University of California
UCNFA News

Spring 2011
(Volume 15, Issue 2)

EDITOR'S NOTE

Articles in this issue continue our discussion of helpful information on managing water runoff from nurseries. Loren Oki writes about some ecological approaches to water treatment. Don Merhaut discusses drainage channel design. Water management and other efforts in Australia are described in the Ventura and Santa Barbara Regional Report from Julie Newman. Some new water-related educational programs in San Diego County are discussed in the San Diego Regional Report from Jim Bethke. Bugs and diseases best describes the content in Field Observations, Regional Reports for Santa Clara/San Benito (Maria de la Fuente) and Santa Cruz/Monterey (Steve Tjosvold), and in Science to the Grower (Richard Evans). Finally, we include the New Publications section with recent publications from UC Agricultural and Natural Resources, and Campus News (Deborah Mathews) that describes awards, retirements and activities by researchers on the Davis and Riverside campuses.

Steve Tjosvold
Managing Editor

ECOLOGICAL APPROACHES USED IN NURSERIES TO TREAT WATER

by Lorence R. Oki and Sarah A. White

Growers face increasing pressure to remediate and treat runoff, both to reduce deterioration of surface and ground water quality and also to facilitate conservation through recycling and reuse of this vital resource. Many nurseries and greenhouses are implementing water and nutrient management plans to manage inputs and runoff, to save money and to comply with regulations. These plans may include treatments based on chemical, thermal, or radiation methods (e.g., chlorine, pasteurization and UV, respectively) to remove contaminants and pathogens from runoff. Certified organic growers and growers with an eye toward future sustainability need alternatives to chemical treatment to manage and recycle runoff. In recent years, many researchers have focused on various alternative methods for remediating pesticide, nutrient and biological contaminants from irrigation water. Two effective, research-based ecological alternatives for removing various contaminants from runoff are constructed wetlands (CWs) and slow sand filtration (SSF).

Nutrient and Pesticide Contaminants

Residential, urban and agricultural land uses contribute to nonpoint source runoff. Excess nitrogen and phosphorus in runoff can lead to increased rates of eutrophication. Eutrophication can be a stable, naturally occurring process in surface waters. However, water bodies with communities of organisms adapted to low nutrient concentrations (e.g., phosphate levels < 0.05 milligrams per liter [mg/L] PO_4-P) are more susceptible to overfertilization whereas naturally eutrophic water bodies are more resilient to additional nutrients because their plant and animal communities are adapted to the more productive environment. Nutrient enrichment and algal blooms occur when the natural balance of an aquatic system is upset.

Inside This Issue

Pesticide release from both agricultural and residential sources is well documented. Many commonly used pesticides have detrimental effects on organisms from microbes to larger fish species living in creeks, streams and rivers. For example, the pyrethroid pesticide bifenthrin affects *Hyallela azteca*, a benthic amphipod, at concentrations as low as 1 to 3 parts per trillion (ppt). Similarly, the degradation products of fipronil, a fairly new phenylpyrazole pesticide, affect bluegill sunfish (*Lepomis macrochirus*) at concentrations between 20 and 25 parts per billion (ppb).

Local, state and federal environmental agencies are under pressure to limit pollutant discharges from identifiable nonpoint source contributors to further protect and improve water quality (Taylor et al. 2006, Calvo-Bado et al. 2003). Agricultural nonpoint sources can include greenhouse and nursery operations that do not capture and recycle runoff. Currently, California, Florida, Maryland, Oregon and Texas have adopted regulations mandating runoff capture or control by irrigated agricultural operations. Similar regulation in other states is likely as efforts continue to protect and maintain the quality of surface and ground water resources. In fact, in January of 2009, the US Environmental Protection Agency in concert with the Florida Department of Environmental Protection proposed an expedited schedule for establishing numeric nutrient criteria limiting nitrogen and phosphorus pollution in Florida lakes, rivers, streams, springs and canals (US Environmental Protection Agency 2010). This precedent could set the stage for regulations in other states in the next decade. California has implemented the Irrigated Lands Regulatory Program which controls runoff from all irrigated agricultural operations, including nurseries and greenhouses, in the State.

Pathogens and Biological Contaminants

Irrigation and runoff water can be infested with a variety of pathogens, and the risk of disease increases when water is recycled. All major pathogen types— fungi, water molds, bacteria, viruses, and nematodes— have been shown to be transmitted via recycled water. Of major concern are waterborne phytopathogens (*Phytophthora*, *Pythium*, etc.), which are perennial problems across all facets of agriculture and are responsible for billions of dollars of crop losses. Moreover, recycled water may contain high levels bacteria. A University of Florida survey of 24 greenhouse and nursery growers throughout the United States found that bacterial load in 76% of all recycled irrigation waters sampled exceeded the levels needed to avoid clogging of water-conserving drip irrigation systems. A number of chemically based treatment methods have proved effective in controlling or reducing disease incidence and clogging of irrigation lines due to biofilms. Drawbacks to chemically based treatment systems include high initial investment costs, continuous operational expenses, worker safety issues and a potential for environmental harm if not properly managed.

Overview of Alternative Treatment Options

In recent years, many researchers have focused on alternative methods for treating pathogens as well as remediating pesticide and nutrient contaminants from recycled water and runoff. These alternative methods facilitate the breakdown and removal of pollutants using biological processes that avoid the hazards associated with chemical-based systems. There are a variety of ecologically based treatment options that are applicable to nursery operations. Constructed wetlands enable both small and large green industry operations to maintain water quality levels necessary for successful crop growth while potentially facilitating the future use of alternative water sources. Nursery operations limited in production space and land expense may find the small-scale treatment systems, including mobile/portable wetlands and sand filtration systems, to be more effective.

Large-Scale Ecological Treatment Systems

Wetlands are considered the "kidneys" of the landscape because of their capacity for cleansing polluted waters. Constructed wetlands have been used for decades, mostly to treat domestic or municipal sewage, focusing on reducing nutrients, suspended solids, heavy metals and human pathogens. Success in cleansing municipal and industrial point-source discharges led to the widespread use of CWs to treat many other types of wastewater, including industrial and agricultural wastewaters, acid mine drainage, landfill leachate and stormwater runoff.

There are various types of CWs: free water surface (surface flow), subsurface flow (horizontal and vertical flow), mobile, and floating vegetation wetlands. Surface flow and subsurface flow CWs are most commonly used to treat agricultural wastewater and are described below. Mobile/portable wetlands are small-scale treatments and are described in the next section.

Surface flow constructed wetlands. A surface flow CW resembles a shallow (0.5 to 2.5 feet) freshwater marsh and generally requires a large land area for wastewater treatment (fig. 1). A five-year study funded as part of the USDA-ARS Floriculture and Nursery Research Initiative and conducted by researchers at Clemson University examined the nutrient-removal capacity of a 9.31- acre sur-

face flow CW receiving runoff from 120 acres of container production at a large nursery in Cairo, GA. The CW was highly efficient at removing nitrogen (nitrate, nitrite and ammonia) from nursery runoff from mid-spring through late fall in the southeastern United States, although it failed to consistently lower phosphorus levels. These CWs may also include vegetation on floatation devices. This vegetation facilitates biological processes that breakdown pollutants in the water.

Surface flow CWs work best for high to moderate runoff volumes, and should be designed to retain water for 3 to 3.5 days. The recommended surface area can be reduced if depth is increased (typical depth is 2 to 3 feet, maximum depth is 4 feet), which promotes anaerobic (low oxygen) conditions that facilitate nitrogen removal.

Subsurface flow constructed wetlands. Subsurface flow CWs utilize a smaller "footprint" than surface flow CWs and can remediate both nitrogen and phosphorus if properly designed. A subsurface flow CW consists of a lined or impermeable basin filled with a 2-foot-deep layer of coarse medium pea gravel with a high hydraulic conductivity and wetland plants (fig. 2). Wastewater flows horizontally or vertically below the surface of the media to prevent exposure to humans or wildlife; remediation is aided by plants and associated microbial populations.

Subsurface flow CWs are better for winter treatment than surface flow CWs and emit less total ammoniacal nitrogen (NH_3-N and NH_4^+-N) to the atmosphere. The gravel substrate of subsurface flow CWs is costly, and treatment longevity is finite because substrate clogging may occur after several years of operation.

