

List of Figures / List of Tables / List of Sidebars

List of Figures

1-1:	Location of Lake St. Clair Direct Drainage Subwatershed	1-1
1-2:	Subwatershed communities	1-2
1-3:	Subwatershed drainage areas	1-3
1-4:	Congressional districts	1-4
	U.S. Capital Building-Washington D.C.	1-4
	Michigan Capital Building-Lansing, Michigan	1-4
	Drainage Areas	1-5
	The Great Lake Basin	1-5
	A Meeting of the LSCW SWAG	1-11
1-5:	Watershed management plan development	1-12
	Conducting the current conditions inventory	1-13
	An Example of a Critical Area for Phosphorus in the subwatershed-Residential Lawns	1-14
	An Example of a Critical Area for Sediment in the subwatershed-Urban Land Use	1-14
1-6:	School districts in the subwatershed	1-15
	Subwatershed photo tour: St. Mark's Church in St. Clair Shores	1-16
	Subwatershed photo tour: The Lake Sainte Clair Nature Sanctuary in St. Clair Shores	1-16
	The Physiographic Regions of Southeastern Michigan	2-2
2-1:	Soil associations in the subwatershed	2-3
2-2:	Elevation in the subwatershed	2-4
	Lake Shore in Grosse Pointe Park	2-4
2-3:	Wetland locations and types in the subwatershed	2-6
	Riparian Corridor on a segment of the Cottrell Drain	2-7
	Riparian Corridor	2-7
	Stream Meanders	2-7
	Habitat Regions of the Eastern United States	2-8
	Yellow Perch	2-10
	Mayfly	2-11
	Wavy-rayed Lampmussel	2-11
	An example of Great Lakes Marsh in its Natural State	2-11
2-4:	Natural Features	2-12
	A Great Lakes Marsh Remnant impacted by past and on-going development	2-12
2-5:	Population densities in the subwatershed	2-14
	Low Density Due to large lot waterfront estates	2-14
2-6:	Median household incomes in the subwatershed	2-16
	Urban Neighborhood	2-16
	Lake Township	2-16
	Beech/Maple Forest	2-18
2-7:	Land cover in the subwatershed circa 1830	2-19
	Emergent Marsh	2-19
	Multiple present day land uses: single family residential and transportation	2-19
2-8:	Land use in the subwatershed – present day	2-20
	Institutional land use	2-22
2-9:	Land use in the subwatershed – future (year 2030)	2-23
2-10:	Land cover/use comparison	2-24

DWSD WWTP	2-25
Chapaton Pump Station	2-25
2-11: Schematic of a combined sewer system	2-25
Milk River RTF	2-26
Aerial view of the Milk River RTF	2-27
2-12: Sewer systems in the subwatershed	2-27
2-13: Waters under the jurisdiction of county-level government	2-28
Enclosure of an Open Channel Watercourse, 1966 – now the 10 Mile Drain	2-28
Storm Sewer Construction	2-28
Storm Sewer Catch Basin	2-28
Storm Sewer Outfall on the Cottrell Drain	2-29
2-14: Public and Private Water Supplies	2-30
Typical private well casing cap	2-30
2-15: Pollution control facilities / potential discharge points	2-31
Aerial view of the South Macomb Disposal Authority Transfer Station	2-31
2-16: Storage tank locations (above and below ground)	2-32
An underground storage tank site: gas station	2-32
Transportation Infrastructure: Jefferson Avenue in St. Clair Shores	2-33
2-17: Transportation Infrastructure	2-33
Miller Marina – St. Clair Shores	2-33
2-18: Historical/cultural sites in the subwatershed	2-35
Historic Site – Blossom Heath Inn	2-35
Kyte Monroe Park	2-35
Welsh Park	2-37
2-19: Nature areas / parks	2-37
3-1: Effects of urbanization on runoff	3-1
Rooftops, Roads, and Parking Lots – downtown St. Clair Shores	3-1
Lake St. Clair – Pier Park Beach and nearby shore, Grosse Pointe Farms	3-2
Example of a Concrete Shore	3-2
Jefferson Ave. Bridge – Milk River, St. Clair Shores	3-3
The Wing-Stemmed Monkey Flower-once found in the subwatershed	3-4
3-2: Biological study locations and summarized data	3-12
Purple Loosestrife	3-15
Eurasian Water-milfoil	3-15
Spiny Water Flea	3-15
Zebra Mussel	3-15
3-3: Floodplains	3-16
3-4: Survey Locations	3-18
Milk River at Jefferson Road	3-19
Tebo Creek at Harper Road	3-19
Cottrell Drain at Cottrell Road	3-19
Roseville – Clinton Drain at 13 Mile Road	3-19
3-5: Identified problems	3-20
Roseville – Clinton Drain at Little Mack Road	3-21
Impacted Buffer along Cottrell Drain	3-22
Armored Banks near Outfall on Cottrell Drain	3-22
Shoreline Conditions-a location in the Grosse Pointe Catchment	3-23
3-6: Streambank conditions in the subwatershed	3-24
3-6: Streambank conditions in the subwatershed (continued)	3-25

