PSC Northern Fund 2008 Final Report #NF-2008-H-9

Bulkley/Kispiox River Agricultural Stream Restoration Seed Funding

PROPONENT IDENTIFICATION

Proponent Name:	Bob France		
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PROJECT IDENTIFICATION

Project Title:
Bulkley/Kispiox River Agricultural Stream Restoration Seed Funding

Project Type:	***(Check one)***
Development of **improved information** for resource management, including stock assessment; data acquisition & scientific understanding of limiting factors.	☐
Habitat restoration; rehabilitation or improvement.	☒
Enhancement of wild stock production through low technology techniques.	☐

Project Location:
Toboggan Creek, Bulkley River Watershed,
Cedar Creek – Kispiox Watershed,

Start Date:	**April, 2008**	**End Date:**	**April 30, 2009**	**Duration:**	**13 months**

	(Specify currency)
Total PSC Funding Requested:	$25,000CAN
Estimated Total Other Funding & In-Kind Contributions:	$279,600CAN
Estimated Total Other Funding & In-Kind Contributions achieved:	$90,000CAN

Part 1. RELEVANCE AND SIGNIFICANCE

1. Issue/problem to be addressed

Fish habitat degradation on agricultural land, often the result of riparian losses, is well documented in the Kispiox and Bulkley drainages (Agra 1998, BC Conservation Foundation 1997 and 1998, Mackay 1997, Remington *et al* 2002, Tamblyn *et al* 2000, Triton 1998). The BC Cattlemen's Association's Environmental Farm Plan program has conducted a large number of riparian assessments in the BC Northwest and concluded that there is a large amount of work to be done to return riparian areas on private lands to proper functioning condition. Every important fish bearing stream from Terrace to Burns Lake has sections of riparian area on private lands that are unstable (D. Russell, pers. comm).

Poorly managed riparian zones can have a tremendous effect on watershed health and stream productivity. Water quality can be reduced due to increases in stream temperature. Livestock management near streams can also have a detrimental effect on water quality and cause increases in suspended sediment and pollutants such as ammonia (Remington *et al*. 2002). Other habitat impacts include stream bank failure, increased sedimentation, loss of instream woody debris for cover and complexity and loss of stable spawning habitat due to increased scour and instability in streambed material. All of these can have a negative impact on the productive capacity of these streams to support salmon populations.

A common concern of many agricultural landowners living adjacent to streams is the loss of land to stream bank erosion. Armouring stream banks with lengthy installations of rip rap can reduce habitat complexity and productivity for fish populations.

This project will focus on a multi-faceted approach to these issues. Environmental Farm Plans for several farms will be developed prescriptions for protecting riparian corridors and restoring damaged fish habitat will be completed. These will include (but not be limited to) riparian fencing and planting, limited cattle access through construction of proper crossings) and stream bank stabilization work. Projects will be implemented with partnership funds and in-kind support from multiple sources. These projects will primarily target juvenile coho rearing habitat, however, they will also provide refuge habitat for other species and will protect existing spawning and rearing habitat by restoring riparian function.

This funding application, if successful, will provide funding support to implement 10 projects on agricultural properties in the Bulkley Valley and Kispiox Watersheds in 2008. Additional sites may be added as new sites become identified.
The British Columbia Cattlemen's Association [BCCA] is seeking a funding partnership to deliver the Farmland Riparian Interface Stewardship Program [FRISP] to the Pacific Northwest Region of the Province. FRISP was established in 2002 to build greater understanding and capacity in the agriculture sector around environmental stewardship through providing technical support that recognizes the needs of the agriculture sector while bringing about compliance with environmental regulations and guidelines. The objectives of the program are:

- To foster long-term environmental stewardship and sustainability for the agricultural community by restoring and enhancing fish-bearing streams and farmland in agricultural areas,
- To promote cooperative planning of habitat restoration and farmland activities between landowners, resource management agencies, and community groups,
- To increase awareness of interactions between land use and fish habitat values, and
- To resolve conflict that may arise between resource agencies and landowners.

This approach has allowed the program to currently assist over 130 clients throughout the Province make positive changes in their day to day management strategies around their utilization of riparian corridors. The majority of the landowners have proceeded with actual projects that have seen the restoration of over 15km of actual instream habitat development while placing over 150 km under new management strategies designed to protect or enhance the riparian corridor (ie. fencing, planting, limited livestock access, off-channel watering, proper stream crossings, etc).

What was achieved as of April 2008 - April 30 2009

This report outlines the activities undertaken by FRISP in promoting stewardship development in the Bulkley Valley and Kispiox Watersheds in 2008/2009. A $25,000 contribution from the PCF Northern Fund [Bulkley/Kispiox River Agricultural Stream Restoration Seed Funding] has allowed FRISP to establish partnerships and trust between the agricultural community and resource management agencies over the past year. While all of the goals have not yet been achieved, great strides have been made as FRISP continues to further develop and promote a "common ground" approach.

FRISP provides technical assistance which increases awareness, involvement, and compliance by the agriculture sector to regulatory requirements. The success of Best Management Practices relevant to resource management is only as effective as the understanding and adaptation by agricultural producers who are responsible for utilizing them. Frequently, the most successful partnerships between landowners, resource users, and government agencies occur when someone mentors or mediates a problem from a neutral position. The availability of technical assistance to provide answers and potential solutions to issues or unknowns that arise between landowners, regulatory agencies, and other vested interest parties is important in resolving potential conflict. Partnerships are stronger and more cost effective when all concerned are striving for a common goal.

When the initial proposal was submitted, contact with 10 individuals who had been identified through consultations with the MoE and DFO habitat staff and the regional Environmental Farm Plan advisor. Each of these landowners had expressed interest in addressing identified riparian problems on their properties.

Since then, FRISP has completed 13 individual ranch or farm consultations in the Bulkley Valley and Kispiox Watersheds in the 2008/2009 work-season. These consultations have provided a variety of challenges for FRISP as each individual had a variety of concerns besides the identified bank stabilization issue. Personalities, financial impacts, legalities, funding partnerships and actually being able to provide a workable solution all came into play.

The following steps are generally followed as each individual moves forward.

1. Initial consultation with the individual landowner, whereby the problem is identified and potential solutions are explored. Property owners are encouraged to recognize that any recommendations are in his/her best interest and to "buy in".

2. Identify potential partners to address and rectify the problem. Partnerships may include programs (EFP), resource groups, or agencies, and individuals with a common interest.

3. Implementation of the project with the assistance of a FRISP advisor. This stage allows a direct opportunity for the landowner to address his identified problem, yet meet regulatory requirements respecting riparian corridor and other works.

The FRISP program as of April 30 2009 had completed restoration on 2 sites while completing 5 other full remediation plans and Riparian Corridor Assessments for projects in the Bulkley watershed. Six other landowners have had onsite consultations on riparian corridor issues or concerns and are now considering possible restoration activities through FRISP support in 2009/2010. While 10 on the ground projects were projected for completion, the work and progress on the ground-work to successfully implement works is ongoing and the work started being a great first step.

Projects and considerations of note:

- The first project completed involved 250 meter section of Toboggan Creek with 2 sites enhanced. This was a partnership created through the landowner completing the EFP program. Fisheries and Oceans Canada, Habitat Restoration staff and Ministry of Environment, Water Management assisted with permitting. This project was completed cost effectively as the landowner was able to source material and rent equipment

- The second project saw restoration to a 150 meter section of Upper Maxan Creek. A similar partnership with regulatory agencies and the EFP program will see over 4 km of river upgraded through the landowner completing restoration work once funding is available through the new version of the program. [a copy of prescription for section 9 application provided as a example of work being developed through FRISP consultation].

- Several landowners are dealing with major problems that involve large sections of riverbank on major systems. While these landowners would like to move forward with restoration work, compounding the problem is the economic realities of the cattle industry and forest sectors in recent years limiting available cash flow to invest in restoration projects. FRISP will continue to work at finding workable solutions as adaptive measures are being prescribed and alternate funding sources are pursued. [EFP program provides matching funding up to 50% up to a limit cap of $20,000 dollars.] Several of these sites may be looking at investments of over $100,000.

- FRISP in general has also developed a handout promoting understanding and cooperation around riparian restoration for the agriculture sector. A draft has also being developed around livestock and access to drinking water.

Over all Measures of Success: Describe the specific objective standards, quantifiable criteria and quality control measures you will use to assess the actual performance of this proposal against expectations.

DESIRED OUTCOMES:	**INDICATORS:**
Increased habitat utilization by salmonids	Higher fish densities in treated sites vs control sites

This will be assessed through density studies of juveniles in treatment sites vs control sites.

