THE STATUS OF BASS MANAGEMENT

An Informational Report to the Natural Resources Board

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INTRODUCTION

For many years bass have been the third most popular warmwater game fish in Wisconsin. Only walleye and northern pike have been more popular among anglers. Historically, about 32% of Wisconsin's anglers fish for largemouth bass and between 15 and 23% for smallmouth bass. Apparently this proportion is changing because intense interest in bass fishing is rapidly spreading from southern states where largemouth bass is king. Large nationwide bass organizations have been formed with numerous Wisconsin chapters recently started. Bass club members are intensely interested in bass management and want to become involved in formulating future management programs and policies.

Wisconsin fish managers and anglers have largely taken bass for granted and the management directed specifically at either largemouth or smallmouth has been somewhat less than that expended for most other large game fish species. The greater popularity of walleyes has encouraged managers to favor that species and thus in many cases the introduction of walleyes has caused severe declines in largemouth bass. Despite the lack of management emphasis on bass, abundant populations of largemouth occur throughout the state and most fish managers believe there is little need for concern about their biological status. In the last few years, however, the possibility of overexploitation in terms of population structure has increased. Informational magazines, club fishing and the development of more effective fishing methods and equipment have made today's bass anglers increasingly effective. Coupled with increased angling pressure, this has caused managers to reassess their positions and direct more effort toward evaluating the status of bass populations in relation to angling quality. The history of past bass management reveals the trends in management thought.

This report discusses the history of bass management, its changing objectives and emphasis. Included is a review of the current status of Wisconsin's fishery and staff recommendations to address current and future needs.

MANAGEMENT HISTORY

Anglers were concerned about overexploitation affecting reproduction as early as 1881 when the first restriction on bass fishing, a closed season from February 1 to April 30, was instituted. As angling pressure increased concern for the fishery also increased, and in 1907 a 10-inch size limit and 15 daily bag limit was imposed. As the years passed by, the trend toward more restrictions continued until the early 1950's when angling regulations became the most restrictive, with the open season limited to between June 20 and January 15 with a daily bag limit of 5 fish and a minimum length of 10 inches.

During the late 1940's and 1950's studies on liberal regulations for all species were carried out throughout the Midwest, with the Tennessee Valley Authority and the states of Ohio, Michigan, and Wisconsin pioneering in this area. These studies demonstrated that even intensive angling did not reduce the number of fish available or affect reproduction. As a result a trend toward more liberal regulations swept the country. Tennessee, Ohio, and a number of other states soon opened angling year-round. Wisconsin followed the trend by removing size limits in 1954 and opening the bass season early in southern Wisconsin starting in 1958.

Liberalization expanded further and in 1970 an early May opening was initiated statewide. Sportsmen from some northwestern counties objected to liberalization and in 1971 a 10-inch length limit was imposed. This regulation was gradually removed when no decided improvement was evident. Currently, the season extends from the first Saturday in May through March 1; there is a daily bag limit of 5 and no minimum length.

Changing attitudes regarding bass management have been reflected in the stocking program as well as in regulations. In 1903, a hatchery was established at Minocqua to produce bass for stocking. The propagation program gradually increased until about 1940, when there were 8 bass hatcheries that stocked between 1.5 and 2.5 million fry and fingerlings annually. Maintenance stocking was widespread throughout the state and popular with anglers.

During the early 1950's, results from numerous research projects showed that maintenance stocking of bass contributed little and that natural reproduction in most waters was more than adequate to reach the carrying capacity. As a result, stocking was drastically reduced and bass production in state facilities was virtually eliminated. Almost all the bass stocked in the state then came from federal hatcheries. By the late 1960's and early 1970's, numerous large chemical rehabilitation projects were carried out and state facilities were again mobilized to restock bass into treated waters. This production has continued at approximately the same level. During the past five years, about 850,000 bass fry and fingerling have been stocked annually. Nearly half of these fish originate at federal hatcheries and the remainder at state facilities. Most bass are still stocked in chemically rehabilitated waters, those having occasional winterkills, or other types subject to infrequent mortality.

Managers have not directed their efforts toward intensive statewide management for bass in recent years but have addressed bass specifically in individual waters where populations were substandard. Bass have been one of the major species benefited in about 65% of the more than 400 waters chemically treated to remove undesirable fish populations. Many of these waters have developed outstanding bass fisheries.

