UCNFA Farm Water Quality Planning and Evaluation of Management Practices

Santa Barbara County Flower and Nursery Growers Association

Thanks to our Sponsors!
Introduction

Julie Newman, Farm Advisor
UC Cooperative Extension
Housekeeping Items

• Don’t forget to sign up for continuing education credit!

• We have been approved for 4 credit hours for the Los Angeles Region conditional waiver.

• We have been approved for DPR hours and California Certified Crop Advisor (CCA) hours.

• Please fill out/return your Meeting Evaluation.
Farm Water Quality and Evaluation of Water Quality Management Practices

- Introduction
- Farm Water Quality Planning
- Evaluation of Management Goals and Management Practices
- Implementing an IPM Program: Lessons Learned from the Bedding and Container Color Plant IPM Alliance Program
Speakers

- Julie Fallon, Cachuma Resource Conservation District
- Michael Parrella, Dept. of Plant Sciences, UC Davis
- Julie Newman/Ben Faber, UC Cooperative Extension Ventura and Santa Barbara Counties
A management goal (MG) is an economically achievable technology or process for effectively limiting runoff and groundwater leaching.

Management goals are general; for example, “Establish an IPM program to reduce pesticide use.”
Management Goals/Practices and Self-Assessments

- **A management practice (MP)** is a specific practice for accomplishing the management goal.
- For example, “Base decisions to use pesticides and other control options on monitoring information.”
- An MP is not necessarily a required practice, and additional practices may be required by regulatory agencies.
Management Goals/Practices and Self-Assessments

- Management practices (MPs) are often called “best management practices (BMPs), but the “best” practices vary with on-site specifications.

- Which MPs you select or plan to continue to implement depends on specific conditions unique to your nursery operation.
A water quality audit or self-assessment is a way to evaluate current management practices that may impact water quality.

It can be conducted by going through a list of MPs and checking off the ones that you have currently implemented.

The next step is to go back through the list and highlight the MPs applicable to your operation that you have not implemented. These are areas that you may be able to implement in the future to improve your water quality management program.
Management Goals/Practices and Self-Assessments

- Conducting an audit/self-assessment will help you identify problems before they become serious and explore options for solving them.
- It can also establish an environmental record that can be used for documenting good management practices for regulatory or public agencies.
- The final step is to develop a comprehensive farm water quality plan for the future adoption of MPs, using the audit results as a basis.
• Conducting an Environmental Audit (Chapter 9)

• Can be used as part of the Farm Plan in lieu of the Checklist that we will be using today
Growers in Region 4 have a mandatory survey of management practices that must be submitted to their water board or ag waiver group. Ventura County growers can download it at the farm bureau website (http://www.farmbureauvc.com/pdf_forms/MgtPractSurvey.pdf). LA County growers should contact the Nursery Growers Assoc. (NGA).
Farm Water Quality Planning

Julie Fallon
Cachuma Resource Conservation District
Farm Water Quality Planning

- What is a farm water quality plan and how can it be used to address ag waiver requirements?
- What are the components of a farm water quality plan?
ORDER NO. R3-2012-0011
CONDITIONAL WAIVER OF
WASTE DISCHARGE REQUIREMENTS
FOR DISCHARGES FROM IRRIGATED LANDS

• **By October 1, 2012**, Dischargers must develop a Farm Plan or update the Farm Plan and implement it

• Farm Plans must be kept current, kept on the farm, and a current copy must be made available to Central Coast Water Board staff, upon request.

At a minimum, Farm Plans must include:

• a. Copy of this Order (94 pages!) and a copy of the Notice of Intent (NOI)
Farm Water Quality Planning

- b. Date the Farm Plan was last updated
- c. Farm/ranch maps
- d. Description of the typical volume of discharges and when the discharge is typically present
- e. Description of type of chemicals applied (e.g., pesticide and fertilizer use)
- f. Description and time schedule for any management practices implemented to comply with this Order
Farm Water Quality Planning

- Description and results of methods used to verify practice effectiveness

Education:

*Dischargers must obtain appropriate farm water quality education and technical assistance necessary to achieve compliance with this Order.*

- keep certificates of WQ education with the Farm Plan and incorporate useful concepts into your Farm Plan
The Farm Water Quality Management Plan (Farm Plan) contains management practices that are being or will be implemented to protect and improve water quality by addressing:

- Irrigation management
- Pesticide management
- Nutrient management
- Salinity management,
- Sediment and Erosion control
- Aquatic habitat protection
Central Coast Agricultural Water Quality Coalition

Projects & Partnerships

The work of the Coalition’s farmers and ranchers on the Central Coast is the result of close collaborations with partnership organizations.

Outreach & Education

The Coalition provides a variety of educational opportunities for growers, including:

- Watershed Working Group Meetings
- Irrigation Efficiency Workshops
- Water Quality Workshops
- Farm Water Quality Planning Short Courses
  - In partnership with University of California Cooperative Extension, the National Resource Conservation Service, and Monterey Bay National Marine Sanctuary

Farm Water Quality Plan Template

The Coalition, in partnership with NRCS, the RCDs, and UCCE has updated the Farm Water Quality Plan Template. The Template is available in English and Spanish as a PDF or a MS Word document.

- Farm Water Quality Plan Template – in English (MS Word format)
- Farm Water Quality Plan Template – in English (PDF format)
- Farm Water Quality Plan Template – in Spanish (MS Word format)
- Farm Water Quality Plan Template – in Spanish (PDF format)
Farm Water Quality Planning Series. A template for a comprehensive farm water quality management plan for use in planning, implementation, and evaluation of management practices to help satisfy water quality regulatory requirements. (Replaces #9002)

Free publication that you can download.

