

# ZONING**PRACTICE** January 2007

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## **PRACTICE** HABITAT PROTECTION

# 1



# Habitat Loss: Global Crisis with a Local Solution

By Rebecca Retzlaff, AICP

Whether picnicking at a local park, taking a scenic bike ride through the country, whale-watching off the Pacific coast, or backyard bird-watching, our favorite pastimes would indicate that most people have a love affair with wildlife.

In fact, so much so that we spend billions on the roads that take us into the hinterlands and even more to secure beachfront property or neighborhood access to wetlands—and all of it so we can connect with the animals in their natural habitat.

From the perspective of many animals, however, the relationship with humans smacks more of dysfunction than mutual love

needs of a wetland community differ vastly from those of a terrestrial community.

This issue of *Zoning Practice* discusses the role of zoning in habitat and species protection. The first section will digest the latest species and habitat information that planners and municipal and elected officials can use to provide a technical and scientific basis for zoning ordinances. The second section provides municipal

Many of the activities that lead to habitat and species losses are at least partially under the control of municipal regulations and programs. The most frequent causes of species extinction are:

- interaction with non-native species;
- urbanization, agriculture, and tourism and recreation development;
- ranching and livestock activities;



Klaas Lingbeck-van Kranen



Debra James

ⓘ Development must be carefully balanced with nature to avoid conflict between wild animals and humans, putting both at risk. (Left): An alligator on the sidewalk of a Florida neighborhood. (Right): A white-tailed buck lost on a suburban street.

affair. Urbanization, road and utility construction, and the presence of humans and domestic animals has led to extreme biodiversity loss, species endangerment or extinction, proliferation of non-native species, and habitat fragmentation. When humans “connect” with nature, the benefits are hardly reciprocal; for the animals it often means ruin.

Planners can help protect species and habitats through zoning tools such as zoning districts, overlay zones, and density bonuses, but they first need to understand the habitat requirements of the species needing protection, including habitat location and level of sensitivity. For example, the

examples of species and habitat protection through such zoning mechanisms as overlay zones and sensitive areas ordinances, and through species-specific regulatory tools, including fencing and lighting ordinances.

## THE ROLE OF ZONING

Much of the discussion about species and habitat protection has to do with federal laws such as the Endangered Species Act and the National Environmental Policy Act. While the federal policies are crucial, local governments play equally important roles in the protection of habitats and endangered and threatened species.

- dams and reservoirs;
- modification of natural fire regimes;
- pollution;
- oil, gas, and mineral extraction;
- industrial and military activities;
- harvesting and logging; and
- road building.

Because local governments control both development and land-use regulation they are better suited to protect some species and habitats with tools that are unavailable to state and federal governments. This is especially true in today's fed-

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### About the Author

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eral culture of deregulation, environmental policy regression, and inadequate funding for environmental protection.

### HABITAT AND SPECIES INFORMATION

There is no one-size-fits-all zoning toolbox for habitat and species protection because of the sheer variety of habitats and species. In Brevard County, Florida, sea turtles need the protection of beachfront lighting ordinances during breeding season to avoid disorientation of nesting females and hatchlings.

quality initiatives. The next section reviews the information sources that are available to planners drafting habitat- and species-specific zoning regulations.

**Natural Heritage Program.** The Natural Heritage Network, a coalition of natural heritage programs, began with the first state Natural Heritage Program (NHP) in South Carolina in 1974. Since that time, Natural Heritage Programs have been established in every state, the Navajo Nation, 10 Canadian provinces, and 19 Latin American and

include taxonomy, species distributions, relative rarity/abundance, population trends, and habitat requirements. Community-level data include vegetation structure and composition, disturbance regimes, and spatial distribution. The major types of information included in NHP data are listed in the table on page 4.

Planners need to be aware of several limitations of NHP data. First, the data contain holes that can result in false negatives—the absence of an occurrence in the data does not

necessarily mean that nothing significant exists. The likely reason is that no data exist for that area. NHPs typically use data collected by others for other purposes. Indeed, the data are biased toward well-surveyed areas such as those around universities, roads, and field stations. Secondly, the data are based on point locations of



⤷ (Clockwise from left) Major contributors to habitat loss: heavy industry (this is a coal plant); dams and reservoirs (Lake Tuscaloosa Dam in Alabama); new road infrastructure (the speck on the bottom right is a rabbit); and clear-cutting (this on a mountainside along the Pacific coast).

