

ANALYSIS OF BMPs AND THE CONDITIONAL WAIVER PROGRAM IN VENTURA COUNTY

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FACULTY ADVISOR: DR. ANDREW PLANTINGA
ADAM JORGE | CHASE LECROY | HANSA SRINIVASAN

ENVIRONMENTAL PROBLEM

Agriculture is the leading nonpoint source (NPS) of waterway impairment in the United States. Over 120,000 miles of US waterways are contaminated by nutrients, pesticides, and sediments of agricultural origin (US EPA, 2002).

To address agricultural NPS pollution in California, Regional Water Quality Control Boards work with stakeholders to develop voluntary pollution control programs in exchange for waiving pollutant discharge permit requirements. This policy tool has become known as the Conditional Waiver Program (CWP).

The requirements under the CWP are different in each State Water Resources Control Board region. In Ventura County, the Los Angeles Regional Water Quality Control Board (LARWQCB) acknowledges that agricultural NPS of pollution from irrigated lands are not in complete compliance with total maximum daily load (TMDL) benchmarks, but waives fines and pollution discharge permit requirements on the condition that frequent monitoring and best management practices (BMPs) are implemented.

The Ventura County 2010 – 2015 CWP requirements involved three main components:

- 1 *Grower attendance of mandatory field management education workshops.*
- 2 *An intensive water quality monitoring and reporting program.*
- 3 *Implementation of scientifically-sound BMPs*

IMPLEMENTATION OF BMPs

Of the CWP requirements listed above, the implementation of field-scale BMPs represents the primary method for reducing agricultural NPS pollutant transport to Ventura County waterways. BMPs control pollutant runoff in a number of ways:

- 1 *Reducing excessive application of fertilizers and pesticides*
- 2 *Preventing over-watering and minimizing nutrient-rich irrigation runoff*
- 3 *Controlling erosion by keeping soil on farms during irrigation and storm events*

Each of these categories includes a number of specific practices chosen based on crop and land needs, such as the use of buffer strips between fields to retain sediments, “fertigation” to efficiently deliver fertilizer, or wattles to prevent erosion during storm events.

SIGNIFICANCE

This project represents an original attempt to use water quality and BMP implementation data collected under California’s CWP to provide a quantitative assessment of BMP efficacy in Ventura County. Though BMPs have been proven to reduce pollutant concentrations in individual case studies, there is little quantitatively defensible data demonstrating their effectiveness at larger scales. The efficacy of BMP implementation programs are therefore unclear. Data collected under the Ventura County CWP presents a unique opportunity to statistically assess the specific impacts of BMPs on agricultural NPS pollution. This project seeks to answer this question by assessing the data gathered under Ventura County’s CWP monitoring requirements. Evaluation of these records provides a critique of CWP requirements and a constructive space to recommend further actions to both the Ventura County Agricultural Irrigated Lands Group (VCAILG) and its regulating body, the LARWQCB.

PROJECT OBJECTIVES

As program implementation costs increase and water quality issues become more pressing throughout California, the need to quantify the effectiveness of BMPs is becoming urgent (B. Dowd, Press, & Huertos, 2008).

To date, VCAILG has spent approximately \$11.5 million on program administration. Despite the investment, a thorough investigation of BMP effectiveness has yet to be conducted (Ventura County Farm Bureau, 2015b).

There are three primary objectives of this project: (1) Analyze water quality and grower survey data to determine which BMPs have been most effective in reducing pollutant runoff; (2) Qualitatively evaluate the overall effectiveness of the CWP to date; (3) Generate a series of recommendations to enhance the VCAILG water quality monitoring program.

Findings of this project should be used to provide VCAILG and the LARWQCB with tools, resources, and a framework to improve water quality in the long term and evaluate the effectiveness of the CWP's BMP and TMDL components. The report aims to identify necessary modifications to the CWP and generate recommendations to VCAILG's water quality improvement efforts during and beyond the 2015-2020 Waiver cycle.

