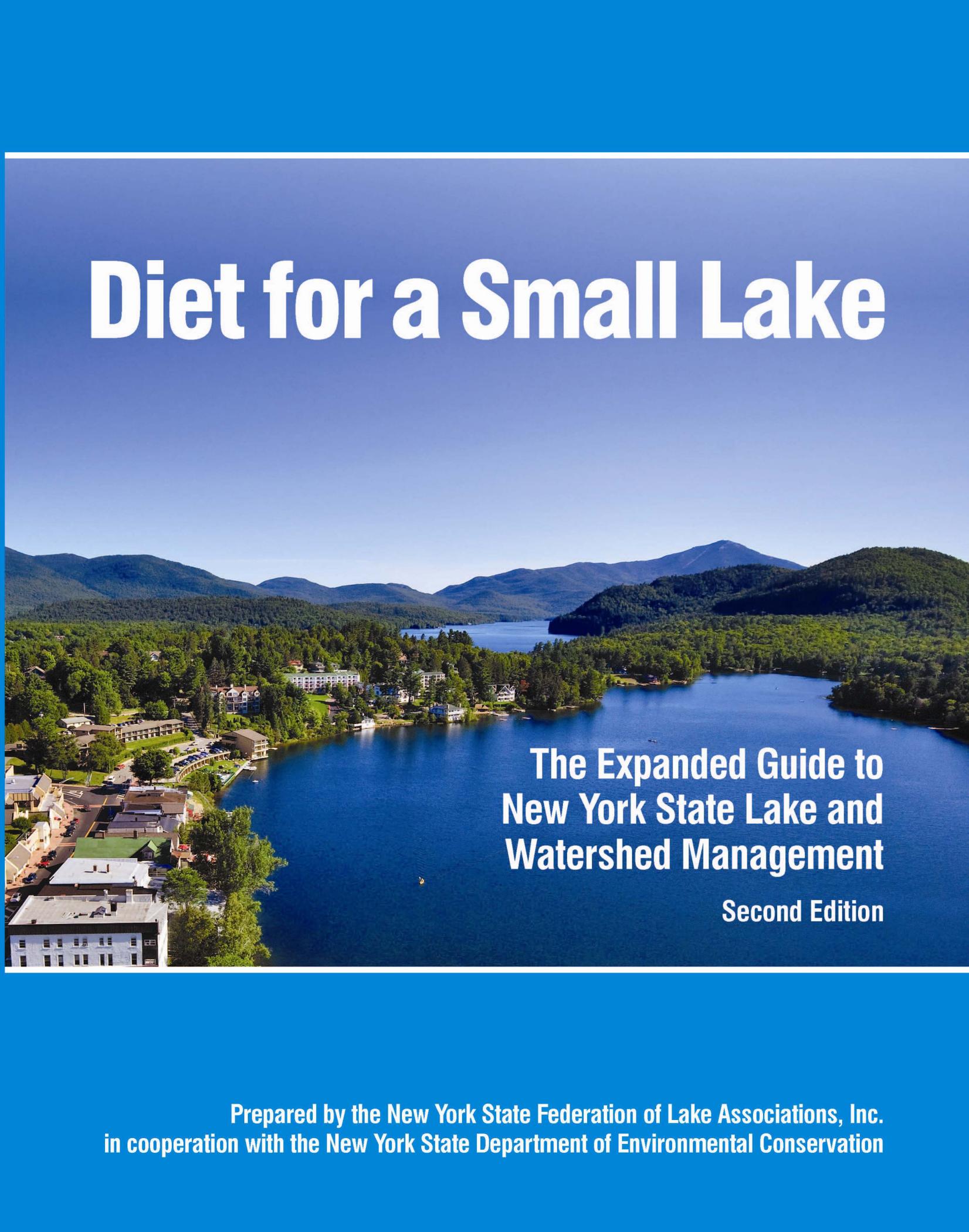


Diet for a Small Lake

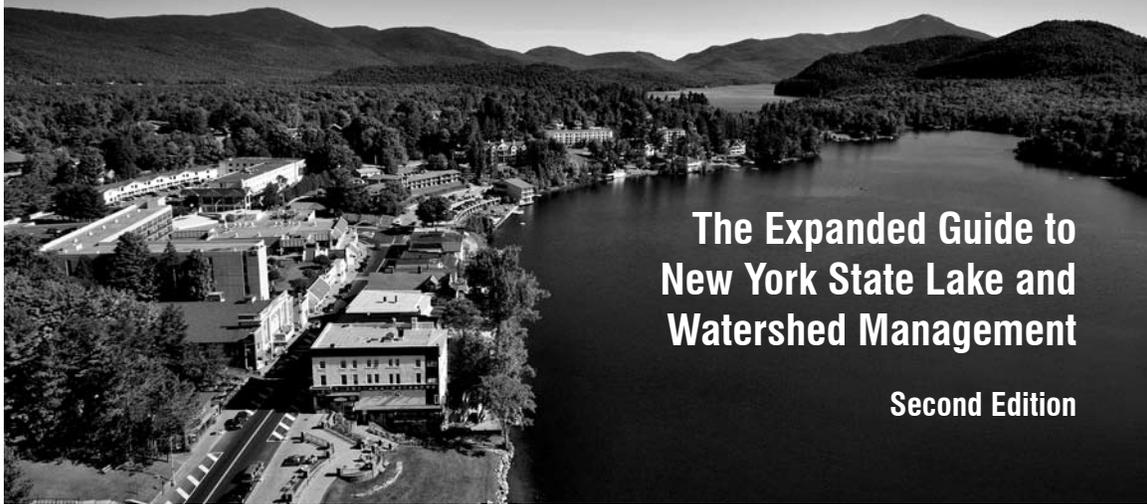
An aerial photograph of a scenic lake surrounded by dense green forests and rolling mountains. In the foreground, a small town or resort area is visible with several buildings, including a large white multi-story structure. The lake is a deep blue color, and the sky is clear and bright.

