COS 397: Computer Science Capstone I

System Requirements Specification Document

(Adapted from Susan Mitchell and Michael Grasso)

BirdSpotter

System Requirements Specification

Developed for: Dr. Cynthia Loftin

Developed by: Penobscot Development Group

Table of Contents

1. **Introduction**

    1.1 Purpose of This Document

    This SRS document provides information on the requirements and specifications associated with the BirdSpotter application. The goal of this document is to give an overview of the various functionalities and components of the application. Additionally, a synopsis of the artifacts delivered to the customer is provided. This document is intended for developers and the client.

    1.2 References
    User Story document, referenced in the requirements section:
    https://airtable.com/shrHLgtG7XOBeyVpv

    1.3 Purpose of the Product

    The BirdSpotter application is a bird tracking app that helps manage aerial imagery data used for bird counts, and allows the user to apply AI algorithms to interpret and report species identification and certainty estimates of the identification. The app enables a user to display geographical data on a map or organize statistical data in various forms such as graphs or tables.

    1.4 Product Scope

    The Bird Spotter app facilitates breeding bird counts in aerial imagery by integrating a machine learning process with a centralized platform for data storage and visualization. The goal of the app is to provide a centralized platform with data storing, visualization, and streamlined statistical functionalities. These are the key features of the application and make up the core of the program. The main audience for the application is biologists involved in research related to birds.

    1.5 User Definitions

    There are four levels of users defined by the requirements in this document. Each user is completely defined by the functional requirements below, so the following list is only provided to add more conveniently accessible context. Note that the users are organized in a linear hierarchy, meaning that each level of permission includes the permissions of each level below it. For example, a registered user has all the permissions a public user has, with additional registered user specific permissions.

    Public User:
        A public user represents a user who has not been granted any permissions by the site administrators. They only have the ability to view a low-resolution version of the results of analysis (map view with low resolution zoom & only aggregate datapoints),

with no export abilities for the data or the analysis. Additionally, they can only view data sets that are not marked as private and do not have access to the resultant statistics.

Registered User:

A registered user represents a user who has been granted an account. They are required to log into their account before they can access their elevated permissions. A registered user can view private data that they are granted access to. They also have the ability to export and download data sets they can view.

Privileged User:

Like a registered user, a privileged user must log in to access their elevated privileges. A privileged user has the additional ability to upload new data sets and edit the metadata of the sets that they own.

Administrator:

A site administrator is the most elevated role and should only be granted to internal, trusted users. A site administrator has the ability to view all data sets, private and public, and to edit any data set owned by any user. They also have the ability to edit the user privileges of all other non-administrator users.
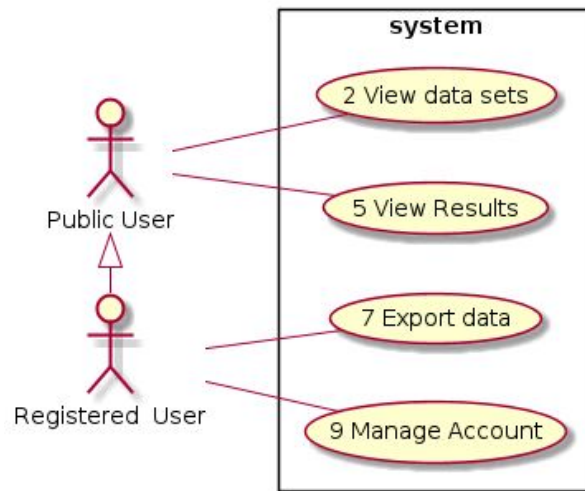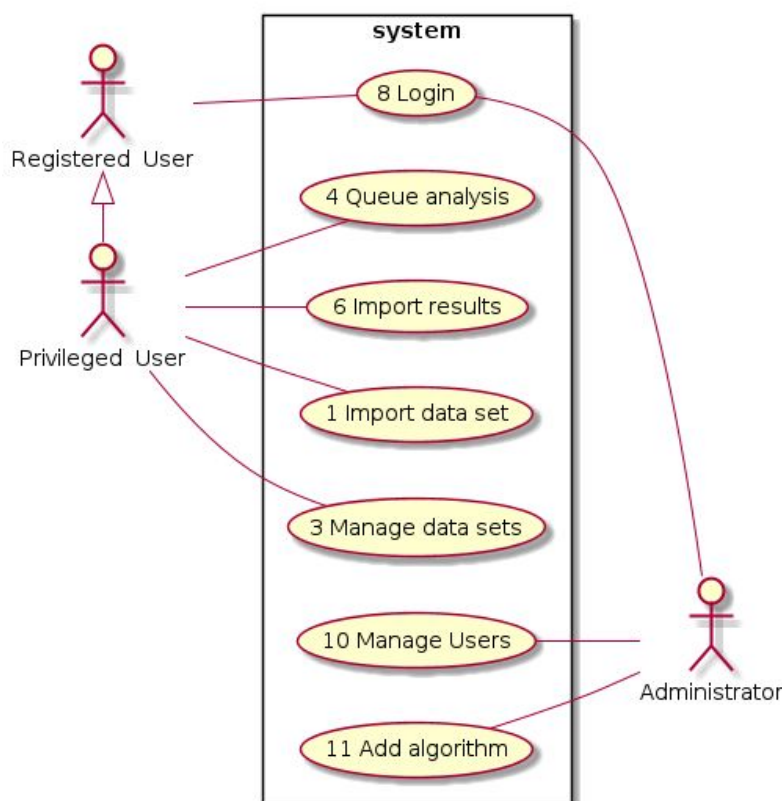

