

# Three-Year Lake Management Plan

## Lake Chemung Livingston County 2008 through 2010

Prepared for:

Aquatic Nuisance Control & Remedial Action Unit  
Water Bureau  
Michigan Department of Environmental Quality

and

Genoa Charter Township

and

Lake Chemung Riparian Association

Prepared by:

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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
AQUATIC NUISANCE CONTROL AND REMEDIAL ACTION UNIT

## LAKE MANAGEMENT PLAN

Pursuant to Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), and Part 33, Aquatic Nuisance Control, of the NREPA, and the administrative rules promulgated thereunder, a lake management plan is required as part of the application for a whole-lake chemical treatment to the waters described below for the control of nuisance aquatic vegetation.

WATERBODY NAME	COUNTY(IES)	TOWN(S)	RANGE(S)	SECTION(S)
Lake Chemung	Livingston	2N	5E	3, 4, 9, 10, and 11

### I. PHYSICAL CHARACTERISTICS OF THE WATERBODY:

LAKE SIZE (ACRES): 313

MAXIMUM DEPTH (FEET): 70

MEAN DEPTH (FEET): 27.6

LAKE VOLUME (ACRE-FEET) – Include volume calculations as an attachment:

WHOLE LAKE = 8.625

BASED ON 0-10 FEET DEPTH = 2,599

SIZE OF LITTORAL ZONE (ACRES): 87

SHORELINE LENGTH (FEET): 26,928

SHORELINE DEVELOPMENT FACTOR: 2.1

RETENTION TIME (DAYS): 1,760 days (based on May, June, July, mean discharge values)

OUTLET FLOW RATE (CFS): 2.47 (based on May, June, July, mean discharge values)

SOURCE: MDEQ Hydrologic Studies Unit (October, 2007)

✓ Location Map – include a map showing the location of the waterbody within the county(ies).

✓ Bathymetric Map – include a map of the waterbody indicating the depth contours at five foot intervals. The following attributes must be identified on the map: tributaries, outlets, inlets, public and private access sites, public land, critical fish spawning areas, wetlands, special habitats, parks, and water control structures. See guidance for instructions.

✓ Land Use Map – include a map of the waterbody indicating the land use of the surrounding area. The following categories shall be used to describe the land use on the map: high density residential, low density residential, commercial/industry, agricultural, parks, and undeveloped areas.

## II. WATER QUALITY INFORMATION:

Provide the water quality parameter measurements on the data sheet provided (Appendix). These parameters are required, at a minimum. If there are additional data available or additional space is required, please attach additional pages. See guidance for specific collection requirements.

- Water Quality Sampling Map – include a map of the waterbody indicating the sampling sites used to collect the water quality parameters.

## III. BIOLOGICAL CHARACTERISTICS OF THE WATERBODY:

Total higher aquatic plant surface coverage (%) = 24

- Aquatic Vegetation Map(s) and Data Analysis – include the results of an aquatic vegetation survey of the waterbody performed in August or September of the year prior to the proposed treatment. The survey and data analysis shall be performed according to DEQ's "Procedures for Aquatic Vegetation Surveys."
- Description of the Fish Community – include the source of the information and copies of any correspondence with fisheries biologists, anglers, natural resource groups, etc. Please attach the original comments as a separate sheet of paper.
- Description of the Wildlife Community - include the source of the information and copies of any correspondence with wildlife or habitat biologists. Please attach the original comments as a separate sheet of paper. **No response from MDNR-Wildlife as of this draft.**
- Description of the Plant Community - include copies of any correspondence with the appropriate agencies. Please attach the original comments as a separate sheet of paper. **No response from MDNR-Wildlife as of this draft.**
- Description of Special Concern, Threatened, or Endangered Species - include copies of any correspondence with Michigan Natural Features Inventory. Please attach as a separate sheet of paper.

