

11

Management Plan Development: Putting the Pieces Together

Introduction

Earlier chapters discussed the history of lakes and the problems to which they are susceptible. Now is the time to prioritize the problems and outline the actions needed to remedy them by gathering together all that has been learned in the earlier chapters, from diagnosing lake problems to understanding how activities in the upland affect lake quality. This can best be done through creating a **watershed management plan**. This chapter describes guidelines for writing such a plan, including who might be involved and suggestions about how to involve them. The term “watershed management plan” has been chosen as a reminder that upland activities affect the health of a lake as much as the activities of lakeside property owners and lake users.

The overall goal of a management plan is to maintain or improve the health of the lake so it can continue to provide services and enjoyment. Creating a watershed management plan is more than a bureaucratic exercise; it is a systematic approach to lake management. Often the catalyst for developing a plan is a visible problem, such as weeds. The plan defines the desired results, lists what needs to change, and the steps necessary to get there. It keeps efforts coordinated and focused on the steps most needed to achieve long-range improvement through addressing the true causes of the problems. A good plan considers the social, economic, political and cultural context of the lake and its watershed.

The dialogue created among watershed stakeholders during the process has long-term benefits. Involvement of diverse interests increases knowledge and awareness, which frequently leads to better decisions and increased acceptance when it comes time to take action. A broad base of support usually is needed to affect change since many problems are the result of nonpoint source pollution and cannot be solved by a single individual or governing body. A planning

process that balances multiple uses can also reduce conflict among lake users.

There are other tangible benefits to creating a watershed management plan. It provides a rationale when seeking funding and the detailed data required by most grant applications. Some funding sources give preference to projects that are outgrowths of a management plan.

Many of the suggestions in this chapter have been distilled from the management planning experience of lakes in New York State, especially from six lakes that participated in a pilot watershed management project. This project was a joint effort of the New York State Federation of Lake Associations (NYSFOLA) and the New York State Department of Environmental Conservation (DEC). The resulting report, *A Primer for Developing a Successful Watershed Management Program* (NYSFOLA, 2001), is referred to and quoted below. The full text is available on the NYSFOLA website (see Appendix F, “Internet resources”.)

Every lake is unique in terms of the economics, ecology, geology, politics, and values. The six lakes selected for the pilot project reflect that diversity. They included:

- Chateaugay Lake, a rural northern Adirondack lake;
- Cossayuna Lake, a shallow lake located between the Capital District and the Adirondack Park;
- Findley Lake, a western lake that is contained almost entirely within one town;
- Oscawana Lake, located in the populated lower Hudson River Valley;
- Owasco Lake, a relatively large Finger Lake whose watershed spans three counties; and
- Queechy Lake, located south of Capital District near the Massachusetts border.

One of the key lessons learned during the pilot program was that creating a lake or watershed management plan takes time—typically three to six years. It requires considerable patience to identify stakeholder groups, establish a communications network, and attract broad involvement. It can be tedious to accumulate from many sources the scientific information needed to document what is known about a watershed. It requires commitment and persistence to maintain the effort needed to choose strategies that are realistic and acceptable to people with diverse interests and values.

In addition to time, two other basic ingredients are expertise and money. At least one of these three ingredients usually is in short supply. If you have the expertise needed to accomplish a task by a certain deadline, there may not be enough money to complete it properly. Remembering this can reduce frustration and aid in anticipating and addressing any shortfall. Lake associations have found that a surprising amount can be done at no monetary cost to the association. Facilities, equipment, expertise and labor have been obtained through in-kind contributions, pro bono technical assistance, and volunteers. If money is in short supply, it can be worth investing time to cultivate the relationships needed to acquire these resources.

Getting people together for a common purpose

“Never doubt that a small group of thoughtful, committed citizens can change the world.” ®
Margaret Mead (used with permission)

Who to include?

The first step is to form a core committee to provide continuity and to shepherd the process from the beginning to completion of the plan. The role of the committee is to oversee the planning process and to keep the broader public informed and involved.

A lake association can be an ideal starting group since it can:

- begin the process;
- become an environmental watchdog;
- educate lake users and property owners on their role in protecting the lake and watershed;
- help to complete small projects; and
- serve as a catalyst to sustain the management plan effort over many years.

If no lake association exists, related conservation groups or a few neighbors might be interested in beginning such a group. Information on forming a lake association is found in Chapter ten, “Legal framework,” and in Appendix D, “Incorporating and insuring a lake association.” While the actions of an association can be large, its membership alone is not sufficient. Lakeside owners may have full-time jobs, time constraints and are unlikely to have all the expertise or the diverse perspectives necessary to create a successful plan.

For the committee to work well together, it needs a common goal. This can be as simple as maintaining their enjoyment of the lake, or seeking to protect property values. Within that context, individuals bring their personal views based on their knowledge and experience. As they participate, their outlook changes and their knowledge increases as they become involved in matters outside of their initial area of interest. The broader this knowledge becomes, the easier it will be for each person to understand the needs and beliefs of others. Moving from conflict to understanding is a critical requirement for a successful plan. The lake associations in the NYSFOLA pilot program saw this resulting sense of community as the greatest benefit of the management planning process.