Similarly, Florida provides “wildlife crossings” over expressways to secure the migratory patterns of large mammals such as the Florida panther. In the West, fencing ordinances like those in Routt County, Colorado, guarantee pass-through access for wildlife (the alternative is entanglement and death). The zoning tool that will protect wildlife and habitat depends on species need, of course. So planners should study the data before drafting the regulations.

Unfortunately, most cities lack staff expertise on these issues, and limited funds often go instead to water supply and water

Caribbean countries. NHP was created to help set priorities for conservation by providing data on rare, endangered, or exemplary species or ecosystems, and to help reduce or avoid damage to biological resources that might result from land use and economic development policies and programs. The program provides detailed local information on plants, animals, and ecosystems to better inform natural resources management and land-use decisions.

NHP data are collected from local, state, and federal agencies, and from universities and citizens. Species-level data

rare species and community types and so emphasize plant populations, small animals, and narrowly defined community types that are easy to map. Locational precision is difficult for species with wide habitat ranges (many large mammals) and species with low population densities. Also, many species rely on multiple habitat types, such as forests and wetlands, and those landscape gradients are not adequately represented in NHP data. The third problem with NHP data is that they heavily emphasize rarity, and rarity does not necessarily mean that the species is vulnerable to extinction.

## MAJOR TYPES OF NATURAL HERITAGE PROGRAM DATA

Type of Data	Description
Elements	A unit of biodiversity, generally species or ecological communities.
Element Occurrences	An element at a specific location; generally delineated species population or ecological community stand.
Trends	Ecological or population trends
Sites	A land unit of ecological, scientific, or conservation interest.
Managed Areas	A land unit under protective or potentially protective natural resource management.
Tracts	A cadastral (land ownership) unit and its surface boundaries, generally used for site protection planning.
Sources	A source of information documenting data included in any of the above (e.g., literature citation, field notes, museum collection, photograph, satellite image, etc.).

Source: Stein, Bruce A. and Frank W. Davis. 2000. "Discovering Life in America: Tools and Techniques of Biodiversity Inventory." *Precious Heritage: The Status of Biodiversity in the United States*. Eds. Bruce A. Stein, Lynn S. Kutner, and Jonathan S. Adams. New York: Oxford University Press.

**GAP analysis.** GAP analysis will supplement NHP inventories. These programs are proactive, ecosystem-level approaches to biodiversity protection and conservation that select priority sites. GAP analyses are carried out through research centers, state and federal agencies, and universities throughout the country.

GAP analysis assesses the representation of vegetation types and species in protected areas using satellite imagery, vegetation data, and wildlife habitat association models, and creates geographic information system (GIS) maps of ecosystems. The goal is to identify gaps in the protection of represen-

tations of species and ecosystems and hot spots of biodiversity and species richness.

Vegetation mapping is the fundamental data layer for GAP analysis. GAP analysis also uses species range maps and species richness maps. Other layers for GAP analysis are aquatic, wetlands, rare species, and land ownership and management status, which categorizes the management status of each land parcel into one of four classes. The first category includes areas that are managed for natural values such as most national parks, Nature Conservancy and Audubon Society preserves, and some wilderness areas and national wildlife refuges. The second category of management status includes areas that are generally managed for natural values but also receive some uses that degrade the natural environment, such as most wilderness areas, national wildlife refuges, and Bureau of Land Management (BLM) areas of critical environmental concern. The third management category includes lands with some legal mandate for conservation but many potentially damaging uses, such as national forests, BLM lands, and state and local parks. The fourth category includes private and public lands without legal mandates to protect or manage the natural environment.

Planners need also be aware of the limitations of GAP analysis data. One major limitation is that the data provide a landscape-level approach to analyzing environmental information, and therefore are light on detail. Habitats smaller than the minimum mapping unit, which

is normally between 100 and 200 hectares, are not shown on GAP analysis maps. Also, there are no differences between serial stages of forests, and ecotones between vegetation types are not included. Put simply, the lines that divide vegetative communities on GAP analysis maps are defined; on the ground they are much less so. Furthermore, species distribution maps are only predictions; they have not been verified in the field. The analysis also ignores habitat quality. GAP analysis maps are produced at a scale of 1:100,000 to 1:500,000—too large for precise land-use decisions. They can, however, be helpful to planners in approximating areas of concern or areas for future study.

