Conservation Biology Information Pack
February 2005

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CONSERVATION BIOLOGY
INFORMATION PACK

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February 1999

Contents

Convention on International Trade in Endangered Species of Wild Fauna and Flora

What is CITES?

The international wildlife trade, worth billions of dollars annually, has caused massive declines in the numbers of many species of animals and plants. The scale of over-exploitation for trade aroused such concern for the survival of species that an international treaty was drawn up in 1973 to protect wildlife against such over-exploitation and to prevent international trade from threatening species with extinction.
Known as CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, entered into force on 1 July 1975 and now has a membership of 144 countries. These countries act by banning commercial international trade in an agreed list of endangered species and by regulating and monitoring trade in others that might become endangered. **Malta signed the convention in 1989. At the time, it was the 99th nation to do so.**
CITES' aims are major components of *Caring for the Earth, a Strategy for Sustainable Living*, launched in 1991 by UNEP - the United Nations Environment Programme, IUCN - The World Conservation Union and WWF - the World Wide Fund for Nature.

Why CITES is Needed

There are over 13,000 known species of mammals and birds, as well as thousands of reptiles, amphibians and fish, millions of invertebrates and some 25,000 flowering plants. Extinction is a natural feature of the evolution of life on Earth. But in recent times humans have been responsible for the loss of most of the animals and plants that have disappeared.
Many species are declining in number because of loss of habitat and increased exploitation as human populations grow. Trade has now also become a major factor in the decline as improvement in transport facilities has made it possible to ship live animals and plants and their products anywhere in the world.
The wildlife trade is a highly lucrative business and involves a wide variety of species, both as live specimens and as products. Millions of animals and plants are traded each year to supply the demand for pets and ornamental plants. Furskins, leather and timber, and articles manufactured from these materials are all traded in large quantities.

Protected Species

CITES has established a world-wide system of controls on international trade in threatened wildlife and wildlife products by stipulating that government permits are required for such trade. Protection is provided for species in two main categories:
The most endangered species

- Appendix I: Includes all species threatened with extinction which are or may be affected by trade.

Other species at serious risk

- Appendix II: a) Includes all species which although not necessarily currently threatened with extinction may become so unless trade is subject to strict regulation; and b) Other species which must be subject to regulation in order that trade in certain specimens of species referred to in sub- paragraph (a) above may be brought under effective control, i.e, species similar in appearance.
- Appendix III: All species which any Party identifies as being subject to regulation within its jurisdiction for the purpose of preventing or restricting exploitation. The cooperation of other Parties, is therefore, needed.
  .

Number of Species on the CITES Appendices

(spp = species, sspp = subspecies, popn = population)

	Appendix I	**Appendix II**	**Appendix III**
Mammals	219 spp. + 21 sspp. + 14 popns.	364 spp. + 54 sspp. + 14 popns.	56 spp. + 11 sspp.
Birds	145 spp. + 13 sspp. + 2 popns.	1263 spp. + 32 sspp.+ 1 popn.	149 spp.
Reptiles	62 spp. + 4 sspp. + 5 popns.	383 + 10 sspp. + 3 popns.	19 spp.
Amphibians	13 spp. + 1 ssp.	68 spp.	-
Fish	8 spp.	28 spp.	-
Invertebrates	64 spp. + 5 sspp.	2006 spp. + 1 ssp.	-
Plants (estimate)	310 spp. + 3 ssp. + 1 popn.	24881 spp. + 3 ssp. + 1 popn.	5 spp. + 1 popn.
Total	821 spp. + 47 sspp. + 22 popns.	28993 spp. + 100 sspp. + 18 popns.	229 spp. + 11 sspp. + 1 popn.

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source: http://www.wcmc.org.uk/CITES/english/index.html

The following extracts are taken from "Biodiversity: Questions and Answers"; Council of Europe Publishing, December 1996.