Outcomes: Future monitoring will provide required data.

Improved function of riparian ecosystems And watersheds	Reduced riparian damage by livestock and other agri-cultural activities, improved water quality in and downstream from treatment areas

Outcomes: FRISP program is working with local landowners in planning habitat restoration projects. The empowerment of these landowners would have a positive effect on over 20 km of privately held riparian corridor through implementing Best Management Practices.

Increased enhancement of riparian areas for Fish and Wildlife	Increased crown cover in treatment sites, increased wildlife use in riparian areas

Outcome: Over 350 meters of riparian corridor was directly enhanced or altered.

Improved understanding by agricultural producers,	Common ground approach to land management

Outcome: 5 other projects have being designed with 6 additional landowners requesting consultation through FRISP for possible works summer/ fall 2009 on into 2010

Improved stewardship ethic among agricultural Producers	Proactive approach to land management with respect to environmental impacts

Outcomes: FRISP has done limited promotion in the Bulkley area as our budget and time availability is restricted and we didn't want to create to much expectation without being able to deliver. The works completed though show a need and a desire for improvements from within the local agriculture sector for improvements. I believe we will continue to move things ahead especially if we can complete the prescribed sites this summer and continue to develop partnerships.

Reduced loss of farmland to rivers and creeks through streambank erosion	Stable streambanks during high water events

Outcomes: Both restoration projects will protect agriculture land base and infrastructure

For more information on projects, please contact Lee Hesketh at 250 547 6586 or silverhillsranch@aol.com

SECTION 9 APPLICATION

PRESCRIPTIONS FOR SITES ON: Maxan Creek

Submitted by Lee Hesketh

On behalf of the: Marvin Strumbold

Submitted to:

Ministry of Environment

Fisheries and Oceans Canada

Environmental Farm Plan

- These prescriptions will cover all authorization and notification requirements to the regulatory agencies.

- These additional applications may be considered for submission in conjunction with this report by the landowner to the Environmental Farm Plan :
    - Bridge replacement
    - Fencing
    - Riparian Planting

Marvin Strumbold is making application to complete habitat restoration work on sites located along Maxan Creek.

Description of Project:

This section of Maxan Creek has reaches that are presently in an unstable state due the steady bank migration and channel aggradation that has occurred above and through these sites in previous freshets.

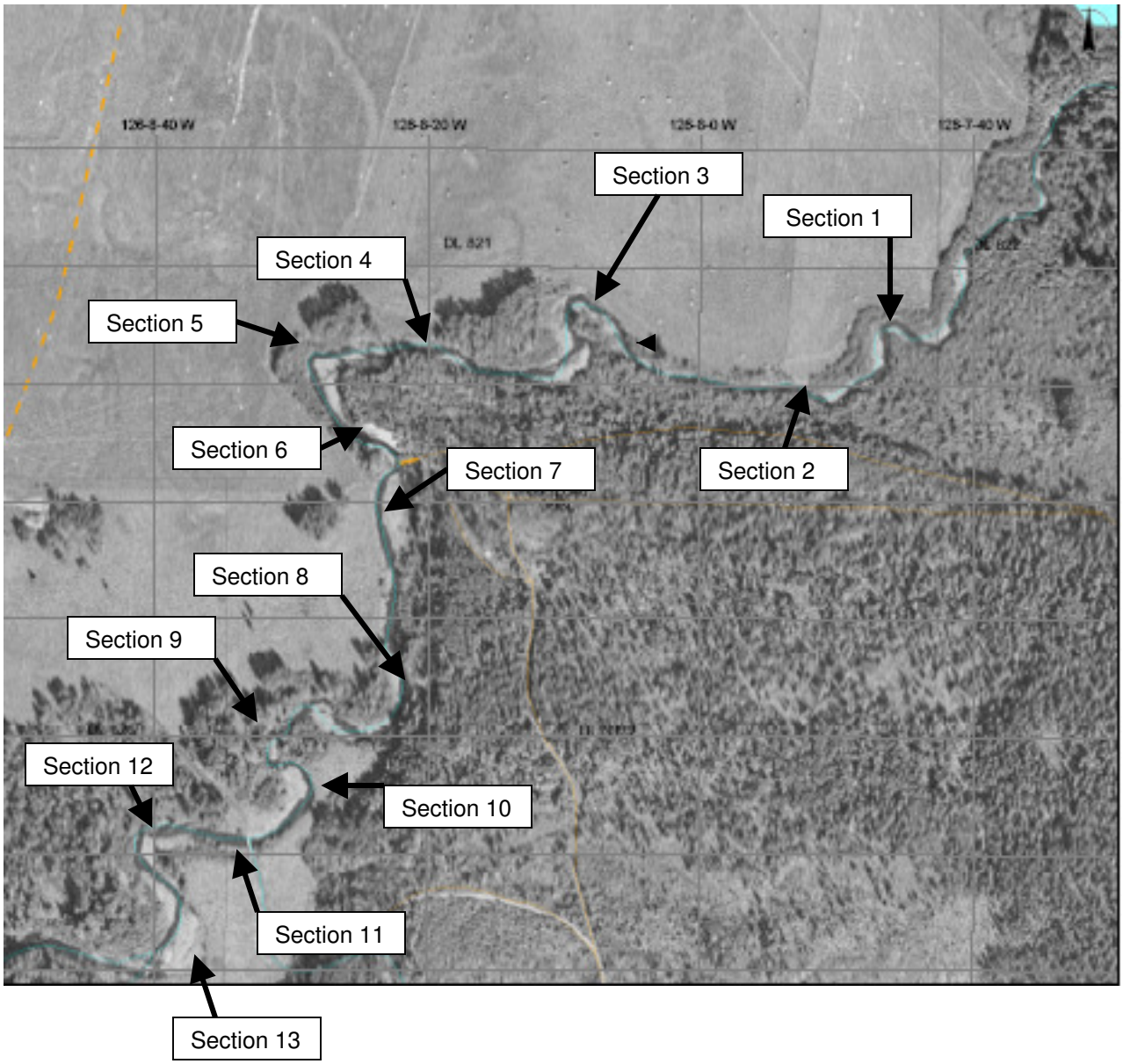
While minor migration of the creek should occur naturally, the unraveling process occurring presently through these reaches are limiting the fish and wildlife habitat values. The impacts also effects downstream sections of Maxan Creek as the bedload created by the bank migration accumulates and aggrades in lower gradient sections downstream.

The removal of the mature conifer trees and the black cottonwoods from the riparian corridor from a combination of timber harvesting and land development and through erosion is evident above and at each of these sites.

The present characteristics of the riparian corridor provides limited channel function. The lack of mature trees has limited shading, root integrity along the river bank and the source of large woody debris. Woody material in the system is deposited during high flows mainly into larger debris jams left high and un-functional during low flow periods.

Previous habitat restoration efforts completed in the late 90's have had positive effects on the recovery of the creek but the high flows of 2007 dramatically changed the flow pattern and sourced more bedload into the channel exposing new problems.

Works would be in a similar nature in design to previous works as large rock and woody debris would be altered or introduced into the flow pattern to create positive channel function.


Section 3
Section 1
Section 4
Section 5
Section 6
Section 7
Section 2
Section 8
Section 9
Section 12
Section 10
Section 11
Section 13

Section 1: Area to be upgraded: 60 meters

Description of over all characteristics:

- Channel morphology: Riffle-Pool
- Disturbance Level: Partially Aggraded to Severely Aggraded
- Limited riparian corridor along migrating creek bank
- Undercutting occurring along 1.2 meter cut bank
- Limited woody debris and over all bank integrity has allowed scouring and potential for further bank migration along 100% of corridor

Recommendation:

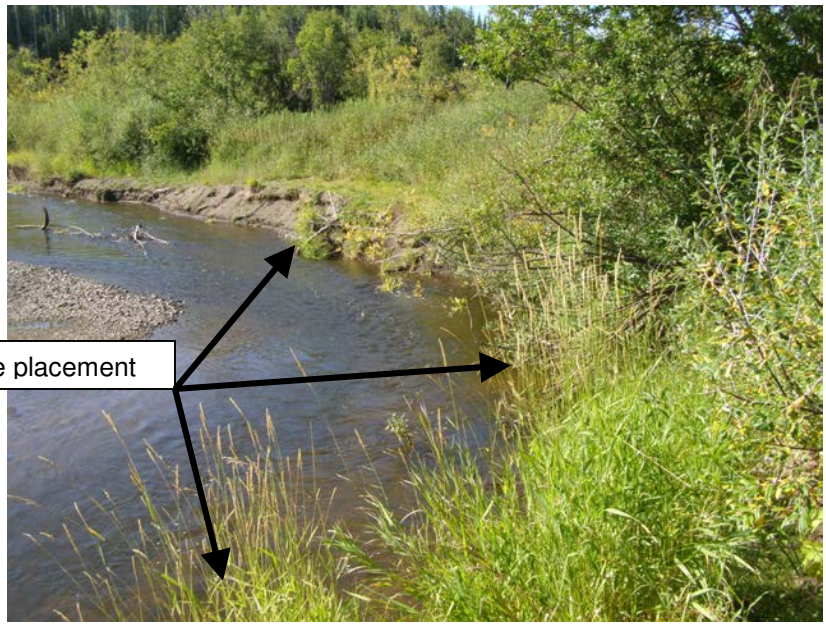
- Placement of 3 habitat recruitment structures along exposed cut bank

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: medium



Looking up stream, riparian corridor on left side of photo shows exposed bank.

