Garrett Durland
GEO 386G – Dr. Helper
12/3/10

Feasibility of Handheld GPS Data with Small Scale Mapping and Ecological Assessment of Pease Park, Austin TX

Introduction

One of Austin's oldest parks, Pease Park is composed of forty-two acres straddling Shoal Creek between 24th and 15th streets. Obtained by the city in 1875 from E.M. Pease, Pease Park is home to several events, including the Jazz Festival and Eeyore's Birthday Party (Austin Parks Foundation 2010). In addition, the park's numerous facilities, ranging from a recently completed sprayground to an extensive disc golf course, are used by hundreds of people every day (Austin Parks Foundation 2010). Pease Park is also used by neighborhood trail users, volleyball players, school field trips, and dog owners attracted to the off-leash areas (Austin Parks Foundation 2010). Since the park's inception, it has been a gathering place for locals as well as visitors to enjoy a beautiful Austin day.

Located within the heart of Austin, the park is within walking distance of the University of Texas campus, and it is approximately one mile from downtown. All of these factors create a situation in which increased pedestrian traffic has degraded Pease Park to a point that it cannot recover from without aid. A study published by the Lady Bird Johnson Wildflower Center in 2007 confirmed that the park is suffering from soil compaction, trampling of vegetation, invasion of non-native plant species, and a general loss of ecological, environmental, and aesthetic values. These conditions have prevented the establishment of younger seedlings necessary to form the next generation of trees as well as resulted in increased erosion and floodwater velocity (LBJWC 2007). These large, well-established tree species provide the bulk of erosion control, but much of the current woody plant recruitment is composed of highly invasive, non-native trees and shrubs (LBJWC 2007).

As a result of these findings, Austin Parks and Recreation Department has decided to close the disc-golf course at Pease Park on January 1, 2011. While ecological restoration of the park is

undoubtedly necessary, no direct evidence has been given to support the idea that removal of the disc golf course would significantly reduce ecological damage or assist ecological restoration. Disc golfers have decried the decision to remove the course, citing the park's many other users as equal contributors to the problems facing the park. With these facts in mind, I wanted to see if it was realistically possible to use a handheld GPS device to generate a map of the disc golf course that could potentially provide information on the relationship between the disc golf course and ecological degradation at Pease Park.

The park itself is only approximately 42 acres, and disc golf fairways are often narrow paths surrounded by canopy trees. The small size of the park means that inherent errors in GPS measurements have a relatively greater effect on the map generated from these data. Also, the often dense woody growth introduces even more error to GPS data collection. Lastly, although the disc golf course was the focus of this mapping exercise, the methodology could be applied to multiple different restoration goals of Pease Park, e.g. monitoring erosion damage and control, mapping the spread of invasive species, etc.

Methodology

The first step in this process was to obtain GIS files on the Austin area, including park, road, creek, and contour shapefiles. These files were obtained from the City of Austin GIS Data Sets website as compressed folders, which were uncompressed and added to a blank ArcMap file (Figure 1). Because I was going to use a GPS Trimble unit, the next step was focusing on Pease Park and creating a personal geodatabase which could be used to generate an ArcPad map for use in the Trimble. First I zoomed in on Pease Park and chose appropriate symbologies for the feature classes (Figure 2). Next I created a blank shapefile in ArcCatalog to which I added an area of interest rectangle that I drew around Pease Park. All features were then clipped to this rectangle. The newly clipped files and the area of interest were then added to a personal geodatabase that I created in order to develop an ArcPad map that could be used for data collection in the field. I also created three new shapefiles (one for points, one for lines, and one for polygons) that were added to the geodatabase and the ArcPad map, and these files would later

