Farm Water Quality News

from Central Coast Farm Advisors

University of California Cooperative Extension

Monterey, San Benito, San Mateo, Santa Barbara, Ventura, Santa Cruz & San Luis Obispo Counties

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Editors Note

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Regulatory Update

Los Angeles Regional Water Quality Control Board Conditional Waiver for Irrigated Lands Program – Update December 2008

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Background

On November 3, 2005, the Los Angeles Regional Water Quality Control Board adopted a Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands within the Los Angeles Region. The Conditional Waiver is designed to protect surface water and groundwater in Ventura and Los Angeles Counties and to protect beneficial uses of these waters. Irrigation return flows, tile drains, and stormwater runoff that are discharged from irrigated lands may contain pollutants such as sediments, nutrients and pesticides, which can impair waterbodies. The Conditional Waiver program is designed to protect water quality from these types of pollutants.

In Ventura County, the Ventura County Agriculture Irrigated Lands Group (VCAILG) was formed to help growers participate in and comply with the requirements of the Conditional Waiver program. Currently, 92% of the irrigated acres in Ventura County are enrolled in the Conditional Waiver program through VCAILG membership. This high level of participation demonstrates the agriculture community's leadership and commitment to comply with this regulation and to protect and improve water quality.

Water Quality Monitoring

The Conditional Waiver program requires growers to conduct water quality monitoring. The VCAILG conducts monitoring on a group basis for constituents such as nutrients, pesticides, salts, and toxicity. There are 24 monitoring sites located in agricultural areas throughout Ventura County. The monitoring results are compared to water quality benchmarks in the Conditional Waiver to determine the health of waterbodies. The VCAILG submitted its first Annual Monitoring Report to the Regional Board in February 2008. The results presented in the Annual Monitoring Report demonstrated exceedances of water quality benchmarks. As a result of the benchmark exceedances, VCAILG is developing an Agriculture Water Quality Management Plan, which will present a strategy for growers to implement best management practices or "BMPs" to mitigate the benchmark exceedances and protect water quality.

Educational Workshops

The Conditional Waiver requires growers to participate in eight hours of educational workshops that focus on BMPs and protecting water quality. VCAILG members have completed 98% of the required education hours. The next step in the Conditional Waiver program is to implement the Agriculture Water Quality Management Plan and BMPs. To successfully complete this step of the Wavier, there will be additional upcoming workshops to help growers identify specific BMPs they can implement to mitigate benchmark exceedances and achieve the goals of the Conditional Waiver.

For additional information please visit our website:
http://www.waterboards.ca.gov/losangeles/water_issues/programs/tmdl/waivers/index.shtml

Industry Update

Central Coast Water Quality Coalitions Form One Region-wide Coalition!

Kay Mercer, Executive Director, Central Coast Agricultural Water Quality Coalition
(805) 208-8039

After five years, the Southern San Luis Obispo and Santa Barbara Counties Ag Watersheds Coalition decided to formalize its organizational structure to become a 501(c) 3 corporation to streamline and improve efficiencies. Simultaneously, the Central Coast Agricultural Water Quality Coalition, a 6 year old 501(c) 3 corporation, was searching for a new Executive Director (ED). The two Coalitions needs were complementary and it was determined synergies would be created through a timely merger. On November 1, 2008, they merged to become The Central Coast Agricultural Water Quality Coalition, a single, region-wide entity. Kay Mercer will serve as the ED. An analysis of the potential merger concluded that advantages outweighed disadvantages. The newly formed Coalition will:

1. Allow for region-wide coordination and collaboration on initiatives like the pending RWQCB Irrigation and Nutrient Management Program;
2. Reduce bureaucracy by eliminating duplication of ED and grant administrative services;
3. Allow Coordinators to specialize on specific project tasks and allow division of labor based on skill sets;
4. Improve fund leveraging by procuring funds for the entire region and eliminate competitive bidding between the two Coalitions;
5. Increase the Coalition's ability to address institutional barriers and complex issues which arise as a result of conflicting policies or regulations;
6. Increase flexibility by coordinating region-wide issues while simultaneously acting on localized issues;
7. Geographically align with Region 3 RWQCB and Central Coast Water Quality Preservation Inc. for better coordination of the Ag Waiver or other agricultural water quality initiatives.
8. Increase the ability to facilitate region-wide water quality related research and implementation projects for regional commodities: cool season vegetables (90% of U.S. production) and strawberries (80% of U.S. Production) and Wine Grapes (~15% of U.S. Production), by teaming with key commodity boards, NGOs, UCCE, NRCS and funding agencies;
9. Prioritize water quality projects; and
10. Improve efficiencies and economies of scale.

