Jemseg Grand Lake Watershed Association
Final Report of the N.B. Environmental Trust Fund Project 200292
Providing Environmental Education, Tackling Water Quality and Restoring Riparian Zones for the Jemseg Grand Lake Watershed

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Jemseg Grand Lake Watershed Association

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Executive Summary

Our Association is a group of committed volunteers, with an overarching goal of a healthy watershed ecosystem for all. From a start-up meeting in October 2019, the Jemseg Grand Lake Watershed Association has grown to have 91 paid members, with a set of by-laws, monthly meetings (with minutes), monthly newsletters and a bank account. Our primary accomplishments during the period April 1, 2020 to March 1, 2021 include (a) holding three well-attended webinars, (b) establishing a website for our Association, (c) completing a significant water quality observation program, and (d) carrying out a shoreline willow tree planting experiment with 10 members. Our planned Priority Area Measures have been achieved.

1. Formation

As explained in our Terms of Reference (see https://bit.ly/3gSCssG), our Association started on the evening of Oct. 17, 2019 at a meeting in the Waterborough Women's Institute Hall. The efforts of the Voices for Sustainable Environments and Communities (VOICES) group, especially their co-chair John Yauss, was instrumental in providing the advertising for this meeting, and organizing the meeting location and presenters. From this meeting of 29 interested people, a group of nine attendees agreed to serve as the initial Board of Directors. Six of the initial board members met on Nov. 9, 2019 at the Mill Cove Nursing Home, elected an initial executive team, and formed a subcommittee to prepare our first N.B. Environmental Trust Fund (NBETF) application. This application, with the above project title, was submitted on Nov. 29, 2019.

2. Organization

After the initial formation, we continued to hold monthly meetings, all with recorded minutes, which are available at https://drive.google.com/drive/folders/166o_e93wnsL9RkHAI2NhaXindsMHLRAN?usp=sharing
With the assistance of Wendy Keats (Executive Director of the Cooperative Enterprise Council of New Brunswick), we established our first set of by-laws (available at https://bit.ly/2AXMuJM) on Feb. 19, 2020. The flavour of these by-laws are in the form of a registered N.B. Cooperative Ltd., under the 2019 Province of N.B. Cooperatives Act. With an established set of by-laws, voted on by members in attendance at the Feb. 2020 monthly meeting, we were able to

establish a bank account at the Progressive Credit Union in Fredericton, and to join the N.B. Alliance of Lake Associations.

With the hard work of our members to encourage their friends, neighbours and family members to join, our membership has expanded to 91 paid members as of February , 2021. Our membership forms are available online at https://bit.ly/2JvRNoe
Each application form asks for "Topics of Interest". Table 1 below shows the top five categories (out of 14) answers received since our initial seven members joined in the Dec. 9, 2019 meeting. The highlighted rows indicate that these three topics are all related to flood level spring freshet water with significant wind.

Table 1. Top five list of Topics of Interest on the New Membership Forms

TOPICS OF INTEREST	TOTALS FOR EACH TOPIC	COMMENTS
Education	9	
Environmental	17	Lake health and safety, improve watershed health & ecosystem, managing blue-green algae, water swimmability
Erosion Control	8	
Flood Mitigation	25	Flood proofing, high water problems, Grand Lake flood control, recent flooding
Property Improvements	14	
Shoreline Protection	9	shoreline preservation
Water Quality & Testing	19	Healthy waterways, lake water quality, a clean lake

The combined (Erosion Control, Flood Mitigation, Shoreline Protection) topics total 42, followed by Water Quality & Testing (19), Environmental (17, lake health and safety, improve watershed health & ecosystem, managing blue-green algae, water swimmability), Property Improvements (14) and Education (9). The remaining seven topics, in order by number of responses, are Ecological (7, lake and estuarine ecology, wildlife, all ecosystem + pertaining info), Science (6), Property Assessments (4), Zoning Changes (3), Invasive Species Control (2, weed growth), Recreation (2, snowmobiling, boating), and Sewage Collection in Flood Zones (2).

