

AUGUST 20, 2020

This document supersedes all previously published versions of the Commodity Specific Food Safety Guidelines for the Production and Harvest of Leafy Greens including those dated March 23, 2007, April 18, 2007, June 5, 2007, October 16, 2007, June 13,

2008, July 10, 2009, January 29, 2010, August 4, 2010, July 22, 2011, January 20, 2012, August 31, 2012, August 2, 2013,

January 29, 2016, August 10, 2017, September 28, 2018, April 19,2019 and October 24, 2019.

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| GLOSSARY | |
| **ACCREDITATION** | A rigorous assessment conducted by an independent science-based organization to assure the overall capability and competency of a laboratory and its quality management systems. |
| **ACTIVE COMPOST** | Compost feedstock that is in the process of being rapidly decomposed and is unstable. Active compost is generating temperatures of at least 50 degrees Celsius (122 degrees Fahrenheit) during decomposition; or is releasing carbon dioxide at a rate of at least 15 milligrams per gram of compost per day, or the equivalent of oxygen uptake. |
| **ADEQUATE / ADEQUATELY** | That which is needed to accomplish the intended purpose in keeping with good public health practice. |
| **AERIAL APPLICATION** | Any application administered from above leafy greens where water may come in contact with the edible portion of the crop; may be delivered via aircraft, sprayer, sprinkler, etc. |
| **AEROSOLIZED** | The dispersion or discharge of a substance under pressure that generates a suspension of fine particles in air or other gas. |
| **AGRICULTURAL / COMPOST TEA** | A water extract of biological materials (such as compost, manure, non-fecal animal byproducts, peat moss, pre-consumer vegetative waste, table waste, or yard trimmings), excluding any form of human waste, produced to transfer microbial biomass, fine particulate organic matter, and soluble chemical components into an aqueous phase. Agricultural / Compost teas are held for longer than one hour before application and are considered non-synthetic crop treatments for the purposes of this document. |
| **AGRICULTURAL TAILWATER** | Excess run off water which is generated and collected during the process of irrigation. |
| **ANCILLARY EQUIPMENT** | Temporary storage equipment for fertilizers such as third-party storage tanks, pony tanks, etc. |
| **AGRICULTURAL WATER** | Water used in activities covered in these guidelines where water is intended to, or is likely to, contact lettuce/leafy greens or food-contact surfaces, including water used in growing activities (including all irrigation water and water used for preparing crop sprays) and in harvesting, packing, and holding activities (including water used for washing or cooling harvested lettuce/leafy greens and water used for preventing dehydration of lettuce/leafy greens). |
| **AGRICULTURAL WATER SYSTEM** | Each distinct , separate combination of water source, conveyance, storage used to carry water from its primary source to its point of use; includes wells, irrigation canals, pumps, valves, storage tanks, reservoirs, meters, pipes, fittings, and sprinklers. |
| **AGRICULTURAL WATER TREATMENT SYSTEM** | An add-on to an agricultural water system that improves the quality (safety) of the water to make it more acceptable for a specific end- use. The agricultural water treatment system may treat multiple ranches, water sources or batches of water as defined by the water system description. |
| **ANIMAL BY-PRODUCT** | Most parts of an animal that do not include muscle meat including organ meat, nervous tissue, cartilage, bone, blood, and excrement. |

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| **ANIMAL HAZARD** | Feeding, skin, feathers, fecal matter or signs of animal presence in an area to be harvested in sufficient number and quantity to suggest to a reasonable person the crop may be contaminated. |
| **ANTIMICROBIAL WATER TREATMENT** | A physical, energetic, or chemical agent, applied alone, in combination, or as a sequential process, to achieve and maintain a defined microbiological water quality standard. |
| **ADENOSINE**  **TRI-PHOSPHATE (ATP)** | A high-energy phosphate molecule required to provide energy for cellular function. |
| **APPLICATION INTERVAL** | Means the time between application of an agricultural input (such as a soil amendment) to a growing area and harvest of leafy greens from the growing area where the agricultural input was applied. |
| **ATP TEST METHODS** | Exploits knowledge of the concentration of ATP as related to viable biomass or metabolic activity; provides an estimate of cleanliness. |
| **BIOFERTILIZERS** | Fertilizer materials/products that contain microorganisms such as bacteria, fungi, and cyanobacteria that shall promote soil biological activities. |
| **BIOSOLIDS** | Solid, semisolid, or liquid residues generated during primary, secondary, or advanced treatment of domestic sanitary sewage through one or more controlled processes. |
| **BLUE VALVE** | Pipes which are used as a closed conveyance system for moving agricultural surface water from water source to irrigation systems or reservoirs for agricultural use. |
| **BREAKPOINT** | The point at which the disinfection demand has been met. |
| **BUILDINGS** | Any fully or partially enclosed building on the farm that is used for storing of food-contact surfaces and packaging materials, including minimal structures that have a roof but no walls. |
| **CLOSED DELIVERY SYSTEM** | A water storage or conveyance system which is fully enclosed and protected such that water is not exposed to the environment from the water source to the point of use. |
| **COLONY FORMING UNITS (CFU)** | Viable microorganisms (bacteria, yeasts & mold) either consisting of single cells or groups of cells, capable of growth under the prescribed conditions (medium, atmosphere, time and temperature) to develop into visible colonies (colony forming units) which are counted. |
| **CONCENTRATED ANIMAL FEEDING OPERATION (CAFO)** | A lot or facility where animals have been, are or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period and crops, vegetation forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility. In addition, there must be more than 1,000 'animal units' (as defined in 40 CFR 122.23) confined at the facility; or more than 300 animal units confined at the facility if either one of the following conditions are met: pollutants are discharged into navigable waters through a man-made ditch, flushing system or other similar man-made device; or pollutants are discharged directly into waters of the United States which originate outside of and pass over, across, or through the facility or otherwise come into direct contact with the animals confined in the operation. |