**U.S. Fish and Wildlife Service.** Habitat conservation plans and recovery plans prepared for or by the U.S. Fish and Wildlife Service (FWS) (for aquatic species, the National Marine Fisheries Service) under the requirements of the federal Endangered Species Act (ESA) are a good source of information about some federally listed threatened and endangered species. Recovery plans identify the critical habitats of species, site-specific management actions, objective and measurable criteria for recovery, and cost estimates to carry out the plan.

ESA recovery plan information is valuable for identifying the habitat requirements of species with approved recovery plans. But as with other sources of habitat data, planners need to be aware of its limitations. Few listed species have recovery plans in place (by one estimate, only about 40 percent of the species listed as "threatened" or "endangered" have approved recovery plans). Furthermore, experts estimate that hundreds, if not thousands, of data-supported threatened or endangered species have not been listed. So, while ESA provides valuable information for certain species, it should be supplemented with other information.

**Other data sources.** The U.S. Fish and Wildlife Service's National Wetlands Inventory provides information on the characteristics, extent, and status of wetlands and deepwater habitats. Other types of data, such as topographic maps and aerial photographs, are available from the TerraServer website at [www.terraserver.com](http://www.terraserver.com). The National Atmospheric and Oceanic Administration (NOAA) can provide planners with data about land cover change, habitats, and species in coastal zones at [www.noaa.gov](http://www.noaa.gov). The U.S. Geological Survey ([www.usgs.gov](http://www.usgs.gov)) has data on daily stream flow conditions, flooding and



Phillip Clay Wilkerson

➡ Protection cannot wait for federal mandates. The State of Florida has taken steps to protect the treasured but endangered Florida Panther.

high water flows, earthquake data, groundwater, and much else. The Nature Conservancy ([www.nature.org](http://www.nature.org)) has developed eco-regional plans for many regions of the United States. Also helpful to planners are the state biodiversity plans from Florida, Maryland, and New Jersey that map important conservation areas.

## ZONING APPLIED

After planners have identified critical and sensitive habitats and species, they should begin drafting the zoning regulations. Because of the diverse needs of species and habitats, prescriptions for a universal solution are impossible. Still, commonly used zoning tools to carry out protection goals will have some benefit almost anywhere. Such tools include sensitive areas districts, overlay zones, critical area designations, and design review requirements. Other zoning methods are tailored to the needs of specific habitats and species, including fencing controls, river corridor protection regulations, buffer zones, and tree protection ordinances. The following section digests most major zoning



Brian Hodson



Amy Walters

🕒 Zoning controls are localized to account for climate, topography, ecosystems, and other variables. Two such examples where the development pattern looks the same but where the zoning would be quite different: (left) new homes creep up the side of a mountain in the American Southwest, and (right) a suburban subdivision appears to be carved out of the hardwood forest on a hillside.

tools used today by planners with examples from cities and counties around the country.

**Zoning districts.** Zoning districts can protect species through use, density, performance, and design. For some habitats and species, prohibiting certain use types—for example, industry—may be all that is needed for protection. Other habitats and species will undoubtedly require a more severe limitation on the number and intensity of uses.

Shasta County, California, has a well-regarded zoning district approach to habitat protection. The county's habitat protection district protects lands that have significant wildlife value. Site development standards include flexible densities, which are determined after the proximity of the proposed development to the sensitive area is known. Except in the most sensitive habitat areas, residential densities are one unit per acre. Densities may be increased if the development is clustered or if the developer includes other habitat protection measures. The clustered lots must be sited to reduce the impacts of the development on critical wildlife habitat components, such as watering sites or thermal areas.

The maximum residential density is five units per acre in the most sensitive habitat areas. Residential clustering and other habitat protection measures are required for all developments to the degree necessary to mitigate the impacts to the sensitive area.