This publication requires the free Adobe® Acrobat® Reader. You can download a free copy of the Acrobat Reader from Adobe Systems Incorporated.
Farm Water Quality Planning

• Goals

• Farm, Watershed, Map Info on pages 1-4

• Section 6: Groundwater on page 8

• Self-Evaluation

• If farm is adjacent or drains to 303(d) listed for Nutrients or Nitrates - questions on page 10

• If farm is adjacent or drains to 303(d) listed for Sediment or Turbidity - questions on page 12

• If farm is adjacent or drains to 303(d) listed for Toxicity or Pesticides - questions on page 14
Management Goals and Management Practices

Julie Newman, UC Cooperative Extension Ventura County
Julie Fallon, Cachuma Resource Conservation District
Checklist for Assessing and Mitigating Runoff in Greenhouses and Nurseries

• You can take the Self-Assessment as we discuss the Goals and MPs, although we will not be discussing all of the MPs in the same order.

• We will not be discussing the “General Operations” section of the checklist, but this can be completed later and used as part of the Farm Water Quality Plan.

• Feel free to stop us for questions. There is also a narrative section for each goal that explains the practices.
IRRIGATION MANAGEMENT GOALS
AND MANAGEMENT PRACTICES
Management Goal A.1: Design or retrofit your irrigation system for improved irrigation uniformity and efficiency

(A.1.1) Do you conduct in-house irrigation audits or use professional services to determine the uniformity and efficiency of the system and make appropriate adjustments based on these audits?

The RCD provides an irrigation audit service for growers.
Management Goal A.1: Design or retrofit your irrigation system for improved irrigation uniformity and efficiency

• (A.1.2) If irrigation uniformity remains low after all practical improvements have been made, have you considered converting to an irrigation system with the potential of high uniformity?

Capillary mat
Management Goal A.1: Design or retrofit your irrigation system for improved irrigation uniformity and efficiency

- (A.1.3) Do you use pressure regulators where appropriate?

- (A.1.4) Do you use emitters that minimize pressure differences or pressure compensating emitters?
Management Goal A.1: Design or retrofit your irrigation system for improved irrigation uniformity and efficiency

- (A.1.5) When using overhead or impact systems, do you use flow control nozzles when pressure is too high or variable?
- (A.1.6) When growing on slopes, do you design the system to compensate for pressure differences at the top and bottom of the slope?
Management Goal A.1: Design or retrofit your irrigation system for improved irrigation uniformity and efficiency

- (A.1.7) Do you ensure that each watering zone has spray stake or emitters with similar flow rates and avoid combining emitters with different flow rates in the same watering zone?

- (A.1.8) Do you correlate emitter flow rates for spray stakes and drippers with plant types, media infiltration rates, and pot sizes in each watering zone?
Management Goal A.1: Design or retrofit your irrigation system for improved irrigation uniformity and efficiency

- (A.1.9) Do you use appropriate and uniform nozzle sizes?
- (A.1.10) Do you use sprinkler heads with a high uniformity rating?
Management Goal A.1: Design or retrofit your irrigation system for improved irrigation uniformity and efficiency

- (A.1.11) Do you use appropriate sprinkler spacing to assure proper overlap to attain optimal distribution uniformity?
• **Management Goal A.2:** Regularly maintain your irrigation system so that it continues to operate efficiently.

  (A.2.1) Do you regularly inspect for leaks in mains and laterals, in irrigation connections, in hoses, or at the ends of drip tape and feeder lines and repair any found leaks?
Management Goal A.2: Regularly maintain your irrigation system so that it continues to operate efficiently.

- (A.2.2) Do you regularly flush and unclog lines and emitters, keeping them free of mineral deposits and biological contaminants such as algae and bacterial slimes?
- (A.2.3) Do you ensure that appropriate filtration is used and regularly clean filters?
Management Goal A.2: Regularly maintain your irrigation system so that it continues to operate efficiently.

• (A.2.4) Do you maintain appropriate pressure throughout the system?

Pressure Gauges before and after
Management Goal A.2: Regularly maintain your irrigation system so that it continues to operate efficiently.

(A.2.5) Do you regularly replace worn, outdated, or inefficient irrigation system components and equipment?
Management Goal A.2: Regularly maintain your irrigation system so that it continues to operate efficiently.

- (A.2.6) Do you keep maintenance records and update them regularly?
- (A.2.7) Do you have a schedule for regular audits?
Management Goal A.3: Regularly manage crops, crop areas, and irrigation systems to avoid applying water to noncropped areas or applying irrigation when not needed.

- (A.3.1) When spacing plants in areas irrigated with overhead or impact systems, do you regularly place plants as closely together as possible to avoid applying water to noncropped areas?
Management Goal A.3: Regularly manage crops, crop areas, and irrigation systems to avoid applying water to noncropped areas or applying irrigation when not needed.

(A.3.2) Do you manage spray stake and dripper systems to ensure that every emitter is located in a plant or pot?

(A.3.3) Do you manage harvest operations and retail areas to avoid emitters located outside of pots?
Management Goal A.3: Regularly manage crops, crop areas, and irrigation systems to avoid applying water to noncropped areas or applying irrigation when not needed.

- (A.3.4) Do you consolidate plants and shut off irrigation in unused portions, including spray stakes and other emitters that can be “turned off” when not in use?
Impact sprinklers with no shut off valves in areas without plants produce too much runoff
Management Goal A.3: Regularly manage crops, crop areas, and irrigation systems to avoid applying water to noncropped areas or applying irrigation when not needed.

(A.3.5) Do you use overhead emitters with check valves to prevent line drainage and drip damage?
Management Goal A.3: Regularly manage crops, crop areas, and irrigation systems to avoid applying water to noncropped areas or applying irrigation when not needed.

- (A.3.6) Do you use an on/off valve in hand-watering systems to prevent runoff?
Management Goal A.3: Regularly manage crops, crop areas, and irrigation systems to avoid applying water to noncropped areas or applying irrigation when not needed.

- (A.3.7) Do you check regularly to ensure that spray patterns of overhead irrigation systems uniformly deliver water only to plants, without creating overspray in walkways and edges?
Management Goal A.4: Use appropriate irrigation rates and scheduling

• (A.4.1) Do you base irrigation scheduling and amount on environmental conditions and plant moisture needs?

