# Assessment of Soil Amendment Types and Rates for Reduced Turfgrass Irrigation

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## Introduction

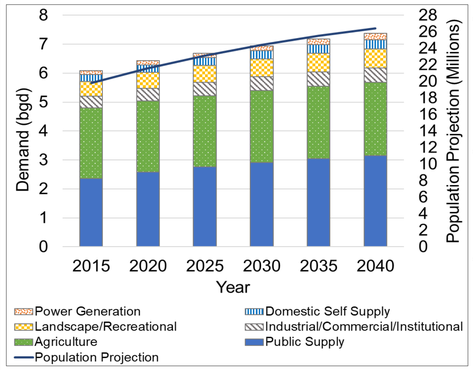


**Figure 1.** Projected water demand (billion gal day-1; bgd) and population growth in Florida from 2015 to 2040[1].

- Landscape irrigation frequently comprises more than half of residential water use in Florida[2]
- Water demand of landscapes can be exacerbated by poor soil quality in urban settings
- Compost soil amendments can decrease bulk density, increase water holding capacity, reduce runoff volumes, and improve turfgrass growth

**Objectives:**

1. Compare 5 compost amendments at 3 rates to determine the effect ($\alpha$ = 0.05) of amendment type and rate on soil organic matter content, bulk density, soil chemical properties, and turfgrass quality (TQ) compared to unamended soils.
2. Assess differences ($\alpha$ = 0.05) in TQ between amended and unamended without irrigation and under 4 reduced irrigation rates

## Methods

- **Study Site:** UF-IFAS PSREU in Citra, FL
- **Treatments:** 4 replicates of 5 compost amendment types (A-E), 3 amendment rates (81, 161, 323 $m^3$ $ha^{-1}$), and 4 irrigation rates (unirrigated, 25%, 50%, 75% ET replacement)
- Amendments tilled to depth of 15 cm and sodded with St. Augustinegrass (*S. secundatum*) 'Floratam'
- Soil samples collected to 15 cm depth with a punch tube (Figures 2 and 3) before and after growing seasons in 2020 and 2021 (4 dates)
- Amendments analyzed to determine particle size, organic matter content, TKN, P, pH, C:N
- Turfgrass quality (TQ) rated every 1-2 weeks during growing season (Figure 4)

**Figure 2.** Punch tube used for soil sample collection.


**Figure 3.** Cutting soil sample to depth of 15 cm (6 in.)

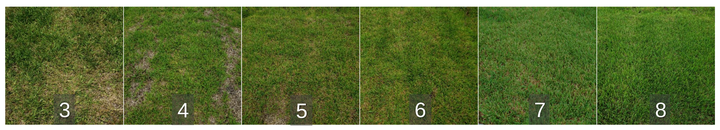


**Figure 4.** Example of turf quality range observed in this study (1-9 scale).

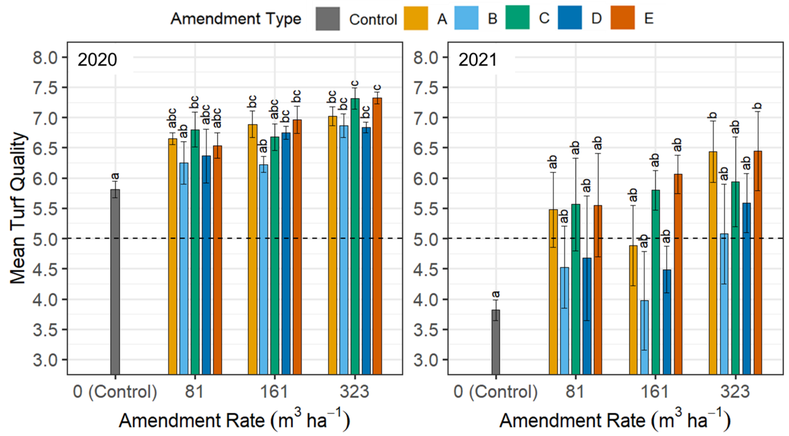


**Figure 6**. Mean TQ during 2020 and 2021 growing seasons by amendment type and rate (50% irrigation rate) The dashed line represents the minimally acceptable turf quality. Means within the same year with the same letter are not significantly different based on Tukey's test ($\alpha$ = 0.05).

