

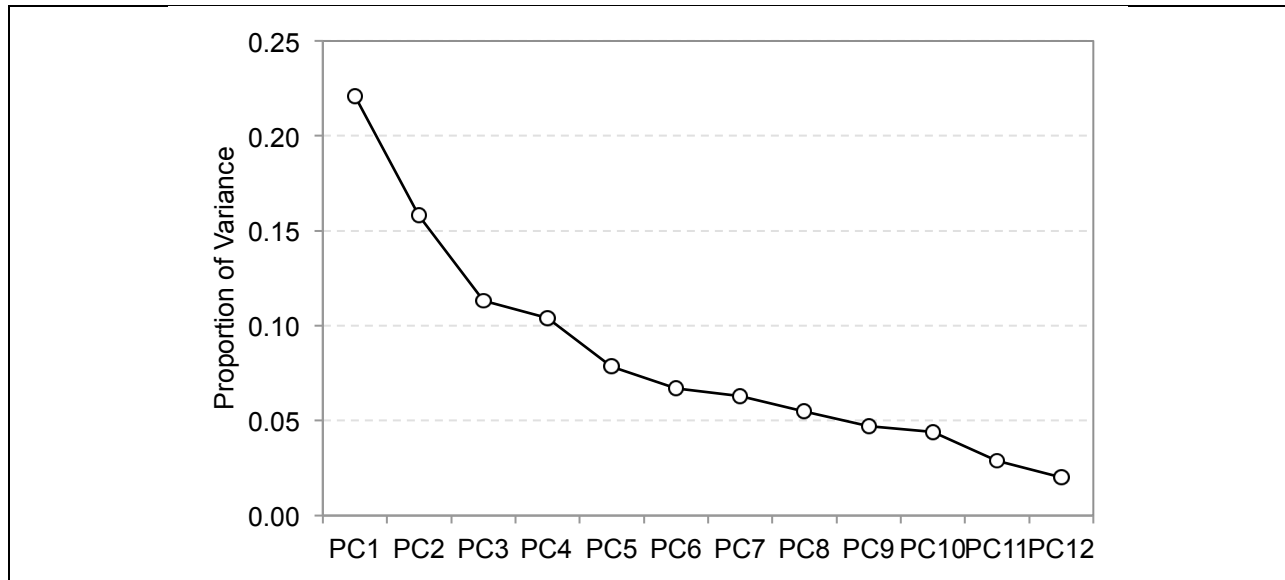
## Supplementary Material

### 1. Principal components analysis

Principal components analysis (PCA) was performed on the variables used in the cluster analysis to evaluate some of the potential underlying structure in the dataset which may have contributed to the separation of the clusters. PCA is a multivariate statistical technique employed often to reduce the dimensions of a dataset, i.e., to reduce the number of variables. PCA was performed using the “princomp” function in R. The resultant loadings and variance explained are provided in Table 1. Figure 1 shows the scree plot, which shows the variance explained by the principal components. From this scree plot there is no clear “break point” from which to identify important principal components. In order to explain 75% of the variance, the first six principal components are necessary.

**Table 1:** Principal component loadings for each of the 12 variables. Highlighted loadings indicate the major variable loadings for a given component. SP = spring; FA = fall; OP = orthophosphate-P; NN = Nitrate-Nitrite-N; DOC = dissolved organic carbon; CLAR = transparency tube clarity; TEMP = temperature; PH = pH.

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12
SP OP	-0.15	0.12	<b>0.65</b>		0.32	<b>0.49</b>	0.17	0.21	-0.21	-0.18	0.13	0.17
SP NN	0.32	<b>0.48</b>		0.12	0.28	-0.21	0.25		-0.12		<b>-0.62</b>	-0.25
SP DOC	<b>-0.48</b>		0.16	0.11	0.14		-0.29	0.24	0.23	<b>0.51</b>	-0.29	-0.41
SP CLAR	-0.36	-0.29		0.19	0.14	-0.34	0.45	0.26	<b>0.34</b>	<b>-0.48</b>		
SP TEMP	-0.15	<b>-0.51</b>	0.16		0.11	-0.10	0.35	<b>-0.57</b>	<b>-0.38</b>	0.24	-0.17	
SP PH				<b>-0.74</b>	0.34	-0.41	-0.14	0.27	-0.21		0.14	
FA OP		0.17	<b>0.60</b>		<b>-0.47</b>	-0.31	-0.17	-0.32	0.17	-0.26		-0.23
FA NN	0.25		0.26	<b>0.53</b>	0.20	<b>-0.52</b>	-0.15	0.13		0.29	0.30	0.23
FA DOC	<b>-0.45</b>	0.39		-0.13		-0.19		-0.13	0.14	0.19	-0.20	<b>0.69</b>
FA CLAR	-0.31	0.45	-0.22	0.11	0.26		0.16	-0.31			<b>0.55</b>	-0.36
FA TEMP	-0.35		-0.15	0.22	-0.34	-0.12	-0.15	0.28	-0.73	-0.18	-0.10	
FA PH		0.11	0.10	-0.15	<b>-0.46</b>		<b>0.62</b>	0.36		<b>0.45</b>	0.16	
Prop. of Var.	0.22	0.16	0.11	0.10	<b>0.08</b>	0.07	<b>0.06</b>	0.05	0.05	<b>0.04</b>	0.03	0.02
Cum. Prop. of Var.	0.22	0.38	0.49	0.60	<b>0.67</b>	0.74	<b>0.80</b>	0.86	0.91	<b>0.95</b>	0.98	1.00