BACKGROUND

Agricultural activities contribute to 48% of waterway impairment in the United States (US EPA, 2002). Agricultural pollutant discharging groups in California are subject to the California Water Code, which allows Regional Water Boards to waive waste discharge requirements if it is perceived as keeping with the best interests of the public. The CWP is an inclusive, negotiated, and regionally-focused voluntary program designed to identify the needs of regional water bodies and ecosystems, develop necessary water quality standards, foster grower adoption of BMPs, and create a stakeholder-driven culture of progressive farm-scale water resource management practices. The CWP is an iterative regulatory process, with a five-year renewal cycle. Ventura County's CWP acknowledges that NPS pollution from agricultural irrigated lands is not in compliance with TMDLs, but waives fines and pollution discharge permit requirements on the condition that frequent monitoring, BMP implementation, and biannual training requirements are satisfied (Ventura County Farm Bureau, 2015a).

MONITORING

The CWP requires farm owners to routinely measure discharges from agricultural irrigated lands through the operation of a water quality monitoring program.

The Ventura County CWP monitoring program is designed to detect, measure, and report the concentrations of agricultural pollutants in streams and waterways receiving irrigated lands discharges. The current program requires that data is collected from twenty VCAILG member sites, each of which drains multiple farms and landowners (Larry Walker Associates, 2013). (Figure 1) Monitoring occurs four times per year at each site with samples taken during two wet and two dry events. Water samples are collected mid-stream and analyzed for pollutants of agricultural origin as identified in the 2010 – 2015 CWP (Larry Walker Associates, 2013).

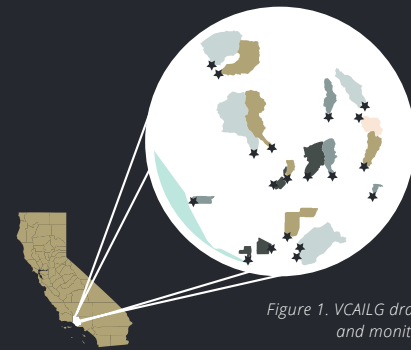


Figure 1. VCAILG drainages and monitoring sites.

Monitoring results conducted in the years since the adoption of the CWP show that nutrients and pesticides are frequently detected at concentrations that exceed their respective TMDL benchmarks. Meeting the benchmarks for these pollutants remains a complex issue; climatic and spatial complexity, variation between farm application rates, and uncertainty surrounding the efficacy of management practices occlude the sources, pathways, and receptors associated with water impairment and improvement.

APPROACH

The 7+ years of publically available water quality data and 5+ years of VCAILG BMP survey data are analyzed in this project to determine which practices have been most effective in reducing pollutant runoff. The relationship between water quality and BMP adoption was explored via multiple regression analysis. Water quality and BMP adoption data are analyzed while controlling for supplementary environmental data including climate, crop type, and location. The data is collected on a sub-watershed level as described above. Survey data on BMP adoption rate has been collected for each drainage area.

RESULTS & DISCUSSION

NITRATE MODELS

The nitrate loading regression showed no significant variables. It is therefore not possible to conclude that these factors have an effect on nitrate loading. Results for nitrate concentration suggest that water management BMPs are more likely to limit nitrate pollution than fertilizer management practices.

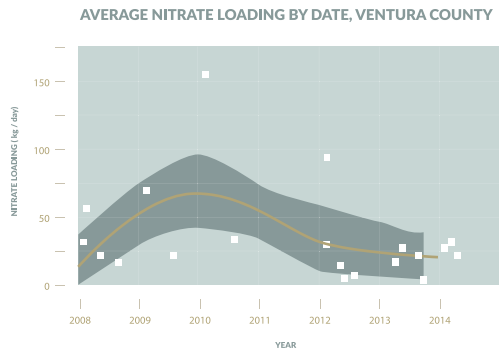


Figure 2. Average nitrate loading by date for all sampling sites in Ventura County, with a LOESS-smoothed curve and 95% confidence interval.

PESTICIDE MODELS

No BMPs were significant predictors of organochlorine pesticide detection. Climatic variables were significant for both pesticides. Two sediment management BMPs were significant and showed an unexpectedly positive effect on organophosphate pesticide detection. Regression results are inconsistent with theory and confounded by unobserved factors. Based on these results, it is not possible to conclude that BMPs have an effect on pesticide detection.

