Good Agricultural Practices (GAP) for Fresh Fruit and Vegetable Growers

Water
On-Farm Water Resources: Water Safety Issues on the Farm

Clean water quality is most important when in direct contact with edible portion of crop close to or at harvest.
Agricultural water used for irrigation is a **major risk factor** in contamination of “high” risk **products**, eaten raw e.g. leafy greens, melons.
On-Farm Water Resources: Water Safety Issues on the Farm

- **On the farm**, water is used for irrigation, applying pesticides and fertilizers, cooling and/or frost control –pre-harvest.

- **In packing operations**, water is used to cool and wash produce, to clean and sanitize, to wash hands and for drinking- post-harvest

- **If the water is contaminated with pathogens, produce may be contaminated.**
Water Safety Issues on the Farm

- Water can be the source of a variety of pathogens.

- Produce related outbreaks of *Salmonella*, *Giardia*, *E. coli* 0157:H7 and *Cyclospora* have been attributed to the use of contaminated water for irrigation or produce washing.
Water Safety Issues on the Farm

- **Municipal or public water systems** are the best source (lowest risk) of water for any on-farm use.

- **Private wells** that are tested annually and found to be safe are also unlikely to contaminate produce.

- **Surface water**, i.e., ponds or streams, is more likely to have microbial contaminants than surface water.

- Only potable/clean water should have contact with the edible portion of the crop after harvest and during post-harvest handling or processing.
What Can You Do?

☑ Recognize the risks associated with your water source.
  - What are you growing?
  - Are crops grown near the ground, or on trees?
  - What is your source of irrigation water?
  - What is the condition of your water supply system?
  - Take a look at the source of your water.

☑ Rate your risk
  - Conduct Self-Assessment
    - Water Source Questionnaire
Potential Sources Bacteria to a Water Source

Potential sources of bacteria to a waterway (from Ely, 1997). URI Watershed Watch, CE
Source determines water risks

- Surface water
- Private well water
- Municipal water
On Farm Water Sources:
Municipal Water Systems
Municipal Water Systems

- Generally considered the safest source of water
- Preferred choice for food producing/processing
- Tested regularly by officials
On Farm Water Sources: Water Wells
Contamination of Well Water

- Can become contaminated by floods or heavy rains
- Can become contaminated if wells located too close to cesspools, septic tanks, agricultural sites, manure storage areas, or drainage fields
- Poorly maintained wells or pumps
- Livestock or other sources of pollutants in active well recharge area

From Penn State, 2012
If you have a well...consider the following:

- Well location (in relation to pollution sources)
- Separation distances (from potential pollution sources)
- Well casing (are there cracks or holes?)
- Well cap (vermin proof, screened vents, tamper proof)
- Well age (older wells may have problems)
- Well type (drilled wells vs. dug wells)
- Well depth (deeper wells are more protected)
If digging a new well...consider the following:

- Follow state's recommended minimum separation distances
- Locate well on ground higher than surrounding pollution sources
- Build soil up around the well so that all surface water drains away from it
- Make the well accessible for pump repair, cleaning, testing and inspection
- Hire a competent, licensed well driller and pump installer
Consider the topography of your site

Run-off

Higher risk

Run off from higher elevations can contaminate wells

Lower risk
On Farm Water Sources: Surface Water
Characteristics of surface water (ponds, lakes, rivers)

- Highest potential for contamination
- Safety can vary greatly over short periods of time
- Easily contaminated by upstream cattle operations, sewage discharge, or runoff from fields (storm run off) and manure piles
- Farm animals, wild life
If you use a surface water...consider the following: Risk related

- Do you use drip, under-tree or low volume spray irrigation? Does it spray *on* the high risk crops during irrigation?
- Are livestock operations located nearby the irrigation source?
- Are good management practices in place to protect the quality of irrigation water?
- Is water used as crop sprays -pesticides, frost protection- been tested for generic E. coli?
- If you use overhead irrigation or evaporative cooling, do you test your irrigation water for generic E. coli concentrations during the growing season?
How Do You Keep Your Water Safe?
How do you know your water is safe?

First you need to look – audit yourself

Penn State 2012
Safe Water Supply: What can you do?

☑️ Test your water

- Municipal water--request records regarding their testing programs, annually. **(Lowest level of risk)**

- Well water-- recommended testing 1-2 times per year. If processing produce, test well water at least once per year to comply with processing regulations.

