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# Status of Atlantic Salmon Stocks of Scotia-Fundy Region, 1991

by

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## ABSTRACT

Retained catches of 1SW salmon in 1991 were 54% of the 1986 - 1990 mean in SFA 19, 60% in SFA 20 and 16% in SFA 21 and 60% in SFA 23. Released catches of MSW salmon decreased to 68% of the previous five year mean in SFA 19, 57% in SFA 20 and 28% in SFA 21. Recreational fisheries in SFA 22 and portions of SFA 23 remained closed for the season because substantially less than the required number of spawners were counted in the index river for the inner Bay of Fundy stocks.

Counts of salmon at most facilities in Scotia-Fundy Region were down from those of 1990 and of the previous five year means. In-river counts of salmon in the Middle River (SFA 19), Alma, Point Wolfe and Big Salmon rivers (SFAs 22 and 23) were less than the minimum spawning requirement. Escapements to the Petitcodiac and St. Croix rivers (SFA 23) were extremely low.

Return rates of hatchery smolts as 1SW fish were the lowest on record for the LaHave River, second lowest for the Saint John River and third lowest for the Liscomb River. MSW return rates were similiarly low. Hatchery returns, however, contributed from 18 to 29% of the MSW returns in rivers where counts are possible.

Forecasts of MSW salmon returning to counting facilities in 1992, relative to 1991 returns, are about the same on the Liscomb, SFA 20, 35% lower on the LaHave, SFA 21, and 13% lower on the Saint John River, SFA 23.

## RÉSUMÉ

En 1991, les prises de saumons unibermarins conservées dans les ZPS 19, 20, 21 et 23 représentaient respectivement 54 %, 60 %, 16 % et 60 % de la moyenne de 1986-1990. Par rapport également à la moyenne des cinq années antérieures, les prises de pluribermarins remises à l'eau ont chuté à 68 % dans la ZPS 19, à 57 % dans la ZPS 20 et à 28 % dans la ZPS 21. La pêche sportive est restée fermée dans la ZPS 22 et dans des parties de la ZPS 23, le nombre de géniteurs recensé dans la rivière repère de l'arrière-baie de Fundy étant considérablement inférieur aux besoins.

Les résultats obtenus dans la plupart des installations de dénombrement la région de Scotia-Fundy étaient inférieurs à ceux de 1990 et à la moyenne des cinq années antérieures. Les dénombrements effectués directement dans les rivières Middle (ZPS 19), Alma, Point Wolfe et Big Salmon (ZPS 22 et 23) étaient inférieurs aux besoins minimums de géniteurs. De plus, les échappées ont été extrêment basses dans les rivières Petitcodiac et St. Croix (ZPS 23).

Dans les rivières LaHave et Liscomb ainsi que dans le fleuve Saint-Jean, les taux de remontée des saumoneaux d'écloserie parvenus au stade d'unibermarin s'inscrivaient respectivement aux premier, troisième et deuxième rangs des taux les plus bas à ce jour. Les taux de remontée de pluribermarins accusaient une baisse comparable. Toutefois, les remontées de saumons d'écloserie représentaient de 18 à 29 % des remontées d'unibermarins dans les rivières où on a pu procéder à des dénombrements.

Par rapport aux résultats de 1991, les prévisions de remontées de pluribermarins aux installations de dénombrement en 1992 restent à peu près les mêmes dans la rivière Liscomb (ZPS 20), tandis qu'elles diminuent de 35 % dans la rivière LaHave (ZPS 21) et de 13 % dans le fleuve Saint-Jean (ZPS 23).

## INTRODUCTION

This document presents a review, similar to those of 1987 to 1990 (Marshall et al. 1988, Amiro et al. 1989, O'Neil et al. 1989, Amiro et al. 1991), of the status of Atlantic salmon stocks of the five Salmon Fishing Areas (SFAs 19 to 23) of Scotia-Fundy Region and as such documents sport landings, fishway counts, diver counts and electrofishing results for specific rivers in 1991 and provides, where possible, forecasts of returns in 1992. Summary sheets are provided for the Grand, Liscomb and LaHave rivers; materials regarding inner Fundy stocks and the Saint John River have been extracted from respective assessments of each by Amiro (1992) and Marshall (in preparation).

## METHODS

Sport fishery data for 1991 in SFAs 19 to 22 (Nova Scotia) were derived from an analysis of Nova Scotia salmon license stubs. Recreational catches, 1974-1986, for all SFAs of Scotia-Fundy Region appear in the "Redbook" series (DFO, Halifax) and O'Neil et al.(1985, 1986, 1987, 1989a, 1989b, 1991). Sport landings for SFAs 19-22, 1974-1983, were adjusted upward to a Nova Scotia license stub equivalency (1984-1990) based on a ratio of (Department of Fisheries and Oceans district officer reports) DFO to license stub comparison in 1983 which indicated that DFO catches were lower. It was assumed that DFO catches for that earlier period were also underestimated. Sport fishery data for 1990, 1991 and 1986 - 1990 mean catches and effort for individual rivers appear in Appendix 1. Catch data for outer Bay of Fundy rivers in SFA 23 were obtained from New Brunswick Dept. of Natural Resources and Energy and DFO field personnel (Atlantic salmon harvest was prohibited in inner Bay of Fundy rivers of SFA23).

Monitoring of upstream-migrating wild and hatchery-origin adult salmon was conducted at six counting facilities in Scotia-Fundy Region: 1) Grand River in SFA 19, 2) Liscomb River in SFA 20, 3) LaHave River in SFA 21, 4) Petitcodiac, 5) Saint John and 6) St. Croix rivers in SFA 23. Counts of returning hatchery-origin fish from the Liscomb, LaHave and Saint John fishways and the number of smolts from which they originated are provided as an index of marine survival in 1989-1991.

Estimates of adult salmon populations above the fishway on Grand River (SFA 19) were made by use of counts at the fishway and estimates of fishway by-pass rates. Rates were established in 1989 (9% for fish <63cm and 43% for larger fish) and again in 1991 (43% for grilse and salmon). An estimate of removals by the angling fishery above the Grand River fishway was based on the 1991 sport catch and a 1990 phone survey that indicated 31% of the 1990 Grand River sport catch occurred above the fishway.

Indices of river escapements were derived from: 1) counts by divers of adult salmon in the Big Salmon and Alma rivers and 2) catch-per-kilometer (CPK) obtained by an electrofishing boat on the Stewiacke River. Counts and CPK's for 1991 were compared to counts obtained in 1989 and 1990 and CPK's obtained in 1988-1990.

Juvenile densities were determined by electrofishing in the Stewiacke River in SFA

22 and in Big Salmon River in SFA 23. Densities in the Big Salmon River were determined by the removal method from within barriered sites. Densities of age 1+ and older parr in the Stewiacke River were determined by mark-recapture methods in unbarriered sites. Age-0+ parr densities for the Stewiacke River were estimated by dividing the count of the 'mark-run', by the capture efficiency estimated for the age-1+ parr population estimate.

Forecasts of wild multi-sea-winter (MSW) returns for 1992 were based on regressions of wild MSW counts on wild one sea-winter (1SW) counts of the same smolt class at the Liscomb and LaHave river facilities. The MSW run destined to Mactaquac Dam, Saint John River, was forecasted by parametric and nonparametric regression methods from total returns of wild 1SW salmon (and their fork length) destined for Mactaquac in 1991 (Marshall, in preparation). The 1992 potential run of wild 1SW fish to Mactaquac was estimated using parametric and nonparametric regressions of 1SW returns on egg depositions four and five years previous.

## RESULTS and DISCUSSION

### SFA 19 (Cape Breton East)

Reported effort in the 1991 sport fishery totaled 6,870 rod days or 77% of the 1986-1990 and 83% of the 1981-1990 mean rod-day effort (Table 1). The 1991 estimated sport catch of 1SW fish is 446 or 54% of the 1986-1990 and 1981-1990 means. An estimated 1,034 MSW salmon were reported released in the 1991 sport fishery which is 68% of the 1986-1990 mean.

The count of wild salmon in 1991 at the Grand River fishway, Richmond County, was 139 fish <63cm, and 13 fish $\geq$63cm (Table 2, App. 2.). The count of wild 1SW salmon was 52% of that of 1990 and 28% of that of 1989; the count of salmon $\geq$63cm was 26% of that of 1989 and 1990. The 1991 return of 108 1SW and 5 repeat-spawning hatchery fish was 45% of the count at the fishway. Counts at the fishway are known to underestimate the population above the falls because some fish ascend the falls adjacent to the fishway. Previous adjustments for by-pass were 9% for fish <63cm and 43% for fish greater than 63cm. Broodstock collected above the fishway on October 17, 1991, indicated 43% of the fish less than 63cm had not passed through the trap at the fishway. Adjustment for the 1991 by-pass resulted in a population estimate of 410 fish <63cm and 32 fish >63cm above the fishway before removals. Because few salmon larger than 63cm were observed at the fishway or in the broodstock collections, salmon $\geq$63cm were adjusted using the 1989 rate. Spawning escapement for the entire river is unknown because of the location of the fishway 10.2 km above the mouth of the river. Native food fishery removals at or above the fishway were reported to be 39 fish of unknown sizes. Recreational fishery removals above the fishway were estimated using the 1990 follow-up phone survey which indicated 31% of the retained grilse were caught above the fishway. The estimated spawning escapement above the fishway was 348 fish or 64% of the required escapement for the entire river.