Initially it may seem easier to exclude individuals with different opinions. The initial progress may be faster, but all too often the group that feels excluded may block further progress after the committee has invested much time in planning. This can cost more time, money and personal energy than it would have if the disparate views had been included from the beginning. The dialogue that results from broad involvement at early stages continues to pay off, as the group’s growing understanding of the interests

of others frequently results in better decisions and smoother implementation. Many funding sources favor proposals that show strong collaboration among groups, and these groups may constitute a broad enough base to spur policy changes or other chosen actions.

The core committee should have representation from each group that may be affected by the identified problems or by the potential strategies to address the problems. The committee should include:

- lake users and property owners;
- farmers and other large landowners in the watershed;
- municipal officials;
- conservation agency staff;
- members of local tribes; and
- people with scientific knowledge about lake ecology and lake restoration.

More members can be added to the core committee when new interest groups are identified. Turnover in membership is normal given the long time commitment and new members should be recruited to maintain the breadth of perspectives.

Involvement of the municipal leaders within the watershed is critical to success. The response from municipal leaders can vary from enthusiastic support to grudging recognition that the town needs to be kept informed. The NYSFOLA *Primer* (2001) reports:

“Local politics, including relationships with the Lake Association and perceptions about the importance of the lake to the town are the key to getting town involvement in lake-management projects. These relationships are extremely variable from one watershed to another, and each must be dealt with according to the perceptions and past relationships between town residents and the lake association.”

Scientists with knowledge of lake ecology and lake restoration techniques can help unravel the underlying causes of problems, identify a suite of potential solutions, and insure that the needs of fish and wildlife can also be considered as well as the desires of the stakeholders. The expertise of scientists

is especially critical in compiling information about the current lake conditions, including the topics discussed in chapters one through nine. The compilation of their findings is often called a **State of the Lake Report**. It becomes the handy reference for recording trends and patterns, ferreting out the causes of problems, assessing whether there is sufficient data

Building partnerships

Recruit people from groups that have diverse perspectives and expertise for the core committee, or at least to serve in an advisory capacity. Many of these groups are discussed in Chapter ten, “Legal framework.” Examples include:

State, federal and tribal groups such as:

- DEC state and regional offices;
- New York State Department of Transportation;
- U.S. Geological Survey;
- New York State Geological Survey;
- Natural Resources Conservation Services in the U.S. Department of Agriculture;
- Regional office of U.S. Environmental Protection Agency EPA;
- Tribal leaders; Bureau of Indian Affairs and EPA’s American Indian;
- Adirondack Park Agency, where applicable.

County agencies such as:

- Cooperative Extension;
- Soil and Water Conservation District;
- Health Department;
- Planning Department;
- Chamber of Commerce;
- Environmental Management Council;
- Water Quality Coordinating Committee WQCC.

Informal leaders and interest groups such as:

- Large landowners such as farmers;
- Businesses that depend on the lake;
- Sportsmen and fishing clubs;
- High school or college environmental clubs;
- Conservation organizations and land trusts;
- Professionals such as educators, lawyers, accountants, and people who know how to write grants. Many of these people may already be in the core committee if they own property on the lake.

to draw meaningful conclusions, and providing a scientific justification for decision making. Some scientists or university faculty may own property on the lake and be willing to help. While not the only factor, good science must be at the foundation of evaluating lake health and identifying possible management actions.

If possible include on the core committee one individual who receives regular salary from a government or county office for administrative services. In addition to helping locate data, this individual is important for keeping the process moving, maintaining consistency as volunteers come and go, and serving as a repository for important documentation. Staff members of local Soil and Water Conservation Districts (SWCD) or county planning departments may be willing to serve in this position if local watershed management fits within their regular duties.

Who will lead?

The results of watershed management planning efforts around the state unequivocally show that success hinges on having the right committee leader. The *NYSFOLA Primer* (2001, p. 11) uses the word “team” rather than “committee” and reports that a successful lake management plan (emphasis original):

“...requires a dedicated leader with good leadership skills. The team leader needs to have the skills necessary to identify who the relevant stakeholder groups are, to define the key issues, and to diplomatically bring these factors into the discussions. Results were best when the leader was locally recognized and accepted. The personality of this team leader is vital.

A major factor in core team success was available time. This project takes a considerable amount of management time. Respondents indicated it often required ten hours or more a week throughout the year to make phone calls, organize meetings, and help organize information. Such a commitment places a heavy burden on volunteers who are also juggling full-time jobs and families. The project becomes a stress instead of a satisfying challenge.

Projects seem to proceed most smoothly when the leadership roles can be included as part of a person’s job duties within a relevant agency. Agency affiliation provides a continuity that is lacking with citizen leaders, who are not necessarily engaged in the process for long-term follow-up. It also provides linkages and a professional interest in the outcome on the part of the Project Leader as part of long-term job responsibilities. Agency people also have ready knowledge to help identify relevant groups and stakeholders.

