Outcomes Estimation Tools Training Webinar Series

Summary of Features, Strengths, & Limitations of each Tool

Webinar #2: June 7, 2023

Model My Watershed®

An online water quality modeling app

Matt Ehrhart, MSAE
Director of Watershed Restoration,

Dave Arscott, Ph.D.
Executive Director, Research Scientist

LimnoTech
Water | Scientists
Environment | Engineers

STROUD
WATER RESEARCH CENTER

Anthony Aufdenkampe, Ph.D.
Senior Environmental Scientist

Outcomes Estimation Tools Webinar Series
7 June, 2023

hosted by
American Farmland Trust

Webinar #2: June 7, 2023

What is Model My Watershed®?

Snapshot of tool characteristics

Snap Shot of Features	Model My Watershed
States & territories	**Continental United States (CONUS) only** In the process of expanding to the entire globe, including all US States and Territories.
How much time, data, & skills needed to generate an outcome estimate	• Users can create hotspot maps for potential pollution in a few minutes, including running subbasin modeling. This also generates easy-to-save tables of results. • Adding different scenarios of generalized BMPs to a watershed or site specific BMPs drawn over farm fields can take an additional 20-60 minutes depending on level of detail and advanced organization of BMP information. This generates easy-to-read figures comparing outcomes among scenarios. • Advanced use of the MMW-BMP-spreadsheet-tool or our Pollution Assessment Python scripts for detailed, location-specific accounting of many BMP projects with a watershed can take hours or days.
Special note	Model My Watershed uses models developed and approved by EPA and PA-DEP with the latest federal datasets -- land cover (2001, '06, '11, '16, '19), soil, weather, elevation & slope, agric. animals, point sources – to produce hotspot maps useful for BMP planning and benefit accounting.

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What is Model My Watershed®?

Strengths and Weaknesses

STRENGTHS

- Quick and easy professional-grade toolkit from a web browser
  - Intuitive and well-documented user interface
  - No installation of software
  - No downloading of data
- User can select any Area of Interest in Continental USA
- Analyze and visualize key datasets from federal agencies:
  - USGS Land Cover,
  - USDA Soils,
  - USGS stream reaches and boundaries (hydrologic units),
  - USGS elevation and slope,
  - EPA point sources
  - NOAA daily climate data for driving models from 1960-2020
- Model and visualize water quality results from federally approved models
  - User can select combinations of input datasets and upload custom climate data
  - Map hotspots of likely pollution
- Creation and comparison of different conservation scenarios

WEAKNESSES

- Only operates in Continental USA
- Only analyzes and models pre-loaded geospatial data
  - User can't upload custom or localized data
  - Future landcover projections can not yet be modeled
- Model calibration to custom datasets must be externally, by exporting the model files to the Mapshed desktop software
  - NOTE: the models have been regionally calibrated, which is sufficient for most uses
- Conservation project details must be tracked externally and modeled with the use of the external tools, such as:
  - Model My Watershed Spreadsheet Tool
  - Model My Watershed Application Programming Interface (API)
- Conservation project cost estimation and cost-benefit optimization must be done externally.
- Not optimized for detailed, field-scale modeling or conservation design

Webinar #3: July 12, 2023

Nutrient Tracking Tool (NTT) Version 8-23

Ali Saleh (project leader)
Texas Institute for Applied Environmental Research
Tarleton State University, Member of The Texas A&M University System
saleh@tarleton.edu

Snap Shot of Features	Nutrient Tracking Tool (NTT)
Scale & level of specificity	**Field level:** with the potential for regional (including watershed, county, and state) scale and multiple-field project and use by adding up outcomes estimated using NTT watershed function routine. **Site-specific**: Field-specific estimates allowing for geo-specific placement of BMPs reflecting specific soils, slope, and weather data
Outcomes	**Water quantity, quality, loss reductions:** total flow, sediment, nitrogen, and phosphorus losses, soil carbon sequestration, crop yield, and economic.
Conservation practices	**Currently:** crop rotation, planting, harvesting, tillage, grazing, irrigation, nutrient management, tile management, and single or multiple structural practices **Next version(2024)**: bacteria, herbicide, pesticides, and urban BMP's
Land uses & production systems	**All land uses** (cropland, grazing, pasture, and forest) **Production systems**: all commodity row crops & grazing livestock, vegetables, fruit orchards **Next version(2024)**: urban

Snap Shot of Features	Nutrient Tracking Tool (NTT)
States & territories	**Currently:** CONUS and Puerto Rico **Next version(2024):** Hawaii and Alaska & U.S. territories
Time, data, & skills needed to generate an outcome estimate	**1)** Perform extensive "before v. after" interview with farmer to collect field specific production & conservation practice data **2)** Enter data into the web-based tool to build "before" & "after" conservation scenarios **3)** Produce and download results in tabular form or graphical bar charts displaying baseline, conservation scenario, and change metrics for water quality/quantity, and crop production estimates.
NTT versions	1. NTT Public (www.NTT.tiaer.Tarleton.edu and ; 2. Research and Educational, and APEX interface program (www.NTT-RE.tiaer.Tarleton.edu), Multiple field simulation project (individual requests) and county level conservation evaluation (to be released in 2024

NTT Strengths

- **National coverage** – Available in CONUS, useful if you have projects in many states
- **User friendly interface** – No software download Required
- **Provide farmers with their own site-specific analysis**– Due to use of national soils and weather datasets and the powerful APEX field production model
- Economic
- **Flexibility with scale analysis**–
  - Watershed scale is possible by creating sub-basins from field scale analysis
  - For a fee, TIAER will provide project, watershed, county, and state scale NTT analysis
- Results can be downloaded for future viewing
- **Become an official tool**: Iowa Dept of Environmental Quality (DEQ), Pennsylvania DEQ, Soil and Water Outcomes Fund (SWOF), Maryland Water Trading Program & MD Dept of Agriculture
- **Other users**: Ohio, Louisiana, Idaho, Oregon, California

