

Costs and Benefits of Natural Infrastructure from Watershed Restoration:

Lessons Learned from the Edmonton Region

Natural infrastructure consists of landscape features—such as wetlands, riparian buffers and forests—that improve water quality and lower the risk of flooding and drought. The additional benefits of natural infrastructure can include carbon sequestration, increased wildlife habitat, and increased biodiversity. Since natural infrastructure helps retain and filter water, it also improves community resilience to climate change by reducing overland flooding and increases water storage capacity for droughts. While the benefits of restoring or retaining natural infrastructure within municipal boundaries have been demonstrated, the benefits of natural infrastructure for multiple municipalities on agricultural landscapes across a watershed is more diffuse and can be linked to additional benefit streams for local and downstream municipalities as well as other stakeholders in the region.

Wetland and riparian restoration on agricultural landscapes contributes to natural infrastructure. This project quantified water quality/quantity changes in local and downstream communities from watershed restoration projects on agricultural lands in the Modeste subwatershed. This project considered the impacts of wetland and riparian restoration in the five rural municipalities where the natural infrastructure projects were located as well impacts on water quality for the City of Edmonton’s water treatment plant.

The Integrated Modelling of Watershed Evaluation of Best Management Practices (IMWEBs) model developed by the University of Guelph, Watershed Evaluation Group, was used to estimate changes to water quality/quantity due to the natural infrastructure. Those changes can be applied to municipalities, agricultural insurance, and recreational landowners through an economic costs and benefits analysis. The impacts of the watershed modeling were discussed with municipalities and agricultural insurance program providers and included in preliminary recreational data analyses.

Municipality

Natural infrastructure can decrease municipal infrastructure operating and capital costs.

Agricultural Insurance

Natural infrastructure can decrease agricultural insurance payouts to farmers.

Recreational Landowners

Natural infrastructure can decrease site maintenance costs, and increase site visits and increase revenues.

** This project was suspended due to COVID-19. The major lessons learned that would impact a cost-benefit analysis of natural infrastructure from a subwatershed perspective are provided below.*

Municipal

Rural Municipalities

WATER QUANTITY

- Rural municipalities spend a larger portion of their budget on road maintenance and repairs; washouts from flooding are a major expense that could be mitigated with natural infrastructure. Rural municipalities do not necessarily have a formal way to track flooding “hots spots” on the landscape. IMWEBs could be used to identify hot spots on the landscape and then targeted natural infrastructure projects to reduce flooding could be planned.
- Rural municipalities do not track flood/drought expenditures separately in their budget and thus it is difficult to obtain these expenditures. It is recommended to identifying time periods when a severe weather event occurred and obtain expenditures before/during/after and event to identify the budget impacts.

City of Edmonton

WATER QUALITY

- Water treatment plants spend a larger portion of their operating budget on chemicals to treatment drinking water; natural infrastructure could reduce operating expenditures on chemicals used to treat water by improving the water quality entering the water treatment plant facility. Since water infrastructure is typically overbuilt to handle large weather events, the capital costs of a water treatment facility will not be measurably impacted by changes in water quality/quantity due to natural infrastructure.

Agricultural

WATER QUANTITY

- Agricultural insurance payouts targeted for flooding and droughts are paid only during specific times of the growing season and only for specific crops (AgriInsurance). Drought-specific (or “moisture deficiency”) payouts are only paid for silage/pasture; thus all other crops impacted by a drought are difficult to track because the payouts are included with all other “production shortfall” payouts. Flooding (or “excessive moisture”) payouts are made only during the planting season; thus insurance payouts specific to flooding can only be tracked in the early spring. All subsequent flooding-related impacts are included in a post-harvest payout with all other production shortfalls.
- Since flooding during the planting seasons can be tracked for agricultural insurance payouts, it is a recommended to include the spring time as a time period to consider in the cost-benefit analysis. Also, this time period coincides with spring run-off which tends to cause more expensive water treatment downstream because of increased concentration of contaminants released in the snow melt.

Recreational

WATER QUANTITY

- Flood events have a major impact on recreationists through site closures and infrastructure damage such as trail closures and camping and RV park facilities. Natural infrastructure could provide flood mitigation through increased retention of stormwater.
- Natural infrastructure could decrease maintenance costs for water bodies in general and during flooding event.

WATER QUALITY

- Natural infrastructure could increase site visits due to cleaner water and decreased blue-green algal blooms through reduced or blocking of excess nutrients and sediments into water bodies, and thereby increase park revenues.

