Riparian Health Assessment of the Tantramar River

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Introduction

Riparian areas are the strip of land running parallel to rivers, streams, brooks, lakes, or wetlands. They are sometimes commonly referred to as shorelines. Riparian areas are one of the most productive and valuable natural resources. Healthy riparian zones provide a number of ecosystem services which protect and strengthen the environment, such as improved water quality, water storage and flood mitigation, erosion protection, and groundwater recharge. In addition, healthy riparian zones will benefit wildlife greatly as species living in riparian zones and the river are dependent on the riparian zone for habitat and food requirements. Healthy riparian zones lead to healthy aquatic ecosystems. They help improve water quality and reduce sediment going into the river which can be detrimental to aquatic ecosystem by suffocating fish and burying aquatic insects. Riparian vegetation provides shelter on land for amphibians, mammals, birds, and insects, and overhanging vegetative cover also helps keeps water cool and provides in-stream habitat for fish and aquatic insects. In addition, vegetation acts as a food source for wildlife on land, as well as for fish and aquatic life when debris fall into the river. Riparian zones are also used as travel corridors for wildlife and stopover areas for migratory birds.

There are many unknowns in terms of watershed health in our region due to the lack of a watershed group covering the area until the recent establishment of EOS's Chignecto Watersheds Committee. Land uses in the Tantramar area include agriculture, forestry activity, residential and commercial developments, municipal sewage lagoons and private wells, all of which can have varying degrees of impact on our riparian zones. Degradation of riparian zones diminishes their capacity to provide critical ecosystem functions, which in turn impacts aquatic ecosystems. A riparian assessment is among the first steps required to protect our aquatic ecosystems by improving our understanding of watershed processes and identifying restoration needs within the watershed.

This summer EOS Eco-Energy received funding from the New Brunswick Wildlife Trust Fund to perform a riparian health assessment of the Tantramar River based on the Alberta Cows & Fish Riparian Health Assessment for Streams and Small Rivers – Field Workbook (Fitch, L., B.W. Adams and G. Hale, 2009. Riparian Health Assessment for Streams and Small Rivers – Field Workbook. Second Edition. Lethbridge, Alberta: Cows and Fish Program. 94 Pages.). The riparian assessments consisted of a series of observations on vegetation coverage, exposed soils, bank stabilization, invasive species, and altered stream banks in order to assign a health score (e.g. unhealthy, healthy with problems, healthy) and identify areas in need of riparian restoration. This final report summarizes the results of our riparian health assessments.

Goals

The project goals were to:

1) Complete a riparian health assessment of the Tantramar River (~20 km in length, starting near Cookville and heading south to Highway 2, shown below in Figure 1)
2) Prepare educational materials on the importance of good riparian health and best management practices for riparian areas

Figure 1: Map showing proposed start & end points for the Riparian Health Assessment of the Tantramar River

Methodology

From June to September 2018, EOS performed riparian health assessments using the Alberta Cows & Fish Riparian Health Assessment for Streams and Small Rivers – Field Workbook to assign a riparian health assessment score (e.g. healthy, healthy with problems, unhealthy), providing a baseline of riparian health of the Tantramar River. A copy of the field sheet used for the assessments can be seen below in Figure 2.

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Landowner/Lessee: _____ Date: _____ Reach No.: _____

Stream/River: _____

Site Description: _____

_____ Scores or N/A Actual / Possible

1. Vegetative Cover of Floodplain and Streambanks
   6 4 2 0 ___/___
2. Invasive Plant Species
   Canopy Cover
   3 2 1 0 ___/___
   Density/Distribution
   3 2 1 0 ___/___
3. Disturbance-increaser Undesirable Herbaceous Species
   3 2 1 0 ___/___
4. Preferred Tree and Shrub Establishment and Regeneration
   6 4 2 0 ___/___
5. Use of Trees and Shrubs
   Preferred Trees and Shrubs - Browse
   3 2 1 0 ___/___
   All Trees and Shrubs – Use other than browse
   3 2 1 0 ___/___
6. Standing Decadent and Dead Woody Material
   3 2 1 0 ___/___
7. Streambank Root Mass Protection
   6 4 2 0 ___/___
8. Human-Caused Bare Ground
   6 4 2 0 ___/___
9. Streambank Structurally Altered by Human Activity
   6 4 2 0 ___/___
10. Reach Structurally Altered by Human Activity (excl. banks)
   3 2 1 0 ___/___
11. Stream Channel Incisement (vertical stability)
   9 6 3 0 ___/___

