## Box 1.5 Biological Diversity

With an estimated 13 million species on Earth (UNEP 1995:118), few people take notice of an extinction of a variety of wheat, a breed of sheep, or an insect. Yet it is the very abundance of species on Earth that helps ecosystems work at their maximum potential. Each species makes a unique contribution to life.

- Species diversity influences ecosystem stability and undergirds essential ecological services. From water purification to the cycling of carbon, a variety of plant species is essential to achieving maximum efficiency of these processes. Diversity also bolsters resilience—an ecosystem's ability to respond to pressures—offering "insurance" against climate change, drought, and other stresses.

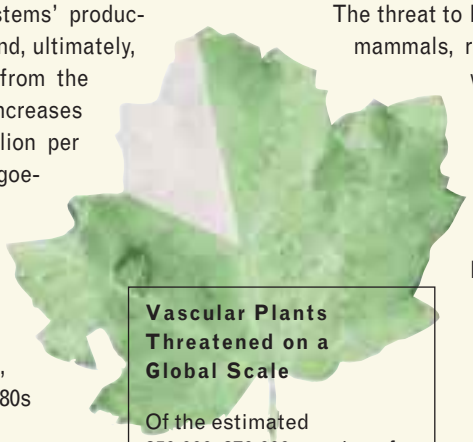
- The genetic diversity of plants, animals, insects, and microorganisms determines agroecosystems' productivity, resistance to pests and disease, and, ultimately, food security for humans. Extractions from the genetic library are credited with annual increases in crop productivity worth about $1 billion per year (WCMC 1992:433); yet the trend in agoecosystems is toward the replacement of polycultures with monocultures and diverse plant seed varieties with uniform seed varieties (Thrupp 1998: 23–24). For example, more than 2,000 rice varieties were found in Sri Lanka in 1959, but just five major varieties in the 1980s (WCMC 1992:427).

- Genetic diversity is fundamental to human health. From high cholesterol to bacteria fighters, 42 percent of the world's 25 top-selling drugs in 1997 were derived from natural sources. The global market value of pharmaceuticals derived from genetic resources is estimated at $75–$150 billion. Botanical medicines like ginseng and echinacea represent an annual market of another $20–$40 billion, with about 440,000 tons of plant material in trade, much of it originating in the developing world. Not fully captured by this commercial data is the value of plant diversity to the 75 percent of the world's population that relies on traditional medicine for primary health care (ten Kate and Laird 1999:1–2, 34, 101, 334–335).

Origins of Top 150 Prescription Drugs in the United States of America

| Origin | Total Number of Compounds | Natural Product | Semi-synthetic | Synthetic | Percent |
|---|---|---|---|---|---|
| Animal | 27 | 6 | 21 | — | 23 |
| Plant | 34 | 9 | 25 | — | 18 |
| Fungus | 17 | 4 | 13 | — | 11 |
| Bacteria | 6 | 5 | 1 | — | 4 |
| Marine | 2 | 2 | 0 | — | 1 |
| Synthetic | 64 | — | — | 64 | 43 |
| Totals | 150 | 26 | 60 | 64 | 100 |

*Source:* Grifo et al. 1997:137.



**Vascular Plants Threatened on a Global Scale**

Of the estimated 250,000–270,000 species of plants in the world, only 751 are known or suspected to be extinct. But an enormous number—33,047, or 12.5 percent—are threatened on a global scale. Even that grim statistic may be an underestimate because much information about plants is incomplete, particularly in the tropics.

*Source:* WCMC/IUCN 1998.

The threat to biodiversity is growing. Among birds and mammals, rates may be 100–1,000 times what they would be without human-induced pressures—overexploitation, invasive species, pollution, global warming, habitat loss, fragmentation, and conversion (Reid and Miller 1989). Regional extinctions, particularly the loss of populations of some species in tropical forests, may be occurring 3–8 times faster than global species extinctions (Hughes et al. 1997:691).

Such localized extinctions may be just as significant as the extinction of an entire species worldwide. Most of the benefits and services provided by species working together in an ecosystem are local and regional. If a keystone species is lost in an area, a dramatic reorganization of the ecosystem can occur. For example, elephants disperse seeds, create water holes, and trample vegetation through their movements and foraging. The extinction of elephants in a piece of savanna can cause the habitat to become less diverse and open and cause water holes to silt up, which would have dramatic repercussions on other species in the region (Goudie 2000:67).