

California Leafy Greens Handlers  
Marketing Agreement (CA LGMA)  
Water Provisions

# Water Sources and Uses “Considerations”

- Using an indicator organism most effective and efficient testing approach
- Generic *E. coli* considered best available indicator for fecal contamination
- Key, action levels for generic *E. coli* do not identify safe or unsafe levels
- Only as indicators of fecal contamination or increasing bacteriological densities

# The Best Practices Are:

- Develop a water system description/map
  - A water system description shall be prepared. This description can use maps, photographs, drawings or other means to communicate the location of permanent fixtures and the flow of the water system (including any water captured for re-use.).
  - Permanent fixtures include wells, gates, reservoirs, valves, returns and other above ground features that make up a complete irrigation system should be documented in such a manner as to enable location in the field.
  - Water sources and the production blocks they may serve should be documented.
- Water systems that convey untreated human or animal waste must be separated from conveyances utilized to deliver irrigation water.
- Use irrigation water and water in harvest operations that is of appropriate microbial quality for its intended use; see Table 1 and Decision Trees (1A, 1B and 1C) for specific numerical criteria.
- Perform a sanitary survey prior to use of water in agricultural operations and if water quality microbial tests are at levels that exceed the numerical values set forth in Table 1.
- Test water as close to the point-of-use as practical, and if microbial levels are above specific action levels, take appropriate remedial and corrective actions.
- Retain documentation of all test results and/or Certificates of Analysis available for inspection for a period of at least 2 years.

# Other Considerations for water:

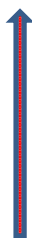
- Evaluate irrigation methods (drip irrigation, overhead sprinkler, furrow, etc.) for their potential to introduce, support or promote the growth of human pathogens on lettuce and leafy greens.
  - Consider such factors as the potential for depositing soil on the crop, presence of pooled or standing water that attracts animals, etc.
- When waters from various sources are combined, consider the potential for pathogen growth in the water.
- For surface water sources, consider the impact of storm events on irrigation practices.
  - Bacterial loads in surface water are generally much higher after a storm than normal, and caution shall be exercised when using these waters for irrigation.
- Use procedures for storing irrigation pipes and drip tape that reduce or eliminate potential pest infestations.
  - Develop procedures to provide for microbiologically safe use of irrigation pipes and drip tape if a pest infestation does occur.
- Reclaimed water shall be subject to applicable state and federal regulations and standards.
  - Use of this water for agricultural purposes must meet the most stringent standard as defined by the following: state and federal regulation or Table 1 of this document.
  - Water sample results and analysis provided by the water district or provider may be utilized as records of water source testing for verification and validation audits.

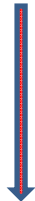
# WATER TO PREVENT PRODUCT DEHYDRATION

- Lettuce/leafy greens may be sprayed with small amounts of water during machine harvest or in the field container just after harvest to reduce water loss.
- Water used in harvest operations may contaminate lettuce and leafy greens if there is direct contact of water containing human pathogens with edible portions of lettuce/leafy greens.
  - The Best Practices Are:
    - Due to the timing of application of water that directly contacts edible portions of lettuce/leafy greens, assure the water is of appropriate microbial quality (e.g., meets U.S. EPA microbial standards for drinking water).
    - Test the water source periodically to demonstrate it is of appropriate microbial quality for its intended purpose (e.g., meets U.S. EPA or WHO microbial standards for drinking water) or assure that it has appropriate disinfection potential as described in Table1.

