# Construction of Plots for Long-Term Evaluation of Effects of Effluent Water on Turfgrass

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## ABSTRACT

The lawncare industry contributes $1.3 billion to the national economic impact. However, global weather conditions and growing populations decrease available resources for turfgrass growth like clean water for turfgrass irrigation, particularly because a large portion is used for landscape irrigation, which is considered nonessential. Reclamation of municipal wastewater shows promise as a means to meet the continued demand and growing pressure on irrigation water resources. Unlike potable water reserves, quantities of reclaimed wastewater continue to increase due to population growth and provide a readily available source of irrigation for urban areas. Diminishing freshwater resources are jeopardizing the future of turf and its benefits to recreation, urban culture, the environment, and the economy. Replacing potable water with effluent/reclaimed water, meets a state objective for conserving freshwater supplies. However, the long-term effects of wastewater irrigation on turf, soil, and environment are not completely understood. Wastewater contains levels of nutrients and micronutrients that are higher than those found in potable water, but also has higher electrical conductivity (EC) which may be detrimental to turfgrass growth. Leaching and modification of soil physicochemical properties can help alleviate salinity stress. However, leaching consists in applying water to levels that are above those required for turfgrass growth and may result in groundwater pollution. Developing and implementing proper water conservation and irrigation management strategies as well as finding alternative sources of irrigation water for turfgrass has become a critical issue for both municipalities and the turfgrass industry. Research is needed to identify and implement best management irrigation practices when wastewater is used as an alternative to potable water.

## OBJECTIVES AND METHODS

1. The objective of this proposal was to construct a research area consisting of 12 irrigation main plots (6 irrigated with potable water and 6 irrigated with reclaimed water; 20 ft x 20 ft); half of which sodded with St. Augustinegrass and the other half with bermudagrass.
2. Long term objectives include to investigate if N leaching is increased when reclaimed water is used for turfgrass irrigation and to investigate if turfgrass can adsorb nutrients present in reclaimed water, and consequently reducing the need for exogenous N fertilization

In August 2020 purple line was brought to FLREC from Town of Davie Water Treatment and Water Reclamation Facility, which is adjacent to the research station (Picture 1). Chemical constituents of regular irrigation water vs. reclaimed water obtained from the treatment plant are listed in **Table 1**. Reclaimed water is considered high in salinity, medium for Na permeability hazard, and very severe for bicarbonates hazard (U.S. Regional salinity laboratory, 1954). In January 2021 from 360 cubic yards of mason sand were brought to FLREC to construct new irrigation system in order to avoid confounding effects of organic matter content in native soil.

**Table 1. Chemical analysis of reclaimed and fresh water to be used in the study**

| | Reclaimed | Fresh |
|---|---|---|
| Electrical Conductivity dS $m^{-1}$ | 1.08 | 0.53 |
| pH | 7.6 | 7.6 |
| Sodium ($Na^+$) ppm | 1550 | 28 |
| Bicarbonates ($HCO_3$) ppm | 1200 | 275 |
| SAR | 13 | 1 |
| Nitrate ($NO_3^-$) ppm | 13.6 | 0.093 |
| Phosphate ($PO_4^{3-}$) ppm | 1.98 | 0.001 |

**Picture 1. Four inches main line purple pipe brought to FLREC from Town of Davie Water Treatment and Water Reclamation Facility that is going to feed the research plots**


**Picture 2. Freshly sprigged Celebration bermudagrass on newly constructed irrigation system. Picture taken February 5, 2020.**

# RESULTS

FNGLA grant partially covered the cost for the irrigation system materials and supply. In particular, the budget was spent for: 500 ft of 3/4 in. PVC pipes, 72 PVC Tees, 12 main valves, 48 sprinklers body, 48 sprinklers heads, 48 sprinklers swing joints, 24 release/butterfly valves, 2 irrigation controllers, primer, and cleaner, and 500 ft of electrical sprinkler wire. Starting January 2022, a 2-year field study will be conducted to evaluate the effects of reclaimed water and different N rates and sources on bermudagrass and St. Augustinegrass performance and nitrate ($NO_3$-N) ammonium ($NH_4$-N) and ortho P leaching from Celebration and CitraBlue. Plots watered daily based on previous week evapotranspiration (ET) with environmental data obtained from a Florida Automated Weather Network (FAWN https://fawn.ifas.ufl.edu/) station which is located within 500 ft of the test site to prevent drought stress. Fertilization treatments will be applied monthly. Nitrogen rates will mimic current recommendation for fairway and lawn fertilization when fresh water is used for irrigation, and will include lower and higher rates.

# CONCLUSIONS

Over the last 40 years, the number of golf courses and municipalities that use treated effluent for irrigation has steadily increased. Because raw effluent typically contains significant quantities of many essential plant nutrients, particularly nitrogen and phosphorus, its use to irrigate turfgrass could reduce the need and reliance on commercial fertilizers. Thus, irrigating with effluent may provide plants with similar quantities of essential plant nutrients to those delivered via fertigation with a dilute concentration of fertilizer. However, there is still a lack of knowledge weather reclaimed water can be used as a 'fertigation' source and could potentially decrease the need for exogenous N application, and if different sources of N in combination with reclaimed water irrigation could pose a significant threat for nutrient leaching. The results of the proposed research will provide golf course superintendents and turfgrass managers an understanding of potential benefits of using reclaimed water on sandy soil. The results will be made accessible to the public in general through an Extension Publication in the Electronic Data Information Source (EDIS) system of the University of Florida, trade magazine articles, and the *Florida Green*. It is expected that the research will be published in two articles in peer-reviewed scientific journals. Furthermore, the results will be presented in regional meetings of the golf course, turfgrass and landscape industries.

# LITERATURE CITED

U.S. Salinity Laboratory Staff. (1954). *Diagnosis and improvement of saline and alkali soils, USDA Handb. 60*. U.S. Gov. Print. Office, Washington, DC.