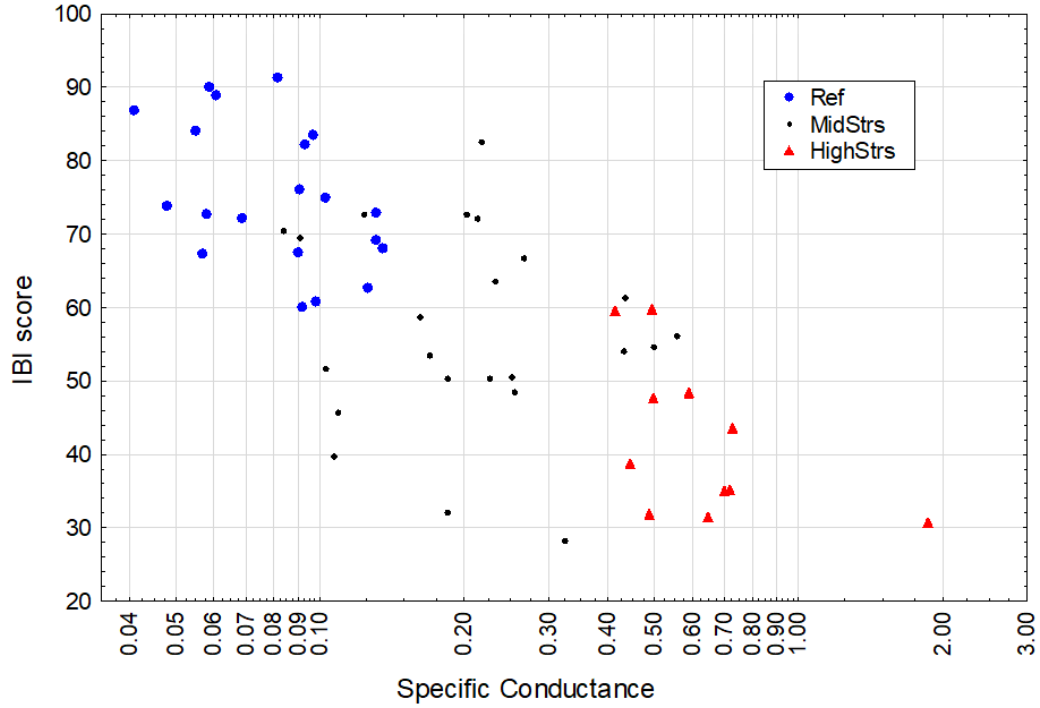

Figure 16. IBI scores in relation to conductivity (on a log-transformed axis) at sites with conductivity data, marked by disturbance category.

The IBI has higher values at sites with a greater percentage of forested land in the watershed (Figure 17). Forest cover is generally the complement of developed land cover, whether developed for urban or agricultural uses. Forest cover was not directly used as a criterion for the calibrated disturbance gradient, while urban and agricultural covers were.

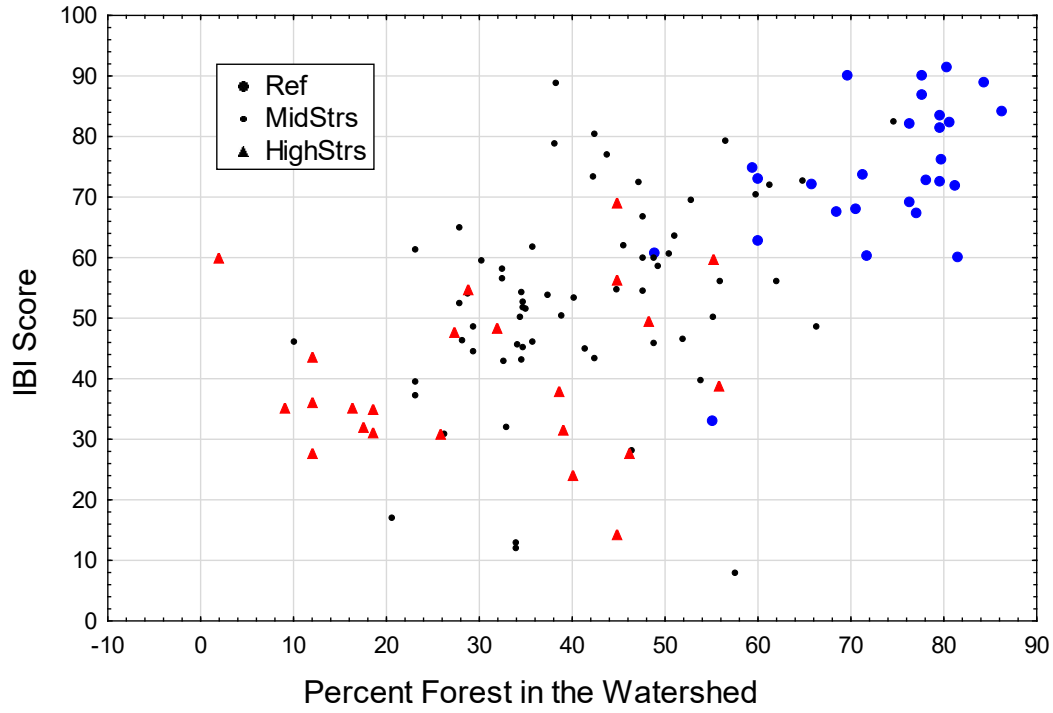

Figure 17. IBI scores in relation to percent forest cover (watershed-scale), marked by disturbance category.

