

Update on Vancouver Lake water and nutrient budget project

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Vancouver Lake Watershed Partnership meeting

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Project overview

- Three year study begun in 2010
- Year 1 and 2 focus on flow and water quality sampling.
- Year 3 - data analysis, report writing, development of data gaps and next steps

Water Budget

- In September 2010, three new flow gages were established.
- Data is telemetered for real-time viewing.
- Currently Burnt Bridge Creek and Flushing Channel discharge data up on web.
- Lake River gage height and velocity on web, discharge relationship still being developed.



Water Budget (con't)

- Precipitation gage located at flushing Channel, data telemetered real-time to web
- Evaporation estimated from data collected at the Vancouver Lake Sailing Club
 - Sensors are measuring air temperature, water temperature, relative humidity, wind speed and direction every 5 minutes since November 2010.
 - Will run until November 2012.



Water Budget (con't)

- To date, seepage measurements made at 2 sites
 - Sailing club
 - Near the southeast shore
- Will repeat measurements at least quarterly and at additional locations.



Nutrient Budget

- Monthly water quality samples starting in November 2011, and will continue through November 2013
- Samples collected at Burnt Bridge Creek, Flushing Channel, Lake River near Felida boat ramp, Salmon Creek, and 2 lake locations.
- Lake locations are:
 - The deep part of lake along the east side of lake
 - At sailing club dock to co-locate with current and historical WSU data collection



Nutrient Budget (con't)

- All samples are analyzed for
 - Nutrients (various forms of N and P)
 - Total suspended sediments
 - Particulate N and P
- In addition, at lake sites –
 - Surface and bottom samples are taken
 - Chlorophyll-a surface samples taken
 - YSI profile for temp, DO, conductivity

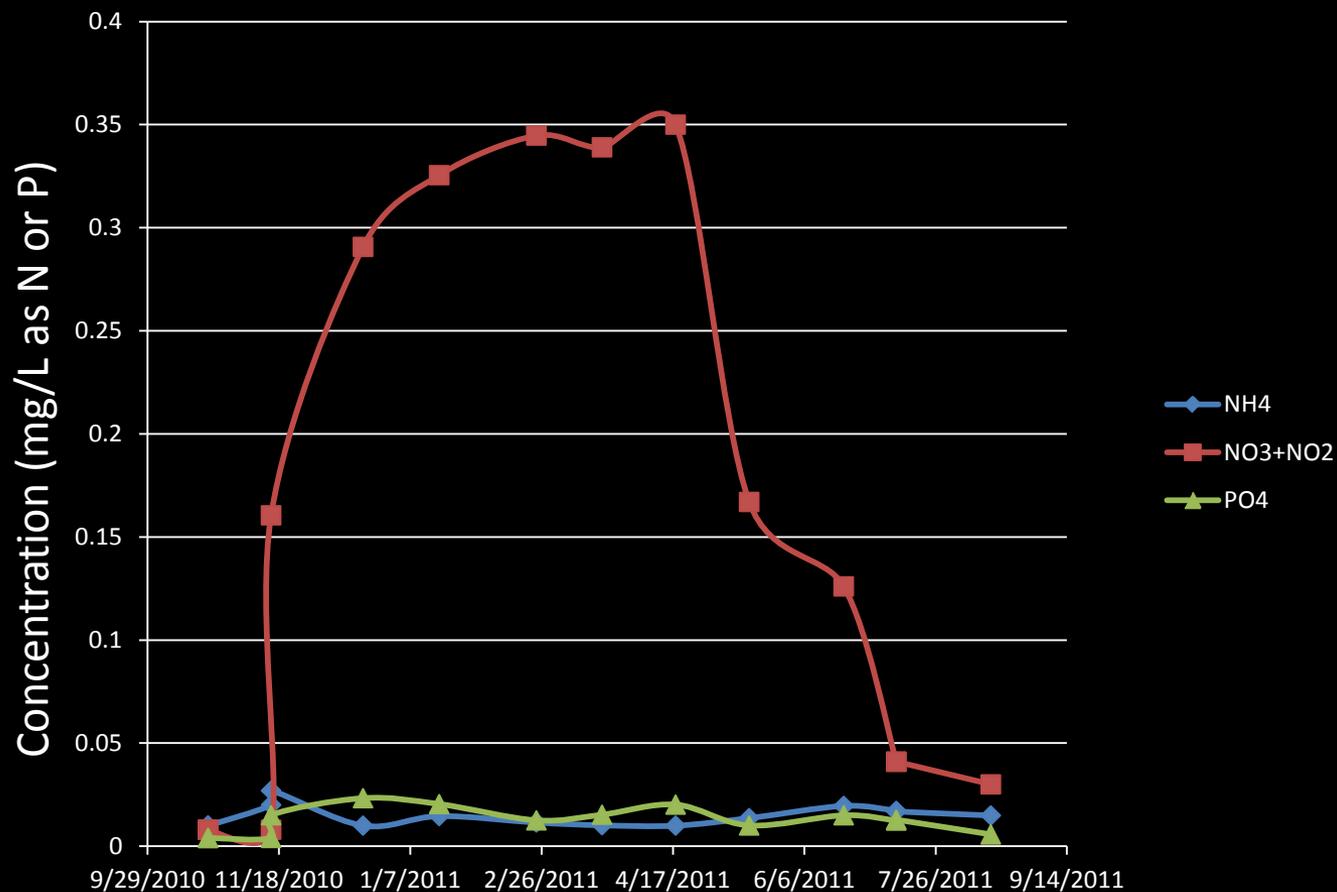
Nutrient Budget (con't)