SUPPLY AND DEMAND

Good bass populations are found throughout the state. Currently, about 1,070,000 acres of Wisconsin lakes and streams support largemouth bass with an estimated population of 10,772,000 fish 8 inches or longer. Of these, about 5,294,000 are 10 inches and larger. About 424,000 largemouth bass anglers fish a total of 3,477,000 times a year and harvest 1,982,000 bass at a rate of 0.57 fish/trip. Creel census data indicate that about 60% of the bass harvested are 10 inches or longer. Biologically, bass populations can support a 40% annual harvest. Figure 1 shows that current statewide harvest is considerably below 40% and largemouth populations should remain stable for many years, even though in the next 10 years bass populations are expected to decline 2.9% because of degrading habitat, and a 12% increase in angling is expected.

Most bass fishing is directed at largemouth, but smallmouth are also an important species. They occur in 755,000 acres of water excluding Green Bay. We estimate that about 277,000 anglers fished smallmouth about 1,718,000 times during 1980. Available population data are limited and insufficient for precisely estimating statewide bass population characteristics. Fish managers state that there are far fewer good smallmouth populations than largemouth and that this species is particularly vulnerable to overharvest. Although the same management principles are probably applicable to both species, less is known of the needs of smallmouth; therefore, most management proposals presented here are addressed mainly to largemouth.

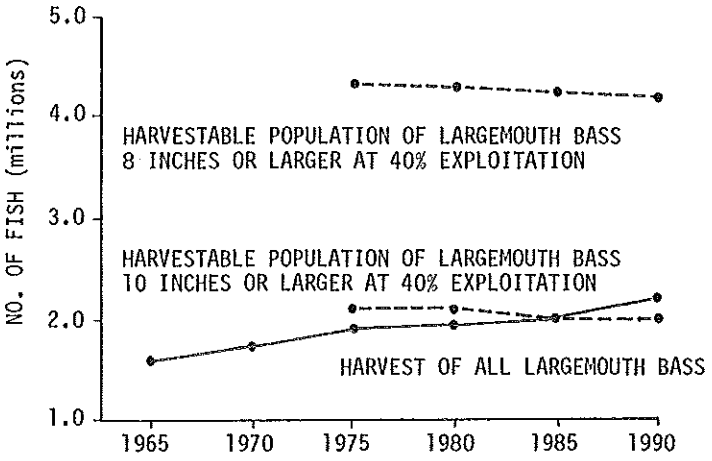

FIGURE 1. Population and harvest trends for largemouth bass.

CHANGING MANAGEMENT TRENDS

Although bass populations appear more than adequate to meet traditional fishing demands, angler attitudes are changing from emphasis on sustained harvest to more concern with the quality of the catch. Fish managers are gradually responding and changing their management philosophy from one of "maximum sustained yield" to that of "optimum sustained yield". "Maximum sustained yield", simply defined as the maximum harvest that can be sustained year after year without depressing the stock, is most concerned with the numbers of fish in the frying pan. Regulations suitable to this philosophy encourage as much harvest as possible without reducing reproductive potential but pay little regard to quality size fish.

"Optimum sustained yield" is a concept that involves making the best use of a fish population considering economics, size of harvest, and social demands. This leaves the precise definition of management objectives open to interpretation and often means different things to different people. Although it is often difficult to determine what most anglers really want, it seems quite clear that more large fish to take home and a shorter time between bites are foremost in the minds of most anglers. What anglers probably want are bass populations similar to those that have never been fished. How this can be accomplished and what anglers are willing to sacrifice for it, is another matter. Many think that better bass angling, in other words more large fish and less time between bites, can be attained by reducing the harvest so that more bass are allowed to live longer and grow big before they are harvested. In the meantime, intermediate size bass are available for anglers to enjoy catch and release fishing. It appears that an increasing number of anglers are willing to release many of the bass they catch if it will result in better fishing.

Although saving fish until they become big seems like a simple concept, a number of factors tend to prevent the predicted results of restrictive catch and release regulations. Among these factors are increased natural mortality, reduced growth, and fish that learn to avoid getting caught.