- If using surface water for irrigation **(Highest level of risk)**– testing is required as close to a harvest as you can. How often? When?
Standards for surface and ground irrigation water have now been identified used in RI GAP program

- EPA recreational/bathing water standards
  - 126 CFU total generic E. coli/100ml water sample
- What if I do not meet the criteria?
  - Look around, see if you can find the problem
  - 0.5 log reduction/day between application and harvest (Produce Safety Rule)
  - What does log reduction mean? $\log_{10} 126 = 2.1; \log_{10} 156=2.2$
    - 1 day
How often to monitor surface water?

USDA audit requires surface water testing three times (3X) each season:

**Current Recommendations**
- 1st at planting
- 2nd at peak use
- 3rd at or near harvest
- Generic E. coli

**New requirements** in FDA Produce Safety Rule. This will change? What does RI GAP require?

Penn State Farm Food Safety 2012
Water Safety by Testing

Where can you go to get water tested?

- RIDOH water testing
- Private, certified testing labs
  - [www.health.ri.gov/find/labs/privatewelltesting/](http://www.health.ri.gov/find/labs/privatewelltesting/)
  - [www.health.ri.gov/find/labs/analytical/index.php](http://www.health.ri.gov/find/labs/analytical/index.php)
    - private well testing
    - analytical
Safe Water Supply: What can you do?

- Keep records for all water tests
  - In addition to water analysis test results, you should keep records of well construction details and dates, and maintenance records for the well and pump.
Safe Water Supply: What can you do?

- Develop a well maintenance plan
  - Keep the well area clean and accessible
  - Keep pollutants as far away as possible and check for possible sources of contamination: septic systems; animal waste, including manure storage; storage, handling and use of chemicals, including pesticides
  - If your well is $\geq$ 30-40 years, have the well examined by a water quality expert.
Safe Water Supply: What can I do?

✓ Pay attention to backflow prevention when using municipal water or drinkable well water systems.

If potable water (drinking water as defined by EPA) and waste water or non-potable water source (boiler or a hose in a wash-water bucket) are connected in some way, this is called a cross-connection.

When a cross-connection exists, there is the potential for backflow, contaminating the drinkable water system.

Backflow occurs when the direction of flow is reversed due to a change in pressures causing either back-siphonage or backpressure backflow.
Examples of Backflow

- **Back-siphonage** can occur when there is a loss of water pressure (negative water pressure) anywhere in the water supply system.
  - A back-siphonage can occur when a faucet hose is in contaminated or dirty water. If there is a pressure drop due to the use of a hydrant down the street, can cause the dirty water to backflow into the piping system and contaminate your drinkable water.

- **Back-pressure backflow** can occur when the pressure is greater than the supply source.
  - This can occur when there is a boiler or elevated tank connected directly to the drinkable or potable water source.
How Do I Prevent Backflow?

- The simplest form of backflow prevention is an air gap--an unobstructed vertical distance between the faucet, hose or plumbing fixture and the flood level rim of the sink.

- There are many different kinds of backflow prevention devices (atmospheric vacuum breaker, pressure vacuum breaker and hose bib vacuum breaker). Not all backflow prevention devices can be used under all conditions. Contact your plumber or health department for information about these devices.
Backflow Prevention Devices

- Double check valve
- Reduced pressure backflow preventer
- Pressur e type vacuum breaker
- Spring loaded vacuum breaker
- Air gap

Adapted from *Retail Best Practices and Guide to Food Safety and Sanitation © 2003*
Well Water Treatments

- Physical and Chemical
- Chemical sanitizers most common
  - Chlorine – based most common to remove microbial hazards
  - Must be EPA approved approach
- Advantages and disadvantages
- Greener technologies being tested (e.g. filtration)
- Should not be an on-going treatment – fix the problem!
On Farm Water Sources: Water Hydrants
Hydrants – What Is Needed?

- Back flow preventer required
- Rental meter/back flow: $2000.00
- Return to Providence Water
  - Money returned minus water use
- Contact
  - John Arruda
    Providence Water Supply Board
    - 401-521-6300 ext. 7279
Using Water......

- In the Field

- In the Barn/Packing House
Water Safety In the Field: What Can You Do?

