A Simple Path to a Better Environmental and Economic Future for Working Lands in Vermont

February 2019

NEWTRIENT™
INNOVATIVE SOLUTIONS IN RESOURCE RECOVERY

Current and Future State of Dairy

CURRENT	→	ACHIEVABLE FUTURE

- Regulatory and societal pressures
- Environmental issues related to nitrogen, phosphorus, GHGs, etc.
- Erosion in consumer trust

- Provide solutions to multiple societal issues
- Incentives to drive increased adoption of on-farm sustainable actions
- Increase in consumer trust

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Who is Newtrient?

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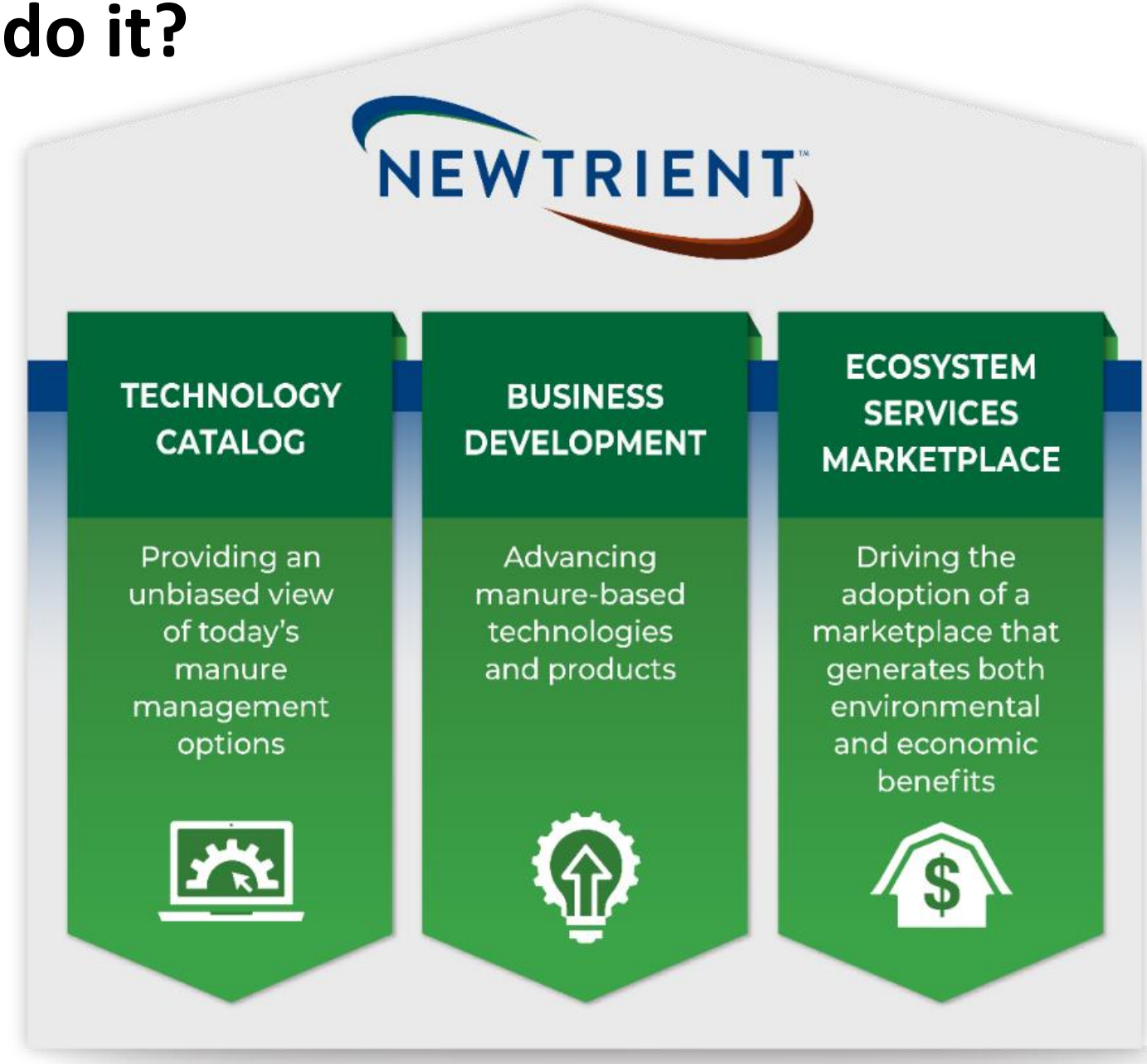
OUR MISSION

Reduce the environmental footprint of dairy and make it economically viable to do so.

