LAKES AND PONDS RECREATION MANAGEMENT: A STATE-WIDE APPLICATION OF THE VISITOR IMPACT MANAGEMENT PROCESS

Jerry J. Vaske

Associate ProfessorDepartment of Resource Economics and Development, University of New Hampshire, Durham, NH 03824

Rodney R. Zwick

Assistant Professor, Department of Recreation Resource Management, Lyndon State College, Lyndonville, VT 05851

Maureen P. Donnelly

Assistant Professor, Department of Leisure Management and Tourism, University of New HampshireDurham, NH 03824

The Visitor Impact Management (VIM) process is designed to identify unacceptable changes occurring as a result of visitor use and to develop management strategies to keep visitor impacts within acceptable levels. All previous attempts to apply the VIM planning framework have concentrated on specific resources. This paper expands this focus to an entire state. Based on the Vermont Lakes and Ponds Recreation Management study, the VIM process can be applied regionally. Differences between site-specific and state-wide applications are noted.

A large body of literature demonstrates that environmental and recreational quality are multi-faceted concepts that can be threatened by a number of interrelated types of impacts (Kuss and others 1990). The amount, type and location of use, for example, influences use/impact relationships in complex, and often non-linear ways. Some types of recreation create impacts faster or to a greater degree than other types of activities. Even within a given activity, impacts can vary according to the type of transportation or equipment used, and the visitors' characteristics (e.g., party size or behavior). Because environments and user groups have different tolerance limits for human disturbance, the extent and severity of impact varies widely. Moreover, given a basic tolerance level, the outcome of recreation use may still depend on the time and place of human intrusion.

In an attempt to summarize this knowledge for managers, planning frameworks have emerged that integrate the scientific data within the judgmental process of balancing values related to preservation and use (Stankey and others 1985, Shelby and Heberlein 1986, Graefe and others 1990).[1] The Visitor Impact Management (VIM) process (Graefe and others 1990), for example, is based on the premise that effective management involves more than setting carrying capacities and use limits. While use quotas represent one possible strategy for reducing the impacts of visitors, it is important to remember the lessons from previous studies that found only weak or indirect relationships between impacts and overall use levels (Hendee and others 1978, Manning 1986, Kuss and others 1990). In such instances, establishing capacities and limits may do little to reduce the impact problems they were intended to solve, whereas other potential management strategies may be quite effective for reducing the impact conditions.

Previous applications of the VIM planning framework have examined the model's utility in two national parks (Great Smoky Mountains National Park, Glacier National Park), a national monument (Buck Island Reef National Monument), an Army Corps of Engineers Reservoir (Raystown Lake), a barrier beach owned and managed by The Trustees of Reservations (Cape Poge Wildlife Refuge and Wasque Reservation), and a state wild and scenic river (Youghiogheny River). These site specific applications suggested that the VIM process offers a logical approach for managers concerned with ameliorating the impacts caused by recreational use. This paper applies the VIM process to the management of lakes and ponds in Vermont. *By broadening the focus to an entire state, the goal is to identify issues that should be addressed when VIM is applied to multiple locations in a region as opposed to a single resource.* We begin by briefly reviewing the VIM process.

The Visitor Impact Management Process

The VIM framework includes an eight-step sequential process for assessing and managing visitor impacts. The first five steps in the process are devoted to the important, yet often slighted, task of problem identification. While this may appear to be a simple matter, it has often proved to be a stumbling block to effective resource management and related investigations. In state-wide planning efforts, characterized by a diversity of environments and experience opportunities, the importance of these considerations becomes even more crucial. Consequently, the problem identification issue is separated into several steps to isolate the various decisions that must be made in assessing existing conditions. The steps in the VIM process are listed below:

1) Preassessment Data Base Review
2) Review of Management Objectives
3) Selection of Key Impact Indicators
4) Selection of Standards for Key Impact Indicators
5) Comparison of Standards and Existing Conditions
6) Identification of Probable Causes of Impacts
7) Identification of Management Strategies
8) Implementation

These steps are designed to facilitate dealing with three basic issues inherent to impact management: (1) the identification of problem conditions (or unacceptable visitor impacts); (2) the determination of potential causal factors affecting the occurrence and severity of unacceptable impacts; and (3) the selection of potential management strategies for ameliorating the unacceptable conditions.