Our Association joined the N.B. Alliance of Lake Associations (NBALA) in March, 2020. The NBALA provides insurance for volunteers participating in voluntary water quality monitoring activities, director's insurance, as well as a YSI Pro Plus instrument to measure pH, temperature, conductivity and dissolved oxygen at depths up to 30 m. The NBALA annual membership fee of $150 also provides an annual calibration of the YSI instrument.

A letter from the Minister of the N.B. Dept. of Environment and Local Government to our Secretary dated April 24, 2020 informed us that our application for funding was supported in the amount of $15,000.

In November 2020 our Association became an Associate member of the New Brunswick Environmental Network (NBEN). The NBEN is the largest environmental network in N.B., comprised of approximately 110 other organizations. The NBEN collects and distributes valuable notifications of upcoming funding opportunities and events related to the environment. We have used their events calendar to advertise our webinars.

3. Priority Area/Priority Area Measures

Our Nov. 30, 2020 submission included the following:
(a) Protecting our Environment – Communication and awareness, education materials
Number of events/initiatives: 4 **Delivered:** 3 webinars + monthly newsletters

Number of people to be reached by each event/initiative: 50 **Delivered:** average of 83 attended each webinar (plus an average of 262 views each of the online YouTube version of three webinars), monthly newsletters delivered electronically to all members (57 members as of April 1, 2020; 91 members as of Feb. 27, 2021; average of 74).

Note: Three webinars instead of four workshops were delivered as described in our revised plan of May 31, 2020.

(b) Protecting our Environment – Other

(i) Water quality monitoring at up to six sites in the Grand Lake area. **Delivered:** six sites sampled (surface water) and observed (vertical profiles at 1 m intervals from surface to bottom), analyzed by RPC, and two water quality reports written (one summary report of 8 pages, one detailed report of 44 pages, see Appendices).

(ii) Riparian zone restoration by planting native trees in shoreline and near shoreline areas. Measure in square meters, number of volunteers involved in planting, and the number of trees planted. **Delivered:** 200 willow rooted cuttings, and 500 willow live stakes delivered to 10 volunteers, with significant failures noted as discussed in section 6. Riparian Zone Tree Planting.

(iii) Establishing and maintaining a web site for event notification, resources, best practice guidelines, and records of monitoring activities. **Delivered:** website https://jemseggrandlakewatershed.ca/ has been established. It is currently in the process of moving from a DRAFT form to a publicly available form, as described in section 4.3. Website.

4. Education

With support from the Voices for Sustainable Environments and Communities (VOICES) group, two pre-COVID-19 workshops entitled "Protecting your property from Grand Lake Flooding: Stories from the Trenches" were held. The workshops were held on Feb. 22, 2020 at the Mill Cove Nursing Home, with 48 attendees. The second workshop was held on Feb. 29, 2020 at the Minto Senior's Hall, with 34 attendees. The slides of the four workshop presentations, along with some interesting introductory slides, are available at

https://bit.ly/2VFHjVD

4.1. Webinars

Support from the NBETF allowed us to purchase a Zoom Pro with Webinar 100 license. This enabled the holding of three online webinars. The first, entitled "Cyanobacteria in New Brunswick: Understanding Toxicity", was given by Dr. Janice Lawrence, UNB, on July 16, 2020, with 114 registered attendees and 53 in attendance.

The second, entitled "Understanding Lake Water Quality: First Steps for Grand Lake, New Brunswick" was given by Eric Luiker, an experienced aquatic ecologist, on Nov. 30, 2020, with 71 registered and 46 in attendance.

The third, entitled "Flooding in New Brunswick: Cause and Effect" was given by Jasmin Boisvert, a water resources specialist with the N.B. Dept. of Environment and Local Government, works in the Hydrology Centre as part of the N.B. River Watch team. This webinar was presented on Jan. 14, 2021, with 241 registered and 150 in attendance.

All three webinars were very well-received, with a lively question and answer session following each presentation. Edited versions of the recorded webinars are available at our YouTube channel at

https://www.youtube.com/channel/UCi_8ZOVc3XR9e42qCnT4g7w

These webinars are valuable for educational purposes. They provide an essentially permanent record of our evidence-based educational activities. The presenters are all professionals in their field. We were fortunate they volunteered to make these webinar presentations, and to have the resources (e.g. Zoom Pro with Webinar 100 software, volunteer member with video editing software, computing expertise and a capable computer) to record, edit and post the webinars. As of Feb. 27, 2021, the number of views for each of these videos totaled 265, 80 and 442, in order of the date presented.