We actively seek comments on this merger from you, our partners in the agricultural community. Please email sbagcoalition@verizon.net or call (805)208-8039 to provide your input.

Technical Tip

Saline Waters - A Growing Problem

Ben Faber, University of California Cooperative Extension, Ventura Co.

Irrigated agriculture must always contend with salts, but after two years without rain and a dry winter forecast, salt is an even more important issue. We rely on winter rainfall to leach the salts that have accumulated from previous irrigations from root zones. Salinity adversely affects plant growth so understanding what it is and how it is measured and evaluated can help reduce impacts.

All waters, even rain water, have some salts dissolved in them, so all waters could be called saline. The term saline is restricted to waters with concentrations that could cause harm to plants or people. Seawater is highly saline, many wells are moderately saline. But unlike humans that excrete salts, plants are often affected by salt levels that have very little health impact on humans. Well waters that are fit for human consumption can often exceed standards for plants when used for irrigation. However, with proper management many waters can be used on plants, depending on the sensitivity of the species to salinity. Domestic water supplies from cities typically have better quality (lower salinity) than some well waters because they are monitored and often blended to meet human consumption. Most domestic water supplies have low concentrations of salts and are not considered to be saline. However, using even domestic water for growing subtropical plants does not mean that we should not be concerned about salinity.

Technical Tip ~ Continued

Before going any further it is worth remembering that salt is not just the sodium chloride that's on the table. Salts are combinations of electrically charged ions. These ions separate from one another when a salt dissolves in water. Water with dissolved sodium chloride and potassium nitrate contains sodium, potassium, chloride and nitrate ions. The most common ions in natural waters are:

sodium (Na^+) chloride(Cl^-) sulfate ($SO4^{2-}$)
calcium (Ca^+) boron (H_3BO_3)
magnesium (Mg^+) bicarbonate (HCO_3-)

Different waters can have very different proportions of these ions and these proportions can change with time. Some typical analyses of City of San Buenaventura water can be seen in the following chart (2005 Annual Report of the City of San Buenaventura).

Ionic composition of some wells in Ventura

Sample	Na^+	Ca^+	Mg^+	Cl^-	SO_4^{2-}	TDS	EC
			(mg/l)				(µmmhos/cm)
1	200	259	70	92	839	1668	1990
2	45	92	191	44	210	645	874
3	28	59	21	20	140	316	580

Total dissolved solids (TDS) and electrical conductivity (EC) are two different ways of measuring the total amount of salts in water. The old way, taking a specified volume (L for liter) of water and boiling it down to the residue which is weighed (mg for milligram), gives TDS. The more modern technique is to measure the electrical current a water will carry (mmhos/cm or micromhos/cm), which is in proportion to the number of ions in the water.

Natural waters also contain low concentrations of many other elements. For most, the amounts are too low to be either harmful or beneficial to plants. The main exception is boron which can be a problem for sensitive plants, such as citrus and avocado and probably for cherimoya as well, when in excess of 1 mg/l. Many well waters in Santa Barbara and Ventura Counties contain potentially harmful levels of boron for plants. This is not as common a problem in San Diego County.

In addition to the ions mentioned, there are also those that come from fertilizers and the soil. The main extra ions are potassium, ammonium, nitrate and phosphate. The concentrations of these will depend on the type of soil and the amounts and kinds of fertilizers applied, minus the amounts taken out by plants, held by the soil and lost by leaching or erosion.

In evaluating a water for its potential to harm plants, it is necessary to look at total salinity, as well as the specific ions. Waters with a TDS in excess of 1000 mg/l or an EC greater than 1500 mmhos/cm might pose problems for sensitive subtropical plants, and none at all to tolerant plants like figs, apricots or pomegranates. Waters with an excess of sodium and/or chloride (more than 100 mg/L can induce symptoms that are similar to high levels of salinity.