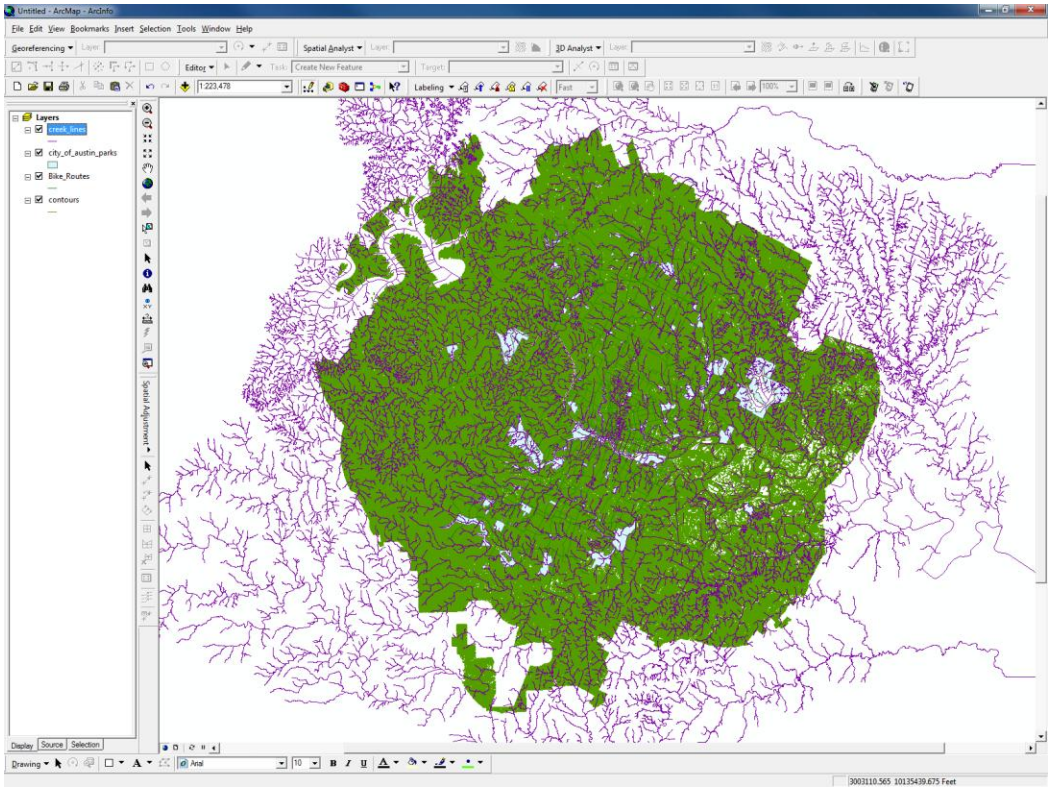

Figure 1. GIS Files Obtained on the Internet Added to ArcMap. Purple lines are creek lines, green lines are contours, polygons are parks, bike routes are also depicted but were not used to construct the final map as they do not provide any information.

