



**GREEN
SHORES**

GREEN SHORES FOR HOMES

Monitoring Guide 2023

*A reference for homeowners
and organizations monitoring
Green Shores for Homes
projects*

*Applicable coast-to-coast for
Washington, British Columbia,
and the Maritime Provinces*



Green Shores[®] for Homes

Monitoring Guide

A reference for homeowners and organizations monitoring Green Shores for Homes projects

2023

By

TransCoastal Adaptations and the Stewardship Centre for BC

GREEN SHORES IS A PROGRAM OF THE
STEWARDSHIP CENTRE FOR BRITISH COLUMBIA

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Content

Introduction	4
How is This Guide Used and Who Can Use It?	4
Why Monitor?	4
Monitoring Program	5
Homeowner Monitoring	6
Methods	6
Photographs.....	6
Taking Photos.....	6
Labelling Photos.....	6
Equipment.....	7
Monitoring Data Sheets	7
Shoreline Maintenance Checklist.....	13
Landscape Maintenance Checklist.....	14
Species Monitoring Plan and Schedule.....	16
Habitat Monitoring Plan.....	19
Credit 3.2 Reduce and Treat Runoff	22
Monitoring Plan and Schedule.....	22
Credit 3.6 Onsite Sewage Treatment	23
Monitoring Plan and Schedule.....	23
Professional Monitoring	26
Category 1: Shoreline Processes	28
Credit 1.3 Hard Armour Removal and Credit 1.5 Nature-Based Erosion and Flood Management.....	29
Monitoring Plan and Schedule.....	53
Methods.....	54
Monitoring Plan and Schedule.....	58
Methods.....	58
Resources	62

Introduction

This Green Shores for Homes (GSH) Monitoring Guide has been created to assist property owners, community organizations, and staff in monitoring the condition and effects of Green Shores projects over time. Sharing the data collected will assist the Stewardship Centre for BC (SCBC), its partners, and the Green Shores program to analyze the effects of using the GSH Credits and Ratings system on ecosystem health and resilience.

How is This Guide Used and Who Can Use It?

This monitoring guide is a tool for homeowners, organizations, and anyone reviewing or monitoring GSH projects to use in gathering consistent and useful environmental information. This guide, when used in combination with the GSH Credits and Ratings Guide and the GSH Submittals Pack, provides additional instructions, step-by-step guidance, and helpful resources to clarify and simplify any information gathering required to meet credit requirements and to achieve long-term monitoring bonus points. SCBC staff and organizations can also use this guide to gather information about GSH projects to evaluate and improve the program, inform future projects, and/or determine environmental effects of the GSH program.

The GSH Monitoring Guide is fully integrated with the GSH Credits and Ratings Guide (2023). Both guides are divided by credit with all relevant information for that credit under the credit heading. Each of the credits within the Credits and Ratings Guide refers directly to this Monitoring Guide when applicable. To use this guide to assist with credit requirements and bonus points:

1. Read all the relevant credit information in the Credits and Ratings Guide;
2. Make note of which Monitoring Guide sections and resources (e.g., checklists) are referenced in the applicable credits;
3. Refer to and complete all relevant sections and resources in this Monitoring Guide;
4. Review the submission requirements for each credit applied for in the Credit and Ratings Guide and the GSH Submittals Pack; and
5. Provide all required information as outlined in the Credit and Ratings Guide and Submittals Pack.

Why Monitor?

The purpose of monitoring is to observe the effect of an action in order to assess whether that action has a positive, negative or neutral contribution to the goals of the project. Monitoring can also indicate whether a project is having the desired effect on ecological or physical processes. The cumulative effects of GSH projects on ecosystem health and resiliency can be better understood by collecting and analyzing environmental data at a GSH site before and after construction, as well as three years post-construction.

Monitoring will help homeowners identify successes and potential issues and can assist everyone in selecting appropriate maintenance and management actions. The most effective management approach in dynamic systems, like shorelines, which are faced with the uncertainties associated

with climate change and sea-level rise, is often adaptive management. Adaptive management involves monitoring the effects of an action (e.g., GSH implementation), identifying any undesired effects and their causes, and then making corrections in response to those observations. Adjustments made in a timely and consistent manner using the adaptive management approach are often more effective and are usually less costly than major repairs further down the road.

Robust and consistent monitoring can also provide valuable information leading to improvements in project design and construction methods resulting in more successful projects and potentially wider acceptance and adoption of the GSH program and principles in shoreline development. All of this will result in healthier and more resilient shorelines for people and all the living beings that rely on them.

Monitoring Program

Many GSH credits require pre- and post-construction data to be collected as part of the GSH submittal process. Some of the credits also offer bonus points for a homeowner's commitment to long-term monitoring (3 years after construction). The following sections outline how the monitoring program applies to each of the credits and provides additional resources, such as monitoring checklists and maintenance plans, to meet credit requirements. The goals of the monitoring program are:

- Long-term, consistent record of the outcomes and effects of GSH projects;
- Better understanding of the cumulative effects of the GSH program on ecosystem health and shoreline resiliency; and
- Knowledge that will improve GSH projects and the GSH program.

The monitoring program is divided into Homeowner Monitoring and Professional Monitoring.

Homeowner Monitoring activities can be performed by homeowners on their own or with assistance from a landscaping design team. Professional Monitoring activities are intended to be performed by qualified Green Shores affiliated professionals as they are more technical and often require specialized materials or equipment.

Homeowner Monitoring

Almost all of the GSH Credits require documentation of pre- and post-construction conditions to be included in the submittals for project verification (GSH rating). Homeowners can quickly and easily monitor their shoreline to provide information which allows GSH verifiers to evaluate the points to be awarded, ensure constructed projects meet GSH credit requirements, and assess projects three years after construction. Homeowner monitoring connects homeowners more deeply to their shorelines and the processes and cycles at work. This understanding is useful for identifying any issues that arise and can also inform adaptive management and maintenance activities. The following sections outline documentation methods and provide resources, such as checklist(s) to streamline documentation and evaluation processes.

Methods

Photographs

Photographs are a quick, easy and effective way to gather observations about a project site. Submittal and monitoring requirements for most credits include photographic documentation. These photographs are intended to provide information to GSH for evaluation of how the environment and property has changed during and after project completion. Photographs provided 3 years post-construction provide information on how the property and environment has adapted to the changes caused by the project. Below you will find instructions of how to take and provide useful photographic documentation to GSH.

Taking Photos

It is important to take photographs from the same points in space and capture the same frame (e.g., choose prominent, ideally permanent, landmarks and select a surface on which you can flatly place the camera). It is also important to have multiple vantage points. As well, it can be beneficial to have an aerial photo, for example from Google Earth or other similar applications (unless you can take aerial pictures with a drone).

Labelling Photos

For all credits for which you provide photographs along with your data sheets, ensure photos are in .jpg or .png format and labelled as per the example below. You can provide any additional notes about the area that might be of an interest in the data sheet.

Homeowner Monitoring

Photo ID:
photonumber_credit_month-day-
year_photographerlastname

Example: 01_cr1_May-8-2021_Yangel

Figure 1: Photograph ID instructions.

Equipment

- GSH Monitoring Guide
- Applicable checklist(s)/data sheets
- Pencil and eraser
- Camera
- Binoculars
- Equipment to mark or record photo locations (e.g., stakes, handheld GPS)
- White board and marker to identify photos

Monitoring Data Sheets

Please complete and submit the following forms, as applicable.

- Project Documentation Submission Cover Sheet
- Homeowner Monitoring Checklist
- Shoreline Maintenance Checklist
- Species at Risk and Migratory Bird Observation Data Sheet

Homeowner Monitoring

Project Documentation Submission Cover Sheet

To be completed and submitted with all required pre- and post-construction monitoring reports.

Property Owner(s) name(s): _____

GSH Region: () British Columbia () Washington () Maritime Provinces () Other, specify: _____

Property Address: _____

Report Name (e.g., Pre-construction): _____

Report prepared by: _____ Reporting Date: _____ (YYYY-MM-DD)

Date of GSH Verification: _____

GSH Credits & Points Summary

Credit Category		Credit	Points Obtained
Shoreline Processes	1.1	No Shoreline Protection Structures	
	1.2	Setback/Impact Avoidance	
	1.3	Hard Armour Removal	
	1.4	Groin Removal	
	1.5	Nature-Based Erosion & Flood Management	
	1.6	Managed Retreat	
Shoreline Habitats	2.1	Enhanced Critical, Sensitive, or Migratory Bird Habitat Stewardship	
	2.2	Riparian and Emergent Vegetation	
	2.3	Trees and Snags	
	2.4	Invasive Plants	
	2.5	Organic Material	
	2.6	Overwater Structures	
	2.7	Access Design	
Water Quality	3.1	Site Disturbance	
	3.2	Reduce and Treat Runoff	
	3.3	Environmentally Friendly Building Products	
	3.4	Creosote Materials Removal	
	3.5	Herbicides, Pesticides, and Fertilizers	
	3.6	Onsite Sewage Treatment	
Shore Stewardship	4.1	Shoreline Collaboration	
	4.2	Public Information and Education	
	4.3	Conservation Easement or Covenant	
	4.4	Shoreline Stewardship Participation	

Homeowner Monitoring

Monitoring Checklist

The Homeowner Monitoring Checklist should be completed pre-construction, post-construction, and three years after certification, as applicable. Most of these monitoring activities will require a photo submission as evidence that the credit has been achieved or maintained. As per photograph instructions on the previous page, ensure that monitoring photos are taken from the same vantage point. This will make changes over time much more evident. The required monitoring is needed for submission. It is separate from the homeowner and professional monitoring which provides additional points.

Submit photos following the photo-instructions. Use the checklist on the following page to keep track of which monitoring activities have been completed.