Weighing plant to determine water loss
Management Goal A.4: Use appropriate irrigation rates and scheduling

- (A.4.2) Do you regularly adjust irrigation schedules to reflect changes in weather, plant needs, or measured soil moisture values?
Management Goal A.4: Use appropriate irrigation rates and scheduling

- (A.4.3) Do you group pot sizes or plant types in watering zones according to moisture requirements?
Management Goal A.4: Use appropriate irrigation rates and scheduling

(A.4.4) Do you avoid irrigating outdoors in windy conditions unless using drip?
Management Goal A.4: Use appropriate irrigation rates and scheduling

- (A.4.5) Do you use pulse irrigation to split irrigation into smaller increments that can more effectively be used by plants?

- (A.4.6) When automatic timers are used, do you check regularly for accuracy and adjust to correlate scheduling with changing environmental conditions and plant growth stage?
Management Goal A.5: Provide appropriate training for personnel involved in irrigating in a language that personnel clearly understand, and maintain records documenting training.

- (A.5.1) Do you provide training to ensure that irrigation duties are performed only by personnel who understand and practice appropriate irrigation and runoff management practices?

- (A.5.2) do you ensure that appropriate personnel are trained in proper irrigation system maintenance procedures and recordkeeping?
Management Goal A.5: Provide appropriate training for personnel involved in irrigating in a language that personnel clearly understand, and maintain records documenting training.

• (A.5.3) If in-house irrigation audits are performed, do you ensure that personnel are trained to evaluate irrigation systems correctly and regularly?
Management Goal A.5: Provide appropriate training for personnel involved in irrigating in a language that personnel clearly understand, and maintain records documenting training.

• (A.5.4) Do you keep records of employee training and maintain them for at least 5 years?
Management Goal B.1: Evaluate irrigation water, soils, growing media, and plant tissue to optimize plant growth and avoid overfertilization.

- Do you monitor the quality of your irrigation source water seasonally or annually, analyzing for levels of constituents such as bicarbonates ($\text{HCO}_3^-$), sodium ($\text{Na}$), chloride ($\text{Cl}^-$), nitrate ($\text{NO}_3^-$), boron ($\text{B}$), soluble salts, and pH?
- Do you maintain records of source water quality?
Management Goal B.1: Evaluate irrigation water, soils, growing media, and plant tissue to optimize plant growth and avoid overfertilization.

- If well water is used on-site for human consumption, have you tested the well water regularly for contamination from fertilizers?
Management Goal B.1: Evaluate irrigation water, soils, growing media, and plant tissue to optimize plant growth and avoid overfertilization.

- Do you regularly test soil or growing media for nutrients, soluble salts, and pH?
Management Goal B.1: Evaluate irrigation water, soils, growing media, and plant tissue to optimize plant growth and avoid overfertilization.

In fertilizer management decision making do you avoid nutrient runoff by...

• using nutrient recommendations for your specific crop?

• using information and recommendations from soil, growing media, and plant tissue analyses?

• considering nutrients already present in your irrigation water, growing media, and previous fertilizer applications?
Management Goal B.1: Evaluate irrigation water, soils, growing media, and plant tissue to optimize plant growth and avoid overfertilization.

• Do you maintain records of fertilizer use?
Management Goal B.2: Conduct efficient fertilizer and leaching practices.

If you use solid fertilizers, do you...

- Incorporate them in a manner that optimizes nutrient availability to growing roots?
- Do you carefully apply top-dressed fertilizers to keep granules in the pot or around the plants at the correct rate?
- Do you use slow-release or controlled-release fertilizers?
Management Goal B.2: Conduct efficient fertilizer and leaching practices.

• When using composts with manure, do you thoroughly compost before application so that the compost isn’t a source of toxic bacteria and other contaminants in runoff?
Management Goal B.2: Conduct efficient fertilizer and leaching practices.

When fertilizers are injected, do you...

• calibrate fertilizer injectors to accurately deliver liquid fertilizer through the irrigation system?

• apply injected fertilizers at the correct rate?

• regularly test fertigation water to monitor fertilizer levels and ensure that injectors are operating properly?
Management Goal B.2: Conduct efficient fertilizer and leaching practices.

- Do you time fertilizer applications with environmental parameters and the growth stage of the plants?
Management Goal B.2: Conduct efficient fertilizer and leaching practices.

When leaching to manage salts in the root zone, do you ...

- use the electrical conductivity (EC) of root media or leachate water to determine leaching practices?
- use clear water without fertilizer at set irrigation events, or apply the appropriate leaching fraction with fertilizer at each irrigation event? (Leaching fraction = volume of leached H2O ÷ volume applied)
- measure the amount of leaching that occurs to ensure that only 10 to 15% of the water applied runs through the container? Measuring demonstrates how easy it is to over-leach.

Recommended leaching fractions at specific EC levels is available in the leach management section of Chapter 2 in Greenhouse and Nursery Management Practices to Protect Water Quality.
Management Goal B.3: Avoid fertilizer material spills during all phases of transport, storage and application.

When storing fertilizers, is your storage structure...

- compliant with local, state, and federal guidelines?
- equipped with a concrete pad and curb to contain spills and leaks?
- protected from rainfall and irrigation?
- located as far away as possible from water conveyances and at least 100 feet downslope of a well or other water supply?
Are fertilizer mixing/loading operations conducted...

- as far away as possible from water conveyances and at least 100 feet downslope of a well or other water supply?
- on an impermeable surface (such as concrete) in a covered area, or where potential for runoff is low?
Management Goal B.3: Avoid fertilizer material spills during all phases of transport, storage and application.

- Do you have a plan for dealing with fertilizer spills?
- Do you immediately clean up fertilizer spills according to a predetermined protocol?

Spilled potting mix is the primary source of fertilizer and pesticide runoff in container nurseries.
Management Goal B.3: Avoid fertilizer material spills during all phases of transport, storage and application.

- Do you equip fertilizer tanks with secondary containment to contain spills and leaks?
Management Goal B.3: Avoid fertilizer material spills during all phases of transport, storage and application.

