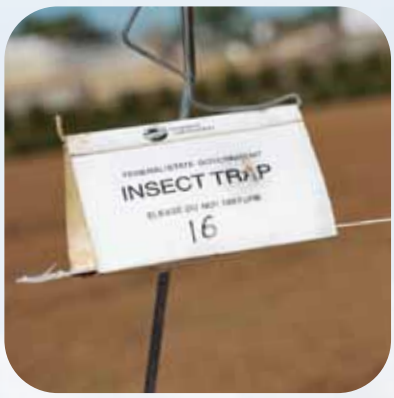
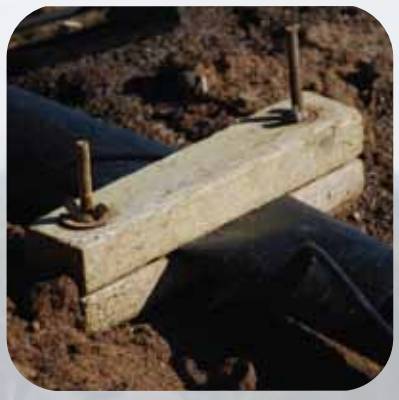
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
AGRICULTURAL WATER QUALITY RESEARCH & EDUCATION
SAN DIEGO COUNTY

SELF ASSESSMENT: TREE CROPS

Ag Water Quality
WATER SCHOOL


http://ucanr.org/agwaterquality

Introduction

Agriculture is under increasing scrutiny for its contributions to nonpoint source pollution. Nonpoint source (NPS) pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. As runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and groundwater. Although agriculture is not the only concern, runoff from agricultural properties may contain contaminant levels that exceed water quality standards. Certain management practices can contribute to nonpoint source pollution in the form of excess sediments, nutrients, salts, pesticides, or pathogenic organisms. In San Diego County, the storm water permit adopted in 2001 has created new requirements for runoff entering the storm drain system. These new requirements affect many different types of businesses, including agriculture.

San Diego County's storm water permit specifically requires the county and cities to inspect greenhouses and nurseries for storm water violations. *Other types of agriculture are not exempt from complying with water quality regulations. However, at this time they will not be regularly inspected for storm water violations.*

Instructions

This self-assessment provides a basis for assessing runoff and nonpoint source pollution potential from tree crop operations. Runoff and nonpoint source pollution management on any agricultural property will involve a combination of practices. Not every property will have the same issues or utilize the same Best Management Practices to address them.

The self-assessment questions are divided into the following categories:

A. Property Management
B. Road Management & Erosion Control
C. Irrigation Practices
D. Leaching & Runoff
E. Nutrient Assessment & Fertilizer Management
F. Integrated Pest Management

Each question may be checked "Yes, No, or Not Applicable." *Answering "No" to any question indicates an issue that may need to be assessed or reconsidered as a Best Management Practice.* However, this does not necessarily determine evidence of nonpoint source pollution or violation of storm water regulations. A brief explanation is provided under each question explaining its importance to runoff, nonpoint source pollution, and/or Best Management Practices.

Acknowledgements

Funding for this program has been provided in full or in part through a contract with the State Water Resources Control Board (SWRCB) pursuant to the Costa-Machado Act of 2000 (Proposition 13) and any amendments thereto for the implementation of California's Nonpoint Source Pollution Control Program. The contents of this document do not necessarily reflect the views and policies of the SWRCB, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Funding also provided by Kee Kitayama Research Foundation, Environmental Quality Incentives Program (EQIP), California Association of Nurserymen, City of Encinitas, and UC Cooperative Extension - County of San Diego.