Indications from habitat, DO, conductivity, and percent forest cover are that the IBI responds as expected to these stressor indicators and is validated. While the relationships between the IBI and habitat and DO are somewhat variable over the whole range of stressor intensity, the relationships show a limitation of biological potential with the most intensive stresses. The strongest IBI relationships are with conductivity and percent forest. Conductivity increases steeply with increasing urban land uses (Figure 18). The urban land uses were also considered in defining the disturbance categories for IBI calibration. This connection between land use, conductivity, and disturbance status might suggest an inevitable relationship between the IBI and conductivity. However, it also provides a mechanistic link between the source of stress (urban intensity) and the macroinvertebrate assemblage through inputs such as salts.

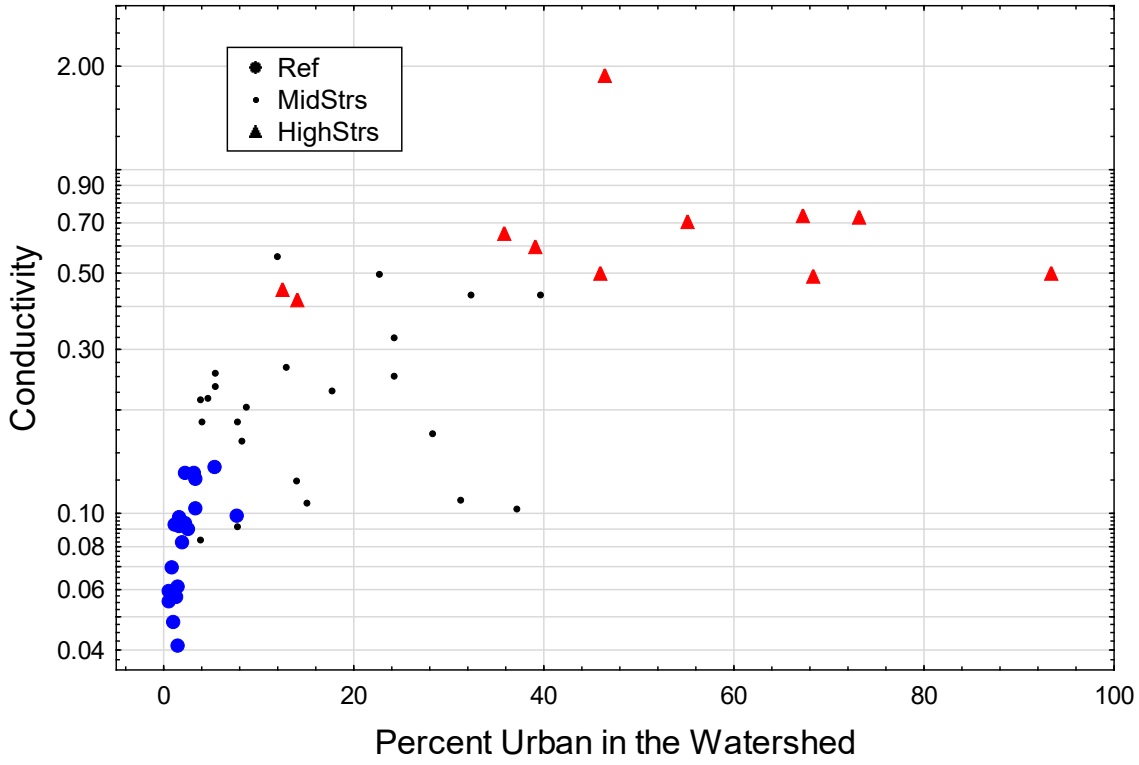

Figure 18. Conductivity (on a log-transformed axis) at sites with conductivity data in relation to percent urban land uses in the watershed, marked by disturbance category.

In this data set, there is a strong correlation between pH and conductivity, with low pH associated with low conductivity (Figure 19). The IBI is also associated with pH, showing better scores with low pH, even below 5.0 su. The reference streams used in calibrating the IBI all had pH < 6.5 su and conductivity < 0.30 mS/cm. These relationships suggest that the natural condition of the low gradient streams in the SNEP region are acidic. The natural setting includes greater canopy cover than in developed areas and therefore greater input of leaf litter as well as cooler temperatures (Figure 20). The soils apparently have low buffering capacity, as is seen in the neighboring pine barrens of Cape Cod. As conductivity increases with human activity, the salts provide buffering capacity and pH increases. Higher pH might not be a stressor, but it is certainly associated with higher conductivity and higher urban land use intensity.