Creel Limits in Minnesota: A Proposal for Change

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ABSTRACT

Recent research has indicated that creel limits are largely ineffective in regulating recreational fish harvest in Minnesota. Current creel limits give an unrealistic picture of the biological capabilities of Minnesota's fisheries and less than 5% of angler-trips culminate with the harvesting of a creel limit. We present evidence that high creel limits may cause anglers to have unrealistic expectations of their potential harvest. When fishing success expectations are not met, the result is often dissatisfied anglers. We propose reducing creel limits to more appropriate levels by using a probability angling management strategy. These new limits would be based on past recreational harvest data from completed angler-trips. Our goal is to select creel limits that more anglers could attain, or come closer to attaining. Over time, we anticipate reduced creel limits would function more as an educational tool and may help anglers develop more realistic expectations of Minnesota's fisheries.

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Creel limits often are intended to distribute the harvest more widely among anglers (Fox 1975; Noble and Jones 1993) and reduce the harvest by more skilled anglers (Porch and Fox 1990). An abundance of information indicates that individual anglers rarely harvest creel limits on most waters (Hess 1991; Goeman et al. 1993; Munger and Kraai 1997), although the general effectiveness of creel limits placed on a fish population rarely has been addressed (Radomski et al. 2001, this issue).

Daily creel limits do provide anglers a benchmark with which they can measure fishing quality and their own skill (Snow 1982; Noble and Jones 1993), or anglers may use creel limits to establish a target or goal (Fox 1975). In our opinion, this may be the most important message conveyed by creel limits. Obviously, the more fish an angler catches, the happier the angler is likely to be. The numbers of fish caught per trip are correlated with subjective ratings of fishing success (Hudgins and Davies 1984). The value at which a particular creel limit is set by a natural resource agency will partially influence how anglers perceive their fishing success, at least in terms of fish numbers. Other factors such as fish size, catch rates, and angler experience will also influence how anglers judge their fishing success, but we limit our discussion to creel limits.

In this manuscript, we review the history of creel limits in Minnesota and use the probability angling management strategy proposed by Hudgins and Davies (1984) to propose reduced creel limits. Data collected from recreational fisheries throughout Minnesota are used to describe the harvest distribution among angler-trips and angler satisfaction with fishing success.

Creel Limits in Minnesota

The principal fishing regulations in Minnesota are creel limits, which are the maximum number of a particular species that an angler may possess at any one time. Many anglers mistake creel limits as a daily limit, which in Minnesota they are not. Technically and legally, once an angler possesses a

Table 1. Historical changes in Minnesota's creel limits for six popular species since 1922, listed by year of revision.

Year	Walleye	Northern pike	Largemouth bass	Crappie	Sunfish	Yellow perch
1922	15	25	15	20	25	no limit
1930	8	10	6	15	15	25
1931	8	10	6	15	15	no limit
1939	8	8	6	15	15	no limit
1947	8	6	6	15	15	no limit
1948	8	3	6	15	15	no limit
1951	8	3	6	15	30	no limit
1956	6	3	6	15	30	no limit
1979	6	3	6	15	30	100
2000	6	3	6	15	30	20

limit (either currently with them, or in their freezer, or any combination thereof) they may not harvest any more of that species until some are consumed or gifted to another individual. In reality, we suspect Minnesota limits function mostly as a daily limit. Additionally, party fishing is legal in Minnesota, so once an angler harvests his/her limit they usually continue to fish, potentially harvesting fish for other members of the party (assuming, of course, the party is harvesting fish). There is no Minnesota law that requires individual anglers to keep their harvest separate from other members of their fishing party.

Over the past 70 years, creel limits have been steadily reduced for most species in Minnesota (Table 1). Unfortunately, the rationale used to arrive at each reduction in a particular creel limit was not documented throughout the years. We suspect that steady increases in the number of anglers fishing in Minnesota (Cook et al. 1997) was a key point in early discussions to reduce creel limits. The number of anglers in Minnesota has continued to rise, although the rate of growth of new anglers has slowed to about 0.5% per year (Cook et al. 1997). Additionally, the number of trips per angler per year has substantially increased from 16 to 25 days per year (USFWS and USDOC 1997). Furthermore, many anglers are now using better fishing equipment than anglers 20 years ago (Cook and Younk 1998).

