THE HUMAN FOOTPRINT: LAND

UNIT 3 STUDENT READING

People and the Planet
Lessons for a Sustainable Future

If you think about the history of the Earth, our time on it as humans is tiny. In fact, if geologic history was a calendar and the Earth formed on January 1 (that was 4.6 billion years ago), you wouldn't find humans until December 31 at 11:37 pm (about 200,000 years ago). Back then, there weren't very many of us, and we had yet to make our mark on the planet.

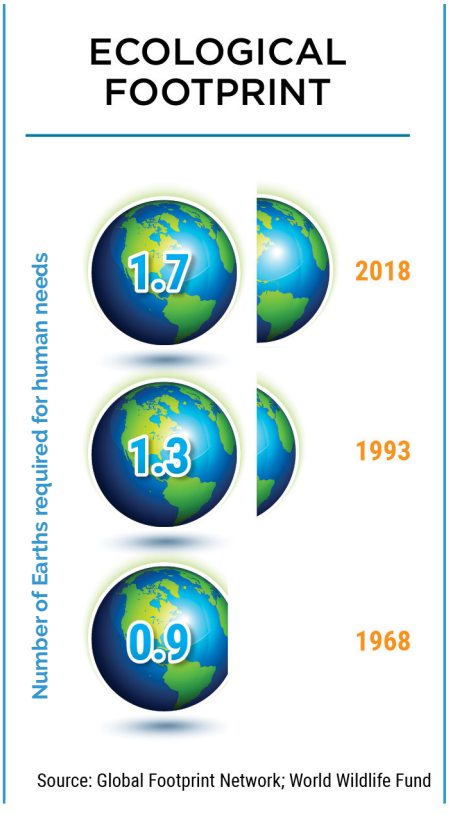
Fast forward to 12,000 years ago. Humans evolve from just hunting and gathering food to staying in one place and farming the land. Before long, we're clearing forests, building cities and expanding human settlements across the globe.

Some trace the human dominance of Earth to those days of early farming. Others think it started much more recently – about 200 years ago with the **Industrial Revolution**. That's when our world began to be mechanized; when we started using fossil fuels to power engines in our factories, on our farms, rivers and rails. Before long, our species had completely remade the Earth's landscape. By the 1900s, we had vast amounts of land cleared for industrial-size farms, sprawling cities and mining operations. Scientists are now referring to this period since the Industrial Revolution as the **Anthropocene**, or Human Age. The word comes from the Greek anthropos (human) and -cene (recent) and is meant to show the overwhelming influence humans have had on the environment in such a short amount of time.

OUR LARGE AGRICULTURE FOOTPRINT

Sometimes, people refer to the "human footprint" to describe how our species has made its mark on the planet. One of the most visible signs of this is how we have altered the land. Satellite images of the Earth now show that nearly 40 percent of Earth's land is used for agriculture – growing crops and grazing livestock.[1] In 1700, just 7 percent of the world's land was used for farming.[2] Experts agree that today, the remaining land that could potentially grow crops is not ideally suited for farming. Much of this land is covered in forest, and using it for farming would mean clearing valuable ecosystems.

This presents a dilemma, because world population is growing. It is estimated that the world will need to produce 70 percent more food for the expected population we will have by 2050 – approximately 2 billion more people than are alive today.[3] In order to maintain precious ecosystems, we will need to find ways to either produce more food, or use our existing food and croplands more effectively, so that we don't need to expand agricultural lands.



Source: Global Footprint Network; World Wildlife Fund

How land is used to produce food also depends on our choices about what we eat. Eating more meat and dairy, for example, has a greater impact on the environment than eating mostly vegetables, fruits and grains. Farming livestock, like cows, pigs and sheep, requires large amounts of land (80 percent of all agricultural land) but provides only a small amount of food (less than 20 percent of the world's calories). One-third of all croplands produce feed for livestock rather than for humans.[4]

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FOREST LOSS

Some of the world's land cleared for crops and livestock was once forest. We depend upon the world's forests to regulate climate, to clean air and water, to conserve precious soil, and to provide habitat to much of the planet's wildlife. Forests cover 31 percent of the global land area and are home to 80 percent of the world's land based plants and animals.[5]

Since the Industrial Revolution, nearly half of Earth's forests have been cleared or degraded to make way for agriculture and other human uses. Of greatest global concern is the loss of the Earth's **tropical rainforests** and all of its **biodiversity**. Although tropical forests cover less than 6 percent of the global land surface, they are home to more than half the species of all living things.[6] Rainforests are a treasure trove of foods, medicines, and other resources we have only begun to discover. Less than one percent of rainforest species have even been studied for their potential usefulness. Many species are so specialized to **microhabitats** within the forest that they can only be found in small areas. This specialization makes them vulnerable to extinction. Many countries have committed to finding ways to manage their forests sustainably, so as not to lose further habitat and all of the ecosystem services that forests provide.