Mixed system constructed wetlands. When phosphorus treatment is needed, simply passing water through a surface flow CW is not adequate. A mixed system, using a surface flow CW for nitrogen removal and subsurface flow CW for phosphorus, may be the most effective treatment option. When targeting phosphorus, instead of pea gravel, the subsurface flow CW substrate should be a pre-screened fired-clay nugget, such as Oil-Dri Agsorb. Lab verification of phosphorus-binding capacity is necessary to insure adequate treatment capacity. The clay nuggets used should be large enough to prevent clogging and to allow water infiltration and movement. Phosphorus-removal efficiency declines as binding sites fill, so monitoring is necessary to determine when to re-

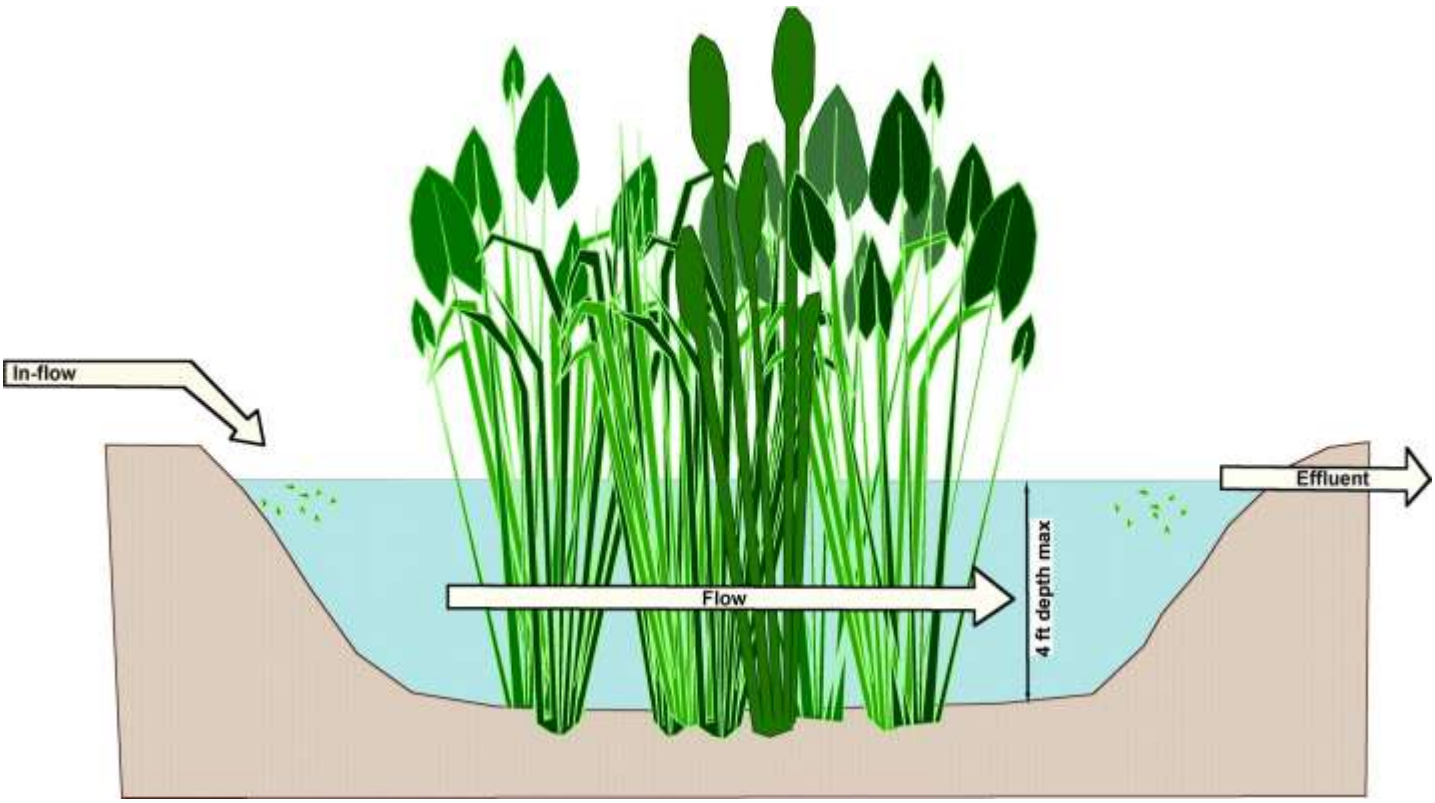

Fig. 1. Surface flow wetland designed for treating nutrient rich runoff from agricultural production areas. Image Sarah White.

place the clay nuggets. These secondary treatments can be greater than 80% efficient in reducing phosphorus concentrations in discharge.

Small-Scale Treatment Systems

Mobile/Portable CWs. A portable subsurface flow CW system was developed by Mobile Environmental Solutions Inc., Tustin, CA (fig. 3). The "portable wetland" uses bulrush (*Schoenoplectus* spp.) planted in a lightweight medium of 3/8-inch pumice. Inflow and outflow pipes manage the movement of water in this self-contained system, which can be transported by a midsized pickup truck.

Slow Sand Filtration. Slow sand filtration (fig. 4a) is a biological treatment method that has been in use for centuries to produce drinking quality water. The filter consists of a bed of sand through which contaminated water slowly passes. A biofilm develops on the surface of the sand grains and is responsible for the removal of pathogens and other pollutants that may be in the water.

This treatment method is sometimes confused with rapid sand filtration, so a description of the two methods will be used to show the differences. Water passes through the sand media in both methods and that's the only commonality among these filtration methods.

Rapid sand filters provide physical filtration, utilizing sand grains larger than 1 millimeter (mm) in diameter, resulting in a high treatment capacity of 18 to 180 gallons per minute (gmp) per square yard of sand bed surface area. Since this filtration is physical, these filters don't remove pathogens or pollutants that are dissolved in the water. Rapid sand filters require frequent cleaning using a backwashing procedure. This process can be automated when backpressure reaches a threshold determined by the operator.

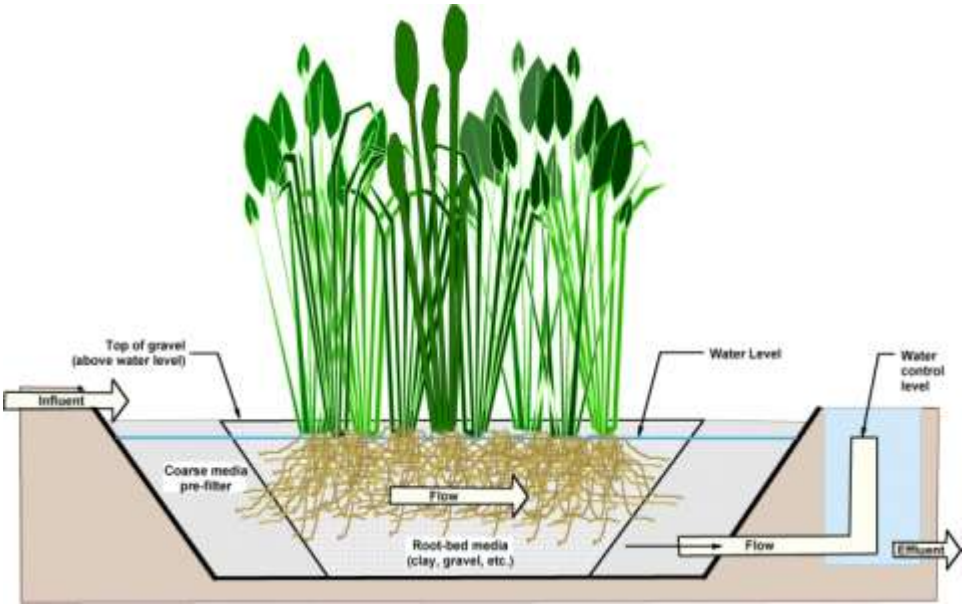

Fig. 2. Horizontal, subsurface flow wetland schematic, with design considerations for treatment of nutrient-rich agricultural runoff. Image Sarah White.

Fig. 3. Portable subsurface flow wetland established with bulrush, water moves through the wetland via a solar-powered pump. Image Jim Welsh.

Slow sand filters are a biological treatment method that facilitates formation and maintenance of biofilms that form on sand grains. To avoid packing, the sand grains must be round, not sharp, and to maximize surface area they are about 0.3 mm in diameter (about 60 mesh). The sand must stay submerged at all times and the sand bed surface must not be disturbed. The recommended depth of the sand bed is 3 feet and is constructed over a drainage system to collect the treated water.

As water is treated, a thick film, or "schmutzdecke," will develop on the bed surface. Over time this film becomes thickened and restricts water flow through the filter so that desired flow rates cannot be maintained. At that point, the sand bed needs to be cleaned by draining water to expose the sand bed surface and the top 2- to 3-inch layer of sand and schmutzdecke is removed. The sand bed is then resubmerged and "reconditioned" for 24 hours before treatment resumes.

