NORTHERN PIKE ASSESSMENT

Maine Department of Inland Fisheries & Wildlife

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November 2001
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January 2008

NORTHERN PIKE LIFE HISTORY

Description

Northern pike, also referred to as northerns, pike, jack, and brochet, are most commonly recognized by their elongate snout, head, and body form, large yellow eyes, and a large mouth full of sharp prominent teeth. An abundance of teeth line the jaws, roof of the mouth, and tongue. Adults are characterized by conspicuous black markings on the fins are in striking contrast to a background color, ranging from shades of yellow/green to orange/red. The pattern of body coloration in juveniles is distinctively different from that found on adults. Juvenile pike are covered by an irregular pattern of long, wavy vertical markings that range in color from white to yellow, set against a slightly darker background. As pike mature the elongate vertical markings undergo a transition to bean-shaped spots.

Chain pickerel are closely related to northern pike, inhabiting all waters where pike currently occur in Maine. Both species are very similar in general appearance, and given the incidence of hybridization (cross breeding between specie), these two species are not always readily distinguished from one another. Chain pickerel possess *dark, chain-like* markings along the flanks, in contrast to the *light colored irregular marking* found on northern pike. Perhaps the two most reliable features to distinguish pike from chain pickerel are the number of sensory pores on the lower jaw and the presence of scales on the gill cover. Pike usually posses *5 pair* of small sensory pores along the underside of the lower jaw, and possess *scales* on only the *upper half* of the gill cover (Figure 1). Where as, chain pickerel usually posses *4 pair* of sensory pores and the gill cover is *fully scaled* (Figure 2).

Figure 1. Northern Pike

Figure 2. Chain Pickerel

Distribution

Northern pike are distributed throughout much of the northern hemisphere and within North America is the most widely distributed member of the [1]Esocidae Family. Northern pike are the only "esocid" native to both North America and Eurasia. The historical North American range included, Alaska, most of Canada below the Arctic Circle, the Missouri River drainage, which includes the upstream confluence of the Mississippi River, the Ohio River drainage in Pennsylvania and New York, and the Great Lakes drainage basin. Northern pike are not indigenous to Maine and the rest of New England, except for Vermont where historical populations were confined to Lake Champlain.

Northern pike have been widely distributed outside their historical range in North America to provide a large-fish sport fishery and to "manage" populations of smaller fish that are prone to stunting. Northerns are now residents in all New England states, although habitat limitations have precluded the state of Rhode Island from establishing a self-sustaining population.

Northern pike were initially introduced into Maine in the 1970's, as the result of an illegal introduction into the Belgrade Chain of Lakes. Subsequent migration within the Belgrade lakes drainage and additional illegal introductions are responsible for an expanding distribution within central and southern Maine.

Habitat Requirements

Northern Pike are a coolwater species, occurring primarily in more nutrient rich lakes and ponds, as well as larger, slow moving rivers. Although predominantly found in freshwater environments, northerns can survive in weak brackish water and are reported to spawn successfully at salinities reaching 7 parts per thousand. Northern pike generally become well established where water is relatively shallow and an abundance of rooted aquatic vegetation provides important spawning, nursery, and adult foraging habitat.

Habitat preference varies seasonally. Northern pike are typically found in shallower water during the spring and fall, with larger individuals moving to deeper, cooler water during the heat of the summer. However, northern pike generally inhabit water shallower than 30 feet deep. Larger individuals are generally associated with structure that is located near areas of open water. Northern pike tend to be rather sedentary, establishing a territory where suitable food and cover exists.

Reproduction

Mature pike migrate to shallow, calm, weedy bays, flooded wetlands, and slow flowing tributary streams to spawn just prior to, or immediately following ice-out in late March or early April. Water temperatures during this period may range from the mid 30's to the mid 40's.

Females may be tended by more than one male during the act of spawning, as adhesive eggs are randomly broadcast over vegetation in shallow water often less than 18 inches deep. Eggs and milt may be simultaneously released periodically throughout the daytime hours over a period

[1] Esocids are comprised of small to large elongate fish that occur within the northern hemisphere and include such species as, northern pike, muskellunge, chain pickerel, redfin pickerel, and grass pickerel.

of 2 to 5 days. A number of environmental factors may delay or inhibit spawning, including the absence of vegetation, the presence of cold weather, water level drawdowns, strong wind, or rain.

Other members of the esocid family also share similar spawning traits and as a result northern pike may hybridize with other esocids found in Maine, including chain pickerel, redfin pickerel and muskellunge. Pike-chain pickerel hybrids are well documented in Maine.

Northern pike egg production is high (approximately 9,000 per pound body weight). However, egg and fry mortality may be also very high, due to predation by perch, minnows, larger aquatic insects, waterfowl, and cannibalistic northern pike. Stranding associated with lowering water levels can also result in significant egg and fry mortality.

Developing eggs are extended no parental care and depending on water temperature hatch in about 12 to 14 days. Upon hatching pike may attach to vegetation by means of an adhesive pad located on the head and continue to feed on the yolk for about a week.

Food Habits

Once the yolk sac is absorbed, the young northern pike feed on larger zooplankton and small aquatic insects for up to several weeks until reaching a length of nearly 2 inches. Upon reaching this size fish become a prey item of primary importance.

Northern pike are generally considered opportunistic carnivores, potentially feeding on any creature within an acceptable size range. Optimal food size has been estimated between 1/3 and 1/2 the length of the pike. Although known to feed on small mammals, amphibians, crayfish, and birds, fish appear to be the most common pike forage in Maine. Diet studies on the Belgrade Lakes indicate that pike eat white perch, yellow perch, smallmouth bass, smelt, landlocked salmon, minnow species, and insects. Although there is some evidence to suggest that non-spiny finned, cylindrical-shaped fish (e.g., suckers, smelt, trout, and salmon) are more easily swallowed by pike, existing studies suggest that white perch are the most commonly consumed forage fish in Maine waters.

Age, Growth and Maturity

Juvenile pike experience very rapid growth, and within 30 days of hatching are nearly 2 inches long. Within the first year they may reach 10 to 15 inches in length. Growth continues to be rapid within the first three to four years until sexual maturity is reached. In Maine, annual growth during this period may exceed 8 inches in length (Tables 1) and 0.75 pounds in weight. Upon reaching sexual maturity growth in length slows, but weight gain increases in greater proportion. Annual growth for mature pike in Sabattus Lake generally ranges from 1 to 4 inches in length, and 1 to 5 pounds in weight.

