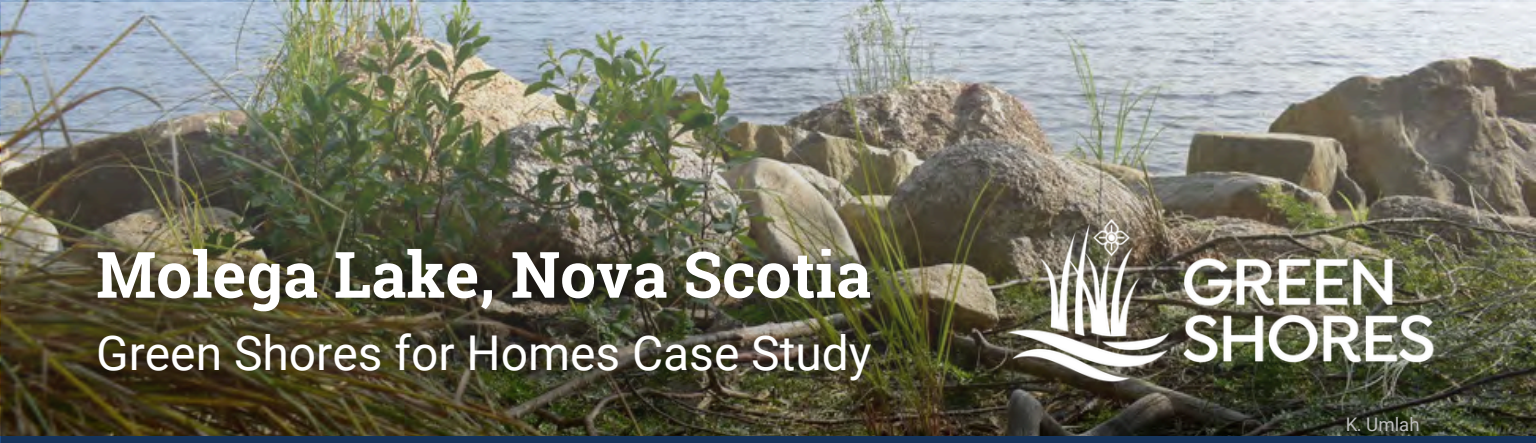

Molega Lake, Nova Scotia

Green Shores for Homes Case Study

GREEN SHORES

K. Umlah

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Introduction

What is Green Shores for Homes?

The Green Shores for Homes (GSH) program offers best practices for homeowners to implement nature-based management on their lake- and ocean-front properties. Homeowners earn credits and receive a Silver or Gold rating.

Green Shores® was initiated by the Stewardship Centre for British Columbia (SCBC). In 2019, The TransCoastal Adaptations Centre for Nature-Based Solutions at Saint Mary's University expanded the program to the Maritime provinces.

Why was this site selected?

In 2023, Credit 2.1 was added to the GSH Credits and Ratings Guide to incentivize homeowners to steward Species at Risk (SAR) habitat and avoid impacting them with shoreline projects. To test the effectiveness of this new credit, the Canadian Wildlife Service provided funding to SCBC and TCA through the Canada Nature Fund to implement two projects on eligible private properties containing SAR habitat within the Kespukwitk/Southwest Nova Scotia Priority Place.

The Molega Lake project was selected as an example of a lakeshore property with SAR habitat in need of restoration due to prior shoreline degradation. Molega Lake is one of the few lakes in Nova Scotia that supports Atlantic Coastal Plain Flora (ACPF), an at risk group of plants. One of the main pressures facing these species is shoreline development. Many ACPF plants cannot be found anywhere else in Canada.

Citation

Umlah, K. & Giacomodonato, H. (2026). Molega Lake: Green Shores for Homes Case Study.


K. Umlah

Kespukwitk Region & Species at Risk

To be eligible for this project, this site needed to meet the following criteria:

- The property is on a coast or lakeshore within the Kespukwitk region
- At least one of the target species at risk **(see right)** lives on or around the property's shoreline;
- The homeowner is willing to allow TCA to:
  a. Visit for a site assessment, and
  b. Use the shoreline project as a case study;
- The shoreline has been altered from its natural state through hard armouring or mowing;
- The property owner is committed to following through with Green Shores for Homes certification.