Selection of the right people and agency is, however, not a minor issue. Many citizens feel an “agency” has a “biased agenda” or is a “regulatory threat.” This reduces their effectiveness for getting stakeholder involvement. The historical relationship of a particular agency with the particular community is very important.”

Who can help?

While the committee provides continuity throughout the process, others may be involved when their expertise is needed. Agency staff may be able to provide services as part of their job. Professionals may donate expertise to a good cause. College students and faculty may be able to help with components such as conducting public opinion surveys, monitoring water, gathering data on flora and fauna, mapping and analysis.

Government agencies have data and knowledge, as well as information on regulations and policies. Relevant information might include soil types, stream-flow data, population data, biological information, and water chemistry. Various government agencies have jurisdiction over activities being conducted in the watershed, or within the lake itself, such as construction of docks, shoreline zoning, discharge of wastewater, and the management of wetlands. Some actions may fall within the purview of a county health department, SWCD, or town planning board, and in-kind help or staff assistance may be available from those agencies.

It is important to carefully select the proper agency when seeking help. Citizens often relate stories of how they called some agency and got “the run-

around,” being transferred to several other phones or getting an employee who doesn’t recognize the agency’s ability to help. The following tips can help obtain the desired information, whether it is from a governmental agency, professionals, volunteers, or committee members:

- Determine what information or assistance is needed and write it out.
- Talk with others who have experience with different agencies to determine who is most likely to be of help. Start with the town, city or village before going to a county or state agency. Federal agencies often refer requests to state and local agencies.
- Start with the agency’s technical staff first, rather than contacting upper-level management.
- Be cordial, no matter how dire the issue may be or how unhelpful a staff person seems. This process is all about building connections.
- Contact your area elected officials for additional advice and support. Describe the information or assistance you need, and the contacts you have already made with government staff.
- Write down who you talked to and a summary of what they said. Seek their opinion on who else might be able to help. Set up a file of notes, correspondence and e-mails.
- Follow up your conversation with a letter that captures key points and expresses appreciation, suggesting a personal meeting after you have reviewed the data.

Enthusiasm and warmth are contagious. Many people are willing to help when approached by someone who is dedicated and passionate about a project or cause. Even someone who is not able to help immediately may become a great contact later in the process.

Public outreach and involvement

Private citizens play a significant role in protecting water quality and aquatic habitat. Surveys conducted in both the Great Lakes (Beldon Russonello & Stewart, 2002) and Chesapeake Bay watersheds

(Blankenship, 2002) show that citizens care deeply about water resources but do not understand how their personal choices and actions affect water health. To many, one failing septic system, one person feeding ducks, one person dumping grass clippings into a stream, or one farmer letting his cows use an upland stream may seem unimportant. The cumulative affect of many instances, however, is quite detrimental and this collective, nonpoint source pollution is the greatest threat to most lakes. Because families and individuals will be asked to change their behavior, and possibly accept additional regulation, it is important to keep them involved in the planning process. Ongoing outreach campaigns can influence public perceptions and foster cooperation.

“Communication with the diverse groups of stakeholders throughout the watersheds was critical to obtaining their perspectives on watershed issues and to building their sense of ownership and involvement. Successful communication needs to increase stakeholder awareness of the project and to get feedback as the critical step of getting the total community to buy into the project and future implementation needs. Communication methods could be divided into two types: those methods conducted to get actual feedback from stakeholders, and those methods largely used to inform stakeholders.” (NYSFOLA, 2001)



Fig. 11–1. It is important to include all relevant stakeholders from the very beginning. Lakeshore owners cannot achieve their goals without collaboration and acceptance from those who have a vested interest in the lake. (CREDIT: HOLDREN ET AL, 2001)

DIET FOR A SMALL LAKE

The core committee ensures that the broader community is well informed and involved from the very beginning. Outreach may be delegated to a sub-committee of people with a talent for presenting technical information in ways that laypersons can readily understand. Sharing information widely and in a variety of ways increases the likelihood that people will respond to at least one facet of an outreach campaign. Some individuals may pay attention in fear of new regulations, others may be interested in fisheries protection, and others may care about the drinking water supply.

Outreach methods may include:

- Using of newspapers, radio and websites;
- Speaking with key organizations, community leaders, and municipal officials;
- Surveying residents and lake users;
- Holding formal public forums at several points in the process; and
- Using formal and informal community bulletin boards.



Fig. 11–2. Keeping the community involved and informed takes persistence, long-term commitment and the use of multiple methods of distributing information.

