**JRH Metric Reduction Notes, will turn into R Markdown document for May Call and share w/Group**

Step 0.5 – Lou suggested that some of the metrics are named differently but are actually the same metric, so I need to remove the replicate metrics as a first step. I ran a

Richard/Blocksom/USEPA Provided Box Score Comparison, Range Test and Redundancy Analysis R code/function (publish in markdown) – ran on 6000 plus sites (show data in markdown).

**Step 1. Remove metrics using Box Score comparison, all 0 and 1 across the board (metrics that show very little promise is showing separation) all the 3’s and some of the 2’s are retained. Reference Karen’s / Tetratech paper and define 0,1,2,3 box plot scoring.**

**Get some examples for the presentation – not necessary for the Rmarkdown – f it, put in the markdown.**

**Chart, box and whisker chart

Description automatically generated**

**Box Score of 3 – interquartile ranges (75th-25th percentile) of reference sites do not overlap with interquartile ranges of stress sites (keep these!)**

**Chart, box and whisker chart

Description automatically generated**

**Box Score of 2 – Interquartile Ranges (75th-25th percentile) of reference sites do overlap with interquartile ranges of stress sites, however the median of reference sites do not overlap with interquartile range of stress sites (keepers!)**

**Chart, box and whisker chart

Description automatically generated  
Box Score of 1 – Interquartile Ranges (75th-25th percentile) of reference sites do overlap with interquartile ranges of stress sites, and the median of reference sites also overlap with interquartile range of stress sites (not a keeper!)**

**Chart, box and whisker chart

Description automatically generated**

**Box Score of 0 – Interquartile Ranges (75th-25th percentile) of reference sites do overlap with interquartile ranges of stress sites, and the median of reference sites also overlap with interquartile range of stress sites, and median of reference sites is not different from the median of stress sites (not a keeper!)**

Blocksom, K.A., J.P Kurtenbach, D.J. Klemm, F.A. Fulk, and S.M. Cormier SM. 2001. Development and evaluation of the lake Macroinvertebrate Integrity Index (LMII) for New Jersey lakes and reservoirs. Environmental Monitoring and Assessment 77 (3):311-333.

Blocksom, K.A. and B.R. Johnson. 2009. Development of a Regional Macroinvertebrate Index for Large River Bioassessment. Ecological Indicators. Elsevier Science Ltd, New York, NY, 9(2):313-328.

Carlisle, Daren & Spaulding, Sarah & Polaskey, Meredith & Schulte, Nicholas & Lee, Sylvia & Mitchell, Richard & Pollard, Amina. (2022). A web-based tool for assessing the condition of benthic diatom assemblages in streams and rivers of the conterminous United States. Ecological Indicators. 135. 108513. 10.1016/j.ecolind.2021.108513.

Klemm, Donald & Blocksom, Karen & Fulk, Florence & Herlihy, Alan & Hughes, Robert & Kaufmann, Philip & Peck, David & Stoddard, John & Thoeny, William & Griffith, Michael & Davis, Wayne. (2003). Development and Evaluation of a Macroinvertebrate Biotic Integrity Index (MBII) for Regionally Assessing Mid-Atlantic Highland Streams. Environmental management. 31. 656-69.

All Subsets Approach:

[(PDF) A web-based tool for assessing the condition of benthic diatom assemblages in streams and rivers of the conterminous United States (researchgate.net)](https://www.researchgate.net/publication/357599861_A_web-based_tool_for_assessing_the_condition_of_benthic_diatom_assemblages_in_streams_and_rivers_of_the_conterminous_United_States)

Carlisle, Daren & Spaulding, Sarah & Polaskey, Meredith & Schulte, Nicholas & Lee, Sylvia & Mitchell, Richard & Pollard, Amina. (2022). A web-based tool for assessing the condition of benthic diatom assemblages in streams and rivers of the conterminous United States. Ecological Indicators. 135. 108513. 10.1016/j.ecolind.2021.108513.