Section 2 Area to be upgraded: 60 meters

Description of over all characteristics:

- Channel morphology: Run
- Disturbance Level: moderately degraded
- Undercutting occurring along 2.0 meter cut bank due to channel depth
- Limited woody debris and over all bank integrity has allowed scouring and potential for further bank migration along 100% of corridor

Recommendation:

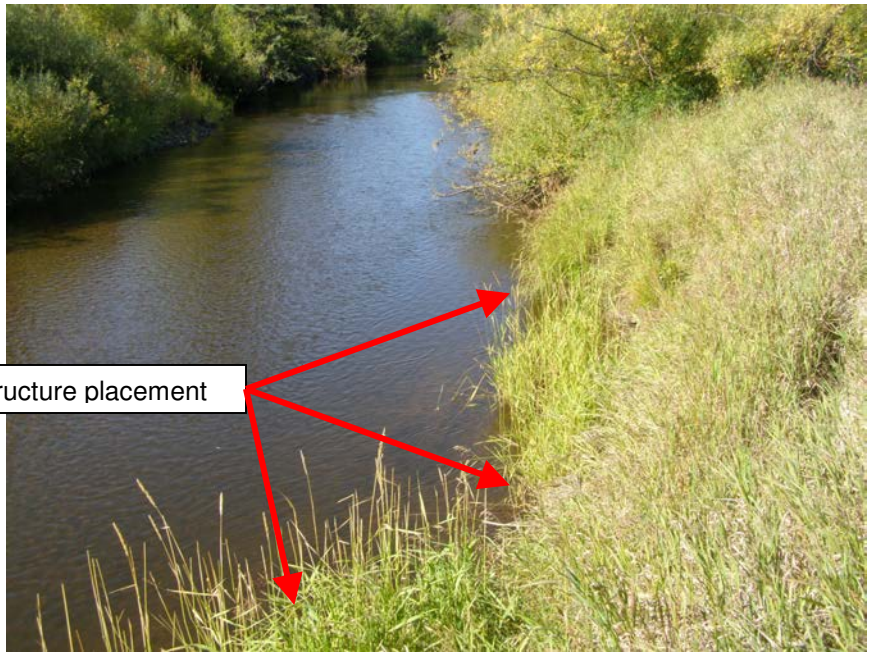
- Placement of 3 habitat recruitment structures along north bank

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: Low



Looking upstream from lower end of site. Channel has degraded or deepened and bank has slumped. Small structures would reduce migration and increase habitat values.

Section 3: Area to be upgraded: 200 meters

Description of over all characteristics:

- Channel morphology: Riffle-Pool
- Disturbance Level: Moderately Aggraded
- Limited riparian corridor along migrating creek bank
- Undercutting occurring along 2.0 meter cut bank
- Limited woody debris and over all bank integrity has allowed scouring and potential for further bank migration along 80% of corridor

Recommendation:

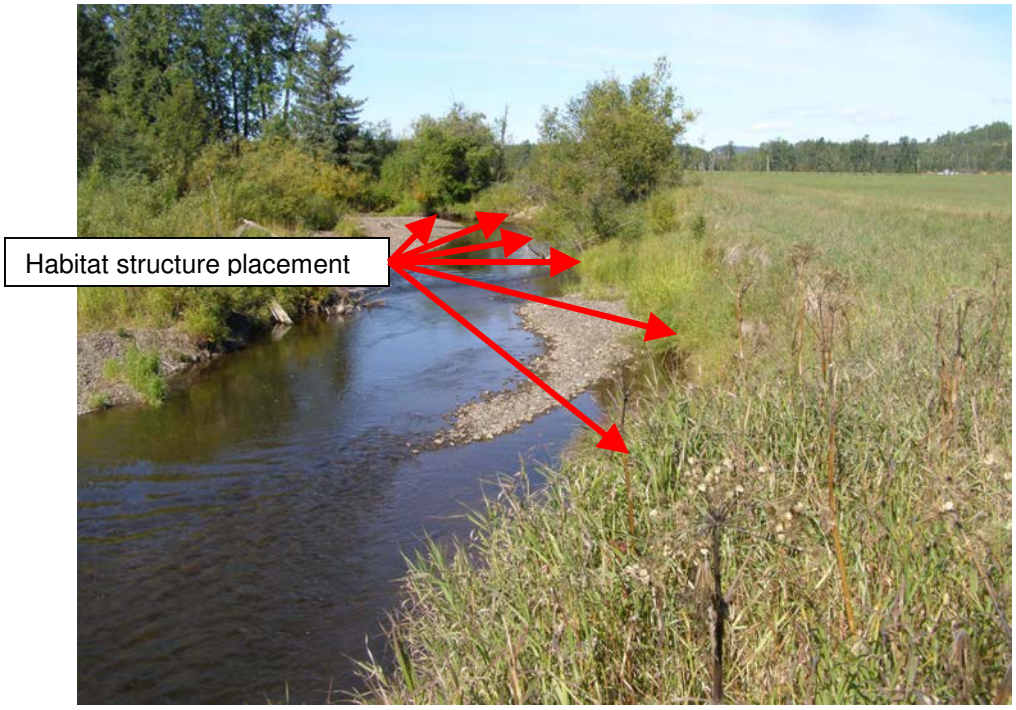
- Placement of 10 habitat recruitment structures along north bank

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

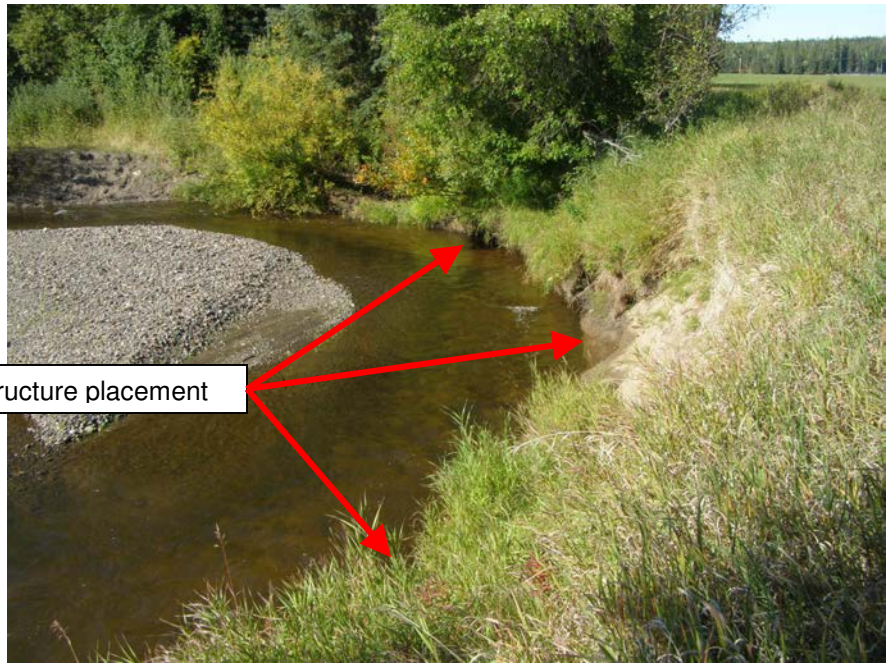
Access: Good

Priority: high



Looking upstream from bottom end of site. Bedload has limited pooling while bank has limited stability.

Looking downstream at lower end of site at slumping bank due to undercutting .



