MassBays: Initial data exploration

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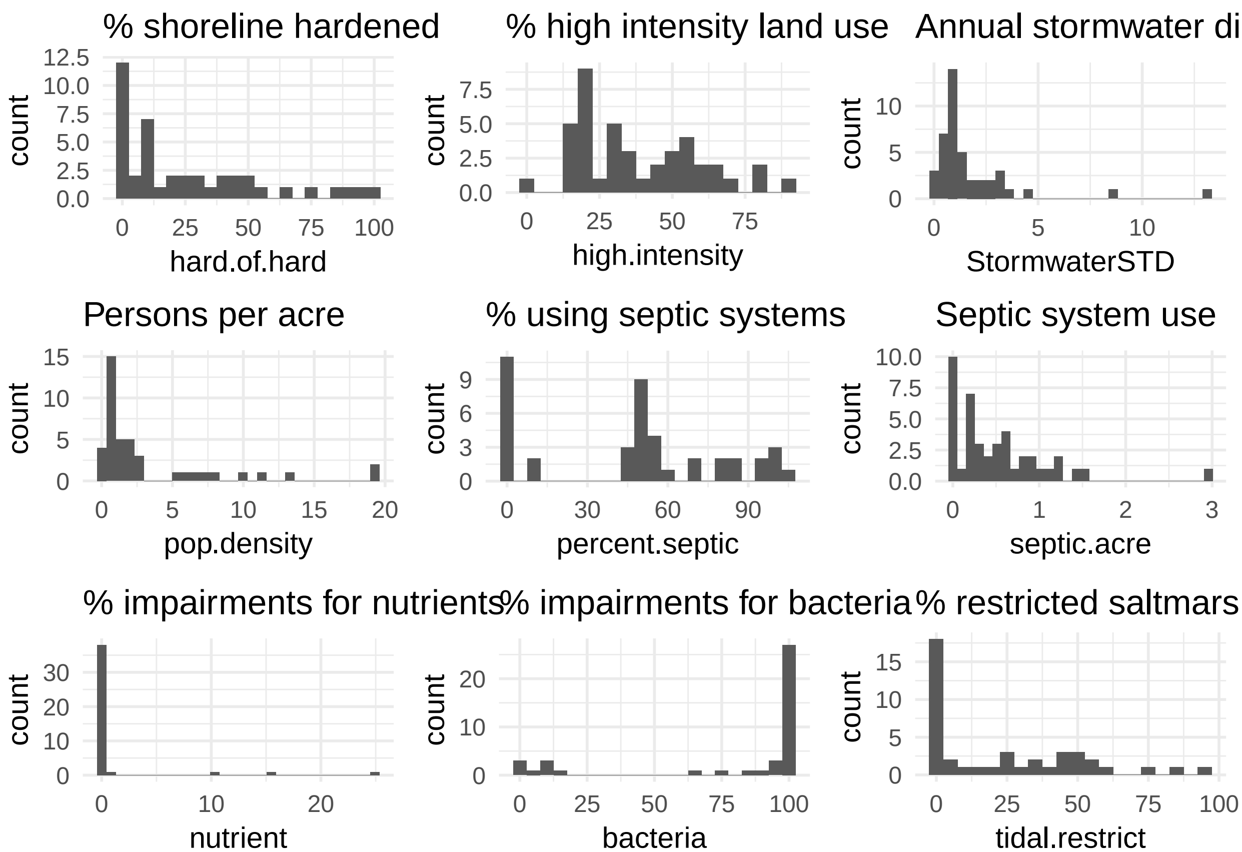
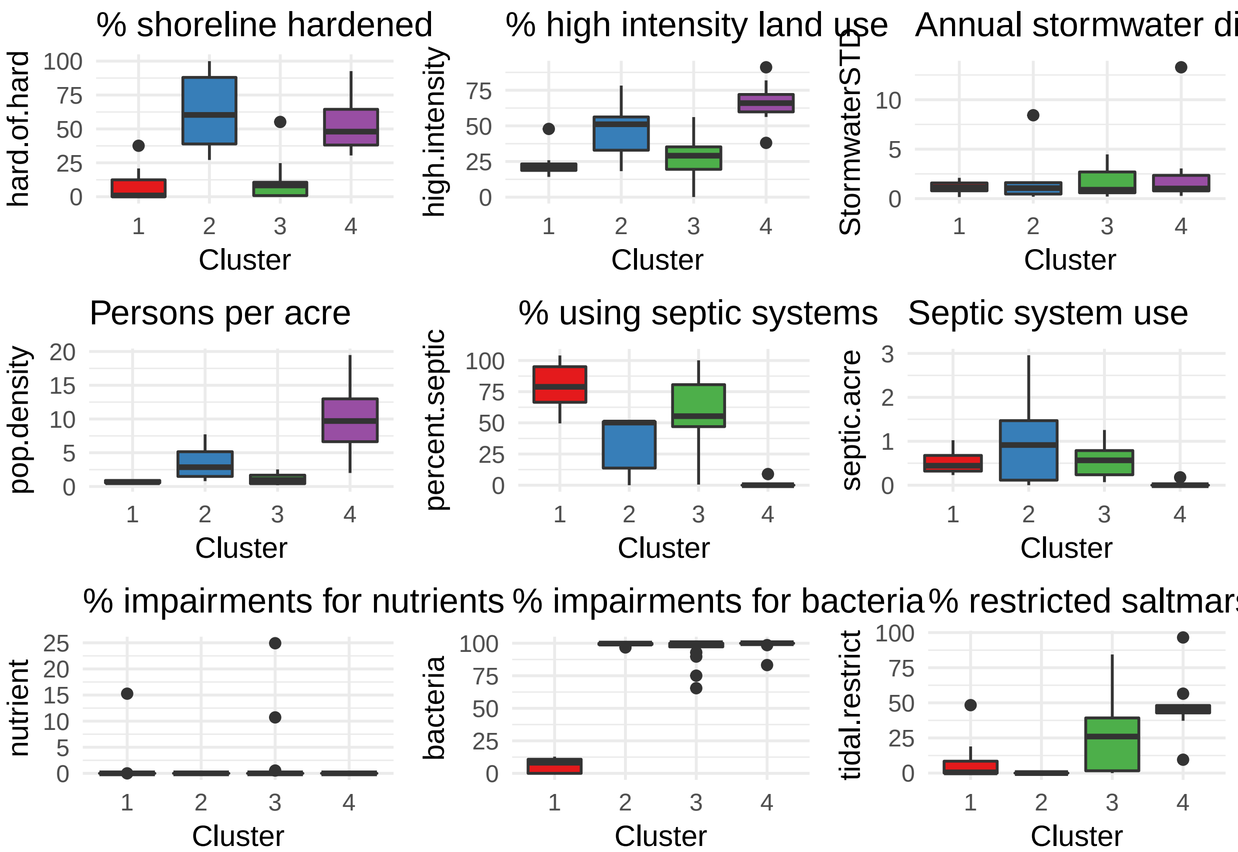
Stressor Data

