

HIGH pH: Narrative for simple conceptual diagram

High pH levels occur when hydroxide ion concentrations are high and hydrogen ions are scarce. Although acidic conditions more commonly result from human activities, alkaline conditions also can occur and adversely affect aquatic biota. Certain human activities and their associated sources can result in increased pH in aquatic systems, including stormwater runoff from sources associated with agriculture (e.g., lime-rich fertilizers) and urbanization (e.g., asphalt roads) and effluents and leachate from sources associated with industry (e.g., soap manufacturing plants) and mining (e.g., oil and gas brine mining wastes). Atmospheric emissions and deposition generally do not contribute to high pH conditions, a marked difference from low pH conditions. There also are natural sources which can result in high pH conditions, such as naturally alkaline geologies and lithologies and high levels of photosynthesis. Because photosynthesis produces hydroxide ions, elevated nutrient concentrations may contribute to pH increases.

High pH levels can affect other stressors, most notably by increasing the proportion of ammonia in its unionized, toxic form. Increases in pH and pH fluctuation may contribute to decreased condition, decreased growth, altered behavior, and increased susceptibility to other stressors in affected biota. Ultimately, these effects may result in increased mortality, decreased reproductive success, and changes in population and community structure and ecosystem function. For example, taxa sensitive to high pH (e.g., perciform fishes) may decrease, while more tolerant taxa (e.g., cypriniform fishes, *Cladophora*) increase; these changes may result in reduced taxa richness or diversity.