

Contents

	<i>Page</i>
Chapter 1. Introduction and Background.....	1
1.1. Overview.....	1
1.2. Objectives and Products.....	2
1.3. Report Organization.....	3
1.4. Acknowledgments.....	3
1.5. Measures of Water Quality	4
1.6. Monitoring and Modeling.....	10
Chapter 2. Study Area.....	11
2.1. Watershed Description.....	11
2.2. Climate and Hydrology.....	16
2.3. Geology, Soils, and Topography	24
2.4. Land Use/Land Cover	27
2.5. Population	32
2.6. Summary	36
Chapter 3. Review of Water Quality Studies of the Fox River Watershed	39
3.1. Pollution Sources	39
3.2. Use Impairment.....	40
3.3. Water Quality	43
3.3.1. Nutrients.....	43
3.3.2. Dissolved Oxygen and pH	46
3.3.3. Sedimentation/Siltation.....	49
3.3.4. Major Elements and Trace Elements	50
3.3.5. Pathogens	52
3.3.6. Pesticides/Synthetic Organic Compounds	53
3.3.7. Emerging Water Quality Issues	56
3.4. Summary	56
Chapter 4. The Fox River Watershed Water Quality Database	59
4.1. Purpose and Goals.....	59
4.2. Data Description	59
4.2.1. Data Sources	60
4.2.2. Streamflow Data Sources.....	62
4.3. Database Design.....	63
4.3.1. Conceptual Design	63
4.3.2. Relational Database	64
4.3.3. Data Model Description.....	65
4.4. Implementation and Navigation.....	67
4.4.1. Example Queries	68
4.4.2. Importing Data and Future Updates.....	70

4.4.3. Special Considerations.....	70
4.4.4. Data Quality	72
Chapter 5. Water Quality Analyses	79
5.1. Water Uses and Water Quality Standards.....	79
5.2. Analyses of FoxDB Water Quality Data	80
5.2.1. Methodology	80
5.2.2. Nitrogen	81
5.2.3. Phosphorus.....	87
5.2.4. Dissolved Oxygen.....	91
5.2.5. pH.....	96
5.2.6. Suspended Solids	97
5.2.7. Fecal Coliform	101
5.2.8. Algae and Biomass – Chlorophyll a	103
5.2.9. Priority Pollutants	104
5.3. Data Gaps.....	108
5.3.1. Geographic Coverage and Period of Record	108
5.3.2. Chemical Data Gaps	118
5.3.3. Limitations Imposed by Frequency and Type of Monitoring	119
5.4. Summary	120
Chapter 6. Sediment Chemistry Analyses	123
6.1. Introduction.....	123
6.2. Data Sources	123
6.3. Sediment Quality Analyses.....	124
6.3.1. Total Phosphorus and Total Kjeldahl Nitrogen	124
6.3.2. Total Mercury and Copper	127
6.3.3. Organic Pollutants.....	132
6.4. Limitations and Data Gaps.....	133
6.5. Summary	134
Chapter 7. Modeling Issues.....	135
7.1. Water Quality Modeling Background.....	135
7.2. Previous Water Quality Modeling Studies for the Fox River Watershed.....	137
7.3. Considerations in Model Selection	139
7.3.1. Constituents and Sources	139
7.3.2. Spatial and Temporal Features.....	139
7.3.3. Model Complexity	141
7.3.4. Types of Model Uncertainty	141
7.3.5. Data Needs and Model Experience.....	142
7.4. Model Recommendations for the Fox River Watershed.....	143
7.4.1. Watershed Loading Modeling.....	144
7.4.2. Receiving Water Quality Modeling	145

Chapter 8. Fox River Watershed Investigation Web Site	147
8.1. Current Features.....	147
8.2. Publications Database	147
8.3. Publications Bibliography.....	148
8.4. Web Mapping Application.....	148
8.5. Geographic Information System Datasets	149
8.6. Downloads	149
Chapter 9. Summary	151
9.1. Review of Water Quality Studies	151
9.2. Water Quality Database	152
9.3. Water Quality Data Analysis	153
9.4. Sediment Chemistry.....	154
9.5. Modeling Issues	155
References.....	157
Appendix 1. Fox River Study Group Outreach Statement	171
Appendix 2. FoxDB data dictionary	175
Appendix 3. Importing Data to FoxDB from USGS and EPA Databases.....	183
Appendix 4. FoxDB Data Loader & Viewer Program	189
Appendix 5. Fox River Study Group Interim Monitoring Evaluation.....	197
Appendix 6. Summary Statistics for Selected Constituents.....	205
Appendix 7. Descriptions of Water Quality Models	225
Appendix 8. FoxDB Diagram	235

