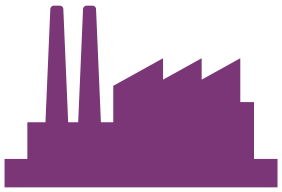
Drivers of Biodiversity Loss:

# POLLUTION


Over the past 50 years, the natural world has experienced unprecedented rates of change with devastating implications.[1] Today, approximately one million species are at risk of extinction globally and integrally linked ecosystem services– from disease buffering to pollination– are at risk of loss. The direct drivers of biodiversity loss with the largest global impact are: changes in land and sea use; direct exploitation of organisms; climate change; pollution; and invasion of nonnative species. These drivers are largely a result of underlying societal values and behaviors; if left unaddressed, they are predicted to continue or increase their detrimental impact. Transformative action is needed to alleviate these threats and the species declines that they contribute to.

Many types of **pollution** – air, water, and soil among others – are increasing, with negative impacts for nature. Although global trends are mixed, air, water, and soil pollution are on the rise in many areas. Greenhouse gas emissions, agricultural fertilizers, plastic waster, oil spills, and many other sources of pollution have had strong negative effects on soil, freshwater, oceans, and atmosphere. These contaminants directly or indirectly threaten many species as well as human health and welfare. At listing, at least 437 species were impacted by pollution.[1]



**POLLUTION**

Nitrogen pollution is considered one of the main drivers of global change, impacting soils, water, and air.

With current rates of water pollution and the demand for water growing, clean water supplies are predicted to drop substantially.

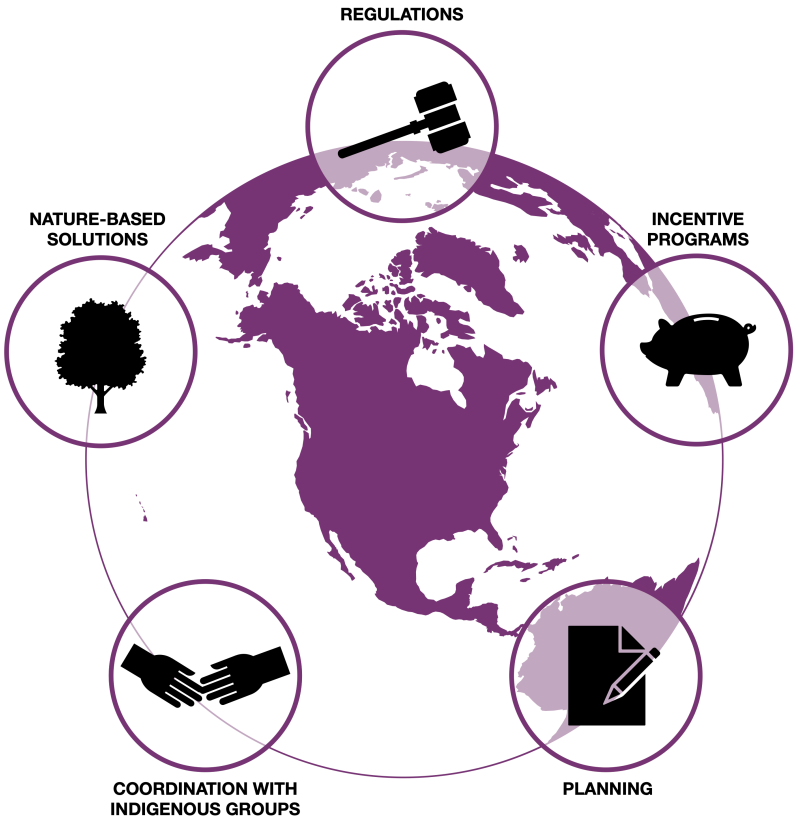
Marine environments face unique issues of plastic pollution, which has increased at rapid rates in the past few decades.

Changes to land management, energy use, and consumption of goods could significantly help reduce pollution.

