

Meadowbrook Golf Club Sprinkler System GIS

GGR903 Final Project

By Paul Morelli

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Introduction



Meadowbrook Golf Club is a private recreational club located in Reading, MA. It was founded in 1898. It provides golf, swim, and tennis facilities for its members.

A 9 hole golf course is contained within the grounds of the club. The focus of this GIS will be the 8th and 9th holes, shown below.



Photo Source: MassGIS

Objective

- Provide a basic coverage analysis of the sprinklers over the study area to ensure all areas are watered sufficiently.
- Perform a sprinkler coverage density analysis to find areas of high “sprinkler rainfall”.
- See if there is any relationship between locations of higher density watering and reports of black algae on the course over the past few years.
- Identify any sprinklers that could be candidates for adjustment.

Sprinkler Specifications

- The course uses TORO © brand sprinklers, the 835S and 855S models shown to the right.
- 835S model has range of 55 feet
- 855S model has range of 80 feet



Both the 835S and 855S sprinklers pump out approximately .50" of "rainfall equivalent" water per hour. Both are fully circular but can be set to go any continuous range of degrees (semi circle, quarter).

Methodology

Using a Garmin 12XL GPS unit sprinkler points within the study area were obtained.

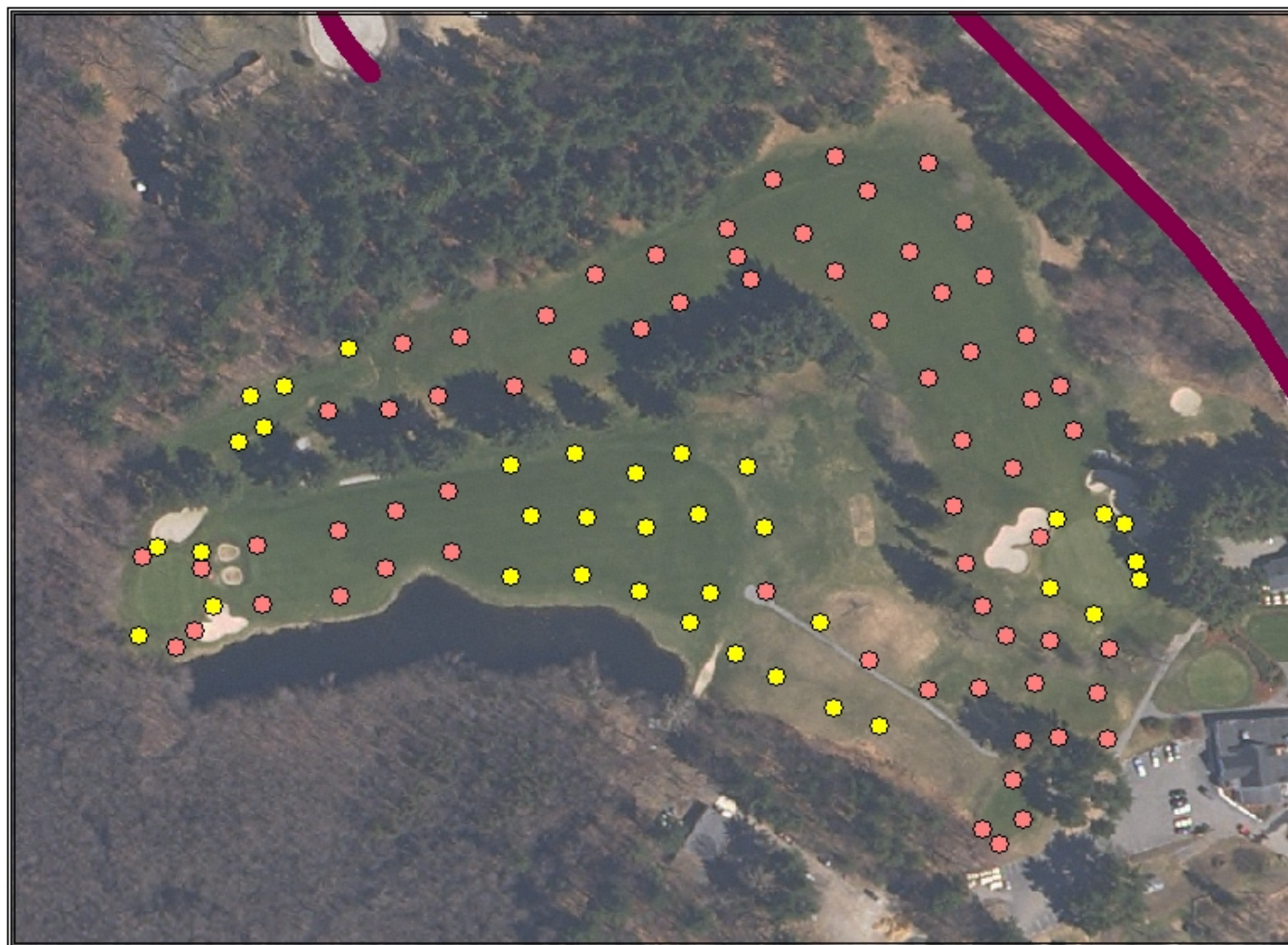
This data was converted into a point shapefile, which was then split into two separate shapefiles based on sprinkler model.



