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A Guide to Managing Recreational Boating Areas

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United States Coast Guard Headquarters
Office of Boating, Public, and Consumer Affairs
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16. Abstract

This guide is intended to be used by anyone managing a recreational boating area, especially those persons working at the state and local level. Traffic patterns, time zoning, activity zoning, warning/information systems, and access limitation are discussed and illustrated. Guidelines for developing a management plan are presented and discussed. The steps for implementing a management plan are also presented and discussed.

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PREFACE

This guide is intended to be used by anyone managing a recreational boating area, especially those persons working at the state and local levels. It is based on recreational boating area management techniques currently employed throughout the United States. The user is reminded that this is a guide. As such, it should not be considered to be all-inclusive nor should it be considered to be the only feasible approach to a management program.

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TRAFFIC PATTERNS

Rotational Traffic Pattern

The rotational traffic pattern is one of the more common boat traffic management techniques used throughout the country. Generally this technique applies specifically to water ski traffic, although in some areas it has been used for all high speed traffic. The rotational pattern is best utilized on small to medium-sized lakes and bays (small to medium sized lakes are 1,500 to 2,500 acres in size). A fairly round and regular shoreline configuration also enhances the usefulness of the technique. A preset traffic pattern will ease boating congestion, reduce activity conflicts, and create more uniform traffic flow.

As illustrated in Figure 1, the rotational traffic pattern is implemented by isolating a rectangular area marked by buoys with instructions that this area is limited to traffic headed in either a clockwise or counterclockwise direction only depending upon the preferred direction for a particular area.

Rotational Traffic Patterns

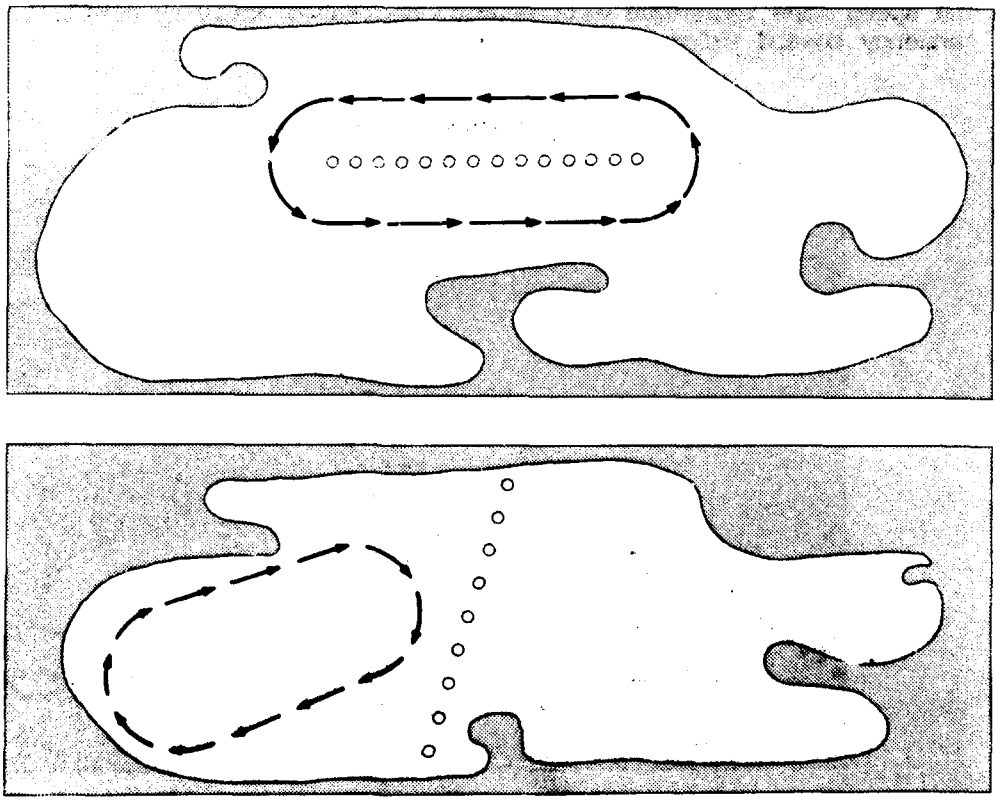
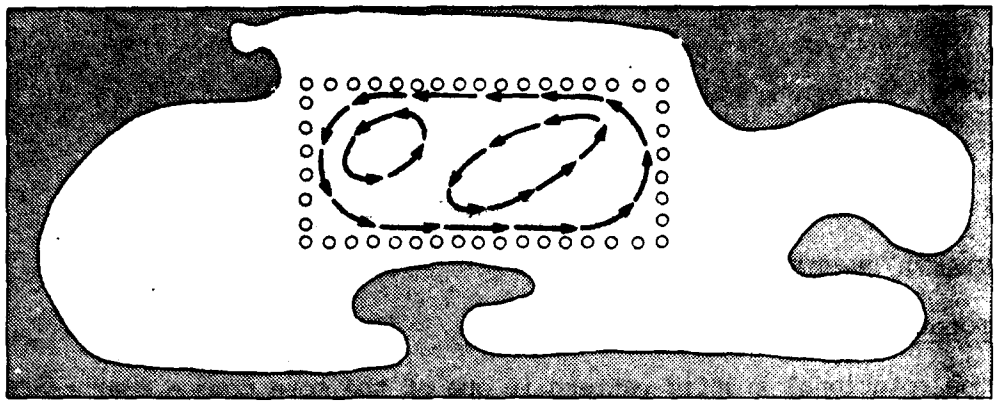


FIGURE 1



The rotational technique will create a tendency towards safer boating conditions as a result of reduced boating congestion and activity conflicts and will enable an area to support more water ski traffic at any given time.

High Speed Lanes

Another traffic pattern noted during the study is the high speed lane illustrated in Figure 2, which is used to segregate high speed and low speed activities. This type of directional control is designed to provide an unobstructed lane for high speed craft. Slower craft are encouraged to avoid this area as much as possible. The speed lane is most successful when placed on long narrow bodies of water such as flatwater rivers and man-made lakes. It is either marked by buoys or indicated on a chart.

The speed lane technique will provide decreased activity conflicts and a tendency toward safer boating conditions.