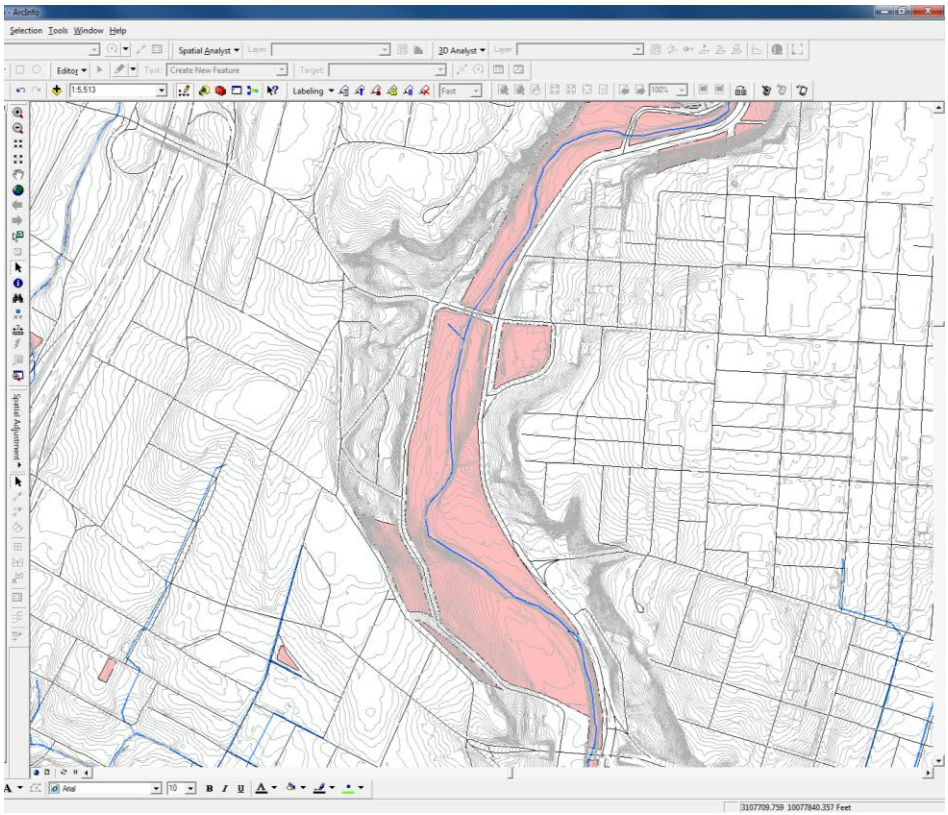

Figure 2. Pease Park and Surrounding Area. Blue lines are creeks, grey lines are contours, black lines are roads, pink areas are parks.

contain measurements made on the Trimble GPS device. Domains were also created within the point, line, and polygon files with fields containing coded values to facilitate easier data entry. Dr. Helper's computer was used to upload the ArcPad map file to the Trimble device. Data collection was completed on Monday, November 29th, 2010 between 2 and 5 pm and Dr. Helper's computer was used to get the updated map file off of the Trimble device (Figure 3). Because some of the collected data existed outside the area of interest rectangle, a new map was needed. To accomplish this, the point, line, and polygon files were combined with the Austin GIS files and a new area of interest rectangle was created (Figure 4).