AN URBAN PLANET

Wildlife habitat is also lost when land is cleared for development, including the expanding **urban** areas around the globe. As our population grows, we need more land for building houses, businesses, power plants, roads, schools, and for disposing of waste. Our planet is becoming increasingly urban.[7] In 1800, only 7 percent of the world's population lived in urban areas; today it's more than half. By 2050, more than two-thirds of the world's people will make their homes in cities.[8]

The expansion of human settlements can pose challenges to the natural environment beyond just a change in the landscape. Communities require **infrastructure** – roads and bridges, public transportation and public utilities – to provide us with water, sewage treatment, power lines and cell phone towers. All of these expand our human impact and take up more space.

EXTRACTING RESOURCES

Another human impact on the world's land results from **resource extraction**. The raw materials that provide us with all of the goods and services we need and want come from somewhere. The Earth is a finite system, after all. Look around you. Every item you can see has either been grown in the soil or extracted from deep underground.

The fossil fuels that power our lives – coal, oil and natural gas – are brought to you by mining and drilling operations. Coal is mined from the ground. Oil is pumped from rigs found on land and in the ocean. Natural gas is either extracted from conventional drilling operations, or from **hydraulic fracturing** (also known as fracking). Fracking has been controversial because it requires huge quantities of water, which become toxic and can leak into underground water sources. When this wastewater is disposed of, it creates pressure in the ground that can cause small earthquakes.

The minerals that comprise everyday objects – copper, aluminum, tin, quartz, clay and so much more – are extracted, either by surface mining or underground mining. Surface mining involves overturning or "stripping" the land to get to the minerals or using explosive to blow the tops off mountains. Underground mining uses shafts and tunnels to get at minerals deep below the Earth's surface. The effect on the land from mining operations can be permanent. This might include removing **topsoil**, destroying animal and plant habitat and polluting nearby water sources (such as rivers, lakes and streams) with chemicals and silt.

As humans, both our numbers and lifestyles affect the Earth's land. Our demand for increasing amounts of food, energy and minerals, as well as our capacity to expand the built environment, has changed our land for all species. Providing for the needs of people while still protecting our remaining wildlife habitat will require a global commitment to land conservation.

Glossary

Anthropocene: a term referring to our current period since the Industrial Revolution where humans have had an overwhelming influence on the environment.
biodiversity: the variety of life in the world or in a particular habitat or ecosystem.
hydraulic fracturing (fracking): a procedure for extracting natural gas from deep in the ground, using a high-pressure stream of water to split open rock, allowing gas to flow more freely out of the well.
Industrial Revolution: a period in history (mid 1700s through late 1800s) when there was a surge of new advances in science and technology.
infrastructure: the basic physical and organizational structures and facilities (e.g., buildings, roads, and power supplies) needed for the operation of a society.
microhabitats: a habitat that is of small or limited extent and which differs in character from some surrounding more extensive habitat.
resource extraction: the act of removing (extracting) minerals and other natural resources from the ground.
topsoil: the thin, rich layer of soil where most nutrients for plants are found.
tropical rainforests: a forest in a tropical region of the world with high annual rainfall.
urban: relating to cities.

[1] Food and Agriculture Organization. (2020, May 7). *Land use in agriculture by the numbers*. http://www.fao.org/sustainability/news/detail/en/c/1274219/

[2] Owen, J. (2005, December 9). *Farming Claims Almost Half Earth's Land, New Maps Show*. National Geographic. https://www.nationalgeographic.com/history/article/agriculture-food-crops-land

[3] Ranganathan, J., Waite, R., Searchinger, T., & Hanson, C. (2019, July 16). *How to Sustainably Feed 10 Billion People by 2050, in 21 Charts*. World Resources Institute. https://www.wri.org/blog/2018/12/how-sustainably-feed-10-billion-people-2050-21-charts

[4] Ritchie, H. (2019, November 11). *Half of the world's habitable land is used for agriculture*. Our World in Data. https://ourworldindata.org/global-land-for-agriculture

[5] Food and Agriculture Organization. (2020). *State of the World's Forests 2020* (ISSN 2521-7542). http://www.fao.org/state-of-forests/en/

[6] World Wildlife Fund. (2020). *WWF - Discover tropical rainforests*. https://wwf.panda.org/discover/our_focus/forests_practice/importance_forests/tropical_rainforest/

[7,8] Ritchie, H. (2018, June 13). *Urbanization*. Our World in Data. https://ourworldindata.org/urbanization#long-run-history-of-urbanization