4.2. Newsletters

Monthly newsletters were sent (beginning in February, 2020) to all members using MailChimp, and via our Facebook and Instagram accounts. Links to the newsletters are available at

https://bit.ly/36Oryls

Four of our members have no email access and were not receiving any communication from us since they joined. In October, 2020, we mailed a package to each of these four members that included printed copies of our September and October newsletters, along with a welcome letter from our Association and additional documents. These members are typically seniors without a computer.

Three large Clean, Drain, Dry signs were installed at the Chipman Marina, Newcastle Creek Yacht Club, and Douglas Harbour boat launch sites in late August.

The signs were obtained from the N.B. Invasive Species Council. The last picture above was taken on January 13, 2021, and shows the Chipman sign keeled over. It is unclear why this happened. This will require a revisit in 2021 to install the sign on a more rigid signpost.

4.3. Website

Our website was modeled after the Nashwaak Watershed Association website. A DRAFT version of it is available for viewing at

https://jemseggrandlakewatershed.ca/wp-login.php

and logging in with username "JGLWAProof" and the password "JGLWA#2020&".

Our website presents a comprehensive repository of our Association's Activities, and serves as a central site for our Association's communication, water quality reports, educational and riparian zone activities. The picture in Figure 1 below shows the current DRAFT website home page.

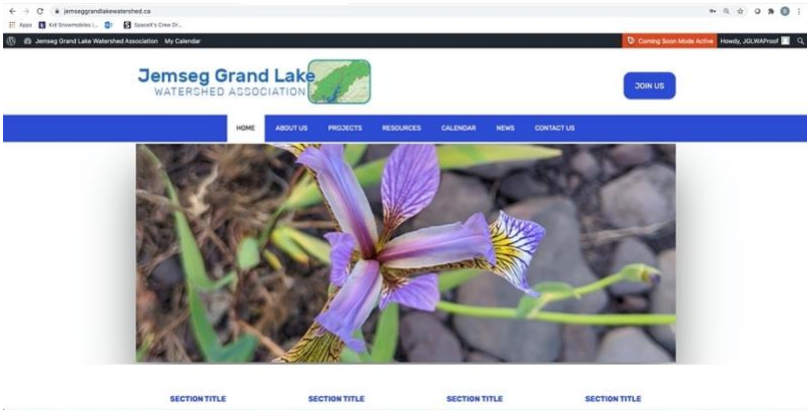

Figure 1. Screenshot of DRAFT https://jemseggrandlakewatershed.ca/ website on Feb. 27, 2021.

As planned in our revised budget dated July 10, 2020, we purchased our website domain name and one year of web service from canspace.ca (includes secure access via SSL certificate to the https://jemseggrandlakewatershed.ca/ website), and our website deployment is being done under contract with Kiers Marketing. Launching the initial publicly accessible version of our website is planned for mid-March, 2021.

5. Water Quality Monitoring Program

Our volunteer water quality monitoring program was led by Eric Luiker, a member with significant experience in monitoring lake water quality. Six sites in our watershed were observed four times, with the observation sites shown in Figure 2.

