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The status of Atlantic salmon (*Salmo salar*) on Prince Edward Island (SFA 17) in 2013

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Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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ABSTRACT

This paper summarizes Atlantic salmon status on Prince Edward Island (PEI) to 2013. The number of PEI rivers containing Atlantic salmon was approximately 71 at the time of European contact, 28 in 2000-2002, 22 in 2007-2008, and approximately 26 currently. Reported aboriginal Food Social and Ceremonial (FSC) harvests were three salmon retained in 2012 and no harvests in 2013. The public recreational salmon fishery on PEI has been catch-and-release only since 2009. Conservation requirements are estimated to be about 4.9 million eggs, equivalent to about 1,098 female spawners, for the 26 rivers currently occupied by salmon. On the basis of the most recent redd counts, spawners on PEI total 1,246 salmon, of which 721 were females, which produced 3.5 million eggs. These numbers should be viewed as a generalization for recent years, since estimates for some rivers are based on redd counts conducted prior to 2013. Estimated egg production is 71% of conservation requirements for the 26 current salmon rivers. Available data series (redds, juvenile densities) have poor temporal and geographic coverage, which limits the ability to infer trends in salmon status. However it is clear that salmon status has improved greatly in a cluster of northeast PEI rivers which have been subject to intensive habitat rehabilitation. Uncertainty and knowledge gaps in this review include lack of recreational catch estimates, unreliable determination of salmon presence in some rivers, poor or dated data on biological characteristics and spawner to redd ratios used in conservation requirement calculations, and poor trend data.

L’état du saumon de l’Atlantique (*Salmo salar*) à l'Île-du-Prince-Édouard (ZPS 17) en 2013

RÉSUMÉ

Le présent document fait le point sur l’état du saumon de l'Atlantique à l'Île-du-Prince-Édouard (Î.-P.-É.) en 2013. Le nombre de rivières de l'Î.-P.-É. contenant des saumons de l’Atlantique était d'environ 71 au moment de l'arrivée des Européens, de 28 en 2000-2002, de 22 en 2007-2008 et d'environ 26 actuellement. Les prises autochtones déclarées dans le cadre des pêches à des fins alimentaires, sociales et rituelles (ASR) étaient de trois saumons conservés en 2012 et de zéro en 2013. La pêche récréative du saumon à l'Île-du-Prince-Édouard se fait uniquement par capture et remise à l'eau depuis 2009. Les exigences en matière de conservation sont estimées à environ 4,9 millions d'œufs, ce qui équivaut à environ 1 098 femelles reproductrices, pour les 26 rivières où l'on trouve actuellement des saumons. En se fondant sur les dénombrements de frayères les plus récents, il y a 1 246 reproducteurs sur l'Île-du-Prince-Édouard au total, dont 721 femelles qui produisent 3,5 millions d'œufs. Ces chiffres devraient être considérés comme une généralisation pour les dernières années, étant donné que les estimations pour certaines rivières sont fondées sur des dénombrements effectués avant 2013. La production d'œufs estimée atteint 71 % des exigences de conservation pour les 26 rivières à saumon actuelles. La couverture temporelle et géographique des séries de données disponibles (frayères, densités de juvéniles) n'est pas bonne, ce qui limite la capacité à dégager des tendances sur l’état du saumon. Cependant, il est évident que l’état du saumon s'est grandement améliorée dans un ensemble de rivières du nord-est de l'Île-du-Prince-Édouard qui ont fait l'objet d'une intensive remise en état de l'habitat. Dans cet examen, l'incertitude et les lacunes dans les connaissances comprennent l'absence d'estimation des prises de la pêche récréative, la détermination non fiable de la présence du saumon dans certaines rivières, des données anciennes ou mauvaises sur les caractéristiques biologiques et les ratios de reproducteurs par rapport aux frayères utilisés dans les calculs des exigences en matière de conservation, ainsi que des données peu fiables sur les tendances.

INTRODUCTION

Atlantic salmon (*Salmo salar*) occupy many rivers of the southern Gulf of St. Lawrence, and are the subject of aboriginal and recreational fisheries in some of these rivers. Atlantic salmon in the southern Gulf of St. Lawrence and the Gaspé Peninsula form a Designatable Unit that COSEWIC (2010) assessed as Special Concern. In February 2014, the status of Atlantic salmon in the southern Gulf of St. Lawrence was reviewed in a meeting held in Moncton, New Brunswick. The objectives of the science review, as outlined in the Terms of Reference, are to address the request for advice considering the following points:

- Description of fisheries management measures, current and recent catch and harvests of Atlantic salmon by size group of salmon in aboriginal and recreational fisheries by river and by SFA of the southern Gulf (as defined in the Atlantic salmon IFMP; 15A, 15B, 16A, 16B, 17, 18A, 18B).
- Description of river-specific conservation requirements for Atlantic salmon.
- Description of the total returns and spawning escapements of Atlantic salmon by size group in the rivers of the southern Gulf of St. Lawrence in 2012 and 2013 and trends in status in each of the SFAs.
- Description of freshwater production trends in the rivers of the southern Gulf.
- Development of indicators which could be used to monitor status of Atlantic salmon populations in the intervening years of the multi-year assessment and management plan cycle.
- Identification of the data requirements for developing a river classification system for managing Atlantic salmon fisheries in Gulf Region.
- Identification of uncertainties and knowledge gaps.

This paper addresses these objectives for Atlantic salmon populations of Prince Edward Island (PEI; Salmon Fishing Area (SFA) 17). As part of the COSEWIC Designatable Unit that includes the Southern Gulf of St. Lawrence and the Gaspe Peninsula, PEI salmon are considered by COSEWIC (2010) to be of Special Concern. However, COSEWIC (2010) recognized that conservation status of Atlantic salmon varied within this Designatable Unit, and noted particular conservation issues on PEI that arise from poor habitat quality.

Salmon <63 cm fork length are classified as small, and those with >= 63 cm fork length are classified as large. These size categories approximately correspond to returning adults which have passed one winter at sea (one sea winter, 1SW), and those which have passed two or more winters at sea (multi-sea winter, MSW).

PEI salmon status and biology has previously been reviewed by Ducharme (1977), Bielak et al. (1991), Davidson and Bielak (1992), Davidson and Angus (1994), Cairns et al. (1995, 1996, 2000, 2010, 2012), Cairns (1997), Marshall et al. (1999), Guignion et al. (2002, 2010), Chaput et al. (2006), Guignion (2009), and MacFarlane et al. (2009)[1]. There are 55 rivers on PEI with historic or current records of salmon occupancy. An additional 16 rivers are thought to have

[1] MacFarlane, R.E., Potter, B., and Guignion, D.L. 2009. Density of juvenile salmonids in selected watersheds 2008. Unpublished report by Prince Edward Island Department of Environment, Energy and Forestry.

been occupied by salmon at the time of European contact, based on the size and nature of the river (Cairns et al. 2010). This gives a total of 71 rivers which probably contained salmon at the time of European contact. Salmon distribution on PEI has diminished greatly in historic times. The number of rivers known to contain salmon was 28 in 2000-2002 and 22 in 2007-2008, with salmon presence detected in one additional river in 2011. In some of these rivers salmon populations are very low, and spawning may occur in intermittent years. Because of the difficulty of determining salmon occupancy when populations are very low, the number of rivers reported to contain salmon must be considered approximate.

Original salmon populations on PEI were dominated by late-run and multi-sea-winter fish. Stocking of Atlantic salmon on PEI began in 1880, and at least 37 million fish were released to PEI waters between 1880 and 1960 (Cairns et al. 2010). Most of these fish were of mainland origin, or descendants of fish of mainland origin. This large-scale stocking has increased the early-run and small components of salmon in some PEI rivers. Early runs are generally limited to larger rivers, while small rivers retain the ancestral pattern of late runs and multi-sea-winter marine migrations.

MANAGEMENT REGIMES AND FISHERY HARVESTS

Salmon harvests on PEI are authorized for aboriginal Food, Social, and Ceremonial (FSC) fisheries, and catch-and-release fisheries are authorized for public recreational angling. The Native Council of PEI had an allocation of 250 grilse (small salmon) in 2013. The season was between 1 April and 30 November and there were no geographical restrictions. However, the Native Council did not operate a retention fishery in 2013, so all salmon caught under this access were released after capture. In previous years, Abegweit First Nation had access to 200 grilse, but a Conservation Harvest Plan was not agreed to in 2013.

In 2012, the Native Council of PEI had an allocation of 250 grilse and Abegweit First Nation had an allocation of 200 grilse. Reported Native Council FSC catches were three slinks (black salmon) caught and released in the Mill River and two slinks caught and released in the Midgell River. Reported Abegweit First Nation FSC harvest in 2012 was three salmon retained. Information on size (small or large) and fishing location is not available. In 2013, reported Native Council FSC catch was two slinks released in the Morell River. In 2013, no reported FSC harvest by Abegweit First Nation occurred. For the period 2007-2011, mean reported FSC harvest was 0.5 salmon per year in the Morell River, 1.0 salmon per year in the Pisquid River, and 0.4 salmon per year in the West River (Table 1).

Recreational angling is governed by regulations pursuant to the federal Fisheries Act, and by Variation Orders which alter the provisions of these regulations. Recreational salmon licencing is administered by the Province of Prince Edward Island, which may impose additional restrictions on salmon angling. Until 2011, recreational salmon anglers on PEI had to first obtain a general angling licence, and then purchase a salmon licence. Beginning in 2012, separate salmon licences were no longer issued, and the provincial angling licence confers recreational fishing access to Atlantic salmon, as well as to brook trout, rainbow trout, and white perch.

