

ST. MARY'S RIVER TRIBUTARY STREAM RESTORATION ASSESSMENT AND  
PLANNING FOR 2011.

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## INTRODUCTION

There are an estimated 118 tributary streams of various size (1<sup>st</sup> order to 3<sup>rd</sup> order) in the St. Mary's River watershed (53 on the West Branch, 27 on each of East and North branches, and 11 on the Main Branch). Twenty three (19.5%) of these streams were surveyed at various levels of completeness between May 16, 2008 and October 5, 2010 with 11 of these on the West Branch, 7 on East Branch, 2 on North Branch, and 3 on Main Branch (Table 1). These surveys were conducted by Sean Mitchell (SMRA Executive Director and Fish Ecologist) or summer employees of the SMRA. Following are brief descriptions of these streams surveyed, a prioritization of these streams and recommended work to be conducted on them. This report is a summary only, for full details (field notes) see Appendix A of this report. Photographs referred to in the Appendix are archived on CD at the St. Mary's River Association Education and Interpretive Centre.

**Table 1:** Streams surveyed in 2008-2010 as assigned to Restoration Priority Categories.

	Priority Category			
	Primary	Secondary	Tertiary	Not on Priority List
West Branch	Sutherland's Brook McQuarries Brook	Archibald's Brook (Gleneelg) Tait Brook Clark Brook Indian Man Brook	MacDonald Brook Barren Brook	Glencross Brook Cross Brook Castley Brook
East Branch	Campbell's Brook East Branch mainstem	Garden River McKeen's Brook	Moose River Unnamed brook (East Branch)	Black Brook
North Branch		Gusset Brook		McNab's Brook
Main Branch	Archibald's Brook (Stillwater)		Crooked Brook Bill Ned's Brook	
Number of stream	5	7	6	5

## STREAM (BRIEF) DESCRIPTIONS

### WEST BRANCH STREAMS

ARCHIBALD'S BROOK (GLENELG) (surveyed June 13, 2008 and September 17, 2008)

The lower section of this brook is a large beaver meadow with the brook running through it. It is very good fish habitat but not for salmon (i.e., good for trout, suckers, cyprinids, etc.). Similar habitat also extends for a long distance upstream of the Highway 348 bridge. There is no need or required restoration in these large areas as the stream is providing excellent fish habitat (deep water, undercut banks); simply not salmon habitat. Between these two large meadow habitats, the stream is a typical alluvial stream flowing through a forested landscape, with typical run-riffle-pool morphology. There are small debris jams in the stream in this middle alluvial section.

**Recommended activities:**

Manual clearing of small debris jams to prevent excess accumulation and subsequent flow diversion. Removal needs to be selective to only remove some but leave some in place to function as Large Woody Debris and cover.

**Estimated Effort:** This debris clearing could be done by a 2-3 man crew in 2 days.

**Priority Category: Secondary**

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TAIT BROOK (surveyed July 14, 2008)

This is a small, low gradient, beaver dominated stream. Beaver dams are present (1) near the confluence with the St. Mary's River, (2) upstream of Lake Road bridge (downstream of McCarthy Lake), and (3) at Tait Lake. This stream likely not an important salmon stream (small, fine sediment substrate, beaver obstructions) but could be to gaspereau, based on finding dead individuals of that species. There is evidence of some previous restoration on this stream (digger log). The culvert under Highway 348 is also obstructed with debris, further interfering with fish movement.

**Recommended activities:**

Re-assess beaver dams in early June to investigate as barrier to gaspereau movement; if obstructive breach for gaspereau run  
Clear debris upstream and downstream of Highway 348 culvert

**Estimated Effort:** Beaver dam monitoring and breaching 2 man-days; culvert debris clearing 1 man-day (1/2 day for 2 man crew).

**Priority Category: Secondary**

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### GLENCROSS BROOK (surveyed June 19, 2008 and September 10, 2010)

The lower section of Glencross Brook is good salmon habitat (large substrate, riffle habitat, good thalweg development, deep pools). Upstream of several debris jams the brook becomes more of a trout stream – increasing frequency of deep pools, change of substrate from larger material to smaller sizes, few riffles, more run. There are some areas of LWD recruitment forming debris jams but these do not appear to be problematic at this point. The stream is overall in good condition; ecologically intact and functioning as it should. There is some subtle evidence of impacts (e.g., some diagonal riffles, occasional thalweg loss, some over-widening), but this is quite limited. There is good indication that the channel is stable (curved trees accommodating bank erosion, moss on boulders and bedrock), this most likely due to flow buffering effect of Archibald Lake. This stream is not a high restoration priority; some work could be done in Reach 2 (thalweg development, modifying debris jams, cover devices, maybe digger logs and deflectors) but access is difficult and the stream not greatly degraded. It is suitable trout habitat and I suspect under higher flow conditions (not baseflow) many of the existing limitation (e.g., thalweg loss) disappear. Banks are stable and there is little erosion, little sign of aggradation compared with other systems. So no point in messing with a “good thing”. Put effort elsewhere and maybe revisit in 5 years to evaluate conditions then.