Applying the VIM Process

There are 295 lakes and ponds, 20 acres or larger in Vermont. Ninety-six of the lakes are at least 100 acres in size. This diversity offers numerous water-based recreation opportunities. Fishing, swimming, boating, camping and a host of other

---

1/ In addition to the Visitor Impact Management process discussed here, other planning frameworks include: the Limits of Acceptable Change (Stankey and others 1985) and the Carrying Capacity Assessment Process (Shelby and Heberlein 1986).

activities are engaged in by hundreds of thousands of Vermonters and visitors to the state (Bevins and others 1987).

The provision of such opportunities occurs on many governmental levels. Federal agencies, such as the U.S. Forest Service, the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers administer lands adjacent to lakes and oversee water impoundments, on which water-oriented recreation activity occurs. On the state level, approximately 200 fishing access areas are maintained by the Department of Fish and Wildlife. The Department of Forests, Parks and Recreation also administers recreation areas on lakes and ponds. Municipalities and towns provide swimming beaches, boat access areas, docks, and fishing facilities available to the general public. When VIM is applied on a state-wide or regional level, this diversity of management authority must be recognized and dealt with specifically, if the process is to be effective.

Increased participation in water-based recreation activities, coupled with unequal dispersion of lakes and ponds within the state, have led to user conflicts, crowding at existing public access points, loss of diversity of recreation opportunities, and private land closure in some locations. Increased developmental pressure has likewise threatened the ecological integrity of the few undeveloped ponds left in Vermont.

As a result of these identified concerns and needs, a Lakes and Ponds Recreation Management study was initiated by the Vermont Department of Forests, Parks and Recreation. The VIM process was selected to assess visitor impacts and to provide recommendations for implementing management and protection strategies. Because each lake and pond in the state can be characterized according to the setting's unique physical features, the presence or absence of specific recreational activities and amenities, and by the desired management objectives for that resource, the eight steps in the VIM process need to be conducted for each lake and pond separately. At the same time, commonalities among lakes can be identified in the process. When viewed in a regional context, therefore, a system for categorizing lakes and ponds with common management objectives, impact indicators and standards is required. The discussion to follow outlines general data collection requirements and decision points that were and should be used in these evaluations.

Step 1: Preassessment Data Base Review

The objective of Step 1 is to identify and summarize what is already known about the area(s) in question so that existing information can be put to its best use as the process continues. During the preassessment data base review for Vermont, it was necessary to delineate the physical area(s) to be included throughout the visitor impact management process. For convenience, management areas were patterned after the 12 planning regions in the state.

Two types of data were relevant for Step 1. The first involved an inventory of the physical features associated with each lake, while the second cataloged the recreational activities and amenities. The physical feature inventory included information regarding the area surrounding the lake, as well as data on the characteristics of the lake itself. The former provided an indication of the types of indirect impacts that may be occurring, while the latter described the existing conditions and suggested variables which may increase or decrease the direct impacts associated with human activity. Examples of variables measured in the physical feature inventory are listed below:

Physical Feature Inventory Data:

- Lake surface area
- Shoreline configuration
- Water level fluctuation
- Lake bottom sediment type
- Critical/unique habitats
- Types of aquatic plants
- Shoreland ownership patterns
- Development of the lakeshore
- Type of road/trail access
- Lake surface area used for recreation
- Shoreline length
- Shallowness ratio
- Water clarity
- Phosphorus levels
- Specific biota
- Shoreline vegetation
- Watershed uses
- Homes around lake
- Distance to nearest road
- Scenic/aesthetic qualities

Data on some of these variables existed in data bases maintained by the state. Information for the other variables was and continues to be gathered. While gaps in these data bases were inevitable, the intent of the physical feature inventory was to determine what is currently known about each lake, and to identify where additional data about the setting should be gathered.

