

Environmental Pressures: Human Activities That Affect Population Size



The greatest threat to populations is the loss of suitable habitat.

Natural Rainforest



Australian rainforest

Deforested Rainforest



Rainforest burned for agriculture

Most habitat loss is caused by human activities.

A suitable habitat can be

- completely destroyed.
- fragmented into disconnected patches, such as near roads and railroad tracks.
- altered into unsuitable habitat.



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Complete Destruction of Habitat: Land Development

Residential



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Business



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Complete Destruction of Habitat: Mining

Environmental issues include:

- erosion of soil
- formation of sinkholes
- loss of habitat
- loss of biodiversity
- pollution



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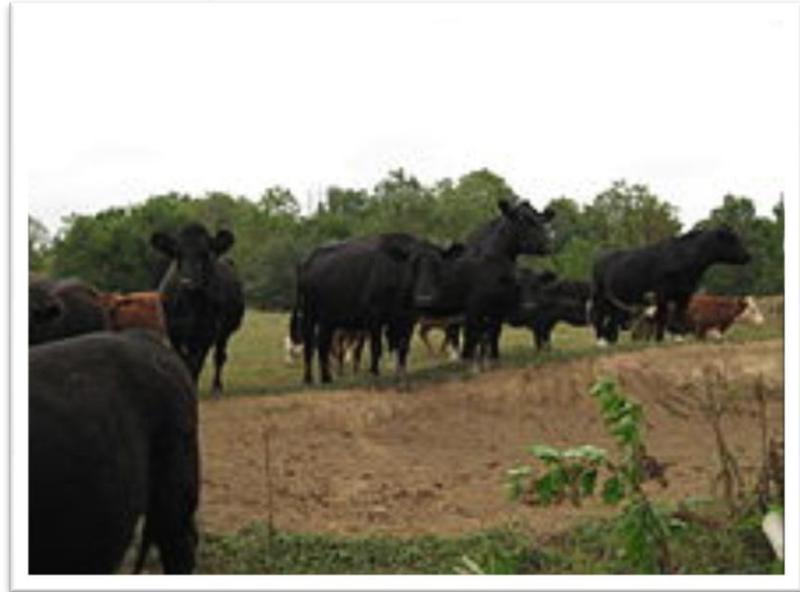
Complete Destruction of Habitat: Deforestation

Timber Production for Construction of Homes, Furniture, and Other Wood Products



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Cattle Production for Human Consumption of Beef

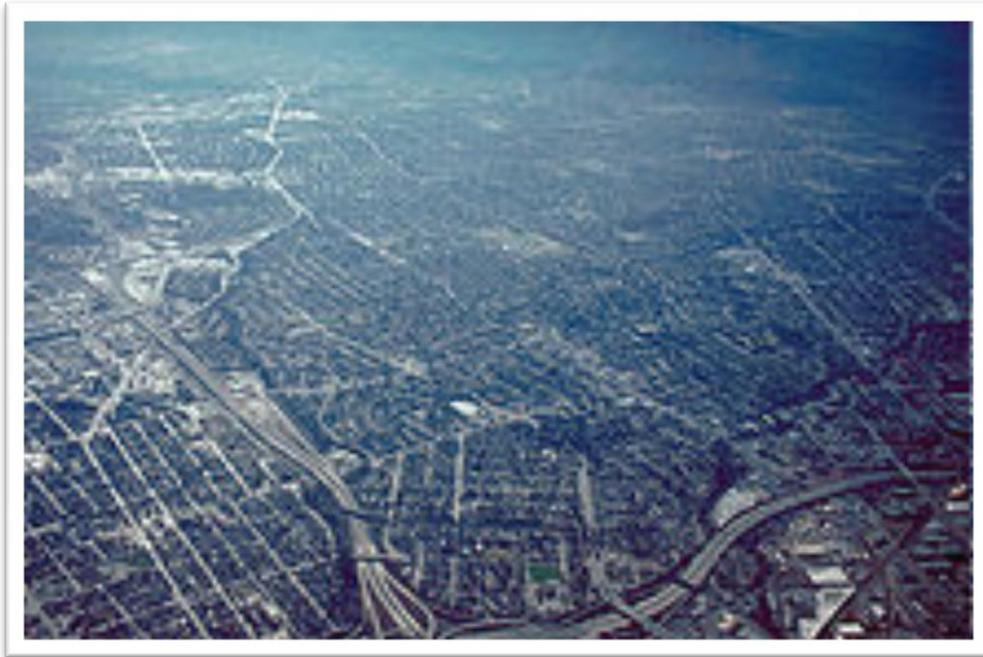


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Fragmentation of Habitat

- Disrupts the continuity of the habitat
- Increases extirpation of populations and species loss due to extinction
- Produces barriers to species movement
- Increases wild species' conflict with humans—often resulting in the species' destruction by humans for safety
- Affects all habitats