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| **COLIFORMS** | Gram-negative, non-spore-forming, rod-shaped bacteria that ferment lactose to gas. They are frequently used as indicators of process control but exist broadly in nature. |
| **CO-MANAGEMENT** | An approach to conserving soil, water, air, wildlife, and other natural resources while simultaneously minimizing microbiological hazards associated with food production. |
| **COMPOSTING** | Means a process to produce compost in which organic material is decomposed by the actions of microorganisms under thermophilic conditions for a designated time period (for example, 3 days) at a designated temperature (for example, 131 °F (55 °C)), followed by a curing stage under cooler conditions. |
| **CROSS-CONTAMINATION** | The transfer of microorganisms, such as bacteria and viruses, from one place to another. |
| **CURING** | The final stage of composting, which is conducted after much of the readily metabolized biological material has been decomposed, at cooler temperatures than those in the thermophilic phase of composting, to further reduce pathogens, promote further decomposition of cellulose and lignin, and stabilize composition. Curing may or may not involve insulation, depending on environmental conditions. |
| **DETECTION LIMIIT** | A detection limit is the lowest quantity of a substance or measurable target that can be distinguished from the absence of that substance or measurable target. Methods that estimate bacterial populations in serial dilutions are limited to a minimum level of <2.2 MPN/100 mL and methods that count bacterial colonies growing on media are limited to a minimum level of <1.0 CFU/100 mL. |
| **DIRECT WATER APPLICATION** | Using agricultural water in a manner whereby the water is intended to, or is likely to, contact leafy greens or food-contact surfaces during use of the water. |
| **ENTEROHEMORRHAGIC *E. COLI*** | Shiga toxin-producing *E. coli* clinically associated with bloody diarrhea. |
| ***ESCHERICHIA COLI***  **(*E. COLI*)** | *Escherichia coli* are common bacteria that live in the lower intestines of animals (including humans) and are generally not harmful. *E. coli* are frequently used as an indicator of fecal contamination but can be found in nature from non-fecal sources. |
| **FECAL COLIFORMS** | Coliform bacteria that grow at elevated temperatures and may or may not be of fecal origin. Useful to monitor effectiveness of composting processes. Also called “thermotolerant coliforms.” |
| **FIELD EQUIPMENT** | Equipment used to: prepare the production area and plant, cultivate, fertilize, treat or any other pre-harvest in-field activities. |
| **FLOODING** | The flowing or overflowing of a field with water outside a grower’s control that is reasonably likely to contain microorganisms of significant public health concern and is reasonably likely to cause adulteration of edible portions of fresh produce in that field. |

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| **FOOD-CONTACT SURFACE** | Those surfaces that contact human food and those surfaces from which drainage, or other transfer, onto the food or onto surfaces that contact the food ordinarily occurs during the normal course of operations. ‘‘Food-contact surfaces’’ includes food-contact surfaces of equipment and tools used during harvest, packing and holding. |
| **FOOD SAFETY ASSESSMENT** | A standardized procedure that predicts the likelihood of harm resulting from exposure to chemical, microbial and physical agents in the diet. |
| **FOOD SAFETY PERSONNEL** | Person trained in basic food safety principals and/or working under the auspices of a food safety professional. |
| **FOOD SAFETY PROFESSIONAL** | Person entrusted with management level responsibility for conducting food safety assessments before food reaches consumers; requires documented training in scientific principles and a solid understanding of the principles of food safety as applied to agricultural production; in addition this individual 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 See appendix B for more details. |
| **GEOMETRIC MEAN** | Mathematical def.: the nth root of the product of n numbers, or:  Geometric Mean = nth root of (X1)(X2)...(Xn), where X1, X2, etc. represent the individual data points, and n is the total number of data points used in the calculation.  Practical def.: the average of the logarithmic values of a data set, converted back to a base 10 number. |
| **GREEN WASTE** | Any plant material that is separated at the point of generation contains no greater than 1.0 percent of physical contaminants by weight. Green material includes, but is not limited to, yard trimmings ("Yard Trimmings" means any wastes generated from the maintenance or alteration of public, commercial or residential landscapes including, but not limited to, yard clippings, leaves, tree trimmings, prunings, brush, and weeds), untreated wood wastes, natural fiber products, and construction and demolition wood waste. Green material does not include food material, biosolids, mixed solid waste, material processed from commingled collection, wood containing lead-based paint or wood preservative, mixed construction or mixed demolition debris. "Separated At The Point of Generation" includes material separated from the solid waste stream by the generator of that material. It may also include material from a centralized facility as long as that material was kept separate from the waste stream prior to receipt by that facility and the material was not commingled with other materials during handling. 1 |
| **GROUND WATER** | The supply of fresh water found beneath the earth’s surface, usually in aquifers, which supply wells and springs. Ground water does not include any water that meets the definition of surface water. |