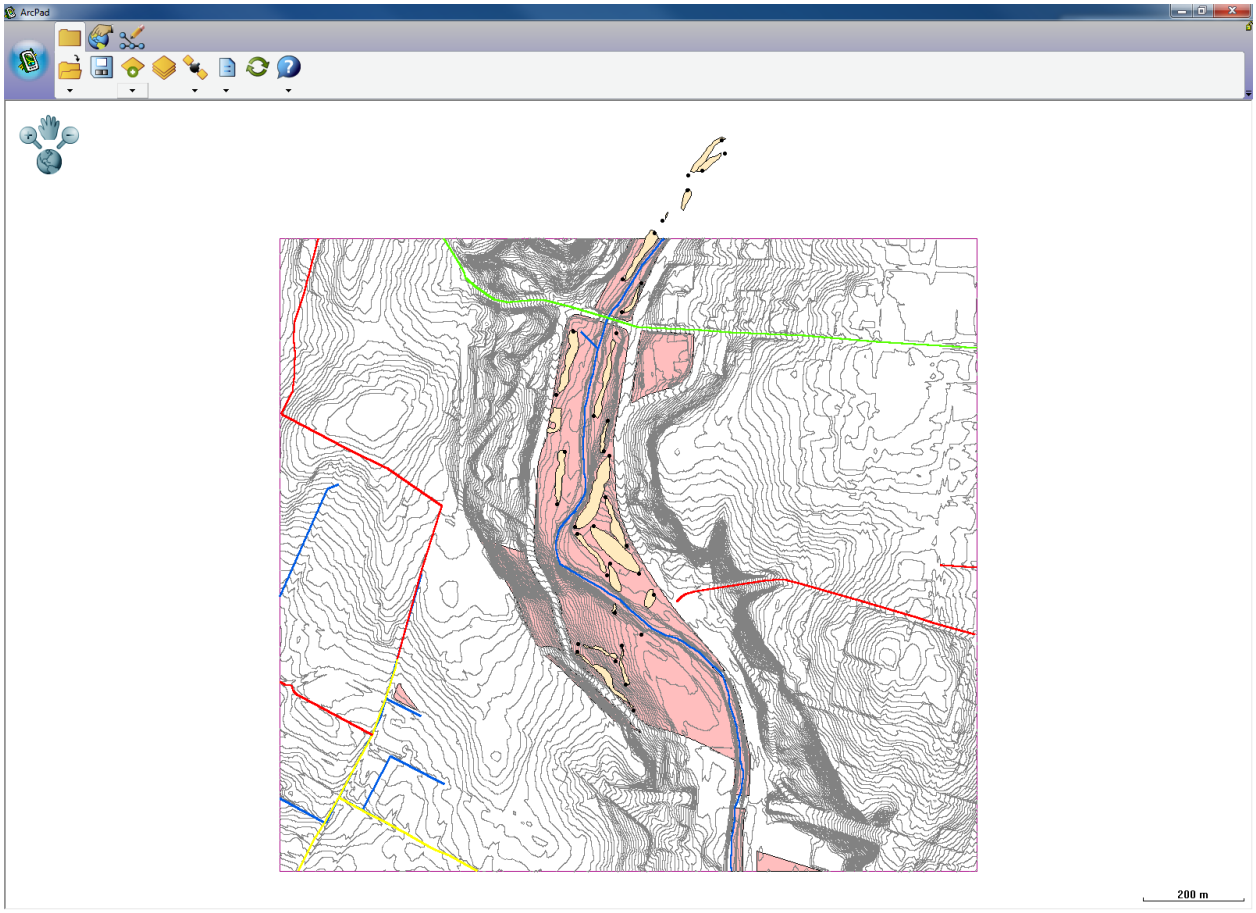

Figure 3. Unedited ArcPad Map Containing Collected Data. Some of the disc golf courses were actually outside of Pease Park and the area of interest polygon.

Also, in Figure 4, half of the contour lines were removed by hand by deleting entries from the attribute table. Next, symbology for collected data was altered to distinguish between tee boxes and pins (Figure

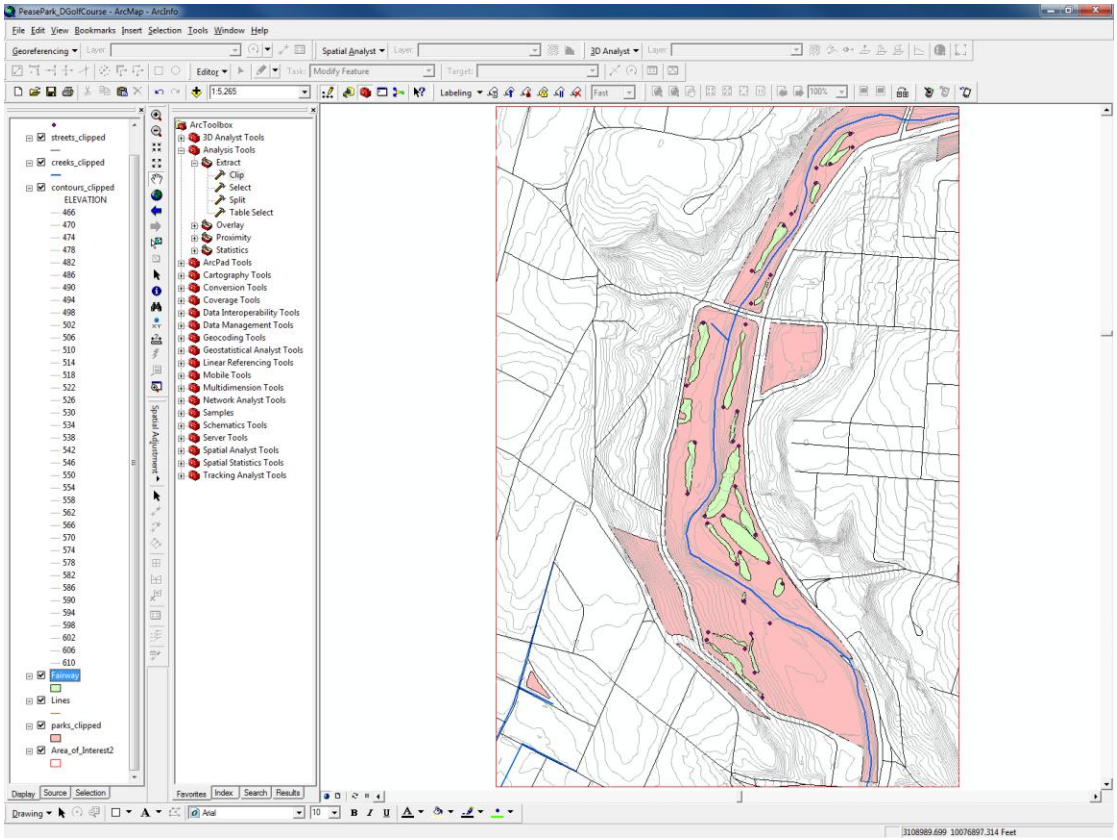

Figure 4. Map with New Area of Interest and Half the Number of Contours.

