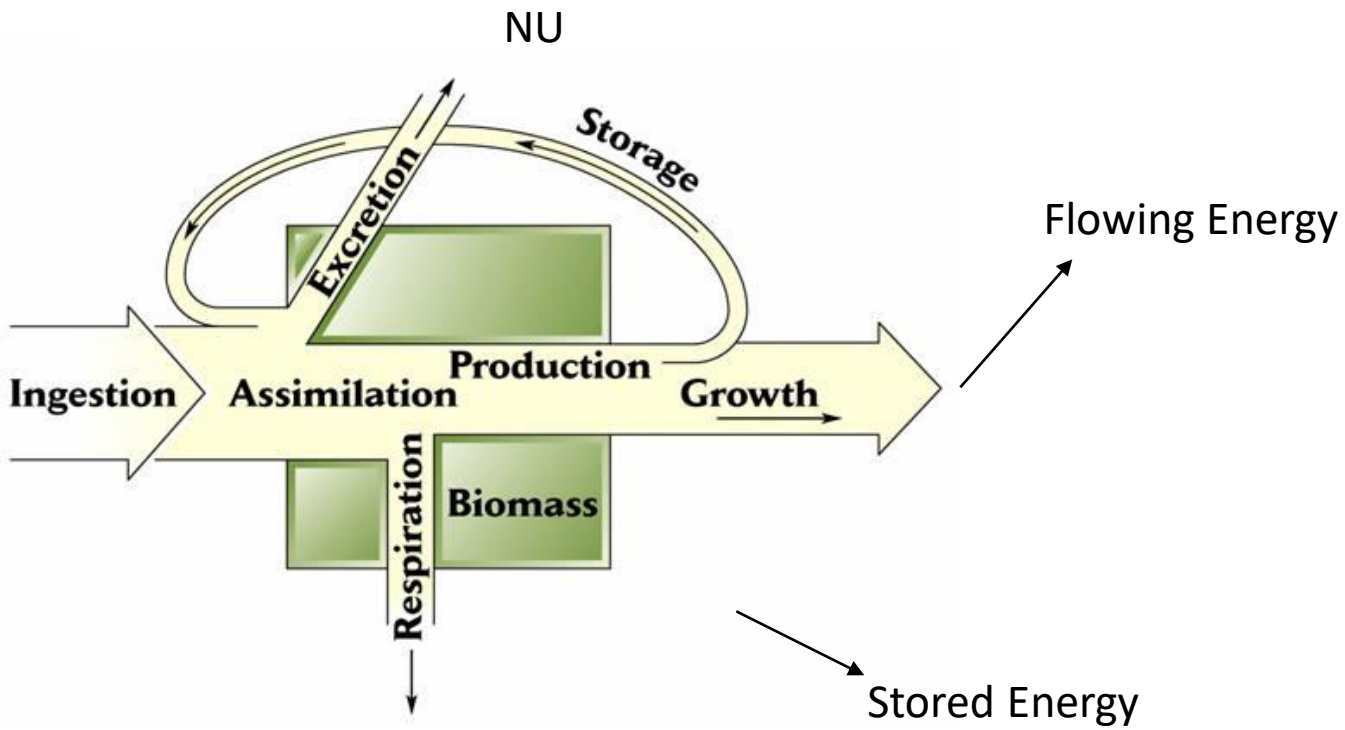
GPP & NPP


Primary productivity
• Primary productivity is the rate of energy capture by producers.= the amount of new biomass of producers, per unit time and space


• Gross primary production (GPP)
= total amount of energy captured
• Net primary production (NPP)
= GPP - respiration
• Net primary production is thus the amount of energy stored by the producers and potentially available to consumers and decomposers.

Models of ecological energy flow

Universal energy flow model

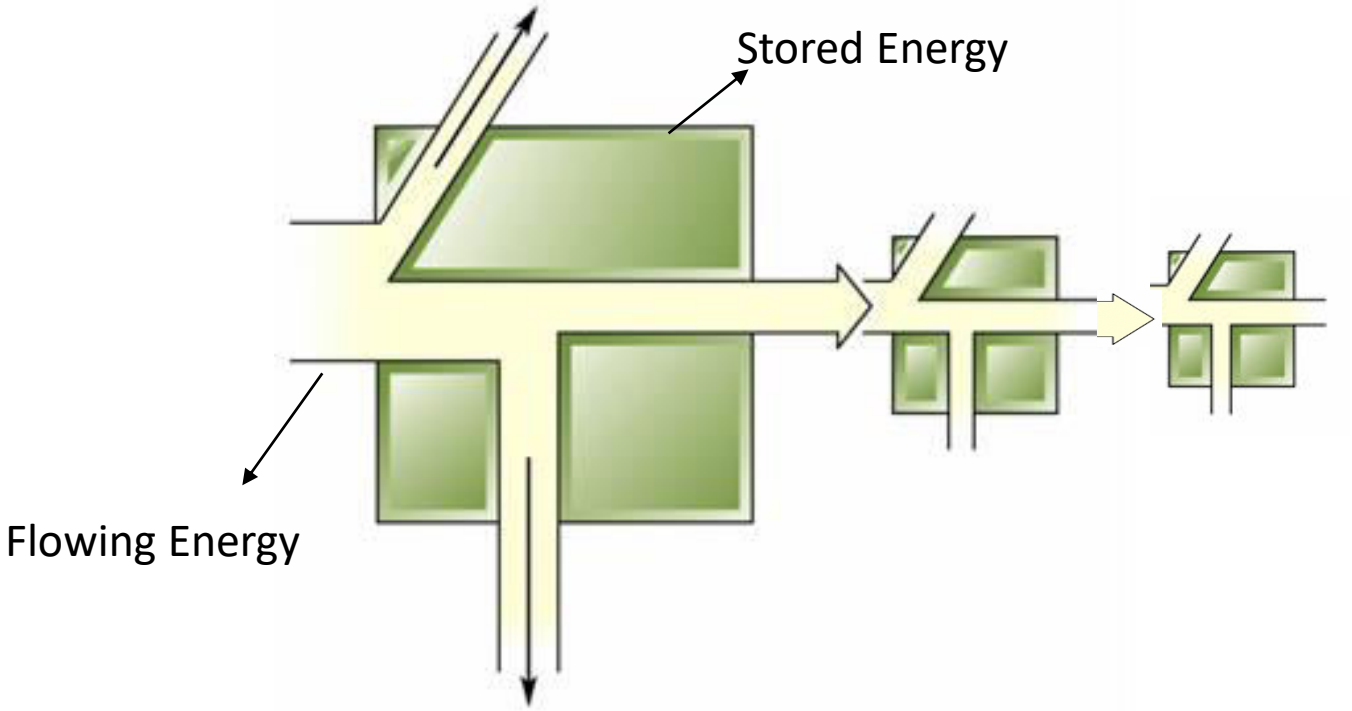


A single trophic level

The loss of energy is due to locomotion, respiration, excretion

Single channel energy flow model

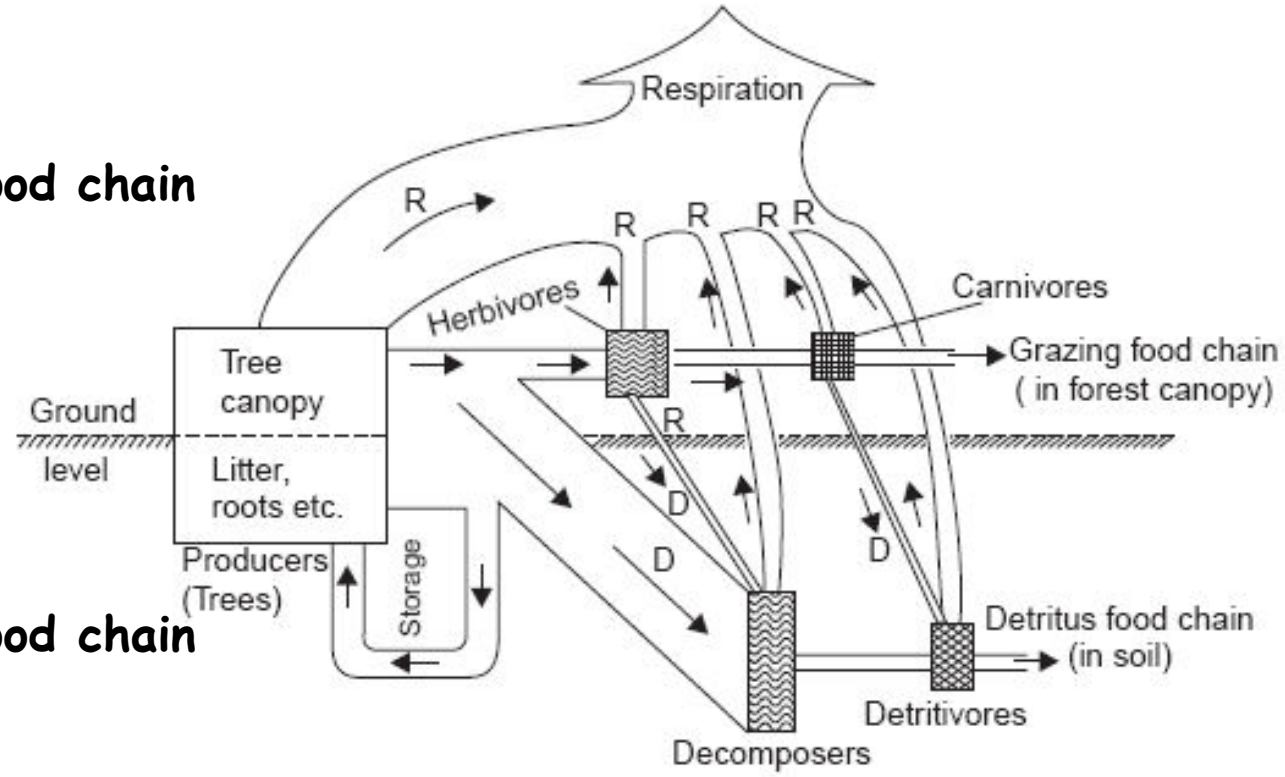
Producers → herbivores → carnivores



A food chain - Unidirectional flow of energy

Both stored energy and flowing energy decrease while moving through a food chain_

Y-shaped or two channel energy flow model

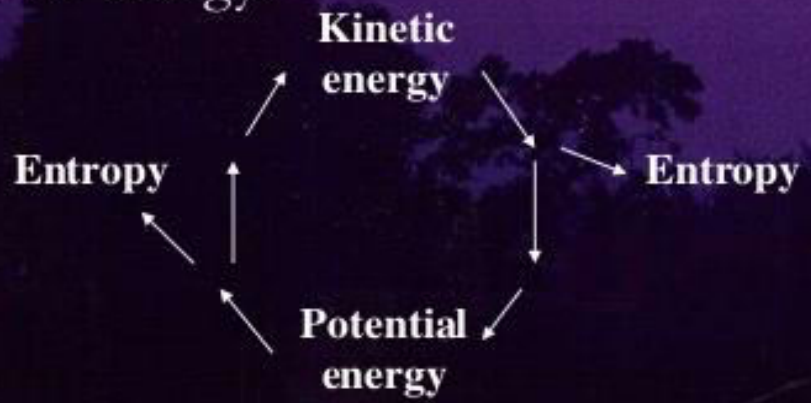


Passage of energy via two food chains

Energy and the Laws of Thermodynamics

20.1 – The Laws of Thermodynamics Govern Energy Flow.

Energy exists in many forms, such as heat, light, chemical energy, and electrical energy. **Energy is the ability to bring about change or to do work.** Thermodynamics is the study of energy.

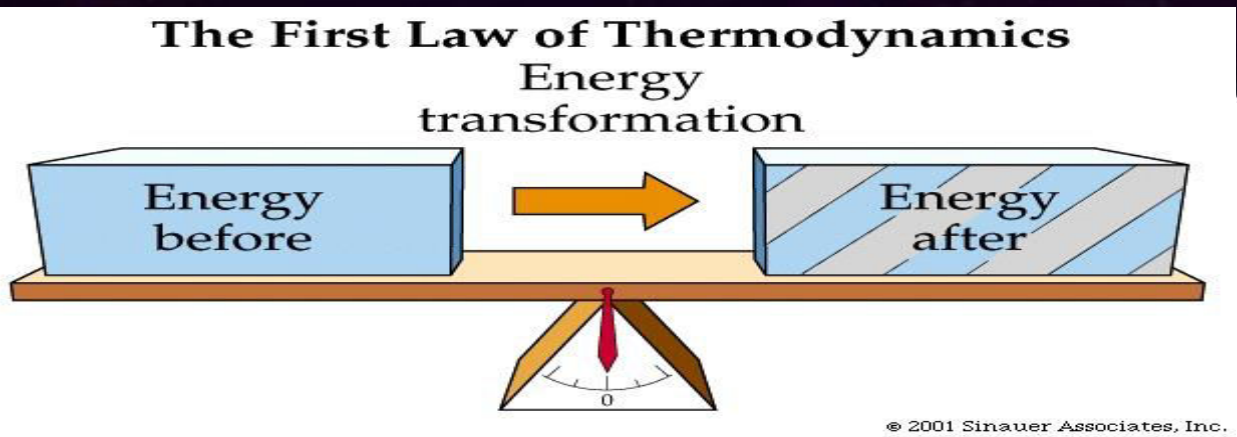


Energy and the Laws of Thermodynamics

The 1st Law of Thermodynamics:
Energy can be changed from one form to another, but it cannot be created or destroyed. The total amount of energy and matter in the Universe remains constant, merely changing from one form to another.

Isaac Newton (1643-1727)

The First Law of Thermodynamics



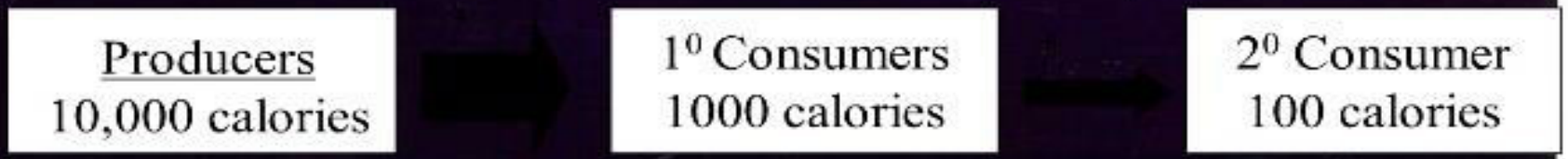
Energy and the Laws of Thermodynamics

The 2nd Law of Thermodynamics: "*in all energy exchanges, if no energy enters or leaves the system, the potential energy of the state will always be less than that of the initial state.*" In energy transfer, some energy will dissipate as heat. The flow of energy maintains order of life.

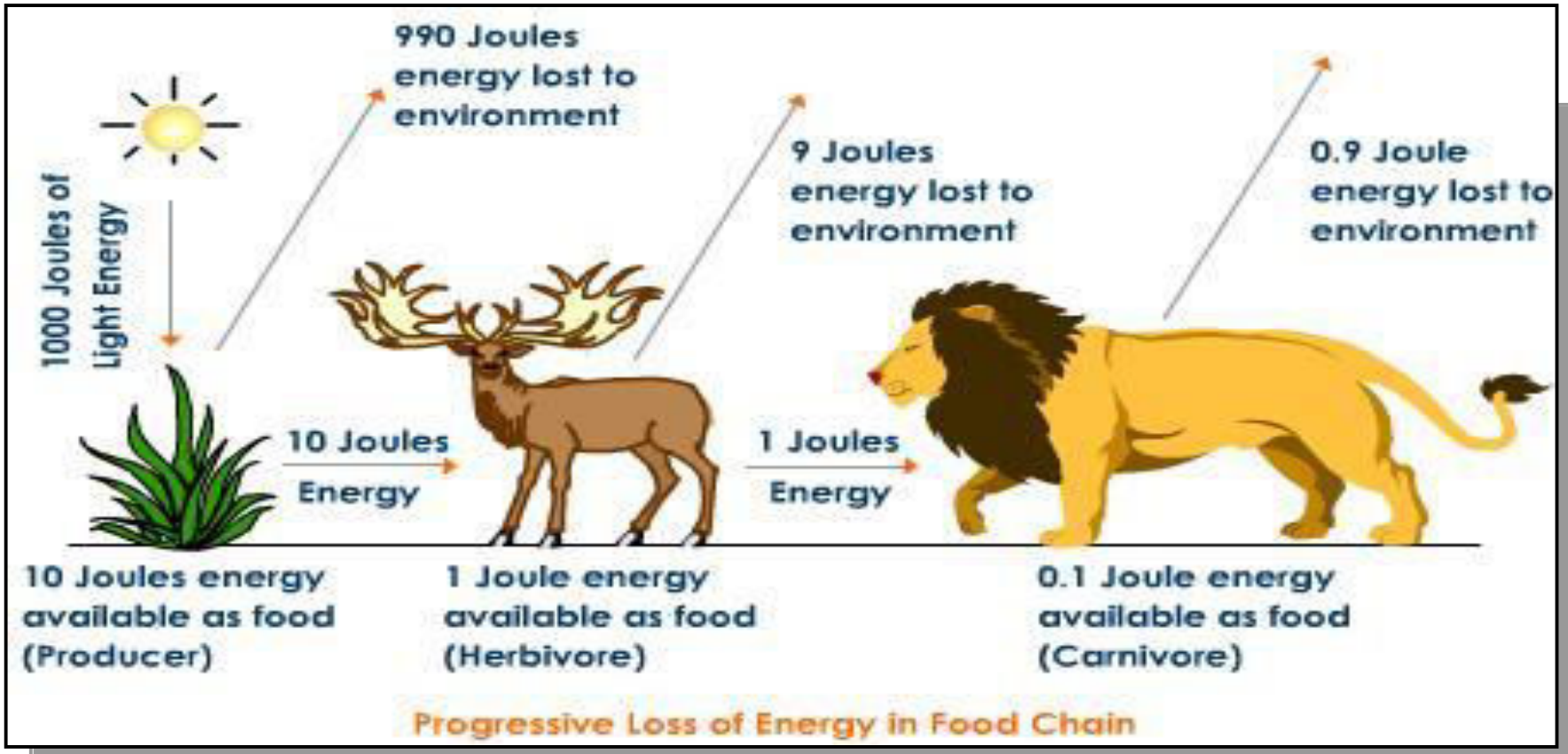
Isaac Newton (1643-1727)

Second Law of Thermodynamics

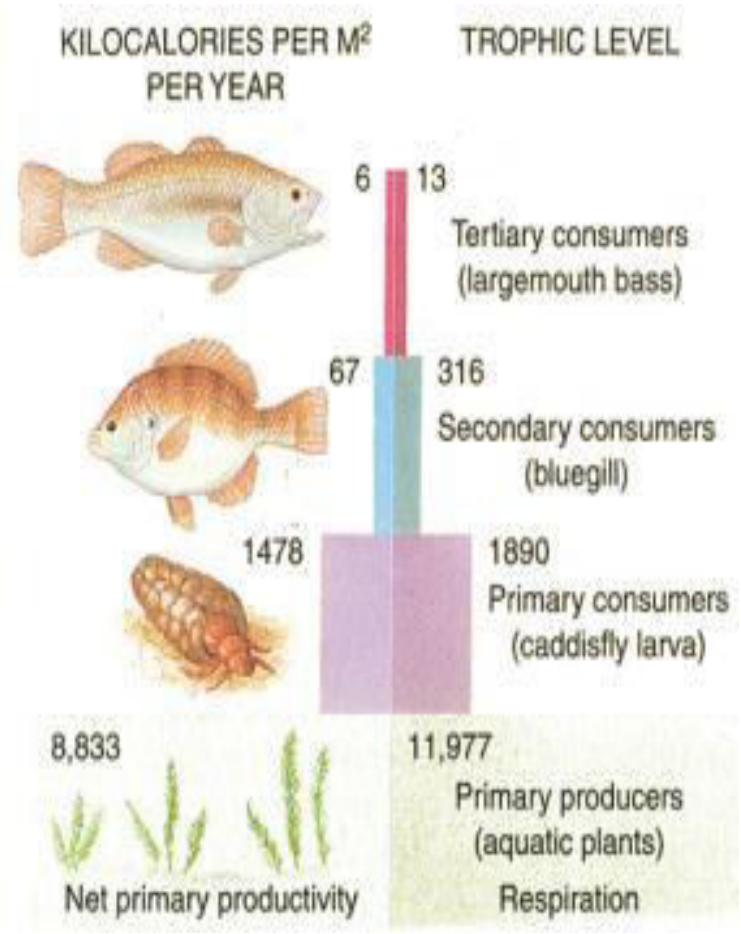
- - Scientists have studied many ecosystems and have concluded that this energy loss is a constant pattern. In fact, scientists have calculated that the percentage (%) of usable energy transferred from one organism to another is 10%.
- !! - That means that 90% of energy is lost as heat!!!
- So…. if producers captured 10,000 calories from the sun, then only bout 1,000 calories will be available to support primary consumers (herbivores), and only about 100 calories to support secondary consumers (carnivores or omnivores).

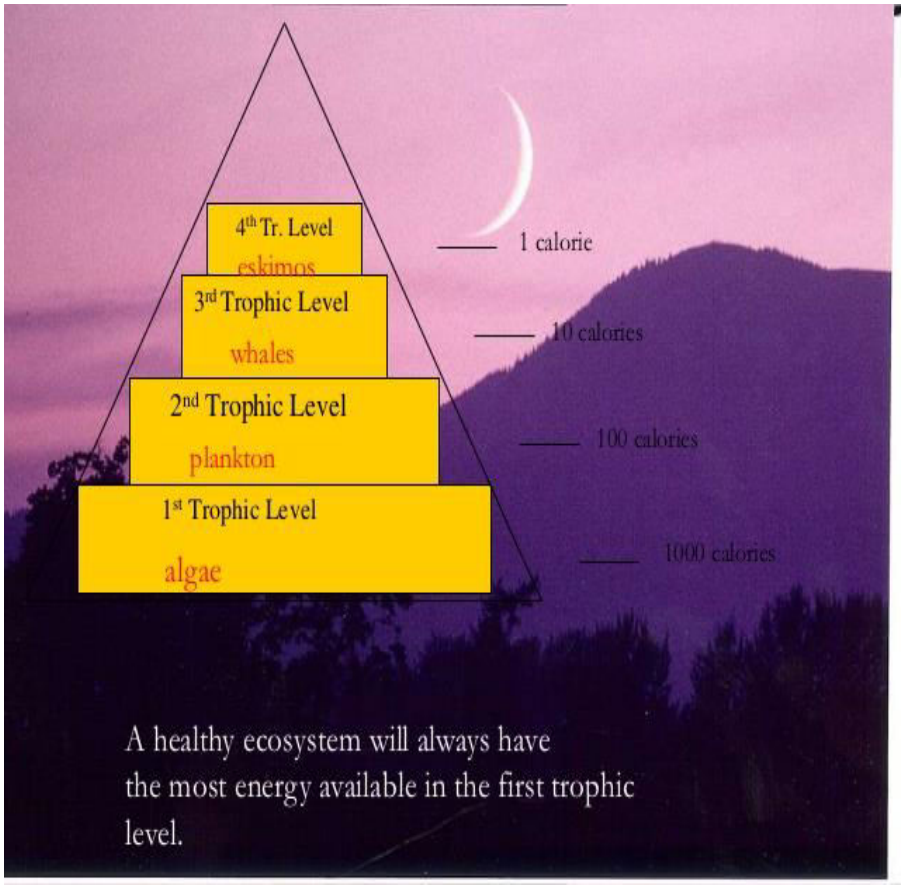


Loss of energy – respiration/locomotion



Pyramid of Energy





Always it is in upright position.

