STATUS OF ATLANTIC SALMON IN SALMON FISHING AREAS (SFAs) 19-21 AND 23

Context

Atlantic salmon populations of the Maritimes Region have experienced over a decade of decline. Atlantic salmon commercial fisheries were closed by 1985. In-river closures of recreational fisheries began in 1990 in the inner Bay of Fundy and expanded to all outer Bay (SFA 23) and many eastern and southern shore rivers (SFAs 20 and 21) by 1998. In addition, Aboriginal communities have either reduced or curtailed their fishing activity. Many populations are extirpated, inner Bay of Fundy salmon (SFA 22 and a portion of 23) are endangered under the Species at Risk Act and the outer Bay of Fundy (western part of SFA 23) and eastern and southern shore salmon (SFAs 20 and 21) are being assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Eastern Cape Breton populations (SFA 19) have declined to a lesser extent. Previous to this document, the most recent assessment reports for Atlantic salmon in SFAs 19-21 and 23 updated their status to 2005 (Amiro et al. 2006; Jones et al. 2006).

Science advice on the status of salmon in SFAs 19-21 and 23 was requested by Fisheries and Aquaculture Management (FAM) on March 6, 2008. This advice is required in advance of 2008 Salmon Zone Management Advisory Committees (ZMACs), i.e., prior to April 15, 2008. ZMACs are the formal consultative forums at which DFO solicits input from stakeholders prior to developing the 2008 recreational salmon fishing plan. Given constraints in timing, it was decided to provide this status report through the Science Special Response Process. Two meetings were held by DFO Maritimes Science (March 20 and April 8, 2008) to review relevant and available information. This Science Response report is a product of those meetings.

Analysis and Responses

Eastern Cape Breton (SFA 19)

Salmon stocks of eastern Cape Breton Island include those of the **Middle**, **Baddeck** and **North** rivers. These rivers have headwaters in the Cape Breton Highlands, have relatively pristine water quality and have no significant impediments to fish migration. **Grand River** (another eastern Cape Breton stock) is of lower gradient than rivers flowing from the Highlands and has flows and temperatures influenced by headwater lakes. Prior to 1998, recreational fishing was open from June 1st to October 31st on these rivers. Since 1998, the season has been shortened with the implementation of a mid-season warm water closure (July 16th – August 31st, see Appendix 1).

This document provides a summary of adult salmon assessments in SFA 19 in 2007 using similar methods to those of Amiro et al. (2006). This update is based on fall-season diver counts of salmon in Middle and Baddeck rivers, and recreational catches in Middle, Baddeck, North and Grand rivers. All rivers within SFA 19, with the exception of Indian Brook and the North River above the Benches, were open to catch-and-release angling in 2007 (Appendix 1).

Status

Returns and escapement to **Middle River** (Figure 1) in 2007 were estimated by two methods: 1) from a dive count using the average observation rate in this river from years when mark-recapture (MR) experiments were conducted, and 2) from the recreational catch using the average catch rate for this river. Escapements were estimated after accounting for losses of salmon due to illegal angling retention and catch-release mortality.

Preliminary estimates of the angling catch in Middle River in 2007 are 101 large and 45 small salmon (Appendix 2). Based on the average catch rates in years when both the angling catch and mark-recapture experiments were carried out (mean catch rates of 0.27 and 0.42, respectively), total returns in 2007 are estimated to be 376 large and 106 small salmon. Losses of salmon in Middle River in 2007 were estimated to be 3 large and 1 small salmon.

During a dive count on October 23, 2007, 153 salmon were observed. Based on MR experiments, 61% of the escapement is observed during these counts. Therefore, returns were estimated to be 256 salmon and estimated escapement was 252 fish, comprised of 63 small and 189 large salmon. Based on the dive counts, the estimated combined escapement (252 fish) was 119% that of 2006.

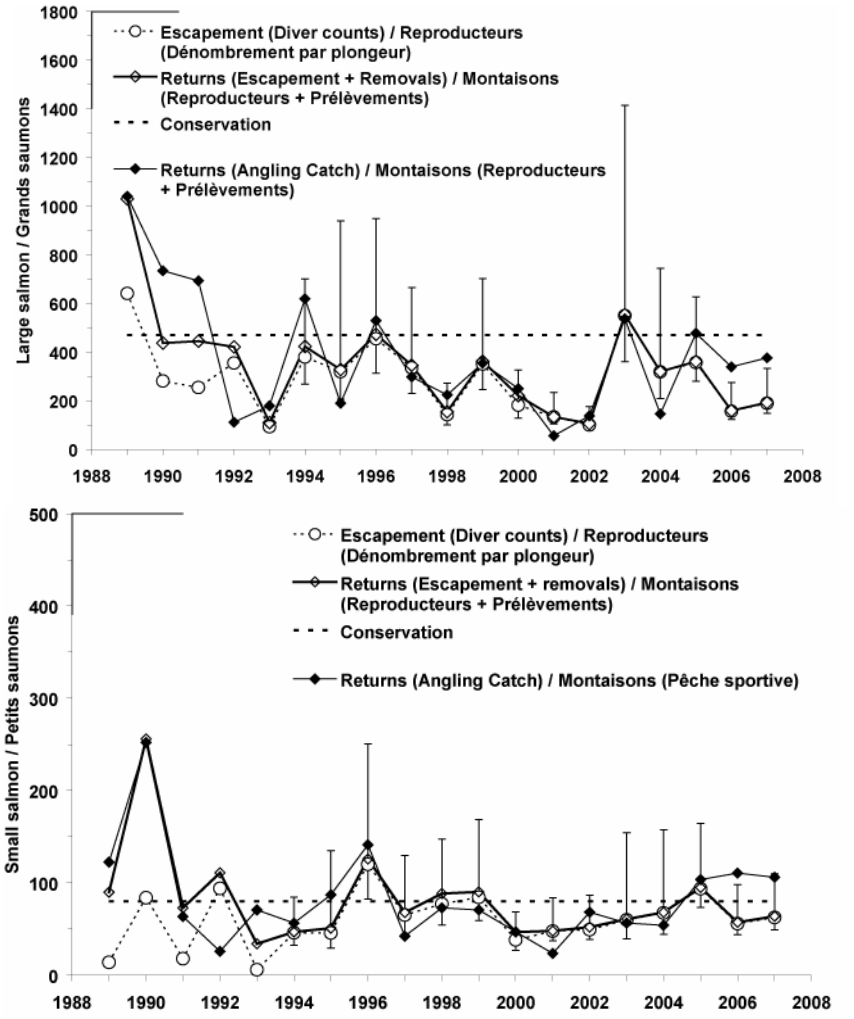

Figure 1. Returns and escapement to Middle River for small and large salmon. Error bars are 90% confidence intervals.

The conservation requirement for the Middle River of 2.07 million eggs is expected from 470 large and 80 small salmon. Based on the dive counts, small salmon escapement was about 79% of the requirement and large salmon escapement was about 40% of the requirement. The combined achievement was about 46%.

Returns and escapement to **Baddeck River** (Figure 2) in 2007 were estimated by two methods: 1) from a dive count using the average observation rate in this river from years when MR experiments were conducted, and 2) from the recreational catch using the average catch rate for this river. Escapements were estimated after accounting for losses of salmon due to illegal angling retention and catch-release mortality.

The preliminary estimates of the angling catch in Baddeck River in 2007 are 72 large and 16 small salmon. Based on the average catch rates (means of 0.48 and 0.60, respectively), the total returns in 2007 are estimated to be 149 large and 27 small salmon. Losses of salmon in Baddeck River in 2007 were estimated to be 2 large (due to angling catch-release mortality) and 2 small (due to illegal retention) salmon.

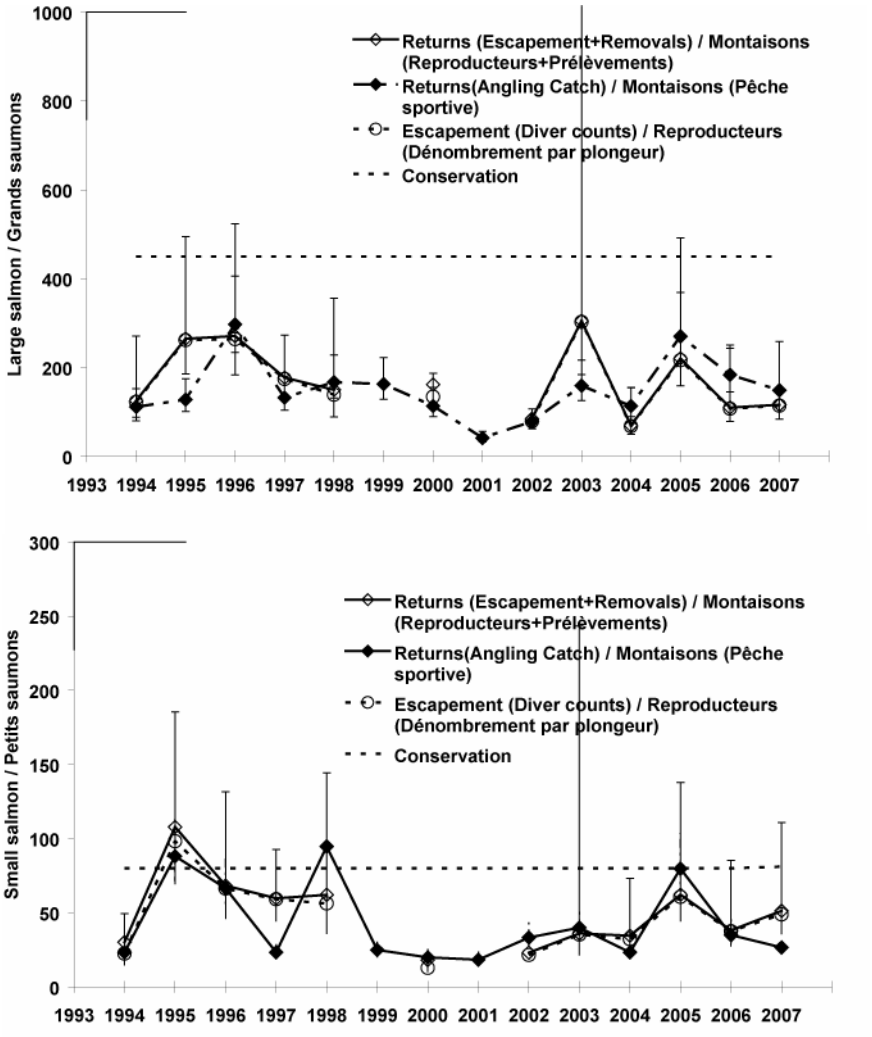

Figure 2. Returns and escapement in Baddeck River for small and large salmon. Error bars are 90% confidence intervals.

During a dive count on October 24, 2007, 91 salmon were observed. Based on a mean observation rate of 55.9% and the ratio of large and small salmon, escapement was estimated to be 163 fish total, comprised of 114 large and 49 small salmon.

The conservation requirement for the Baddeck River is 2.0 million eggs, expected from 450 large and 80 small salmon. Based on the diver counts, escapement of small salmon was 61% of the requirement and of large salmon was 25% of the requirement. The combined percentage of the conservation requirement attained was 31%.

Returns to **North River** (Figure 3) in 2007 were estimated using the preliminary recreational catch data and a mean catch rate derived for this river. Recreational catches were estimated to be 138 large and 95 small salmon. Based on recreational catch rates of 0.41 for large and 0.69 for small salmon, the estimated returns are therefore 338 large and 138 small salmon. Losses of salmon from the North River in 2007 were estimated to be 4 large and 3 small salmon, all from catch-and-release angling mortality.