1. BIODIVERSITY

1.1. WHAT DOES IT MEAN?

In recent years biodiversity has virtually become a cult concept. With the signing of the Convention on Biological Diversity by a large number of states at the Earth Summit held in Rio de Janeiro (Brazil) in 1992, the term gained international political recognition. Since then it has been widely used by governments, the media and almost everybody. It is a complex concept, however, with controversy often surrounding its interpretation. Biodiversity is in fact a "global" concept, which is not merely scientific in nature but takes on social and economic dimensions as well.

The whole of life on Earth is part of an immense interdependent system. Biodiversity is the expression of the diversity of life. It is present everywhere, covering all genes, animal and plant species, ecosystems and landscapes. It includes forests, freshwater, marine and temperate environments, the soil, crop plants, domestic animals, wild species and micro-organisms. It thus encompasses the full diversity of the field of biology, from genes to the biosphere.

All of humanity depends on this community of life – the biosphere – of which we are just one element.

1.1.1 DIVERSITY OF SPECIES: an abundance of life

The word biodiversity refers firstly to the diversity of living organisms, beginning with the abundance of animal, plant and microbial species.

Although we have extensive knowledge about the Earth's biological resources, there is still much to learn. There are almost no tropical or temperate sites on the planet for which complete inventories have been made of all the organisms living there. Nobody knows the precise number of living species. To date, scientists have counted and described some 1.7 million living organisms, but the planet's total number is estimated at between 5 and 30 million, with some scientists putting forward figures of 80 million or more.

The bird and mammal species are now fairly well known, which is not the case for small organisms such as insects, fungi, mites nematodes, bacteria and viruses. Our knowledge of micro-organisms is relatively limited.

These uncertainties also exist in Europe, but to a much lesser extent than in tropical regions. It is known, however, that the Mediterranean areas contain great biological diversity in respect of certain groups of organisms, including a considerable number of endemic species.

1.1.2 GENETIC DIVERSITY: so many different faces

Genetic diversity refers to the diversity (or variability of genes) within species. Each individual of a species possesses a multitude of genes which are the source of its own particular features: in the case of human beings, for example, the huge variety of faces reflects each person's genetic specificity. The term also covers distinct populations of a single species, such as, for example, the thousands of breeds of dogs or varieties of roses.

For 12000 years, human beings have identified the species they need by observing the visible characteristics of living organisms. They have always used artificial selection to domesticate certain species of wild animals and, by means of genetic engineering are now able to modify those organisms according to their requirements, creating new varieties of transgenic plants and animals such as fruit without pips and animals designed for use in medical experiments or for agricultural purposes. However, the greatest possible caution should be exercised in this area so as to avoid distortions which may have unforeseen consequences.

1.1.3 ECOSYSTEM DIVERSITY: environments in constant evolution

An ecosystem is made up of a community of organisms, their environment and the interactions between them. Ecosystems are formed on very different scales, ranging from microsites to the biosphere. A forest constitutes an ecosystem, as does a dead tree-trunk, a river, a pond a mountain, a sea and even the entire planet.

An ecosystem is a dynamic unit in which the composition, structure and roles of the different elements within it are constantly evolving with time.

We know little about the role of biodiversity in the functioning of ecosystems. We do not know to what extent particular ecosystem features such as primary production and decomposition, owe their preservation to biodiversity. Nonetheless, it has been observed that certain species (known as 'dominant' or 'keystone' species) have a major influence on ecosystem structures and functions.

1.1.4 LANDSCAPE DIVERSITY: humanity's imprint on nature

Landscapes are made up of sets of natural and cultural elements which have been shaped by humanity's imprint for so long that there is almost no virgin landscape left in western and central Europe. By developing agriculture, human beings have generated coppice forests. Certain landscapes are totally artificial, for example, the Minsmere nature reserve in England and, to a certain extent, the Poitou marshland and the Landes forest in France.

The concept of landscape diversity also takes account of the relationships between landscapes: their territorial organisation, dynamics and inter-relationships as seen by individuals and societies through different local, regional and national cultures.