Speed Lanes

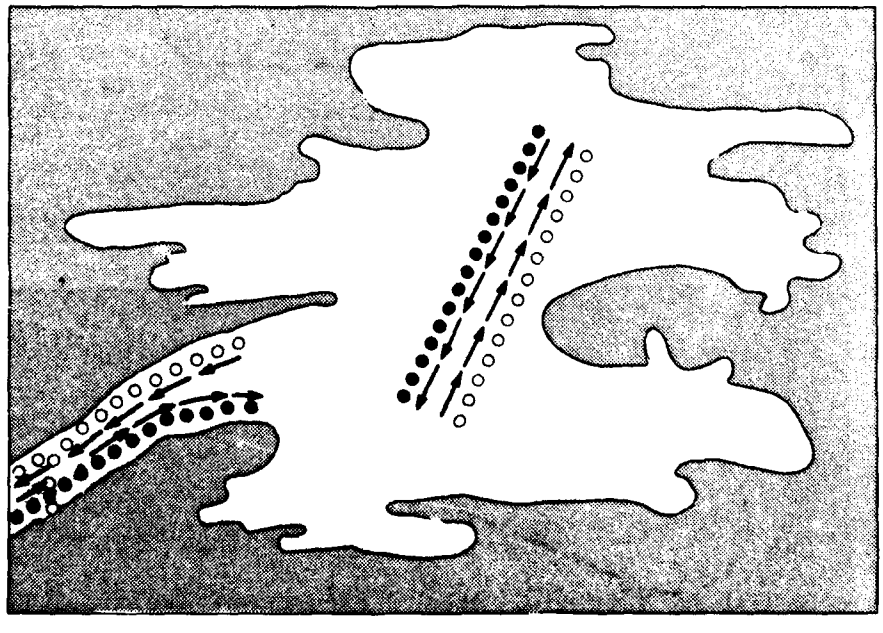


FIGURE 2

SPEED LIMITS AND SPEED ZONING

General Day and Night Speed Limits

Speed limits are commonly set on lakes, rivers, and ocean bays throughout the United States for a variety of reasons which include, maintaining a reduced level of shore erosion, maintaining the quality of fishing in an area, preventing damage to boats tied to shore structures and providing safe boating in congested areas. Most often, a single speed limit is used for day and night, although some areas set lower limits for nighttime boating. The speed limits used vary from 5 mph up to 50 mph. Areas which experience a full range of boating activity such as waterskiing, cruising, sailing, and fishing, normally set a day limit at 35 mph to 50 mph; whereas areas which experience low speed activities such as canoeing, fishing, and sailing, normally set a limit of 5 mph to 15 mph to prevent high speed boating which may intimidate those boaters who are involved in low speed activities. Night limits have been set anywhere from 5 mph to 35 mph depending on the size of the area, types of boats used, and/or State regulations. Night limits are generally set lower than day limits for safety and noise control purposes.

The most widely acknowledged problem with speed limits is that boat speeds are very difficult to measure, making enforcement difficult.

"No Wake" and "Open" Zoning

The "No Wake" zone is probably the most widespread technique in the country. Nearly every State has a law that requires "No Wake" in some area.

No Wake and Open Zones

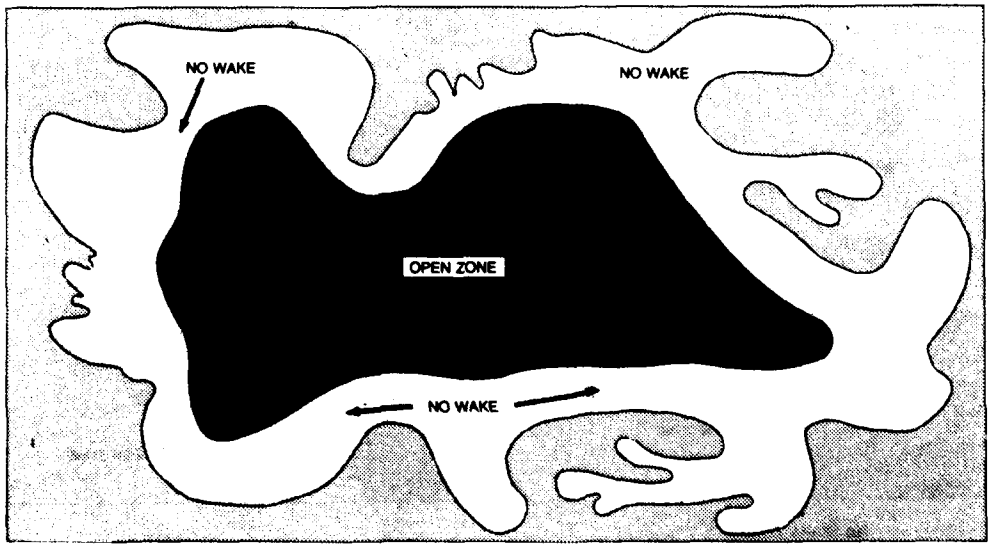


FIGURE 3

The "No Wake" zone technique can help prevent unnessecary damage to shoreline structures, to craft moored in shallow waters, and craft tied to docks. It will also help reduce shoreline erosion and make congested areas safer. Some States imply "No Wake" by setting 5 mph to 6 mph speed limits within 100 to 300 feet from shore on all types of bodies of water. For some areas the concept of "No Wake" zoning has been combined with the "Open" zone, an area that is open to all activities. These techniques are used so that high and low speed activities are segregated on a single body of water as illustrated in Figure 3. Illustrated are areas suitable for canoeing and fishing around the perimeter, while areas for waterskiing and high speed boating are restricted to the center. A 35 to 50 mph speed limit can be set in th "pen" zone if desired.

"No Wake/Open" zoning will provide reduced activity conflicts, and a t ency towards safer boating conditions.

"No Wake" Zone for Hazard Management

"No Wake" zoning is another technique which is commonly used for hazard management. The zone is usually marked by buoys and/or signs and sometimes indicated on a map. The "No Wake" zone is typically utilized in areas which are shallow or have submerged objects. In addition, the "No Wake" zone has been sucessfully implemented in areas where two or more channels converge, and there have been a large number of collisions and swampings. By making the convergence areas "No Wake" zones, approaching vessels are forced to slow down thus reducing the chances of an accident. This technique will reduce accidents, particularly collisions, groundings, and swampings. Figure 4 illustrates the use of a "No Wake" zone in a convergence area.

No Wake at Convergence Area

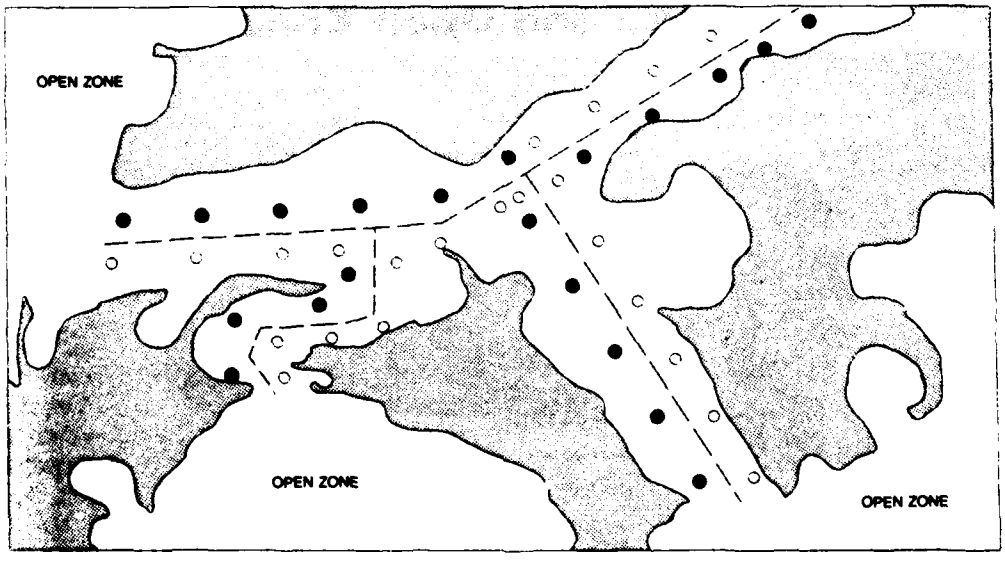


FIGURE 4

Multiple Speed Zoning

Multiple speed zoning usually consists of two or more speed zones on the same body of water. For example, a lake may have a "No Wake" or 6 mph speed zone, a 15 mph speed zone, and an unlimited speed zone. Multiple speed zones can be marked by buoys or indicated on a chart. An example of a chart indicating multiple speed zones is shown in Figure 5. Multiple speed zoning is less commonly used than general speed limited and "No Wake/Open" zoning and is most applicable to large bodies of water with many islands, coves, and channels which have moderate to high density traffic.