Table 1. Pike SIZE BY AGE FOR REGION B WATERS. AGE DETERMINATION BY SCALE AND CLETHRUM

	AGE								
SIZE[1]	1	2	3	4	5	6	7	8	10
LENGTH	14.3	19.3	23.7	27.6	31.3	30.2	40.7	34.0	42.0
SE	0.6	0.5	2.5	0.6	0.6	0.9	1.4	0.0	0.0
WEIGHT (N)	0.6	1.8	3.3	5.4	8.3	7.2	20.9	12.1	N/A
SE	0.1	0.2	0.1	0.4	0.5	0.7	0.0	0.0	N/A

[1] LENGTH IN INCHES WEIGHT IN POUNDS

Male pike may reach sexual maturity by age 2 or 3, and females typically mature by age 3 or 4. Spawning studies in the Belgrade Lakes indicate that spawning males average 26 inches long and weigh 5 pounds, where as spawning females average 31 inches long and weigh 9 pounds.

The life expectancy of pike may exceed 15 years and females generally live longer and achieve greater size than males. Northern pike are among the largest freshwater fish in Maine, topping the scales in excess of 31 pounds.

MANAGEMENT HISTORY

Management in Other States

Northern pike have been widely distributed outside their historic range to create popular recreational and commercial fisheries. As a sportfish, northern pike offer fisheries managers the following desirable management attributes: 1) produces an excellent winter fishery that offers productive fishing throughout the duration of the ice fishing season, 2) good fighting qualities, 3) good eating, 4) large size growth potential, and 5) ability to "regulate" forage populations and utilize a wide range of prey. It is perhaps ironic, but it is because of these latter traits that pike may jeopardize other well established and popular fisheries. For example, the traditional salmon fishery at Long Pond in Belgrade is currently threatened by the presence of northern pike, which not only prey on smelt, an important forage for salmon, but on salmon as well. The large size and opportunistic feeding habits of northern pike have enabled them to exploit both ends of the Long Pond food chain.

A variety of management strategies are used in other states to enhance pike populations where they provide popular sport fisheries. Fishing season closures, and restrictive size and bag limits are used to increase spawning success and recruitment. Northern pike are also reared in conventional hatcheries to support state stocking programs. Intensive management of "artificial" spawning marshes using water level control structures is also used to propagate pike. These marshes are drained and kept dry for most of the year to encourage the growth of grasses and inhibit the production of predaceous aquatic insects. The marshes are flooded in early spring and stocked with captured brood stock. The brood stock are subsequently removed and stocked after spawning. The resulting fingerling pike are collected and stocked out in early summer.

New Sportfish in Maine

Northern Pike were initially introduced into Maine during the 1970's, as a result of an illegal introduction to the Belgrade Chain of Lakes. Pike became well established and subsequently colonized other lakes within the Belgrade Lakes drainage. Early spawning, early utilization of fish forage and subsequent rapid growth, opportunistic foraging habits, and large size potential are qualities that enabled pike to successfully establish as a dominant predator in the Belgrades, where habitat is not limiting. The recreational fisheries that initially developed were characterized by large size quality. Pike averaged over 30 inches long and exceeded 7 pounds. This exciting new fishery was producing fish of larger average size than that offered by more traditional existing fisheries and the popularity of this sportfish grew. The perceived success of the Belgrade Lakes pike fisheries likely contributed to numerous subsequent illegal pike introductions to new waters within central and southern Maine. Although pike occur in several rivers and streams, available information suggests that most angling for pike occurs in lakes and ponds. Currently, northern pike are known to reside in 28 non-flowing Maine waters, and are reported in an additional 15 waters; those reports have yet to be confirmed. Most of the waters are located in the Androscoggin and Kennebec River watersheds but the most recent introduction occurred in the Penobscot watershed.

Because of their size potential and status as a major sportfish elsewhere, northern pike have become increasingly popular with Maine anglers. Pike are vulnerable to anglers of varying skill levels during both the open water and ice fishing seasons. However, the winter fishery appears to be better utilized by Maine anglers.

Some modifications to traditional fishing equipment are needed to fish successfully for northern pike. The use of highly abrasion resistant leaders, large hook size (larger than 2.0), and larger terminal tackle, are recommended. Northern pike provide anglers action throughout the winter fishing season, however, many avid pike enthusiasts enjoy fishing in March, when trophy-size adult pike concentrate in shallow water areas with the approach of the spawning season. Larger golden shiners and smaller common suckers fished dead or alive are popular baits. At "ice-out" anglers are most successful catching large pike by fishing shallow weedy areas where pike are spawning. In addition to live baits, large spoons, spinner baits, and stick baits are popular terminal tackle. Trolling and casting along weed lines and other areas of structure are productive fishing strategies for the spring and early summer. Late summer fishing is generally most productive in deeper water. With the arrival of fall, shallower water areas again offer productive fishing.

Prevention & Control Measures

Even though MDIFW has not authorized, or undertaken, any pike introductions to new waters, pike are establishing in a growing number of waters. Existing regulations designed to discourage illegal introductions have not served as an effective deterrent in preventing the spread of northern pike. Furthermore, if the history of illegal introductions involving native (e.g., white perch, rainbow smelt, cusk, golden shiners, etc.) and other non-native fish (e.g., smallmouth bass, largemouth bass, black crappie, etc.) is any indication the spread of northern pike will likely continue in response to individual angler desires and expectations.

When pike establish where they pose unacceptable risks to existing fisheries there are generally very few, proven, cost effective eradication or suppression strategies available to fishery resource managers. Use of broad-spectrum fish poisons (piscicides) are deemed impractical on all but perhaps our smallest trout ponds considering environmental and social concerns, cost, and the potential for success. The use of piscicides is further limited by the absence of a stable source of funding for this potentially expensive control/eradication procedure. Regulatory options that allow for increased angler harvest to reduce or eradicate pike populations, where spawning habitat is not limiting, offers little promise. Furthermore, it may be difficult to gain public support to comply with regulations designed to reduce the size and abundance of large spawning adults, which are prized sportfish. Where water levels can be sufficiently regulated there exists perhaps the greatest opportunity to reduce pike spawning success by lowering waters levels immediately after spawning. Unfortunately, the timing of pike spawning also coincides with spring rains, and snow and ice melt which tends to increase lake water levels. Furthermore, water levels in many lakes and ponds are lowered in the fall to prevent ice damage to shoreline property. As a result, properly timed significant reductions in water levels may be difficult to realize.