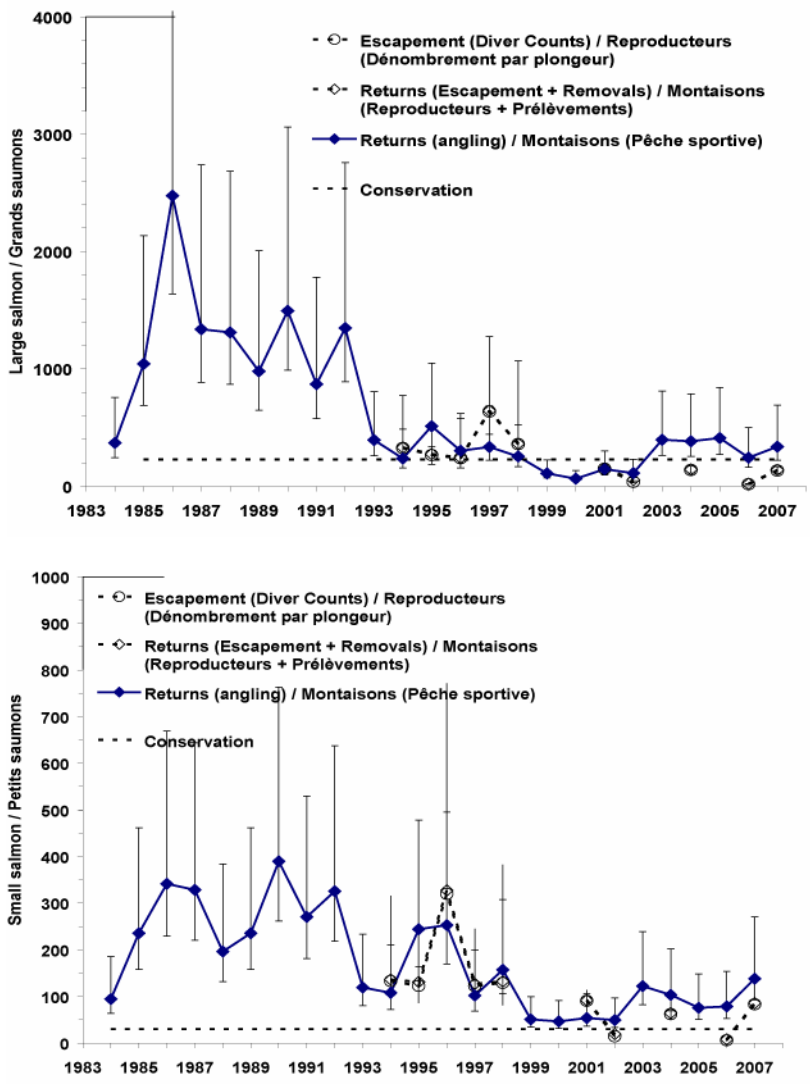

Figure 3. Returns and escapement to North River for small and large salmon. Error bars are 90% confidence intervals.

The conservation requirement for the North River is 0.85 million eggs expected from 200 large and 30 small salmon. Based on the recreational catch, the large and small salmon escapement would have exceeded conservation requirements; the combined attainment of the requirement was 207%. Note however, that for both Middle and Baddeck rivers, the escapement estimates based on the recreational catch were high relative to those for the dive surveys.

During a dive survey in North River on October 25, 2007, only 40 small and 66 large salmon were observed on a day with moderate visibility. The proportion of the population observed during dive surveys in North River can be highly variable. Therefore, scaling up to a total population estimate based on the diver counts is not possible.

Grand River is obstructed to salmon passage at low discharge by a falls located 10.2 km upstream of head-of-tide. A fishway at the falls passes about 60% of small and 43% of large salmon. Most salmon returning to the river are small; the few large fish are usually repeat-spawning one sea-winter (1SW) fish. About 45% of the total juvenile production potential (based on habitat area) is upstream of the falls.

Salmon movements at the Grand River fishway have not been monitored since 2000. Returns to the river in recent years have been estimated from recreational catches with an assumed catch rate of 0.5. Estimates of recreational catch in 2007 from returned Nova Scotia Salmon License stubs were 6 small and 2 large salmon. It is the first time in the last three years that large salmon have been captured on the Grand River. From the catch, total returns in 2007 were estimated to be 16 fish (4 large and 12 small), down from 36 fish in 2006 (Figure 4). Note that these estimates are based on stub returns of five anglers and an estimated fishing effort of 37 rod days. However, even though fishing effort is low and total returns may be underestimated, the population appears to be well below its conservation spawner requirement.

The conservation requirements upstream of the fishway are 475,000 eggs, which is the production expected from about 234 salmon (large and small combined). The estimated returns in 2007 are the second lowest in the dataset, at 7% of the conservation spawner requirement. Low returns in recent years of wild fish to Grand River, suggest a low probability that egg conservation requirements were met in 2007.

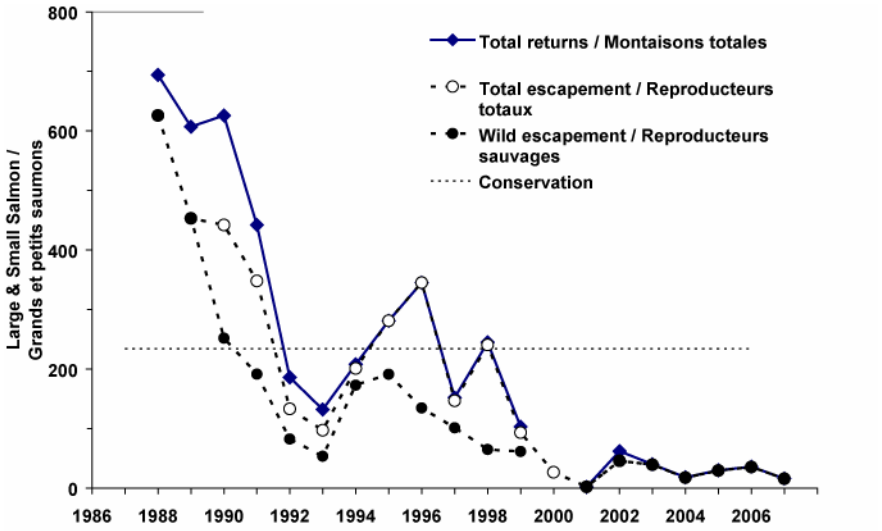

Figure 4. Returns and escapement to the Grand River for large and small salmon.

Outlook

The forecast is based on 5-year average returns in recent years.

For the **Middle River**, the forecasted returns of small and large salmon in 2008 is about 386 fish (90% C.I. = 133-649 fish). The probability of returns exceeding the conservation requirement (550 fish) is about 15%.

For the **Baddeck River**, the forecasted returns in 2008 is about 209 fish (90% C.I. = 59-372 fish) and the probability of exceeding the conservation requirement of 530 salmon is near zero.

The forecasted return of small and large salmon to **North River** in 2008 is about 459 fish (90% C.I. = 104-646). The probability of meeting or exceeding the conservation requirement of 230 fish is about 91%.

For the **Grand River,** the forecasted returns of wild salmon returns in 2008 is about 28 fish (90% C.I. = 9-45). The probability of exceeding the conservation requirement of 234 fish is virtually zero.

Management Considerations

Conservation requirements were generally not achieved in monitored rivers of Eastern Cape Breton in recent years. However, they may have been achieved on the North River in 2007 on the basis of adult escapement estimates. Escapement of salmon on the Baddeck, Middle, and Grand rivers remained below conservation requirements.

There is an ongoing decrease in salmon abundance in many Nova Scotia Atlantic coast rivers, although populations in eastern Cape Breton (with the exception of Grand River) appear to be doing better than those on the mainland, showing slight increases in 2007. However, with the exception of North River, the probability of meeting conservation requirements remains very low in three of the four assessed rivers.

Considering the variable status and low probability of meeting conservation requirements to the monitored rivers in Eastern Cape Breton in recent years, a continued conservative approach to management is recommended.

Southern Upland of Nova Scotia

At least 65 rivers within the geological area known as the Southern Upland of Nova Scotia (most of SFAs 20 and 21) were known to maintain salmon populations. Acidification has decimated some of these populations and threatens others. As of 1986, fourteen rivers in SFA 20 (including the St. Mary's River) and eight rivers in SFA 21 (including the LaHave River upstream of Morgans Falls) were classified as low- or non-acidified (pH > 5.1). Twenty rivers were partially acidified (annual mean pH was 4.7 to 5.1). At least fourteen rivers were classified as heavily acidified (pH < 4.7) and had lost their populations of Atlantic salmon (DFO 2000). Since that analysis, pH has not improved and populations have been further threatened by a decrease in marine survival.

Despite reduction in sulphate depositions, there is evidence that pH in Southern Upland rivers has not recovered at rates observed in other geographic areas. Recoveries of elements like calcium, necessary for growth and development of fish, are now expected to take as long as fifty

to one hundred years in waters of the Southern Upland. Some of these rivers are further impacted by impoundment for hydroelectric or domestic water use.

Based on electrofishing in 2000, juvenile salmon could not be found in 28 of 57 rivers sampled on the Southern Upland; 16 of the 29 rivers with juvenile salmon had fewer than 5.0 juvenile salmon per 100 m^2 or 7% of a "normal" abundance (Figure 5). These data suggest that population extirpations have doubled in the 15 years since 1986 and that most populations are critically low.

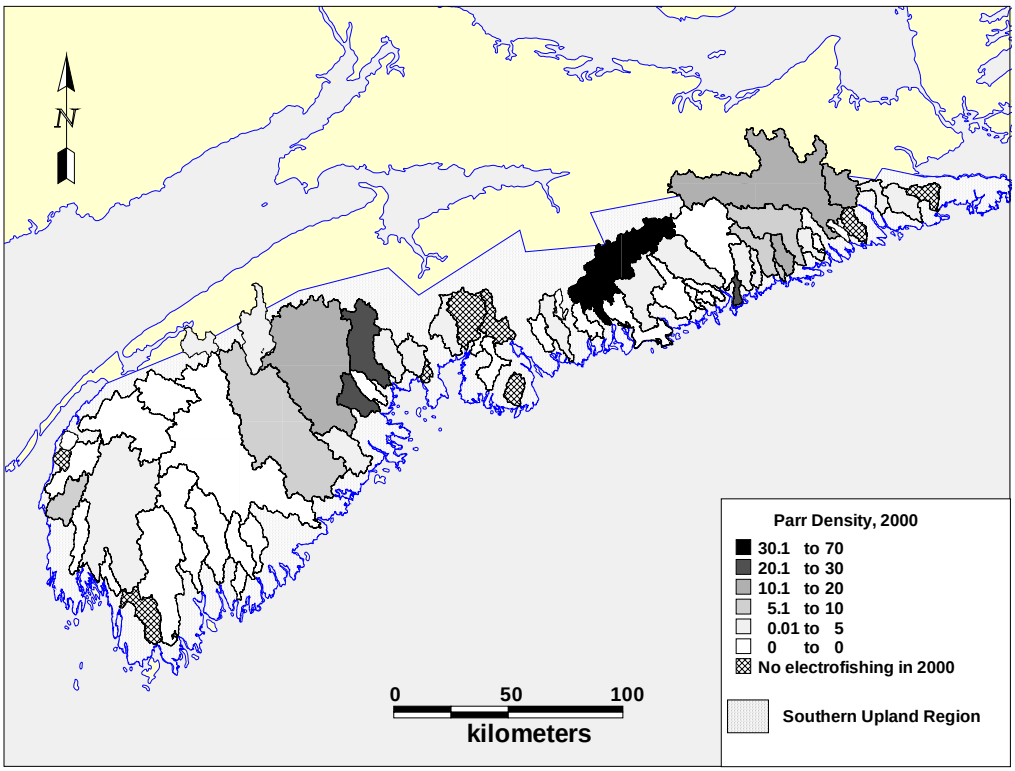

Figure 5. Map of the river drainage areas on the Southern Upland of Nova Scotia indicating the category of total juvenile Atlantic salmon densities per 100 m^2 determined by electrofishing in 2000.