Target Shoreline Species at Risk:

- Bank Swallow
- Piping Plover
- Blanding's Turtle
- Pink Coreopsis*
- Plymouth Gentian*
- Tall Beakrush*
- Water Pennywort*
- Eastern Baccharis*
- Wood Turtle
- Eastern Ribbonsnake
- Sweet Pepperbush*
- Snapping Turtle
- Eastern Lilaeopsis*
- Goldencrest*
- Redroot*
- Long's Bulrush*
- Tubercled Spikerush*
- Eastern Painted Turtle

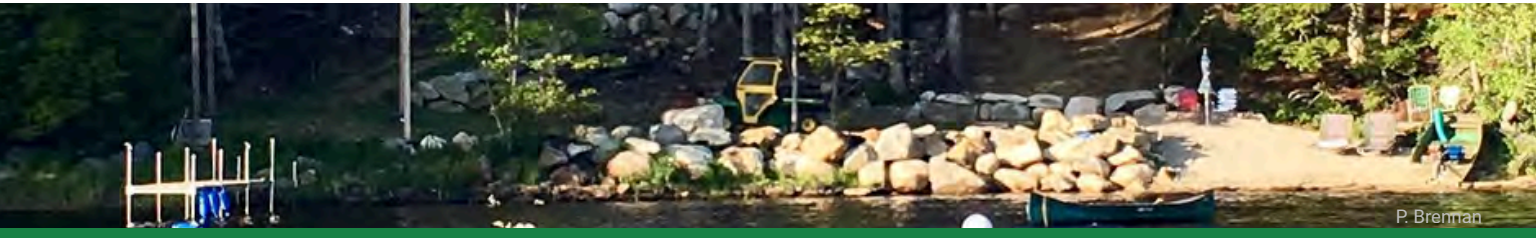
* These species are Atlantic Coastal Plain Flora (ACPF), many of which can't be found anywhere else in Canada!


Snapping Turtle in Molega Lake community. Photo by Ite Stackman.

Kespukwitk Region:

Kespukwitk is the Mi'kmaw province of Southwest Nova Scotia, and translates to "end of flow." Kespukwitk is a UNESCO Biosphere Reserve and one of eleven priority places in Canada for SAR conservation. Priority places have significant biodiversity and concentrations of species at risk, which provide ample opportunities for conservation actions. Kesputwitk is a vital place to live and visit for 67 at-risk species, including the target shoreline SAR listed above. For some species, it is the only place in Canada where they are found.

Many of the critical habitats for species at risk within Kesputwitk are negatively impacted by human activities on the shoreline. Activities like development, erosion or flooding protection measures, removal of riparian vegetation, mowing, and removal of organic material can all impact a species at risk's ability to survive and thrive. This project explores how GSH certification can demonstrate SAR stewardship and restoration in Kespukwitk.



Site Conditions & History

In 2014, before the property was developed, the Mersey Tobeatic Research Institute identified hundreds of Redroot (*Lachnanthes caroliniana*) onsite. Redroot is a COSEWIC-listed and locally rare ACPF. Various at-risk reptile species have also been recorded around Molega Lake over the years.

The shoreline is 33m long, with a riparian buffer width of about 10m. In 2019, approximately 200m^2 of this 330m^2 riparian zone was altered, including approximately 50m^2 below the Ordinary High Water Mark (OHWM) (See Design on p.4).

The previous riparian zone alterations included:

- Installation of a French drain at the base of the slope, which outlets to the lake at the eastern end of the rock retaining wall
- Removal of vegetation
- Lake water intake for residential use
- Construction of a wooden dock platform
- Rearrangement of shoreline rocks to create a retaining wall (15m) and a rock-free area (7m);
- Placement of poor-quality infill behind the retaining wall
- Placement of coarse sand in rock-free area to create a beach

c.2016-2017: the site before cottage placement and any shoreline alterations. Stars signify trees that remained for comparison.

2025: Site visit by CBWES and TCA showing shoreline alterations before GSH project implementation. Stars signify trees that remained for comparison.