Looking up stream at exposed cut bank along top end of site. Recent bank migration has seen channel widen out leaving a point bar developing on inside bend of channel. Habitat structures would protect bank while increasing habitat values. Alterations would promote pooling and point bar removal through positive hydrologic influence during next springs freshet.

Section 4: Area to be upgraded: 35 meters

Description of over all characteristics:

- Channel morphology: Riffle-Pool
- Disturbance Level: stable
- Limited riparian corridor along migrating creek bank
- Undercutting occurring along 1.2 meter cut bank
- Limited woody debris and over all bank integrity has allowed scouring and potential for further bank migration along 70% of corridor

Recommendation:

- Placement of 2 habitat recruitment structures along north bank

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.
- Cattle and wildlife access improved but limited

Access: Good

Priority: low

Material can be placed to limit access along the riparian corridor. Rock could be placed to maintain toe of bank while access down to creeks edge could be improved to reduce mingling and impacts by livestock.

Looking upstream at current watering point utilized by livestock and wildlife.

Section 5:

Area to be upgraded 60 meters

- Channel morphology: Riffle-Pool
- Disturbance Level: Partially Aggraded
- Limited riparian corridor along migrating creek bank
- Undercutting occurring along 1.0 meter cut bank
- Limited woody debris and over all bank integrity has allowed scouring and potential for further bank migration along 60% of corridor
- Dry channel

Recommendation:

- Placement of 3 habitat recruitment structures along north bank

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: medium

Looking upstream at undercut bank. Habitat structures would enhance stability and habitat values.

Section 6: Area to be upgraded 100 meters

- Channel morphology: Riffle-Pool
- Disturbance Level: Partially Aggraded
- Limited riparian corridor along migrating creek bank
- Undercutting occurring along 10.0 meter cut bank
- Limited woody debris and over all bank integrity has allowed scouring and potential for further bank migration along 100 % of corridor

Recommendation:

- Placement of 8 habitat recruitment structures along north bank

Expected Results:

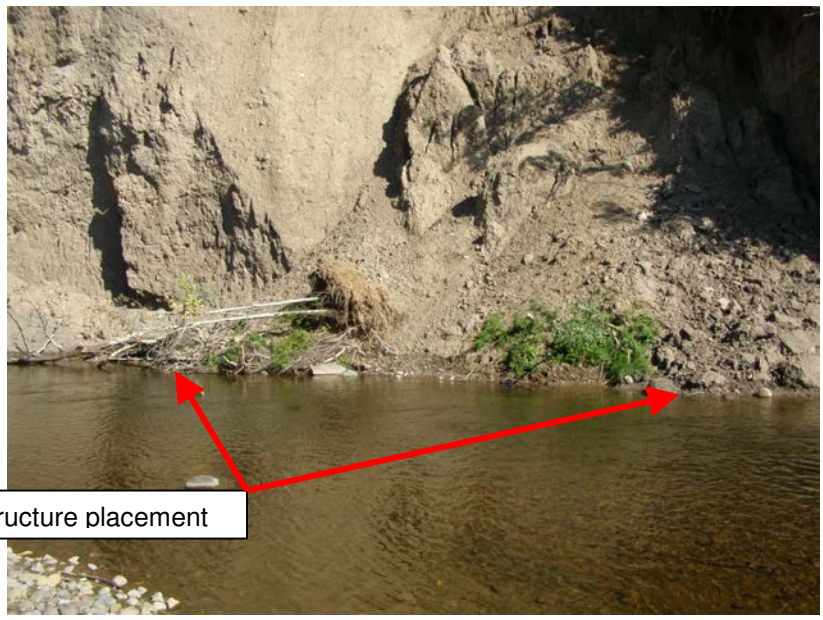
- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

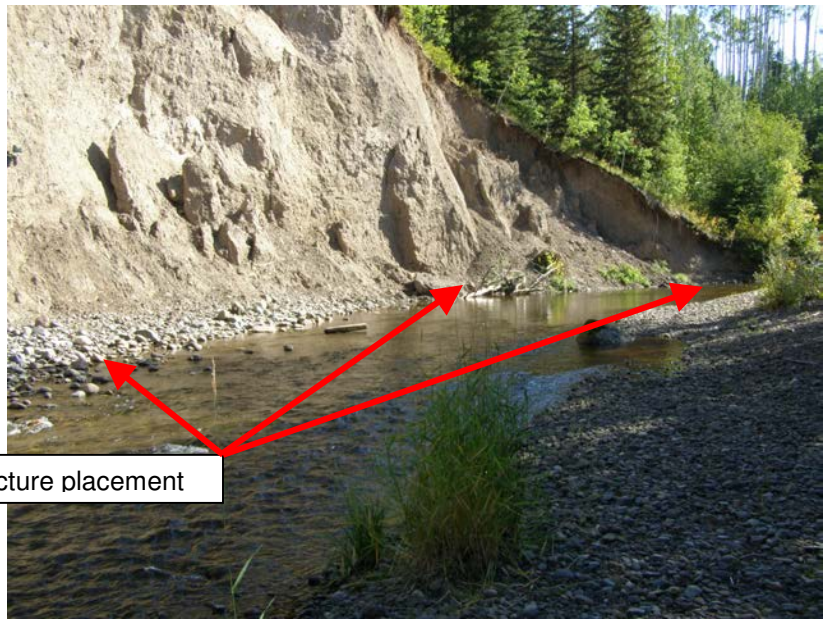
Priority: high

Habitat structure placement

Looking down stream at lower end of undercut bank. Habitat structures would enhance stability and habitat values.



Looking across at midpoint of cut bank. Habitat structures would enhance stability and habitat values. Bank would still slump but base of bank would not migrate back allowing for reduced bedload sourcing.



Looking upstream at top end of undercut bank.

Section 7: Area to be upgraded 50 meters

- Channel morphology: Run - Riffle-Pool
- Disturbance Level: Partially degraded as backcutting action occurring at bottom end of site allowing channel erosion and sediment sourcing.
- Undercutting occurring along 1.0 meter cut bank

Recommendation:

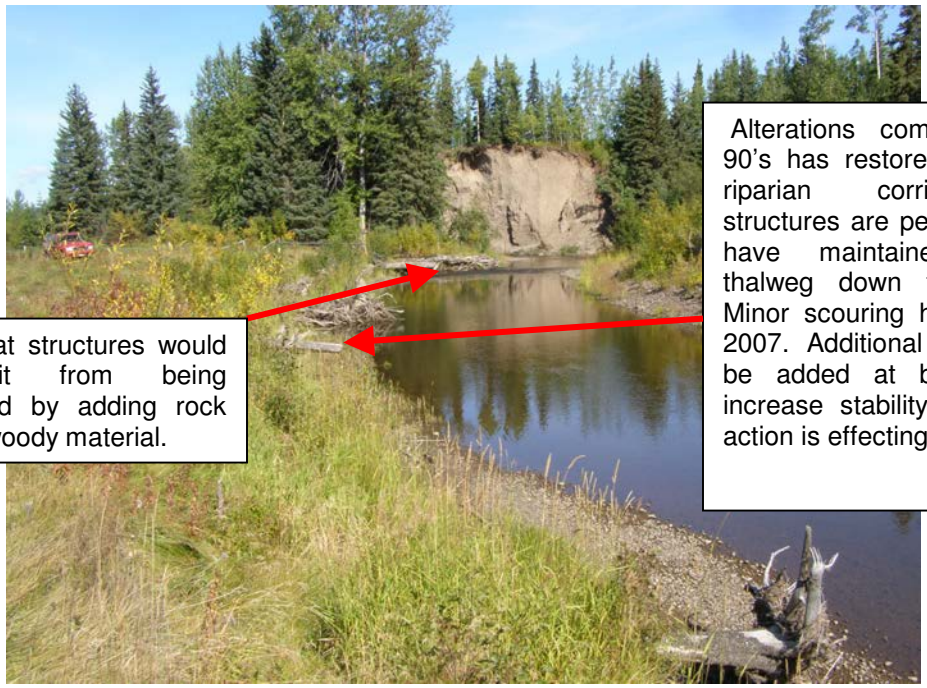
- Placement of 3 habitat recruitment structures along north bank

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: medium



Looking down stream at undercut banks for sections 6 and 7. Habitat structures would enhance stability and habitat values.

Section 8: Area to be upgraded 160 meters

- Channel morphology: Riffle-Pool
- Disturbance Level: Partially Aggraded
- Limited riparian corridor along migrating creek bank that is slumping
- Undercutting occurring along 2.0 meter cut bank
- Limited woody debris and over all bank integrity has allowed scouring and potential for further bank migration along 90% of corridor

Recommendation:

- Placement of 10 habitat recruitment structures along east bank slumping into the creek

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good during low flow periods.