The water flow rate through the sand filter should be about 800 gallons per day (gpd) per square yard of sand bed surface area. This flow rate is used to determine the size of the filters required. For example, to treat 50,000 gallons of captured runoff per day, two sand beds constructed in 20-foot diameter tanks, totaling 628 square feet, would be needed. The slow sand filters are one part of a water treatment system (fig 4b). The other components are similar to other treatment systems. However, because the treatment flow rates are low and rely on biological constituents, water must flow continuously through the sand bed. Since the pores between the sand grains are very small, water that is high in particulates can accelerate the treatment frequency due to plugging.

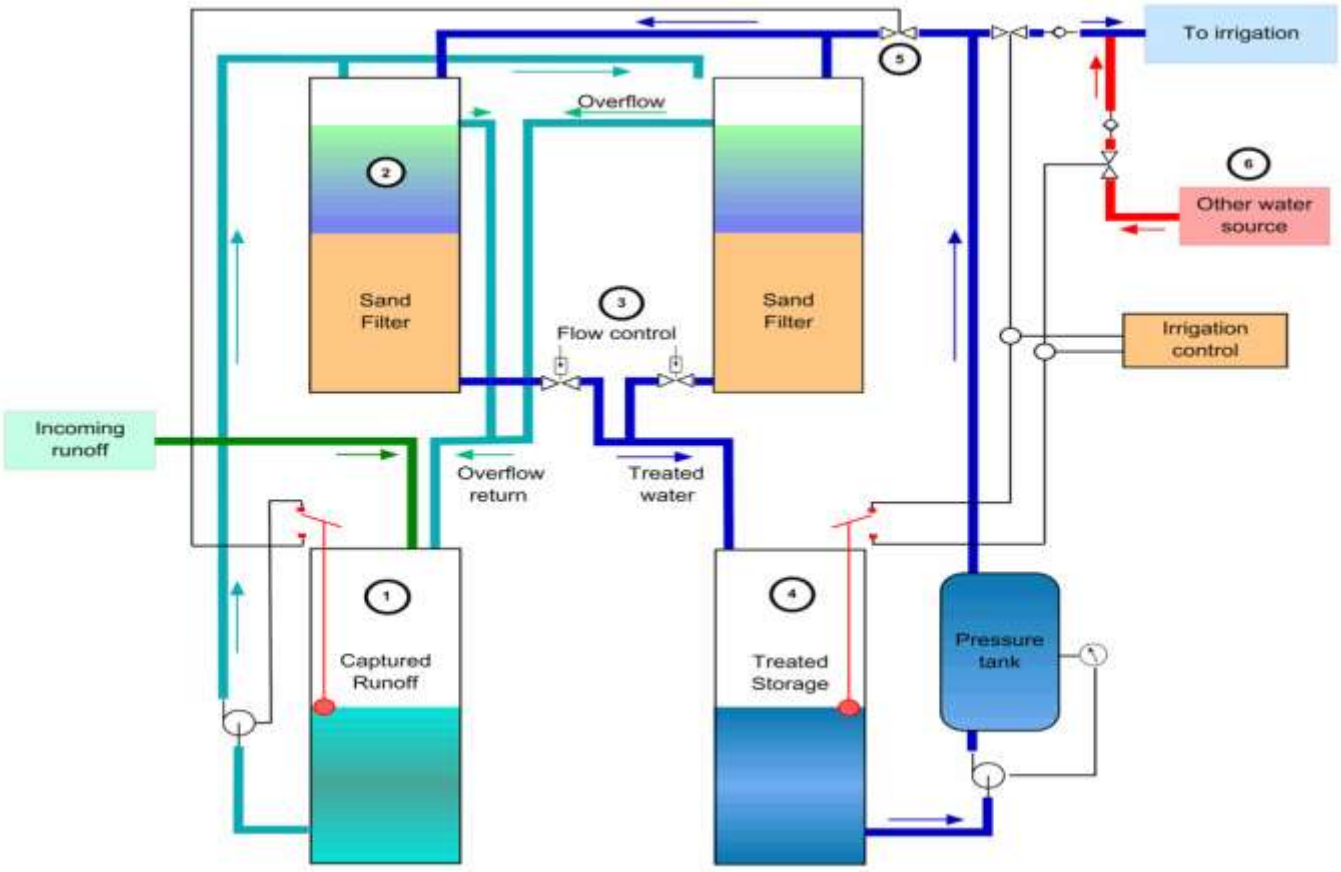

Fig. 4. Slow sand filtration system (a) and operation (b). Image Loren Oki.

1. **Captured runoff is stored. A float monitors the water level. If runoff is present, it is pumped into the sand filters.**
2. **A 3-foot water depth is maintained over the sand bed. Overflow returns to the captured runoff storage tank.**
3. **Flow is controlled to maintain the required rate.**
4. **Treated water is stored for use. A float monitors water level. If treated water is present, it is used for irrigation.**
5. **If there is no runoff to be treated, treated water is pumped back to the filters to maintain the water level over the sand bed.**
6. **If there is no treated water available, water from an alternate source is used for irrigation.**

So, removal of these particulates from the water prior to treatment through the sand beds would promote longer intervals between servicing.

Research at the University of California, Davis funded as part of the USDA-ARS Floriculture and Nursery Research Initiative has shown that higher than optimal flows can only be maintained for a short period. At high flow rates, filters plug more quickly and thus require more frequent monitoring and maintenance. Slower flow rates ensure that the filters perform optimally with longer intervals between maintenance.

Other research at UC Davis demonstrated that filters established against a specific pathogen can be effective in treating water that contains other pathogens. Sand filters were established using captured runoff inoculated with *Phytophthora capsici* for 30 days. When stream water containing a mixture of several other *Phytophthora* species was introduced to the filters, all of the pathogens were removed. Other studies have identified organisms in the biofilms that produce cellulose, amylase, chitinase and biosurfactants (Calvo-Bado et al. 2003). Work is underway to further characterize the components of the biofilms. Future work will also examine the efficacy of slow sand filters to remove plant viruses and plant pathogenic nematodes from captured runoff.

Research is underway to examine pairing slow sand filters with other treatment systems such as mobile/portable CWs. For the nursery and greenhouse industry, slow sand filtration coupled with CWs offer producers an ecologically based approach for treating runoff containing nutrients, pesticides, pathogens and other organic and biological contaminants. These treatment technologies can be used to recycle water or to assure compliance with increasingly stringent environmental regulations regarding the discharge of nonpoint-source pollutants.

References

Taylor MD, White SA, Chandler SL, Klaine SJ, Whitwell T. 2006. Nutrient management of nursery runoff water using constructed wetland systems. HortTechnology 16:610-614.

US Environmental Protection Agency. 2010. Water quality standards for the state of Florida's lakes and flowing waters. January 2010 Fact Sheet.

California Environmental Protection Agency. State Water Resources Control Board. Irrigated Lands Regulatory Program. http://www.swrcb.ca.gov/water_issues/programs/agriculture/. (accessed Sept. 13, 2010).

Calvo-Bado LA, Pettitt TR, Parsons N, Petch GM, Morgan JAW, Whipps JM. 2003. Spatial and temporal analysis of the microbial community in slow sand filters used for treating horticultural irrigation water. Applied & Environmental Microbiology 69:2116-2125.

Fisher, P.R., R. Raudales, D.P. Meador. 2010. How Clean Is Your Water? Choosing a Water Treatment System. OFA Bull. July/August 2010: 4-7.

Lorence Oki is a UC Cooperative Extension Landscape Horticulture Specialist, Department of Plant Sciences, UC Davis and Sarah White is a Nursery Extension Specialist, Environmental Horticulture Department, Clemson University.

GET CULTURED: Drainage Channels and Vegetated Filter Strips in Nurseries

by **Don Merhaut**

In the following two-article series, different types of drainage channels will be described.

Part I: *In this first article, the different types of drainage channels will be described along with the advantages and disadvantages of different types of systems. Non-vegetated drains will be highlighted.*

Part II: *In the next article, we will focus on vegetative filter strips, providing information on plant performance, plant selection and maintenance issues. The use of vegetation in drainage ditches, fields and slopes to remediate nutrients, pesticides and sediments will also be discussed.*

Vegetated and non-vegetated drainage channels can be used to remediate storm water and irrigation runoff that may occur from agricultural production. Primary and secondary functions of both of these types of drainage channels are listed in table 1. When deciding what type of drainage channel to install, vegetated or non-vegetated, one must decide on the purpose of the drainage channel. If runoff is inevitable, the use of vegetative filter strips can reduce the amount of nutrients, pesticides and sediments before water flows off of the property. If feasible, it may be cost effective to recycle runoff water back into the nursery since this will reduce fertilizer and water costs. If water recycling is practiced, conveying water to collection ponds should be done with the use of non-vegetated channels. Pipes and/or gravel, concrete or fabric-lined channels are options.