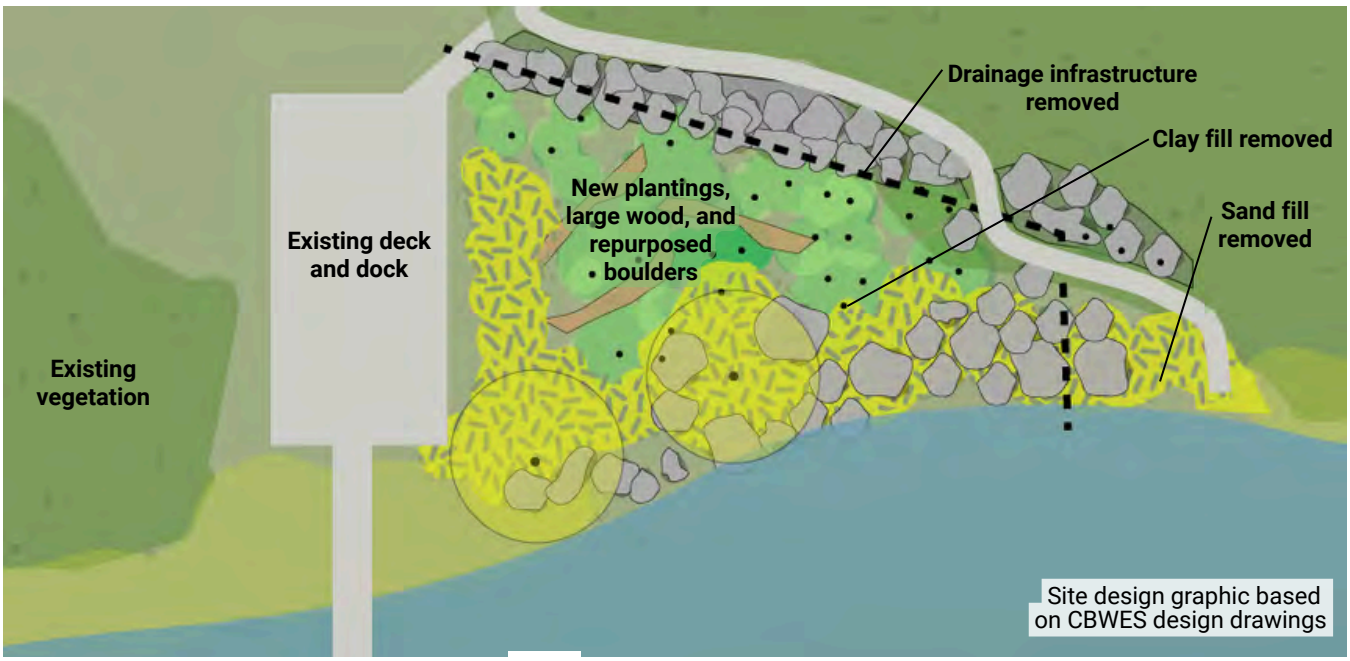
These previous alterations diminished the site's habitat quality. Redroot habitat, for example, was lost or highly damaged through infilling, shoreline hardening, moving rocks, and adding sand material to create an artificial beach. Changing the natural substrate to compacted poor-quality fill may have also reduced the site suitability for nesting reptiles. The homeowners reported that they were unable to grow vegetation in the infilled area over the past six years due to the poor fill quality.

The shore is within a cove and naturally experienced little erosion. The main focus of the project was to recreate the habitat conditions needed for ACPF and at-risk reptile species to return to the shoreline.


Kirsten Ellis, CBWES

Design

CB Wetlands and Environmental Specialists Inc. (CBWES) designed the shoreline to maximize credits under the Green Shores for Homes program. The project design diagram below shows the key restoration activities along the shoreline.

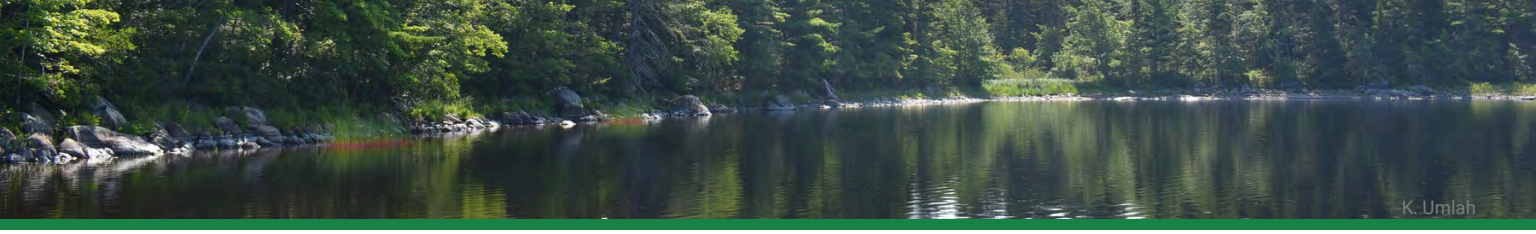


TCA, CBWES, and the homeowners met with federal and provincial SAR biologists to discuss the importance of maintaining reptile nesting habitat and how that may conflict with restoring the site to meet the needs of ACPF. The biologists provided advice on how best to design the project to meet the needs of both species groups.