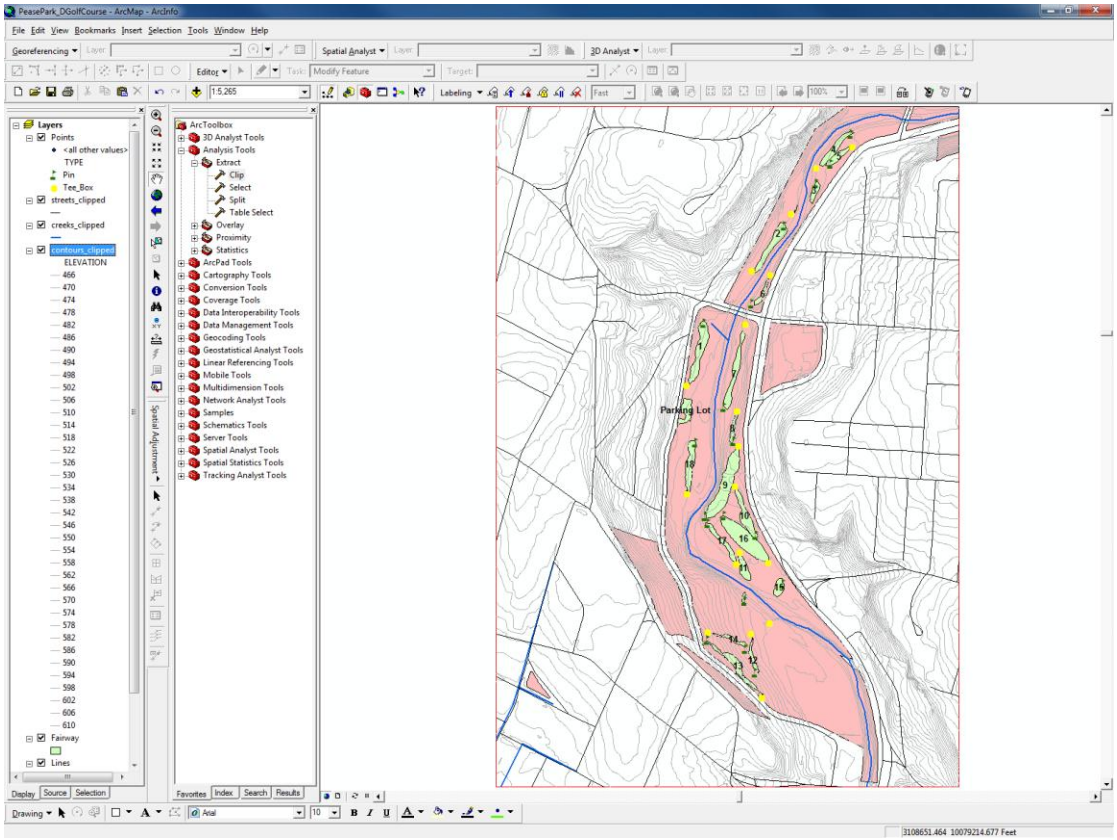

Figure 5. Map with Updated Symbology and Labeling.

5). Additionally, labels were added for all polygons, creating two label classes: one for fairways (labeled with hole number) and one for the parking lot (labeled with name) (Figure 5). I was interested in the percentage of Pease Park covered by disc golf fairways so I selected all fairway polygons within Pease Park, added a new field to the attribute table, and calculated the acreage for each polygon (Figure 6).

