ESMC Eco-Harvest Program: Protocol Summary – May 2024

The ESMC Protocol Summary includes the current ESMC protocol for both Eco-Harvest Market and Pilot (research) projects, and provides a high-level overview of impact unit 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 Impact Units Can Be Generated?

The ESMC Eco-Harvest Program issues impact units for increased 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 impact units. Certain impact units can be generated annually for GHG inventory reporting of supply chain (Scope 3) emissions, as well as analogous water quality and water quantity corporate sustainability reporting. Program enrollment and impact unit periods are typically established in five-year increments, with annual reporting, and are renewable for a maximum of 30 years.

Impact Unit Type	GHG (Carbon Equivalents)	Water Quality	Water Quantity	Biodiversity
Corporate Supply Chain / ESG Reporting [a, b]	• Scope 3 Soil organic carbon removals • Scope 3 GHG emission reductions • GHG avoided emissions (in development)[c]	• Tons sediment reduced • Pounds nitrogen reduced • Pounds phosphorus reduced	• Irrigation efficiency	• In development

a. Note that a carbon offset (Scope 1) option is in a development phase for Avoided Conversion of Grasslands (ACOGS)
b. Compliance / Regulatory impact units are applicable when ESMC's protocol is deemed acceptable by the regulatory entities
c. ESMC is working with SustainCERT to determine how to credit avoided SOC losses, as they are not removals or permanent reductions

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 impacts.
- Enrolled land must be within an approved ESMC Program Region and have an ESMC approved production system, practice change.
- Producers must provide proof of impact unit ownership rights.
- Producers must voluntarily implement new eligible practices in each field following enrollment:
    - Practice changes planned for the project enrollment year must not have been implemented on the field in the last 10 years, although fields that have included such practices on a trial basis in the past may still be eligible.
- 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 credits, impact units, 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 Impact Units Section of this guide).

Which Management Activities Are Eligible?

The following table outlines potential impact unit types which can be generated by eligible agricultural management practices. Certain practices have already been evaluated and are eligible for Eco-Harvest Market Program enrollment, while others remain at the Pilot stage for further evaluation.