- Do you regularly verify that fertilizer solution tanks are free of leaks?
Management Goal B.3: Avoid fertilizer material spills during all phases of transport, storage and application.

- When transporting fertilizer, are you careful not to overfill trailers/tanks and cover loads properly?
- When transferring fertilizer into storage or into a fertilizer applicator, do you avoid spilling fertilizer?
Management Goal B.3: Avoid fertilizer material spills during all phases of transport, storage and application.

- Do you use check valves on application equipment?
- When applying fertilizer from a tractor or rig in a field, do you shut off the fertilizer applicators during turns?
Management Goal B.3: Avoid fertilizer material spills during all phases of transport, storage and application.

- Do you dispose of fertilizer bags in trash bins with lids?
Management Goal B.3: Avoid fertilizer material spills during all phases of transport, storage and application.

• Have you installed backflow prevention devices, and do you check them at least once a year, recording the date and result of this check?

• Whenever you are injecting fertilizer into irrigation water, do you make sure that you do not allow backflow into wells or other water sources?
Management Goal B.3: Avoid fertilizer material spills during all phases of transport, storage and application.

NEW AG WAIVER BACKFLOW REQUIREMENTS

- Ag Wells – Generally require a low pressure drain, check valve, and vacuum release (exceptions include use of a sand filter, gooseneck, water source >2’ + dia. above final delivery .. ) See DPR regulations for pesticide chemigation
  Contact: Santa Barbara Ag Commissioner’s Office
  Debbie Trupe (805) 681-5600

- District Water at Meter – Requires a Reduced Pressure Preventer “RP” device that is tested annually by a certified backflow tester
  Contact: Carpinteria Valley Water District
  Brian King (805) 684-2816 x103
Management Goal B.4: Provide organized training sessions for employees handling fertilizers in a language that they clearly understand and maintain records documenting training.

- Do you provide training to ensure that employees understand how and when to use fertilizers and when to leach?

- Are employees trained to understand safe fertilizer transport, storage, and disposal practices, including what to do in case of a fertilizer spill?

- Do you keep records of training and maintain them for at least 5 years?
PEST MANAGEMENT GOALS AND
MANAGEMENT PRACTICES
Management Goal C.1: Establish an IPM program to reduce pesticide use and the potential contamination of ground and surface water with pesticides.

- Do you regularly scout crop and non-crop areas of your nursery looking for the presence of pests and pest damage, including disease symptoms?
Management Goal C.1: Establish an IPM program to reduce pesticide use and the potential contamination of ground and surface water with pesticides.

If you have employee scouts, do you...

- train them to identify disease symptoms and common pests?
- ensure that they are familiar with pest and pathogen life cycles?
- update training as new pests and diseases are introduced?
Management Goal C.1: Establish an IPM program to reduce pesticide use and the potential contamination of ground and surface water with pesticides.

- Do you train other employees who handle or walk the crop, (such as irrigators and flower harvesters) to recognize common pests and diseases so they can communicate problems they see to the scout?
Management Goal C.1: Establish an IPM program to reduce pesticide use and the potential contamination of ground and surface water with pesticides.

- Do you use diagnostic lab services or other professional assistance to identify unknown pathogens, pests, or growth problems before implementing a control measure?
Management Goal C.1: Establish an IPM program to reduce pesticide use and the potential contamination of ground and surface water with pesticides.

- Do you monitor environmental parameters to help predict growth of pest and pathogen populations?

- When applicable, do you use degree-days to predict insect development and timing of pesticide applications, or computer modeling programs for disease forecasting (see http://www.ipm.ucdavis.edu)?
Management Goal C.1: Establish an IPM program to reduce pesticide use and the potential contamination of ground and surface water with pesticides.

- Do you keep records of pest counts, degree of injury, and other data needed to determine pest pressure and pest population trends?
- Do you summarize pest population data collected over time by graphing, or compare current data with the previous collection period?
Management Goal C.1: Establish an IPM program to reduce pesticide use and the potential contamination of ground and surface water with pesticides.

- Do you base decisions on applying pesticides and other pest control options on monitoring information?
Management Goal C.1: Establish an IPM program to reduce pesticide use and the potential contamination of ground and surface water with pesticides.

• Do you use economic thresholds to select the most appropriate pest control strategies and in deciding when pesticides should be used?

Economic thresholds determine when the benefit of controlling a pest is worth the cost of control methods and the associated potential hazards.

For example, WFT thrips damage on roses may be linked with pest numbers on sticky traps and in flowers to develop threshold levels.
Management Goal C.1: Establish an IPM program to reduce pesticide use and the potential contamination of ground and surface water with pesticides.

- Do you use techniques to reduce pesticide use such as spot spraying, direct spraying, applying the lowest recommended pesticide rate on the label, and use of adjuvants?

- Do you rotate pesticides with different modes of action?

Areas where pests are found are flagged and located on a map. Only infested plants are spot-sprayed.
Management Goal C.1: Establish an IPM program to reduce pesticide use and the potential contamination of ground and surface water with pesticides.

- Do you use the most recent IPM recommendations for your crops?

- UC IPM Pest Management Guidelines for Floriculture and Ornamental Nurseries
  http://www.ipm.ucdavis.edu/index.html

- Integrated Pest Management for Floriculture and Nurseries
  http://anrcatalog.ucdavis.edu/

- UCCE Farm Advisor and PCA
Management Goal C.2: Use good sanitation and other preventive control techniques to avoid pest problems and maintain a healthy production environment.

When new plant material is shipped to the nursery or when new plant material is propagated on site, do you...

- inspect carefully to ensure that new plant material is free of pests and diseases?
- treat or discard infected plant material promptly before introducing it into the growing area?

This ensures that other plants will not become infected, reducing the size of treatment areas.
Management Goal C.2: Use good sanitation and other preventive control techniques to avoid pest problems and maintain a healthy production environment.

- Do you quarantine new plants before introducing them into growing areas to allow time for latent diseases to be expressed?
Management Goal C.2: Use good sanitation and other preventive control techniques to avoid pest problems and maintain a healthy production environment.