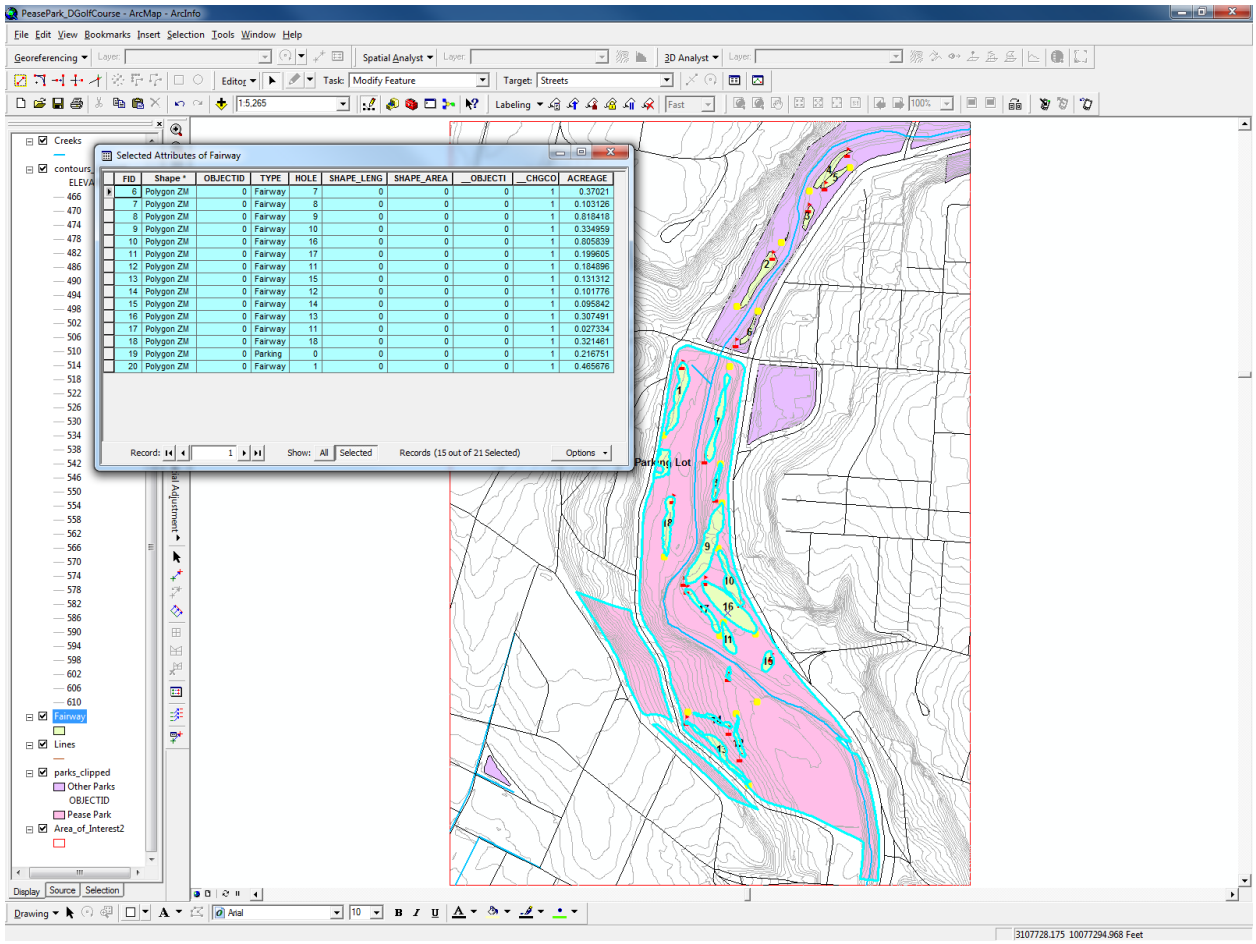

Figure 6. Selection of Fairways Within Pease Park and Calculation of Acreage.

I did the same with fairways outside Pease Park and totaled the acreages. Acreage totals are depicted in Table 1. From these totals it was determined that approximately 9.54% of Pease Park is covered by disc golf fairways.

Table 1. Acreages of Pease Park and Disc Golf Fairways.