Multiple speed zoning will provide reduced activity conflicts, and a tendency towards safer boating, swimming, and scuba diving conditions. A drawback to this technique would be the difficulty of providing enough personnel to enforce the various speed limits.

Speed Lanes for Hazard Management

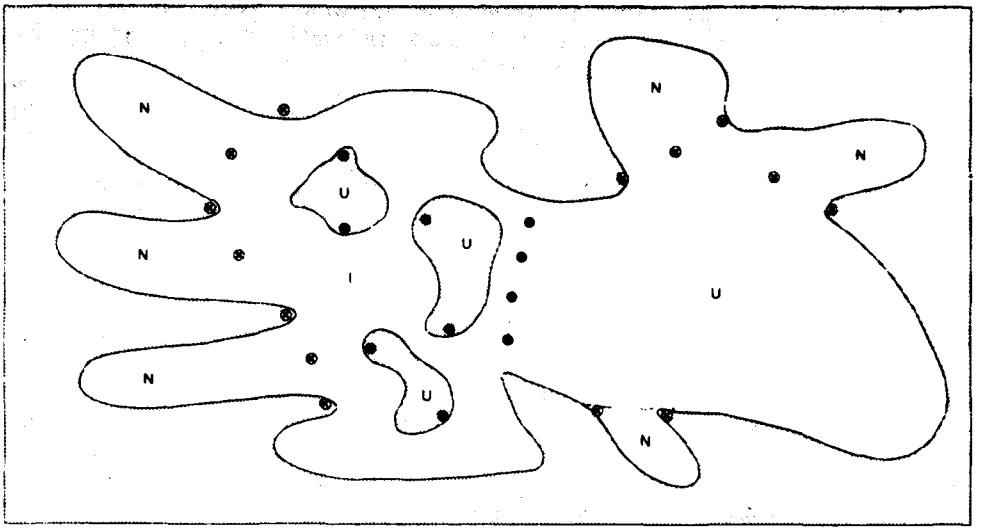
In addition to being useful for segregating high and low speed traffic, speed lanes can also be implemented for the purpose of hazard management. This technique is most commonly implemented on large shallow lakes which have a proliferation of submerged objects such as stumps and rocks. The speed lanes are set up where there are no submerged objects. By creating this marked speed lane, a "safe boating" area is designated. Boaters are allowed to use the entire lake; however, use outside the marked speed lane is at the user's risk. It would be unsafe outside the speed lane for many types of boats because of the danger of hitting a submerged object.

This technique will provide increased safety through prevention of groundings, collisions with submerged objects, skiing accidents, and damage to boats and motors. In order for this technique to be successfully implemented, an existing channel or deep water area is needed.

Horsepower Limitation

A horsepower limitation is usually set at one of the following limits: No motors, electric motors only, 10 horsepower, or 16 horsepower. This technique is generally used on small lakes or on lakes which are being preserved as wildnerness areas or water supply reservoirs. Horsepower limitations will make an area more desirable for canoeing, fishing, or sailing, eliminate excess wash and wake, and preserve the natural state of the area.

Multiple Speed Zones



U—Unlimited Speed

I—Intermediate Speed

N—No Wake

× No Wake Buoy or Sign (Depth Dependent)

● Speed Limit Buoy or Sign (Depth Dependent)

FIGURE 5

"NO BOAT" ZONES FOR HAZARD MANAGEMENT

In addition to their use in buffered swim zones (see page 11), "No Boat" zones can also be used to prevent boats from getting too close to dams, spillways, powerlines and waterfalls, which pose potentially life-threatening hazards. In areas where there is a strong current or a steady water flow over a dam or falls, warning signs should be placed far upstream from the hazardous area. Still well upstream from the dam or falls a series of large "NO BOAT" buoys connected by a wire cable should be placed as a rigid barrier to the danger zone. Because the "boil" area below the dam or falls creates an "entrapment" zone, a boater who accidentally gets carried over the edge and is caught, is likely to drown. A boater may also fall overboard while maneuvering around obstacles. This may be avoided by providing a means of portage. On lakes or rivers that are crossed by low hanging powerlines, "NO BOAT" buoys may be placed within a safe distance of the lines to keep people in sailboats or boats with tall superstructures away from them. Figure 6 illustrates the placement of large "NO BOAT" buoys.

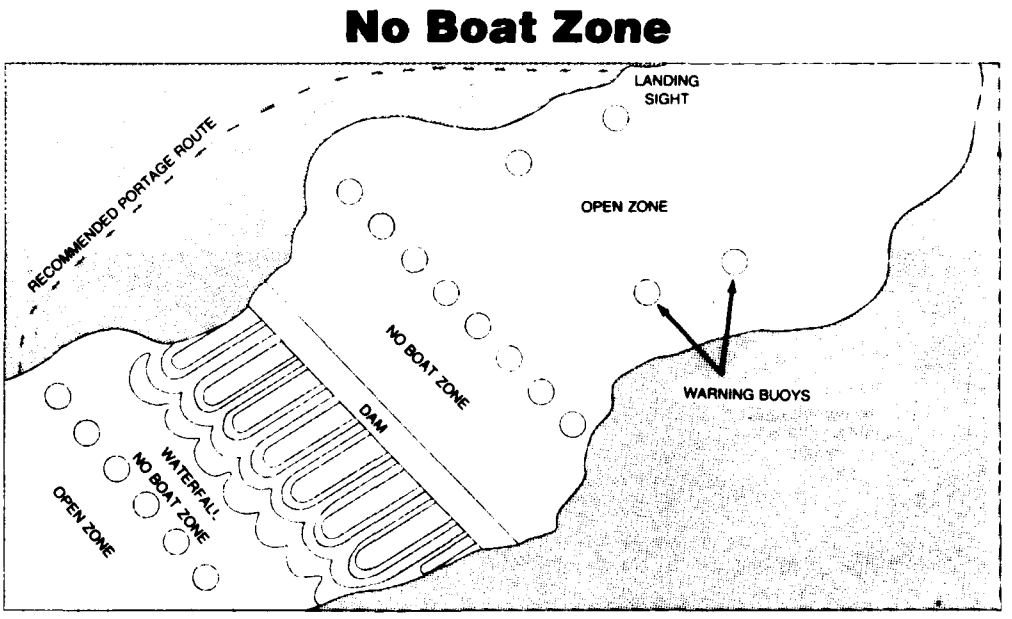


FIGURE 6

TIME ZONING

Time Zones For Segregating And Resricting Activities

Time zoning is a technique that can be used to segregate conflicting activities in a single area or to restrict activities during peak traffic periods. This technique can be applied to any area where high traffic density or space limitations tend to create activity conflicts. For example, on a lake which experiences high density conditions on weekends, waterskiing and high speed traffic can be prohibited in coves and small bays from Friday evening to Sunday evening, thus creating reduced noise on weekends in these areas. A second example might be an area which experiences diverse activities and the amount of suitable water area for particular activities is limited. This type of area could be managed with different time zones for sailing and waterskiing; waterskiing only in the morning and sailing only in the afternoon. Figure 7 illustrates the above examples of time zoning.

The method generally used to enforce these techniques in these segregated or restricted areas would be to maintain a "presence" of enforcement officers among the boaters. Time zoning reduces activity conflicts and congestion.