The level of natural mortality is important when attempting to save the fish until they grow larger. Studies have shown that 40-75% of the adult bass die each year -- some from natural causes and some from angler harvest. At Murphy Flowage, the years when angling harvest was low, natural mortality increased, and conversely, when angling harvest was high, natural mortality was low. They tended to compensate for each other. Snow (1978) estimated that 50% of the fish removed by anglers would have died of natural causes anyway. If this is true, a 50% reduction of the harvest would allow only half of those saved to live until the following year. The angler would have to reduce his harvest by two fish for each additional fish added to the population (Fig. 2). The relationship between angling harvest and natural mortality undoubtedly varies greatly. Fish managers and researchers do not agree on its significance, but at least in some instances it is important.

Although predation and disease are probably important, their exact contribution to the total natural mortality is unknown. In some instances hooking mortality may contribute significantly, especially where catch and release angling is popular or length limits restrictive.

The effectiveness of encouraging catch and release angling depends mostly on maintaining minimal hook mortality. Hooking mortality has been discussed at great length in studies provided in connection with bass tournaments. Holbrook (1975) reported that mortalities at bass tournaments vary considerably, but are certainly highest in warm summer months. He reported that of 20 tournaments held from September to May, hooking mortality averaged 19% and ranged from 2 to 57%. Tests in Texas revealed hooking mortalities of 32-38% (Seidensticker 1977, Rutledge and Pritchard 1977), but other tests in Missouri indicated mortalities less than 5% (Weithman and Anderson 1977). In recent years, hooking mortality has probably decreased somewhat because of better holding methods and equipment.

The applicability of these data to public fishing is questionable because anglers involved in tournaments and many research projects know how to handle the fish to minimize mortality and usually make a special effort to do so. Methods used by the average angler probably cause somewhat greater mortalities.

Another factor that often affects the results expected from reducing harvests is a reduced growth rate. When bass populations increase, competition for food increases and growth decreases. The reduction of growth can drastically reduce the potential for increasing the numbers of large fish since they must live longer to achieve a larger size and are subjected to increased natural mortality. The length distribution shown in Figure 2 compares normal growth of bass from Murphy Flowage with what it would have been if they grew 25% slower after they reached age two. The actual population has 157 bass over 14 inches, with the largest being 20 inches, whereas the slower-growing population would have only 49 bass over 14 inches, the largest of which would be 17 inches.

