



ESMC’s EcoHarvest Program: Inventory Accounting Protocol Summary – May 2026

The following summarizes the ESMC protocol for inventory-based projects, and provides a high-level overview of outcome generation, program eligibility, enrollment, data requirements, and how outcomes are used for corporate reporting. This document is updated on a regular basis as the ESMC protocol continues to develop.

What Outcomes Can Be Generated?

The ESMC EcoHarvest Program helps improve the overall environmental impact of commodities by incentivizing the adoption/continuation of practices that increase soil carbon and reduced greenhouse gas (GHG) emissions, water quality improvements, and reduced water use. The program provides multiple opportunities for agricultural producers to generate outcomes. Certain outcomes can be generated annually for GHG inventory reporting of supply chain (Scope 3) emissions, as well as analogous water quality and biodiversity corporate sustainability reporting.

Outcome Type	Inventory GHG Outcomes	Water Quality	Biodiversity
Corporate Supply Chain / ESG Reporting	<ul style="list-style-type: none"> • Scope 3 emissions factors (to capture emissions reductions over time) • Scope 3 removals 	<ul style="list-style-type: none"> • Tons sediment reduced • Pounds nitrogen reduced • Pounds phosphorus reduced 	<ul style="list-style-type: none"> • Ecosystem Function • Habitat Quality

How Is ESMC Program Eligibility Determined?

Producers must meet the following criteria to participate in the Eco-Harvest Program:

- Agricultural producers are interested in adopting soil health systems and conservation practices that benefit their agricultural operations while improving environmental outcomes.
- Enrolled land must be within an approved ESMC Program Region and have an ESMC approved production system, practice change.
- Producers must provide proof of outcomes ownership rights to establish a right to report.
- At least one eligible practice in each field must be implemented or maintained following enrollment.

- Agricultural practices that are legally required are not eligible.
- Enrolled land must not have been deforested or in natural grassland in the past 10 years.
- Enrolled land must not be a wetland or other protected area.
- Fields cannot be enrolled in another ecosystem service program that generates Scope 3 emission factors, credits, outcomes, offsets, or claims related to soil carbon sequestration and/or changes in GHG emissions, however co-claiming is allowed under certain circumstances (this is detailed in the Sale and Reporting of ESMC Outcomes Section of this guide).

Which Management Activities Are Eligible?

The following table outlines potential outcomes types which can be generated by eligible agricultural management practices.

Agricultural Management Practice	Greenhouse Gas	Water Quality	Biodiversity
Tillage Reduction conservation tillage, no till	X	X	X
Nutrient Management	X	X	X
Split application			
Use of inhibitor/enhanced fertilizer			
Reduction in Nitrogen fertilizer application			
Improved Nitrogen Use Efficiency			
Cover Cropping	X	X	X
Conservation Crop Rotation	X	X	X

Which Emissions Sources and Crops can be Modeled?

Soil organic carbon flux, soil methane emissions, and direct N₂O emissions for row-crop production can be modeled using ecosys, a process-based ecosystem model (provided on behalf of HabiTerre). Note that indirect N₂O emissions are also reported but not modeled entirely in ecosys.

Habiterre uses a tier-based system to describe the level of detail related to modeling each production system in ecosys based on the status of model validation for a specific crop or functional group. A summary of included production systems by tier is included below:

Table 1. Current Crop Classification by Tier (CONUS, Grain)

Tier	Definition (Summary)	Crops
Tier 1 — Premium	Full end-to-end readiness: validated modeling, complete remote-sensing gap-filling, and LCA module operational	Corn; Soybean; Wheat
Tier 2 — Waiting List (Becoming Premium)	Core modeling supported; one or more critical capabilities still under development with defined delivery timelines. LCD module ready except Cotton.	Cotton; Rice; Sorghum; Barley; Canola (Rapeseed); Oats
Tier 3 — Basic	Basic modeling support only, with default practice assumptions; typically used to support crop rotations rather than stand-alone analysis	Alfalfa; Dry Beans; Sugar Beets; Buckwheat; Wheatgrass (Kernza®); Rye; Sunflower; Triticale; Pumpkin; Pea; Chinese Pea; Flax; Lentil; Millet; Mustard; Fescue / Timothy; Camelina

Note: Tier 3 crops are considered *supported but not fully observable*, and are generally included to preserve agronomic realism in rotations dominated by Tier 1 & 2 crops

In addition to the emissions sources above captured in ecosys an emissions factor is applied (either managed by Habiterre or ESMC depending on the crop) for the following additional emissions sources:

- Indirect N₂O
- On-farm Energy Consumption
- Upstream Fertilizer Production
- Upstream Pesticide Production

Where Can Projects Be Enrolled?

