

Water Quality Index in the Ohio River (October 2010)

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Nine teams, each consisting of a graduate student, high school teacher and students, of the NSF-funded project (BookS) conducted on-boat water samplings in the Muskingum and Ohio Rivers in October 2010. There were two teams sampling water at M3 and M5 locations of Muskingum River (3 and 5 miles upstream from Marietta, respectively), and 7 teams sampling, respectively, at O164 (Ohio River mileage 164), O170, O174, O180, O182, O185, and O190. The confluence of Muskingum and Ohio Rivers is at O172.

Samples from three varied depths (0.1 m, 1 m, and 2 m below water surface) were analyzed for dissolved oxygen, E. coli, pH, total phosphate, nitrate, and turbidity for the estimation of Water Quality Index (WQI). The National Sanitation Foundation, a non-profit organization established at University of Michigan in 1944, uses nine weighting factors, dissolved oxygen (0.17), fecal coliform (0.16), pH (0.11), biochemical oxygen demand (0.11), temperature change (0.10), total phosphate (0.10), nitrate (0.10), turbidity (0.08), and total solids (0.07), to form the WQI to grade water quality, which is a controversial issue among water quality scientists (Qram, 2010; Brown et al., 1970).

Nevertheless, WQI has been used by the Ohio River Valley Water Sanitation Commission (ORSANCO) to monitor the water quality in the Ohio River. For the purpose of comparison, water quality data analyzed in the BookS project were combined to estimate WQI. Table 1 provides an example for the calculation of WQI based on the water sample taken from M3 location. Figure 1 is a plot of the preliminary result of WQI, which shows a somewhat downward trend from upstream (Marietta, Ohio) to downstream (Parkersburg, West Virginia). It is noted that three data sets have not been reported.

Table 1. An example for the calculation of WQI

Parameter	Test Results	Q value	Weighting factor	Calculation
Dissolved Oxygen	84% saturation	91	0.18	16.38
E. coli	200 colonies/100ml	37	0.17	6.29
pH	7.7	90	0.12	10.80
Total Phosphate	0 mg/L	99	0.11	10.89
Nitrate	0.6 mg/L	95.5	0.1	9.55
Turbidity	28.2 cm	59	0.09	5.31
		Totals	0.77	59.22
			WQI	76.91

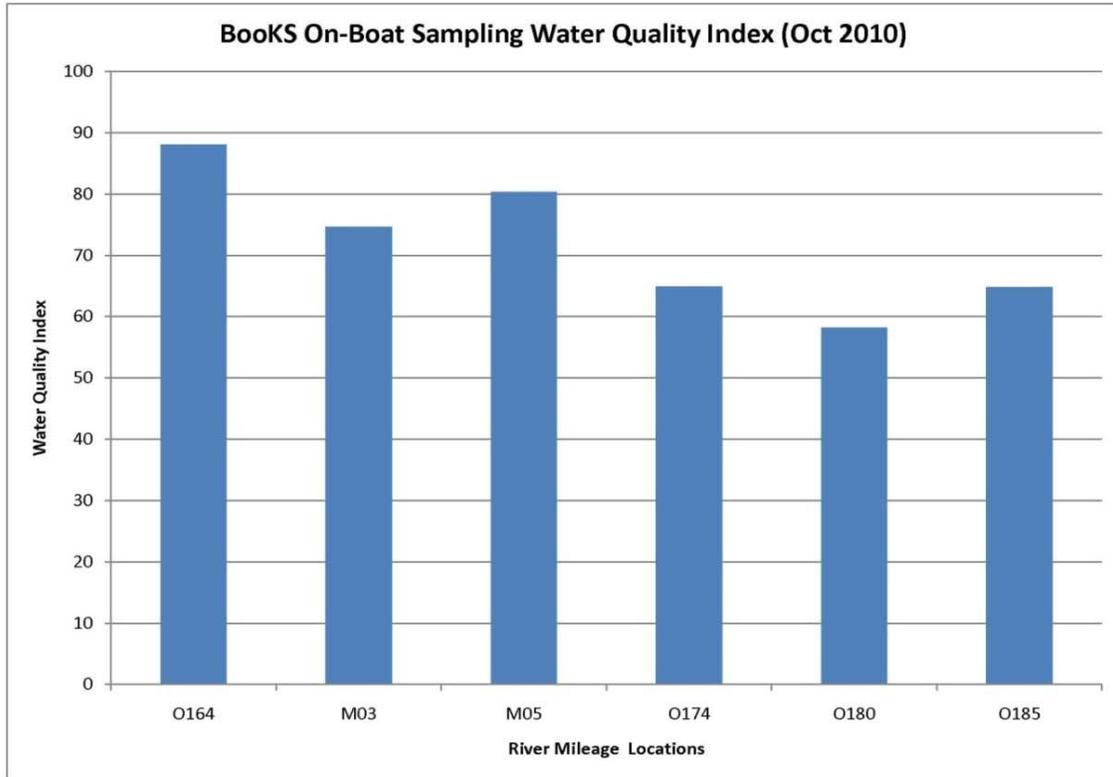


Figure 1. WQI at varied locations of Ohio and Muskingum Rivers

Acknowledgement

It is acknowledged that the samples were analyzed by the nine teams of the BookS project, respectively and Yanhui Fang prepared the table plot.

References

Brown, R.M., N.I. McClelland, R.A. Deininger, and R.G. Tozer (1970). "A Water Quality Index – Do We Dare?" *Water and Sewage Works*, pp. 339-343.

Qram, B. (2010). *Water Quality Index: Monitoring the quality of surface waters*, B.F. Environmental Consultants, Inc., <http://www.water-research.net/watrqualindex/waterqualityindex.htm>.