



- **Sprawl reduces biodiversity by destroying and fragmenting undisturbed natural areas that provide habitat for species.**
- **As habitat disappears, species populations decline in numbers or are entirely removed from the ecosystem.**
- **Fire suppression, flood control, and other efforts to alter natural processes for the convenience and economic benefit of sprawling communities can change the entire composition of ecosystems.**
- **Government agencies and nonprofit organizations are working on the conservation of large, landscape-scale areas, using strategies designed to link networks of habitat and effectively manage ecosystems as whole units.**

Impacts of Sprawl on Habitat

Conversion of Land Use

Uncontrolled development of natural areas is second only to agriculture as the most prevalent form of habitat loss threatening endangered species in the U.S. Developers bulldoze and fill wetlands, build office parks in prairies, and flood deserts to create golf courses, erasing essential habitat for a multitude of species and natural communities. Habitat conversion to urban, suburban, or agricultural development is responsible for 2 to 20 percent of species loss in the lower 48 states.

- 83 percent of 98 threatened or endangered plant species are threatened primarily by habitat destruction through human activity.
- 27 critically endangered ecosystems in the U.S. have lost more than 98 percent of the area they occupied at the time of European settlement.

- One million acres of open space, including parks, farms, and natural areas are lost to sprawl each year.
- Only 10 percent of all imperiled species populations live on lands protected from development.
- 50 percent of the continental U.S. no longer supports its original natural vegetation.

Loss of habitat acreage leads to a decline in the abundance of a species, which reduces the genetic diversity within that species. This makes a species more susceptible to extinction, by making it less resistant to disease or catastrophic events. Habitat loss also reduces the potential for population maintenance or growth, as there is not sufficient area to support more individuals.

- The Florida panther has been reduced to a single population of 30 to 50 individuals; it has no other habitat into which the population can expand.

Hot spots—concentrations of imperiled biodiversity—often coincide with areas of rapid development and growth. Hawaii, the San Francisco Bay Area, the southern California coast, and the Florida panhandle all harbor astonishing degrees of biodiversity, but they are also the focus of some of the most intensive development pressures in the nation.

- 150 years ago, San Francisco Bay supported grizzlies, salmon, elk, deer, pronghorn antelope, and cougar.

Habitat loss is both quantitative—number of acres—and qualitative—degradation in the structure and composition of the habitat. Even areas of seemingly little human disturbance have had profound alterations since the beginning of European settlement. In many forested areas of the eastern U.S., total forest cover may now be greater than it was at the

Critically Endangered Ecosystems

- Southern Appalachian Spruce-Fir Forest
- Midwest Oak Savanna
- All Native Californian Grasslands
- Sagebrush Steppe in Intermountain

What is Being Done/ What Can Be Done

Ecosystem Conservation

Biodiversity conservation will depend on stemming the loss of habitat from development, fragmentation, and degradation. Isolated patches of intact habitat will not be sufficient to preserve biodiversity, so conservation strategies need to be implemented at the ecosystem level. A handful of public agencies and many nonprofit organizations are working on conservation of landscape-scale areas, using strategies designed to link networks of conservation areas and effectively manage ecosystems.

Government Initiatives

The U.S. Fish and Wildlife Service has adopted as its mission “the effective conservation of natural biological diversity through perpetuation of dynamic, healthy ecosystems.” This new approach is being used to plan for national wildlife refuges as links in a continuous landscape, rather than as discrete, isolated units.

Many states have policies and programs that promote open space preservation as well as local planning efforts that preserve natural communities. These initiatives foster urban renewal, establish zones for open space, and set up funds for the protection of existing natural areas, all of which result in less habitat lost to development.

- Maryland’s Rural Legacy Program will spend \$71.3 million over four years to create links among protected areas, establishing networks of wild lands.
- In 2000, California voters passed two bonds of more than \$4 billion to add ecologically significant properties to state parks and to restore and protect critical watersheds and rivers.
- In 1999, voters passed 90% of 102 ballot questions on protection of open space, generating \$1.8 billion in funds for open space preservation.