Projects can be enrolled in the EcoHarvest program for select agricultural lands following the practice changes and production systems detailed above in the following locations:

- Continental USA
- Canada provinces of
 - AB: Alberta
 - SK: Saskatchewan
 - MB: Manitoba

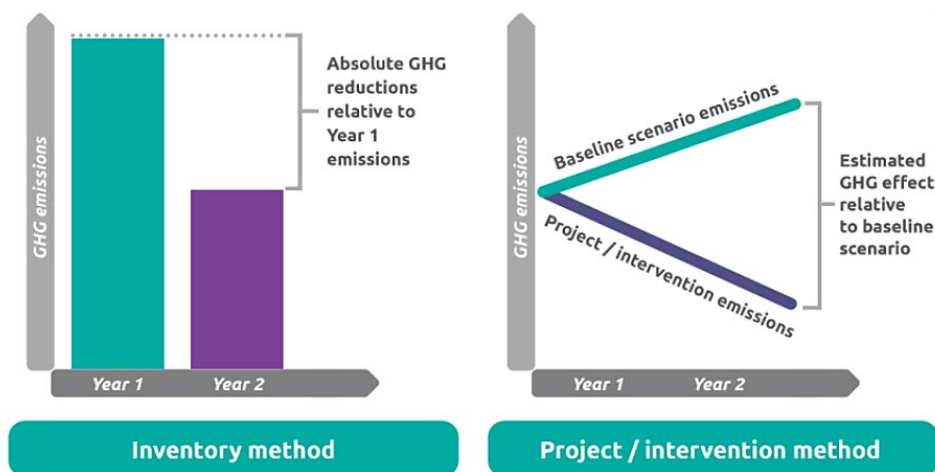
- ON: Ontario
- QC: Quebec

How are ESMC Outcomes Quantified?

To calculate inventory accounting outcomes from the ESMC program an emissions factor from a historical base year is compared to a project year emissions factor on an ongoing basis. GHG modeling scenarios are represented by primary producer data and may be completed with secondary ESMC proxy data, when applicable. Included emissions sources are summarized in the table below:

Outcome Type	Sources, Sinks, and Reservoirs (SSRs)	Quantification Approach
Greenhouse Gas (GHG; Emissions Reductions, Soil Organic Carbon-Removals)	Soil Organic Carbon (CO ₂)	ecosys modeling & soil sampling
	Decomposition of Manure (CH ₄ , N ₂ O)	ecosys modeling for land application of manure
	Direct N ₂ O Emissions (N ₂ O)	ecosys modeling
	Indirect N ₂ O Emissions (N ₂ O)	ecosys modeling & emission factors
	Upstream Fertilizer Manufacturing Emissions	Emission factors
	Fossil Fuel Emissions from Combustion & Electrical Consumption (CO ₂ , CH ₄ , N ₂ O)	Emission factors
	Pesticide Emissions (CO ₂ , N ₂ O)	Emission factors
	Soil CH ₄ Emissions	ecosys modeling
	Irrigation (N ₂ O)	Emissions factors
Water Quality	Not based on SSR framework.	ESMC Water Quality (PLET) Calculator Load based (Mass balance) pollutant modeling
Biodiversity	Not based on SSR framework.	ESMC BEAT Calculator Functional/Ecological modeling (not mass balance)

Note reporting inventory outcomes is different than reporting intervention outcomes (carbon credit-style accounting) in that with the inventory method we are reviewing overall emissions over time for a project, while with intervention accounting, we are comparing the project to a counterfactual (business as usual) scenario to approximate the total GHG impact of project practices. The figure below is a visualization of these two GHG accounting approaches from the [Greenhouse Gas Protocol](#).



What Data Are Required and How Are Data Managed?

Producer data requirements vary by outcome type, practice change, and other factors. At a high level, data are typically required on a field basis for both current and past years for the following:

- Field attributes including location, size, presence of tile drainage
- Crop type(s) and associated yield
- Planting and harvesting activities
- Tillage
- Cover crops
- Fertilizer and pesticides
- Irrigation
- Grazing and herd management
- Electricity and fuel

A quality assurance and quality control process is conducted for all producer data entered into the ESMC monitoring, reporting, and validation (MRV) platform. In some cases, ESMC is also able to provide select secondary data (i.e., ESMC proxy data) via public data sources or remote sensing.

Are There Outcome Specific Requirements?

ESMC's Protocol includes outcome specific modules that provide requirements and information that is only applicable to a particular outcome unit type.

ESMC Scope 3 Inventory Accounting Module

- GHGs include sources, sinks, and reservoirs of carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O).
- Emissions factors (total GHG in CO₂e per unit commodity) are reported that are applicable for the

total volume of each crop type produced by a project. Scope 3 removals are also reported in addition to emissions factors. Emissions factors are quantified and reported annually. Payments to producers are made annually.