Maine currently does not actively manage northern pike with protective fishing regulations. There are no size or daily bag limits on pike and anglers are encouraged to harvest any fish caught to reduce the population. This lack of management has met with some resistance from the angling public especially in the Belgrade Chain of Lakes Region. Most pike anglers are interested in catching large pike (over 15 pounds) consequently smaller fish are often released back into the water with the belief these fish will remain in the fishery and grow to a large size.

PAST MANAGEMENT GOALS

The following management goal and objectives were identified for northern pike in the 1986 Minor Sportfish Management Plan:

Goal: *Limit populations to present distribution and abundance, and increase use.*

Objective: *No specific performance standards are considered necessary for the management of these species. Unlimited harvest will be allowed and encouraged within the framework of general regulations*.

In 1996 the Minor Sportfish Management Plan was updated and the following two findings were disclosed regarding the 1986 management goal and objectives for northern pike:

1) *The 1986 goal to limit population distribution and abundance has not been realized. In 1986 pike were present in 6 waters, and by 1995 pike were known to exist in 7 waters and unconfirmed reports suggested an even wider distribution* (As of 2007 pike have been confirmed in 28 lakes and ponds, and suspected in 15 others).
2) *Special regulations were adopted on four pike waters, representing a departure from the 1986 objective to allow unlimited harvest under general law.*

Based on the aforementioned findings the 1996 Minor Sportfish Management Plan update adopted the following new goal and objectives for northern pike:

Goal: *Develop / clarify Department policy pertaining to the management on non-native esocids. This policy should be consistent with the management of other non-native species, and proactive with respect to addressing angler support for active management.*

Objectives:

1) *Identify fishery management concerns associated with the presence northern pike in Maine and develop a study plan designed to investigate and address identified concerns;*
2) *Develop criteria to: (a) determine the management position that will be taken by the Department in response to illegal pike introductions (e.g., unlimited harvest of pike will be allowed and encouraged where their presence adversely affects Regionally significant sport fisheries); (b) address angler support for Department initiated introductory stocking programs; and (c) develop specific performance standards necessary to support active management efforts.*

As of 2001 the 1996 goal and objectives have not been realized, due in part to the following factors:

1) The management of non-native species, like northern pike, is controversial, complicating efforts to achieve consensus from the public and within the Department regarding the direction that should be taken in formulating policy.
2) The task of developing appropriate policy and implementing management objectives has not been identified as a Departmental priority, given the many other resource and program issues facing the Department;

3) There is an increasing reliance upon Regional staff to develop and implement statewide management plans and at the same time the Regional workload is increasing.

A three member Department workgroup was formed in 1997, in part to compile information to fulfill the 1996 management goal. Little other progress has been made toward achieving the 1996 goal and objectives.

OPPORTUNITY

Northern pike are currently present in 28 lakes and ponds, which have a combined surface area of acres (Table 2 & 3). Pike are also likely present, but have not been confirmed in at least 15 additional ponds that occur within the same drainage of known pike populations. Northern pike are presently restricted to three major river drainages (Kennebec, Penobscot and Androscoggin) and occur within four Maine counties (Sagadahoc, Androscoggin, Kennebec, and Oxford).

The current distribution of pike is confined to four Fisheries Management Regions (Figures 3 & 4). In 1985 northern pike were present in only two Administrative Fisheries Management Regions (B & D), but have since expanded to Regions (A and F) (Table 3). Fisheries Management Region B accounts for 75% of all the northern pike waters and their associated total combined surface area.

The number of northern pike waters has increased by 183% (10 new waters) statewide, which represents a 45% increase (11,056 acres) in lake surface area since 1985. The expanded distribution of pike has resulted from illegal stockings, and the subsequent migration from established populations to other waters within the same watershed. Introductory pike stockings have not been undertaken by the MDIFW to expand pike angling opportunities.

Table 2. Waters with Confirmed Pike Populations by Town and County

WATER	TOWN	REGION	COUNTY
Umbagog Lake	Magalloway Plantation	D	Oxford
Bear Pond & Little Bear Pond	Hartford	B	"
North & Little North Pond	Rome	B	Kennebec
Great Pond	Belgrade	B	"
Long Pond	Belgrade	B	"
Messalonskee Lake	Belgrade	B	"
Berry Pond	Winthrop	B	"
Ingham Pond	Mount Vernon	B	"
Cobboseecontee Lake	Manchester	B	"
Annabessacook Lake	Monmouth	B	"
Wilson Pond	Wayne	B	"
Taylor Pond	Auburn	A	Androscoggin
Sabattus Pond	Sabattus	B	"
Little Sabattus Pond	Greene	A	"
Winnegance Lake	West Bath	A	Sagadahoc
Estes Lake	Sanford	A	York
Branch Pond (Middle)	Waterboro	A	York
Sebago Lake	Sebago	A	Cumberland
Lower Narrows Pond	Winthrop	B	Kennebec
Long Pond	Livermore	B	Androscoggin
Round Pond	Livermore	B	Androscoggin
Lovejoy Pond	Albion	B	Kennebec
Nequasset Lake	Woolwich	B	Sagadahoc
Torsey Pond	Mount Vernon	B	Kennebec
Mosher Pond	Fayette	B	Kennebec
North Pond	Warren	B	Knox
Little Cobboseecontee Lake	Winthrop	B	Kennebec
Pushaw Lake	Old Town	F	Penobscot

Northern Pike presently provide principal fisheries in 6 (21%) of the 28 known pike waters (Table 3). Principal fisheries for northern pike have not developed in the remaining 10 waters, and this is at least partially attributed to the fact that these are relatively new developing populations. All principal fisheries for northern pike are located in Fisheries Management Region B. The number of principal fisheries for pike has increased by 3 (100%) waters (Long Pond, Ingham Pond, and Sabattus Pond) since 1985. The lake surface area associated with these waters is 4,676 acres, which represents a 33% increase over 1986 levels.