Table 1. Primary and Secondary Functions of Vegetated and Non-Vegetated Drainage channels

Primary

1. Directing water flow away from production areas to capturing/recycling basins or to other treatment areas such as vegetated filter strips and constructed wetlands before discharge from the property.
2. Mitigating nutrients, pesticides and sediments from runoff water before the water enters the watershed.

Secondary

1. For vegetated channels, production of ornamental crops with high water demands, such as cannas.
2. For vegetated channels, production of vegetation for use as compost or mulch.

When constructing non-vegetated drainage channels or installing pipes, take into consideration: (1) angle of slopes, (2) water flow during normal flow rates, (3) water flow during major storm events, (4) safety issues, (5) leaching into groundwater and (6) local regulations. The ability to remove sediment should also be taken into consideration. Sediment accumulation into drainage ditches and pipes is one of the bigger concerns (fig. 1). Therefore, the primary maintenance issue with these systems is the periodic dredging of sediment. Three variables will increase the amount of sediment that accumulates in drains: (1) sediment-laden water sources; (2) water flowing through unprotected, erosion-susceptible land and (3) low-slope angles of drainage areas. Costly dredging can be minimized by using cleaner water sources, preventing erosion in ditches, and where possible, increasing the slope of drainage channels, so that drainage water does not stay in drains. If sediment is a problem or low-slope angles are unavoidable, do not use gravel, since it will be difficult, if not impossible to remove sediment from gravel. Fabric-lined ditches may also be problematic, since many fabrics break down over time. However, on steeper slopes, gravel and/or fabrics can be used since there is less likelihood of sediment accumulation and gravel and fabric will reduce erosion of native soil.

Donald Merhaut is UC Cooperative Extension Specialist for Nursery and Floriculture Crops, Department of Botany and Plant Sciences, UC Riverside.

Fig. 1. Inside of a five-feet diameter drainage pipe. Sediment has accumulated on the bottom of this drain as a result of erosion from ditches leading to it. Photo by Donald Merhaut.

SCIENCE TO THE GROWER: Give your potting mix the gentle and clean smell of freshly laundered linens while it repels insect pests

by **Richard Evans**

Many of us think that fungus gnats are nothing more than a light snack. Consuming them while working in a greenhouse is as natural as breathing. It's true that, in the greenhouse, the adult gnats don't have much effect other than as a dietary supplement for workers. The young gnats, however, like youngsters everywhere, can be serious pests. The larvae feed on roots, and may spread plant pathogens like *Fusarium oxysporum*.

What to do about them? We have known for years that fungus gnats prefer wet conditions, so providing good drainage and avoiding overwatering are cultural practices that may keep their numbers low. The gnats also like rotting plant material, so mulches, partially composted organic matter, and even organic fertilizers can attract and harbor them. Therefore growers need to make judicious use of these materials if gnats are a potential problem, and store them in closed containers to exclude gnats.

Chemical and biological controls for fungus gnats are also available. Soil drenches with broad-spectrum insecticides are effective, but also can kill beneficial organisms or pollute surface waters. Research in the 1990s showed that nematodes and predatory mites can be effective biological control agents (Chambers and others, 1993; Harris and others, 1995). Even earlier, researchers reported that a microbial insecticide, *Bacillus thuringiensis* subspecies *israelensis* (Bti), is effective against fungus gnat larvae (Osborne and others, 1985). However, the predatory mites and the microbial insecticide are short-lived, so frequent applications are necessary. Also, Bti is effective only on larvae, not on later-stage insects, so its effectiveness depends on applications made before the fungus gnat populations boom (Cloyd and Dickinson, 2006).

Now scientists have discovered a new method of controlling fungus gnats. Well, maybe they didn't discover it. For years, gardeners, athletes, hunters and other fans of outdoor activities have extolled the benefits of Bounce® fabric softener dryer sheets as a mosquito and gnat repellent. The claim was made that these sheets, folded and placed in a shirt pocket, would repel adult insects for many hours.

This wasn't hard for me to believe, considering how repellent those sheets are to me, but more convincing evidence was recently reported by Cloyd and others (2011). These scientists tested the efficacy of the Outdoor Fresh Scent™ version of the fabric softener sheets in a laboratory experiment involving adult fungus gnats and a commercial potting mix in containers that either had a small piece of the dryer sheets on it or was left uncovered. They found that a much lower percentage (12 to 18%) of the gnats were present in the dryer sheet treatments than in the uncovered controls (33 to 48%). Voilà!

Even better, Cloyd's group analyzed the volatile compounds released by the dryer sheets. Prominent ones included linalool, which is toxic to many mites and insects but hadn't been reported as a repellent, and citronellol, which was already known to be a mosquito repellent. It remains to be seen how long the dryer sheets are repellent, and at what range they are effective, and how well they work in a greenhouse filled with plants and dryer sheets. I wonder if Procter and Gamble will offer financial support.

Adult fungus gnat (left) and shore fly, (right) from UC Davis greenhouses on leaf (5x). Source: UC IPM. Photo by Jack Kelly Clark.

Fungus gnat larvae on underside of fallen leaf on container plant media surface (3x) in UC Davis greenhouse. Source: UC IPM. Photo by Jack Kelly Clark.

Science to the Grower, Continued

References

Chambers RJ, Wright EM, Lind R.J. 1993. Biological control of glasshouse sciarid flies (*Bradysia* spp.) with the predatory mite, *Hypoaspis miles*, on cyclamen and poinsettia. Biocontrol Science and Technology 3:285–293.

Cloyd RA, Dickinson A. 2006. Effect of *Bacillus thuringiensis* subsp. *israelensis* and neonicotinoid insecticides on the fungus gnat *Bradysia* sp nr. *coprophila* (Lintner) (Diptera: Sciaridae). Pest Management Science 62:171-177.

Cloyd RA, Marley KA, Larson RA, Arieli B. 2011. Bounce® fabric softener dryer sheets repel fungus gnat, *Bradysia* sp. nr. *coprophila* (Diptera: Sciaridae), Adults. HortScience 45:1830-1833.

Harris MA, Oetting RD, Gardner WA. 1995. Use of entomopathogenic nematodes and a new monitoring technique for control of fungus gnats, *Bradysia coprophila* (Dipt.: Sciaridae), in floriculture. Biological Control 5:412–418.

Osborne LS, Boucias DG, Lindquist RK. 1985. Activity of *Bacillus thuringiensis* var. *israelensis* on *Bradysia coprophila* (Diptera: Sciaridae). Journal of Economic Entomology 78:922–925.

Richard Evans is UC Cooperative Extension Specialist for Nursery Crop Production, Department of Plant Sciences, UC Davis.

REGIONAL REPORT Two new pests and soil fumigant label changes

by **María de la Fuente, Ph.D.**

European Grapevine Moth

The European grapevine moth (EGVM) detection program has deployed approximately 800 traps in Santa Clara County. Traps for this moth species (*Lobesia botrana*) have been placed in vineyards throughout the County and in secondary hosts such as olives, stone fruits and privets (*Ligustrum* spp.) located within the 94-square mile EGVM quarantine area. Due to limited state and federal funds, all EGVM traps will now be serviced by biologists from the Department of Agriculture on a two-week schedule. The traps will be serviced throughout the growing season and then removed in November. The first generation of adult EGVM is expected to begin flying at any time. A coordinated treatment effort will be conducted by grape producers within 500 meters of the locations where EGVM were found last September. The Agricultural Commissioner will provide information to affected growers to assist them in application timing and in selecting appropriate products. Treatment alternatives exist for both organic and conventional growing systems.

For additional information on EGVM, view the UC IPM Guideline at: http://www.ipm.ucdavis.edu/EXOTIC/eurograpevinemoth.html. In addition, information about the detection of this pest in Santa Cruz County and implications to the ornamental industry were discussed in a previous newsletter, available at: http://ucanr.org/sites/UCNFAnews/Regional_Reports/Santa_Cruz_and_Monterey_Counties/.

Adult European grapevine moth, *Lobesia botrana.* Source: UC IPM. Photo by Jack Kelly Clark.

Glassy-winged sharpshooter and Pierce's disease program

In 2001, glassy-winged sharpshooter (GWSS) infestations were discovered in Santa Clara County for the first time. Since then, a total of six separate infestations of this leafhopper (*Homalodisca vitripennis*) were identified which resulted in regulatory quarantines in portions of south San Jose and Saratoga. By the end of December 2010, the County's Division of Agriculture successfully eradicated four of the six GWSS infestations in Santa Clara County.

