

Post-Flood Soil Sampling Guidance

This table is supplied as guidance for taking soil samples for microbial testing prior to replanting after a flooding event. The sampling protocol outlined below is provided as an example. **NOTE: Protocol specifics may vary depending on site-specific conditions and laboratory requirements. Please check with your laboratory prior to gathering the sample as the number and weight of samples may vary based on the size of the production block that was flooded and laboratory-specific testing methods** (AOAC certified/approved technologies are preferred).¹

Sampling Protocol ²	Measurement Criteria	Remedial Actions	Timeline
<ul style="list-style-type: none"> Collect soil samples from various locations in the potentially contaminated area to assure a representative sample. A map of the flooded field that identifies the sampling locations is recommended. At a minimum, collect no less than 5 individual samples per acre (e.g. soil cores or scooped soil). Individual samples can be combined into a composite sample of at least 500 grams (with a maximum of 5 acres per composite sample). The following two methods provide examples of how to collect samples: <ul style="list-style-type: none"> Take soil cores to a depth of 15 cm. Composite five cores per location into one sterile polyethylene bag. Using a sterile scoop, remove top 2-3 cm x 2-3 cm of surface soil from a bed (seed-bed or prepared planting row) or furrow at five locations. Composite per location into one sterile polyethylene bag 	<ul style="list-style-type: none"> <i>Salmonella</i> spp.: Negative or < DL (<1/ 30 grams) Enterohemorrhagic <i>E. coli</i> (EHEC) or Shiga toxin-producing <i>E. coli</i> (STEC): Negative or < DL (<1/ 30 grams) If EHEC/STEC test result is positive, confirm presence of pathogens with further testing.⁴ <p>If conducting a comparative analysis:³</p> <ul style="list-style-type: none"> Fecal coliforms:⁵ a significant difference between flooded and non-flooded field(s) 	<ul style="list-style-type: none"> If test result for any one pathogen is positive, wait 2 weeks and retest for the same pathogen. If initial testing was quantitative and the pathogen levels were near the lower limits of the measurement criteria, than a shorter interval for retesting may be warranted. Soil preparation such as aerating, tilling, disking, etc. helps to reduce the survival of pathogenic organisms. All equipment utilized to till contaminated soil should be cleaned and sanitized upon exiting the field. 	<p>If test results for pathogens are negative, replant after a minimum of 30 days. The 30-day interval should commence after flood waters have receded to the point where they are not visible in the areas that are to be planted and the soil should be at a moisture level at which the grower can get equipment in to the field for preparation or soil moisture test results are in the normal range for that particular field.⁶</p>

¹ Currently no methods for detecting EHEC/STEC in soil are AOAC-approved.

² From an unpublished protocol from the Suslow Lab, UC Davis.

³ Because the levels and composition of the microbial community in soil often varies widely and “normal” levels, generally speaking, are difficult to define, comparative soil analysis may be useful in evaluating food safety risks related to a flooding event. An optimal comparison would be microbial test results of soil taken concurrently from flooded and non-flooded areas of the same field. Alternatively, post-flooding soil microbial testing results could be compared with 1) pre-flooding soil test results if microbial testing was conducted on the field in the past or 2) concurrent microbial test results from a nearby non-flooded field that has the same soil type and was managed similarly to the flooded field.

⁴ Because PCR methods may result in false positives or the detection of non-viable organisms, confirming the presence of EHEC/STEC by culturing is recommended.

⁵ Incubation temperature specific for fecal coliforms (also known as thermotolerant coliforms) is 42-44°C; commonly used lower incubation temperatures (e.g. 35°C) provide results for total coliforms.

⁶ Methods typically used by growers to determine soil moisture content include, but are not limited to, tensiometers, electric resistance blocks, oven drying analysis, or other methods that are measurable and repeatable.

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<ul style="list-style-type: none"> • If doing a comparative soil analysis, also collect from appropriate non-flooded areas. ³ • Although working in a non-sterile outdoor environment, reasonable aseptic sample collection techniques should be utilized if taking samples from different fields (i.e. change gloves, use different collection devices or clean devices thoroughly between fields). • Double-bagging of samples is preferred. This practice protects the sample integrity if the bag is damaged and against potential cross-contamination between samples from soil on the first sample bag's lip or exterior. • Samples should be stored on ice during transport and/or shipping to laboratory. 		<ul style="list-style-type: none"> • Observe appropriate turn-around buffer zones when using vehicles and equipment in close proximity to uncontaminated areas. 	

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