

US EPA ARCHIVE DOCUMENT



Muskegon Lake  
Ruddiman Creek  
Ecological Restoration Master Plan

# Muskegon Lake, Ruddiman Creek and nearby shoreline

Ecological Restoration Master Plan  
March 31, 2008

## Appendix & Workshop Materials



# Muskegon Lake Ruddiman Creek And Nearby Shoreline

## Ecological Restoration Master Plan Appendices

March 31, 2008

Prepared For:

U.S. Environmental Protection Agency

Great Lakes National Program Office

77 West Jackson

Chicago, IL 60604

Contract No. GS-10F-0262R

Order No. EP07500066

Requisition/Reference No. HKX017 QT-IL-07-000089

Prepared by:

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2026 Murray Hill Road

Cleveland, Ohio 44106

## APPENDICES

### Appendix A

#### Public Workshop Materials

##### South Muskegon Lake and Ruddiman Creek

##### Public Workshop Agenda

September 11th, 2007

9:30AM – 4:30PM

- |  |                      |
|--|----------------------|
| I. Introduction  | (9:30 AM – 10:30 AM) |
| <ul style="list-style-type: none"> <li>○ Welcome – Biohabitats &amp; EPA</li> <li>○ Introductions by attendees</li> <li>○ Overview of the day</li> <li>○ Remediation to Restoration Presentation by EPA</li> </ul>   |                      |
| II. Ruddiman Creek and South Muskegon Lake   |                      |
| Inventory and Analysis   | (10:30 AM – 11:20AM) |
| <ul style="list-style-type: none"> <li>○ Discussion of existing conditions – <i>30 minutes</i> <ul style="list-style-type: none"> <li>○ Human uses of sites</li> <li>○ Ecological features</li> <li>○ Ecological references</li> <li>○ Ecological controls</li> </ul> </li> <li>○ Present and explain each board</li> <li>○ Self “Board tour”: add to, edit and write on boards – <i>20 minutes</i></li> </ul> |                      |
| 25 minute break  | (11:20AM – 11:45AM)  |
| III. Visioning Exercises   | (11:45AM – 12:45PM)  |
| <ul style="list-style-type: none"> <li>○ Purpose and role of vision</li> <li>○ Bumper sticker exercise</li> </ul>  |                      |
| Lunch  | (12:45PM – 1:30PM)   |
| IV. Setting Priorities   | (1:30PM – 2:30PM)    |
| <ul style="list-style-type: none"> <li>○ Attributes of ecological restoration</li> <li>○ Slider board exercise</li> </ul>  |                      |
| V. Specific Strategies   | (2:30PM – 4:00PM)    |
| <ul style="list-style-type: none"> <li>○ Slide presentation of techniques</li> <li>○ Opportunities / constraints exercise.</li> </ul>  |                      |
| VI. Wrap-up  | (4:00 PM – 4:30 PM)  |
| <ul style="list-style-type: none"> <li>○ Evaluation forms</li> <li>○ Next steps</li> <li>○ Announcement of 2<sup>nd</sup> workshop</li> </ul>  |                      |

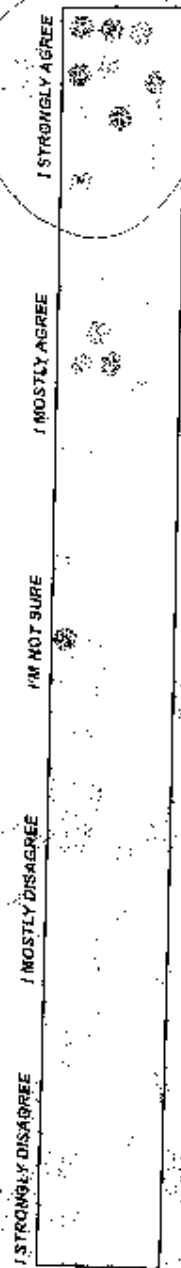
## LIST OF FIRST WORKSHOP PARTICIPANTS

South Muskegon Lake and Ruddiman Creek Ecological Restoration Plan: Workshop #1

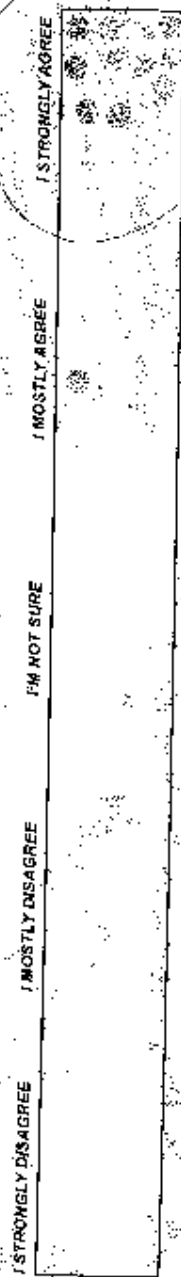
Name	Affiliation
Julie Sims	Michigan Department of Environmental Quality (DEQ)
Tom Berdinski	Michigan DEQ
Kathy Evans	MLWP/WMSRDC
Wayne Groesbeck	Muskegon Lake Watershed Partnership
Cynthia Price	Muskegon Lake Watershed Partnership
Greg Mund	Muskegon Lake Watershed Partnership
Theresa Bernhardt	Ruddiman Creek Task Force/MLWP
Roy Schrameck	Environmental Consulting and Technology
Scott Parker	Environmental Consulting and Technology
Bob Fountain	City of Muskegon Department of Public Works
Hope Mitchell	City of Muskegon Planning
Beth Hinchey Malloy	Illinois-Indiana Sea Grant
Jackie Adams	Illinois-Indiana Sea Grant
Bob Kavetaky	U.S. Fish and Wildlife Service
Kathy Neff	
John Perrecone	US EPA Great Lakes National Program Office (GLNPO)
Danielle Green	US EPA Great Lakes National Program Office (GLNPO)
Karen Rodriguez	US EPA Great Lakes National Program Office (GLNPO)
Carolyn Weng	Muskegon County Nature Club
George Bailey	Great Lakes Dock and Materials
Gary Noble	Muskegon River Watershed Assembly
Ken Szallai	Lake Express
Carl Ruetz	Grand Valley State University
Ivette Bolender	Biohabitats, Inc.
Paul Kovalcik	Biohabitats, Inc.
Amelia Greiner	Biohabitats, Inc.



"A restored Ruddiman Creek and South Muskegon Lake should contain typical species assemblages that occur in a reference ecosystem."



"A restored Ruddiman Creek and South Muskegon Lake should contain native species to the greatest practicable extent."

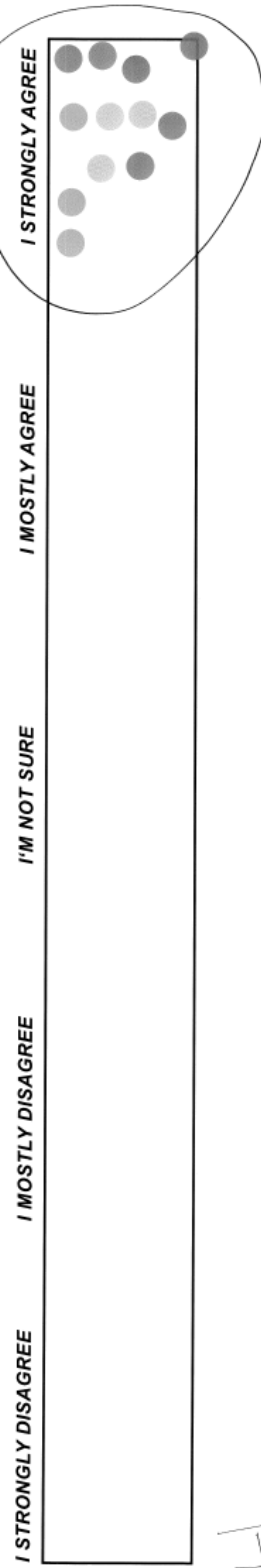


SOUTH MUSKEGON LAKE  
RUDDIMAN CREEK

US EPA

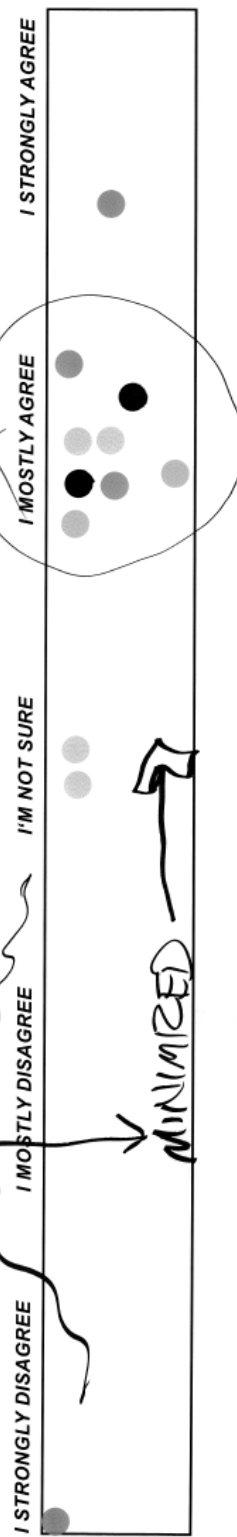
#2

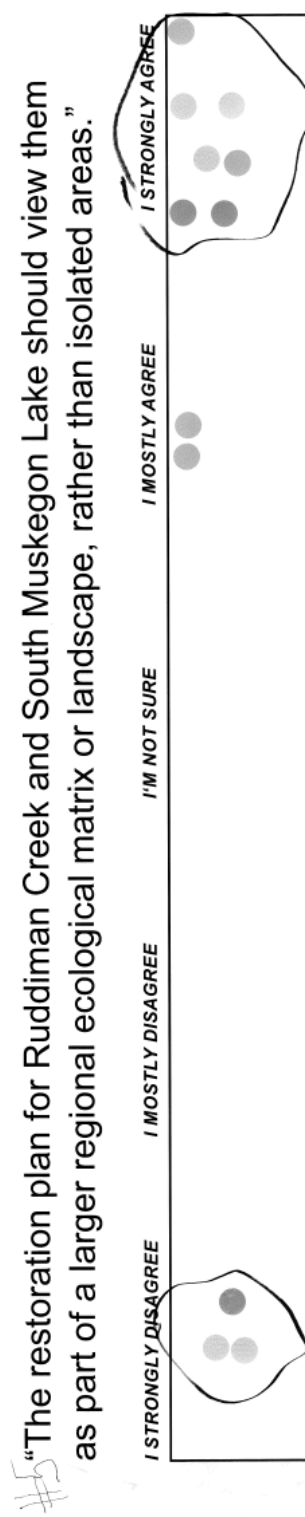
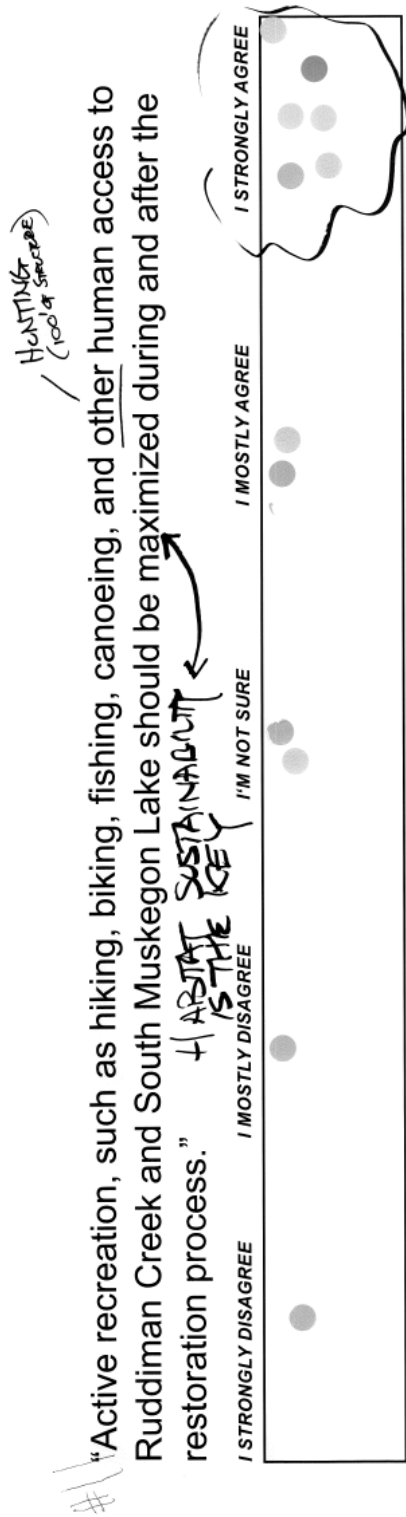
"A restored Ruddiman Creek and South Muskegon Lake should be able to sustain the species necessary for its continued stability and development along the proposed ecological trajectory."