Priority: High for conservation, medium for stability

Looking upstream at undercut bank. Habitat structures would enhance stability and habitat values.

Looking down stream at undercut bank and toppled trees. Habitat structures would enhance stability and habitat values by moving energy away from bank. Slump runs 15 meters back.

Looking downstream at undercut bank near top of site. Habitat structures would enhance stability and habitat values.

Looking up stream at undercut bank near top of site. Habitat structures would enhance stability and habitat values. Slumping of bank runs the entire 140 meters of site, note angle of trees along top of bank.

Section 9: Area to be upgraded 90 meters

- Channel morphology: Riffle-Pool
- Disturbance Level: Heavily Aggraded
- Limited riparian corridor along migrating creek bank
- Undercutting occurring along 1.0 meter cut bank
- Limited woody debris and over all bank integrity has allowed scouring and potential for further bank migration along 60% of corridor
- Dry channel and fish stranding potential

Recommendation:

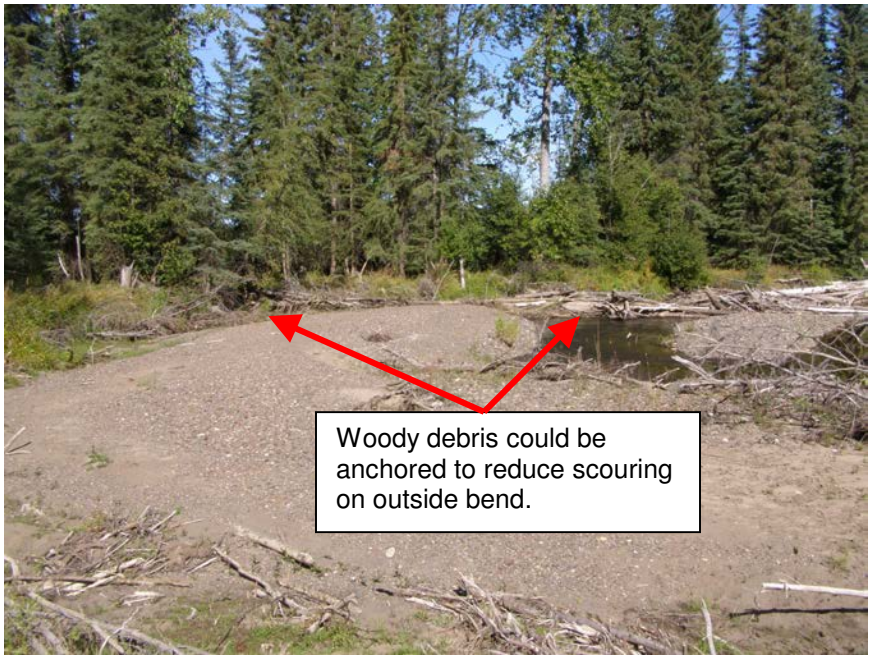
- Placement of rock to enhance woody debris pushed into corner

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: limited

Priority: Low



Looking down stream at undercut bank. Habitat structures utilizing woody debris already distributed along corner would enhance stability and habitat values.

Section 10: Area to be upgraded 70 meters

- Channel morphology: Riffle-Pool
- Disturbance Level: Partially Aggraded
- Limited riparian corridor along migrating creek bank
- Undercutting occurring along 1.0 meter cut bank
- Limited woody debris and over all bank integrity has allowed scouring and potential for further bank migration along 100% of corridor
- Dry channel

Recommendation:

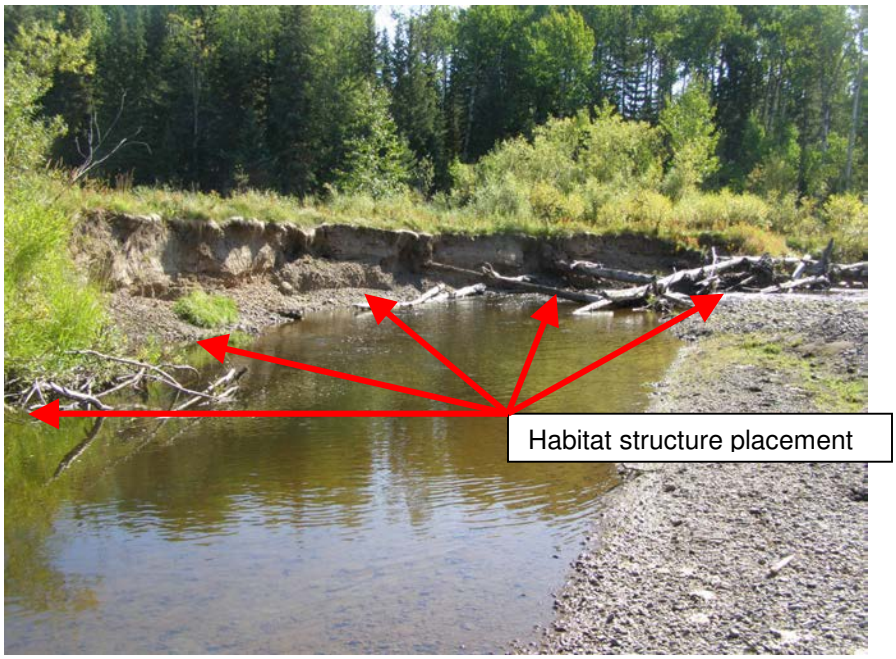
- Placement of 6 habitat recruitment structures along east bank

Expected Results:

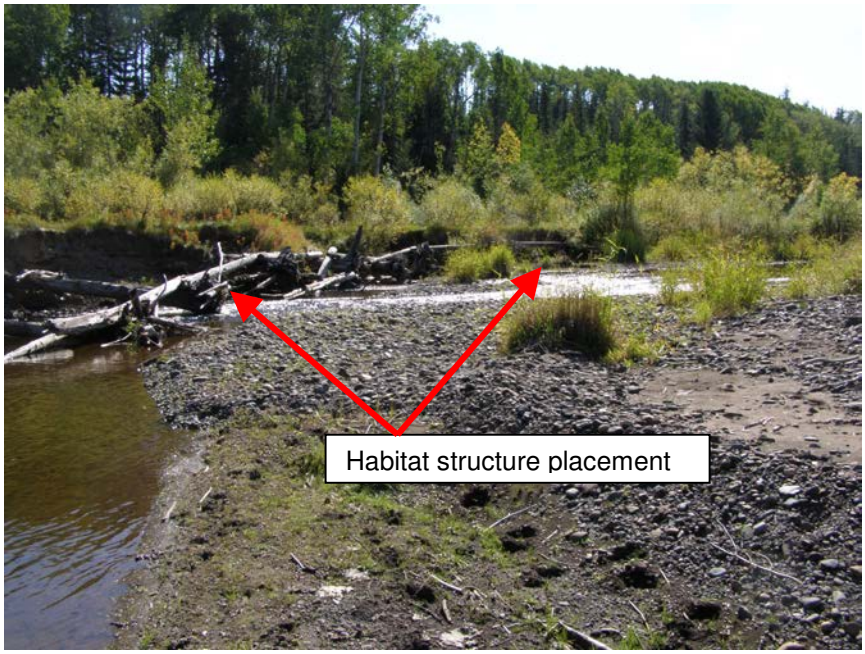
- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: Low



Looking upstream at undercut bank. Habitat structures placed in mid 90's have been undercut during the 2007 freshet and have started to fail.



Looking upstream at undercut bank along top end of site.

Looking across stream at undercut bank. Habitat structures still provide influence but extreme flows have down cut channel.

Section 11: Area to be upgraded 10 meters

- Channel morphology: Riffle-Pool
- Disturbance Level: Partially Aggraded
- Inflow point of small seasonal creek requires upgrading to reduce sediment sourcing from back cutting action during spring runoff.
- Point area used as crossing point by livestock and wildlife

Recommendation:

- Placement of rock to maintain inflow point and to increase access stabilty

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: high

Backcutting action from small seasonal creek has cut ditch

Looking at access on south side of creek. Crush rock to be placed to reduce scouring and erosion during high flows along creeks edge.