	Typical House in the Shorewood Street / Jefferson Avenue Neighborhood in St. Clair Shores	3-26
	Deteriorating Conditions on Culver Street between Little Mack Avenue and Stephens St	3-27
	Windmill Pointe Park and Marina in Grosse Pointe Park	3-28
	Impervious Surfaces – Groesbeck Highway near N. Common Road	3-29
3-7:	Impervious cover based on land use type	3-30
	Various levels of imperviousness in Harper Woods	3-30
3-8:	Relationship between impervious cover and stream quality	3-31
	Satellite imagery of a portion of St. Clair Shores	3-32
3-9:	Location of listed waterbodies	3-36
	Memorial Beach	3-36
	SWAG Meeting	4-1
	Stakeholder Workshop	4-1
	Stakeholder Workshop	4-2
	Community Forum	4-3
	Community Forum #2	4-5
	CRWC Website: Utilized for Draft Plan Distribution and Receiving Public Comments	4-5
	Stakeholder Workshop #2	4-5
	CRWC Display at Home and Garden Show – Detroit, MI	4-6
	An Example of Public Education Materials Developed by SEMCOG	4-9
5-1:	Location of water quality monitoring stations	5-6
5-2:	Estimated sediment load by source and catchment	5-14
5-3:	Estimated phosphorus load by source and catchment	5-21
	The Beach at Memorial Park: Goal III Aims to Promote This and Other Opportunities	6-2
	The Cottrell Drain: A Potential Area in Need of Habitat Restoration	6-3
	A Subwatershed Advisory Group Meeting: Continued Meetings and Action (Goal VI, Objective B) is a Key Making this Plan a Success	6-3
	A Community Forum: Public Involvement and Education is a Tool that Can be Used to Address Many of the Goals and Objectives of this Plan	6-4
	Subwatershed Photo Tour: The St. Clair Academy	6-5
7-1:	Example of an Overlay Zone	7-8
	The Marina at Windmill Park	7-12
	Storm Sewer Outfall w/ Dry Weather Flow – possible illicit discharge	7-14
	CRWC Stream Leaders	7-31
	CRWC Adopt-A-Stream	7-31
7-2:	MDEQ monitoring basins for Basin Year 2	7-32
	MDEQ Basin Years 1, 3, 4 & 5	7-32
	Unified Stream Assessment	7-33
	Subwatershed Photo Tour: Grosse Pointe Farms Water Filtration Plant	7-36
8-1:	General Schedule	8-1
8-2:	Implementation milestones	8-2
	Example of Public Education Materials	8-8
	Watershed Sign	8-10
9-1:	Relationship between the three elements	9-1
	The Planning Process (detail) – see Chapter 1 for Expanded Information	9-2
9-2:	Success levels	9-2
	Field Data Collection for Developing the Plan: Unified Stream Assessment	9-10