**The Expanded Guide to
New York State Lake and
Watershed Management**

Second Edition

**Prepared by the New York State Federation of Lake Associations, Inc.
in cooperation with the New York State Department of Environmental Conservation**

Diet for a Small Lake



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PHOTOGRAPH BY CARL HEILMAN II / WILD VISIONS, INC.



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Diet for a Small Lake

The Expanded Guide to New York State Lake and Watershed Management

Second Edition, 2009

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CONTRIBUTORS

Scott Kishbaugh
Sharon K. Anderson
Rebecca Schneider
Lyle Raymond
John Foster
Jim Cunningham

EDITORIAL CONTROL

Sharon K. Anderson
Nancy Craft
Scott Kishbaugh
Nancy Mueller
George C. Kelley

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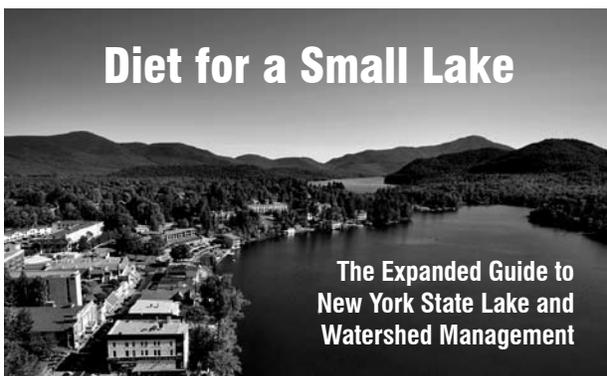
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Contents



PHOTOGRAPH BY CARL HEILMAN II / WILD VISIONS, INC.

Preface to the Second Edition *xiii*

Preface to the First Edition *xv*

About NYSFOLA *xvii*

Introduction: Designing a Health Plan for a Lake

Welcome *xix*

The ideal lake *xix*

Lake management *xx*

Accept what you cannot change and
manage the rest *xx*

How to use this manual *xxi*

Summing it up *xxi*

1 Lake Ecology: Getting your Feet Wet

Introduction 1

A lake by any other name 1

In the beginning... 2

The power of glaciers 2

Human hands shape the land 4

Water colors 4

The water cycle 5

What's so special about water? 6

At the base of the ecosystem 8

The cycles of the elements 10

Food webs 11

Little green dots and other stuff 12

Weeding through the larger plants 12

Primary consumers 14

Box 1-1: The vanishing Common Loon:

Harbinger of trouble in the food chain 15

Second-order consumers and beyond 15

Lake habitats 16

Lake eutrophication and the
succession of lakes 17

Really big picture stuff 19

Summing it up 19

2 From Montauk to Erie:

7850 New York State Lakes

Introduction 21

Water, water everywhere 21

What's in a name 21

Lake classifications and characteristics 21

Best intentions 21

Water-quality parameters 22

Box 2-1: A tale of two lakes 22

What's the dirt on New York State lakes? 24

Bureaucratic tags 25

Ecozones and ecoregions 25

Hydrologic Unit Codes 26

Location, location, location 26

Long Island and New York City lakes 26

Downstate lakes 28

Box 2-2: Snapshot of the New York City

Reservoirs 29

Central New York lakes 30

Adirondack lakes 32

Finger Lakes region lakes 34

Western New York lakes 36

Summing it up 37

3 Lake Problems: Acid Rain to Zebra Mussels

Introduction 39

Problems, problems, problems 39

Invasive species: A new focus for
a growing problem 41

Nuisance plants: Aquatic plants gone wild 41

Nuisance algae: It's not easy being green 46

Exotic but not rare animals 47

Box 3-1: Case study:

Algal toxins in Craine Lake 48

Pathogens: Itching swimmers and
water fowlers 50

Box 3-2: Case study:

Impacts of waterfowl on Collins Lake 51

Acid raining, mercury rising and
other toxic troubles 52

The emerging frontier:

From the pharmacy and laboratory 54

Tastes bad 54

Case of the disappearing lake 54

Curiosities 55

Poor fishing 56

Box 3-3: Case study: Responding to an
emergency—Koi Herpes virus 56

People problems 57

Summing it up 57

4 Problem Diagnosis:

Seeing Beyond the Symptoms

- Introduction 59
 - Box 4-1: Concentration versus load 59
- Monitoring 60
- Why? 60
- Who? 61
 - Long, long ago (1926 to 1980) 61
 - Recently defunct programs (1980 to 2000) 62
 - Ongoing programs 62
 - Academic, local government and private monitors 63
 - Volunteer monitoring and CSLAP 65
- What? 66
 - Secchi disk transparency 66
 - Temperature and dissolved oxygen profiles 67
 - Precipitation and lake level monitoring 68
 - Macrophyte surveys and mapping 68
 - Water chemistry parameters 69
 - Sampling techniques 70
 - Nutrients 70
 - Chlorophyll a 71
 - Plankton 71
 - Conductivity 71
 - Dissolved organic carbon 72
 - Color 72
 - Turbidity 72
 - Alkalinity and pH 72
 - Metals, tracers and organic compounds 73
 - Microbial analyses 74
 - Sediments hold clues 75
 - What other information should be collected? 76
 - Environmental setting 76
 - Following the flow 78
 - Dye testing 78
 - Dam inspection 78
 - Cultural context 79
 - Surveys for qualitative information 79
 - Identifying gaps and collecting additional information 80
 - Back to square one 80
- Where? 81
- When? 82
- How do we use all these data? 82
 - Trophic state 82
 - Ratios 84
 - Meeting the standards 84
 - Budgets for water, nutrients and other pollutants 86
 - Taking advantage of relationships and interconnections 88
 - Modeling 89
- How much will it cost? 90
- The lake looks bad 91
 - Symptoms determination 91
 - Causes determination 92
 - Sources determination and actions 92
- Bringing it back to "Why?" 93
- Summing it up 93

5 Fisheries Management:

Matching Expectations to Reality

- Introduction 95
- Gathering fisheries information 95
- Habitat limiting factors and critical parameters 96
 - Physical limiting factors 97
 - Chemical limiting factors 98
 - Biological limiting factors 99
- Scientific techniques for conducting fisheries surveys 100
 - Fish surveys 100
 - Angler surveys 101
 - Habitat surveys 102
- Analysis of fish populations 103
 - Fish community structure 103
 - Population structure 104
 - Fish population size 105
 - Population well being 106
- Managing fish populations 107
- Managing fish habitat 110
- Managing the angler 113
 - Education to adjust expectations 113
 - Ecology 113
 - Fisheries regulations 114
 - Harvest regulations 114
 - Summing it up 115

6 Aquatic Plants: Not Just Weeds

- Introduction 117
- Aquatic plants in the ecosystem 117
- Preparing for action 118
 - Developing a plan 118
 - Aquatic plant identification 118
 - Who's in charge 119
 - An ounce of prevention 120
 - Rapid response 121
- Plant management techniques: What works? 122
- Local management activities 123
 - Hand harvesting 123
 - Principle 123
 - Advantages and disadvantages 124
 - Box 6-1 Insider's guide to hand harvesting weeds 124
 - Target and non-target plants 125
 - Costs 125
 - Regulatory issues 125
 - History and case studies in New York State 125
 - Diver harvesting 126
 - Principle 126
 - Advantages and disadvantages 126
 - Box 6-2: Case study: Hand harvesting by divers in Upper Saranac Lake 126
 - Target and non-target plants 128
 - Costs 128
 - Regulatory issues 128
 - History and case studies in New York State 129

Benthic barriers	129	Grass carp	148
Principle	129	Principle	148
Advantages and disadvantages	129	Advantages and disadvantages	148
Target and non-target plants	130	Target and non-target plants	150
Costs	130	Costs	150
Box 6-3: An insiders guide to benthic barriers	131	Regulatory issues	150
Regulatory issues	132	History and case studies in	
History and case studies in New York State	132	New York State	151
Rotovating / Hydroraking	132	Box 6-9: Case study: Grass carp in Lake Mahopac and Lake Carmel	151
Principle	132	Box 6-10: Case study: Anecdotal reports regarding the use of grass carp in Plymouth Reservoir	152
Advantages and disadvantages	133	Aquatic herbicides	153
Target and non-target plants	133	Principle	153
Costs	133	Advantages and disadvantages	154
Regulatory issues	133	Target and non-target plants	155
History and case studies in New York State	134	Costs	157
Lakewide or whole-lake management activities	134	Regulatory issues	157
Mechanical harvesting	134	History and case studies in	
Principle	134	New York State	157
Advantages and disadvantages	134	Box 6-11: Case study: Aquatic herbicides in Waneta and Lamoka Lakes	158
Target and non-target plants	136	Box 6-12: Case study: Aquatic herbicides in Snyders Lake	159
Costs	136	Shading	160
Regulatory issues	136	Principle	160
History and case studies in New York State	136	Advantages and disadvantages	160
Box 6-4: Case study: Mechanical harvesting in Saratoga Lake	137	Target and non-target plants	160
Dredging	138	Costs	160
Principle	138	Regulatory issues	160
Advantages and disadvantages	138	History and case studies in	
Target and non-target plants	139	New York State	161
Costs	139	Box 6-13: Case study: Multiple strategies for invasive species control in Adirondack Lake	161
Box 6-5: Case study: Dredging on Collins Lake	139	Integrated Plant Management (IPM)	
Box 6-6: Case study: Dredging on Ann Lee Pond	140	Box 6-14: Case study: Integrated Plant Management techniques in Lake George	162
Regulatory issues	140	Other management activities	163
History and case studies in New York State	140	Decision trees for Eurasian watermilfoil and water chestnut	164
Water-level drawdown	141	Putting it all together: The art of aquatic plant management	164
Principle	141	The convergence of timing, longevity and public perception	164
Advantages and disadvantages	141	Sacrificing the wrong plants	164
Target and non-target plants	142	All are equal but some are more equal	164
Costs	143	There is no such thing as eradication	167
Regulatory issues	143	Summing it up	167
History and case studies in New York State	143		
Biological control	143		
Herbivorous insects	143		
Principle	143		
Box 6-7: Case study: Herbivorous insects—Natural control in Cayuga Lake	144		
Advantages and disadvantages	145		
Target and non-target plants	146		
Costs	146		
Regulatory issues	146		
History and case studies in New York State	147		
Box 6-8: Case study: Herbivorous insects—Active management	147		