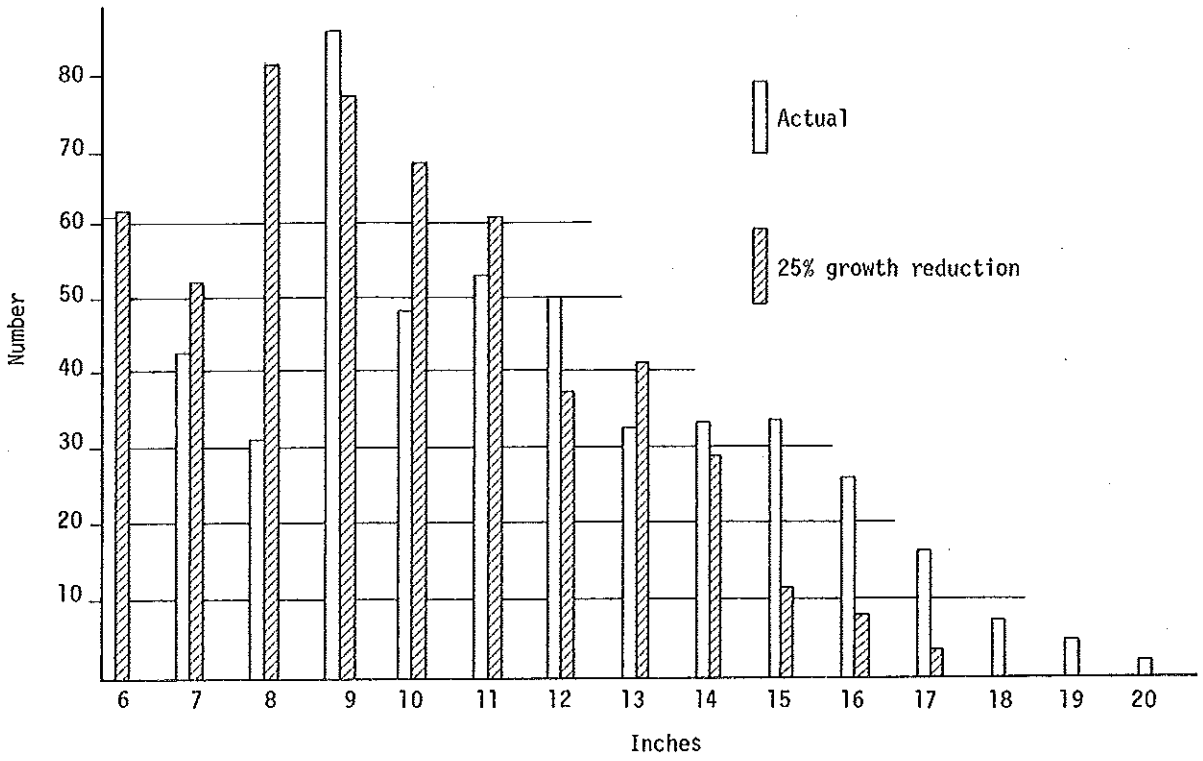

FIGURE 2. Actual length distribution of bass in Murphy Fl. compared to what it would be if growth rates reduced 25% after fish reach age II.

How large the bass population must become before growth is affected depends on the food supply. In infertile waters with limited cover, growth could be reduced substantially with very modest population increases. In more fertile waters, increases would have to be considerably greater before growth rates would be affected.

A third factor that tends to work against anglers when they delay the harvest of bass until they are larger is that many bass very quickly learn how to avoid being caught. This is particularly true where there is heavy angling pressure and many bass are caught and released. Although some bass can be caught many times and never seem to learn to avoid a hook, most become increasingly difficult to catch. Although the catch rate then decreases, the challenge becomes greater.

An important side effect of the "optimum sustained yield" philosophy is its effect upon populations of other fish species, particularly panfish. Management for "optimum sustained yield" of bass usually calls for a larger number of intermediate size bass and more quality panfish in the population. The larger bass population will consume more food. If their principal food supply is panfish, eventually bass can control panfish numbers and thereby maintain good panfish growth rates. This concept has often been demonstrated in farm ponds in the South but is yet to be proven in the North Central United States.

Most northern managers are not completely convinced that bass are effective for controlling bluegills and other panfish. All agree that panfish can usually be controlled if there are enough effective predators. In waters with very abundant aquatic vegetation, predator levels must be extremely high before this occurs and there must be a shortage of types of food that are more highly preferred. Bass in southern states tend to have considerably faster growth rates than in most Wisconsin lakes because of the longer growing season, thus making them more effective predators on intermediate size panfish.

The effectiveness of bass as bluegill predators depends on their size. The larger the bass, the larger the bluegills they will eat. Snow (1971) indicates that the average length of bluegills eaten by a 12-inch bass is only 3 inches (Fig. 3). A 5-inch fish is a common size in stunted bluegill populations; only 18-inch bass or larger regularly eat bluegills that large. This indicates that predation by bass is probably most effective on small bluegills, especially those less than 3-inches long.