Time Zoning

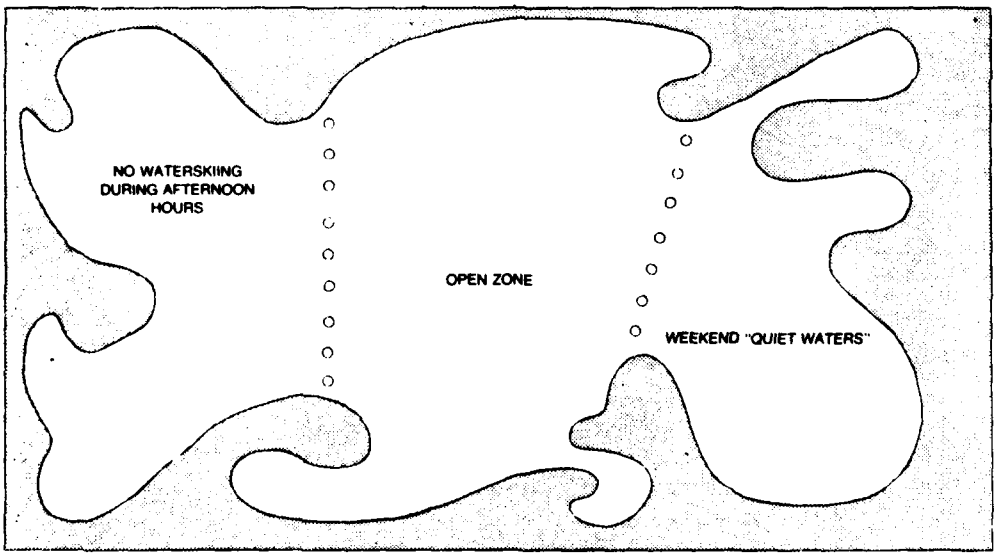


FIGURE 7

Odd/Even Day Horsepower Limit

The odd/even day horsepower limit is a unique time zoning technique which can be implemented on small lakes that are apt to be used heavily. On odd days of the month there is a limit of 10 horsepower, thereby prohibiting waterskiing and high speed power boating and providing good conditions for sailing, canoeing, and fishing. On even days there is no horsepower limitation, thus favoring waterskiing and power boating.

This technique will provide reduced activity conflicts, but the major drawback to the technique is that a very high degree of access control is necessary for it to be effective. Waterfront property owner's rights could be a major legal roadblock.

ACTIVITY ZONING

Waterskiing Zones and Takeoff/Landing Areas

Waterskiing zones are often used on lakes and bays to segregate waterskiing from other activities such as sailing, canoeing, and fishing. Waterskiing takeoff and landing areas can also be incorporated into the technique if rotational traffic is also required. Takeoff and landing areas are generally instituted for the safety of the skier who is landing or is waiting in the water.

Waterskiing zones are usually marked by buoys or indicated on a map. The takeoff and landing areas may be marked by a short line of buoys or indicated by signs on the shoreline. There is usually a distance of 60 to 180 yards on either side of the buoys or signs that mark the takeoff/landing areas. Skiers take off from the left side and land on the right side of the marker as viewed from the water looking towards shore. Examples of these techniques are illustrated in Figure 8.

This technique will reduce activity conflicts and make water skiing safer.

Waterski Zone with Take Off/Landing Areas

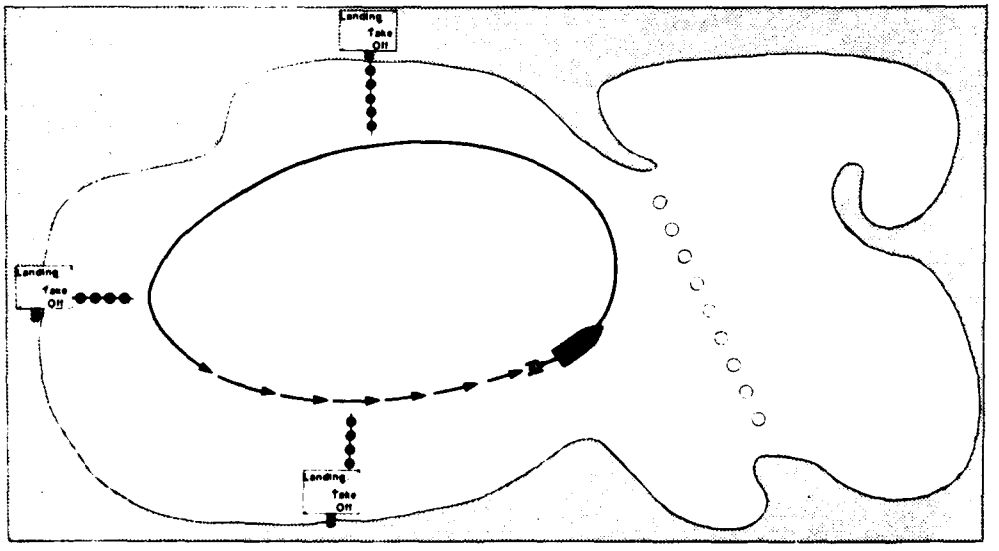


FIGURE 8

Waterskiing zones are also often created on water bodies where the presence of submerged rocks and stumps requires that skiing be restricted to safe areas.

Fishing Zones

Fishing zones are usually created in upstream or cove areas to preserve the quality of fishing. These zones are established by either making an area "No Wake" or setting the speed limit below 6 mph. (An alternate method of creating a fishing zone would be by marking an area with buoys or signs to indicate the "Fishing Zone," or indicate it on a map. This would imply low speed activities that would not interfere with fishing. Local rules would then be used to define which specific activities are permitted in the fishing zone, i.e. speed, traffic, etc.) This technique can be implemented on lakes, bays, or flat water rivers where waterskiing and other high speed activities interfere with fishing activity. This technique is illustrated in Figure 9.

This technique will reduce activity conflicts, improve fishing conditions, and protect small boats and canoes from damage due to excess wake.

Swim Zones

Swim zoning is a universally used technique on waters that are used by both boaters and swimmers. Like fishing zones, swim zones can be successfully implemented on lakes, ocean bays, and flat water rivers. The simplest type of swim zone is an area that is sectioned off by a string of bright-colored floating buoys. A "Buffered" swim zone can be created by placing a set of navigational "NO BOAT" buoys beyond the swim area. The area between the floating buoys and the "NO BOAT" buoys thus becomes a "Buffer Zone" where neither swimmers nor boaters are allowed. An alternative to the string of buoys would be a series of docks or rafts sectioning off the area. These methods are also illustrated in Figure 9. The enforcement of laws pertaining to boaters in the area is usually the responsibility of the lifeguard at the swim zone.

Swim Zones and Fishing Zones

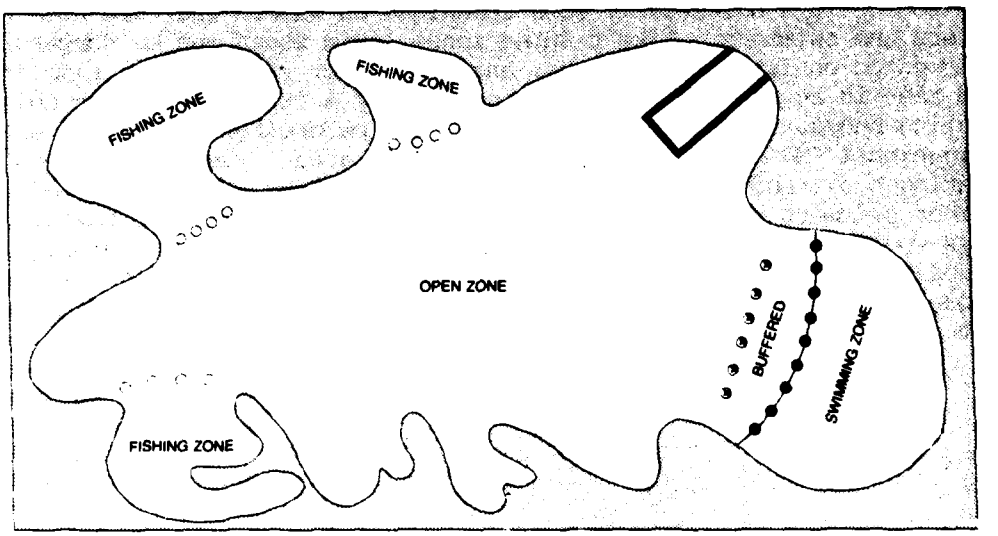


FIGURE 9

The major intended benefit of swim zoning is to create safer swimming conditions by reducing the chances of a swimmer being hit by a boat. The "Buffered" swim zone is most effective in areas where activity conflicts between swimmers and boaters are an existing or potential problem.

