
Threemile Creek Restoration Design

— Aspen Environmental Group —

THREEMILE CREEK RESTORATION SITE



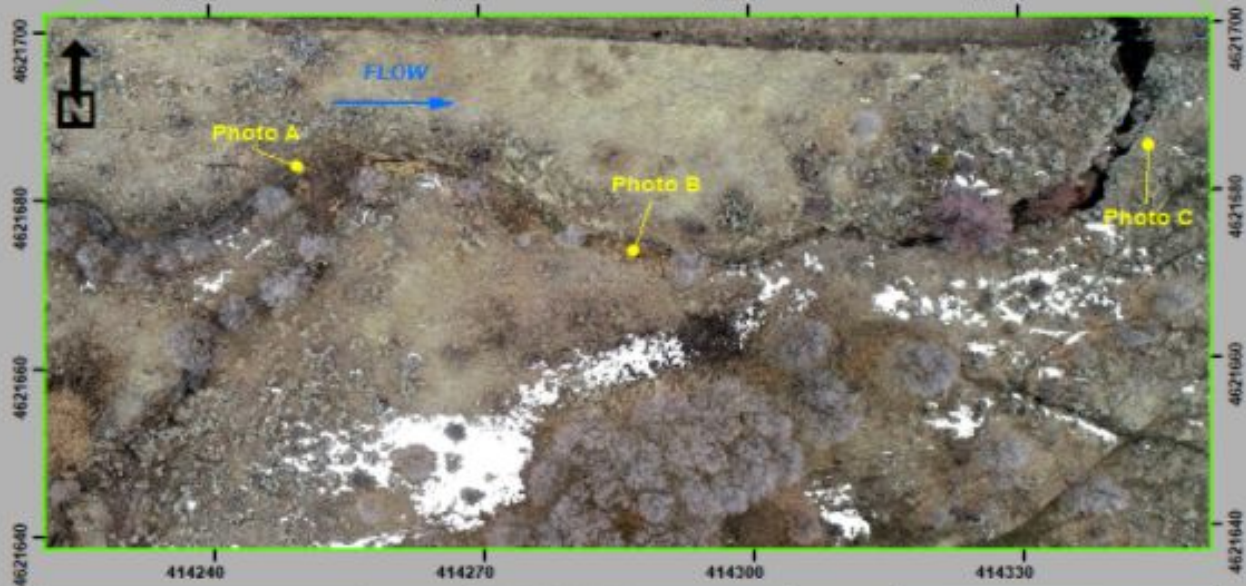
-looking down stream-

