Watershed Coalition News

INFORMATION FOR CENTRAL VALLEY AGRICULTURE

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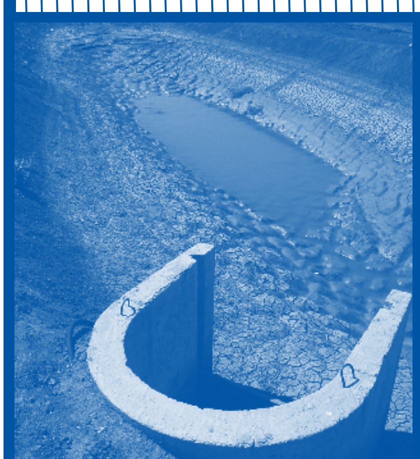
IN THIS ISSUE



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Toxicity Tests Can Reveal Farm Inputs

Monitoring results from several Central Valley watershed coalitions indicate farm inputs are moving from fields into nearby waterways. Some samples show farm inputs that exceed state water quality standards and toxicity to test organisms. While the toxicity can't always be tied to a particular pesticide or fertilizer, there are instances where cause and effect are certain.

An exceedance or toxicity event is called a trigger, meaning it triggers a subsequent action. In the Irrigated Lands Regulatory Program, an exceedance of a state standard for a farm input triggers an effort by the Coalition to first identify the source, then compile and/or develop management practices to address the exceedance. Those practices are then communicated to growers who are encouraged to adopt the practices when using those farm inputs.

Below are descriptions of the four main test organisms used in coalition sampling programs and the most common farm inputs found in water or sediment at levels that exceed State water quality standards.

■ Water flea *(Ceriodaphnia dubia)* toxicity is most often caused by insecticides and at high concentrations, metals such as copper or zinc. Also combinations of several constituents can cause toxicity to water flea.

■ Green algae *(Selenastrum capricornutum)* toxicity could have several causes, including herbicides or copper. Ten herbicides currently are being analyzed by coalitions: atrazine, cyanazine, diuron, glyphosate, linuron, molinate, paraquat, simazine, and thiobencarb. Simazine, diruon, and other herbicides have been detected at sites where algae toxicity has occurred.

■ Toxicity to Fathead minnow *(Pimephales promelas)* has been relatively rare in the Central Valley and is typically attributed to high ammonia levels in water. High ammonia can originate from water treatment plants, dairy lagoon waste water or other sources.

■ Sediment toxicity is measured by the test organism *Hyalella azteca* and is generally associated with high pyrethroid levels or metals in sediment. Coalition testing determines only if sediment is toxic but cannot identify specific causes of toxicity, as yet.

Several farm inputs have been identified as sources of toxicity or exceedances of State standards:

■ Chlorpyrifos (Lorsban, Lock-On, Govern) and diazinon are insecticides used in alfalfa, walnuts, almonds and other crops. These products are soluble in water and break down slowly, and as a result can easily be transported from a treated field in either irrigation water, storm water runoff, or by spray drift from an application near water.

■ Pyrethroids and metals have the characteristic of binding to soil particles washed by irrigation drainage or storm water from a treated field, and accumulate in stream sediments to cause sediment toxicity to the test organism. Pesticides or metals from urban areas can also reach waterways and contribute to sediment toxicity.

■ Copper is used as a fungicide on grapes, tree crops and vegetables, is added to some irrigation canals for algae control and has other urban and industrial sources. Potential pathways to water from agricultural uses could be spray drift into waterways or storm or irrigation drainage runoff from fields treated with copper.

■ High levels of ammonia and nitrate/nitrite have several potential sources originating from irrigated agriculture: runoff from irrigated pasture, irrigation or storm runoff after fertilizer applications and drainage from confined animal facilities.

■ High bacteria *(E. coli)* levels in waterways can originate from manure runoff from pasture or irrigated crop land, wildlife, leaking septic systems and other sources. Several Central Valley coalitions sponsored DNA studies of bacteria taken from numerous sites in the Central Valley. Results showed that while some cow and chicken DNA was present, the highest levels in many waterways were from human DNA.

The coalitions have initiated efforts to develop and compile management practices to address these and other exceedances. These efforts include contacting pesticide manufactures to obtain stewardship information on their products. Coalitions plan to distribute the information to members when it becomes available.

Management Practice Profiles

Settling Ponds, Constructed Wetlands Show Water Quality Benefits

A recent study of a constructed wetland and a multi-acre settling pond shows the structures have promise for managing farm drainage. William Stringfellow led a team of researchers from University of Pacific, Stockton that studied a pond and constructed wetland in Western Stanislaus County for the structures' ability to remove sediments and nutrients from farm drainage.