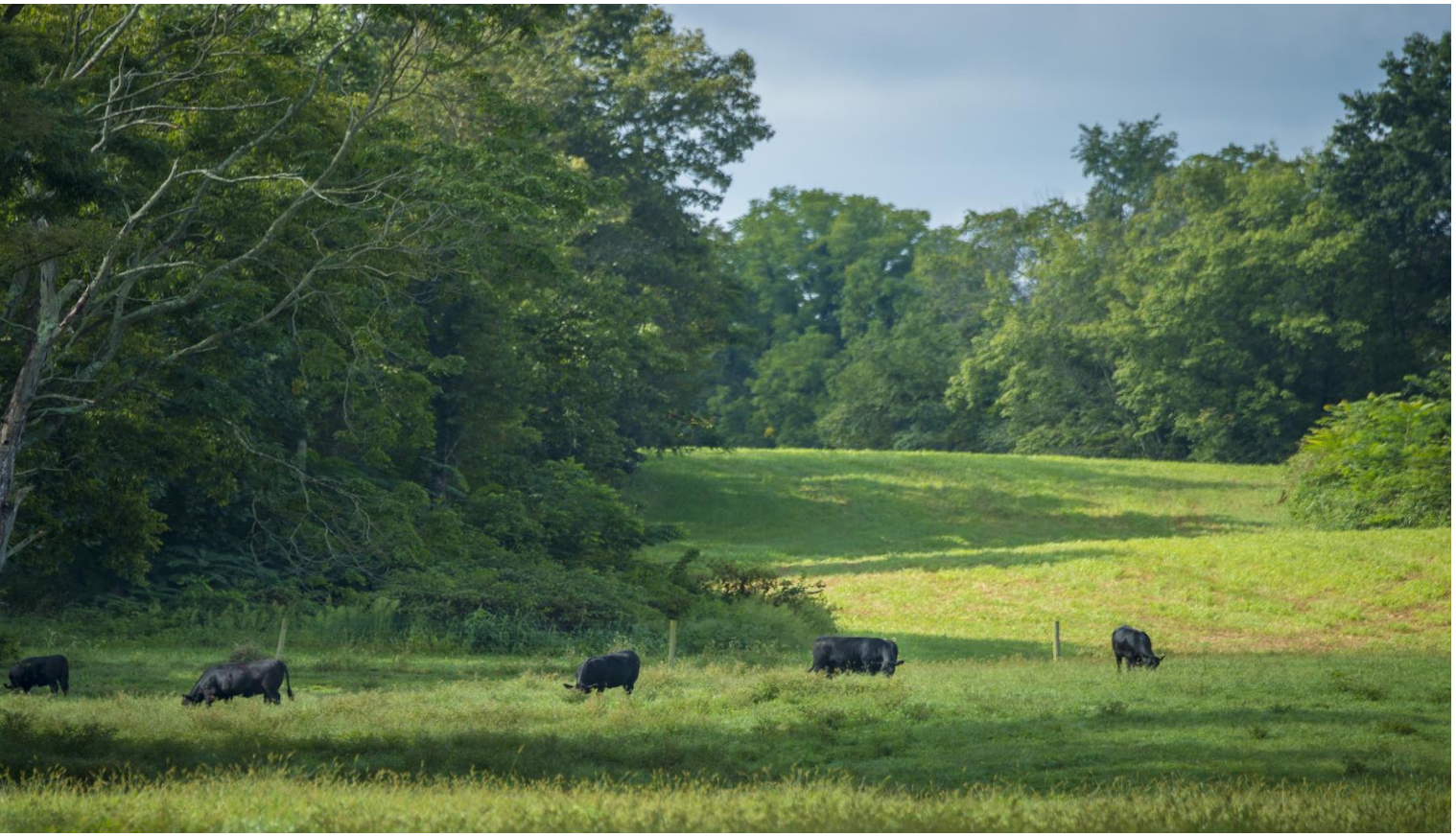
Limitations, & Trade Offs

- **Initially built for field-level analysis** – Application at farm-scale, county / watershed / project scale, or larger takes additional effort
- **Validation and Calibration** – Generally validated for CONUS; addition calibration using field studies would be recommended
- **Data intensive** – It may require significant interview time with the farmer to obtain the production and management data for creation of hypothetical before (baseline) vs after (conservation) scenarios
- **Difficulty with unstable internet** – Data entry should be conducted in locations with good internet connection & not while interfacing with the farmer.
- Is not adopted for Hawaii and Alaska, or U.S. Territories (except Puerto Rico)

Webinar #4: August 2, 2023

United States Department of Agriculture

NRCS Cover Crops Economic Tool



Natural Resources Conservation Service

nrcs.usda.gov

Snap Shot of Features	NRCS Cover Crop Economics Tool
Scale & level of specificity	**Farm level** designed to measure the economic effect of cover crops on the individual farm and crop rotation. Tool is not geo-specific.
Outcomes	**Economic and Financial** evaluations of adding cover crop(s) to an existing crop rotation, focusing on those attributes which can be measured and monetized ($/ac costs and benefits).
Conservation practices	**Type of cover crop** is only differentiated by cost of seed, planting type, termination type. Effects of cover crops on **tillage, nutrient management, or herbicides** can be evaluated.
Land uses & production systems	**Land uses:** Cropland & grazing land. **Production systems**: All commodity row crops & grazing livestock; has applicability in vegetable crops.
States & territories	**CONUS only:** Tool was extensively beta tested across the continental United States; Will beta-test it in AK, HI, and US territories.
How much time, data, & skills needed to generate an outcome estimate	Information needed on the common costs of production on an individual farm, the yields on the farm, utilization of livestock or not, and expected costs of cover crop seed, planting, & termination costs. Data runs are possible in 30 minutes or less with assembly of aforementioned data.