The recreational salmon season in most PEI rivers is 1 June to 15 September (Table 1). In parts of the Mill River (Cains and Carruthers Brooks) and Morell River, salmon angling is extended to 31 October. Salmon angling, and all angling after 15 September, is restricted to artificial flies with barbless hooks. Seasonal retention limits for small salmon were seven in 1997-2004, four in 2005-2006, two in 2007-2008, and zero in 2009 and subsequently. Hence beginning in 2009, all recreational salmon angling on PEI has been catch-and-release only. Daily catch limit in 2013 is two released salmon. PEI Angling Summaries for 2012 and 2013 provide further details on fishing restrictions in 2012 and 2013.

From 1995 to 2006, salmon harvest surveys were administered through tear-off stubs attached to the salmon licence, with mail-outs to those who did not return the stub. In 2007-2011, the survey was administered by mailing questionnaire cards to licence-holders. In 2012 and subsequently, surveys could no longer be directed specifically to salmon anglers because salmon-specific licences are no longer issued. Consequently, salmon harvest estimates for the recreational fishery are unavailable for 2012 and subsequently.

Although the provincial angling licence permits salmon fishing in all waters that are legal for angling, in practice, recreational salmon fishing is limited to those rivers where the legal season overlaps with the run-timing of returning fish. For the period 2007-2011, recreational salmon catches were reported in only three rivers (means 1.7 salmon/yr in the Mill River, 75.5/yr in the Morell River, and 44.7/yr in the West River; Table 1). In the three other rivers which have early-run components (Trout (Coleman), Cardigan, Dunk), no salmon catches were reported. For PEI as a whole, mean estimated recreational catches for 2007-2011 were 121.9 salmon/yr, of which 72.5/yr were small and 68/yr were large (Cairns et al. 2012). For 2011, estimated recreational catches were 136 salmon, of which 68 were small and 68 were large.

For the period 2009-2011 (after the imposition of compulsory release), mean losses of salmon on PEI from both recreational and aboriginal FSC fisheries, including estimated catch-and-release mortality, was 1.8 small salmon per year and 1.2 large salmon per year (Cairns et al. 2012).

In 2013, anglers wishing to participate in the extended season (16 Sep - 31 Oct) were required to register, and to submit a logbook of their fishing activities during the extended season. These requirements applied to those wishing to fish salmon in the Morell River, or rainbow trout in the Souris, Montague, Valleyfield, West, and Dunk Rivers. The extended season did not apply to the Mill River because of a fish kill there in July 2013. There were 265 anglers who registered for the extended season, of which 81 returned logbooks. However, many of these anglers were fishing for rainbow trout rather than Atlantic salmon. Angling effort from logbooks in the Morell during the extended season totaled 442 hours (108 rod-days). Logbooks submitted by 19 anglers who fished the Morell reported a catch of 12 small salmon and 23 large salmon (total 35). A bycatch of 89 brook trout was also reported.

The 35 salmon reported caught in Morell River logbooks in 2013 are not an estimate of total catch for that river, because the logs cover only the extended season, and because an unknown number of anglers may not have returned logs. For the 2011 fishing season, the mail-out questionnaire asked salmon anglers to report the number of days fishing for salmon on PEI in 15 Apr - 15 Sep (regular season) and 16 Sep - 31 Oct (extended season). Of 151 reported salmon fishing days, 113 (74.8%) were in the regular season and 38 days were in the extended season (Cairns et al. 2012). This suggests that the majority of salmon fishing effort on PEI occurs in the regular season.

There are no quantitative data on illegal salmon harvest on PEI. Unintentional bycatch of salmon in legal fisheries may impose catch-and-release mortality. There is a large trout fishery in the estuary of the Morell River at the beginning of the trout season, in mid-April. Anecdotal reports suggest that slinks are sometimes caught in this fishery. This fishery is prosecuted with baited hooks and the salmon are in poor condition after overwintering in the river. Both of these factors may increase risk of post-release mortality.

CONSERVATION REQUIREMENTS AND RETURNS

The conservation reference point for Atlantic salmon in PEI rivers is an egg deposition rate of 2.4 eggs per m^2. Egg conservation requirements for PEI rivers which currently contain salmon,

or which probably contained them in the past, were calculated from stream areas. Stream areas were estimated from a regression based on measurements of stream area and watershed area in larger rivers (Cairns et al. 2010). This process estimates total stream area, including habitat which is inaccessible to salmon due to human- and beaver-made dams. The proportion of stream habitat that is inaccessible to salmon is unmeasured but possibly substantial. This means that estimates of egg conservation requirements are greater than those which would be produced if only accessible habitat were considered.

The number of female spawners needed to meet egg conservation requirements was calculated from data on size-specific sex ratio and size-specific fecundity (Table 2). There are no recent data on the proportion of spawners that are large. For the purposes of calculating spawner requirements, it is assumed that large fish comprise 50% and 90% of spawners in rivers with and without an early run component, respectively.

Table 3 lists the 71 PEI rivers which currently contain or probably historically contained Atlantic salmon. Total conservation requirements for these rivers are 10,565,273 eggs, equivalent to 2,288 female spawners, and 3,557 total spawners. Of these, 26 rivers are considered to currently contain salmon, on the basis of electrofishing records in 2007-2008, or presence of redds in recent years. Total conservation requirements for rivers considered to currently contain salmon are 4,875,127 eggs, equivalent to 1,098 female spawners, and 1,836 total spawners (Table 3).

A single female salmon may produce several spawning redds, and redds are often superimposed on each other (Beland 1996; Cunjak and Therrien 1998). Despite the variability imposed by these circumstances, ratios of redd counts to spawners are commonly used in New England to estimate spawning escapement (Anon. 2011). They are also commonly used in assessments of Pacific salmon (Gallagher et al. 2007). Redd surveys were used in salmon assessments of the Restigouche River in the 1990s (Locke et al. 1998). DFO (2001) reported a mean ratio of 2.5 redds per large returning female in the Nepisiguit River. In 1990-1996, redd counts above Leards Pond on the Morell River were significantly correlated with the number of salmon counted and released at Leards Dam ($r = 0.85$, $n=6$, $p = 0.03$) (Cairns et al. 2012). However, this series cannot be used to calculate a relation between redd counts and spawners because an unknown, but possibly substantial, number of salmon entered the waters upstream of Leards Dam in 1990-1996 without being counted (Cairns 1997).

No early run salmon were stocked in the West River prior to 1991. In 1990, 48 salmon were counted through a fence on the river's tidal estuary. These included 14 females, of which 13 were large and 1 was small. Forty-seven redds were counted in the river in fall 1990. The ratio of redds to escaping females is thus 47/14 = 3.357.

Salmon redd surveys have been conducted in all current PEI salmon rivers at least once since 1990 (Table 4). Based on the ratio of redds to escaping females in the West River in 1990, estimated spawners, estimated egg deposition, and egg deposition as a percent of conservation requirement are calculated from the most recent redd counts (Table 3) and all redd counts (Table 4). On the basis of the most recent redd counts, spawners on PEI total 1,246 salmon, of which 721 were females. These numbers should not be considered an indication of status of PEI salmon in 2013, because many of the redd counts used in the calculations are from earlier years. Instead, the numbers reflect a generalized picture for recent years.

The estimated 721 female spawners produced an estimated 3,455,095 eggs. This egg production was 32.7% of conservation requirements for the 71 rivers which currently or probably formerly contained salmon, and 70.9% of the conservation requirements of the 26 rivers which currently contain salmon.

Based on the most recent redd counts, egg deposition exceeded conservation requirements in seven rivers (Carruthers, Morell, Cow, Naufrage, Cross, Priest Pond, North Lake) (Fig. 1). In three rivers classed as current salmon rivers on the basis of electrofishing and other data, the most recent redd count was zero, meaning that deposition as a percent of conservation requirement is zero.

All of the rivers that exceeded conservation requirement are located on PEI's north shore, and none contain rainbow trout. Rainbow trout is considered a possible competitor with possible negative effects on Atlantic salmon distribution and numbers on PEI (Cairns 2006; Cairns et al. 2012).

Five of the seven rivers that exceeded conservation requirements are located on the north side of the northeast extremity of PEI. The rivers in this area, collectively termed the "Northeast Cluster," are McAskill Creek, Cow River, Naufrage River, Bear River, Hay River, Cross Creek, Priest Pond Creek, and North Lake Creek. All but one of these rivers (McAskill Creek) currently contain salmon. These rivers have been the subject of extensive habitat restoration work by the Souris and Area Branch of the PEI Wildlife Federation, which also conducts the redd surveys in the area.

North Lake Creek drains into a saline lagoon which connects to the Gulf of St. Lawrence by a narrow run. The other rivers in the Northeast Cluster drain into the Gulf of St. Lawrence with little or no estuary. The near-absence of estuaries in most of these rivers has possible conservation significance, because estuaries may be sites where outgoing smolts and returning adults have particular vulnerability to pinniped predators (Jonsson and Jonsson 2004). In the other two rivers which exceed conservation requirements (Carruthers, Morell) extensive estuary and bay habitat lies between fresh water and the open Gulf of St. Lawrence.