In most cases, the leaf margins in plants that accumulate toxic levels of salts turn yellow and die. This happens first on older leaves because they have had the longest time to accumulate the ions. Annual plants are often less affected than perennials, since they do not grow long enough to accumulate sufficient ions to cause damage.

As trees remove water from the soil, the concentration of salts in the remaining soil water increases. Plants adapt to moderate increases in soil salinity, but if the plant is sensitive (and most subtropicals are), even the moderate increases in salinity will slow growth. If the salt increase is small, the growth reduction will be small and acceptable. But if the level of fertilizer use is high, the water quality poor, or the soil has not been properly leached, the increased soil salinity could seriously reduce growth.

Technical Tip ~ Continued

The effects of salinity on plants are usually gradual, unless too much fertilizer has been suddenly applied or strong, dry winds causes rapid drying. Also, with some domestic water there is variation in concentration and kinds of salts in the water with time. The 200 mg/l of sodium in water sample 1 on the chart would be a problem if this were what the homeowner continuously received. However, according to city data, this house does get 94 mg/l at times (not on the chart). The better quality water serves to flush out the higher concentration salts. And this is how to practically deal with poorer quality water, by occasionally leaching the soil with a volume of water in excess of plant need. When there are no leaching rains, we need to be more aware of the potential for salt accumulation in the soil. With proper plant selection and water management even extremely saline waters can be used.

Water Terminology

Ben Faber, University of California Cooperative Extension, Ventura Co.

The ions in water are measured as parts per million (ppm) or milligrams per liter (mg/L). The terms are interchangeable. This is like saying a percent, but instead of the ions' weight per 100 weight of water, it is the ions' weight per million weight of water. The ion concentration also can appear as milliequivalents per liter (meq/l). A milliequivalent is the ppm of that ion divided by its atomic weight per charge.

> Example: Ca2+ with atomic weight of 40 and a solution concentration of 200 ppm. Ca2+ has two charges per atom, so it has an atomic weight of 20 per charge. 200 ppm divided by 20 = 10 meq of calcium for a liter of water.

Total Dissolved Solids (TDS): measure of total salts in solution in ppm or mg/l

Electrical Conductivity (EC): similar to TDS but analyzed differently.
Units: deciSiemens/meter(dS/m)=millimhos/centimeter (mmhos/cm)=
1000 micromhos/cm (umhos/cm).
Conversion TDS<->EC: 640 ppm=1 dS/m=1000 umhos/cm

Hardness: measure of calcium and magnesium in water expressed as ppm CaCO3

pH: measure of how acid or basic the solution is

Alkalinity: measure of the amount of carbonate and bicarbonate controlling the pH, expressed as ppm CaCO3.

Sodium Adsorption Ratio (SAR): describes the relative sodium hazard of water

SAR= (Na)/((Ca+Mg)/2)1/2, all units in meq/l

There is also an Adjusted SAR which considers the carbonate and bicarbonate present, but does not do much better in predicting plant response.

Technical Tip

General Irrigation Quality Guidelines

(From: U.C. Leaflet 2995, 1979)

Measurement	No problem	Increasing	Unsuitable
Effect on plant growth			
EC (dS/m)	<0.75	0.75-3	>3
Na+ (SAR)	<3	3-9	>9
Cl- (ppm)	140	140-350	>350
H3BO3 (ppm)	<0.5	0.5-2	>2
Effect on soil permeability			
EC (dS/m)	>0.5	<0.5	-
SAR	<6	6-9	>9

1.5 feet of water with EC of 1.6 dS/m adds 10,000 # of salt per acre

Research Update

Nurseries Implement Management Practices to Protect Water Quality

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Project Overview

Over the past three years, University of California Cooperative Extension researchers worked on a $2.6 million project funded by the State Water Resources Control Board to help nursery growers in Ventura and Los Angeles Counties comply with increased water quality regulations. We established a quarterly educational program that resulted in increased implementation of nursery management practices that protect water quality. We assisted growers in the development of nursery plans for addressing water quality issues specific to their operations. We then implemented a cost-share program so that growers had the necessary capital to make the changes. In addition, we evaluated the improvements, documenting the environmental benefits and the costs associated with the improvements.

