

2023–2024 Florida Citrus Production Guide: Food Safety Requirements and Considerations for the Florida Citrus Grower¹

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Introduction and Objective

Florida citrus growers have long implemented *Good Agricultural Practices (GAPs)*, preharvest practices (e.g., in the field) established to prevent, minimize, or eliminate contamination and hazards to human health. Essential components of the GAPs process include careful planning, implementation, and documentation of required steps and procedures that together analyze and minimize risks from biological, chemical, and physical hazards.

The development of GAPs is based on sound science, including peer-reviewed scientific literature as well as outbreak investigations related to various fresh produce commodities. The Produce Safety Rule (PSR) of the Food Safety Modernization Act (FSMA) formalized and codified many of the previously voluntary GAPs that growers had practiced for many years. GAPs related to citrus will continue to evolve as new information is discovered. Growers represent the first link in the farm-to-table food chain. Growers who develop and maintain a strong GAPs program will be well-positioned to meet the evolving market-driven demands and regulatory requirements.

The objective of this document is to present general GAPs principles and PSR requirements needed to plan, execute, and document production practices that will prevent, minimize, or eliminate risks that can result in contamination. The materials contained in this document are a combination of recommendations based on the best available science and minimum standards outlined in the PSR. The distinction between voluntary GAPs recommendations and PSR requirements is made in this document by the deliberate use of the words “must” and “should,” where “must” is used to denote PSR requirements and “should” is used to denote voluntary GAPs. This document will be reviewed and updated as new risk data emerges; it is not a comprehensive list of all PSR requirements.

Background

GAPs represent important procedures that Florida citrus growers should follow to minimize the potential for fruit contamination and meet specific requirements of the PSR. Florida's citrus growers, processors, and fresh-fruit packers have invested considerable resources in developing and implementing food safety protocols to participate in third-party audit programs. Many growers document production,

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harvest, and transportation practices as part of their normal operations to mitigate the potential for foodborne illnesses, and packers also adhere to their own food safety requirements. Citrus juice processors implement the *Hazard Analysis and Critical Control Point Program (Juice HACCP)*, which is required by the FDA (21 CFR Part 120). Farm owners and managers who produce citrus intended for fresh-squeezed juice should also be aware of and follow the Juice HACCP regulation in that rule.

GAPs are a prerequisite of these fresh-citrus packing and juicing food safety requirements. Combining a GAPs program that has been developed, supervised, and properly implemented with PSR requirements protects the health of consumers and the producer's investment in the product.

In general, GAPs programs address three types of hazards:

1. Biological
2. Chemical
3. Physical

Biological hazards, including human *pathogens* such as bacteria, viruses, and parasites, can lead to widespread foodborne illness if practices are not in place to minimize or eliminate product contact with such contamination. There are many routes biological hazards may take to contaminate produce. Biological contamination can occur by contact of fruit with feces. Direct contact may occur from untreated or improperly treated manure used as soil amendments or from animal feces contacting fruit in the grove. Indirect contact can include transfer from contaminated soil, water, bins, gloves, equipment, and hands or clothes of field workers onto produce during production, harvesting, or handling.

Chemical hazards can include residues of agrochemicals, sanitizers, and pathogen toxins that may be present in or on fruit. While agrochemicals can enhance the production of horticultural commodities and are valuable tools for growers, it should be documented that materials were applied only according to label instructions.

Physical hazards can include hard or sharp objects in food that may result in personal injuries. Such objects, if present, are removed during the sorting and culling of citrus fruit.

While acknowledging the potential for chemical and physical hazards to be present, the FSMA PSR focuses mainly on biological hazards and relies on the proper implementation

of GAPs programs to prevent the introduction of chemical or physical hazards into the food supply.

GAPs Topics

Management and Personnel Responsibility

Food safety is a shared responsibility; the collective efforts of growers, harvesters, processors, packers, shippers, and regulators of fresh and processed citrus products are essential to ensure a safe and wholesome product. Each company must specifically designate an individual or team that is responsible for implementing food safety programs and ensuring compliance with the requirements of the PSR. For absentee landowners not directly involved with citrus production, grove caretaking companies or independent consultants may serve in this role through a contractual agreement.

Worker Training, Health, and Hygiene

Proper worker hygiene is critical for the successful implementation of GAPs. Without it, employees who work with citrus fruit may increase the risk of transmitting foodborne illness. A review highlighting information and field sanitation requirements (OSHA Standard 1928.110) is available from OSHA (<https://www.osha.gov/laws-regs/regulations/standardnumber/1928/1928.110>) and expands on many of the subjects discussed below.