Section 12: Area to be upgraded: 90 meters

Description of over all characteristics:

- Channel morphology: Riffle-Pool
- Disturbance Level: Partially Aggraded to Severely Aggraded
- Limited riparian corridor along migrating creek bank
- Undercutting occurring along 1.2 meter cut bank
- Limited woody debris and over all bank integrity has allowed scouring and potential for further bank migration along 90% of corridor

Recommendation:

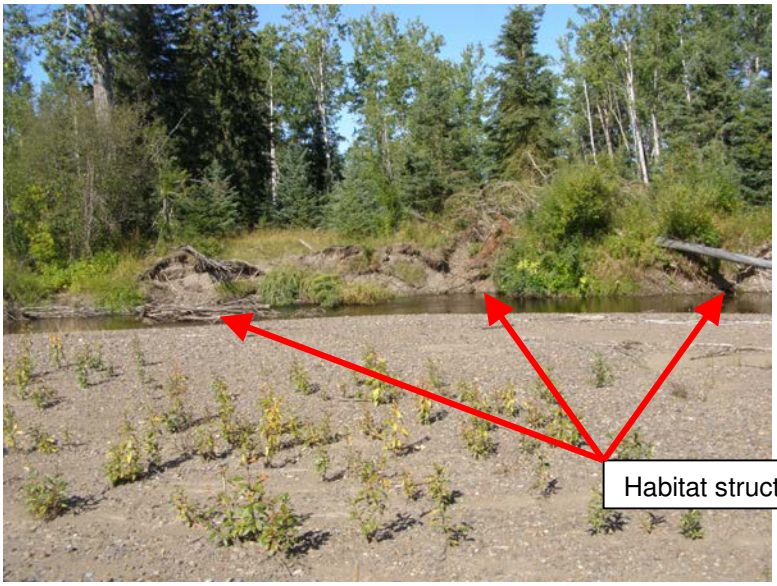
- Placement of 6 habitat recruitment structures along north bank

Expected Results:

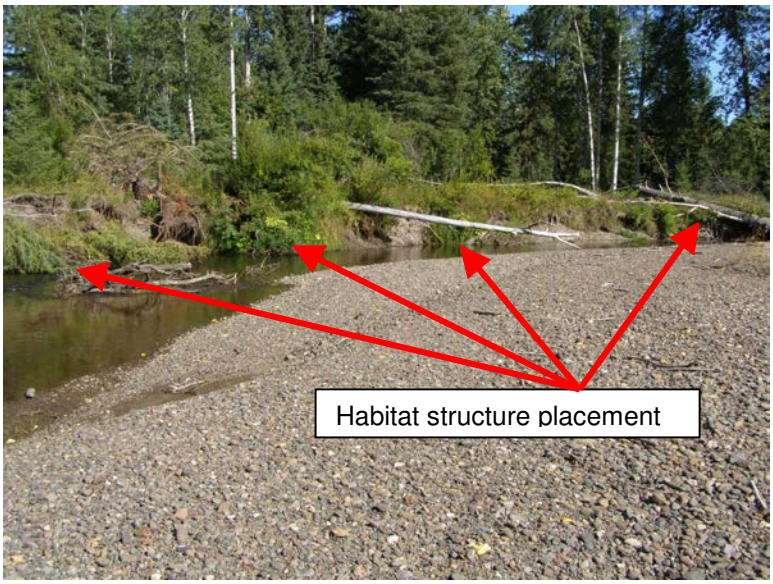
- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

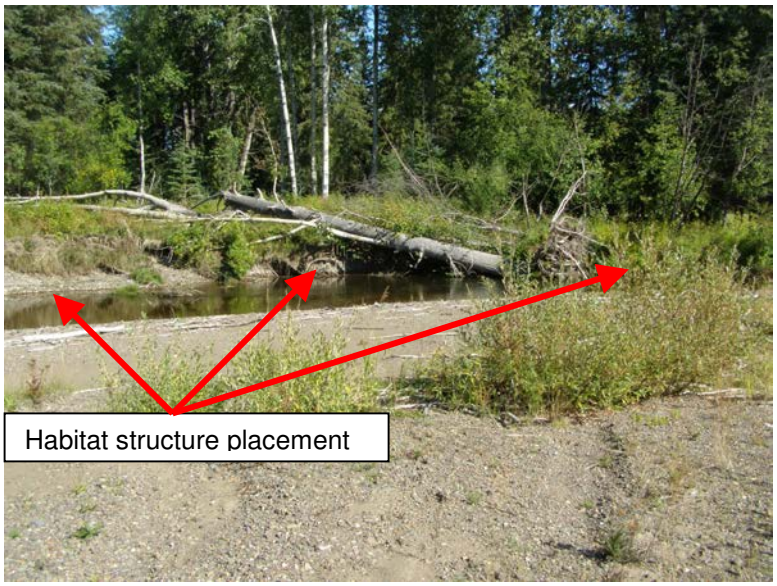
Priority: Medium



Looking across at cutbank that has migrated back on top end of site. Note cottonwood trees newly established on gravel bar.



Looking downstream at lower end of site. Creek has migrated over into corner 10 meters



Looking downstream at large cottonwood toppled at lower end of site.

Section 13: Area to be upgraded 160 meters

- Channel morphology: Riffle-Pool
- Disturbance Level: heavily aggraded

Recommendation:

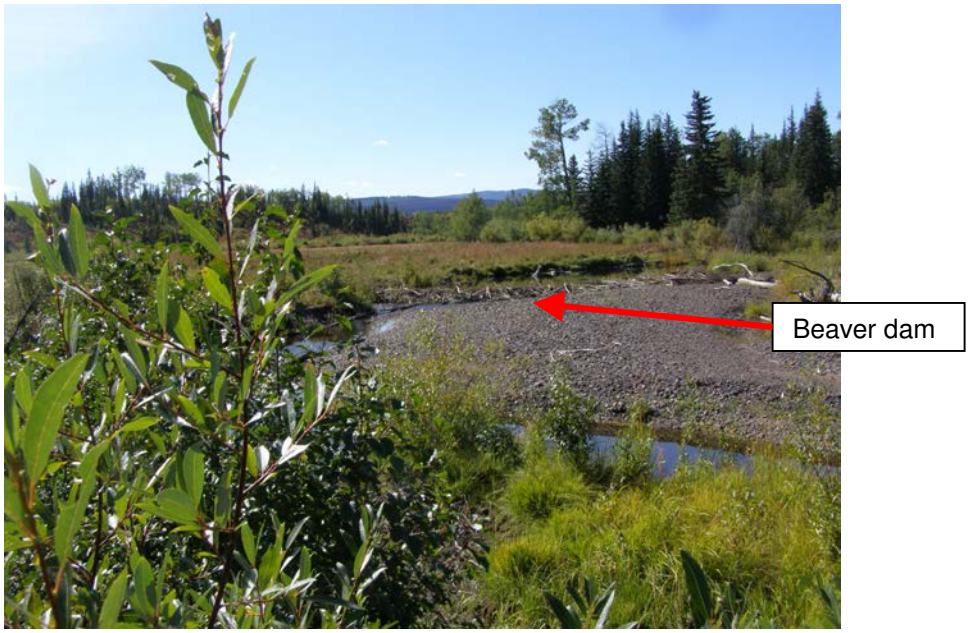
- Placement of 7 structures along outside bend to increase stability and force thalweg into mid channel. Works would be designed to address bedload accumulation by encouraging scouring and a shorter flow pattern.

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: medium



Looking at channel heavily aggraded by channel migration upstream. Beaver dam will be washed out during next freshet.

Section 14: Area to be upgraded 80 meters

- Channel morphology: Riffle-Pool
- Disturbance Level: heavily aggraded

Recommendation:

- Placement of 4 structures along outside bends to increase stability and force thalweg into mid channel. Works would be designed to address bedload accumulation by encouraging scouring and a shorter flow pattern. Gravel bar scalping would allow channel to be redefined once flows increase.

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: low

Looking upstream. Bedload accumulation has widened out flow pattern. Low gradient has channel braided with a portion flowing out across pasture downstream

Mid channel bar has forced flow pattern to braid

Channel avultion upstream due to bedload accumulation has creek flowing through pasture.

Section 15: Area to be upgraded 130 meters

- Channel morphology: Riffle - Run
- Disturbance Level: heavily aggraded

Recommendation:

- Placement of 7 structures along outside bend to increase stability and force thalweg into mid channel. Works would be designed to address bedload accumulation by encouraging scouring and a shorter flow pattern.

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: medium

Old restoration works could be upgraded to increase influence.

Section 16:

Area to be upgraded 120 meters

- Channel morphology: Riffle-Pool
- Disturbance Level: heavily aggraded

Recommendation:

- Placement of 6 structures along outside bend to increase stability and force thalweg into mid channel. Works would be designed to address bedload accumulation by encouraging scouring and a shorter flow pattern.