The data base review also identified the need for an inventory of the current recreational use of the water, estimating the range and percentage of type of use occurring, determining how much of the use was attributable to day users (e.g., boating use from designated launch areas versus use by shoreline owners), and estimating peak use (i.e., the maximum recreation use at any one time). The estimate of the range and percent of use of activities occurring on a lake will be accomplished through on-site counts, or through volunteer monitoring of the recreational use of the lake. Counts and activity use percentages will be taken at random times over the primary recreation season to ensure a more representative sample. Estimates of the percentage of boating use attributed to day users will be determined through on-site observations of day user launches. Similar methods may be used to determine day use shoreline fishing, day use picnicking, and swimming. The following delineates examples of suggested criteria for the recreation inventory.

Recreation Activity / Amenity Inventory Data:

Management
- Management authority for the lake (public vs private)
- Existing management objectives
- Type and presence/absence of lake zoning practices
- Prevalence of law enforcement
- Existing use restrictions

Facilities
- Location and number of boat launching areas
- Location and number of marinas, moorings and docks
- Location and number of camping / picnic areas
- Location and number of designated swimming areas

Activities
- Range / mix of recreation activities
- Current usage patterns
- User satisfaction / crowding / user conflicts
- Type of experiences provided / desired

Of the two types of inventory data (physical feature and recreation activity / amenity), the state had a more complete understanding of the physical feature data. To apply the VIM process on either a site-specific or regional basis, however, both types of information and the interaction between the setting and social attributes are important. Recreational

activities, for example, affect and are effected by water quality factors such as clarity, pH, temperature, macrophyte coverage, and plankton abundance.

Step 2: Review of Management Objectives

The second step in the process is to review management objectives pertinent to the situation. In recent years, authors have emphasized the importance of clear and specific management objectives (Hendee and others 1978, Shelby and Heberlein 1986). To be effective, management objectives need to define the type of experience to be provided in terms of appropriate ecological and social conditions (Stankey 1980, Graefe and others 1990).

Early in the study, it became apparent that the management objectives for Vermont's lakes and ponds were not clearly delineated. A classification scheme was developed to help managers set objectives for acceptable recreational uses and impacts. In general, some lakes could be characterized as high density recreational experiences where motorized watercraft are common, while others provided low density wilderness opportunities with no motorized use. While no single set of objectives existed for all areas, the VIM process allowed different sets of objectives to be established for broad categories of lakes and ponds throughout the state.

Based on the manager interviews conducted as part of the project, four initial categories were identified: 1) solitude and/or wilderness, 2) non-motorized recreational, 3) low-speed motorized use and compatible non-motorized recreation, and 4) lakes or ponds managed for high-speed use and compatible low-speed uses. This array provided a range of environments in which alternative experiences and activities could occur.

The process of setting objectives was further facilitated by categorizing each of the initial classifications according to the amount of use found on the lake. Low, medium, and high use occurred within each of the four classifications.[2] The state operationally defined boundaries of what constituted low versus medium versus high use within each experience classification. Little Averill Pond, for example, was classified as high-speed use because water-skiing is permitted, but because the magnitude of use was low, the pond was categorized as a high-speed, low use resource. Lake Paran, on the other hand, had a high level of use on the peak swimming days of summer even though motorized watercraft were prohibited. This lake was classified as a non-motorized, high use lake. All lakes and ponds in Vermont over 20 acres in size were classified in a similar manner.

Although judgments regarding the initial four categories and the amount of existing use were somewhat subjective, the classification process was enhanced by incorporating other lake characteristics into the formation of management objectives. Remoteness, range and mix of recreation use, modifications to the surrounding natural environment, extent of access, size of lake, shoreland development, and existing management controls are examples of additional criteria that proved useful in the classification process. Each pond or lake was cross-classified using the four initial categorizations, use level, and the above criteria.