Background

Three years ago Ventura County agriculture was at a crossroad. Stricter water quality regulations promised over the past decade were finally being implemented. Regulatory agencies were mandating changes that would greatly impact agriculture. There was much concern that new conditional waiver regulations and slated regulation of pollution levels in the Santa Clara River and Calleguas Creek would drive Ventura County farmers out of business or into other areas where regulations were not as restrictive. Another concern was that substantial capital would be required to comply with these regulations, especially for those nurseries where the best long-term solution was the construction of recycling and water capture systems. We received a Proposition 13 grant through the Los Angeles Water Quality Control Board of over $2.6 million to address water quality issues in the ornamental production industry in Ventura and Los Angeles counties. We set up a $1.2 million cost-share program to implement technologies and practices in nurseries to improve water quality. The cost-share program was administered by the California Cut Flower Commission; a committee of growers helped evaluate project proposals and determine funding levels for the projects.

Methods

A total of 19 improvement projects were approved and installed at 17 nursery sites. Improvements included recycling basins, detention basins, irrigation upgrades, and mulching to control erosion. Most of the projects were in Somis or along the Hwy. 126 corridor in Ventura County.

We installed flow meters and flumes to measure runoff flow. Water samples from irrigation and storm events were collected for the analysis of nutrients and pesticides using autosamplers or grab samples. At sites without irrigation runoff, lysimeters were used to sample leached water. We monitored flow and water quality before and after project implementation to assess effectiveness in reducing runoff and loading. We also collected other data such as water use and irrigation distribution uniformity.

Recycling Basin Results

The most dramatic improvements in the reduction of runoff concentrations were seen for sites with recycling systems. Water flowing into these systems had the highest nutrient concentrations of any project improvement group. There was no measurable runoff from irrigation events leaving the properties once these projects were completed. It is also expected that these improvements will collect considerable runoff from storm events (no significant storms occurred after the completion of most of the recycling systems). Because nutrients in the recycled water are reused by these sites, these systems also reduce fertilizer costs.

Research Update ~ Continued

Water savings was 136,000 gallons per acre per year, as a median value and increased with nursery size. Savings represented a range of 14 to 42% of total water use.

Though costs of implementing a recycling system increased with production area, the per-acre costs were greatest for smaller facilities. Median cost per acre for water recycling systems was $8,000 per acre, with a range of $4,000 to $18,000 per acre.

Detention Basin Results

For each of the sites where detention basins were installed, there was no measurable runoff from irrigation events once these projects were completed, and it is expected that these improvements will collect considerable runoff from storm events. However, leaching losses of some constituents, particularly nitrates, may be a consideration for unlined basins. Costs for the construction of detention basins were $9,000 to $16,000 per acre.

Irrigation Upgrade Results

Irrigation upgrade projects increased the uniformity of irrigation water application by 10–50%, in one case saving an estimated 19,000 gallons per acre per irrigation-hour. For irrigation system upgrades, the median cost was $7,000 per acre, with a range of $2,000 to $9,000 per acre.

Educational Program

We conducted 16 quarterly water quality educational meetings for nursery growers in both English and Spanish. Meetings included hands-on demonstrations and tours of nurseries that implemented management practices to protect water quality. In addition to local participation, growers from other areas of the state also attended.

Survey

Sixty-seven nursery growers completed a 142-question survey that we developed to evaluate current nursery operations and areas in need of improvements. After attending the educational programs for a minimum of one year and participating in staff evaluations of management practices, the growers then completed the survey again. In this manner, we were able to assess areas of their operations that improved because of participation in this project. By the end of the two-year period, statistically significant changes in many nursery irrigation practices were documented.

Future Work

We are currently working on a SWRCB Proposition 50 grant of nearly $1 million to further assist nurseries and to extend the program to orchard growers. We are continuing to offer educational programs and evaluate implemented management practices. In this manner, we hope to keep documenting improvements growers are making in protecting water quality.