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Commentary Article

A BRIEF NOTE ON THERMAL POLLUTION AND ITS SOURCES

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DESCRIPTION

Thermal pollution, sometimes classified as "thermal enrichment," is the degradation of water quality produced by any process that alters the heat from the surrounding water. The rise or reduction in the temperature of a natural body of water caused by human intervention is called thermal pollution. Unlike chemical pollution, thermal pollution can cause a change in the physical qualities of water. The use of water as a coolant by power plants and industrial manufacturers is a common source of thermal pollution. Thermal pollution can come from urban runoff, which is storm water discharged to surface waters from rooftops, highways, and parking lots, as well as reservoirs. The release of very cold water from reservoir foundations into warmer rivers can also generate thermal pollution.

When cooling water is returned to the natural environment at a higher temperature, the sudden change in temperature reduces oxygen supply and has an impact on ecosystem balance. An abrupt change in water temperature (either a rapid increase or drop) known as "thermal shock" can kill fish and other species adapted to a specific temperature range. Warm coolant water has a long-term influence on water temperature, raising the overall temperature of bodies of water, including deep water. The location of these temperature rises throughout the water column is influenced by seasonality. Excessive water temperatures reduce oxygen content, which can kill fish and change the makeup of food sources, reduce species biodiversity, and increase the invasion of new thermophilic species.

THERMAL POLLUTION SOURCES AND CONTROL

Industrial wastewater

Once-Through Cooling (OTC) systems, which do not reduce the temperature as well as the above techniques, are one of the most important contributions to thermal pollution. A major power plant may extract and export up to 500 million gallons of water each day. On average, such systems can create water

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that is 10°C warmer. The Potrero Generating Station in San Francisco (which closed in 2011) used OTC and released water to San Francisco Bay at a temperature about 10 degrees Centigrade (20°Fahrenheit) above the ambient bay temperature. As of 2014, over 1,200 facilities in the United States had used OTC systems.

Temperatures can be assessed utilizing remote sensing data to keep track ofto how toxic plants are. This makes it easier to quantify each plant's individual effects and to regulate thermal pollution greater strictly. Converting facilities from once-through cooling to closed-loop systems reduces the amount of thermal pollution generated drastically. These systems release water at a temperature that is nearer to that of the natural world.

Urban runoff

Urban runoff can have a significant thermal influence on minor streams during hot weather. Storm water absorbs some of the heat whenever it travels over hot rooftops, parking lots, roadways, and walkways, a result of the urban heat island. Storm water management facilities such as bio-retention systems and infiltration basins, that absorb runoff or divert it into groundwater, decrease these thermal impacts by giving the water more time to dissipate excess heat before entering the aquatic environment. These related runoff management systems are part of the growing urban design approach referred to as green infrastructure.

So because water may be heated by the sun before being discharged to a receiving stream, retention basins (storm-water ponds) are less successful in reducing runoff temperature.

Reservoirs

The temperatures at the bottom of man-made dams lower dramatically as water stratifies. Many dams are built to release the cold water from the bowels of the earth into natural systems. It could be addressed by constructing the dam to release warmer surface waters instead of the cold water at the reservoir's bottom.