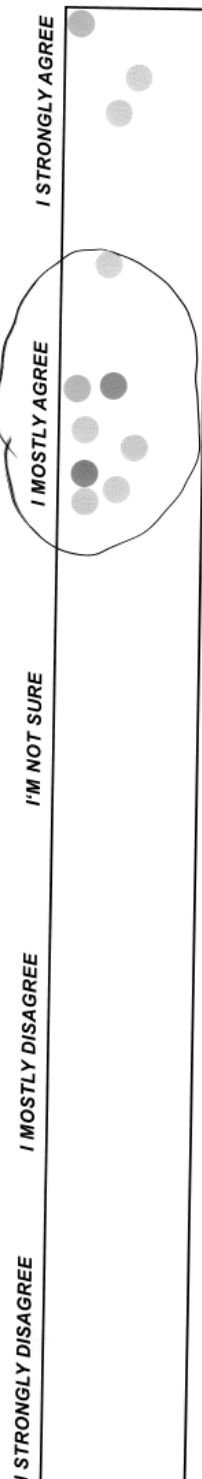
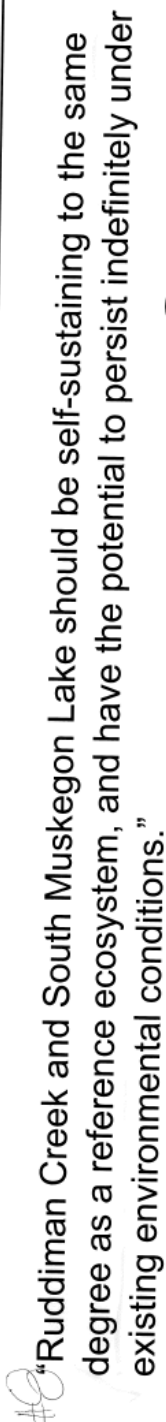
#1

"Signs of ecological or physical dysfunction such as invasive species and decreased diversity should be absent in the restored Ruddiman Creek and South Muskegon Lake."

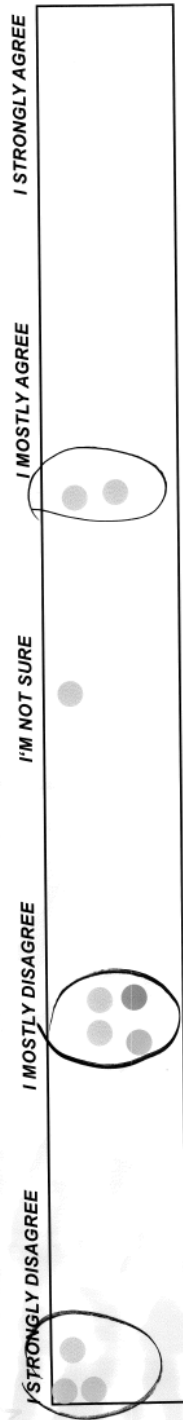




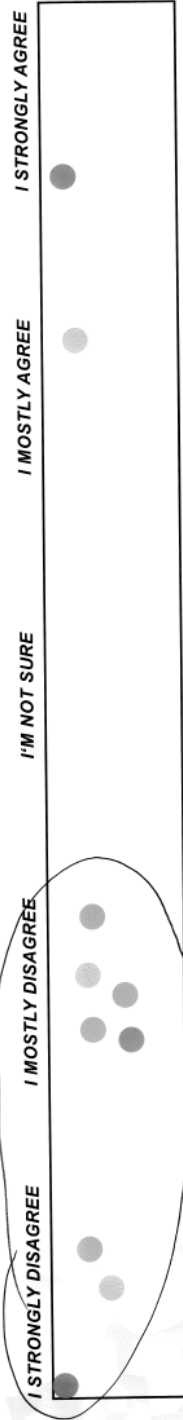


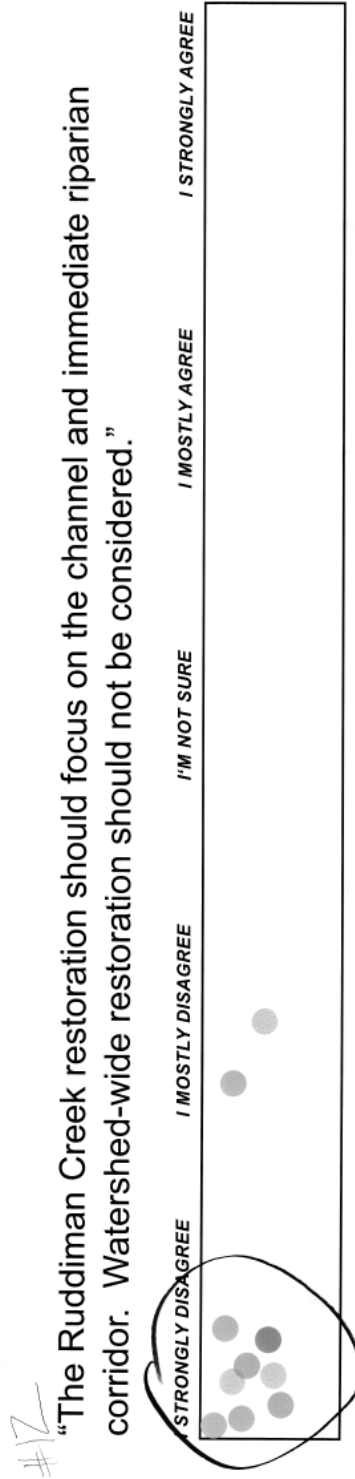
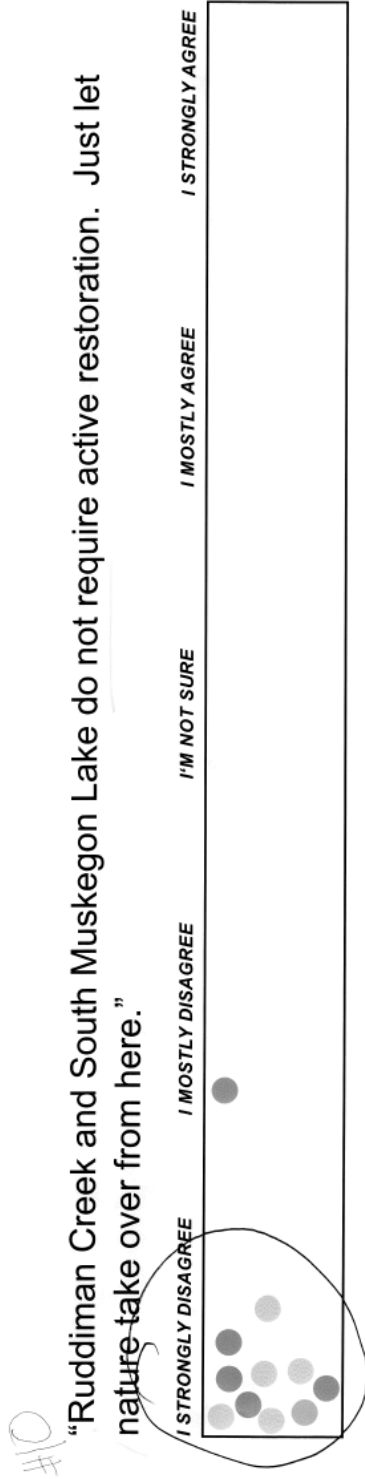


#1 "Ruddiman Creek and the South Muskegon Lake shoreline should be restored to their original, pre-development morphology."



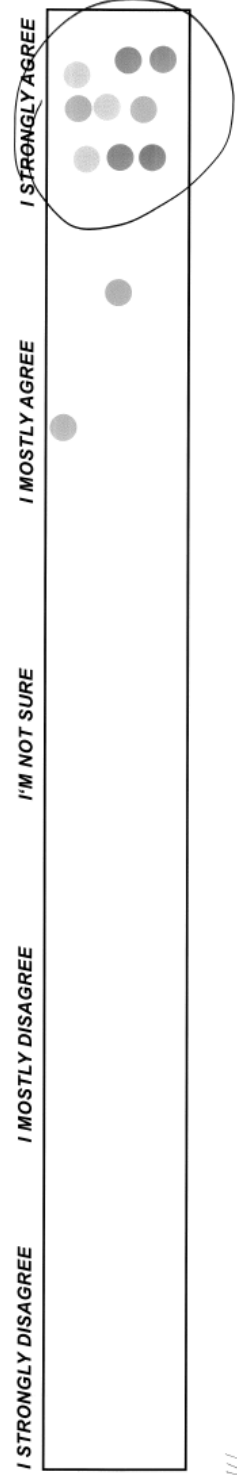
#10 "Only passive recreation such as nature appreciation and wildlife viewing should be allowed along Ruddiman Creek and South Muskegon Lake during and after the restoration process."





