CHAPTER 1

AN INTRODUCTION TO NATURE CONSERVATION

CHAPTER OUTLINE

1.1 WHAT IS CONSERVATION?

There are many misconceptions about what conservation is all about, which can all too easily prejudice our views towards it. It is therefore important to note that conservation is now typically defined as ***the management of human use of organisms or ecosystems so that it may yield the greatest sustainable benefit to present generations, while maintaining its potential to meet the needs and aspirations of future generations*** (IUCN/UNEP/WWF, 1991).

Conservation normally involves two main components: **sustainable use** and **preservation**. Sustainable use can be defined as ***using renewable resources at rates within their capacity for renewal***, while preservation can be defined as ***protection of species or natural areas in an undisturbed state, without any human use*** (IUCN/UNEP/WWF, 1991). Neither sustainable use nor preservation alone gives us a good idea of what conservation is about; successful conservation is about balancing these two components in a way which allows optimum human use of natural resources indefinitely without endangering the long-term survival chances of other species with which we share the planet.

A hypothetical relationship between preservation, nature conservation, conservation and sustainable use is illustrated in Figure 1.1.

Putting conservation into practice involves three main activities (Deshmukh, 1986):

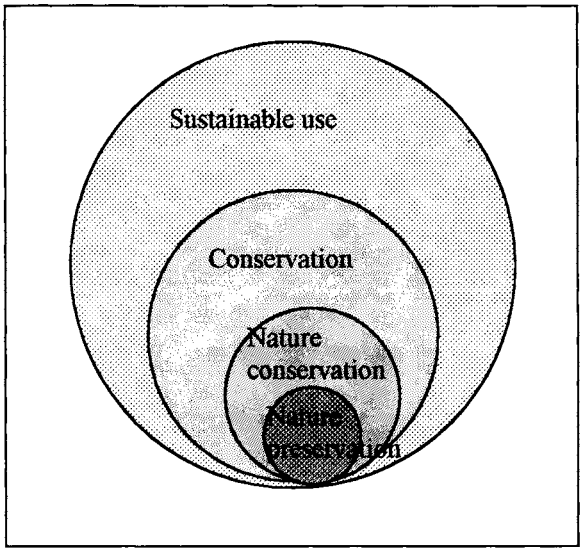

Figure 1.1. A hypothetical relationship between sustainable use, conservation and preservation

- The design and protection of productive and sustainable land-use systems (*environmental conservation*)
- The preservation of species with actual or potential economic benefit to humanity (*nature conservation*)
- Conservation of communities or species for non-economic reasons (*nature conservation*)

So far we have talked about conservation in rather general terms. This book is mostly about something rather more specific, namely **nature conservation**.

In nature conservation, we are particularly concerned about the survival of **wildlife** (for instance plants, animals and the living communities that they form), and so our attention focuses on how we can best manage our use of the land to optimise the chances of long-term survival for as much of nature as possible. In the past, nature conservationists often tended to ignore the human dimension to conservation, resulting in a lot of conflict, but these days, people are becoming more aware of the necessity of taking human needs into account as well. Theoretically, for most wildlife the best form of conservation would be preservation, with no human use, but it is now recognised that this is often not feasible or even desirable, and that some human use is frequently quite acceptable and compatible with nature conservation objectives.

1.2 WHY IS THERE SO MUCH CONCERN ABOUT CONSERVATION?

Many people are now quite used to hearing the words "conservation", "environment" and "biodiversity", words which scarcely anyone would have heard of even a few years ago. Why has there been this explosion of interest in conservation?

1.2.1 Some statistics

The interest stems from a growing realisation that the world today seems to be is in trouble, and that degradation of the environment through human activity is the root cause. The degradation going on around us has caught us unawares, and we are only now beginning to see that unless we change our ways, then the outlook for our descendants, not to mention for all the other species on the planet, is bleak indeed. Conservation, then, is seen as the way out of our problems.

The statistics are not looking very promising at the moment. Here are just a few:

Population

- Humans consume natural resources just like any other organism. The problem is that as human populations grow, so too does human consumption of resources. Today consumption of many natural resources has grown beyond sustainable levels, and the problem is likely to get worse the more humans there are.
- The world's human population is now 5.7 billion, of which 4.4 billion live in developing countries (Harrison, 1994).
- The world's population is growing by three people per second, or 180 people per minute, or 92 million people per year. It took over 1600 years for the total global population in the year AD 1 to double; today it will take just over 60 years. The area of land theoretically needed to support the estimated increase in global populations by the year 2050 is equivalent to 41% of the land area of the African continent (Farrow, 1994).
- Future population growth is inevitable, but the rate of growth may be low, medium or high depending on to what extent people respond to the present rate of growth, and how. The high projection for the year 2050 is 12.5 billion, which is greater than the low projection by the same amount of people as existed in the world in 1984. If the low projection were realised, then this would leave undisturbed at least 4.4 million km^2 of forests, wetlands and mountains that would be needed by people under the medium projection (Harrison, 1994).

