PSA Grower Training with HP/AP Supplements: Trainer Companion

Table of Contents

Project Background

The Northeast Center to Advance Food Safety (NECAFS) identified a need for produce safety resources specific to hydroponic and aquaponic (HP/AP) operations, which use different technologies and techniques than soil-based agriculture. Five topic-based factsheets were released to initially address this need. Next, additional educational resources for produce safety in HP/AP operations were created, including a comprehensive "101 Guide;" introductory webinars for educators, regulators, and growers; and multimedia grower case studies; all available at https://go.uvm.edu/ponics. Lastly, a Produce Safety Alliance (PSA) Grower Training (GT) with supplemental materials, tailored for HP/AP operations, was developed. The goals of the PSA GT supplemental materials are to help HP/AP audiences feel represented in the materials and to understand how to apply produce safety practices to their operations.

This *Trainer Companion* explains how the supplemental materials were developed and provides information to Produce Safety Alliance Trainers on how to approach and deliver its content as part of a Produce Safety Alliance Grower Training Course.

How did we supplement the curriculum?

In this tailored curriculum for HP/AP audiences, you will find the following modifications:

- **Photos**: Many of the original photos on the slides of the PSA GT course are of field-based farming are replaced with photos from HP/AP operations. Visual HP/AP examples will be found on both original PSA slides and HP/AP supplemental slides.
- **Supplemental notes**: Notes within the "Notes Section" throughout the PSA GT course slide deck (PSA curriculum v1.2-1.2a) are always labeled as "Original PSA Notes." Underneath the Original PSA Notes, HP/AP Supplemental Notes are added where appropriate. HP/AP-specific examples are utilized to reflect the application of the PSR and GAPs to situations seen in these types of operations. Discussion prompts and trainer notes are added to facilitate delivery in a dynamic and interactive way that responds to the audience's characteristics.
- **Supplemental slides**: Where extra clarity or explanation is needed on key points, supplemental slides are added within Modules 1-6. For example, in Module 5.1 we added a slide showing the range of irrigation methods in HP/AP and discussing the relative levels of risk associated with them. This slide immediately follows the original slide which describes irrigation methods in the field. In a few cases, trainer notes specify when a trainer should move quickly through the original slide to move on to the next, tailored slide. Remember, all of the original slides must be presented.

- **Glossary of Aquaponic and Hydroponic Produce Safety Terms**: This glossary, found at the back of the manual along with the original PSA glossary, is our attempt at standardizing terminology, yet, we realize each operation is unique and that there may be other perspectives and nuance related to terms. This glossary collects definitions from various sources and includes previously undefined terms, offering everything in one central location.

Completion by trainees of this curriculum satisfies the requirement that "[a]t least one supervisor or responsible party for your farm must have successfully completed food safety training at least equivalent to that received under standardized curriculum recognized as adequate by the Food and Drug Administration" (§ 112.22(c)).

What to expect

Some modules required more modification than others, therefore, not every slide has supplemental notes or HP/AP-specific photos. The modules that relate to soil amendments, water, and sanitation are amended the most, because each of these topics contains one or more substantial differences in how to think about applying the PSR and GAPs as compared to the language and/or examples in the original PSA curriculum. We use photos, illustrations, and text to demonstrate the thought process of adapting the existing educational and regulatory information for HP/AP audiences. For example, Module 3 begins with several supplemental slides, along with supplemental notes on the original slides, which walk trainees through the translation of the relatively soil-centric content for the parallel ways in which substrates and other system inputs are used in HP/AP. These slides and notes serve the double purpose of introducing trainers who are unfamiliar with HP/AP to the same translational framework, so everyone is on the same page. They also explain how we use the term "substrate," which was defined as part of the project and included in the *Glossary of Aquaponic and Hydroponic Produce Safety Terms*. In the print files for the manual, this glossary is appended to the PSA Glossary.

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USDA United States Department of Agriculture
National Institute of Food and Agriculture

NECAFS
The Northeast Center to Advance Food Safety

Using the HP/AP Supplements: Training logistics

Delivering the curriculum with HP/AP Supplements takes **about 1 hour longer** than the standard training. All of the standard PSA slides must still be shown. Thus, it is important to allow enough time for delivery of the supplemental content. Course Agenda Templates are bundled with the slides and also available separately (https://www.uvm.edu/extension/necafs/produce-safety-alliance-grower-training-hydroponic-and-aquaponic-supplements).