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: medium

Old restoration works require upgrades along 120 meter section. Channel pattern movement due to bedload has undercut some structures that were constructed of only wood.

Section 17:

Area to be upgraded 110 meters

- Channel morphology: Riffle-Pool
- Disturbance Level: heavily aggraded

Recommendation:

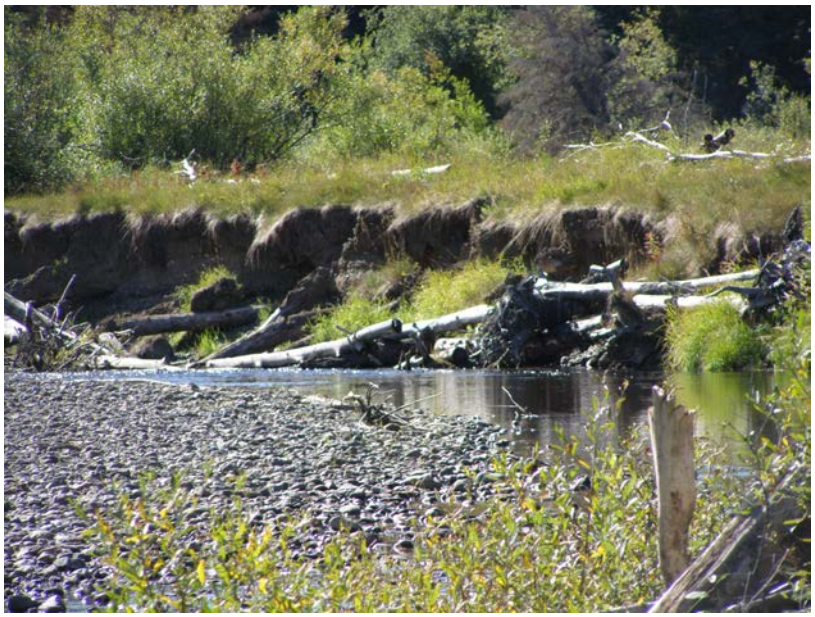
- Placement of 7 structures along outside bend to increase stability and force thalweg into mid channel. Works would be designed to address bedload accumulation by encouraging scouring and a shorter flow pattern.

Expected Results:

- Riparian corridor health and function maintained and increased
- Bank stability maintained and migration risk reduced
- Instream habitat values increased
- Landowner is also developing a riparian management plan through the EFP program.

Access: Good

Priority: medium



Old restoration works along pasture is failing due to undercutting along toe of bank. Upgrades would see habitat structures push thalweg to center of stream and reduce erosion while creating instream habitat values.

Old restoration works to stabilize gravel bars has worked well as silt has accumulated and vegetation established

IMPLEMENTATION METHODOLOGY FOR HABITAT STUCTURES

A series of habitat structures will be introduced as set back groynes parallel to the riverbank. Location, length between structures and size of groynes will be determined by considering the flow angle and pressure of Maxan Creek and the natural features maintaining the present bank configuration.

The following steps outline the construction of a habitat structure. This outline is based on successful implementation of similar works in the past. The same basic steps are always taken when building habitat recruitment structures into exposed cut banks though the structure may vary in size and composition. The construction of these structures outside the work window must be completed without damage to redd sites either directly or by creating a souring action that will affect redds downstream of the structures.

Step 1: Excavate riverbank down to edge of water to allow for anchor logs to be secured into place at lowest depth possible. The depth of channel, composition of bank, length of material available and access with equipment will also determine the depth of cut into bank. All efforts should be made not to disturb sections of banks with healthy root structure. A larger excavator, e.g. 200, will have more reach and ability to handle larger materials Shrubs and sod should be lifted in clumps to keep as much of the root structure in tact as possible and set to the side. This material is replaced over the disturbed area after construction is complete.

Step 2: To increase bank stability and provide a better base for anchoring woody debris, the excavation and placement of angular rock in a trench below the current waterline will reduce risk of future undercutting. Depth of trench will depend upon cohesiveness of bank material, depth of water and height of bank. A narrow berm must be maintained between river and trench to isolate the work area and prevent any release of sediment from the excavation and placement of rock. A pump is used to keep the water level within the berm low enough to prevent silty water surging over the berm when material is being placed. The discharge hose must be long enough to keep the bank around the work area dry and to prevent the silty water from flowing directly back into the stream.

Step 3: Once a base is established level with the waterline, the first layer of brush clumps are placed with tops extending out over water. Angle of material will be determined by desired area of influence and length of material. The farther out and closer to the channel bottom that the material is placed, the greater the dampening of energy along base of bank.

Step 4: Willows and cottonwood cuttings are laid or driven in among the brush clumps. The level of exposure desired determines sequence of placement. One third of the cutting will be exposed above the soil after backfilling occurs. Consideration of mid-summer flow levels determines the height of placement on the bank. Cuttings lay horizontally with the lower half buried when backfilling are less likely to be completely girded by voles or beaver.

Step 5: Support logs (0.2 - 0.6 m butt diameter x 5 – 7 m) are placed over top the structure. These are the main anchors that will hold the structure in place. In some circumstances, these anchor logs can be pushed into bank without excavation. This works best in clay while gravelly soils have little tensile strength.

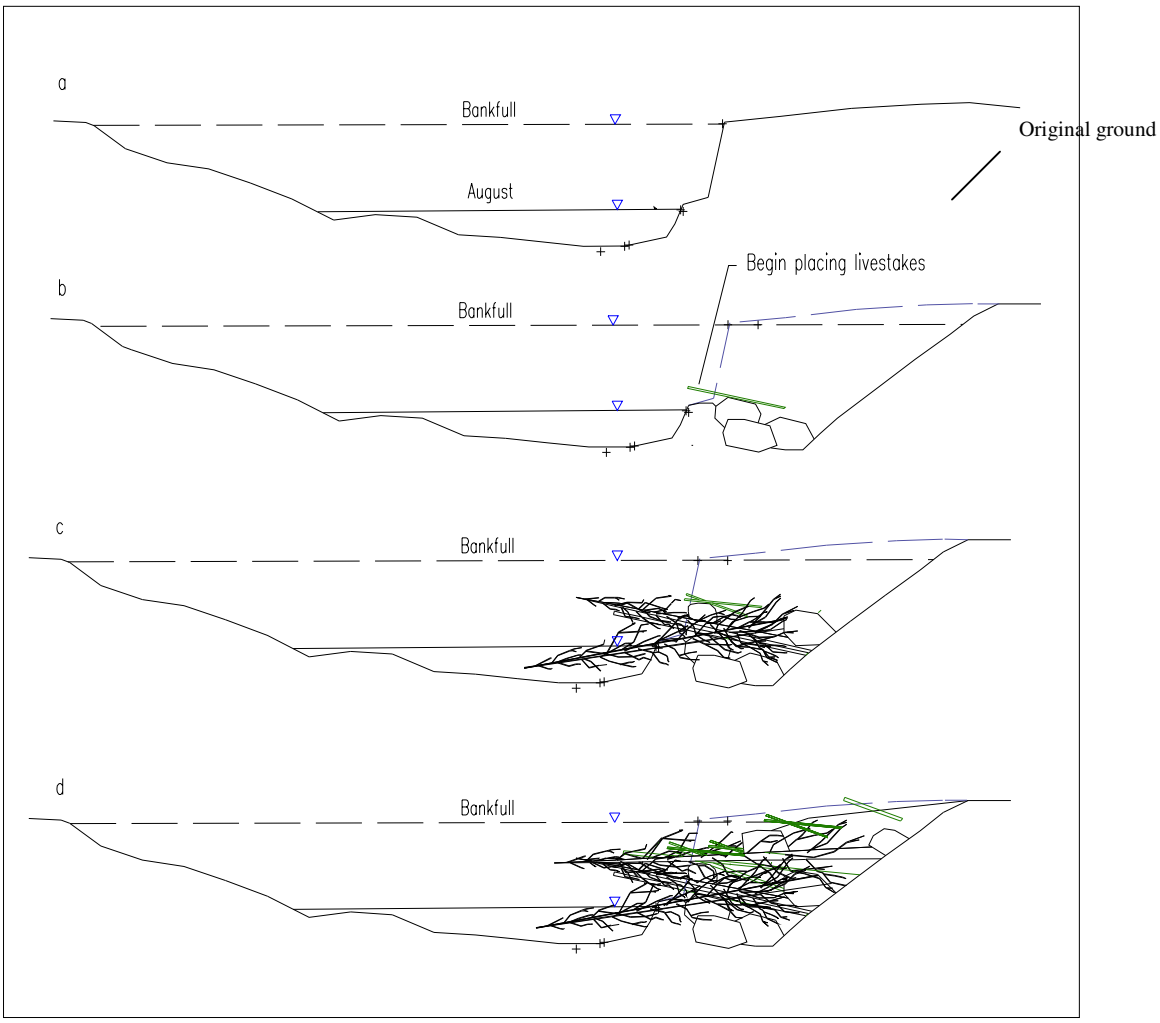


Figure 6: Steps in construction of a habitat recruitment structure perpendicular to flow. When built at low water, there is no siltation or other disturbance to the stream. The cut bank is tapered back so that during high flow, there is no loss of stream capacity even with the woody material projecting into the stream. The berm left between the work area and stream will erode creating an overhang for low water refuge.