2/ Wilderness / solitude lakes were the exception to this general rule. By definition, high use does not occur on solitude lakes, however, low to medium use may exist.

Bean Pond in Lyndon, for example, is managed for non-motorized recreation, has relatively few recreationists, provides substantial isolation from the sights and sounds of mankind, and allows for a considerable degree of interaction with the natural environment. Using the proposed classification scheme, Bean Pond was considered a remote, non-motorized, low use lake. Lake Bomoseen provides an example where there is a wide range and mix of recreation activities and all types of watercraft are in evidence. In this instance, the resource was classified as a high-speed motorized lake, with high concentrations of use, where interaction with the natural environment was not a primary objective of the experience. Colchester Pond illustrates a limited access lake with minimal recreation use. Only two private owners have abutting property, restricting use and the number of encounters occurring on the lake. The lake has a relatively unmodified natural environment and provides an opportunity to escape the sights and sounds of humans. These setting characteristics suggested classifying Colchester Pond as a low use, non-motorized recreation lake.

The aforementioned characteristics or indicators function interdependently. In most instances combinations of the setting characteristics delineated the most appropriate type of recreation experience opportunity. For example, a remote, low density lake with limited access, and no shoreland development was classified as wilderness. This lake, however, would be classified differently if it lacked the remoteness associated with solitude (e.g., Colchester Pond). In these cases, setting inconsistencies became key indicators of the experience categorizations. The four categories when considered in conjunction with additional defining attributes (e.g., amount of use, remoteness, etc.) enabled management to set objectives for opportunities that met the diverse experiences users desire. While such categories of experience/use environments provided for development of standardized management actions, they also allowed for individualized lake management plans and implementation strategies. Thus, similar to a single large resource with many different subunits (e.g., a large national forest with both wilderness areas and developed campgrounds), visitor impact management objectives for a state-wide planning context should incorporate a range of acceptable impact levels to accommodate the diversity of environments and experience opportunities.

Step 3: Selection of Key Impact Indicators

The third step in the VIM process involves identifying measurable indicators for the pertinent management objectives. Once the objectives described the type of environmental conditions and visitor experiences to be provided, this step served to identify how the specified conditions and experiences were to be measured. The specific decision required here was the selection of the most important variables or attributes to serve as indicators of the desired conditions.

While there was no single indicator or set of indicators that were appropriate for all lakes and ponds, commonalities within and between lake classifications were sought. Several criteria were used to evaluate the potential usefulness of alternative indicators. Useful indicators included those that were directly observable, relatively easy to measure, directly related to the objectives for the lake, sensitive to changing use conditions and amenable to management. Depending on the resource, any of the defining characteristics discussed in Step 2 were considered key impact indicators. Selection of one indicator over another depended on the specific characteristics of the lake and the level of measurable impact (low, medium or high).

A nominal group meeting and a Delphi survey were also used to identify key impact indicators across all lakes and ponds in the state. Previous applications of the VIM process highlighted the importance of including representation of a diversity of interest groups (e.g., managers, users, property owners, etc.). When applied to a state-wide perspective, it is equally important to incorporate regional interests.

The goal of the nominal group was to generate issues of common concern and arrive at a consensus regarding the importance of each. Eleven experts participated in the nominal group session, representing a range of interest groups and agency perspectives. The results of these sessions were used to develop the Delphi survey. The Delphi sequence was conducted through a series of three rounds of questionnaires presented to a panel of 97 individuals, representative of various interest groups and geographic locations in the state. The surveys used in the Delphi sequence not only asked questions about significant issues, but also provided feedback to the panel members regarding the degree of group consensus.

Respondents to the survey were asked to evaluate 21 specific issues (e.g., milfoil spread, amount of development, access, recreational conflict, etc.) in terms of the severity of the problem, the extent to which the issue was being addressed, and whether they perceived the issue to be a future trend. Overall, the results indicated that physical impacts on Vermont lakes (milfoil spread, development around lakes, pollution from run-off, and excessive weed growth) are not only the most severe problems currently facing recreation managers, but are also likely to continue to be problems in the future. Social impacts such as amount of recreation use, year round recreation use of lakes, insufficient power boating access, and conflicts between recreation user groups, while not considered to be extreme problems at this time, were seen as areas of major concern for the years to come.