Sprinklers overlayed on Ortho

Legend

-  Roads
-  835S Model
-  855S Model



0 62.5 125 250 375 500
Feet

Main features of the course were traced in ArcMap using the MassGIS Ortho photo obtained for the area as a guide.

These features were converted into polygon or point shapefiles.

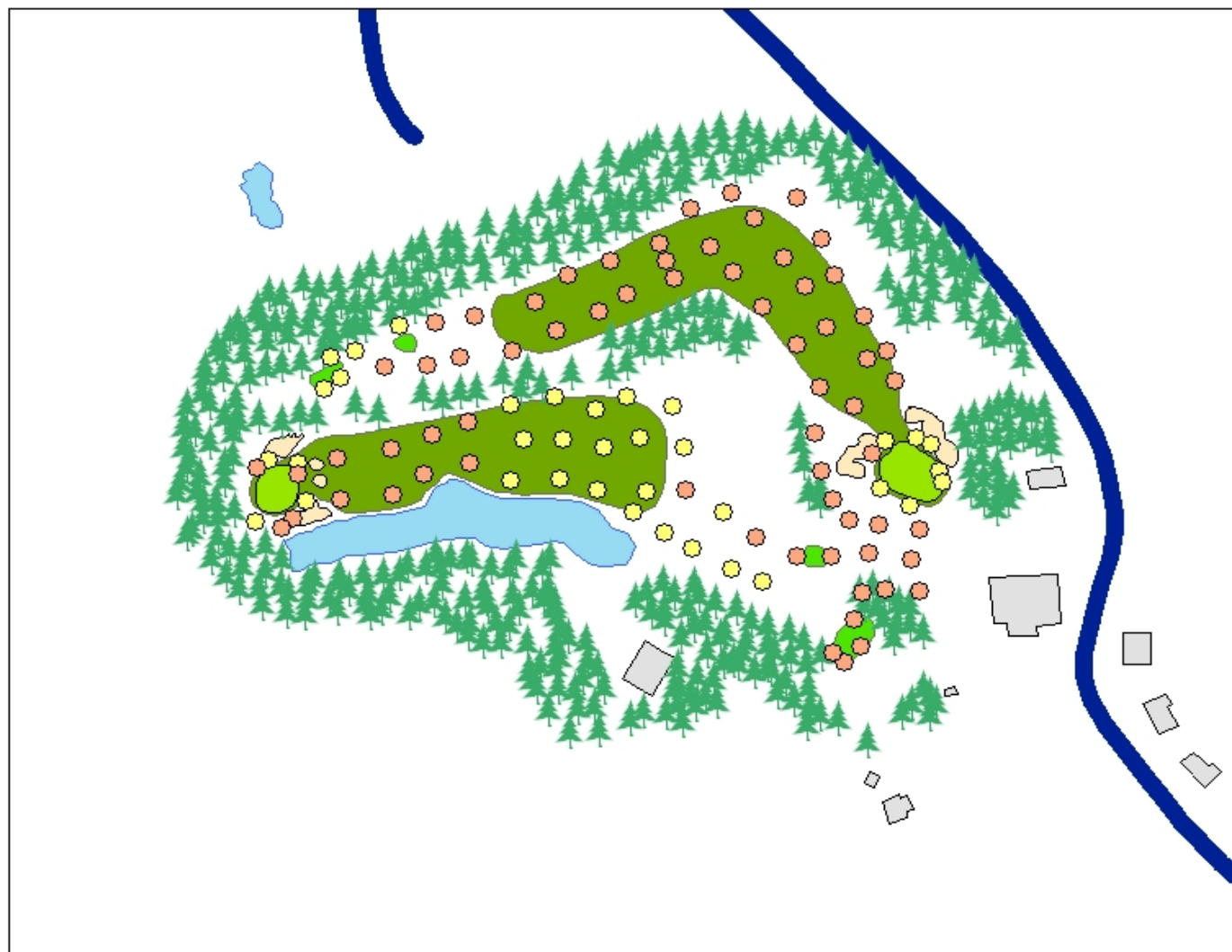
Sketch Map based on Ortho

Features in map based on photo that has State Plane Massachusetts 2001 Projection



Legend

- 855S Model
- 835S Model
- Trees
- Roads
- Buildings
- Sandtraps
- Green
- Fairway
- Tees
- Water



0 62.5 125 250 375 500 Feet

A coverage analysis was done using the ArcGIS Buffer Tool on each of the two shapefiles containing points representing the location of sprinklers.

The resulting buffer shapefiles were merged into one and dissolved to depict what area of the course is currently being watered.