Homeowner Monitoring

Credit Category		Credit	Submittals	Pre-Construction	Post-Construction	Third Year Monitoring
Shoreline Processes	1.1	No Shoreline Protection Structures	Provide photo from same vantage point of no structures.			
	1.2	Setback/Impact Avoidance	Provide photos showing appropriate setback distance.			
	1.3	Hard Armour Removal	Submit photos showing removal and/or maintenance.			
	1.4	Groin Removal	Provide photos before and after groin removal.			N/A
	1.5	Nature-Based Erosion and Flood Management	Provide photo of the shoreline from the same vantage point.			
	1.6	Managed Retreat	Provide photos of the building showing managed retreat.			N/A
Shoreline Habitats	2.1	Enhanced Critical, Sensitive, or Migratory Bird Habitat Stewardship	Provide photos showing extra critical habitat, sensitive habitat, and/or migratory bird habitat stewardship.			
	2.2	Riparian and Emergent Vegetation	Provide photos showing riparian and emergent vegetation.			
	2.3	Trees and Snags	Provide photos of trees or snags.			N/A
	2.4	Invasive Plants	Provide photos of invasive plants, including on neighbouring properties.			
	2.5	Organic Material	Show organic materials including wrack and seaweed along shoreline.			
	2.6	Overwater Structures	Show the continued absence of overwater structure OR show the conditions of the structure.			N/A
	2.7	Access Design	Show the condition of any existing or new access areas.			N/A
Water Quality	3.1	Site Disturbance	Provide photos to show minimal disturbance.			N/A
	3.2	Reduce and Treat Runoff	Provide photos of <ul style="list-style-type: none"> • Impervious Surface Areas (ISAs) • Effective Impervious Surface Areas • Features to treat rainwater. 			
	3.3	Environmentally Friendly Building Products	Provide list of products used.	N/A		N/A
	3.4	Creosote Materials Removal	Provide photos of removal and/or disposal receipt.		N/A	
	3.5	Herbicides, Pesticides, and Fertilizers	Complete the Landscape Monitoring Checklist.	N/A		
	3.6	Onsite Sewage Treatment	Provide photos showing any changes to the system.	N/A	N/A	

Homeowner Monitoring

Shore Stewardship	4.2	Public Information and Education	Provide a photo of the education measures in place.	N/A		
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Homeowner Monitoring

There are five monitoring activities that can be completed by the homeowner or with assistance from a landscape design team, a qualified non-governmental organization or academic group. Completing these activities can help ensure the health and longevity of a Green Shores shoreline, as well as receive monitoring points.

- Shoreline Maintenance Checklist;
- Landscape Maintenance Checklist;
- Species at Risk and Migratory Bird Observations;
- Credit 3.2 – Reduce and Treat Runoff; and
- Credit 3.6 – Onsite Sewage Treatment Systems.

Homeowner Monitoring

Shoreline Maintenance Checklist

Best Practices for shoreline maintenance are for areas with no critical, sensitive, or migratory bird habitat identified. If critical, sensitive, or migratory bird habitat is identified on your property, you must take extra steps to ensure that maintenance does not constitute activities that are likely to destroy critical habitat. Refer to the recovery strategy for the species identified on your property for which activities are likely to destroy critical habitat (see Resources section).

Maintaining Shorelines and Organic Materials	Additional Information
<p>Indicate which of the following Maintenance Best Practices you use:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Leave all seaweed, wrack and organic debris in place <input type="checkbox"/> Do not rake debris along the shoreline <input type="checkbox"/> Remove all plastic, rope and other litter <input type="checkbox"/> Bag and remove all pet waste <input type="checkbox"/> Do not fertilize shoreline plants <input type="checkbox"/> Keep yard and/or garden waste off the shoreline <input type="checkbox"/> Leave all naturally occurring shoreline plants in place <input type="checkbox"/> Leave all rocks and gravel on the shoreline <input type="checkbox"/> Leave all sand and sediment on the shoreline 	<p>Wrack material provides habitat for a wide variety of invertebrates which in turn provide food for shorebirds. Wrack also provides natural fertilizer for shoreline plants. Pet waste, while being a nuisance, can also carry microorganisms that are dangerous to wild animals and people (especially children). Yard and garden waste often contain weeds and non-native species, these species can colonize shorelines, which displaces native plants, changes the habitat, and provides fewer food resources for native fauna. Rocks, gravel, and sand all have important functions on the shoreline, removing them can change the sediment dynamics of the shore.</p>
<ul style="list-style-type: none"> <input type="checkbox"/> Take photos throughout the year of the beach or shoreline from the same vantage point, at high and low tides. Record the date and time of each photo. 	<p>The amount of sand or sediment on the beach is constantly changing. Sand migrates in and out in response to waves and tides. Photographs that show the amount of sand or the wrack water line helps monitor how the shoreline is withstanding storm-caused erosion or long-term environmental changes. Continual photographic monitoring assists coastal managers and researchers in understanding erosion and recovery processes, enhancing our understanding of coastal dynamics at the Green Shores location.</p>

Landscape Maintenance Checklist

Best Practices for landscape maintenance are for areas with no critical, sensitive, or migratory bird habitat identified. If critical, sensitive, or migratory bird habitat is identified on your property, you must take extra steps to ensure that maintenance does not constitute activities that are likely to destroy critical habitat. Refer to the recovery strategy for the species identified on your property for which activities are likely to destroy critical habitat (see [Resources](#) section).

	Maintaining Trees, Shrubs & Lawns	Additional Information
Gardening Best Practices	<p>Indicate which of the following Maintenance Best Practices you use:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Aerate (core) lawn areas annually <input type="checkbox"/> Let grass clippings fall in place <input type="checkbox"/> Dry out plants between watering <input type="checkbox"/> Apply 1-2 inches of composted mulch to planted areas annually <input type="checkbox"/> Hand weed planter beds/pots <input type="checkbox"/> Relocate or replace plants requiring high maintenance/water inputs (i.e.: use plants adapted to your garden's climate and soils) <input type="checkbox"/> Fertilize only when required 	<p>Aeration of turf reduces compaction and increases air, nutrient and water movement into the soil. By increasing water infiltration, runoff and erosion can be reduced. Letting grass clippings fall in place cycles nutrients. Drying out plants between watering promotes healthy rooting. Relocating plants to sites with optimal conditions for that species can help reduce maintenance inputs (right plant - right place). Also, plants that are adapted to your garden's conditions (i.e.: native plants) reduce watering and general maintenance needs.</p>
Product Selection	<p>Indicate which of the following Maintenance Products you use (or plan to use):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Local organic fertilizers (compost, composted manure, etc.) <input type="checkbox"/> Organic 'processed' fertilizers (bone meal, fish compost, blood meal, etc.) <input type="checkbox"/> Slow Release Nitrogen fertilizers <input type="checkbox"/> Electric, cordless electric or push-reel (non-gas powered) mower 	<p>Avoiding the use of chemical or synthetic fertilizers can dramatically reduce the amount of nutrients delivered to shorelines and receiving water bodies. It also reduces demand for non-renewable resources that are used to manufacture synthetic fertilizers. Using human-powered tool helps improve urban air quality and reduces noise pollution.</p>
	Pest Management	Additional Information
Gardening Best Practices	<p>Indicate which of the following Pest Management Best Practices you use (or plan to use):</p> <ul style="list-style-type: none"> <input type="checkbox"/> Hand removal or pruning out of pests and disease <input type="checkbox"/> Pest traps (slug traps, or tanglefoot on tree trunks, etc.) <input type="checkbox"/> Barriers to pest movement (copper strips to stop slugs; mesh netting for birds, etc.) 	<p>Simple gardening techniques can go a long way to reducing pest problems in the average garden. Spending time in your yard to identify pests or disease occurrences early, and then remove them manually before they become an infestation is often the least expensive and most effective strategy for pest management.</p>

Homeowner Monitoring

<p>Product Selection</p>	<p>Indicate which of the following Pest Control Products you use (or plan to use):</p> <ul style="list-style-type: none"><input type="checkbox"/> Horticultural oils, soaps or minerals (e.g., sulphur, baking soda, iron phosphate, horticultural oil, etc)<input type="checkbox"/> Bio-controls (i.e.: Bt, predatory nematodes, or beneficial insects, etc)<input type="checkbox"/> Botanicals (e.g., neem oil, pyrethrum, etc.) <p><i><u>NOTE:</u> Use these pesticides only as a last resort!</i></p>	<p>Avoiding the use of synthetic and poisonous substances in your garden reduces health risks to humans, and it also prevents the removal of beneficial insects. Typically, poisons and chemical sprays will kill not only the pest, but also insects that feed on the pests or insects that provide other 'services' to your garden (pollinators, spiders, ladybugs, etc.).</p>
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Credit 2.1 Enhanced Critical, Sensitive, or Migratory Bird Habitat Stewardship

Homeowner monitoring described for this credit focuses on monitoring large, charismatic, at-risk wildlife and migratory birds – as these are more easily observed and identified compared to other species – and habitat quality monitoring. Homeowner monitoring is valuable, as the professionals undertaking official monitoring on site visits are not present as much as the homeowner; since most of the species being monitored are mobile, they may not be around at the small point in time when a professional visits, thus making the homeowner an important agent in monitoring species and habitat health. Observations of other species such as plants, amphibians, reptiles and/or insects are also welcome, and can be similarly recorded in the observation data sheet. Additionally, homeowners can see changes in the physical aspects of their property better and thus can track any and all changes that enhanced habitat stewardship may have on critical or sensitive habitats occurring on their land, or can report on any changes that may be negatively affecting the habitat.