Strengths, Limitations, & Trade Offs of NRCS Cover Crop Economic Tool – Is this the Right Tool for You?

Strengths

- **Built for answering** "what if scenarios" for economic analysis – Application is farm-scale
- Could be used within a county or watershed-scale project to answer farmer questions about the costs & benefits of cover crops; which may get them to adopt
- **User friendly interface –** Download to excel is needed.
- **Used by many including universities**
- **National coverage** – Available in CONUS

Limitations

- Does not provide a county or watershed-scale project-level economic evaluation
- Not geographically-site specific; a generalized tool
- Focuses only on benefits & costs that accrue to producer &/or landowner; does not consider positive & negative externalities
- **Moderate data intensity** – Producer can easily override pre-loaded datasets to fit their operation

Webinar #5: September 6, 2023

Field to Market®

The Fieldprint Platform As an Outcomes Estimation Tool

www.fieldtomarket.org

Feature	Fieldprint Platform
Scale & level of specificity	Field level. Users and projects can aggregate outcomes as needed. Several metrics capture location-specific data: weather, soil types and properties, energy grid, field slope and orientation, among others.
Outcomes	Biodiversity (index), Energy Use, GHG Emissions, Irrigation Water Use, Land Use, Soil Carbon (index), Soil Conservation, and Water Quality (index)
Conservation practices	Tillage management, cover crops, crop rotations, irrigation, biodiversity, 30+ CPS (not all conservation practices influence all metrics)
Land uses & production systems	Cropland and grazing (alfalfa only). Twelve commodity row crops.
States & territories	Continental United States
Time, data, skills to generate an outcome estimate	No experience required. Nearly all first-time users can generate an analysis within 20-40 minutes per field. Users can copy inputs among fields. Users need crop rotation information and field boundaries.
Current version	V4
Utilization	In 2022, the Fieldprint Platform analyzed over 500,000 reports from 6,000 growers

Strengths

- Growers can typically enter data inputs from memory and copy inputs across fields with similar management.
- Metrics developed in collaboration with all sectors of the supply chain.
- Quantification estimates at both the field and project scale; aggregation of results across farmers for a project.
- Supply chain actors can readily use data outputs.
- Equivalency with other sustainability organizations such as the Sustainable Agriculture Initiative (SAI) and The Sustainability Consortium (TSC).
- There are nine data partners who have incorporated the Fieldprint Platform into their own systems.

Limitations

- All eight metrics are calculated simultaneously; the Platform cannot calculate one metric separately.
- Entering data for the first time could take from 20 to 30 minutes per field; it gets much easier with practice.
- Though the tool is free and publicly available, organizations must join Field to Market to access all data and project management features.
- Field to Market has rules about communicating of environmental impacts if reported in a public-facing document.
- Three metrics are qualitative rather than quantitative (Biodiversity, Soil Carbon, Water Quality).
- The Platform works in the continental U.S.

Pollutant Load Estimation Tool

Outcomes Estimation Tools Training Webinar Series

October 4, 2023

Adrienne Donaghue, PhD
Physical Scientist
EPA Office of Water

PLET Snapshot Summary

Features	Description
Scale	Field, county level, and HUC12; multiple fields and HUC12s can be considered simultaneously
Outcomes	Long-term annual loads pre and post BMP implementation • Nitrogen, Phosphorus, Biological Oxygen Demand (BOD): **lbs/year** • Sediment: **tons/year** Volume Reductions • Applies to select urban BMPs: **gallons/year**
Conservation Practices	Includes more than 30 BMPs for Cropland and Pastureland such as: • Conservation tillage, contour farming, cover crops, nutrient management, critical area planting, rotational grazing, prescribed grazing, forest and grass buffers
Land uses	Cropland, Pastureland, Urban*, Forest, Feedlots, and User Defined *9 different urban land use types
Coverage	States and U.S. Territories (American Samoa, Guam, Puerto Rico)
Time and Data Demands	Simple Most inputs are auto populated for the HUC12 scale

PLET Strengths and Limitation

Strengths

- Appropriate for planning and screening level
- Share models with other users
- Include territories
- Customizable:
  - User-defined land use
  - Custom BMP
  - Combined BMP efficiencies (parallel and in series)
  - Other pollutants

Limitations

- Does not include point sources
- Is a stand-alone web-based application
- Does not reflect subsurface flow of tile drains
- Not appropriate for design of BMPs
- For multiple HUC12, weather data is based on the primary watershed

Prioritize Target Measure Application (PTMApp)

Drew Kessler | Houston Engineering Inc.
Udai Singh| Minnesota Board of Water and Soil Resources

PTMApp Snapshot

Snap Shot of Features	Prioritize, Target, and Measure Application (PTMApp)
Scale & level of specificity	**Field level** to **HUC 8** watershed level
Outcomes	**Water quality, loss reductions:** sediment losses (tons & ton/ac), total nitrogen (lbs & lb/ac) losses, total phosphorus losses (lbs & lb/ac)
Conservation practices	**Currently:** 21 different practices based upon NRCSA design standards Nutrient Management Plan, Prescribed grazing, Forage/Biomass Planting, Reduced Till, Cover Crops, No Till Perennial Crops, lake and Wetland Shoreline Restoration, Grassed waterway, Grade Stabilization, Critical Area Planting, Multi-Stage Ditch, Infiltration Trench, Denitrifying Bioreactor, Riparian Buffer, Filtration Strip, Wetland Restoration, Water and Sediment Control Basin, Drainage Water Management, Farm Pond