Appropriate advertising language:

> PSA Grower Training with Hydroponic and Aquaponic Supplements
>
> This Grower Training includes the standard Produce Safety Alliance curriculum plus additional materials tailored to hydroponic and aquaponic growers. Completion of this training will satisfy the training requirement in the Produce Safety Rule for supervisors or other responsible parties (§ 112.22(c)).

Pilot students highly valued time for questions and discussion, so also consider this when planning a training agenda. Modules 3, 5-1, 5-2, and 6, in particular, contain a lot of additional information and the nuances can be challenging.

Pilot students also requested as many HP/AP example photos and/or videos as possible. When organizing a training, it would be valuable to ask registrants about the types of systems they run and/or solicit photos. Photos can be added to relevant modules to spur practical discussions. This requires additional work ahead of time but can help students to make the leap from the training to implementation in their own operations.

Printing the manual with HP/AP Supplements

Each student must have a printed copy of the manual. These are not available for purchase and must be printed before a delivery using the HP/AP Supplements. It's recommended to print in color to improve legibility and accessibility for students.

The PSA provides these guidelines for printing manuals:

> Files for the Produce Safety Alliance Grower Training manual have been designed with margins that can accommodate spiral binding, or the use of 3-hole drilled paper and a 2" ring binder. The finished size of the **cover** is 9" x 11" and the file includes crop marks. If the manual is spiral bound a 100# gloss cover stock should be used. Plastic front and back covers with a lighter weight cover stock may also be used to provide protection. Please note the back cover is a blank page and should use the same stock as the front cover. If the manual is used with a 3-hole binder the cover can be slipped into the exterior of the binder and should be printed on 80# gloss cover. The **tabs** that separate each section are 9" x 11" and designed to print on a 5-bank tab layout, 80# gloss cover stock is recommended for the tabs. The **interior pages** are designed to duplex; you will have problems with the margins if you print simplex. 60# opaque smooth text stock is recommended for the tab pages.

Print files for Modules 1-7 are undersized but should be scaled to fill the 8.5" x 11" interior pages.

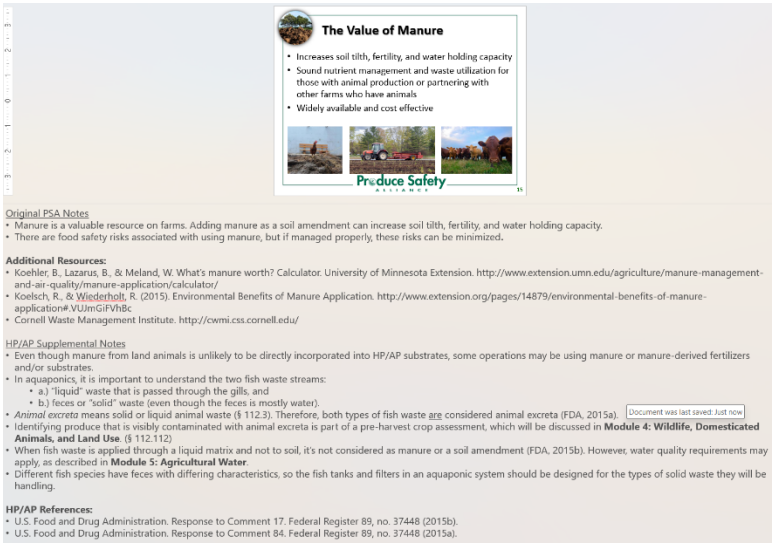
Using the HP/AP Supplements: How to approach the slides

When it comes to delivering the curriculum with HP/AP Supplements, trainers must deliver all of the original PSA GT content. Where slides have no supplemental notes, they should be presented as originally intended. Trainers should adjust their examples and emphasis based on the HP/AP audience when possible, avoiding examples from field-based agriculture. Where there are supplemental notes, they indicate key information to convey to HP/AP audiences. The HP/AP notes are truly supplemental to the content of the original PSA notes, therefore, they do not replicate information except to emphasize it.