Landscapes, in all their quality and diversity, are fashioned by human activities undertaken over thousands of years. They are continually evolving, owing to the constant changes in the way that different societies use land. Landscapes consequently embody the collective memory of nature and their inhabitants, forming a complex element of the environment.

1.2. VALUES: life put up for auction?

Conserving biodiversity is of great importance to humanity in many aspects, both because of its various "utilitarian" benefits for human beings and because of its apparently "non-utilitarian" value.

Biodiversity is useful to humanity for economic, recreational, cultural and ecological purposes. Not only do we take many primary materials and draw great benefit from it, but it also regulates the biosphere.

While biodiversity represents unimaginable riches from a "utilitarian" point of view, it is no less impossible to quantify its aesthetic, intrinsic and ethical value. The way in which nature inspires and is celebrated by painters, poets and musicians bears witness to our attachment to these intangible merits.

1.1.5 Economic and medical values

Biological resources provide us with all kinds of products: food, fibres for clothing, building material, colourings, synthetic substances, medicines and so on. They are the basis for most human undertakings, and a significant proportion of the world's economy depends upon them.

Micro-organisms, which play a vital role in many ecosystems, have enabled significant progress to be made in the field of food products.

He components of biodiversity are also important for human health. For centuries, almost all medical treatments were based on plant and animal extracts, and this type of treatment remains essential even today. Traditional medicine is still used extensively for basic medical care in developing countries and is being rediscovered in our

part of the world. Modern medicine is taking a keen interest in these resources in the hope of discovering new cures.

According to some, the greater the diversity of life, the greater the possibility of discovering new medicines and fostering economic development. Every species could potential be of some commercial or medical value. According to this view, it is therefore imperative to conserve all living species.

In the field of agriculture, the genetic diversity discovered within each type of crop is of considerable importance. It is a major weapon against the threats posed to crops and livestock by pests and diseases. In ancient agricultural techniques, genetically distinct crop varieties were always planted together to form hedgerows in order to reduce possible crop losses. It is harder for a single crop to resist attacks by insects and diseases than for varied crops. Farmers are now showing a growing interest in the genetic diversity of crops and livestock in order to increase production and cope with changing environmental conditions.

Biodiversity is also a significant source of leisure activities. It is a focal point for tourism and all kinds of recreational activity, which are undergoing rapid expansion in natural environments and are often the main source of income for the local population.

Many animal or plant species prove very useful for medical purposes:

- Aspirin is made from an organic molecule derived from willow;
- The yew tree, found in many parks and gardens, is a source of taxol, an anticarcinogenic substance used to treat cancer of the breast or ovaries;
- Digitalin, which comes from foxgloves, is used to treat heart insufficiencies;
- The venom of certain snakes is the basis for substances which enable blood clots to form;
- Caribbean sponges can be used to combat rejection of organ transplants.

Certain species are extremely useful to farmers and gardeners:

- Numerous insects pollinate crops;
- Termites and earthworms aerate the soil;
- Toads, frogs and salamanders love eating insects, showing a preference for slugs;
- In just one day a ladybird eats over 100 aphids, which are harmful to crops;
- Great tits feed their chicks on caterpillars, thereby protecting fruit trees.

1.1.6 Ecological value

Biodiversity is of fundamental importance because it is the prerequisite for the survival and smooth functioning of many ecosystems. Ecosystems, which incorporate the millions of species existing today, contribute to preserving the environmental conditions required for our survival. They consequently do us many ecological favours.

The functioning of the planet as a whole and its climatic equilibria depend to a large extent on the regulation of the major water, carbon, nitrogen, phosphorous and other cycles, which are in turn ensured by ecosystem diversity.

Ecosystems:

- Contribute to the process of soil formation. Hey ensure soil fertility through maturation and the deposit and the transport of essential nutrients. They assimilate waste and absorb pollutants.