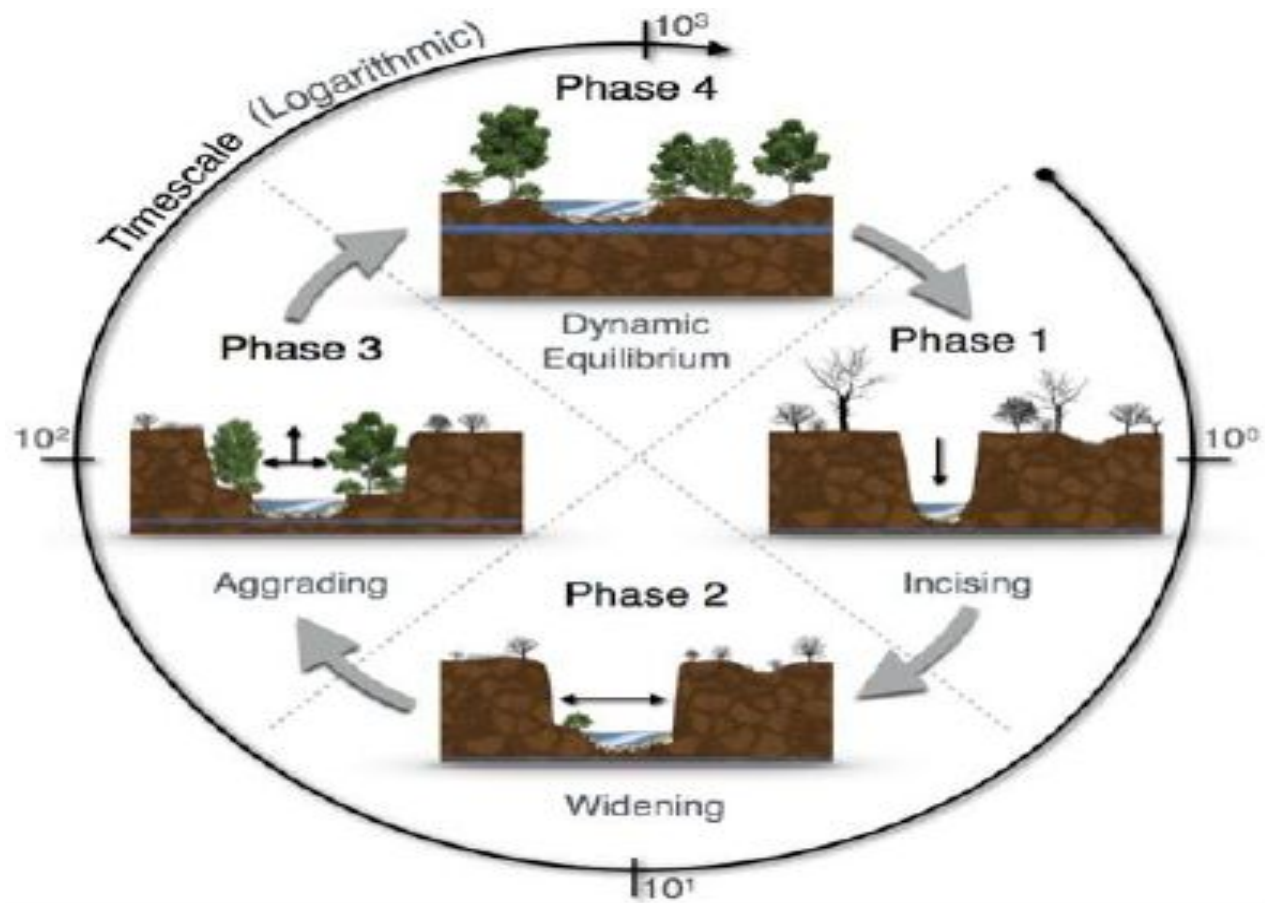


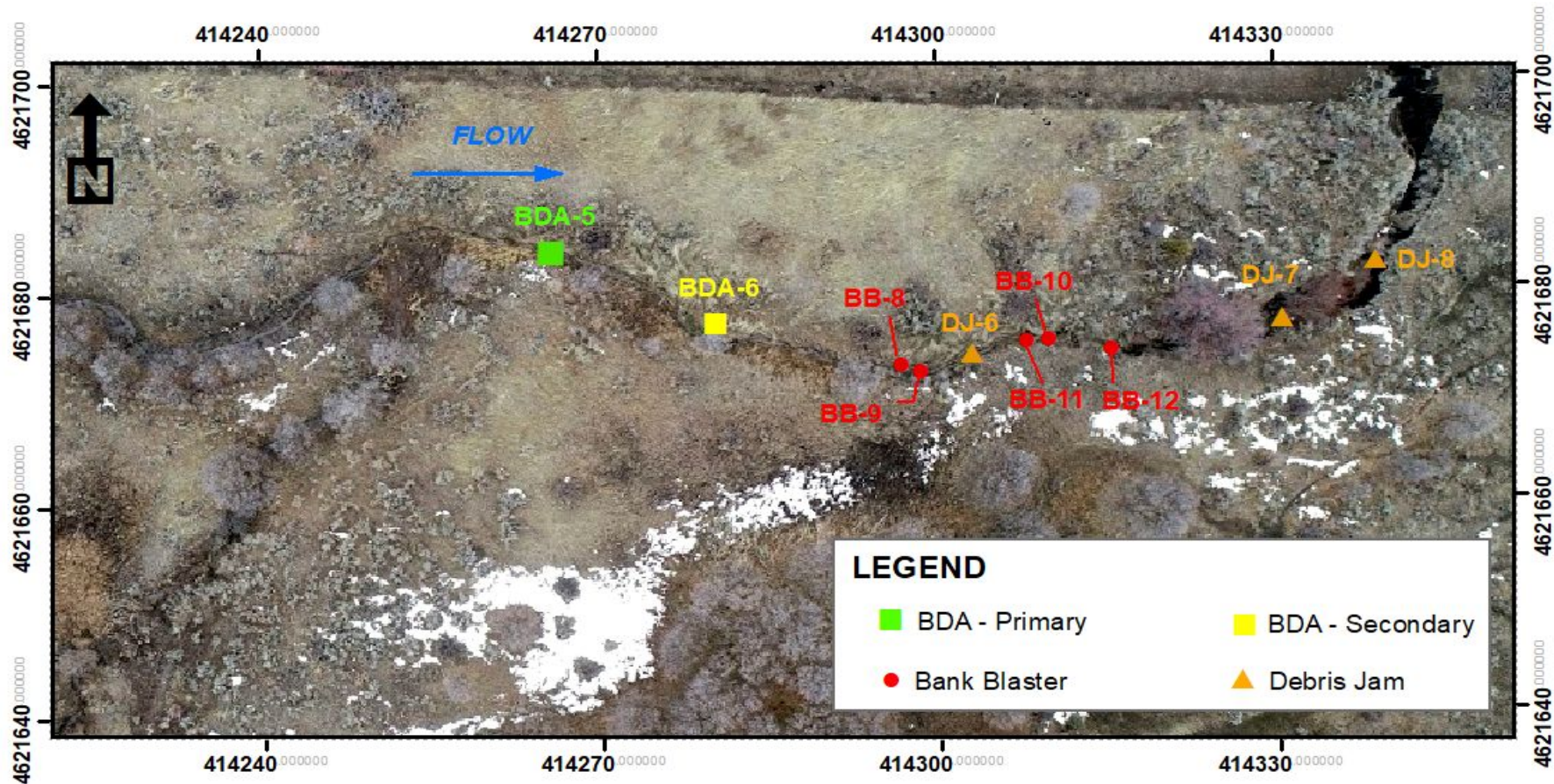
-looking up stream-



-looking down stream-







Goals and Objectives

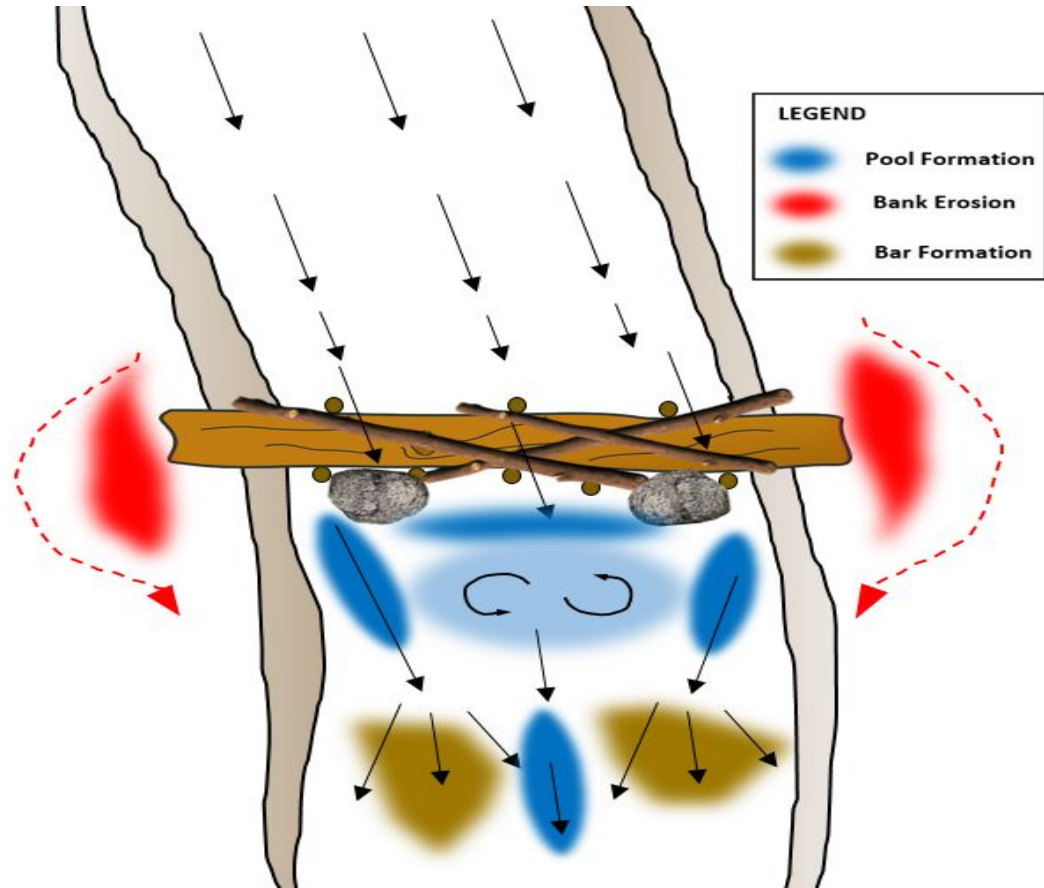
We were tasked by the US Forest Service to design and implement a restoration project for Threemile Creek, with the overall intent to introduce beaver and promote incision recovery