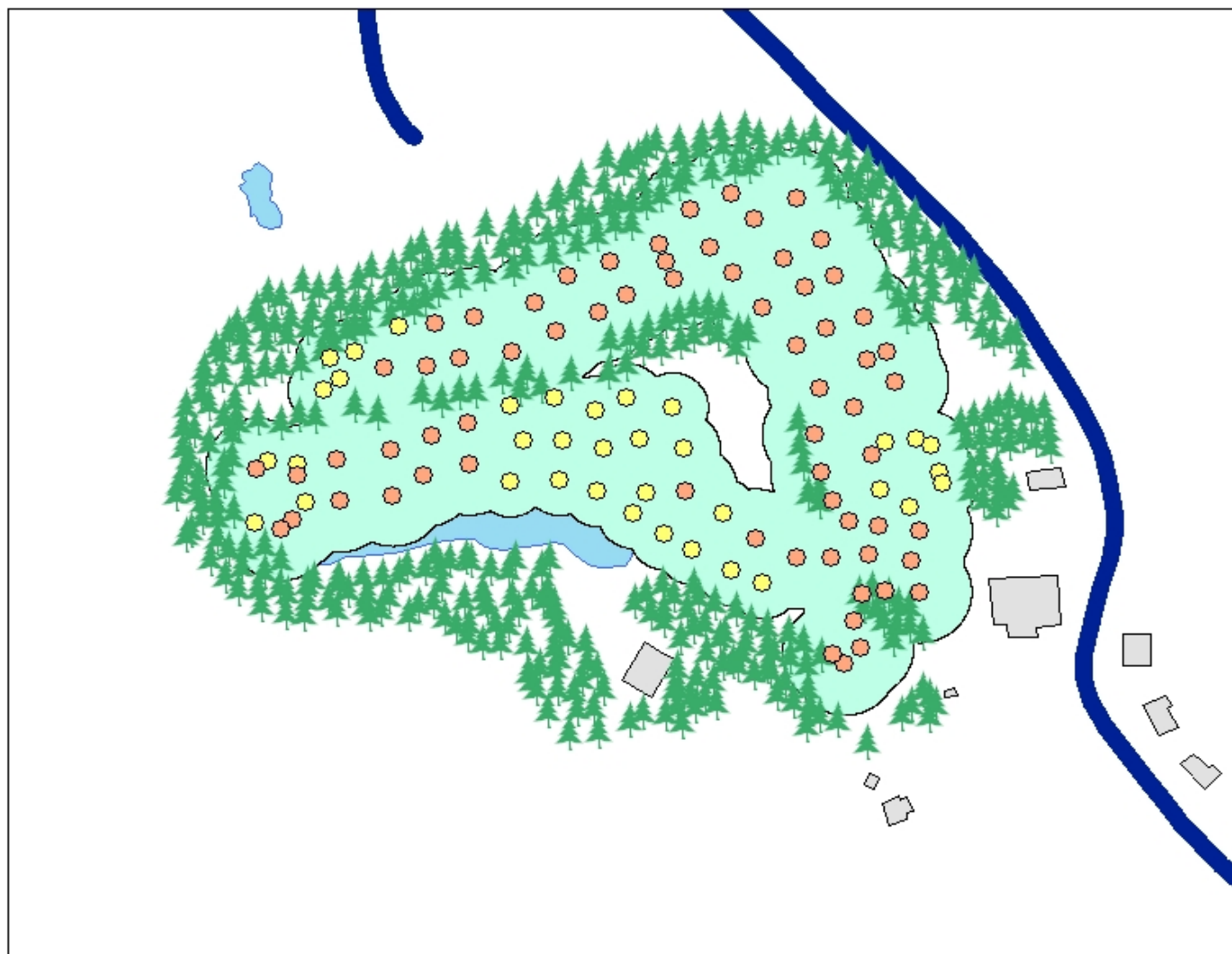
Sprinkler Coverage Map

Features in map based on photo that has State Plane Massachusetts 2001 Projection



Legend

-  855S Model
-  835S Model
-  Trees
-  Roads
-  Buildings
-  Watered Area
-  Sandtraps
-  Green
-  Fairway
-  Tees
-  Water



0 62.5 125 250 375 500 Feet

To answer the question about the density of water output from the sprinklers at a particular point, a raster analysis was the methodology used.

The merged buffer shapefile produced earlier was separated into 10 different shapefiles so that no buffers overlapped each other. These files were then converted to raster files and the Raster Calculator function was used to add them as if they were on top of each other. The sum of the resulting raster shows the density of sprinkler coverage.



Single Buffer Sprinkler Coverage Density

Features in map based on photo that has State Plane Massachusetts 2001 Projection

Legend

- Trees
- Roads
- Buildings
- Sandtraps
- Green
- Fairway
- Tees
- Water

Value

- No Water
- .50 Inches
- 1.00 Inches
- 1.50 Inches
- 2.00 Inches
- 2.50 Inches
- 3.00 Inches
- 3.50 Inches
- > 3.50 Inches



0 62.5 125 250 375 500 Feet

One of the objectives was to show areas that have a high level of watering from the sprinklers.

The next map shows areas that would receive over 2.5 inches of water per hour.

Calculated area of 'high watered' areas using the single buffer method is 20850 sq feet.



Single Buffer Sprinkler Coverage Density

Estimated areas with greater than 2.50 inches of water from sprinklers

Features in map based on photo that has State Plane Massachusetts 2001 Projection



Legend

- Trees
- Roads
- Buildings
- Sandtraps
- Green
- Fairway
- Tees
- Water
- > 2.50 Inches

