


**Post Harvest: Sanitation and Practices**


**As bacteria and viruses are not easily washed off produce, limiting contamination is the best policy.**

**Harvest Training** 


Training on Produce Rule standards that are applicable to the employee's job responsibilities; and

Persons who conduct harvest must receive training on:

1. Inspecting harvest containers and equipment to ensure they are functioning, clean, and maintained not to be a source of contamination
2. Correcting problems with harvest containers or equipment and/or reporting to the right person
3. What produce must not be harvested

 You must not distribute dropped covered produce (*drops to the ground before harvest*) does not include:

- root crops that grow underground (carrots)
- crops that grow on the ground (squash)
- produce that is intentionally dropped to the ground as part of harvesting (such as almonds)



**Pick It Clean!**

Policy and Training

- Harvesters avoid cut produce surfaces contacting soil by . . .
- Excessive dirt and mud are removed as much as possible from produce at harvest



SOPS and Training

You must inspect, maintain, and clean and, when necessary and appropriate, sanitize all food contact surfaces of equipment and tools as frequently as reasonably necessary to protect against contamination of covered produce. 

**Zone 1 – Produce contact surface**



**Cleanliness**

**General Cleanliness**

- Keep things in their place
- Managing pests, trash, sweeping, standing water . . .

**Cleaning (3-step)**

1. **Remove** obvious dirt and debris
2. **Apply** soap and **scrub** surfaces
3. **Rinse** with water free of E. coli

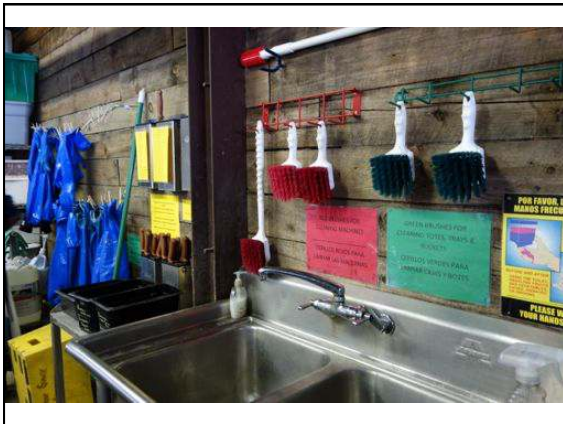
**Sanitizing (4-step)**

4. **Apply** a sanitizer. Let surface air dry

**You can't  
sanitize a  
dirty surface**

**WRITE A SOP: Harvest Containers**

- At the start of harvest season, wash and sanitize all harvest containers.
- Prior to each field harvest, inspect all harvest totes, to ensure cleanliness. Correct problems . . . or report to . . .
- Remove any dirt or debris. Wash and sanitize containers that have any leftover produce, rotting organic matter or signs of rodents.
- Store harvest containers off the ground and protected from access by animals and birds.





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Equipment should be designed and installed to facilitate cleaning and sanitizing

- Easy access to equipment and adjacent spaces
- Able to remove or access brushes, rollers, and nozzles for cleaning and sanitizing

**How frequently?**  
**When?**  
**How?**     **SOP**

### Hygienic Design

- **Smooth Surfaces** – Pathogens attach to rough surfaces
- **Scratch Free** – Pathogens can hide in scratches
- **NO Produce/Soil Catching** – Nutrient source
- **Hollow Bodies** – Harbor and reproduction area

Policy examples: Food contact surfaces are designed and maintained to minimize harboring dirt, filth, food, and microorganisms

Equipment and tools are of adequate design, construction, and workmanship to enable them to be adequately cleaned and properly maintained

Old or wooden equipment can be cleaned on a regular basis, can be sanitized.



- Establish cleaning schedules that reduce contamination risks and prevent biofilm formation
- Air dry wooden surfaces after washing



**Pathogens are often below your feet.  
 How would you clean these cracks?**

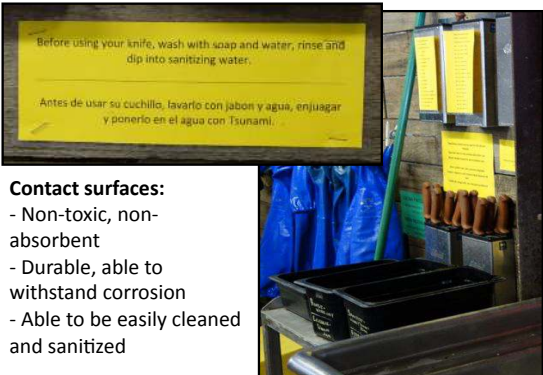
FSMA: Maintain and clean all non-food-contact surfaces of equipment and tools used during harvesting, packing, and holding as frequently as reasonably necessary to protect against contamination of covered produce.

