Appendix 2.

The following figures illustrate how the lower (25th percentile; left box) and upper (75th percentile; right box) quartiles of *Response Variable* values correspond to variation among a subset of *Stressor Metrics*. See Box 1 in Chapter 5 for information on interpreting these types of figures.

Response of SAV Index to Stressor Metrics

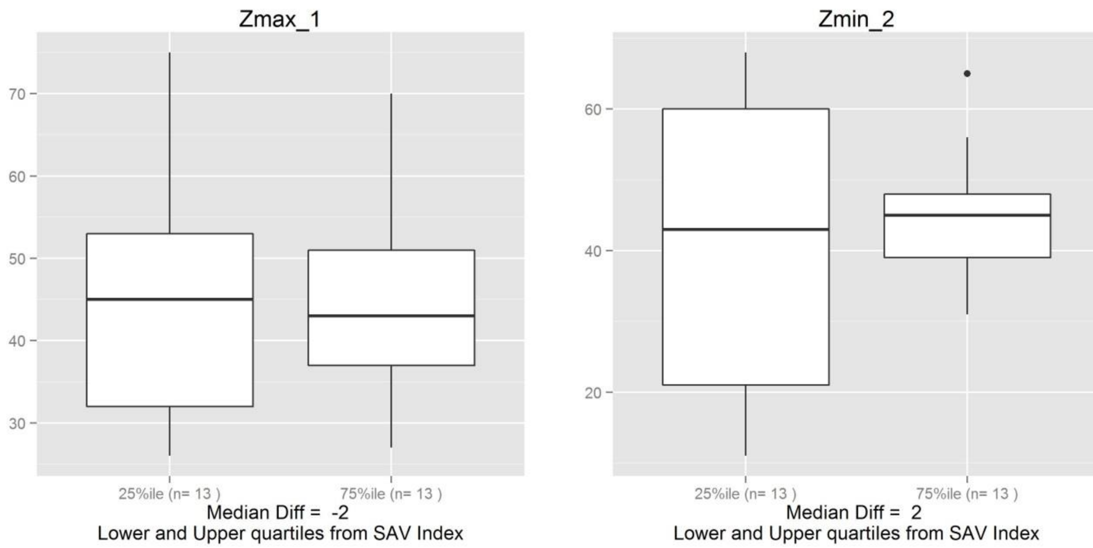


Figure A2-1. Response of SAV Index to summer maximum water depth (left) and early-autumn minimum water depth (right)

There is little difference in early season maximum water depth (left figure) or autumn minimum water depth (right figure) among sites with GOOD vs. POOR SAV Index scores.

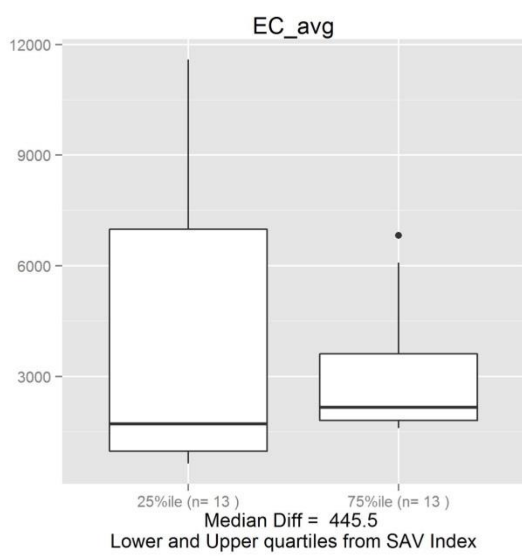


Figure A2-2. Response of SAV index to average specific conductivity (electrical conductivity, adjusted to 25 ℃).

Sites with GOOD SAV Index occurred in waters with a narrower range of salinities (as defined by specific conductivity; electrical conductivity, corrected to 25 °C) than sites with POOR SAV Index.

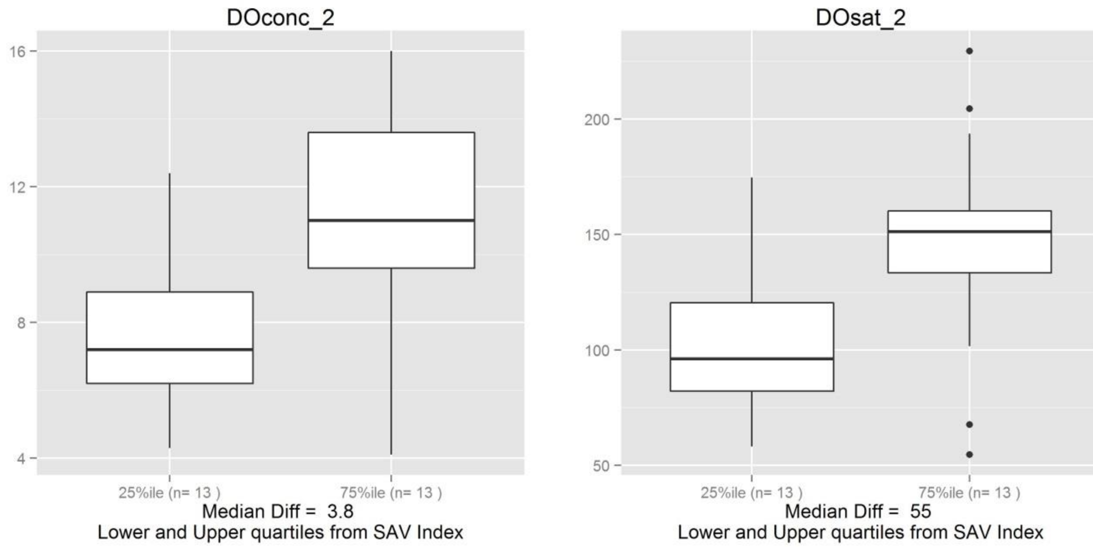


Figure A3-3. Response of SAV Index to dissolved oxygen concentrations.

Sites with GOOD SAV Index values had higher dissolved oxygen (DO) concentrations than POOR sites, which were near physical equilibrium (100% saturation; right figure).

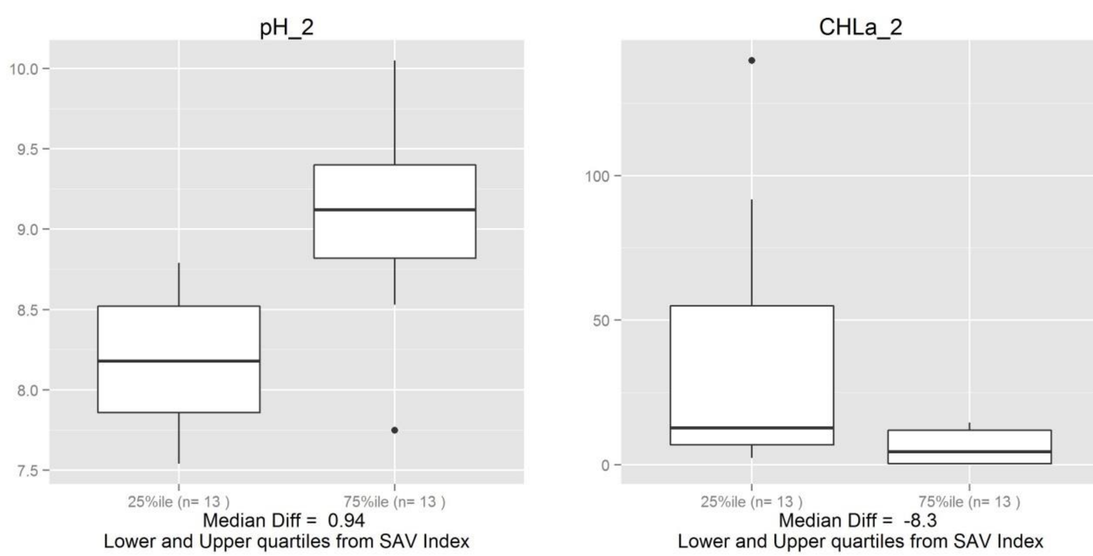


Figure A2-4. Response of SAV Index to water column pH (field measure) and chlorophyll-a concentrations.

