# Team 12
# Nathan's Monarchy

Client: Nathan Brockman
Advisor: Dr. Diane Rover
5/1/2023

## Unified Butterfly Recorder

### Final Presentation - CPR E 492

Anthony Mazzie, Jeremiah Marchesani, Zachary Wingert, Ryan McNally, Grace Wigen, Timothy Ellis, Lucas Onwu-Chekwa

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# Introduction

- Client: **Reiman Gardens**
- Iowa Butterfly Survey Network
- **Users:** Trained volunteers and researchers

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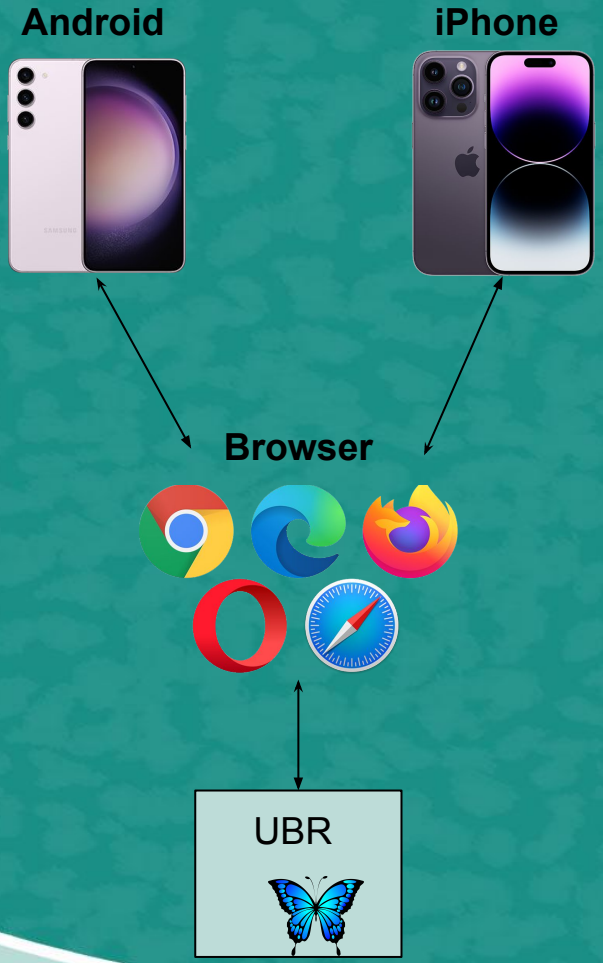


# Objective

- Develop a new app that is:
  - A **Cross-Platform** application
  - **Maintainable** with longevity
  - **Faster** than pen & paper
  - Able to package data to the PollardBase **research standards**

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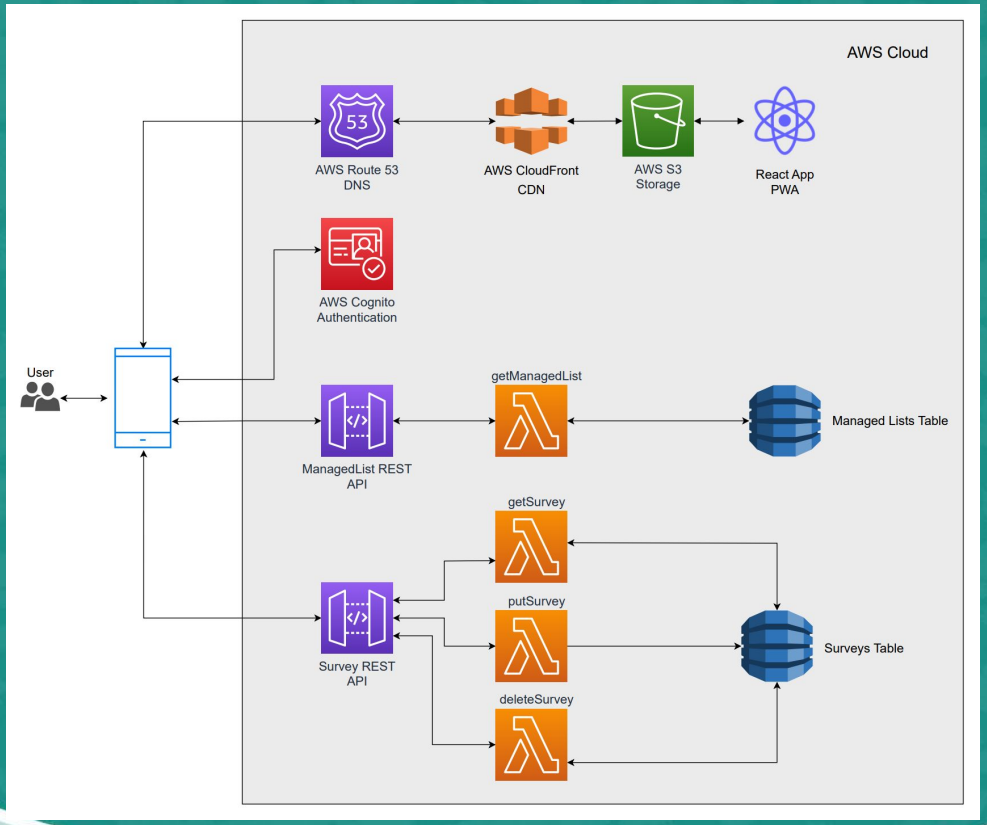
# Implementation




- React Progressive Web Application (PWA) Frontend

- AWS Backend

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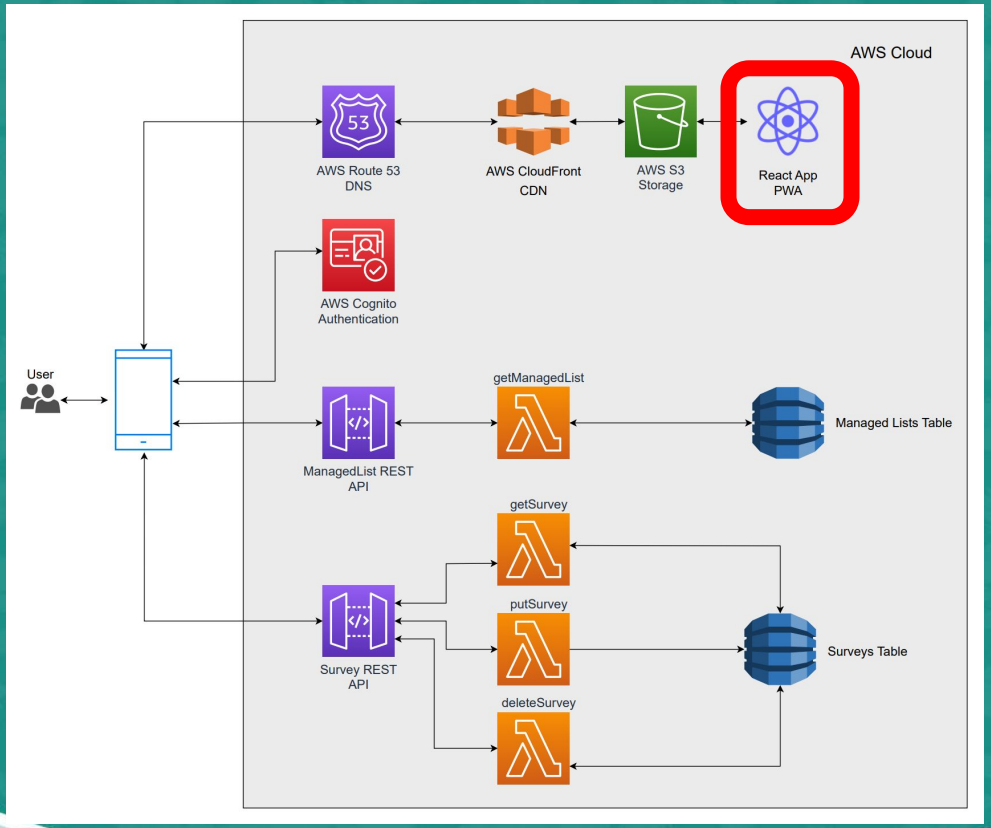
# Implementation