**Overlay districts.** Overlay districts are more common than habitat zoning districts because of the relative convenience of applying an additional set of issue-specific regulations to an existing area (district(s)). Tucson's environmental resource zone (ERZ) protects critical and sensitive wildlife habitat in eastern Pima County near Tucson's public lands (Saguaro National Park, Coronado National

Forest, and Tucson Mountain Park). The city began the planning process by mapping critical wildlife, sensitive areas, riparian areas, and resource corridors. All new development proposals and subdivisions in those areas must undergo planning and zoning review for compliance with the overlay zoning designation. Applicants have two options for development under the ERZ overlay zoning regulations: They can choose not to build in the 100-year floodplain—a sizable area in arid Arizona—or they can complete a study of the corridor that includes an environmental resource report and a mitigation plan. Aside from those two choices, preservation of all of the critical riparian habitat areas within the resource corridors is required.

The overlay district also includes requirements for roads, bike paths, and sidewalks in critical riparian habitat areas. Roadways and paths are normally prohibited in critical areas, but when essential they have to cross the habitat area—they cannot run parallel to it—to minimize damage. They are also permitted only at the narrowest points. Utilities must be placed underground. Damage to vegetation from development in the critical area should be restored with plant material salvaged from the site. The ordinance also includes standards for lighting, fencing, and variances.

The Tucson ordinance is a good example of how cities can use data and natural resources maps to draft a policy that targets specific critical habitats and species. Planners in Tucson found that the critical and sensitive areas were not isolated to a few sites but were linked to corridors that serve as important migratory routes and help preserve gene pool interactions.

Marin County, California's overlay district for habitat and species protection—the

## GLOSSARY

**Biodiversity:** The variety of life and its processes which includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur (*PAS Report 521/522*).

**Critical Area:** Includes the following areas and ecosystems: (1) wetlands; (2) areas with a critical recharging effect on aquifers used for potable water; (3) fish and wildlife habitat conservation areas; (4) frequently flooded areas; (5) geologically hazardous areas; (6) ponds and lakes; and (7) streams, creeks, and rivers (*Skamania County, Washington*).

**Ecosystem:** The interacting system of biological community and its non-living environmental surroundings (*PAS Report 521/522*).

**Endangered Species:** Any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of this Act would present an overwhelming and overriding risk to man (*U.S. Federal Endangered Species Act*).

**Habitat:** The physical location or type of environment in which an organism or biological population lives or occurs (*PAS Report 521/522*).

**Threatened Species:** Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (*U.S. Federal Endangered Species Act*).

Bay Front Conservation Combining District—helps prevent the destruction of habitat and the deterioration of environmental quality and maintains options for further restoration of former tidal marshlands. A key provision of the district is that applicants must complete an environmental assessment before filing an application for development on any undeveloped, agricultural, or redevelopable (infill) land within the district.

The district has three subzones: a tidelands subzone that includes areas subject to tidal action (salt marshes, beaches, rocky shorelines, and mudflats), a diked bay marshland and agricultural subzone for historic bay marshlands diked off from tidal action and/or filled and converted to agriculture and urban development, and a shoreline subzone for a few shoreline areas where main roads follow the coastline. The zoning ordinance has specific development standards for each of the subzones.

The district also includes design guidelines to prevent encroachment into wetlands and sensitive wildlife habitats, restrict access to environmentally sensitive marshlands, create buffers between wetland habitats and developed uses, and minimize the removal of vegetation.

**Density bonuses.** Density bonuses can encourage developers to protect sensitive habitats and species. Routt County uses maps prepared by the Colorado Department of Natural Resources to determine the location of critical habitats, including the habitats of threatened or endangered species. The county provides a density bonus to developers who protect sensitive areas and meet several standards, including: (1) Avoiding areas used by threatened or endangered species if those areas are critical to survival or production; (2) avoiding critical winter habitat of elk, deer, moose, bald eagle, golden eagle, sharptail grouse, and sage grouse; (3) locating development to permit wildlife movement and migration of elk, deer, and moose, and maintaining wildlife corridors of such animals and avoiding fragmentation of habitat; (4) avoiding areas that are critical for wildlife production; and (5) limiting wildlife harassment by domestic predators.

The regulations include specific methods to assure fulfillment of the objectives. For example, to be certain that critical wildlife production areas are avoided (number four) the ordinance requires either limiting development within production areas (including mating, nesting, rearing, calving, fawning, leks, or staging areas) or entering into a wildlife mitigation plan agreement. To avoid disruption of

the critical habitats (number two) the regulations require restricting activities including construction, maintenance, and special events to avoid seasonally sensitive habitat and limiting development in the area or entering into a wildlife mitigation plan agreement.