How do we do it?



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Newtrient's Approach for Water Quality Improvement in VT

- A market-based mechanism should be used to guide and prioritize investments to reduce nutrient loading to impaired waters
- Investments are needed to fund implementation of practices and technologies that drive improvements beyond regulatory requirements
- Methodology should provide a mechanism to prioritize projects based on ROI…water quality benefit correlated with proposed investment
- Newtrient has developed a methodology to address this critical need

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Newtrient's Proposed Methodology

Newtrient Protocol + Stone Environmental Farm-PREP tool + Regulatory Entity

Step 1 Site Assessment & Eligibility Determination

Step 2 Modeling to Establish Baseline (RAP's)

Step 3 Modeling to Quantify Voluntary Practices and/or Technology

Step 4 Project Summary & Application

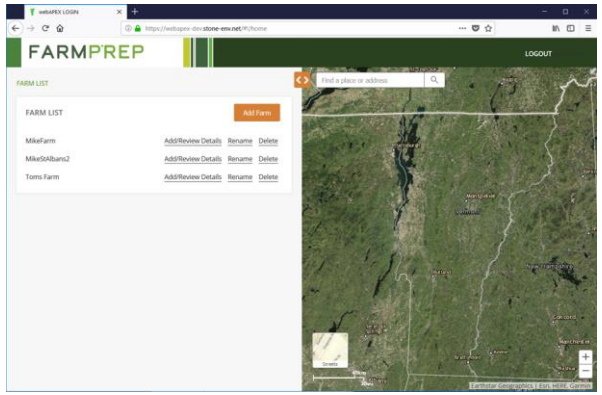
Step 5 Administrative Project Review & Decision

Step 6 Implement Project

Step 7 Verification of Implemented Project

Step 8 Certification of Reductions

STONE ENVIRONMENTAL



Regulatory Entity

1. Review, prioritize and fund projects based on ROI
2. Oversight of Third-Party Verifiers (Step 7)
3. Accountability through reporting quantified water quality benefit (Step 8)

Legend

- Farm Operator*
- Program Administrator
- Third-Party Verifier

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*Farm Operator assisted by Technical Service Provider, Technical Consultant, and/or Technology Vendor