**Recommended activities:** None

**Estimated Effort:** None

**Priority Category:** Not on the priority list

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### CLARK BROOK (surveyed July 15, 2008)

Only a short section of this brook was assessed in 2008; a more comprehensive survey is required. From the short distance surveyed (< 1 km of lower section) it looks to be salmon habitat (high frequency of riffles and relatively large substrate). A debris jam was identified which appears to be a new structure on the stream.

**Recommended activities:** Conduct stream survey in summer 2011 walking at least 20-25% of stream length; Evaluate debris jam identified in 2008 for possible removal

**Estimated Effort:** 1 man-day (survey and evaluate debris jam)

**Priority Category:** Secondary

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### INDIAN MAN BROOK (surveyed July 15, 2008 and September 11, 2008)

Most of this stream upstream of the Highway 348 bridge is in very good condition- good meander, little aggradation, deep pools, deep runs, stable banks. The stream character seems to change on a fairly regular basis from a “trout stream” (deep pools, smaller substrate, tortuous meander) to a “salmon stream” (riffle predominance, larger substrate) and so likely supports both species rather than a predominance of one over the other. The lowest section of stream (bottom

200-300 m) is in poor condition (highly aggraded with large, flat cobble that has eroded from steep sedimentary banks). This lower section is not rearing habitat, but should be viewed simply as a corridor to allow fish movement from the river to the much better quality habitat upstream. This brook is in very good shape and is likely a major producer of both salmon and trout. Unfortunately, I suspect that the DFO electrofishing site is in the worst habitat in the entire brook and so those results are not representative of fish populations in the brook.

No further restoration work required on this stream. As long as access from St. Mary's River to a point approximately 500 m upstream is guaranteed do not put more effort into this stream. The eroding bedrock in the lowest 500 m will continue to compromise digger logs and instream structures. This area of stream was likely never great habitat and is simply a corridor from the river to good habitat.

**Recommended activities:** Walk lower 500 m to 1.0 km of stream at absolute low flow to ensure flow sufficient for access from St. Mary's River upstream into very good habitat.

**Estimated Effort:** 1/2 man-day (survey lower 1 km of stream to ensure fish passage feasible)

**Priority Category: Secondary**

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SUTHERLAND'S BROOK (surveyed July 16, 2008 and August 16, 2010)

This stream is the most degraded found in these three years of surveys. The condition of the stream is highly flow-dependent. When surveyed at low flows the flow disappears altogether in some areas (i.e., subsurface flow), while casual survey of this brook at higher flows revealed it to be a very nice trout/salmon stream with great habitat. Low flows are the limiting factor in this stream. The agreement between the 2008 and 2010 surveys with respect to low flow and lack of water in channel suggest low flows may be problematic for extended periods (i.e., 2008 survey in July, 2010 survey in August). This is potentially a significant problem for extended periods of time. In addition, this stream is a cold water system, which makes it all the more important during summer months. Reach 1 of this brook is a mess (shallow water, flows disappearing, small substrate) and so of little value to any species. Reach 2 is an improvement, flow appears more stable, channel is narrower than downstream, thalweg more defined, substrate is gravel-cobble. However, in this reach LWD recruitment may be problematic due to the excessive nature of it and existing debris jams already splitting flow into separate channels. Reach 2 is characterized by anastomosing channel and multiple flows around islands. Upstream of Reach 2 the habitat improves. It is not pristine but it does develop a diversity of habitats which is beneficial to fish. Low flows will still result in minimal habitat but diversity allows maintenance of small populations. There is increasing bedrock control as one proceeds upstream. Downstream of the Highway 348 bridge is extensive beaver activity significantly affecting the channel.

Reach 1 is the reach on which to concentrate restoration. Re-assess Reach 1 in early 2011 to develop comprehensive restoration plan for this section. This restoration will be complex and likely require more than one technique. Therefore, proper planning will be key to clearly identify the limiting factors and how to remediate them. This project will also serve nicely as a "pilot

project” for West Branch restoration as this can be viewed as a scaled down version of comprehensive restoration.

Re-assess Reach 2 as well for potential work. Monitor section of brook downstream of Highway 348 bridge in September of each year for beaver activity –do not interfere with beaver as long as fish passage assured and integrity of bridge/highway not in danger.

**Recommended activities:**

Conduct detailed assessment and prescription development for Reaches 1 and 2 in early summer 2011.

Develop comprehensive restoration plan.