San Benito/Santa Clara Counties, Continued

Santa Clara County developed eradication strategies that combine the inspection of nursery shipments with intensive trapping, visual surveys, pesticide treatments and the release of natural enemies. These same methods were used to eradicate GWSS infestations in both Solano County and in Sacramento County. The strategies developed in Santa Clara County are now recommended for use in other California counties that experience GWSS infestations in urban areas.

There are two remaining GWSS infestations in Santa Clara County. Both infestations are in south San Jose — one near Capitol Expressway east of Highway 87, and the second near the intersection of Meridian Avenue and Curtner Avenue.

Adult glassy-winged sharpshooter with eggs laid in leaf. Source: UC IPM. Photo by Jack Kelly

For additional information on GWSS and Pierce's disease (*Xylella fastidiosa*), view the UC IPM Guideline at: http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7492.html.

U.S. EPA soil fumigant label changes

In 2010, the U.S. Environmental Protection Agency (U.S. EPA) required registrants to make label revisions to their soil fumigant products. Based on U.S. EPA risk assessments, these revisions were needed to add improved safety measures for use of these products nationwide. Although California has long had numerous regulations and recommended permit conditions for use of soil fumigants, these newly revised U.S. EPA labels will mandate certain changes in fumigant use in California.

Highlights of the U.S. EPA label revisions for methyl bromide, metam sodium, metam potassium, chloropicrin and dazomet soil fumigants include:

1. Limits on certain application methods.
2. Lower maximum rate of application.
3. Requires line-of-sight supervision by the certified applicator during application.
4. Requires a site-specific Fumigant Management Plan before fumigation begins; includes a comprehensive Post-Application Summary.
5. Expands who is a handler, respiratory protections and other work activities.
6. Mandates stop work triggers and air monitoring when sensory irritation is experienced by any handler involved in the application.
7. Makes all soil fumigants federal Restricted Use Products.
8. Lengthens time before tarp perforation and removal.
9. Requires the product registrant to disseminate information about the new labels.
10. Creates an Entry Restricted Period.
11. Makes certain Good Agricultural Practices mandatory, such as soil preparation, tilling and sealing.

Changes affecting use in California. In California, as in other states, the U.S. EPA label must be followed. States are allowed to impose requirements more restrictive than U.S. EPA's, but not less restrictive. Over the years, California has passed legislation and regulations strengthening safety measures, such as personal protective equipment, and has recommended permit conditions for use of federal and California-restricted materials.

California-specific activities prompted by the new labels include the following:

1. Development of Fumigation Management Plan templates specific to California needs, approved by the U.S. EPA, and now available on DPR's Fumigant Resource Center website at: http://www.cdpr.ca.gov/docs/emon/methbrom/mb_main.htm.
2. Confirmation of applicator licensing subcategory O as the acceptable license.
3. Determination of where new labeling supersedes existing California requirements. (Note that where new labeling is more restrictive than existing California laws, regulations, or permit conditions, the label must be followed.)

Future U.S. EPA label revisions. In late 2011, U.S. EPA plans to require further label revisions. These will include buffer zones around treated fields, "credits" to reduce emissions, posting at buffer zones, emergency preparedness information in the Fumigation Management Plan, registrant-developed training and community outreach including for emergency responders, notification to neighbors, notification to regulators and much more.

For background information and information about U.S. EPA's future label changes in 2011 and in 2012, see their website at: http://www.epa.gov/oppsrrd1/reregistration/soil_fumigants/.

REGIONAL REPORT - Light brown apple moth management in nursery stock: Mating disruption control strategy proven useful but incomplete

***by* Steve Tjosvold**

Our research project in local ornamental nurseries demonstrates the useful but incomplete effectiveness of using pheromone mating disruption for the management of light brown apple moth (LBAM) in typical Santa Cruz County nurseries. Conventional wisdom has shown that, in general, a mating disruption treatment should be used on a contiguous production area that is 10 acres or greater. For LBAM management, mating disruption (with pheromone "twist ties") has been successful in these type of production areas such as vineyards and citrus in Australia, or recently, in the large berry fields of Watsonville. In our experiments, we wanted to see whether the control strategy would work in local nurseries, where nurseries are typically smaller than the 10-acre recommended area.

We found that mating disruption was useful in reducing LBAM, but we also found LBAM on plant hosts that surrounded these nurseries on ornamentals, weeds and native plants. Because many of the LBAM detections on production plants were located near nursery perimeters, we believe that fertile moths from these infested areas could be migrating into nurseries and confound the success of pheromone mating disruption and other management strategies.

We developed and used bait traps to evaluate pheromone mating disruption and generally monitor LBAM populations in and around nurseries. We found that bait traps using solutions of vinegar, terpinyl acetate (a food additive) + brown sugar, or portwine can be useful for monitoring LBAM adult populations, although their rate of capturing insects is lower than commercial synthetic pheromone traps and ultraviolet light traps. A greater proportion of female moths are attracted to the bait traps than to ultraviolet traps, which is an advantage, and commercial pheromone traps only capture male moths.

Bait traps can be used to monitor for LBAM even when mating disruption is employed. Bait and pheromone traps are inexpensive and relatively easy to maintain. Ultraviolet light traps are expensive and work best when they can be powered by an AC power source, so they are not adaptable to many field monitoring situations. For more information about this project and details on the baits and design of the traps see http://ucanr.org/sites/UCNFAnews/newsletters/Download_UCNFA_News_as_PDF33434.pdf.

We recently submitted a grant proposal to improve the LBAM mating disruption strategy and develop other IPM strategies. We now are prepared to evaluate the use of bait traps and other traps to mass trap and kill migrating moths at nursery perimeters. Also, sterilized moths from the USDA should be available by next year, and we propose to apply these moths at or near nursery perimeters. We believe that the combined effect of pheromone mating disruption strategy with twist ties and the use of sterile moth releases at nursery perimeters will broaden control beyond nursery boundaries. This should help reduce successful mating and the migration of fertile female moths into the nursery.

FIELD OBSERVATIONS —
UC Cooperative Extension Santa Cruz/ Monterey Counties

Root pathogens and foliar nematodes

A very wet late-winter and spring has predictably led to numerous diseases that are favored by wet weather. The root pathogens, *Pythium* and *Rhizoctonia*, have been detected on multiple nursery stock hosts at the propagation stage or recently transplanted. A review of the prevention and management of these diseases at the UC IPM website should be useful (http://www.ipm.ucdavis.edu/PMG/r280100211.html and http://www.ipm.ucdavis.edu/PMG/r280100111.html).

Of particular interest, has been the detection of foliar nematode on nursery stock. Foliar nematode (*Aphelenchoides* spp.) damage can be confused with damage caused by other foliar pathogens and some non-infectious disorders. Damage most often appears as vein-limited, angular blotches and lesions on leaves. The lesions are often angular because nematodes are initially contained between the main leaf veins. If young leaves or shoots are infected, they may remain undersized and can

Santa Cruz/Monterey Counties, Continued

Fig. 1. Foliar nematode on anemone (*top)* and bergenia. Top: Photo by S. Tjosvold. Bottom: Photo by S. Tjosvold.

Fig. 2. Disease resulting from infection of Rhizoctonia on azalea at propagation. Photo by S. Tjosvold.

become distorted, and the plants may lose vigor and flower productivity. Foliar nematode damage in California occurs mostly in greenhouses and along coastal areas where ornamental hosts and strawberries are grown. Foliar nematodes are tiny, only 0.02 to 0.04 inch (0.5to1 mm) long, and must be sent to a diagnostic laboratory to confirm infestation. They spread by contact between plants in the presence of water, and move on the surface of the plant and enter the stomates (gas exchange pores) of leaves.

Plants should be well spaced to allow foliage to dry between watering and prevent movement between plants. Drip irrigation should eliminate splashing and reduce spread. Still, foliar nematodes can be tolerant of dry conditions and can remain viable for several years in decaying plant material. Control with pesticides is difficult at best, although chlorfenapyr (Pylon) is registered for control of foliar nematode in greenhouses. Sanitation is of greatest value for management, and, yes, destruction of an infected crop is often a prudent management option.