GOOD sites also had higher pH than POOR sites; most likely a consequence of reduced CO_2 concentrations from plant uptake, but lower water column Chlorophyll-a concentrations than POOR sites.

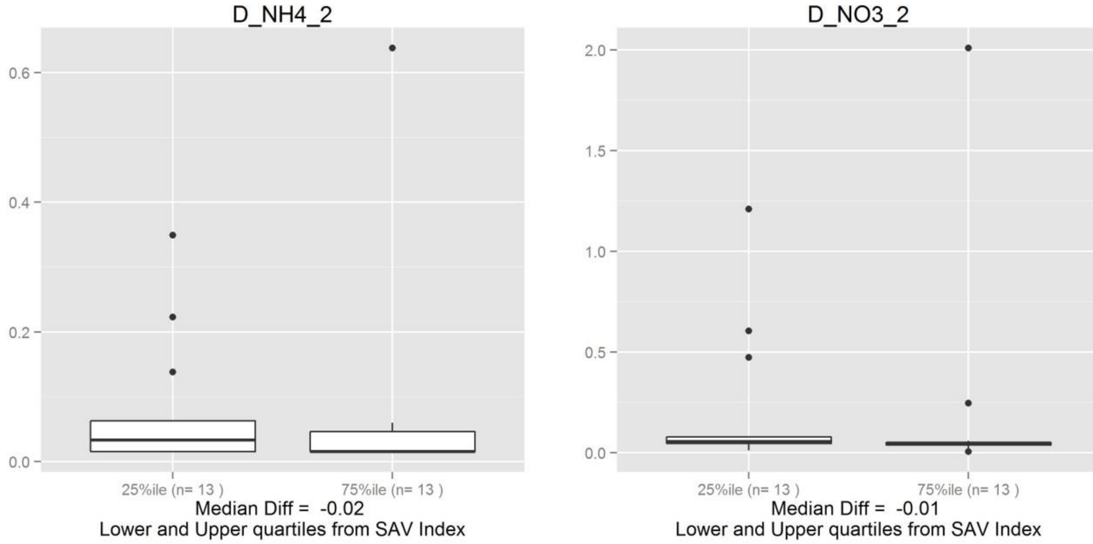


Figure A2-5. Response of SAV Index to dissolved inorganic N concentrations.

There was no observable difference of GOOD vs. POOR SAV Index values on dissolved NH_4 or NO_3 concentrations within the water column (or in the sediments, data not shown). Dissolved total phosphorus concentrations were slightly higher in GOOD vs. POOR sites, but the range of values within GOOD sites was large (interquartile range of 0.72 mg P/L vs. 0.15 mg P/L for POOR sites), compared to the difference in medians (0.05 mg P/L).

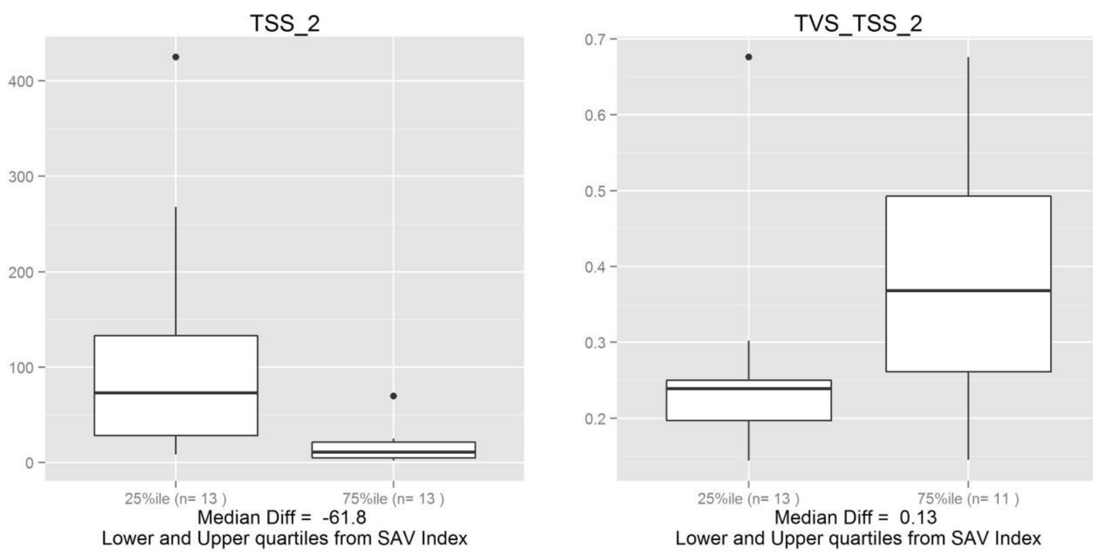


Figure A2-6. Response of SAV Index to total suspended solids and % organic matter of TSS.

GOOD sites had lower TSS and higher TVS/TSS than POOR sites. It may be that SAV effectively trapped suspended solids within the architecture of the submerged vegetation, and the remaining materials were primarily particulate organic matter rather than mineral in origin.

Patterns between SAV Index and other Response Metrics

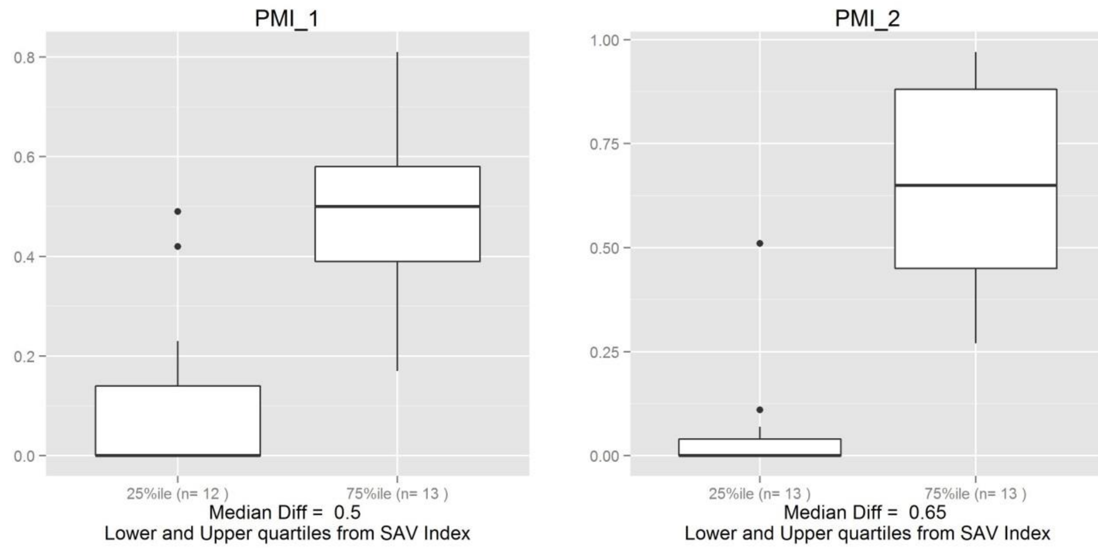


Figure A2-7. Response of SAV Index to PMI index for macroinvertebrates.

PMI displayed the highest sensitivity to GOOD vs. POOR SAV-Index sites, compared to other macroinvertebrate metrics. These figures suggest that differences in SAV condition are a meaningful ecological response across multiple trophic levels.