Cannot do with matter and energy

- **Law of conservation**: no atoms are created or destroyed. *We cannot change matter, can change only physical state – one form to another*
- **First law of TD**: we cannot get more energy from what we have put in.
- **Second law of TD**: we end in low amount of energy than we start with.

Thank You

PROCESS OF ECOLOGICAL SUCCESSION

BY

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VIT UNIVERSITY

VELLORE- 632014

An overlook

Hult (1885) – He was the first to term succession for the orderly changes in communities.

Clements (1916) while studying plant communities defined succession as the natural process by which the same locality becomes successively colonised by different groups or communities of plants.

Odum (1971) preferred to call this orderly process as ecosystem development rather than the more often known ecological succession.

Definition

Ecological succession is defined as an orderly process of changes in the community structure and function with time mediated through modifications in the physical environment and ultimately culminating in a stabilized ecosystem known as climax. The whole sequence of communities which are transitory are known as *Seral stages* or *seres* whereas the community establishing first of all in the area is called a *pioneer* community.

Types of Ecological Succession

Primary succession

The process of Creating life in an area where no life previously existed.

The soil layer thickens, and grasses, wildflowers, and other plants begin to take over

Secondary Succession

The process of re- stabilization that follows a disturbance in an area where life has formed an ecosystem.

Ecological Succession of Coral Reefs

Small coral polyps colonize the rocks.

These polyps grow and divide to form coral colonies.

The shape of the coral reefs attracts small fish and crustaceans that are food for the larger fish. Thus, a fully functional coral reef exists.

Examples of Succession

Primary

Secondary

Pioneer Species

Lichens break down rock to form soil.

Low, growing moss plants trap moisture and prevent soil erosion

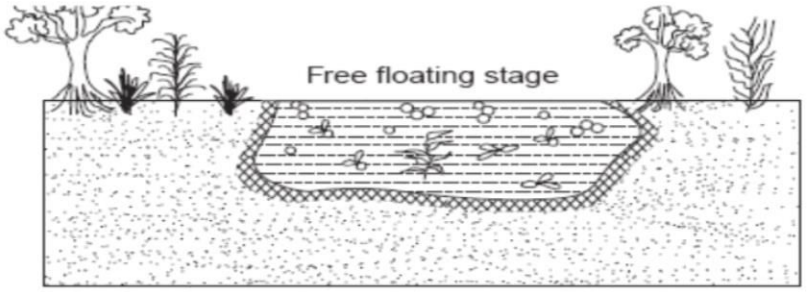
Types of Seres

Hydrosere	Succession in Aquatic habitat.
Xerosere	Succession in Dry habitat.
Lithosere	Succession in Bare rock surface
Psammosere	Succession initiating on Sandy Areas.
Halosere	Succession starting in saline soil.
Eosere	Development of Vegetation in an era.

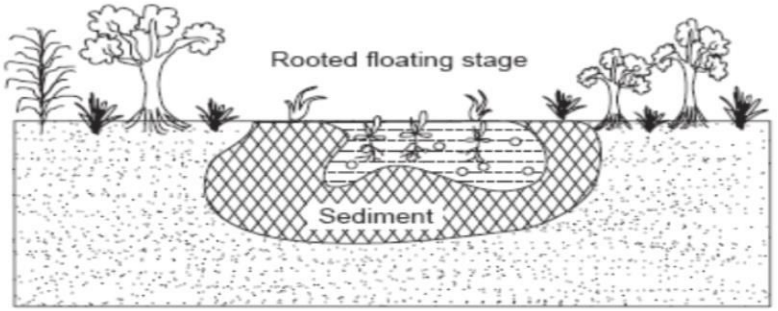
Xerosere (lithosere)

bare rock→lichens→mosses→grasses→shrubs→trees

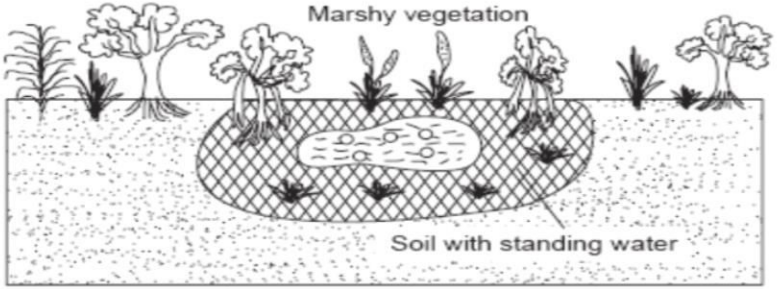
Hydrosere



(*a*) Open water body (lake), sediment brought in by river.



(*b*) Sediment accumulation continues, organic debris from plants too add to soil formation and shrinking of water body occurs.



(*c*) A mat of vegetation covers the water which is mostly a marshy habitat now, with a small part as aquatic system.

Five process

Nudation

Invasion

Competition & Coaction

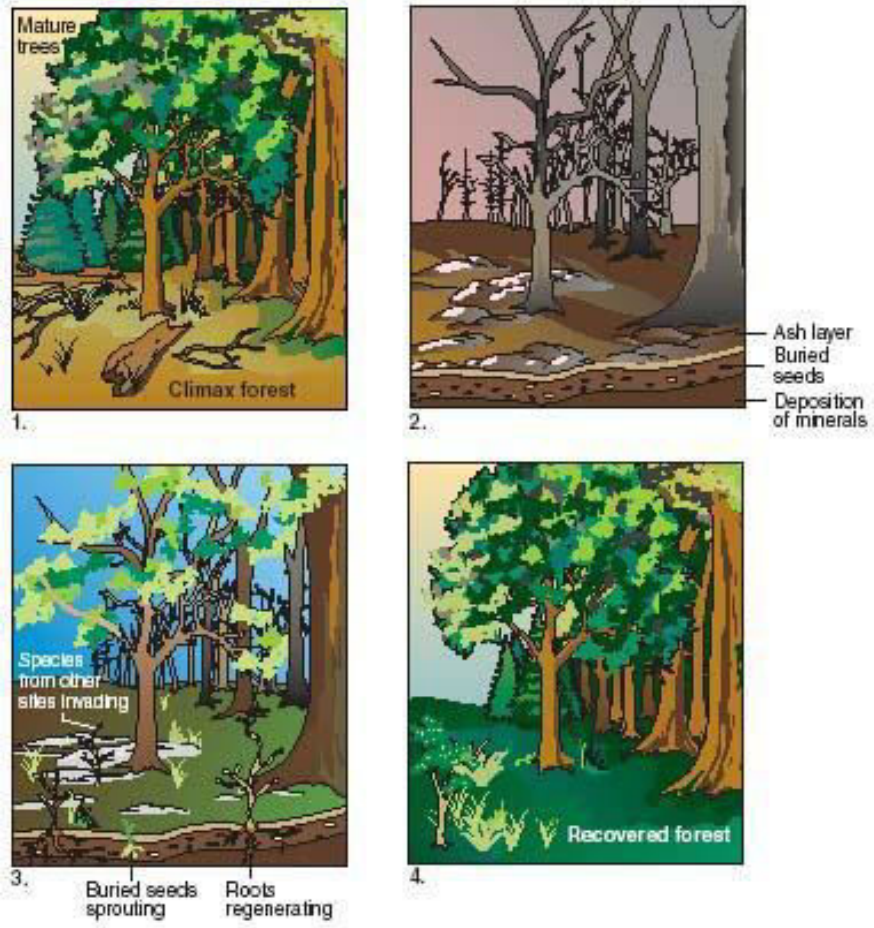
Reaction

stabilization

Nudation

Development of bare area without life forms.

Bare area due to land slides, volcanic, overgrazing etc…



Invasion

Successful establishment of one or more species on a bare area.

Ie. Dispersal of seeds, spores etc.

As they grow, the species increase the numbers and form the groups.

Competition & Coaction

The no. of individuals grows there : **competition, both intra** and inter-specific, nutrition etc.

They influence each other in a no. of ways: coaction

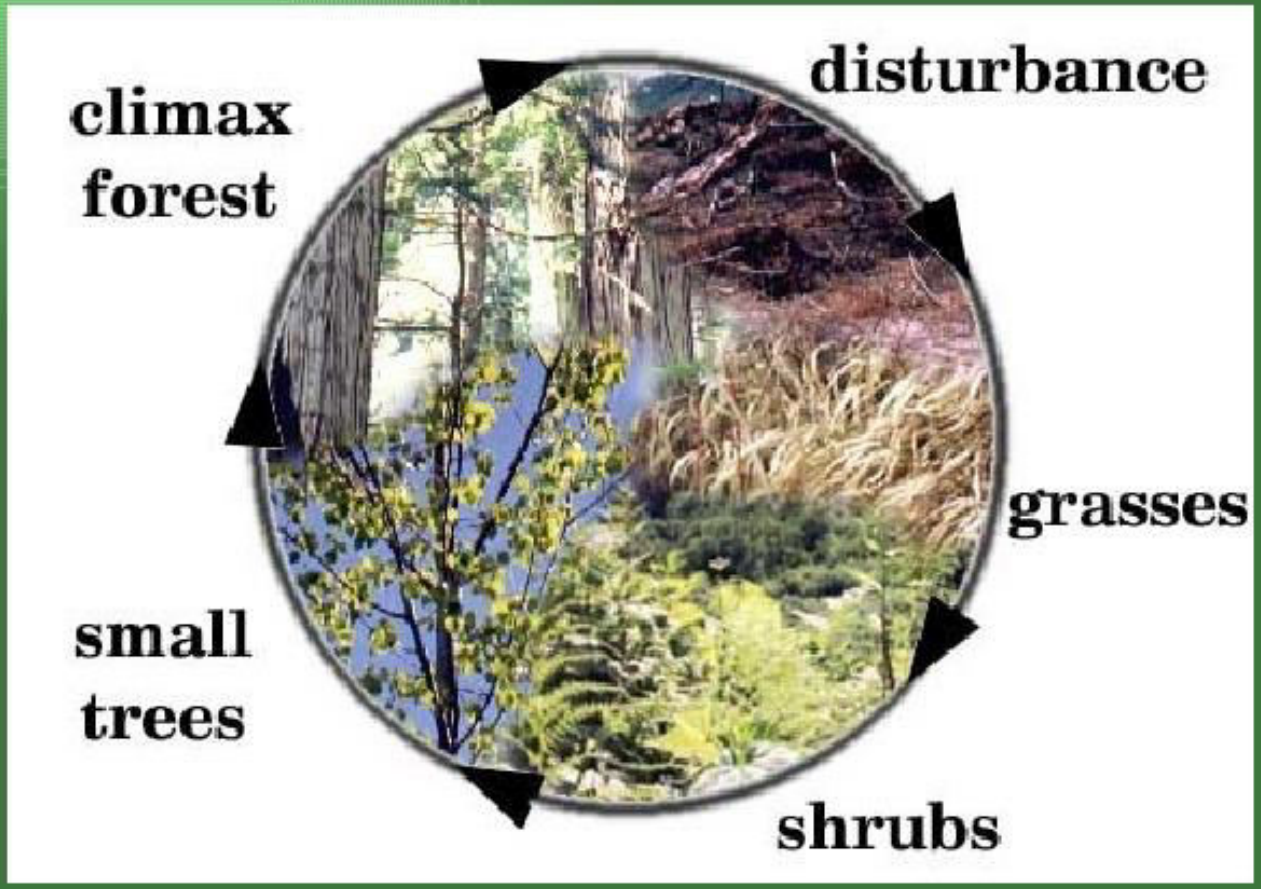
Reaction

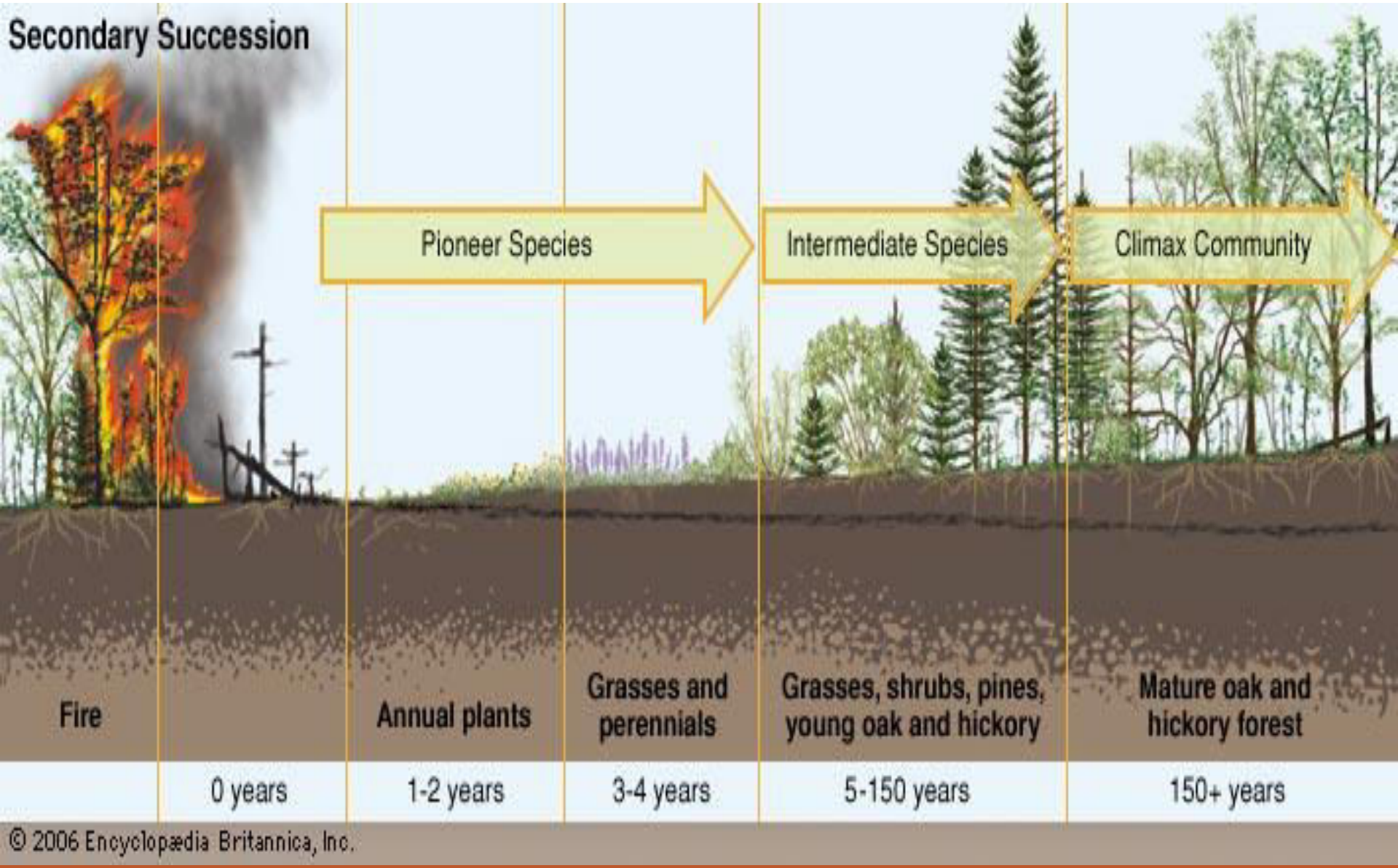
The living organism grow, use water, nutrients from the substratum, in-turn they are influenced by the environment, this is known as **reaction.**

Stabilization

Ultimate culminates in more or less stable community called **climax.**

The Circle of Life in Secondary Succession




Secondary Succession
Pioneer Species
Intermediate Species
Climax Community
Fire
Annual plants
Grasses and perennials
Grasses, shrubs, pines, young oak and hickory
Mature oak and hickory forest
0 years
1-2 years
3-4 years
5-150 years
150+ years
© 2006 Encyclopædia Britannica, Inc.

Threats to ecological succession

The grasses that move in as pioneer species – weeds

Subsequent growth of shrubs – change as brush

Without intermediate stages, the habitat cant return to a natural forest

Stability of community depends various factors.

Ecological Succession Never Ends …….

Thank You

VIT UNIVERSITY
(Estd. u/s 3 of UGC Act 1956)

Nutrient Cycle and its Effects on Ecosystem

By

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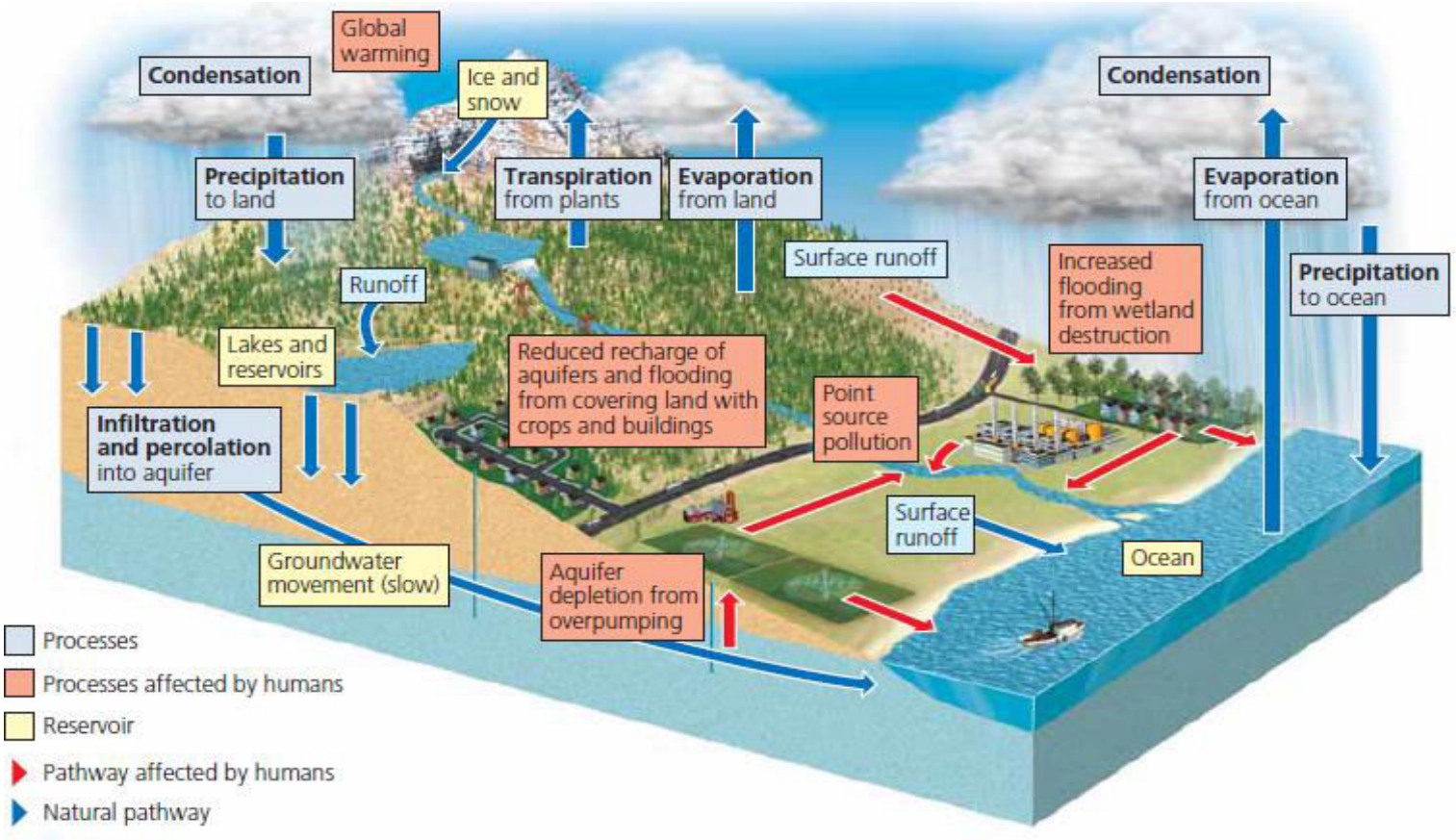
Vellore- 632014

Nutrients Cycle within Ecosystem

- The elements and compounds that make up nutrients move continually through air, water, soil, rock and living organism in cycles called **biogeochemical cycles or nutrient cycles**.
- These cycles are driven directly or indirectly by solar energy and gravity, includes **water, carbon, nitrogen and phosphorus cycles.**
- **Temporary storage sites such as atmosphere, oceans, water and underground deposits are called as reservoirs.**

Water cycle

- Water cycle collects, purifies, and distributes the earth's fixed supply of water.



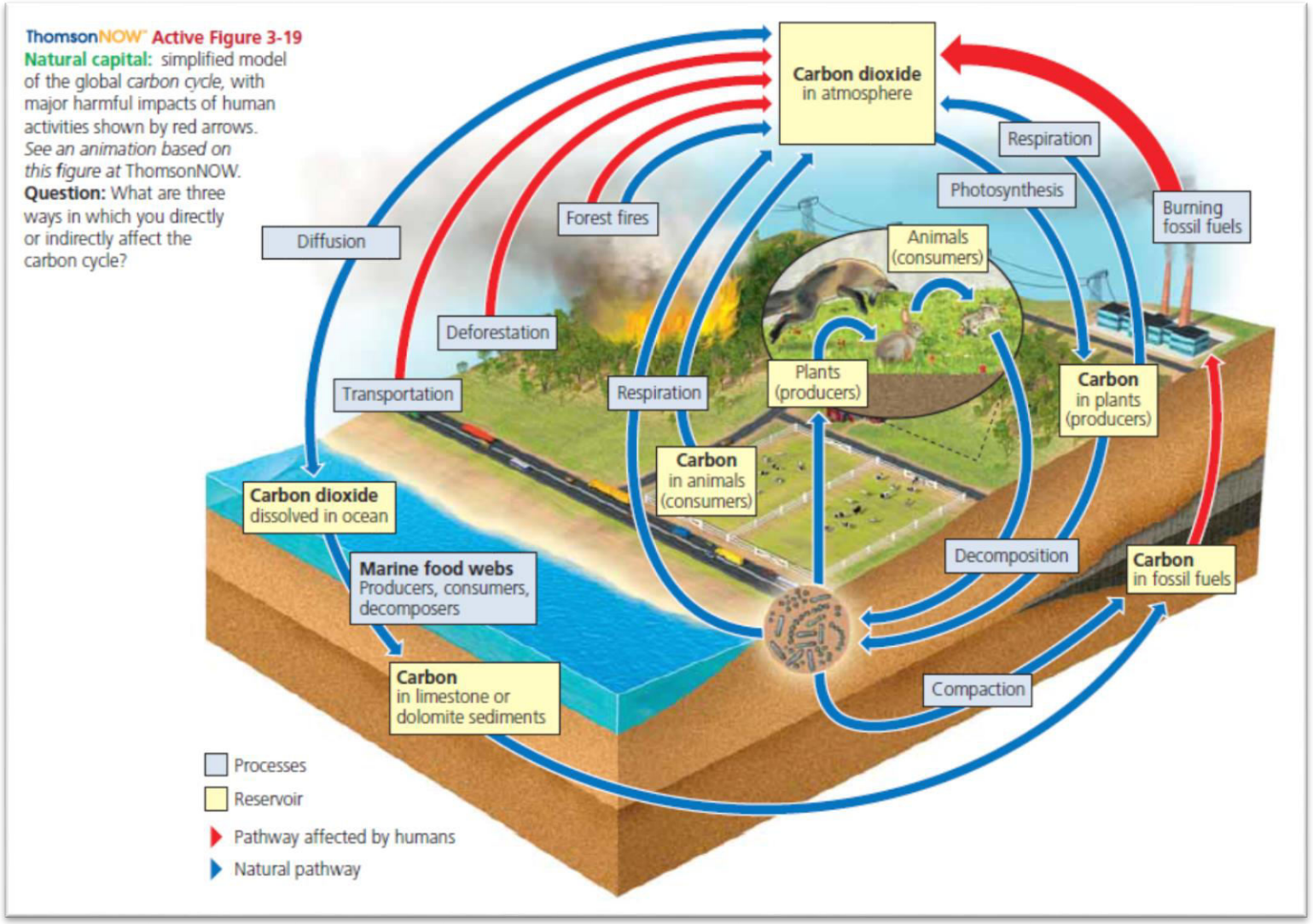
Transpiration, Precipitation, Evaporation

- About 84 % water vapor in atmosphere comes from the ocean and rest from land.
- 90 % of water reaches the atmosphere evaporates from the surface of plants through a process called transpiration.
- Aquifers: water returning to earth's surface as precipitation by various paths. Some precipitation sinks through soil and permeable rock formations to underground layers of rock, sand and gravel called aquifers- stored as ground water.
- Some combines with CO_2 during photosynthesis and produce high energy organic compounds-carbohydrates.
- In terrestrial ecosystems: most of precipitation becomes as surface runoff.