Species extinction

- We are rapidly eliminating the wealth of life-forms which have taken four billion years to evolve. We have accelerated the species extinction rate from a natural rate of one species per century, to today's one or more species per day (WWF, 1991a).
- Tropical deforestation may cause the extinction of between 2% and 13% of all life-forms between 1990 and 2015 (Whitmore and Sayer, 1992).

Deforestation and environmental degradation

- Intact tropical forests, home to between 50% and 90% of all species, cover only half the area that they covered fifty years ago, and the rate of loss continues at about the equivalent of six football pitches every minute (WWF, 1991b), or an area of 15.4 million ha (nearly the size of Uganda) every year (FAO, 1993).
- Between 1980 and 2000, 30% of the world's agricultural land is expected to be destroyed or seriously degraded by inappropriate use or overuse (IUCN/UNEP/WWF (1980)).

1.2.2 Deforestation and environmental degradation in Africa

Humans, then, are using more and more of the world's resources, at a faster and faster rate. Some of those resources (such as fossil fuels) are non-renewable; others are potentially renewable but in many cases we are using them at a rate that is exceeding their capacity for renewal. Let us first look at how this is affecting forests, a potentially renewable natural resource.

Figure 1.2 plots the decline of Uganda's tropical moist forests during the course of the twentieth century. Over this period, the proportion of the country covered by closed tropical moist forest has fallen from about 12.5 % to probably less than 2%, this from a probable original forest area of 43%. In other words, about 95% of the forest area has been lost, two-thirds of it this century. By the end of the century, there may be only 4,000 km^2 remaining, out of the original 100,000,000 km^2 or so. Figure 1.3 shows the approximate past and present extent of tropical moist forest in Uganda.

This level of deforestation is by no means unusual in Africa, as Figure 1.4 illustrates for Uganda and neighbouring countries, although Abe and Pomeroy (1988) suggest that Uganda has probably lost a higher proportion of its natural forest than any of its neighbours.

In each country, the present extent of tropical moist forest is a tiny fraction of the probable original area, and the same is probably true of other forest types. According to FAO (1994), nearly half the deforestation in Africa has occurred since the 1940s, and is currently averaging 0.7% per year; if the rate of deforestation does not slow down (and it shows no signs of doing so), most of tropical Africa will be deforested within a few decades.

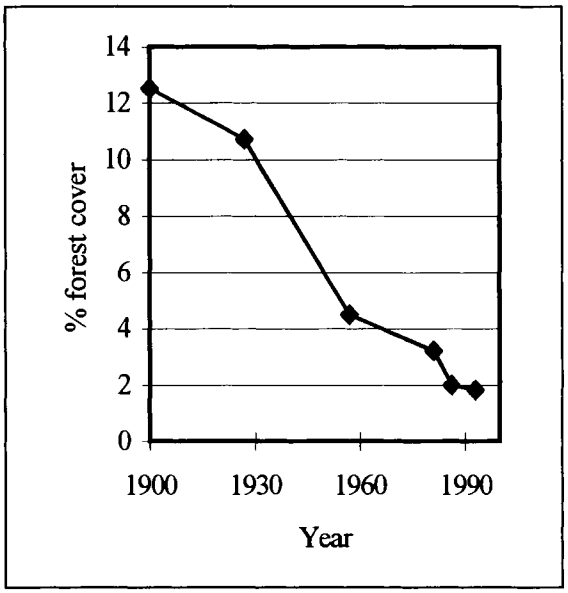

Figure 1.2. Change in the proportion of Uganda covered by tropical moist forest since 1900 (note that about 43% of the country was probably originally forested). From various sources, especially Hamilton (1994).

