Conducting an Agricultural Water Assessment

Risk V Hazard

- A **hazard** is a biological, chemical, or physical agent that could cause harm
- **Risk** is the likelihood of a hazard causing harm.

Impact →

Likelihood ↑

	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium

- Identify any condition(s) that are reasonably likely to introduce known or reasonably foreseeable hazards into or onto covered produce or food contact surfaces
- Determine whether measures are reasonably necessary to reduce the potential for contamination
- Once annually, at the beginning of the growing season
- Reassessed whenever there is a significant change
- Must be written, reviewed, dated, and signed, in a reasonable time by a supervisor or responsible party
- Agricultural Water Assessment ≠ Agricultural Water System Inspection

Parts of the AgWA

- agricultural water system
- agricultural water practices
- crop characteristics
- environmental conditions
- other relevant factors (e.g., water test results)

Agricultural Water System

- The location and nature of the water source
  - Surface water vs groundwater vs municipal water
- The type of water distribution system
  - Open vs closed
- The degree to which the system is protected from possible sources of contamination:
  - other users of the water system
  - animal impacts
  - adjacent and nearby land uses
    - animal activity
    - biological soil amendments of animal origin
    - presence of untreated or improperly treated human waste

"By ‘adjacent’ land, we are referring to land sharing a common border with the farm’s land... By “nearby” land, we are referring to a broader category of land, including land that does not adjoin the farm’s land but has the potential to affect the covered farm’s agricultural water system(s) based on the land’s location.”

