



ECOSYSTEM  
SERVICES MARKET  
CONSORTIUM

# ECOSYSTEM SERVICES MARKET CONSORTIUM (ESMC) & ESM Research Consortium (ESMRC)

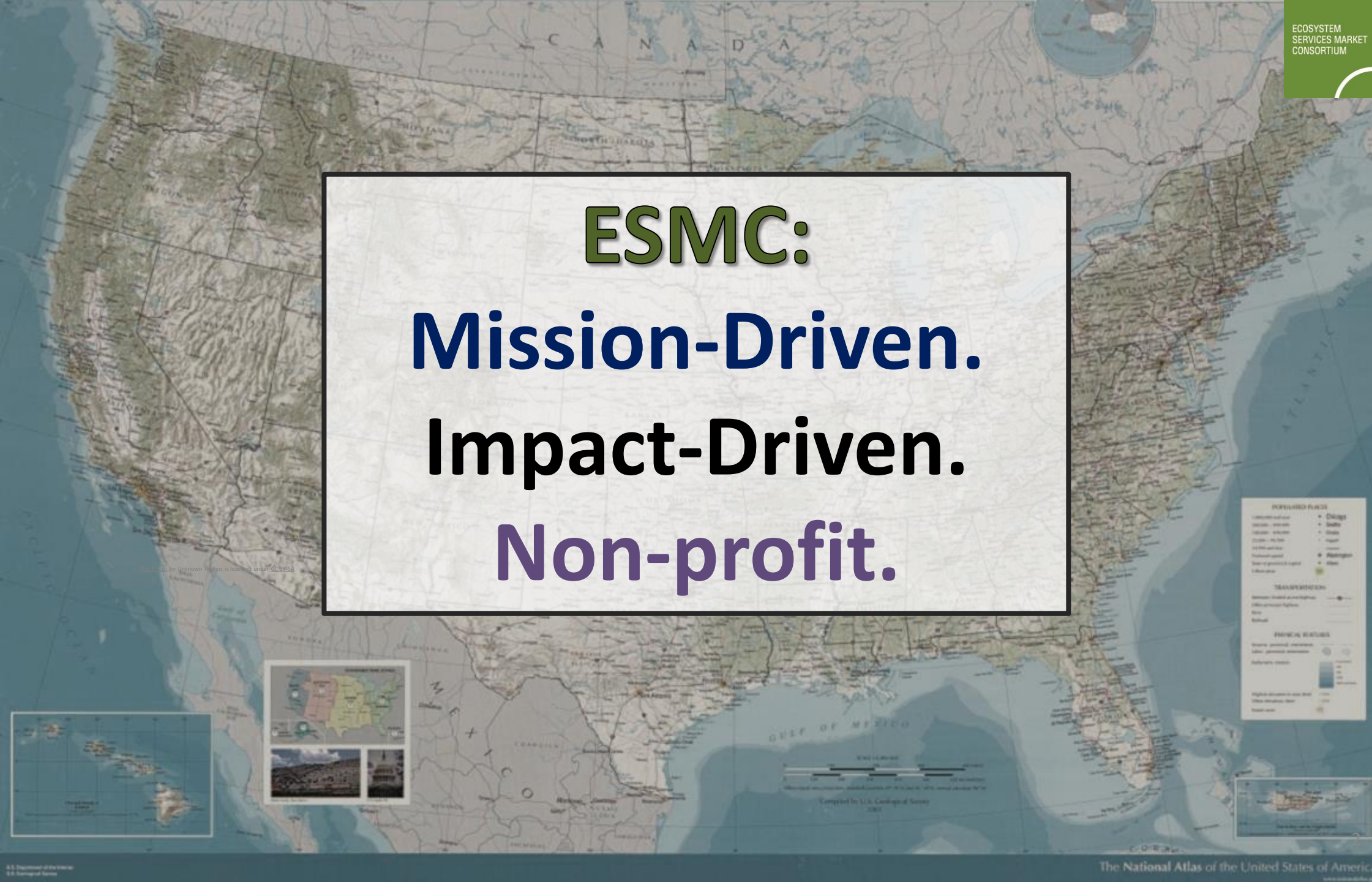
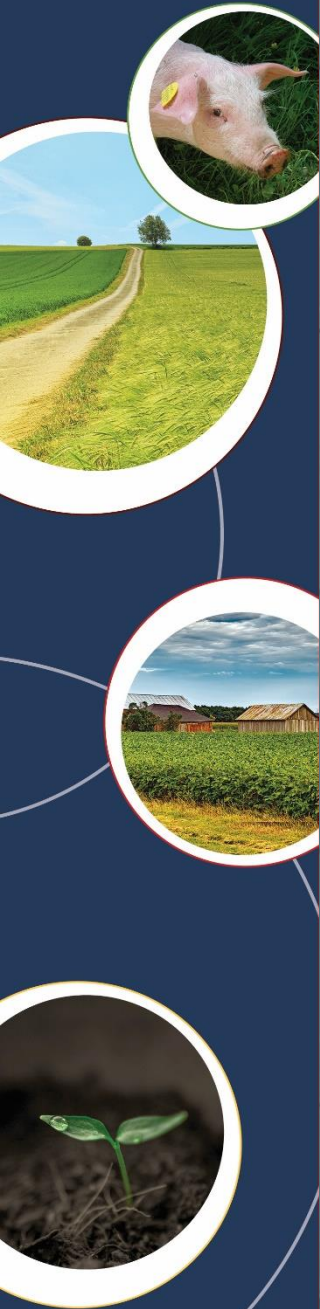
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# ESMC: Mission-Driven. Impact-Driven. Non-profit.