**FDA** You must use equipment and tools that are of adequate design, construction, and workmanship to enable them to be adequately cleaned and properly maintained



**How would you clean the pouch?**

**Establish Cleaning Systems for Equipment**



**Contact surfaces:**

- Non-toxic, non-absorbent
- Durable, able to withstand corrosion
- Able to be easily cleaned and sanitized

**SOPS: Harvest Tools**

- Inspect and clean harvest tools prior to use.
- Sanitize harvest tools prior to use.
- Use harvest tools only for harvesting produce.
- At the end of each day, clean and store tools secure from animal contamination.



**Zone 1 – Produce contact surface**



**Zone 1**  
**Zone 2** — Contact surfaces  
**Zone 3** — Areas and materials inside of packing area  
**Zone 4** — Outside or adjacent to packing area




**Zone 1** — Contact Surface  
**Zone 2** — Areas and surfaces close to contact surfaces  
**Zone 3** — Areas and materials inside of packing area  
**Zone 4** — Outside or adjacent to packing area

**Packaging**

- Only new, single-use containers or cleaned, reusable containers should be used to pack produce
- Stored in a covered area, off the floor, to reduce the risk of from pests, windblown dirt, and other




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Farm name \_\_\_\_\_ Address \_\_\_\_\_ Date \_\_\_\_\_ Initials \_\_\_\_\_

### Zone Management Risk Assessment

Diagram your packing and storage facilities. Include:

- Product flow
- All cooling, cleaning, handling tools and equipment
- All coolers and storage areas
- Storage of containers, tools, and packing materials
- Pest trapping and exclusion devices
- Toilet, hand washing facilities, trash, and culls

**Zone 1** – Produce Contact Surface  
**Zone 2** – Close to Contact Surfaces  
**Zone 3** – Inside Packing Area  
**Zone 4** - Outside

1. Identify: What tools and materials do you use in each zone?
2. Identify: What potential risks for contamination are in each zone?
3. Plan: What policies or practices will you use to minimize risk? Include cleaning and sanitizing frequency

Zone	Tools/materials	Potential Risk	Plans to Minimize Risk	Date Accomplished

**Zone 1** — Contact Surface  
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### Vehicles, Equipment, Tools, and Utensils Cleaning and Sanitizing Schedule and Log

Farm Name:				Completed By: Initial box on date completed						
Week Beginning				Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Reviewed by:										
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Area	Activity Performed	Responsible	Frequency							

FSMA & Audits: Keep documentation of the date and method of cleaning and sanitizing of equipment used in harvesting, packing, or holding activities.

1. Fill in the plan for an area of your farm

## Pairing Postharvest Quality With Food Safety


### RISK ASSESSMENT WASHING PRODUCE

**Wash systems need to be evaluated for food safety risk. Farms may change their practices as a result.**

**Food Safety and Water**


- Pathogens can transfer from product to product
- Pathogens can be imbibed
  - Depth
  - Length of time
  - Temperature
- Bruised fruit more likely

**DUNK TANKS INCREASE RISK**



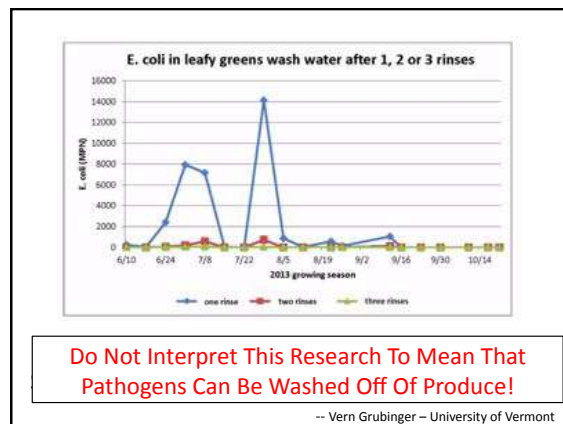
## Why do we use water?

Clean  
Cool  
Crisp



*Is there a way to accomplish our goals without dunk tanks?*

**If there is a food safety consequence, it trumps cleaning, cooling, and crisping**





Producers of all scales are changing systems from dunk tanks and into spray systems.