Underwater counts of adult salmon were conducted in six sections (Fig. 1 in Amiro et al. 1991) of the Middle River (SFA 19) on October 21, 1991. Counts totalled 18 small salmon thought to be 1SW and 267 large salmon thought to be MSW fish of which 4% was of hatchery origin. In-river native food fisheries reportedly removed 30 salmon after the count had taken place. Estimated escapement was 57% of the MSW required spawning escapement.

**SFA 20 (Eastern Shore)**

The 1991 estimated retained catch of 1,392 1SW fish is 59% of the 1986-1990 and 65% of the 1981-1990 mean (Table 1). An estimated 604 MSW salmon were reported released in 1990 (58% of the 1986-1990 mean).

The retained angling catch of 744 1SW fish on the St. Mary's River was 74% of the average retained catch, 1986-1990. Release of 264 MSW fish was 49% of that of the past five years (App. 1). Angling catches of 1SW fish in other rivers of SFA 20 were all lower, often substantially lower, than in 1990 while releases of MSW fish were either similar to or lower than in 1990. In most rivers, angling effort was lower than in 1990 (range 5% higher to 54% lower) due to the very low water levels that prevailed throughout much of the fishing season.

The count of 586 wild 1SW fish at the Liscomb Falls fishway was the fourth highest of a 13-year record but was 61% of the 955 fish recorded in 1990 and 68% of the 1986-1990 mean (Table 2, App. 3). The count of 38 wild salmon was the lowest since 1983. The return rate to the fishway of hatchery-origin 1SW fish was 0.79%, (Table 3) which is 43% less than the 1978-1989 mean of 1.39%. Counts of wild (Table 1) and hatchery adults (Table 2) in 1991 totalled 824 fish or about 38% of a river target of 1,908 1SW and 280 MSW fish (Semple and Cameron 1990) estimated without consideration for habitat adversely impacted by acidification. Revised targets are being considered.

The equation used to predict a return of 54 MSW (90% CI 27-81) to the Liscomb River in 1991 (as compared with an observed return of 38 MSW salmon) from 1SW returns in 1990, was updated in 1991 to $Y = 0.048X + 24.42$ ($n=12$, $r^2=0.30$, $p = 0.064$). The return of MSW salmon to the Liscomb River in 1992 is predicted as 53 fish (90% CI 34-72).

**SFA 21 (Southwest N.S.)**

The 1991 estimated rod catch of retained 1SW fish in SFA 21 was 557 or 16% of the 1990 catch and 15% of the 1986-1990 mean (Table 1). An estimated 313 MSW salmon were reported released in 1991, 28% of the 1986-1990 mean.

A count of 495 wild 1SW fish at the Morgan Falls fishway, LaHave River, was merely 24% of the 1986-1990 mean count and was the lowest since 1978 which was during the stock development phase above Morgan Falls (Table 2, App. 4). The estimated recreational catch of 1SW fish in the LaHave River was 233, 11% of the 1990 and the

1986-1990 mean catch (App. 1). The return rate for 1SW fish from 12.56 * $10^3$ hatchery smolts stocked above Morgan Falls in 1990 was 0.87%, the lowest observed since 1978 (Table 3).

A total of 236 wild MSW salmon was counted at Morgan Falls during 1991, which was 45% of the 1986-1990 mean count of 521 MSW salmon (Table 2). The return rate for 2SW salmon from 33.2 * $10^3$ hatchery smolts stocked above Morgan Falls in 1989 was 0.22% which is comparable to rates seen in some of the years of the last decade.

The count of wild (Table 2) and hatchery-origin adults at Morgan Falls is well short of the average spawner target of 2,815 1SW and 497 MSW fish for the entire river (Cutting et al. 1987) although rearing area above the falls is about 40% of the drainage total and is acid-impacted. Estimated egg deposition in 1991 is 1.73 million eggs (2.5 eggs $m^{-2}$, without adjustment for poaching or angling removals and disease. This estimate approximates the 1.65 million eggs required by the interim 2.4 eggs $m^{-2}$ standard for non-acid-impacted rivers, but the LaHave is acid-impacted. The regression equation $Y = 0.204X + 51.706$ ($n=17$; $r^2=0.64$; $p=<0.0001$) and the 495 wild 1SW fish count in 1991 forecasts a count in 1992 of 152 (90% CI 76 - 228) MSW salmon, 65% of the 1991 count and 30% of the 1986-1990 mean count.

**Inner Bay of Fundy (Portions of SFA 22 and SFA 23 )**

A downturn in catches and counts in inner Bay of Fundy rivers in 1990 again raised concerns that these salmon stocks were declining to irrecoverable levels. In-season restrictions on the retention of 1SW fish in the Big Salmon River, NB, 1989-1990, were widened in 1991 to closures of all harvests in inner Bay of Fundy of Nova Scotia and New Brunswick until 700 'salmon' were estimated to have ascended the Big Salmon River. Because 700 fish were never estimated to be in the Big Salmon River, harvests were terminated on August 24, 1991, and recreational fishing remained closed for Atlantic salmon. (A catch of 9 1SW fish in the recreational fishery of SFA 22 in occurred in the Gaspereau River prior to August 24, 1991; 25 salmon were taken in a Native food fishery in the Shubenacadie River before the Big Salmon River count was compleated). By comparison, the 1986-1990 retained catch of salmon <63 cm in SFA 22 was 738 fish; that of 1981-1990 was 1,072 fish. Catches in inner Fundy rivers of SFA 23 accounted for only 6% of the mean catches, 1984-1989, and 22% of the mean catch, 1974-1983 (Amiro et al. 1991).

Count of salmon obtained in September, 1991, by diving in the Big Salmon River was 256 salmon of which 41% was classed as <63 cm length. Accounting for one pool in which the count was not obtained, the total in-river estimate was 300 fish or 43% of the target for spawning and opening of fisheries to harvests. High water prevented a late season estimate. Age-1+ parr densities for four of six sites on the Big Salmon River in 1991 were similiar to values obtained 1989-1990 (Amiro 1992).

Counts of salmon conducted by Parks Canada divers in the Alma River in 1991

were 28 smaller fish, thought to be maiden 1SW salmon, and 12 large salmon, thought to be repeat spawners. These numbers are quite similar to those of 1990 and less than the target spawner requirement of 60 grilse and 29 salmon set by Parks Canada (Amiro 1992). A return of seven salmon to the Petitcodiac River fishway was equal to that of 1990 and the lowest count since records began in 1983.

Although the electrofishing boat CPK technique is at the developmental stage and difficult to interpret, the results suggest that spawning escapements in the Stewiacke River in 1991 may have exceeded those of 1989 or 1990 (Amiro 1992).

Mean density $100^{-1}$ $m^2$ at 31 sites in the Stewiacke River, 1991, was 12.3 age-1+ parr and 4.1 for age-2+ parr. The 1991 estimate of age-1+ parr was 60% of that of 1990 and the 1986-1990 mean; age-2+ parr were 67% of the 1986-1990 mean. Post-hoc comparison of annual mean density, adjusted for habitat and location in the system, indicated a significant ($p=0.036$) difference between 1991 and 1984 to 1990 means (Amiro 1992). A similiar analysis of fry densities indicated a significant ($p=0.002$) low mean density of fry in 1991.

**SFA 23 (South Western N.B.)**

Fishing effort (12,635 rod-days) and landings of salmon (1,915 1SW fish) in SFA 23 were down nearly 50% from the 1986-90 means (Table 1). In 1984-1989, when retention was permitted for the entire season, inner Fundy rivers accounted for only 6% of the mean retained catch.

Counts of salmon at Milltown fishway, St. Croix River, numbered 53 'grilse' and 154 'salmon'. Scale samples from 75% of the fish, external deformities and fin clips suggest that the run consisted of only 16 wild 1SW and 75 wild MSW salmon (Table 2). Wild designation of the numbers for previous years require review. Return rates of hatchery smolts (Maine Atlantic Sea-Run Salmon Commission) to the Milltown fishway in 1991 were 0.03% for 1SW fish released as smolts in 1990 and 0.1% for 2SW fish released as smolts in 1989.

The count of wild 1SW fish at Mactaquac in 1991 was 85% of the 1990 count and 79% and 91% of the previous 5- and 10- year mean counts (Table 2). However, estimated river returns of wild 1SW fish destined for Mactaquac in 1991 (App. 5) were 108% of the forecast (Marshall, in preparation). July entry of 1SW fish (normally about 70% of the total run) to the Mactaquac fishway lagged behind that of recent years by about two weeks, even though record low discharges from Mactaquac would have been expected to enhance the entry of available salmon into the fishway. Mean daily river discharges at Mactaquac in July were the lowest of a 26-year record. Return of hatchery 1SW fish originating from smolts released at Mactaquac was 0.67% (Table 3) which approximates the mean value, 1988-1990.

A count of 3,639 wild MSW salmon at Mactaquac in 1991 was 115% of the 1990 count and 131% and 108% of the 5- and 10- year mean counts (Table 2). Estimated wild MSW fish destined for Mactaquac (App. 5) were 108% of the 1990 forecast (Marshall, in preparation). Spawning requirement above Mactaquac is 4,400 MSW fish. The estimated escapement of 3,481 wild and hatchery MSW spawners (unadjusted for losses to poaching and disease) is 79% of the requirement. Egg depositions from 1SW fish contributed about 8% of the 2.4 eggs $m^{-2}$ requirement.