SUPERVISOR TRAINING REQUIREMENTS

The PSR requires at least one supervisor or representative to receive food safety training at least equivalent to the standardized curriculum recognized as adequate by the FDA. Successfully completing a Produce Safety Alliance Grower Training course is one way to fulfill this requirement (<https://producesafetyalliance.cornell.edu/training/grower-training-courses>). Day-to-day duties and many other key food safety responsibilities can be delegated to qualified staff or third parties, but these duties should be overseen by a responsible supervisor or representative.

WORKER TRAINING

An employee training program is essential to ensure food safety practices are carried out correctly and that workers are aware of and can identify and reduce food safety risks. All personnel must receive food safety training appropriate to their specific job duties before starting work and at least once annually. The date and time the training is conducted, the names of personnel trained, and the training content must be recorded.

Training programs must include principles of food safety, health, and personal hygiene (e.g., general cleanliness, proper handwashing). Workers must know symptoms of foodborne illness and policies regarding sick employees. They must also be trained to recognize contaminated fruit and contact surfaces (i.e., visible fecal matter) and not to harvest any fruit that may be contaminated, including fruit that is dropped during harvest. Workers must be trained to inspect harvest containers and equipment for contamination and the procedures for correcting problems, such as cleaning and sanitizing and proper storage of tools and equipment.

HANDWASHING AND SANITARY FACILITIES

Proper management of toilet and handwashing facilities is required in the field and can significantly reduce the risk of contaminating produce by encouraging good hygiene practices. A minimum of one toilet and one handwashing facility must be maintained for every 20 employees. For both regulatory compliance and workers' convenience, handwashing and bathroom facilities must be located within a one-quarter mile walk or a five-minute drive. For details, see:

- OSHA 29 CFR part 1928.110—Field Sanitation (<https://www.osha.gov/laws-regs/regulations/standardnumber/1928/1928.110>), and
- Florida Administrative Code, Rule 64E-14.016—Field Sanitation (<https://www.flrules.org/gateway/ruleno.asp?id=64E-14.016>).

GAPs for Facilities to Support Worker Hygiene

- All employees who handle produce or food-contact surfaces must receive proper hygiene and food safety training upon hiring and be retrained annually after that. Any responsible supervisor or representative may train employees.
- Toilet and handwashing facilities must be provided during harvesting activities.
- Handwashing facilities must be furnished with running water. Water should be potable (best practice) but, at a minimum, must meet the standards of no detectable generic *E. coli* in 100 milliliters.
- Handwashing facilities must be furnished with soap, single use towels and a hand drier or a receptacle for used towels. One must monitor the facilities when in use.
- Toilet facilities must be maintained in clean condition. Documentation of maintenance and servicing of toilet and handwashing facilities should be kept. Cleaning and

servicing of toilets must be conducted in a manner to prevent contamination or accidental spillage.

- Portable toilets should be placed outside the immediate crop production area (best practice) but within ¼ mile of where workers will be working. At a minimum, toilets must be placed in a manner that prevents the contamination of fruit with human waste.
- Wash water and garbage must be contained for proper disposal after use.
- Have a mitigation plan in place so that workers know the company response policy in case of a sewage spill.

GAPs for Worker Health and Hygiene

- Workers who display symptoms of infectious disease must either be assigned tasks that prevent them from coming in direct contact with fruit or food contact surfaces, or these workers must be sent home.
- Workers with visible open wounds or sores should cover them sufficiently (for example, hand wounds should be bandaged and gloved) to prevent bodily fluids from contacting fruit.
- Hands must be washed before starting work, putting on gloves, after eating, smoking, or using the restroom, sneezing or coughing, and any other time they might become contaminated.
- If worn, gloves must be maintained in clean condition and changed when they become soiled or torn.
- Store harvest gloves and equipment properly (off the ground in a designated, clean area) when using the bathroom or on breaks. Do not carry gloves, aprons, or equipment into the toilet facility.
- Eating, drinking, and tobacco use must be limited to non-fruit-production areas.

Water

Citrus production relies on water supplies for several field operations, including irrigation, freeze protection, and the application of agrochemicals. Water is also used for washing hands and equipment. These applications can result in water being a source of contamination through direct or indirect methods, so policies and procedures must be in place to minimize risks. Water that is intended or likely to contact fruit or fruit-contact surfaces is called *agricultural water* and presents a higher level of risk than water that does not contact fruit or fruit-contact surfaces. Different sources of *agricultural water* can also present different levels of risk, with untreated surface water representing a higher level of risk than groundwater or treated water. These risk

factors should be weighed when considering the best uses of different water supplies (e.g., using higher-risk water sources for lower-risk applications and vice versa). For example, untreated surface water could be used for seepage or under-canopy irrigation, where contact is not likely. In contrast, groundwater, municipal water, or properly treated surface water must be used for handwashing by harvest workers. For more information regarding water GAPs, refer to <https://doi.org/10.32473/edis-fs136-2019>.