Harvest estimates from the public recreational fishery are unavailable for 2012 and 2013. In 2009-2011, estimated annual losses of salmon in the recreational fishery, due to catch-and-release mortality, was 2.7 salmon per year (Cairns et al. 2012). FSC fisheries retained three salmon in 2012 and no salmon in 2013. Assuming a recreational fisheries mortality equivalent to the mean for 2009-2011, and FSC mortality as reported, total fisheries losses were six fish in 2012 and three fish in 2013. Total returns are calculated as the generalized estimate of spawners for recent years plus fishing related losses. Total returns are thus estimated as 1,246 + 6 = 1,252 salmon in 2012 and 1,246 + 3 = 1,249 salmon in 2013.

There are limited quantitative data to indicate status trends for salmon on PEI. Contemporary accounts from the Canadian Department of Fisheries and other sources indicate that Atlantic salmon were abundant and widespread on PEI in the late 19th century (Cairns et al. 2010). It is evident that salmon have diminished greatly in PEI since that time. Figures 2 and 3 present time series of redd counts and egg deposition as a percent of conservation requirements for 12 PEI rivers. Trend interpretation is complicated by the intermittent nature of available data. In two rivers (Bristol Creek, Morell River) recent counts are lower than those from the 1990s, but there is no obvious trend in several others (Midgell, St. Peters, North, West). For two rivers in the Northeast Cluster (Naufrage River, North Lake Creek), redd counts are available for the 1990s. Redd count series in these rivers indicate a large rise in spawning activity between the 1990s, and the 2000s when extensive habitat restoration was undertaken (Fig. 2). In five of the six Northeast Cluster rivers for which multi-year redd counts are available, the highest redd counts were recorded in 2013.

FRESHWATER PRODUCTION TRENDS

Most electrofishing conducted on PEI since 2000 has been directed at determining the presence of salmon and helping identify habitat problems (Guignion 2009). The river with the most extensive electrofishing data is the Morell (Table 5; Fig. 4). However, only three electrofishing sessions have been conducted since 2003, all at sites which were not used in previous surveys. For these reasons the electrofishing data series is poorly suited to indicate recent trends in freshwater production in the Morell River.

DEVELOPMENT OF INDICATORS FOR MONITORING

Fisheries and Oceans Canada does not have a program for collecting data on Atlantic salmon status and fisheries in PEI. With the recent change in the provincial angling licencing regime, salmon catch estimates are no longer available. The main current data source on salmon status is redd counts, which are primarily conducted by local watershed groups. Such counts can indicate relative abundance of returning adults, but they are valuable as long-term indicators only if they are repeated over long periods of time. Because redd counts are subject to the interest of local volunteer-led committees, and the funding availability to these groups, long-term continuity of these counts is not assured.

DATA REQUIREMENTS FOR A RIVER CLASSIFICATION SYSTEM

Data available for current and former Atlantic salmon rivers on PEI include stocking history, run timing, fishing seasons, estimated harvest (up to 2011), presence of rainbow trout (a potential competitor), stream area, watershed area, and egg conservation requirements.

UNCERTAINTIES AND KNOWLEDGE GAPS

Since 2012, recreational Atlantic salmon catches and harvests on PEI cannot be estimated due to the elimination of a separate salmon licence. Salmon harvest estimates prior to 2012 were limited in their reliability because of low sample sizes and low return rates of licence reports. However, because the recreational fishery is catch-and-release only, mortality due to this fishery can be assumed to be small. FSC harvests are not always reliably known because groups with FSC licences do not always provide harvest information.

The number of rivers currently occupied by salmon is derived from electrofishing surveys and redd surveys. These surveys are not conducted regularly in most rivers, so knowledge of salmon presence in many rivers is not up to date. In addition, when salmon populations are very low, they may reproduce only intermittently, which makes it difficult to detect salmon presence without a high degree of effort.

The estimate of egg conservation requirements is based on estimates of total habitat in each stream. However, a portion of many streams is unavailable to salmon due to artificial and beaver dams and to culverts that do not pass returning adult salmon. Hence the conservation requirements used in this paper may overestimate the requirements of habitat that the fish have access to.

Most data inputs used in the evaluation of compliance with egg conservation requirements are poorly known. The calculations use fecundities, sex-ratios, size distributions, and run timings which are primarily based on measurements from the 1990s or earlier.

For the Dunk River, the most recent full redd count was conducted in 1993. This count is unlikely to reflect current conditions. Egg deposition is estimated using a ratio of redd counts to

female spawners that is derived from a single year's data in the West River. Redd to spawner ratios are likely to vary among years and among sites. Redd to spawner ratios may vary non-linearly with density, because redd superimposition is likely to occur with increasing frequency when density is high, notably in those rivers in northeastern PEI where salmon have been abundant in recent years. More years of data at more sites are needed to properly characterize the red to spawner ratios on PEI.

Trend data in adult returns and compliance with conservation requirements depends on redd count series. In most rivers these counts have been conducted intermittently, which limits the ability to infer trends.

Trend data on freshwater production are based on electrofishing series on the Morell River. Trend interpretation in this series is limited by inconsistent site use and poor temporal coverage in recent years.

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TABLES

Table 1. Stocking history, run timing, fishing season, and estimated mean annual catches of Atlantic salmon in 2007 to 2011 in PEI rivers which contain Atlantic salmon. A dash indicates not applicable.

River name	Stocked with Atlantic salmon in			Run timing	Atlantic salmon recreational angling season in 2013	Mean annual catch of Atlantic salmon, 2007 to 2011[a]		
	1880 to 1899	1900 to 1949	1950 to 2011			Recreational	Aboriginal FSC	Total
Cains Brook, Mill River	-	-	-	Some early, but mostly late	1 Jun - 31 Oct[b]	-	-	-
Carruthers Brook, Mill River	-	Y	Y	Some early, but mostly late	1 Jun - 31 Oct[b]	1.7[c]	0[c]	1.7[c]
Trout River (Coleman)	Y	Y	Y	Some early, but mostly late	Closed[d]	0	0	0
Trout River, Tyne Valley	Y	Y	-	Late	1 Jun - 15 Sep	0	0	0
Little Trout River	-	-	-	Late	1 Jun - 15 Sep	0	0	0
Bristol (Berrigans) Creek	-	-	-	Late	1 Jun - 15 Sep	0	0	0
Morell River	Y	Y	Y	Mixed early and late	1 Jun - 31 Octe	75.5	0.5	76
Midgell River	-	Y	Y	Late	1 Jun - 15 Sep	0	0	0
St. Peters River	-	Y	Y	Late	1 Jun - 15 Sep	0	0	0
Cow River	-	-	-	Late	1 Jun - 15 Sep	0	0	0
Naufrage River	-	Y	Y	Late	1 Jun - 15 Sep	0	0	0
Bear River	-	-	-	Late	1 Jun - 15 Sep	0	0	0
Hay River	-	-	-	Late	1 Jun - 15 Sep	0	0	0
Cross Creek	-	Y	-	Late	1 Jun - 15 Sep	0	0	0
Priest Pond Creek	-	-	-	Late	1 Jun - 15 Sep	0	0	0
North Lake Creek	Y	Y	-	Late	1 Jun - 15 Sep	0	0	0
Cardigan River	-	Y	Y[f]	Mixed early and late	1 Jun - 15 Sep	0	0	0
Vernon River	Y	-	-	Late	1 Jun - 15 Sep	0	0	0
Seal River (Vernon)	-	-	-	Late	1 Jun - 15 Sep	0	0	0
Clarks Creek	-	-	-	Late	1 Jun - 15 Sep	0	0	0
Pisquid River	-	-	-	Late	1 Jun - 15 Sep	0	1	1
Head of Hillsborough R.	-	Y	-	Late	1 Jun - 15 Sep	0	0	0
North River	-	Y	-	Late	1 Jun - 15 Sep	0	0	0
Clyde River	-	Y	-	Late	1 Jun - 15 Sep	0	0	0
West River	Y	Y	Y	Some early, but mostly late	1 Jun - 15 Sep	44.7	0.4	45.1
Dunk River	Y	Y	Y	Some early, but mostly late	1 Jun - 15 Sep	0	0	0
Wilmot River	Y	Y	-	Late	1 Jun - 15 Sep	0	0	0

[a]Includes all salmon caught (both small and large, retained and released).

[b]An extended season from 16 Sep to 31 Oct was announced for areas downstream of Route 148. However, this was cancelled following a fish kill that occurred in July

[c]Mill River total.

[d]Closed due to a fish kill in 2012.

[e]The extended season from 16 Sept. to 31 Oct. applies to Leards Pond and to the Morell River mainstem from the Forks to MacKays

[f]Unintentional stocking occurred through escapes from the Cardigan Fish Hatchery.

Table 2. Proportion of spawning salmon by size and by sex in rivers where the proportion large is assumed to be 0.5 or 0.9, based on size-specific sex ratios measured on the Morell River in 1986-2001 (Cairns et al. 2012).

	Size		
Sex	Small	Large	Total
Proportion large is 0.5			
Male	0.4036	0.1368	0.5404
Female	0.0964	0.3632	0.4596
Total	0.5000	0.5000	1.0000
Proportion large is 0.9			
Male	0.0807	0.2462	0.3269
Female	0.0193	0.6538	0.6731
Total	0.1000	0.9000	1.0000

Table 3. Atlantic salmon conservation requirements and estimated egg deposition in 71 PEI rivers which have or probably had Atlantic salmon populations.

