

Belle River Watershed Management Plan

July 2015

www.sccwater.org





ST. CLAIR COUNTY HEALTH DEPARTMENT

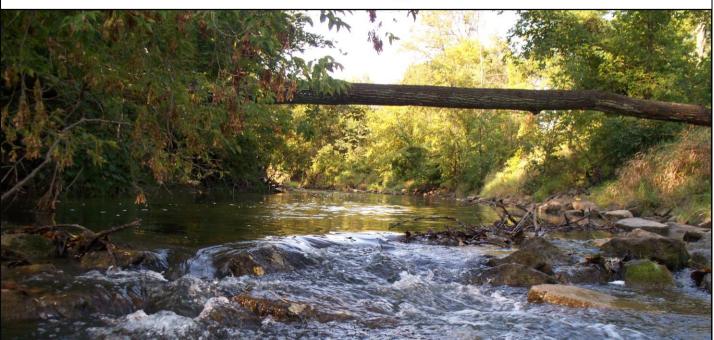


TABLE OF CONTENTS

Table of Con	itents	i
Appendices		v
List of Figure	es	vi
List of Table	s	ix
Abbreviation	ıs	xi
1 Chapter	1 - Watershed Description	1
1.1 Wa	atershed Management Planning	1
1.2 Ge	ographical Scope	1
1.2.1	River Zones	3
1.2.2	Subwatersheds	6
1.2.3	Belle River Intercounty Drain	8
1.2.4	Topography	9
1.2.5	Soils	11
1.3 Hy	drology	12
1.3.1	Dams and Barriers	13
1.3.2	Wetlands	15
1.3.3	Baseflows	17
1.3.4	Flashiness and Flood Flows	20
1.3.5	Channelization	21
1.4 Sig	gnificant Natural Features	22
1.4.1	Existing Parks and Conservation Areas	22
1.4.2	Wetlands	23
1.4.3	Threatened and Endangered Species	24
1.4.4	Farmland	25
1.5 La	nd Use, Growth Trends, and Master Plan Analysis	26
1.5.1	Land Use Analysis	26
1.5.2	Growth Trends	29
1.5.3	Master Plan Analysis	31
2 Chapter	2 – Water Quality Conditions	38
2.1 Wa	ater Quality	39

2	.1.1	Total Maximum Daily Load (TMDL)	40
2	.1.2	Biological Oxygen Demand (BOD)	41
2	.1.3	Turbidity and Suspended Solids	42
2	.1.4	Phosphorus	44
2	.1.5	Nitrogen	45
2	.1.6	Chloride	46
2	.1.7	Surface Water Temperature	47
2	.1.8	Pesticides	47
2	.1.9	Pathogenic Microorganisms	48
2	.1.10	Dumping and Litter	49
2	.1.11	Nonpoint Source Pollutants	50
2.2	Bio	omonitoring	51
2	.2.1	Aquatic Habitat	52
2	.2.2	Fisheries	53
2	.2.3	Macroinvertebrates	57
2	.2.4	Mussels	60
2.3	Sec	liment Loading & Channel Stability	62
2	.3.1	Stable Reference Reach Areas	63
2	.3.2	Bed Erosion	65
2	.3.3	Streambank Erosion	66
2	.3.4	Channel Enlargement	68
2	.3.5	Hillslope Failures	68
2	.3.6	Channel Blockages	70
2	.3.7	Road Stream Crossings	71
C	hapter	3 - Prioritized Pollutants, Critical Areas, and Priority Areas	74
3.1	Pri	oritized Pollutants and Watershed Concerns	74
3.2	Pri	ority Areas and Critical Areas	76
3	.2.1	Priority Areas	76
3	.2.2	Critical Areas	80
3.3	Cri	tical Sources of Prioritized Pollutants throughout the Watershed	83
3	.3.1	Sediment	83
3	.3.2	Bacteria	86
3	3 3	Nutrients	87