Nine stressors variables were incorporated into the Northeastern assessment. To understand the distribution of values for each stressor throughout MassBays, we can look at the histograms below.

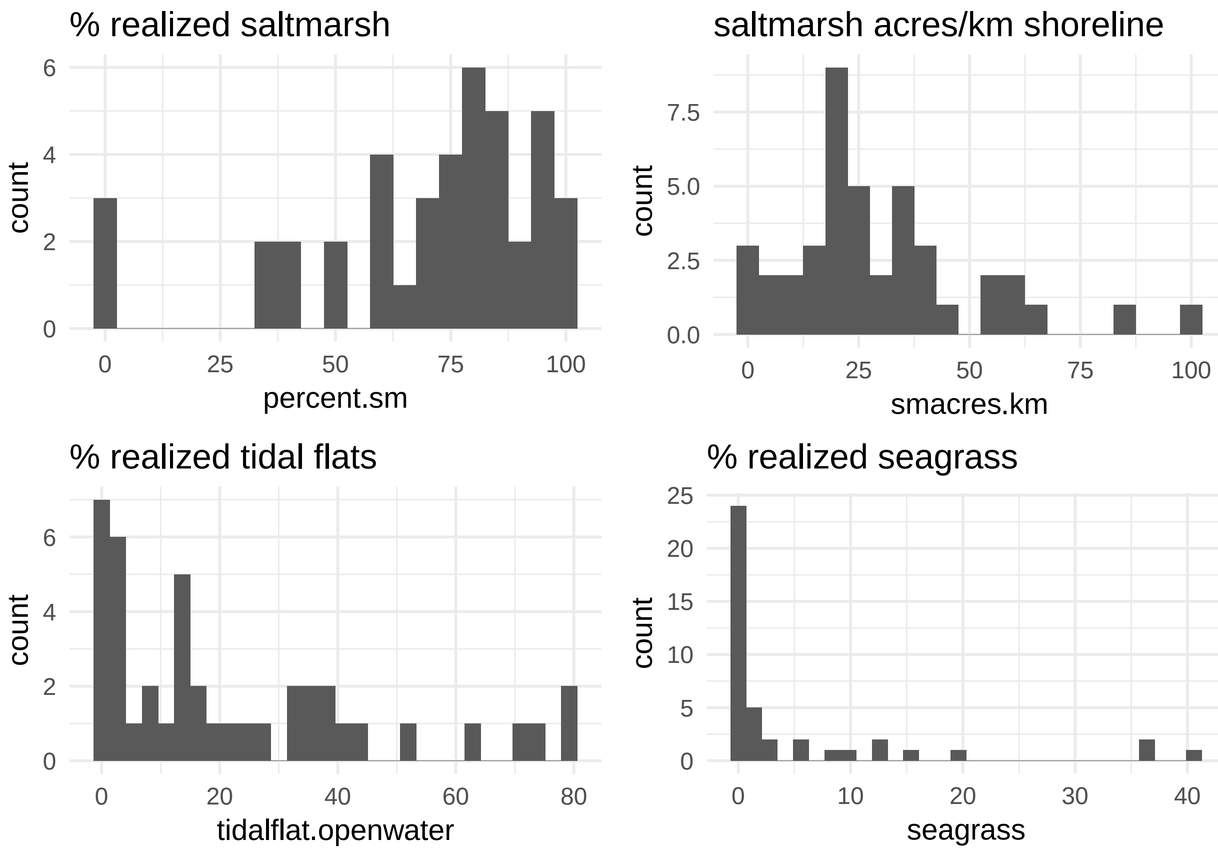


Now we want to know how the embayment clusters differ with respect to these stressors. We can look at box plots showing the range of values for each stressor in each embayment cluster.