TABLE 3 Pike Occurrence in Lakes by Fisheries Management Region for Years 1985 & 2000

REGION	TOTAL OCCURRENCE		PRINCIPAL FISHERIES		ON-GOING INTRODUCTIONS	
	NUMBER OF LAKES	ACRES OF LAKES	NUMBER OF LAKES	ACRES OF LAKES	NUMBER OF LAKES	ACRES OF LAKES
YEAR 1985						
A	0	0	0	0	0	0
B	5	16,688	3	13,974	0	0
C	0	0	0	0	0	0
D	1	7,850	0	0	0	0
E	0	0	0	0	0	0
F	0	0	0	0	0	0
G	0	0	0	0	0	0
STATE	**6**	**24,538**	**3**	**13,974**	**0**	**0**
YEAR 2000						
A	3	787	0	0	0	0
B	12	26,957	6	18,650	0	0
C	0	0	0	0	0	0
D	1	7,850	0	0	0	0
E	0	0	0	0	0	0
F	0	0	0	0	0	0
G	0	0	0	0	0	0
STATE	**16**	**35,594**	**6**	**18,650**	**0**	**0**
CHANGE BETWEEN 1985 AND 2000						
A	+3 (up 100%)	+787	0	0	0	0
B	+7 (up 160%)	+10,269 (up 61%)	+3 (100%)	+4,676 (up 33%)	0	0
C	0	0	0	0	0	
D	0	0	0	0	0	0
E	0	0	0	0	0	0
F	0	0	0	0	0	0
G	0	0	0		0	0
STATE	**+10 (up 183%)**	**+11,056 (up 45%)**	**+3 (100%)**	**+4,676 (up 33%)**	**0**	**0**

Five of the 6 principal fisheries for northern pike occur in mesotrophic lakes; one occurs in a moderately eutrophic lake. Another shared characteristic is that these relatively shallow, productive lakes support an abundance of aquatic vegetation that offers excellent pike spawning and nursery habitat. In addition, most support a diverse fish community characterized by an abundance of warmwater fish. Approximately half the waters are also stocked with coldwater fish (brown trout, splake, and salmon). The aforementioned characteristics also exist in many other

lakes and ponds throughout the state, particularly in southern, central, and coastal Maine, thereby providing additional potential opportunities for the creation of self-sustaining pike fisheries. However, serious concerns regarding potential interaction impacts to existing fisheries, particularly more traditional coldwater fisheries, would severely limit any future introductions that might be contemplated by the Department. Another concern related to the range expansion of northern pike is the creation of new “donor” sources that could facilitate additional unauthorized introductions to waters where existing management programs could be jeopardized.

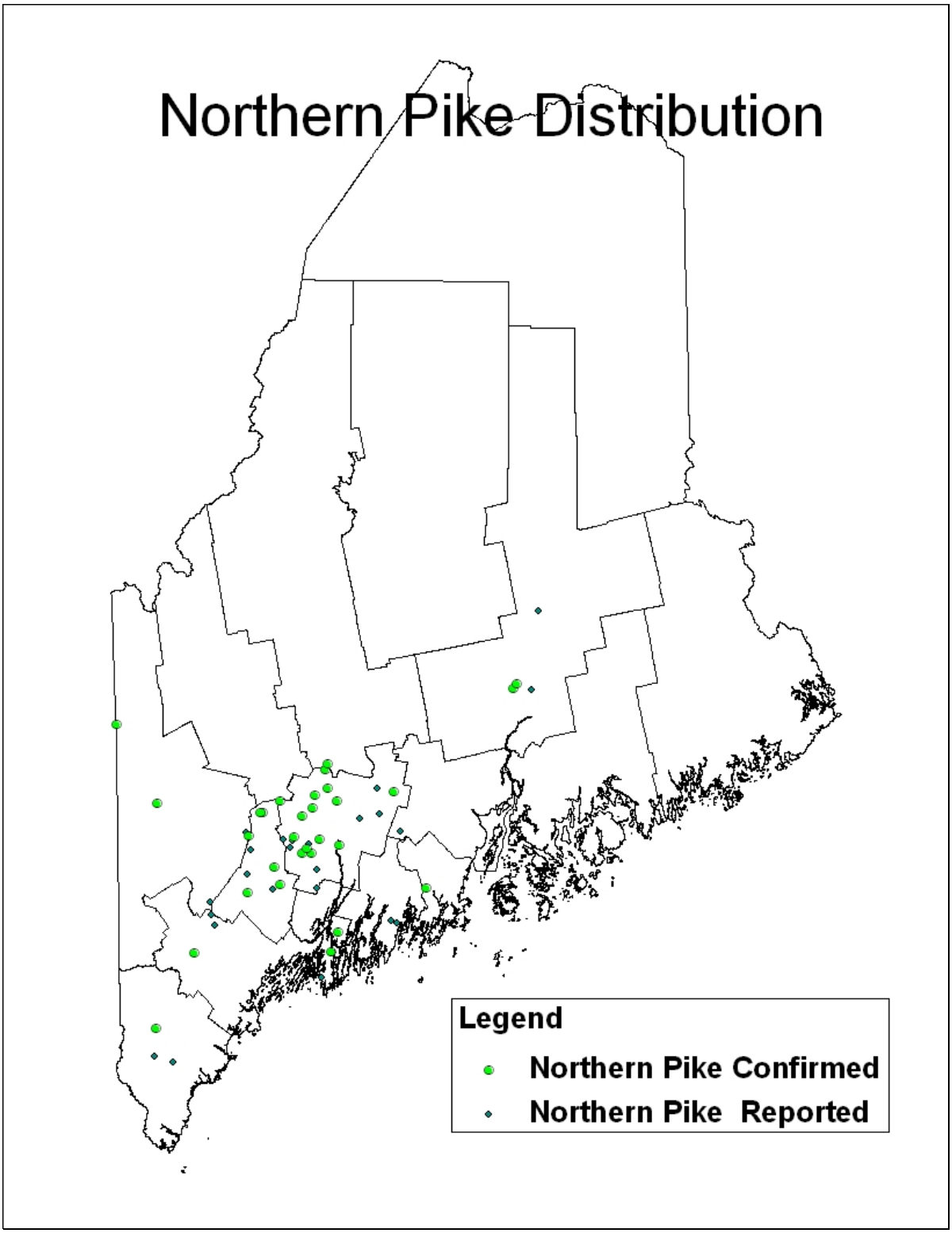

FIGURE 3. CONFIRMED AND REPORTED WATERS WITH NORTHERN PIKE POPULATIONS.

