Appendix C

Wisconsin Trophic Status Index (WTSI)

The Secchi depth results, along with phosphorus and chlorophyll data if available, allow us to determine the trophic status (or level of nutrient enrichment) of the lake. Trophic state index is a continuum scale of 0 to 100, corresponding with the clearest (and most nutrient poor) lake possible, to the least clear (and presumably, most nutrient rich) lake possible. Lakes can be divided into three main levels of nutrient enrichment categories. **The first is oligotrophic (TSI 0-40), or nutrient poor.** These lakes are characterized by very high Secchi depths (very clear water), plenty of oxygen even in deep water, and they may have cold-water fish species living in them.

Oxygen concentrations may be low if the lake is closer to the next category, **called mesotrophic (TSI 40-50).** Mesotrophic lakes fall in the middle of the continuum from nutrient-poor to nutrient-rich. They have moderately clear water, and may experience low to no oxygen concentrations in bottom waters.

Lakes that are nutrient-rich are called eutrophic (TSI > 50). They have decreased Secchi disc readings and experience low to no oxygen in the bottom waters during the summer. These lakes would only be habitable to warm water fish. They may also experience blue-green algae blooms. **Lakes that are super-enriched fall into a fourth category termed hypereutrophic (TSI >70).** These lakes experience heavy algae blooms throughout the summer, and may even experience fish kills. Rough fish dominate in hypereutrophic lake systems.

We label trophic states for the purposes of discussion, but remember that the categories actually make smooth transitions into each other. Data from one date may show a lake as being eutrophic, and the next date as being mesotrophic. (If the general tendency for the lake is eutrophic, we refer to the lake as eutrophic).

A note on aquatic plants: If your lake has many rooted aquatic plant and otherwise clear water for the most part, the Trophic State Index could be a mischaracterization of the true nutrient status of the lake. Lakes dominated by aquatic plants tend to have high amounts of phosphorus in the bottom sediments and relatively low phosphorus in the water column. Lakes that grow mostly algae, on the other hand, have high phosphorus in the water. Most lakes have a fairly stable ratio of aquatic plants to algae. Trophic Status Index only measures the portion of nutrients that are found in the water column, as evidenced by the amount of algae. So if most of the nutrients are held in the sediments and the lake is loaded with aquatic plants, the true, total nutrient status cannot be accurately measured using the Trophic Status Index.

Trophic State Index Scale

Description	Chlorophyll (ug/L)
TSI < 30	Classical oligotrophy: clear water, many algal species, oxygen throughout the year in bottom water, cold water, oxygen-sensitive fish species in deep lakes.
TSI 30-40	Deeper lakes still oligotrophic, but bottom water of some shallower lakes will become oxygen-depleted during the summer.
TSI 40-50	Water moderately clear, but increasing chance of low dissolved oxygen in deep water during the summer.
TSI 50-60	Lakes becoming eutrophic: decreased clarity, fewer algal species, oxygen-depleted bottom waters during the summer, plant overgrowth evident, warm-water fisheries (pike, perch, bass, etc.) only.
TSI 60-70	Blue-green algae become dominant and algal scums are possible, extensive plant overgrowth problems possible.
TSI 70-80	Becoming very eutrophic. Heavy algal blooms possible throughout summer, dense plant beds, but extent limited by light penetration (blue-green algae block sunlight).
TSI > 80	Algal scums, summer fishkills, few plants, rough fish dominant.