Assessing the Environmental Impacts of Acid Rain, Microplastics, Road Salt, and Volatile Organic Compounds on Aquatic and Terrestrial Ecosystems

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Acid rain, microplastics, road salt, and volatile organic compounds (VOCs) are among the most harmful pollutants affecting terrestrial and aquatic ecosystems. Acid rain forms when sulfur dioxide (SO2) and nitrogen oxides (NO?) react with water in the atmosphere, producing acids that can lower soil and water pH to 4-5, a level harmful to many plants and aquatic organisms. Microplastics, defined as plastic particles smaller than 5 mm, accumulate in soil and water and can cause both chemical and physical damage. According to the Global Burden of Diseases (GBD) each human consumes over 287 grams of microplastics yearly. Road salt, commonly used for de-icing roads, increases salinity in soil and freshwater, often reaching levels above 1000 ppm, which are harmful to many organisms. VOCs are chemical compounds that can alter water chemistry and affect plant and microbial growth. This experiment utilizes controlled aquatic and terrestrial microecosystems contained in enclosed mason jars. The aquatic system contains Pancium repens and pond water, while the terrestrial system contains Triticum aestivum seeds and swamp water. Each ecosystem is divided into six groups: acid rain, microplastics, road salt, VOCs, all pollutants combined, and a control with no pollutants. The effects of these pollutants are assessed by measuring plant growth, water pH, water hardness, water alkalinity, water carbonate, and microbial count. Results from each treatment group are compared to the control to determine how each pollutant impacts ecosystem health and stability.

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