- Do you eliminate weeds in the growing environment and in noncropped areas which may be harboring pests and diseases?

- Do you steam or chemically treat planting areas and recycled media to eliminate pests before establishing new crops?
Management Goal C.2: Use good sanitation and other preventive control techniques to avoid pest problems and maintain a healthy production environment.

- Do you select plants that are tolerant or resistant to pests and diseases?
- Do you use certified or culture-indexed stock where available and feasible?

Plants that have inherently few pests require fewer chemical applications.

Most ornamental species susceptible to fire blight have certain cultivars that are resistant.
Management Goal C.2: Use good sanitation and other preventive control techniques to avoid pest problems and maintain a healthy production environment.

- Do you use hand dispensers and foot baths at production house entrances and in propagation facilities to disinfest hands and shoes, ensuring that appropriate employees use them regularly?
Management Goal C.2: Use good sanitation and other preventive control techniques to avoid pest problems and maintain a healthy production environment.

• Do you keep irrigation hose nozzles off the ground to avoid contaminating plants?
Management Goal C.2: Use good sanitation and other preventive control techniques to avoid pest problems and maintain a healthy production environment.

• Do you avoid standing water in the growing environment (conducive to certain pest and disease problems)?
Management Goal C.2: Use good sanitation and other preventive control techniques to avoid pest problems and maintain a healthy production environment.

• Do you remove diseased plants, destroying them or treating them in an isolated area?

Dying or dead plants can be a source of pathogen inoculum that may spread to nearby crops.
Management Goal C.3: Where feasible and appropriate, use nonchemical control tactics to reduce overall pesticide use.

- Do you incorporate cultural and environmental control methods to reduce or prevent pests?

Cultural control includes practices such as avoiding continuous cropping in one location (encourages spreading of pests to young plants from older plants).

Environmental control includes practices such as hot water dips and steaming.
Management Goal C.3: Where feasible and appropriate, use nonchemical control tactics to reduce overall pesticide use.

• Do you incorporate mechanical controls using methods such as pulling weeds, use of machinery, or physical barriers such as greenhouse exclusion to reduce or prevent pests?
Management Goal C.3: Where feasible and appropriate, use nonchemical control tactics to reduce overall pesticide use.

- Are you familiar with the beneficials that naturally occur in your growing area and do you monitor for them?
- When beneficials are present, do you use compatible pesticides when possible?
Management Goal C.3: Where feasible and appropriate, use nonchemical control tactics to reduce overall pesticide use.

- Have you incorporated commercially available beneficials into your IPM program on crops where their use has been demonstrated to be effective and do you monitor for them?
Management Goal C.3: Where feasible and appropriate, use nonchemical control tactics to reduce overall pesticide use.

- Do you use control strategies that conserve beneficials such as direct spraying, spot spraying, and reduced pesticide rates?
- Do you prevent ants from disrupting natural enemies?

Ant feeding on honeydew excreted by whiteflies
Management Goal C.4: When chemical pest control is necessary, select reduced-risk pesticides to prevent contamination of ground or surface water with toxic chemicals.

- Do you consider site conditions, pesticide labels, and hazard warnings of migration risk when selecting pesticides?
- Whenever possible, do you select pesticides that do not potentially contaminate surface and groundwater?
- Do you avoid the use of groundwater-risk pesticides in rainy weather, in areas of shallow water tables, and where soils are sandy or have low organic matter content?
PesticideWise searches through a comprehensive EPA-USD database and presents critical information on a pesticide’s properties and water quality risks.

- Search products by trade or chemical name, partial or full.
- Calculate the risk for your application.
- Provide application-specific mitigation options.

Understanding the risk associated with using a specific pesticide on a specific site is key to knowing what mitigation practices or pesticide alternatives may be required.

http://www.pw.ucr.edu

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This Web site has been visited 2781 times
Example: Bifenthrin moves on soil particles in runoff and has been found in creeks at levels that are toxic to aquatic invertebrates.
Management Goal C.4: When chemical pest control is necessary, select reduced-risk pesticides to prevent contamination of ground or surface water with toxic chemicals.

- When feasible, do you choose pesticides that are the most selective for the target pest species avoiding the use of broad-spectrum pesticides?

Narrow-spectrum biological pesticides (e.g., bacillus thuringiensis, spinosid, Botanigard) are environmentally friendly; however, may require applications of other types of products in a complex pest community.

The use of some broad-spectrum pesticides has led to secondary pests. For example, if a pesticide applied to kill aphids (e.g. a pyrethroid) also kills predatory mites, a secondary pest outbreak of spider mites could occur.
Management Goal C.5: Apply pesticides in a safe manner to reduce pesticide loads and potential runoff.

- Do you accurately measure pesticides to assure that you are within the label rate and to eliminate disposal problems associated with excess spray mix?
Management Goal C.5: Apply pesticides in a safe manner to reduce pesticide loads and potential runoff.

- Do you know the exact location of the area to be treated, as well as the potential hazard of spray drift or subsequent pesticide movement to the surrounding areas?
Management Goal C.5: Apply pesticides in a safe manner to reduce pesticide loads and potential runoff.

• Do you apply pesticides according to the label and follow environmental hazard instructions?
Management Goal C.5: Apply pesticides in a safe manner to reduce pesticide loads and potential runoff.

- Do you calibrate pesticide spray equipment to ensure the best coverage and efficacy of pesticide applications as well as accurate application rates?
- Do you ensure that the spray tank is free of leaks?
Management Goal C.5: Apply pesticides in a safe manner to reduce pesticide loads and potential runoff.

Do you avoid spraying pesticides outdoors when it is windy or when rain or scheduled irrigation could move pesticides in runoff and ground percolation?
Management Goal C.5: Apply pesticides in a safe manner to reduce pesticide loads and potential runoff.

• Do you maintain records of the amount and type or pesticides applied?
Management Goal C.6: Avoid pesticide spills and leakage during all phases of transport, storage, and application.