- Frontend: React PWA
- IndexedDB for client-side storage
- Four contexts (State Mgmt)
  - Authorization
  - Settings
  - List
  - Survey

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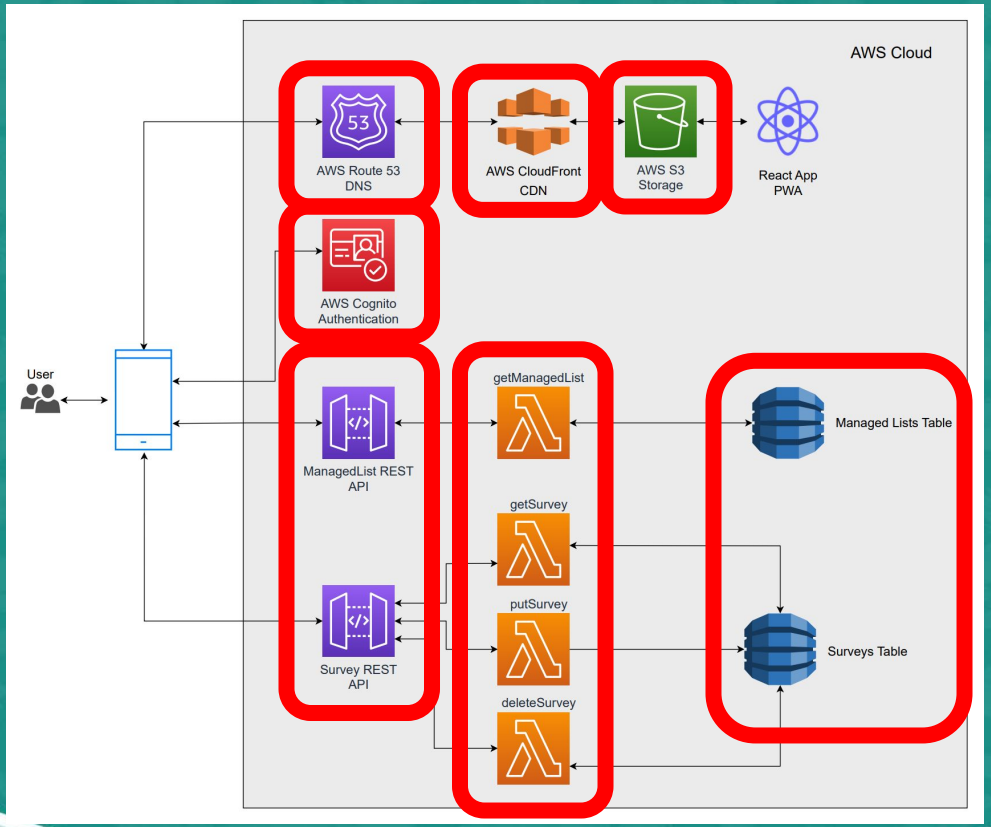
# Implementation




- AWS Backend:
  - S3 (Storage)
  - CloudFront (CDN)
  - Route53 (DNS)
  - Cognito (Authentication)
  - API Gateway (API)
  - Lambda (Compute)
  - DynamoDB (Data store)

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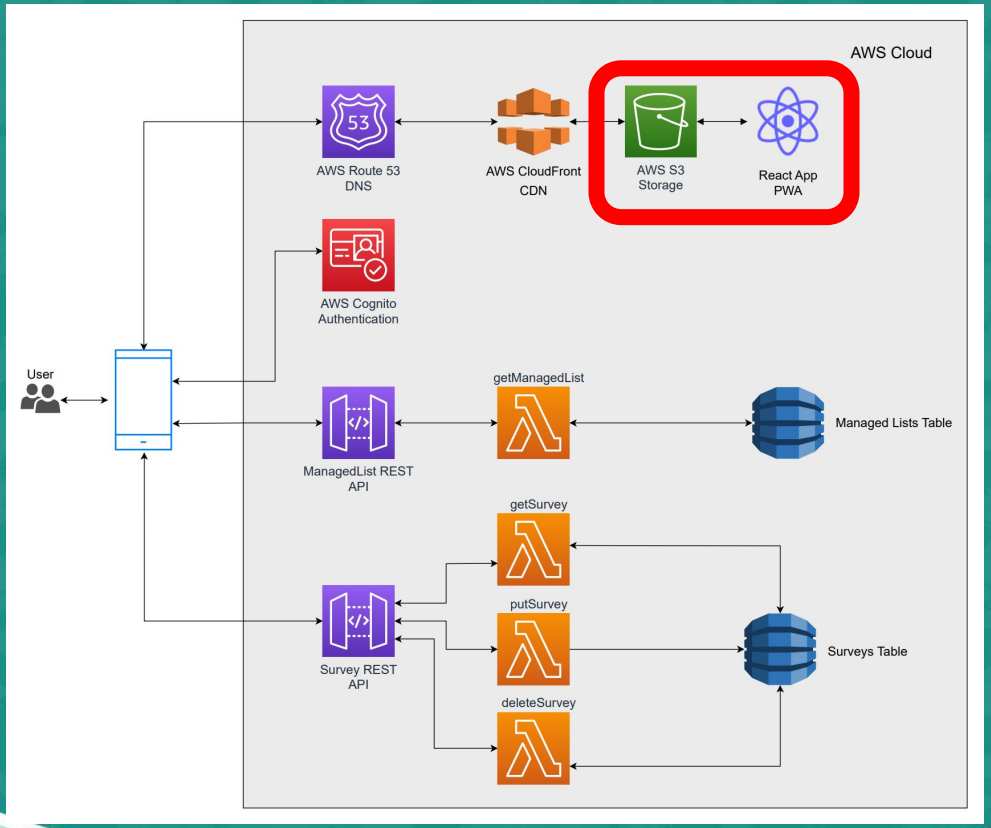
# Implementation