Steve Tjosvold, Farm Advisor,
Environmental Horticulture
UC Cooperative Extension Santa Cruz County
1432 Freedom Boulevard
Watsonville, CA 95076-2796
(831) 763-8013 phone; (831) 763-8006 fax
satjosvold@ucdavis.edu;
http://cesantacruz.ucdavis.edu

REGIONAL REPORT How Aussie growers are addressing water issues, Part II

***by* Julie Newman**

To learn firsthand how the Australian nursery industry is addressing water issues, I visited with staff at the Nursery and Garden Industry Association, Queensland (NGIQ) and toured nurseries in the Brisbane-Gold Coast area of Australia last September as part of my sabbatical leave. The area I visited is along the south coast of Queensland, where the majority of the population resides. The climate is mild and conducive to the production of a broad palette of plants, similar to coastal California.

NGIQ was formed in 1934 as a professional organization for plant growers in Queensland, and is aligned with the national association, Nursery and Garden Industry Australia (NGIA). I met with John McDonald, development manager, and Steve Hart, farm management systems officer, who coordinated tour arrangements to nurseries and research project sites. John and Steve have extension roles similar to the UC farm advisor in providing technical on-site assistance and in developing and implementing educational programs. They do not conduct their own research but do coordinate research projects, especially with the Queensland Primary Industries and Fisheries. Their positions are funded by industry with matching funds from the Queensland government.

An emphasis of the NGIQ program is staff commitment to the Industry Accreditation Scheme Australia (NIASA), a national program for the adoption of best management practices for production nurseries and growing media manufacturers. John and Steve provide accreditation for nurseries that implement the NIASA program and help growers achieve certification through the EcoHort program. (Details about the NIASA and EcoHort national programs were described in my last report: http://ucanr.org/sites/UCNFAnews/Regional_Reports/Ventura_County/.)

All the nurseries that I visited are NIASA accredited and EcoHort certified, and have implemented progressive water management practices to improve water use efficiency. These nurseries also recycle irrigation and storm water. (In fact, a 2006 National Water Use Survey conducted by the NGIA showed that more than half of Australian production nurseries recycle water.) Furthermore, these nurseries have implemented IPM programs that incorporate biological control to reduce pesticide loads.

Fig. 1. Excess irrigation water from Pohlman's Nursery drains to a collecting pond where it is treated and reused for irrigation. Photo by J. P. Newman.

Fig. 2. Pohlman's Nursery uses specially-designed container sleeves to mitigate leaching of fertilizers and pesticides into the ground. The container sleeves capture drainage water. Photo by J. P. Newman.

One of the nurseries I toured, Pohlman's Nursery, is the largest independently owned nursery in Queensland and one of the largest in the country. This family-run business is comprised of 150 acres and employs up to 185 people during the peak season. Significant economic returns over the past decade have been driven by three core activities: production and packaging automation,

climate control technology for producing new plant varieties, and a strong emphasis on brand marketing.

Pohlman's Nursery has a highly organized agritourism program. They offer guided train rides through the nursery for bus tours, garden clubs and others, displaying numerous best management practices, which include recycling water (fig. 1) as well as container sleeves (fig. 2) and capillary mats to absorb drainage water from pots on benches. The nursery tour includes packages for tea and lunches at the nursery at reasonable rates (about 5-10 U.S. dollars per person). Showcasing their environmental stewardship program has helped to build strong community support. Moreover, while Pohlman's Nursery is primarily a wholesaler, they have a retail outlet where tour groups can choose plants and gifts straight from the production nursery.

Improvement of water management is a major objective of the NGIQ technical program because drought is common: from 2001 until 2008, Brisbane and surrounding areas experienced the most severe drought in over a century. However, during late December and early January, unprecedented rainfall and flooding occurred over much of the state, with three quarters of Queensland declared a disaster zone. Most of the area that flooded is farm land, and damage included cut flower fields and one production nursery that was washed away. Moreover, the continuous inclement weather that followed has impacted nursery sales. Worse yet, a severe tropical cyclone that crossed the coast in early February with gale force winds and flooding rain caused significant damage to approximately 50 production nurseries in northern Queensland.

Risk Management Workshop in Carpinteria

Many businesses are impacted from natural disasters such as the recent floods and cyclone in Queensland and the earthquake and tsunami in Japan. Risk management is important for nursery managers, not only to recover from financial losses following natural disasters, but also to avoid financial risks and survive during economic recessions. On May 10, UCNFA held a risk management workshop for greenhouse and nursery managers in Carpinteria, co-sponsored by the Santa Barbara County Flower and Nursery Growers Association. If you missed this meeting, watch for information on this important topic to be published in an upcoming *UCNFA News* issue by the workshop presenters, Trent Teegerstrom and Ursula Schuch, extension specialists with the University of Arizona.

FIELD OBSERVATIONS — UC Cooperative Extension Ventura/Santa Barbara Counties

New serious pest found in Ventura County: Asian citrus psyllid

The California Department of Food and Agriculture announced that two Asian citrus psyllid (ACP) specimens were found in traps in commercial citrus orchards near La Conchita and Santa Paula in Ventura County last December. The finds triggered establishment of a quarantine zone encompassing all of Ventura County and part of southern Santa Barbara County. Host nursery stock plants cannot be moved out of the quarantine area, and all citrus fruit must be cleaned of leaves and stems prior to moving out of the quarantine area. The most common or preferred hosts of ACP are in the genera *Citropis*, *Citrus* and *Murraya*. Detection of a single ACP triggers eradication treatment of all host plants within 400 meters of an ACP find with cyfluthrin and imidacloprid.

The Asian citrus psyllid, *Diaphorina citri* (Kuwayama), feeds on host leaves and stems. Although the psyllid can damage plants, the real danger lies in its ability to transmit a phloem-inhabiting bacterium that causes a devastating disease called Huanglongbing (HLB). The disease is incurable, untreatable and fatal to all varieties of citrus. Diseased trees produce bitter, inedible, misshapen fruit and eventually die. HLB has destroyed citrus production in various parts of the world, including Florida, where the industry is now in rapid decline. Prompt eradication of new infestations is necessary to prevent ACP from becoming established in California.

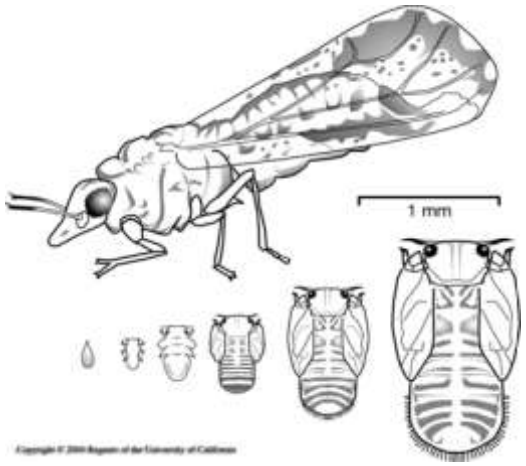

Fig. 1. Asian citrus psyllid life cycle. The insect progresses from egg (lower left) through 5 nymphal instars to the adult (above). Source: ANR Publication 8205. Illustration by G. O. Conville after Catling 1970.

Observations - Ventura/Santa Barbara, Con't.

ACP arrived in Southern California in 2008. Quarantines have been established in the following counties (listed in chronological order): San Diego, Imperial, Orange, Los Angeles, San Bernardino, Riverside and Ventura counties. So far, testing has not found any trapped insects or trees in California to be infected with HLB. ACP can spread throughout the state on infested host plants. Distribution of orange jasmine plants (*Murraya paniculata*) by retail nurseries was the main method of movement of ACP throughout Florida. ACP has also been intercepted coming into California in packages of fruits, plants, and on cut foliage shipped from other states and countries.

There are three life stages of the psyllid: eggs, nymphs and adults. Eggs are bright yellow-orange, almond-shaped, and found on the tips of growing shoots or between unfurling leaves. Nymphs are yellowish-orange and feed exclusively on new growth. They move in a slow, steady manner and flick their abdomens when disturbed. Nymphs pass through five instars, and the later instars have large wing pads. The feeding nymphs produce long, waxy filaments that direct honeydew away from their bodies. The adults are 0.1 to 0.2 inches in length and are brown mottled. They feed with their heads down and their bodies lifted up at about a 45-degree angle to the plant surface. Adults jump or fly short distances when disturbed. Female adults lay about 300 to 800 eggs during their lifetime, which may last for more than a month. The total life cycle is from 15 to 47 days depending on environmental factors; there are typically 9 to 10 generations per year.

Fig. 2. Asian citrus psyllid adult feeding. Source: ANR Publication 8205. Photo by M.E. Rogers.

Nursery growers in Southern California should visually inspect citrus plants and related ornamentals such as orange jasmine. Adults can be detected through visual surveys and yellow sticky cards. Monitoring for immature stages should be directed to the new growth, using a hand lens. Look for characteristic damage symptoms. High populations of psyllids can cause permanent deformation of newly formed leaves and shoots. The tender young growth becomes twisted and stunted. Honeydew produced by nymphs and adults allows growth of sooty mold that coats leaves. Ants, attracted by the honeydew, may be observed visiting infested plants.