In Coastal Areas, removed the following metrics:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| METRIC | BoxScore\_AllData | BoxScore\_All\_JustCoast | BoxScore\_Coast\_Spring | BoxScore\_Coast\_Fall | Sum |
| %BCG\_Acidity\_att2&3 | 0 | 2 | 2 | 1 | 5 |
| %BCG\_Acidity\_att5 | 0 | 0 | 1 | 0 | 1 |
| %BCG\_Alkalinity\_att2&3 | 0 | 0 | 0 | 0 | 0 |
| %BCG\_Alkalinity\_att5 | 0 | 1 | 1 | 1 | 3 |
| %BCG\_Chloride\_att5 | 0 | 1 | 1 | 0 | 2 |
| %BCG\_RBS\_att2&3 | 3 | 0 | 1 | 0 | 4 |
| %BCG\_Sulfate\_att2&3 | 1 | 0 | 0 | 0 | 1 |
| %BCG\_Sulfate\_att5 | 0 | 1 | 1 | 0 | 2 |
| %BCG\_TN.TP\_att2&3 | 3 | 1 | 1 | 1 | 6 |
| %Chiro | 2 | 0 | 0 | 0 | 2 |
| %Collector | 0 | 0 | 0 | 0 | 0 |
| %GenusScraper | 1 | 1 | 0 | 2 | 4 |
| AMPHNTAX | 0 | 0 | 0 | 0 | 0 |
| AMPHPIND | 0 | 0 | 0 | 0 | 0 |
| AMPHPTAX | 0 | 2 | 2 | 1 | 5 |
| BCGatt5 | 0 | 0 | 0 | 0 | 0 |
| BURRNTAX | 0 | 0 | 0 | 0 | 0 |
| BURRPIND | 0 | 0 | 0 | 0 | 0 |
| BURRPTAX | 0 | 0 | 0 | 0 | 0 |
| CHIRDOM1PIND | 0 | 0 | 0 | 0 | 0 |
| CHIRDOM3PIND | 0 | 0 | 0 | 0 | 0 |
| CHIRDOM5PIND | 0 | 0 | 0 | 0 | 0 |
| CHIRNTAX | 0 | 0 | 0 | 0 | 0 |
| CHIRPIND | 2 | 0 | 0 | 0 | 2 |
| CLMBNTAX | 0 | 0 | 0 | 0 | 0 |
| CLMBPIND | 0 | 0 | 0 | 0 | 0 |
| CLMBPTAX | 0 | 0 | 0 | 0 | 0 |
| COFINTAX | 0 | 0 | 0 | 1 | 1 |
| COFIPIND | 0 | 0 | 1 | 0 | 1 |
| COFIPTAX | 0 | 0 | 0 | 0 | 0 |
| COFITRICNTAX | 0 | 1 | 2 | 2 | 5 |
| COFITRICPIND | 0 | 2 | 2 | 2 | 6 |
| COFITRICPTAX | 0 | 0 | 1 | 1 | 2 |
| COGAPIND | 0 | 0 | 1 | 0 | 1 |
| COGAPTAX | 2 | 0 | 0 | 0 | 2 |
| CRUSNTAX | 0 | 0 | 0 | 0 | 0 |
| CRUSPIND | 0 | 0 | 1 | 2 | 3 |
| CRUSPTAX | 0 | 1 | 2 | 0 | 3 |
| DIPTNTAX | 0 | 0 | 0 | 0 | 0 |
| DIPTPIND | 2 | 0 | 0 | 0 | 2 |
| DIPTPTAX | 1 | 2 | 2 | 1 | 6 |
| FACLPIND | 2 | 1 | 1 | 2 | 6 |
| gregTol\_%BCG\_Acidity\_att2&3 | 0 | 2 | 2 | 1 | 5 |
| gregTol\_%BCG\_Acidity\_att5 | 0 | 0 | 1 | 0 | 1 |
| gregTol\_%BCG\_Alkalinity\_att2&3 | 0 | 0 | 0 | 0 | 0 |
| gregTol\_%BCG\_Alkalinity\_att5 | 0 | 1 | 1 | 1 | 3 |
| gregTol\_%BCG\_Chloride\_att5 | 0 | 1 | 1 | 0 | 2 |
| gregTol\_%BCG\_RBS\_att2&3 | 3 | 0 | 1 | 0 | 4 |
| gregTol\_%BCG\_Sulfate\_att2&3 | 1 | 0 | 0 | 0 | 1 |
| gregTol\_%BCG\_Sulfate\_att5 | 0 | 1 | 1 | 0 | 2 |
| gregTol\_%BCG\_TN.TP\_att2&3 | 3 | 1 | 1 | 1 | 6 |
| gregTol\_%Chiro | 2 | 0 | 0 | 0 | 2 |
