|  |  |
| --- | --- |
|  | Nitrate Pollution  Vascular plants, seaweeds, and phytoplankton require certain elements as building blocks to synthesize organic molecules. There are six essential nutrients that are required in relatively large quantities: nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur, and seven more required in smaller quantities: iron, chlorine, copper, manganese, zinc, molybdenum, and boron. The different species of marine plants, however, need somewhat different amounts of these nutrient elements. The lack of these nutrients is a major factor limiting primary production. Hence, it is ironic that nutrient pollution in the sea is a large and growing problem. The UN�s Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP 1990) identified nutrients as the most damaging pollutants in the marine ecosystem. Too much of a good thing can be harmful in the sea, as elsewhere (Clark).  As is the case in nitrate pollution. Agricultural pollution contains nitrates in large quantities. Nitrate is one form of nitrogen. It is nitrogen combined with 3 oxygen atoms (its symbol is NO ). On an annual basis, about 11.5 million tons of nitrogen are applied as commercial fertilizer for agricultural purposes throughout the United States. Between 1945 and 1985, commercial nitrogen fertilizer use increased twentyfold in the United States, from about 594,000 to almost 11.5 million tons per year (Alexander and Smith, 1990).  Nitrogen is important because it is an essential nutrient for plant and animal growth. It is one of the key components of proteins. Many aquatic plants use nitrate for their source of nitrogen but nitrate levels should be below those that will cause excessive plant growth. Nitrate is a very mobile form of nitrogen---it is not readily retained by the soil and is highly soluble in water. Because of the mobility of nitrate, farmers tend to apply it in greater quantities than crops require. Also, given its high solubility, nitrate may be washed into adjacent streams by rain, or it may leach into the ground-water system.  Ground water is the sole source of drinking water for many rural communities and some larger cities. Because nitrate is soluble in water it can pass through the soil and potentially contaminate ground water. Nitrates can persist in ground water for decades and accumulate to high levels as more is applied to the land.  Although nitrate generally is not an adult public-health threat, ingestion in drinking water by infants can cause low oxygen levels in the blood, a potentially fatal condition. For this reason, the U.S. Environmental Protection Agency (1995) has established a drinking-water standard of 10 milligrams per liter (mg/L) for nitrate. Nitrate concentrations in natural ground waters are usually less than 2 mg/L.  Nitrate concentrations in streams tend to increase as the percent of drainage area in agriculture increase. Evidence of this was documented when nitrate concentrations exceeded maximum levels allowed in Bear and Zollner Creeks in the Pudding Basin northwest of Salem (Harb). Both streams drained predominantly from agricultural land.When nitrate pollution occurs in streams with close proximity to the ocean, the nutrients are discharged into the ocean, often having adverse effects on the ecosystem of the ocean. One result of this disruption is increased growth of the green algae Ulva.  San Vincente Creek  [Intro #1](http://docs.google.com/intro.html)  [Intro #3](http://docs.google.com/intro3.html)  [Intro #4](http://docs.google.com/intro4.html) |

*This Web Site is Best viewed with 256 or more colors.*

*For More Information about Creekwatch, please contact Eric Thiel at* [*ethiel@pleasanton.k12.ca.us*](mailto:ethiel@pleasanton.k12.ca.us)