3

	3.3.4	4	Total Dissolved Solids	.88
	3.3.5	5	Toxic Pollutants	.88
	3.4 Imp	pleme	entation Strategy	.89
4	Cha	pter 4	- Designated and Desired Uses	.90
	4.1	Desi	gnated Uses of Michigan Waterways	.90
	4.2	Desi	red Uses of the Belle River Watershed	.92
	4.3	St. C	lair River Remedial Action Plan	.93
5	Chaj	pter 5	- Watershed Goals and Objectives	.96
	5.1	Long	g-Term Goals and Short-Term Objectives	.98
	5.2	Addi	tional Considerations	111
6	Chaj	pter 6	- Best Management Practices	112
	6.1	Mana	agement Alternatives	112
	6.1.1	1	Managerial & Structural Actions: Agricultural Runoff Controls	113
	6.1.2	2	Stream and Drain Runoff Controls	116
	6.1.3	3	Structural & Vegetative Actions: Stormwater Runoff Controls	121
	6.1.4		Managerial Actions: Illicit Discharge Elimination	130
	6.1.5		Managerial Actions: Public Education, Outreach, & Participation	132
	6.1.6		Managerial Actions: Ordinances & Policies	138
	6.1.7		Managerial Actions: Studies and Plans	144
	6.1.8		Watershed Plan Implementation	146
	6.2	Estin	nated Costs of Management Alternatives	147
7	Chaj	Chapter 7 – Watershed Action Plan		166
	7.1	Best	Management Practice Implementation Schedule	166
	7.2	Actio	on Plan Matrix	167
	7.3	Prior	ity Projects	167
8	Chaj	pter 8	- Public Education and Participation	188
	8.1	Publ	ic Involvement Process	188
	8.2	Wate	ershed Advisory Group and Subcommittee Meetings	189
	8.3	Publ	ic Meetings	191
	8.4	Publ	ic Opinion Survey Results	193
	8.4.1	1	Value of Water Quality	193
	8.4.2	2	Sources of Water Pollution	194
	8.4.3	3	Practices to Improve Water Quality	195

	8.4.	Willingness to Take Action	196
	8.4.	5 Farm Operations	196
	8.4.	6 Demographics	197
	8.4.	7 Best Ways to Inform Residents	197
	8.4.	8 Comments	198
	8.5	Involvement and Education Implementation Strategy	198
	8.6	Priority Education Recommendations	204
	8.6.	Prioritized Water Quality Education Recommendations	204
	8.7	Project Partnerships	205
9	Cha	pter 9 – Evaluation Process	208
	9.1	Methods of Evaluation	208
	9.1.	1 Programmatic Indicators/BMP Results	209
	9.1.	Photographic Surveys	209
	9.1.	3 Stakeholder Surveys/Social Indicators	209
	9.1.	4 Water Quality Indicators	210
	9.1.	5 Biological Indicators	211
	9.2	Monitoring Strategy	212
	9.3	Adaptive Management	212
	9.4	Summary of Methods for Evaluating Progress and Measurable Goals	213

APPENDICES

Appendix A References

Appendix B Maps

Appendix C Resource Directory

Appendix D Belle River Watershed Hydrologic Study

Appendix E Landscape Level Wetland Functional Assessment

Appendix F Data Gap Analysis

Appendix G Non-Point Source Pollutant Identification

Appendix H Belle River Watershed Assessment of River Stability and Sediment Supply