The 12-acre settling pond used in the first study is managed by Patterson Irrigation District. Drain water from 2000 acres of irrigated cropland flows into the facility. The reservoir is deep (greater than 10 feet) and was designed for sediment removal, but is not managed as a biologically active system. Plant growth on pond edges is controlled with herbicides so there is minimal vegetation and biological activity. Water analysis over a four month period showed that the pond reduced suspended sediments by an average of 71% between the inlet and the outlet. Soluble phosphate was also reduced by 40% in outlet flows. The pond, which is drained and excavated each year, traps approximately 2,000 cubic-yards of sediment annually from drainage water. Phosphate is removed by physical processes (settling with sediments) in this pond.

The second study site is a 20-acre permanent wetland near Ramona Lake that receive irrigation drainage from 5,000 acres of farmland. The wetland is shallow (2 feet); populated with native vegetation, includes broad swaths of native rushes; and has biologically active sediments. Sediment removal was less in the wetland than the pond (31% vs 71%) but phosphate removal was higher (58% vs 40%). Significant nitrate-nitrite (NO3-N) removal also occurred in the wetland (50%). The researchers reported that improved phosphate and nitrate removal is due to active biological processes in the wetland, including nutrient demand by emergent vegetation, microbial removal of nitrate, and phytoplankton growth.

Stringfellow concluded that diversion of agricultural drainage through wetlands and ponds before discharge provides a reduction in nutrient and sediment loads to surface waters. Experience with excessive sediment accumulation at both sites shows that a sediment management plan is needed to maintain long-term viability of ponds and wetlands as part of a water quality improvement plan.

Managing Manure Applications to Irrigated Cropland

A joint effort between watershed coalitions and the dairy industry is resulting in a publication outlining management practices for manure applications to irrigated crop land. Technical experts from Western United Dairyman, University of California, CURES and several Central Valley coalitions are compiling a list of do's and don'ts that growers can follow when storing or applying animal manures.

Field runoff carrying manures applied as a nutrient is potentially one source of high *E. Coli* levels being found in numerous Central Valley waterways. In addition to manure runoff from pasture or irrigated crop land, other potential *E. coli* sources include wildlife, leaking septic systems and illegal dumping of human waste. Three Central Valley coalitions performed DNA mapping studies of bacteria taken from several sites in the San Joaquin and Sacramento Valleys. Results showed that while some cow and chicken DNA was present, the highest levels in many waterways were from human DNA. While the reports are being reviewed by the Water Board, the coalitions are encouraging anyone applying or storing animal manure to follow the practices outlined in the new publication. Highlights of those practices (some still being refined) include:

Storing Manure and Compost:

- Develop physical barriers to act as a buffer to help prevent storm runoff contamination from stacked piles to waterways.
- Plan field storage and application so rainfall does not cause runoff from stacked piles.
- Locate piles away from sensitive areas, cover or provide other barriers to minimize wind-driven particle drift onto unintended products, crops or waterways, as needed.

Manure Application Practices:

- Incorporate manure into soil immediately after application to prevent wind drift and runoff in storm water or irrigation drainage water.
- If incorporation isn't possible, using adequately composted materials will minimize pathogen risk.
- Do not top dress with fresh or slurry manure (unless properly incorporated).
- Use biosolids or municipal waste only if allowed by local regulations.
- Document compost/manure applications
  - Date, rate and location
- Uncomposted manure should never be applied to fields just before planting to "ready-to-eat" crops. The Leafy Green Marketing Order encourages growers to allow for a minimum 12-month waiting period before planting.

Buying/Using Compost;

- Manure that has been simply stacked and aged does qualify as compost.
- If you buy compost, ask the compost producer for proof that he has followed proper pathogen reduction procedures.
- One method of verifying compliance with pathogen reductions requirements is participation by a compost provider in the US Composting Council (www.compostingcouncil.org).

Do not:

- sidedress with fresh or slurry manure.
- use biosolids or municipal waste.

Irrigated Pasture and Animal Husbandry Management Practices:

- Control animal and equipment access to streams, stream banks and sensitive areas.
- Construct all animal facilities (barns, arenas, etc.) and manure composting/storage at least 50 feet away from streams, drains, and domestic wells.
- Construct an adequate storm water collection system or earthen berms in cases where water quality can be impacted by facility drainage.
- Adopt pasture management practices appropriate for field conditions (i.e. slope, vegetation density, proximity to waterway, etc.)
- Maintain vegetated buffers between streams and animal facilities and manure composting/storage areas.

The four-page publication *Managing Manure Applications to Irrigated Cropland* will be available in Winter 2008 from watersheds coalitions or at www.curesworks.org.

This special issue of Watershed Coalition News highlights the steps coalitions groups and individual growers are taking to implement components of the Irrigated Lands Regulatory Program. The focus is on how Best Management Practices (BMPs) can be used to address farm runoff into streams and rivers.

Vineyards, Nutrients and Water Quality Stewardship

The Fresno County Farm Bureau recently published *"Vineyards and Water Quality Stewardship: Best Management Practices for Protecting Water."* The stewardship practices described for nutrient management encompass all aspects of grape fertility management, from decision-making to nutrient formulations to application timing and clean-up. Many of the principles apply to other crops.