# ESMC MISSION

To advance ecosystem service markets that incentivize farmers and ranchers to improve soil health systems that benefit society

# Ecosystem Services Markets for Agriculture

## Ecosystem Services Markets Conceived & Designed...

- *...for Agriculture*
- *...to Overcome Past Market Challenges*
- *...to recognize and reward farmers & ranchers for their impacts*



## ESMC/ESMRC Funders



## ESMC/ESMRC Founding Circle Members



## ESMC/ESMRC Legacy Partner Members



# ESMC Program: Value to Stakeholders

- National scale harmonized market for US agriculture
- Transparent, certified program to meet corporate needs for scope 3 GHG reporting requirements and (developing) water risk reporting and tracking
  - Modular approach: biodiversity, additional assets added in future
  - ESMC first market to quantify multiple assets in integrated approach
- **ESMC as agent of change** to help meet CSR goals in ag supply chains while ensuring farmers & ranchers are paid
- ESMC programmatic investments will also meet **variable markets (e.g. C markets)** & needs as they change, develop



# ESMC Protocols & Market Design

- Farm-level accounting
- Farmer data, credits are farmer owned
- Data privacy critical, extensive policies and procedures (HST)
- Pricing value to farmers: market analyses, pilots testing costs, returns
- Market launch – price discovery, transparency will be key