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| **HARVESTING** | Activities that are traditionally performed on farms for the purpose of removing leafy greens from the field and preparing them for use as food; does not include activities that transform a raw agricultural commodity into a processed food. Examples of harvesting include cutting (or otherwise separating) the edible portion of the leafy greens from the crop plant and removing or trimming parts, cooling, field coring, gathering, hulling, removing stems, trimming of outer leaves of, and washing. |
| **HARVEST EQUIPMENT** | Any kind of equipment which is used during or to assist with the harvesting process including but not limited to harvesting machines, food-contact tables, belts, knives, etc. |
| **HAZARD** | Any biological, physical, or chemical agent that has the potential to cause illness or injury in the absence of its control. |
| **HOBBY FARM** | A noncommercial farming operation or a farm where the primary source of income is not obtained by the sale of its products. |
| **HOLDING** | Storage of leafy greens in warehouses, cold storage, etc. including activities performed incidental to storage (*e.g.,* activities performed for safe or effective leafy green storage) as well as activities performed as a practical necessity for leafy green distribution (such as blending and breaking down pallets) but does not include activities that transform the raw commodity into a processed food. |
| **HYDROPONIC** | The growing of plants in nutrient solutions with or without an inert medium (as soil) to provide mechanical support. |
| **INDICATOR MICROORGANISMS** | An organism that when present suggests the possibility of contamination or under processing. |
| **IRRIGATION WATER TREATMENT** | Any system used to treat agricultural water, so it makes the quality adequate for its intended use |
| **KNOWN OR REASONABLY FORESEEABLE HAZARD** | Known or reasonably foreseeable hazard means a biological, chemical, and physical hazard that is known to be, or has the potential to be, associated with the farm or the food. |
| **LEAFY GREENS** | Iceberg lettuce, romaine lettuce, green leaf lettuce, red leaf lettuce, butter lettuce, baby leaf lettuce (i.e., immature lettuce or leafy greens), escarole, endive, spring mix, spinach, cabbage (green, red and savoy), kale, arugula and chard. |
| **MANURE** | Animal excreta, alone or in combination with litter (such as straw and feathers used for animal bedding) for use as a soil amendment. |
| **MICROORGANISMS** | Yeasts, molds, bacteria, viruses, protozoa, and microscopic parasites and includes species having public health significance and those subjecting leafy greens to decomposition or that otherwise may cause leafy greens to be adulterated. |
| **MONITOR** | To conduct a planned sequence of observations or measurements to assess whether a process, point or procedure is under control and, when required, to produce an accurate record of the observation or measurement. |

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| **MONTHLY** | Because irrigation schedules and delivery of water is not always in a grower’s control “monthly” for purposes of water sampling means within 35 days of the previous sample. |
| **MOST PROBABLE NUMBER (MPN)** | Estimated values that are statistical in nature; a method for enumeration of microbes in a sample, particularly when present in small numbers. |
| **MUNICIPAL WATER** | Water that is processed and treated by a municipality to meet USEPA drinking water standards. |
| **NON-SYNTHETIC CROP TREATMENTS** | Any crop input that contains animal manure, an animal product, and/or an animal by-product that is reasonably likely to contain human pathogens. Includes agricultural or compost teas for the purposes of these guidelines. |
| **OPEN DELIVERY SYSTEM** | A water storage or conveyance system which is partially or fully open and unprotected such that water is exposed to the environment at any point from the water source to the point of use. |
| **PACKING** | Placing leafy greens into a container other than packaging them and also includes activities performed incidental to packing (*e.g.,* activities performed for the safe or effective packing of leafy greens (such as sorting, culling, grading, and weighing or conveying incidental to packing or repacking)). |
| **PARTS PER MILLION (PPM)** | Usually describes the concentration of something in water or soil; one particle of a given substance for every 999,999 other particles. |
| **PATHOGEN** | A disease-causing agent such as a virus, parasite, or bacteria. |
| **PEST** | Any objectionable animals or insects, including birds, rodents, flies, and larvae. |
| **POOLED WATER** | An accumulation of standing water; not free-flowing. |
| **POTABLE WATER** | Water that is safe to drink or to use for food preparation without risk of health problems. |
| **PROCESS AUTHORITY** | A regulatory body, person, or organization that has specific responsibility and knowledge regarding a particular process or method; these authorities publish standards, metrics, or guidance for these processes and/or methods. |
| **READY-TO-EAT (RTE) FOOD**  ***(EXCERPTED FROM USFDA 2005 MODEL FOOD CODE)*** | 1. "Ready-to-eat food" means FOOD that:    1. Is in a form that is edible without additional preparation to achieve FOOD safety, as specified under one of the following: 3-401.11(A) or (B), § 3-401.12, or § 3-402.11, or as specified in 3-401.11(C); or   (d) May receive additional preparation for palatability or aesthetic, epicurean, gastronomic, or culinary purposes.   1. "Ready-to-eat food" includes:    1. Raw fruits and vegetables that are washed as specified under § 3- 302.15;    2. Fruits and vegetables that are cooked for hot holding, as specified under § 3-401.13;   (e) Plant FOOD for which further washing, cooking, or other processing is not required for FOOD safety, and from which rinds, peels, husks, or shells, if naturally present are removed. |
| **RISK MITIGATION** | Actions to reduce the severity/impact of a risk. |