Fresh water

- **0.024 %** of earth's vast water supply is available as freshwater in accessible to groundwater deposits, lakes, rives, and streams. Rest are salty, stored as ice.
- The water cycle by withdrawing large amounts of fresh water, clearing of agriculture land, soil erosion, pollution, ground water pollution and leads to climate change.

Carbon Cycle



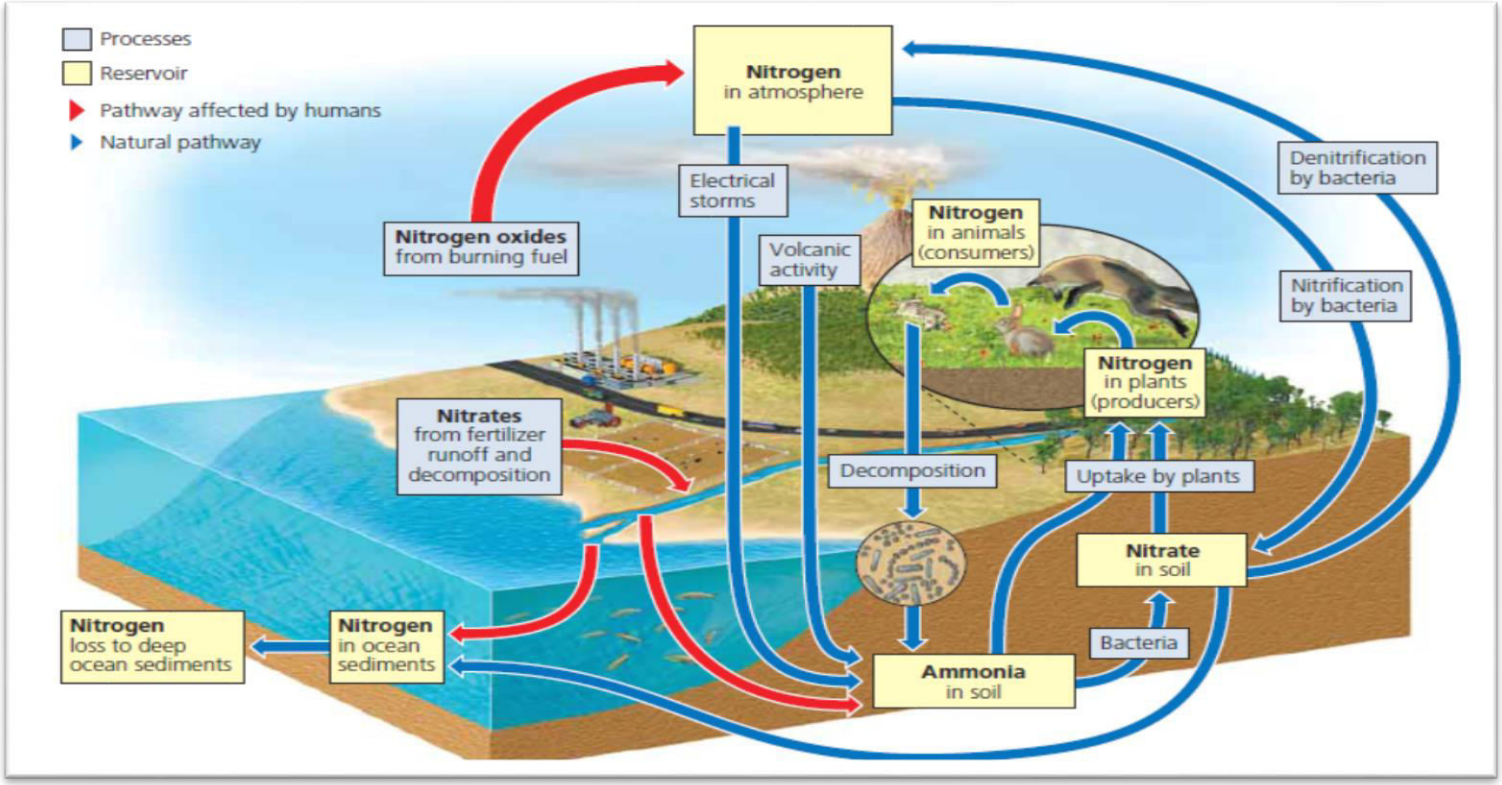
Carbon Cycles- Biosphere

- Carbon- building block of carbohydrates, fat, protein, DNA, and other organic compounds- shown in fig.
- Carbon dioxide – which make up 0.038% of volume of the atmosphere and dissolved in water.
- Key component of nature's thermostat.
- If carbon- removes CO_2 from atmosphere, the atmosphere is cool.
- If it generates CO_2 the atmosphere will get warmer. – change in climate happens.
- Terrestrial producers remove CO_2 from the atmosphere and aquatic removes in water. (CO_2 to glucose sugar unit)
- Aerobic respiration : carried by producers, consumers and decomposers.

- Some carbon atoms take long term to recycle. Eg: fossil fuels- coal, oil and natural gas.
- This carbon is not released in atmosphere as CO_2 for recycling until these fuels are extracted and burned.
- Measures to alter CO_2 : afforestation, grasslands maintenance, - global warming is decreased and decrease in sea level.

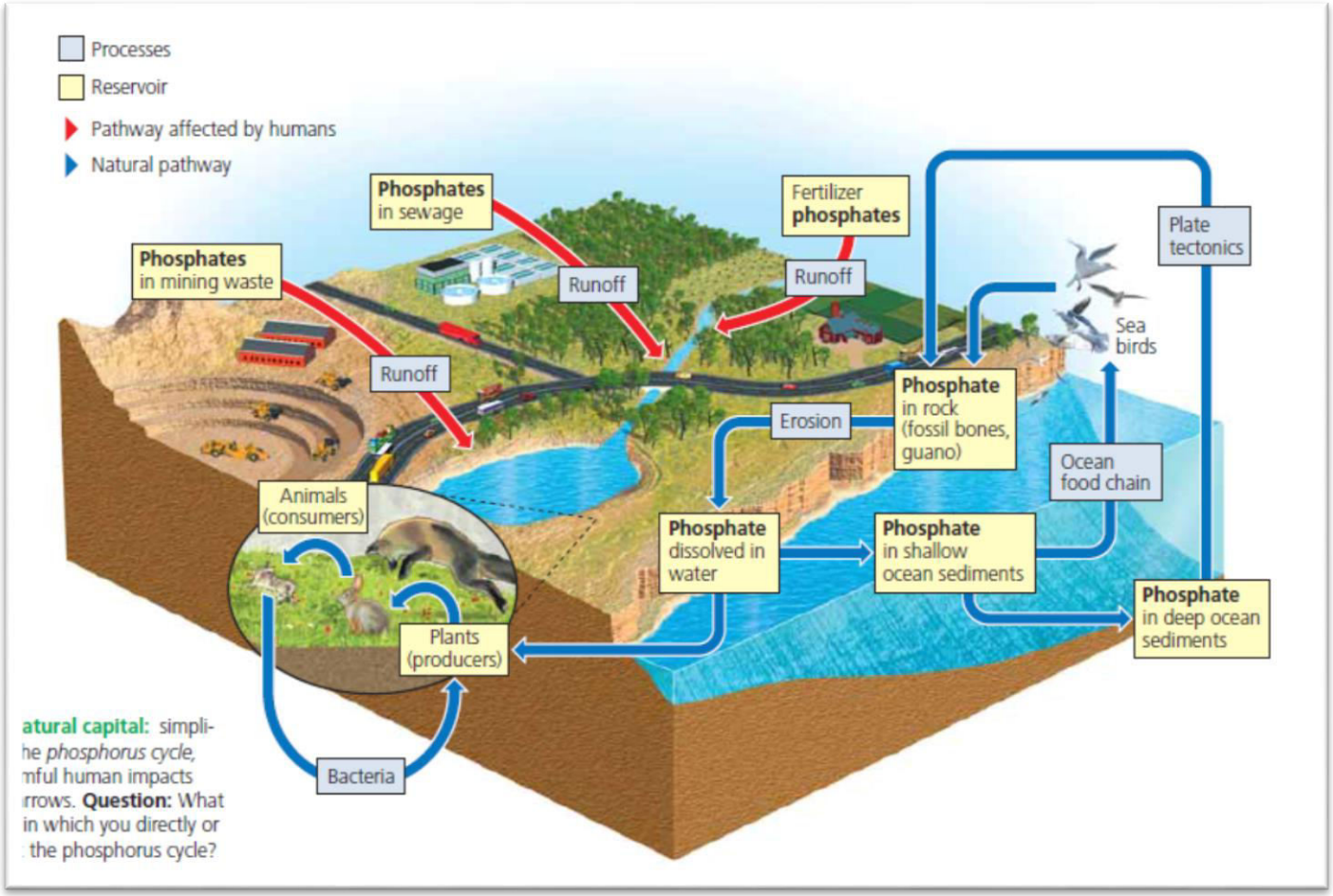
Nitrogen cycle

- The major reservoir for nitrogen is the atmosphere.
- Unreactive N_2 gas makes up 78% of atm. Volume.
- Component of proteins, DNA, vitamins, etc.
- It cannot be absorbed. Can be used directly as nutrient by multicellular plants or animals.



- Two natural process convert or fix nitrogen into compounds useful as nutrients for plants and animals.
  - One is electrical discharge, - in atmosphere.
  - Other is nitrogen fixing bacteria –nitrogen cycle.
- nitrogen fixation: special bacteria in soil and blue green algae in aquatic environment combine Nitrogen with hydrogen to take ammonia.
- Bacteria takes up nitrogen to produce nutrients and excrete in soil or water.
- Some ammonia is converted to ammonium ions that can be used by plants.

Phosphorus cycle



atural capital: simpli-
he *phosphorus cycle*,
nful human impacts
rrows. **Question:** What
in which you directly or
the phosphorus cycle?

- The major reservoirs for phosphorus is phosphate salts containing phosphate ions in rock/ ocean sediments.
- It is slow compared to other cycle.
- The dissolved phosphate ions are absorbed by roots of plants and other producers.
- Major component vertebrate bones and teeth.
- It is applied as fertilizer.
- This leads to eutrophication- phosphorus rich run-off from land produce high amount of algae, which can upset chemical cycling and other lake ecosystem.

Thank you

Module -2
Biodiversity

BY

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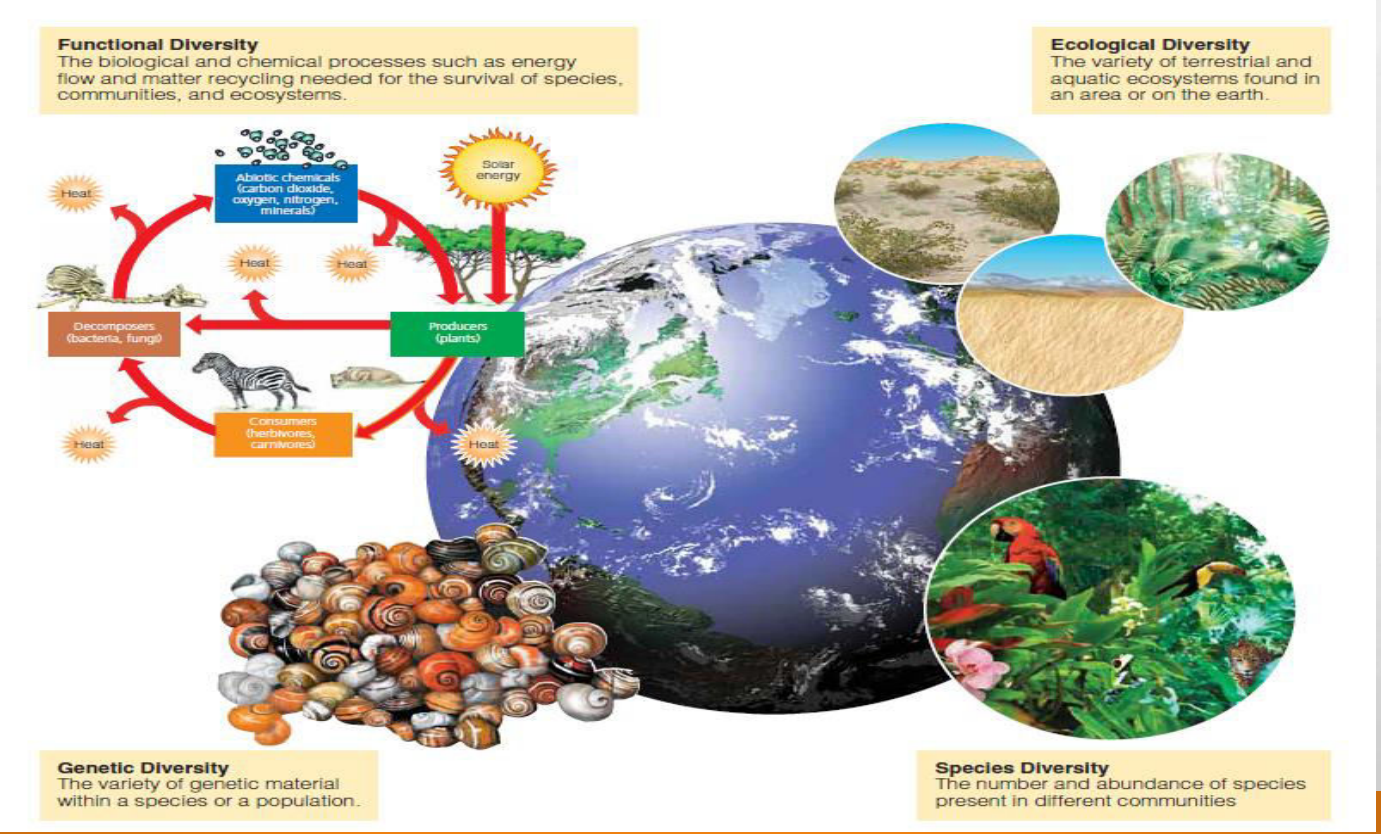
CONTENT

- IMPORTANCE
- TYPES,
- MEGA-BIODIVERSITY
- SPECIES INTERACTION –
  - EXTINCT,
  - ENDEMIC,
  - ENDANGERED AND
  - RARE SPECIES
- HOT-SPOTS
- GM CROPS
- THREATS TO BIODIVERSITY:
- NATURAL AND ANTHROPOGENIC ACTIVITIES
- CONSERVATION: TERRESTRIAL AND AQUATIC BIODIVERSITY.

INTRODUCTION- BIODIVERSITY

- BIODIVERSITY OR BIOLOGICAL DIVERSITY IS THE DIVERSITY OF THE EARTH' S SPECIES, GENES THEY CONTAIN, THE ECOSYSTEM IN WHICH THEY LIVE, AND ECOSYSTEM PROCESSES OF ENERGY FLOW AND NUTRIENT CYCLING THAT SUSTAIN ALL LIFE.



IMPORTANCE OF BIODIVERSITY

- THE EARTH'S BIODIVERSITY IS A VITAL PART OF THE NATURAL CAPITAL THAT HELP TO SURVIVE ALL ECOSYSTEM.
  - FOOD
  - WOOD
  - FIBER
  - ENERGY
  - MEDICINES
  - ECONOMIC WEALTH
  - QUALITY OF WATER
  - AIR
  - FERTILITY OF SOIL
  - DISPOSE OF WASTE
  - CONTROL OF PESTS

TYPES OF BIODIVERSITY

- GENETIC DIVERSITY: PROVIDES A VARIETY OF GENES THAT ENABLE LIFE ON THE EARTH TO ADAPT TO AND SURVIVE DRAMATIC ENVIRONMENTAL CHANGES.
- ECOSYSTEM DIVERSITY: THE EARTH'S VARIETY OF DESERT, GRASSLANDS , FOREST AND MOUNTAINS, OCEANS, LAKES, RIVERS AND WETLANDS IS THE MAJOR COMPONENTS OF BIODIVERSITY.
- FUNCTIONAL DIVERSITY: THE VARIETY OF PROCESSES OF MATTER CYCLING AND ENERGY FLOW WITHIN ECOSYSTEMS AND BIOSPHERE.

INDIA –MEGA BIODIVERSITY

India as a Mega Diversity region

- India is one of 12 mega diversity countries of world.
- It has 47,000 species of plants and 81,000 species of animals.
- Many endemic plants and animals.
- Centre of origin of many flowering and crop plants.
- Great marine diversity due to 7500 km long coastline

Sapria himalayana(parasitic angiosperm)

INDIA- MEGA BIODIVERSITY

- 10TH RANK AMONG PLANT RICHNESS
- 11TH – ENDEMIC SPECIES OF HIGHER VERTEBRATES
- 6TH IN CENTRES OF DIVERSITY AND ORIGIN OF FOOD CROPS
- INDIA IS ONE OF THE 12 MEGA BIODIVERSITY NATION
- 5000 SPECIES ARE THERE OF FLOWERING AND 320 SPECIES OF FOOD PLANTS
- MARINE BIODIVERSITY IS STILL TO BE EXPLORED
- 45,000 PLANT SPECIES- 7% WORLD'S CONTRIBUTION
- 81000 ANIMAL SPECIES- 6.5 % FAUNA

SPECIES INTERACTION - TERMS

- **EXTINCTION: THIS AFFECTS THE NUMBER AND TYPES OF SPECIES ON THE EARTH- ENTIRE SPECIES CEASES TO EXIST.**
- **ENDEMIC SPECIES: SPECIES FOUND IN FEW AREAS ONLY.**
  - **EXIST IN ISLANDS AND TROPICAL RAIN FOREST.**
  - **EG: GOLDEN TOAD – FOUND IN COSTA RICA'S MOUNTAINOUS REGION. IN 1989 IT BECAME EXTINCT.**
  - ***REASON*: WARMER AIR FROM GLOBAL CLIMATE CHANGE CAUSED THE AREA'S MOISTURE BEARING CLOUDS IN CARIBBEAN SEA TO RISE AND DRY OUT THE HABITAT FOR THIS FROG.**

Michael P. Fogden/Bruce Coleman USA

Figure 4-7 Depleted natural capital: male golden toad in Costa Rica's high-altitude Monteverde Cloud Forest Reserve. This species has recently become extinct because changes in climate dried up its habitat.

EXTINCTION

- **BACKGROUND EXTINCTION: SPECIES DISAPPEAR AT A LOW RATE**
  - **BIOLOGIST ESTIMATE THE AVERAGE ANNUAL BACKGROUND EXTINCTION RATE IN ONE TO FIVE SPECIES FOR EACH MILLION SPECIES ON THE EARTH.**
- **MASS EXTINCTION: SIGNIFICANT RISE IN EXTINCTION RATE.**
- **THIS LEADS TO EVOLUTION OF NEW SPECIES.**
- **AS ENVIRONMENTAL CONDITIONS CHANGES, THE BALANCE BETWEEN FORMATION OF NEW SPECIES AND EXTINCTION OF EXISTING ONES DETERMINES THE EARTH'S BIODIVERSITY.**

TYPES OF SPECIES EXTINCTION

- **LOCAL EXTINCTION**: WHEN A SPECIES IS NO LONGER FOUND IN AN AREA. BUT STILL FOUND ELSEWHERE IN THE WORLD.
- **ECOLOGICAL EXTINCTION**: FEW MEMBERS OF A SPECIES ARE LEFT AND IT CAN NO LONGER PLAY ITS ECOLOGICAL ROLES IN COMMUNITIES.
- **BIOLOGICAL EXTINCTION**: SPECIES IS NO LONGER FOUND ANYWHERE ON THE EARTH.

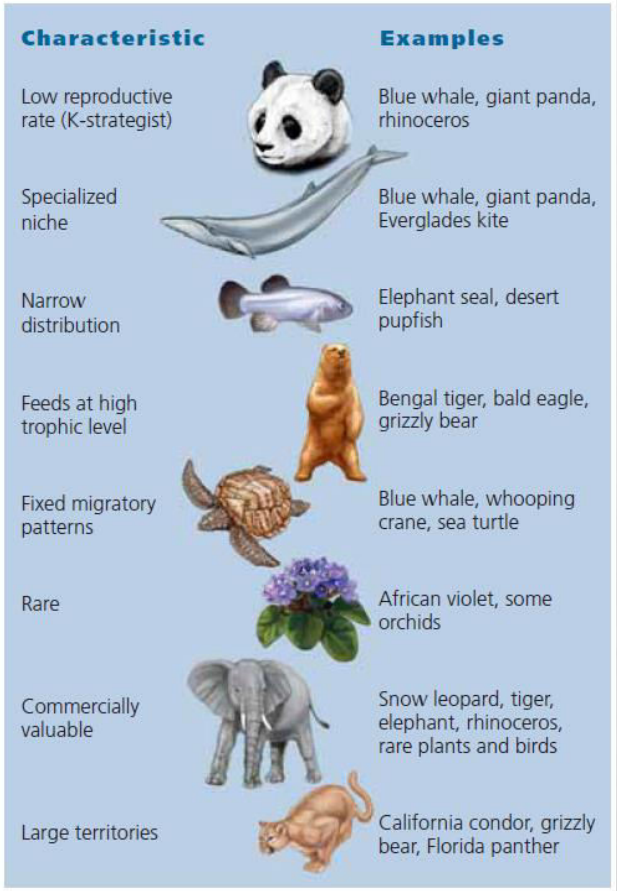


Figure 9-4 Characteristics of species that are prone to ecological and biological extinction.