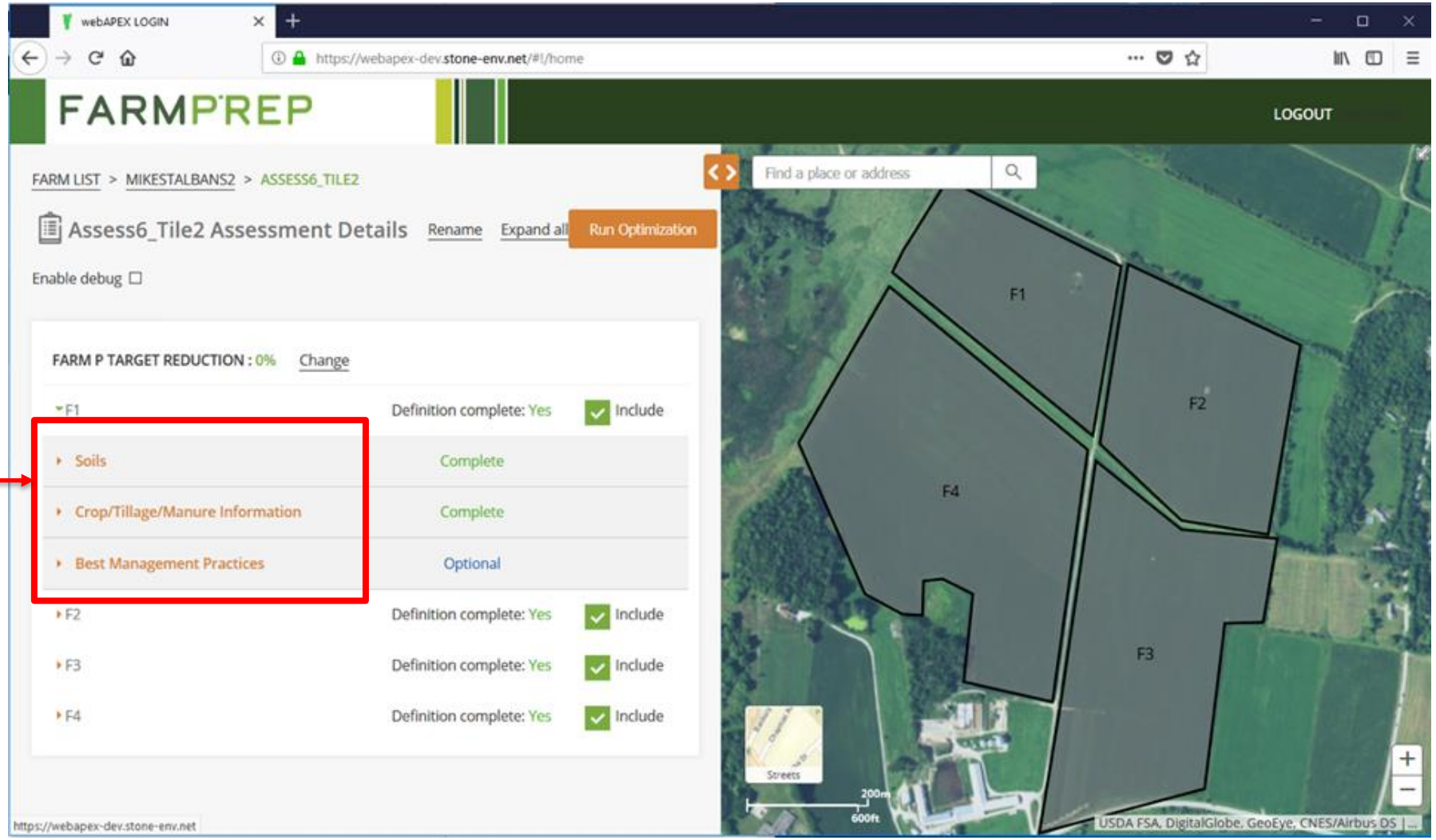
Background on Farm-P REduction Planner (Farm-PREP)

- Farm-PREP evolved out of another web-based APEX model interface developed by Stone and Texas A&M University (VT-STAR)
- The APEX model (developed and maintained by Texas A&M and NRCS) serves as the water quality/agronomic modeling engine for Farm-PREP
- Farm-PREP simplifies the use of APEX by pre-processing many required inputs (soils, topography, weather)
- Farm-PREP includes an extensive database of agronomic practices that were developed in collaboration with UVM Extension, crop consultants and technical advisors

Farm-PREP Tool Inputs

Field Level Inputs

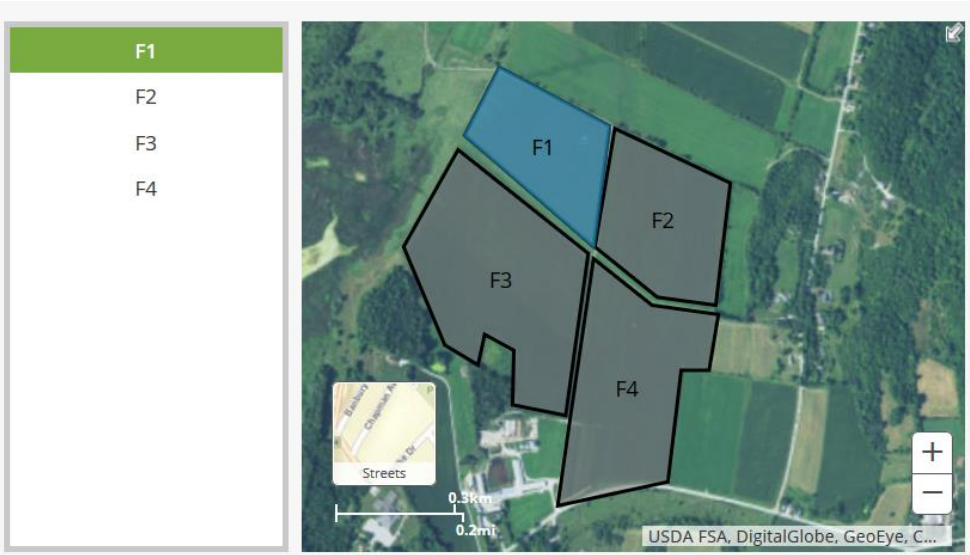
1. Soil Information
2. Crop Rotations, Tillage and Manure Application
3. Structural BMP's