## IV. NUISANCE CONDITIONS:

List the current aquatic nuisance condition(s) occurring in the waterbody:

**Lake Chemung currently supports an abundant Eurasian milfoil population throughout a large portion of its littoral zone. The Eurasian milfoil infestation is impairing swimming, boating, fishing and other recreational activities. In portions of the lake, native pondweeds and curly-leaf pondweed also exist at nuisance levels.**

Indicate the activities that are being impaired by the nuisance conditions:

- Swimming
- Boating
- Fishing
- Hunting
- Other:

- Target Species Map – include a map of the waterbody indicating the current location(s) of each targeted nuisance species.

## V. MANAGEMENT GOALS:

Indicate the appropriate management goals that are the desired outcome(s) of this program.

Create/Maintain Swimming Areas

Create/Protect Fish/Wildlife Habitat

Improve Native Plant Diversity

Protect Endangered/Threatened Species

Create Areas for Recreational Use (boating, water skiing, fishing, etc.)

Remove Exotic Plant Species

Other: **Education through presentations and association newsletter mailings to Lake Chemung residents**

Management Goal Maps – include map(s) indicating locations where each of the goals may be achieved through the proposed management activities.

## VI. HISTORY OF WATERBODY MANAGEMENT:

Provide a written description of the management activities performed on the waterbody within the past ten years. Include mechanical, chemical, or biological control efforts, lake level manipulation, dredging, and fish stocking activities (including species stocked and stocking schedule).

## VII. MANAGEMENT OPTIONS:

List all management options considered to achieve the goals established for this waterbody:

**Option 1: Control of Eurasian milfoil with a whole-lake fluridone treatment.**

**Option 2: Control of Eurasian milfoil using selective, systemic herbicides such as 2,4-D and Renovate, and possibly the contact herbicide Reward in near-shore areas where well-setback and/or irrigation restrictions may be a problem.**

**Option 3: Control of curly-leaf pondweed and nuisance growth of native plant species via mechanical harvesting and/or select treatments with contact herbicides.**

**Option 4: Control of Eurasian milfoil with the milfoil weevil (*Euhrychiopsis lecontei*).**

Why was the proposed management option chosen over other options?

**Control of Eurasian milfoil with a whole-lake fluridone treatment (Option 1) is proposed to be used in 2008. Low-dose fluridone treatments have been shown to be extremely effective in providing season-long control of Eurasian milfoil with minimal impacts to non-target species (Madsen et al. 2002; MESB 1999) and the aquatic environment (MESB 1999). Given the recent history of treatment of Lake Chemung with 2,4-D, Renovate, and Reward, a fluridone application in accordance with the MDEQ's "6-bump-6" application protocol appears to be the most cost-effective and environmentally sound option to control Eurasian milfoil on a whole-lake basis.**

Control of Eurasian milfoil using selective, systemic herbicides such as 2,4-D and Renovate, and possibly the contact herbicide Reward (Option 2) is proposed to help control the potential re-introduction of Eurasian milfoil in Lake Chemung in 2009 and 2010. In addition, control of curly-leaf pondweed and nuisance growth of native plant species via mechanical harvesting and/or spot-treatments with contact herbicides is contemplated for 2009 and 2010, if warranted. Algaecides treatments, if needed at all, would be very limited in Lake Chemung.

The use of milfoil weevils (*Euhrychiopsis lecontei*) to control Eurasian milfoil in Lake Chemung is not being considered at this time because milfoil control is not predictable; weevils have been effective in some lakes and not in others. Sunfish predation on weevils may limit weevil abundance (Ward and Newman 2006). If hybrid milfoil is present, developmental performance of weevils may be reduced (Roley and Newman 2006). Weevils do not eradicate Eurasian milfoil. In some lakes stocked with weevils, viable standing stems of Eurasian milfoil are reduced. However, the overall biomass of Eurasian milfoil may not decline as a result of weevil stocking (Cofrancesco et al. 2004). Given the unpredictability of milfoil weevils for long-term Eurasian milfoil control, Option 4 was not chosen for Lake Chemung.

#### References:

Cofrancesco, A.F., D.G. McFarland, J.D. Madsen, A.G. Poovey, and H.L. Jones, 2004. Impacts of *Euhrychiopsis lecontei* (Dietz) from different populations on the growth and nutrition of Eurasian milfoil. APCRP Technical Notes Collection (APCRP-BC-07), U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Madsen, J.D., K.D. Getsinger, R.M. Stewart, and C.S. Owens, 2002. Whole lake fluridone treatments for selective control of Eurasian milfoil: II. Impacts of submersed plant communities. *Lake and Reservoir Management*. 18(3):191-200.