- To date, about 90 samples collected across all sites.
- Over the 2 year data collection period, samples collected at a range of flows are desired in order to develop a robust flow-concentration relationship to estimate nutrient loads

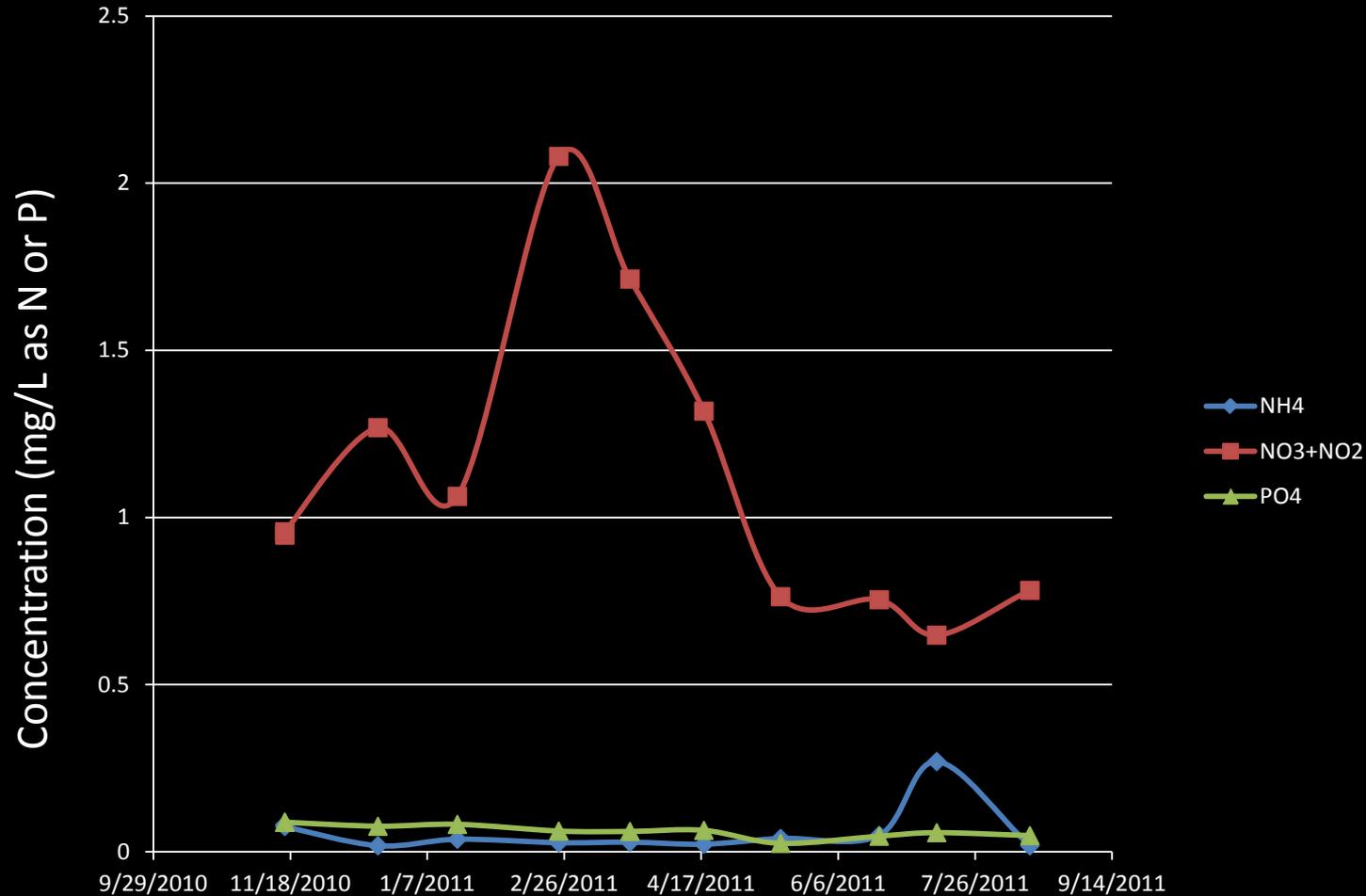
Nutrient Budget (con't)

