

VANISHING ACTS: TREES UNDER THREAT



INTRODUCTION

Why Save Endangered Trees?

As we walk through the world every day, we are surrounded by trees and plants. They are so ubiquitous and common that we take them for granted. They are part of the daily fabric of our lives, growing in our yards, lining our streets, enhancing our parks, and forming the framework for our adventures in nature. We depend on plants for food, wood for fuel and shelter, a wide variety of products such as rubber and paper, and for beauty and solace. Fossilized plants in the form of coal and oil power our society, and nearly half of all of the medicines in current use are based on substances derived from plants. And of course, plants are necessary for the oxygen in the very air we breathe.

Hikers pushing through brush in North American woodlands or exploring the dense rainforests of the tropics might feel that there is such a diversity and abundance of plant life that there could never be such a thing as an endangered plant. There is, indeed, a tremendous diversity of plant species in the world. Recent estimates from the Royal Botanic Gardens, Kew, and the Missouri Botanical Gardens indicate that there are more than 300,000 described plant species on record, hundreds of thousands more than birds, mammals, or fish – and that number is rising. As we continue to explore new areas of the globe, new plants are still being discovered. One estimate indicates that there may be around 10,000 undiscovered plants just in Central and South America.

Yet trees and plants all over the world are in immediate peril. Trees are adapted to the unique environments in which they grow. And all over the world, the forests and habitats that trees depend upon are disappearing. Estimates of forest loss vary, but there can be no doubt that all of our forest ecosystems, and the unique plant and animal life in these ecosystems, are in danger. Global losses in the unique tropical forests that contain nearly half of the world's species have been estimated at nearly 100,000 miles (160,000 km) per year, with a total shrinkage of nearly 9% (981,766 miles or 1,580,000 km) between 1990 and 2000 (World Resources Institute, WRI). While much emphasis has been placed on tropical rainforests due to their fragile and complex ecosystems, losses in temperate regions have been even more dramatic. In Europe and North America, only about 1% of the original forest cover remains today.

While the total number of tree and plant species at risk is not clear, the estimates that exist are alarming. The International Union for Conservation of Nature and Natural Resources (IUCN) catalogues threats to animals and plants and identifies species at risk in its Red Data lists and books. A study in 2010 by the IUCN, Royal Botanic Gardens, Kew, and the Natural History Museum, London estimated that one in five, or 20% of the world's plant species were dangerously

rare or threatened with extinction. The situation is just as dire for trees – the World List of Threatened Trees describes more than 8,000 tree species (about 10% of known tree species) that are threatened with extinction. More than 1,000 tree species are currently listed as Critically Endangered based on the IUCN Red List criteria (see page 4) and biologists estimate that in the past 100 years, 77 species of trees have become extinct. Current documented extinction rates are nearly 1,000 times higher than the “background” rate, the rate at which species have been naturally going extinct for the past 65 million years.

The trees under threat today offer immeasurable benefits. They lower energy costs, control storm water runoff and erosion, and provide medicine, food, timber, and more. Trees create cleaner, healthier, more livable, and more beautiful communities, both through their environmental benefits and the calming effects scientists have observed on human behavior. And the extinction of any plant species has ripple effects on other species. The extinction of a plant species can result in the loss of habitat and food for other organisms, as well as resulting in an overall loss of productivity in the habitat of that plant. Endangered trees do not receive as much international conservation attention as their counterparts in the animal kingdom and fewer are top of mind for the general public. Because of all of these reasons, learning more about endangered trees and their conservation and taking action to protect these trees is of critical importance to all of us.

Evaluating the Threats

The levels of threats to the trees in this exhibit are described using the categories from the IUCN Red List version 2010.4. The IUCN Red List was developed for classifying species at high risk of global extinction and identifying the need for more study and better protection at a global level. Inclusion in the list is based on several numerically based factors or criteria. The size of populations and subpopulations of the species play a key role in evaluation, as do the number of mature individuals and reproductive potential of the species, and the documented declines and fluctuations in the number of mature individuals of a species. The habitat (the environmental conditions required for a species to thrive) and distribution (the number and location of individuals of a species) of the species are also considered. As part of the habitat and distribution, the range of the species; the availability potential habitat suitable for that species; the fragmentation of that habitat; and the under-utilization of existing habitat by a species are all considered. Scientists also account for the possibility that a single threatening event could rapidly affect all individuals remaining in a given location and all are taken into account when evaluating extinction risk.