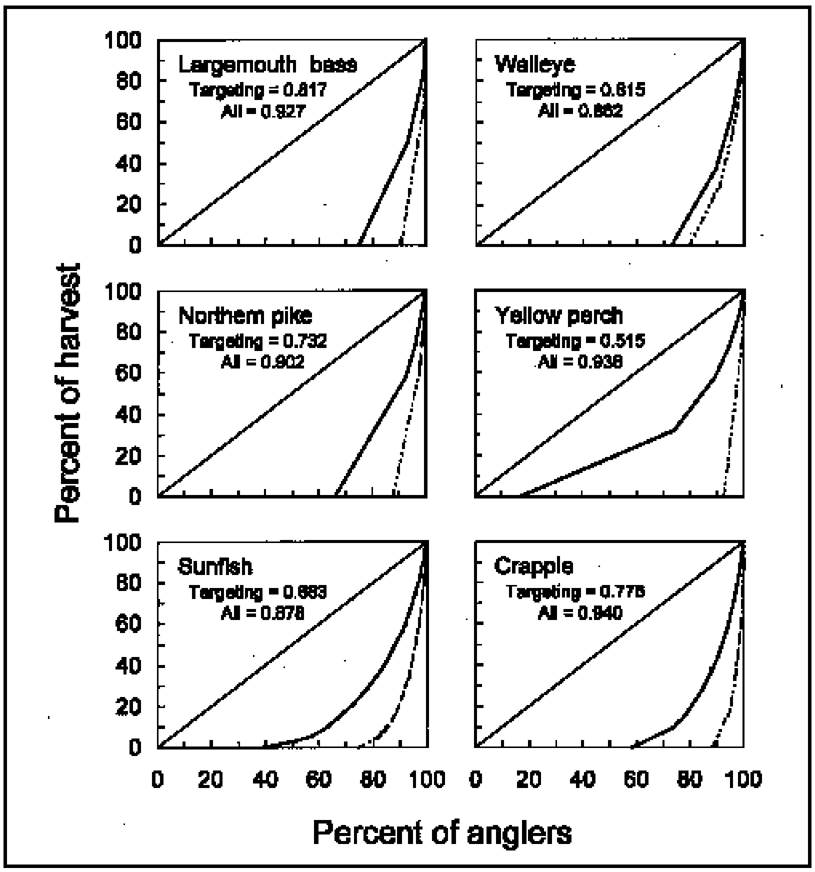

Figure 1. Lorenz curves for six commonly harvested fish species from Minnesota waters. Curves were formed for all anglers (dashed lines) and anglers targeting specific species (solid lines). The 45° line represents perfect equality of harvest among anglers (Gini coefficient = 0.0). Gini coefficients for each species, by angler type, are presented within the graphs.

A recent survey of Minnesota anglers found that they agreed with the statement, "Heavy fishing pressure is reducing the numbers of fish in lakes and streams" (Anthony 1998). Minnesota anglers also perceived a decline in the quality of fishing, and a decline in fish size over the past 10 years. With increasing frequency, many anglers and angling organizations are asking the Minnesota Department of Natural Resources (MNDNR) to improve the quality (numbers and/or size) of Minnesota fisheries. Working with a static resource base and increasing fishing effort, many of the options available to the fisheries manager will involve reduction of harvest. Reducing creel limits is frequently suggested by anglers, politicians, and in certain situations, by fisheries managers as the most publicly acceptable means of reducing harvest. In 2000, the MNDNR began a process to re- evaluate creel limits of all the major recreational fish species (Radomski et al. 2001, this issue).

