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A Practical Guide for Peach Irrigation Scheduling in Florida[1]

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Introduction

The goal of this publication is to provide a practical guideline for irrigation of young (1–3 years old) and adult (>3 years old) peach trees (*Prunus persica* L.) cultivated in Florida. This document is based on field research of peach water uptake conducted by UF/IFAS (Zambrano-Vaca, Zotarelli, Beeson, et al. 2020; Zambrano-Vaca, Zotarelli, Morgan, et al. 2020). The adequate application of irrigation water that matches the crop water demand is considered a best management practice, which will directly impact fruit yield and quality and minimize runoff and leaching of nutrients (FDACS 2011). The target audience for this publication is peach growers, Extension agents, crop consultants, representatives of irrigation industry, state and local agencies, high school and college students and instructors, researchers, and interested Florida citizens. This publication is divided into three main sections. The first section describes peach tree growth stages and their respective crop water demands. The second and third sections present practical information on preparing year-round irrigation scheduling for young and adult peach trees, respectively. More information about irrigation practices for peaches is provided in EDIS publication HS1316 (https://edis.ifas.ufl.edu/hs1316).

List of Acronyms Used in This Publication

- ASWD%, maximum allowable soil water depletion
- DOY, day of the year
- ET, evapotranspiration
- ET_A, actual evapotranspiration
- ET_O, reference evapotranspiration
- FAWN, Florida Automated Weather Network
- FC, soil field capacity
- Kc, crop coefficient
- MAD, management allowable depletion

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- PCA, projected canopy area
- WP, soil wilting point

Peach Tree Phenology versus Crop Water Demand in Central Florida

Peach tree phenology, or seasonal growth stages, is a response from combining factors, including environmental conditions and cultivar characteristics (e.g., chilling hour requirements), which result in different lengths of phenological stages, depending on the location. Thus, peaches grown in subtropical humid conditions, like Florida, have a shorter dormancy period (approximately 50 days) than trees grown in northern states, such as New Jersey, where dormancy can last over 90 days. A shorter dormancy stage results in a longer growing period, which can reach up to 315 days in Florida. Dormancy is the temporary suspension of visible growth of any plant structure containing a meristem, a bud or growing point (Lang et al. 1987). In Florida, this occurs between December and January (335–20 day of the year, DOY). The end of the dormancy stage is characterized by the beginning of bud swelling, the formation of light green buds, and the visibility of leaf tips. Generally, around this time, the first application of fertilizer occurs (Figure 1). It is noteworthy that fertilizer rates should be determined from results of soil and leaf analyses, which can vary among orchards. The most critical timing for peaches regarding crop water demand is between January and May (21–120 DOY). During this time, the growth stage is characterized by flowering, leaf expansion, fruit development, and fruit maturation. Maintenance of adequate soil moisture in the root zone is crucial for achieving yield potential and fruit quality, mainly because of the increasing crop water demand and lower seasonal precipitation rates. According to peach growers and representatives of the peach industry in Florida, the minimum marketable fruit size for peach is 2.24 inches. Peach fruit size is the product of cell division and cell expansion. Any plant stress that negatively impacts cell division early in ovary growth and cell expansion after pit hardening will serve to reduce fruit size (Mirás-Avalos et al. 2013). Figure 2 illustrates the three stages of peach fruit development, including cell division, pit hardening, and cell expansion, which span about 80 days, under Florida conditions occurring between the end of January and the end of April. Mild drought stress during pit hardening (second stage) is less likely to negatively affect final fruit size; however, any water stress should be avoided. After harvest, there is a shoot elongation (growth) stage lasting from May to November (120–300 DOY). Shoot development is characterized by vigorous growth of peach shoots. Summer pruning and fertilization are scheduled during this period to ensure strong flower bud development. This period also coincides with high air temperatures, long days, and greater tree crop water demand. For more information about training and pruning of peaches, see EDIS publication HS1111, *Training and Pruning Florida Peaches, Nectarines, and Plums* (https://edis.ifas.ufl.edu/hs365). The beginning of the peach senescence stage, leaf drop, occurs around November and leads to the dormancy period (Figure 1).