SWAG Meeting	10-1
Example of a Program Implementation Activity: A Volunteer Assisting with Road-Stream Crossing Inventories	10-7
Example of a Past Capital Project: Straightened and Armored Banks of the Stephens Relief Drain	10-7

List of Tables

1-1:	Subwatershed communities	1-2
1-2:	Subwatershed drainage areas	1-3
1-3:	Congressional districts by community	1-4
2-1:	Climatic data for the subwatershed	2-1
2-2:	Wetland coverage in the subwatershed	2-6
2-3:	Natural features	2-12
2-4:	Year 2000 community populations and densities	2-13
2-5:	Community populations for 1970, 2000, and 2030	2-15
2-6:	Subwatershed community populations for 2000 presented on a catchment basis	2-15
2-7:	Community income, poverty, and education levels	2-17
2-8:	Land cover in the subwatershed circa 1830	2-18
2-9:	Land use in the subwatershed – present day	2-21
2-10:	Land use in the subwatershed – future (year 2030)	2-23
2-11:	Sewage disposal in the subwatershed, by catchment	2-26
2-12:	Transportation infrastructure, by catchment	2-32
2-13:	Historical/cultural sites in the subwatershed, by catchment	2-34
2-14:	Nature area / park summary	2-35
2-15:	Largest nature areas / parks in the subwatershed	2-36
3-1:	Water quality standards	3-5
3-2:	Threatened or endangered species in the subwatershed	3-14
3-3:	Detailed road-stream crossing survey results	3-21
3-4:	Assumed percent impervious values	3-29
3-5:	Impervious cover percentages	3-30
4-1:	Results from feedback forms	4-6
5-1:	Status of designated uses	5-2
5-2:	General sources of sediment	5-8
5-3:	TSS water quality monitoring data compared to target value	5-11
5-4:	Estimated existing annual loads and associated reductions by catchment	5-11
5-5:	Estimated annual TSS load and additional load to account for streambank erosion by catchment	5-12
5-6:	Final estimated sediment load reduction needed by catchment	5-12
5-7:	General sources of phosphorus	5-16
5-8:	TP data used to estimate current and allowable loads	5-19
5-9:	Estimated existing annual TP loads and associated reductions by catchment	5-19
5-10:	Estimated annual TP load and additional load to account for streambank erosion by catchment	5-20
5-11:	Final estimated phosphorus load reduction needed by catchment	5-20
5-12:	E. coli data used to estimate current and target loads	5-26
5-13:	Contaminated sediments – sources and causes	5-29
5-14:	PCBs – sources and causes	5-30
	Goal I – Objectives	6-1
	Goal II – Objectives	6-2
	Goal III – Objectives	6-2
	Goal IV – Objectives	6-3
	Goal V – Objectives	6-3
	Goal VI – Objectives	6-3
6-1:	Relationship of WMP goals to RAP BUIs	6-5
6-2:	Relationship of WMP goals to Lake St. Clair Comprehensive Management Plan	

	goals	6-6
8-1:	Relationship of actions to goals and objectives	8-32
8-1:	Relationship of actions to goals and objectives (continued)	8-33
8-2:	Action details	8-34
8-2:	Action details (rows continue across from previous page)	8-35
8-3:	Potential funding/technical assistance	8-36
8-3:	Potential funding/technical assistance (rows continue across from previous page)	8-37
8-4:	Numerical cross-reference for previous table	8-38
8-4:	Numerical cross-reference for previous table (continued)	8-39
8-5:	Loading Reductions that result from addressing known sources	8-42
8-6:	Phosphorus load reductions associated with the addressing of known sediment problems	8-43
9-1:	Measures of success associated with the actions	9-7
9-1:	Measures of success associated with the actions (continued)	9-8
9-2:	Evaluation action details	9-11
9-3:	Goals and objectives evaluation questions	9-16
9-3:	Goals and objectives evaluation questions (continued)	9-17
9-3:	Goals and objectives evaluation questions (continued)	9-18
10-1:	Legal relationship options (continued on following page)	10-4
10-1:	Legal relationship options (continuation from previous page)	10-5
10-2:	Funding mechanisms (continued on following page)	10-8
10-2:	Funding mechanisms (continuation from previous page)	10-9
10-3:	Examples of actions and potential funding mechanisms	10-10