Algae and Other Undesirables:

Getting Rid of Yuck

- Introduction 169
- Algae control by physical means 169
 - Artificial circulation 169
 - Principle 169
 - Advantages and disadvantages 170
 - Costs 170
 - Regulatory issues 171
 - History and case studies in New York State 171
 - Box 7-1: Case study: Artificial circulation in East Sidney Reservoir 171
 - Hypolimnion aeration 171
 - Principle 171
 - Advantages and disadvantages 172
 - Costs 172
 - Regulatory issues 172
 - History and case studies in New York State 172
 - Box 7-2: Case study: Aeration in Lake Waccabuc 172
 - Hypolimnetic withdrawal 173
 - Principle 173
 - Advantages and disadvantages 174
 - Costs 174
 - Regulatory issues 174
 - History and case studies in New York State 174
- Algae control with chemicals 175
 - Algicides 175
 - Principle 175
 - Advantages and disadvantages 175
 - Box 7-3: Case study: Algicides in Ballston and Kinderhook Lakes 177
 - Costs 178
 - Regulatory issues 178
 - History and case studies in New York State 178
 - Nutrient precipitation and inactivation 178
 - Principle 178
 - Advantages and disadvantages 179
 - Costs 180
 - Regulatory issues 180
 - History and case studies in New York State 180
 - Box 7-4: Case study: Nutrient inactivation (alum) in Kinderhook Lake 181
- Algae control through biology 182
 - Biomanipulation and fish stocking 182
 - Principle 182
 - Advantages and disadvantages 183
 - Costs 184
 - Regulatory issues 184
 - History and case studies in New York State 184
 - Box 7-5: Case study: Biomanipulation in Moe Pond 185

- Barley straw 186
 - Principle 186
 - Advantages and disadvantages 187
 - Costs 187
 - Regulatory issues 187
 - History and case studies in New York State 188
- Other in-lake problems 188
- Nuisance species management 188
 - Waterfowl control strategies 188
 - Box 7-6: Case study: Waterfowl control on Collins Lake 189
 - Swimmers itch 190
 - Muscling out the zebra (and quagga) mussels 191
 - Box 7-7: Case study: Invasive species control in Lake George 192
 - Leeches 192
 - Sea lamprey 193
 - Just skimmin' the surface 193
- Water-quality problems 193
 - Mitigating acid rain effects through liming 193
 - Principle 193
 - Box 7-8: Case study: Lake pH neutralization in Wolf Pond 194
 - Advantages and disadvantages 195
 - Costs 195
 - Regulatory issues 196
 - History and case studies in New York State 196
 - Box 7-9: Case study: Large scale management – Lake pH neutralization with lime 197
 - Taste and odor problems 197
 - Not so clear 197
 - I'm not gonna drink that! 198
 - Other in-lake management solutions for water-quality problems, and why they are given short shrift here 198
 - Dilution and flushing 198
 - Fungi, bacteria, and viral pathogens 198
 - Sediment oxidation 199
 - Nutrient addition 199
 - Can't stand the noise 199
- Summing it up 199



Fanwort (Cabomba caroliniana)
(CREDIT: CROW AND HELLQUIST)

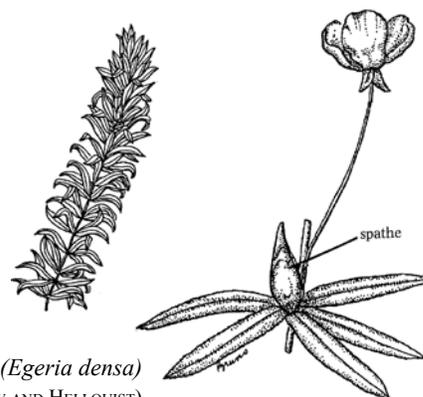
8 User Conflicts: Learning to Share

- Introduction 201
- Incompatible uses 201
- Water-level issues 202
- Public access issues 202
- Incompatible uses: Use and user conflicts 203
- Use restrictions 203
 - Box 8-1: Case study: Speed limits on the Erie Canalway. 203
 - Box 8-2: Case study: Access permits for the New York City Reservoir System. 204
- Lake zoning 204
- Swimming prohibited 205
- Role of lake associations 205
- Water-level issues 205
- Water-level control 205
- Fixing the dam 206
- Dock management 207
 - Box 8-3: Case study: Dock management using de-icers. 208
- Role of lake associations 209
- Public access issues 209
- Guarding the keys to the lake 209
- User fees and licenses 210
- Life's a beach 210
- Role of lake associations 210
- Summing it up 211

9 Watershed management: The Big Picture

- Introduction 213
- Natural water flowpaths 213
- Human effects on watersheds 215
- Human effects on water quality 217
- What can you do? 218
- General strategies for watershed management 218
- Regulation 218
 - Box 9-1: Sample ordinance: Streamside protection setback 219
 - Stakeholder outreach and education 219
 - Financial incentives 219
- Comprehensive watershed planning 220
- Management of growth 221
- Zoning 221
- Zoning variances 222
- Reality check on the power of zoning controls 222
- Land acquisition 222
- Point source pollution control 223
- Wastewater treatment facilities 224
- Large-scale municipal wastewater-treatment systems 224
- Preliminary treatment 225
- Primary treatment 225
- Secondary treatment 225