**Mechanical Wet Brush Washer/Pack Line**

*cucumbers - winter squash - peppers - potatoes - melons*

Market Farm Implement      Roeters Farm Implement  
AZS Brusher Equipment 821 Crooked Ln, Ephrata, PA  
17522      717-733-2584



- Low Pressure**  
Leaf lettuce  
Celery  
Bunched roots
- High Pressure**  
Carrots  
Beets  
Potatoes  
Winter squash

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**Step 1**  
- Hydro-Clean

**Step 2**  
- Hydro-Cool  
- Hydro-Crisp

**Triple Washing Greens**

*Reduced microbe levels in water*

<b>Step 1</b> - Hydro-Clean	<b>Step 1</b> - Hydro-Clean	<b>Step 2</b> - Hydro-Cool - Hydro-Crisp
	↓ 91%	↓ 98%
USE A SANITIZER!		

Average reduction of E. coli in leafy greens wash water, compared with a single rinse


**Sanitizer: Goal, Prevent Cross Contamination**

Sanitizers Treat The Water Not The Produce!



- Reduces item to item transfer
- Reduces risk of pathogen infiltration
- + Reduces plant pathogens that affect shelf life

**Sanitizers For Fresh Produce Washing**

 <b>NOTICE</b> <small>POTABLE DRINKING WATER</small>	Rinse Required	pH Control	NOP Allowed	Use
<b>Tsunami™ (Ecolab)</b>	NO	NO	YES	Produce only
<b>StorOx (BioSafe)</b>	NO	NO	YES	Produce & contact
<b>SaniDate (BioSafe)</b>	NO	NO	YES	Produce & contact
<b>BENEFITS of peroxide based cleaners:</b>				
<ul style="list-style-type: none"> <li>• No taste residue</li> <li>• No dumping restrictions, environmentally responsible</li> <li>• Less affected by organic matter than chloride</li> <li>• <u>Effective against microorganisms that affect shelf-life</u></li> </ul>				
<b>Chlorine Bleach</b>	YES	YES	YES	Produce & contact


Sanitizer must be labeled for contact with product – Read the label  
Download process, UC Davis, IA State, U of M, Penn State

Use Sanitizer According To The Label And Test



- Test strips: Correct Concentration. Record.
- Efficacy decreases with time dirt.
- Discard and change water as needed.

**Recirculated and Batch Water**




- Sanitizer can be used to maintain water quality and reduce cross-contamination risks
- Sanitizer is not required by Produce Rule – usually require by Audits
- A schedule must be established for changing batch water or a process in place for minimizing the build-up of organic material in the water

NEED ANOTHER REASON NOT TO DUNK?

must maintain and monitor the temperature of water at a temperature that is appropriate for the commodity and operation (considering the time and depth of submersion) and is adequate to minimize the potential for infiltration of microorganisms . . .

Harmonized GAP and Water Temperature

*Only where there is a clear risk based on science and metrics and rules*







Single use water can also benefit from sanitizer. Sanitizer is not required by the Produce Rule. Many Audits require.

**FDA** Poll: Instruments or controls you use to measure, regulate, or record temperatures, pH, sanitizer efficacy or other conditions, in order to control or prevent the growth of microorganisms of public health significance, must be:

1. Accurate and precise as necessary;
2. Adequately maintained; and
3. Adequate in number for their designated uses
4. All of the above

**Minimize The Potential For Contamination**

- **Wear clean outer garments.**
  - Change clothing or don aprons if coming from the field.
- **Maintain personal cleanliness.**
- **Wash hands thoroughly:**
  - Before starting work.
  - After each absence from work station.
  - At any time when hands become soiled.

**ZONE Management 4 to 1**

**Ice Cooling**

- Water is free of detectable generic *E. coli*/
- Clean/Sanitize Schedule
- Ice Policies
- Prevent cross-contamination from dripping ice

**MATERIALS NEEDED** 20-25 min

- Write a Standard Operating Procedure
- Paper and writing tool

**PROCESS**

1. Break into small groups (2-4 people)
2. As a group write a SOP
  - Cleaning and Sanitizing Food Contact Surfaces
  - Blood Or Body Fluids Contact Produce Or Food Contact Surfaces
  - Produce Contamination in Field by an Animal
3. Full classroom discussion: groups report on their SOP & discuss

**Write a Standard Operating Procedures (SOP) to Minimize Potential Risks**

**SOPs should include:**

- **Title, Date, and Author:** Descriptive title, date written and updated, and who wrote it
- **Responsibility:** Who does it and who makes sure it gets done
- **When:** When and how often the procedure is performed
- **Materials:** A list of the items needed to accomplish the task