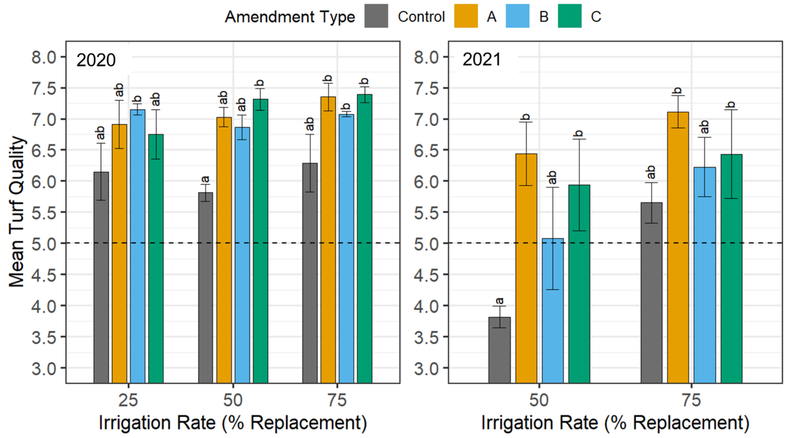


**Figure 7.** Mean TQ during 2020 and 2021 growing seasons by amendment type (323 $m^3$ $ha^{-1}$) and irrigation rate. The dashed line is minimally acceptable turf quality, Means within the same year with the same letter are not significantly different based on Tukey's test ($\alpha$ = 0.05).

## Results


**Figure 5**. Aerial photos of turfgrass plots during 2020 and 2021.

**Soil Properties:**

- Bulk density was reduced by 12% at 323 $m^3$ $ha^{-1}$ rate across amendment types compared to unamended control
- SOM increased by 32% and 66% at 161 and 323 $m^3$ $ha^{-1}$ rates, respectively, compared to the unamended control

**Turf Quality:**

**2020**:

- At least one replicate of all unirrigated treatments failed
- Significantly improved at 50% irrigation rate for all amendment types at 323 $m^3$ $ha^{-1}$ rate and 3 of 5 amendment types at the 161 $m^3$ $ha^{-1}$ rate, compared to unamended control
- No significant differences observed between amended and unamended plots at the 25% or 75% irrigation rates

**2021**:

- All unirrigated plots and 15 of 16 plots at 25% irrigation rate failed
- Significantly improved at 50% irrigation rate for two of the five amendment types at the 323 $m^3$ $ha^{-1}$ amendment rate compared to unamended control
  - All plots amended at 323 $m^3$ $ha^{-1}$ rate maintained TQ above minimally acceptable level of 5, whereas unamended control had mean TQ of 3.8
- No significant differences observed between amended and unamended plots at the 75% irrigation rate

## Conclusions

- Soil amendment incorporation up to 323 $m^3$ $ha^{-1}$ in sandy soil is not sufficient to forego irrigation of Floratam St. Augustinegrass turf
- Minimum amendment rate to achieve improvements to soil quality and turfgrass growth is 161 $m^3$ $ha^{-1}$, but 323 $m^3$ $ha^{-1}$ rate provided superior results
- Similar performance among amendment types, indicating flexibility for in material sourcing and implementation by developers and landscapers
- Up to a 50% reduction in turfgrass irrigation (compared to current recommended rate) may be possible for sandy soil amended at 323 $m^3$ $ha^{-1}$ rate
- Higher amendment rates (> 323 $m^3$ $ha^{-1}$) were not tested but may provide greater benefits
- Project will continue at least through end of 2022

## References

[1] Florida Department of Environmental Protection. (2019). *Regional Water Supply Planning 2019 Annual Report*. https://fdep.maps.arcgis.com/apps/MapSeries/index.html?appid=04f84e6ae64c45e292e5b3db82f045e3

[2] Haley, M. B., Dukes, M. D., & Miller, G. L. (2007). Residential Irrigation Water Use in Central Florida. Journal of Irrigation and Drainage Engineering, 133(5), 427–434. https://doi.org/10.1061/(asce)0733-9437(2007)133:5(427)

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