PTMApp Snapshot

Snap Shot of Features	Prioritize, Target, and Measure Application (PTMApp)
Land uses & production systems	**All land uses** (cropland, grazing, pasture, forest) **Production systems**: Focused primarily on row crop and pasture lands. Currently being adapted to Agroforestry.
States & territories	**Available everywhere, but needs work for adaptation** Currently deployed in MN, ND, IA, WI, MB and O'ahu
How much time, data, & skills needed to generate an outcome estimate	1) Inputs need moderate GIS expertise and time 2) Running the tool, novice level GIS expertise 3) Using the outputs, moderate level of GIS expertise and Water Quality understanding
Special note	Meant to make water quality modeling more broadly available through GIS

PTMApp Purpose: Strengths and Limitations

Strengths

- Publicly available and supported
- User defined results at multiple scales
- Supports planning and implementation
- Demonstrated to support portions of federal 9-step plans

Limitations

- Largely an empirical tool
- Doesn’t speciate nutrients
- Moderate level GIS expertise needed to prep input
- Still needs adaptation guidance in many US regions

Webinar #8: December 6, 2023

Photo by: Bob Waring featuring his cover crop mix (for upcoming VA Soil Health Case Study)

The Retrospective – Soil Health Economic Calculator (SHEC) Tool

Ellen Yeatman, Ag Economist
AFT Water Initiative

R-SHEC Tool Overview

Features	Retrospective Soil Health Economic Calculator (R-SHEC) Tool
Scale & level of specificity	• **Study area / farm-level** • **Level of specificity:** not site-specific (does not consider weather or soil data)
Outcomes	• **Partial budget analysis table** that quantifies changes due to switching from conventional management to a soil health management system • **Change in $/ac by category:** machinery type/use, volume of pesticide & fertilizer, cover crop costs, soil erosion, yield, learning costs, and other farmer-provided estimates • **Total change in net income as $/ac, $/yr, and % return on investment (ROI)**
Conservation practices	**Row Crop R-SHEC Tool:** Reduced tillage, no-till, nutrient management, cover crops, conservation crop rotation (diversification of rotation) **Almond R-SHEC Tool:** cover crops, conservation cover, nutrient management, mulching, compost

R-SHEC Tool Overview

Features	Retrospective Soil Health Economic Calculator (R-SHEC) Tool
Land uses & production systems	• **Land uses:** cropland • **Production systems**: row crops (*barley, corn grain, corn silage, grain sorghum, hay, soybeans, oats, &/or wheat*) or almonds; organic or non-organic
States & territories	**CONUS –** currently works best for midwestern states and California (almonds)
How much time, data, & skills needed to generate an outcome estimate	**1)** Perform extensive "before vs after" interview with farmer to collect study area-specific field operations data to complete the R-SHEC Questionnaire (up to 10 hours); **2)** Enter data into Excel-based R-SHEC Tool to build "before" & "after" management scenarios; **3)** Finalize the partial budget analysis table in the Tool (requires manually deleting un-used rows) • Familiarity with Excel - ideally intermediate skill-level • Familiarity with field operations to build those management scenarios

R-SHEC Strengths & Limitations

Strengths	Limitations
• One or multiple soil health practices can be analyzed • Grazing or haying of cover crops can be included	• Data intensive - Requires significant interview time with the farmer to obtain the production and management data for their conventional, before and after soil health adoption management scenarios *(gathering averages)*
• Adaptable to farmer's specific rotation & field operations	• Limited to a farm level analysis and specific crops
• Default data used in the Tool can be updated or changed by the user in the workbook	• Works best for row crop- and almond-dominated production states
• Excel-based tool that is easy to download and work in; no internet required once downloaded to your computer	• Currently, R-SHEC Tool doesn't work well for analyzing a conservation crop rotation alongside other practices
• Results presented in a pre-populated partial budget analysis table that is easy-to-interpret and compelling and can be easily edited and saved as an independent table of results	

SIPES Method and SIDMA

American Farmland Trust
Outcomes Estimation Tools Training Webinar Series

January 10, 2024

Snapshot

Snapshot of Features	SIPES/SIDMA
Scale & level of specificity	**Watersheds:** focused on measuring social indicators within watersheds, but it is not a requirement. The system can and has been used from city to statewide scales.
Outcomes	**Measures of progress towards improving awareness attitudes, capacity, and behaviors regarding water quality improvement:** SIDMA helps users utilize the SIPES method to evaluate whether planning and outreach activities improve social indicators of water quality improvement.
Conservation practices	**Many:** SIDMA surveys can include questions evaluating familiarity, willingness to adopt, and capacity to adopt a large range of agricultural and urban conservation practices. Users can also create their own questions to a survey, if a particular conservation practice isn't represented in SIDMA's databank of survey questions.
Land uses & production systems	**All land uses**: SIDMA's questions database includes items tailored for both agricultural and urban settings.
States & territories	**Anywhere:** Though many of the questions in SIDMA's databank are focused on the U.S. (e.g. Attitudes towards US EPA), there is no formal requirement that a survey be designed for a US location.
How much time, data, & skills needed to generate an outcome estimate	**Variable:** Time is needed to consider a set of project questions, develop a survey, administer the survey, and analyze/interpret. Project questions require knowledge of water quality challenges to be addressed, critical areas contributing to those problems, actors influencing those areas, and practices/actions being encouraged.
Special note	**SIDMA Upgrades**: By the end of 2024: modernizing the front end, survey import/export functions, backend updates.

