Turfgrass Fertigation: An Investigation Into Sustainable Backyard Irrigation

Isabelle Horvath
In the lab of Dr. Bernd Leinauer and with the advisement of Dr. Elena Sevostianova

Addressing the Problem

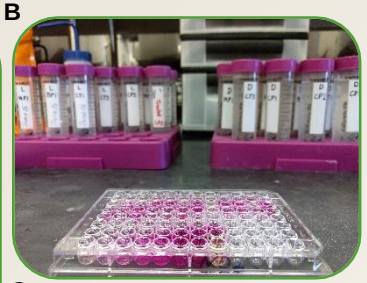
- Current turfgrass maintenance reliance on potable water and nitrogen fertilizer application
- Nitrogen based fertilizers are responsible for nitrous oxide emissions and nitrate leaching
- Urban communities in the desert rely on turfgrass for dust control, erosion prevention, urban greenspace and it's cooling effect; making turfgrass a highly valued domestic asset. Compare natural desert environment (left) to ideal backyard (right).

Proposed Solution

- Maintaining turfgrass using fertigation.
  - *Fertigation* (def): Providing necessary nutrients during an irrigation event by combining these nutrients with irrigation water
- Accomplish this fertigation through the use of tailored water
  - *Tailored water* (def): Treated water spiked with N or left unpurified so that it has a specific nitrate concentration

A

B



C

Hypothesis

- Fertigating will not…
  - Reduce turfgrass growth and aesthetic value
  - Increase nitrous oxide emission
  - Increase nitrate concentrations in leachate and drainage water

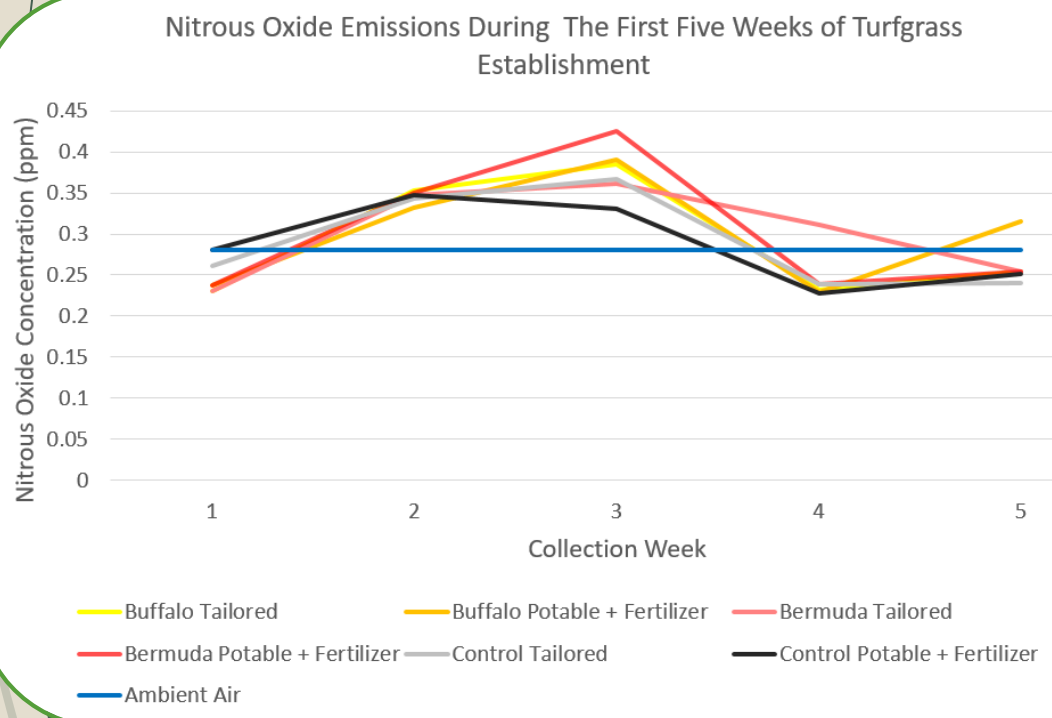
Experimental Methods

- Maintain turfgrass with two treatments
  - Traditional: Potable water daily + granular fertilizer biweekly
  - Fertigation: Tailored water (15ppm nitrate) daily
- Establish three turfgrasses in a greenhouse
  - Buffalograss (native)
  - Inland Saltgrass (native)
  - Bermudagrass
  - Bare soil plot
- Track Nitrogen Pathways
  - Nitrous Oxide Emissions (A)
  - Nitrate Leaching (B)
- Monitor Growth Indicators
  - Root Sampling (C)
  - Photo analytics
  - Grass Clippings

Results

- Nitrous Oxide emissions (D) show fluctuations with little variation from the expected ambient air range of 0.25 to 0.31ppm nitrous oxide in the first 5 weeks.
- Nitrate concentrations in drainage and leachate samples show a general downwards trend over time in Buffalograss (E) and Inland Saltgrass (F).

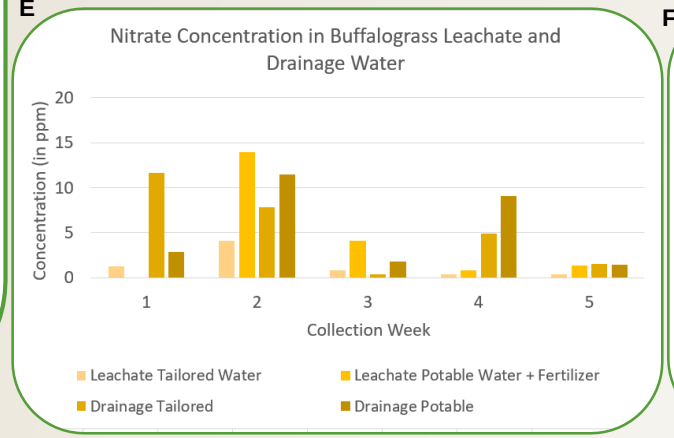
D



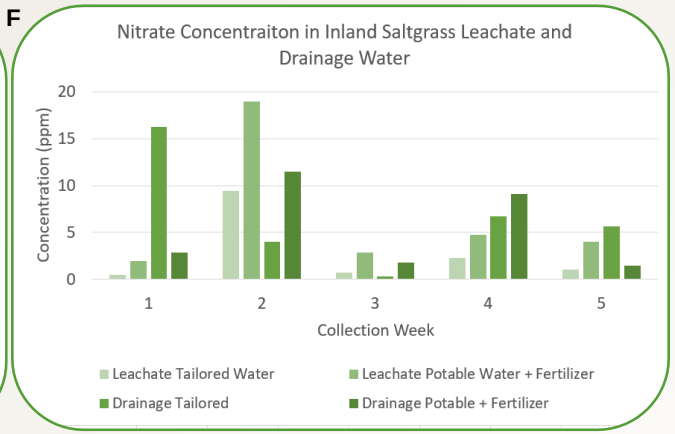
Conclusions

- Over the first 5 weeks of establishment
  - Little to no nitrous oxide is emitted from grass regardless of water treatment
  - Nitrate concentrations are generally higher the closer to germination
- These results are logical because it is believed that little root growth occurred in the first five weeks. Without mature roots
  - Microbes are not established, and thus can't denitrify the nitrate therefore resulting in no nitrous oxide emission
  - Nitrate is not being taken up into the grass, but is left to be leached in water

E



F



Project Outlook

- With continued monitoring, the beginning of nitrous oxide emission can be pin pointed within a week
- Nitrate concentration levels will be compared with statistical analyses to determine if there is a difference between leachate and drainage water nitrate concentrations once mature roots are formed