A. Property Management

1. Does irrigation and other operation runoff during dry weather remain on the property? ***All dry weather runoff is prohibited from entering the storm drain system, which includes street gutters, public waterways, and other conveyances that drain to public waters. Discharging dry weather runoff onto neighboring properties is not allowed unless done with consent. Dry weather runoff may also not be discharged onto public streets/ roads.***	☐ Yes ☐ No ☐ N/A ☐ public street/road ☐ storm drain ☐ surface waters ☐ neighbor property
2. Is the property located away from public waterways, which includes streams, rivers, lakes, lagoons, wetlands, and bays? ***A higher potential to pollute exists when public water bodies are located directly on or adjacent to a growing operation. In addition, commercial operations near public water bodies designated as "impaired" under Clean Water Act section 303(d), or regulated under a "total maximum daily load" (TMDL) requirement may have more stringent requirements.***	☐ Yes ☐ No ☐ N/A
3. Has the location of all drainage pipes/ditches and their outfalls been determined? **Are storm drain ditches designated with signs (*e.g., No Dumping)*?** **Is buffer/filter vegetation located between production areas and storm drains?** ***Growers must be aware of all drainage pipes and ditches on their properties and know where they drain. Designating storm drains and ditches with signs to prevent dumping is encouraged but not required. The regulatory community is looking to detect and disconnect illicit connections to the storm drain system. A storm drain must only convey wet weather runoff. Buffer/filter vegetation can help absorb both dry and wet weather runoff.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
4. Are outdoor driveways, parking areas, and loading areas periodically cleaned for debris, vehicle residues, and other contaminants? **If wet cleaned, does all runoff remain on the property?** ***Periodic dry cleaning is recommended to prevent debris from washing into the storm drain system during wet weather. Driveways, parking areas, and loading/packing areas may contain contaminants from vehicle fluids and emissions. Oil and other vehicle fluid spills must be cleaned up. Wash runoff may not leave the property. Dry cleaning methods are recommended to avoid creating runoff, and dust control practices also must not create runoff.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A

5. In landscaped *non-production areas*, are irrigation, fertilization, and pest management properly managed to avoid contaminated runoff? **Are all *non-production* areas managed to prevent erosion?** ***Landscaped areas must not create runoff. Highly erodible areas should be managed with appropriate vegetation or other means to avoid contributing sediments to runoff. Non-production areas may be appropriate for reuse of collected irrigation runoff or constructing collection ponds.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
6. Is roof runoff diverted from flowing across contaminated areas such as animal pens, parking areas, loading areas, etc.? **Is roof runoff directed into pervious areas (e.g., gravel, landscaping) or collection ponds?** ***Roof runoff should not be directed to flow across areas where contaminants will be picked up and washed into the storm drain. If possible, roof runoff should be directed to flow into pervious areas where it can be absorbed or collected.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
7. Are fuel tanks/nozzles checked and maintained to prevent leaks? **Are fuel tanks located away from waterways, drainage ditches, and storm drains?** **Are fuel tanks equipped with secondary containment to contain spills?** ***A small amount of petroleum product can contaminate a large body of water. Locating fuel tanks away from surface waters, drainage ditches, and storm drains minimizes risk of spills into water bodies. Secondary containment provides a method to contain spills in the event of an accidental leak.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
8. Are vehicles/trucks/tractors regularly maintained to detect and prevent fluid leaks? **Are vehicle spills and leaks immediately and properly cleaned up?** **Are collected fluids and solid waste from maintenance properly disposed (e.g., oil, antifreeze, batteries)?** **Are maintenance/storage areas located away from waterways, drainage ditches, and storm drains?** **Are maintenance/storage areas cleaned to avoid oil/grease buildup?** **Does wash runoff remain on the property?** ***Vehicles/trucks/tractors use numerous fluids that are very toxic to the environment. Wash runoff may not leave the property. Washing activities should be done over pervious areas (gravel, landscaping) where runoff will soak into the ground.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A

9. Are spill clean-up available materials for all potential types and sizes of spills? **Have all employees been trained in proper procedures for managing a spill?** ***Preparedness for spills can eliminate or minimize runoff of harmful substances into the storm drain in the event of an accident. Basic spill materials include: adequate amount of absorbent material (e.g., kitty litter), broom and dustpan, chemically resistant gloves, and a large labeled container to dispose of contaminated absorbent material.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
10. Is the property kept clean and free of solid waste and debris? **Are adequate numbers of waste containers with lids available and regularly collected to avoid overflow?** **Are waste containers located away from waterways, drainage ditches, and storm drains?** ***Solid waste and debris can clog storm drains and cause fatalities for marine life through strangulation or ingestion. Solid waste and debris also creates an unsightly mess in waterways and on beaches.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
11. Are outdoor storage and stockpile areas covered to prevent wet weather washing into the storm drain system? **Are retired vehicles, equipment, and storage tanks/drums either removed from the property or drained of fluids?** ***Materials stockpiled outdoors should be properly located and covered to prevent wet weather washing into the storm drain system. Retired vehicles, equipment, and storage tanks/drums often contain hazardous materials and should either be removed from the property or drained of fluids to prevent accidental leaks and spills.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
12. Are pesticides, fertilizers, and other chemical products stored in closed, labeled containers, under cover and off the ground? **Are pesticides, fertilizers, and other chemical products and containers disposed according to label directions and all applicable regulations?** ***Pesticides, fertilizers, and other chemical products and their containers must be properly stored and disposed to prevent spills and wet weather washing into the storm drain system.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A

