LANDLOCKED SALMON MANAGEMENT PLAN

DEPARTMENT OF INLAND FISHERIES & WILDLIFE
DIVISION OF FISHERIES AND HATCHERIES

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LANDLOCKED SALMON LIFE HISTORY

The landlocked salmon (*Salmo salar*) is one of Maine's most highly prized sport fishes. A recent survey shows landlocked salmon are sought by more anglers than any other coldwater sportfish, except brook trout. Among the landlocked salmon's many positive attributes as a sport fish are its high catchability, its outstanding sporting qualities, its relatively great longevity, its good growth potential, and the ease with which it can be cultured in hatcheries. These factors, along with its tolerance of a moderately wide range of habitat conditions, make the landlocked salmon highly responsive to intensive management.

Description

Our freshwater salmon originated from the sea-run Atlantic salmon through gradual physiological adaptation to the lake environment and not by physical "landlocking" as its name would imply. Landlocked salmon are structurally identical and similar in appearance to sea-run Atlantic salmon. Distinguishing characteristics of salmon are their deeply forked tail, their usual silvery color as adults, and the presence of X-shaped marks on their dorsal and lateral surfaces. Males in spawning condition exhibit the characteristic hooked jaw, or kype, and become darker; spawning females become very silvery with distended abdomens. Spawned-out salmon often become gaunt and dark and are referred to as "racers" or "black salmon". Young salmon are slender and have several pigmented vertical bars, called parr marks, with each separated by a single red spot. Just prior to migrating from streams to lake environments, parr marks fade considerably and the fish become silvery. Salmon are referred to as smolts during this life stage.

Distribution

In eastern North America, landlocked salmon are native to lakes in Maine, New Brunswick and Nova Scotia. Known in Canada as ouananiche, salmon are also distributed in more remote areas of Quebec, Labrador, and Newfoundland. Salmon were formerly present in Lake Ontario and Lake Champlain, and freshwater forms of Atlantic salmon are native to several waters in Scandinavia and western Russia. Early fish culturists attempted to introduce landlocked salmon to virtually every state in the United States and throughout the world. Most of these early introductions failed, but some fisheries presently exist in New Hampshire, Vermont, Massachusetts, and New York.

Prior to 1868, landlocked salmon populations occurred in only four river basins in Maine: the St. Croix, including West Grand Lake in Washington County; the Union, including Green Lake in Hancock County; the Penobscot, including Sebec Lake in Piscataquis County; and the Presumpscot, including Sebago Lake in Cumberland County. By 1900, the salmon's range was extended considerably through numerous introductions by fish-culturists. In suitable waters with adequate conditions for reproduction, salmon survived and reproduced naturally. Introductions in less suitable habitat often met with failure or only temporary success. As hatchery facilities increased, more suitable waters with inadequate natural reproduction were maintained by periodic stocking. More recent successful introductions have been maintained by regular plantings of hatchery-reared fish. Landlocked salmon are now present in at least one lake in every Maine County. Maine supports one of the largest sport fisheries for this species in the world.

Habitat requirements

The classical picture of salmon habitat is a large, deep, clear lake with rocky shores, cool well-oxygenated water in its depths, an abundance of smelts, and fed by a swiftly flowing stream with a gravelly bottom. Indeed, Maine's best salmon fisheries occur in lakes with large volumes of deep water that remain less than 50°F during the critical summer period and where dissolved oxygen levels remain above 8 parts per million, and our best wild fisheries are in lakes that have large inlet or outlet streams with abundant spawning and rearing habitat. These lakes do, in fact, represent ideal salmon habitat, but recent research has shown that salmon can tolerate somewhat more "marginal" conditions. Experimental stockings have established salmon populations that thrive, grow rapidly, and provide a good fishery in lakes with cold water in their depths but with slight oxygen deficiencies, or in those with similar temperatures from top to bottom where summer temperatures may reach the mid-70's F, provided smelts are abundant for forage. However, optimum development of salmon fisheries, including management for certain types of fisheries such as those emphasizing "trophy-size" fish, is best achieved in lakes with excellent habitat and where competition for food (smelts) and space from other species is negligible.

Reproduction

Landlocked salmon spawn during the period from mid-October to late November. Salmon prefer lake outlets or large inlets for spawning, but where these are lacking they may utilize lake shoals or small inlets, though production from these areas is generally very low. Females select sites where the water is accelerating and there is good percolation of water through gravel or rubble substrate. Eggs are buried from 4 to 12 inches deep and remain there until hatching early the following spring. The young salmon remain in the gravel for about 6 weeks during which time they are nourished by nutritive material in their yolk sacs. Upon emergence from the gravel, young salmon spend from 1 to 4 years in a stream environment prior to migrating to a lake. Recent studies in Maine show most salmon (about 75%) spend 2 years as stream dwellers. Salmon smolts emigrate into lakes during both spring and fall, but major movement appears to be in the spring.

The age at which salmon reach sexual maturity varies considerably. In self-sustaining populations most males spawn first at ages 3 and 4, although some precocious males spawn at ages 1 and 2. Females usually spawn first at ages 4 and 5. Spawning runs of wild salmon may be composed of fish ranging in age from 1 to 10, but 3, 4, and 5-year old individuals make up the bulk of most runs. Landlocked salmon may be repeat spawners, but most of the fish observed on spawning runs are maiden fish spawning for the first time. Salmon may spawn in consecutive or alternate years, some may spawn in consecutive years then skip a year, and some may skip 2 or 3 years between spawnings.

Food habits

The diet of young salmon consists of a variety of invertebrates. Fish become an increasingly important part of the diet when salmon reach a length of about 12 inches. Rainbow smelts are the principal forage species for salmon in Maine lakes. Without adequate numbers of smelts, salmon growth and condition can become poor, markedly reducing their value as a sportfish. Therefore, maintaining adequate numbers of smelts for forage is the most important element of salmon management in Maine.

Insects and other invertebrates are the second most important food items utilized by adult salmon. Fish other than smelts are frequently consumed but their contribution is usually minor. Minnows, sticklebacks, white perch, and yellow perch are the most frequently consumed fish other than smelts.

Age and growth

Landlocked salmon are among Maine's longest-lived sportfish. While most salmon harvested by anglers are from 2 to 5 years old, older fish are frequently observed. Populations sustained by natural reproduction often have more older-age fish than those supported by stocking; wild salmon usually exhibit slower growth than do hatchery salmon, so they are recruited to legal size and harvested 1 or 2 years later. The oldest salmon on record in Maine was age 13.

There are large variations in salmon growth rates between lakes and in the same lake from year to year. These differences are largely attributable to variations in smelt abundance, which in turn is influenced by many factors, some which are not fully understood. However, recent studies in Maine clearly show that salmon growth rates, and consequently the size of fish available to anglers, is best in lakes with excellent water quality that do not have significant populations of other smelt predators, particularly lake trout. The origin of salmon in given lakes, be they hatchery fish or from natural recruitment, often determines that population's growth and size characteristics. Hatchery fish generally provide fisheries with higher size quality than do naturally reared fish because the number of smelt predators can be strictly controlled. Therefore, precise management for particular types of fisheries is best achieved with hatchery stocks rather than wild stocks.

LANDLOCKED SALMON MANAGEMENT HISTORY

The challenge offered by the landlocked salmon as a sport fish has been most fully recognized within the past 100 years. Reports by the early Commissioners praised the sporting qualities of salmon and urged their propagation and distribution in Maine waters. However, only a minority of enthusiastic anglers benefited from the early sport fishery. During this early period, poachers reportedly accounted for large numbers of salmon, especially during their spawning runs in tributaries. Many of the early sport fisheries were of exceptionally high quality either in "fast" action or for large fish. Even then, however, not all fish were "trophy" sized. Some lakes (e.g. Sebago) had an early reputation for producing larger fish in the 3 to 10 pound class, but other lakes seldom produced salmon over 1 to 3 pounds. For example, a report in 1868 cited catch records from West Grand Lake in 1856-58, where 1,641 salmon were caught in 2,367 hours, for an average catch per hour of 0.69 salmon. The fish, however, averaged only 1.4 pounds in weight.

Accessibility to salmon waters gradually improved beginning near the turn of the century, first through improved railroad transportation, and later as a result of improved automotive transportation and better road networks. Logging operations, using more advanced equipment, increased accessibility to more and more salmon waters, especially after World War II. With these improvements in access, an increasing number of anglers began to take advantage of opportunities for salmon angling, and the salmon soon became one of Maine's most sought-after fish. Coincident with improved access and increased fishing effort, our Department's lake inventories revealed additional potential salmon waters that could provide fisheries through introductions. Successful introductions were made in many waters resulting in increased fishing opportunity and use by anglers.

While use of the salmon sport fishing resource has been aided significantly by improved mechanical equipment and road networks, certain other conditions tended to reduce opportunity for use.

Beginning with the early battles against abuse by poachers, fishing regulations became more and more restrictive with increasing numbers of anglers using the salmon resource. Over-restriction sometimes resulted from efforts of anglers and legislators who became concerned, and even alarmed, that our salmon populations might be over-exploited. Types of regulation restrictions most often imposed were: closure to ice fishing, shortening open water seasons, closure of specific areas, restrictions in types of angling gear, reduced bag limits, and increased length limits.

Although improved physical access has generally occurred, permitting higher angler-use of salmon, in some cases this situation has only been temporary. This has been true where logging roads permitted access to some waters, but when operations were completed, roads were often abandoned and no longer passable to conventional vehicles used by most anglers.

With an increasing human population and generally improved access, fishing camps and summer cottages began to proliferate the shores of many salmon lakes, often leaving no opportunity for public access by other anglers. Opportunity for use by the general angling public was also restricted by chaining of roads in wild lands by some large landowners and posting of some access roads by small landowners in more populated areas.

In some lakes, opportunity for use of the salmon resource has been reduced because salmon management is no longer feasible for some reason. Poor fishing, resulting from poor salmon survival, sometimes occurred because of introduction or increases in predator or competitor species.