Farm-PREP Tool Outputs

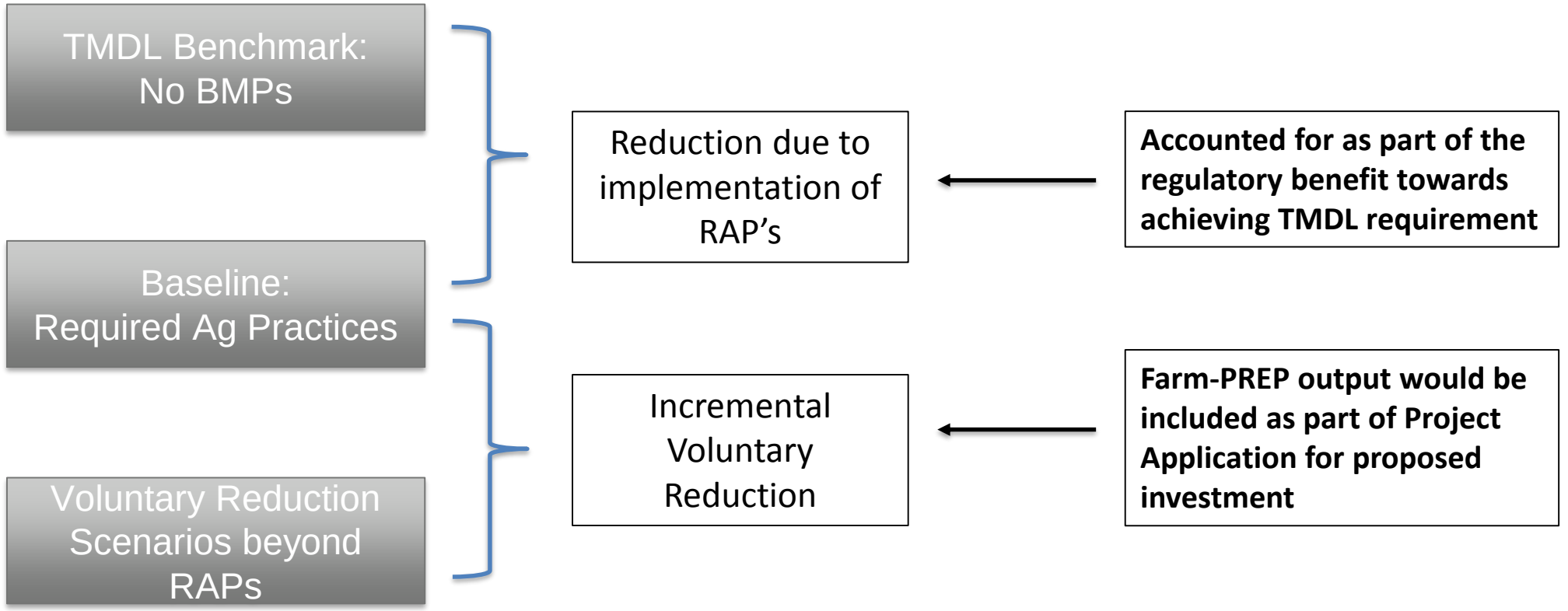
Outputs

1. Field level calculations and outputs that are aggregated to total farm
2. Model uses site specific data and real-time APEX calculations
3. Model functionality includes a scenario optimizer to identify field level modifications to meet target P reductions
4. Project underway to improve calibration and validation based on Vermont edge of field data