- Use less risky application methods
  - Use drip irrigation whenever possible
  - Microbial risks in overhead irrigation are reduced by using potable water
Use less risky application methods

- **Source determines risks:** If surface water is used for overhead irrigation or pesticide application, examine the source of the water and be aware of upstream uses of that waterway.

- **Speed leaf drying time.** By applying overhead irrigation in the morning, time for leaf drying is reduced.
  - Rapid drying and ultraviolet light will reduce survival of human pathogens on crops.

- **Extend periods application and harvest:** Consider not using overhead irrigation or pesticide application methods within one week of harvest. Maximize time between overhead and harvest.

- Keep records of application methods, rates, and dates.
Water Safety In the Field: What Can You Do?

☑️ Management/location of farm animals
- Do not allow pets, poultry, or livestock to roam in crop areas, especially close to harvest time.
- Do not let "pick your own" patrons bring their pets along.
- Minimize wild animal and bird traffic in ponds and fields where possible.
- Clean tractors that were used in manure handling prior to entering produce fields.
Water Safety In the Field: What Can You Do?

☑ Potable water available in the field for workers and "pick your own patrons."
  - Set up a portable and temporary handwashing station if potable water is not readily available in the field.
  - Hand sanitizers – not as effective, last resort
Water Safety in the Barn/Packing House: What can you do?

- Microbial standards for post-harvest use are more stringent than irrigation water
- EPA Drinking Water
- Maintaining the cleanliness of water in the packing house can sometimes be a challenge
- Packinghouse operations, not just field operations, have been sources of foodborne pathogens
Water Safety in the **Barn/Packing House**: What can you do?

- **Backflow prevention**
  - have backflow prevention devices installed
  - contact your licensed plumber if you have concerns
Water Safety in the Barn/Packing House: What can you do?

✓ Produce washing and cooling
  - Potable water
  - Change water when it is dirty or after several hours of operation. **Pathogen accumulation**
  - Disinfection of any wash water – discussion later in sanitation.
  - Clean water stops cross-contamination

✓ **Clean and sanitize** water contact surfaces.
  - Potable water

✓ **Handwashing**
  - Make sure that **potable** water is available for handwashing.
Water Safety in the Barn/Packing House: What can you do?

✓ Cleaning and Sanitizing
  ● Use **potable water** for cleaning and rinsing dump or wash tanks, flumes, packing lines, conveyer belts and any other food contact surfaces.
    ● Wet environment can also increase risk
  ● If sanitizers are mixed with water, be sure to use **potable water**.

✓ Proper drainage

✓ Waste water disposal
Water Summary

- Know the source of the water and intended use
- Choose application method and treatment to minimize risk
- Avoid spray irrigation or pesticide application close to harvest unless you are sure the water is safe to use
- Test water that contacts edible portion of crop and keep records of all water test results.
- All post-harvest water applications must be done with clean, potable water

Penn State Farm Food Safety 2012
Addressing Flooding

Irene 2011—help us to prepare for next time!

Resources for best practices when produce fields are flooded:

- **Guidance for Industry: Evaluating the Safety of Flood-affected Food Crops for Human Consumption**
  
  - Go to [www.fda.gov](http://www.fda.gov)
  - Click on Food
  - Click on Guidance
  - Compliance and Regulatory Information
  - Click on Guidance Documents and then search for flood guidance

- **Guidance on:** flood waters contacting and NOT contacting edible portions of crops, assessment of fields before replanting and avoid cross-contamination after flooding
Addressing Flooding

http://www.fda.gov/Food/RecallsOutbreaksEmergencies/Emergencies/ucm272322.htm

Letter to State Agriculture Departments/Agencies 2011

- **Assessment of field for replanting after flooding**
  - Assess field history and crop selection
  - Time interval between flooding, planting and harvest
  - Source of flood waters and whether significant potential of human pathogens.
  - Allow soils to dry sufficiently
  - Sampling flooded soil of microbial concerns
Addressing Flooding

How does this relate to GAP?

- Flooded crop production areas - potential microbial hazards.
- Soil tests are recommended, especially if:
  - nearby animal production operation
  - a sewage treatment plant or sewers.
- Safety assessment of flood-affected crops – microbial contamination?
- Fresh fruits and vegetables inundated by flood waters and cannot adequately be cleaned – destroyed.
Resources