420 TABLE 1. WATER USE

Use	Metric	Rationale /Remedial Actions
<p><b>PREHARVEST Foliar Applications</b> Whereby Edible Portions of the Crop <b>ARE</b> Contacted by Water</p> <p>(e.g. overhead sprinkler irrigation, pesticides/fungicide application, etc.)</p>	<p><b>Target Organism:</b> generic <i>E. coli</i>.</p> <p><b>Sampling Procedure:</b> 100 mL sample collected aseptically at the point of use; i.e., one sprinkler head per water source for irrigation, water tap for pesticides, etc. Water utilized in pre-season irrigation operations may be tested and utilized.</p> <p><b>Sampling Frequency:</b> One sample per water source shall be collected and tested prior to use if &gt;60 days since last test of the water source. Additional samples shall be collected no less than 18 hr apart and at least monthly during use from points within the distribution system.</p> <p><b>Municipal &amp; Well Exemption:</b> For wells and municipal water sources, if generic <i>E. coli</i> are below detection limits for five consecutive samples, the sampling frequency may be decreased to no less than once every 180 days and the requirements for 60 and monthly sampling are waived. This exemption is void if there is a significant source or distribution system change.</p>	<p>For any given water source (municipal, well, reclaimed water, reservoir or other surface water), sam- ples for microbial testing shall be taken at a point as close to the point of use as practical (as determined by a sampler, to ensure the integrity of the sample, using sampling methods as prescribed in Table 1) where the water contacts the crop, so as to test both the water source and the water distribution system. In closed water system (meaning no connection to the outside) water samples may be collected from any point within the system but are still preferred as close to point of use as practical. No less than one sam- ple per month per distribution system is required under these metrics unless a system has qualified for an exemption. If there are multiple potential point-of-use sampling points in a distribution system, then samples shall be taken from different point-of-use locations each subsequent month (randomize or rotate sample locations).</p> <p>Water for preharvest, direct edible portion contact shall meet or exceed microbial standards for recreational water, based on a rolling geometric mean of the five most recent samples. However, a rolling geometric mean of five samples is not necessarily required prior to irrigation or harvest. If less than five samples are collected prior to irrigation, the acceptance criteria depends on the number of samples taken. If only one sample has been taken, it must be below 126 CFU/100 mL. Once two samples are taken, a rolling geometric mean can be calculated and the normal acceptance criteria apply. If the acceptance criteria are exceeded during this time period, additional samples may be collected to reach a 5 sample rolling geometric mean (as long as the water has not been used for irrigation). The rolling geometric mean calculation starts after 5 samples have been collected. If the water source has not been tested in the 60 days, the first water sample shall be tested prior to use, to avoid using a contaminated water source. After the first sample is shown to be within acceptance criteria, subsequent samples shall be collected less frequently than monthly at points of use within the distribution system.</p> <p>Ideally, preharvest water should not contain generic <i>E. coli</i>, but low levels do not necessarily indicate the water is unsafe. Investigation and/or remedial action SHOULD be taken when test results are higher than normal, or indicate an upward trend. Investigation and remedial action SHALL be taken when acceptance criteria are exceeded.</p> <p><b>Remedial Actions:</b> If the rolling geometric mean (n=5) or any one sample exceeds the acceptance criteria, then the water shall not be used whereby edible portions of the crop are contacted by water until remedial actions have been completed and generic <i>E. coli</i> levels are within acceptance criteria:</p> <ul style="list-style-type: none"> <li>• Conduct a sanitary survey of water source and distribution system to determine if a contamination source is evident and can be eliminated. Eliminate identified contamination source(s).</li> </ul>