| gregTol\_%Collector | 0 | 0 | 0 | 0 | 0 |
| gregTol\_%GenusScraper | 1 | 1 | 0 | 2 | 4 |
| gregTol\_BCGatt5 | 0 | 0 | 0 | 0 | 0 |
| gregTol\_FACLPIND | 1 | 0 | 1 | 1 | 3 |
| gregTol\_INTLNTAX | 0 | 0 | 0 | 0 | 0 |
| gregTol\_INTLPIND | 1 | 0 | 0 | 0 | 1 |
| gregTol\_INTLPTAX | 1 | 0 | 0 | 0 | 1 |
| gregTol\_STOLNTAX | 1 | 0 | 1 | 0 | 2 |
| gregTol\_TL01NTAX | 0 | 0 | 0 | 0 | 0 |
| gregTol\_TL01PIND | 0 | 0 | 0 | 0 | 0 |
| gregTol\_TL01PTAX | 0 | 0 | 0 | 0 | 0 |
| gregTol\_TL23NTAX | 2 | 0 | 0 | 1 | 3 |
| gregTol\_TL23PIND | 3 | 0 | 0 | 1 | 4 |
| gregTol\_TL23PTAX | 2 | 0 | 0 | 1 | 3 |
| gregTol\_TL67NTAX | 0 | 2 | 2 | 1 | 5 |
| gregTol\_TL67PIND | 2 | 1 | 0 | 1 | 4 |
| gregTol\_TL67PTAX | 2 | 0 | 0 | 0 | 2 |
| gregTol\_TOLRNTAX | 0 | 0 | 0 | 0 | 0 |
| gregTol\_TOLRPIND | 2 | 1 | 1 | 1 | 5 |
| HEMINTAX | 0 | 0 | 0 | 0 | 0 |
| HEMIPIND | 0 | 0 | 0 | 0 | 0 |
| HEMIPTAX | 0 | 0 | 0 | 0 | 0 |
| INTLNTAX | 0 | 0 | 0 | 0 | 0 |
| INTLPIND | 0 | 0 | 0 | 0 | 0 |
| INTLPTAX | 0 | 0 | 0 | 0 | 0 |
| MITENTAX | 0 | 0 | 0 | 0 | 0 |
| MITEPIND | 0 | 0 | 0 | 0 | 0 |
| MITEPTAX | 0 | 0 | 0 | 0 | 0 |
| MOLLNTAX | 0 | 0 | 0 | 0 | 0 |
| MOLLPIND | 0 | 1 | 1 | 1 | 3 |
| NOINNTAX | 0 | 0 | 0 | 0 | 0 |
| ODONNTAX | 0 | 0 | 0 | 0 | 0 |
| ODONPIND | 0 | 0 | 0 | 0 | 0 |
| ODONPTAX | 0 | 0 | 0 | 0 | 0 |
| OLLENTAX | 0 | 0 | 0 | 0 | 0 |
| PREDNTAX | 2 | 1 | 2 | 1 | 6 |
| PREDPIND | 2 | 0 | 2 | 0 | 4 |
| PREDPTAX | 1 | 0 | 0 | 0 | 1 |
| SCRPNTAX | 2 | 1 | 0 | 0 | 3 |
| SCRPPIND | 1 | 1 | 0 | 2 | 4 |
| SCRPPTAX | 0 | 0 | 0 | 0 | 0 |
| SHRDNTAX | 2 | 0 | 0 | 0 | 2 |
| SHRDPIND | 2 | 2 | 0 | 2 | 6 |
| SHRDPTAX | 0 | 0 | 0 | 0 | 0 |
| SPWLNTAX | 0 | 0 | 0 | 0 | 0 |
| SPWLPIND | 0 | 0 | 0 | 0 | 0 |
| SPWLPTAX | 0 | 0 | 0 | 0 | 0 |
| STOLNTAX | 1 | 0 | 1 | 0 | 2 |
| SWIMNTAX | 0 | 0 | 2 | 0 | 2 |
| SWIMPIND | 1 | 0 | 0 | 0 | 1 |
| SWIMPTAX | 0 | 0 | 0 | 0 | 0 |
| TL01NTAX | 0 | 0 | 0 | 0 | 0 |
| TL01PIND | 0 | 0 | 0 | 0 | 0 |
| TL01PTAX | 0 | 0 | 0 | 0 | 0 |
| TL23NTAX | 2 | 0 | 0 | 0 | 2 |
| TL23PIND | 2 | 0 | 0 | 0 | 2 |
| TL23PTAX | 2 | 0 | 0 | 0 | 2 |
| TL67NTAX | 0 | 2 | 2 | 1 | 5 |
| TL67PIND | 2 | 0 | 0 | 0 | 2 |
| TL67PTAX | 2 | 0 | 0 | 0 | 2 |
| TOLRNTAX | 0 | 0 | 0 | 0 | 0 |
| TOLRPIND | 2 | 1 | 1 | 1 | 5 |
| TRICPTAX | 0 | 2 | 2 | 2 | 6 |