These changes in distribution, abundance, fishing pressure, and opportunity for use by anglers, along with broader knowledge of habitat requirements and life history, have all contributed to the present status of salmon as one of Maine's most important freshwater sport fishes.

PAST MANAGEMENT GOALS

The goals for salmon management, established in 1991 and modified slightly in 1996, were to (1) maintain the distribution, abundance (supply), and fishing quality at present levels; (2) provide the opportunity to catch larger-than-average-size salmon in selected waters; (3) maintain the present balance between winter and summer fisheries; and (4) ensure reasonable public access to all salmon waters. Specific management objectives were as follows:

Distribution and Abundance Objectives

Maintain current distribution and abundance to provide moderate to high quality salmon fisheries (principal fisheries) in about 200 lakes totaling 534,000 acres and in about 290 miles of streams.

During the past 5 years, the number of lakes with principal fisheries declined from 201 to 176 (-12%) and the number of acres declined from 533,905 acres to 484,791 acres (-9%). The greatest loss in numbers of principal fishery salmon lakes occurred in Regions C and E while acreage declines were highest in Regions B, E, and F. Most (60%) lakes dropped as principal salmon fisheries were small (<1,000 acres) and provided only marginal habitat for salmon. Chronically poor performance of salmon in these and in several larger lakes, along with continued demand for improved fishing opportunities, resulted in management changes emphasizing splake or brown trout. These species have been shown to provide better fisheries in lakes with marginal habitat than do salmon. Several lakes were dropped simply because Regional Biologists continued to refine their lake inventory files based on more recent information. Competition from recently introduced exotic species (smallmouth bass and muskellunge) resulted in the loss of principal fisheries in three waters. Small remnant populations of wild salmon will continue to provide incidental fisheries in most of these lakes. These losses are probably not significant on a statewide basis because angler use declined considerably during the recent planning period. The present distribution and abundance of salmon lakes appears to satisfy existing demand, except in Region B where salmon habitat is very limited.

The number of stream miles supporting moderate-to-high quality salmon fisheries was maintained at about 290 miles.

Harvest objectives

In selected waters capable of maintaining age 5+ and older salmon annual harvest should not exceed 0.30 lbs/acre. In waters not capable of maintaining age 5+ and older salmon, the pounds of salmon harvested should be at least 100% of the pounds stocked.

Annual harvests averaged 0.17 lbs/acre/year in several lakes where sampling indicated age 5 and older salmon comprised at least 25% of the population or the fishery. For those lakes not capable of maintaining older-ages, anglers harvested salmon that weighed 350% greater than their weight at stocking.

Fishing quality objectives

Provide 0.20 legal fish caught/angler day in high quality fisheries with current use. Average length and weight should be 16.5 inches and 1.5 pounds. On selected waters provide a catch rate of 0.50 salmon/angler day with an average fish weight of 2.0 pounds.

These objectives were exceeded. For all waters surveyed, the average catch rate of legal salmon (released plus harvested) increased to 0.29 fish/angler day and the average size of harvested salmon increased to 17.3 inches and 1.73 pounds. Two waters surveyed during the most recent planning period provided catch rates of 0.65 legals/day for fish that averaged 2.3 pounds.

Since 1996, fishing regulations designed to provide larger salmon were established on three waters (two lakes in Region C; one river reach in Regions E and F).

Seasonal balance objectives:	**Winter**	**Summer**
Angler days:	**35%**	**65%**
Harvest:	**30%**	**70%**

On a statewide basis winter use (angler days) as a percentage of annual use declined from 34% during 1991-1995 to 18% from 1996-2000. Winter fisheries accounted for about 26% of the annual harvest of salmon compared to 29% during the previous planning period.

Since 1996, there have been slight improvements in the public's ability to access salmon waters. Federal funds have become available to secure legal rights-of-way and to construct new boat landings or upgrade existing ones. Free access to salmon waters declined slightly, however, as large landowners in Northern Maine expanded gate fees to include additional salmon waters. Region E waters were particularly affected by this action.

OPPORTUNITY

The data in this plan are presented on the basis of the Department's Fisheries Regions, which are aggregations of townships (Figure 1).

A total of 303 Maine lakes comprising 641,207 acres have salmon populations at the present time (Figure 2). Of these, 176 lakes totaling 484,791 acres provide principal salmon fisheries (Table 1) and 127 waters comprising 156,416 acres provide salmon fisheries categorized by Regional Fisheries Biologists as incidental in nature. These latter waters are of general interest in that they provide anglers with an opportunity to catch the occasional salmon while fishing for other species. For the purpose of decision-making, however, this plan addresses only those lakes known to provide principal fisheries. The only major groups of waters in the state with significant potential for producing salmon fisheries that presently do not are located in the Allagash and upper Penobscot River drainages in Regions E and G. These waters are managed for native populations of lake trout, brook trout, and whitefish, and introduction of salmon has not been considered desirable.

The salmon lakes of Maine are distributed so that few anglers live far from one (Figure 2). Some of the better known lakes, however, occur in quite widely separated groups; for example, the Rangeley Lakes in Franklin and Oxford Counties, the Grand Lakes in Washington County, and the Fish River Lakes in Aroostook County. Regions D, E, and G, comprising much of the interior highlands of the state (Figure 1), have the greatest number of principal fishery salmon lakes (96 lakes or 55% of the total) and the greatest acreage (266,117 acres or 55% of the total), including Moosehead Lake, Maine's largest lake (74,890 acres), in Region E. Average lake size for all Regions is 2,755 acres (Table 1), but if Moosehead Lake is excluded, average size drops to 2,342 acres.

Most of Maine's principal salmon fisheries (53%) occur in the cooler, deeper oligotrophic (unproductive) lakes (Table 2). However, a significant portion of the fisheries occurs in moderately productive or mesotrophic lakes (33%), and a total of 24 fisheries (14%) occur in eutrophic (productive) lakes. With the exception of Region A in far southern Maine, the majority of these latter fisheries are in northern and western Maine (Table 2) where during most years summer surface temperatures exceed 70°F for only brief periods. The fact that nearly half of the state's principal salmon fisheries occur in habitats formerly thought to be poorly suited for the species indicates its ability to often thrive in a diversity of habitats. However, it should be noted that most of the "loss" of principal salmon fisheries during the past 10 years has been in lakes of this type - where managers had attempted to create additional salmon fisheries but failed due to constraints imposed by the more marginal habitat.