TOTAL SCORE = ___/___

PTS	18/60	26/60	30/60	33/60	36/60	39/60	42/60	45/60	54/60
%	30	40	50	55	60	65	70	80	90

Non-Functional (Unhealthy) | Functional At Risk (Healthy with problems) | Functioning (Healthy)

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Figure 2: Riparian Health Assessment Field Sheet used to assign a Riparian Health Score

The riparian health assessments involved paddling down the river and making a series of observations on vegetation coverage, exposed soils, bank stabilization, invasive species, and altered stream banks in order to assign a health score and identify areas in need of protection or restoration. The EOS watershed coordinator was accompanied on the assessments by a conservation biologist with plant ID and habitat assessment experience. In each event that the characteristics of the riparian area changed; a new assessment was started.

Assessment sites were marked using a GPS and pictures were taken for documentation purposes. In-situ water quality measurements (temperature, pH, conductivity, total dissolved solids (TDS), dissolved oxygen (DO), and salinity) were taken at each assessment using a HI9829 Hanna Multiparameter Meter.

Following the assessments, data was summarized into a final report for publication on the EOS website. Educational materials on the importance of good riparian health and best management practices for riparian areas were also prepared (Appendix 1 & 2).

Results

Overall 28.41 km of the Tantramar River was assessed from north of Cookville down to the Highway 2 (TCH) near Sackville (see below in Figure 3). The different colours represent the different assessments completed as follows: **Navy blue,** July 23, 2018 assessment of Cookville Loop Road to Cookville Marsh; Pink, June 15, 2017 assessment of Cookville Marsh to Double Culvert at Route 940; **Plum,** July 20, 2018 Double Culvert at Route 940 to Covered Bridge at Highmarsh Road; and Light blue, September 9, 2018 Covered Bridge at Highmarsh Road to Highway 2.