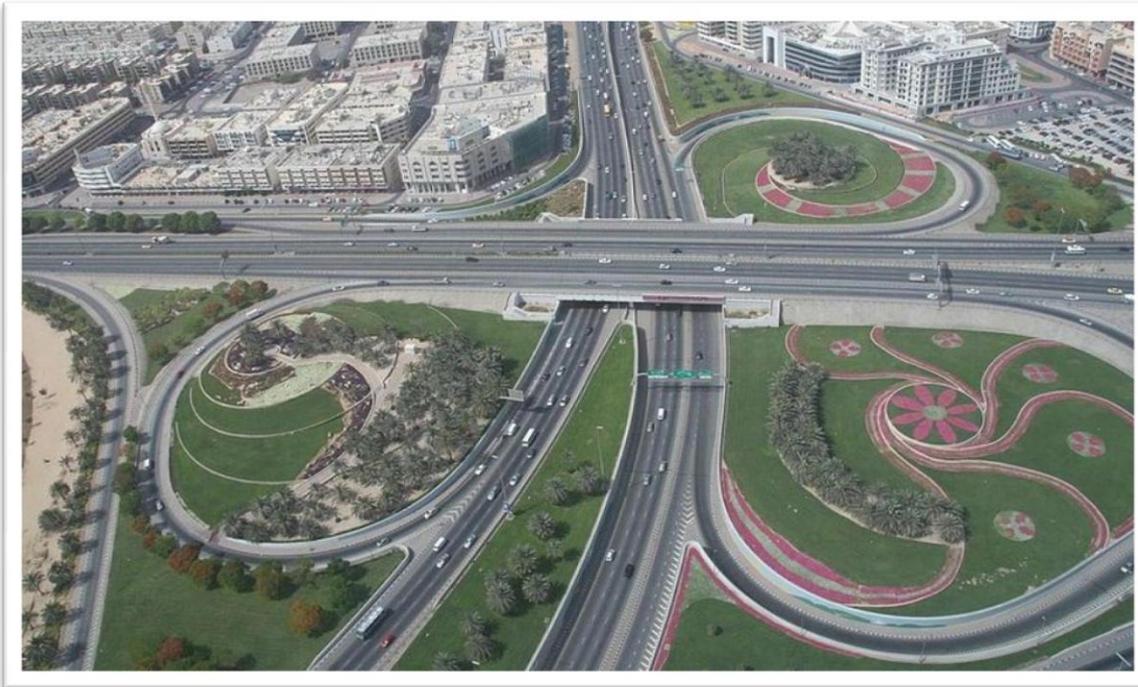
Fragmentation of Habitat: Housing Developments



This photo of San Jose, California, shows how the landscape is fragmented and the movement of many species is blocked.

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Fragmentation of Habitat: Highway Development