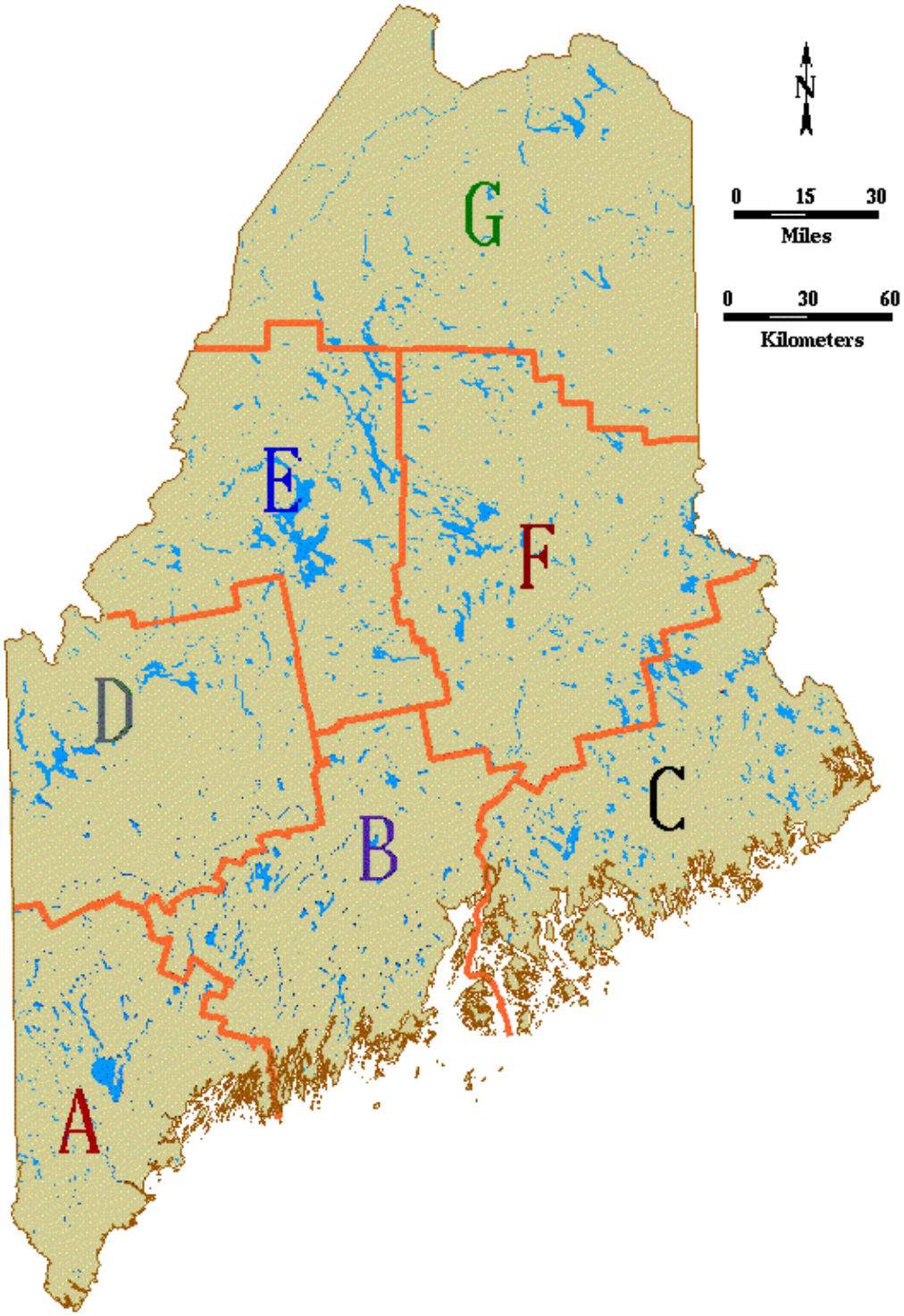

FIGURE 4. ADMINISTRATIVE FISHERIES MANAGEMENT REGIONS FOR THE MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

All northern pike waters in Maine are open to fishing during the open water and ice fishing seasons. There are no regulations governing the harvest of northern pike. Public boat launch facilities provide anglers good access to all 6 lakes that support principle fisheries for northern pike.

DEMAND

Information provided in this section on angler effort, catch, harvest, and angler preferences were obtained from 3 sources: statewide angler questionnaire surveys, water specific clerk surveys, and aircraft angler counts. Statewide angler surveys are conducted periodically by sending written questionnaires to randomly selected anglers. Questionnaire surveys rely on many assumptions and while useful in assessing trends are generally considered less accurate than the remaining two methods of data collection. Regional biologists conduct roving clerk surveys on individual waters by interviewing anglers engaged in fishing. Angler counts that are utilized to estimate effort are often obtained by aircraft.

Evidence of the growing popularity of pike fishing is revealed in the results of the "1999 Open Water Angler Survey", which indicate that next to bass, northern pike are tied with white perch as the most preferred warmwater sportfish targeted by anglers. This finding is somewhat unexpected considering that the acreage of water where pike provide a principle fishery is significantly less than that of any sportfish, except muskellunge. In fact, statewide, there are in excess of 21 times more principle fisheries for bass or white perch (based on lake acreage) than for pike. Of the 15 sportfish (both coldwater & warmwater) identified in the questionnaire, northern pike were the 8th most targeted by summer anglers. In addition, approximately 22% of anglers indicated it was important or very important to have the opportunity to catch northern pike in Maine. Northern Pike were the 9th most preferred sportfish from a list of 17 species. The 1999 open water survey results indicate there is a demand for pike fishing opportunities in Maine. Earlier statewide angler survey results are not available for comparison with the 1999 survey, because northern pike were not incorporated in earlier survey questionnaires.