The supplemental notes were written to help trainers highlight important principles covered within the slide content as they relate to HP/AP. The notes provide HP/AP-specific considerations and examples and explain in detail how the PSR applies to HP/AP operations. Some slides, both original PSA slides and HP/AP supplemental slides, have "Trainer Notes" explicitly explaining how to approach the slide or prompt a discussion. A few slide animations are also described in the Trainer Notes.

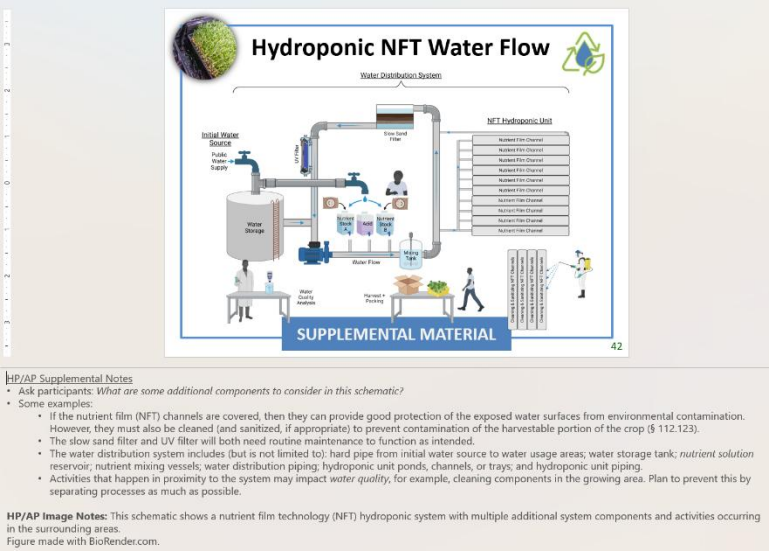
Slide without HP/AP notes

- This slide has no HP/AP notes because it can presented as is to HP/AP audiences.
- If you use examples as you train, adjust to use HP/AP ones when possible and avoid examples from field-based agriculture.



Slide with PSA and HP/AP notes

- HP/AP Supplemental Notes indicate key information to convey to HP/AP audiences.
- Cover the original information and use the HP/AP notes for guidance on appropriate examples and emphasis.
- The HP/AP notes do not replicate information from the Original PSA Notes, except to emphasize it.
- Some slides have notes labeled as "HP/AP Trainer Notes," which provide important information about delivering the slide.



HP/AP Supplemental Notes

- Ask participants: *What are some additional components to consider in this schematic?*
- Some examples:
  - If the nutrient film (NFT) channels are covered, then they can provide good protection of the exposed water surfaces from environmental contamination. However, they must also be cleaned (and sanitized, if appropriate) to prevent contamination of the harvestable portion of the crop (§ 112.123).
  - The slow sand filter and UV filter will both need routine maintenance to function as intended.
  - The water distribution system includes (but is not limited to): hard pipe from initial water source to water usage areas; water storage tank; *nutrient solution* reservoir; nutrient mixing vessels; water distribution piping; hydroponic unit ponds, channels, or trays; and hydroponic unit piping.
  - Activities that happen in proximity to the system may impact *water quality*, for example, cleaning components in the growing area. Plan to prevent this by separating processes as much as possible.

HP/AP Image Notes: This schematic shows a nutrient film technology (NFT) hydroponic system with multiple additional system components and activities occurring in the surrounding areas.
Figure made with BioRender.com.

HP/AP Supplemental Slide

- When HP/AP practices and operations look substantially different from other types of agriculture, supplemental slides provide examples familiar to HP/AP growers and/or explain produce safety considerations specific to HP/AP.
- Some HP/AP notes contain discussion prompts along with example answers, as in the example at left. Others may help trainers to answer questions from the audience.
- If trainers are unfamiliar with the slide content, they should refer to the notes for more detailed explanations.
- These materials were designed to be used together as a complete set. However, an alternative way to use them is to pull individual supplemental slides and include them in your delivery of the standard PSA curriculum. The HP/AP Supplemental Notes build on each other as each module progresses, so you may want to review the HP/AP Summary slide for key HP/AP learning points.

This curriculum with HP/AP Supplements contains both the original content and a lot of additional information, so it will take longer to deliver. The general structure and flow of the modules has not changed, so remember to emphasize the module flow: assessing risks, implementing practices, monitoring, corrective actions, and recordkeeping.