- Purify water and stabilise the hydrology of an area by retaining ground water. Wetlands, for example, purify water before it reaches watercourses and act as water reservoirs in dry periods.

- Regulate climates and preserve the quality of the atmosphere by maintaining an appropriate level of oxygen through plant photosynthesis.

The environment will be vastly altered by the effects of probable climatic changes and human activities. We must therefore study ecosystems and species, for in the future our need to draw upon these riches in order to manage such changes to our benefit and to adapt to them, will doubtless be even greater.

1.1.7 Aesthetic, intrinsic and cultural value

The beauty inherent in biodiversity is a great source of pleasure. Although this aesthetic value is impossible to quantify, it remains no less fundamental. Human beings need a varied natural environment. The aesthetic aspect of biodiversity is not simply a matter of enjoying the beauty of particular sites, but rather a genuine need which is deeply rooted in every person, as the diversity of life adds to its quality.

The preservation of biodiversity is also an ethical issue. Nature, in all its components plays a very important role in the formation of our ideals and our aspirations. Many of us feel a certain despair or even shame when a natural aspect of our countryside disappears as a result of human activity. There is a sense that we have a moral duty to pass on to our children the tissue of tangled existences that we ourselves have inherited, in all its beauty, strangeness and complexity. We carry within us the desire to protect and improve the environment for present and future generations.

A species is the unique and irreplaceable product of millions of years of evolution. Although its beauty confers great value on it, it is also valuable for itself, regardless of the uses that human beings may find for it. Wise and advised management of biodiversity is thus a question of respecting each human being's right to it.

Landscapes also reflect cultural diversity. We value this diversity because it contribute to our sense of belonging. It is the source of our different ways of seeing reality. Landscapes have embodied local history and inspired the imaginations of different peoples for thousands of years.

1.3. THREATS

For millions of years, our planets has undergone countless transformations for which the forces of nature were alone responsible. The result of this long period of evolution is a complex and dynamic context which ahs enable the human race to exist and prosper within an extremely diverse biological community of inestimable value.

Since its appearance on Earth, the human species has continued to increase in number and to extend to the four corners of the globe. This is because human beings have been able to adapt themselves and their environment to such a degree that has probably never been attained by any other species since the beginning of life on Earth.

Humanity's use of natural resources is increasingly being called into question. Human activities pose numerous threats to the environment, resulting in the disappearance of species and their habitats and the general depletion and exhaustion of natural resources.

1.1.8 Human activities called into question

It is true that the extinction of specie is a phenomenon which can occur in the absence of all human intervention. Al animal and plant species probably have a limited lifetime. Biodiversity is thus continually being lost and created according to modifications in environmental conditions. Nonetheless, the phenomenon of migration and

adaptation, along with the emergence of new species, has generally counterbalanced the effect of extinction over very long periods.

However, the extinction rates reached today have never been so high since the disappearance of the last dinosaurs, about 60 million years ago. Around 10% of the plant species in temperate regions and 11% of the world's 9000 bird species are threatened with extinction. Some scientists hold that several tens of thousands of tropical rain forest species disappear each year or are condemned to die in the near future because of the destruction of these forests.

This degradation and depletion of biological diversity may largely be attributed to the unprecedented pressure that human beings exert on nature. Among the threats that human activities pose to landscapes, ecosystems and species, it is possible to identify the following:

- Over-exploitation of natural resources to the point of exhaustion, particularly by excessive forestry, fishing and hunting. This over-exploitation may be explained in part by human overpopulation in some areas of the planet, ever-increasing world demand for these resources and the development of international trade.

- Industrialised and intensive agriculture using single-crop techniques. This type of farming reduces the genetic diversity of animal and plant species, since the more a species is uniform, the more vulnerable it is to attacks by viruses, insects and fungi.

- Regional/spatial planning characterised by sometimes unsupervised and disorganised urbanisation, such as that found along certain coasts, and the construction of roads or dams which break up species' habitats.