In Coastal Areas, Kept the following metrics (n=105):

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| METRIC | BoxScore\_AllData | BoxScore\_All\_JustCoast | BoxScore\_Coast\_Spring | BoxScore\_Coast\_Fall | Sum |
| %BCG\_Chloride\_att2&3 | 3 | 3 | 3 | 3 | 12 |
| %BCG\_DO\_att2&3 | 3 | 2 | 2 | 2 | 9 |
| %BCG\_DO\_att5 | 1 | 3 | 3 | 3 | 10 |
| %BCG\_pctIMP\_att2&3 | 3 | 3 | 3 | 3 | 12 |
| %BCG\_pctIMP\_att5 | 3 | 3 | 3 | 3 | 12 |
| %BCG\_RBS\_att5 | 2 | 3 | 3 | 3 | 11 |
| %BCG\_spCond\_att2&3 | 3 | 3 | 3 | 3 | 12 |
| %BCG\_spCond\_att5 | 3 | 2 | 2 | 2 | 9 |
| %BCG\_TN.TP\_att5 | 3 | 3 | 3 | 3 | 12 |
| %BCG\_totHab\_att2&3 | 3 | 3 | 3 | 2 | 11 |
| %BCG\_totHab\_att5 | 3 | 3 | 3 | 3 | 12 |
| %BCGatt2&3 | 3 | 3 | 3 | 3 | 12 |
| %BCGatt5 | 3 | 3 | 3 | 3 | 12 |
| %Clinger-HS | 2 | 3 | 3 | 3 | 11 |
| %Ephem | 2 | 3 | 3 | 3 | 11 |
| %Ephem-B | 2 | 3 | 3 | 3 | 11 |
| %EPT4.5 | 3 | 3 | 3 | 3 | 12 |
| %EPT6.5 | 3 | 3 | 3 | 3 | 12 |
| %EPT-H+C | 3 | 3 | 3 | 3 | 12 |
| %PT - Hydropsychidae | 2 | 3 | 3 | 3 | 11 |
| BCGatt2&3 | 3 | 3 | 3 | 3 | 12 |
| CHIRPTAX | 3 | 3 | 3 | 3 | 12 |
| CLNGNTAX | 3 | 3 | 3 | 3 | 12 |
| CLNGPIND | 2 | 3 | 3 | 3 | 11 |
| CLNGPTAX | 2 | 3 | 3 | 3 | 11 |
| COGANTAX | 0 | 2 | 3 | 2 | 7 |
| DOM1PIND | 2 | 1 | 2 | 2 | 7 |
| DOM3PIND | 3 | 3 | 2 | 3 | 11 |
| DOM5PIND | 3 | 3 | 3 | 3 | 12 |
| Elmid | 0 | 3 | 3 | 3 | 9 |
| EPHENTAX | 2 | 3 | 3 | 3 | 11 |
| EPHEPIND | 2 | 3 | 3 | 3 | 11 |
| EPHEPTAX | 1 | 3 | 3 | 3 | 10 |
| EPOTNTAX | 3 | 3 | 3 | 3 | 12 |
| EPOTPIND | 2 | 3 | 3 | 3 | 11 |
| EPOTPTAX | 3 | 3 | 3 | 3 | 12 |
| EPT\_NTAX | 3 | 3 | 3 | 3 | 12 |
| EPT\_PIND | 2 | 3 | 3 | 3 | 11 |
| EPT\_PTAX | 2 | 3 | 3 | 3 | 11 |
| FACLNTAX | 3 | 3 | 3 | 3 | 12 |
| FACLPTAX | 3 | 3 | 3 | 3 | 12 |
| Genus %2 Dominant | 3 | 2 | 2 | 2 | 9 |
| Genus EPT Taxa | 3 | 3 | 3 | 3 | 12 |
| Genus HBI | 3 | 3 | 3 | 3 | 12 |
| Genus Total Taxa | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%BCG\_Chloride\_att2&3 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%BCG\_DO\_att2&3 | 3 | 2 | 2 | 2 | 9 |
| gregTol\_%BCG\_DO\_att5 | 1 | 3 | 3 | 3 | 10 |
| gregTol\_%BCG\_pctIMP\_att2&3 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%BCG\_pctIMP\_att5 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%BCG\_RBS\_att5 | 2 | 3 | 3 | 3 | 11 |
| gregTol\_%BCG\_spCond\_att2&3 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%BCG\_spCond\_att5 | 3 | 2 | 2 | 2 | 9 |
| gregTol\_%BCG\_TN.TP\_att5 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%BCG\_totHab\_att2&3 | 3 | 3 | 3 | 2 | 11 |
| gregTol\_%BCG\_totHab\_att5 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%BCGatt2&3 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%BCGatt5 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%Clinger-HS | 2 | 3 | 3 | 3 | 11 |
| gregTol\_%Ephem | 2 | 3 | 3 | 3 | 11 |
| gregTol\_%Ephem-B | 2 | 3 | 3 | 3 | 11 |
| gregTol\_%EPT4.5 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%EPT6.5 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%EPT-H+C | 3 | 3 | 3 | 3 | 12 |
| gregTol\_%PT - Hydropsychidae | 2 | 3 | 3 | 3 | 11 |
| gregTol\_BCGatt2&3 | 3 | 3 | 3 | 3 | 12 |
| gregTol\_Elmid | 0 | 3 | 3 | 3 | 9 |
| gregTol\_FACLNTAX | 3 | 3 | 3 | 3 | 12 |
| gregTol\_FACLPTAX | 2 | 3 | 3 | 3 | 11 |
| gregTol\_Genus %2 Dominant | 3 | 2 | 2 | 2 | 9 |
| gregTol\_Genus EPT Taxa | 3 | 3 | 3 | 3 | 12 |
| gregTol\_Genus HBI | 3 | 3 | 3 | 3 | 12 |
| gregTol\_Genus Total Taxa | 3 | 3 | 3 | 3 | 12 |
| gregTol\_NTOLNTAX | 3 | 3 | 3 | 3 | 12 |
| gregTol\_NTOLPIND | 3 | 2 | 3 | 2 | 10 |
| gregTol\_NTOLPTAX | 3 | 3 | 3 | 3 | 12 |
| gregTol\_STOLPIND | 2 | 2 | 2 | 1 | 7 |
| gregTol\_STOLPTAX | 3 | 3 | 3 | 3 | 12 |
| gregTol\_TL45NTAX | 3 | 3 | 3 | 3 | 12 |
| gregTol\_TL45PIND | 3 | 2 | 3 | 2 | 10 |
| gregTol\_TL45PTAX | 2 | 3 | 3 | 3 | 11 |
| gregTol\_TOLRPTAX | 3 | 3 | 3 | 2 | 11 |
| gregTol\_WTD\_TV | 3 | 3 | 3 | 3 | 12 |
| HPRIME | 3 | 3 | 3 | 3 | 12 |
| MOLLPTAX | 1 | 2 | 2 | 2 | 7 |
| NOINPIND | 2 | 2 | 3 | 2 | 9 |
| NOINPTAX | 2 | 3 | 3 | 3 | 11 |
| NTOLNTAX | 3 | 3 | 3 | 3 | 12 |
| NTOLPIND | 3 | 2 | 3 | 2 | 10 |
| NTOLPTAX | 3 | 3 | 3 | 3 | 12 |
| OLLEPIND | 2 | 2 | 2 | 2 | 8 |
| OLLEPTAX | 2 | 3 | 3 | 3 | 11 |
| PLECNTAX | 2 | 1 | 3 | 1 | 7 |
| PLECPIND | 3 | 1 | 3 | 1 | 8 |
| PLECPTAX | 2 | 1 | 3 | 1 | 7 |
| STOLPIND | 2 | 2 | 2 | 1 | 7 |
| STOLPTAX | 3 | 3 | 3 | 3 | 12 |
| TL45NTAX | 3 | 3 | 3 | 3 | 12 |
| TL45PIND | 3 | 2 | 3 | 2 | 10 |
| TL45PTAX | 3 | 3 | 3 | 3 | 12 |
| TOLRPTAX | 3 | 3 | 3 | 2 | 11 |
| TOTLNTAX | 3 | 3 | 3 | 3 | 12 |
| TRICNTAX | 1 | 2 | 3 | 2 | 8 |
| TRICPIND | 0 | 2 | 3 | 2 | 7 |
| WTD\_TV | 3 | 3 | 3 | 2 | 11 |

