SMELT MANAGEMENT PLAN

DEPARTMENT OF INLAND FISHERIES AND WILDLIFE
DIVISION OF FISHERIES AND HATCHERIES

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REGION A

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SMELT LIFE HISTORY

Rainbow smelt (*Osmerus mordax*) are an anadromous species that is, they grow to maturity in the ocean and return to freshwater streams to spawn. The species is distributed along the Atlantic seaboard from Labrador to New Jersey. Smelt have also established landlocked populations throughout the northeastern United States and eastern Canada. The distribution of landlocked populations, originally restricted to coastal drainages, has been expanded inland and throughout the Great Lakes drainage via human introductions. A brief description of the life history of landlocked populations follows.

Mature smelt, 2-3 years of age or older, generally ascend streams to spawn around the time of ice-out (March-May). However, it is well documented that some populations spawn successfully within lakes and ponds that lack suitable spawning tributaries by utilizing shoreline areas or offshore shoals. There is also evidence suggesting smelt may choose to spawn within the lake environment as a result of inclement weather or unfavorable stream flows. The spawning event ranges from 2 days to 3 weeks, but peak activity is usually less than one week in duration. The majority of spawning activity typically occurs at night with most of the spawning individuals dropping back into the lake during daylight hours.

Larger individuals of the population spawn first, followed by smaller individuals in the latter part of the run. Spawning fish travel a short distance upstream and position themselves within the current over shallow riffle areas. Two or more adult males will crowd around a female, and as more and more of these small breeding groups develop, females will begin extruding small clusters of eggs with males excreting milt simultaneously. The eggs are adhesive and quickly attach to whatever they contact (i.e. rocks, vegetation). The outer coating of the egg peels off to form a stalk, which allows the egg to sway within the current.

Egg development proceeds rapidly, and hatching generally occurs within 2-4 weeks, depending upon water temperatures. After hatching, the transparent larvae, approximately a quarter of an inch in length, drift downstream into the lake. Initially, smelt movement is largely restricted to drifting with existing currents, which temporarily makes them a component of the lake's planktonic community. Growth is fairly rapid, and they can obtain lengths of up to 2 inches by late summer of their first year. Smelt vary in size from water to water, but most mature individuals from landlocked populations range from 3-6 inches in length. Smelt from some lake systems can resemble their sea-run relatives in size as smelt up to 14 inches and longer have occasionally been recorded throughout their landlocked range. Smelt are a carnivorous species, they feed on a variety of food items and their feeding habits are largely size dependent. Juvenile smelt feed predominantly on a variety of plankton and smaller aquatic invertebrates, while larger individuals target bigger forms of zooplankton, aquatic invertebrates, and even small fishes. Smelt are also cannibalistic and will commonly feed on smaller individuals within the population.

Smelt are generally thought of as inhabiting only larger, stratified, coldwater lakes; however, fishery biologists have documented viable smelt populations in other environments. For example, smelt populations have been documented in some Maine ponds less than 10 acres in size and in waters with maximum depths as shallow as 14 feet. Smelt are considered to be a schooling, pelagic species that exhibits nocturnal behavioral patterns. In the summer, they generally tend to congregate in large, tight schools near the bottom of the lake throughout daylight. However, as night approaches they migrate vertically to feed. Individual smelt fan out to form larger, loose schools associated around the thermocline. Smelt movements and daily patterns appear to be more variable during the fall and winter seasons, when they are known to utilize the entire lake environment.

SMELT MANAGEMENT HISTORY

Despite their relatively small size and low profile, rainbow smelt are of great importance to anglers and fisheries statewide. They are the only inland fish species to provide such a variety of uses and benefits including: recreational sport fishing opportunities, a commercial bait fishery, a favored bait for anglers targeting other sportfish, a popular food fish and a primary forage fish for both coldwater and warmwater fishes. These same attributes contribute to the complexity of smelt management, because demands from various user groups are often in direct conflict with one another, particularly when resources are limited. For example, protecting smelt populations for one type of use (i.e. forage) typically reduces or eliminates other use opportunities. Unpredictable and extreme fluctuations in smelt abundance, combined with a lack of knowledge and control over the factors influencing abundance further complicates management of the species. All of these factors can be the source of conflict among the various user groups and can create dissatisfaction towards the resource management agency.

Freshwater smelt populations typically inhabit cool, stratified lakes where they may become extremely abundant. MDIFW lake surveys have revealed that smelt are currently widely distributed throughout Maine; however, the original distribution of the species may have extended no more than 50 or 60 miles from the coast. Unauthorized and unrecorded introductions of smelts have been frequent in Maine, beginning at least as early as the 1870's, making a determination of their original distribution impossible. In addition, MDIFW biologists have made many introductions throughout the state to create or improve fishing opportunities for Maine's anglers.

In Maine, most lake habitat with suitable dissolved oxygen and temperature is capable of supporting smelts. Over the years, MDIFW has documented some losses or degradation of smelt habitat due to environmental impacts. For example, Sabattus Pond, Cobbosseecontee Lake, and Sebasticook Lake have all experienced varying degrees of habitat loss or degradation through eutrophication. Pesticide contamination has led to smelt population losses at Sebago Lake in the 1960's and several marginal waters (i.e. Hutchinson Pond, Albany TWP) have been known to lose their smelt populations during exceptionally dry, hot summers. Some of the Management Regions have also noted losses of historical spawning runs in brooks due to a variety of physical and chemical alterations to these spawning tributaries. For example, it is suspected that siltation, fertilizers, and pesticides draining into some of the brooks in Aroostook County's potato land may have eliminated a small number of smelt spawning runs in the area. Improvements in environmental regulation and education have slowed further habitat degradation and losses.

Smelt are extremely valuable as a forage fish, and are a principal food source for a variety of Maine's coldwater and warmwater sport fish. Many species, including landlocked salmon, lake trout and brown trout rely on smelt as a food item and do not produce the same quality fisheries without smelt present. Smelt can even be important forage for certain warm water species such as smallmouth bass and white perch. It is well documented that the overall health and quality of Maine's landlocked salmon fisheries are largely dependent on smelt population abundance. The use of smelt as forage for gamefish, particularly landlocked salmon, is the Department's highest management priority for this fish species. Consequently, other use opportunities for smelt have decreased despite an increase in the number of smelt waters.

Many Maine anglers hold smelt in high esteem as a food fish and some catch smelt for their personal bait needs. Recreational hook-and-line fisheries in the summer and winter, and dip-net fisheries in the spring provide anglers with a variety of opportunities for harvesting smelts

recreationally. General laws governing fishing in Maine entitle licensed fishermen to take up to 2 quarts per day from waters open to smelting. Anglers were afforded greater use-opportunity as the species became more widely distributed around the State; however, the number of regulations and restrictions has increased over the years, particularly the number of streams closed to smelt dipping. The two primary reasons for these stream closures are: (1) closures by fishery managers to protect a valuable forage fish in important salmonid waters; and (2) closures as a result of public concern about over-fishing, vandalism, trespass, and littering. The MDIFW considers recreational fishing opportunities as a higher priority for this species than commercial use of the resource. The basis for this priority is that the recreational use of the resource is a more traditional use; recreational harvesting typically poses less of a threat to the resource than commercial activities, and MDIFW is largely geared toward and funded by recreational user groups.

Smelts are preferred bait for anglers targeting coldwater fish species, which has resulted in a valuable and lucrative commercial smelt fishery. Conservative projections in 1991 estimated sales of 6.9 million smelt worth $1.94 million. Smelt harvested by commercial smelt dealers, are commonly sold through both wholesale and retail markets.

A Maine smelt wholesaler's license (2001 - $69.00) allows holders to harvest up to 8 quarts of smelts daily from select waters, or 2 quarts from all other waters open to the harvesting of smelt; to possess more than this amount as long as they were legally taken; and to sell smelts. Licensed smelt dealers may take smelts by hook-and-line, dipnet, and dropnet according to the laws, rules, and policies of the Department. Harvest by licensed smelt dealers is restricted to waters designated by the Department, which are selected in accordance with the overall harvest objectives outlined in the previous species plan (1986).