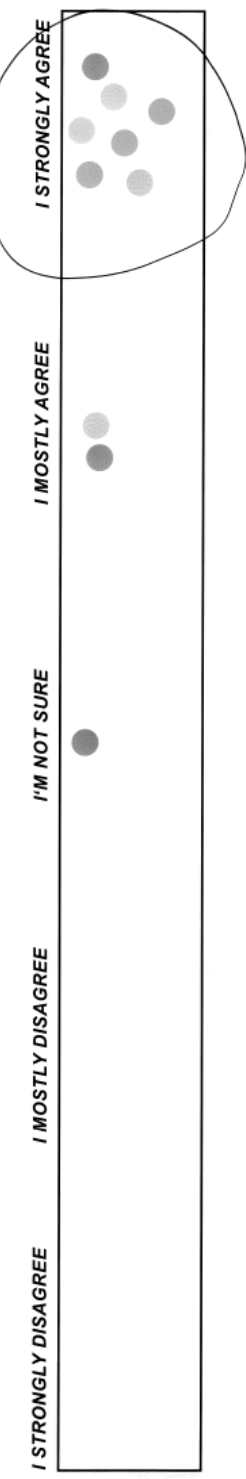
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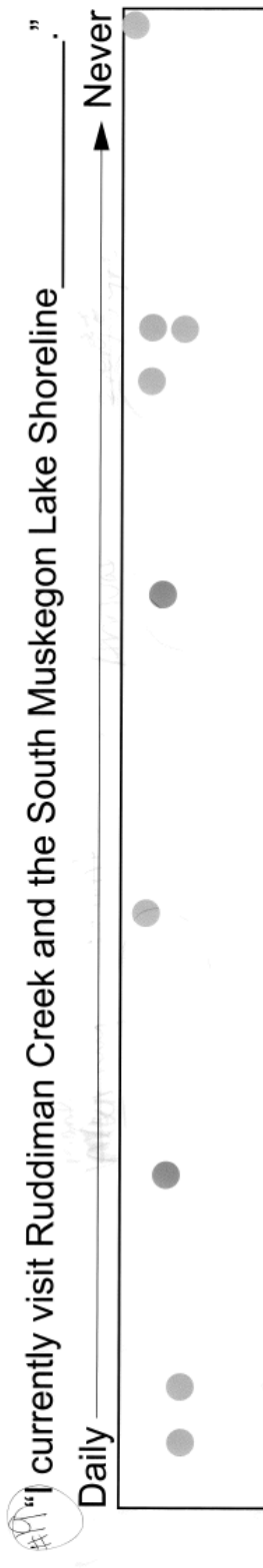
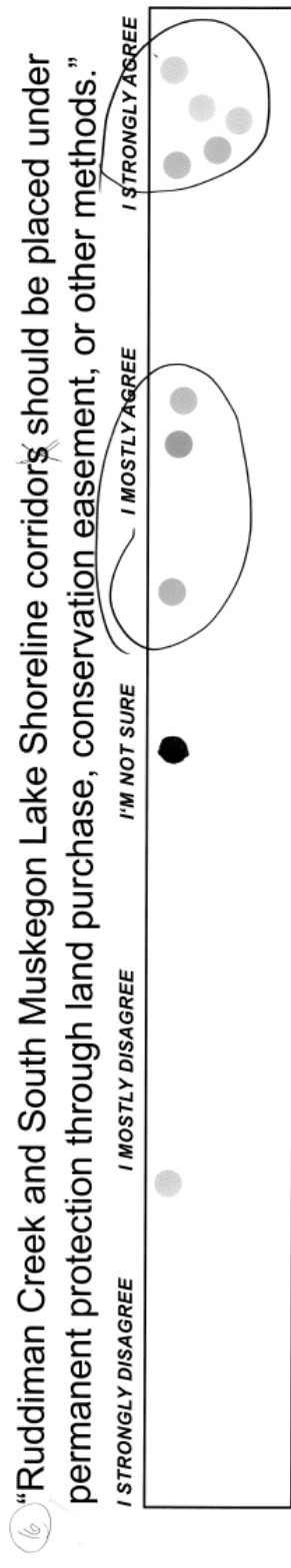
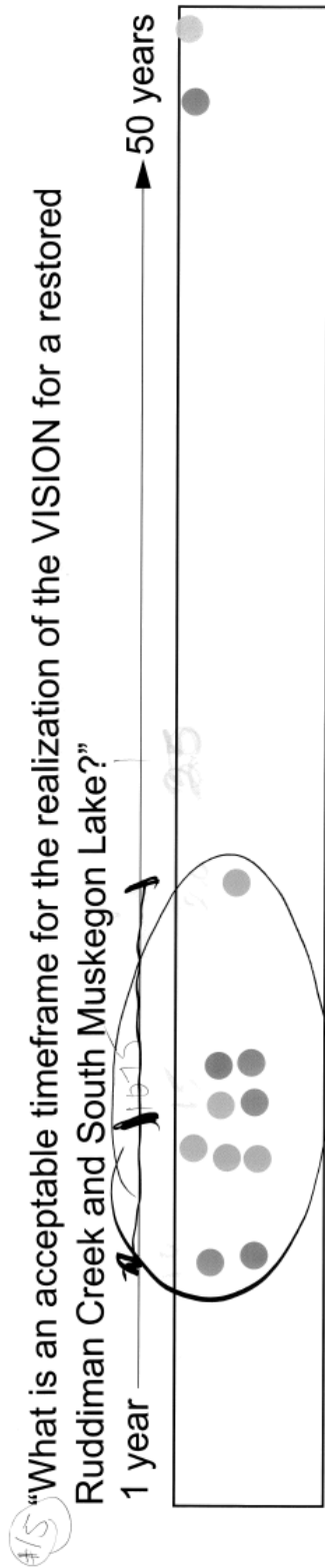
"The Ruddiman Creek and South Muskegon Lake restoration project should maximize the use of volunteers, and provide educational opportunities for the local community."



#14

"The Ruddiman Creek and South Muskegon Lake restoration will contribute to local economic development."



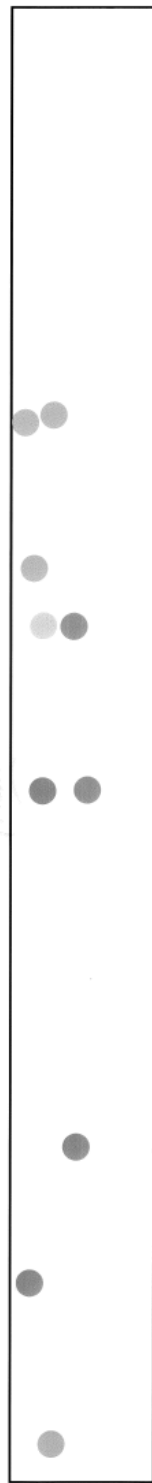




Handwritten notes: "NW" in a box, "#20", and "not a PDP" with an arrow pointing to the box.

"I would visit Ruddiman Creek and the South Muskegon Lake Shoreline \_\_\_\_\_ after the restoration plan has been implemented."

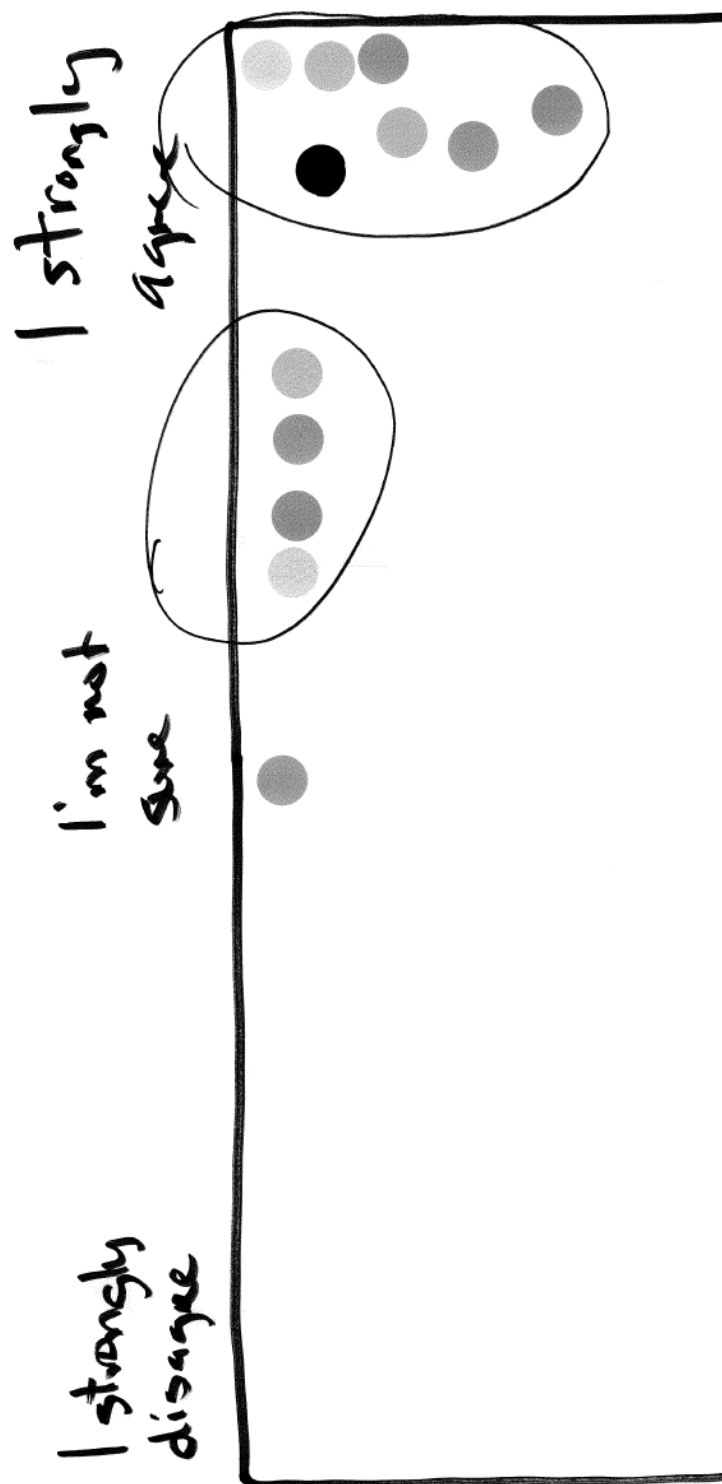
Daily \_\_\_\_\_ Never



⑦ "The Ruddiman Creek and South Muskegon Lake restoration master plan should remain flexible, to allow for the integration of new information and stakeholder interests."



#2/ Should there be a tool to judge the restoration's impact on the community values?