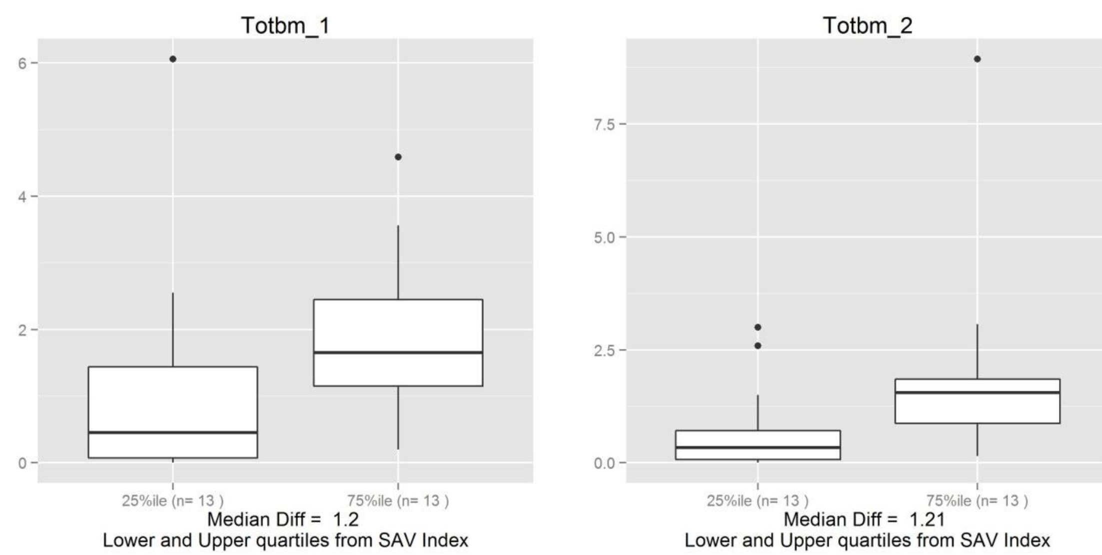


Figure A2-8. Response of SAV Index to total invertebrate biomass

While the total biomass of macroinvertebrates is not considered a 'stressor' for this project, the above figures show that invertebrate biomass was slightly higher in GOOD vs POOR sites, consistent with increased habitat diversity and food availability associated with the complex structure of submerged plant communities. This suggests that SAV cover in and early autumn is an important condition supporting the waterfowl and other waterbird beneficial use class for this wetland type.

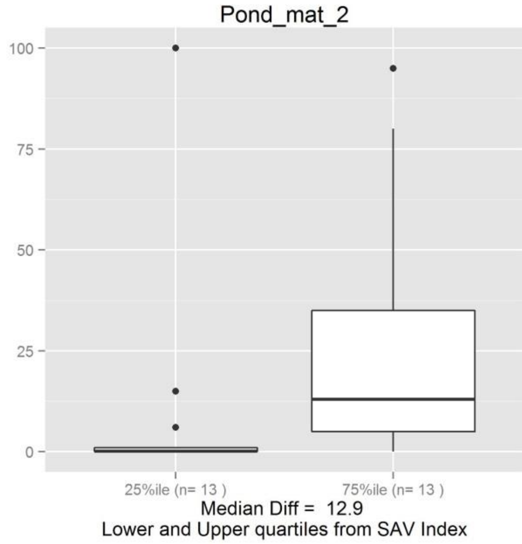


Figure A2-9. Response of SAV Index to early-autumn cover of Surface Mats.

Interestingly, GOOD SAV-Index sites had higher cover of surface mats in the second index period, compared to POOR sites.

Response of Surface Mat Cover to Stressor Metrics

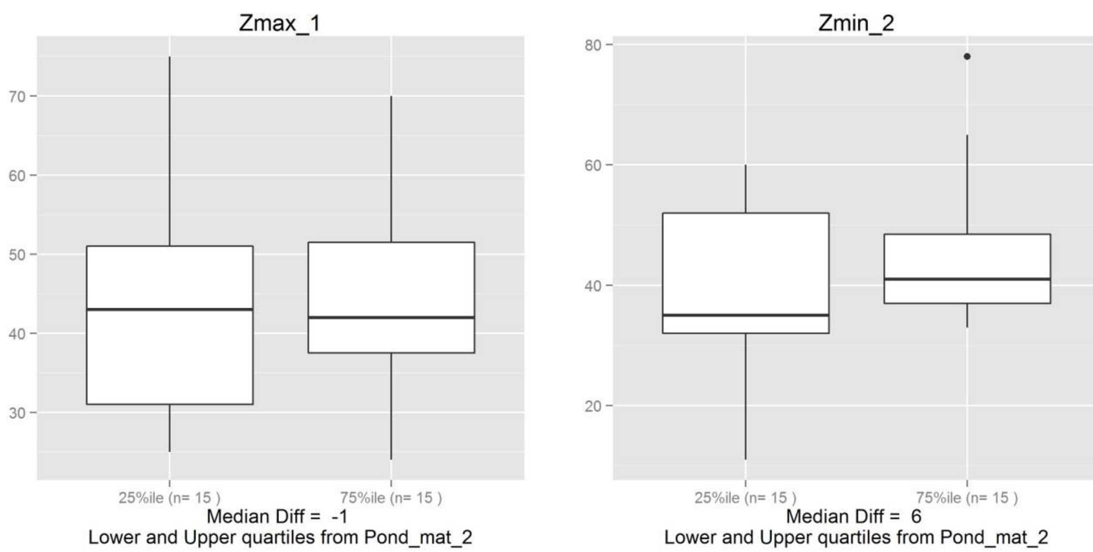


Figure A2-10. Response of Surface Mats to water depth

Similar to the SAV Index, GOOD vs. POOR condition classes of Surface Mats in early autumn were not sensitive to variations in maximum water depth in summer or minimum water depth in early autumn. Note that the 75th percentile represents a *lower*, or more degraded, ecological condition than the 25th percentile.

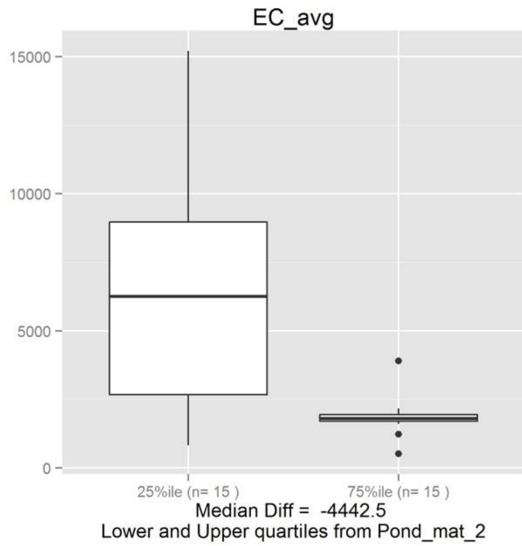


Figure A2-11. Response of Surface Mats to specific conductivity

Sites with greater Surface Mat cover (right box) occurred in water with *lower* salinity (as defined by specific conductivity; electrical conductivity, corrected to 25 °C), on average, than sites lacking extensive cover of Surface Mats. It may be that salinity

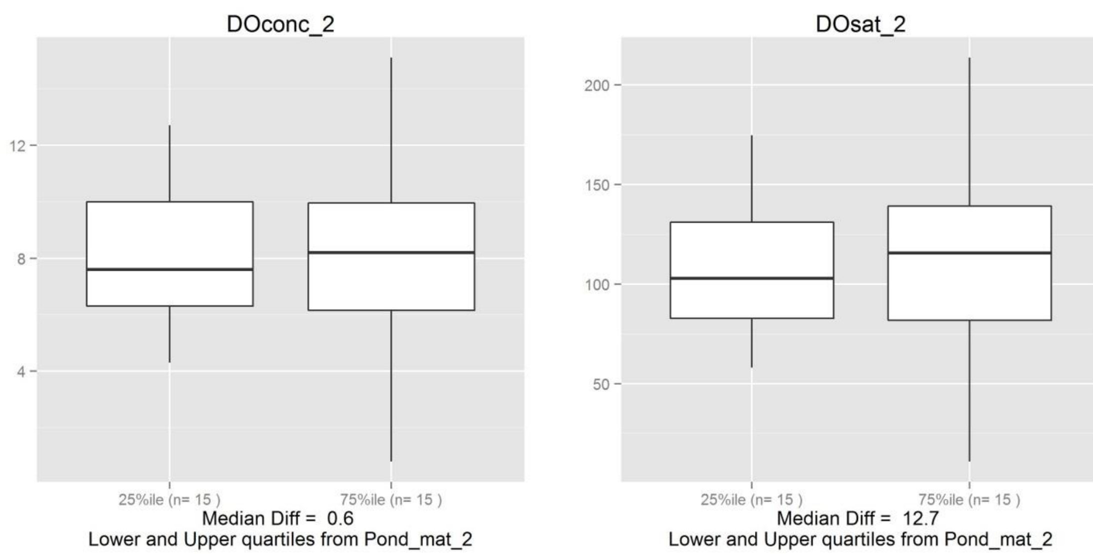


Figure A2-12. Response of Surface Mats to dissolved oxygen concentration

There was no clear difference in DO concentrations among sites with or without extensive surface mats.

