Quantifying Nutrient Levels of Reclaimed Water in Turf Grass Irrigation Overspray

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INTRODUCTION

- Reclaimed Water (RW) also called treated municipal wastewater.
- Used for multiple purposes in Florida, especially residential turfgrass irrigation.
- Beneficial for water conservation efforts in FL.
- Concerns with nutrient concentrations in RW, especially when over sprayed onto impervious surfaces.

RW irrigation can mobilize nutrients to surface water bodies.

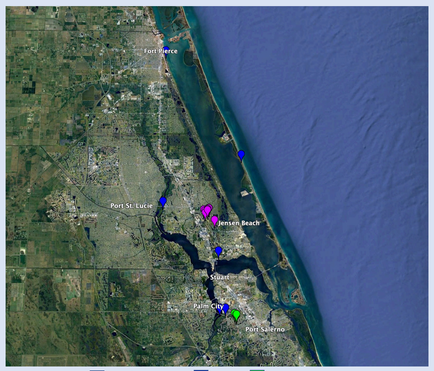
Wasteful overspray of irrigation.

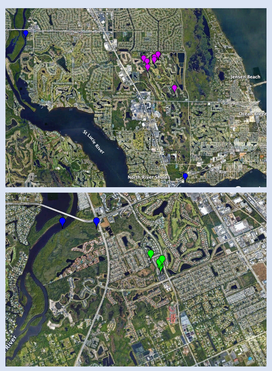
Purpose

- Develop and implement a method to quantify irrigation overspray.
- Analyze reclaimed water to determine nutrient concentration.
- Use data collected to quantify nutrient amount applied to overspray area.
- Estimate nutrient load reductions to Indian River Lagoon if overspray is reduced within the watershed.

RESEARCH AREA

- Indian River Lagoon watershed.
- St. Lucie and Martin Counties.
- Estuary prone to algal blooms.
- One neighborhood that uses RW and one that uses groundwater (GW) for irrigation.
- Surface water of the St. Lucie River (SLR) and Indian River Lagoon (IRL).





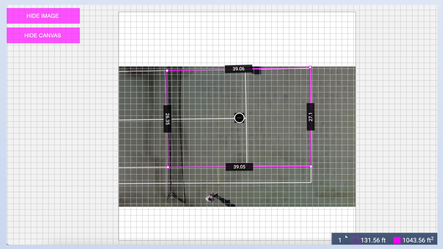
RW - Surface Water - GW -

METHODS

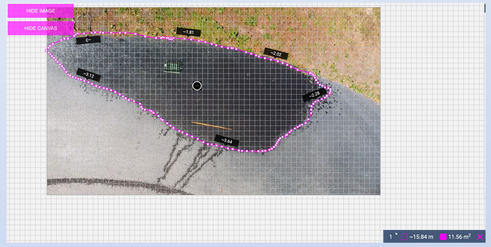
Field

- A drone is used to capture images of the wet overspray area (20-40ft altitude).
- Allows for a direct overhead photograph for spatial accuracy.
- Known measurement on ground is placed to set a reference scale.

- Images are uploaded into SketchAndCalc software system to calculate area of wetted overspray area.
- Area measurements within 90-99% accurate.
- Wetted area combined with irrigation depth allow us to calculate volume of overspray.



SketchAndCalc software spatial validation using known area.



Example of using SketchAndCalc software to determine overspray area from image obtained by the drone.

- Reclaimed water and groundwater irrigation samples collected directly from sprinkler heads and sent back to lab for analysis.
- Surface water samples collected in the area for comparison.

Lab

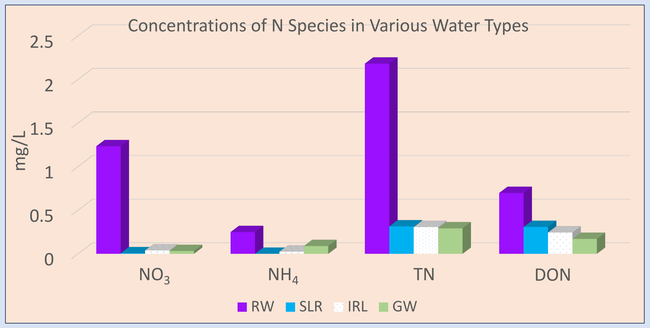
- Nitrate (NO_3) and Ammonium (NH_4) analyzed by Seal AA3 continuous flow analyzer.
- Total Nitrogen (TN) and Total Organic Carbon (TOC) analyzed by Shimadzu TOC analyzer.
- Nitrogen concentrations multiplied by irrigation overspray volume to obtain nutrient load to the watershed.

Irrigation Volume x Nutrient Concentration = Nutrient Load

Seal AA3 used for Nitrate and Ammonium concentration analysis

RESULTS

- Nitrate and Ammonium levels much higher in reclaimed water irrigation water than in groundwater and surface water.
- Low levels of NO_3 and NH_4 in St. Lucie River and Indian River Lagoon.



CONCLUSIONS

Assuming a yard of 0.2 acres and year-round irrigation at UF/IFAS recommended rate:

- A house irrigating at the UF/IFAS recommendation of 0.75"/week uses 4,073 gallons of water/week.
- 2.17 lbs. of Nitrate/house per year.
- 292,666 lbs. of Nitrate for whole SFWMD from reclaimed water.
- If 20% of irrigation is applied improperly to impervious surfaces, that is 58,533 lbs. of Nitrate/year.
- This range can vary depending on irrigation amount and seasonality.

FUTURE RESEARCH

- Use this research to develop BMPs and a community education program for residential RW irrigation.
- Expand analysis to include other nutrients like Carbon and Phosphorus.
- Investigate factors like wind drift and evaporation on irrigation overspray volume.

Acknowledgement

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