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Geography 777, Spring 2022

Project #2 Report

Problem Statement

We have been tasked to develop an application that will improve the park user experience for either a real or imaginary park. The application should help visitors before they arrive as well as provide information while they are inside the park and should be centered around a specific theme. Finally, visitors must be able to contribute data to the database.

For this project, I have developed a mobile-friendly application to improve the trail user experience within the Eleanor Klapp-Phipps Park in northern Tallahassee, Florida. Per the City's Parks & Recreation website:

"The Elinor Klapp-Phipps Park - through the cooperative efforts of the Northwest Florida Water Management District, the City of Tallahassee, and the property owner, Colin Phipps - was purchased in October of 1992. It is a beautiful 670 acre tract of land on the eastern shore of Lake Jackson.

The City purchased 162 acres outright, containing two existing active recreation areas. The Meadows Soccer Complex on Millers Landing Road will continue to function as a youth and adult soccer facility, and the Meridian Park area has been re-developed as a multi-use youth sports complex. The vast majority of the park, over 600 acres, will be utilized for passive forms of recreation and environmental education."

The park currently has numerous miles of intertwined equestrian, bicycle, and hiking trails. The land varies from open plain to deep ravines and swamp land, offering a beautiful and varied trail experience. However, currently there is only a pdf-based map which is hard to follow when on the trails, especially for users new to the park. Since the park is so large and trails frequently cross each other, stories of people getting lost for an hour or more trying to find their way back to their trailhead are common. The local GIS office has mapped the trails and they do show on some official basemaps, but unless users have some GIS savvy and the

correct application on their phone, they wouldn't be able to access that information. Furthermore, the trailheads aren't currently shown in any official GIS layers.

Implementation Plan

This application was built using the ArcGIS API for Javascript utilizing authoritative layers supplemented by additional context layers. It will enhance the trail user experience by:

1. Showing all trails on an interactive, mobile map;
2. Showing all trailheads in the context of a surrounding street map to make it easier to get to the park;
3. Allowing the user to highlight shared use, bicycle, hiking, or access trails;
4. Allowing the user to find their current location or track their location as they move;
5. Giving the user the option to change basemaps to better identify changes in terrain;
6. Providing contour and severe grade layers as additional options to identify terrain changes.

The park is also known as a haven for over 100 species of butterflies and the City has even developed a written guide to help park visitors identify common species. The application draws off of this guide to allow users to mark where and when they've seen a particular species.