- Tertiary treatment 225
- Post treatment 226
- Solids-handling systems 226
- Phosphorus and nitrogen removal 226
- Role of lake associations 228
- Nonpoint source pollution controls 228
- Best Management Practices 228
 - Box 9-2: Pollution control guidelines for lakeshore homeowners 229
- Erosion and stormwater runoff 229
- Agricultural sources 230
 - Box 9-3: Case study: Agricultural Best Management Practices 230
- Residential development 231
- Town maintenance 231
- Nutrients and pathogens 232
- Agricultural sources 232
- Urban sources: On-site wastewater treatment systems 233
- Traditional septic systems 233
- Alternatives to traditional septic systems 234
 - Box 9-4: Case study: Septic management and education 234
- Systems for small communities 235
- Role of lake associations 236
- Pesticides 236
 - Agricultural uses 237
 - Homeowner uses 237
- Antibiotics, pharmaceuticals, and health care products 237
- Role of lake associations 238
- Natural-areas management 238
- Forestry Best Management Practices 239
- Streamside erosion control 239
- Buffer strips or greenbelts 240
- Streambank and roadbank stabilization and management 240
- Summing it up 240



Brazilian elodea (Egeria densa)
(CREDIT: CROW AND HELLQUIST)

10 Legal Framework: It Helps to Know the rules

- Introduction 241
- Government roles and responsibilities 241
 - Federal government 241
 - Federal government and Indian tribes 242
 - New York State government 243
 - Interstate River Basin Commissions 243
 - Local government 243
- Role of private organizations 244
- Role of lake associations 245
- Water law 245
- Laws and regulations 248
 - Federal and State Pollution Discharge Elimination System 248
 - State Environmental Quality Review act 249
- Wetlands 250
 - Federal laws and regulations 250
 - New York State Freshwater Wetlands act 251
- Protection of Waters Program 252
- Public water supply regulations 252
 - Box 10-1: Who owns your dam? 253
- Dock and mooring regulations 253
- Boating regulations 254
- Special districts 254
 - County 255
 - Town 255
 - Village 256
 - District operation 256
- Local land-use planning and regulation 256
- Role of lake associations 258
- Land protection for lake protection 258
- Summing it up 259



11 Management Plan Development:

Putting the Pieces Together

- Introduction 261
- Getting people together for a common purpose 262
 - Who to include? 262
 - Box 11-1: Building partnerships 263
 - Who will lead? 264
 - Who can help? 264
- Public outreach and involvement 265
 - Box 11-2: Techniques for building awareness in the community 266
- Watershed inventory 267
 - Box 11-3: Data that can be included in a State of the Lake Report 267
- Biophysical assessment 268
- Assessing trends and public concerns 269
- Analyzing the data 270
- Watershed management strategies 270
 - Indicators and objectives 271
 - Box 11-4: Moving from goal to management: a simplistic example 272
 - Choosing management strategies 272
 - The devil is in the details 273
 - Box 11-5: Outline of a typical Watershed Management Plan 273
- The management plan 274
 - Information and education 274
- Summing it up 274

12 Implementation and Evaluation:

Don't Stop Now

- Introduction 275
- Proposal writing 101 275
- Finding the pot of gold 276
 - Federal funding sources 276
 - New York State funding sources 277
 - Local funding sources 278
 - Cruising the information highway 278
- Proposal preparation 278
- Conflict is normal 279
- Is the management plan working? 280
- Summing it up 281
- ABCs of lake management 282

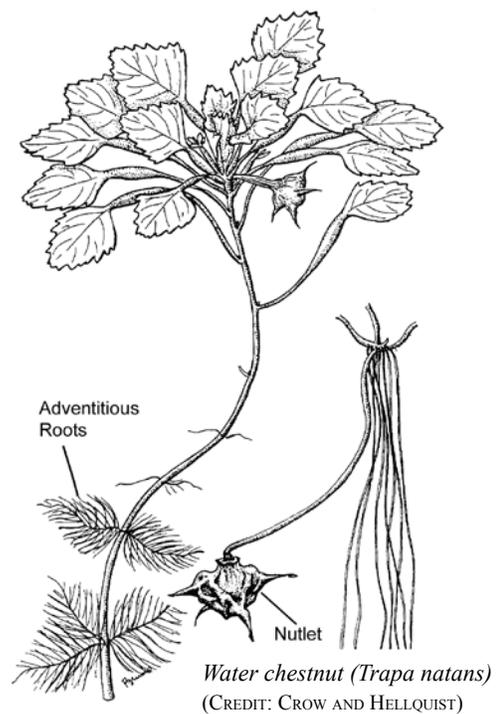
Zebra mussels (Dreissena polymorpha)
Top: Single zebra mussel. Bottom: Colony of zebra mussels attached to a hard surface (clam).