If you suspect that you have found ACP, place the infested plant in a container or place adults and nymphs in alcohol. Contact your local county agricultural commissioner's office for identification.

For more information, see ANR Publication 8205 http://anrcatalog.ucdavis.edu/Citrus/8205.aspx, the CDFA Asian citrus website: http://www.cdfa.ca.gov/phpps/acp/, and the Ventura County ACP-HLB Task Force on Facebook: http://www.facebook.com/pages/Ventura-County-ACP-HLB-Task-Force/351010182791?ref=mf.

Julie P Newman
Floriculture and Nursery Crops Advisor
UC Cooperative Extension Ventura County
669 County Square Drive, #100
Ventura, CA 93003-5401
(805) 645-1459 phone; (805) 645-1474 fax
jpnewman@ucdavis.edu; http://ceventura.ucdavis.edu

REGIONAL REPORT - Time to get serious about water in San Diego County

by **James A. Bethke and Valerie J. Mellano**

San Diego County has been a little behind the curve in fulfilling the requirements of clean water regulations that other regions have already implemented. Regulations were recently adopted by the Regional Water Quality Control Board requiring all irrigated agricultural and nursery operations in the San Diego region to sample and test wet and dry weather runoff for pollutants and report the findings. In addition to the water quality testing and reporting, the new rules require two annual continuing education hours, regular contact with the UC Cooperative Extension or other agencies that can assist in helping you with Best Management Practices (BMPs), and record keeping.

As with other regions, the regulations allow for two options for testing and reporting. Growers can conduct these activities as a group or individually. Acting as an individual is very expensive and requires submission of a plan, independent water quality testing, and filing of the results directly with the Regional Board.

There are two monitoring groups in San Diego County. The San Diego County Farm Bureau has provided its members with a collective testing and reporting option through the San Diego Region Irrigated Lands Group. In addition, Rainbow Municipal Water District has created a monitoring group that will serve only the growers who are in its service area. A small group has also formed for those who grow in a limited area of Riverside County, an area that is not served by the San Diego County Farm Bureau or the Rainbow Municipal Water District. Although the original deadline to register with the Regional Board was December 31, 2010, the Board has now extended the deadline a few months. San Diego County growers who need to join a group, should contact the Farm Bureau or, if you are in their service area, the Rainbow Municipal Water District.

UC Cooperative Extension in San Diego has initiated a valuable website that contains a blog and a link to a calendar of water-related programs and events that can assist growers with BMPs or help fulfill the Water Board educational requirements. One important program is the "Water Wise Farming" demonstration that runs from March 1, 2011 to May 8, 2011 (9:00 AM to 6:00 PM). This water quality awareness program is sponsored by the UC Cooperative Extension, in cooperation with The Flower Fields® at Carlsbad Ranch and Mellano and Company Growers. You are invited to visit this onsite educational model that demonstrates more than 20 management practices to help farmers protect water resources. In addition, UC Cooperative Extension is holding a number of "Water Schools" that will allow you to complete your two-hour annual educational requirement. Furthermore, the website includes "Online Classes: Water Quality Issues for Agriculture and Landscape." These online classes also qualify for continuing education hours necessary for the Water Board requirements.

There are also a variety of pdf downloads that are available on the UC Cooperative Extension website such as the *Quick Tips* water quality newsletter issue on Runoff Management. "Grower Resources" downloads include Employee Training modules in English and Spanish and Self-Assessment Questionnaires for greenhouses and nurseries, tree crops and animal agriculture to help you assess the runoff and containment potentials of your facilities. Other "Grower Resources" include (1) Ag Water Quality Record Keeping, (2) Management Options for Nonpoint Source Pollution: Greenhouse and Container Crop Industries, (3) Stormwater Compliance Checklist for Commercial Facilities, and (4) Best Management Practices, which includes BMPs related to nurseries, orchards and field operations, and residents and animal owners, as well as common pollution prevention management options.

In addition, there are "Slide Presentations" on the website which include PowerPoint presentations from the San Diego County Department of Environmental Health

San Diego County, Continued

about subjects such as: (1) Used Oil Regulations, (2) Land Use Program Septic System, (3) Irrigation Pumping Plants, (4) Mitigation of Pollution in Nursery Runoff, and (5) Pesticides in Nursery Runoff: Sources and Transport Processes.

Please visit: http://ucanr.org/sites/agwaterquality/.

James A. Bethke, Farm Advisor, Nurseries and Floriculture
UC Cooperative Extension San Diego
North County Office
151 E. Carmel St.
San Marcos, CA 92078
(760) 752-4715 phone
(760) 752-4725 fax
jabethke@ucdavis.edu; http://cesandiego.ucdavis.edu/

Valerie J. Mellano, Ph.D., Environmental Issues Advisor
UC Cooperative Extension San Diego
5555 Overland Ave., Suite 4101, Bldg 4
San Diego, CA 92123-1219
(858) 694-2849 fax
(858) 571-4204, 760-752-4717 phone
vjmellano@ucdavis.edu; http://cesandiego.ucdavis.edu/

Resistant twospotted mite from Carpinteria. Photo by James A. Bethke.

FIELD OBSERVATIONS — UC Cooperative Extension San Diego County

Calls about mites

Like my colleagues, I get a flurry of calls every once in a while, and recently I have received calls about uncontrollable mite populations. Unusually, it's occurring during the cool season. Regardless, there is difficulty in controlling two-spotted spider mites on foliage crops in San Diego County. It wasn't long ago that Avid-resistant mites were appearing in greenhouse cut flower production and there was great difficulty in controlling populations with most miticides.

We have not assayed the San Diego populations for resistance, so first things first. Many times the problem controlling mites is plant density and coverage. If the plants are too dense and the mites are on the undersides of the leaves, coverage will be non-existent.

Dos

- Make sure your equipment is in good working order and calibrated. It's easy to assume that the equipment is just fine.
- Check the pH and other water quality, which may have an effect on the pesticide.
- If you are using the same or a few products over and over again, change products. You should be routinely changing products at almost every application so that a different mode of action is being used.
- Try adding a surfactant to the spray tank. Insecticidal soap or horticultural oil will work fine.
- I'm not fond of tank mixes, but mixing products that kill adults with products that kill eggs and small nymphs may be of some help, but you stand the chance of creating even greater resistance.

Don'ts

- Most of the miticides have good residuals, so do not increase frequency of application. Rotate modes of action instead.

James A. Bethke, Farm Advisor, Nurseries and Floriculture
UC Cooperative Extension San Diego, North County Office
151 E. Carmel St.
San Marcos, CA 92078
(760) 752-4715 phone
(760) 752-4725 fax
jabethke@ucdavis.edu; http://cesandiego.ucdavis.edu/

CAMPUS NEWS AND RESEARCH UPDATES

compiled by **Deborah Mathews**

UC DAVIS NEWS

Dr. Michael Parrella, professor and chair of the Department of Entomology at UC Davis, was inducted into the California Floriculture Hall of Fame during a ceremony at the Society of American Florist's 27th Annual Pest and Production Conference in San Diego on February 25, 2011. The award was sponsored by the Kee Kitayama Research Foundation and is given to individuals who have made significant contributions to the floriculture industry during their careers. Dr. Parrella's research focuses on Integrated Pest Management (IPM) strategies with an emphasis on biological control of insects on ornamental crops.

Two other UC Davis researchers who made significant contributions to the California floriculture industry recently retired. Dr. Michael Reid spent 32 years as an environmental horticulture professor and specialist, as well as associate dean for Cooperative Extension in the College of Agriculture and Environmental Sciences. He received numerous industry awards, such as induction into the California Floriculture Hall of Fame, in recognition for his work on the post harvest biology and handling of cut flowers and ornamental potted plants. Jim Thompson, Cooperative Extension specialist at UC Davis in the Department of Biological and Agricultural Engineering, retired after 35 years of service. Thompson's research also focused on postharvest technologies and was instrumental in introducing forced-air cooling for cut flower processing and preservation to the ornamental industry.

UC RIVERSIDE NEWS

Dr. Deborah Mathews, UC Cooperative specialist in the Department of Plant Pathology and Microbiology, will be a presenter at the 2011 Ohio State Florist Association (OFA) Plug & Cutting Conference held on September 12-14, at the Doubletree Hotel in San Jose, California. Mathews will be discussing virus detection and management. Other sessions at the conference will include topics such as plug and cutting principals, production inputs and pest and disease management; some sessions will be available in Spanish. For more information or to register, go to http://www.ofa.org/.