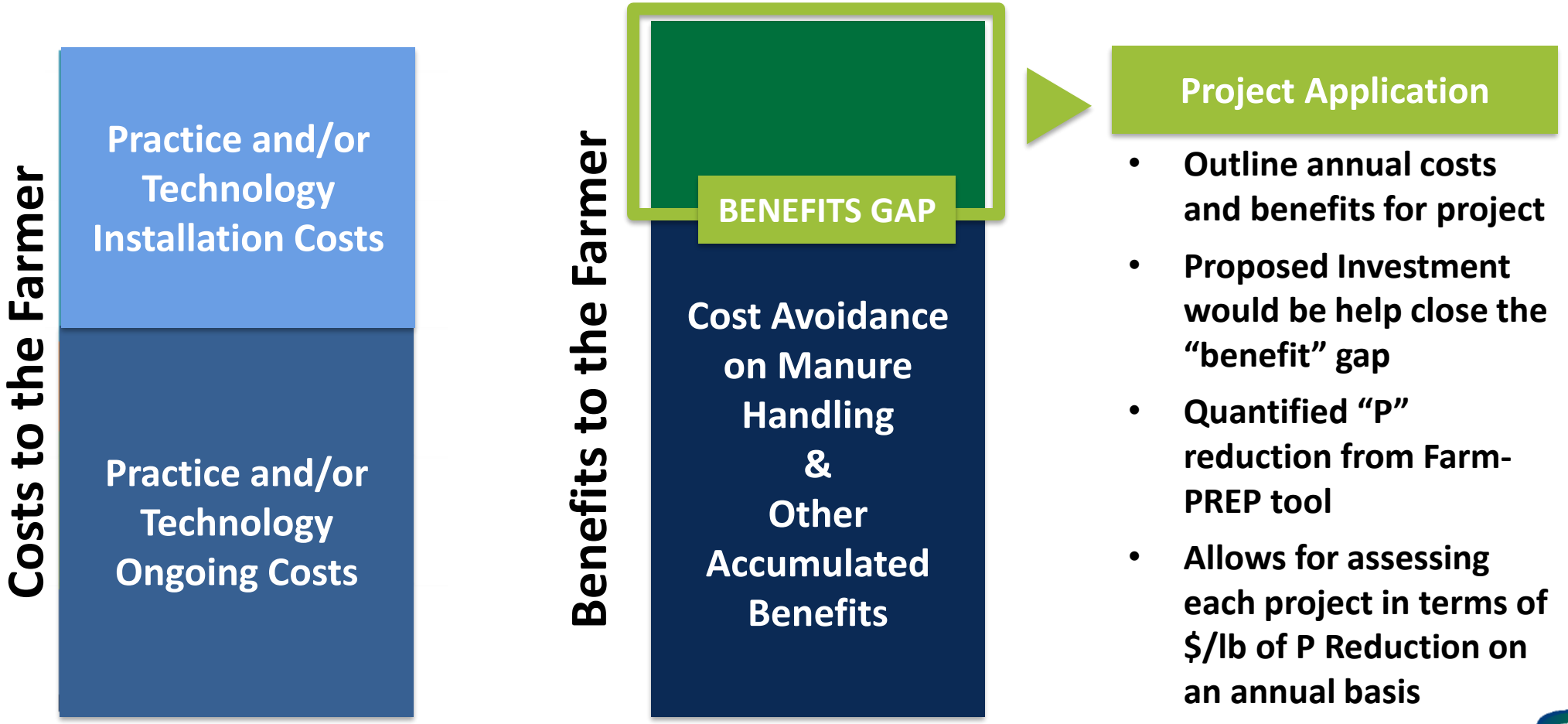
	TMDL Benchmark	Baseline (RAP's)	Scenario with Incremental Voluntary Practices Beyond RAP's
Total P Reduction from Baseline(%)		0	33.33
Total P Reduction from Current (%)	0		33.33
Total P (lbs/ac)	3.06	3.06	2.04
Soluble P (lbs/ac)	1.96	1.96	0.96
Sediment P (lbs/ac)	1.1	1.1	1.08
Tile P (lbs/ac)	0	0	0