CAUSE FOR PREMATURE EXTINCTION

- **HIPPCO-**
  - H- HABITAT DESTRUCTION, DEGRADATION AND FRAGMENTATION
  - I- INVASIVE
  - P- POPULATION GROWTH
  - P- POLLUTION
  - C- CLIMATE CHANGE
  - O- OVER EXPLOITAION

HUMAN ACTIVITIES – PREMATURE EXTINCTION OF SPECIES

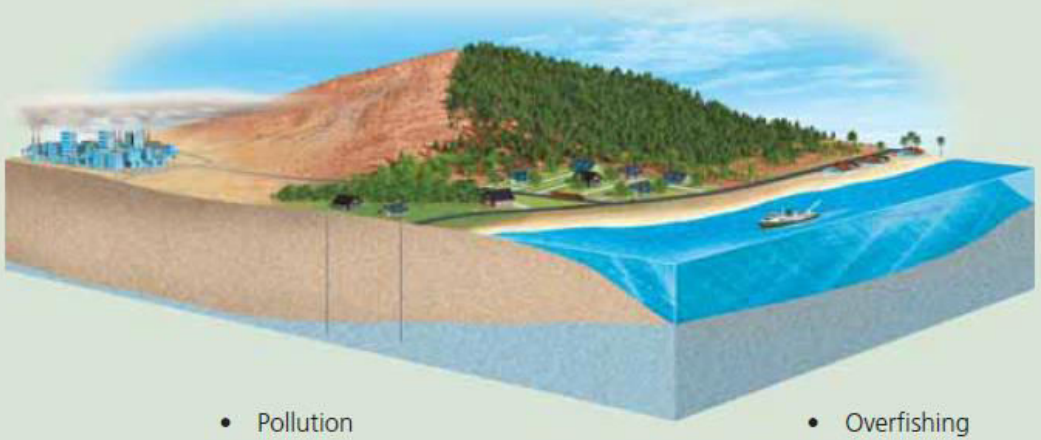
- ACCORDING TO BIOLOGIST: AS POPULATION AND RESOURCES CONSUMPTION INCREASES OVER NEXT 50 YEARS OUR ECOLOGICAL FOOT PRINT WILL EXPAND LIKELY.
- PREMATURE EXTINCTION WILL BE THERE FOR CURRENT SPECIES BY 2050.
- THIS WILL LEAD TO DEGRADE AND DEPLETE THE NATURAL CAPITAL THAT SUPPORTS ALL LIFE.
- IT TOOK MILLION'S OF YEARS FOR MASS EXTINCTION.
- WE ARE DEGRADING THE TROPICAL FOREST, CORAL REEFS AND WETLANDS- CENTERS FOR FUTURE SPECIATION.

CAUSES OF DEPLETION- PREMATURE EXTINCTION

Causes of Depletion and Premature Extinction of Wild Species

Basic Causes

- Population growth
- Rising resource use
- Undervaluing natural capital
- Poverty

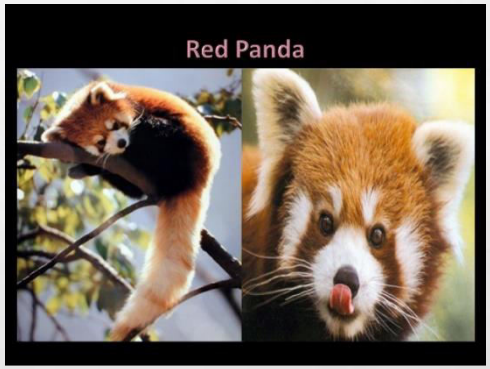


Secondary Causes

- Habitat loss
- Habitat degradation and fragmentation
- Introduction of nonnative species
- Pollution
- Commercial hunting and poaching
- Sale of exotic pets and decorative plants
- Overfishing
- Climate change
- Predator and pest control

ENDANGERED AND THREATENED SPECIES

- EVEN BIOLOGIST CLASSIFY SPECIES INTO TWO EXTINCTION
  - **ENDANGERED SPECIES:** FEW INDIVIDUALS ARE THERE AND THOSE SPECIES COULD BECOME EXTINCT. (NATURAL RANGE)



  - **THREATENED SPECIES:** (KNOWN AS VULNERABLE SPECIES) IS STILL ABUNDANT IN NATURAL RANGE, BUT DECLINE IN NUMBERS AND BECOME ENDANGERED IN NEAR FUTURE.

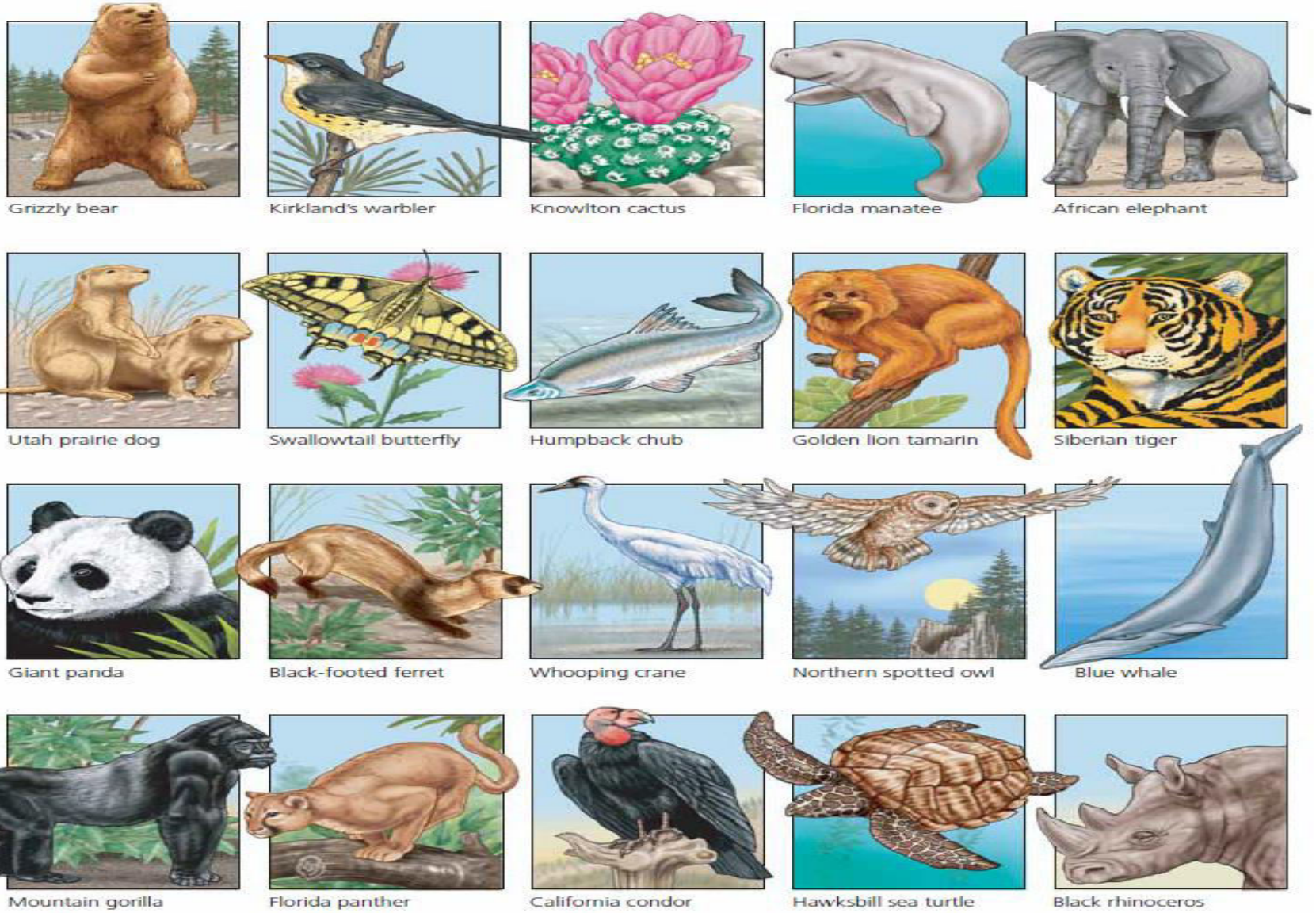


Figure 9-3 Endangered natural capital: species that are endangered or threatened with premature extinction largely because of human activities. Almost 30,000 of the world's species and 1,260 of those in the United States are officially listed as being in danger of becoming extinct. Most biologists believe the actual number of species at risk is much larger.

WAYS THAT SPECIES BECOME ENDANGERED

- HABITAT LOSS
- UNREGULATED OR ILLEGAL POACHING
- PESTICIDES
- POLLUTION
- COMPETITION WITH OTHER SPECIES
- DISEASE
- PREDATORS IN NATURAL

INVASIVE SPECIES- CASE STUDY

- **INTRODUCING THE EXOTIC SPECIES ALSO DISTURB THE ECOSYSTEM.**

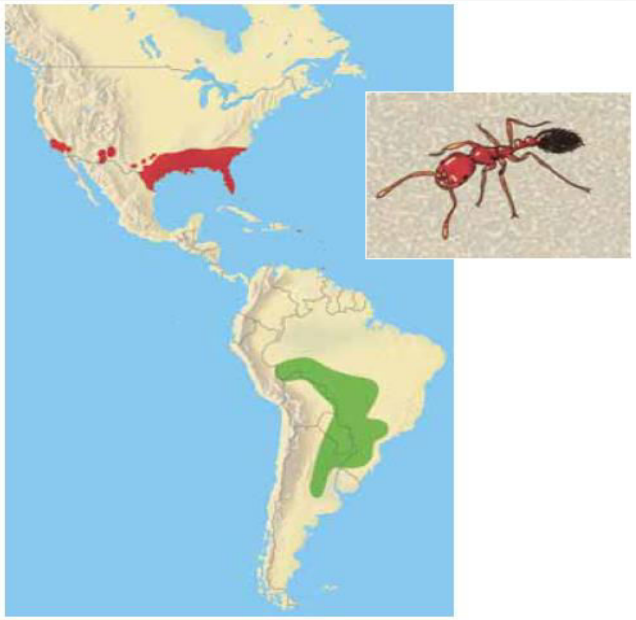


Figure 9-11 *Accidentally introduced invasive species:* the *Argentina fire ant,* introduced accidentally into Mobile, Alabama, in 1932 from South America (green area), has spread over much of the southern United States (red area). This invader is also found in Puerto Rico, New Mexico, and California. **Question:** How might this accidental introduction of fire ants have been prevented? (Data from S.D. Porter, Agricultural Research Service, U.S. Department of Agriculture)

- Aggressive argentina fire ant introduced

Into the United states.

- When these ant invade an area, they

wipe off 90% native species.

- They killed the deer fawns, birds, livestock

Pets, 80 % people was allergic to their venom.

WAYS TO REDUCE THREATS FROM INVASIVE SPECIES

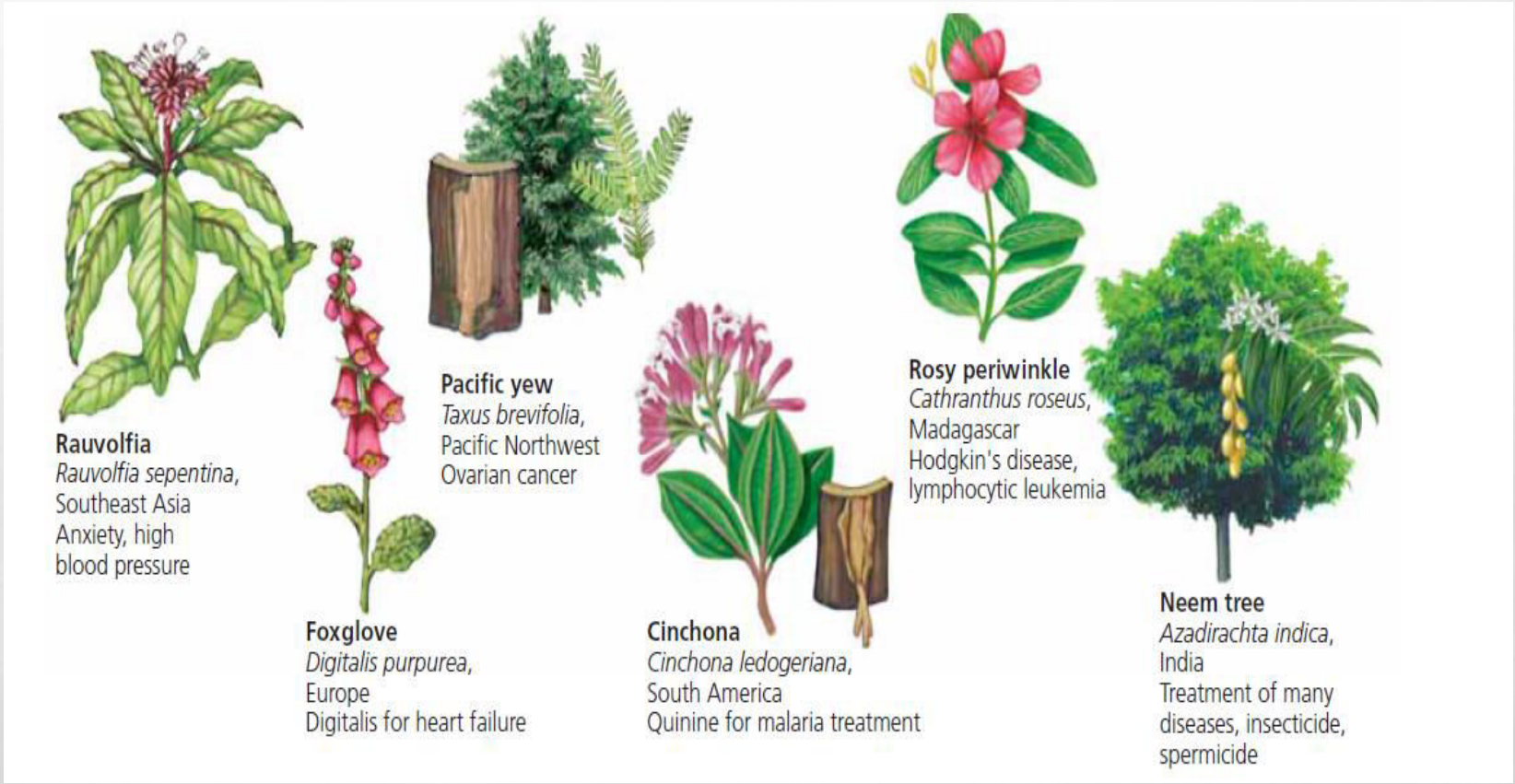
- ONCE AN NON-NATIVE SPECIES IS ESTABLISHED IN AN ECOSYSTEM, ITS REMOVAL IS ALMOST IMPOSSIBLE.
- FUND A MASSIVE RESEARCH PROGRAM TO IDENTIFY THE SPECIES TO BECOME SUCCESSFUL INVADERS.
- INCREASE THE GROUND SURVEYS AND MONITOR THE SPECIES AND FIND HOW THEY WILL SPREAD.
- STEP UP FOR IMPORTED GOODS WHICH LIKELY CONTAIN THE INVADER SPECIES.
- IDENTIFY MAJOR HARMFUL INVADER SPECIES AND PASS INTERNATIONAL LAWS BANNING IN TRANSFER FROM ONE TO THE ANOTHER.
- INCREASE RESEARCH TO FIND NATURAL PREDATORS, BACTERIA, AND VIRUSES TO CONTROL THE POPULATION OF THE INVADER SPECIES.

RARE SPECIES

Protect those species from poaching

- THESE ARE SPECIES WITH SMALL POPULATION SIZE IN THE WORLD, DISTRIBUTED IN LOCALISED OR RESTRICTED AREA.

PREVENTING SPECIES TO EXTINCTION



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(Estd. u/s 3 of UGC Act 1956)

Species Interaction

By

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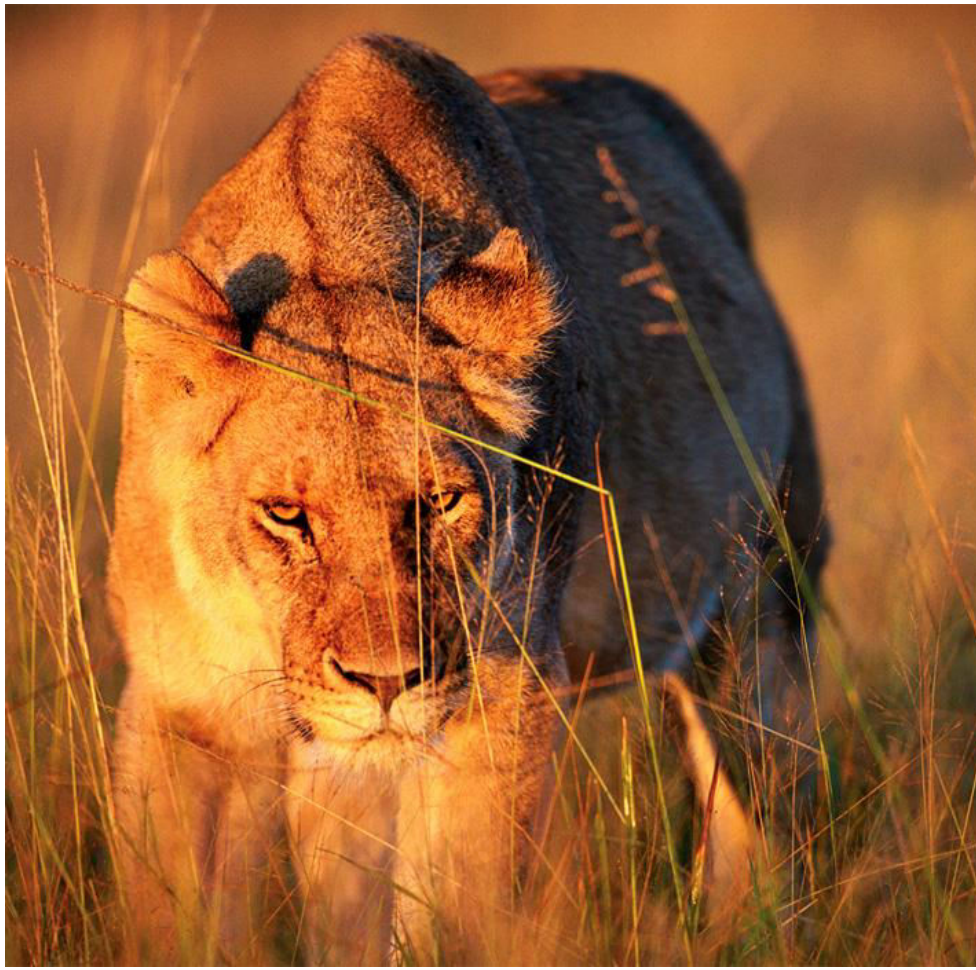
Habitat and Niche

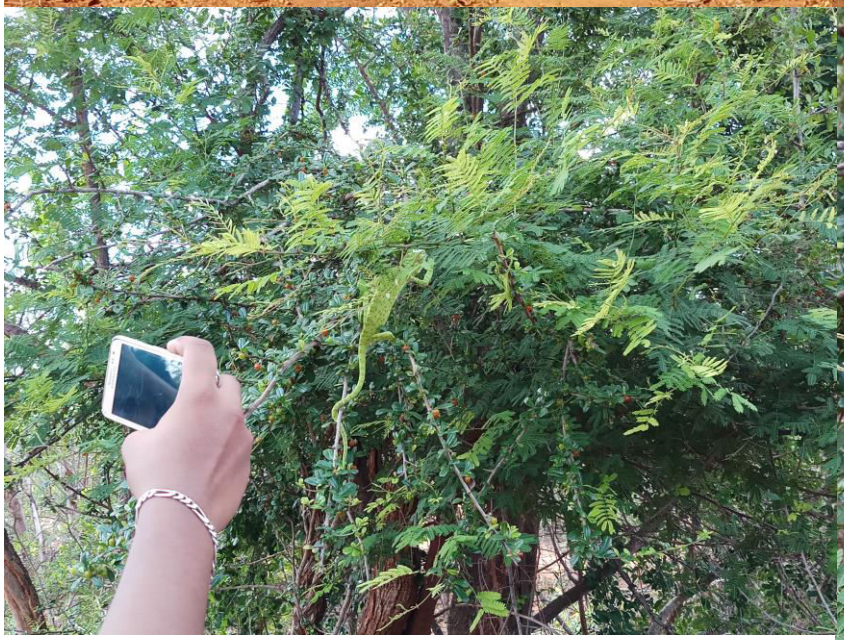
- A habitat is the home of the animals or an organism lives.
- Niche: An organism role in the ecosystem.
- No two species can exact same niche, because they do not exact same thing.
- It gets the food, water, shelter and space to live in

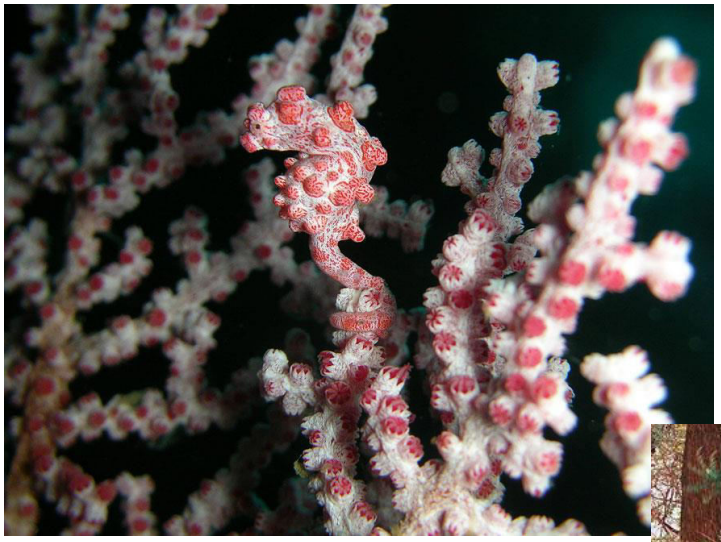


Ecological equivalent: species occupy similar niches and live in different geographical regions.

Camouflage

- Camouflage is protective coloration in which an animal resembles its background.





Species interaction

- Predator/Prey
- Parasitism
- Commensalism
- Mutualism

Prey – predation

- It is any interaction between two organisms in which one organism (predator) and consumes all or part of the other (prey)

Herbivorous prey predation

An herbivore grazing on a plant is another example of predation.

Figure 4: A carnivorous pitcher plant.
A carnivorous pitcher plant that preys upon insects by luring them into the elongated tube where the insects get trapped, die and are then digested.

Predation as Herbivory

Figure 5: Sharp thorns on the branch of a tree, used as anti-herbivory defense.

Symbiosis

- Symbiosis is an intimate relationship between different species in which at least one species depends upon the relationship to survive.

TYPES OF SYMBIOSIS

- Mutualism: Both partners benefit from the relationship (+, +)
- Commensalism: One partner benefits from the relationship; the other partner is not affected (+, 0)
- Parasitism: One partner benefits from the relationship; the other partner is harmed (+, -)

Mutualism

(a) Acacia tree and ants (genus *Pseudomyrmex*)

- Acacia ants live in acacia trees.
- The tree provides big hollow thorns as a home for the ants.
- The tree also provides food for the ants in yellow swellings on the leaves (red oval).

- The ants also clear an area around the tree of competing vegetation.
- Without the ants, the acacia tree cannot compete with other trees.

(b) Area cleared by ants at the base of an acacia tree

Flowers and their Pollinators (examples: Bees and hummingbirds gather nectar and spread pollen)

Examples of Mutualism

- The oxpecker is a bird that has a mutualistic relationship with a rhino or a zebra.
- Ocean: Zooxanthellae are photosynthetic algae that lives inside the corals tissues.

Commensalism

Cattle Egret

- The cattle egrets eat insects that are flushed as the big herbivores move around.
- The herbivores get no benefit or harm from the egrets

Orchids Growing on Branches of Trees

- Orchids belong to a family of flowering plants that form a commensal relationship with the trees.
- It is a well-known epiphytic plant that grows on the branches or trunks of other trees.
- Orchids are usually found in dense tropical forests. They form their base of attachment on the branches of trees,
- and benefit by getting adequate sunlight and nutrition that flows down the branches.
- The orchids do not grow to a large size, and thus the host tree is not harmed in any way.

piphytic bromeliads that grow on the limbs of large tropical rainforest trees.
liads benefit by occupying space on the limb receiving rain and sunlight, but do not harm the tree.