What does the assignment of a tree to the different threat categories or other categories in the IUCN Red List mean?

Extinct (EX) means ... there is no reasonable doubt that the last tree of this species has died. The species is gone.

Extinct in the Wild (EW) means... there is no doubt that all natural populations of these species have died and that a species is only known to survive in cultivation or in populations that have escaped from cultivation well outside of the natural range of the species.

Threatened means ... that a tree's population is declining and the species is likely to become extinct unless its conditions improve. Species are described as threatened when they fall into the **Critically Endangered**, **Endangered**, or **Vulnerable** categories (species that are already extinct in the wild or extinct can no longer be threatened with extinction). A variety of numerically based criteria define these categories, and meeting any one of these criteria qualifies a species for listing at the appropriate level.

Critically Endangered (CR) means...that the tree is facing an extremely high risk of extinction in the wild in the near future. Population size has been reduced or is expected to be reduced by 80% or more in 10 years or three generations; population size is less than 250 total individuals and is declining, or is less than 50 mature individuals; geographic range or habitat is severely limited and declining, or is so reduced or fragmented that a single event could wipe out the species; or a numerical analysis of the species shows a greater than 50% probability of extinction within 10 years or three generations.

Endangered (EN) means ... that the tree is facing a very high risk of extinction in the wild in the near future. Population size has been reduced or is expected to be reduced by 50% or more in 10 years or three generations; populations are under 2500 mature individuals and are in decline or are under 250 mature individuals; geographic range is significantly limited, and is severely fragmented and decline or extreme fluctuations are observed in population size and distribution; or a numerical analysis shows that the probability of extinction in the wild is at least 20% within 20 years or 5 generations, whichever is longer (up to a maximum of 100 years).

Vulnerable (VU) means ...that the tree is facing a high risk of extinction in the wild in the near future. Population size has been reduced or is expected to be reduced by 30% or more in 10 years or three generations; populations are under 10,000 mature individuals and are in decline or are under 1000 mature individuals; geographic range is reduced or fragmented and decline, severe fragmentation, or extreme fluctuations are observed in population size and distribution; or a numerical analysis shows that the probability of extinction in the wild is at least 20% within 20 years or 5 generations, whichever is longer (up to a maximum of 100 years).

Near Threatened (NT) means...a species has been evaluated, does not yet qualify for any of the Threatened categories, but is likely to qualify in the near future.

Least Concern (LC) means...a species has been evaluated and does not qualify for any of the categories above. Species that are widespread and abundant are included in this category.

A large number of species evaluated are also deemed **Data Deficient (DD)**; that is, the data available on a species is inadequate to determine the level of threat. Listing in the categories Data Deficient or **Not Evaluated** implies that no assessment of extinction risk has been made, not that species are not at risk.

Since extinction is a chance process, the list can only describe the expected chance of extinction. All species in a higher category of extinction risk meet the criteria of the category below it (i.e., all taxa listed as Critically Endangered also qualify for Vulnerable and Endangered). It is important to remember that the IUCN list only describes plants that have currently been evaluated by IUCN. In 2010, the number of plant species that had been evaluated by the IUCN was just under 13,000, only 4% of the known plant species. Many known plant species not included in the list are almost certainly threatened with extinction, but their status has not been evaluated yet.

You can find more information about the IUCN Red List at:

www.iucn.org/themes/ssc/redlists/rlcategories2000

Other terms you may see used in this guide are the terms *in-situ* and *ex-situ* conservation. *In-situ* conservation describes the process of protecting and restoring populations of species in their natural habitats. *Ex-situ* conservation describes the protection and preservation of species at locations outside of their natural habitat, and includes cultivation in botanic gardens and arboreta, in the landscape, and storage in seed banks and other repositories for the diversity of plant genetic material. These two types of efforts can and should be used in combination to protect trees and other plants against the threat of extinction.