Appendix I Belle River Management Plan for Large Woody Material

Appendix J Critical Project Profiles

Appendix K Belle River Watershed Land Prioritization Model

Appendix L Public Participation Survey

LIST OF FIGURES

- Figure 1.1 Overview of the Belle River Watershed
- Figure 1.2 Belle River system by zones
- Figure 1.3 North Branch of the Belle River in Zone 1, Lions Park in Imlay City
- Figure 1.4 Belle River in Zone 2, Columbus Township Roadside Park
- Figure 1.5 Belle River in Zone 3, Marine City
- Figure 1.6 Belle River subwatersheds
- Figure 1.7 The Belle River Intercounty Drain
- Figure 1.8 Long topographical profile of the Belle River
- Figure 1.9 Soil hydrogroups in the Belle River Watershed
- Figure 1.10 Belle River circa 1900, Marine City (Source: Marine City Historical Society)
- Figure 1.11 Map of existing and historic dams and hydraulic structures
- Figure 1.12 Former Radike Dam looking upstream at Indianhead Trail in 1937
- Figure 1.13 Existing wetland area near the N. Branch Belle River in Imlay City
- Figure 1.14 Pre-settlement vs. 2005 wetland areas providing fish habitat
- Figure 1.15 Butler Drain (Berlin Twp. between Sperry & Berville Rd.) with no flow (Source: SCCDC)
- Figure 1.16 Discharge data for the Belle River at Memphis (USGS, 2013)
- Figure 1.17 Decadal flow duration curves for North Branch Belle River at Imlay City, MI
- Figure 1.18 Decadal flow duration curve analysis for Belle River at Memphis
- Figure 1.19 Hydrologic critical areas (MDEQ, 2012 in Appendix D)
- Figure 1.20 Example of historic dredging practices in St. Clair County
- Figure 1.21 Musiel Park in City of Memphis, St. Clair County
- Figure 1.22 China Township Park public access site, St. Clair County
- Figure 1.23 An eastern sand darter from the Belle River (MDNR, 2009)
- Figure 1.24 Federally endangered and state endangered mussels in the Lower Belle River (MDNR, 2011)
- Figure 1.25 Prime agricultural lands in St. Clair County
- Figure 1.26 Land cover in the Belle River Watershed in 1800
- Figure 1.27 Land cover in the Belle River Watershed in 1978
- Figure 1.28 Land cover in the Belle River Watershed in 2005
- Figure 2.1 Fish consumption advisory sign for the St. Clair River Area of Concern
- Figure 2.2 Dissolved Oxygen TMDL areas in the Belle River Watershed
- Figure 2.3 Estimated monthly biological oxygen demand loads near Marine City (USGS, 2007)
- Figure 2.4 Estimated monthly phosphorus loads near Marine City (USGS, 2007)
- Figure 2.5 Estimated monthly total nitrogen loads near Marine City (USGS, 2007)
- Figure 2.6 Estimated monthly chloride loads near Marine City (USGS, 2007)
- Figure 2.7 Debris in Currier Drain (Berlin Twp., Burt Rd.)
- Figure 2.8 Trash in Hannah Drain (Berlin Twp., Burt Rd.)
- Figure 2.9 2012 Belle River GLEAS habitat scores
- Figure 2.10 MDNR fish shocking in the Belle River, Kronner Road, Columbus Township
- Figure 2.11 2008 Belle River GLEAS fish scores
- Figure 2.12 Belle River Watershed trout streams shown in purple (Appendix D)

- Figure 2.13 Steelhead stocking in the Belle River
- Figure 2.14 Representative photographs taken in the Belle River Watershed in July/August 2012: Top
- Left) Belle River at St. Clair Hwy (Station 28), Top Right) Belle River at Kronner Road (Station 29),
- Bottom Left) N. Br. Belle River at Newark Road d/s of Pinnacle (Vlasic) Foods outfall (Station 32), and
- Bottom Right) N. Br. Belle River at Newark Road u/s of Pinnacle (Vlasic) Foods outfall (Station 33) (MDEQ, 2013)
- Figure 2.15 2012 Belle River GLEAS macroinvertebrate scores
- Figure 2.16 Belle Rive report card for the MiCorps volunteer stream monitoring program
- Figure 2.17 Volunteers monitoring the Belle River,
- Figure 2.18 Volunteers monitoring the Belle River, Memphis
- Figure 2.19 Sampling locations on the Belle River from 2011 MDNR studies
- Figure 2.20 Belle River mussel surveys, St. Clair Township
- Figure 2.21 Reference Reach III on the Belle River upstream of Ashery Creek to Konner Rd.
- Figure 2.22 Reference Reach V on an unnamed tributary of the Belle River N. of St. Clair Hwy.
- Figure 2.23 Localized regional curve of drainage area vs. bankfull discharge
- Figure 2.24 Example of excessive deposition in Currier Drain (Berlin Twp.)
- Figure 2.25 Example of channel downcutting in Schneider-China Drain (China Twp.)
- Figure 2.26 Hillslope failures on Belle River upstream of the Memphis gauge station
- Figure 2.27 Hillslope failure on Belle River downstream of Memphis gauge station
- Figure 2.28 Extensive logiam on the Belle River, Columbus Township
- Figure 2.29 Jerome Creek at Church Road crossing (facing upstream)
- Figure 2.30 Belle River at Palms Road crossing (facing upstream)
- Figure 3.1 Belle River Coal-Fired Power Plant in E. China Township (Source: J. Smith, Times Herald)
- Figure 3.2 Prioritized parcel for woodland and wetland preservation, Lapeer County (Source: SRLC)
- Figure 3.3 Priority parcel for prime agricultural land, Lapeer County
- Figure 3.4 Blueways Trail Map of the Belle River Route
- Figure 3.5 Kayakers on the Belle River Blueway Trail
- Figure 3.6 Priority parcels to improve water quality identified in the SRLC study
- Figure 3.7 Typical channelized and modified tributaries in agricultural areas
- Figure 3.8 Schematic of channelized and meandering drainage courses
- Figure 3.9 Non-point source critical areas in the Belle River Watershed headwaters
- Figure 3.10 Farmed, unstable headwater tributary of the Belle River
- Figure 3.11 Sedimentation in a tributary to Belle River
- Figure 3.12 Evidence of streambank erosion along the Lower Belle River
- Figure 3.13 Erosion hazard areas in the Belle River Watershed based on soils
- Figure 4.1 The Belle River is a direct tributary to the St. Clair River
- Figure 4.2 A recently completed fish and wildlife habitat shoreline restoration project in
- Cottrellville Township for the St. Clair River Area of Concern
- Figure 5.1 Broad-level view of the stream function pyramid
- Figure 5.2 Detailed view of the stream functions pyramid
- Figure 5.3 A riparian buffer is needed to stabilize this streambank at
- Figure 5.4 SCC PARC streambank stabilization demonstration project using large woody material from the Belle River, Columbus County Park
- Figure 5.5 SEMCOG has developed the Seven Simple Steps to Clean Water campaign materials