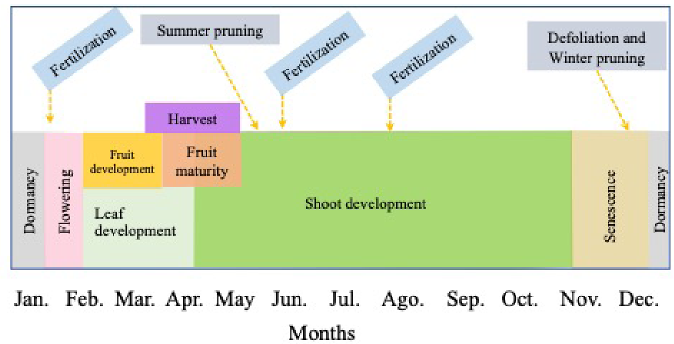


Figure 1. Example of a typical peach tree growth stages between January and December in central Florida. Yellow broken arrows indicate fertilizer application timing, pruning, and defoliation practices. In this study, the trees were fertilized with a blend of soluble fertilizer (70%) and controlled-release fertilizer (30%) for each application, for a total annual application rate of 89 lb/ac of N, 30 lb/ac of P_2O_5, and 45 lb/ac of K_2O, split in three equal applications in late January, May, and August.

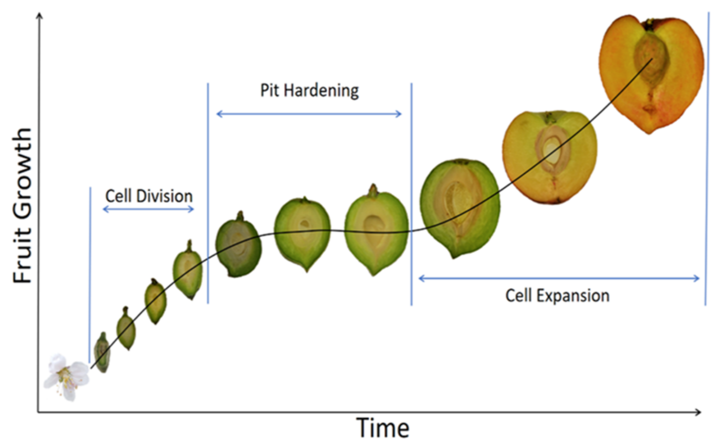
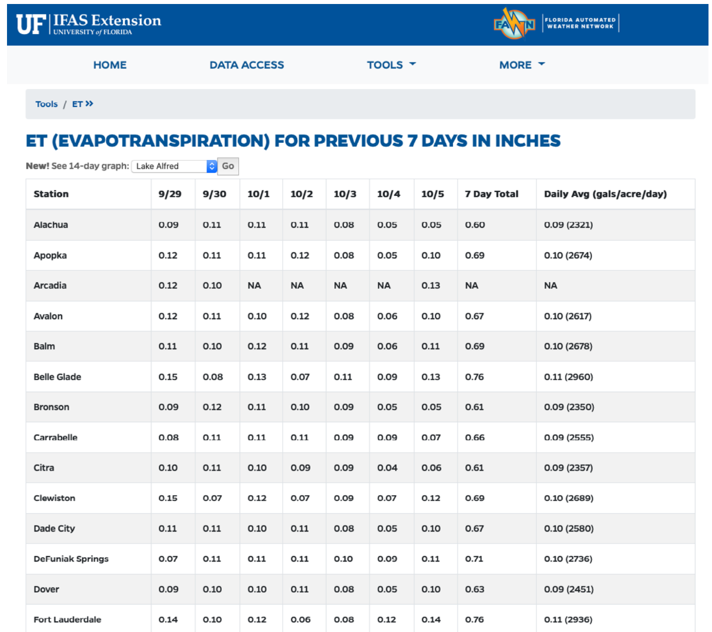


Figure 2. Representation of cultivar 'UFSun' peach fruit growth stages over approximately 80 days. In Florida, these stages occur between the end of January and the end of April.
Credits: D. Huff and A. Sarkhosh, UF/IFAS

Reference Evapotranspiration (ET_o)

In agriculture, evapotranspiration (ET) is defined as the combined loss of water to atmosphere by evaporation from soil surfaces and water droplets on the plant leaves and by plant transpiration, which is water loss through plant systems. The major weather drivers affecting ET are solar radiation, air temperature, relative humidity, and wind speed. These weather parameters are available at the Florida Automated Weather Network (FAWN, www.fawn.ifas.ufl.edu). Soil water availability to the plant and soil hydraulic conductivity are also factors that impact the ET rate (Allen et al. 1998).