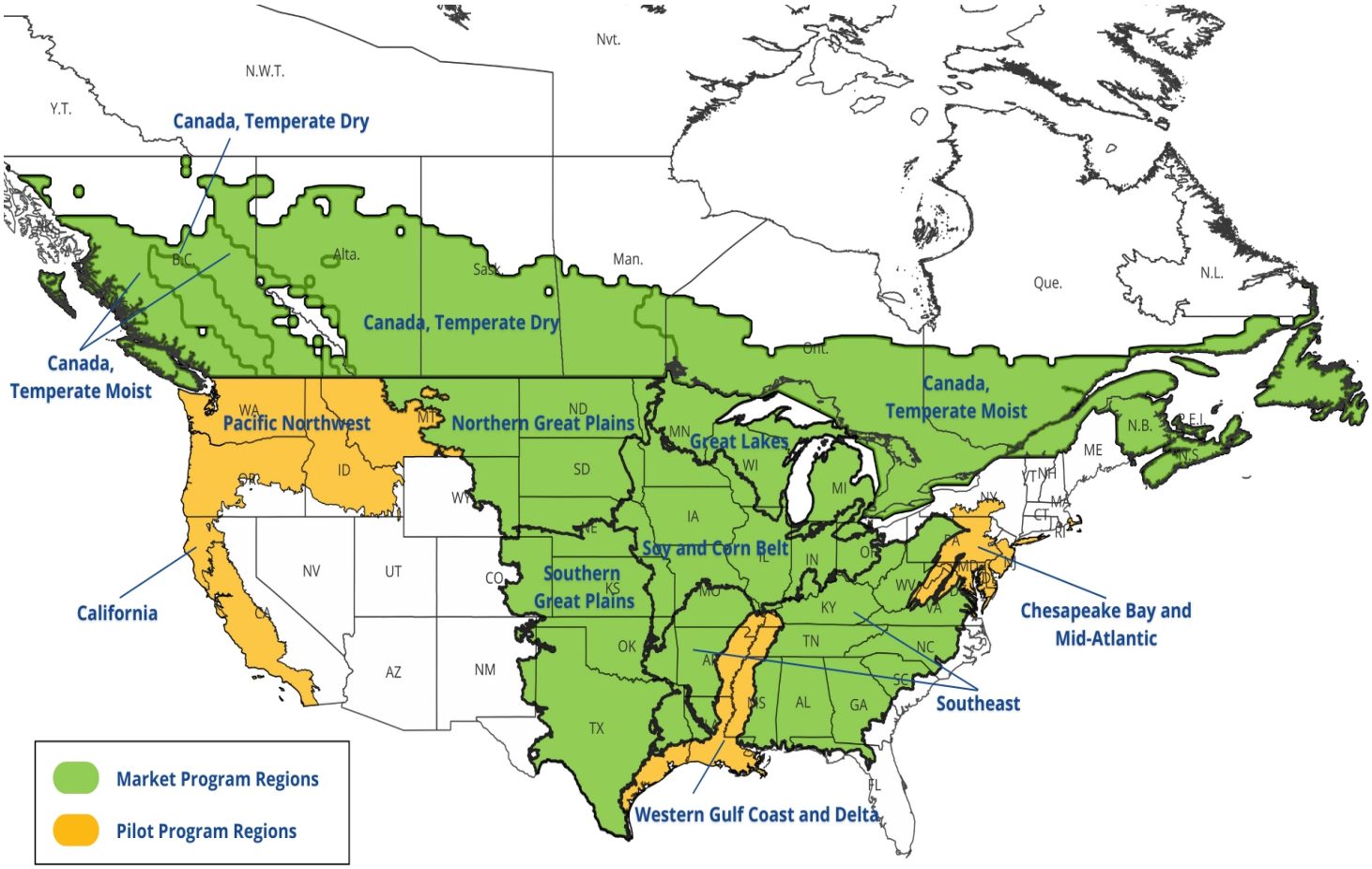
Agricultural Management Practice	Greenhouse Gas		Water Quality		Water Quantity	
	Pilot	Market	Pilot	Market	Pilot	Market
Residue and tillage management, reduced tillage		X		X	X	
Cover crop		X		X	X	
Nutrient management:						
Injection		X		X		
Incorporation		X		X		
Reduced fertilizer application rate		X		X		
Timing (no winter application)		X		X		
Split application		X		X		
Change in source		X		X		
Composting and organic amendments		X		X	X	
Cropland grazing	X		X		X	
Prescribed grazing	X		X		X	
Conversion of cropland to grassland [a]	X		X		X	
Conservation crop rotation	Case by Case		Case by Case		Case by Case	
Whole orchard recycling	Case by Case		Case by Case		Case by Case	
Irrigation water management	Case by Case		Case by Case		Case by Case	
Drainage water management						
Drainage Water Management Structure				X		
Bioreactor				X	X	
Surface water management						
Saturated buffer				X	X	
Sediment basin/pond				X	X	
Constructed Wetland				X	X	
Grassed waterway				X		

a. Refer to ESMC Program Region Map for Crops and Regions Eligible for ESMC Market and Pilot Programs

b. < 25% of the cropland within a Project Area can be converted to grassland and the converted cropland must be contiguous to the Project Area

Where Can Projects Be Enrolled?

Projects can be enrolled for select agricultural lands using select production systems in the following ESMC Program Regions: California, Chesapeake Bay and Mid-Atlantic, Pacific Northwest, Northern Great Plains, Southern Great Plains, Great Lakes, Soy and Corn Belt, Southeast, and Western Gulf Coast and Delta. Certain combinations of ESMC regions and production systems are ready for market scale implementation (referred to as Market stage) while others are still in the research and piloting phase (referred to as Pilot stage), as illustrated in the following figure.



How Are ESMC Impact Units Quantified?

Impact units are quantified by comparing a baseline scenario (i.e., environmental outcomes on an enrolled field in the absence of new management practice implementation) to a project scenario (i.e., environmental outcome following implementation of a new eligible practice). The baseline and project scenarios are represented by primary producer data and may be completed with secondary ESMC proxy data, when applicable. The following table outlines the quantification approach used for different impact unit types.

