

Summary of Common Pollutants

Pollutant Type (Accumulation/ Delivery)	Information	Common Sources	Examples of Impact on Nature	Examples of Impact on Public Health
Ground-Level Ozone (Air)	<ul style="list-style-type: none"> ◆ One of the most common air pollutants¹ ◆ Colorless gas found in air² ◆ Completely distinct from upper atmosphere ozone (which protects Earth from ultraviolet rays)¹ 	<ul style="list-style-type: none"> ◆ Forms as a chemical reaction when pollutants combine³ such as industrial and vehicle emissions² 	<ul style="list-style-type: none"> ◆ Plant damage through the oxidization (burning) of the plant's leaves in:¹ <ul style="list-style-type: none"> ◆ Crops¹ ◆ Natural ecosystems¹ 	<ul style="list-style-type: none"> ◆ Reduced lung function² ◆ Increase susceptibility of lungs to:² <ul style="list-style-type: none"> ◆ Infection² ◆ Allergens² ◆ Other air pollutants² ◆ These problems may continue well after the ozone exposure.²
Sulfur & Nitrogen (Air, Water, Soil, Food Chain)	<ul style="list-style-type: none"> ◆ Travels through the environment by various pathways, including wind⁴ and water⁵ ◆ Can accumulate in the environment and lead to many forms of degradation including acidification⁴ 	<ul style="list-style-type: none"> ◆ Power plants/factories³ ◆ Vehicles³ ◆ Crop Fertilizer³ ◆ Animal Waste³ 	<ul style="list-style-type: none"> ◆ Change in the plant and animal species that can live in an ecosystem⁴ ◆ Increase in insects and disease⁴ ◆ Change in susceptibility to fire⁴ ◆ Excess nitrogen:⁴ <ul style="list-style-type: none"> ◆ Algal blooms⁴ ◆ Fish death⁴ ◆ Loss of biodiversity⁴ 	<ul style="list-style-type: none"> ◆ Soil acidification can make it difficult or impossible to grow food crops, as plants are not able to absorb nutrients in the soil to live and thrive⁶ ◆ Algal blooms, such as those that occur in Lake Erie, can expose humans to toxins through:⁵ <ul style="list-style-type: none"> ◆ Consuming contaminated:⁵ <ul style="list-style-type: none"> ◆ Drinking water⁵ ◆ Seafood⁵ ◆ Direct exposure (such as swimming in contaminated water)⁵ ◆ Breathing contaminated air⁵ ◆ Impacts of algal blooms include:⁷ <ul style="list-style-type: none"> ◆ Gastrointestinal illness⁷ ◆ Liver damage⁷ ◆ Death⁷ ◆ Sulfur dioxide exposure irritates:⁸ <ul style="list-style-type: none"> ◆ Skin⁸ ◆ Eyes⁸ ◆ Nose⁸ ◆ Throat⁸ ◆ Lungs⁸ ◆ These effects are most damaging to children and the elderly.⁹

Summary of Common Pollutants (cont.)

Pollutant Type (Accumulation/ Delivery)	Information	Common Sources	Examples of Impact on Nature	Examples of Impact on Public Health
Particulate Matter (Air)	<ul style="list-style-type: none"> ◆ Liquid and solid matter suspended in the air that varies in size:⁹ <ul style="list-style-type: none"> ◆ Visible particles include dust, soot, and smoke⁹ ◆ Microscopic particles, largely considered more dangerous than those that are visible⁹ ◆ PM includes:¹⁰ <ul style="list-style-type: none"> ◆ Acids¹⁰ ◆ Organic chemicals¹⁰ ◆ Metals¹⁰ ◆ Soil/dust¹⁰ ◆ Allergens¹⁰ 	<ul style="list-style-type: none"> ◆ Dust/smoke from sources such as:³ <ul style="list-style-type: none"> ◆ Burning fossil fuels³ ◆ Forest/grassland fires³ 	<ul style="list-style-type: none"> ◆ Wildlife respiratory inflammation, similar to that found in humans¹¹ ◆ Corrosion¹² ◆ Damage to vegetation¹² ◆ Reduced visibility¹² ◆ Accumulation on surfaces, making them dirty¹² ◆ Airborne particulate matter may accumulate in water, soil, and the food chain. These instances are discussed in the “Sulfur & Nitrogen” and “Toxic Compounds” sections 	<ul style="list-style-type: none"> ◆ Long-term exposure¹⁰ <ul style="list-style-type: none"> ◆ Reduced lung function¹⁰ ◆ Chronic bronchitis¹⁰ ◆ Short-term exposure can:¹⁰ <ul style="list-style-type: none"> ◆ Aggravate lung disease¹⁰ ◆ Cause asthma attacks¹⁰ ◆ Cause acute bronchitis¹⁰ ◆ Be linked to heart attacks for those with heart disease¹⁰
Toxic Compounds (Air, Water, Soil, Food Chain)	<ul style="list-style-type: none"> ◆ Enter the environment at various points and through various methods ◆ Include metals and chemicals³ ◆ Do not break down¹³ ◆ Can build up in the tissue of animals and humans throughout the food chain¹³ ◆ There is no safe level of many toxins, including lead.¹⁴ ◆ Examples include: <ul style="list-style-type: none"> ◆ Mercury¹³ ◆ Lead¹⁵ ◆ Pesticides¹³ ◆ PCBs¹³ ◆ Flame retardants¹³ ◆ PFOS and PFOAS¹⁶ 	<ul style="list-style-type: none"> ◆ Power plants: <ul style="list-style-type: none"> ◆ Coal-burning³ ◆ Nuclear¹⁷ ◆ Failing infrastructure¹⁴ ◆ Laboratories/Hospitals¹⁸ ◆ Production/use of agriculture and consumer products such as:³ <ul style="list-style-type: none"> ◆ Paint¹⁵ ◆ Pesticides¹³ ◆ Batteries¹⁸ 	<ul style="list-style-type: none"> ◆ Harmful effects on wildlife include negative impact on:¹³ <ul style="list-style-type: none"> ◆ Behavior¹³ ◆ Neurology¹³ ◆ Reproduction¹³ ◆ Growth and development¹³ ◆ Decreased immune response¹³ ◆ These harmful effects can change the abundance of wildlife within the ecosystem¹⁹ 	<ul style="list-style-type: none"> ◆ Toxic compounds can accumulate in the food chain, as food sources collect these toxins in one or more source of the environment.²⁰ ◆ Harmful effects on public health include negative impact on:²⁰ <ul style="list-style-type: none"> ◆ Behavior²⁰ ◆ Neurology²⁰ ◆ Reproduction²⁰