Monitor beaver dam downstream of Highway 348 bridge for salmon passage (October)

**Estimated Effort:** 1 man-day (survey Reaches 1 and 2); 4 man-days (Develop restoration plan); ½ man day (October beaver dam monitoring)

**Priority Category: Primary**

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MACDONALD BOOK (surveyed September 16, 2010)

The lower section of this brook is low gradient and beaver influenced. The habitat is primarily run-pool, with little riffle. The runs are deep and there is abundant over. Banks are stable. This is good trout habitat. The nature of the channel in this area is broad, low gradient and slow. Upstream of the highway 348 bridge is higher gradient, increasing substrate size and increasing riffle presence (i.e., increasingly salmon rearing habitat rather than trout). There is a greater variety of habitats than downstream. The channel appears over-widened, but the habitat not degraded.

Having seen ~4 km of stream do not plan any work. Reaches 1 and 2 OK to good trout habitat (saw fish rising in several pools), while Reaches 3 and 4 good salmon rearing habitat.

**Recommended activities:**

Possibly survey this stream for salmon redds in November of years.

Evaluate beaver dams at mouth in October/November to ensure passage of adult salmon is possible.

**Estimated Effort:** 1 man-day (redd survey in November); ½ man day (October beaver dam monitoring)

**Priority Category: Tertiary**

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BARREN BROOK (surveyed November 26, 2008 and July 18, 2010)

Barren Brook is a stream with little evidence of impact. It is a high quality salmon rearing stream with a substrate of gravel-cobble, deep water throughout with frequent pools, LWD available for cover, and an appropriate run-pool-riffle structure. It is in very good shape, there is



little to no priority for restoration. Indeed, this brook may be a good “Model” brook for restoration on other systems to aim for. In the section below the bridge, there is evidence of aggradation (large bars exposed even at this moderately high water level; eroding unstable banks; stream being pushed laterally). These impacts likely all due to the bridge.

The short section downstream of bridge should be monitored for change over time and if bar development or bank erosion accelerating then restoration measures be conducted. At this point I would not recommend restoration as access through area is good and there are still several very nice deep pools. Resources could be better spent elsewhere.

**Recommended activities:**

Monitor the section downstream of the Barren Brook Road bridge every two years for changes in this impacted area.

**Estimated Effort:** ½ man day every two years to monitor section of brook downstream of bridge

**Priority Category:** Tertiary

MCQUARRIES BROOK (surveyed June 24, 2008 and September 24, 2010)

The Highway 348 culvert on this brook has been identified as an obstruction to fish passage (see SMRA Technical Report 8). Further, there are impassable falls 2.5 km upstream from the confluence with the St. Mary’s River. The channel morphology between the confluence and the falls is good, with good meander and the banks are stable. The substrate is slightly small for salmon and would likely favour trout. It is a nice salmon/trout stream with an appropriate ratio of pool-riffle-run. Cutblocks are present along the entire length of stream to the falls on one side or the other, or both, with buffer strips left adjacent to the stream. These buffer strips are suffering significant blowdown and there is thus, a tremendous amount of blowdown over the channel which will recruit to the channel over time. This will be a problem in the future as it will lead to debris jams and channel movement.

I recommend “preventative maintenance” on the blowdown over this stream to reduce subsequent recruitment to channel and debris jam formation. Much of the blowdown occurs in fairly discrete patches. I suggest a crew go in with a powersaw and remove ½ of the over channel LWD in these patches and every fourth (i.e., ¼) piece of LWD along the length of the channel outside of these discrete patches. I will have to layout the cutting before the crew goes in and revisit after cutting to determine effectiveness and sufficiency.

Concurrently (summer 2011), the impassable highway culvert is to be modified to allow fish passage. Thus, this work on the brook will allow fish passage and also prevent future habitat degradation.

**Recommended activities:**

Layout cutting of LWD along brook. Have crew cut flagged pieces and remove from channel. Revisit after cutting to assess effectiveness.

Restoration of Highway 348 culvert (see SMRA Technical Report 8)

**Estimated Effort:** 2 man-days (Layout cutting and post cutting survey); 10 man-days (crew of 2 cutting and removing debris for 5 days)

Culvert remediation (effort not estimated for that project here)

**Priority Category: Primary**

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CROSS BROOK (surveyed August 25, 2010)

From the Highway 348 bridge to the confluence with the St. Mary's River the stream is aggraded, but stable. It is low gradient, deep run-pool habitat. Good trout habitat. Upstream of the highway, the brook remains fairly low gradient, dominated by runs with the substrate increasing in size relative to downstream of bridge. The channel throughout survey length has a strange morphology – what I am calling “string-of-pearls” with long runs interspersed by very short riffle sections. The channel is also over-widened. The channel morphology is strange but I am not sure there is a need for restoration here. Even at baseflow during survey there was plenty of water. There are existing pools and LWD, meander is good, there is connectivity throughout. It is functioning ecologically as a stream should, it just may not match our notion of a beautiful stream. Thus restoration efforts would not improve ecological function but only force it into our aesthetic. There is abundant fish use throughout survey length. The stream has areas of heavy algal growth on the substrate and is quite exposed to sun, which may explain heavy algal growth. Riparian forest does not shade stream well due to north-south aspect and that riparian forest set back from stream.