List of Sidebars

Plan Applicability	1-1
Quotable Quotation	1-1
Lake St. Clair Direct Drainage Subwatershed	1-2
Regulated Areas	1-2
Acronyms and Terms	1-2
Hydrologic Boundaries	1-3
Relationship to Clinton River Watershed	1-3
Municipality Names	1-3
Federal and State Level Representatives	1-4
State of Michigan Symbol of Water Quality	1-6
Additional WMP Elements	1-7
One Vision	1-7
Waters of the U.S.	1-7
Goals and Principles of the Clean Water Act	1-8
Special Laws / Programs	1-9
Special Laws / Programs (continued)	1-10
International Joint Commission	1-10
Clinton River Area of Concern Information	1-10
Lac Sainte Claire	1-11
Public Participation Process	1-13
Nested Jurisdictions	1-15
Data Sources	2-1
Effects of the Great Lakes	2-2
24-hour Storm Events	2-2
Average Annual Runoff	2-2
Soil Associations	2-3
Hydrologic Soil Groups	2-3
Hydrologic Soil Groups (continued)	2-4
Quotable Quotation	2-5
Primary Producers	2-5
Emergent Wetland Types / Forested Wetland Types	2-6
Bank Slope Processes	2-8
Tree Canopy	2-9
Fish Habitat	2-9
Neither Plant nor Animal	2-10
Zooplankton	2-10
Population Growth 2000 to 2005	2-13
Development Trends	2-14
Income Data	2-16
Minority Percent of Community Populations	2-17
Minority Percent of Catchment Populations	2-17
Land Use Types – Present	2-21
Developed Types	2-22
Future Land Use	2-22
Land Use Types – Future	2-22
Public Land	2-24
Sanitary Sewer Overflows	2-25

CSO Data 7/00 – 7/06	2-26
Inland Lake Levels	2-27
Fox Creek	2-27
Storm Sewer Coverage	2-28
Lake St. Clair Flooding	2-29
Pollution Control / Discharge Data Sources	2-30
Pollution Control Legislation	2-31
Navigable Waters	2-34
Edsel & Eleanor Ford House	2-34
Nature Areas and Parks	2-35
Recreational Use of waters for fishing	2-37
Infrastructure	3-1
Impervious Surfaces and Storm Sewers	3-2
Water Quality Standards	3-5
Example Pollutants / Factors Affecting Designated Uses	3-6
Beach Closing Information	3-7
Milk River Retention and Treatment Basin	3-7
Pollution Related Discussion in the 1998 RAP	3-8
Water Quality Parameters	3-8
Water Quality Parameters (continued)	3-9
Water Quality Parameters (continued)	3-10
Water Quality Parameters (continued)	3-11
Earliest Data	3-11
Biological Conditions Rankings	3-13
Historical Fish Species	3-13
Lake St. Clair Fishing	3-13
Native Species	3-14
Lake Water Levels – Impacts on Biota	3-15
FEMA Floodplain Categories	3-16
Flood Control Structures	3-16
Water Budget Issues	3-17
Volunteers	3-17
Road-Stream Crossing Potential Problem Descriptions	3-21
Unified Subwatershed and Site Reconnaissance	3-26
SSD Terms	3-27
Imperviousness of Open Water	3-29
Impervious Cover Model	3-31
Audit Methodology	3-33
Communities not Included in Audit Results	3-33
Group 1 Synopsis	3-34
Group 2 Synopsis	3-34
Group 3 Synopsis	3-35
Fish Consumption Advisories	3-36
Lake St. Clair	3-36
Stakeholder Workshop Visions and Desired Uses	4-2
Stakeholder Workshop Issues and Concerns	4-2
Meeting Fact Sheets	4-3
Community Forum Visions and Desired Uses	4-3
Community Forum Issues and Concerns	4-3
Desired Uses	4-4