Farm-PREP Provides the Reduction Eligible for Investment



Proposed Investments would Equal the “Benefits” Gap

Annual Cost and Benefits Gap of Practice/Technology Adoption



Project Application

- Outline annual costs and benefits for project
- Proposed Investment would be help close the “benefit” gap
- Quantified “P” reduction from Farm-PREP tool
- Allows for assessing each project in terms of $/lb of P Reduction on an annual basis

Project Prioritization and Funding

- Regulatory Entity would prioritize and fund projects based on highest ROI ($/lb) and other relevant criteria (e.g., tactical basin planning priorities or other co-benefits)

- Project funding could be structured based on a “Pay for Performance” model:

  - Funding set aside in annualized amounts that are paid based on ongoing performance (continuation of practice and/or technology adoption)

  - Ongoing Third-Party Verification provides regulatory entity the basis to Certify the Reductions and issue annual payment

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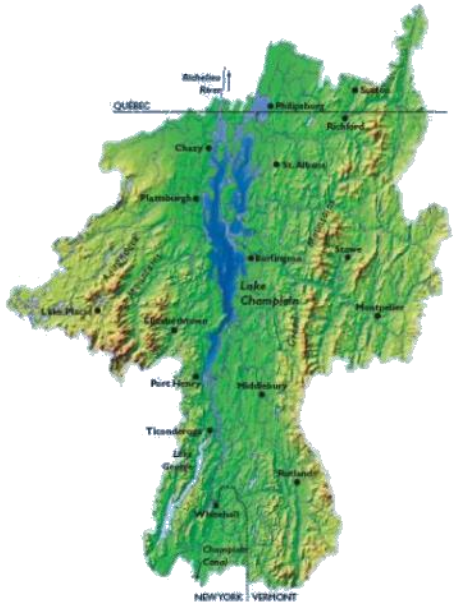
Opportunity for Dairy Market-based Solutions

Lake Champlain Stormwater Reductions – Phosphorus



STORMWATER REDUCTION (lbs/yr)	MUNICIPALITY REDUCTION COST = $2,500 (lb/yr)	DAIRY REDUCTION COST = $100 (lb/yr)
54,000 lbs	$135 MM	$5.4 MM
NEED	***CURRENT REDUCTION COST***	***AG SOLUTIONS COST***

Summary

- Newtrient's proposed methodology provides a mechanism to ensure that public investments deliver the highest ROI and corresponding water quality benefit
- Farm-PREP tool provides a high degree of confidence that water quality benefit will be achieved
- Pay-for-Performance funding structure ensures continuation of practice and/or technology adoption
- Investments provide economic incentive for adoption of practices and technologies that otherwise will not occur
- Methodology can be evolved longer-term to allow for other market participants to achieve compliance with lower costs options