- React PWA stored in an AWS S3 bucket

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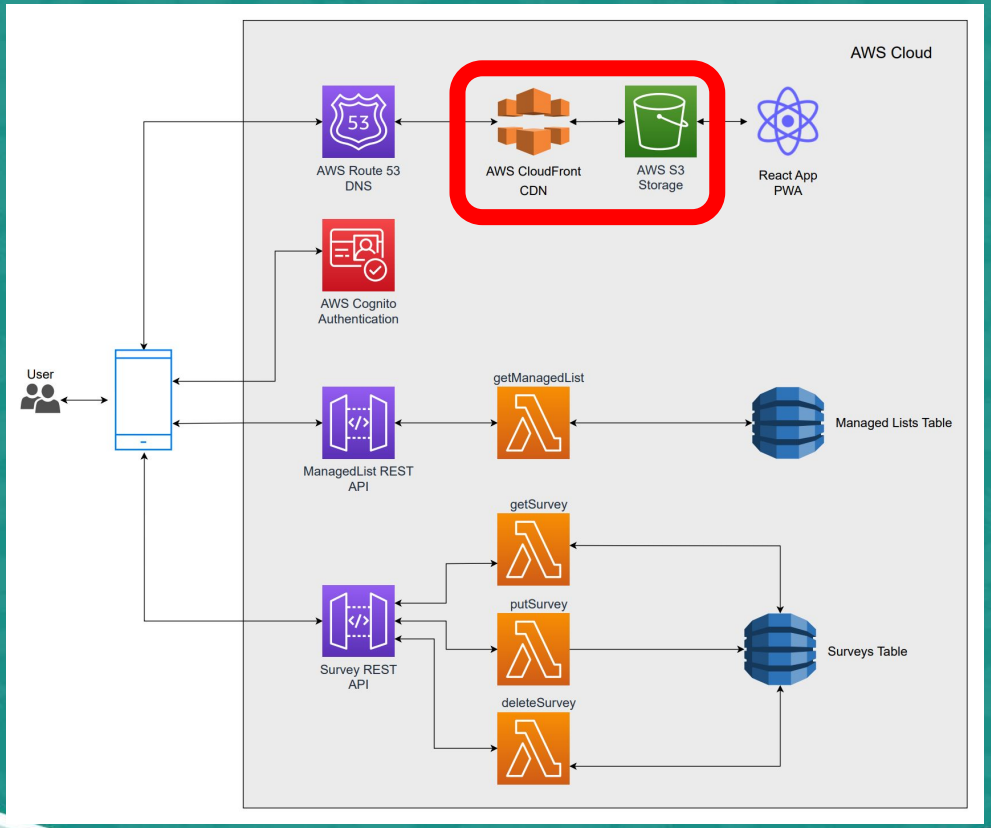
# Implementation




- Contents of the S3 bucket shared to the AWS CloudFront Content Delivery Network

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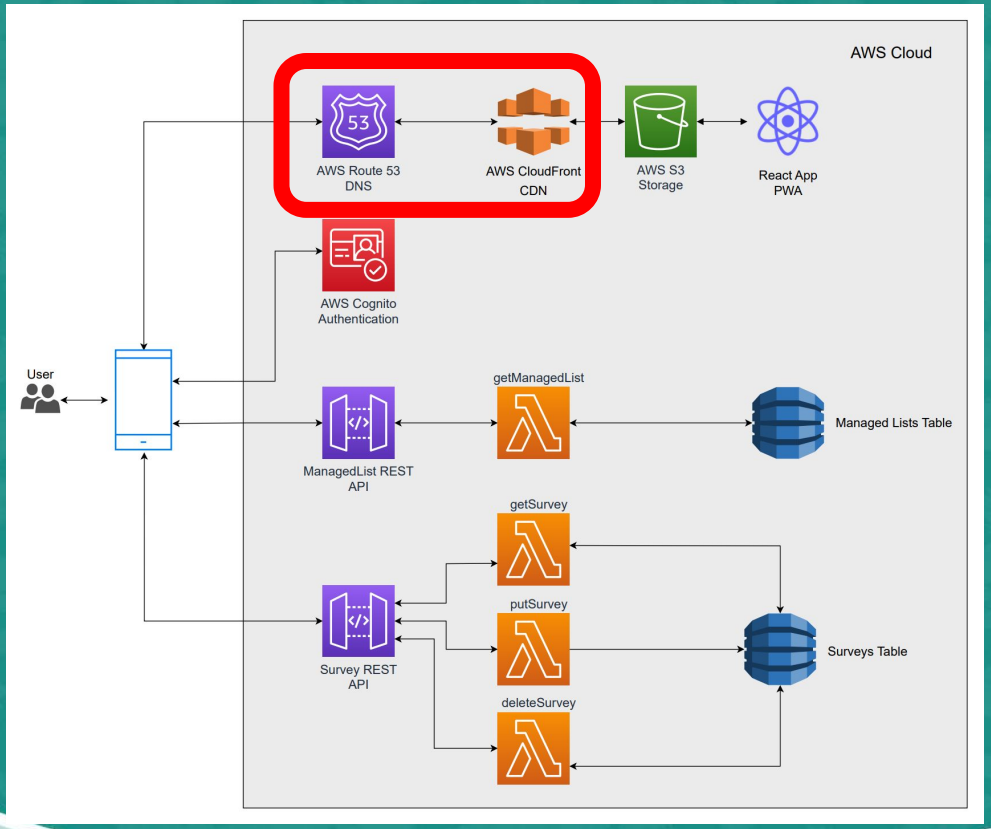
# Implementation




- AWS Route 53 routes traffic directed to www.unifiedbutterflyrecorder.com to the CloudFront distribution

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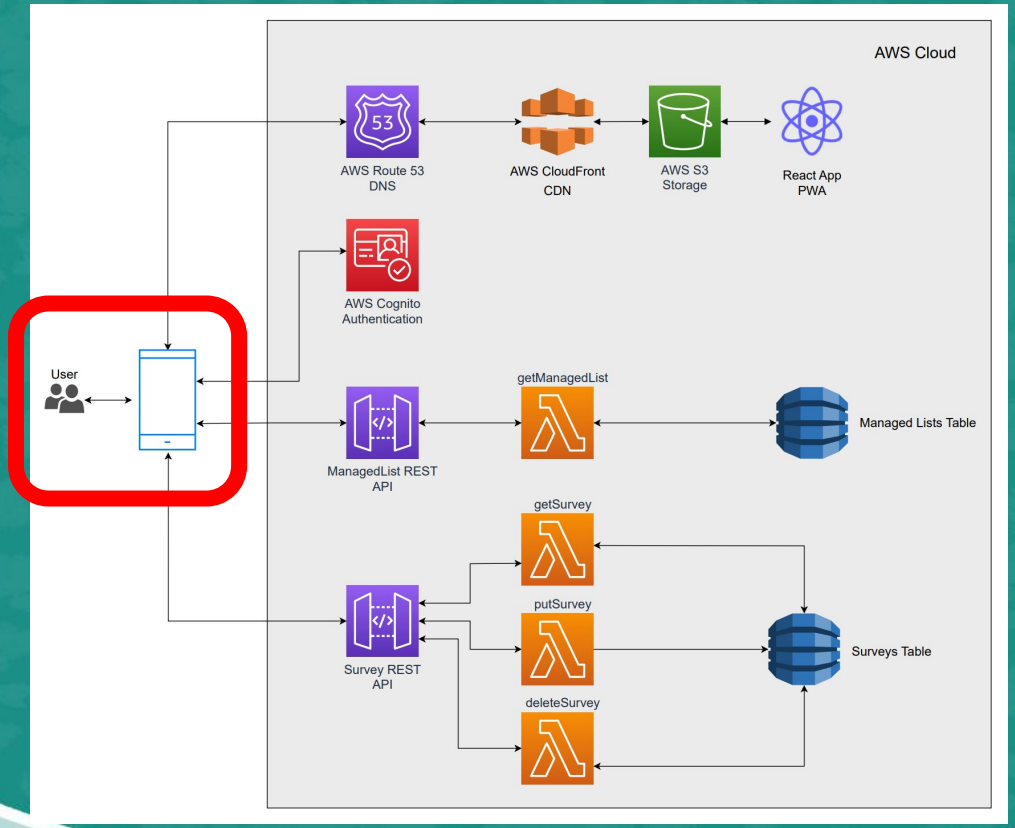
# Implementation




- User accesses UBR using a mobile device and a web browser.
- Application can be installed to mobile device.