Reference evapotranspiration (ET_O) is a method to standardize the evaporative demand of the atmosphere, independent of crop type or stage of development (Allen et al. 1998). The methodology to calculate the Penman-Monteith Evapotranspiration is provided in EDIS publication AE459, *Step by Step Calculation of the Penman-Monteith Evapotranspiration (FAO-56 Method)* (https://edis.ifas.ufl.edu/ae459) and by Allen et al. (1998). For example, in central Florida, the ET_O is lowest (0.05–0.07 inches/day) during the winter months of November, December, and January, which coincide with peach leaf senescence and dormancy periods. There is a progressive increase in ET_O during the spring months, from 0.07 to 0.17 inches/day, between February and May. The spring months are characterized by low precipitation, so supplemental irrigation is generally required for peaches. Spring is also the most critical timing for peach production because leaf and fruit development occur, and crop water stress can cause reductions in vegetative growth and consequently reduce yield, fruit size, and quality. After fruit harvest (late March to May), peach trees enter the shoot development stage, which lasts until mid-November. The highest values of ET_O occur between May and August, with monthly ET_O above 0.15 inches/day or 4.5 inches/month. During fall months, decreasing air temperatures and solar radiation contribute to a gradual decrease in ET_O. The ET_O value for the previous day can be retrieved from the nearest FAWN weather station on the FAWN website (https://fawn.ifas.ufl.edu/tools/et/). Figure 3 presents the ET_O values retrieved from FAWN for the previous 7 days in inches. The daily ET_O values present valuable information that describes the potential evaporative demand year-round for the hypothetical well-watered grass. However, this information still needs to be correlated with crop type, crop stage, and management practices to determine the actual crop evapotranspiration (ET_C) or crop water demand. The estimation of crop water requirement for young and adult peach trees is presented below.



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HOME DATA ACCESS TOOLS MORE

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ET (EVAPOTRANSPIRATION) FOR PREVIOUS 7 DAYS IN INCHES

New! See 14-day graph: Lake Alfred Go

Station	9/29	9/30	10/1	10/2	10/3	10/4	10/5	7 Day Total	Daily Avg (gals/acre/day)
Alachua	0.09	0.11	0.11	0.11	0.08	0.05	0.05	0.60	0.09 (2321)
Apopka	0.12	0.11	0.11	0.12	0.08	0.05	0.10	0.69	0.10 (2674)
Arcadia	0.12	0.10	NA	NA	NA	NA	0.13	NA	NA
Avalon	0.12	0.11	0.10	0.12	0.08	0.06	0.10	0.67	0.10 (2617)
Balm	0.11	0.10	0.12	0.11	0.09	0.06	0.11	0.69	0.10 (2678)
Belle Glade	0.15	0.08	0.13	0.07	0.11	0.09	0.13	0.76	0.11 (2960)
Bronson	0.09	0.12	0.11	0.10	0.09	0.05	0.05	0.61	0.09 (2350)
Carrabelle	0.08	0.11	0.11	0.11	0.09	0.09	0.07	0.66	0.09 (2555)
Citra	0.10	0.11	0.10	0.09	0.09	0.04	0.06	0.61	0.09 (2357)
Clewiston	0.15	0.07	0.12	0.07	0.09	0.07	0.12	0.69	0.10 (2689)
Dade City	0.11	0.11	0.10	0.11	0.08	0.05	0.10	0.67	0.10 (2580)
DeFuniak Springs	0.07	0.11	0.11	0.11	0.10	0.09	0.11	0.71	0.10 (2736)
Dover	0.09	0.10	0.10	0.11	0.08	0.05	0.10	0.63	0.09 (2451)
Fort Lauderdale	0.14	0.10	0.12	0.06	0.08	0.12	0.14	0.76	0.11 (2936)

Figure 3. Reference evapotranspiration (ET_O) in inches from the previous seven days.
Credits: https://fawn.ifas.ufl.edu/tools/et/

Determining Crop Water Requirement for Young Peach Trees Using Daily Actual Evapotranspiration

For young peach trees (1–3 years old), the daily actual evapotranspiration (ET_A), which is the volume of water a tree transpires and evaporates from the soil surface of the container, expressed in gallons per plant per day, has been determined using weighing lysimeters (Zambrano-Vaca, Zotarelli, Morgan, et al. 2020). A weighing lysimeter is a very accurate method to determine plant water use (Figure 4). As the peach canopy grows in size, the crop water requirement increases proportionally. Thus, ET_A was directly correlated to the plant projected canopy area (PCA) for young peach trees. The PCA can be easily determined with a tape measure by multiplying consistent perpendicular branch spread measurements, from north-south and east-west directions (Figure 4). PCA can be expressed in square feet.

