

Crop, Livestock, Tree, and Pesticide Management Considerations - Tropical Storm and Hurricane Assessments

The following information addresses a range of field crops and horticultural commodities, and has been compiled by Extension Specialists in the Animal Science, Crop and Soil Sciences, and Horticultural Science departments. It is intended to guide management recommendations in the aftermath of tropical storms and hurricanes in North Carolina. If you have any questions, please reach out to the Extension Specialist(s) associated with each topic.

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EXTENSION

Agronomic Crops

Corn

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How can you cause further damage to a corn crop that has already been subjected to prolonged drought? You subject it to excessive rainfall such that the soil is saturated or, even worse, the field is flooded!! When it comes to the North Carolina corn crop there are two main problems associated with tropical storm Debby. First, is the increased likelihood of ear rot and kernel damage. For corn that was either already at physiological maturity (blacklayer) or that was past growth stage R4 (hard dough) the saturated soils or flooded fields resulted in root damage that will hasten maturity and desiccation of the green leaves remaining on the plant. While this hastened maturity will not hurt grain yield since the plant can rob the stalk of the energy it needs to finish grain fill, it will hurt ear and stalk quality. The result in corn at these late growth stages will be more ear rot and the likelihood of stalk lodging. Dr. Ahumada and I have put together an [extension bulletin](#) on assessing ear rots in damaged corn fields that growers should use to determine how ear rots are impacting their crop. Growers should use this information to determine if they should have the grain tested for mycotoxins and to plan a harvest strategy. The best management in these fields is to harvest as early as possible to prevent further damage from ear rot and to avoid stalk lodging.

The second problem associated with Debby comes in fields that were planted late (late May through early July) that were flooded. Corn that was underwater for over 72 hrs can not survive the lack of oxygen and will die. Corn that was partially flooded will suffer some leaf loss. For corn that was flooded the first thing to do is assess how much leaf area remains. If there is sufficient green leaf area then the plant has a chance to recover. In these situations growers should wait for seven days and then reassess the situation before making a hasty decision on whether or not to destroy the crop. The bottom line is that Debby added insult to injury such that the 2024 North Carolina corn crop has suffered significant damage.

Cotton

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The impacts of tropical weather on cotton is closely related to the time of year in which such weather occurs. A tropical storm in July or August can have a positive impact on cotton, and often minimal negative impact to cotton, aside from flooding or excessive moisture for a prolonged period of time. A tropical storm in September or October nearly always results in some degree of negative impact, depending on severity of wind/rains

- A tropical storm in June or July can result in nitrogen losses if side-dressed nitrogen applications have been made. This can occur true on sandier soils with more leaching potential. Also nitrogen can be lost due to denitrification if the soil remains water-logged, especially in lower parts of the field.

- A tropical storm occurring in July or August can benefit cotton if soil moisture was insufficient or in a deficit prior to the storm. In many cases, rains come over a period of 1 to 3 days, and comes in bands, which can allow for better soil uptake, as long as rains aren't excessive. August is a critical time for boll development, therefore rains in August tend to have a significantly positive impact on yield IF soil moisture was in a deficit prior to the storm
- If rainfall is excessive, resulting from a tropical storm in August, lower lying areas along creeks or rivers are naturally prone to flooding. Flooded cotton for more than a day can result in loss of bolls due to rotting, or fruit shed of younger bolls if soils remain saturated to a point where no oxygen is available for roots
- A tropical storm in August can lead to high moisture conditions for longer periods of time than is desired. During August, cotton usually is tall with a dense canopy, and prolonged high moisture conditions can and often do lead to boll rot and/or leaf pathogens such as Target Spot. This is less of a problem if sunny and dry conditions quickly follow a storm, but is often made worse if cloudy or damp/rainy conditions continue following a storm. High winds (in excess of 30-40 mph) can result in lodged cotton. If bolls are in direct contact with foliage from windblown plants or in contact with mud, boll rot is to be expected.
- A tropical storm in September often leads to additional boll rot or hard lock. Hard locked cotton occurs when wet conditions prevail during the period when bolls reach maturity and are opening. The carpal walls of cotton, referred to as burrs, essentially need to dry out so that they can retract and expose the lint for harvest. When wet conditions occur during the boll opening period, the burrs can not dry out, therefore bolls remain in a state of partial opening. Further moist conditions allow for pathogen development in the partially opened bolls. Hardlocked cotton often shatters and falls to the ground during harvest.
- A tropical storm in late September or October, when a high proportion of bolls are open and ready for harvest, often results in substantial yield loss due to weathering from intense winds and rains. The amount of yield loss depends on severity of rains and winds, as well as the amount of exposure (number or percentage of opened bolls when the storm occurs). Winds exceeding 30-40 mph can result in some degree of lossage, with greater losses occurring at higher wind speeds. Lodged plants often occur when the plants are top heavy due to lower bolls that are opened and closed (heavier bolls) on upper nodes
- The best way to offset or prevent weathering losses from a tropical storm that occurs in late September or October, is to defoliate and harvest as soon as cotton is mature and ready for such, assuming a tropical storm is not in the forecast. Delaying defoliation and harvest beyond the point of maturity is unnecessary and can only lead to potential losses. If closed bolls are present during late September or October, and a tropical storm is imminent, it is best to delay defoliation until after the storm passes. Post-storm defoliation can be effective at standing plants back up, and opening any closed bolls that were thrashed around during the storm. During this time of year, closed bolls are protected bolls, and are far less likely to encounter losses compared to partially or fully opened bolls. Many growers want to defoliate prior to a storm so that they can stay on schedule. This is a fallacy because defoliation enhances and accelerates boll opening. Fully opened bolls are highly susceptible to weathering loss, and partially opened bolls are susceptible to hardlock.