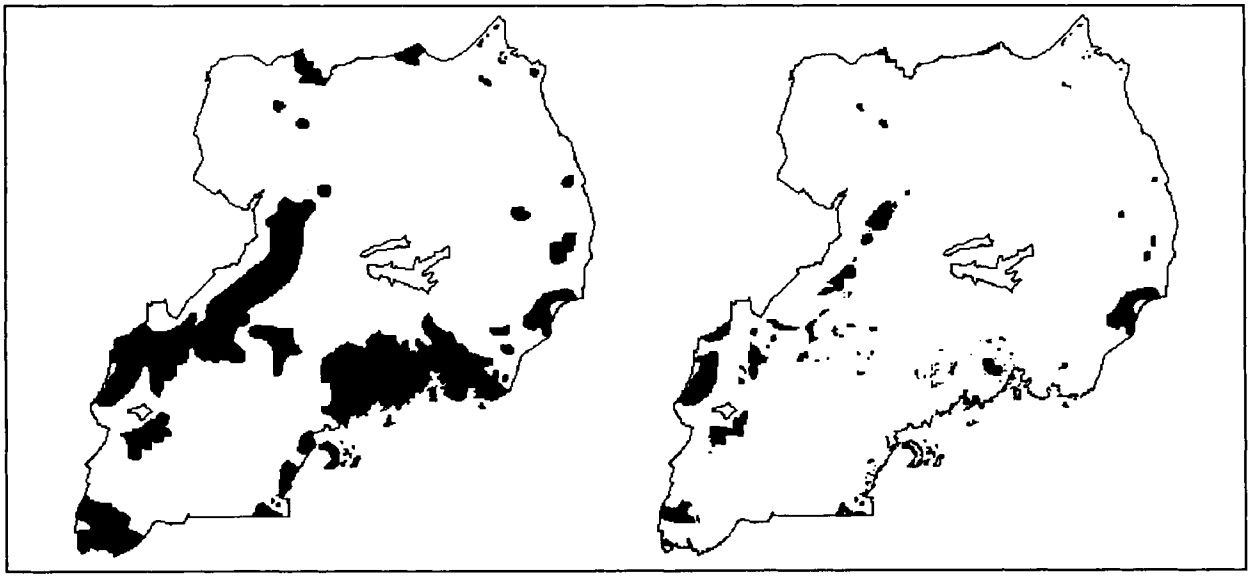

Figure 1.3. The approximate original (left) and present (right) extent of tropical moist forest in Uganda. From various sources, especially Hamilton (1984) and Howard (1991).

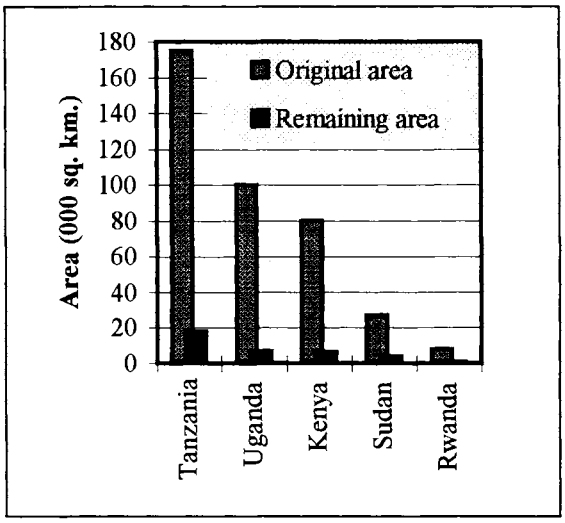

Figure 1.4. Original versus remaining extent (in 1980) of tropical moist forest in some East African countries (FAO 1980 data from WCMC (1992) and McNeely et al.. (1990)).

We should remember, too, that these statistics refer to forest loss (i.e. **deforestation**); they do not include forest **degradation**, which, in Uganda at least, affects large areas of forest. For instance, a recent survey of the twelve principal tropical *moist forest* reserves (Howard, 1991), found that little over half the forest area remained essentially undisturbed (Figure 1.6); the proportion of undisturbed forest in the remaining, smaller reserves is likely to be even lower. Although most of the encroached areas have since been reclaimed, they will take many decades or even centuries to recover to an "essentially undisturbed" condition.

1.2.3 Some causes of deforestation and environmental degradation

Everyone has their own ideas about the causes of deforestation and the associated environmental degradation. Box 1.1 lists some suggestions, divided into direct causes and underlying causes. This book is not the place to discuss them in detail: see the Further Reading section at the end of the chapter, or the Reference List at the back of the book for more information.

Although it is clear that there is no one cause, increasing human populations are probably the direct cause of much of the environmental degradation, primarily through increased consumption levels: more people take up more land and consume more resources. There is a negative correlation between human population and natural forest cover, as shown by Figure 1.7, although a cause-effect relationship is a bit more contentious. Furthermore, the issue is not as simple as this, because there are gross discrepancies in peoples' standards of living, but these discrepancies only make an existing problem worse, because as standards of living improve, consumption of resources tends to rise.