The correlation between peach PCA and water demand in gallons per plant per day is presented in Table 1. PCA can be useful as a practical tool to determine water demand for containerized peach trees in nurseries or recently transplanted orchards, where tree canopies are generally kept with similar size or recently transplanted orchards.

Figure 4. Weighing lysimeter used to determine the actual evapotranspiration (ETA) of young peach trees by weighting the volume of water is lost by evaporation and transpiration daily. The yellow arrows indicate the projected canopy area measurements in feet.
Credits: Carlos Zambrano-Vaca, UF/IFAS

In the example below, we present all the steps needed to determine the volume of water required by a young peach tree using the daily ET_O from FAWN website.

Example 1—Using Current FAWN Daily ET_O

Determine the actual evapotranspiration (ET_A) of a 2-year-old peach tree located in Apopka between 10/2 and 10/5:

Projected plant canopy (PCA) = 35 ft^2

Using the values of Table 1, the nearest value of PCA of 35 ft^2 indicates that the ET_A is 13.18 gal/day per plant per inch of ET_O.

The ET_A value needs to be adjusted by the daily ET_O retrieved from FAWN (Figure 3) for Apopka for the period of 10/2 and 10/5.

Thus, ET_A of peach tree can be calculated as:

$ET_{A\text{-}10/02}$ (inch/day) = 13.18 gal/day * 0.12 inch/day = 1.58 gal/day/plant

$ET_{A\text{-}10/03}$ (inch/day) = 13.18 gal/day * 0.08 inch/day = 1.05 gal/day/plant

$ET_{A\text{-}10/04}$ (inch/day) = 13.18 gal/day * 0.05 inch/day = 0.66 gal/day/plant

$ET_{A\text{-}10/05}$ (inch/day) = 13.18 gal/day * 0.10 inch/day = 1.32 gal/day/plant

Determining Crop Water Demand for Adult Peach Trees Using ET_O × Kc

Mature peach trees (>3 years old) are periodically pruned to maintain a determined canopy size to favor fruit production. Thus, the correlation of ET_A and PCA is not applicable for adult peach trees. For mature peach plants, the daily ET_C (inch/day) is determined by multiplying the ET_O value by the respective crop coefficient (Kc). The Kc is the integrated crop factor that accounts for the differences in tree size, height, surface area, tree stage, and management practices compared to the hypothetical well-watered grass-reference. The Kc values have been determined for field peaches grown in Florida conditions (Zambrano-Vaca, Zotarelli, Beeson, et al. 2020; Zambrano-Vaca, Zotarelli, Morgan, et al. 2020), allowing an accurate estimation of peach ET_C year-round. The Kc for peaches was determined with the typical management used in Florida. Peach trees were planted 15 ft apart in-row and 20 ft apart in between rows, with an allocated tree space of 300 ft^2, resulting in 154 trees/acre plant population. Pruning was conducted twice a year in December and June (Figure 1).

Example 2—Using ET_O and Kc

Determine the daily crop evapotranspiration (ET_C) of a 5-year-old peach orchard located in Apopka between 10/2 and 10/5:

The Kc value presented in Table 2 for the shoot development stage in October is 0.61.

Then, from Figure 3, the daily ET_O from FAWN for Apopka for the period of 10/2 and 10/5 can be obtained. ET_C of peach tree can be calculated as:

$ET_{C\text{-}10/02}$ (inch/day) = Kc * $ET_{O\text{-}10/02}$ = 0.61 * 0.12 inch/day = 0.07 in/day

$ET_{C\text{-}10/03}$ (inch/day) = Kc * $ET_{O\text{-}10/03}$ = 0.61 * 0.08 inch/day = 0.05 in/day

$ET_{C\text{-}10/04}$ (inch/day) = Kc * $ET_{O\text{-}10/04}$ = 0.61 * 0.05 inch/day = 0.03 in/day

$ET_{C\text{-}10/05}$ (inch/day) = Kc * $ET_{O\text{-}10/05}$ = 0.61 * 0.10 inch/day = 0.06 in/day

For the period of 10/2–5, the estimated ET_C of peach trees ranged from 0.03 to 0.07 in/day. Below, we present the development of an irrigation scheduling for peach trees considering the soil characteristics, root zone depth, and type of irrigation system.

