

Muskegon Lake Fish and Wildlife Habitat Restoration and BUI Removal Strategy

Addendum Biodiversity Protection and Phragmites Management Plan



The West Michigan Shoreline Regional Development Commission (WMSRDC) and the Muskegon Lake Watershed Partnership (MLWP) initiated a project to protect biodiversity within the Muskegon Lake Area of Concern (AOC) during the summer of 2012. Support for the project was provided by WMSRDC through a US Environmental Protection Agency (EPA) Lake Michigan Watershed Academy mini grant program to implement the Lake Michigan Lakewide Management Plan (LAMP).

The Muskegon Lake Fish and Wildlife Habitat Restoration and Beneficial Use Impairment Removal Strategy was completed by the Muskegon Lake Watershed Partnership in December, 2008.

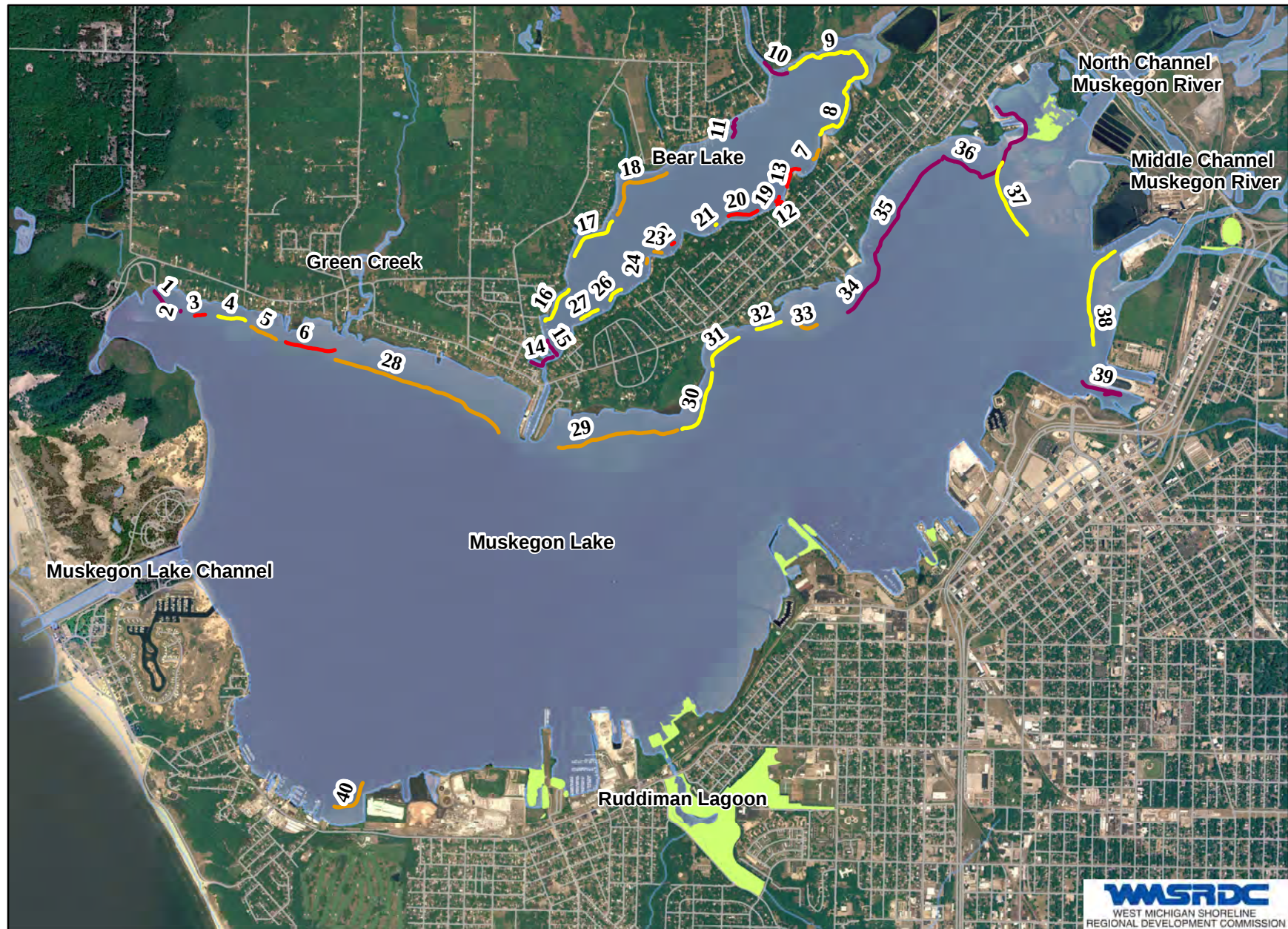
Large scale implementation of the restoration strategy has occurred from 2009-2012 with the guidance of the MLWP. Funding for the restoration activities has been provided by the US EPA Great Lakes Restoration Initiative, National Oceanic and Atmospheric Administration, US Fish and Wildlife Service, Community Foundation for Muskegon County, Muskegon River Ice Mountain Foundation, CMS Energy and local landowners. The West Michigan Shoreline Regional Development Commission is coordinating and managing the large scale restoration project in cooperation with local public and private landowners, GVSU Annis Water Resources Institute, Muskegon River Watershed Assembly, Great Lakes Commission and other project partners. Restoration has focused on the problems associated with the historic loss of fish and wildlife habitat and the resulting degradation of populations along the Muskegon Lake south shoreline and river mouth due to the historic filling of open lake, littoral zone, wetland and the protective terrestrial critical function zone habitats. Large scale removal of foundry sand, slag, broken concrete and sawmill waste materials has been completed and the AOC is preparing for the final restoration needed to remove the fish and wildlife related BUIs.