Risk Related to Degree of Protection

Adjacent > Nearby > Proximity

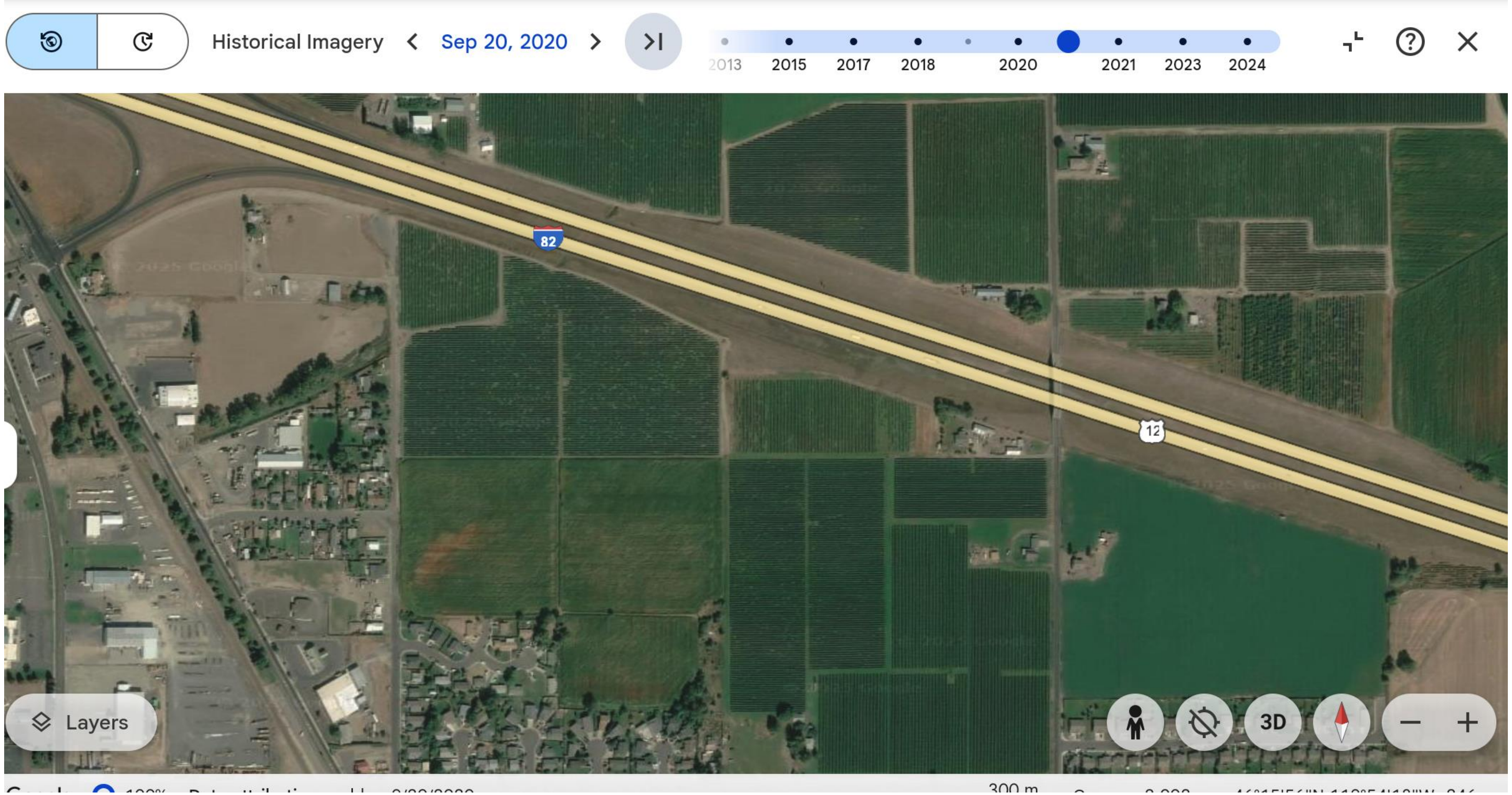
Considerations

- Berms or ditches
- Lined or unlined surface water systems
- Wildlife monitoring
- Manure and livestock management
- Maintenance activities (e.g., dredging)
- Neighbors' water usage and runoff
- Septic systems and wastewater discharge