(CREDIT: HOLDREN ET AL, 2001)

Techniques for building awareness in the community

1. Develop a logo and standardized look for materials to help people recognize your efforts.
2. Prepare a short informational flyer that introduces the idea of a watershed management plan. Include a map of the watershed with political boundaries, a summary of the purpose and process, and trivia information such as size, wildlife, and history. Include information on how people can get involved.
3. Distribute a press packet that includes the flyer and a couple of articles about the process and key issues. Submit additional articles on a regular basis, including quotes from people and officials.
4. Contact radio and TV stations for their policies regarding public-service announcements and interviews. Remember to include stations at local colleges and public-access cable channels.
5. Attend networking events such as meetings of the Chamber of Commerce, tourism organizations, and other events where one-on-one conversations flourish.
6. Develop a presentation that any committee member could give at a meeting of service clubs such as Kiwanis and Rotary, a church discussion group, a town board meeting or an outdoor recreation club.
7. Create a table-top display that can be set up in libraries, bank lobbies, community centers, county fairs, Earth days and Water Weeks, etc.
8. Host activities that raise interest and awareness such as a lakeshore or stream clean-up days, a fishing derby, a canoe trip, a photography contest, or a water festival. Finding another group to co-sponsor the event is a good way to build partnerships and gain help. Invite local politicians to the events, especially when there are photo opportunities.
9. Set up a website and keep it updated so people will visit often. Ask other groups to set links to your website and offer links to theirs in return. Link the website to the NYSFOLA website.
10. Publish a newsletter from the committee, and submit articles to newsletters from other groups such as the Soil and Water Conservation District, Cooperative Extension, recreation clubs, schools and towns.
11. Create fact sheets on specific topics such as weed management, septic system care, and ecological landscaping. Seek permission to customize existing materials already developed by other watershed groups and government agencies.
12. Host informational meetings on key topics. If the topic is controversial, be sure multiple sides are presented in a balanced way.

Watershed inventory

Problems, both existing and foreseen, are frequently the stimulus for creating a management plan. As discussed in Chapter four, “Problem diagnosis” and Chapter nine “Watershed management,” the real cause behind the symptoms may not be obvious, but it must be found if lake management is to be effective. An important step, therefore, is to gather available information and data that are needed to understand the problems. This process also includes analyzing the information, identifying data and information gaps, and setting goals. The preceding chapters of this manual provided guidance for this investigation and facilitated dialogue with people who have needed technical information.

Compiling information in one document, often called a Watershed Inventory or State of the Lake Report, builds the foundation for the management process and results in a valuable long-term resource. It should include detailed information about the biological and physical conditions of the lake and its watershed, demographic characteristics and the input gathered through public surveys and meetings.

The type, amount and sources of information can vary in different watersheds. When vast quantities of information exist, it can be difficult to decide what is relevant and useful. Initial identification of problems and input from stakeholders can guide the investigation and tailor data collection efforts. Once the problems have been identified and defined, general goals can be developed that include both short-term and long-term solutions. These initial solutions will not involve specific recommendations or management alternatives, but they will provide direction for the evaluation process. While this step is important, be careful not to overspend time, energy and money compiling information, thus depleting these resources before finishing the management plan.

Keep good records as information is collected such as the source, contact information, explanations of uncommon terms, and information about when and how data were created. This information is called **metadata**: essentially data about data.

Data that can be included in a State of the Lake Report

The amount of information that can be collected may seem endless. Before you start, think about which types of data are needed for good decision making. Focus your efforts based on concerns and preliminary goals. The following are examples of some of the information and data that can be collected:

- The size and boundaries of the watershed.
- Major tributaries and the larger watersheds of which the lake is part.
- Facts about the lake such as the surface area, length of shoreline, volume of water and hydraulic retention time.
- Location of any dams and their ownership.
- Lake uses and trends.
- Boundaries of all municipalities and tribal lands within the watershed.
- Information on land management such as land-use ordinances and zoning for all the municipalities that govern the watershed.
- Land use, including the location of specific uses, their percentages and whether land is public or protected
- Wetlands and flood plain delineations.
- Weather patterns.
- Geology, terrain and soil types.
- Water-quality monitoring data.
- Documentation of native and invasive flora and fauna.
- Special attributes or areas within the watershed and what could threaten them.
- Stormwater outfall pipes in developed areas.
- Agency reports such as Rotating Intensive Basin Study (RIBS) reports and the Priority Waterbody List/Waterbody Inventory (PWL-WI) from DEC. (See Appendix F, “Internet resources”)
- Significant restoration projects already completed or underway.
- Anecdotal and traditional knowledge from long-term residents and tribal members.
- Point-sources of pollution.
- Significant water-quality violations such as chemical spills.
- Aerial, satellite and infrared photographs (together called remote sensing.)
- Demographics and population distribution.
- Social and economic trends.

Biophysical assessment

To understand where lake water is coming from and going to, the first step is to become familiar with the boundaries of the lake's watershed. The Natural Resource Conservation Service (NRCS), SWCD or U.S. Geological Survey (USGS) may have already identified the watershed boundary and the political boundaries of the towns and counties that intersect the watershed.

USGS 1:24,000 topographic maps are excellent aids for delineating the watershed divide, determining surface tributaries that contribute to the lake and the terrain that directs the movement of contaminants (Fig 11-3). Commonly referred to as "topo" maps, they can be obtained from the USGS (see Appendix F, "Internet Resources") and often from local sporting goods stores.