Thrillcraft Zones

The establishment of special zones for the operation of watercraft such as Jetskis (TM) is not a widely used technique, however, it is applicable where their use is a popular activity. The zones are marked with buoys or are indicated on a map. Dock or launch facilities are provided most of the time for access to the area by thrillcraft operators. In the zones no other boat activities are allowed.

Thrillcraft zones will eliminate activity conflicts and increase thrillcraft safety.

Special Event Zones

The segregated special event zoning illustrated in Figure 10, is most effectively utilized on lakes, ocean bays, and flat water rivers, which often have special events involving high speed activities such as waterskiing tournaments and boat races. The nature of these activities requires that they be segregated from normal boating activities for safety reasons. Special event zoning will eliminate activity conflicts and increase safety. Usually a highly specialized zone, such as a competitive waterskiing area, will have permanent courses set up and will be isolated from all other traffic. Signs or maps are used to inform the public of the special event zone.

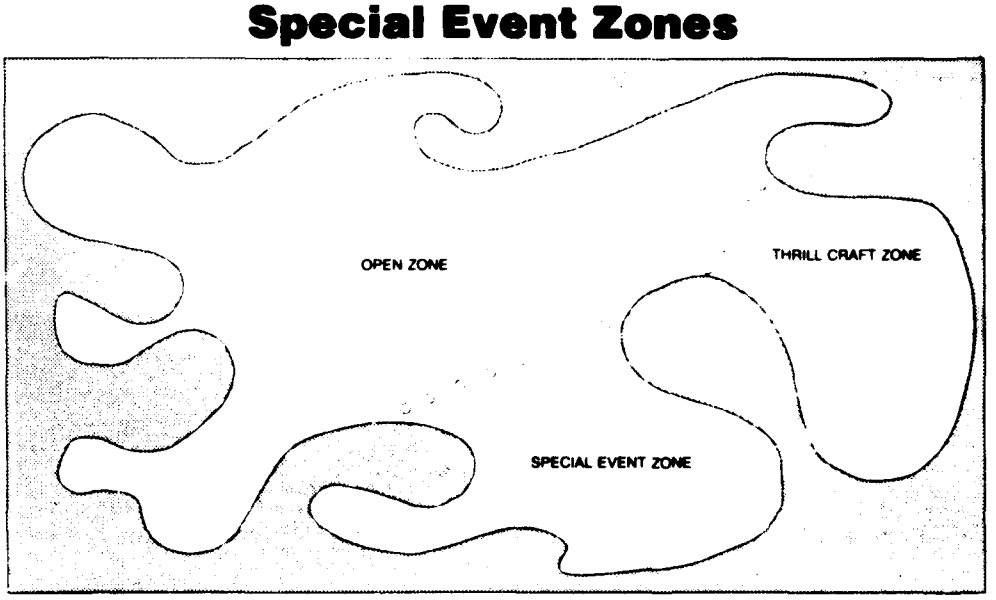


FIGURE 10

Activity and Multiple Speed Zoning

Activity zoning is often combined with multiple speed zoning. For instance, fishing is allowed in the 6 and 15 mph zones; swimming and scuba diving are restricted to the 6 mph zone and waterskiing is restricted to the unlimited speed zone. The intermediate speed zone is usually placed in areas that are too small or narrow to allow high speed traffic or water ski activity but not so small as to warrant "No Wake" zoning.

WARNING/INFORMATION SYSTEMS

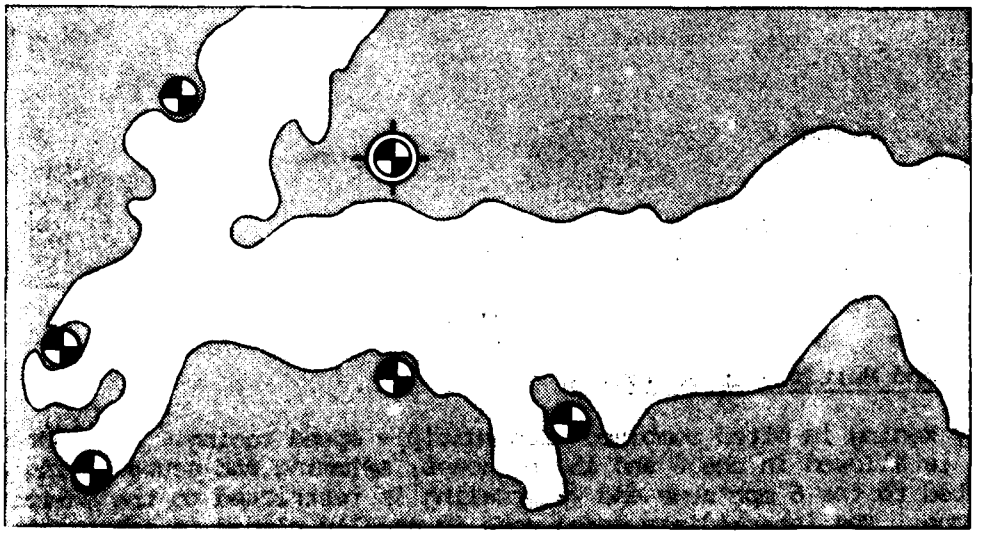
Wind Warning Systems

Wind warning systems can be effectively implemented on any type or size body of water. One technique noted during the study consisted of a public address system. Generally, for this technique to be effective it is essential that the PA system can be heard over the entire body of water.

A widely used system for large lakes and ocean bays is a system of colored flags or beacons. Generally a red flag or light means "Danger, winds over 25 mph", a yellow flag or light means, "Caution, winds from 15 mph to 25 mph", and a green flag or light means "Safe Conditions, winds under 15 mph". A major advantage of the red, yellow, and green color scheme is that its meaning is easily understood by the boating public due to its similarity to automotive traffic light systems. When using this system it is essential that the flags or lights can be seen from any point on the body of water.

Unlike the widely used "Small Craft Warning System" which is related to storms, the wind warning system just relates to wind. This can serve as a supplement to the "Small Craft Warning System". Figure 11 illustrates a typical warning light system for a large lake.

Warning/Information System



Master Beacon, Visible from Anywhere on Lake, Red Only. Indicates Unsafe Conditions: Lake Closed

Limited Visibility Warning Lights
Green: Weather Conditions Suitable
Yellow: Caution Stay Near Shore
Red: Unsafe Head for Nearest Shore

FIGURE 11

River Condition Information Systems

Various types of river condition information systems have been instituted throughout the country for white water rivers. In one State a telephone hot-line is used to provide "river runners" with up-to-date information on river flow rates. Measurements are taken daily at approximately 50 stations. Using this information, a boater can determine which areas are safe for any particular skill level.