In Non-Coastal Areas, we removed the following Metrics:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| METRIC | BoxScore\_AllData | BoxScore\_All\_NoCoast | BoxScore\_NoCoast\_Fall | BoxScore\_NoCoast\_Spring | sum |
| %BCG\_Alkalinity\_att5 | 0 | 0 | 0 | 0 | 0 |
| %BCG\_Chloride\_att5 | 0 | 0 | 0 | 0 | 0 |
| %BCG\_DO\_att2&3 | 3 | 3 | 3 | 3 | 0 |
| %BCG\_RBS\_att5 | 2 | 3 | 3 | 3 | 0 |
| %BCG\_totHab\_att2&3 | 3 | 3 | 3 | 3 | 0 |
| AMPHNTAX | 0 | 0 | 0 | 0 | 0 |
| AMPHPIND | 0 | 0 | 0 | 0 | 0 |
| AMPHPTAX | 0 | 0 | 0 | 0 | 0 |
| CHIRDOM1PIND | 0 | 0 | 0 | 0 | 0 |
| CHIRDOM3PIND | 0 | 0 | 0 | 0 | 0 |
| CHIRDOM5PIND | 0 | 0 | 0 | 0 | 0 |
| CHIRNTAX | 0 | 0 | 0 | 0 | 0 |
| CLMBNTAX | 0 | 0 | 0 | 0 | 0 |
| CLMBPIND | 0 | 0 | 0 | 0 | 0 |
| CLMBPTAX | 0 | 0 | 0 | 0 | 0 |
| CLNGPTAX | 2 | 2 | 2 | 2 | 0 |
| COFITRICPTAX | 0 | 0 | 0 | 0 | 0 |
| COGANTAX | 0 | 0 | 0 | 0 | 0 |
| CRUSNTAX | 0 | 0 | 0 | 0 | 0 |
| CRUSPIND | 0 | 0 | 0 | 0 | 0 |
| DIPTNTAX | 0 | 0 | 0 | 0 | 0 |
| Elmid | 0 | 0 | 0 | 0 | 0 |
| gregTol\_%BCG\_Alkalinity\_att5 | 0 | 0 | 0 | 0 | 0 |
| gregTol\_%BCG\_Chloride\_att5 | 0 | 0 | 0 | 0 | 0 |
| gregTol\_%BCG\_DO\_att2&3 | 3 | 3 | 3 | 3 | 0 |
| gregTol\_%BCG\_RBS\_att2&3 | 3 | 3 | 3 | 3 | 0 |
| gregTol\_%BCG\_RBS\_att5 | 2 | 3 | 3 | 3 | 0 |
| gregTol\_Elmid | 0 | 0 | 0 | 0 | 0 |
| gregTol\_INTLNTAX | 0 | 2 | 0 | 2 | 0 |
| gregTol\_INTLPIND | 1 | 3 | 1 | 3 | 0 |
| gregTol\_INTLPTAX | 1 | 2 | 1 | 2 | 0 |
| gregTol\_TL01NTAX | 0 | 0 | 0 | 0 | 0 |
| gregTol\_TL01PIND | 0 | 0 | 0 | 0 | 0 |
| gregTol\_TL01PTAX | 0 | 0 | 0 | 0 | 0 |
| gregTol\_TL67NTAX | 0 | 0 | 0 | 0 | 0 |
| HEMINTAX | 0 | 0 | 0 | 0 | 0 |
| HEMIPIND | 0 | 0 | 0 | 0 | 0 |
| HEMIPTAX | 0 | 0 | 0 | 0 | 0 |
| INTLNTAX | 0 | 0 | 0 | 0 | 0 |
| INTLPIND | 0 | 0 | 0 | 0 | 0 |
| INTLPTAX | 0 | 0 | 0 | 0 | 0 |
| MITENTAX | 0 | 0 | 0 | 0 | 0 |
| MITEPIND | 0 | 0 | 0 | 0 | 0 |
| MITEPTAX | 0 | 0 | 0 | 0 | 0 |
| ODONNTAX | 0 | 0 | 0 | 0 | 0 |
| ODONPIND | 0 | 0 | 0 | 0 | 0 |
| SWIMPTAX | 0 | 0 | 0 | 0 | 0 |
| TL01NTAX | 0 | 0 | 0 | 0 | 0 |
| TL01PIND | 0 | 0 | 0 | 0 | 0 |
| TL01PTAX | 0 | 0 | 0 | 0 | 0 |
| TL23NTAX | 2 | 2 | 2 | 2 | 0 |
| TL67NTAX | 0 | 0 | 0 | 0 | 0 |
| TRICPTAX | 0 | 0 | 0 | 0 | 0 |
| %BCG\_RBS\_att2&3 | 3 | 3 | 3 | 3 | 0 |
| gregTol\_%BCG\_totHab\_att2&3 | 3 | 3 | 3 | 3 | 0 |
| %BCG\_Acidity\_att2&3 | 0 | 0 | 0 | 0 | 1 |
| %Collector | 0 | 0 | 0 | 0 | 1 |
| BURRPTAX | 0 | 0 | 0 | 0 | 1 |
| COFIPIND | 0 | 0 | 0 | 0 | 1 |
| COFITRICPIND | 0 | 0 | 0 | 0 | 1 |
| CRUSPTAX | 0 | 0 | 0 | 0 | 1 |
| gregTol\_%BCG\_Acidity\_att2&3 | 0 | 0 | 0 | 0 | 1 |
| gregTol\_%Collector | 0 | 0 | 0 | 0 | 1 |
| MOLLNTAX | 0 | 0 | 0 | 0 | 1 |
| MOLLPIND | 0 | 0 | 0 | 0 | 1 |
| SPWLNTAX | 0 | 0 | 0 | 0 | 1 |
| SWIMNTAX | 0 | 0 | 0 | 0 | 1 |
| TRICPIND | 0 | 0 | 0 | 0 | 1 |
| %BCG\_DO\_att5 | 1 | 0 | 0 | 0 | 2 |
| BURRNTAX | 0 | 0 | 0 | 0 | 2 |
| COGAPIND | 0 | 0 | 0 | 1 | 2 |
| gregTol\_%BCG\_DO\_att5 | 1 | 0 | 0 | 0 | 2 |
| ODONPTAX | 0 | 0 | 1 | 0 | 2 |
| SPWLPTAX | 0 | 0 | 0 | 1 | 2 |
| %BCG\_Acidity\_att5 | 0 | 0 | 0 | 1 | 3 |
| COFINTAX | 0 | 0 | 0 | 0 | 3 |
| gregTol\_%BCG\_Acidity\_att5 | 0 | 0 | 0 | 1 | 3 |
| NOINNTAX | 0 | 0 | 0 | 0 | 3 |
| OLLENTAX | 0 | 1 | 0 | 1 | 3 |
| SCRPPTAX | 0 | 0 | 0 | 1 | 3 |
| SPWLPIND | 0 | 0 | 0 | 1 | 3 |
| COFITRICNTAX | 0 | 0 | 1 | 1 | 4 |
| BCGatt5 | 0 | 1 | 0 | 1 | 5 |
| BURRPIND | 0 | 0 | 0 | 1 | 5 |
| COFIPTAX | 0 | 0 | 0 | 1 | 5 |
| DIPTPTAX | 1 | 1 | 0 | 1 | 5 |
| gregTol\_BCGatt5 | 0 | 1 | 0 | 1 | 5 |
| gregTol\_STOLNTAX | 1 | 1 | 0 | 1 | 5 |
| SHRDPTAX | 0 | 0 | 0 | 1 | 5 |
| STOLNTAX | 1 | 1 | 0 | 1 | 5 |