Developing an Irrigation Scheduling for Peach Trees

For practical purposes, the development of irrigation scheduling of peaches in Florida uses different methods to determine the plant water demand for young and adult peach trees. For young peach trees, it is recommended to use the ET_A method based on the peach PCA, and for adult peach trees, the ET_C method of multiplying $ET_O \times Kc$ is recommended. As discussed above, the daily crop water demand varies with plant age and size, time of the year, and weather conditions. A fine-tuned irrigation schedule considers the crop water demand in addition to soil water-holding capacity, depth of the root zone, and capabilities of the irrigation system. The goal is to determine the volume of irrigation water and application timing to avoid plant water stress and overirrigation.

The first question we need to answer is what is the soil water storage in the root zone? The soil water-holding capacity can be defined as available water between soil field capacity (FC) and the wilting point (WP). For more details, see EDIS publication AE260, *Principles and Practices of Irrigation Management for Vegetables* (https://edis.ifas.ufl.edu/cv107). There are two major soil types in Florida where peaches can be cultivated: the sandy Ridge soils, which can hold 0.3–0.7 inches/ft, and the Flatwood soils, which can hold 0.3–1.2 inches/ft. In other words, a few hours after a long and persistent rainfall ceases, it is expected that the excess water in the soil profile is drained, and it is very likely the soil moisture at the root zone is about FC. As the days go by, the evapotranspiration process occurs using the available soil water until a point that the plant cannot uptake water from the soil anymore; that point is WP. Proper irrigation management provides supplemental irrigation water before all available water is depleted and WP is reached. From flowering and fruit maturity (January and May), when soil moisture values get below 25% of the FC, peach trees may be subjected to water stress. This value is also called maximum Available Soil Water Depletion (ASWD%) or Management Allowable Depletion (MAD), which was experimentally determined for Arredondo sand soil (Zambrano-Vaca, Zotarelli, Morgan, et al. 2020). During summer and fall months, which are also characterized higher precipitation than spring, ASWD% may be reduced to 40% and the contribution of daily rainfall should be accounted for.

The second question is, how deep is the peach root zone? About 90% of the peach root mass is concentrated in the top 12 inches depth (Forey et al. 2017). However, peach roots can be found down to 3 ft. Peach trees cultivated on sandy Ridge soils can have a deeper root system than the Flatwood soils in which the water table depth generally limits the root zone.

Example 3—Putting It All Together

Determine the irrigation scheduling of an adult peach orchard in April (leaf and fruit) development stage in Lake Alfred, FL.

The characteristics of the orchard are:

- Orchard—154 trees/acre spaced 15 ft apart in-row and 20 ft between rows.
- Root depth—3 ft.
- Soil—sandy Ridge soil—0.7 inches/ft.
- Maximum allowable depletion (MAD)—25%.
- Irrigation system details: each tree is irrigated by 2 microsprinklers (12 ft diameter, 240?, flow rate of 0.175 gal/min or 10.5 gal/hr), and efficiency of the irrigation system (Ea = 90%).
- Irrigation system wets approximately 40% of the total area of the orchard.

Step-by-step calculation of soil water-holding capacity, MAD, and maximum irrigation runtime:

The determination of the how much water the soil profile can hold will determine the runtime and interval of irrigation events. For more details about the concept of soil moisture and water-holding capacity, see EDIS publication AE460, *Interpretation of Soil Moisture Content to Determine Soil Field Capacity and Avoid Over-Irrigating Sandy Soils Using Soil Moisture Sensors* (https://edis.ifas.ufl.edu/ae460). For practical purposes, we have included the following steps on the calculation of soil water-holding capacity, maximum allowable depletion, and maximum irrigation runtime for soils in which peaches are commonly grown in the state.

Step 1. Calculate the volume of water the root zone can hold and the MAD: 0.7 inches/ft × 3 ft deep root zone = 2.1 inches.

Step 2. Considering the MAD of 25%: 2.1 inches × 25% = 0.53 inches is the water volume to refill at maximum depletion allowable.