Species Monitoring Plan and Schedule

Observing habitat use by species is an ongoing monitoring activity that occurs anytime in the year to observe trends throughout different seasons, and to capture the activities of migratory species when present. Although there are well known windows for when certain species are most likely to be present, wildlife do not let us know their schedule, so observations tend to be opportunistic and unplanned. Professional site visits are intended to be recorded once a year for three years after construction to observe the frequency and changes of wildlife species at risk or migratory bird sightings at the property. Species monitoring should occur as frequently as possible for the three-year period. Photographs are encouraged where possible while also respecting the need to keep a distance from wildlife, particularly nesting species. Visit your local Green Shores website (see Resources) for more information on what relevant species identification resources are available in the area.

Apps such as iNaturalist for plants and animals and Merlin for Bird ID are helpful resources to aid in the identification of flora and fauna. Additionally, there are great citizen science tools that homeowners can use to monitor species at risk on their properties. For example, Birds Canada has numerous monitoring programs and data portals that a homeowner could use to monitor birds on their shores, such as Piping Plover (*Charadrius melodus*) or Bank Swallow (*Riparia riparia*). Additional resources may be available with other NGOs in your locality.

Instructions:

Homeowner Monitoring

1. Take time each day, when possible, to observe any wildlife on your property. Binoculars are useful tools for observation of species from afar. Dawn and dusk are often good times to observe wildlife, but this is very species dependant.

When wildlife is spotted:

- a) Take note of the time.
- b) Use binoculars to get a better view of wildlife.
- c) Take a photo if possible.
- d) Keep a copy of the species at risk and migratory bird observation data sheet nearby to record observations.
- e) Use field guides, iNaturalist, Merlin or other resources to identify species.

Species at Risk and Migratory Bird Observation Data Sheet

Date	Name of Species Observed	# of individuals observed	Direct or indirect (e.g., footprints, feathers) observation	Photo (Y/N)	Activities observed (e.g., feeding, resting)	Nests (Y/N) and number	Duration of observation (min)

Homeowner Monitoring

Habitat Monitoring Plan

If you reside in Canada, you can access the information needed for this sheet by going to the species at risk public registry: <https://species-registry.canada.ca/index-en.html#/documents?documentTypeId=10&sortBy=documentTypeSort&sortDirection=asc&pageSize=20> and searching for the recovery strategy for the species found on/near your property. Within the recovery strategy document, under the Critical Habitat section, you should find a table or list outlining the essential habitat needs of the species (biophysical attributes), and another table or list describing activities likely to destroy critical habitat (ALTDs). Similar information for Important Bird Areas (IBAs), sensitive habitats, or in Washington state (<https://wdfw.wa.gov/species-habitats/at-risk/phs>) can be found through online sources as well. Remember: sensitive habitats can include federally, provincially, or regionally designated Environmentally Sensitive/Significant Areas, Protected Natural Areas, National Parks, and Nature Reserves. Search for provincial resources and/or work with a biologist, ecologist, or other coastal professional to determine which sensitive habitats your property may be in/around, as the information is spread across many resources based on your local jurisdiction.

When filling in the habitat monitoring data sheet, write all the biophysical attributes of the critical habitat in the left column, and all ALTDs in the right column to refer to on each monitoring year and indicate whether they are present (Y) or not present (N) on your site next to them. Note any changes year-to-year in the rows below. For example, two biophysical attributes for Bank Swallows (*Riparia riparia*) are highlighted below¹:

Life stage	Function	Biophysical Feature(s)	Attributes
Adults and juveniles	Nesting	Natural bank structure such as stream bank, river bank, bluffs, cliffs, eskers, or dunes	<ul style="list-style-type: none">• Morphological attributes:<ul style="list-style-type: none">- Vertical or near-vertical face (portion of the bank above the talus with a slope of at least 70 degrees) structure- Minimum height of bank face of 0.5 metres• Composition of erodible material that would include any proportions of the following substrates:<ul style="list-style-type: none">- Sand- Silt- Loose clay- Fine gravel- Organic soils

Figure 2: A portion of the critical habitat identification table outlining the life stage, function, biophysical features and attributes of the habitat necessary for Bank Swallow survival.

¹ Environment and Climate Change Canada. 2022. Recovery Strategy for the Bank Swallow (*Riparia riparia*) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 125 pp.

Habitat Monitoring Data Sheet

Year of Construction:	
Species: Indicate if present (Y) or not present (N) on your site when you list them below	
Biophysical Attributes needed for this species:	ALTD critical habitat for this species:
<p>Have any biophysical attributes changed? Note any changes below each year:</p>	<p>Have any activities likely to destroy critical habitat been observed? If yes, list below each year:</p>
YEAR 1 POST-CONSTRUCTION OBSERVATION DATE:	

Homeowner Monitoring

YEAR 2 POST-CONSTRUCTION OBSERVATION DATE:

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YEAR 3 POST-CONSTRUCTION OBSERVATION DATE:

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Important Bird Area links:

Canada: https://www.ibacanada.com/explore_how.jsp?lang=EN

United States: <https://www.audubon.org/important-bird-areas>

Credit 3.2 Reduce and Treat Runoff

Monitoring Plan and Schedule

This monitoring activity can be completed three years after construction to observe changes to runoff designs and patterns on the property.

Reduce and Treat Runoff Data Sheet

Describe any changes to the reduction and treatment plans for runoff. Monitoring of runoff can occur at multiple times of the year, including during spring snowmelt runoff and after large storms. Indicate any changes in the chart below and submit photos, when relevant, to show any changes.

	Post-Construction	Year 3 Monitoring
Are low impact development measures for runoff reduction being implemented/still in place?		
Has new impervious surface area been installed/maintained?		
Any impervious surface removed and none added?		
Is the runoff drainage path effective/still the same?		
Any new features for treating rainwater (e.g., absorbent landscape, green roof etc.)?		

Update Site Plan

The Site Design Plan for the property should be updated if:

- New impervious surface areas have been installed,
- Impervious surface areas have been removed,
- A new drainage path has been created, or
- New features for treating rainwater have been installed.

Homeowner Monitoring

Credit 3.6 Onsite Sewage Treatment

Monitoring Plan and Schedule

This monitoring section should be completed three years after construction to ensure the proper function of the onsite sewage system (OSS).

OSS Maintenance Plan Checklist

Please answer the following questions if there is an onsite sewage treatment system (e.g. septic tank) on the property:

When was the septic system last checked/pumped by a qualified professional? _____
(YYYY-MM-DD)

Next anticipated check? _____ (YYYY-MM-DD)

*Note: we recommend the septic system to be pumped out by a license contractor every 3-5 years (Shoreline Property Resources, n.d.).

Complete the following checklist of your septic system.

Requirement Met?	Requirements	Information
Y / N	<input type="checkbox"/> Note the following: <ul style="list-style-type: none"> ○ All tank access points, dispersal, and outfall locations if applicable. ○ Type of OSS (i.e., contour, peat, approved alternatives) ○ Size/capacity of OSS <input type="checkbox"/> Recommended pumping schedule <input type="checkbox"/> List contact information for: septic hauler; inspector; and agency/department to report system malfunctions or possible release of untreated sewage to environment <input type="checkbox"/> Note any issues or malfunctions such as backups, odours and/or pooling water)	
Y / N	Best Management Practices in maintenance plan: <input type="checkbox"/> Avoid pouring or flushing into the septic system the following: oil, grease, disinfectants	For further information on Onsite Sewage

	<p>(kills the bacteria within the system), solvents, paints, caustic cleaners, cigarette butts, sanitary supplies, diapers, condoms, tissues, napkins, tea leaves, coffee grounds, and fats. These contaminants can all plug a septic tank, treatment components, dispersal field, or harm the biological processes in the treatment system.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Protect the system from physical damage, for example, <ul style="list-style-type: none"> ○ no vehicle traffic over the system components including the dispersal field, ○ do not alter the substrate or cover the dispersal field with textile or plastic liner (the dispersal field requires oxygen), ○ do not plant trees or shrubs over or within proximity of the dispersal field (the roots can damage the integrity of the dispersal field and cause short circuiting) <input type="checkbox"/> Do not use septic system additives <input type="checkbox"/> Do not allow roof or foundation drains, sump pumps, or other surface water sources to discharge into the onsite sewage system <input type="checkbox"/> Do not hydraulically overload the system; for example, running toilets, leaky faucets, etc. <input type="checkbox"/> Do not irrigate or water the dispersal field or near tanks <input type="checkbox"/> Do not install a garburator <input type="checkbox"/> Do not discharge drinking water treatment systems backwash (water softeners, filter media recharge) to the onsite system <input type="checkbox"/> Mitigate excessive surface water and inflow from rain runoff. This can be achieved by grading the property to avoid surface water pooling or installing interceptor trenches to divert stormwater around the dispersal field 	<p>System see Green Shores for Homes Credits and Ratings Guide, Credit 3.6.</p>
	<ul style="list-style-type: none"> <input type="checkbox"/> If it is a new/replaced/relocated, provide documentation signed by a qualified inspector or 	

Homeowner Monitoring

	appropriate authority that the system meets the current standards/regulations in your local jurisdiction for distance (setback) from the shoreline, or a minimum 15 m/50 ft from the ordinary high-water mark (OHWM), whichever is greater	
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Professional Monitoring

The GSH Credits and Ratings Guide includes 4 credits with bonus points that can be achieved through a commitment to 3 years of post-construction monitoring by a trained professional(s). Applicable monitoring methods and resources, such as checklist(s), are included in the following sections for each credit where monitoring bonus points are available.