The yellow perch (*Perca flavescens*) creel limit was the first regulation to be scrutinized. Biological data from Minnesota's most popular yellow perch fishery, Lake Winnibigoshish, indicated a decline in fish size that was correlated with increasing harvest. To reverse this trend, the MNDNR recommended reducing the yellow perch daily creel limit from 100 to 20 fish. With a proposed reduction of 80% in the creel limit, public comment was swift in coming. Surprisingly, the majority of comments were in favor of reducing the yellow perch creel limit. However, the amount of the reduction was a point of great contention and often revolved around economic concerns. A law reducing the daily yellow perch creel limit from 100 to 20, with a 50 fish possession limit was recently passed by the state legislature. Discussions on how to adjust creel limits for other fish species, if needed, have been initiated between the MNDNR, citizens, and representatives from angling groups and the tourism industry. Much of the data that will be discussed between these parties, and how to apply it to potential changes in creel limits in Minnesota, follows.

Methods

Only completed-trip interview data were used to quantify the distribution of anglers harvesting various numbers of fish up to their individual creel limit. All creel data used were collected from 1980 to 1996 by the MNDNR. Creel surveys were either roving stratified-random or access-based non-uniform probability surveys, depending primarily on water body size. Creel surveys used in this analysis were mostly from the open-water (spring and summer) season on lakes, but a few winter and river creel surveys were included.

There is no law prohibiting party fishing in Minnesota, therefore most anglers fish as a group or party of anglers and pool their harvest. Because of this, creel reports summarized an individual angler's harvest by dividing the total party fish harvest (by species) by the number of anglers in the party. Because of this summary procedure, we rounded harvest numbers with fractions down to the nearest whole integer. This method of handling pooled data slightly underestimates the true percentage of individual anglers harvesting or nearly harvesting a creel limit. Conversely, when the number of fish per angler was less than one, all anglers were assigned one fish. This methodology preserved the actual percentage of party-based angler-trips where no fish were harvested by any angler, or all the anglers had harvested a limit, both of which were of interest to Minnesota fisheries managers. Creel limit data were analyzed two ways: by pooling all anglers interviewed during a creel survey, and by pooling anglers targeting (seeking) a particular species. Projections of harvest reductions at various creel limits were made using all angler data, while estimates of anglers affected at various limit reductions were made from targeting angler data.

Analyses were conducted for six species commonly harvested by Minnesota anglers: walleye (*Stizostedion vitreum*), northern pike (*Esox lucius*), largemouth bass (*Micropterus salmoides*), yellow perch, sunfish (*Lepomis* spp.), and crappie (*Pomoxis* spp.). Legal creel limits during the study period were: 6 walleye, 3 northern pike, 6 largemouth bass, 100 yellow perch, 30 sunfish (all species combined), and 15 crappie (both species combined).

Gini coefficients (Smith 1990) were calculated and Lorenz curves (Lorenz 1905) constructed for each species by angler type. Lorenz curves are a plot of the cumulative percentages of angler trips versus the cumulative harvest. We arranged the curves with angler trips on the x-axis and harvest on the y-axis. The closer the curve is to the 45° reference line, the more equal the harvest is distributed among angler trips. A Gini coefficient numerically describes the Lorenz curve between the values of 0 and 1, the lower the Gini coefficient the more equitable the harvest. Gini coefficients are the quotient of the area between the 45° line and the Lorenz curve and the total area under the 45° line.

