Modernization of the USDA's Bird Banding Data Collection

Executive Summary

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Overview

The overall goal of this project was to develop a modernized workflow for bird banding data collection. The project needed to comply with a workflow starting with a data-directed, pre-validated mobile data collection form and ending with a web-based application for viewing and analyzing those data collected in the field. A caveat to the data collection design is that the data needed to be collected in a format (mainly field names and values) that would allow for automatic import into an external database. The target audience of users was a nation-wide set of USDA employees collecting data about bird banding activities and the banding data managers in each state. The development of the applications needed to meet the standards of the USDA's GIS data collection standards and rules, which led to a workflow harnessing the USDA's ArcGIS Enterprise portal.

Background for Need

A commonly requested data collection option from the USDA field staff and banding data managers is a mobile form to collect bird banding data, and a streamlined process to upload data to the USGS banding database. As an agency we band and relocate hundreds of birds each year. Banding data is collected by each individual employee, followed by merges at a district level, which is then followed by another merge at the state level 3-6 times each year. After merging the data is then uploaded into the USGS bird banding database value-by-value and line-by-line by a banding data manager in each state. The current processes in place for bird banding data collection differ for each state and methods range from simple to complex (e.g. paper-based printouts of blank banding data spreadsheets vs. Trimble GPS units with editable copies of file geodatabase feature classes designed to capture bird banding data). No matter which method is employed, the process requires double, triple or even quadrable entry of banding data as it progresses from the field and ultimately into the USGS banding database.

Implementation

In order to meet the needs of the users, banding data managers and still maintain data integrity that meet the schema of the USGS banding database, a trio of ESRI applications were used. The form-centric Survey123 app possessed the crucial customization for the initial field-level collection of the banding data. The map-centric Collector app allowed users to view and edit previously collected data in the Survey123 app. Finally, a Web App was created in the USDA portal, which provided the functionality for banding data managers to view, edit, query, and eventually export data in a format readable by the USGS banding database.

Survey123

In order to create a highly user-friendly mobile data collection form, the Survey123 Connect for ArcGIS desktop application was used. The Survey123 Connect application allows the initial schema development (and creation in the portal) of the hosted feature layer which will house all the banding data. The application is based around an XLS form and allows for an immense level of customization and data-directed flow of entries as the form is filled out by the user. By harnessing the ability to write complex expressions for each of the 110 fields the form reduces the data entry errors commonly found in current data collection processes. Because all 110 fields of data are not pertinent to every entry, the ability to show/hide fields and present a cascading form based on previous questions keeps the user from being visually overwhelmed with a long form on a short device screen. Because some domains contain hundreds of values, but only three or four of those values may be an accurate answer given previously entered data, a dynamic filtering method was needed. To address this, a useful (but complicated) functionality of Survey123 Connect was employed which allows for the filtering of answer choices based on previous questions. This functionality provided a much-needed specificity of answer choices to an initially broad set of domain values. Ultimately a form that contains all 67 fields and hundreds of domain values found in the schema of the USGS banding database was successfully designed (Figure 1). The form's user interface was polished up and made to be user-friendly, all while doing data validation and error checks in the background as fields are filled out.