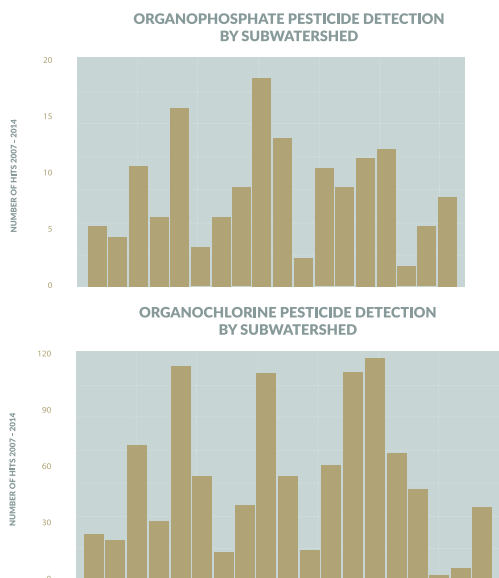


Figure 4. Total number of pesticide hits by sub-watershed for Ventura County.

CONCLUSIONS

STATISTICAL ANALYSIS

Results of the statistical analysis are inconclusive. Ventura County water quality data acquired under the CWP is limited by inconsistent and infrequent collection, inadequate BMP adoption data, and unknown values for irrigation quantity, nutrient and pesticide application rate, and continuous in-stream flow rate. A majority of BMPs were either adopted by nearly all farms or split between no adoption and full adoption; the lack of low to mid-range rates makes evaluating relationships difficult. Each of these restrictions limits the ability of both regulators and VCAILG to accurately evaluate CWP success, determine BMP effectiveness, or analyze changes in water quality.

INSTITUTIONAL EFFECTIVENESS

The CWP in Ventura County has effectively fostered an organized, engaged response from irrigated lands farmers. The current nature of the Farm Bureau/VCAILG voluntary program enables adherence to the law and encourages improved land management throughout the county while diffusing and reducing program administration costs across VCAILG's nearly 3,000 members, saving greater than \$95 million over the past eight years (Ventura County Farm Bureau, 2015b). VCAILG has successfully complied with CWP requirements and the educational components have cultivated an understanding of water quality and ecological health amongst Ventura County farmers (Merhaut et al., 2013). The CWP has mobilized a countywide, voluntary grower response to reducing diffuse agricultural NPS pollution. The VCAILG program enrolls on average 85% of Ventura County's total irrigated acres, and has measured BMP adoption in all sub-watersheds monitored; in this sense, the program constitutes a significant success.

MONITORING PROGRAM DESIGN

Current monitoring requirements issued by the CWP do not provide data capable of demonstrating trends in water quality over time. This problem is not unique to the Ventura County CWP; it is consistently seen throughout State Water Resources Control Board regions (B. M. Dowd, Press, & Huertos, 2008). BMP implementation data collected and organized by VCAILG is also insufficient to associate any potential water quality improvement with grower action. In this respect, monitoring requirements under the CWP are less successful yet constitute a heavy expense.

Though monitoring requirements do not generate all necessary data, this should by no means suggest that the program is holistically unwarranted; these findings instead suggest that monitoring requirements under the Ventura County CWP must be realigned to provide the most useful data possible under an economically feasible program budget.

RECOMMENDATIONS

Findings of this project should be used to identify the most effective ways to move the CWP forward during and beyond the 2015-2020 waiver. Ultimately, the final recommendations made in this report— if incorporated into future VCAILG actions— are designed to provide tools, resources, and a framework to improve water quality in the long term and statistically evaluate the overall effectiveness of the CWP's BMP and TMDL components.



In order to improve regional water quality in the face of data limitations, it is recommended that the Farm Bureau and VCAILG act to: (1) Augment and enhance the current water quality monitoring program, (2) Increase the frequency and scope BMP surveys, (3) Encourage development of farm-to-gate nutrient management plans, and (4) Apply for federal grant funding through Clean Water Act Section 319 and the Environmental Quality Improvement Program to supplement current and future monitoring program costs.

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NANCY BROSCART

DALE ZURAWSKI

(LARRY WALKER ASSOCIATES)

AMY STORM

DIANA ENGLE

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