In addition to density bonus provisions, Routt County requires developers to protect wildlife through a set of specific mitigation techniques in specified critical areas. Some of those mitigation techniques include buffer zones, domestic predator control, retaining existing vegetation, fencing requirements, developing additional or improved habitat to

limited development area (LDA), and resource conservation area (RCA). LDA is the most intensive land-use designation in the critical area and includes areas with housing densities greater than four dwelling units per acre; concentrations of industrial, institutional, or commercial uses; or developments in which public sewer and water collection and distribution systems currently serve the area.

LDA districts are developed with low- or moderate-intensity uses, and contain areas of natural animal and plant habitat. RCAs are characterized by nature-dominant environments such as wetlands, forests, and agricul-

#### FEATURED HABITAT PROTECTION ORDINANCES

- **Benton County, Oregon, Sensitive Fish and Wildlife Habitat Overlay Zone:**  
[www.co.benton.or.us/development/Dev\\_Code/ch\\_87.pdf](http://www.co.benton.or.us/development/Dev_Code/ch_87.pdf)
- **Bothell, Washington, North Creek Fish and Wildlife Critical Protection Area:**  
[www.mrsc.org/mc/bothell/Title12/bothel1252.html](http://www.mrsc.org/mc/bothell/Title12/bothel1252.html)
- **Marin County, California, Bayfront Combining District:**  
[http://municipalcodes.lexisnexis.com/codes/marincounty/\\_DATA/TITLE22/Chapter\\_22\\_14\\_SPECIAL\\_PURPOSE\\_.html](http://municipalcodes.lexisnexis.com/codes/marincounty/_DATA/TITLE22/Chapter_22_14_SPECIAL_PURPOSE_.html)
- **Routt County, Colorado, wildlife protection regulations:**  
[www.co.routt.co.us/sections.php?op=viewarticle&artid=80914](http://www.co.routt.co.us/sections.php?op=viewarticle&artid=80914)
- **Shasta County, California, Habitat Protection District:**  
[www.co.shasta.ca.us/departments/resourcegmt/drm/Zoning\\_Plan\\_PDF/1714.pdf](http://www.co.shasta.ca.us/departments/resourcegmt/drm/Zoning_Plan_PDF/1714.pdf)
- **Tampa, Florida, Upland Habitat Overlay District (ch. 17.5, art. V):**  
[www.tampagov.net/dept\\_land\\_development/zoning/LandRegulations.asp](http://www.tampagov.net/dept_land_development/zoning/LandRegulations.asp)
- **Tucson, Arizona, Environmental Resource Zone:**  
[www.tucsonaz.gov/planning/codes/luc/lucweb/Art2div8.html#P1424\\_85473](http://www.tucsonaz.gov/planning/codes/luc/lucweb/Art2div8.html#P1424_85473)

compensate for habitat loss, and providing bear- or rodent-proof trash containers.

**Critical areas.** Some critical area regulations are prompted by state or federal plans or legislation, such as multiple species recovery plans under ESA, sensitive area planning requirements—Washington State has these—or multi-state programs such as the Chesapeake Bay Program.

Chesterton, Maryland, passed the Critical Areas Act because of the state’s Chesapeake Bay Critical Area Protection Program. Affected jurisdictions were required by the state to develop and implement a critical area implementation program.

While Chesterton’s Critical Areas Act and related criteria are separate from the community’s zoning ordinance, the purpose is to “implement special zoning regulations and measures designed to protect and enhance water quality and habitat resources located within Chesterton’s critical area.”

The critical areas ordinance established three districts: intensely developed area (IDA),

tural areas, existing density less than one dwelling unit per five acres, or the dominant land use in agriculture, wetland, forest, barren land, surface water, or open space.

The ordinance includes development standards that are specific to each district. Because LDA and RCA districts include the most sensitive environments they have the strictest development regulations. All development applications in these areas must identify environmental or natural features of the site, and development must be designed to protect the identified habitat areas. Roads, bridges, and utilities must be located to avoid disturbing the sensitive areas. Requirements to protect the tree canopy and threatened or endangered species are also included in the ordinance. All development applications must also include identification of element occurrences from the state NHP database.