Is your pesticide storage structure...

- compliant with local, state, and federal guidelines?
- equipped with a concrete pad and curb to contain spills and leaks and is it protected from rainfall and irrigation?
- located as far away as possible from waterways, and at least 100 feet from a well or other water supply?
Management Goal C.6: Avoid pesticide spills and leakage during all phases of transport, storage, and application.

Are pesticide mixing areas and loading operations conducted...

- as far away as possible from waterways, and at least 100 feet from a well or other water supply?
- on an impermeable surface such as a concrete floor and in areas where potential for runoff is low?
- is mixing/loading conducted in a matter that prevents spilling?
Management Goal C.6: Avoid pesticide spills and leakage during all phases of transport, storage, and application.

When transporting pesticides, do you...

- avoid overfilling trailers or tanks and cover loads properly?
- transport pesticides in the back of a truck and secure containers to prevent breaking or spilling?
- ensure that pesticides are never left unattended in a vehicle unless they are in a locked container?
Management Goal C.6: Avoid pesticide spills and leakage during all phases of transport, storage, and application.

- When applying pesticides from a tractor or rig in a field, do you use check valves on application equipment and shut off the nozzles during turns?

- Do you distribute rinse water from pesticide application equipment evenly over the crop to reduce pesticide contamination in nontarget areas during the cleanup process following application?
Management Goal C.6: Avoid pesticide spills and leakage during all phases of transport, storage, and application.

If you inject pesticides into irrigation water, do you...

- Ensure that you do not allow backflow into wells or other water sources?

- Use backflow prevention devices and check them at least once a year, recording the date and result of this check?
Management Goal C.6: Avoid pesticide spills and leakage during all phases of transport, storage, and application.

- Do you clean up any spilled potting media that contains pesticide residues?
- If pesticides are mixed into potting media before potting, are concrete curbs or sandbags used to isolate these areas so that the potting mix is not washed away in the runoff?
Management Goal C.6: Avoid pesticide spills and leakage during all phases of transport, storage, and application.

- Do you keep a spill kit available at the pesticide storage facility and other sites where pesticides are used?

- Do you immediately clean up pesticide spills according to a predetermined protocol, referring to the pesticide product material safety data sheet (MSDS)?
Management Goal C.6: Avoid pesticide spills and leakage during all phases of transport, storage, and application.

- Do you dispose of pesticides and pesticide containers according to label instructions and in an environmentally safe manner?
Management Goal C.7: Ensure that the use of other agricultural chemicals potentially toxic to the environment do not contribute to runoff.

When treating ethylene-sensitive crops, do you...

- Neutralize residuals before disposal when using STS products (e.g., Chrysal AVB), following manufacturer instructions, to ensure that the product does not contaminate groundwater or surface waterways?

- Use 1-methylcyclopropene (1-MCP, EthylBloc) as an alternative to STS when feasible?

Silver is a heavy metal that persists in soil and water and may pollute drinking water. It is toxic to aquatic organisms.
Management Goal C.7: Ensure that the use of other agricultural chemicals potentially toxic to the environment do not contribute to runoff.

When using exterior greenhouse shading compounds, do you...

- Select exterior greenhouse shading compounds that are relatively nontoxic?
- Apply and remove exterior shading compounds so that they produce minimal runoff and remain on the property?

Use of interior shade fabric or reflective covers avoids runoff problems.
Management Goal C.7: Ensure that the use of other agricultural chemicals potentially toxic to the environment do not contribute to runoff.

- Do you exercise care when disposing of household products used in greenhouses and nurseries such as cleaning products and disinfectants?
Management Goal C.8: Provide organized training sessions for personnel handling pesticides in a language that they can clearly understand and maintain records documenting training.

- Do you provide training so that employees understand how and when to use pesticides in a safe manner, including safe pesticide transport, storage, and disposal practices and what to do in case of a pesticide spill?
- Do you keep records of training and maintain them for at least 5 years?
EROSION AND RUNOFF MANAGEMENT GOALS AND MANAGEMENT PRACTICES
Management Goal D.1: Evaluate the water quality of irrigation and storm runoff to comply with water regulations and determine options for reuse or treatment.

- (D.1.1) Do you inventory chemicals used in your operation, especially those likely to be present in runoff?
- (D.1.2) Do you regularly sample runoff water, following commercial lab instructions for taking and handling samples?
Management Goal D.1: Evaluate the water quality of irrigation and storm runoff to comply with water regulations and determine options for reuse or treatment.

- **(D.1.3)** Do you analyze (or have a lab analyze) runoff water samples to determine what is in it and at what levels, including pH, electrical conductivity (EC), nitrate ($\text{NO}_3^-$) and phosphate ($\text{PO}_4^{3-}$)?

- **(D.1.4)** Do you compare water analyses against local, state, and federal water quality standards and regulations?

- **(D.1.5)** Do you maintain water quality runoff records for at least 5 years?
Management Goal D.2: Use practices that improve soil/media infiltration and water-holding capacity to reduce soil erosion, runoff, and excessive leaching.

- (D.2.1) Do you incorporate organic amendments on sandy soil to improve water-holding capacity and prevent excessive leaching?

- (D.2.2) Do you incorporate amendments on clay soil to improve infiltration and reduce runoff?
Management Goal D.2: Use practices that improve soil/media infiltration and water-holding capacity to reduce soil erosion, runoff, and excessive leaching.

- (D.2.4) Do you test media used in containers and select media for high water-holding capacity as well as good drainage?
Management Goal D.2: Use practices that improve soil/media infiltration and water-holding capacity to reduce soil erosion, runoff, and excessive leaching.

- **(D.2.5)** Do you use wetting agents to increase water absorption, allow quicker wetting, and reduce channeling down the sides of pots?
Management Goal D.3: Use practices that retard movement of runoff water and sediment and keep it on the property.

- (D.3.1) Do you determine where and how much erosion and runoff is generated, the causes of erosion and runoff, and whether runoff exits the property?
Management Goal D.3: Use practices that retard movement of runoff water and sediment and keep it on the property.

