



AVISON MANAGEMENT SERVICES LTD.

Leader in Environmental Services | Vanderhoof, BC

East Murray 2024 Stream Restoration Project – Lindsay Janzen

Date: March 31, 2025

Revised:

Project No.: 24-52

Prepared for:

Nechako Environment and Water
Stewardship Society
NEWSS
PO Box 2576
Vanderhoof, BC
V0J 3A0
250.567.0844

Prepared by:

Olin Albertson, RPBio
Dudley Philips, RPBio
Avison Management Services
220 Stewart St E
Vanderhoof BC
V0J 3A0
250.567.2111





CONTENTS

1.0 Executive Summary	2
2.0 Project Description	3
2.1 Introduction	3
2.2 Location & Proposed Work	3
3.0 2024 Activities	4
3.1 Pre-Construction Approvals and Activities	4
3.2 BDA Construction	4
3.4 Groundwater Monitoring	6
3.5 Willow Planting	6
4.0 Next Steps and Lessons Learned	7
4.1 Planned Activities for 2025	7
4.2 Ongoing Monitoring	7
4.3 Lessons Learned from BDA Construction	8
5.0 Disclaimer	9
6.0 Bibliography and References	10
Appendices	11
Appendix A – BDA Conceptual Design	11
Appendix B – Project Map	12
Appendix C – Project Imagery	13
Appendix D – Project Photos	14
Appendix E – Written Landowner Consent	16
Appendix F – Environmental Monitoring Report	17

List of Figures

Figure 1: Map location of BDAs on the property of Lindsay Janzen.	4
Figure 2: Completed BDA	5
Figure 3: Location of groundwater wells.	6

Table 1. UTM locations of BDAs	4
Table 2: Potential water storage of each BDA (m ³).	5
Table 3: UTM coordinates of shallow groundwater wells.	6



1.0 EXECUTIVE SUMMARY

Avison Management Services Ltd. (AMS) was engaged by the Nechako Environment and Water Stewardship Society (NEWSS) to execute a restoration initiative along a 1 km section of East Murray Creek on Lindsay Janzen's property. Historical land use activities, such as logging, agricultural clearing, and the Mountain Pine Beetle epidemic, compounded by recent drought conditions, have severely degraded the creek's ecological integrity. These factors have resulted in unstable streambanks, limited riparian vegetation, and inadequate habitat for fish spawning and rearing. The restoration plan integrates low-tech and bioengineering approaches to rehabilitate the stream's ecological function. Key interventions include constructing Beaver Dam Analogues (BDAs) to increase riparian function, slow water, and enhance water retention through process-based restoration. Groundwater monitoring wells equipped with HOBO loggers were installed to assess recharge dynamics, and erosion control measures were implemented to mitigate sediment transport.

Additional monitoring infrastructure, including hydrometric stations and telemetry systems, will be introduced to enhance data collection and project oversight. Lessons from the 2024 phase underscore the importance of collaboration with regulators and stakeholders, adopting process-based restoration principles, and leveraging local materials and mechanized construction techniques to improve scalability and efficiency. By prioritizing ecological resilience and community alignment, the project aims to establish a sustainable framework for future restoration efforts across British Columbia's central interior.



2.0 PROJECT DESCRIPTION

2.1 INTRODUCTION

Avison Management Services Ltd. (AMS) has been engaged by the Nechako Environment and Water Stewardship Society (NEWSS) to develop and oversee restoration initiatives for a section of East Murray Creek, the property of Lindsay Janzen, a tributary of Murray Creek. Historical land use activities, including logging and land clearing for agricultural, residential, and commercial purposes, have significantly altered the creek's ecological integrity. Additionally, the Mountain Pine Beetle epidemic (1997–2006) led to extensive salvage logging in upland forested regions of British Columbia's central interior, resulting in cumulative impacts on aquatic ecosystems. Recent drought conditions, particularly those observed in 2023 and 2024, have further exacerbated flow variability, with high spring freshet flows followed by intermittent summer flow. These challenges underscore the critical need for targeted restoration to enhance the ecological function and resilience of East Murray Creek.