Parasitism

- An organism that lives at the expense of another (host), which it does not usually kill." *Usually smaller than host.*

Ticks

Fleas

Tomato Hornworm with Wasp Eggs

Tape worm

Mosquito on humans

Thank You

BIODIVERSITY HOTSPOTS

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Introduction

- To protect the earth's biodiversity, conservation biologist have identified the emergency action plans and protect the biodiversity hotspots. – Norman Myers.
- 34 global terrestrial hotspots are there, which covers 2% of the earth's land surface.
- 50 % -world's flowering plants, 42 % of vertebrates (Mammals, birds, reptiles, amphibians)
- Acc. ***To International Union of Conservation of Nature (IUCN)***, large majority of world's endangered or critically endangered species, -92% of earth's amphibians, 86% of birds, 72% of mammals.

World's 35 Biodiversity Hotspots

I. Africa

1. **Cape Floristic Region**
2. **Coastal Forests of Eastern Africa**
3. **Eastern Afromontane**
4. **Guinean Forests of West Africa**
5. **Horn of Africa**
6. **Madagascar and the Indian Ocean Islands**
7. **Maputaland-Pondoland-Albany**
8. **Succulent Karoo**

II. Asia-Pacific

9. **East Melanesian Islands**
10. **Himalaya**
11. **Indo-Burma**
12. **Japan**
13. **Mountains of Southwest China**
14. **New Caledonia**
15. **New Zealand**
16. **Philippines**
17. Polynesia-Micronesia
18. Southwest Australia
19. Forests of Eastern Australia (new)
20. Sundaland
21. Wallacea
22. Western Ghats and Sri Lanka

III. Europe and Central Asia

23. **Caucasus**
24. **Irano-Anatolian**
25. **Mediterranean Basin**
26. **Mountains of Central Asia**

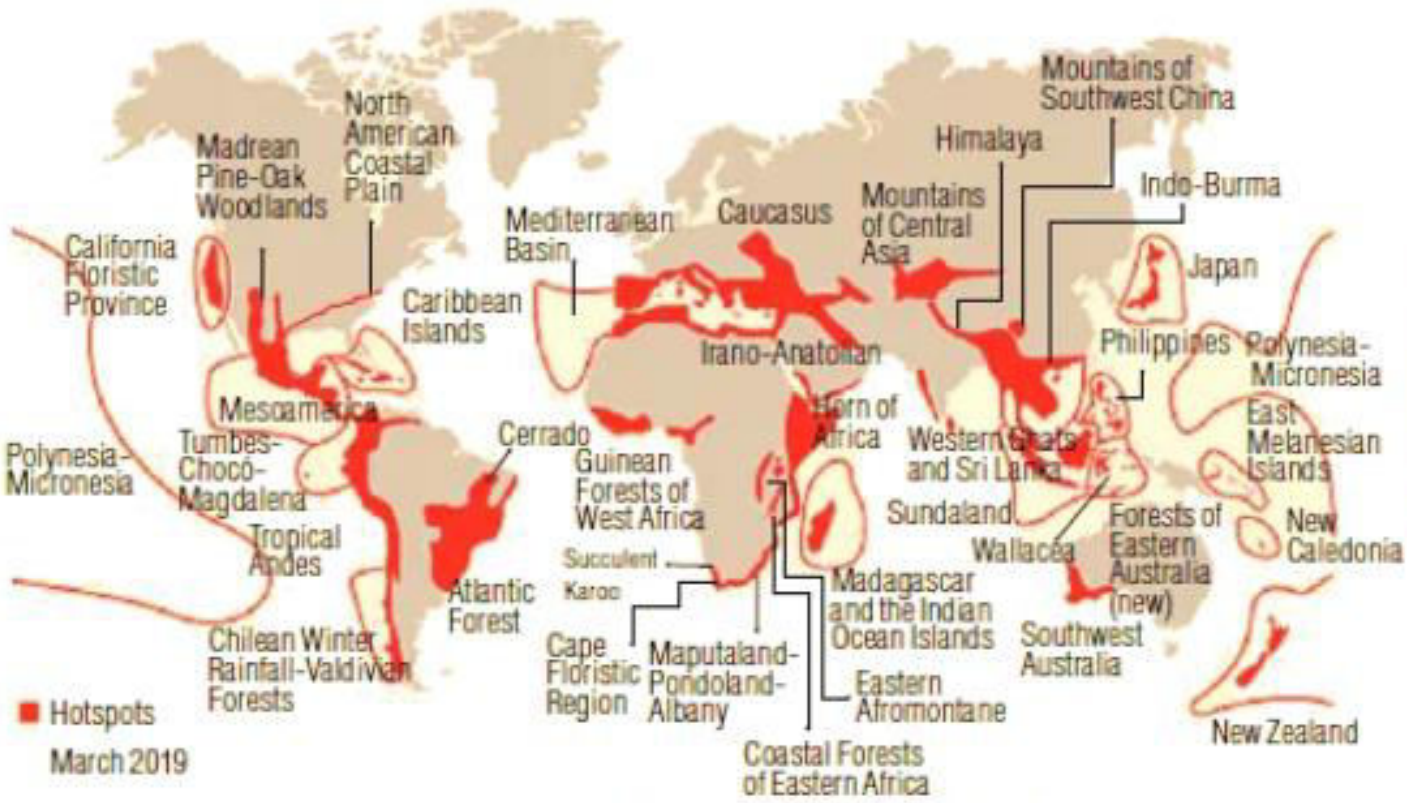
IV. North and Central America

27. **California Floristic Province**
28. **Caribbean Islands**
29. Madrean Pine-Oak Woodlands
30. **Mesoamerica**

V. South America

31. **Atlantic Forest**
32. **Cerrado**
33. **Chilean Winter Rainfall-Valdivian Forests**
34. Tumbes-Chocó-Magdalena
35. **Tropical Andes**

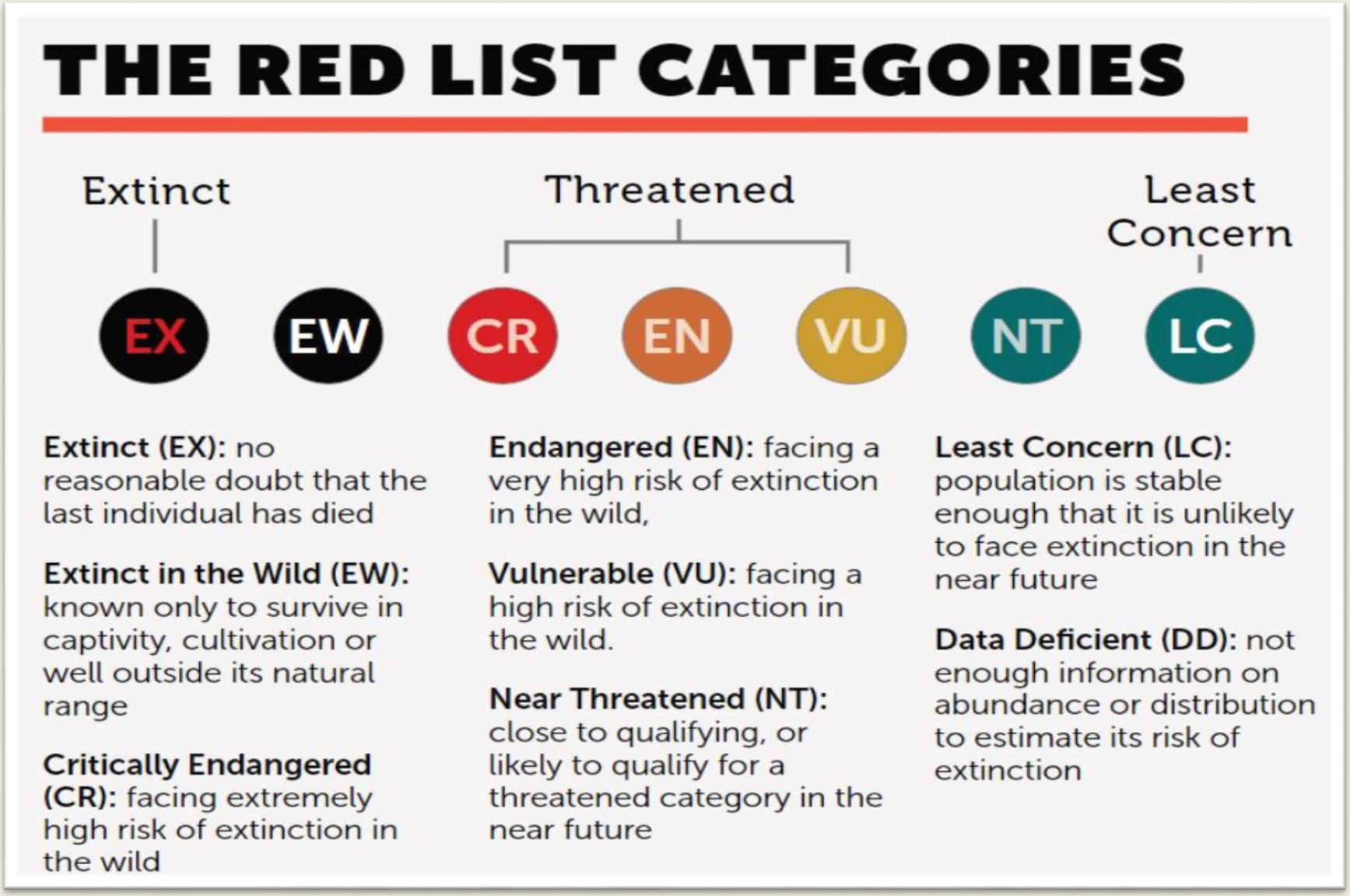
36 Biodiversity Hotspots - Globe



Biodiversity Hotspots around the World

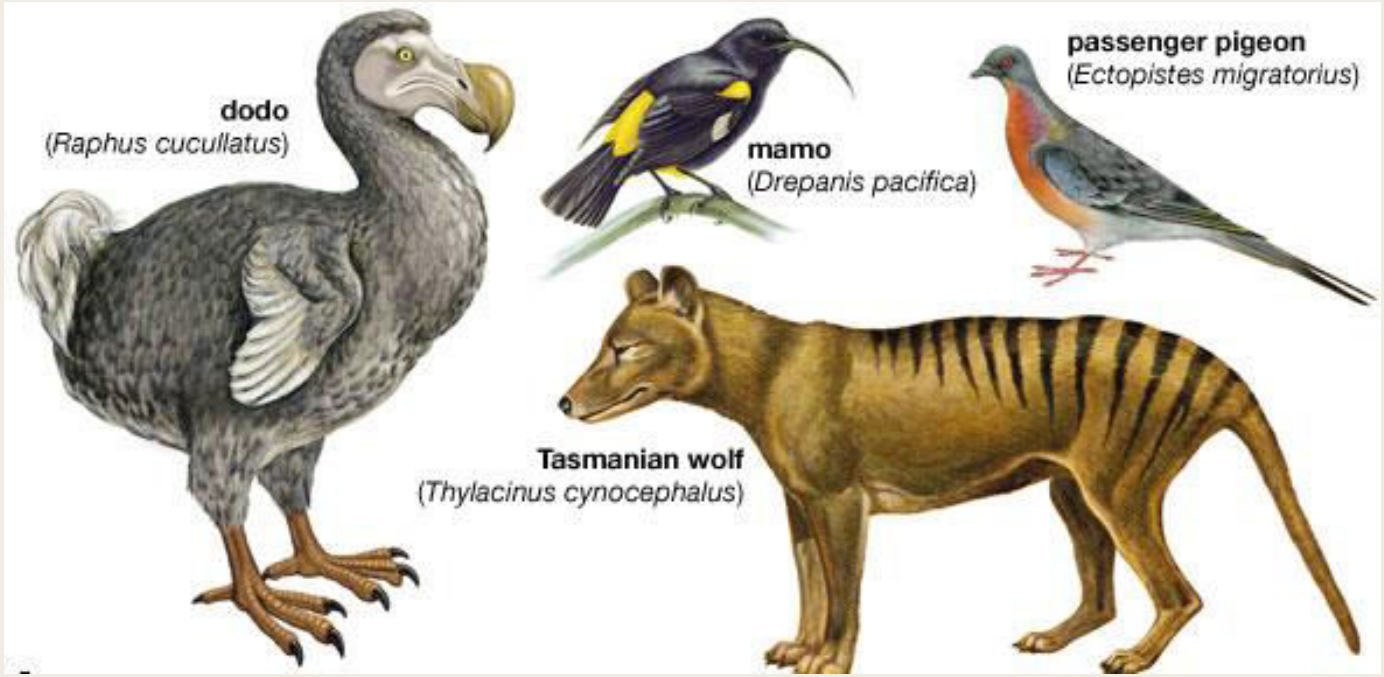
Biodiversity Hotspots around the World

Since 1964, IUCN -established a “Red List”



Extinct Species

- Extinct Species: Species that are no longer known to exist in the wild.
- https://www.indiatoday.in/education-today/gk-current-affairs/story/world-wildlife-day-2020-here-are-7-significant-wildlife-species-that-went-extinct-in-2019-1652013-2020-03-03



Endangered Species

- Endangered: Species is found less in number and verge to be extinct. Eg. Asian elephant, *Elephas maximus* (endangered).

  Early in the 20th century, perhaps 100,000 elephants roamed across Asia. Since then, their population likely has been cut in half. They're killed not just for their ivory tusks but also for their meat and hides—and sometimes in retaliation for the damage they do to crops.

Vulnerable Species

- A vulnerable species is a species which has been categorized by the International Union for Conservation of Nature as likely to become endangered unless the circumstances that are threatening its survival and reproduction improve.
- The Black spider Monkey, Dudong

Endemic Species

The Nilgiri tahr (*Nilgiritragus hylocrius*) is an ungulate that is endemic to the Nilgiri Hills and the southern portion of the Western & Eastern Ghats in the states of Tamil Nadu and Kerala in Southern India. It is the state animal of Tamil Nadu.

The **Nilgiri laughing thrush** (*Montecincla cachinnans)* is a species of **laughing thrush** endemic to the high elevation areas of the **Nilgiris** and adjoining hill ranges in Peninsular India.

Endemism or Endemic species of India

- Species, which are confined to a particular area, are called endemic species.
- Our country has a rich endemic flora and fauna.
- About 33% of the flowering plants, 62% of amphibians, 50% lizards.

Endemic species of plants in India

Group	No. of species
Pteridophyta	200
Angiosperms	4950

Endemic species of animals in India

Group	No. of species
Freshwater	64
Marine	14
Amphibia	123
Reptilia	182
Mammalia	44

Hot-Spots of Biodiversity

Definition: The hot spots are the geographic areas, which possess the high endemic species.

Criteria for recognizing hot spots

1. Richness of the endemic species is the primary criterion for recognizing hot spots.
2. Hot spots should have a significant percentage of specialized species.
3. Site is under threat.
4. Should contain gene pools of potentially useful plants.

Reason for rich biodiversity in the tropics

1. Tropics have a more stable climate.
2. Warm temperatures and high humidity provide favorable conditions.
3. No single species domination, thus giving an opportunity for many species to coexist.
4. Among plants, rate of out-crossing appear to be higher in tropics.

Area of hot spot

- The term hot spot was introduced by Myers (1988).
- There are 25 such hot spots of biodiversity on a global level out of which two are present in India, namely the Eastern Himalayas and Western Ghats.
- These hot spots covering less than 2% of the world's land area are found to have about 50% of the terrestrial biodiversity.
- According to Myers et al (2000) an area is designated as a hotspot when it contains at least 0.5% of the plant species as endemics.
- About 40% of terrestrial plants and 25% of vertebrate species are endemic and found in the hotspots.

To Qualify as a Hotspot

- According to CI, to qualify as a hotspot a region must meet two strict criteria:
- It must contain at least 1,500 species of vascular plants (> 0.5% of the world's total) as endemics,
- and it has to have lost at least 70% of its original habitat. In 1999,
- CI identified 25 biodiversity hotspots in the book "Hotspots: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions".
- Collectively, these areas held as endemics about 44% of the world's plants and 35% of terrestrial vertebrates in an area that formerly covered only 11.8% of the planet's land surface.
- The habitat extent of this land area had been reduced by 87.8% of its original extent, such that this wealth of biodiversity was restricted to only 1.4% of Earth's land surface.

BIODIVERSITY HOTSPOTS IN INDIA

1.Himalaya: Includes the entire Indian Himalayan region (and that falling in Pakistan, Tibet, Nepal, Bhutan, China and Myanmar)

2.Indo-Burma: Includes entire North-eastern India, except Assam and Andaman group of Islands (and Myanmar, Thailand, Vietnam, Laos, Cambodia and southern China)

3.Sundalands: Includes Nicobar group of Islands (and Indonesia, Malaysia, Singapore, Brunei, Philippines)

4.Western Ghats and Sri Lanka: Includes entire Western Ghats (and Sri Lanka)

Two of which are found in India

1. **Eastern Himalayas** : Indo-Burma region
2. **Western Ghats** : Sri Lanka region

1. Eastern Himalayas: Geographically these areas comprise Nepal, Bhutan, and neighboring states of Northern India. There are 35,000 plant species found in the Himalayas, of which 30% are endemic. The Eastern Himalayas are rich in wild plants of economic value.

Examples: Rice, banana, citrus, chilli, jute, and sugarcane

2. Western Ghats: The area comprises Maharashtra, Karnataka, Tamil Nadu and Kerala and has 40% of the total endemic plant species, 62% amphibians and 50% lizards are endemic in Western Ghats. It is reported that only 7% of the original forests are existing today while the rest has been deforested or degraded.

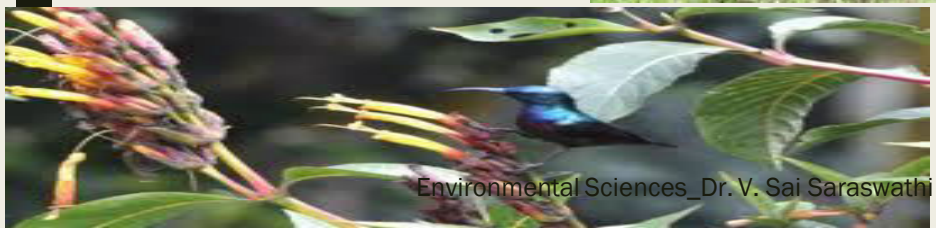
Some common plants: Ternstroemia japonica, Rhododendron and Hypericum

Some common animals: Blue bird, lizard hawk

Facts & Figures – Western Ghats

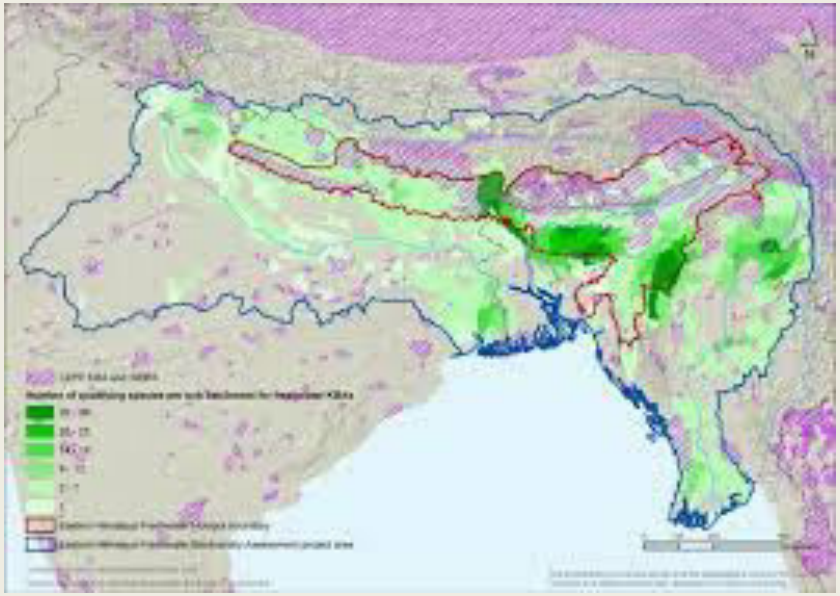
- The Western Ghats are one of the world's biodiversity hotspots with over 5,000 flowering plants, 139 mammals, 508 birds and 179 amphibian species.
- At least 325 globally threatened species occur here.
- The range covers 60,000km^2 and forms the catchment area for a complex of river systems that drain almost 40% of India.
- At 2695m, Mt Anamudi in Kerala, India is the highest peak in the Western Ghats.
- The Western Ghats are being considered as a UNESCO World Heritage Site.

Species in Western Ghats



The Himalayan Biodiversity Hotspot

- It extends over an arc of 3000 km and includes the entire Indian Himalayan region and this region which fall in Paksitan, Tiber, Nepal, Bhutan, China and Myanmar.
- The Indian Himalayas Hotspot has eight endemic threatened species, four endemic threatened mammals and four endemic threatened amphibians.



***Rafflesia Arnoldii* – The Largest Flower in The World is in Indonesia**

Himalayas –Hotspots

Sundalands- Biodiversity

- Sundaland holds about 25,000 species of vascular plants, 15,000 of which are found nowhere else. There are at least 117 endemic plant genera in the hotspot; 59 of these endemic genera are found in Borneo, 17 in Sumatra, and 41 on the Malay Peninsula.
- Of the approximately 770 bird species that regularly occur in Sundaland, nearly 150 are endemic.
- Native species include the Critically Endangered Bali myna.
- Of Sundaland's more than 380 mammal species, more 170 are endemic to the hotspot.
- The best known are the orangutans, represented by two species: the Critically Endangered Bornean orangutan (*Pongo pygmaeus*) and the Critically Endangered Sumatran orangutan (*P. abelii*).
- 1,000 known species of freshwater fish in the hotspot.
- 240 species of amphibians, nearly 200 of which are endemic.