Angler use and effort estimates derived from the 1994 and the 1999 open water questionnaire surveys indicate that summer use on northern pike waters has increased by 84% in the last 5 years (Table 4)! Use and effort estimates derived from water-specific surveys on three Belgrade

Table 4. Total Angler Effort Expended on Lakes Where Northern Pike Provide a Principle Fishery, Based on the 1994 and 1999 Statewide Ice and Open Water Survey

REGION	SEASON	TOTAL ANGLER USE (95% CI)			ANGLER DAYS PER ACRE	
		1994	1999	CHANGE	1994	1999
A	-	-	-	-	-	-
B	Summer	62,439 (2,457)	114,923 (25,818)	Up 84%	4.2	6.2
	Winter	-	-	-	-	-
	Annual	-	-	-	-	-
C	-	-	-	-	-	-
D	-	-	-	-	-	-
E	-	-	-	-	-	-
F	-	-	-	-	-	-
G	-	-	-	-	-	-
STATE	Summer	62,439	114,923	Up 84%	?	6.2
	Winter	-	-	-		-
	Annual	-	-	-		-

Lakes indicate a similar and consistent trend of increasing fishing pressure expended on waters where pike provide a principle fishery (Table 5). Summer use on the three Belgrade lakes has increased by 79% in the last 5 years. Over this same period there was only a slight increase (3%) in summer use observed statewide. The apparent large increase in summer use on pike waters, relative to the very modest increase in use observed statewide, provides additional evidence of growing angler interest in pike fishing. Some of the observed increase may be also attributed to an increase in the number of pike fisheries, and the growing popularity of other coexisting fisheries, including bass, as well as stocked coldwater species.

Table 5. Total Angler Use and Effort Expended on Lakes Where Northern Pike Provide a Principle Fishery, Based on Clerk Surveys Completed in 1994 and 1999

WATER	SEASON	TOTAL ANGLER USE (95% CI)			ANGLER DAYS PER ACRE	
		1994	1999	CHANGE	1994	1999
North Pond	Summer	2,822 (453)	4,716 (955)	**up 67%**	1.82 (0.16)	1.86 (0.28)
	Winter	1,140 (179)	1,194 (173)	**up 5%**	0.40 (0.06)	0.42 (0.06)
	Annual	3,962	5,910	**Up 49%**	2.22	2.28
Great Pond	Summer	11,742 (1,690)	14,308 (2,151)	**up 22%**	1.71 (0.21)	1.93 (0.22)
	Winter	2,341 (560)	2,956 (388)	**up 26%**	0.28 (0.07)	0.36 (0.05)
	Annual	14,083	17,264	**Up 22%**	1.99	2.29
Messalonskee Lake	Summer	2,566 (393)	6,356 (955)	**up 148%**	1.14 (0.11)	1.78 (0.26)
	Winter	1,430 (391)	2,216 (710)	**up 55%**	0.41 (0.11)	0.63 (0.20)
	Annual	3,996	8,572	**Up 115%**	1.55	2.41

While some increase in summer use on northern pike waters can be attributed to other factors previously mentioned, the trend of increasing winter use on pike waters appears to be even more closely tied to the growing popularity of winter pike fishing. Although winter use estimates were not available from statewide ice fishing questionnaires, use estimates on three Belgrade pike waters indicate that average winter use has increased by 29%. The increase in winter use on pike waters was somewhat unexpected because there has been a 27% decline in winter use observed statewide. The statewide decline in winter use has been attributed to the growing popularity of other competing winter sports (e.g., snowmobiling, skiing, etc.). It appears that while winter use directed at more traditional fisheries has declined, pike fisheries are attracting growing numbers of anglers.

Estimates of fishing effort on the three Belgrade Lakes in 1999 indicate an average of 1.86 trips per acre in the summer and a winter effort of 0.36 trips per acre. The 1999 open water survey revealed a higher average summer effort of 6.2 trips per acre (winter effort was not available from state-wide ice fishing questionnaires). The disparity in summer effort between the two data sources may be at least partially explained by sampling differences. The three Belgrade Lakes are the largest waters that support principle fisheries for pike and since effort is a function of lake surface area (larger waters generally have smaller estimates of effort) lower average estimates of effort are anticipated for the three Belgrade lakes. In addition, anglers responding to the 1999 open water survey may have fished for pike in smaller ponds, including those where pike have not been identified as providing principle fisheries. This latter condition would inflate

questionnaire based effort estimates, which rely solely upon the acreage of waters with principle fisheries for pike.

Available trend information suggests that there is growing demand for pike fishing, and angler use directed at northern pike is expected to increase in the future. As demand grows, there will likely be an increased incidence of illegal stocking by the public to create additional pike fishing opportunities. In addition, the Department will likely experience increased public pressure to "deal" with the problem of illegal introductions, as well as to take a more active role in the management of northern pike in Maine.

FISHING QUALITY

Available information to assess the quality of Maine's pike fisheries is limited to the results of the 1999 open water questionnaire survey and the results from 8 ice fishing creel surveys completed primarily within the last 10 years on specific waters in Fisheries Management Region B. There were no fish quality performance objectives developed for northern pike in the 1996 updated Minor Sportfish Management Plan, and as a result, changes in the fishery are described in the absence of standards for evaluation.

Even though northern pike are considered very good table fare, the fishery supports a strong catch and release ethic, as evidenced by a 92% release rate for legals reported in the 1999 open water survey report. A desire by anglers to allow northern pike to reach their great size potential may partially account for this high release rate. The 1999 open water survey also indicated that summer anglers catch pike at the rate of 0.47 legals (SE: 0.04) per angler trip. No open water creel surveys on individual waters have been completed that provide meaningful summer catch rate information for comparison. Furthermore, existing summer catch rate information is insufficient to evaluate long-term trends or changes.

Available winter catch rate information is derived from relatively recent creel surveys, and as a result, there is insufficient data to evaluate long-term changes or trends. On those pike waters afforded protection by the 24-inch minimum length limit anglers average 0.05 legal-sized northern pike per each angler trip (Table 6), or a combined (sublegal + legal-size pike) catch rate of 0.08 pike per angler trip.

Table 6. Angler Catch Rates for Northern Pike by Water and Year, Based on Winter Creel Surveys

WATER	YEAR	CATCH RATE (LEGALS PER ANGLER TRIP)	CATCH RATE (LEGALS & SUBLEGALS CAUGHT PER ANGLER TRIP)
24 Inch Minimum Length Limit			
Great Pond	2001	0.0484	0.0840
" "	2000	0.0592	0.1268
Messalonskee Lake	2001	0.0492	0.0644
" "	2000	0.0312	0.0376
North Pond	1999	0.0432	0.0684
All Waters	**All Years**	**0.0462**	**0.0762**
No Minimum Length Limit			
Sabattus Lake	1998	0.2132	0.0533
" "	1997	0.5084	0.1271
" "	1996	0.2904	0.0726
Sabattus Lake	**All Years**	**0.3373**	**0.0843**

On Sabattus Lake, where there are no minimum length provisions, anglers experience a higher mean catch rate of 0.34 northern pike per angler trip. The statewide average catch rate is 0.19 (SE: 0.07) legals per angler trip.