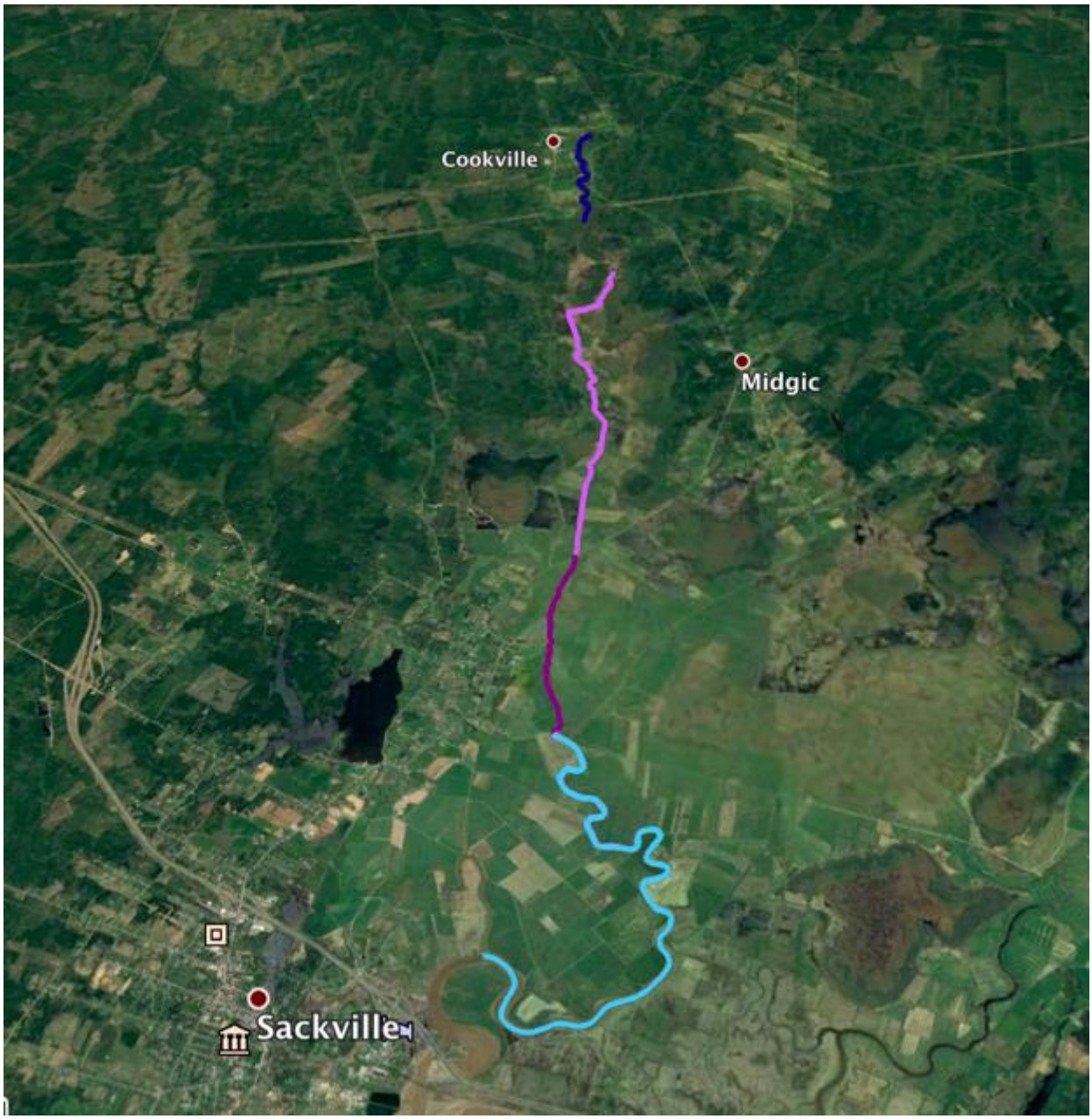


Figure 3: Map showing assessed areas of the Tantramar River

A total of 32 riparian health assessments were completed. A new assessment was started every time the characteristics of the riparian area changed. Riparian assessments consist of a series of observations on

vegetation coverage, exposed soils, bank stabilization, invasive species, and altered stream banks in order to assign a health score and identify areas in need of riparian restoration.

Some indicators of a healthy riparian area include abundant vegetation with very little exposed soil, bare ground, or altered banks (as demonstrated in Figure 4). In particular the vegetation should consist of deep-rooted plant species (e.g. trees & shrubs); few (if any) invasive weeds and disturbance caused plants; lightly browsed vegetation by livestock or wildlife; and the presence of seedlings and saplings for successful regeneration of woody species.

Figure 4: Examples of healthy reaches of the Tantramar River

Indicators of an unhealthy riparian area include signs of bank erosion (Figure 5); undercut banks; bare ground (sometimes with rutting or hummocking) from livestock or human activity (Figure 5); standing dead woody vegetation; lack of preferred tree and shrub establishment and regeneration (Figure 6); and an abundance of invasive weeds or disturbance caused plants (Figure 7).

Figure 5: Signs of bank erosion and bare ground from livestock activity

Figure 6: Lack of preferred tree and shrub establishment and regeneration, as well as an incised channel with limited access to its floodplain

Figure 7: Bank with an abundance of disturbance caused vegetation

The results of the riparian health assessments are colour coded according to their health score, which is demonstrated below in Table 1.

Table 1: Riparian Health Ratings Colour Designation

Unhealthy	**30-59**
Healthy with problems	**60-79**
Healthy	**80-100**

The assessment results have been summarized in Tables 2 – 6, starting from the most northern section of the river (above Cookville) and continuing down the river to the Trans-Canada Highway. There are 8 questions regarding vegetation, and 5 concerning soil and hydrology. An overall health rating is given, as well as a rating on the state of the vegetation and soil/hydrology.

An excel file was prepared noting flora and fauna identified during the assessments, as well as in-situ water quality measurements taken (temperature, pH, conductivity, TDS, DO, and salinity). A large number of photos were also taken throughout the assessments. This report provides a sample, however there are more that could be made available upon request.

Table 2: Assessment from Cookville Loop Road down to Cookville Marsh on July 23, 2018 (navy blue line in Figure 3)

Riparian Health Assessment Question					
Vegetation	**Assessment 1**	**Assessment 2**	**Assessment 3**	**Assessment 4**	**Assessment 5**
Vegetative Cover of Floodplain and Streambanks	6/6	6/6	6/6	6/6	6/6
Invasive Plant Species (Canopy Cover)	2/3	2/3	2/3	3/3	2/3
Invasive Plant Species (Density/Distribution)	3/3	3/3	3/3	3/3	3/3
Disturbance-increaser Undesirable Herbaceous Species	3/3	3/3	3/3	3/3	3/3
Preferred Tree and Shrub Establishment and Regeneration	6/6	4/6	4/6	6/6	2/6
Utilization of Preferred Trees and Shrubs	0/3	3/3	3/3	3/3	3/3
Live Woody Removal Other than Browsing	2/3	3/3	3/3	3/3	3/3
Standing Decadent and Dead Woody Material	3/3	3/3	3/3	3/3	2/3
Vegetation Rating	**25/30 = 83%**	**27/30 = 90%**	**27/30 = 90%**	**30/30 = 100%**	**24/30 = 80%**
Soil/Hydrology					
Streambank Root Mass Protection	6/6	4/6	2/6	0/6	2/6
Human-Caused Bare Ground	6/6	6/6	6/6	6/6	6/6
Streambank Structurally Altered by Human Activity	6/6	6/6	6/6	6/6	6/6
Reach Structurally Altered by Human Activity	3/3	3/3	3/3	3/3	3/3
Stream Channel Incisement (vertical stability)	9/9	9/9	9/9	9/9	9/9
Soil/Hydrology Rating	**30/30 = 100%**	**28/30 = 93%**	**26/30 = 73%**	**24/30 = 80%**	**26/30 = 87%**
Overall Rating	**55/60 = 92%**	**55/60 = 92%**	**53/60 = 88%**	**54/60 = 90%**	**50/60 = 83%**