13. Are adequate restrooms or portable sanitation available?	☐ Yes ☐ No ☐ N/A
Are restroom toilets, floor, and sink drains properly hooked up to the municipal sewer or a septic system?	☐ Yes ☐ No ☐ N/A
Is portable sanitation located away from waterways, drainage ditches, and storm drains?	☐ Yes ☐ No ☐ N/A
Is portable sanitation regularly maintained?	☐ Yes ☐ No ☐ N/A
Are septic systems and leach fields properly maintained?	☐ Yes ☐ No ☐ N/A
Properly maintained restrooms and portable sanitation are necessary to prevent human waste and sewage from entering the storm drain system or contaminating groundwater. Human waste contains fecal coliforms, which are monitored by county officials to determine beach closures.	

14. Has a record-keeping system for water quality issues been started and maintained?	☐ Yes ☐ No ☐ N/A
Record-keeping helps to document management practices A record-keeping system is available from UC Cooperative Extension – County of San Diego at http://cesandiego.ucdavis.edu. Click on "Ag Water Quality Program", then "Grower Resources."	

B. Road Management & Erosion Control

1. Are new grove roads properly permitted?	☐ Yes ☐ No ☐ N/A
In road design, is soil type for erodibility and suitability evaluated?	☐ Yes ☐ No ☐ N/A
In road design, are excessive slopes avoided?	☐ Yes ☐ No ☐ N/A
In road construction, is final grading performed during dry months?	☐ Yes ☐ No ☐ N/A
In road construction, are exposed soils seeded and mulched to establish vegetation before winter rains?	☐ Yes ☐ No ☐ N/A
To avoid future complications with regulatory agencies, it is necessary to comply with all grading regulations. This may require the submission of an engineering plan for the roads along with specifications and an environmental assessment. Roads that are properly designed, constructed, and maintained will avoid long-term costs of erosion and grading. Exposed soils are subject to erosion losses during winter rains. Sediments are a contaminant in waterways.	

2. Are waterbreaks (or waterbars) utilized on roads with gradients exceeding 8%? **Are earthen waterbreaks properly sized (6 in. above and 6 in. below the road surface)?** **Are waterbreaks placed only where water flow has an outlet?** **Does diverted water from waterbreaks flow only into stable areas, avoiding septic fields or waterways?** **Are filter strips used at the outlet of waterbreaks and culverts to trap sediments?** ***On gradients over 8%, waterbreaks (or waterbars) are effective in diverting accumulated water from the road surface onto a vegetated fill bank or toward a cutback. Diverted flow should not directly entering into waterways. Filter strips are vegetated areas between roads and waterways, and can help trap sediments before they reach waterways. Sediments are a contaminant in waterways.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
3. Is road use restricted during wet weather? **Are culverts inspected and cleaned out during winter rains?** **Is excessive road maintenance avoided?** ***Using roads during wet weather will aggravate erosion and drainage problems. Maintaining culverts will allow water to freely drain. Avoid excessive maintenance to minimize disturbing the soil. Only regrade to remove deep ruts or damaged areas caused by severe storms.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
4. Are cover crops established on the contour between tree rows for erosion control? **Is mulching used in the sprinkler pattern of the trees for erosion control?** ***Cover crops consisting of planted annual grasses or natural vegetation help stabilize the soil and prevent erosion within the grove. Cover crops should not be allowed in the sprinkler pattern around the trees. Mulching can consist of a clean, organic material such as straw or leaf litter for erosion control directly around the trees in the sprinkler pattern. Mulching 2-4 inches deep will also reduce weed growth, conserve moisture and improve soil tilth. Do not incorporate mulch into the soil.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A

C. Irrigation Practices

1. Is irrigation water quality regularly monitored by grove personnel and/or professionally by a lab? ☐ Yes ☐ No ☐ N/A

Are water quality records maintained? ☐ Yes ☐ No ☐ N/A

Regularly testing irrigation water quality is important for maintaining good tree health. Simple equipment can be used to test such parameters as EC, pH, and nitrate-nitrogen. Regularly testing fertigation water is also recommended to monitor fertilizer levels and to ensure injectors are operating properly.

2. Do spray patterns of sprinkler systems uniformly deliver water to target areas? ☐ Yes ☐ No ☐ N/A

Spray patterns should be checked to ensure water is being applied only to the growing areas. Water applied past root zone areas or onto roads wastes water and can result in erosion and runoff.