One State has a color coded information system to warn boaters of hazardous conditions. River conditions are classified as follows:

Red	Indicates that the sum of water temperature plus air temperature is less than 120°F: unsuitable conditions.
Yellow	Indicates that water temperature plus air temperature is more than 120°F, but water level is high: generally unsuitable conditions.
Green	Indicates that water temperature plus air temperature is more than 120°F, and water level is low: suitable conditions.

This information is disseminated to the public through the media (e.g., television, radio, newspapers).

When setting up such a system, it is recommended that you contact local and national canoe organizations such as the American Canoe Association (ACA), the American Whitewater Association (AWA) and the U. S. Canoe Association (USCA). Skill levels vary widely among canoeists, and river conditions which could be fatal for a novice, may be relatively safe for an experienced group.

The purpose of both systems is to increase the safety of river activities by providing users with the necessary information to carefully plan their activities.

Network of Numbered and Lighted Buoys

Night navigation systems consisting of a network of numbered and lighted buoys or fixed marks, illustrated in Figure 12, are useful for large lakes which have irregular shorelines with numerous inlets and/or islands. The purpose of such a system is to provide navigational assistance to boaters during periods of darkness or poor visibility. The buoys are positioned so that a boater can see the next buoy in the line of travel from any other buoy. These systems are usually implemented on a lake with a heavy residential shoreline where the residents support the cost of the buoys. Thus, it is possible for people to visit waterfront neighbors and find their way home in the dark.

The major drawback to this technique is that it is very costly. The lakes that implement this type of system were found to have heavily populated residential shorelines where the residents, with the help of lake associations, support the cost of the buoys or marks.

Network of Numbered and Lighted Buoys

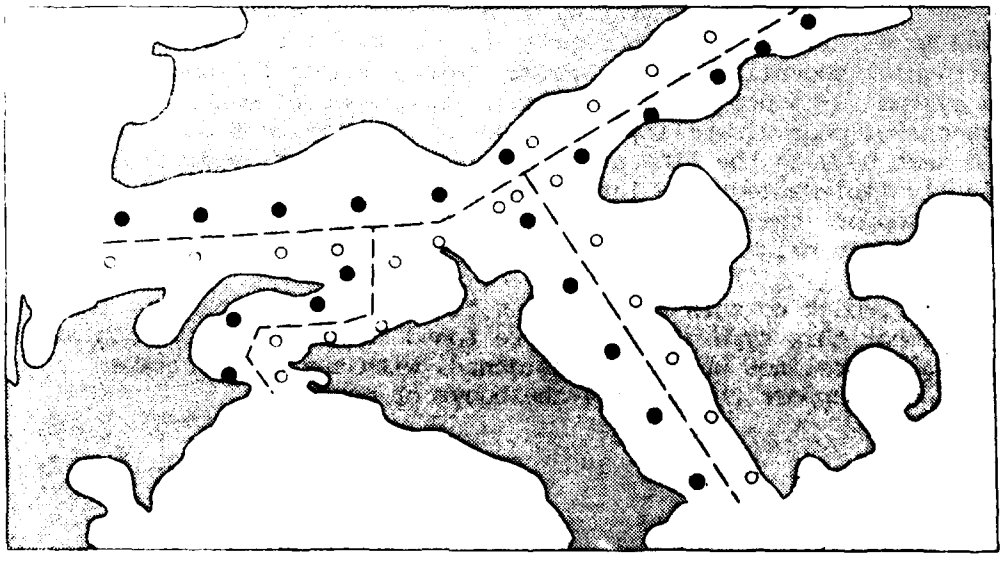


FIGURE 12

ACCESS LIMITATION

Carrying Capacity Limits

The carrying capacity limit is a method of preventing overcrowded and potentially dangerous boating conditions. The technique is most appropriate for small lakes where the shoreline is publicly owned and access can be gained only at designated launching areas. A maximum number of users can be set by limiting the size of parking lots at access points and not allowing overflow parking. The rights of waterfront property owners must be considered fully before adopting this technique. Also, the technique will require some type of parking regulation enforcement.

This technique will reduce traffic congestion, increase safety and reduce activity conflicts.

Permit Systems

Permit systems are another method of controlling the number of users for a given area. They are most often implemented on popular whitewater canoeing and rafting areas to prevent overuse and dangerously overcrowded conditions. Generally, use is regulated during the summer months, Memorial Day through Labor Day, and the number of issued permits is allocated between private boaters and commercial outfitters on a percentage basis.

In order to effectively regulate use, the permit system should pertain to an area located between designated controlled access points. This type of system has also been effective on widerness lakes and rivers where it is desirable to maintain the natural state of the area.

GUIDELINES FOR DEVELOPING A MANAGEMENT PLAN

PROFILE OF THE SITE

The first step in developing a boat traffic management plan for any area should be to create a profile of the site. The profile should consider the following eleven factors:

1. Type of Area
2. Level of Average Traffic Density
3. Average Number of Boating Days Per Year
4. Boating Profile
5. Activity Profile
6. Traffic Profile
7. Surrounding Land Use
8. Current Management Techniques
9. Current Enforcement
10. Existing Hazards
11. Number of Accidents Yearly

The "Site Profile Checklist" shown in Table A is designed as an aid in profiling the site and considering these factors. This profile will assist the planner in choosing the appropriate management techniques and in developing and implementing a management plan for a particular site.

NOTE

The information on the following pages is only an executive outline to highlight the type of information that might be needed to develop a management plan. Some boating safety organizations may already have an accurate assessment of the boating safety problems in their areas and may be managing them successfully. Thus, this section should only be used as a guide, and not as the final word on developing a management plan.

DEVELOPING A MANAGEMENT PLAN

After the site profile has been completed, an appropriate boat traffic management plan can be developed. The planner should be familiar with the techniques described in Section 1 and have an idea of those which may be useful for the particular site.

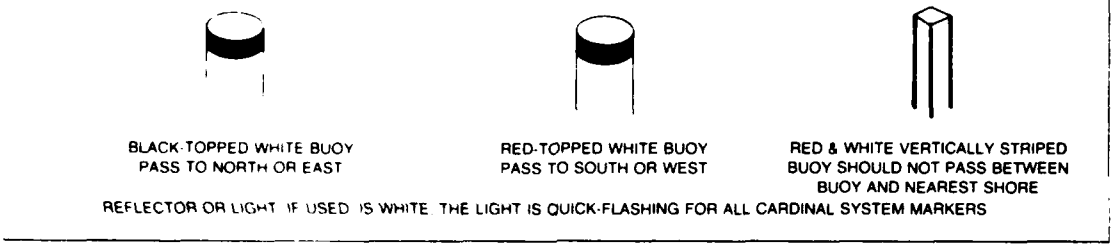
DETERMINING THE COSTS OF THE MANAGEMENT PLAN

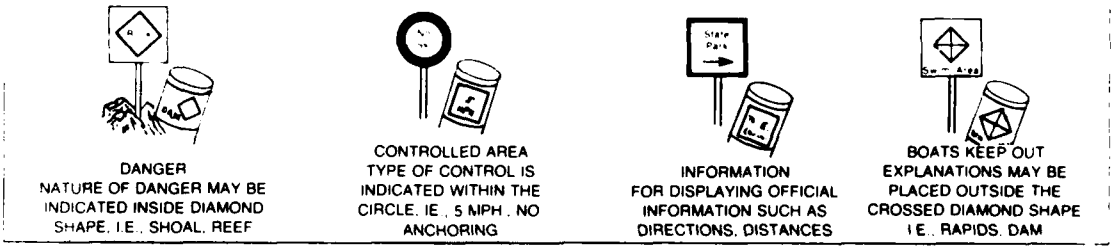
Equipment Needed

In order to implement a management plan, equipment will be needed. The type and amount of equipment will vary according to the extent of the plan and the techniques chosen. For proper enforcement most plans require at least one boat and motor, associated extras and fuel; informational signs showing the management plan at access points; handouts of maps and regulations; a number of buoys and markers for "No Wake", "Ski Zone", "No Boats", "Speed Limit 40 mph", etc.; and other miscellaneous supplies and services. Standard buoys and markers used throughout the country are illustrated in Figure 13.