Outcomes & Impact for Species at Risk

Guided by this design, the following outcomes were achieved:

- Removal of imported clay infill above the OHWM with an excavator to restore the natural shoreline elevation
- Removal of imported sand material above the water line at time of construction, by hand (rakes, shovels, and wheelbarrows)
- Removal of drainage to allow the landscape to absorb excess water
- Redistribution of retaining wall rocks to recreate the natural shoreline
- Planted shore zone with native, ecologically suitable vegetation
- Recreated habitat conditions for local species at risk, such as Atlantic Coastal Plain Flora (ACPF) and reptiles.



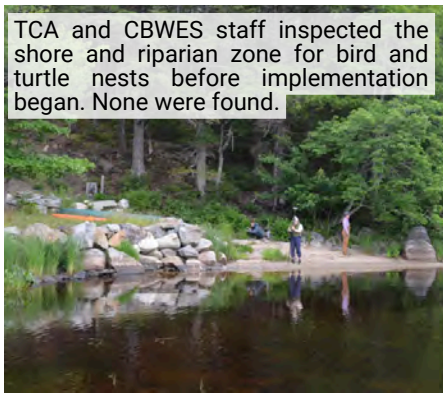
Outcomes & Impact for Species at Risk (Continued)

The five days of work resulted in over 76 m^3 of low-quality fill being removed from the foreshore and backshore, re-exposing as much of the natural substrate as the excavator could access without damaging the existing overhanging or native vegetation in the riparian zone. In this natural substrate, 207 individual shrub and herbaceous plants were added, with nearly all surviving to the winter despite some grazing from local deer and extreme drought conditions. This newly revegetated riparian zone restored approximately 150 m^2 of habitat for at-risk reptiles, and recovered the conditions needed for Redroot and other ACPF to re-establish along the previously altered shoreline.

The homeowners monitored the success of plantings within the first few weeks of implementation, and noticed deer grazing on the Joe Pye Weed and some thorny plants. As a result, they took the initiative to add more deer fencing in an attempt to protect the plantings from further grazing, and allow them time to regrow before the weather cooled off.

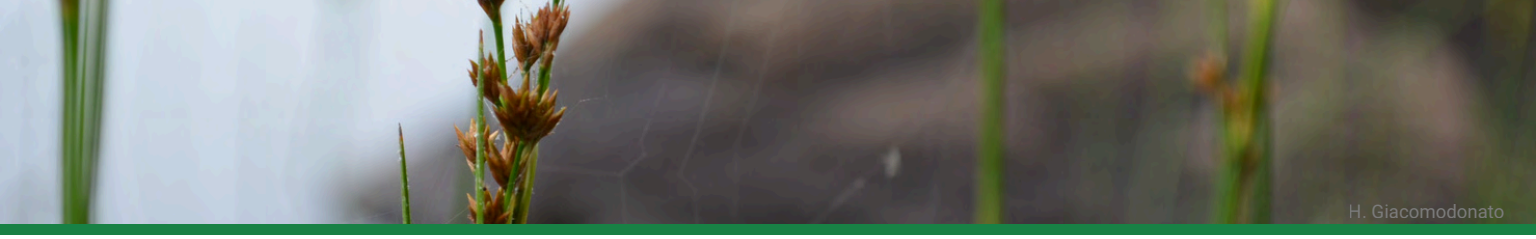

Beach sand removal by hand.


Silt fencing utilized when excavator on site.


TCA and CBWES staff inspected the shore and riparian zone for bird and turtle nests before implementation began. None were found.