Using the HP/AP Supplements: Evaluation

The PSA Training Pre and Post Test Evaluation (https://foodsafetyclearinghouse.org/resources/psa-training-pre-and-post-test-evaluation-english-and-spanish-versions) measures changes in knowledge as a result of the training program. In addition, a pre/post-test specific to the HP/AP Learning Objectives is available (https://www.uvm.edu/extension/necafs/produce-safety-alliance-grower-training-hydroponic-and-aquaponic-supplements). The Hydroponic and Aquaponic Supplements Pre- and Post-Training Exam is only valid if all of the supplemental materials are delivered.

To evaluate other aspects of the delivery, administer the PSA Grower Training Course Evaluation as usual.

HP/AP Learning Objectives by module

The table below lists key concepts by module. These are the intended learning objectives for HP/AP audiences and summarize the main points that should be emphasized in each module. These tailored objectives are complementary to the learning objectives in the original PSA slides.

Module	Learning Objectives and Key Learning Points	Resources by Module

1	- **Learning Objective:** Understand that the interconnection of HP/AP system components makes contamination of water a hazard.
	- **Key Learning Points:**
	  - HP/AP systems use stored and/or circulating nutrient rich water, which can support pathogen growth and spread contamination throughout a production system.
	  - HP/AP systems contain many surfaces in contact with circulating water.
	  - HP/AP systems contain many surfaces which may contact produce.
	  - Clean and sanitize production system components before startup.
	  - Protect HP/AP system components and circulating nutrient rich water from sources of contamination.
	
	- **Learning Objective:** Recognize that standard operating procedures can help to ensure that food safety practices are being followed by everyone.
	- **Key Learning Points:**
	  - SOPs are a tool that outlines the specific procedures followed by the operation.
	  - SOPs should be the basis for all food safety training delivered at the operation.
	  - SOPs serve as a reference when food safety questions arise and can help to ensure that practices are being followed by everyone.
		- *Introduction to Produce Safety for Hydroponic & Aquaponic Growers* https://go.uvm.edu/hpapintropdf
		- *Glossary of Hydroponic & Aquaponic Produce Safety Terms* https://go.uvm.edu/glossary
		- CEA Alliance Food Safety Webinars. https://ceaalliance.com/food-safety-webinar-series/

Module	Learning Objectives and Key Learning Points	Resources by Module

2	- **Learning Objective:** Identify when hands must be washed in HP/AP operations.
	- **Key Learning Points:**
	  ○ Note: Several situations when hands must be washed are described on the PSA slide, "When must hands be washed?" (slide #25). Added points for HP/AP audiences are listed below.
	  ○ Hands must be washed before interacting with produce.
	  ○ Hands must be washed before touching food contact surfaces.
	  ○ Hands must be washed after handling waste.
	  ○ Hands must be washed before and after interacting with agricultural water, including nutrient solution.
	  ○ Hands must be washed before handling amendments.
	  ○ Hands must be washed after handling untreated amendments.
	
	- **Learning Objective:** Recognize potential occupational hazards to workers in HP/AP environments.
	- **Key Learning Points:**
	  ○ Constant noise from water and air circulation systems can be hazardous to workers.
	  ○ Excess heat and humidity can be hazardous to workers.
	  ○ Some chemicals may present hazards to worker health.
	  ○ Handling fish can lead to worker injury.
	  ○ Owners/supervisors must provide appropriate personal projective equipment (PPE) to protect against injury and illness.
		- *Produce Safety for Hydroponic & Aquaponic Growers: Personal Health and Hygiene* https://go.uvm.edu/hpapphhpdf
		- *Produce Safety for Hydroponic & Aquaponic Growers: Fish Health and Handling* https://go.uvm.edu/hpapfhhpdf
		- *Food Safety Supervisor's Produce TRAINer Manual* https://producetrainer.org/supervisor.html
		- *Service Animals on U-Pick Farms* https://extension.uga.edu/publications/detail.html?number=C1153&title=service-animals-on-u-pick-farms
		- *Regulations impacting farms about service, comfort, and emotional support animals* https://foodsafetyclearinghouse.org/resources/regulations-impacting-farms-about-service-comfort-and-emotional-support-animals
		- *Assessing Wildlife and Animal Contamination* https://dst.necafs.org/animal
		- *Heat Illness Prevention* https://deohs.washington.edu/pnash/heat_illness
		- *Personal Protective Equipment* https://www.osha.gov/personal-protective-equipment