Dr. Deborah Mathews is UC Cooperative Extension Specialist in Plant Pathology, Department of Plant Pathology and Microbiology, UC Riverside.

CAMPUS RESEARCH UPDATES

Rose Replant Problem Apparently of Biological Nature
by F. Da Silva Rocha, M. Mundo-Ocampo, J.F. Karlik, U.K. Schuch, J.A. Smith Becker and J.O. Becker.

Victoria Avenue is an attractive botanical 4-mile long parkway in Riverside. The roadway, created in 1892, is planted along each edge of the median with rose bushes (*Rosa* sp. 'Ragged Robin'). Difficulties in replanting own-rooted roses led us to focus on potential soilborne causes for the problems. Soil samples from the root zone of hundreds of rose bushes were pooled and extracted for enumeration of plant parasitic nematodes. Although lesion (*Pratylenchus vulnus*), root-knot (*Meloidogyne hapla*) and dagger nematodes (*Xiphinema* sp.) were present in nearly all samples, none of the nematode species occurred at population densities likely to cause replant problems.

In two lath house trials, rose plant growth was assessed in response to various soil treatments. The Victoria Avenue replant soil was either fumigated with methyl iodide or incubated in a water bath at temperatures of 104, 122, 140 or 158˚F for 30 minutes. A non-treated sample served as a control. In a second trial, replant soil was diluted with the same but fumigated soil at increasing ratios. Two-year-old bare-root roses 'Space Odyssey' on rootstock 'Dr. Huey' (Weeks Roses, Upland, CA), were planted into 2-liter plastic pots. Both trials were conducted as a randomized complete block with 8 replications at ambient light and temperature. All pots received label rate slow-release fertilizer and were watered as needed. After 8 weeks, the number of new shoots, their average length and the number of flowers per plant were recorded. Plant weight and population density of plant parasitic nematodes were determined after 10 weeks.

In the first trial, dry weight of foliage increased linearly with increasing temperatures of the preplant soil treatment. A few lesion nematodes were found only in the non-treated control and in the 104˚F treatment. Compared to the non-treated control, soil fumigation increased the average length of new shoots and the number of flowers by 56% and 48%, respectively. New root growth increased by 42%, and the foliage dry weight more than doubled. In the soil dilution trial, blooming increased from 6.7 flowers in the non-treated control to 17 per plant in the methyl iodide-treated soil. Roses grown in a mix of 10% replant soil with 90% fumigated soil showed similar growth suppression as in the non-treated control soil. The transfer of replant problem with only 10% of the original Victoria Avenue soil and its elimination by soil fumigation or pasteurization strongly suggests one or more biological factors are responsible for the replant problem.

F. Da Silva Rocha is Postdoctoral Researcher, M. Mundo-Ocampo is Staff Research Associate, J.A. Smith Becker is Assistant Specialist and J.O. Becker is Cooperative Extension Specialist and Nematologist, Department of Nematology, UC Riverside; J.F. Karlik is Farm Advisor, UC Cooperative Extension Kern County; and U.K. Schuch is Extension Specialist Environmental Horticulture and Professor, Department of Plant Sciences, University of Arizona.

NEW PUBLICATIONS FROM AGRICULTURE AND NATURAL RESOURSES (ANR)

compiled by **Steve Tjosvold**

Retail Nursery and Garden Center IPM News
UC IPM launched its first issue of an e-newsletter directed at retail nurseries and garden centers. If you are interested in receiving the newsletter, send an email to UCIPMretail@ucdavis.edu with the subject "subscribe" and you will be added to the email list. You can also find the newsletter and can subscribe to it through the new Retail Portal web page at www.ipm.ucdavis.edu/retail.

Leafrollers on Ornamental and Fruit Trees: Pest Notes for Home and Landscape
Publication Number: 7473
Author: W.J. Bentley
Length: 4 pp.
Description: Fruittree leafroller, *Archips argyrospila*, can be a serious pest throughout California. It occurs on a very large number of ornamental trees and is particularly damaging to deciduous and live oaks.
Available at: http://anrcatalog.ucdavis.edu/Items/7473.aspx

Sudden Oak Death: Pest Notes for Home and Landscape
Publication Number: 74151
Authors: J. M. Alexander, S. V. Swain
Length: 8 pp.
Description: Sudden oak death is the name given to an epidemic, first detected in 1995, that affects three true oak species—coast live oak (*Quercus agrifolia*), California black oak (*Q. kelloggii*), and Shreve oak (*Q. parvula* var. *shrevei*)—and tanbark oak (*Lithocarpus densiflorus*). A previously undescribed pathogen, *Phytophthora ramorum*, has been identified as the infectious agent. Note that this updated publication replaces Sudden Oak Death in California.
Available at: http://anrcatalog.ucdavis.edu/Items/74151.aspx

Marketing Strategies for Agritourism Operations
Publication Number: 8444
Authors: H. George and E. Rilla
Length: 21 pp.
Description: Agritourism gives the farmer a broad choice of opportunities to market products, on-farm experiences and hospitality services. This publication will help you assess your options and work out a solid plan for marketing your agritourism operation.
Available at: http://anrcatalog.ucdavis.edu/Items/8444.aspx

Asian Citrus Psyllid: Pest Notes for Home and Landscape
Publication Number: 74155
Authors: E.E. Grafton-Cardwell and V.F. Lazaneo
Length: 4 pp.
Description: About the size of an aphid, the Asian citrus psyllid (ACP) poses a serious threat to California's citrus trees, including those grown in home gardens and on farms. Learn to identify and manage this pest.
Available at:
http://anrcatalog.ucdavis.edu/NewAdditions/74155.aspx

HORTICULTURE EVENTS CALENDAR FOR 2011

CANGC California Grown Show and The Nursery Mart
June 8, 2011 Long Beach

UCNFA Scouting and Spray Evaluation Workshop
June 15, 2011 Watsonville

2nd Annual Monterey Bay Greenhouse Growers Open House
June 18, 2011 Watsonville

UCNFA ABCs of Fertilizer and Irrigation Management in Spanish
June 23, 2011 Azusa

UCNFA Monitoring/Scouting Workshop
July 2011 Vista/San Marcos

CAFGS Fun 'n Sun Weekend California Floral Convention
July 20-23, 2011 Carlsbad

UCNFA Erosion and Pesticide Runoff Management Meeting
September 13, 2011 Ventura County

OFA Plug & Cutting Conference
September 12-14, 2011 San Jose

Society of American Florists 127th Annual Convention
September 14-17 Palm Springs

UCNFA California Nursery Conference
October 6, 2011 Rancho Cucamonga

UCNFA Pesticide Use and Rotation in Spanish
October 18, 19 or 20, 2011 Vista/San Marcos

American Society of Landscape Architects Annual Meeting and Expo
October 30-November 2, 2011 San Diego

UCNFA Insect Biocontrol Symposium
November 3, 2011 San Marcos

UCNFA ABCs of Fertilizer Management in Spanish
Fall 2011 Dinuba

UCNFA PARTNERS

UCNFA News is published by the University of California Nursery and Floriculture Alliance, a statewide partnership of researchers and educators, growers, floriculture associations and allied industry.

UCNFA Directors:
Loren Oki, UC Cooperative Extension Specialist for Landscape Horticulture, UC Davis
David Fujino, Executive Director, California Center for Urban Horticulture (CCUH)
Website - http://ucanr.org/sites/UCNFA

Managing Editor:
Steve Tjosvold, UC Cooperative Extension Monterey & Santa Cruz counties
Co-Editor:
Julie Newman, UC Cooperative Extension Ventura and Santa Barbara counties

Layout and Design:
Linda Dodge, Plant Sciences Dept., UC Davis
Cris Johnson, UC Cooperative Extension Ventura County

Editorial Committee:
James Bethke, UC Cooperative Extension San Diego County
Maria de la Fuente, UC Cooperative Extension Santa Clara & San Benito counties
Don Merhaut, UC Cooperative Extension Specialist for Nursery and Floriculture Crops, UC Riverside
Deborah Mathews, UC Cooperative Extension Specialist for Plant Pathology, UC Riverside

Follow UCNFA on Facebook!

http://www.facebook.com/pages/University-of-California-Nursery-and-Floriculture-Alliance/172471082771255?v=wall

Get updates on events presented by the University of California Nursery and Floriculture Alliance (UCNFA)

Get timely information on news and other events of interest to the California ornamental horticulture industry

Find links to Facebook pages for nursery and floriculture businesses, organizations and people in the industry