Water for Field Use

Agricultural water quality must be safe and adequate for its intended use and meet all applicable federal, state, and local laws and regulations.

Note that *agricultural water* will need to meet specific PSR provisions; however, the FDA is currently reviewing the pre-harvest agricultural water criteria in the PSR, and we anticipate FDA clarification around *agricultural water* requirements (all of subpart E of the PSR). Harvest and post-harvest agricultural water must meet the standard of no detectable *E. coli* per 100 mL sample, and the standard must be maintained throughout its use.

REQUIREMENTS AND BEST PRACTICES

- *Agricultural water for pre- and post-harvest water sources and distribution systems* must be assessed for potential food safety hazards at least annually, with consideration given to the type of water source (e.g., surface, ground); control and protection of each source (e.g., deep well, shared canal); adjacent land use; and maintenance issues, including keeping the source free of debris, trash, and domestic animals.
- Water used in foliar applications can be obtained from (1) municipal, treated water sources, (2) groundwater obtained from a properly constructed well (<https://edis.ifas.ufl.edu/fe603>) in good condition, or (3) surface water that is suitable for its intended use (e.g., as shown through microbial testing and visual inspection).
- Water sources used for foliar applications should be routinely tested, as needed, and water quality records maintained. Treated water and municipal water do not require testing, however, water treatments must be monitored and recorded to demonstrate effectiveness.
- Well water used for foliar applications should be drawn from properly engineered and protected sources. Wells should be properly cased and above grade. Wells must be inspected for cracks, leaks, etc.; records of repairs must be kept.

- If available, results of a microbial analysis of a water source from a public entity, such as the local water authority, may serve as acceptable documentation in place of testing by the grower and should be kept on file.
- Animals should be excluded from surface water used for foliar application to the extent possible.
- As much as possible, the time should be extended between the last foliar application of agricultural water and harvest to allow time for microbial die-off.

Water Contamination Risk from Adjacent Land

Farmland or other uses and activities on adjacent land may pose a risk for runoff or leaching of microbiological or chemical contaminants leaching. Producers should work with local watershed authorities to understand watershed issues and consider mitigation strategies such as berms or ditches where necessary to minimize runoff.

GAPS FOR MANAGING WATER SOURCES AND ADJACENT LAND USE

- Risks from adjacent land and water should be identified and documented as part of the annual inspection of your agricultural water source(s). Such risks can include landfill sites, sewage treatment facilities, septic tanks and leach fields, or surrounding farm operations such as dairy farms or compost producers.
- Preventive or corrective actions should be taken and documented if water contamination sources are identified. Such actions can include the construction of physical barriers (berms, ditches, or fencing) or the use of a catch basin. You must inspect your water sources annually to ensure mitigation steps are still functioning as intended.

Land Use and Soil Amendments

Land use prior to grove establishment and patterns of adjacent land use can have food safety implications. The grower has no control over historical uses, but awareness of potential problems may help determine if mitigation is needed and what control options are feasible.

Biological soil amendments of animal origin are identified in the PSR as the soil amendments most vulnerable to microbial contamination. Manure or biosolids can serve as effective and safe fertilizers if proper treatment and application procedures are in place. Such treatment procedures can include composting to reduce microbial pathogens in number, thereby reducing the risks associated with their presence in soil amendments. The PSR outlines criteria to determine whether a biological soil amendment of animal

origin is considered treated or untreated, and such designation determines the allowable application methods and minimum application-to-harvest intervals. Only specific composting methods can be used to produce treated amendments, and specific treatment conditions must be monitored and documented. Currently, the FDA does not intend to take exception to growers using (raw) manure in compliance with National Organic Program (NOP) standards. The NOP standard is 90 days from the last application to harvest for tree fruit. Additional research and risk assessments are being conducted to further determine an appropriate time interval between the application of raw manure and crop harvest. The PSR allows the use of Class A biosolids. Detailed GAPs related to manure and biosolids are available at <https://doi.org/10.32473/edis-fs150-2019>. Preventing fruit from touching the ground greatly reduces the potential for contamination. In cases where fruit may fall to the ground, they must never be harvested for use in the fresh market.