Michigan Environmental Science Board Sonar Investigation Panel. 1999. Evaluation of the use of Sonar® in Michigan.

Roley, S.S. and R.M. Newman. 2006. Developmental performance of the milfoil weevil *Euhrychiopsis lecontei* (Coleoptera: Curculionidae), on northern watermilfoil, Eurasian milfoil, and hybrid (northern x Eurasian) watermilfoil. *Environmental Entomology* 35(1): 121 – 126.

Ward, D.M. and R.M. Newman 2006. Fish predation on Eurasian watermilfoil (*Myriophyllum spicatum*) herbivores and indirect effects on macrophytes. *Can. J. Fish. Aquat. Sci.* 63: 1049-1057.

**VIII. VEGETATION MANAGEMENT PLAN:**

Propose a three-year aquatic vegetation management plan that will be used to attain the management goals for this project by checking the appropriate box(es) below. Include a brief summary for each year of the plan that prioritizes and describes the management strategy. For example:

Year 2: 2006

1. Eurasian watermilfoil control – control any offshore reoccurrences of EWM using granular 2,4-D, reoccurrences within well isolation distances will be controlled using Renovate 3 (if budget allows) or Reward...

Year 1: 2008

	Fluridone	Algaecides	Harvesting	Biological Control	Other
<i>Exotic Submerged Species</i>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Algae</i>	<input type="checkbox"/>	√	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Prioritize and provide a detailed description of your proposed treatment strategy:

**A split-6-part-per-billion fluridone treatment in late April or early May. This seasonally-timed low-dose strategy should provide season-long control of Eurasian milfoil.**

**Algaecides, if necessary, would be used sparingly and target specific areas of Lake Chemung where nuisance blooms of filamentous algae, *Chara* or starry stonewort occur.**

Year 2: 2009

	Systemic herbicides	Contact herbicides	Algaecides	Harvesting	Biological Control	Other
<i>Exotic Submerged Species</i>	✓	✓	<input type="checkbox"/>	✓	<input type="checkbox"/>	<input type="checkbox"/>
<i>Native Submerged Species</i>	<input type="checkbox"/>	✓	<input type="checkbox"/>	✓	<input type="checkbox"/>	<input type="checkbox"/>
<i>Emergent Species</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Algae</i>	<input type="checkbox"/>	<input type="checkbox"/>	✓	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Prioritize and provide a detailed description of your proposed treatment strategy:

**Control of Eurasian milfoil infestations using selective, systemic herbicides such as 2,4-D and Renovate, and possibly the contact herbicide Reward in near-shore areas where well setback and/or irrigation restrictions may be a problem.**

**If warranted, control of curly-leaf pondweed and nuisance growth of native plant species via mechanical harvesting and/or select treatments with contact herbicides.**

**Algaecides would be used sparingly and target specific areas of Lake Chemung where nuisance blooms of filamentous algae, or nuisance growth of *Chara* or starry stonewort occur.**

## VEGETATION MANAGEMENT PLAN (CONTINUED)

Year 3: 2010

	Systemic herbicides	Contact herbicides	Algaecides	Harvesting	Biological Control	Other
<i>Exotic Submerged Species</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Native Submerged Species</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Emergent Species</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Algae</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Prioritize and provide a detailed description of your proposed treatment strategy:

**Control of Eurasian milfoil infestations using selective, systemic herbicides such as 2,4-D and Renovate, and possibly the contact herbicide Reward in near-shore areas where well setback and/or irrigation restrictions may be a problem.**

**If warranted, control of curly-leaf pondweed and nuisance growth of native plant species via mechanical harvesting and/or select treatments with contact herbicides.**

**Algaecides, if necessary, would be used to specifically target nuisance blooms of filamentous algae, or to suppress nuisance growth of *Chara* or starry stonewort.**

Annual Vegetation Management Maps – include maps showing areas of management for each year. Be sure to compare the Management Goal Maps with the Annual Vegetation Management Maps to ensure that the proposed treatments are consistent with the management goals.