**BREAK OUT Write A SOP**

### Standard Operating Procedures

- SOPs guide cleaning and sanitation practices and help ensure they are done correctly
- SOPs could be developed for:
  - Monitoring for pests
  - Preparing cleaning and sanitizing solutions
  - Cleaning and sanitizing produce washing lines
  - Cleaning and monitoring cold storage areas
  - Inspecting trucks prior to loading fresh produce
  - Cleaning vehicles used to transport fresh produce


### Minimum Packing Shed Needs

*Food safety CAN be accomplished WITHOUT a state-of-the-art shed.*

- **Water tested, free of detectible generic E. coli**
- Access to **toilet** and **hand washing** facilities
- A system to **sanitize** equipment and tools
- Non-porous, no niche, cleanable **food-contact** surfaces
- **Designated** space, not shared with machines/repair
- Adequate **Drainage**
- Shade and protection from the elements
- **Don't attract and harbor:** Rodents, flies, birds and pets

### Map the flow of produce from the field through the packing area into storage and out to transportation

*Produce should move to a cleaner area during each step of the process.*




### Pest Control In Buildings

Take measures reasonably necessary to protect produce, food contact surfaces, and food-packing materials from contamination by pests in buildings, including routine monitoring for pests as necessary and appropriate.

**For fully-enclosed buildings,** you must take measures to exclude pests from your buildings.

**For partially-enclosed buildings,** you must take measures to prevent pests from becoming established in your buildings.

### Risk Assessment



1. **Identification** of potential physical, chemical, and biological hazards
2. **Analysis** of any identified hazards



3. **Control** measures for ID'ed hazards



**4. Monitoring and verification**  
of hazard mitigation 61



**Hot Spot**  
**1. Make necessary changes to system**  
**2. Clean and sanitize**  
**3. Upgrade monitoring until area is pest free for 10 days**  
**5. Corrective and preventive actions**  
to prevent additional hazards 62



**Eliminate pest nesting areas**



**What Zone Do You Want Your Culls/Trash In?**





**RISK ASSESSMENT: What are the risks?**

- Physical
- Chemical
- Biological

It does not require a state of the art packing facility to reduce these risks.

**RISK ASSESSMENT: What are the risks and strategies.**

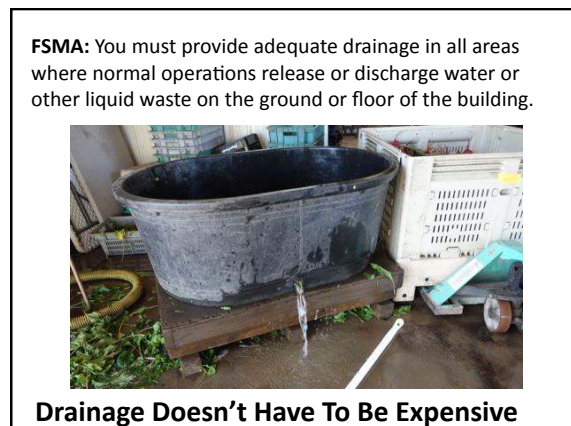
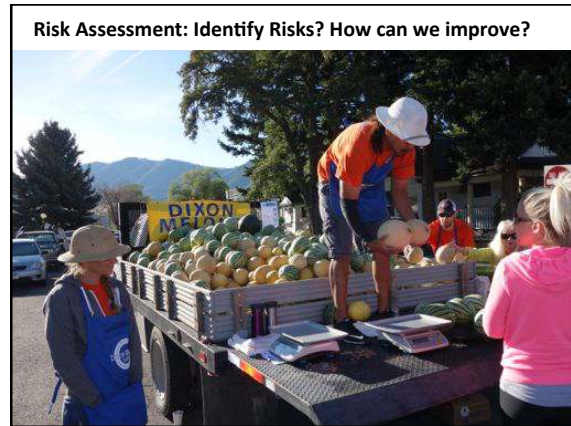
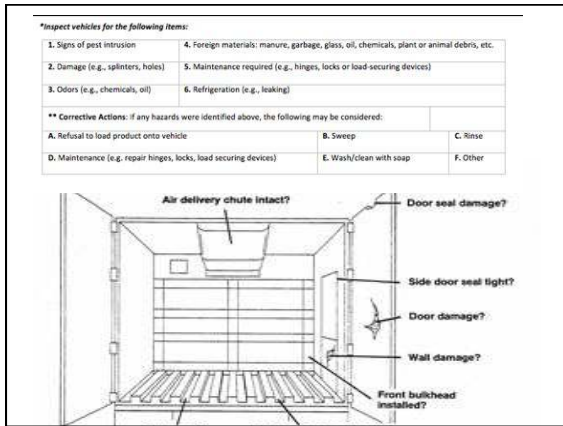
**Post-manufacturing welds are not easy to clean and may become a source of contamination**