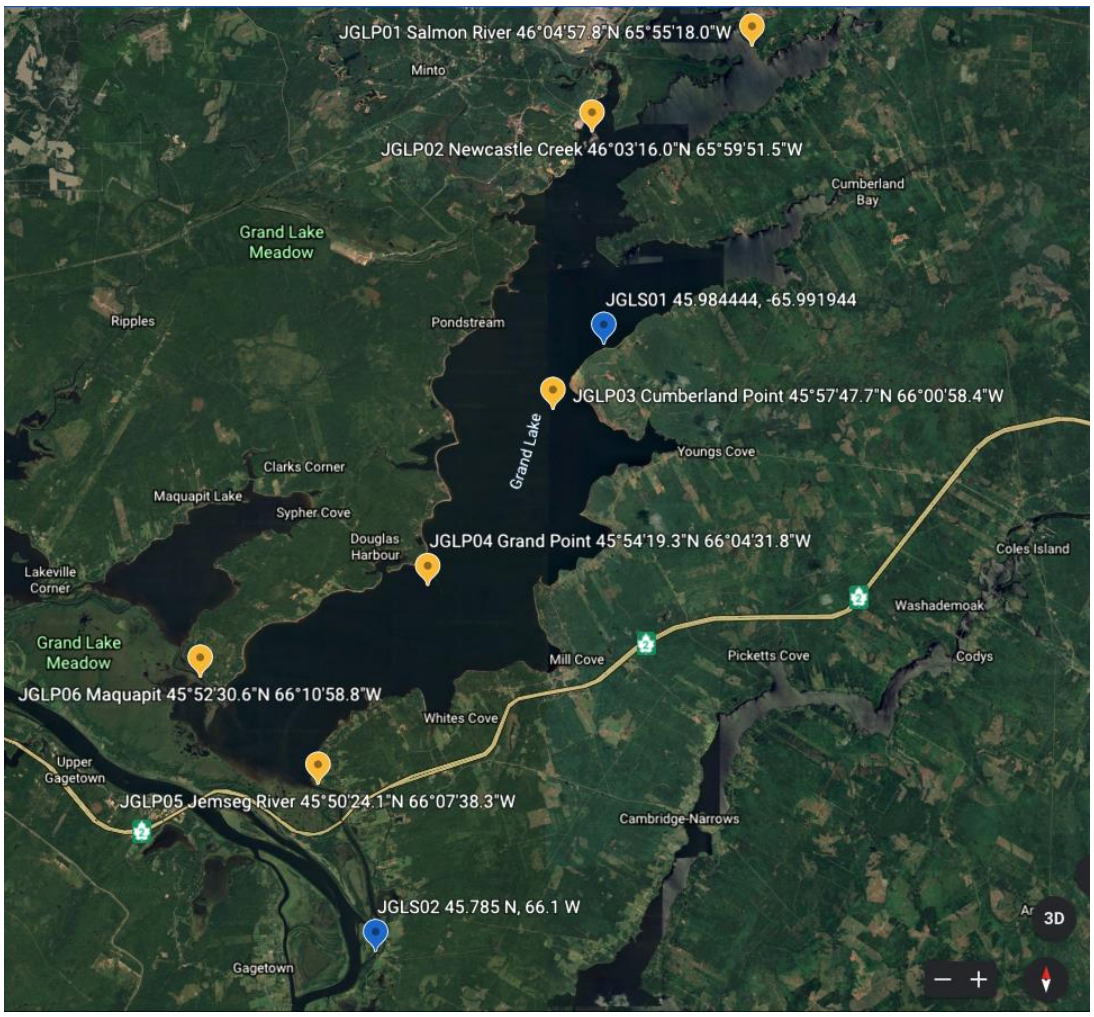

Figure 2. Water quality observation sites plotted on a Google Earth map.

Our program was made possible by the dedication of two volunteer teams; team South (Hazen Hughes, Joy and Robert Thomas) and team North (Brad Nickerson, Michael Kelly and Eric Luiker). Each team collected data plus water samples using a 19 or 20 foot boat from three of the six locations on the lake. Preliminary results of our 2020 water quality observation program were presented by Eric Luiker in his November 30 webinar.

An eight page 2020 Water Quality Report for our watershed's monitoring program is attached as Appendix 1. The report summarizes the Jemseg Grand Lake water quality monitoring program activities which included: collection of surface and at depth (by 1 m intervals) biophysical water parameters, as well as collection of water samples for analysis of nutrients, major ions and trace metals. From this information, data was compared to Canadian Council of Ministers of the Environment (CCME) guidelines. In addition, a Water quality index and Trophic Status index was estimated for each sampling station. The Appendix 1 report follows a template recommended by the Atlantic Water Network, and was made possible by the knowledge and expertise of Eric Luiker (aquatic ecologist) and Jillian Hudgins (project coordinator for the Nashwaak Watershed Association, and Senior Project Scientist for the Olive Ridley Project). Appendix 2 contains a more detailed report and discussion of our 2020 water quality monitoring program.