- Burnt Bridge Creek
 - Discharge range since study began 6-340 cfs
 - Flow when samples were collected 10-60 cfs
- Flushing Channel
 - Discharge range since study began 0-194 cfs
 - Lower end (0 cfs) due to presence of tide gate prohibiting backward flow
 - Flow when samples were collected 30-134 cfs
- Lake River – sampling on both IN and OUT, still working on flow data

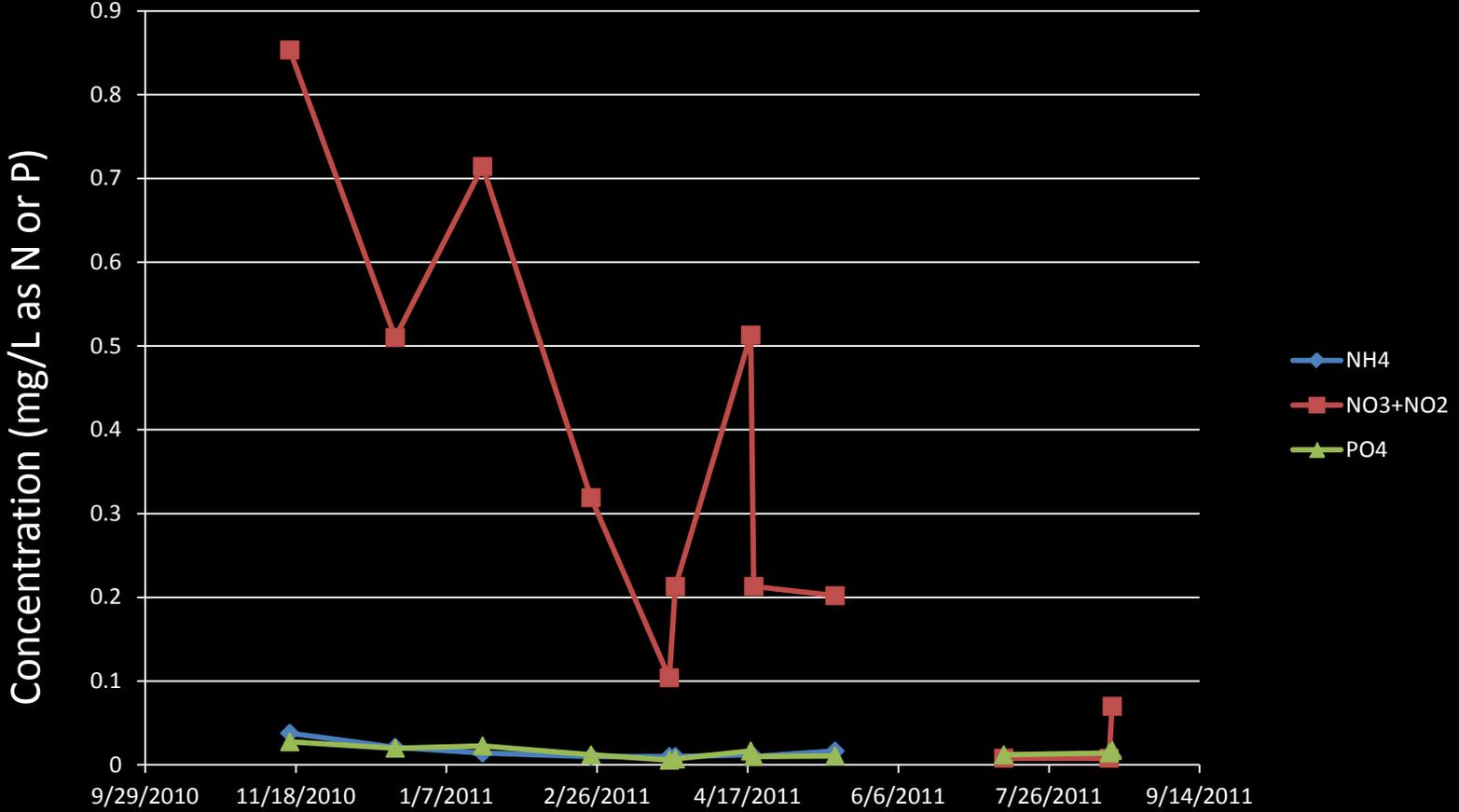
Flushing Channel



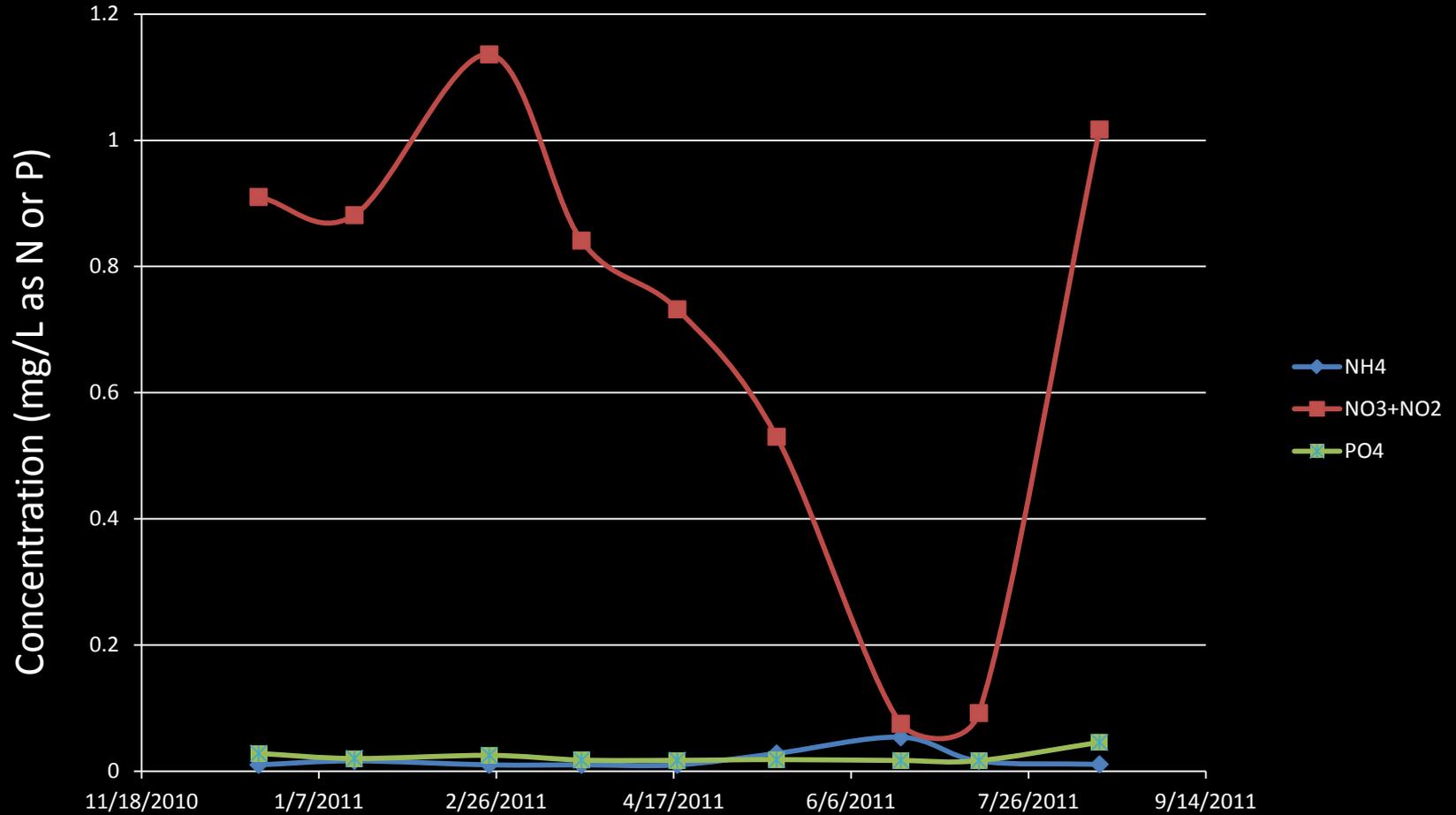
Burnt Bridge Creek



Lake River



Salmon Creek

