



Water Quality & Food Safety Program Summary

Program Title: Investigating the Compatibility of Water Quality and Food Safety through Research and Implementation

Program Components: A) Food Safety/Water Quality Research – Investigating Polyacrylamide and Grassed Waterways; B) Food Safety/Water Quality Pilot Research – On-farm Investigation of Vegetated Treatment Systems; C) Implementation of Best Management Practices for Water Quality & Environmental Protection

Funder: State Water Resources Control Board; Prop 40/50 Agricultural Water Quality Grant Program

Duration: 3 years; January 2007 - January 2010

Award Amount: \$1,000,000; funding distributed among three project components



Figure 1. Porous sand bags inoculated with three marked strains of generic *E.coli*. Method used as field inoculum for practice effectiveness monitoring.



Figure 2. Illustration of flume with automatic water sampler used during grassed waterways and polyacrylamide field trials.



Figure 3. Example of a Vegetated Treatment System – dual ponds and floating pennywort.

ABOUT THE COALITION

Mission: The Central Coast Agricultural Water Quality Coalition represents farmers and ranchers in the development and implementation of voluntary, cost-effective, producer-directed programs to protect water quality in the greater Monterey Bay watershed.

History: The Coalition's agricultural water quality work began in 1999 with the development of a unique partnership with the Monterey Bay National Marine Sanctuary. Together with the Sanctuary, environmental organizations, governmental agencies, farmers and ranchers, the Coalition launched its water quality program. The Coalition is 501 (c)(3) non-profit organization; nearly 100% of our funding is from grants.

Geography: The Agricultural Water Quality Program spans 6 counties, including Monterey, Santa Cruz, San Mateo, Santa Clara, San Benito and San Luis Obispo counties. Within these counties are 11 major watersheds that drain into the Monterey Bay National Marine Sanctuary. There is a Coalition Coordinator in each of the six counties working to link growers with resources to improve water quality.

Board of Directors: The Coalition Board is comprised of farmers and ranchers

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| ▪ Paul Hain, President | ▪ Benny Jefferson, Secretary | ▪ Gary Ketcham, Director |
| ▪ Don Hordness, Chief Financial Officer | ▪ BJ Burns, Director | ▪ Elia Vasquez, Director |
| | ▪ Bill Hammond, Director | |

ABSTRACT

The co-management of food safety and water quality requires the development and promulgation of science-based recommendations for the concurrent achievements of both water quality and food safety standards. The purpose of the Water Quality/Food Safety Program is to implement pilot field trials and on-farm demonstration projects aimed at exploring the compatibility of water quality and food safety.

Pilot field trials investigate the influence of vegetative water quality Best Management Practices (including grassed waterways/drainage ditches, vegetative treatment systems, and polyacrylamide) on nutrient, sediment, and bacterial levels. Field trials are implemented on both commercial and research farms in the Pajaro and Salinas River Watersheds. In addition, the design and installation of over twenty on-farm demonstration projects is underway.

BACKGROUND

The agricultural industry on the Central Coast of California is under increasing pressure to comply with water quality regulations¹ while also ensuring a healthy, safe supply of fresh market produce (please refer to Leafy Green Marketing Agreement information below⁴). The concurrent achievement of both water quality and food safety standards has become one of the most important challenges facing farmers and ranchers today. In the spring of 2007 the Resource Conservation District of Monterey County² conducted a Grower Survey to assess the impact of the conflicting demands between food safety and environmental protection. Survey results reported that over 30% of respondents had removed non-crop vegetation, 15% had removed conservation practices, and 89% of growers had adopted practices to deter wildlife. Additionally it was found that conventional, larger scale, leafy green growers who sell to large shippers/buyers have been most affected.

The Central Coast Regional Water Quality Control Board's 303(d) List of Impaired Water Bodies³ identifies agriculture as a significant source of water quality impairment within 37 water bodies residing in 9 major watersheds throughout the Central Coast. In an effort to meet water quality standards, Total Maximum Daily Loads, and compliance with the Conditional Waiver of Waste Discharge Requirements, growers utilize agricultural Best Management Practices (BMPs) to mitigate for nutrients and chemicals prior to contact with a river or stream. BMPs implemented on or adjacent to Central Coast farms include practices such as critical area plantings, grassed waterways, hedgerows, riparian buffers, and vegetative/wetland treatment systems. However, the presence of non-crop vegetation on, adjacent to, or near the farm, has been identified as a potential risk factor for microbial and vertebrate contamination by various private food companies and food safety auditors.