STRUCTURE OBJECTIVES		
STRUCTURE TYPE	PRIMARY OBJECTIVE	SECONDARY OBJECTIVE
Primary BDA	Create pool habitat	Promote aggradation/ increase lateral connectivity/ raise water level
Secondary BDA	Support primary dam	Promote aggradation /increase lateral connectivity/ raise water levels
Bank Blaster	Widen channel/ supply sediment	Increase hydrologic diversity
Debris Jam	Increase channel roughness to promote aggradation	Widen channel/ supply sediment

Design Hypotheses and Intended Outcomes

Hypothesis	Intended Outcome
The debris jam structures will create more geomorphic stream complexity by increasing the channel width, while also aggrading the bed of the channel.	This structure is intended to promote lateral bank erosion over time where the structure connects into the banks. It will also cause sediment deposition within the channel directly upstream and further downstream of the debris jam.

Debris Jam

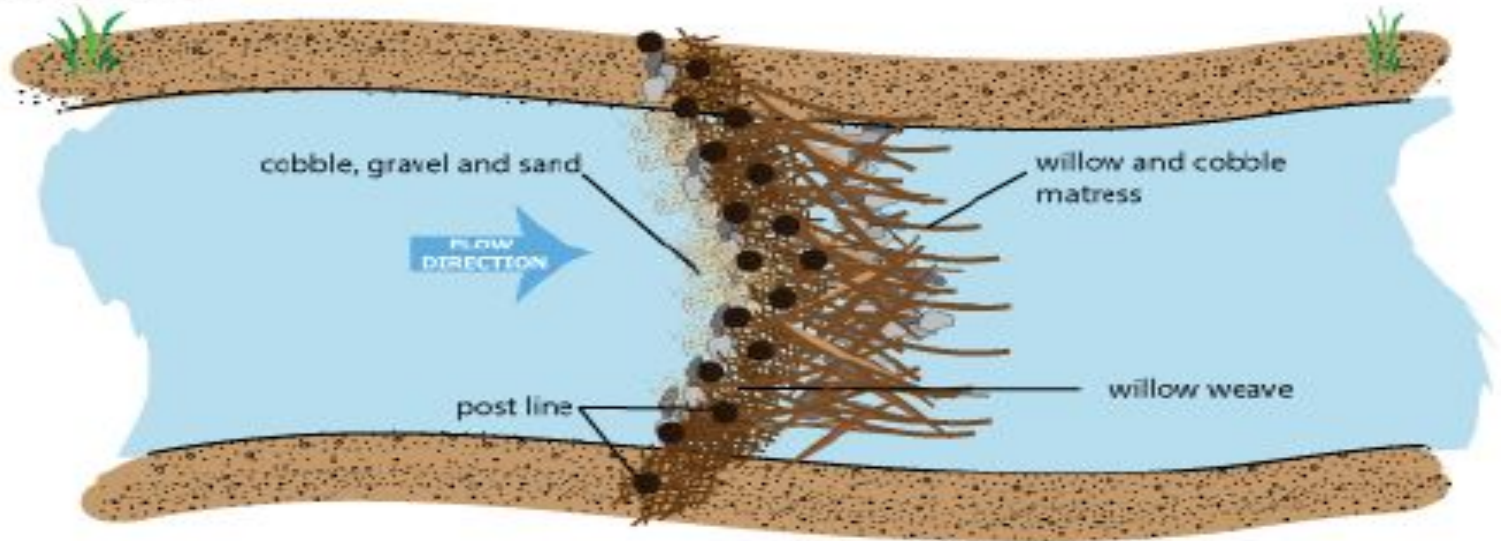


Design Hypotheses and Intended Outcomes

Hypothesis	Intended Outcome
The BDA structures will provide pool habitat for beavers and encourage them to take up residence in the Threemile Creek area.	The presence of the BDA structure will increase the water levels, providing a pool habitat for beavers. This will increase the chances of successful recruitment of beaver to the area.