#22 "Should the Muskegon Lake Restoration

Partnership Monitor the restoration

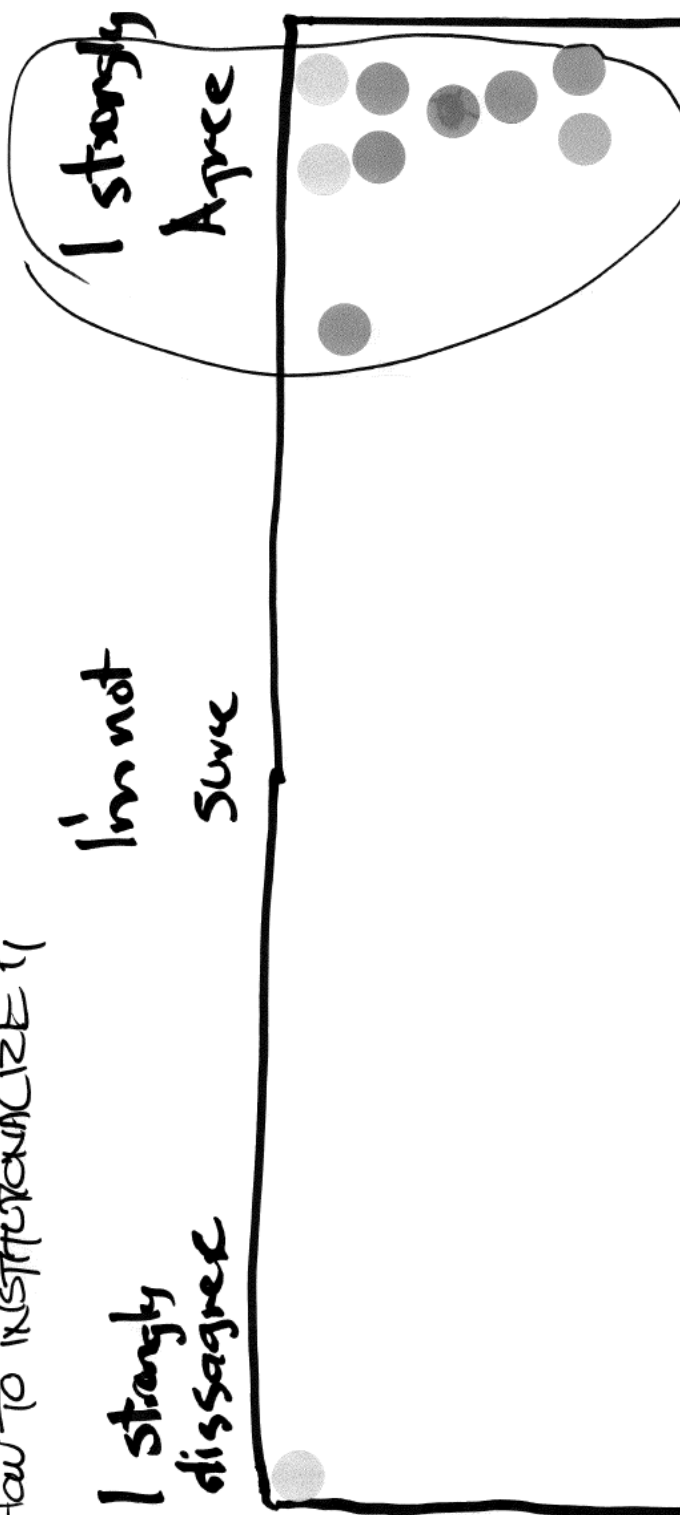
OR STAKEHOLDER COMMUNICATION

OR OTHERS to completion?

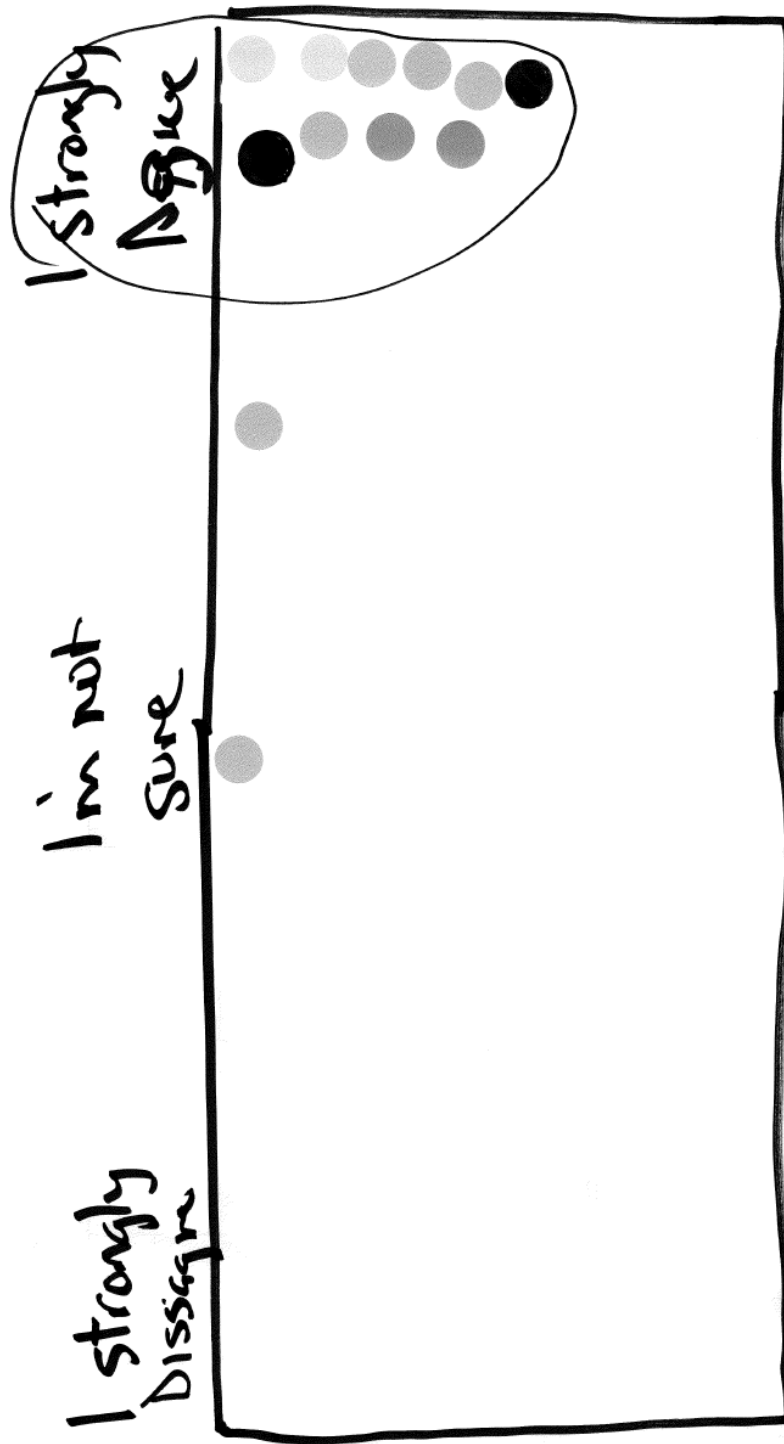
How to institutionalize it

I strongly disagree

I'm not sure



"There should be short term  
#23 mileposts/goals to track success."

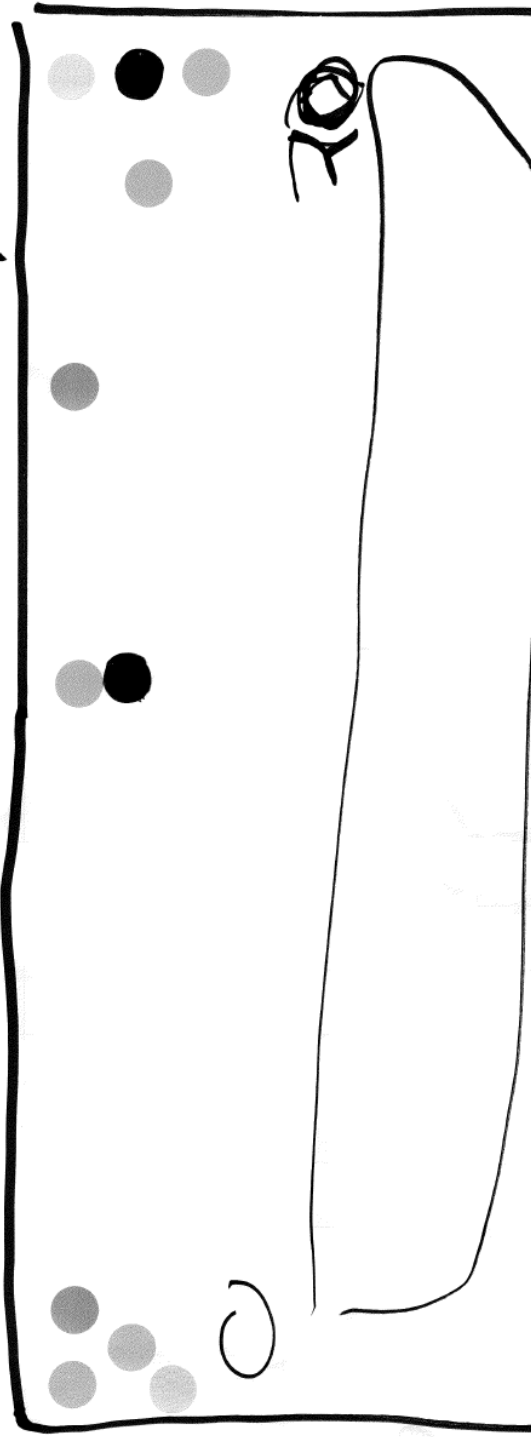


Should this master plan be revisited  
 every ~~5~~ other years?  
 # 24

I strongly  
 Disagree

I'm not  
 Sure

I strongly  
 AGREE





HEALTHY BORDERING CHILDREN  
VIEWING the healthy young of  
native wild life

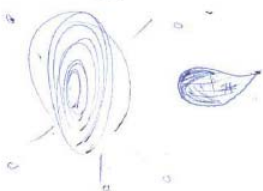
Ruddiman Natural Corridor x Pathway

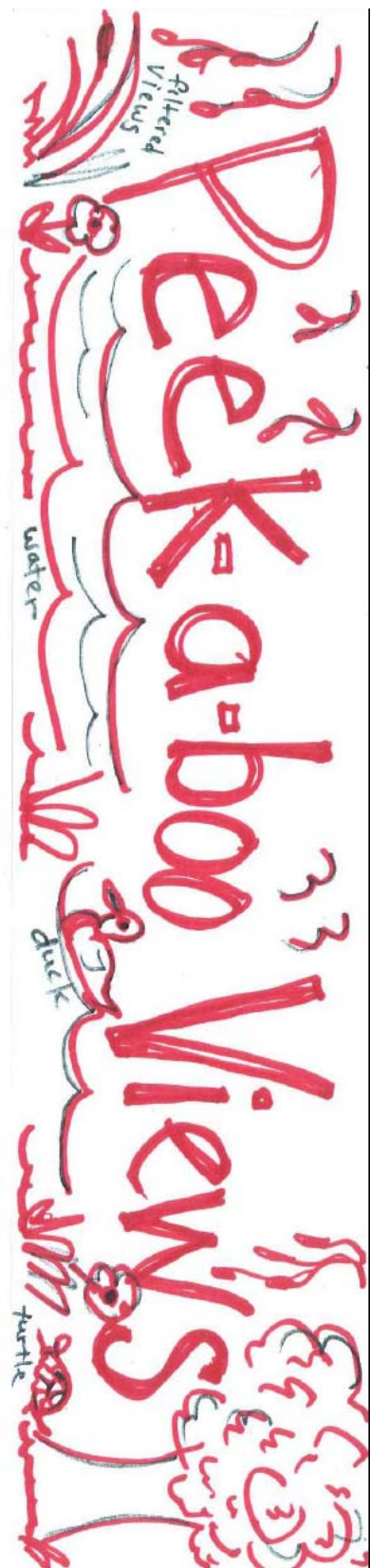
I SEE REDD   
AT RUDDI MAN CREEK

RUDDIMAN CREEK:  
Love It To Life!!