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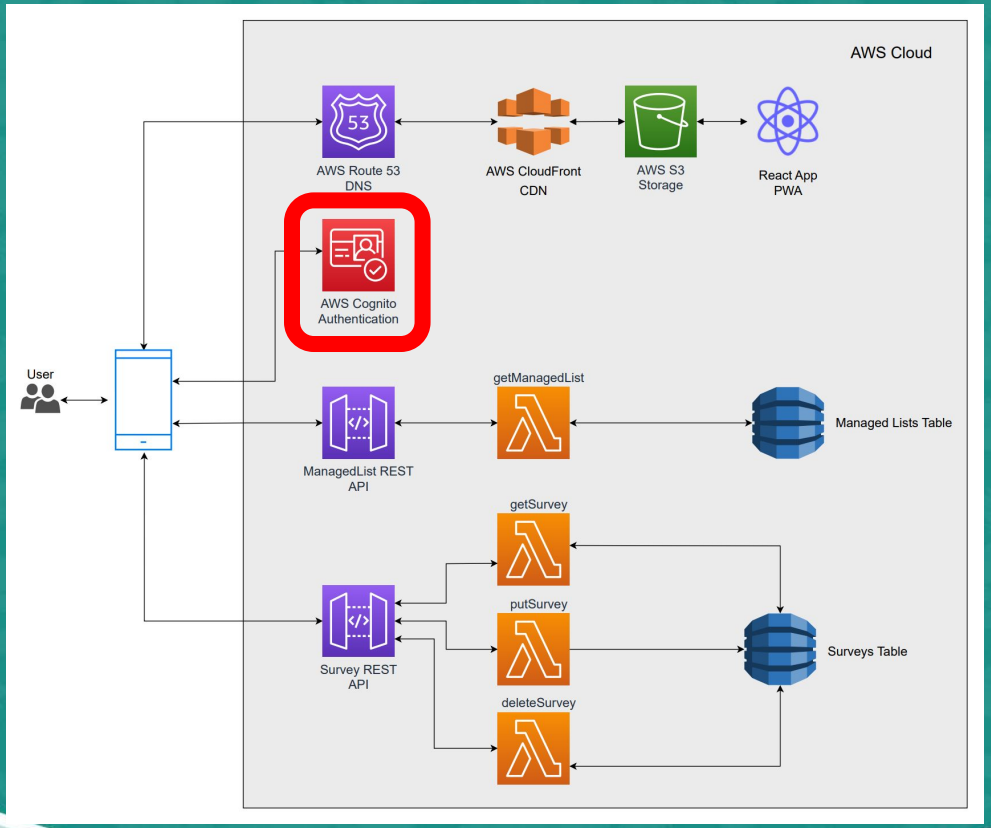
# Implementation




- Upon reaching the application, the user must be authenticated.
- AWS Cognito provides authentication, authorization, and user management.

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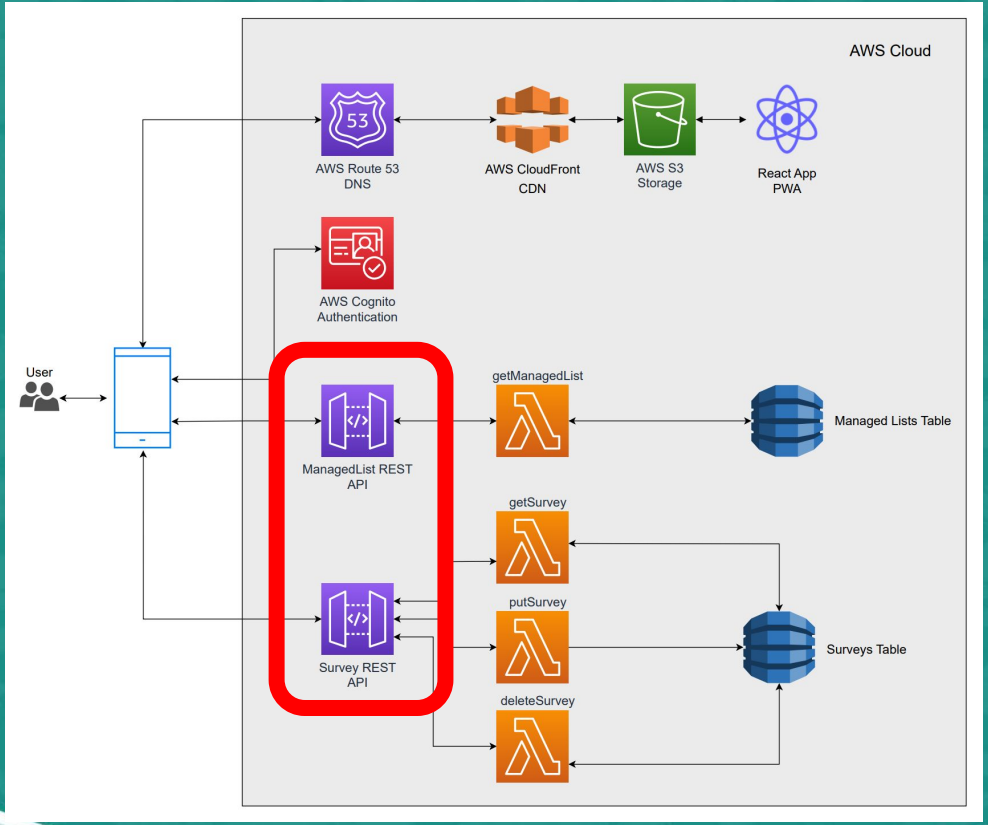
# Implementation




- UBR has 2 REST API's between our front end and the backend:
  - Managed List (Butterfly lists)
  - Survey (User generated surveys)