River	Watershed area (km²)	Stream area (m²)[a]	Egg conservation requirements (X 1000)[b]	Current salmon river[c]	Assumed proportion large	Required spawners		Most recent redd count		Estimated male spawners[f]			Estimated female spawners[f]			Grand total spawners[f]	Estimated eggs deposited (X 1000)[g]	Estimated eggs as a percentage of requirement
						Female[d]	Total[e]	Number of redds	Year	Small	Large	Total	Small	Large	Total			
Tignish River	44.5	58,241	140	N	0.9	29	42	na	na	0	0	0	0	0	0	0	0	0
Montrose (Kildare) River	29	37,911	91	N	0.9	19	28	na	na	0	0	0	0	0	0	0	0	0
Huntley River	28.9	37,767	91	N	0.9	19	27	na	na	0	0	0	0	0	0	0	0	0
Long Creek (Mill R. East)	19.2	25,069	60	N	0.9	13	18	na	na	0	0	0	0	0	0	0	0	0
Cains Brook, Mill River	30.9	22,845	55	Y	0.5	14	26	38	2013	10	3	13	2	9	11	25	52	95
Carruthers Brook, Mill River	47.9	35,455	85	Y	0.5	21	40	131	2012	34	12	46	8	31	39	85	179	210
Mill River total	78.8	58,300	140	Y	0.5	35	66	169		44	15	59	11	40	50	110	231	165
Trout River (Coleman)	107.1	140,202	336	Y	0.5	83	160	59	2013	15	5	21	4	14	18	38	81	24
Ellerslie (Bideford) River	34.1	44,653	107	N	0.9	22	32	na	na	0	0	0	0	0	0	0	0	0
Trout River, Tyne Valley	48.3	63,281	152	Y	0.9	32	46	14	2008	1	2	2	0	4	4	6	20	13
Little Trout River	21.3	27,883	67	Y	0.9	14	20	28	2011	1	3	4	0	8	8	12	41	61
Indian River	23.9	31,326	75	N	0.9	16	23	na	na	0	0	0	0	0	0	0	0	0
Granville Creek	26	34,036	82	N	0.9	17	25	na	na	0	0	0	0	0	0	0	0	0
Trout River (Millvale)	53.3	69,787	167	N	0.9	35	51	na	na	0	0	0	0	0	0	0	0	0
Hunter River	88.8	116,259	279	N	0.9	58	84	na	na	0	0	0	0	0	0	0	0	0
Wheatley River	58	75,914	182	N	0.9	38	55	na	na	0	0	0	0	0	0	0	0	0
Black River	20.9	27,307	66	N	0.9	14	20	na	na	0	0	0	0	0	0	0	0	0
Bells Creek	28.9	37,819	91	N	0.9	19	28	na	na	0	0	0	0	0	0	0	0	0
Auld Creek	14.4	18,785	45	N	0.9	9	14	na	na	0	0	0	0	0	0	0	0	0
Winter River	69.6	91,112	219	N	0.9	46	66	na	na	0	0	0	0	0	0	0	0	0
Bristol (Berrigans) Creek	41.4	54,183	130	Y	0.9	27	39	10	2012	0	1	1	0	3	3	4	15	11
Morell River	170.6	237,176	569	Y	0.5	140	270	450	2011	118	40	158	28	106	134	292	614	108
Marie River	29.3	38,408	92	N	0.9	19	28	na	na	0	0	0	0	0	0	0	0	0
Midgell River	63.8	83,532	200	Y	0.9	42	61	81	2012	3	9	12	1	23	24	36	118	59
St. Peters River	44.6	58,333	140	Y	0.9	29	42	44	2012	2	5	6	0	13	13	19	64	46
McAskill Crk. (Goose R.)	10.6	13,876	33	N	0.9	7	10	na	na	0	0	0	0	0	0	0	0	0
Cow River	22.8	29,886	72	Y	0.9	15	22	50	2013	2	5	7	0	14	15	22	73	102
Naufrage River	43.6	57,037	137	Y	0.9	29	41	453	2013	16	49	66	4	131	135	200	663	484
Bear River	17.2	22,477	54	Y	0.9	11	16	16	2013	1	2	2	0	5	5	7	23	43
Hay River	25.7	33,696	81	Y	0.9	17	25	43	2013	2	5	6	0	12	13	19	63	78
Cross Creek	44.3	57,992	139	Y	0.9	29	42	268	2013	10	29	39	2	78	80	119	392	282
Priest Pond Creek	24.9	32,557	78	Y	0.9	16	24	151	2013	5	16	22	1	44	45	67	221	283
North Lake Creek	47.7	62,495	150	Y	0.9	31	45	333	2013	12	36	48	3	96	99	147	487	325
Northeast Cluster total[h]	236.8	310,016	744	Y	0.9	156	225	1314	na	47	143	190	11	380	391	582	1922	258

River	Watershed area (km²)	Stream area (m²)[a]	Egg conservation requirements (X 1000)[b]	Current salmon river[c]	Assumed proportion large	Required spawners		Most recent redd count		Estimated male spawners[f]			Estimated female spawners[f]			Grand total spawners[f]	Estimated eggs deposited (X 1000)[g]	Estimated eggs as a percentage of requirement
						Female[d]	Total[e]	Number of redds	Year	Small	Large	Total	Small	Large	Total			
Black Pond Creek	14.3	18,759	45	N	0.9	9	14	na	na	0	0	0	0	0	0	0	0	0
Souris River	53.2	69,578	167	N	0.9	35	51	0	2012	0	0	0	0	0	0	0	0	0
Fortune River	75.4	98,652	237	N	0.9	50	72	na	na	0	0	0	0	0	0	0	0	0
Boughton River	51.2	67,025	161	N	0.9	34	49	na	na	0	0	0	0	0	0	0	0	0
Cardigan River	44.6	58,411	140	Y	0.5	35	67	0	2008	0	0	0	0	0	0	0	0	0
Brudenell River	55.3	72,379	174	N	0.9	36	53	na	na	0	0	0	0	0	0	0	0	0
Montague River	76.3	99,883	240	N	0.9	50	73	na	na	0	0	0	0	0	0	0	0	0
Valleyfield River	87.7	127,500	306	N	0.9	64	93	na	na	0	0	0	0	0	0	0	0	0
Sturgeon River	60.4	79,068	190	N	0.9	40	57	na	na	0	0	0	0	0	0	0	0	0
Murray River	71	92,905	223	N	0.9	47	68	na	na	0	0	0	0	0	0	0	0	0
Belle River	35.9	47,022	113	N	0.9	24	34	na	na	0	0	0	0	0	0	0	0	0
Flat River	30.1	39,390	95	N	0.9	20	29	na	na	0	0	0	0	0	0	0	0	0
South Pinette River	18.3	23,891	57	N	0.9	12	17	na	na	0	0	0	0	0	0	0	0	0
Middle Pinette River	8.8	11,530	28	N	0.9	6	8	na	na	0	0	0	0	0	0	0	0	0
North Pinette River	27.5	35,987	86	N	0.9	18	26	na	na	0	0	0	0	0	0	0	0	0
Orwell River	29.5	38,657	93	N	0.9	19	28	na	na	0	0	0	0	0	0	0	0	0
Vernon River	69.2	90,536	217	Y	0.9	45	66	11	2013	0	1	2	0	3	3	5	16	7
Seal River (Vernon)	23.4	30,646	74	N	0.9	15	22	na	na	0	0	0	0	0	0	0	0	0
Johnstons River	39.3	51,421	123	N	0.9	26	37	na	na	0	0	0	0	0	0	0	0	0
Glenfinnan River	33.3	43,553	105	N	0.9	22	32	na	na	0	0	0	0	0	0	0	0	0
Clarks Creek	46.3	60,610	145	Y	0.9	30	44	3	2013	0	0	0	0	1	1	1	4	3
Pisquid River	47.6	62,247	149	Y	0.9	31	45	39	2013	1	4	6	0	11	12	17	57	38
Head of Hillsborough R.	53.1	69,512	167	Y	0.9	35	51	2	2013	0	0	0	0	1	1	1	3	2
North River	99	129,651	311	Y	0.9	65	94	21	2013	1	2	3	0	6	6	9	31	10
Clyde River	41.7	54,549	131	Y	0.9	27	40	0	2011	0	0	0	0	0	0	0	0	0
West River	114.1	184,500	443	Y	0.5	109	210	168	2013	44	15	59	10	40	50	109	229	52
Desable River	43.7	57,246	137	N	0.9	29	42	na	na	0	0	0	0	0	0	0	0	0
Westmoreland River	43.2	56,500	136	N	0.9	28	41	na	na	0	0	0	0	0	0	0	0	0
Tryon River	56.4	73,767	177	N	0.9	37	54	na	na	0	0	0	0	0	0	0	0	0
Bradshaw River	46.1	60,362	145	N	0.9	30	44	na	na	0	0	0	0	0	0	0	0	0
Dunk River	165.7	193,078	463	Y	0.5	114	220	6	1993	2	1	2	0	1	2	4	8	2
Wilmot River	83.4	109,177	262	Y	0.9	55	79	0	2008	0	0	0	0	0	0	0	0	0
Sheep River	30.7	40,202	96	N	0.9	20	29	na	na	0	0	0	0	0	0	0	0	0
Enmore River	42.6	55,767	134	N	0.9	28	41	na	na	0	0	0	0	0	0	0	0	0
Brae River	19.5	25,553	61	N	0.9	13	19	na	na	0	0	0	0	0	0	0	0	0
Little Pierre Jacques	21.8	28,472	68	N	0.9	14	21	na	na	0	0	0	0	0	0	0	0	0
Big Pierre Jacques River	40.6	53,122	127	N	0.9	27	39	na	na	0	0	0	0	0	0	0	0	0

River	Watershed area (km²)	Stream area (m²)[a]	Egg conservation requirements (X 1000)[b]	Current salmon river[c]	Assumed proportion large	Required spawners		Most recent redd count		Estimated male spawners[f]			Estimated female spawners[f]			Grand total spawners[f]	Estimated eggs deposited (X 1000)[g]	Estimated eggs as a percentage of requirement
						Female[d]	Total[e]	Number of redds	Year	Small	Large	Total	Small	Large	Total			
Little Mininigash River	60.2	78,846	189	N	0.9	40	57	na	na	0	0	0	0	0	0	0	0	0
Miminigash River	26.7	34,939	84	N	0.9	18	25	na	na	0	0	0	0	0	0	0	0	0
Total, current salmon rivers	1,566.7	2,031,303	4,875	Y	na	1,098	1,836	2,419	na	279	246	525	67	654	721	1,246	3,455	71
Total, all rivers	3,368.2	4,402,197	10,565	na	na	2,288	3,557	2,419	na	279	246	525	67	654	721	1,246	3,455	33

[a]For the Mill, Morell, Valleyfield, West, and Dunk Rivers, from field measurements of stream area. For other rivers, estimated from a linear regression based on stream area measurements and watershed areas for the Mill, Morell, Valleyfield, West and Dunk Rivers. For the Mill River, the breakdown between Cains and Carruthers Brooks is assumed to follow the relative proportions of the watershed areas of the two streams.