Bothell, Washington, also does sensitive-area zoning through critical area requirements in accordance with the state’s Growth Management Act. In the North Creek Fish and Wildlife Critical

Protection Area all development applications must include a fish and wildlife study prepared by a qualified biologist. The study must determine the location of all fish and wildlife habitats, evaluate the species present, discuss measures that must be taken to avoid impacts to habitats, and identify management practices to protect the habitats in the future.

A 2006 study commissioned by the city to determine the impact of the zoning designation on the North Creek Habitat Area concluded that the low-density residential development required under the designation has had a beneficial effect on streams and associated wildlife. The zoning designation protects native forest cover and limits impervious surfaces only indi-

Tampa, Florida's Upland Habitat Overlay District is designed to protect xeric and mesic plant communities and wildlife habitat associated with them. According to the ordinance most of the original upland habitat has been replaced with development, and the ordinance protects the last remaining communities. Development in the overlay zone is prohibited until the developer attains approval of a site-specific upland habitat plan. Similar to the Benton County example, Tampa's ordinance includes requirements tailored to the needs of the natural community, such as policies to prevent habitat fragmentation, rules against building new roads, wildlife crossings for roads, on-site (in some cases, off-site) preservation of

ies suggest that by the middle of the century one quarter of the species on the planet will be jeopardized by climate change unless current trends are reversed.

- An estimated one plant species in eight worldwide is threatened with extinction.
- An estimated 30 percent of freshwater fish species worldwide may be extinct by 2020.
- Land-use changes that cause habitat loss are associated first with expansion of agriculture and secondarily with the expansion of urban areas and infrastructure.

The natural world needs many innovative approaches to solve as complex a problem as biodiversity loss. It continues to need federal regulations with dedicated funding sources and viable implementation plans, state laws for sensitive areas planning requirements and statewide biodiversity plans, and local habitat and species zoning regulations. Planners are the vital local link in the chain of protection that can reverse the despairing trend of biodiversity loss.

🔗 Planners need to do their homework before crafting species-specific regulations. An overlay zone in Benton County, Oregon, accommodates the needs of a variety of protected and endangered species, including the spotted owl (left), osprey (middle), and great blue heron (right).



Paul Semczuk

Gord Home

David Hutchison

Cover photo by Miguel Angelo Silva. Great blue heron standing over a reef at a beach.

rectly, however. The study showed that the zoning district is not large enough to counteract the effects of impervious surface coverage in the region's greater watershed. The recommendations of the study included similar regulations and new, low-impact development requirements throughout the watershed.

**Species-specific requirements.** The regulatory nuances of species and habitat protection mechanisms depend largely on the needs of the species. For example, Benton County, Oregon's, Sensitive Fish and Wildlife Habitat Overlay Zone is designed to protect nesting, roosting, and watering sites for certain bird species. The overlay zone applies to all areas where the northern bald eagle nests or roosts, where spotted owls and osprey nest, to great blue heron rookeries, and band-tailed pigeon springs. It also applies to areas within 600 feet of a great blue heron or band-tailed pigeon mineral spring, or within a quarter mile of a northern bald eagle nest or roosting site or spotted owl or osprey nest. Development standards to protect the birds include protections against tree removal, submittal of an impact report, and development of a site-specific management plan.

species and habitat, and stricter requirements for essential upland habitat where threatened, endangered, or sensitive species live.

#### IN SUMMARY

Habitat and species protection is not a standard part of code writing. But that sad reality does not negate the urgency surrounding the issue, nor should it prevent planners and code writers from considering the following:

- The world is losing biodiversity more quickly than ever in human history and there is no sign of this process slowing down.
- Human activity has increased the extinction rate by at least 100 times the natural rate of extinction. The natural extinction rate during periods of normal extinction is about an average of one species every four years.
- Twelve to 52 percent of species within well-studied higher taxa are threatened with extinction. However, less than 10 percent of named species have been assessed in terms of their conservation status, so the actual rates for extinction are unknown.
- Some of the newest threats to biodiversity come from global climate change. Recent stud-

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IS IT TOO LATE TO SAVE  
THE PLANET?