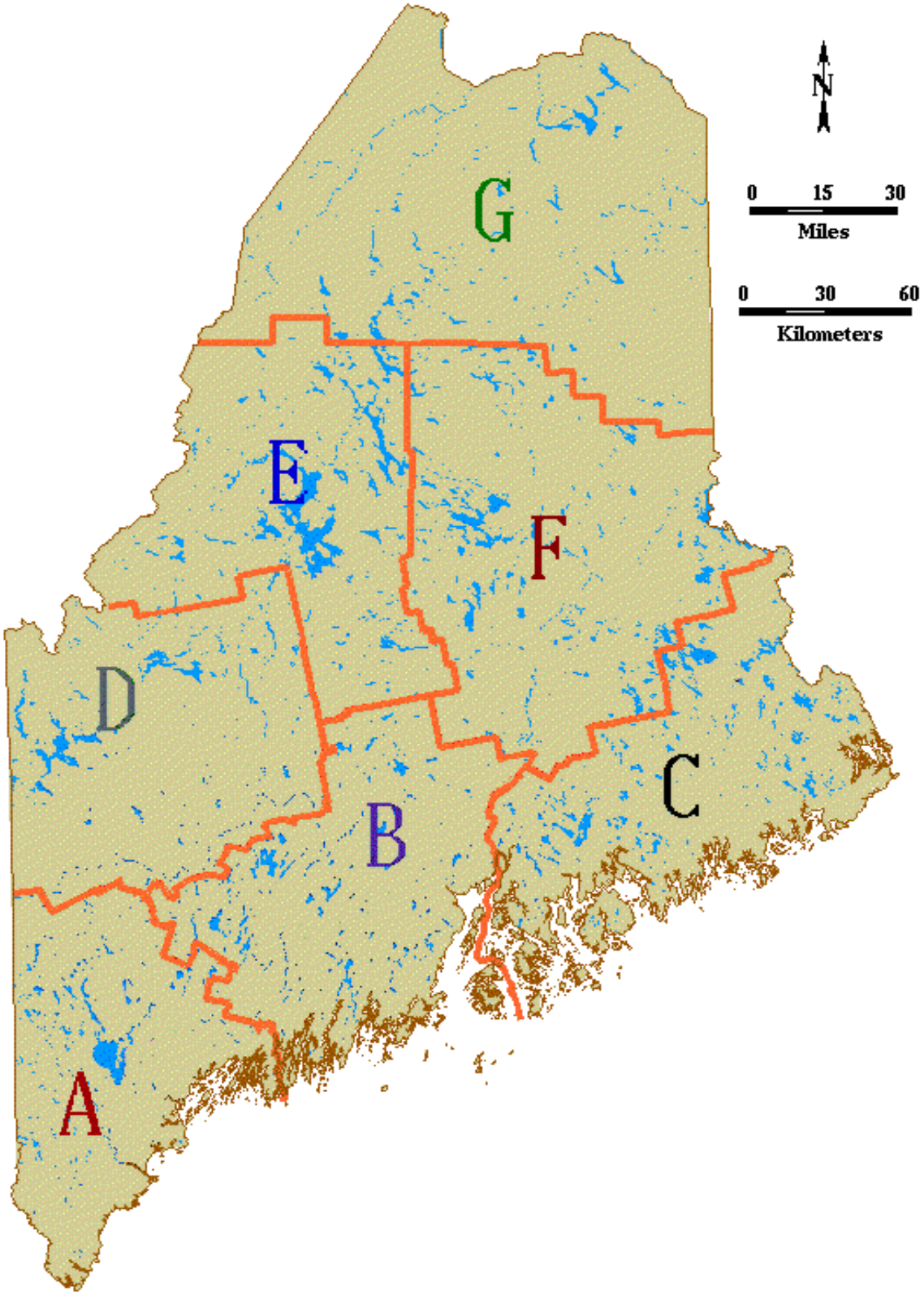


Figure 1.
Maine Department of Inland Fisheries and Wildlife
Fishery Management

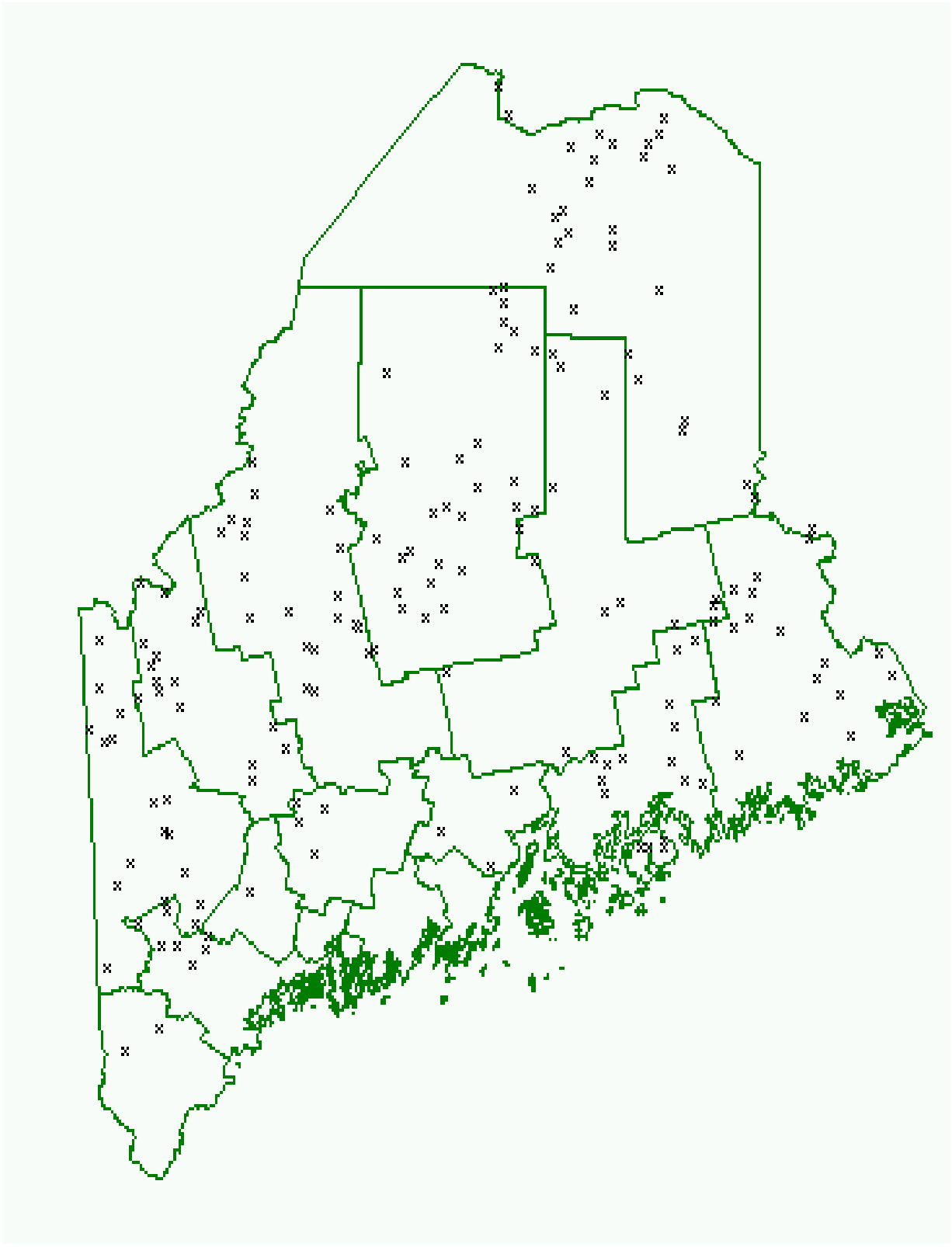


Figure 2. Species Distribution in Lakes, 2000
LANDLOCKED ATLANTIC SALMON
Salmo salar

Table 1. Number and area of Maine salmon Lakes That Provide Principal Salmon Fisheries by Management Region

REGION	NO. OF LAKES	NO. OF LAKES AS PERCENT OF TOTAL	NO. OF LAKES PER SQUARE 100 MILES	AREA OF LAKES (ACRES)	AREA OF LAKES AS PERCENT OF TOTAL	AREA OF LAKES PER 100 SQUARE MILES	AVERAGE LAKE SIZE
A	20	11	0.63	53,073	11	1,659	2,654
B	8	5	0.20	10,493	2	265	1,312
C	28	16	0.70	58,550	12	1,456	2,091
D	35	20	0.83	65,640	14	1,551	1,875
E	29	16	0.66	149,847	31	3,413	5,167
F	24	14	0.48	96,558	20	1,914	4,023
G	32	18	0.46	50,630	10	722	1,582
STATE	**176**	**100**	**0.55**	**484,791**	**100**	**1,521**	**2,755**

Table 2. Occurrence of Principal Salmon Fisheries in Maine Lakes by Lake Type and Management Region

	OLIGOTROPHIC LAKES		MESOTROPHIC LAKES		EUTROPHIC LAKES		TOTAL	
REGION	NUMBER	ACRES	NUMBER	ACRES	NUMBER	ACRES	NUMBER	ACRES
A	6	38,611	0	0	14	14,462	20	53,073
B	4	4,825	4	5,668	0	0	8	10,493
C	18	36,104	10	22,446	0	0	28	58,550
D	20	45,158	13	11,948	2	8,534	35	65,640
E	18	134,396	10	14,881	1	570	29	149,847
F	16	63,670	7	29,558	1	3,330	24	96,558
G	11	29,120	15	16,675	6	4,835	32	50,630
STATE	**93**	**351,884**	**59**	**101,176**	**24**	**31,731**	**176**	**484,791**

Moreover, 74 of 176 lakes (42%) supporting principal fisheries occur in lakes managed for warmwater sport fish (Table 3.). Over 235,000 acres (48%) managed for salmon are also managed for various warmwater sport fish species, including smallmouth bass, largemouth bass, white perch and others. In the southern and eastern regions where warmwater sport fish species are widely distributed (Regions A, B, and C), virtually all salmon management is in conjunction with warmwater species. Salmon coexist and thrive in the presence of at least some of the major warmwater sport fish, attesting again to the adaptability of the species. As a group, combination management lakes often provide conditions that foster faster salmon growth rates than those lakes managed strictly for coldwater species. The growing season in southern and eastern Maine, where most combination management waters are located, is up to a month longer than in northern Maine, and lake trout, significant competitors with salmon for smelts, are more abundant in northern and western Maine where coldwater management lakes prevail.

Table 3. Occurrence of Principal Salmon Fisheries in Maine Lakes by Management Type and Management Region

REGION	COLDWATER MANAGEMENT		COMBINATION COLDWATER AND WARMWATER MANAGEMENT	
	NUMBER	ACRES	NUMBER	ACRES
A	0	0	20	53,073
B	0	0	8	10,493
C	7	7,129	21	51,421
D	32	56,476	3	9,164
E	19	105,927	10	46,920
F	12	29,347	12	67,211
G	32	50,630	0	0
STATE	**102**	**249,509**	**74**	**235,282**

Statewide, 67% of lakes (77% of acreage) supporting principal salmon fisheries are open to ice fishing (Table 4). Regions C, E, and F have the largest number of lakes and highest percentage of acreage open to winter use. The highest number and acreage closed to ice fishing are in Region D, where emphasis has traditionally been placed on open water fishing. The high percentage of salmon acreage closed to ice fishing in Region A reflects the closure to salmon fishing of Sebago Lake, the largest lake in the Region.

Table 4. Numbers and Numbers of Acres of Inventoried Maine Salmon Lakes That are Open and Closed to Ice Fishing Where There is a Principal Fishery for Salmon by Management Region

REGION	LAKES OPEN			LAKES CLOSED				REGIONAL TOTALS		
	NO.	PERCENT	ACRES	PERCENT	NO.	PERCENT	ACRES	PERCENT	NO. LAKES	NO. ACRES
A	17	85.0	21,307	40.1	3	15.0	31,766	59.9	20	53,073
B	7	87.5	7,779	74.1	1	12.5	2,714	25.9	8	10,493
C	27	96.4	58,083	99.2	1	3.6	467	0.8	28	58,550
D	9	25.7	10,156	15.5	26	74.3	55,484	84.5	35	65,640
E	18	62.1	137,491	91.8	11	37.9	12,356	8.2	29	149,847
F	24	100.0	96,558	100.0	0	0.0	0	0.0	24	96,558
G	16	50.0	41,339	81.7	16	50.0	9,291	18.3	32	50,630
STATE	**118**	**67.1**	**372,713**	**76.9**	**58**	**32.9**	**112,078**	**23.1**	**176**	**484,791**

Ice fishing opportunity, expressed as numbers or acreage of lakes, has remained relatively stable since 1985, except in Region B where salmon principal fisheries were reduced due to management changes on several large waters. Restrictive fishing regulations recently imposed on many salmon lakes, including shortened winter seasons, line restrictions, and stricter length and bag limits, have reduced fishing and harvest opportunities on many waters.

Significant river fisheries for salmon are confined primarily to Regions D, E, F and G (Table 5), but there are notable exceptions. Grand Lake Stream in Region C, for example, has gained countrywide fame for its fishery, and fishery managers in Region A have created an extremely popular fishery for hatchery-reared salmon in the Presumpcot River in Cumberland County. In total, the State provides 64 known river fisheries, comprising 635 miles, of which 44 streams totaling 289 miles are considered to provide a moderate-to-high quality fishery. River fisheries are often associated with lake fisheries and may be seasonal rather than year-round.