(CREDIT: WENDY SKINNER)

Appendices

- A. Citizen's Statewide Lake Assessment Program (CSLAP) 285
- B. New York State Water Quality Classifications 286
- C. Who Owns New York State Lakes? 287
- D. Incorporating and Insuring a Lake Association 290
- E. Interstate River Basin Commissions 293
- F. Internet Resources: Government and Private 295
- G. References Cited 302
- H. Additional Readings 308

Index of Terms 311



Preface to the Second Edition

Since its inception in 1983, the goal of the New York State Federation of Lake Associations, Inc. (NYSFOLA) has been to provide a source of dependable information and resources to the diverse lake associations across New York State. The first edition of *Diet for a Small Lake*, published in 1990, was intended for a growing group of lakefront property owners who had a wide-ranging level of understanding about lakes, streams and watersheds. This expanded and updated version of *Diet for a Small Lake* was prompted by questions from NYSFOLA members as well as new developments in watershed management techniques.

The first *Diet for a Small Lake* was a high-water mark in the cooperation between New York State Department of Environmental Conservation (DEC) personnel and the NYSFOLA staff and members. The book benefited both the people and the state. This cooperation has continued with both organizations working together to monitor and improve the lakes in New York State.

When the NYSFOLA Board of Directors authorized the revised and updated second edition of *Diet for a Small Lake*, several officers and directors agreed to assist, and Scott Kishbaugh from DEC joined them again. Committee members met regularly, traveling in all seasons to review and critique the developing chapters, suggest additional information for inclusion, and work on organizational procedures for the revision.

- Sharon Anderson, a former NYSFOLA Director, served as chair. In addition to contributing to the writing, she arranged numerous details with DEC and kept the rest of us on track, even though very busy with her job as Watershed Steward at the Cayuga Lake Watershed Network.
- Nancy Craft, retired librarian from Tompkins Cortland Community College, contributed ideas, indexing and editing, and worked tirelessly to maintain consistency in format and style.
- James Cunningham, New Water Technologies, Inc., shared his extensive knowledge of septic and wastewater management systems for Chapter nine, shared some of his image collection, and assisted with the mechanics of publication.
- George Kelley, NYSFOLA Past President and geologist retired from Syracuse University and Onondaga Community College, contributed ideas, this preface, and information about the glacial geology involved in lake formation and change.
- Scott Kishbaugh, DEC Division of Water and CSLAP Program Coordinator, stayed awake many nights writing and editing, and drove many miles to contribute from his professional background and his extensive experience assisting lake associations in New York State.
- Nancy Mueller, NYSFOLA Manager and CSLAP Assistant Program Coordinator, was one of the people who realized the need for a revised edition since she is the focal point for questions from the membership. She kept us in touch with the true needs of the reader, edited text and assisted with images and graphics.
- Lyle Raymond, retired Water Resources Specialist from Cornell University, shared his extensive knowledge in Chapter ten and his experience working with water laws, regulations agencies and local governments to remind us of the roles that policy and people play in protecting lakes.

DIET FOR A SMALL LAKE

- Rebecca Schneider, Cornell University professor and NYSFOLA Director, shared her knowledge regarding watersheds for Chapter nine. She also shared her perceptive assessments of how to best present complex materials, and inspired the re-ordering of the content of several chapters.
- Dr. John Foster of SUNY Cobleskill is thanked for sharing his extensive knowledge in authoring Chapter five, “Fisheries Management: Matching Expectations to Reality.” Except for Figures 5–3, 5–6, and 5–8 through 5–19, illustrations are from his collection and any copyright remains his.

Other contributors deserve acknowledgement and they retain their individual copyrights.

- The cover photograph (which is also used on the title page and in the table of contents) is courtesy of Carl Heilman II / Wild Visions, Inc., Brant Lake, NY and the copyright remains his. (www.carlheilman.com)
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- The University of Florida Center for Aquatic and Invasive Plants gave permission to use their line drawings of plants for Chapter six. (www.aquat1.ifas.edu)
- Wayne Wurtsbaugh, Utah State University; David F. Brakke, James Madison University; and American Society of Limnology and Oceanography, gave permission for a couple of pictures. (www.aslo.org)
- Original cartoons were provided by Mark Wilson, a member of the Shore Owners’ Association of Lake Placid, and copyright remains his (www.EmpireWire.com).
- Some images were used with permission from various government agencies (see Appendix F, “Internet resources”).
- Artists Wendy Skinner and Chris Cooley improved the presentation of information through their excellent illustrations (© NYSFOLA).

We appreciate the cooperation of individuals in DEC who helped us maneuver around bumps along the way to completion of the new book. DEC also provided funds to support the editing of this document, and provided staff time for the development of Chapters three and six in support of on-going changes in the state aquatic plant management program. Fish images were originally prepared by Ellen Edmonson and Hugh Chrisp as part of *1927-1940 New York Biological Survey*, and are used with permission. Tim Sinnott provided information regarding invasive fish species.

The members of the committee dedicate this book to the people, present and future, who use, appreciate and protect the waterways of New York State.

Preface to the First Edition

Several years ago, the Federation of Lake Associations of New York (FOLA), in response to requests from its membership, saw the need for a publication that would describe lake management activities to the public. Although several excellent publications were available that covered the topics of lake ecology and lake restoration techniques, we felt that none of the publications adequately met this need. It was at this time that I began discussions with Dan Barolo, the Director of the Division of Water of the New York State Department of Environmental Conservation (NYSDEC). Dan agreed with the necessity of such a publication and assigned his staff to work on the manual. Thus, the publication *Diet for a Small Lake: A New Yorker's Guide to lake Management* was engendered.