The credits that have monitoring bonus points available are:

- Credit 1.3 – Hard Armour Removal*
- Credit 1.5 – Nature-Based Erosion and Flood Management*
- Credit 2.1 – Enhanced Critical, Sensitive, or Migratory Bird Habitat Stewardship
- Credit 2.2 – Riparian and Emergent Vegetation
- Credit 2.5 – Organic Material

* You cannot get points for Credit 1.5 AND for Credit 1.3 EXCEPT if hard armour is removed from one portion of the shoreline (Credit 1.3) and another portion of the shoreline that was previously unprotected is treated with nature-based erosion and flood management methods (Credit 1.5). It is only possible to get monitoring bonuses for both credits in the aforementioned scenario. If a portion of shoreline had hard armour removed and then was treated with nature-based methods, monitoring points can only be claimed in one credit or the other, but not both.

This section is organized by category and credit, as outlined within the GSH Credits and Ratings Guide, and all bonus monitoring information provided aligns with the GSH Credits and Ratings Guide and GSH Submittals Pack.

Professional Monitoring

Professional Monitoring Submission Cover Sheet

To be completed and submitted with all post-construction bonus monitoring reports.

Property Owner(s) name(s): _____

GSH Region: () British Columbia () Washington () Maritime Provinces () Other, specify: _____

Property Address: _____

Report prepared by: _____ Reporting Date: _____ (YYYY-MM-DD)

Report Name (e.g., As-built, Year 3 post, etc.): _____

Date of GSH Verification: _____

GSH Bonus Points Summary:

Credit Category		Credit	Original Points Obtained
Shoreline Processes	1.3	Hard Armour Removal	
	1.5	Nature-Based Erosion & Flood Management	
Shoreline Habitats	2.1	Enhanced Critical, Sensitive, or Migratory Bird Habitat Stewardship	
	2.2	Riparian and Emergent Vegetation	
	2.5	Organic Material	

Category 1: Shoreline Processes

Shoreline processes refer to the interaction of water, wind, and waves with the shore that shape our diverse beach, bluff, cliff, and estuarine areas.

Monitoring shoreline processes is essential for the protection, restoration, and/or maintenance of the natural physical processes that form and maintain shorelines. Through monitoring, we can ensure that shoreline processes are not negatively impacted by project elements and are able to continue to benefit shoreline ecosystems along with the many organisms that live within them.

This category is intended to reward restoration and enhancement actions, and avoidance of activities that damage shoreline processes. Bonus monitoring for this category is focused on collecting data about shoreline processes after construction of a GSH project.

This section provides monitoring details for:

Credit 1.3: Hard Armour Removal

Credit 1.5: Nature-Based Erosion and Flood Management

Credit 1.3 Hard Armour Removal and Credit 1.5 Nature-Based Erosion and Flood Management

Observing the effect of a nature-based protection measure on shoreline processes is necessary to evaluate the success of a project in upholding GSH principles. Monitoring the effectiveness of nature-based methods for addressing coastal erosion and/or habitat loss will contribute to a growing body of information about nature-based solutions. Regular monitoring will help identify any issues early on and will help guide maintenance activities. Small, incremental modifications in response to observations early in the life of a project can increase its effectiveness and reduce maintenance costs by addressing small issues before they become major repairs.

Monitoring Plan and Schedule

The professional monitoring plan for Credits 1.3 and 1.5 includes documentation of shoreline features that indicate the effect of a project on shoreline processes. Features such as shore substrate composition, losses/gains in plant material, erosion, log or rock movement and changes to beach profiles provide valuable information about sediment movement, the energy level of coastal forces experienced at a site, and the ability of the project to withstand impacts. A schedule is provided (Table 1) for inspecting the elements of nature-based methods on a seasonal basis as well as after major storm events, to determine how key features stand up to storm surge, wind, waves, etc.

Table 1: Credit 1.3 and Credit 1.5 bonus monitoring schedule.

Monitoring Activity	Shoreline Feature	Sampling Frequency	Pre-Construction	As-built	Post-Construction		
					Year 1	Year 2	Year 3
Photo-documentation	All elements of nature-based shoreline protection	Twice annually; May and November. Post storm		✓	✓	✓	✓
	Foreshore habitat	Twice annually; May and November	✓	✓	✓	✓	✓
	Erosion/Damage	Twice annually; May and	✓	✓	✓	✓	✓

Category 1: Shoreline Processes

		November. Post storm					
Vegetation Survey*	Vegetation; critical to the structure and/or function of the method	Annually; August		✓	✓	✓	✓
Substrate Survey	Shore substrate/ sediment composition	Annually; August	✓	✓	✓	✓	✓
Shore Profile Survey	Shore slope (bank, beach, intertidal) and width	Annually; August	✓	✓	✓	✓	✓
Updated Site Plan**	All elements of nature-based protection measures	Pre-construction , As built, and Year 3		✓			✓

* Only applicable to vegetation that did not receive points under Credit 2.2 Riparian and Emergent Vegetation.

** If conducting professional monitoring for more than one credit, a single updated site plan that contains the information for all credits being monitored is recommended.

Methods

Photo-documentation

Photographs are a quick, easy, and effective way to gather observations about the project site and nature-based methods implemented. Complete instructions of how to take and provide useful photographic documentation, as well as an equipment list, are provided on pages 6 and 7 of this Monitoring Guide.

Nature-Based Erosion and Flood Management Photos

Pre-construction and as-built photographs provide information about the pre-existing shoreline conditions, project structures, and surrounding environment before, during, and after project completion. Post-construction photographs provide information on how the project elements have evolved over time in response to environmental conditions and how surrounding shoreline has adapted to the changes caused by the project.

Instructions:

1. Identify photo locations; mark with stakes or on GPS (initial survey) or locate stakes/navigate to GPS coordinates (subsequent surveys).
2. Photographs of the nature-based method from the same vantage points as in the initial surveys. Include photos of all elements of the project.
3. Close up photos of key features; i.e., structures, vegetation, nourishment areas.

4. Photos of any repairs or adaptive management actions.

Foreshore Habitat Photos

Fish and wildlife tend to favour beaches with adjacent vegetated areas, which are almost always increased in quantity and quality following implementation of nature-based methods. Soft shore protection and shoreline beach enhancement projects can restore or augment shoreline features to provide a net gain in shoreline habitats area and function, as well as ecological services such as carbon sequestration water purification, and nutrient cycling. Monitoring of these features can provide the property owner and the GS program a better understanding of foreshore habitat changes over time.

Instructions:

1. Identify photo locations; mark with stakes or on GPS (initial survey) or locate stakes/navigate to GPS coordinates (subsequent surveys).
2. Photographs of the beach from the same vantage points as in the initial surveys, covering the areas with soft shore protection. Incorporating a characteristic landmark or feature in your photographs (e.g., point of land, tree, large boulder), when possible, helps with interpretation of shoreline changes.
3. Include photos of the upper beach area below the Ordinary High Water Mark from the same vantage points as in previous stages for comparison.
4. Close up photographs of the intertidal zone capturing any invertebrates, seaweed and seagrass you can see.

Category 1: Shoreline Processes

Option 1:



Figure 3: Top and bottom panels on the left depict the beach from two different vantage points (Porpoise Bay, British Columbia). The right panel captures a section the intertidal zone covered with seagrass, small mollusks, and crabs (White Rock beach, British Columbia). *Credit: E. Yangel.*

Category 1: Shoreline Processes

Option 2:



Figure 4: Left panels depict the beach from two different vantage points (Porpoise Bay, BC). Panels on the right capture a section of an intertidal zone: the top right shows sea stars and seaweeds in the rocky intertidal (Gabriola Island, BC), the bottom right captures seagrass, small mollusks and crabs in the sandy intertidal zone (White Rock, BC). *Credit: E. Yangel.*

Erosion or Damage Photos

Damage, erosion and/or scour can occur around any shoreline structure in response to normal coastal processes or extreme events (i.e., storms, flooding, drought). Seasonal and post-storm inspections and documentation of issues can help identify normal seasonal variations, as well as areas where adaptive management or repairs may be needed.

Vegetation Survey

Vegetation monitoring for nature-based methods only applies to vegetation that is a key structural and/or functional component of the project. For example, monitoring would apply to plantings on

Category 1: Shoreline Processes

engineered dunes, graded banks or created marshes because they are required for the structural integrity and ecological function of those methods. For approaches such as beach nourishment that do not require vegetation, any riparian vegetation added would receive credit, and therefore be monitored, under Credit 2.2. Vegetation surveys are easiest to complete at the height of the growing season; typically, August in Canada and Washington.

Equipment:

- GSH Monitoring Guide
- Field guide to local flora
- Vegetation survey data sheet
- Pencil and eraser
- Camera
- 100 ft (30 m) tape measure or measuring wheel
- White board and marker to identify photo

Instructions:

1. Identify a suitable daytime low tide window (1 hour before to 1 hour after low tide) to conduct the survey at the site. Use <https://tides.gc.ca/en/stations> or https://tidesandcurrents.noaa.gov/tide_predictions.html?gid=1415 to find the nearest tidal station information including tide times and heights. Low tides will be lowest during full and new moon cycles.
2. Complete Vegetation Survey Data Sheet.
 - During as-built survey, record number of individuals of each species planted.
3. Identify photo locations; mark with stakes or on GPS (initial survey) or locate stakes/navigate to GPS coordinates (subsequent surveys).
4. Take photo(s) of each vegetation community surveyed; instructions and equipment needed are provided in the Methods section above.

