

APES Tutoring Review



Day 4- Land and Water Use

Green Revolution

- Fritz Haber created the Haber process which could produce inorganic N-based fertilizer
- **Monocultures**- single type of crops planted in an area became common as they had high yield
- pesticide and fertilizer use also increased leading to environmental issues such as biomagnification (DDT) and eutrophication (fertilizers)
- Also could lead to **Desertification** where soil became depleted of nutrients and was unusable for growing crops
- **Salinization**- watering crops could deposit salts on the soil

Other Agricultural Problems

- **Soil erosion**- movement of soil away from its original location by wind and water, common with tilled agricultural soil
- loss of topsoil leads to lack of water and nutrient retention
- **Overgrazing**- cattle and other livestock would overeat at a certain location, outcompeting native animals
- **Waterlogging**- over irrigation leads to ground saturation, depriving roots of oxygen
- Polyculture, agroforestry and intercropping are more sustainable methods of agriculture

Pesticides

- Carbamates- can contaminate groundwater, stronger than DDT
- DDT- caused shell thinning in water birds like eagles, pelicans and osprey, U.S. ban
- Chlorinated Hydrocarbons (POPs)- DDT is an example, “Persistent Organic Pollutant”

Ways to Solve Agricultural Problems

- Drip irrigation- manages water use
- plant the appropriate species for the location
- Low/no till- prevents erosion
- cover cropping- prevent erosion
- integrated pest management- reduces need for pesticides.

Aquatic Ecosystems

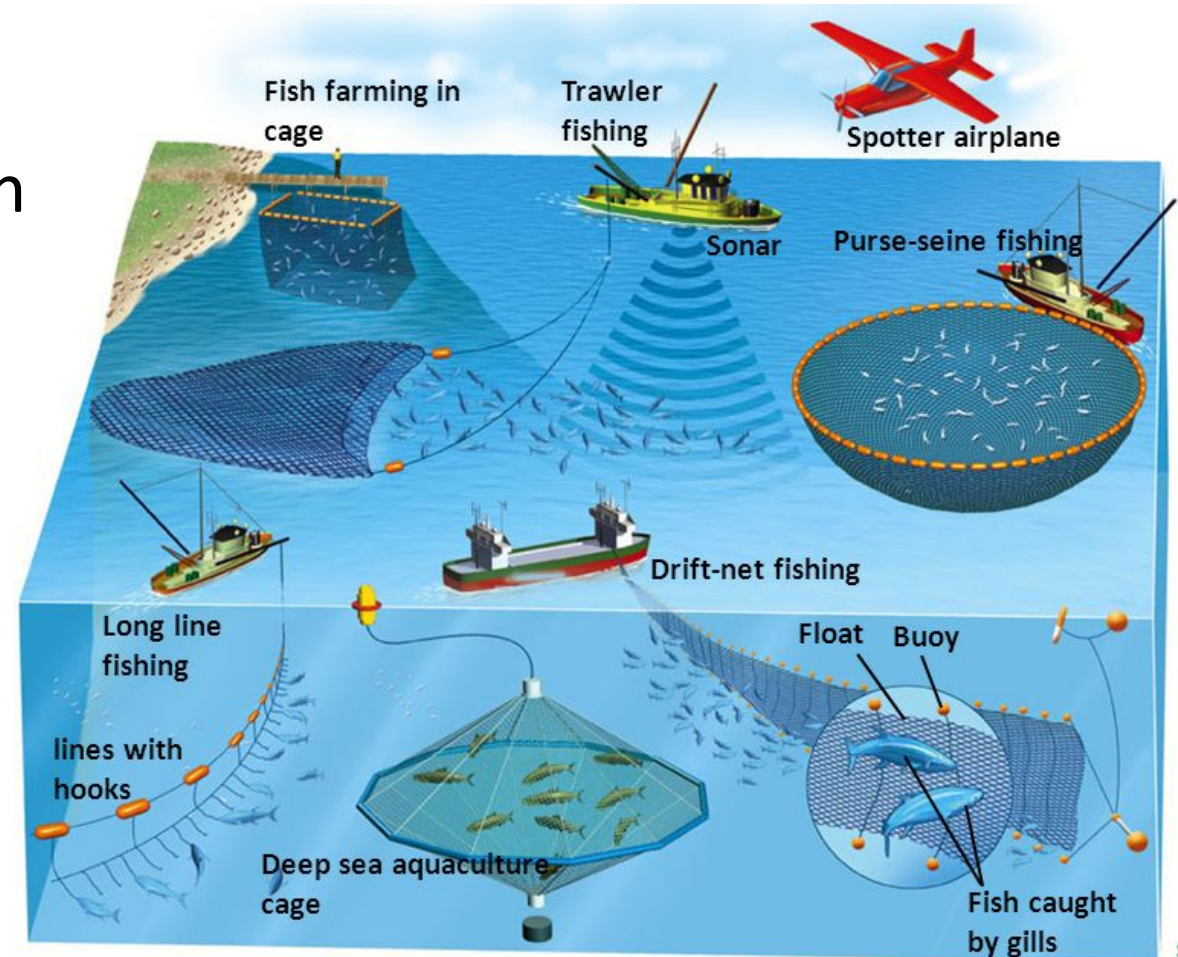
- **Wetlands are compromised**
 - Wetland area has decreased dramatically from 10% of land in U.S. to 5%.
 - Threatened by:
 - **Agriculture:** too much fertilizer (eutrophication)
 - **Fishing:** fish stock depletion
 - **Development:** destruction
 - **Dams:** block water and results in sediment buildup
- **Roles:**
 - filter water
 - absorb & release water like a sponge
 - high in nutrients