Step 3. Convert the volume of water in inches to gallons/tree: 0.53 inches/tree × 1 ft/12 in × (15 ft × 20 ft) × 7.5 gal/ft^3 × 40% coverage = 39.75 gal/tree.

Step 4. Calculate the maximum irrigation run time: 39.75 gal/10.5 gal/hr emitter flow rate × 2 emitters/tree = 1.9 hr.

Step 5. Adjust runtime by irrigation efficiency (Ea) for microsprinkler: 1.9 hr/0.9 = 2.1 hr of maximum runtime.

Calculation of irrigation scheduling for the period of 9/29–10/5 in Apopka.

- ET_O: 0.12; 0.11; 0.11; 0.12; 0.08; 0.05; 0.10 inches/day for 9/29 to 10/5, respectively (Figure 3).
- Kc for crop stage Leaf Develop. (fruit develop./maturity): 0.61.
- Rainfall events during the period: on 9/29, 1.03 inches, and no rainfall reported for the other days.

Step 6. Calculate the $ET_C = ET_O \times Kc$:

$ET_{C\text{-}09/29}$ = 0.12 inches/day × 0.61 = 0.073 inches/day.

$ET_{C\text{-}09/30}$ = 0.11 inches/day × 0.61 = 0.067 inches/day.

$ET_{C\text{-}10/01}$ = 0.11 inches/day × 0.61 = 0.067 inches/day.

$ET_{C\text{-}10/02}$ = 0.12 inches/day × 0.61 = 0.073 inches/day.

$ET_{C\text{-}10/03}$ = 0.08 inches/day × 0.61 = 0.049 inches/day.

$ET_{C\text{-}10/04}$ = 0.05 inches/day × 0.61 = 0.031 inches/day.

$ET_{C\text{-}10/05}$ = 0.10 inches/day × 0.61 = 0.061 inches/day.

Step 7. Convert the volume of water in inches to gallons/tree:

Volume of water $_{\text{9/29 and 10/02}}$ (gal/tree) = 0.073 inches/tree/day × 1 ft/12 in × (15 ft × 20 ft) × 7.5 gal/ft^3 × 40% coverage = 3.3 gal/tree.

Volume of water $_{\text{9/30 and 10/01}}$ (gal/tree) = 0.067 inches/tree/day × 1 ft/12 in × (15 ft × 20 ft) × 7.5 gal/ft^3 × 40% coverage = 3.0 gal/tree.

Volume of water $_{\text{10/03}}$ (gal/tree) = 0.08 inches/tree/day × 1 ft/12 in × (15 ft x 20 ft) × 7.5 gal/ft^3 × 40% coverage = 2.2 gal/tree.

Volume of water $_{\text{10/04}}$ (gal/tree) = 0.05 inches/tree/day × 1 ft/12 in × (15 ft x 20 ft) × 7.5 gal/ft^3 × 40% coverage = 1.4 gal/tree.

Volume of water $_{\text{10/05}}$ (gal/tree) = 0.10 inches/tree/day × 1 ft/12 in × (15 ft × 20 ft) × 7.5 gal/ft^3 × 40% coverage = 2.7 gal/tree.

Step 8. Calculate the irrigation run time:

Runtime $_{\text{9/29 and 10/02}}$ = 3.3 gal/10.5 gal/hr emitter flow rate × 2 emitters/tree = 0.63 hr × 60 min = 38 minutes of irrigation/day.

Runtime $_{\text{9/30 and 10/01}}$ = 3.0 gal/10.5 gal/hr emitter flow rate × 2 emitters/tree = 0.58 hr × 60 min = 35 minutes of irrigation/day.

Runtime $_{\text{10/03}}$ = 2.2 gal/10.5 gal/hr emitter flow rate × 2 emitters/tree = 0.42 hr × 60 min = 25 minutes of irrigation/day.

Runtime $_{\text{10/04}}$ = 1.4 gal/10.5 gal/hr emitter flow rate × 2 emitters/tree = 0.26 hr × 60 min = 16 minutes of irrigation/day.

Runtime $_{\text{10/05}}$ = 2.7 gal/10.5 gal/hr emitter flow rate × 2 emitters/tree = 0.52 hr × 60 min = 31 minutes of irrigation/day.

Step 9. Adjust runtime by irrigation efficiency (Ea) for microsprinkler:

Runtime $_{\text{Ea-9/29 and 10/02}}$ = 38 min/0.9 = 42 minutes of irrigation/day.