Category 1: Shoreline Processes

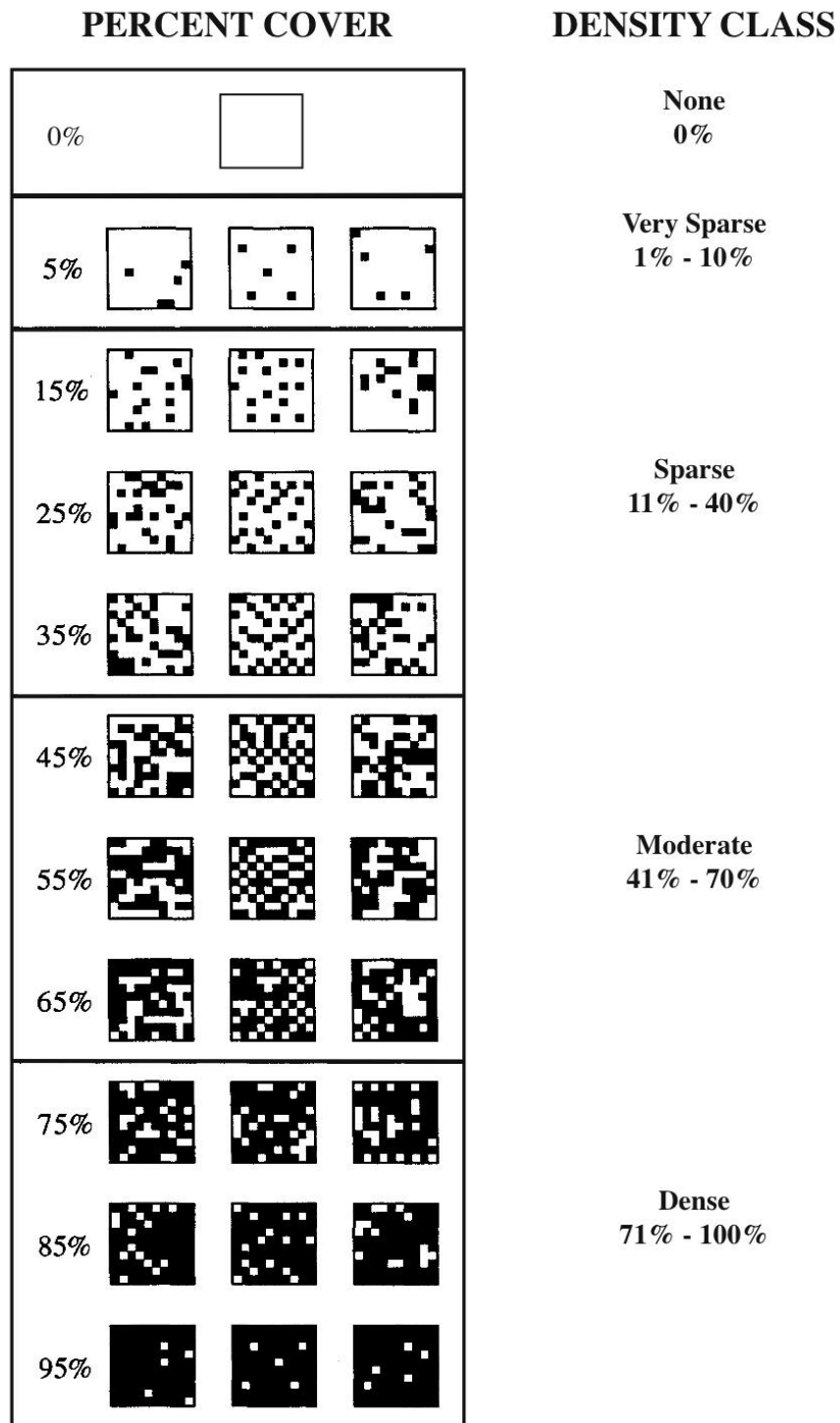


Figure 5: Visual aide for estimating % cover.

Category 1: Shoreline Processes

Vegetation Survey Data Sheet

Use this data sheet to record vegetation observations. Complete one data sheet for each vegetation community (i.e., salt marsh, dune, upland).

Site:

Surveyor Name:

Date:

Weather conditions:

Vegetation community type: _____

Species observed:

Length of vegetated area (parallel to water line): _____

Width of vegetated area (perpendicular to water line): _____

Vegetated Area (Length x width) = _____

Vegetation coverage (Visual estimate; % of area that is vegetated vs % bare ground): _____ % (see

Figure 5: Visual aide for estimating % cover.

Total # of plants originally planted: _____

Total # of plantings living during survey: _____

Survival rate: (# living /total planted)*100 = _____ % survival

New plantings (# of plants planted after original planting): _____

Note: attach photos of each vegetation community surveyed.

Shore Substrate Survey

To understand changes in the type of material on a shoreline, explore the intertidal zone between the Ordinary High-Water Mark (or Natural Boundary) and Low Water Mark. Identify the types of sediment in the intertidal zone to see if/how the shoreline substrate composition has changed in response to the implementation of nature-based adaptation methods. Select random point(s) that are representative of sediment composition of different zones within the intertidal.

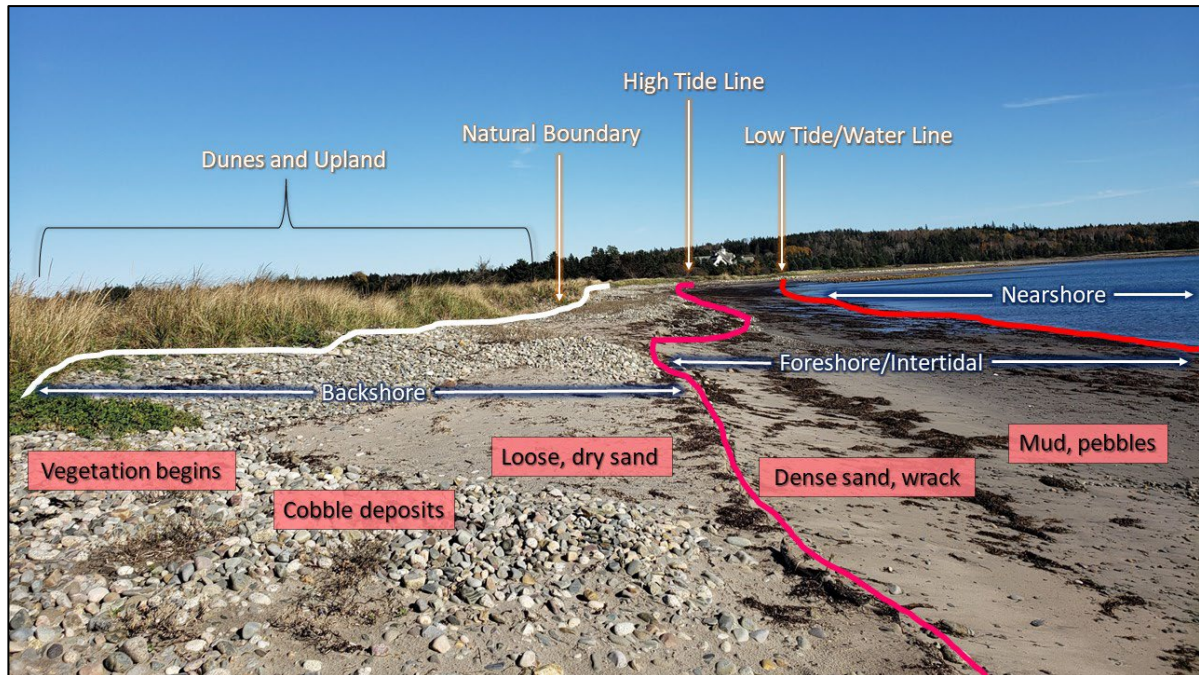


Figure 6: Example of sediments that can be found on shorelines in different tidal zones. *Photo credit: J. Heeney.*

Equipment:

- GSH Monitoring Guide
- Handheld GPS or GPS enabled device with Google Earth
- Camera
- Pencil and eraser
- Shore substrate data sheet
- 1m x 1m quadrat or ruler
- 2m stakes or pins per 50m of shoreline; hammer to install
- White board and marker for photo identification
- Rope

Instructions:

1. Identify a suitable daytime low tide window (1 hour before to 1 hour after low tide) to conduct the survey at the site. Use <https://tides.gc.ca/en/stations> or

Category 1: Shoreline Processes

https://tidesandcurrents.noaa.gov/tide_predictions.html?gid=1415 to find the nearest tidal station information including tide times and heights. Low tides will be lowest during full and new moon cycles.

2. Establish transect(s) perpendicular to shoreline. 1 transect per 50 m of shoreline length is recommended. Mark with stakes or pins. Starting stake should be 2 meters into the upland (i.e., at the top of a bank or the back of the dune) and second stake should be 1 meter into the upland. To ensure a straight, repeatable transect, make sure to align visually both stakes or tie one end of the transect rope to the first stake and pull the rope walking towards the shoreline making sure it touches the second stake.
3. Identify areas of different sediment composition within the intertidal zone along each transect (e.g., cobble upper beach, sandy mid-intertidal, gravel low-intertidal). See Figure 6.
4. Select a representative point in each sediment type along each transect for the survey and record GPS coordinates of the sampling point using handheld GPS or, or Google Earth on GPS enabled device.
5. Place quadrat or ruler for scale and take a photo of sediment at each sampling location (Figure 7). Photo should be taken looking straight down.
6. Using the sediment guide provided (Figure 8), identify the key components of your substrate.
7. List the main components on the data sheet and estimate percent cover of each (see Figure 5).
8. If your shoreline is longer than 50 metres or substrate patterns change within 50m, repeat steps 1-6 for each 50m section of shoreline or area of different shore substrate.