Table 3: Assessment from the Cookville Marsh down to the Double Culvert at Route 940 on June 15, 2018 (pink line in Figure 3)

Riparian Health Assessment Question								
Vegetation	**Assessment 1**	**Assessment 2**	**Assessment 3**	**Assessment 4**	**Assessment 5**	**Assessment 6**	**Assessment 7**	**Assessment 8**
Vegetative Cover of Floodplain and Streambanks	6/6	6/6	4/6	6/6	4/6	4/6	6/6	4/6
Invasive Plant Species (Canopy Cover)	1/3	2/3	3/3	3/3	3/3	3/3	3/3	3/3
Invasive Plant Species (Density/Distribution)	1/3	1/3	3/3	3/3	3/3	3/3	3/3	3/3
Disturbance-increaser Undesirable Herbaceous Species	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Preferred Tree and Shrub Establishment and Regeneration	2/6	4/6	4/6	2/6	4/6	4/6	2/6	4/6
Utilization of Preferred Trees and Shrubs	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Live Woody Removal Other than Browsing	3/3	3/3	3/3	3/3	2/3	2/3	3/3	3/3
Standing Decadent and Dead Woody Material	3/3	3/3	3/3	3/3	2/3	3/3	3/3	3/3
Vegetation Rating	**22/30 = 73%**	**25/30 = 83%**	**26/30 = 86%**	**26/30 = 86%**	**24/30 = 80%**	**25/30 = 83%**	**26/30 = 86%**	**26/30 = 86%**
Soil/Hydrology								
Streambank Root Mass Protection	0/6	2/6	0/6	2/6	4/6	2/6	0/6	2/6
Human-Caused Bare Ground	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6
Streambank Structurally Altered by Human Activity	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6
Reach Structurally Altered by Human Activity	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Stream Channel Incisement (vertical stability)	9/9	9/9	3/9	3/9	3/9	3/9	3/9	3/9
Soil/Hydrology Rating	**24/30 = 80%**	**23/30 = 77%**	**24/30 = 80%**	**20/30 = 67%**	**22/30 = 73%**	**20/30 = 67%**	**18/30 = 60%**	**20/30 = 67%**
Overall Rating	**46/60 = 76%**	**48/60 = 80%**	**50/60 = 83%**	**46/60 = 77%**	**46/60 = 77%**	**45/60 = 75%**	**44/60 = 73%**	**46/60 = 77%**

Table 4: Assessment from the Cookville Marsh down to the Double Culvert at Route 940 on June 15, 2018 (continued)

Riparian Health Assessment Question			
Vegetation	**Assessment 9**	**Assessment 10**	**Assessment 11**
Vegetative Cover of Floodplain and Streambanks	6/6	4/6	6/6
Invasive Plant Species (Canopy Cover)	3/3	1/3	3/3
Invasive Plant Species (Density/Distribution)	3/3	1/3	3/3
Disturbance-increaser Undesirable Herbaceous Species	3/3	2/3	3/3
Preferred Tree and Shrub Establishment and Regeneration	2/6	2/6	4/6
Utilization of Preferred Trees and Shrubs	3/3	3/3	3/3
Live Woody Removal Other than Browsing	3/3	3/3	3/3
Standing Decadent and Dead Woody Material	2/3	3/3	3/3
Vegetation Rating	**25/30 = 83%**	**19/30 = 63%**	**28/30 = 93%**
Soil/Hydrology			
Streambank Root Mass Protection	0/6	0/6	2/6
Human-Caused Bare Ground	6/6	4/6	6/6
Streambank Structurally Altered by Human Activity	6/6	2/6	6/6
Reach Structurally Altered by Human Activity	3/3	1/3	3/3
Stream Channel Incisement (vertical stability)	9/9	3/9	3/9
Soil/Hydrology Rating	**24/30 = 80%**	**10/30 = 33%**	**20/30 = 67%**
Overall Rating	**49/60 = 82%**	**29/60 = 48%**	**51/60 = 85%**