Area	Acreage
Pease Park	42.805818
Fairways (within Pease Park)	4.484696
Fairways (outside Pease Park)	0.957494

Because Shoal Creek is ecologically important to Pease Park, I wanted to know which holes were most likely to affect the creek and selected holes which were within 100 feet of it. I symbolized these holes in a different color (Figure 7). Also, annotation was added to label Pease Park and surrounding parks (Figure 7). Lastly, I switched to layout view and created a mock printout. I rotated the map 90 degrees in

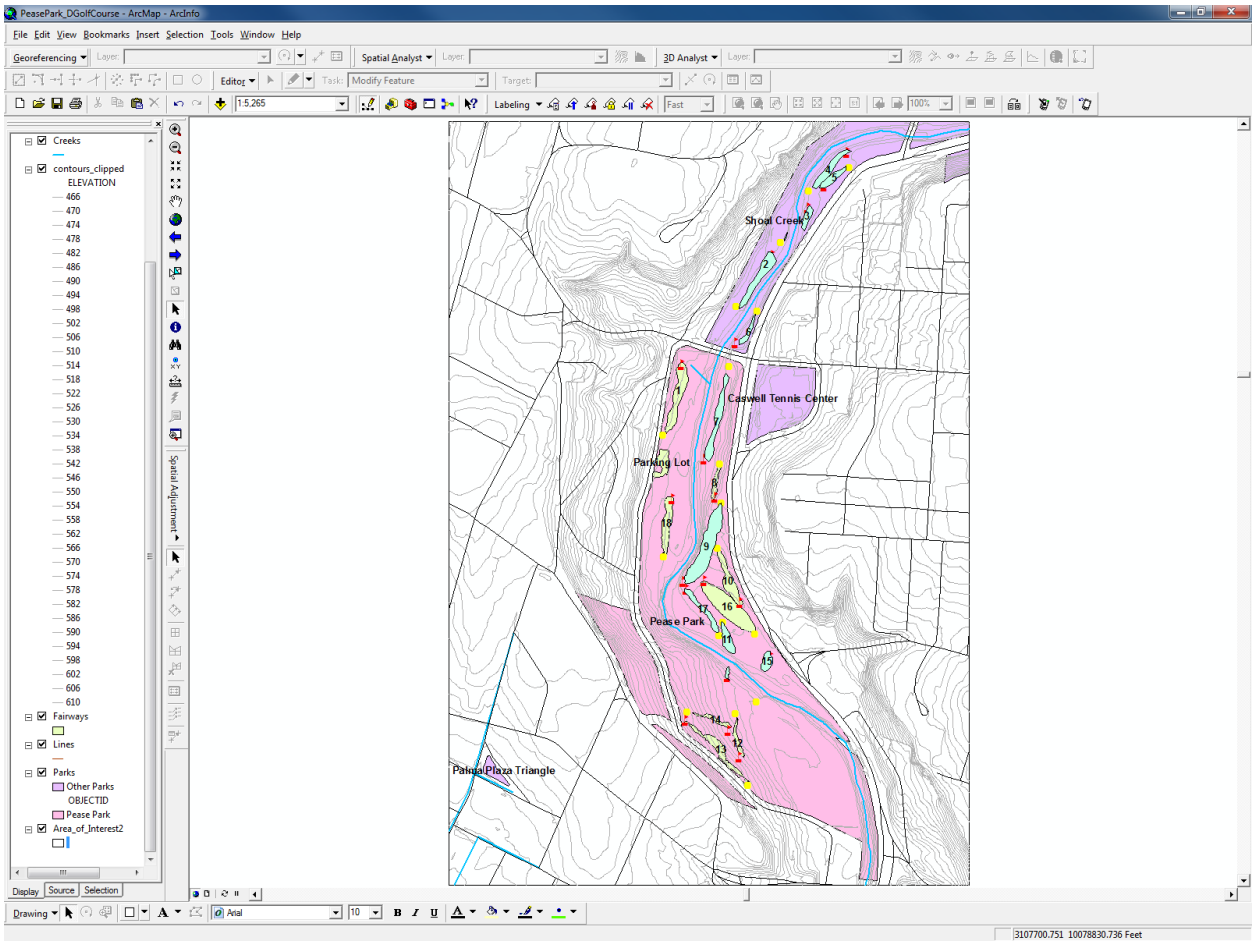

Figure 7. Map Depicting Fairways Within 100 feet of Shoal Creek and Labeled Parks.

order to make it fit the page better, rotated the symbols for the pin to match the map, and added a legend, scale bar, scale text, and north arrow (Figure 8).