The next step is to identify the different types of land uses and their locations in the watershed using aerial photographs or geographic information systems analysis (GIS) (see Fig. 11-4). GIS is a powerful, computerized mapping tool used to precisely overlay and analyze maps and aerial images. Use these tools to locate residential areas, industrial complexes, livestock facilities and other potential sources of runoff or groundwater contaminants. Both potential point and nonpoint sources of contaminants should be identified. Under the category of potential point-sources, note the presence of gas stations, auto repair shops, stockpiles of road salt and de-icers, dry cleaners and sites of current and former industrial and municipal waste disposal areas.

Consideration must be given to all of these land uses and their potential contaminants relative to their position along the topographic gradients, particularly on steep slopes. This will influence the flowpaths of water that enters the lake. The tributary stream-channel network must be identified and its condition assessed. USGS topographic maps show the main stream-channel system by using dashed or solid lines to indicate whether streams are intermittent or perennial. Such detailed information is not available from large-scale topo maps or most remote sensing data. Data from maps or aerial photographs may be out of date and it may be necessary to walk along streams

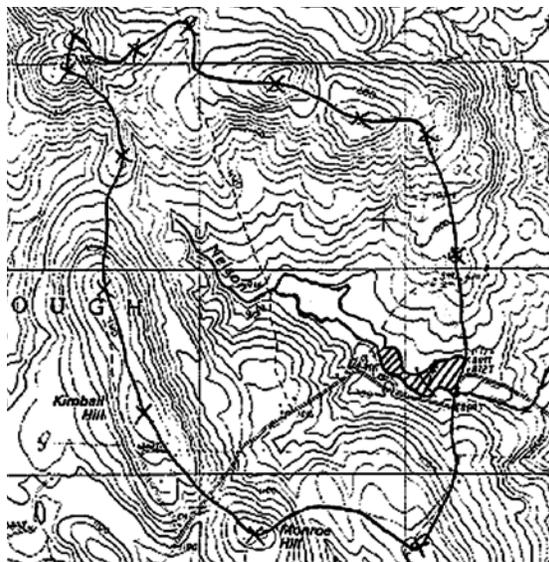


Fig. 11-3. The high points around Nelson Lake and its adjacent wetland (noted with hatch marks) are marked with Xs on a topographic map. The line that results when the Xs are connected across these highest areas represents the boundary of the watershed. (CREDIT: NRCS)

and roadside ditches to collect detailed information about present conditions. Is there a healthy buffer of natural trees, shrubs and other plants at least 30 to 50 feet wide along every stream? Are there sites of extensive stream bank erosion? How do networks of roadside ditches act to augment stream channels? Take time to map their outflows into streams and note whether the ditches have scraped or exposed substrates that can be a source of erosion sediment during storm events. Where do storm drains discharge into streams? Gathering this information will take time and effort but can provide a valuable source of information about pollutants and how they move into the lake. School classes and youth groups are an excellent resource for the stream walks needed to develop this database. Highway departments may have some of this information already and be grateful for any additional information you can provide them.

One of the most challenging tasks will be to evaluate the groundwater system contributing to the lake. A useful rule of thumb is that the groundwater table generally parallels the surface topography, with higher water-table heights under hills and lower water-table heights in valleys and lowlands. Groundwater moves

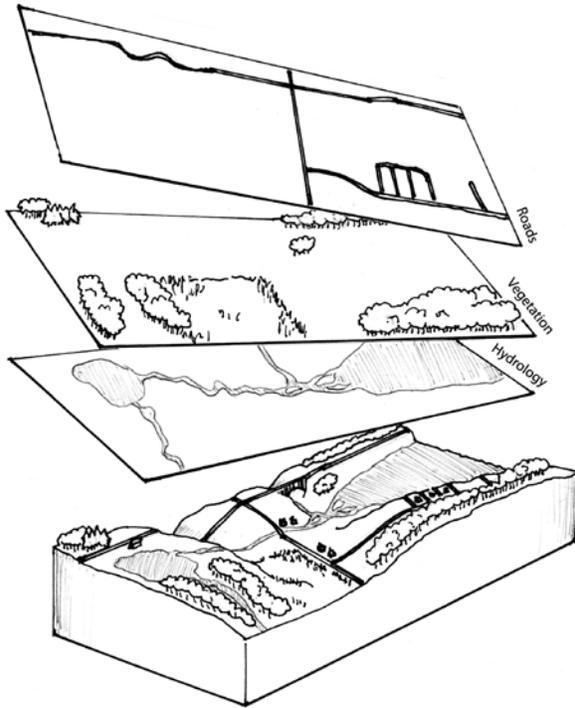


Fig. 11–4. Schematic showing how GIS software overlays different layers of data to show their spatial relationships with each other. The bottom image represents the reality of the landscape. Each additional layer represents one feature of the landscape such as the surface water features (hydrology), vegetation and the network of roads. (CREDIT: CHRIS COOLEY)

downslope from areas where the water table is higher to areas where it is lower.

Information from homeowners about water-table depths in their private wells can provide useful guidance on local variations. Topo maps, augmented with well data, can help to highlight the direction of groundwater flow that can transport a plume of contaminants into the lake or the location of groundwater recharge areas.

