

Managing Your Tropical Fruit Grove under Changing Water Table Levels¹

Jonathan H. Crane, Carlos F. Balerdi, and Bruce Schaffer²

This fact sheet has been prepared by IFAS faculty working with tropical fruit crops in an effort to assist growers manage their groves under conditions of flooding, high water tables, or drought. Although weather events cannot be controlled, becoming familiar with the effects of a high water table, flooding, or drought on tropical fruit crops may assist growers in managing their fruit trees so they survive these events with minimal or no damage. However, this process will be impacted by ground water levels, which are managed in south Florida, and thus are dependent on regional water management decisions.

Tropical Fruit Crops Flood and Drought Tolerance

Table 1 and 2 show the relative sensitivity of tropical and subtropical fruit crops to flooding or high water tables and drought, respectively. For south Miami-Dade, flooding tolerance may be more important than drought tolerance. This information was compiled from several sources including the scientific literature and field observations.

Flood tolerance is dependent upon crop species, prior plant stress (e.g., freezing weather, drought), crop load, air temperatures (warm temperatures are more detrimental), soil type, flooding depth and duration. Similarly, drought tolerance is dependent upon crop species, prior plant stress, and crop load.

Flood Tolerance Definitions

1. Tolerant—Flood tolerant fruit crops will survive excessively wet (high water table) and flooded conditions for several days to a few weeks. However, the stress of wet conditions may reduce tree growth and fruit production. In addition, root diseases may develop and result in tree damage or death.
2. Moderately tolerant—Moderately flood tolerant trees will survive several days of excessively wet or flooded soil conditions. However, the stress of wet conditions may reduce tree growth and fruit production. In addition, root disease may develop and result in tree damage or death.
3. Not tolerant—Trees not tolerant of wet or flooded soil conditions. Trees may sustain heavy damage or be killed by one to a few days of wet soil conditions.

Drought Tolerance Definitions

1. Tolerant—Trees tolerate lack of water for a few days to several weeks. However, drought stress may reduce tree growth and yields.
2. Moderately Tolerant—Trees may withstand several days of drought. However, drought stress may reduce tree growth and yields.

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2. Jonathan H. Crane, professor, tropical fruit crops Extension specialist, UF/IFAS Tropical Research and Education Center; Carlos F. Balerdi, multi-county fruit crops Extension agent IV (retired), UF/IFAS Extension Miami-Dade; and Bruce Schaffer, environmental plant physiologist, UF/IFAS Tropical Research and Education Center; UF/IFAS Extension, Gainesville, FL 32611.

3. Not Tolerant—Trees may survive a few days of drought. However, this may result in severe leaf drop, poor vegetative growth, and a large reduction in yield.

Symptoms and Recovery From Flooding and Drought Stress

Tree symptoms of flooding stress vary, and in general, flooding reduces plant growth and crop yields of flood tolerant and non-tolerant fruit crops.

Symptoms of flooding or excessively wet soil conditions progress from 1 to 4 and include the following.

1. Leaf wilting and browning (scorching).
2. Fruit drop and leaf chlorosis and leaf abscission (drop).
3. Stem dieback, limb dieback.
4. Tree death.

Symptoms of drought stress are identical to flooding stress. Drought generally reduces plant growth and potential yields of drought tolerant and non-tolerant crop species alike.

Documentation and Reporting

1. Report damage to your local Farm Service Agency (FSA) (a part of USDA) as soon as possible after the adverse weather event. Be sure to ask FSA for advice on when it is ok to begin repair and recovery of trees because they will need to verify the damage prior to your repairs and/or removal of trees.
2. Document the number of damaged trees and the extent of damage of each tree. Photograph flooding and flood stressed trees and keeping receipts for any supplies or work pertaining to mitigating tree damage and recovery.

Steps in Flooding and Drought Stress Recovery

Flooding stress recovery:

1. Allow the flood-water to subside.
2. Remove a portion of the tree canopy. This will reduce the leaf water loss (transpirational load) from the root system so the remaining leaves do not desiccate and die.

3. Remove fruit from the tree, which may decrease the effect of the flooding stress.
4. If your trees show flooding stress symptoms and the water subsides, and if there is a registered fungicide for your crop, apply the fungicide according to label instructions.
5. Note: Damage may be more severe on young trees than on large mature trees. Trees with fruit tend to have a more severe negative reaction to flooding than trees without a fruit load.
6. Wait several weeks to months to evaluate the extent of tree damage or tree death. This is because it takes time for trees to recover from flooding stress, and for trees to decline from flooding. As an example, sometimes trees may lose leaves or have scorched (brown) leaves, but the tree is still alive and eventually recovers.