• (D.3.2) Do you protect bare areas with mulches (or use cover crops on bare soil) to reduce runoff?

Unpaved nursery road was rutted and rilled

Mulch on unpaved nursery road
Management Goal D.3: Use practices that retard movement of runoff water and sediment and keep it on the property.

- (D.3.3) Wherever possible, do you convert paved or bare soil areas to vegetation that retards runoff and takes up nutrients, pesticides, and other pollutants?
- (D.3.4) Do you use sediment barriers such as sandbags, straw wattle, and synthetic hay bales to curtail runoff and trap sediments?
Management Goal D.3: Use practices that retard movement of runoff water and sediment and keep it on the property.

• (D.3.5) Have you established engineered barriers or vegetated buffers between production areas and ditches, creeks, ponds, lakes, or wetlands?
Management Goal D.3: Use practices that retard movement of runoff water and sediment and keep it on the property.

(D.3.6) Have you considered using polyacrylamide (PAM) — a commercially available, nontoxic soil stabilizer — to reduce sediment runoff?

PAM was highly effective in reducing sediments and pyrethroids when added to irrigation water in liquid or tablet form in this UC study. Left, untreated runoff; Right, runoff resulting from PAM-treated irrigation source water runs clear.
Management Goal D.3: Use practices that retard movement of runoff water and sediment and keep it on the property.

(D.3.7) Do you use windbreaks (shelterbelts) in areas prone to wind erosion?
Management Goal D.3: Use practices that retard movement of runoff water and sediment and keep it on the property.

- (D.3.8) you store and mix container media in a location sheltered from wind and away from drainage channels?
Management Goal D.3: Use practices that retard movement of runoff water and sediment and keep it on the property.

(D.3.9) If your property is affected by discharge sediment or runoff from upslope or upstream properties, do you use practices to contain this sediment or runoff, such as diversions, filter strips, sediment basins, underground outlets?
Management Goal D.3: Use practices that retard movement of runoff water and sediment and keep it on the property.

(D.3.10) Have you implemented and maintained a record-keeping system for documenting management practices addressing runoff management?
Management Goal Management Goal D.4: Manage hilly, sloped areas to prevent soil erosion and increased runoff volume and velocity (hilly production and nonproduction areas).

- (D.4.1) Do you use terraces, where appropriate, to control soil erosion and runoff?
- (D.4.2) Do you use mulches to control soil erosion and runoff?
Management Goal D.4: Manage hilly, sloped areas to prevent soil erosion and increased runoff volume and velocity (including hilly production areas as well as sloped nonproduction areas).

- (D.4.3) Do you use vegetation (cover crops, buffer strips, grassed swales, etc.) to control soil erosion and runoff?

- (D.4.4) Do you use berms to control soil erosion and runoff?

- (D.4.5) Do you use proper irrigation, pest, and nutrition management in hilly production and landscaped nonproduction areas to avoid runoff and soil erosion?
Management Goal D.5: Design and manage nursery roads to prevent erosion and contaminated runoff.

- (D.5.1) Do you ensure that all new roads are properly designed and permitted to avoid erosion?
Management Goal D.5: Design and manage nursery roads to prevent erosion and contaminated runoff.

• (D.5.2) Do you use filter strips to protect waterways by absorbing runoff from roads and trapping toxic sediment?
Management Goal D.5: Design and manage nursery roads to prevent erosion and contaminated runoff.

(D.5.3) Do you use and regularly maintain waterbreaks (waterbars) on nursery roads with gradients exceeding 8% to control surface runoff, ensuring that discharge areas are vegetated or have other erosion resistant materials?
Management Goal D.5: Design and manage nursery roads to prevent erosion and contaminated runoff.

- (D.5.4) Do you grade roads to direct runoff into ditches or, when crops are grown adjacent to roads, toward the center of the road?

- (D.5.5) Do you thoroughly compact all backfill in irrigation pipeline trenches along unpaved roads

- (D.5.6) Do you seed moderately used road surfaces and exposed soils with grasses prior to winter rains and mulch during establishment?
Management Goal D.5: Design and manage nursery roads to prevent erosion and contaminated runoff.

- (D.5.7) Do you inspect culverts, roadside ditches, waterbreaks, and outlets, cleaning them out after each major rain event so that water drains freely?
Management Goal D.5: Design and manage nursery roads to prevent erosion and contaminated runoff.

- (D.5.8) Do you construct and re-grade only during dry weather and avoid using unpaved roads during wet weather when feasible?

Unpaved access roads that must be used in wet weather should be protected with gravel or mulch.
Management Goal D.5: Design and manage nursery roads to prevent erosion and contaminated runoff.

- (D.5.9) Do you prevent contaminant-laden dust from traffic and wind erosion by sealing or watering unpaved roads, ensuring that dust control with applied water does not create runoff?
Management Goal D.6: Collect excess irrigation and storm water runoff and sediment.

- (D.6.1) In locations where erosion is expected, do you use methods to intercept sediment-laden runoff (e.g., sediment traps or sediment basins)?

Sediment basin
Management Goal D.6: Collect excess irrigation and storm water runoff and sediment.

- (D.6.2) Do you capture excess irrigation runoff and/or storm water using impoundments (e.g., retention basins, infiltration basins, ponds, recycling systems, tailwater recovery systems, and reservoirs)?

- (D.6.3) If you capture runoff water, do you reuse the water for irrigation (noncrop areas or on crops)?
Management Goal D.6: Collect excess irrigation and storm water runoff and sediment.

(D.6.4) If you capture runoff water, have you designed the impoundment to capture at least part of the storm and do you reduce storm overflow runoff by using management practices such as vegetated buffers, landscaping, cover crops, sediment barriers, diversions, and underground outlets?
Management Goal D.6: Collect excess irrigation and storm water runoff and sediment.

- (D.6.5) If controlled flows are necessary to allow sufficient room for blending for recycling, do you ensure that controlled flows are managed so that they are treated (e.g., using vegetated buffers to remove excess nutrients and pesticides) and remain on-site?