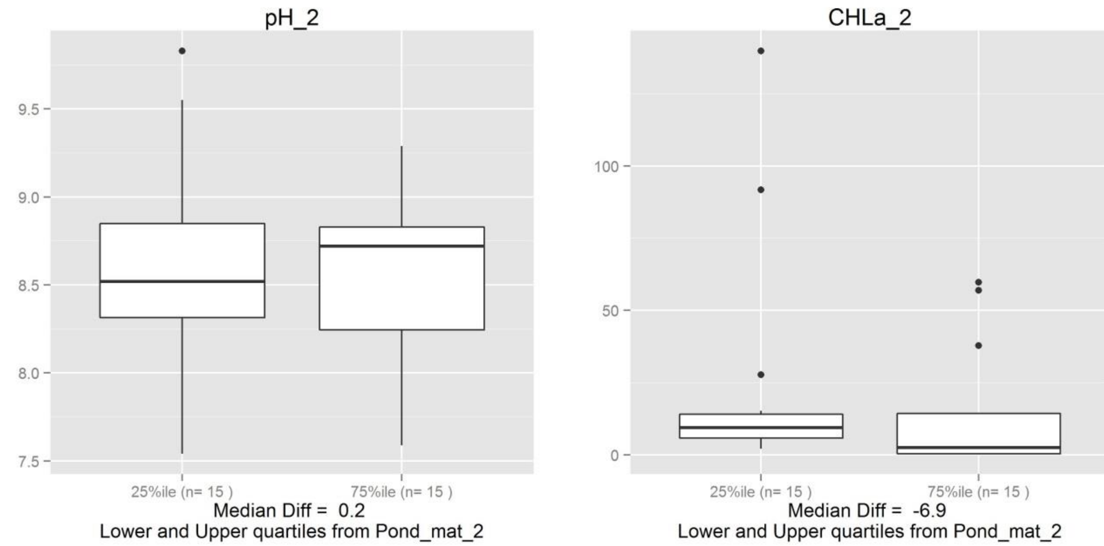


Figure A2-13. Response of Surface Mats to water column pH and chlorophyll-a concentration

Similarly, the occurrence of extensive Surface Mats in early autumn was not sensitive to water column pH or chlorophyll-a concentrations.

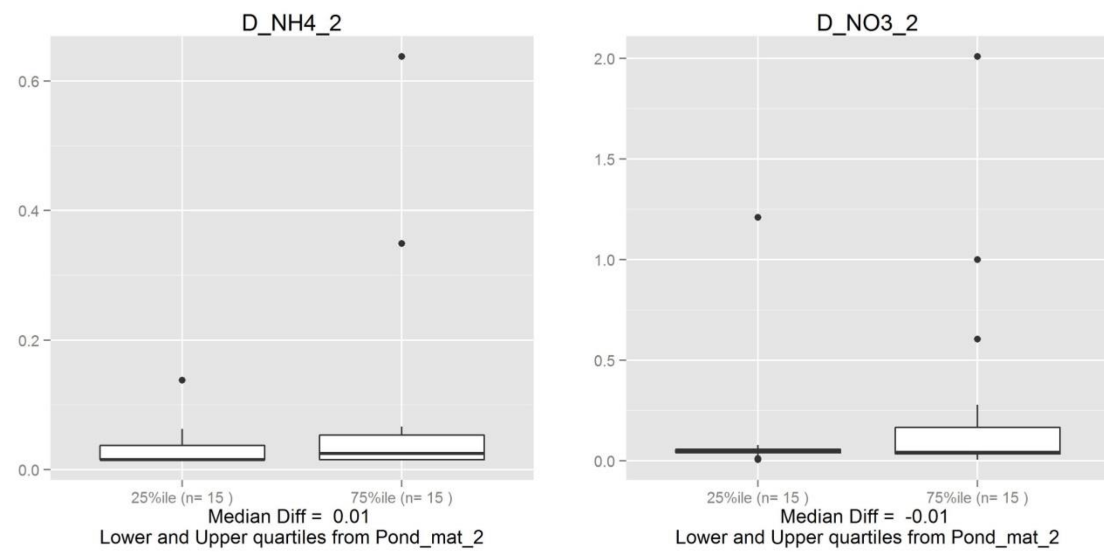


Figure A2-14. Response of Surface Mats to dissolved inorganic N concentrations

Dissolved inorganic NH_4 and NO_3 concentrations also did not differ among sites with or without extensive Surface Mats.

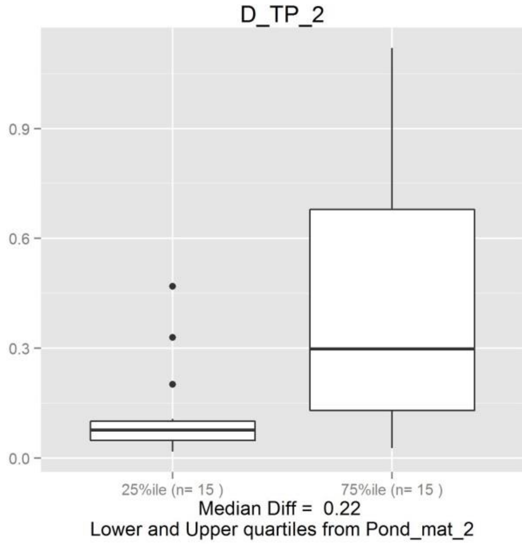


Figure A2-15. Response of Surface Mats to dissolved total phosphorus concentration

Dissolved total phosphorus concentrations were generally higher in POOR sites with extensive surface mats than GOOD sites with only trace mats.

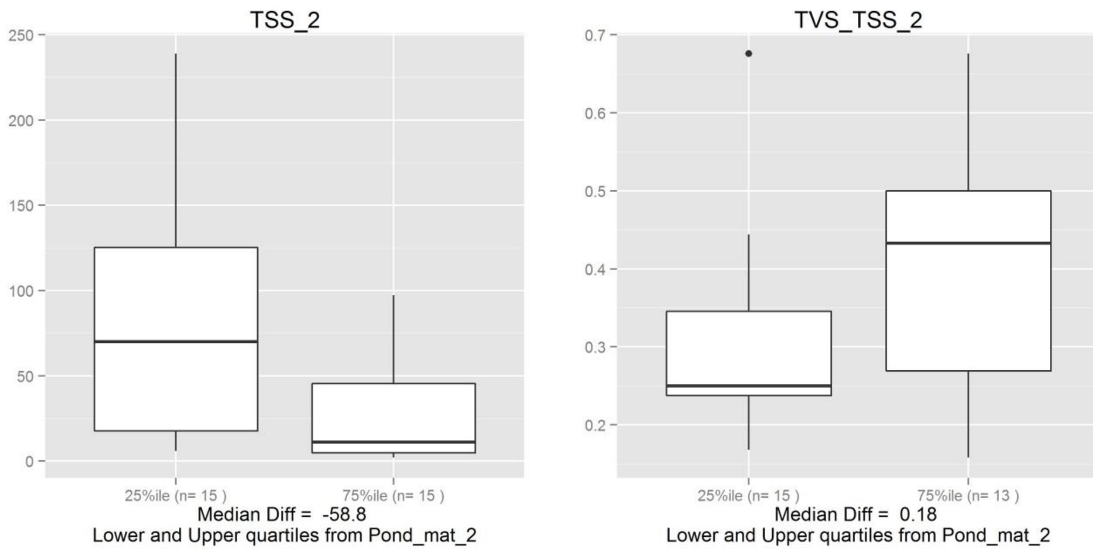


Figure A2-16. Response of Surface Mats to TSS and % organic matter of TSS

Similar to SAV cover, sites with greater Surface Mats had lower TSS concentrations and higher organic matter content of TSS (as TVS to TSS ratio) than sites lacking Surface Mats.