Legal and illegal stocking of smelt has a long history in Maine. MDIFW Biologists stock smelt to create or augment forage, and more recently to establish new smelt populations for the purpose of developing sport and commercial opportunities. Individuals sometimes establish smelt populations through illegal introductions to improve their own personal opportunities. Stocking smelt into new waters has the same potential risks as introducing any new species to a system, and should be used cautiously and conservatively to avoid significant ecological impacts. In addition, fishery biologists commonly use smelt egg transfers to augment existing smelt populations. Short-term use of this technique is acceptable, and several instances of apparent improvement in smelt abundance and concomitant improvement in salmonid growth have been noted. On the other hand, long-term abundance issues indicate a deeper problem that needs to be addressed to avoid committing to a long-term artificial feeding program.

Smelt stocking is currently conducted via egg transfers or live smelt transfers from donor waters, because propagation of smelt under hatchery conditions has not been successful. The potential for introducing new diseases or parasites during live transfers, particularly *Glugea hertwigi*, has prompted the Department to enact a policy of allowing egg transfers only. This greatly reduces the risks involved with live transfers because eggs can be easily treated in the field for *Glugea* and other external parasites. In 1996, an 11 member Smelt Working Group comprised of one legislator, MDIFW staff, recreational smelt anglers, and commercial smelt dealers was created to discuss smelt management and provide recommendations to MDIFW's Commissioner. A few members of the Group felt the Department should reconsider the use of live smelt transfers as a method for establishing new populations, and the Group recommended conducting an experimental project to test the effectiveness of this technique. To date, MDIFW staff and a few commercial dealers have conducted multiple year transfers on four waters with

disappointing results. We have yet to confirm an established population in any of the three ponds, and the time/resource commitment is extensive when compared to egg transfers.

Another factor that plagues smelt management is the difficulty of quantifying and tracking population abundance. Currently smelt population monitoring is conducted by indirect observations including: studying salmonid growth and condition; annual observations of the smelt spawning run; lake trout stomach analyses; quality of hook-and-line fisheries; and even miscellaneous reports from user groups and Game Wardens. Many of these techniques are based on value judgments, which means the data are largely anecdotal and non-quantitative. At this time, landlocked salmon condition and growth is the best objective indicator of smelt abundance. However, there is often a substantial lag time between a change in smelt numbers and the detection of a growth change. This delays corrective actions and, consequently, the recovery of the forage base. Furthermore, many of our smelt lakes do not support salmon populations.

The Department recently received a grant from the Outdoor Heritage Program to acquire hydroacoustics equipment for monitoring smelt numbers and biomass. Training in the use of this equipment for data collection commenced in the summer of 2000. Although this new equipment gives us an additional and valuable tool for smelt monitoring, it is not likely to be the cure for Maine's smelt and salmon problems. Biologists will still have to use more traditional techniques on the majority of our smelt waters due to the time consuming nature of data collection and analysis, and the statewide use of a single set of equipment. Realistically, we can probably expect to routinely collect annual data on two to three waters per Region, which will likely be the State's most important landlocked salmon waters.

PAST MANAGEMENT GOALS

The long-range goal and management objectives established in the previous smelt plan (1986) and subsequent updates are presented below.

Goal: To increase smelt abundance and availability and maintain at levels sufficient to sustain competing uses as a forage fish for predator sportfish, as a sportfish in its own right, and as a commercial baitfish.

> **Abundance Objective:** At present there are no data available to quantify smelt abundance and harvest. Indirect indices of smelt abundance, such as salmonid growth, captures by trawling, density of egg deposition during spawning and other general observations currently constitute the only useable information on abundance within individual waters. On a statewide basis, maintain smelt populations in 468 Maine lakes, totaling 696,716 acres. Increase distribution of smelts into 25 new waters by 1990.
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> **Harvest Objective:** To (1) maintain adequate populations of smelts as forage fish to maintain satisfactory growth rates of predator sportfish; (2) increase the number of populations of smelts as a sportfish species to satisfy demand for recreational hook-and-line and spring dip-netting fisheries, and (3) increase the number of smelt waters and maintain adequate populations for use as a commercial baitfish to allow harvest by hook and line, spring dip-netting, and other legal methods utilized by commercial smelt dealers under allowable legal limits.

Since the mid 1980's, considerable fishery management activity has been directed toward the accomplishment of the goal and objectives established in the 1986 smelt plan (Table 1). The majority of these accomplishments were the result of smelt egg transfer operations, which were conducted to establish new populations or augment existing ones. The driving forces behind this smelt transfer work included: initiatives by Regional Biologists in identifying and working towards correcting problems with salmonid growth; response to increased demands by anglers for more recreational opportunities; and more demands from the rapidly growing baitfish industry to provide new sources of smelt to replace those lost through more restrictive regulations.

Table 1. Summary of Smelt Egg Transfers Conducted by MDIFW, 1985-2000

PURPOSE/DESCRIPTION FOR SMELT TRANSFER[1]	NUMBER OF SMELT TRANSFERS BY PERIOD			
	1985-1990	1991-1995	1996-2000[2]	Totals
Forage for LLS	52	54	41	147
Forage for LKT	39	32	33	104
Forage for BNT	21	6	15	42
Forage for BKT	14	3	1	18
Forage for SPK	0	1	12	13
Forage for SMB	NA	3	1	4
Forage for Multiple Species	42	32	35	109
Smelt Sport Fisheries	31	26	26	83
Commercial Bait Fisheries	22	11	18	51
Forage & Fisheries	18	24	9	51
New/Reintroductions of SLT[3]	17	6	13	36
Number of Different Waters	77	52	56	185
Number of Transfers	106	83	98	287

In 2000, smelt populations existed in 558 lakes totaling 749,114 acres, which represents an increase of 90 lakes (19.2%) and 52,398 acres (7.5%) since 1985. The increase resulted from a combination of new knowledge and better accounting of previously existing populations, as well as, successful new or reintroductions of smelt via egg transfers. As a result, the objective of maintaining smelt populations in 468 lakes was fully met and exceeded.

The second priority of the abundance objective was to introduce smelt into 25 new waters by 1995. Smelt were introduced into 23 new waters by 1995, a 92% achievement of the objective. However, between 1996 and 2000 the Department continued to introduce smelt via egg/live fish transfers and four new introductions occurred in 1996. Thus, the objective of 25 new waters was ultimately surpassed, albeit one year behind schedule. Reasons for the delay in meeting this objective within the specified time frame were largely the result of other work priorities and limited availability of resources. Some Regions, particularly those in southern Maine, reported a shortage of suitable donor populations. Other Regions indicated a limited availability of adequate candidate waters for new introductions.

Overall, the objective of maintaining adequate populations of smelt to maintain satisfactory growth of predatory sportfish populations was successfully met during the last planning period. Two hundred and nineteen (76%) out of 287 smelt transfers were made for the purpose of providing forage for other species of sport fish, and all but one were egg transfers. Populations of smelt commonly exhibit periodic, natural fluctuations in abundance; as a result, the majority of the 219 transfers were performed in an attempt to augment existing populations that were experiencing a decline.

Another harvest objective set in the 1985 species plan was to increase the number of smelt populations available for recreational hook-and-line and spring dip-netting fisheries to satisfy demand. Between 1985 and 2000, fisheries managers introduced smelt into 23 new

[1] Individual transfers conducted for multiple purposes may be counted in more than one category.
[2] A small number of transfers during this period were experimental live smelt transfers.
[3] New/reintroductions were counted in only a single year, but most include multiple year transfers.

waters in an attempt to establish populations for recreational opportunities. The actual number of hook-and-line fisheries increased 11% during the past planning period, which is quite good considering a 19% increase in the number of smelt waters. Yet, there are still several indications that we have not satisfied angler demand for hook-and-line fisheries. Smelt run surveys conducted in 1974 and 1995, demonstrate a substantial decline in spring dip-netting opportunities despite a 26.5% increase in the number of known smelt runs. The loss of dipping opportunities is primarily due to the enactment of new regulations, which were created to maintain adequate smelt abundance for forage purposes and/or to reduce landowner conflicts associated with dipping activities.

