

Parent Background Information

What is Biodiversity?

Biodiversity is the variety of life. It can be studied on many levels. At the highest level, you can look at all the different species on the entire Earth. On a much smaller scale, you can study biodiversity within a pond ecosystem or a neighborhood park. Identifying and understanding the relationships between all the life on Earth are some of the greatest challenges in science.

Most people recognize biodiversity by species. A species is a group of living organisms that can interbreed. Examples of species include blue whales, white-tailed deer, white pine trees, sunflowers and microscopic bacteria that you cannot even see with your eye. Biodiversity includes the full range of species that live in an area.

Biodiversity is More than Just Species

Species diversity is only one part of biodiversity. To properly catalogue all the life on Earth, we also have to recognize the genetic diversity that exists within species as well as the diversity of entire habitats and ecosystems.

Genetic Biodiversity is the variation in genes that exists within a species. A helpful way to understand genetic diversity is to think about dogs. All dogs are part of the same species, but their genes can dictate whether they are Chihuahua or a Great Dane. There can be a lot of variation in genes – just think about all the colors, sizes, and shapes that make up the genetic diversity of dogs.

Ecological Biodiversity is the diversity of ecosystems, natural communities and habitats. In essence, it's the variety of ways that species interact with each other and their environment. The forests of Maine differ from the forests of Colorado by the types of species found in both ecosystems, as well as the temperature and rainfall. These two seemingly similar ecosystems have a lot of differences that make them both special.

Researchers have estimated that there are between 3 - 30 million species on Earth, with a few studies predicting that there may be over 100 million species on Earth. We have identified only about 1.7 million species, so we have a long way to go before we can come close to figuring out how many species are on Earth.

There is more biodiversity within tropical ecosystems than temperate or boreal ecosystems. Tropical rainforests have the most diversity.

The most diverse group of animals are invertebrates. Invertebrates are animals without backbones, including insects, crustaceans, sponges, scorpions and many other kinds of organisms. Over half of all the animals already identified are invertebrates. Beetles are some of the most numerous species.

There is still much more to learn about the biodiversity of microscopic organisms like bacteria and protozoa.

The Importance of Biodiversity

Biodiversity is extremely important to people and the health of ecosystems. A few of the reasons are:

Biodiversity allows us to live healthy and happy lives. It provides us with an array of foods and materials and it contributes to the economy. Without a diversity of pollinators, plants, and soils, our supermarkets would have a lot less produce.

Most medical discoveries to cure diseases and lengthen life spans were made because of research into plant and animal biology and genetics. Every time a species goes extinct or genetic diversity is lost, we will never know whether research would have given us a new vaccine or drug.

Biodiversity is an important part of ecological services that make life livable on Earth. They include everything from cleaning water and absorbing chemicals, which wetlands do, to providing oxygen for us to breathe—one of the many things that plants do for people.

Biodiversity allows for ecosystems to adjust to disturbances like extreme fires and floods. If a reptile species goes extinct, a forest with 20 other reptiles is likely to adapt better than another forest with only one reptile.

Genetic diversity prevents diseases and helps species adjust to changes in their environment.

Simply for the wonder of it all. There are few things as beautiful and inspiring as the diversity of life that exists on Earth.

Threats to Biodiversity

Extinction is a natural part of life on Earth. Over the history of the planet, most of the species that ever existed evolved and then gradually went extinct. Species go extinct because of natural shifts in the environment that take place over long periods of time, such as ice ages.

Today, species are going extinct at an accelerated and dangerous rate, because of non-natural environmental changes caused by human activities. Some of the activities have direct effects on species and ecosystems, such as:

- Habitat loss/ degradation
- Over exploitation (such as overfishing)
- Spread of Non-native Species/ Diseases
- Some human activities have indirect but wide-reaching effects on biodiversity, including:
 - Climate change
 - Pollution

All of these threats have put a serious strain on the diversity of species on Earth. According to the International Union for Conservation of Nature (IUCN), globally about one third of all known species are threatened with extinction. That includes 29% of all amphibians, 21% of all mammals and 12% of all birds. If we do not stop the threats to biodiversity, we could be facing another mass extinction with dire consequences to the environment and human health and livelihood.

Why Population Matters

With the world confronting a host of major crises relating to climate, energy, severe poverty, food, the global economy and political instability, why should anyone be concerned about population? The simple answer is that virtually all of the major problems that confront the world today relate in some critical way to population growth.

While public concern about rapid population growth has subsided in recent decades, world population is still growing at about 80 million people a year, or about 220,000 people per day. If current trends persist, there will 2.5 billion more people on the planet by mid-century, bringing the total to about 9.2 billion. That projected population growth raises a host of questions about the future of humanity and the planet we inhabit.

Most importantly, will we be able to feed 9.2 billion people? This year, for the first time in history, over 1 billion people go to bed hungry every day. High food prices and the global economic recession have pushed 100 million more people than last year into chronic hunger and poverty. And, looking ahead, we know that climate change, rising energy prices, and growing water scarcity will make it harder, not easier, to grow the crops necessary to feed an expanding population. Mounting soil erosion and the loss of farm land will also add to the challenge of boosting food production.