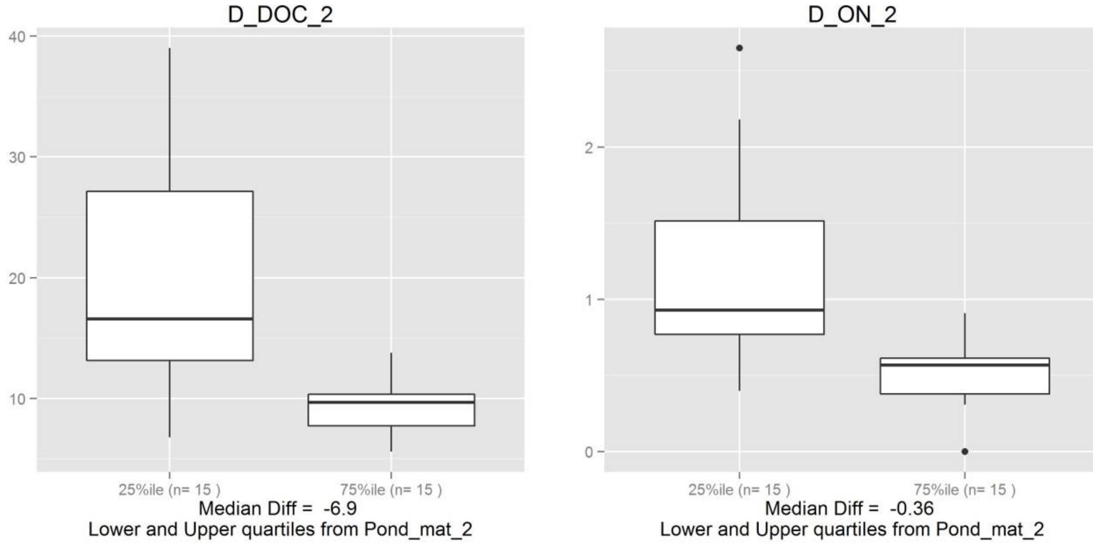


Figure A2-17. Response of Surface Mats to dissolved organic C and organic N concentrations

Interestingly, sites with greater cover of Surface Mats had *lower* concentrations of dissolved organic C and organic N than sites lacking surface mats. This pattern was not observed for other response variables.

Patterns among Surface Mats and other Response Metrics

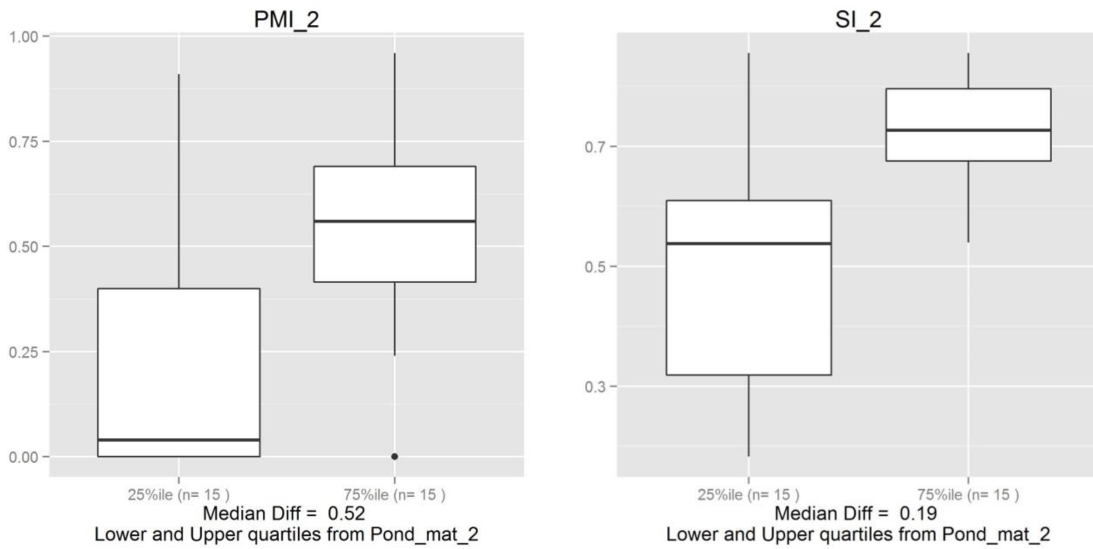


Figure A2-18. Response of Surface mats to early-autumn indices of macroinvertebrate communities

Sites with greater Surface Mat cover had higher values for PMI and Simpson's Index compared to low Surface Mat sites. This pattern is broadly similar to SAV Index, suggesting a possible similarity among SAV and algal mats in terms of habitat structure or food availability.

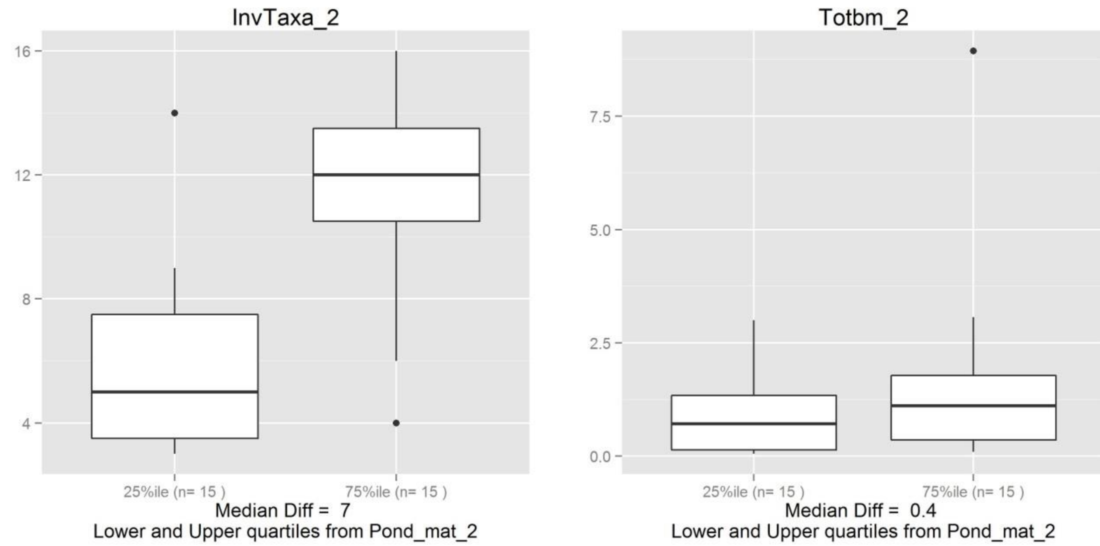


Figure A2-19. Response of Surface mats to invertebrate taxa richness and total biomass

Other invertebrate indicators (such as # of taxa or metrics based on taxa-evenness) displayed similar patterns as for PMI or SI. By contrast, differences in Surface Mat cover were not associated with differences in biomass.

