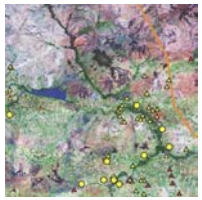
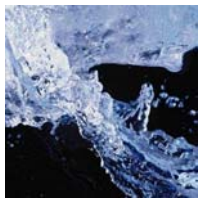


Assessment of Dairy Manure Management Practices to Reduce Pathogen Runoff Losses From Agricultural Watersheds



Donald W. Meals, David C. Braun, John P. Hanzas

CSREES National Water Conference 2007

January 29, 2007

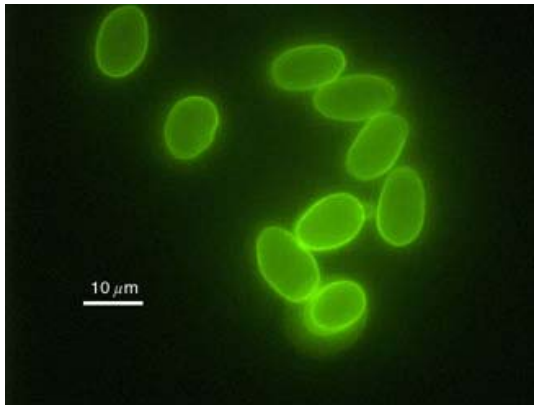
STONE ENVIRONMENTAL INC

Introduction

Contamination by bacteria and other microorganisms is a leading cause of impairment of US waters.

Runoff from animal waste applied to agricultural land frequently delivers indicator bacteria and pathogens to surface waters, contributing to violations of water quality standards and presenting a potential risk to public health

Introduction



Improved manure management practices of known effectiveness are needed to reduce export of pathogens from agricultural land

Project Goals

- Quantify patterns of microbial pathogen and indicator bacteria application and transport in runoff from agricultural lands receiving dairy manure; and

- Assess the effectiveness of several management practices in reducing runoff losses of indicators and pathogens under field conditions.

Objectives

- Document and quantify the occurrence of *E. coli* O157:H7, *Cryptosporidium,* and *Giardia* in representative dairy manure in Vermont;
- Characterize pathogen and indicator organism losses in surface runoff from hayland and cornland receiving manure at the field scale;
- Quantify the relative magnitude of microorganisms in runoff losses from hayland and cornland; and
- Document the effects of improved management at the field scale on runoff losses of microorganisms.

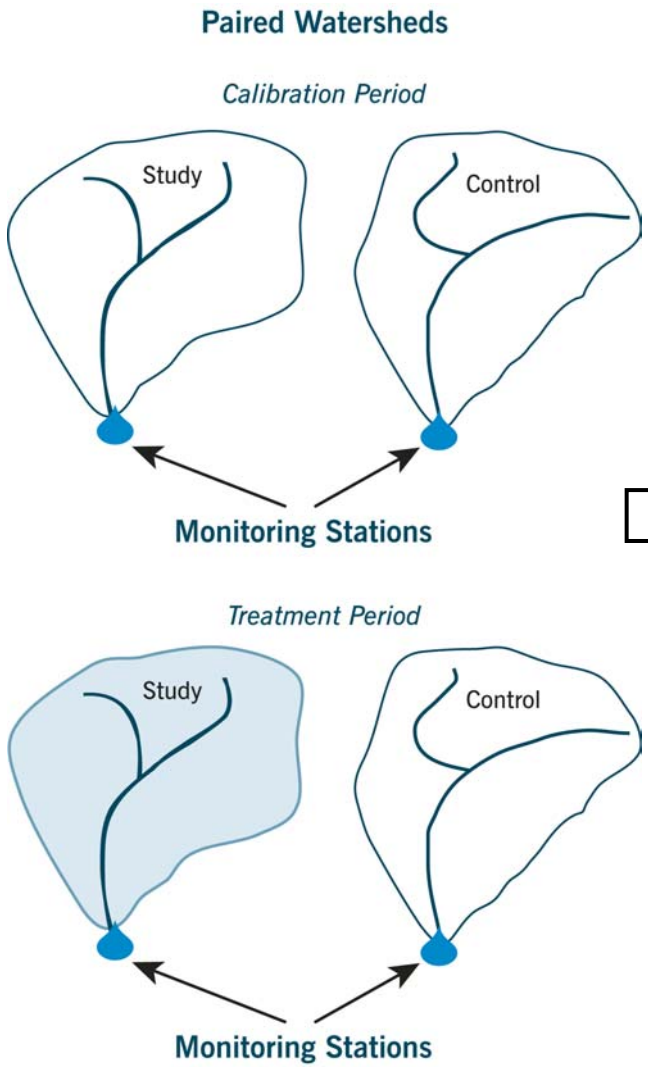
Approach

- Analysis of fresh and stored liquid dairy manure for generic *E. coli* and pathogens
- Storm-event monitoring of field-sized watersheds in corn and hay for runoff quantity and microorganism content under present management