I recommend re-assessing this stream in 5 years (2015) to investigate changes or possible degradation.

**Recommended activities:** None

**Estimated Effort:** None

**Priority Category: Not on Priority List**

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CASTLEY BROOK (September 13, 2010)

Castley Brook is a deep stream, almost entirely deep run from the Highway 374 culvert crossing downstream to the confluence with the St. Mary's River. Banks are stable and undercut and there is a great deal of channel meandering – a high sinuosity value. The habitat is long deep runs interspersed by short riffles. There is an increasing proportion of riffles and increasing substrate size as one gets closer to the confluence. This is a transition from trout and other fish species habitat to more typical salmon rearing habitat, though it is still not prime salmon habitat as the gradient is low and substrate smaller than optimal for salmon.

I do not recommend any restoration efforts on this brook. It is in very good condition and likely supports and abundance of non-salmon species.

**Recommended activities:** None

**Estimated Effort:** None

**Priority Category:** Not on Priority List

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## **EAST BRANCH STREAMS**

MOOSE RIVER (surveyed July 8, 2010)

The lower section of Moose River is impacted by agriculture. It is over-widened, composed of run type habitats with many of these being shallow, and a sand-gravel substrate. From Highway 347 to the Garden River confluence, the habitat remains primarily low gradient runs, but water is surprisingly deep in these runs. Buffer strips are narrow or non-existent adjacent to agricultural fields. This lower area is not salmon habitat, but seems to be quite good trout habitat. In the more downstream areas of this section the substrate is largely sand and gravel in runs, gravels and cobbles in the short riffles. Upstream of the agricultural areas the stream takes on an appropriate alluvial stream character; good riffle-pool-run structure, substrate gravel-cobble, good cover. This area is better salmon habitat than that area adjacent to agricultural fields.

Restoration potential –I would say restoration need on this system is low. The channel is largely intact, even where it is overwidened it is deep (thigh to waist) at baseflow. Meanders are maintained in river. Some aggradation of sediment but not extreme. ~50% of length surveyed has relatively good to good riparian condition. Upstream of bridge where I started survey there is a reasonable amount of LWD and SWD both instream and overstream. Ultimately excess sediment deposited into Eden Lake; does not move far downstream. Therefore, apart from cover structures and that type of restoration I do not think we should put effort into physical habitat restoration of this system. Any structures should be kept upstream of the house, too much activity below (cows, people using stream for swimming?, junk in stream).

Twenty three cover structures were placed in Moose River in 2010

**Recommended activities:**

Possibly installation of more cover devices in future years, but there are higher priority restoration sites to work on than this.

**Estimated Effort:** To be determined after identifying number and placement of devices if they are to be used.

**Priority Category:** Tertiary

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### GARDEN RIVER (surveyed October 4, 2010)

This stream is quite impacted over the lower section (i.e., downstream of the powerline crossing ~3 km upstream from confluence with Moose River. The channel is straightened, few meanders, shallow runs and riffles, and few pools. Substrate is primarily gravels with little cobble. Plenty of fish presence is noted so the stream is being used by fish. There is a complex of three beaver dams in the lower area of this reach; likely not impassable as the drop is small at low flow and would be less under higher flows. Principle concern in this section below the powerline crossing is lack of riparian vegetation. No LWD recruitment, little leaf fall (nutrients) apart from alder; little shading in heat of summer (what about cooling in winter?). The stream supports fish but it would be considered a poor “salmon stream”. Upstream of the powerline crossing the stream takes on more of a “salmon” habitat character in the form of riffle-pool-run structure, pools and runs are deep, riffles energetic, and substrate size has increased relative to downstream. There are a few very large bars indicating aggradation and suggesting a problematic sediment supply upstream. The upper road crossing may be a source of sediment to the stream; there is a need to investigate this road as well as the stream further upstream of that crossing.

I recommend little restoration to be done in stream. The entire section is somewhat aggraded, loss of thalweg in large areas (flats), homogenous cross section, lack of pools; but this is over 3+ km – no real site specific place to restore. The source of sediment causing aggradation has not yet been located, must still be upstream. The stream not pristine but not in as bad a shape as other areas in the St. Mary’s. Biggest issue is riparian and there is little to be done there but let nature take its course (succession). Could install cover devices (e.g., half logs) to increase instream cover, which is presently lacking. This would benefit trout as likely few salmon in river. Limiting factor, however, is likely lack of riparian environment to provide all of the functions typical of riparian zones.