Graphing the responses to these three sets of questions highlights these interrelationships. Figure 1 plots the severity of each issue against the extent to which the problem is being addressed, while Table 1 describes the items in each of the quadrants. Regardless of how severe a problem was perceived, the panel members did not believe the issue was being dealt with adequately. From a management perspective, the items in the lower right quadrant of Figure 1 represent the key impact indicators. These issues were considered extreme problems that are not being addressed. The top three issues in Table 1 show that the most important impact indicators are ecological in nature (milfoil spread between lakes, polluted run-off into lakes, excessive aquatic weed growth). A social indicator ranked fourth (development around lakes and ponds), while a managerial indicator ranked fifth (insufficient shoreland zoning).

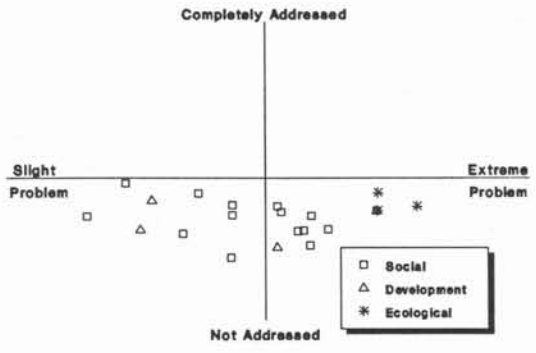

Figure 1. Vermont lake problems are being addressed.

Table 1. Perceived problems versus perceptions problems are being addressed.[1]

Lower Right (Perceived Problem / Not Addressed)
Milfoil spread between lakes
Polluted run-off into lakes
Excessive aquatic weed growth
Development around Vermont lakes and ponds
Insufficient shoreland zoning
Specialized user groups influencing decision makers
Too much power boating on remote lakes
Lack of stable funding sources
Conflict between recreation user groups
Pressure on local & state govt. to regulate use
Amount of recreation use of lakes
Development of undeveloped lakes
Lower Left (Not Perceived as Problem / Not Addressed)
Insufficient swimming access to lakes
Pressure on local & state govt. to provide services
Winterization of lakeshore homes
Not enough handicap facilities and access
Year round recreation use of lakes
Not enough recreation facilities and services
Utility company constraints on access
Insufficient power boat access to lakes
Insufficient trail access to undeveloped lakes

1. Quadrant descriptions are based on Figure 1.

Figure 2 plots the intensity of the 21 items against panel members' perceptions that the problems are increasing. Table 2 identifies the items in each quadrant. With respect to these relationships, items contained in the upper right quadrant were the immediate focus of management. Again, the first five items in Table 2 are the same as those in Table 1. Items in the upper left quadrant of Figure 2 (e.g., insufficient swimming access, more government services, winterization of summer homes), were considered less problematic at this time, but are likely to become key impact indicators in the future.

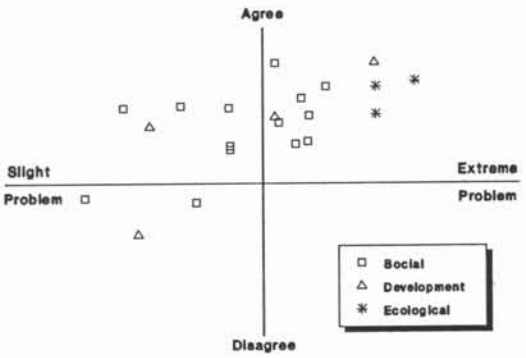

Figure 2. Vermont lake problems are increasing.

Overall, the findings from the Delphi survey indicated that the key impact indicators for Vermont lakes and ponds were primarily ecological. Social and managerial indicators, while considered important issues, were judged to be less problematic at this time. These issues, however, may increase in importance as the demand for water-based recreation grows.

