

# 2013 Flood FAQs from CSU Extension

November 13, 2013, v10



## Use of this document

- 1) Two client groups were identified: Urban/Suburban (p. 1 – 3) and Ag/Small Acreage (p. 4 – 9).
- 2) Please contact your local CSU Extension office for specifics on the FAQ's below
- 3) Find your local Extension office at: <https://extension.colostate.edu/staff-directory/>
- 4) Find additional CSU Extension flood resources at: <https://extension.colostate.edu/disaster-web-sites/flood-recovery-resources/>



## Urban/Suburban Clients

Includes community gardens, communal gardens (smaller than 1-acre), landscapes, home vegetable gardens, golf courses, parks, playgrounds, ballfields, HOA common space, corporate campuses, etc. Impacts are from river flood water and/or non-river storm water flooding, ponding of water in gardens, against building foundations, on impermeable surfaces.

- 1) Should routine soil testing be considered (i.e. sending a sample to our CSU lab...not a pollutant lab)? And the pros/cons of this recommendation. When, if ever, should this be done--now or in the spring/summer? *(CSU Soil testing lab offering \$25 for heavy metals testing thru Dec 1 for those impacted by the flood. Write FLOOD on sample reporting)*
  - a) **ANSWER:** Routine soil testing for gardens and urban landscapes is recommended to assess changes to soil fertility due to nutrient deposition or runoff losses. In addition, any changes to salts (EC, electrical conductivity) or pH would be determined through routine testing. It is important to be aware, however, of the limitations of routine soil testing. Pollutants are not determined through routine testing, and a false sense of safety could result. Sampling could be done this fall or in the Spring; however, if you suspect that raw sewage has contaminated your property, it may be better to delay until Spring.
- 2) Likelihood of soil contamination, short and long term.
  - a) **ANSWER:** Overall, the likelihood of soil contamination with organic contaminants or heavy metals is low. However, if you are aware of specific concerns in your local area, additional analysis may be warranted. For example, if you are in the proximity of a mine tailings site, you may want to consider heavy metal analysis. If you're in the vicinity of a significant source of hydrocarbons, such as an oil or gas production or storage facility, testing for these types of organic compounds may be warranted. However, if you suspect an oil spill from an existing oil or

Created by a collaborative team of CSU faculty and staff September and October 2013.  
Questions recruited from field staff. Process facilitated by Adrian Card.

gas production or storage sites, contact the Colorado Oil and Gas Conservation Commission at 888-235-1101 or send an email to [DNR\\_FloodInfo@state.co.us](mailto:DNR_FloodInfo@state.co.us). They will need:

1. Your Name and Phone Number.
2. Location of the Concern (e.g nearest crossroads, section, township, range).
3. Describe your concern (tanks, wells, pipelines, etc.).
4. If you have pictures, please attach them to your email.

(see also <http://cogcc.state.co.us/>)

- 3) Testing mechanisms for the soil to determine pollutants.
  - a) **ANSWER:** Samples can be analyzed for heavy metals at the CSU Soil Testing Lab (970-491-5061). Laboratories for organic compound analysis (such as pesticides, herbicides, gasoline, and diesel fuel) can be identified using CSU's Extension factsheet 0.520 Selecting an Analytical Laboratory (<http://www.ext.colostate.edu/pubs/crops/00520.html>). CDPHE has a pesticide package for \$200 for the most common herbicides and pesticides. For pathogen analysis, contact CSU's Environmental Quality Lab (970-491-4837). The Colorado Department of Public Health and Environment is not accepting soil samples from the general public for microbial testing.
- 4) Potential for bio-uptake of the pollutants by plants, especially vegetables, perennial vegetables.
  - a) **ANSWER:** This time of the year, it is unlikely that vegetables would take up these pollutants to any extent. If you are concerned about this, soil sample in the Spring prior to planting to verify the concentrations of any suspected pollutants.
- 5) Remediation of the soil in vegetable gardens, playgrounds where small children play (child care businesses, home child care provider play areas. Sandboxes, children's gardens, etc.). How long will it take for photodegradation of contaminants?
  - a) **ANSWER:** If you suspect contamination of a site from sewage or other contaminants, contact your local health department to find out to what extent the playground of concern was impacted. The Colorado Department of Public Health and the Environment offers the following advice to handling flood deposited sediment:

#### Mud, Soil and Sediment

- 1) It is important to remember that current sediments are a result of redistribution of soil and sediment.
- 2) To this point, there have been few reported spills of hazardous materials that have been known to enter flood waters.
- 3) Most flooded areas do not have soil that typically has elevated levels of chemicals or heavy metals.

Created by a collaborative team of CSU faculty and staff September and October 2013.  
Questions recruited from field staff. Process facilitated by Adrian Card.

- 4) Some of the flood water that carried the sediment may have been contaminated with sewage that does contain bacterial, viral and parasitic pathogens. However, this risk can be minimized by avoiding contact with the sediment or appropriate hand washing after contact.
- 5) To further minimize risk, we recommend that remaining sediments be spread out and allowed to dry fully in the sunlight, which will further reduce the concentrations of pathogens in the sediment.
- 6) Individuals working with the sediment in a way that generates visible dust should consider wearing an N95 respirator as an additional precaution and make sure they wash their hands with soap and water.
- 7) If you have concerns about the sediment, it can be discarded as solid waste. Soil that is comingled with other visible waste or that is visibly stained should be discarded. Objectionable odors may or may not indicate presence of pathogens. When in doubt, throw it out.

After receiving the analysis of your soil, so you know what specific contaminants are present and at what concentrations, consult with an expert regarding remediation and degradation. If you suspect a site to be contaminated with raw sewage and/or other health-threatening contaminants, avoid the site until the site can be assessed by an expert. Most pathogens will die-off during the winter months; therefore, waiting until spring of 2014 for evaluation may be the best course of action.

- 6) Time frames for soil recovery. In other words, can we sketch out a generalized plan that outlines X-number of days for sediment to lay exposed to sunlight UV. Then waiting X-number of months after incorporation and additions of compost or composted manure before planting vegetables into that area.
  - a) **ANSWER:** Each site will be specific and hard to generalize for soil recovery. This depends on whether the contaminant is pathogens, pesticides, hydrocarbons, or heavy metals.

## Ag/Small Acreage Clients

- Flood waters direct erosion of riparian soils
- Deposition of sediments, gravel, rocks and debris onto pastures and annual crop fields
- Water logged soils (flooding or heavy rainfall)
- Flood water contaminants into fields, irrigation ponds and wells

## Food and Feed crops contamination

1) Can food and feed crops be harvested if contacted with flood waters?

- a) **ANSWER:** If the edible portion has come in contact with flood waters they are considered adulterated and cannot enter the human or animal food supply per the FDA. September 19, 2013 a CSU Extension tip sheet was developed that integrated FDA guidance and factsheets from other states regarding produce safety.

<http://www.fda.gov/food/guidanceregulation/guidancedocumentsregulatoryinformation/emergencyresponse/ucm287808.htm#eval>

<http://ohioline.osu.edu/anr-fact/pdf/0027.pdf>

<http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-963/FAPC-116web.pdf>

2) Are there bioaccumulation concerns for food and feed crops?

- a) **ANSWER:** See #4 under “Urban/Suburban Clients”

3) In follow up to the plant uptake question, what type of waiting period would be in effect before any harvest of crops could occur? Or grazing occurrence?

- a) **ANSWER:** No one can say absolutely when it is safe to return livestock to grazing the flooded fields so common sense must be the guide. The fields should be dry. Flood debris should be removed and fences repaired. Old growth should be mowed to minimize exposure to molds. New growth should be underway and in the fall at this time of year, preferably dormant. Rule of thumb is that 30 days of sunshine will “cook” pathogens left from the floodwaters. Supplemental feed should be provided if necessary so that animals do not overgraze the new growth nor turn to grazing poisonous plants.