Forages (hay and pastures) and Grazing Management

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Excessive rainfall brought by a tropical storm or hurricane during summer can affect management of forages and livestock in several ways. The extent of damages, and hence the remediation options, can vary widely from farm to farm considering the different types of forage species (e.g., cool- and warm-season forages, annuals and perennials, monoculture and mixed pastures) that can be grown in the same farm. This brief provides considerations for management of warm-season hay-land and pastures by land and livestock managers after heavy rainfall during summer.

- Wet soils do not allow traffic of hay equipment across fields and hence harvesting schedules for hay production may be delayed. Mature forages, like those with extended regrowth periods, will have lower nutritive value (i.e., lower concentrations of crude protein and energy). Feeding hay of low protein and energy levels will negatively affect livestock performance calling for the need of supplemental feed to maintain livestock.
- Hay producers should continuously assess soil moisture conditions before bringing equipment back into the field and consider the weather forecast to decide if cutting at a given date is warranted. Usually after a heavy rainfall there is a window of dry weather of several days (or weeks) sometimes warranting hay production, but continuous monitoring of current conditions and of the weather forecast is of utmost importance before initiating field activities for production of hay. Hay will usually require 3 to 5 days or more of field curing to reduce moisture to less than 20%. It is especially important to dry hay to less than 40% as soon as possible to prevent nutrient loss due to plant respiration and microbial degradation. Clipped forage left in the field that gets rained on will deteriorate at a very fast rate. Also, following a warm and moist period, scouting for pests like fall armyworm and bermudagrass stem maggot, especially during July and August, should be considered in order to decide if an application for pest control will be needed.
- For grazed pastures, livestock managers should consider moving livestock through paddocks at a faster pace, even if the forage is not grazed to the recommended stubble heights. This is especially important for preventing pasture damage and subsequent weed infestation in warm-season perennial pastures. Leaving a taller stubble height and moving animals faster from paddock to paddock will prevent damage of pastures and reduce development of muddy and weedy areas. In extreme circumstances where pastures are continuously flooded for an extended period, managers should consider identifying a potential sacrifice area preferably planted to annual crops where livestock could graze and hay could be fed. These areas could then be planted to a cool-season annual forage during the September to October timeframe.
- Flood events of one day or less usually have a low impact on forage survival. Damage is less in areas of moving water compared to standing, stagnant water. Damage from flooding is also reduced if the forage is not completely covered by water. Grasses with leaves extending above the water surface survive longer than those fully submerged. If legumes are present, it is likely for rhizobia bacteria in legume nodules to be weakened and likely will

cease nitrogen fixation for an extended period. Consequently, flood-damaged plants will appear yellowed and nitrogen deficient.

- Our experience after Hurricane Matthew in 2016 is that well-established hay-land and pastures are resilient to heavy rainfall and to a degree to flooding. While there is not a definite number of days that flooded pastures can survive, our experience in the Coastal Plains was that after one week of being submerged, tall fescue pastures were lost and some bermudagrass pastures were affected but later recovered. Native warm-season grasses (e.g., switchgrass, big bluestem) and bahiagrass were able to recover to a much better pace after the prolonged flooding. Hence, if there are wet areas that easily flood, land and livestock managers should consider selecting forage species better adapted for those types of sites.