The final 1985 species plan objective was to increase the number of smelt waters and to maintain adequate populations for use as a commercial baitfish. In the last fifteen years, MDIFW biologists have tried to establish or reintroduce smelt populations into 17 new waters for commercial bait purposes. Nevertheless, commercial fisheries experienced opportunity losses due to the enactment of regulations to restrict harvest, often through the closure of tributaries. In addition, the number of 8-quart waters open to commercial smelt dealers declined from 192 in 1986 to 188 by the year 2000. In spite of our efforts, there are several indications that we have not been able to satisfy commercial demands for smelt including: (1) the commercial smelt survey conducted in 1992 showed four out of five of the top problems identified by dealers were related to the need for more smelt waters or greater smelt abundance; (2) a smelt working group was created in the mid 1990's to address smelt management issues and concerns by commercial dealers; and (3) a "shortage" of smelt in 2001 prompted commercial dealers to petition the Department to open additional waters.

OPPORTUNITY

As discussed earlier, numerical estimates of smelt abundance are unavailable and the portion of the statewide smelt population available to anglers cannot be quantified in terms of precise numbers or weight of fish. As a result, this section will generally represent opportunity for various user groups as a function of the number and/or acreage of available smelt habitat.

Habitat & Abundance – Lakes

The State of Maine is divided up into seven different Fishery Management Regions, which are identified by letter designations, A through G (Figure 1). Data throughout this report will generally be presented on a Fishery Management Region basis to illustrate and explain area differences in smelt populations and fisheries within the State.

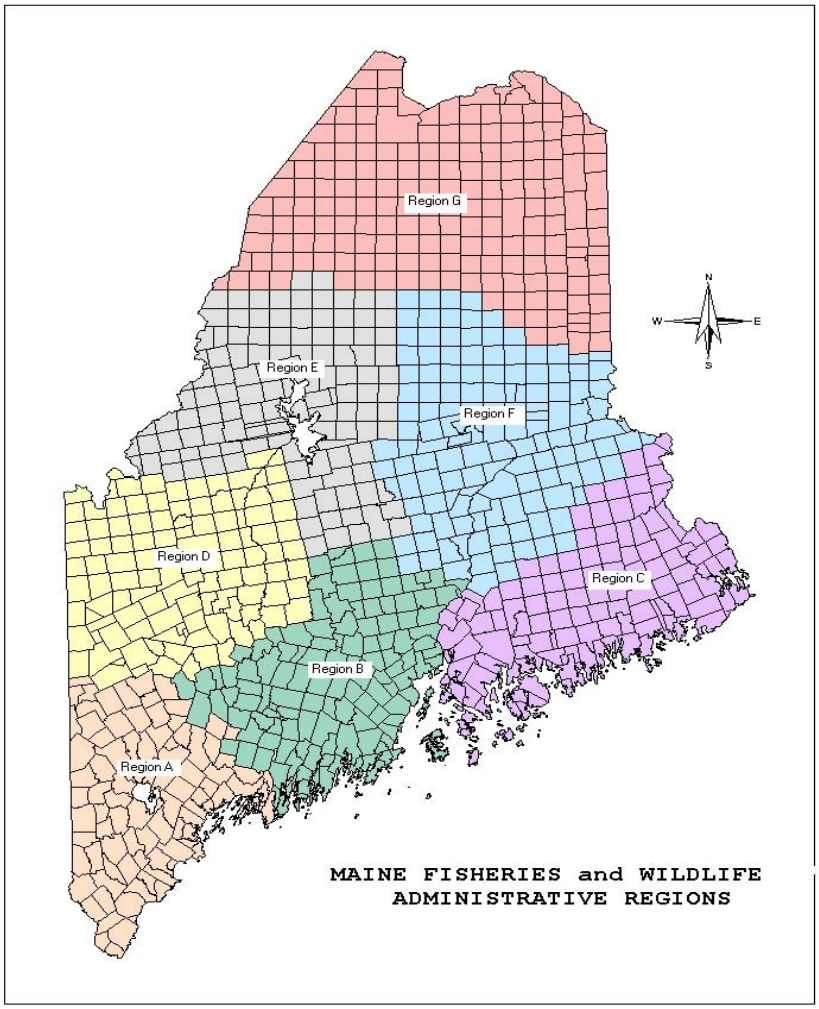

Figure 1. Maine Department of Inland Fisheries and Wildlife Fishery Management Regions

Smelts presently occur in 558 Maine lakes, totaling 749,114 acres that are widely distributed about the state (Figure 2). Once believed to thrive only in deep, coldwater lakes, they are now known to inhabit a variety of lake environments including small, shallow, and even eutrophic water bodies. For example, smelts currently exist in 14 waters less than 20 acres in size, and 31 lakes less than 20 feet deep. However, there are several shallower ponds in southern Maine that have lost their smelt populations during unusually warm summers. The only types of standing water habitat where smelts have not been found are bogs, very shallow homothermous ponds with high summer water temperatures, and temporary ponds

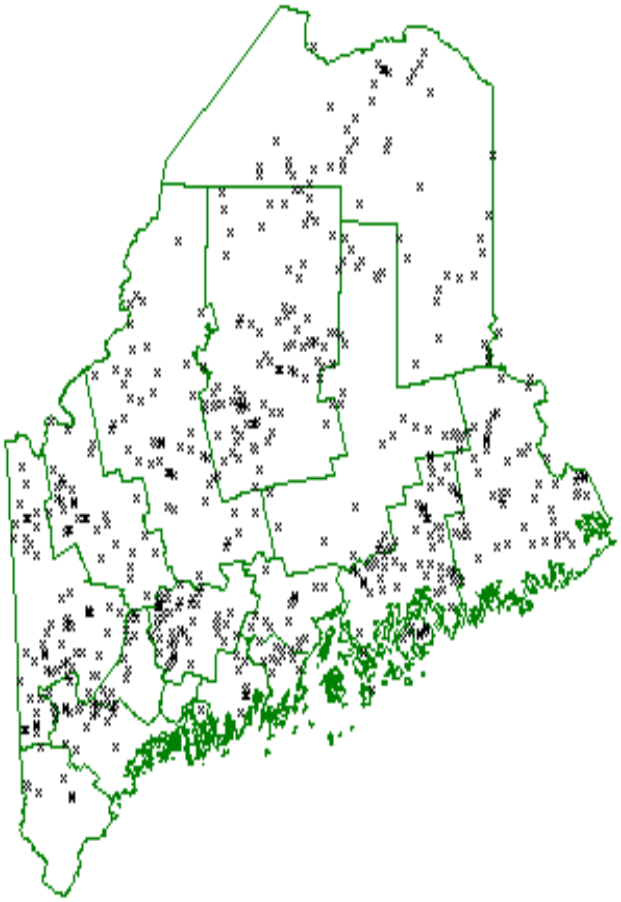

Figure 2. The Distribution of Maine's Smelt Populations, 2000.

created by beavers. Though usually considered stream spawners, smelt can reproduce by shore spawning, as evidenced by their successful reproduction in a number of waters having no

tributaries such as Trickey Pond in Naples. Anecdotal information suggests shore-spawning populations may be more stable than stream spawning ones.

The number of smelt lakes and total acreages by Region is presented in Table 2. During the last planning period, the statewide numbers and acreage of smelt waters increased 19.2% and 7.5 %, respectively. The overall increase is largely the result of new knowledge and better accounting of previously existing populations, as well as, a handful of successful introductions /reintroductions of smelt by Department personnel. Region A was the only management zone to show a decline in the number of smelt waters since 1985; however, the total acreage increased slightly.

Table 2. Total Occurrence of Rainbow Smelts by Fishery Management Region, 2000

REGION	NUMBER OF LAKES	ACRES OF LAKES	PERCENT CHANGE FROM 1985 (NO. OF LAKES)	PERCENT CHANGE FROM 1985 (LAKE ACRES)
A	77	71,658	-3.8	+1.2
B	97	78,585	+32.9	+16.5
C	112	115,360	+23.1	+9.6
D	74	94,407	+5.7	+1.3
E	81	180,081	+37.3	+7.2
F	63	135,154	+21.2	+10.2
G	54	73,869	+26.6	+6.4
State	**558**	**749,114**	**+19.2**	**+7.5**

Smelt abundance is difficult to quantify and only two attempts have been made to assess the statewide relative abundance of smelt, once in 1974 and again in 1995. Although the data are based on smelt run inspections and will be discussed in the following section, it is also indicative of smelt abundance in lake habitats. There does not appear to be any substantial abundance changes statewide between the two survey periods. Yet, biologists in southern areas of the State suspect a slow, general decline in smelt abundance over the last several decades. This apparent decline may be caused by several factors such as increasing demands for the resource as human population levels continue to escalate; increasing and changing species compositions due to illegal stockings; and cumulative environmental impacts associated with increasing development.