In 2007, retention angling fisheries for small salmon in the Maritimes Region (SFA 19-21) were restricted to four heavily acidified rivers (East River Sheet Harbour, Mersey, Jordan and Clyde) of the Atlantic coast (Appendix 1). Five other eastern and southern shore rivers were open to a catch-and-release fishery of at least 45 days duration. As well, aboriginal communities have respected these conservation initiatives and generally restricted their harvests to hatchery "adipose-clipped" grilse from within nine rivers in Nova Scotia using methods that facilitate the live release of wild fish.

Eastern Shore of Nova Scotia (SFA 20)

Rivers of SFA 20 are generally organic-acid stained, of lower productivity, and, when combined with acid precipitation can result in acidic conditions toxic to salmon. The last assessment report for these rivers summarized status to 2005 (Amiro et al. 2006). The present document provides a summary of adult salmon assessments in this area in 2007 using similar methods to those of Amiro et al. (2006). This update is based on an assessment of the adult spawning escapement estimates, juvenile electrofishing surveys and smolt monitoring in St. Mary's River.

Status

With the exception of electrofishing surveys, assessment activities in the **St. Mary's River** are focused on the West Branch of the river, which contains 55% of the juvenile habitat available in the watershed. Escapement estimates (Table 1) for the river are based either on the recreational catches (1996 and earlier), or on adult mark-recapture experiments (1997 to 2001 and in 2006) in the West Branch. From 2002 to 2005, mark-recapture experiments were attempted but were unsuccessful, and escapement estimates in these years were derived using the mean catch rate for seining during years when the mark-recapture experiments were successful. A mark-recapture estimate of spawning escapement for the West Branch was obtained in 2007. Sutherlands, Indian Man, and Cumminger's pools were seined on September 25th and 26th, and 112 adults were captured, marked and released back into the river. These pools were seined again on October 9th and 10th, and 107 adults (59 marked and 48 unmarked) were captured. Therefore, the estimated seining efficiency was 55% in 2007, a value similar to 2006. Based on this efficiency, the spawning escapement for the West Branch of the St. Mary's River was estimated to be 205 adults, comprised of 23 salmon and 182 grilse. This is a decrease from the 2006 estimate of 240 adults. The 2007 escapement estimate is about 12% of the spawner requirement and is one of the lowest values recorded.

Table 1. Escapement estimates for the West Branch of the St. Mary's River.

Escapement Estimates West Branch, St. Mary's River			
Year	Small	Large	% Spawner Conservation
1995	1121	240	78
1996	844	325	67
1997	390	61	26
1998	1059	41	63
1999	307	83	22
2000	315	25	20
2001	319	106	24
2002	220	16	14
2003	600	122	42
2004	464	23	28
2005	192	8	12
2006	222	18	14
2007	182	23	12

Biological information was collected from 159 salmon captured during seining. Based on these samples, 50% of the salmon were female, 89% of the population had matured as one sea-winter salmon, and only 5% of the population had previously spawned. This later value is extremely low.

Fifty-five percent of the total juvenile salmon habitat in the St. Mary's River is in the West Branch. If, as has been done in past assessments, this value was used to scale the population estimate up to an estimate for the entire river, total escapement would be 309 salmon for the entire river, down from 436 fish in 2006. The conservation requirement for both branches of St. Mary's River is 7.4 million eggs, which is the expected egg deposition of about 3,155 fish. As shown below, this estimated escapement may be low relative to both the electrofishing results and recreational catch data.

The preliminary estimate of the recreational catch of salmon in the St. Mary's River during 2007 is 223 small salmon and 95 large salmon. This estimated catch is high relative to the estimates of escapement for the entire river reported above.

In 2007, 14 sites along the St. Mary's River were electrofished for juvenile salmon. The 2007 estimates for fry (age-0) and parr (age-1 and age-2 and older) density were approximately twice those recorded for 2006, and are the second highest since 2001 (Figure 6). For the entire river, the average density was 10.1 fish/100 m^2 for fry and 4.2 fish/100 m^2 for parr (age-1 and age-2 and older). These values are very low relative to Elson's norm (29 fry/100 m^2 and 38 parr/100 m^2), a standard against which juvenile densities are sometimes compared.

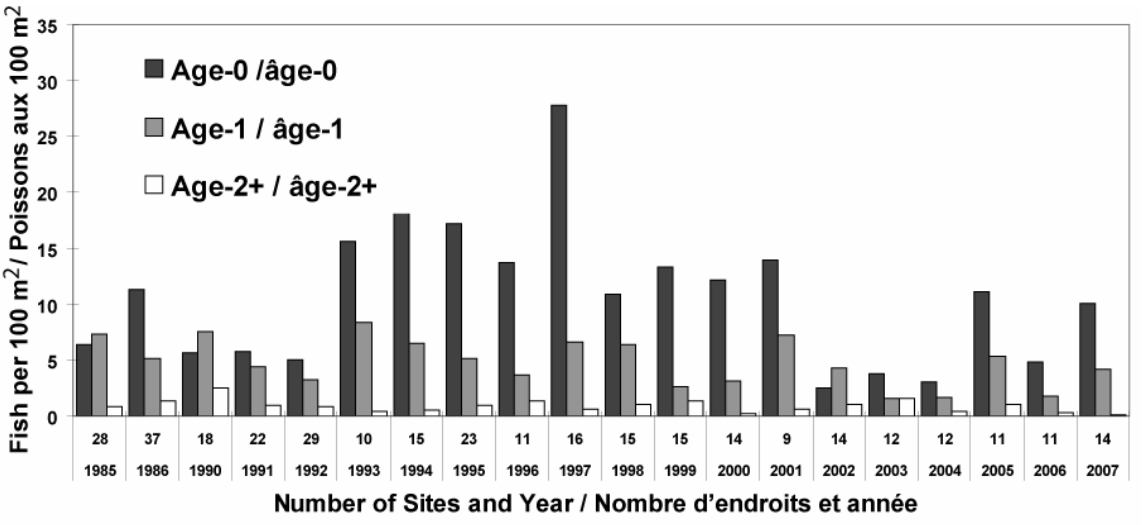

Figure 6. Electrofishing results for St. Mary's River from 1985-2007.

The density of fry can be used as an index of the spawner abundance in the previous year. The age-0 densities observed in 2007 are above the relationship between the estimated salmon returns and subsequent age-0 densities for the years for the years 1993-2006 (Figure 7). Together with the recreational fishery catch, this result also indicates that spawning escapement in 2006 may have been underestimated.

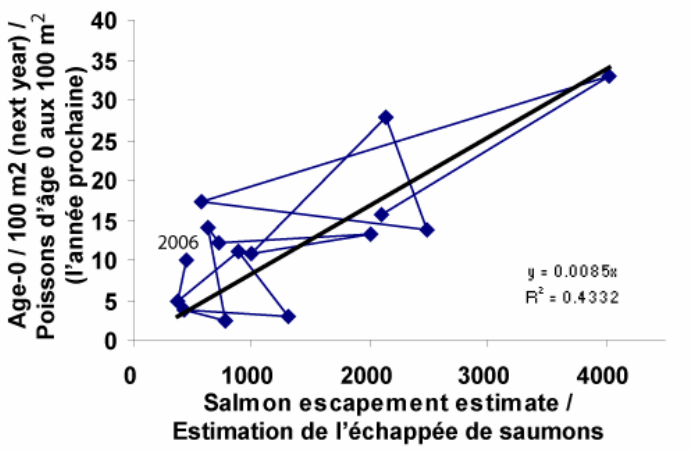

Figure 7. Relationship between salmon returns and fry abundance the next year in the St. Mary's River from 1992-2006.

To evaluate whether the West Branch assessment is presently indicative of abundance in the entire river, we compared juvenile densities in the West Branch with juvenile densities in the East Branch (Figure 8). This comparison shows that the abundance of fry was higher in the East Branch than in the West for the years 2005 to 2007. It is not known whether this higher fry density is the result of higher spawner abundance or differences in egg-to-fry survival between the branches. Both explanations are quite plausible given that pH in the East Branch is higher than in the West Branch.

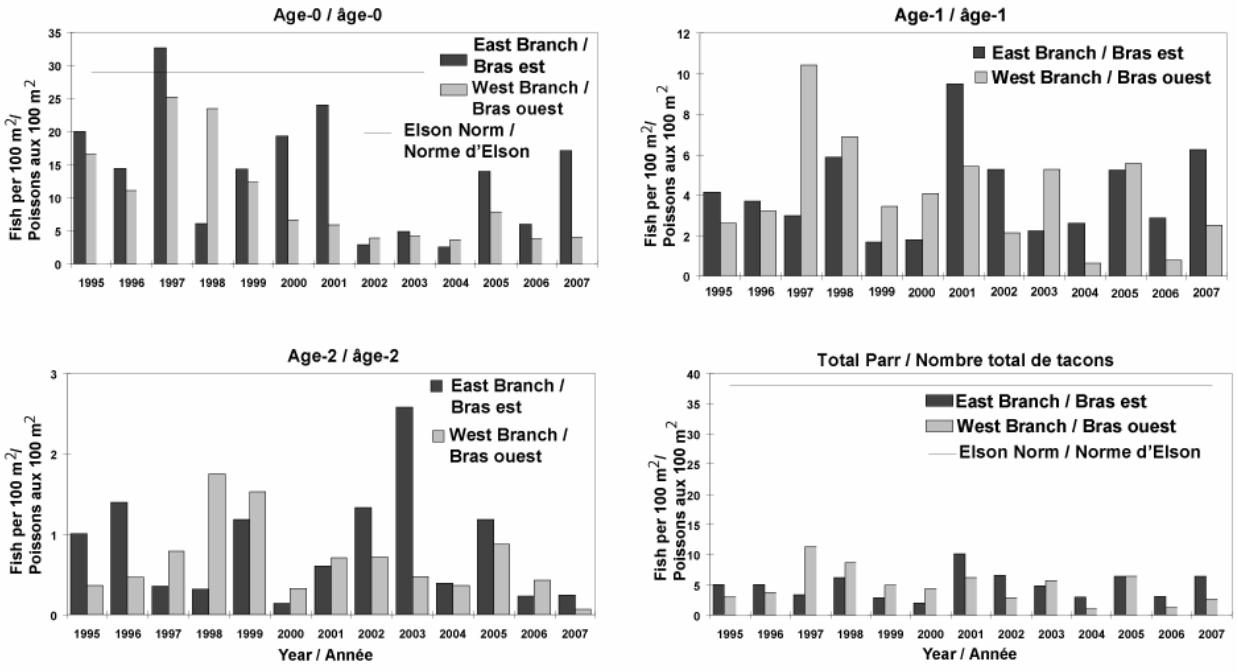

Figure 8. Comparison of juvenile densities in the east and west branches of the St. Mary's River.

If one were to assume that the differences in fry abundance were the result of differences in spawner abundance only (implying that differences in egg-to-fry survival between the two branches are negligible), the abundance of salmon in the East Branch could be estimated by rescaling the estimates for the East Branch using the relative fry densities. Note again that, given that pH is higher on the East Branch than on the West, it is quite plausible that survival from egg-to-fry is higher on the East Branch. However, this analysis gives a rough approximation of the magnitude of the difference in abundance that could exist if spawner abundance was the only reason that fry abundance differs between the branches. This method would place abundance in the East Branch in 2006 at roughly 72% of the spawner requirement for that branch. This method cannot be applied to the 2007 adult estimates until after the 2008 electrofishing survey. Again, given the differences in pH between the branches, it is likely that this method overestimates abundance, and in reality, it is likely that the true abundance in the East Branch falls between 10% and 72% of its spawner requirement. Note again that juvenile densities are consistently low in this river relative to Elson's norm, implying low abundance of salmon in the river.

