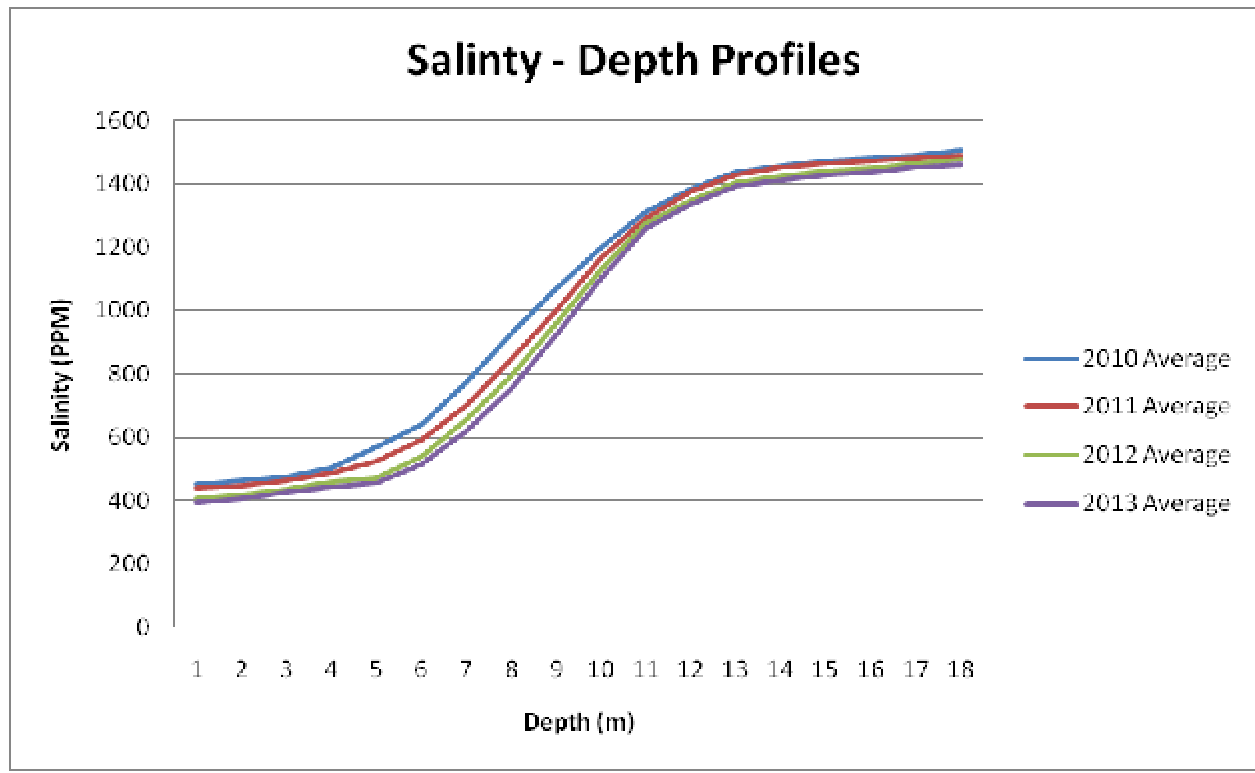


2013 Forest Lake Salinity Update

The goal of this testing protocol was to monitor the salinity throughout the lake and determine if the total amount of salt is changing and if the concentrations pose a threat to the ecosystems of the lake. The Salinity-Depth Profile readings were taken at the southern deep hole of the lake. Readings were taken on a monthly basis from April through August. This report describes conditions at the times the samples were taken. The quality of the water was tested only to the parameters listed below.

Salinity-Depth Profile:

The Salinity-Depth Profile describes the salt concentration at various depths throughout the water column. For the purpose of this study, readings were taken at 1 meter intervals.