Northern pike harvested by anglers average 25.4 inches long and weigh 4.56 pounds, based on 9 creel surveys completed over the last 20 years (Table 7). A review of Table 7 indicates a trend of diminishing size quality. The apparent decline in average length and weight may be partially attributed to a phenomenon commonly associated with new introductions, where initial cohorts are characterized by unusually rapid growth and large size. As the population develops a

new ecological equilibrium is established, and the fishery assumes characteristics more typical of that species. However, with increasing fishing pressure directed at northern pike, and harvest being directed at larger, trophy-size individuals, some of the change in size structure could be attributed to increased angler exploitation. The intent of the special 24 inch minimum length limit imposed on four pike waters in 1994 and 1996 was to enhance pike size quality and maintain reproductive success. Although, the effectiveness of the special regulation has not been formally evaluated, preliminary findings presented in Table 7 suggest that the average pike size has not increased. This cursory finding suggests the need to examine other minimum size limits, as well as other factors that may be affecting size quality.

Table 7. Mean Lengths and Weights of Northern Pike, by Year Group, Based on Combined Summer and Winter Creel Surveys for Waters Within Fisheries Management Region B

YEARS	LENGTH (N)[1]	LENGTH (INCHES)	LENGTH (SE)	WEIGHT (N)	WEIGHT (POUNDS)	WEIGHT (SE)
1980 & before	2	29.8	0.23	2	7.10	0.40
1991-1995	4	26.0	0.67	4	5.13	0.30
1996-2000	6	24.5	0.84	6	4.00	0.55
ALL	12	**25.4**	0.66	12	**4.56**	0.41

[1] Number of surveys providing data

NORTHERN PIKE GOALS AND OBJECTIVES

2001-2016

GOAL: Maintain existing northern pike populations and fishing opportunities, except where traditional popular fisheries are threatened, and limit any new introductions.

OBJECTIVES:

1. Further illegal introductions will be vigorously discouraged.
2. Where northern pike threaten significant existing fish populations, management efforts should strive to reduce pike predation and interspecific competition.
3. Proposals for officially sanctioned pike introductions outside of the river drainages within Fisheries Management Regions A and B in which the species now occurs will not be sanctioned by the DIFW.
4. Proposed introductions of pike within the river drainages in Fisheries Management Regions A and B in which the species now occurs may be considered by the Department if the introduction does not threaten significant, pre-existing fish populations and is acceptable to the angling public.

Capability: Suitable habitat for northern pike is generally not limiting in Maine. Existing northern pike waters and many others throughout Maine provide an abundance of high quality spawning, nursery and adult habitat for northern pike, particularly in Management Regions A and B. A diversity and abundance of preferred forage fish also occur within Management Regions A and B. Habitat suitability and forage availability for northern pike are expected to remain suitable or even improve on some waters as the range and abundance of potential forage fish and aquatic vegetation increase through unwelcome introductions.

Feasibility: Whether the Department should further enhance northern pike fisheries and expand opportunity is a topic of considerable public controversy. The debate will likely continue and prevailing opinions will dictate the level of future enhancement and suppression efforts. Where northern pike threaten existing popular fisheries there may be few, if any cost-effective and socially acceptable eradication and control measures available to protect and/or restore affected fisheries.

Furthermore, it may be difficult to achieve angler cooperation with regulations designed to reduce the size and abundance of the large adults prized by pike anglers. The merit of suppression and eradication efforts must continue to be evaluated on a case-by-case basis and may include measures like chemical reclamation, liberalized regulations on the harvest of pike, spring drawdowns, and stocking a larger-size, more expensive hatchery-propagated salmonids, among others. Illegal stocking of northern pike by the public, fueled by the growing popularity of this trophy fishery, will likely increase their distribution to other suitable waters outside the current range, creating additional threats to existing fisheries. Few, if any Department initiated introductions are anticipated over the next planning period, although some may be undertaken in carefully selected waters to satisfy growing demand for additional recreational opportunity and to address management research needs.

Desirability: Satisfying the increasing demand for recreational pike fishing must be balanced by the need to protect traditional and native fisheries. Angler survey questionnaires have indicated the angling public is very concerned about the potential effect of non-native introductions on native populations. Unfortunately a number of poorly conceived illegal introductions have placed important regional fisheries at risk. Although controversial, Department sanctioned introductions in carefully selected waters could reduce the incidence of illegal introductions by satisfying local demand, while ensuring the introduction would not adversely affect important native and traditional fisheries. Some strong advocates for native and traditional fisheries do not support the Department's efforts to actively manage non-native and illegally stocked fisheries, including northern pike. However, public pressure from pike fishing enthusiasts resulted in special regulations imposed on 4 waters, these regulations have since been removed in an effort by the Department to demonstrate the philosophy of not managing exotic species despite the fact of starting the non-native rainbow trout stocking program.

Any officially sanctioned introduction efforts should be confined to select waters in southern central Maine, a region where existing native fisheries have been replaced and/or significantly compromised by introduced species, many of which were illegally introduced. Numerous waters outside of south-central Maine support valuable sport fisheries, including many native trout and salmon fisheries that have not been compromised by unwanted predator and competitor species. The latter fisheries are particularly vulnerable to new fish introductions.

Consequences: The creation of additional northern pike fisheries could provide more convenient sources of fish to support additional unwanted illegal introductions. However, the creation of new northern pike fisheries by the Department might, in combination with an effective outreach program, alleviate the perceived need for illegal stockings to expand pike fishing opportunity. The enhancement of existing fisheries and the creation of new pike fishing opportunities through protective regulations and authorized/unauthorized stocking efforts could further increase the popularity of pike fishing by exposing more anglers to this sport fishery. Furthermore, the introduction of northern pike into more waters could significantly increase recreational use where historical use was low thus adding to the local economy, particularly during the winter months when pike fishing is very popular.