Development of the Server-Side

Conceptual Database Design

The first phase of designing a database is to conceptually visualize the relationships and attributes of the entities, as shown below in an Entity Relationship Diagram.
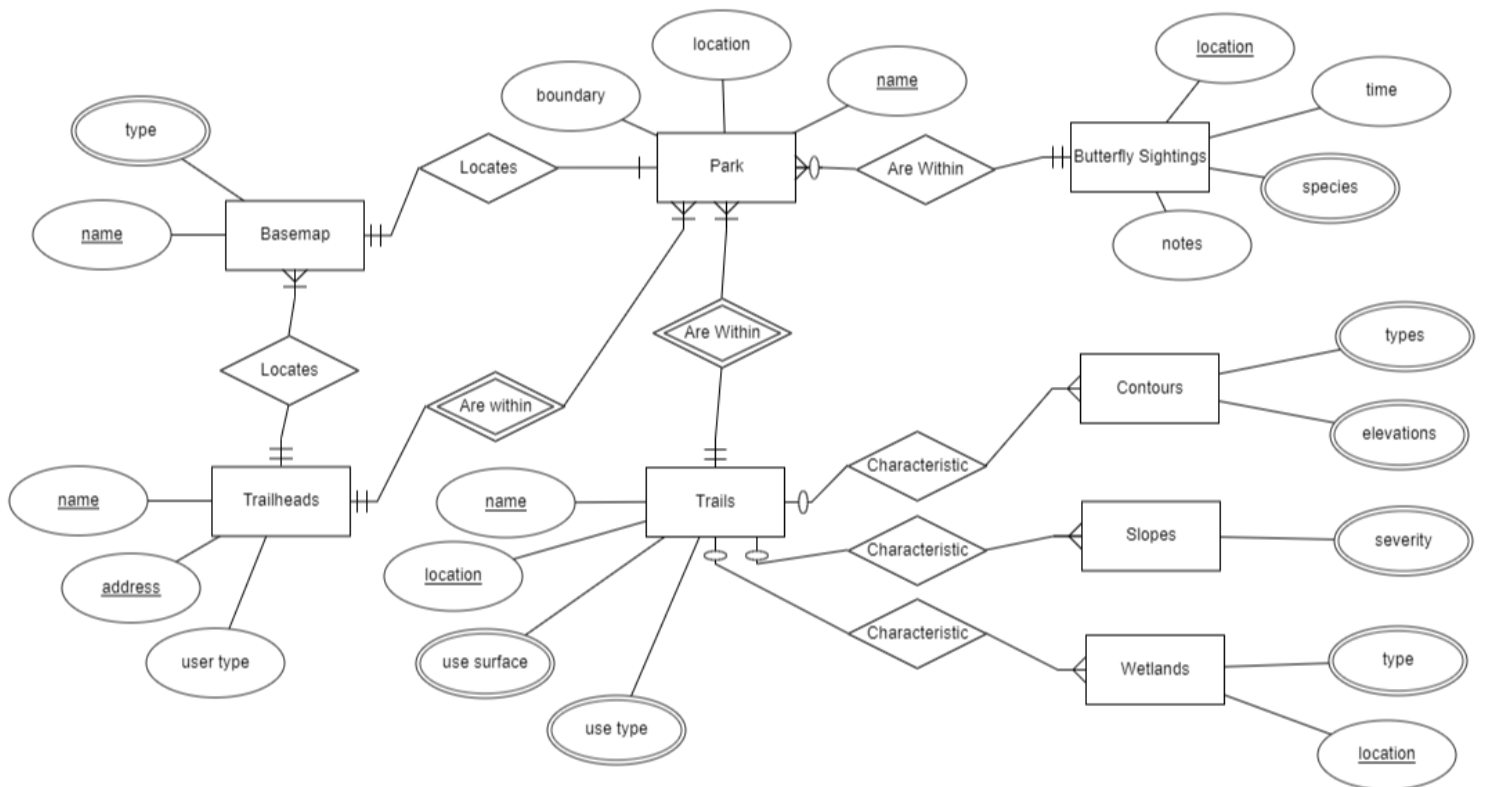
Logical Schema & Database Creation

The logical schema refines the conceptual design to show how the features and datasets will be represented and connected in the database. This project draws upon both authoritative and created layers hosted on ArcGIS online, as shown below. The logical schema is shown on the right, with the locations where the databases exist (in the case of authoritative) or are created (in the case of new layers) shown on the left.
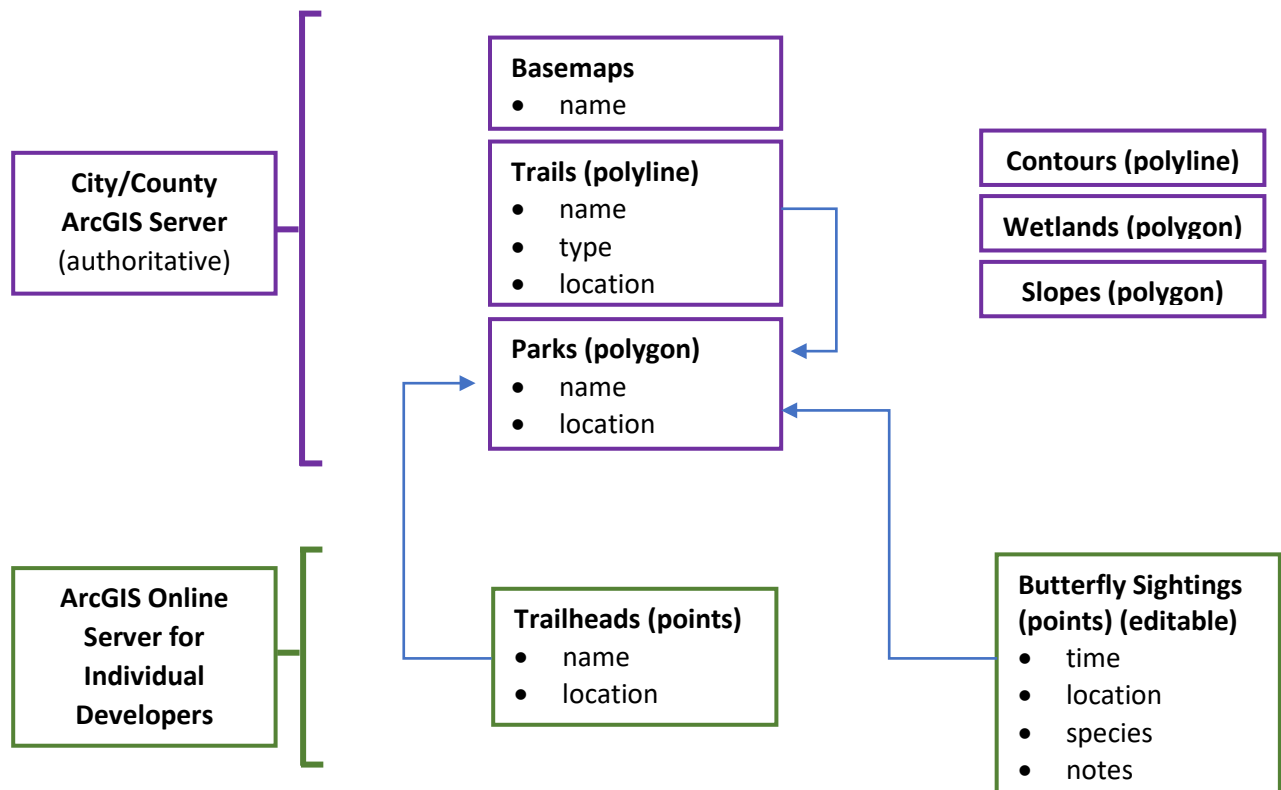
Database Maintenance