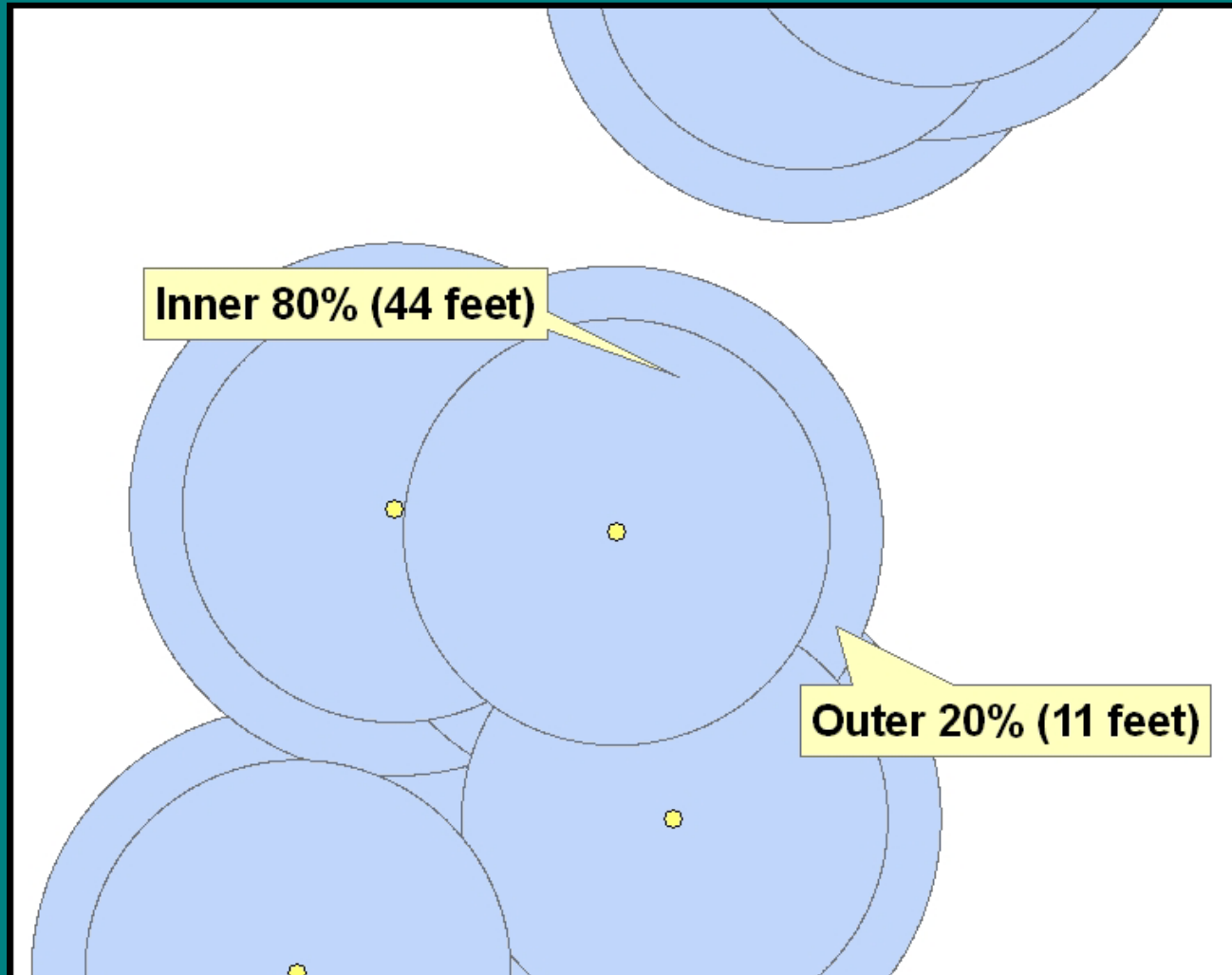
0 62.5 125 250 375 500 Feet

The previous analysis assumed that all sprinklers have the same density of coverage within its circle of coverage. As it turns out, that is not necessarily true as the coverage is actually less dense on the outer fringes. Thus, the same analysis discussed above was performed with one difference. The buffers that were used were concentric, with an outer ring at the full length of the coverage, and then an inner ring at an 80% distance of the coverage.

Each buffer in this methodology was assigned a rainfall value of .25" per hour. This means the inner 80% would contain the full .50" value of the previous study, while the outer 20% would be represented with .25" of rainfall .

The double buffer method found that 'high watered' areas make up an area of 6707 square feet.