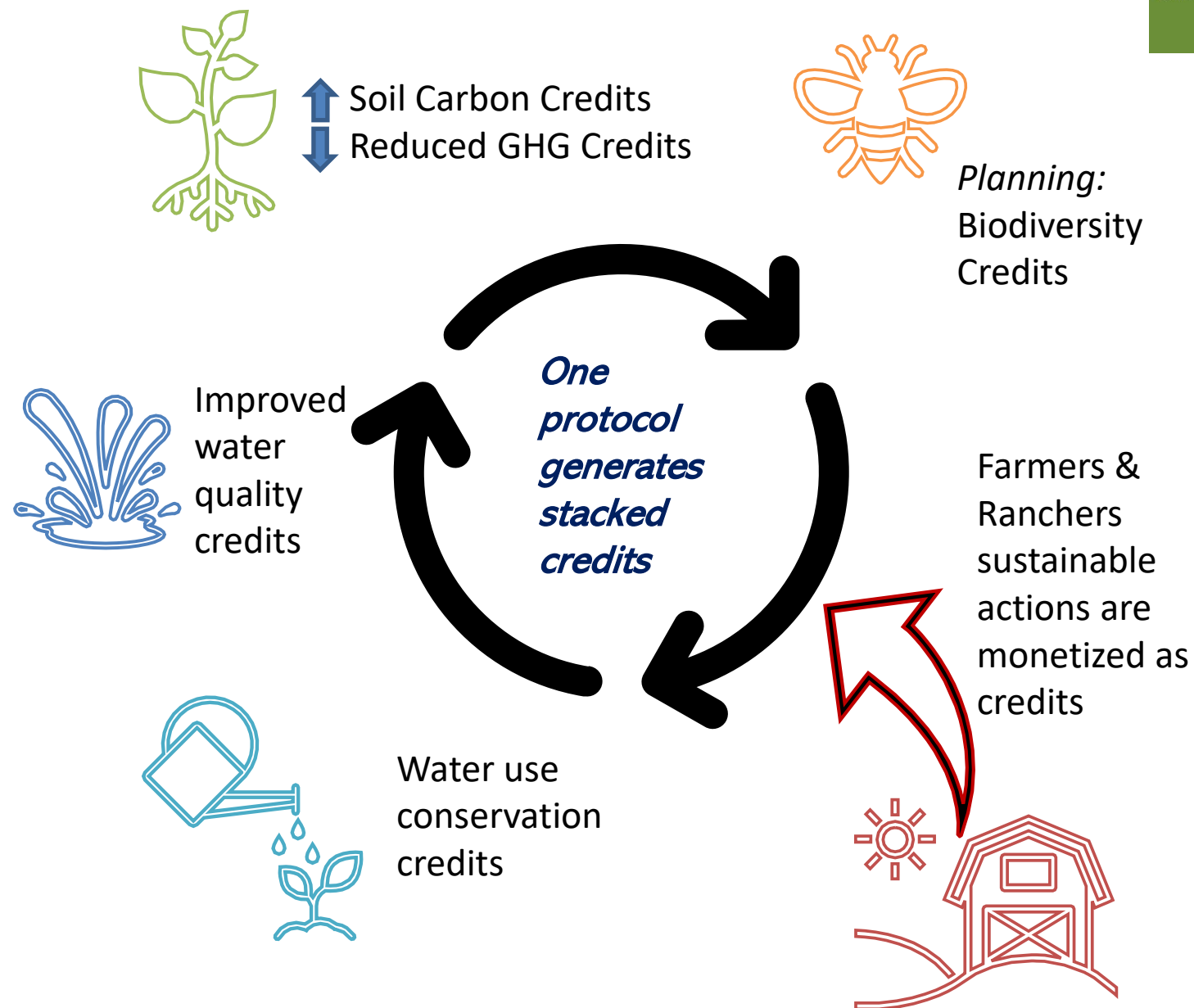


# ESMC Market Design:

## Modular tiered protocols

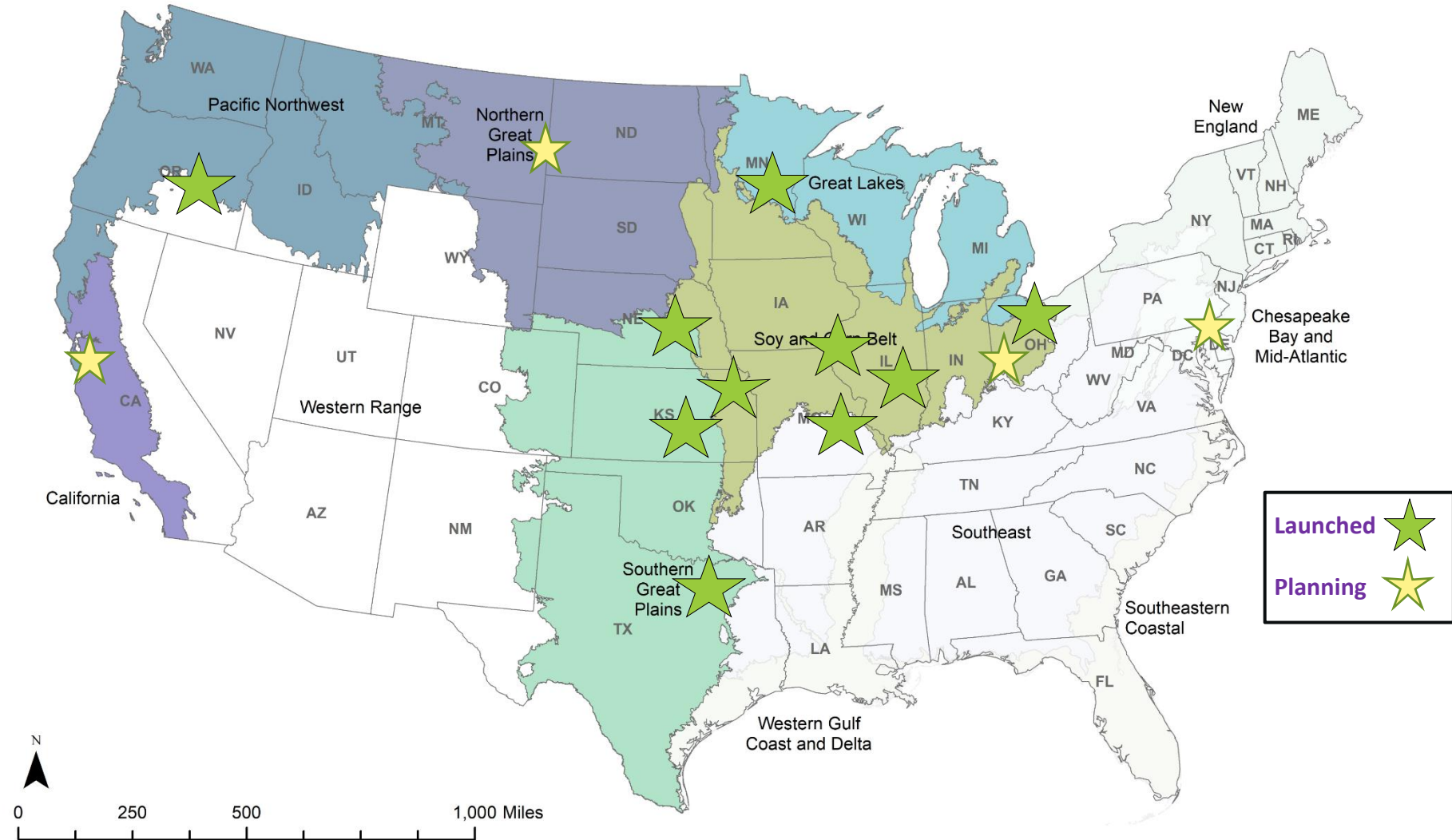
- Modular = stack multiple credits
- ESMC quantifies, verifies, certifies\*, stacks, sells credits
- ESMC pays farmers

\*Gold Standard & SustainCERT are global certification bodies we are using for certification





# ESMC Pilot Project Locations



# Asset Quantification

- Approach focuses on model rigor, scale (field), applicability across the U.S., multiple production systems and conservation practices, model documentation
- **Water quality assets:** sediment, total phosphorus, and total nitrogen
- **Greenhouse gas assets:** soil organic carbon, methane, nitrous oxide, carbon dioxide from fuels/electricity
- **Water quantity assets:** irrigation efficiency based on monitoring



# Current Production Systems and Practices

- **Grazing**
- **Corn**
- **Soybeans**
- **Wheat**
- **Cotton**
- **Sorghum**
- **Oats**
- **Sugar beets**
- **Potatoes**
- **Hay/alfalfa**
- **Barley**
- **Almonds**

