**WABS Stem Fellows 2017-18**

**4th Grade Computer Science, Math and Science**

**Lesson 1 Background Resources: Lake Washington Restoration**

Water quality is greatly influenced by human activities, but other seemingly subtle biological activities also have great significance. Lake Washington is an interesting example of how human influences and biological processes can alter water quality. Lake Washington is 2nd largest freshwater lake in the State of Washington (33.8 square miles of surface area). It is a major water body of the Puget Sound region, located directly east of Seattle, WA and west of Bellevue, WA.

As the population in the Seattle area increased rapidly after World War II, the amount of sewage that was discharged into Lake Washington also began to rise. Sewage treatment was not well regulated, and wastewater that had only received primary treatment (i.e. settling, screening) was routinely discharged directly into the lake. This caused the water quality to drastically decrease between 1940 and the early 1960s. This decline in water quality was mostly characterized by massive eutrophication (i.e. high level of nutrients which cause massive algal blooms). Planktonic algal blooms were dominated by blue-green bacteria (algae) which caused decreased visual clarity of water; algae also washed ashore in mass quantities where it rotted and smelled (making lakefront property extremely undesirable in this time period).

Research on Lake Washington showed that high levels of phosphorus (a major nutrient and cause of algal blooms), were a result of the sewage inputs to the lake (because the wastewater was only being treated for solids removal, and not necessarily for nutrient loading removal). This research lead to the creation of “Metro”- a public regional utility that was tasked with centralizing sewage to receive proper treatment. Between 1963 and 1968, more than 100 miles of large trunk lines and pipeline interceptors were installed to carry sewage to treatment plants (rather than discharging into Lake WA (and other water bodies).

At the time, the $140 million dollar campaign was considered the most costly pollution control effort in the country. Effluent, which was at one time entering Lake Washington at the rate of 20 million gallons per day, was reduced to zero discharge in February 1968. After the last lakeshore treatment plant was closed, the concentration of phosphorus dropped quickly to about 16 parts per billion from a previous level of 70+ parts per billion. The lake's transparency, as low as 30 inches in 1964, reached 10 feet by 1968. Water quality would continue to improve: in later years the transparency would reach depths of 17 to 20 feet, with a maximum depth of nearly 25 feet in 1993. These efforts also saw a major return of complex species developing habit again in Lake WA, such as zooplakton and several fish species (including salmon, longfin smelt).

The success story of Lake WAS was an early precursor to a major amount of political discussion in the United States surround environmental quality. The Environmental Protection Agency (EPA) was successfully established shortly after (in 1970), after several years of movement within the Federal Government to react to the increasing public concern regarding the natural environment. The Clean Water Act was then passed in 1972, which gave the EPA to federally regulate sewage treatment. Wastewater diversion and treatment (similar to what was implemented in the Puget Sound, was implemented all over the country).

Link to more information: <https://www.kingcounty.gov/services/environment/water-and-land/lakes/lakes-of-king-county/lake-washington/lake-washington-story.aspx>