And it's not just food that's potentially in short supply. Water scarcity is a growing concern. In many parts of the world today, major rivers at various times of the year no longer reach the ocean. In some areas, lakes are going dry and underground water aquifers are being rapidly depleted. And climate change, of course, will make the water situation even more critical. Drier areas will be more prone to drought, wetter areas more prone to flooding, and the summer runoff from snowpack and glaciers will diminish.

As food, water, and other resources are strained by the escalating demands of a growing world population, the number of environmental refugees in the world will rise, and so will the potential for conflict and civil war.

One strategy to address overpopulation is to provide universal access to voluntary family planning and reproductive health services. There are over 100 million women in the world today who want to space or limit their pregnancies, but who lack knowledge of, or

access to, modern methods of contraception. By educating and empowering women, and giving them access to family planning services, we can save lives, strengthen families, fight poverty, preserve the environment, and help achieve a world population that can live in harmony with the planet.

Demographic Transition

Beginning in the late 1700s, something remarkable happened: death rates declined. With new technologies in agriculture and production, and advancements in health and sanitation, a greater number of people lived through their adolescent years, increasing the average life expectancy and creating a new trajectory for population growth. This sudden change created a shift in understanding the correlation between birth and death rates, which up to that point had both been relatively equal, regardless of location. Over the past 300 years, population demographics have continued to evolve as a result of the relationship between the birth and death rates within a country. The observation and documentation of this global phenomenon has produced a model, the Demographic Transition Model, which helps explain and make sense of changes in population demographics. Using the Demographic Transition Model, demographers can better understand a country's current population growth based on its placement within one of five stages and then pass on that data to be used for addressing economic and social policies within a country and across nations.

What is the Demographic Transition Model?

The Demographic Transition Model (DTM) is based on historical population trends of two demographic characteristics – birth rate and death rate – to suggest that a country's total population growth rate cycles through stages as that country develops economically. Each stage is characterized by a specific relationship between birth rate (number of annual births per one thousand people) and death rate (number of annual deaths per one thousand people). As these rates change in relation to each other, their produced impact greatly affects a country's total population. Within the model, a country will progress over time from one stage to the next as certain social and economic forces act upon the birth and death rates. Every country can be placed within the DTM, but not every stage of the model has a country that meets its specific definition. For example, there are currently no countries in Stage 1, nor are there any countries in Stage 5, but the potential is there for movement in the future.

What are the stages of the Demographic Transition Model?

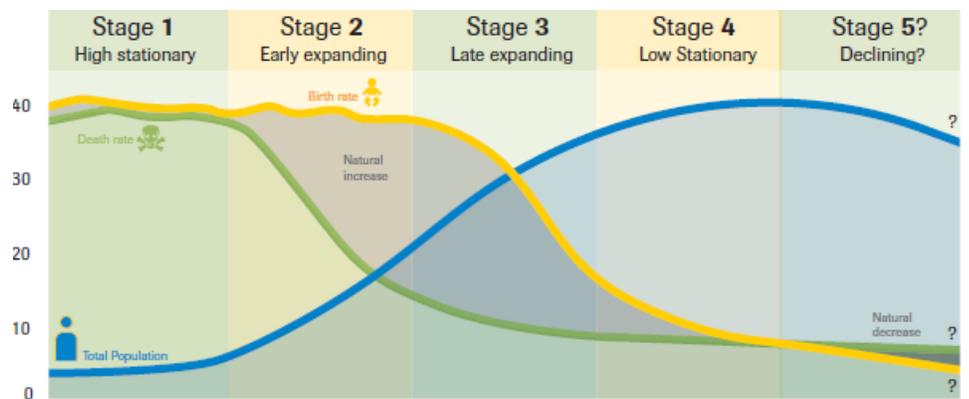
In Stage 1, which applied to most of the world before the Industrial Revolution, both birth rates and death rates are high. As a result, population size remains fairly constant but can have major swings with events such as wars or pandemics.

In Stage 2, the introduction of modern medicine lowers death rates, especially among children, while birth rates remain high; the result is rapid population growth. Many of the least developed countries today are in Stage 2.

In Stage 3, birth rates gradually decrease, usually as a result of improved economic conditions, an increase in women's status, and access to contraception. Population growth continues, but at a lower rate. Most developing countries are in Stage 3.

In Stage 4, birth and death rates are both low, stabilizing the population. These countries tend to have stronger economies, higher levels of education, better healthcare, a higher proportion of working women, and a fertility rate hovering around two children per woman. Most developed countries are in Stage 4.

A possible Stage 5 would include countries in which fertility rates have fallen significantly below replacement level (2 children) and the elderly population is greater than the youthful population.



Limitations of the Demographic Transition Model

Like any model, there will be outliers and exceptions to the rule and the Demographic Transition Model is no different. Additionally, there are things the DTM cannot reveal: the impact of other demographic variables such as migration, are not considered, nor does the model predict how long a country will be in each stage. But even so, the relationship between birth rate and death rate is an important concept when discussing population and any patterns, such as those provided by the DTM, that aid in understanding are helpful.

Sources:

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- <https://www.populationeducation.org/content/what-demographic-transition-model>
- <https://www.khanacademy.org/science/biology/ecology/population-growth-and-regulation/a/exponential-logistic-growth>