[b]Based on 2.4 eggs/m^2

[c]For the Clyde River, based on juvenile electrofishing surveys in 2011. For all other rivers, based on juvenile electrofishing surveys conducted in 2007-2008, reviews of recent records (Guignion 2009), and reported presence of redds in 2010-2013.

[d]Number of female spawners required to meet egg conservation requirements, based on the formula: Required female spawners = eggs required / ((Prop. of salmon that are large x Fecundity of large females) + ((1-prop. of salmon that are large) x Fecundity of small females)).

[e]Total number of spawners required to meet egg conservation requirements, based on the formula: Required spawners = eggs required / ((Prop. of salmon that are large x Prop. of large salmon that are female x Fecundity of large females) + ((1-prop. of salmon that are large) x Prop. of small salmon that are female x Fecundity of small females)). See Table 2 for sex ratios.

[f]The number of female spawners is estimated from the most recent redd count, assuming 3.357 redds per female spawner. Numbers of small male, large male, small female, and large female spawners are calculated from the size-specific proportions given in Table 2.

[g]Based on a fecundity of 3,143 eggs for small female salmon and 4,963 eggs for large female salmon.

[h]Northeast cluster total includes McAskill Creek, Cow River, Naufrage River, Bear River, Hay River, Cross Creek, Priest Pond Creek, and North Lake Creek.

Table 4a. Counts of Atlantic salmon redds in current PEI salmon rivers, 1990-2013. Values in brackets indicate incomplete counts. Dashes indicate no survey.

River	1990	1991	1992	1993	1994	1995	1996	2004	2005	2008	2009	2010	2011	2012	2013
Cains Brook	-	-	-	-	-	-	-	-	-	(58)	-	-	56	41	38
Carruthers Brook	-	-	-	311	-	-	-	-	-	(152)	-	-	294	131	(98)
Trout River, Coleman	-	-	33	58	33	-	42	-	-	(2)	-	-	-	-	59
Trout River, Tyne Valley	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-
Little Trout River	-	-	-	-	-	-	-	5	12	11	19	-9	28	-	-
Bristol (Berrigans) Creek	-	-	-	41	-	-	49	15	11	7	-	23	-	6	10
Morell River	656	637	917	377	(162)	(309)	438	(71)	-	328	-	-	450	(243)	(326)
Midgell River	-	-	-	77	-	-	73	64	-	69	116	-	110	81	(36)
St. Peters River	-	-	-	93	-	-	30	-	-	53	-	-	53	70	44
Cow River	-	-	-	-	-	-	-	-	-	-	-	-	-	1	50
Naufrage River	-	-	-	32	-	-	88	53	-	100	32	33	429	43	453
Bear River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Hay River	-	-	-	-	-	-	-	-	-	-	-	-	1	3	43
Cross Creek	-	-	-	-	-	-	-	-	-	120	70	113	190	83	268
Priest Pond Creek	-	-	-	-	-	-	-	-	-	(11)	8	14	20	21	151
North Lake Creek	-	29	200	36	-	-	-	84	68	200	213	205	355	106	333
Souris River	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
Cardigan River	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-
Vernon River	-	-	-	-	-	-	-	-	-	0	-	-	-	7	11
Seal River (Vernon)[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Clarks Creek	-	-	-	-	-	-	-	-	-	0	-	-	-	0	3
Pisquid River	-	-	-	-	-	-	-	14	17	38	-	(37)	68	35	39
Head of Hillsborough R.	-	-	-	-	-	-	-	-	-	0	-	-	0	0	2
North River	-	-	-	-	-	-	-	-	-	18	-	-	11	-	21
Clyde River	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
West River	47	(33)	(274)	(165)	(59)	(57)	-	(18)	-	141	47	88	90	89	168
Dunk River	-	-	-	6	-	-	-	-		(17)	-	-	-	(12)	-
Wilmot River	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-

[a] For Seal River (Vernon) reports of 0 redds in 2012 and 3 redds in 2013 have not been confirmed by experienced redd surveyors.

Table 4b. Estimated numbers of female spawners in current PEI salmon rivers, 1990-2013. Values in brackets indicate minimum values. Dashes indicate no estimate.

River	1990	1991	1992	1993	1994	1995	1996	2004	2005	2008	2009	2010	2011	2012	2013
Cains Brook	-	-	-	-	-	-	-	-	-	(17)	-	-	17	12	11
Carruthers Brook	-	-	-	93	-	-	-	-	-	(45)	-	-	88	39	(29)
Trout River, Coleman	-	-	10	17	10	-	13	-	-	(1)	-	-	-	-	18
Trout River, Tyne Valley	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-
Little Trout River	-	-	-	-	-	-	-	2	4	3	6	(3)	8	-	-
Bristol (Berrigans) Creek	-	-	-	12	-	-	15	5	3	2	-	7	-	2	3
Morell River	195	190	273	112	(48)	(92)	131	(21)	-	98	-	-	134	(72)	(97)
Midgell River	-	-	-	23	-	-	22	19	-	21	35	-	33	24	(11)
St. Peters River	-	-	-	28	-	-	9	-	-	16	-	-	16	21	13
Cow River	-	-	-	-	-	-	-	-	-	-	-	-	-	1	15
Naufrage River	-	-	-	10	-	-	26	16	-	30	10	10	128	13	135
Bear River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Hay River	-	-	-	-	-	-	-	-	-	-	-	-	1	1	13
Cross Creek	-	-	-	-	-	-	-	-	-	36	21	34	57	25	80
Priest Pond Creek	-	-	-	-	-	-	-	-	-	(3)	2	4	6	6	45
North Lake Creek	-	9	60	11	-	-	-	25	20	60	63	61	106	32	99
Souris River	-	-	-	-	-	-	-	-	-		-	-	-	0	-
Cardigan River	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-
Vernon River	-	-	-	-	-	-	-	-	-	0	-	-	-	2	3
Seal River (Vernon)	-	-	-	-	-	-	-	-	-		-	-	-	-	-
Clarks Creek	-	-	-	-	-	-	-	-	-	0	-	-	-	0	1
Pisquid River	-	-	-	-	-	-	-	4	5	11	-	(11)	20	10	12
Head of Hillsborough R.	-	-	-	-	-	-	-	-	-	0	-	-	0	0	1
North River	-	-	-	-	-	-	-	-	-	5	-	-	3	-	6
Clyde River	-	-	-	-	-	-	-	-	-		-	-	0	-	-
West River	14	(10)	(82)	(49)	(18)	(17)	-	(5)	-	42	14	26	27	27	50
Dunk River	-	-	-	2	-	-	-	-	-	(5)	-	-	-	(4)	-
Wilmot River	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-

Table 4c. Estimated number of eggs deposited (X 1000) in current PEI salmon rivers, 1990-2013. Values in brackets indicate minimum values. Dashes indicate no estimate.

River	1990	1991	1992	1993	1994	1995	1996	2004	2005	2008	2009	2010	2011	2012	2013
Cains Brook	-	-	-	-	-	-	-	-	-	(79)	-	-	76	56	52
Carruthers Brook	-	-	-	424	-	-	-	-	-	(207)	-	-	401	179	(134)
Trout River, Coleman	-	-	45	79	45	-	57	-	-	(3)	-	-	-	-	81
Trout River, Tyne Valley	-	-	-	-	-	-	-	-	-	20	-	-	-	-	-
Little Trout River	-	-	-	-	-	-	-	7	18	16	28	(13)	41	-	-
Bristol (Berrigans) Creek	-	-	-	60	-	-	72	22	16	10	-	34	-	9	15
Morell River	895	869	1,251	514	(221)	(422)	598	(97)	-	448	-	-	614	(332)	(445)
Midgell River	-	-	-	113	-	-	107	94	-	101	170	-	161	118	(53)
St. Peters River	-	-	-	136	-	-	44	-	-	78	-	-	78	102	64
Cow River	-	-	-	-	-	-	-	-	-	-	-	-	-	1	73
Naufrage River	-	-	-	47	-	-	129	78	-	146	47	48	628	63	663
Bear River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23
Hay River	-	-	-	-	-	-	-	-	-	-	-	-	1	4	63
Cross Creek	-	-	-	-	-	-	-	-	-	176	102	165	278	121	392
Priest Pond Creek	-	-	-	-	-	-	-	-	-	(16)	12	20	29	31	221
North Lake Creek	-	42	293	53	-	-	-	123	99	293	312	300	519	155	487
Souris River	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
Cardigan River	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-
Vernon River	-	-	-	-	-	-	-	-	-	0	-	-	-	10	16
Seal River (Vernon)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Clarks Creek	-	-	-	-	-	-	-	-	-	0	-	-	-	0	4
Pisquid River	-	-	-	-	-	-	-	20	25	56	-	(54)	99	51	57
Head of Hillsborough R.	-	-	-	-	-	-	-	-	-	0	-	-	0	0	3
North River	-	-	-	-	-	-	-	-	-	26	-	-	16	-	31
Clyde River	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
West River	64	(45)	(374)	(225)	(81)	(78)	-	(25)	-	192	64	120	123	121	229
Dunk River	-	-	-	8	-	-	-	-	-	(23)	-	-	-	(16)	-
Wilmot River	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-

Table 4d. Estimated number of eggs deposited as a percentage of egg conservation requirements in current PEI salmon rivers, 1990-2013. Values in brackets indicate minimum percentages. Dashes indicate no estimate.