Forecasts of wild 1SW fish returning to the Saint John River in 1992 and destined for Mactaquac are 5,800 or 7,600 fish, depending on forecast method (Marshall, in preparation). Forecasts of wild MSW returns to Mactaquac in 1992 are 3,900 MSW fish by parametric regression technique or 4,200 MSW fish by non-parametric regression technique. Hatchery-origin 1SW returns are expected to number 2,000 fish, 80% of the number estimated to have returned in 1990. Hatchery MSW returns are expected to number 1,200 fish, about 60% more than were estimated to have returned in 1991. A total return of either 5,100 or 5,400 MSW salmon in 1992 would result in a potential surplus to spawning escapement of either 700 or 1,000 salmon. A total return of either 7,800 or 9,600 1SW returns will exceed spawning requirements by 4,400 or 6,400 fish.

## SUMMARY/SYNOPSIS

Retained catches of 1SW fish in the recreational fisheries of SFAs 19, 20, 21, and 23 fell to 54%, 60%, 16% and 50%, respectively, of the 1986-1990 landings and 54%, 66%, 19%, and 61%, respectively, of the previous 10-year mean landings. Released catches of MSW fish in SFAs 19, 20 and 21 also fell to 68%, 57%, and 28%, respectively, of the mean number released, 1986-1990 (MSW releases are not reported for SFA 23). Effort in SFAs 19, 20 21 and 23 was down to 77%, 74%, 51% and 47%, of the 1986-1989 mean effort possibly because of poor angling conditions (e.g., low river discharges, warm water temperatures, paucity of fish) through much of the angling season. Catch-per-unit effort for retained 1SW fish was 71%, 82%, 30% and 121% of the 1986-1990 mean in SFAs 19, 20, 21 and 23, respectively. All rivers of inner Fundy (portions of SFAs 22 and 23) were closed to angling.

Counts of wild adult salmon at most counting facilities in SFAs 19, 20, 21 and 23 were down from those of 1990 and the previous 5- and 10- year means. Wild 1SW counts in the Liscomb (SFA 20), LaHave (SFA 21) and Saint John (SFA 23) rivers were 68%, 24% and 79% respectively, of the 1986-1990 mean. Wild MSW counts were 48%, 45%, and 116% of the 1986-1990 mean. In-river counts of salmon in the Middle (SFA 19), Big Salmon and Alma (SFA 23) rivers were down from those of 1990 while an index of escapement for the Stewiacke River was up from that of 1988-1990.

Estimated returns of wild MSW salmon to Mactaquac on the Saint John River, 1991, was 132% of the parametric forecast; counts of MSW on the Liscomb and LaHave rivers were 70% and 55% of thier respective preseason forecasts.

The Middle (SFA 19), Alma and Big Salmon rivers and the Saint John River above

Mactaquac (SFA 23) did not achieve target spawning requirements. Escapement to the Petitcodiac and St. Croix rivers (SFA 23) was extremely low.

The estimayed egg deposition above Liscomb Falls on the Liscomb River (SFA 20) was 0.9 eggs $m^{-2}$; the potential egg deposition above Morgan Falls on the LaHave River (SFA 21) was 2.5 eggs $m^{-2}$, possibly the lowest since 1976. Target requirements for the Liscomb and LaHave Rivers remain to be established because these rivers are acid-impacted.

The percentage return of 1SW fish from hatchery smolts to the LaHave and Liscomb river counting facilities was the lowest and third lowest of the 13-year record. Survival of Saint John River smolts increased over the previous year but was the second lowest of the 16 year record. MSW return rates on the Lahave, Saint John and Liscomb rivers were among the lowest of the series.

Hatchery fish contributed 29% and 14% of the MSW and 1SW potential spawning escapement above Mactaquac on the Saint John River, 23% and 37% of MSW and 1SW fish above Liscomb Falls on the Liscomb River, 18% and 23% of 1SW and MSW salmon above Morgan Falls on the LaHave River and 45% of all salmon above the Grand River Falls on Grand River.

Forecasts indicate that wild MSW salmon returns in 1992 will be about the same as the 1991 count at the Liscomb River fishway and 65% of the 1991 count at Morgan Falls on the LaHave River. The estimated return of wild MSW salmon destined for Mactaquac on the Saint John River is expected to be 87% or 94% (depending on method) of the 1991 return. Wild 1SW returns to Mactaquac in 1992 are projected to be 92% or 121% (depending on method) of the 1991 return.

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Table 1. Numbers of 1SW salmon retained and MSW salmon retained and released and effort by SFA in the of Scotia-Fundy Region, 1974-1991*.

| Year | SFA 19 | | | | SFA 20 | | | | SFA 21 | | | | SFA 22** | | | | SFA 23 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Catch | | | | Catch | | | | Catch | | | | Catch | | | | Catch | | | |
| | 1SW | MSW | | Effort in rod-days | 1SW | MSW | | Effort in rod-days | 1SW | MSW | | Effort in rod-days | 1SW | MSW | | Effort in rod-days | 1SW | MSW | | Effort in rod-days |
| | | Ret. | Rel. | | | Ret. | Rel. | | | Ret. | Rel. | | | Ret. | Rel. | | | Ret. | | |
| 1974 | 416 | 588 | | 7,229 | 3,462 | 434 | | 24,977 | 2,462 | 397 | | 13,236 | 2,004 | 714 | | 7,418 | 1,312 | 1,798 | | 16,897 |
| 1975 | 117 | 213 | | 2,157 | 694 | 94 | | 8,455 | 1,416 | 656 | | 8,286 | 818 | 293 | | 3,662 | 1,888 | 1,691 | | 17,078 |
| 1976 | 278 | 445 | | 4,209 | 2,652 | 219 | | 18,530 | 2,474 | 321 | | 16,026 | 1,931 | 537 | | 8,815 | 3,150 | 2,498 | | 20,511 |
| 1977 | 768 | 561 | | 6,703 | 1,639 | 422 | | 14,364 | 3,434 | 643 | | 20,278 | 296 | 898 | | 9,267 | 2,040 | 2,553 | | 22,792 |
| 1978 | 257 | 456 | | 10,780 | 396 | 272 | | 12,403 | 460 | 481 | | 9,748 | 1,681 | 334 | | 6,078 | 843 | 924 | | 17,128 |
| 1979 | 281 | 304 | | 16,761 | 2,178 | 267 | | 22,312 | 2,969 | 374 | | 14,834 | 1,258 | 490 | | 13,030 | 3,034 | 927 | | 21,420 |
| 1980 | 997 | 795 | | 30,143 | 3,483 | 469 | | 25,458 | 2,773 | 1,104 | | 25,682 | 151 | 526 | | 6,408 | 2,734 | 2,860 | | 28,947 |
| 1981 | 1,265 | 496 | | 9,365 | 2,556 | 581 | | 30,840 | 4,342 | 1,284 | | 38,111 | 1,045 | 379 | | 6,887 | 1,963 | 1,473 | | 30,423 |
| 1982 | 857 | 523 | | 18,661 | 1,657 | 201 | | 28,187 | 1,847 | 494 | | 28,351 | 983 | 444 | | 8,717 | 3,129 | 2,361 | | 45,520 |
| 1983 | 240 | 269 | | 15,322 | 1,336 | 401 | | 37,352 | 471 | 409 | | 13,743 | 2,402 | 386 | | 16,764 | 2,210 | 1,103 | | 40,311 |
| 1984 | 821 | 108 | 358 | 8,759 | 1,744 | 128 | 282 | 14,426 | 2,159 | 232 | 316 | 18,868 | 966 | 29 | 257 | 10,226 | 2,891 | 0 | | 28,912 |
| 1985 | 1,015 | 0 | 833 | 7,749 | 2,555 | 0 | 1,713 | 17,578 | 2,790 | 0 | 1,567 | 18,863 | 1,634 | 0 | 578 | 11,619 | 4,485 | 0 | | 38,716 |
| 1986 | 804 | 0 | 1,976 | 8,901 | 2,268 | 0 | 1,622 | 20,150 | 3,110 | 0 | 1,583 | 23,240 | 830 | 0 | 843 | 11,710 | 4,033 | 0 | | 33,555 |
| 1987 | 890 | 0 | 1,390 | 8,139 | 1,771 | 0 | 686 | 13,251 | 4,395 | 0 | 799 | 24,593 | 255 | 0 | 311 | 6,347 | 3,870 | 0 | | 26,870 |
| 1988 | 873 | 0 | 1,580 | 10,357 | 2,758 | 0 | 1,280 | 21,434 | 3,022 | 0 | 846 | 27,222 | 574 | 0 | 175 | 6,788 | 2,991 | 0 | | 26,627 |
| 1989 | 675 | 0 | 1,247 | 8,081 | 1,884 | 0 | 940 | 17,908 | 4,016 | 0 | 1,150 | 27,981 | 1,755 | 0 | 365 | 10,572 | 3,590 | 0 | | 26,354 |
| 1990 | 865 | 0 | 1,370 | 9,141 | 3,029 | 0 | 696 | 17,787 | 3,497 | 0 | 933 | 29,029 | 274 | 0 | 114 | 5,598 | 2,613 | 0 | | 21,915 |
| 1991 | 452 | 0 | 1,076 | 7,076 | 1,392 | 0 | 604 | 13,133 | 557 | 0 | 313 | 13,411 | 9 | 0 | 27 | 845 | 1,915 | 0 | | 12,635 *** |
| Means | | | | | | | | | | | | | | | | | | | | |
| 1976-90 | 726 | | | 11,538 | 2,127 | | | 20,799 | 2,784 | | | 22,438 | 1,069 | | | 9,255 | 2,905 | | | 28,667 |
| 1981-90 | 831 | | | 10,447 | 2,156 | | | 21,891 | 2,965 | | | 25,000 | 1,072 | | | 9,523 | 3,178 | | | 31,920 |
| 1986-90 | 821 | | 1,513 | 8,924 | 2,342 | | 1,045 | 18,106 | 3,608 | | 1,062 | 26,413 | 738 | | 362 | 8,203 | 3,419 | | | 27,064 |

* SFA's 19-22 based on DFO estimates 1974-1983 adjusted by differential between DFO and Nova Scotia license stub returns, 1983; i.e., 1.52, 1.32, 1.36, and 1.04 and license stub returns since 1983. SFA 23 based on DFO estimates.

