   a. At this level of correlation, the variable seems to be affecting the reference metric values
3. Identify variables that are correlated with more than one metric
   a. Variables that are consistently correlated are likely to have robust effects
4. Plot the 95th quantile regression line for all reference sites
   a. Included non-reference sites as points on the plots, though they do not drive the quantile regression
5. Identify plateaus in the relationships so the effective adjustment range is limited
   a. Extrapolation beyond the effective range might result in unreasonable metric expectations
   b. Define the plateau subjectively
6. Define the optimal end of the metric scoring range as the 95th quantile regression line and the plateaus intersecting that regression line
7. Score metrics on a 0-100 scale, interpolating between 0 and the optimal scoring range, based on the observed metric value and adjustment variable value

An example of an adjustment is shown in Figure 9. The number of taxa was higher in reference sites in larger drainage areas than smaller drainage areas (r = 0.61). The optimal number of taxa greater than 10 km^2 ($\log_{10}$ = 1.0) was about 65 taxa. For drainage areas smaller than 10 km^2, the optimal number of taxa is defined by the 95th quantile line and the actual drainage area of the site. A site with a drainage area of 6.0 km^2 would be expected to have about 52 taxa and the actual expectation would be calculated from the regression equation. Metric adjustments were made by converting metric values to metric scores on a 100-point scale, using the optimal metric value as the top of the scale (100), and interpolating down to 0. For example, a site with a drainage area of 6.0 km^2, expected to have 52 taxa, but truly having 48 taxa would have a score of 100 * 48/52 = 92.3.

The complexity of adjustment was also considered. If a metric showed a high correlation coefficient with a classification variable, then using the unadjusted metric might cause bias in evaluation and the unadjusted metric should not be used. If a similar responsive metric was available, but it did not require adjustment, then that similar metric might be a better choice for inclusion in the index. Those adjustments were applied and tested. However, if metrics based on relative richness (percent of taxa) did not require adjustment and performed as well as the adjusted metric, then the relative richness metric should be selected.

Seventeen of the biological metrics were adjusted to one or more classification variables. However, in the end, only the drainage area adjustment for the number of total taxa metric was considered in index development. All other adjusted metrics had similar performance to their non-adjusted equivalents (based on DE and z-score, as described in Section 5.2). Therefore, the non-adjusted metric versions were favored as they were conceptually easier to calculate and communicate.

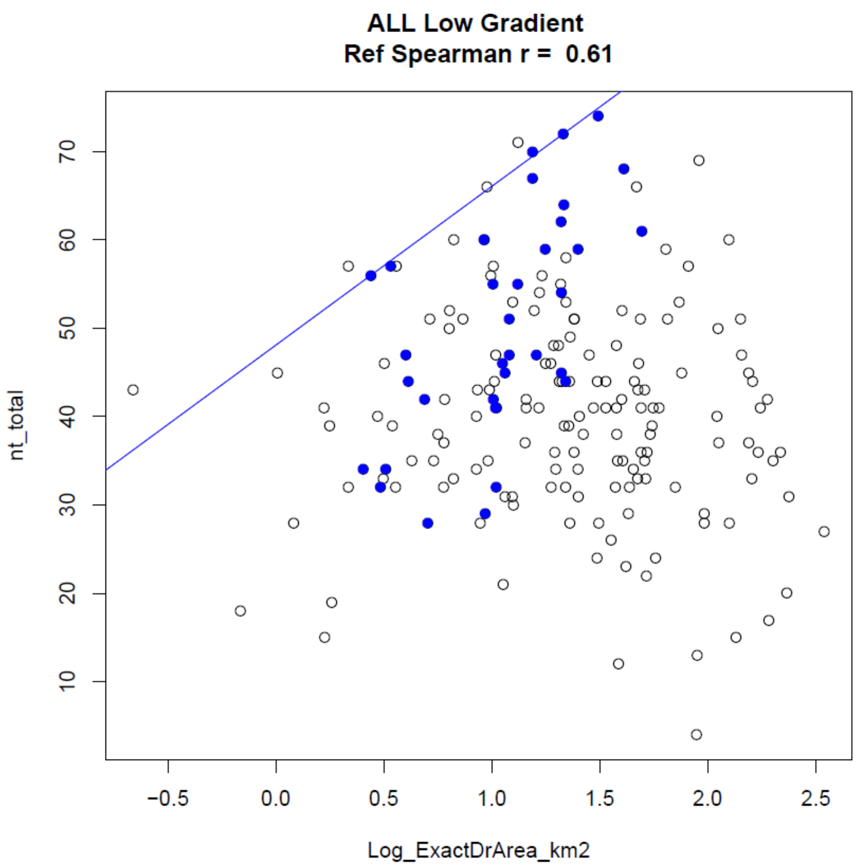

Figure 9. Bi-plot of total taxa (nt_total) and the log(10) transformation of drainage area, showing reference sites as solid blue markers, non-reference sites as open circles, and the reference 95th quantile regression line as a blue sloping line. Subjective limits to the regression adjustment were applied below 0.5 km^2 and above 1.5 km^2.