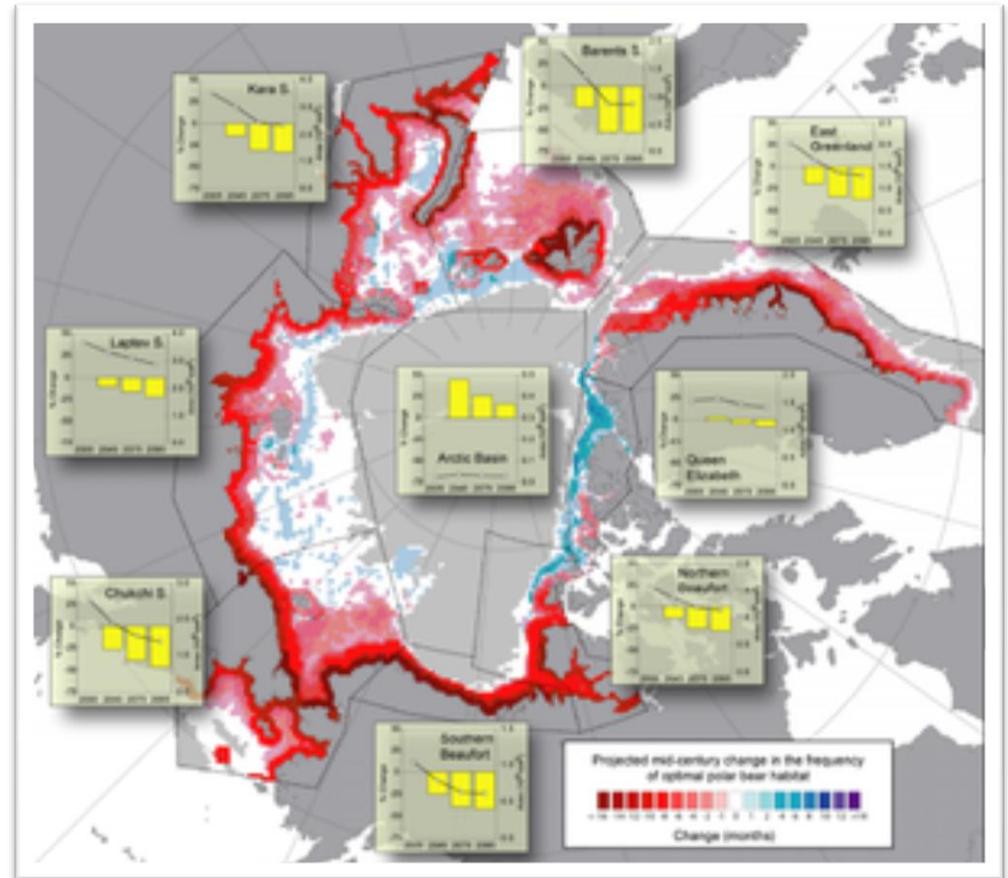


Highways, such as this one in Dubai, United Arab Emirates, are hazards for wildlife; they disrupt traditional migration routes, dispersal of young, and movement to find mates, not to mention the deaths caused by collisions with vehicles.

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Fragmentation of Habitat: Global Warming

The warming of Earth's atmosphere by human production of greenhouse gases (such as automobile exhaust and factory efflux) is believed to be causing the fragmentation of the Arctic polar ice cap. Polar bears rely on this ice for vantage posts from which to hunt for seals—their primary food. As the ice cap vanishes, polar bears have fewer places to hunt and could starve.



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This map from the U.S. Geological Survey shows projected changes in polar bear habitat from 2001 to 2010 and 2041 to 2050. Red areas indicate loss of optimal polar bear habitat; blue areas indicate gain.

Fragmentation of Habitat: Increased Conflict with Humans

Joggers in the California foothills have been attacked by cougars. Joggers are at risk because they often jog in the early morning, when cougars hunt, and running triggers the predators' instinct to chase.



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Alteration of Suitable Habitat: Alteration into Farmland



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The alteration of the land into farms to feed the human population takes habitat away from wild populations. The application of fertilizers and pesticides also causes problems for wild species: Fertilizers add nutrients to the soil and waters, promoting the growth of algae and bacteria, and pesticides kill target “pest” species but also affect the species that feed on those pests. For example, birds produced thinner eggshells after exposure to DDT, few young survived, and the species’ numbers dropped.

Alteration of Suitable Habitat: Alteration of River Courses



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Human alteration of river courses by construction of canals to facilitate barge traffic quickens the flow of water and destroys riparian (river) habitat. This photo shows the restoration of the Kissimmee River's (in Florida) original meandering course, thus restoring riparian habitat.

Alteration of Suitable Habitat: Damming of Rivers



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The construction of dams along the Colorado River flooded Glen Canyon and its tributary canyons, causing the fragmentation of habitat into islands and the extinction of many species that had not yet been studied by scientists. Glen Canyon was described by explorer John Wesley Powell as being more spectacular than the Grand Canyon. So many dams now exist along the Colorado River that its waters often do not reach the sea.

Other Human Activities That Affect Populations

- Recreational activities
- Overharvesting
- Introduction of nonnative species
- Feral domesticated species
- Urbanization