Aquatic Laws to know

- **Marine Mammal Protection Act (1972):** established federal responsibility to conserve marine mammals
- **Endangered Species Act (1973):** provided broad protection for organisms listed as threatened and endangered

Fisheries

- **Fishery** – concentration of a particular wild aquatic species suitable for commercial harvesting in a specific area
- **Trawlers**
 - Destroy ocean bottom habitat
- **Purse-seine fishing**
 - Can kill dolphins
- **Long-lining**
 - Kills large numbers of sea turtles, dolphins, and seabirds
- **Drift net fishing**
 - Large bycatch



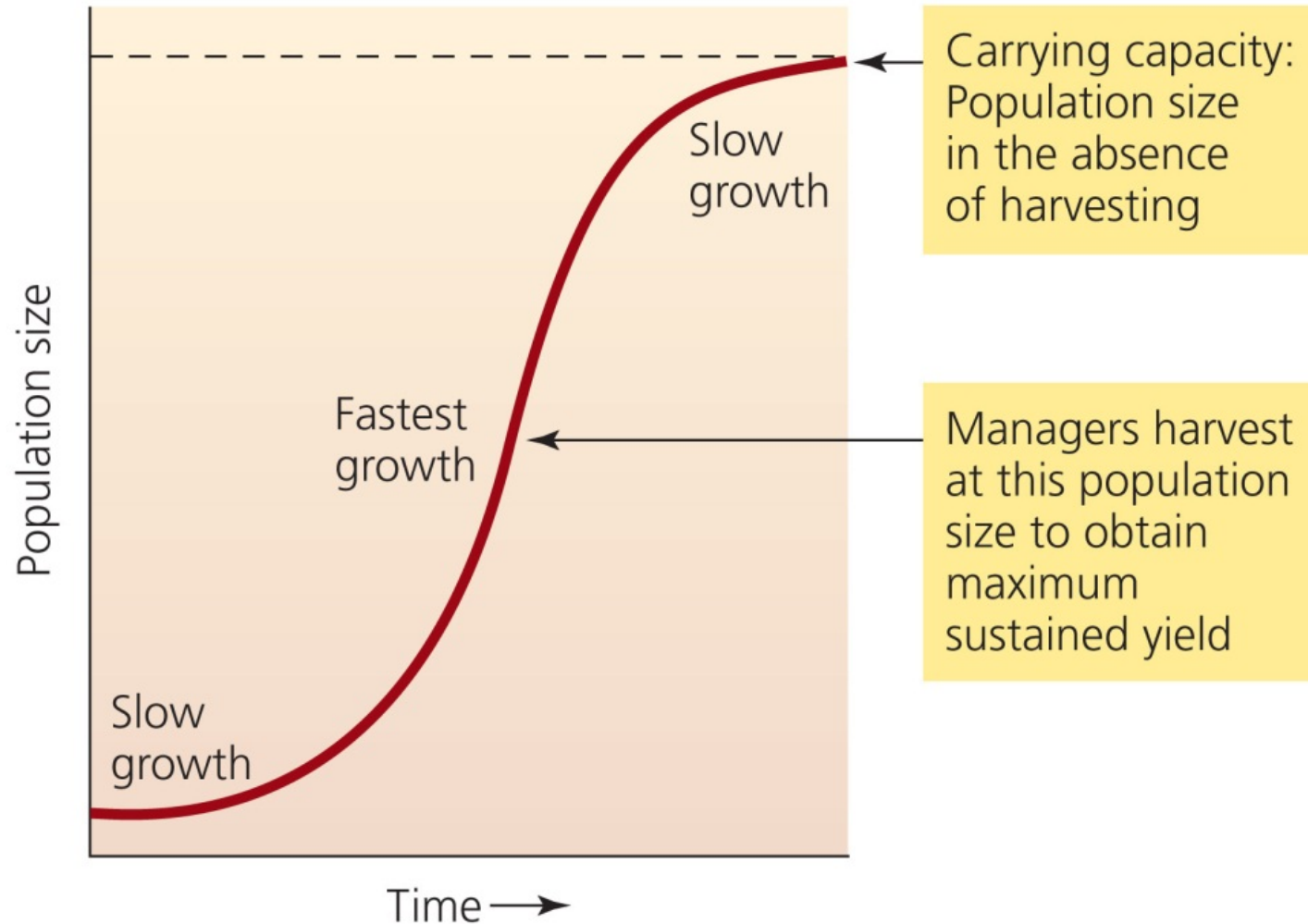
How to protect marine biodiversity from fishing...