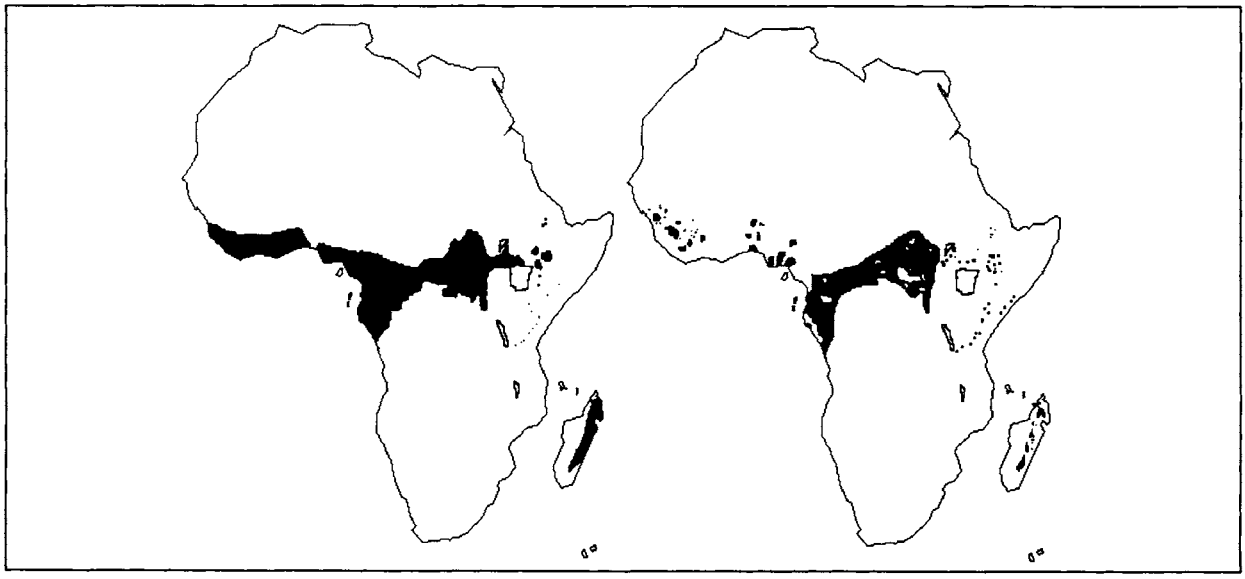

Figure 1.5. The approximate original (left) and present (right) extent of tropical moist forest in Africa. After Sayer, Harcourt and Collins (1992).

Box 1.1
Some of the causes of deforestation and associated environmental degradation

Direct causes	Underlying causes
• Subsidies, tax breaks, fiscal policies and legislation which promote deforestation • Destructive commercial logging • Over-grazing and repeated burning • Lack of, or poor, forest management, resulting in poor regeneration and low rates of reforestation • Over-exploitation of forests, woodlands, and farm trees for fuelwood, poles and other forest products • Neglect of traditional biomass fuels in energy sector assistance • Few incentives and weak extension for private tree-planting • Failure to sustain/encourage trees in farming systems • Degradation of currently cropped land • Shortened fallows and increased consumption of forest land by shifting cultivators • Encroachment by landless farmers • Lack of community participation in development planning and project design • Erosion of traditional community controls over land use and communal resource management strategies • Displacement and disruption of indigenous forest dwellers • Ineffective protection and management of national parks, forest reserves and public forest lands • Low valuation of biological diversity • Faulty analysis of full costs and benefits of land conversion • Inattention to sustainability issues in economic development and natural resource use • Inadequate information base and monitoring of forest land use and forest resources • Inattention to forestry institutions • Low priority to forestry in development plans • Lack of suitable investment in forestry	• Poor policies and incentives • Consumer demand in developed countries • Debt burden; macroeconomic and trade inequities • Need for foreign exchange • Climate change and drought • Shortages and inefficient use of fuelwood • Shortages and lack of alternative sources of fodder • Lack of alternatives to fuelwood • Rapid population growth • Increased demand for cropland • Inequitable land ownership patterns • Failure of agrarian reform • Insecure land tenure • Lack of support for sustainable agriculture • Export commodity/production focus of development projects • Poorly planned agricultural resettlement • Increased access along logging roads • Land use conflicts • Poorly planned, large-scale development projects (e.g. transport infrastructure, energy, commercial agriculture etc.) • Low level of development assistance in forestry, especially for forest protection • Short-term profit-taking, corruption • Lack of awareness of economic and environmental costs of deforestation • Weak institutional capacity • Misuse of forest lands among political decision-makers • Poor inter-sectoral co-ordination

