

## Production Practices for Nurseries, Greenhouses and Growers

### Description

Nurseries, greenhouses and other growers should implement a variety of source, structural, cultural and managerial controls to minimize pollution of water resources. Irrigation practices that minimize off-site transport of pollutants also typically conserve water.

*This BMP is based primarily on and is condensed from "Pollution Prevention in Colorado Greenhouses, XCM-206" (Colorado State University Cooperative Extension, 1998).*

BMP Type			
Design			
Installation			
Maintenance/Operations		X	
Green Industry Relevance			
ASLA		GCC	
ALCC		ISA	X
CALCP		RMSGGA	X
CGGA	X	WFC	
CNA	X		

### Basic Practice Guidelines

1. Manage irrigation to minimize transport of chemicals from the soil surface or immediate crop root zone and to conserve water. Follow these key practices:
  - Schedule irrigation according to crop needs and growing-medium water depletion. Watering requirements will vary and should be adjusted based on time of year, weather, methods of storage and type and stage of the plant (e.g., dormancy). Plants need less water during cool, rainy weather than during hot, dry, windy weather.
  - Upgrade irrigation equipment to improve application efficiency. For example, a computerized irrigation scheduler using a drip system can reduce overwatering and excessive leaching compared to an overhead system.
  - Implement closed irrigation techniques (water recycling system) whenever water rights and site constraints allow. (Note: recycled water should be ozonated or otherwise treated to remove pathogens from the water to prevent spread of disease.)
  - Reduce water application rates to ensure no runoff or percolation occurs during chemigation.
  - Group plants together that have the same water requirements (i.e., use hydrozoning).
  - When ball-and-burlapped stock and containerized stock is received, it should be kept out of the wind and sun. Ideally, balls should be covered with moisture-retaining materials such as sawdust or wood chips if stock will be stored for a long time.
  - Plug sprinkler heads that are not watering plants, keep sprinkler heads as low as possible to the plants and use larger water droplet size to reduce irrigation time.
  - Proper backflow prevention devices are necessary to prevent cross-contamination of public water supplies. This is particularly critical if chemigation is used.

2. Use integrated pest management (IPM)/plant health care (PHC) in pest control decisions. This integrated approach keeps pests and their damage at acceptable levels. Follow these key practices:
  - Host Resistance: Select crops and plant varieties with few insect and disease problems.
  - Eradication/Sanitation: Remove and dispose of diseased plants or plant parts. Also, properly disinfect tools and other equipment.
  - Avoidance: Avoid introduction of plant diseases by procuring disease-free plant material and isolating, inspecting and treating newly arrived plants.
  - Cultural Practices: Implement practices that create an unfavorable environment for disease development. Some key practices include:
    - Avoid overhead irrigation and frequent, light watering to reduce leaf spot diseases caused by many fungal and bacterial pathogens.
    - Do not extend the period of leaf wetness beyond 12 hours to reduce disease problems.
    - Time pesticide application to minimize host plant damage and maximize pest control.
    - Continually monitor all stock for signs of insect or disease problems.
    - Spot-treat problem areas, rather than the entire greenhouse or nursery.
    - Improve plant vigor and pest tolerance by supplying adequate light, nutrients and water and by adjusting the greenhouse environment for optimum growth. It is important to monitor the nutrient needs of plants in nurseries. A newly containerized plant may need to have nutrients added. A container shipped from a grower and held in nursery for more than one season, may need additional nutrients.
  - Crop Rotation: Rotate crops in greenhouses and nurseries to prevent the spread of disease.
  - Implement Chemical Alternatives: Only about 10 percent of plant diseases in Colorado require chemical controls. Use the controls described above plus beneficial insects and other biological controls whenever possible.
3. Apply pesticides only when needed and use in a manner to minimize off-target effects. Follow these key practices:
  - Always follow the label—it's the law!
  - Ensure chemical applicators receive thorough training and proper certification prior to chemical use.

- Know characteristics of the application site, including soil type and depth to groundwater under the greenhouse or nursery. Be aware of any drinking water wells downgradient of the operation.
  - Compare chemical leaching hazard, persistence and toxicity to site-specific conditions to determine suitability of the pesticide at each location.
  - Be aware that some pesticide formulations are not compatible and may result in increased potency and phytotoxicity.
4. Maintain records of all pesticides applied (both restricted and non-restricted use), including brand name, formulation, EPA registration number, amount and date applied, exact location of application, and name, address and certification number of applicator. Combine this information with irrigation water data, crop growth records and notes on effectiveness of alternative pest control measures to help identify and track measures to both save money and reduce pesticide usage.
5. Protect groundwater and surface water from spills and leaks of pesticides by properly designing pesticide storage, mixing and loading facilities. Follow these key practices:
- Store all pesticides in a locked building with cement floors, located at least 100 feet away from any water supply.
  - Equip storage facilities with secondary containment dikes designed to contain liquid spills or leaks.
  - Use impermeable mixing/loading pads at pesticide loading sites.
  - Make material safety data sheets (MSDSs) available at the mixing station.
  - Provide worker safety features such as showers, protective clothing and spill cleanup kits in accordance with MSDS requirements.
6. Protect wellheads from potential sources of contamination. Follow these key practices:
- Regularly inspect and maintain wells.
  - Install backflow prevention devices.
  - Stay at least 100 feet away from the well when mixing, loading and storing agricultural chemicals.
  - Monitor well water quality periodically and know site-specific variables affecting aquifer vulnerability.
7. Protect surface water from contaminated runoff. Follow these key practices:

- Recover irrigation water and store it in impermeable tanks or reservoirs.
- Keep greenhouse open runoff channels, condensate gutters and reservoirs separate from rainwater flows and catchment basins to prevent contamination of surface runoff.
- Keep roof and site drainage directed away from greenhouse structures and separated from spill containment structures for petroleum, fertilizers and pesticides.
- Monitor surface water periodically to determine whether pollution is occurring.

***Regional or Industry Considerations/Adaptations***

None identified.

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