Runtime $_{\text{Ea-9/30 and 10/01}}$ = 35 min/0.9 = 38 minutes of irrigation/day.

$\text{Runtime}_{\text{Ea-10/03}}$ = 25 min/0.9 = 28 minutes of irrigation/day.

$\text{Runtime}_{\text{Ea-10/04}}$ = 16 min/0.9 = 17 minutes of irrigation/day.

$\text{Runtime}_{\text{Ea-10/05}}$ = 31 min/0.9 = 35 minutes of irrigation/day.

Because there was a rainfall of 1.03 inches on 09/29 that brought the soil moisture near the FC, when should the first irrigation occur?

From Step 1, we calculated that the 3 ft depth soil profile could store up to 2.1 inches of water; however, when the soil moisture reaches the 25% MAD, which for this particular soil is equivalent to the volume of 0.53 inches, irrigation should be resumed to avoid water stress. From Step 6, we calculated that the daily ET_C for the adult peach fruit development stage is 0.073; 0.067; 0.067; 0.073; 0.049; 0.031; and 0.061 inches/day for the period of 9/29 to 10/5, totaling 0.42 inches. Therefore, subtracting the cumulative daily ET_C for the period from the MAD (0.53 - 0.42 = 0.11 inches of soil-available water on 10/05, which means that no irrigation was needed in the period in question. However, considering the ET_C for the next following days (10/06 to 10/10) is 0.061 inches/day. On 10/07, the cumulative ET_O will be reaching the MAD level, thus, the irrigation can be resumed on 10/07 to bring the soil moisture near the soil FC, following Steps 3, 4, and 5. In other words, the volume of precipitation should be accounted and irrigation events should be halted until the soil moisture is depleted near the MAD.

In summary, this article described the development of irrigation strategy for young and adult peach trees in Florida. Multiple factors should be accounted for the development of an irrigation strategy, among them ET_O, rainfall, crop stage, soil water-holding capacity, and irrigation capabilities and design.

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Table 1. Young peach (1–3 years old) projected canopy area (ft^2) and corresponding actual crop evapotranspiration ($ET_{A\text{-}young}$) in gallons of water per plant per inch of reference evapotranspiration (ET_O). Data source from field measurements collected from April 2016 and October 2018 in Apopka, FL, and reported in Zambrano-Vaca, Zotarelli, Beeson, et al. (2020).

Young peach tree projected canopy area	**Actual crop evapotranspiration ($ET_{A\text{-}young}$) per inch of reference evapotranspiration (ET_O)**
(ft^2)	**(Gallons/inch)**
1	0.55
5	2.03
10	3.89
15	5.75
20	7.61
25	9.46
30	11.32
35	13.18
40	15.04
45	16.90
50	18.75
55	20.61
60	22.47
70	26.19

Table 2. Monthly growth stages of adult peach trees and respective crop coefficients (Kc), historic reference evapotranspiration (ET_o), and crop evapotranspiration (ET_c) in inches per month and inches per day.

			Historic Reference Evapotranspiration (ET_O)		**Crop evapotranspiration (ET_C)^z**	
Month	**Growth stage**	**Kc**	**Inch/month**	**Inch/day**	**Inch/month**	**Inch/day**
Jan	Dormancy	0.38	1.87	0.06	0.70	0.02
Feb	Leaf Develop. (flowering)	0.47	2.46	0.09	1.16	0.04
Mar	Leaf Develop. (flowering/fruit develop.)	0.55	3.54	0.11	1.95	0.06
Apr	Leaf Develop. (fruit develop./ maturity)	0.61	4.44	0.15	2.72	0.09
May	Harvest	0.66	5.24	0.17	3.44	0.11
Jun	Shoot Develop.	0.68	5.05	0.17	3.46	0.12
Jul	Shoot Develop.	0.69	5.10	0.16	3.54	0.11
Aug	Shoot Develop.	0.68	4.82	0.16	3.30	0.11
Sep	Shoot Develop.	0.66	4.06	0.14	2.67	0.09
Oct	Shoot Develop.	0.61	3.20	0.10	1.96	0.06
Nov	Senescence	0.55	2.15	0.07	1.19	0.04
Dec	Dormancy	0.47	1.68	0.06	0.79	0.03

^{z}Crop evapotranspiration (ET_C) is calculated by multiplying the historic ET_O and respective Kc for each month.