"Ruddiman Creek"  
Our Blue Lagoon

Habitat Ruddiman Creek





## Ruddiman Creek


Muskegon's Quiet Enjoyment

Salmon Q it - so should you

Ruddiman ~~Salmon~~ Creek

Learn to dislike  
 • Spotted Knapweed.  
 muskegon lake -  
 keep it cool  
 [Signature]

MUSKEGON	MARSH
RUDDIMAN	REIDS
WILDFIRE	WINDMILL


 Biohabitats  
incorporated  
[www.biohabitats.com](http://www.biohabitats.com)

Project: \_\_\_\_\_  
 Subject: \_\_\_\_\_



Big Bird Needs Habitat  
NOT MORE PAVEMENT  
AND GRASS

"All Natural" - Ruddiman Creek



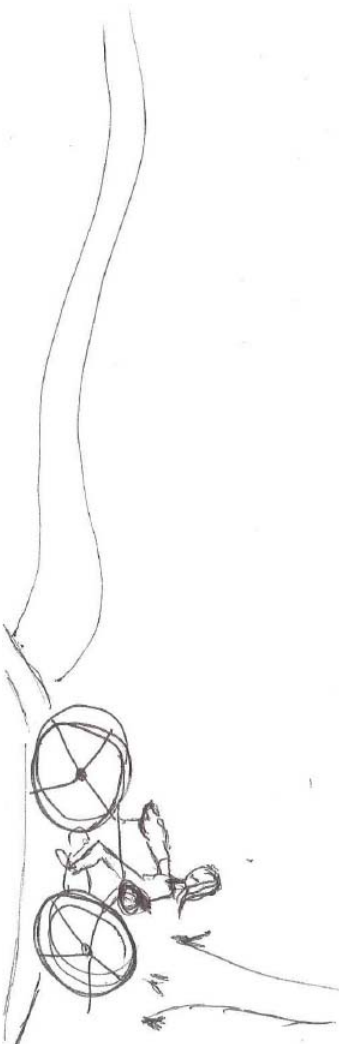
Muskegon's Nature Shore ~~Shore~~



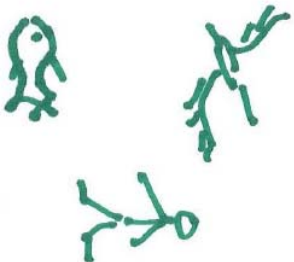


Touch the Resource  
Feel the source

Ruddiman Waterway  
Restored  
Revitalized  
Return to Nature



RUDDIMAN CREEK  
It's For the BIRDS!

MUSKEGON LAKE -  
IT MAKES LIFE  


I Swam in Ruddiman Creek!  
YOU CAN TOO!

Muskegon Lake  
(Is a great investment)

Up The Creek with  
a Paddle... <sup>Ruddiman</sup> ~~Muskegon Lake~~  
waters

PLANT MORE NATIVE  
TREES AND SHRUBS  
= MORE WILDLIFE HABITAT

✓  
✓  
✓

~~WELCOME~~  
 "HUMANS WELCOME"  
 The birds, fish, and wildlife of  
 Ruddiman Creek, Muskegon

~~Cross Lake Ferry~~  
 Nature & People  
 Lakeshore Trail

Ruddiman Creek  
 Clean MUD  
 Let your kids bring it home on their shoes...



LET'S BRING BACK THE

RUDDIMAN ... BECAUSE WE CAN!

WE BROUGHT BACK THE

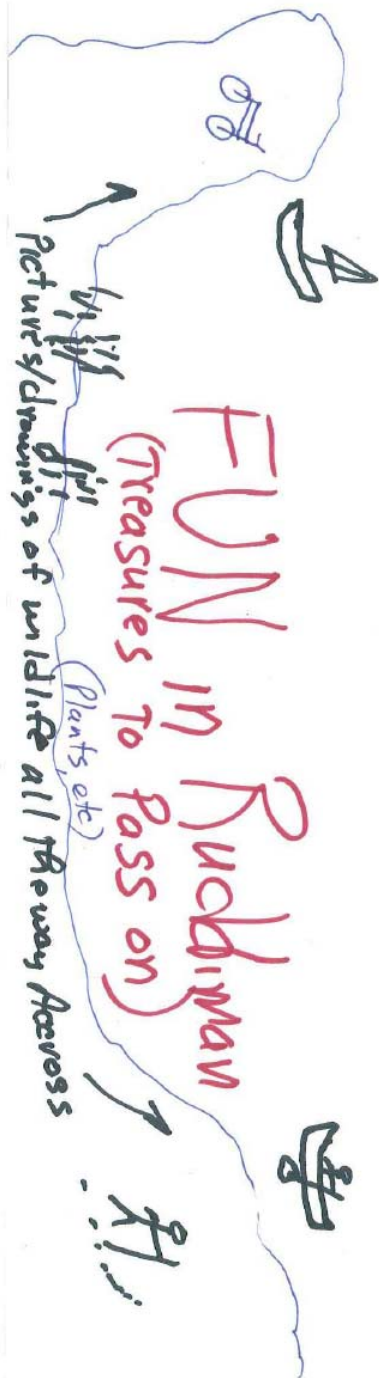
RUDDIMAN ... BECAUSE WE COULD!

*Native Species--Lots of Clean Water*



# Nature by Bike

Muskegon on a Human Scale



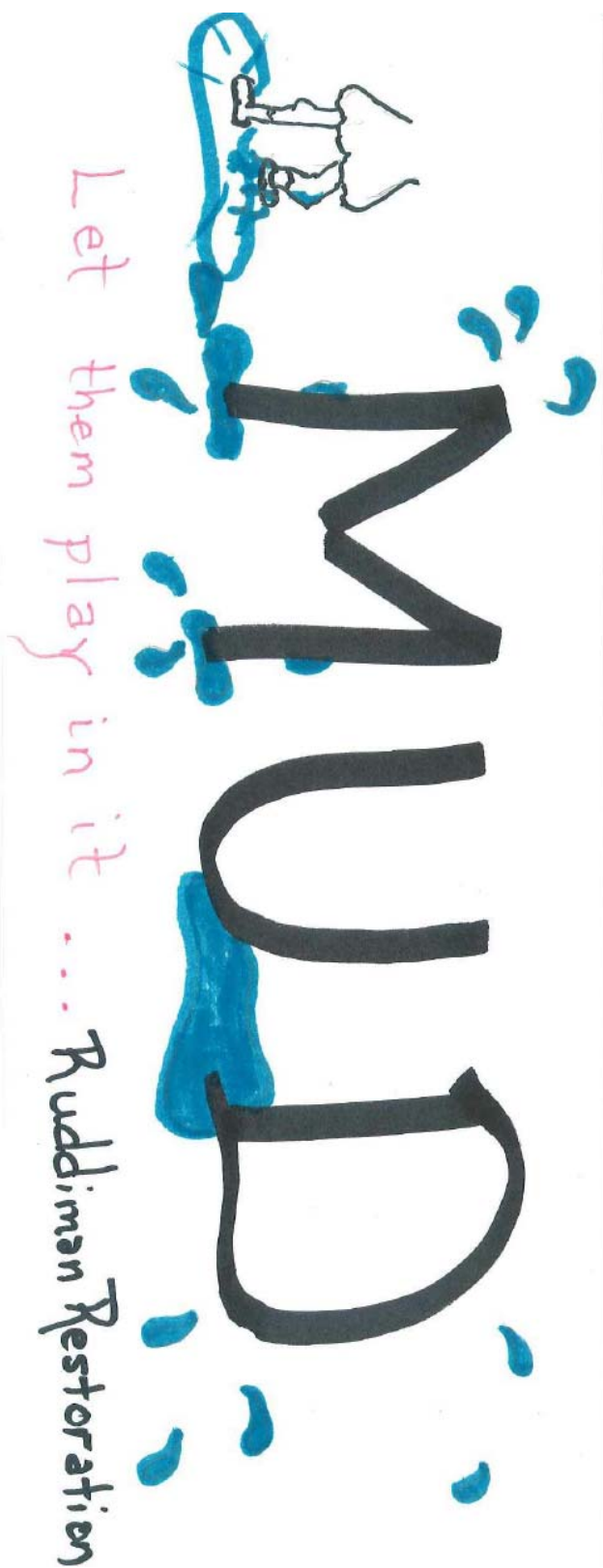
vision

A useful, attractive waterfront area blending human purpose and activity with a successful, high quality animal and plant habitat.

K.C.

The People, Place & The Things -  
Getting it Right

It is safe to eat the fish  
in Ruddiman Creek, I did!



**Muskegon Lake, Ruddiman Creek and Nearby Shoreline  
Public Workshop #2  
GVSU Michigan Alternative and Renewable  
Energy Center  
November 29, 2007  
2:00 – 6:30 PM**

**AGENDA**

- I. Field tour** **2:00 – 3:30**
- Travel from MAREC to the Outfall at West Sherman Blvd
  - McGraft Park and Ruddiman Lagoon
  - Muskegon lake shoreline near the Amoco Tank Farm Site and return to MAREC
- II. Break** **3:30 – 3:45**
- III. Introduction** **3:45 – 4:30**
- Welcome back – Biohabitats & USEPA.
  - Introductions by attendees – name & affiliation. What do you hope to accomplish today?
  - Overview of the afternoon- review the agenda and objective of the workshop:
    - What we hope to accomplish – how workshop information will be used.
    - Report back on Workshop No. 1
    - Review Vision and Guiding Principles – how these created the Draft Plan
- II. Break** **4:30 – 4:40**
- IV. The *Draft* Ecological Restoration Master Plan** **4:40 – 5:45**
- Overview
  - Clarification of Terminology in Plan
  - Board Tour
  - Open discussion
  - Adaptive management framework.
- V. Break** **5:45 – 6:00**
- VI. Transition to Implementation** **6:00 – 6:20**
- Phasing of the Plan
  - Funding of the Plan
  - Stakeholder roles
- VII . Wrap-up** **6:20 – 6:30**
- Steps to finalizing the Master Plan.
  - Evaluation
  - Thank you and Goodbye!



**LIST OF WORKSHOP PARTICIPANTS**  
**Muskegon Lake and Ruddiman Creek Ecological Restoration Workshop No. 2**  
 Muskegon, MI  
 November 29, 2007, 2:00PM - 6:30PM



Name	Affiliation	Email Address
Bob Fountain	City of Muskegon DPW	<a href="mailto:bob.fountain@postman.org">bob.fountain@postman.org</a>
Hope Mitchell	City of Muskegon Planning	<a href="mailto:hope.mitchell@postman.org">hope.mitchell@postman.org</a>
Bob Kavetsky	FWS	<a href="mailto:bob.kavetsky@fws.gov">bob.kavetsky@fws.gov</a>
Joe Bailey	Great Lakes Dock & Materials	<a href="mailto:jbailey@greatlakesdock.com">jbailey@greatlakesdock.com</a>
Jackie Adams	Illinois-Indiana Sea Grant	<a href="mailto:adams.jacqueline@epa.gov">adams.jacqueline@epa.gov</a>
Julie Sims	MDEQ	<a href="mailto:simsj@michigan.gov">simsj@michigan.gov</a>
Tom Berdinski	MDEQ-GR	<a href="mailto:berdinski@yahoo.com">berdinski@yahoo.com</a>
Greg Mund	MLPAC/WLPAC	<a href="mailto:gmund@aol.com">gmund@aol.com</a>
Wayne Groosbeck	MLWP Secretary	<a href="mailto:wgroos1308@comcast.net">wgroos1308@comcast.net</a>
Cynthia Price	MLWP/MLPAC	<a href="mailto:skyprice@gmail.com">skyprice@gmail.com</a>
Carolyn Weng	Muskegon County Nature Club/ Marsh Monitoring for BSC	<a href="mailto:wengch@gmail.com">wengch@gmail.com</a>
Kathy Evans	MLWP/WMSRDC	<a href="mailto:kevanssrcd@aol.com">kevanssrcd@aol.com</a>
Gary Noble	Muskegon River Watershed Assembly	<a href="mailto:nobleq@ferris.edu">nobleq@ferris.edu</a>
Theresa Bernhardt	RCTF/PAC	<a href="mailto:tbernhardt@comcast.net">tbernhardt@comcast.net</a>
Danielle Green	USEPA	<a href="mailto:green.danielle@epa.gov">green.danielle@epa.gov</a>
Karen Rodriguez	USEPA	<a href="mailto:rodriguez.karen@epa.gov">rodriguez.karen@epa.gov</a>
Ivette Bolender	Biohabitats	<a href="mailto:ibolender@biohabitats.com">ibolender@biohabitats.com</a>
Amelia Greiner	Biohabitats	<a href="mailto:adams.jacqueline@epa.gov">adams.jacqueline@epa.gov</a>
Paul Kovalcik	Biohabitats	<a href="mailto:pkovalcik@biohabitats.com">pkovalcik@biohabitats.com</a>
Brooke Derr	Biohabitats	<a href="mailto:bderr@biohabitats.com">bderr@biohabitats.com</a>
Dennis McKee	MLWP/Consumers Energy	
Gib King	USFWS	<a href="mailto:gib_king@fws.gov">gib_king@fws.gov</a>
Michael Stevenson	MCC Biology	
Terry Stilson	MRWA	<a href="mailto:mrwa@ferris.edu">mrwa@ferris.edu</a>
Christie Kroskie	GVSU	<a href="mailto:christieleep@hotmail.com">christieleep@hotmail.com</a>
Todd Parker	Delta Institute	<a href="mailto:tparker@deltainstitute.org">tparker@deltainstitute.org</a>
Jane Kroskie	GVSU	