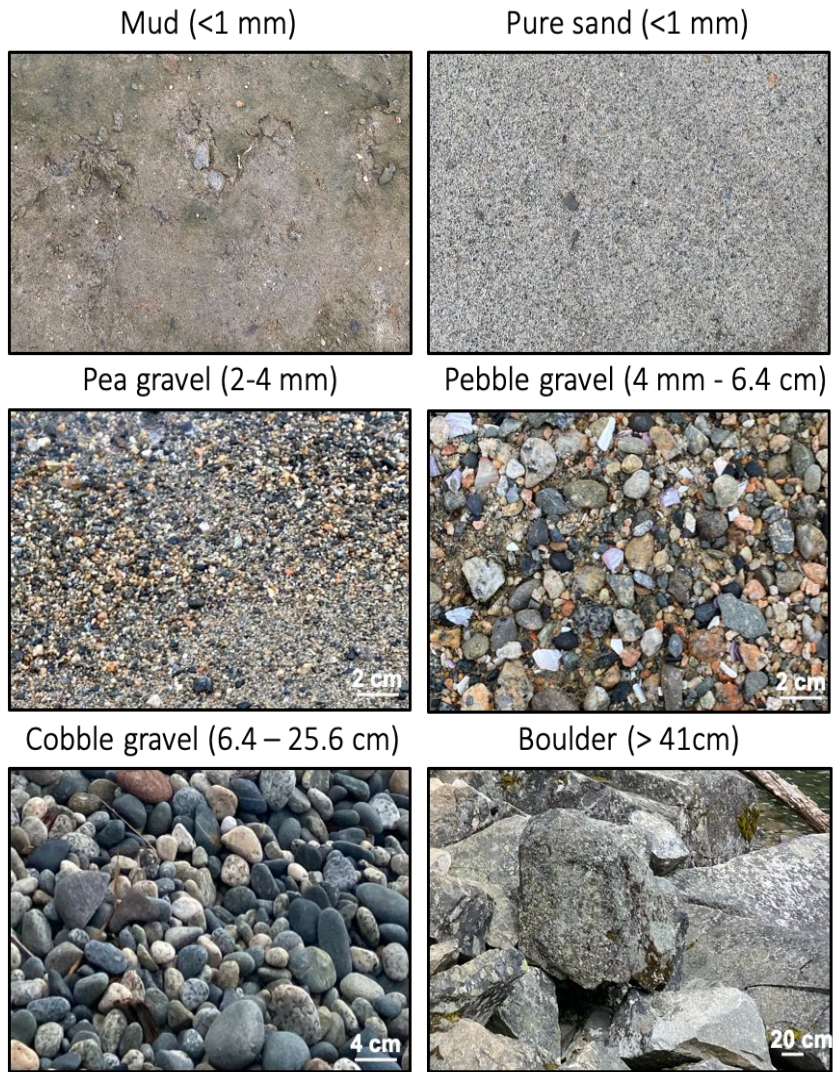
Category 1: Shoreline Processes



Figure 7: Example of shore substrate survey photo (step 4). Credit: CBWES Inc.

Category 1: Shoreline Processes

Sediment Guide



The key to the sediment character of the beach (Wentworth Scale):

- Silt, clay and mud - feels “slimy”
- Pure sand and shell - feels “gritty”
- Pea gravel - fine gravel*
- Pebble gravel*
- Cobble gravel*
- Boulder gravel* (size: 25.6 - 40.9 cm)
- Boulders*
- Bedrock

* - note if gravel or boulders have the sand base or not

Figure 8: Visual sediment key for doing beach substrate profile. Photo scale is provided to estimate the sediment size. Credit: E. Yangel.

Category 1: Shoreline Processes

Shore Substrate Data Sheet

Use this data sheet to record shore substrate observations. For gravel, cobble, and boulder note the base material (i.e., sand or clay), if present. Fill out a new data sheet for each sampling transect.

Note: record GPS coordinates in decimal degrees.

Site:

Date:

Surveyor Name:

Weather conditions:

Sampling Transect (#) _____

Area surveyed:

Upper shore (at or near Ordinary High Water Mark); GPS coordinates and unique station name (e.g., Transect1_Station1[T1_S1]):

GPS coordinates:

Sediment type (select all that apply): sand, pea gravel, pebble gravel, cobble, boulder, shell, mud, clay. Estimated percentage of each type present:

Mid shore (between OHWM and LWM); GPS coordinates and unique station name (e.g., Transect 1_Station 2[T1_S2]):

Sediment type(s):

Estimated percentage of each type present:

Low shore (at or near LWM); GPS coordinates and unique station name (e.g., Transect 1_Station 3[T1_S3]):

Sediment type(s):

Estimated percentage of each type present:

Other, specify: _____; GPS coordinates and unique station name (e.g., Transect 1_Station 4[T1_S4]):

Sediment type(s):

Estimated percentage of each type present:

Note: attach photos of each sampling location.

Category 1: Shoreline Processes

Shore Profile Survey

Monitoring the shape and size of the shore (i.e., shore profile) and how it has responded to the implementation of a nature-based method provides information about how a GSH project is affecting sediment transport processes. The Emery profiling method, developed by K.O. Emery (1961), is a relatively simple, repeatable, and accurate technique to measure shore profile using accessible, low-cost materials. The method works best when surveys are done by two people.

While it is preferable to use advanced technology like Real-Time Kinematic corrected GNSS, the Emery profiling method is a reliable method that uses simple equipment. The Emery Method is more challenging for repeat surveys, so it is recommended to use proper survey equipment for the greatest accuracy.

Equipment:

- 2 stakes or pins per 50 m of shoreline; hammer to install (recommend using same transects established for Shore Substrate Survey)
- GSH Monitoring Guide
- Shore Profile Data Sheet
- Pencil and eraser
- Handheld GPS or GPS enabled device with Google Earth
- 2 poles
- 2 graduated rods (1 cm intervals) or measuring sticks
- Camera
- 30m/100 ft measuring tape
- 2 ft level, if using alternative method in Step 8

Instructions:

1. Identify a suitable daytime low tide window (1 hour before to 1 hour after low tide) to conduct the survey at the site. Use <https://tides.gc.ca/en/stations> or https://tidesandcurrents.noaa.gov/tide_predictions.html?gid=1415 to check your local tide times. Low tides will be lowest during full and new moon cycles.
2. Establish transect(s) perpendicular to the shoreline every 50m or more, as needed, to capture changes in shoreline shape. Mark starting points with stake(s) or pin(s). Starting point should be 2m into the upland (i.e., at the top of a bank or the back of the dune).
3. Establish a second point, can be a stake placed 1m into the upland, or object (e.g., tree, power pole etc.) upland of starting point. The points established in steps 2 and 3 define the transect line to be measured. Poles can be placed at these points during surveying so they can be aligned more easily from a distance.
4. Record the GPS coordinates of starting point and second point in decimal degrees.
5. Take a photograph of the transect from the starting point towards the water.

Category 1: Shoreline Processes

6. Set Rod 1 at the transect starting point. One person holds Rod 1 with one end on the ground and number scale up (0 at the top).
7. Set Rod 2 at the first change in slope along the transect or 1m, whichever comes first. If working on wide and/or evenly sloped sections of shoreline, select a consistent rod spacing of 1m for ease of analysis. A rope, of known length, tied between the rods can ensure consistent spacing (Figure 9).

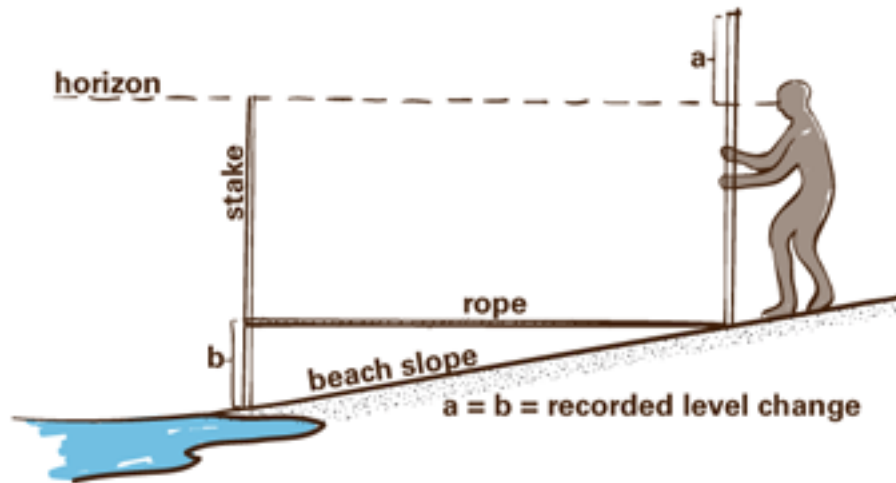


Figure 9: Diagram of how to conduct a shore profile using the Emery Method. Credit: Florida Center for Instructional Technology, 2005.

8. Take measurements. The person at the higher rod (usually Rod 1) sights to align the horizon and the top of the lower rod (usually Rod 2). This line of sight will intersect part way up the higher rod. **Ensure both rods are vertical.** Read and record the number on the higher rod (or measure the distance from the top to the point) that lines up with the top of the lower rod and the horizon.
Alternative method: If you are using rope tied between the rods, it can be placed at the soil level on the higher rod and slid up the lower rod until a level line (confirmed using 2ft level) between the two rods is achieved. Record elevation of rope on lower rod (if using this method may want to reverse the scale of the rods so that 0 is at the bottom). Note: The reading will not always come from Rod 1 because depending on the slope of the shoreline, Rod 2 may be the higher rod. If the shoreline slopes down towards the water (typical) then Rod 2 will be lower and a negative (-) will be given to the reading off Rod 1. If the shoreline slopes up toward the water, Rod 1 will be lower and a positive (+) will be given to the reading off Rod 2. It is very important to **assign the correct sign (+ or -) to all the values** collected otherwise the data will plot incorrectly. Measure and record the horizontal distance between the two rods. Make note of any physical features at Rod 2 (e.g., bank crest, bank toe, top of dune, water line etc.).