Table 5: Assessment from the Double Culvert at Route 940 down to the Covered Bridge on Highmarsh Road on July 20, 2018 (plum line in Figure 3)

Riparian Health Assessment Question								
Vegetation	**Assessment 1**	**Assessment 2**	**Assessment 3**	**Assessment 4**	**Assessment 5**	**Assessment 6**	**Assessment 7**	**Assessment 8**
Vegetative Cover of Floodplain and Streambanks	6/6	6/6	6/6	6/6	4/6	4/6	4/6	6/6
Invasive Plant Species (Canopy Cover)	2/3	2/3	2/3	2/3	2/3	3/3	1/3	3/3
Invasive Plant Species (Density/Distribution)	1/3	2/3	2/3	2/3	2/3	3/3	0/3	3/3
Disturbance-increaser Undesirable Herbaceous Species	3/3	3/3	3/3	3/3	2/3	2/3	2/3	3/3
Preferred Tree and Shrub Establishment and Regeneration	4/6	4/6	2/6	2/6	0/6	2/6	2/6	2/6
Utilization of Preferred Trees and Shrubs	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Live Woody Removal Other than Browsing	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Standing Decadent and Dead Woody Material	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Vegetation Rating	**25/30 = 83%**	**26/30 = 86%**	**24/30 = 80%**	**24/30 = 80%**	**19/30 = 63%**	**23/30 = 77%**	**18/30 = 60%**	**28/30 = 93%**
Soil/Hydrology								
Streambank Root Mass Protection	2/6	2/6	4/6	4/6	0/6	0/6	0/6	2/6
Human-Caused Bare Ground	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6
Streambank Structurally Altered by Human Activity	6/6	6/6	6/6	6/6	6/6	6/6	6/6	6/6
Reach Structurally Altered by Human Activity	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Stream Channel Incisement (vertical stability)	3/9	3/9	3/9	3/9	3/9	0/9	3/9	3/9
Soil/Hydrology Rating	**20/30 = 67%**	**20/30 = 67%**	**22/30 = 73%**	**22/30 = 73%**	**18/30 = 60%**	**15/30 = 50%**	**18/30 = 60%**	**20/30 = 67%**
Overall Rating	**45/60 = 75%**	**46/60 = 77%**	**46/60 = 77%**	**46/60 = 77%**	**37/60 = 62%**	**38/60 = 63%**	**36/60 = 60%**	**46/60 = 77%**

Table 6: Assessment from the Covered Bridge down to Highway 2 on September 9, 2018 (light blue line in Figure 3)

Riparian Health Assessment Question								
Vegetation	**Assessment 1**	**Assessment 2**	**Assessment 3**	**Assessment 4**	**Assessment 5**	**Assessment 6**	**Assessment 7**	**Assessment 8**
Vegetative Cover of Floodplain and Streambanks	4/6	4/6	0/6	4/6	6/6	6/6	0/6	4/6
Invasive Plant Species (Canopy Cover)	2/3	2/3	1/3	1/3	1/3	3/3	1/3	2/3
Invasive Plant Species (Density/Distribution)	2/3	2/3	1/3	2/3	1/3	3/3	1/3	2/3
Disturbance-increaser Undesirable Herbaceous Species	3/3	3/3	3/3	3/3	2/3	3/3	3/3	2/3
Preferred Tree and Shrub Establishment and Regeneration	2/6	2/6	2/6	2/6	0/6	4/6	2/6	2/6
Utilization of Preferred Trees and Shrubs	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Live Woody Removal Other than Browsing	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Standing Decadent and Dead Woody Material	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3
Vegetation Rating	**22/30 = 73%**	**22/30 = 73%**	**16/30 = 53%**	**21/30 =70%**	**19/30 = 63%**	**28/30 = 93%**	**16/30 = 53%**	**21/30 = 70%**
Soil/Hydrology								
Streambank Root Mass Protection	0/6	0/6	2/6	2/6	0/6	2/6	2/6	2/6
Human-Caused Bare Ground	6/6	6/6	2/6	2/6	2/6	0/6	2/6	4/6
Streambank Structurally Altered by Human Activity	6/6	6/6	4/6	4/6	4/6	0/6	4/6	4/6
Reach Structurally Altered by Human Activity	3/3	3/3	2/3	2/3	2/3	0/3	2/3	2/3
Stream Channel Incisement (vertical stability)	3/9	3/9	3/9	3/9	6/9	3/9	3/9	6/9
Soil/Hydrology Rating	**18/30 = 60%**	**18/30 = 60%**	**13/30 = 43%**	**13/30 = 43%**	**14/30 = 47%**	**5/30 = 17%**	**13/30 = 43%**	**18/30 = 60%**
Overall Rating	**40/60 = 67%**	**40/60 = 67%**	**29/60 = 48%**	**34/60 = 57%**	**33/60 = 55%**	**33/60 = 55%**	**29/60 = 48%**	**46/60 = 65%**