Habitat & Abundance – Streams

Lake tributaries used by spawning smelt range in size from large rivers to small seasonal inlets fed by melting snow and spring rains. In addition, spawning tributaries are also highly variable in turbidity, color, bottom substrate, debris, and temperature at time of spawning. Essentially, spawning smelt will utilize a variety of stream habitat types if they are accessible and not grossly polluted. Smelt run surveys were conducted in 1974 and 1995, and some of the habitat data is summarized below by region (Table 3).

Table 3. Miles and Acres of Known Smelt Runs by Fishery Management Region, 1974 & 1995

REGION	NUMBER OF KNOWN RUNS		ESTIMATED TOTAL MILES		ESTIMATED TOTAL ACRES	
	1974	1995	1974	1995	1974	1995
A	88	90	10.8	8.4	52.9	18.7
B	24	71	0.8	3.2	2.5	7.8
C	21	23	0.8	0.4	0.9	0.4
D	117	85	6.0	6.5	18.2	11.0
E	23	38	0.6	2.2	1.2	4.4
F	28	60	1.0	2.7	1.9	5.7
G	43	68	3.3	3.1	18.3	3.3
State	344	435	23.3	26.2	95.9	48.4

Between the two survey periods, the number of known smelt runs increased from 344 to 435 (26.5%) statewide, which again is largely due to improved access and better accounting. Southern areas of the State appear to have a relatively high number of known smelt runs, which is simply a function of accessibility. Many waters in the North-central, Northwestern, and Eastern part of the state are inaccessible, particularly during the springtime, and have not been evaluated for smelt runs. Region D is the only region to show a decline in the number of known runs, which is probably the result of accounting errors that occurred during both surveys. Region D staff indicated that the 117 runs depicted in 1974 may have been too high, and there is some evidence to suggest a small number of field sheets for the 1995 survey were unavailable for processing. Despite an increase in the number of smelt runs, the estimated miles of known smelt runs showed only a slight increase, whereas the estimated acres decreased by almost one-half. This unexpected acreage change is believed to be the result of more accurate estimates of average stream width.

Of the 435 known smelt runs in Maine, 350 were evaluated for relative abundance during the 1995 inventory. The number and percentage of runs by abundance are presented on a Regional basis below with 1974 data for comparison (Table 4). Abundance ratings were based on value judgments assigned by Maine Fishery Biologists and Game Wardens. Although this analysis is based on survey results for only a single year and for a portion of all the total runs, it is probably indicative of smelt runs on a statewide basis. The data suggests relatively small

Table 4. Number of Smelt Runs and Relative Population Abundance by Fisheries Management Region, 1974 and 1995. Within Region Percentages are Given in Parentheses.

REGION	RUNS W/ NIL-LOW ABUNDANCE BY SURVEY YEAR				RUNS W/MODERATE-HIGH ABUNDANCE BY SURVEY YEAR			
	1974		1995		1974		1995	
A	42	(47.7)	33	(60.0)	46	(52.3)	22	(40.0)
B	14	(58.3)	25	(41.0)	10	(41.7)	36	(59.0)
C	10	(50.0)	10	(47.6)	10	(50.0)	11	(52.4)
D	91	(82.7)	55	(70.5)	19	(17.3)	23	(29.5)
E	9	(50.0)	19	(63.3)	9	(50.0)	11	(36.7)
F	7	(43.8)	10	(24.4)	16	(56.2)	31	(75.6)
G	18	(43.9)	39	(60.9)	23	(56.1)	25	(39.1)
State	**191**	**(58.9)**	**191**	**(54.6)**	**133**	**(41.1)**	**159**	**(45.4)**

percentage changes in statewide abundance between the 1974 and 1995 surveys. Less than one-half (41.1% & 45.4%) of the known runs statewide were rated to be of moderate to high abundance during both surveys, which appears to be relatively consistent over time and within regions. This data should be utilized cautiously, particularly when comparing Regional differences and changes over time. Gradual, Regional changes are unlikely to be ferreted out

with smelt run surveys based on value judgments for a variety of reasons: (1) judgments are made relative to other waters within a given area; (2) judgments are not consistent over time as personnel changes occur; and (3) consistency between different individuals is never achieved. This lack of consistent, quantitative data makes it difficult for biologists to track meaningful Regional and statewide abundance trends for this species.

Hook-and-Line Fisheries

Hook-and-line smelt fisheries occur in every Fisheries Management Region and are quite popular among smelt anglers. Viable hook-and-line fisheries for smelt currently exist in 57 lakes, 10.2% of Maine's smelt waters (Table 5). The number of significant hook-and-line smelt fisheries appears to have decreased from 68 to 57 waters (-16.2%) during the last planning period. This would seem to be alarming given the fact that the number of known smelt waters actually increased during the same time period. However, one region inadvertently included dip-net and commercial smelt fisheries in their tally of principal fisheries in the 1986 plan. Recalculating the number of significant hook-and-line fisheries actually results in a slight net gain of 11.8% (six waters) for the same time period, which is more consistent with changes observed

Table 5. Principal Hook-and-Line Smelt Fisheries by Region, 2000

REGION	PRINCIPAL HOOK AND LINE SMELT FISHERIES	
	NUMBER OF LAKES	ACRES OF LAKES
A	13	5,974
B	6	9,162
C	1	218
D	4	4,323
E	7	44,676
F	10	32,824
G	16	39,221
State	57	136,398

in the number of known smelt waters. The individual waters where hook-and-line fisheries occur can change quickly from year to year depending on smelt abundance and size quality, but we have no reason to believe the total number or acreage of waters statewide varies significantly from one year to the next.

Fishing opportunities for hook-and-line smelt anglers is presented in Table 6. A very high percentage of the statewide smelt waters (96.1%) are open to angling during the summer, but a substantial number of these same waters (66.5%) are closed during the winter ice fishing season. Two of the regions, D and E, show a particularly strong bias against winter hook-and-line smelting opportunities with closures of 74.3% and 65.4% of their smelt waters, respectively. On a statewide basis, the numbers of waters closed to the taking of smelts in the summer has increased from 13 to 22 waters during the last planning period. The number of lakes closed to the taking of smelts in the winter has progressively increased from 111 lakes in 1975 to 148 lakes in 1985 and 187 lakes in 2000. It is important to note that over the same time period the number of smelt populations has increased, consequently the percentage of smelt waters closed to winter angling has remained relatively stable (32-34 %).

Table 6. Smelt Occurrence in Lakes With Numbers and Acres of Waters Open to Hook-and-Line Fishing, 2000

REGION	SMELT OCCURRENCE		OPEN TO FISHING			
			SUMMER		WINTER	
	NUMBER OF LAKES	ACRES OF LAKES	NUMBER OF LAKES (%)	ACRES OF LAKES	NUMBER OF LAKES (%)	ACRES OF LAKES
A	77	71,658	72 (93.5)	39,288	63 (81.8)	39,681
B	97	78,585	91 (93.8)	75,495	86 (88.7)	75,073
C	112	115,360	107 (95.5)	113,212	90 (80.4)	110,888
D	74	94,407	71 (95.9)	91,900	19 (25.7)	41,486
E	81	180,081	79 (97.5)	179,466	28 (34.6)	150,841
F	63	135,154	62 (98.4)	135,098	56 (88.9)	134,744
G	54	73,869	54 (100.0)	73,869	29 (53.7)	61,105
State	558	749,114	536 (96.1)	708,328	371 (66.5)	613,818

Statewide physical and legal access to Maine's smelt waters has remained relatively constant over the last 15-year planning period (Table 7). Public rights-of-way are present on 71% of the lake acreage with Regions C, E, and G having the three lowest percentages. These three Regions contain lower human population levels than other areas of the State, which generates a lower demand for public rights-of-way. In addition, significant portions of the smelt lake acreage for these Regions are located within large wooded tracts, which are predominantly owned by private timber companies that allow recreational land use. Over 98% of the smelt lake