## Key Facts

- Increased nitrogen pollution - due to agricultural fertilization or atmospheric deposition - is one of the main drivers of global change.[2] By 2050, an estimated one fifth of the global population will face risks from eutrophication, and a third will be exposed to water with excessive nitrogen and phosphorous.[3] Increased nitrogen in agricultural ecosystems in the Americas has resulted in reduced drinking water and air quality, freshwater eutrophication, biodiversity loss, rain acidification, stratospheric ozone depletion, climate change, and coastal ecosystem destruction (dead zones).[4]
- Over 80% of global wastewater is discharged back into the environment without treatment and 300–400 million tons of heavy metals, solvents, toxic sludge, and other industrial wastes are dumped into the world's waters each year.[3] Future trends in the Americas are uncertain but as human populations and economies grow, the demand for clean water will increase and could exceed supply by 40%.[5]
- Marine plastic pollution has increased tenfold since 1980, affecting at least 267 species, including 86% of marine turtles, 44% of seabirds and 43% of marine mammals.[3]
- Pesticides (e.g., noenicitinoids) can be toxic to wildlife and people. In addition, herbicides, which reduce plant cover and change plant species diversity, were found to be responsible for reduced food availability for pollinators.[6]
- At night, light pollution threatens many species of wildlife and can disrupt plants by distorting their natural day–night cycle. Migratory fish and birds can become confused by artificial lighting, impeding migration efforts.[7]
- Noise pollution can affect species' behaviors and distributions and may hold significant consequences for natural communities in the short- and long-term. Noise can travel long distances underwater and potentially prevent marine animals from hearing their prey or predators, finding their way, or communicating with one another.

- Air pollution causes significant adverse health effects on people and biodiversity (e.g., increased levels of CO2 cause ocean acidification and air pollution from mercury can permeate into soil and water, which eventually bioaccumulates up the food chain).[4]




## Possible Solutions

- *Existing regulatory authorities should be used to their fullest extent to avoid, minimize, or mitigate pollution.* In the U.S., this includes the Clean Water Act and Clean Air Act, the Federal Insecticide, Fungicide, and Rodenticide Act for pesticides, and numerous other federal, state, and local laws and regulations. New laws or regulations may be needed to fill gaps where existing authorities are lacking or unclear, such as when managing emerging pollutants (e.g., implementing single-use plastic bans).
- *Incentive programs that prioritize improved conservation outcomes.* Further modification and continued support for current Farm Bill programs (e.g., EQIP) and Clean Water Act permit programs can help with control and reduction of water pollution from agricultural and industrial sources to target beneficial conservation outcomes. Increasing incentives for public transportation or use of renewable energy sources can help to decrease emissions.
- *Indirect regulatory or planning authorities should be used to reduce the harms caused by pollution.* Zoning and engineering plans can be leveraged to prioritize pollution management and reduction at a landscape scale. (e.g., light pollution regulations in zoning codes).
- *Collaboration with Indigenous peoples could make efforts to curb pollution more effective.* Traditional agricultural practices often limit pollution through low or infrequent use of pesticides and fertilizers. Traditional management practices also include remediation techniques (e.g., phytoremediation) to restore landscapes affected by pollution and contribute to pollution buffering and nutrient cycling. Additionally, local observations and Indigenous knowledge often enable monitoring, mapping and reporting of pollution expansion.[3]
- *Nature-based solutions should be prioritized.* Restoration of native vegetation, particularly in coastal, wetland and riparian areas can help increase filtration of pollutants and sediments before they reach waterways. Low impact developments and green infrastructure are some ways of reducing storm water runoff.[2] Integrated pest management can significantly reduce the amount of pesticides applied on the landscape reducing overall toxicity to biodiversity.

## References

1. Leu, M., et al. 2019. Temporal analysis of threats causing species endangerment in the United States. Conservation Science and Practice. DOI 10.1111/csp2.78
2. National Service Center for Environmental Publications (NSCEP). 2011. Reactive Nitrogen in the United States: An Analysis of Inputs, Flows, Consequences, and Management Options: A Report of the EPA Science Advisory Board. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100DD0K.PDF?Dockey=P100DD0K.PDF
3. IPBES. 2019. Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Brondizio, E.S., Settele, J., Díaz, S., Ngo, H.T. (eds). IPBES secretariate, Bonn, Germany. DOI 10.5281/zenodo.5517154
4. IPBES. 2018. The IPBES regional assessment report on biodiversity and ecosystem services for the Americas. Rice, J., Seixas, C. S., Zaccagnini, M. E., Bedoya-Gaitán, M., and Valderrama N. (eds.). Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany. 656 pages. DOI 10.5281/zenodo.3236252
5. United Nations, Department of Economic and Social Affairs, Population Division. 2013. World Population Prospects: The 2012 Revision, Highlights and Advance Tables. Working Paper No. ESA/P/WP.228.
6. Kohler, H.R. & Triebskorn, R. 2013. Wildlife ecotoxicology of pesticides: can we track effects to the population level and beyond? Science. DOI 10.1126/science.1237591
7. Holker, F., et al. 2010. Light pollution as a biodiversity threat. Trends in Ecology & Evolution. DOI 10.1016/j.tree.2010.09.007