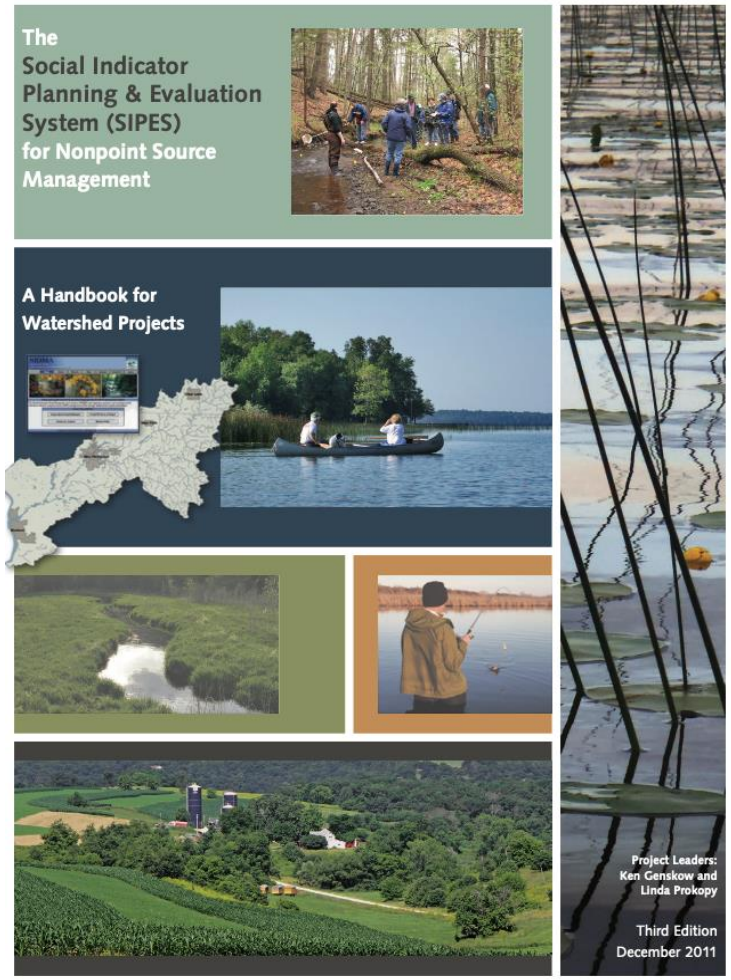
SIPES: Social Indicators Planning & Evaluation System Strengths and Limitations

Strengths

- Vetted process with guidance aimed at project managers
- Lays out steps and rationale
- Integrates with USEPA watershed planning & implementation process
- Examples and references

Limitations

- Guidance is from 2011
- Could improve online survey integration
- Lacking detail on working with watershed organizations to build capacity



SIDMA Strengths and Limitations

Strengths

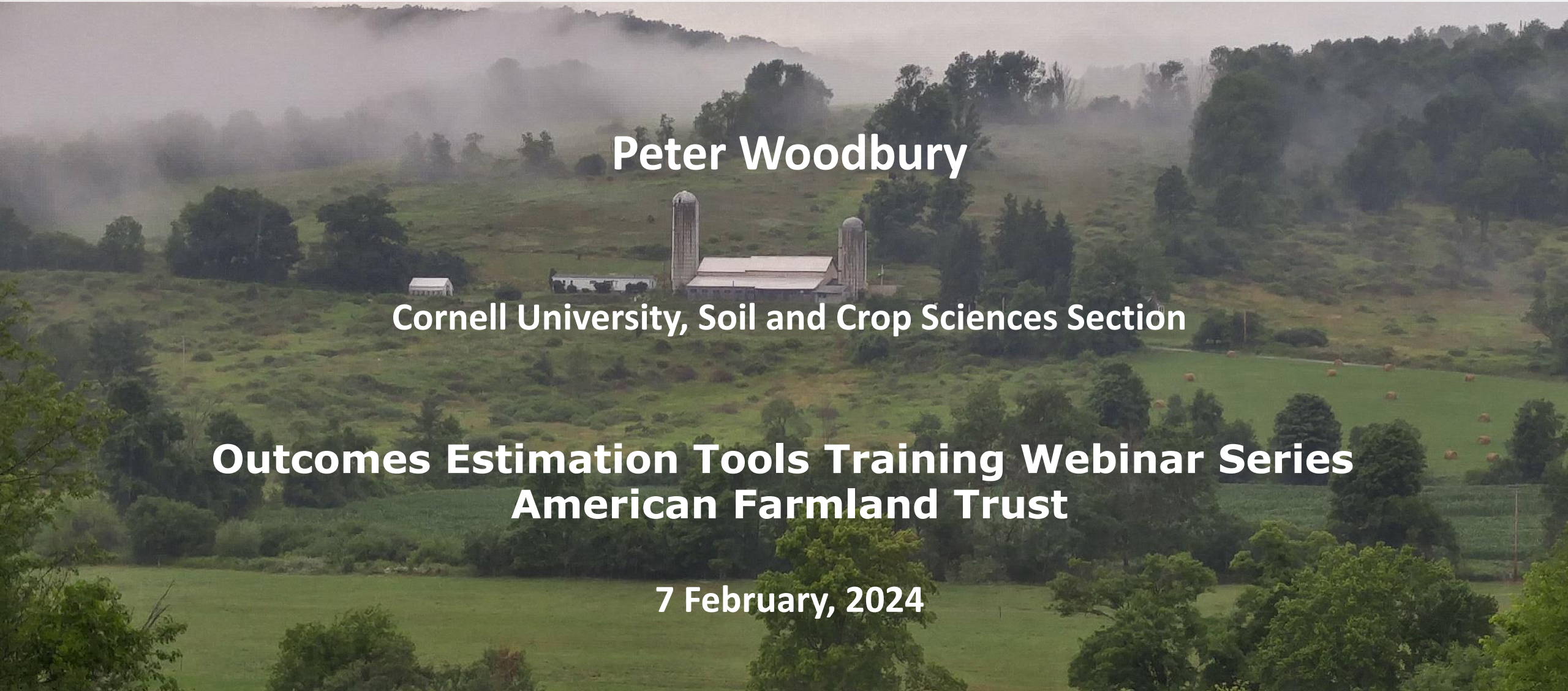
- Free to use
- Not many conservation/water quality tools focus on social indicators – this does
- No geographic limitations
- Existing databank of questions, but also able to add your own