The smolt wheel at Glenelg Bridge (West Branch) was deployed in late April and was fished from May 1st until June 4th. High water levels caused the wheel to turn sideways in the channel on May 18th and the wings, which help direct smolts into the trap, had to be removed until May 21st. Smolt catches were high near the beginning and end of the monitoring period, but were relatively low in the middle (Figure 9). In total, 775 smolts were captured, marked and released back upstream. Of these fish, 42 were recaptured as they passed the wheel a second time. Making an adjustment for the days when the wings on the wheel were not working, these

values suggest the smolt wheel was catching 5.4% of the smolts, and that 16,110 smolts (95% C.I.: 12,735 to 20,835 smolts) emigrated from the West branch of the St. Mary's River in 2007. This is lower than the previous year's estimate of 20,300 (95% C.I.: 14,300 to 31,100 smolts). As in previous years, most of the smolts (92%) were age-2 and the remainder were age-3.

The amount of habitat in the West Branch of the St. Mary's River is estimated to be 1.69 million m^2. The smolt production per unit area is thus estimated to be 0.009 smolt/m^2 (95% C.I.: 0.007 to 0.012). This value is also very low, corroborating the recent adult abundance and juvenile density estimates for the West Branch.

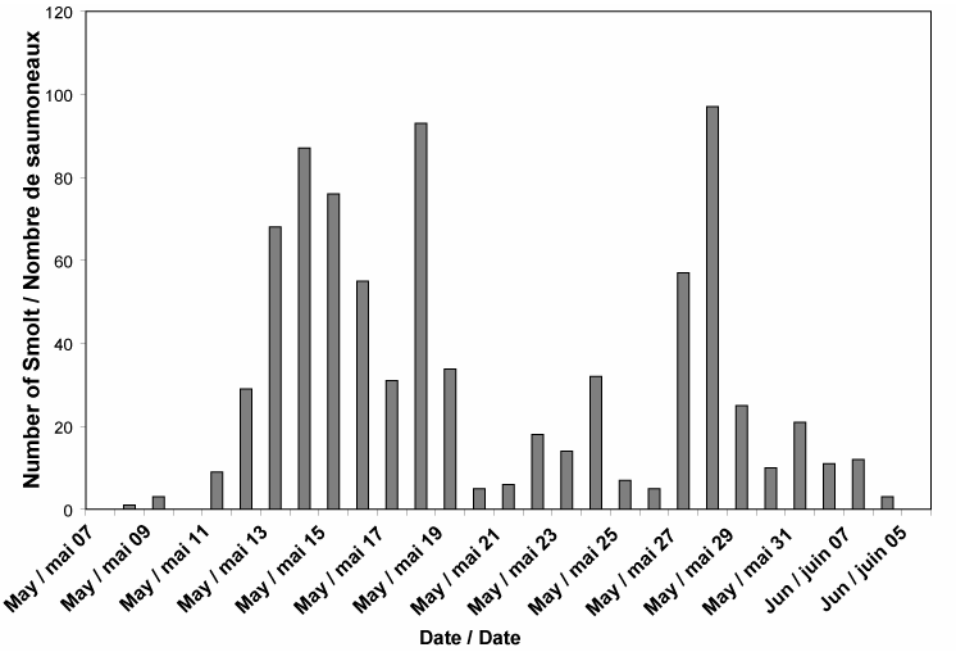

Figure 9. Daily smolt catches at a smolt wheel operated on the St. Mary's River, 2007.

Given the recent low escapements, decreased age-at-maturity, low numbers of repeat spawning escaped salmon in the past several years, and the low juvenile densities of the last three years, this population may be reaching a level where its genetic integrity is at risk and the potential for depensatory dynamics exists, particularly in the West Branch. Additionally, the estimate of the number of salmon returning in 2007 is the lowest since 1995. Due to concerns about declining abundance, a supportive rearing program was initiated for this river in 2006. This program differs from traditional hatchery programs (which are targeted towards fisheries enhancement) in that its purpose is to help maintain the genetic diversity of the population if its abundance continues to decline. A total of 289 parr were captured at seven sites within the West Branch of the river in 2006, and are being held at DFO's Coldbrook Biodiversity Facility. A further 286 parr were collected in 2007 (Table 2).

Table 2. St. Mary's River parr collections for the supportive rearing program in 2007.

Location	Number Collected
Indian Man Brook	50
Cross Brook	50
Archibald's Brook	50
Barren Brook	50
Main stem above Caledonia	50
South Brook	36

Outlook

Although uncertainty exists in the estimate of the adult population size (particularly for the East Branch), the electrofishing time series, smolt abundance time series, adult assessment for the West Branch and the age structure of the adult population all indicate that **St. Mary's River** salmon are at low abundance. Given the low abundance of juveniles in the watershed, the potential for the adult abundance to increase in the near future is low.

Management Considerations

All indicators of status for the **West Branch** indicate very low abundance of salmon in this branch of the river. The estimate of spawning escapement in 2007 was 205 adults (about 12% of the spawner requirement).

Two methods of estimating spawning escapement in the **East Branch** indicate that abundance in this branch in 2006 was in the range 10% to 72% of the conservation requirement. This comparison cannot be made for 2007 until after an electrofishing survey in 2008. If results are similar to 2006, the estimate of spawning escapement for this branch in 2007 would be in the range of 168 to 712 salmon (about 12% to 50% the spawner requirement).

Given the overall low abundance of salmon in **SFA 20**, coupled with the low probability that adult abundance will increase in the next few years, a continued very conservative approach to management in this SFA is recommended.

Advice to management would be improved if the relationship between abundance in the West and East branches were established. Given the importance of this watershed to the overall health of Eastern Shore salmon, development of an independent assessment method for adults on the East Branch is a priority.

Southern Shore of Nova Scotia (SFA 21)

Rivers of SFA 21 are generally organic-acid stained, of lower productivity, and, when combined with acid precipitation can result in acidic conditions toxic to salmon. The last assessment report for these rivers summarized status to 2005 (Amiro et al. 2006). The present document provides a summary of adult salmon assessments in this area in 2007 using similar methods.

Status

Low- or Non-Acidified Rivers of SFA 21

In view of the uncertainty of the effects of acidification on the provision of appropriate conservation requirements, an interim conservation requirement of 1.96 million eggs, equivalent to 1,320 salmon of average characteristics, was established for the LaHave River above Morgans Falls.

LaHave River above Morgans Falls, Lunenburg County, Nova Scotia

Counts of adult salmon at the Morgans Falls fishway on the **LaHave River** (Figure 10) were 382 fish (341 small and 41 large salmon). The count of wild salmon (341 small and 35 large) was the 5th lowest since 1979, just six years after the fishway opened up the area with efficient fish passage. The collection of adult broodstock for enhancement ceased at Morgans Falls in 2003, but three adults were removed for spawning for an educational program (Fish Friends).

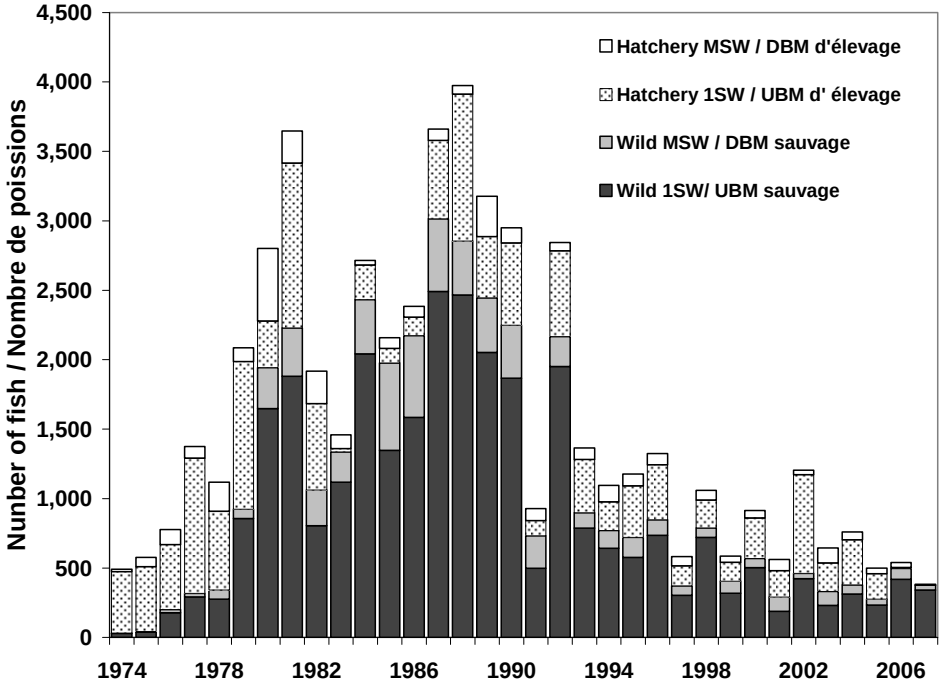

Figure 10. Counts of Atlantic salmon at Morgans Falls Fishway on the LaHave Ruver, Lunenburg County Nova Scotia, 1974 to 2007.

Egg deposition above Morgans Falls (corrected for removals) decreased to 560,926 eggs in 2007 or 29% of the conservation requirement (Figures 11 and 12). Hatchery origin fish (0 small and 6 large) contributed 6% of the estimated egg deposition.

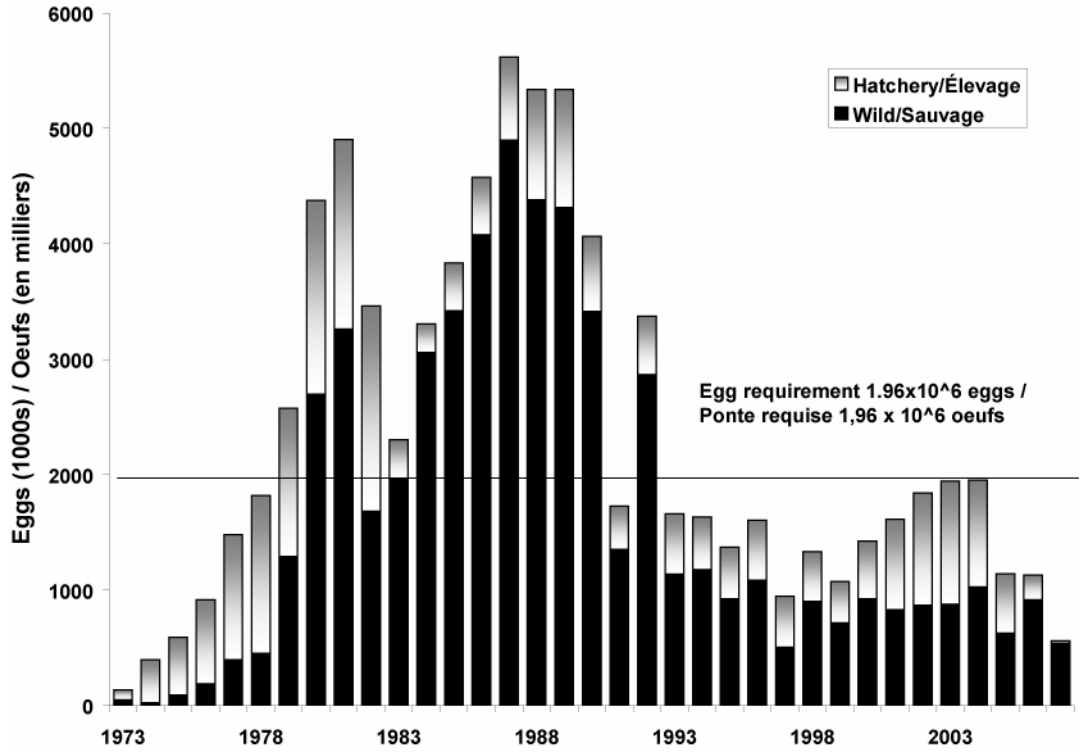

Figure 11. Estimated egg deposition (1000's) and total eggs required to meet the conservation requirement by wild and hatchery Atlantic salmon above Morgans Falls 1973 to 2007.