In Non-Coastal Areas, we removed the following Metrics due to collection method reasons (blue metrics would have made the cut) I made Box Score test to look at all reference sites that just had a different collection method:

|  |  |
| --- | --- |
| METRIC | BoxScore\_CollMethod |
| %BCG\_DO\_att2&3 | 3 |
| %BCG\_DO\_att5 | 3 |
| %BCG\_RBS\_att2&3 | 3 |
| %BCG\_RBS\_att5 | 3 |
| %BCG\_totHab\_att2&3 | 3 |
| CLMBPIND | 3 |
| CLMBPTAX | 3 |
| CLNGPTAX | 3 |
| gregTol\_%BCG\_DO\_att2&3 | 3 |
| gregTol\_%BCG\_DO\_att5 | 3 |
| gregTol\_%BCG\_RBS\_att2&3 | 3 |
| gregTol\_%BCG\_RBS\_att5 | 3 |
| gregTol\_%BCG\_totHab\_att2&3 | 3 |
| gregTol\_INTLNTAX | 3 |
| gregTol\_INTLPIND | 3 |
| gregTol\_INTLPTAX | 3 |
| NOINNTAX | 3 |
| ODONPIND | 3 |
| TL23PTAX | 3 |

In non-coastal areas we kept the following metrics (n=130):