According to US Food and Drug Administration, California Department of Public Health Service, and Center for Disease Control records, there have been at least twenty lettuce-associated *E-coli* (O157:H7) outbreaks since 1995. At least nine of those outbreaks have resulted in trace-backs that led to fields in the Central Coast. Consequently, the "field to fork" supply chain is under increasing pressure to reduce the risk of pathogens in fresh market vegetables. To establish strict food safety standards, the agricultural industry has developed the Leafy Green Marketing Agreement⁴. One-hundred and twenty major handlers⁵, representing 99% of the volume of fresh leafy green produce on the Central Coast have voluntarily signed onto and participate in the *Leafy Greens Marketing Agreement*. "Super Metrics" is the term commonly used by the agricultural industry, technical resource providers, non-governmental and governmental staff to refer to private food companies (buyers/retailers) that have developed in-house, proprietary food safety guidelines that often exceed the *Commodity Specific Food Safety Guidelines for the Lettuce and Leafy Greens Supply Chain* ("Metrics" or "GAPS").

COOPERATING ENTITIES

- Central Coast Regional Water Quality Control Board
- Central Coast Agricultural Water Quality Coalition
- Community Alliance with Family Farmers
- Resource Conservation District of Monterey County
- Resource Conservation District of Santa Cruz County
- Growers in the Pajaro and Salinas River Watersheds

¹ CCRWQCB – Water Quality Standards and Regulations: <http://www.swrcb.ca.gov/rwqcb3/>

² Resource Conservation District of Monterey County: <http://www.rcdmonterey.org/>

³ 303(d) List of Impaired Water Bodies: <http://www.waterboards.ca.gov/centralcoast/TMDL/303dList.htm>

⁴ Leafy Green Marketing Agreement Website: <http://www.caleafygreens.ca.gov/about/lgma.asp>

⁵ Handler per LGMA: Any person who handles, processes, ships, or distributes leafy green product for market, whether as owner, agent, employee, broker, or otherwise. Definition does not include retailers.

RESEARCH TEAM

- **Michael, Cahn** - Ph.D, University of California Cooperative Extension, Salinas. Expertise in irrigation and nutrient management.
- **Marc Los Huertos** - Ph.D, California State University Monterey Bay. Expertise in water quality.
- **Trevor Suslow** - Ph.D, University of California, Davis. Expertise in microbiology and food safety.

PROGRAM COMPONENTS: PILOT FIELD TRIALS & DEMONSTRATION PROJECT IMPLEMENTATION

- A) **Grassed Waterway & Polyacrylamide Field Trials:** Evaluate effectiveness of vegetative and non-vegetative management practices to reduce nutrients, sediments, and bacteria in irrigation tail water.
- The study utilizes a randomized Latin square cross over design. BMP treatments include vegetated ditch, PAM, PAM plus vegetated ditch, and control (bare ditch). Three marked strains of generic *E.coli* are introduced to the irrigation tailwater through the use of porous sand bags inoculated with known concentrations of bacterium (see Figure 1). The sand bags are evenly distributed among furrow bottoms, prior to contact with BMP treatment(s). Solid set sprinklers irrigate to generate adequate runoff for the trials (1.25" for 3 hours per irrigation). Outflow rates are measured at the outflow of each ditch with a flume and composite samples are pumped into a bucket. Water and soil samples are collected (see Figure 2). Samples are analyzed for nutrient, sediment, total coliform and generic *E.coli* concentrations. This study will take place over two field seasons. The first field season commenced in the fall of 2007, the second and final season will take place in fall 2008.
- B) **Vegetated Treatment System Field Trials:** Evaluate the influence of Vegetated Treatment Systems (designed to assimilate nutrients and pesticides) on *E. Coli* and coliform bacteria concentrations.
- Four on-farm Vegetated Treatment Systems within the Pajaro and Salinas River watersheds are being studied to compare water quality improvements resulting between the inflow and outflow (see Figure 3). Site selection was based on several variables, including: known high background levels of total coliforms and generic *E.coli*; elevated nutrient concentrations; well established aquatic vegetation; water availability; and grower willingness to participate. Water samples will be collected weekly at the inflow and outflow of each system, between May and September of 2008 and 2009. Samples will be analyzed for nutrients, sediments, generic *E. coli* and total coliform. Generic *E.coli* and total coliform samples are processed within 2-6 hours after collection using the Colilert method. The Colilert method uses a nutrient indicator reagent that causes a yellow color and a UV glow as positive indicators. When total coliforms metabolize the indicator sample turns yellow. When *E.coli* metabolizes the indicator sample fluoresces under a UV lamp. No color indicates a negative. From this the Most Probable Number (MPN) is established for both indicators.
- C) **Implementation of Best Management Practices:** Design, coordination, and implementation of vegetative Best Management Practices are ongoing components of the program. Projects are implemented in the Pajaro and Salinas River Watersheds. Projects include critical area plantings, native plant hedgerows, riparian forests, filter strips, and grassed waterways/ditches. To date we have installed approximately 21,615 linear feet, totaling 4 miles of conservation practices to improve water quality.

STAFF CONTACTS

For more information about this program, please contact:

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