Mapping the classification and distribution of different soil types will provide additional insights into factors that affect groundwater. “Light” soils that have a high content of porous sands and gravels provide little filtering capacity and will readily permit contaminants to leach underground. Professionals can help identify soils and their associated land uses that can put groundwater at risk. Check with the local SWCD for soil maps that may already exist.

Finally, it is important to record the presence of other natural features that may be contributing to sustaining the lake’s water, such as floodplains, healthy forest patches and wetlands where groundwater recharge can occur or water is filtered before it enters the lake. These features deserve protection.

Assessing trends and public concerns

Decisions are not based solely on physical and biological science. If the priorities and management strategies recommended by the core committee are to be broadly adopted they must be relevant to the broader local community. Economic, political and social trends all influence lake management. Census data, research by social scientists, reports by the Chamber of Commerce and forecasts by planning departments can be helpful sources of information. Planning departments may have projections on the amount and probable location of future development derived from current patterns and land use controls such as zoning. Communities with zoning may find it very instructive to create a map of what the community could look like if all the land were developed to the extent that zoning allows. This is called a **zoning buildout**. During the data analysis phase, this map can be used to investigate implications for the lake, other water resources and natural areas if the buildout became a reality. It may also point to areas of the watershed that can best support new development.

The core committee should do additional investigations to identify the areas of concern to stakeholders. There are many ways to gather stakeholder views such as personal dialogue, small group discussions, phone interviews, surveys on the web, surveys mailed to watershed residents and visitors, and large formal meetings. Plan to use a variety of methods because each has pros and cons related to the number of people reached, the time and money expended, and accuracy of the feedback. Some people lack access to electronic communication, some will not take time to give a written response, and some people are uncomfortable talking in groups. There are many books about how to write surveys. *Mail and telephone surveys* (Dillman, 2000) is a classic text that includes basic information

on design and discusses alternatives to a traditional written survey.

The participants in the NYSFOLA watershed project (2001) used surveys to identify watershed issues and to generate public interest. Surveys were viewed as one good way to inform the public about lake issues and the management planning process. Project participants were nearly unanimous in their feeling that public opinion surveys were one of the most successful activities conducted for communicating with stakeholders. The *Primer* continues (op. cit., p. 31):

“Writing a good survey requires considerable effort and is not a task to be undertaken lightly. The questions must be thoughtfully worded, a [mail] survey needs to be sent out at least twice to get adequate feedback, and follow-up telephoning may be needed.”

Whatever information collection method is used, it is important that the process be unbiased. The way a question is phrased can give the appearance of bias, can breed suspicion, skew the answer, and result in erroneous information. The process used must communicate sincere interest in divergent opinions and result in information that is actually used to improve decision making.

Analyzing the data

A core committee which has strong involvement with water resource professionals may be able to analyze and interpret the information collected. Alternatively, forming a separate technical committee can be useful. Professionals not willing to commit to service on the core committee may be willing to be a member of the technical committee where their particular expertise is needed. Water resource professionals should be heavily involved and help guide the process.

- *Identify data gaps.* Amassing available relevant data does not mean all the data necessary for good decision making has been collected. Targeted studies and water monitoring may need to be conducted to move forward. Alternatively, the committee may have to make the best decisions possible with known data, keeping in mind that

the plan will be revisited and revised as more information becomes available. The management plan should, therefore, include steps to obtain the desired additional data.

- *Assess the overall water quality* and the variations in conditions. Patterns may be found based on weather, land use, political boundaries or other factors. Political differences in protective ordinances and levels of enforcement are factors that can affect water quality.
- *Quantify the amount of pollution* and its sources based on information available. See the Chapter four, “Problem diagnosis” section on *Budgets for water, nutrients and other pollutants*. A limited number of critical pollution sources will often contribute a disproportionate amount of contaminants. Identifying and targeting these critical sources can provide the greatest return for the resources expended.
- *Compare water quality conditions* to standards, regulations and information on concerns and priorities gathered through public participation.

Data collection and analysis can consume many resources and slow down the process. There is a balance between having strong scientific information for decisions and getting mired in the plethora of fascinating, and often expensive analysis tools. Neither information gathering nor analysis of information is the desired end. These tools, such as monitoring, mapping, and modeling, are a means to an end and the focus should stay on the contribution these tools can make to management decisions. The information collected and related data analysis is compiled into a document that can be shared with stakeholders, used when deciding on management strategies and quoted when writing funding proposals.

Watershed management strategies

A broad or preliminary goal was identified early in the process, such as eliminating beach closures, improving drinking water or reducing aquatic weeds. Subsequent investigations improved knowledge of current conditions, underlying causes and public

priorities. This knowledge is now used to further define the desired outcome and to select specific objectives for the level of watershed protection that is appropriate and achievable, and to identify indicators that show measurable progress. The indicators and objectives will guide the selection of management strategies needed to meet the goal. They should be recorded as part of the plan because they provide the rationale and targets for the management strategies.