Figure 1. Use Cases: Part One

Figure 2. Use Cases: Part two

2. Functional Requirements

Number	1.0	
Name	Import data set	
User Story ID(s)	1, 30	
Summary	Upload your own data set for analysis	
Priority	5	
Preconditions	Successful Login	
Postconditions	Data set will be available in the system to analyze	
Primary Actor	Privileged User	
Secondary Actors	Client system	
Trigger	User selects "Import data set" menu option	
Main Scenario	**Step**	**Action**
	1	Privileged User selects "Upload new data set"
	2	System displays displays an upload prompt to choose a file
	3	Privileged User selects desired file
Extensions	**Step**	**Branching Action**

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	4a	Privileged User selects "make this data set visible to all users": System adds data set to internal data repository
	4b	Privileged User selects "make lower-resolution data open to the public": System adds data set to public data repository
	4c	Privileged User selects "don't share this data": System adds data set to user-specific data repository
Open Issues		

Number	2.0	
Name	View Data	
User Story ID(s)	21	
Summary	View list of data sets available	
Priority	5	
Preconditions	None.	
Postconditions	List of data sets is displayed, the user can perform actions on them	
Primary Actor	Public User, Registered User	
Secondary Actors	None	
Trigger	User loads website	
Main Scenario	**Step**	**Action**
	1	System displays list of data sets
Extensions	**Step**	**Branching Action**
	2a	Public User : System displays additional metadata for data sets, such as data entered, general location, species of focus
	2a	Registered User : System displays additional metadata for data sets, such as data entered, exact, species of focus, observer(s), data set owner
Open Issues		

Number	2.1	
Name	Sort/Filter Data	
User Story ID(s)	19	
Summary	Sort, filter	
Priority	3	
Preconditions	User is viewing data set list (Use case 2.0)	
Postconditions	None.	
Primary Actor	Registered User	
Secondary Actors	None.	
Trigger	User sorts by a column, selects a specific data set requirement, or enters a search term	
Main Scenario	**Step**	**Action**
	1	Registered User sorts by a column, selects a specific data set requirement, or enters a search term

	2	System displays newly-limited data set list matching user requirements or keywords
Open Issues		

Number	3.0	
Name	Manage Data	
User Story ID(s)		
Summary	Modify data set permissions and other meta-data	
Priority	4	
Preconditions	Privileged User is viewing data sets (Use case 2.0)	
Postconditions	Data set metadata is modified	
Primary Actor	Privileged User	
Secondary Actors	None.	
Trigger	Privileged User selects data set to modify	
Main Scenario	**Step**	**Action**
	1	Privileged User selects data set to modify
Extensions	**Step**	**Branching Action**
	2a	Privileged User is not the owner (uploader) of the selected data set: System displays "permission denied" message. System returns to data set view.
	3a	Privileged User selects "Add meta-data": Proceed to Use case 3.1
	3b	Privileged User selects "Change visibility": Proceed to Use case 3.2
Open Issues		