Discussion

The stretch of the river from Cookville Loop Road down to Cookville Marsh was in the least human impacted & most representative of "natural conditions" of the river. This can be seen in the aerial map in Figure 3, and is also reflected in the assessment results in Table 2. This first section of the river had 5 assessments taken, all of which were healthy overall. This is likely due to a combination of high biodiversity of riparian vegetation (the overall vegetation rating was also health for all assessments (Table 2)). The soil/hydrology rating was 80% (4/5) healthy, likely due to the lack of human impact as well as the good vertical stability of the stream channel (the riparian zone was very wide, with minimal to no slope, allowing the stream access to its floodplain during high water events). The one assessment that came as healthy with problems due to a lack of streambank root mass protection. As we progressed further down the river, we saw a change from lots of trees and shrub species in the riparian area providing deep roots and bank stability, to a riparian area rich in grasses which have shallow root systems and do not fulfill this key role.

Eleven assessments were completed from Cookville Marsh to the Double Culvert (Table 3 & 4). Overall 4 were healthy, 6 were healthy with problems, and 1 was unhealthy. The vegetation ratings were 9 healthy stretches with 2 healthy with problems, and the soil/hydrology ratings were 3 healthy, 7 healthy with problems, and 1 unhealthy stretch of river. As we paddled down the river from the Cookville Marsh, it started to become more channelized (Table 3 & 4). Rivers that are incised can limit the ability of the river to access its floodplain during high water events. Channel incisement can result from watershed-scale or local-scale, cumulative effects of vegetation removal, drainage and development which increase runoff. Incisement can result in increased stream energy which leads to more erosion and unstable banks that can spread downstream or even upstream as the river tries to adjust, it also impairs the ability of the reach to restore itself. In addition to the river becoming more channelized, there was also a notable decrease in vegetative cover of the floodplain and streambanks with more erosion due to disturbance by human and livestock activity. This disturbance also led to the presence of more disturbance and invasive plants rather than preferred tree and shrub establishment and regeneration, therefore very poor streambank root mass protection.

The trend of the river becoming unhealthier kept continuing as we paddled further downstream. The river continued to have very steep banks, limiting the river's access to a floodplain. There was an increasing amount of human disturbance (mostly through livestock having direct access to the river), leading to an increase of erosion, bare soil, and disturbance caused vegetation. There was an increasing lack of preferred tree and shrub establishment on the river banks due to there being a lack of trees & shrubs at the top of the banks to regenerate the vegetation. This lack of preferred vegetation results in poor streambank root mass protection, leaving the river banks even more susceptible to erosion.

We completed 8 assessments for the section of the river from the Double Culvert at Route 940 down to the Covered Bridge on Highmarsh Road (Table 5), all of which were healthy with problems. In terms of vegetation ratings, 5 assessments were healthy, while 3 were healthy with problems. For soil/hydrology ratings, 7 assessments were healthy with problems and 1 was unhealthy. From the Covered Bridge down to Highway 2 we completed 8 assessments, 5 were unhealthy and 3 were healthy with problems. For the vegetation ratings, 1 assessment was healthy, 5 were healthy with problems, and 2 were unhealthy. For the soil/hydrology ratings, 3 assessments were healthy with problems and 5 assessments were unhealthy.

Table 7: Summary of the Overall Health of the Tantramar

	Healthy	Healthy with Problems	Unhealthy
Overall Assessment Score	28%	53%	19%
Vegetation Rating	63%	31%	6%
Soil/Hydrology Rating	22%	56%	22%

In total, 32 assessments were completed of the Tantramar River. There was a notable trend of the top section of the river was healthier than the bottom section, with the river gradually becoming unhealthier the further we progressed. The overall riparian health assessment determined that 28% (9 reaches) of the river is healthy, 53% (17 reaches) of the river is healthy with problems, and 19% (6 reaches) of the river is unhealthy (Table 7).