A Minnesota Perspective

The perfect recreational fishery has been described as one that has enormous effort and no harvest (Hilborn 1985). However, Minnesota anglers do harvest fish and that harvest is not equally distributed among anglers or angling parties. At the completion of a fishing trip, very few Minnesota anglers had harvested their creel limit (Tables 2–5). When examined by species targeted, many anglers do not harvest a single fish during an angling trip (Figure 1). Staggs (1989) found that the walleye harvest was not equally distributed in Wisconsin lakes, where only 7.4% of walleye anglers were successful in harvesting at least 1 walleye and <1% harvested a limit during a fishing trip. In Minnesota, anglers were slightly more successful where 27.2% of angler-trips ended with a harvest of at least 1 walleye, and about 1% harvesting a limit. Churchill and Snow (1964) and Snow (1978) were among the first investigators to document that "10% of the anglers harvest 50% of the fish." Analysis of creel data from Minnesota waters showed little deviation from this generality. Anglers targeting a particular species were generally more successful harvesting that species than all anglers combined. Panfish anglers were more successful in terms of numbers harvested than anglers targeting predator fish. The Lorenz curves generally illustrate that panfish harvest was distributed among more anglers than the predator fish harvest. However, the harvest of northern pike was just slightly more equitable than the crappie harvest, based on Gini coefficients (Figure 1). The Lorenz curve of yellow perch harvested by targeting anglers was the only curve that hinted at an equitable harvest distribution. Harvest of panfish species was more equally distributed among anglers than predator species in two Wisconsin lakes (Churchill and Snow 1964).

Figure 2. The relationship between number of black crappie harvested and how anglers rated fishing on a 1-10 scale (with 10 being high) at Upper Red Lake, Minnesota, during the 1999-2000 winter fishery. The mean fishing rating at each possible number of harvested fish is represented by the thick solid line (approximate confidence bands are indicated by the dashed lines). Minimum and maximum values of fishing ratings at each number of black crappie harvested are presented by the thin lines.

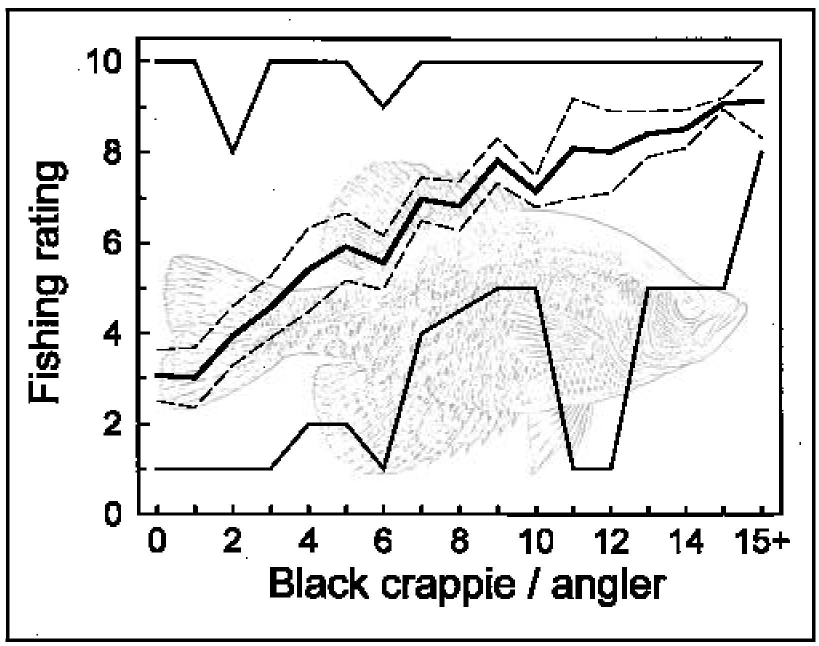

PHOTO: DUANE RAVER/USFWS

As fishing effort has increased, so have complaints from Minnesota anglers about declining fishing quality, both in terms of numbers and size. Increases in fishing effort were correlated with shifts in the population size structure to smaller fish (Olson and Cunningham 1989) and reduced harvest per individual angler (Cook and Younk 1998) for several fish species that are popular in Minnesota. However, the high level of the creel limits were not likely the cause of the complaints, as reducing creel limits has not been shown to correct any of the typical symptoms of an over-exploited recreational fishery (Radomski et al. 2001, this issue). In spite of this, anglers and politicians still frequently suggest lowering the creel limit to cure problems caused by