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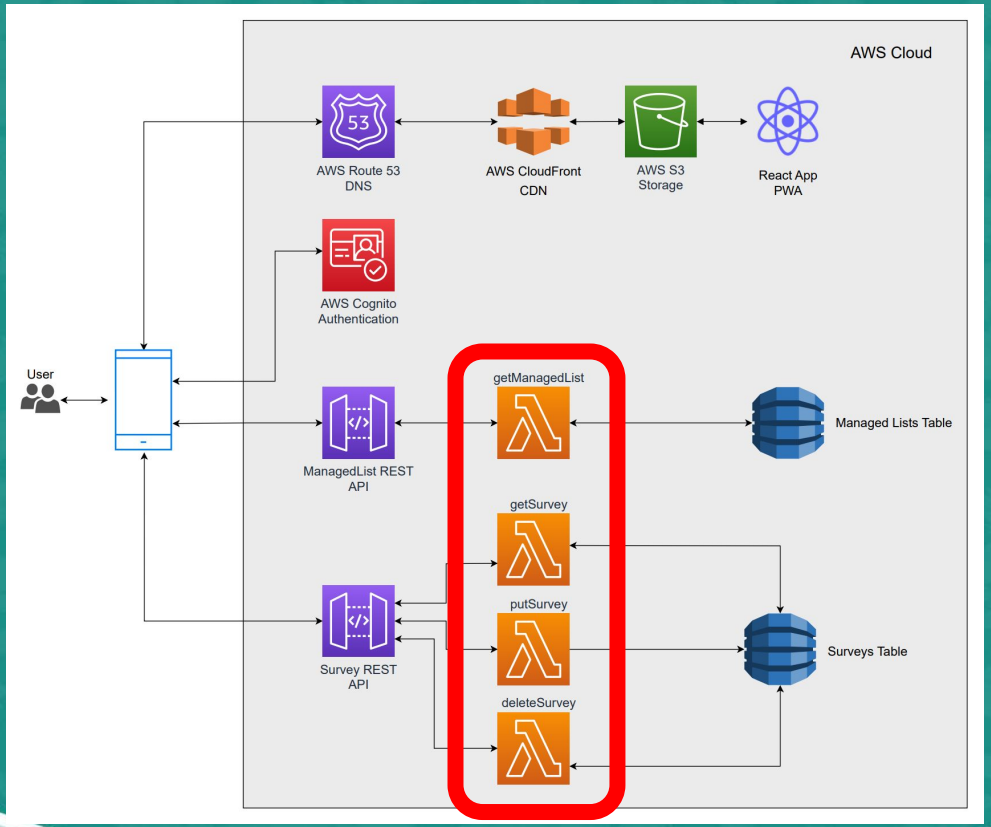
# Implementation




- UBR has 4 Lambda functions to perform backend logic

- GET on the List table
- CRUD on the Survey table

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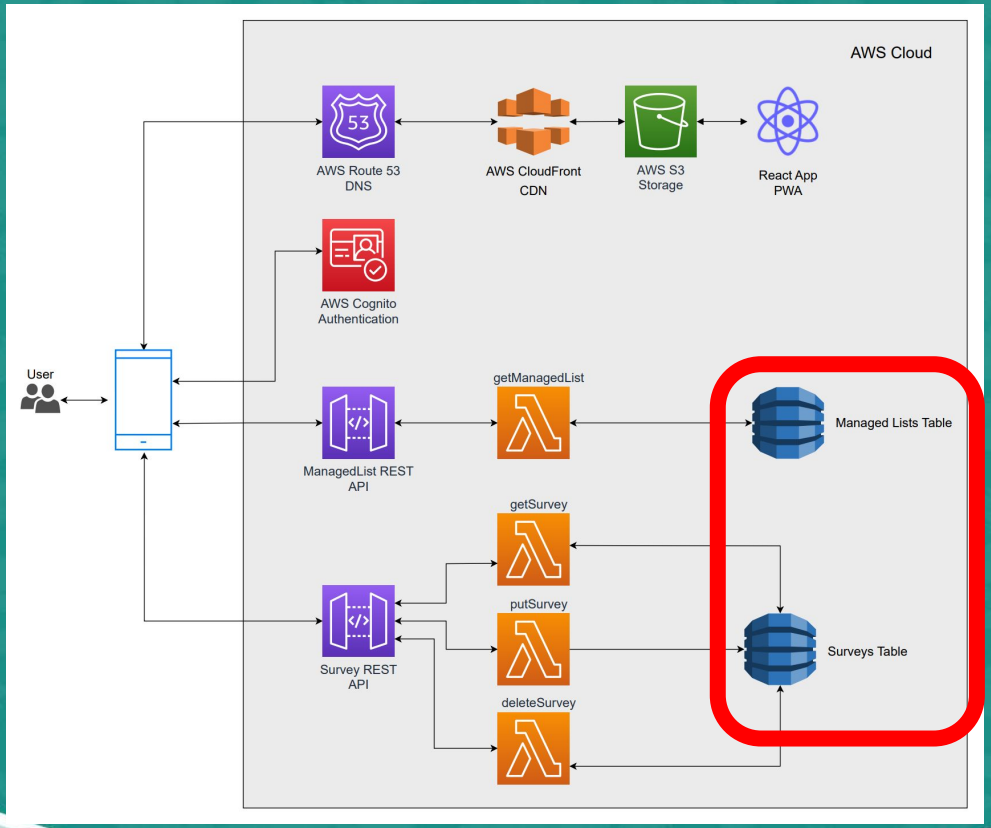
# Implementation




- UBR has 2 database tables
- Managed Lists
  - Reiman Gardens / client managed
- Survey
  - For all survey-related data

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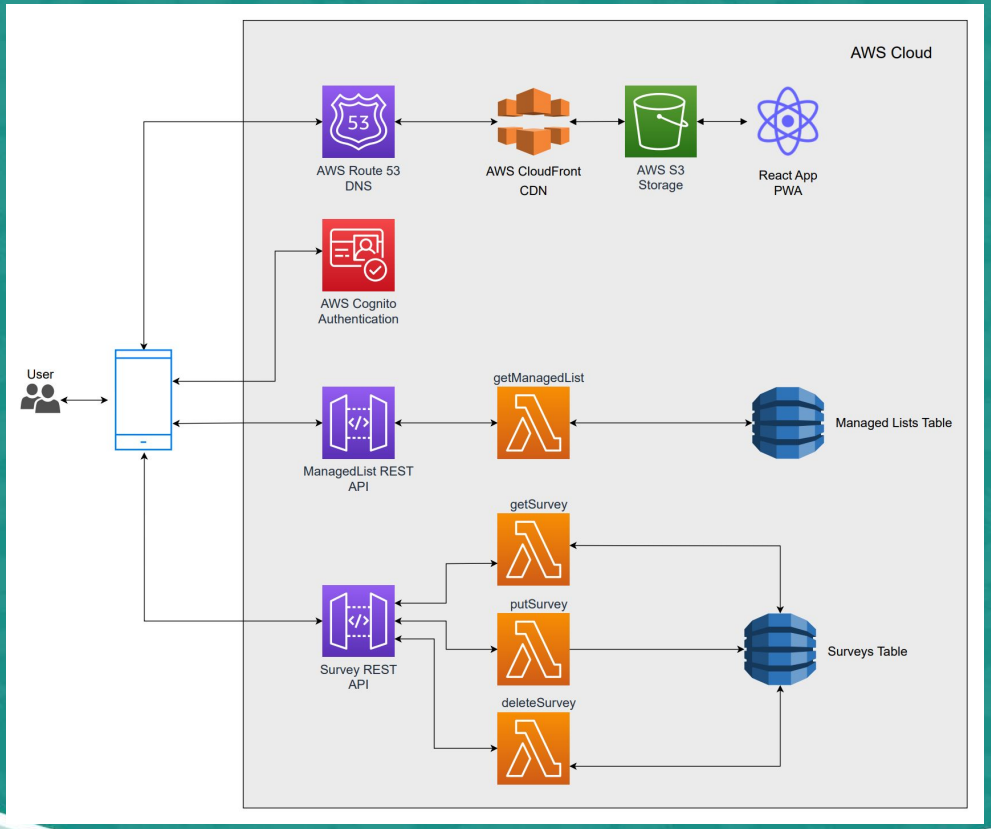
# Implementation




## Overview:

- All resources are serverless and event-driven, i.e. they only run when a user is actively using them
- Architecture is secure and scalable
- Built to be easy to maintain

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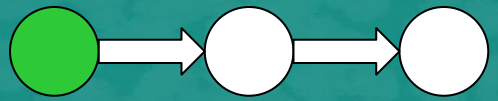
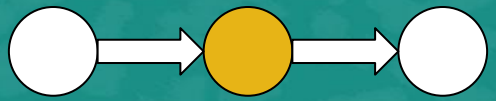
# General Use-Case

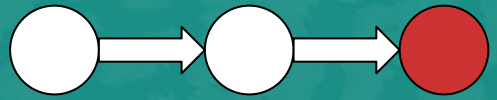
**Before Survey**:
Configure & Create Survey



**Mid-Survey**:
Record Butterfly Sightings



**After Survey**:
View & Download Survey Data



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# Work Accomplishments

UBR

Email

Password

Login

Sign-up

Forgot Password

Register

Username

Email

Password

Your password must be at least 6 characters in length and include at least one lowercase, uppercase, and a number.