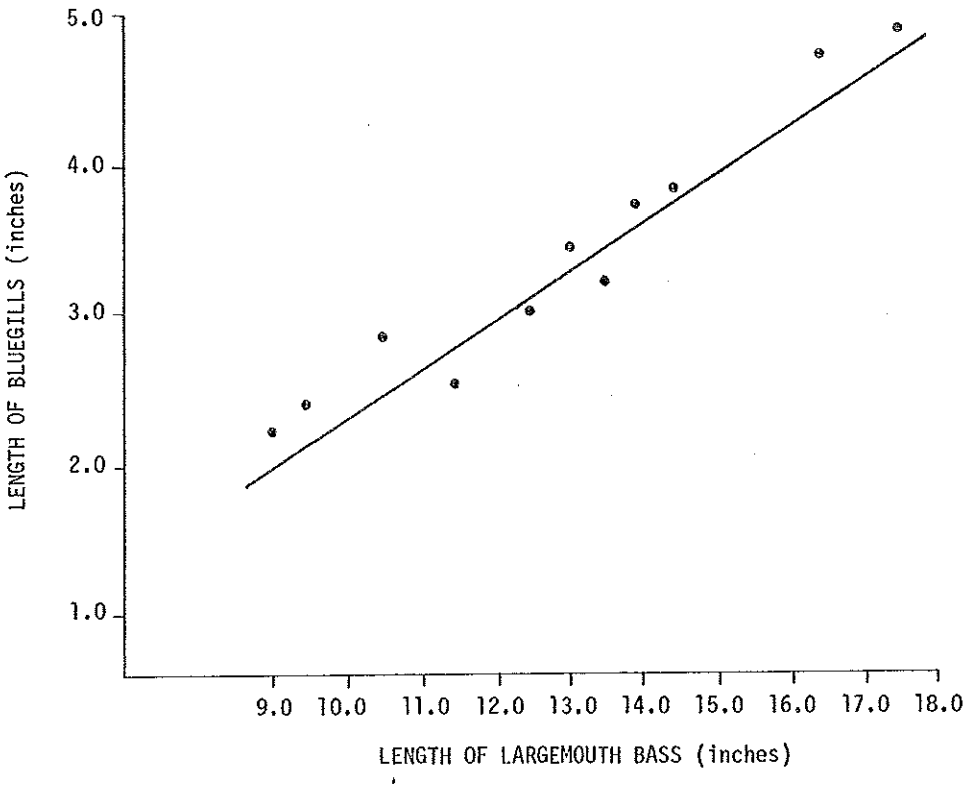

FIGURE 3. Relationship between average largemouth bass length and length of bluegill eaten. (from Snow 1971)

POSSIBLE MANAGEMENT RESPONSES

The current popularity of increased angling quality will have a substantial impact on bass management. Although the stock of bass statewide seems to be sufficient, three objectives should be accomplished to enhance bass fishing: (1) produce more large bass statewide, (2) increase bass populations in selected waters, and (3) obtain more reliable information on bass populations and their harvest so that full potentials can be reached.

More Large Bass

A number of regulatory measures are being tested in various states to increase the numbers of large bass. All require reducing the angling harvest in an attempt to increase survival and let fish grow larger before they are harvested. Later season openings and restrictive size limits are the most popular proposals for reducing harvest.

Alternative 1 -- Delay season opening

It appears that over 50% of the bass harvested in Wisconsin are caught before July 1. This is evident in the creel census on Murphy Flowage, Rusk County (Snow 1971), Cosgrove and Elwood Lakes, Florence County (R. Heiser Wis. Dep. Nat. Resour. pers. comm.,) and Fox Lake, Dodge County (Congdon in press).

Even though the catch during the early season is high, a number of researchers (Maloney et al. 1962, Mraz 1964, and Forney 1972) indicate that the opening date has little to do with the total catch because most bass are caught within a few weeks of opening regardless of when it takes place. These studies are all based on various opening dates before July 1, however. Currently we do not know how much the harvest would be reduced by a later opening, but it would be considerably less than 50%.

Many anglers object to the current opening of the first Saturday in May because it allows people to fish during the spawning season when angling success is particularly high. The male bass builds the nest in shallow water and guards the eggs and fry until they are ready to disperse. During this time, many nests and guarding bass can be easily located by anglers who may fish specifically for them. Males are very aggressive during this time and actively chase intruders and remove foreign objects from their nests. Most spawning takes place in May and early June, but extends to the end of June and sometimes even later in the deeper, colder lakes. Angling during spawning would be avoided in most waters, in most years, if the season opened the Saturday after June 1 in the southern half of the state and the Saturday after June 20 in the northern half. A July 1 opening oate would eliminate angling during spawning in almost all waters.

Some anglers are concerned that reproduction is decreased substantially when bass are harvested from the nests and the eggs and fry are no longer protected. Even though reproduction from nests is lost, tests in Illinois (Bennett 1962) and California (Murphy 1950) indicate that angling during spawning does not affect the total bass reproduction. A substantial surplus of egg and fry production apparently occurs in most waters.

Many bass anglers are willing to sacrifice the early opening for the possibility of obtaining better bass fishing later in the season. Others are not willing to give up a major portion of their bass angling opportunity but would be willing to support an extremely high length limit during the early portion of the season. The Department does not believe the later season will produce significantly better bass fishing statewide but we do not object if the public is willing to sacrifice that portion of the season. In those places where angler harvest is extremely high, benefits to the population may be significant; however, in areas having normal harvest, little, if any result can be expected.