	SPECIES					
	Walleye		Largemouth bass		Northern pike	
	All anglers	Targeting	All anglers	Targeting	All anglers	Targeting
Lakes surveyed	26	26	34	34	42	36
Interviews conducted	13,918	6,660	15,150	1,150	21,817	1,762
Number harvested	**Percentage of anglers harvesting per trip**					
6	1.1	0.4	0.1	0.3	NA	NA
5	0.4	0.5	0.2	0.6	NA	NA
4	1.2	1.0	0.2	0.6	NA	NA
3	1.5	2.0	0.2	0.4	1.1	4.0
2	5.5	6.5	0.7	5.0	1.4	3.5
1	11.1	16.7	7.9	18.3	9.8	26.3
0	79.2	72.8	90.6	74.8	87.8	66.2
Creel limit	**Cumulative percentage of angler-trips affected at reductions in the creel limit**					
6	0.0	0.0	0.0	0.0	NA	NA
5	1.1	0.4	0.1	0.3	NA	NA
4	1.6	0.9	0.3	0.9	NA	NA
3	2.8	1.9	0.5	1.5	0.0	0.0
2	4.3	3.9	0.7	1.9	1.1	4.0
1	9.8	10.5	1.5	6.9	2.5	7.6
0	20.9	27.2	9.4	25.2	12.3	33.8
Creel limit	**Potential harvest reduction (percent) at lower creel limits**					
6	0.0	0.0	0.0	0.0	NA	NA
5	2.8	1.0	0.9	0.7	NA	NA
4	6.7	3.1	3.1	3.2	NA	NA
3	13.5	7.3	7.1	7.3	0.0	0.0
2	24.1	16.1	13.0	12.4	6.8	8.9
1	48.3	39.4	24.6	31.2	22.5	25.5
0	100.0	100.0	100.0	100.0	100.0	100.0

Table 2. The number of walleye, largemouth bass, and northern pike harvested per angler at the end of their fishing trip as determined by creel surveys conducted in Minnesota from 1980 to 1996. The possession limits during the study were six walleye, six largemouth bass, and three northern pike.

overharvest. But if angler behavior changes with lower creel limits, a potential harvest increase could occur if they fished longer to achieve a more obtainable fish limit. An unknown change in angler behavior such as this would complicate attempts to reverse a downward spiral in fishing quality.

We believe that the most important attribute of a creel limit has nothing to do with regulating the fishery. It is, instead, the message it conveys to anglers. A creel limit is one of many elements that may be used by anglers to define fishing success. When a creel limit is determined by the MNDNR, it is the maximum number of fish that may be potentially harvested by an angler during a fishing trip (assuming no previously harvested fish are in the angler's possession). Many anglers assume that they have a realistic chance of harvesting the limit (if they choose) and removing that limit will not harm or change the resource. This assumption is based on confidence that the MNDNR sets the creel limit at a level that will protect the resource.

Anglers in the 1930s show off their catch of large pike.

Harvesting fish is still an important aspect of fishing in Minnesota and several sources of anecdotal evidence support this hypothesis. Length analysis of harvested and released fish indicated that anglers usually release only smaller, less acceptable fish of most species, and true catch-and-release fishing is not widely practiced by many Minnesota anglers (Cook and Younk 1998). Furthermore, anglers who harvested fish consistently rated fishing quality higher than two other groups of anglers: those who caught some fish but harvested no fish, and those who caught no fish at all (Persons 1993a, 1993b; Cook 2000). Conversations among Minnesota anglers illustrate how the creel limit is used as a benchmark for fishing success. Phrases such as "we caught the limit," "we filled out," or "we were one short of the limit" are common. Satisfaction with fishing is partially judged against the established creel limit, and creel limits may send an unintended message to anglers of what is biologically and personally achievable in terms of potential fish harvest. Other factors such as fish size, harvest and catch rates, and angler experience play a role in angler satisfaction with fishing, but creel limits are one factor that can be controlled by a management agency. Although more Minnesota anglers are practicing catch-and-release (especially for species like largemouth bass), we believe even these anglers judge their success relative to the creel limit for many species.