** SFA 22 data for 1983 are based on Nova Scotia license stub data, not converted DFO figures.

*** Incomplete.

Table 2. Counts of wild Atlantic salmon from fishway traps in SFAs 19, 20, 21 and 23, Scotia-Fundy Region.

| | SFA 19 | | SFA 20 | | SFA 21 | | SFA 23 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Grand a | | Liscomb | | LaHave | | Saint John | | St. Croix b | |
| Year | 1SW | MSW | 1SW | MSW | 1SW | MSW | 1SW | MSW | 1SW | MSW |
| 1974 | | | | | 29 | 2 | 3,389 | 4,775 | | |
| 1975 | | | | | 38 | 5 | 5,725 | 6,200 | | |
| 1976 | | | | | 178 | 23 | 6,797 | 5,511 | | |
| 1977 | | | | | 292 | 25 | 3,504 | 7,247 | | |
| 1978 | | | | | 275 | 67 | 1,584 | 3,034 | | |
| 1979 | | | 60 | | 856 | 67 | 6,234 | 1,993 | | |
| 1980 | | | 111 | 0 | 1,637 | 288 | 7,555 | 8,157 | | |
| 1981 | | | 76 | 6 | 1,866 | 366 | 4,571 | 2,441 | | |
| 1982 | | | 252 | 10 | 799 | 256 | 3,932 | 2,262 | 10 | 51 |
| 1983 | | | 520 | 15 | 1,129 | 213 | 3,623 | 1,712 | 22 | 78 |
| 1984 | | | 606 | 48 | 2,043 | 384 | 7,353 | 7,011 | 166 | 64 |
| 1985 | | | 507 | 87 | 1,343 | 638 | 5,331 | 6,391 | 41 | 264 |
| 1986 | | | 736 | 117 | 1,579 | 584 | 6,347 | 3,656 | 38 | 204 |
| 1987 | | | 1,614 | 88 | 2,529 | 532 | 5,097 | 3,088 | 128 | 135 |
| 1988 | 553 | 25 | 477 | 76 | 2,464 | 380 | 8,062 | 1,930 | 93 | 190 |
| 1989 | 490 | 50 | 532 | 75 | 2,087 | 511 | 8,417 | 3,854 | 79 | 94 |
| 1990 | 269 | 50 | 955 | 44 | 1,861 | 596 | 6,486 | 3,163 | 10 | 52 |
| 1991 | 139 | 13 | 586 | 38 | 495 | 236 | 5,415 | 3,639 | 16 | 75 |
| Means: | | | | | | | | | | |
| 1986-90 | N/A | N/A | 863 | 80 | 2,104 | 521 | 6,882 | 3,138 | 70 | 135 |
| 1981-90 | N/A | N/A | 628 | 57 | 1,770 | 446 | 5,922 | 3,551 | 65 | 126 |
| 1991 as % | | | | | | | | | | |
| 1986-90 | N/A | N/A | 68% | 48% | 24% | 45% | 79% | 116% | 23% | 56% |
| 1981-90 | N/A | N/A | 93% | 67% | 28% | 53% | 91% | 102% | 25% | 60% |

a. By-pass rate may vary annually.

b. Wild designation under review.

Table 3. Estimated numbers of 1SW and 2SW returns from hatchery-reared smolts released at or above counting facilities on Scotia-Fundy rivers, 1975-1990.

| Sea-age | River | Smolts (1000's) Returns | Smolt year i | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
| 1SW | LaHave | Smolts a. | | | | 83.9 | 21.9 | 61.4 | 29.0 | 2.0 | 19.6 | 7.2 | 5.6 | 23.4 | 26.9 | 21.4 | 33.2 | 12.5 |
| | | Ret. (i+1) | | | | 1,064 | 336 | 1,181 | 621 | 27 | 250 | 102 | 135 | 573 | 1,056 | 405 | 573 | 109 |
| | | % | | | | 1.27 | 1.54 | 1.92 | 2.14 | 1.32 | 1.27 | 1.42 | 2.42 | 2.45 | 3.92 | 1.89 | 1.72 | 0.87 |
| | Tusket | Smolts | | | | | | 11.3 | 29.4 | 15.8 | 52.1 | 10.0 | 22.6 | 55.7 | 30.3 | 48.1 | 32.4 | 36.7 |
| | | Ret. (i+1) | | | | | | 110 | 108 | 102+ | 41+ | 51+ | 71 | 735 | 348+ | 314 | 323 | |
| | | % | | | | | | 0.97 | 0.37 | 0.64+ | 0.08+ | 0.51+ | 0.31 | 1.32 | 1.15+ | 0.65 | 1.00 | |
| | Liscomb | Smolts | | | | 47.4 | 57.5 | 26.9 | 42.4 | 43.8 | 58.2 | 50.0 | 29.6 | 19.0 | 31.3 | 48.4 | 28.0 | 22.4 |
| | | Ret. (i+1) | | | | 485 | 931 | 241 | 827 | 594 | 331 | 175 | 766 | 523 | 431 | 288 | 438 | 178 |
| | | % | | | | 1.02 | 1.61 | 0.90 | 1.95 | 1.35 | 0.57 | 0.35 | 2.59 | 2.75 | 1.38 | 0.60 | 1.56 | 0.79 |
| | Saint John | Smolts b. | 324.2 | 297.4 | 293.1 | 196.2 | 244.0 | 232.3 | 189.1 | 172.2 | 144.5 | 206.5 | 89.1 | 191.5 | 113.4 | 142.4 | 238.2 | 241.1 |
| | | Ret. (i+1) | 9,074 | 6,992 | 3,044 | 3,827 | 10,793 | 4,730 | 2,732 | 1,337 | 1,410 | 1,899 | 773 | 3,006 | 762 | 1,085 | 965 | 1,610 |
| | | % | 2.80 | 2.35 | 1.04 | 1.95 | 4.42 | 2.04 | 1.44 | 0.78 | 0.97 | 0.92 | 0.87 | 1.57 | 0.67 | 0.76 | 0.40 | 0.67 |
| MSW | LaHave | Smolts a. | | | | 83.9 | 21.9 | 61.4 | 29.0 | 2.0 | 19.6 | 7.2 | 5.6 | 23.4 | 26.9 | 21.4 | 33.2 | |
| | | Ret. (i+2) | | | | 385 | 116 | 102 | 64 | 0 | 63 | 49 | 54 | 54 | 164 | 83 | 72 | |
| | | % | | | | 0.46 | 0.53 | 0.17 | 0.22 | 0.00 | 0.32 | 0.68 | 0.97 | 0.23 | 0.61 | 0.39 | 0.22 | |
| | Tusket | Smolts | | | | | | 11.3 | 29.4 | 15.8 | 52.1 | 10.0 | 22.6 | 55.7 | 30.3 | 48.1 | 32.4 | |
| | | Ret. (i+2) | | | | | | 12 | 16+ | 6+ | 17+ | 8 | 11 | 59+ | 65 | 44 | | |
| | | % | | | | | | 0.11 | .05+ | .04+ | .03+ | 0.08 | 0.05 | 0.11+ | 0.21 | 0.09 | | |
| | Liscomb | Smolts | | | | 47.4 | 57.7 | 26.9 | 42.4 | 43.8 | 58.2 | 50.0 | 29.6 | 19.0 | 31.3 | 48.4 | 28.0 | |
| | | Ret. (i+2) | | | | 51 | 49 | 41 | 63 | 42 | 49 | 108 | 54 | 44 | 71 | 22 | 22 | |
| | | % | | | | 0.11 | 0.08 | 0.15 | 0.15 | 0.10 | 0.08 | 0.22 | 0.18 | 0.23 | 0.23 | 0.05 | 0.08 | |
| | Saint John | Smolts b. | 324.2 | 297.4 | 293.1 | 196.2 | 244.0 | 232.3 | 189.1 | 172.2 | 144.5 | 206.5 | 89.1 | 191.5 | 113.4 | 142.4 | 238.2 | |
| | | Ret. (i+2) c. | 2,725 | 2,534 | 1,188 | 2,992 | 2,612 | 1,531 | 539 | 963 | 799 | 714 | 403 | 678 | 374 | 474 | 429 | |
| | | % | 0.84 | 0.85 | 0.40 | 1.52 | 1.07 | 0.66 | 0.28 | 0.56 | 0.55 | 0.35 | 0.45 | 0.35 | 0.33 | 0.33 | 0.18 | |

a. Estimated "good quality" smolts.
b. Smolts > 12 cm.
c. Incl. some repeat spawners.
+ Potentially higher.