Agricultural Management Practice	Applicable Environmental Attributes
Residue and tillage management, reduced tillage	GHG, Water Quality
Cover crop	GHG, Water Quality
Nutrient management	GHG, Water Quality
Prescribed grazing	GHG, Water Quality
Field buffer, filter strip, field border	Water Quality
Contour buffer strip, vegetative barrier within a field	GHG, Water Quality
Constructed ponds and wetlands	Water Quality
Grassed waterway	Water Quality
Conservation crop rotation	GHG, Water Quality
Prescribed burning	GHG
Irrigation water management	GHG, Water Quality

# Water Quality

- Agricultural Policy Environmental eXtender (APEX)
  - Texas A&M AgriLife
  - NRCS Conservation Effects Assessment Project
- Agronomic and crop growth model
- Field scale, daily timestep

**Water Quality Credit or Asset = (Baseline Scenario Load – Project Scenario Load) – Uncertainty Deduction**



# Greenhouse Gases

- DeNitrification-DeComposition (DNDC) model
  - daily time-step, process-based biogeochemical model that predicts carbon and nitrogen fluxes in agricultural ecosystems
- Emission factors for fuel, electricity, enteric
- SOC measurement via soil sampling

**Net GHG Credits = GHG Emission Reductions + GHG Emission Removals – Uncertainty Deduction**

**GHG Emission Reductions = Baseline Emissions – Project Emissions**

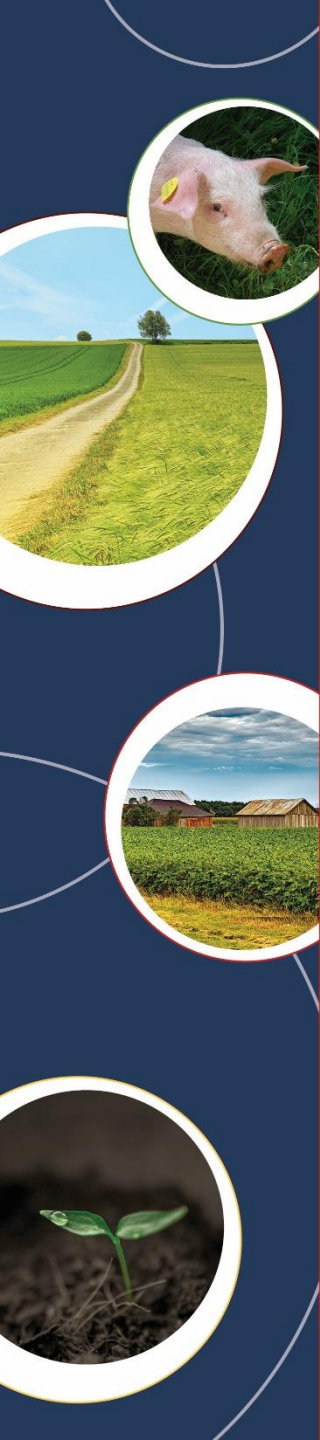
**GHG Emission Removals = Project Removals – Baseline Removals**

# Producer Input – Per Field

- Cropland: species/rotation, yield
- Tillage: dates, type
- Irrigation: method, source, schedule/frequency, rate
- Drainage: percent tiled, tile depth
- Residue management: percent covered, OpTis satellite-derived datasets
- Cover crops: species, establishment success, dates
- Conservation practices: multiple inputs for each practice (date installed, size, etc.)
- Non-manure fertilizer: type, rate, nutrient content, method, dates
- Manure fertilizer: source, type, rate, nutrient content
- Operation: planting, harvesting, cutting/baling, burning
- Grazing: head, hours/days, additional feed



# Questions & Answers





# Integrated GHG quantification

- Quantify GHG outcomes
- 1 GHG credit = 1 ton CO<sub>2</sub>e sequestered and/or reduced
  - SOC removals
  - GHG reductions
- Model: GHG quantification using DNDC biogeochemical model (CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>) *and*
- Sample: SOC sampling (0, 5, 10 yr) due to lack of accurate SOC baselines, data
- Calculate uncertainty