Table 7. Physical and Legal Access to Smelt Lakes Expressed as a Percentage of Total Acres for the Year 2000, 1986 Statewide Data is Presented in Parenthesis

REGION	PUBLIC RIGHT-OF-WAY[1]	AUTOMOBILE ACCESS[2]	BOAT LANDING[3]	ACCESS FEE CHARGED[4]	PUBLIC ACCESS RESTRICTED[5]
A	83.0	100.0	92.4	2.9	1.2
B	91.9	100.0	98.1	1.4	0.8
C	64.7	99.8	92.3	0.0	1.9
D	77.8	98.5	93.4	4.2	2.4
E	53.3	96.1	92.5	31.7	0.5
F	78.1	98.4	88.0	1.8	0.4
G	69.1	99.9	71.5	48.6	0.0
State	71.0 (69.6)	98.5 (97.7)	90.2 (90.3)	13.7 (8.1)	1.0 (0.9)

acreage statewide is accessible by vehicle, and 90.2% of the acreage has boat landings available. Region G exhibits a substantially lower number of boat landings than the other regions, because much of their smelt acreage is located within the Allagash Wilderness Waterway. The unusually high percentage of fee access in Regions E and G is the result of user fees charged by the North Maine Woods, a coalition of private timber holding companies and state agencies. Only 1% of all the State's smelt lake acreage has legally restricted access.

Spring Smelt Dipping Fishery

Spring dipping for smelt has a long history throughout the State and the sport is very popular among a relatively small group of individuals. This activity provides recreation, food, and bait for

1 Legal right-of-way for public use present.
[2] Summer access within ½ mile by either 2-wheel or 4-wheel drive vehiles.
[3] Includes all lakes where a know, "reasonable" boat ramp exists.
[4] Fees charged by landowners at landings or as general land-use fees charged at road gates.
[5] Public access restricted by gate or discouraged by exercise of trespass rights by private landowners.

individuals and commercial dealers. Spring dipping opportunities for smelt have continuously declined over the years as a result of stream closures by the Department (Table 8).

Table 8. Smelt Stream Closures by Fishery Management Region, 1974 and 1995 Surveys

REGION	NUMBER OF SMELT RUNS		NUMBER CLOSED		PERCENT CLOSED	
	1974	1995	1974	1995	1974	1995
A	88	90	36	37	41	41
B	24	71	1	24	4	34
C	21	23	5	10	24	44
D	117	85	17	57	15	67
E	23	38	5	27	22	71
F	28	60	5	45	18	75
G	43	68	14	31	33	46
State	344	435	83	231	24	53

The statewide percentage of known runs closed to spring smelt dipping nearly doubled between the two surveys. In 1974, Region A was already the most restrictive Region in regard to closures, but by 1995 every other Region had followed suit. It is likely that Region A, the most heavily populated region, was one of the first to experience and react to smelt abundance problems and landowner conflicts. Region A was the only one to show no new closures between the two periods, because most of the smelt resources had already been protected.

This trend toward more conservative regulations has continued since the 1995 survey. Table 9 illustrates historical changes regarding smelt dipping regulations. Between 1970 and 1985, the greatest increase in closures was accomplished through closure of "lakes and all of their tributaries" to smelt dipping. During the following 15-year period program objectives changed as fishery managers attempted to increase opportunities by keeping lakes open to smelting and allowing more hook-and-line opportunities. In spite of these efforts, overall restrictions on smelt dipping statewide have increased significantly since 1970.

There are two primary reasons for the increased closures of streams to spring dipping: (1) to protect smelt populations for use as forage, and (2) to address increasing public relations issues. Even though bag limits are in place to restrict harvest, fishery managers are still very concerned about possible impacts from spring dipping activities. Smelt populations are particularly vulnerable to over-harvest due to their spawning behavior. Dipping activities can result in future year class failures due to excessive harvest prior to spawning, interference and/or blockage of smelt spawning activities, and increased egg mortalities through siltation and direct physical damage due to wading anglers.

Table 9. Number of Regulations Prohibiting the Taking of Smelts as Printed in the Open Water Fishing Law Books for the Years 1970, 1985, 2000

REGION BY YEAR	LAKE & TRIBUTARIES CLOSED	LAKE OPEN – ALL TRIBUTARIES CLOSED	SPECIFIC STREAMS CLOSED	EXCEPTIONS FOR HOOK & LINE	TOTAL NUMBER OF RESTRICTIONS
REGION A					
1970	10	4	2	0	16
1985	19	1	5	17	25
2000	2	26	3	22	53
REGION B					
1970	1	2	0	0	3
1985	13	3	0	12	16
2000	1	20	0	17	38
REGION C					
1970	1	0	1	0	2
1985	10	0	1	5	11
2000	0	10	1	12	23
REGION D					
1970	5	2	6	0	13
1985	6	2	4	2	12
2000	2	11	1	9	23
REGION E					
1970	5	0	1	0	6
1985	8	0	2	4	10
2000	0	5	3	7	15
REGION F					
1970	2	1	1	0	4
1985	4	0	1	3	5
2000	0	9	1	9	19
REGION G					
1970	0	0	2	0	2
1985	10	1	0	10	11
2000	0	12	0	12	24
STATE					
1970	24	9	13	0	46
1985	70	7	13	53	90
2000	3	93	7	88	193

The second problem relates to interactions between spring smelters and the general public. Aggregations of smelt-dippers crowding into small areas along streams are highly visible to the public and landowners. Trespass, littering, general land abuse, and disturbing noises or behaviors are often associated with dipping activities. This may lead to opportunity losses through landowner postings, or legislative/departmental closures. Consequently, this user group indirectly affects their own use opportunity as a result of adverse public opinion. Increasing population levels and more development adjacent to traditional dipping tributaries over the last planning period has created more confrontations and additional stream closures. This further aggravates problems at other sites by concentrating more use at areas that remain open.

Opportunity for spring dip net fisheries for both anglers and bait dealers has decreased during the last two planning periods. It is likely that further losses of use opportunity will occur, but the Fisheries Division is attempting to offset these losses by creating new smelt fisheries in non-salmonid waters. In addition, we may see increased access to additional smelt waters from new timber harvesting roads in undeveloped areas of the state.

Commercial Smelt Fishery

Commercial smelt dealers are another user group that utilizes Maine's smelt fisheries. Changes in opportunity for commercial dealers are similar to the other user groups described above. Although there has been a statewide increase in the number and acreage of smelt waters, these dealers have lost opportunities to collect smelt due to more restrictive regulations, particularly stream closures.

In addition, wholesale smelt dealers are also allowed to use dropnets and collect up to 8 quarts of smelt on a number of waters around the State (Table 10). In 2000, 16.9 % of the state's smelt waters were open to wholesalers. During the last planning period, the number and acreage of waters open under this listing has decreased by 2% and 29%, respectively.

Table 10. Number and Acreage of Lakes Open to the Taking of Smelt Under the Live Smelt Wholesaler's License, 1986 and 2000

REGION	1986		2000	
	NUMBER OF	ACRES	NUMBER OF WATERS	ACRES
A	38	17,512	25	13,171
B	50	28,698	62	31,302
C	33	53,771	30	32,387
D	20	21,568	20	22,296
E	31	16,193	29	11,309
F	16	39,427	12	14,492
G	4	1,126	10	1,997
State	192	178,295	188	126,954

DEMAND

Forage

Typically, demand on a sport fishery is discussed in terms of human desires; however, it is important to realize that smelt are an extremely valuable source of forage for many of Maine's sport fish populations. Thus, the utilization of smelts as forage is perhaps the largest demand made on the species. The species is consumed by every coldwater game fish in the State, but is particularly important as forage for landlocked salmon and lake trout. Table 11 shows the number and acreage of smelt waters supporting principal coldwater fisheries for several popular species.