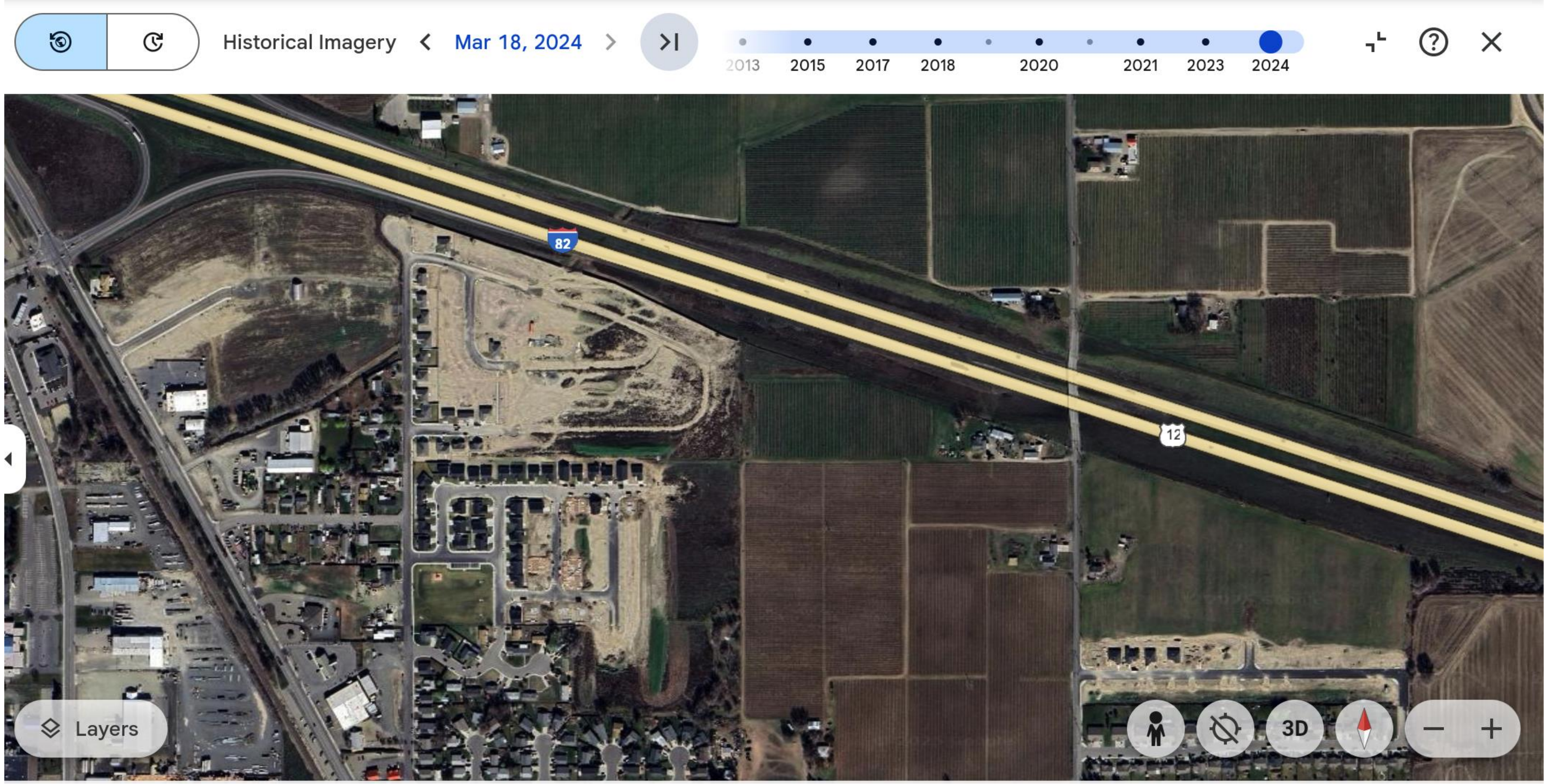
Ground Truthing

- The process of verifying data or conclusions by comparing them with real-world observations
  - Satellite data is ground-truthed by physically inspecting the area to ensure the data's accuracy

Ground Truthing



Ground Truthing



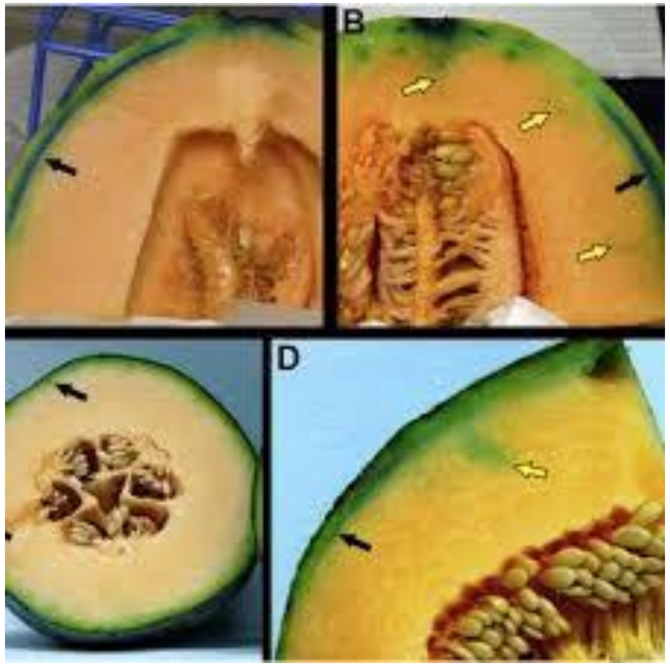
How far/what distance do I need to know about my adjacent/nearby/proximity land?

Agricultural Water Practices

- Application Method
  - Overhead/foliar vs furrow/flood vs drip
- The interval between application and harvest
  - Close to harvest vs further from harvest

Crop Characteristics

- "Susceptibility of the covered produce to surface adhesion or internalization of hazards"
  - **Adhesion** - The initial attachment of bacteria to a surface
    - Reversible?
  - **Internalization** - The process by which bacteria penetrate and enter host cells or tissues.
    - Irreversible?



Is internalization a preharvest risk?