In order to maintain data integrity for the layer that allows user editing, users are only permitted to add new features. They cannot alter or delete existing features. To further control the quality of data input, domains were set for the month, year, and species. Only the notes field allows free text entry.

Development of the Client-Side

User Stories & Goals

There are several different user stories for this application. One is a hiker or cyclist who has never visited the park and consults the application both to find a trailhead, then to explore the park using the filter function to highlight the desired trail type, and finally for navigating through the park once on the trail. Another is an equestrian looking for the correct entrance to bring a trailer. Another is someone who has used the park but has gotten lost on an earlier visit. This user knows where to access the trailheads but turns to the application once on the trail to ensure they are headed in the right direction. Another user may have trouble going up or down hills, so consults the slopes layer to ensure their route is in the more open, flat part of the park. And finally, the butterfly enthusiast uses the app to record their sighting and to consult others' records to learn where and when they are likely to see certain species.

Functionality & User Interface

Considering the theme is spotting butterflies or exploring the natural features of the park on foot, bike or horse, a warm and colorful interface was created. Default widget colors were adjusted to a warmer color in line with the artistic basemap. The default editor widget & feature marker were replaced with a custom icon showing a butterfly.

Since this is a mobile-first app, all widgets were minimized within *Expand* widgets, save for the *Editor*. The default *Editor* expansion covered the entire mobile screen and created an unintuitive process for the user to place the marker location. In its place, the 'butterfly' button was created via HTML and attached to a toggle function that changes the *Editor's visible* property from *false* to *true* and vice versa, with the button changing from a butterfly to an 'X' accordingly.

For filtering the trails, rather than hide the trails not selected, a *FilterEffect* function is applied instead. This allows the user to easily see the trail type of interest, but also lets them see where their path intersects other trails.

Other functions include the ability to center on one's location, track one's movement, return to the default map location & zoom, change the basemap, make additional layers visible, view the legend, and of course, add butterfly sightings. A pop-up template was also added so the user can see details of each individual butterfly sighting by touching the marker. On smaller screens, the pop-up is docked at the bottom of the screen to minimize interference with the map.

Client-side/server-side Communication

As referenced elsewhere, this project is built using the ArcGIS API for Javascript (4.25) and accesses data layers hosted on ArcGIS Online via portal ID. The ArcGIS API incorporates responsive frameworks (i.e., Bootstrap) which typically result in aesthetically pleasing layouts for all screen sizes. However, in the case of the *Editor* functionality, the default frameworks were insufficient for phone screens so additional custom coding was added to ensure a smooth, intuitive user experience.

Intellectual Property Consent

The materials for this project may be shared with other students.

Code

Project files are available at https://github.com/cybryant/Project2 and the functioning web application is located at https://cybryant.github.io/Project2/.