Appendix 1. Atlantic salmon sportcatch and effort for Scotia-Fundy Region rivers for 1990 and 1991, contrasted with mean catches 1986-90.

| River | 1991 | | | | 1990 | | | | 1986 - 90 means | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grilse | | Salmon | | Grilse | | Salmon | | Grilse | | | | Salmon | | Effort | |
| | retained | released | released | Effort | retained | released | released | Effort | retained | 95% C.I. | released | 95% C.I. | released | 95% C.I. | roddays | 95% C.I. |
| **Salmon Fishing Area 19** | | | | | | | | | | | | | | | | |
| Aconi Brook | 8 | 0 | 8 | 41 | 13 | 1 | 15 | 65 | 4.6 | 6.22 | 0.2 | 0.51 | 3.2 | 7.60 | 45.2 | 59.46 |
| Baddeck | 28 | 23 | 213 | 640 | 40 | 30 | 182 | 580 | 22.6 | 13.45 | 15.6 | 10.59 | 173.0 | 52.53 | 466.4 | 85.09 |
| Barachois | 4 | 3 | 22 | 110 | 6 | 8 | 21 | 98 | 6.2 | 3.85 | 3.6 | 3.69 | 19.2 | 14.09 | 62.0 | 30.54 |
| Catalone | 5 | 1 | 3 | 225 | 27 | 3 | 19 | 403 | 57.2 | 31.38 | 7.2 | 6.05 | 45.8 | 33.83 | 751.8 | 319.53 |
| Clyburne | 4 | 0 | 4 | 38 | 0 | 0 | 0 | 3 | 1.0 | 1.99 | 0.6 | 1.54 | 5.0 | 7.54 | 29.8 | 25.80 |
| Framboise | 24 | 5 | 22 | 283 | 33 | 9 | 29 | 464 | 70.0 | 24.73 | 5.6 | 3.87 | 46.8 | 15.77 | 528.2 | 106.40 |
| Gaspereau: Cape Breton Co. | 1 | 0 | 1 | 52 | 1 | 0 | 0 | 16 | 0.8 | 0.96 | 0.0 | 0.00 | 0.2 | 0.51 | 20.0 | 13.77 |
| Gerratt | 1 | 1 | 0 | 37 | 4 | 6 | 0 | 37 | 1.6 | 2.09 | 2.4 | 3.00 | 0.4 | 0.63 | 23.0 | 18.45 |
| Grand | 115 | 13 | 18 | 1985 | 335 | 78 | 101 | 2858 | 306.0 | 20.87 | 43.2 | 29.51 | 115.4 | 52.62 | 2793.6 | 527.49 |
| Indian Brook | 3 | 8 | 26 | 89 | 1 | 1 | 9 | 40 | 2.8 | 2.49 | 2.0 | 2.15 | 13.0 | 10.51 | 35.2 | 14.98 |
| Ingonish | 10 | 1 | 4 | 103 | 10 | 0 | 14 | 51 | 5.4 | 4.19 | 2.0 | 3.25 | 17.6 | 12.74 | 57.0 | 61.29 |
| Inhabitants | 38 | 6 | 139 | 367 | 37 | 10 | 105 | 489 | 33.2 | 11.57 | 4.4 | 5.37 | 158.4 | 83.94 | 371.4 | 86.60 |
| Little Lorraine | | | | | 0 | 0 | 0 | 0 | 0.4 | 1.03 | 0.0 | 0.00 | 0.0 | 0.00 | 1.0 | 1.99 |
| Lorraine Brook | 0 | 3 | 0 | 58 | 15 | 1 | 3 | 200 | 22.4 | 9.98 | 1.2 | 0.51 | 5.4 | 3.31 | 218.0 | 61.29 |
| MacAskill's Brook | | | | | 1 | 6 | 9 | 65 | 0.2 | 0.51 | 1.2 | 3.09 | 1.8 | 4.63 | 13.0 | 33.42 |
| Marie Joseph | 1 | 0 | 0 | 24 | 14 | 0 | 1 | 95 | 15.4 | 7.70 | 1.6 | 2.52 | 3.6 | 3.11 | 81.8 | 21.84 |
| Middle: Victoria Co. | 18 | 9 | 186 | 856 | 80 | 28 | 197 | 1005 | 49.2 | 21.35 | 12.8 | 10.52 | 168.0 | 80.04 | 740.2 | 264.52 |
| Mira | 21 | 1 | 9 | 219 | 14 | 0 | 13 | 308 | 11.2 | 9.39 | 0.4 | 0.63 | 9.2 | 8.31 | 185.2 | 104.73 |
| North: Victoria Co. | 148 | 38 | 355 | 1391 | 202 | 66 | 610 | 1846 | 160.4 | 44.68 | 44.0 | 21.15 | 619.2 | 266.89 | 1696.8 | 306.83 |
| North Aspy | 9 | 1 | 35 | 99 | 0 | 0 | 10 | 60 | 4.0 | 5.01 | 1.4 | 1.92 | 37.0 | 27.37 | 84.0 | 52.78 |
| Northwest Brook (River Ryan) | 0 | 0 | 0 | 40 | 1 | 0 | 10 | 39 | 0.2 | 0.51 | 0.0 | 0.00 | 2.0 | 5.14 | 10.0 | 18.95 |
| River Bennett | | | | | 0 | 0 | 0 | 0 | 0.2 | 0.51 | 0.0 | 0.00 | 0.8 | 2.06 | 2.6 | 6.68 |
| River Deny's | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 1.8 | 4.63 | 0.4 | 1.03 | 1.2 | 3.09 | 1.8 | 3.39 |
| River Tillard | 5 | 4 | 15 | 72 | 19 | 3 | 10 | 77 | 15.0 | 8.17 | 2.2 | 3.39 | 24.4 | 23.60 | 120.2 | 38.47 |
| Saint Esprit | 0 | 0 | 0 | 3 | 1 | 0 | 1 | 13 | 2.6 | 5.43 | 0.0 | 0.00 | 2.0 | 3.90 | 23.8 | 38.84 |
| Salmon: Cape Breton Co. | 8 | 5 | 9 | 339 | 11 | 1 | 11 | 321 | 19.2 | 11.90 | 1.2 | 1.89 | 23.0 | 10.35 | 462.6 | 180.97 |
| Skye | | | | | 0 | 0 | 0 | 0 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 |
| Sydney | 0 | 0 | 9 | 4 | 0 | 0 | 0 | 7 | 0.0 | 0.00 | 0.2 | 0.51 | 3.4 | 5.73 | 10.4 | 12.58 |
| Totals | 451 | 122 | 1078 | 7078 | 865 | 251 | 1370 | 9141 | 814 | | 153 | | 1499 | | 8835 | |



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Appendix 1. (Continued)