Table 5. Salmon Streams With Moderate-to-High Fishing Quality by Management Region

REGION	NUMBER OF STREAMS	NUMBER OF MILES
A	2	21.3
B	1	3.9
C	1	3.2
D	7	68.2
E	15	86.2
F	10	57.8
G	8	48.3
STATE	**44**	**288.9**

The public can reach most salmon waters by either 2-wheel or 4-wheel drive vehicle (Table 6). Most of the road systems in unorganized townships of the state are owned by large landowners for forest management who, for the most part, allow the public to use their roads without charge. Access for boat landings are available throughout much of the state although public rights-of-way are present on only 75% of salmon acreage. Regions E and G in northern Maine have the fewest public rights-of-way. Funds have become available to secure legal rights-of-way and to construct new boat landings or upgrade existing ones, thereby improving convenience if not use. Free access to salmon fisheries declined slightly, however, as large landowners in Northern Maine expanded gate fees to include additional salmon waters. Region E waters were particularly affected by this action. Fees are charged on about 11% of the salmon acreage statewide. Fees are charged principally by North Maine Woods and Baxter State Park

Table 6. Physical Access to all Salmon Lakes Expressed as a Percentage of Total Areas by Management Region

REGION	SUMMER[A] ACCESS BY AUTO	BOAT[B] LANDINGS PRESENT	PUBLIC RIGHT-OF-WAY[C] PRESENT	SUMMER[D] ACCESS FEE CHARGED	PUBLIC[E] ACCESS RESTRICTED
A	100.0	100.0	97.7	1.0	0.0
B	100.0	100.0	97.3	0.0	0.0
C	100.0	97.2	76.6	0.00	0.00
D	98.5	95.4	81.1	2.5	1.4
E	100.0	98.1	59.9	24.5	0.6
F	99.7	88.5	81.2	2.3	0.0
G	100.0	82.9	66.7	27.9	0.0
STATE	**99.7**	**94.3**	**74.7**	**11.4**	**0.4**

authorities. Public access is restricted to less than 1% of salmon acreage, mainly by exercise of trespass rights by private landowners and by a few municipalities to protect water supplies.

Within the next planning period there is expected to be slight overall improvements in access to salmon waters as federal and state funds continue to become available for additional public rights-of-way and boat launching facilities. Continued construction of logging roads will also improve opportunity for use in unorganized townships. At the same time there may be losses as private landowners exercise their trespass rights. The number of waters where fees are charged may increase if demand for outdoor recreation increases, and fees may increase.

[a] Access to within ½ mile by either 2-wheel or 4-wheel drive.
[b] Includes lakes where it is "reasonably possible to back a boat trailer to the water".
[c] Rights-of-way may include those established by tradition as well as by legal, public deed.
[d] Fees charged by landowners at landing points or as general land-use fees charged at road gates.
[e] Primarily municipal restrictions on access to public water supplies and exercise of trespass rights by private landowners.

Stocking continues to play an important role in salmon management. Of the 176 lakes supporting principal salmon fisheries, 127 (72%) are stocked (Table 7). All Management Regions use stocked salmon in their programs, with Regions A, B, C and F being most dependent on stocking to provide fisheries. Most (98%) salmon stocked in lakes are planted as spring yearlings.

Table 7. Number and Area of Maine Lakes with Principal Fisheries for Salmon That are Sustained by Natural Reproduction or by Stocking

REGION	SUSTAINED BY NATURAL REPRODUCTION				SUSTAINED BY STOCKING[1]			
	NO. OF LAKES (%)		ACRES (%)		NO. OF LAKES (%)		ACRES(%)	
A	0		0		20	(100)	53,073	(100)
B	0		0		8	(100)	10,493	(100)
C	2	(7)	2,080	(4)	26	(93)	56,470	(96)
D	13	(37)	39,117	(60)	22	(63)	26,523	(40)
E	14	(48)	49,148	(33)	15	(52)	100,699	(67)
F	4	(17)	3,616	(4)	20	(83)	92,942	(96)
G	16	(50)	17,879	(35)	16	(50)	32,751	(65)
STATE	**49**	**(28)**	**111,840**	**(23)**	**127**	**(72)**	**372,951**	**(77)**

The average annual stocking rate of spring yearlings from 1996 to 1999 was 122,713 fish per year (Table 8), a reduction of 24% since the previous 5-year period. Continued improvements in fish quality, resulting in greater survival after stocking, necessitated reductions in stocking rates to maintain a balance between predators (salmon) and prey (smelt). More importantly, during the most recent period higher release rates of salmon by anglers and reduced angler effort (discussed later) have threatened to "stockpile" young salmon, with resultant growth declines in many lakes. This has forced biologists to further adjust stocking rates downward to maintain an appropriate balance between salmon and smelts. Currently, annual stocking rates of spring yearling salmon in lakes average about 0.53 fish/surface acre/year (Table 8).

Region A biologists recently initiated fall yearling-based stockings in several lakes to enhance winter fishing opportunities in some heavily fished waters of southern Maine. A total of about 2,000 fall yearling salmon, which are largely legal-size (14 inches) when stocked, were distributed annually from 1996 to 1999. These new stocking programs have not yet been fully evaluated, but indications are that the objective of providing short-term winter fisheries in high-use lakes is being met, and the lakes' spring yearling-based salmon populations are not being compromised.

[1] Includes all lakes stocked in one or more years during the period 1996-1999, and only those lakes where stocking is intended to provide the fishery on a consistent basis.

Table 8. Four-Year Stocking Summary (1996-1999) for Spring Yearling Salmon in Maine Lakes by Management Region

REGION	NO. OF LAKES STOCKED	NO. OF ACRES STOCKED	AVERAGE STOCKED/YEAR		AVERAGE STOCKED/ACRES	
			NUMBER	POUNDS	NUMBER	POUNDS
A	15	45,366	11,844	3,288	0.40	0.11
B	6	8,033	5,575	1,321	0.71	0.17
C	34	70,033	25,122	4,073	0.41	0.06
D	23	31,788	9,654	1,864	0.58	0.12
E	14	101,071	21,977	3,575	0.64	0.10
F	23	100,684	36,416	5,959	0.52	0.09
G	18	39,395	12,125	2,237	0.72	0.13
STATE	**133**	**396,370**	**122,713**	**22,317**	**0.53**	**0.10**

Natural reproduction supports principal fisheries in 49 lakes comprising nearly 112,000 acres (Table 7). Not surprisingly, the bulk of wild salmon fisheries are located in western and northern Maine (Regions D, E, and G) where spawning and nursery habitat for salmon is most abundant. Specific drainages in these Regions that provide outstanding spawning and nursery areas include the Kennebago and Magalloway Rivers in Region D, the West Branch Penobscot, Roach, and Moose Rivers in Region E, and the upper Aroostook River and thoroughfares connecting the Fish River Lakes in Region G.

Nearly 25,000 salmon were stocked annually in 20 stream reaches from 1996 to 1999 (Table 9). Fry, spring yearlings, and fall yearlings are the primary cohorts stocked; adult salmon (retired brood fish) and fall fingerlings are only occasionally used. Fry stockings are usually in support of lake populations, whereas spring and fall yearling fish are used to create stream fishing opportunities, where habitat can support it, for larger salmon with appropriate regulations. Stream stockings are utilized most in Regions A and B, where demand for riverine salmon fishing is high and suitable habitat is not abundant.

Table 9. Four-Year Stocking Summary (1996-1999) for Salmon in Maine Streams by Management Region and Age Group

REGION	AGE	NO. OF STREAMS STOCKED	AVERAGE STOCKED/YEAR		AVERAGE NUMBER STOCKED PER YEAR PER STREAM	
			NUMBER	POUNDS	NUMBER	POUNDS
A	AD	1	8	45	8	45
	FR	3	11,250	14	3,750	5
	FF	1	1,000	114	1,000	114
	SY	3	1,975	660	658	220
	FY	2	438	346	219	173
	ALL	10	14,671	1,179	5,635	557
B	SY	1	1,008	311	1,008	311
	FY	1	750	628	750	628
	ALL	2	1,758	939	1,758	939
C	AD	1	79	374	79	374
	FR	1	300	0.25	300	0.25
	SY	1	50	139	50	139
	ALL	3	429	513.25	429	513.25
D	SY	1	500	139	500	139
E	SY	2	1,875	282	938	141
F	FR	2	2,624	4	1,312	2
STATE	AD	2	87	419	44	210
	FR	6	14,174	18	2,362	3
	FF	1	4,000	454	4,000	454
	SY	8	5,408	1,437	676	180
	FY	3	1,188	974	396	325
	ALL	20	24,857	3,302	7,478	1,172

The revised estimate of opportunity in this section is due both to better accounting as well as actual changes in management over the past 5 years. We do not anticipate that habitat or abundance of salmon will change markedly by 2015, provided the integrity of lake water quality and stream rearing areas remains intact, management remains capable of monitoring and evaluating fisheries at current or higher levels, and angler use patterns and behavior remain relatively stable. Salmon abundance may be mitigated to some extent by stocking, but the nature of the populations would change toward fewer wild salmon if habitat is lost. Distribution of habitat will also be essentially the same in 2016 as now.

DEMAND

Data from the most recent angler questionnaires indicate demand (angler use) on lakes declined by 6% for open water and winter fishing combined (Table 10). Statewide annual use in 1994 was 1,767,059 angler days compared to 1,669,358 in 1999. Changes in annual use were not equal among regions – Regions A and D experienced slight increases in annual use, while annual use in the remaining Regions declined by 9% to 34%. During this most recent period annual use (number of angler days) was highest in Regions A, D, and E and lowest in the Regions B, C, and G. On a per-acre basis annual demand was highest in Regions A and B and lowest in Regions E and F.