20 Years Ago	4-4
Quotable Quotation	4-7
Information Displays	4-9
School Districts	4-10
Future Public Education and Involvement	4-10
What are stressors?	5-1
Purpose of this Chapter	5-1
Water Quality Classifications	5-2
STEPL Model Inputs for Current Conditions	5-5
Distinguishing Between Sources and Causes of Impairment	5-7
What is a critical area?	5-12
What is a critical area?	5-21
Critical Area Summary	5-29
Quotable Quotation	6-1
Applicability of Goals and Objectives	6-1
Illicit Discharge Elimination Plans	6-1
Clinton River RAP Public Education Goals	6-2
Social Marketing	6-2
Combined and Sanitary Sewer Overflows	6-3
Quotable Quotation	7-1
SEMCOG Three-tiered Planning Approach	7-1
Clinton River Basin Watershed Initiative	7-2
Important CRWC Programs	7-2
Public Education Vehicles	7-3
Public Education Additional Considerations	7-3
Other Youth Education Programs	7-4
Environmental Protection Options for Local Governments	7-5
The Development Cycle	7-6
More on Zoning	7-7
Macomb County Model Ordinances	7-8
Macomb County Stormwater Standards	7-8
Storm Water Center Model Ordinances	7-9
Macomb County Natural Features Inventory	7-9
Better Site Design Options	7-10
Professional Reviews	7-11
Spill Response	7-15
Cross-Jurisdictional Enforcing Agent / County Enforcing Agents / Approved Public Agencies / Municipal Enforcing Agencies / Conservation District	7-17
BMP Resources	7-17
BMP Resources (cont'd)	7-18
Additional Considerations	7-19
Impervious Surface Mitigation Scorecard	7-19
Infiltration Systems Scorecard	7-19
Filtration Systems Scorecard	7-20
Vegetated Buffers / Natural Conveyance Scorecard	7-21
Retention / Detention Scorecard	7-22
Vegetation Management Actions to Consider for Natural Features and Resources Management	7-23
Conservation District Websites	7-26
Geese	7-27

Aquatic Nuisance Species Task Force	7-28
Macroinvertebrates	7-31
U.S. EPA STORET	7-31
Water Quality Index	7-34
Other Resources	7-35
Quotable Quotation	8-1
Appropriateness of Actions	8-3
Terminology	8-3
Planning Levels	8-4
Benefits of the Actions	8-4
Importance of the Funding Program	8-5
Pollutant Sources	8-7
Potential Targets for Business Education	8-9
Recommended Implementation Approach	8-12
Solid Waste Management Plans	8-17
IDEP Hotline Numbers	8-19
Natural Features Information in the WMP	8-27
Recreation Consideration	8-29
Sources of the Actions	8-30
History of Actions Taken	8-31
Future Loadings	8-40
Stream Order	8-41
Adaptive Management	8-46
Quotable Quotations	9-1
Permit Requirements	9-3
Difficulty in Measuring Success	9-3
Notes on the Annual Reports	9-4
Characteristics of the Evaluation Measures	9-5
Actions Most Likely to have Quantifiable Load Reductions	9-6
Guideposts for Achieving Loading Reductions	9-9
Non-Action Milestones	9-15
Actions without Milestones	9-15
Goals and Objectives Evaluation – Phase II Related	9-15
Plans Developed in Conjunction with this WMP / Other Groups to Consider for SWAG Participation	10-2
Examples of Legal Entities Utilized Throughout Michigan for Watershed Protection and Contact Information	10-3
Legal Issues	10-6
Cool Cities Initiative	10-10