Category 1: Shoreline Processes

9. Move to next measurement. Leap frog so that Rod 2 becomes the landward rod and Rod 1 becomes the forward rod (closest to the water). The person with the forward rod must ensure that they remain on the transect line by aligning the landward rod with the starting points established in Steps 2 and 3. Set the forward rod at the next change in slope or 1m, whichever comes first.
10. Repeat Steps 8 and 9 until the water is reached. Ensure your last measurement includes the waterline. Note the waterline measurement with a W.L. on the data sheet. Record the time of that measurement as the Survey End Time. Waterline is estimated as the location where the water would be without waves.
11. Take a photo of the transect from the waterline towards the starting point. Take photos of any interesting features along the transect (e.g., dune toe, bank face, vegetation)

Category 1: Shoreline Processes

Shore Profile Data Sheet

Use the following data sheet to record shore profile measurements. Fill out a new data sheet for each transect.

Site:

Surveyors Names:

Date:

GPS coordinates of back stake:

front stake:

Weather conditions:

Survey Start Time: _____ / Survey End Time: _____

Low tide time: _____

GPS coordinates of starting point: _____; of second point: _____

Transect #:

Measurement (#)	Elevation Reading (cm; -/+)	Horizontal Distance (m)	Notes
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			

...

Category 1: Shoreline Processes

Emery Profile Data Analysis

See Sheet 13, “Emery Calc” in GSH Submittals Pack for data analysis instructions and template.

Updated Site Plan

To understand the overall changes at your site, update your site plan immediately post-construction (as-built) and at three years post-construction. Make sure that the updated site plan includes all important shoreline features (natural and project related), and the year post-construction plan should highlight any aspects of the shoreline that have changed since the as-built plan. If conducting professional monitoring for more than one credit, one updated site plan that contains all relevant information is recommended.

Category 2: Shoreline Habitats

The Shoreline Habitats credits encompass actions that protect, enhance, or restore shoreline habitat, including aquatic and riparian habitats.

Monitoring of shoreline habitats is intended to show the ways in which GSH projects protect and/or enhance shoreline habitats or identify areas where habitats can be better protected. Monitoring indicates whether a project is having the desired effect on habitat and will also help identify issues and inform necessary maintenance such as plant replacement. Monitoring shoreline habitat includes subtidal zone (in marine environments) or the littoral zone (in lake environments); the foreshore or intertidal zone; and the riparian and backshore area. In addition to filling out the GSH submittal documentation, the following additional information will guide monitoring of shoreline habitat.

This section provides monitoring details for:

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

Credit 2.2: Riparian and Emergent Vegetation

Credit 2.5: Organic Material

Category 2: Shoreline Habitats

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

Professional monitoring of critical and sensitive habitat areas, attributes, and condition as well as species at risk and migratory bird observations are intended to augment homeowner's species at risk and migratory bird observations.

Monitoring Plan and Schedule

This Professional Monitoring credit is intended to be completed before construction, immediately post-construction, and every year for three years after construction to observe any the changes to: the area, attributes, or condition of critical or sensitive habitat; and species at risk or migratory bird sightings at the property (Table 2). Monitoring schedules should be designed by professionals based on the habitats and life histories of the species of interest. For example plant species monitoring could target flowering or fruiting seasons when the plants are easiest to identify while for other species it might be most appropriate to target breeding or migration seasons. While looking for wildlife along the shoreline, record species seen in the water as well as on land. Photographs are encouraged where possible while also respecting the need to keep a distance from wildlife, particularly nesting species. Visit your provincial Green Shores website (see Resources) for more information on what relevant species identification resources are available in the area.

Table 2: Critical and Sensitive Habitats monitoring schedule.

Monitoring Activity	Parameter	Sampling Frequency	Pre-Construction	As-built	Post-Construction		
					Year 1	Year 2	Year 3
Photo-documentation	Critical or sensitive habitat; species at risk; Migratory birds	Annually, during appropriate season	✓	✓	✓	✓	✓
Habitat Survey	Area (m ²), attributes (if defined), and condition of critical or sensitive habitat	Annually, during appropriate season	✓	✓	✓	✓	✓
Species at risk/Migratory Bird Survey	Presences/absence, #, and condition of species of interest	Annually, during appropriate season	✓	✓	✓	✓	✓

Methods

Surveying methods that are the appropriate for the habitats and species being monitored should be determined by the monitoring professional. Federal and provincial/state monitoring guidelines exist for some species at risk and critical habitats. Permits may also be required for certain species or monitoring activities, so it is recommended that professionals consult with relevant regulatory agencies prior to conducting any monitoring.

Data Sheets

A generalized data sheet for critical and sensitive habitats is provided below. However, it is anticipated that monitoring professionals will adjust this data sheet as appropriate for the critical and sensitive habitats being monitored. For more specific information on Species at Risk and their recovery strategies, search the species at risk public registry (see Resources). The Species at Risk and Migratory Bird Professional Observation Data Sheet is intended to be submitted with the Sensitive Habitats Data Sheet as this sheet includes all the basic site and survey information.

Critical and Sensitive Habitats Data Sheet

Site:

Date:

Surveyor name:

Weather conditions:

Start time:

End time:

Tide times (High tide/Low tide) if applicable:

Habitat designation: Critical / Sensitive / Other (specify): _____

Habitat type (i.e., riparian, peat bog, salt marsh): _____

Area of surveyed habitat (m²):

Critical habitat attributes, if applicable. Describe, indicate presence/absence, and any other observations:

- 1.
- 2.
- 3.
- 4.
- 5.

Category 2: Shoreline Habitats

Habitat condition. Describe using appropriate indicators:

The homeowner should have a list of biophysical attributes and activities likely to destroy habitat for any species at risk found on their properties in the Habitat Monitoring Data Sheet on page 19 of this guide. Collaborate and incorporate homeowner findings with professional expertise.

Species at Risk and Migratory Bird Professional Observation Datasheet

Name of Species Observed	# of individuals observed	Direct or indirect (e.g., song, footprints, feathers) observation	Condition of individuals	Photo (Y/N)	Activities observed (e.g., feeding, resting)	Nests (Y/N) and number

Category 2: Shoreline Habitats

Other Observations or Notes:

Use this space to indicate any relevant or important observations. This could include observations of increased bird song, preferred plants, other species that are not considered at risk, or new human activities in the area.

Credit 2.2 Riparian and Emergent Vegetation

Healthy riparian and emergent vegetation communities are an important part of resilient shoreline ecosystems. They provide habitat and important ecosystem services such as water purification, erosion control, and resilience to natural hazards (i.e., storms). Monitoring riparian and emergent vegetation allows the effect of GSH projects on shoreline vegetation communities to be evaluated. This information can be used to guide riparian zone maintenance and management activities (i.e., additional planting, pruning) as well as to further refine plant lists and planting methods.

Monitoring Plan and Schedule

The Professional Monitoring plan for Credit 2.2 collects information on the riparian zone area to document changes resulting from GSH projects. It also collects information on shoreline vegetation, such as community size, survival rates, and species composition, that provides insights into how the vegetation community is establishing and/or responding to the implementation of a GSH project. A schedule is provided (Table 3) for surveying the riparian zone and shoreline vegetation.

Table 3: Credit 2.2 Riparian and Emergent Vegetation monitoring schedule.

Monitoring Activity	Shoreline Feature	Sampling Frequency	Pre-Construction	As-built	Post-Construction		
					Year 1	Year 2	Year 3
Photo-documentation	Riparian zone; riparian and emergent vegetation communities	Annually; August. Post storm.	✓	✓	✓	✓	✓
Riparian Zone and Vegetation Survey	Riparian zone; riparian and emergent vegetation communities	Annually; August	✓	✓	✓	✓	✓
Updated Site Plan*	Riparian zone; riparian and emergent vegetation communities	Pre-construction, As-built and Year 3	✓	✓			✓

* If conducting monitoring for more than one credit, a single updated site plan that contains the information for all credits being monitored is recommended.

Category 2: Shoreline Habitats

Methods

Photo-documentation

Photographs are a quick, easy and effective way to gather observations about the riparian zone and riparian and emergent vegetation. Complete instructions of how to take and provide useful photographic documentation are provided in the Methods on pages 6 and 7 of this Monitoring Guide. Pre-construction and as-built photographs provide information about the riparian zone and vegetation communities before, during, and after project completion. Post-construction photographs provide information on how the riparian zone and vegetation communities have evolved over time in response to the GSH project elements.

Equipment:

- GSH Monitoring Guide
- Notebook
- Pencil and eraser
- Camera
- Stakes or handheld GPS/GPS enabled device to mark photo locations
- White board and marker to identify photos

Instructions:

1. Identify a suitable daytime low tide window (1 hour before to 1 hour after low tide) to conduct the survey at the site. Use <https://tides.gc.ca/en/stations> or https://tidesandcurrents.noaa.gov/tide_predictions.html?gid=1415 to find the nearest tidal station information including tide times and heights. Low tides will be lowest during full and new moon cycles.
2. Identify photo locations; mark with stakes or on GPS (initial survey) or locate stakes/navigate to GPS coordinates (subsequent surveys).
3. Photographs of the riparian zone (60m/200ft inland from OHWM for tidal shorelines or 60m inland from Natural Boundary for lakes) from the same vantage points as initial surveys. Take photos of each vegetation community looking toward the water and looking toward the upland.
4. Photographs of emergent vegetation (Between low tide line and OHWM for tidal shorelines below Natural Boundary for lakes).
5. Close up photos of important or interesting features; i.e., unhealthy plants or communities, replaced or new plants, erosion or damaged areas, repairs or adaptive management.
6. Take photos after any major storm events.