Because anglers partially use creel limits as a benchmark to establish their expectations, we think there is a risk of inflating anglers' expectations when creel limits are too high. We used data from the 1999-2000 winter black crappie fishery on Upper Red Lake to illustrate the effect of a creel limit on perceived success by anglers. The black crappie creel limit was 15 fish with no size restrictions during the survey period. We found a positive relationship between number of fish harvested and how anglers rated fishing (Figure 2). The spread of 95% confidence bands around the mean rating remained relatively consistent, but the range of response values tightens as anglers approach harvesting a limit. We believe this data set supports our contention that the established creel limit will indeed influence how anglers perceive their fishing success. The influence of black crappie size on how anglers rated fishing was minimized due to the fact that >90% of the harvested (and available) fish were from a single year class. The winter fishery of Upper Red Lake in 1999-2000 could easily be described as the best black crappie fishery ever experienced in Minnesota. The completed-trip mean harvest rate of 985 anglers was 2.16 black crappie per hour, which was only exceeded by three other Minnesota lakes during the 1950s. By all standards, the Upper Red Lake fishery was as good as it gets in Minnesota. We acknowledge that this may have skewed angler expectations upward, because some anglers who harvested a limit did not rate fishing high. However, we believe the trend of increasing satisfaction as the creel limit is approached holds true for many of Minnesota's fisheries, because this same pattern has been exhibited in other fisheries although the sample sizes were much smaller (Persons 1994a, 1994b, 1995).

Today, some Minnesota anglers feel that the pike are declining in size

When creel limits are higher than the biological capabilities of the fishery and few anglers come close to harvesting a limit, this likely will contribute to low satisfaction with fishing. In Minnesota, current statewide creel limits exaggerate the biological capabilities of most fisheries. For example, the Minnesota adult (>15 inches) walleye population has been estimated at 14 million fish (MNDNR unpublished data) and approximately 2.3 million anglers fish Minnesota waters annually. If every angler harvested one limit of six walleye per year, the annual harvest would be 13.8 million walleye, or 98.6% of the estimated adult standing crop. Obviously, there are other factors that come into play here—not all anglers fish for walleye, some walleye harvested are

Table 3. The number of crappie harvested per angler at the end of their fishing trip as determined by creel surveys conducted in Minnesota from 1980 to 1996. The possession limit during the study was 15 crappie.

	Percentage of anglers harvesting per trip		Cumulative percentage of angler-trips affected at reductions in the creel limit		Potential harvest reduction (percent) at lower creel limits	
Number harvested or creel limit	All anglers[a]	Targeting anglers[b]	All anglers[a]	Targeting anglers[b]	All anglers[a]	Targeting anglers[b]
15	0.1	0.4	0.0	0.0	0.0	0.0
14	0.2	0.8	0.1	0.4	0.3	0.3
13	0.0	0.0	0.3	1.2	0.5	0.5
12	0.0	0.2	0.3	1.2	0.8	0.8
11	0.5	2.4	0.3	1.4	1.0	1.1
10	0.1	0.7	0.8	3.8	2.6	3.0
9	0.2	0.6	0.9	4.5	4.3	5.3
8	0.4	0.7	1.1	5.1	6.7	8.1
7	0.4	1.9	1.5	5.8	9.9	11.2
6	0.5	1.6	1.9	7.6	14.3	15.5
5	0.4	2.4	2.5	9.2	19.9	20.8
4	0.6	4.2	2.9	11.6	26.5	27.7
3	1.8	6.3	3.4	15.9	34.5	37.2
2	1.1	4.2	5.2	22.1	51.4	54.7
1	6.1	15.3	6.3	26.3	62.3	66.9
0	87.8	58.4	12.4	41.6	100.0	100.0

[a] Data compiled from 30 lakes and 6,931 anglers interviews.
[b] Data compiled from 34 lakes and 1,392 anglers interviews.

not adults, and inputs from walleye growth and recruitment are not considered. Nonetheless, a six-walleye creel limit definitely overstates the potential supply when compared to the demand. Reducing the creel limit for walleye may adjust the benchmark and expectations of anglers to more accurately reflect the production capabilities of the fishery.