Grassed waterway and constructed wetland for periodic discharge of runoff water
Management Goal D.6: Collect excess irrigation and storm water runoff and sediment.

- (D.6.6) If you use a recycling system, do you use fiber or activated charcoal filters to filter pollutants such as pesticides?
Management Goal D.6: Collect excess irrigation and storm water runoff and sediment.

- (D.6.7) If you use a recycling system do you treat pathogens before reuse?

Water that is drawn from the retention basin is treated for pathogens with ultraviolet light and ozone before being reused for irrigation.
Management Goal D.6: Collect excess irrigation and storm water runoff and sediment.

- (D.6.8) Do you remove sediment from traps or water storage facilities before rain seasons?
Management Goal D.7: Manage greenhouse roof runoff to reduce pollution and erosion, to prevent flooding, and improve drainage.

- (D.7.1) Do you direct roof runoff to avoid flow across areas where contaminants could be washed into a municipal storm water system, sewer system, or agricultural drainage system?
- (D.7.2) Do you direct roof runoff into pervious areas such as gravel, vegetation, paving material, self-contained tailwater system, or retention ponds?
- (D.7.3) Do you collect and/or reuse collected roof runoff for irrigation (noncrop areas or on crops)?
Management Goal D.8: Provide organized training sessions for personnel in runoff management in a language that personnel clearly understand, and maintain records documenting training.

• (D.8.1) Do you ensure that all appropriate employees receive training in runoff management and all applicable regulations?
Management Goal D.8: Provide organized training sessions for personnel in runoff management in a language that personnel clearly understand, and maintain records documenting training.

- (D.8.2) Do you train staff so that they become aware of all drainage conduits and ditches on the property and know where they drain?
- (D.8.3) Do you ensure that all municipal storm water or sewer system conduits and ditches are stenciled or designated with signs, and that there are no illicit connections to the municipal storm water or sewer system?
- (D.8.4) Do you keep documentation and records of employee training for at least 5 years?
Nonproduction areas include walkways, driveways, packing areas, loading areas, parking areas, maintenance and storage areas, landscaped areas, restrooms.

These areas may contain fertilizers, pesticides, or petroleum products. Portable toilets can be a source of bacteria (fecal coliform).
Management Goal E.1: Ensure that nonproduction areas do not contribute to dry or wet weather runoff

- Do you periodically clean outdoor nonproduction areas to remove debris, vehicle residues, and other contaminants and prevent them from washing off, using only dry methods (such as sweeping or dry absorbents)?

- Do you clean indoor nonproduction areas using only dry methods?
Management Goal E.2: Maintain vehicles, trucks, and tractors and their storage areas so that they do not leak fluids into groundwater or surface water.

- Do you regularly maintain vehicles, trucks, and tractors used in the nursery to detect and prevent fluid leaks?
- Do you properly dispose of collected fluids?
- When there are vehicles, equipment, and storage tanks that are no longer used on the property, do you drain fluids and properly dispose of them?
Management Goal E.2: Maintain vehicles, trucks, and tractors and their storage areas so that they do not leak fluids into groundwater or surface water.

In maintenance and storage areas for vehicles and tractors, do you...

- Periodically clean to avoid oil and grease buildup, ensuring that wash runoff from vehicles and tractors remains on the property and does not drain into a municipal storm water or sewer system, or leach into groundwater?

- Locate these areas where wet weather will not wash fluids into surface or groundwater?

Concrete pad for maintenance and farm equipment helps to capture oils. Adding a covering structure would reduce runoff in wet weather.
Management Goal E.2: Maintain vehicles, trucks, and tractors and their storage areas so that they do not leak fluids into groundwater or surface water.

- Do you immediately and properly clean up spills from vehicles, trucks, and tractors?
Management Goal E.3: Locate and maintain fuel tanks so that they do not leak, spill, overflow, or leach into groundwater or surface water.

If you have fuel tanks, do you...

- locate them where wet weather will not wash fluids into surface or ground water?
- check and maintain them to prevent leaks?
- perform fueling activities carefully to avoid overflow and spills?
- immediately and properly clean up fuel spills?

Fuel tank with secondary containment for potential fuel leaks and spills.
Management Goal E.4: Keep the nursery property free of debris and trash so that trash does not clog storm drains and litter or pollute waterways and beaches.

- Do you regularly maintain the entire nursery property to keep it clean and free of debris?
Management Goal E.4: Keep the nursery property free of debris and trash so that it does not clog storm drains and litter or pollute waterways and beaches.

Are waste containers...

• available where needed and is trash regularly collected to avoid overflow?

• kept in good condition and kept closed?

• located indoors or covered when outdoors, along with collection areas, storage areas, and stockpile areas?
Management Goal E.5: Maintain restrooms to avoid spills and leakage of fecal coliform from human waste into the storm water system.

Are there an adequate number of restrooms and portable toilets that are...

- protected from wet weather and properly hooked up to the sanitary sewer system?
- regularly maintained to prevent sewage and human waste from entering a municipal storm water system?

- Do employees receive training in proper waste disposal and use of restrooms and mobile toilets?
Management Goal E.6: Provide training in waste, sanitation, and spill management for all personnel in a language that they clearly understand, and maintain records documenting training.

- Do you educate and require your employees to help in recycling all the waste that you can from your nursery operation such as metal, oil, paper, and plastic?
Management Goal E.6: Provide organized training sessions in waste, sanitation, and spill management for all personnel in a language that they clearly understand, and maintain records documenting training.

- Do you educate employees in the proper disposal of batteries, paints, and other potentially hazardous materials used in the nursery?
- Are all employees trained on what to do in the event of a spill?
- Do you document and maintain records of employee training for a minimum of 5 years?
Once you have checked off the appropriate MPs that you have implemented, you will have a written record of your self-evaluation.

You can then review the applicable MPs you have not implemented and decide which of these could be implemented in the future as part of your farm water quality plan.
Questions?