2.2 LOCATION & PROPOSED WORK

The project site is located along a 1,000-meter stretch of East Murray Creek, a tributary of Murray Creek in central British Columbia. The area has been significantly affected by extensive logging, agricultural activity, and drought conditions, resulting in a range of impacts. These activities have impacted stream and riparian health, and exacerbate flow conditions causing high flow short duration spring freshet flow's, followed by summer low flow or no flow conditions. Assessments indicate a lack of riparian vegetation, insufficient deep pools, and limited habitat complexity, which impair the streams ability to retain runoff and release it slowly into the system. These conditions also provide impaired fish spawning, juvenile rearing, and overwintering opportunities.

The proposed restoration plan addresses these challenges through a combination of low-tech and bio-engineering techniques aimed at rehabilitating the degraded stream and riparian habitats. Key measures include:

- **Riparian Restoration and Streambank Stabilization:** Planting live willow cuttings, cottonwood seedlings, and conifers seedlings to restore riparian vegetation and enhance bank stability.
- **Beaver Dam Analogues (BDA):** Constructing BDAs to slow water flowing through the system, increase water storage, improve hydrological connectivity, and enhance stream resilience (Figure 1, Table 1).

These restoration efforts aim to restore the stream's ecological functions, improve habitat quality, and enhance the overall health and resilience of the aquatic ecosystem.



Figure 1: Map location of BDAs on the property of Lindsay Janzen.

Table 1. UTM locations of BDAs

East Murray - Janzen			
Name	Zone	Easting	Northing
BDA 1	10U	434619	5991136
BDA 2	10U	434555	5991195
BDA 3	10U	434532	5991201
BDA 4	10U	434429	5991193
BDA 5	10U	434396	5991180
BDA 6	10U	434273	5991183
BDA 7	10U	434220	5991189
BDA 8	10U	434156	5991211
BDA 9	10U	434058	5991218
BDA 10	10U	433994	5991228
BDA 11	10U	433942	5991242

3.0 2024 ACTIVITIES

3.1 PRE-CONSTRUCTION APPROVALS AND ACTIVITIES

Prior to initiating construction, Schedule 11 approvals (*Changes In and About a Stream*) were secured to authorize all stream-related activities in compliance with regulatory requirements. Notably, no fish salvage operations were necessary for the in-stream work.

3.2 BDA CONSTRUCTION

The BDAs were built according to the designs provided by Golder (Appendix A). Each structure consisted of layered willow branches and spruce boughs, built to a maximum height of one meter, with a combined water storage



capacity of less than 300m³ (Table 1). The structures were capped with mud and rocks collected in situ from the local area. To finalize the structures, they were reinforced with stakes to ensure structural integrity and resilience against freshet flows (Figure 3).



Figure 2: Completed BDA.

Table 2: Potential water storage of each BDA (m³).

BDA ID	Potential Water Storage (m ³)
1	29
2	12
3	10
4	10
5	12
6	14
7	15
8	25
9	19
10	16
11	19
Total	181



3.4 GROUNDWATER MONITORING

To monitor groundwater recharge, four shallow groundwater wells were installed (Figure 3, Table 3), each equipped with HOBO loggers. The wells were constructed using 10-foot sections of 6-inch PVC pipe, perforated to allow groundwater infiltration. The wells were installed to depths of 6–7 feet below ground level, surrounded by pea gravel, and capped with a clay layer to prevent surface water infiltration. The loggers were winterized using a combination of latex covers and an environmentally friendly antifreeze solution to ensure functionality during colder months.



Figure 3: Location of groundwater wells.

Table 3: UTM coordinates of shallow groundwater wells.

East Murray - Janzen			
Name	Zone	Easting	Northing
EM_J_1	10U	434657	5991133
EM_J_2	10U	434435	5991181
EM_J_3	10U	434225	5991190
EM_J_4	10U	433950	5991227

3.5 WILLOW PLANTING

In conjunction with the other works at the East Murray Allan Martens Project, willow was planted on approximately 1.5 hectares of stream bank around East Murray Creek (Appendix B).



4.0 NEXT STEPS AND LESSONS LEARNED

4.1 PLANNED ACTIVITIES FOR 2025

The BDA installation program will continue in 2025 at other locations. This phase will include the addition of groundwater wells, instrumentation, and potential hydrometric stations for flow measurement. Furthermore, the installation of real-time telemetry unit is planned for the summer of 2025 to enhance monitoring capabilities.

