Recovery after historic flooding
March 25, 2019

The recent spring floods have been devastating for many communities across Nebraska and Western Iowa. As flood waters recede, priorities shift from survival to recovery. Many are finding inches to feet of sand, silt and ice covering their turfgrass surfaces. We have received numerous inquiries related to golf courses, sports fields and home lawns with managers wondering what to expect and what to do next.

Chip Carr is the Golf Course Superintendent at Iron Eagle Golf Course in North Platte, NE. He's battled extreme flooding during his tenure at Iron Eagle. In May 2015, the South Platte River inundated his golf course and it didn't recede for six weeks. Afterward, he and his crew needed to remove a thick layer of silt from his greens, sand piles from the fairways and rough, and ultimately overseed all but five holes. He recently shared his experience with us to help others struggling from the recent flooding.

Turfgrass Submersion Tolerance

As submersion depth increases, the potential for injury increases. Turf in flooded conditions declines from lack of oxygen and light. For *actively* growing turf, substantial loss can be expected after 4 days of continued submersion. While minimal data for winter dormant turf is available, testimonials indicate most turf at this stage of dormancy can survive considerably longer than 4 days. If the leaf tissue is above the water line - even just a little bit — the turf has a greater potential for survival. Other factors affecting turf survival are water temperature and light intensity. The good news for our recent floods is turfgrass injury from flooding increases as water temperature increases from 50 to 86 degrees F. During cooler times of the year, the turfgrass injury will be less because of lower water temperatures and lower light intensity. A simple way to determine if submersion has caused injury is to dig several plants from the flooded area and cut a horizontal cross-section through the crowns (the area at or near the original soil surface (Fig. 1). If the crown is brown and mushy, it's dead. If a plant's crown is white and firm, it has survived. Do this in several locations on your facility. If the majority are alive than recovery should be good. If the opposite is true, consider an aggressive over-seeding.

Figure 1. Crown area of turfgrass. https://www.k-state.edu/turf/resources/lawn-problem-solver/problem-solver/thin/thatch/

Initial Clean-up

Once affected homes and businesses have been secured, it will be time to clean up the facility. Common sense would tell you to pick up any debris, such as wood, glass, stones, nails and other metal objects, deposited on turf areas. This debris is a safety hazard to operators and can damage power mowers or other equipment. Remove leaves or any other material that may smother the grass. Underneath all this, the turf may be yellow or brown. The discoloration is related to several factors, including the turf's loss of chlorophyll, loss of soil nitrogen through denitrification and leaching, and limited nutrient uptake due to a compromised root system. It doesn't take long once turf is submerged for soil oxygen levels to decline and root hairs to begin to die. As the root system becomes impaired, nutrient and water uptake

will be limited. The cool soil temperature should help slow this submergence damage. Keep this in mind, once the water has receded, the turf may benefit from a light nitrogen fertilizer application.

Removing sand and silt layers

Sand and silt deposition is common after river flooding. Some observed deposits are greater than two feet deep. The fast moving river water suspends sand, silt and clay-sized particles and carries them over the landscape. Once the water slows, the sand and silt particles settle out leaving layers of silt and clay. Even a thin layer of silt, in particular, can have serious negative effects on turfgrass. Failure to remove the silt creates a fine-textured layer on top of the existing soil. It slows water infiltration and penetration deeper into the profile. Imagine placing a large sponge on top of the soil and watering it with a garden hose. Water will only go through the sponge and into the soil once that sponge nears saturation. Turn off the hose, and the sponge stays wet while the underlying soil continues to drain and dry. The silt layer does the same thing. The top layer will stay wet and only drain when it is near saturation. This makes for sloppy conditions and shallow rooting.

Figure 2. Silt needs to be removed from sand-based soils to avoid permanent damage to the drainage characteristics of these engineered soil. Water hoses can blast off the debris.

The recent floods have deposited several inches to feet of sand and silt at many locations. This layer needs to be removed with excavation equipment – tracked equipment is preferred – such as a skid steer, tractor with a box blade, a sand pro machine, sweeper, blower or by hand. It is best to remove heavy deposits of soil and debris because they may be contaminated with unknown petroleum products and pesticide. Plywood boards may be needed to resist compaction and rutting on access roads from the excessively saturated soils. There are also companies and equipment that can mill off the top surface. This technology has become more popular because it is used for fraze mowing turf stands with significant weed or thatch problems. On greens, it is common to use water to physically blast the silt off the surface. Walking squeegees can further help to push the silt/water solution off the surface (Fig. 2). If removal is not possible, till the area to thoroughly mix the flood deposits with the previous grass and soil. When tilling, be sure to break up the old sod layer. Soil deposits of 1-2 inches can be spread and dragged into the grass surface as a beneficial layer of topdressing. Once the silt is removed or incorporated, aggressive cultivation such as aeration, slicing, or vertical mowing can create channels to promote drainage.

Re-establishing turf

Some of the damaged areas will need to be re-established from seed or sod. We recommend seeding as soon as possible, use a starter fertilizer, and try to maximize seed-to-soil contact. Flood waters often carry and spread weed seeds. In the short term, however, weed control should not be a primary concern, since a weed cover is better than no cover and will help dry out the surface soil. At the very least, try to keep seedheads mowed and wait for significant turf recovery before using broad-action

herbicides. There are several herbicides that can be used during seeding (i.e. mesotrione, ethofumesate, carfentrazone, siduron, quinclorac), and they can help maximize spring seeding success.

Here's more information about spring seeding:

https://turf.unl.edu/turfinfo/3-28_spring_seeding_lawns.pdf

https://turf.unl.edu/turfinfo/9-1_Seed-to-Soil_Contact.pdf

https://turf.unl.edu/turfinfo/May5_post_seeding_care.pdf

https://turf.unl.edu/turfinfo/April_30_Seedingbentgrass.pdf

For many turf managers and homeowners, the unknown is often frustrating. In many areas we have visited, grass recovery may simply require patience. We will continue to update with new Turf iNfo's as the growing season progresses.

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Sources: https://extension2.missouri.edu/g6722 and www.canr.msu.edu/resources/flooding-of-turf and Beard, J.B. 1973. Turfgrass: Science and Culture. Englewood Cliffs, N.J.: Prentice-Hall.