

# Frequently Asked Questions about Soil Moisture Sensor Irrigation Controllers (SMS)<sup>1</sup>

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## What is a soil moisture sensor (SMS)?

A soil moisture sensor (SMS) is a sensor that detects how much moisture is in the soil and prevents an irrigation system from running when it is not needed.

## What are the benefits of an SMS?

Research has shown that a properly calibrated SMS can help homeowners irrigate more efficiently, potentially resulting in water and monetary savings. The use of an SMS in the landscape can help reduce errors that lead to over- or underestimating landscape water needs. Using an SMS can also help reduce the work needed to maintain a healthy landscape.

## How does an SMS work?

Sensors are placed beneath the soil in the root zone. They help to reduce irrigation water waste by preventing irrigation from turning on when not needed or turning it on only when necessary. Many irrigation systems have one SMS; however, it is possible to have more than one for separate irrigation zones that have different moisture needs. When there is only one sensor, it is often located in the driest part of the landscape, typically the area that receives the most sun exposure.

Once installed, the contractor or homeowner programs the SMS controller with the desired “moisture threshold” based on landscape plant needs. This moisture threshold determines when the system will operate to achieve the desired irrigation. **Bypass** SMS controllers either allow or bypass a scheduled irrigation cycle based on the level of moisture in the soil; however, they do not actually turn on the irrigation system. **On-demand** SMS controllers turn on an irrigation system when the soil moisture level falls below a specified level. Learn more about the design, installation, and setting of SMS controllers at <http://edis.ifas.ufl.edu/ae437>.

## Frequently Asked Questions about SMS

### *1. I am uncertain about adopting new technologies; how do I know this really works?*

SMS controllers have been used in commercial and agricultural settings for many years and are now becoming more widespread in home landscapes. SMS controllers have been around for more than fifty years, but the technology has improved since its initial development. Many years of research and development have gone into ensuring that the products available to homeowners are durable, effective, and easy to use.

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Figure 1. An example of a soil moisture sensor being installed in the soil. Credits: Michael Gutierrez, UF/IFAS



Figure 2. An example of a soil moisture sensor control panel. Credits: Michael Gutierrez, UF/IFAS

## 2. Why are the irrigation cycles shorter with SMS?

Irrigation cycles are shorter because the amount of water applied is more precise, meaning less unnecessary waste. An SMS can be programmed to irrigate multiple times on a designated irrigation day. These irrigation cycles are shorter than one long programmed cycle. After each cycle, the SMS will check the soil moisture. If the SMS determines the soil has reached the desired moisture threshold, it will bypass the remaining cycles for that day. If the soil needs more moisture, it will allow the system to run the next cycle. The system will continue to run until the soil moisture level has either reached the threshold or the total run time has been completed.

## 3. Why will the system irrigate if it is raining?

There is not an automatic rain shut off device on an SMS. Therefore, if it begins to rain while the system is irrigating, it will continue to irrigate until that cycle is complete. However, before the SMS runs its next irrigation cycle, it will recheck the moisture to determine if the previous irrigation cycle plus the rain have attained the desired moisture threshold. If the moisture is sufficient, it will bypass the next cycle. If the moisture has not yet reached its threshold, the next short cycle will still run. By running multiple short irrigation cycles rather than one long cycle, the SMS is able to regularly check the soil moisture levels to prevent overwatering.

## 4. When it has not been raining regularly, do I need to manually water or manually set the irrigation timer?

No. You do not need to manually water or manually set the irrigation timer. The SMS will determine when the soil moisture has fallen below the desired level and will allow the system to irrigate on the next scheduled day. Proper calibration of the SMS will ensure that the landscape's water needs are met even during dry periods.

## 5. Should I change the settings on the timer or the SMS controller on a seasonal basis?

Neither the timer nor the SMS controller needs to be reprogrammed seasonally. Since the SMS controller measures the actual moisture in the soil, as more or less rain falls, it will make adjustments to ensure adequate water for the landscape.

## 6. When should I change the settings?

There may be times when changing the settings on the SMS is appropriate:

- **New plantings**

After installing new plants, follow appropriate guidelines and bypass the SMS until establishment. Watering guidelines for new plants may be found at the following links:

Trees: <http://edis.ifas.ufl.edu/ep113>

Shrubs: <http://edis.ifas.ufl.edu/ep391>

Turfgrass: [http://manatee.ifas.ufl.edu/lawn\\_and\\_garden/master-gardener/gardening-manatee-style/f/fertilization-irrigation-fl-lawns-landscapes.pdf](http://manatee.ifas.ufl.edu/lawn_and_garden/master-gardener/gardening-manatee-style/f/fertilization-irrigation-fl-lawns-landscapes.pdf)

- **Too little or too much irrigation is observed**

If the sensor is placed in the driest area of the landscape, some areas of the landscape may receive too much irrigation. The sensor could be moved or the run times of the different zones can be adjusted to provide less/more water as needed. See "Let Your Lawn Tell You When to Water"

(<http://edis.ifas.ufl.edu/ep054>) for a discussion on the visual cues of underwatering.