Number	3.1	
Name	Add Metadata	
User Story ID(s)	8	
Summary	Add additional relevant metadata to the data(collection method, notes, etc)	
Priority	4	
Preconditions	Privileged User is viewing data set list (Use case 2.0), User has selected data set (Use case 3.0), User is owner (uploader) of the data set	
Postconditions	Data set metadata is modified	
Primary Actor	Privileged User	
Secondary Actors	None	
Trigger	Privileged User selects "Add meta-data"	
Main Scenario	**Step**	**Action**
	1	Privileged User selects "Add meta-data"
	2	System displays current meta-data (if any) in as editable
	3	Privileged User edits meta-data
Extensions	**Step**	**Branching Action**
	4a	Privileged User selects "Save": System overwrites old meta-data with new meta-data

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		System closes meta-data and returns to data set view
	4b	Privileged User selects "Cancel": System closes meta-data and returns to data set view
Open Issues		

Number	3.2	
Name	Manage Visibility of Data	
User Story ID(s)	18	
Summary	Modify the visibility of data sets the owner has uploaded	
Priority	4	
Preconditions	Privileged User is viewing data sets (Use case 2.0), User has selected data set (Use case 3.0), User is owner (uploader) of the data set	
Postconditions	Data set	
Primary Actor	Privileged User	
Secondary Actors	None	
Trigger	Privileged User selects "Change visibility"	
Main Scenario	**Step**	**Action**
	1	Privileged User selects "Change visibility"
	2	System displays 3 options (public, internal, only you)
	3	Privileged User selects an option.
	4	System prompts user to confirm
Extensions	**Step**	**Branching Action**
	5a	User selects "confirm": System changes visibility based on user's selection
	5b	User selects "cancel": System returns to Data set view (Use case 2.0)
Open Issues		

Number	4.0	
Name	Queue Analysis	
User Story ID(s)	15	
Summary	Choose algorithm and run against previously specified data set	
Priority	5	
Preconditions	Successful Login	
Postconditions	Data set analysis is registered on the ACG Queue	
Primary Actor	Privileged User	
Secondary Actors	ACG	
Trigger	User selects the "Queue Analysis" menu option	
Main Scenario	**Step**	**Action**
	1	System displays list of available algorithms
	2	Privileged User selects desired algorithm
	3	System displays displays additional info about chosen algorithm with confirm/cancel buttons
Extensions	**Step**	**Branching Action**

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	4a	Privileged User selects "confirm": System queues data set to be analyzed with chosen algorithm
	4b	Privileged User selects "cancel": Revert to step 1.
Open Issues	2	

Number	5.0	
Name	View Results	
User Story ID(s)	7	
Summary	View visualizations of the results of analysis of data set	
Priority	5	
Preconditions	Successful Login, User has selected data set (Use case 3.0), selected data set has associated analysis data (Use case 6.0)	
Postconditions	None.	
Primary Actor	Public User, Registered User	
Secondary Actors	None.	
Trigger	User selects "View completed analysis" menu option	
Main Scenario	**Step**	**Action**
	1	User selects "View completed analysis"
	2	System displays view options
Extensions	**Step**	**Branching Action**
	3a	User selects "View Map": Proceed to Use case 3.2
	3b	User selects "View Charts and Aggregates": Proceed to Use case 3.3
Open Issues	5	

Number	5.1	
Name	View Charts and Aggregates	
User Story ID(s)	11, 13, 9, 24	
Summary	View the aggregate data (certainty, number of data points, etc)	
Priority	4	
Preconditions	Successful Login	
Postconditions	Chart view is displayed	
Primary Actor	Public User, Registered User	
Secondary Actors	None.	
Trigger	User selects "Charts and Aggregates" menu option	
Main Scenario	**Step**	**Action**
	1	User selects "Charts and Aggregates"
Extensions	**Step**	**Branching Action**
	2	Registered User:

		System displays overall statistics by nesting type, species and island or specific geolocation, including certainty
Open Issues	5	

Number	5.2	
Name	View Map	
User Story ID(s)	12, 13, 10, 22, 24	
Summary	View geodata on a map, with the ability to re-color and rescale the map	
Priority	5	
Preconditions	Successful Login	
Postconditions	Map view is displayed	
Primary Actor	Public User, Registered User	
Secondary Actors	None.	
Trigger	User selects "Map View" menu option	
Main Scenario	**Step**	**Action**
	1	User selects "Map View"
Extensions	**Step**	**Branching Action**
	2a	Public User: System displays lower-resolution map (data points represent larger geographical areas) System displays general geographical statistics
	2b	Registered User: System displays detailed map (up to 1 datapoint per bird) System displays fully detailed geographical statistics
	3	System displays menu to re-color and re-scale map
Open Issues	3, 5	

Number	5.3	
Name	View Details by Data Point	
User Story ID(s)	6, 11, 32, 24	
Summary	View statistics, location, source photos, AI categorization and certainty by datapoint	
Priority	4	
Preconditions	User is viewing map (Use case 5.2)	
Postconditions	None.	
Primary Actor	Public User, Registered User	
Secondary Actors	None.	
Trigger	User interacts with datapoint on map	
Main Scenario	**Step**	**Action**
	1	User interacts with datapoint
Extensions	**Step**	**Branching Action**
	2a	Public User: System displays statistics for the aggregate data point
	2b	Registered User:

		System displays statistics and exact location for that datapoint System displays source image for that datapoint, if available
Open Issues	5	

Number	5.4	
Name	Aggregate data points per-island	
User Story ID(s)	11, 13, 32	
Summary	System displays a datapoint per island (instead of proximity or per-bird)	
Priority	4	
Preconditions	User is viewing map (Use case 5.2)	
Postconditions	Map view is displayed with a single point over the island per set.	
Primary Actor	Registered User	
Secondary Actors	None.	
Trigger	User selects the "Aggregate by Island" toggle option	
Main Scenario	**Step**	
	1	User selects the "Aggregate by Island"
	2	System displays a single datapoint per-island, sizing datapoints by population
Open Issues		

Number	6.0	
Name	Import Results	
User Story ID(s)	20	
Summary	Results of analysis are associated with a data set	
Priority	5	
Preconditions	Login. User is viewing data sets (Use case 2.0)	
Postconditions	Results are associated with a data set and can be viewed	
Primary Actor	Privileged User	
Secondary Actors	None.	
Trigger	Privileged User selects "Upload data" menu option	
Main Scenario	**Step**	**Action**
	1	Privileged User selects data set that their results are associated with
	2	Privileged User selects "Upload data"
	3	System displays displays an upload prompt to choose a file
	4	Privileged User selects desired file
	5	System imports results and associated them with the chosen data set
Open Issues		

Number	7.0
Name	Export Data
User Story ID(s)	5, 17, 33
Summary	Data is exported on to the users computer

Priority	5	
Preconditions	Successful Login, User is viewing datasets (Use case 2.0)	
Postconditions	Data is exported to the users computer	
Primary Actor	Registered User	
Secondary Actors	ACG	
Trigger	Registered User selects "Export Data"	
Main Scenario	Step	
	1	Registered User selects a data set.
	2	Registered User selects "Export Data"
	3	System displays export options (export geodatabase, statistical data, or analysis script)
Extensions	Step	
	3a	Registered User selects "Export geodatabase": System exports geodatabase to client machine
	3b	Registered User selects "Export statistical data": System exports statistical data to client machine
	3c	Registered User selects "Generate and Export analysis script": System displays list of available algorithms User selects algorithm System exports generated analysis script to client machine
Open Issues		