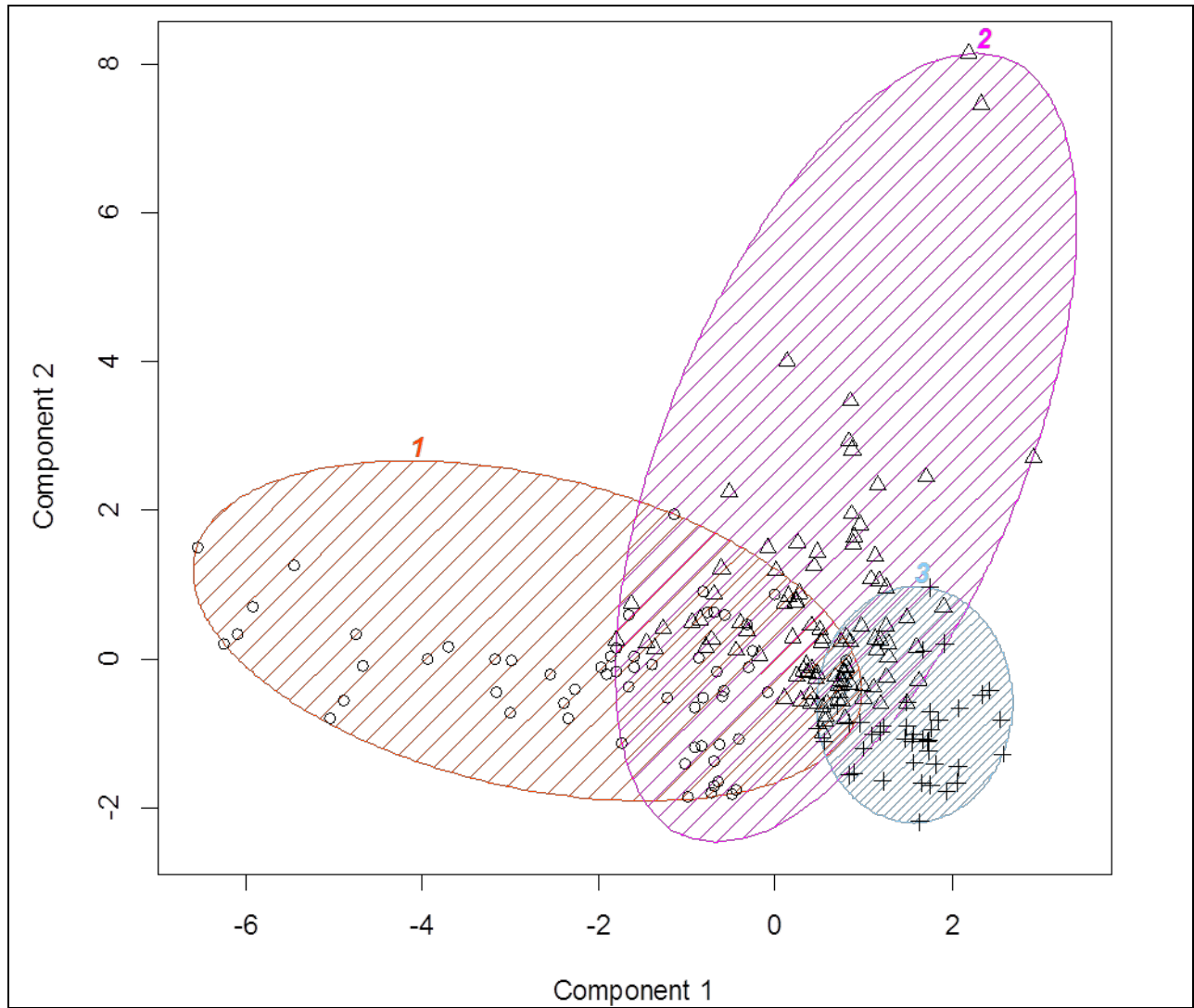


**Figure 1:** Variance explained by each principal component.

From examining the major loadings on each principal component, we can attempt to describe them (Table 2). While we could take this further and attempt to explain why certain variables would be the major loadings for a given principal component, the purpose of this exploratory analysis was to highlight variables that may have contributed to the cluster separation. Focusing on the first two principal components which cumulatively explain 38% of the variance, we see three variables that contribute the major loadings: dissolved organic carbon, nitrate-nitrite, and temperature. The first two principal components are plotted by cluster in Figure 2. The third principal component includes loadings from both fall and spring orthophosphate and together with the first two principal components explains almost 50% of the variance.

**Table 2:** Descriptions of the major loadings for each principal component.

Principal Component	Description based on major loadings
PC1	Major negative loadings from both fall and spring DOC
PC2	Positive loadings for spring NN and temperature
PC3	Positive loadings for both fall and spring OP
PC4	Negative loading for spring PH and positive loading for fall NN
PC5	Negative loadings for both fall OP and PH
PC6	Positive loading for spring OP and negative loading for spring NN
PC7	Positive loading for fall PH
PC8	Negative loading for spring temperature
PC9	Positive loading for spring turbidity and negative loading for spring temperature
PC10	Positive loadings for spring DOC and fall pH and negative loading for spring turbidity
PC11	Negative loading for spring NN and positive loading for fall turbidity
PC12	Positive loading for fall DOC



**Figure 2:** First two principal components plotted by cluster membership, showing some separation based on these two principal components.

## 2. Boxplots of all variables used in cluster analysis.