Due to the filling and hardening of the lake's shallow zones, wetlands and hardening of the riparian corridors and shoreline, fish and wildlife habitat was eliminated and the resulting stormwater runoff degraded aquatic life and water quality in nearshore areas. This resulted in conditions that were conducive to the spread of the non-native invasive plant species, including Phragmites.

The 2012 Phragmites Management Plan was developed to guide future invasive species management activities to protect biodiversity and the restoration that has been completed in the Muskegon Lake AOC.

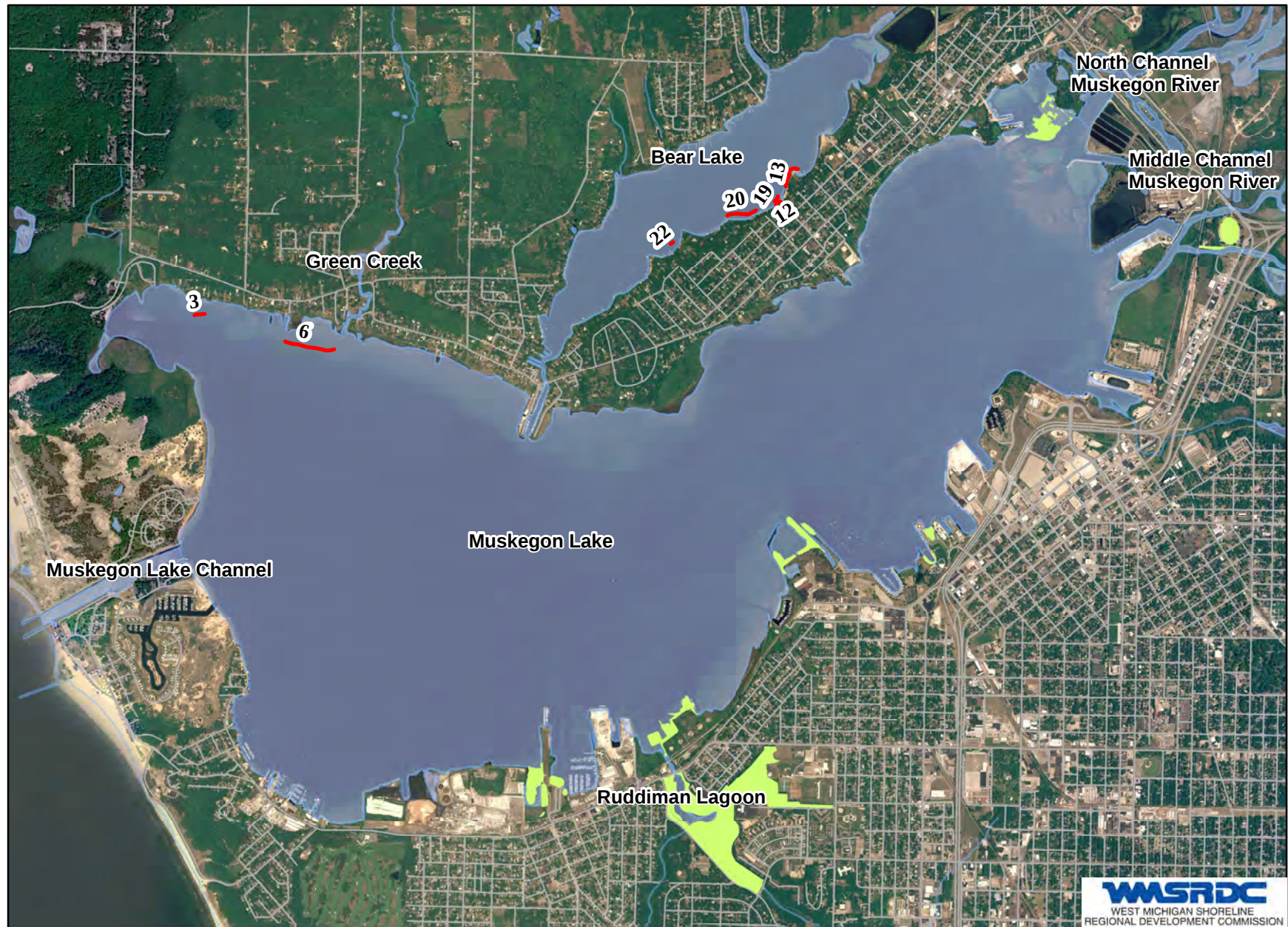
Lake Michigan Lakewide Management Biodiversity Plan

Muskegon & Bear Lake Restoration Priority Map



Lake Michigan Lakewide Management Biodiversity Plan

Muskegon & Bear Lake Restoration Priority Map

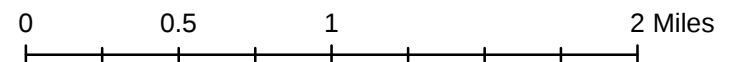
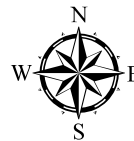