Number	8.0	
Name	Login	
User Story ID(s)	2	
Summary	Registered User logs in	
Priority	5	
Preconditions		
Postconditions	Registered User will have access to the functions of their account	
Primary Actor	Registered User	
Secondary Actors	ACG	
Trigger	Registered user selects login	
Main Scenario	Step	
	1	Registered User selects "log in"
	2b	Registered User enters username password pair
	2b	Registered User enters invalid username password pair
	3a	Registered User is granted access to their account
	3b	Registered User is not granted access to their account
Open Issues	1	

Number	9.0
Name	Manage Account
User Story ID(s)	25, 26

Summary	Manage Account Settings	
Priority	4	
Preconditions	Successful login	
Postconditions	System updates user account information	
Primary Actor	Registered user	
Secondary Actors	None.	
Trigger	Registered user selects edit information on account page	
Main Scenario	Step	
	1	Registered User selects Account tab
	2	Registered User clicks "Edit info" button
	3	Registered User changes desired information
	4	Registered User select "Done" button
Open Issues	1	

Number	10.0	
Name	Manage Users	
User Story ID(s)	27, 29	
Summary	Modify user settings	
Priority	5	
Preconditions	Successful login	
Postconditions	System displays user management screen	
Primary Actor	Administrator	
Secondary Actors	ACG	
Trigger	Administrator selects "Manage Users"	
Main Scenario	Step	Action
	1	Administrator selects "Manage Users"
	2	Systems displays user list
Extensions	Step	Branching Action
	1a	Administrator clicks "Add user" : Proceed to use case 10.1
	1b	Administrator clicks delete icon for desired user: Proceed to use case 10.2
	1c	Administrator clicks edit icon for desired user: Proceed to use case 10.3
Open Issues	1	

Number	10.1
Name	Add User
User Story ID(s)	2, 34
Summary	Adds a user to the system
Priority	5
Preconditions	Administrator is logged in

Postconditions	A user is added to the system	
Primary Actor	Administrator	
Secondary Actors	ACG	
Trigger	Administrator selects "Add User"	
Main Scenario	**Step**	**Action**
	1	Administrator selects "Add User"
	2	A prompt appears asking for an email address
	3	Administrator enters a valid email address
Open Issues	1	

Number	10.2	
Name	Remove User	
User Story ID(s)	2	
Summary	Remove a user from the system	
Priority	5	
Preconditions	Administrator is logged in	
Postconditions	A user is removed from the system.	
Primary Actor	Administrator	
Secondary Actors	ACG	
Trigger	Administrator selects "Remove User"	
Main Scenario	**Step**	**Action**
	1	Administrator clicks delete icon for desired user
	2	System displays confirmation dialog
	2a	Administrator clicks "Confirm" button
	2b	Administrator clicks "Cancel" button
Open Issues	1	

Number	10.3	
Name	List Accounts	
User Story ID(s)	27	
Summary	View the accounts logged within the system	
Priority	5	
Preconditions	Successful login	
Postconditions	A list of accounts appears	
Primary Actor	Administrator	
Secondary Actors	ACG	
Trigger	Administrator clicks "List Accounts"	
Main Scenario	**Step**	**Action**
	1	Administrator clicks "List Accounts"
	2	System displays a list of accounts
Open Issues		

Number	10.4	
Name	Assign Privileges	
User Story ID(s)	29	
Summary	Assign a user privileged access to the application	
Priority	5	
Preconditions	Successful login	
Postconditions	User is assigned privileged access	
Primary Actor	Administrator	
Secondary Actors	ACG	
Trigger	Administrator selects "Set Access Level"	
Main Scenario	Step	
	1	Administrator selects "Set Access Level"
	2	System displays a prompt with a dropdown containing levels
	3	Administrator selects "Privileged"
	4	Administrator selects "Apply"
	5	User is assigned "Privileged" access
Extensions	Step	
	3a	Administrator selects "Administrator"
	4a	Administrator selects "Apply"
	5a	User is assigned "Administrator" access
Open Issues		

Number	11.0	
Name	Add Analysis Script	
User Story ID(s)	16	
Summary	Upload an analysis script matching a predefined format to be available to users as an analysis method	
Priority	3	
Preconditions	Successful login	
Postconditions	Analysis script is available for use	
Primary Actor	Administrator	
Secondary Actors	ACG	
Trigger	Administrator selects "Upload Analysis Script" option	
Main Scenario	Step	Action
	1	Administrator selects "Upload Analysis Script" option
	2	System displays an upload prompt
	3	Administrator selects Analysis Script file
	4	System adds Analysis Script
Open Issues		

Testing
1. Import raw data in geotiff format and ensure data is saved into the database

2. Upload numerous raw data files and ensure that they show up in the user's data section

3.