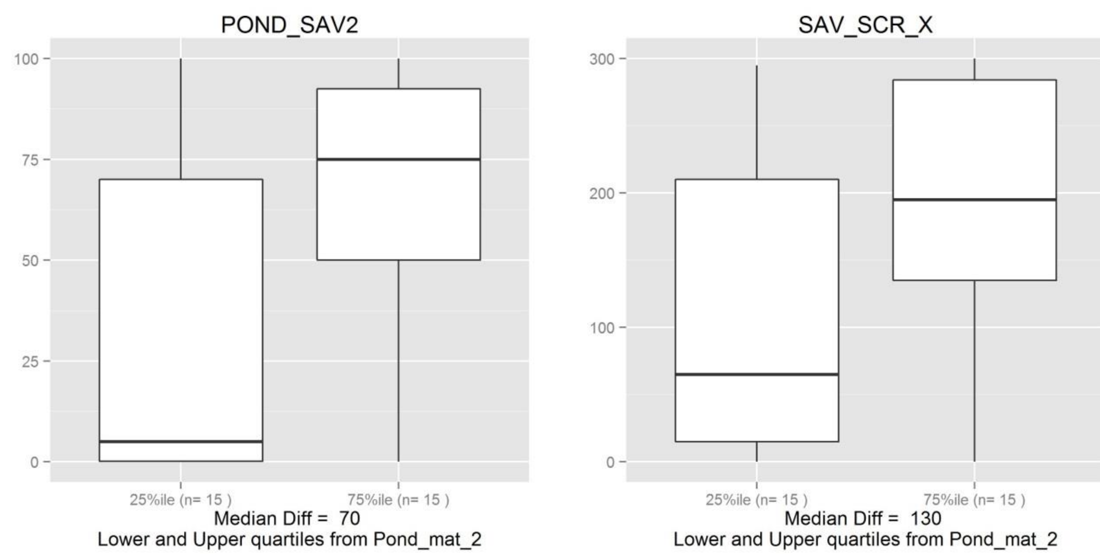


Figure A2-20. Responses of Surface Mats to SAV cover and Index scores

Generally, sites with extensive Surface Mats (> 25% cover) had greater cover of SAV in autumn (left), and higher SAV Index scores (right), however there was substantial amounts of overlap among GOOD vs. POOR classes for these variables.

Response of Macroinvertebrate Indices to Stressor Metrics

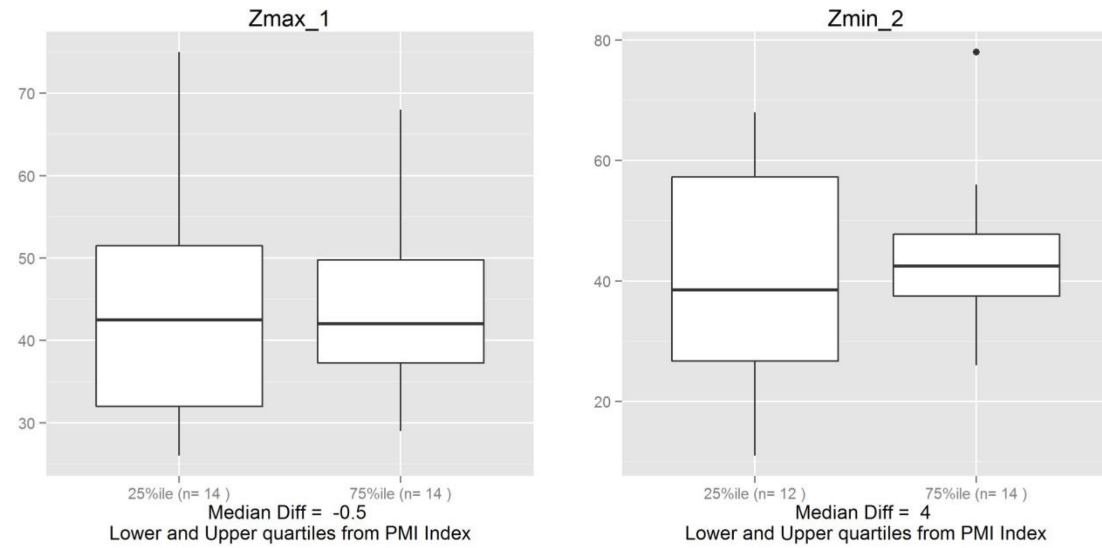


Figure A2-21. Response of Macroinvertebrates to water depths

The above figures show that GOOD vs. POOR classes of PMI were not associated with differences in summer maximum or early-autumn minimum water depths in ponds.

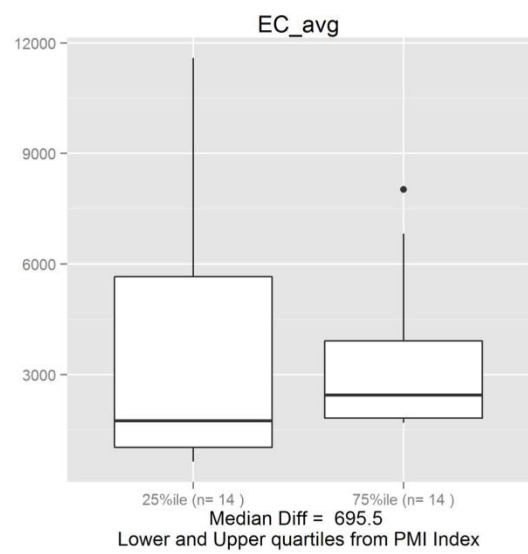


Figure A2-22. Response of Macroinvertebrates to specific conductivity

Similarly, there was no clear difference in the salinity (as specific conductivity) of the water column between GOOD and POOR PMI classes.

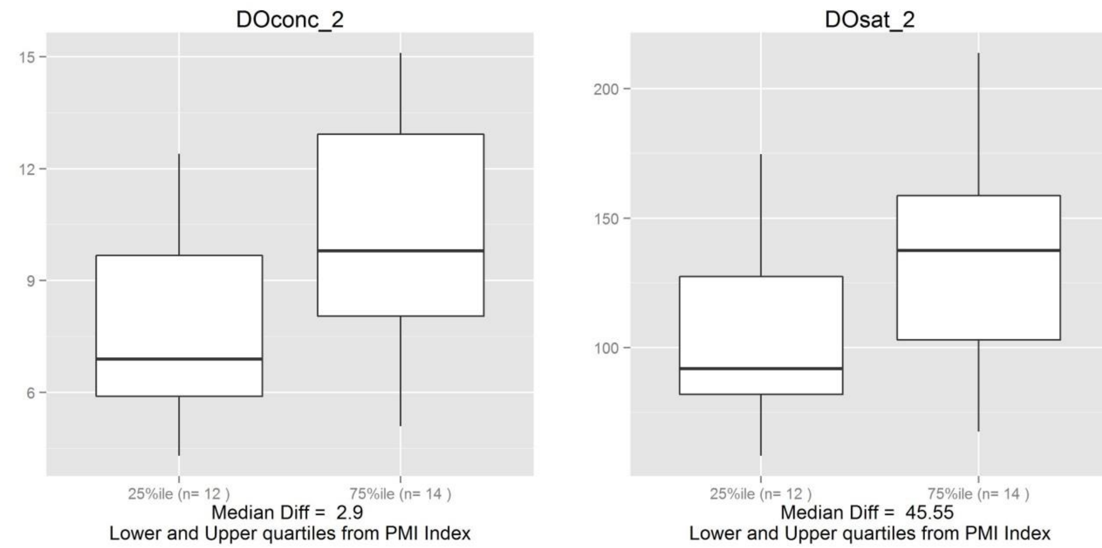


Figure A2-23. Response of Macroinvertebrates to dissolved oxygen concentrations

Dissolved oxygen concentrations tended to be higher in GOOD vs POOR PMI classes – this may be an additive effect from the PMI – SAV association.