Permitting, Avoidance & Mitigation

Regulatory Body	Action Required	Purpose
Department of Fisheries and Oceans Canada	Obtained a permit under The Fish and Fish Habitat Protection Program	Sand removal work occurred below the Ordinary High Water Mark (OHWM). Hand tools only were used below the OHWM to limit potential impacts.
Nova Scotia Department of Environment and Climate Change	Obtained Water Approval, Erosion Protection Permit	Excavation work within the riparian zone introduced the risk of sediment entering the lake. Silt fencing was used to limit potential impacts.
Nova Scotia Department of Natural Resources and Renewables	Submitted Avoidance and Mitigation Plan	Species at risk on site and mobile SAR in the area.



Credit 2.1: Enhanced Critical, Sensitive, or Migratory Bird Habitat Stewardship Update

The project was awarded 4 points under the GSH Credit 2.1: Enhanced Critical, Sensitive, and Migratory Bird Habitat Stewardship (see points details on page 9). The credit, as currently written in the GSH credits & ratings guide, only awards points for avoiding impacts to SAR, and stipulates that work not take place in critical or sensitive habitat. For this project, it was necessary for restoration efforts to occur within SAR habitat in order to restore previous impacts. The verifier awarded 4 points as the work honoured the intent of the credit. Credit 2.1 encourages stewardship of species at risk and migratory birds, which includes helping to recover native plant and wildlife populations. Special considerations were also made for implementation work to occur outside the nesting period of at-risk reptiles. Currently, Credit 2.1 awards points for scheduling work activities outside of the nesting period of migratory birds specifically. The verifier concluded that this point category should apply to at-risk reptiles as well to reward the protection of any at-risk species. The GSH credits & ratings guide will be updated to incorporate these lessons learned. It is important to incorporate new knowledge and understanding generated by hands-on implementation work.

Construction Details

Below are the activities undertaken during implementation in July and August 2025. The homeowners volunteered their time to be onsite and to support project implementation.

Day 1 – July 30: Removal of imported fill and beach sand began. Manzer Brothers Excavation & Landworks Inc. used an excavator to remove fill above the OHWM while CBWES and TCA staff and the homeowners removed beach sand below the OHWM using hand tools.

Day 2 – July 31: Continuation of fill removal to restore natural shoreline elevation. Manzer Brothers also used the excavator to redistribute large rocks from the rock wall along the shoreline, recreating a more natural, dispersed boulder shoreline under the guidance of CBWES staff.


Beach sand removal by hand.


Repurposed rock wall placement.

Construction Details (Continued)

Day 3 – August 1: Final day of fill removal and large rock placement by Manzer Brothers. Many of the large rocks from the shoreline armouring were repurposed to create a rustic retaining wall at the back of the riparian zone that was used to hold excess fill.

Day 4 – August 6: CBWES, TCA, and the homeowners began replanting native vegetation in the riparian zone by preparing the substrate, confirming plant arrangements, watering, and planting some of the materials. Due to very hard, rocky, and compacted substrate, many of the holes for plant placement needed to be pickaxed. Shovels and other hand tools were also used.

Day 5 – August 7: CBWES, TCA, and the homeowners continued planting activities. About 322 native plants were added to the site including: grasses, rushes, ACPF shrubs, native shrubs, and flowering perennials. Existing woody materials, such as brush and logs, were placed to facilitate plant establishment, provide habitat features, and direct water run-off. Brush and logs were sourced from materials already onsite. Plants that were likely to be impacted by deer were protected with metal caging. The weather during this period was hot and dry. It was important to keep the vegetation sufficiently watered during and after the implementation. The homeowners offered to continue watering the newly planted vegetation for several days after the project was complete to assist with plant survival.

Vegetation placement.

Planting

Post-planting and organic material placement in riparian zone.

Restored riparian zone and foreshore.

Project Timeline

Oct 2023

GIS analysis identified Molega Lake of interest as Atlantic Coastal Plain Flora and reptile habitat. Targeted outreach to property owners on Molega Lake — **Mid 2024**

Initial meetings with homeowners to discuss responsibilities, first site visit to take measurements that would inform the design — **Feb 2025**

Walkthrough site with NSECC and applied for Watercourse alteration permit. Manzer Brothers Excavation & Landworks Inc. walkthrough to assess scope of project. Sediment core sampling — **Apr 2025**

Presented to Queens Municipality on Green Shores program. Met with NSDNRR re: SAR permitting. Developed and submitted Avoidance and Mitigation Plan for SAR to DNRR — **June 2025**

Days 3-5 of construction. Rock movement, fill removal, native vegetation planting, organic material placement, deer fencing installed. Monitoring and watering plantings due to drought — **Aug 2025**