- The development of tourist activities which may have particularly significant repercussion on the environment, given that there have been few planning or development initiatives in this area. The paradox is that it is precisely the resources that attract tourists which are now threatened with deterioration and exhaustion.

- Pollution or poisoning of the soil, water and atmosphere as a result of excessive use of chemical fertilisers and pesticides in agriculture and of certain human activities, especially those connected with industry.

    - ❖ Acid deposits (sulphates and nitrates) have left a large number of Scandinavian lakes almost devoid of life and have damaged many European forests.

    - ❖ These deposits also have harmful effects on birds, which lay eggs with more fragile and porous shells.

    - ❖ Air pollution explains the depletion in plant diversity observed in grasslands in Poland.

    - ❖ Marine pollution cause serious damage to coral reefs and estuaries, thereby affecting the reproduction of certain marine species.

- Intentional or accidental introduction of exotic species which compete with indigenous species and can undermine an ecosystem's equilibrium. There are numerous examples: coypu, muskrat, Canada goose, Himalayan balsam, *Caulerpa taxifolia* (an alga) etc.

1.1.9 Endangered habitats

All these threats damage or even destroy landscape and natural habitats, cause species to die out and reduce their genetic diversity.

Such is the speed with which new technologies are being developed that the damage caused to the environment by human beings is increasing so rapidly that other species do not have time to adapt to the ensuing changes. Modifications in their behaviour, such as restricting their vital habitat, or becoming nocturnal rather than diurnal, might enable them to adjust. However, the time available is generally so limited that they are unable to do so.

Moreover, many animals require large habitats or, in the case of small divided ecosystems, separate habitats linked by corridors. Significant fragmentation into isolated habitats can affect the breeding patterns of such animals and

their search for food and shelter, resulting in gradual depletion of their genetic diversity. Habitats fragmentation can also be a problem for plants, preventing seed and pollen dispersal and consequently blocking reproduction.

We know very little about the interactions between species and we do not know which species may play a crucial role in the functioning of ecosystems and whose disappearance would result in major upheaval. In a number of cases, several species perform the same function, thereby protecting ecosystems from premature destruction. However, the disappearance of specialised species encourages weeds and diseases to replace them. Selective extinction may thus lead to a world with fewer species which are adapted to their environment and which are useful and pleasant for humanity, and more specimens of a few opportunistic species.

2. Glossary

Biosphere: all of the planet's ecosystems, including all living beings and their habitats

Coppice: a small wood of small trees and undergrowth, cut periodically for firewood.

Essential nutrient: a chemical element which is an essential part of a living organism's food and which its body does not produce itself.

Habitat: the area in which an animal or plant species lives

Nematode: a variety of worm which lives either in the soil or in water or as a parasite on humans and other mammals.

Photosynthesis: the process whereby plants and certain bacteria manufacture the organic molecules necessary for their survival, using sunlight as a source of energy.

Primary production: the organic matter (plant debris such as dead leaves) produced by organisms such as plants and certain bacteria during a given period.

Temperate: (of climate) not liable to excess of heat or cold, mild.

Multiple Choice Test: Conservation Biology

1. We are usually referring to species diversity when we talk about biodiversity. However, genetic diversity is also important to ecological systems because diverse genes
A. increase the efficiency and productivity of a system because all niches are filled.
B. allow an individual organism to adapt to its changing environment.
C. are necessary for a population to evolve in a changing environment.
D. lead to diverse ecological processes in a biological community.

2. Ecological diversity is a measure of the number of
A. different kinds of organisms within a community or ecosystem.
B. different versions of the same gene in an ecological community.
C. sizes, colours, and shapes of organisms within an ecological community.
D. niches, trophic levels, and ecological processes of a biological community.

3. The total number of living species is probably
A. between 3 million and 50 million.
B. between 500,000 and 1 million.
C. about 450,000.
D. at least 300 million.