Since 1994, statewide demand for winter fishing declined by 32% (Table 10). During the 1994 ice season 437,190 angler days were expended annually compared to 296,132 angler days in 1999. The largest declines were observed in the southern and coastal regions (A and C) and in Region D.

Regions C and E attracted the largest number of winter anglers, but on a per-acre basis Region B was fished the heaviest, reflecting that Region's limited acreage of salmon principal fisheries. For all lakes, winter fishing accounted for 18% of annual use in 1999 compared to 34% in 1994; this ratio was highest in Regions B (35%) and C (44%) and lowest in Regions A (9%) and D (7%), where ice fishing opportunities are most limited.

Statewide demand for summer salmon fishing increased only slightly (3%). Summer anglers expended 1,369,226 days fishing in 1999 compared to 1,329,869 days in 1994 (Table 10). The largest increases in summer use occurred in Regions A and D. All other Regions except Region F experienced declines in summer use that ranged from 6% to 34%. Regions D and E hosted the largest numbers of open water anglers; Regions A and B received the highest amount of summer use per acre.

Declining angler use of Maine's salmon fisheries during the most recent planning period mirrors statewide trends, reflected in declining license sales (-5%) and numbers of anglers (-12%). Winter angler use, which peaked during the years following the Department's decision to expand ice-fishing opportunities in 1978, seems to be in a steady decline. Biologists in most Regions have noted the novelty of ice fishing as a winter sport has clearly waned in favor of other activities (especially snowmobiling). More recently, poor ice conditions that prevailed during several winters in southern and coastal Regions (A, B, and C) negatively affected winter use there. Recent salmon growth problems on several major lakes, including Moosehead Lake and Sebago Lake, resulted in declines in angler use because stocking rates, and therefore salmon catch rates, were temporarily reduced in order to rebuild smelt populations. Angler use of salmon fisheries in Region B was reduced by the collapse of the fishery in Long Pond (Belgrade) through predation and competition from northern pike, and from management changes made on several large lakes that emphasize other coldwater species. Moreover, burgeoning coastal fisheries for striped bass and bluefish may have attracted many anglers away from inland waters. Despite these recent declines in angler use, demand on the state's salmon lakes remains far in excess of that observed during the 1960's and 1970's. High rates of angler use will remain a major factor determining the Department's approach to salmon management during the next planning period.

Table 10. Angler Effort on Maine Lakes With Principal Fisheries for Salmon by Season and Management Region. Data From the 1998-1999 Angler Questionnaires. Sums are not Additive Because Estimates Were Made Independently.

REGION	SEASON	ANGLER DAYS	PERCENT OF ANNUAL USE	ANGLER DAYS PER ACRES	PERCENT CHANGE FROM 1994
A	Winter	43,531	9	2.04	(-) 49%
	Summer	427,278	91	8.04	(+) 26%
	Annual	470,809		8.87	(+) 11%
B	Winter	40,658	35	5.23	(-) 13%
	Summer	117,260	65	11.18	(-) 23%
	Annual	157,918		15.05	(-) 21%
C	Winter	51,099	44	0.88	(-) 33%
	Summer	115,002	56	1.96	(-) 34%
	Annual	166,101		2.84	(-) 34%
D	Winter	18,878	7	1.86	(-) 31%
	Summer	265,549	73	4.05	(+) 28%
	Annual	284,427		4.33	(+) 29%
E	Winter	65,618	22	0.48	(-) 18%
	Summer	226,685	78	1.51	(-) 8%
	Annual	292,303		1.95	(-) 10%
F	Winter	46,334	26	0.48	(-) 30%
	Summer	131,001	74	1.36	(+) 3%
	Annual	177,335		1.84	(-) 9%
G	Winter	40,153	31	0.97	(-) 26%
	Summer	89,520	69	1.77	(-) 6%
	Annual	129,673		2.56	(-) 13%
STATEWIDE ESTIMATES	**Winter**	**296,132**	**18**	**0.79**	**(-) 32%**
	Summer	**1,369,226**	**72**	**2.82**	**(+) 3%**
	Annual	**1,665,358**		**3.44**	**(-) 6%**

Data from the 1999 angler questionnaire indicate that demand for salmon fishing in rivers declined by about 16% from the previous 5-year period (Table 11). In 1994 there was an estimated 167,557 angler-days expended compared to 141,473 angler-days in the year 1999. Highest use occurred on rivers in Regions D, E, and F, where much of the habitat exists; demand was lowest in Regions B and C. Salmon fishing in rivers increased by about 49% in Region A where a popular fishery was developed in the Eel Weir Bypass reach on the Presumpscot River. Small increases in river use were also observed in Regions D (+9%) and G (+3%). Demand in the remaining Regions declined by 30-50%.

Table 11. Angler Use and Catch Estimates for Salmon Rivers by Management Region. Data From 1999 Angler Questionnaire. Sums are not Additive Because Estimates Were Made Independently.

REGION	ANGLER DAYS	NUMBER OF LEGALS CAUGHT	NUMBER OF LEGALS KEPT	PERCENT LEGALS KEPT	LEGALS PER ANGLER DAY	
					CAUGHT	KEPT
A	18,333	11,684	1,925	17	0.64	0.11
B	6,174	3,515	380	11	0.57	0.06
C	4,465	7,029	475	7	1.57	0.11
D	43,834	56,140	2,537	5	1.28	0.06
E	26,416	38,567	2,913	8	1.46	0.11
F	23,938	37,142	1.757	5	1.55	0.07
G	10,496	5,604	823	15	0.53	0.08
STATE TOTALS OR MEANS	**141,473**	**171,730**	**11,133**	**7**	**1.25**	**0.08**

FISHING QUALITY

The current combination of supply, demand, and fishing regulations resulted in significant improvements in lake fishing quality over the previous 5-year period. Creel surveys conducted by Department staff showed the number of legal salmon caught per angler day by winter anglers increased from 0.19 to 0.29; for summer anglers the catch rate improved from 0.21 fish per day to 0.31 (Table 12). Harvest rates increased less dramatically as anglers continued to release more of their legal catch. Winter anglers harvested legal salmon at the rate of 0.19 fish per day from 1996 to 2000 compared to 0.15 fish per day during the 1990-1995 period. Summer harvest rates were virtually unchanged from the previous period - 0.12 fish per day from 1996 to 2000 compared to 0.11 from 1990 to 1995. For both seasons combined, catch rates and harvest rates were 0.29 and 0.17 legal salmon per angler day, respectively, from 1996 to 2000. Catch rate (1.25 fish per day) and harvest rate (0.08 fish per day) in river fisheries were virtually unchanged from 1994 (Table 11).

The average size of harvested salmon also increased over the previous 5-year period. For all lakes surveyed from 1996 to 2000 (Table 13), winter anglers harvested salmon that were 17.3 inches long and weighed 1.7 pounds compared to 16.9 inches and 1.6 pounds in 1995; the summer harvest was comprised of salmon averaging 17.5 inches long and 1.8 pounds compared to 16.8 inches and 1.7 pounds in 1995. On a statewide basis, the average size of salmon presently harvested by Maine anglers during both seasons is larger than at any time since the Department began conducting formal creel surveys in the 1950's.

Table 12. Catch and Harvest Rates of Salmon From Maine Lakes by Management Region and Season. Values are Weighted Means of Mean Rates Obtained From Creel Surveys Conducted From 1996 to 2000. N is the Number of Surveys and SE is the Standard Error of the Weighted Means.

	WINTER					SUMMER				
	CATCH RATE			HARVEST RATE		CATCH RATE			HARVEST RATE	
REGION	N	MEAN	SE	MEAN	SE	N	MEAN	SE	MEAN	SE
A	5	0.07	0.04	0.05	0.03	3	0.16	0.04	0.10	0.03
B	6	0.09	0.02	0.06	0.02	*	*	*	*	*
C	2	0.06	0.04	0.04	0.01	1	0.49	0	0.23	0
D	9	0.08	0.02	0.06	0.02	7	0.38	0.08	0.13	0.03
E	18	0.17	0.04	0.12	0.02	7	0.24	0.04	0.11	0.02
F	2	0.17	0.07	0.13	0.05	1	0.58	0	0.05	0
G	25	0.57	0.11	0.37	0.06	2	0.28	0.2	0.12	0.06
STATE	**68**	**0.29**	**0.06**	**0.19**	**0.03**	**21**	**0.31**	**0.01**	**0.12**	**0.01**

Table 13. Mean Length (Inches) and Weight (Pounds) of Salmon From Lakes by Management Region and Season for the Period 1996-2000. Data are From Clerk Creel Surveys. Values are Weighted Means Obtained by Averaging Data From all Creel Surveys Conducted During the Period. N is the Number of Surveys and SE is the Standard Error of the Weighted Means.

	WINTER						SUMMER					
	LENGTH			WEIGHT			LENGTH			WEIGHT		
REGION	N	MEAN	SE	N	MEAN	SE	N	MEAN	SE	N	MEAN	SE
A	5	19.1	2.10	5	2.43	0.97	3	17.8	1.39	3	1.91	0.42
B	6	17.3	0.34	6	1.58	0.10	*	*	*	*	*	*
C	3	20.0	0.98	2	2.91	0.33	1	17.2	0	1	1.69	0
D	8	17.4	0.90	6	2.17	0.50	7	18.2	0.72	7	2.11	0.28
E	16	16.9	0.34	16	1.46	0.09	7	16.9	0.45	7	1.58	0.17
F	2	17.8	0.22	2	1.34	0.44	1	16.3	1.73	1	1.73	0
G	22	16.6	0.22	22	1.52	0.10	2	17.7	1.04	2	1.66	0.30
STATE	**63**	**17.3**	**0.25**	**60**	**1.69**	**0.11**	**21**	**17.5**	**0.35**	**21**	**1.82**	**0.13**

Declining angler use, higher release rates of legal-size fish, and slight changes in harvest regulations resulted in small changes in statewide estimates of numbers of salmon caught (legals harvested plus legals released) and harvested. The annual salmon catch increased by 5% and the harvest declined by 7% since 1994. At present, annual catch and harvest in lakes are approximately 940,000 and 205,000 legal salmon, respectively (Table 14). Total annual harvest was 0.68 pounds/acre/year in 1999.