Because harvest is an important part of the fishing experience in Minnesota, the perception of reduced personal harvest by anglers could make acceptance of reduced creel limits a formidable challenge for the MNDNR. With some anglers, any benefits of adjusted expectations from reduced creel limits would not occur until the initial resentment of the "agency" taking something away subsided. The optimistic nature of anglers is that someday they might harvest that higher limit of fish, and they value the opportunity to do so. Interviews collected from winter ice-anglers at Lake Winnibigoshish, Minnesota, suggest that some anglers (44% of nonresidents and 2% of residents) would quit fishing at Lake Winnibigoshish for yellow perch if the limit was reduced from 100 to 50 fish, and a larger percentage would not fish there if the limit was reduced to 30 fish (80% of nonresidents and 23% of residents; MNDNR unpublished data). Angler illusions of being able to harvest high creel limits are also perpetuated by anglers themselves, when they consistently overestimate realistic catch rates (Spencer and Spangler 1992).

Adjusting Creel Limits by Probability Angling

Because angler perceptions of fishing success are partially based on creel limits, angling satisfaction should be maximized when creel limits provide a goal that is at least occasionally attained. Hudgins and Davies (1984) have described probability angling as a management strategy that uses catch assessment data to establish criteria for anglers to evaluate their personal fishing success. They suggested providing actual catch data to anglers so they could evaluate how relatively successful they had been, based on a gradient of fish numbers caught below creel limits. Ranges in numbers of fish below a creel limit were classified as poor (40%), fair (30%), good (20%), and excellent (10%) to define probability management angling success (Hudgins and Davies 1984). We propose altering this concept by reducing creel limits, so the most successful anglers would attain limits a specified percentage of the time based on empirical data. We used a probability angling management strategy to select creel limits that approximately 5% of the targeting anglers would attain for predator fish (walleye, northern pike, and largemouth bass) and approximately 10% would attain for panfish (yellow perch, sunfish, and crappie) in an angling trip. Anglers targeting a particular species usually were the most successful group of anglers (Figure 1), and were used as the data set for proposing new creel limits.

Examination of harvest from Minnesota waters revealed that reduced creel limits would affect few angler-trips and (Tables 2-5), unless creel limits were set very low, reductions in harvest would be negligible. Generally, if current Minnesota creel limits were reduced by half, less than 10% of all angler-trips would be affected. Therefore, we believe that the greatest benefits in reducing creel limits would eventually come from adjusted angler expectations, as more anglers neared harvesting the creel limit.

A probability-angling management strategy suggests that if we were to use creel limits in an attempt to alter angler expectations to reflect biological realities, Minnesota creel limits would need

Table 4. The number of sunfish harvested per angler at the end of their fishing trip as determined by creel surveys conducted in Minnesota from 1980 to 1996. The possession limit during the study was 30 sunfish.

	Percentage of anglers harvesting per trip		Cumulative percentage of angler-trips affected at reductions in the creel limit		Potential harvest reduction (percent) at lower creel limits	
Number harvested or creel limit	All anglers[a]	Targeting anglers[b]	All anglers[a]	Targeting anglers[b]	All anglers[a]	Targeting anglers[b]
30	0.2	0.7	0.0	0.0	0.0	0.0
29	0.0	0.5	0.2	0.7	0.1	0.2
27	0.6	1.3	0.2	1.1	0.4	0.7
24	0.4	1.1	0.8	2.4	1.5	2.0
21	0.5	1.2	1.2	3.5	3.6	4.2
18	0.9	2.8	1.7	4.7	6.7	7.3
15	0.6	0.9	2.6	7.5	10.9	11.6
12	2.4	6.8	3.2	8.4	16.8	17.4
9	2.4	7.7	5.5	15.2	25.5	26.1
6	5.1	15.5	7.9	22.9	39.1	39.9
3	12.1	22.8	13.0	38.3	61.4	63.6
0	74.8	39.0	25.2	61.1	100.0	100.0

[a] Data compiled from 34 lakes and 14,507 anglers interviews.
[b] Data compiled from 34 lakes and 1,976 anglers interviews.