#### • **After fertilizer application**

After fertilizing, a manual cycle may be needed to water-in the fertilizer. (No more than ¼ inch of water should be applied.) This will put the SMS into a bypass mode. After this manual cycle, the bypass should be turned off so the regularly scheduled irrigation cycles can resume. The SMS does not need to be recalibrated. Fertilizer should never be applied before a heavy rain is predicted because fertilizer runoff can pollute local waterways.

A correctly calibrated SMS system that is functioning properly should only be recalibrated when conducting annual maintenance. Calibration of the SMS should be conducted by utilizing the appropriate procedure as outlined in the SMS operating manual or by an irrigation contractor trained in the operation of a SMS.

#### **7. How do I know the settings are programmed correctly?**

An error light indicates a problem on the controller that should be addressed by a contractor trained in SMS maintenance. However, if there is no error light, the landscape looks healthy, and the system typically does not run when it has recently rained, it is likely that the settings are correct.

#### **8. What if I notice brown spots in my yard?**

Brown spots may appear for many different reasons: underwatering, overwatering, fungus, root rot, insect damage, or disease. Because brown spots may be a result of overwatering, improper diagnosis and a subsequent increase in irrigation could make the problem worse. For this reason, it is best to consult with a professional before altering the SMS system. A county Extension agent (<http://sfyl.ifas.ufl.edu/map/index.shtml>) can provide assistance in diagnosing and addressing the specific issue. The University of Florida's Plant Diagnostic Center (<http://plantpath.ifas.ufl.edu/extension/plant-diagnostic-center/>) is a useful resource for identifying plant diseases.

#### **9. If I think the system is underwatering or overwatering, what should I do?**

If the landscape receives too little or too much water, the moisture threshold may be set either too low (dry) or too high (wet). It is also possible that the system is not functioning correctly. In either case, consult the SMS owners' manual or contact an irrigation contractor trained in the operation of an SMS.

#### **10. What if part of my yard is getting sufficient water, but another part is not?**

An SMS typically measures the soil moisture at the driest location in the landscape. There are many reasons why parts

of a landscape may require more or less water, such as plant type, soil type, and sunlight availability. If certain areas are not receiving adequate irrigation, a contractor can move the soil moisture sensor or adjust the run times of the different zones to provide less or more water as needed in each zone. In extreme situations, a more extensive irrigation system change may be needed.

#### **11. Will I be able to maintain my lawn to the quality that is expected by my homeowners association (HOA)?**

Yes. Research has shown that correctly installed and calibrated SMS effectively maintain good quality turf (Shedd, Dukes, & Miller 2007). Additionally, SMS can help avoid unsightly turf decline caused by over- or underwatering.

#### **12. Why will the system not come on at a regularly scheduled time? Can I override the system to run the cycle?**

The irrigation system will not water when there is sufficient moisture already in the soil. Overriding the system to irrigate risks overwatering the landscape.

#### **13. How can I stop the system from running at an inconvenient time or waking me up in the morning?**

Adjusting the start time on the timer will ensure that the system does not operate at an inconvenient time. Irrigation should be in the early morning to avoid loss of water through evaporation. Many water management districts will allow watering any time before 10am, but be sure to check your local rules. Spray heads should also be directed away from buildings, windows, driveways, and sidewalks.

#### **14. What is the best way to reprogram the controller if it gets deactivated?**

If the SMS needs to be reprogrammed, it is best to consult the owner's manual or contact an irrigation contractor trained in SMS technology. The contractor will recalibrate the system based on the landscape needs, soil type, and type of irrigation system.

#### **15. How can I make sure I am following local watering restrictions?**

All jurisdictions in Florida have watering restrictions that dictate which days or times irrigation can occur. Properly setting the timer ensures these restrictions are followed and will prevent irrigation from operating on restricted days. If it has recently rained and the SMS finds that soil moisture is sufficient on the allowed watering days, the system will not irrigate and will, instead wait until the next scheduled watering day. For example, in areas where irrigation is restricted to one day a week, the SMS will bypass the irrigation cycle if it measures a sufficient amount of moisture to maintain the landscape on that day. While it may be concerning to skip a day of watering, a properly calibrated

SMS will ensure that the soil will have enough consistent moisture to maintain the landscape even when it skips days.

Refer to the appropriate water management district for information on watering restrictions. A list of districts may be found at <http://www.dep.state.fl.us/secretary/watman/>.

#### **16. Who is qualified to fix my irrigation system?**

Licensed irrigation contractors are the most qualified individuals to fix your system. Both the Florida Irrigation Society (<http://fisstate.org/>) and the Irrigation Association (<http://www.irrigation.org/>) maintain a list of contractors. Ask if the individual has received training in SMS controllers. Homeowners who feel comfortable following the SMS controller instruction manual can also make calibrations and adjustments on their own. Many companies who make SMS products have mechanisms in place to assist with troubleshooting. Consult the owners' manual for more information, such as technical assistance websites and telephone numbers.

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## **References**

Shedd, M., Dukes, M. D., Miller, G. L. (2007). Evaluation of Evapotranspiration and Soil Moisture-based Irrigation Control on Turfgrass. Proceedings ASCE EWRI World Environmental & Water Resources Congress May 15–19, 2007, Tampa, FL.