4.2 ONGOING MONITORING

Monitoring efforts initiated in 2024 will continue through the open-water season of 2025. These activities will incorporate drone-based mapping to assess and document pre- and post-installation conditions at the site. Ground-based inspections will also be conducted to evaluate the functionality of the BDAs. This comprehensive approach aims to ensure that the installations are performing as intended and contributing to the desired outcomes.

Continued monitoring plan for 2025 will follow:

1. Drone Imaging for Water Retention Monitoring

- **Purpose:** Evaluate BDA (Beaver Dam Analogue) effectiveness in retaining water, and their impact on local hydrology.
- **Frequency:**
 - Conduct pre and post-construction imaging.
 - Perform seasonal inspections during freshet, Post freshet, mid-summer, and fall.
- **Methodology:**
 - Use a drone (e.g., Maverick Mini 2) to capture high-resolution images from consistent flight paths and angles for comparative analysis.
 - Assess pooling, saturation, or changes in flow patterns around the BDA.
 - Document observations of sediment accumulation and structural issues affecting water retention.
 - Record any visible signs of erosion or sediment entering the stream.

2. Groundwater Monitoring

- **Purpose:** Track changes in groundwater levels to evaluate the BDAs' impact on water retention and infiltration.
- **Frequency:**
 - Manual data collection: End of freshet, mid-summer, and fall.
 - Continuous data logging via HOBO loggers installed in all wells.
 - Real-time monitoring: One well integrated into a telemetry system (planned for 2025).
- **Methodology:**
 - Maintain groundwater wells and ensure logger functionality year-round.
 - Equip one well with telemetry for remote, real-time data collection.
 - Analyze trends in water table fluctuations corresponding to freshet flows and seasonal changes.
 - Output: Evaluate success based on measurable changes in the groundwater system over time.

3. BDA Affects

- **Define observable indicators such as:**
 - Water retention (e.g., seasonal or year-round ponding and detectable groundwater storage increase).



- Are natural processes occurring similar to what is observed in natural systems (e.g. increase water table, rejuvenation of riparian vegetation, increased biodiversity, evidence of beavers taking over and maintaining BDA's)

4.3 LESSONS LEARNED FROM BDA CONSTRUCTION

Key Lessons from BDA Planning and Construction:

- 1. Regulatory Risk and Approvals:** Process-based restoration has gained traction in Canada in recent years, prompting regulatory agencies to refine their approval frameworks. The 2024 BDA projects faced delays as practitioners collaborated with regulators to establish a permitting framework that balances risk with ecological benefits. Improved communication and the groundwork laid during this process should expedite future approvals.
- 2. Core Principles of Process-Based Restoration:** Effective low-tech restoration emphasizes initiating natural processes rather than over-engineering solutions. Key principles include avoiding over-design, prioritizing scalable solutions, adapting to local conditions, and recognizing that structural additions will integrate dynamically into the ecosystem.
- 3. Streamlined Design and Implementation:** Simple designs using locally sourced, natural materials enhance feasibility, minimize environmental disturbance, and reduce costs.
- 4. Mechanized Construction:** Where site conditions permit, mechanized approaches, such as using excavators, significantly improve efficiency, reducing project timelines from several days to under a day for multiple BDA installations.
- 5. Local Material Sourcing:** Utilizing nearby materials minimizes transportation efforts, improves project efficiency, and mitigates the risk of introducing invasive species.
- 6. Collaboration for Success:** Engaging property owners and aligning with ecological principles fosters community support and enhances project outcomes.



5.0 DISCLAIMER

This report has been prepared by Avison Management Services to summarize the work conducted upon the completion of the Beaver Dam Analogue (BDA) installations. The information contained herein reflects the scope of activities, findings, and lessons learned during the project. While every effort has been made to ensure accuracy, this report is intended for informational purposes only and should not be considered a comprehensive assessment or a guarantee of project outcomes. Avison Management Services accepts no liability for decisions or actions taken based on the contents of this report. For specific details or technical inquiries, please contact Avison Management Services directly.



6.0 BIBLIOGRAPHY AND REFERENCES

Albertson, O.A. 2024. Nechako River Watershed Restoration Project: East Murry Creek - Stephen Property - Site Assessment and Restoration Plan. Submitted on behalf of Nechako Environment and Water Stewardship Society (NEWSS), to the British Columbia Ministry of Water, Land, and Resource Stewardship. 17 p.

