Human Ecology

- The study of the interactions of humans with their environment
- Natural resources = any natural material used by humans
  
  2 Types
  1. Renewable
  2. Non-renewable

**Renewable Resources**
- Can be replenished (replaced) quickly by natural resources
  - Examples:
    - Water (if not polluted)
    - Air
    - Solar power (solar battery)
    - Wind power (electrical windmills)
    - Water power (waterfalls)
    - Reforestation?
    - Food supply (food crops)

**Nonrenewal Resources**
- Cannot be replenished (replaced) quickly by natural resources
  - Examples:
    - Fossil fuels, oil, gas, coal
    - Minerals
    - Metals (aluminum, silicon)
    - Trees?
    - Soil?

*Pollute environment & fill-up landfills

**Words To Know.........**
- **Sustainability** – using natural resources without depleting it or causing long term environmental harm.
- **Resource Depletion** - using resources faster than they are replenished.

**In what ways do humans negatively impact the environment?**

**Human Population Growth**
Recall Carrying Capacity?
- The number of species an environment is capable of supporting

How have humans been so successful?
- Humans have increased the carrying capacity of the environment again and again

ADVANCES.............

<table>
<thead>
<tr>
<th>Agriculture</th>
<th>Technology</th>
<th>Medicine</th>
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<tbody>
<tr>
<td>Better farming</td>
<td>Bigger, better, faster machines</td>
<td>Better health-care</td>
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<td>Machines replaced human labor</td>
<td>Chemical engineering: pesticides, fertilizers</td>
<td>Medicines (antibiotics)</td>
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<td>Man made fertilizers</td>
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<td>Treatments</td>
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Outcomes:
More food

Better, faster way of doing things; increased food

Increased survival (healthier), reduced death rate

Human Population Growth Results in
- Greater demand for more resources (energy, food, space)
- Adds stress to the environment!

The Weight of Human Population on Nature

1. Poor Farming Practices
2. Destroying Biodiversity
3. Direct Harvesting
4. Introduction of Foreign Species
5. Land/Water/Air Pollution

Negative Human Impacts
1. Poor Farming Practices

**Causes**
- Loss of topsoil
- Soil erosion
- Pesticide use
- Desertification

**Effects**
- Less rich nutrients for crops to grow
- Wearing away of surface soil by water, wind
- Toxic chemicals
- Land turns into desert by farming, overgrazing, & drought

**Goals/Efforts:**
- Contour plowing (reduces erosion)
- Cover cropping (replenish nutrients back into the soil so reduces soil erosion)
- Use natural predators (instead of pesticides)
- Use chemical- hormone traps for insects (reduce toxic pesticides)

Contour Plowing - plowing along the contours of the land to prevent or slow down soil erosion (the topsoil, fertilizers, insecticides, & bacteria from animal waste to be swept away by rainstorms to other land & water areas).

Cover Cropping

2. Destroying Biodiversity

**Biodiversity** - the sum total of a variety of all organisms in the biosphere.

**Loss of Biodiversity** results in loss of future “cures” - medicines & loss of
- Ecosystem diversity
- Species diversity
- Genetic diversity

**Causes**
- Deforestation – cut down trees for homes, malls, cooking, heating, crops
- Habitat Fragmentation - Splitting ecosystems into small, isolated “islands”
- Extinction & Endangered Species - hunting

**Effects**
- Leads to severe soil erosion that may prevent re-growth
- Reduces habitats & species
- Causes disappearance or decline in population size
Deforestation

3 Sharks Die Every Second From Habitat Destruction & Commercial Fishing

Medicines Come From the Living World

Goals/Efforts:
- Create National State Parks (prevent development)
- Reforestation (plant new trees)

3. Direct Harvesting (removal of species)

Causes
- Overhunting, fishing
- Overcollecting of exotic plants & animals
- Poaching – the illegal hunting, killing, & capturing of animals (elephants for tusks, rhinos for horns)

Effects
- Decline in some fish species (cod, haddock)
- Loss of species diversity (plant, animal) that may have useful traits
- Causes extinction of species
Wildlife Hunting

- Bison - Near extinction
- Passenger pigeon - Extinct 1914
- Carolina Parakeet - Extinct 1918
- Dodo - Extinct 1690
- Great Auk - Extinct 1844
- Bald Eagle - Endangered

Endangered

- **Habitat Loss/ Fragmentation
- Starvation
- Strict Diets
- Picky Mates
- Short Reprod. Cycle

Goals/Efforts:

- Pass & enforce laws
- Create National State Parks

4. Introduce Foreign Species to Non-native Areas

**Causes**
- Foreign organisms transported into new habitats
  - (invasive species)

**Effects**
- Pushes out native species
- Population increases & become pests because no predators to control it

Goal/Efforts:

- Pass laws to prevent foreign species into non-native areas

Gypsy Moth

- From Europe to U.S. in 1860s
- Was a major problem in Wisconsin, under controlled
- Problems:
  - voracious eaters (defoliate trees)
  - reduce outdoor recreation due to bare trees, caterpillar presence, & droppings of feces
  - loss of trees
  - few natural predators to keep them in check

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**Natural Controls: Predators**
- White footed mice
- Tiny non-stinging wasps
- Sapsuckers
- Fungal pathogen
- Nucleopolyhedrosis (NPV) - a virus specific to the gypsy moth
- Pheromone flakes (confuses males, reduced reproduction)

**Invasive Species**

- **Zebra mussels** (Native to Asia) - first seen in 1986, probably dumped by a European freighter. Reproduce rapidly & have no predators in North America (Great Lakes). Feed on algae & reduces the food source for native organisms (clams) & excretion increases water quality problems.

- **Nutrias** (Native to South America): overharvest (overconsume) killing the desirable plant species. Reduce food supply for muskrats & waterfowl. Introduce parasites (Flatworms).

- **The European Wild Rabbit**
  - 1 man released 24 rabbits in 1859
  - Over 100 years, Australia has been overpopulated by wild European rabbits
  - Estimated total population 200-300 million
  - 600 million dollars lost annually in agriculture
  - It is estimated in order to reduce the population, about 150 million rabbits need to be hunted per year
  - Have a high reproductive capacity
The Wild European Rabbit in Australia

Native to Spain (Europe)

Australian Rabbit’s Effect on Ecology

- Overgrazing & damage vegetation
- Degradation of land
- Soil erosion because they like to dig and eat the roots & seeds of plants. This causes the topsoil to be vulnerable exposed to wind erosion. It takes hundred of years to regenerate topsoil.
- Loss of species diversity (native plants & animals)

Erosion in South Australia Caused by the European Rabbits

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Measures Tried to Control Rabbit Population

- **Mechanical Control**
  - Fencing
  - Harbour destruction
  - Shooting
  - Trapping

- **Chemical Control**
  - Fumigants
  - Poisoning

- **Biological Control**
  - Myxomatosis
  - Rabbit calicivirus disease (RCD)
  - Immunocontraception

Efforts Are Aimed at Integrated Controls

This means using a combination of conventional and new control methods to maximize the reduction of rabbit damage.

Why Do You Think Biological Control Was Not As Effective?

Rabbits Developed Resistance
Invasive Species: Purple Loosestrife

A wetland plant. (Native from Europe & Asia). Invases marshes & lakeshores. Replaces other wetland plants which is a nonsuitable habitat for ducks, geese, & frogs. Reproduce fast (2 million seeds annually) & lack predators in North America.

Mile-A-Minute Weed
-an invasive plant that competes with other native species by blocking light.
- Reproduces fast

Effect
- reduces plant diversity in the area
- reduces other species’ habitat and their food

Treat
- Handpulling & weeding
- Weevil (beetle)

5. Land/Water/Air Pollution

Pollutant- a harmful material that enters the biosphere through land, air, or water

Air/Water/Land Pollution

<table>
<thead>
<tr>
<th>Causes</th>
<th>Results</th>
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<tbody>
<tr>
<td><strong>Air pollution</strong></td>
<td>smog, acid rain, global warming, ozone depletion, respiratory health problems</td>
</tr>
<tr>
<td>release of nitrates, sulfates, &amp; ash/dust from the burning of fossil fuels</td>
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<tr>
<td><strong>Water pollution</strong></td>
<td>Harmful bacteria, viruses, industry (heavy metals, PCB’s) into waters</td>
</tr>
<tr>
<td>domestic sewage, pesticides, fertilizers, run-off oil spills</td>
<td>Road run-off (oil, salts) into waters</td>
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<td>Ex: Water heat pollution (factories use river water for cooling machines) kills algae &amp; fish eggs</td>
<td>Farming (chemicals polluting water result in biomagnification)</td>
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<tr>
<td><strong>Land pollution</strong></td>
<td>Leaks into ground &amp; enter underground water supplies (wells)</td>
</tr>
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<td>pesticides, fertilizers, toxic chemicals</td>
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Goals/Efforts:
- Use less fertilizer
- Use genetically altered plants
- Use composting
  - organic wastes like yard trimmings, food wastes, & manures. Wood chips can be added to accelerate the breakdown of organic materials