- Outcomes are quantified using emissions factors and ecosys (an ecosystem process-based model) by comparing a historic base year to a current project year. The ecosys model is validated by ESMC program region, practice change, crop type, and soil type to correct for model bias and estimate structural uncertainty.
- The producer cannot displace agricultural activities that could result in increased GHG emissions or loss of soil organic carbon to non-ESMC enrolled fields.
- Protocol requirements will align to the removals requirements with the GHGP Land Sector and Removals Standard. This includes managing the monitoring and storage length of sequestered carbon.
- The ESMC program and outcomes can be third-party validated/verified depending on the needs of a sponsoring company.

ESMC Water Quality Module

- Water quality outcomes include reductions in nitrogen (N), phosphorus (P), and sediment losses from agricultural production systems.
- Outcome metrics (total lbs of nitrogen reduced, lbs of phosphorus reduced, and tons of sediment reduced) are reported and are applicable to the total acreage enrolled in a project. Outcomes are quantified and reported annually. Payments to producers may be made annually.
- Outcomes are quantified using the ESMC PLET, which is an empirical, coefficient-based modeling approach that applies standardized regional loading coefficients and BMP-specific reduction efficiencies to estimate pollutant losses and reductions.
- Baseline and project scenarios are represented using producer-reported data, supplemented with ESMC proxy data where applicable, to estimate changes in pollutant loading resulting from practice implementation.
- The producer cannot displace agricultural activities that could result in increased nutrient or sediment losses to non-ESMC enrolled fields.
- Protocol requirements will align with relevant watershed-scale nutrient reduction goals and water quality frameworks (e.g., regional nutrient reduction strategies and TMDLs where applicable).
- The ESMC program and outcomes can be third-party validated/verified depending on the needs of a sponsoring company.
- Complete documentation on the Water Quality Module is [here](#).

ESMC Biodiversity Module

- Biodiversity outcomes reflect changes in ecosystem function, habitat quality, and support for key functional groups resulting from agricultural management practices.
- Outcome metrics (e.g., Biodiversity Units (BU) and change in Biodiversity Units (Δ BU)) are

reported and are applicable to the total acreage enrolled in a project. Outcomes are quantified and reported annually. Payments to producers may be made annually.

- Outcomes are quantified using the Biodiversity Estimation for Agriculture Tool (BEAT), which is a functional trait-based modeling framework that estimates changes in Weighted Functional Presence (WFP) across key ecological groups (e.g., pollinators, soil organisms, birds, and plants).
- Baseline and project scenarios are represented using land use, habitat characteristics, species occurrence data, and producer-reported management practices, supplemented with ESMC proxy data where applicable, to estimate biodiversity changes resulting from practice implementation.
- The producer cannot displace agricultural activities that could result in degradation of habitat or biodiversity outcomes to non-ESMC enrolled fields.
- Protocol requirements will align with emerging biodiversity frameworks and standards for corporate sustainability reporting and nature-related disclosures.
- The ESMC program and outcomes can be third-party validated/verified depending on the needs of a sponsoring company.
- Complete documentation on the Biodiversity Module can be found [here](#).

Are Soils Required to Be Sampled?

If removals are going to be claimed by the corporate, soil sampling is required within the first year of enrollment to establish initial values for soil organic carbon (SOC), bulk density, and pH. Sample site selection is determined using ESMC's soil stratification application. Soil sampling will typically be repeated every 5 years in alignment with the GHGP LSRS.

How Can Outcomes Be Used for Corporate Reporting?

Corporates seeking to make voluntary commitments to reduce their GHG emissions and improve their environmental impact can do so using ESMC's science-based, standards-based protocols. To ensure credibility and accuracy, ESMC's protocols are designed to align with internationally recognized third party accounting standards and target setting programs, including the GHG Protocol Corporate Accounting and Reporting Standard, and the Science Based Targets Initiative (SBTi) and Science Based Targets Network (SBTN) target setting programs.

Corporate Reporting of Scope 3 Carbon Outcomes (Emission Factors)

- ESMC generates carbon outcomes to meet GHG Protocol Land Sector and Removals Standard requirements for inventory accounting and SBTi Forest, Land, and Agriculture guidance.
- Scope 3 GHG emission factors from supply chain interventions are developed and provided annually to be reported within a corporate GHG inventory.
- Verified emission factors generated from ESMC outcomes can be co-claimed by multiple entities at different stages of the same value chain, provided collective investments are made, and no double counting occurs within the same point along the value chain per GHGP LSRS requirements

regarding avoiding double counting.