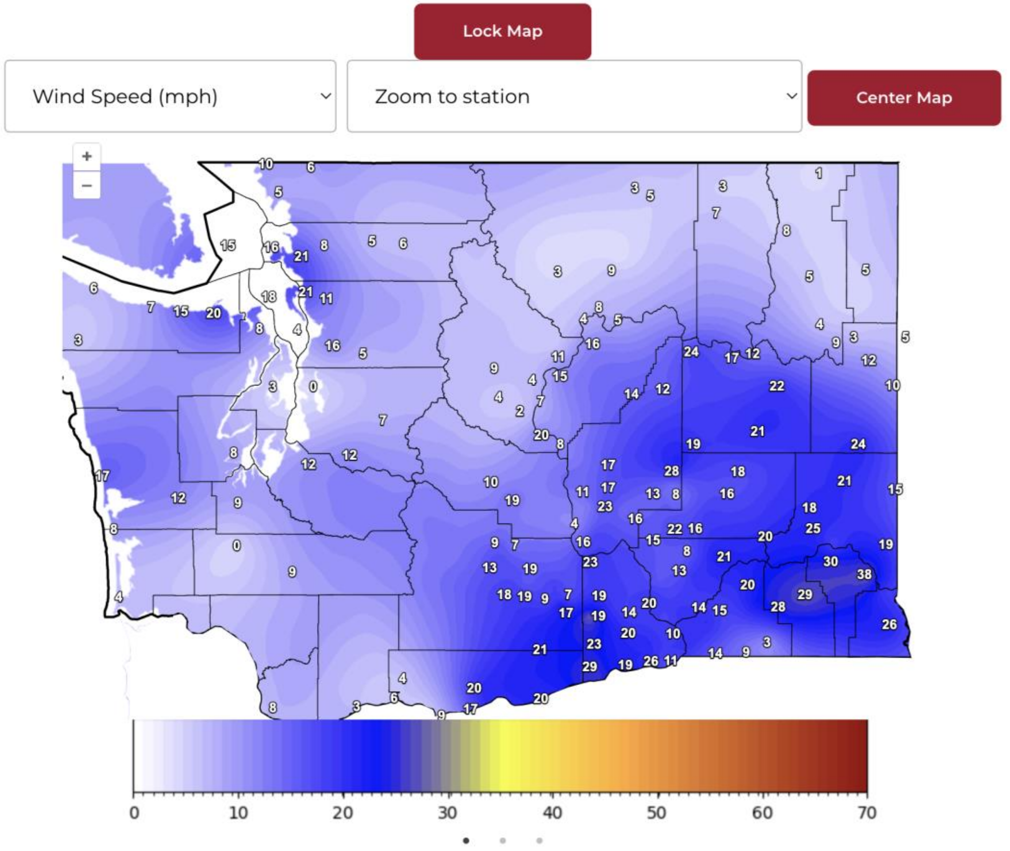
- Few research studies
  - Through the root system or blossom,
  - Submersion in water with a temperature differential
  - High level of inoculum
  - Varying results

Crop Characteristics

- Crop texture
  - Rough vs smooth & waxy
- Retain or hide pathogens
- Close to ground vs higher off ground
- Fragile vs tough epidermal layer

Environmental Conditions

- Rain
  - Intensity
  - Quantity
  - Duration
- Air Temperatures
  - survival of pathogens in water sources decreases with increasing temperatures
- Wind
  - Speed
  - Direction
- Sun (UV) exposure
- Relative Humidity