Impacts and Community Benefits

The goal of this project was to assess the riparian health of the Tantramar River in order to maintain or improve a healthy riparian zone. Healthy riparian zones mean thriving terrestrial and aquatic habitats for mammals, amphibians, insects, fish, and birds. This will have a positive impact on traditional uses by maintaining populations for fishing, hunting, and trapping.

Healthy riparian zones also provide many ecosystem services such as improved water quality, water storage and flood mitigation, erosion protection, groundwater recharge, and providing habitat for terrestrial and aquatic wildlife. These ecosystem services provide the community with many social, environmental, and economic benefits. They also help build a more sustainable and resilient community in the face of climate change. The Tantramar region in particular is one of the most vulnerable regions to climate change due to its low-lying location. A healthy Tantramar riparian zone can help store water and mitigate flood impacts.

Recommendations and Next Steps

The riparian health assessment data gathered from this project will provide a record of the current state of riparian health of the Tantramar River. Using this data, we can plan restoration projects for problem areas and work to prevent potential future problems by maintaining the healthy reaches of the river. In the future, we would like to extend our assessments to tributaries/smaller streams of the Tantramar River, as well as other watersheds within our area. We would also like to build on the riparian health assessments to produce more in-depth riparian inventories. This will result in the long-term achievement of healthy riparian areas that will maintain biodiversity by providing habitat and protect aquatic habitat by trapping sediment and filtering water.

Figure 8: Cows coming down to the river to greet the canoe

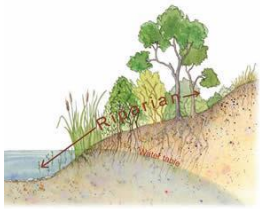
Looking at the summary of our assessment results (Table 7), the overall vegetation health rating of the Tantramar River was 63% healthy, 31% healthy with problems, and 6% unhealthy; while the overall soil/hydrology health rating was 22% healthy, 56% healthy with problems, and 22% unhealthy. A lot of vegetation problems could be addressed by increasing and maintaining native vegetation along shorelines. The province recommends to not alter the landscape within 30 m of a riparian area. The healthy with problems or unhealthy sections of the river often were lacking in any preferred or deep-rooting vegetation along the tops of the bank/riparian area, therefore there were no mature trees or shrubs to encourage growth further down the steep banks. In addition, on several occasions' livestock were found to have full access to the river, which has led to visible hummocking, rutting, and bank erosion. This loosening of soil causes increased sediment levels in the river, negatively impacting aquatic life. EOS recommends engaging with farmers in livestock fencing and riparian restoration projects (e.g. bank stabilization projects) in the future to mitigate these impacts and restore the health of the Tantramar River. This would help support item 88 of the New Brunswick Climate Change Action Plan, "Strengthen the existing program to assist with riparian buffer restoration in agricultural areas, recognizing that riparian buffers between agricultural activities and watercourses are important to address erosion and runoff from extreme weather events".

Appendix 1 – Brochure on Riparian Areas

Functions of a Riparian Area

The basic ecological functions of a riparian area are as followed:

- Traps and stores sediment
- Builds and maintains banks & shorelines
- Filters run-off entering the water source from upland areas
- Maintains biodiversity
- Dissipates energy associated with high waterflow, thereby reducing erosion
- Recharges aquifers
- Stores water and energy



Fitch, L. and N. Ambrose 2003. Riparian Areas: A User's Guide to Health. Lethbridge, Alberta: Cows and Fish Program. ISBN No. 0-7785-2305-5

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Riparian Health Assessments

During the summer and fall of 2018, EOS completed a riparian health assessment of the Tantramar River.

Contact Info and Inquires

If you have any question, would like more information on riparian areas or any other watershed issue, please feel free to contact us:

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506-536-4487
www.eosecoenergy.com
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NB Wildlife Trust Fund www.nbwtf.ca — Fonds en fiducie pour la faune du Nouveau-Brunswick www.ffnb.ca

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Riparian Areas

A better understanding of what a riparian area is, what it does, and what to look for when assessing its health not only builds upon our knowledge of these important areas, but also enhances our appreciation of the role they play as ecosystems.

What is a Riparian Area?

A riparian area is the ribbon of land running parallel to rivers, streams, brooks, lakes, or wetlands. They are the transitional zones between the water and the drier upland areas. They are often described as "wetter than dry, and drier than wet".