The seasonal distribution of the harvest increased slightly in favor of summer anglers (74% of annual). This ratio was not uniform among Regions, however. Winter harvest as a percent of annual harvest was lowest in Regions A (10%) and D (8%), reflecting the large number of waters or acreage closed to ice fishing. Winter harvests in Regions B, C and G were much higher, comprising 37% to 51% of the annual harvest. The catch of salmon in rivers declined by 16% since 1994, but the harvest in rivers increased by 20% (Table 11). Region A accounted for much of the increase in harvest of river salmon.

The statewide annual harvest from lakes is currently composed of 69% hatchery-reared salmon and 31% wild fish. This ratio is quite different between seasons; the winter harvest is comprised mostly of hatchery fish (78%), while harvest by summer anglers is nearly evenly split between hatchery salmon (49%) and wild salmon (51%). This reflects the closure to ice fishing of

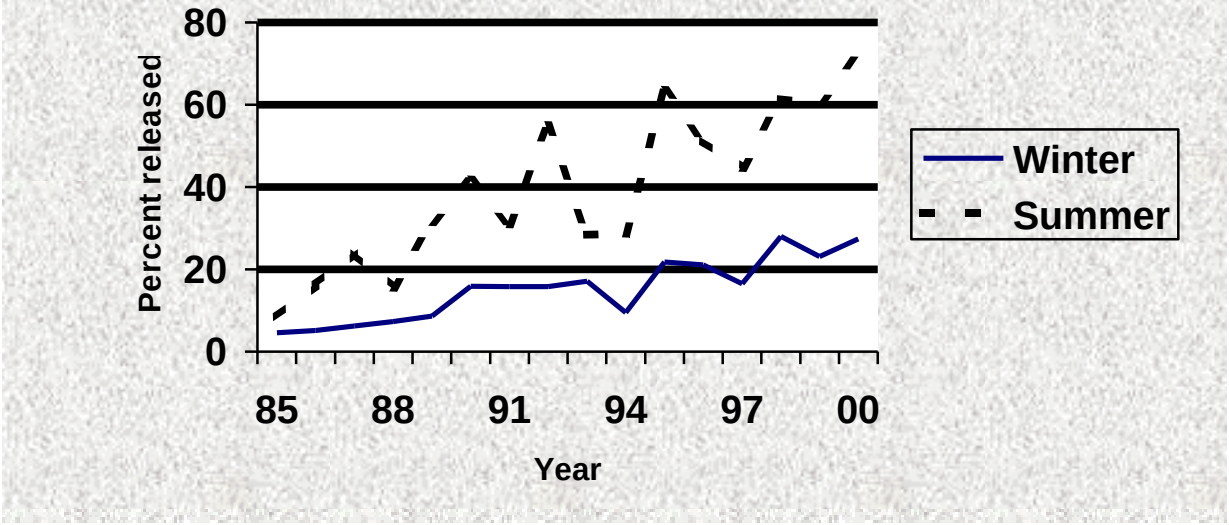
Table 14. Estimated Catch and Harvest of Salmon in Maine Lakes With Principal Salmon Fisheries by Season and Management Region. Estimates Derived From 1998-1999 Angler Questionnaires[1] and From Creel Surveys[2] Conducted from 1996 to 2000.

REGION	SEASON	NO. OF LEGALS CAUGHT	NO. OF LEGALS KEPT	PERCENT OF ANNUAL HARVEST	PERCENT LEGALS KEPT	HARVEST PER ACRE	
						NUMBER	POUNDS
A	Winter	11,536	2,753	10	24	0.13	0.31
	Summer	144,359	35,008	90	17	0.47	0.90
	Annual	155,895	27,761			0.52	1.05
B	Winter	18,436	7,040	51	38	0.91	1.43
	Summer	29,875	6,902	49	23	0.66	1.20
	Annual	48,311	13,942			1.33	2.42
C	Winter	44,435	10,316	37	23	0.18	0.30
	Summer	51,141	17,688	63	35	0.30	0.51
	Annual	95,576	28,004			0.48	0.81
D	Winter	7,110	1,708	8	24	0.17	0.36
	Summer	169,955	20,263	92	12	0.31	0.65
	Annual	177,065	21,971			0.33	0.70
E	Winter	41,089	8,782	25	21	0.06	0.09
	Summer	178,145	26,496	75	15	0.18	0.28
	Annual	219,234	35,278			0.24	0.35
F	Winter	40,079	12,721	31	32	0.13	0.18
	Summer	134,571	28,284	69	21	0.29	0.51
	Annual	174,650	41,005			0.42	0.65
G	Winter	23,106	9,619	39	42	0.23	0.35
	Summer	59,559	15,122	61	25	0.30	0.50
	Annual	82,665	24,741			0.49	0.78
STATEWIDE ESTIMATES	**Winter**	**170,079**	**48,520**	**26**	**29**	0.13	0.22
	Summer	**770,228**	**141,099**	**74**	**18**	0.29	0.53
	Annual	**940,307**	**189,619**		**20**	0.39	0.68

several large waters, located primarily in Region D, that are supported substantially by natural reproduction.

Clerk creel surveys, which provide better estimates of angler release rates than the angler questionnaires, indicate salmon anglers currently release about 34% and 61% of their legal catch during the ice and open water seasons, respectively (Figure 3). Release rates among salmon anglers have increased dramatically since 1985. This trend has been noted for other species and probably reflects a response by anglers to more restrictive harvest regulations, as well as a change in angler attitudes toward fishery resources.

Figure 3. Release Rates of Legal Salmon From Maine Lakes, 1985-2000. Data From Clerk Creel Surveys.



These changes in angler behavior and angler use will clearly alter the dynamics of salmon management on many lakes during the next planning period. If these trends continue they will present both new challenges and opportunities to Regional Biologists, some which are already being assessed or implemented on a water-by-water basis. For example, on some salmon waters high release rates and reduced harvests have resulted in higher population densities. This is generally viewed as a positive development because catch rates are higher, escapement to older, larger cohorts is maintained or improved, and anglers' satisfaction with the fishery is enhanced. However, there is clear evidence that on some waters this has resulted in "stockpiling" of younger fish, which are heavy consumers of smelts, the principal prey species of salmon in all lakes. In some cases this problem has been exacerbated by restrictive harvest regulations, particularly those emphasizing high minimum size limits. Consequently, size and condition of salmon have declined in some lakes, thereby reducing their value as sport fisheries. Regional Biologists have responded to these problems by reducing stocking rates on those waters supported by hatchery fish, or on wild fisheries by liberalizing harvest regulations. In other waters, regulations have been established that are designed to redirect a portion of the harvest to the more abundant younger age classes, which are the most voracious smelt predators, while providing additional protection to those older, larger salmon that escape harvest.

In addition, declining interest in harvesting salmon may permit management on a small number of carefully selected waters to evolve toward strategies that stress other objectives, such as "trophy fish management". This type of approach is currently being evaluated on a few lakes and river reaches. If more anglers accept the consequences of this particular type of management, whereby population size and catch rates are necessarily maintained at low levels, then more waters may be considered. At present, though, most Maine salmon anglers seem satisfied with catch rates and size quality currently being provided.

LANDLOCKED SALMON GOALS AND OBJECTIVES
2012-2022

STATEWIDE GOALS: To 1) maintain the current distribution of principal fisheries for landlocked salmon; 2) provide for a diversity of fishing opportunities; 3) maintain and, where feasible, expand the contribution of wild salmon to the sport fishery; 4) where feasible, increase statewide fishing quality.

STATEWIDE OBJECTIVES:

1) Maintain principal fisheries for landlocked salmon in about 260 waters.
   a) Maintain principal fisheries in about 200 lakes and ponds (505,000 acres), to include about 140 waters based wholly or partially on hatchery stocks and about 60 waters based entirely on natural reproduction.
   b) Maintain riverine fisheries of moderate to high fishing quality in 50 stream reaches (about 320 miles).
   c) Maintain habitat quality in waters that support principal fisheries for salmon.
   d) Develop strategies to address threats to salmon populations from illegally introduced exotic fish species.
2) Provide for a variety of fishing opportunities for salmon.
   a) Maintain present level and statewide distribution of open water and ice fishing opportunities.
   b) Increase remote and urban fishing opportunities.
   c) Increase riverine fishing opportunities in central and southern Maine.
   d) Increase fall fishing opportunities.
   e) Increase fishing opportunities for large salmon.
3) Where feasible, maintain or enhance the contribution of natural reproduction to salmon fisheries. Provide enhanced emphasis, including appropriate regulatory protection, to selected wild populations that will ensure adequate spawning escapement and preserve older-age salmon to maintain genetic diversity. Protect critical spawning and nursery habitat that support wild populations.
4) Provide for a variety of fishing quality objectives for salmon, as follows:
   1. **Harvest Opportunity Waters:** A total of 45 lakes comprising 83,801 acres or as necessary where forage availability limits salmon growth and condition. Waters selected for this management class will provide the opportunity to catch salmon that commonly range from 14.0 to 16.0 inches long, with an expectation of catching an occasional fish over 2 pounds.
   2. **General Management Waters:** A total of 108 lakes comprising 282,182 acres. Waters selected for this management class will provide the opportunity to catch salmon that commonly range from 16.0 to 18.0 inches long, with an expectation of catching an occasional fish over 3 pounds.
   3. **Size Quality Management Waters:** A total of 26 lakes comprising 73,869 acres. Waters selected for this management class will provide the opportunity to catch salmon that commonly range from 18.0 to 21.0 inches, with an expectation of catching an occasional fish over 5 pounds.
   4. On **Special Management Waters:** A total of 22 lakes comprising 71,547 acres. Waters selected for this management class will exhibit unique and/or valuable population and fishery characteristics. These may include, but are not limited to, extraordinarily high population densities, large numbers of older-age fish, or unique genetic attributes. Objectives for these waters will be developed on a water-by-water basis.