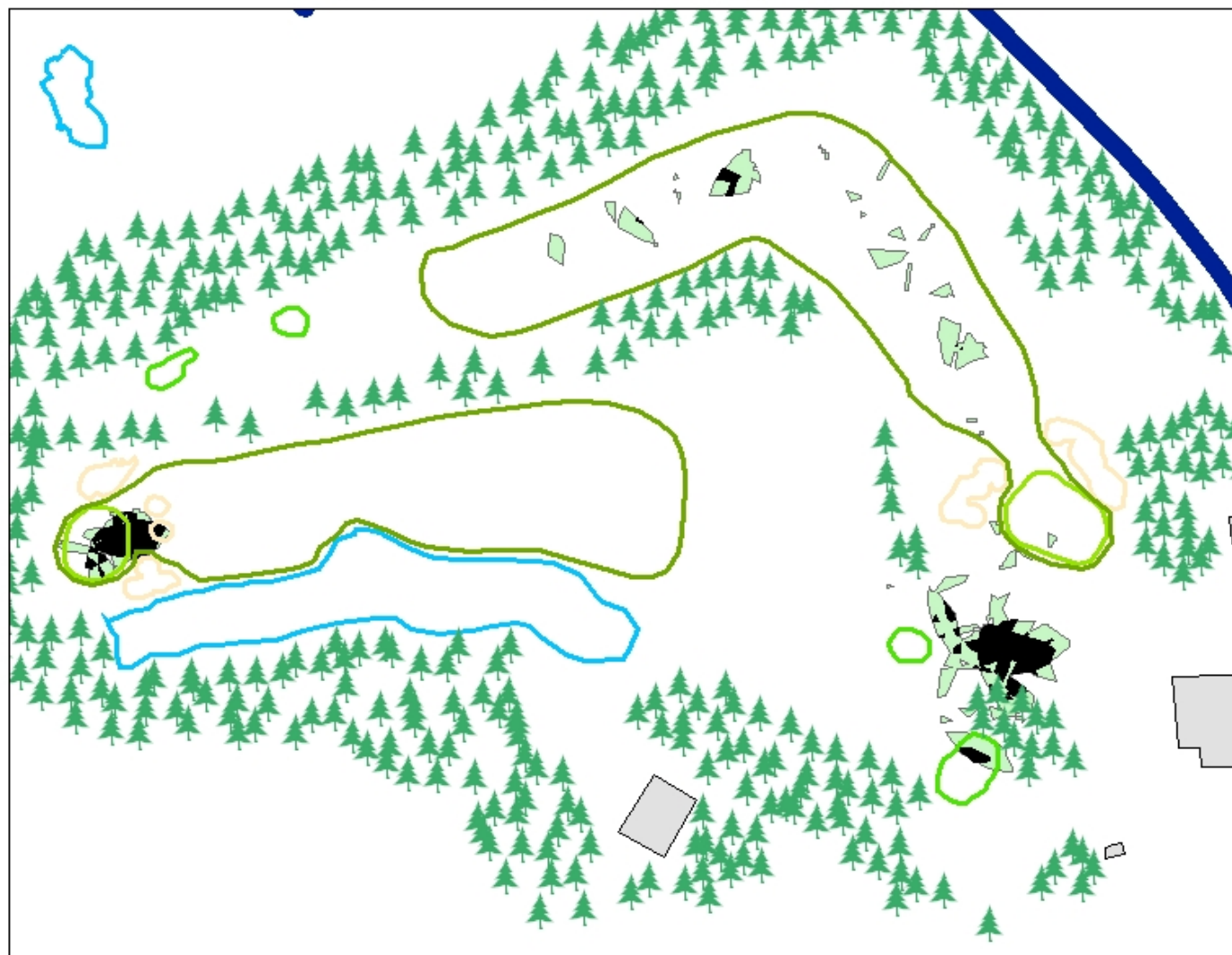
Example of concentric buffers applied to 835S sprinklers with a range of 55 feet