4) Any potential hazards from grazing residues that may still have contaminants on them? Shouldn't be grazing for at least a month but what about winter months?

- a) **ANSWER:** It is impossible to make a blanket prediction of what type of contaminants maybe in the flooded fields. Take note of potential contaminant sites in your area that might have spilled into the floodwaters. Watch livestock for any signs of disease and have a veterinarian examine them if a problem is noticed. Contact CSU Veterinary Extension (970-217-2051) or Dr Charlie Davis, case coordinator at CSU Diagnostic Laboratory 970-297-0370. [charlie.davis@colostate.edu](mailto:charlie.davis@colostate.edu) for further assistance.

Fields should be prepared as described above. Grazing recommendations are discussed above.

Created by a collaborative team of CSU faculty and staff September and October 2013.  
Questions recruited from field staff. Process facilitated by Adrian Card.

5) What about the potential for a livestock disease spread or increase post flood (the extreme case is anthrax)?

a) **ANSWER:**

Livestock health issues of which to be aware can be divided into these general categories.

**Animal and debris displacement immediately after the flood: (Rattlesnakes, Rabies, and Lacerations)** Rattlesnakes will be displaced in a large-scale flood. They float/swim along with the debris and are looking for a dry location. When you are evaluating livestock for injuries, consider the potential of snakebites. Wildlife are also displaced by the floods. With the increase in incidence of rabies in Colorado especially along the Front Range, rabies should be suspected in any mammal that displays unusual behavior. Debris from the flood has been dumped all over pastures. Livestock should be examined for lacerations and puncture wounds.

**Infections associated with prolonged exposure to flood waters: (Foot Rot, Mastitis, Skin Infections)** Skin infections are common on the legs and body of livestock that are in water or muddy conditions for an extended period of time. Horses are especially prone to skin infections on their legs that can become very serious. All livestock may develop softening of the hooves, foot rot and foot abscesses and females wading in muddy flood waters or lying in mud are prone to develop mastitis.

**Spore associated Diseases: (Anthrax, Blackleg, Tetanus, Malignant Edema, Botulism)**

Occurrence of spore-associated diseases have a tendency to rise following floods. The spore bacterium are pulled from the soil and spread with the floodwaters. As the water recedes, animals are exposed to spores through ingestion, inhalation, or via wounds. Your veterinarian should examine any animal that dies after return to a flooded pasture but especially if anthrax is suspected. Anthrax maybe very serious (even lethal) in people. Horses and poultry are the most susceptible animals to Botulism. Birds can be exposed when scavenging on rotten vegetables or decaying carcasses and horses by drinking stagnant flood waters or eating spoiled feeds. The general rule of thumb is to allow thirty or more days of sun to “cook” pathogens before turning livestock on to the flood impacted land.

**Disease Transmission Between Livestock:** During floods livestock are often moved into crowded, dry places and may mix with other herds. This stress, along with a lack of clean water and dry, good quality feed make these animals more susceptible to an array of infectious diseases. Keep a close eye on your animals and have a veterinarian examine them at the first sign of disease.

**Facility related diseases:** During recovery from floods it is often necessary to house animals in places that are not adequately dried up and cleaned out. This is understandable but keep a watchful eye for signs of disease. Molds in the feed and in confined barns can cause illness in all species. Wet feeds and wet litter following a flood can also lead to brooder pneumonia among poultry. Swine and turkeys should be vaccinated against Erysipelas before returning to a barn that has previously been flooded.

Created by a collaborative team of CSU faculty and staff September and October 2013.

Questions recruited from field staff. Process facilitated by Adrian Card.

**Insect-borne Diseases (West Nile, Vesicular Stomatitis, Encephalitis):** When floods occur at certain times of year, the standing water and warm temperatures will result in an increase in biting flies and mosquitoes and possible increase in these diseases. However, in the September 2013 flood researchers predicted that the incidence of WNV would not increase because of the life cycle stage of the mosquito vector.