Peanuts

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***note that information is specific to 2024 growing conditions and Tropical Storm Debby**

On August 12, 13, and 14, 2024 I traveled from south of Elizabethtown to Roanoke Rapids making an assessment of the peanut crop. Images from that route can be found, along with a crop report for the Virginia-Carolina region, on the peanut extension portal that is available at:

<https://peanut.ces.ncsu.edu/2024/08/v-c-crop-report-august-15-peanut-notes-no-193-2024/>

A portion of that report is found after this section. In general, there were some areas of fields in the southeastern part of North Carolina that had ponding of water for several days after the storm. There are very few fields that had sections with peanuts under water completely for more than a day or so. Peanuts can survive being submerged for at least three days. I did not see any peanuts submerged but a considerable number of fields with low areas had standing water. Yields will be lower in those areas. The major issue is water-logged soils and the ramifications of these conditions on pods and root systems. However, if fields dry out now, the adverse impact will be minimal even in areas of fields where ponding occurred. A major challenge at this point in the season is the need to make fungicide sprays on a 14-day schedule. This schedule has been disrupted by the excessive rainfall and inability to move through fields in a timely manner. Fungicides perform poorly when applied by fixed-wing aircraft. The spray solution delivered by air has an insufficient volume of spray and inadequate pressure to penetrate the peanut canopy and reach the base of the plant. Infection and epidemics of leaf spot disease, Sclerotinia blight and southern stem rot begin at the base of the plant and in the lower leaves. It is very likely that disease will be greater as we move into the harvest season because of gaps in protection offered by fungicides during August. Areas in and southeastern North Carolina were wet prior to the storm, and this prevented applications of fungicides. With all this said, the peanut crop as a whole looks very promising. Historically, peanuts can withstand a major tropical event in August with minimal damage. A second storm later this month or in September could cause significant yield losses due to ponding of water because the soil profile is saturated, inability to apply fungicides, and less than ideal soil moisture for digging some sections of fields.

However, we are in good shape now, and if we can avoid major rainfall events for the balance of the season, we should experience a very good peanut crop in North Carolina.

Crop Report on August 15 (see peanut extension portal at the address listed above for photographs and tables mentioned in this section.)

Recent rainfall has eliminated drought in almost every area of the Virginia-Carolina region. Even though some pockets received over 12 inches of rain from Tropical Storm Debby, most amounts were more modest than expected prior to the storm reaching this production area. The lower area of the region, in particular, benefited from the rainfall. However, where rainfall was intense and ponding of fields occurred, some yield loss will be experienced. Lack of appreciable wind from the storm minimized structural damage, although tornadoes were spawned in the coastal plain of the region. Rainfall amounts for the month of August, which included Debby are presented in the table.

Growers in the lower Virginia-Carolina region have moved to their fifth fungicide spray for leaf spot and stem rot disease while growers further north have are planning their fourth spray in the schedule (e.g., fungicides are most often sprayed on 14-day intervals.) Rainfall in late July and early August, including Debby, has resulted in delays in fungicide applications. This has occurred even for growers with adequate equipment to apply fungicides in a timely manner. Some growers have applied only two sprays, and peanuts in these fields are vulnerable to epidemics developing given the rainfall amounts, temperatures and relative humidity in the peanut canopy. Excessive vine growth in many fields has limited movement of fungicides to the base of the plant where leaf spot epidemics begin and where southern stem (e.g., white mold) will be present. For growers in the central and northern areas of the region, with a combination of cooler temperatures in the coming week, a dense canopy, and wet soils, the Sclerotinia blight, caused by a soil-borne pathogen, most likely will become active in fields with a history of this disease. Growers will be challenged to get fungicide for all three of these diseases into the canopy where they are needed. In many fields, it could be another week before fungicides can be applied by ground equipment even if no more rain is received at the present time. Some growers and their advisors have been inquiring about the efficacy of fungicides applied using fixed-wing aircraft. The general consensus is that spray volumes and spray pressure at the peanut canopy level are too low to provide adequate coverage of foliage with fungicides, especially lower in the canopy where epidemics begin. The extent of impact of periods of time where peanuts are unprotected with fungicides due to gaps in protection is not known. Growers are encouraged to apply fungicides on a “tighter” schedule within product label specifications to protect as much of the canopy as possible from disease. Fungicides with as much curative activity as possible are encouraged.

Many growers are making their second application of prohexadione calcium, a plant growth regulator that minimizes excessive vine growth by inhibiting internode elongation. Some growers have inquired as to whether or not applications at this point are warranted. In cases where this plant growth regulator was applied on time at 50% row closure (e.g., when 50% of vines from adjacent rows are touching) a second application can be effective in minimizing regrowth and maintaining a less robust canopy. However, for growers who did not apply

prohexadione calcium in a timely manner, applications at this point are not recommended. Although intuitive, it is important to note that this plant growth regulator does not shrink plants but prevents excessive vine growth. There is no advantage to late-season applications to peanuts that are already large and approaching the final stages of vegetative growth.