GAPs for Soil Amendments and Land Use

- Avoid planting citrus on land previously used for any operations engaged in risk-accumulation practices, like landfills, or areas previously spread with contaminated wastes or those of an unknown industrial use.
- If needed, question state/local officials or conduct a title search or environmental assessment to establish whether previous land use involved the disposal of chemical or biological wastes.
- Documents should be kept for the application of soil amendments, including the source of the soil amendment, treatments, compost producer, amount used, and when and how it was applied.
- The type of soil amendment, application and the time interval between application and harvest should also be kept. The interval between application and harvest should be as long as feasible, with adequate consideration to other crops nearby.
- Obtain a certificate of conformance annually from compost suppliers to demonstrate the compost treatment process meets PSR requirements for treated compost.
- Apply treated compost in a way that prevents contact with fruit.
- Untreated compost should never be applied in a way that it contacts fruit during application.
- Compost must be handled and stored in a location and manner to minimize the potential for contamination of citrus fruit and surface waters.

Animal Control

Wildlife and domestic animals—including but not limited to dogs, cats, cattle, rodents, hogs, deer, reptiles, amphibians, and birds—may serve as sources of contamination. While minimizing animal contact with fresh produce also minimizes the risk of product contamination, wildlife is challenging to control in grove settings. Growers should balance these management efforts with their responsibility for environmental stewardship; this is commonly referred to as co-managing food safety and ecological health (<https://producesafetyalliance.cornell.edu/sites/producesafetyalliance.cornell.edu/files/shared/documents/MillsCo-Management.pdf>).

Domestic Animals

The activities of domestic animals are the easiest to manage; and their access into production, packing, and equipment storage areas should be prevented. If a domestic animal is not totally excluded (e.g., in the case of guide or guard dogs), reasonable precautions should be taken to prevent contamination.

Wild Animals

Growers are not expected to take extraordinary measures to exclude all animals from outdoor growing areas or destroy wildlife habitats. However, if there is a reasonable possibility that animals will contaminate crops, the grove areas should be monitored for evidence of animal intrusion immediately prior to harvest and as needed throughout the year. Fruit visibly contaminated with feces must not be harvested.

GAPS FOR MANAGING CONTAMINATION RISKS FROM DOMESTIC AND WILD ANIMALS

- Maintain fencing or other barriers to prevent intrusion by neighboring cattle or other domestic livestock, as appropriate.
- Have a policy in place to mitigate fecal material deposited by domestic animals in the grove to the extent possible.
- To the extent possible, minimize animal attractants by discarding old equipment and containers and removing excess water from the field.
- Inspect storage areas for rodents, birds, and insects and use pest control procedures (e.g., traps, screens, etc.) to minimize pests.
- Keep cull and debris piles away from crop production areas.

- Have a policy in place to look for and mitigate risks from fecal material deposited by wild animals in the grove to the extent possible.
- Fruit with visible fecal contamination should be from the grove and must never be harvested for the fresh market.

Agrochemical Use

Agrochemicals such as sanitizers, disinfectants, fungicides, insecticides, and herbicides can enhance the production, quality, and the safety of horticultural commodities when used according to their product labels. The EPA closely regulates pesticides, and the approval of each formulation includes specific limitations regarding the means by which the agrochemical may be applied, conditions of application, labeled rates, target organisms against which the chemical may be employed, use restrictions, and requirements for pesticide disposal and its containers.

The EPA also has the responsibility to determine tolerances or exemptions from tolerances for pesticide residues on raw agricultural commodities in the United States. Residue tolerances for export markets are regulated and enforced by their respective countries. Proper pesticide use involves close working relationships among citrus growers, packers, shippers, and processors.

This GAPs document is not intended to provide guidance for pest management practices (for this guidance, please refer to other chapters of [this guide](#)).

Pesticides

- As part of GAPs documentation, labels and safety data sheets (SDS) of pesticides used should be kept on file, and a detailed written procedure for the application of all pesticides should be recorded.
- Pesticides must be used in a manner consistent with their label, including for the purpose specifically identified explicitly on the label.
- Florida law requires maintaining specific records for Restricted Use Products (i.e., products for which use and application are restricted to certified applicators or under the direct supervision of such) that include the EPA registration number, the date each pesticide was applied, the quantity used, and where and how the application was made.
- Verify proper licensing and registration of subcontractors, custom applicators, crop advisors, etc.
- Document compliance with the EPA's Worker Protection Standard (<https://www.epa.gov/pesticide-worker-safety/agricultural-worker-protection-standard-wps>).

