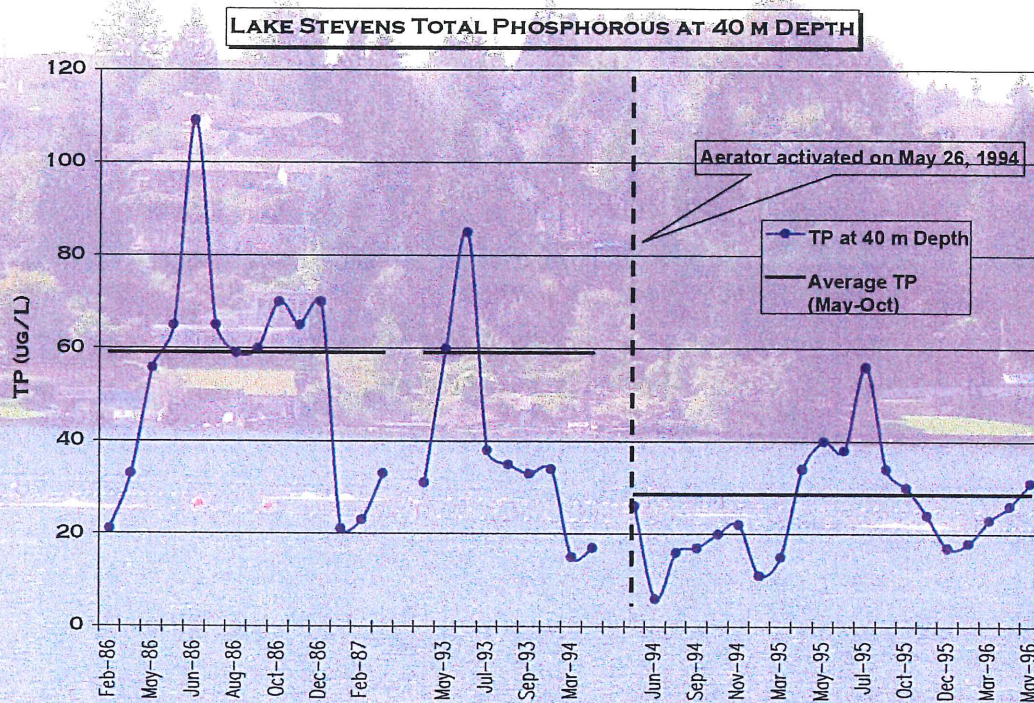


LAKE STEVENS RESTORATION PROJECT PHASE IIC MONITORING REPORT



SEPTEMBER 2001
G&O #01632

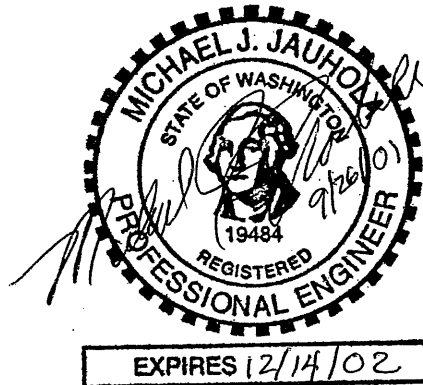


Gray & Osborne, Inc.

CITY OF LAKE STEVENS

**LAKE STEVENS RESTORATION
PROJECT PHASE IIC MONITORING
REPORT**

SEPTEMBER 2001




Gray & Osborne, Inc.
CONSULTING ENGINEERS

G&O No. 01632

EXECUTIVE SUMMARY

Under Phase IIc of the Lake Stevens Restoration Project, the City was tasked with monitoring various water quality parameters for Lake Stevens and its tributaries as well as the restoration projects constructed under Phase IIb. Following this monitoring, the City was required to evaluate the effectiveness of the restoration projects including any noticeable long term trends resulting from the data collected. The intent of this monitoring report is to analyze these issues by observing the data collected between 1987 and 1996. The data shown in this report was collected from a number of sources including K.C.M., citizens of Lake Stevens, and Drainage Improvement District No. 8.

A number of positive impacts were realized throughout the analysis of this data. Overall, it appears the aerator had a significant effect on improving the water quality of the lake by decreasing phosphorous levels in Lake Stevens. At the 40 meter depth, dissolved oxygen levels significantly increased while iron, total phosphorous and soluble reactive phosphorous decreased. Table E1 displays the averages for each of these parameters from the months of May through October. The aerator also appears to have helped decrease nuisance algae while it is still unclear as to whether or not the aerator helped in increasing benthic invertebrate concentrations in the lake.

TABLE E1

Percent Change of DO, Iron, TP, and SRP at the 40 meter Depth in Lake Stevens

	Pre-Aerator Summer Average	Post-Aerator Summer Average	Percent Change
Dissolved Oxygen (mg/L)	3.2	8.0	+250%
Iron (mg/L)	0.12	0.08	-33%
Total Phosphorous (ug/L)	59.1	28.5	-52%
Soluble Reactive Phosphorous (ug/L)	35.5	25.0	-30%

Some positive trends were also realized when analyzing the tributary streams. Total phosphorous and soluble reactive phosphorous were slightly decreased in Stevens, Lundeen and Stitch Creeks which was possibly due to the implementation of various best management practices throughout the region at the time the data was collected. The decrease in phosphorous in the Outlet Channel was most likely due to the decrease in phosphorous in the lake. Total Kheldahl nitrogen as well as nitrate and nitrite nitrogen were also slightly reduced in most of the creeks. This may be due to a decrease in failing septic systems or a reduction in livestock around this area. A slight increase in temperature and dissolved oxygen was observed amongst the creeks while alkalinity, pH,

iron, ammonia, conductivity and total suspended solids remained relatively unchanged throughout the monitoring period.

Unfortunately, the data collected in regards to storm events and the stream restoration projects was minimal and scattered. It should be noted that in the past few years, a number of Kokanee salmon have inhabited the area, suggesting the success of the restoration projects. However, to truly assess these projects and their impacts, further observation is recommended.

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