International Organisations to Conserve Biodiversity Hotspots

- Critical Ecosystem Partnership Fund (CEPF)
- Conservation International (CI)
- Global 200 Ecoregions(WWF)
- Bird life International (Endemic Bird Area - EBAs)
- Plant Life International
- Alliance for Zero Extinction

Thank You

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Aquatic Biodiversity

By

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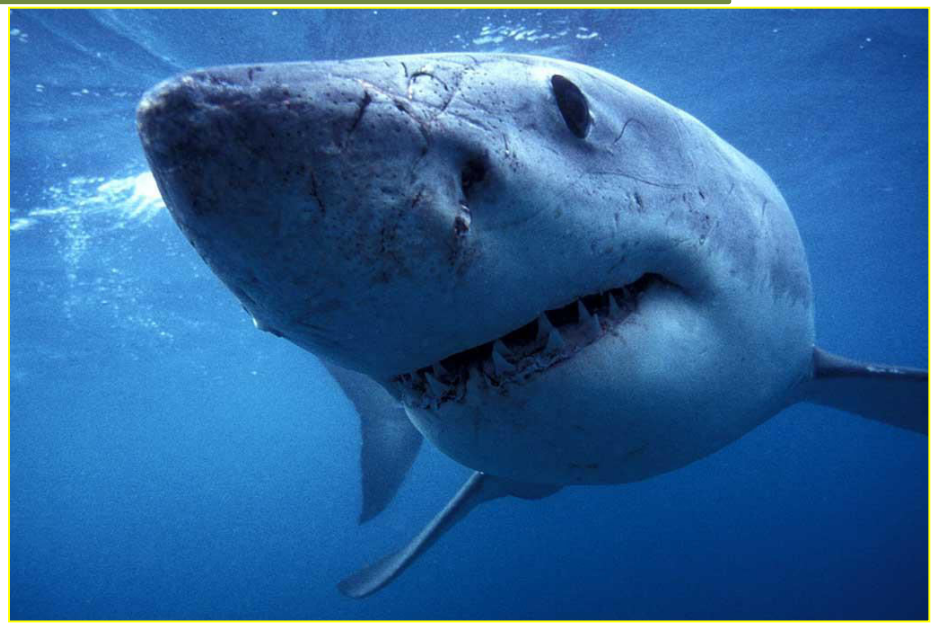


Ecological Services of Biodiversity

Ecological services:

- Balance of nature
- Biological productivity
- Regulation of climate
- Degradation of waste
- Cleaning of air and water
- Cycling of nutrients
- Control of potential pest and disease causing species
- Detoxification of soil and sediments
- Stabilization of land against erosion
- Carbon sequestration and global climate change
- Maintenance of Soil fertility

Water

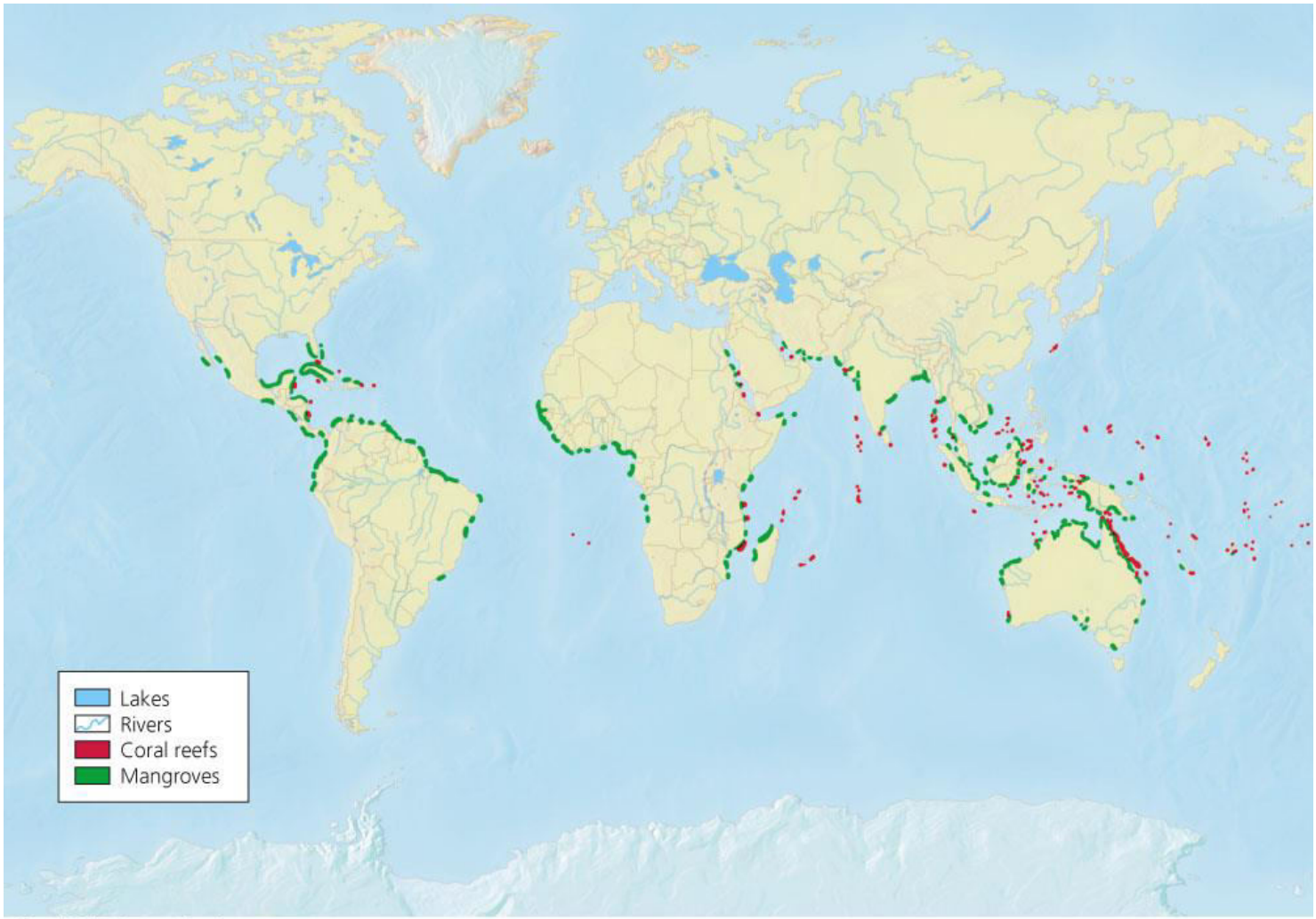
- Earth is Covered with Water (97%)
- Salt water (71%)
    - Oceans and Estuaries
    - Coastlands and shorelines
    - Coral Reefs
    - Mangrove Forests
- Fresh Water
    - Lakes
    - Rivers and Streams
    - Inland Wetlands

The Ocean Planet

Ocean hemisphere

Land–ocean hemisphere

Distribution of the World's Major Saltwater and Freshwater Sources

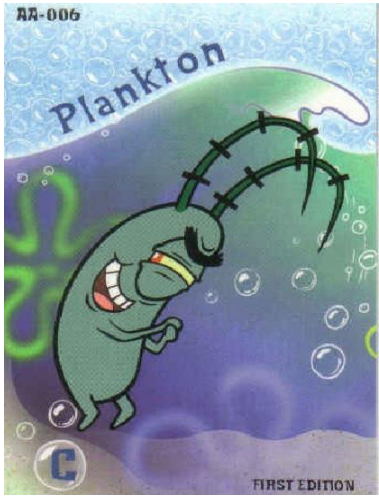


Marine Ecosystem

- Salt marshes
- Intertidal zones
- Estuaries
- Lagoons
- Coral Reefs
- Deep Sea
- Sea Floor

Aquatic Zones

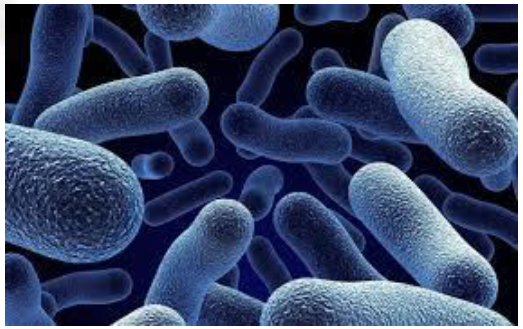
- Saltwater and Freshwater portions of the biosphere- support life
- Aquatic Zones
- **Plankton**: Free Floating (Plants, Algae etc)
  - Zooplankton: Plankton that feed on other plankton
  - Ultra plankton: Photosynthetic bacteria.

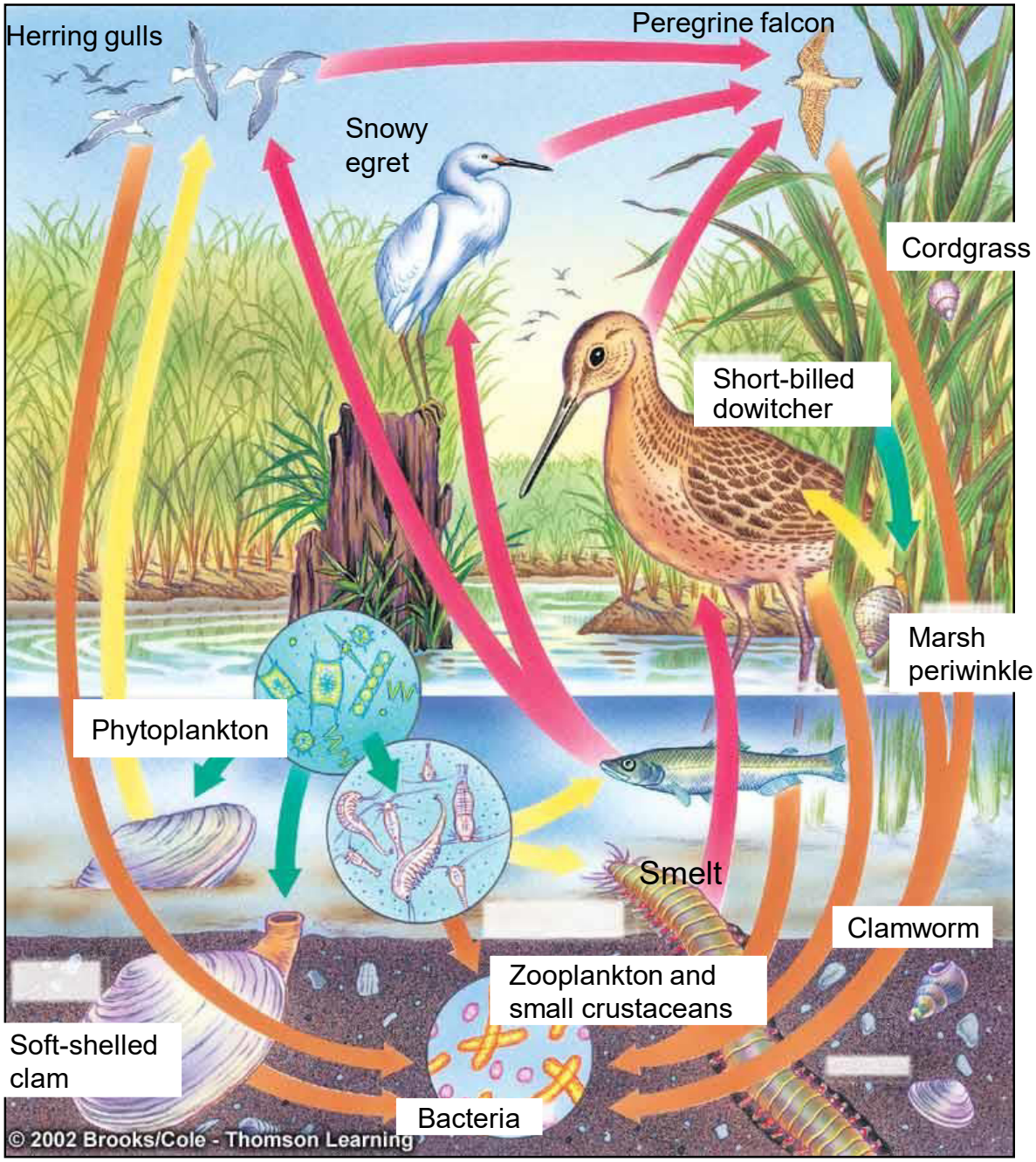


- **Nekton**: Strongly fishing Consumers – Fish, Turtles and whales

- **Benthos** or bottom Dwellers: Osyters, Clams and Lobsters

- **Decomposers**: bacteria





Producer to primary consumer

Primary to secondary consumer

Secondary to higher-level consumer

All producers and consumers to decomposers

Figure 7-8
Page 132

Salt marsh food web

Zones

- Coastal zone: warm, Nutrient rich, shallow water that extend from high tide mark on land to the gently sloping.
- Shallow edge of continental shelf
- Coastal zone contains 10% ocean, but 90% of all marine species and is the site for commercial fishing.

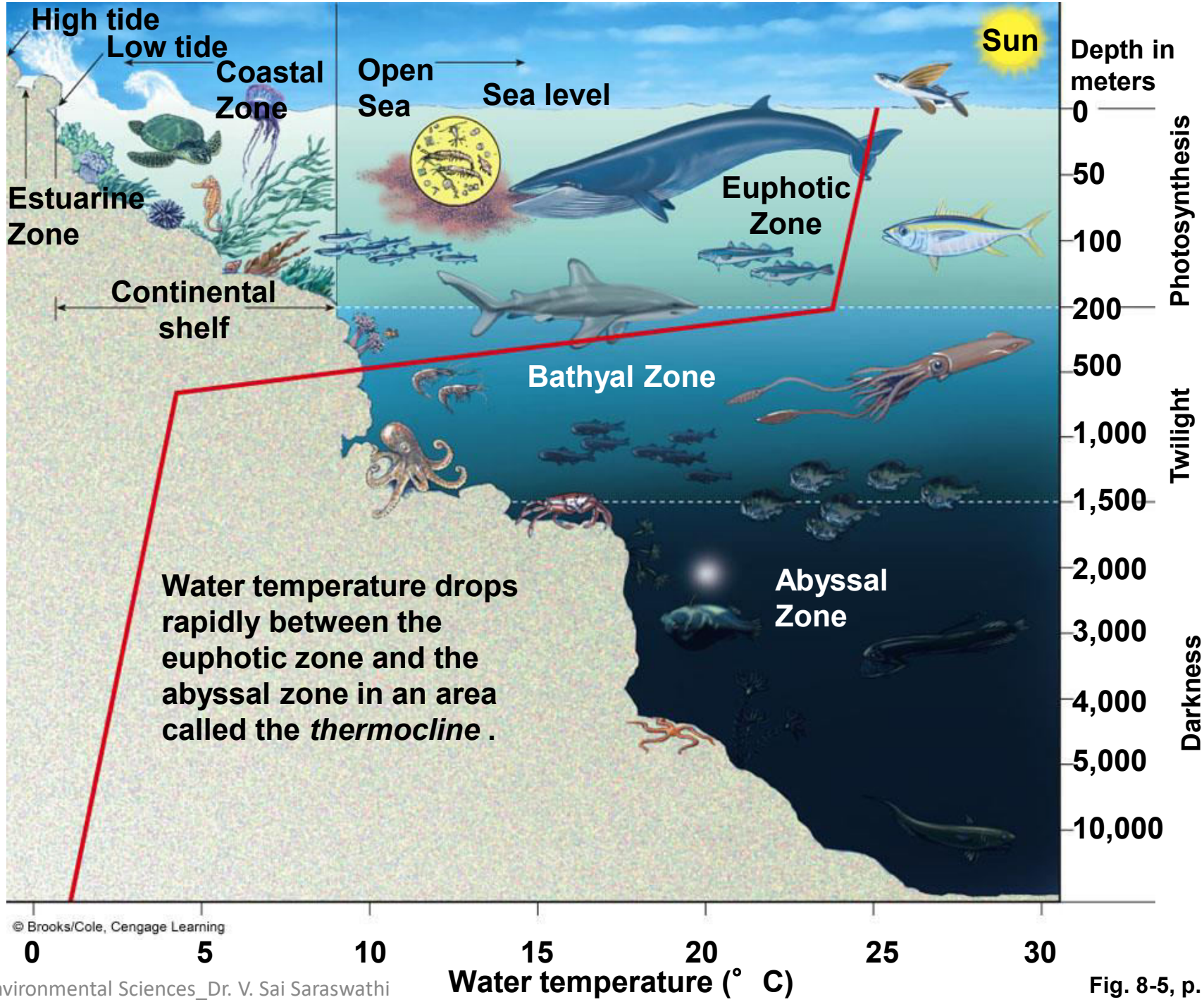

High tide
Low tide
Coastal Zone
Open Sea
Sea level
Sun
Depth in meters
0
50
100
200
500
1,000
1,500
2,000
3,000
4,000
5,000
10,000
Photosynthesis
Twilight
Darkness
Estuarine Zone
Euphotic Zone
Continental shelf
Bathyal Zone
Abyssal Zone
Water temperature drops rapidly between the euphotic zone and the abyssal zone in an area called the *thermocline* .
© Brooks/Cole, Cengage Learning
0
5
10
15
20
25
30
Water temperature (° C)

Fig. 8-5, p. 166

Importance of Aquatic Biodiversity

- Enormous Economic
- Aesthetic value
- Food
- Medicines
- Materials – recreational and commercial purpose for fishing and Tourism

What are the major ecological and economic services provided by marine systems?

Natural Capital

Marine Ecosystems

Ecological Services		Economic Services
Climate moderation		Food
CO_2 absorption		Animal and pet feed (fish meal)
Nutrient cycling		Pharmaceuticals
Waste treatment and dilution		Harbors and transportation routes
Reduced storm impact (mangrove, barrier islands, coastal wetlands)		Coastal habitats for humans
Habitats and nursery areas for marine and terrestrial species		Recreation
		Employment
Genetic resources and biodiversity		Offshore oil and natural gas
Scientific information		Minerals
		Building materials

Treats to Aquatic Biodiversity
Human activities – Degrading fresh water

- Dams and canal alter and destroy- terrestrial and aquatic biodiversity.
- Reduces the water flow and increasing damage from coastal storms.
- Flood control – rivers disconnect the rivers from their flood plains.
- Pollutants – eutrophication
- Inland wetlands drain.

Conservation of Aquatic Biodiversity

- Reduce Carbon Dioxide
- Safe and sustainable seafood choice
- Reduce plastic pollution
- Take care while – Beach- walking – coastal zone – Not polluting
- Be eco-friendly
- Don’t over exploitation

Conservation of Aquatic Biodiversity

- Aquarium – endangered and rare species
- Individual species conservation- Tertiary Consumers – Thereby Ecological Balance – Maintained

The Biggest Aquariums in the World

Rank	Aquarium	Location	Size (million gallons)
1	Chimelong Ocean Kingdom	China	12.9
2	Marine Life Park	Singapore	12.0
3	Oceanografic	Spain	11.0
4	Georgia Aquarium	United States	10.0
5	Moscow Oceanarium	Russia	6.6
6	The Seas with Nemo & Friends	United States	5.7
7	Shedd Aquarium	United States	5.0
8	uShaka Marine World	South Africa	4.6
9	Atlantic Sea Park	Norway	4.0
10	Ambassador Lagoon	United Arab Emirates	2.9

Thank You

GM CROPS

BY

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Introduction

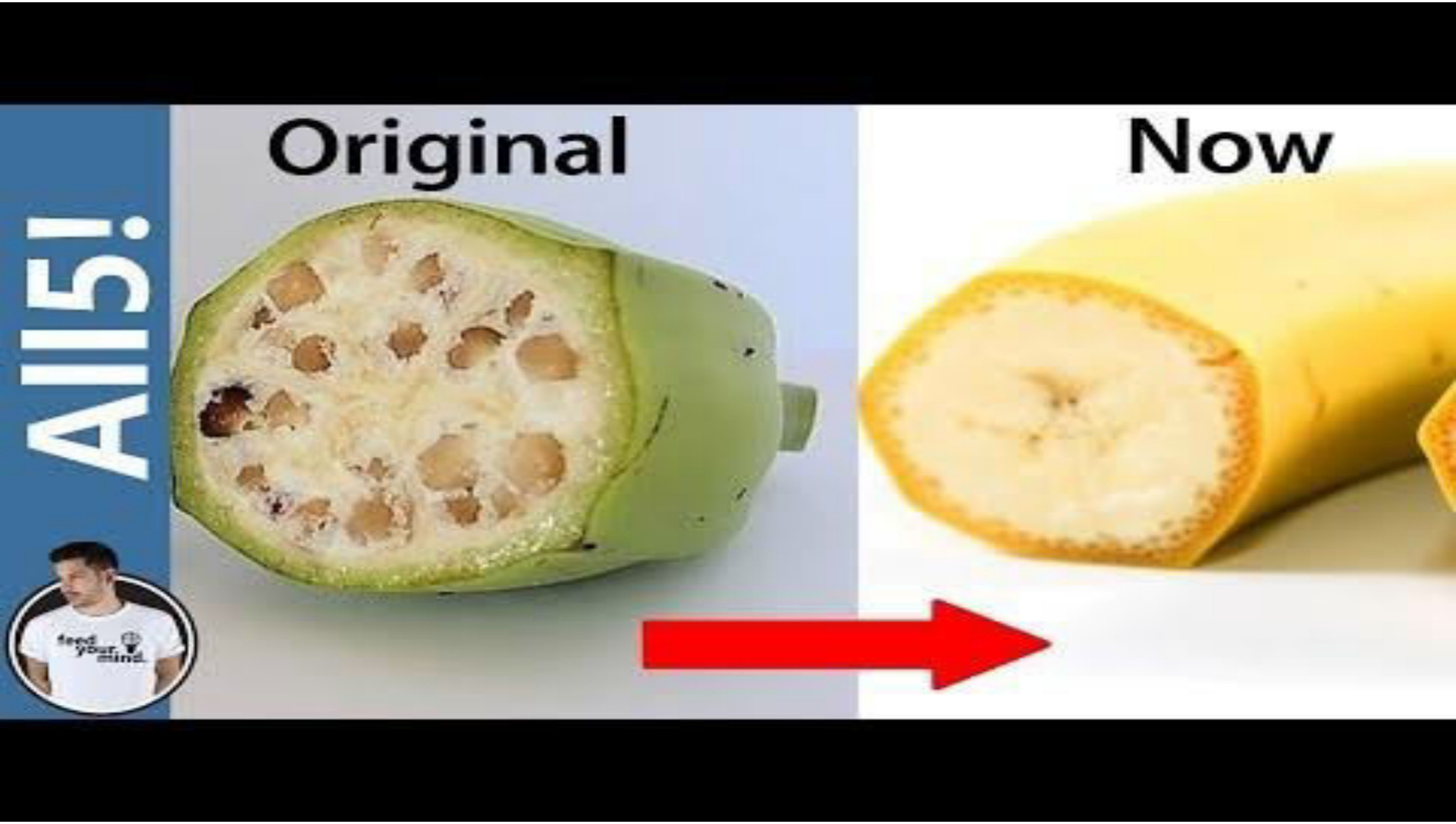
An artificial selection to change the genetic characteristic of populations with similar genes.

Animals or plants can be selected.

- Eg. **Tomato, Wheat, Fruit, or dog.**

Selective breeding ends with populations of species containing large no. of individuals with the desired traits.