3	- **Learning Objective:** Understand when and why substrates and other system inputs used in HP/AP must be managed to reduce risk.
	- **Key Learning Points:**
	  ○ In HP and AP systems, there is potential for contact between the harvestable portion of the crop, the substrate, and the nutrient solution.
	  ○ While soil amendments may not be utilized in the traditional sense in many HP/AP operations, biological additions like those discussed in this module are often used in hydroponics, and fish waste is used in all aquaponic operations. Depending on how they're applied, these may be regulated under Subpart E—Agricultural Water.
	  ○ Growers should consider and manage risks associated with substrates in a similar way as they manage risks associated with soil amendments.
	
	- **Learning Objective:** Describe how substrates and other system inputs used in HP/AP can become contaminated
	- **Key Learning Points:**
	  ○ Substrates and other system inputs can become contaminated…
	  ▪ if they are handled by a worker who doesn't wash their hands first.
	  ▪ during storage:
	  • through animal intrusion.
	  • if structural leaks or condensation and dripping occur where substrates are stored.
	  ▪ if they are mixed with untreated soil amendments.
	  ▪ if tools and equipment are not cleaned adequately before use.
	  ○ Fish feces and nutrient solution can become contaminated if fish are fed with contaminated feed.
	
	- **Learning Objective:** Identify ways to reduce produce safety risk related to substrates and other system inputs used in HP/AP
	- **Key Learning Points:**
	  ○ Protect stored amendments from water and animals.
	  ○ Prevent contact between substrates and the harvestable portion of the crop.
	  ○ Prevent cross-contamination of produce and substrates through dripping and splashing of water.
	  ○ Ensure compliance with worker hygiene procedures (e.g., handwashing, proper use of PPE if it is used).
	  ○ Use only products treated to reduce microbial hazards.
		- *Produce Safety for Hydroponic & Aquaponic Growers: Harvest and Postharvest Handling* https://go.uvm.edu/hpaphphpdf

Module	Learning Objectives and Key Learning Points	Resources by Module
	○ Obtain system inputs from trusted suppliers. ○ Ask suppliers for Certificates of Conformance. ○ Do not use human waste or biosolids. ○ Store cleaning supplies and other chemicals separately from substrates and other system inputs.	
4	- **Learning Objective:** Understand that pest, wildlife, and domesticated animal management practices will differ depending on the type(s) of structure(s) where production, harvest, and postharvest activities occur. - **Key Learning Points:** ○ HP/AP operations are more likely to be housed inside some type of building structure which will determine their wildlife and pest management requirements. ○ In fully enclosed buildings, pest animal monitoring and exclusion is required. ○ In partially-enclosed or outdoor operations, growers must monitor for animal intrusion and conduct pre-harvest assessments for evidence of animal contamination. - **Learning Objective:** Describe ways to reduce fish stress and promote fish immunity and overall health. - **Key Learning Points:** ○ Maintain water quality parameters within ranges appropriate for the species being grown. ○ Log water quality over time and make frequent adjustments. ○ Reduce fish stressors including fast movement, bright light, and loud noises. ○ Observe fish daily to catch signs of disease early. - **Learning Objective**: Identify strategies to avoid and/or prevent cross-contamination risk between fish and produce in aquaponics. - **Key Learning Points**: ○ Protect aquaponic systems and their inputs from environmental sources of contamination. ○ To avoid cross-contamination through splashing water, either separate fish tanks and plant production systems in space or install physical barriers between them. ○ Maintain water quality parameters within appropriate ranges for the species being grown. ○ Reduce fish stress and promote fish immunity and overall health. ○ Observe fish daily for signs of disease.	- *Introduction to Produce Safety for Hydroponic & Aquaponic Growers* https://go.uvm.edu/hpapintropdf - *Produce Safety for Hydroponic & Aquaponic Growers: Fish Health and Handling* https://go.uvm.edu/hpapfhhpdf - *Aquaponic Operation Good Agricultural Practices (GAP)* https://www.ams.usda.gov/sites/default/files/media/AquaponicOperationGAP.pdf - *Biosecurity in Aquaculture, Part 2: Recirculating Aquaculture Systems* https://srac.tamu.edu/fact-sheets/serve/238 - *Service Animals on U-Pick Farms* https://extension.uga.edu/publications/detail.html?number=C1153&title=service-animals-on-u-pick-farms - *Regulations impacting farms about service, comfort, and emotional support animals* https://foodsafetyclearinghouse.org/resources/regulations-impacting-farms-about-service-comfort-and-emotional-support-animals