Corn earworm, tobacco budworm and to a lesser extent fall armyworm were developing in some areas of the region. In most cases, growers applied insecticide to suppress these insects prior to excessive rain from tropical weather. It is also the case that heavy rains, especially thunder showers with relatively high intensity, can wash worms and caterpillars from the canopy. Growers are encouraged to scout fields as soon as they can as fields dry, but application of insecticides may not be needed. The threshold for insecticide sprays in North Carolina, for example, in August is 12 worms/foot of row using a beat cloth. The excessive vine growth in many fields also will buffer against insect damage if outbreaks occur.

Some fields have escaped weeds, primarily Palmer amaranth and annual grasses. There are no herbicides at this point in the season that will adequately control Palmer amaranth. In many cases, seeds that are beginning to be produced for this weed are viable. However, applications of selective grass herbicides can suppress escaped annual grasses and to minimize yield loss during digging and vine inversion.

Heat unit accumulations from May 1-August 12, May 15-August 12, and June 1-August 12 are provided in the table. As mentioned previously, Virginia market type varieties require approximately 2,600 DD₅₆ to reach optimum maturity. While low temperatures and dry conditions can delay maturity, water-logged fields and cloudy weather can also slow the maturation process. Heat unit accumulation is one of several indicators of when peanuts will reach optimum maturity. In many cases, peanuts will reach optimum maturity a number of days after reaching the 2,600 DD₅₆ mark for Virginia market types. This is because heat units continue to accumulate even though stresses can occur during the cropping cycle (e.g., drought, excessive moisture, etc.).

Yield potential for peanuts in the region is 4,340 kg/ha (4,050 lbs/acre). While conditions became more favorable for peanut growth and development during the last two weeks of July, conditions have been less than ideal for peanut growth and development in many areas of the region in August. Fields that are wet will prevent growers from continuing their fungicide sprays. If growers can get into fields by early next week, yield potential will remain at the current level. If cloudy weather and additional rain occurs, yield potential will decrease. Yield potential may decrease further based on assessments of how peanuts recover from Debby.

Soybeans

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Introduction: Hurricane damage to soybeans is unfortunately often encountered from August through October in North Carolina as soybeans move into later developmental stages. Degree of damage will depend on various factors including soybean growth stage, length of time fields are flooded, wind speed, and subsequent weather events. Soybeans at all growth stages can be

negatively impacted by hurricane-related damage. Certain stressors can be worse at earlier soybean growth stages or later soybean growth stages. Earlier maturing varieties are likely to be impacted by delayed harvest, premature sprouting, and potential shattering. Later maturing varieties may be impacted by inhibited seed development, disease pressure, and reduced quality.

Symptoms: Soybeans that have been under flooded conditions for several days have an increased risk of being contaminated by things such as mycotoxins and diseases. Excessive rainfall can cause pod splitting. This is especially problematic if the excessive rainfall followed a dry spell. When soybeans are at R6 (full seed) or R7 (physiological maturity) and receive excessive rainfall, rapid seed growth can cause pod splitting, especially when pods are small due to earlier season stressors. Premature seed sprouting is generally rare but can be an issue when the moisture of the seed drops below 50%, and then goes back above 50%.

Soybean lodging can be caused by strong winds and by water flow across the field. The effect of lodging on soybean yield is variable, but soybeans in the beginning seed stage (R5) will likely be more prone to damage from lodging than soybeans that are further into physiological development. There are two types of yield losses associated with lodging including restriction of maximum physiological development and harvest loss. Restriction of maximum physiological development can occur from lodging reducing photosynthesis in the upper, more productive leaves. Harvest loss from lodging can range from 3-10% (Holshouser, 2015).

Shattering is intensified when dry pods are rehydrated by excessive moisture followed again by a dry period. Shattering losses can be more severe with earlier maturing varieties that are close to physiological maturity and are ready for harvest. Delayed harvest can intensify shattering.

Management: Follow recommended seeding rates for your location and planting date. Too high of a seeding rate will reduce stem size and increase the potential for above-ground lodging. Non-uniform seed spacing also increases lodging potential, so ensure uniform seed spacing in the row. (Planting with standard drills (non-uniform placement) usually results in more lodging.)