- Figure 5.6 Volunteers conduct a stream clean-up, Cottrellville Township
- Figure 5.7 An ADA canoe/kayak launch provided by SCC PARC
- Figure 5.8 Paddler on the Belle River Blueway Trail (Source: Marine City)
- Figure 6.1 Examples of Michigan cover crops, crimson clover and buckwheat (Source: MSU Extension)
- Figure 6.2 Livestock exclusion fencing protects riparian vegetation and prevents excessive streambank erosion (Source: Virginia Department of Conservation)
- Figure 6.3 Crop residue prevents soil from washing away during precipitation events (Source: US EPA)
- Figure 6.4 Drainage management practices allow farmers to drain only as needed (Source: Purdue University)
- Figure 6.5 Large woody material removal and bank stabilization in Columbus County Park
- Figure 6.6 Example of a vegetative buffer in E. China Township
- Figure 6.7 Example of riprap shoreline stabilization practices
- Figure 6.8 Typical two-stage drainage ditch design (Source: The Nature Conservancy)
- Figure 6.9 Culvert in poor condition on Rayment Drain in Subwatershed 5
- Figure 6.10 Example of a wet detention pond to detain stormwater (Source: US EPA)
- Figure 6.11 Vegetated green roof at the Ford Motor Company River Rouge Plant
- Figure 6.12 An example of a rain garden to increase rainwater infiltration
- Figure 6.13 Typical permeable pavement design (Source: Smith, 2009)
- Figure 6.14 Example of Michigan native grasses and wildflowers (Source: Native Connections)
- Figure 6.15 A riparian buffer lining a farm creek (Source: USDA NRCS)
- Figure 6.16 SCCHD sanitarians investigating an illicit discharge
- Figure 6.17 A watershed road sign installed on King Road at the Baird Drain bridge crossing, China Township
- Figure 6.18 Volunteers collecting macroinvertebrates as part of the Stream Leaders program

(Source: Friends of the St. Clair River)

- Figure 6.19 An example of a volunteer placing a permanent storm drain marker to increase watershed awareness
- Figure 6.20 The SCCHD hosts an annual River Day event in June across St. Clair County's waterways
- Figure 6.21 Example of a riparian buffer (Source: USDA NRCS)
- Figure 6.22 Example of a standard subdivision parcel arrangement (left) and a cluster subdivision arrangement (right)
- Figure 6.23 A silt fence is an example of a Soil Erosion and Sedimentation Control BMP (Soucre: SCCHD)
- Figure 7.1 Priority reduction sites and priority subwatersheds for wetland restoration
- Figure 7.2 Priority wetland restoration sites in the DO TMDL area
- Figure 8.1 Stream Leader volunteers conducted macroinvertebrate monitoring on the Belle River at the Indian Trail Road Bridge in China Township.
- Figure 8.2 Public meeting held on January 28 at Southeast Michigan Conservation Club in East China Township