**LIST OF WORKSHOP PARTICIPANTS**  
**Muskegon Lake and Ruddiman Creek Ecological Restoration Workshop No. 2**  
 Muskegon, MI  
 November 29, 2007, 2:00PM - 6:30PM



Name	Affiliation	Email Address
John Steinbeck	MLWP/Resident	<a href="mailto:mrjohn56@www.mail">mrjohn56@www.mail</a>
Mark Eisenbarth	Muskegon County Wastewater	
Janet Vail	GVSU-AWRI	<a href="mailto:vailj@gvsu.edu">vailj@gvsu.edu</a>
Tracy Collin	DEQ - LWMD	<a href="mailto:collint@michigan.gov">collint@michigan.gov</a>
Collette Klukos	White Pine Partners	
Dennis Kirksey	Kirksey Investments	<a href="mailto:Dkirksey@kirksey.cc">Dkirksey@kirksey.cc</a>
Jillian Koebbe	Michigan Steel	<a href="mailto:jillann_koebbe@awcqlc.com">jillann_koebbe@awcqlc.com</a>
Rich O'Neal	Michigan DNR	
David Boehm	City of Roosevelt Park	<a href="mailto:manager@rooseveltpark.org">manager@rooseveltpark.org</a>



**Stakeholder Group Meetings February 11-13, 2008**

Meetings included individuals from the following entities.

City of Muskegon

Michigan Steel

Kirksey Investment Corp.

Grand Valley State University

Muskegon Lake Public Advisory Council

Muskegon Conservation District

Greater Muskegon Catholic Schools

West Michigan Shoreline Regional Development Commission

## Appendix B

### Aquatic Vegetation 1995 Study

Muskegon Lake Aquatic Plant Assessment by Dr. Mark Luttenton (1995): associated with Water Resources Institute, Grand Valley State University

2 transects located within project area

	SS7 south end of natural shoreline		SS8 off of south peninsula	
Length	265 m		265m	
Depth limits	3.10m		1.80m	
Plants (shore to 50m out)	Few plants Vallisneria americana (Wild celery)	Also present Potamogeton (pond weed family)  Ranunculus (crowfoot family)	Vallisneria	Also present Potamogeton richardsonii Najas flexilis  Myriophyllum Heteranthera Elodea Chara
60 – 225m out	78m – Potamogeton, Myriophyllum, Heteranthera		Vallisneria	
245m out	Elodea, Myriophyllum Heteranthera		Vallisneria	



## Appendix C

### Wetland Vegetation

#### Emergent Wetland

Common Name	Scientific Name	Frequency
common cattail	<i>Typha latifolia</i>	present
common reed*	<i>Phragmites australis</i>	present
narrow-leaved cattail*	<i>Typha angustifolia</i>	abundant
purple loosestrife*	<i>Lythrum salicaria</i>	present
reed canary grass*	<i>Phalaris arundinacea</i>	common
rush	<i>Scirpus</i> spp.	present
sedge	<i>Carex</i> spp.	present
* exotic/invasive species		

#### Scrub-shrub Wetland

Common Name	Scientific Name	Frequency
dogwood, grey	<i>Cornus</i>	common
dogwood, red-osier	<i>Cornus stolonifera</i>	common
dogwood, silky	<i>Cornus</i>	common
glossy buckthorn*	<i>Rhamnus frangula</i>	abundant
Japanese knotweed*	<i>Polygonum cuspidatum</i>	present
swamp milkweed	<i>Aesclepias incarnata</i>	present
swamp rose	<i>Rosa palustris</i>	common
willow	<i>Salix</i> spp.	abundant
* exotic/invasive species		

## Appendix D

### Terrestrial Vegetation

#### Lakeshore Upland

Common Name	Scientific Name	Frequency
black locust	<i>Robinia pseudoacacia</i>	present
boxelder	<i>Acer negundo</i>	present
eastern cottonwood	<i>Populus deltoides</i>	common
London planetree*	<i>Platanus hybrida</i>	rare
tree of heaven*	<i>Ailanthus altissima</i>	common
red maple	<i>Acer rubrum</i>	rare
red mulberry	<i>Morus rubra</i>	common
staghorn sumac	<i>Rhus typhina</i>	common
bindweed*	<i>Convolvulus arvensis</i>	present
bouncing bet*	<i>Saponaria officinalis</i>	present
butter-and-eggs*	<i>Linaria vulgaris</i>	present
Canada thistle*	<i>Cirsium canadensis</i>	present
chicory*	<i>Cichorium intybus</i>	present
common mullein*	<i>Verbascum thapsus</i>	present
crown vetch*	<i>Coronilla varia</i>	present
grape*	<i>Vitis</i> spp.	present
hoary alyssum*	<i>Berteroa incana</i>	present
ironweed	<i>Veronia</i> Shreb.	present
pokeweed*	<i>Phytolacca americana</i>	present
swamp milkweed	<i>Aesclepias incarnata</i>	present
spotted knapweed*	<i>Centaurea maculosa</i>	present
St. Johnswort*	<i>Hypericum perforatum</i>	present
Virginia creeper	<i>Parthenocissus quinquefolia</i>	present
white campion*	<i>Silene pratensis</i>	present
white sweet clover*	<i>Melilotus alba</i>	common

\* exotic/invasive species

## Riparian Upland – Lagoon Park Land Area

Common Name	Scientific Name	Frequency
black locust*	<i>Robinia pseudoacacia</i>	present
boxelder	<i>Acer negundo</i>	present
eastern cottonwood	<i>Populus deltoides</i>	common
ironweed	<i>Veronia</i> Shreb.	present
Pokeweed*	<i>Phytolacca americana</i>	present
maple, red	<i>Acer rubrum</i>	rare
maple, silver	<i>Acer saccharinum</i>	present
oak, red	<i>Quercus rubra</i>	common
Norway maple*	<i>Acer platanoides</i>	present
red mulberry	<i>Morus rubra</i>	common
sassafras	<i>Sassafras albidum</i>	present
staghorn sumac	<i>Rhus typhina</i>	common
tree of heaven*	<i>Ailanthus altissima</i>	abundant
viburnum	<i>Viburnum</i> spp.	rare
white ash	<i>Fraxinus americana</i>	present
burdock*	<i>Arctium minus</i>	present
Canada thistle	<i>Cirsium canadensis</i>	present
common mullein*	<i>Verbascum thapsus</i>	present
grape	<i>Vitis</i> spp.	present
turf grass		present
white sweet clover*	<i>Melilotus alba</i>	common

\* exotic/invasive species

## Riparian Upland

Common Name	Scientific Name	Frequency
American beech	<i>Fagus grandifolia</i>	present
black locust*	<i>Robinia pseudoacacia</i>	present
boxelder	<i>Acer negundo</i>	present
eastern cottonwood	<i>Populus deltoides</i>	common
elderberry	<i>Sambucus</i> spp.	present
flowering dogwood	<i>Cornus florida</i>	rare
greenbriar*		present
honeysuckle amur	<i>Lonicera maackii</i>	common
honeysuckle, tartarian	<i>Lonicera tartarica</i>	abundant
lowbush blueberry	<i>Vaccinium angustifolium</i>	present
maple, red	<i>Acer rubrum</i>	rare
maple, silver	<i>Acer saccharinum</i>	present
oak, red	<i>Quercus rubra</i>	common
oak, white	<i>Quercus alba</i>	present
red mulberry	<i>Morus rubra</i>	common
sassafras	<i>Sassafras albidum</i>	present
tree of heaven*	<i>Ailanthus altissima</i>	abundant
viburnum, arrowwood	<i>Viburnum dentatum</i>	present
viburnum, mapleleaf	<i>Viburnum acerifolium</i>	common
white pine	<i>Pinus strobus</i>	present
wild cherry	<i>Prunus</i> spp.	common
witchhazel	<i>Hamamelis virginiana</i>	present
bindweed*	<i>Convolvulus arvensis</i>	present
bittersweet*	<i>Celastrus orbiculatus</i>	rare
Canada thistle*	<i>Cirsium canadensis</i>	present
european lily of the valley	<i>Convallaria majalis</i>	present
garlic mustard*	<i>Alliaria petiolata</i>	present
grape	<i>Vitis</i> spp.	present
periwinkle*	<i>Vinca minor</i>	present
swamp milkweed	<i>Aesclepias incarnata</i>	present
* exotic/invasive species		

## Appendix E

### Reference Site Vegetation

#### Ryerson Creek: Between Home and Getty Streets

Common Name	Scientific Name	Frequency
bearberry	<i>Arctostaphylos uva-ursi</i>	present
blazing star	<i>Liatris</i> spp.	present
dogwood, redosier	<i>Cornus stolonifera</i>	common
harebell	<i>Campanula rotundifolia</i>	present
horsetail	<i>Equisetum arvense</i>	present
lowbush blueberry	<i>Vaccinium angustifolia</i>	present
lupine	<i>Lupinus perennis</i>	present
oak, white	<i>Quercus alba</i>	present
oak, red	<i>Quercus rubra</i>	common
sassafras	<i>Sassafras albidum</i>	present
sweet fern	<i>Comptonia peregrine</i>	present
wild Cherry	<i>Prunus</i> spp.	common

\* exotic/invasive species

## Duck Lake: North Shore

Common Name	Scientific Name	Frequency
American beech	<i>Fagus grandifolia</i>	present
bearberry	<i>Kinnikinnick uva-ursi</i>	present
cottonwood	<i>Populus deltoids</i>	present
creeping juniper	<i>Juniperus horizontalis</i>	common
dogwood, shrub	<i>Cornus</i> spp.	present
horsetail	<i>Equisetum arvense</i>	present
lowbush blueberry	<i>Vaccinium angustifolia</i>	present
lupine	<i>Lupinus perennis</i>	present
maple, red	<i>Acer rubrum</i>	present
oak, white	<i>Quercus alba</i>	present
oak, red	<i>Quercus rubra</i>	common
sassafras	<i>Sassafras albidum</i>	common
sedge	<i>Carex</i> spp.	present
white pine	<i>Pinus strobus</i>	common
willow	<i>Salix</i> spp.	present
witch-hazel	<i>Hamamelis virginiana</i>	present

\* exotic/invasive species



## Appendix F

### Relevant Zoning in the Project Area

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#### ARTICLE XV - I-2 GENERAL INDUSTRIAL DISTRICTS

##### PREAMBLE

The I-2 General Industrial Districts are established primarily for manufacturing, assembling, and fabrication activities including large scale or specialized industrial operations whose external physical effects may be felt to some degree by surrounding districts. The I-2 District is so structured as to permit, in addition to I-1 Light Industrial District uses, the manufacturing, processing and compounding of semifinished or finished products from raw materials.