Some techniques require specialized equipment and services, such as public address systems, lights, flags, and/or beacons required for wind warning systems; special buoys for a network of numbered and lighted buoys; printed permits for a permit system; radio air time, advertising space and/or telephone equipment for river condition information systems. In addition, there may be a need for maintenance equipment and administrative facilities.

Aids to Navigation





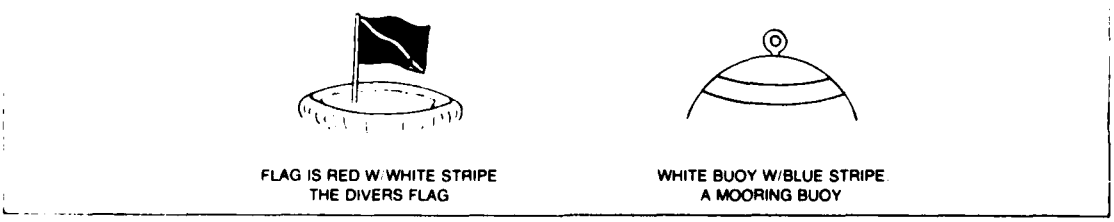


FIGURE 13

Equipment Costs

Equipment costs can vary a great deal depending upon the type and source of equipment, and the amount required. Initial equipment requirements for most plans include aids to navigation, boats, and motors. For instance, costs for aids to navigation vary a great deal depending upon whether they are simple painted plywood shapes mounted atop wooden stakes or molded fiberglass buoys equipped with anchors and chains. Obviously, the choice of one over another is largely dependent upon the amount of seasonal maintenance that may be expected and the costs to repair or replace lost or damaged aids to navigation. The cost for a single fiberglass buoy in 1981,for example, was as high as $250.

A 16-foot outboard runabout with an 80 horsepower motor may cost about $7,500 and a 21-foot cabin cruiser with an inboard/outboard and a cabin may cost as high as $10,000 to $15,000. The number and sizes of boats necessary to implement a vessel traffic management technique will depend upon many factors, including the size of a body of water, weather conditions that may be expected, the required cruising range for a patrol vessel, the amount of desired safety equipment that must be carried, etc.

Continuing equipment costs consist of maintenance of initial equipment purchases. The planner must determine both initial costs for capital equipment and annual maintenance costs.

Some sample management plan costs are listed in Table B. Three sample plans are described and sample costs for equipment, enforcement and maintenance are estimated. Actual costs would depend upon each individual site and plan combination.

Level of Enforcement Needed

The manpower needed to adequately enforce a management plan depends upon the size of the site, the amount of boat traffic, the extent of the management plan, and the length of the boating season. For example, in Plan 1 of Table B, a small lake (under 100 acres) located in a northern State, having its peak boating season from Memorial Day to Labor Day with a management plan consisting of a "No Wake/Open" zone, counterclockwise skiing, and a buffered swim zone might have the following enforcement requirements: One full-time officer on duty 40 hours/week for three and one-half months, Memorial Day weekend through Labor Day weekend; and one part-time officer on weekends for six months, April 1 through September 30, for approximately six man-months of effort per year.

The second example covered in Table B is a medium-sized lake (approximately 2,000 acres) in the Midwest which would have a six-month boating season. The management plan consists of time-zoned "quiet waters", a ski zone with take-off and landing areas,a "No Wake" zone along the shore, swim zones, and a 40 mph maximum speed limit. Traffic is light on weekdays, moderate on weekends and summer weekdays, and heavy on holiday weekends. Enforcement requirements

could be met by two full-time officers, one for six months, one for nine months, and one part-time officer on weekends for six months. Total enforcement man-power requirements for this plan would be about 18 man-months of effort per year.

The third example in Table B is a medium-sized ocean bay on the west coast with a year-round boating season. The management plan would have to be extensive, and might consist of time zoning, ski zones, jet ski zones, fishing zones, special event zones, "No Wake" zones, swim zones, and day night speed limits. This type of plan would require six to eight full-time officers for proper enforcement. Because of the year-long boating season and resort location, six to eight man-years of effort would be required annually.

Note that the manpower estimates for the above plans are based only on the time spent enforcing boat traffic management plans. In most areas, full-time officers spend off-season months patrolling in other recreation areas or performing administrative duties.

Enforcement costs vary across the country depending on salary scales. Therefore, the costs can be figured by multiplying the average monthly salary for enforcement officers by the necesssary man-months per year and then adding the cost of fringe benefits and other known overhead costs. Additional costs which may be incurred include recruitment and training costs, uniforms, and miscellaneous equipment.

The amount of maintenance required for all three example plans in Table B depends on the amount of equipment involved. Equipment that will require maintenance includes boats, motors, signs, markers, buoys, wharfs, docks, buildings, and access areas. Maintenance needs may be minimal and could be contracted out, or may be large and might require a full-time staff of carpenters and mechanics. The cost for the maintenance of each of the three plans is estimated based on equipment needed in Table B.

Note that the level of enforcement would be specific to the site. In planning the level of enforcement required for your site, the main consideration should be the "Visibility" of enforcement officers to the boating public.

Sources of Income

In addition to the costs outlined above, some income may be derived from the management plan. If the site is publicly owned or controlled, it may be possible to charge user fees, ramp fees, parking fees, and/or permit fees. The agency having jurisdiction may also have the right to funds gained from fines and license fees. However, municipal, county, or State laws may already govern how such income is disbursed.

STEPS FOR IMPLEMENTING A MANAGEMENT PLAN

You as the planner have decided on the boat traffic management techniques that are appropriate for your site management plan and have a good estimate of the cost of implementing the management plan. The implementation process includes setting goals, determining problems which may arise, considering legal aspects, funding, procuring equipment and personnel, disseminating information to the user public, obtaining feedback, and conducting an annual review. This section briefly outlines each of these steps.

Setting Goals

Goals of the program should be set from the desired benefits provided by a management plan. These goals might include increased safety, reduced boating congestion and activity conflicts, and possibly increased utilization of recreational resources. Goals should be set with a definite time frame in mind. Note that a measurement of increased safety will require an accurate and consistent collection of accident and citation data.

Determining Problems Which May Arise

Along with the benefits to be derived from the management plan, a number of problems may be expected. These problems may include a rapid increase in use due to better boating conditions, an unexpected increase in costs, or a lack of acceptance by the user public. The planner should make a careful examination of his site, the management plan, and public attitudes to gain some insight into the problems which may arise as a result of the new management plan.

Following the implementation of a management plan that includes increased enforcement is that it may appear that the accident rate has gone up and any critics might believe that the plan is a failure. In general, however, increased enforcement means that there will be an increase in the number of accidents reported and not an increase in the number of accidents. There are probably fewer accidents because prior to active enforcement, fewer accidents were reported.