#### **Recommended activities:**

Survey upstream of road to look for source of sediment causing aggradation.  
Investigate road crossing more fully as source of gravel contribution to stream.  
Consider cover devices in lower section (Reach 1)

**Estimated Effort:** 1 man-day (survey upstream of second road crossing, evaluate road for sediment contribution).

Estimated effort for cover devices to be determined after identifying number and placement of devices if they are to be used.

**Priority Category: Secondary**

### CAMPBELL’S BROOK (surveyed September 19, 2008)

The lowest section of this stream is extremely aggraded and armoured (rip-rap) on nearly every bend as it flows through agricultural land with no riparian cover at all. It is the most aggraded channel I have seen for its size in Nova Scotia! Extremely large bars present. Fish habitat very low (shallow riffle, shallow run; no deep pools). Upstream of agricultural field the stream enters intact forest as riparian environment. The stream channel is overwidened in this section

upstream of agricultural field. Many fewer bars and those present are much smaller than those downstream. habitat is shallow riffle and run. There is a bedrock chute (passable to fish) upstream of the agricultural field. Evidence that stream is “flashy” or at least powerful is conspicuous lack of LWD in channel and several areas of gravel in the forest – deposited during flood flows.

This stream is aggrading but no single source was found contributing sediment in this survey. There is a gradual transition from slight aggradation near Tributary 4 confluence to extreme aggradation in the lower reach. This aggradation is cumulative, not discrete patches/sources. Could be accumulation from dispersed sources or a historical large contribution from slump which is now recovered (well vegetated). Upstream of this slump there are very few bars, they are not large, and there is greater depth and thalweg development to channel.

This was a reconnaissance survey. A more detailed stream survey is required to identify work to be done and also to conduct pre-restoration measurements (channel width, substrate composition, riffle pool ratio, pool depths, etc.). In summary, the need is in the area where the stream flows through the agricultural field is to remove the excess sediment (bars and islands) from the channel, re-establish the thalweg, develop appropriate pool-riffle ratio; re-establish meanders, re-establish riparian forest/buffer for stream shading/nutrient input; and fencing to limit livestock access to stream.

This stream has one of the higher pH measures (pH 6.80 on August 8, 2008) in the watershed and the clarity is outstanding. It appears that water chemistry is likely good, the limiting factor is physical habitat further emphasizing the need to restore the physical conditions of this stream. This stream is also injecting a large amount of sediment (gravels) into the mainstem East Branch and so restoration is required to slow down this process and reduce aggradation in East Branch.

**Recommended activities:**

Conduct a more detailed stream survey and develop restoration plan. Similar to Sutherland’s Brook and East Branch mainstem, this will be a complex restoration project and appropriate planning will be necessary for it to be effective. This will require working closely with NSLC/NSSA Adopt-a-stream program for their technical expertise.

**Estimated Effort:** 10 man-days (Conduct detailed stream survey of stream through agricultural area and develop restoration plan to be initiated 2012).

**Priority Category: Primary**

BLACK BROOK (surveyed June 28, 2008, August 11, 2008, and August 21, 2008)

Downstream of the Highway 347 bridge this stream flows though agricultural land and is cutting new channels. It is dynamic. At the stream mouth are very large bars of accumulated sediment carried downstream by the brook. The water is deep, substrate large, and channel wide. This is a large, dynamic and powerful stream. Upstream of the highway bridge the stream is relatively high gradient with large substrate and areas of bedrock exposure. The banks appear stable, except for a large slump immediately downstream of Black Brook falls (the toe of which was

protected by cribwork in 2009). There is almost no spawning habitat in the brook as the substrate is generally too large. This is likely a good rearing stream but juveniles would have to come in from elsewhere. Habitat in the upper section (upper half of survey below the falls) is cascade-riffle interspersed with riffle and moderately deep runs. There is good cover for fish in the form of boulders and deep runs, but little to no LWD for cover. Downstream of where Green's Brook enters, the gradient decreases somewhat, there are true riffles rather than the cascade-riffle of upstream. Also there are more islands and bar development as sediment carried from upstream is deposited. The stream takes on characteristics of aggrading systems – bar development, loss of deep pools, homogenization of channel as run, increased eroding banks. The stream is overwidened and shallow. In the lower section, near the highway bridge, the stream is dramatically straightened (loss of meanders) and local knowledge tells us this was done purposely in the 1960s by Department of Transport to align the brook with the bridge (i.e., it was physically straightened to improve flow under the bridge).

In 2009 the large slump was stabilized by construction of a large crib at toe of slope. As well, three digger logs and 2 deflectors were installed near Highway 347 bridge.

It is uncertain the value of putting more effort into this brook. It is high gradient, energetic, dynamic with almost no salmon spawning habitat, though quite good rearing habitat. The extent of available stream is relatively small up to the falls. To fully restore this stream would likely take a great deal of effort, and that effort would likely be better put into Campbell's Brook for which we would get bigger bang for the buck.