Following Oregon’s adoption of statewide planning codes in 1973, many other states have inaugurated smart growth legislation to curb sprawl. These acts and laws use urban growth boundaries, alternative transportation, and coordinated local planning to integrate open space preservation into all levels of government. In combination with increased spending on transportation alternatives, these policies work to renew the economic vitality of cities, drawing businesses and people back downtown and reducing pressure on undeveloped open space.

Nonprofit Conservation Efforts

Today, there are more than 1,210 local land trusts working to protect open space and wildlife habitat through direct land purchase or conservation easements. These land trusts, working in every state in the nation, have protected over 4.7 million acres of natural habitat from development.

- The Minnesota Land Trust has grown from a volunteer organization, focusing on Washington County in 1991, to a statewide operation with nine staff that has protected nearly 12,500 acres.
- The Montana Land Reliance holds conservation easements on over 26,500 acres in the Greater Yellowstone area, the world’s largest intact temperate ecosystem. In addition, elsewhere in the state, it has protected approximately 360,000 acres with conservation easements.

The Nature Conservancy is designing conservation plans for 63 ecoregions in the continental U.S. These plans identify the species and natural communities within each ecoregion. A list of conservation targets is developed and long-term goals are set, both of which then guide the design of natural area preserves.

Strategies for the conservation of these species and communities include land protection through acquisition and easements as well as partnerships with government agencies and private landowners.

Numerous other nonprofit organizations work to preserve remaining intact natural ecosystems and to reduce the rate and scale of development. Several conservation groups, such as the Wildlands Project, are now focusing their efforts on core protected areas that are connected by corridors. These corridors enable animals to pass through areas of more concentrated human use and development as they move between core areas. Corridors can be used to offset the effects of fragmentation on the movement of species, effectively enlarging their available habitat. Current projects involve protection and restoration of large-scale habitat in the American Southwest and in the Yellowstone-to-Yukon corridor along the northern Rocky Mountain chain.

- The Chesapeake Bay Foundation uses advocacy, restoration, and environmental education to protect and restore the health of the Bay. The group has been in existence since 1967 and has been instrumental in creating a coalition of government and business leaders from the four states in the watershed of the Bay.
- The network of “1000 Friends” groups in over two dozen states and cities uses education and advocacy to promote smart growth techniques to curb sprawl and rebuild cities.
- The Wilderness Society, the Sierra Club, and dozens of state and regional coalitions work to protect wilderness areas—areas that provide core habitat for many species.

end of the 19th century, but the diversity of species within those forests has been dramatically changed. The trees, plants, and soils are likely to have less variety and to support different communities of species than were present in the original old-growth forest systems.

Fragmentation

Natural communities can be fragmented by roads, power lines, rural subdivisions, or pipelines. This fragmentation reduces biodiversity without directly destroying a large amount of habitat, for an area of contiguous forest will support many more species and individuals than the same total area divided into several small patches. Species that have large individual home ranges, those that prefer unbroken landscapes, and those that do not disperse among discontinuous habitat patches, are less able to hunt for food, find mates, and find appropriate nest or den sites in fragmented landscapes.

- Forest breeding birds of the eastern U.S. require a minimum of 7400 acres of habitat to support viable populations.
- For many invertebrates and smaller vertebrates, a two-lane road presents an impassable barrier to movement between patches of habitat.

Many species will not use habitat near a road or other disruption in the land, even though that area of habitat is otherwise equal in quality to areas more distant from the road. This limits the species' potential range to an area even smaller than that delineated by the road or the opening in the habitat.

- Habitat within 100 meters of the edge of a forest is poor quality habitat for songbirds living in forests, and they have reduced reproductive rates in these edge areas.

Fragmentation increases the proportion

of edge to interior habitat patterns. The line where two habitat types meet is an edge, a specific niche exploited by several species which themselves can cause biodiversity loss. Brown-headed cowbirds, which live primarily on forest edges, are one source of biodiversity loss. These birds prefer to lay their eggs in other species' nests, leaving their hatchlings to be raised by those other species. Migratory songbirds, such as warblers and vireos, are often the unsuspecting hosts. Cowbird young are typically larger and hatch earlier than the nesting birds' eggs and thus out-compete the original hatchlings for food. In fragmented landscapes, birds' nests in the forest interior become more accessible to cowbirds, as the cowbirds follow edges further and further into the forest. Nest parasitism increases, and populations of the songbirds decline, often to the point of disappearing.