| River | 1991 Grilse retained | 1991 Grilse released | 1991 Salmon released | 1991 Effort | 1990 Grilse retained | 1990 Grilse released | 1990 Salmon released | 1990 Effort | 1986 - 90 means Grilse retained | 95% C.I. | Grilse released | 95% C.I. | Salmon released | 95% C.I. | Effort roddays | 95% C.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Salmon Fishing Area 20** | | | | | | | | | | | | | | | | |
| Clam Harbour | 0 | 0 | 0 | 5 | 3 | 0 | 0 | 23 | 0.6 | 1.54 | 0.0 | 0.00 | 0.0 | 0.00 | 4.8 | 11.71 |
| Cole Harbour | 10 | 0 | 4 | 40 | 6 | 1 | 1 | 7 | 1.2 | 3.09 | 0.2 | 0.51 | 0.2 | 0.51 | 1.4 | 3.60 |
| Country Harbour | 40 | 1 | 13 | 175 | 32 | 13 | 6 | 179 | 28.8 | 8.73 | 8.8 | 5.10 | 10.2 | 5.10 | 202.4 | 54.74 |
| East Sheet Harbour | 15 | 1 | 1 | 97 | 21 | 9 | 0 | 202 | 62.0 | 59.51 | 14.6 | 21.58 | 11.4 | 11.08 | 378.4 | 345.28 |
| Ecum Secum | 19 | 0 | 1 | 417 | 93 | 9 | 6 | 948 | 85.8 | 20.65 | 9.0 | 4.38 | 13.4 | 7.52 | 736.4 | 196.53 |
| Gaspereau Brook | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 55 | 4.8 | 5.54 | 0.2 | 0.51 | 0.2 | 0.51 | 39.2 | 19.09 |
| Guysborough | 1 | 0 | 4 | 13 | 3 | 0 | 6 | 22 | 2.8 | 2.75 | 0.0 | 0.00 | 2.0 | 3.25 | 29.4 | 16.41 |
| Halfway Brook | 1 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0.4 | 1.03 | 0.0 | 0.00 | 0.0 | 0.00 | 3.6 | 5.90 |
| Isaac's Harbour | 4 | 0 | 0 | 68 | 33 | 1 | 1 | 141 | 29.0 | 4.38 | 1.4 | 2.38 | 1.6 | 2.89 | 138.4 | 34.57 |
| Kirby | 1 | 0 | 0 | 29 | 5 | 0 | 0 | 26 | 8.0 | 7.67 | 0.2 | 0.51 | 2.6 | 4.27 | 45.0 | 44.87 |
| Larry's | | | | | 0 | 0 | 0 | 5 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 2.0 | 3.15 |
| Lawrencetown Lake | 4 | 3 | 0 | 49 | 5 | 3 | 1 | 39 | 1.4 | 2.52 | 0.6 | 1.54 | 0.2 | 0.51 | 10.8 | 19.37 |
| Liscomb | 46 | 18 | 5 | 513 | 165 | 11 | 6 | 737 | 157.2 | 85.91 | 23.2 | 22.40 | 18.2 | 12.07 | 891.6 | 165.11 |
| Little Salmon | | | | | 0 | 0 | 0 | 7 | 0.0 | 0.00 | 0.0 | 0.00 | 2.4 | 6.17 | 8.8 | 18.46 |
| Moser | 106 | 26 | 12 | 633 | 220 | 34 | 20 | 1239 | 199.2 | 46.59 | 17.4 | 12.56 | 23.0 | 21.09 | 1172.6 | 275.32 |
| Musquodoboit | 106 | 26 | 144 | 2142 | 255 | 68 | 130 | 3448 | 259.2 | 71.71 | 107.6 | 53.43 | 225.0 | 111.61 | 3778.0 | 1108.12 |
| Necum Teuch | | | | | 0 | 0 | 0 | 0 | 0.2 | 0.51 | 0.8 | 1.26 | 0.4 | 1.03 | 4.2 | 6.32 |
| New Harbour | 23 | 0 | 1 | 335 | 100 | 4 | 3 | 632 | 37.6 | 40.80 | 0.8 | 2.06 | 1.8 | 2.49 | 349.8 | 189.46 |
| Port Dufferin | 5 | 0 | 0 | 119 | 27 | 4 | 0 | 193 | 25.0 | 15.53 | 2.0 | 2.70 | 1.6 | 3.51 | 181.0 | 69.89 |
| Porters Lake (East Brook) | | | | | 0 | 0 | 0 | 0 | 0.2 | 0.51 | 0.0 | 0.00 | 0.0 | 0.00 | 0.8 | 2.06 |
| Quoddy | 0 | 0 | 0 | 17 | 1 | 0 | 0 | 26 | 2.0 | 4.53 | 0.0 | 0.00 | 0.4 | 0.63 | 22.6 | 9.78 |
| Rocky Run Porters Lake | | | | | 0 | 0 | 0 | 3 | 0.2 | 0.51 | 0.0 | 0.00 | 0.0 | 0.00 | 6.8 | 15.63 |
| Saint Francis | | | | | 0 | 0 | 0 | 0 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 1.0 | 2.57 |
| Saint Mary's | 744 | 231 | 264 | 5486 | 1612 | 451 | 274 | 6536 | 1007.6 | 529.36 | 227.2 | 177.32 | 537.8 | 321.47 | 6610.4 | 1754.97 |
| Salmon: Guysborough Co. | 190 | 23 | 148 | 1809 | 250 | 34 | 226 | 1787 | 198.2 | 96.35 | 12.4 | 14.33 | 152.0 | 80.30 | 1435.4 | 407.61 |
| Salmon: Halifax Co. | 3 | 0 | 0 | 30 | 21 | 0 | 3 | 125 | 10.0 | 8.87 | 1.6 | 2.52 | 2.2 | 2.21 | 95.8 | 38.37 |
| Ship Harbour Lake Charlotte | 5 | 0 | 0 | 264 | 24 | 0 | 3 | 292 | 34.8 | 15.71 | 0.4 | 1.03 | 4.4 | 1.74 | 387.2 | 130.62 |
| Tangier | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 14 | 0.0 | 0.00 | 0.0 | 0.00 | 0.2 | 0.51 | 12.6 | 6.97 |
| West Sheet Harbour | 67 | 9 | 8 | 864 | 150 | 9 | 9 | 1102 | 160.8 | 71.98 | 13.2 | 20.73 | 22.4 | 9.36 | 1360.2 | 492.46 |
| Totals | 1390 | 338 | 605 | 13130 | 3029 | 651 | 695 | 17788 | 2317 | | 442 | | 1034 | | 17911 | |



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Appendix 1. (Continued)

| River | 1991 Grilse retained | 1991 Grilse released | 1991 Salmon released | 1991 Effort | 1990 Grilse retained | 1990 Grilse released | 1990 Salmon released | 1990 Effort | 1986 - 90 means Grilse retained | 95% C.I. | Grilse released | 95% C.I. | Salmon released | 95% C.I. | Effort roddays | 95% C.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Salmon fishing area 21** | | | | | | | | | | | | | | | | |
| Broad | | | | | 0 | 0 | 0 | 0 | 0.0 | 0.00 | 0.0 | 0.00 | 2.4 | 6.17 | 17.4 | 44.74 |
| Clyde | 15 | 0 | 0 | 355 | 29 | 1 | 0 | 475 | 49.4 | 56.31 | 12.4 | 18.34 | 12.0 | 22.46 | 467.2 | 322.39 |
| East: Lunenburg Co. | 0 | 0 | 0 | 11 | 0 | 1 | 0 | 8 | 0.2 | 0.51 | 0.8 | 0.51 | 0.2 | 0.51 | 8.0 | 3.64 |
| Gold | 51 | 4 | 26 | 1087 | 318 | 72 | 91 | 3081 | 313.0 | 114.65 | 38.4 | 26.92 | 99.8 | 59.98 | 2572.4 | 561.23 |
| Ingram | 3 | 1 | 0 | 68 | 3 | 1 | 0 | 51 | 2.8 | 3.19 | 2.8 | 2.49 | 0.4 | 1.03 | 45.6 | 10.46 |
| LaHave | 233 | 44 | 142 | 4359 | 2008 | 373 | 581 | 14057 | 2068.6 | 487.12 | 312.4 | 128.71 | 593.2 | 275.43 | 12927.4 | 995.00 |
| Martins | | | | | 0 | 0 | 0 | 4 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 4.0 | 6.14 |
| Medway | 47 | 3 | 47 | 2637 | 590 | 27 | 144 | 5466 | 630.6 | 126.87 | 36.6 | 10.80 | 198.2 | 79.46 | 5210.6 | 478.02 |
| Mersey | 65 | 8 | 21 | 2251 | 143 | 11 | 9 | 2212 | 95.4 | 45.69 | 9.6 | 7.70 | 22.2 | 23.82 | 1578.8 | 730.86 |
| Middle: Lunenburg Co | 1 | 0 | 0 | 5 | 1 | 3 | 0 | 22 | 1.6 | 1.74 | 3.4 | 1.31 | 0.4 | 0.63 | 26.0 | 23.35 |
| Mushamush | 10 | 0 | 0 | 37 | 37 | 1 | 8 | 331 | 40.4 | 17.41 | 2.0 | 1.99 | 7.6 | 4.03 | 333.2 | 33.71 |
| Nine Mile | | | | | 0 | 0 | 0 | 0 | 0.0 | 0.00 | 0.0 | 0.00 | 0.2 | 0.51 | 4.6 | 3.31 |
| Petite Riviere | 35 | 1 | 6 | 546 | 157 | 9 | 24 | 952 | 119.2 | 48.90 | 14.8 | 9.03 | 24.2 | 9.43 | 937.0 | 153.68 |
| Sackville | 19 | 8 | 13 | 397 | 34 | 11 | 14 | 295 | 16.8 | 20.23 | 6.2 | 9.21 | 5.2 | 7.38 | 102.6 | 144.49 |
| Salmon: Digby Co. | 18 | 4 | 8 | 350 | 51 | 6 | 21 | 666 | 71.6 | 14.05 | 10.2 | 6.87 | 20.2 | 12.79 | 619.0 | 88.70 |
| Tusket | 58 | 10 | 50 | 1302 | 128 | 10 | 42 | 1408 | 176.0 | 119.66 | 18.6 | 12.45 | 69.6 | 49.50 | 1334.8 | 544.56 |
| Totals | 555 | 83 | 313 | 13405 | 3499 | 526 | 934 | 29028 | 3586 | | 468 | | 1056 | | 26189 | |