Continued collecting submittals to maximize GSH points. Development of 3-year monitoring plan — **Oct 2025**

Jan 2025 Harry Freeman Rd. site is selected. Potential for redroot, reptiles, and other ACPF onsite. CB Wetlands and Environmental Specialists Inc. contracted for design and implementation

Mar 2025 Met with Mersey Tobeatic Research Institute to learn about reptile nesting. Walkthrough of design draft with homeowners. 90% design completion. Manzer Brothers contracted for earthworks

May 2025 Homeowners completed Green Shores training

July 2025 Plan for implementation completed, pre-construction site survey for nesting reptiles completed, permits and approvals received. Day 1 & 2 of construction, mainly fill and beach sand removal

Sept 2025 Organizing before and after photos for verification, gathering submittals. Homeowners shared educational materials with community

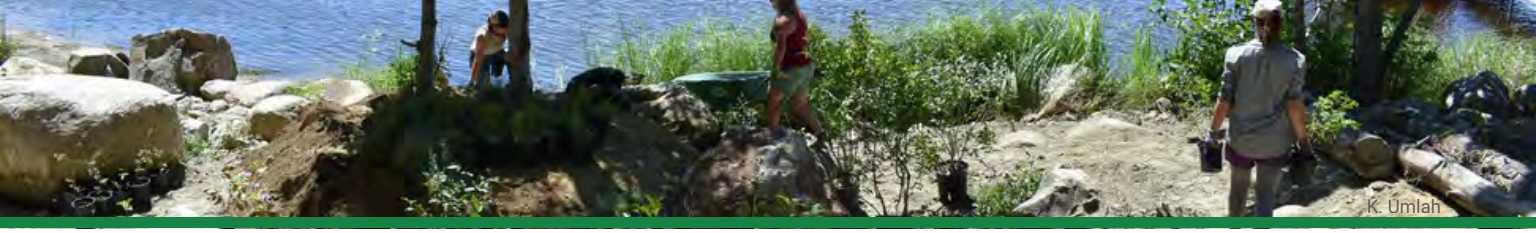
Nov 2025 Site verification and certification

Green Shores for Homes Credits

The following table outlines the activities under which credits this project received points for, and its rating.

Credit	Activity	Points
1.2 Setback/Impact Avoidance	Current regulatory setback: Meet the current setback from the OHWM, Higher High Water Large Tide (HHWLT) mark, the Natural Boundary (NB), or a similar reference line required in your local jurisdiction, with no variance or relaxation of that requirement.	3
1.3 Hard Armour Removal	Net hard armour removal along 25-49% of the shoreline [13m removal of 33m shoreline = 39%]. Monitoring (3 years)	4 1
2.1 Enhanced Critical, Sensitive, or Migratory Bird Habitat	Project work restored critical habitat for Atlantic Coastal Plain Flora and occurred outside nesting period for reptiles Annual monitoring of habitat quality and species observed (yearly for 3 yrs)	3 1
2.2 Riparian and Emergent Vegetation	Maintain and/or plant native vegetation in 75-100% of the Riparian Buffer (RB). Retain or plant overhanging vegetation along 25-49% of shoreline Complete Vegetation Survey as per monitoring guide.	7 1 1
2.3 Trees and Snags	Retain existing trees within the riparian buffer Retain a minimum of 2 snags per acre	1 1
2.5 Organic Material	Add organic material in a way that provides habitat value Retain wrack on shoreline Monitor	1 1 1
2.6 Overwater Structures	No lighting on overwater structures	1
2.7 Access Design	Replace an existing access with one that meets the “Best Practices”	1
3.2 Reduce and Treat Runoff	Naturalization of lot, reducing Effective Impervious Area (EIA) to 5-10%	1
3.5 Herbicides, Pesticides, and Fertilizers	Manage landscaping without the use of synthetic herbicides, pesticides, or fertilizers Complete Landscape Maintenance Checklist	2 1
3.6 Onsite Sewage	Existing onsite sewage treatment is up to date and recently inspected Complete Onsite Sewage Maintenance Plan	2 1
4.2 Public Information and Education	Create 3 or more public information/education measures, including an onsite open house or public demonstration about the project	3
4.4 Shoreline Stewardship Participation	Integrate the project with an environmental program aimed at shoreline protection, enhancement, or restroation	2
	Total	**40**