White-tailed deer also thrive in edge habitats, and their populations have exploded in recent years. These increased populations have a deleterious effect on the diversity of forest plant species. The deer feed largely on seedlings, saplings, and herbaceous plants, eliminating regeneration of some tree species and decimating populations of susceptible wildflowers and herbs. This not only reduces forest floral diversity—trilliums are a deer favorite—it reduces habitat and food sources for many animal species, reducing diversity of fauna as well.

Alteration of Natural Processes

Flood control projects and fire suppression are among the top causes of habitat loss. As humans encroach on natural areas, we (understandably) seek to protect our homes and businesses from the floods and fires that are part of natural ecosystem processes. As a result, the Corps of Engineers has straightened and deepened rivers and built levees and dams, in order to control flooding (as well as to provide

energy and facilitate transportation). These projects alter the hydrology and composition of aquatic and riverside communities, damaging or destroying habitat for species within those communities.

- Channelization and bank stabilization projects on the Missouri River have eliminated the river otter population from this waterway.
- The Willamette River in Oregon has lost 80% of riparian forests and shoreline habitats as a result of straightening and deepening the river channel.

By suppressing wild fires, the U.S. has dramatically altered the composition of its temperate forests and prairies. Prior to suppression, these ecosystems had frequent, low-intensity fires and a mosaic of diverse communities, supporting many different species. Fire suppression has reduced this diversity in two ways. First, a lack of frequent fires increases the "fuel" in the ecosystem, such as downed trees and low-lying shrubs and brush. This increased fuel means that any fires that do occur are likely to be more severe than in the past. Mature trees that could have survived a low-intensity fire succumb to these extreme blazes. Second, lack of fire results in a less complex landscape of communities. Longer intervals between fires allow the original mosaic of communities time to become more uniform in species composition, thus reducing biodiversity.

- As a result of suppressing the cyclical fires of the Florida panhandle, 98% of the longleaf pine forests there have disappeared.
- Lack of fire on Midwestern prairies and savannas has resulted in the loss of many of the native species of those communities.

Resources

- Alverson, W., Waller, D., and Solheim, S. "Forests Too Deer: Edge Effects in Northern Wisconsin." *Conservation Biology* Vol. 2., 1988.
- Benfield, F. Kaid, Raimi, M. and Chen, D. *Once There Were Greenfields*. New York: Natural Resources Defense Council, 1999.
- Hannah, L., Carr, J. and Lankerani, A. "Human Disturbance and Natural Habitat: A Biome Level Analysis of a Global Data Set." *Biodiversity and Conservation* Vol. 4, 1995.
- Land Trust Alliance website: www.lta.org.
- Lassila, K. "The New Suburbanites." *The Amicus Journal* Vol. 21, No. 2, Summer 1999.
- Mac, M., Opler, P., Puckett Haecker, C., and Doran, P., eds. *Status and Trends of the Nation's Biological Resources Vols. 1 & 2*. Reston, VA: United States Department of the Interior. United States Geological Survey, 1998.
- Millet, L. "Endgame for the Desert?" *The Amicus Journal* Vol. 21, No. 2, Summer 1999.
- Noss, R., LaRoe, E. and Scott, J. M. "Endangered Ecosystems of the United States: A Preliminary Assessment of Loss and Degradation." *Biological Report 28*. Washington, D.C.: United States Department of Interior, 1995.
- Robbins, C., Dawson, D. and Dowell, B. "Habitat Area Requirements of Breeding Forest Birds of the Middle Atlantic States." *Wildlife Monographs* Vol. 103, 1989.
- Stein, B., Kutner, L. and Adams, J., eds. *Precious Heritage: The Status of Biodiversity in the United States*. New York: Oxford University Press, 2000.
- "The Wildlands Project: Mission, Vision and Purpose." *Wild Earth Special Issue*, Spring 2000.



PHOTO COURTESY WALKABLE COMMUNITIES, INC.



Biodiversity Project
214 N. Henry St., Suite 201
Madison, WI 53703
608.250.9876
fax 608.257.3513
www.biodiversityproject.org