Table 11. Acreage and Number of Smelt Lakes That Support One or More Principal Fisheries for Listed Coldwater Species, 2000

REGION	LAKE ACREAGE (# OF WATERS) BY SPECIES									
	LLS		LKT		BNT		SPK		BKT	
A	53,073	(20)	40,725	(6)	16,365	(28)	2,913	(11)	12,721	(44)
B	10,493	(8)	11,089	(7)	55,330	(45)	1,431	(4)	7,901	(22)
C	58,550	(28)	29,213	(13)	12,763	(21)	3,296	(9)	6,360	(30)
D	64,878	(34)	20,670	(17)	3,106	(8)	1,255	(3)	65,951	(55)
E	148,792	(28)	136,948	(28)	0	(0)	7,076	(9)	133,995	(66)
F	100,424	(25)	65,734	(13)	0	(0)	0	(0)	27,242	(29)
G	48,141	(28)	35,329	(19)	1,291	(2)	8,098	(4)	72,812	(53)
STATE	484,351	(171)	339,708	(103)	88,855	(104)	24,069	(40)	326,982	(299)

Of all the smelt waters in Maine, 97% of the acreage has one or more coldwater sportfish species present, and 86 % of the acreage supports at least one principal coldwater fishery. The number of principal coldwater sport fisheries supported within Maine's smelt lakes impressively illustrates the extent of forage demand. In addition, many of our warmwater sportfish (i.e. smallmouth bass, white perch, etc.) also utilize smelt for forage. Several species of coldwater and/or warmwater smelt predators often exist within individual lakes creating a cumulative impact on a water's smelt population. This critical connection between smelt and other important fishery resources has and may continue to reduce use opportunity for other user groups through regulations to protect smelt for forage.

Heavily populated Regions (A and B) have experienced dramatic changes in the species composition of their waters due in large part to illegally introduced fish species. As a result, forage demand in southern Maine waters may partially explain what appears to be poorer quality smelt fisheries.

Recreational Hook-and-Line

A comparison of the Department's angler questionnaire results for 1978, 1983, and 1994 demonstrates increased angler demand for freshwater smelt (Table 12). Total angler effort for lakes and streams were combined and applied to lake area, because fishable stream spawning populations are directly related to a home lake where the main production of smelt biomass occurs. It should also be noted that these values represent all fishing activity on waters with

Table 12. Estimated Angler Days of Fishing for Freshwater Smelt and Percent Change From 1983 to 1994. Data is From Department Questionnaire Surveys and Represents a Combined Estimate for Streams/Lakes, and Summer/Winter Use by Management Region

REGION	ANGLER DAYS BY YEAR			% CHANGE 1983 TO 1994[1]
	1978	1983	1994	
A	15,096	23,293	42,482	+82.4
B	3,857	10,968	62,113	+466.3
C	*	8,749	9,609	+9.8
D	9,971	6,844	19,614	+186.6
E	*	4,913	18,253	+271.5
F	12,764	14,311	28,168	+483.2
G	18,211	17,488	83,461	+377.2
State	59,955	86,566	263,700	+204.6

*fishing activity too low to estimate

principal smelt fisheries. Consequently, these use numbers likely exceed actual smelt use, but percent change and trend information is assumed to be indicative of fishery usage.

Human population numbers can also be utilized as an index of demand, assuming fishing pressure on smelt fisheries is related to human population distribution. Another indicator of demand is the occurrence of traditional fisheries that have developed over the years. There are many smelt populations seemingly available for hook-and-line exploitation, which have never caught the fancy of anglers, while others have traditionally received heavy fishing pressure. A comparison of supply and demand factors and their Regional variation is shown below (Table 13).

Table 13. Demand for Hook-and-Line Smelt Fishing by Management Region

REGION	LAND AREA (SQ. MILE)	SMELT LAKES (ACRES/MILE^3)	PRINCIPAL FISHERIES (ACRES/MILE^3)	HUMAN POPULATION (PER MILE^2)	ANGLER DAYS/ACRE[2]
A	3,199	22.4	1.9	161	7.11
B	3,965	19.8	2.3	79	6.78
C	4,021	28.7	0.1	24	*
D	4,232	22.3	1.0	19	4.54
E	4,391	41.0	10.2	3	0.41
F	5,044	26.8	6.5	15	0.86
G	7,015	10.5	5.6	12	2.13
STATE	31,876	23.5	4.3	37	1.93

*Inadequate data

Distribution of the smelt supply is fairly well dispersed among the Regions with a state average of 23.5 acres of smelt lakes per square mile of land area. An exception is Region G in Aroostook County, which has the lowest amount of smelt water, and yet has fishing pressure above the statewide average. Hook-and-line fishing for smelt is a strong tradition in this area of the state, particularly in the Fish River Chain. Even though potential fishing opportunities are numerous in Region C, hook-and-line lake fisheries for smelt are virtually non-existent in this

[1] More recent data (1999) not used due to unidentified, but apparent inconsistencies
[2] Angler days/acre based on 1994 use data and 2000 principal fishery data.

Region. Regions A and B receive the highest fishing pressure, consistent with their high human population density.

Overall, the data seem to indicate an increasing demand for hook-and-line opportunities, which may be associated with human population growth. For example, Region A recently experienced what appeared to be an overnight development of hook-and-line smelt fisheries on two of its waters. The rapid development of smelt fisheries when abundance and size quality are good may indicate a latent demand for more opportunities. It is probable that the supplies of smelt resources in heavily populated areas of the State are unable to meet current demand.

Recreational Spring Smelt Dipping

Relative demand relationships for spring dip net fisheries are represented in Table 14. In 1995, less than half of the runs with moderate to high abundance were open to angling and 91% of them experienced moderate to high fishing pressure. In addition, three of the Regions experienced high angler participation at traditional smelt spawning streams that were providing poor runs at the time of the survey.

Table 14. Spring Dipnetting Demands by Fishery Management Region, 1995 Survey

REGION	NUMBER OF RUNS WITH MODERATE-HIGH ABUNDANCE	NUMBER OF OPEN SPAWNING RUNS WITH MODERATE-HIGH ABUNDANCE (% of Runs)		NUMBER OF RUNS WITH MODERATE-HIGH FISHING PRESSURE (% of Open Runs)	
A	22	9	(41)	8	(89)
B	36	11	(31)	4	(36)
C	11	2	(18)	5	(250)
D	23	15	(65)	22	(147)
E	11	6	(55)	13	(217)
F	31	21	(68)	16	(76)
G	25	14	(56)	3	(21)
STATE	159	78	(49)	71	(91)

The above information, complaints from smelt dippers and commercial dealers, and comments from various Regional Biologists suggests the demand for spring dipping opportunities is not being met. Southern Regions, which have high human populations and relatively low smelt abundance compared to other Regions, are plagued with more demands for the resource. In northern Maine supplies are often adequate, but accessibility in the springtime to a majority of the runs can be difficult. A trend of increasing stream closures for resource protection compounds demand by creating overcrowded conditions on runs that remain open, or by discouraging anglers from traveling long distances to dip open streams.

Commercial Smelt Fisheries

The commercial bait industry has developed into a productive business over the last few decades with an estimated $4.7 million in total bait sales with predicted sales of 6.9 million smelt worth $1.9 million (1991). Again, only holders of a wholesale smelt dealers license can legally harvest and sell smelt and the remainder of this section will focus on this group.

In 1992, questionnaire responses from Maine's commercial smelt dealers projected 189 dealers expended 7,409 workdays collecting smelt through the ice, which does not include bait dealer collections. A summary of the supply and demand information collected during the 1992 survey is presented below (Table 15). The 1992 data reveal an uneven statewide distribution in the number of dealers. Sixty seven percent of the smelt dealers were located in regions A and B, which contained less than 32% of the State's smelt waters. Consequently, southern areas of the State are experiencing substantially more demand by dealers, as well as, other supply and demand problems unique to these areas. Furthermore, the data shows that approximately 21% of Maine's smelt waters were open to commercial dealers in 1992 compared to 17% in 2000, an additional loss of opportunity for commercial dealers. The number of smelt dealers has varied over the years: 70 in 1985, 189 in 1992, and 151 in 2000. This information implies that the number of dealers may be leveling off after a strong growth-period during the 1980's and early 1990's.

Table 15. Number of Smelt Dealers and Availability of Smelt Lakes Open to Fishing Under the Wholesale License by Region, 1992 Survey.