Disease can be worsened by periods of flooding, significant rainfall, and damages from wind, hard rain, or hail. Select soybean varieties with robust disease resistance, especially during La Niña years when hurricanes are likely to be more abundant. The [North Carolina Soybean Variety Selection tool](#) can be used to filter for varieties with robust disease resistance packages. In periods of extended flooding, root rots caused by *Phytophthora sojae* or *Pythium* spp. or other fungal pathogens like *Fusarium* spp. may cause significant losses in soybeans. The yield and quality of soybeans can also be threatened following hurricanes by foliar diseases—including frogeye leaf spot, Cercospora blight, rust, and bacterial blight—due to prolonged exposure to high moisture and high temperature. If conditions are likely conducive for disease development, you can proactively spray fungicides to help prevent disease proliferation.

When safe, closely inspect fields where flooding has occurred. Three to four days of continuous flooding can cause irreversible damage in soybean and subsequent yield declines. In addition to agronomic damage, flooded grain could be considered altered by your insurance company depending on flooded water source. Completely submerged pods have the potential for toxin

contamination and some insurance policies may allow for zero appraisal following this situation. This situation may require entry into nontraditional markets if grain is determined sellable.

Devise an alternative storage plan for damaged soybeans. If you have a diversity of soybean maturity groups and varieties planted on your farm, chances are you will have differing levels of soybean damage among your fields. Field to field damage will also vary depending on proximity to flooded water sources. If possible damaged grain should be stored separately for undamaged or minimally damaged grain to ensure high-quality grain can be sold without dockage.

Resources

<https://content.ces.ncsu.edu/soybean-hurricane-damage>

<https://soybeans.ces.ncsu.edu/2018/09/soybean-considerations-following-hurricane-florence/>

Tobacco

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All types of commercial tobacco are vulnerable to damage from tropical storms or hurricanes. Financial losses in tobacco can be significantly higher compared to other crops, due to its high economic value and the fact that the leaves are the harvested part of the plant. Here are some key management considerations to address immediately and in the short term following a storm.

- As tobacco plants mature they become more susceptible to wind damage. The first issue is leaves being dislodged from stalks due to wind speed. Second is physical damage while leaves remain on the stalk (shredding). Third is damage that may not be immediately visible but it stimulates ethylene production which leads to rapid deterioration.
- Standing water and/or saturated soils are also problematic. Water-logged soils have little to no oxygen available to roots. If saturation is present for an extended period (generally more than 48 hours), root decay is likely to occur and will lead to leaf deterioration.
- Heat is another concern, as that will promote leaf deterioration. Sunscald may also be apparent. Heat indices in excess of 95 degrees are concerning from a holdingability standpoint.
- Consideration for soilborne and foliar disease should also be made. For example, tobacco black shank is spread by water. Spreading and a decline in root health (and an increase in wounding) may promote black shank infections. Foliar leaf disease may also increase due to high humidity and significant vegetation presence. Common foliar diseases would be: target spot, brown spot, frog-eye leaf spot, and/or angular leaf spot.
- Under these conditions it is impossible to stop or slow down leaf deterioration. There have been questions regarding the benefit of additional fertilizer and/or fungicides. Neither are likely to help because the plant is dying very slowly. The change in leaf color from green to yellow is not a result of nitrogen loss, and may not always be attributable to disease. Foliar fungicides would only be recommended where tobacco is healthy, not in decline, and the disease is present. Pesticide applications should be made in accordance with EPA labels.
- Entering saturated fields with machinery will be impossible and producers may not have enough labor to harvest in a timely manner. This should be taken into account.

- Wind blown tobacco that is leaning may also be impossible to harvest with a machine and should be taken into consideration.
- Where possible, producers should harvest fields as quickly as possible and begin with the worst fields first. This guidance is for salvaging fields.

Horticultural Crops

Caneberries (Blackberry and Raspberry)

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IF YOU ARE IN AN AREA WITH HIGH PREDICTED WINDS: You should consult with your tunnel manufacturer to determine how much wind your tunnels can withstand. Removing or skinning the plastic off the tunnels is a whole lot less costly than having the entire tunnel mangled.

IF YOU HAVE A SHIFT OR ROTATING ARM TRELLIS: Lay the trellis in the horizontal or down position and make sure it can stay in that position. Some trellises do not have the capability to lock in the horizontal position. If that is the case, it may be better in the upright position.