Recently scientist are using genetic engineering to speed up the manipulation of genes.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Original
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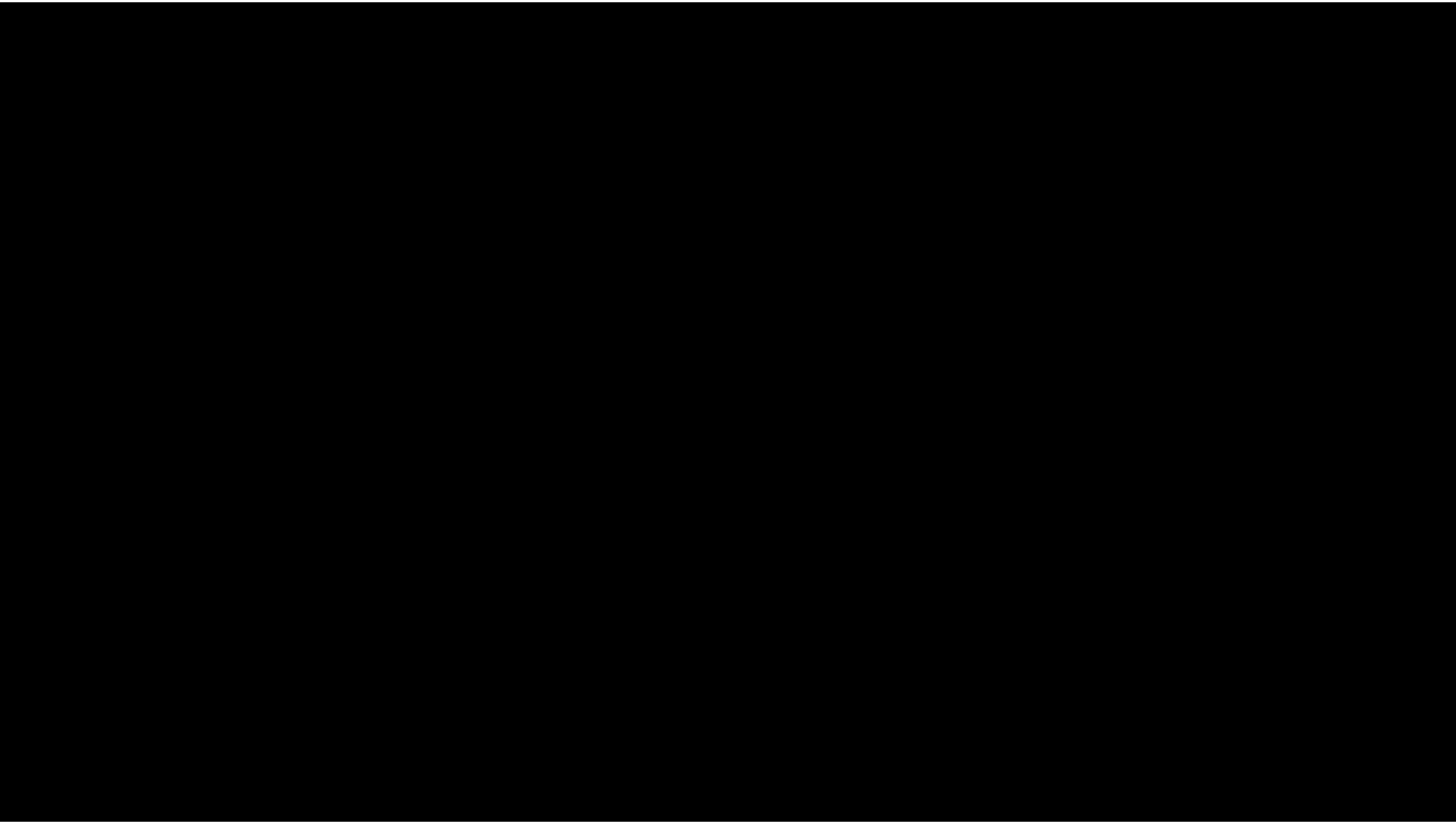

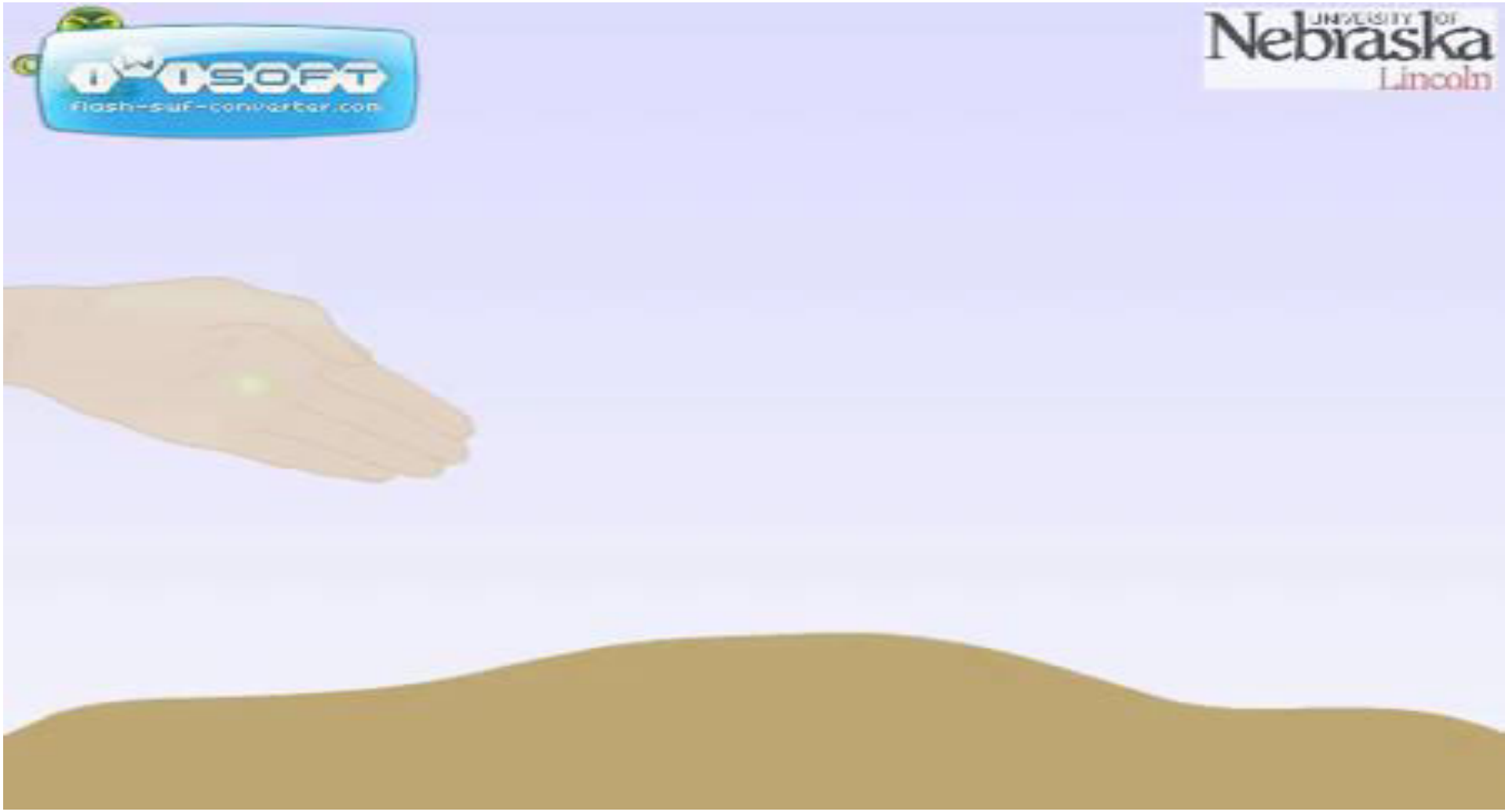
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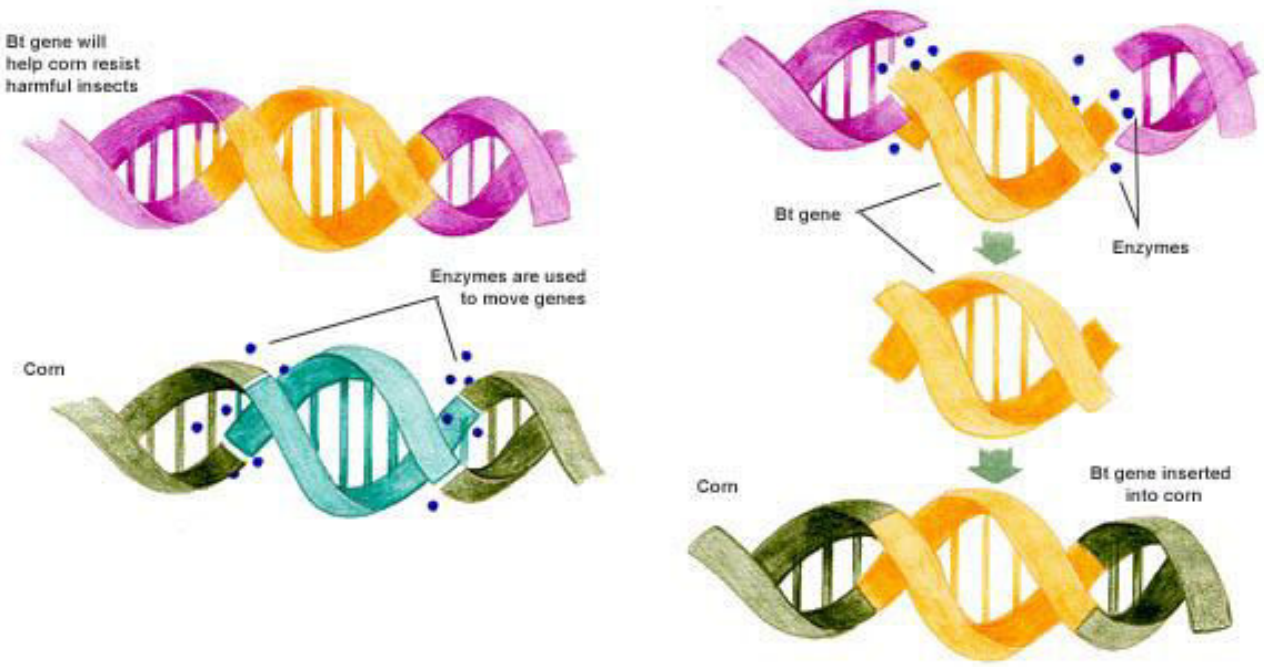
University of Nebraska Lincoln

Definition

Genetic engineering or gene splicing is the alteration of an organism's genetic material, thro' adding, deleting, or changing segments of its DNA



Genetically Modified Organisms

Eg: Genes from a fish species can be transferred into a tomato plant to give its properties.

The resulting organism are called as **Genetically modified organisms (GMOs) or Transgenic Organisms**.

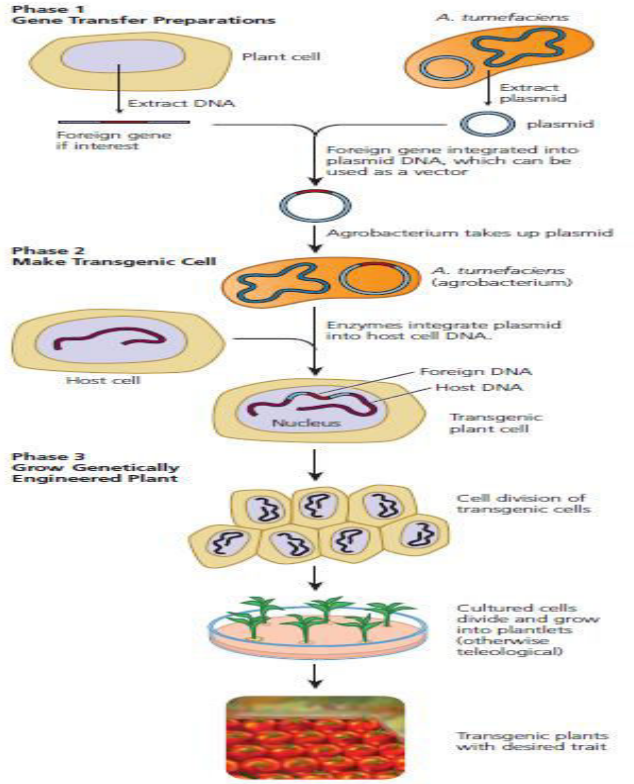


Figure 4-8 *Genetic engineering:* steps in genetically modifying a plant. **Question:** How does this process change the nature of evolution by natural selection?

Examples

- Bioengineers have developed many beneficial GMOs that may low the cholesterol eggs.

- Wheat that thrives in drought conditions
- Bananas that don't rot on the way to market.
- Tomatoes with genes can help to prevent some type of cancer.
- Genetic engineers have produced two mice – schwarzenegger mouse- muscle building genes and marathon mouse – never seems to tire.

Figure 4-9 An example of genetic engineering. The 6-month-old mouse on the left is normal; the same-age mouse on the right has a human growth hormone gene inserted in its cells. Mice with the human growth hormone gene grow two to three times faster and twice as large as mice without the gene. **Question:** How do you think the creation of such species might change the process of evolution by natural selection?

What are GM crops?

- Plants which have been genetically altered to express a desirable trait (Perry 2003)
  - Herbicide resistance
  - Virus resistance
  - Insecticides
  - Environmental Tolerance
  - Increased nutritional value

Genetically Modified Crops and Foods

Projected Advantages		Projected Disadvantages
Need less fertilizer		Irreversible and unpredictable genetic and ecological effects
Need less water		
More resistant to insects, disease, frost, and drought		Harmful toxins in food from possible plant cell mutations
Grow faster		New allergens in food
Can grow in slightly salty soils		Lower nutrition
May need less pesticides		Increase in pesticide-resistant insects, herbicide-resistant weeds, and plant diseases
Tolerate higher levels of herbicides		
Higher yields		Can harm beneficial insects
Less spoilage		Lower genetic diversity

Critics to GM crops

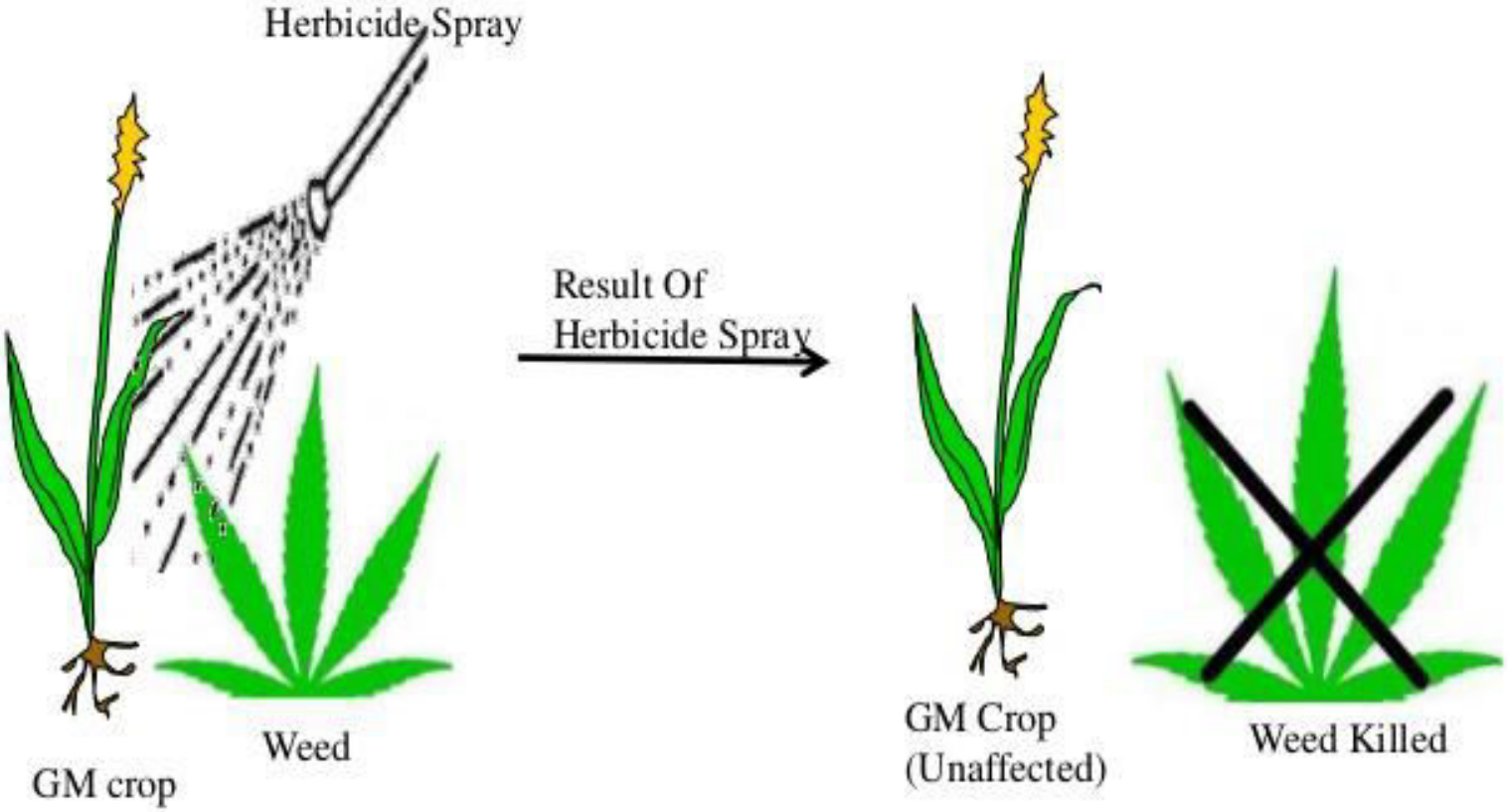
- Safety issues
- Ecological concerns
- Economic concerns
- These organism are subjected to IPR.

Benefits to GM foods

- Easing for worlds hunger
- Reduced use of pesticides and herbicides
- Improved crop quality
- Improved Nutritional quality,

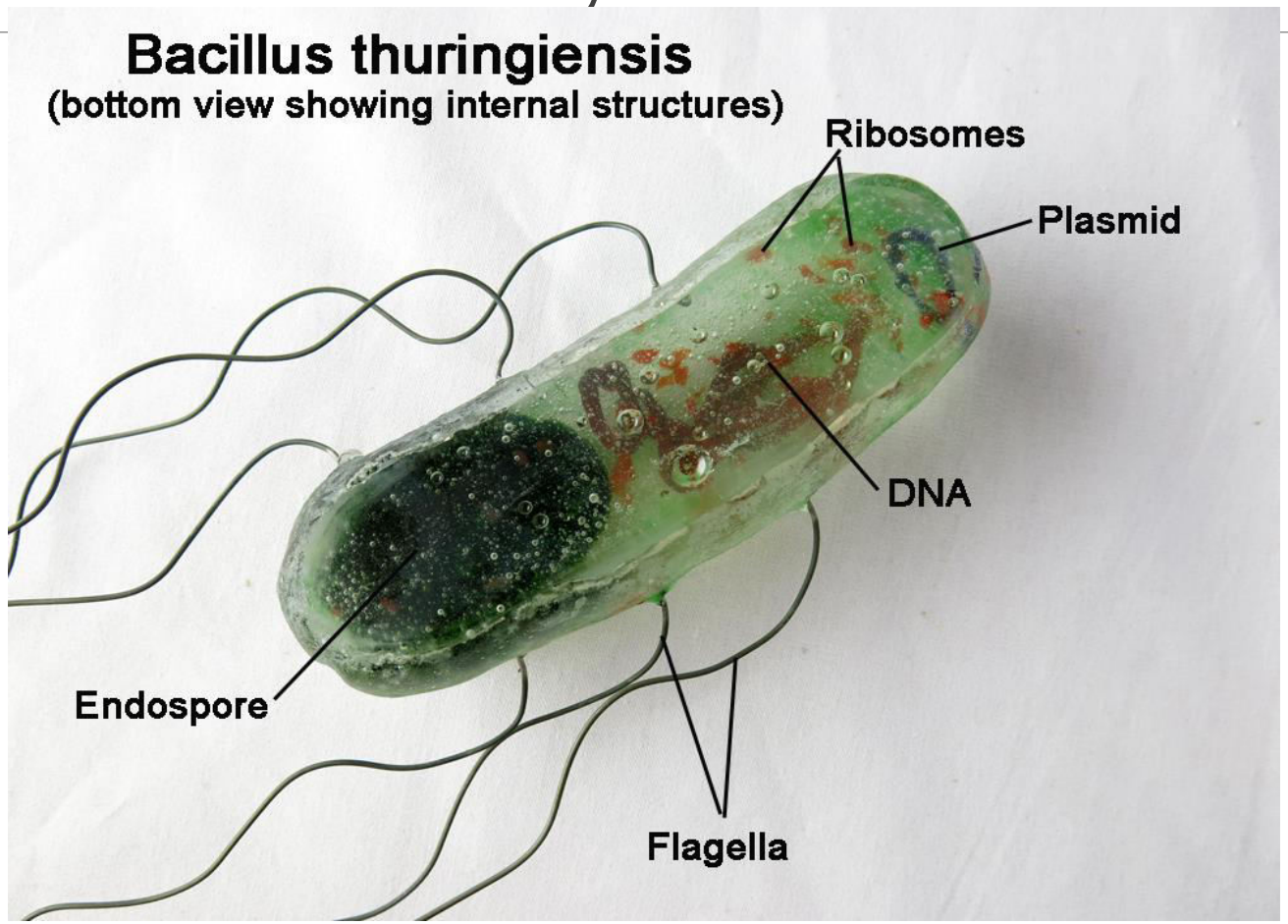
Herbicide Tolerance

- Over 63% of Gm crops grown globally have herbicide tolerance traits.
- Herbicide tolerance is achieved through the introduction of a gene from a bacterium conveying resistance to some herbicides. In situations where weed pressure is high, the use of such crops has resulted in a reduction in the quantity of the herbicides used.



Our concern……

Bt cotton – a new plant to add to biodiversity?



Bt Bringal

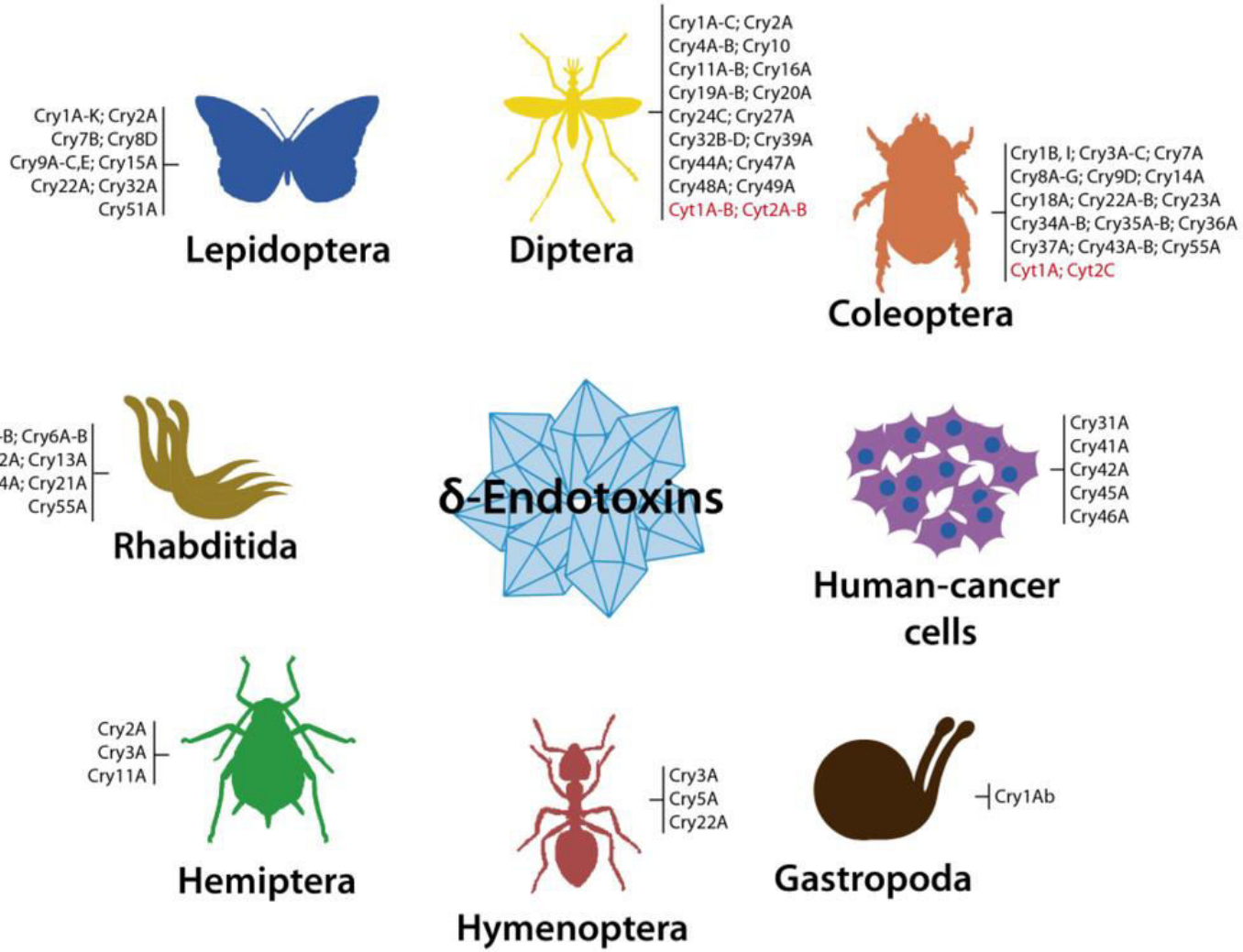
The **Bt brinjal** is a suite of transgenic bringals (also known as an eggplant or aubergine) created by inserting a crystal protein gene (*Cry1Ac*) from the soil bacterium ***Bacillus thuringiensis*** into the genome of various brinjal cultivators.