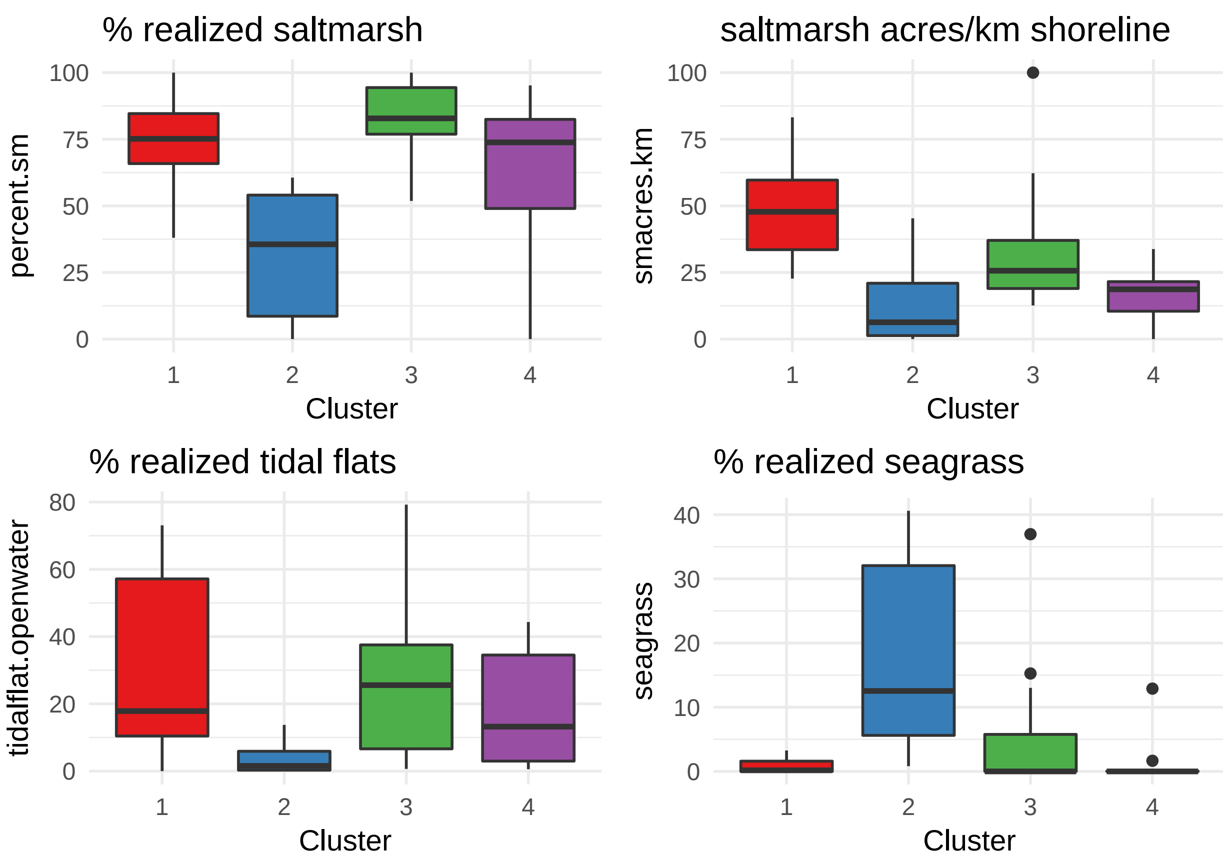


Resource Data (Habitat mosaic components)

Four habitat metrics were examined by Northeastern: two for saltmarsh, one for seagrass, and one for tidal flats. Three of them are percentages of habitat existing with respect to the habitat available. For example, "% realized seagrass" is a measure of the acreage of seagrass that exists divided by the total area with depths suitable for eelgrass growth. In order to be comparable with the others, we rescaled saltmarsh acres on a scale from 0-100. The distribution of values for these metrics throughout all MassBays embayments is shown below.



Now we can also look at the amount of each habitat in each embayment cluster:

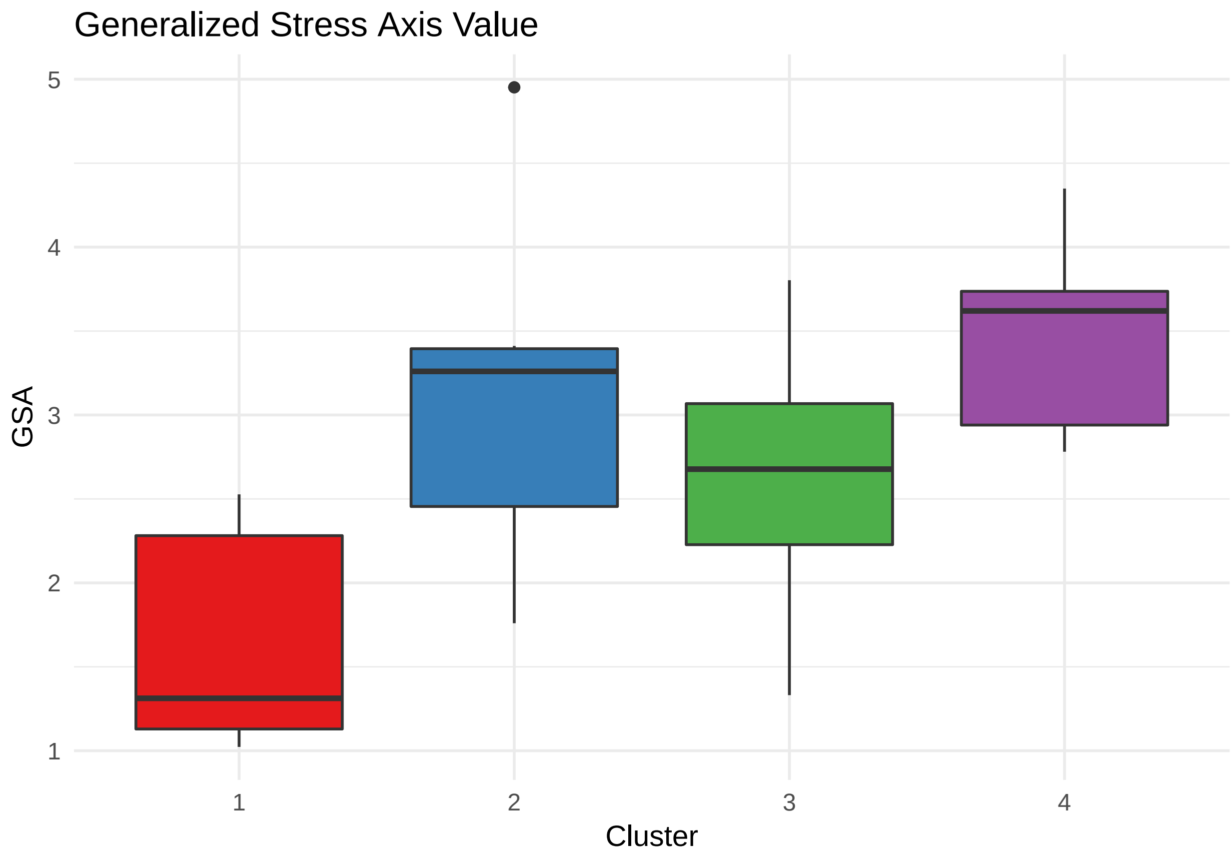


Apply these data to a BCG framework

To apply these data to a BCG framework, we'll plot the habitat data for each embayment in MassBays against a Generalized Stress Axis (GSA). This will also allow us to evaluate stressor-habitat characteristics in each embayment and cluster. The GSA is not meant to be used to examine causality between