Phragmites Density



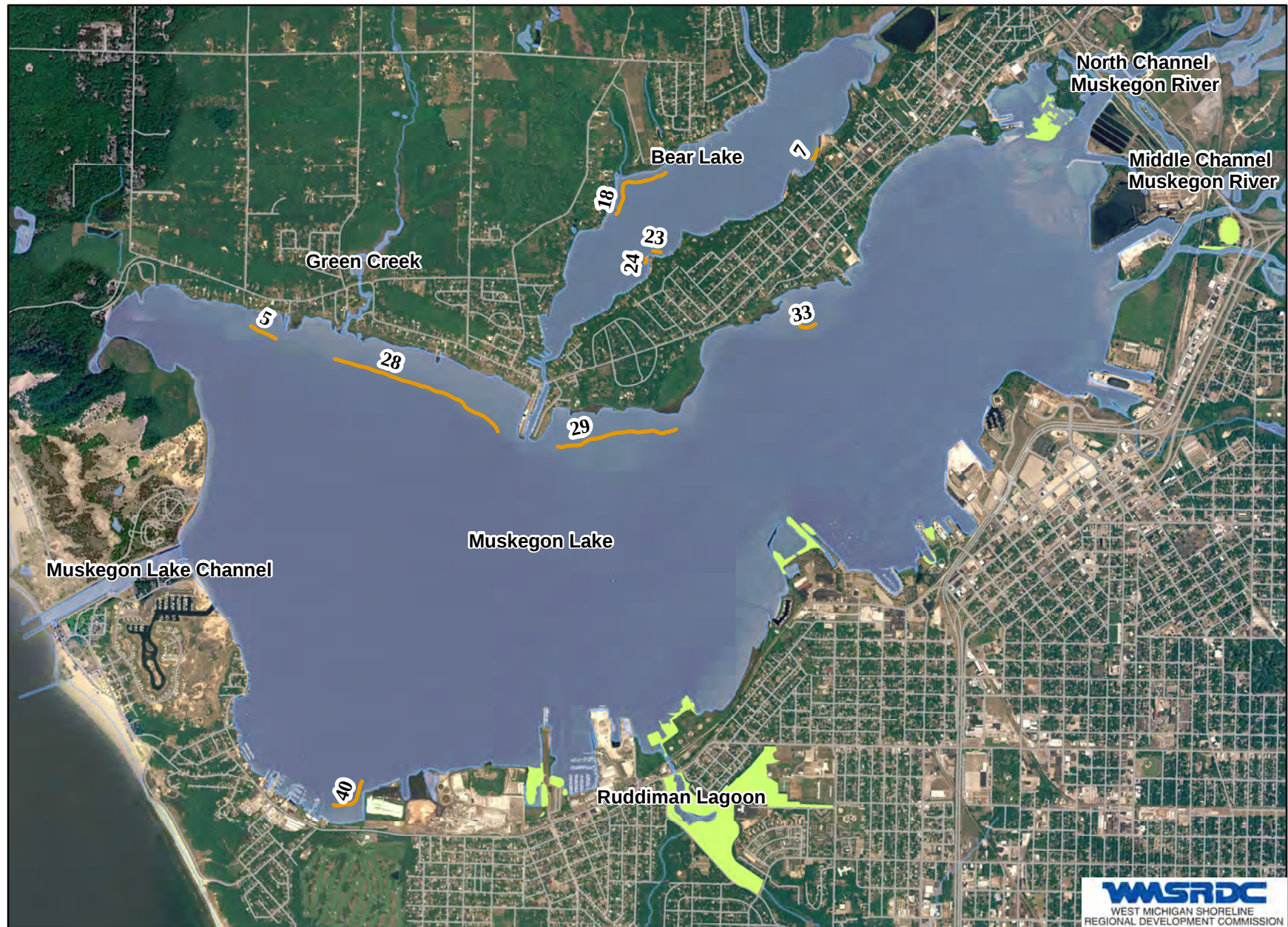
Completed Restoration Area

Monoculture



Lake Michigan Lakewide Management Biodiversity Plan

Muskegon & Bear Lake Restoration Priority Map

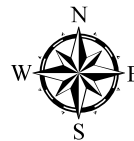


Phragmites Density