Indicators and objectives

Data analysis led to improved understanding of the severity of watershed conditions, the likely underlying causes and the critical sources of deleterious contributions, all relating to the health of the lake. Indicators either directly or indirectly quantify the status of a condition, especially a complex condition like “a healthy fishery” or “a polluted lake”. What do these phrases really mean? How will you know if the fishery is healthy or the lake is no longer polluted? If the underlying cause of a poor fishery is low oxygen and excess turbidity, then sufficient dissolved oxygen levels and a reduction of total dissolved solids to a stated level would indicate that the lake can support a healthy fishery.

The indicators selected should measure environmental changes clearly linked to the problem or the desired goal so they will be a valid indicator of progress. A value should be set for each indicator. Total phosphorus, for example, may be chosen as an indicator of eutrophication and a desired value of less than 0.015 mg/l (milligrams per liter) established as the target. Indicators may be regulatory, such as when a Total Maximum Daily Load (TMDL) has been set for the waterbody (see Chapter four “Problem diagnosis”). One indicator generally will not be sufficient; it is better to have a combination of indicators. The additional indicators of chlorophyll *a*, Secchi disk readings and other forms of phosphorus data would provide a better gauge of eutrophic changes. Indicators need to be quantifiable using methods that are affordable, practical and dependable for measuring the magnitude of the problem and the progress toward the established goal.

Indicators can be valuable as a communication tool. The “sneaker index” has gained popularity since 1988 when it was first used in Maryland’s Patuxent River (Clarke, 2002). Each year volunteers wade into the river and measure the depth at which they can no longer see their white sneakers. It is a powerful symbol as well as a meaningful marker toward a goal.

Objectives are tools for achieving the indicator targets. Both the critical sources of contaminants and public priorities are considered when developing objectives. It is important to include all relevant stakeholders in this objective-setting process from the very beginning. The objectives must consider the interests of all relevant stakeholders and the need for sustainable water protection.

Sample objectives include:

- Restoring vegetation along 20 miles of streambanks to prevent erosion and improve filtering.
- Avoiding further loss of wetlands within the watershed.
- Reducing the transport of erosion sediment to the lake by roadside ditches.
- Reducing nutrient runoff from farm fields.
- Repairing or replacing all failing septic systems.
- Minimizing flooding by increasing infiltration of surface water and groundwater recharge.

Once a complete list of objectives and targets is developed, evaluate their feasibility and appropriateness relative to the biophysical condition of the watershed and lake, the costs and public acceptance. Keep refocusing on the end goal rather than individual self interests. Appropriate science-based strategies for improving the watershed that are acceptable to the public can then be identified. When the core committee and involved stakeholders have divergent perspectives, it helps to work on “can you live with it” rather than “do you like it”.

**Moving from goals to management:
a simplistic example**

Goal: The lake is no longer pea-soup green

Data analysis: Phosphorus levels are highest after storm events and at the mouth of two tributaries with residential communities as the predominant land use.

Indicators and targets:

- Total phosphorus to have a monthly average of less than 0.015 mg/l and measurements after storms or snowmelt not to exceed 0.025 mg/l.
- Chlorophyll *a* measured in the water column to have a geometric mean of less than 5 µg/l.
- Secchi disk reading of at least 10 feet on average and 6 feet after storm events.

Objectives:

- Reduce phosphorus contributions from lawn fertilizers.
- Restore a minimum 15-foot buffer strip of woody vegetation along 60 percent of the stream.

Management strategies:

- Educational programs on environmentally-responsible lawn care for homeowners to be given each spring and fall.
- Establish a “lake friendly” certification program for lawn-care companies.
- Train landscape designers and nursery firms on the selection, marketing, and care of attractive woody ornamentals for streamsides.
- Include training and work in lawn care, landscaping and stream-side plantings in the youth summer job program.
- Adopt a local ordinance that prohibits application of fertilizer with phosphorus on established lawns unless a soil test shows the need.
- Strengthen enforcement of the existing stormwater ordinance.
- Install sediment traps in the stormwater collection system to reduce the movement of soil to which phosphorus is attached.
- Preserve undeveloped land by creating conservation incentives and promoting conservation easements.

Choosing management strategies

There are many potential management strategies and they can be divided into two broad categories. Most management plans, including the example to the left, will have items from both of these categories.

- *Structural practices* include physical devices such as vegetated basins that trap sediment, fences that keep livestock out of streams, and porous pavers that increase infiltration of stormwater.
- *Nonstructural practices* include regulations and voluntary changes in behavior such as municipal ordinances, permits, stormwater pollution prevention plans, inspection of septic systems and improved lawn care practices.

The first step is to review the structural and nonstructural practices already in place. Which are most effective? How does the public accept them? Are current practices in critical areas? Acknowledge protective efforts already established, look for modifications that could improve existing practices and programs, and identify gaps that should be filled.