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| **SANITARY FACILITY** | Includes both toilet and hand-washing stations. |
| **SANITIZE** | To adequately treat cleaned surfaces by a process that is effective in destroying vegetative cells of microorganisms of public health significance, and in substantially reducing numbers of other undesirable microorganisms, but without adversely affecting the product or its safety for the consumer. |
| **SEDIMENT** | Undissolved organic and inorganic material transported or deposited by water. |
| **SHIGA-TOXIN PRODUCING *E. COLI*** | Bacteria found in the environment, foods, and animal and human intestines that produce a potent disease-causing toxin. The serogroup most commonly identified and associated with severe illness and hospitalization in the United States is *E. coli* O157; however, there are over 50 other serogroups that can also cause illness. |
| **SHIPPING UNIT/ EQUIPMENT** | Any cargo area used to transport leafy greens on the farm or from the farm to cooling, packing, or processing facilities. |
| **SOIL AMENDMENT** | Elements added to the soil, such as compost, peat moss, or fertilizer, to improve its capacity to support plant life. |
| **SURFACE WATER** | Water either stored or conveyed on the surface and open to the environment. (e.g. rivers, lakes, streams, reservoirs, etc.) |
| **SYNTHETIC CROP TREATMENTS (CHEMICAL FERTILIZERS)** | Any crop inputs that may be refined, and/or chemically synthesized and/or transformed through a chemical process (e.g. gypsum, lime, sulfur, potash, ammonium sulfate etc.). |
| **TOTAL COLIFORMS** | Total coliforms are a group of related bacteria that are (with few exceptions) not harmful to humans. This family of bacteria are found in soil and water. The EPA considers total coliforms to be a useful indicator of the possible presence of other pathogens for drinking water. Total coliforms are used to determine the adequacy of water treatment and the integrity of a water distribution system. |
| **TRANSPORTER** | The entity responsible for transporting product from the field; LGMA guidelines apply only to handlers and cover production through harvesting. |
| **ULTRAVIOLET INDEX (UV INDEX)** | A measure of the solar ultraviolet intensity at the Earth's surface; indicates the day's exposure to ultraviolet rays. The UV index is measured around noon for a one-hour period and rated on a scale of 0-15. |
| **VALIDATED PROCESS** | A process that has been demonstrated to be effective though a statistically based study, literature, or regulatory guidance. |
| **VALIDATION** | The act of determining whether products or services conform to meet specific requirements. |
| **VERIFICATION** | The act of confirming a product or service meets the requirements for which it was intended. |
| **VISITOR** | Any person (other than personnel) who enters your field/operations with your permission. |

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| **WATER DISTRIBUTION SYSTEM** | Distribution systems -- consisting of pipes, pumps, valves, storage tanks, reservoirs, meters, fittings, and other hydraulic appurtenances - to carry water from its primary source to a lettuce and leafy green crop. |
| **WATER SOURCE** | The location from which water originates; water sources can be municipal, well or surface water such as rivers, lakes, or streams. |
| **WATER TREATMENT** | Any process that improves the quality (safety) of the water to make it more acceptable for a specific end-use. |
| **WATER USE** | The method by which water is being used in the agricultural process. |
| **WELL** | An artificial excavation put down by any method for the purposes of withdrawing water from the underground aquifers. A bored, drilled, or driven shaft, or a dug hole whose depth is greater than the largest surface dimension and whose purpose is to reach underground water supplies |

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AOAC International (formerly the Association of Official Analytical Chemists)