Caring for Livestock after Disaster:

<http://www.ext.colostate.edu/pubs/livestk/01816.html>

Flood Related Diseases in Poultry and Livestock. The Disaster Handbook University of Florida  
<http://disaster.ifas.ufl.edu/chap6fr.htm>

- 6) Produce crop residues: do flood contaminated crop residues need to be removed from the field or can they be disked/plowed under? Can they be composted?
  - a) **ANSWER:** For most situations, crop residues should be tilled into the soil and allowed to decompose in place. If desired, they can also be removed and composted. For crops where the edible portion has come into contact with flood waters, see #1 above in this section.

### **Soils contamination**

*(CSU Soil testing lab offering \$25 for heavy metals testing thru Dec 1 for those impacted by the flood. Write FLOOD on sample reporting)*

- 7) How can we assess what we should be testing for outside of routine soil macro and micro-nutrient analysis? Pesticides, hydrocarbons, etc.
  - a) **ANSWER:** In most situations, recent water sampling results suggest additional testing beyond the routine soil nutrients assessed in Colorado is not warranted at this time. The advice given above in #1 for Urban areas applies to agricultural soils. Producers in low lying areas and with heavy or poorly draining soil, may want to have soils analyzed for soil salinity parameters such as pH electrical conductivity (EC) and basic cations.
- 8) What are the protocols for pulling soil cores if environmental soil testing?
  - a) **ANSWER:** Check with the laboratory you plan to use, because different analyses require different sampling protocols, and sometimes environmental labs prefer to pull the samples themselves. Areas of deposition should be sampled separately from areas of scouring. That may help you to decide whether to move soil around or whether to fertilize different parts of the field differently. For most situations, a routine agronomic soil fertility package is sufficient. Additional testing for soil salinity parameters may be useful, especially for poorly draining soils, sites with past high soil salinity, and/or if growing salt sensitive crops.

Created by a collaborative team of CSU faculty and staff September and October 2013.  
Questions recruited from field staff. Process facilitated by Adrian Card.

9) What soil testing would be advisable for 2014?

- a) **ANSWER:** A general routine analysis is advisable. See answers to 7 and 8. Many hydrocarbons and pesticides will have degraded between fall 2013 and spring 2014. Sampling for nitrate at deeper soil depths (deeper than 12 inches) may be advised for field with heavy rain or standing water. If pesticides test is requested, testing for a specific pesticide is advised.

### **Soils Erosion and deposition**

10) When erosion removes prime topsoil from high value fields, can similar texture soil be trucked in to fill in areas and blend on margins with existing soil?

- a) **ANSWER:** In most cases, replacing topsoil from external sources would be prohibitively costly and difficult. It may be more economically feasible to amend eroded soils with compost or manure to restore lost productivity. An exception might be surface-irrigated (furrow/flood) fields where the grade has been seriously eroded and this erosion may affect proper water flow. In these situations, contact your local USDA Natural Resources Conservation Service (NRCS) to assess the field grade. If replacing soil is an economically feasible solution in your specific situation, then be sure to test the topsoil before it's purchased to verify its quality. Routine soil testing, especially for electrical conductivity (EC), is advisable.

11) When sand or gravel are deposited, when is action needed to mitigate from fields?

- a) **ANSWER:** The action needed is going to depend upon how much of the material is actually 'sand', which is classified as a soil material 0.05 – 2.0 mm in diameter as opposed to gravel, which is composed of particles >2.0 mm. Sand deposits are going to have less impact on soil properties than gravel. The course of action is also going to depend upon the soil type of the field where it is deposited. For deposits less than 2-3 inches deep, incorporation with normal tillage operations is likely the best course of action. Deposits of 3-8 inches will require deeper tillage such as ripping and deep incorporation to mix with a larger portion of the soil. However some soils will change their water holding capacity when this much sand is added and could affect long term productivity. Deeper amounts (>8 inches) should be spread out to 2-3 inches of depth to minimize long term soil productivity losses due to increased variability and changes in soil water holding capacity. Following mixing and incorporation, soil testing is advised to determine changes to fertility and texture. See also:

<http://efotg.sc.egov.usda.gov/references/public/IA/AgronomyTECHnote22.pdf>

## Irrigation water contamination

12) Does pond water that received ditch overflows from creeks/river need to be tested? If so, for what? What if positive test results?