Capability: Current landlocked salmon abundance and distribution is sustainable throughout the next planning period, provided present habitat quality is maintained, public access is not reduced, and management remains capable of monitoring and evaluating fisheries at current or higher levels.

There is habitat available in central and southern Maine to create additional riverine fisheries for salmon by utilizing large hatchery fish. Similarly, increasing fall fishing opportunities for salmon can be achieved in streams or lakes by utilizing large hatchery fish. Existing habitat is capable of supporting the development of additional fisheries for large salmon. Existing habitat can support all remaining fishing opportunity objectives.

The contribution of wild salmon can be maintained or enhanced on some waters with suitable spawning and nursery habitat. Existing habitat can support all fishing quality objectives.

Feasibility: Maintenance of the current distribution of landlocked salmon at approximately 505,000 acres of lakes and 320 miles of streams is feasible with intensive management.

The willingness of salmon anglers to voluntarily release legal fish, and their increasing support for restrictive or innovative harvest regulations indicate continued improvements in fishing quality are feasible in some regions of the state. Some fisheries remain at critical levels of exploitation and may require further harvest restrictions. In other fisheries where high angler release rates continue to compromise salmon growth and condition, stockings rates may be further reduced and/or regulations implemented to redirect harvest from older-age salmon to the more abundant younger cohorts.

Enhanced protection of older-age salmon will benefit selected wild salmon populations by ensuring adequate spawning escapement and maintaining genetic diversity.

Development of additional fisheries for larger salmon is feasible, but this depends on size and catch rate objectives acceptable to anglers on individual waters. These types of fisheries will require markedly higher levels of monitoring by regional biologists in order to sustain them. Expanding monitoring efforts may not be feasible at current staffing levels.

Reductions in lake stocking rates may permit development of additional urban, youth, riverine, and fall fishing opportunities with existing hatchery capacity.

Desirability: Maintaining the current distribution and abundance of landlocked salmon, providing diversified fishing opportunities, and seeking improvements in fishing quality are desirable because the species is highly regarded by anglers and is of significant economic importance. Maintaining or enhancing the contribution of wild salmon will ensure the continued existence of several naturalized populations that may contain valuable genetic traits for future management programs, and have high aesthetic value to some anglers.

Possible consequences: Maintaining current landlocked salmon distribution may prevent development of better fisheries utilizing other coldwater species in lakes where salmon have performed poorly. Developing additional fisheries for larger salmon may engender considerable public debate because stocking rates, catch rates and harvest rates will be reduced dramatically. Implementation of restrictive regulations necessary to protect salmon to larger sizes may generate public opposition because of real, or perceived, limitations on harvest. Restrictive regulations may result in increased rates of hooking injury and mortality. Increasing urban, riverine, and fall fishing opportunities may require additional hatchery capacity or curtailment of the production of other hatchery-reared species.

LANDLOCKED SALMON
MANAGEMENT PROBLEMS AND STRATEGIES

Financial Issues

PROBLEM 1. The Fisheries Division lacks sufficient staff and financial resources to fully implement strategies necessary to achieve the objectives of the Management Plan.

Strategy a. Actively seek public and political support for additional staff and financial resources sufficient to achieve the objectives of the Management Plan.

Habitat Protection Issues

PROBLEM 1. Cultural development of lake shorelines, modification of spawning and nursery areas, and non-point sources of pollution in lake watersheds continue to threaten existing salmon habitat.

Strategy a. Continue to monitor habitat quality of salmon lakes.

Strategy b. Seek adequate regulatory protection of critical salmon spawning and nursery habitat.

Strategy c. Continue to provide technical support to other state and federal agencies responsible for managing and protecting lake and stream habitat quality.

Strategy d. Stringently enforce existing environmental laws and seek enactment of stronger measures where appropriate.

PROBLEM 2. Recent unauthorized introductions of competing fish species have reduced or threaten to reduce salmon production in certain lakes.

Strategy a. Intensify ongoing public education efforts that stress the negative impacts illegal fish introductions have on existing sport fisheries.

Strategy b. Vigorously prosecute those apprehended making illegal fish introductions and prominently advertise these prosecutions in the popular press.

Strategy c. Involve the public in enforcement efforts by encouraging the use of 1-800-ALERT-US.

Strategy d. Coordinate and combine the educational and enforcement strategies noted above with those recently developed and funded to prevent the introduction of nuisance aquatic plants.

Strategy e. A contingency plan should be established that would permit a rapid response when exotic species that pose threats to salmon populations have been illegally introduced, and when the likelihood of successful chemical eradication is high.

Population and Management Information Issues

PROBLEM 1. Current fishing quality is threatened in some salmon fisheries because angler use and harvest rates remain at critical levels.

Strategy a. Continue to monitor angler use and harvest on waters with heavy exploitation.

Strategy b. Promulgate and evaluate regulations designed to control angler harvest thereby maintaining fishing quality at acceptable levels.

PROBLEM 2. Declining angler use and harvest rates are providing benefits to anglers on some Maine lakes in the form of increased salmon population densities or older (larger) salmon. However, high population densities have resulted in declining growth, size, and condition of salmon in other lakes, threatening to reduce their value as sport fisheries.

Strategy a. Continue intensive monitoring of major salmon lakes to evaluate the need for changes in stocking regimes or regulations that will maintain desirable population structure and size characteristics.

PROBLEM 3. Populations of smelts, the principal forage fish for salmon, fluctuate dramatically in abundance on most salmon lakes, making it difficult to maintain desirable salmon growth rates and body condition on a sustained basis.

Strategy a. Conduct continuous monitoring of major salmon populations to permit dynamic, proactive management based on current conditions.

Strategy b. Using the Department's newly purchased hydroacoustics technology, develop sampling protocols and monitoring strategies that will provide annual estimates of smelt abundance on major salmon lakes, thereby providing enhanced notice of population declines to Regional Biologists.

Strategy c. Continue to augment depressed smelt populations through egg transfers where it's practical and appropriate.

Strategy d. Investigate means of maximizing production of forage within the context of desired fish quality objectives.

Strategy e. Where biologically feasible, seek to maximize smelt production by improving access to traditional spawning habitat, restricting commercial and/or recreational harvest, and by attempting to create new spawning runs by the stocking of smelt eggs and/or adults.

Strategy f. Recruit local anglers to monitor important smelt spawning tributaries.

PROBLEM 4. Burgeoning populations of competing coldwater species, especially lake trout, have reduced salmon production in certain lakes.

Strategy a. Seek public input to determine species management priorities that are socially acceptable when managing salmon with other cold water species in the same body of water.

Strategy b. Continue and expand ongoing evaluations of the role of competition and interrelationships with other coldwater species in salmon management.

Strategy c. Continue current trend of liberalizing fishing regulations on coldwater competitors, and continue to evaluate the efficacy of these regulations where they have already been applied.

PROBLEM 5. There is insufficient information for a number of salmon fisheries and types of fisheries, particularly during the open water season.

Strategy a. Broaden the scope of surveys to obtain better coverage and reliable estimates of angler use, catch, and harvest, fishing quality, and population structure for all seasons and habitat types.

Strategy b. Expand the existing network of ice and open water anglers who maintain detailed records of their fishing trips.

PROBLEM 6. There is limited knowledge of the abundance and distribution of salmon in rivers and the nature of fisheries they provide.

Strategy a. Continue to expand river survey and monitoring efforts to identify and evaluate important riverine salmon resources.

Strategy b. Expand the existing network of anglers who maintain detailed records of their fishing trips on salmon rivers and streams.

PROBLEM 7. An adequate assessment of the location, amount, and quality of salmon spawning and nursery areas is lacking.

Strategy a. Expand existing efforts to inventory salmon spawning and nursery areas in rivers and streams.

PROBLEM 8. Several salmon populations have become naturalized since being introduced many decades ago. It is likely that some of these populations have not been influenced by the stocking of hatchery-reared fish since the initial introductions. The genetic characteristics of these populations, their potential value as unique genotypes, and the degree to which they should receive special regulatory protection are unknown.

Strategy a. Determine the genetic diversity and the degree of differentiation from likely donor waters of several naturalized salmon populations.

Access Issues

PROBLEM 1. Loss of public access to salmon waters continues to threaten use opportunities by anglers and other users. Several salmon lakes remain inaccessible to anglers because access is denied over privately owned roads.

Strategy a. Continue to utilize existing funding sources to secure legal rights-of-way to all publicly owned salmon waters, and provide physical access facilities as appropriate.

Strategy b. Cooperate with state and federal agencies, the Legislature, and private groups to secure public access rights over private roads by purchase, easement, or gift.

Resource Allocation Issues

PROBLEM 1. Anglers have resisted management strategies necessary to create and sustain trophy fisheries, which include markedly reduced stocking and catch rates, restrictive harvest and terminal tackle regulations, and curtailment of winter fishing.

Strategy a. Increase efforts to elicit support from local and statewide angler groups in developing biologically sound trophy fish management strategies that are acceptable to the majority of those anglers with particular interests on individual lakes.

PROBLEM 2. Angler preferences for various types of salmon fisheries are rapidly evolving and are not fully understood by resource managers.

Strategy a. Continue efforts to survey angler preferences through ongoing public outreach programs, including day-to-day contact with anglers, speaking engagements, scientifically valid angler questionnaires, and through the Department's Public Information and Education Division.

PROBLEM 3. Increased use of salmon waters (particularly rivers) for recreational uses other than angling detracts from the aesthetic value of angling and may have other deleterious effects on angler use as well.

Strategy a. Identify and measure competing recreational uses of salmon waters and seek public input on the most reasonable means of reducing or eliminating competing impacts.

Public and Professional Information Issues

PROBLEM 1. Fishing regulations proposals are still often made without sound biological data, or when these data are available they are sometimes ignored. The effects of some of these fishing regulations are not fully understood and may place salmon fisheries at risk.