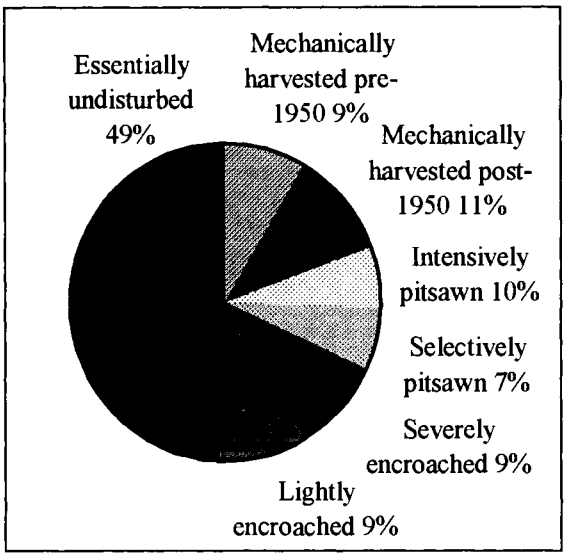

Figure 1.6. The extent of disturbance in Uganda's twelve principal Forest Reserves. After Howard (1991). (Note that some of the areas considered are now National Parks).

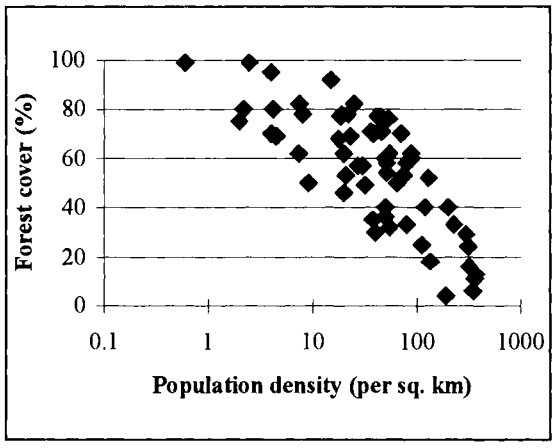

Figure 1.7. The relationship between human population density and forest cover, based on 1980 data for 60 tropical countries. Redrawn from Palo and Salmi (1987).

Figure 1.8 shows population growth in Uganda since the first census of 1921. The shape of the graph indicates a classic case of exponential population increase, such that the current rate of increase is between 2.5% and 3% per year. This corresponds to a population doubling time of just 25 years or less, meaning that over the next century the population could theoretically increase at least eight-fold (HBEW, 1994). As Figure 1.9 shows, Uganda's situation is typical of most developing countries; indeed, Africa's human population has doubled in 23 years (Mabberley, 1992); by contrast, most developed countries show much slower population growth, and some even show a decline. Between 1950 and 1990, the population of developing countries increased by 140%, and is expected to increase by a further 112% over the next century, whereas for developed countries the corresponding figures are 50% and 15%. Overall, global population is doubling every 37 years (UNESCO, 1993).

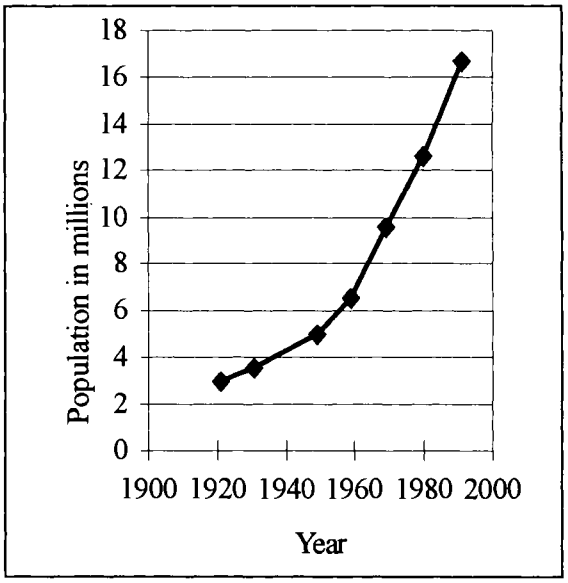

Figure 1.8. Population growth in Uganda since the first census of 1921. From various sources.

Most Ugandan families have no option but to try and scrape a living off smaller and smaller parcels of land which is of lower and lower quality. Woodlands, swamps and forests have progressively been cleared to accommodate more and more people or to provide fuelwood. In Uganda, most major towns now have to bring in fuelwood from outside their districts because of local over-collection (HBEW, 1994).