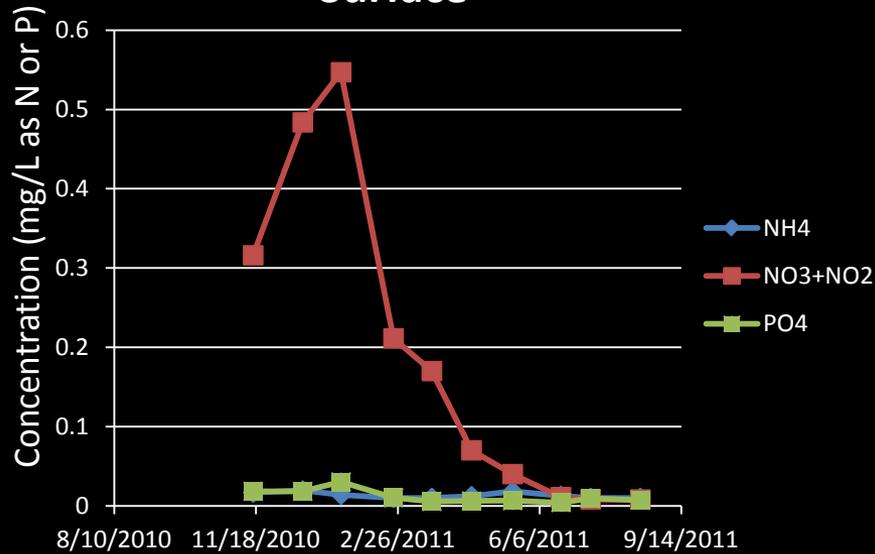


Summary from tributaries

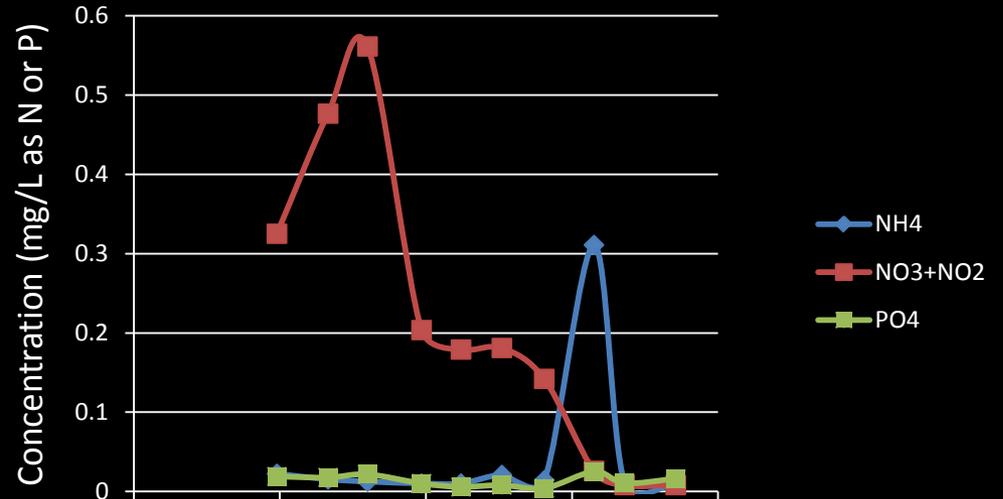
- In general, NH_4 and PO_4 are much less than NO_3 in most samples.
- Burnt Bridge Creek has highest levels of NO_3 across all tributaries