Alternative 2 -- Establish minimum length limits

Minimum size limits are designed to protect the smaller bass so that they can grow and be harvested as larger fish, and, in some cases, provide control of panfish to assure good growth. Test results vary greatly. Undoubtedly, their effect depends a great deal upon the amount of angling, and the changes in growth rate and natural mortality that would occur.

Size limits have been partially evaluated in some states. Ming and McDannold (1975) report that a 12-inch limit on a 240-acre Missouri impoundment resulted in a sevenfold increase of sub-legal bass, a fivefold increase of legal size bass and a marked improvement in the size of bluegills. Those are exceptional results and probably would not have been as great if the angling pressure ranging from 388 to 536 hours/acre had not been so high. This is much higher than in Wisconsin, where the highest recorded on warmwater lakes is 268 hours/acre on Fox lake, Dodge County. Moveover, the Fox Lake pressure was over 42% ice fishing, a period which is relatively ineffective for bass fishing (Congdon in press). A lake getting 100 hours/acre is considered heavily fished in Wisconsin and many northern waters have much less pressure.

A number of other studies of the 12-inch size limit have shown substantial increases in bass smaller than 12 inches, but very few large fish (Rasmussen and Michaelson 1974; Farabee 1974; Johnson and Anderson 1974, Hickman and Congdon 1974). Most accompanying bluegill populations were drastically reduced, resulting in better bluegill growth. Because of bluegill reductions, growth of bass deteriorated in most waters.

After 5-8 years trial of 10-inch, 16-inch, and 14-inch size limits on Sugar Loaf Lake, Michigan, survival and abundance of bass increased very slightly if at all. The mean annual harvest 808 with a 10-inch limit, 281 with 14 inches, and 87 with 16 inches, a significant decline as the size increased (Laarman and Schneider 1979).

Most assessments of bass length limits in Wisconsin have been based on harvest data from lakes with no length limits; the percentage of the harvest smaller than the length limit is considered the reduction that would have occurred if a length limit had been enforced. Although these data are of value, they do not actually predict the effect of size limits, because they do not consider changes in survival, growth, and reproduction.

From the angler's standpoint, length limits, especially those 12 inches and larger, usually have resulted in considerable reductions in numbers of fish harvested, significantly higher catches of small (sub-legal) bass and better panfish angling. The number of bass harvested that are larger than the size limit usually increases, but only slightly. The fish population generally responds with a significant increase in the number of bass smaller than the length limit, a reduction of bass growth rates and a reduction in the number of panfish, but an increase in their average size and growth rates.

Statewide length limits in Wisconsin are not justified currently. It is doubtful that Wisconsin anglers would be willing to sacrifice most of the bass harvest so that they could increase their catch of panfish and small sub-legal bass. Relatively high length limits; however, may benefit individual waters having stunted panfish and high bass harvest rates.

Alternative 3 -- Slot length limit

The slot length limit allows the angler to harvest all bass except those in a specific intermediate size range, possibly 11 to 14 inches. Bass smaller than 11 inches and larger than 14 can be harvested. The concept is much like that of the minimum length limit except that the harvest of small bass minimizes the possibility of reducing growth rates. Slot length limits are probably not as effective as minimum length limits in controlling panfish, but appear to be better suited for increasing the number of large bass in the creel.

Although slot length limits have been discussed for many years, only recently have a few states initiated tests, and Wisconsin will be conducting its own evaluations in the next biennium.

Suggested Strategies

1. Sample public opinion on attitudes toward later season opening date by placing the following advisory questions before the Conservation Congress:

   a. Do you favor delaying the opening of the bass season north of Wisconsin 29 until the first Saturday after June 20?

   b. Do you favor delaying the opening of the bass season south of Wisconsin 29 until the first Saturday after June 1?

   c. Do you favor the current opening of the bass season, with an 18-inch length limit imposed from the opening to the first Saturday after June 20 north of Highway 29, and the Saturday after June 1 south of Highway 29? There would be no length limits after those dates.

2. Initiate tests of slot length limits on a number of waters having high bass mortality rates and abundant slow-growing bluegills.

More Bass in Selected Waters

Bass populations are poor in some waters where they have the potential of providing a substantial fishery. Intensive management can improve populations in many places. Usually, a combination of management measures is necessary for making significant gains. Bass stocking, chemical rehabilitation, and prevention of winterkill can be effective. Limitations on harvest may be necessary if high exploitation is expected.