3. Has the irrigation system been assessed for worn, outdated, and/or inefficient equipment that can be replaced? ☐ Yes ☐ No ☐ N/A

Is appropriate filtration in place for all irrigation equipment? ☐ Yes ☐ No ☐ N/A

Is appropriate pressure regulation in place for all irrigation equipment? ☐ Yes ☐ No ☐ N/A

Is all irrigation equipment regularly checked and repaired for leaks? ☐ Yes ☐ No ☐ N/A

Is all irrigation equipment regularly flushed and managed for clogging? ☐ Yes ☐ No ☐ N/A

Adapting efficient irrigation technologies can help reduce the amount of runoff. Appropriate filtration will prevent problems associated with clogging, and appropriate pressure regulation will improve uniformity. General maintenance that includes managing leaks and clogging will also improve uniformity and prevent runoff.

4. Is a uniformity evaluation regularly performed on the irrigation system? ☐ Yes ☐ No ☐ N/A

A uniformity evaluation measures the capability of an irrigation system to evenly deliver water. A system with low uniformity will typically overwater some trees to provide adequate water to other trees through lower flowing emitters. High uniformity can be achieved with good system design, pressure regulation, prevention of clogs and leaks, and prevention of line draining. Mission Resource Conservation District (760-728-1332) provides free uniformity evaluations.

5. Are specific methods/equipment, such as CIMIS data or tensiometers, used to help determine irrigation schedules? **Are irrigation duties performed only by employees who understand and practice appropriate irrigation scheduling?** ***Common watering practices can be imprecise and result in runoff. Irrigation scheduling should be based on environmental conditions and plant moisture requirements, and this must constantly be monitored.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
6. Is pulse irrigation used? ***Pulse irrigation is the practice of splitting irrigations into smaller increments. The goal is to apply water in smaller increments that can be more effectively used by the plants, rather than one larger increment that produces excessive leach rates and runoff.***	☐ Yes ☐ No ☐ N/A
7. Are automatic timers and clocks regularly checked and adjusted to correlate schedules with environmental conditions and tree growth stage? ***Automatic timers/clocks can help implement more complicated irrigation schedules, such as pulsing. They can also reduce labor and avoid operator errors associated with manual systems. However, clocks/timers must also be routinely checked for accuracy, including those that operate during unsupervised hours (i.e., night, early morning).***	☐ Yes ☐ No ☐ N/A

D. Leaching & Runoff

1. Are specific factors, such as appearance of plants or EC measurements, used to determine leaching practices? **Are irrigation schedules set to perform leaching at specific irrigation events, rather than at every irrigation?** **Is leaching performed only with fertilizer injectors turned off?** ***Leaching is necessary to flush excess salts from the root zone. Excessive leaching, or leaching performed too frequently may contribute to runoff or leaching into groundwater. Different trees have different tolerances to salts. Use of high fertilizer concentrations may require more leaching to avoid build-up in the root zone.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
2. Are irrigation schedules managed according to soil types? ***Irrigation runoff in tree crops is an indication that water is being applied too fast and/or in quantities too large for the soil to absorb. Soils higher in clay will not absorb water as quickly as other soil types. Soils higher in sand may be prone to excessive leach rates. Variations in soil types across a growing operation may require different irrigation schedules. Irrigation schedules may need to be shortened or split into smaller increments (pulsing). Irrigation on slopes will also be more prone to runoff and may cause erosion problems. Sediments are a contaminant in waterways.***	☐ Yes ☐ No ☐ N/A

E. Nutrient Assessment & Fertilizer Management

1. Are soil/media tests performed? **Are leaf analyses performed?** **Is information from soil or leaf analyses used in fertilizer management?** **Are the most recent nutrient recommendations for your trees and growing practices used in nutrient management?** ***The goal of successful nutrient management is to provide adequate plant nutrition through various growth stages without over-fertilization. Soil testing and leaf analyses can help better manage nutrients. Consult UC Cooperative Extension to obtain the most recent research-backed nutrient recommendations available for your specific crops.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
2. Are nutrients already present in irrigation water considered in nutrient management? **Are nutrients already present in soil amendments considered in nutrient management?** ***Over-fertilization can result if nutrients already present in water are not taken into account.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
3. Is nitrogen applied only during the growing season? **Is nitrogen applied in smaller increments throughout the growing season rather than in one large application?** ***Proper timing and amounts of nitrogen application are important to avoid leaching losses. Nitrogen may be added to the soil in a variety of forms that convert to nitrate. Nitrates are extremely soluble in water and can move easily through the soil. Nitrogen applied during the winter is not readily taken up by tree crops. During the growing season, applying nitrogen in smaller increments will better provide nitrogen in quantities the trees can utilize to avoid leaching losses.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
4. Are organic materials or manures thoroughly composted before application? ***Composts and manures that are not thoroughly composted have the potential to contribute bacteria and other contaminants to runoff. Organic materials and manures not fully composted will also cause a nitrogen imbalance in the soil, as they require nitrogen to break down.***	☐ Yes ☐ No ☐ N/A