LIST OF TABLES

- Table 1.1Belle River subwatersheds
- Table 1.2 Explanation of soil hydrogroups
- Table 1.3 Existing and historic dams and hydraulic structures in the Belle River Watershed
- Table 1.4 Predicted change in functional capacity due to loss of wetlands since pre-settlement
- Table 1.5 Critical minimum Belle River dry season flows based on the Tennant Method
- Table 1.6 Belle River Watershed land cover comparison
- Table 1.7 More specific land uses from 1800 to 2005
- Table 1.8 Acres of land cover
- Table 1.9 Population change from 2000 to 2010
- Table 1.10 Watershed growth 2000 to 2030 forecast
- Table 2.1 Belle and North Branch Belle Rivers DO TMDL reaches
- Table 2.2 Results of 2013 pollutant source identification surveys
- Table 2.3 Summary of E. coli monitoring results from 2008 to 2011 (cfu/mL)
- Table 2.4 Upland nonpoint sources area loadings from inadequate riparian buffers
- Table 2.5 Upland nonpoint source area loadings from nonpoint agricultural sources
- Table 2.6 Mussel species found during MDNR surveys at four sampling locations. State and federal status are indicated with the following abbreviations: E=endangered; T= threatened; SC=species of special concern.
- Table 2.7 Actively downcutting water courses in the Belle River Watershed
- Table 2.8 In-stream nonpoint source loadings from streambank erosion
- Table 2.9 Upland nonpoint sources area loadings from streambank erosion
- Table 2.10 Upland nonpoint source area loadings from gully erosion
- Table 2.11 In-stream nonpoint source loadings from hillslope failures
- Table 2.12 Upland nonpoint source area loadings from stream crossings
- Table 3.1 Prioritized pollutants and watershed concerns in the Belle River Watershed
- Table 3.2 Summary of 303(d) listed areas in the Belle River Watershed (MDEQ, 2004)
- Table 3.3 Ranking of upper 50% of subwatersheds by total phosphorus as calculated by the STEPL model
- Table 3.4 DTE Energy 2013 chemical releases from the Belle River plant
- Table 4.1 Definitions for the designated uses for water
- Table 4.2 Belle River impaired designated uses
- Table 4.3 Summary of desired uses for the Belle River Watershed
- Table 5.1 Summary of long-term goals
- Table 5.2 Long-term goals and measurable objectives for the Belle River Watershed
- Table 5.3 St. Clair River Remedial Action Plan (RAP) goals
- Table 6.1 BMPs to address pollutants and sources, including estimated costs
- Table 7.1 Watershed Action Plan Matrix for the Belle River Watershed
- Table 7.2 Priority projects to address the goals of the Belle River Watershed Management Plan
- Table 7.3 Priority project sites to reduce sediment and nutrient loading in the TMDL area. Projects are prioritized based on the quantity of sediment load reduction. See project # in Appendix J for more details.

- Table 7.4 Priority projects for critical ecosystem conservation
- Table 7.5 Large woody material management sites identified in the 2013 LWM assessment of the Belle River. See project # in Appendix J for more details.
- Table 7.6 Priority river restoration projects in or near existing parks on the Belle River. See project # in Appendix J for more details.
- Table 8.1 Participants in the Belle River Watershed Advisory Group
- Table 8.2 Survey results from question regarding trusted sources for water quality information
- Table 8.3 I&E strategy, including delivery mechanism, target audience, and evaluation mechanism
- Table 8.4 I&E strategy to address pollutant causes in impaired subwatersheds
- Table 8.5 Watershed-wide water quality and natural resource protection organizations
- Table 9.1 Water quality standards associated with water quality parameters
- Table 9.2 Targets for assessment of fish and macroinvertebrate assemblages
- Table 9.3 Methods of evaluation and evaluation schedule for each method
- Table 9.4 Evaluation methods to address goals and priority projects
- Table 9.5 Monitoring and evaluation sites from current and previous monitoring efforts
- Table 9.6 Methods of evaluating progress for the watershed management alternatives

ABBREVIATIONS

AOC Area of Concern

BMP Best Management Practice
BOD Biological Oxygen Demand
CSO Combined Sewer Overflow

DO Dissolved Oxygen

EPA US Environmental Protection Agency
GIS Geographic Information System

GLEAS Great Lakes Environmental Assessment Section

IDEP Illicit Discharge Elimination Plan

LID Low Impact Development

MDEQMichigan Department of Environmental QualityMDNRMichigan Department of Natural ResourcesMS4Municipal Separate Storm Sewer System

NPDES National Pollutant Discharge Elimination System

NRCS Natural Resources Conservation Service

OSDS Onsite Sewage Disposal System

RAP Remedial Action Plan

SCCHD St. Clair County Health Department SCCDO St. Clair County Drain Office

SCCDPW St. Clair County Department of Public Works

SCCRC St. Clair County Road Commission

SEMCOG Southeast Michigan Council of Governments

SSO Sanitary Sewer Overflow

STEPL Spreadsheet Tool for Estimating Pollutant Loads

TDSTotal Dissolved SolidsTMDLTotal Maximum Daily LoadTSSTotal Suspended Solids

USGS United States Geological Survey
WAG Watershed Advisory Group
WMP Watershed Management Plan
WQS Water Quality Standards
WWTP Waste Water Treatment Plant