Albertson, O. (2024). Nechako Environment and Water Stewardship Society (NEWSS) – General Stream Restoration Environmental Management Plan.

British Columbia Water Sustainability Act [SBC 2014] CHAPTER 15. Available at:
<https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/14015>

British Columbia Water Sustainability Act - WATER SUSTAINABILITY REGULATION B.C. Reg. 36/2016. Available at:
https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/36_2016

"Canadian Water Quality Guidelines for the Protection of Aquatic Life: Summary Table, . Canadian Council of Ministers of the Environment. 2007. Available at: <https://www.ccme.ca/files/cegg/en/backup/222-080516095450.pdf>

Castro, J, M. Pollock, C. Jordan, G. Lewallen, and K. Woodruff. The Beaver Restoration Guidebook: Working with Beaver to Restore Streams, Wetlands, and Floodplains. Version 2.0, June 30, 2017.
<https://www.fws.gov/oregonfwo/promo.cfm?id=177175812>

Department of Fisheries and Oceans. 2014. A Modernized Fisheries Act for Canada. Available at: <https://www.dfo-mpo.gc.ca/campaign-campagne/fisheries-act-loi-sur-les-peches/index-eng.html>

Department of Fisheries and Oceans. 2019. Measures to Avoid Causing Harm to Fish and Fish Habitat. Available at: <https://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.html>

Department of Fisheries and Oceans. 2020. Projects Near Water. Available at: <http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>

Goldfarb, 2018. Beavers, rebooted. Science: Vol 360, Issue 6393 pp. 1058-1061
<https://www.science.org/doi/10.1126/science.360.6393.1058>

Matechuk, L. (2024). Nechako Environment Watershed Stewardship Society: Beaver Dam Analog Risk Assessment. [Unpublished document].

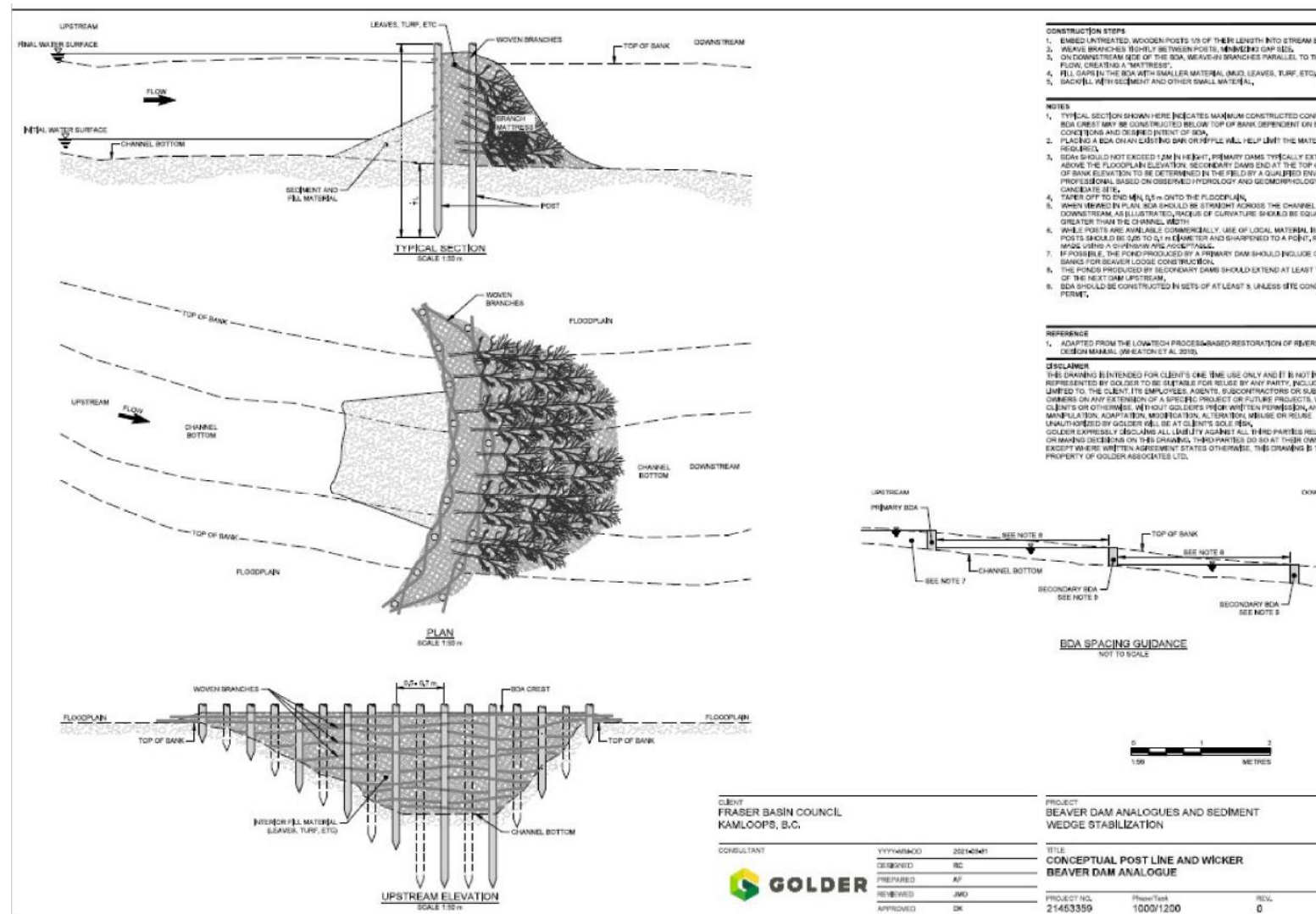
Ministry of Environment & Climate Change Strategy. 2019. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture Available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf

Ministry of Environment. 2005. A USERS' GUIDE TO WORKING IN AND AROUND WATER. Available at:
http://www.env.gov.bc.ca/wsd/water_rights/cabinet/working_around_water.pdf

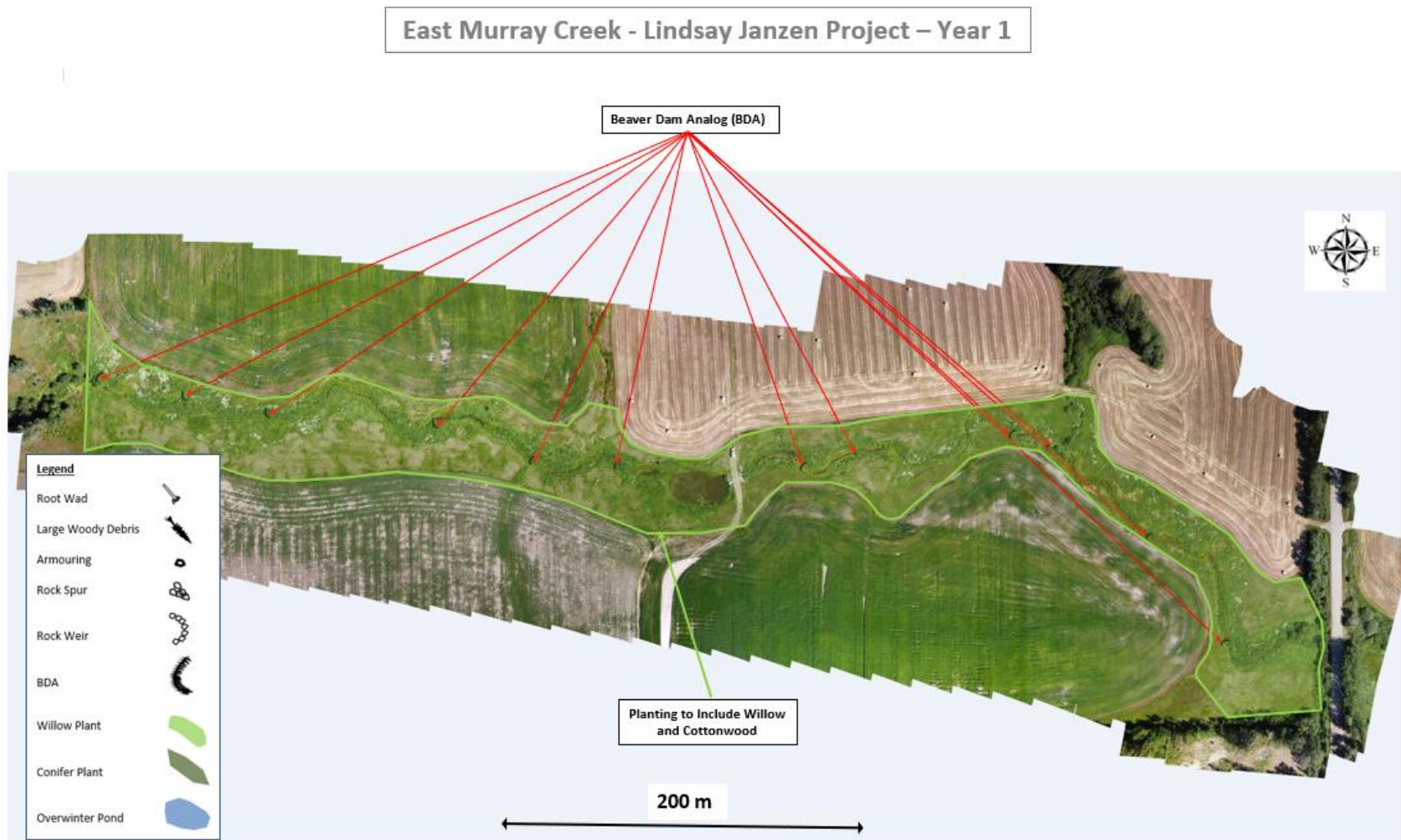
Polster, D.F. 2003. Soil Bioengineering for Slope Stabilization and Site Restoration. Wheaton J.M., Bennett S.N., Bouwes, N., Maestas J.D. and Shahverdian S.M. (Editors). 2019. [Low-Tech Process-Based Restoration of Riverscapes: Design Manual. Version 1.0](#). Utah State University Restoration Consortium. Logan, UT. 286 pp.
DOI: [10.13140/RG.2.2.19590.63049/2](https://doi.org/10.13140/RG.2.2.19590.63049/2).