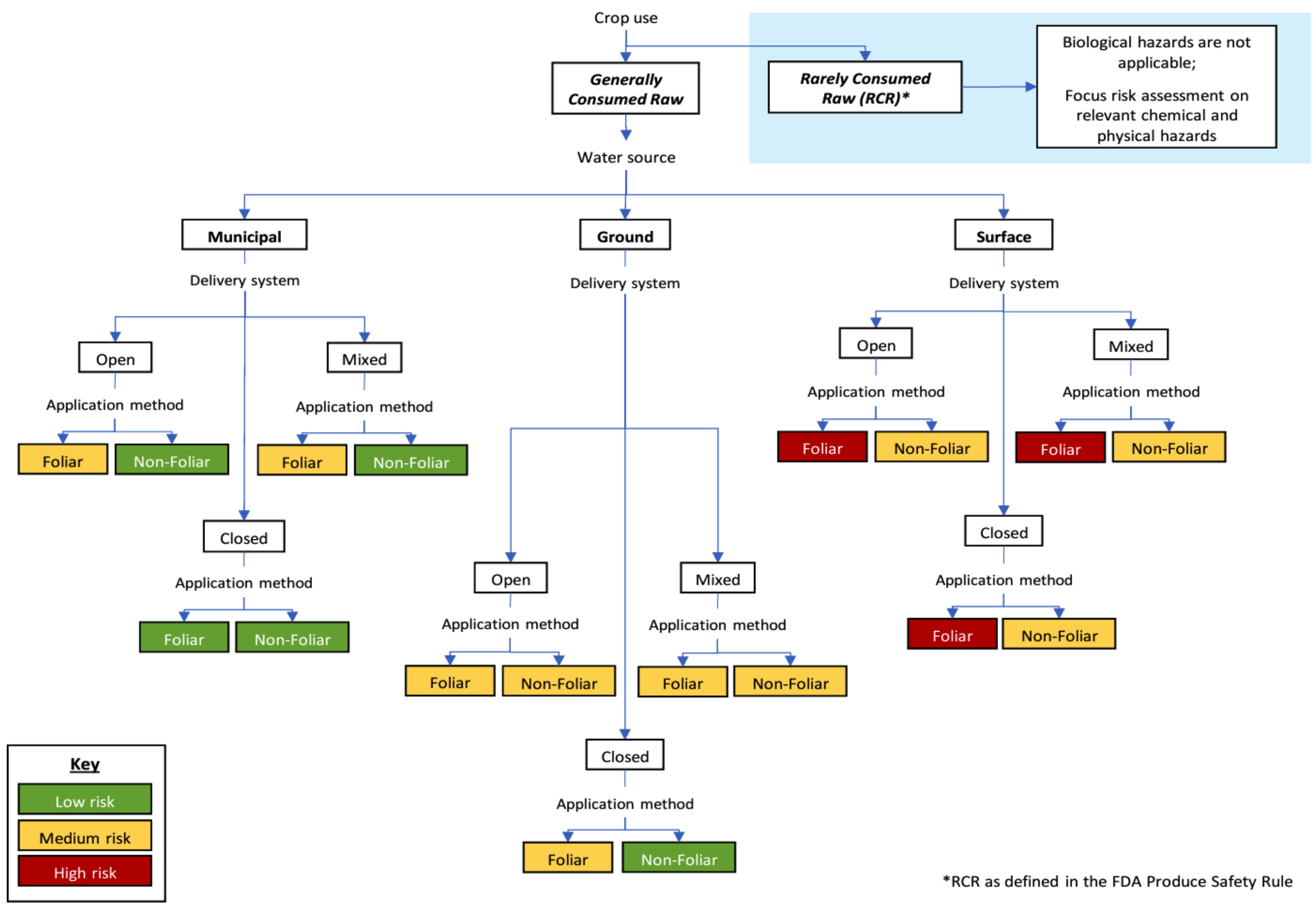
Other…

- Water testing
  - Tested for:
    - generic *E. coli*
    - another "scientifically valid indicator organism, index organism, or analyte"
  - Frequency:
    - "Scientifically valid and appropriate"
  - Microbial criterion
    - "Scientifically valid and appropriate"
- Justify your actions/decisions
- Tests cannot be used as the only basis for water use decisions

What if we don't know?

- We rely on
  - Assumptions
  - Learnings from past experience
  - Data from similar scenarios
  - Decision trees

Figure 1: Assessing potential biological risk associated with pre-harvest agricultural water



What is I have multiple…

Group by common or similar characteristics

Lump:

- Like irrigation sources
- Application methods
- Crop types

When to Reassess

- ‘Significant change’
- What is ‘significant’
  - Flooding
  - Extreme weather event
  - Change in water use/source
  - Crop rotation
- Justify your actions/decisions

Risk is Subjective!

Scenario 1:

A vegetable farm grows trellised cucumbers. Beds are covered with black plastic mulch, separated by furrows..

Agricultural Water System

Water Source	Well water
Distribution System	pumped from well, directly through a sediment filter
Degree of Protection	• Well is 200 feet deep, with a 1-foot concrete pad over the grouted bore hole and sanitary seal well cap over the well head. • Deer and rabbits are observed in the fields, particularly near the forested area.