River	1990	1991	1992	1993	1994	1995	1996	2004	2005	2008	2009	2010	2011	2012	2013
Cains Brook	-	-	-	-	-	-	-	-	-	(144)	-	-	139	102	95
Carruthers Brook	-	-	-	499	-	-	-	-	-	(244)	-	-	472	210	(157)
Trout River, Coleman	-	-	13	24	13	-	17	-	-	(1)	-	-	-	-	24
Trout River, Tyne Valley	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-
Little Trout River	-	-	-	-	-	-	-	11	26	24	42	(20)	61	-	-
Bristol (Berrigans) Creek	-	-	-	46	-	-	55	17	12	8	-	26	-	7	11
Morell River	157	153	220	90	(39)	(74)	105	(17)	-	79	-	-	108	(58)	(78)
Midgell River	-	-	-	56	-	-	53	47	-	50	85	-	80	59	(26)
St. Peters River	-	-	-	97	-	-	31	-	-	55	-	-	55	73	46
Cow River	-	-	-	-	-	-	-	-	-	-	-	-	-	2	102
Naufrage River	-	-	-	34	-	-	94	57	-	107	34	35	459	46	484
Bear River	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43
Hay River	-	-	-	-	-	-	-	-	-	-	-	-	2	5	78
Cross Creek	-	-	-	-	-	-	-	-	-	126	74	119	200	87	282
Priest Pond Creek	-	-	-	-	-	-	-	-	-	(21)	15	26	37	39	283
North Lake Creek	-	28	195	35	-	-	-	82	66	195	208	200	346	103	325
Souris River	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-
Cardigan River	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-
Vernon River	-	-	-	-	-	-	-	-	-	0	-	-	-	5	7
Seal River (Vernon)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Clarks Creek	-	-	-	-	-	-	-	-	-	0	-	-	-	0	3
Pisquid River	-	-	-	-	-	-	-	14	17	37	-	(36)	67	34	38
Head of Hillsborough R.	-	-	-	-	-	-	-	-	-	0	-	-	0	0	2
North River	-	-	-	-	-	-	-	-	-	9	-	-	5	-	10
Clyde River	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-
West River	15	(10)	(84)	(51)	(18)	(18)	-	(6)	-	44	15	27	28	27	52
Dunk River	-	-	-	2	-	-	-	-	-	(5)	-	-	-	(4)	-
Wilmot River	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-

Table 5. Mean densities of juvenile Atlantic salmon on the Morell River, from electrofishing surveys. N is the number of sites sampled. ns means not specified.

Year	N	Mean densities of Atlantic salmon (fish 100 m^{-2})			Source
		Age 0+	Age 1+	Total	
1975	5	0	3.4	3.4	Ducharme 1977
1984	4	8.5	3.5	12.0	Cairns et al. 1995
1985	6	6.8	4.3	11.1	Cairns et al. 1995
1994	12	20.4	5.7	26.1	Cairns et al. 1995
1995	30	8.6	6.5	15.1	Cairns et al. 2000
1996	15	11.7	0.3	12.0	Cairns et al. 2000
1997	13	9.1	4.7	13.8	Cairns et al. 2000
1998	6	12.1	6.8	18.9	Cairns et al. 2000
1999	6	10.1	10.9	21.0	Cairns et al. 2000
2000	6	18.5	12.8	31.3	Cairns et al. 2000
2001	8	ns	ns	35.3	Guignion et al. 2002; DFO unpublished[a]
2002	6	ns	ns	13.0	Guignion 2009; DFO unpublished[a]
2007	1	ns	ns	62.4	Guignion 2009
2008	2	ns	ns	11.9	Guignion 2009

[a] Data available on request from D. Cairns

FIGURES

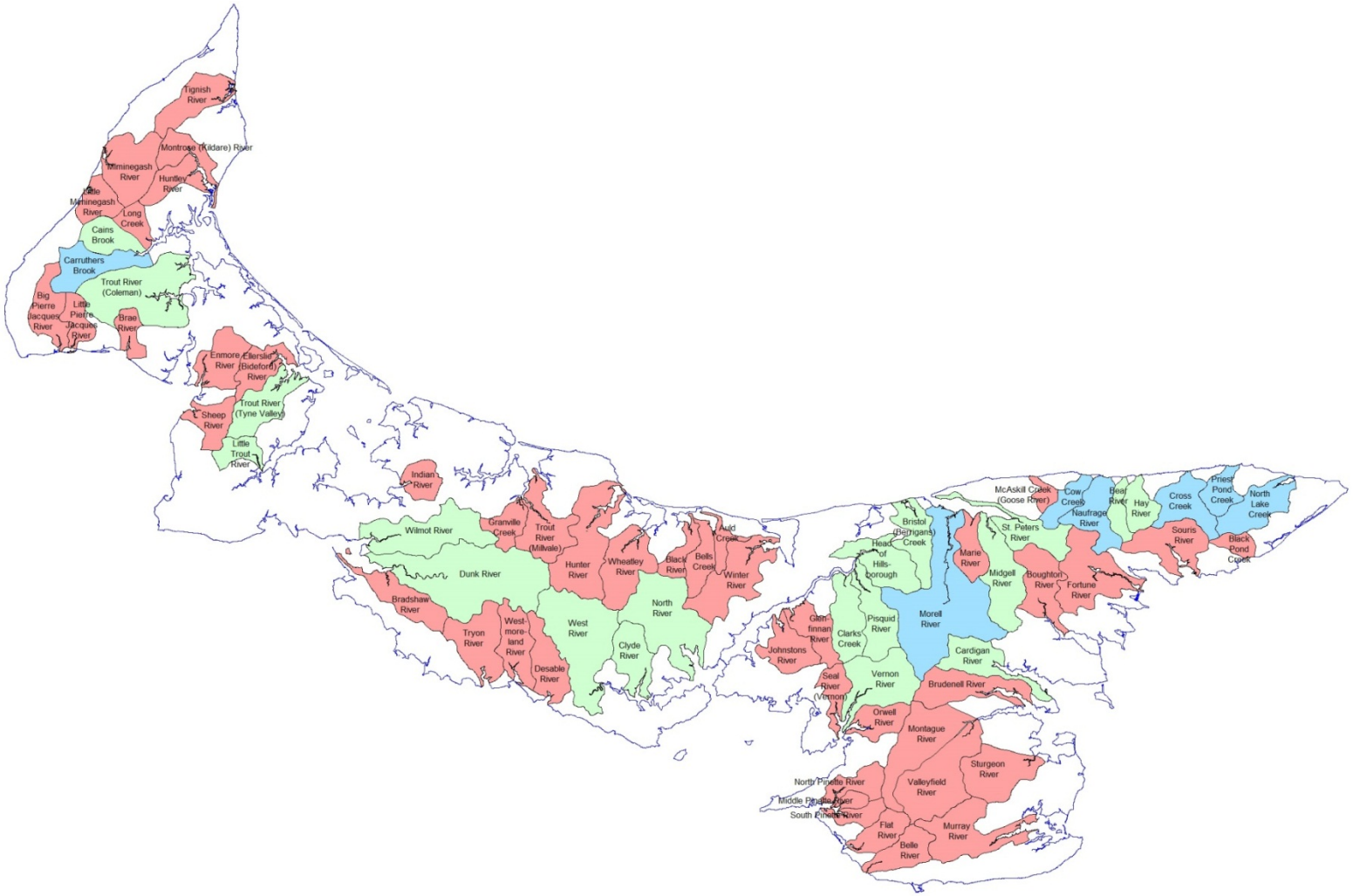

Figure 1. Watersheds of Prince Edward Island. Blue indicates rivers whose estimated Atlantic salmon egg deposition exceeds conservation requirements. Green indicates rivers with Atlantic salmon populations whose estimated egg deposition is less than conservation requirements. Pink indicates rivers which probably contained salmon at the time of European contact, but which do not currently contain salmon.