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ACRONYMS AND ABBREVIATIONS

# CAFOs Concentrated animal feeding operations

CFU Colony forming units

cGMP Current good manufacturing practices

COA Certificate of analysis

# DL Detection limit

FDA Food and Drug Administration

FSMA Food Safety Modernization Act

GAPs Good agricultural practices

# GLPs Good laboratory practices

HACCP Hazard analysis critical control point

mL Milliliter

MPN Most probable number

# NRCS Natural Resources Conservation Service

PPM Parts per million

SOP Standard operating procedure

# SSOPs Sanitation standard operating procedures

STEC Shiga-toxin producing *E. coli*

TMECC Test methods for the examination of composting and compost US EPA

USDA United States Department of Agriculture

# US EPA United States Environmental Protection Agency

UV Ultraviolet

WHO World Health Organization

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| 1022 | The Best Practices for Formerly Flooded Production Ground Are: |
| 1023 | * Prior to replanting or soil testing, the designated food safety professional for the grower shall perform a |
| 1024 | detailed food safety assessment of the production field. This designated professional will be responsible for |
| 1025 | assessing the relative merits of testing versus observing the appropriate time interval for planting, and also will |
| 1026 | coordinate any soil testing plan with appropriate third-party consultants and/or laboratories that have |
| 1027 | experience in this type of testing. |
| 1028 | * Evaluate the source of flood waters (e.g., drainage canal, river, irrigation canal, etc.) for potential significant |
| 1029 | upstream contributors of human pathogens at levels that pose a significant threat to human health. |
| 1030 | * Allow soils to dry sufficiently and be reworked prior to planting subsequent crops on formerly flooded |
| 1031 | production ground. |
| 1032 | * Do not replant formerly flooded production ground for at least 60 days following the receding of floodwaters. |
| 1033 | This period or longer and active tillage of the soil provide additional protection against the survival of |
| 1034 | pathogenic organisms. |
| 1035 | * If flooding has occurred in the past on the property, soil clearance testing may be conducted prior to planting |
| 1036 | leafy greens. Soil testing may be used to shorten the clearance period to 30 days. If performed, testing must |
| 1037 | indicate soil levels of microorganisms lower than the standards for processed compost. Suitable representative |
| 1038 | samples should be collected for the entire area suspected to have been exposed to flooding. |
| 1039 | * Sample previously flooded soil for the presence of microorganisms of significant public health concern or |
| 1040 | appropriate indicator microorganisms. Microbial soil sampling can provide valuable information regarding |
| 1041 | relative risks; however, sampling by itself does not guarantee that crops grown within the formerly flooded |
| 1042 | production area will be free of the presence of human pathogens. |
| 1043 | * Evaluate the field history and crop selection on formerly flooded production ground. |
| 1044 | * Assess the time interval between the flooding event, crop planting, and crop harvest. Comparative soil samples |
| 1045 | may be utilized to assess relative risk if significant reductions in indicator microorganisms have occurred within |
| 1046 | this time interval. |
| 1047 | * Prevent cross-contamination by cleaning or sanitizing any equipment that may have contacted previously |
| 1048 | flooded soil (also see the section on Equipment Facilitated Cross-Contamination above). |
| 1049  1050 | 14. ISSUE: PRODUCTION LOCATIONS - CLIMATIC CONDITIONS AND  ENVIRONMENT |
| 1051 | Lettuce/leafy greens are grown in varying regions but generally in moderate weather conditions. Cool, humid |
| 1052 | conditions favor human pathogen persistence (Takeuchi and Frank 2000; Takeuchi et al. 2000) while drier climates |
| 1053 | may present other problems such as requirements for additional water that may increase the potential for |
| 1054 | introduction of human pathogens. Heavy rains in certain areas may also cause lettuce/leafy greens to be exposed |
| 1055 | to contaminated soil due to rain splashing. It is important to tailor practices and procedures designed to promote |
| 1056 | food safety to the unique environment in which each crop may be produced. |
| 1057 | The Best Practices Are: |
| 1058 | * Consider harvest practices such as removing soiled leaves, not harvesting soiled heads, etc., when excessive |
| 1059 | soil or mud builds up on lettuce/leafy greens. |

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| 1060 | The Best Practices for Environmental Source of Pathogens and Conditions and Environments: |
| 1061 | * Take care to reduce the potential for windborne soil, including soil from roads adjacent to fields, water, or |
| 1062 | other media that may be a source of contamination to come into direct contact with the edible portions of |
| 1063 | lettuce and leafy greens. Do not allow runoff from adjacent properties to come into contact with produce. |
| 1064 | * Evaluate and implement practices to reduce the potential for the introduction of pathogens into |
| 1065 | production blocks by wind or runoff. Such practices may include but are not limited to berms, windbreaks, |
| 1066 | diversions, ditches and vegetated filter strips. |
| 1067 | * Establish an SOP for production locations that have environmental source of pathogens (i.e. CAFO, dairy, |
| 1068 | hobby farm and manure or livestock compost facility) and the potential for contamination during weather |
| 1069 | conditions and events. |
| 1070 | * When soil has accumulated on plants, remove soil during the harvest or further processing. |

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Lettuce/leafy greens are generally grown in rural areas that may have adjacent wetlands, wildlands, parks and/or other areas where animals may be present. Some animal species are known to be potential carriers of various human pathogens (Fenlon 1985; Gorski et al. 2011; Jay et al. 2007; Keene et al. 1997; LeJeune et al.

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ISSUE: PRODUCTION LOCATIONS - ENCROACHMENT BY ANIMALS AND

URBAN SETTINGS

2008; Perz et al. 2001). In addition, extensive development in certain farming communities has also created situations with urban encroachment and unintentional access by domestic animals and/or livestock which may also pose varying degrees of risk. Finally, it is possible that some land uses may be of greater concern than others when located near production fields. Table 7 provides a list of these uses and recommended buffer distances.

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# The Best Practices Are:

* See Tables 6 and 7 and Decision Tree (Figure 9) for numerical criteria and guidance applicable to animal encroachment and adjacent land uses. The Technical Basis Document (Appendix B) describes the process used to develop these metrics.
* During the Environmental Assessments discussed in Section 3, the location of any adjacent land uses that are likely to present a food safety risk should be documented. In addition, as specified in Table 7, any deviations from the recommended buffer distances due to mitigation factors or increased risk should be documented.
* Evaluate and monitor animal activity in and proximate to lettuce/leafy greens fields and production environments. Conduct and document periodic monitoring and pre-season, pre-harvest, and harvest assessments. If animals present a probable risk (medium/high hazard), make particular efforts to reduce their access to lettuce and leafy green produce.
* Fencing, vegetation removal, and destruction of habitat may result in adverse impacts to the environment. Potential adverse impacts include loss of habitat to beneficial insects and pollinators; wildlife loss; increased discharges of sediment and other pollutants resulting from the loss of vegetative filtering; and increased air quality impacts if bare soil is exposed to wind. It is recommended that growers check for local, state, and federal laws and regulations that protect riparian habitat and wetland areas,

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restrict removal of vegetation or habitat, or regulate wildlife deterrence measures, including hazing, harassment, lethal and non-lethal removal, etc.