Conceptual restoration for this stream would be to develop pools, enhance meander to reduce power of water, and narrow and deepen channel for enhanced habitat but also to reduce ice formation.

**Recommended activities:** None

**Estimated Effort:** None

**Priority Category:** Not on Priority List

EAST BRANCH MAINSTEM (surveyed August 23, 2008 and September 25, 2008)

The area surveyed was from Leitch Lake brook confluence to the Newtown bridge.

This area has tremendous sediment problems from adjacent agricultural land use practices. There are large, frequent eroding banks, and extremely large accumulations of gravel as bars in the stream. This accumulation has led to anastomosing (braiding) channels in several locations. Some of the bars are sufficiently large to be visible on "Google Earth". There are isolated areas that do not appear to be impacted by this sediment and they possess deep runs and deep pools, but they are relatively small in comparison to the impacted areas, and these high quality areas will likely be impacted as sediment moves downstream through the system.

This will be a very large restoration project to stabilize bars and re-shape and plant banks to reduce erosion. Similar to Sutherland's Brook, the first step here is a comprehensive plan to guide restoration efforts in this area. A summary of restoration needs is:

Within the Leitch Lake Brook to Black Brook section, restoration should focus on two areas in this section (1) agricultural fields below bridge but upstream of Leitch Lake Brook (on north side), (2) Black Brook – large sediment input; reduce that, riparian planting of agricultural field (north side) immediately upstream of Black Brook confluence. Restoration should aim to (i) Stabilize eroding banks (cribwork, riparian planting, tree revetments), and (ii) Stabilize gravel bars –add organic soil, mulch, hay; plant with grasses and alder/willow

Within the Black Brook to Newtown Bridge section restoration should focus on (1) Black Brook to lunch spot (see field notes in appendix for location of lunch spot) – highly impacted, highly aggraded, little riparian, high solar insolation, little habitat (shallow run and riffle), and (2) Agricultural field to Newtown bridge – extreme aggradation, some deep pools, extensive channel braiding and island formation. Specific restoration approaches are not outlined here, they will need to be developed in comprehensive plan.

**Recommended activities:**

Conduct a more detailed stream survey and develop restoration plan. Similar to Sutherland's Brook and Campbell's Brook, this will be a complex restoration project and appropriate planning will be necessary for it to be effective. This will require working closely with NSLC/NSSA Adopt-a-stream program for their technical expertise.

**Estimated Effort:** 10 man-days (Conduct detailed stream survey of stream through identified areas requiring work and develop restoration plan to be initiated 2012).

**Priority Category: Primary**

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UNNAMED BROOK (East Branch) (surveyed May 16, 2008)

**Note:** This unnamed stream drains a small lake and is located south of Archibald's Mill brook, draining from the west into the river. Lat/Long at stream mouth approximately 45°19.75'N, 62°05.6'W.

This is a small stream draining a small lake, likely used by trout and cyprinids but unlikely to be used by salmon due to small size. There is a possible migration barrier downstream of Highway 347 – it is an old concrete bridge and is thought to be a depth, and possibly velocity, barrier. This obstruction needs to be investigated further to determine if it warrants remediation.

**Recommended activities:**

Revisit the concrete bridge to assess for barrier to movement upstream

**Estimated Effort:** 1/2 man-days (assess concrete bridge for obstruction and determine feasibility of remediation if necessary).

**Priority Category: Tertiary**

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### MCKEEN'S BROOK (July 28, 2008)

Downstream of the Highway 7 bridge crossing the stream widens, has beaver activity, and develops a substrate of silt and organic matter. Beaver activity at the mouth of this brook is potentially problematic due to the high productive capacity of the brook and so there is a need to ensure spawner access into the brook. The habitat type upstream of the Highway bridge, up to the confluence with the outflow from McKeen's Lake appears to be primarily run with little riffle and pool. Substrate is largely cobble with lesser gravels. Similar to Clark Brook, the survey conducted on this brook was incomplete and needs to be repeated by a more experienced surveyor to identify impacts or lack thereof.

I recommend monitoring the brook in October of each year between the Highway 7 bridge and confluence with the St. Mary's River to ensure spawners (salmon and trout) have access into McKeen's Brook.