POTENTIAL FOR ELEVATED DISEASES: Canes if properly trellised should not lodge as a result of the wind and rain. However, there may be some physical damage to canes. Make sure you walk your fields before and after the storm. There may be a need to do some extra pruning and use of a fungicide if you can get out into the field after the storm. See the SRSFC for recommended chemicals for disease control before (for cane blight) and after the storm. <https://extension.uga.edu/publications/detail.html?number=AP121-4>

After the hurricane passes:

There may be some soils that have flooded. Here is some information from a previous post from Cornell University. Since most of the berry crops have already been harvested, we are primarily concerned with flooded fields' effects on roots.

<https://teamrbus.blogspot.com/search?q=hurricane>

Produce Crops

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Tropical systems and hurricanes can lead to situations where produce inadvertently comes in contact with contaminated water that may lead to produce safety concerns. Following these events, produce growers should pay close attention to water accumulation in areas where produce is grown. In such areas, it is important to determine the source of the water and differentiate between standing water that comes from excessive rainfall as the soil becomes saturated and standing surface water from river, stream, and creek overflows. This is especially important when flood waters touch the edible portion of the crop. Another concern would be for produce fields downgrade from livestock operations or areas where manure has accumulated –

flooding and associated runoff from these operations could ultimately lead to produce contamination.

During periods of excessive rainfall, water can easily be contaminated with biological, physical and chemical contaminants. As an example, water that moves into a field from a surface water source (lakes, rivers, streams, and creeks) can be contaminated with bacterial or parasitic pathogens, petroleum products, pesticides, and heavy metals.

In order to prevent contaminated or “adulterated” produce from entering commerce, the FDA has set guidelines for produce that has been impacted by flood waters ([FDA’s guidance on food affected by hurricanes, flooding and power outages](#)). If you are a produce grower with flood concerns for your growing area, please take time to review these guidelines.

Another timely resource is available from the Produce Safety Alliance that discusses [food safety concerns for flooded farms](#). This fact sheet summarizes information that will help you determine whether crops are safe to be harvested. This is a great tool to use when assessing damage and identifying possible problems that arise from flood waters and periods of excessive rainfall. Note that direct contact of flood water with produce is not the only concern during this time. It is important that water sources such as wells and farm ponds be monitored closely for potential contamination from overland flow of flood waters. Furthermore, it is critical to determine if produce that did not come into contact with flood waters can be safely harvested when it is close to flooded areas.

In North Carolina, if you need help assessing damage in your fields from a food safety perspective or have general produce safety questions, please do not hesitate contacting your local County Extension Agent who will work closely with Area Specialized Agents focusing on Fresh Produce Safety.

Western NC and Piedmont:

Elena Rogers – Area Specialized Agent- Food Safety/Fresh Produce, elena_rogers@ncsu.edu or via phone at (828)352-2519

Eastern NC

Dr. Chip Simmons – Area Specialized Agent- Food Safety/Fresh Produce, odsimmon@ncsu.edu or via phone at (919)414-5632

For regulatory inquiries, you can also contact staff members at the North Carolina Department of Agriculture and Consumer Services, Produce Safety Program at (984) 236- 4820.

Additional Web Resources

[FDA Definition of Adulterated Food](#)

[California LGMA Flooding and Food Safety](#)

[Impact of Flooding on Organic Food and Fields](#)

[RAFI Disaster Assistance](#)

Livestock

Beef Cattle

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Once again, we are entering that time of year when mother nature lets us know exactly how powerful she can be. Although storms are an inevitable part of our life, having an emergency preparedness plan for your livestock operations can make flooding, tornadoes or hurricane season a breeze. The following is a storm preparedness list that you can do right now to help you be more prepared for future storms.

- When disaster strikes, follow instructions of your local emergency management to keep you, your family and your livestock safe. Plan to stay if it is safe to do so, or leave if ordered to evacuate. Stay informed by having a weather radio on hand with plenty of batteries or a generator with additional fuel to keep your electronics or appliances functioning. Generators may be expensive but are a useful investment if storms frequently impact your area. Having a generator with an ample amount of fuel can be used to pump well water to cattle, run feed out of feed bins, power fence chargers, and prevent your family from being in the dark. It is also useful to have several power cords available.
- Keeping your files in a dry and secure area is a proactive way for you to be prepared to clean up after the storm. Keeping a record of important contacts, such as insurance company information, local FSA office, and veterinary support can make the disaster response less stressful.
- Some methods of storm preparedness may take place months prior to hurricane season. If your farm contains toxic plants that may become damaged during a storm, it is best to take care of the problem before it becomes a problem. In the summertime, mark any wild cherry trees or other toxic plants when they are easily identifiable. In the winter, when the leaves are gone, take time to remove those toxic plants from your pasture when they do not pose a threat to animal health. This proactive step will save you some time and worry during and after a storm.
- Prior to the storm, move livestock to interior pastures. Locating livestock in interior pastures will help prevent animals from escaping if trees fall on fence lines or if they are swept away by swift moving water. If possible, consider relocating animals from high impact areas prior to the weather event. This may include areas prone to flooding and areas where falling trees pose a safety threat to cattle.
- During storms, flooding and power outages pose major threats to the security of water and feed resources. Water can be stored for several days in plastic water totes for emergency use. Likewise, feed resources should be placed in dry areas that are not prone to flooding.
- Cattle should have a unique identification tag that can be linked to farm management records. Ear tags work great but could be paired with a permanent tattoo ID just in case tags become torn or lost. Having good farm management records prior to the storm can help identify missing animals after the storm and help with insurance claims. Horse owners can braid tag identifying information into the mane.