- NO_3 elevated during winter/spring and decreases in summer.
 - This pattern is typical of a high runoff, cool and wet winter/spring; low runoff with sunny/warm summer

Lake Site 1

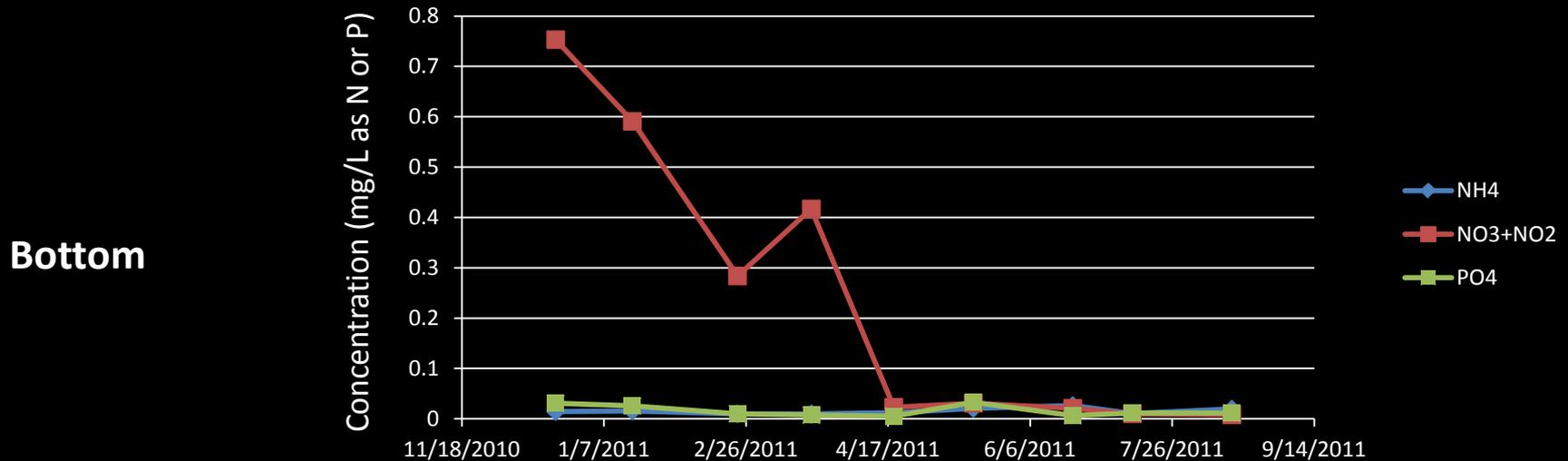
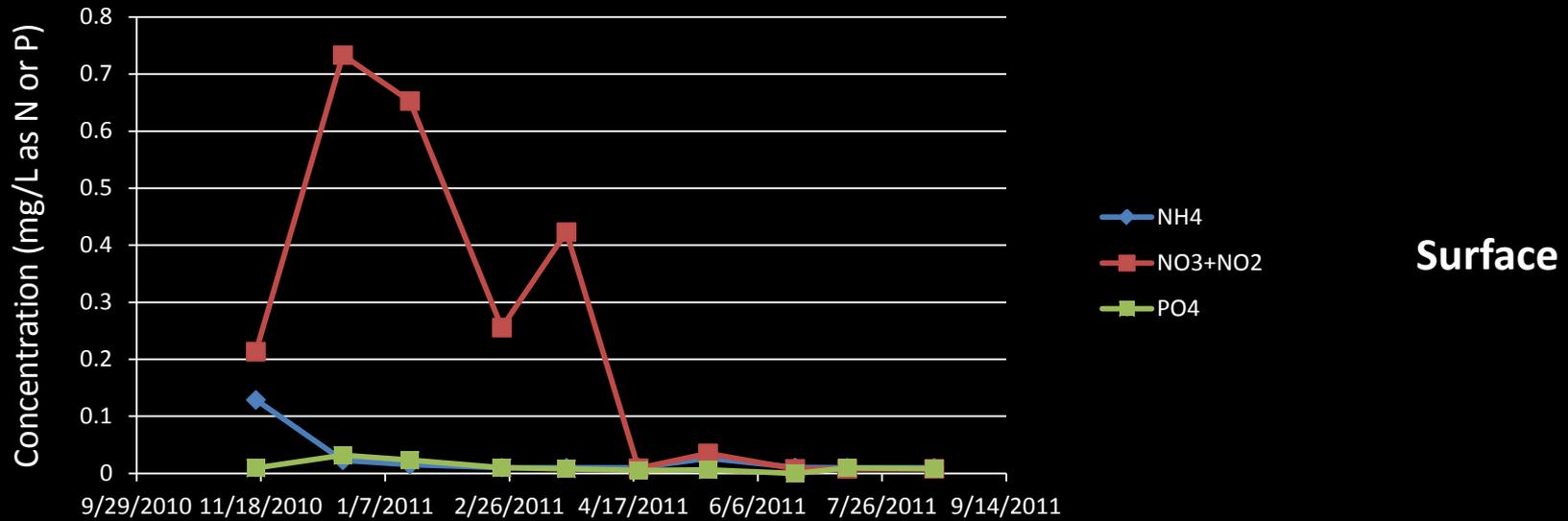
Surface