Drought stress recovery:

1. Apply water to trees as soon as possible, thoroughly drenching the soil profile.
2. If severe wilting or leaf drop begins, remove a portion of the tree canopy. This will reduce the leaf water loss (transpirational load) from the root system so the remaining leaves do not desiccate and die.
3. Remove fruit from the tree which may decrease the effect of the drought stress.
4. Note: Damage may be more severe to young trees than to large mature trees. Like flooding stress, trees with fruit tend to have a more severe negative reaction to drought than trees without a fruit load.
5. Wait several weeks to months to evaluate the extent of tree damage or tree dieback. This is because it takes time for trees to recover from drought stress. Like flooding stress, sometimes trees may lose leaves or have scorched (brown) leaves but the tree is still alive and eventually recovers.

Disease Control for Flood Stressed Trees

Under flooding and high water table conditions root diseases proliferate. This is especially true of the disease causing “water molds”—*Pythium* and *Phytophthora*. For groves that are located in low, flood prone areas, or areas of high water table, the grower has to be aware that these fungi can attack tree roots and cause severe losses. These

diseases spread very fast, and growers cannot afford to wait for long before taking remedial action. Two fungicides are commonly used to stop the spread and the damage of these diseases—mefenoxam and phosphorous acid (e.g., fosetyl-Al, phosphonate, phosphonic acid). Mefenoxam is usually drenched around the root area, and phosphorous acid may be sprayed on the foliage, drenched into the soil adjacent to the base of the tree for root uptake, or injected into the trunk. Timely use of these compounds on labeled crops can be very effective in avoiding extensive damage. On the other hand, repeated preventative treatments should be avoided as resistance to these products may develop, as is already happening with mefenoxam on citrus in some areas of Florida. These fungicides are only registered for certain crops and must be applied according to label instructions. Please contact your local county agricultural Extension agent for specific information.

Planting and Replanting

Avoid property that has a history of flooding or excessively wet soil conditions. Along the east and west coastal flatwoods areas, single or double beds should be erected prior to planting. In previously planted groves that were recently flooded or suspected to be subject to flooding, we recommend replanting those trees that have died on 3 ft high mounds or higher. If you lose entire rows you should consider making 3 ft high by 3 ft to 5 ft wide beds. You may also want to consider replanting with flood tolerant tropical fruit crops (see Table 1).

SITE SELECTION

Before purchasing land several factors should be determined including land elevation, soil type, the flooding history of the property, and the status of access to good quality water. This information may be obtained from some Cooperative Extension Offices, land title companies, the Natural Resources Conservation Service (formerly the Soil Conservation Service), and the regional water management district. Elevations at or below 4–6 feet may be subject to periodic flooding in some areas of south Florida. In addition, view adjacent property for what agricultural activity is occurring, e.g., container nursery, fruit crop, vegetable crop, and potential signs of flood damage (e.g., dead plants). Speak with potential neighbors concerning past conditions of the land you intend to buy. You may also want to contact an agent at the Cooperative Extension Service about the property.

SOIL TYPES AND PLANTING

There are two basic soil types in most of the land in south Miami-Dade County, the marls and the rock soils. Tropical fruit trees should only be planted in rock soils. There are very few cases where tropical fruit groves have been planted in marl. Trees in these areas are at greater risk of excessively wet or flooded soil conditions than on the rock soils. In other counties of south Florida sandy and muck soils predominate. In general, the elevation in areas with muck soils is low, and the potential for excessively wet or flooded conditions is high. Sandy soils found along the east and west coastal counties vary in their depth above the water table. The main criteria used to choose a planting site is to look for sites with as high an elevation as possible and with well drained sandy soil.

During the tree planting process, the soil going into the planting hole should be the same soil that was removed from it. Do not add any other soil to the planting hole. Muck, marl, peat, etc. have a high water holding capacity and may provide an excessively wet environment leading to root disease.

Table 1. Flood tolerance of tropical and subtropical fruit crops based on the literature and field observations.

Tolerant	Moderately tolerant	Not tolerant
Guava	Lychee	Avocado
Sapodilla	Longan	Papaya
Caimito	'Tahiti' lime	Mamey sapote
Coconut	Canistel	Sugar apple
Grafted citrus	Mango	Atemoya
	Carambola	Passion fruit
	Banana	Jackfruit

Table 2. Drought tolerance of tropical and subtropical fruit crops based on the literature and field observations.

Tolerant	Moderately tolerant	Not tolerant
Grafted citrus	Avocado	Air-layered citrus
Sapodilla	Mamey sapote	Papaya
Mango	Passion fruit	Banana
Canistel	Lychee	
	Longan	
	Carambola	
	Caimito	
	Coconut	
	Guava	
	Jackfruit	
	Sugar apple	
	Atemoya	