Most people in Uganda depend directly on the land for their sustenance; indeed 93% of Uganda's population is rural, and many people are subsistence farmers, such that up to 57% of agricultural gross domestic production does not even enter the monetary economy (FAO, 1992). This dependence on the land is both a strength and a weakness. As long as there is sufficient good quality farmland, it is a strength. But between 1975 and 1990, although the area of land under cultivation in Uganda increased by 9% (NEAP, 1992), the human population increased by something approaching 50%. As a result, the amount of arable land per person in Uganda has continued to shrink, from 3.6 ha in 1948 to 1.4 ha in 1984; by 2000 it is set to reduce further to less than 0.6 ha (FAO, 1992). The consequences of this are revealed in recent statistics that record that 20% of Ugandan children are malnourished.

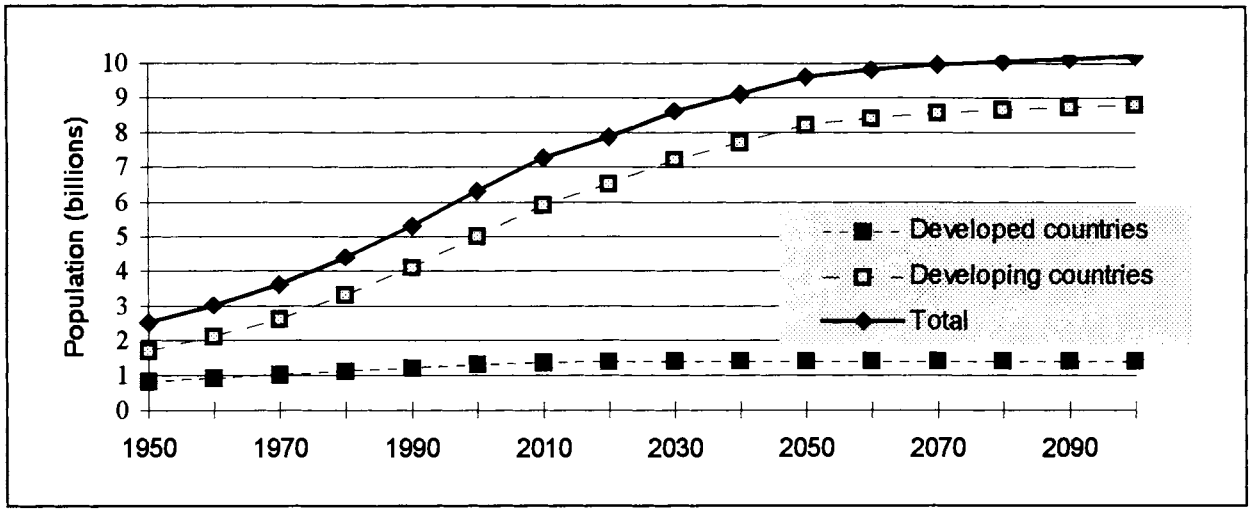

Figure 1.9 Global population increase since 1950, actual and predicted. From various sources.

Meanwhile, land that cannot be cultivated is usually grazed, and sometimes overgrazed, resulting in further degradation. Between 1966 and 1986, the recorded number of cattle in Uganda increased by 44%, goats by 74% and sheep by 117% (Ministry of Energy, Minerals and Environment Protection, 1991), yet the area of grazing land probably remained the same or even declined. Overall in Uganda, the degree of medium to severe land degradation is said to be high (ODA, 1992a). So in Uganda's situation, environmental degradation is continuing as population increases, even though material standards of living remain very low for most people. A similar situation exists in much of Africa: 70% of all Africans are subsistence farmers, and expansion of small-scale agriculture is thought to account for about 70% of the deforestation in Africa, compared with 50% in Asia and 35% in the Americas (WCMC, 1992). The conclusions of a report by UNEP (in Struhsaker, 1988) are worth quoting: "*the impacts of an increasing population on any developing country, and especially on Uganda, are enormous. Continued high rates of populations growth will systematically undermine all programmes aimed at restoring and improving economic development, and will continue to deplete the basic resource base of the country in environmentally unsound ways... there is patently a need for population policies that match Uganda's growth with available resources*".

In developed countries, the issue is more of consumption levels rather than population growth, since population growth is generally much slower. Nevertheless, every birth in the developed countries puts as much extra pressure on natural resources as tens of births in the developing countries (UNESCO, 1993). Overall, 20% of the world's population consume 80% of its natural resources, and it is said that each American child born today will use as much energy in its life as about 500 people born in central Africa (Farrow, 1994) , while the average American family's level of consumption has 100 times the global environmental impact of the average Kenyan family (Ehrlich and Ehrlich, 1990). In the four decades to 1990, global consumption exceeded the level reached by all past generations since humans first appeared (Hurtado, 1994).