Table 2. Perceived problems versus perceptions problems are increasing.[1]

Upper Right
(Perceived Problem / Agree Problem is Increasing)
- Milfoil spread between lakes
- Polluted run-off into lakes
- Excessive aquatic weed growth
- Development around Vermont lakes and ponds
- Insufficient shoreland zoning
- Specialized user groups influencing decision makers
- Too much power boating on remote lakes
- Lack of stable funding sources
- Conflict between recreation user groups
- Pressure on local & state govt. to regulate use
- Amount of recreation use of lakes
- Development of undeveloped lakes

Upper Left
(Not Perceived as Problem / Agree Issue is Becoming Problem)
- Insufficient swimming access to lakes
- Pressure on local & state-wide govt. to provide services
- Winterization of lakeshore homes
- Year round recreation use of lakes
- Not enough recreation facilities and services
- Insufficient power boat access to lakes

Lower Left
(Not Perceived as Problem / Disagree Issue is Becoming Problem)
- Not enough handicap facilities and access
- Utility company constraints on access
- Insufficient trail access to undeveloped lakes

1 Quadrant descriptions are based on Figure 2.

In general, the nominal group and the Delphi survey proved useful for identifying impact indicators on a state-wide basis. This technique could be equally helpful for defining issues for a single site.

Step 4: Selection of Standards for Impact Indicators

Step 4 adds one further layer of specificity to the VIM process by calling for standards for the previously selected impact indicators. This step, in essence, calls for a restatement of management objectives in quantitative terms. Standards differ from management objectives by specifying appropriate levels or acceptable limits for the impact indicators designated in Step 3. The standards selected become the basis against which the existing situation is evaluated. Thus, this step serves the important function of describing the environmental conditions and type of experience to be provided in definable units of measurement.

Specific standards for evaluating each lake were established. For some indicators, the standard was the total absence of the impact. The presence of *any* Eurasian milfoil, for example, was judged to be unacceptable. For other indicators, a range of acceptable impacts was defined. Littoral zone coverage, for example, was considered acceptable if less than 25 percent of the lake was covered. Greater than 50 percent coverage was deemed high impact. Values between these extremes were evaluated as moderate impact.

Some of the standards could be established for the entire state (e.g., milfoil). Other standards, however, had to be lake specific and tied to the management objectives for that lake. Development standards for lakes classified as wilderness, for example, differed from the standards applied to high density, high use lakes. In the former situation, zero development was the standard, while standards in the latter case varied according to the desired type of experience.

Step 5: Comparison of Standards & Existing Conditions

After the first four steps in the process clarified the conditions the state was trying to achieve for a given lake, the existing situation could be compared to this desired state of affairs. This step requires an inventory and assessment of current conditions for those impact indicators that were selected in Step 3. This assessment does not necessarily require elaborate and costly studies. What is necessary, however, is a level of observation and measurement that provides for a reasonable comparison of existing conditions and their corresponding standards.

When no discrepancy between current measures of pertinent indicators and corresponding standards exists, the managers can monitor the situation for future changes. In this situation, the lake or pond is currently providing the environmental conditions and type of experience that are defined as appropriate for the area in Step 2. The monitoring should include the impact indicators that are most susceptible to future changes, as well as the use patterns that may lead to changes in the status of these impact indicators. Because these data are collected prior to the time problem conditions are identified, the evaluation of the probable causes of the problem can be more easily determined.

When current measures for certain indicators do not meet the standards for the lake or pond, a problem situation is documented. It is then appropriate to move on to the identification of probable causes of the unacceptable impacts. The State of Vermont is currently in the process of making these comparisons.