Bottom



Lake site 2



Summary from Lake Sites

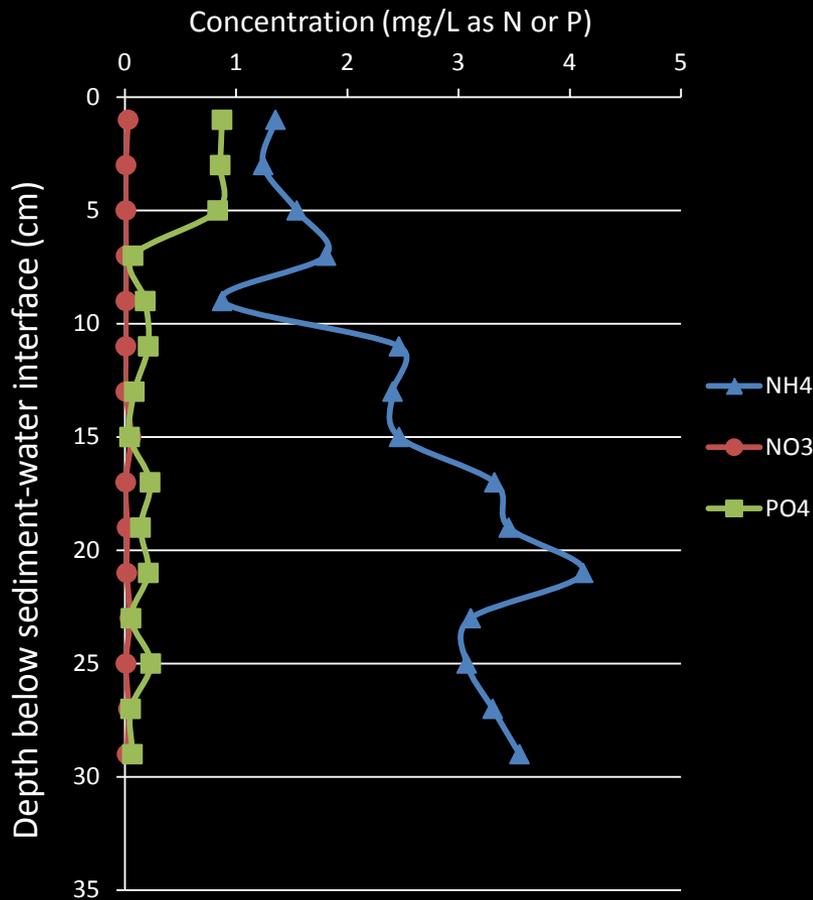
- In general, NH_4 and PO_4 much less than NO_3 in most samples, similar to surface tributaries.
- Surface and bottom very similar with respect to nutrients
- NO_3 elevated during winter/spring and decreases in summer, similar to what is seen in surface tributaries
- Lake sites in summer very low concentrations