Limitations

- Customizable in some sections, fixed in others
- Unable to import survey data
- Looks 15 years old
- Limited spatial analysis

Webinar #10: February 7, 2024

Using the FAST-GHG tool to estimate greenhouse gas benefits of soil health management practices



Peter Woodbury

Cornell University, Soil and Crop Sciences Section

Outcomes Estimation Tools Training Webinar Series
American Farmland Trust

7 February, 2024

Snapshot of Features	FAST-GHG Tool
Scale & level of specificity	**Field level** **Predicts average** based on default or site-specific inputs
Outcomes	**Greenhouse gas emission reductions** (Mg CO2e/ha) including breakdown of 7 source categories
Conservation practices	**Cover crop** (legume, non-legume, mixed**), tillage, fertilizer management**
Land uses & production systems	**Commodity crop production** (corn, wheat, soybean)
States & territories	**CONUS only**
How much time, data, & skills needed	**Easy to use web interface,** Just 3 to 11 clicks to get results. Default crop yield and N rate data available for all 3 crops and all counties
Special note	Includes factors not in other tools. Based mostly on field data

Key strengths of FAST-GHG

Accounts for impacts of management practices

Can make estimates with no farm-specific data

Makes improved estimates with farm-specific data

Grounded in mechanistic understanding of C and N cycles

Grounded in results of field experiments

Publicly available

Thoroughly documented

Key limitations of FAST-GHG

The default N fertilizer rate for a few states with much manure use (e .g. NY) should not be used for most purposes. Instead, use the “advanced inputs” option to define the N rate and yield

Does not include manure

Units are metric, not English

Cannot include all variations among farms and practices

The publicly available version is for a single combination of crop, location, and management practices

We do not currently have resources to provide user support

We hope to address some of the above issues, but don’t have a target date yet

Webinar #11: March 6, 2024

Cool Farm Tool

March 2024

Michaela Aschbacher
Training & Consultancy Manager

Snap Shot of Features	Cool Farm Tool
Scale & level of specificity	**Product & Field level for crops (GHG & water) and livestock (GHG).** Scalable through aggregation and outcome comparison on state/national level. **Farm level for biodiversity.** **Site-specific**: Field & product-specific estimates reflecting best management practices adapted to specific soils, locations and weather conditions, or specific animal categories and her management practices.
Outcomes	**GHG:** GHG emissions with CO2/N2O/CH4 breakdown (disaggregation as per GHG Protocol in 2025), carbon sequestration, soil organic carbon increase, Nitrogen use efficiency (NUE). **Water quantity:** crop water consumption (per kg), crop water requirements, and crop water footprints. **Biodiversity:** Beneficial effect on biome-specific species groups and monitoring of natural habitats sizes.
Conservation practices	**Crops:** Reduced tillage, improved nitrogen management, carbon input increase -> cover crops, manure, compost, residues etc., sustainable yield intensification, irrigation efficiency, reforestation, additional trees. **Livestock:** Improved herd & manure management, feed use (enteric emissions) & deforestation-free feed. **Biodiversity:** Diversity, food/nests for pollinators & birds, watercourses & windbreaks, habitat increase etc. **In Q2 2024:** Perennials: yield efficiency, residue management, agroforestry, hedges, shade trees, intercrops. **In 2025:** new process-based soil organic carbon model, perennials model improvements for crop model.
Land uses & production systems	Crops grown in mineral soils & livestock systems (currently dairy & beef, other livestock to be updated). Currently not suitable for organic soils (>12% SOC), non-soil or hydroponic systems, polar regions.
States & territories	Global – all U.S. territories (incl. islands)
How much time, data, & skills needed to generate an outcome estimate	No special skills needed, basic data at hand available from farm records, bills, etc. Data collection may take up some time, but once available, creating a field/farm assessment takes 10-15 minutes. Fields with same soil & management characteristics can be combined. Time needed for project scale data analysis.

Strengths, Limitations, & Trade Offs of the Cool Farm Tool – Is this the Right Tool for You?

Strengths

- Free for farmers – fee for project-scale use covered by project budgets
- Simple to use – data needs limited to what is available & needed for scientifically credible assessment
- U.S. wide – can be used anywhere
- Units in imperial and metric
- User friendly online interface - No software download needed
- Site-specific analysis - granular data with own soil structure data, local weather datasets from ERA5
- Default ranges or values where available or support functionality (e.g. machinery)
- Data aggregation, results can be downloaded
- Industry-backed and scientifically robust
- Certified advisor course for full tool training

Limitations

- Currently not suitable for: organic soils (>12% SOC), non-soil or hydroponic systems, polar regions (few areas in Alaska), other livestock (needs update)
- No rotational grazing or grassland sequestration in livestock
- No water quality assessments possible
- No offline use
- Whole-farm analysis needs multiple assessments
- External data analysis for project-scale comparisons
- No benchmarking comparisons with peers

Planning and Implementation of Conservation in Critical Source Areas through Watershed Based Management Planning in a Multi-Jurisdictional Watershed

Tate Wentz · Water Quality Section Manager · Arkansas Dept. of Agriculture

Shanon Phillips · Water Quality Division Director · Oklahoma Conservation Commission

Leif Kindberg · Director · Illinois River Watershed Partnership

Webinar #12: April 3, 2024

Use of OK HAWQS, a Web-Based Tool for Critical Source Area Identification in Oklahoma