- Have a fencing tool kit prepared that includes t-posts, t-post driver, clips, barbwire, smooth wire, bolt cutters, fencing pliers, hammer, and staples. It would also be very beneficial to include temporary fencing in your fencing toolkit. Having a reel of polywire, step-in posts, fiberglass posts and a solar charger can help you quickly erect a fence to keep cattle from escaping a storm-damaged pasture. It is also useful when trying to exclude cattle from toxic plants (such as wild cherry trees) that were damaged/blown over during the storm.
- Keeping a well-maintained chainsaw will help you quickly get down-trees cut off fences. Check the bar and chain oil level often and have an extra bottle stored for emergency purposes. Maintaining a sharp chain and having an extra one on hand will make cutting more efficient and safer for the person running the chainsaw.
- Move tractors and other equipment to open areas away from trees, structures, and flood prone areas to prevent damage from water and falling debris.
- Maintaining an ample supply of tarps may be useful to help protect feed resources prior to the storm or quickly cover and temporarily repair damaged roofs, barns, or storage sheds after the storm.
- Unfortunately, in some scenarios, euthanizing of hurt livestock may be a necessary and humane mode of action. In your storm preparedness toolkit, make sure you have the ability to euthanize if necessary, and follow guidelines on the proper techniques of doing so.
- Lastly, the primary goal of storm preparedness is to make sure you and your family are safe. Create a storm toolkit for your family that includes any important documents including identification, insurance, deeds, first aid kit, storm-radio, flashlight, battery packs for electronics, blankets, medications, canned food, water, electrolytes, bug spray with deet, sunscreen, and any other consumables you deem necessary. A backup suggestion would be to upload your documents onto a google drive to access documents at any location if the internet is accessible. Also think about the safety of your pets that may need food, water, and a crate.

Dealing with weather-related disasters can be stressful. Having a well-developed plan for your family and your livestock operation can help ease some of the headaches of a natural disaster. For more information on storm-preparedness and cleaning up after, visit us at beef.ces.ncsu.edu and at cefs.ncsu.edu/extension-and-outreach/amazing-grazing/.

Trees

Homeowner Storm Readiness

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Thunder/lightning storms, hail, tornadoes, snow/ice storms, and straight-line winds are relatively common occurrences in North Carolina - in addition to tropical storms and hurricanes. As property owner, being prepared well before these storms hit can help prevent and minimize damage to landscape trees. The document below will help with long-term storm preparedness.

[https://www.ncufc.org/uploads/Homeowner_Readiness_REV2%20\(1\).pdf](https://www.ncufc.org/uploads/Homeowner_Readiness_REV2%20(1).pdf)

Homeowner Response & Recovery

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The actions taken in the aftermath of a storm event are crucial to the safety and efficiency of disaster responses. The document below outlines the steps to take after a storm passes.

https://www.ncufc.org/uploads/Homeowner_Response&Recovery.pdf

Tree Care Professionals: Readiness, Response, & Recovery

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The following document contains additional information for storm readiness, response, and recovery for tree care professionals.

https://www.ncufc.org/uploads/NCTS_TreeCareProfessionals.pdf

Pesticides

Pesticide Storage Concerns During a Flood (Wayne Buhler, wbuhler@ncsu.edu)

Safe pesticide storage is essential, especially in disaster situations. Improperly stored pesticide products can pose significant threats to humans and our environment. If you live in an area prone to flooding, familiarize yourself with emergency procedures before a disaster hits. During times of expectant flooding, it is critical that anyone who stores pesticides takes preventative measures to minimize potential exposure to floodwaters. During clean-up, be aware of what types of products you are handling and always watch for signs of pesticide poisoning. Acute (sudden in onset) symptoms frequently include headache, nausea, diarrhea, blurred vision, excessive salivation or sweating, difficulty breathing, weakness, tremors, or convulsions. These symptoms will usually appear immediately or within a few hours of exposure. See a doctor immediately or contact the NC Poison Control at 1-800-222-1222 if symptoms occur. If possible, write down brand names or active ingredients of pesticides you have handled.