**FDA TRANSPORTATION**

Equipment used to transport produce must be:

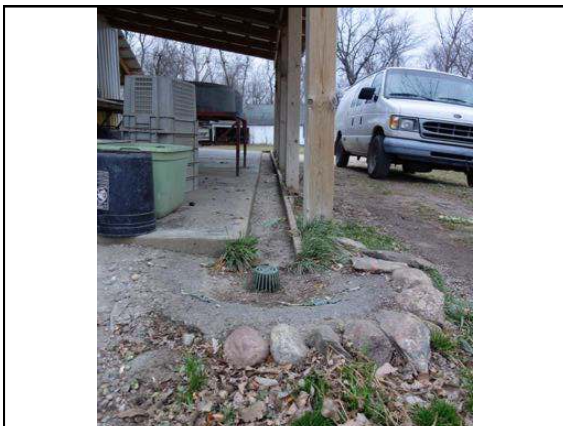
- Adequately clean before use transporting produce
- Adequate for use in transporting produce

- General cleanliness
- Has it been used for other purposes?
- Broken plastic, glass windows, metal parts
- Does the load need to be covered?



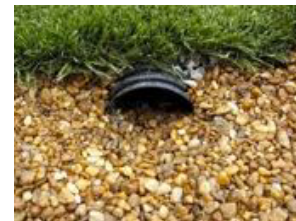


**Sloped Floors and Surfaces** – Pathogens and flies can breed in standing water.





**Discharge options include;** submerged dry wells, water gardens, storm sewers, wetlands, a bioswales.


- Check local codes
- Never direct a French drain or any other drainage:
  - Into crops
  - To a neighbor's property without permission
  - Do not allow puddling



**Vegetation's Filtering Capacity**



*UC Davis researchers found grass and wetlands can filter up to 99% of E coli during rain events.*



**Floor Drain** – Everything ends up there!  
Clean it!  
Manage drain water and soil properly so it doesn't contaminate

- Water sources
- Crops
- Contact Surfaces

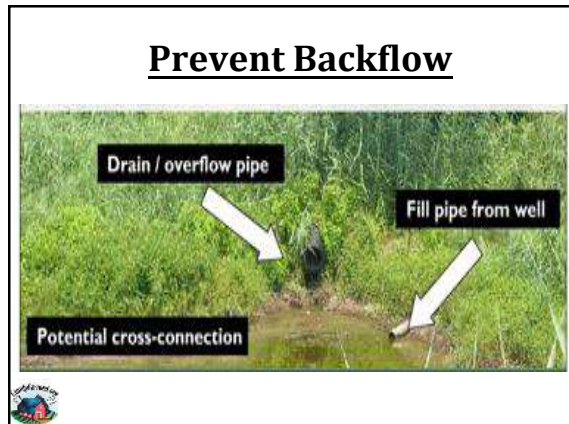


**Floor Drain** – Pathogen persistence and reproduction  
- Clean and sanitize on schedule

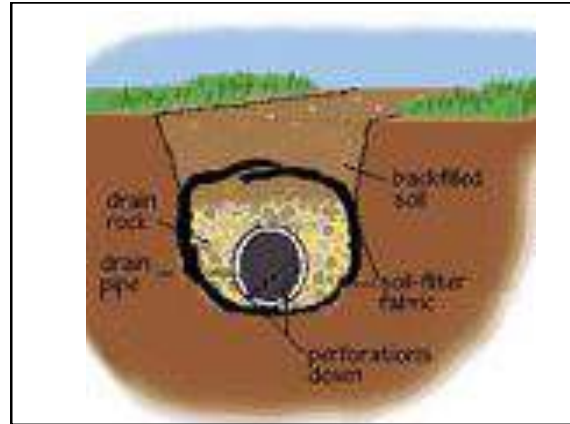


*Sediments and algae blooms can be a key site for pathogen persistence in water bodies.*

*Biofilms can protect pathogens from environmental stress and predation by other microbes*



Trap – Straw makes the sediment easier to handle. It will be composted.