Legal Aspects

Another important point which must be considered before a management plan can be implemented is the legal aspect. First, existing boating regulations must be examined to determine how they must be revised, augmented, or deleted. When developing new regulations the planner must consider State, county, or city regulations which may already apply to areas such as speed limits, waterskiing and horsepower limitation, and access rights. In addition, the planner must consider how implementation efforts may be obstructed by special interest groups such as waterskiing, racing, and sailing clubs, as well as commercial outfitters, and lake associations.

Funding the Program

Funding for a management plan can be gained from a number of sources depending on who has jurisdiction of the site. Sites under Federal control might obtain Federal grants while State controlled areas might obtain State funding. Areas under the jurisdiction of multiple municipalities may have the option of funding their programs with municipal, county, conservation district, or State funds or a combination of those.

Procuring Equipment and Personnel

Once adequate funding has been obtained, equipment and personnel must be procured. Lead times for equipment procurement need to be determined. Boats, motors, and customized buoys and signs may take several months to obtain. The layout and printing of maps and regulations may take several weeks. Prior to actual implementation it will also be necessary to recruit the additional personnel needed for enforcement, maintenance, and/or administration.

Dissemination of Information to User Public

At the time of implementation the public must be informed about the new management plan. Initially the media, such as newspaper, mail, and radio stations, may be used to notify the public of new regulations and to explain the intended benefits of the plan. Printed maps and regulations should be made available at access points, municipal offices, and site administrative buildings. If possible, the help of local businesses should be obtained in offering literature to the public. The types of businesses to contact include marinas, boating supply stores, bait shops and sporting goods stores.

Obtaining Feedback

After the management plan is in force it is vital to the success of the plan to start obtaining feedback from the user public. Feedback can be obtained using both formal and informal methods. An example of an informal method might be law enforcement officials talking to users to determine whether there is a general feeling of acceptance or rejection of the plan. An example of a formal method would be to use a questionnaire to survey users either in person at the site or through the mail. Law enforcement officials could produce and implement questionnaires to measure the safety factor under the plan. It could include a section on how the boating public feels about the increase/decrease in recreational quality due to the plan.

For a more analytic type of feedback local officers could plot all accidents as to their exact location on a master map. They could use aerial surveys to identify congested areas and obtain accurate boat counts throughout the day; improve the accident reporting systems for non-fatal accidents; and determine the cause of the accidents with as much detail as possible.

Annual Review and Assessment

Periodically, preferably on an annual basis, the management plan should be reviewed and assessed for its effectiveness in accomplishing goals. If goals have not been met or undue problems arise, the management plan may need to be

modified. Modifications might include increasing or decreasing the level of management or enforcement, using different management techniques, or eliminating the plan entirely.

If the management plan has been successful, changes may still be desirable. In this case it might be appropriate to augment the plan with additional or more sophisticated techniques. Management and enforcement may also have to be increased if boat density levels are increasing. Whenever changes are made to the plan, it is important that the planner reassess the goals, expected problems, legal aspects, and personnel and equipment needs to assure that the management plan continues to be properly implemented.

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TABLE B

SAMPLE MANAGEMENT PLAN COSTS

		Estimated Costs
Plan 1 (Small Scale Management Plan, Small Lake, Low/Moderate Traffic, Four Month Boating Season)		
Equipment:	One Boat & Outboard Motor	$7500
	Buoys & Signs	5000
	Boat Fuel	1500
	Literature & Miscellaneous Supplies	3000
Enforcement:	1/2 man-year of effort	$6000-9000
Maintenance:	Contracted for boat, motor and buoys	$1500-3000
Plan 2 (Medium Scale Management Plan, Medium Sized Lake, Moderate to Heavy Traffic, Six Month Boating Season)		
Equipment:	Two Boats & Outboard Motors	$15,000
	Buoys & Signs	20,000
	Boat Fuel	3,000
	Literature & Miscellaneous Supplies	8,000
Enforcement:	1 1/2 man years of effort	$15,000
Maintenance:	1/2 man-year of effort (carpentry and mechanical duties)	6,000-9,000
Plan 3 (Large Scale Management Plan, Medium Sized Ocean Bay, Heavy Traffic, Year Round Season)		
Equipment:	Boats & Motors (4 boats with outboards 1 inboard/outboard)	$45,000
	Buoys & Signs	25,000
	Boat Fuel	8,000
	Literature & Miscellaneous Supplies	16,000
Enforcement:	6-8 man-years of effort	$72,000-144,000
Maintenance:	2 man-years of effort (full-time carpenter and mechanic)	$25,000-40,000
Other (Administrative) Building Costs		$10,000

1. TYPE OF AREA
   - A. Lake
     - 1. Small: 500 acres ___
     - 2. Medium: 500 - 2500 acres ___
     - 3. Large: 2500 acres ___
   - B. Ocean bay
     - 1. Small: 500 acres ___
     - 2. Medium: 500 - 2500 acres ___
     - 3. Large: 2500 acres ___
   - C. River
     - 1. White Water ___
     - 2. Flat Water ___

2. LEVEL OF TRAFFIC DENSITY (boats/acre)

		AVG	PEAK
A. Low:	.1	___	___
B. Moderate	.1 - .5	___	___
C. High	.5 or more	___	___

3. AVERAGE NUMBER OF BOATING DAYS PER YEAR _____

4. BOATING PROFILE
   - A. Motorboats _____%
   - B. Canoes _____%
   - C. Thrillcraft _____%
   - D. Sailboats _____%
   - E. Rowboats _____%
   - F. Sea Planes _____%
   - G. Other _____%

5. ACTIVITY PROFILE
   - A. Waterskiing _____%
   - B. Fishing _____%
   - C. Thrillcraft _____%
   - D. Cruising _____%
   - E. Sailing _____%
   - F. Special Events _____%
   - G. Swimming _____%
   - H. Canoeing _____%
   - I. Hunting _____%
   - J. Scuba Diving _____%
   - K. Surfing _____%
   - L. Other _____%

6. TRAFFIC PROFILE
   - A. Recreational _____%
   - B. Commercial _____%

7. SURROUNDING LAND USE
   - A. Private _____%
   - B. Public _____%
   - C. Access (private) _____%
   - D. Access (public) _____%
   - E. Agricultural _____%
   - F. Residential _____%
   - G. Rural _____%
   - H. Urban _____%
   - I. Commercial _____%

8. CURRENT MANAGEMENT TECHNIQUES
   - A. Speed Limits ___
   - B. Speed Zones ___
   - C. High Speed Lanes ___
   - D. Speed Limit Zone Times ___
   - E. Fishing Zones ___
   - F. Swimming Zones ___
   - G. Scuba Zones ___
   - H. Sailing Zones ___
   - I. Water Ski Zones ___
   - J. Water Ski Takeoff/ Landing Zones ___
   - K. Rotational Traffic Flow ___
   - L. Carrying Capacity Limits ___
   - M. Horsepower Limits ___
   - N. Boat Length Limits ___
   - O. Trip Permit ___
   - P. None ___
   - Q. Other _____ ___
   - R. Other _____ ___
   - S. Other _____ ___

9. CURRENT ENFORCEMENT
   - A. Number of Officers ___
   - B. Patrol Hours/week ___
   - C. Number of Boats ___
   - D. Cost/Year (including maintenance) ___
   - E. Enforcement Agency ___

10. EXISTING HAZARDS
    - A. Dams, Falls and Spillways ___
    - B. Submerged Stumps or Rocks ___
    - C. Shallows ___
    - D. Low Bridges ___
    - E. Narrow Channels ___
    - F. Power Lines ___

11. ACCIDENTS YEARLY
    - A. Number ___
    - B. Location ___
    - C. Primary Causes

END

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