REGION	NUMBER OF DEALERS	LAKES OPEN TO SMELT WHOLESALE LICENSE		SMELT ACRES OPEN PER DEALER	PERCENT OF SMELT ACRES OPEN TO WHOLESALE LICENSE
		NUMBER	ACRES		
A	65	34	16,076	247	22.8
B	61	58	31,911	523	41.6
C	12	37	42,576	3,548	39.2
D	12	21	21,583	1,799	23.1
E	20	32	13,053	653	7.5
F	8	19	24,539	3,067	19.0
G	11	10	1,570	143	2.2
State	189	211	151,308	801	20.9

The same 1992 survey demonstrated that 90.4 % of the smelt wholesalers traveled less than 75 miles from home, and 90.2 % fished four or less waters during the season. This information suggests the majority of dealers prefer to fish familiar waters that are close to home. This further compounds Regional demands, because dealers are not fully utilizing all of the waters available to them. A poll conducted in 1996 further illustrates this problem. Regions A and B had no viable smelt populations open to commercial dealers that were not being utilized, whereas other Regions indicated that a total of 32 open waters were not known to be utilized by commercial dealers. Additional information suggests commercial demand for smelt exceeds supply and opportunities. For example, 77% of the wholesale smelt dealers responded that they were having problems obtaining smelt, and four out of five of their top reasons were associated with a lack of sources and/or abundance of smelt. Clearly, the commercial industry has lost opportunities to harvest smelt and current demands from this user group are not are not being met.

Another interesting aspect of the commercial industry involves the export of smelt outside of Maine's boundaries. The State of New Hampshire is relatively conservative in regard to commercial smelting regulations and they have limited smelt resources, which creates a shortage of smelt for bait in their State. As a result, Maine's commercial smelt dealers export a substantial number of smelt to New Hampshire (Table 16).

Table 16. Number of Smelt Imported to New Hampshire From Maine, 1995-2000

Year	ESTIMATED NUMBER OF SMELT IMPORTED TO NH
1995	196,280
1996	178,000
1997	186,000
1998	61,000
1999	136,000
2000	103,777[1]

It should also be recognized that the above numbers are based on a voluntary reporting system, and likely presents an underestimate of the actual numbers of smelt exported from Maine. This export of smelt places additional demands upon Maine's smelt resource, which is already believed to be insufficient for in-state demands.

[1] Data for 2000 is still being processed, figure includes data up to May .

SUMMARY

The number of smelt waters has continued to expand during the last few planning periods. This trend is expected to continue in the future as a result of new introductions and knowledge. However, the expansion of smelt waters is likely to proceed at a slower pace than in the past and may eventually cease due to the limited number of suitable habitat. Although not easily demonstrated some areas of the State may be experiencing abundance issues, particularly southern Maine. Restrictive regulations have increased substantially over the years to protect the State's smelt resources, which has in turn reduced opportunities for the various user groups. This trend is predicted to continue; however, restrictions may eventually level off as they have in some of the southern Regions.

During the last planning period, the supply of smelt increased as numerous attempts were made by Department staff to establish new smelt populations for sport and commercial fishery opportunities. Yet, the current supply of smelt is still not adequate to satisfy existing demands for forage, hook-and-line angling, dipping, and commercial use in five out of seven fishery management regions (A, B, C, D, G). Satisfying the future demands of this species complex and varied user groups will be difficult or impossible to achieve should existing trends continue. In addition, the unpredictable nature and uncontrollable characteristics of smelt populations are likely to plague smelt management efforts for the foreseeable future.

SMELT

GOALS AND OBJECTIVES

2001-2016

Goal: Maintain existing smelt habitat quantity and quality; and increase smelt abundance and availability where feasible to moderate current demands as a forage fish, as a sportfish, and as a commercial baitfish.

Abundance Objective: On a statewide basis, maintain smelt populations at or above current abundance levels in 558 Maine lakes, totaling 749,114 acres. Seek opportunities to increase the distribution of smelts into new waters by 2016, where it will not negatively impact other coldwater species, to mediate demand for sport fishing and commercial interests.

Harvest Objective: The following objectives are prioritized as follows.
(1) Maximize the supply of smelt available as forage for salmonids, particularly landlocked salmon and lake trout, within the context of the management objectives for those species.
(2) Maintain and/or increase recreational hook-and-line and dip-netting opportunities.
(3) Maintain and/or improve the supply of smelts available for the commercial baitfish industry.

Capability of Habitat: Existing smelt habitat is expected to remain suitable for sustaining smelt populations. In addition, new smelt waters will likely be identified and/or created throughout the State over the next planning period, particularly in more remote regions.

Feasibility: Current smelt populations are generally adequate for use as a forage species, and egg transfers can periodically be utilized to assist recovery of populations experiencing reduced levels of abundance. The creation of new populations via smelt egg transfers is feasible, and can be used to help satisfy demands for more recreational and commercial opportunities. Suitable candidate waters for new introductions still remain, but their numbers are limited (particularly in southern areas of the State).

Desirability: Current demand for smelts as a recreational sportfish and as a commercial baitfish exceeds supply in 5 out of 7 fishery management regions. Complaints of reduced opportunities and requests for new introductions are common throughout the State. The successful establishment of new smelt populations exclusively for recreational and commercial needs should improve opportunities for these user groups.

Possible Consequences: Regulation changes to promote harvest of predatory sportfish and/or manipulation of stocking rates may be required to protect smelt populations and/or to optimize abundance. In addition, fishery managers may periodically transfer smelt eggs, from donor lakes with abundant populations, to augment lakes experiencing a decline in abundance. Smelt egg transfers may also be used to establish/re-establish populations in waters where they are absent. Smelt introductions may reduce opportunities to establish other species of sportfish, and mangers need to be careful new introductions do not jeopardize populations of other native species. Creation of additional smelt fisheries may result in landowner conflicts if littering, noise, or property damage becomes a problem.

SMELT MANAGEMENT PROBLEMS AND STRATEGIES

PROBLEM 1. There is a lack of staff and funding to adequately address smelt issues and research needs.

Strategy 1. At present levels, it is unlikely the Department will be able to fund new positions and research regarding smelt. It may be possible to address some key research issues (below) through the Cooperative Research Unit at UMO or other universities.

PROBLEM 2. Smelt populations exhibit drastic natural fluctuations in abundance, making management of the species difficult without an understanding of the factors controlling abundance.

Strategy 2. Augment existing smelt populations through smelt egg transfers to hasten population recovery from periods of low abundance. Again, chronic forage problems need to be addressed by other means before augmentation is applied.

Strategy 3. On a statewide basis, manage smelts for desired levels of abundance according to the following priorities: (1) forage for predator sportfish; (2) sportfish for recreational hook-and-line and dipping opportunities; and (3) as a commercial baitfish. Individual waters may be managed solely for any one of the above or for a combination of purposes but may not be managed solely for commercial purposes.

Strategy 4. Continue to work within the scientific community towards unraveling the mystery behind what factors cause drastic declines and die-offs in smelts.

PROBLEM 3. No practical method for measuring smelt abundance on a statewide scale is available. Past management has relied upon indirect evidences of smelt abundance (growth of salmonids, density of egg deposition, captures by trawling, observations by fishermen), but these indices fail to provide timely notice of population declines to biologists.

Strategy 5. Develop the best indices possible for determining smelt abundance. The Department now has hydroacoustics equipment; however, its overall use statewide is still likely to be limited to a select number of our premier salmon waters.

Strategy 6. Conduct another comprehensive smelt run survey towards the end of the current planning period. Development of a more consistent and quantitative method of smelt run inspections with the assistance of the warden service staff should be implemented.

PROBLEM 4. The success of smelt egg transfers in augmenting existing smelt populations and in establishing new populations depends on transferring adequate numbers of eggs and on proper handling of eggs. Questions remain regarding what constitutes an adequate number of eggs and what are the best methods of handling.

Strategy 7. Record smelt egg density for each transfer, methods, and attempt to assess results in order to develop best methods for accomplishing successful transfers and introductions.

Strategy 8. Determine which habitat and competition characteristics have significant impacts on smelt abundance and success of transfers.

PROBLEM 5. For reasons unknown, smelts often exhibit great variation in size structure, causing currently unsolvable management problems. For example, poor salmon growth is often associated with populations of exceptionally large "jack" smelts. Other lakes containing predominantly small "needle" smelts fail to provide attractive smelt fisheries for recreational and commercial uses.

Strategy 9. Determine smelt size structure and relate to age where possible. Attempt to devise management techniques to enhance smelt availability as forage for salmonids and as a game fish of suitable size.