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Appendix 1. (Continued)

| River | 1991 Grilse retained | 1991 Salmon released | 1991 Salmon released | 1991 Effort | 1990 Grilse retained | 1990 Salmon released | 1990 Salmon released | 1990 Effort | 1986 - 90 means Grilse retained | 95% C.I. | Grilse released | 95% C.I. | Salmon released | 95% C.I. | Effort roddays | 95% C.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Salmon Fishing Area 22** | | | | | | | | | | | | | | | | |
| Annapolis | 0 | 0 | 0 | 5 | 4 | 0 | 0 | 31 | 3.2 | 2.06 | 0.0 | 0.00 | 1.2 | 1.50 | 46.4 | 21.40 |
| Apple | | | | | 1 | 1 | 1 | 40 | 2.8 | 3.09 | 0.2 | 0.51 | 3.0 | 6.45 | 49.8 | 37.30 |
| Bass | | | | | 0 | 0 | 0 | 0 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 |
| Chiganois | | | | | 0 | 0 | 0 | 14 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 15.4 | 4.99 |
| Cornwallis | 0 | 0 | 1 | 21 | 3 | 0 | 0 | 61 | 3.8 | 6.67 | 2.0 | 3.25 | 3.4 | 6.88 | 93.8 | 53.96 |
| Debert | | | | | 4 | 0 | 0 | 106 | 14.6 | 15.69 | 1.4 | 3.00 | 7.2 | 11.19 | 185.2 | 92.87 |
| Diligent | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 |
| East Colchester | | | | | 3 | 0 | 4 | 18 | 0.6 | 1.54 | 0.0 | 0.00 | 0.8 | 2.06 | 4.4 | 8.85 |
| Economy | | | | | 0 | 0 | 4 | 30 | 5.4 | 5.31 | 0.6 | 1.03 | 2.8 | 1.89 | 130.0 | 99.29 |
| Folly | | | | | 8 | 4 | 0 | 90 | 19.6 | 17.99 | 3.4 | 3.95 | 3.2 | 4.10 | 164.8 | 88.92 |
| Gaspereau: Kings Co. | 9 | 1 | 26 | 646 | 23 | 9 | 43 | 665 | 36.8 | 16.39 | 2.2 | 4.41 | 32.4 | 14.47 | 542.0 | 92.23 |
| Great Village | | | | | 1 | 0 | 0 | 13 | 5.4 | 9.54 | 1.4 | 3.60 | 1.2 | 1.26 | 21.0 | 18.32 |
| Harrington | | | | | 0 | 1 | 4 | 25 | 0.0 | 0.00 | 0.2 | 0.51 | 0.8 | 2.06 | 5.0 | 12.86 |
| Kennetcook | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 0.2 | 0.51 | 0.0 | 0.00 | 0.0 | 0.00 | 13.4 | 13.72 |
| Lequille | 0 | 0 | 0 | 40 | | | | | | | | | | | | |
| Maccan | 0 | 0 | 0 | 1 | 24 | 9 | 5 | 621 | 54.8 | 54.92 | 7.6 | 6.63 | 12.8 | 16.06 | 710.8 | 331.55 |
| Meander (Avon) | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 |
| Nappan | | | | | 0 | 0 | 0 | 33 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 8.8 | 16.29 |
| Nictaux | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 3.6 | 7.48 |
| North : Colchester | 0 | 0 | 0 | 4 | 10 | 1 | 0 | 164 | 58.8 | 56.81 | 6.4 | 6.68 | 10.8 | 11.25 | 347.8 | 169.44 |
| Portapique | | | | | 4 | 3 | 1 | 34 | 6.6 | 6.83 | 2.2 | 2.21 | 1.0 | 0.81 | 39.2 | 15.39 |
| Ramshead (Ramsey) | | | | | 0 | 0 | 0 | 0 | 0.0 | 0.51 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 |
| River Hebert | | | | | 9 | 0 | 1 | 188 | 25.0 | 36.08 | 2.6 | 4.27 | 3.6 | 4.19 | 294.6 | 167.54 |
| Round Hill | | | | | 0 | 0 | 0 | 0 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.2 | 0.51 |
| Saint Croix | 0 | 0 | 0 | 33 | 16 | 0 | 0 | 327 | 9.4 | 13.52 | 3.8 | 9.77 | 0.0 | 0.00 | 159.2 | 160.53 |
| Salmon: Colchester | | | | | 1 | 1 | 1 | 177 | 40.8 | 43.09 | 13.4 | 23.68 | 19.0 | 15.68 | 326.6 | 191.10 |
| Shubenacadie | 0 | 0 | 0 | 20 | 21 | 0 | 9 | 248 | 50.8 | 31.75 | 5.2 | 5.77 | 31.0 | 33.06 | 678.0 | 507.27 |
| Stewiacke | 0 | 6 | 0 | 23 | 143 | 30 | 40 | 2710 | 394.0 | 458.74 | 79.2 | 104.43 | 226.0 | 243.85 | 4306.0 | 1896.18 |
| Totals | 9 | 7 | 27 | 845 | 275 | 59 | 113 | 5598 | 732.6 | | 131.8 | | 360.2 | | 8146 | |

...cont'd

Appendix 1. (Continued)

| River | 1991 Grilse retained | 1991 Salmon released | 1991 Salmon released | 1991 Effort | 1990 Grilse retained | 1990 Grilse released | 1990 Salmon released | 1990 Effort | 1986 - 90 means Grilse retained | 95% C.I. | Grilse released | 95% C.I. | Salmon released | 95% C.I. | Effort roddays | 95% C.I. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Salmon fishing area 23** | | | | | | | | | | | | | | | | |
| Alma | | | | | 4 | U | 2 | 35 | 6.6 | 8.97 | U | | 0.4 | * | 65.8 | * |
| Big Salmon | | | | | 45 | U | U | 517 | 76 | 65.25 | U | | 0 | * | 727.6 | * |
| Canaan | | | | | 6 | U | U | 32 | 8.6 | 11.99 | U | | 0 | * | 47.8 | * |
| Dennis Stream | 7 | 2 | 18 | | | | | | | | | | | | | |
| Digdeguash | 5 | 1 | 26 | | 18 | U | 5 | 95 | 16 | 6.70 | U | | 4 | * | 109.6 | * |
| Hammond | | | | | 150 | U | U | 794 | 118.4 | 66.35 | U | | 0 | * | 720.4 | * |
| Kennebecasis | | | | | 50 | U | 20 | 200 | 152.6 | 158.53 | U | | 4 | * | 1614 | * |
| Magaguadavic | 67 | 46 | 360 | | 89 | U | 48 | 477 | 79.2 | 69.83 | U | | 44.6 | * | 454.4 | * |
| Nashwaak | 186 | 77 | 2208 | | 196 | U | 134 | 3,155 | 469.2 | 317.64 | U | | 107.6 | * | 3734 | * |
| Nerepis | 4 | 0 | 110 | | 10 | U | 3 | 210 | 51.6 | 112.87 | U | | 1.4 | * | 493 | * |
| New | 0 | 10 | | | | | | | | | | | | | | |
| St. Croix | 4 | 5 | 40 | | 7 | U | 2 | 82 | 17.8 | 15.20 | U | | 8.8 | * | 272.4 | * |
| Saint John | 805 | 275 | 5278 | | 960 | U | 318 | 6,417 | 987.6 | 174.69 | U | | 194.8 | * | 6995.2 | * |
| Salmon: Queens Co. | | | | | 42 | U | 8 | 264 | 68.4 | 63.29 | U | | 1.6 | * | 364.4 | * |
| Salmon: Victoria Co. | 130 | | U | | 500 | U | 175 | 1,400 | 165.4 | 223.15 | U | | 60 | * | 784 | * |
| Tobique | 704 | 0 | 4570 | | 529 | U | U | 8,186 | 863 | 272.48 | U | | 0 | * | 9439.4 | * |
| Waweig | 3 | 1 | 25 | | 7 | U | 3 | 51 | 5.4 | 5.84 | U | | 5.2 | * | 81.2 | * |
| Totals | 1915 ** | 417 | 12635 | | 2613 | | 718 | 21915 | 3086 | | | | 432 | | 25903 | |

* Confidence limits were not calculated on SFA 23 salmon releases or effort because of the number of missing values.

** Keswick (29) and Pocologan (1) excluded.

U Unknown

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# Appendix 2

Stock: **Grand River, SFA 19.**

Life Stage: 1SW and Repeat 1SW, limited 2SW and Repeat 2SW
Target: 1.1 million eggs

| | 1985 | 1986 | 1987 | 1988 | 1989[a] | 1990 | 1991[a] | 1985-90 Mean |
|---|---|---|---|---|---|---|---|---|
| Native Fisheries | | | | | | 24 | 39 | |
| Recreational catch | | | | | | | | |
| Grilse | 542 | 360 | 342 | 338 | 307 | 416 | 115 | 346 |
| Salmon | 133 | 194 | 107 | 105 | 74 | 98 | 15 | 120 |
| Broodstock | | | | 33 | 25 | 18 | 19 | |
| Count at Fishway | | | | | | | | |
| grilse | | | | 554 | 512 | 527 | 234 | |
| salmon | | | | 31 | 25 | 27 | 18 | |
| % Hatchery | | | | NA | NA | 43 | 45 | |
| Correction for by-pass | | | | | | | | |
| grilse | | | | 55 | 51 | 52 | 176[e] | |
| salmon | | | | 54 | 19 | 20 | 14 | |
| Total above fishway | | | | 694 | 607 | 626 | 442 | |
| Population below fishway (est) | | | | 143 | uk | uk | uk | |
| % Angled above | | | | uk[b] | 42[c] | 31[c] | 31(1990) | |
| Required spawing esca. | | | | 539 | 545 | 545 | 545 | |
| Estimated escapement | | | | 736 | 453[d] | 442[d] | 348[d] | |
| % of Target | | | | 136 | 83 | 83 | 64 | |

[a] In-season varriation closures.
[b] 20% Assumed angled above fishway.
[c] Determined from post-season phone survey.
[d] Above fishway in relation to entire river.
[e] 1991 by-pass rate for fish <63cm.