Fluridone Distribution Map – include a map of the waterbody indicating the proposed path of fluridone distribution in the lake.

Fluridone Calculations – include any calculations used to determine the amount of fluridone requested for use.

**IX. MONITORING AND EVALUATION:**

List the proposed monitoring activities to be performed on the waterbody during the 3 years of the management plan, include proposed date(s) of each activity. Be as specific as possible.

Proposed Activity:	Proposed Date(s)
<input checked="" type="checkbox"/> Aquatic vegetation survey	Periodic surveys to gauge treatment effects and detailed AVAS survey in late August or early September of 2008; Detailed AVAS survey in late August or early September of 2009. In addition, follow-up surveys would be conducted to gauge treatment effectiveness and to make management adjustments. Detailed AVAS survey in late August or early September of 2010. In addition, follow-up surveys would be conducted to gauge treatment effectiveness and to make management adjustments.
<input checked="" type="checkbox"/> Fluridone residue sampling	Per the MDEQ permit requirements in 2008.
<input checked="" type="checkbox"/> EffecTEST™	If necessary in 2008.
<input type="checkbox"/> PlanTEST™	N.A.
<input checked="" type="checkbox"/> Water quality sampling	If necessary in 2010.
<input checked="" type="checkbox"/> Fish surveys	According to the MDNR schedule for public access lakes (last surveyed in 2007 – results pending).
<input type="checkbox"/> Other: _____	

Describe how the monitoring results will be used to evaluate the success of this program in achieving the stated management goals:

<u>Management Goals (from Section V.)</u>	<u>How will you evaluate your success of this goal using the monitoring results?</u>
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**Create/Maintain Swimming Areas:** Selective removal of exotic species and limited removal of nuisance native pondweeds to improve swimming conditions – monitor effectiveness and make adjustments based upon aquatic plant surveys.

**Create/Protect Fish/Wildlife Habitat:** Selective removal of exotic species to promote the re-vegetation of the littoral zone with native plants of varying architectural types (i.e., low-growing, mid- to full-depth, floating-leaved, and emergent). Should remove all or nearly all of the EWM and curly-leaf pondweed in 2008 – plant surveys to monitor and manage re-growth of exotic plants in subsequent years.

**Improve Native Plant Diversity:** Removing exotic canopy-forming species such as Eurasian milfoil and curly-leaf pondweed should allow native plants to re-colonize the littoral zone. Should remove all or nearly all of the Eurasian milfoil and curly-leaf pondweed in 2008 – plant surveys to monitor and manage re-growth of exotic species in subsequent years.

**Protect Endangered/Threatened Species:**

**Create Areas for Recreational Use:** Selective removal of exotic species and limited removal of nuisance native pondweed growth should greatly enhance the current recreational opportunities

on Lake Chemung. Should remove all or nearly all of the EWM and curly-leaf pondweed in 2008 – plant surveys to monitor and manage re-growth of exotic species and nuisance growth of native plants in subsequent years.

Remove Exotic Plant Species: Selective removal of exotics through the use of selective systemic herbicides (fluridone in 2008; 2,4-D and Renovate in subsequent years). Should remove all or nearly all of the EWM and curly-leaf pondweed in 2008 – plant surveys to monitor and manage re-growth of exotic species in subsequent years.

Education of Lake Chemung Residents: Newsletters and presentations will emphasize important things that lake residents can do to protect and enhance the water quality and fish and wildlife habitat within Lake Chemung. Monitoring can help to ensure that up-to-date issues (e.g. infestations of new exotic species such as hydrilla) are being addressed.

✓ Fluridone Residue Sampling Map – include a map of the waterbody showing locations where residue samples will be collected. Number each sample site.

### X. LAKE MANAGEMENT PLAN DEVELOPMENT:

Who has participated in developing the lake management plan for this project?

