

Appendix C. Phosphorus Target Development for Sugar Creek

Total phosphorus (TP) concentrations in the range of 0.10 mg/l are considered protective of eventual attainment of the Warmwater Habitat biological criteria in wadeable streams of the Sugar Creek basin when the following factors are considered.

Biological Factors

The distribution of data points, especially in nearby waters, as well as specific statistics (e.g., medians and 75th percentiles) can be useful in deriving target values.

For example, the median value for reference sites in the EOLP ecoregion for wadeable streams is 0.05. However, examination of a scatter plot of values in similar sized streams in the EOLP ecoregion indicates that a substantial number of streams frequently achieve a WWH IBI value of 34 or greater at levels above the median TP value, but below 0.10 mg/l (Figure 1). For wadeable streams in the EOLP ecoregion with total phosphorus concentrations above 0.10 - 20 mg/l, IBI scores attaining a WWH level are much less frequent (Figure 1, dashed box).

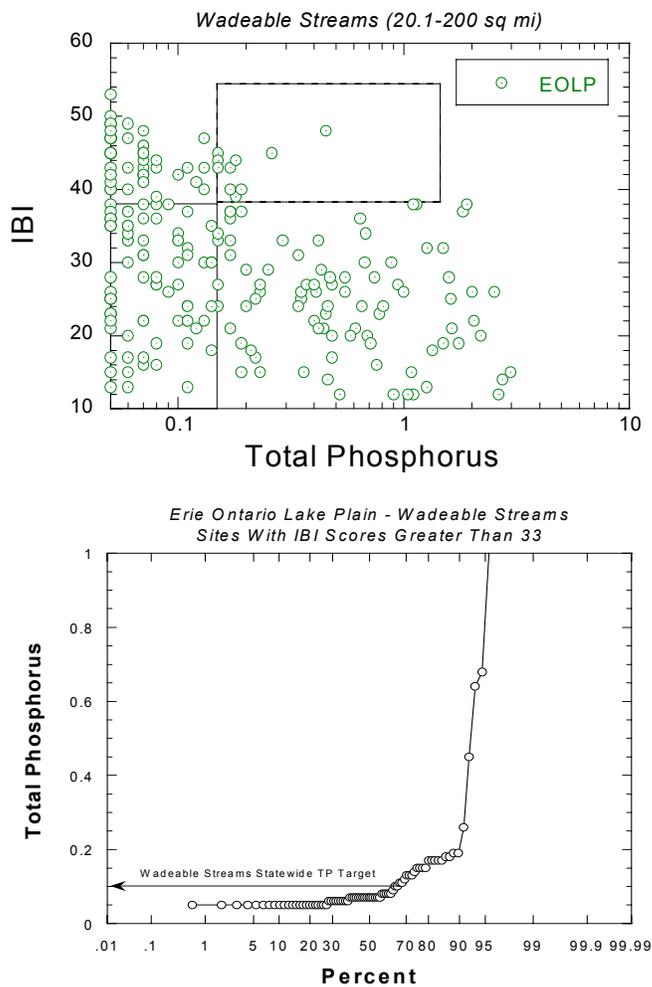


Figure 1. Scatter plot of IBI versus total phosphorus (ug/l) in wadeable streams in the EOLP ecoregion (top) and a probability plot of a subset of the data in top figure where the IBI scores were above 33 (bottom).

By plotting the data in Figure 1 using a probability plot (total phosphorus where IBI scores are attaining or in “non-significant departure” from the biocriteria; IBI > 34), it can also be determined that a target value of 0.10 mg/l is within the main distribution of the data (just below the 70th percentile) and is not an “outlier” data point.

Targeting nonpoint sources of nutrients that also reduce sediment delivery to streams and considering habitat restoration and protection should enhance the stream’s ability to assimilate nutrients. Other similar size streams in the EOLP ecoregion attain a WWH biocriteria value (or better) with TP concentrations above the reference median value and the Sugar Creek target value of 0.10 mg/l (wadeable streams). Thus, the target value of 0.10 mg/l is appropriate. Future monitoring, after implementation of the nonpoint source controls, will allow us to refine

the link between various control measures, habitat, and the success of nutrient reduction in various stream types in Ohio.

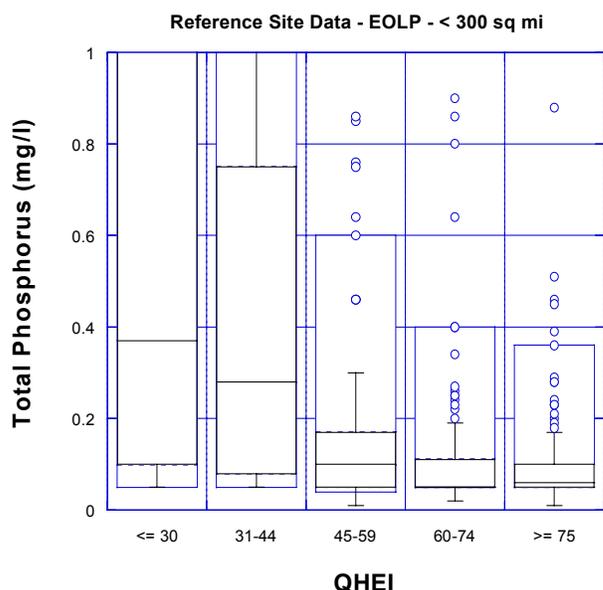


Figure 2. QHEI vs total phosphorus for reference sites less than 300 sq mi drainage in the EOLP ecoregion. Boxes represent the 10th, 25th, median, 75th, and 90th percentiles.

during low flow is lower in stream sites with higher quality habitats as measured by the QHEI (Figure 2). The proportion of the phosphorus that is assimilated instream by improving habitat quality versus the proportion of nutrient load kept from reaching the stream compared to poor quality habitats is not known. Further work is needed to examine specifically how instream and riparian habitat mediates nutrient assimilation in Ohio streams.

Conclusion

The choice of an initial total phosphorus endpoint of 0.10 mg/l is just below the 75th percentile of EOLP wadeable sites with habitat scores of 60-74. This choice is reasonable based on both biological and habitat considerations.

Habitat

The inter-relationships between stream habitat and nutrient concentrations are complex and not completely understood. Basic research has shown the ability for streams to assimilate some levels of nutrients without impairing aquatic life. Natural stream systems with intact instream and riparian habitats also work to trap and sequester nutrients before they reach the stream and during flood events when these waters come into contact with their floodplains, bars, etc.

Data from reference sites in Ohio, especially headwater and wading streams, show that total phosphorus