The insertion of the gene, along with other genetic elements like Promoters, Terminator and an antibotic resistance marker gene into the brinjal plant is accomplished using Agrobacterium -mediated genetic transformation

Why should we are worried in eating Brinjal

- Antibiotic resistance
- Toxicity of the proteins released in brinjal
- No long term safety for usage
- Babies are at high risk
- Organic risk
- Increase of cost
- Irreversible gene transformation
- Regulatory problem

Bt targets……..


Cry1A-K; Cry2A
Cry7B; Cry8D
Cry9A-C,E; Cry15A
Cry22A; Cry32A
Cry51A
Lepidoptera
Cry1A-C; Cry2A
Cry4A-B; Cry10
Cry11A-B; Cry16A
Cry19A-B; Cry20A
Cry24C; Cry27A
Cry32B-D; Cry39A
Cry44A; Cry47A
Cry48A; Cry49A
Cyt1A-B; Cyt2A-B
Diptera
Cry1B, I; Cry3A-C; Cry7A
Cry8A-G; Cry9D; Cry14A
Cry18A; Cry22A-B; Cry23A
Cry34A-B; Cry35A-B; Cry36A
Cry37A; Cry43A-B; Cry55A
Cyt1A; Cyt2C
Coleoptera
Cry5A-B; Cry6A-B
Cry12A; Cry13A
Cry14A; Cry21A
Cry55A
Rhabditida
δ-Endotoxins
Cry31A
Cry41A
Cry42A
Cry45A
Cry46A
Human-cancer cells
Cry2A
Cry3A
Cry11A
Hemiptera
Cry3A
Cry5A
Cry22A
Hymenoptera
Cry1Ab
Gastropoda

Non- target organisms


"LOOK
DEEP INTO
NATURE,
and then you
will understand
everything better."
– Albert Einstein

Thank You

Threats to Biodiversity

By

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School of Advanced Sciences

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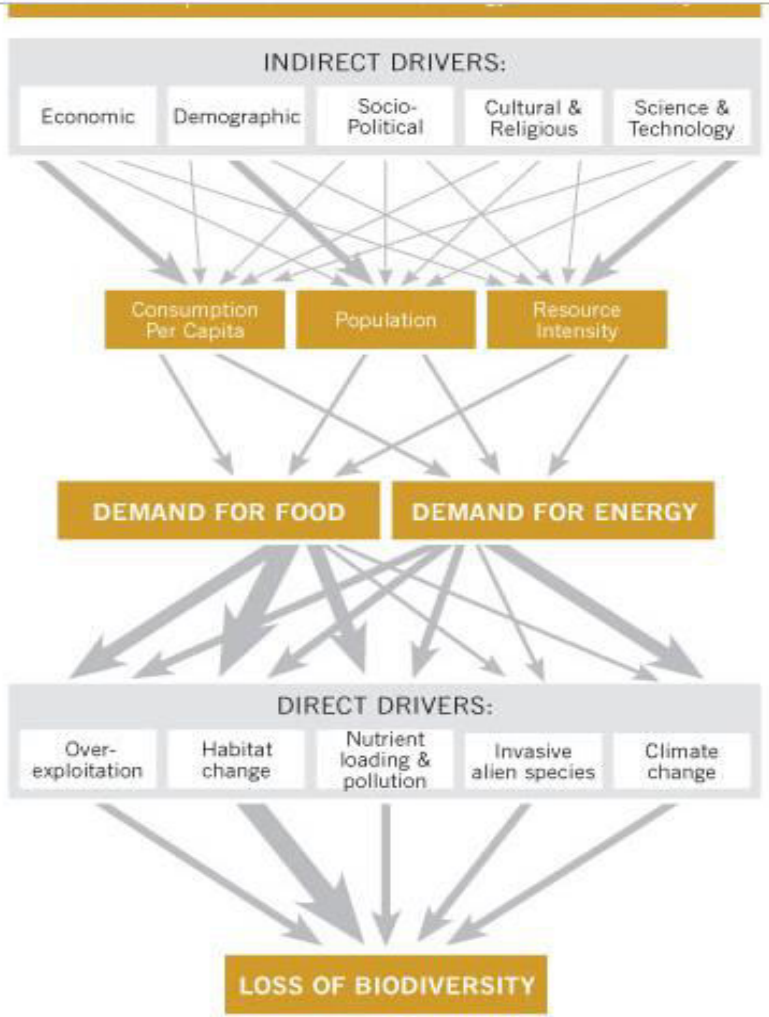
Biodiversity and threats to it



Schematic representation of the links between biodiversity loss, the direct and indirect drivers of change, and the demand for food and energy. The width of the arrows gives a broad and approximate illustration of the importance of the economic sectors in driving biodiversity loss.

Threats in terrestrial areas	
Degradation, destruction and fragmentation of natural habitats	Spread of the urbanised areas, road network and industrial areas and associated problems (noise, pollution); abandon of former agricultural practices that were favourable to biodiversity
Decrease in the capacity of the agricultural areas to host wildlife	Intensification of agricultural practices (yielding pollution and disturbance) and disappearance of landscape elements that provide food and shelter that are exploitable by wildlife (such as hedges, trees, ponds, etc.)
Pollution of soils, air and water	Excess of heavy metals (industry, roads), manure and pesticides (agriculture) and other pollutants
Invasions by alien species	International trade and transport (roads, railways, rivers), gardening practices, exotic trees in forestry, exotic pests released in the wild, climate change, etc.
Epidemics affecting wildlife	Arrivals of pathogens that are favoured by the introduction of exotic species, pollution and the destruction of habitats
Climate change	Carbon emissions, deforestation and other land use changes due to human activities
Dessication of soils and wetlands	Excess pumping of underground water tables
Recreation and leisure	Overuse of green open spaces and wild areas, little respect for nature, mountain biking and motor sports in fragile areas, dogs not on leash
Threats in marine areas	
Overfishing and decline of species	Industrial fishing, overexploitation of target species, by-catch species
Pollution and eutrophication	Land-based activities (river run-off), atmospheric deposition, maritime traffic
Degradation and destruction of the sea floor	Beam trawling, dredging, sand and gravel extraction
Alien species introductions	Maritime trade (ballast waters, fouling), leisure navigation, mariculture, climate change
Leisure and tourism	Coastal development, water quality in summer (high population), mechanical beach cleaning, noise and other perturbations due to the high population

Causes of threats to biodiversity

- **Habitat destruction**
- **Global climate change**
- **Habitat fragmentation**
- **Pollution**
- **Over exploitation**
- **Invasive species**
- **Disease**
- **Poaching**

- **Reason for habitat loss by humans**
  - Agriculture farming.
  - Harvesting natural resources
  - Industrial era
  - Urbanization – urban sprawl
  - Habitat destruction is currently ranked as a primary causes of species extinction world wide.

Forest fire – Man Made or Natural

Habitat Fragmentation


Human development, such as subdivisions, can fragment large blocks of habitat into smaller, scattered pieces.

Habitat Destruction

Habitat destruction and **fragmentation**, the carving of large blocks of habitat into smaller, scattered pieces, are the biggest threats to most species. Without adequate habitat in which to grow, survive and reproduce, births decrease, deaths increase, and it isn't long before species goes extinct.

Poaching

Figure 9-15 White rhinoceros killed by a poacher for its horn in South Africa. **Question:** What would you say if you could talk to the poacher of this animal?

Poaching is not limited to animals its also for plants too.....!

Three of the most often poached species in the park are galax, black cohosh, and ginseng.

GALAX

BLACK COHOSH

GINSENG

Illegally killing and capturing – threat to species

- 2/3 of the live animals smuggled around the world die in transit.
- Poor people in areas rich with wildlife may kill or trap them for money to survive and feed their families.
- To poachers
  - Mountain gorilla – $150,000
  - Gaint panda $1,00,000
  - Chimpanzee $ 50000
  - Dragon reptile from Indonesia – $ 30000
  - One horn rhinoceros $ 28,600
  - Bengal tiger or Indian tiger is at risk for its fur – $ 1,00,000

Encroachment of animals – man wildlife conflicts

- Human Encroachment into the forest.
- The ill, weak, and injured animals- attack man.
- Forest dept. cultivate the staple foods for animals.

  eg. One adult elephant- 2 quintal of green fodder.

➢ Villagers – electric wiring around the fields, suffer with pain & turn violent.

➢ Due to human settlement in the forest, the animals attack the settlement.

- The cash compensation paid by the government – damage – farmers crop is not enough.
- In Mysore, a farmer gets the cash compensation of Rs. 400/- per quintal. While the market value is Rs. 2400/-
- Revengeful and kills the wild animals.

Remedial Measures of Man- Wildlife Conflict

- Tiger conservation project.
- Adequate cash compensation.
- Solar Powered fencing.
- Cropping pattern near the forest region should be changed.
- Seasonal migration.
- Sanctuary.

Disease –Animals

GRASS TETANY (GRASS STAGGERS)

- Cause
  – Low blood Mg and in many cases low blood Ca
  – Cattle grazing on lush grass pastures in latter stages of gestation or early lactation
- Symptoms
  –
  Nervousness, staggering, convulsions, coma and death

Invasive species- case study

- Introducing the exotic species also disturb the ecosystem.

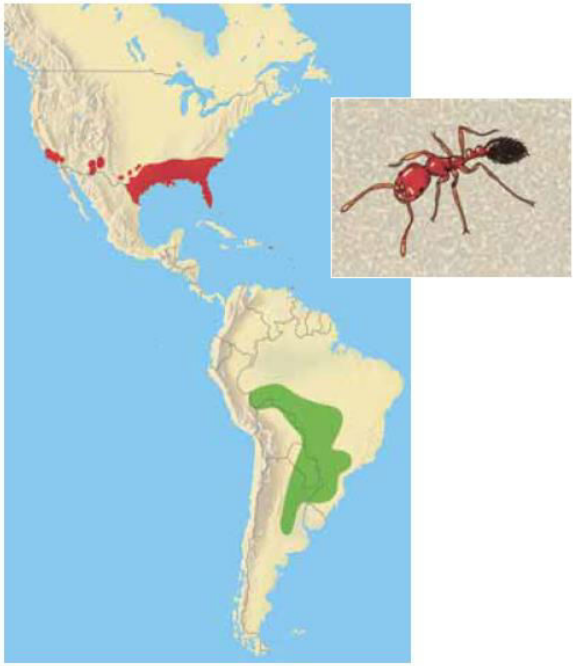


Figure 9-11 *Accidentally introduced invasive species:* the *Argentina fire ant,* introduced accidentally into Mobile, Alabama, in 1932 from South America (green area), has spread over much of the southern United States (red area). This invader is also found in Puerto Rico, New Mexico, and California. **Question:** How might this accidental introduction of fire ants have been prevented? (Data from S.D. Porter, Agricultural Research Service, U.S. Department of Agriculture)

- Aggressive argentina fire ant introduced

Into the United states.

- When these ant invade an area, they

wipe off 90% native species.

- They killed the deer, fawns, birds, livestock

Pets, 80 % people was allergic to their venom.

Pollution

- Air pollution lead to acid rain- therefore the pH of the soil/ water bodies go acidic.
- The monuments get corroded. Eg. Taj mahal.
- Hence the species living in those aquatic system may die.
  - Eg. Fishes, frog, reptiles, insects become extinct.

Global warming is a major threat to biodiversity

- Acc. To 2007 IPCC report, changes in climate may affect the biodiversity. Eg. Weeds, insect pest- fire ant, etc.

By 2050 polar bears may be found in zoos,
due to arctic sea ice melts.

Figure 15-19 Melting of Alaska's Muir Glacier in the popular Glacier Bay National Park and Preserve between 1948 and 2004. **Question:** How might melting glaciers in Alaska and other parts of the Arctic affect your lifestyle during this century?

Premature extinction

- Changes in structure and location of wildlife cause to premature extinction
  - Eg: **golden toad – found in costa Rica's mountainous region. In 1989 it became extinct.**
  - ***Reason***: warmer air from global climate change caused the area's moisture bearing clouds in caribbean sea to rise and dry out the habitat for this frog.

Figure 4-7 Depleted natural capital: male golden toad in Costa Rica's high-altitude Monteverde Cloud Forest Reserve. This species has recently become extinct because changes in climate dried up its habitat.

Ways to reduce threat of global warming

- Four major strategies
  - Improve energy *efficiency* to reduce fossil fuel use
  - Shift to renewable resources
  - Stop cutting down tropical forest.
  - Capture CO2 as possible in soil, vegetation, and deep in ocean.

Figure 15-22 Methods for slowing atmospheric warming during this century (Concept 15-5A). **Question:** Which five of these solutions do you think are the most important? Why?

Thank You

VIT UNIVERSITY
(Estd. u/s 3 of UGC Act 1956)

Conservation of Biodiversity

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Biodiversity - Conservation

- **Types of Biodiversity Conservation**

There are two types of biodiversity conservation

1. In-situ conservation (within habitat)
2. Ex-situ conservation (outside habitat)

4.11.1. In-situ conservation

- In-situ conservation involves protection of fauna and flora within its natural habitat, where the species normally occurs is called in-situ conservation.
- The natural habitats or ecosystems maintained under in-situ conservation are called '***protected areas***'.

4.11.2. Ex-situ Conservation

- Ex-situ conservation involves protection of fauna and flora outside the natural habitats.
- This type of conservation is mainly done for conservation of crop varieties and the wild relatives of crops.

In- situ Conservation

Important In-situ conservation: *National parks, Wildlife sanctuaries, Biosphere reserves, Gene sanctuary etc.*

- **Methods of In-situ conservation**

Around 4% of the total geographical area of the country is used for In-situ conservation. The following methods are presently used for In-situ conservation

In-situ Conservation	Numbers available
National Parks	80
Wild-life sanctuaries	420
Biosphere reserves	7
Botanical gardens	120

National Parks in India

Some important national parks in India

Name of National Park	State	Important Wildlife
Kaziranga	Assam	One horned Rhino
Gir National Park	Gujarat	Indian Lion
Bandipur	Karnataka	Elephant
Dachigam	J & K	Hangul
Corbett	U.P	Tiger
Kanha	M.P	Tiger
Ranthambore	Rajasthan	Tiger
Sariska	Rajasthan	Tiger
Periyar	Kerala	Tiger, Elephant

Watch Top Wildlife Sanctuaries & National Parks, India:
https://www.youtube.com/watch?v=zP1Yux3qBlE

Wildlife Sanctuaries

Some Important Wildlife Sanctuaries in India

Name of Sanctuary	State	Major Wildlife
Mudamalai Wildlife Sanctuary	Tamil Nadu	Tiger, Elephant, Leopard
Vedanthangal Wildlife Sanctuary	Tamil Nadu	Water birds
Nal Sarovar Bird Sanctuary	Gujarat	Water birds
Wild Ass Sanctuary	Gujarat	Wild ass, wolf, nilgai, chinkara
Hazaribagh Sanctuary	Bihar	Tiger, Leopard
Ghana Bird Sanctuary	Rajasthan	Birds
Abohar Wildlife Sanctuary	Punjab	Black buck
Jaldapara Wildlife Sanctuary	W. Bengal	Rhinoceros, Elephant, Tiger

Biosphere Reserves in India

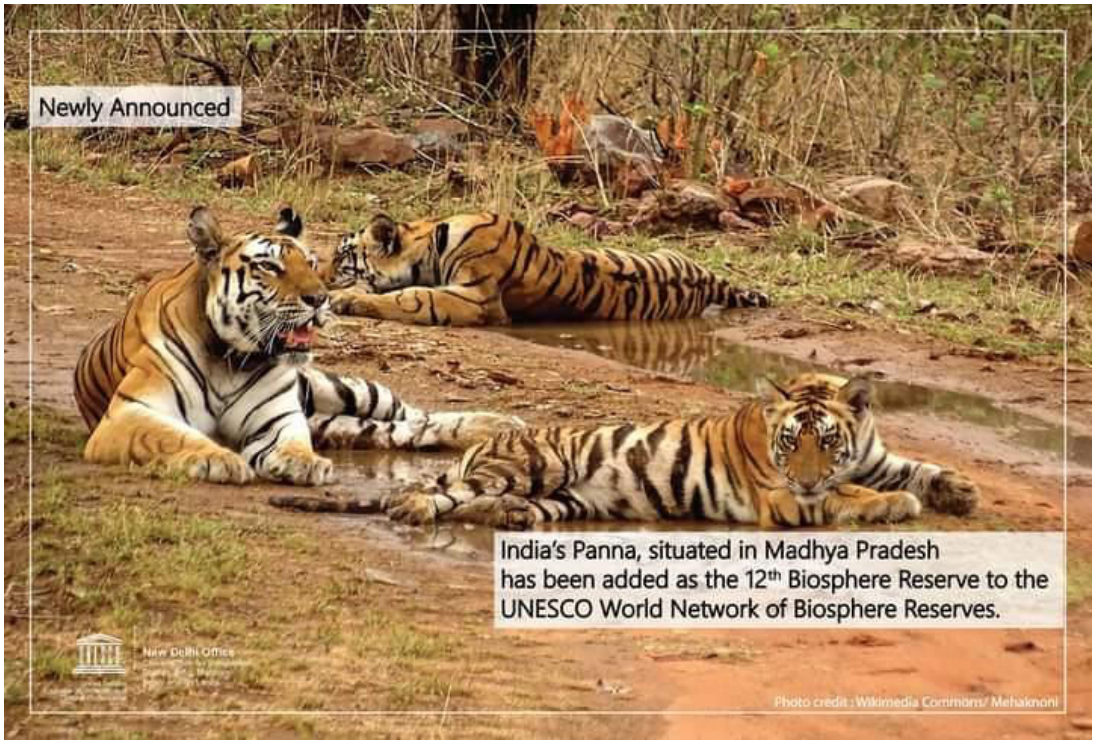
Some important Biosphere Reserves in India

Name of Biosphere	State
Gulf of Mannar	Tamil Nadu
Nilgiri	Tamil Nadu, Kerala, Karnataka
Nanda Devi	U.P
Nokrek	Meghalaya
Mannas	Assam
Sunder bans	West Bengal
Great Nicobars and Similipal	Orissa

Role of biosphere reserves

1. It gives long term survival of evolving ecosystem
2. It protects endangered species
3. It protects maximum number of species and communities
4. It serves as site or recreation and tourism
5. It is useful for educational and research purposes

Madhya Pradesh: Unesco stripes for Panna Biosphere Reserve



Source: https://timesofindia.indiatimes.com/city/bhopal/madhya-pradesh-unesco-stripes-for-panna-biosphere-reserve/articleshow/78963588.cms

https://en.unesco.org/news/panna-india-fuvahmulah-and-addu-atoll-maldives-join-unescos-world-network-biosphere-reserves

Ex-situ Conservation

Role of Ex-situ conservation

1. It involves maintenance and breeding of endangered plant and animal species under controlled conditions
2. It identifies those species which are at more risk of extinction
3. It prefers the species, which are more important to man in near future among the endangered species

Important Ex-situ conservation: Botanical gardens, seed banks, microbial culture collections, tissue and cell cultures, museums, zoological gardens.

Methods

- **Methods of Ex-situ Conservation**

The following important gene bank (or) seed bank facilities are used in Ex-situ conservation

1. **National Bureau of Plant Genetic Resources (NBPGR)**
   It is located in New Delhi. It uses cryo preservation techniques to preserve agricultural and horticultural crops.
   Cryo preservation technique: It involves the preservation of seeds, pollen of some important agricultural and horticultural crops by using liquid nitrogen at a temperature as low as -196^{O}C. Varieties of rice, pearl millet, Brassica, turnip, radish, tomato, onion, carrot, chilli, tobacco, etc., have been preserved successfully in liquid nitrogen for several years.

2. **National Bureau of Animal Genetic Resources (NBAGR)**
   It is located at Karnal, Haryana. It preserves the semen of domesticated bovine animals.
3. **National Facility for Plant Tissue Culture Repository (NFPTCR)**
   It develops the facility for conservation of varieties of crop plants or trees by tissue culture. This facility has been created within the NBPGR

Case Study

- Endangered vultures found dead @ Botswana. Vulture is excellent scavengers play its critical role in keeping ecosystems clean of diseases found in rotting carcasses. These endangered vultures are poisoned deliberately by poachers, or accidentally by farmers in Southern Africa.

White backed Vulture, Africa

KMTR

THE HINDU

Forest dept. road endangers core KMTR habitat: activists

But officials insist they only cleared the '*katcha*' road to have better access for officials to the core areas for better surveillance

B ARAVIND KUMAR
P. SUDHAKAR

A road laid by the Forest Department with heavy machinery inside the core, inviolate habitats of the Kalakkad Mundanthurai Tiger Reserve (KMTR) in Tirunelveli district could endanger its very existence, activists say.

While KMTR officials insist that they were only clearing the '*katcha*' road to have better access for Forest Department officials to the core areas for better surveillance and that no heavy machinery was used, activists point out that for decades, foresters have only travelled by foot and not on jeeps, and this could set off a dangerous trend.

Photographs accessed by *The Hindu* show that bulldozers are being used to lay the road. The road was being laid in gross violation of the Forest (Conservation) Act and the Wildlife Protection Act. The new road and the resultant vehicular movement could endanger the KMTR's core and threaten its very survival, and activists have called for a halt to this activity.

Photograph accessed by *The Hindu* shows that bulldozers are being used to lay the road.

Type-I unit

KMTR was declared a tiger reserve in 1988, the first in Tamil Nadu. It has been identified as a Type-I tiger conservation unit representing the tropical moist evergreen forests. It also forms part of the inter-State Agasthiyarmalai Biosphere Reserve, declared one of the plant diversity centres by UNESCO.

It was also declared the Regional Centre of Endemism in the Indian subcontinent. There are 2,255 species of Angiosperms so far recorded from the KMTR, including 448 species endemic to the Western Ghats, in addition to 150 species that are strictly endemic to the Agasthiyarmalai, say researchers working in the reserve.

According to activists, this core habitat is one of the highly protected areas with the least entry points. One has to cross the Papanasam checkpoint and reach the Mundanthurai plateau and thereon travel to Servalar and the Karaiyar dam inside the core.

The vehicular movement is usually restricted up to the dam, as *pucca* roads have been laid only up to that. Only 5 kani tribal settlements are present in the core area. There are very few elephant areas in the reserve.

About 10 years ago, trekking was also stopped. There are only patrolling/combing routes available from the Karaiyar dam to Kalivarpul until recently, which lead to Bomacadu (Kerala border). The forest staff and the anti-poaching watchers were patrolling the forest by foot, say activists.

Importantly, activists and researchers said these were the few tropical evergreen patches left in the country, free from any man-made interventions and serving as a water catchment for the perennial Tamirabharani river.

Alleging that heavy machinery was being operated now to clear rainforest patch along Karaiyar-Kannikatti-Kalivarpul Mottai for 30 km, the activists say such clearing would amount to loss of biodiversity, encourage a larger vehicular movement and allow easy access to poachers and even Maoist infiltration.

And for an area that had no road entry, creating a road by clearing the forest inside the core area raises suspicion, they add.

"Another reason for laying the road could be to facilitate access for high-profile pilgrims to the Agasthiyar temple in the peak in vehicles. Now they have to trek," says an activist.

KMTR field director Yogesh Singh did not react and said the local officer (a deputy director) would answer. KMTR deputy director (Ambasamudram division) Kommu Omkaram denied that heavy equipment was used to lay roads in the core zone between the Papanasam dam and Kalibar Pullmottai. The 30-km 'katcha' road connecting the border with Kerala through the dense jungle would usually be maintained to ensure the movement of the vehicles of KMTR officials to reach the spots within the shortest possible time.

Thank You