Shanon Phillips
Oklahoma Conservation Commission

OKLAHOMA WATER RESOURCES CENTER

OKLAHOMA CONSERVATION COMMISSION

AgriLIFE RESEARCH
Texas A&M System

Strengths and Limitations of OK - HAWQS

- **Strengths-**
  - Public domain, automatic data updates
  - No GIS software or knowledge required
  - "Standard" assessments + additional tools for complex analyses
  - Can link to other models
  - Calibrated
  - **90% reduction in time and effort for SWAT-based environmental assessments**
- **Limitations-**
  - Available data may be limited
    - Spatial/temporal
    - Flow separation
    - Land management
  - Limitations inherent to SWAT
    - Daily estimates using monthly input data
    - Routing pollutants through subbasins
    - In-stream pollutant dynamics

OKLAHOMA CONSERVATION COMMISSION

Webinar #13: May 1, 2024

COMET-Farm & COMET-Planner

Tools for Conservation Planning and Greenhouse Gas Mitigation in Agriculture and Forestry

Cooperative Agreement COMET-Team

Natural Resource Ecology Laboratory
Colorado State University
Fort Collins, CO

U.S. Department of Agriculture
Natural Resources Conservation Services
Agriculture Resource Service
USDA Office of Chief Economist

COLORADO STATE UNIVERSITY

USDA

Webinar #13: May 1, 2024

Farm United States Department of Agriculture Natural Resources Conservation Service Colorado State University COMET Planner

COMET-Tools Feature Snapshot

	COMET-Farm	COMET-Planner
Scale & Specificity	Field-level with potential for project scale (depending on project size, this can be done in- or out of tool)	Regional/county-level
Outcomes	Soil carbon and greenhouse gas emissions (carbon dioxide, methane[1], and nitrous oxide) in tonnes of CO2e per year) per scenario per field. Outcomes can be summed on project level.	Soil carbon and greenhouse gas emission reductions (tonnes of CO2e per year) relative to a *fixed* baseline over given acreage of practice application. Outcomes summed on project level.
Conservation Practices	Changes in management related to planting, harvest, tillage, fertilizer application, manure application, irrigation, liming, and burning Quick add practices: Tillage and/or fertilizer reduction, and conversion to herbaceous cover(s)	Up to 34 NRCS Conservation Practice Standards with varying implementation methods, regionally dependent.

1- Methane estimated in cropland, pasture, rangeland, orchard/vineyard accounting is only relative to biomass burning; methane estimates for rice will be included in the new interface summer 2024

Webinar #13: May 1, 2024

COMET-Tools Feature Snapshot Continued…

	COMET-Farm	COMET-Planner
Land uses & production systems	Cropland, pasture, rangeland, orchard/vineyard; animal agriculture; agroforestry; forestry	Croplands, grazing lands, herbaceous cover (i.e. field border), disturbed lands, riparian, agroforestry
States & Territories	Contiguous US (No HI, AK, US territories due to interest, funding, and/or soil data)[2]	All US States (limited in HI & AK) [3]
Time, Data, & Skills required for outcomes	Time investment: High[4] Dependent on project size and complexity Data requirements: High[4] Specific field/site locations; general historic management, detailed baseline/current land management; detailed scenario management Skill requirements: Low to Medium	Time investment: Low 4 quick steps Data requirements: Low location (county/state), conservation practice standard and implementation, acres to apply practice Skill requirements: Low

2- Select US Territories coming soon to COMET-Farm. These will not be available until after the 2024 new interface redesign is complete.
3- COMET-Planner Global is available for select conservation practices applied outside of CONUS + HI
4- The new COMET-Farm interface (summer 2024) will reduce the data and time requirements
5- The new COMET-Farm interface (summer 2024) will not require the addition of scenarios to generate a report.

Webinar #13: May 1, 2024

Farm United States Department of Agriculture Natural Resources Conservation Service Colorado State University COMET Planner

COMET-Tools Strengths & Limitations…

Strengths	Limitations
Underlying peer reviewed methods: *Quantifying Greenhouse Gas Fluxes: Methods for Entity-Scale Inventory*	Process for adding NRCS Conservation Practice Standards (COMET-Planner)
Official GHG Accounting tool of the USDA	Crops available for assessment require DayCent parameterizations (COMET-Farm)
Coverage in most of the United States (both tools)	
User-friendly interface (soon to be even better…)	Current data requirements of ~23 years of baseline management (COMET-Farm)
Saving projects (COMET-Farm) & Downloadable reports (both tools)	
Flexibility in scale & management: Users can create multiple projects with 1-50 fields (COMET-Farm)	Updating the COMET-Farm UI to reflect the practice and methods takes time
Time & required data: 4 clicks to generate report (COMET-Planner)	
Trainings & support (both tools)	

Webinar #14: June 5, 2024

Devereux Consulting

Data ✦ Research ✦ Analysis ✦ Strategy

June 5, 2024

Chesapeake Assessment Scenario Tool

and Associated Data Resources

Snapshot of Features	CAST
Scale & level of specificity	**Output represents the sub-county** fate and transport of nutrients and sediment from the land to the water and vary with land use and management practices. **Project or farm-specific scales** can be modeled by using the loading rate (pounds per acre) for each land use. **Hydrology** is an average hydrological period and does not reflect the actual rainfall in a wet, dry, or other specific year. This provides an estimate of expected load in the future.
Outcome	**Data to inform decision making** for establishing water quality improvement plans and translate BMPs into ecosystem benefits, maps, and graphs. Specific numeric output is the **pounds** or **pounds per acre** of nitrogen, phosphorus, and sediment.
Conservation practices	Various types of: Cover Crops, Manure Transport, Land Retirement, Ammonia Emissions Reductions, Denitrifying Ditch Bioreactors, Nutrient Management, Feed Additives, Forest Buffers, Animal Waste Management Systems, Water Control Structures, Tillage, Pasture Management, Blind inlets, Animal Mortality, Carbon Sequestration/Alternative Crops, Access Area, Manure Incorporation, Feeding Space Management, Crop Irrigation Management, Wetland Restoration, Wetland Creation, Grass Buffer, Saturated Buffers, Tree Planting, Ag Stormwater Management, Ditch Filter, Off Stream Watering without Fencing, Conservation Plans, Irrigation Water Capture Reuse

