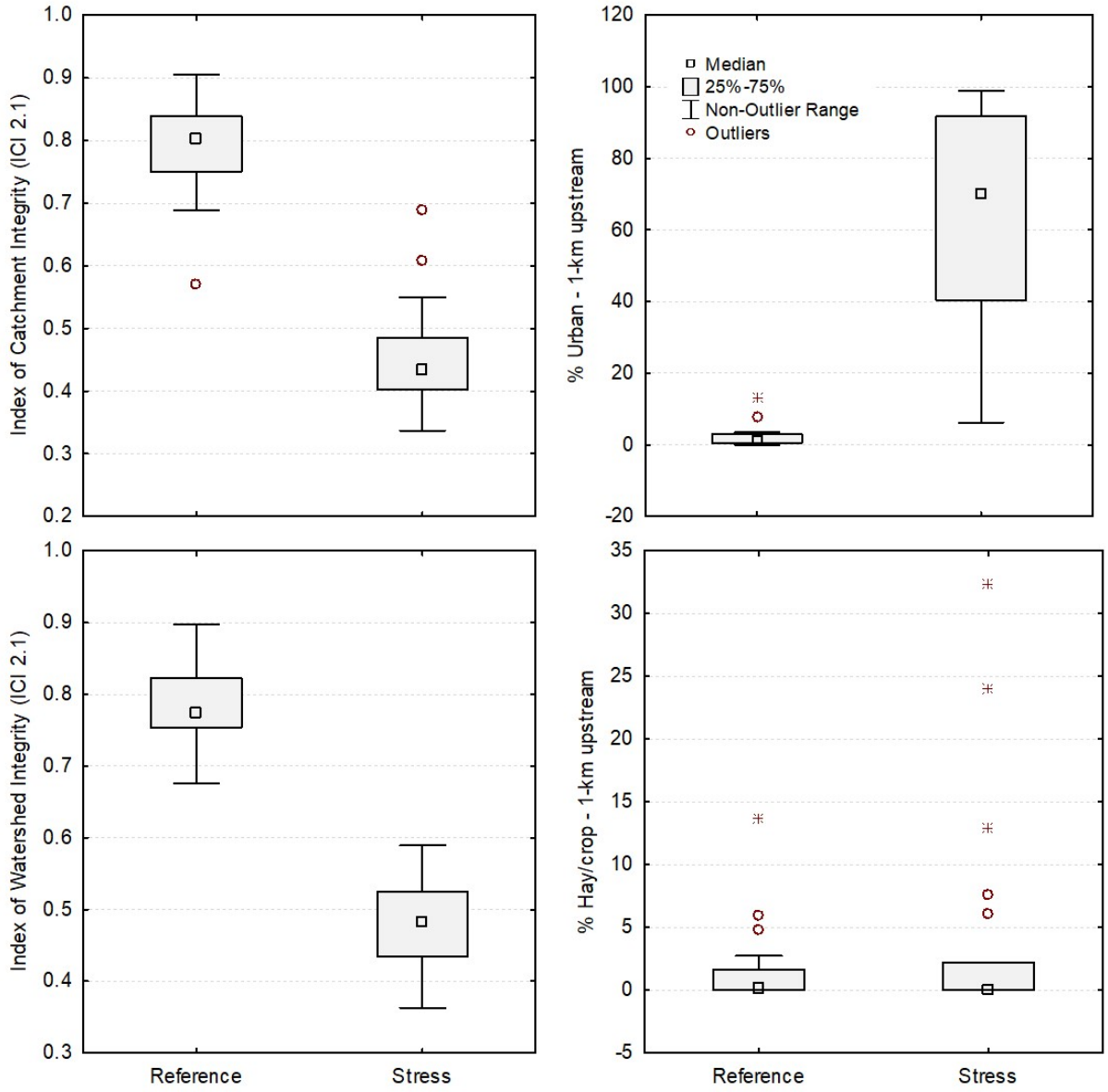

Figure 8. Box plots showing the range of disturbance represented in the reference (n=26) and stressed (n=23) sites, as measured by the ICI, IWI, percent urban, and percent agricultural land cover.

4 Classification

Site classification addresses the recognition that even with the least disturbance to streams, there might be different expectations of the sampled benthic assemblage due to natural effects and influences. Natural variation in stream slope, stream size, dominant substrates, temperature, and other factors are components of ecoregional characteristics that might cause a sample to contain more or less of certain taxa groups, sensitive taxa, or functionally specialized taxa. These types of taxa and some of the metrics derived from their traits are expected to exhibit variation not only with natural variation but also with human disturbance and unnatural stressors. When we use the benthic assemblage to indicate biological conditions relative to disturbance, we attempt to account for different expectations due to the background natural setting.

Accounting for different biological expectations was explored through an investigation of natural variation in samples from the least-disturbed reference sites. If the variation in taxa or metrics can be associated with natural categories or gradients, then those categories or gradients can be used to characterize different reference conditions. Comparisons of metrics between reference sites and those with high disturbance will be more sensitive to stressors if the natural variation is filtered out through site classification.

Site classification was expected to result in no classes or at most two classes. The low-gradient characteristics of the sites define the overall class in this data set. Only two discrete site classes could possibly be recognized before the separate classes became too small to robustly represent the reference condition in each class or to allow comparisons between reference and disturbed data within each class. The results of the classification exploration are summarized here because there was evidence of natural influences on the taxonomic composition. However, the details of the analysis are only included in an appendix because the ultimate decision was to address all low-gradient streams as a single category with no further site classification (Appendix E). General characteristics of the reference and highly stressed site groups and in all sites are shown in Table 7.

Table 7. Minimum and maximum values for selected characteristics of reference (Ref) and highly stressed (Strs) site groups and in all sites (All).

Variable	Ref Min	Ref Max	Strs Min	Strs Max	All Min	All Max
Drainage area (km^2)	3.1	91.1	1.8	175.2	1.7	188.8
Stream slope, 500m	0.00	2.94	0.03	1.76	0.00	2.94
% wetland/open water	8.5	34.3	0.2	34.2	0.2	44.4
Elevation (ft)	25	159	12	185	7	188
IWI	0.68	0.90	0.36	0.56	0.36	0.90
ICI	0.57	0.91	0.34	0.55	0.33	0.91
% urban	0.76	5.70	6.32	98.9	0.8	98.9
Road density	1.5	4.0	2.8	19.6	1.4	19.6