- a) **ANSWER:** The actions to take for this scenario are extremely site specific and depend upon what crop the water is irrigating, how soon the water will be applied and the method of irrigation. Any water that is suspected of having been contaminated with raw sewage should be not be used in this growing season if it will have direct contact with food crops for human consumption. If you do decide to use water suspected of contamination, testing for E coli is advised and use the proposed FDA FSMA Ag Water guidelines  
<http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm334552.htm#E>

13) What testing would be advisable in 2014 for irrigation water?

- a) **ANSWER:** If the irrigation water source was likely impacted by flood waters, a routine irrigation water test would be advisable for 2014. Interpretations for irrigation, drinking and livestock water quality are found at: <https://erams.com/wqtool/> Additional tests for other potential contaminants are not advised unless specific, localized contamination is suspected.

## Pasture

14) Will the grass come back and through what depth of sediment deposition will it come back.

- a) **ANSWER:** As a general rule, if the sediment is less than 2 inches deep, most plants will be able to send up new tillers and shoots. As sediment depth increases above 2 inches, the greater the number of plants that will be smothered and die. Some of the rhizomatous species like western wheatgrass and prairie sandreed can probably send up new tillers through deeper depths of sediment (up to 4 or 5 inches).

15) Should I reseed?

- a) **ANSWER:** This will depend on sediment depth. If it is 2 inches or less, then I would recommend wait and see. As spring approaches (just prior to greenup), it may be helpful to break up the crust of the sediment by lightly disking, etc. If the sediment is deeper than 2 inches, I would suggest doing some land leveling/scraping this fall or early next spring to redistribute the sediment in a thin layer over more of the pasture/field area. For reseeding dryland pastures, I would suggest early next spring (March into early April). For irrigated pastures, you can reseed just prior to the start of irrigation (March through early May).

Created by a collaborative team of CSU faculty and staff September and October 2013.  
Questions recruited from field staff. Process facilitated by Adrian Card.



16) What should I do with all the sediment?

- a) **ANSWER:** See answers 11, 14, and 15 and if questions regarding contamination test first, then see answer to 7. Generally, till it in, move it or dispose of it.

17) What should I do with all the debris?

- a. **ANSWER:** Check with County representatives on disposal specifics.

18) On a native grass small acreage property, sediment from the Big Thompson River was deposited in feet, not inches. How much sediment should be removed prior to reseeding with native grasses?

- a. **ANSWER:** If you are going to remove it, then I would think it would be best to try and remove most of it. Leaving 2 inches or less would be what I would suggest. This could easily be disked and mixed with the underlying topsoil and then reseeded.

19) What should be done with the sediment left on a native pasture?

- b. **ANSWER:** If it is not too deep, I would suggest just spreading it out with some type of scraper or landleveler. If there is too much to spread, then it needs to be removed.

**Other Resources:**

Repairing Flood Damaged Fields. Technical Notes, Agronomy #22. USDA Soil Conservation Service, November, 1993. <http://efotg.sc.egov.usda.gov/references/public/IA/AgronomyTECHnote22.pdf>

Soil Testing Following Flooding, Overland Flow of Waste Waters and other Freshwater Related Disasters. T.L. Provin, S.E. Feagley, J.L. Pitt, M.L. McFarland. Texas Cooperative Extension SCS-2008-07 <http://varietytesting.tamu.edu/criticalinformation/Freshwater%20flooding%20soil%20testing%20issues.pdf>



**Colorado State University**  
**Extension**

Created by a collaborative team of CSU faculty and staff September and October 2013.  
Questions recruited from field staff. Process facilitated by Adrian Card.