Module	Learning Objectives and Key Learning Points	Resources by Module

5.1	- **Learning Objective**: Understand the definition of agricultural water.
	- **Key Learning Points**:
	  ○ If water is intended or likely to come into contact with the harvestable portion of the crop, it is agricultural water.
	  ○ Contact with the harvestable portion is often not intended in HP/AP, but if it is likely to occur, then the water is considered agricultural water.
	  ○ The type of production systems, crops, and harvest practices growers choose will impact whether irrigation water and/or nutrient solution is agricultural water.
	  ○ If systems are designed and function in such a way as to prevent contact between irrigation water and the harvestable portion of the crop, then that water is not considered to be agricultural water.
	- **Learning Objective:** Adopt practices to prevent contamination of stored and circulating pre-harvest water, including nutrient solution, and monitor for contamination events.
	- **Key Learning Points:**
	  ○ Establish and enforce worker hygiene measures such as frequent handwashing.
	  ○ Monitor and control animal access to irrigation water (e.g., holding tanks, deep water culture beds, fish tanks).
	  ○ Assess nearby land use and neighboring activities to identify risks.
	  ○ Consider the potential impacts of floodwaters from nearby water bodies.
	  ○ Assess and address drainage needs in production/harvest areas.
	  ○ Store pre-harvest water in securely closed containers when possible.
	  ○ Use a closed distribution system such as NFT.
	  ○ Prevent dripping of rainwater and/or condensation from structural components into pre-harvest water.
	  ○ Clean and sanitize production system components before startup.
	
	- **Learning Objective:** Assess the production, harvest, and packing layout and adopt practices to reduce cross-contamination from pre-harvest water through dipping, splashing, and dripping onto produce and food contact surfaces.
	- **Key Learning Points:**
	  ○ Map produce and water flows through the operation to identify opportunities for cross-contamination.
	  ○ Avoid moving system components while they are wet.
	  ○ Move rafts slowly and evenly in deep water culture (DWC).
		- *Produce Safety for Hydroponic & Aquaponic Growers: Harvest and Postharvest Handling* https://go.uvm.edu/hpaphphpdf
		- *Investigation Report: Factors Potentially Contributing to the Contamination of Packaged Leafy Greens Implicated in the Outbreak of Salmonella Typhimurium During the Summer of 2021* https://www.fda.gov/food/outbreaks-foodborne-illness/factors-potentially-contributing-contamination-packaged-leafy-greens-implicated-outbreak-salmonella
		- FDA Response to Comment 47. Federal Register 89, no. 37448 (2024). https://www.federalregister.gov/d/2024-09153/p-332
		- *FSMA Produce Safety Rule: Agricultural Water System Inspection is Different from the Proposed Agricultural Water Assessment* https://resources.producesafetyalliance.cornell.edu/documents/AGWA-FSMA-PSR-Agricultural-Water-System-Inspection-is-Different.pdf
		- *Records Required by the FSMA Produce Safety Rule* https://resources.producesafetyalliance.cornell.edu/documents/Records-Required-by-the-FSMA-PSR.pdf

Module	Learning Objectives and Key Learning Points	Resources by Module
	○ When rafts are removed from DWC ponds, avoid lifting them over other harvested or growing produce. ○ Choose crops with upright growth habits and/or maintain infrastructure that supports crops upright growth. ○ Prevent dripping of rainwater and/or condensation from structural components on to covered produce. - **Learning Objective:** Recognize that for crops harvested with roots attached, postharvest water quality requirements will apply. - **Key Learning Point:** ○ Postharvest agricultural water requirements will apply to irrigation water, including nutrient solution, if crops are harvested and packaged with roots intact or the water comes in contact with the harvestable portion of the crop.	- FDA Response to Comment 40. Federal Register 89, no. 37448 (2024). https://www.federalregister.gov/d/2024-09153/p-304