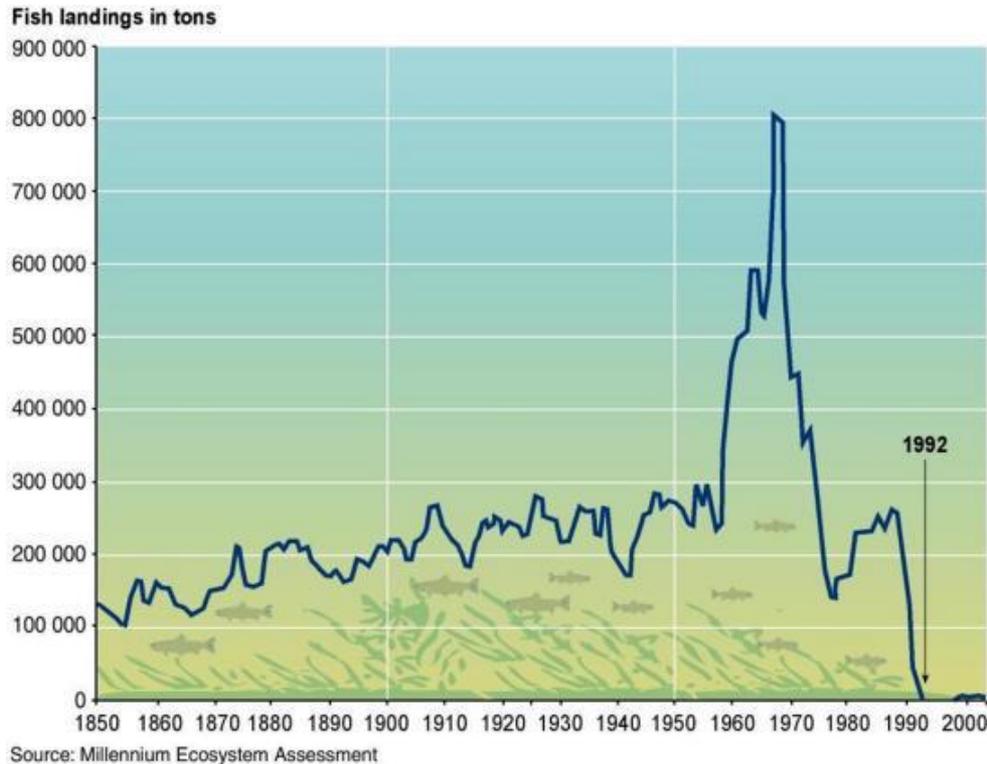
Recreational Activities



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Such recreational vehicles as ATVs, mountain bikes, and dune buggies not only kill desert tortoises by running over them, but they also destroy the fragile desert soil that grows the plants on which the vegetarian desert tortoise feeds. Along coastlines, the breeding of shore-nesting birds is also affected by recreational activities. Manatees are frequently killed or seriously wounded by the propellers of recreational boats.

Overharvesting: Food Sources



Overharvesting of species reduces population numbers dramatically. Atlantic cod stocks were severely overfished in the 1970s and 1980s, leading to their abrupt collapse in 1992.

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Introduction of Nonnative Species



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The brown tree snake was accidentally introduced into Guam, where it decimated populations of ground-dwelling birds. Other nonnative species have been introduced by humans intentionally for various reasons: sport hunting (rabbits in Australia and starlings in the United States), rodent control (mongooses in Hawaii and Jamaica), ornamental garden plants (everywhere), or nostalgia (opossums in Oregon). Such introductions usually result in population decline for the native species.

Feral Domestic Species



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Feral domestic cats—such as the one shown killing a native Australian cockatoo—deplete populations of native songbirds, insects, and rodents—not only jeopardizing these species’ survival but also the survival of the native predators that would normally feed on these species (for example, hawks). Such feral cats are the result of unchecked reproduction of farm “barn” cats or abandoned kittens resulting from unwanted pregnancies of pet cats. Other feral domestic species include (but are not limited to) dogs, pigs, gerbils, burros, camels, and horses.

Urbanization

Urbanization = the movement of people
from rural to urban areas

How does urbanization affect wild populations?

How Does Urbanization Affect Wild Species?

- habitat degradation (decreasing the quality of habitat)
- habitat loss
- road kills
- noise pollution
- light pollution



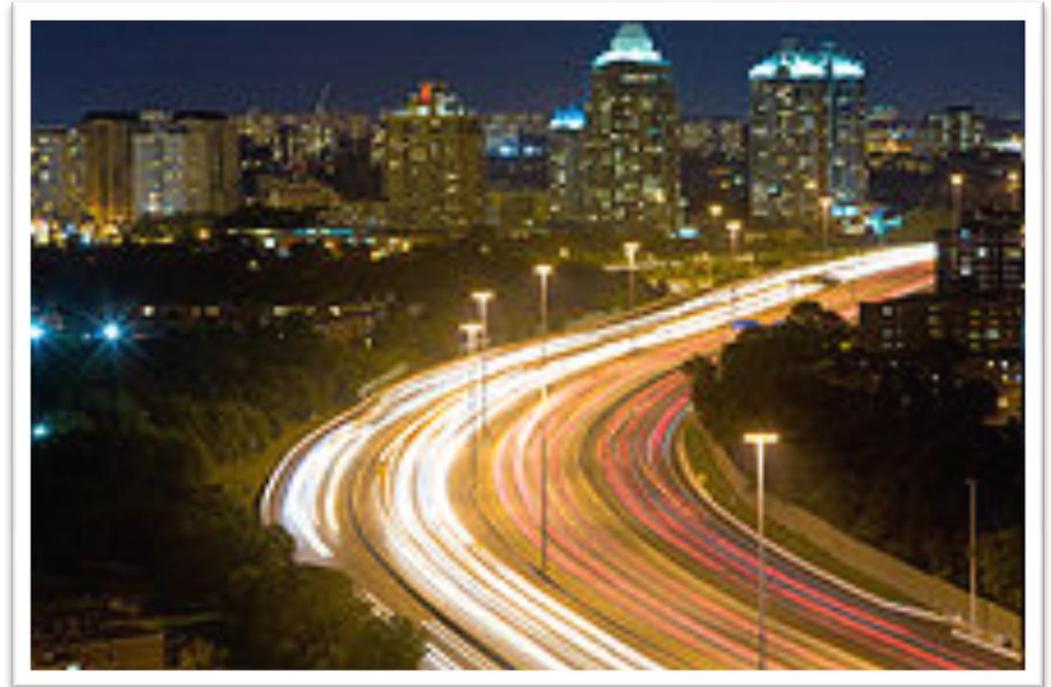
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Humans are increasingly using artificial lighting to illuminate the night sky.