4. Approximately how many species have been identified on Earth?
A. 500,000
B. 1 million
C. 2.1 million
D. 30 million

5. Most of the species that are yet undiscovered are probably
A. mammals and reptiles.
B. invertebrates and vertebrates.
C. birds and fish.
D. invertebrates, bacteria, and fungi.

6. One of the reasons humans rely heavily on only a few food crops is because
A. we haven't explored the cultivation of thousands of edible wild species.
B. there are few edible wild species.
C. we have already focused on the best tasting species for domestication and cultivation.
D. it would be difficult for small farmers to cultivate the fragile wild species.

7. Which of the following is *not* a benefit of biodiversity for humans?
A. aesthetics
B. food
C. ecological services
D. All of these are benefits of biodiversity.

8. Which of the following drugs is not derived from a naturally occurring organism?
A. penicillin
B. aspirin
C. cortisone
D. morphine
E. All of these are natural products.

9. An important drug for treating Hodgkin's disease was discovered in a periwinkle native to _____ and is valued at approximately _____ per year.
A. Madagascar, $15 million
B. New Guinea, $1 million
C. Costa Rica, $15 million
D. Greenland, $1 million

10. The pharmaceutical industry has an interest in preventing species extinction because
A. people are healthier in a healthy environment.
B. undiscovered species may provide important new drugs.
C. most taxonomists are drug makers.
D. it wants to increase diversity in North America.

11. Soil formation and water purification are examples of _____ based on the biodiversity that benefit humans.
A. aesthetic benefits
B. geological cycles
C. ecological services
D. health benefits

12. Habitat fragmentation usually leads to a(n)
A. decrease in biodiversity.
B. reduction in the number of introduced species.
C. increase in biodiversity due to the isolated populations.
D. increase in the number of introduced species.
E. more stable environment.

13. Extinction is the term used when all members of a species
A. disappear in a locality.
B. die.
C. live in zoos.
D. are threatened with imminent habitat loss.

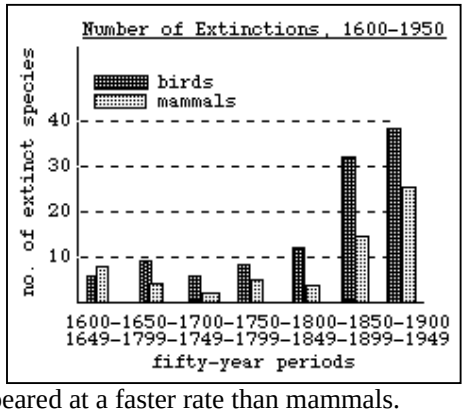
14. Which of the following is true?
A. Humans may have been causing extinctions thousands of years ago, but our impact has recently increased.
B. Humans are responsible for most of the mass extinctions in the geologic record.
C. Humans began causing extinctions only in the past 150 years.
D. Humans have never had significant impact on species extinctions until the past four decades.

15. Generally speaking, an animal whose population is widely scattered geographically is _____ as/than one whose population is geographically restricted.
A. more likely to become extinct
B. less likely to become extinct
C. equally likely to become extinct
D. equally unlikely to become extinct

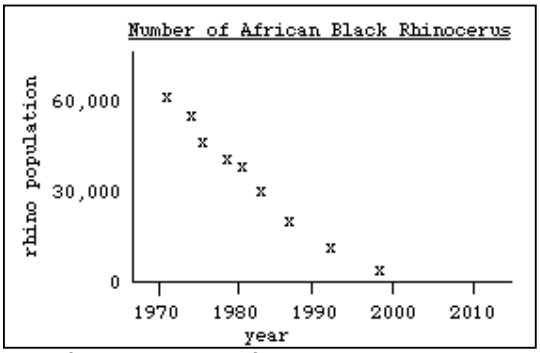
16. The main reason for the high rate of animal extinctions at the present time is
A. uncontrolled sport hunting in the developed world.
B. commercial harvesting of wildlife in Africa.
C. drought conditions caused by the greenhouse effect.
D. habitat destruction world-wide.

