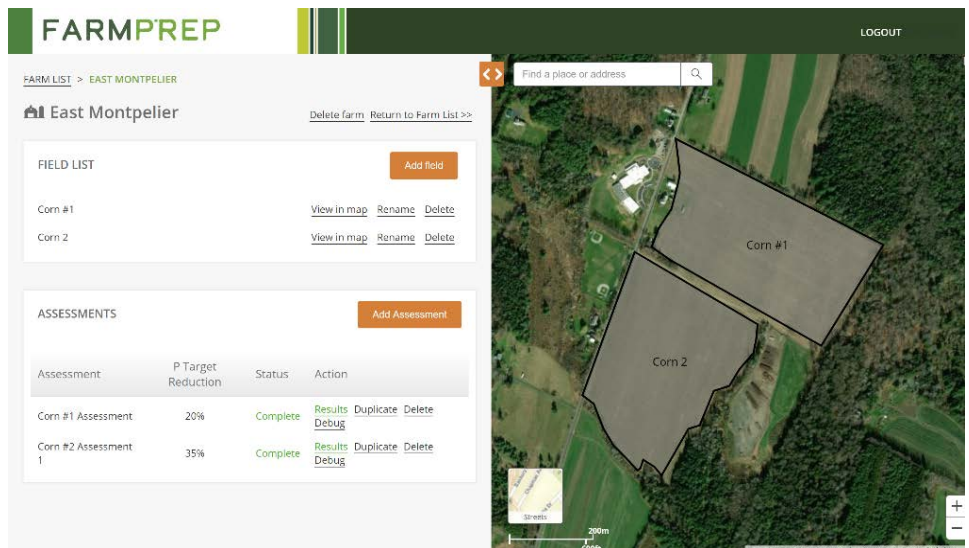


The Farm-P Reduction Planner (Farm-PREP): An Integrated Tool for Optimizing Field Practices to Achieve Farm-Scale Nutrient Reductions and Improve Water Quality

Stone developed the Farm Phosphorus Reduction Planner (Farm-PREP), an integrated web-based application, to help farmers, technical crop consultants, and stakeholders easily evaluate the impacts of field-level best management practices on farm scale phosphorus (P) loss reductions and identify modifications to their field operations to help achieve water quality improvement targets on the watershed-scale.

Farm-PREP brings the power of the USDA Natural Resource Conservation Service's farm-scale water quality model, the Agricultural Policy Environmental eXtender model (APEX), to a much broader audience through a streamlined and user-friendly user interface allowing for evaluation of thousands of farm management scenarios. The tool integrates agronomic and hydrologic science, numerical modeling, and web-based application development that is packed with science and engineering on the back-end, yet elegant and intuitive on the user-facing front end.

Stone worked closely with the University of Vermont agricultural scientists, local crop consultants, and stakeholders on the development of APEX model inputs to represent thousands of possible field practice combinations representative of Vermont dairy operations. These model inputs were then built into a relational database and accessed by the Farm-PREP tool based on user input. Using the tool, Stone tested APEX model simulations and evaluated the model predictions for a broad range of agricultural practices and field conditions.



Assessment	P Target Reduction	Status	Action
Corn #1 Assessment	20%	Complete	Results Duplicate Delete Debug
Corn #2 Assessment 1	35%	Complete	Results Duplicate Delete Debug

Farm-PREP's web-based user interface provides a streamlined and user-friendly interface to APEX, allowing farmers, crop consultants, and other stakeholders to easily identify options for field-level practices that meet water quality objectives and identify solutions that meet their farm's operational needs and preferences.

Numerical modeling and optimization methods were developed to enable the execution of thousands of APEX model simulations for each farm to identify management solutions that met a target for reducing phosphorus losses. The modeling and optimization approach utilized distributed cloud computing in a dynamic framework that could accommodate increasingly complex analyses associated with increasing farm size and number of concurrent users. Farm-PREP's web-based user interface with a logical workflow is designed to allow efficient inputs of the most critical farm information required to conduct the modeling analysis. The information provided by the tool offers farmers multiple options for field-level practices that meet water quality objectives and allows the farmer to make decisions on solutions that also meet their farm's operational needs and preferences.

The Farm-PREP tool is currently being expanded throughout the state of Vermont and is being enhanced to include additional field-level management practices and consideration of alternative nutrient management technologies. The implementation of this tool will lead to a substantially more quantitative and targeted approach to implementing improvements in farm agronomic practices that meet water quality objectives required to satisfy the Lake Champlain P Total Maximum Daily Load (TMDL).

Expanding the Use of Farm-PREP to Other Agricultural States and Regions

Farm-PREP is ready for expansion into other agricultural regions of the United States. Stone's team of environmental modelers, hydrologists, and application developers will work with you to develop appropriate crop rotation and agricultural practice inputs for your region. Farm-PREP will provide you with a consistent, defensible approach to decision-making and quantifying environmental sustainability benefits.

To learn more about the Farm-PREP tool please visit <https://farm-prep.net/info>. You can also contact Michael Winchell (mwinchell@stone-env.com) or Barbara Patterson (bpatterson@stone-env.com) for additional information or a free demo.

Farm-PREP was funded (in part) by an agreement awarded by the Environmental Protection Agency to the New England Interstate Water Pollution Control Commission in partnership with the Lake Champlain Basin Program. NEIWPCC manages LCBP's personnel, contract, grant, and budget tasks and provides input on the program's activities through a partnership with the LCBP Steering Committee. Although the information in this document has been funded wholly or in part by the United States Environmental Protection Agency under agreement LC00A00134 to NEIWPCC, it has not undergone the Agency's publications review process and therefore, may not necessarily reflect the views of the Agency and no official endorsement should be inferred. The viewpoints expressed here do not necessarily represent those of NEIWPCC, the LCBP Steering Committee, or EPA, nor does mention of trade names, commercial products, or causes constitute endorsement or recommendation for use.



The screenshot shows a web interface for 'Crop/Tillage/Manure Information'. At the top, it says 'Complete' and 'Select agronomic practices associated with the primary crop in rotation:'. Below this, there are dropdown menus for 'Crop: Corn silage' and 'Years in Rotation: 4', along with a 'Back' button. The main area is titled 'Operations Information' and has a 'Clear form' link. It is divided into two columns: 'Spring Operations' and 'Fall Operations'.
 Spring Operations:
 - Tillage: Conventional and Reduce (dropdown)
 - Manure Application Method: None (dropdown)
 - Manure Application Rate (lbs P₂O₅/ac): [empty text box]
 - Commercial P Fert (lbs P₂O₅/ac): 0.01 (text box)
 - Commercial N Fert (lbs N/ac): 136 (text box)
 Fall Operations:
 - Tillage: Reduced (dropdown)
 - Manure Application Method: Incorporated (dropdown)
 - Manure Application Rate (lbs P₂O₅/ac): 54 (text box)
 - Cover Crop Variety: Winter hardy cover crop (dropdown)
 - Cover Crop Planting Date: Late - by 10/15 (dropdown)

Users provide current crop rotations and agronomic practices, and Farm-PREP generates model simulations of multiple combinations of field practices to arrive at a farm-level plan that meets pre-determined farm phosphorous reduction targets.