What Are the Threats to Trees?

All over the world, the threats to trees, plants, and their habitats mount week to week. What are the key threats that are driving trees towards extinction?

Overharvesting: Some species of trees are in high demand due to the value and use of their wood for commercial products, food and medicinal products from trees, and their value as a landscape tree or as a collected specimen. This demand can result in overharvesting of those species to the point of decimating the natural populations of these trees.

Habitat Destruction: As the human population continues to rapidly increase and expand our roads and cities, our demands for land for habitation, food production, animal fodder, raw materials and for exploitation of natural resources for economic and recreational purposes have increasingly destructive effects on tree habitats. Timber harvesting for fuel, building supplies, paper and other products, and clearing land for agricultural use decimates forests, and the removal of trees has additional destructive effects on the soil and water sources in the vicinity. Increasing air and water pollution also has damaging effects on forests all over the world, altering the chemical balance in the soil and water required by the plants native to the habitat, and creating imbalance in the affected ecosystems. Changes in natural fire regimes can also create unsuitable habitat for trees. Species that once thrived in the conditions created by fire can be out-competed by other species in the absence of fire, and the creation of conditions for wildfires can destroy entire forests. Destruction of forests can lead to increased deflection of light and heat from the sun and reduce the ability of an ecosystem to trap and recirculate moisture from rainfall. All of these effects can result in desertification, or increases in unnaturally barren land wherever the destruction of natural vegetation occurs.

Invasive Species: Thousands of non-native invasive plants, insects, animals, and plant diseases are infesting millions of acres of lands and waters worldwide. These invaders cause massive damage to trees, disrupting the natural ecosystem processes in tree habitats. Pressure from these aggressive and damaging species reduces biodiversity and degrades the health of forests. In the United States alone, financial impact from invasive species infestations in the United States has been estimated at \$138 billion per year in total economic damages and associated control costs; the uncounted ecosystem costs make this toll much higher.

Climate Change: Today, the scientific evidence is unequivocal: the climate is changing all over the globe. A study released by the U.S. National Academy of Sciences in 2010 said, "Climate change is occurring, is caused largely by human activities, and poses significant risks for – and in many cases is already affecting – a broad range of human and natural systems." (NAS, 2010. Advancing the Science of Climate Change.) The impacts of rising average global temperatures and increased fluctuation in temperatures, seasons, and precipitation spell major trouble for tree populations. Botanists classify the world's vegetation into a range of zones determined by climate; each tree species has a particular climatic environment that it thrives in. As climate shifts, the habitats suitable for trees may shift faster than trees can follow. Other effects of changing climate may

include increasing droughts and desertification, as well as the increased emergence of invasive pests and diseases that can decimate tree populations. These effects have particularly strong impacts on tree species that already have reduced population sizes, or restricted or fragmented geographic ranges; as the climate changes, species already under threat stand a lower chance of being able to respond to the changes they experience.

This exhibit from The Morton Arboretum, *Vanishing Acts: Trees Under Threat*, takes a close look at the precarious plight of the world's trees, the forces that threaten them, and the actions that can be taken to help conserve these valued resources. Towards this end, we have selected fifteen species of threatened trees to explore, based on the level of threat the IUCN has identified for these trees, their geographic distribution, reasons for endangerment, and their ecological, economical, cultural, or medicinal importance. As you visit the exhibit and leaf through these pages, you will discover trees that are important for their medicinal properties, scientific value, use as a source of food or other economically important products, key role in maintaining species diversity in different habitats, and their spiritual, cultural, aesthetic, and recreational value. These tree species were selected in part for their ability to demonstrate the diversity of threats facing trees today, the global nature of tree species endangerment, and the range of threat levels from near threatened to extinct in the wild. As you meet these trees and learn their stories, remember that these are only a tiny fraction of the fascinating and beautiful trees that humanity and life on earth depend upon – that are disappearing right before our eyes. We hope that by showing how trees enrich our lives and the dangers that trees face, we can inspire others to join us, including you.