PREVENTION & PLANNING:

- **Store products in a safe location.** Store all hazardous products in an area that will not flood. Check on local building and fire codes, as well as environmental regulations regarding nearby sensitive areas (e.g., wells, residences, bodies of water) when choosing a storage site.
- **Evaluate the safety of your storage design and update, if needed.** Contact your County Extension Center (<https://www.ces.ncsu.edu>) or consult the “Storage” module of the Pesticide Environmental Stewardship website at <https://pesticidestewardship.org> for storage plans and ideas. Safety and efficiency are key components of a functional pesticide storage design. Always be sure to practice safe storage techniques and follow the NCDA&CS pesticide storage regulations* at all times, not just during a natural disaster. While evaluating your storage design, take a moment to make sure you meet the following requirements:

1. Store to prevent leaking and to make accessible for inspection
2. Do not store pesticides in unlabeled containers
3. Do not store pesticides in any food, feed or drink container
4. Do not store pesticides in a way that could contaminate food, feed, drinks, eating utensils, tobacco, seeds, fertilizer or other pesticides
5. Store products according to the label directions
6. Lock storage areas to prevent unauthorized access
7. Store pesticides in an area that is dry and has ventilation
8. Do not store pesticides with petroleum or other flammable materials.

*Find the full NCDA&CS pesticide storage regulation here: [02 NCAC 09L .1902](#).

- **Keep pesticide inventory to a minimum.** The less product you have on site, the less you have to worry about. Need to clean out existing inventory? If a product is still registered, apply it according to the labeled directions for use. If products are no longer registered or you just want to dispose of it, consult the North Carolina Department of Agriculture & Consumer Services (NCDA&CS) Disposal Program at 919-733-3556 or visit their website for

a list of approved disposal sites and programs at

<http://www.ncagr.gov/SPCAP/pesticides/PDAP/>. Pesticide Storage Concerns During a Flood

- **Develop an emergency response plan in case of a leak, spill or fire.** Depending on what kind and how much hazardous material you store, you may be required to develop a contingency plan for commercial pesticide storage. Please call NCDA&CS at (919) 733-3556 to see if you meet the requirements for this type of plan.
- **Store on hand spill clean-up materials** such as non-chlorinated cat litter, sand, sawdust or other absorptive materials, a shovel, and a drum with a lid for storing contaminated material.

AFTER A FLOOD HAS OCCURRED:

- **Investigate-** If you suspect flooding has occurred in your pesticide storage area, use great caution in investigating as floodwaters may be contaminated with pesticides. Make sure to wear appropriate PPE to avoid exposure, particularly safety boots and gloves.
- **Report-** If a release of pesticide has occurred, contact NCDA&CS at (919)733-3556 to speak with trained staff that can provide information to help in a pesticide emergency. For emergencies during non-business hours, contact 911 or the North Carolina Emergency Operations Center at 1-800-858-0368. Emergency personnel will gather information about the pesticide spill and notify emergency response professionals in your area to serve as first responders to the flood site, as necessary. NCDA&CS can also inform you of other government agencies you may be required to report to, depending on the type and amount of chemical(s) involved in your spill.
- **Contain-** Take steps to prevent further release of the pesticides, if possible. Place leaking containers into sealed, larger containers. Wear protective clothing and equipment so you do not expose yourself to hazardous material in the process. While the leak is being controlled, contain the spill material to the original area.

NCState Pesticide Safety Education Program 919-515-3113

<https://pesticidesafety.ces.ncsu.edu/>

NCDA&CS Structural Pest Control and Pesticide Division 919-733-3556

<https://www.ncagr.gov/divisions/structural-pest-control-and-pesticides>

Disposal Program <http://www.ncagr.gov/SPCAP/pesticides/PDAP/>

North Carolina Emergency Operations Center 1-800-858-0368

<https://www.ncdps.gov/hazardous-materials>

NC Poison Control (24 hours) 1-800-222-1222 <https://www.ncpoisoncontrol.org/>

Additional Resources

[North Carolina Disaster Information](#)

[USDA Hurricane Preparedness and Recovery - North Carolina](#)

[USDA-Farm Service Agency Disaster Assistance Programs](#)

[USDA-Risk Management Agency](#)

[USDA-Risk Management Agency - Raleigh Field Office](#)