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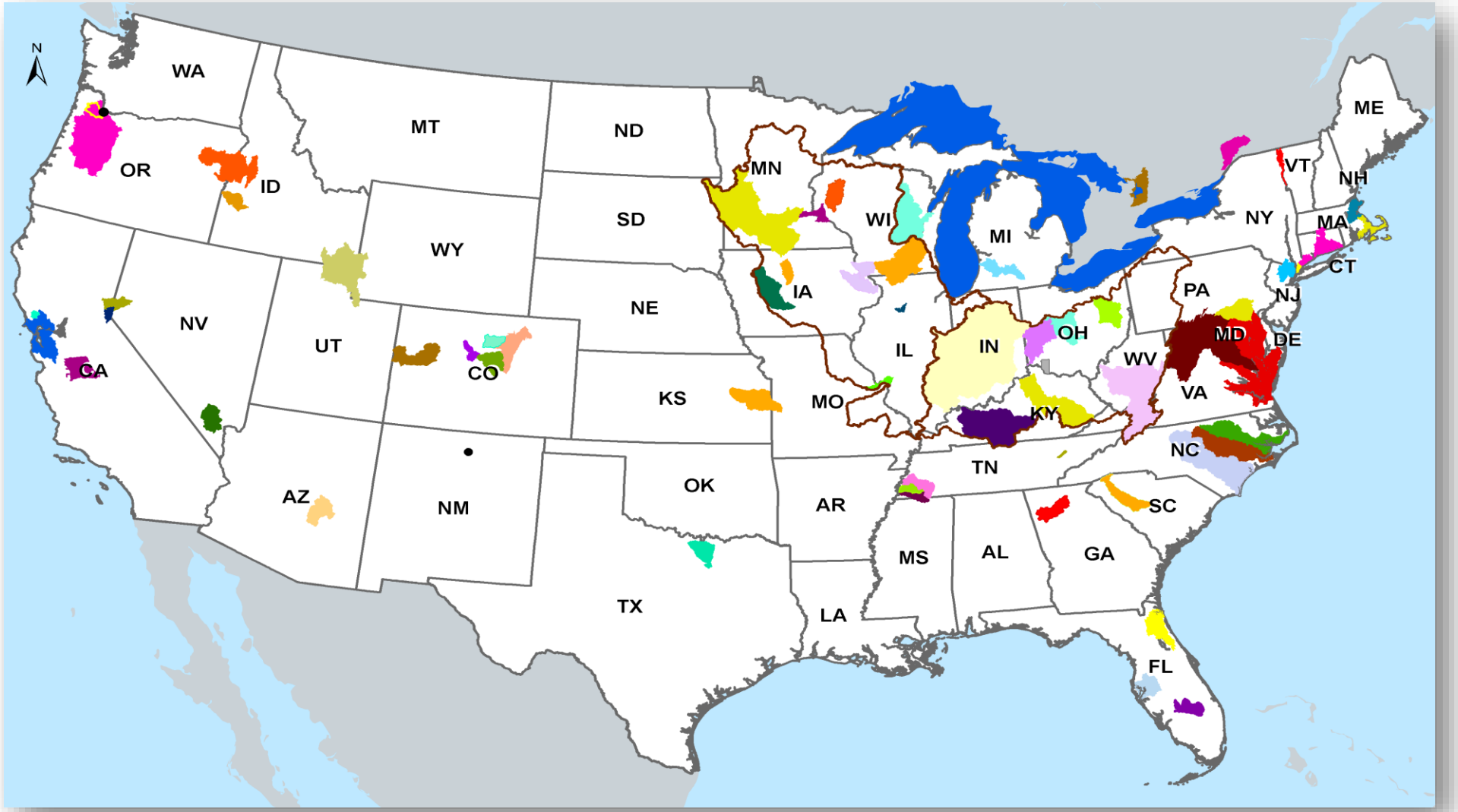
APPENDIX

Existing water quality trading programs



Source: Kieser and Associates

Newtrient's Market-based Approach

Manure P in VT Portion of Lake Champlain Basin

Farming Operation	Manure P Generation (lbs/yr)	6% Leakage of Manure P to Lake Champlain (lbs/yr)	50% Reduction of P Leakage with Technology (lbs/yr)
LFOs (22)	1,609,229	96,554	48,277
MFOs (148)	3,514,566	210,874	105,437
Subtotals	***5,123,795***	***307,428***	***153,714***

SUPPLY

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Stormwater TMDL Costs Compared to Manure Technology for Achieving Lake Champlain TMDL

Baseline Stormwater P Loads (2001-2010) (lbs/yr)	"Developed Land" TMDL WLA for Stormwater (lbs/yr)[1]	Stormwater P Load Reductions Needed (lbs/yr)	Stormwater BMP Load Reduction Cost at $902/lb[2]	Stormwater BMP Load Reduction Cost at $4,067/lb[2]	Savings with Delivered Ag P Reductions at $225.67/lb[3] Compared to *LOW SW Cost*	Savings with Delivered Ag P Reductions at $225.67/lb[3] Compared to *HIGH SW Costs*
251,327	197,005	54,322	$49M	$221M	$37M	$209M

Demand

[1] Lake Champlain TMDL

[2] Vermont Department of Environmental Conservation. 2014. Vermont Lake Champlain phosphorus TMDL Phase I Implementation Plan. Prepared for Governor presentation.

[3] Highest cost manure separation technology. (Costs range from $81-225/lb P delivered to Lake Champlain at 6% leakage and a load reduction of 50% following technology installation and new operational and manure P field management.)

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