The eight page summary report is submitted as a separate file due to the limitation of 10 MB on file size submission to ETF-FFE@gnb.ca .

We have also supported the cyanobacteria monitoring program led by Dr. Janice Lawrence and ACAP Saint John, as part of their "Determination and modelling of nutrient hotspots and related ecosystem impacts in the lower Wəlastəkw/St. John River watershed" project funded by the Environment and Climate Change Canada Atlantic Ecosystems Initiatives (AEI). The blue JGLS01 and JGLS02 sites in Figure 2 show the locations of the two cyanobacteria monitoring sites in our watershed. Eric Luiker wrote a summary of our Association's activities in support of this project [1]. In addition, the ACAP Saint John team was able to use our Association's water quality observation results in their analysis.

[1] Luiker, Eric "Jemseg Grand Lake Watershed Association SPATT Collector and Algal Sample Program – Summer 2020", Nov. 4, 2020, 2 pages.

6. Riparian Zone Tree Planting

In May, 2020 our Association received approximately 200 red-tip willow (*Salix eriocephala*) rooted cuttings from the Nashwaak Watershed Association. These cuttings, along with an additional 500 willow live stakes, were distributed to approximately 10 of our members for planting on their shorelines. Our experiment was to determine which technique (rooted cuttings or live stakes) worked best. Red-tip willows were chosen as they have an extensive root system that helps prevent erosion, and are native to New Brunswick. Figure 3 shows a mature red-tip willow on the shore of Grand Lake. They grow up to 3 to 4 m in height, and have a multitude of smaller stems branching from the root system, making them resistant to ice damage. They are very different from the much larger weeping willow tree. Initial results showed that the cuttings survived much better when rooted, placed in a sunny location along the shoreline, and watered well during dry weather.

Figure 3. Mature red-tip willow on the Grand Lake shoreline; picture taken Oct. 10, 2020.

Some results of this experiment are shown in Table 2.

Table 2. Qualitative results for Association members' 2020 willow planting activities. R = red-tip willow rooted cuttings, L = willow live stakes. Only some members provided feedback.

Member Id	No. of willows planted	Survival rate	Comments
1B	50 R, 55 L	50% of R, 10% (6) of L	Most of L died due to lack of water, R died due to too much competition for light and lack of water during hot weather
2J	20 R, 20 L	5% of R, 0% of L	Too much competition for light
3M	50 L	50% of L	Failures due to lack of water from very dry summer, near drought conditions
4D	14 L	100% of L	Planted in full sun, watered morning and evening via sprinkler when not raining
5K	50 L	0% of L	Live stakes planted in coconut husk fibre logs, dried out due to lack of water
6R	20 L	70% of L	Repotted in six and three inch pots, watered regularly, then transplanted to gravelly beach area in Sept. 2020. Failures due to lack of water while in pots in southern exposure.
7Y	20 R	90% of R	Watered twice per day, as needed, planted in black earth with manure
8H	15 R, 15 L	30% of R, 13% (2) of L	Lack of water likely cause of failure
9HB	20 R, 15 L	70% of R, 13% (2) of L	Watered well
10E	18 R	50% of R	Lack of water and competition likely causes of failure
11MC	26 R, 20 L	Unknown R, 0% of L	Lack of water, L planted in sandy beach area, R lost in grass field

In general, we found that the rooted cuttings worked better. Results were not optimal for rooted cuttings as the pots they came in were very small (a 26 cube tray, see the picture below left, picture taken June 9, 2020), and it was hard to remove them for planting as the roots got caught on the sharp plastic defining the drainage hole at the bottom.



The middle picture above shows six bags of willow live stakes obtained from Mike Thorne, ready for distribution on June 14, 2020. The right picture shows planting live stakes in gravel next to existing willows on June 15, 2020. No potting soil was used; these were planted directly in the gravel, and initially watered on a daily basis.