- We can help to sustain marine biodiversity by:
 - Using laws and economic incentives to protect species
 - Setting aside marine reserves to protect ecosystems and ecosystem services
 - Using community-based integrated coastal management that considers more than the human uses of the ocean but also how to maintain healthy ecosystems

Management of Fisheries

- **Maximum sustained yield (MSY)**
 - Traditional approach
 - Projects maximum annual harvest without causing population drop
- **Optimum sustained yield (OSY)**
 - Attempts to account for interactions among species
- **Management of the fisheries with the government**
 - Government sets quotas for species and divides the quotas among communities
 - Limits fishing seasons
 - Regulates fishing gear

Maximum Sustainable Yield



Deforestation

- **Deforestation** = the clearing and loss of forests
 - Alters landscapes and ecosystems
 - Degrades soil
 - Causes species decline and extinction
 - Adds carbon dioxide to the air
- *Developing countries boost their economies and get land for their growing populations by logging forests*

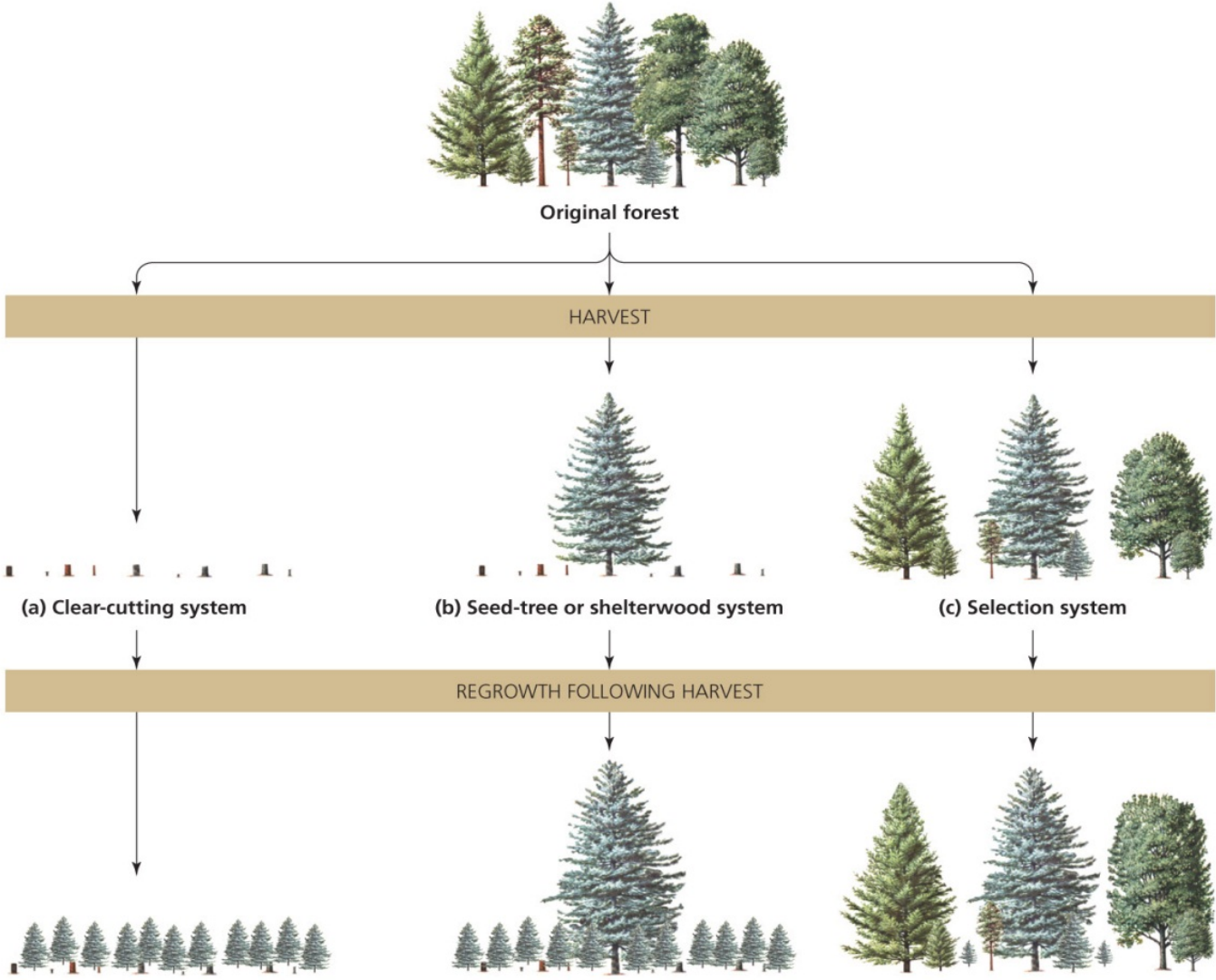
Timber Plantations

- The timber industry focuses on timber plantations
 - Fast-growing species
 - Monocultures
 - **Even-aged trees** = all trees are the same age (not seen in natural forests, low diversity)

Timber Harvesting

- **Clear-cutting**: all trees in an area are cut, needed and un-needed, more cost efficient but HIGH impact on ecosystems
- **Seed-tree cutting**: a small number of seed-producing trees are left standing to reseed the area