    3.1. Change the visibility of a data object from private to public and ensure proper visibility

    3.2. Change the visibility of a data object from public to private and ensure proper visibility

    3.3. Perform a delete action on the data and ensure raw data and results are removed from the system

4. Select the "Perform analysis" option and ensure that the proper script is generated and sent to the ACG server

5. Ensure that selecting a data object that has already had analysis performed on it displays correctly in both the data overview and map views

6. Upload data using a shape file, and ensure that it is saved correctly as results in a data object

7. For a data object that has already has had analysis performed on it, select the "Export results" option and verify that the corresponding shape file is exported

8. Perform a login attempt with a registered account providing the correct credentials and ensure that the user is redirected to the homepage

9.

    9.1. Perform edit actions on all user data fields and ensure that the changes are stored upon pressing the "Done" button

    9.2. Perform edit actions on all user data fields and ensure that changes are not stored upon pressing the "Edit" button

10.

    10.1. Ensure that adding a user from the admin page creates a user in the system and sends the corresponding email address a notification along with a link to a create password page

    10.2. Ensure that removing an existing user from the system removes access to the system along with all data associated with that account

    10.3. Upon selecting "List Accounts" ensure that all accounts in the system are displayed

    10.4. For an account that exists in the system, ensure that changing the privilege for an account is reflected in the system and the user can view data according to their privilege level

3. Non-Functional Requirements

NFR #	1
Name	Sign in
Priority	5
Description	A user will reach the home page in less than 2 seconds from pressing the submit button or enter key when the correct credentials are provided 95% of the time

Tests	Sign in using correct credentials and measure response time from the system

NFR #	2
Name	Display available data sets
Priority	3
Description	The system shall display all data sets available to the user within 5 seconds 85% of the time
Tests	Open the UI for selecting a data set and measure the time taken to completely display all available data sets

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NFR #	3
Name	Upload data sets
Priority	4
Description	The system shall import a data set provided by the user in less than 10 seconds 80% of the time.
Tests	Import data sets of varying size and measure response time

NFR #	4
Name	Export data sets
Priority	3
Description	The system shall export a specified data set in within 5 seconds 90% of the time
Tests	Export data sets of varying sizes and measure the response time of the system

NFR #	5
Name	Display data overview

Priority	5
Description	The system shall display an overview of that data with graphics in less that 5 seconds of the user switching to the display tab 90% of the time
Tests	Select large data sets and measure time taken to parse data, create, and display charts

NFR #	6
Name	Display map with data points
Priority	5
Description	The system shall display the map overview with bird locations in less than 10 seconds 80% of the time
Tests	Measure time taken to render map and bird locations for varying sized data sets

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There is room for

NFR #	7
Name	Registration request notifications
Priority	3
Description	An admin shall receive an email notification for access requests within 5 minutes of the request being submitted 90% of the time
Tests	Create a user request and measure elapsed time until the notification email is received

NFR #	8
Name	Private data sets shall not be visible to other users
Priority	5
Description	The system shall not show data sets to users that do not have explicit access to such a data set unless that user has administrative privileges.
Tests	Make a private data set under one user and ensure that another non-administrative user cannot see said data set.

NFR #	9
Name	Non-registered actors shall not have access to the system
Priority	5
Description	An actor that does not have a registered account shall not be able to view any page other than the sign in page
Tests	Ensure that all endpoints of the system are unable to be accessed using a non-authenticated user.