Alternative 1 -- Bass stocking

Stocking of bass fry and small fingerling in waters with established populations is generally recognized as ineffective or unnecessary (Newburg 1975). Stocking small bass in waters devoid of fish populations or where they have been significantly reduced is often effective.

Stocking of large fingerling in waters having poor recruitment may be effective if predation is low and food abundant.

Alternative 2 -- Chemical rehabilitation

When panfish become overabundant and severe stunting occurs, survival of small bass fingerling may decline drastically and result in a depressed population. Total or partial removal of the fish population can be effected with toxicants. Subsequent stocking is necessary.

Alternative 3 -- Winterkill prevention

Prevention of winterkill with aeration systems can be effective in providing proper conditions for bass. Winterkill lakes usually contain populations of bullheads or carp. These must be drastically reduced or eliminated and then bass subsequently stocked. Chemical rehabilitation of these waters is often necessary before bass stocking. The purchase of aeration systems is often costly and, in most cases, must be operated continuously each winter.

Alternative 4 -- Minimum size limits in specific waters.

Although minimum size limits may not be applicable for general use to increase numbers of large bass, they may be effective in increasing numbers of smaller bass in waters with heavy fishing pressure, small bass populations, and large numbers of stunted panfish. They may also be applicable to new populations that are developing after chemical rehabilitation, winterkill prevention, or on waters recently established. Minimum length limits may be desirable for only a few years until the bass population is well established. A slot length limit regulation may be more applicable as the population stabilizes. More research is necessary to determine whether this is an effective method.

Suggested Strategies

1. Stock fry and small fingerling only in waters having no fish or those with reduced populations of other species. Large fingerling may be stocked where there is poor recruitment, few predators, and abundant food.

2. Chemically rehabilitate waters having undesirable populations, and stock bass.

3. Encourage cooperators to install and operate aeration systems to prevent winterkill and, subsequently, stock and manage for bass.

4. Evaluate high minimum size limits in a number of waters having abundant slow-growing panfish, few bass, and a medium amount of cover.

More Reliable Information

The current and projected status of bass populations in relation to angling pressure, harvest, and exploitation is of major importance in defining management direction. Insufficient accurate data on these activities limit the effectiveness of the management program. Current angling pressure data are based upon a series of general fishing questionnaires sent to the public between 1964 and 1975. More in-depth and current information is needed, especially on smallmouth bass populations. Although some data are available, information for more waters is needed to better estimate statewide supply and demand.

Alternative 1 -- Population studies

Fish managers and researchers have gathered information on population size and structure in a number of waters; however, insufficient work has been done in Wisconsin to determine if this information is representative. Creel census should be taken on representative waters to determine the amount and the impact of angling.

Suggested Strategies

1. Conduct bass population and harvest studies on representative waters. Population size and structure, as well as angling pressure and harvest data, should be collected.

SUMMARY

Wisconsin has many waters with good bass populations. Both largemouth and smallmouth bass are scattered throughout the state in over a million acres of water. Annually, more than 425,000 anglers harvest well over 2 million bass.

Growing interest in bass fishing, concern by some fish managers that bass populations can no longer keep up with the increasing angling pressure, and standards of modern anglers dictate that we evaluate our bass populations more closely and update our programs accordingly. A sharper focus must be placed upon current programs such as stocking, fish control, and winterkill prevention. Emphasis on quality fishing is increasing and must be considered in management. This can best be addressed through angling regulations based upon sound scientific principles. Testing of minimum size limits and slot length limits is necessary to determine their applicability for both bass and panfish management.

The proper use of angling regulations must be stressed and the possibility of having different regulations for different zones or lake classifications must be explored. Management on an individual lake basis is not practiced in Wisconsin because of the numerous lakes. Effective statewide management depends upon the effectiveness of local management, however, and both are necessary to utilize the potential of our water resource and to fulfill the needs of Wisconsin's anglers.

By utilizing the Conservation Congress, clubs, and general publicity as vehicles for explaining the management principles, needs, and directions to the public, Board and Congress, we hope to receive the input and support necessary to provide the best possible management, and develop and maintain the high quality fisheries for which Wisconsin is noted.

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