This changes the nighttime light environment and can lead to ecological light pollution.

Ecological Light Pollution

- Chronic or periodically increased illumination, unexpected changes in illumination, and direct glare (from streetlights) have adverse effects on wildlife
- Can alter natural light regimes in terrestrial and aquatic environments



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Can you name some animals that might be at risk from ecological light pollution?

What are some possible consequences of ecological light pollution?

Animals at Risk from Ecological Light Pollution

- moths
- sea turtles
- fireflies
- owls
- bats
- frogs
- migrating birds
- salamanders and newts
- migrating fish



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Consequences of Ecological Light Pollution

- Changes in photoperiodic physiology
 - Changes in behavior
 - Disorientation/orientation toward light
 - Decreased survival
 - Decreased reproductive success
 - Decreased diversity
 - Changes in predator-prey relationships
 - Changes in mammalian melatonin production
- Lead to ecological disruption

Ecological Light Pollution and Birds

Birds migrating at night are strongly attracted to—or at least trapped by—sources of artificial light, particularly during periods of bad weather.

Approaching the lights of lighthouses, floodlit obstacles, communication towers, or lighted tall buildings, they become vulnerable to collisions with the structures themselves.



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Fatal Light Awareness Program: <http://www.flap.org/new/prefr.htm>

Lights Out Boston

Voluntary program that started in 2009—during the bird migratory season from March 28 through May 31.

During that time period, 47 commercial skyscrapers in downtown Boston agreed to diminish their lighting in accordance with the initiative during the spring bird migratory season.

Businesses dimmed or turned off all their architectural and internal lighting between 11 p.m. and 5 a.m. during the bird migratory season.

Lights Out Boston aims to:

- save energy.
- protect migratory birds.
- use energy more efficiently.

Sea Turtles and Night Lighting

- Hatchlings emerge from the nest at night.
- Instinctively, they are drawn to moonlight reflecting off the ocean.
- Beachfront night lighting can disorient them.
- Once misdirected, they are susceptible to predators, exhaustion, dehydration, and being hit and killed by cars.

Solutions:

- Mandatory lights out
- Recessed street lights



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Moths at Streetlights

- Moths are attracted to UV light from streetlights.
- Lights can act as a “light trap” for moths.
- This attracts small, fast-flying bats who prey on the moths.
- Many moth species have ultrasound detectors used to avoid bat predation. The presence of night lighting disrupts this sensor, and moths are more susceptible to bat predation.
- Leads to drop in moth population
- Decreased moth diversity

Type of Light Affects Flight-to-Light Behavior

Many species of moths are attracted to high-pressure mercury streetlights, as shown to the right (due to the presence of UV light, which most moths can see).

A conversion from high-pressure mercury lights to high-pressure sodium streetlight would reduce the total number to insects attracted by 55%.

Encasing streetlights with UV filters significantly reduces the number of insects attracted.



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Moths

Because moths are important pollinators and members of the food chain, their loss could have drastic ecological effects.



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Fireflies

In North America, there are 120 named species of fireflies, and there are thousands worldwide. However, there has been a worldwide decline of fireflies. Some possible causes are habitat degradation and loss, pollution, and ecological light pollution.



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There has been a worldwide decline in the firefly population. What can you do to help?

Become a citizen scientist and collect data to help scientists learn why firefly numbers are declining, as well as what can be done to reverse the trend.

Firefly Watch: <https://www.mos.org/fireflywatch>