Decision making

Consider the following when making a nutrient application decision.

- Annual leaf petiole analysis;
- Leaf blade samples and analyses;
- Vine vigor;
- Fruit quality;
- Leaf symptoms;
- Water quality tests (particularly nitrate concentration);
- Soil samples and analyses;
- Apply only the amount of nutrient(s) needed to meet yield and quality goals.

Application Method and Timing

- Nitrogen is best applied in at least two separate applications in the growing season or post harvest.
- Avoid applications when the vine is dormant: leaching may occur.
- Apply nutrients through a drip irrigation system when possible.
- During fertigation, ensure that irrigation water does not move off-site.

Application Practices

- Clean-up fertilizer spills promptly.
- Shut off fertilizer applicators during turns and use check valves when possible.
- Maintain proper calibration of fertilizer application equipment.
- Whenever injecting fertilizer into irrigation water, use a backflow device on the source water supply.
- Fertilizer tanks and equipment should be cleaned by rinsing in the field or at a properly designed wash facility.
- Rinse water/sludge from fertilizer tanks should be evenly spread throughout a vineyard using good agronomic practices.
- When equipment is parked, use care to prevent material from leaking onto the ground. If equipment is known to be in disrepair, completely remove fertilizer material before parking.
- When transferring fertilizer into on-farm storage or into fertilizer applicators, take care not to allow materials to drip and accumulate on the soil.
- Good housekeeping practices prevent contamination of groundwater and surface water.

Less Pesticide Runoff From Almonds with Vegetation

A new study in dormant almonds set for this winter intends to verify what is strongly suggested by University of California and industry research: resident vegetation during winter decreases storm runoff of dormant season insecticides. In the new study, funded by a State Water Board grant to Coalition for Urban Rural Environmental Stewardship (CURES), researchers will apply a pyrethroid insecticide (Asana) to an almond orchard where resident vegetation is allowed to grow after harvest. Scientists from Department of Pesticide Regulation will collect runoff from the almond orchard in western Stanislaus County after either a rain event or by running under-tree sprinklers to create runoff after the dormant spray is applied in January.

Orchard growers in many regions allow winter growth of resident vegetation, which is commonly defined as an existing, unplanted mixture of annual or perennial weeds, crop species and/or native grasses and forbs which have adapted to management methods used in the orchard. Typically, seeded or resident vegetation growing on orchard floors is mowed and/or sprayed with herbicides prior to bloom. Also used in some almond growing regions is seeded vegetation which generally incorporates cover crops with mixes of cultivated species including legumes (bell beans, peas, clover, medics and vetches) and grasses such as cereal grains, turf grasses and sudan grass.

The biggest benefit of orchard floor vegetation in almonds or other tree crops is reducing dormant spray pesticide runoff to surface waters. This occurs in several ways:

- Improves water infiltration, soil aeration and soil texture.
- Reduction in runoff volume through increased water infiltration.
- Reduction in sheet erosion caused by rainfall impact on bare ground.
- Anchors soil during winter rains preventing soil, nutrient and pesticide runoff.
- Shorter pesticide persistence (faster breakdown) on vegetation than soil.
- Adsorption of pesticides to plant surfaces.
- Allows pesticides to break down and be filtered onsite.
- Accelerates the biodegradation of pesticides in soil.
- Legume cover crops fix atmospheric nitrogen and release it to the orchard crop during the growing season.
- Improves soil fertility.
- Assists in weed control (seeded covers).
- Improves orchard access during wet weather.
- Cover crops provide nectar sources, pollen and prey for beneficial pollinators and predators.

Many almond growers prefer native vegetation because it easily grows in the fall and early winter with a single post harvest irrigation or moisture from early rains. Resident vegetation also requires little to no management to establish.

The drawbacks include difficulty managing noxious weeds if they are present. Vegetation also requires mechanical or herbicide control in late winter or early spring if overgrown. Other potential management challenges to consider when allowing vegetation to grow in an orchard:

- Increased danger of frost damage. A tall, dense cover crop can reduce nighttime temperatures by up to 5 or 6 degrees, increasing the potential for frost damage. However, orchards with closely mowed cover crops and moist soil may be only about one degree colder than bare soil. Alternate row cover cropping can reduce the difference even more. Mowing before frost reduces the risk of frost damage.
- Increased cover and feed for gophers, ground squirrels and mice (also higher populations from increased habitat and reduced predation).
- Increased humidity can potentially create conditions for fungal diseases.
- Potentially increased nematode populations with summer-grown cover crop.
- Higher water use with perennial cover crops.
- Sprinklers can be blocked by climbing vetches.
- Blooming cover crops can compete with tree crops for pollinator insects if not mowed.
- Trash (plant residue, particularly grasses) at harvest can hinder almond pick-up. However, growing an annual legume cover crop mix that can be mowed and allowed to decompose over summer causes fewer harvest problems.
- In almonds, perennials may interfere with harvest. Perennials are most suited for stone fruit orchards.

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