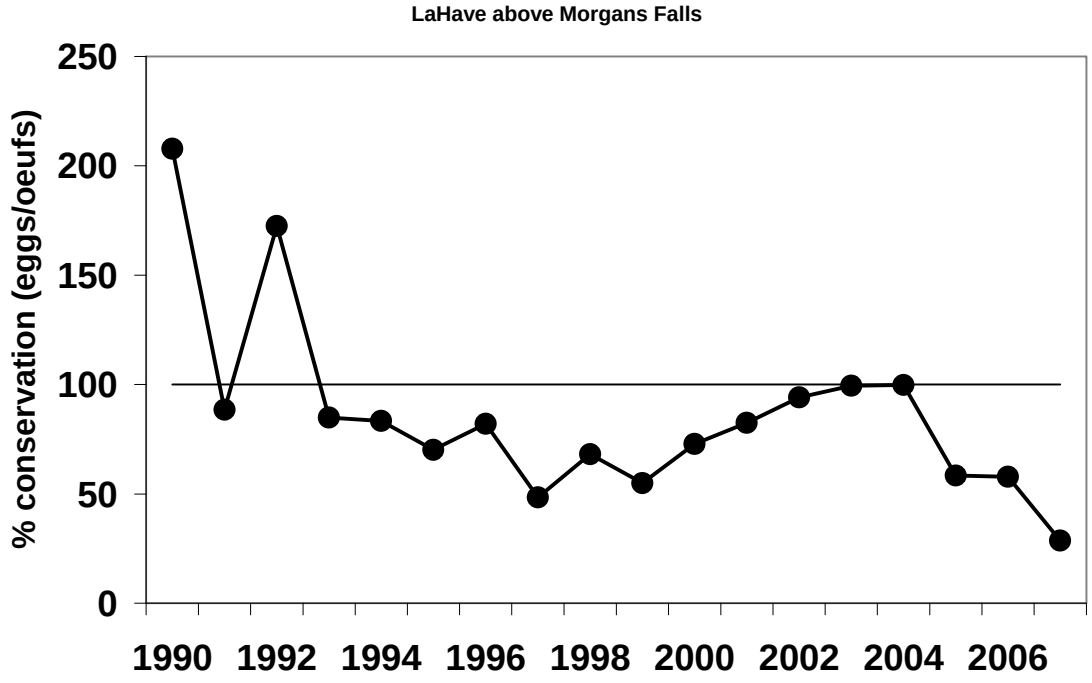

Figure 12. Percent of the conservation requirement (1.96x10^6 eggs) attained annually above Morgans Falls on the LaHave River, Lunenburg County, Nova Scotia, 1990 to 2006.

Based on complete sampling and age determination, successive generations of the salmon population above Morgans Falls in the LaHave River have not replaced themselves since the 1985 escapement year (Figure 13).

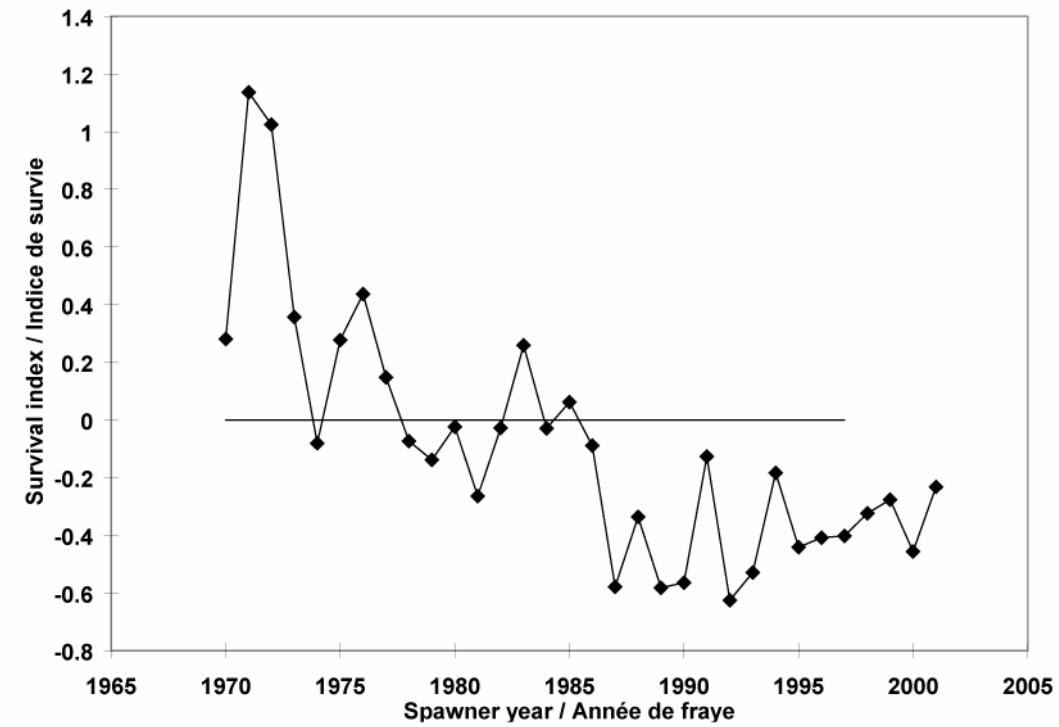

Figure 13. Survival index (Ln Recruits/spawning salmon) of Atlantic salmon above Morgans Falls on the LaHave River for the 1970 to 2001 spawning escapements and the 1974 to 2007 returns.

This pattern of non-replacement since 1985 is congruent with a downturn in marine survival since 1989/1990 throughout early run southern Atlantic salmon stocks in North America and Southern Europe (ICES 2007).

Wild Smolts Production and Performance above Morgans Falls

In 2007, a total of 24,430 wild smolts was estimated to have migrated from above Morgans Falls, similar to the 2006 value and greater than the 1996- 2005 mean of 15,067 (Table 3). The estimate of the return rate of wild smolts emigrating from above Morgans Falls in 2006 to 1SW return in 2007 was 1.48%, much less than the unusually high value of 7.95% in 2006 and less than the long term mean of 2.8%.

Smolt production was 0.98 smolts per 100 m^2 in 2007, greater than the long term mean of 0.64 smolts per 100 m^2 Egg-to-smolt survival increased to 2.8% more than double the long term mean of 1.1%. Both of these parameters indicate improved freshwater production of juvenile salmon in 2006 and 2007.

Table 3. Wild smolt production, 90% confidence intervals, and performance above Morgans Falls.

	Wild Smolts		Return rate to 1SW
Smolt year	Estimate	per 100 m²	
1996	20,510 (19,890 – 21,090)	0.79	1.47%
1997	16,550 (16,000 – 17,100)	0.63	4.33%
1998	15,600 (14,700 – 16,625)	0.60	2.04%
1999	10,420 (9,760 – 11,060)	0.40	4.82%
2000	16,300 (15,950 – 16,700)	0.63	1.16%
2001	15,700 (15,230 -16,070)	0.60	2.70%
2002	11,860 (11,510 – 12,210)	0.46	1.95%
2003	17,845 (8,821 – 26,870)	0.68	1.75%
2004	21,613 (19,613 – 21,513)	0.79	1.13%
2005	5,270 (4,670 – 5,920)	0.20	7.95%
2006	22,971 (20,166 - 26,271)	0.88	1.48%
2007	24,430 (23,000 – 28,460)	0.98	

Wild Parr LaHave River

Electrofishing for juvenile salmon above and below Morgans Falls in 2007 indicated mean parr densities of 7.4 (above) and 9.4 (below) parr per 100 m^2, similar to the long term average parr density of 8.5 per 100 m^2 (Figure 14).

Three locations in the North Branch had an average parr density of 8.0 fish per 100 m^2 down from the 2006 value of 12.5 but larger than the 1980 to 2007 series mean value of 5.9 parr.

These parr densities, which may be low relative to many more northerly salmon producing rivers, remain relatively stable. If returns continue to decline and parr densities diminish then supportive breeding and rearing activities may need to be considered.

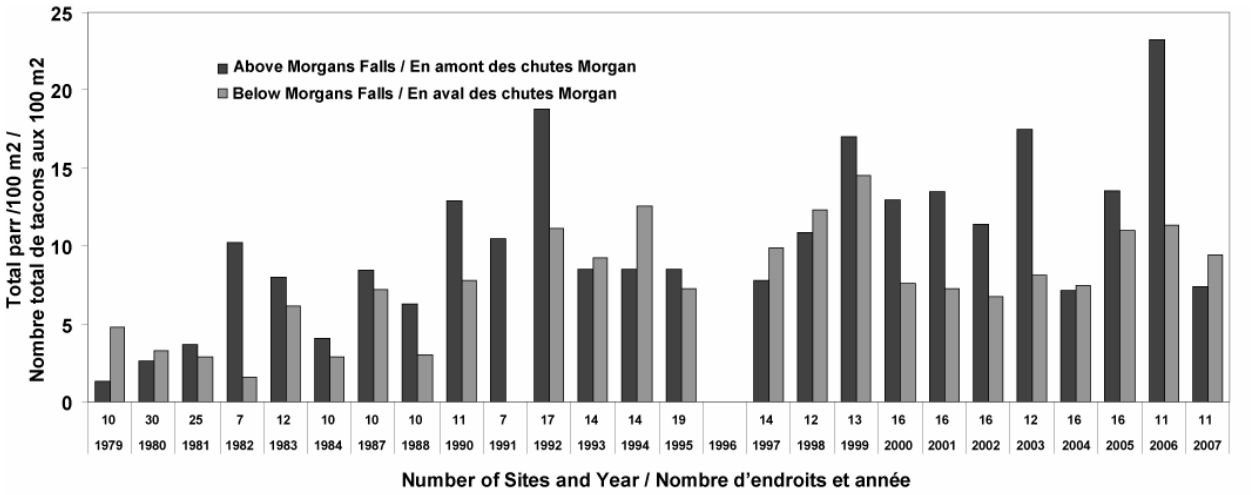

Figure 14. Total juvenile Atlantic salmon per 100 m^2 determined by electrofishing in 7 to 30 locations in the LaHave River 1979 to 1984, 1987, 1988, 1990 – 1995, and 1997 – 2007.

Relevance of LaHave to other Low-Acidified Rivers

The status of other low-acidified rivers in SFAs 20 and 21, that are still capable of producing wild Atlantic salmon, is expected to be similar or worse than the index rivers. Dissimilarities in the status of salmon stocks among rivers of these SFAs may be attributed to the levels of acidification.

Partially-Acidified Rivers

The two fishways of the **Tusket River** in Yarmouth County have not been monitored for salmon since 2003.

The status of the **Medway** and **Gold River** salmon populations has not been assessed recently; however, a review of status relative to the LaHave River in 1996 was re-examined and is provided for a perspective on those populations. Salmon population status in 1996 was estimated through simultaneous stocking of smolts and monitoring of returns on the Medway River and Gold River (Amiro 1998). Catch data on 11 rivers in SFA 21, and a catch rate determined for the LaHave was used to derive an assessment of returns for these rivers (Amiro and Jefferson 1998). These data and analysis indicated that production of smolt from the Medway, based on the estimates of returns and an assumed egg to smolt survival of 1%, was only at 13% of the LaHave River operational conservation requirement (80 eggs per 100 m^2) and only 4% of the international standard conservation requirement reported to the International Commission on Exploration of the Sea (ICES; 240 eggs per 100m^2). Estimated smolt production for the Gold River, with an assumed egg to smolt survival of 1%, was somewhat better in 1996 at 52% and 16% of the LaHave and ICES conservation requirements, respectively. Current salmon population status would be expected to be lower than that found in 1996 given the declining marine survival rates that have occurred since then.

Collections of fry (age 0) and parr (age 1 and 2) for rearing to adult maturity was initiated on the **Medway River** in 2004. Collections numbered 304 in 2004 and 339 in 2005. In 2006 a total of 30 fish were mated and produced 34,556 eggs. Some of these were retained to produce fish for research in 2008. A total of 7,374 parr were released on October 12, 2007, at 11 locations in the Medway River.