However, growing angler interest in pike fishing could accentuate the potential for more illegal introductions of the species. Additionally, proactive management by the Department, through stocking or the adoption of additional protective regulations could also be perceived as condoning illegal stocking practices. In many cases the influence of a dominant apex predator like northern pike cannot be suppressed through conventional management practices. Furthermore, attempts to control and/or extirpate pike will, in some instances, result in the diversion of staff and funds from more effective management efforts.

NORTHERN PIKE MANAGEMENT PROBLEMS AND STRATEGIES

PROBLEM 1. The Fisheries Division lacks sufficient staff and funding to adequately address northern pike management research needs.

Strategy a. Seek public support for sufficient staff and resources to accomplish the plan's objectives.

PROBLEM 2. The management of non-native species, including northern pike is complex and controversial. However, there is general broad-based public concern regarding the spread of exotics and the potential effects on native and traditional fisheries. Public opinions and perceptions are premised upon broad-based assumptions, which may not apply on a case-by-case basis. This apparent disparity complicates efforts by the Department to determine the direction taken on key management issues, particularly on a case-by-case basis.

Strategy a. Develop and distribute a detailed questionnaire to licensed anglers to obtain additional public input on managing northern pike in Maine.

Strategy b. Review existing policies regarding the management of non-native and introduced (authorized & unauthorized) species to determine if the goals, objectives and management strategies identified for northern pike can be accommodated by current policies. Any modifications of existing policies can only be adopted if they are determined to be consistent with the Department's long-range fisheries management goals and objectives and additional public input.

PROBLEM 3. The interactions and response of fish communities found in typical Maine lakes to introduced populations of northern pike is not well known.

Strategy a. Undertake an extensive literature review for interaction information, as well as information regarding pike fishery manipulation strategies (i.e., suppression of population size, enhance size quality, etc.)

Strategy b. Assess short and long term changes in fish communities following introductions of northern pike.

Strategy c. Seek support from universities to investigate key research issues.

PROBLEM 4. Illegal stockings of northern pike threaten important trout and salmon fisheries. Existing eradication and suppression efforts are only effective in specific situations.

Strategy a. Intensify enforcement efforts on illegal stocking, including:

1. Publicize the use of Operation Game thief to report illegal introductions.

2. Publicize violations and convictions of people found guilty of an illegal introduction.

Strategy b. Intensify educational and outreach efforts regarding the problems of illegal fish stocking:

1. Devote a larger section of the law book to this topic.

2. Require the completion of a fishing ethics program before issuing an adult fishing license.

APPENDIX A

WARMWATER WORKING GROUP INPUT

NORTHERN PIKE MEETING SUMMARY
WARMWATER WORKING GROUP
JANUARY 24, 2002

Issues:

- ✓ Is the size of statewide record pike continuing to increase?
- ✓ What impact are pike having on traditional fisheries?
- ✓ What is the potential for pike expanding their range with the removal of dams and/or provisions for fish passage?
- ✓ What harm would be caused by expanding the range of pike into waters already "stressed" by numerous exotics or having no "significant" fisheries?

Statewide Goals:

I. Restrict distribution to the present distribution.
II. Statewide Objectives:
   A. Restrict distribution to the existing waters ($^{1}24^{\pm}16^{1}$ lakes and ponds).
   B. Continue laissez-faire management with no general law bag or length limits and no further special regulations.

PRIORITIZED NORTHERN PIKE MANAGEMENT OBJECTIVES

DESCRIPTION OF STATEWIDE OBJECTIVES	RANKINGS WARMWATER GROUP
Further illegal introductions will be vigorously discouraged.	**1**
Proposals for officially sanctioned pike introductions outside of the river drainages within Fisheries Management Regions A and B in which the species now occurs will not be sanctioned by the DIFW.	**2**
Where northern pike threaten significant existing fish populations, management efforts should strive to reduce pike predation and interspecific competition.	**3**
Where northern pike are actively managed, management efforts should strive to enhance those catch and size qualities of interest to the anglers utilizing the fishery.	**4**
Proposed introductions of pike within the river drainages in Fisheries Management Regions A and B in which the species now occurs may be considered by the Department if the introduction does not threaten significant, pre-existing fish populations and is acceptable to the angling public.	**5**

PRIORITIZED NORTHERN PIKE MANAGEMENT PROBLEMS

DESCRIPTION OF MANAGEMENT PROBLEMS	FISHERIES	WARMWATER GROUP	FINAL RANKING
The interactions and response of fish communities found in typical Maine lakes to introduced populations of northern pike is not well known.	4	1	?
Public input into determining our pike management focus is complicated by the fact that the general, broad-based public concern regarding the spread of exotics breaks down in the face of case-by-case (water-by-water) situations.	2	2	?
Illegal stockings of northern pike threaten important trout and salmon fisheries. Existing eradication and suppression efforts are only effective in specific situations.	1	3	?
The Fisheries Division lacks sufficient staff and funding to adequately address northern pike management research needs.	3	4	?

CONCEPT PLAN FOR IMPLEMENTATION OF NORTHERN PIKE MANAGEMENT OBJECTIVES (2001-2016)

PRIORITIZED NORTHERN PIKE MANAGEMENT OBJECTIVES		Region A Contribution			Region B Contribution			Region C Contribution			Region D Contribution			Region E Contribution			Region F Contribution			Region G Contribution			Statewide Totals[1]		
DESCRIPTION OF STATEWIDE MANAGEMENT OBJECTIVES	**Rank**	**Exst**	**Prop**	**Dfct**	**Exst**	**Prop**	**Dfct**	**Exst**	**Prop**	**Dfct**	**Exst**	**Prop**	**Dfct**	**Exst**	**Prop**	**Dfct**	**Exst**	**Prop**	**Dfct**	**Exst**	**Prop**	**Dfct**	**Exst**	**Prop**	**Dfct**
Further illegal introductions will be vigorously discouraged.	**1**																								
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Where northern pike are actively managed, management efforts should strive to enhance those catch and size qualities of interest to the anglers utilizing the fishery.	**4**																								

Exst = Existing;
Prop = Proposed;
Dfct = Deficit (Proposed – Existing).

IF THIS TABLE REMAINS BLANK IT SHOULD BE DELETE

[1] Numbers only include those waters having principal fisheries for pickerel