Number harvested or creel limit	Percentage of anglers harvesting per trip		Cumulative percentage of angler-trips affected at reductions in the creel limit		Potential harvest reduction (percent) at lower creel limits	
	All anglers[a]	Targeting anglers[b]	All anglers[a]	Targeting anglers[b]	All anglers[a]	Targeting anglers[b]
100	0.0	0.3	0.0	0.0	0.0	0.0
90	0.0	0.1	0.0	0.3	0.0	0.3
80	0.0	0.2	0.0	0.4	0.0	0.8
70	0.0	0.1	0.0	0.6	0.0	1.4
60	0.0	0.3	0.0	0.7	0.0	2.2
50	0.0	1.6	0.0	1.0	0.1	3.4
40	0.0	2.7	0.0	2.7	0.3	6.4
30	0.1	5.4	0.0	5.4	0.8	12.4
20	0.5	15.1	0.2	10.8	4.4	24.5
10	6.9	56.8	0.7	25.9	19.1	53.6
0	92.4	17.1	7.5	82.7	100.0	100.0

[a] Data compiled from 8 lakes and 5,975 anglers interviews.
[b] Data compiled from 4 lakes and 1,619 anglers interviews.

Table 5. The number of yellow perch harvested per angler at the end of their fishing trip as determined by creel surveys conducted in Minnesota from 1980 to 1996. The possession limit during the study was 100 yellow perch.

to be adjusted to 3 walleye, 2 largemouth bass, 6 crappie, 12 sunfish, and 30 yellow perch (Table 6), based on harvest by targeting anglers. These limits represent a reduction from current creel limits of 0% to 70% (Table 6). Maximum projected harvest reduction from reduced creel limits would be less than 14% for predator species and less than 17% for panfish (Table 3) on a per trip basis. Therefore, if reduced creel limits were implemented, any reductions of total annual fish harvest would likely be neither perceptible nor measurable.

We propose that the probability angling management strategy is a valid management option for Minnesota waters. The current Minnesota creel limits have been in place for more than 40 years, except the yellow perch limit, which was established in 2000. In Minnesota, total yield likely has been maximized for the most popular species, while fishing effort and fishing efficiency due to technological advances continue to increase (Cook et al. 1997; Cook and Younk 1998). As a result, angler harvest rates have declined for most Minnesota species and each angler's share has gotten smaller (Cook and Younk 1998). The fishery resource in Minnesota is becoming increasingly scarce from the perspective of an individual angler. As the fisheries resources become increasingly scarce, the allocation of resources becomes less equitably distributed among anglers (Smith 1990; Baccante 1995). Reduced creel limits will provide a more realistic standard of good fishing than existing limits, while maintaining the harvest component of recreational angling. However, because many fishery yields likely have been maximized, fishing quality as perceived by anglers eventually must be measured by metrics other than fish harvest. We believe lower and more biologically realistic creel limits are a first step toward this goal.

	SPECIES					
	Walleye	Largemouth bass	Northern pike	Crappie	Sunfish	Yellow perch
Present creel limit	6	6	3	15	30	100
Proposed creel limit	3	2	3	6	12	30
Reduction in creel limit	50%	67%	0%	60%	60%	70%
Anglers expected to harvest a limit	3.9%	6.9%	4.0%	9.3%	9.3%	10.7%
Angler-trips affected by lower creel limit	1.9%	1.9%	NA	7.6%	8.4%	5.4%
Maximum amount of harvest reduction	13.5%	13.0%	NA	14.3%	16.8%	0.8%

Table 6. A proposed probability angling management strategy for Minnesota sport fisheries. Percentage of angler-trips affected is based on targeting anglers, while maximum harvest reduction is based on all anglers.

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