	<p><b>Test Method:</b> FDA BAM method or any U.S. EPA approved or AOAC accredited method for quantitative monitoring of water for generic <i>E. coli</i>. Presence/absence testing with a similar limit of detection may be used as well.</p> <p><b>Acceptance Criteria:</b> ≤126 MPN (or CFU*)/100 mL (rolling geometric mean n=5) and ≤235 MPN/100mL for any single sample.</p> <p>*for the purposes of water testing, MPN and CFU shall be considered equivalent.</p>	<ul style="list-style-type: none"> <li>For wells, perform a sanitary survey and/or treat as described in Appendix A Sanitary Survey.</li> <li>Retest the water after conducting the sanitary survey and/or taking remedial actions to determine if it meets the outlined microbial acceptance criteria for this use. This sample should represent the conditions of the original water system, if feasible this test should be as close as practical to the original sampling point. A more aggressive sampling program (i.e., sampling once per week instead of once) shall be instituted if an explanation for the exceedence is not readily apparent. This type of sampling program should also be instituted if an upward trend is noted in normal sampling results.</li> </ul> <p><b>Crop Testing:</b> If water testing indicates that a crop has been directly contacted with water exceeding acceptance criteria, product shall be sampled and tested for <i>E. coli</i> O157:H7 and <i>Salmonella</i> as described in Appendix C, prior to harvest. If crop testing indicates the presence of either pathogen, the crop shall NOT be harvested for human consumption.</p> <p><b>Records:</b> Information requirements: Each water sample and analysis shall record: the type of water (canal, reservoir, well, etc) date, time, and location of the sample and the method of analysis and detection limit. Records of the analysis of source water may be provided by municipalities, irrigation districts or other water providers. All test results and remedial actions shall be documented and available for verification from the grower/handler who is the responsible party for a period of two years.</p>
<p><b>PREHARVEST Non-foliar Applications</b> Whereby Edible Portions of the Crop are NOT Contacted by Water</p> <p>(e.g., furrow or drip irrigation, dust abatement water, if water is not used in the vicinity of produce, then testing is not necessary)</p>	<p><b>Target Organism, Sampling Procedure, Sampling Frequency Test Method and Municipal Well Exemption:</b> as described for foliar application.</p> <p><b>Acceptance Criteria:</b> ≤126 MPN /100 mL (rolling geometric mean n=5) and ≤576 MPN /100 mL for any single sample.</p>	<p>Testing and remedial actions for preharvest water that does not come in direct contact with edible portions of the crop are the same as for direct contact water, but acceptance criteria are less stringent because of the reduced risk of contact of the edible portion with contamination from water. Acceptance criteria here are derived from U.S. EPA recreational water standards.</p>

# LGMA Metrics Applicable to Water Testing in Arizona



# Sampling Frequency

- 1 Sample per water source at least 60 days prior to use.
- Additional testing is no less than 18 hours apart, and at least monthly (35 days).
- Distribution System shall be tested at a point as close to the point-of-use as practical.

# Exemptions

- Municipal & Well
  - Generic *E. coli* are below detection limits for five consecutive samples, the frequency of sampling may be decreased to less than once every 180 days.
  - 60 day prior use and monthly sampling are waived.
  - Closed systems that are below generic *E. coli* detection limits for two preceding seasons may decrease sampling to single sample per season.
    - If there is a source or distribution system change – this exemption is voided.

# Acceptance Criteria

## Foliar Application

- Accepted Level
- $\leq 126$  MPN / 100mL  
(geometric Mean of 5 samples)
- ***AND***
- $\leq 235$  MPN/ 100mL  
(all single samples)

- ACTION LEVEL
- $> 126$  MPN/100mL  
(geometric Mean of 5 samples)
- ***OR***
- $>235$  MPN/100mL  
(any single sample)

# Acceptance Criteria

## Non-Foliar Application

- Accepted Level
- $\leq 126$  MPN / 100mL  
(geometric mean of 5 samples)
- ***AND***
- $\leq 576$  MPN/ 100mL  
(all single samples)

- ACTION LEVEL
- $> 126$  MPN/100mL  
(geometric mean of 5 samples)
- ***OR***
- $>576$  MPN/100mL  
(any single sample)

# Remedial Actions

- Discontinue Use – Conduct a Sanitary Survey of water source and distribution system to determine if the contamination source is evident and can be eliminated
- Retest the water daily for five days, approx. 24h apart, at point closest to use.
- If any samples are  $>235$  (foliar) or  $>576$  (non-foliar) - repeat sanitary survey and/or remedial actions again. Do not use from that water system until water can meet the outlined acceptance

# Remedial Actions - Wells

- Discontinue use
- Conduct Water Sanitary Survey
- Disinfection – Appendices 1.1-1.3
- Re-test for 5 days

# Crop Testing

- If water that exceeded acceptance criteria has been used in crop production, sample and test product for *E. coli* O157:H7 and *Salmonella*.
- Appendix C – Sampling Procedures – within 10 days to harvest.
- If either pathogen is present in crop sample – Do not harvest for human or animal consumption.

# Records

- Water Sample record must include –
  - Type of water(canal, reservoir, etc)
  - Date
  - Time
  - Location of Sample
  - Method of analysis
  - Detection Limit
- Municipalities, irrigation districts records are acceptable
- Must be kept for a period of two years



# LGMA Water Standards

Questions?