* Evaluate the risk to subsequent crop production or production acreage that has experienced recent postharvest grazing with or by domesticated animals that used field culls as a source of animal feed.
* Document any probable risk (medium/high hazard) during production and/or harvest periods and take appropriate corrective action per Table 7 in LGMA metrics.
* Locate production blocks to minimize potential access by animals and maximize distances to possible sources of microbial contamination. For example, consider the proximity to water (i.e., riparian areas), animal harborage, open range lands, non-contiguous blocks, urban centers, etc. Periodically monitor these factors and assess during pre-season and pre-harvest assessments as outlined in Tables 6 and 7. If the designated food safety professional deems that there is the potential for microbial contamination from adjacent areas, a risk assessment shall be performed to determine the risk level as well as to evaluate potential strategies to control or reduce the introduction of human pathogens.
* DO NOT harvest areas of fields where unusually heavy activity by animals has occurred (see Figure 9 Decision Tree).
* If animal intrusions are common on a particular production field, consider fencing, barriers, noisemakers, and other practices that may reduce intrusions.
* Train harvest employees to recognize and report evidence (e.g., feces) of animal activity.
* Pooled water (e.g., a seasonal lake) from rainfall may attract animals and should be considered as part of any land use evaluation.
* Consider controlling risks associated with encroachment by urban development. Risks may include, but are not limited to, domestic animal fecal contamination of production fields and harvest equipment and septic tank leaching.
* After a significant event (such as flooding or an earthquake) that could negatively impact a sewage or septic system, takes appropriate steps to ensure that sewage and septic systems continue to operate in a manner that does not contaminate produce, food-contact surfaces, areas used for produce handling, water sources, or water distribution systems.
* Growers are encouraged to contact the relevant agencies (e.g., the Regional Water Quality Control Board and state and federal fish and wildlife agencies) to confirm the details of these requirements. In addition, growers may wish to consult with local USDA Natural Resources Conservation Service (NRCS) staff to evaluate the food safety risks associated with wildlife, livestock, domestic animals and other adjacent land uses and to develop and document strategies to manage or reduce the introduction of human pathogens for each production block.

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FIGURE 9. PRE-HARVEST and HARVEST Assessment – Animal Hazard/Fecal Matter Decision Tree

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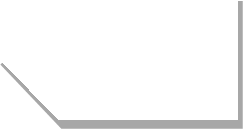
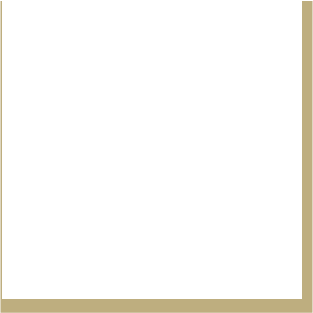
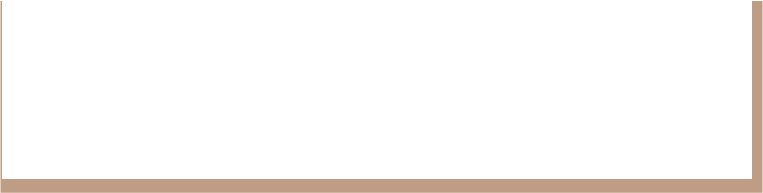
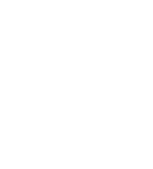
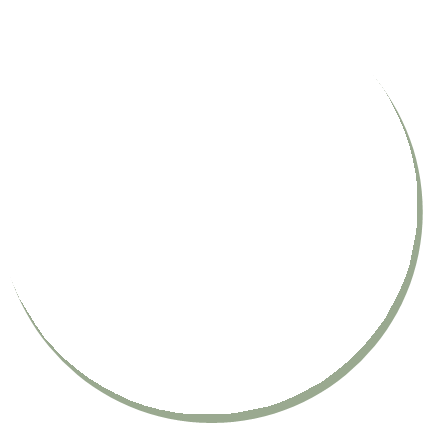
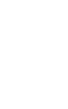
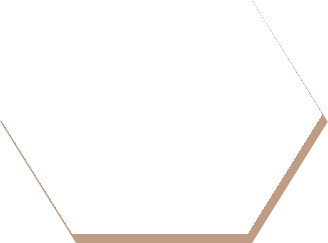
**INDICATIONS OF ANIMAL HAZARD MAY INCLUDE**

feeding, skin, feathers, or other signs of animals – present in area to be harvested – in sufficient number and quantity – so as to suggest to a reasonable person that crop may be contaminated.

**ASSESS HAZARD AND POTENTIAL RISK**

**PROCEED**

**WITH HARVEST**



**CONSIDERATIONS IN ASSESSING POTENTIAL HAZARDS AND RISKS**

**Associated with Animal Activity in the Field (domestic, wild):**

* Volume and concentration of fecal material in the field and production area
* Frequency of animal sightings and sign

(e.g., tracks, scat, rubbing, animal damage to crop).

* Animal species likely to aggregate (e.g., flocks and herds) and produce concentrated areas of fecal material and incidental contact with the crop.
* Potential for animals, pests, rodents and birds as a risk source to transport pathogens from a high-risk source (e.g., CAFO, garbage dump, sewage treatment facility) to the field.
* Species with seasonal migrations that result in increased population density and potential for activity in the field.

**MEDIUM-HIGH HAZARD PROBABLE RISK**

**STOP HARVEST**

**LOW HAZARD NEGLIGIBLE RISK**

**TAKE CORRECTIVE ACTION PER SOP**

Document or Record

**BUFFER AFFECTED AREA**

**Take Corrective Action per LGMA**

Address hazard and reduce negligible risk in accordance with company SOP

Document or Record

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**IF AREA CANNOT BE EFFECTIVELY BUFFERED DO NOT HARVEST**

Document or Record

**DO NOT HARVEST WITHIN BUFFER**

## AREA OUTSIDE SAFE BUFFER

If necessary, consult with state and regional experts (see Appendix Z) to develop co-management strategies to prevent recurrence.