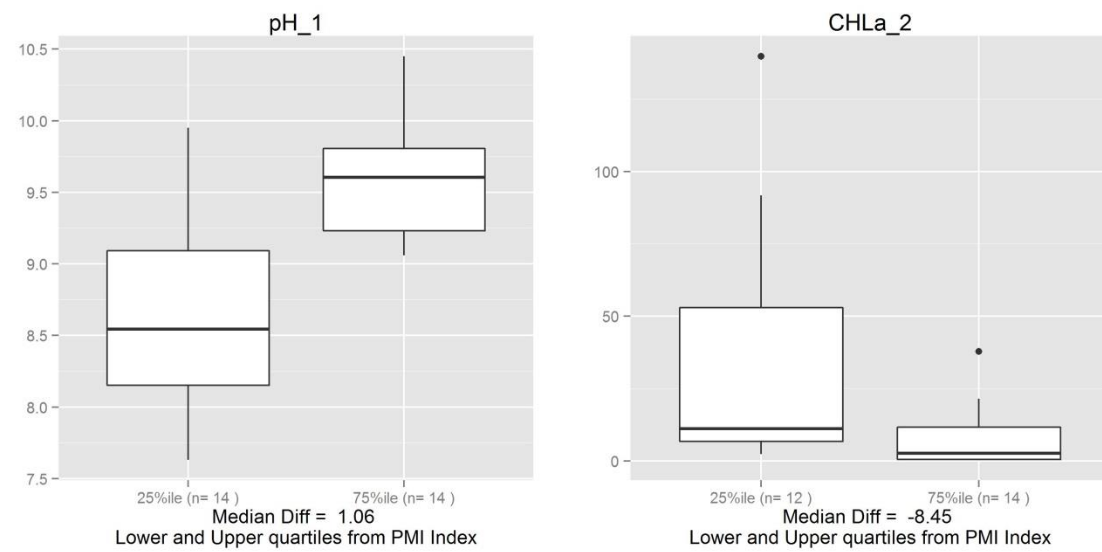


Figure A2-24. Response of Macroinvertebrates to water column pH and chlorophyll-a concentations

In a pattern similar to the SAV Index, GOOD PMI sites had higher pH and lower Chlorophyll-a concentrations than POOR sites.

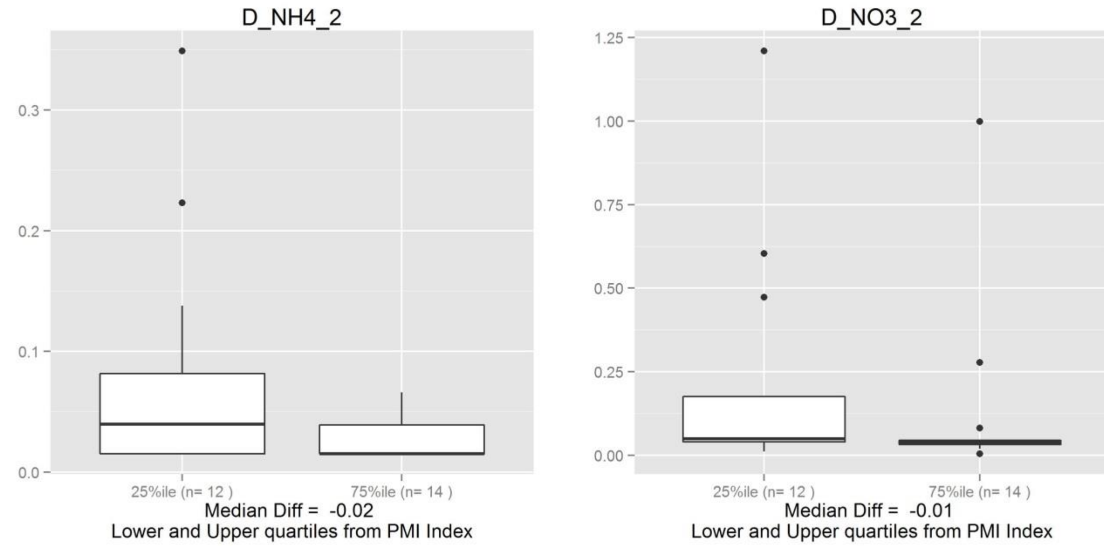


Figure A2-25. Response of Macroinvertebrates to dissolved inorganic N concentrations

There were no clear differences between GOOD vs POOR sites for dissolved NH4 or NO3 concentrations; there was a slight tendency for the upper quartile of POOR sites (left boxes) to have higher concentrations than GOOD sites, but this evidence is not strong.

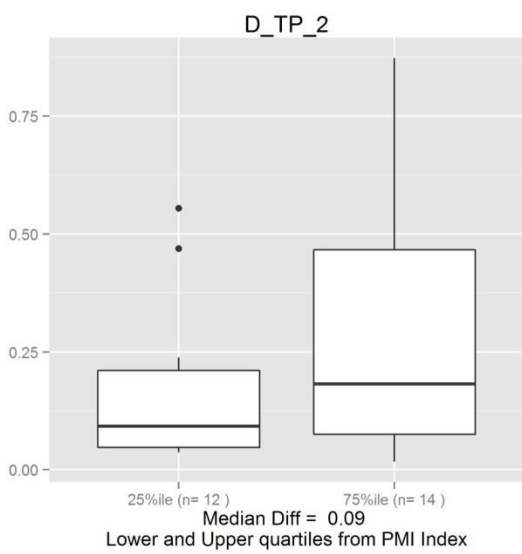
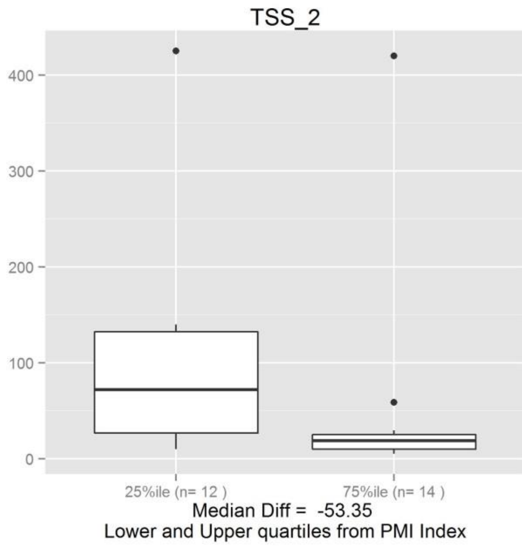


Figure A2-26. Response of Macroinvertebrates to dissolved total phosphorus concentrations

Total dissolved phosphorus concentrations were slightly higher in GOOD vs. POOR sites, a pattern similar to that observed for the Surface Mat and SAV Index response variables, but again the range for GOOD sites was large.



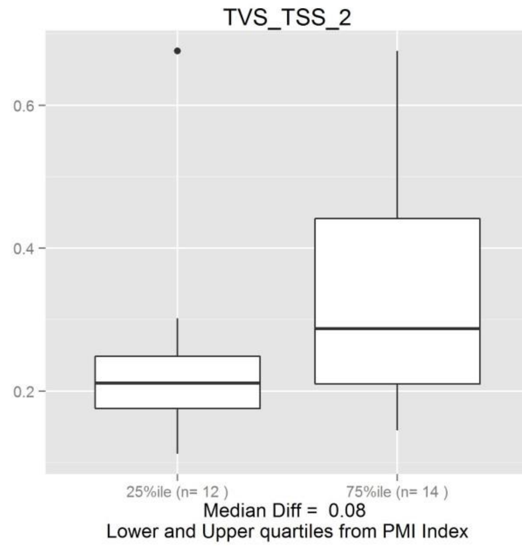


Figure A2-27. Response of Macroinvertebrates to TSS and % organic matter of TSS

The above figures show that GOOD sites had lower TSS and higher TVS/TSS (organic matter concentration of suspended solids) that POOR sites. This patter is similar to that for the other two ecological response variables (SAV Index and Surface mats).