Approach

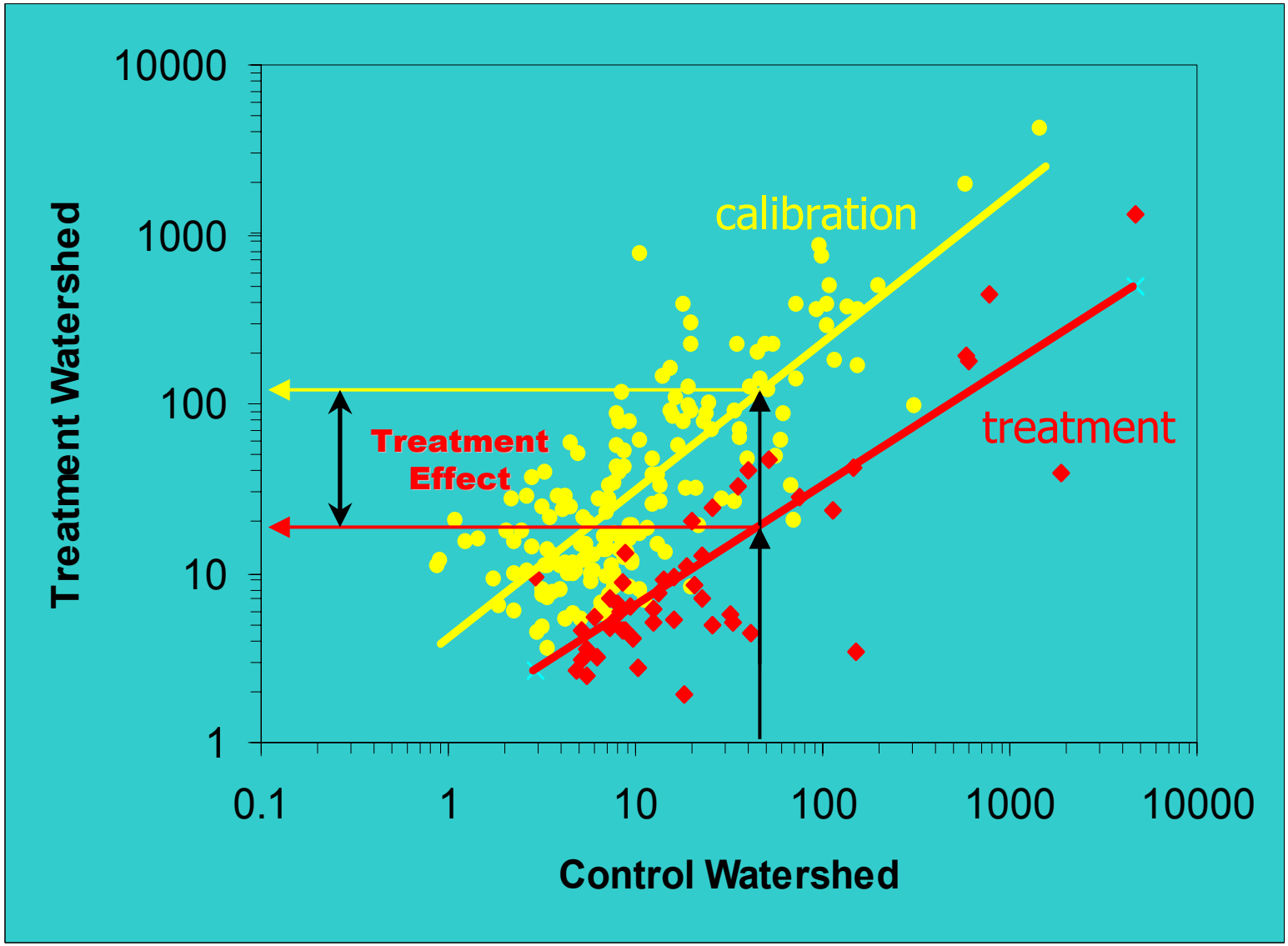
- Storm-event monitoring following management changes:
  - Delay between manure application and rainfall
  - Manure incorporation on cornland
  - High vegetation on hayland

Paired-Watershed Design



TIME	WATERSHED: CONTROL	WATERSHED: STUDY
CALIBRATION PERIOD	No BMP	No BMP
TREATMENT PERIOD	No BMP	BMP

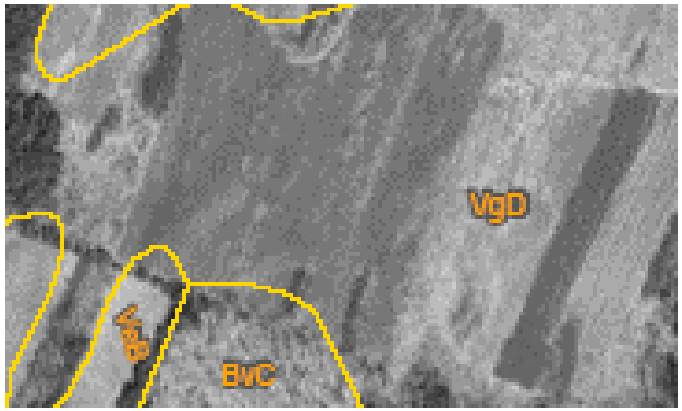
Paired-Watershed Design



Progress to Date

- Sampled manure from 3 farms, 3 times
- No *E. coli* O157:H7, few *Crypto* and *Giardia* found
- Working on enhanced microbiological analysis, additional organisms

Progress to Date



- Identified suitable paired field sites for corn and hay
- Negotiated agreement with producer for monitoring and management
- Obtained H-flumes, autosamplers, other monitoring equipment
- Anticipate initial runoff monitoring in April 2007

Progress to Date

- Convened Project Advisory Committee, including representatives from:
  - USDA-NRCS
  - University of Vermont
  - Vermont Agency of Agriculture
  - Vermont Department of Environmental Conservation
  - Lake Champlain Basin Program
  - USGS

Next steps

- Continue manure sampling program
- Instrument study fields
- Install meteorologic station
- Characterize topography, soils of study fields
- Collect farm and field management data
- Sample and analyze applied manure
- Monitor 7 to 10 runoff events for precipitation, runoff volume, and microorganisms