Beaver Dam Analog (BDA)

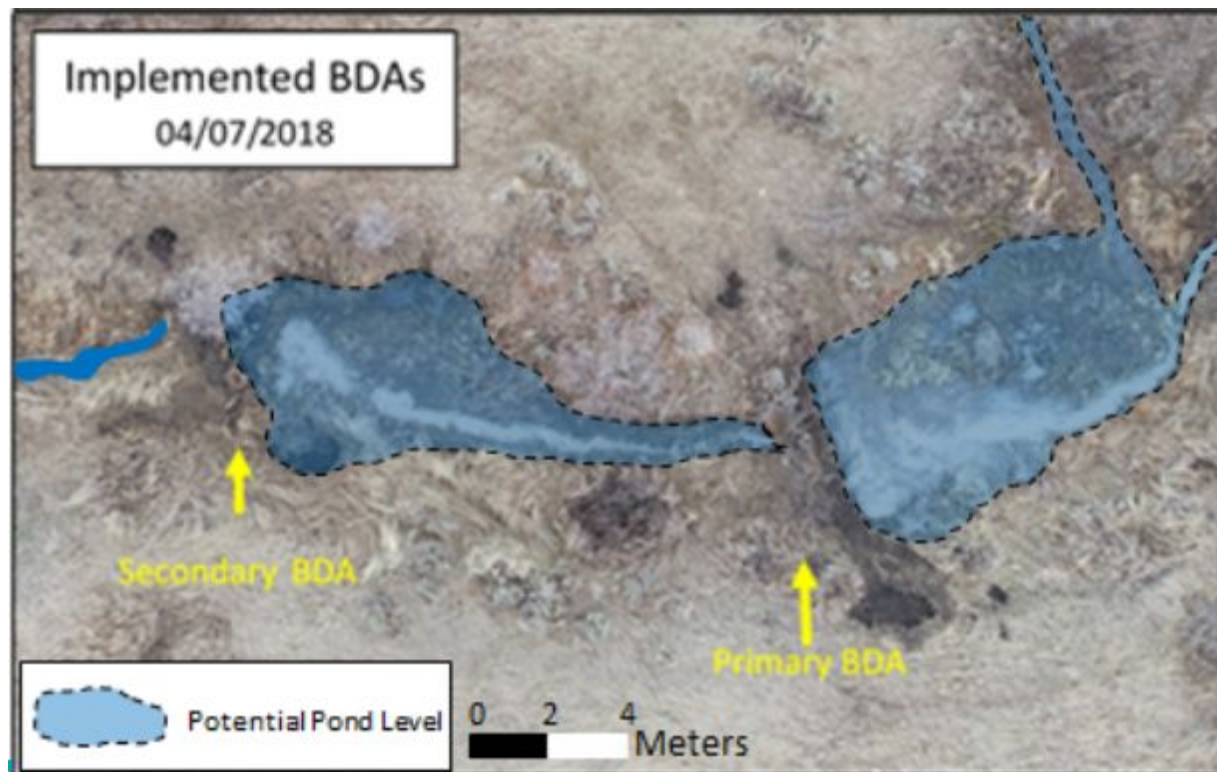
Plan View
(Convex Primary Dam)



Design Hypotheses and Intended Outcomes

Hypothesis	Intended Outcome
The BDA structures will increase floodplain connectivity by raising the water levels and causing aggradation.	The presence of the BDA structures will decelerate the flow of the water, causing the water levels to rise and increase the area of inundation. Because the flow is decelerated, the water will become less turbid, allowing sediment to deposit upstream of the structure and increase the floodplain connectivity.