**Low Tech – Low Cost**

**Materials**

- 4" Perforated drain pipe
- 3/4" (or larger) washed gravel
- Permeable landscape fabric

**& Tools**

- Plastic tarp
- Tall stakes
- Mason's string
- String level
- Tape measure
- Turf cutter or garden spade
- Straight 8' 2 x 4

**The Most Important Part Of The French Drain Is The Slope**

Use a 2 x 4 with a level on top to slope trench to outlet.

The French drain should slope at least 1% – 2% (~ 1/8 – 1/4 inch per foot) toward the discharge location.



**Add Gravel**

- Add 1" of washed gravel to the bottom of the trench.
- Don't use gravel with fines that could clog or block the holes in the drainpipe.
- Use clear gravel to surround the pipe for the same reason.



**Lay Pipe/Drain Tile**

- Lay perforated pipe (called drain tile) all the way along the trench.





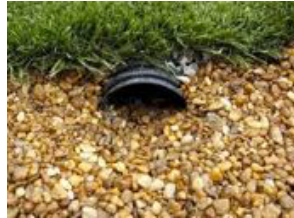
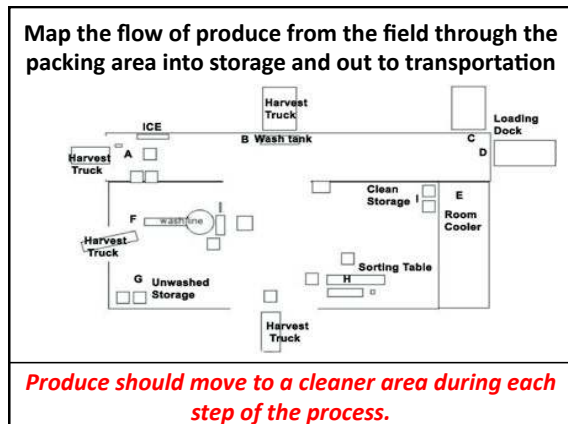
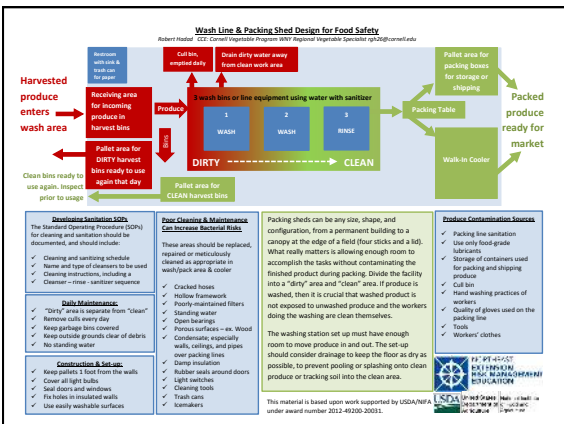
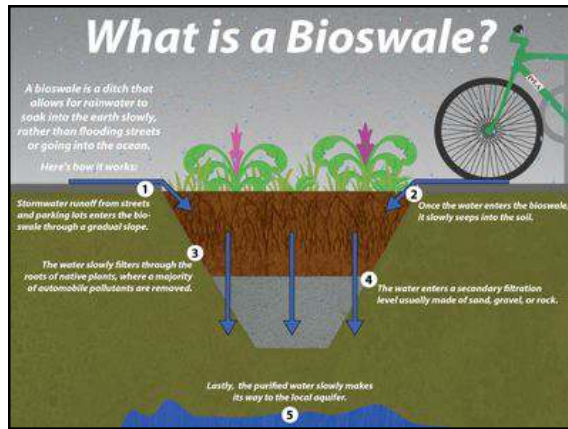
**Fill With Gravel To Cover Pipe**

- Add 3" to 4" of gravel on top of the pipe
- Fold the edges of the landscape fabric over the top of the gravel and pipe, making an outer sheath of fabric.
- The idea is to allow for water to flow through, while blocking fine soil that could clog up the holes in the drainpipe.



**Discharge options include;** submerged dry wells, water gardens, storm sewers, wetlands, a bioswales.

- Check local codes
- Never direct a French drain or any other drainage:
  - Into crops
  - To a neighbor's property without permission
  - Do not allow puddling

**Vehicles, Equipment, Tools, and Utensils Cleaning and Sanitizing Schedule and Log**

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Reviewed by: \_\_\_\_\_

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**Zone Management Risk Assessment**

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**THANK-YOU**

- Evaluations  
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