#### **Recommended activities:**

Re-assess stream in summer 2011 to develop complete survey description of system

Survey for beaver dams below Highway 7 bridge in October

**Estimated Effort:** 1 man-day (Re-assess stream); ½ man day (survey for beaver dams).

**Priority Category:** Secondary

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### NORTH BRANCH STREAMS

#### GUSSET BROOK (surveyed July 23, 2008 and October 5, 2010)

The stream upstream of the Highway 7 bridge crossing is a beautiful small stream, flowing adjacent to agricultural fields in the lower section. For much of the surveyed length the stream is very nice trout habitat, with good pool-riffle ratio, habitat primarily being riffle with deep pools on bends, the substrate is cobble and gravels. The stream has good meander pattern and at this low flow, thalweg is so well developed that the stream actually meanders within the channel rather than being consistently at channel width. Banks are stable and there is moss on boulders suggesting stable flow. The water during low flow is shallow, but I expect under higher flows water depth much better. This is excellent habitat and see a lot of trout. There is variable width buffer strip between stream and agricultural field in lower section; this buffer appears to work well as impacts to stream, if any, are very subtle. Proceeding further upstream the stream becomes typical 1<sup>st</sup> order stream (small, shallow, silt/organics substrate mixed with small gravel), and for a section flows through an abandoned beaver meadow where it is exposed to direct solar insolation and so would result in heating of the water in summer.

Downstream of the Highway 7 bridge, the stream changes character completely. It is heavily impacted below (and by) the bridge. Here it is overwidened, a flat plain cross section, dominated



by runs, and with a silt/fines substrate. Typical stream response below a bridge. I walked only a short distance downstream from bridge during this survey. A complete survey from the bridge to Lochaber Lake should be conducted in 2011.

I recommend that there is no need for restoration on this brook above the Highway 7 bridge. Similar to Barren Brook, this stream might be very useful as model for what local streams should look like (i.e., meander patterns, pool frequency and depths; riffle-pool ratios etc.)

**Recommended activities:**

Walk from Highway 7 bridge down to Lochaber Lake in 2011 to assess impacts in that section.

**Estimated Effort:** 1 man-day (survey stream)

**Priority Category:** Secondary

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MCNAB'S BROOK (surveyed July 16, 2008)

This is a small, high gradient stream with large substrate (boulder/large cobble). There is a gorge with 2 small falls (impassable) approximately 1.0-1.5 km upstream of the stream mouth. Downstream of this gorge is high gradient, the channel is stable (curved trees accommodating bank erosion, moss on boulders), and stable undercut banks are present. There is some bar development/sediment aggradation, debris jams forming significant sediment wedges, and extensive blowdown from historical forestry activities. Above the gorge the gradient is reduced and substrate size decreased; the stream becomes a more typical lower gradient stream above the impassable gorge. The stream downstream of the gorge may be used to some degree by salmon, but gradient likely excessive for them and stream very small for salmon rearing.

In general this stream does not require work. It is in good shape and stable. It is not a salmon stream (too high a gradient, and no spawning habitat) but a good trout stream. See fry and parr throughout. Perhaps worth revisiting under higher flows.

**Recommended activities:** None

**Estimated Effort:** None

**Priority Category:** Not on Priority List

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**MAIN BRANCH STREAMS**

UNNAMED BROOK (LOCAL NAME "CROOKED BROOK") (surveyed May 15, 2009)

**Note:** This unnamed stream located southwest of Cochrane Hill, draining from the east into the river. Lat/Long at stream mouth approximately 45°13.6'N, 62°01.2'W.

Crooked Brook downstream of Highway 7 is high gradient, bedrock stream. Some sections high gradient, including impassable falls. Lower down get into more of an alluvial channel. A beautiful small stream – reminiscent of some west coast streams in part.

This was a very cursory survey as was a short walk upstream of Highway 7 where stream drains from cutblock. I recommend a complete survey of this stream in 2011. This survey is to: (1) conduct a proper stream survey from confluence with St. Mary's River to where the stream drains the cutblock upstream of the Highway 7 crossing, (2) determine spawning potential below the impassable falls (i.e., substrate and gradient), (3) describe impassable falls or series of falls, and (4) sample fish upstream of falls for presence.

**Recommended activities:** Conduct proper stream survey of short length of this stream from confluence with St. Mary's River to where it is a first order stream draining a cutblock.

**Estimated Effort:** ½ man-day (survey of short section of stream)

**Priority Category:** Tertiary

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BILL NED'S BROOK (surveyed June 6, 2008 and July 7, 2008)

Downstream of the Waternish Road bridge the stream is relatively low gradient, primarily riffle and deep pool, has a substrate of large gravel and cobble, and the banks are stable. Here it is a beautiful brook; the habitat looks appropriate for trout. From bridge upstream to impassable falls (3-4 m high falls located approximately 1.5-2.0 km upstream of Waternish Road) is high gradient stream, cascade-riffle habitat, no pools and very few runs. Appears to be adequate salmon rearing habitat but there is no spawning habitat in this section of brook. The substrate is large (cobble/boulder). Downstream of Bill Ned's Lake the stream is a beaver meadow with deep runs. Throughout brook below falls there is good meander to stream; it is not channelized, and there is an appropriate presence of LWD, with some debris jams formed but not too many.

Falls are definitely a barrier to fish migration. Habitat downstream of the falls is a good rearing habitat but little to no spawning habitat. Priority for restoration is very low, a beautiful intact healthy stream as is.

