

BETWEEN THE ROWS[®]

Effects of Flooding and Saturated Soils on Corn

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Summer rain events can lead to many fields with saturated and flooded soils. Areas of those fields that are not flooded with standing water may still remain saturated for an extended period of time. Survival of corn plants is dependent on temperature, stage of growth and length of time the soil is saturated.

Corn Survival in Saturated Soils

There is no way to tell for sure whether a corn field will survive until enough time has passed to assess recovery of affected plants. The following are some factors that can increase the risk of damage or death.

1. Completely submerged corn is at higher risk than partially submerged corn. Partially submerged plants may continue to photosynthesize at limited rates, extending the amount of time they can survive.
2. Extended saturation will increase the risk of injury and death. Soil oxygen is depleted within about 48 hours of soil saturation. Without oxygen, nutrient and water uptake is impaired and root growth is reduced. A general belief is that young corn plants can survive up to 4 days of ponding if temperatures are in the mid-60s or cooler. With warmer temperatures, the plants will use the available oxygen faster and likely will not be able to survive as long.
3. Corn younger than V6 is more susceptible to damage from flooding and saturated soils. The plant's growing point is still below ground. Once water has subsided, the health of the growing point can be assessed by splitting the stalk of an affected plant. A healthy growing point will be firm and white or yellow in color. A damaged or dead growing point will be soft and grey or brown in color.
4. Surface crusts could form if water subsides and the soil dries quickly. This will obstruct air exchange into the root zone, making full recovery less likely.
5. Extended periods of saturated soils will negatively affect the overall vigor of the plant. Root health and growth will be affected until the soil dries to normal levels. Poor root development will leave the corn plant more vulnerable to environmental factors later in the season.
6. Wet soil conditions will promote the development of seedling blight diseases, especially Pythium. The highest risk of these diseases will be in poorly drained

areas of the field. The risk will also be higher for corn replanted into these areas. Diseases such as common smut and crazy top also become a much higher risk when corn seedlings are exposed to flooding.



Corn seedlings under flooded conditions. Photo courtesy of R.L. (Bob) Nielsen, Purdue University.

Nitrogen Loss

A secondary consequence of flooded or saturated soils is the loss of nitrogen (N). Most water-damaged fields lack the usual dark green color associated with a normal corn crop. Roots' inability to take up N due to lack of oxygen will cause plants to appear stunted and lack good dark green color. This poor color is not necessarily from lack of N in the soil. However, significant N can be lost under these conditions through denitrification (change of fertilizer N to N₂ gas under anaerobic conditions) and leaching of nitrate with water percolation into the soil profile.

This table (Figure 1) shows the amount of denitrification that can be expected at the given soil temperatures when soils are saturated for an extended period of time.

Figure 1.

Estimated denitrification N losses as influenced by soil temperature and days saturated.		
SOIL TEMP (°F)	DAYS SATURATED	LOSS (% of applied)
55-60	5	10
	10	25
75-80	3	60
	5	75
	7	85
	9	95

Nitrogen is lost to leaching when in the nitrate form. As weather warms, N in ammonium form will convert to nitrate making it more susceptible to losses. Nitrogen loss will likely be more severe in low areas of the field where ponding occurs and more water is moving through the soil profile. If field conditions permit, a supplemental N application may be needed to ensure the corn crop has enough N to reach its full yield potential.



Discolored corn seedlings from prolonged soil saturation.

Assessment and Management

It is best to wait about five days after a flooding event to fully assess your crop. It is likely no field work can be done in this period, and it will allow corn plants time to show signs of recovery. Examine the growing point by splitting the seedlings lengthwise. If you see signs of a healthy growing point and the appearance of fresh leaves from the whorl then the plant may be able to recover a lot of its yield potential. Young corn plants can only tolerate a few days of full submersion, especially with warm temperatures. Corn can recover with minimal impact on yield potential if the plants stay healthy and favorable growing conditions occur.

After enough time has passed, you can properly assess the health of corn plants with a stand evaluation. This tells you whether replant action is necessary. As with any replant situation, it is best to use a formula that takes into account targeted stand, actual stand and possible replant date to evaluate whether replanting would, in fact, be more profitable than leaving the current stand. Using a replant calculator will help you to make a management decision based on economics and not on emotion. You can find the Wyffels [Replant Calculator](#) here.

A Silver Lining

One good thing that can come from saturated soils during late May and early June is its effect on rootworm larvae survival. One of the few weak points in corn rootworms' life cycle is the period when larvae are hatching from eggs. In order for rootworm larvae survival to be affected, soils must be saturated long enough to suffocate larvae as they are hatching and in the early part of their life cycle.

The timing of larval hatch is dependent upon heat units and will vary across the Corn Belt. Research shows that fifty percent of corn rootworm larvae will hatch from 684 to 767 accumulated growing degree days, starting January 1. Most years rootworm larvae will hatch about the same time lightning bugs appear, usually around Memorial Day thru the first week of June in Central IL and Southern IA. You can determine how many growing degree days have been accumulated in your area by using the [Wyffels Growing Degree Day Calculator](#) found here.

Conclusion

The full extent of damage from flooding and saturated soils cannot be seen until the corn plant has a chance to recover. Knowing what factors affect damage and survivability, and what signs to look for when assessing plant health will help you make the best decision for the long-term success of your corn crop.

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