Step 6: Identification of Probable Causes of Impacts

Because of the many potential factors that may contribute to impact conditions, the challenge of Step 6 is to isolate the most significant causes(s) of the problem situation. This task is approached by examining the relationships between visitor use patterns and the impact indicators that exceed their respective standards. In examining potential causal factors, it is important to consider the full range of specific aspects of visitor use that may influence the situation, including type of use, size of groups, time of use, concentration of use, frequency of high use periods, overall amount of use, and behavior of visitors. It is also important to remember that use/impact relationships may be mediated by site characteristics and consequently may vary for different times and places.

The introduction of Eurasian milfoil, for example, is typically caused by a change in the numbers or types of visitors using a lake. Milfoil becomes entangled in boat motors or trailers. Visitors who have boated on a lake where milfoil is present, may inadvertently introduce the weed to another lake where none exists. In situations where the number of motor boaters is increasing or where motor boating is being introduced on a lake, the probability of Eurasian milfoil spread also increases.

Step 7: Identification of Management Strategies
With some understanding of how the amount, type and distribution of people using a given area affect the quality attributes of the area and experience, it is possible to identify a range of alternative management strategies. Just as many aspects of use contribute to the problem, many management alternatives are available for dealing with the problem. It is important at this phase to focus on the probable causes of the visitor impacts rather than on the impact conditions themselves. It is also important to recognize that one may never have a complete understanding of the causes underlying certain visitor impacts, nor can one predict exactly how a given management action will affect a particular problem situation.

Management techniques aimed at reducing a particular impact problem may adversely affect other aspects of the situation or may introduce other problems for managers. A given management option may seem quite desirable according to some criteria but less desirable from the perspective of other criteria. A strategy with high odds of producing the desired outcome may be impractical due to the difficulty or cost of implementation. It may also be inadvisable if it causes as many problems as it solves in terms of visitor acceptance or other experience indicators. In the case of Eurasian milfoil, a program could be established to inspect boats at launch areas. Milfoil found on boats could be eliminated before entering the water. This management strategy, however, is costly to implement due to increased personnel requirements, and may cause increased congestion at the launch site. Less costly alternatives might involve boater education about milfoil spread, and/or volunteer monitoring of boats at the launch areas.

Step 8: Implementation
Because lakes and ponds classified as wilderness are the most susceptible to impacts, these resources should receive priority when implementing the identified management strategies. Appropriate management actions for lakes in the remaining classifications should be taken as soon as the necessary resources are available. Given the highly variable nature and causes of visitor impacts, management programs designed to deal with these impacts need to be flexible and quick to respond to changing conditions.

At the present time, for example, milfoil is most common in southern Vermont, and least common in the Northeast Kingdom. If evidence of the presence of milfoil is found in the northeast, a combined effort of boater education and boat inspection by lake association volunteers may need to be implemented quickly to curb further spread.

Once a management program is implemented, it is important to continue monitoring the key impact indicators and use patterns to determine whether the management actions are producing the desired outcomes without altering other characteristics of the experience. Regardless of the outcome of any particular step in the VIM process, continuous monitoring is essential for understanding the current status of each lake and pond and predicting when unacceptable impacts may occur.

Discussion

The Vermont lakes and ponds recreation study highlighted similarities / differences between multiple versus single resource applications of the Visitor Impact Management process. When applied to multiple locations, it was important to consider the unique physical and social characteristics of each resource. In essence, the eight steps in the VIM process were conducted for each resource separately. However, because commonalities between the lakes and ponds were evident, it was possible to develop a classification scheme for setting objectives (Step 2), identifying key impact indicators (Step 3) and specifying standards (Step 4) within broad categories.

This classification scheme offered several advantages. First, categorizing the lakes provided a structure for comparing and contrasting the diversity of environments and experiences within the state. Second, the framework established a foundation for setting objectives by differentiating what is currently offered from what should be offered. Third, the categories of lakes allowed for broad policy development and initiatives. Rather than dealing with each lake individually, state legislators and planners could mandate appropriate management actions for different classes of lakes. Fourth, by considering the state as a system of lakes, it was possible to assess differences in geographic distribution of lake classes within and between regions.