APPENDICES

APPENDIX A – BDA CONCEPTUAL DESIGN



APPENDIX B – PROJECT MAP





APPENDIX C – PROJECT IMAGERY



Aerial imaging of East Murray prior to BDA installation June 2024 (Above). After BDA completion October 2024 (Below).

APPENDIX D – PROJECT PHOTOS



Building of BDA using backhoe.



Completed BDA in-stream.



Completed BDA holding water following Fall rains.



APPENDIX E – WRITTEN LANDOWNER CONSENT

Landowner Letter of Consent

I hereby agree to allow the members of the Nechako Watershed Stewardship Society (NEWSS) and its agents to gain access to (stream name) MURRAY CK., located through my property (legal description " 007-785-917 ") (see attached map).

Access is permitted between the following dates, SEPT 1 - 2024 - NOV 31 2025

I hereby agree to the following activities on my property:

STREAM RESTORATION - BEAVER DAM ANALOGS - OUBURNWATERBANK POND

Liability for all NEWSS personnel and its agents while on the said property will be the responsibility of NEWSS and its agents, and NEWSS will hold harmless the landowner while accessing, crossing, or working on the said property.

Where applicable: The landowner does hereby agree to take on the liability of all future matters in relation to culvert, bridge, or other works NEWSS or its agents have undertaken on the landowner's property, following project completion. Furthermore, the landowner will hold harmless NEWSS and its agents for all work completed on said property.

Property Owner

Name: LINDSAY JANZEN
Address: BOX 1334
VANDERHOOF BC
Phone #: 250-567-0793 V0J 3A0

NEWSS

Wayne Salewski
PO Box 2576
Vanderhoof, BC V0J 3A0
Ph: 250-567-0844

Signature: [Signature]

Signature: [Signature]

Date: SEPT 1 2024





APPENDIX F – ENVIRONMENTAL MONITORING REPORT

NEWSS has developed a Stream Restoration Environmental Management Plan (SREMP) which includes measures to protect aquatic resources and the environment following regulatory. The SREMP was followed during stream restoration activities.

Turbidity Levels

Turbidity Measurements were not taken on this project as the stream was dry, and BDA's were constructed in the dry.

Fish Sightings

No fish were observed during construction of the BDA's, as the stream was dry.

Sediment and Erosion Control

As BDA construction and willow planting required the assistance of an excavator. Heavy equipment was operated in dry conditions with minimal impact to stream bank vegetation. Work areas were chosen away from treed areas to avoid any need for clearing or grubbing.



Photo of excavator operating from above the stream bank while constructing a BDA.