1.3 WHY CONSERVE TROPICAL FORESTS?

Although the focus of this book is on nature conservation, we should remember that forests are also important for numerous other reasons. Conserving the forests can not only benefit nature, but can also provide for a whole range of human needs. Box 1.2 lists some of the "goods and services" provided by tropical forests, divided into the five so-called "domains of human welfare".

Box 1.2
Some of the goods and services provided by tropical forests, divided into the five domains of human welfare. After Laarman and Sedjo (1992)

1. Protective services and influences

- Climate regulation
- Regulation of atmospheric composition
- Stabilisation of slopes, stream banks, water catchments and sand dunes
- Shelter belts, soil moisture retention
- Stream flow regulation, flood reduction
- Land reclamation
- Buffers against the spread of pests and diseases
- Nutrient storage, distribution and cycling
- Wildlife habitat
- Conservation of biodiversity

2. Consumption of plants, animals and derivatives

- Timber: logs, pulpwood, posts, poles
- Fuelwood: firewood and charcoal
- Food products: fish, game, fruit, nuts, berries, seeds, mushrooms, spices, eggs, larvae, honey, syrups, teas, other beverages
- Herbs, flowers, medicinal plants
- Gums, resins, lacs, oils, tannin, waxes, distillates
- Livestock fodder (grass, leaves)
- Thatch, ropes and string, weaving materials, silk
- Non-wood structural materials (e.g. bamboo, rattan)
- Skin, feathers, teeth, bones, horns
- Game meat
- House plants and pets

3. Psychophysiological influences

- Recreation, tourism, sports
- Sense of stewardship, peace, harmony with nature
- Inspiration for art, literature, music, myths, religion and philosophy
- Historic sites and values

4. Source of land and living space

- New lands for cropping and grazing
- Habitat of indigenous people

5. Education and scientific services

- Research on ecosystems and organisms
- Zones for monitoring ecological changes
- Specimens for museums, zoos, botanical gardens
- Wild stocks of foods, chemicals, biological control agents
- Environmental education

1.4 CONSERVATION WAYS AND MEANS

1.4.1 Environmental conservation

It should be clear now that conservation is not a simple issue. How are we going to put the world back on a sustainable footing? Again, everyone probably has their own ideas about what needs to be done. Box 1.3 lists just a few suggestions, particularly as they relate to forests and forestry, from the perspective of developing and developed countries. Many of them came out of discussions held during the conservation training courses held at Nyabyeya Forestry College.

1.4.2 Nature conservation

The goal of nature conservation can probably only succeed in the long-term within the overall framework of environmental conservation. Having said that, there are several specific approaches which, when taken together, provide an effective mechanism for meeting nature conservation objectives. Some of these approaches are, individually, more effective than others. In general, approaches that seek to conserve nature in its natural environment (***in situ conservation***) are more effective than those that rely on conserving nature outside the natural environment (***ex situ conservation***). *In situ* conservation will therefore form the main focus of the rest of this book.

Box 1.3
Conservation ways and means: some suggestions

Developing countries

- Development of networks of protected areas with buffer zones
- Policy and institutional reform
- Elimination of inefficient and destructive subsidies, tax breaks, etc.
- Incentives and support for improved forest management and improved forest utilisation
- Strengthen relevant institutions
- Increase capacity for research, training and extension
- Better data and monitoring of forest resources
- Improve land use planning and inter-sectoral co-ordination
- Increase awareness among decision-makers
- Improve political commitment to conservation
- Agrarian reform and more secure land tenure
- Redirect agricultural settlement to already degraded/deforested areas
- More investment in sustainable agriculture, especially in areas adjacent to natural forests
- Family planning and increasing the status of women in society
- Recognition of the rights of indigenous peoples
- More community participation
- Incorporate development concerns into conservation programs (e.g. buffer zones)
- Increase the area of woodlots and agroforestry, through incentives if necessary
- Promotion of multi-purpose trees
- Fuelwood conservation and increased access to fuelwood substitutes
- Development of markets for alternative forest products
- Afforestation of degraded land with multi-purpose and/or high yield tree species

Developed countries

- Debt rescheduling and cancellation
- Lobbying for reform of the international policies of governments, international agencies and multinational companies
- Joining environmental pressure groups
- Boycotting banks, timber and oil companies that support activities leading to deforestation
- Paying more realistic prices for tropical forest products
- Developing markets for alternative forest products
- Education and extension
- Pressing for democratic reform of international agencies
- Long-term change in lifestyle from one valuing consumption to one valuing quality of life

1.4.21 In situ conservation

The most effective form of *in situ* conservation, and the most effective form of conservation all round, is the establishment and maintenance of **protected areas** of natural or semi-natural ecosystems. Natural Forest Reserves are a good example of this; others include National Parks and Game Reserves. Carrying out conservation in protected areas is the most effective way of protecting all the species of a given ecosystem. All other approaches, such as those that follow, can be useful in certain situations.