Agricultural Water Practices

Irrigation Method	Drip tape is placed under black plastic during bed formation. Drip is the only form of irrigation for these crops.
Foliar Herbicides	PPP are applied to vines as needed to control insect damage and fungal disease. PPP application can occur up to 24 hours prior to harvest.

The application method for irrigation water likely does not meet the definition of agricultural water.

Foliar application does meet the definition of agricultural water.

Crop Characteristics

Crop Texture	smooth
Retain/Hide Pathogens	No
Proximity to ground	Trellised
Epidermis Layer	Fragile

No – there are not any known or reasonably foreseeable hazards for which mitigation is reasonably necessary

Environmental Conditions

- **Average High Temperature:** 75–85°F
- **Average Low Temperature:** 55–65°F
- **Precipitation:** 1–1.5 inches per week
- **Humidity:** 60–80%

Other…

Each well is tested on a monthly schedule. Generic E. coli test results are always no detect (<1 CFU/ 100 mL).

Results of AgWA

Meets the microbial quality criterion for postharvest water

- No detectable generic *E. coli* in 100 mL and meets other postharvest agricultural water testing requirements
- Is not untreated surface water

Scenario 2:

A blackberry farm produces at an orchard located in Whatcom County. Canes are managed to keep the berries growing at least 45 centimeters off the ground.

Agricultural Water System

Water Source	River water
Distribution System	River water is diverted to an unprotected open canal, 5 mile in canal until reaches orchard
Degree of Protection	• A blueberry growing operation, immediately up the river, uses untreated BSAAO • Domesticated animals (cows, goats, dogs) are active in the riverbank area.

Yes - there is one or more known or reasonably foreseeable hazards related to animal activity, BSAAOs, or untreated or improperly treated human waste on adjacent or nearby land for which mitigation is reasonably necessary

Agricultural Water Practices

Irrigation Method	Irrigation water is brought from the canal using an irrigation gate into a system of furrows between the rows of canes.
Foliar Herbicides	foliar plant protective sprays are mixed with surface water and applied in July (harvest is September)

The application method for irrigation water likely does not meet the definition of agricultural water.

Foliar application does meet the definition of agricultural water. Time from the last foliar application of water and harvest is >30 days

Crop Characteristics

Crop Texture	Smooth
Retain/Hide Pathogens	Clustered drupelets
Proximity to ground	Harvestable portion is 45 cm off of the ground
Epidermis Layer	Thin

Maybe… - there is one or more known or reasonably foreseeable hazards not related to animal activity, BSAAOs, or untreated or improperly treated human waste on adjacent or nearby land for which mitigation is reasonably necessary

Environmental Conditions

July (foliar application):

- **Average High Temperature:** 75°F
- **Average Low Temperature:** 55°F
- **Precipitation:** 1 inch
- **Humidity:** 65%

September (harvest):

- **Average High Temperature:** 63°F
- **Average Low Temperature:** 48°F
- **Precipitation:** 2.5 inches
- **Humidity:** 70%

No – there are not any known or reasonably foreseeable hazards for which mitigation is reasonably necessary

Other…

The river water has a history of generic *E. coli* concentration measurements around 200 MPN/100 mL

Results of AgWA

There is one or more known or reasonably foreseeable hazards related to animal activity, BSAAOs, or untreated or improperly treated human waste on adjacent or nearby land for which mitigation is reasonably necessary

Corrective measures	• Re-inspecting the entire affected agricultural water system under the farm's control and, among other steps, making necessary changes **OR** • Treating the water in accordance with the standards in FSMA PSR
Mitigation measures	• Making necessary changes such as repairs • Increasing time interval between last direct application and harvest (microbial die-off) • Increasing time interval between harvest and end of storage (microbial die-off) • Other activities that result in die-off or removal • Changing water application method • Treating water (PSR standards) • Taking alternative mitigation measures supported by scientific information

Results of AgWA

There is one or more known or reasonably foreseeable hazards related to animal activity, BSAAOs, or untreated or improperly treated human waste on adjacent or nearby land for which mitigation is reasonably necessary

Mitigation Measure:

Increasing the time interval between last direct application of agricultural water and harvest of the covered produce to allow for microbial die-off

Breakout Sessions