Module	Learning Objectives and Key Learning Points	Resources by Module

5.2	- **Learning Objective:** Identify pre-harvest and postharvest agricultural water uses in HP/AP operations.
	- **Key Learning Points:**
	  o Pre-harvest water uses in HP/AP operations include:
	  ▪ Irrigation
	  ▪ Fertigation (nutrient solution)
	  ▪ Crop sprays
	  ▪ Greenhouse cooling
	  ▪ Handwashing for pre-harvest activities
	  o Postharvest water uses in HP/AP operations include:
	  ▪ Handwashing
	  ▪ Cleaning and sanitizing
	  ▪ Cooling produce
	  ▪ Rinsing/washing produce
	  ▪ Irrigation water if crop is harvested with roots attached
	  ▪ Fertigation water (nutrient solution) if crop is harvested with roots attached
	
	- **Learning Objective:** Understand the different reasons water may be treated and the requirements for treating postharvest agricultural water.
	- **Key Learning Points:**
	  o The term "water treatment" can be used in multiple contexts related to HP/AP production.
	  o Water treatment in HP/AP operations improves water quality for its intended use (e.g., nutrient solution) which differs from "treating agricultural water" which focuses on preventing contamination of produce.
	
	- **Learning Objective:** Describe the produce safety hazards of harvesting with roots attached.
	- **Key Learning Points:**
	  o Harvesting and packing produce with roots attached provides opportunities for irrigation water to come into contact with the edible portions of the crop during harvest and over the storage and shelf life of the produce.
	  o If irrigation water is contaminated, packaging roots with the edible portion increases the likelihood that pathogens will be transferred to the edible portion via contact with the water.
	  o When crops are harvested with roots attached, the irrigation water remaining in the root-substrate ball is always considered postharvest agricultural water and must have no detectable generic E. coli per 100 mL sample.
		No additional resources listed

Module	Learning Objectives and Key Learning Points	Resources by Module

6	- **Learning Objective:** Describe the importance of cleaning and sanitizing throughout produce growing, harvesting, packing, and holding areas.
	- **Key Learning Points:**
	  ○ Surfaces in production areas, such as the top covers of NFT channels or top surfaces of floating rafts, may be food contact surfaces depending on contact with produce.
	  ○ Due to the intensive nature of a rapid and continuous growing season, many lots of produce will move through an operation over short periods of time.
	  ○ Physical proximity of different activities in HP/AP operations increases opportunities for cross-contamination of produce through hands and surfaces.
	
	- **Learning Objective:** Recognize the value of hygienic and sanitary design
	- **Key Learning Points:**
	  ○ When purchasing or building new equipment, it is important to select materials that are easy to clean and sanitize.
	  ○ 5 key principles of hygienic design:
	  1. Visible and Reachable Surfaces
	  2. Smooth and Cleanable Surfaces
	  3. No Collection Points
	  4. Compatible Materials
	  5. Preventing Contamination
	
	- **Learning Objective:** Identify opportunities for cross-contamination from activities occurring in adjacent spaces.
	- **Key Learning Objectives:**
	  ○ Since the growing and packing areas may be in the same area or close to each other, consideration should be given to potential cross-contamination between the growing area, packing and holding area, food contact surfaces, and non-food contact surfaces.
	  ○ Any contamination brought in by workers has the chance to spread rapidly to a large volume of water and/or produce.
	  ○ Cleaning with high-pressure water can cause splashing and overspray into adjacent areas.
	  ○ Handling fish can cause splashing and dripping into adjacent areas.
	  ○ Map produce flow and consider adjustments as needed to avoid contamination from harvesting, packing, and holding activities that may be occurring nearby or in adjacent spaces.
		- *Produce Safety for Hydroponic & Aquaponic Growers: Cleaning and Sanitizing* https://go.uvm.edu/hpaphphpdf
		- *Hygienic and Sanitary Design for Produce Farms* http://go.uvm.edu/hygienicdesign
		- *Rats (and other rodents)* https://go.uvm.edu/rats
		- *Produce Safety for Hydroponic & Aquaponic Growers: Wildlife and Domesticated Animals* https://go.uvm.edu/hpapwdapdf

7	N/A – Photos were replaced where appropriate, but no supplemental notes or slides were added.	No additional resources listed