Also as a result of this program, a total of 293 mature adult salmon were released into the Medway River at 7 locations on October 11, 2007. Local associations assisted with distribution of these fish.

Heavily-Acidified Rivers
No assessment activities for salmon were carried out in heavily acidified rivers for the last two years. These rivers are not thought to be able to support the production of Atlantic salmon.

Outlook

Low- or Non-Acidified Rivers
For the **LaHave River** above Morgans Falls, forecast models based on cohorts for multi-sea-winter (MSW) salmon and five-year average return rates and number of smolts migrating in 2007, suggest less than a 2% chance that salmon returns in 2008 will be greater than the operational conservation requirement.

Partially-acidified rivers
Persistent low pH, declining wild salmon returns and low smolt-to-adult return rates indicate that wild returns will be insufficient to meet conservation requirements in 2008.

Heavily acidified rivers
Based on the status of low and partially acidified rivers, as well as the known effects of pH, the salmon returns to these rivers in 2008 are expected to be minimal.

Management Considerations

Based on the status and recent performance of wild salmon stock above Morgans Falls on the LaHave River, rivers in **SFA 21** are not expected to achieve conservation requirements in 2008.

Previous practices of releasing Atlantic salmon in support of fisheries have been discontinued. Preservation of “endangered” populations of Atlantic Whitefish (*Coregonus huntsmani*) and inner Bay of Fundy Atlantic salmon now have the highest priority for space at Nova Scotia’s biodiversity facilities. However, given the status of populations in SFA 20 and 21, consideration should be given to supportive rearing or Live Gene Banking of some populations on Southern Uplands Rivers to maintain the genetic diversity of these populations as appropriate.

Outer Bay of Fundy (SFA 23)

Salmon populations of the western part of SFA 23, including the **Saint John River upriver of Mactaquac Dam** and the **Nashwaak River** (tributary of the Saint John River downriver of Mactaquac Dam), are bounded on the east by the “endangered” inner Bay of Fundy populations and on the west by the United States “endangered” populations of Eastern Maine. Many of these outer Bay populations face a multitude of constraints including hydroelectric dams (with upstream passage facilities but mostly devoid of safe downstream passage), artificial flow regimes, headponds, significant industrial and municipal effluents, run-off from intensive forestry and agricultural operations, and developing communities of invasive fish predators.

The entire SFA 23 has been closed to commercial fishing for Atlantic salmon since 1984. The continual failure of populations to achieve the conservation requirement has resulted in the complete closures of the Aboriginal food and recreational fisheries since 1998. The last assessment report for SFA 23 updated status to 2005 (Jones et al. 2006). This update for 2007 uses similar methods to those used in Jones et al. (2006) and includes estimated returns based on fishway counts for the Saint John River upriver of Mactaquac Dam and mark and recapture estimates for both smolts and adult returns on the Nashwaak River.

Status

Total one-sea-winter (1SW) (903) and multi-sea-winter (MSW) (336) returns destined for **upriver of Mactaquac Dam** on the Saint John River in 2007 were both the lowest on record since 1970 (Figure 15). Wild origin fish comprised 54% of 1SW and 61% of MSW fish.

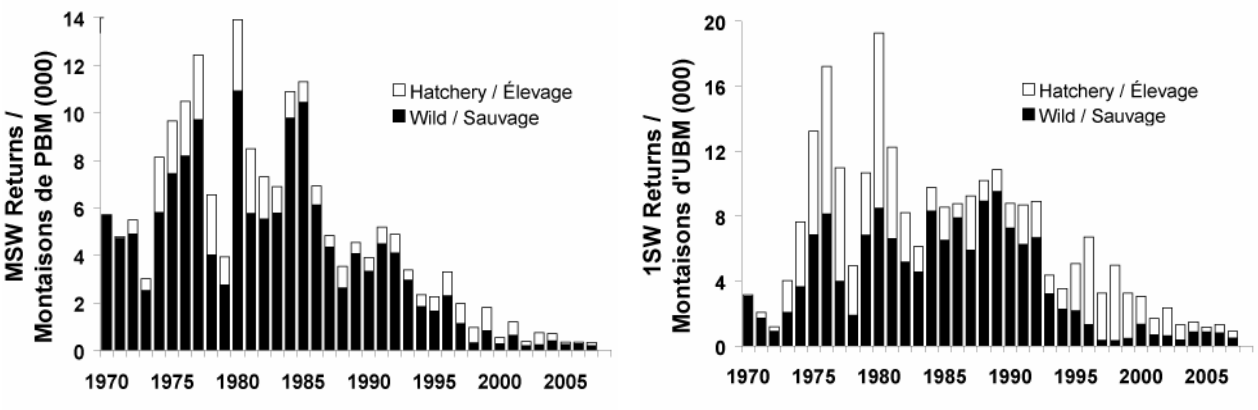

Figure 15. Estimated total adjusted returns of wild and hatchery 1SW and MSW salmon destined for Mactaquac Dam, Saint John River, 1970 - 2007.

Return rates for hatchery-released smolts were 0.24% for 1SW salmon and 0.12% for two sea-winter (2SW) salmon, a decrease of 56% and an increase of 37%, respectively, from the values in 2006 (Figure 16). The smolt-to-1SW salmon rate from the 2006 smolts was the lowest on record. The 2006 hatchery smolts were also the first smolts from the captive-reared adult program.

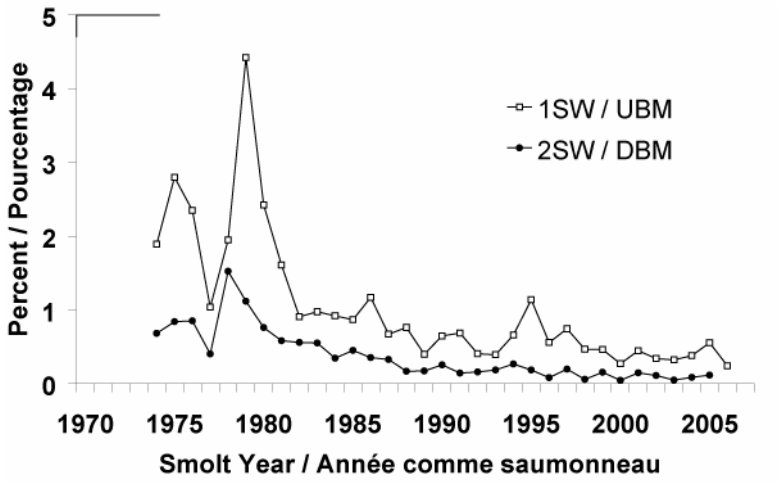

Figure 16. Return rates of hatchery reared smolts to virgin 1SW and virgin 2SW salmon destined for Mactaquac Dam, Saint John River, by smolt year, 1974 – 2006.

Spawners numbered 832 1SW and 259 MSW salmon, 17% and 4% of the respective requirements. The egg deposition estimate (58% from wild fish) was 5% of the requirement, the lowest value on record (Figure 17). An additional 3.5 million eggs (or 12% of requirement) were potentially deposited from captive-reared spawners in 2007.

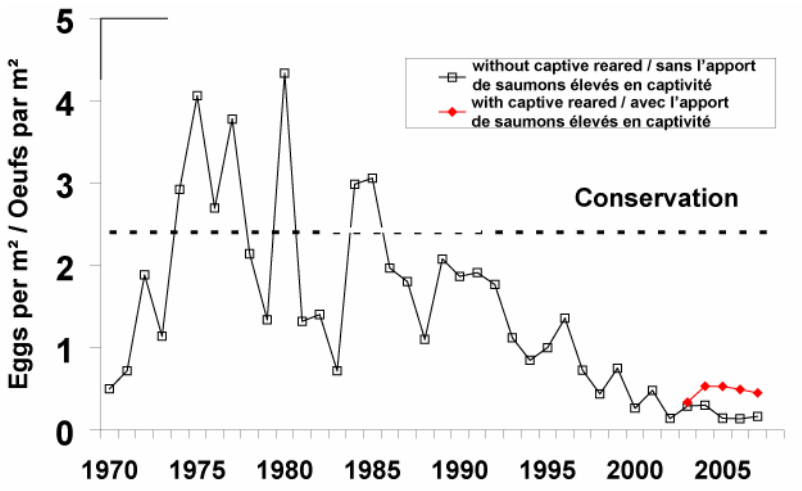

Figure 17. Estimated egg deposition up river of Mactaquac Dam, Saint John River, 1970 - 2007.

Counts of 221 1SW and 101 MSW salmon at the **Nashwaak River** fence, combined with seining of upriver holding pools resulted in an estimated return of 469 1SW and 106 MSW salmon (Figure 18). Both 1SW and MSW returns in 2007 were lower than the previous three years and the MSW returns were second lowest since monitoring resumed in 1993.

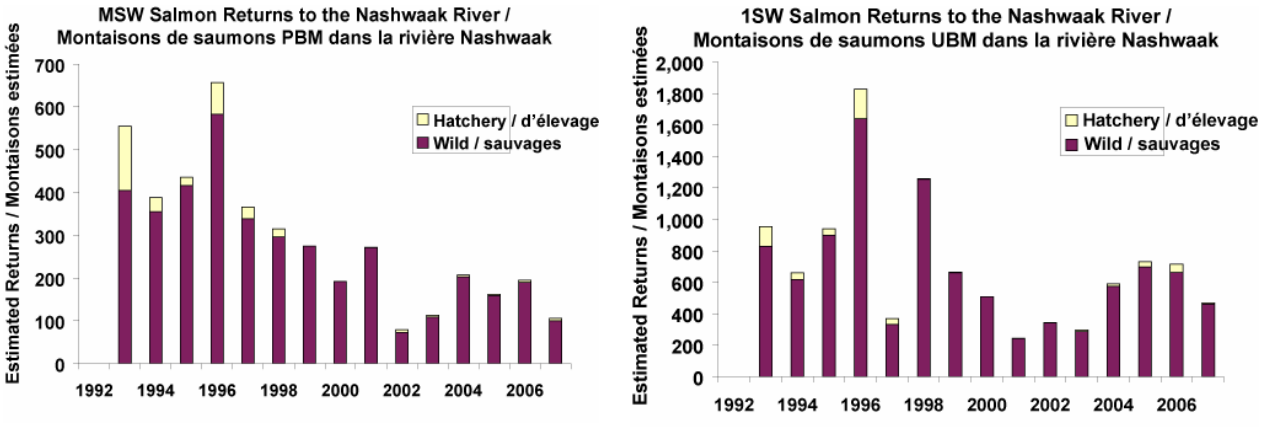

Figure 18. Estimated wild and hatchery 1SW and MSW salmon returns to the Nashwaak River, 1993-2007.

The number of smolts immigrating from upriver of the adult counting fence site in 2007 was estimated to be 21,550 (16,675 – 30,175). Return rates for wild smolts to 1SW and 2SW fish in 2007 were 1.81% and 1.52%, a decrease of 86% and an increase of 19% respectively from the previous year (Table 4).

Table 4. Estimates of the wild smolt emigration upriver of Durham Bridge, (and 2.5 and 97.5 percentiles) and smolt-to-adult return rates for the Nashwaak River, 1998 – 2007.

	Wild Smolt Estimate			Return Rate (%)	
Year	Mode	2.5 perc	97.5 perc.	1SW	2SW
1998	22,750	17,900	32,850	2.91	0.67
1999	28,500	25,300	33,200	1.79	0.84
2000	15,800	13,400	19,700	1.53	0.28
2001	11,000	8,100	17,400	3.11	0.90
2002	15,000	12,300	19,000	1.91	1.26
2003	9,000	6,800	13,200	6.38	1.58
2004	13,600	10,060	20,800	5.13	1.28
2005	5,200	3,200	12,600	12.73	1.52
2006	25,400	21,950	30,100	1.81	
2007	21,550	16,675	30,175		

Spawners represented 22% and 5% of the respective 1SW and MSW conservation requirements. In 2007, the egg deposition estimate of 9% of the requirement was about 45% lower than the previous three year estimates of 16%, 16%, and 17% (Figure 19).