5. Are injected fertilizers carefully mixed and applied at the correct rate? **Is an electrical conductivity (EC) meter or other method regularly used to monitor the liquid fertilizer mix?** **Are injectors calibrated to accurately deliver liquid fertilizer through the irrigation system?** ***Highly soluble liquid fertilizers are easily leached and must be carefully managed. An EC meter can be utilized to easily monitor the fertigation water.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A

F. Integrated Pest Management

1. Are plants regularly monitored for pests with proper scouting/monitoring methods, including traps and plant inspection? **Does the decision to use chemical pesticides include scouting/monitoring information?** ***Establishing an ongoing monitoring system will help detect pest infestations early. By regularly inspecting plants, growers can detect troublesome pests while they are still manageable and before major damage is done.*** ***Evaluating pest populations on a regular basis also helps determine the actual need for chemical control, rather than relying on regularly scheduled chemical applications. Reducing the number of applications will lower production costs and reduce the amount of chemical released into the environment.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
2. Are weather conditions, such as fog and rain, considered in scheduling pesticide applications? **Are irrigation schedules considered in scheduling pesticide applications?** ***Schedule applications to avoid pesticide leaching and runoff.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A

3. Are diagnostic lab services or other professional assistance used to determine unknown pathogens, insects, or other growth problems? ***Different pathogens can have similar symptoms. Insects and mites can also be difficult to identify. Some symptoms may be related to environmental conditions or nutrient and water issues. Accurately diagnosing a problem may sometimes require professional assistance.***	☐ Yes ☐ No ☐ N/A
4. Are low-toxicity and/or non-toxic chemicals selected for pest control whenever possible? ***Using less toxic materials reduces risk of pollution. Always read and follow label directions.***	☐ Yes ☐ No ☐ N/A
5. Are pesticides applied only according to the label? **Are improved application techniques used whenever possible (ultra low volume application, surfactants, stickers and sticker-spreaders)?** **Is chemical spray equipment calibrated to ensure accurate application rates?** ***It is illegal to use a chemical product in a manner inconsistent with the label, and this may also pose additional water quality risks. Adopt improved application technology where available, registered and legal, to reduce the amount of chemicals applied and to maximize effectiveness.***	☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☐ N/A
6. Are biological controls integrated when possible and where effective? ***The use of natural predators or parasites to keep harmful pests in check can be highly effective in combination with good management practices and judicious use of chemical agents.***	☐ Yes ☐ No ☐ N/A
7. Is the need for soil treatment assessed before planting a new tree crop? ***Before establishing a new crop, it may be necessary to treat the soil with nematicides or other fumigants to eliminate pathogens and avoid future problems. All soil fumigants and treatments should be handled carefully and according to label instructions.***	☐ Yes ☐ No ☐ N/A
8. Is nursery stock inspected for pests before planting a new crop? ***Only stock that is free of diseases and pests should enter the growing area. Carefully inspect all new nursery stock, discarding or treating any with pest problems. Proper disposal of infested plants will keep pests out of the growing area.***	☐ Yes ☐ No ☐ N/A
9. Are invasive weeds, such as Bermudagrass and Johnsongrass, controlled in the growing areas? ***Although groundcover is recommended in tree crops to minimize erosion, invasive weeds should be eliminated. In particular, Bermudagrass and Johnsongrass should be eliminated to avoid water and nutrient competition with the tree crop. Tillage prior to planting a new crop can help minimize weeds.***	☐ Yes ☐ No ☐ N/A

10. Is ant control practiced? ***Controlling ants will in turn help to control other pests by allowing parasites and predators to be active. Control methods can include skirting the trees or judicious use of chemical pesticides. All pesticides should be handled carefully and according to label instructions.***	☐ Yes ☐ No ☐ N/A
11. Are gophers and squirrels managed? ***Gophers and squirrels damage tree roots. In addition, the holes in the soil they create channel water past tree roots and can cause erosion problems, allowing sediments to enter waterways. Traps and poison bait can be used to manage their populations.***	☐ Yes ☐ No ☐ N/A

Additional Assistance

Additional assistance is available from UC Cooperative Extension – County of San Diego. Please call 858-694-2845.