Riparian Zone and Vegetation Surveys

Riparian zone monitoring documents changes in the area and condition of the riparian zone resulting from a GSH project. The riparian zone is defined as; the low tide line to 60m inland of the OHWM for tidal shorelines, or 60m inland from Natural Boundary for lake shores. Vegetation monitoring for Credit 2.2 applies to all riparian and emergent vegetation, planted or maintained as part of a GSH project, that has not received credit under Credit 1.5 as a structural and/or functional element of a nature-based adaptation method. Vegetation surveys are easiest to complete at the height of the growing season; typically, August in Canada and Washington.

Equipment:

- GSH Monitoring Guide
- Field guide to local flora
- Riparian Zone Data Sheet
- Vegetation Survey Data Sheet
- Pencil and eraser
- 30m/100ft tape measure or measuring wheel

Instructions:

1. Identify a suitable daytime low tide window (1 hour before to 1 hour after low tide) to conduct the survey at the site. Use <https://tides.gc.ca/en/stations> or https://tidesandcurrents.noaa.gov/tide_predictions.html?gid=1415 to find the nearest tidal station information including tide times and heights. Low tides will be lowest during full and new moon cycles.
2. Complete Riparian Zone Survey Data Sheet.
 - $\text{Area (m}^2\text{)} = \text{width parallel to waterline (m)} \times \text{depth perpendicular to water line (m)}$.
3. Complete Vegetation Survey Data Sheet (provided in Vegetation Survey section of shoreline processes monitoring) for each vegetation community present.
 - During as-built survey, record number of individuals of each species planted.

Category 2: Shoreline Habitats

Riparian Zone Survey Data Sheet

Use the following data sheet to record observations of the riparian zone.

Site: _____ Surveyor Name(s): _____

Date: _____ Weather conditions: _____

Shoreline type: () Tidal or () Lake

Upland extent of the naturalized riparian zone: _____ m. Note: this does not include lawns, formal gardens or other built features.

Total riparian zone area: _____ m².

Riparian zone features present (check all that apply):

() Upland; () Dune; () Backshore; () Foreshore; () Intertidal; () Other (specify)

Area (m²) of each of the riparian zone features present (see above):

Change in Riparian Zone Area:

Calculate the change (%) in riparian area as-built and 3-years post-construction.

As-built change (m²) = (as-built area _____ m² – Pre-construction area _____ m²) / Pre-construction area _____ m² + _____ x 100 = _____ %

3 years post-construction; As-built change (m²) = (as-built area _____ m² – Pre-construction area _____ m²) / Pre-construction area _____ m² = _____ x 100 = _____ %

Comments/Notes about the riparian zone:

Category 2: Shoreline Habitats

Update Site Plan

Update riparian area of the site plan to reflect as-built or 3-years post construction riparian zone and vegetation conditions. Ensure that the site plan includes the areal extent and location of all riparian zone features and vegetation including trees, shrubs, plants, and emergent vegetation. See example Site Plan. If conducting professional monitoring for more than one credit, one updated site plan that contains all relevant information is recommended.

Category 2: Shoreline Habitats

Credit 2.5 Organic Material

Organic materials along the shoreline, such as detached seaweed, dead plants (wrack), trees, branches and stumps, provide food and habitat for many species and can help protect the shoreline from erosion by trapping sediment and providing nutrients for shoreline vegetation. Monitoring of organic material maintained and/or placed as part of a GSH project allows for documentation of the evolution of those materials as well as the recruitment patterns of material naturally deposited after project construction. This information can be used to guide shoreline organic matter maintenance and management activities.

Monitoring Plan and Schedule

The professional monitoring plan for Credit 2.5 collects information on shoreline organic material to document changes resulting from GSH projects. This information provides insights into how patterns of organic material movement, deposition and removal is influenced by the implementation of a GSH project. A schedule is provided (Table 4) for surveying shoreline organic material.

Table 4: Credit 2.5 Organic material monitoring schedule.

Monitoring Activity	Shoreline Feature	Sampling Frequency	Pre-Construction	As-built	Post-Construction		
					Year 1	Year 2	Year 3
Photo-documentation	Shoreline organic material above OHWM/Natural boundary	Annually; April and November. Post storm.	✓	✓	✓	✓	✓
Organic Material Survey	Shoreline organic material above OHWM/Natural boundary	Annually; April and November	✓	✓	✓	✓	✓

Methods

Photo-documentation

Photographs are a quick, easy and effective way to gather observations about organic materials along the shoreline. Complete instructions of how to take and provide useful photographic documentation are provided in the Methods section on pages 6 and 7 in this Monitoring Guide. Pre-construction and as-built photographs provide information about the organic materials present before, during, and after project completion. Post-construction photographs provide information on how shoreline organic materials have responded to a GSH project.

Category 2: Shoreline Habitats

Equipment:

- GSH Monitoring Guide
- Notebook
- Pencil and eraser
- Camera
- Stakes or handheld GPS/GPS enabled device to mark photo locations
- White board and marker to identify photos

Instructions:

1. Identify a suitable daytime low tide window (1 hour before to 1 hour after low tide) to conduct the survey at the site. Use <https://tides.gc.ca/en/stations> or https://tidesandcurrents.noaa.gov/tide_predictions.html?gid=1415 to find the nearest tidal station information including tide times and heights. Low tides will be lowest during full and new moon cycles.
2. Identify photo locations; mark with stakes or on GPS (initial survey) or locate stakes/navigate to GPS coordinates (subsequent surveys).
3. Photographs of backshore areas (above OHWM for tidal shorelines or Natural Boundary for lakes) from the same vantage points as initial surveys. Take photos looking toward the water and looking toward the upland.
4. Photographs of pre-existing organic materials, materials placed as part of the project, and any materials deposited after project completion.
5. Close up photos of unique or important organic materials.
6. Take photos of organic materials after any major storm events.

Organic Material Survey

Organic material monitoring documents changes in the type, amount, and coverage of organic materials on the shoreline resulting from a GSH project. Organic material is defined as detached seaweed, dead plants (wrack), trees, branches, stumps and any other naturally occurring organic materials deposited on the shoreline through natural processes. Bonus monitoring for Credit 2.5 applies to organic material that was pre-existing, placed or maintained as part of a GSH project (including maintenance activities), and deposited via natural processes post-construction. Seasonal surveys (spring and fall) provide information on seasonal variation in movement of organic materials on a shoreline and the processes affecting them.

Category 2: Shoreline Habitats

Equipment:

- GSH Monitoring Guide
- Organic Materials Data Sheet
- Pencil and eraser
- 30m/100ft tape measure or measuring wheel

Instructions:

1. Identify a suitable daytime low tide window (1 hour before to 1 hour after low tide) to conduct the survey at the site. Use <https://tides.gc.ca/en/stations> or https://tidesandcurrents.noaa.gov/tide_predictions.html?gid=1415 to find the nearest tidal station information including tide times and heights. Low tides will be lowest during full and new moon cycles.
2. Complete Organic Materials Data Sheet.

Category 2: Shoreline Habitats

Organic Materials Data Sheet

Use the following data sheet to record observations of shoreline organic materials.

Site: _____ Surveyor Name(s): _____

Date: _____ Weather conditions: _____

Survey type (spring, fall, post-storm): _____

Shoreline type: () Tidal or () Lake

Organic materials present (check all that apply):

() Wrack; () Large woody debris; () Small woody debris; () Other (specify)

Large woody debris (> _____ diameter)

Length of shoreline covered by LWD: _____ m

Width of shoreline covered by LWD: _____ m

Number of pieces:

Dimensions of largest piece: length _____ m; diameter _____ cm

Average size (calculated from up to 10 pieces): Avg. length _____ m; Avg. diameter _____ cm

Small woody debris (< _____ diameter)

Length of shoreline covered by SWD: _____ m

Width of shoreline covered by SWD: _____ m

Average size (calculated from up to 10 pieces): Avg. length _____ cm; Avg. diameter _____ cm

Wrack:

Dominant vegetation type making up wrack (>60%; seaweed, grass, leaves): _____

Dominant vegetation species, if identifiable: _____

Length of shoreline covered by wrack: _____ m

Width of wrack line: _____ cm

Thickness of wrack line: _____ cm

Resources

Green Shores

General: <https://stewardshipcentrebc.ca/green-shores-home/>

Maritime provinces: <https://www.transcoastaladaptations.com/green-shores>

Washington State <https://wsg.washington.edu/incentives-for-sustainable-shoreline-development-green-shores/>

Monitoring Tools

Instructions Adapted from: Maine Geological Survey, Department of Conservation, 22 State House Station, Augusta, ME 04333-0022 retrieved from <https://seagrant.umaine.edu/wp-content/uploads/sites/467/2019/05/emerymethod.pdf>

Emery, K.O., 1961, A simple method of measuring beach profiles: *Limnology and Oceanography*, v. 6, p. 90-93.

Florida Center for Instructional Technology, 2005. Beach Profiling with “Emery Boards” and Measuring Sand Grain Size. College of Education, University of South Florida. <https://fcit.usf.edu/florida/teacher/science/mod2/resources/emery.board.pdf>

a1ahna, 2018. How to build Emery Board Survey Tools. Public Lab #17771. <https://publiclab.org/notes/a1ahna/12-03-2018/how-to-build-emery-board-survey-tools>

Recovery Strategies for Species at Risk

Species at Risk Public Registry Canada: <https://species-registry.canada.ca/index-en.html#/documents?documentTypeId=10&sortBy=documentTypeSort&sortDirection=asc&pageSize=20>.

Priority Habitats and Species Washington State: <https://wdfw.wa.gov/species-habitats/at-risk/phs>.

Helpful Apps

Merlin bird identification app: <https://merlin.allaboutbirds.org>

iNaturalist: <https://www.inaturalist.org>



GREEN SHORES

Washington,
British Columbia and Maritime
Provinces