Strategy a. Continue to provide anglers with accurate information on probable consequences of their proposals

Strategy b. Provide effective leadership that will minimize Department staff time spent evaluating superfluous and sometimes harmful fishing regulation proposals.

Strategy c. Continue to monitor the effects of fishing regulations.

PROBLEM 2. Anglers and professional fishery workers in other states and provinces are inadequately informed about the progress and results of salmon management in Maine.

Strategy a. Develop and implement an information program to inform the public about salmon management in Maine.

Strategy b. Report management findings at appropriate scientific meetings, in progress reports, and in scientific journals.

ADDITIONAL INFORMATION

The following pages (31-33) contain the Department of Inland Fisheries and Wildlife's verbal testimony that was presented during the Second Regular Session of the 125th State of Maine Legislature to the Committee on Inland Fisheries & Wildlife in January of 2012. The testimony accompanied a department report that was requested by the committee during the First Regular Session in reference to LD 1329: "Resolve, To Study the Condition of the Landlocked Salmon in Maine and Make Recommendations To Improve Their Health." To read the department's full report to the Inland Fisheries and Wildlife Legislative Committee on LD 1329 please visit the Reports section of the department's web page.

- This report is provided in accordance with your letter dated June 28, 2011, whereby the Department was instructed to reconvene Maine's Coldwater Working Group, with new members, to update our agency's Goals and Objectives for Landlocked Salmon, established in 2001 and intended to reach 2016.

- This request followed the committee's unanimous ONTP vote on LD 1329, a Resolve To Study the Condition of the Landlocked Salmon in Maine and Make Recommendations To Improve Their Health.

- We are pleased to report that this effort was recently completed. A detailed summary of the Department's work with the Coldwater Working Group (CWWG) is provided in the packet.

- Maine's Coldwater Working Group was re-established in late summer 2011. Members serving during the 2001 planning effort were polled regarding their interest in serving in 2011. There was strong interest expressed by most 2001 members in continuing to serve on the CWWG, though one member was deceased, one member moved out of state, and one member declined to participate in 2011. New members were added to replace these individuals, and included Mr. Dennis Smith as requested by this Committee.

- The list of CWWG members who served in 2011 are listed on the first page of the report delivered to you this morning.

- During October and November 2011, each CWWG member was provided detailed assessments of progress the Department made in meeting the Goals and Objectives set forth in the 2001 Strategic Management Plan for salmon.

- Written comments on these assessments were received from 8 of 13 CWWG members, and a meeting to elicit oral comments on the assessments was held on December 5, 2011. The December 5th meeting also provided the CWWG an opportunity to finalize their suggestions for changes to the Objectives moving forward. This meeting was attended by 10 of 13 CWWG members, 9 Fisheries Division biological staff members, and 2 public members.

- Written and oral reviews by the CWWG, which are provided in your packet, clearly indicated there was broad agreement that the Department made significant, meaningful progress in meeting the management Objectives set forth in 2001, and they recommended retention of most Objectives as presently constructed.

- I would add that the overall satisfaction with our salmon sport fisheries expressed by the CWWG clearly reflects the input our field staff routinely receives during thousands of face-to-face interviews with Maine salmon anglers that we have each year.

- The CWWG suggested only one minor revision to the Management Objectives, which was to **remove the "youth fishing opportunities" from Objective 2b. In this regard, the CWWG and Department staff agreed that brook trout are a more appropriate species for providing this type of fishing opportunity.**

- **However, the CWWG strongly encouraged the Department to continue existing programs designed to promote the growth of youth fishing (e.g. Hooked on Fishing - Not on Drugs, youth fishing derbies, etc.)**

- While the majority of CWWG members clearly affirmed that the Department made excellent progress in meeting the 2001 Plan Objectives, there were several areas of focused discussion and concern, which can be summarized as follows:

- There was some concern regarding the Department's staffing and budget capability to adequately manage and monitor the increase in principal salmon fisheries - about 24 waters were added from 2001 to 2010. Their point was that increasing salmon fishing opportunity should not come at the expense of our ability to maintain quality fisheries in a smaller number of waters.

- Some Working Group members believed that resources dedicated to smelt research and management activities were inadequate, and the Department was strongly encouraged to seek "novel" means of bolstering and maintaining smelt populations in support of those Plan Objectives that focus on growing large salmon in selected lakes.

- Two Working Group members strongly contended that the Department made little or no progress in generating more opportunity for "trophy-size" salmon, and that additional efforts must be made to grow larger salmon in a larger number of lakes.

- There was general agreement by the Working Group to encourage the Department to intensify its work to increase salmon size on a small subset of the state's "best" salmon lakes, most of which are presently listed in the Plan's "Size Quality Management" category.

- In consideration of the assessment conducted by the Department's biological staff ,and the valuable input provided by the CWWG, we're proposing the following work items in support of the revised Statewide Objectives for Landlocked Salmon:

1. **We'll seek input from the CWWG in <u>re-prioritizing</u> the revised Objectives for landlocked salmon, which are attached beginning on page 4 of your report. That work is already in progress;**

2. **We'll update the Problems and Strategies section of the Strategic Plan for Landlocked Salmon and submit the revisions to the CWWG. That work will begin this month;**

3. **We'll publish the revised Objectives on the Department's website, and submit same to the Department's Federal Aid Coordinator to assure continued Sportfish Restoration funding for landlocked salmon projects. That task will be completed before March 1, 2012;**

4. **We'll complete a comprehensive update of all statewide databases related to landlocked salmon. This work is in progress and is expected to be completed by April 1, 2012;**

5. **Finally, we'll reassemble our Fisheries Division's Salmon Management Committee to review the revised Objectives and recommend regional strategies to meet the Objectives, particularly as they pertain to improving salmon size quality within the context of the agency's staffing and budget capability. This work is likely to occur during April or May of 2012.**

PRIORITIZED LANDLOCKED SALMON MANAGEMENT OBJECTIVES[1]

	RANKINGS Coldwater Working Group	
DESCRIPTION OF STATEWIDE OBJECTIVES	**2001**	**2011**
Maintain habitat quality in waters that support principal fisheries for salmon.	1	1
Develop strategies to address threats to salmon populations from illegally introduced exotic fish species.	2	2
Where feasible, maintain or enhance the contribution of natural reproduction to salmon fisheries.	3	3
Maintain principal fisheries in about ~~176~~ 200 lakes and ponds (about ~~130~~ 138 waters based wholly or partially on hatchery stocks and about ~~46~~ 62 waters based entirely on natural reproduction).	4	4
Maintain riverine fisheries of moderate to high fishing quality in ~~44~~ 50 stream reaches (about ~~290~~ 320 miles).	5	5
Increase fishing opportunities for large salmon.	6	6
In Size Quality Management Waters provide the opportunity to catch salmon that commonly range from 18.0 to 21.0 inches, with an expectation of catching an occasional fish over 5 pounds.	7	7
Maintain present level and statewide distribution of open water and ice fishing opportunities.	8	8
Special Management Waters: Waters selected for this management class will exhibit unique and/or valuable population and fishery characteristics.	8	9
In General Management Waters provide the opportunity to catch salmon that commonly range from 16.0 to 18.0 inches long, with an expectation of catching an occasional fish over 3 pounds.	10	10
In Harvest Opportunity Waters provide the opportunity to catch salmon that commonly range from 14.0 to 16.0 inches long, with an expectation of catching an occasional fish over 2 pounds.	11	11
Increase remote, urban, and ~~youth~~ fishing opportunities.	12	12

[1] Items in red reflect either changes occurring from 2001 to 2011, or changes recommended by the CWWG on December 5, 2011.

PRIORITIZED LANDLOCKED SALMON MANAGEMENT PROBLEMS

DESCRIPTION OF MANAGEMENT PROBLEMS	FINAL RANKING (2001)
The population abundance of smelts, the principal forage for salmon, fluctuates dramatically on most salmon lakes, making it difficult to sustain desirable growth rates and body condition.	**1**
The Fisheries Division lacks sufficient staff and financial resources to implement the strategies necessary to achieve the plan's objectives.	**2**
Recent unauthorized introductions of competing fish species have reduced or threaten to reduce salmon production in certain lakes.	**3**
Cultural development of lakeshores, modification of spawning and nursery areas, and non-point sources of pollution in lake watersheds continue to threaten existing salmon habitat.	**4**
Anglers have resisted application of the management strategies necessary to create and sustain trophy salmon fisheries.	**5**
Increasing populations of competing coldwater species, especially lake trout, have reduced salmon production in certain lakes.	**6**
The data available on a number of lake salmon fisheries and types of fisheries, particularly during the open water season, is insufficient for developing and implementing the most effective management programs.	**7**
Existing knowledge of the abundance and distribution of salmon in rivers and the nature of the fisheries they provide is not sufficient for developing and implementing the most effective management programs for salmon fisheries in rivers.	**8**
Fishing regulation proposals are often made without or in spite of sound biological data and may result in regulations that place a salmon fishery at risk.	**9**
Current fishing quality is threatened in some salmon fisheries because angler use and harvest rates remain at critical levels.	**10**
DIFW lacks an adequate assessment of the location, amount, and quality of salmon spawning and nursery areas.	**11**
Increased use of salmon waters, particularly rivers, for recreational purposes other than angling detracts from the aesthetic value of angling and may have deleterious effects on angler use, as well.	**12**
In some cases declining angler use and salmon harvests have led to high salmon population densities followed by declining growth, size and condition and reduced value as a sport fishery.	**13**
Lack of public access to some salmon waters continues to threaten use opportunity.	**14**
Angler preferences for various types of salmon fisheries are rapidly evolving and are not fully understood by resource managers.	**15**
The genetic characteristics of Maine's naturalized salmon populations (wild populations established originally by stocking) are unknown.	**16**
Anglers and professional fishery workers in other states and provinces are inadequately informed about the progress and results of salmon management in Maine	**17**