The 7,500 lakes ponds and reservoirs of New York State need our help. It is often thought that the role of managing our water resources is best left to the “experts” in academia, private industry and government. How will these experts communicate with members of the public? Each individual citizen has his or her own personal beliefs based on education and life experiences. Do these citizens have a minimum knowledge about the ecological and societal aspects of lakes? This manual, and other similar publications used in an integral fashion, are designed to raise the level of understanding for members of the public who are genuinely interested in protecting and preserving out lakes.

The manual is a joint publication of the Federation and DEC. Its title page shows no authorship, but this

“oversight” is related to the dilemma of trying to give credit to the spectrum of individuals who contributed to its genesis. The primary authors of the publication were Scott Kishbaugh and Jay Bloomfield of DEC and Ann Saltman of the Federation. Elizabeth Smith of DEC did much of the editing, and without her contribution the manual would probably still be a few faded ideas and a pile of papers in a box. The following NYSDEC employees contributed greatly to the preparation of individual chapters: Jim Sutherland, Sue Benjamin, Mike Rafferty, Jim Swart, Pat Longabucco, Ed Woltmann and Bill Morton.

Finally, my deep gratitude is extended to Italo Carcich, Dan Barolo and Sal Pagano from the Division of Water in NYSDEC for providing the leadership required to complete the manual, particularly when there were equally pressing demands on their staff's time to protect New York State's waters. I also am grateful to Commissioner Tom Jorling of NYSDEC for his strong support of lake management activities in the face of current budgetary constraints. Lastly, I would like to express my appreciation to the 50,000 or so members of the State's lake property owners associations, which make up the Federation. Without their commitment to cleaner lakes, the preparation of this manual would not have been possible.

John Colgan. M.D.
President, NY Federation of Lake Associations
Rochester, New York
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About NYSFOLA



The Federation of Lake Associations, Inc. was founded in 1983 by a small consortium of lake associations concerned about a variety of problems facing their lakes. Water quality was of concern to nearly all of the lakes, and little information was available on methods to combat the increasing presence of aquatic invasive species. In 1995, the name was changed to the New York State Federation of Lake Associations, Inc. (NYSFOLA) in recognition of the geographic area it served.

With the assistance of the New York State Department of Environmental Conservation (DEC), NYSFOLA spearheaded the development of the Citizens Statewide Lake Assessment Program (CSLAP). This nationally-recognized water testing program, detailed in the Appendix A, "Citizens Statewide Lake Assessment Program," trains and uses citizen volunteers to monitor the health of their lakes. This statewide lake monitoring program remains an important part of NYSFOLA's mission:

To protect the water resources of New York State by assisting local organizations and individuals through public dialogue, education, information exchange and collaborative efforts.

Since its founding, membership has grown to more than 200 lakes throughout the state, as well as many individual members. Members are invited each May to attend a conference that brings together lake managers from government, academia and the

corporate sector to share new technologies and case studies in lake and watershed management.

In 1990, NYSFOLA and DEC collaborated to collect the best lake management information in a single publication. Since its publication, *Diet for a Small Lake: A New Yorker's Guide to Lake Management* has been shipped all over the world and has been used by lake associations, colleges and professional lake managers.

In 1993, the organization became the New York State Chapter of the North American Lake Management Society. This brought the organization into a broader spectrum of lake-related issues and made its members' voices heard at the national level.

In the late 1990's NYSFOLA and DEC again collaborated to study how to develop watershed management plans. Six member lakes worked on the pilot project. The lessons and conclusions from that project are contained in *A Primer for Developing a Successful Watershed Management Program*. Information developed during this and other projects has been incorporated into this manual.

The organization continues to be actively involved in emerging lake management issues. Members of its Board of Directors serve with a number of lake-related advisory groups, including the Northeast Aquatic Nuisance Species Panel, The New York State Invasive Species Task Force, the New York State Water Management Advisory Committee, and the North American Management Society Board of Directors.

Introduction:

Designing a Health Plan for a Lake

Welcome

Diet for a Small Lake is a combined effort by the New York State Federation of Lake Associations (NYSFOLA) and New York State Department of Environmental Conservation (DEC). It is designed to motivate private citizens who may not have knowledge or experience in the field of lake and watershed management. Examples from within New York State are provided to illustrate the topics. References to state laws and government structure are specific to New York State, making this book a valuable reference for professionals in the field of water resources management. The information will build the knowledge and confidence required to delve deeper into lake management. Appendices F, G and H contain internet resources, references cited, and additional readings for those who seek more information.

This manual focuses on New York State and refers to common situations faced by lake associations and lakeshore residents. *Diet for a Small Lake* is a practical source to help address immediate problems. The goal is to demonstrate the importance of a management plan as the best tool for long-term reduction and prevention of problems. A comprehensive management plan is the key to the long-term health of a lake and its watershed. A management plan describes the activities that can be undertaken by lake associations, government, the private sector and individuals. It empowers local residents, and helps to balance conflicting interests.

Experience has reinforced the belief that management plans are the best method to ensure optimum use of the lake and surrounding land. Beginning in 1996, NYSFOLA and DEC worked with six lake associations and created several management plans. The results can be found in *A Primer for Developing a Successful Watershed Management Program* (NYSFOLA, 2001), available on the NYSFOLA



App's Landing on Oneida Lake's North Shore at dawn.
(CREDIT: ROY REEHIL)

website (see Appendix F, "Internet resources" and Appendix G, "References cited"). The participating associations represented a wide breadth of lake ecology found in New York. Their experiences, the lessons shared at annual conferences, and countless conversations and emails have been combined with DEC input to create this expanded second edition of *Diet for a Small Lake*.