Confirm Password

Sign up

Login?

Forgot password

Email:

Reset My Password

Login

Sign-up

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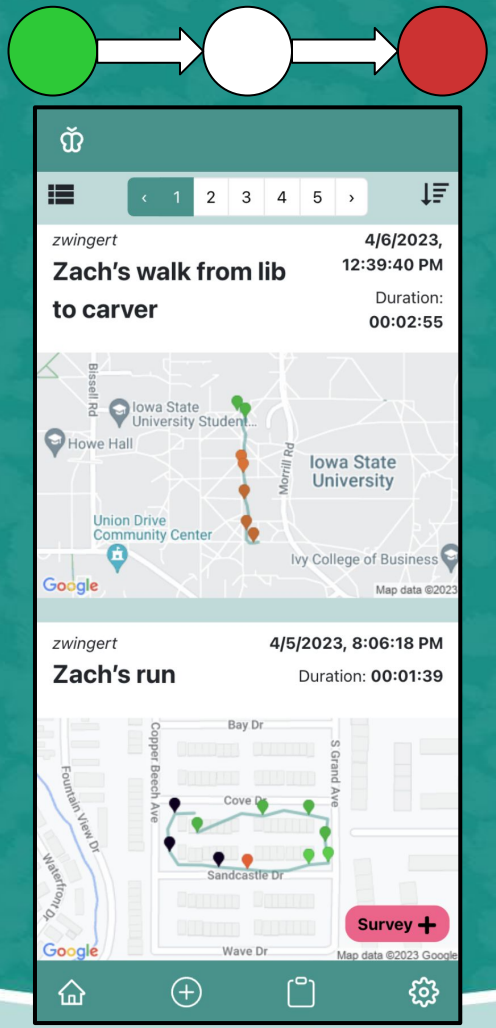
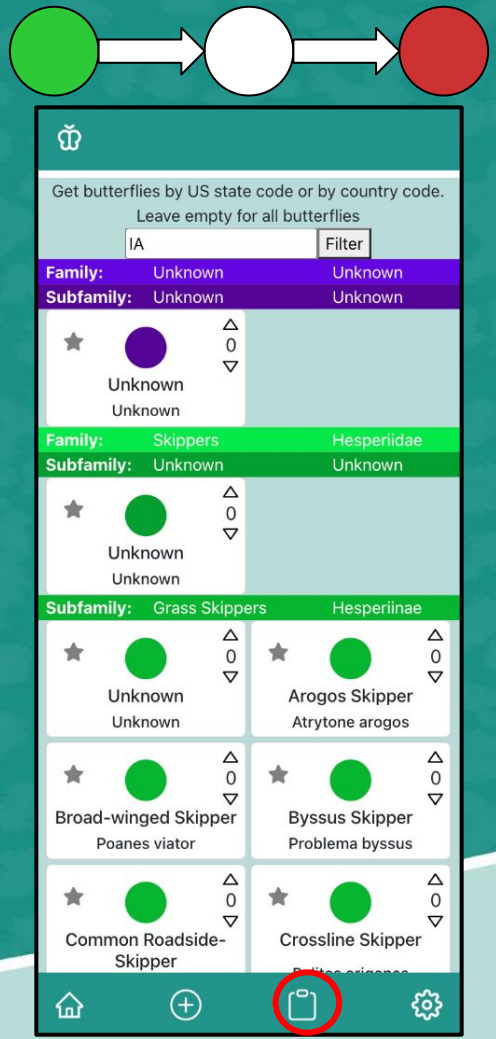

‹ 1 2 3 4 5 ›
zwingert
4/6/2023, 12:39:40 PM
Zach's walk from lib to carver
Duration: 00:02:55
Bissell Rd
Iowa State University Student...
Howe Hall
Morrill Rd
Iowa State University
Union Drive Community Center
Ivy College of Business
Google
Map data ©2023
zwingert
4/5/2023, 8:06:18 PM
Zach's run
Duration: 00:01:39
Bay Dr
Copper Beech Ave
S Grand Ave
Fountain View Dr
Cove Dr
Waterfront Dr
Sandcastle Dr
Wave Dr
Survey +
Google
Map data ©2023 Google


Get butterflies by US state code or by country code.
Leave empty for all butterflies
IA
Filter
Family: Unknown Unknown
Subfamily: Unknown Unknown
Unknown
Unknown
Family: Skippers Hesperiidae
Subfamily: Unknown Unknown
Unknown
Unknown
Subfamily: Grass Skippers Hesperiinae
Unknown
Unknown
Arogos Skipper
Atrytone arogos
Broad-winged Skipper
Poanes viator
Byssus Skipper
Problema byssus
Common Roadside-Skipper
Crossline Skipper

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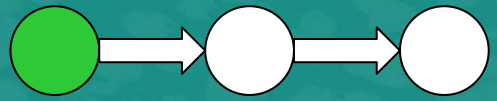

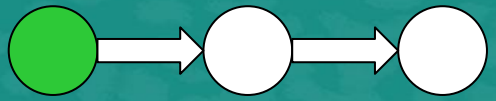

## User Preferences

Hello jeremy

Sign Out

Default Survey Name

Jeremy's Survey

Default Surveyor Name

Jeremy

Default Surveyor Type

Pollard

Default Transect Division Format

Habitat

Default Location

Iowa

Temp Preference

Fahrenheit

Section Type

Numeric

Survey Name *

Jeremy's Survey

Survey Type *

Pollard

Section Type *

Numeric

Number of Sections *

2

Transect division format *

Habitat

Number of Surveyors *

1

Names of Surveyors *

Jeremy

Location *

Iowa

Start Survey

Habitat Condition

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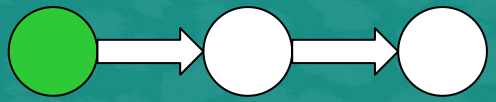


Location *

Iowa

Habitat Condition

Wind Speed (mph) *

5

Cloud Cover *

15

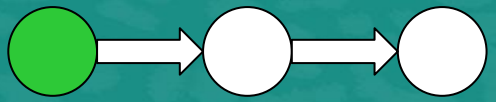
Temperature (F) *

75

Comments

| | |
|---|---|
| Habitat 1 | Water |
| Habitat 2 | Prarie |

Start Survey



Wind Speed (mph) *

5

Cloud Cover *

15

Temperature (F) *

75

Comments

| | |
|---|---|
| Habitat 1 | Water |
| Habitat 2 | Prarie |
| Habitat 3 | Prarie |
| Habitat 4 | Grassland |
| Habitat 5 | Prarie |