A variety of potential action strategies can then be evaluated for their ability to address the underlying cause of problems, meet objectives and make the most progress toward the established goal. Some management strategies may work in some critical areas and not in others. Other strategies may be effective only if several are combined or done in sequence. Selection criteria should include:

- considerations of short and long-term costs relative to effectiveness;
- current conditions;
- likelihood of success;
- permitting or legal issues including compatibility with existing processes;
- additional benefits derived from the practices (such as increased wildlife habitat);
- unintended consequences or negative side affects; and
- community acceptance.

The committee presents key findings on the state of the lake, objectives, indicators and an early draft of management strategies. These meetings can minimize delays imposed by individuals or interest groups claiming at a later date that they were left out of the decision loop. Public forums are most effective when there has been outreach from the beginning of the planning process, and when feedback is thoughtfully considered and incorporated. Like surveys, these forums double as public education.

The devil is in the details

Before finalizing the plan, more information is needed. Who will accomplish what, in what time frame, and what resources will be needed? Many of the strategies are likely to fit within the core work of agencies such as Soil and Water Conservation Districts, planning and health departments, and Cooperative Extension. Other tasks might be logically addressed by municipalities, the lake association or a county Water Quality Coordinating Committee.

Consider scheduling projects that can be accomplished quickly and provide some “easy wins” and highly visible successes. Be realistic when setting time frames. A strategy might take a short amount of time to carry out but the permitting process, grant proposals or building the necessary collaborations can take a considerable amount of time.

The availability of resources is another important factor when drafting a timeline. Shortages of labor, money and public support can all limit progress, especially if the timeframe to completion is long. Acknowledging the completion of interim steps toward reaching an objective can reduce frustration if progress is slow. Consider defining and setting dates for milestones, such as the completion of a significant task or progress made, as measured by indicators. This level of planning has the added value of defining points where the management strategies can be evaluated.

Each milestone is an opportunity to take advantage of experiences and any new information gained. **Adaptive management** is a type of natural resource management in which decisions are made as part of an ongoing science-based process. Adaptive management

Outline of a typical watershed management plan

Executive Summary

Introduction

Information on the core committee and any sub-committees such as the technical committee.

Public participation efforts

Watershed description

- Physical and natural features
- Land use and land cover
- Demographic characteristics
- Watershed Conditions
- Water quality standards
- Available monitoring and resource data

Pollutant source assessment

- Nonpoint sources of pollution
- Point-sources of pollution
- Hazardous waste sites
- Mines and other pollutant sources
- Historic sites such as an abandoned tannery

Pollution loads and water quality

- An estimate of existing pollutant loads
- Future build-out pollutant load estimates
- Identification of critical areas

Watershed goals

- Management objectives
- Indicators
- Key pollutant load reduction targets

Identification of management strategies

- Existing management strategies to be continued
- Additional strategies needed to achieve goals

Implementation program design

- Schedule of activities
- Interim milestones
- Costs
- Technical assistance and other resources needed
- Informational and educational activities
- Evaluation/adaption process (USEPA, 2008)

involves testing, monitoring, and evaluating applied strategies, and incorporating new knowledge into management approaches that are based on scientific findings and the needs of society. Results are used to modify management policy, strategies, and practices (adapted from *Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management, 2000*). The repetitive nature of adaptive management recognizes that protecting natural resources requires coping with uncertainty. Planning that allows for assessing and adjusting goals supports continual improvement.

The management plan

Once details have been settled, the information is gathered into a management plan. The sample outline on the previous page provides a description of the process, as well as showing the common elements of a plan. If the compiled information produces a document that is lengthy, or if the process is taking a long time and a tangible proof of progress is desired, the plan can be broken into two documents—a State of the Lake Report containing the gathered data and a Watershed Management Plan containing the objectives and working plans. Full or summary versions of the plan may be included later in requests for funding or for permits.

The plan may be printed, transferred to compact discs, or posted on a website. It is then made available to those involved in development and implementation, including property owners, governmental bodies and agencies. Presenting the final document is another key time for a public forum and a celebratory party. NYSFOLA would appreciate receiving a copy to be shared with other lakes that are starting their own planning process.

Information and education

Some management strategies will be educational efforts, such as programs on environmentally-responsible lawn care. General education needs to be ongoing in addition to any programs specifically intended to help meet the objectives. Keeping the

public informed about progress keeps the plan alive and ensures the continuation of implementation. Strategies such as the adoption of new ordinances or a new tax will take education to build public support (sometimes called political will) and to educate people on how to comply. Education about water science is also helpful. Increasing understanding of the concepts covered in the earlier chapters of this book will support behavioral change, may reduce resistance and conflict, and will build the community's capacity to deal with emerging problems. People become interested and learn in different ways, so use a variety of approaches such as money savings, health implications, improved quality of life, and economic benefits. Use different methods such as websites, pamphlets, events, contests, and press releases.

Summing it up

Creating a watershed management plan is a giant step towards the real goal of implementing actions to protect the lake and its watershed. A plan should not sit on a shelf. It is a “living document” to be revised and reorganized as more information is learned, and the public continues to have input. Leadership and broad involvement are important beginning in the early planning stage. They continue to be important as funds are sought and adaptations are made. Implementation, funding, and evaluation are discussed in the next chapter.