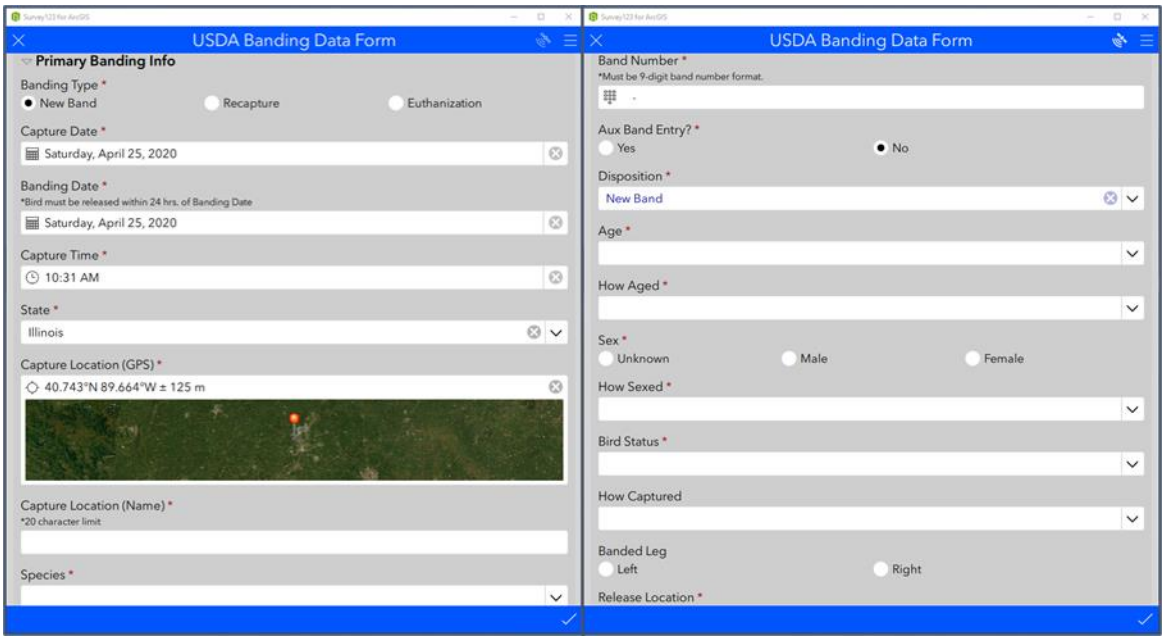

Figure 1 *Screenshot of the Bird Banding Surey123 form.*

Collector

The Collector application proved to be extremely useful for the field users. One drawback of Survey123 is the viewing and editing of previously collected data. Although the app can be configured to allow viewing and editing, it is not the app's strongest feature. Conversely, the Collector application possesses all the needed functionality for field users to view and edit previously collected data points. Some data required for the bird banding database is unknown or changes after the initial data collection (e.g. a bird's age, sex or release location), so allowing a field user the ability to edit their data in Collector added a level of integrity to the data before it is eventually inspected and uploaded to the USGS banding database by a banding data manager.

Web App

The greatest advantage to using the USDA Enterprise portal for the data collection process, was the ability to create a Web App around the banding data hosted feature layer. The plethora of functions and customizations available in a Web App provided a final hub for the banding data to reside for user and banding manager interaction. The Web App was linked to a layer view of the original hosted feature layer. By creating a layer view, the viewable fields and values within the fields can be customized to meet the requirements of the import tool in the USGS banding database. Within the app, users can filter a nation-wide dataset all the way down to the user level. Data can be filtered by values like date range, state name, capture location, bird species, etc. These filter options allow a banding data manager the ability to query out a necessary dataset from the root data layer, export those records to a CSV file, and then import into the USGS banding database with a few clicks.

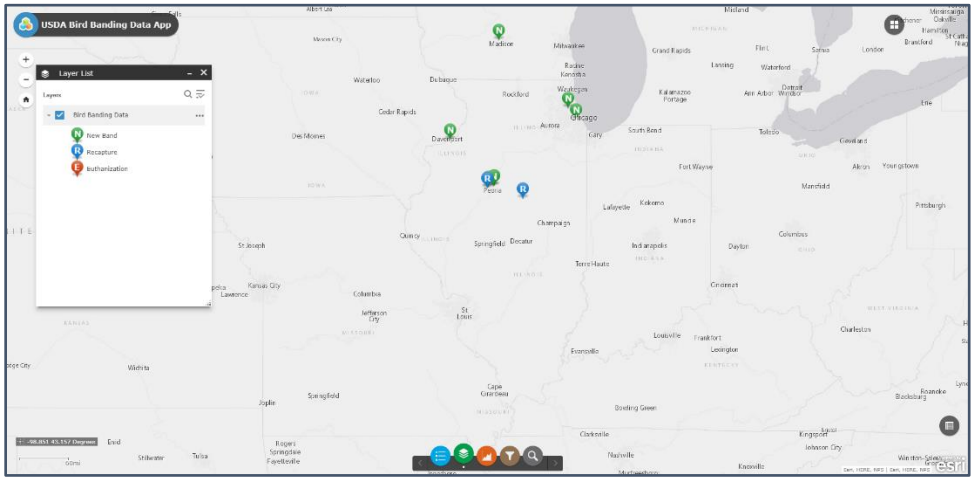

Figure 2 *Screenshot of the Web App for banding data.*

Future Improvements

As with any workflow, there will be a need for changes and improvements as the workflow gets put into production by USDA users. Currently the process works and meets the needs of all stakeholders in the banding data collection process. The largest issue that will inevitably arise will be the migration of the USGS banding database to a new system, as it is already outdated and talks of an upgrade are in the works. Other improvements pertaining to the Survey123 form or the Web App will likely arise as use increases and requests arise. The current Survey123 from is set up for beta-testing by three states and will need to have domains updated to meet the needs for adoption by the other 39 state programs in the USDA.

Conclusion

The development of the workflow using applications centered around the USDA's Enterprise portal proved to be a success. The Survey123 for ArcGIS application allows for the initial data collection to be validated and pre-checked for errors before it is ever submitted to the hosted feature layer. The Web App allows banding data mangers a hub to interact with all banding data and reduces the burden of inputting data into the USGS banding database. The workflow saves a large amount of time by reducing the double and triple entry of data for the field user all the way up to the banding data manager.

A demonstration of the developed workflow can be viewed at:

https://www.youtube.com/watch?v=8fqDhUWSKaE