Other Measurements Completed

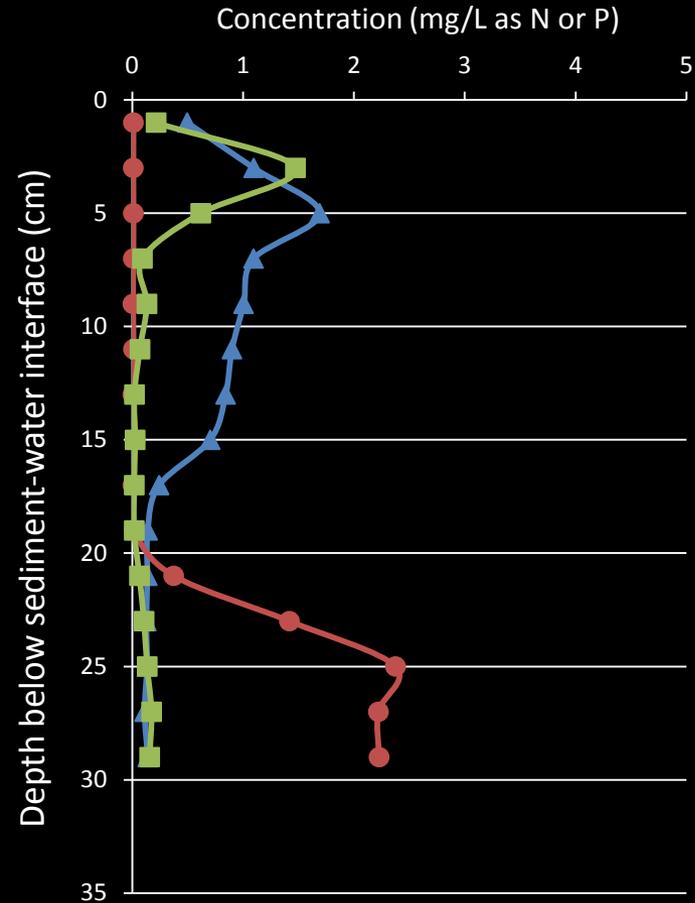
- Groundwater sample at sailing club dock, highest nutrient concentrations recorded to date
 - NO_3 (3.6 mg/L); PO_4 (0.12 mg/L)
- Temperature profilers on east and west side of lake measuring temperatures at 5 min intervals
- Porewater samples collected at the two lake locations in August 2011
- Sediment cores collected at 4 lake locations to look at historical N and P in FY2012, funding permitted

Porewater Results

Site 1



Site 2



Next Year's Focus

- Continue with routine monthly sampling for water quality and flow monitoring
- Focus more on high flow events
- Collect more groundwater data
- Further investigation of porewater