##### SECTION 1500: PRINCIPAL USES PERMITTED

In an I-2 General Industrial District, buildings and land may be used for one (1) or more of the following specified uses, unless otherwise provided in this Article.

1. Any Principal Use Permitted in the I-1 District, subject to the requirements of this District.
2. Primary metal industries, including foundries, smelting and refining of metal or alloys, rolling and extruding plants.
3. Chemical plants whose manufacturing process produce products which are not hazardous materials as defined in the Fire Code.

4. Paper and pulp manufacturing.
5. Power generating plants.
6. Junk yards and scrap metal processing.
7. Rubber manufacturing or the remanufacturing of rubber products.
8. Uses similar to the above principal uses.
9. Non-accessory signs provided that the signs conform to Section 2308(1) of this Code.

#### SECTION 1501: SPECIAL LAND USES PERMITTED

The following uses, and their accessory buildings and accessory uses, shall be permitted as a special land use if it is found to meet the standards outlined in Section 2332 of this Ordinance, subject to applicable conditions imposed by Ordinance or other reasonable conditions imposed by the Planning Commission:

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1. Any use with outside storage of aggregate, sand or other soil, or raw materials used in a manufacturing process such as brick, tile manufacturing plants, asphalt and cement batch plants.
2. Gasoline storage facilities.
3. Bulk storage or the production of acetylene, natural gas, and oxygen or other highly explosive or toxic gases. The storage of such gases for use in a production process or of an industry, business, or health care facility shall not be considered bulk storage.
4. Chemical plants whose manufacturing process produce products which are hazardous materials as defined in the Fire Code.
5. Uses similar to the above Special Land uses.

#### SECTION 1502: PLANNED UNIT DEVELOPMENTS

Planned developments may be allowed by the Planning Commission under the procedural guidelines of Section 2101. The intent of Planned Unit Developments in the I-2 General Industrial District is to allow mixed land uses, which are compatible to each other.

#### SECTION 1503: AREA AND BULK REQUIREMENTS [amended 4/00]

1. Minimum lot size: 43,560 sq. feet.
2. Maximum lot coverage:

Buildings: 85 %

Pavement: 25 %

3. Lot width: 150 feet (shall be measured at road frontage unless a cul-de-sac, then measured from setback).

4. Width to depth ratios: The depth of any lot(s) or parcel(s) shall not be more than three (3) times longer its width.

5. Height limit: 3 stories or 50 feet

Height measurement: In the case of a principal building, the vertical distance measured from the average finished grade to the highest point of the roof surface where the

building line abuts the front yard, except as follows: to the deck line of mansard roofs,

and the average height between eaves and the ridge of gable, hip, and gambrel roofs (see

Figure 2-2). If the ground is not entirely level, the grade shall be determined by

averaging the elevation of the ground for each face of the building (see Figure 2-4).

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2/05

6. Front Setbacks: [amended 1/05]

Minimum:

Expressway or Arterial Street :  
30 feet

Collector or Major Street: 20  
feet

Minor Street: 10 feet

7. Rear setback: 10 feet

8. Setback from the ordinary high water mark or wetland:  
75 feet (principal structures  
only).

9. Side setbacks:

1-story: 10 feet and 20 feet

2-story: 15 feet and 25 feet

3-story: 20 feet and 30 feet

Note, setback measurement: All required setbacks shall  
be measured from the right-of-

way line to the nearest point of the determined drip  
line of buildings. [amended 10/02]

10. Zero lot line option: New principal buildings may be  
erected on the rear lot line and/or

one side lot line provided: [amended 10/02]

a. The building has an approved fire rating for  
zero-lot line development under the  
building code.

b. The building has adequate fire access



preserved pursuant to fire code requirements.

c. The zero lot line side is not adjacent to a street.

d. A maintenance access easement is granted by the adjacent property owner and recorded with the County Register of Deeds and provided to the zoning administrator with the site plan or plot plan.

e. It is not adjacent to wetlands, or waterfront.

11. All required side and rear setbacks shall be landscaped, greenbelt buffers, unless zero-lot-line is employed for a structure or fire access. At least fifty percent of all required front setbacks shall be landscaped and adjacent to the road right-of-way. An average minimum greenbelt of 10 feet shall be maintained along each street frontage. [amended 12/01, amended 10/02]

## ARTICLE XVI - OSC OPEN SPACE CONSERVATION DISTRICTS

### PREAMBLE

The OSC Open Space Conservation Districts are intended to provide for permanent open spaces in the community, and the protection of sand dunes and other natural features, and are designed to provide undeveloped recreational areas and to safeguard the health, safety, and welfare of the citizens of Muskegon and adjacent areas by limiting development in locations where police and fire protection, protection against flooding by high water table or storm water, and dangers from excessive erosion are not possible without excessive costs to the City.

### SECTION 1600: PRINCIPAL USES PERMITTED

In the OSC Open Space Conservation District, no building or land shall be used and no building shall be erected, structurally altered, or occupied except for one (1) or more of the following specified uses, unless otherwise provided in this Ordinance.

1. Fishing docks and piers.
2. Hiking, bicycling, jogging, or ski trails.
3. Wildlife preserves or refuge structures.
4. Watershed or erosion protection facilities.
5. Uses similar to the above Principal Uses Permitted.

### SECTION 1601: SPECIAL LAND USES PERMITTED

The following uses, and their accessory buildings and accessory uses, shall be permitted under the purview of Section 2332 after review and approval of the use (and a site plan, if required) by the Planning Commission, after Public Hearing, subject to the applicable conditions, and any other reasonable conditions imposed by the Planning Commission:

1. Public and private utilities and services.
2. Accessory buildings and accessory uses customarily incidental to the above Special Land Uses Permitted.
3. Uses similar to the above Special Land Uses Permitted.
4. Parking areas for Principal Uses.

#### SECTION 1602: PLANNED UNIT DEVELOPMENTS [amended 10/98]

Planned developments may be allowed by the Planning Commission under the procedural guidelines of Section 2101. The intent of Planned Unit Developments in the open space conservation districts to allow mixed land uses permitted in the OSC zone, which are compatible to each other.

#### SECTION 1603: AREA AND BULK REQUIREMENTS [amended 4/00]

1. Minimum lot size: 21,780 sq. feet.
2. Maximum lot coverage:

Buildings: 20 %

Pavement: 15 %

3. Lot width: 100 feet (shall be measured at road frontage unless a cul-de-sac, then measured from setback).

4. Width to depth ratios: The depth of any lot(s) or parcel(s) shall not be more than three (3) times longer its width.

5. Height limit: 2 stories or 35 feet.

Height measurement: In the case of a principal building, the vertical distance measured

from the average finished grade to the highest point of the roof surface where the

building line abuts the front yard, except as follows: to the deck line of mansard roofs,

and the average height between eaves and the ridge of gable, hip, and gambrel roofs (see

Figure 2-2). If the ground is not entirely level, the grade shall be determined by

averaging the elevation of the ground for each face of the building (see Figure 2-3).

6. Front Setbacks:

Minimum:

Expressway, Arterial Street or Major Street: 30 feet

Collector Street: 20 feet

Minor Street: 10 feet

7. Rear setback: 10 feet

8. Setback from the ordinary high water mark or wetland: 75

feet (principal structures only).

9. Side setbacks:

1-story: 6 feet and 10 feet

2-story: 8 feet and 12 feet

Note, setback measurement: All required setbacks shall be measured from the right-of-

way line to the nearest point of the determined drip line of buildings. [amended 10/02]

10. Zero lot line option: New principal buildings may be erected on the rear lot line and/or

one side lot line provided: [amended 10/02]

a. The building has an approved fire rating for zero-lot line development under the building code.

b. The building has adequate fire access preserved pursuant to fire code requirements.

c. The zero lot line side is not adjacent to a street.

d. A maintenance access easement is granted by the adjacent property owner and recorded with the County Register of Deeds and provided to the zoning administrator with the site plan or plot plan.

e. It is not adjacent to wetlands, or waterfront.



11. All required side and rear setbacks shall be landscaped, greenbelt buffers, unless zero-lot-

line is employed for a structure or fire access. At least fifty percent of all required front

setbacks shall be landscaped and adjacent to the road right-of-way. An average

minimum greenbelt of 10 feet shall be maintained along each street frontage. [amended

12/01, amended 10/02]

## ARTICLE XVII - OSR OPEN SPACE RECREATION DISTRICTS

### PREAMBLE

The OSR Open Space Recreation Districts are intended to provide for permanent open spaces in the City and are designed to provide recreational activities that are limited to country clubs, marinas, and the like. These Districts are further intended to safeguard the natural features of the City, and the health, safety, and welfare of the citizens of Muskegon and the adjacent area by limiting developments to locations where police and fire protection, or protection against flooding by high water table or storm water, or dangers from excessive erosion are not possible without excessive costs to the City.

### SECTION 1700: PRINCIPAL USES PERMITTED

In the OSR Open Space Recreation Districts, no building or land shall be used and no building shall be erected, structurally altered, or occupied except for one (1) or more of the following specified used, unless otherwise provided in this Ordinance:

1. Fishing docks and piers.
2. Hiking, bicycling, jogging, or ski trails.
3. Wildlife preserves or refuge structures.
4. Watershed or erosion protection facilities.
5. Parks, playgrounds, and playfields.

6. Accessory uses customarily incidental to the above Principal Uses Permitted.

7. Uses similar to the above Principal Uses Permitted.

#### SECTION 1701: SPECIAL LAND USES PERMITTED

The following uses, and their accessory buildings and accessory uses, shall be permitted under the purview of Section 2332 after review and approval of the use (and a site plan, if required) by the Planning Commission, after Public Hearing, subject to the applicable conditions, and any other reasonable conditions imposed by the Planning Commission:

1. Country clubs.
2. Marinas for the berthing and servicing of boats, but without major repair or storage facilities.
3. Public and private utilities and services.
4. Seasonal, recreational, campers and trailer parks, and facilities.
5. Amusement facilities excepting outdoor theaters, adult theaters, and adult bookstores.
6. Seasonal or year-round craft shops.
7. Conference and reception auditoriums.
8. Galleries and museums.

9. Open air amphitheaters.
10. Restaurants and cocktail lounges.
11. Any other similar uses or activity requiring buildings or structures.
12. Accessory buildings and accessory uses customarily incidental to the above Special Land  
Uses Permitted.
13. Uses similar to the above Special Land Uses Permitted.

SECTION 1702: PLANNED UNIT DEVELOPMENT [amended 10/98]

Planned developments may be allowed by the Planning Commission under the procedural guidelines of Section 2101. The intent of Planned Unit Developments in the OSR Open Space Recreation Districts is to allow mixed land uses which are compatible to each other, while prohibiting uses which would not be compatible or harmonious with permitted uses.