Gold	The project exhibits exceptional design regarding improvement/conservation of the natural features and processes of the shoreline.	*Minimum 40 points of which a minimum of 20 points (collectively) are acquired from Shoreline Process and Shoreline Habitat credit categories.*



Costs

Project Element	Costs rounded to nearest 100
Background Data Collection	$4,800
Design	$18,600
Staff Hours & Travel	$21,000
Permitting	$8,500
Fill Removal	$10,500
Plants	$2,600
Post-Construction Monitoring	$8,800
Tax (excl. travel + monitoring)	$9,200
Total	**$84,000**


Fill transport.


Redistribution of large rocks on site


Excavation showing the depth of fill onsite.

The table on the left is a breakdown of the approximate costs for each element of this project. One of the major costs was removing the previously imported fill. However, the potential cost of removing the fill was greatly reduced because it was kept within the community. If the fill had to be trucked away, each of the 10 loads could have cost an additional $250 to 500 minimum. Additionally, reutilizing the large rocks from the retaining wall on-site saved 8+ hours of work with a larger machine, at a rate of $75 per hour, and up to 5 more $250 - 500 truck loads to move. An additional 6 hours of work, at a rate of $180 an hour, were graciously absorbed by the project team to finish the project on budget. If these costs had not been avoided or absorbed, the project would have cost an additional $5,000. The final cost of fill removal for this project was about $138/$m^3$ and the final cost of re-vegetating the site was about $17/$m^2$. **Overall, the project cost $560/$m^2$**. A triple bottom line analysis found that Green Shores projects have a 7:1 benefit-cost ratio, meaning for every $1 spent, about $7 of economic, social, and ecological benefits can be expected (Eyzaguirre et al. 2020). Based on this ratio, the added benefits for this project could amount to over $580,000!

Lessons Learned

Effective outreach efforts are important for project success. The Molega Lake site was selected for a fully-funded GSH project after approximately 10 months of outreach efforts to recruit participating homeowners. This ultimately contributed to a shorter timeline for the planning, implementation, and verification phases. Outreach efforts involved: social media posts, including Facebook posts in targeted community pages; a webpage on the TCA website; Green Shores and TCA newsletters; information shared during Green Shores for Homes trainings; and flyer distribution in targeted communities. Working with contractors and consultants proved useful to find participants who had previously considered undertaking shoreline work.

Lessons Learned (Continued)

Timing project around Canadian seasons can be a challenge. The first site visit was in February 2025. The winter climate and weather made obtaining baseline data very difficult. This directly lead to the project taking longer and costing more than necessary. Due to the icy conditions, proper soil sampling for fill depth was not possible, so the onsite fill volume was greatly underestimated. It is helpful for project scheduling to take such conditions into account.

Permitting can be a timely and unpredictable process. There are currently no guidelines for writing an Avoidance and Mitigation Plan for the Department of Natural Resources and Renewables (NSDNRR). If one is required for a project, it may take extra time to determine what needs to be included in the plan for the relevant species. The permit costs are also difficult to find and variable based on the design.

Homeowners are important project participants and champions. The homeowners' involvement in the project from start to finish was key to its success. The homeowners took Green Shores Level 1 and 2 training, and engaged with their neighbourhood, councillors, and communities to further spread the word about the Green Shores program. While the training may have helped equip them to speak to their communities about lakeshore health, their commitment will surely safeguard this project's success for years to come.

Providing comments during the GSH submittal and verification process can ensure applicable points are awarded and project proponent feedback may guide future updates to the GSH Credits & Ratings Guide. Perhaps one of the most important takeaways from this project was that Credit 2.1, as written, does not apply to SAR habitat restoration projects, despite the prevalence of degraded shorelines across Nova Scotia with impacted critical, sensitive, and migratory bird habitats. The credit is a challenge to meet as written, as it requires critical, sensitive, or migratory bird habitat to be on-site, but shoreline work cannot take place within that habitat.

Written comments in the submission helped the verifier understand that the restoration activities within SAR habitat aligned with the intent of Credit 2.1. Consequently, this project highlighted the need for Credit 2.1 to be updated to include points for restoring habitat where it's safe to do so. Further collaboration with the relevant Federal and Provincial SAR biologists will support the development of this credit appropriately.