- **Shelterwood cutting**: a small number of trees are left to provide shelter for the seedlings
- All methods disturb habitat
 - Change forest structure and composition
 - Increase erosion, siltation, runoff, flooding, landslides

Timber Harvesting



Prescribed Burns

- **Prescribed (controlled) burns** = burning areas of forests under carefully controlled conditions
 - Effective
 - May get out of control
 - Impeded by public misunderstanding and political interference
- For over 100 years, the Forest Service suppressed all fires
 - But many ecosystems depend on fires
 - Fire suppression allows woody accumulation, which produces kindling for future fires

Livestock

- **Bureau of Land Management (BLM)** = owns and manages most U.S. rangeland
 - Ranchers can graze cattle on BLM lands for low fees
 - Low fees encourage overgrazing
- Overexploitation of resources caused great damage to the American West
 - Poor farming practices, overgrazing, farming arid lands
- Tragedy of the Commons Example

NEPA

- **1969 National Environmental Policy Act (NEPA)**- mandates an environmental assessment of all projects involving federal money or permits. (Clean Air Act, Clean Water Act, Endangered Species Act)—ensure protection of nation's resources.
- **Environmental impact statement (EIS)**- outlines the scope and purpose of the project. EIS may suggest alternative approaches and analyzes the environmental impact of each alternative
- **Environmental mitigation plan**- outlines how the developer will address concerns raised by the projects impact on the environment