17. The graph on the next page tells us that
A. species extinctions will continue to rise in the next fifty years.
B. species extinctions first occurred in 1600.
C. species extinctions have accelerated since about 1800.
D. there has been little change in species extinctions in recent history.

18. The graph of species extinctions (below) shows us that



A. birds have disappeared at a faster rate than mammals.
B. birds have lost more habitat than have mammals.
C. mammals are hardier than birds.
D. birds have been hunted more than mammals.

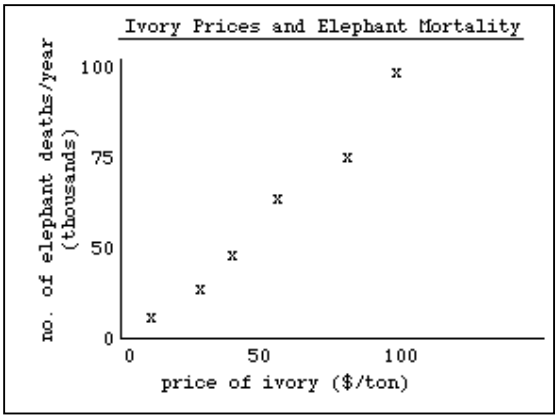


19. According to trends of the last twenty five years (as shown above), the African black rhinoceros should be extinct by the year

A. 1995.
B. 2000.
C. 2010.
D. 2015.

20. The drastic reduction in rhinoceros as shown by the graph above was due mostly to

A. the supposed medicinal value of, and corresponding demand for, their horns.
B. overharvesting for their meat and hide.
C. introduction of exotic species that compete for their food.
D. habitat destruction.



21. From the graph above you can tell how many elephants died

A. in 1980 and 1990.

B. during the Civil War in Zimbabwe.
C. compared to the surviving population.
D. when ivory was worth $50 per ton.

22. The graph above suggests that
A. the price of ivory depends on the number of surviving elephants.
B. more elephants die when ivory is valuable.
C. the total elephant population is shrinking.
D. ivory has become more valuable now that it is hard to find and trade.

23. What did CITES (the Convention on International Trade in Endangered Species) do in 1989 to help save the African elephant population?
A. established parks
B. banned all trade in ivory
C. established breeding programs
D. wrote laws making it illegal to kill or transport elephants

24. The main reason for continued trade in endangered species is
A. a surplus of these species in their home countries.
B. ruthless traders and collectors in tropical countries.
C. the need for international capital exchange in developing countries.
D. pet lovers and collectors who like exotic species.

25. If you have an aquarium with salt-water fish, 75 percent of your fish probably came from
A. captive breeding programs in the United States.
B. captive breeding in Indonesia or the Philippines.
C. wild fish populations caught with cyanide or nets.
D. hybrid crosses of native United States fish.

26. "Exotic" is another word for
A. tropical.
B. foreign.
C. rare.
D. beautiful.

27. Introduced (exotic) species tend to _____ the balance of ecosystems and _____ biodiversity.
A. increase, decrease
B. increase, enhance
C. maintain, enhance
D. upset, decrease

Answer Sheet for Test "Environmental Science, 4/e"

Chapter/ Question	Test Quest	Correct Answer
13-4	1	C
13-5	2	D
13-7	3	A
13-8	4	C
13-9	5	D
13-11	6	A
13-12	7	D
13-14	8	E
13-15	9	A
13-16	10	B
13-17	11	C
13-20	12	A
13-21	13	B
13-22	14	A
13-23	15	B
13-24	16	D
13-25 (-,-,a)	17	C
13-26 (-,-,a)	18	A
13-29 (-,-,b)	19	B
13-30 (-,-,b)	20	A
13-31 (-,-,c)	21	D
13-32 (-,-,c)	22	B
13-33	23	B
13-34	24	D
13-35	25	C
13-40	26	B
13-41	27	D