PROBLEM 6. Some regions, particularly A and B have a lack of donor waters to collect smelt eggs for augmenting existing populations or for creating/re-establishing new populations.

Strategy 10. Better cooperation, assistance, and use of egg supplies in other regions should benefit regions where egg donor sources are limited.

PROBLEM 7. Demand for recreational and commercial uses of smelt exceeds supply in 5 out of 7 of the fishery management regions, and is a major concern for southern Maine.

Strategy 11. Individual lake populations of smelts are often incapable of fulfilling multiple roles as: (1) forage fish, (2) sportfish, and (3) commercial baitfish. Set individual lake priorities for smelt use and develop a list of waters dedicated to sport and commercial use; new introductions of other sportfish into these waters would detract from such uses.

Strategy 12. Introduce smelts into 7 new waters with priority for sport and commercial uses by 2016.

Strategy 13. A number of smelt waters statewide exist where brook trout are the only principal coldwater fishery. In some of these ponds, smelt may actually be more of a competitor to brook trout than a benefit, and could potentially be opened for sport and/or commercial purposes.

Strategy 14. Some regions have more abundant smelt resources, and have indicated that many of the existing resources are not utilized or underutilized. The Department should consider new ways of informing the public of underutilized smelt populations. Perhaps, a listing of underutilized resources by region could be made available to recreational and commercial users.

Strategy 15. Underutilized resources are typically located in remote regions of the State, and are far removed from areas where demand is higher. Thus, these resources are not convenient and/or economically feasible enough to pursue under current regulations. The Department should encourage the use of underutilized resources through more liberal regulations.

Strategy 16. Again, it is not unusual for northern regions to have adequate supplies of smelt throughout the winter, whereas southern dealers are unable to adequately supply local retailers. A statewide listing of wholesalers should be provided to all retailers to facilitate the movement of smelt from northern to southern Maine as the market demands.

Strategy 17. New regulations (i.e. alternate year closures) for the commercial industry in high use areas may be warranted, and could be implemented on an experimental basis.

Strategy 18. Reinvestigate the feasibility of raising smelt. Several researchers attempted to culture smelt during the mid 1980's, but failed largely due to the feeding behavior of the species. The aquaculture industry has made some important advances in technology and feeds during the past 10-20 years that may now allow smelt to be raised in a hatchery environment. If successful, private hatcheries could raise smelt for bait and food, which would reduce the overall demands on the resource.

PROBLEM 8. Regulations and access restrictions may continue to decrease use opportunity of smelts for sport and commercial purposes.

Strategy 19. Base smelt fishing regulations on the best available factual information.
Strategy 20. Purchase selected access sites along smelt spawning streams.
Strategy 21. Continue to educate angling public on necessity of considerate, careful, and conservation-minded use of privately owned smelting sites to ensure future access.

PROBLEM 9. Environmental degradation, especially from pollution and siltation will cause loss of smelt habitat.

Strategy 22. Continue to enforce DEP environmental laws.
Strategy 23. Monitor habitat losses, and attempt to restore and/or mitigate.

PROBLEM 10. Dense populations of spawning smelts may tempt individual anglers to violate fishing laws during an important period in the smelt's life cycle.

Strategy 24. Warden service should continue to enforce smelt fishing laws and regulations.

PROBLEM 11. Data on angler and commercial use of smelts is presently insufficient for a thorough assessment on the use and economic value of the species.

Strategy 25. Assess use of smelts through specific questions in the Department's next angler questionnaire.
Strategy 26. Assess economic value of smelts through bait dealer inspections, interviews, and a special questionnaire for smelt dealers.

PROBLEM 12. The exportation of smelt to New Hampshire contributes to Maine's supply and demand problems, and the Department is unable to stop the exportation of smelt due to Federal commerce laws.

Strategy 27. MDIFW could contact New Hampshire Department of Fish and Wildlife and request them to stop the importation of smelt from Maine. Changing our laws to allow importation is not likely to increase Maine's smelt supply due to a lack of smelt availability throughout New England, and it could lead to the introduction of diseases and other exotics.

Appendix A

Baitfish/Commercial Fish Work Group
Smelt G & O's Review [1]

April 11, 2002

I. Presentation of DIFW review of Smelt Goals and Objectives developed by the Public Working Groups.
- ✓ Define "where feasible"
- ✓ Add "as soon as possible" to the abundance objective.
- ✓ Capability = no comments, accepted as presented.
- ✓ Feasibility =
  - Questioned North/South distribution re types of use permitted. Why are southern lakes mostly limited to forage with few sport/commercial opportunities?
  - Need to increase smelt sport fishing opportunity.
  - Why can't smelt spawning &/or nursery habitat be rehabilitated to its condition 100 years ago?
  - Is maximum smelt production known?
  - How about providing a list of possible new smelt waters?
  - Predators effect on smelts.
- ✓ Desirability =
  - We are overstating our ability to establish new smelt waters.
- ✓ Possible Consequences =
  - Re social problems, "Fish are important not social problems!" Start runs where you can, never mind the landowner complaints.

II. Smelt Management Problems:

Number 1. Probably doesn't need to be in every plan.
Number 2. No comments.
Number 3. Utilize volunteers to help biologists monitor smelt runs. Some dealers won't share info on runs to protect their own $ interests.
Number 4,5,6. No comments.
Number 7. Supply and Demand Issues: Some waters on the lists have no smelts and should be dropped. Also dealers must let us know when they discover "smelt ponds" with no smelt population! Smelt forage? What are the effects of changes in run-off, snow melt, temperature regimens? DIFW is in the early stages of a new look at developing usable techniques for rearing smelts as a possible means of alleviating supply problems.
Number 8. Regs/access and opportunity: Consider opening some remote, walk-in smelt brooks that are now closed.
Number 9. No comments
Number 10. Enforcement issue, why present in the plan?
Number 11. No comments.
Number 12. Exportation/importation: Why can't we certify smelts for importation into the state? We certify other species for import.

Others:

[1] This meeting dealt with a variety of fish species. The outline presented above is a summary of that **portion** of the meeting that dealt with rainbow smelt.

1. Illegal introductions should be addressed as a problem for this species.
2. Look more closely at successes as a source of information.

BF/CF WORKING GROUP SUMMARY
August 22, 2002

RAINBOW SMELT

Issues/Strategies:

- ✓ Increase bag limits on "remote", i.e. difficult to reach, waters as a means of encouraging dealers to utilize these opportunities.
- ✓ The bait business is an important part of the state's economy.
- ✓ Smelt sales seems to have been "off" in many parts of the state last year (2000).
- ✓ The exportation of smelts contributes to the in state shortage of the supply available to local bait dealers.
- ✓ It is against the law to import smelts into Maine.
- ✓ Some waters should be managed for the smelt fishery, itself.
- ✓ What is the DIFW policy regarding the stocking of sea-run alewives into smelt waters?
- ✓ Landlocked alewives may be a greater threat to smelts than sea-run alewives.
- ✓ Has their been any scientific documentation of the role of the various user groups in smelt population dynamics?
- ✓ Smelt dealers are in trouble now with respect to supply. "We" need action now to improve supply.
- ✓ Northern Maine has sufficient supply to meet demand.
- ✓ The introduction of exotics can have a negative impact on smelt population numbers through predation and competition.
- ✓ What are the effects of stocking smelts and/or smelt eggs on smelt population numbers?
- ✓ The state lacks sufficient donor waters.
- ✓ What about improving smelt spawning habitat and/or access to this habitat in spawning tributaries?
- ✓ Why not utilize commercial fisheries to reduce the number of smelt predators/competitors thus improving smelt population numbers?
- ✓ Smelt dipping opportunities should be increased by opening more lakes to dipping and establishing populations for dipping, with special attention to Regions A and B.
- ✓ Recreational and commercial opportunities could be increased by increasing the number of waters open to hook-and-line fishing for smelts at night.

GOALS AND OBJECTIVES

I. Maintain smelt populations in 558 *(403,396 acres*) as per present distribution (map attached) with the following management priorities:

1. Maximize supply available as forage for salmonids, particularly landlocked salmon and lake trout, within the context of management objectives for those species.
2. Maintain and/or increase recreational fishing opportunities.
3. Maintain and/or improve the supply of smelts available for the commercial fishery.