Completed Restoration Area

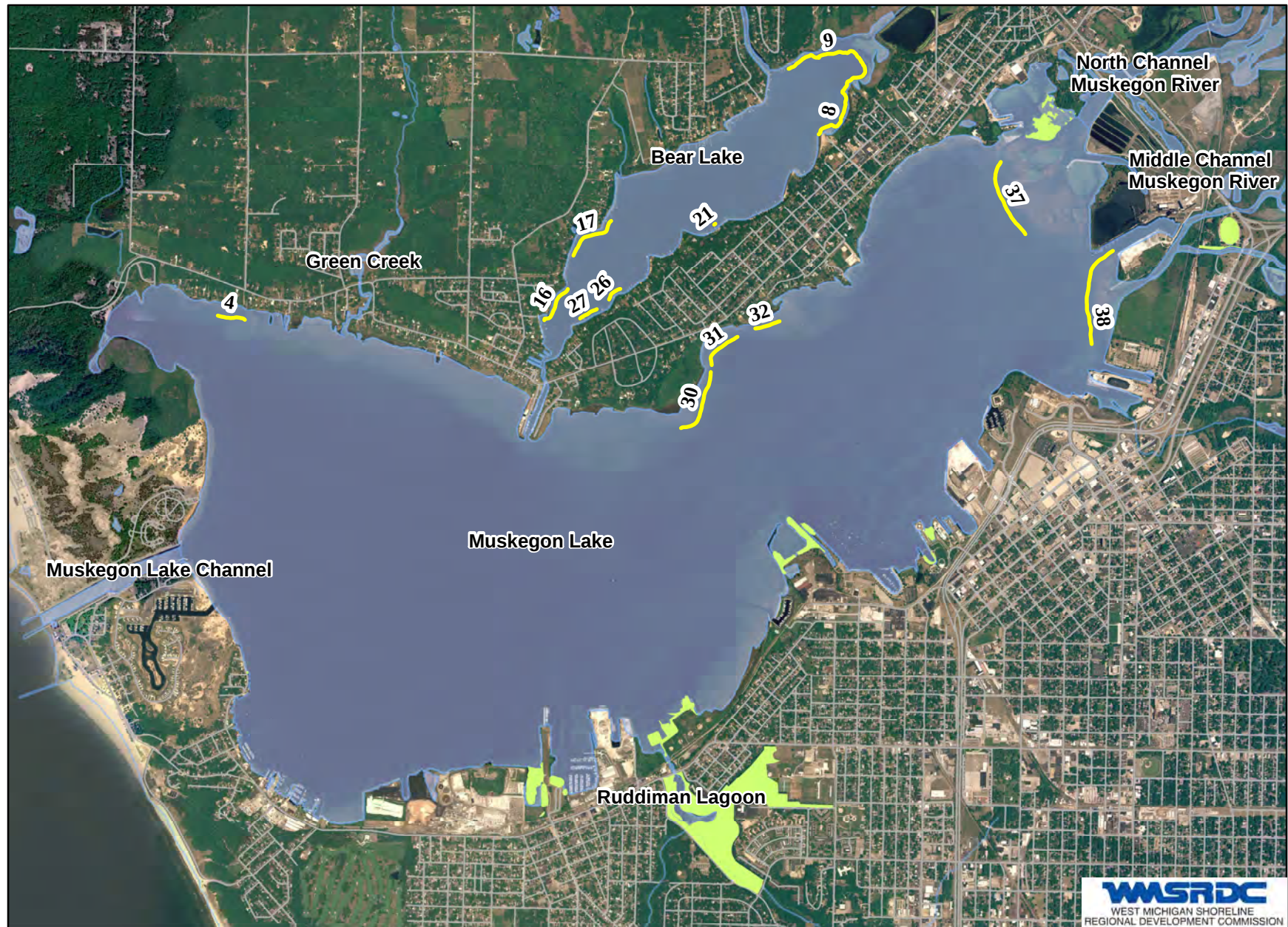
Dense



0 0.5 1 2 Miles

Lake Michigan Lakewide Management Biodiversity Plan

Muskegon & Bear Lake Restoration Priority Map

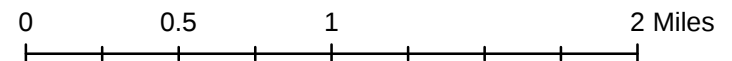
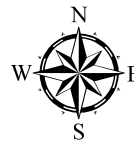