Summary of Common Pollutants (cont.)

Pollutant Type (Accumulation/ Delivery)	Information	Common Sources	Examples of Impact on Nature	Examples of Impact on Public Health
<p>Greenhouse Gases (GHG)</p>	<ul style="list-style-type: none"> ◆ Trap heat in the atmosphere, make the planet warmer,²¹ and lead to climate change²² ◆ Humans are responsible for the increases in GHGs observed in the last 150 years.²² ◆ Examples include:²³ <ul style="list-style-type: none"> ◆ Carbon dioxide²³ ◆ Methane²³ ◆ Nitrous oxide²³ ◆ Hydrofluorocarbons²³ ◆ Perfluorocarabons²³ ◆ Sulfur hexafluoride²³ ◆ Nitrogen trifluoride²³ ◆ Land use and forestry offsets GHG emissions. In 2017, 11.1% of US GHG emissions were offset by US managed forests.²¹ 	<ul style="list-style-type: none"> ◆ Transportation²¹ ◆ Electricity production²¹ ◆ Industry²¹ ◆ Burning of fossil fuel including:²¹ <ul style="list-style-type: none"> ◆ Transportation²¹ ◆ Energy production²¹ ◆ Heating²¹ ◆ Chemical reaction²¹ ◆ Agriculture²¹ ◆ Food waste²⁴ 	<ul style="list-style-type: none"> ◆ Observed: <ul style="list-style-type: none"> ◆ Change in migratory patterns²⁵ ◆ Species migration north²⁵ ◆ Change in the location, abundance, and timing of food sources²⁵ ◆ Increased extreme heat²⁶ ◆ Increased natural disasters²⁶ ◆ Increased infectious disease²⁶ ◆ Anticipated by 20100:²⁷ <ul style="list-style-type: none"> ◆ Almost half the plant communities on Earth's surface will be modified.²⁷ ◆ Almost 40 percent of land-based ecosystems will shift type (e.g., forest, tundra)²⁷ ◆ Further reduction of biodiversity²⁷ <ul style="list-style-type: none"> ◆ The Great Lakes region is considered an ecologically sensitive "hotspot," and is projected to have among the highest amount of species turnover, internationally²⁷ 	<ul style="list-style-type: none"> ◆ Climate change affects the social and environmental determinants of human health.²⁶ <ul style="list-style-type: none"> ◆ Clean air²⁶ ◆ Safe drinking water²⁶ ◆ Sufficient food²⁶ ◆ Secure shelter²⁶ ◆ Additional observed impacts include: <ul style="list-style-type: none"> ◆ Extreme heat:²⁶ <ul style="list-style-type: none"> ◆ Death from disease such as: <ul style="list-style-type: none"> ◆ Cardiovascular²⁶ ◆ Respiratory²⁶ ◆ Respiratory distress (including asthma) from:²⁶ <ul style="list-style-type: none"> ◆ Raised ozone²⁶ ◆ Increased pollen²⁶ ◆ Increased Natural Disasters²⁶ ◆ Infectious Disease²⁶ ◆ Climate change is a danger to all people. Factors that increase risk include:²⁶ <ul style="list-style-type: none"> ◆ Location:²⁶ <ul style="list-style-type: none"> ◆ Coastal regions, including and especially small island states²⁶ ◆ Developing states²⁶ ◆ States with weak infrastructure²⁶ ◆ Large cities²⁶ ◆ Mountains²⁶ ◆ Polar regions²⁶ ◆ Age (young and old)²⁶ ◆ Pre-existing conditions²⁶

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