A healthy riparian area will facilitate the growth of trees, shrubs, and grasses that grow along a water course. They are also home to many species of birds, fish, amphibians, insects and mammals.

Unhealthy Riparian Areas

An unhealthy riparian area:

- Struggles at filtering sediment which can carry contaminants and nutrients that flow into the watercourse
- Unable to generate proper habitat or cover for many species of native animals
- Displays an inability in controlling high water on the floodplain during periods of high precipitation or spring break up
- Unable to control the amount of sediment entering the watercourse which can harm aquatic animals such as fish

Indicators of an unhealthy riparian area:

- Undercut banks
- Presence of upland plants within the riparian area
- Bare ground from livestock or human activity
- Dead wood

Healthy Riparian Areas

Healthy Riparian Areas can:

- Builds and maintain banks and shorelines
- Reduce flood damage by slowing water and reducing erosion
- Healthier populations of local fish & wildlife
- Reduce water quality issues
- Dissipates the effects of spring break up ice flows on shorelines

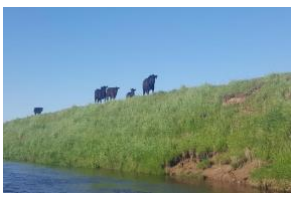
Indicators of a healthy riparian area:

- Presence of woody vegetation
- Undisturbed soils
- Native shrubs, grasses, and trees
- Presence of birds, fish, and other wildlife

Riparian Stewardship for Landowners

It is mutually beneficial in taking a stewardship role when living or working near a riparian area. Some measures of maintaining and restoring riparian areas to their natural functions one could employ may include:

- Avoid or minimize activities that would disturb the soils and vegetation during vulnerable times (e.g. when shorelines are saturated they are more vulnerable to livestock rutting)
- Avoid clearing deep rooted, native tree species and vegetation Leave enough native vegetation to protect plants and soil, conserve moisture, and trap sediment
- Avoid manipulation of the water course (e.g. dewatering and diverting)
- Consider using eco friendly methods when dealing with unwanted weeds and insects near the watercourse.
- Do not build, add or remove fill material, or alter the landscape within 30 meters of a riparian area



Appendix 2 – Bookmark hand-out for livestock farmers

Why a Healthy Riparian Area is Important to Livestock Farmers

Water Quality

There are a number of diseases and infections associated with poor water quality and livestock. When key functions of a riparian area have been compromised, a watercourse can be left vulnerable to pathogens

Availability to clean water dramatically effects the productivity of livestock. Cattle and other livestock are healthier and make greater weight gains when they have access to clean water. Studies show, cattle will drink from a trough 8 times out of 10, even if they have access to surface water.

Healthy, well vegetated riparian areas can be good at removing sediments, as well as microbes, nutrients, and pesticides attached to sediments, leaving a watercourse which provides clean drinking water for livestock.

Erosion

A river, brook, or stream can develop an incredible amount of energy and that energy can exceed the counter action provided by the bends in a meandering watercourse, leaving banks vulnerable to a rate of erosion that may have detrimental effects on the size and functionality of pastures.

How to Ensure a Healthy Riparian Area

Some measures that can be taken in effort to maintain and restore riparian areas to their natural functions are as followed:

- Avoid or minimize grazing during vulnerable times (e.g. when shorelines are saturated they are more vulnerable to rutting)
- Leave enough vegetation to protect plants and soil, conserve moisture, and trap sediment
- Give plants time to rest when growing conditions are favourable to rebuild roots & energy supply
- Spread the grazing load over the landscape
- Reduce manure build up in riparian area
- Consider alternative water sources

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What is a Riparian Area?

A riparian area is the ribbon of land running parallel to rivers, streams, brooks, lakes, or wetlands. They are the transitional zones between the water and the drier, upland areas. They are often described as “wetter than dry, and drier than wet”, which speaks to their physical characteristics and also hints to their function.

A healthy riparian area will facilitate the growth of trees, shrubs, and grasses that grow along a water course. They are also home to many species of birds, fish, amphibians, insects and mammals.

Functions of a Riparian Area

Aside from being a vital component to the health and natural function of a watercourse, numerous benefits are made possible when the following foundational ecological functions are occurring in a healthy riparian area:

- Traps and stores sediment
- Builds and maintains banks & shorelines
- Filters run-off entering the water source from upland areas
- Maintains biodiversity
- Dissipates energy associated with high waterflow, thereby reducing erosion
- Recharges aquifers
- Stores water and energy

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Figure 9: Bank swallow roost along the Tantramar River