Start Survey

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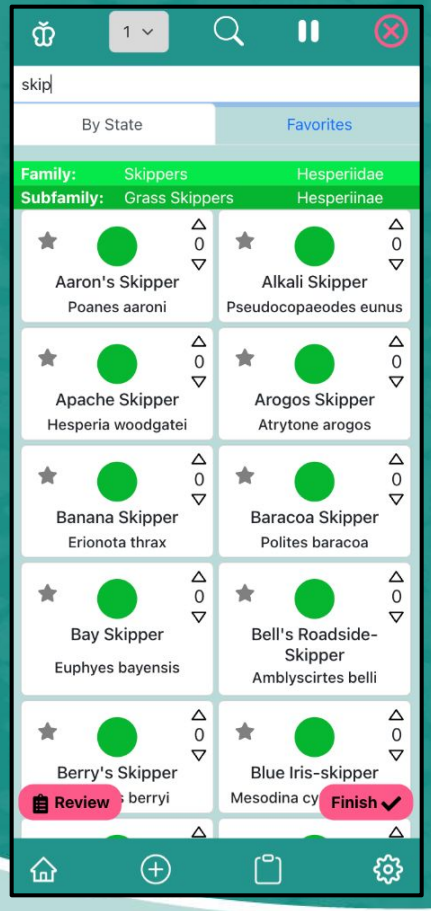
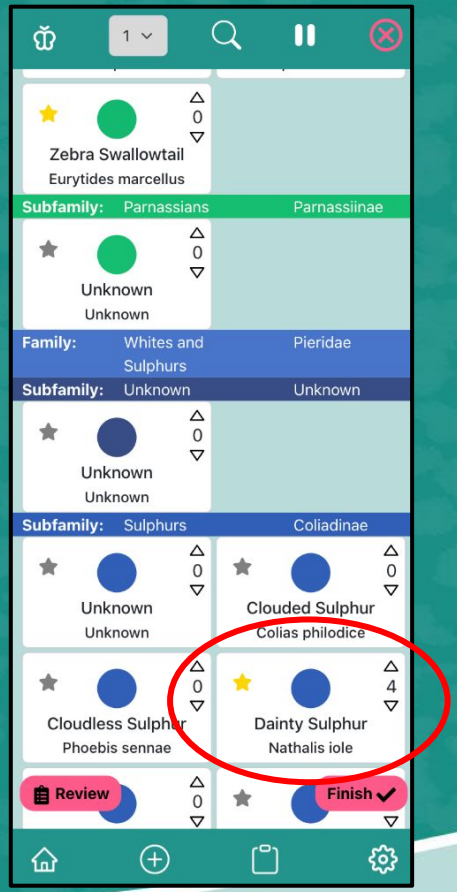

1
skip
By State
Favorites
Family: Skippers Hesperiidae
Subfamily: Grass Skippers Hesperiinae
Aaron's Skipper
Poanes aaroni
Alkali Skipper
Pseudocopaeodes eunus
Apache Skipper
Hesperia woodgatei
Arogos Skipper
Atrytone arogos
Banana Skipper
Erionota thrax
Baracoa Skipper
Polites baracoa
Bay Skipper
Euphyes bayensis
Bell's Roadside-Skipper
Amblyscirtes belli
Berry's Skipper
Blue Iris-skipper
Review
Finish


1
Zebra Swallowtail
Eurytides marcellus
Subfamily: Parnassians Parnassiinae
Unknown
Unknown
Family: Whites and Sulphurs Pieridae
Subfamily: Unknown Unknown
Unknown
Unknown
Subfamily: Sulphurs Coliadinae
Unknown
Unknown
Clouded Sulphur
Colias philodice
Cloudless Sulphur
Phoebis sennae
Dainty Sulphur
Nathalis iole
Review
Finish

2
By State
Favorites
Family: Unknown Unknown
Subfamily: Unknown Unknown
Family: Skippers Hesperiidae
Subfamily: Unknown Unknown
Subfamily: Grass Skippers Coeliadinae
Subfamily: Grass Skippers Hesperiinae
Byssus Skipper
Problema byssus
Delaware Skipper
Anatrytone logan
Subfamily: Skipperlings Heteropterinae
Subfamily: Giant-Skippers Megathyminae
Subfamily: Spread-wing Skippers Pyrginae
Common Checkered-Skipper
Pyrgus communis
Juvenal's Duskywing
Erynnis juvenalis
Subfamily: Firetips Pyrrhopyginae
Subfamily: Grass Skippers Trapezitinae
Family: Gossamer-wing Butterflies Lycaenidae
Subfamily: Unknown Unknown
Subfamily: Sunbeams Curetinae
Subfamily: Coppers Lycaeninae
Review
Finish

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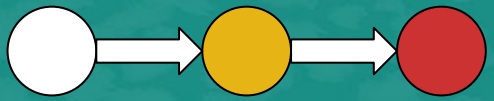


Overview | Sightings

**Silver-spotted Skipper** — Skippers / Spread-wing Skippers — **Epargyreus clarus** — 3

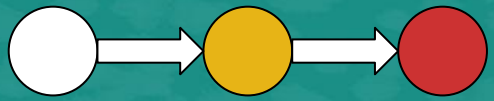
**Dainty Sulphur** — Whites and Sulphurs / Sulphurs — **Nathalis iole** — 4

**Unknown** — Skippers / Grass Skippers — **Unknown** — 2

**Peck's Skipper** — Skippers / Grass Skippers — **Polites peckius** — 1

**Gray Copper** — Gossamer-wing Butterflies / Coppers — **Lycaena dione** — 3

**Coral Hairstreak** — Gossamer-wing Butterflies / Hairstreaks — 1



2

**Dainty Sulphur** — Whites and Sulphurs / Sulphurs — **Nathalis iole** — 4

Dainty Sulphur

Number Seen: 4

Time Seen:

4/27/2023, 10:18:34 AM

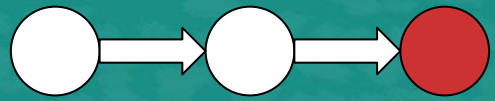
Section:

1

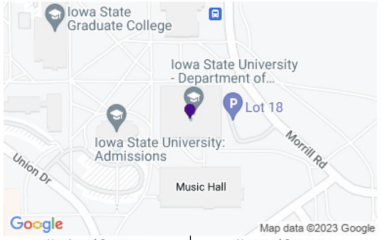
Comments:

Picture?