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TABLE 6. Animal Hazard in Field (Wild or Domestic)

When evidence of animal intrusion in a production block occurs.

|  |  |  |
| --- | --- | --- |
| **Issue** | **Metric** | **Remedial Actions** |
| **Evidence of Intrusion** | Frequency   * There shall be a periodic monitoring plan in place for production fields. | * If there is evidence of intrusion by animals, the production block must undergo a detailed food safety assessment by appropriately trained food safety personnel (see Glossary) prior to harvest, as defined in the text of this document. * Animal intrusion events shall be categorized as low or medium/high hazard. An example of a low hazard might be a sign of animal intrusion into the leafy green production area by a single small animal or solitary bird with minimal to no fecal deposition. * Corrective actions for “Low hazard” animal intrusion shall be carried out according to company SOP. * Corrective actions for “medium/high hazard” animal intrusion shall be carried out per the accepted LGMA metrics and must include food safety buffers and do not harvest areas. * In developing preventive remedial and corrective actions, consider consulting with wildlife and/or domestic animal experts as appropriate. * If remedial actions, such as appropriate no harvest buffers, cannot be formulated to control or eliminate the identified risk, do not harvest and instead destroy the contaminated crop. * Equipment used to destroy crop must be cleaned and sanitized upon exiting the field. * Formulate effective corrective actions. Prior to taking action that may affect natural resources, growers should check local, state and federal laws and regulations that protect riparian habitat and wetland areas, restrict removal of vegetation or habitat, or regulate wildlife deterrence measures, including hazing, harassment, lethal and non- lethal removal, etc. * Food safety assessments and corrective actions shall be documented and available for verification for a period of two years. |
|  | * There shall be Pre- Season, Pre- Harvest, and Harvest Assessments |
|  | Variables |
|  | * Physical observation of animals in the field |
|  | * Downed fences |
|  | * Animal tracks in production block |
|  | * Animal feces or urine in production block |
|  | * Damaged or eaten plants in production block |
| **Allowable Harvest Distance from Evidence of Intrusion** | | |
| **Please see Figure 9. Decision Tree for Conducting Pre-Harvest and Harvest Assessments.**  Monitoring   * Conduct periodic monitoring and pre-season, pre-harvest, and harvest assessments. Evaluate and monitor animal activity in and proximate to lettuce/leafy greens fields and production environments.   Pre-Harvest Assessment and Daily Harvest Assessment:   * Conduct the pre-harvest assessment not more than one week prior to harvest. * Conduct the daily harvest assessment on each day of harvest. Fecal Material | | |

|  |  |  |
| --- | --- | --- |
| **Issue** | **Metric** | **Remedial Actions** |
| * Do not harvest any produce that has come into direct contact with fecal material. * If evidence of fecal material is found, conduct a food safety assessment using qualified personnel. Do not harvest any crop found within a minimum 5-foot radius buffer distance from the spot of the contamination unless remedial action can be found that adequately control the risk. The food safety professional can increase this buffer distance if deemed appropriate.   Intrusion   * If evidence of animal intrusion is found in a production field, conduct a visual food safety assessment to determine whether the intrusion is a probable (medium/high hazard) or negligible (low hazard) risk. Low hazard (negligible risk) can be corrected by following a company SOP. Medium to high hazard (probable risk) intrusion should include a three-foot buffer radius around a do not-harvest area where the impacted crop has been isolated.   Daily Harvest Assessment ONLY  If evidence of medium/high hazard risk animal intrusion into the production block is not discovered until harvest operations:   * Stop harvest operations. * Initiate an intensified block assessment for evidence of further contamination and take appropriate actions per the aforementioned actions. * If evidence of intrusion is discovered during production block harvest operations and the harvest rig has been potentially contaminated by contaminated product or feces, clean and sanitize the equipment before resuming harvest operations. * Require all employees to wash and sanitize their hands/gloves before resuming harvest operations. * If contamination is discovered in harvest containers such as bins/totes, discard the product, and clean and sanitize the container before reuse. | | |
| **Verification** | | |
| * Archive documentation for a period of two years following the intrusion event. Documentation may include photographs, sketched maps, or other means of delineating affected portions of production fields. | | |
| **Rationale** | | |
| * The basis of these metrics is qualitative assessment of the relative risk from a variety of intrusions. Some animal feces and some signs of intrusion (feces vs. tracks) are considered to be of more concern than others. Because it is difficult to develop quantitative metrics for these types of risks, a food safety assessment is considered appropriate for this issue. * Individual companies need to make the determination as to the level of hazard after considering the following risk factors: the concentration and volume of fecal matter, frequency of animals (observed or indicators) in the field, density of animal population and surrounding area risk – all identified during a risk assessment. A trained food safety professional should be involved in decisions related to animal intrusion. See Appendix B for more details on the qualifications for this person. * Appendix B describes in detail the process used to develop these metrics | | |

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# TABLE 7. Crop Land and Water Source Adjacent Land Use