Screenshot from homeowner's educational Facebook post to local lake groups about the importance of natural lakeshores.

Green Shores Rating

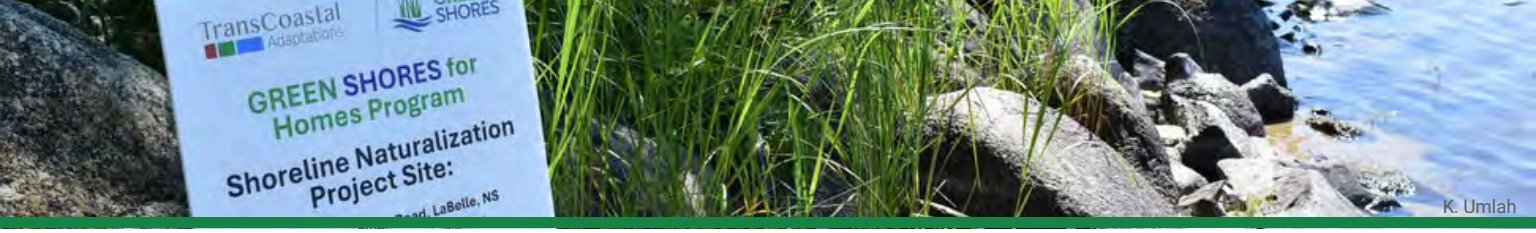
The Molega Lake project received a Green Shores for Homes Gold rating! Gold ratings are awarded to projects that go 'above and beyond' to improve or conserve natural features and processes on the shoreline. Gold ratings require a minimum of 40 points, 20 of which must collectively come from Credit Categories 1 and 2: Shoreline Processes and Shoreline Habitats. The Molega Lake project achieved 28 points from the first two credit categories and 40 points in total, solidifying its status as a Gold standard project (see the credits table on page 9 for details). The homeowners also exceeded expectations for Credit Category 4: Shoreline Stewardship. The homeowners created ample opportunities for the public - especially people living at Molega Lake - to learn about Green Shores, about how to maintain a healthy lake shoreline, and how to conserve habitat for species at risk found around the lake.


Before Construction


During Construction


After Construction


Redroot remains along an unaltered portion of the shoreline at the Molega Lake site.



K. Umlah

Conclusion

The Molega Lake Gold-rated Green Shores for Homes demonstration project improved habitat conditions for multiple SAR within the Kespukwitk Priority Place. Redroot (*Lachnanthes caroliniana*), an ACPF species that is only found on eight lakes in southwestern Nova Scotia - remains in unimpacted shoreline adjacent to the project site. However, previous shoreline activities on the project site had degraded or destroyed Redroot habitat inadvertently, which is unfortunately a common practice along Nova Scotia's shorelines. This project restored suitable habitat conditions for Redroot, other ACPF, and at-risk reptiles by re-naturalizing the shore zone. The project team removed over 76 m^3 of low-quality imported clay fill and sand material, removed upland drainage infrastructure that was having negative ecological impacts, redistributed large rocks to mimic the natural boulder shoreline, and replanted the riparian zone with native and habitat-appropriate vegetation.

Project implementation took place over five days in July and August 2025 and cost $560 per square metre. The project was led by CB Wetlands and Environmental Specialists Inc., with assistance from TransCoastal Adaptations staff, Manzer Brothers Excavation & Landworks Inc., and the homeowners. The project achieved a gold rating (40 points) through the Green Shores for Homes credits and ratings framework. Lessons learned will strengthen GSH Credit 2.1: Enhanced Critical, Sensitive, or Migratory Bird Habitat Stewardship, by incentivizing the restoration of SAR habitat. Overall, the Green Shores for Homes program is a useful tool for SAR stewardship on private property, and will continue to improve through project partner feedback and experiential learning.

Photo Credits

Photos used for this report were taken by: Kelly Umlah (TCA), Holly Giacomodonato (TCA), Kirsten Ellis (CBWES Inc.), Pamela Brennan, and Ite Stackman.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Further Reading

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This project was undertaken with the financial support of:
Ce projet a été réalisé avec l'appui financier de :

Environment and Climate Change Canada | Environnement et Changement climatique Canada

This project took place in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq people. This land is governed by the Treaties of Peace and Friendship. We are all treaty people, and we all have a responsibility to take care of Mi'kma'ki as it takes care of us.