For example, if a particular species needs special protection, such as from hunting or trade, then specific **species protection** measures can be taken, such as passing new laws, but it would be impossible to have a law for every species and every situation, and anyway wildlife laws are notoriously difficult to implement. Alternatively, **controls on resource use** can be introduced, such as closed seasons for hunters, size limits for cutting trees, or restrictions on public access at certain times of the year. These can be useful adjuncts to protected area establishment, but are seldom a good substitute. Once again, such controls are often difficult to implement in practice.

Sometimes, it is desirable to **reintroduce** species to areas where they have become extinct, and sometimes some form of **habitat manipulation** is necessary for conservation, for instance, removing an invasive exotic species that is threatening to take over a protected area, or culling herbivores such as duikers in the absence of their natural predators. Occasionally, it is even worth the effort of **providing a critical resource** needed by a certain species, for instance, making sure that fig trees are left in logged forest to provide food for monkeys and fruit-eating birds.

1.4.22 Ex situ conservation

Ex situ approaches to conservation are usually only useful when *in situ* approaches cannot be used. The biggest limitation of *ex situ* approaches is that they cannot cater for every single species that lives in a natural ecosystem: there are simply too many species and we do not know enough about them to even identify them all, let alone manage them outside their natural areas. Nevertheless, for some species, **botanical gardens** and **zoos** can be very important; indeed, some species which are extinct in the wild now only survive in such places. They are particularly useful if the species kept there can later be used to reintroduce the species to the wild once the problems that lead to its extinction in the wild have been sorted out.

Finally, because botanical gardens and zoos take up so much space and resources, people are increasingly setting up **seed banks** and **sperm/egg banks**, where the viable genetic material of many more species can be safely stored. Again, such banks work well for plants and some larger animals, but are next to useless for the majority of species.

1.4.3 The cost of conservation

We have been emphasising the costs of deforestation and environmental degradation, and the benefits of conservation. But we should not imagine that conservation comes free: it too has a cost, whether social, political or financial. They can be grouped into **direct costs**, and indirect or **opportunity costs**:

Direct costs

- The costs of managing protected areas
- The institutional costs of management
- The costs of *ex situ* conservation
- The costs of damage to crops by wildlife

Opportunity costs

- The monetary value of resources left unexploited
- The potential value of land if it were put to other productive uses

Unless we intervene, some of these costs end up being borne by those least able to afford them, while the benefits are often to society at large. For instance, it is normally local people who bear the cost of crop damage by monkeys or bush-pigs. Similarly, it may often be the national authority (such as the Forest Department) that has to meet the cost of managing a protected area, even though it may have been the international community who pushed for its protection in the first place. In each of these cases, there may be a need to (1) redistribute the costs, so that they fall more fairly on those who can afford to pay and on those who want to push conservation (especially the international community), and (2) ensure that those paying the costs are fully aware of the benefits they receive in return.

1.5 SUMMARY

- As human population and consumption levels increase, we are using more and more of the earth's renewable resources unsustainably.
- This unsustainable use creates many problems, both for humans and for the rest of nature.
- One visible symptom of our consumption is deforestation and its associated environmental degradation, which has never been going on at higher levels than it is today.
- Deforestation leads to further consequences, such as species extinction and the loss of many benefits to humans.
- Conservation seeks to put the world back on a sustainable footing.
- There is something that everyone can do, and conservation will not succeed without the support of all sectors of society.
- The forestry sector has a particularly important role to play, because of the high value of tropical forests for nature and for humans.
- Conservation costs money, and requires expertise.

1.6 FURTHER READING

Hamilton, C.A. 1984. *Deforestation in Uganda.* Oxford University Press, Nairobi.

Howard, P.C. 1991. *Nature conservation in Uganda's tropical forest reserves* . IUCN, Gland.

IUCN/UNEP/WWF. 1991. *Caring for the earth: a strategy for sustainable living.* IUCN, Gland.