Snapshot of Features	CAST
Land uses & production systems	**Agricultural land uses include** Permitted and Non-Permitted Feeding Space, Grain with and without Manure, Specialty Crop High, Small Grains and Grains, Full Season Soybeans, Specialty Crop Low, Double Cropped Land, Silage with and without Manure, Other Agronomic Crops, Leguminous Hay, Other Hay, Riparian Pasture Deposition, Pasture, and Ag Open Space **Developed, natural, septic, and wastewater are also included.**
States & territories	**Chesapeake Bay** states including New York, Pennsylvania, West Virginia, Delaware, Maryland, Virginia, and the District of Columbia.
How much time, data, & skills needed to generate an outcome estimate	CAST is designed to be used by **any person familiar with conservation practices**. The amount of time depends on the type of question being asked and ranges from 5 minutes to hours if working through development of a plan to meet a specific planning goal of pounds reduced.
Targeting maps	BMP Targeting maps have been created using CAST delivery factors and 2022 Progress loads to communicate which land-river segments in the watershed would be **most effective for BMP targeting**. https://experience.arcgis.com/template/1dab55bd52e843d0a619f52b86e0c663/

Is CAST right for you?

Geography: Working in a state that drains to the Chesapeake Bay

Time period: Land use is available for 1985 to 2025. BMP history is available for 1985 to the present(ish)

Scale: County, project, state, watersheds of various sizes from the Chesapeake Bay watershed down to HUC-12s

Runoff concerns: Total nitrogen, total phosphorus, and total suspended sediment

Benefits:

- No need to download or maintain any special software
- Free
- Official tool used by the Chesapeake Bay Program for evaluating the Bay TMDL, which is why it was originally developed in 2011

Is CAST right for you?

Scale of Inputs: Most agricultural inputs are from the USDA data and are at the county scale.

Time period: While we include data back to 1985, the management practice data is better in years after 2006. The model is an annual average predictive model, so uses average hydrology—wet/dry years not reflected in estimates.

Maps: GIS features for explicit planning are not yet incorporated, but maps will be added in the next year or two.

Runoff concerns: Does not yet include carbon, bacteria, or any other co-benefits to nutrient and sediment reduction

Limitations:

- Does not model the nutrient balance on a farm or field. Users can consider the nutrient applications as if an entire county were a farm. Variations within counties are only estimated in terms of landscape and stream characteristics.
- Management practice data is more limited in years prior to 2006.
- Does not vary load predictions by wet/dry years.
- GIS functionality not yet incorporated and even when it is, we will not be able to show USDA PII data of common land units (CLUs)
- Modeled pollutants limited to TN, TP, and TSS.

Webinar #15: July 10, 2024

Agricultural Conservation PLANNING FRAMEWORK

Housed at the National Hub

Prioritizing Practice Locations with Agricultural Conservation Planning Framework

ANNE NARDI
DR. HALEIGH SUMMERS
GREGG HADISH

USDA

IOWA WATER CENTER

IOWA STATE UNIVERSITY

Conservation Professional Training Program

Extension UNIVERSITY OF WISCONSIN-MADISON

Water Resources Center UNIVERSITY OF MINNESOTA

NORTH CENTRAL REGION WATER NETWORK

acpf4watersheds.org

Snapshot Summary of Agricultural Conservation Planning Framework (ACPF)

Agricultural Conservation PLANNING FRAMEWORK
Housed at the National Hub

Scale & level of specificity	**HUC-12 watershed scale** with the potential to combine multiple HUC-12s or focus on one field after the analysis is complete. **Site-specific:** Each practice is located based on the watershed, land use, soils, and topography in that exact location.
Outcomes	A file geodatabase containing **opportunity locations** for conservation practices. **Run-off risk** ratings for each field. **Soil vulnerability index** for each soil map unit.
Conservation practices	**Structural In-field/Edge-of-Field Practices**: Grassed waterways, contour buffer strips, bioreactors, nutrient removal wetlands, farm ponds, water and sediment control basins (WASCOBs), riparian buffers, saturated buffers.
Land uses & production systems	All land uses are evaluated (from the Cropland Data Layer), but conservation practices are specifically designed for agricultural row-crop fields.
States & territories	Core ACPF data is available for **IL, IA, MN, and WI and parts of IN, KS, MO, NE, and SD.** ACPF can be run anywhere, but more time would be needed to create the initial database and evaluate results.
How much time, data, & skills needed to generate an outcome estimate	Requires GIS experience and hydrology knowledge 40-50 hours/HUC-12 watershed where results data do not exist Data provided by user, ACPF National Hub, and state offices

Strengths, Limitations, and Trade-Offs of ACPF

Agricultural Conservation PLANNING FRAMEWORK
Housed at the National Hub

STRENGTHS

- Provides field-scale suggestions in a HUC-12 watershed
- Facilitates targeted conservation
- Supports watershed planning – identifies high risk areas and suggest opportunities
- Free to use
- Built-in file organization
- Not prescriptive
- Visual portray of watershed management
- Provides scientific validity to funding opportunities

LIMITATIONS

- Requires an ESRI ArcGIS subscription to run
- Not tested in every state – if outside of current data boundaries, users must collect their own data
- Requires GIS and hydrology knowledge
- Time-intensive