Phragmites Density



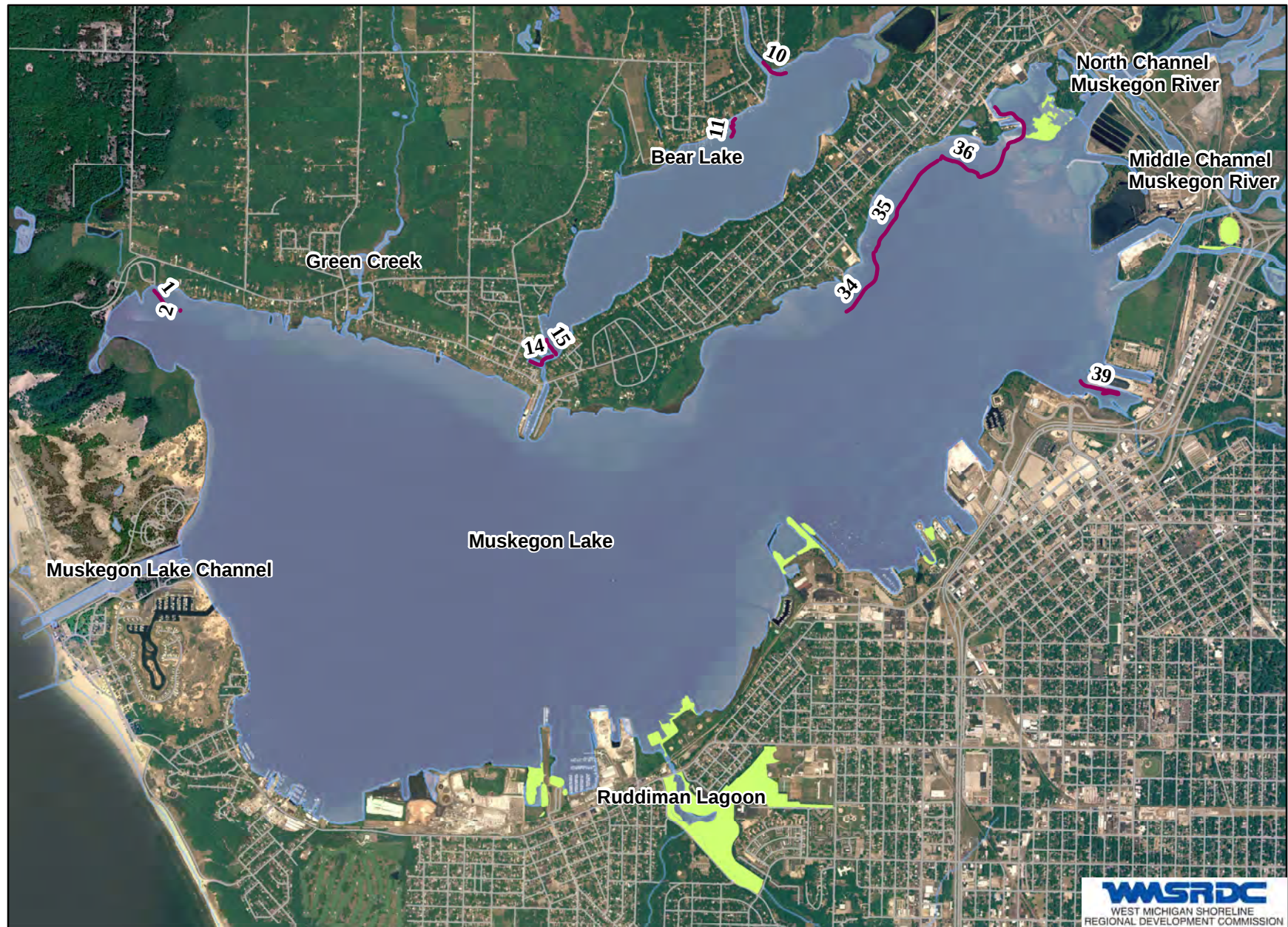
Completed Restoration Area

— Patchy



Lake Michigan Lakewide Management Biodiversity Plan

Muskegon & Bear Lake Restoration Priority Map

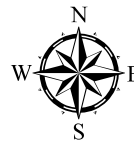


Phragmites Density



Completed Restoration Area

— Sparse



0 0.5 1 2 Miles

Phragmites		Treatment			Memo	Dispersal	Latitude Start	Longitude Start	Latitude End	Longitude End
Site i.d.	Location	Area	Density	Values	Status					
1	mll	1	s	abde	u	lg	43.24894517	-86.33031964	43.24796183	-86.3288813
2	mll	1	s	e	?	ng	43.24770683	-86.32800464	43.2476585	-86.32802464
3	mll	1	m	e	?	o	43.24738183	-86.32676797	43.24746683	-86.32587297
4	mll	3	p	bl	u	l	43.24735517	-86.3247313	43.2470935	-86.32236464
5	mll	3	d	ed	?	n	43.24670517	-86.32183631	43.24589683	-86.31965631
6	mll	3	m	bd	u	n	43.2457235	-86.31882131	43.2452285	-86.31451131
7	bln	1	d	e	u	g	43.25812016	-86.27221799	43.25752016	-86.27270965
8	bln	3	p	abde	u	ng	43.25910183	-86.27212965	43.26225183	-86.26966299
9	bln	4	p	abcde	?	ng	43.26228516	-86.26965965	43.26328516	-86.27478632
10	bln	2	s	e	?	ng	43.26302849	-86.27501298	43.26370016	-86.27699798
11	bln	2	s	e	t	g	43.26008183	-86.27945132	43.25892183	-86.27978298
12	bln	1	m	e	u	ng	43.2545885	-86.27584965	43.2547835	-86.27544299
13	bln	2	m	deb	t	n	43.25575183	-86.27499799	43.25687016	-86.27392965
14	bln	1	s	ade	u	n	43.24450516	-86.29733631	43.2448285	-86.29542798
15	bln	2	s	ade	u	g	43.24495183	-86.29508465	43.24589683	-86.29591631
16	bln	2	p	de	?	g	43.24714683	-86.29612798	43.2491335	-86.29406965
17	bln	3	p	de	?	g	43.25128183	-86.29357465	43.25351183	-86.29029131