Conclusion

Although two of the fairways had to be walked twice, the data collection went rather well, even at this small scale with the sources of error discussed above. This lends credence to the idea that this sort of project could be used to improve ecological assessments. If for example, one also mapped signs

of erosion, or abundant invasive species, you could then correlate these things with their proximity to disc golf fairways. Applications not geared towards ecological degradation from disc golf are also very possible. Repeated data collection over a period of years could be used to map out the spread of a particular invasive species, possibly providing insight and improvement to the removal and control of that species.

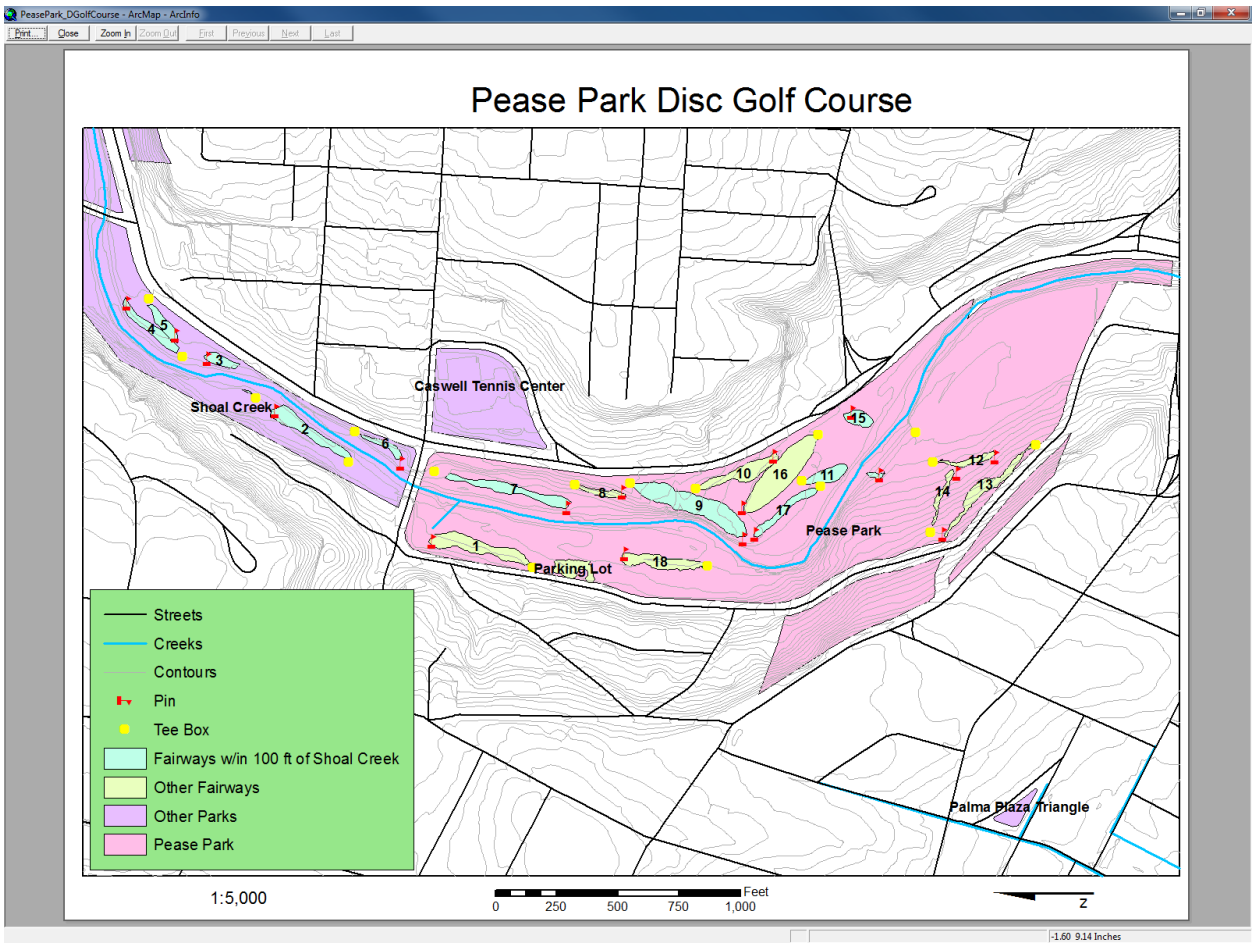

Figure 8. An Example of a Potential Final Map.