Recreational catches: Have ranged from 422 fish in 1984 to 115 fish in 1991, the period since the Nova Scotia license-stub return system. This river is the highest or second highest producer of fish < 63 cm on Cape Breton Island.

Data and Assessment: Counts and scale samples are taken at the fishway 10.2 km above the head of tide on the main river. By-pass of fish ascending the falls was estimated in 1989 at 9% for fish <63 cm and 43% for fish >=63 cm but may have been different in 1991 when flood conditions followed a prolonged drought. The 1991 by-pass rate for grilse of 43% was estimated from broodstock collected above the fishway ( 8 of 14 grilse were marked). Numbers below the fishway were estimated from redd counts in 1988 only.

State of the Stock: The target spawning escapement for the Grand River has not been met during the past three years, based on the number of salmon estimated to be spawing above the fishway.

Forecasts: No forecasting mechanism presently exists.

# Appendix 3

Stock: **Liscomb River above Liscomb Falls fishway, SFA 20.**

Life Stage: 1SW, MSW salmon of both wild and hatchery origins.
Target: Under development for this acid-stressed river.
Habitat: Area 147,100 $m^2$ below Liscomb Falls; 1,538,500 $m^2$ above.

| Year | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1985-1990 Mean |
|---|---|---|---|---|---|---|---|---|
| Recreational catch (1SW)[a] | 80 | 234 | 289 | 138 | 65 | 177 | 68 | 164 |
| Counts: | | | | | | | | |
| Wild 1SW | 507 | 736 | 1614 | 477 | 532 | 955 | 586 | 804 |
| Wild MSW | 87 | 117 | 88 | 76 | 75 | 44 | 38 | 81 |
| Hatchery 1SW | 175 | 766 | 523 | 431 | 288 | 438 | 178 | 437 |
| Hatchery MSW | 49 | 108 | 54 | 44 | 71 | 22 | 22 | 58 |
| Total | 818 | 1727 | 2279 | 1028 | 966 | 1459 | 824 | 1380 |
| Egg deposition/$m^2$[b] | 1.0 | 2.1 | 2.5 | 1.2 | 1.2 | 1.6 | 0.9 | 1.6 |
| Return rate of hatchery smolts: | | | | | | | | |
| 1SW(%) | 0.35 | 2.59 | 2.75 | 1.38 | 0.60 | 1.56 | 0.79 | 1.54 |
| MSW(%) | 0.08 | 0.22 | 0.18 | 0.23 | 0.23 | 0.05 | 0.08 | 0.16 |

[a]below fishway.
[b]above fishway

Recreational catches: No retention of MSW fish since 1984; 1SW catches (1984-1991) have ranged from 65 (1989) to 289 (1987) with 68 angled in 1991.

Data and assessment: Counts of adult fish are obtained at Liscomb Falls fishway, 3.2 km above tidehead.

State of the stock: Target egg requirements according to the 2.4 eggs/$m^2$ have been met only once since 1979 (1987); a significant contribution to egg deposition comes from hatchery-origin fish of Liscomb River stock.

Forecast for 1992: Forecasts of 1SW returns are unavailable. An annually-updated relation between 1SW returns in year t and MSW returns in year t + 1 predicts a return of 54 MSW salmon (90% CI 27-81) in 1992.

Special comment: An unusually dry early summer delayed fish entry to the river until after mid-August (normal peak in July).

# Appendix 4

Stock: **LaHave River above Morgan Falls Fishway, SFA 21.**

Life Stage: 1SW and MSW salmon of both wild and hatchery origins.
Target: Under development for this acid-stressed river.

| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1985-1990 Mean |
|---|---|---|---|---|---|---|---|---|
| Recreational catch (1SW)[a] | 1683 | 1844 | 2562 | 1585 | 2411 | 2008 | 227 | 2016 |
| Counts: | | | | | | | | |
| Wild 1SW | 1343 | 1579 | 2529 | 2464 | 2087 | 1861 | 495 | 2037 |
| Wild MSW | 638 | 584 | 532 | 380 | 511 | 596 | 236 | 542 |
| Hatchery 1SW[b] | 102 | 135 | 573 | 1026 | 443 | 402 | 109 | 392 |
| Hatchery MSW[b] | 77 | 78 | 79 | 59 | 183 | 118 | 90 | 99 |
| Total | 2160 | 2386 | 3713 | 3929 | 3224 | 2977 | 930 | 3070 |
| Return rate of hatchery smolts: | | | | | | | | |
| 1SW (%) | 1.42 | 2.42 | 2.45 | 3.92 | 1.89 | 1.72 | 0.87 | 2.30 |
| 2SW (%) | 0.32 | 0.68 | 0.97 | 0.23 | 0.61 | 0.39 | 0.22 | 0.53 |

[a]Mostly below the fishway.
[b]Mostly as a result of smolt releases.

Recreational catches: Catches are for the entire river rather than only those from the stock above Morgan Falls. Retention of MSW catch since 1983 has been prohibited, but large numbers have been released after hooking.

Data and assessment: Spawner counts are made at a fishway at a natural falls, 25.3 km above tidehead.

State of the stock: Target egg requirements according to the 2.4 eggs/$m^2$ (approx. 2,800 1SW and 500 MSW salmon for the entire river; 60% of the drainage below Morgan Falls) have been exceeded except for 1991, but the adequacy of that rate under conditions of some acid stress is uncertain at this time. Ominously the total fishway count in 1991 is the lowest since 1976.

Forecast for 1992: A significant regression of wild MSW counts at Morgan Falls on wild 1SW counts at Morgan Falls in the previous year (17 years) forecasts a count of 152 MSW salmon in 1992.

Conditions in 1991: A period of unusually low rainfall from mid-June to mid-August interfered with the normal timing of the entry of the spawning run. The drought was followed by high discharges in the latter half of August.

Appendix 5

Stock: **Saint John River, N.B. (above Mactaquac) SFA 23**

Life stage: 1SW, MSW salmon (wild and hatchery origin)
Target spawning requirement: 29.4 million eggs (4,400 MSW and 3,200 1SW fish)

| | | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | Min | Max | Mean |
|---|---|---|---|---|---|---|---|---|---|---|
| Recreational catch: | 1SW | 1692 | 1650 | 1755 | 2304 | 1610 | 1690 | 1151[a] | 3580[a] | 2260[a] |
| Native food fishery: | 1SW | 600 | 280 | 190 | 560 | 273 | 657 | 190[b] | 657[b] | 381[b] |
| | MSW | 2400 | 1120 | 760 | 240 | 247 | 957 | 240[b] | 2400[b] | 953[b] |
| Mactaquac counts: | 1SW | 7046 | 7972 | 9191 | 9587 | 7907 | 7575 | 4140[a] | 17314[a] | 8939[a] |
| | MSW | 4143 | 3430 | 2600 | 4291 | 3919 | 4226 | 2010[a] | 10451[a] | 5283[a] |
| River returns: | 1SW | 8766 | 9237 | 10180 | 10861 | 8804 | 8751 | 4946[a] | 19275[a] | 10408[a] |
| | MSW | 6925 | 4832 | 3537 | 4541 | 4125 | 5255 | 3537[a] | 13916[a] | 7644[a] |
| Spawning escapement: | 1SW | 5887 | 7020 | 7810 | 7533 | 6057 | 5721 | 5887[b] | 7810[b] | 6861[b] |
| | MSW | 3519 | 2758 | 1704 | 3491 | 3207 | 3481 | 1704[b] | 3519[b] | 2935[b] |
| % target: | 1SW | 184 | 219 | 244 | 235 | 189 | 179 | 179[b] | 244[b] | 214[b] |
| | MSW | 80 | 63 | 39 | 79 | 73 | 79 | 39[b] | 80[b] | 67[b] |

[a] For the period 1975-1990.
[b] For the period 1986-1990.

**Recreational catches**: MSW salmon have not been retained since 1984; up to 1990, 1SW landings have ranged from 311 in 1972 to 3,580 in 1976.

**Native food fisheries**: Highest landings since 1986; the absence of complete catch statistics seriously hampers the stock assessment and forecasting processes.

**Data and assessment**: Counts of fish obtained from the collection facility at Mactaquac Dam were augmented by estimates of down river removals. Smolts and juveniles of hatchery origin were counted at time of release.

**State of the stock**: Target egg requirements have been met only three times in the last 14 years (1980, 1984, 1985); 1SW escapement contributed to only 8% of the target egg deposition; hatchery fish comprised 14.5% and 28.5% of 1SW and MSW returns in 1991.

**Forecast**: A relationship between egg depositions and wild 1SW retruns indicates a return of 5,800 or 7,600 wild 1SW fish, depending on the forecast model. Another relationship between wild 1SW retruns, their fork length and MSW returns suggests that the 6,300 1SW returns in 1991 will provide 3,900 or 4,200 wild MSW returns, depending on forecast model. The product of the numbers of hatchery releases and recent return rates suggest hatchery returns in 1992 of 2,000 1SW and 1,200 MSW salmon. Total 1SW returns could be 7,800 or 9,600 1SW fish; total MSW returns could be 5,100 or 5,400 MSW salmon. Target spawning requirements do not include 400 MSW broodstock required to seed Mactaquac Hatchery.