18	bln	3	d	ade	u	g	43.2539435	-86.28983798	43.25660516	-86.28551965
19	bln	1	m	de	u	g	43.2551185	-86.27568799	43.25481016	-86.27596632
20	bln	3	m	de	u	g	43.25422683	-86.27759465	43.2538785	-86.28012298
21	bln	1	p	e	u	g	43.25335183	-86.28116298	43.25329683	-86.28126132
22	bln	1	m	de	t	g	43.25217016	-86.28486465	43.2520485	-86.28506632
23	bln	1	d	de	?	g	43.25152183	-86.28595465	43.25159183	-86.28660798
24	bln	1	d	de	t	g	43.25111516	-86.28722798	43.25084016	-86.28727298
25	bln	0	0	0			43.24976183	-86.28795298	43.24970516	-86.28805465
26	bln	1	p	de	u	g	43.24916016	-86.28947965	43.24847683	-86.29045798
27	bln	2	p	de	u	g	43.2478585	-86.29152798	43.24726016	-86.29298965
28	mll	5	d	abde	u	n	43.2446135	-86.31445464	43.24000017	-86.30015131
29	mln	3	d	de	u	ng	43.23905683	-86.29490631	43.24017683	-86.28453132
30	mln	4	p	abde	u	n	43.24025683	-86.28410965	43.24384683	-86.28151132
31	mln	3	p	abde	u	n	43.24430683	-86.28143965	43.24611683	-86.27919632
32	mln	3	p	abde	u	ng	43.2466485	-86.27763132	43.24712183	-86.27550299
33	mln	3	d	de	u	ng	43.24732016	-86.27413465	43.24694516	-86.27235965
34	mln	3	s	abde	u	ng	43.2477535	-86.26964965	43.2515235	-86.26727799
35	mln	4	s	de	u	ng	43.2516185	-86.26712299	43.25743016	-86.26168799
36	mln	4	s	ade	u	n	43.25753849	-86.26143966	43.26087849	-86.25667299
37	mlm	5	p	abcde	tu	n	43.25736349	-86.25616299	43.25274849	-86.25398466
38	mlm	3	p	abcde	u	n	43.25169516	-86.24631799	43.24571683	-86.24815466
39	mlm	3	s	ad	u	n	43.2433485	-86.24911966	43.24256183	-86.24716633
40	mlm	3	d	ade	u	l	43.21757517	-86.31194131	43.21605184	-86.31441798
41		0					43.23252027	-86.32800623	43.24597673	-86.33282226