**Recommended activities:** Locate and fully describe/document impassable falls on brook.

**Estimated Effort:** ½ man-day (survey of falls)

**Priority Category:** Tertiary

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### ARCHIBALD'S BROOK (STILLWATER) (surveyed July 10, 2008)

Similar to Clark Brook and McKeen's Brook, the survey conducted on this brook was incomplete and needs to be repeated by a more experienced surveyor to identify impacts or lack thereof.

**Recommended activities:** Re-assess stream in summer 2011 to develop complete survey description of system

**Estimated Effort:** 1 man-day (Re-assess stream)

**Priority Category:** Primary

## DISCUSSION/CONCLUSIONS

There were certain themes encountered on most of these brooks during these surveys which can inform us of significant influence on channel structure in the St. Mary's River.

- Debris accumulations and jams were quite frequent and appear to be major influences affecting the dynamisms and frequency of channel changes as they redirect water. A certain amount of debris is essential for channel maintenance and cover for fish, but excessive debris leads to inappropriately high rates of flow diversion and lack of stability within the channel, to the detriment of fish habitat. Future surveys should pay more attention to quantity of debris in-channel and over-channel to determine what the optimal density is in these systems, thereby allowing placement of debris or digger logs in those channels lacking it, and removal of excess LWD in those in which density is artificially high.
- Beaver activity was quite common on several streams. There were few identified problematic dams, but beavers tend to increase the size of their dams in late summer and early autumn; a time most of the surveys reported here missed. The most problematic dams will be those lowest down on a stream near the stream mouth where they may cut off access to the entire brook. Due to the lack of feasibility of comprehensive autumn beaver dam surveys and lack of knowledge of stream use by spawning salmonids in the St. Mary's, beaver activity will likely continue to be an undocumented and unmanaged factor in this drainage.
- Frequently habitat was somewhat partitioned along the length of a stream with "trout" habitat (deep pools, greater frequency of runs, smaller substrate size) in lower sections of streams and "salmon" habitat (riffles, larger substrate size) in the mid sections of these streams. In the future, consideration should be given in restoration in this watershed to mimic that pattern. That is, to restore lower sections to deep water, relatively slow moving areas) and avoid trying to turn these areas into "salmon" habitat.

*Activities for 2011 restoration season*

Recommended activities for the 2011 restoration season are presented in Table 2. Note, this list does not include the culvert remediation program outlined in SMRA Technical Report 8, which is to be conducted in conjunction with these activities. The primary priorities are the most ambitious, but also most important, projects while the secondary and tertiary priorities may be accomplished as short discrete projects, but are of less critical importance.

Table 2: Summary of restoration priorities and estimated effort for 2011 based on stream surveys 2008-2010.

	System	Priority	Estimated effort
Physical Restoration (debris clearing)	<b>McQuarries Brook</b>	<b>Primary</b>	<b>12 man-days</b>
	Archibald's Brook (Glenelg)	Secondary	4-6 man-days
	Tait Brook	Secondary	1 man-day
Assessment/Monitoring	<b>Sutherland's Brook</b>	<b>Primary</b>	<b>1 man-day</b>
	<b>Campbell's Brook</b>	<b>Primary</b>	<b>4 man-days</b>
	<b>East Branch mainstem</b>	<b>Primary</b>	<b>6 man-days</b>
	<b>Archibald's Brook (Stillwater)</b>	<b>Primary</b>	<b>1 man-day</b>
	Tait Brook	Secondary	1 man-day
	Clark Brook	Secondary	1 man-day
	Indian Man Brook	Secondary	½ man-day
	Garden River	Secondary	1 man-day
	McKeen's Brook	Secondary	1 ½ man-days
	Gusset Brook	Secondary	1 man-day
	MacDonald Brook	Tertiary	1 ½ man-days
	Barren Brook	Tertiary	¼ man-day
	Unnamed brook (East Branch) "Crooked Brook"	Tertiary	½ man-day
Bill Ned's Brook	Tertiary	½ man-day	
Planning	<b>Sutherland's Brook</b>	<b>Primary</b>	<b>4 man-day</b>
	<b>Campbell's Brook</b>	<b>Primary</b>	<b>6 man-days</b>
	<b>East Branch mainstem</b>	<b>Primary</b>	<b>4 man-days</b>

In order to increase the number of streams surveyed in the St. Mary's River drainage, a further ten (10) streams should be surveyed in 2011. Recommended streams to survey are:

1. Archibald's Brook (Stillwater) (Main Branch)
2. McKeen's Brook (East Branch)
3. Big Meadow Brook (East Branch)
4. Clark Brook (West Branch)

5. Ross Brook (West Branch)
6. Kelly Brook (West Branch)
7. Mitchell Brook (West Branch)
8. Bryden Brook (West Branch)
9. Upper Bryden Brook (West Branch)
10. Nelson & North Nelson River (West Branch)