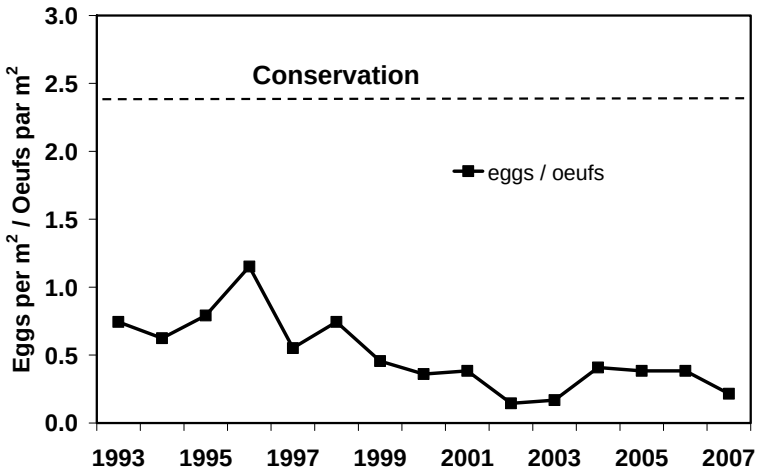

Figure 19. Estimated egg deposition upriver of the counting fence operated just below Durham Bridge, Nashwaak River, 1993 - 2007.

Outlook

Projected returns, based on the average returns of the previous five years, for populations originating **upriver of Mactaquac Dam** on the Saint John River in 2008 are 1,240 1SW (90% C.I.; 860 - 1,590) and 500 MSW (90% C.I.; 160 – 840) salmon. The probabilities of attaining the conservation requirement of 4,900 for both 1SW and MSW salmon are near zero for both forecasts. Hatchery smolt releases in 2007 were 26% lower than 2006 so unless marine survival improves there could be a slight decrease in the number of hatchery 1SW salmon returns for 2008. Marine survival similar to that observed for the 2005 smolt class or an improvement combined with a 47% increase in the number of hatchery smolts released in 2006 from 2005 suggests a possible increase of hatchery 2SW returns in 2008.

Predicted returns to the **Nashwaak River** in 2008 using the five year average are 561 1SW fish (90% C.I.; 261 - 855). There is a near zero probability that the 1SW requirement of 2,040 fish will be

achieved. The forecast of MSW returns is 157 fish (90% C.I.; 80 - 231) and the probability that the conservation requirement of 2,040 MSW fish will be attained is also near zero.

Applying the smolt-to-1SW return rates observed over the past 5 years to the mode of the 2007 wild smolt estimate indicates the predicted 1SW returns to the Nashwaak River in 2008 could be 1,205 fish (90% C.I.; 200 – 2,830). Using this method there is a 1.3% chance that the 1SW requirement will be achieved. The predicted 2SW salmon returns in 2008, from the 2006 smolt class, is 332 fish (90% C.I.; 219 – 443) using the observed smolt-to-2SW return rates in the past 5 years.

Management Considerations

For the Saint John River populations **upriver of Mactaquac Dam**, egg depositions have been less than 50% of requirement for 13 of the last 14 years. There is a near zero probability that MSW and 1SW returns will be adequate to meet the conservation requirement in 2008.

In an effort to maintain existing genetic integrity for potential recovery of the upriver populations and to reduce the number of wild sea-run removals for broodstock, a captive-reared broodstock program was initiated in 2001 at Mactaquac Biodiversity Facility. The first releases of 1SW fish from this program occurred in 2003. There were significant potential contributions to egg depositions since 2004 from captive-reared salmon due to the annual release of approximately 1,000 individuals. The first adult (1SW salmon) returns from the 2004 releases are expected in 2008.

The strategy being used to distribute adult returns upstream of Mactaquac Dam was modified in 2005. Salmon returning before the end of June were released at Perth-Andover, rather than at the Tobique Barrier Pool, whereas those returning after the end of June were released near Woodstock and allowed to migrate upstream on their own. The rational for this change was to reduce both the mixing of tributary stocks and exposure to downstream mortality at dams as salmon are finding their tributary of origin. The assessment of juvenile parr densities in the various tributaries is part of the ongoing evaluation of this management change.

The **Nashwaak River** population attained only about 9% of the conservation requirement in 2007. Total egg depositions were less than 25% of the conservation requirement for the last nine years. Prospects for attaining the conservation requirement in 2008 are near zero, based on the expected low MSW returns. Although the expected returns are well below requirements, the prospects for increased returns for the next couple years are better because of the increase in smolt outputs in 2006 and 2007 combined with improving smolt-to-adult return rates since 2004 (with the exception of the 1SW return rate in 2007).

Unlike 1SW fish returning to Mactaquac Dam which have a low (<10%) component of female 1SW salmon, the Nashwaak River 1SW salmon averaged 40% female from 2003 to 2007. These females have contributed an average of 43% of the total Nashwaak River egg depositions over those same five years and will be extremely valuable in 2008 with the anticipated low number of MSW returns.

Conclusions

Adult salmon populations of eastern Cape Breton Island **(SFA 19)** were assessed on the Middle, Baddeck, North and Grand Rivers. Conservation requirements which have generally not been achieved in recent years for these populations, were not generally met on the assessed rivers in 2007. Adult salmon populations on Nova Scotia's Eastern Shore Rivers **(SFA 20)** were assessed on the St. Mary's River. Conservation requirements have not been achieved in recent years for populations in this region, and based on the status of the St. Mary's River population,

were not met in 2007. Returns and escapements to rivers along the Southern Shore of mainland Nova Scotia **(SFA 21)** in 2007 were insufficient to meet conservation requirements. Population extirpations are known to be occurring on Southern Upland Rivers **(SFA's 20 and 21)**. Wild salmon populations are now at critically low abundance and remaining remnant populations require actions to maintain their genetic integrity and ensure their persistence. None of the assessed salmon populations of the outer Bay of Fundy (**western part of SFA 23**) met their conservation requirements in 2007. On those rivers, egg depositions were less than 10% of requirement. Despite some recent improvement in marine survival and smolt estimates, the probabilities of most populations achieving requirements in 2008 are virtually zero.

Authors or Editor and other Contributors

Name	Affiliation
P. Amiro (author)	DFO Maritimes Science
H. Bowlby (author)	DFO Maritimes Science
J. Gibson (author)	DFO Maritimes Science
R. Jones (author)	DFO Maritimes Science
S. O'Neil (reviewer)	DFO Maritimes Science
T. Worcester (chair)	DFO Maritimes Science

Approved by

Mike Sinclair Regional Director, Science
Date Approved: April 24, 2008

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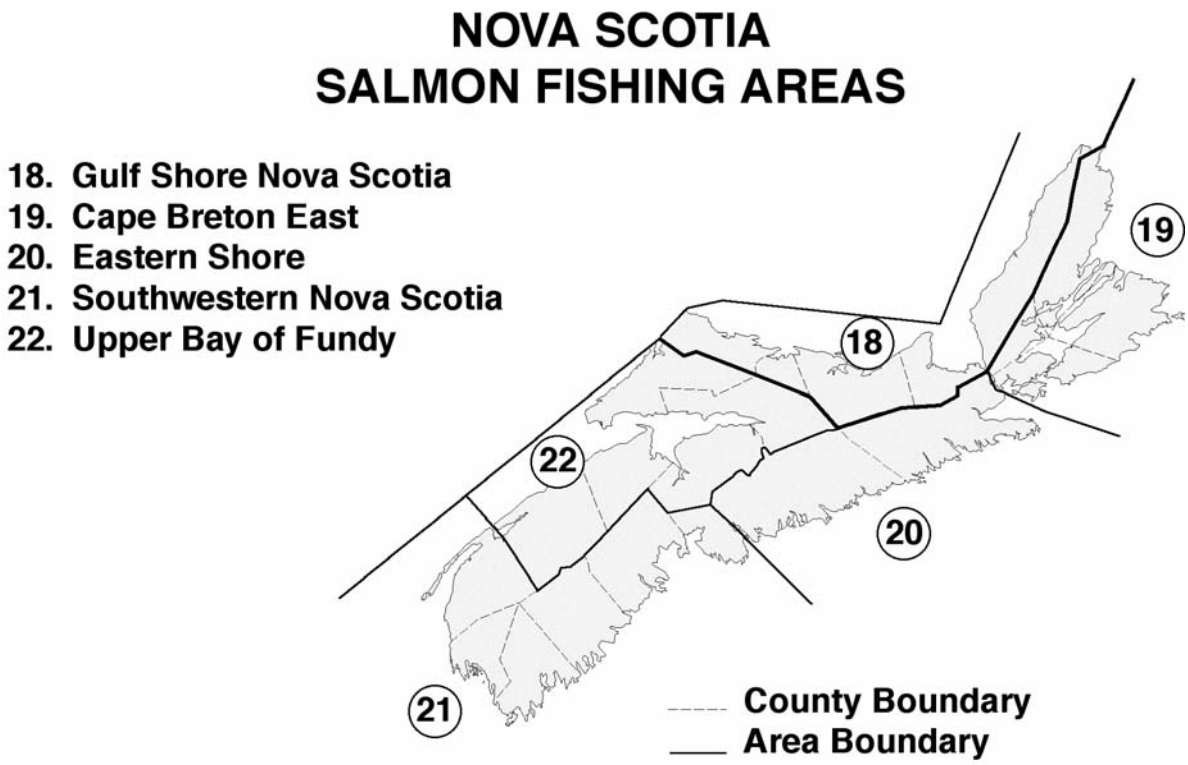
Appendices

Appendix 1: Fisheries and Oceans Canada Notice 2007 Salmon Angling Seasons for Nova Scotia.

The Regional Director-General, Maritimes Region, Department of Fisheries and Oceans wishes to advise the public of the following changes to seasons and bag limits for Atlantic salmon in Nova Scotia.



1 (a) SALMON FISHING AREA 18 (Gulf Shore of Nova Scotia) and all waters of the Province flowing into that Area, except the waters referred to in paragraphs (b) to (j)..... Sept. 1 to Oct. 31
(b) East River, Pictou County ..... Sept. 1 to Oct. 31
(c) West River, Pictou County ..... Sept. 1 to Oct. 31
(d) River Phillip ..... Sept. 1 to Oct. 31
(e) Wallace River ..... Sept. 1 to Oct. 31
(f) West River, Antigonish County ..... Sept. 1 to Oct. 31
(g) South River, Antigonish County ..... Sept. 1 to Oct. 31
(h) Margaree River, Northeast Margaree River, Southwest Margaree River and tributaries, except the waters referred to in paragraphs (i) and (j).....June 1 to Oct. 15
(i) Margaree River upstream from the highway bridges at East Margaree to the Big Intervale bridges on the Northeast Margaree River and upstream to the Scotsville highway bridge on the Southwest Margaree River, not including tributaries.....June 1 to Oct. 31
(j) Northeast Margaree River and tributaries upstream from the Big Intervale bridges ..... Closed all year

NOTES FOR SALMON FISHING AREA 18

THE DAILY CATCH AND RETAIN LIMIT IS TWO GRILSE (SALMON LESS THAN 63 CM IN LENGTH) AND THE DAILY CATCH AND RELEASE LIMIT IS ANY COMBINATION OF GRILSE OR SALMON TOTALING FOUR.