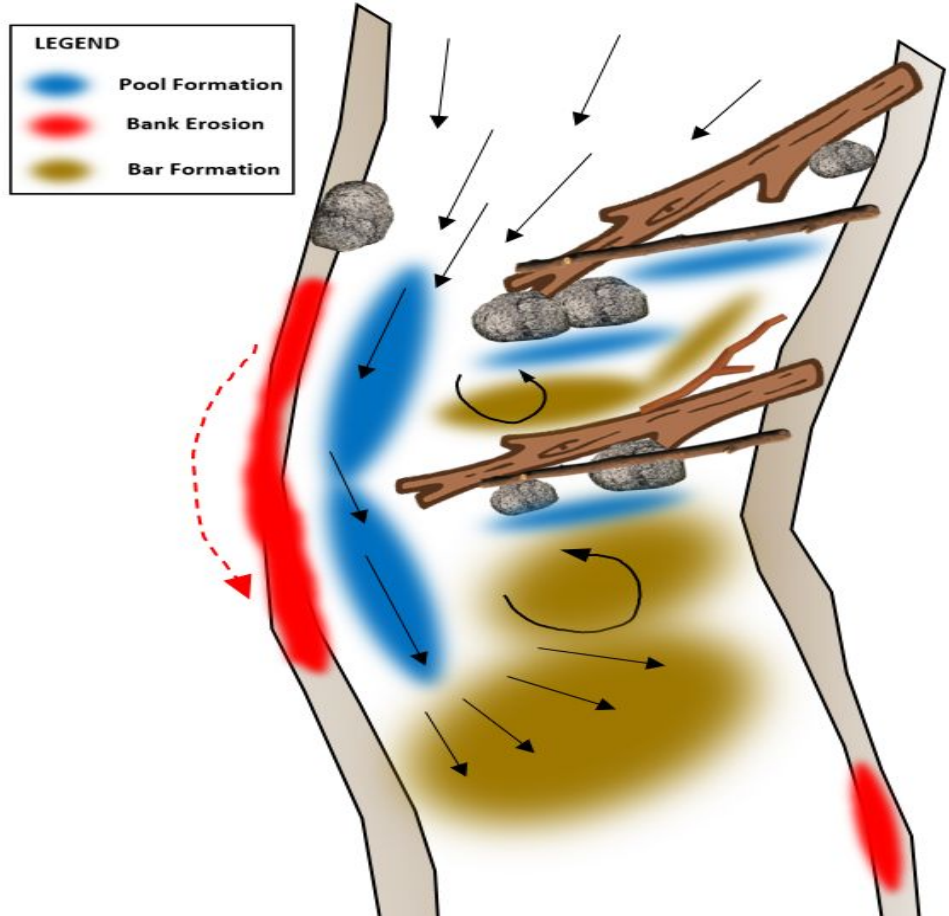
BDA



Design Hypotheses and Intended Outcomes

Hypothesis	Intended Outcome
The bank blaster structures will cause erosion of the opposing bank which will widen the channel and provide sediment for downstream structures.	The bank blasters will direct flow to the opposite bank, causing scouring of the bank, increase the width of the channel, and create a source of sediment for the structures downstream.

Bank Blaster



Design Hypotheses and Intended Outcomes

Hypothesis	Intended Outcome
Live cut plantings would increase wood dominance within the stream and serve a potential supply of a food source for beaver if established within Threemile Creek.	The placement of live cuttings is intended to provide more wood and roots to hold the banks in place and assist with holding the structures in place as the plantings grow. The other intended outcome for the plantings is to be used as a food source for the beaver if they do colonize and take hold within the stretch of river.