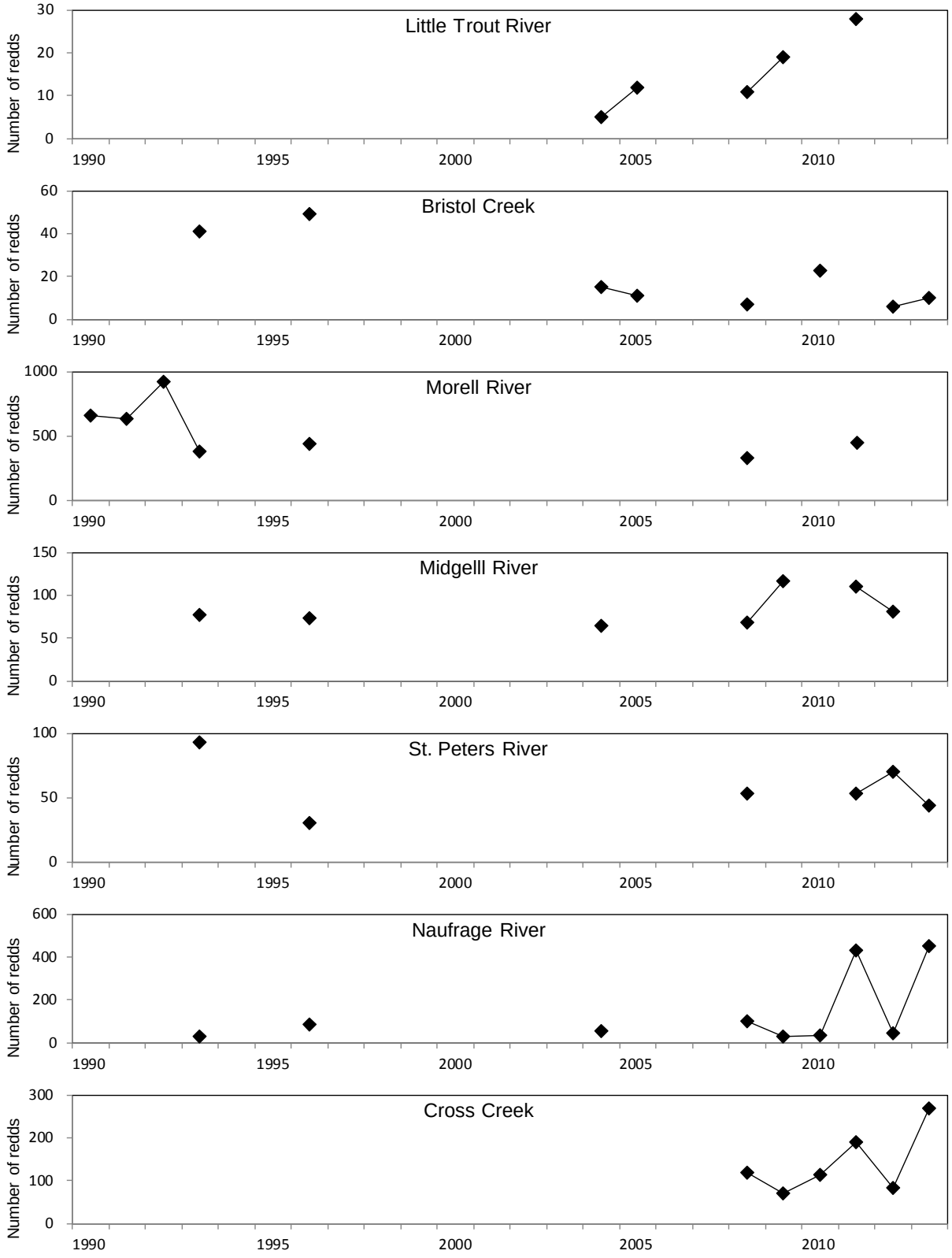

Figure 2. Atlantic salmon redd counts in 12 PEI rivers.

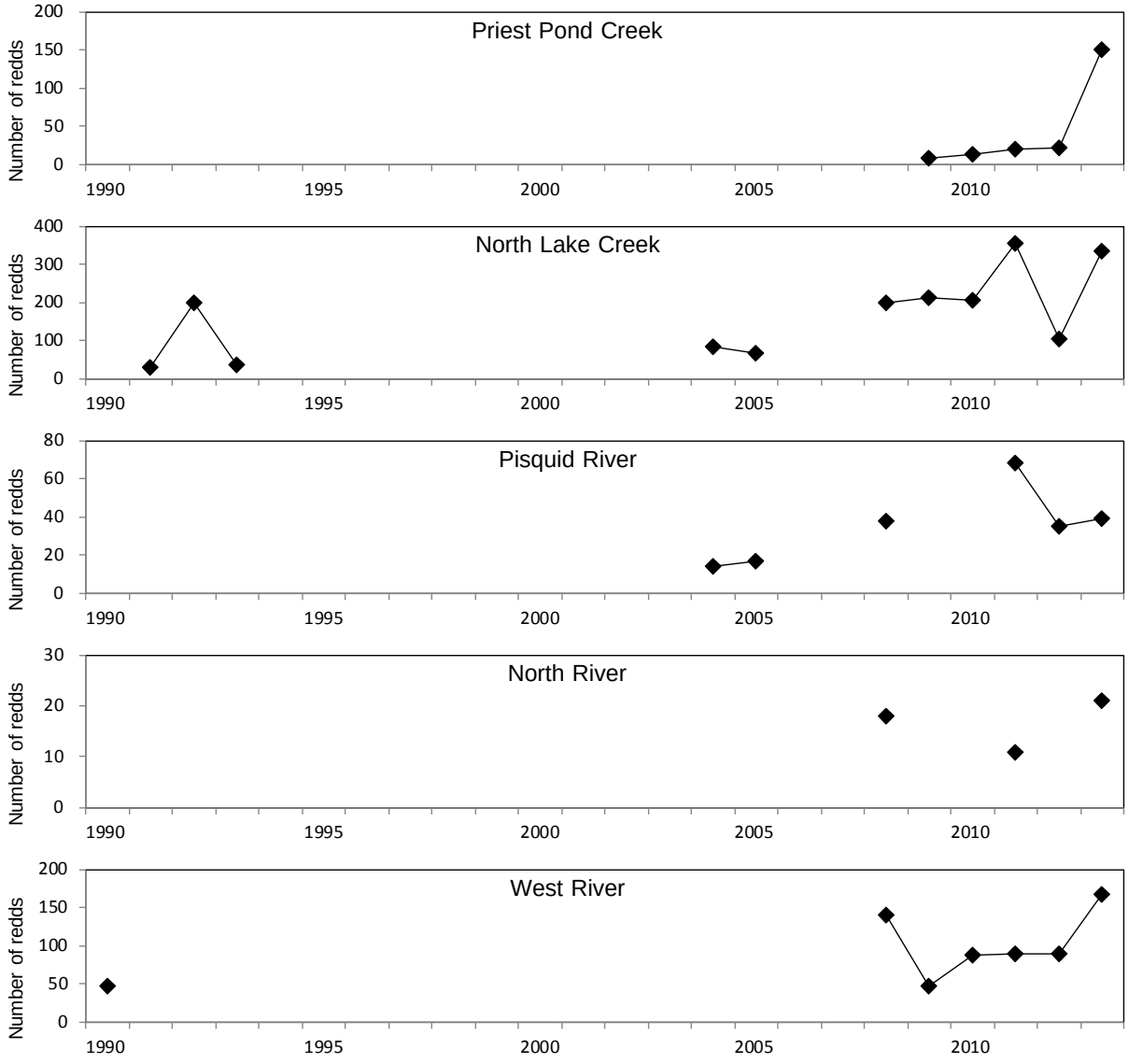

Figure 2 (continued).