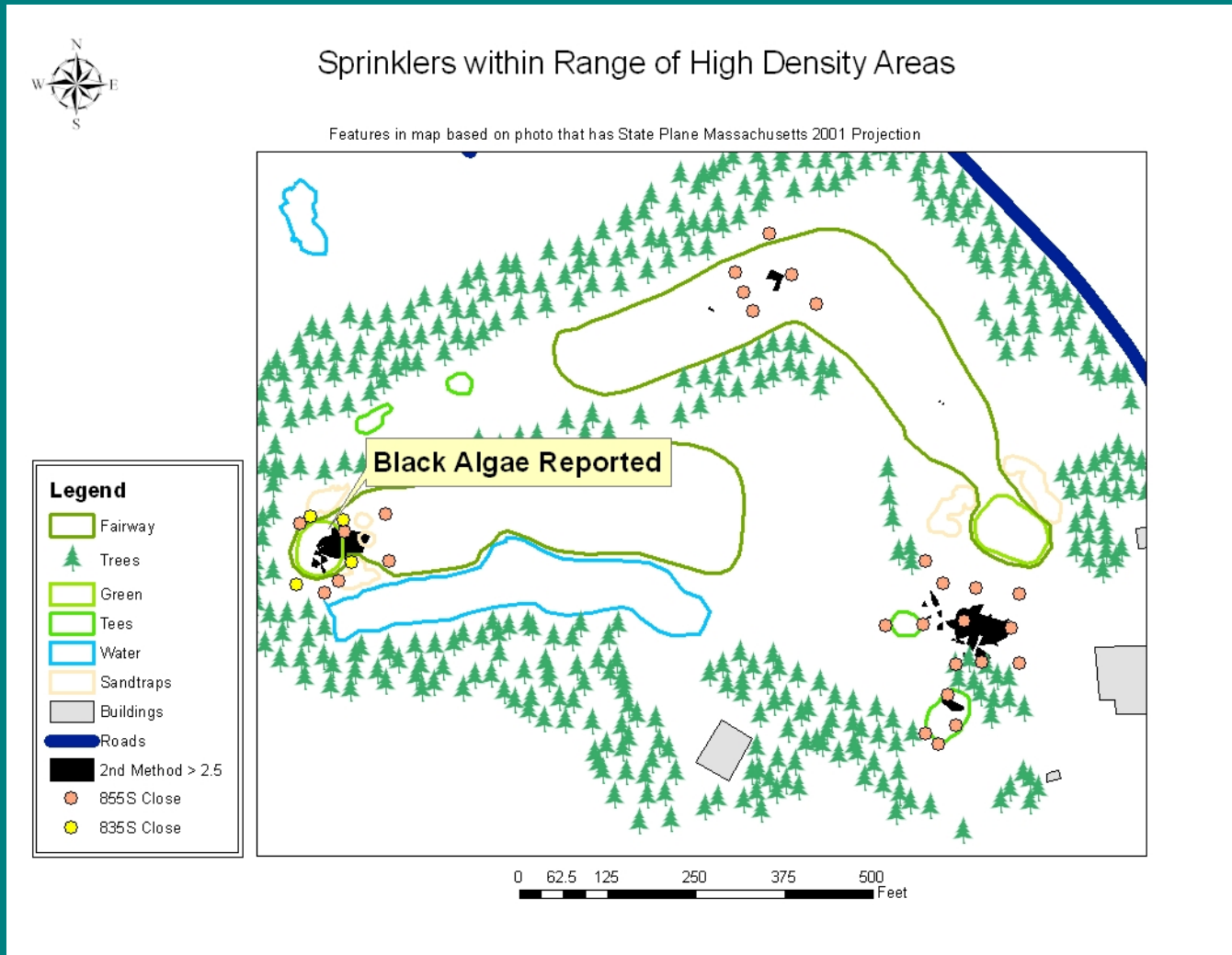
Single Buffer Sprinkler Coverage Density Comparison of results of 2 methods

Features in map based on photo that has State Plane Massachusetts 2001 Projection



0 62.5 125 250 375 500
Feet

To determine which sprinklers might need to be altered or adjusted, a select by location was done on the sprinkler heads if a polygon of 'high watering' was within their range that was over 20 sq feet in area.



Conclusion

- Overall sprinkler coverage over the study area appears adequate.
- The density of water dropped by sprinklers does appear to be higher in a few areas.
- One area of high water density is an area that has experienced black algae.
- 31 sprinklers were determined to be contributing to high density watered areas.