SECTION 1703: AREA AND BULK REQUIREMENTS [amended 4/00]

1. Minimum lot size: 21,780 sq. feet.
2. Maximum lot coverage:  
Buildings: 20%  
Pavement: 15%
3. Lot width: 100 feet (shall be measured at road frontage unless a cul-de-sac, then  
measured from setback).

4. Width to depth ratios: The depth of any lot(s) or parcel(s) shall not be more than three (3) times longer its width.

5. Height limit: 2 stories or 35 feet.

Height measurement: In the case of a principal building, the vertical distance measured

from the average finished grade to the highest point of the roof surface where the

building line abuts the front yard, except as follows: to the deck line of mansard roofs,

and the average height between eaves and the ridge of gable, hip, and gambrel roofs (see

Figure 2-2). If the ground is not entirely level, the grade shall be determined by

averaging the elevation of the ground for each face of the building (see Figure 2-3).

6. Front Setbacks:

Minimum:

Expressway, Arterial Street or Major Street: 30 feet

Collector Street: 20 feet

Minor Street: 10 feet

7. Rear setback: 10 feet

8. Setback from the ordinary high water mark or wetland: 75 feet (principal structures only).

9. Side setbacks:

1-story: 6 feet and 10 feet  
2-story: 8 feet and 12 feet

Note, setback measurement: All required setbacks shall be measured from the right-of-

way line to the nearest point of the determined drip line of buildings. [amended 10/02]

10. Zero lot line option: New principal buildings may be erected on the rear lot line and/or one side lot line provided: [amended 10/02]

a. The building has an approved fire rating for zero-lot line development under the building code.

b. The building has adequate fire access preserved pursuant to fire code requirements.

c. The zero lot line side is not adjacent to a street.

d. A maintenance access easement is granted by the adjacent property owner and recorded with the County Register of Deeds and provided to the zoning administrator with the site plan or plot plan.

e. It is not adjacent to wetlands, or waterfront.

11. All required side and rear setbacks shall be landscaped, greenbelt buffers, unless zero-lot-line is employed for a structure or fire access. At



least fifty percent of all required front

setbacks shall be landscaped and adjacent to the road right-of-way. An average

minimum greenbelt of 10 feet shall be maintained along each street frontage. [amended

12/01, amended 10/02]

## ARTICLE XVIII - LR LAKEFRONT RECREATION DISTRICTS

### PREAMBLE

The primary intent of the LR Lakefront Recreation District is to provide for areas abutting Muskegon Lake including Muskegon River and Lake Michigan to be utilized for both public and private recreational and recreation oriented facilities. It is intended that any commercial facilities be limited to water related recreation activities.

### SECTION 1800: PRINCIPAL USED PERMITTED

In the LR Lakefront Recreation District, no building or land shall be used and no building shall be erected, structurally altered, or occupied except for one (1) or more of the following specified uses, unless otherwise provided in this Ordinance.

1. Marinas for the berthing and servicing of boats, but without major repair or storage facilities.
2. Restaurants and cocktail lounges.
3. Hotels and motels.
4. Accessory buildings and accessory uses customarily incidental to the above Principal Uses Permitted.
5. Uses similar to the above Principal Uses Permitted.

### SECTION 1801: SPECIAL LAND USES PERMITTED

The following uses, and their accessory buildings and accessory uses, shall be permitted under the purview of Section 2332 after review and approval of the use (and a site plan, if required) by the Planning Commission, after Public Hearing, subject to the applicable conditions, and any other reasonable conditions imposed by the Planning Commission:

1. Residential development projects.
2. Private clubs, lodge halls, social, or recreational uses.
3. Accessory buildings and accessory uses customarily incidental to the above Special Land Use Permitted.
4. Seasonal, recreational, camper and trailer parks, and facilities.
5. Uses similar to the above Special Land Uses Permitted.

#### SECTION 1802: PLANNED UNIT DEVELOPMENTS [amended 10/98]

Planned developments may be allowed by the Planning Commission under the procedural guidelines of Section 2101. The intent of Planned Unit Developments in the LR Lakefront Recreation Districts is to allow mixed land uses, which are compatible to each other, while prohibiting nonresidential uses which would not be compatible or harmonious with lakefront recreation activities, or residential dwellings.

#### SECTION 1803: AREA AND BULK REQUIREMENTS [amended 4/00]

1. Minimum lot size: 21,780 sq. feet.
2. Dedicated open space requirement: 15%
3. Maximum lot coverage:  
Buildings: 60 %  
Pavement: 15 %
4. Lot width: 150 feet (shall be measured at road frontage unless a cul-de-sac, then measured from setback).
5. Maximum building width: 50% (as a portion of the lot width).
6. Width to depth ratios: The depth of any lot(s) or parcel(s) shall not be more than three (3) times longer its width.
7. Height limit: 4 stories or 60 feet.

Height measurement: In the case of a principal building, the vertical distance measured from the average finished grade to the highest point of the roof surface where the building line abuts the front yard, except as follows: to the deck line of mansard roofs, and the average height between eaves and the ridge of gable, hip, and gambrel roofs (see Figure 2-2). If the ground is not entirely level, the grade shall be determined by averaging the elevation of the ground for each face of the building (see Figure 2-3).

8. Front Setbacks:

Minimum:

Expressway, Arterial Street or Major  
Street: 30 feet

Collector Street: 20 feet

Minor Street: 10 feet

9. Rear setback: 10 feet

10. Setback from the ordinary high water mark or wetland: 75  
feet (principal structures  
only).

11. Side setbacks:

1-story: 8 feet and 12 feet

2-story: 10 feet and 14 feet

3-story: 12 feet and 16 feet

4-story: 16 feet and 20 feet

Note, setback measurement: All required setbacks shall  
be measured from the right-of-

way line to the nearest point of the determined drip line  
of buildings. [amended 10/02]

12. Zero lot line option: New principal buildings may be  
erected on the rear lot line and/or

one side lot line provided: [amended 10/02]

a. The building has an approved fire rating for zero-  
lot line development under the  
building code.

b. The building has adequate fire access preserved  
pursuant to fire code  
requirements.

c. The zero lot line side is not adjacent to a street.

d. A maintenance access easement is granted by the adjacent property owner and  
recorded with the County Register of Deeds and  
provided to the zoning  
administrator with the site plan or plot plan.

e. It is not adjacent to wetlands, or waterfront.

13. All required side and rear setbacks shall be landscaped, greenbelt buffers, unless zero-lot-

line is employed for a structure or fire access. At least fifty percent of all required front

setbacks shall be landscaped and adjacent to the road right-of-way. An average

minimum greenbelt of 10 feet shall be maintained along each street frontage. [amended

12/01, amended 10/02]



## ARTICLE XIX - WM WATERFRONT MARINE DISTRICTS

### PREAMBLE

The WM Waterfront Marine Districts are designed to accommodate boating and water oriented land and building use along with those activities and services related to harbor and waterway improvements, thereby facilitating navigation, and providing safe and economical waterfront developments.

### SECTION 1900: PRINCIPAL USES PERMITTED

In the WM Waterfront Marine District no building or land shall be used and no building shall be erected, structurally altered, be used and no building shall be erected, structurally altered, or occupied except for one (1) or more of the following specified uses, unless otherwise provided in this Ordinance:

1. Marinas including the out of water seasonal storage of boats.
2. Commissary facilities for the provision of food, beverages, and the like to be stores aboard boats.
3. Municipal or private beaches.
4. Retail businesses which supply commodities for persons using the facilities of the District, such as the sale of boats, engines and accessories, fishing equipment, and other similar items.

5. Restaurants and cocktail lounges.
6. Hotels and motels.
7. Accessory buildings and accessory uses customarily incidental to the above Principal  
Uses Permitted.
8. Uses similar to the above Principal Uses Permitted.

#### SECTION 1901: SPECIAL LAND USES PERMITTED

The following uses, and their accessory buildings and accessory uses, shall be permitted under the purview of Section 2332 after review and approval of the use (and a site plan, if required) by the Planning Commission, after Public Hearing, subject to the applicable conditions, and any other reasonable conditions imposed by the Planning Commission:

1. Engine and hull repair shops.
2. Marine contracting.
3. Commercial fishing and processing facilities.
4. Accessory buildings and accessory uses customarily incidental to the above Special Land  
Uses Permitted.
5. Seasonal recreational camper, trailer parks and facilities.

6. Uses similar to the above Special Land Uses Permitted.

SECTION 1902: PLANNED UNIT DEVELOPMENTS [amended 10/98]

Planned developments may be allowed by the Planning Commission under the procedural guidelines of Section 2101. The intent of Planned Unit Developments in the WM Waterfront Marine Districts is to allow mixed land uses, which are compatible to each other, while prohibiting uses which would not be compatible or harmonious with permitted uses.

SECTION 1903: AREA AND BULK REQUIREMENTS [amended 4/00]

1. Minimum lot size: 21,780 sq. feet.
2. Density (see definition in Article II): 24 dwelling units per buildable acre.
3. Dedicated open space requirement: 15%
4. Maximum lot coverage:
  - Buildings: 60%
  - Pavement: 25%
5. Lot width: 150 feet (shall be measured at road frontage unless a cul-de-sac, then measured from setback).
6. Maximum building width: 50% (as a portion of the lot width).
7. Width to depth ratios: The depth of any lot(s) or parcel(s) shall not be more than three (3) times longer its width.

8. Height limit: 4 stories or 60 feet

Height measurement: In the case of a principal building, the vertical distance measured

from the average finished grade to the highest point of the roof surface where the

building line abuts the front yard, except as follows: to the deck line of mansard roofs,

and the average height between eaves and the ridge of gable, hip, and gambrel roofs (see

Figure 2-2). If the ground is not entirely level, the grade shall be determined by

averaging the elevation of the ground for each face of the building (see Figure 2-3).

9. Front Setbacks:

Minimum:

Expressway, Arterial Street or Major  
Street: 30 feet

Collector Street: 20 feet

Minor Street: 10 feet

10. Rear setback: 10 feet

11. Setback from the ordinary high water mark or wetland: 75 feet (principal structures only).

12. Side setbacks:

1-story: 8 feet and 12 feet

2-story: 10 feet and 14 feet

3-story: 12 feet and 16 feet

4-story: 16 feet and 20 feet

Note, setback measurement: All required setbacks shall be measured from the right-of-

way line to the nearest point of the determined drip line of buildings. [amended 10/02]

13. Zero lot line option: New principal buildings may be erected on the rear lot line and/or one side lot line provided: [amended 10/02]

a. The building has an approved fire rating for zero-lot line development under the building code.

b. The building has adequate fire access preserved pursuant to fire code requirements.

c. The zero lot line side is not adjacent to a street.

d. A maintenance access easement is granted by the adjacent property owner and recorded with the County Register of Deeds and provided to the zoning administrator with the site plan or plot plan.

e. It is not adjacent to wetlands, or waterfront.

14. All required side and rear setbacks shall be landscaped, greenbelt buffers, unless zero-lot-

line is employed for a structure or fire access. At least fifty percent of all required front

setbacks shall be landscaped and adjacent to the road right-of-way. An average

minimum greenbelt of 10 feet shall be maintained along

each street frontage. [amended  
12/01, amended 10/02]





*Restore the Earth & Inspire Ecological Stewardship*