Patterns among Macroinvertebrates (PMI) and other Response Metrics

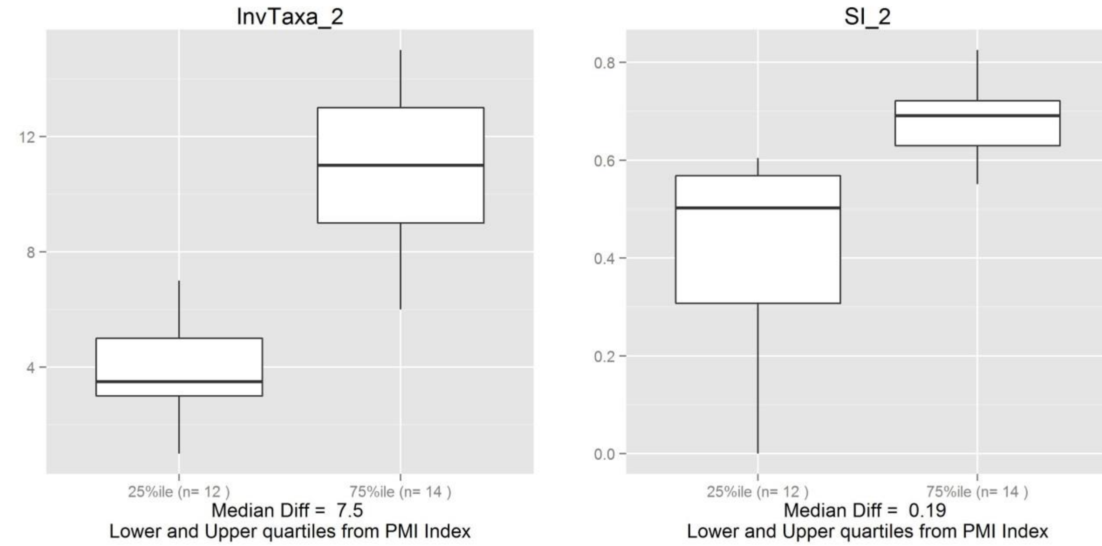


Figure A2-28. Response of Macroinvertebrates to other invertebrate composition metrics

Sites with GOOD PMI scores also had higher scores on diversity metrics (total number of taxa observed and Simson's Index) than POOR sites.

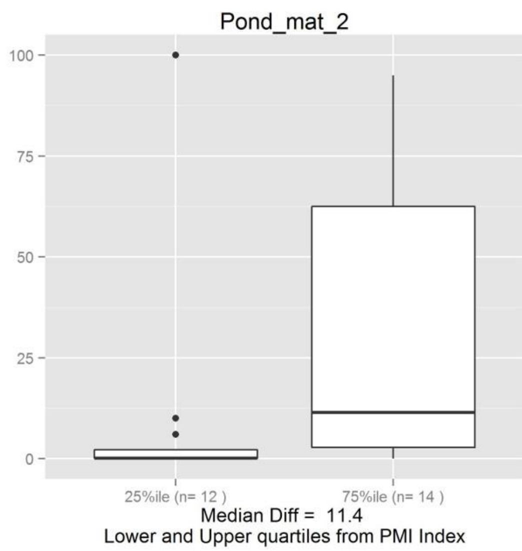


Figure A2-29. Response of Macroinvertebrates to Surface Mat cover

GOOD sites also had higher cover of Surface Mats than POOR sites.

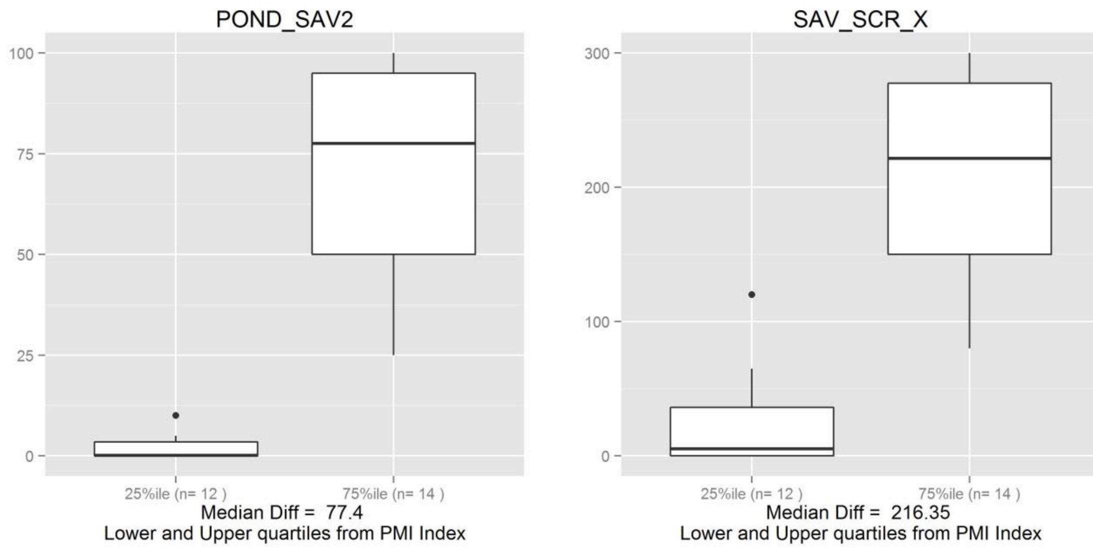


Figure A2-30. Response of Macroinvertebrates to SAV cover and Index scores

GOOD sites had much greater SAV cover during the early-autumn Index Period and also greater SAV Index scores than POOR sites.

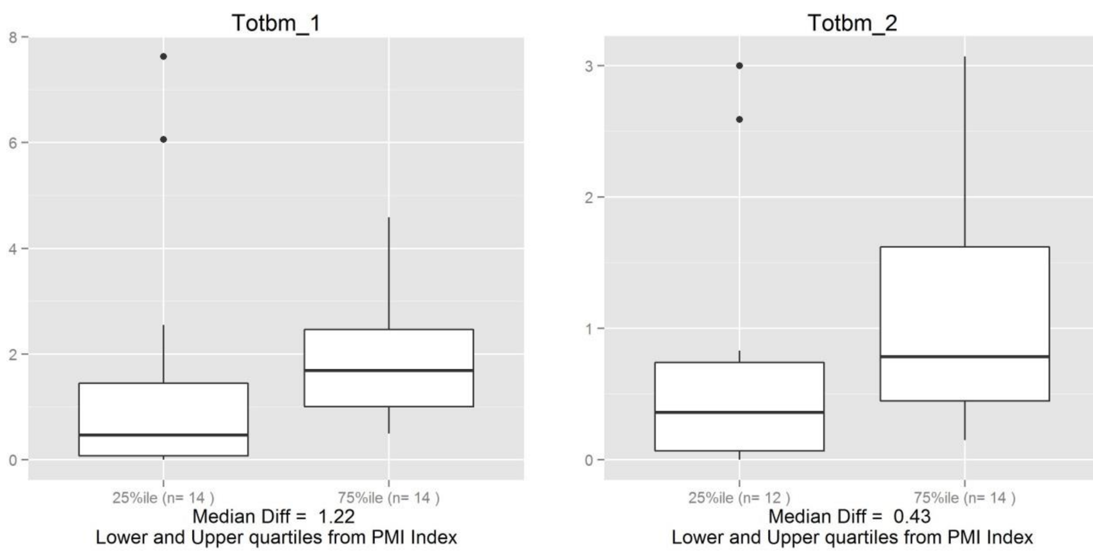


Figure A2-31. Response of Macroinvertebrates to total invertebrate biomass

There was some (limited) evidence that total biomass of macroinvertebrates was higher in GOOD vs. POOR sites during both index periods.