Cornell University Cooperative Extension
NEW YORK EDEN EXTENSION DISASTER EDUCATION NETWORK
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Saltwater Inundation:

Implications for Agriculture

Significant acreage across Long Island has been damaged by flooding, both with fresh rain water, and with salt water along the coast. In fields along tidal areas, significant acreage was inundated with salt water from the tidal surge from Hurricane Sandy. The tidal surge also brought large amounts of debris into these fields.

Salt water inundation occurred where fields were flooded with sea water, brackish water, or tidal surge water. Salt contaminated soils will have several effects on crops. The first is osmotic where high salt levels in the soil solution will draw water out of germinating seedlings and the roots of plants, causing desiccation. In less severe cases, elevated salt levels will make it more difficult for plants to take up water, thus increasing water stress and reducing growth. The second concern is the toxic effect of salt water constituents. Excess sodium is toxic to crop plants. In addition, chloride from salt water can be toxic to many crops. A third effect is the negative impacts of sodium on soil structure and aggregation, making the soils dense and compacted.

Soils that have had salt water leach into them will have high osmotic conditions (high dissolved solutes) and high levels of sodium. Levels of overall salts, sodium, and chloride will be reduced with leaching from rainfall, but this may take a considerable amount of time, depending on the amount of rainfall, soil type, water table, and the presence or absence of salt water intrusion in the ground water. On a sandy loam soil, salt levels may be reduced to tolerable levels within a year's period of time. On heavier soils and soils with high water tables, it may take several years for salt levels to drop to acceptable levels. In areas where salt water ponded for long periods of time, also expect effects to last for several years. Other problems include salt water mixing with ground water contaminating shallow wells and tidal overwash into irrigation ponds, contaminating irrigation water sources.

Field crops vary in their sensitivity to high salt and high sodium levels. Soybeans, alfalfa, and most vegetable crops are very sensitive and will not tolerate much salinity. Soybeans will not survive in any fields flooded with tidal surge waters if planted this year. Corn has more tolerance (rated as moderate salt tolerance), but again will likely not grow next year in salt water inundated soils. Sorghum and small grains have higher salt tolerance. These will be future options as salt levels drop (if they fit into your crop rotation).

A quick test for soluble salts is the electrical conductivity (EC) of the soil: the higher the conductivity, the higher the salts. Some extension offices have an electrical conductivity meter equipped with soil probe sensors for direct soil EC measurements if you want to confirm soluble salt levels or monitor salt levels directly in fields during the year. Call your county extension office if you want to have your soils tested for EC. For sodium levels, a laboratory soil test will be needed.

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To reclaim a waterlogged, salt-affected soil, excess salts must be leached out, and where sodium is very high, it should be replaced with a more desirable cation such as calcium. The following are some strategies to manage salt affected soils:

• Irrigation, where available, will help to move salts out of the surface soil so that crops may be established. This requires significant amounts of water being applied over a long period of time so good drainage will be necessary. Make sure the irrigation water itself is non-saline. It is suggested to irrigate regularly over the winter (as conditions allow) to leach out as much salt as possible. It is best to irrigate intermittently, because the salt removal is more effective if the irrigation is done in separate 1-inch event (every few days), than a few big irrigation event.

- Drainage practices like subsurface tile or drainage ditches help remove the salty water from soils that are otherwise not well-drained.
- If the soil was flooded with salty or brackish water, gypsum application is strongly recommended as the calcium replaces the sodium on the soil exchange complex. This improves soil aggregation and drainage, and will be especially beneficial in medium and fine-textured soils. An initial application of 2 to 4 tons/acre is recommended, with lower rates generally needed for soils that are lighter (more sandy) or received less salt water. The gypsum can be surface applied and allowed to dissolve and infiltrate.
- Practices that promote uniform infiltration, leaching and mixing (e.g., plowing after the first season) can be beneficial
- If a field was seriously salinized, it may be best to leave it fallow for a season, with weeds controlled through herbicides or shallow mechanical weeding. This reduces plant transpiration and promotes leaching of the salts to the deeper parts of the soil.

• Plant salt tolerant crops once enough leaching from rainfall or irrigation has occurred. Sorghum species, including grain sorghum, Sudan grass, sweet sorghum, and sorghum/Sudan grass hybrids, have some salt tolerance. Many millets also are salt tolerant with Japanese millet being a good choice for salt contaminated soils. Small grains have relatively high salt tolerance. There are several perennial species such as coastal panic grass, tall fescue, and Bermuda grass that have good salt tolerance. Salt tolerant alfalfa varieties are also commercially available.

• Add low salt containing organic materials to the soil such as leaf compost or yard waste compost (do not use manure, sewage sludge, or mushroom soil based compost).

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