Lake Michigan Lakewide Management Biodiversity Plan Report - Phragmites

Report Key

Area (Acres):	Dispersal Pathways:	Location Code:	Values:
1= single/ small patch	N= Nearby Polupation	MLL= Muskegon Lake Laketon Township	A= High biological diversity
2= < 1	D= Ditch	MLM= Muskegon Lake City of Muskegon	B= Habitat for economically important game species
3= 1-10	L= Boat Launch	BLL= Bear Lake Laketon Township	C= Rare animals
4= 10-50	G= Beach Grooming	BLN= Bear Lake North Muskegon	D= Critical nursery habitat for fish
5= 50-100	T= Tributary		E= Recreational boating or fishing
6= > 100	O= Other		

Monoculture Site Id	Location Code	Area (Acres)	Values	Treatment Status	Memo	Dispersal Pathway
3	mll	1	e	?	beach grooming/residential	o
6	mll	3	bd	u	large area, very few docks. Good setbacks.	n
12	bln	1	e	u	groomed	ng
13	bln	2	deb	t	spray treatment natural area	n
19	bln	1	de	u	Residents above on high bank above water	g
20	bln	3	de	u		g
22	bln	1	de	t		g

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Dense Site Id	Location Code	Area (Acres)	Values	Treatment Status	Memo	Dispersal Pathway
5	mll	3	ed	?	residential w/ docks	n
7	bln	1	e	u	DIS from city beach	g
18	bll	3	ade	u	Less docks compared with adjacent areas	g
23	bln	1	de	?	Probably not treated except for grooming	g
24	bln	1	de	t	Tilled beach w/ stems for beach	g
28	mll	5	abde	u	Shallow, so fewer boat docks.	n
29	mln	3	de	u	From Pointe Marine to Johnson's BL Channel-Grooming Mechanical Cutting	ng
33	mln	3	de	u	Cutting for view. Homes @ lower elevated slopes	ng
40	mlm	3	ade	u	Country Club @ West end of papermill	l

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5= 50-100	T= Tributary		E= Recreational boating or fishing
6= > 100	O= Other		

Patchy Site Id	Location Code	Area (Acres)	Values	Treatment Status	Memo	Dispersal Pathway
4	ml	3	bl	u	weber rd launch-not many docks	l
8	bln	3	abde	u	Below water tower N. Muskegon School	ng
9	bll	4	abcde	?	Next to Willbrant restoration	ng
16	bll	2	de	?	interspersed w/ docks. lawns groomed-beaches	g
17	bll	3	de	?		g
21	bln	1	e	u		g
26	bln	1	de	u	Seawall Sheet Pile	g
27	bln	2	de	u		g
30	mln	4	abde	u	Johnson's Point	n
31	mln	3	abde	u	Landowners on high bluff only one boat dock good shrubs & trees for amphibs	n
32	mln	3	abde	u	Tostenabe Bay	ng
37	mlm	5	abcde	tu	River Mouth Area	n
38	mlm	3	abcde	u	Cobb Plant/Verplank/Fisherman's Landing	n

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4= 10-50	G=Beach Grooming	BLN=Bear Lake North Muskegon	D=Critical nursery habitat for fish
5= 50-100	T=Tributary		E=Recreational boating or fishing
6= > 100	O=Other		

Sparse Site Id	Location Code	Area (Acres)	Values	Treatment Status	Memo	Dispersal Pathway
1	mll	1	abde	Unknown		g
2	mll	1	e	Unknown	beach grooming/residential	ng
10	bll	2	e	Unknown	Mouth of Fenner's Ditch	ng
11	bll	2	e	Treated	residential beach grooming & boat docks	g
14	bln	1	ade	Untreated	1 small patch Bear Lake Channel Slips	n
15	bln	2	ade	Untreated	Near groomed beaches & docks & bulrushes	g
34	mln	3	abde	Untreated	Block 58/ City Park area to protect	ng
35	mln	4	de	Untreated	Houses on high bluff / Custer Park	ng
36	mln	4	ade	Untreated	Conservation Club Area	n
39	mlm	3	ad	Untreated	Ryerson Creek Mouth	n