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| METRIC | BoxScore\_AllData | BoxScore\_All\_NoCoast | BoxScore\_NoCoast\_Fall | BoxScore\_NoCoast\_Spring | sum |
| %BCG\_Alkalinity\_att2&3 | 0 | 0 | 0 | 1 | 6 |
| %BCG\_Chloride\_att2&3 | 3 | 3 | 3 | 3 | 23 |
| %BCG\_pctIMP\_att2&3 | 3 | 3 | 3 | 3 | 24 |
| %BCG\_pctIMP\_att5 | 3 | 3 | 3 | 3 | 23 |
| %BCG\_spCond\_att2&3 | 3 | 3 | 3 | 3 | 23 |
| %BCG\_spCond\_att5 | 3 | 3 | 3 | 3 | 22 |
| %BCG\_Sulfate\_att2&3 | 1 | 2 | 0 | 2 | 11 |
| %BCG\_Sulfate\_att5 | 0 | 0 | 0 | 1 | 6 |
| %BCG\_TN.TP\_att2&3 | 3 | 3 | 3 | 3 | 24 |
| %BCG\_TN.TP\_att5 | 3 | 3 | 3 | 3 | 23 |
| %BCG\_totHab\_att5 | 3 | 3 | 3 | 3 | 22 |
| %BCGatt2&3 | 3 | 3 | 3 | 3 | 23 |
| %BCGatt5 | 3 | 3 | 3 | 3 | 23 |
| %Chiro | 2 | 2 | 2 | 3 | 18 |
| %Clinger-HS | 2 | 2 | 1 | 3 | 14 |
| %Ephem | 2 | 2 | 2 | 3 | 18 |
| %Ephem-B | 2 | 2 | 2 | 3 | 18 |
| %EPT4.5 | 3 | 3 | 3 | 3 | 23 |
| %EPT6.5 | 3 | 3 | 3 | 3 | 22 |
| %EPT-H+C | 3 | 3 | 3 | 3 | 23 |
| %GenusScraper | 1 | 1 | 0 | 2 | 8 |
| %PT - Hydropsychidae | 2 | 2 | 0 | 2 | 9 |
| BCGatt2&3 | 3 | 3 | 3 | 3 | 24 |
| CHIRPIND | 2 | 2 | 2 | 3 | 18 |
| CHIRPTAX | 3 | 3 | 2 | 3 | 22 |
| CLNGNTAX | 3 | 3 | 3 | 3 | 24 |
| CLNGPIND | 2 | 2 | 1 | 2 | 12 |
| COGAPTAX | 2 | 2 | 2 | 2 | 16 |
| DIPTPIND | 2 | 2 | 2 | 3 | 17 |
| DOM1PIND | 2 | 2 | 2 | 3 | 19 |
| DOM3PIND | 3 | 3 | 3 | 3 | 24 |
| DOM5PIND | 3 | 3 | 3 | 3 | 24 |
| EPHENTAX | 2 | 2 | 1 | 3 | 17 |
| EPHEPIND | 2 | 2 | 2 | 3 | 18 |
| EPHEPTAX | 1 | 2 | 0 | 2 | 10 |
| EPOTNTAX | 3 | 3 | 3 | 3 | 23 |
| EPOTPIND | 2 | 2 | 2 | 3 | 18 |
| EPOTPTAX | 3 | 3 | 3 | 3 | 21 |
| EPT\_NTAX | 3 | 3 | 3 | 3 | 24 |
| EPT\_PIND | 2 | 2 | 2 | 3 | 18 |
| EPT\_PTAX | 2 | 3 | 3 | 3 | 21 |
| FACLNTAX | 3 | 3 | 3 | 3 | 24 |
| FACLPIND | 2 | 2 | 2 | 2 | 16 |
| FACLPTAX | 3 | 3 | 3 | 3 | 22 |
| Genus %2 Dominant | 3 | 3 | 3 | 3 | 24 |
| Genus EPT Taxa | 3 | 3 | 3 | 3 | 24 |
| Genus HBI | 3 | 3 | 3 | 3 | 23 |
| Genus Total Taxa | 3 | 3 | 2 | 3 | 22 |
| gregTol\_%BCG\_Alkalinity\_att2&3 | 0 | 0 | 0 | 1 | 6 |
| gregTol\_%BCG\_Chloride\_att2&3 | 3 | 3 | 3 | 3 | 23 |
| gregTol\_%BCG\_pctIMP\_att2&3 | 3 | 3 | 3 | 3 | 24 |
| gregTol\_%BCG\_pctIMP\_att5 | 3 | 3 | 3 | 3 | 23 |
| gregTol\_%BCG\_spCond\_att2&3 | 3 | 3 | 3 | 3 | 23 |
| gregTol\_%BCG\_spCond\_att5 | 3 | 3 | 3 | 3 | 22 |
| gregTol\_%BCG\_Sulfate\_att2&3 | 1 | 2 | 0 | 2 | 11 |
| gregTol\_%BCG\_Sulfate\_att5 | 0 | 0 | 0 | 1 | 6 |
| gregTol\_%BCG\_TN.TP\_att2&3 | 3 | 3 | 3 | 3 | 24 |
| gregTol\_%BCG\_TN.TP\_att5 | 3 | 3 | 3 | 3 | 23 |
| gregTol\_%BCG\_totHab\_att5 | 3 | 3 | 3 | 3 | 22 |
| gregTol\_%BCGatt2&3 | 3 | 3 | 3 | 3 | 23 |
| gregTol\_%BCGatt5 | 3 | 3 | 3 | 3 | 23 |
| gregTol\_%Chiro | 2 | 2 | 2 | 3 | 18 |
| gregTol\_%Clinger-HS | 2 | 2 | 1 | 3 | 14 |
| gregTol\_%Ephem | 2 | 2 | 2 | 3 | 18 |
| gregTol\_%Ephem-B | 2 | 2 | 2 | 3 | 18 |
| gregTol\_%EPT4.5 | 3 | 3 | 3 | 3 | 23 |
| gregTol\_%EPT6.5 | 3 | 3 | 3 | 3 | 22 |