stressors and habitats; it is meant to depict the cumulative stress gradient.

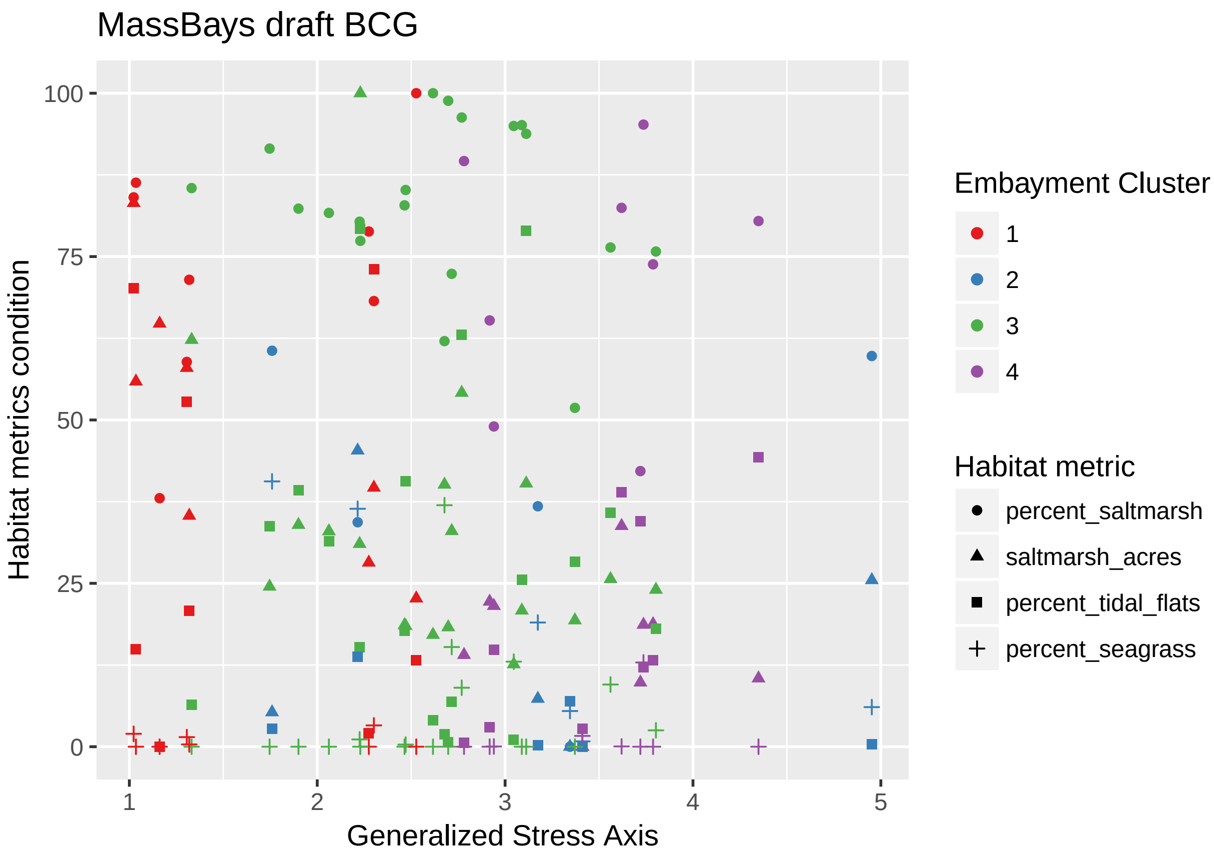
Developing a draft GSA

We'll use a simple formula to develop a draft GSA for all MassBays embayments together. First, we'll scale each stressor from 0-1 and then sum those values for each embayment in MassBays. Here are the values for a GSA in each cluster:



Assembling a draft BCG for all of MassBays

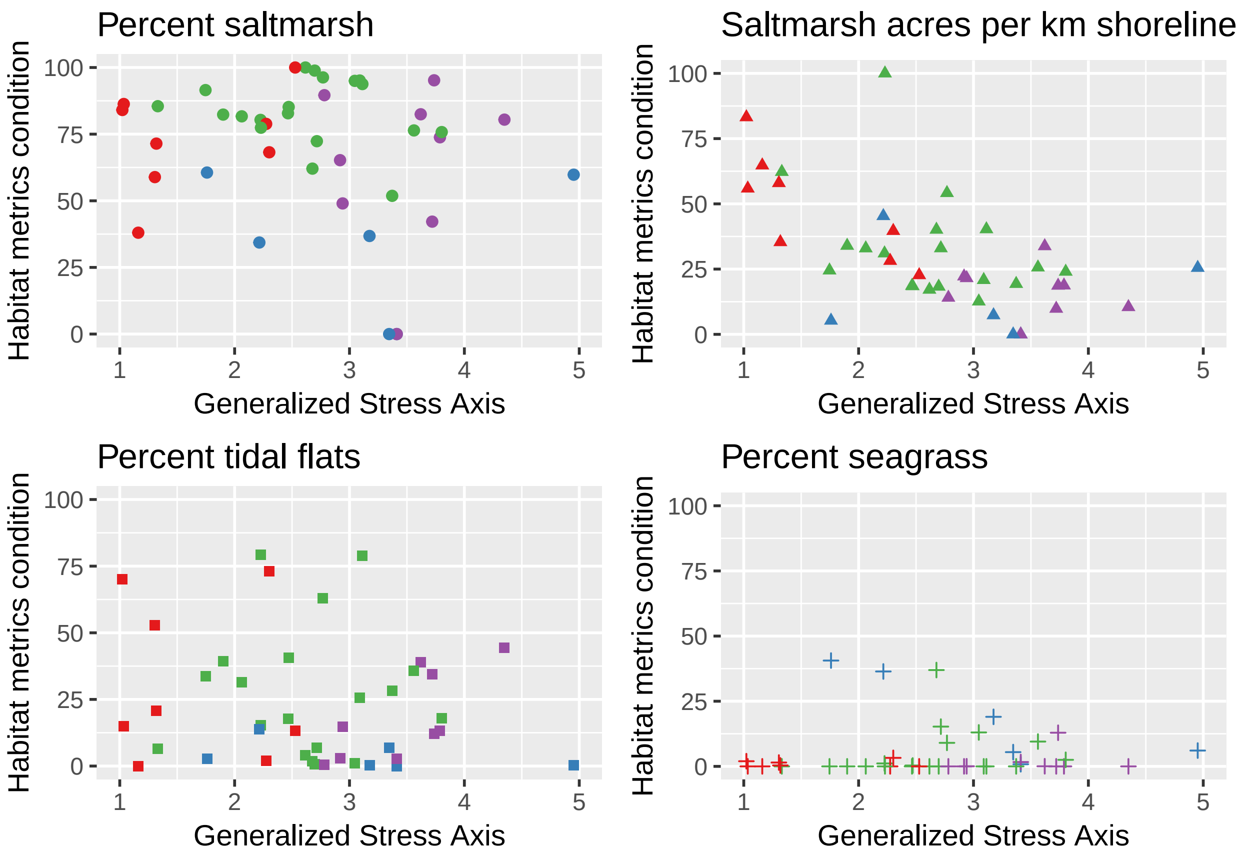
Now we want to plot the values of the habitat metrics in each MassBays embayment against the GSA. The resulting plot is very busy because there are 42 embayments and 4 habitat metrics in each.



The plot can be simplified a number of ways. For example, each quadrant of the BCG represents a unique combination of stressor and habitat characteristics.