Urbanization

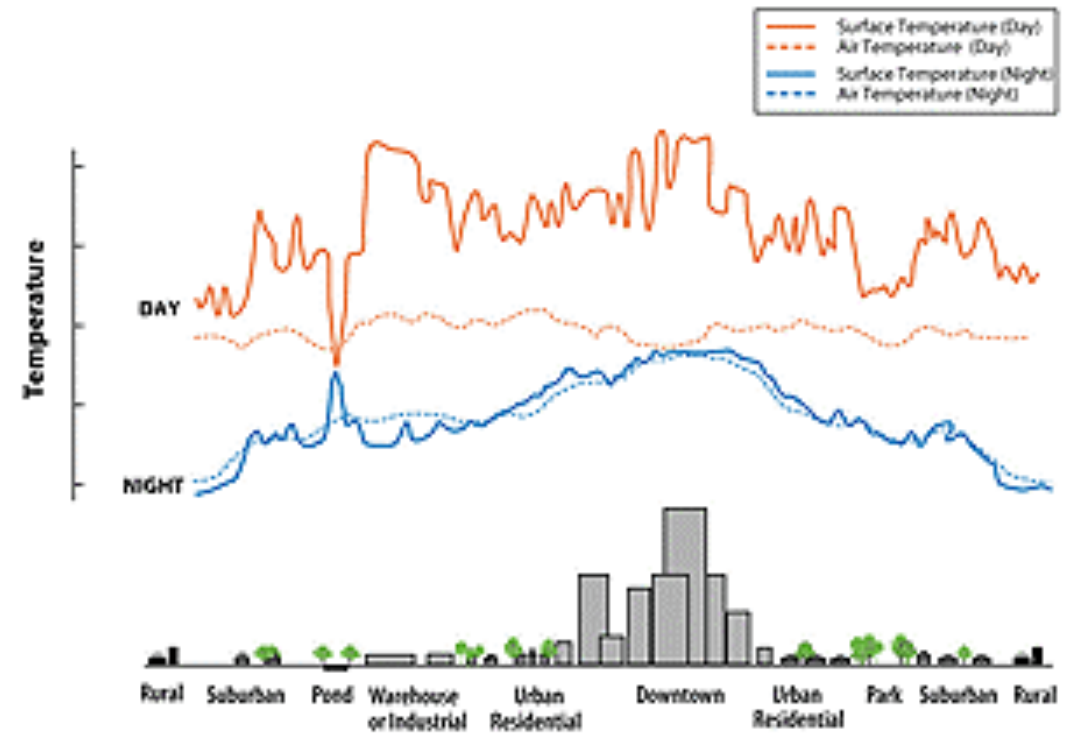
- Currently 50% globally lives urban
 - **Urban sprawl**- the creation of urbanized areas that spread into rural areas.
 - The four main concerns of urban sprawl in the U.S. are:
 - automobiles and highway construction
 - living costs (people can get more land and a larger house in the suburbs for the same amount of money)
 - urban blight (city revenue shrinks as people move to the suburbs)
 - government policies

Smart Growth

- Mixed land uses
- create a range of housing opportunities and choices
- create walkable neighborhoods
- take advantage of compact building design
- Preserve open space, farmland, natural beauty and critical environmental areas
- Provide a variety of transportation choices, cluster housing near transport
- Strengthen and direct development toward existing communities

Urban Heat Island Effect

- Urban areas tend to be warmer than the surrounding land
- Buildings, roads, and other infrastructure replace open land and vegetation
- exposed urban surfaces, such as roofs and pavement, can warm significantly in the sun creating overall warmer temperatures



Mining

- **Mineral Resource**: a concentration of naturally occurring material from the earth's crust that we can extract and process into raw materials and useful products
- **Ore**: rock that contains a large enough concentration of a particular mineral to make it profitable for mining
- **Reserves**: identified sources of minerals from which we can extract the mineral profitably at the current selling price
- **Overburden**: soils that are removed
- **Spoils**: piles of waste material created by mining

Types of Mining

- **Open-Pit Mining**: Machines dig very large holes and remove metal ore
- **Strip Mining**: Useful for extracting minerals lying in horizontal beds close to earth's surface
- **Contour Strip Mining**: Used mostly to mine coal on hill or mountainous terrain
- **Mountaintop Removal**: Explosives, earthmovers and other large machines are used to remove the top of a mountain to expose coal

Effects of Mining

- Wastewater and toxic sludge from processing are left behind dams which can overflow
- Water pollution from sediment and chemicals can occur
- Mountaintop removal can destroy forests and streams