| gregTol\_%EPT-H+C | 3 | 3 | 3 | 3 | 23 |
| gregTol\_%GenusScraper | 1 | 1 | 0 | 2 | 8 |
| gregTol\_%PT - Hydropsychidae | 2 | 2 | 0 | 2 | 9 |
| gregTol\_BCGatt2&3 | 3 | 3 | 3 | 3 | 24 |
| gregTol\_FACLNTAX | 3 | 3 | 3 | 3 | 23 |
| gregTol\_FACLPIND | 1 | 2 | 1 | 2 | 11 |
| gregTol\_FACLPTAX | 2 | 2 | 2 | 2 | 18 |
| gregTol\_Genus %2 Dominant | 3 | 3 | 3 | 3 | 24 |
| gregTol\_Genus EPT Taxa | 3 | 3 | 3 | 3 | 24 |
| gregTol\_Genus HBI | 3 | 3 | 3 | 3 | 23 |
| gregTol\_Genus Total Taxa | 3 | 3 | 2 | 3 | 22 |
| gregTol\_NTOLNTAX | 3 | 3 | 3 | 3 | 24 |
| gregTol\_NTOLPIND | 3 | 3 | 3 | 3 | 23 |
| gregTol\_NTOLPTAX | 3 | 3 | 3 | 3 | 23 |
| gregTol\_STOLPIND | 2 | 2 | 2 | 2 | 14 |
| gregTol\_STOLPTAX | 3 | 3 | 3 | 3 | 23 |
| gregTol\_TL23NTAX | 2 | 3 | 2 | 3 | 20 |
| gregTol\_TL23PIND | 3 | 3 | 3 | 3 | 23 |
| gregTol\_TL23PTAX | 2 | 3 | 3 | 3 | 21 |
| gregTol\_TL45NTAX | 3 | 3 | 3 | 3 | 22 |
| gregTol\_TL45PIND | 3 | 3 | 2 | 3 | 22 |
| gregTol\_TL45PTAX | 2 | 2 | 2 | 2 | 17 |
| gregTol\_TL67PIND | 2 | 3 | 2 | 3 | 19 |
| gregTol\_TL67PTAX | 2 | 3 | 3 | 3 | 21 |
| gregTol\_TOLRNTAX | 0 | 0 | 0 | 1 | 6 |
| gregTol\_TOLRPIND | 2 | 2 | 2 | 2 | 17 |
| gregTol\_TOLRPTAX | 3 | 3 | 3 | 3 | 23 |
| gregTol\_WTD\_TV | 3 | 3 | 3 | 3 | 23 |
| HPRIME | 3 | 3 | 3 | 3 | 24 |
| MOLLPTAX | 1 | 1 | 1 | 1 | 7 |
| NOINPIND | 2 | 2 | 2 | 2 | 13 |
| NOINPTAX | 2 | 2 | 2 | 2 | 17 |
| NTOLNTAX | 3 | 3 | 3 | 3 | 24 |
| NTOLPIND | 3 | 3 | 3 | 3 | 23 |
| NTOLPTAX | 3 | 3 | 3 | 3 | 23 |
| OLLEPIND | 2 | 2 | 1 | 2 | 11 |
| OLLEPTAX | 2 | 2 | 1 | 3 | 14 |
| PLECNTAX | 2 | 3 | 2 | 3 | 20 |
| PLECPIND | 3 | 3 | 3 | 3 | 22 |
| PLECPTAX | 2 | 3 | 2 | 3 | 20 |
| PREDNTAX | 2 | 2 | 2 | 2 | 17 |
| PREDPIND | 2 | 3 | 3 | 2 | 20 |
| PREDPTAX | 1 | 2 | 2 | 2 | 13 |
| SCRPNTAX | 2 | 2 | 1 | 2 | 10 |
| SCRPPIND | 1 | 1 | 0 | 2 | 8 |
| SHRDNTAX | 2 | 2 | 2 | 2 | 13 |
| SHRDPIND | 2 | 2 | 1 | 2 | 14 |
| STOLPIND | 2 | 2 | 2 | 2 | 14 |
| STOLPTAX | 3 | 3 | 3 | 3 | 23 |
| SWIMPIND | 1 | 2 | 2 | 1 | 11 |
| TL23PIND | 2 | 3 | 3 | 3 | 20 |
| TL23PTAX | 2 | 2 | 2 | 3 | 17 |
| TL45NTAX | 3 | 3 | 3 | 3 | 23 |
| TL45PIND | 3 | 3 | 3 | 3 | 23 |
| TL45PTAX | 3 | 3 | 3 | 3 | 22 |
| TL67PIND | 2 | 3 | 2 | 3 | 19 |
| TL67PTAX | 2 | 3 | 2 | 3 | 20 |
| TOLRNTAX | 0 | 0 | 0 | 1 | 6 |
| TOLRPIND | 2 | 2 | 2 | 2 | 17 |
| TOLRPTAX | 3 | 3 | 3 | 3 | 23 |
| TOTLNTAX | 3 | 3 | 2 | 3 | 22 |
| TRICNTAX | 1 | 3 | 2 | 2 | 16 |
| WTD\_TV | 3 | 3 | 3 | 3 | 23 |

**Step 2 – Look at the range test to remove metrics with low range.**

Whelp, turns out only 3 metrics that are even “pass-“ in coastal analysis (PLECOPs) agree to remove so down to 102 in coastal

All metrics in non coastal analysis passed with flying colors, so still have 130 metrics, so we need to use step 3 to make progress

**Step 3- Look at redundancy test to remove intercorrelated metrics (ran at 0.8).**

Look at removing the metrics with correlation of 1 and re-run?