The ideal lake

Ask any audience of lake enthusiasts to imagine the ideal lake and each person will have a slightly different picture. A composite description of an ideal lake might include a completely forested watershed, a beautiful home with a large veranda, tennis courts, a pleasure boat and canoe in the boathouse, and no noise except the songs of birds. The water is clear enough to see the bottom in 20 feet of water. A few blocks away are well-supplied shops and entertainment. Public utilities are reliable, cell phone reception is exceptional, and cable and internet

DIET FOR A SMALL LAKE

access are affordable. There are no messy weeds in the lake, no troublesome neighbors, and taxes never seem to increase.

Is all this possible? Even spectacular lakes such as Lake George and Upper Saranac don't come close to this fantasy. Many of the features listed conflict with each other. Crystal clear water, a sandy bottom and weed-free lake may provide great swimming but will not provide what a fishery needs to flourish. Nearby stores, municipal water and sewers only come to an area when there are a sufficient number of people to support them. Conflicts typically arise, however, as the sound of powerboats break through the peace that others cherish. Remember the natural limitations that exist. A lake cannot be all things to all people.

Lake management

Lake management is an art, informed by science, of balancing the demands of various users of the land and water. To keep lakes healthy, it is no longer possible to expect nature to take care of problems. Human activities combine with naturally occurring processes to create pollution and disturbances that exceed the natural capability of waters to dilute and purify. Managing a lake means accounting for the needs of fish, plants, wildlife and people.

Lake management is the responsibility of the users of the lake and its watershed and not solely a government function or a job for professors or private consultants. Lake and watershed property owners must understand natural processes, limitations of science, tradeoffs, and even how to work with people. A management plan pulls together all of these factors and then recommends a systematic approach to protecting and enhancing water resources. Lake associations can play a powerful role in motivating, cajoling and supporting governments and professional lake managers who work to draft and implement a management plan.

The resulting document may be called a Lake Management Plan or a Watershed Management Plan. Both terms are used in this publication as applicable to a particular discussion. Lake and watershed management is only possible when the ideas from the

entire watershed and all interested parties are taken into consideration. Shoreline property owners, for example, may find a way to get rid of excess water weeds using a process that must be repeated every few weeks. Longer relief, however, means recognizing that the weeds are really a symptom and the cause may be soil and fertilizer washed off their shoreline lawns as well as from farms miles away from the lake.

Accept what you cannot change and manage the rest

Property owners, lake users, and municipalities must be realistic about to what extent a lake and its watershed can be controlled. Disagreements at this fundamental level are among the challenges involved in developing a realistic management plan.

A blend of human and natural laws influences water and watersheds. A reservoir is an example of a system designed by humans and generally conforming to natural laws. An engineer designs the dam, including size, structure and material, based on "natural laws", such as the existence of water pressure. As time passes, human-influenced factors will change how dams are built due to the availability of new building materials, better understanding of technical options and amended regulations. Nature's "laws," however, will always exist.

Another challenge is the limitations of existing knowledge. The best scientists and engineers can do is study the system using observations, models and experiments. It may not be comforting to the reader, but most scientists who study lakes (limnologists) believe that they understand only a fraction of what could be known about lake ecosystems. A lake watershed management plan needs to remember that science is not always black and white, and that the different values of people greatly influence decision-making. To design effective ways for resolving lake problems, lakeshore property owners must join with other watershed residents and with government officials to make decisions that are crucial to creating and implementing a management plan.

How to use this manual

See Preface two for full information on contributors to this publication and the names of the people and organizations who gave permission for use of their copyrighted images. The image owners, organizations and government agencies are also listed more fully in Appendix F, “Internet resources”. The copyright for those images remain with the originators; they do not come to NYSFOLA. The artist-created images are © NYSFOLA.

Conventions used include:

- Important terms appear in boldface where they are defined within the context of the paragraph. Refer to the Index of Terms for a listing of the page on which a word is first used and defined.
- Units are given in their standard English versions (gallons, feet, Fahrenheit) except for scientific reporting where the convention is to use metric units (liters, meters, Celsius).

The book is organized to be read from start to finish. A chapter may be selected that addresses an urgent concern, but the reader may need to refer back to previous chapters for background information. This manual attempts to:

- Help the reader understand the overall workings of a lake and how activities on the surrounding land affect it;
- Familiarize the reader with how lakes differ across New York State;
- Explain the most common lake problems and possible solutions;
- Introduce the legal framework that allows for the management of lakes; and
- Walk through the steps for creating a lake management plan.

The NYSFOLA website posts significant new regulations, permitting procedures, and supplemental information as they become available (see Appendix F, “Internet resources”).

Summing it up

The best “treatment” for a lake will resemble a health plan rather than a bandage. An effective lake management plan will include immediate actions as well as long-range watershed approaches and will combine both preventive and remedial options. A comprehensive management plan charts a course to identify causes and sources of problems, and a course to plan and implement solutions to the problems. A management plan must be revisited on a regular basis to keep it viable as the lake conditions and people’s expectations change. The success of the plan is measured by the degree to which people and actions work together to solve conflicts, protect the lake, and prevent future problems.