The state-wide evaluation process allowed for consideration of other conceptual issues related to the VIM process. For example, the potential substitutability of resources could be considered. When the classification process highlighted deficiencies in the availability of particular experience opportunities (e.g., wilderness lakes) in sections of the state, protecting the existing areas became paramount since there were no substitutes. Alternatively, if lakes of the same class were common in a region, managers could reduce use levels or change the type of use on a specific lake, since other similar resources existed. Because resource substitutes are not necessarily symmetrical (Shelby and others 1989), and because the other lakes may not have the capacity to absorb the influx of additional visitors, information about resource characteristics still needs to be interpreted in light of corresponding information about user perceptions of those characteristics.

The nominal group and Delphi survey proved useful for determining the extent of agreement about key impact indicators (Step 3). For both site-specific and region-wide applications of VIM, a diversity of interest groups should be represented in this step. With a regional focus, representation of the different geographic areas is always necessary. For site-specific evaluations, the significance of the resource determines the extent of geographic representation needed. Applying VIM to a nationally known landmark, for example, would require broad input. Less diverse feedback would be necessary for a small locally used resource.

In this study, graphing the potential impact indicators highlighted the interaction between the perceived severity of problems, the extent to which they were currently being addressed, and the likelihood of the indicator becoming a future trend. This technique is useful for either site-specific or regional applications of VIM.

Regardless of the focus, site-specific or region-wide, both ecological and social standards need to be established for specific resources (Step 4). In regional applications, some of the standards will cross all resources. The standard of no milfoil, for example, was applied to all lakes and ponds in Vermont. Other standards may not be universal. The amount of acceptable development, for example, varied according to the lake's classification (i.e., zero for wilderness, higher for other classes).

Steps 5 through 8 of the VIM process are also similar for both site-specific and region-wide applications. With a regional focus, however, they must be applied to each resource individually. This process does increase labor costs and is more

time consuming, but by classifying the resources into discrete categories, managers can prioritize areas of greatest need. Wilderness areas, for example, should receive priority because they are more sensitive to change. Once modified, they are lost. Impacts occurring on other classes of lakes (e.g., lakes managed for high speed use), may be more acceptable to both managers and users. Management strategies for these lakes can be implemented as funds and resources become available.

Literature Cited

Bevins, M. I; Boucher, M. L.; Tessaglia, D. L. 1987. Recreation needs assessment: The State of Vermont 1982 - 1987. Burlington, VT: Travel-Tourism-Recreation Clearinghouse, University of Vermont.

Graefe, A. R.; Kuss, F. R.; Vaske, J. J. 1990. *Visitor Impact Management: The Planning Framework.* Washington, DC: National Parks and Conservation Association. 105 p.

Hendee, J. C.; Stankey, G. H.; Lucas, R. C. 1978. *Wilderness Management.* (Miscellaneous Publication No. 1365). Washington D. C.: USDA Forest Service. 381 p.

Kuss, F. R.; Graefe, A. R.; Vaske, J. J. 1990. *Visitor Impact Management: A Review of Research.* Washington, DC: National Parks and Conservation Association. 256 p.

Manning, R. E. 1986. *Studies in Outdoor Recreation: Search and Research for Satisfaction.* Corvallis, OR: Oregon State University Press. 166 p.

Shelby, B.; Heberlein, T. A. 1986. *Social carrying capacity in recreation settings.* Corvallis, OR: Oregon State University Press. 164 p.

Shelby, B; Vaske, J. J.; Heberlein, T. A. 1989. Comparative analysis of crowding in multiple locations: Results from fifteen years of research. *Leisure Sciences.* 11: 269-291.

Stankey, G. H. 1980. Wilderness carrying capacity: management and research progress in the United States. *Landscape Research,* 5: 6-11.

Stankey, G. H.; Cole, D. N.; Lucas, R. C.; Petersen, M. E.; Frissell;, S. S. 1985. *The Limits of Acceptable Change (LAC) system for wilderness planning.* Report INT-176. Ogden, Utah: USDA Department of Agriculture.