Implementation Schedule:

Works will be completed in the fall or early spring. Timing of implementation on all sites will be dependant access and upon low flows to minimize contact within the wetted perimeter of Maxan Creek .

Material will be placed onto site before commencing with project to allow for quick implementation of all structures. [Material placed on high ground]

Design and implementation will be similar to works successfully completed on the Coldwater River in 2003. Photo documentary demonstrates positive changes through introduction of structures

Habitat recruitment structure implementation methodology: Coldwater River

Step 1: Excavate riverbank down to edge of water to allow for anchor logs to be secured into place at lowest depth possible. The depth of channel, composition of bank, length of material available and access with equipment will also determine the depth of cut into the bank. All efforts should be made not to disturb sections of banks with healthy root structure. A small excavator, e.g. 120, will have more room to maneuver while only giving up a small amount of reach. Shrubs and sod should be lifted in clumps to keep as much of the root structure in tact as possible and set to the side. This material is replaced over the disturbed area after construction is complete.

Figure 1: A trench is dug into the bank leaving enough of the original bank to form a berm between the work area and the stream. The trench is excavated to below the riverbed level.

Step 2: To increase bank stability and provide a better base for anchoring woody debris, the excavation and placement of angular rock in a trench below the current waterline will reduce risk of future undercutting. Depth of trench will depend upon cohesiveness of bank material, depth of water and height of bank. A narrow berm must be maintained between river and trench to isolate the work area and prevent any release of sediment from the excavation and placement of rock. A pump is used to keep the water level within the berm low enough to prevent silty water surging over the berm when material is being placed. The discharge hose must be long enough to keep the bank around the work area dry and to prevent the silty water from flowing directly back into the stream.

Figure 2: Wood and brush are placed in the trench extending over the water. Care is taken to leave the berm in tact and the work area isolated.

Step 3: Once a base is established level with the waterline, the first layer of brush clumps are placed with tops extending out over water. Angle of material will be determined by desired area of influence and length of material. The farther out and closer to the channel bottom that the material is placed, the greater the dampening of energy along base of bank.

Figure 3: Rock is placed along the bank side of the berm to secure the toe of the bank and is used to anchor the wood.

Step 4: Willows and cottonwood cuttings are laid or driven in among the brush clumps. The level of exposure desired determines sequence of placement. One third of the cutting will be exposed above the soil after backfilling occurs. Consideration of mid-summer flow levels determines the height of placement on the bank. Cuttings laid horizontally with the lower half buried when backfilling are less likely to be completely girded by voles. Upright willow and cottonwood stakes should be protected with vole guards.

Figure 4: More brushy material including live willows are added and secured with rock and soil. Care is taken while the trench is being backfilled not to displace the dirty water into the river. It is removed from the trench with the bucket or a pump and moved far enough from the river that there is no sediment returning to the flowing water.

Step 5: Support logs (0.2 - 0.6 m butt diameter x 5 – 7 m) are placed over top the structure. These are the main anchors that will hold the structure in place. In some circumstances, these anchor logs can be pushed into bank without excavation. This works best in clay while gravelly soils have little tensile strength.

Figure 5: A habitat structure is placed downstream of the previous structure. The tops of the material from the upstream structure protect the downstream structure.

BEFORE AND AFTERS

Figure 6: The structures are placed close enough on this outside corner to overlap and appear continuous. Eventually, the soil berm that was left during construction may be eroded, leaving the rock toe with overhanging wood. The live willow, placed with the roots below the high water table, continue to grow through the rock and wood. Cattle are reluctant to walk on the rock and debris to graze the willow overhanging the river.

Figure 7: Looking upstream at same location after 2 summers.

Environmental Management Plan Mitigation Considerations

- The development of this stabilization and habitat restoration project will address channel migration concerns in a manner that does not encroach on Maxan Creek.

- All operations shall be conducted in such a manner to prevent the deposition of deleterious substances from the construction site into the creek. To achieve this, all work will be completed in a manner that will have no harmful alteration, disruption or destruction of fish habitat through restricting or isolation of material to flowing water.

- All operations shall be immediately shut down upon detection of a sediment release, corrective measures are to be undertaken and Fisheries and Oceans Canada staff will be notified immediately.

- Any machinery operating near the stream shall be clean, in good repair and free of hydraulic leaks and surface oil and grease. Oil spill clean-up kits will be at the work site at all times machinery is working near the stream. Employees on site will be trained in their deployment and operation. Machinery will be serviced and refueled a minimum distance of 15m from any watercourse.

- Machinery will be operated from top of stream bank; no part of machine mobility system will be permitted in stream unless working in an isolation area.

- Any rock used on site used shall be clean, free of fines and deleterious substances, and suitably sized and graded to resist erosion.

- All excavated materials and debris shall be placed in a stable area above the high water mark of the stream and will be protected from erosion in order to prevent it entering the creek.

- Every effort will be made to ensure that the riparian vegetation immediately adjacent to the work site is protected from disturbance. Any trees or shrubs damaged or destroyed in the process of conducting any of the works will be replaced using replacement seedlings or plants

- All disturbed areas will be stabilized upon completion of works in order to control erosion and ensure sediment does not enter the compensation channel.

- Structures will be incorporated along bank at points that they can be successfully secured with rock ballast to prevent outflanking.

- Structures will be designed to accommodate 2007 freshet levels as indicated by watermark evidence present on individual sites.

- Consideration of habitat structures permeability, size and configuration will be determined based upon individual site locations hydrologic considerations.

- Limiting width of structures into the main flow corridor will recognize considerations of navigational impacts to canoeist, kayakers and tubers. Visibility of large woody debris will also be considered during construction.

The landowner recognizes that the traditional approach of using straight riprap or hard armoring of these cut banks are cost prohibitive. It was discussed that a softer bioengineered approach would be more cost effective as well as providing in-stream and above stream fish cover. The landowner has supported this approach and expressed that he would consider assisting with implementation of this project. I have agreed to supervise the installation of the work as the environmental monitor.

The prescriptions I have provided are based upon diffusing the stream energy away from the base of bank at the critical locations noted presently as unstable. The placement of habitat recruitment structures allow for reduced migration of the stream and increased bank and channel stabilization. The structures create depth towards the center of the stream by directing local flow to the tips of the brushy material. Besides the increased depth in center stream, the following positive flow pattern characteristics occur:

- The development of a stable channel as defined by the Channel Assessment Procedure Field Guidebook
- The creation of still water areas or low velocity areas that encourages deposition and riparian establishment behind structures
- The provision of stream complexity for vegetation, invertebrate, fish and wildlife habitat
- The reduction of bedload and silt contribution
- The provision of transition areas for fish migration
- Increased channel flow capacity due to deepening of channel and re-sloping the banks

The landowner recognizes that there are limitations to the protection these structures can provide compared to a traditional rip rapped stabilization technique:

- Upstream and downstream flow pattern changes may alter structures effectiveness to redirect excessive flow energy. This is based upon the length of bank being influenced by a group of spurs is directly proportional to the length and spacing of the habitat structures in combination with thalweg angle.
- The inclusion of woody debris increases permeability and decreases ballast in the structure
- Structures size and length determines channel influence. An over-size structure may fail by creating a degraded channel morphology. Too small a structure may prove ineffective in reducing thalweg energy from eroding the unprotected sections of riverbank.

The overall plan is to reduce Maxan Creek's present flow pattern migration and bedload accumulation. While the individual landowner's concerns are with the volatile nature of the system and the constant erosion of valuable agricultural land, he recognizes the values and long-term benefits to the fisheries resource if the work is to be completed. His investment in this project would be a good example of the new partnerships being formed to promote in developing watershed stewardship in the local community