2 (a) SALMON FISHING AREA 19 (Cape Breton East) and all waters of the Province flowing into that Area, except the waters referred to in paragraphs (b) to (q) ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(b) Baddeck River ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(c) Catalone River ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(d) Framboise River ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(e) Gaspereau River ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(f) Gerratt Brook ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(g) Indian Brook, Eskasoni ..... Closed all year

(h) Lorraine Brook ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(i) Marie Joseph River ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(j) Mira River ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(k) Salmon River ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(l) Grand River ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(m) Middle River ..... (catch and release only) June 1 to July 15 ..... and Sept. 1 to Oct. 31

(n) North River downstream from the area known as “The Benches” as marked by a Fishery Officer ..... (catch and release only) June 1 to Oct. 31

(o) North River upstream from the area known as “The Benches” ..... Closed all year

(p) River Tillard ..... (catch and release only) June 1 to July 15
..... and Sept. 1 to Oct. 31

(q) Inhabitants River ..... (catch and release only) June 1 to July 15
..... and Sept. 1 to Oct. 31

NOTES FOR SALMON FISHING AREA 19

THE ANGLING SEASONS ARE OPEN TO CATCH AND RELEASE FISHING ONLY ON THE ABOVE SPECIFIED DATES AND ARE SUBJECT TO IN-SEASON ADJUSTMENTS.

THE DAILY CATCH AND RELEASE LIMIT IS ANY COMBINATION OF GRILSE OR SALMON TOTALING TWO.

3 (a) SALMON FISHING AREA 20 (Eastern Shore) and all waters of the Province flowing into that Area, except the waters referred to in paragraph (b) to (f) ..... Closed all year

(b) East River, Sheet Harbour ..... June 1 to Sept. 30

(c) Musquodoboit River ..... (catch and release only) June 1 to July 15

(d) Salmon River (Guysborough), downstream from the highway bridge at West Cooks Cove ..... (catch and release only) July 1 to Sept. 30

(e) Salmon River (Guysborough), upstream from the highway bridge at West Cooks Cove ..... Closed all year

(f) St. Mary's River ..... (catch and release only) June 1 to July 15

NOTES FOR SALMON FISHING AREA 20

ON THE EAST RIVER, SHEET HARBOUR, THE DAILY CATCH AND RETAIN LIMIT IS TWO GRILSE (SALMON LESS THAN 63 CM IN LENGTH) AND THE DAILY CATCH AND RELEASE LIMIT ON THE EAST RIVER, SHEET HARBOUR, IS ANY COMBINATION OF GRILSE OR SALMON TOTALING FOUR.

ON THE MUSQUODOBOIT RIVER, SALMON RIVER (GUYSBOROUGH) AND ST.MARY'S RIVER, THE DAILY CATCH AND RELEASE LIMIT IS ANY COMBINATION OF GRILSE OR SALMON TOTALING TWO.

4 (a) SALMON FISHING AREA 21 (Southwestern Nova Scotia) and all waters of the Province flowing into that Area, except the waters referred to in paragraphs (b) to (k) ..... Closed all year

(b) Clyde River ..... May 10 to Sept. 30

(c) Jordan River ..... May 10 to Sept. 30

(d) Mersey River ..... May 10 to Aug. 15
..... and Sept. 1 to Sept. 30

(e) Sackville River ..... (catch and release only) June 1 to July 15

(f) Mushamush River ..... (catch and release only) June 1 to July 15

(g) LaHave River downstream from
Morgan Falls..... (catch and release only) June 1 to July 15

(h) LaHave River upstream from Morgan Falls
except the waters referred to in paragraph (i) ..... Closed all year

(i) LaHave River between the bridge on the Lower Branch Road
(Varner's Bridge #2) in New Germany and the Cherryfield Bridge
at Cherryfield, not including tributaries ..... (catch and release only) June 1 to July 15

(j) Petite Rivière, downstream from Fancy Lake... (catch and release only) June 1 to July 15

(k) Tusket River ..... (catch and release only) June 1 to July 15

NOTES FOR SALMON FISHING AREA 21

ON THE CLYDE, JORDAN AND MERSEY RIVERS, THE DAILY CATCH AND RETAIN LIMIT IS TWO GRILSE (SALMON LESS THAN 63 CM IN LENGTH) AND THE DAILY CATCH AND RELEASE LIMIT IS ANY COMBINATION OF GRILSE OR SALMON TOTALING FOUR.

FOR THE RIVERS LISTED IN ITEMS 4(e) TO 4(g) AND 4(i) TO 4(k), THE DAILY CATCH AND RELEASE LIMIT IS ANY COMBINATION OF GRILSE OR SALMON TOTALING TWO.

5 (a) SALMON FISHING AREA 22 (Upper Bay of Fundy) and all waters of
the Province flowing into that Area..... Closed all year

ANGLERS ARE REMINDED THAT, FOR THOSE RIVERS ON WHICH RETENTION IS PERMITTED, THE YEARLY BAG LIMIT FOR ATLANTIC SALMON IS EIGHT (8) FISH (GRILSE) THAT MEASURE LESS THAN 63 CM FROM THE TIP OF THE NOSE TO THE FORK OF THE TAIL. ALL SALMON 63 CM OR LONGER MUST BE RETURNED TO THE WATER IN A MANNER THAT CAUSES THE LEAST POSSIBLE HARM TO THAT FISH.

PLEASE NOTE THAT SEASONS AND BAG LIMITS MAY CHANGE AT ANY TIME FOR CONSERVATION REASONS AND SUBJECT TO ABORIGINAL HARVEST AGREEMENTS.

FOR FURTHER INFORMATION CONTACT THE LOCAL FISHERY OFFICER AND REFER TO MARITIMES REGION VARIATION ORDERS 2007-071 AND 2007-072.

FAITH SCATTOLON
REGIONAL DIRECTOR-GENERAL
MARITIMES REGION

Appendix 2. Reported recreational catches in SFA's 19 to 21 for 2007, 2006 and the average catches for 2002-2006 time period. All salmon fisheries in SFA 22 and 23 were closed for this time period

	2007 (preliminary)				2006				5 -Year Mean (2002-2006)							
	Grilse		Salmon	Effort	Grilse		Salmon	Effort	Grilse				Salmon		Mean Effort	
	Retained	Released	Released	Rod-days	Retained	Released	Released	Rod-days	Retained	95% CI	Released	95% CI	Released	95% CI	Rod-days	95% CI
SFA 19: EASTERN CAPE BRETON ISLAND																
ACONI BROOK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BADDECK	2	16	72	267	0	21	88	316	0.3	0.9	23.3	12.1	73.7	35.4	264.8	111.3
BARACHOIS	0	0	1	10	0	2	2	6	0	0	1	1.2	0.7	1.3	12.6	7.9
CATALONE	0	0	0	0	0	0	0	0	0	0	1.4	3.1	1.3	2.3	4.8	8.5
CLYBURNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.1	10.9
FRAMBOISE (GIANT LAKE)	0	3	1	17	0	0	0	6	0	0	1	2.8	0	0	6.1	9.9
FRENCHVALE BROOK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GASPEREAUX: C. BRETON CO.	0	0	0	0	0	0	2	5	0	0	0	0	0.3	0.8	1.7	2.5
GERRATT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GRAND	0	6	2	37	0	15	0	28	0	0	17.8	10.7	0.9	1.7	44.6	35.4
GRANTMIRE BROOK	0	0	3	5	0	6	0	14	0	0	4.8	7	2.8	3.5	9.7	7.9
INDIAN BROOK	0	0	0	3	0	0	0	13	0	0	1.1	2.9	1	1.9	10.4	1.9
INGONISH	0	0	0	0	0	0	0	5	0	0	0.6	1	1.6	3.7	3.6	1
INHABITANTS	0	7	19	27	0	6	15	47	0	0	3.9	2.5	4.4	7.2	17.2	21.3
LITTLE LORRAINE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LORRAINE BROOK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MACASKILL'S BROOK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MARIE JOSEPH	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0.6	1
MIDDLE: VICTORIA CO.	0	45	101	525	0	44	87	416	0.3	0.7	30.8	12.2	87.4	59.1	325.2	144.6
MIRA	0	0	0	0	0	0	0	9	0	0	0.3	0.7	0	0	12.8	21.6
NORTH ASPY	0	18	13	83	0	2	3	27	0	0	1.6	3.5	12.3	11.2	36.9	22.9
NORTH: VICTORIA CO.	0	95	138	522	0	56	104	445	0.3	0.7	59.1	22	125.8	64	436.9	125.1
NORTHWEST BROOK (RIVER RYAN)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RIVER BENNETT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RIVER DENY'S	0	2	0	5	0	0	0	0	0	0	0	0	0	0	0	0
RIVER TILLARD	0	0	0	0	0	3	2	6	0	0	0.6	1.8	0.6	1	4.7	4.5
SAINT ESPRIT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SALMON: CAPE BRETON CO.	0	2	2	11	0	1	0	9	0	0	2	3.7	1	1.2	15.6	16.1
SKYE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SYDNEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SFA TOTALS :	2	194	351	1513	0	157	302	1356	0.9	1	149.2	25.1	314	153.5	1213.2	317.7
SFA 20: EASTERN SHORE																
COUNTRY HARBOUR	River Closed				0	0	0	2	0	N/A	0	N/A	0	N/A	1.6	N/A
EAST: SHEET HARBOUR	0	0	2	8	0	0	0	8	0	0	0	0	0.3	0.8	4.3	3.7
ECUM SECUM	River Closed				River Closed				0	N/A	1.4	N/A	0	N/A	8.8	N/A
GUYSBOROUGH	River Closed				River Closed				0	N/A	1.3	N/A	0	N/A	1.3	N/A
LISCOMB	River Closed				River Closed				0	N/A	0	N/A	0	N/A	1.3	N/A
MOSER	River Closed				0	0	0	5	0	0	0.6	2.5	0	0	2.7	4.5
MUSQUODOBOIT	0	25	8	113	0	27	3	115	0.3	0.7	16.3	12.8	2.3	1.9	68.8	49.3
NEW HARBOUR	River Closed				River Closed				0	N/A	4.4	N/A	0	N/A	2.9	N/A
SAINT MARY'S	3	220	95	624	2	218	69	476	0.4	1.2	77.1	150.3	25.5	47.9	223.8	274.8
SALMON: GUYSBOROUGH CO.	2	7	3	56	0	10	8	43	0	0	17.6	19.6	7.9	7.1	42.3	38.9
SFA TOTALS :	5	251	108	800	2	255	80	649	0.6	1	97.4	111.1	30.9	37.1	299.2	272.7
SFA 21: SOUTHERN UPLANDS																
CLYDE	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1.3	2.3
GOLD	River Closed				River Closed				0	N/A	6.6	N/A	0.7	N/A	12.4	N/A
JORDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LAHAVE	0	90	18	501	0	211	65	476	0	0	170.4	45.1	63.2	37.8	472.5	145.4
MEDWAY	River Closed				0	0	0	3	0	N/A	0.7	N/A	0	N/A	2.2	N/A
MERSEY	0	0	0	0	0	0	0	0	6.5	8.8	1.9	3.6	2	2.9	153.8	218.3
MIDDLE: LUNENBURG CO.	0	3	0	3	0	0	0	3	0	N/A	0	N/A	0	N/A	3.2	N/A
MUSHAMUSH	0	0	0	0	0	3	0	6	0	0	1.2	1.6	0	0	2.6	3.7
PETITE RIVIERE	0	11	3	35	River Closed				River Closed							
SACKVILLE	0	1	0	52	0	7	0	28	0	0	3.4	3.8	0.3	0.7	35.6	13.2
TUSKET	0	0	0	0	0	0	0	0	0	0	3.4	5.7	1.4	1.9	34.4	40.2
SFA TOTALS :	0	105	21	593	0	221	65	517	6.5	8.8	183.2	45.8	67.1	37.5	706.7	168.3

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Centre for Science Advice,
Maritimes Region
Department of Fisheries and Oceans
P.O. Box 1006, Stn. B203
Dartmouth, Nova Scotia
Canada B2Y 4A2

Phone number: 902-426-7070
Fax: 902-426-5435
e-mail address: XMARMRAP@mar.dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas

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