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.
Saltwater Inundation:
Implications for Agriculture

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).

Harold M. van Es | Professor, Department of Crop and Soil Sciences, Cornell University | 1005 Bradfield Hall, Ithaca, NY 14853-1901 | ph: 1-607-255-5629; fax: 1-607-255-2644; email: hmv1@cornell.edu; Skype: harold.van.es | http://css.cals.cornell.edu/

** THIS FACT SHEET IS AN UPDATED VERSION OF JOHNSON (2008), KENT COUNTY, UNIVERSITY OF DELAWARE COOPERATIVE EXTENSION. https://agdev.anr.udel.edu/weeklycropupdate/?p=189

Cornell Cooperative Extension provides equal program and employment opportunity. November 2012