Planting red-tip willow rooted cuttings on May 8, 2020 (left above, member 1B). Each plant had two large double handfuls of potting soil added to the planting hole. Watering red-tip willows (middle above) on May 25, 2020. Right picture above was taken in June, 2020, and shows planting in black earth and manure by member 7Y.

The picture above shows a failure of 14 live stakes, and one alive with green leaves in the middle (picture taken June 30, 2020, member 1B). These were in full sun, and well-watered every day.


The left and right pictures above show two rooted cuttings on June 30 and July 20, 2020 (planted on May 8, 2020, member 1B) doing well in full sun and well-watered every day.


The above left picture was taken on Aug. 11, 2020, and shows heavily wilted red-tip willows due to too little moisture with direct sun in hot conditions and small root size. About half of these survived after heavy watering, but were seriously slowed down in their growth. The above right picture (taken Aug. 16, 2020, member 1B) shows three failed red-tip willows (lower left and right in the picture) due to competition for sunlight from surrounding bushes and trees. Willows in the above right picture were watered regularly.


The above left picture shows surviving, well-watered live stakes (member 4D) on Aug. 10, 2020. The above right picture shows live stakes planted in six inch pots, watered regularly and doing well (member 6R) on June 29, 2020.

What have we learned from this limited experiment? The very small root size of the rooted cuttings gives them very little resilience to lack of water and competition (for sunlight). We understand that the rooted cuttings we received were grown in a greenhouse for six weeks prior to delivery for planting. The cuttings should be rooted for a longer time in larger containers. Root size can be improved by transplanting into e.g. six inch pots with potting soil and watered regularly before transplanting to a shoreline setting. It is also clear that the gravelly, rocky soil of Grand Lake shorelines require potting soil around the roots when transplanted to help hold moisture for developing roots. Most live stakes transplanted without any accompanying soil failed at an 87% to 100% rate. The only successful live stakes (member 4D) were planted in full sun, and watered twice per day when it was not raining.

Our Association was fortunate to have been contacted by J.D. Irving Woodlands with an offer to grow up to 5,000 red-tip willow rooted cuttings in their Sussex greenhouse operation for 8 to 10 weeks. With the assistance of Mike Thorne, we harvested approximately 450 red-tip willow whips (two to five foot long stems) from Mike's willow plantation in Waterborough on January 21, 2021. The picture below left illustrates this operation. Mike Thorne is a member of our Association, is a registered professional forester, and has significant experience in growing a wide variety of trees on his properties.

These whips were delivered to the J.D. Irving Woodlands Sussex greenhouse operation on Jan. 25, 2021 (see picture above right). J.D. Irving Woodlands knows how to grow trees. Their rooting pots are much deeper than the 26 cube trays we received as shown in the June 9, 2020 picture above. They have a professional team approach to cutting the provided whips into six inch long cuttings for rooting, planting them in multi-pots, watering and caring for them. Our Association plans to pick them up in Sussex in mid-May, 2021. Assuming our submitted NBETF application entitled "Riparian Zone Tree Planting in the Jemseg Grand Lake Watershed" is funded in 2021, we plant to distribute 2,000 rooted red-tip willow cuttings to our members starting in mid-May, 2021. With our 2020 experience, and following the best practices we have discovered to date, we should have a much better survival rate for rooted red-tip willows planted on shorelines in our Association's watershed.

We have a long-term partnership plan with J.D. Irving Woodlands and with Mike Thorne to increase Mike's red-tip willow plantation by approximately 500 new plants added per year for five years. This will give an increasing number of available rooted red-tip willow cuttings per year, with a sustainable three year rotating harvest plan to let red-tip willow plants rest and grow bigger for two years before harvesting again.

7. Appendix 1. 2020 Water Quality Report

This eight page summary report is attached as the file "Jemseg Water Quality Report FINAL_low_res.pdf", 9.6 MB.

8. Appendix 2. Water Monitoring Program Report – 2020

This 44 page detailed report is attached as the file "JGLWA Water Monitoring Program Report Final Feb 28 2021_withAppendix.pdf", 2.9 MB. It can be cited as

E. Luiker, J. Hudgins, B. Nickerson "Jemseg Grand Lake Watershed Association Water Monitoring Program Report – 2020", Feb. 28, 2021, 44 pages.