Restoration Design and Construction

Pre Construction Photo



As-built Photo



Restoration Design and Construction

Pre Construction Photo



As-built Photo



Restoration Design and Construction

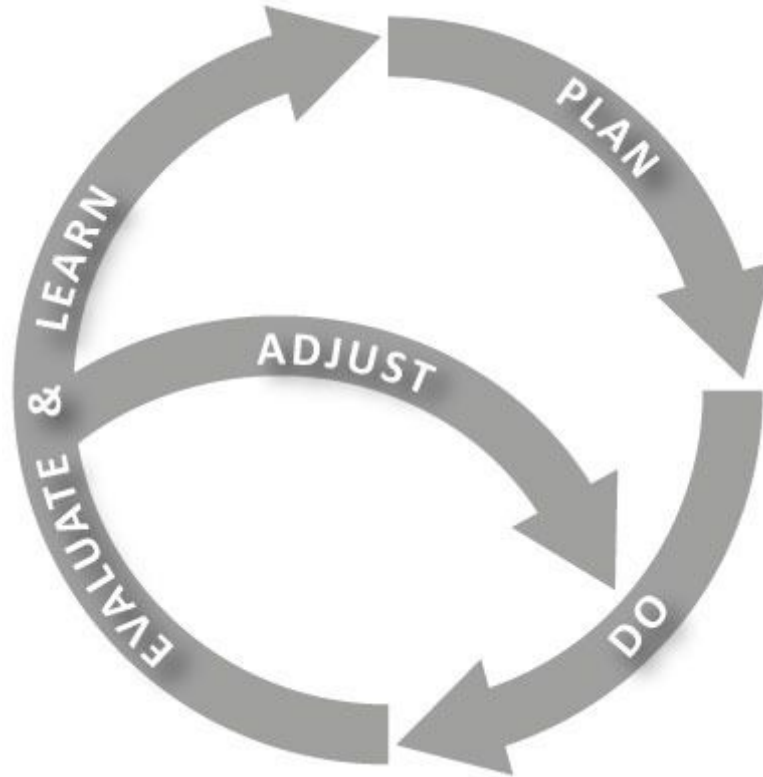
Pre Construction Photo



As-built Photo



Adaptive Management





Pathway in flowchart	Action	Reason
Complex achieving objectives?	If yes, <ul style="list-style-type: none"> Continue to 'Functional lifespan exceeded?' step. 	The desired outcome is being achieved by the structure. Beaver have been recruited and there is progress in incision recovery. See (Phase 4 in Figure 3)
	If no, <ul style="list-style-type: none"> Continue to 'Causing harm?' step. 	One or more objectives are not being met for the structure and/or beaver have not been recruited. Movement into the next stage of incision recovery has not been initiated. Mitigation may be needed and should be determined on site.

Causing harm?	<p>If yes,</p> <ol style="list-style-type: none"> 1. Repair/ rebuild or 2. Remove structure 	<ol style="list-style-type: none"> 1. "Harm" would be considered as causing inverse effects to the incision recovery process. Repairing the "harmful" structure would assist it to function properly and promote incision recovery. 2. If the structure is causing additional incision, removing the structure could prevent further damage to the system. Removal would also add woody material to the system and could benefit structures downstream.
	<p>If no,</p> <ul style="list-style-type: none"> • Continue to 'New opportunities or risks?' step 	<p>The structure is not producing the intended outcomes, but is not causing harm to the system either. Further assessment needs to be made on site to determine whether any additions or improvements can be made.</p>

Functional lifespan exceeded?	<p>If yes,</p> <ul style="list-style-type: none"> Continue to 'Achieve desired new dynamic stable state?' step. 	The structure is fulfilling its objectives and has recruited beaver within its expected lifespan. The structure is considered successful for the expectations that have been set for it. Assess whether additional improvements could be made to help in the process of further incision recovery.
	<p>If no,</p> <ul style="list-style-type: none"> Leave it alone 	The structure is fulfilling its objectives, beaver have been recruited, but it has not exceeded its expected life span yet. Monitoring will continue in the future, but no mitigation is required at the time.

New opportunities or risks?	<p>If yes,</p> <ul style="list-style-type: none"> • Make necessary improvements to existing structure 	<p>If the structure is not performing as expected but is still repairable, then improvements to the structure should be based on ideas and observations made during a reevaluation process and geared towards turning it into a more functional wood structure.</p>
	<p>If no,</p> <ul style="list-style-type: none"> • Leave it alone 	<p>If there are no improvements that can be made at the site, then leave it alone and continue future monitoring processes.</p>

Achieved desired new dynamic stable state?	<p>If yes,</p> <ul style="list-style-type: none"> Project is considered successful and completed. 	<p>Our objectives have been fulfilled, the system is sustainable, beaver have been recruited, and the system is recovering properly. The project is completed and successful at this point.</p>
	<p>If no,</p> <ol style="list-style-type: none"> Add new structures <p>or</p> <ol style="list-style-type: none"> Leave it alone 	<ol style="list-style-type: none"> The addition of new structures could help reach the desired state at the site faster. The objectives have been met, the beaver have been successfully recruited, incision recovery is in process, and the structure is sustainable. Let the structure be improved by the beaver present, or just allow natural processes to adjust the system.

Questions?