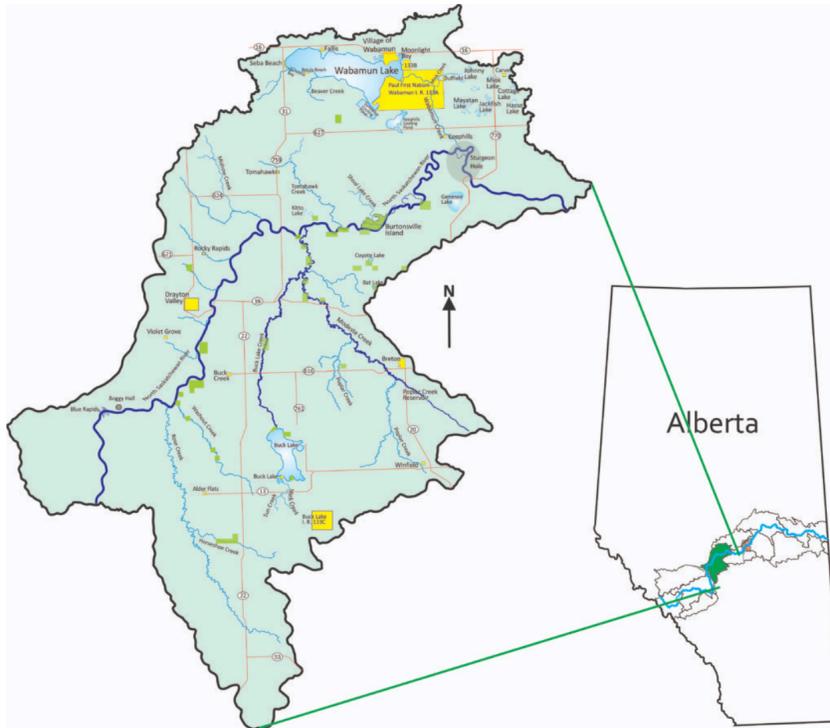


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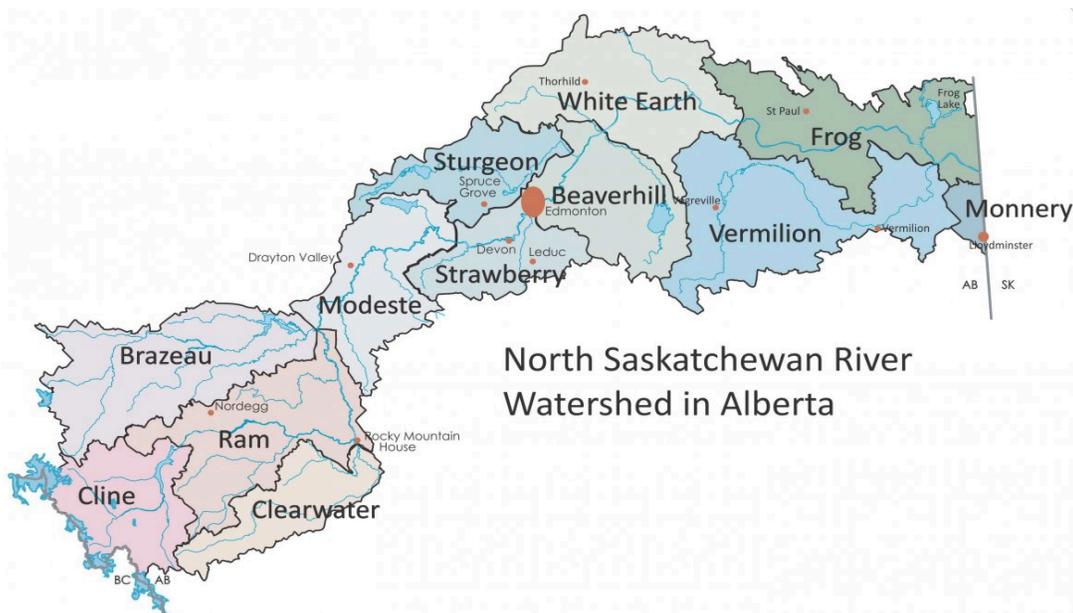


Project Area:

Modeste Subwatershed



North Saskatchewan River Watershed (and subwatersheds)



Source: North Saskatchewan Watershed Alliance

Available online:

<https://www.nswa.ab.ca/subwatershed/modeste/>

<https://www.nswa.ab.ca/our-watershed>



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