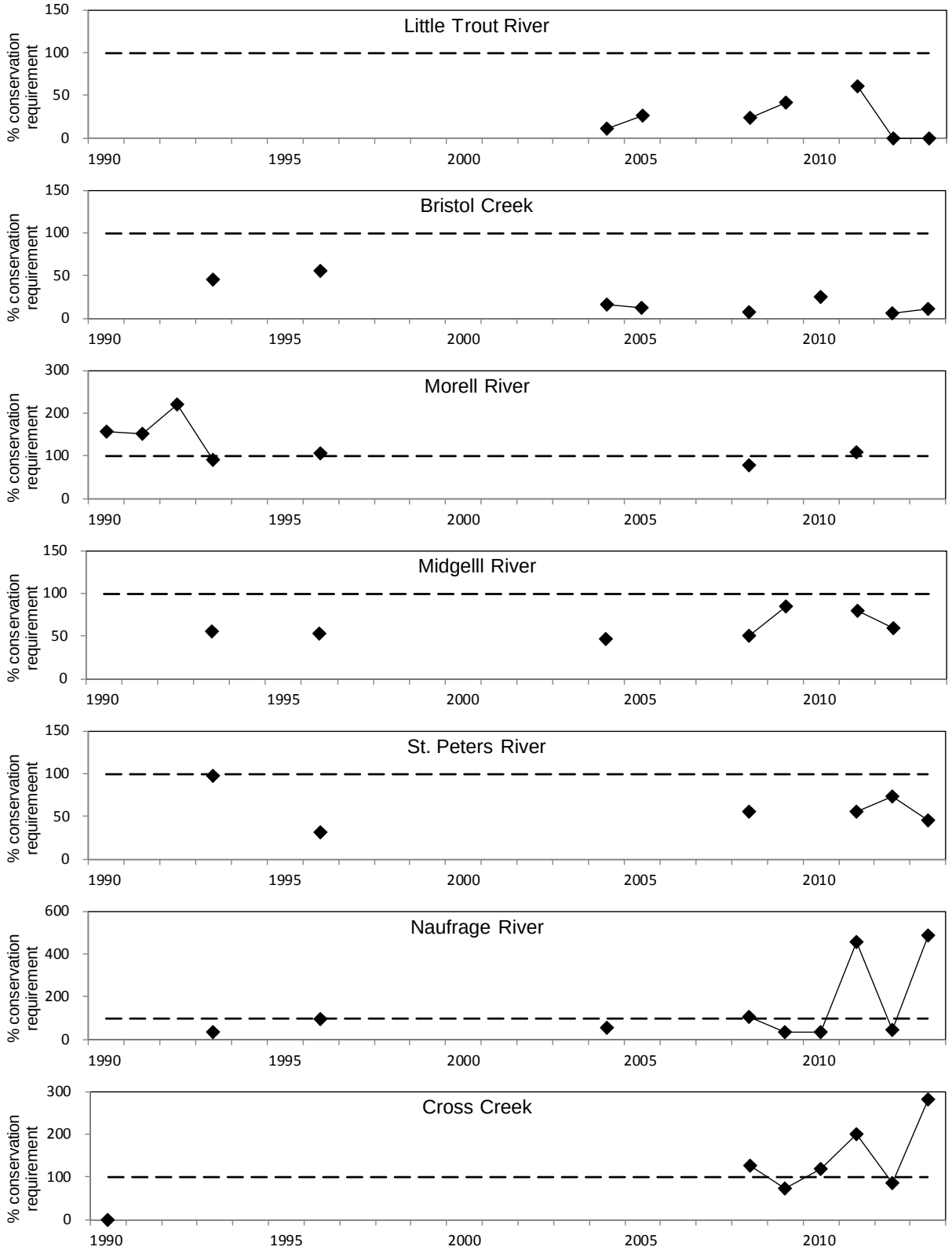

Figure 3. Estimated Atlantic salmon egg deposition as a percent of conservation requirements in 12 PEI rivers. The dashed line indicates 100% conservation requirements.

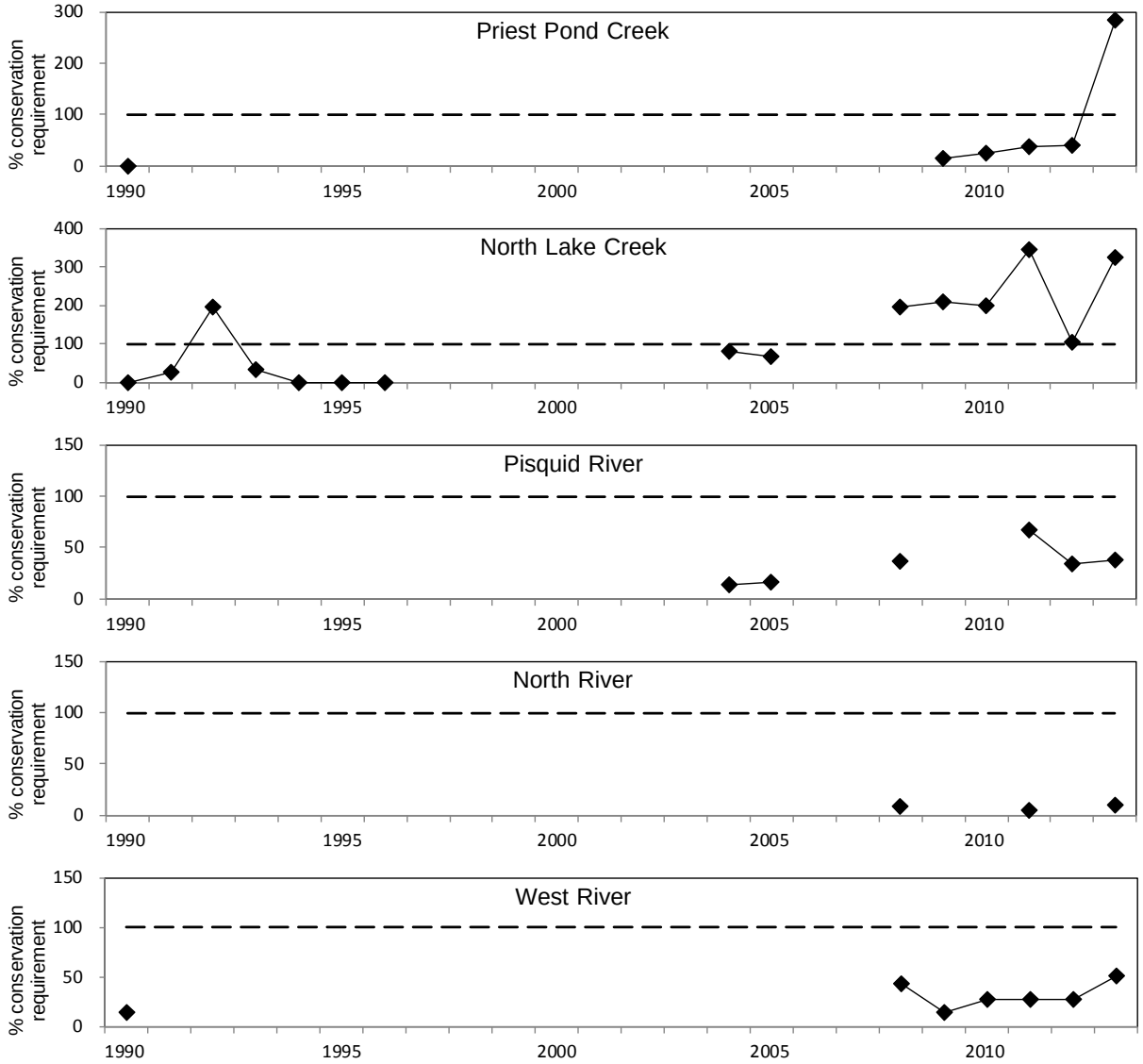

Figure 3 (continued).

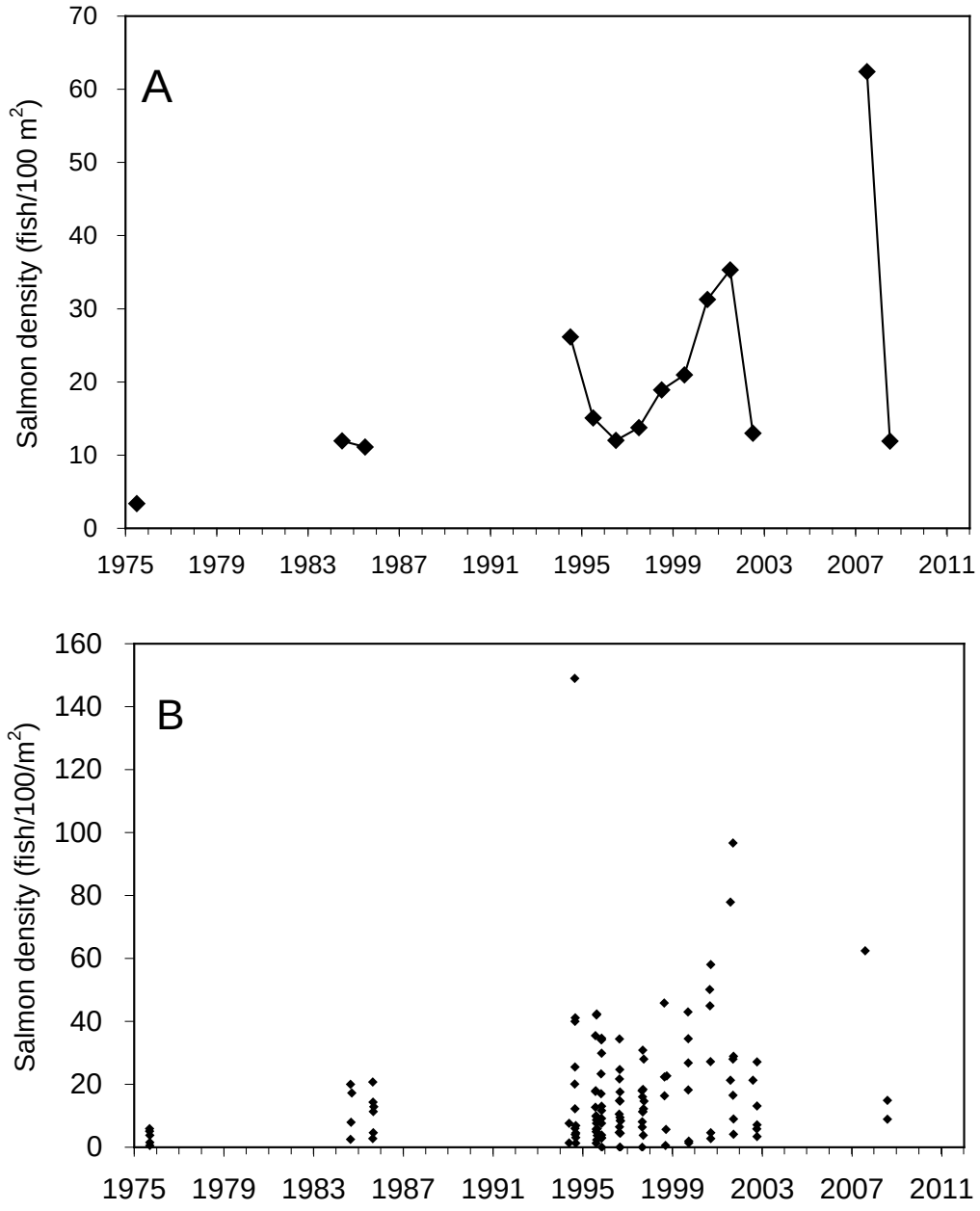

Figure 4. Annual mean (A) and site-specific (B) densities of juvenile Atlantic salmon on the Morell River, estimated by electrofishing. Note: sites in 2003-2011 were different than previous years.