Georeferencing Furman University's Irrigation Valves Using Aerial Drone Images

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Abstract

Furman's current irrigation system is old and outdated. Operating with such an old system, Furman's irrigation management is difficult in aspects of weather and climate change. Furman is in a long process of upgrading the irrigation system. Even though Furman uses 30% of the water from the Furman Lake (lessening the need for city water), there is still a substantial amount of water waste (Furman.edu). I decided to do some research on how much water we were wasting by calculating the overlaps of sprinklers on 6 different fields. By calculating this, Furman University can ultimately change the amount of water wasted, and money.

Methods

Within ArcMap 10.3, I was able to use tools and skills to create these maps that is easy to read for the viewer. In the first map, I georeferenced all the aerial images, Dr. Suresh had captured with his Drone, to the base map of Furman University's campus. I used tools such as "Add Control Points" to match up the images with the base map, this allows us to layer one another and add features to the map. Next step, I placed utility points for every sprinkler head for each field. After this, I created a layer for each field to make it easier to calculate the overlap. Lastly I took those layers and used the proximity tool, Buffer, to show full 360 degrees of how far the sprinklers sprayed. This tool helped show where the overlaps were.

Conclusion

After the useful tools in ArcMap, The two maps that had the least and the most overlap were, the PAC Circle, having the most, and the Practice Soccer Fields, having the least. Many of the fields had a significant amount of overlap which means a substantial amount of water is wasted everyday. The PAC circle sprinkler heads run everyday for 30 mins, by reducing overlap we can reduce the water wasted everyday! Most of the sports stadium and practice fields are using unnecessary amounts of water as well. My proposal to a solution would be turn all the sports fields into turf. This would help save an even greater sum of money and water. ArcMap and GIS can be used in this way to solve everyday problems to help the planet become more environmentally aware and more sustainable for future generations.

References and Data Sources

http://www.furman.edu/sites/sustainability/Resources/Pages/EnergyEfficiency

http://cramp.wcc.hawaii.edu/Mapping_files/mapping_AA_background.htm

- Morgan, Jessica L., et.al Aerial Photography: A Rapidly Evolving Tool for Ecological Management. BioScience 60: 47-59. (2010)
- Dr. Suresh Muthukrishnan
- Facilities Staff: Rick Schosky and Astrid Truman

Soccer Stadium

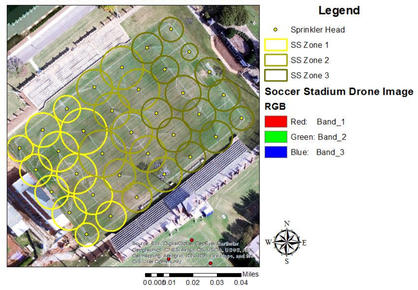


Figure-1: The Soccer Stadium has 35 sprinkler heads. These sprinkler heads are represented with yellow utility points. A buffer around each sprinkler head is color coated with a zone. There are 3 zones where each zone runs for 30 minutes at a time.

Soccer Practice Field

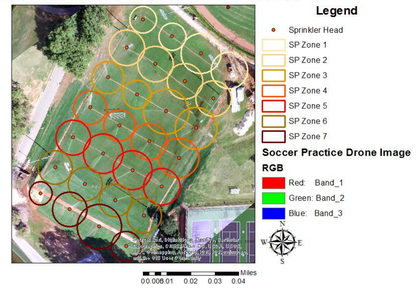


Figure-2: The Soccer Practice Field has 28 sprinkler heads. These sprinkler heads are represented with orange utility points . A buffer around each sprinkler head is color coated with a zone. There are 7 zones where each zone runs for 20 minutes at a time.

Football Practice Field

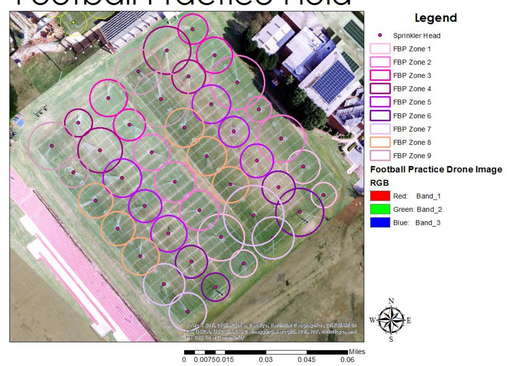


Figure-3: The Practice Football Field has 42 sprinkler heads. These sprinkler heads are represented with fuchsia utility points. A buffer around each sprinkler head is color coated with a zone. There are 9 zones where each zone runs for 30 minutes at a time.