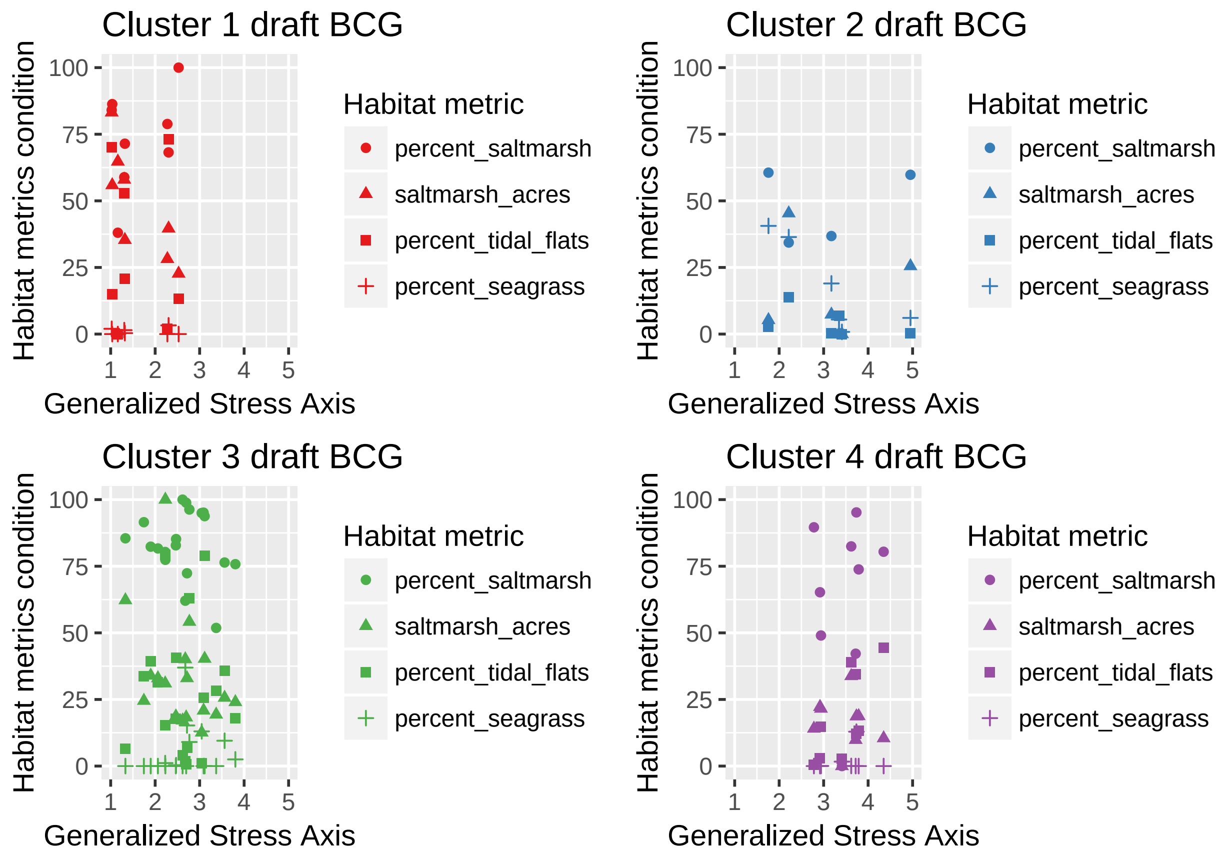
Individual BCG plots of each habitat type

Another way to simplify is to look at a BCG plot for each habitat type separately. We can see that Saltmarsh acres per km shoreline has the most linear relationship with the GSA.



Individual BCG plots for each embayment type

More likely, we would want to look at a BCG plot of each embayment cluster separately. We can clearly see that the ranges of stressors and habitats differs among clusters. For example, Cluster 1 seems to be comprised of embayments with low exposure to stressors (the GSA is never greater than 3). On the other hand, despite high levels of exposure to stressors (the GSA is never less than about 2.5), Cluster 4 shows relatively high values for percent saltmarsh habitat.



Summary

What we've done so far is explore the stressors and habitat metrics within the bounds of MassBays as a whole. In doing so, we've shown that there are real differences among clusters that could be considered when assembling new draft BCGs.

In addition, these BCGs only consider the present range of stressor and habitat values captured in the EDA2.0.

The Northeastern analysis identified which stressors are most predictive of habitat condition. Shoreline hardening and septic system use were able to predict percent saltmarsh; population density and shoreline hardening could predict saltmarsh acres per km shoreline. One option is to have future iterations of the BCG use only those stressors as inputs to a GSA.

Alternatively, the highest 3 stressors in each embayment cluster could be used to develop custom GSAs for each cluster.