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Commercial Applicator   | <input checked="" type="checkbox"/> State Agency(ies) (specify) MDNR |
| <input checked="" type="checkbox"/> Lake Consultant         | <input type="checkbox"/> Park Administrator/Board                    |
| <input type="checkbox"/> Lake Board                         | <input type="checkbox"/> Group of Individual Riparians               |
| <input checked="" type="checkbox"/> Lake Association        | <input checked="" type="checkbox"/> Back Lot Owner(s)                |
| <input checked="" type="checkbox"/> Township(s)/County(ies) | <input type="checkbox"/> Other (specify) _____                       |

✓ Documentation of Lake Management Plan Development – provide documentation of participation in development of this Lake Management Plan by stakeholders and agencies responsible for managing public trust resources. Attach meeting minutes and other correspondence separately.

Lake Management Plan prepared by:  (signature)

Paul J. Hausler, Progressive AE (print name)

Date: January 30, 2008



## LAKE MANAGEMENT PLAN APPENDIX

### WATER QUALITY DATA

Waterbody Name: Lake Chemung County: Livingston

Temperature and Dissolved Oxygen:		Date measured: August 9, 2005
Depth measured (feet)	Temperature (°F)	Dissolved Oxygen (mg/L)
1	83.5	8.3
3	83.0	8.2
6	82.0	8.0
9	81.5	7.8
12	79.0	5.7
15	76.5	4.8
18	71.0	2.6
21	64.0	2.5
24	57.0	2.8
27	52.5	4.2
30	49.0	4.8
33	47.0	4.2
36	45.5	4.1
39	44.5	3.9
42	43.5	2.8
45	43.5	2.5
48	43.0	2.4
51	43.0	2.4
54	43.0	2.5
57	43.0	2.7
60	43.0	2.8
63	43.0	2.8
66	43.0	3.0
68	43.0	3.0

  

Transparency:	
Date measured:	Secchi Disk Transparency (feet)
May 21, 2007	8.5
June 1, 2007	9.0
June 9, 2007	9.5
June 16, 2007	9.5
June 21, 2007	8.5
June 30, 2007	8.5
July 13, 2007	10.0
July 27, 2007	8.5
August 11, 2007	10.5
August 17, 2007	9.5
August 23, 2007	9.0
August 26, 2007	10.5
September 3, 2007	12.5

**Total Phosphorus and Total Alkalinity:**

	Date measured	Total phosphorus ( $\mu\text{g/L}$ )	Total alkalinity ( $\text{mg CaCO}_3/\text{L}$ )
Surface sample at spring turnover	<b>April 21, 2005</b>	<b>64</b>	<b>156</b>
Deep sample	<b>August 9, 2005</b>	<b>195</b>	

Lake Chemung Volume Calculations  
from CAD (GEOPAC)

Contour	Area	Frustrum Volume
0	313	1,407
5	251	1,192
10	226	2,046
20	184	1,536
30	125	1,091
40	94	801
50	67	551
60	44	
	Total	8,625

**This reply is being sent via email only.**

We have estimated the low flow discharges requested in your email of October 3, 2007 (Process No.6635), as follows:

Bogue Creek Trib At Lake Chemung Outlet, NE ¼ of the SE ¼ of Section 04, T2N, R5E, Genoa Township, Livingston County, has a drainage area of 4.8 square miles. The 50% and 95% exceedance and mean monthly flows in cubic feet per second (cfs) are:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
50%	1.7	2.1	5.4	4.9	2.2	1	0.4	0.3	0.3	0.5	1.4	2.1
95%	0.3	0.4	1	1.7	0.7	0.3	0.1	0.1	0.1	0.1	0.2	0.4
Mean	3.4	5.1	8.9	7.1	3.7	2.5	1.2	0.7	0.9	1.6	2.8	3.6

If you have any questions, please contact Mr. Marlio Lesmez, Land and Water Management Division, Hydrologic Studies Unit, at 517-335-3173, or by e-mail at: [lesmezm@michigan.gov](mailto:lesmezm@michigan.gov).

Sincerely,

Richard C. Sorrell, P.E., Chief  
Hydrologic Studies Unit  
Land and Water Management Division  
517-335-3176

RCS:MWL

cc: Mr. Eric Bacon, MDEQ (T-27-SE)