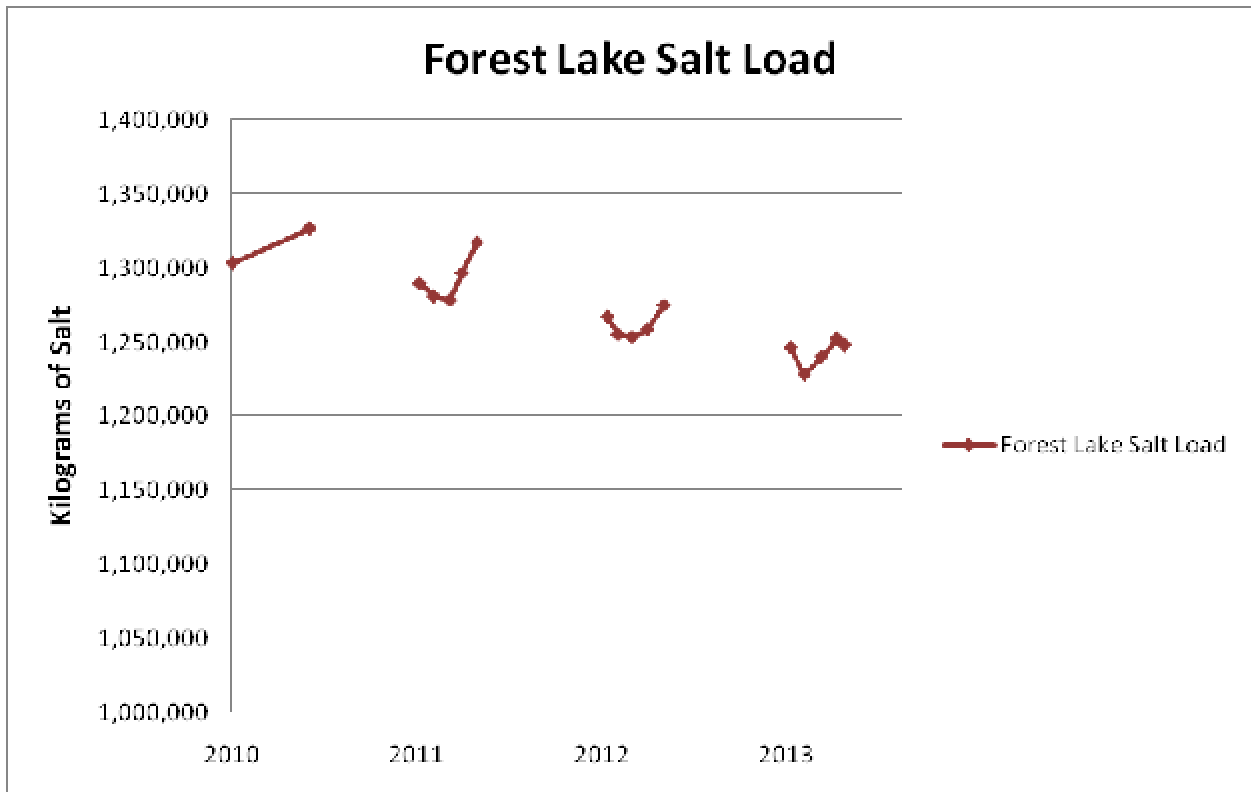
The above graph displays the salinity concentration at each depth during the tests. The variation in salinity at a given depth is due to mixing of the water as water temperature changes. Also, as rain brings in more freshwater or more salt-laden water from Turtle Lake, the concentrations at the surface vary.

Using the bathymetric map of the lake, we can approximate the amount of water in each depth interval and then use the salinity concentration to estimate a salt load for that layer and, therefore, the entire lake. The chart below displays the salinity concentration at each interval and the salt load of the lake. The graph below displays the salt load of the lake.





Depth (meters)	Salinity on 4/26/2013 (ppm)	Salinity on 5/24/2013 (ppm)	Salinity on 6/27/2013 (ppm)	Salinity on 7/22/2013 (ppm)	Salinity on 8/12/2013 (ppm)
0	400	382	394	404	401
1	412	395	407	417	413
2	430	415	426	434	431
3	447	432	444	454	450
4	459	462	458	460	453
5	518	508	507	528	521
6	625	605	612	636	627
7	759	732	744	772	762
8	931	899	919	941	934
9	1,110	1,082	1,102	1,117	1,112
10	1,263	1,248	1,259	1,267	1,264
11	1,339	1,323	1,334	1,343	1,340
12	1,395	1,381	1,391	1,398	1,396
13	1,417	1,402	1,412	1,421	1,418
14	1,432	1,418	1,428	1,436	1,433
15	1,442	1,429	1,438	1,446	1,443
16	1,457	1,446	1,453	1,460	1,458
17	1,465	1,452	1,461	1,468	1,466
Salt Load (kg)	1,246,600	1,228,239	1,240,360	1,252,204	1,248,002



Overall, the data and analysis indicate the overall amount of salt in the lake decreased in each year of testing. Despite these decreases, the overall concentration of salts in the lake remains very high, especially in the deep water. The need for a remediation method is no less than when testing began in 2010.

Discussion

Monitoring the salinity-depth profile monthly revealed that the amount of salt in the lake decreased from April to May, then increased through July, and dipped slightly in August. This is consistent with spring overflow removing some salt from the lake. Then, as the temperatures came up in the summer, evaporation increased and left behind saltier water, and in August there were rain storms that diluted and flushed some of the salt.

The “halocline” is the layer of water that separates the two portions of the lake: the upper portion that still mixes and has relatively less salt and the lower portion that does not mix and has relatively more salt. Further analysis of the depth profile indicates the halocline moves depending on the lake conditions.

Sampling Date	Halocline Depth
April 19, 2010	7 m
September 20, 2010	7 to 9 m
April 25, 2011	9 m
May 23, 2011	9 m
June 23, 2011	9 m
July 18, 2011	8 m
August 16, 2011	7 m
April 30, 2012	9 m
May 21, 2012	9 m
June 18, 2012	9 m
July 17, 2012	8 m
August 20, 2012	9 m
April 26, 2013	8 m
May 24, 2013	8 m
June 27, 2013	8 m
July 22, 2013	8 m
August 12, 2013	8 m

The halocline remained at 8 meters for most of the season – a decline since 2012. Although the salt load in the lake decreased, the salt distribution moved upward to reduce the size of the upper layer of water. Both possible solutions for the salt accumulation (aeration, bottom draw) will be best utilized in the spring to exploit the high flow over the weir and increased mixing of the upper layer of the lake. The lake naturally flushes salt at this time, so either remedy will bring more salt-laden water to the surface, where it can be passed downstream in a relatively short time compared to later in the year.