Submit Changes



Survey in Carver




| Number of Surveyors | Names of Surveyors |
|---|---|
| 1 | Zach |
| **Locations Name** | **Total Survey Time (H:M:S)** |
| IA | 00:00:36 |
| **Habitat Type** | **Habitat Condition** |
| | Classroom |
| **Cloud Cover** | **Wind Speed (mph)** |
| 0 | 7.2 |
| **Temperature (F)** | **Viewing Radius (meters)** |
| 71.10 | DUMMY DATA |
| **Level of Engagement (1 is low)** | **Comments** |
| DUMMY DATA | |

DOWNLOAD Survey Info CSV | DOWNLOAD Sightings CSV | DOWNLOAD Breadcrumbs CSV

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# Key Contributions

**Timothy Ellis - Frontend**

- Butterfly counter cards
- Family and subfamily organization
- Cancel and Finish dialogs
- Real time Timer
- Pause and continue survey

**Grace Wigen - Frontend**

- Favourites system
- Butterfly list page
- Automatic butterfly color assignment

**Ryan McNally - Backend**

- Survey Context/Persistent Data
- User Preferences
- Settings
- Local storage (default values)
- Incidental survey

**Anthony Mazzie - Backend**

- AWS CDK Infrastructure as Code for:
  - Database
  - Api's
  - Lambda's
  - DNS
  - CDN
  - S3 Storage
  - Cognito Authentication
- CI/CD
- Survey data download to CSV
- Frontend login/signup/forgot password

**Lucas Onwu-Chekwa - Frontend**

- Butterfly counter
- Edit survey (survey data and sighting details)
- Home page previous survey display
- Survey preview
- Active survey Search

**Zach Wingert - Frontend**

- Maps
- Real time Weather api
- Pagination on homepage

**Jeremy Marchesani - Frontend**

- Active survey data flow
- Top nav bar
- Survey Context/Persistent Data

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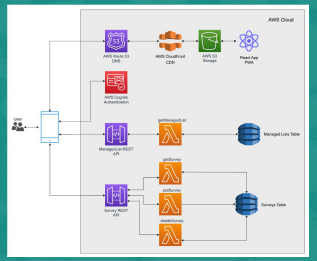
## Survey data download to CSV

- Anthony Mazzie



## Backend and Infrastructure

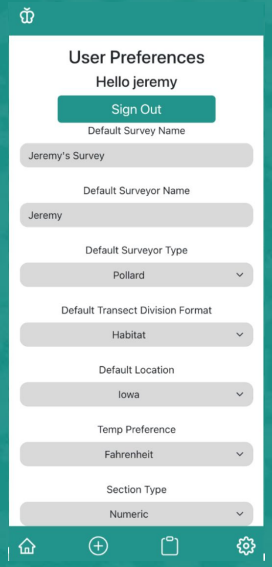
- Anthony Mazzie

## Maps

- Zach Wingert

## Butterfly Counter

- Timothy Ellis




## Settings page

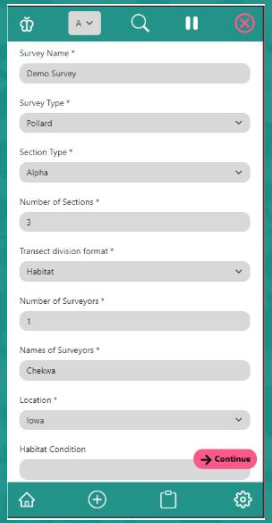
- Ryan McNally

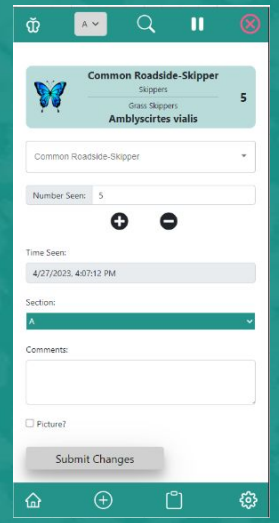
## Favorites & coloring system

- Grace Wigen

## Top Nav Bar

- Jeremy Marchesani




## Edit Active survey

- Lucas Onwu-Chekwa

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# Testing

- User testing
- GitLab Pipeline for CI/CD
- AWS CDK tests

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# Challenges & Solutions

?

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# Challenges & Solutions

## IndexedDB API

IndexedDB is a low-level API for client-side storage of significant amounts of structured data, including files/blobs. This API uses indexes to enable high-performance searches of this data. While Web Storage is useful for storing smaller amounts of data, it is less useful for storing larger amounts of structured data. IndexedDB provides a solution. This is the main landing page for MDN's IndexedDB coverage — here we provide links to the full API reference and usage guides, browser support details, and some explanation of key concepts.

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# Challenges & Solutions

## IDB-Keyval

npm v6.2.0

This is a super-simple promise-based keyval store implemented with IndexedDB, originally based on async-storage by Mozilla.

It's small and tree-shakeable. If you only use get/set, the library is ~250 bytes (brotli'd), if you use all methods it's ~534 bytes.

localForage offers similar functionality, but supports older browsers with broken/absent IDB implementations. Because of that, it's orders of magnitude bigger (~7k).

This is only a keyval store. If you need to do more complex things like iteration & indexing, check out IDB on NPM (a little heavier at 1k). The first example in its README is how to create a keyval store.

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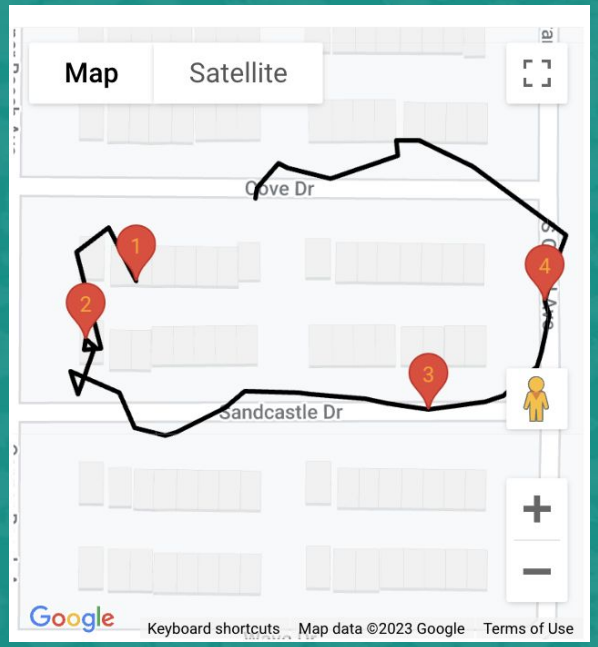
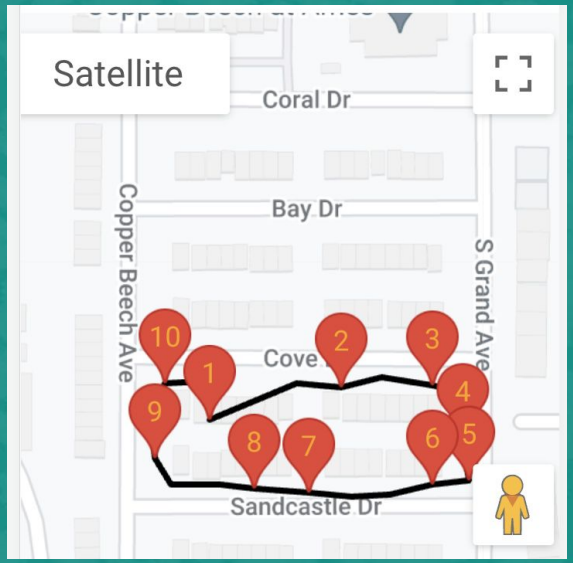
# Challenges & Solutions




< Before optimization

After optimization >

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# Challenges & Solutions

PollardBase

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# Future Work

- PollardBase integration
- Pictures
- User Custom Lists

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# Conclusion

- We learned so much from this project
  - Interacting with a client
  - Managing a product
- UBR will be used across the United States
- We are super proud of the product we have come up with

Questions?

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