Impact Unit Type	Sources, Sinks, and Reservoirs (SSRs)	Quantification Approach
GHG (Emissions Reductions, Soil Organic Carbon- Removals, Avoided Emissions)	Soil Organic Carbon (CO_2)	DeNitrification-DeComposition (DNDC) modeling *and* soil sampling
	Enteric Fermentation (CH_4)	Emission factors
	Decomposition of Manure (CH_4, N_2O)	DNDC modeling for land application of manure
	Direct N_2O Emissions (N_2O)	DNDC modeling and emission factors
	Indirect N_2O Emissions (N_2O)	DNDC modeling and emission factors
	Fossil Fuel Emissions from Combustion and Electrical Consumption (CO_2, CH_4, N_2O)	Emission factors
	Pesticide Emissions (CO_2, N_2O)	Emission factors
	Soil CH_4 Emissions	DNDC modeling
	Burning (CH_4, N_2O)	Emission factors
	Irrigation (N_2O)	DNDC modeling
Water Quality	All SSRs (see Water Quality Protocol Module)	ESMC Water Quality Calculator; Agricultural Policy/Environmental eXtender (APEX) modeling
Water Quantity	All SSRs (see Water Quantity Protocol Module)	ESMC Quantity Calculator; Agricultural Policy/Environmental eXtender (APEX) modeling
Water Quantity (Irrigation Efficiency)	All SSRs (see Water Quantity Protocol Module)	Measured reduction in irrigation volume

What Data Are Required and How Are Data Managed?

Producer data requirements vary by impact unit 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 Impact Unit-Specific Requirements?

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

ESMC Scope 3 GHG Module

- Greenhouse gases (GHGs) include a number of sources, sinks, and reservoirs of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).
- Impact units are quantified and reported annually, and payments are made annually.
- Market leakage will be assessed as a decrease in yields due to the implementation of eligible practices; if a leakage threshold is exceeded, a deduction will be applied to the resulting impact units.
- Impact units are quantified using emission factors and DNDC which is a biogeochemical process-based model. The DNDC model is validated for 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 related to the monitoring and storage length of sequestered carbon will align with the forthcoming GHG Protocol (GHGP) Land Sector Guidance (expected 2023).
- Impact units are third-party validated and verified to SustainCERT's Value Chain Intervention program.

ESMC Water Quality Module

- ESMC's Water Quality impact units address sources of nutrients (i.e., nitrogen and phosphorus) and sediment.
- The period for Water Quality Impact Units is typically annual and can be renewed for a total enrollment period of 5 years. In certain cases, a different period may be needed to comply with local water quality program requirements.
- Water Quality Impact Units can be quantified using two methods: 1) ESMC Water Quality Calculator or 2) APEX water quality model. The ESMC Water Quality Calculator is a simplified tool that results in load reduction estimates while the APEX model is a complex, process-based model capable of simulating many agricultural processes.

ESMC Water Quantity Module

- **Water Quantity Impact Unit:** Impact units can be quantified using two methods: 1) ESMC Water Quantity Calculator or 2) APEX water quality model. The ESMC Water Quantity Calculator is a simplified tool that results in load reduction estimates while the APEX model is a complex, process-based model capable of simulating many agricultural processes.
- **Irrigation Efficiency Impact Unit:** Addresses surface water or groundwater irrigation supply sources.
    - Irrigation Efficiency impact units reflect reduced water consumption

- 10 years of historic irrigation/water use data is required, if less information is available an impact unit deduction of up to 50% is applied depending on the amount of available data
- Impact unit volume is determined through measured reductions in diverted water from surface or groundwater sources for irrigation

Are Soils Required to Be Sampled?

Soil sampling is required within the first year of enrollment to establish baseline values for soil organic carbon (SOC), bulk density, and pH. Soil samples to determine phosphorus content in soil are also required for certain water quality modeling applications. Sample site selection is determined using ESMCs soil stratification application. Soil sampling will typically be repeated every 5 years, pending final GHGP guidance.

How Can Impact Units 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[1], including the GHG Protocol Corporate Accounting and Reporting Standard, Gold Standard's Scope 3 Value Chain Intervention (VCI) program, 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)

- Carbon outcomes are designed in accordance with the VCI standard to generate Scope 3 emission factors for application in inventory accounting methods.
- ESMC generates carbon outcomes to meet GHG Protocol Land Sector and Removals guidance for inventory accounting (pending) 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.
- Co-Claiming Carbon Emissions Factors. 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 VCI guidance.

[1] Avoided emissions are broken out here given per GHG Protocol guidance these emissions are not reportable within the Scopes for corporates and are only intended to be used for narrative claims.