NFR #	10
Name	Non-registered actors shall not have access to the system
Priority	5
Description	An actor that does not have a registered account shall not be able to view any page other than the sign in page
Tests	Ensure that all endpoints of the system are unable to be accessed using a non-authenticated user.

NFR #	11
Name	Sensitive information zoom behavior
Priority	3
Description	Sensitive information shall not be displayed in any greater detail than a 2 sq. mile aggregation
Tests	Attempt to zoom in on sensitive information with a non-authorized user and check that their view is constrained to a minimum scale of 2 sq. miles.

4. **User Interface**

See "User Interface Design Document for *BirdSpotter*."

5. Deliverables

Item	Date	Format
Systems Requirement Specification	10/28/20	PDF
System Design Document	11/10/20	PDF
User Interface Design Document	11/24/20	PDF
User Manual	Spring 2021	PDF/Github
Administrator Manual	Spring 2021	PDF
Source Code	Always available	Github
Prototype	12/2/20	Web link
Executable program	12/2/20	Github
Additional Software	Spring 2021	Github

6. Open Issues

1. The type of sign in or account management has not yet been decided, though we have a few levels of access listed in with the user stories document referenced in the 'external resources' section

2. Whether the use of the machine learning can be automatically applied to given data or must be done manually, and related to this is should any user or only privileged users have access to the compute time of the ACG. Currently requirements are written for both options, with the manual method being the higher priority.

3. We have not fully decided on the scope of the data visualisation abilities, and we may later choose to extend our data model and visualization to include a time dimension.

4. The license that the code should be made under has not yet been decided, and should be discussed in the future. Likely open source would be a good choice due to the nature of the application but confirmation would be needed.

5. The library to be used: initially we had planned on using arcGIS because it was previously used for the project, but it appears to come with some licensing costs. We are currently working this out as developers.

6. How the run script works. If it is something that is just changing a couple user specified variables then it can be done automatically by the system, otherwise the user imports a run script that they created and that is used.

Appendix A – Agreement Between Customer and Contractor

By signing on the provided line below, the client acknowledges and agrees that the deliverables described by the above terms in sections 1, 2, and 3 are satisfactory. The client also accepts the delivery dates for each item described in section 5 and all other clauses described in this document.

Client signature:

Cynthia S. Loftin   date: 11/2/2020

Client comments:

Type text here

The project description and functional requirements are well-written and appear complete.

There are some issues that will be resolved as we work through the project with the team. We look forward to working with the team!

By signing on the provided lines below, all Penobscot Development Group members acknowledge and agree to meet all requirements for deliverables described in sections 1, 2, and 3. Additionally, signing indicates that the Penobscot Development Team agrees to deliver all items by their respective dates described in section 5 and to accept all other clauses described in this document.
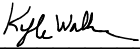
Penobscot Development Team signatures:

Alexarh   date: October 28th 2020

Grant Morin   date: October 28th 2020

DocuSigned by:
Devin Christianson   date: October 28th, 2020
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Kyle Walk   date: October 28th, 2020

_____   date: October 28th, 2020

Changes to requirements or dates may be required as the development cycle progresses. All new drafts of this document must be reviewed, agreed upon, and signed by both the Penobscot Development Group and the client. Upon the signing of a new draft, the previous draft becomes void and the new draft supersedes any obligations set by the previous draft.

Appendix B – Team Review Sign-off

By signing below, all Penobscot Development Group members acknowledge that they have reviewed all requirements for deliverables described in sections 1, 2, and 3. Additionally, signing indicates that each team member has reviewed the delivery dates described in section 5.

date: October 28th 2020

date: October 28th 2020

DocuSigned by:

Devin Christianson

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date: October 28th, 2020

date: October 28th, 2020

date: October 28th, 2020

Appendix C – Document Contributions

The below table describes the Penobscot Development Group members contribution to the document for internal purposes.

10% - Jacob Morin - Section 1.5, Appendices A, B, C
40% - Devin Christianson - Section 2, 3, 5
10% - Alexandre Feren - Section 1.2, Section 2, Section 6
20% - Kyle Walker - Section 1, Section 2
20% - Nick Kania - Section 2, Section 3, Section 5