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Land Use/Water Source** | **Metric**  **(This distance may be either increased or decreased depending on risk and mitigation factors.)** | **Considerations for Risk Analysis\*** | | |
| **Risk/Mitigation Factors** | **Increase Distance** | **Decrease Distance** |
| **Composting Operations** (manure or animal products) | Due to the lack of science at this time an interim guidance distance of 400 ft. from the edge of crop can occur. This number is only a reference and subject to change as more science becomes available.  The proximate safe distance depends on the risk/mitigation factors listed to the right. Evaluate risk and document consideration of these factors. Research is being proposed to study appropriate distance. | Distance from active compost operation | -- | -- |
| Topography: Uphill from crop | √ |  |
| Topography: Downhill from crop |  | √ |
| Opportunity for water run off through or from composting operations | √ |  |
| Opportunity for soil leaching | √ |  |
| Presence of physical barriers such as windbreaks, diversion ditches, vegetative strips |  |  |
| **Concentrated Animal Feeding Operations**  (as defined in 40 CFR 122.23) | Distance from a CAFO is not sufficient to address/manage all potential hazards that may be associated with growing leafy greens in proximity to a CAFO. Due to the lack of science at this time interim guidance distances from the edge of a CAFO are established as follows:  >1000 head – 1200 feet  >80,000 head – 1 mile  These numbers are only references and subject to change as science becomes available. The proximate safe distance depends on many risk mitigation factors. These distances may increase or decrease after assessing the risk, determining and deploying mitigation measures and consulting with customers. | Fencing and other physical barriers such as berms, diversion ditches and vegetated strips can be employed to prevent intrusion of domestic animals, control runoff, etc. |  | √ |
| Topography: Uphill from crop | √ |  |
| Topography: Downhill from crop |  | √ |
| Opportunity for water run off through or from CAFOs | √ |  |
| Opportunity for soil leaching |  |  |
| Manure Management Program utilized |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Land Use/Water Source** | **Metric**  **(This distance may be either increased or decreased depending on risk and mitigation factors.)** | **Considerations for Risk Analysis\*** | | |
| **Risk/Mitigation Factors** | **Increase Distance** | **Decrease Distance** |
| **Non-synthetic**  **Soil Amendment Pile** (containing manure or animal products) | Due to the lack of science at this time, an interim guidance distance of 400 ft. from the edge of crop can occur. This number is only a reference and subject to change as science becomes available.  The proximate safe distance depends on the risk/mitigation factors listed to the right. Evaluate risk and document consideration of these factors. Research is being proposed to study appropriate distance.  For non-synthetic crop treatments that have been heat treated using a validated process an interim guidance distance of 30 feet from the edge of the  crop is proposed | Access and review COA for materials in question |  | √ |
| Topography: Uphill from crop | √ |  |
| Topography: Downhill from crop |  | √ |
| Opportunity for water run off through or from CAFOs | √ |  |
| Opportunity for soil leaching | √ |  |
| Manure Management Program utilized |  | √ |
| Covering on pile to prevent wind dispersion |  | √ |
| **Grazing Lands/Domestic Animals** (includes homes with hobby farms, and non-commercial livestock) | 30 ft. from the edge of crop. | Fencing and other physical barriers such as berms, diversion ditches and vegetated strips can be employed to prevent intrusion of domestic animals, control runoff, etc. |  | √ |
| Topography: Uphill from crop | √ |  |
| Topography: Downhill from crop |  | √ |
| Opportunity for water run off through or from grazing lands | √ |  |
| Opportunity for soil leaching | √ |  |
| **Homes or other building with a septic leach field** | 30 ft. from the edge of crop to the leach field. | Active leach field: < 10 yrs old |  | √ |
| Active leach field: > 25 yrs old | √ |  |
| Inactive leach field |  | √ |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Land Use/Water Source** | **Metric**  **(This distance may be either increased or decreased depending on risk and mitigation factors.)** | **Considerations for Risk Analysis\*** | | |
| **Risk/Mitigation Factors** | **Increase Distance** | **Decrease Distance** |
|  |  | Topography: Uphill from crop | √ |  |
| Topography: Downhill from crop |  | √ |
| Physical barriers |  | √ |
| **Well Head Distance from Untreated Manure** | 200 ft. separation of untreated manure from wells, although less distance may be sufficient. | Topography: Uphill from manure |  | √ |
| Topography: Downhill from manure | √ |  |
| Opportunity for water runoff from or through untreated manure to well head | √ |  |
| Opportunity for soil leaching | √ |  |
| Presence of physical barriers such as windbreaks, diversion ditches, vegetative strips |  | √ |
| **Surface Water Distance from Untreated Manure** | At least 100 feet separation for sandy soil and 200 feet separation for loamy or clay soil (slope less than 6%; increase distance to 300 feet if slope greater than 6%) is recommended. | Topography: Uphill from manure |  | √ |
| Topography: Downhill from manure | √ |  |
| Opportunity for water runoff from or through untreated manure to surface waters. | √ |  |
| Opportunity for soil leaching | √ |  |
| Presence of physical barriers such as windbreaks, diversion ditches, vegetative strips |  | √ |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Land Use/Water Source** | **Metric**  **(This distance may be either increased or decreased depending on risk and mitigation factors.)** | **Considerations for Risk Analysis\*** | | |
| **Risk/Mitigation Factors** | **Increase Distance** | **Decrease Distance** |
| **Rationale** | The bases for these distances above is best professional judgment of authors, contributors, and expert reviewers to prevent potential cross-contamination from adjacent land uses, taking into consideration the 200 foot distance cited in FDA (US FDA 2001) for separation of manure from wellheads and the 30 foot turn-around distance for production equipment. Because of the numerous factors that must be taken into account to determine appropriate distances, a qualitative assessment of the relative risk from various types of land use and surface waters was used to determine appropriate distances. | | | |

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Growers should check for local, state and federal laws and regulations that protect riparian habitat, restrict removal of vegetation or habitat, or restrict construction of wildlife deterrent fences in riparian areas or wildlife corridors. Growers may want to contact the relevant agencies (e.g., the Regional Water Quality Control Board and state and federal fish and wildlife agencies) to confirm the details of these requirements.