For additional information and requirements, see the Florida Department of Agriculture and Consumer Services Pesticide Applicator Licenses website (<https://www.fdacs.gov/Business-Services/Pesticide-Licensing/Pesticide-Applicator-Licenses/Pesticide-Applicator-Certification-and-Licensing>). Meet all federal, state, and local pesticide application, field posting, preharvest intervals, and documentation requirements.

Field Sanitation, Harvest, and Transport

Fresh produce can become contaminated when contacted by soil, fertilizers, water, workers, and harvesting equipment during growing and harvest activities. General sanitation of the bins and equipment is necessary to prevent fruit contamination with biological hazards.

GAPS FOR HARVEST BINS AND EQUIPMENT

- Harvesting equipment such as gloves, hand tools, and picking sacks should be routinely cleaned and sanitized as appropriate.
- Document procedures and schedules for cleaning and sanitizing equipment used in the field. At a minimum, a cleaning record is required for fruit-contact tools and equipment.
- Picking bins should be maintained free from debris and contaminants.
- Bins should be used only for the purpose of holding and transporting fruit. Any out-of-service bins used for storage need to be clearly marked and never returned to service.
- Inspect bins regularly for evidence of animal intrusion and fecal matter. Cleaning and sanitizing should occur on a routine, documented basis.
- Separate, segregate, and dispose of fruit if exposed to oils or chemical contaminants from harvesting equipment.
- Exclude all fruit that have touched the ground or are visibly contaminated with fecal matter.

Transportation

Proper transport of fresh produce will help reduce the potential for biological hazards.

GAPS FOR TRANSPORTATION

- Good hygienic and sanitation practices should be used when loading, unloading, and inspecting produce.

- Inspect transportation vehicles for obvious dirt and debris before loading. The vehicle should be cleaned and sanitized if evidence of debris, animal manure, or other raw animal by-product exists.
- Load produce carefully to minimize physical damage.

Traceability and Recordkeeping

A written food safety plan is central to successfully implementing any GAPs program, although the PSR does not require a full food safety plan. Having records to document these practices, and the resulting traceability benefits, are vital to the GAPs process. Documentation, including records of all corrective actions, is required to prove to regulatory agencies, handlers, and retailers that you are following GAPs. Such documentation is important to demonstrate that proper procedures (e.g., cleaning and sanitation) were followed.

Traceability is an important part of GAPs documentation. *Traceback* is the ability to track food back to its source. *Trace forward* is the ability to identify all receivers of your citrus fruit from a given grove or source. It is critical that growers establish tracking systems from the earliest stages that follow their fruit within the distribution system. This system includes supply-chain partners involved in processing, packing, storing, shipping, and transporting Florida citrus fruit. Both traceback and trace forward actions are necessary to identify the potential source of any safety problems that might occur and for supply-chain partners to implement targeted recalls efficiently and effectively. GAPs forms should be readily available or collected together in a single location for ease of rapid access in the event that fruit is associated with an alleged contamination issue. For more information about preparing for and conducting a recall, see EDIS publication FSHN0410, *The Food Recall Manual* (<https://doi.org/10.32473/edis-fs108-2018>).

Basic sample recordkeeping forms are available online (<https://producesafetyalliance.cornell.edu/sites/producesafetyalliance.cornell.edu/files/shared/documents/Records-Required-by-the-FSMA-PSR.pdf>), but these are not intended to replace other required state report forms or forms prescribed by your packer or processor as part of their quality management systems. While they represent excellent examples, forms should be adapted to fit individual operation needs.

In addition to the documentation and recordkeeping indicated in this document, each load of harvested product should include the source of the product, the date of harvest, farm identification, and a record of who handled

the product. These may include properly completed Trip Tickets (<https://www.flrules.org/gateway/ChapterHome.asp?Chapter=20-2>).

GAPS FOR TRACEABILITY AND RECORDKEEPING

- Ensure a food safety plan and a traceability plan are in place.
- Organize all documentation so that records can be accessed quickly—at least within 24 hours of request from a regulatory body.
- Demonstrate that the product can be traced one step forward and one step back.
- Include tracking information with each citrus load (fruit source, harvest date, harvest crew, etc.). This information can usually be satisfied with a properly completed Trip Ticket.

Summary

It is important to ensure the food safety of all citrus commodities in order to minimize food safety risks and maintain consumer trust. As with other commodities, producers of Florida citrus should follow the guidelines and requirements outlined above. Audit tools generally follow these guidelines quite closely, although individual customers often impose requirements of their own that should be addressed.