Baseball Field

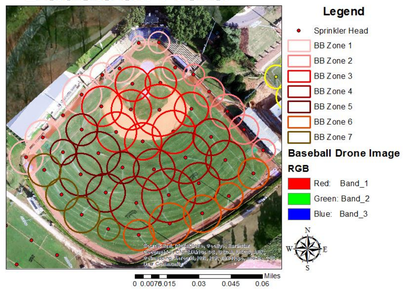


Figure-4: The Baseball Field has 44 sprinkler heads. These sprinkler heads are represented by red utility points. A buffer around each sprinkler head is color coated with a zone. There are 7 zones where each zone runs for 30 minutes at a time.

Softball Field

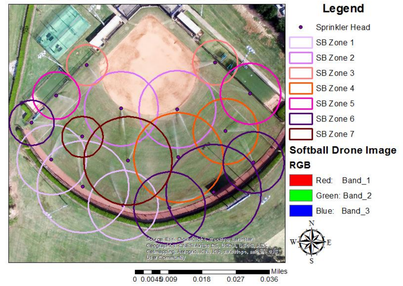


Figure-5: The Softball Field has 17 sprinkler heads. These sprinkler heads are represented with purple utility points. A buffer around each sprinkler head is color coated with a zone. There are 7 zones where each zone runs for 20 minutes at a time.

Physical Activities Center Circle

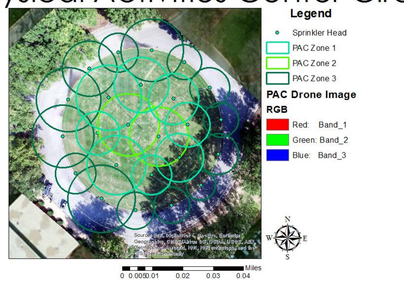
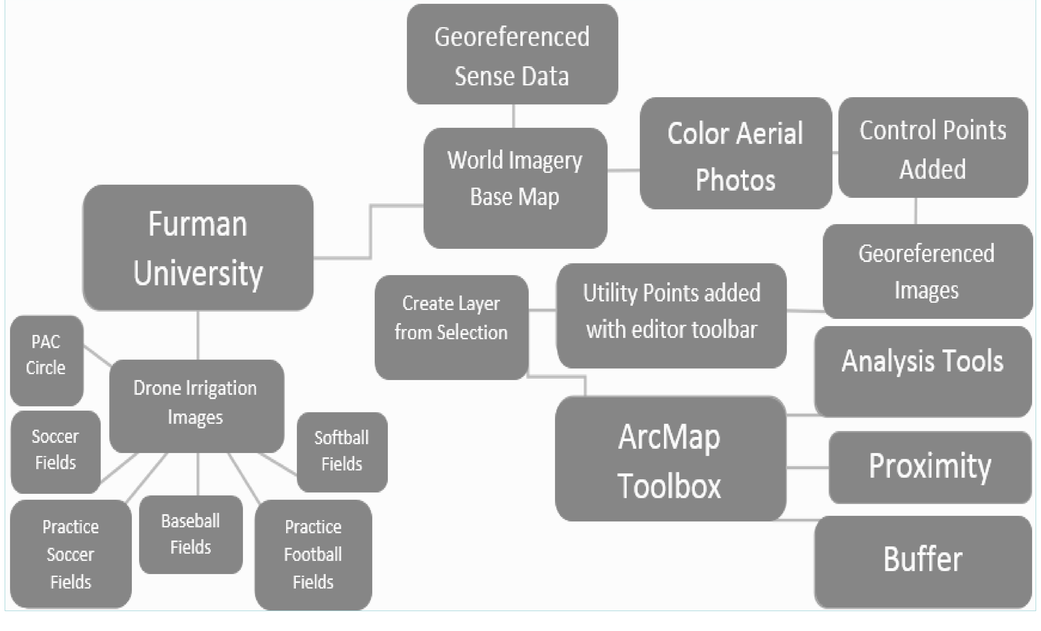


Figure-6: The PAC Circle has 23 sprinkler heads. These sprinkler heads are represented with light blue utility points. A buffer around each sprinkler head is color coated with a zone. There are 3 zones where each zone runs for 30 minutes at a time.

Methodology



Results and Discussion

Use of Aerial photographs to help answer many current pressing ecological questions is considerable. Geo-referencing drone images enables resource managers to:

- View, query, and analyze the images with other geographic data.
- Utilize conditions from archived aerial drone photography to characterize irrigation within a specific area.
- Monitor the land and ecosystem change, such as irrigation and climate working together to conserve water.

There are specific challenges however, for using remotely sensed images:

Manually interpretation requires highly trained individuals with vast personal experience, (Morgan, 2010)

There is a need to provide training to bridge the traditional methods of aerial photograph analysis with its emphasis on local knowledge with the more advanced analysis capabilities and broad spatial coverage provided for by the evolving use of GIS.

FURMAN